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The collection of shop kinks in the current issue contains the first and second prize awards in the January competition. The first prize, of $50, was awarded to F. C. Pickard, assistant master mechanic of the Cincinnati, Hamilton & Dayton; Indianapolis shops. The second prize, of $25, was awarded to W. H. Snyder, assistant general foreman of the New York, Susquehanna & Western; Stroudsburg shops. We wish to extend our hearty congratulations to these gentlemen for their work, and to say, as we have said to them personally, that they are performing a real service to a very large number of mechanical men in placing before them these devices for producing shop efficiency. Our next competition will close February 7. As before, we are offering a first prize of $50 and a second prize of $25 for the best collection of shop kinks, each prize to be awarded on the basis of a collection of not less than three nor more than five kinks, although competitors are advised to submit a larger number, so that the judges will have range for selection. Competitors are urged to make their descriptions full; the editors of the *Railway Age Gazette* have had to do a good deal of work in making clear some of the devices shown in this issue.

The duty on oranges and lemons has been increased, and the statement has been quite generally made in the press that the railways have so increased their rates as to deprive the grower of all the advantage from the duty. The facts in the case are as follows: There has been no change proposed in the freight rates on oranges and lemons grown in Florida. The rates from California to points west of Chicago will be unchanged, but it is proposed to advance the rate on November 1 by the sum of 15 cents per 100 lbs. from California to Chicago and all eastern points. Now, the advance in the rate of duty is from $1.00 per 100 lbs. to $1.50 per 100 lbs.—from six to ten times the proposed increase in railway rates. Up to 1901 the rail rate was $1.25 per 100 lbs. The fruit industry at that time was not at all prosperous and the railways reduced the rate to $1.00 per 100 lbs., with the thought that as soon as the industry was on its feet the rate could be advanced. This rate has been continued up to the present time, and it will be noted that the proposed advance does not reach the old rate. If the increase in duty has anything to do with the increase in freight rates, the railways are not, by any means, getting the lion's share.

THE IMPORTANCE OF THE MECHANICAL ENGINEER.

The Hudson-Fulton celebration, following so quickly after the remarkable performances of flying machines in France, brings to mind in the most forcible manner what the mechanic and the mechanical engineer have done for transportation. It has been just one hundred years since the mechanic first turned his attention to this problem, and during that period all the large problems connected with it have been solved. He has developed means for transportation on the water and under the water, on land and in the air. The work of Fulton and Stephenson has had a greater influence on the spread of civilization, and perhaps modified our methods of living more than all other influences combined. It is too early yet to predict what will be the effect of that of the Wright brothers.

We have before us the diary of a man who, in 1830, went from the vicinity of Boston to Tuscaloosa, Alabama, "in the marvelously short time of three weeks," which he adds was "little short of flying." Can we conceive what effect a return to such methods of transportation would have on modern life? No other evidence, however, is needed to prove that the mechanic and the mechanical engineer are dominant forces in modern life, and the question of how to use them to the best advantage becomes one of great importance. That the community to-day is not getting from the mechanical eengineer all it could, and should, is all too evident; but how to make his influence more thoroughly felt is not as clear. Perhaps the first step in this direction is to make the public appreciate more thoroughly what he has already done, and that he is every day solving for their benefit problems of which they have never heard.

The only engineer most people know anything about is the locomotive engineer, and it was no exaggeration when John Fritz said, a few years ago, that the average man pictured a mechanical engineer as having a bunch of waste in one hand and an oil can in the other. Perhaps this general conception has had something to do with the difficulty the mechanical engineer has in making himself heard. When the public in general realizes that his principal tools are not bunches of waste and oil cans, but science and mathematics, he will have a better chance to do his work properly. In most industrial enterprises the work of the mechanical engineer is not directly revenue producing, but of a preliminary or auxiliary nature. Hence the financial man, who usually has eyes only for actual income and expenditure, is all too apt to cut off auxiliary expense when his income is diminished, thereby hampering the engineer and making the whole organization less efficient.

It is a notorious fact that the motive power department of a railway most often has to suffer when the income is a little short, because this does not at once affect the income. In the long run, however, there is no department in which false economy may have such a bad effect as in the motive power

department. As a matter of fact, increased efficiency in this department will usually result in increased efficiency over the whole line. But difficulty of proving this to the man who does not recognize efficient operation of a machine when he sees it is so great that it is not often even attempted, and the superintendent of motive power takes what he can get and is thankful.

EFFICIENCY OF OPERATION.

The recent furor in the magazines about the attempt of an alleged trust to get control of the water powers of the country had little direct importance. Indirectly, it was a striking testimonial to the work of the mechanical engineer. The power of the waterfall is of no value unless the engineer harnesses it to his turbines and directs its application. The power lying dormant in the great deposits of coal became available only when the mechanic made the steam engine, which, in its various forms, does the work of thousands of men and horses in every corner of the earth. It is impossible to form an estimate of what the steam engine means to modern life, but the part it plays may be hinted at by a consideration of the fact that the millions of dollars spent in railways are spent simply to enable us to utilize efficiently the power of the locomotive.

The cost of the road, however, is so much greater than that of the locomotives that the latter are often not given as much consideration by those financially responsible as they are entitled to. Naturally the items needing the largest expenditures receive most attention from the financial heads, with the result that the needs of the locomotives themselves are sometimes neglected. The man that has the authority to spend the money does not realize the importance of these needs. When it comes to the maintenance and repair of locomotives, or indeed of any kind of machinery, it is the mechanical engineer who knows what he needs and when he needs it. This knowledge, however, is not sufficient; he must study the problems of labor and management in order to utilize it properly. As railways are now managed, the superintendent of motive power is often obliged to take for materials what the purchasing agent or storekeeper will give him; and do what he will, he is often compelled to run his department inefficiently, in accordance with the ideas of those who are in control of the finances. This condition can only be modified when he has proved his ability as a manager. As the head of large repair shops, the superintendent of motive power should be able to do work as cheaply as the average manufacturing company does similar work, but he is notoriously unable to do so. Why this is so interests him quite as much as others.

It is absurd to suggest that the average superintendent of motive power is less capable, or less conscientious, than his associate doing similar work in other lines, and the cause must be sought not so much in the man doing the work, but in the conditions under which it is being done and the methods he is forced to employ. His large problem is how to free himself of the hampering conditions by which he is surrounded, and to put himself on a plane where he will have the same opportunity for efficient work that the superintendent of manufacture usually has. In ordinary manufacture the superintendent specifies what the purchasing agent shall buy, and what the storekeeper shall keep in stock. If the superintendent of motive power will keep such records as will show the financial management the savings he could make by having the same privilege it would be but a short time before he could get it.

Again, moreover, in spite of the fact that the work of a machine shop clerk is much more difficult than the clerical work of the auditor's office, the shop clerk is seldom allowed as much money as the office clerk. The shop clerk is looked upon by the auditing department as an unnecessary expense. There was a day when the auditor regarded a draftsman in a similar light. To-day, good draftsmen are essential to economical manufacture, and it will not be long before good shop clerks will be considered just as important. This change will take place as soon as the idea of cutting expenses gives way to the idea of efficiency. There is no objection to large expense if you get correspondingly large returns. In fact, large expenses are necessary to large returns, and when the management of large corporations, and railways in particular, begin to concentrate attention on efficiency rather than expense, the mechanical engineers will be listened to more attentively.

SHOP KINKS AND SHOP EFFICIENCY.

If everything mechanical had been developed to the point where improvement was impossible, and if everybody understood and adopted the best practice, then there would be no such thing as a shop kink, and individual effort would have no place. With the present mechanical and mental equipment of the world, however, the shop kink has a very important place in the economy of shop operation. The shop kink is usually understood to be a home-made piece of mechanism or appliance for performing some piece of work in a cheaper and more expeditious manner than would be possible with the ordinary machine tools—store tools, as a countryman might say. Where these kinks have been adapted to their purpose with skill they have outgrown the limitations of their original environment and have been taken into the great family of machine tools, so that the market is filled with appliances that started originally as kinks and then received extensive recognition of their value. For example, it is not so very many years ago that a master mechanic was showing, with great pride, a kink consisting of a cylinder and piston with its rod that, by means of compressed air, was used to lift work on and off a planer. A discarded Westinghouse brake pump served to supply the air, and the master mechanic was jubilant at the idea of thus saving the services of a helper.

The idea caught, and compressed air as a means of hoisting was taken from among the "kinks" and put on the basis of established practice. So with many other devices, such as the swinging link grinder, the pressure for putting couplings in air-brake hose, the presses for brasses and the like, through a range so wide that to catalogue it would be to write a book.

The source of the kink may be a suggestion remote from the purpose. It may come to the workman, the foreman or the superintendent, but its aim is always to increase the efficiency of the workman and enlarge his output. The kink often comes from the dire necessity of making bricks without straw. The management insists upon reduction of unit costs, and, at the same time, calmly refuses an appropriation for better tools by which that reduction can be brought about. So the foreman or the workman schemes, and, searching in the scrap, he pulls out an old cylinder here, and a frame there, and a rusty lever from another place. Then he puts them together and produces a kink that cuts up scrap, or shears staybolts, or does some other thing which reduces time expenditure from hours to minutes, and his road reaps the benefit, with all too little thanks to the originator.

Unfortunately, this is too often a state of affairs that reacts directly upon the man who encourages it. We all like to receive the credit for our achievements, and some of us are willing occasionally to appropriate that belonging to others as well. Yet the "boss" who does this is striking a hard blow against the loyalty of his men, whereas the spirit of giving credit will be repaid a hundred-fold. Take two instances, to point the moral: On a certain western road there was a superintendent, ignorant, selfish, domineering, promoted from engineer, of small ability, whose sole hold on his position lay

in his power to convince the manager of his great ability. He constantly showed the manager some new wonder of his originating. His method was practical and direct; he simply appropriated everything that was done as his own, and was cordially hated accordingly. Every man on the road "had it in for him," and finally a new management "saw," and he was dropped over night and his railway career was at an end. Meanwhile, it was a common saying, "Oh, there's no use getting up anything new here, ———— will only take it." The road suffered and the administration of the man dropped far below the point of efficiency that it might have reached by exercise of ordinary fairness.

In contrast, there was once a superintendent of motive power who was keenly alert to anything and everything that would cut down cost and add to shop efficiency. He would give every promising device a trial, and then help the man who got it up to patent and exploit it, and he made it his custom to call attention to these kinks, and add that John Jones did this or Tom Murphy that. Consequently, his shops swarmed with kinks, designed by all sorts and conditions of men, and costs were correspondingly low, while the superintendent was supported by the greatest loyalty and devotion from all who came in contact with him.

In a word, this simple matter of giving credit where it is due has an effect on shop costs that is literally incalculable, because the loss in the absence of it can never be known.

This principle shows another danger which is incurred when the uninformed criticize shop management and efficiency. It is an easy matter to find fault, but it is unsafe to do so until all the conditions of operation are known, when it will usually be found to be far more difficult to suggest improvements than at first appears. There are always local conditions that have to be taken into consideration, and it is apt to be the local condition that produces the kink and enhances its value.

At first the improvement may be a slight change in design that lessens the work of finishing without taking away from effectiveness; this leads to another and another until the whole method of manufacture has been changed.

Take as a simple example the design of crosshead slides. We had, at one time, an elaborate system of slippers and wedges and adjusting bolts. The bolts and wedges gave way to the plain flat slipper, to be renewed when worn out; then the slipper was babbitted to save it; then the crosshead was babbitted and planed to size to save the cost of the slipper and the fitting incident thereto, and finally the planing has been done away with and the crosshead is babbitted to size. Every step was a kink, and every one saved money to the railway—a sum which, if multiplied by all the crossheads in use, would be large.

With the other shop kink, that takes the form of a handy tool, it may be assumed that there is a saving always; otherwise it would not have been perpetuated. What the saving is depends entirely on what the tool is intended to do. Since we have learned what we know about the possibility of the flow of metal, the die forging in the blacksmith shop has cut the cost of many articles to a tenth of what it would be with the older methods, through the innumerable kinks that have been brought out, and so, all along the line these little things that flourish, for a time in private, often come into the market later as full-fledged tools of greater capacity than their predecessors, and the efficiency of the modern machine shop owes more than is ordinarily realized to what was once merely a "kink."

It is important for every shop foreman and for every master mechanic who has to do with shops, as well as for the higher officer who is interested in the economical operation of the road, to encourage the development of the kink, and there is no better way to encourage this development than to give full credit to the man who gets it up.

THE INCREMENT OF RAILWAY TAXATION.

About a year ago we had occasion to point out that the fiscal railway year, 1909, would show among its most striking of railway burdens the increase of that element in railway charges represented by taxation. The period of "railway baiting" by state legislatures in 1907, and still more conspicuously in the first six months of 1908, very clearly prefigured such an increase. It was not to be expected that the law-making bodies actively engrossed in methods of placing new burdens on the railways, meditating questions of fresh "regulation" and investing state commissioners with added powers, would overlook the weapon of taxation so ready at hand and so easily wielded. But the effects of the stroke were necessarily deferred. New taxation of almost every kind requires from twelve to eighteen months for its actual incidence to appear. There is the new assessment to be made, questions of readjustment to be settled and usually a legal interval before the taxes for the year are actually paid. One must wait a considerable time before statutary taxation gets in its full work, though in the end it usually comes with the certitude of the death with which taxation is proverbially bracketed.

The year's report of the Interstate Commerce Commission now gives us a preliminary hint of taxation's new onset upon the railways. The best comparison is obviously to be made on the basis of gross earnings per mile, to which all fixed charges naturally ratio. The return is very striking. The taxes were 3.6 per cent. approximately in 1909 as compared with 3.4 per cent. approximately in 1908, or an actual absolute increase of about 6 per cent., and this notwithstanding the assessments were presumptively made in 1908, a year of depression when taxes levied on market values of railway stocks—as distinguished from bonds—must in many cases have decreased—a noteworthy feature in the case of the New England railways. Looking back into past years, one finds that as compared with the year 1906 on the basis of gross earnings taxes in 1907 fell from about 3.2 per cent. to about 3.1 per cent. But this is due largely to an increase of gross earnings from $10,460 to $11,383 per mile, taxes absolutely increasing from $336 to $353 per mile—and this sudden lift of gross earnings tends to vitiate comparison of 1907 with 1908 when gross earnings fell from $11,383 per mile, as stated, to $10,778 per mile and taxes in ratio to net earnings rose from about 3.1 per cent. to about 3.4 per cent. Broadly expressed and using five years as a basis of comparison, railway taxes per mile of railway operated show an increase for the period from $292 per mile to $382 per mile on the railway increase of nearly 31 per cent. Taking gross earnings per mile as a basis, the increase for the period is from about 3.0 per cent. to 3.6 per cent. approximately or an actual increase of taxes of about 20 per cent. And finally, but not least important, hard times have not lessened railway taxation but decidedly increased it.

One could emphasize the situation by the citation of special cases. Thus the New Haven road paid out in taxes last year no less than $3,446,125, or some $1,700 per mile, or about 6.5 per cent. on gross earnings per mile. Taxes amounted to more than 3.4 per cent. on its outstanding capital stock, which paid 8 per cent. on the par to shareholders, or say 5 per cent. to investors at the market price. But it is fairer to take the average for the American railway rather than the extreme case, except as such a case suggests the wide range and disparities of the tax burden.

It is a fact of gravity which the railway corporations of the land face in this steady increment of taxation. If taxation adjusted itself to the prosperity—or lack of it—of the railways it would be one thing; quite another when taxes lift whether times are good or bad and whether the railway thrives or goes downward. It would be one thing if tax systems in the states were equalized or, at least, homogeneous, quite another thing when they are unequal, complicated often discordant. It would

be one thing if, as in the case of indirect taxes, they could be "charged up" to the consumer; it is another thing when they are charged up almost exclusively to the railway stockholder and any attempt to charge them up to the public—for example by increased rates—meets with the fiercest opposition. It is human nature to shift taxes if possible to the other man and the safety of the other man is in the equation of resistive power among the taxed; but states, constantly increasing their own expenses, often too lavishly, find an implement of taxation both too facile and too unjust when new taxes can be levied in mass on the corporation and diverted from the individual. The political and partisan favor which such "mass" taxation, aimed at the aggregation of capital rather than the civic unit, finds is a fact which all corporations must confront.

It explains as a basic but inequitable truism the steady increments of railway taxation cited; and the added increment of the new federal corporation tax is yet—perhaps—to be heard from.

CRANES AND DROP TABLES FOR ERECTING SHOPS.

The modern erecting shop with double-deck cranes is a very expensive plant, and while it may be justified where there is a large number of locomotives concentrated at one point and a large number of repair pits, yet there is a limit somewhere, beyond which the interest and depreciation on the plant makes too large a charge against locomotive repairs. The heavy expense is not only in the large cranes, which cost about $15,000 each, but the cost per cubic foot of erecting shop increases much more rapidly than a direct proportion, as the height of the building is increased for an upper deck runway. This is due to the heavy columns necessary for the support of the load of crane and locomotive at a height of 42 ft., making the cost of the steel structure girders and columns about $75 per running foot. The cost of a complete locomotive shop for the repairs of 500 locomotives as built according to recent designs is $1,500,000, and allowing 5 per cent. interest and 2 per cent. depreciation, the charge per locomotive for these items amounts to $200 a year, or 8 per cent. of the cost of repairs.

For smaller shops the outside transfer table is evidently a much cheaper method for the lateral movement of locomotives, as it has its supports directly on the earth and no expensive columns and girders are required, and the height of the building can be considerably reduced, with a large saving in that item. While light traveling cranes of a 10-ton capacity can be employed to advantage for hoisting the separate details, the heavy traveling crane and runway for the complete locomotive can be dispensed with by the use of a stationary bridge for hoisting. Such bridges were originally employed at the Oelwein shops of the Chicago Great Western and more recently at the new shops of the Pere Marquette at Grand Rapids.

As a further measure of economy in the construction and equipment of small erecting shops, it would seem possible to return to the old drop table method. It could be operated rapidly by electric motors or by a system of jacks operated in series by the same kind of motors. The East Altoona roundshop is equipped with a large drop table, and the screws are driven by electric motors. Similar tables, large enough to unwheel a consolidation engine, are to be found in the Dunmore shop of the Erie Railroad and the Ivorydale shop of the Cincinnati, Hamilton & Dayton.

By the crane hoist method the whole weight of the locomotive is lifted and, as above explained, the steel structure and the cranes must be so large and heavy that they become very expensive. As the weight of four pairs of drivers of a consolidation locomotive is about 20 tons, while the whole locomotive weighs over 100 tons, the drop table need have a capacity of only one-fourth or one-fifth that of the hoisting cranes. The drop table is becoming an essential part of the equipment of every large roundhouse. For erecting shops it is usually regarded as obsolete, in competition with cranes; yet, where the system is properly developed, not only for rapid movement in dropping and elevating, but for the quick movement of the wheels on the two levels, the table or jacks system has possibilities which are worthy of consideration when economical construction is desirable for small shops.

NEW BOOKS.

Valuation of Public Service Corporations. By W. H. Williams, third vice-president of the Delaware & Hudson Company. Pamphlet; 6 in. x 9 in.; 51 pages.

The pamphlet at hand was prepared by Mr. Williams for discussion at the joint session of the American Economic Association and the American Political Science Association held in New York December 30, 1909. We have already published in the *Railway Age Gazette* the greater part of Mr. Williams' subject matter, which is a close and careful review of the problem of valuation as viewed by commissions, state and national, and its bearing on national policy. Mr. Williams points out that railways do not usually object to having a valuation placed upon their property; in effect such valuations are daily attempted with greater or less success by subscribers to new issues of securities; but there is serious objection to an incomplete and misleading valuation bearing the stamp and carrying the weight of government sanction. which can be of no practical advantage to the government, the public or the railway, but may easily injure the public and the railways by disturbing the confidence of the former and by hampering the activities of the latter. There are only three purposes for which valuation has been suggested; rate making, control of security issues and depreciation. But, unless the Supreme Court overrules its well considered decisions, such partial valuation cannot possibly form the basis of determination of any rate or rates, general or special. Mr. Williams believes that control of security issues cannot be vested in the commission under the federal constitution; hence that there can be no advantage in securing a valuation to facilitate the performance of a function which does not now and probably never will exist. As regards federal taxation, Mr. Williams points out that a partial and unequal valuation could not be the basis of a fair tax. Congress has already elected to tax all corporations, including railways, upon their net profits, to which a physical valuation can have no relation. If in future other methods of taxation should be proposed to which any valuation is relevent, it will then be soon enough to provide for a valuation which will harmonize with the system under consideration.

A Treatise on Masonry Construction. By Ira O. Baker, Member Am. Soc. C.E., Professor of Civil Engineering, University of Illinois. Tenth edition, rewritten and enlarged. John Wylie & Sons, New York. Chapman & Hall, Ltd., London. 745 pages, 244 illustrations and 100 tables; 5¾ in. x 9¼ in. Cloth. Price, $5.00.

One of the preceding editions of this excellent authority on masonry construction, which was first issued in 1889, will undoubtedly be found in the library of every technical man who has to do with general construction work. So well known and highly valued is it that any remarks as to its excellence are superfluous.

This new edition has all of the merit of its predecessors with the additional advantage of being to date as regards general masonry and practically new as regards concrete. It has been entirely revised and much of it re-written. The number of pages has been increased over the ninth edition from 556 to 745, largely under Part II, Preparing and Using Materials. New chapters on Reinforced Concrete, Concrete Building Blocks and Elastic Arch have been added. The matter regarding Stone Masonry has been little changed. Concrete-Steel Skeleton Construction is not discussed, being considered as coming under steel construction rather than masonry. The chapter on Reinforced Concrete is excellent as

far as it goes but is not as complete a discussion as will be found in books entirely devoted to this subject. The following chapter on Artificial Stone is of much interest, as is an earlier discussion of Sand Lime Brick. There is much other new material scattered through the book, all treated with the same characteristic sound judgment which has marked previous editions.

For the sake of those who are not familiar with the scope of the work—it is divided into four parts: Materials; Preparing and Using Materials; Foundations, and Masonry Structures, respectively. Part I covers Natural Stone, Building Brick, Common and Hydraulic Lime, Hydraulic Cement and Sand, Gravel and Broken Stone. Part II covers Lime and Cement Mortar, Plain Concrete, Reinforced Concrete, Concrete Building Blocks and Artificial Stone, Stone Cutting, Stone Masonry and Brick Masonry. Part III covers Ordinary Foundations, Pile Foundations and Foundations under Water. Part IV covers Masonry Dams, Retaining Walls, Bridge Abutments, Bridge Piers, Culverts, Voussoir's Arch and Elastic Arch. In an appendix are specifications for Cement, Concrete and Railway Masonry. There is an excellent subject index at the end. The general typography and makeup is of the well known Wylie standard.

Contributed Papers.

THE GRAND TRUNK SHOP APPRENTICE SYSTEM.*

The problem of supplying the demand for thoroughly trained mechanics has for some years caused much anxiety, and the Grand Trunk some years ago endeavored to fill the breach and pioneered a movement which has since been copied on a minor scale by all the great railways of Canada and the United States, as well as the largest manufacturing firms in both these countries, namely, the technical training of their apprentices. Night schools, while beneficial, are in the most part drudgery, owing to the subjects taught not bearing directly on the daily work.

The Grand Trunk started a class for its apprentice boys, and in a surprisingly short time it was found necessary to increase the scope of the teaching, as the apprentice boy of the day saw within his grasp the very highest position of responsibility in the management and operation of the road. He realized that here was an opportunity to obtain an education little short of a college course, with a minimum exertion on his part and at the same time be independent and self-supporting.

From the commencement on a small scale, the system has grown until at the present time there are technical schools at all important centers throughout the entire Grand Trunk System, and hundreds of scholars are enrolled, while every large railway system of this continent boasts several graduates of the G. T. training school as their chief mechanical engineers, and more than one of our largest industrial concerns have graduates as their chief draughtsmen.

The subjects taught are graded to suit the student's ability, and in dozens of cases boys who left school when in the second book can now do problems which would tax the powers of a high school graduate to the utmost. The subjects comprise everything from simple arithmetic to higher mathematics, mechanics, machine design and mechanical drawing. The entire cost is borne by the Grand Trunk System, and further encouragement is given by the large number of prizes given annually, open to competition. These include free scholarships in engineering at McGill University, as well as handsome cash prizes.

*From a pamphlet issued by the railway company.

Compulsory Night Classes.—For two evenings a week during the fall and winter months the student must attend mechanical drawing classes, study of practical mechanics and elementary electricity, the most competent instructors procurable being provided. On the staff are two graduates of American and Canadian engineering colleges, Purdue and McGill. The work in the drawing class is outlined in a special text book written by the company's chief draughtsman at Montreal, who is also the author of the book used on practical mechanics. During the term frequent examinations are held, and the points gained by each boy are posted. The master mechanic is constantly in touch with each boy's progress and standing, and if necessary he calls a boy up, and in a kindly manner points out to him the necessity of applying himself more consistently to bring his rating up to the required standard.

Prizes for Best Work.—The annual competitive examination is always conducted by the company's chief draughtsman from Montreal. Prizes are awarded to the apprentices obtaining the highest average in their respective years. These prizes amount to $40 for each shop, and are distributed over the different years of apprenticeship, thus: the apprentice obtaining the highest average for his first year in mechanical drawing gets $4, and the one obtaining the highest in practical mechanics gets $4 also. Therefore, it is quite possible for one apprentice to obtain both prizes.

A keen interest is taken in this examination, which takes the form of a contest between the various shops. In addition there is a capital prize of $25 for each subject. This is competed for by the apprentices obtaining the highest averages in drawing and practical mechanics at their respective stations. These apprentices are given a trip to some point on the system where the final examinations are held, and the one receiving the highest number of points in each subject receives the $25. This, in addition to what he has already received at his station, will make a total of $29, $33 or $58, if he has been successful in all subjects.

After the season has closed, the boys at some of the large shops hold what is termed "Apprentice Night." This is the social event of the season. Each one makes a drawing, which is neatly gotten up and inked in. This is placed on exhibition, and the prizes are awarded for each year of apprenticeship. These prizes amount to $2.50 for the first prize, and $1.50 for the second prize. There are also prizes offered for special colored drawings amounting to $3 for first prize, and $1.50 for second prize. This may be competed for by any apprentice, irrespective of his year, and considerable interest is manifested by those of artistic ability.

The form of apprenticeship which has been adopted has been in successful operation for a number of years and has been the means of supplying the company with skilled mechanics in the most satisfactory manner. All apprentices are indentured to machinist's trade for five years, and to blacksmith's, boilermaker's, or other trades for four years. Five cents a day is deducted from the wages of each apprentice, and the total amount is returned to him at the expiration of his apprenticeship with an addition of $25 as a bonus if services have been entirely satisfactory.

The first requisite in employing an apprentice is to know that he is morally, physically and mentally capable. The examination being satisfactory, he is provided with a text-book for his instruction and guidance. This book contains examinations for the apprentice for each promotion he takes while serving his apprenticeship, and if he fails in any of these examinations he is set back to his old position for another term and the next apprentice in turn is promoted ahead of him. When another promotion is necessary the apprentice who failed is given another opportunity to qualify. If he fails the second time he is either dismissed from the service or given some minor position he is capable of filling outside of the trade,

as it is concluded that he is either not sufficiently intelligent or too indifferent to make a mechanic.

After passing the entrance examination the apprentice is sent out to the boiler, blacksmith or coppersmith shops, or other shop, as may be required. He stays there from six to nine months, and is taught to be active and obedient, and to prepare himself for future promotions.

When a boy is to learn one branch of the business only, for instance, boilermaking, blacksmithing, steam-fitting, etc., he is only required to serve four years, but if he is to learn the machine work and fitting, he is required to serve five years, and all the machinists' apprentices are indentured for five years. In the case of the four-year apprentices being few in number after the first examination, in comparison to the machinists' apprentices, they are instructed in their business by the foreman in charge, and each year they are required to pass an examination in mechanical drawing before receiving their advance in wages, the same as machinists' apprentices.

The text-book makes the boy theoretically conversant with the work that is going to be done by him after his next promotion. While the apprentice is working at one machine he is studying as much as possible about the machine he is to go on next, and this leads him to read up in line with his work.

The indenture system has been found of great advantage both to the company and the apprentice. It has a tendency to keep the apprentice satisfied, and steady his energies along the required lines. It also prevents him from being tampered with by outside firms or corporations who desire to obtain the services of the boy as soon as he has become useful to the company who has instructed him. An apprentice is required to serve five years at the following rates: 8 cents, 10 cents, 12 cents, 15 cents and 17 cents per hour. Before he is granted each year's advance he is required to pass a written examination on shop work, also make a drawing of some detail part of a locomotive, as specified in the apprenticeship book, which examination and drawing must have the approval of the master mechanic and the superintendent of motive power before his advance is allowed.

The system insures thorough education in all details of the trade, and while some of the work may be specialized it is not done by the apprentice until he becomes a journeyman. For instance, the apprentice comes from the boiler shop to the machine shop, from the machine shop to motion bench, to the side rod bench, to the axlebox gang, to the steam pipe gang, to the valve gang, and finally to the erecting gang, so that after an apprentice is out of his time he is a specialist in any one of these branches.

This system of apprenticeship on the Grand Trunk has also been found to be the means of parents giving their sons who desire to enter the service a better education than formerly. Before its adoption the only requirement was that the boy had to be 15 years of age. It was found that parents took their boys away from school at 12 or 13 years of age and put them at some other work until old enough to enter the Grand Trunk shops. When the examinations were first inaugurated quite a number of the boys were turned down, and had to go back to school again before they could qualify to enter the service.

This has not only resulted in prospective applicants getting a better education, but has elevated the moral standing of the apprentices' work, and made the system attractive to boys who have passed the high school entrance examination, and who, although well advanced along the lines of school education, adopt the machanic's trade in preference to other pursuits.

The success of the apprenticeship system is imperatively dependent upon the careful management of the examinations and the compulsory attendance at the classes.

TRANSPORTATION OFFICERS' MEETING.

The winter meeting of the Association of Transportation and Car Accounting Officers was held at Chattanooga, Tenn., December 14 and 15, with about 100 members present, and President C. C. Riley in the chair. An interesting address was given by R. V. Taylor, General Manager of the Mobile & Ohio. The membership of the association represents companies operating 230,826 miles of road and having in service 2,274,488 cars. A resolution authorizing the executive committee to declare an assessment of such an amount as in its judgment may be necessary to properly carry on the work of the association was adopted. A proposed change in the constitution which will permit the appointment of an assistant secretary by the executive committee, and a proposed change in the by-laws changing the name of the committee on car service and per diem to read "Committee on Car Service," were laid over for action at the next meeting. The next meeting is to be held at Colorado Springs, Col., June 21 and 22.

The committee on car service made a report on pooling of freight cars. After an interesting discussion the committee was instructed to continue its investigations. The committee reported that at points where its recommendation with regard to the adjustment of switching reclaims in connection with the switching charges is in operation admirable results are being secured.

The committee presented certain revisions in the Standard Code of Switching Reclaim Rules adopted at the Montreal meeting last June. The changes suggested were adopted for submission to the American Railway Association.

The committee on office methods and accounting reported on the duplication of initials and numbers in the marking of freight cars. In compliance with the request of the American Railway Association reporting marks had been assigned to the cars contained in the list heretofore prepared and the code of markings is now in the hands of the A. R. A. The association adopted for submission to the American Railway Association a proposed change in Rule 11, code of per diem rules, which will definitely fix the time within which statements of errors or omissions in per diem reports may be presented and will discontinue the privilege of perpetuating a discrepancy claim when the claimant allows it to lie dormant in his own office for a period of six months.

The committee presented an extensive compilation indicating the condition of per diem reports as rendered by all railways for the month of October, 1098. As compared with the previous compilation (for October, November and December, 1906) this shows a decided improvement; but October, 1908, was a month in which general business was below normal, and as notice has been given that these statistics were to be prepared they naturally reflect the favorable conditions under which they were prepared.

The association adopted the recommendation of the committee to submit to the American Railway Association a revised form of individual discrepancy report in lieu of present Form I of the standard per diem blanks of the A. R. A.

Report Forms 24 (c) per diem report, (g) summary of per diem reports, (h) per diem adjustment report, (i) passenger equipment mileage report and (j) interchange report correction were also adopted for submission to the American Railway Association with recommendation that their use be made mandatory. However, the original report, form 24 (j), recommended by the committee for the correction of interchange reports was revised by the association to conform as to the column arrangement to the present A. R. A. interchange report form which includes a separation of loaded from empty cars. It was also decided to provide at the top of the blank a space on which to note the date of correction of interchange report.

The association adopted a set of instructions for handling

per diem claims, designed to secure uniform practice. The committee on handling railway business mail presented correspondence between one of its members and the post office department regarding the handling of claim papers with letter of transmittal separately enclosed. Under the decision of the post office department it appears that a package of claim papers may be sent to or beyond immediately connecting railways as "railroad business mail" without the payment of postage, provided the letter of transmittal is separately enclosed in a sealed government stamped envelope, sent separately or attached to the *outside* of the package of claim papers; and this irrespective of the fact as to whether the papers in the claim have previously traveled as railroad mail or as U. S. mail. This decision sustains the committee's interpretation (Montreal, June, 1909) of the orders and decisions of the post office department so far as they relate to the transportation of claim papers. The committee recommends that packages containing printed matter be so wrapped that they may be readily inspected and be marked "Printed Matter" or "Claim Papers," etc. It also calls attention to the saving that has been accomplished by some roads in taking advantage of its recommendations with regard to the perforation of stamps with identifying ownership marks for the prevention of pilfering, misuse, etc., and the economies possible by the assembling of outgoing mail at each general office or large division office for the purpose of consolidation.

Reports of progress were made by the committees on conducting freight transportation and conducting passenger transportation.

The committee on joint interchange and inspection bureaus presented its first report, which, in view of the short time since its organization, is necessarily one of progress only. It is understood that the committee will confer with a committee from the Master Car Builders' Association. When the work of the committee is fully under way it is anticipated that splendid results will be obtained from the investigation of the subject of "joint interchange and inspection bureaus" by the two committees representing the interests of the mechanical and transportation departments.

POWER DEVELOPMENT FOR THE SCRANTON SHOPS.

The power situation at Scranton, Pa., the location of the new Delaware, Lackawanna & Western shops, described in the *Railway Age Gazette* of November 5, 1909, is unique in that the possibility of failure and consequent closing down of the plant is reduced to a minimum. This is accomplished by the mutual relationship of four large and somewhat widely separated plants. Owing to the shops being located in the city and the necessity of carrying fuel to them from the mines, no power plant was built upon the grounds. Current for driving the machinery will be obtained from the Hampton plant, mines department of the railway, which plant will be enlarged for the purpose. This plant is located about three and a half miles from the shops near the mines and culm piles, from which fuel is obtained. Under ordinary working conditions, the generators in this plant will send a current of 4,150 volts to the shops. To guard against failure, the plant is connected with the two large city plants, which furnish light and power, and also with that of the Kaiser Valley car shops. In case of the failure of any one of the three, the others can be used to carry its load. This condition is not entirely true in case of failure of the Hampton plant, because of its size, although sufficient power would be available from the others to carry that part of its load which is an absolute necessity or the mine pumps and the essential elements of the shops.

The plant is interesting, not alone on account of its association with the railway shops but also on account of some peculiar features of its arrangement.

The engine and generator building is a brick structure, 42 ft x 108 ft. On the gallery floor are five Curtis turbines of



Boiler House; Hampton Power Plant of the Delaware, Lackawanna & Western.

500 k.w. capacity each, arranged along the wall. At the end of the building is a 2,000-k.w. turbo generator, built by the Allis-Chalmers Co., Milwaukee, Wis. A second generator of the same size and make has been ordered and will be in place soon. This second machine is intended to carry the load to the new shops. These turbo generators run at 1,800 r.p.m. and develop a current of 2,300 volts, which is stepped up to 4,150 volts for transmission. This voltage corresponds to that of the city mains so that the two can be used interchangeably. It is a three-phase 60-cycle current.

Indicated boiler pressure is 140 lbs., and it reaches the inlet of the engine at 125 lbs., from which it is wiredrawn down to 60 lbs for engine use. This latter pressure corresponds to a load of 2,700 k.w. The vacuum maintained is 27 to 28 in. The turbines are of the simple type without compounding but are run condensing. Tests show that they can work on 17.2 lbs. of steam consumption per kilowatt hour, which corresponds to 12.83 lbs. per horse power hour, a figure that is well down to the best performance of compound condensing reciprocating engines and much below the average practice. It is well known that these machines run with remarkable regularity, the variation in these instances being not more than five r.p.m., or a regulation at the speed of a little more than one-quarter to one per cent.

There are three transformers with a capacity of 1,200 k.w.

each in the house, all tied to the city mains, and one to be used for the shops of 1,500 k.w. They are all three-phase, 60-cycle machines, stepping up from 2,300 to 4,150 volts.

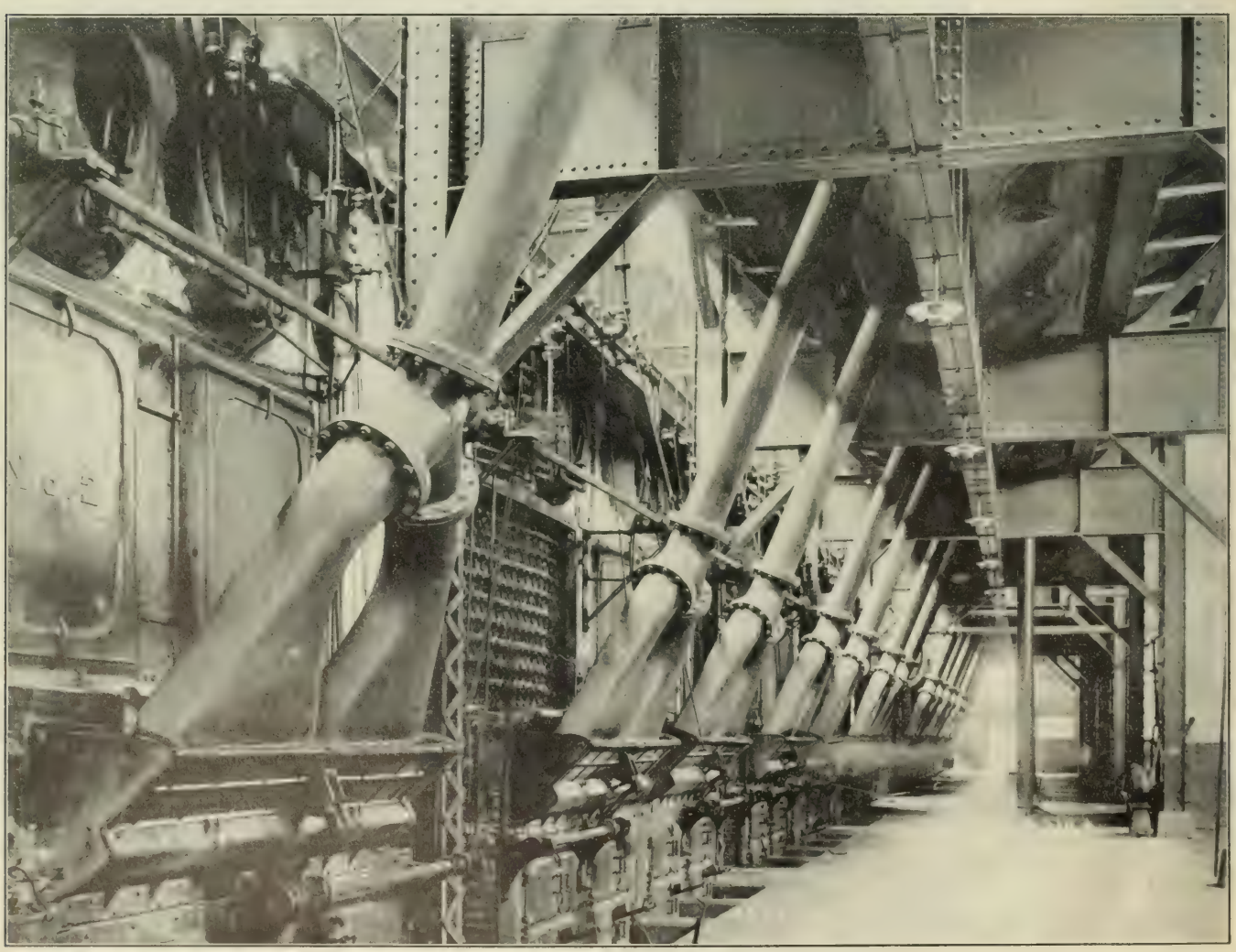
At the further end of the building is an induction motor generator, taking a current, 2,300 volts at 60 cycles, from the main generator and with a development of 85 h.p., driving a 50-k.w. generator, developing a current of 125 volts and 400 amperes at 690 r.p.m. for exciting the fields of the alternators. This completes the cycle. The main current is tapped for the motor which drives the generator, producing the current for exciting the main fields. As there is no current at starting, a separate exciting set is used for this purpose. This consists of a direct connected generator, a duplicate of the one described above, driven by a 12-in. x 12-in., 120-h.p. engine at 280 r.p.m.

All of this machinery is placed upon concrete foundations, extending up through the basement floor below. In the case of the main Allis-Chalmers generator, the foundations are hollow with an opening on the end facing a window in the basement wall. Through these openings and passages the air current for cooling purposes is drawn.

The switchboard occupies almost the entire length of the north wall of the building. The board itself is of marble slabs and on the several panels the operating switches for the many connections and combinations are arranged. The meters for measuring the current received from and delivered to the city mains are also placed on this board. There are two of them, one for each current direction. They are built with ratchets to prevent any possible backward registration. The difference between the readings of the two shows the balance due to one plant or the other. The switches are each in individual cells back of the switchboard and separated from it by a space of about three feet. They stand against the wall of the building. This is a wise precaution, in that it confines any trouble to the particular cell in which it originated and avoids all possibility of any extensive burning out. A case of this kind occurred but a short time ago, which, had the switch been on the back of the board and unconfined, would probably have crippled the entire plant. The basement of the building is occupied by the transformers and auxiliary machinery. This latter consists of several pumps and three regulators for the Scranton mines. There are two Worthington vacuum pumps for the Curtis turbines. These have steam cylinders 10 in. in diameter, vacuum cylinders 18 in. in diameter, with a common stroke of 18 in. There is also a separate vacuum pump for the Allis-Chalmers turbine. It has cylinders 10-in. and 24-in. x 20-in. stroke.

In addition to these there are two Blake 7½-in. x 3-in. x 10-in. pressure pumps for maintaining a pressure of 250 lbs. per square inch beneath the step bearings of the Curtis turbines. These pumps discharge into an accumulator having a lift of 8 ft. with an 8-in. plunger carrying a load of 18,000 lbs. With the installation of the second turbine generator another vacuum pump similar to that already in place will be set up.

The brick boiler house stands about 35 ft. west of the power house. The boilers have a total capacity of 8,445 h.p. There are 15 Babcock & Wilcox water tube boilers of 313 h.p. each and six two-drum Sterling boilers of 625 h.p. each. In the fitting up of these boilers, there is a 6-in. pipe extending around the building as a loop with which each boiler is connected, so that any unit can be cut out without disturbing the action of the rest. The boilers work under a pressure of 140



Interior of Boiler House; Hampton Power Plant of the Delaware, Lackawanna & Western.

lbs. The Babcock & Wilcox boilers are fitted with McClave stokers, driven by small slide valve engine. The Sterling boilers are hand fired, rice coal being used under all boilers.

Draft is maintained in the furnaces through a combination of a closed ash pan, forced draft and vacuum exhaust. Slightly superheated steam is also admitted to the ash pan in order to avoid the formation of clinker on the grates. This steam is superheated in a two-in. pipe that passes down the length of the battery back of the bridge walls, where it is raised from 15 deg. to 20 deg. Fahr. The pressure in the ash pans of the Babcock & Wilcox boilers varies from 1 in. to 1½ in. of water, while under the Sterling boilers it runs from ½ in. to ¾ in. This pressure is maintained by two 15-ft. diameter x 43-in. fans, driven by direct connected 13-in. x 16-in. engines, running at an average speed of from 150 to 200 r.p.m. At this speed the fans have a delivering capacity of about 100,000 cu. ft. per minute. Under ordinary conditions, one of these fans is sufficient for the work and the other is held in reserve in case of accident. Should the suction fan fail it may be cut out together with the economizer and the plant operated with the pressure fans alone, and the gases are sent direct from the boiler to the stack. The speed, however, is subject to wide variations, dependent upon the steam pressure and the demand upon the boilers. This is automatically regulated by mechanism devised by O. E. Williams, engineer of the plant, and will be described in detail in a future issue.

The exhaust fans are used entirely for removing the waste gases of combustion and are not intended in any way to create a draft. They produce the very slight vacuum of from ⅛ in. to 1/10 in. of water and have a capacity of about 100,000 cu. ft. per minute when running at a speed of 110 r.p.m. There are two of these fans, each 14 ft. in diameter x 84 in. wide. They receive the gases from the economizer and deliver them into the stacks. These fans are built by the American Blower Co., Detroit, Mich.

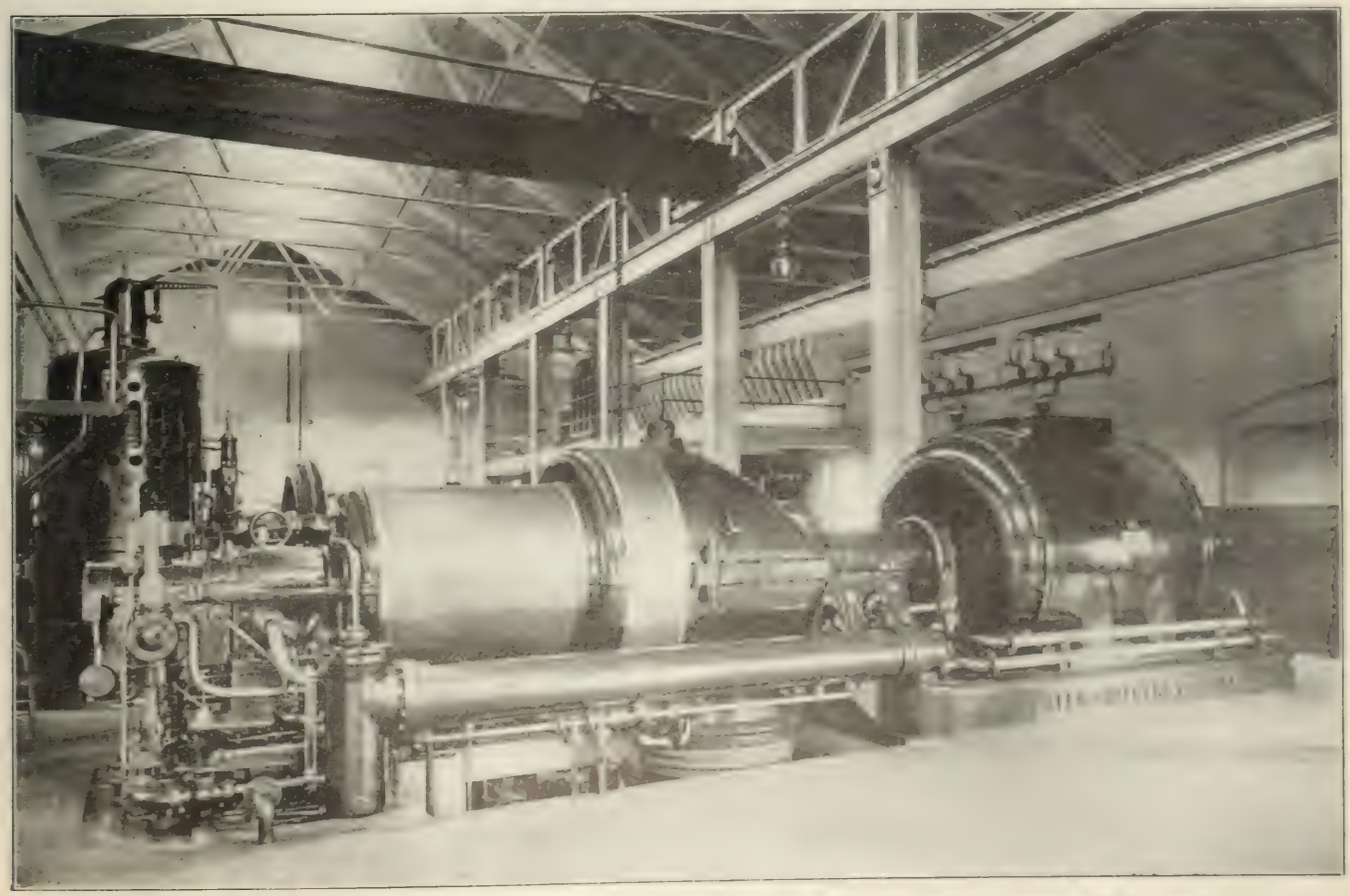
The water is fed to the boilers by two 22-in. and 12-in. x 24-in. compound Worthington pumps with an Epping-Carpenter tandem compound pump held in reserve. The water supply is obtained from the city works and bore holes in the hills. It is a surface water remarkably pure and very well adapted for boiler purposes. Although an analysis is not available, the results obtained in the boilers show that it is free from acid and scale forming properties. The boilers are blown down at frequent intervals and are drained for cleaning the tubes once every six months. At such times a small amount of soft deposit is removed but no hard scale. No boiler compounds are used.

The connections for blowing out are made from each pair of boilers led down to a concrete sewer beneath. Following approved practice the boilers are never blown off while hot but are allowed to cool before the water is drawn off. The water for condensation is obtained by mine drainage. It is acid in its reaction and can only be used in jet condensers. Four of the Curtis turbines and the Allis-Chalmers machine are so equipped. The fifth Curtis machine has a surface condenser and draws its supply from the boiler feed reservoir, discharging back to the source. This reservoir is a concrete tank, 100 ft. in diameter and 12 ft. deep, set in a hill at a small elevation above the engine house. The discharge from the surface condenser serves to warm it somewhat while it in turn acts as a cooling pool for the water for condensation.

The coal used is the fine rice size obtained by washing the culm banks. It is clean, its only drawback being its size, but as the grates are suited to it, an evaporation of about 8.3 lbs. of water per pound of coal from and at 212 deg. Fahr. is obtained. An average analysis of this coal would run about as follows:

Moisture	1.96 per cent.
Volatile combustible matter	9.24 "
Fixed carbon	72.69 "
Ash	16.11 "

The coal is brought to the plant in hopper bottom cars



Allis-Chalmers Turbo-Generator: Hampton Power Plant of the Delaware, Lackawanna & Western.

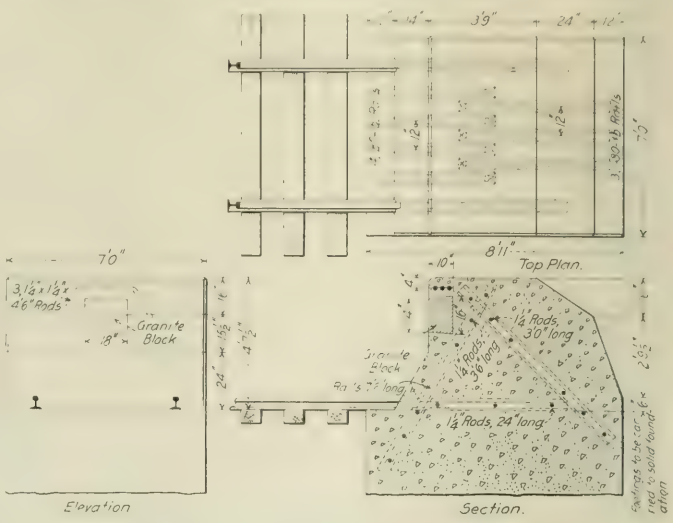
from which it is dumped into a hopper between the tracks. It then flows to a double belt conveyor and is carried up, on an incline, and over the line of hoppers extending the entire length of the boiler house. These hoppers, as well as the receiving one and the incline, are built of reinforced concrete. The average capacity of the boiler house hoppers is 1,000 tons, about 800 tons being usually kept on hand. From the hopper the coal flows by gravity to the stokers. The arrangement of these overhead hoppers and the coal feed pipes, as well as the general arrangement in the boiler room, is shown in one of the engravings. In the case of the hand fired Sterling boilers the coal falls through 8-in. pipe to the floor and is handled from there to the grates.

The ashes are handled by an air blast, the ash pan of each blower being connected with a conveyor pipe leading to a large square reinforced concrete tank, raised above the tracks outside of the building. From the top of this tank a galvanized iron pipe passes through into a dust separator and thence to a Root positive blower, which is capable of exhausting the air from the tank and reducing the pressure to about two lbs. per square inch. The blower is driven by 11-in. x 10-in. engine at a speed of 220 r.p.m. By opening the connection between the ash pan and the pipe a strong blast carries the ashes to the tank or bin. Being wet down, very little dust is raised and that is caught in the separator above. The capacity of the tank is about 50 tons. At the bottom there is a hopper chute discharging into the cars beneath. This conveyor is in operation only while the fires are being cleaned, at which time the several ash pans are connected with it in rotation.

By taking advantage of the existence of this plant the company will be able to deliver power to the new shops at an exceedingly low rate. The cost for fuel will be simply that which it chooses to charge in for the culm, plus the cost of washing. Most of this fuel is not marketable and is that which would not pass inspection. Its commercial value is therefore low, although from a standpoint of its chemical analysis and heat content, it ranks high. The overhead charges will be light, since they will be shared by the balance of the plant, which is furnishing power and steam to the mines. To these two items must be added the interest and depreciation on the machinery, the total of all being a very low figure.

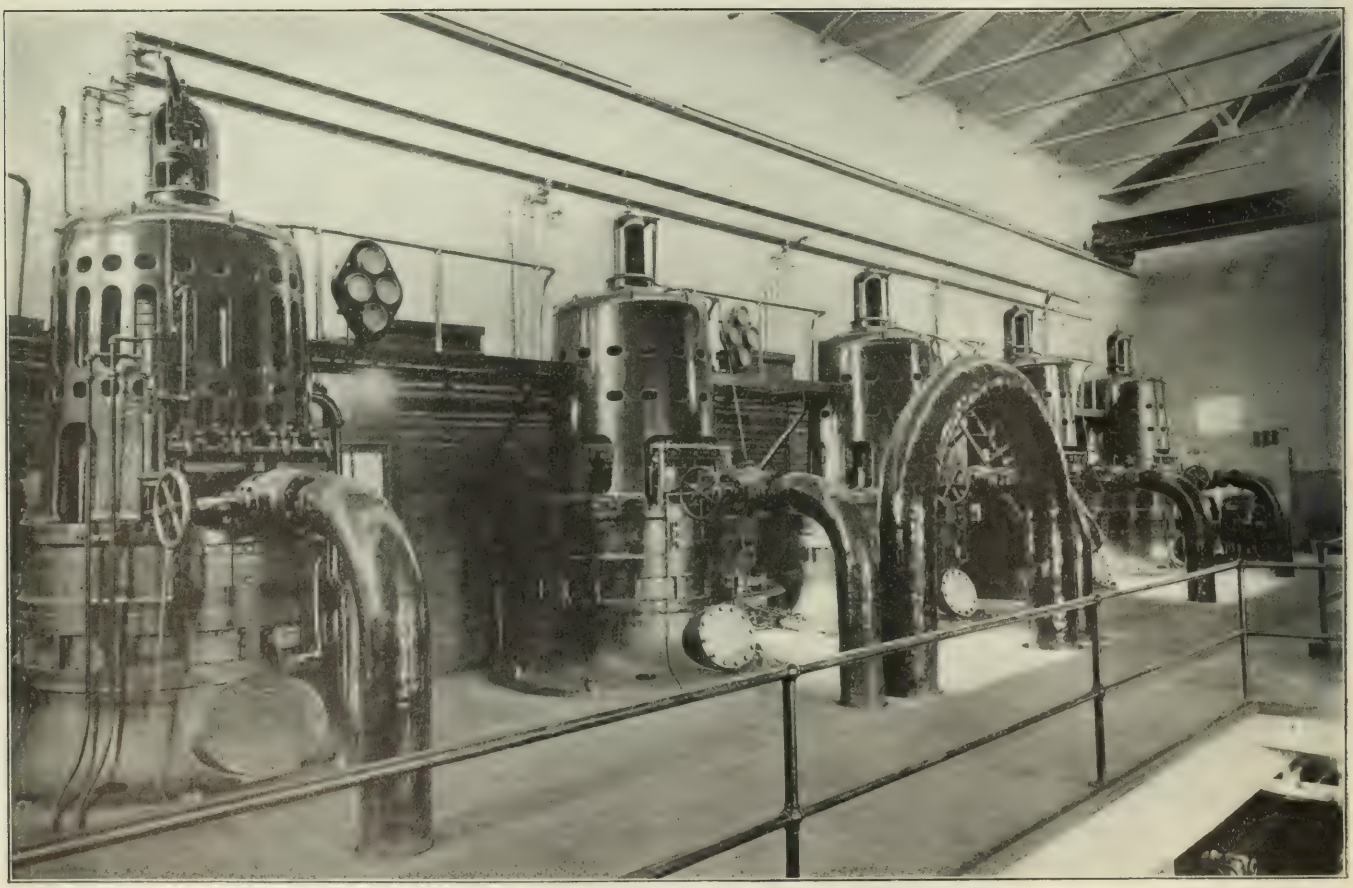
CONCRETE BUMPING POSTS.

The Delaware, Lackawanna & Western has concrete bumping posts in service at several points. They are found to be



Details of Concrete Bumping Post.

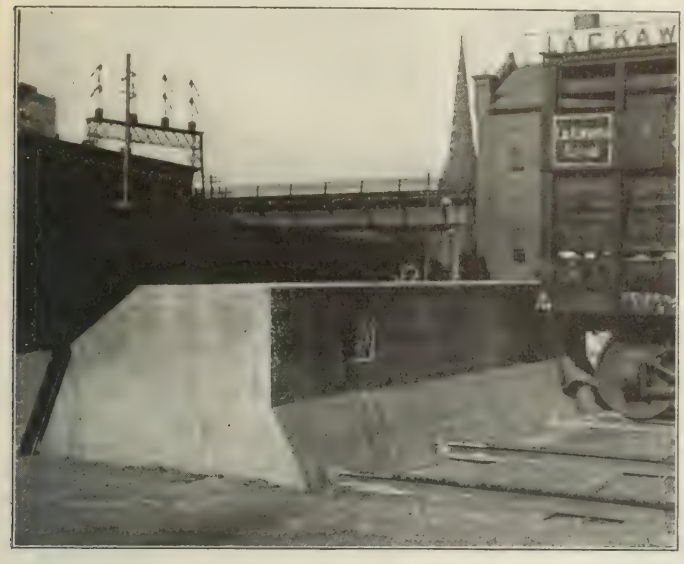
superior to the ordinary posts, both in strength and in durability. They are therefore used where a particularly strong block is required. At other points the ordinary blocks are preferable,



Group of Curtis Turbines; Hampton Power Plant of the Delaware. Lackawanna & Western.

as the effect of the heavy concrete block is to transfer the damage of the blow from the block to the equipment.

The blocks cost about $135 each. It requires a gang of



Concrete Bumping Post; Delaware, Lackawanna & Western.

nine men, consisting of a foreman, a carpenter and seven laborers, about four days to make one block.

GENERAL SHOPS OF THE SUD-PACIFICO DE MEXICO AT EMPALME.

The Southern Pacific lines in Mexico consist of the old Sonora Railway, extending from Nogales and Naco on the Mexican border to Guaymas on the Gulf of California, 265 miles, and the new line, Guaymas to Guadalajara, 860 miles. The new shops are located at Empalme, the junction of the old and new lines, which is 5 miles east of Guaymas. An account of the new construction of the roadway will be found in the *Railway Age Gazette*, January 1, 1909.

The shops are complete in every respect, being built to take care of locomotive, passenger and freight car repairing and rebuilding, and are also equipped as a manufacturing plant, making them to a very large extent self-supporting. The walls of the principal locomotive shops are concrete, while the car shops have wooden frames.

The shops are electrically driven throughout, power being furnished from a central power station, which is a handsome reinforced concrete building, 88 ft. wide and 106 ft. long. This building is divided longitudinally by a wall extending its full length, separating the engine and boiler rooms. The engine room floor is about five feet above the boiler room floor, which provides for a basement to accommodate condenser, air pumps, hot well, boiler washing, general service, hydraulic and fire pumps, steam and exhaust headers and all piping.

The equipment in the power house consists of four 260 h.p. Sterling water tube boilers, set up in two batteries, which are connected by a breeching to a self-supporting, reinforced concrete stack, 6 ft. 6 in. diameter inside by 125 ft. high; two Fleming Harrisburg 14 in. x 28 in. x 18 in. tandem compound condensing engines, direct connected to Westinghouse d.c. generators, 220 volts; and two Ingersoll-Rand compound condensing air compressors of 1,200 cu. ft. of free air capacity.

In the basement are located air pumps, etc., necessary for a compound condensing plant. Coal is dumped from cars into a hopper outside of the building, so arranged as to deliver it in front of each fire door. In addition to providing power and light for the shops, light is furnished for the town of Empalme and all company buildings. Sufficient space has been provided for an additional battery of boilers, an additional engine and generator and an air compressor.

MACHINE AND ERECTING SHOP.

The machine and erecting shop is 161 ft. wide and 264 ft. long, and belongs to what is called the "Transverse Type." The erecting side is 65 ft. 6 in. wide and 50 ft. high, and is



Locomotive Shop and Power House.

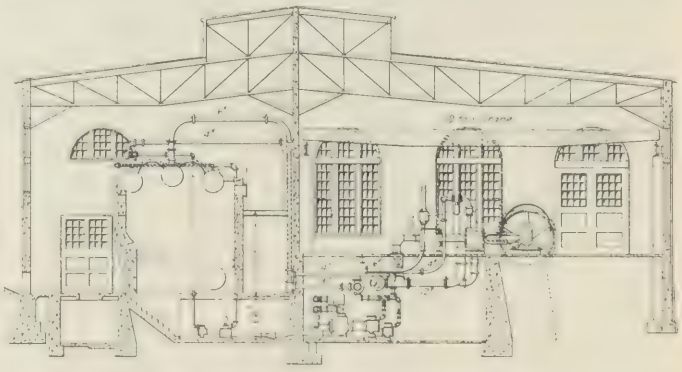
served with a 100-ton Niles traveling crane, set high enough to carry a locomotive well over the top of the highest locomotives. The machine side is 65 ft. 6 in. wide and 29 ft. high, and is served by a 15-ton Niles crane running the full length of the shop.

The machine side is equipped with the latest machine tools for handling locomotive and manufacturing work, and, with the exception of the tool room group and a group of small lathes, which are each driven by a separate motor, the tools are all independent-motor driven.

The shop is provided with compressed air, general service water and hydraulic pressure pipes with connections and extension and electric cord sockets, located at convenient places.

BOILER AND BLACKSMITH SHOPS.

The boiler and blacksmith shops are under one roof, and parallel to the machine shop. The building is 121 ft. wide and 264 ft. long. A wooden partition at the center of the length separates the two shops, and a row of columns divides the



Cross Section Through Power House.

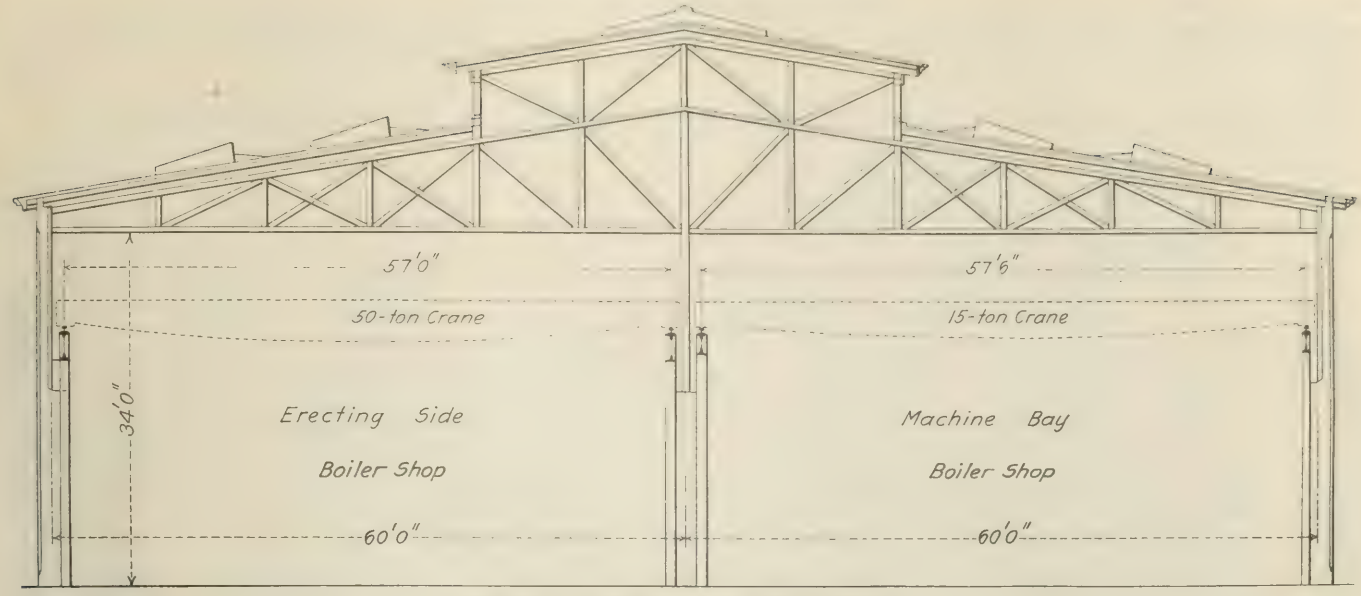
shops longitudinally into two bays, providing an erecting and a machine bay in the boiler shop. The erecting bay is served with a 50-ton Niles crane, and the machine bay by a 15-ton crane. The machines are individual-motor driven, and are so arranged that boiler sheets brought in the end door pass along through the different machines to the erecting floor without doubling back. Flanging is done by a Chambersburg sectional flanger, which is served by a 2-ton self-supporting crane. The blacksmith shop is equipped with suitable steam hammers, cranes, and a bloom furnace on which is erected a locomotive



Locomotive Machine Shop; Empalme Shops.



Engine Room of Power House.



Sectional Elevation of the Boiler Shop.

type boiler to furnish steam for the hammers.

MATERIAL SHED AND BOLT SHOP.

Back of and parallel to the boiler and blacksmith shop is the material and bolt shop. In this building is stored all bar iron, boiler steel, flues, rivets, etc., and in it are located the bolt headers, bolt cutters, bulldozers, etc. On the side farthest from the boiler shop is the unloading track. Boiler steel is stored in one end of the building and is handled by an electric-driven crane, the runway of which extends out over the unloading track, picking up material direct from the cars and setting the different size sheets in spaces provided. On the side next to the boiler shop is provided a push car track connecting with the boiler, flue and blacksmith shops by turntables; the crane runway extending out over this track also.

The flue shop is located at the south end of machine shop and is connected with all pit tracks in machine shop and with the boiler and material shops by push car tracks with turntables and floor air jacks. The shop is equipped with necessary flue welders, cutters, and a Ryerson flue rattler, arranged so that a set of flues coming from any shop is taken direct to the rattler on cars provided for that purpose and the entire set picked up at one time, thus avoiding the handling of each flue as is necessary with other rattlers.

FOUNDRY.

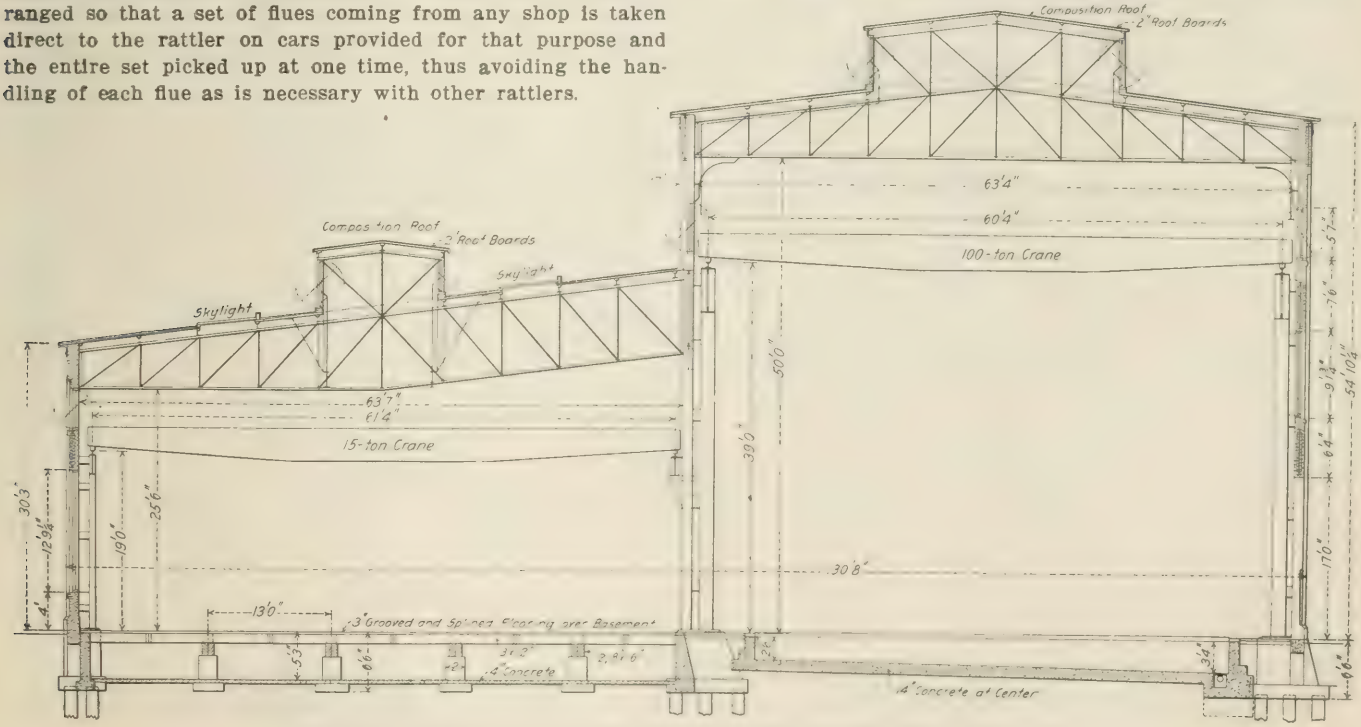
The gray iron and brass foundries are under one roof and provided with all necessary labor-saving conveniences, tracks, turntables, moulding machines, etc. The pattern shop is a two-story fireproof concrete building, located conveniently to the foundry, and is equipped with all necessary individual-driven wood working tools. The second floor of this building is used as a pattern storage.

CAR AND PAINT SHOPS.

The car and paint shops are separate buildings, parallel with one another, with a transfer table between them. These shops are fitted up to handle all passenger car work and rebuilding.

In one end of the car shop is located the car wheel shop, fitted up with all necessary machine tools for handling car work. The mill is located parallel with and next to the car shop, and is equipped with wood working tools suitable for handling freight, passenger car and manufacturing work.

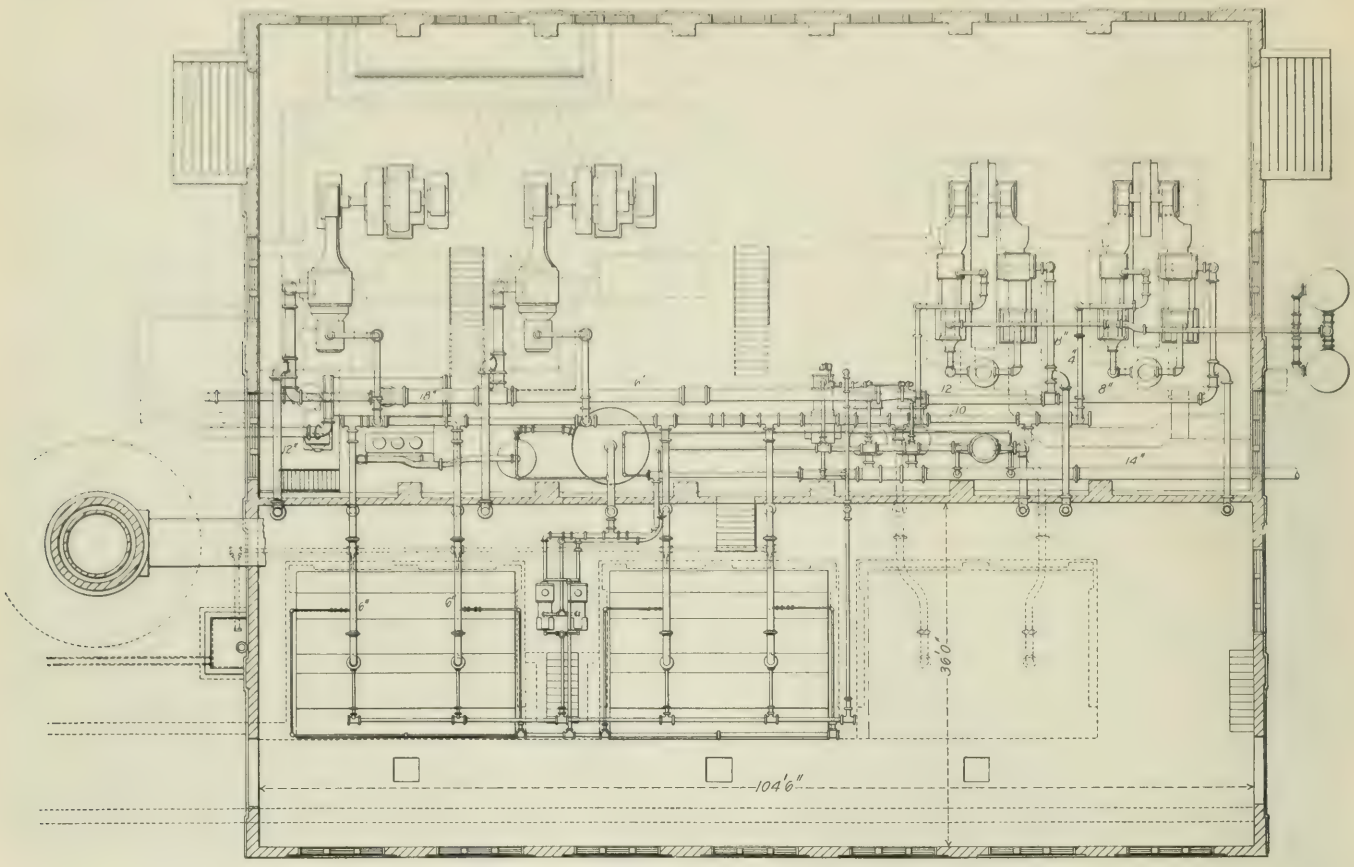
The freight car repair tracks are located directly south of



Sectional Elevations; Machine Shop (Left), Erecting Shop (Right).

and at right angles to the car shops and mill, and connected with the different shops by suitable push car and wheel tracks.

over three tracks with a runway extending 250 ft. outside of the building. The shop is equipped with machine tools, fires, formers, etc., necessary for this class of repairs.

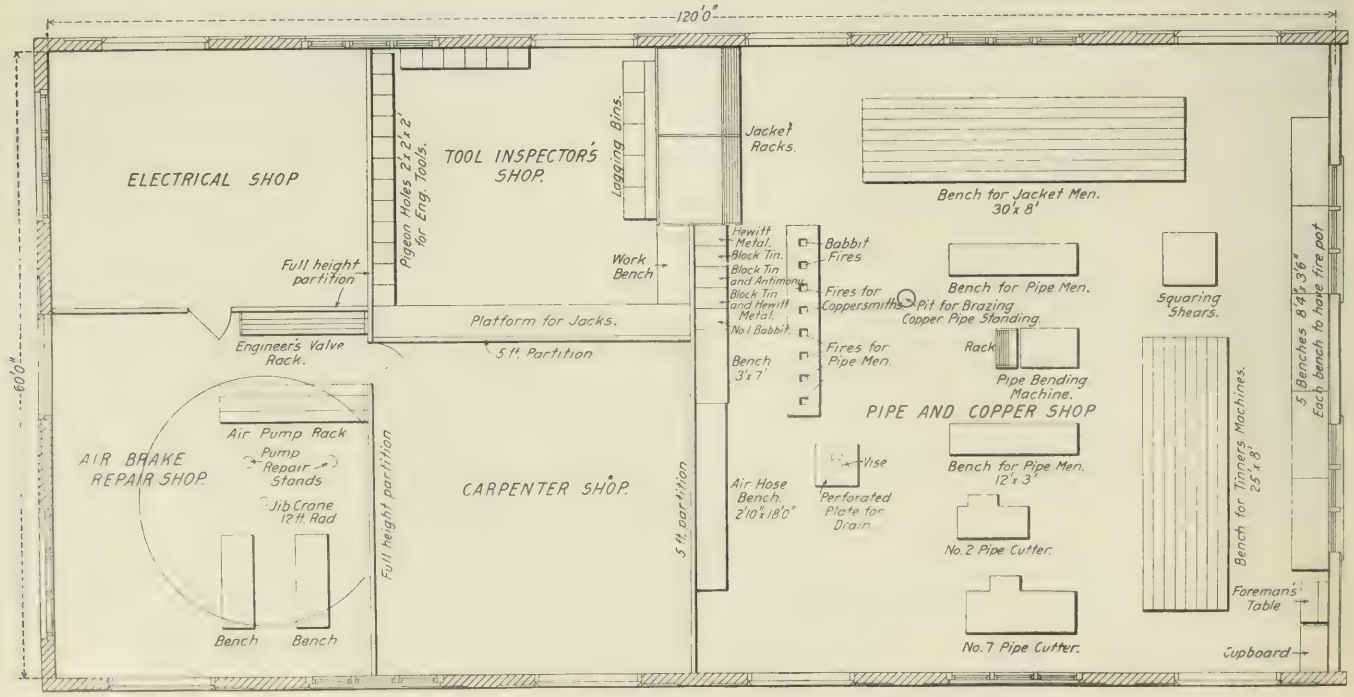


Plan of Power House.

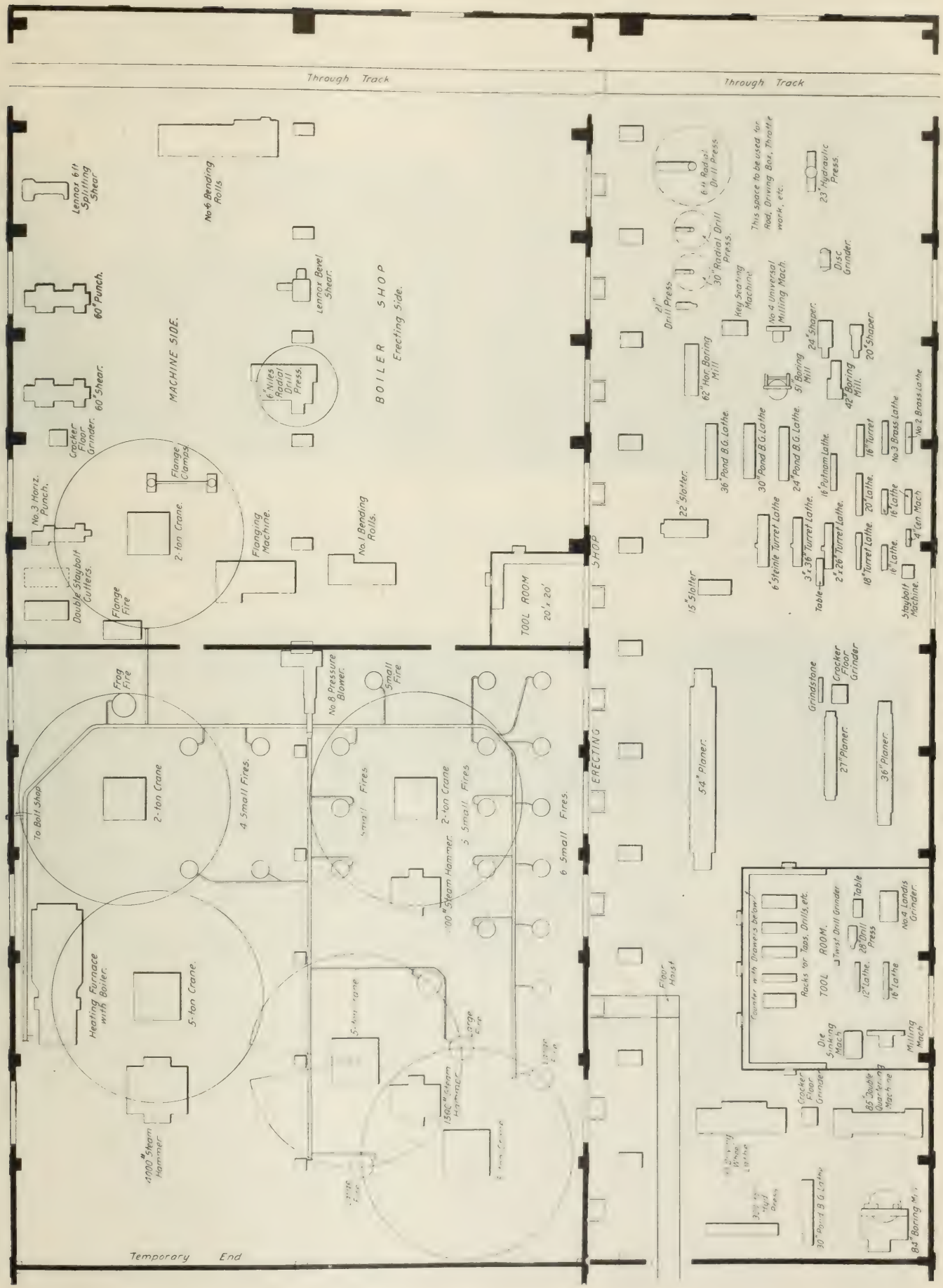
A steel car repair shop and blacksmith shop is located alongside of and connecting with the repair tracks. In this building is handled all repairs to steel cars and all car blacksmith repair work. It is provided with an electric crane extending

A car shop store, in which car material exclusively is kept, is located at the end of and between the car shop and repair tracks.

Lumber storage with suitable unloading tracks and push



General Arrangement of Machinery; Empalme Shops.



General Arrangement of Tools; Forge Shop, Boiler Shop and Machine Shop, Empalme Shops.

car tracks connecting with the mill, car shops and repair tracks, is located at the north end of the mill.

Plans are now completed for a dry lumber storage building and a dry kiln and erection is about to be started.



Interior of Foundry.

Special attention has been paid to light, and all buildings are exceptionally well lighted. To eliminate the disagreeable feature of the strong sunlight of Mexico, factory ribbed glass is used throughout.

Particular attention has been given to labor and time-saving devices. Cranes, push car tracks, turntables, floor air jacks, air hoists, etc., have been provided wherever considered practical, and a telephone system connecting all shops, offices and stores is installed. A general fire alarm system with fire alarm boxes located at suitable places about the shops and connecting with the power-house, is provided. An independent fire line with hydrants has been installed, and is used only in case of fire or fire drill by the shop fire department, thus insuring piping in good condition that will stand high pressure in case of fire, and eliminating the dangerous practice of allowing general service and other taps to be connected to the fire line, which ordinarily bursts when it is subjected to a good pressure.



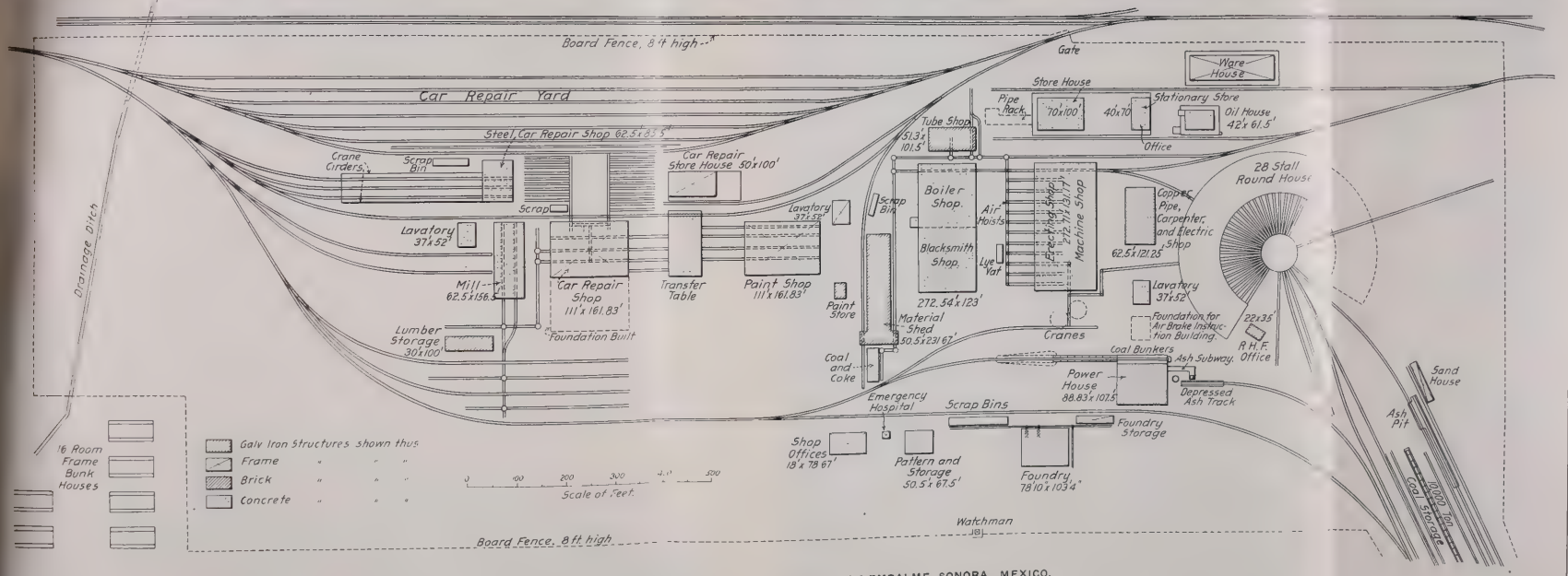
Exterior of Foundry.



Erecting Shop, Empalme Shops.



SOUTHERN PACIFIC SHOPS AT EMPALME, SONORA, MEXICO.



GENERAL LAYOUT: SOUTHERN PACIFIC SHOPS AT EMPALME, SONORA, MEXICO.

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THE NEW HEINE BOILER SHOP.

The Heine Safety Boiler Company, St. Louis, Mo., recently completed a new shop which is a good illustration of a modern factory devoted exclusively to the manufacture of water tube boilers. The buildings consist of a main shop with a wing for a flange shop, the power house, toilet and wash rooms and general office, making a total of 2½ acres of floor space. The relative locations of these buildings are shown in the illustrations.

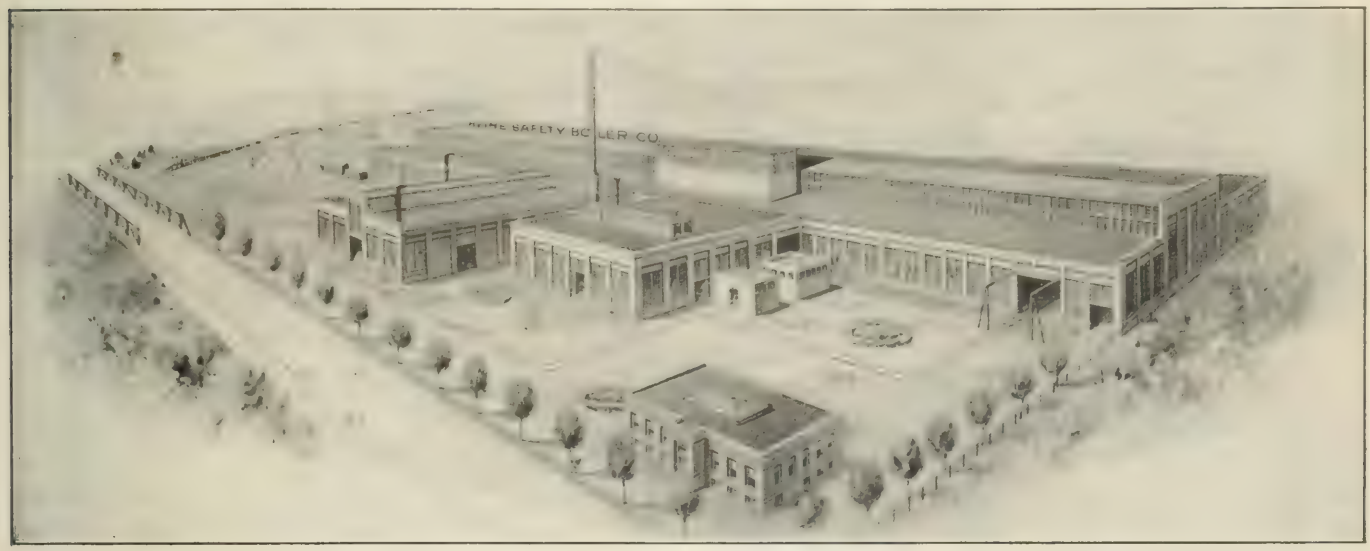
The raw material is received at one end of the large building which is used as a storage room, and it passes without reversal to the opposite end, where completed boilers are stored and shipped. Tubes not being needed until boilers are assembled are received and stored at the shipping end. The whole floor area of both the main and the flange shop is served by small and large traveling cranes, while a 24-in. gage industrial railway, made by the Arthur Kopple Co., Pittsburgh, Pa., completely encircles these structures and has connection with the interior.

For the operation of the equipment, electric, hydraulic and pneumatic power is employed, and the power house is placed in close proximity to the hydraulic and pneumatic tools in order to reduce the length of the transmission lines, thus saving in first cost frictional loss and maintenance. The majority of the tools are electric-driven by individual Wagner motors.

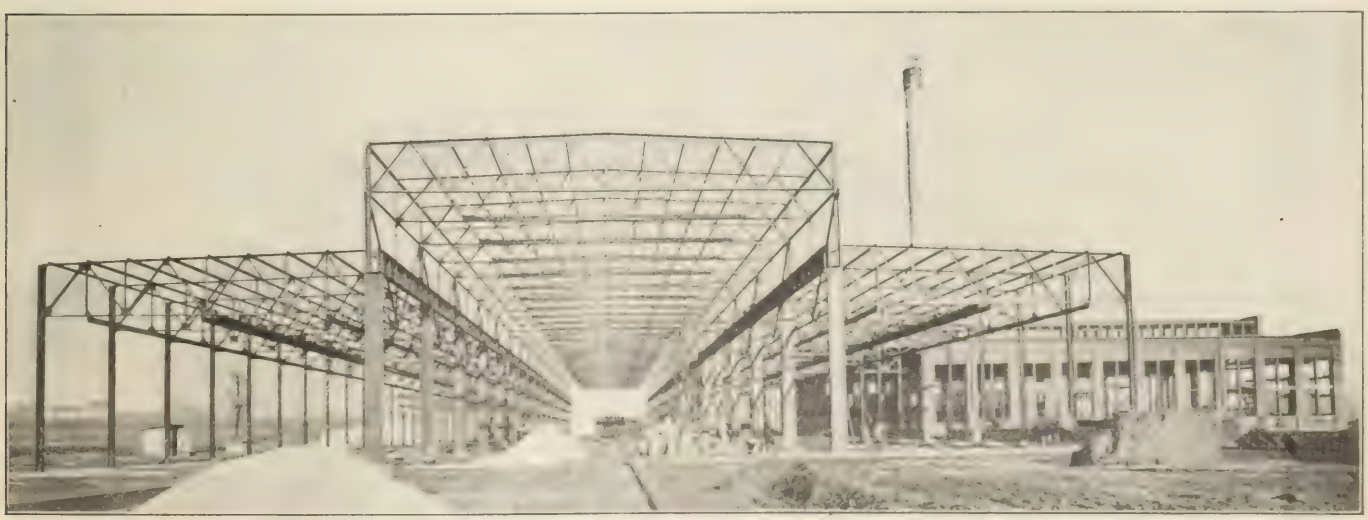
A drainage system is provided into which all rain water from the roof, as well as clean waste from manufacturing, is discharged into a large cement-lined cistern 20 ft. in diameter and 20 ft. deep, near the power house. As the only source of water supply is from the city mains, this arrangement effects a very appreciable economy.

The buildings are of steel frame construction with outside walls of brick and reinforced concrete slab roofs. About 75 per cent. of the vertical areas is glass. The main shop is 450 ft. long, 143 ft. wide for 250 ft. of its length, and 180 ft. wide for the remaining 200 ft. The narrow portion is divided into three longitudinal bays, the middle one 50 ft. and the two side ones 41½ ft. wide.

The central bay is supplied with a 25-ton traveling crane, and this bay is 14 ft. higher than the side bays. About the middle of the side toward the power house is a riveting tower 24 ft. wide, its roof being 55 ft. above the floor In the side walls the middle sash is stationary, and the upper and lower sash are arranged so that they can be raised and lowered vertically. They counterbalance each other through steel chains over special pulleys. In the monitor the lower row of sash is stationary, and the upper sash are arranged so that they can be opened for ventilation. A special door, 22 ft. 2 in. wide



General View of Heine Boiler Shop.

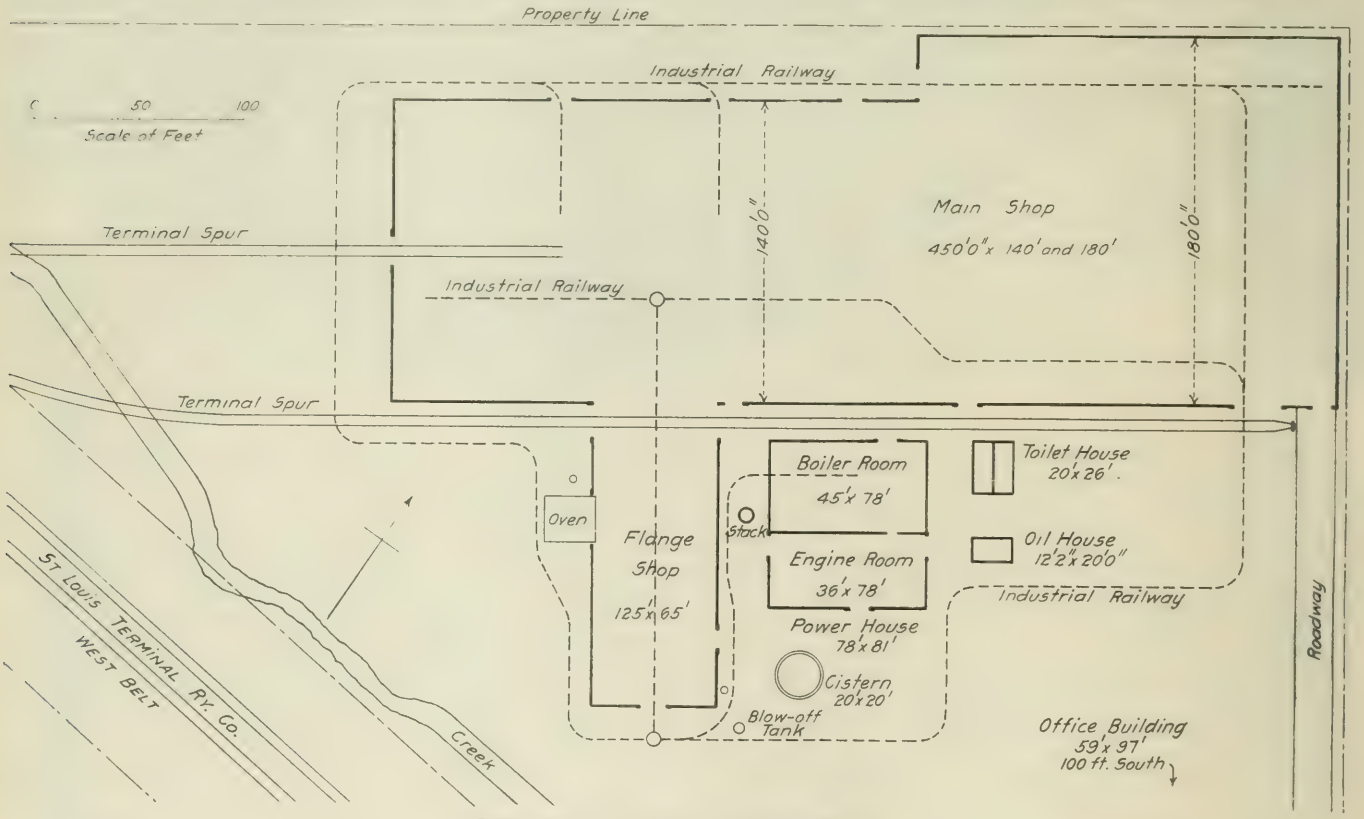


Steel Framing of Main Shop.

x 20 ft. high, is located in the receiving end, and through this is carried a transverse craneway projecting outside of the building and over the receiving tracks. It connects with the longitudinal cranes on the inside, thus permitting unloading material from cars expeditiously and cheaply.

The flange shop, 62 ft. 4 in. x 144 ft., is similar in construction to the main building. Large door openings are placed in the side walls, through which the receiving switch passes. These openinsg are closed by rolling steel doors made by the Kinnear Manufacturing Co., Columbus, Ohio. The power house, 75 ft. x 79 ft., is divided by a brick wall near the center into an engine room and a boiler room. A three-ton traveling crane, made by the Yale & Towne Manufacturing Co., New York, is located on a transverse craneway at the storage end of the main shop. This is used to place boiler plate, the heaviest material received, directly into a series of racks, which hold the plates in vertical position so that they may be withdrawn without unnecessary handling.

The side bays are each served by four three-ton Curtis traveling cranes, with hand-operated triple blocks. This shop is supplied with a full complement of boiler-making tools, most of which are motor-driven. The flange shop is also supplied with heavy hydraulic tools for punching and flanging, and the floor is served by four three-ton Curtis traveling cranes. All the small traveling cranes in both shops on adjacent parallel tracks overhang their runways so as to be locked together, and the trolleys run from one to the other.



General Plan of Heine Boiler Plant.

The equipment in the boiler house consists of three 250-h.p. Heine boilers each set separately, two of them being provided with Heine superheaters of different capacities. They are all hand fired and have flat shaking grates. The third boiler has a concrete setting with fire brick lining, which is an experiment to determine the availability of concrete for this purpose. The three boilers differ from each other in dimensions and are all arranged so that observations can be made in testing, as the company has in view a great variety of experiments to determine questions now in doubt and to develop further improvements in boiler practice. The electric power is developed by a 162-h.p. Ball engine directly connected to a 100-k.w. Western Electric Co., New York, generator. A Laidlaw-Dunn-Gordon two-stage compound air compressor is located next to the engine. It has a capacity of 1,200 cu. ft. of free air per minute at 100 lbs. pressure. The hydraulic system is supplied by a Worthington duplex compound pump having a capacity of 100 gal. per minute against 1,500 lbs. pressure. A Wood hydraulic accumulator with 12-in. ram and 15-ft. stroke, loaded for this pressure, is located in one corner of the room. A 10-ton hand-power traveling crane, 33½-ft. span, made by Pawling & Harnischfeger, Milwaukee, Wis., serves the entire area of the engine room. The steel construction was purposely undertaken at a time of business depression so that low prices could be obtained, and the work was commenced early in 1908. The grading was completed in July, 1908, and 18,000 cu. yds. of earth were excavated at a cost of 16 cents per yard. This work and the retaining walls were executed by the Fruin & Colnon Constructing Company. The steel work, amounting to about 790 tons, was furnished by the Ritter Conley Manufacturing Company at the rate of 2.6 cents per pound, f.o.b. St. Louis. It was all inspected by Robert W. Hunt & Company, New York, before leaving the factory. The steel work was erected by the Midland Erection Company at the rate of $8.80 per ton, and the general contract for the completion of the main shop and power house was given to the Fruit & Colnon Constructing Company. The total cost of the buildings was $1.15 per sq. ft. of floor area, excluding the retaining walls and grading, and $1.29 per sq. ft. including these two items. This, of course, does not include any of the equipment. The whole work of constructing the shop was under the direct supervision of H. C. Meinholtz, vice-president and superintendent of the Heine Safety Boiler Co.

Main Shop Tools.

1 Ryerson high-speed friction saw, 30-h.p. motor.
1 24-in. Kraut punch, 7½-h.p. motor.
1 36-in. Cleveland punch, 7½-h.p. motor.
1 8-ft. Lennox splitting shears, 7½-h.p. motor.
1 60-in. Cleveland punch and shear, 10-h.p. motor.
1 Lennox rotary bevel shear, 7½-h.p. motor.
1 14-ft. Hilles & Jones bending roll, 10-h.p. and 30-h.p. motors.
2 100-ton Woods triple-power hydraulic riveters.
1 30-in. Long & Allstetter horizontal punch, 7½-h.p. motor.

The three last machines are located under the riveting tower and are served by three 10-ton Wood hydraulic tower traveling cranes with 40-ft. lift and 20-ft. 7-in. span. Provision is also made for an additional riveter.

2 5-ft. radial drills belted from a shaft driven by a 10-h.p. motor.
1 Wood portable hydraulic riveter, handled by the hydraulic hoist in the 30-in. horizontal punch tower.
1 25-ton Pawling & Harnischfeger electric traveling crane, 26½-ft. lift, 60-ft. span with 5-ton auxiliary hoist; General Electric motors for all movements.
An outfit of pneumatic calking, riveting and chipping hammers.
1 Angle bending roll, 10-h.p. motor.
1 Sheet-iron break, 7½-h.p. motor.
1 42-in. Lennox rotary splitting shears, 7½-h.p. motor.
1 36-in. Kraut punch, 7½-h.p. motor
1 8-ft. Hilles & Jones bending roll, 10-h.p. motor.
2 6-in. Cleveland punches belted to a counter shaft driven by a 7½-h.p. motor.
1 6-ft. Hilles & Jones bending roll.
1 24-in. Long & Allstatter punch.
These two latter are belted to a countershaft driven by a 7½-h.p. motor.

The machine shop equipment is mainly belt-driven by a 20-h.p. motor through a line shaft. There are four lathes of various sizes, one shaper, one universal milling machine, three different sizes of radial drills, one planer, one heavy duty motor-driven boring mill, one double head bolt cutter, two pipe-threading machines, a combination grinder, one wet grinder.

Flange Shop Tools.

1 180-ton, 60-in. Wood hydraulic punch and shear.
1 130-ton, 60-in. hydraulic sectional flanging machine.
1 1,100-lb. Niles-Bement-Pond steam hammer.
1 10-in. Long & Allstatter horizontal punch, 7½-h.p. motor.
1 250-lb. Niles-Bement-Pond steam hammer.
2 2-ft. 10-in. x 14-ft. hearth open forge fires
1 2-ft. 10-in. x 6-ft. hearth open forge fire.
1 4-ft. 3-in. x 6-ft. hearth reverberatory forge furnace.
1 10-ft. 6-in. x 15-ft. 6-in. hearth reverberatory plate heating furnace.
3 Blacksmith forges.
1 24½-in. motor-driven blast fan and pipe connections to forger.
1 Cast iron plate-straightening bed and roller.
Complete set of cast iron forming blocks, dies, etc., to suit the special requirements of the type of boiler built by this company.
4 3-ton Curtis traveling cranes.

NEW YORK TUNNEL EXTENSION OF THE PENNSYLVANIA RAILROAD; CROSSTOWN TUNNELS.*

BY JAMES H. BRACE AND FRANCIS MASON, MEMBERS, AM. SOC. C. E.

III.

Thirty-second Street Open-Cut Work.—Before actual open-cut excavation was started, all buildings facing it were underpinned to rock. For this purpose, a trench was dug along the face of the buildings and of the same depth as their cellars. Holes were cut in the front foundation walls through which long needle-beams were inserted and jacked up on blocking placed on the cellar floor and in the trench, until the weight of the building had been taken off its foundations. A close-sheeted trench was then sunk to rock under the front building walls, and a light rubble masonry retaining wall was built in it to support the building permanently. Frequently, the excavation for the underpinning wall, which was taken out in sections from 30 to 40 ft. long, and in places was carried to a depth of 40 ft., was very troublesome on account of the large quantity of water encountered and the fineness of the sand, which exhibited a tendency to flow when saturated.

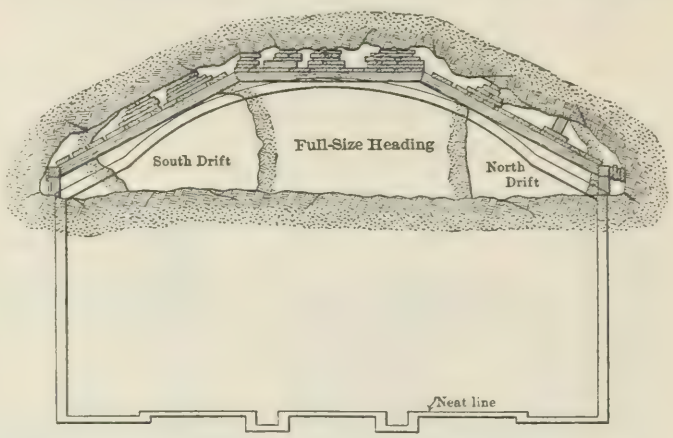
The elevated railway columns in Sixth avenue, near the north and south lines of Thirty-second street, were underpinned in a manner similar to the building foundations, while those on the center line of the street were supported by girders riveted to them close under the track level. The girders in turn were supported on posts footed on the new underpinning of the adjacent columns. On the completion of the tunnels, concrete piers were built up from the roof of the tunnel to form a permanent foundation for the center-line columns. The area to be excavated under Sixth avenue was enclosed by a rubble masonry retaining wall constructed in a trench.

Open-cut excavation was started by planking over the street on stringers resting on transverse 12-in. x 12-in. caps. The caps were gradually undermined and supported on temporary posts which were then replaced by short posts resting on 12-in. x 12-in. sills about 7 ft. below the cap. The operation was then repeated and the sill was supported on another set of short posts resting on a second sill. When the excavation had been carried down in this manner to the level of the top of the tunnel, diagonal 3-in. x 10-in. timbers were cut in between the posts and sills to form a species of double A-frame, the legs of which rested in niches cut in the rock and on posts carried up the face of the underpinning wall, and the whole was stiffened with vertical tie-rods. The brick sewer was replaced temporarily by one of riveted steel pipe. This pipe and the water and gas pipes and electric conduits were suspended from the timbers as the pipes were uncovered.

Excavation in rock was made by sinking a pit to sub-grade for the full width of the tunnel and advancing the face of the pit in several lifts, the muck being blown over the slope and loaded into buckets at its foot.

The work was attacked at several places simultaneously, and the spoil was hoisted by derricks located at convenient points along the side of the cut.

Thirty-third Street Work in Tunnel and Open Cut.—The West Thirty-third street shaft was similar to the one in Thirty-second street, and was sunk during February, March and April, 1907, through 10 ft. of earth, 21 ft. of soft rock, and 29 ft. of fairly hard rock. It was necessary to timber heavily



North and South Heading and Enlargement to Single Heading; Three-Track Tunnel.

the upper 30 ft. of the shaft. The timber later showed evidences of severe strain, and had to be reinforced.

As soon as the shaft excavation was deep enough, a drift was driven part way across the tunnels, and top headings were started both east and west to explore the rock. The heading to the west was divided into two drifts, as shown herewith. These two drifts were continued to the west end of the contract, and were then enlarged to a full-sized heading and timbered, as shown. The rock near the shaft contained many wet, rusty seams, and settlement was detected in the segmental tunnel timbering soon after the widening of the heading was completed. Short props were placed under the timbers, and the street surface was opened with a view of stripping the earth down to the rock and thus lightening the load on the timbering. Street traffic was maintained on a timber structure with posts eventually carried down to the rock surface, and the walls of the buildings on the north side of the street were underpinned to rock. The settlement of the tunnel timbering was checked for a time, and the bench was excavated as shown. In this work the cut in the center was first made, and the short props were replaced by struts, as shown; after this the berms were removed and the side posts were placed. While building the brick arches, holes were left in the masonry around the struts. After the masonry had hardened, piers were built on the arches to

*From a paper presented before the American Society of Civil Engineers on December 1. Published in *Proceedings* for October, 1909, page 1016.

support the segmental timbers. The struts were then removed and the openings filled with masonry. The voids above the arch were packed with rock and afterward thoroughly grouted.

The timbers near the shaft continued to settle, and, although they had been placed from 9 to 12 in. above the level of the top of the masonry, by October 1, they encroached 9 in. within the line of masonry. It was then decided to remove the rock 48 ft. west of the shaft, and build this portion of the tunnel in open cut. The posts supporting the deck forming the street surface were replaced by an A-frame structure similar to that developed for the Thirty-second street open cut, without interruption of the street traffic.

After making the open cut to the westward of the shaft, there was a slip in the rock north of and adpoining the shaft. Fortunately, the timbers did not give way entirely, and no damage was done. The open cut was extended eastward for 46 ft., making the total length of tunnel built in open cut on this street 94 ft.

East of the shaft, for about 125 ft., the rock was broken and could not be excavated to full size without timbering the roof, but between this section of poor rock and those already mentioned in connection with the work at Fifth avenue there was a stretch of 600 ft. of good rock where all the spoil was handled with a steam shovel.

TWIN-TUNNEL LINING.

The masonry lining for the tunnels was not started until the late fall of 1906, after excavation had been in progress for a year and a half. At that time concreting was started in the single tunnels westward from the First avenue shafts, and by spring was in full swing in the twin tunnels.

The plans contemplated the use of a complete concrete lining except where large quantities of water were encountered; in which case the arches, beginning at a point 15 deg. above the springing line, were to be built of vitrified paving brick. The water-proofing, which in the concrete-roof tunnels extended the full height of the sides to the 15-deg. line, was carried in the brick-roof tunnels completely around the extrados of the arch. The electric conduits were buried in the mass of the side and core-walls, and limited the height to which the concrete could be carried in one operation.

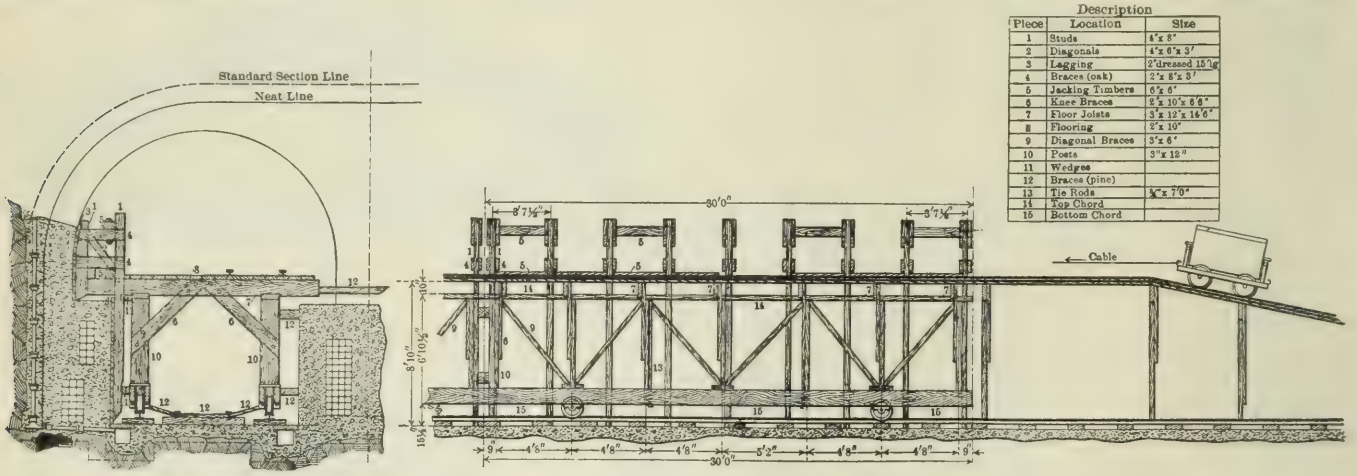
The same general scheme of operations was used whenever possible throughout the twin-tunnel work, but was subject to minor modifications as circumstances dictated. Concrete was first deposited in the bottom, to the grade of the flow line of the drains; after it had set, collapsible box forms, of 2-in. plank with 3-in. plank tops, were laid on it to form the ditch and the shoulders for the flagstone covers. The track, which had previously been blocked up on the rock between the ditches, was raised and supported on the ditch boxes above the finished floor level. At the same time, light forms were braced from the ditch boxes to the grade of the base of the low-tension and telephone-duct bank. After depositing the concrete to this level, the telephone ducts were laid.

The forms for the water-proofing or sand-wall up to the 15-deg. line and for the main side-walls and core-walls were built in 30-ft. panels and were supported on carriages, which, traveling on a broad-gage track above the ditches, moved along the tunnel, section by section, as the work advanced. The panels were hung loosely from joists carrying a platform on the top chord of the carriage trusses, and were adjusted transversely by bracing and wedging them out from the car riage. The small forms for the refuge niches, ladders, etc., were collapsible, and were spiked to the main panel forms just before depositing the concrete. The concrete was deposited from the platform on top of the carriage, to which the cars were elevated in various ways. The accompanying drawing shows the details of the carriages, and is self-explanatory.

The concrete for the sand-walls and the core-wall, to the level of the sidewalk, was deposited at the same time; two carriages in each tunnel, placed opposite each other, forming a 60-ft. length, were used at each setting. The floor section of the 4-in. tile drains had been laid with the floor concrete, and, as the sand-wall concrete was deposited, the drains were brought up simultaneously, broken stone being deposited between the tile and the rock to form a blind drain and afford access to the open joints of the tile for the water entering the tunnel through seams in the rock. The drains were spaced at intervals not exceeding 25 ft., depending on the wetness of the rock, and were placed at similar intervals in the core-wall under the lowest projecting points of the rock on the center line between the tunnels. A small ditch lined with loose 6-in. vitrified half pipe was provided in the top of the sand-wall to collect the water from the extrados of the arch and lead it to the top of the drains. Great difficulty was experienced in maintaining these drains clear, and, on completion of the work, a large amount of labor was expended in removing obstructions from the floor sections, the only portion then accessible.

After water-proofing the sand-walls and laying the low-tension ducts, a second pair of carriages, with panels on one side only, for 60 ft. of side-wall and skewback to the 15-deg. line, were set and braced against the core-wall. They were concreted to the base of the high-tension duct bank, and, after the concrete had hardened and the bank of ducts had been laid, the concreting was completed in a second operation.

In places where the roof was supported temporarily by posts and heavy timbering, such as Fifth avenue, the form carriages could not be used, and special methods were devised to suit the local conditions. Usually, the panels were stripped from the carriages and moved from section to section by hand, and, when in position, were braced to the timbering.



Piece	Description Location	Size
1	Studs	4"x 8"
2	Diagonals	4"x 6"x 3'
3	Lagging	2"dressed 15'6"
4	Braces (oak)	2"x 8"x 3'
5	Jacking Timbers	6"x 6"
6	Knee Braces	2"x 10"x 6'6"
7	Floor Joists	3"x 12"x 14'6"
8	Flooring	2"x 10"
9	Diagonal Braces	3"x 6"
10	Posts	3"x 12"
11	Wedges	
12	Braces (pine)	
13	Tie Rods	¾"x 7'0"
14	Top Chord	
15	Bottom Chord	

Carriage Form for Side Walls; Twin Tunnels.

The arch centers were built up of two 5-in. x 3-in. x ⅜-in. steel angles, and, when set, were blocked up on the sidewalks opposite each other in the two tunnels. A temporary platform was laid on the bottom chord angles of the ribs, on which the concrete was dumped, the same as on the form carriages. The lagging used was 3-in. x 3-in. dressed pine or spruce 16 ft. long, and was placed as the concreting of the arch proceeded above the 15-deg. line on the side-wall and above the sidewalk on the core-wall. After the arch had reached such a height that the concrete could not be passed over the lagging directly from the main platform, it was cast on a small plaform on the upper horizontal bracing of the centers, and was thence shoveled in to the work. In the upper part of the arch the face of the concrete was kept on a radial plane, and, when only 3 ft. remained to be placed, it was keyed in from one end, the key lagging being set in about 5-ft. lengths. The arches were concreted usually in 60-ft. lengths.

Where brick arches were used, the core-wall skewback was concreted behind special forms set up on the sidewalks, or the arch ribs and lagging were used for forms, and the brick arch was not started until after the concrete had set. In laying the brick in the arch, the five courses of the ring were carried up as high as the void between the extrados and the rock would permit and still leave a working space in which to place the water-proofing. This was usually not more than 3 ft., except on the core-wall side. The felt and pitch water-proofing was then laid for that height, joined to the previous water-proofing on the side-walls, and was followed by the brick armor course over the water-proofing and by the rock packing, after which another lift of brick was laid and the operations were repeated. The large void above the core-wall gave convenient access for working on top of the adjacent sides of the roof, and the keying of the arches and the water-proofing and rock packing above the core-wall were usually carried on from that point, the work progressing from one end.

The concrete for all work above the floor was dumped on the platform of the carriages, to which it was transported in the early part of the work in cars running on a high-level track laid on long ties, resting on the finished sidewalks. This arrangement, although requiring a large amount of timber for the track, permitted the muck to be carried out on the low-level track without interference. Later, when the advance of the heading had ceased and the heavy mucking was over, all concrete was transported on the floor level, and the cars were lifted to the carriage platforms by elevators and were hauled by hoisting engines up a movable incline.

Water-Proofing.—The water-proofing referred to above was in all cases felt and pitch laid with six thicknesses of felt and seven of pitch. The sub-contractor for the work was the Sicilian Asphalt Paving Co. All joints were lapped at least 1 ft., and where work was suspended for a time and a bevel lap could not be made, the edges of the felt were left unpitched for 1 ft. and the newer work was interlaced with the old. This method was not always successful, however, on account of the softening of the unpitched felt on long-continued exposure to the water. The felt used was mainly Tunaloid, together with some Hydrex. It weighed about 12 lbs. per 100 sq. ft. when saturated and coated on one side only, and contained about 25 per cent. of wool. The coal-tar pitch used had a melting point of 100 deg. Fahr.

After the completion of the tunnel, the concrete arch showed some leakage and in places unsightly lime deposits. It was determined to attempt to stop these leaks by the application of a water-proof cement coating on the intrados of the arch. Extended experimental application of two varieties of materials used for this purpose—Hydrolithic cement and the U. S. Water-Proofing Co.'s compound—have been made with apparent success up to the present time, and the results after the lapse of a considerable period are awaited with interest.

Duct Laying.—The position of the electric conduits, buried in the heart of the concrete walls, interfered greatly with the economical and speedy placing of the lining, and their laying proved to be one of the most troublesome features of the work. The power conduits were single-way, with the bank for high-tension cables separated in the side-walls from the low-tension bank. The conduits for telephone and telegraph service were four-way, and were located in the core-wall. All ducts had ¾-in. walls and a minimum clear opening of 3⅜ in. square, with corners rounded. They were laid with joints broken in all directions, and in about ¼-in. beds of 1: 2½ mortar. Flat steel bond-irons, 2 in. x ⅛ in., with split and bent ends, were placed in the joints at intervals of 3 ft. and projected into the concrete 3 in. on each side, tying together the concrete on opposite sides of the ducts. The joints were wrapped with a 6-in. strip of 10-oz. duck saturated with neat-cement grout, and, in addition, the power conduits were completely covered with a ½-in. coat of mortar to prevent the intrusion of cement and sand from the fluid concrete. The four-way conduits were plastered only over the wraps. Splicing chambers were provided at intervals of 400 ft.

THREE-TRACK TUNNEL LINING.

In the three-track tunnels, a heavy brick arch was used for those portions constructed in tunnel, while, in the open-cut sections, the roof was of concrete. Both were completely water-proofed on the roof and sides, and in the tunnel sections the space above the brick roof was filled with rock packing. On account of the unstable nature of the rock encountered throughout, the voids in the packing were afterward filled with grout.

The haunches of the arch were tied together by steel I-beams anchored in the concrete, with the object of making the structure self-supporting in the event of the removal of the adjacent rock for deep cellar excavations. This construction materialy influenced the contractor's method of placing the masonry lining.

After depositing the floor concrete, by the same method that was used in the twin tunnels, a timber trestle was erected to the height of the underside of the I-beam ties, the posts being footed in holes, about 3 in. deep, left in the concrete floor to prevent slipping. In the open-cut sections the sand-wall forms were of undressed plank tacked to the studding and braced from the trestle; in the tunnel section they were spiked to the face of the posts supporting the timbering.

The side-wall forms were made up in panels about 3 in. x 10 ft., and were clamped to studs by U-shaped irons passing around the stud and bolted to the cleats on the back of the panels, the studs being braced from the trestle. The side-wall concrete was deposited in three sections. The first was brought up just above the sidewalk and formed the bench for the high-tension ducts; the second carried the wall up to the springing line. Before placing the third section the I-beam ties were set in position on top of the trestle, and the reinforcing rods in the haunch of the arch were hung from them. The concrete was carried up to a skewback for the arch and embedded the ends of the ties.

The centers for the arches stood on the I-beam ties, and the top of the hangers, for the permanent support of the ties near their center, were inserted through the lagging. The brick arch, water-proofing, and rock packing were laid up in lifts, in the same manner as in the twin tunnel, with grout pipes built in at intervals of about 8 ft. The concrete arch was placed in sections, from 25 to 50 ft. in length, with a rather wet mixture and a back form on the steep slope of the extrados.

The concrete for the sand-walls and lower part of side-walls was handled on tracks and platforms laid on cantilever beams at mid-height of the trestle. For the walls above the springing line, the tracks were laid on top of the I-beam ties, and some of the arch concrete, also, was delivered from the mixer at that level and hauled up an incline to the level of the top

of the arch. By far the greater part, however, was turned out from mixers set on the completed arch, and was transported on tracks hung in part from the street timbering.

Completion.—Except in the heavily-timbered portions, such as at Fifth avenue, where the load had to be transferred from posts to the completed masonry section by section, the lining of the tunnels presented no special difficulty. The large number of small forms to be set, and the mutual interference of the concreting and duct-laying operations, proved to be the most troublesome features of the work.

The restoration of the streets, public utilities, etc., at the open-cut sections was a slow and tedious operation, but the tunnels themselves were completed in March, 1909, 3 years and 10 months after the inception of the work.

METHOD OF APPLYING AND MAINTAINING TUBES IN LOCOMOTIVE BOILERS—PENNSYLVANIA RAILROAD STANDARDS.

In common with other railways the Pennsylvania has experienced much trouble from leaky tubes, and while on most roads this is attributed to bad water or improper methods of feeding, filling and cooling boilers, on the Pennsylvania, where there is a good water supply and proper methods of handling water are employed, it was found that a large part of the tube leakage was caused by irregular methods of setting and tightening tubes. The practice at different shops and roundhouses was not uniform, and when a passenger

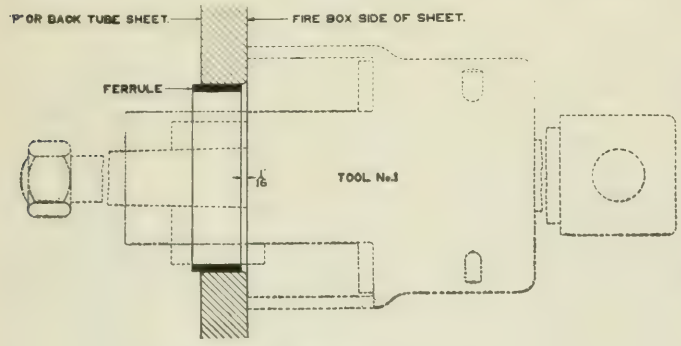


Fig. 1.

locomotive passed over several divisions and required tube repairs, the work was not always done in such a manner as to prevent leakage. In other words, tube repairs were not sufficiently standardized to obtain the desired results. After careful investigation, the best practice for setting tubes at shops and engine houses, the best method of maintaining tubes

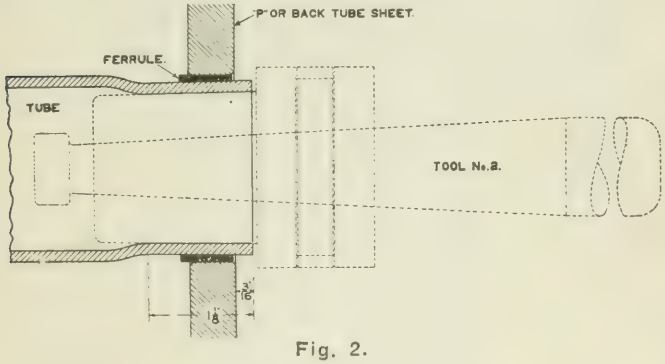


Fig. 2.

at engine houses, the best method of preventing leaky tubes when engines arrive at terminals, and the proper tools for tube work, were all standardized and printed in a circular which was approved in June, 1909, by the lines East and West. Since the adoption of this standard tube practice the number of leaky tubes on the Pennsylvania Lines has been materially reduced. The new circular relating to tubes is as follows:

Tubes must be in accordance with standard specifications and must be ordered .120 in. thick. Material for safe ends must be in accordance with standard specifications and must be ordered .134 in. thick. Ferrules must be made of soft copper and 1/32 in. longer than thickness of tube sheet, and must be ordered .075 in. thick. The outside diameter must be the same as the outside diameter of the tube. Tube holes

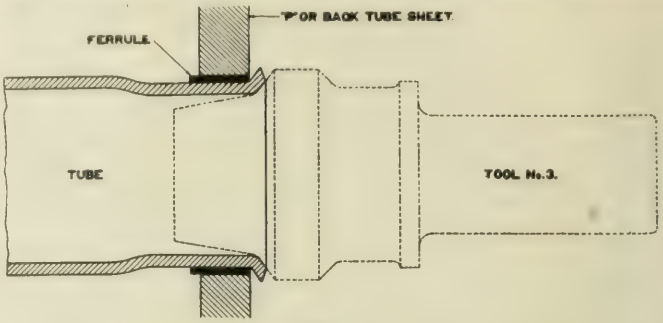


Fig. 3.

in firebox tube sheet must be the same diameter as outside of the tube and a 1/16 in. radius fillet must be provided on each edge of tube holes.

When tube hole in firebox tube sheet becomes ⅛-in. out round it must be reamed. Tube holes in smoke box tube sheets must be $\frac{1}{16}$-in. larger in diameter than the outside diameter of the tube and sharp edges of tube holes removed.

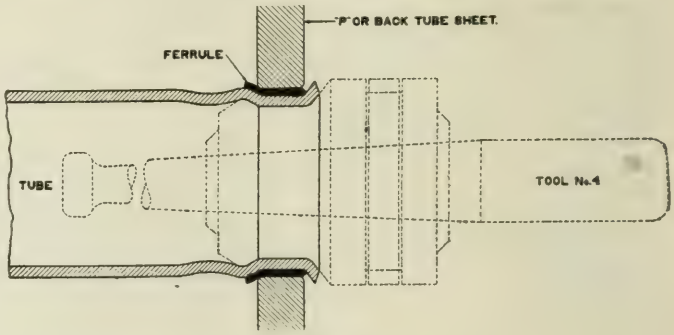
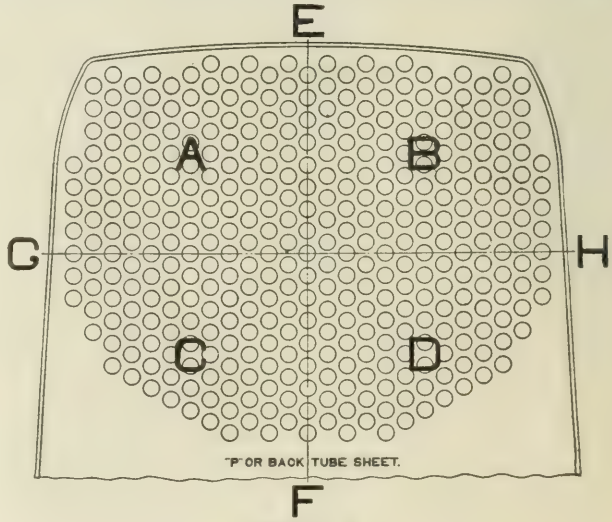


Fig. 4.

Firebox end of tubes must be swaged down with a slight taper towards end of tube to a diameter sufficiently small to allow end of tube to neatly fit ferrule after ferrule has been rolled in tube holes. The swaged end of tube must not be less than 1⅛-in. long, as shown in Fig. 2.

All tools for working tubes in locomotive boilers must be in accordance with standard tracings and the tool numbers



Sketch B.

stamped on each tool with ¼-in. figures. Each tool must be used for the operation specified. All tools No. 5 must be maintained within limits of standard gages and tools No. 4

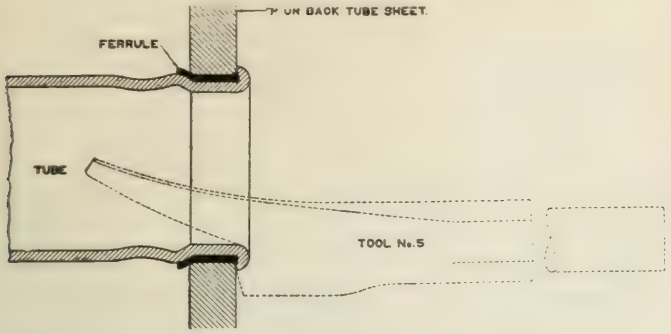


Fig. 5.

must be taken out of service when worn hollow 3/32-in. between fillets.

APPLICATION OF TUBES IN SHOPS AND ENGINE HOUSES.

Operation No. 1.—Ferrules must be placed in tube holes in firebox sheet, as shown in Fig. 1, and rolled tight with tool No. 1.

Operation No. 2.—Tubes must be placed in tube holes in firebox tube sheet neatly fitted, as shown in Fig. 2, and

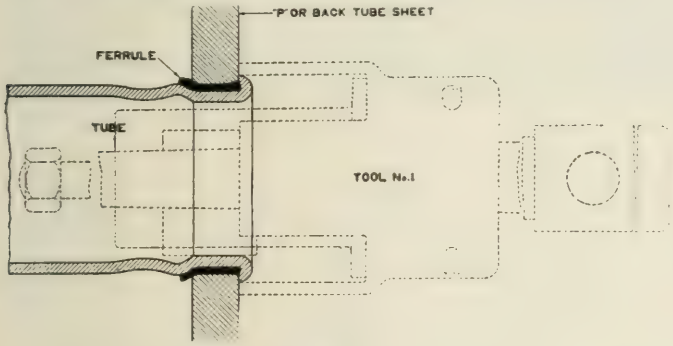


Fig. 6

tightened with tool No. 2. (Operations Nos. 7 and 8, respectively, must be performed after operation No. 2 is completed and prior to commencing operation No. 3.)

Operation No. 3.—Firebox ends of tubes, as shown in Fig. 3, must be opened with tool No. 3, using either a pneumatic or a hand hammer.

Operation No. 4.—Firebox ends of tubes, as shown in Fig. 4, must be expanded with tool No. 4. This operation should

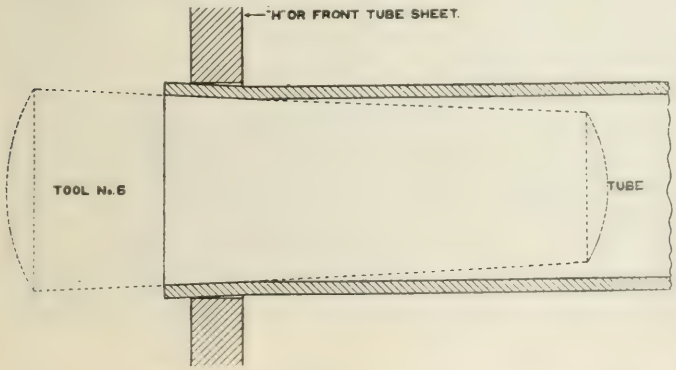


Fig. 7.

be done on tubes along the lines E-F and G-H respectively, as shown in sketch B, and then sections A, B, C and D should be worked out by performing this operation in each section commencing at outer edge of sheet in working the tubes in these sections in circumferential rows toward the center.

Operation No. 5.—Firebox ends of tubes, as shown in Fig. 5, must be beaded with tool No. 5, using either a pneumatic or a hand hammer.

Operation No. 6.—Firebox ends of the tubes, as shown in

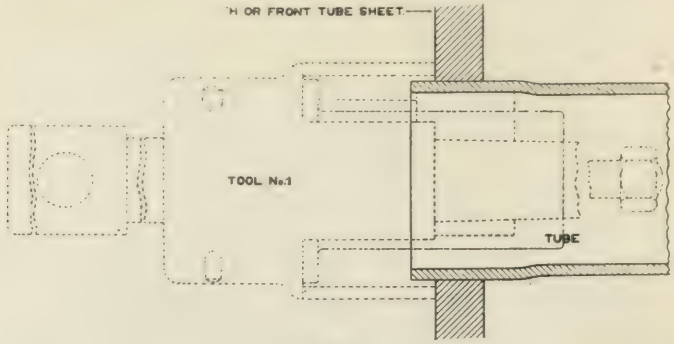


Fig. 8.

Fig. 6, may be slightly rolled with tool No. 1 if necessary.

Operation No. 7.—Smoke box ends of tubes, as shown in Fig. 7, must be tightened with tool No. 6.

Operation No. 8.—Smoke box ends of tubes, as shown in Fig. 8, must be rolled with tool No. 1.

MAINTENANCE OF TUBES AT ENGINE HOUSE.

Tubes which are slightly leaking at the firebox end of locomotive boilers in service must be tightened with tool No. 4 if necessary, after which beads must be reset with tool No. 5. Tubes which are slightly leaking at the smoke box must be tightened with tool No. 1. When a locomotive arrives at an engine house with tubes leaking so badly at firebox end that it must be taken out of service, the boiler must be drained, after which firebox ends of tubes must be reset with tool No. 4 and beads then reset with tool No. 5. When tubes will not stand resetting with tool No. 4, they may be rolled with tool No. 1, after which the beads must be reset with tool No. 5. (Tool No. 1 *must not* be used except in the judgement of the foreman it is necessary.)

PREVENTION OF LEAKING TUBES.

In order to reduce the tube leakage to a minimum the following practice must be followed: When fires are being cleaned or drawn the blower should be used only sufficiently hard to prevent smoke emitting from the fire door. All fires must be banked at tube sheet except in the fire boxes having front grates, bricked off, in which case the fire should be banked over the adjoining grates. Unless absolutely necessary, injectors should not be used while fires are being cleaned, also when no fire is in fireboxes, nor while locomotives are being moved under their own steam in engine yards without first brightening up the fire.

EXPRESS PASSENGER LOCOMOTIVES; PARIS, LYONS AND MEDITERRANEAN RAILWAY.

BY ERNEST GRAHAM.

The Paris, Lyons & Mediterranean Railway may be said to be the home of the compound locomotive. Here the Henri-Baudry system of compounding reigns supreme. The first compound, built by M. Henri, the locomotive engineer of the P. L. M., was introduced in 1889, four years after the introduction of the first de Glehn compound on the Northern Railway of France. Both the Henri and de Glehn types were exhibited at the Paris Exhibition of 1889. One notable difference between these two engines was that M. Henri used coupling rods, whereas M. de Glehn did not. M. Henri also used a high steam pressure, 213 lbs. per sq. in.; that used on the de Glehn engine was 156 lbs. per sq. in. Both engines had the h.p. cylinders placed inside the frame and coupled to the leading driving axle, the low pressure being outside and coupled to the rear driving axle. In the de Glehn engine the l.p. cylinders were set back on the frames, but in the Henri en-

gine all four cylinders were abreast, long piston and connecting rods being used in connection with them.

The Henri system was applied to several distinct types of engines, and proved very successful. The disposition of the cylinders was not always the same as in the above-mentioned engine. The system was continued with modifications by M. Baudry, successor to M. Henri. In 1892 the first of 50 eight-wheel-coupled four-cylinder compound goods engines was introduced, all cylinders driving the second axle. The same year a new type of four-cylinder compound 4-4-0 express engine appeared, with l.p. cylinders inside the frame driving the leading coupled wheels, and h.p. cylinders outside the frame set back to drive the trailing coupled wheels in the same way as in the de Glehn system.

Forty more 4-4-0 engines of the same type were built in 1894, and various types compounded on the same system were introduced in the succeeding years. It is hard to draw a dividing line between the Henri-Baudry and de Glehn systems; the difference is chiefly one of intercepting valves and other details. Up to 1904 the bulk of the express work was done by the four-cylinder compound 4-4-0 engines known as class C. There were 120 of these engines numbered 61 to 180, and even now they are doing very fine work. The goods traffic during the same period was worked largely by a 4-6-0 class of four-cylinder compound, numbered 3,401 to 3,650. Since 1904 the locomotive stock of the P. L. M. has been largely augmented by more compounds of the Henri-Baudry type. I append a tabulated list of the principal dimensions of these later types.

The first to appear were the large 4-6-0 class, series 2,600 (Fig. 1). In this class the h.p. cylinders placed outside the frame drive the second pair of coupled wheels, the l.p. cylinders being inside the frame and driving the leading coupled wheels, all being placed nearly in line, the outside cylinders having much longer piston and connecting rods. Independent motion of the Walschaerts type is provided for both inside and outside cylinders, and provision is made for the independent adjustment of the h.p. valve gear, but I understand that, as a rule, this is not used, the reversing shafts of both sets of motion being actuated at the same time, and not separately at the will of the driver. The maximum admission of steam to the cylinders is 88 per cent. of the stroke in the h.p. and 63 per cent. in the l.p. Live steam is admitted to the l.p. cylinders for starting. Of this class 137 engines were in service on Oct. 1, the last 10, built in 1908, being fitted with

PRINCIPAL DIMENSIONS OF P. M. L. RY. LOCOMOTIVES.

		4-6-0 Compound Express Locomotive. Series 2600		4-8-0	Pacific Type	
		Without superheater.	With superheater.	Comp. Goods locomotive.	Comp. Exp. locomotive.	Simple Exp. locomotive.
Cylinders	Diameter, HP	13.386 in.	14.567 in.	14.96 in.	15.354 in.	4 cyl. 18.898 in.
	" LP	21.26 "	21.26 "	23.622 "	24.41 "	....
	Stroke of piston	25.59 "	25.59 "	25.59 "	25.59 "	25.59 in.
	Ratio of volume, HP to LP	2.52	2.13	2.49	2.55	....
Wheels	Diameter of bogie	.3 ft. 3⅜ in.		3 ft. 3⅜ in.	3 ft. 3⅜ in.	3 ft. 3⅜ in.
	" " coupled	6 " 6¾ "		4 " 11 "	6 " 6¾ "	6 " 6¾ "
	" " trailing	....		....	4 " 5½ "	4 " 5½ "
Boiler	Center of boiler from rail level	8 " 6⅝ "		8 " 6⅜ "	9 " 6⅛ "	9 " 6⅛ "
	Length of barrel	12 " 9½ "		13 " 6½ "	19 " 4¼ "	19 " 4¼ "
	Diameter of barrel (outside)	5 " 0⅜ "		5 " 2⅜ "	5 " 7½ "	5 " 7½ "
	Steam pressure	227 lbs.		227 lbs.	227 lbs.	170 lbs.
	Grate area	32 sq. ft.		33.2 sq. ft.	45.7 sq. ft.	45.7 sq. ft.
	Number of tubes	138 serve	64 serve 21 plain large 19 plain small	146 serve	278 plain	143 pln. sm'll 28 " large
	Diameter of tubes (exterior)	2.756 in.	64—2.756 in. 21—5.0 " 19—1.969 "	2.756 in.	2.323 in.	143—2.323 in. 28—5.236 "
	Tubes—Material	Steel	Steel	Steel	Steel	Steel
	Total heating surface of boiler	2,380 sq. ft.	1,546 sq. ft. without superheater	2,660 sq. ft.	3,046 sq. ft.	2,348 sq. ft.†
Weights, in working order	On bogie ..... lbs.	46,046	47,645	35,750	44,419	50,198
	" coupled wheels ..... "	112,468	112,987	126,560	122,326	122,326
	" trailing wheels ..... "	....	....	....	34,989	33,354
	Total ..... "	158,514	160,632	162,310	201,734	205,878
Tender	Capacity of tank ... gallons	4,842		3,543	6,162	6,162
	Coal carried ..... tons	3.6		4.5	4.5	4.5
	Total weight in working order ..... lbs.	99,613		86,060	135,744	135,744
Engine and tender	Total weight in working order (tender empty) ..... lbs.	258,127	260,245	248,370	337,478	341,602
	First of class commenced running	1905	1908	1908	1909	1909
	Number of class in service Oct. 1, 1909	127	10	185	1	1
	Type of superheater used	....	Schmidt	....	....	Schmidt
	Makers	Various	Henschel & Sons.	Various	P.L.M. Ry. Co.	P.L.M. Ry. Co.
Tractive effort ..... lbs.		16,971	18,789	28,740	22,407	33,539
Weight on drivers / Total weight		70.95*	70.32*	77.97*	60.40*	59.41*
Tractive effort / Total weight		6.62	6.01	4.40	5.46	3.64
Tractive effort / Tractive effort × diam. of drivers		9.34	8.55	5.62	9.04	6.13
Heating surface / Heating surface		560.82	132.23	691.11	549.01	1,123.40
Grate area / Weight on drivers		71.37	48.31	80.12	66.65	51.37
Heating surface / Total weight		47.25	73.08	47.58	40.16	52.09
Heating surface / Displacement 2-h.p. cylinders ..... cu. ft.		66.60	103.90	60.64	66.49	87.68
Heating surface / Displacement 2-h.p. cylinders		4.16	5.94	5.2	5.48	8.30
Heating surface / Displacement 4 cylinders		572.16	312.95	511.53	555.84	.....
Grate area / Displacement 4 cylinders		.....	.....	.....	....	.141.44
Grate area / Displacement 2-h.p. cylinders		7.69	5.38	6.38	8.33	.....
Grate area / Displacement 4 cylinders		.....	.....	.....	.....	5.51

*Per cent. †Plus 649 sq. ft. superheater.

Schmidt superheaters. These 10 engines have h.p. cylinders increased from 13.38 in. diam. to 14.56 in. diam., the l.p. remaining the same as on the previous 127 engines of this class. This reduces the ratio of cylinder volumes h.p. to l.p. from 1:2.52 to 1.:2.13, and comparative results should be interesting.

In 1908 a type of 4-8-0 four-cylinder compound goods locomotive (Fig. 2) was introduced. This engine has a larger boiler than the 2,600 class (for full particulars see tabulated list). I understand these engines have been remarkably successful, and 185 of this class were in service on October 1.

Some very fine 4-6-4 tank engines having the same boiler as the 2,600 class, and weighing 86 tons, were also introduced about this time. The dimensions of this class I have not to hand. Some Atlantic type engines having similar dimensions to the 4-6-0 class series 2,600 were also built. The year 1909 has seen the introduction of two remarkable locomotives on the P. L. M. Both have been built to the designs of the present locomotive engineer of the P. L. M. at the company's works in Paris. They are of the 4-6-2 or Pacific type, one (Fig. 3) being a four-cylinder compound, having cylinders h.p. (2) 15.35 in. diam., l.p. (2) 24.41 in. diam., with a stroke of 25.59 in., giving a ratio of cylinder volumes h.p. to l.p. of 1.:2.55. The other (Fig. 4) is a four-cylinder simple engine fitted with a Schmidt superheater, the cylinders being 18.898 in. diam. by 25.59 in. stroke. These engines have very large tenders, carrying 6,100 gallons of water, this being made a necessity by the absence of water pick-up troughs. At present a trial is being run between these two interesting locomotives. I understand that whichever of the two gives greatest satisfaction will be adopted for the heavy express work on the P. L. M. system. In view of the controversy which has long raged round the subject of simple versus compound, the result will be awaited with interest by all locomotive engineers. I think it will be generally agreed that the battle in the future will be between the four-cylinder compound and the four-cylinder simple fitted with a superheater. Although in England at the present time the two-cylinder engine still holds almost unrivalled sway there are signs that the better balancing and distribution of stresses obtained by the four-cylinder arrangement will eventually triumph. These advantages should make themselves felt in the repair bill. As compounding does not seem to make much headway in England, it looks as though superheating would have an easy victory. The apparently conflicting conclusions arrived at by locomotive engineers in England are very difficult to understand. To-day, after 30 years, the compound locomotive holds an assured position on many large continental railways; whereas in England it is looked on with disfavor and dis-

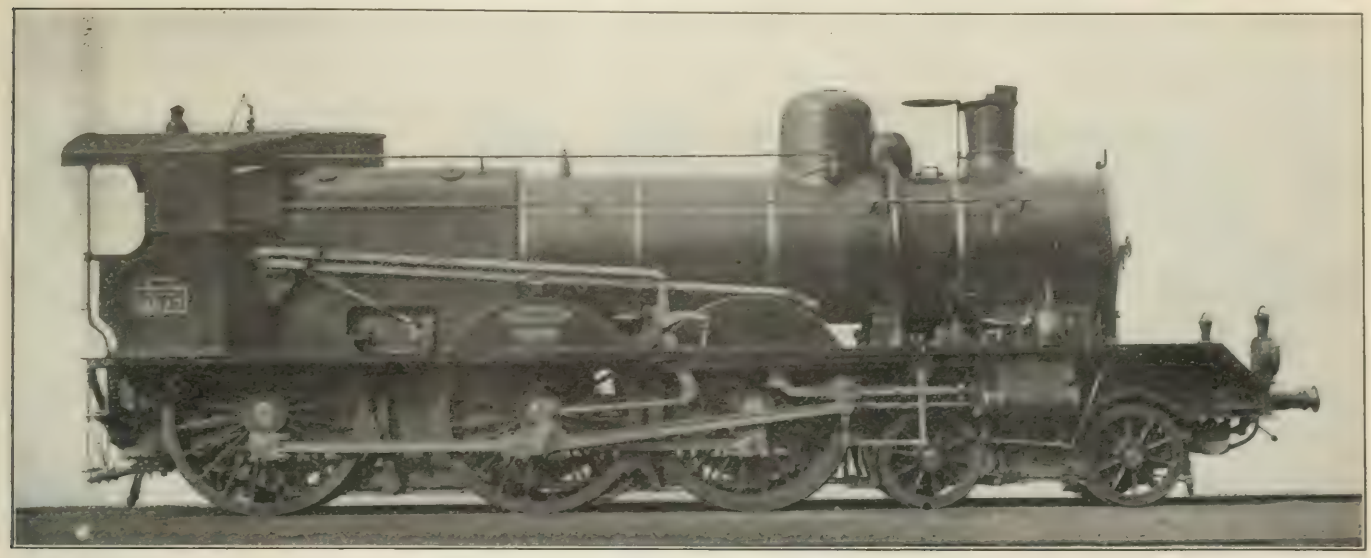


Fig. 1—Ten-Wheel Four-Cylinder Compound.

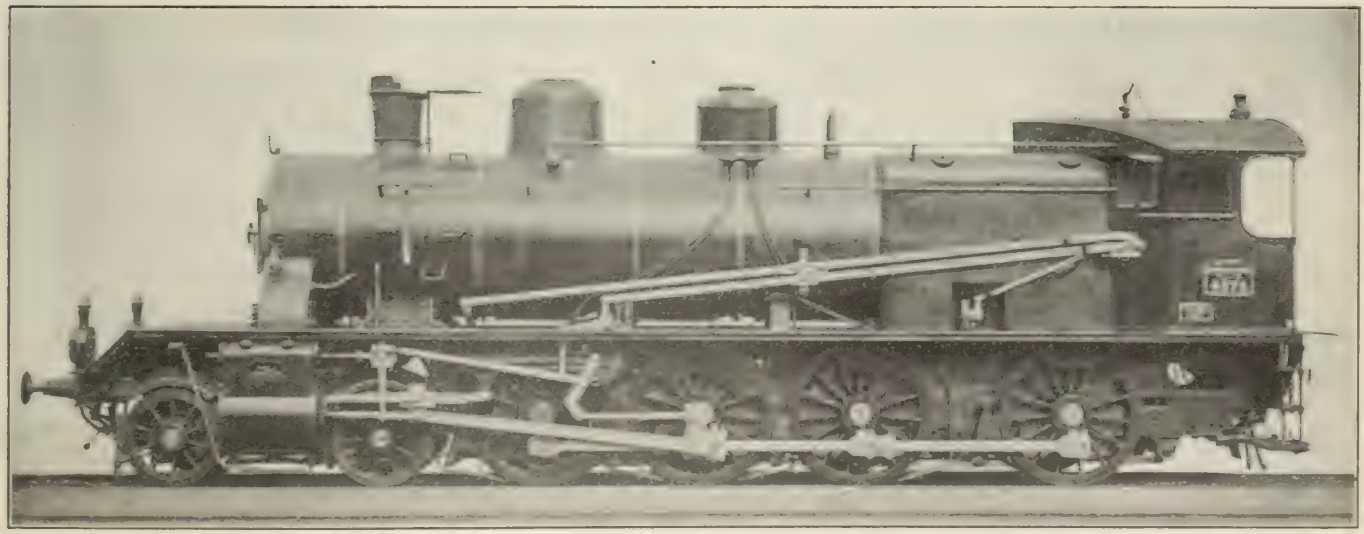


Fig. 2—Twelve-Wheel Four-Cylinder Compound.

trust in most quarters. The conditions of work may be different but that can hardly account for the difference of opinion, as in some systems of compounding, notably that introduced by the late W. M. Smith, of the North Eastern Railway, the main object was to produce an engine which could be adapted, in a very considerable degree, to the work required of it, and not so much to obtain direct economy by compounding. One writer, in a contemporary, makes the assertion that "at present there is not on British rails a compound with cylinder volumes really appropriate for the steam pressures

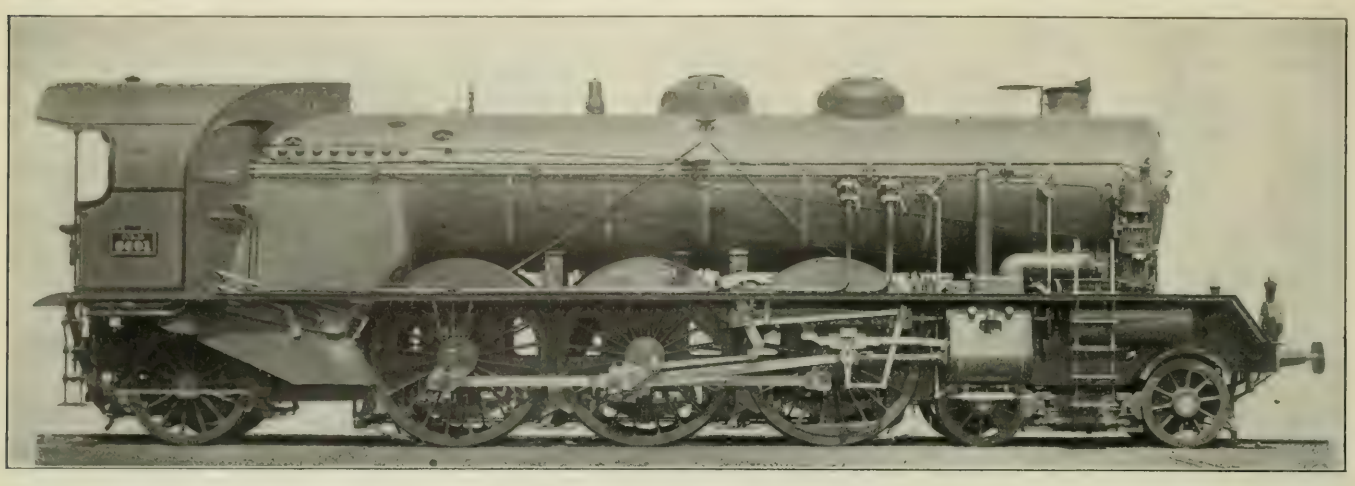


Fig. 3—Pacific Four-Cylinder Compound.

used or designed in a manner to successfully utilize two-stage expansion with all its advantages."

Yet if we compare the cylinder volumes of the P. L. M. compounds (and no one can say they are not successful) with the later English compounds we find practically no difference. The new compound Pacific on the P. L. M. has a ratio of 1:2.55, the 4-8-0 class on the same railway have a ratio of 1:2.49. The latest compound on the Great Northern of England, No. 1,421, has a ratio of 1:2.49; No. 1,300, a de Glehn compound on the G. N. Ry., has a ratio of 1:2.69; No. 730, on the North Eastern Ry., has a ratio of 1:2.38. "La France," a French built compound on the Great Western Ry., has a ratio of 1:2.72. No. 103, another Great Western French built compound, has a ratio of 1:2.77, and yet the respective locomotive engineers on the various English railways mentioned have all decided against compounding, presumably because of the extra first cost involved. The writer cannot accept the suggestion put forward in some quarters that French-built simple engines are inferior to English engines of the same type. The fault may lie, not so much in the design of the English compound, as in the management of the machine after it leaves the works. Perhaps English locomotive superintendents are not encouraged to experiment or depart radically from standard methods, and, rightly or wrongly, individual originality of persons not occupying principal positions has very little opportunity.

Superheating is slowly but surely coming to the front in England, but to Germany, Belgium and America must be given the entire credit for all pioneer work in connection with what they have proved, beyond doubt, to be a source of much economy in coal. The main advantage of both superheating and compounding is reduction of cylinder condensation. It is not likely that the two will be employed in conjunction to any large extent. It is claimed that an economy of 15 per cent. can be gained by superheating when applied to a compound; but compounding needs a very high steam pressure, whereas with superheating on a simple engine the boiler pressure can be reduced very considerably, thereby reducing the upkeep of the most expensive part of the engine. I contend, therefore, that the issue is one of compounding versus superheating. It is with the intention of solving this problem that the P. L. M. Co. has built what I consider to be two of the finest locomotives in the world.

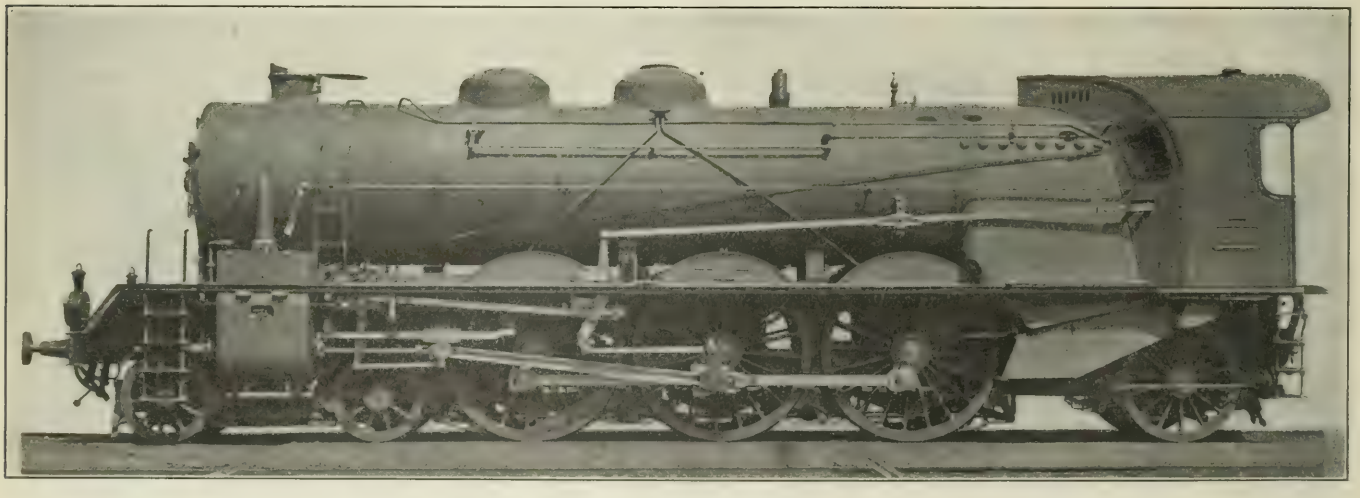


Fig. 4—Pacific Four-Cylinder Simple Locomotive.

All these later P. L. M. engines are fitted with automatic speed indicators, generally of the Flaman type. Detroit sight feed lubricators are used for the cylinders and piston valves except on those fitted with superheaters, which have Friedmann pumps.

Figure 5 is a profile of the main line of the P. L. M. from

Paris to Dijon, drawn to a scale of English measurements for purposes of comparison with grades on English and American railways. The diagram gives only the average grade between any two stations. The most interesting section of the line from Paris to Marseilles is that from Laroche to Dijon. Blaisy Bas summit is over 1,000 ft. higher than Laroche, and although the grades, with the exception of the last 20 miles, are fairly easy, they are long and continuous. Between Marseilles and Nice heavy grades are also encountered. The speed is generally limited to 100 kilometers (62.1 miles) per hour, although higher speeds are sometimes allowed.

The P. L. M. not only has the largest mileage of any railway in France, but also the fastest long-distance train. This train, the celebrated "Coté d'Azur Rapid," the day train between Paris and the Riviera, both up and down in the winter season, was introduced in 1904, and was the first train to leave Paris in the morning and reach the Riviera the same evening. It is a train de luxe, but also conveys ordinary first-class passengers. The load of this train is usually from 230 to 280 tons, and its schedule in both directions is given below.

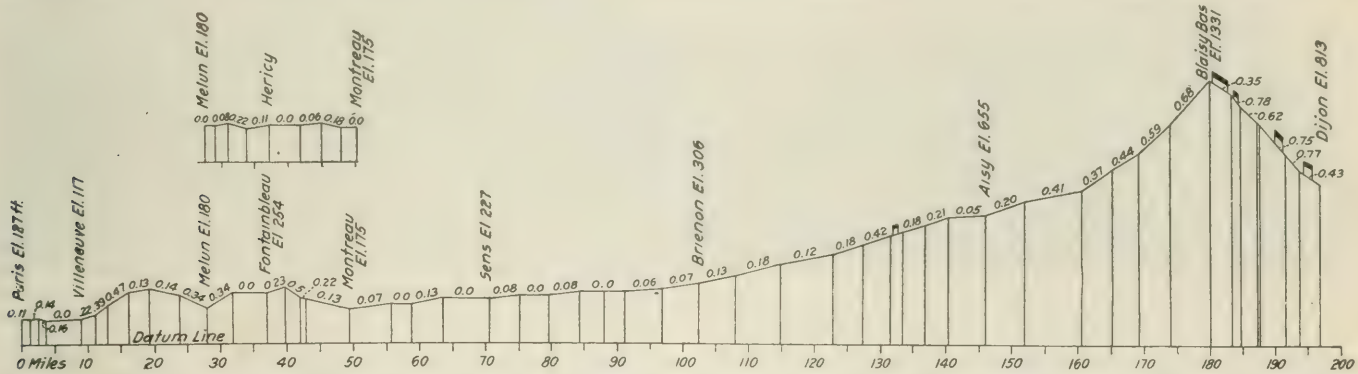


Fig. 5—Profile of Line from Paris to Dijon; Paris, Lyons & Mediterranean.

TABLE B—*"Coté d'Azur" Schedule—Outward Journey.*

Place.	Time—Arrive.	Time—Depart.	Miles.	Speed in m.p.h.
Paris	.....	9:00 a. m.	..	....
Laroche	10:49 a. m.	10:54 a. m.	97	53.2
Dijon	12:52 p. m.	12:58 p. m.	100	50.8
Macon	2:21 p. m.	2:24 p. m.	78	55.7
Lyons	3:13 p. m.	3:19 p. m.	45	55.1
Valence	4:29 p. m.	4:32 p. m.	66	56.5
Avignon	5:55 p. m.	6:01 p. m.	78½	56.7
Marseilles	7:27 p. m.	7:33 p. m.	75	52.9
Toulon	8:30 p.m.	8:35 p. m.	41½	44.4
St. Raphael	9:51 p. m.	9:52 p. m.	59½	46.9
Cannes	10:25 p. m.	10:31 p. m.	20	36.3
Nice	10:58 p. m.	.....	19	42.2

Total time including stops, 13 hours 58 minutes. Average speed for the 540 miles to Marseilles, 51.3 m.p.h.

TABLE C.—*"Coté d'Azur" Schedule—Homeward Journey.*

Place.	Time—Arrive.	Time—Depart.	Miles.	Speed in m.p.h.
Nice	.....	8:05 a. m.	..	....
Cannes	8:30 a. m.	8:35 a. m.	19	....
St. Raphael	.....	9:06 a. m.	20	....
Toulon	10:23 a. m.	10:28 a. m.	59½	....
Marseilles	11:37 a. m.	11:42 a. m.	41½	....
Avignon	1:08 p. m.	1:14 p. m.	75	52.3
Valence	2:43 p. m.	2:46 p. m.	78½	52.9
Lyons	4:02 p. m.	4:07 p. m.	66	52
Macon	4:57 p. m.	5:00 p. m.	45	54
Dijon	6:28 p. m.	6:34 p. m.	78	53.1
Laroche	8:24 p. m.	8:29 p. m.	100	54.5
Paris	10:15 p. m.	.....	97	54.9

Total time, Nice to Paris, including stops, 14 hours 10 minutes. Average speed for 540 miles, Marseilles to Paris, 53.5 m.p.h.

It covers the 540 miles from Paris to Marseilles at an average speed of 51.3 miles per hour, and on the return journey from Marseilles to Paris its average speed is 53.5 m.p.h., a performance which is perhaps unequalled in the world.*

*The 18-hour trains from New York to Chicago, over the New York Central and the L. S. & M. S., run 964 miles at an average speed of 53.5 miles per hour.—EDITOR.

A concession has been granted by the municipal authorities of Bergen, Norway, for an electric cable railway for passenger traffic, from Bergen to a point on the mountainside overlooking the harbor.

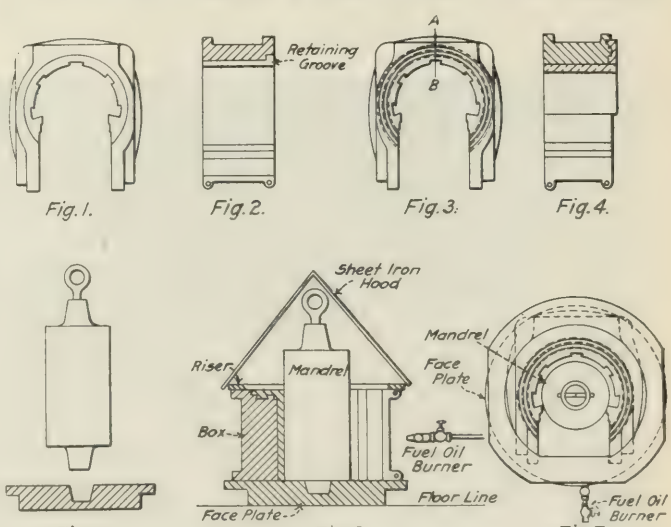
LAKE SHORE METHOD OF CASTING DRIVING BEARINGS IN THE BOX.

At the recent meeting of the International Railway Foremen's Association, A. O. Berry, superintendent of the Elkhart, Ind., shops, gave a description of their method of pouring the brass bearing of driving boxes into the steel boxes, thus saving the necessity of slotting the boxes and turning the bearings. This method is as follows:

After the old shell is pressed out, the box is sent to the slotter, where five dove-tailed grooves are cut in the old shell bearing, as shown on Fig. 1. If the box is too thin on top, the upper groove may be done away with, and only four grooves applied, bringing the two middle ones a little closer to the top.

Likewise, if it is found that the two extreme lower grooves will cut through into the shoe or wedge face, they can be brought upward or not made as deep as the other grooves. These grooves are 1¼ in. to 2 in. in length, and ¼-in. to ⅜-in. deep.

The box is then taken to the boring mill and a groove cut in the hub face about ½-in. deep and ½-in. wide at the edge of the old crown bearing as shown in Fig. 2. This groove is shown, also, in Fig. 1, and may be called a "retaining groove," inasmuch as it will retain the shell in the box, even if it becomes slightly loose.



Method of Casting Driving Bearings in the Box.

If the design of the box calls for a hub-liner on the box, and the hub-face on the box is not already grooved for retaining some soft metal, then the box is left on the boring mill until dove-tailed grooves are cut in the hub-face for retaining the brass hub liner.

Fig. 4 shows a cross-section through A-B of Fig. 3, with

the brass already poured, and the hub-liner and crown brass in one solid piece. After the machine operations are completed on the box, it is taken to the brass foundry, where the operations are as follows: The box is set on a face plate with the inside face down, and the hub face up, and a cast iron riser is placed over the top of the box, care being taken that all places for brass to run out are stopped with fire-clay, and a sheet iron hood placed over the box for retaining the heat thrown out by the oil-burner. A fuel oil torch is then applied between the lower ends of the box; that is, in the cellar space, and the box is heated in this manner until it is dark red. The burner is then taken away, the hood removed and the proper size mandril dropped in place. The exact position of the box on the face plate is originally determined with the mandril in place, the mandril being then removed during the process of heating. After the box is sufficiently heated, and the mandril dropped in place, the space between it and the box is lined up with long sheet iron strips dropped in place. Oil holes or other holes in the top of the box are stopped up by means of fire-clay.

Fig. 6 shows the box after it is heated, and with riser and mandril in place. It also shows the hood in place. The hood, however, must be removed during the process of pouring, and is simply shown in this sketch to give an idea of its appearance. Fig. 7 is a plain view of the box, with mandril and riser in place ready to be poured. The mandrils used are always of a smaller diameter than the driving journal, and all boxes are bored after leaving the brass foundry.

NEW FEATHERSTONE FOUNDRY, CHICAGO.

The new Featherstone foundry was built especially for the production of miscellaneous locomotive and car castings and it will be of considerable interest to mechanical officers of railways, as it embodies the latest ideas in foundry construction and operation. The principal customers of the Featherstone Foundry Company are the Illinois Central, the Chicago, Rock Island and Pacific, and other western roads and the Pullman Company. The location at Ninety-fifth street and Cottage Grove avenue, Chicago, is a convenient one for delivering to the shops of these companies. It is directly east of the Burnside shops of the Illinois Central, at a junction of that line with the Rock Island, and the Pullman shops are but a short distance south. The Arnold Company designed the plant and supervised the engineering features of construction. The general contract was secured by R. & S. Sollett Company, and the material for the steel structure was sublet to the Kenwood Bridge Company.

The foundry was placed in operation about July 1, 1909, and has already worked up to an output of 75 tons per day. The



Pattern Storehouse.

molding floor space is 3,200 sq. ft., and the production of castings is at the rate of 2 tons per sq. ft. The ordinary rate at most foundries is ¾ to 1½ tons per sq. ft. of floor. The plant consists of two principal structures, the foundry building and the pattern storage building. The yard is ample for the storage of material, the storage bins, sand house, etc., all of which can be served by the yard crane, which runs practically the entire length of both buildings.

THE FOUNDRY BUILDING.

The foundry building is 361 ft. long by 130 ft. wide inside, with side bays for shipping room, charging platform and ovens. Steel columns support the crane runways and roof trusses of the central bay, while the outer ends of the side bay roof trusses rest on the brick walls. All the outer walls



Featherstone Foundry; Interior.

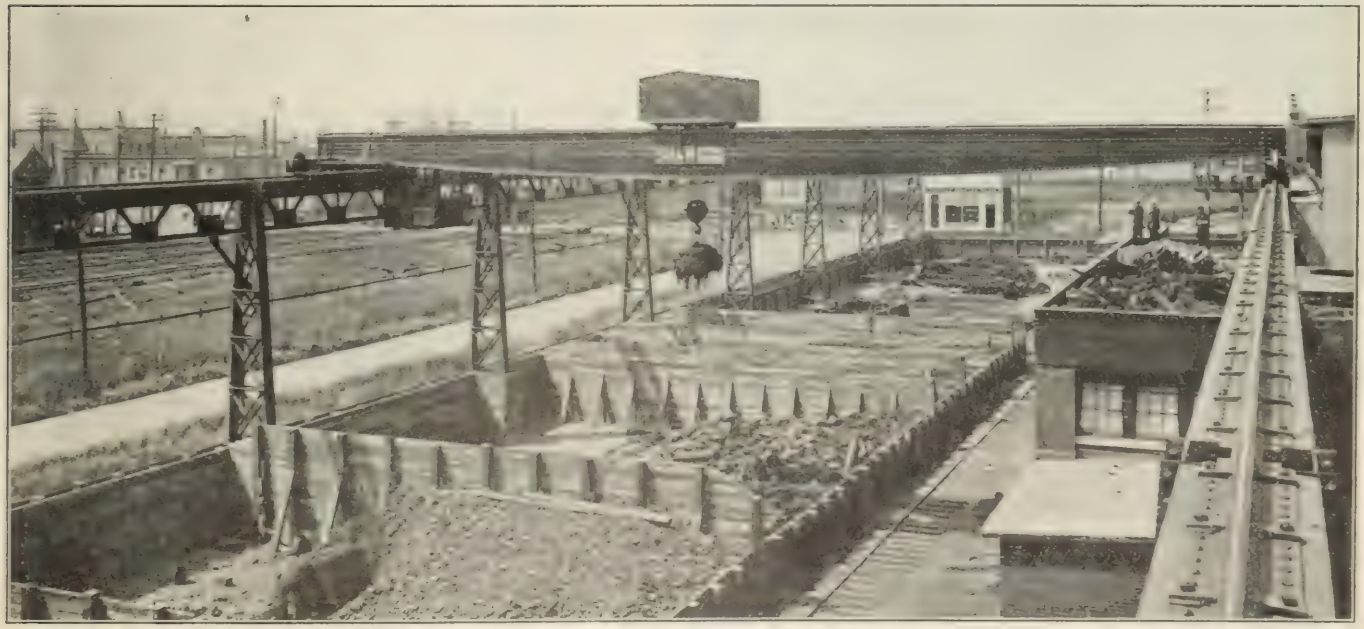
are brick, with the exception of the south end of the foundry, which is made of cement plaster on expanded metal so that it can be readily removed when any extension to the building is desired. The foundations are concrete, extending down to firm blue clay, and the wall footings are carried up with concrete to an elevation of 4 ft. above the clay floor. The roof construction is somewhat novel. Hyrib, an expanded metal manufactured by the Trussed Concrete Steel Company, was laid directly on and fastened to the steel purlins, which are spaced about 5 ft. span. On top of this expanded metal was spread 1¾ in. of concrete. Then the under side of the metal was plastered with cement, making the total thickness of the roof 2 in. Upon this was spread the regular 4-ply composition roofing. The central bay of the foundry is 59 ft. wide and 31 ft. 6 in. high to the bottom of the roof truss. A standard gage track runs the entire length of the building, and industrial tracks are conveniently located for handling ladles, castings and other materials. A 15-ton electric traveling crane serves not only this entire bay, but the runways are extended out 80 ft. beyond the end wall so that this crane can run over the cleaning room and outside for heavy cleaning and to serve cars. A passage is made in the end wall by means of five steel roller doors of the Kinnear type, which are operated by a 5 h. p. electric motor.

Special consideration was given to light and ventilation. The clear story windows are large size and alternate sash are hung on specially constructed Allith hangers and made to slide back of the intermediate sash. These intermediate sash are attached to an endless cable with chain inserts passing over the sprocket wheel and returning to a 4 in. compressed air cylinder. The windows are operated in four groups, each group provided with this device so that they can be opened or closed by means of a 3-way cock in an air pipe attached to a column on the main floor.

The east bay is 35 ft. 6 in. wide and 19 ft. high, and is served by two hand-operated 2-ton traveling cranes with electric hoist for use in molding and pouring. The west bay is similar in dimensions to the east bay, excepting that that portion by the cupola and storage room is served by one 2-ton nand crane with electric hoist. The storage rooms extend 18 ft. outside the main building line and are each 29 ft. 5 in. x 25 ft. 5 in. x 10 ft. 6 in. high. Between these two storage rooms is an 8-ft. passage way leading from the elevator to the outside yard. At present only one cupola is installed, but provision is made for a second one. The one installed is a No. 9 standard Whiting, capable of melting 14 to 18 tons per hour. Immediately south of the storage room and cupola is the dry oven, 16 ft. x 35 ft. 9 in. and 11 ft. high inside. The core ovens, three in number, are 20 ft. long and of different widths, each provided with a steel roller door and trucks. Above the storage room is the mezzanine floor of reinforced concrete construction. Here are installed a No. 6½ blower supplying blast to the cupola and an air compressor with 8 in. x 12 in. cylinders, supplying air for the air lifts and for handling the upper deck sash. On this floor is also provided ample room for lavatories and lockers. Above the mezzanine floor



General Elevation; Featherstone Foundry.



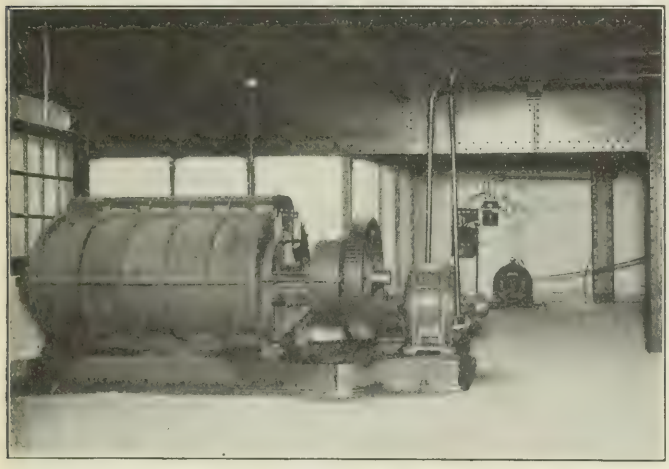
Material Yard and Crane; Featherstone Foundry.

is a charging floor. The portion of this floor inside the line of the main building wall is made of ½-in. steel plate on steel framing designed to carry a load of 500 lbs. per sq. ft., and it is surrounded by a steel curb 4 ft. high. The platform extending outside the main building is ⅝ in. plate, capable of carrying 800 lbs. per sq. ft. and has a steel plate curb 18 in. high. The outside platform may be shut off from the inside charging room by roller doors hung between the columns



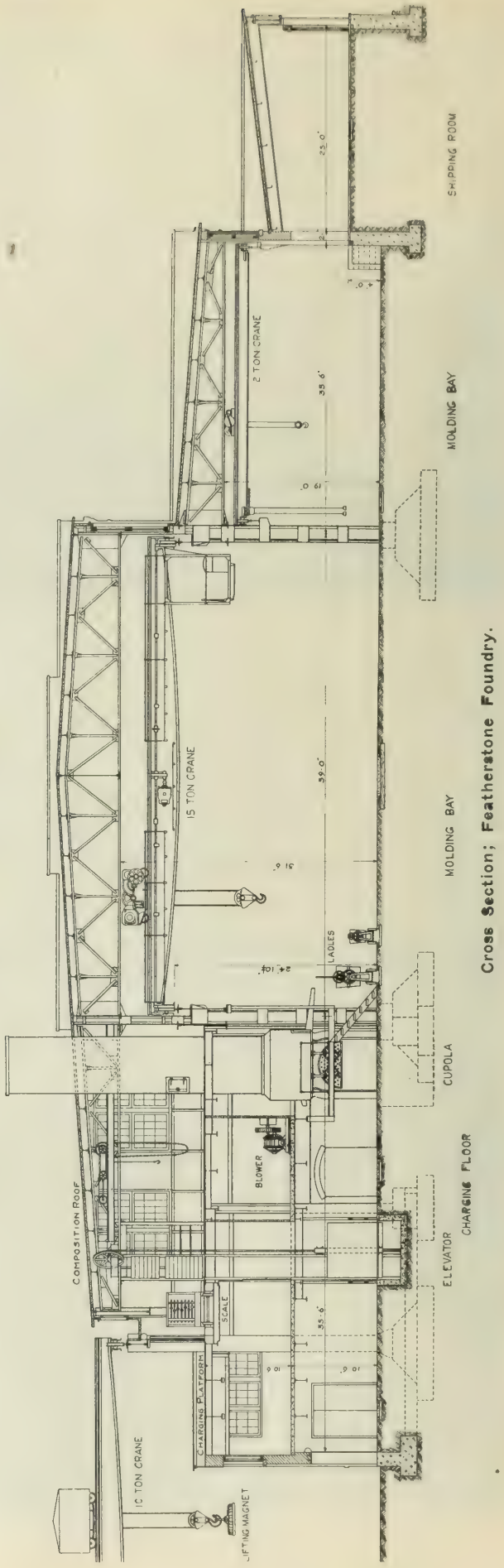
Cupola Charging Platform.

along the wall line. The floor plates are all riveted to the floor beams and are made water tight. Just inside the door, and extending the width of the charging floor, is a transfer pit made of steel plates and a truck running in this pit has a turntable and multiple beam foundry scale. The inside charging floor is also served by a 6,000-lb. electric freight elevator and a hand-operated air hoist traveling crane is pro-



Blower Room.

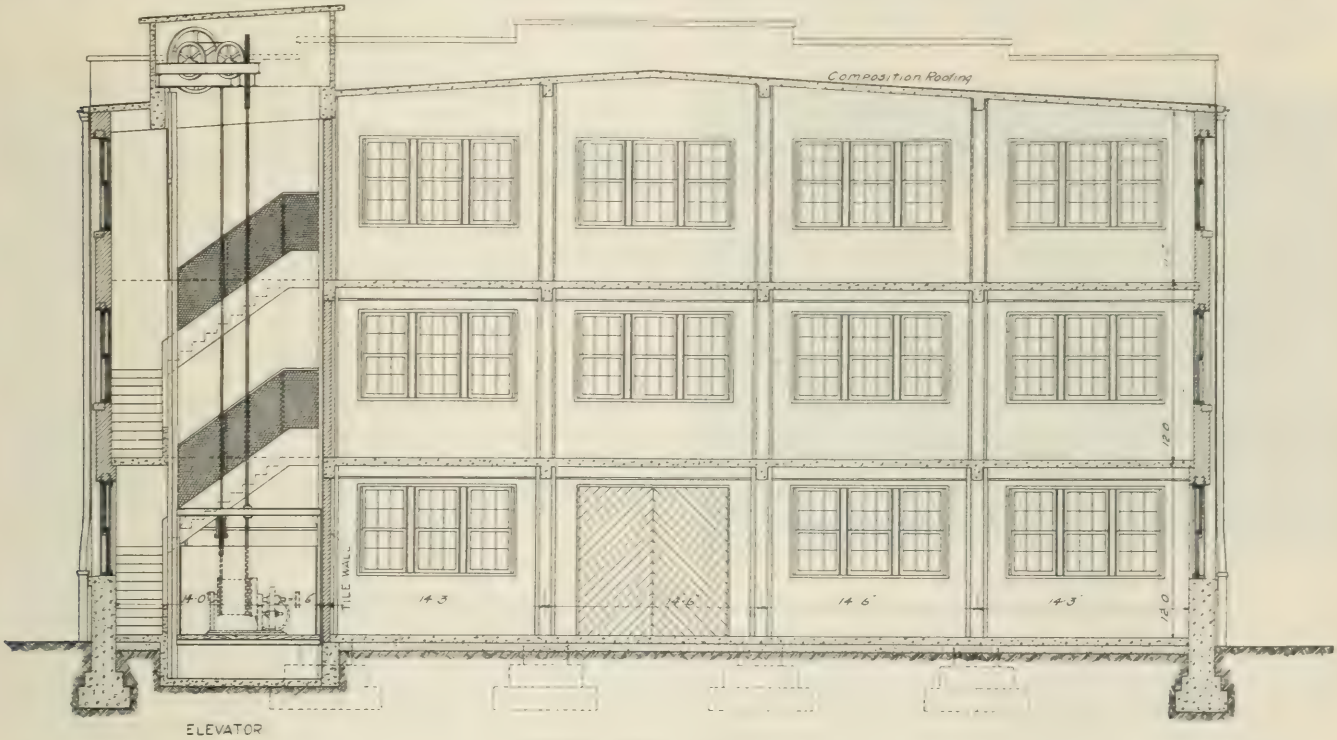
vided for handling coke. The outside charging platform is served by a 10-ton yard crane. This arrangement of weigh scales and transfer table is intended to save repeated handling. The lifting magnet on the yard crane will take scrap or pig iron from the cars on which it is shipped, raise it to the charging platform and deliver to the small cars. These cars then pass on to the transfer scale and are weighed and delivered to the cupola side ready for direct discharge into it. In the



Cross Section; Featherstone Foundry.

same way the coke is loaded into a square sheet iron bucket with drop bottom. This is delivered to charging platform and set down on a frame with casters and it can be moved over the transfer, weighed and then on to the cupola, where it is dumped direct. This direct method of handling iron and coke to the cupola saves a large amount of labor, which is usually employed by the ordinary indirect method.

The cleaning room is 60 ft. wide and extends across the south end of the building 130 ft. The partition wall between this room and the main bay is of cement plaster on expanded metal, extending in the side bays to the roof and in the center bay only 16 ft. 6 in. high to allow passage overhead for the traveling crane. Industrial tracks lead from the molding room into the cleaning room alongside the tumblers and thence to the air lifts leading to the platform.

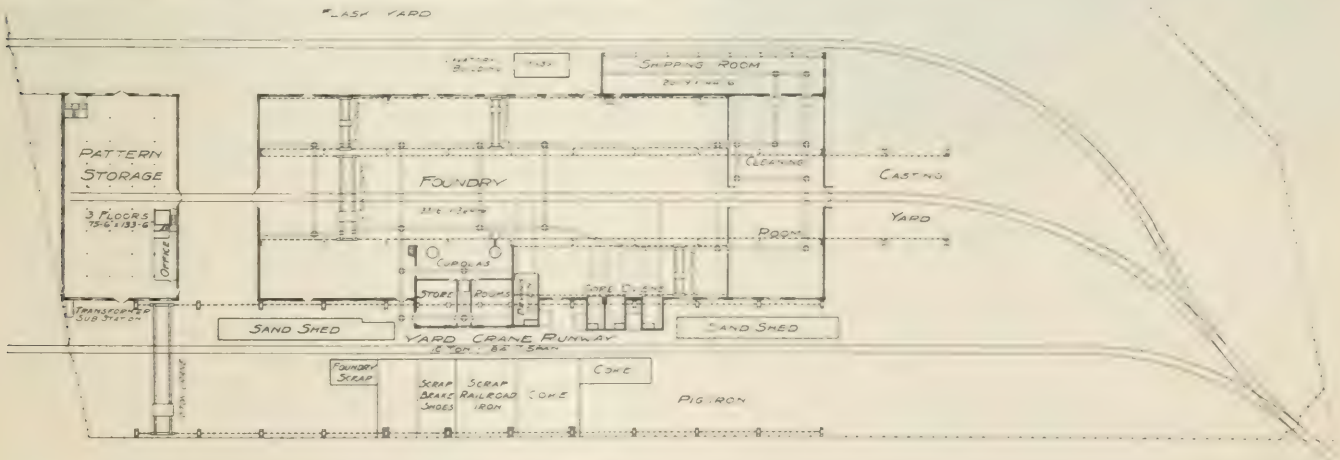


Pattern Store House.

THE PATTERN STORAGE BUILDING.

The pattern storage building is a 3-story structure with reinforced concrete floors, columns and roof and with brick exterior walls. The inside dimensions are 130 ft. x 72 ft. A 3,000-lb. electric elevator serves the three floors. The elevator shaft, together with the concrete stairway, is partitioned off from the main building by plastered tile partitions. The pattern shop is located at the east end of the first floor and is supplied with planer, band saws and other necessary pattern makers' tools. These are driven by a 15 h. p. motor connected to a line shaft.

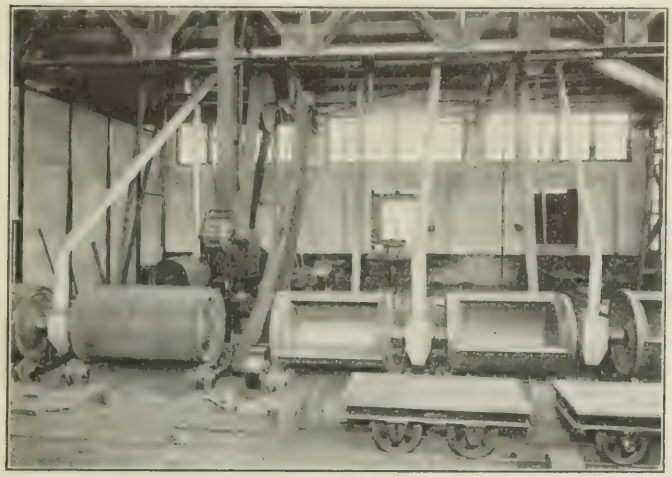
The yard crane is 84 ft. 1 in. center to center of rails and extends along the west side of both the pattern storage building and the foundry, a length of 440 ft. The crane is equipped with a 10-ton electric trolley, fitted with a lifting magnet having an ultimate lifting capacity of 3,000 lbs. The 15-ton traveling cranes in the foundry and the 10-ton yard crane are Shaw cranes, and the smaller hand cranes were made by the Maris Company, Philadelphia. All these cranes were furnished by Manning, Maxwell & Moore. The standard gage track is located between the buildings and the bins, where cars are easily served by the yard crane. The lifting magnet is operated by a 10-kw. 220-volt direct current generator connected to a 15 h. p. 3-phase 60-cycle 220-volt constant speed motor. This equipment is all on the bridge of the yard crane.



Ground Plan; Featherstone Foundry.

ELECTRICAL EQUIPMENT.

The motive power of the entire plant aggregates 475 h. p., and electric current is purchased from the Commonwealth Edison Company. Through six oil transformers the current is stepped down from 2,200 volts to 230 volts 3-phase. The entire electric system is laid out with provision for future extension and with special attention to safety devices so as to withstand the inattention or actual abuse which is almost sure to occur at times in a plant of this nature. All motors are 3-phase of the squirrel cage rotor type provided with 3-pole single throw oil circuit breakers with no voltage release, Westinghouse type H.



Cleaning Room.

The lighting system of the plant is a 3-wire single phase alternating current system. A main panel is installed at the foundry building from which three main wires lead to the various distributing panels in the two buildings. The wiring is all done in conduit incorporated in the concrete floors and roof. The pattern shop is lighted entirely by incandescent lamps suspended from the ceiling by packing house cord. The



Shipping Room.

lighting of the foundry is for the most part by means of type F automatic Cooper-Hewitt lamps suspended from the steel purlins. The mezzanine floor and storage rooms are lighted with incandescent lamps and Westinghouse receptacle plugs with 35 ft. extension cords are conveniently located for use in the cupola and dry oven.

MADEIRA-MAMORE RAILWAY.

The location and construction has so far followed quite nearly the lines of the original survey. On October 22 the track was laid and the engine was running on 60 kilometers southwesterly from San Antonio, Brazil, in the valley of the Madeira river. At that time the grading was nearly done on an additional 20 kilometers; the clearing was made to the 140 kilometer mark; the location, about half way, to 160 kilometers; the preliminary surveying party was at the 180 kilometer point. The total length from San Antonio, Brazil, to the head of navigation on the Mamore river, in Bolivia, is about 329 kilometers. No serious trouble from the Indians has yet occurred, and malarial troubles are fairly well under control.

LAND DEVELOPMENT FOR CIVIC BEAUTY.*

We are just beginning to understand the mission of the landscape gardener and the importance of educating the people to appreciate the beneficial influence of the beautiful outdoors on the moral as well as the physical conditions of society. Our parks have a great economic value inasmuch as they raise the standard of health, happiness and contentment of the people, especially in large centers of population, and we now have magnificent parks and boulevard systems not only in the East, but in the Middle West: Chicago, Kansas City, Colorado Springs, Denver and many other cities. In Oklahoma, on a site that was but a few years ago considered a hopeless waste, stands now a city of 50,000 inhabitants, with a number of 8, 10 and 12-story buildings in its business center, with 500 acres to be devoted to a 30-mile boulevard encircling the city, and 1,700 acres for parks, in different parts of the city, ranging in size up to 600 acres.

Railway station parks offer a great field for the landscape gardener. In the past little has been done but the planting of tender greenhouse material, which is generally grouped into more or less appropriate designs. This is not landscape gardening in its proper sense. It is also quite expensive and transient, as the beds have to be renewed every year and at best only last a few months in this latitude, leaving the ground bare and unsightly from the time of the first frost in fall till the warm weather in May. The landscape gardener uses hardy material, such as trees, shrubs and hardy herbaceous plants. This material is cheaper and the plantings perennial, and it gives a more natural effect and is attractive the year around.

Besides the ornamental, the emergency and economic plantings play an important part in railway gardening, such as screens for shutting out unsightly features which are beyond the control of the railway management, hedges along the property lines, snow hedges to protect cuts from filling up with snow and lastly timber plantings for posts, crossties and telegraph poles.

The Santa Fe has carried out the simple plan of using hardy plants for the embellishment of station grounds and has improved most of the larger stations in this manner. Several are more than one acre in extent. This area of well-kept rich green turf fringed by a background of masses of shrubs with a varying skyline is a picture long remembered by the weary traveler. The Union Pacific maintains well-planted station parks and it is branching out into the culture of timber.

Home Grounds.—The proper planting of trees, shrubs, vines and hardy perennials for the adornment of the home grounds extends the habitation beyond the mere walls of the house, and makes a large and grand living room outdoors, and a pleasant sight for the passerby. It is in the reach of every farmer to have a beautiful green lawn with a fringe of shrubs and a few trees to give shade and coolness during the hot summer days. He can thus forestall the discontent with farm life of the growing sons and daughters.

*Extracts from a paper read before the National Farm Land Congress at Chicago, November 18, 1909, by E. F. A. Reinisch, Consulting Landscape Gardener of the Atchison, Topeka & Santa Fe.

Shop Kinks.

TWELFTH COLLECTION. (First Prize).

BY F. C. PICKARD.
Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.

STAYBOLT BREAKER.

This tool, shown in Fig. 1, will break three 1-in. staybolts at a single stroke. It consists of a 5-in. pipe, into which a 12-in. plunger is fitted. The two ends of the pipe are connected by smaller piping with a three-way cock, to the handle of which a connection reaches down to a second three-way cock near the end of the cylinder. The device is suspended outside of the line of the water leg, and the chisel, with a 12-ft. stem, is inserted at one end. The hook or chisel end is placed against the staybolt and air admitted to the back end of the cylinder, which throws the plunger violently forward. The blow of the plunger is cushioned by the air and a rubber pad placed at the delivering end of the 5-in. pipe.

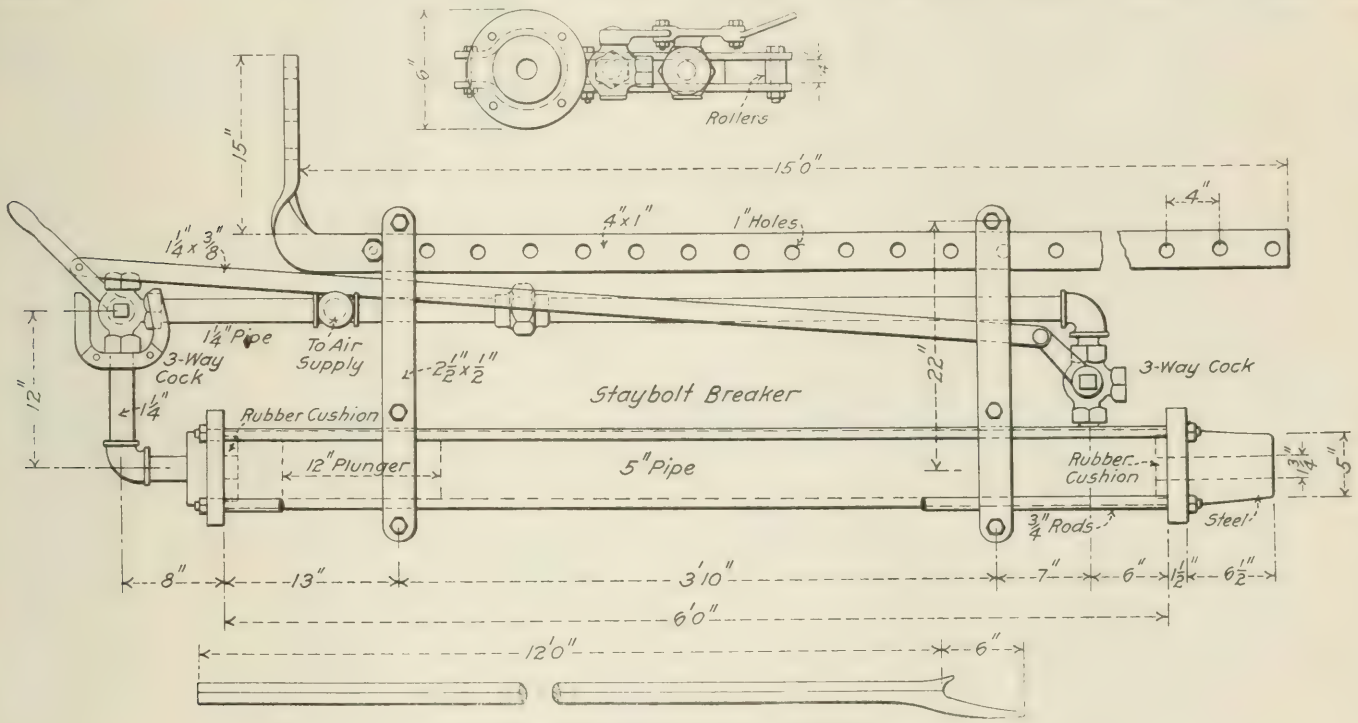


Fig. 1—Staybolt Breaker. Pickard.

BORING BAR HOLDER.

Fig. 2 shows a boring bar holder used in the place of the ordinary tool posts on a lathe. It has a T-head bolt by which it is clamped down, and the boring bar is held by two set screws as indicated.

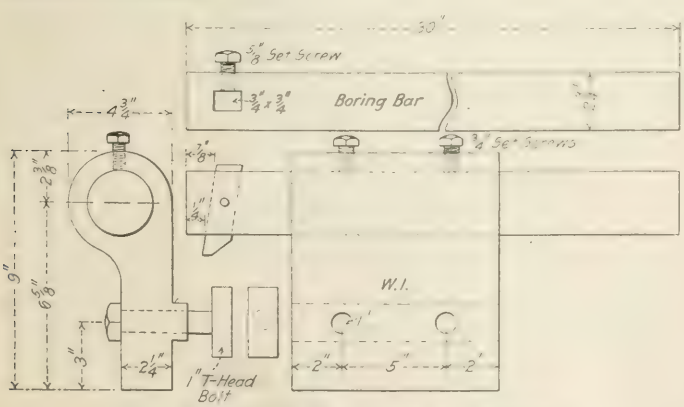


Fig. 2—Boring Bar Holder. Pickard.

TRANSFER CARRIAGE FOR MOUNTED CAR WHEELS.

Fig. 3 represents a car wheel transfer carriage, used for moving mounted wheels. Two of these trucks are operated together. The arc which sets over the wheel is grooved to receive the collar on the journal. When the handle of the truck is raised the different arms slip beneath the gear, and by bringing the handle down again the wheel is raised from the floor. By using one of these trucks at each end of the axle, wheels and axle can be transferred to any convenient place, and the trucks are of such shape that they can be run under a car or across the track so as to bring the wheels in proper position.

WHEEL AND PLATE TRUCK.

A truck for carrying car wheels or boiler plates, and arranged so that the plate is swung between the wheels and the handle and held from supports beneath, is shown in Fig. 4. The wheels are 50 in. in diameter, and the arc over the top will take boiler sheets of moderate size.

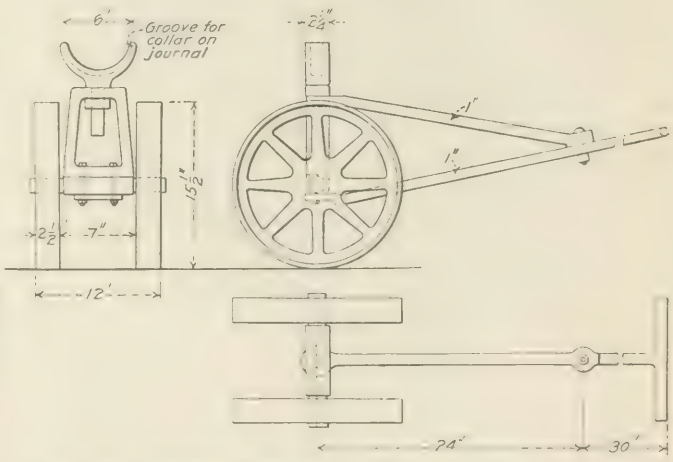


Fig. 3—Transfer Carriage for Mounted Car Wheels. Pickard.

FLUE HOLE CUTTING TOOL.

Fig. 5 shows a tool for cutting flue sheet holes. The taper shank is made to fit the socket of a drill press. At the end of the bar the cutter C slips over the end of the shank, to

which it is secured by a pin or key. The bottom of the cutter is fluted similar to a milling cutter and it operates in the same way. This tool will drill 200 holes in a ½-in. flue sheet in about one hour and forty-five minutes.

DEVICE FOR PLANING ROD BRASSES.

Fig. 6 shows a device used for planing strap rod brasses. A small angle plate is secured to a table, planer or shaper

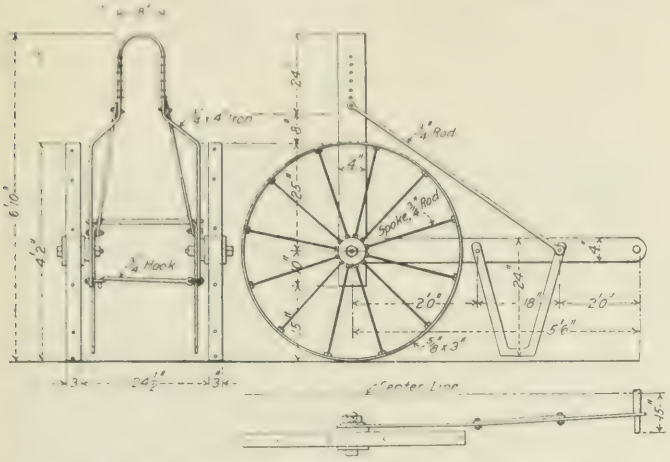


Fig. 4—Wheel and Plate Truck. Pickard.

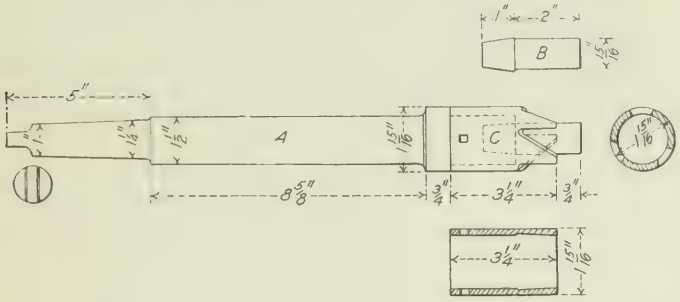


Fig. 5—Flue Hole Cutting Tool. Pickard.

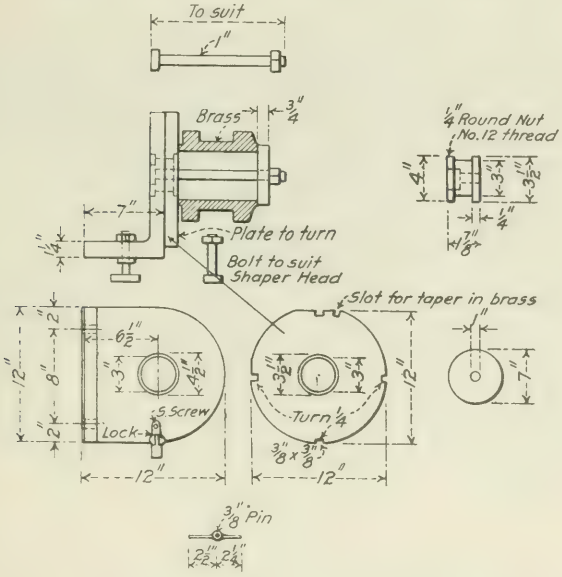


Fig. 6—Device for Planing Rod Brasses. Pickard.

bed. An index plate provides for changing the position of the brass. This plate has four slots set 90 deg. apart. After the brass is secured in position it is not necessary to readjust it, but simply to remove the catch and revolve the brass and plate, the position being maintained by the catch. There is also a slot at one side for planing the taper ends. This device will greatly increase the capacity of the shaper on this class of work.

AIR HOSE MOUNTING MACHINE.

An outfit for mounting air hose is shown in Fig. 7. The two cylinders are used at right angles. The vertical one operates the clamp C, by which the hose is firmly held in position, and the horizontal cylinder holds the nipple or couplings fitted to the end of the piston rod. A single cock admits air to both cylinders, thus clamping and forcing the

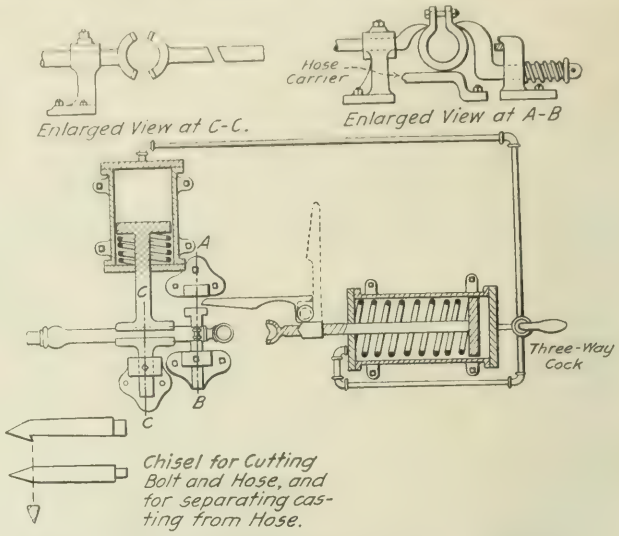


Fig. 7—Air Hose Mounting Machine. Pickard.

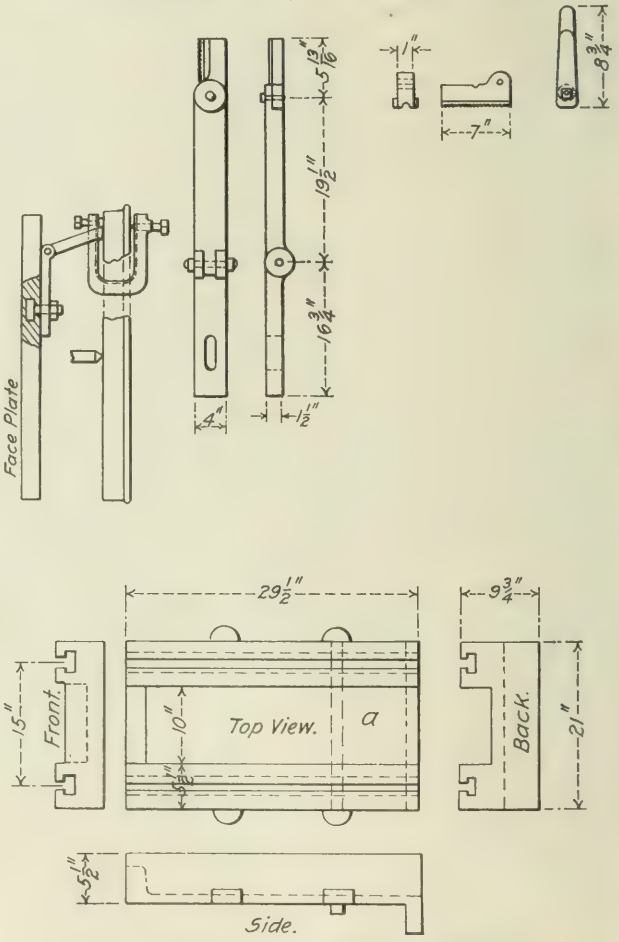


Fig. 8—Driver for Wheel Lathe. Pickard.

nipple in at the same time. The horizontal cylinder is also equipped with a knife, shown in two positions, with which the hose is cut from the couplings.

DRIVER FOR WHEEL LATHES.

In Fig. 8 is shown a driver used on a wheel lathe. It con-

sists of a bar with two pieces hinged at right angles. The lower hinge portion is bolted to the face plate through a slotted hole, the whole device taking the position indicated in the engraving. The driver proper, the bearing face of which is toothed, is first held tightly in position by the C clamp and the lathe started. The work is then tightened up and the driver adjusts itself to a firm bearing. The device is made of forgings, and is easily and quickly applied.

PAINT SPRAYER.

Fig. 9 shows an arrangement for spraying paint over cars and locomotives. It consists of a nozzle leading from an air

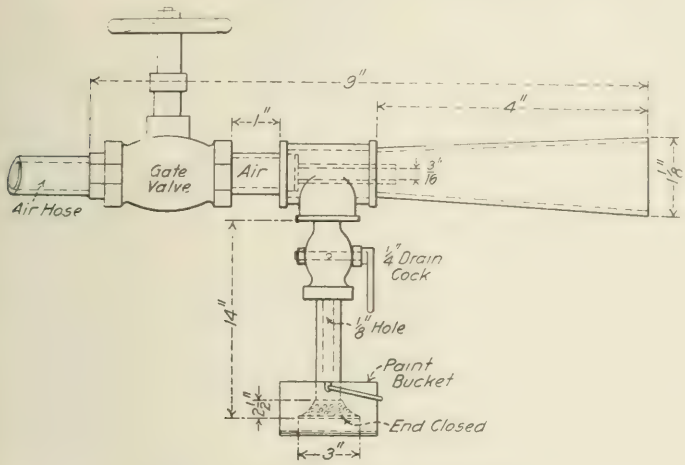


Fig. 9—Paint Sprayer. Pickard.

pipe into the bottom of a funnel, into one side of which a pipe is led from the paint supply. This latter pipe has a strainer in one end, and the flow of paint is controlled by a small cock. Admission of air through to the nozzle creates an action similar to that of a locomotive injector, and the stream of paint spreads as it passes out of the funnel-shaped nozzle.

HEAVY DUTY TOOL HOLDER.

Fig. 10 shows a tool holder for use on a heavy duty lathe. It is made of an ordinary forging, the one shown being intended to receive 1¼-in. steel. A saving of about 50 per cent. is effected by being able to use a smaller piece of high-speed

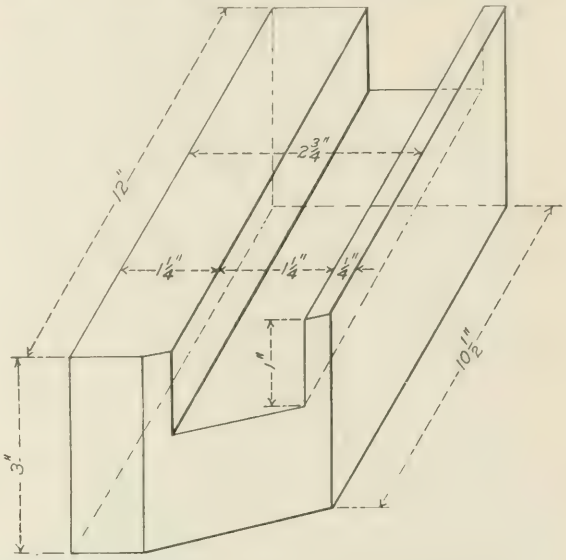


Fig. 10—Heavy Duty Tool Holder. Pickard.

tool than were the holder not employed. The same cut and point of the tool is maintained, together with a considerable increase in the strength of the tool.

DOUBLE TOOL HOLDER.

Fig. 11 shows a double tool holder, used principally for

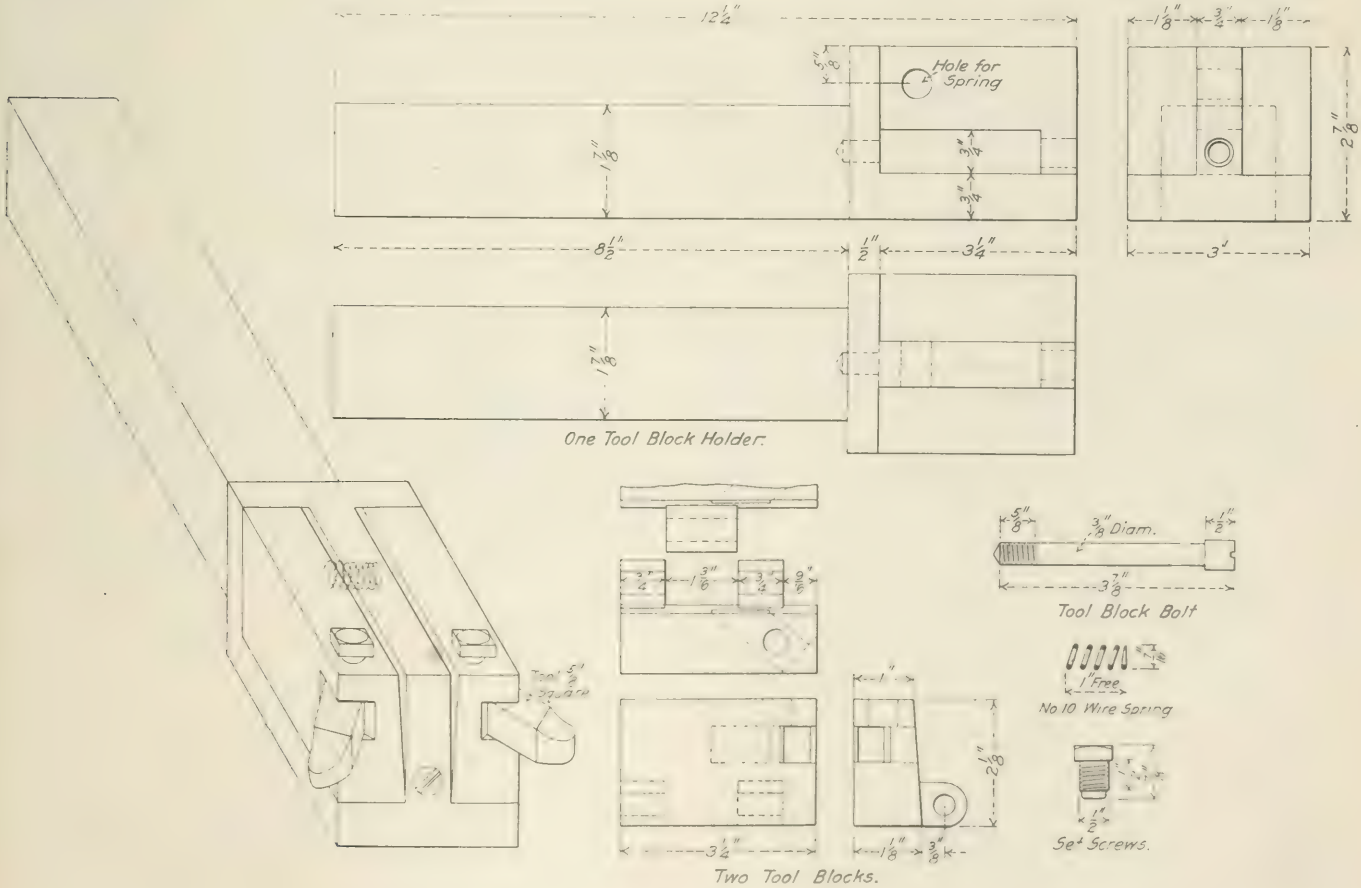


Fig. 11—Double Tool Holder. Pickard.

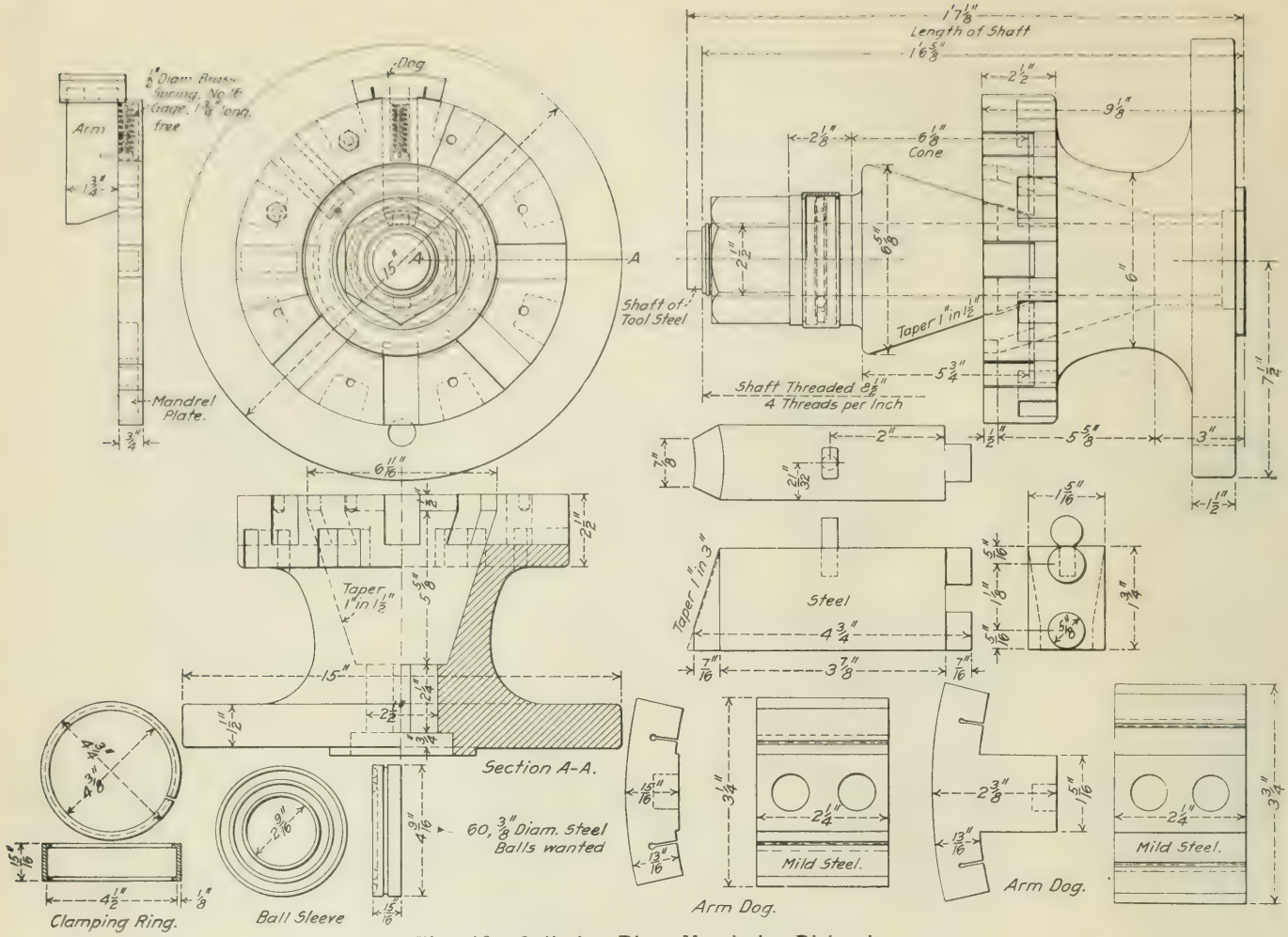


Fig. 12—Cylinder Ring Mandrel. Pickard.

finishing shoes and wedges. The tube blocks inserted in the end of the holder are pivoted on ⅜-in. pins. These blocks are held in position by the spring shown. Both sides of the frame fit are finished at the same time, and the spring arrangement provides release for all reverse movements. This tool has been successfully used in these shops for several years.

CYLINDER RING MANDREL.

Fig. 12 shows an expanding mandrel for holding cylinder rings during turning. It consists of a casting bolted to the face plate of the lathe, which casting has a conical opening on its front face. Extending down to this opening are a number of small arm dogs, which are expanded by driving the cone into the tapered hole. This cone is held up by the tail stop, and in expanding the mandrel holds the ring rigidly and in position for turning.

FLUE SWEDGING MACHINE.

Fig. 13 shows a flue swedging machine, which is made from a 10-in. brake cylinder with an 8-in. stroke fitted for a ⅜-in. spring. The machine has two sets of dies. By use of exhaust air the scales are blown off on releasing the machine. The foot pedal operates a three-way cock, which controls the flow of air.

PNEUMATIC TOOL POST.

A pneumatic tool post, as shown in Fig. 14, has been used for several years in the Grand Rapids shops of the Pere Marquette. The time of changing tools in the lathe has been reduced from an average of five minutes to one minute, and, in addition to this, difficulties with broken studs, strapping of wrenches, etc., has been eliminated. The air cylin-

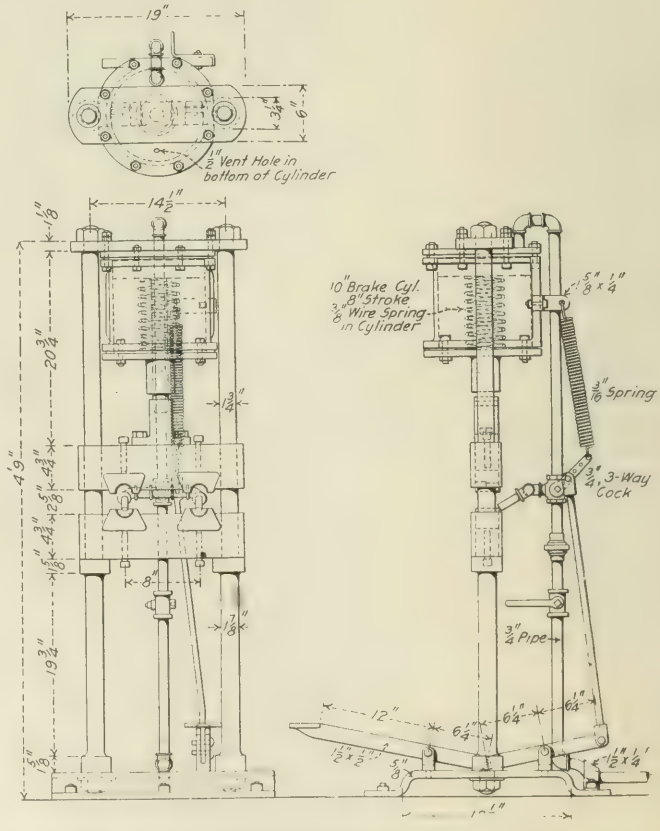


Fig. 13—Flue Swedging Machine. Pickard.

der, which has a 5¼-in. stroke, is fastened to the carriage by four long studs, 7½ in. in diameter. The piston rod connects the two cam levers, which force the holder plates down upon the tool. The four springs act to release the tool when the pressure is released in the cylinder. The tool holder shown in Fig. 10 is used with this device. The springs hold the

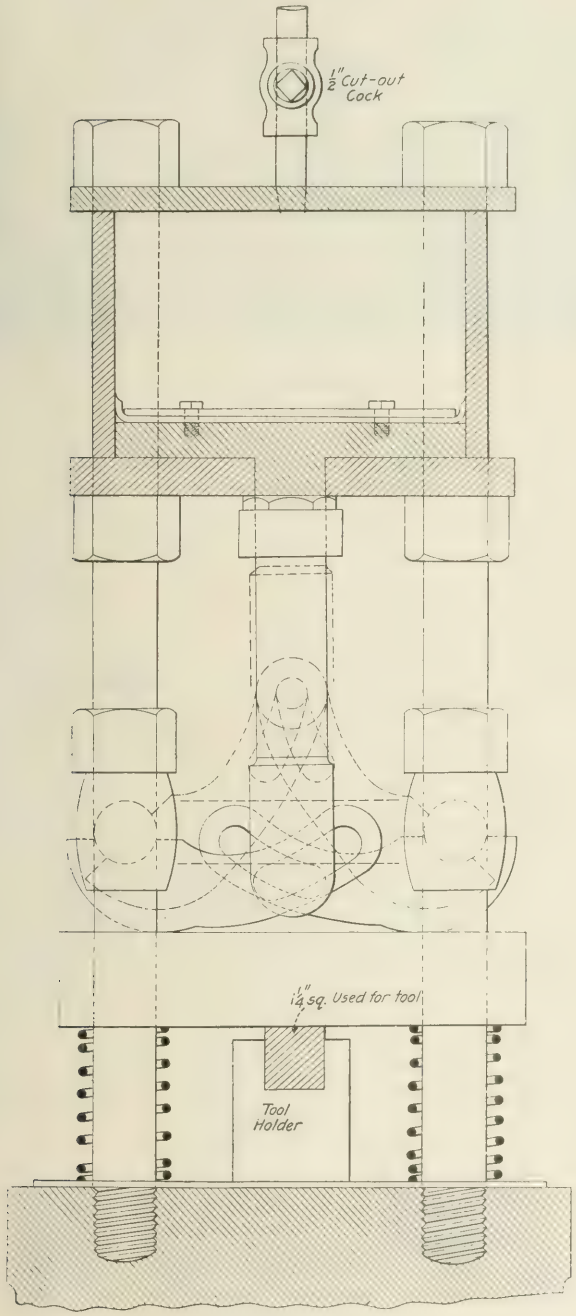


Fig. 14—Pneumatic Tool Post. Pickard.

tool plate about ½ in. from the tool, giving ample room for removal or adjustment.

LATHE GRINDER.

Fig. 15 shows an arrangement for adjusting an emery wheel to an ordinary lathe for grinding purposes. The wheel is carried by bearings running in a block bolted to the carriage instead of a tool post. The shaft of the wheel has a small pulley about 4 in. in diameter, which is belted to the line shaft. The tool is used for grinding motion work pins particularly. The overhead work consists of a countershaft, on which is mounted a 12-in. in diameter by 36-in. long pulley to provide for the travel of the belt, due to the

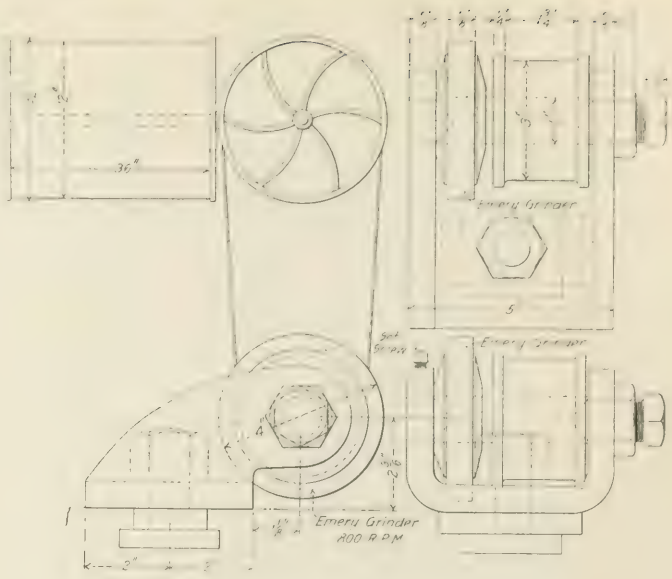


Fig. 15— Lathe Grinder. Pickard.

movement of the carriage. The body of this device is an ordinary forging, fitted with the shaft, which has pointed center bearings to take up all lost motion. This device can be made to fit a lathe. It is especially useful on case hardened work in shops which have no grinder.

THIRTEENTH COLLECTION. (Second Prize).

BY W. H. SNYDER,
Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.

ROCKER ARM BOSS AND SOLID OIL CUP TURNING TOOL.

This tool, shown in Fig. 16, is used for turning rocker arm bosses or oil cups made integral with the rod forging. This tool, as is the case, with one exception, of all of the tools in this collection, was designed by W. H. Snyder. The end A,

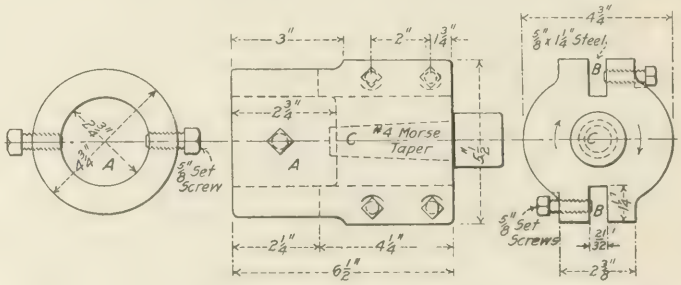


Fig. 16—Rocker Arm Boss and Solid Oil Cup Turning Tool. Snyder.

or top of the tool, is bored to fit the drill press spindle to which it is secured by two ⅝-in. steel set screws. The slots, B, B, are made to receive the cutting tools, which are ⅝-in. x 4-in. high-speed steel, and secured by ⅝-in. steel set screws. The hole C is made to fit the No. 4 Morse taper of the plugs, the diameter of the guide ends of which vary according to that of the pin hole in the rocker arm or the inside diameter of the oil cup. This projecting end acts to steady the tool.

ASBESTOS GRINDER.

This device, shown in Fig. 17, is one easily and cheaply made, and one which has proven very efficient for grinding into a pulp old and broken section magnesia or asbestos boiler lagging. Both upper and lower boxes are made of wood.

The division plate is made of thin sheet iron, perforated with ¾-in. square meshes. The three-blade cutter is made from an old brake wheel, the cutting edges of which, being vertical, work in connection with the perforations in the plate. An air motor is fitted to the upper end of the spindle and the lagging is fed into the top box, and the resulting pulp is removed from the lower one.

PEDESTAL V-BLOCKS FOR PLANING CROSSHEADS.

A very simple but efficient design of pedestal V-blocks for planing crossheads is shown in Fig. 18. The base lugs are made to fit the planer slots, and the crosshead is planed and mounted upon the piston, and perfect alignment is insured.

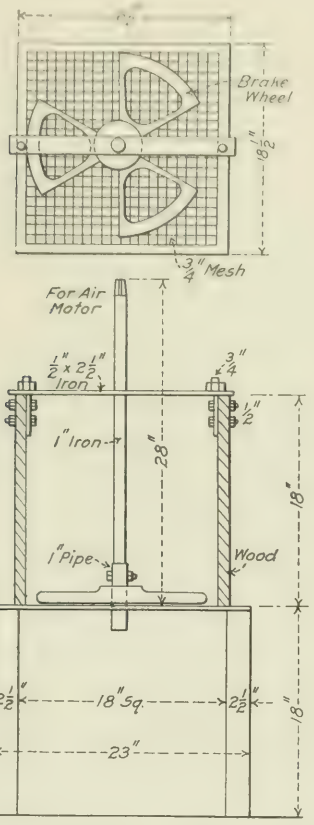


Fig. 17—Asbestos Grinder. Snyder.

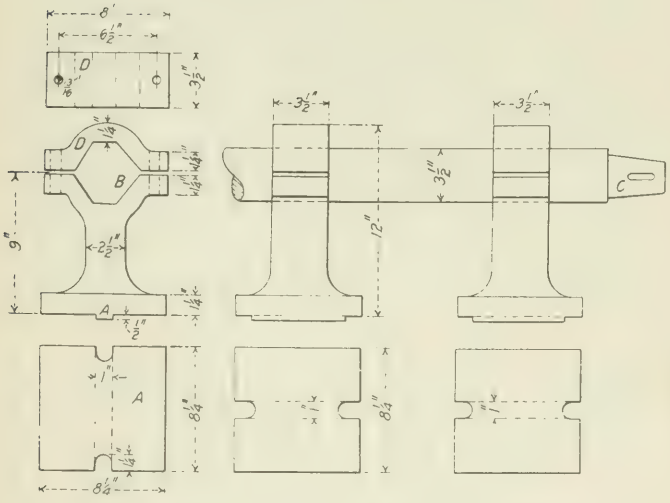


Fig. 18—Pedestal V-Blocks for Planing Crossheads. Snyder.

FLUE CUTTING TOOL.

The halftone, Fig. 19, and the complete details, Figs. 20, 21 and 22, show a device for cutting out flues. The holder is first inserted in the flue, after which the cutting tool is placed and the point driven through the tube wall. Only one revolution is necessary for the cut-off. The halftone shows clearly the assembled device and the method of swinging it with the block and fall. The large gear wheel is mounted on the spindle which carries the cutting tool, and the power

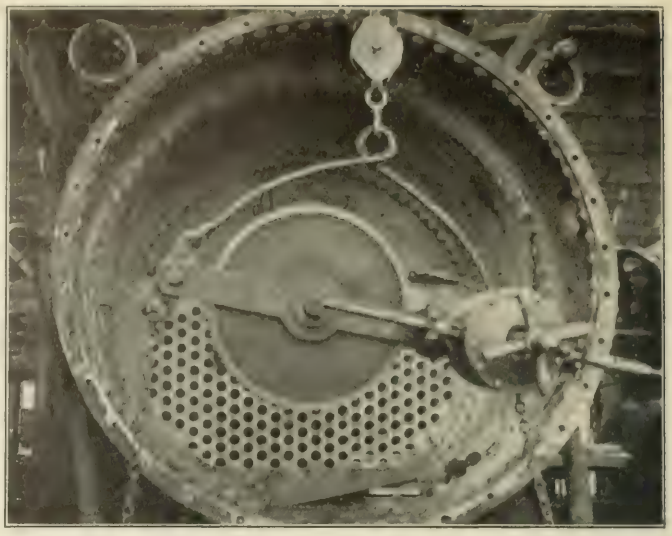


Fig. 19—Flue Cutting Tool in Position. Snyder.

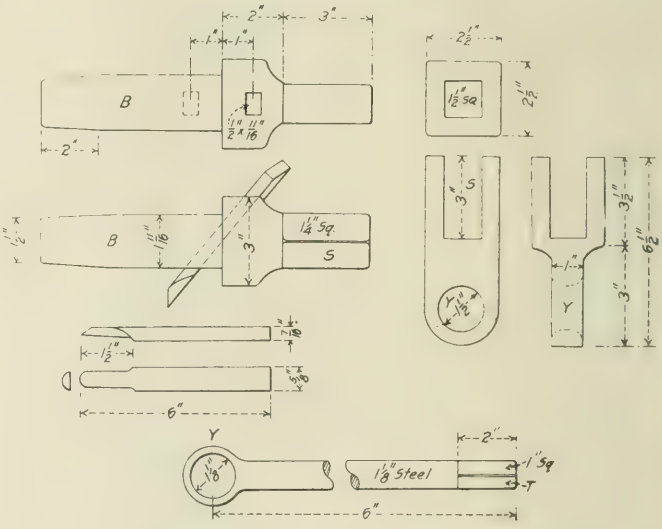


Fig. 20—Flue Cutting Tool Details. Snyder.

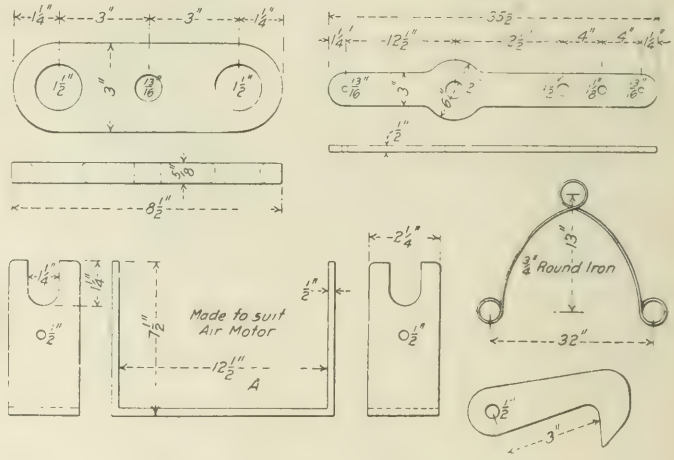


Fig. 21—Flue Cutting Tool Details. Snyder.

of the motor is transmitted through the gears V and W. This arrangement greatly increases the power and at the same time reduces the speed. The flexibility of this device for adjusting it to the different flues is seen in the halftone

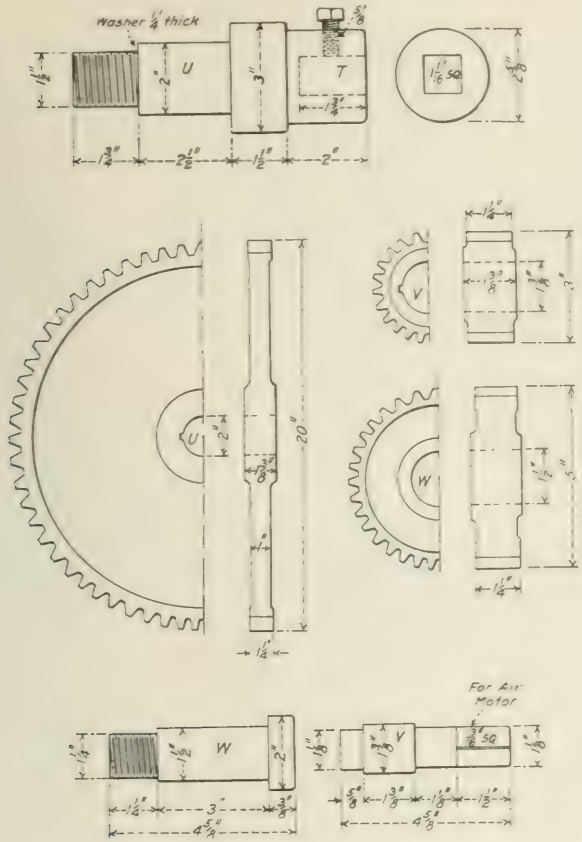


Fig. 22—Flue Cutting Tool Details. Snyder.

illustration, and this one feature should recommend it as a simple and rapid flue cutting tool.

SPRING CLIP FORGING DIES.

In Fig. 23 is shown a device for facilitating the work of making spring clips. Th lower block or die is held on the hammer anvil by the ⅛-in. boiler plate sheets which are

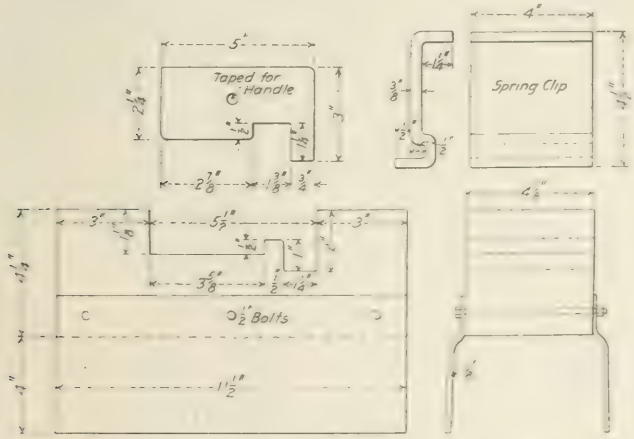


Fig. 23—Spring Clip Forging Dies. Snyder.

fastened to the die by ½-in. through bolts. The top die is held by a handle tapped into it near its center. Spring clips of the shape are shown made of ⅜-in x 4-in. spring steel. The stock is cut to the proper length, heated and then placed across the lower die. The upper die is forced down by one or two blows of the steam hammer. This device was designed by T. F. McDonald, blacksmith foreman at Stroudsburg.

FOURTEENTH COLLECTION.

BY A. S. DAVIS,
Shop Foreman, Northern Pacific, Jamestown, N. Dak., Shops.

DROP PIT RAIL REMOVER.

Fig. 24 shows a handy and easily made arrangement for moving the heavy I-beams on which the rails are laid alongside of drop pits. It consists of a piece of 8-in. pipe, about 2 ft. long, capped at each end and fitted with an ordinary air piston packed with leather, the rod of which extends out

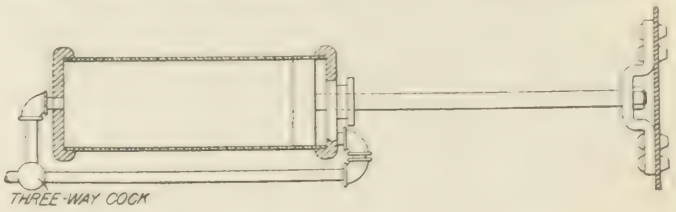


Fig. 24—Drop Pit Rail Remover. Davis.

through one head, which is bored and fitted with a gland and stuffing-box and takes hold of a bent bar at the end, which is in turn riveted to the web of the I-beam. The air connection is made as shown, with a three-way cock, by which air can be admitted to either end of the cylinder and exhausted therefrom. When the rails are in place the piston stands with its rod out, as shown in the engraving. After the wheels have been raised from the rail, air is admitted to the head and the rails are drawn bodily to one side, thus permitting the wheels to be dropped into the pit and removed.

WHEEL AND AXLE JACK.

Fig. 25 shows a small track jack, used for lifting heavy tender truck and engine wheels and axles, so that they may be

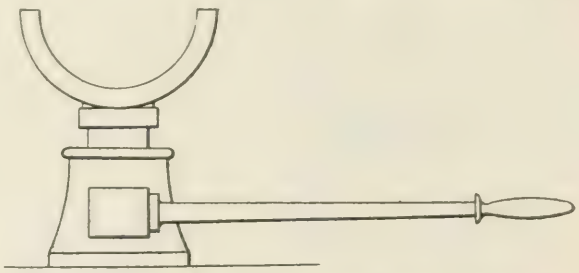


Fig. 25—Wheel Swinging Jack. Davis.

turned and run from one track to another when the tracks stand at right angles to each other. The jack is low, so that a wheel with its axle can be rolled over it when it is down. The cap is removed and a semi-circular yoke riveted in its place. This yoke is of such size as to grasp the center of the axle and may be made of 1-in. by 4-in. iron. The wheel and axle to be turned is rolled over it, the jack raised, lifting the wheels from the rails, when they are turned to the proper position.

CROSS-HEAD BABBITTER.

Fig. 26 illustrates a device used for babbitting two-bar cross-head gibs, so that they are ready for use without any

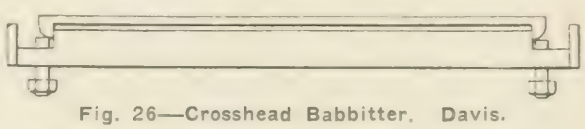


Fig. 26—Crosshead Babbitter. Davis.

finishing in the planer. It is made from a piece of 2-in. by 8-in. x 24-in. iron, planed off to fit the inside of the gibs. Four set screws are placed in it, one at each corner, for adjusting the thickness of the babbitt. The gib is laid on, as shown, and raised so that the proper thickness of babbitt will be provided by means of the set screws mentioned. The babbitt is then

poured into the open space, and when it is cold the work is done and ready for application without requiring any machine work whatever.

FIFTEENTH COLLECTION.

BY A. LOWE,
Canadian Pacific Railway.

TIRE HEATER.

This form of tire, Fig. 27, heater is used with gasolene. It is a simple contrivance, consisting of a reservoir about 9 in. in diameter and 24 in. long, with a pipe at the top for filling and one leading off from the bottom to the burner, which is shown at the right. Air is admitted to the top of the reservoir, thereby putting a pressure on the liquid and at the same time it comes down to the burner through the pipe on the outside. The mixture of air and gasolene is drawn out through the Y connection into the circular burner that surrounds the tire and is there ignited, heating the metal in the ordinary way.

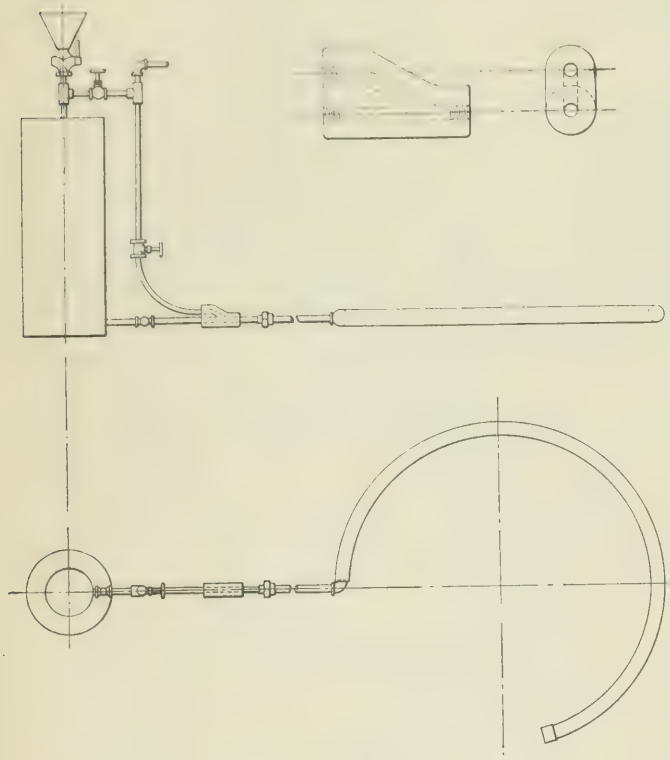


Fig. 27—Tire Heater. Lowe.

AIR HAMMER FOR DRIVING BOLTS.

The air hammer shown herewith, Fig. 28, consists of a cylinder 6 in. in diameter, into which is fitted a 3½-in. piston with packing grooves. Air is admitted from a tank to the bottom by suddenly opening the air cock on the pipe connection, thereby giving the piston the necessary impulse.

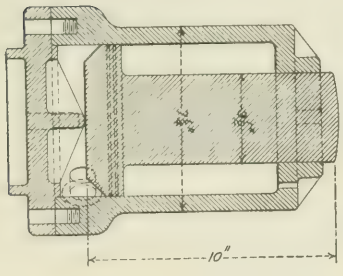


Fig. 28—Air Hammer for Driving Bolts. Lowe.

SPRING COMPRESSOR.

This device, Fig. 29, is for compressing the spring so that the driving or truck spring hangers can be put in position. It consists of a flat bar A with holes drilled at one end and a hinge hook C at the other. It is placed against the inside of the frame and a key B inserted in one of the upper holes, and the chain drawn down and looped into the hook, thus compressing the spring and holding it until the hanger is put in place.

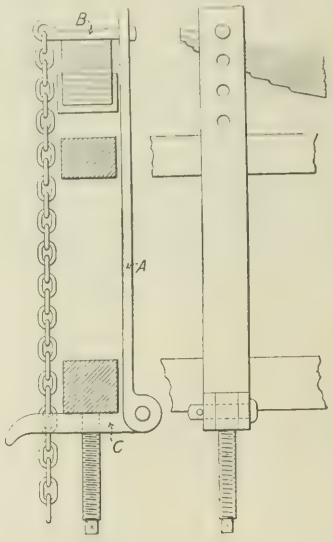


Fig. 29—Spring Compressor. Lowe.

GASOLENE HEATING FURNACE.

Fig. 30 shows a stand with a basin filled with cement upon which the material to be heated is laid, with the gasolene torch burners on either side. The gasolene is furnished from the tank beneath by being forced through to the burners by air pressure, where it is regulated by a needle valve. This apparatus, it will be seen, is portable, and connections can be made at any point with the air pressure pipes of the shop.

A modification is also shown in a similar burner which is used for heating plates or rods where the work has to be done in position. It can also be used for brazing purposes. Its operation is exceedingly simple. A reservoir about 9 in. in diameter and 14 in. long is fitted with a pipe at the top, under which it can be filled and under which air can be admitted for pressure purposes. The exit pipe enters from the top and extends to within a very short distance of the bottom of the tank, so that pressure applied to the upper surface of the liquid forces it up through and out of the burner.

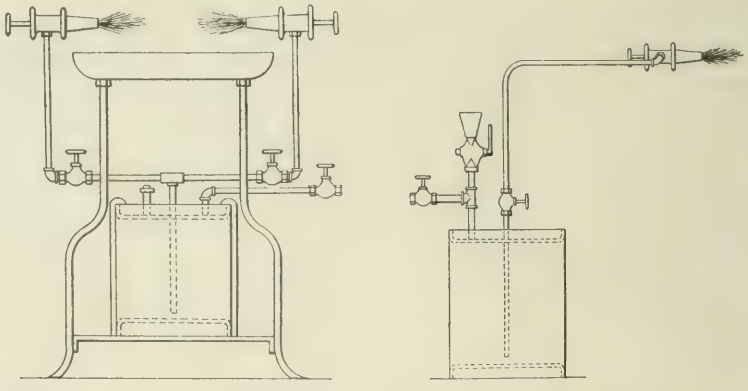


Fig. 30—Gasolene Heating Furnaces. Lowe.

SIXTEENTH COLLECTION.

BY E. J. MCKERNAN.
Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.

CROSSHEAD BABBITTING DEVICE.

The illustration herewith, Fig. 31, shows a device for babbitting crosshead shoes, after which planing is not necessary. A material reduction may be made in the cost of babbitting crosshead shoes, and the operation is performed in one-fourth of the time required by the old method.

Two tapered castings are arranged with grooves on their inside faces to receive a central wedge, the three parts constituting the core. By adjusting the wedge the width of the core is increased or decreased to correspond to the size of the shoe and the amount of babbitt metal desired. An adjusting screw is provided for this purpose. The end plates are hinged and close up the ends, to retain the babbitt, and are clamped in position by screws. Strips are also clamped to the core above the crosshead shoe, closing the mold and forming the upper babbitt edge along the flange of the shoe. All parts are arranged to be handled easily and adjusted quickly. As soon as the molten babbitt hardens the device is removed and the crosshead shoe is ready to be applied.

The time required for finishing one shoe of a large crosshead with the device is 10 minutes. Under the old methods 42 minutes were required to babbitt and plane up one shoe. As about 4 lbs. of babbitt were removed in the planer, the total saving accomplished by using the device is $1.13, of which $0.88 is in material and $0.25 in labor. On 1936 crossheads babbitted last year on the Santa Fé, a total saving of $2,191.55 was made by using the device.

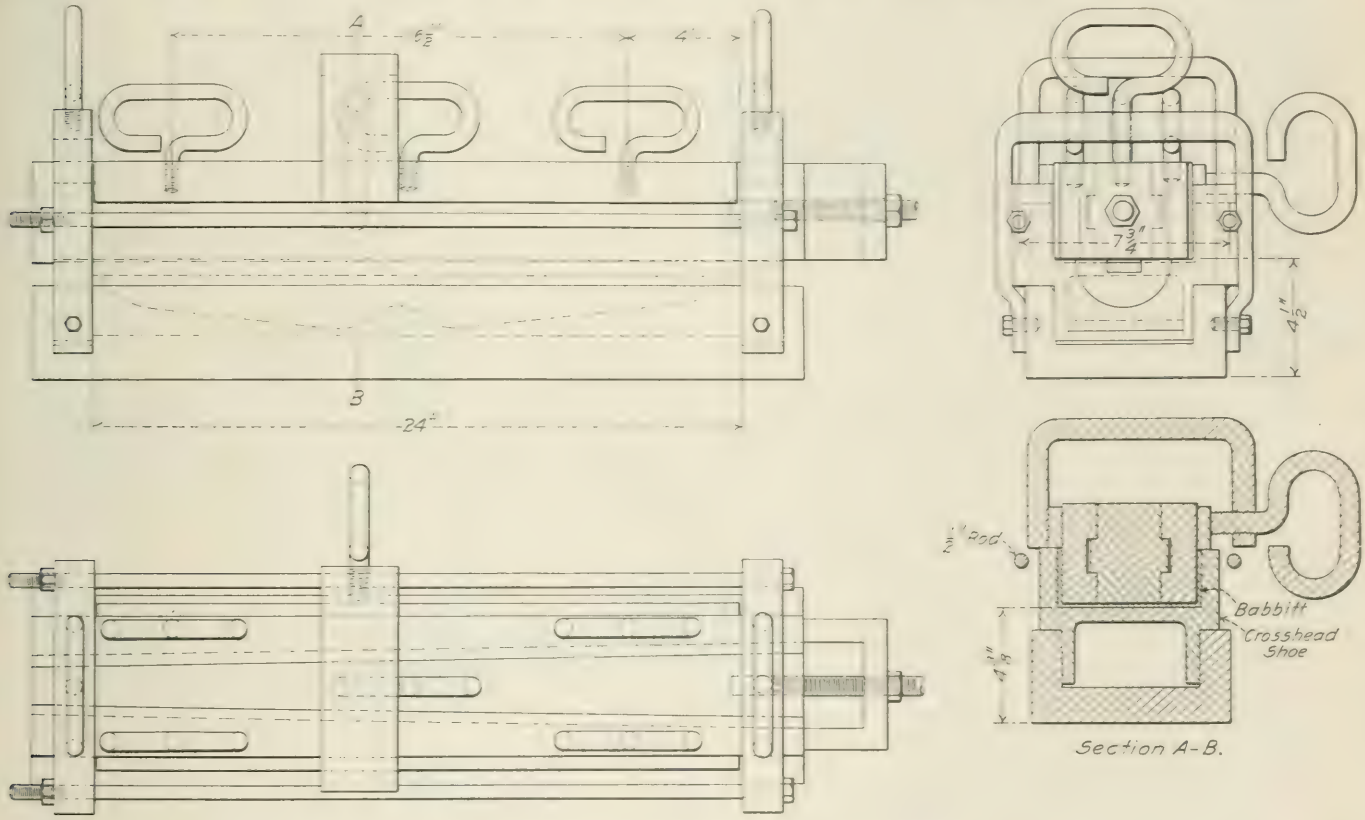


Fig. 31—Crosshead Babbitting Device. McKernan.

BELT CLAMP AND STRETCHER.

A very efficient belt clamp and stretcher is illustrated in Fig. 32. The device consists of two clamps 12½ in. long, made of 2-in. angle iron. Two parallel iron strips with teeth cut in the outer edges are riveted to the clamp, which carries an operating lever and two dogs. When the lever is operated back and forth the clamp is advanced and the belt stretched a corresponding amount. With one of these clamps a man can take care of all belts of 6-in. width and under, and, as the operation of stretching belts is performed very quickly, the expense of belt maintenance will be largely reduced by introducing such a device into shop practice.

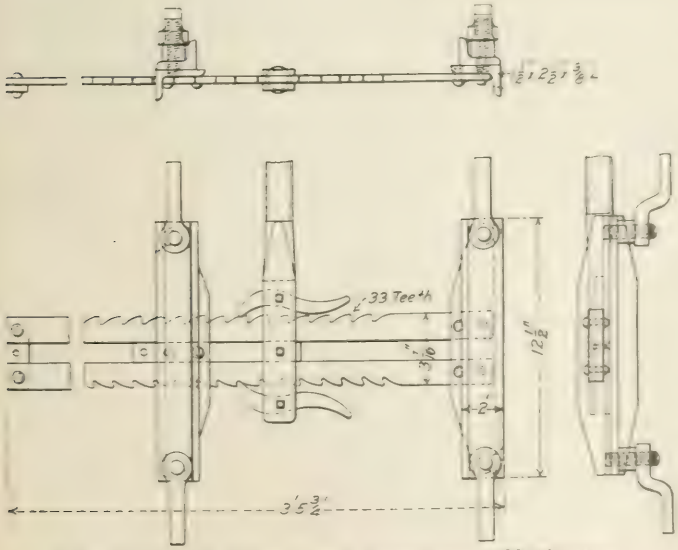


Fig. 32—Belt Clamp and Stretcher. McKernan.

CRANK PIN TURNING MACHINE.

The machine shown in Fig. 33 is designed for returning side and main rod crank pins which have become untrue in service. The machine consists of an outer frame with interior mechanism for driving two turning tools. The frame has points for adjusting the machine to the centers of the axle and pin, in order to correctly establish its position. The tools are driven by an air motor through gearing independently of each other, and are fed automatically. The machine is adjustable to all sizes of pins.

With the machine one man can turn up and finish a crank

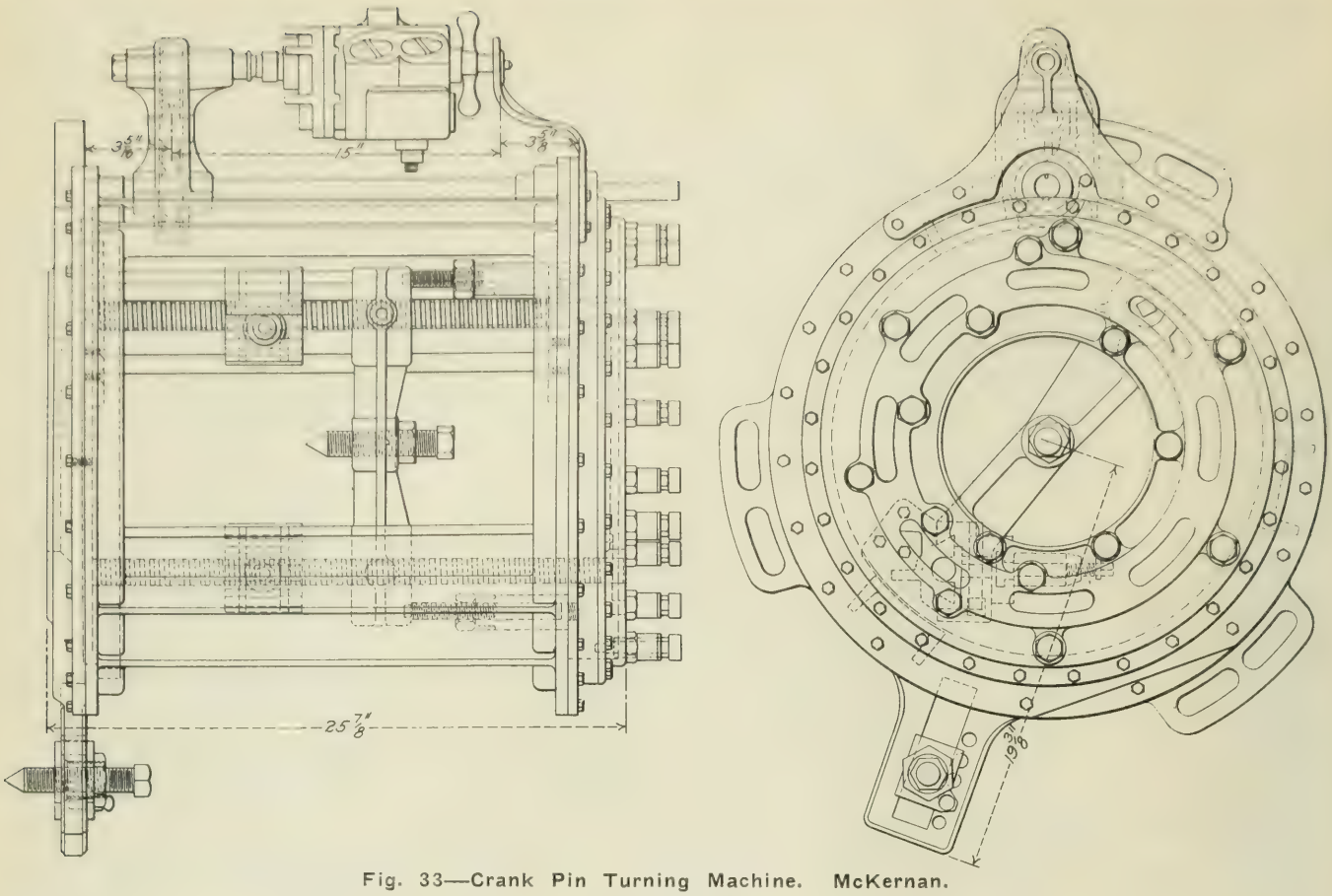


Fig. 33—Crank Pin Turning Machine. McKernan.

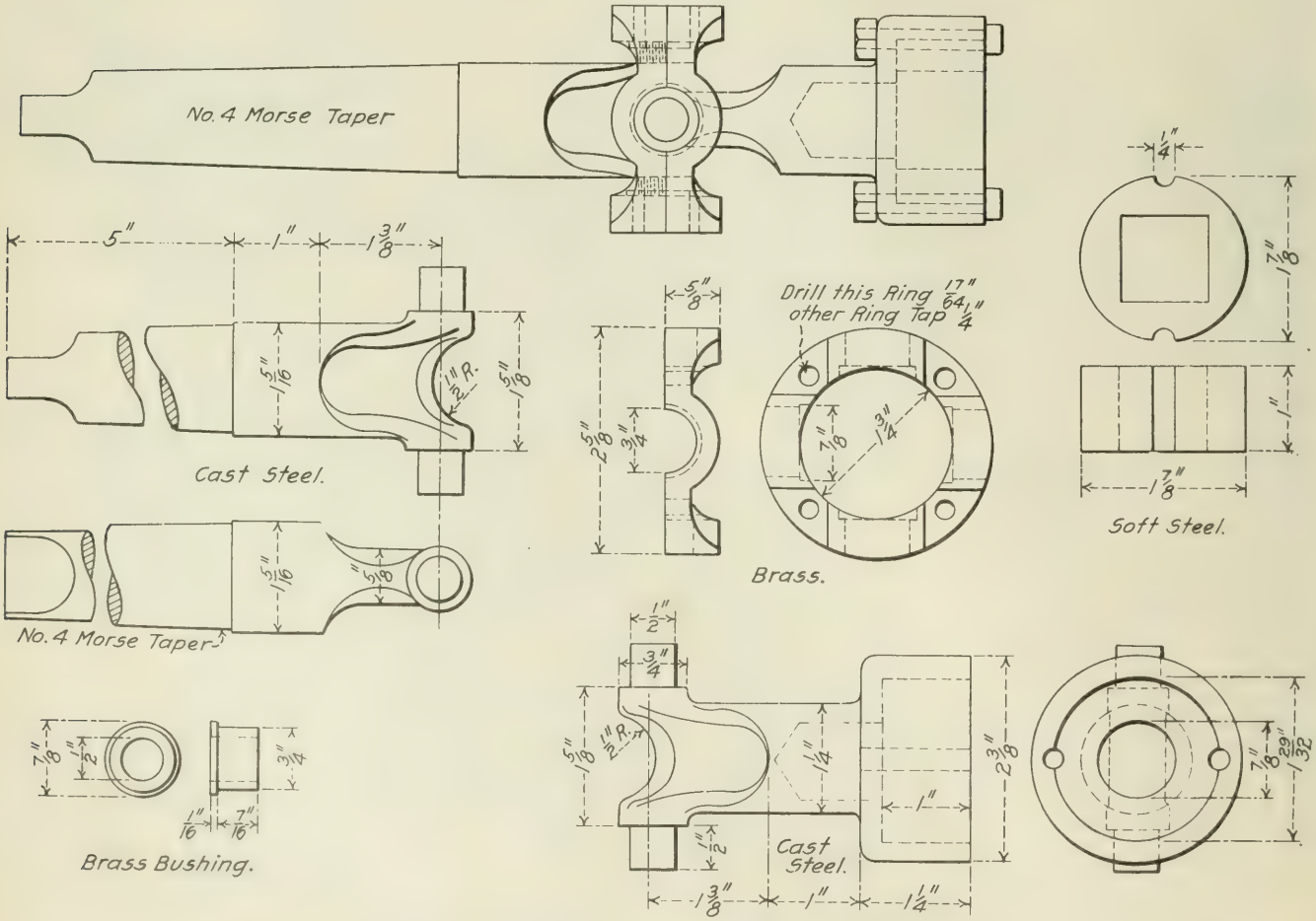


Fig. 34—Knuckle Joint and Socket. McKernan.

pin in about 3½ hours, at an average cost of $1.14. By hand, with chisel and file, it requires a skilled mechanic on an average of 9 hours to true up a pin, at a cost of $3.60. With the machine the pins are round and in correct throw and quarter, which is not usually the case when finished by hand. About 300 pins are turned up each year, and at the rate of $2.46 per pin a considerable saving is effected by the machine, and the quality of work is far superior.

KNUCKLE JOINT AND SOCKET.

Fig. 34 shows a universal or knuckle joint and socket for use in reaming with an air motor when the latter cannot be used directly over the reamer. When drilling or reaming in close quarters, where there is not sufficient room to use the motor direct, one of these sockets with knuckle joint will enable a motor to be used. Otherwise the work would have to be performed by hand, which is much slower and more expensive.

One end of the knuckle joint is turned to the regular No. 4 Morse taper, to fit in the air motor, and the other end is an adjustable socket for all reamers. The socket is turned to receive steel centers, with square holes of different sizes for reamer shanks of various dimensions. These are held in place by two screws and are quickly removed or replaced. The device is of solid construction, and has proved to be extremely useful and handy in shop work.

SEVENTEENTH COLLECTION.

BY A. D. PORTER.
Shop Efficiency Foreman, Canadian Pacific, West Toronto, Canada.

BOLT EXTRACTOR.

The extractor shown in Fig. 35 is used for removing bolts from locomotive frames, and is one of the most useful tools in the shop. It is made of an old crank pin machined as shown in the sketch. The barrel is filled with thick oil, the plunger being withdrawn to its full back position before

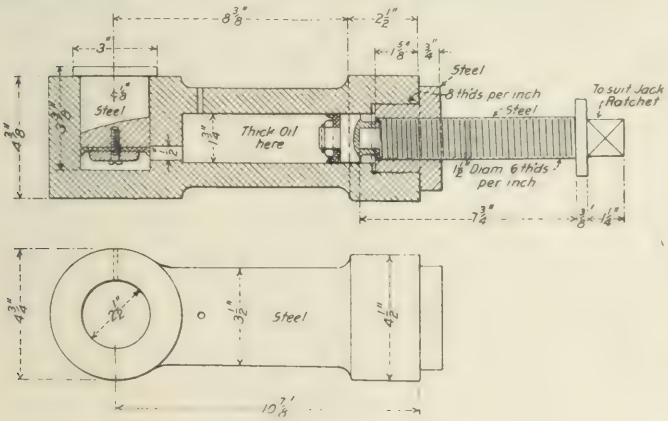


Fig. 35—Bolt Extractor. Porter.

filling. The 3-in. ram is securely placed under the bolt to be removed. The screw forces oil in the cylinder against the ram. A small hole is provided near the top of the plunger to prevent its being moved beyond the bore.

CROSSHEAD AND PISTON SEPARATOR.

This separator, Fig. 36, is made on the same principle as the bolt extractor shown in Fig. 35, and is used for separating the crosshead and piston rod. The tool is made of wrought iron, and the machine is shown. The ⅛-in. holes and the space behind the ram are filled with thick oil. The separator is applied to the crosshead in a manner similar to that of placing a connecting rod and the wrist pin is put in place. The wrought iron ram forces the oil against the plunger, which is shown separate and in enlarged scale. The center of the ram engages that of the piston rod, forcing the latter out of the crosshead. This is a very handy tool for both shops and roundhouses.

SPRING PULLER.

Fig. 37 shows a tool which is very useful in rapidly removing broken and replacing new locomotive springs in the roundhouse. Being light, the device is easily handled and

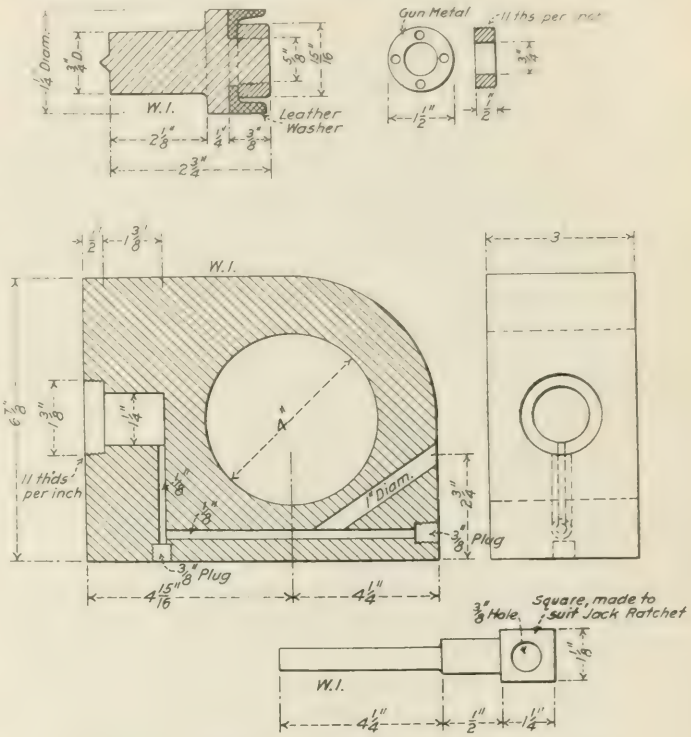


Fig. 36—Crosshead and Piston Separator. Porter.

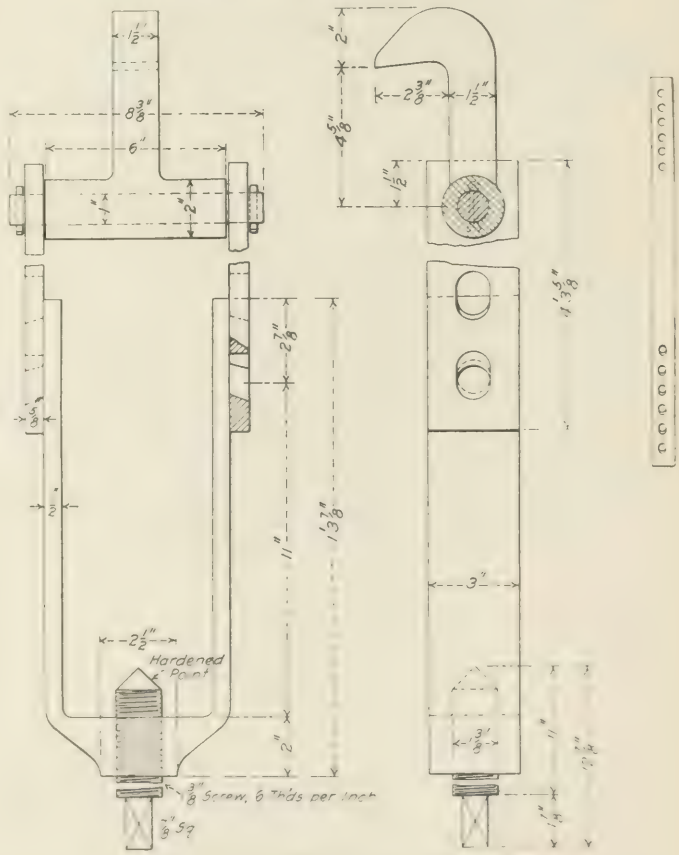


Fig. 37—Spring Puller. Porter.

quickly adjusted. The hardened point bears against the lower rail of the frame, and the hook grips the springs.

SMOKE STACK CRANE.

This crane, shown in Fig. 38, does not differ greatly from

what has become every day practice in the large majority of shops, but at the same time it is a design which should prove very efficient. As it is made of wrought iron it is very light and easily handled. When applied to the stack it may be easily placed in any position.

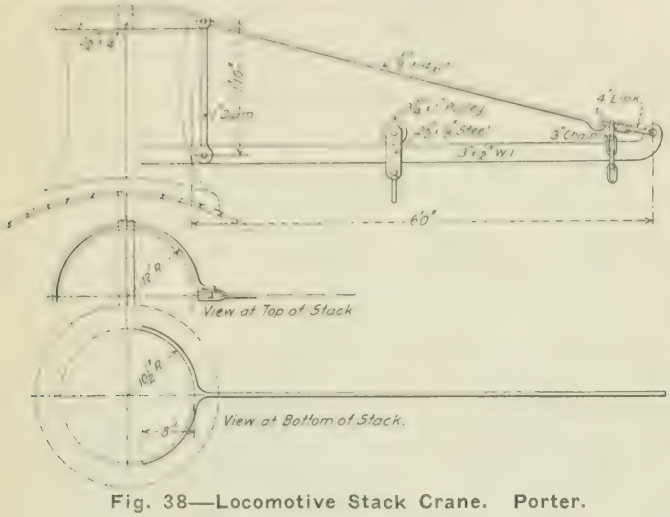


Fig. 38—Locomotive Stack Crane. Porter.

AIR PUMP PISTON HOLDERS.

The air pump piston holders, shown in Fig. 39, are applied to piston heads to prevent their turning when removing the piston rod nuts. The designs are exceedingly simple, steel

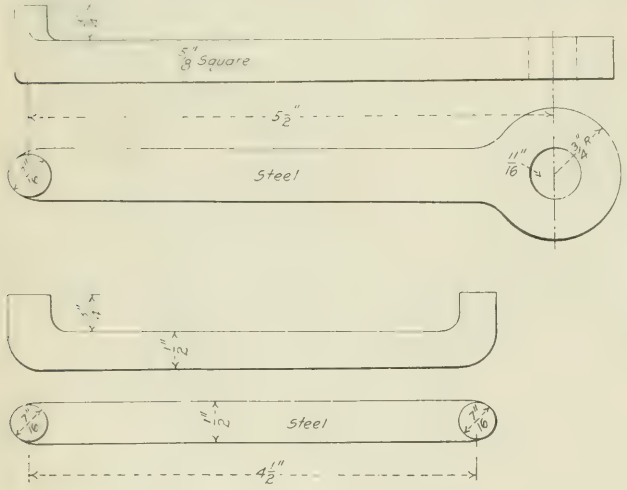


Fig. 39—Air Pump Piston Holders. Porter.

being the metal used. Both are used constantly in the air brake department. All of the tools in this collection are in use in the West Toronto shops of the Canadian Pacific, where they are considered very efficient ones, particularly the bolt extractor and the crosshead and piston separator.

EIGHTEENTH COLLECTION.

BY J. F. PERRITT.
Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.

BRAKE HANGER BENDING MACHINE.

The illustrations, Figs. 40, 41 and 42, show a machine for bending brake hangers. The halftone illustrations show the two positions of the machine. The adjustable fingers are set according to the length of hanger required. The complete details are given in the line cut, from which this tool can be made.

HOOK BENDING MACHINE.

The two halftone illustrations, Figs. 43 and 44, show a machine, or tool, for bending hooks, especially for train chains.

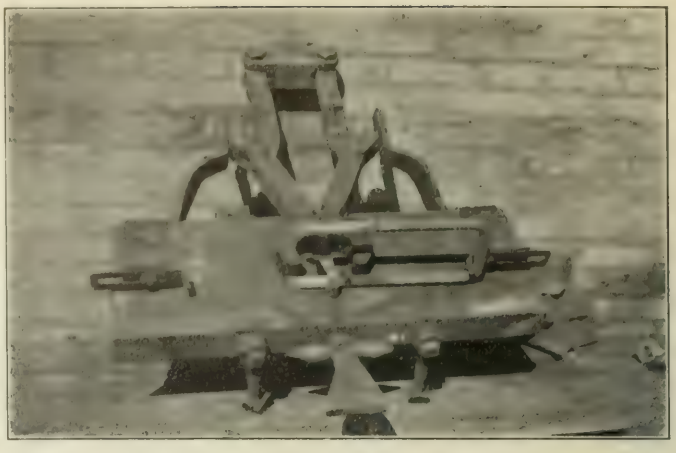


Fig. 40—Brake Hanger Bending Machine. Perritt.



Fig. 41—Brake Hanger Bending Machine. Perritt.

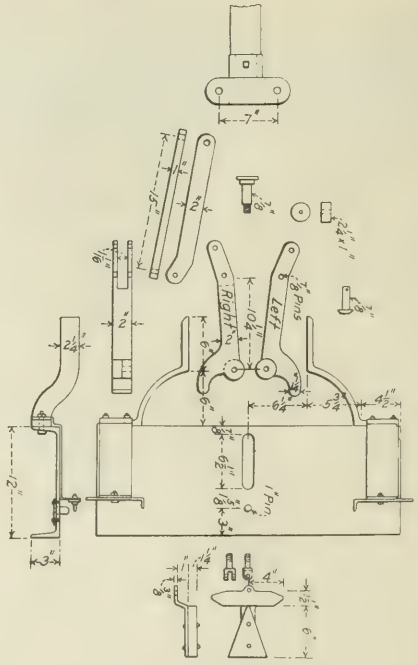


Fig. 42—Brake Hanger Bending Machine. Perritt.

The open position is shown in Fig. 43 and the closed, or forming position in Fig. 44. It will be noticed that the vertically operating hinge has beveled edges. These bevels, when the hinge is closed, provide a mold which gives the proper section to the hook. This same effect is gotten on the outside of the hook by the slot-section of the formers.

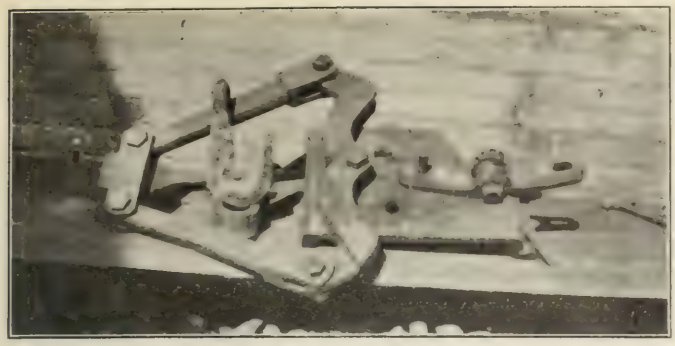


Fig. 43—Hook Bending Machine. Perritt.

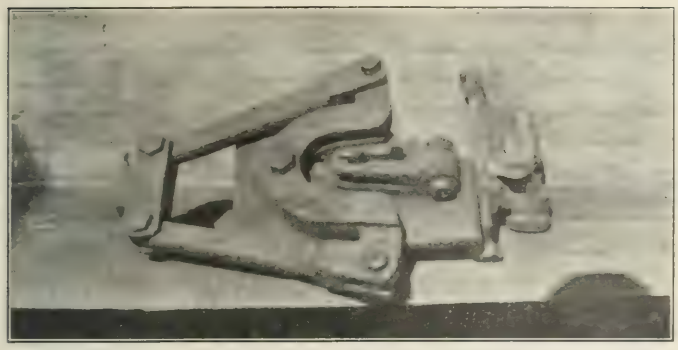


Fig. 44—Hook Bending Machine. Perritt.

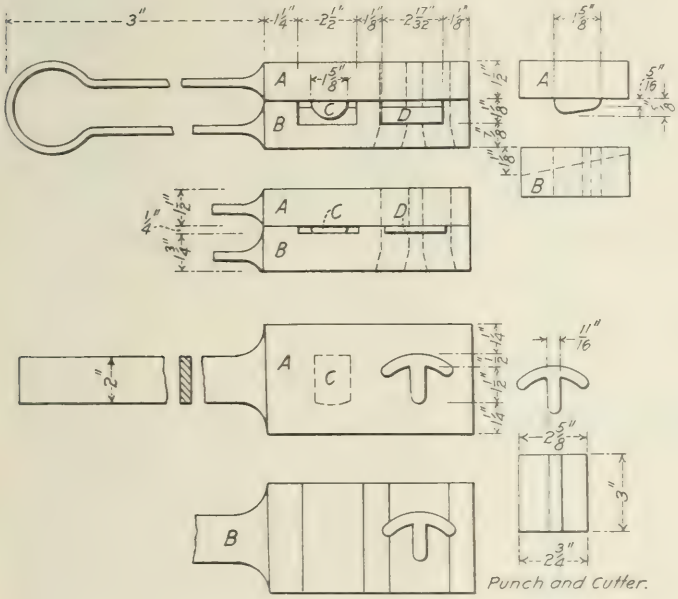


Fig. 45—Steam Hammer Claw Bar Tool. Perritt.

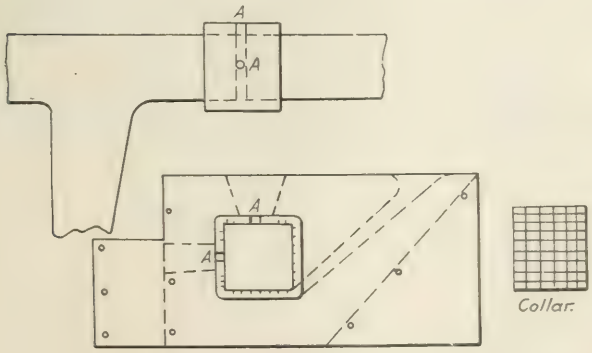


Fig. 46—Wood Collar for Thermit Weld. Perritt.

STEAM HAMMER CLAW BAR TOOL.

Fig. 45 shows a tool for use with a steam hammer. It is made up of male and female dies, to which the spring steel handle is welded. The steel for the claw bar is first drawn to the desired shape, after which it is placed between the dies at C. This form completed, the metal is placed between the dies at D, by which it is punched and cut off.

WOOD COLLAR FOR THERMIT WELD.

The sketch given as Fig. 46 shows a method of using white pine wood, instead of wax, for forming the collar around a locomotive frame when making a Thermit weld. This method is used entirely in the Jacksonville shops of the Seaboard. The wood is not alone much cheaper than the wax which would be required, but the frame is heated in about two-thirds of the time required when wax is used. The interior face of the wood mold is changed to a heated band, which aids in heating the frame. The inside surface of the collar is checked as shown. This reduces its thickness and allows the collar to burn out more quickly. After the mold has been packed and the plugs removed ¾-in. holes are drilled through the collar at the points marked A.

STEAM HAMMER PILE BAND TOOL.

In Fig. 47 are shown, assembled and in detail, a tool for welding pile bands under a steam hammer. The block C rests

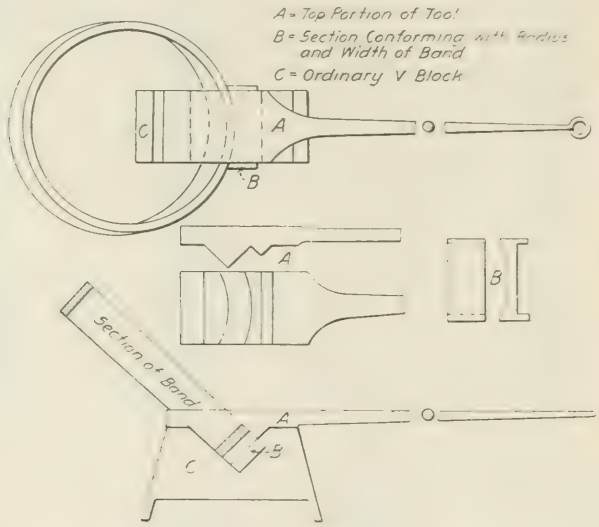


Fig. 47—Steam Hammer Pile Band Tool. Perritt.

upon the anvil of the hammer and the band takes a diagonal position, so that the necessary hammer blows may be struck. The several parts, A, B and C are referred to in wording on the cut.

MISCELLANEOUS KINKS.

LOW TRANSFER TABLE.

A deep pit for a transfer table is usually very much of a nuisance, and this is particularly true where it is necessary to locate it within the walls of the building. A table, by the use of which the depth is reduced to 13 in. below the top of the rail, is shown in the illustration, Fig. 48. The table is formed of I beams, upon which the running rails rest and are used as girders for the table. They are practically suspended from the journals of the carrying wheels. The table has a running width capable of taking two tracks and is also provided with spools for hauling cars. It is braced and held square by diagonal tension braces, as shown, and runs upon six rails, one-half of the table only being shown in the engraving. It would, of course, be possible to fit it with electric motors by an extension of one of the end axles, so as to run the whole length of the machine and placing the

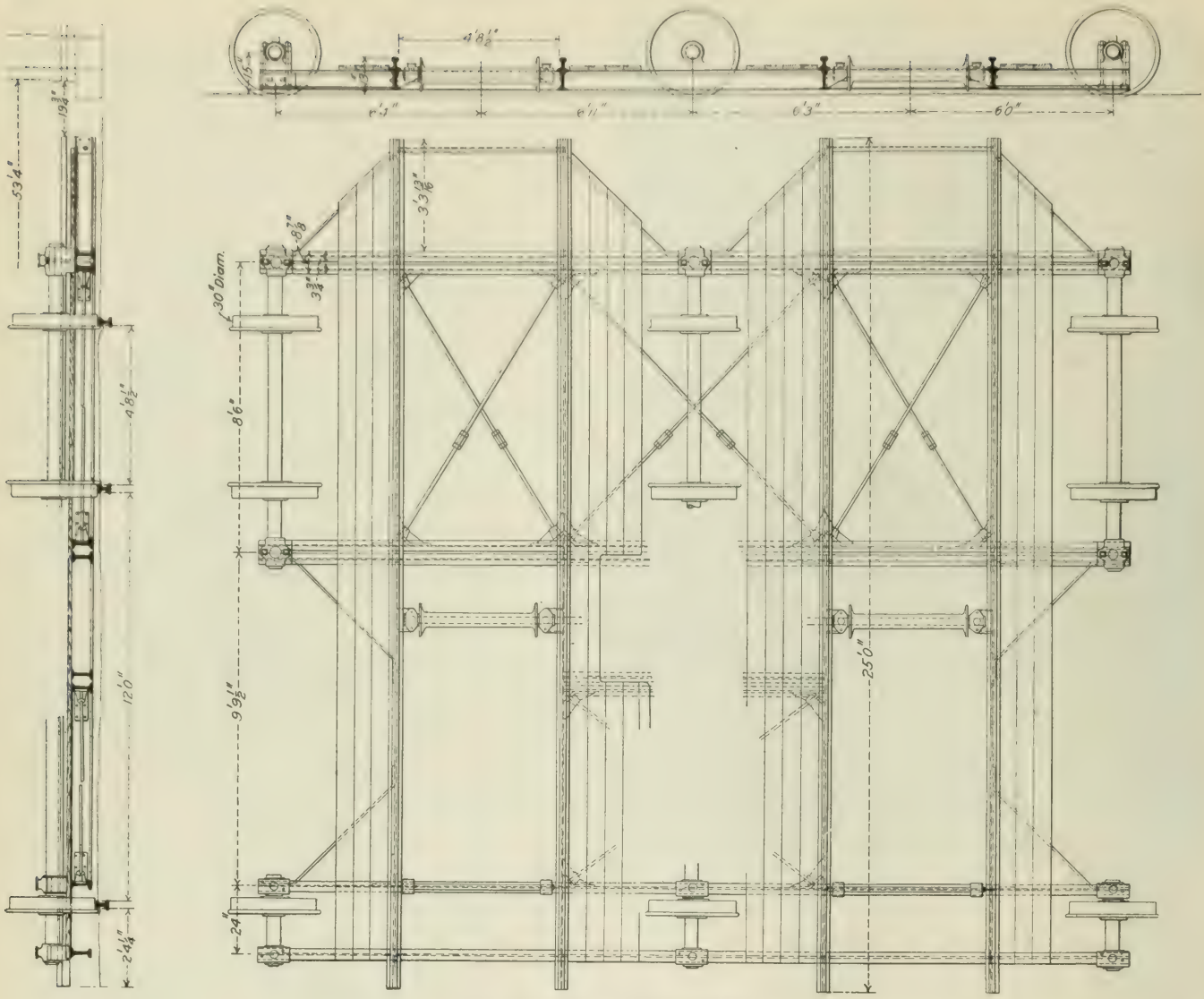


Fig. 48—Low Transfer Table.

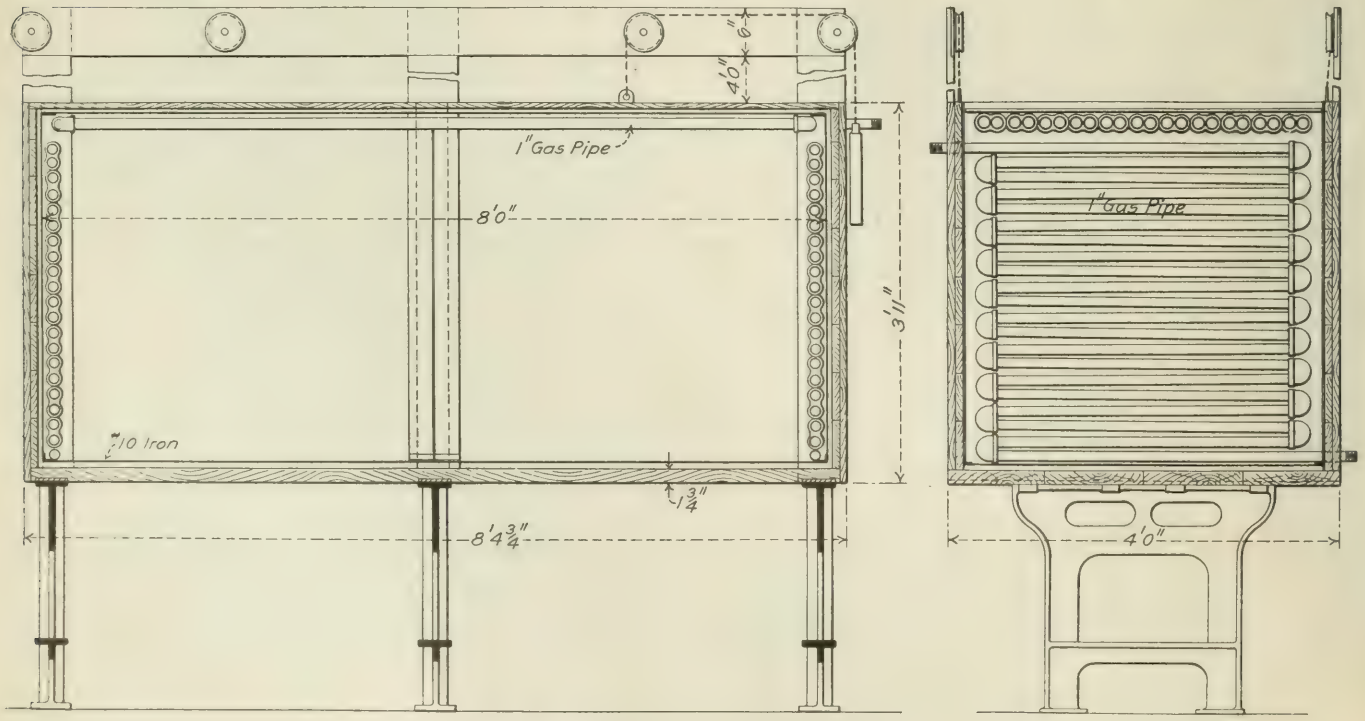


Fig. 49—Hot Oven for Plating Room.

electric drive on a floor at a level with the rails. It is not necessary to use the full width of the table on the double-track, as it is of sufficient strength to hold itself square under ordinary conditions for even the narrow width. The I beams used are 7 in. deep and of average strength.

HOT OVEN FOR PLATING ROOM.

A convenient form of plating room or hot oven, for use in connection with the replating of headlight reflectors and ornamental brass work of cars, is shown, Fig. 49. It is also used for drying lacquer. It consists of three substantial legs of cast iron, supporting a wooden box, lined with 1-in. gas pipe. The wooden box has an inner lining of No. 10 iron, held at the corners by light angles, and with a space ½-in. thick between it and the wood of the box, which is filled with plaster-of-Paris for insulating purposes. The doors at the front are opened by sliding vertically and are counterbalanced by the weights, as shown. The total height of the dryer is 3 ft. 11 in., with a width of 8 ft. 4¾ in.

FROM THE MEADVILLE SHOPS OF THE ERIE.

The following collection of shop kinks were gathered by F. E. Lister, associate editor, *Railway Age Gazette*, from the shops of the Erie, at Meadville, Pa. We are indebted to E. G. Chenoweth, mechanical engineer of the Erie, for courtesies extended in this connection.

STEAM PIPE JOINT RING GRINDER.

Probably one of the most undesirable jobs in overhauling a locomotive is that which has to do with the removing and replacing of steam pipes. The insuring of steam-tight joints between the several sections of the piping is much more important than the work is undesirable. Any tool or device

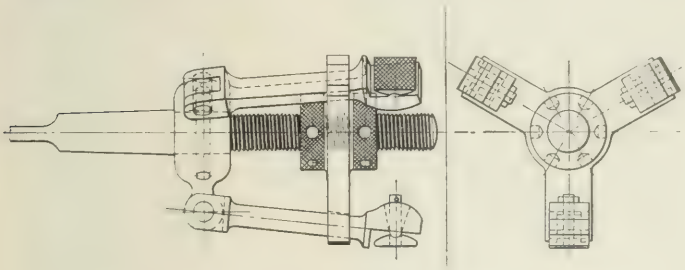


Fig. 50—Steam Pipe Joint Ring Grinder. Erie.

which will assist in grinding the joint ring will be a welcome one in any shop, especially those where a block, shaped like a frustum of a cone, is used. The tool shown, Fig. 50, is intended for use with an air motor, the shank having the standard Morse taper. The tool is seen to be adjustable and the three self-adjusting shoes accommodate themselves to the inner rough surface of the ring. This device is not only adaptable for grinding joints on the sections of the pipe after removing them from the locomotive, but also for those joints which are not easily accessible, such as the one in the flue sheet. The tool is also very advantageous for roundhouse use.

PORTABLE ECCENTRIC KEY SEAT MILLER.

The use of a rough forged tit-drill and chisel for sinking eccentric key seats in driving axles is undoubtedly a time-honored practice and one which may ever continue, especially in roundhouse running repairs. The tool shown, Fig. 51, is designed to greatly facilitate this work. The standard Morse taper shank provides for attaching an air motor directly above the milling cutter. Steel ball races and bearings prevent any loss of power due to friction. The tool is fastened to the axle by means of two chains and tightening screws, which latter bear against the underside of the axle. The V-shaped surfaces of the device provide for bringing the cutter on the center line of the axle. The depth of the key way is governed by

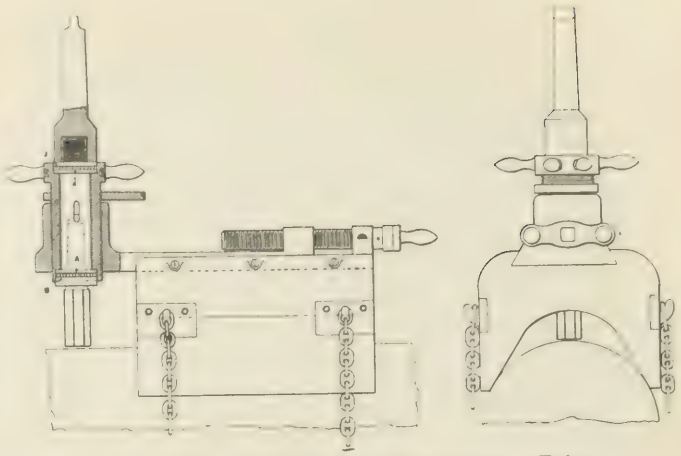


Fig. 51—Portable Key Seat Miller. Erie.

the horizontal star wheels and maintained by setting the lock nut. The feed is governed by the two-spoke wheel at the opposite end of the device. Provision is made in the guides for taking up all possible wear, there being two adjustable gibbs which are adjusted by set screws, shown in the side elevation.

FLUE CUTTER.

The assembled and detailed drawings of the flue cutter, Fig. 52, illustrate what probably is as efficient a tool for this work as is now in use. Removing a set of flues, using an air hammer and chisel to cut loose the rolling at the front flue sheet, not only takes from 15 to 20 hours' time, but it is also a laborious task, as the mechanic is compelled to work in a cramped position, especially in small diameter arches. The

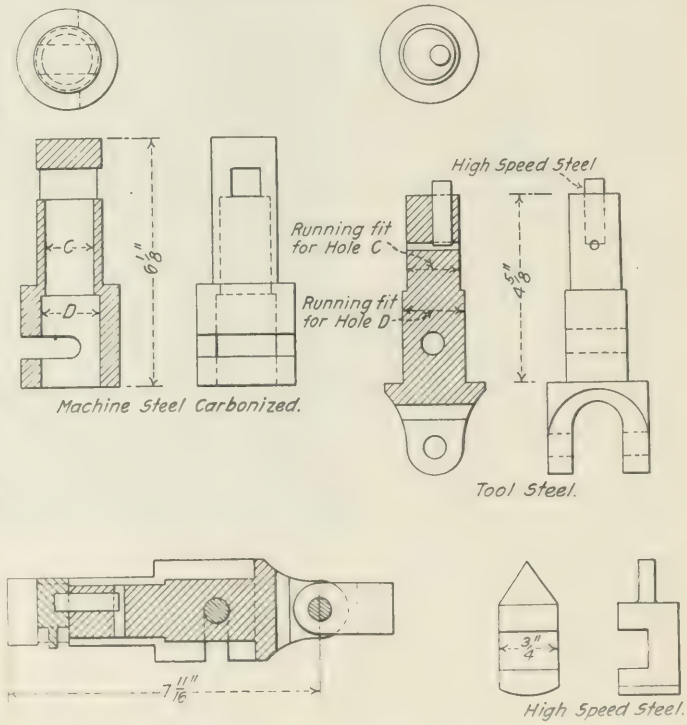


Fig. 52—Flue Cutter. Erie.

simplicity of this tool at once recommends it to the tool maker as well as the user. The outside bushing shaped part is made of carbonized machine steel and the center cylindrical portion is made of tool steel. The second portion carries the tool steel pin, which bears directly against the high-speed steel cutter. Reference to the drawing shows that when the inner cylinder is in its full position toward the left, the eccentric action of the tool steel pin, which engages the cutter, draws the blade inside of the tool diameter, permitting the whole to be inserted in the tube. When power is applied in the

right-hand direction, the eccentric action of the pin forces the cutter out and through the walls of the tube just behind the flue sheet and to complete the circle, taking out a band of metal the width of the blade face. The power is then reversed, which throws the blade back into the tool and permits its withdrawal from the tube for another cut.

This tool is intended for use with an air motor, the toggle permitting a universal joint connection to a bar, one end of which has a Morse taper end for inserting in the motor socket. The air motor is swung in the arch on the center line of the boiler, and the universal joint permits cutting out the entire set of flues without changing the position of the motor. The motor should have a quick reversing valve arrangement, as the tool makes but one revolution in cutting and one in the opposite direction for removing.

The tool foreman at Meadville, John Hessler, who designed and made all of the pneumatic tools here given, is authority for the statement that the tool will cut a set of 326 tubes in five hours, which, with an air hammer and chisel, would take about three times as long.

FLUE EXPANDER.

A very efficient tool for expanding flues, one which is used in all of the shops of the Erie, is shown, Fig. 53. This tool differs from the well-known expander of this general type, in that the three $\frac{5}{8}$-in. cold rolled steel rollers are set on an angle of $3\frac{1}{2}$ deg. with the center line of the tool. In using

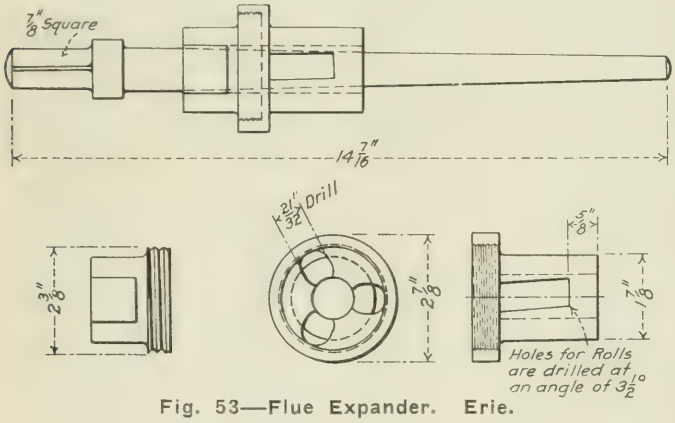


Fig. 53—Flue Expander. Erie.

an expander in which the rolls are set on the center line, it is necessary to expand the rolls by striking the end of the spindle. This not only tends to strain the fibers of the tube metal but makes a more or less uneven roll, and also shortens the life of the spindle by battering its end. With the rolls set on an angle, the feed is automatic, as is also the withdrawal of the tool when revolving the spindle in the left-hand direction.

SOLID OIL CUP UNDER CUTTER.

With the advent of side and main rods having oil cups made integral with the forging, it became necessary to devise a tool for cutting the clearance space at the base of the threads inside the cup. This can be done by using a small cutter on a vertical spindle. In this case, however, it is necessary to have the spindle of a diameter sufficiently small to allow for feeding the tool into the work, with the result that the tool chatters and the cut is generally unsatisfactory. The tool shown, Fig. 54, is one designed to obviate these difficulties.

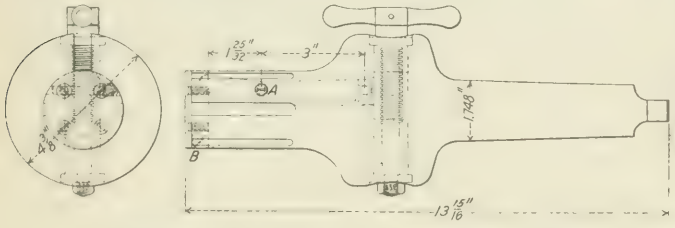


Fig. 54—Solid Oil Cup Under Cutter. Erie.

Its outside diameter is made slightly less than that of the hole drilled for tapping. The cutting edge of the tool is seen at B. The opposite end of the cutter receives the end of the lever which is fulcrumed at A. Power is applied through the square threaded screw to force the cutter outward. The circular plate, fastened by four countersunk screws, holds the cutter within the tool. The six flutes provide for gathering the cutterings. This tool is for use in a drill press, having the standard Morse taper.

TELL-TALE HOLE PUNCHING DIES.

In those shops where solid staybolt iron is used it is necessary to provide for tell-tale holes in the ends of the bolts. These holes are usually drilled after the bolts are riveted up, using an air-driven breast drill. This method is not always satisfactory, as the small diameter drill often breaks off in the hole, thus placing a steel plug which is difficult to remove. The Erie uses solid staybolt iron, but instead of drilling tell-tale holes they are hot punched before the bolt is threaded. This is done in a bulldozer, using the die and punch shown, Fig. 55. Provision is made for $\frac{15}{16}$-in., 1-in., $1\frac{1}{8}$-in. and $1\frac{3}{16}$-in. iron. The dies are made according to the bulldozer

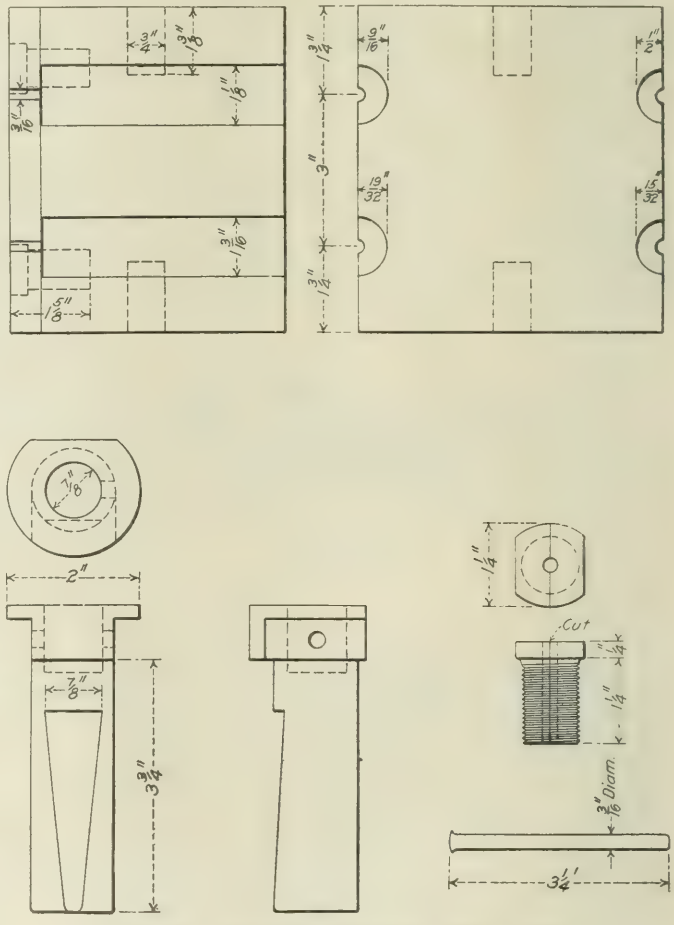


Fig. 55—Tell-Tale Punching Dies. Erie.

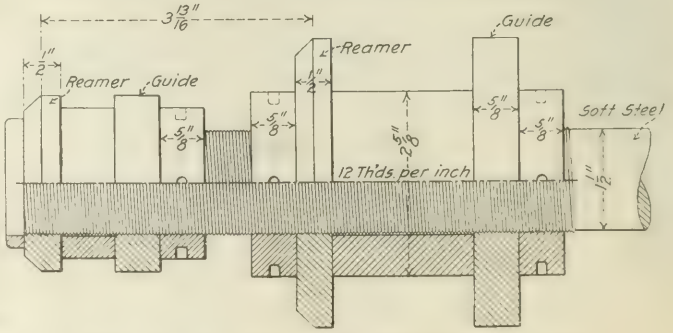


Fig. 56—By-Pass Valve Seat Reamer. Erie.

which will receive them. The ⅜-in. steel pin is inserted in the steel plug, which in turn is screwed into the holder. The hole through the plug is drilled of the same diameter as the pin and the plug is then sawed into halves. This provides for clamping the pin firmly when the plug is screwed in place. The small head on the pin is peened cold, the end being previously annealed. The iron, after being cut into bolt lengths, is heated in a furnace. One blow of the steel pin is sufficient to pierce the required tell-tale hole, and the bolts are threaded after cooling.

BY-PASS VALVE SEAT REAMER.

The sketch herewith, Fig. 56, shows a built-up reamer for trueing up the bevel seats of by-pass valves. The spindle, which receives the cutters, thimbles, guides and nuts, is made of soft steel. The lower end of the spindle has a washer, machined in place, against which the lower cutter rests. The lower guide is separated from the reamer by a distance piece, or thimble, and the three are secured in position by the ring nut which bears against the guide. The upper cutter and guide are similarly clamped in position, there being two ring nuts. These nuts allow for adjustment of the cutters. The tool is designed for use with an air motor, the top of the spindle having a standard Morse taper.

DANIEL WILLARD.

Daniel Willard, vice-president of the Chicago, Burlington & Quincy, the Colorado & Southern and the Colorado Springs & Cripple Creek District Railway, and president of the Colorado Midland, has been elected president of the Baltimore & Ohio, succeeding Oscar G. Murray, who has been elected chairman of the board. Mr. Willard began his railway career at the bottom. He was born in North Hartland, Va., and on Jan. 28, 1910, he will be 49 years old. When he was 18 he began railway work as a track laborer on the Central Vermont. He was later fireman and locomotive engineman on the Passumpsic Railroad, now a part of the Boston & Maine, and on the Lake Shore & Michigan Southern.



Daniel Willard.

He got his real start, however, on the Minneapolis, St. Paul & Sault Ste. Marie. He got work as a brakeman on this road in 1884 and remained in its employ as brakeman, conductor, roundhouse foreman, engineman, trainmaster, assistant superintendent and superintendent of the Wisconsin and the Peninsular divisions until 1899.

While he was on the "Soo" he formed a friendship which has had a strong influence on his subsequent career. This was with Frederick D. Underwood. Like Mr. Willard, Mr. Underwood started at the bottom. In 1886 he had become general manager of the Minneapolis & Pacific, and when this road became a part of the Minneapolis, St. Paul & Sault Ste. Marie he became general manager of the latter property. Meantime, Mr. Willard had come under his observation and had been singled out as especially deserving of confidence. When Underwood went to the Baltimore & Ohio in 1899 as general manager he took Willard with him as assistant general manager, and during the month of May, 1901, Willard was acting general manager. Two years later, when Mr. Underwood became president of the Erie, Mr. Willard went to the Erie with him as assistant to the president. Mr. Willard subsequently became third vice-president and then first vice-president and general manager of the Erie.

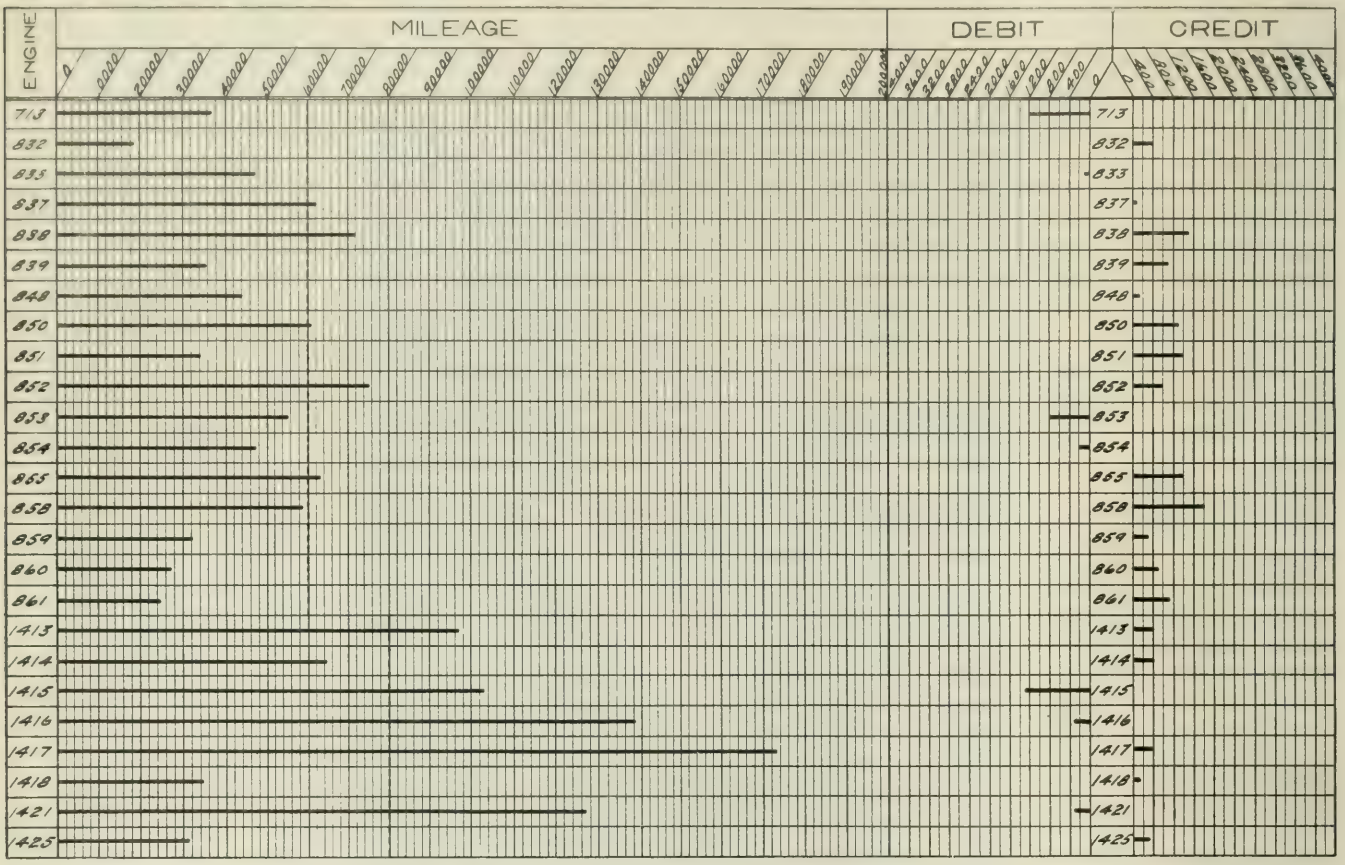
Nature gave Mr. Willard unusual ability and tremendous energy. He is one of the most indefatigable workers in the railway business. He not only works hard, but he works fast. These natural endowments alone would not have put him where he is; but in addition to having ability and energy he has had an extraordinary taste for serious study. He has been a student all his life. Few active business men have read so many books on economic and kindred subjects.

It will be noted that during his railway career he has had experience in the track and the motive power departments as well as in the operating department. This has made him an all-round operating man, and, taken in connection with the large knowledge he has acquired by study, makes him an extraordinarily broad railway executive. One way that Mr. Willard has shown his intelligence and breadth in recent years has been by frankly recognizing that the anti-railway agitation has not been without cause and in choosing means for stopping it. He has welcomed fair and intelligent criticism of the Burlington from every source. He has had newspaper and all other kinds of criticism sent to the general offices in Chicago, and has had the criticized conditions systematically studied with a view either to showing the critics that their complaints were unjustifiable or to removing the grounds for complaints. He has frankly recognized the fact that public sentiment is more powerful than any corporation or number of corporations, and has insisted that the railways should adopt the policy of educating rather than opposing it.

Mr. Willard was elected second vice-president of the Chicago, Burlington & Quincy in January, 1904. Under his administration second track has been nearly completed between Chicago and Omaha, a good deal of second track has been built elsewhere, and various extensions have been made. The cost of improvements has risen as high as $15,000,000 in a year. Mr. Willard was made vice-president of the Colorado & Southern and subsidiary lines and president of the Colorado Midland when the Burlington acquired control of these properties from the Hawley interests. He comes to the Baltimore & Ohio at a time when this company has need of a thoroughly aggressive management to help it meet the competition in the soft coal business. His past record indicates that he is a man likely to give the B. & O. such a management.

LOCOMOTIVE MILEAGE CHART.

The mileage chart given herewith is one which is used in connection with the locomotive mileage allotment system used on the Atchison, Topeka & Santa Fe. The debit and credit columns are not useful on roads which have no allotment system, but the mileage column alone is valuable on any road, as it shows at a glance the mileage expected of each locomotive and also the amount which has been made up to the time of making the report. The vertical dotted line in the upper left hand section of the chart indicates the standard mileage which the freight locomotives given on the chart are supposed to make before being again shopped. The vertical dotted line in the lower left hand section of the chart indicates the mileage for the passenger locomotives listed. The debit and credit columns show the amounts accrued at the time of the report under the allotment system. The various classes of locomotives are allowed a certain fixed amount per mile run towards their next shopping. If running or light repairs absorb more than the allotment in any case the balance is shown on the debit column. We are indebted to C. J. Drury, general road foreman of engines, A. T. & S. F., for the above.



Locomotive Mileage Chart.

LOCOMOTIVE AND CAR REPAIR SHOPS OF THE NEW ORLEANS GREAT NORTHERN AT BOGALUSA, LA.

The shops here illustrated are a good example of modern design and construction adapted to a small road and arranged so as to answer for a locomotive terminal as well as a locomotive repair plant. The New Orleans Great Northern is a new southern railway extending from Jackson, Miss., to New Orleans, La. The road passes through an extensive undeveloped section of pine forests and the present operating mileage is 273 miles, including branches, over which passenger and freight service is being maintained. The general manager is N. G. Pearsall and the chief engineer is J. F. Coleman. The Arnold Company, Chicago, made a study of the conditions and requirements of this line pertaining to locomotive, freight and passenger car repair shops; it was then retained as engineers to prepare plans and specifications for the buildings and equipment and later acted as constructors of the complete plant ready for service.

The construction was taken up in January and completed in June, 1909. The site for the location of the shops at Bogalusa, 70 miles north of New Orleans, was selected for the following reasons: First, its nearness to the center of gravity of the system; second, the prospective development of the new city promising to attract skilled and common labor; third, the large area of level ground adjacent to the main line, affording an ideal place for shop tracks; fourth, convenience and economy of purchasing electric power from the large plant of the Great Southern Lumber Company adjucent to the shop site, thus saving the railway the expense of building a plant of its own; and, fifth, an abundant supply of pure artesian well water and excellent natural drainage.

The shops are not intended to provide for repairs of the railway equipment only, but provision is made for repairing a portion of the special logging machinery of the Great Southern Lumber Company, comprising locomotives, steam log rollers, steam skidding machines and cars. The capacity of the plant with present facilities is sufficient to handle 50 locomotives, 20 geared locomotives, 10 steam logging and skidding machines and 5 Barnhardt steam log rollers, in addition to 3,000 freight cars and 30 passenger cars. There are five main buildings and seven auxiliary structures. By referring to the ground plan it will be seen that the layout is designed to provide for the necessary terminal facilities as well as those for general repairs.

SHOP TRACK SYSTEM.

The yards and buildings are served with a system of standard gage tracks, and each department is laid out to permit of 100 per cent. extension. At present the locomotive and coach shops are approached by a system of ladder tracks, but it is intended to remove these whenever the tracks are extended

and to install a transfer table running between the two buildings. A standard gage track passes through the woodworking shop parallel with the freight car repair tracks and industrial track for timber from the mill to the repair yard. A



General View of New Orleans Great Northern Shops at Bogalusa, La.

similar track extends through the locomotive and forge shop, passing the material sheds and scrap yard, thus facilitating the handling of material between these departments. The track directly through the machine shop and engine house passes over the driving wheel drop pit and renders it possible to roll drivers directly from it into the machine shop, where they are taken by an electric telpher hoist directly to the wheel lathes.

MAIN BUILDINGS.

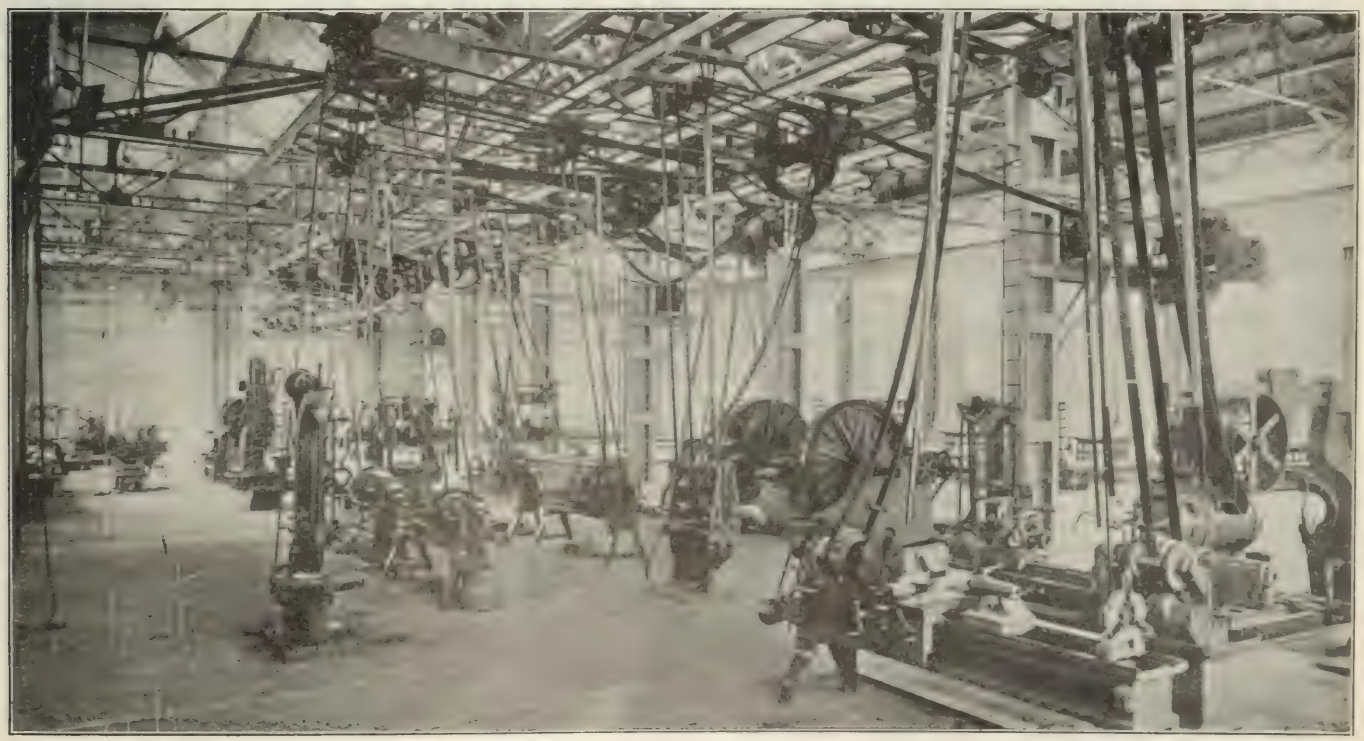
The buildings are constructed from the foundation up of reinforced concrete made from washed creek gravel. An abundant supply of gravel and sand well adapted to concrete construction was obtained from Bogalusa creek, immediately adjacent to the building site. The walls are reinforced with steel bars and they are in general 8 in. thick. The window and door frames were placed in concrete forms and the walls cast around them, thus insuring good anchorage in the joints.

LOCOMOTIVE SHOP.

The locomotive shop is 176 ft. long by 120 ft. wide, with a wing at the west end 66 ft. by 110 ft., which is occupied by the forge shop. The erecting shop has tracks arranged on the transverse system and is 76 ft. wide and 37 ft. high clear under the roof trusses. It has 8 concrete engine pits spaced 22 ft. centers. The machine bay is 44 ft. in width and extends the entire length of the building adjacent to the erecting bay. The roofs of most of the buildings are made of corrugated iron. The floor of the locomotive shops is 3-in. yellow pine laid on 4-in. x 6-in. sleepers embedded in sand. The steel columns are designed to support a future 100-ton crane runway with traveling crane over the erecting bay. For the present needs a 5-ton traveling hoist on a bracket runway is provided on the north side of the bay. Careful attention was given to the natural lighting of the building, and in addition



Locomotive Shop at Bogalusa, La.



Machine Floor of Locomotive Shop.

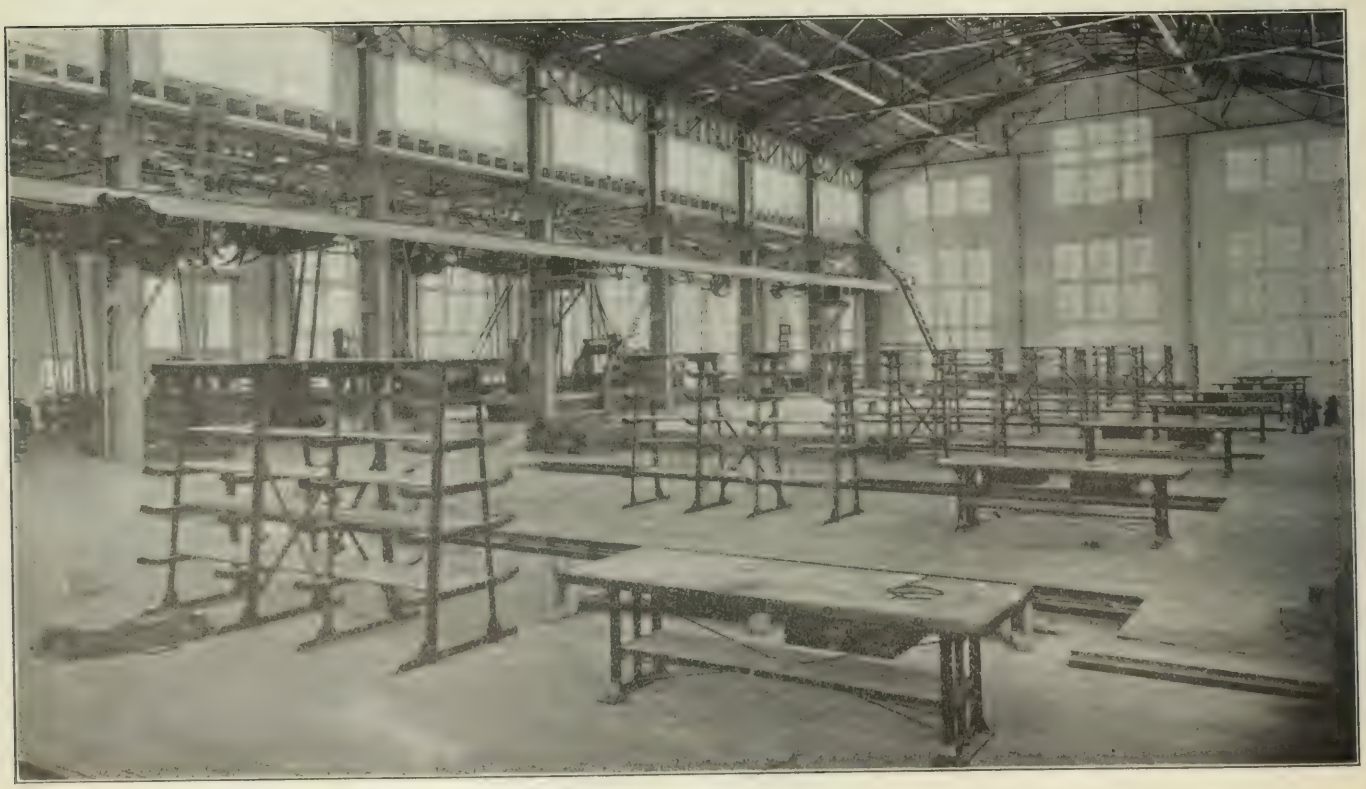
to large side windows and transoms over the track doors, more than one-third the area of the doors is glass. The erecting bay has a large monitor with windows on each side over the entire length, and the machine bay is lighted with three saw-tooth skylights which extend the whole length of the building. On account of the heat and humidity of the climate the windows are designed to provide for all possible ventilation, and are equipped with mechanical operators. The side windows are given an opening of about 30 per cent. of the total area and the monitor windows are arranged for the sash to slide past each other, giving an openin gof about 50 per cent. These windows are moved by a steel cable controlled by a geared operating device.



Machine Floor of Coach Shop.

COACH SHOP.

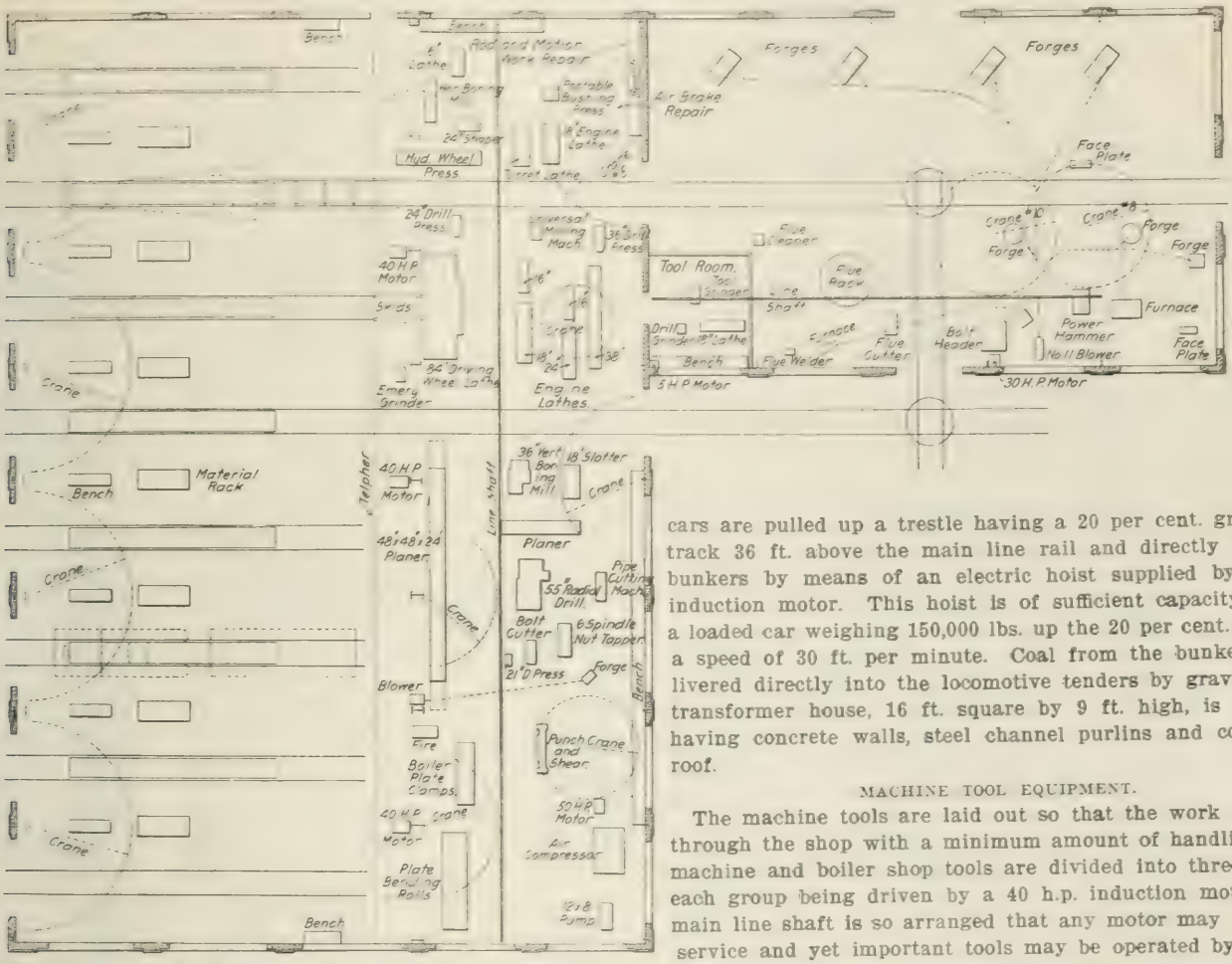
The coach shop is 160 ft. long by 91 ft. wide, having concrete walls and a wide roof framing covered with corrugated iron. The section devoted to woodworking machinery is 50 ft. x 91 ft. and is separated from the coach department by an



Erecting Floor of Locomotive Shop.

8-in. concrete wall, with two double automatic fire doors. At one end a section 20 ft. wide is equipped for brass finishing, upholstering, paint, storage and bench work. The central portion of the building, 90 ft. x 90 ft., is used for coach repairs and painting. The tracks are spaced 20 ft. centers and the floor is of 3-in. yellow pine laid on 4-in. x 6-in. sleepers embedded in sand.

The engine house has two pits connected by a driving wheel drop pit, in which the wheels are handled by a traveling pneumatic jack. The building is of concrete, has wood roof framing and a tar and gravel composition roof. The sheeting for the roof is 2-in. matched yellow pine and the purlins are heavy enough to provide a slow burning type of construction. The smoke jacks are "vitribestos," suspended from the purlins by heavy iron rods painted with asphaltum. The usual track doors on the inner circle of the roundhouse are omitted on account of the warm climate. The storehouse and office building is 121 ft. 4 in. by 60 ft. 4 in. It is reinforced concrete of slow burning wood construction with corrugated iron roof.



Layout of Machinery in Locomotive Shop.

COALING PLANT.

The coal wharf is a wood structure with steel-lined bunkers, having a storage capacity of 300 tons. Standard coal dump cars are pulled up a trestle having a 20 per cent. grade to a track 36 ft. above the main line rail and directly over the bunkers by means of an electric hoist supplied by 40 h.p. induction motor. This hoist is of sufficient capacity to pull a loaded car weighing 150,000 lbs. up the 20 per cent. grade at a speed of 30 ft. per minute. Coal from the bunkers is delivered directly into the locomotive tenders by gravity. The transformer house, 16 ft. square by 9 ft. high, is fireproof, having concrete walls, steel channel purlins and corrugated roof.

MACHINE TOOL EQUIPMENT.

The machine tools are laid out so that the work will pass through the shop with a minimum amount of handling. The machine and boiler shop tools are divided into three groups, each group being driven by a 40 h.p. induction motor. The main line shaft is so arranged that any motor may be out of service and yet important tools may be operated by coupling its tools to adjacent sections driven by other motors. The machinery in the tool room is driven by a 5 h.p. motor, and in case of necessity the tool room shaft can be coupled with that of the forge shop, and these tools driven by that motor. Jib cranes are liberally provided for use in stripping and assembling locomotives, and the heavier machines are likewise

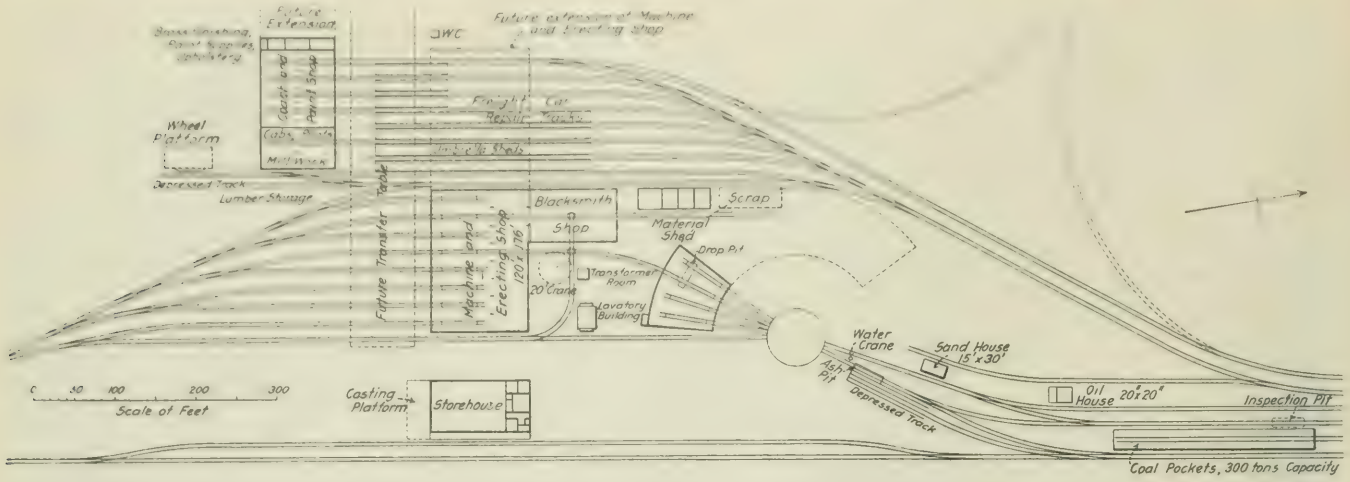


General View, Showing Round House and Station.

served by these cranes, which range in capacity from 1 to 4 tons. They were supplied by the Whiting Foundry Equipment Company, Chicago, and each is fitted with a chain hoist

POWER AND LIGHTING SYSTEM.

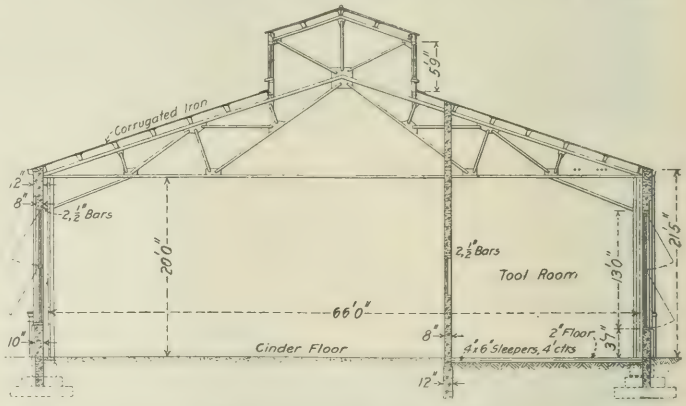
Electric power is furnished from the Great Southern Lumber Company, whose plant is located about one-half a mile



Ground Plan of New Orleans Great Northern Shops at Bogalusa, La.

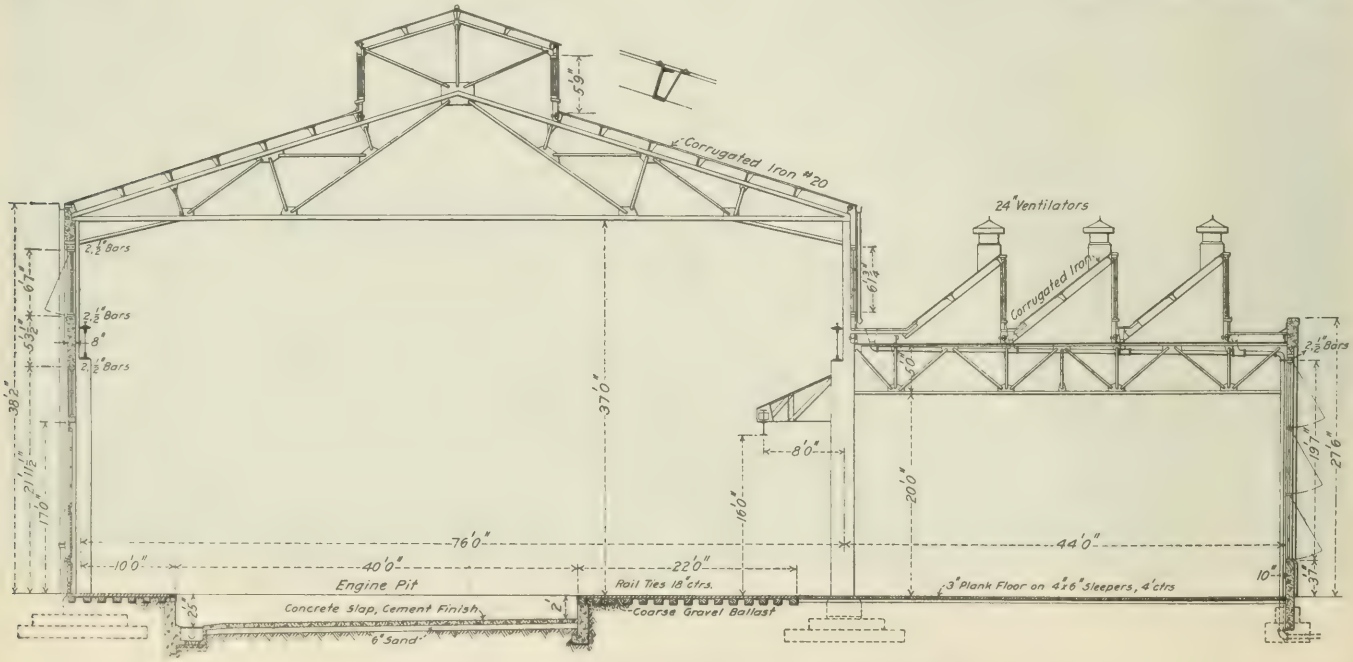
made by the Yale & Towne Mfg. Co., New York. Running lengthwise of the erecting bay and near the machine bay is a floor controlled by a Northern Electric traveling hoist of 5 tons capacity, equipped with 3-phase induction motors. This hoist handles principally the driving wheel work between the various pits and the wheel lathes and serves for general transportation of heavy material. The wheel work is concentrated in one end of the shop, and the tool equipment includes a hydraulic wheel press, a double wheel axle lathe and a car wheel borer, the wheel press being located directly opposite the wheel storage platform located outside, and a depressed wheel track for loading and unloading mounted wheels is located adjacent to the wheel platform. The woodworking machinery is divided into two independent groups, each operated by a 40-h.p. motor. The shafting in this building is supported by 4-in. x 12-in. lattice work struts fastened to the bottom chord of the roof truss. The forge shop tools and blower are driven by a 30-h.p. induction motor. In addition to 11 forges the blower furnishes blast for the furnace used with the power hammer, bolt heater and flues. All blast ducts are laid underground in salt glazed sewer tile. The power hammer furnace and forges are served by two Whiting 4-ton post cranes.

distant. The current is brought to the shops over a 2,300-volt 3-phase transmission line consisting of three No. 4 bare copper wires carried on wood pins and cross arms on 40-ft.

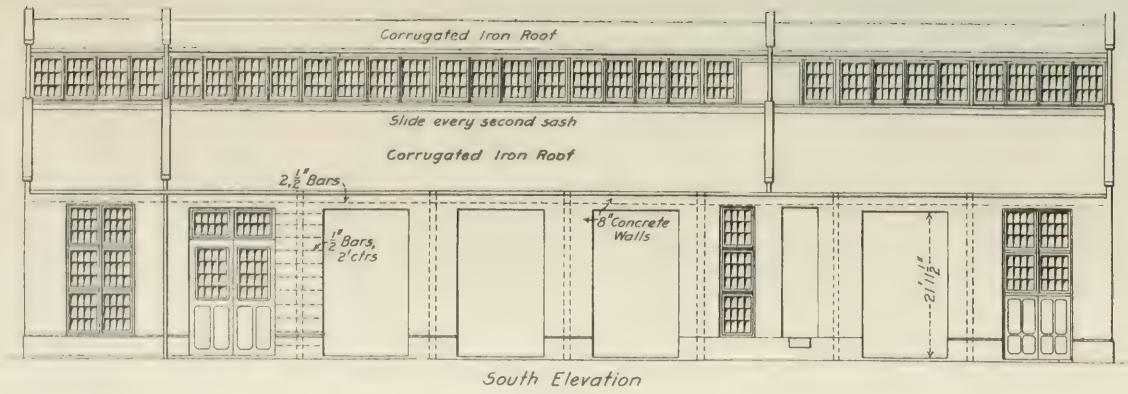


Cross Section Through Forge Shop.

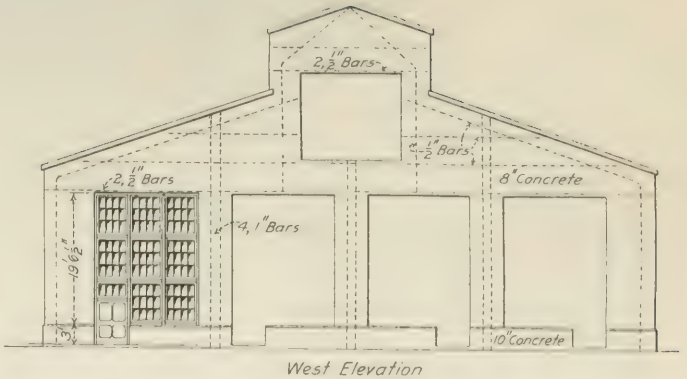
yellow pine poles. The portion of the power plant used by the motors and arc lamps is transformed from 2,300 to 460 volts by means of three 75-k.w. Westinghouse single phase



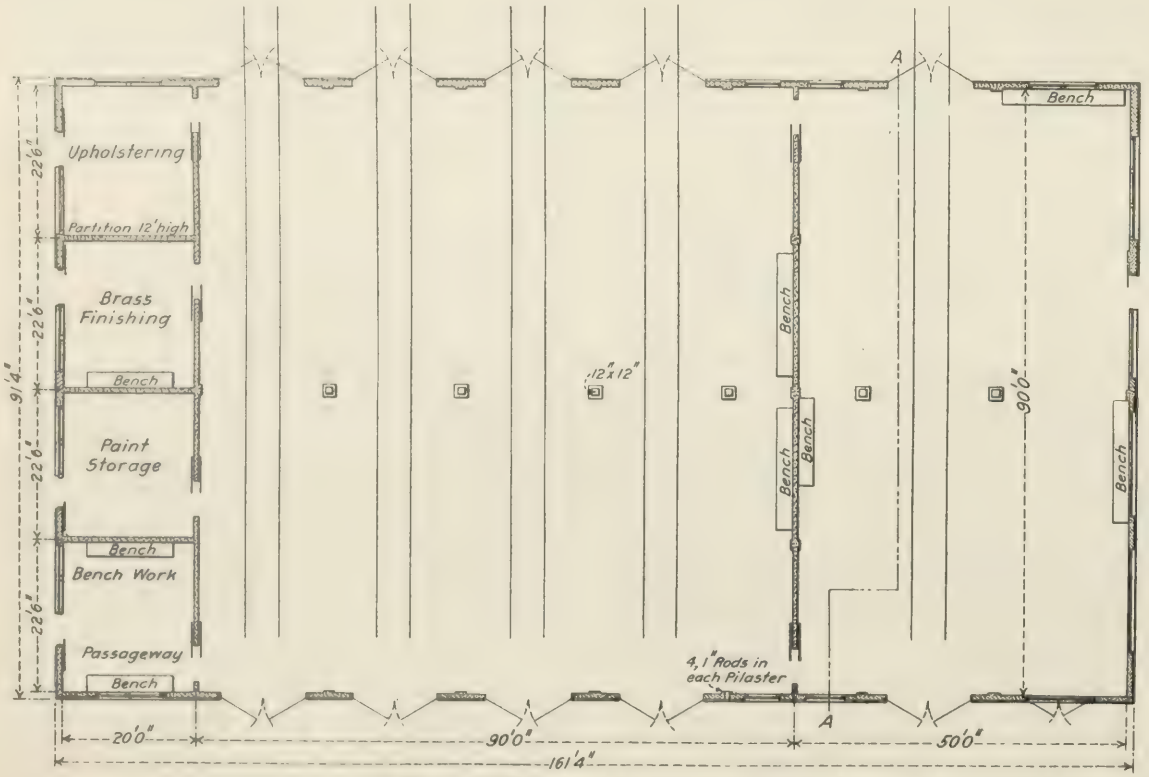
Cross Section Through Machine and Erecting Shop.

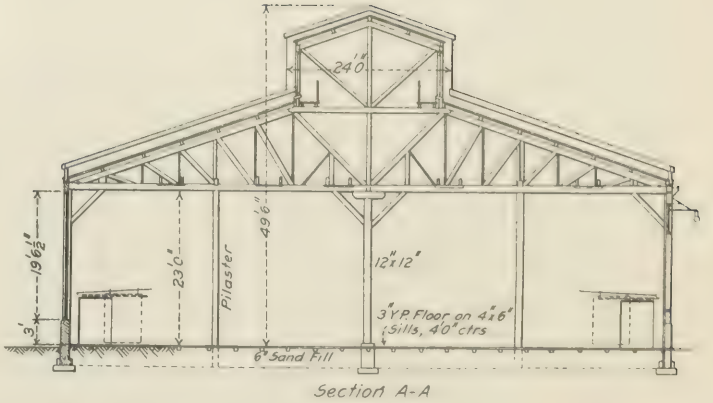


South Elevation



West Elevation





Section A-A

Plan, Section and Elevation of Coach Shop; New Orleans Great Northern Shops at Bogalusa, La.

transformers. A 3-phase 2,300-volt — 110-volt transformer provides for the incandescent line.

Allis-Chalmers 3-phase induction motors are used throughout, nine motors being installed at present with an aggregate of 325 h.p. There are 28 Westinghouse 460-volt arc lamps installed throughout the yards and buildings, 14 of these being in the locomotive shop, 3 in the engine house and 11 in the yards. This type of lamp is used because of its convenience in operation on power circuits, thus simplifying the wiring system. There are also installed about the shops about 200 incandescent lamps. Water for shop purposes is piped from the plant of the Great Southern Lumber Company, where fire pumps are installed in connection with an elevated tank. The ordinary pressure on the water service mains is 45 lbs., but this can be increased to 100 lbs. in case of fire. For boiler washing purposes a Deane triplex pump of 325 gal. capacity per minute is placed in the machine shop and it delivers water at 100 lbs. pressure to the hose valves in the engine house.

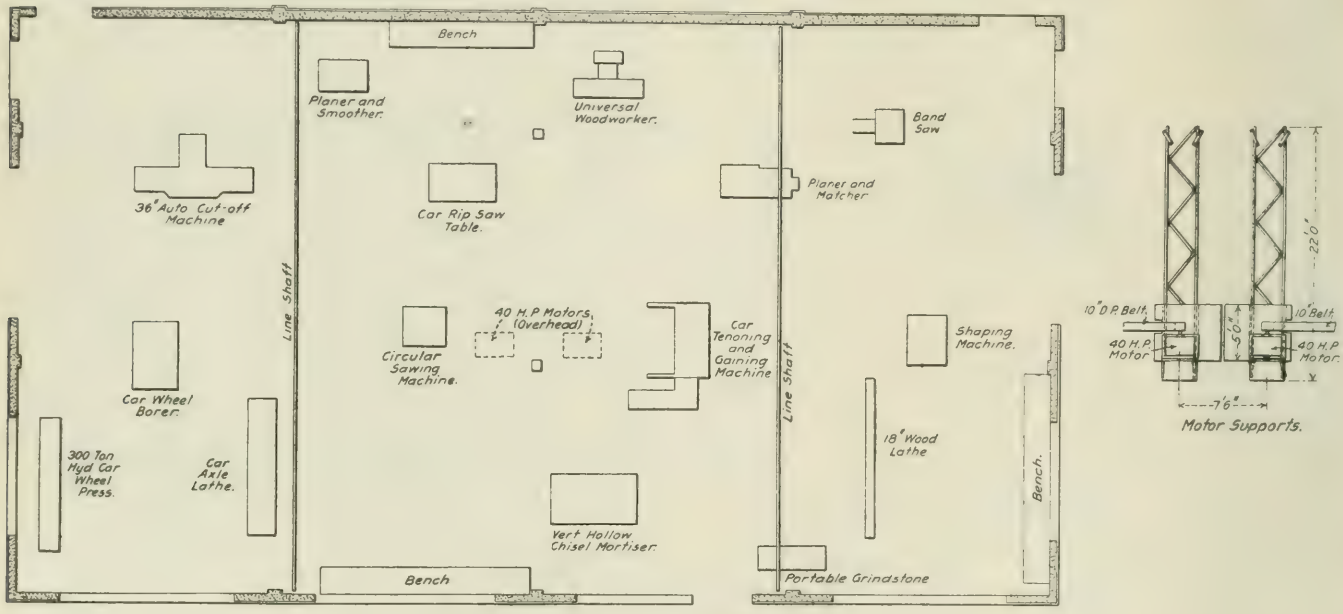
An Ingersoll-Rand, Chicago, air compressor of 275 cu. ft. capacity, belt-driven directly by a 50-h.p. motor furnishes compressed air for shop purposes.

A rather unusual feature of the shop is the attention which

One 18 in. x 10 ft. LeBlond engine lathe.
Two 16 in. x 8 ft. " " "
One 2 in. x 26 in. Pratt & Whitney turret lathe.
One 42 in. Niles-Bement-Pond vertical boring and turning mill.
One 24 in. Acme crank shaper.
One No. 2 LeBlond universal milling machine.
One 30 in. x 8 ft. planer. (Moved from Florinville shop.)
One 48 in. x 48 in. x 24 ft. Niles-Bement-Pond three-head planer.
One 36-in. Aurora drill press.
One 24-in. Aurora drill press.
One 5-ft. Niles-Bement-Pond semi-universal radial drill.
One 20-in. "D" standard dry grinder.
One 84-in. Niles-Bement-Pond hydraulic wheel press.
One 18-in. Niles-Bement-Pond slotter.
One 23½-in. x 32-in. Niles-Bement-Pond No. 0 horizontal boring mill.
One 16-in. x 5-in. universal turret lathe.
One 35-ton W. & S. portable hydraulic rod bushing press.
One 2-in. bolt cutter. (Moved from Florinville shop.)
One 2-in. Acme 6-spindle nut tapper.
One 21-in. drill press. (Moved from Florinville shop.)
One 225 cu. ft. Ingersoll-Rand Imperial type 10, power-driven air compressor.
One 8 x 10-in. Dean triplex power pump, 225 gallons at 100 lbs. press.
One 48 x 6-in. Niles-Bement-Pond grindstone.
One 3¼-in. x 8-in. Underwood portable cylinder boring bar.
One 26-in. Underwood portable valve seating rotary planer.
One 12-in. Birdsboro-Jackson spiral belt lacing machine.

Boiler and Tank Shop:
One No. 2 Long & Allstatter double punch shear.
One No. 5 (¾-in. x 10-in.) Niles-Bement-Pond plate bending rolls.
One 10-ft. Niles-Bement-Pond plate flanging clamp.
One 4-in. Cox pipe threading and cutting-off machine.
One blower. (Moved from Florinville shop.)

Flue Shop:
One Otto flue cleaner.
One McGrath pneumatic flue welder and scarfer.
One 14-in. x 5-in. Gantt "B" coke furnace for flue welding.
One vertical, revolving, ball bearing flue rack.
One No. 6 Fox flue cutter.



Layout of Machinery in Coach Shop.

has been given to appearance and harmonizing of the structural scheme with the carefully studied landscaping of the city of Bogalusa. The entire town, including the buildings, is an interesting result of what can be accomplished by a well-directed effort to please the eye without in any way detracting from general utility. The shops with the dark red metal roofs, light gray concrete walls and white window trimmings, surrounded as they are by the deep green of the pine forests, present a very pleasing appearance. The engineering and construction of the complete plant as handled by the Arnold Company was under the general direction of A. R. Kipp, engineer in charge, and H. H. Dickinson, superintendent of construction. P. L. Battey, chief engineer railway shop department, had general supervision over the entire work.

The following is a list of the principal tools installed in the various departments. The arrangement of the tools and equipment is shown in the machinery layout plans:

Locomotive Department.

Machine Shop:
One 84-in. Niles double driving wheel lathe.
One 38-in. x 16-ft. engine lathe. (Moved from Florinville shop.)
One 24-in. x 16-ft. LeBlond engine lathe.

Forge Shop:
One 2-in. Acme bolt heading and forging machine.
One 24-in. x 5-in. Gantt "C" coke furnace for bolt header.
One No. 12 500-lb. Beaudry power hammer.
One 30-in. x 7½-in. Gantt "D" coke furnace for Beaudry hammer.
One No. 11 Buffalo blower. (Moved from Florinville shop.)
One 14-in. x 5-in. Gantt "B" coke furnace for case-hardening.
Two face plates.
Nine railway forges.
Two frame fires.

Tool Room:
One 18-in. Pratt & Whitney improved tool room lathe.
One Yankee (Style "P. O.") twist drill grinder.
One Blount wet tool grinder.

Car Department.

Car Wheel Shop:
One No. 2 Niles-Bement-Pond double axle lathe
One 42-in. car wheel borer. (Moved from Florinville shop.)
One 300-ton hydraulic wheel press. (Moved from Florinville shop.)

Wood-Working Shop:
One No. 3 (26-in.) Fay & Egan car rip saw.
One 16-in. Greenlee double arbor universal sawbench.
One 36-in. Greenlee automatic cut-off machine.
One No. 225 Greenlee vertical automatic hollow chisel mortising machine.
One No. 62 Fay & Egan variety wood-worker.
One No. 85 Fay & Egan double spindle shaper.
One No. 108 (15 x 8-in.) Berlin open side moulder.
One No. 5 Greenlee horizontal car tenoning and gaining machine.
One No. 3 Fay & Egan planer and smoother.
One No. 50 (36-in.) Fay & Egan band saw.
One No. 4 (18-in.) Fay & Egan wood lathe.
One 48-in. x 6-in. Niles-Bement-Pond grindstone.
One No. 6A Fox bench wood-trimmer.

General News Section.

Labor leaders in New York City say that no important discussions between themselves and railway officers concerning wages will take place until about January 20.

Officers of the Cleveland, Cincinnati, Chicago & St. Louis, after prolonged conferences with a committee of the telegraphers of the road, have agreed to certain increases of pay.

The Atchison, Topeka & Santa Fe is equipping its freight cabooses with telephones and with "fish poles" for making connection with the line wire along the road at any point.

The Michigan Car Demurrage Bureau, headquarters at Detroit, has been reorganized and now has no direct dealings with the public. The records will be kept the same as before.

In a special election, December 30, the voters of San Francisco decided in favor of an issue of $2,020,000 in bonds to enable the city to operate directly the street railway to Golden Gate Park, which, though owned by the city, has hitherto been leased.

According to Bulletin 105, issued by the census office, the 157 cities in the country which have an estimated population of over 30,000 each, had, two years ago, 17,148 crossings of streets by steam railways, of which 13,718 were at grade. The percentage at grade had fallen slightly since 1905.

The New Jersey State Railroad Commission in making its annual report recommends that the next legislature give the commission jurisdiction over express companies and also pass laws to compel electric and steam railways to establish proper protection at grade crossings where their lines intersect.

The Lehigh Valley, which a week or two since increased the wages of locomotive engineers, has made a new agreement with conductors. According to the newspapers, the principal change is the addition of a clause providing that overtime shall hereafter be paid on the completion of 10 hours' work, instead of 12 hours.

The directors of the Delaware, Lackawanna & Western Coal Co. have declared an initial dividend of 2½ per cent., payable January 15. It is understood that this is a quarterly dividend. The $6,800,000 stock of the coal company was offered to the stockholders of the Delaware, Lackawanna & Western Railroad in July, 1909, at par.

In Baltimore last Friday night one of the shop buildings of the Baltimore & Ohio was damaged by an explosion of dynamite, and at about the same time a bridge was also damaged sufficiently to delay traffic. On the following day five men were arrested. The police connect these outrages with the strike of machinists several months ago.

At Albany, N. Y., December 28, bids were opened for four contracts on the state barge canal. The aggregate of lowest bids, $4,343,474, was less than the aggregate of engineers' estimates. The lowest bidders were the Penn Bridge Company, of Beaver Falls, Pa.; Scott Bros. of Baldwinsville, N. Y., and Shanley-Morrissey, Inc., of New York.

The Boston Elevated Railroad Company distributed in New Year's gifts, to employees having good records for 1909, over $75,000. The number of conductors and motormen employed by this company, including those on both elevated and surface lines, is 3,500. In the past seven years the company has given the employees in this way over $400,000.

The difficulty that railways sometimes experience in meeting public demands is illustrated by the row which is going on in Chicago as a result of an attempt to oust the Illinois Central from its Thirty-first street station. Property owners in this neighborhood got the city council to order the Illinois Central to abandon this station, the technical ground on which the abandonment was required being that the station encroached 10 ft. on city property. Immediately, another faction in the neighborhood began circulating a petition to the city council objecting to the removal of the station. The objectors are mainly working people who say that if the action ordered by the council is taken they will be deprived of reasonable facilities of transportation.

The dispute between the New York, New Haven & Hartford Railroad and the Adams Express Company has been adjusted to the satisfaction of both parties. No details of the settlement are given out. The dispute originated some nine months ago over a claim of the New Haven company, dating back several years, that the division of receipts between the road and the express company had not been fair and just.

Martin S. Decker, president of the National Association of Railway Commissioners, has appointed as delegates to attend the national conference on uniform state legislation of the National Civic Federation in Washington January 17: Chairman Knapp, of the Interstate Commerce Commission; Ira B. Mills, of Minnesota; H. Warner Hill, of Georgia; B. A. Eckhart, of Illinois, and Wm. O. Seymour, of Connecticut. Mr. Decker will attend as a delegate.

S. E. Busser, chief of the reading room department of the Atchison, Topeka & Santa Fe, says that each division headquarters of the company now has a reading room and an auditorium. There are 30 buildings in all. Four concert companies and a number of lecturers are engaged to give entertainments frequently at those division terminals which are situated remote from large towns. The company's reading rooms have 40 billiard tables, 18 pianos and 40,000 books.

The Public Service Corporation, operating street railways in Newark and other cities in northern New Jersey, has voluntarily increased the wages of its conductors and motormen, those who have been in the service more than one year being increased about one cent an hour. Under the new schedule the pay will be as follows: First year, twenty-one cents an hour; second year, twenty-two cents; third year and up to the tenth year, twenty-three cents, when it will become twenty-four cents and be at that figure for all greater terms of service.

The Switchmen in the Northwest.

The time limit fixed by the railways of the Northwest within which such of their striking switchmen as they had positions for could return to work expired on December 29, and the offer which the general managers had made to the strikers was withdrawn on that date. The roads have since been employing additional men to take the places of the strikers. James C. Haynes, mayor of Minneapolis, telegraphed President Taft asking him to intervene in the switchmen's strike, declaring that its continuance was highly injurious to the Northwest and that much loss and suffering have resulted; but Mr. Dickeson, spokesman of the railways, said that the roads had received no complaints of public inconvenience and traffic was normal; and that the telegram to President Taft was evidently prompted by the labor union leaders.

A conference between representatives of the railways and of the striking switchmen in the Northwest, held in the office of Governor A. O. Eberhart, of Minnesota, was reported in our last issue. In this connection a letter sent by the railway officers to Governor Eberhart has some points of interest. This letter recalled that at a conference, held December 23, the roads complied with the Governor's request that they agree to apply in the Northwest the provisions of whatever settlement might be reached by the Chicago roads and their switchmen. Continuing it said:

"With every wish to meet any suggestions made by your Excellency and with the natural desire of employers to help worthy men who gave up their positions and who should be at work for the support of their families and themselves, the representatives of the Twin-City lines submit that no hardship should be imposed nor any injustice permitted to the large number of present employees in yard service who are in no way responsible for the present situation.

"When the former yard employees voluntarily gave up their positions on November 30, after refusing the offer of the railways to arbitrate and be bound by the arbitration award without appeal, it became necessary for the railways to promote many of the men who remained in the service, to transfer some from other branches and to employ many new men in order to perform their duty to the public, to the other employees and to the owners of the properties.

"As large employers of labor under wage agreements, the Twin-City lines would not be justified in reducing in rank these employees who have been promoted since November 30, in returning to their former employment those who have left positions in other branches of the service, or in dismissing without cause the competent men who have been employed to fill the other vacancies.

"It is, however, certain that upon the basis of reemployment suggested by your Excellency many of the old switchmen can be given employment and probably a large number would be restored to their old positions. * * * "

The demand of the switchmen in Chicago territory for advances in wages was formally refused by the general managers' conference committee last week. The railways submitted a counter proposition, the terms of which have not been made public. The answer of the railways was not final, however, and conferences were resumed at Chicago on Monday.

Commissioner E. E. Clark on the Interstate Commerce Commission's Work.*

"Many important and difficult problems arise and demand solution. Frequently they are strongly contested by able men whose views are in direct opposition to each other. Often no decision will be accepted as final except at the hands of the supreme court. The circuit courts of the United States do not agree as to what power the act confers upon the commission. As to some matters we find ourselves in a sort of a 'twilight zone.' We must, however, proceed according to the light we have, and as it is given to us to see, in an earnest effort to find and apply the lawful purposes of the act and to uphold its principles. We perform a legislative and not a judicial function. The judicial branch of the government will not interfere with the legislative unless it shall appear that the legislature has failed to act along lawful lines or that the effect of the legislation is to deprive the carriers of constitutional rights. * * * To my mind the provision for court review of decisions of the commission meant, and still means, review along these lines and no further. * * * It may be thought that the commission is restive under a provision for review of its findings or that it is reaching out for more power because of a desire to exercise that power. The commission earnestly desires and industriously strives to reach full understandings and just conclusions. Its findings must, in the very nature of things, rest primarily upon the facts. If its findings based upon facts are to be reviewed on questions of fact it seems obvious that the commission will be sustained or reversed according to the view taken by the court on questions of fact, upon which differing views can and will be held. * * * We now have a decision of a majority of one circuit court, accompanied by a vigorous dissent, in which it is held that the decisions of the commission are reviewable *de novo*, and a unanimous decision from another circuit court to the effect that the decisions of the commission are reviewable only upon the questions of whether or not the law has been complied with and whether or not constitutional rights have been invaded. The last word on this subject has not yet been said.

"It is obvious that if the power to determine the relationship of rates as between two localities has not been taken from the railway officials and vested in the commission, under the act which specifically prohibits undue preference for or unjust discrimination against any locality, that power still remains in the hands of the railway officers. If that power is vested in the commission and on the facts it finds that a rate is unduly preferential in favor of one city and unduly discriminatory against another city, and a carrier serves both cities, and those cities are respectively in the jurisdiction of two circuit courts, and those courts review the decision of the commission on questions of fact, and one court sustains and the other court reverses the commission, how will the carrier obey the mandates of both courts? And how can the supreme court decide between them except by trying the matter on the facts? This the supreme court will not, and ought not to, do. If that power is not vested in the commission but still rests in the officers of the carriers what recourse has the locality that is unjustly discriminated against, and where shall it turn for relief from such conditions? The act authorizes the commission, when after full hearing it is of the opinion that a rate is unreasonable, to prescribe, not a reasonable rate, but what shall be *the* reasonable rate to be thereafter charged as a maximum.'

*From an address at a dinner of the Chicago Railway Club December 29.

"Shopping" a Locomotive.

The men of the Canadian Pacific shop force at Winnipeg last month went after a record in the matter of fast work on the general overhauling of a locomotive. They turned over the completed work in 57½ hours elapsed time, despite a heavy handicap in the way of setting up the Vaughan-Horsey superheater with which the locomotive was equipped. The trial was undertaken at the men's own suggestion, no materials being prepared in advance or special preparations made, beyond arranging a minimum time schedule for their guidance. This was beaten in most of the departments by over 50 per cent.

Engine No. 712 was placed in the back shop and stripping down was commenced at 7 a. m. on Monday, October 11. At 4:30 p. m. on Wednesday, October 13, the engine left the shop



Canadian Pacific Locomotive No. 712.

yards on a trial trip and at 7 o'clock the same evening was delivered to the operating department to be taken out on a regular freight run. The engine was of the 4-6-0 freight type, class D-10, and is shown in the accompanying cut. It has cylinders 21 inches in diameter and 28 inches stroke, and weighs 190,000 lbs., the total weight of engine and tender ready for service being 315,000 lbs. The replacing of the Vaughan-Horsey superheater after the tubes were put in and the boiler tested, consumed about ten hours, so that the time would have been shortened by that much had the engine been of the ordinary type, using saturated steam.

There was no scamping of the work and the engine had been on the road for its full mileage before being brought in. All alterations and improvements were made in accordance with regular standards, nothing being neglected. A large amount of new material was machined up and applied, including new tires for the drivers, driving box brasses and liners, shoes and wedges, main and side rod brasses, motion pins and bushes, piston and valve rings, piston head and ashpan. The 244 flues of the boiler and the 22 five-inch tubes of the superheater were removed, and cleaned, and tubes renewed where necessary; new staybolts where needed and all sealing carefully done. A new form of boiler check and bell stand were applied, these necessitating new discharge pipes.

The regular pit gang that carried on the work in the erecting shops on the day shift consisted of nine fitters, two apprentices, five fitters' helpers, four boilermakers, two boilermakers' helpers and three tubers. The night shift consisted of seven fitters, two apprentices, three fitters' helpers, two boilermakers, four boilermakers' helpers and five tubers. Nine strippers were employed on the first half day, and during the progress of repairs five painters, three painters' cleaners, three carpen-

ters, two pilot men, four pipe fitters and four pipe fitters' helpers were employed on the engine during a part of the time.

The work was carried on with regular day and night shifts of nine hours as above, working the prescribed shop hours, except that certain of the more important jobs, such as the application of staybolts, tubes and superheater, were carried on during the meal hours as well. Special crews were not delegated to this particular work. In the fall the C. P. R. shops always work double shifts.

In all about 400 different men charged time against this engine to some extent, including all those employed in the foundry, machine, blacksmith, boiler and tender shops. The charges of the different departments were (cents omitted):

Erecting shop	$448
Machine shop	564
Boiler shop	287
Blacksmith shop	94
Steam fitters	67
Tinsmith shop	1
Tender shop	50
Carpenters	12
Painters	50
Patternmakers	1
Total labor	$1,597
Material	1,078
Total labor and material	$2,675

Telegraph Business.

A Western Union Telegraph official says that the telegraph business was never in a healthier condition. There is a steadiness and volume to it never before experienced at this season of the year. "There is not a single idle wire in our switchboards, and we are unable to supply the demands for private leased wires. In spite of the inroads made on our leased wire service to the brokers by the American Telephone & Telegraph, we have more wires in lease than ever before. What we have lost with the brokers we have more than made up from the press associations and big industrial corporations. The growth of the private wire business is one of the wonders of the development of the telegraph business, and the greatest source of revenue of the telegraph companies. Once a large business concern installs a private wire system it never goes back to the mails and public service again. The public never before received such accurate and fast service. Our instructions are to give the service and never mind the expense."

A Postal Telegraph official says: Our facilities are taxed to their utmost capacity to handle the business. We are extending rapidly in the West and will soon have a new central route to the Pacific coast in addition to our northern and southern routes.—*Wall Street Journal.*

Postmaster General's Annual Report.

The service now has about 325,000 employes, and fourteen billion pieces of mail were handled during the year. The number of post offices in operation is 60,144. A delivery service by carrier is provided in 1,440 cities and towns and there are 40,628 rural routes. The total receipts for the fiscal year 1909 were $203,562,383.07, an increase of 6.31 per cent. over the receipts of the previous year. The total expenditures amounted to $221,004,102.89, an increase of 6.07 per cent.

The loss on second-class mail matter has been increasing for many years, until it now amounts to $64,000,000. The loss from rural delivery, a service begun hardly a dozen years ago and of unprecedented growth, is $28,000,000. By the weighing of 1907 second-class matter was shown to constitute 63 per cent. of all domestic mail, and yet it yielded only about 5 per cent. of the postal revenues. The loss on second-class matter was greater than the profits of all classes of mail combined. It exceeded the total amount paid the railways for mail transportation.

Magazine and other periodical publications exclusive of daily newspapers comprise about 60 per cent. of the second-class mail. The magazines alone form about 20 per cent. The average haul of magazines proper is over 1,000 miles and that of other classes of periodicals, not including daily newspapers, ranges from 550 to over 1,100 miles.

The rural delivery service has developed in twelve years to one of the largest branches of the postal establishment, with an annual expenditure exceeding $35,000,000. The postage on matter mailed on rural routes is estimated at about $7,000,000. The cost of rural delivery is probably much greater than it should be.

The cost of railway transportation during the past fiscal year was nearly $50,000,000.

The department's recommendation for the establishment of postal savings banks is renewed. By limiting deposits and fixing a low rate of interest competition with private banks could be avoided.

To provide a simple and cheap means of transmitting small sums through the mails, and to lessen the use of coins, bills, and postage stamps for that purpose, it is recommended that a form of postal note or check be adopted, similar to the present money order, but issued for lower fees, without written application, in fixed denominations less than $10.

Work on the Panama Railroad.

Some idea of the work that is being done nowadays by Uncle Sam's little 50-mile railway on the isthmus is given by F. W. Fitch, chief despatcher of the Panama Railroad. "On the average we have 450 trainloads of dirt to move in a day. The usual haul is 15 to 20 miles. The Culebra cut furnishes the greater part of it, and this goes to Balboa, formerly La Boca, where they are making a breakwater about five miles out at sea. The Bas Obispo rock goes to the Gatun dam.

"Of commercial freight we handle an average of 6,000 tons a day southbound and 1,000 northbound. The passenger service is immense. There are six passenger trains each way a day, and the usual train carries three first and five second class coaches crowded. The Panamans are great travelers, and the Jamaica negroes spend Sundays and holidays traveling back and forth. Last Fourth of July we carried 45,000 passengers, all free. The number of tourists down there is large, especially Europeans, who seem to take more interest in the canal than do the Americans."—*New York Sun.*

The Transandine Railway.

At the 22d annual meeting of the Argentine Transandine Railway Company, Ltd., in London last week the chairman summarized the progress of the work: "It was in 1874 that Messrs. Clark obtained a concession for two railways, one from Buenos Ayres, to the foot of the Andes, and the other from Mendoza to the limit of Argentine frontier. In 1878 the definite contract was signed. This company was incorporated in 1886. It then had a capital of £700,000, with power to borrow up to £691,000. They started building at once, and in 1888 the first train ran across the important bridge 24 kilometres out of Mendoza—the bridge across the River Mendoza. From that time construction continued steadily, until in 1891 the first 91½ kilometres were opened, and the extra few kilometres at Rio Blanco were completed in 1892. After that, owing to financial and other difficulties, construction was suspended, and it remained in abeyance from 1893 to 1899. At that time the work was recommenced, and went on steadily until we got close to the neighborhood of the Summit Tunnel, when it was no use pressing on with the work, in view of the fact that the Chilian end of the tunnel was not then being built. In 1906 the Chilian side was energetically taken up, and we then entered into an agreement with the Chilian Transandine Construction Company to build our own portion of the tunnel as well as theirs. It was on the 27th of November that we had a telegram to say that the heading of the tunnel was through.—Philadelphia News Bureau.

American Society of Mechanical Engineers.

The New York monthly meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies' building on January 11. A paper on Efficiency Tests of Lubricating Oils by Prof. F. H. Sibley, of the University of Alabama, will be presented and the subject will be discussed by Dr. C. F. Mabery and Gen. Charles Miller. F. R. Low, I. E. Moultrop, J. P. Sparrow and others will also speak.

Meetings of the society will be held in St. Louis January 15 and in Boston January 21. Atlantic City has been selected as the place for the spring meeting, and it will be held from

May 31 to June 3, headquarters at the Marlboro-Blenheim.

The meeting in Boston Jan. 21 will take the form of a banquet at the Hotel Somerset, to be tendered jointly by the American Society of Mechanical Engineers, the Boston Society of Civil Engineers and the Boston branch of the American Institute of Electrical Engineers, to the presidents of the three societies, George Westinghouse, Geo. B. Francis and L. B. Stillwell and other guests, including J. A. Bensel, the incoming president of the American Society of Civil Engineers. A paper will be presented on the main and auxiliary machinery of the battleship North Dakota, illustrated by lantern slides.

American Society of Civil Engineers.

At the meeting held on January 5 a paper entitled "Notes on the Replacing of the Superstructure of the Harlem Ship Canal Bridge," by Horace J. Howe, M. Am. Soc. C. E., was presented for discussion and illustrated with lantern slides.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa. June, 1910; Niagara Falls, Ont.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASSN'S.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18: New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y.
BUFFALO TRANSPORTATION CLUB.—J. M. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York.; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; May 16-18; St. Louis.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The New York Central Lines announce that from January 31 an excess fare of $1 will be charged from Cincinnati to New York on the train leaving Cincinnati at noon.

The number of passengers arriving in New York during the year 1909 by the principal trans-Atlantic steamship lines was 1,247,244, and the number leaving New York by the same lines was 482,756.

The Pennsylvania is again sending through freight from the Pittsburg to the Middle divisions by way of Hollidaysburg, indicating a heavy movement of eastbound freight. The reopening of the Hollidaysburg classification yards marks the restoration of business to the high level attained in 1907.

Through Southern Pacific passenger trains began running between San Francisco and Seattle on January 2 under the trackage arrangements with the Northern Pacific and other roads which have been already mentioned. The first train run through was the "Shasta Limited," and its scheduled time was 34 hours.

According to a press despatch from London the North Atlantic Steamship lines have agreed on freight tariffs, and the severe competition, resulting in unprofitable rates, which has been going on for a long time, is expected to be stopped. It is said that the cutting of rates arose in the first place in connection with rates to interior points in the United States.

There is one place where the car shortage is now pronounced and constant; that is at Detroit among the automobile manufacturers. That city makes so many of these vehicles that the railways find it impossible to keep up the supply of large cars needed. Fortunately, most of these automobiles are not "necessaries of life" and one's sympathies may still be reserved for other sufferers from "car famine"—such as the coal dealers who did not think to order their supplies before the snow came. Again, the automobile can propel itself, if it is not too proud.

In the 1909 season 12,803 vessels passed through the United States canal at Sault Ste. Marie and 6,401 through the Canadian canal, making a total of 19,204. The total net tonnage of freight through both canals eastbound was 46,379,086 tons, and westbound 11,516,063 tons, making a total of 57,895,149 tons, of which 30,132,374 tons passed through the United States canal and 27,762,775 tons passed through the Canadian canal. In the season of 1908 a total of 41,390,557 tons passed through the two canals, so that the increase in 1909 over the previous year amounted to 40 per cent.

The Hudson & Manhattan Railroad carried, in the month of December, 4,053,586 passengers, which is 52 per cent. more than the number carried in August, when the last line was opened. The line of this company, all tunnels, extends from Twenty-third street and Sixth avenue, Manhattan, south to Morton street; thence across the Hudson river; thence from a junction north to the Lackawanna station at Hoboken, and south to the Erie and the Pennsylvania stations at Jersey City; and thence east across the river to Church street, Manhattan. Of the rooms in the mammoth terminal buildings at Church street, about four-fifths are rented, and it is estimated that the company will earn the interest on its bonds for the current year.

Paul Carbon, a labor contractor and saloon keeper at St. Paul, Minn., and A. Tascas, a labor contractor at Grand Forks, N. D., have been arrested at the instance of the Great Northern on a charge of having defrauded this road out of $200,000 through the sale of trip passes. It is said that other arrests may follow. The method by which these alleged frauds are said to have been perpetrated is as follows: Requisition was made on the Great Northern headquarters at St. Paul for transportation for laborers who, it was represented, were to work on the road's right-of-way. When the transportation was obtained it was sold to the laborers who then were sent to points on the main line of the Great Northern to work for other persons. When they wanted to return to St. Paul transportation was again obtained from the road

which also was sold to the laborers. It is said that there was collusion by employees of the road.

Officers of the Southern Pacific in California continue to report gratifying results from the collection of demurrage on freight cars in that state at the rate of six dollars a day, in accordance with the law passed a year ago. In most cases this sum is more than the car is worth to the consignee as a storehouse, and that, of course gives him an immediate incentive to take his freight away promptly. The "reciprocal demurrage" feature of the law has not made much stir as yet. Possibly this is not strange, for, with the $6 rate for delays in unloading, all kinds of cars have been released so promptly that the railways have, thus far, had no difficulty in meeting shippers' demands promptly. Again, the shipper who wishes to claim the $5 a day penalty from the railway for neglect is obliged to accompany his order for cars with a deposit of one-fourth of the freight charges on the goods that he proposes to ship, and few have taken the trouble to do this. The Southern Pacific has had but three claims for recovery of penalty by shippers.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 61-A, giving a summary of car shortages and surpluses by groups from August 19, 1908, to December 22, 1909, says:

"The surplus shows an increase of 884, bringing the total up 58,354. The shortage totals 24,054, an increase of 5,461 over last report. Both the surplus and shortage figures denote a brisk demand for box and coal cars. The surplus box decreased 2,705, with increases in the box shortage of 3,234. The coal car surplus shows an increase of 365 and the shortage an increase of 2,635."

The accompanying table gives the surpluses and shortage for the period covered by the report, and the chart shows surpluses and shortages in 1907, 1908 and 1909.

CAR SURPLUSES AND SHORTAGES, AUGUST 19, 1908, TO DECEMBER 22, 1909.

	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
December 22, 1909	177	24,284	7,595	7,213	19,262	58,354	10,947	1,021	8,562	3,524	24,054
December 10, 1909	176	26,989	6,488	6,848	17,145	57,470	7,713	757	5,927	4,196	18,593
November 24, 1909	163	17,538	4,091	5,628	12,271	39,528	12,230	891	9,542	4,833	27,496
October 27, 1909	174	13,029	3,090	5,287	9,490	30,896	23,138	1,412	8,743	3,343	36,636
September 29, 1909	174	22,330	3,821	11,239	15,998	53,388	8,184	655	4,392	1,351	14,582
August 18, 1909	169	82,505	5,953	42,158	28,808	159,424	556	277	1,076	100	2,009
July 21, 1909	165	116,221	9,971	78,675	38,487	243,354	106	169	31	33	339
June 23, 1909	166	121,441	12,099	89,292	40,112	262,944	211	190	193	233	827
May 26, 1909	158	118,077	14,940	97,006	43,687	273,710	83	99	1,011	47	1,240
April 28, 1909	161	107,665	16,487	110,538	47,638	282,328	144	106	74	173	497
March 31, 1909	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854

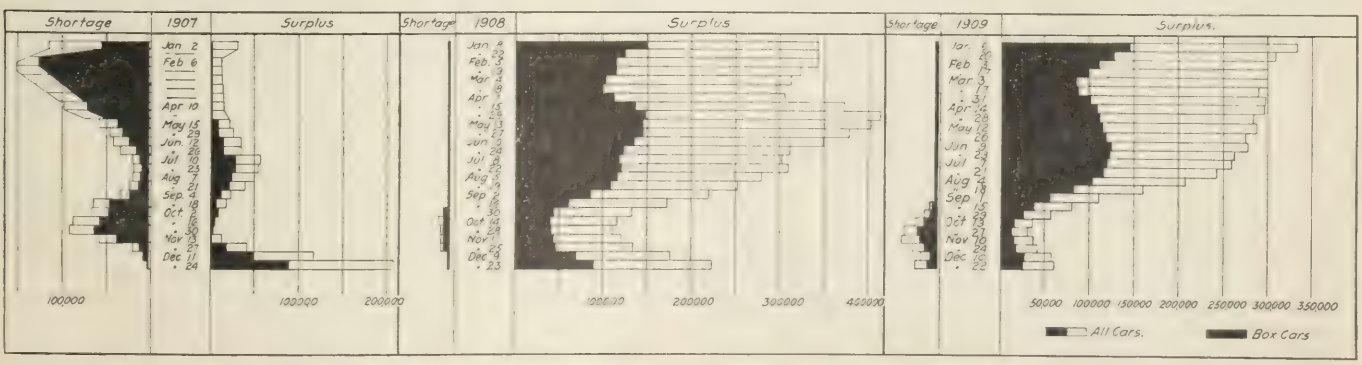
Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 58, covering car balance and performance for June, 1909, says:

"The average number of idle cars during June was 270,252, or 12.62 per cent. of the total cars reported, while the shop cars averaged 7.73 per cent. The averages covering performance, after the elimination of surplus cars, are as follows:

	Average miles per day. Inc. surp. cars.	Exc. surp. cars.	Average ton-miles per car per day. Inc. surp. cars.	Exc. surp. cars.	Average earnings per car per day. Inc. surp. cars.	Exc. surp. cars.
December, 1907.	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908.	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908....	19.6	24.5	258	324	1.83	2.29
May, 1908.....	19.3	24.8	254	329	1.72	2.22
June, 1908 ...	19.6	24.7	276	347	1.88	2.37
July, 1908.....	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909	21.7	25.9	306	365	2.04	2.43
March, 1909 ..	22.7	27.2	330	393	2.19	2.61
April, 1909.....	22.4	26.8	310	371	2.13	2.54
May, 1909.....	22.5	26.8	304	362	2.05	2.45
June, 1909....	22.4	26.5	314	371	2.13	2.52

"While the miles per day show a slight decrease, this is more than made up in the ton miles per car day and the daily earnings of all cars on line. This is explained by the improvement in the load per car, which increased from 20.0 in May to 20.7 in June. The per cent. of cars at home increased from 74 in May to 75 in June, with no change in the per cent. of



Car Surpluses and Shortages in 1907, 1908, and 1909.

CAR BALANCE AND PERFORMANCE IN JUNE, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines	Grand total.
Revenue freight cars owned	75,152	667,852	258,872	132,029	175,137	375,649	16,528	131,498	26,582	116,702	98,511	2,074,692
Average number system cars on line	55,588	484,104	202,070	94,981	132,772	305,215	7,527	100,436	16,497	66,657	82,736	1,548,577
Railroad-owned cars: Av. foreign in line	25,021	164,222	59,176	22,953	31,151	79,444	11,504	29,486	16,530	44,208	15,583	499,279
Total cars on line	80,609	648,326	261,246	117,934	163,923	384,659	19,031	129,922	33,027	110,865	98,314	2,047,856
Excess	5,457	.....	2,374	.....	.....	9,010	2,503	.....	6,445	.....	.....	.....
Per cent. cars on line to total owned:												
Home	74	72	78	72	76	81	45	76	62	57	84	75
Foreign	33	25	23	17	18	21	70	23	62	38	16	24
All railroads	107	97	101	89	94	102	115	99	124	95	100	99
Private cars on line	3,311	38,055	8,906	2,668	6,831	12,909	1,162	6,093	2,143	7,786	3,227	92,091
Total, all cars on line	83,920	686,381	270,152	120,602	170,754	397,568	20,193	136,015	35,170	118,651	101,541	2,140,947
Per cent. of cars in shop	6.49	6.83	6.86	9.05	8.66	6.82	4.53	16.00	6.27	6.48	11.52	7.73
No. of freight engines owned	1,111	9,999	3,686	2,219	2,551	6,262	446	2,508	722	2,356	2,111	33,971
Av. cars on line per freight engine owned	76	69	73	54	67	63	45	54	49	50	48	63
Total freight-car mileage	41,592,750	464,025,022	168,822,354	83,349,486	105,667,631	265,416,142	21,680,374	84,211,555	25,953,423	102,231,458	70,202,536	1,433,152,731
Average miles per car per day	16.6	22.5	20.8	23.0	20.6	22.4	35.8	21.6	23.7	28.7	23.1	22.4
Per cent. loaded mileage	72.0	65.5	64.6	64.2	67.5	71.3	77.4	67.3	67.2	70.7	73.6	67.8
Ton-miles of freight, inc. Co. freight	422,379,129	6,983,602,109	2,511,276,130	1,086,978,674	1,334,748,837	2,084,537,963	330,109,731	1,113,489,135	298,027,219	1,431,010,718	872,056,339	18,468,215,984
Average ton-miles, including Co. freight:												
Per car-mile	10.2	15.1	15.8	13.0	12.7	12.8	15.7	13.2	11.5	14.0	12.4	14.0
Per loaded car-mile	14.1	23.0	24.5	20.3	17.5	18.2	20.2	19.7	17.1	19.8	16.8	20.7
Per car per day	168	339	344	300	263	274	580	286	282	402	286	314
Gross freight earnings	$5,189,845	$42,674,598	$14,173,461	$7,416,918	$8,969,482	$18,720,696	$2,765,395	$9,297,454	$2,565,634	$13,298,180	$6,220,146	$131,291,807
Average daily earnings: Per car owned	$2.30	$2.13	$1.83	$1.87	$1.72	$2.13	$5.58	$2.36	$3.22	$3.80	$2.10	$2.20
Per railroad-owned car on line	2.15	2.20	1.81	2.10	1.84	2.10	4.84	2.39	2.59	4.00	2.11	2.23
All cars on line	2.07	2.08	1.75	2.05	1.77	2.01	4.56	2.28	2.43	3.74	2.04	2.13

loaded mileage, which remained at 67.8. As noted above, there was a slight decrease in the shop car percentage."

The accompanying table shows freight car balance and performance in June.

INTERSTATE COMMERCE COMMISSION.

The commission cannot permit a refund applicable to a particular shipment for the sole purpose of enabling carriers to make good a rate not in effect when the shipment moved, but which they had agreed to protect. Such a practice would do away with the published tariff altogether if generally applied. (17 I. C. C., 333.)

A carrier voluntarily establishing a through rate less than the sum of the locals after a shipment has moved does not, *ipso facto*, become liable for the difference between the amount charged and the amount which would have been collected if the through rate had been in effect at the time of the movement. (17 I. C. C., 295.)

A carload rate and minimum weight, specified in a published tariff as applicable to a car of stated size, constitute a definite offer to the shipping public to move the commodity on those terms, and when a shipper has ordered a car of that capacity the commission will not sanction the imposition on him of additional transportation charges on a shipment that could have been loaded into such a car when the carrier for its own convenience furnishes him a larger car. (17 I. C. C., 209.)

Delay in Repayment of Overcharges Criticized.

Tyson & Jones Buggy Co. v. Aberdeen & Asheboro et al. Opinion by Commissioner Harlan.

Complaint of an overcharge dismissed, the defendants having refunded the amount, but only after formal complaint had been made and copies served on them.

From shippers in all parts of the country, and from local traffic associations which are making earnest efforts on fair and reasonable lines to secure a reform in the practices of carriers in this regard, many complaints have been received during the past year of the inattention of carriers to plain overcharge claims and of their delay in adjusting them. And a survey of these complaints has led us to the conclusion that this practice, or rather lack of practice, among carriers is open to severe criticism.

A substantial portion of the time and labor of the commission is given to the effort to secure, through informal correspondence, the settlement of claims of this character, and it is a burden from which we ought to be relieved by carriers. On the other hand, from the shippers' point of view, nothing in connection with transportation is more vexing and irritating than the labor and delay incident to the following up of an overcharge claim and securing its repayment. When an undercharge occurs it is promptly discovered by the accounting departments of carriers when revising the billing, and demand is at once made on the shipper for payment. With equal facility overcharges are also detected by accounting officers. But from the complaints that reach us it seems to be the duty of no one in the interior organization of many carriers to see that the amount is refunded to the shipper. And when an overcharge is detected by a shipper himself, he is able in the great majority of cases, if we may form conclusions from the numerous complaints now before us, to secure its repayment only after his patience has been sorely tried by the effort and delay required in order to secure serious attention to his demand.

Without wishing to be understood as expressing the view that this loose practice with respect to overcharge claims is characteristic of all interstate carriers, it is nevertheless so common as to justify some attention by the commission. Apparently it is not understood as fully as it should be, by railway officials charged with the adjustment of such matters, that the retention by a carrier of an overcharge not only has all the effects of an unjust discrimination against the shipper from whom the excess has been demanded, but leaves the transportation transaction in an unlawful condition, both under

the act to regulate commerce and under the Elkins Act, until the overcharge has been adjusted. We are advised that the delay in making repayment is frequently due, not to the failure to discover the overcharge, but to the efforts of the delivering carrier to ascertain before making the refund to the shipper which carrier participating in the movement is responsible. This is not a proper practice. The shipper is entitled to repayment from the carrier that has collected the freight charges as soon as it appears that an overcharge has in fact been made. When the refund has been made it is then that carrier's duty to see which of the carriers that participated in the movement is responsible and charge it accordingly. When the overcharge has been discovered it should immediately be repaid by the carrier that collected the charges, and this should be done whether a demand has been presented by the shipper or not.

The amended act to regulate commerce gives the commission no authority to establish any limit of time for the adjustment of claims or any authority to discipline carriers that are not attentive to their plain duty in such matters. Carriers owe it to themselves not to put the commission under the necessity of calling this matter to the attention of the Congress and asking for power to compel them to do what, in their own interest and in fairness to shippers, should be done on their own initiative. (17 I. C. C., 330.)

Increased Cotton-Seed Oil Rate Upheld.

Memphis Cotton Oil Co. et al. v. Illinois Central et al. Opinion by Commissioner Harlan.

The long-continued maintenance of a lower rate raises no presumption of law that a newly established higher rate is unreasonable. The fact that the lower rate remained undisturbed for many years has probative value and considered merely as evidence must ordinarily have much weight, in the absence of some explanation showing the propriety and need of an increased rate. But in every case all pertinent facts must be considered before an increased rate may be held to be unreasonable and therefore unlawful. On the facts shown of record the present increased rates on cotton-seed oil from Memphis to Louisville, Cincinnati and Chicago are not found to be unreasonable, although lower rates between those points had been in effect for many years.

Rates on Empty Beer Kegs.

Pabst Brewing Co. et al. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Lane.

It is not the province of the commission to order reparation for the exaction of an alleged unreasonable charge merely on a showing that the carrier is willing to honor the claim. An award of reparation can be predicated only on an affirmative finding that the rate exacted was in fact excessive.

The commission will inquire with particular care into the merits of complaints which are presented by shippers and carriers jointly lest unlawful preferences be unwittingly sanctioned.

Rate assessed on shipments of empty beer packages from Omaha, Neb., and Kansas City, Mo., to Milwaukee, Wis., not found unreasonable. Complaint dismissed. (17 I. C. C., 359.)

Through Rates to Points in Mexico.

Awbrey & Semple v. Galveston, Harrisburg & San Antonio et al. Opinion by Commissioner Clements.

Defendants collected on complainant's shipments of cement from Galveston, Tex., to Magdalena, Mex., a so-called through rate of $1 per 100 lbs., made up on a combination of 75 cents from Galveston to Guaymas, Mex., plus a rate of 25 cents from Guaymas to Magdalena. The 25-cent rate was the lawful rate established by the Mexican government, but was not on file with the commission. The rate from Galveston to Nogales, Ariz., an international point, was 62½ cents, and the rate from Nogales to Magdalena was 6 cents, the latter rate having been lawfully established by the Mexican government, making a combination of 68½ cents, but the rate from Nogales to Magdalena was not on file with the commission. In the absence of the publication of a specific through rate from Galveston to Magdalena, the lawful rate applicable to these shipments was defendants' published rate of 62½ cents from Galveston to Nogales plus the lawful rate of 6 cents prescribed by the Mexican government from Nogales to Magdalena. Reparation awarded. (17 I. C. C., 267.)

STATE COMMISSIONS.

The Michigan Railway Commission has sent notices to the railways and to the shippers' associations of the state that it will not be governed by the uniform demurrage code recommended by the National Association of Railway Commissioners and by the Interstate Commerce Commission, and that all rules and regulations proposed by railways relating to demurrage must be filed with and approved by the state commission, which will determine whether or not they are adapted to local conditions.

Frank E. Payne, of Jeffersonville, Ind., has been appointed a member of the Indiana Railway Commission to succeed Henry M. Dowling, resigned. The appointment of Mr. Payne fulfills a promise made by Governor Marshall during the political campaign preceding his election that he would appoint to the commission a member of some railway brotherhood. Mr. Payne is a locomotive engineer and was in the employ of the Pennsylvania Railroad. He was endorsed by the Indiana lodges of the Brotherhood of Railway Trainmen, the Brotherhood of Locomotive Engineers, the Brotherhood of Locomotive Firemen and Enginemen, and the general committee on adjustment of the Brotherhood of Locomotive Engineers of the Pennsylvania Lines West of Pittsburgh.

The New York State Public Service Commission, Second district, responding to complaints of trains constantly behind time, has ordered the Erie to run two trains on the schedule of its eastbound No. 8 from Jamestown to Hornell, whenever the train from the west is half an hour late, and to start train 114 from Jamestown for Buffalo regularly on time. It appears that No. 114 has waited for a western connection so much that complaints have been numerous. The order in relation to No. 8 says that in case of delay (as mentioned) a train must be started from Jamestown on time, with two or more passenger cars and a baggage car. The commission has called for new reports of passenger train delays on the Erie for the past year and a half, the reports which have been received month by month proving to have been made in a way that did not conform to the directions of the commission.

Oswald West, a member of the Railway Commission of Oregon, has written a letter to the Railway Commission of Tennessee, opposing legislation to permit railways to give passes to state railway commissioners. The Tennessee commission started the movement to have the Interstate Commerce law amended so as to permit state commissioners to use passes. In the course of his letter Mr. West says: "The legislature of this state makes liberal appropriations to assist us in carrying out the purposes of the Railroad Commission Act, and these appropriations cover traveling expenses and relieve us of the necessity of accepting favors to which we think we are not entitled.

"We regret that your state does not see fit to appropriate money to pay your traveling expenses and we believe that it would be far better to start a campaign of education at home to secure more liberal appropriation for traveling expenses than to try to bring about an amendment, such as you suggest, to the interstate commerce law, for if you succeed it will only be an opening wedge and in a very short time every public official, as in the good old days, will be flashing a cardboard when the conductor comes along."

The Iowa Railway Commission has made a ruling requiring the Chicago, Milwaukee & St. Paul to accept loaded coal cars from other roads for delivery on its road. The facts in the case are as follows: The St. Paul refused to accept coal shipped from Illinois mines to Davenport, Iowa, for reshipment to other points, unless before reshipment the coal was transferred from the cars in which it was brought to cars belonging to the St. Paul. The coal dealers of Davenport com-

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,458	$5,536,504	$1,660,020	$7,798,337	$1,330,802	$1,128,687	$147,490	$2,068,081	$146,268	$4,821,328	$2,977,009	.....	$287,658	$2,689,351	$895,028
Atlantic Coast Line	4,482*	2,010,643	550,024	2,746,292	337,375	348,334	41,335	764,036	62,213	1,553,293	1,192,999	.....	95,500	1,097,499	386,348
Boston & Maine	2,242	2,364,001	1,121,090	3,746,625	492,379	424,069	35,053	1,514,797	76,022	2,542,320	1,204,305	$5,282	181,927	1,027,660	217,760
Chesapeake & Ohio	1,939†	2,178,430	384,030	2,657,437	266,176	525,619	46,533	684,444	52,639	1,575,411	1,082,026	3,757	67,500	1,010,769	365,544
Chicago & Eastern Illinois	965	875,918	145,872	1,072,515	95,937	218,040	20,620	341,609	32,814	709,020	363,495	2,256	32,400	328,839	59,559
Chicago & North Western	7,638	4,569,334	1,523,824	6,586,681	863,049	828,909	114,846	2,617,356	102,608	4,526,768	2,059,913	6,508	228,000	1,825,405	46,925
Chicago, Burlington & Quincy	9,021	5,517,515	1,812,338	7,952,241	1,371,739	1,402,348	141,614	2,364,346	172,783	5,452,830	2,499,411	18,465	215,587	2,265,359	554,849
Chicago, Rock Island & Pacific	7,393	3,657,611	1,494,286	5,467,794	938,607	737,730	122,620	1,989,535	146,840	3,935,332	1,532,462	16,994	222,118	1,293,350	265,670
Chicago, St. Paul, Minn., & Omaha	1,739	964,204	370,688	1,427,236	149,071	146,508	23,307	490,804	26,608	836,298	590,938	591	53,008	537,339	84,171
Colorado & Southern	1,248	742,404	115,711	901,747	108,744	118,124	16,098	282,847	21,179	546,992	354,755	1,719	21,625	331,411	45,507
Delaware & Hudson Co.	845	1,571,744	178,150	1,838,466	95,054	189,673	18,478	571,005	37,232	911,442	927,024	585	40,000	886,439	167,109
Delaware, Lackawanna & Western	931‡	2,503,289	539,948	3,232,599	253,392	392,391	48,699	858,623	52,070	1,605,175	1,627,424	47,847	151,600	1,523,671	7,500
El Paso & Southwestern Co.	867	513,323	92,247	633,681	78,373	77,454	12,260	155,021	21,802	344,910	288,771	754	26,167	261,850	20,513
Erie	1,961§	3,258,631	693,459	4,240,370	375,262	687,401	86,120	1,313,751	82,763	2,545,297	1,695,073	5,226	108,930	1,580,917	647,243
Great Northern	7,037*	4,690,297	1,151,914	6,135,465	623,894	619,181	67,151	1,589,701	75,970	2,975,897	3,159,568	10,272	318,650	2,851,190	86,341
Gulf, Colorado & Santa Fe	1,518	952,015	251,620	1,271,128	209,200	172,314	25,404	413,089	29,306	849,313	421,815	.....	32,649	389,167	87,797
Illinois Central	4,550	3,516,693	965,554	5,095,180	556,783	1,081,757	107,487	1,630,531	107,163	3,483,721	1,611,459	6,025	208,074	1,397,360	5,442
Kansas City Southern	827	634,243	111,924	832,256	82,487	99,107	25,001	266,532	34,084	507,211	325,045	.....	25,831	299,214	25,948
Lehigh Valley	1,441	2,880,140	308,898	3,302,219	285,275	498,485	71,644	927,405	53,233	1,836,042	1,466,177	847	94,600	1,372,424	408,682
Missouri, Kansas & Texas	3,072	1,615,547	676,321	2,433,439	323,752	301,513	48,352	957,734	79,637	1,710,988	722,451	975	95,010	628,416	79,536
Nashville, Chattanooga & St. Louis	1,230	725,752	204,743	989,554	153,659	160,765	37,216	328,345	22,555	702,540	287,014	3,774	20,500	262,740	72,873
New York, New Haven & Hartford	2,045	2,646,503	2,054,786	5,161,870	591,847	565,299	26,260	1,904,584	130,828	3,218,818	1,943,052	125,000	330,000	1,738,052	482,960
New York, Ontario & Western	545	562,733	88,068	677,327	61,102	111,374	14,344	261,484	18,801	467,106	210,221	6,384	16,666	187,171	48,125
Norfolk & Western	1,941	2,596,064‡	301,604	2,990,353	308,838	470,847	41,500	821,040	54,588	1,696,813	1,293,540	678	84,000	1,208,862	321,328
Northern Central	466	916,259	170,909	1,148,755	69,945	226,774	13,994	469,353	20,089	800,155	348,600	922	24,708	324,814	132,391
Oregon Short Line	1,508‖	1,407,198	402,758	1,906,918	166,817	147,208	25,087	383,552	34,132	756,796	1,150,122	3,473	50,000	1,096,649	22,823
Pennsylvania R.R. Co.	4,017	10,685,674	2,531,695	14,157,551	1,178,258	2,614,228	155,742	4,426,210	307,847	8,682,285	5,475,266	121,702	197,526	5,156,038	1,382,923
Pennsylvania Co.	1,416	3,829,840	564,052	4,742,466	503,759	753,547	66,560	1,445,983	71,772	2,841,621	1,900,845	7,720	150,280	1,742,845	690,891
Pere Marquette	2,330	1,004,574	288,483	1,390,746	177,119	181,348	29,044	527,367	29,422	944,300	446,446	9,717	47,372	408,791	80,525
Philadelphia, Balto. & Washington	716	761,005	586,008	1,501,350	144,559	259,776	20,205	609,677	29,293	1,063,510	437,840	.....	35,772	402,068	40,838
Pittsburgh, Cin., Chic. & St. Louis	1,468	2,464,948	569,176	3,406,473	411,507	550,843	61,317	1,041,140	60,198	2,125,005	1,281,468	866	105,017	1,175,585	457,667
Southern Pacific Co.—Pacific System	6,060¶	5,435,716	2,407,610	8,385,436	920,635	1,009,426	109,555	2,120,540	201,861	4,362,017	4,023,419	29,505	240,063	3,753,851	700,151
Southern Ry.	7,050	3,506,181	1,204,138	5,089,245	607,385	784,009	123,748	1,648,925	146,290	3,310,357	1,778,888	1,652	157,933	1,619,303	335,922
Texas & Pacific	1,885	1,197,472	319,801	1,599,683	142,216	193,355	22,993	577,668	33,082	969,314	630,369	11,515	77,762	541,092	27,385
Vandalia	827	584,272	164,253	834,500	138,061	142,788	21,248	286,809	17,727	606,633	227,867	.....	24,086	203,781	27,022
Yazoo & Mississippi Valley	1,370	767,070	227,868	1,057,266	151,669	165,828	16,640	285,925	24,891	644,953	412,313	1,309	34,740	378,882	31,801
FIVE MONTHS OF FISCAL YEAR.															
Atchison, Topeka & Santa Fe	7,458	25,013,188	8,723,296	36,469,841	5,774,428	5,267,932	676,925	9,607,896	749,173	22,076,354	14,393,487	.....	1,301,489	13,091,998	1,974,363
Atlantic Coast Line	4,482*	7,836,833	2,482,050	11,080,800	1,619,048	1,740,499	190,566	3,452,954	298,340	7,301,407	3,779,393	.....	472,000	3,307,393	800,127
Boston & Maine	2,242	10,895,590	7,075,958	1,931,828	2,609,989	2,090,930	212,925	7,505,797	382,474	12,802,115	6,517,713	52,073	852,696	5,717,090	927,025
Chesapeake & Ohio	1,939†	10,410,249	2,239,342	13,149,265	1,485,546	2,467,528	219,174	3,315,975	233,959	7,722,182	5,427,083	5,296	337,500	5,084,287	989,627
Chicago & Eastern Illinois	965	3,911,936	807,362	4,972,104	452,827	888,981	111,964	1,551,403	160,502	3,165,677	1,806,427	7,196	162,000	1,637,231	453,375
Chicago & North Western	7,638	22,617,198	8,718,508	33,824,726	5,523,937	3,883,640	596,674	11,755,270	485,762	22,245,283	11,579,443	7,566	1,140,000	10,431,877	324,619
Chicago, Burlington & Quincy	9,021	25,329,228	10,511,036	38,849,135	7,693,897	6,352,739	716,975	11,069,204	887,696	26,720,511	12,128,624	64,726	1,077,976	10,985,922	87,491
Chicago, Rock Island & Pacific	7,393	17,627,260	8,719,477	27,922,492	4,565,435	3,338,141	607,622	9,373,604	685,561	18,570,363	9,352,129	72,284	1,001,147	8,278,698	1,406,666
Chicago, St. Paul, Minn., & Omaha	1,739	4,228,018	2,043,360	6,688,689	995,538	746,796	118,072	2,233,106	137,052	4,230,558	2,458,131	2,414	265,939	2,195,506	157,978
Colorado & Southern	1,248	3,110,544	823,693	4,140,196	578,272	651,366	73,110	1,239,478	104,474	2,646,700	1,493,496	786	108,125	1,384,585	175,090
Delaware & Hudson Co.	845	6,578,488	1,544,820	8,542,503	613,891	1,076,448	112,140	2,732,376	179,857	4,714,712	3,827,791	2,387	180,000	3,650,178	244,274
Delaware, Lackawanna & Western	931‡	11,350,436	3,227,495	15,489,776	1,575,866	1,960,376	264,641	3,947,745	271,894	8,020,522	7,469,254	165,831	652,500	6,982,585	765,402
El Paso & Southwestern Co.	867	2,402,013	428,283	2,962,257	381,355	386,338	55,007	782,485	112,418	1,717,603	1,244,654	3,242	94,834	1,146,578	46,188
Erie	1,961§	14,795,437	4,024,720	20,253,712	2,507,193	3,456,307	447,103	6,163,101	405,214	12,978,918	7,274,794	25,066	522,137	6,777,723	1,122,433
Great Northern	7,037*	22,734,442	6,889,219	31,078,621	4,696,332	3,075,676	374,687	7,267,857	417,887	15,832,439	15,246,182	218,827	1,490,940	13,974,069	2,829,769
Gulf, Colorado & Santa Fe	1,518	3,789,845	1,330,398	5,440,749	992,519	771,017	114,624	1,906,663	145,162	3,929,985	1,510,764	.....	161,566	1,349,198	518,344
Illinois Central	4,550	16,153,232	5,183,966	24,244,939	3,980,667	5,599,397	514,965	7,783,278	490,684	18,368,991	5,875,948	17,851	1,026,298	4,831,889	116,389
Kansas City Southern	827	2,812,005	604,520	3,808,903	441,518	521,641	126,797	1,241,539	147,571	2,479,066	1,329,837	.....	126,948	1,202,889	110,391
Lehigh Valley	1,441	12,628,905	2,037,462	15,214,924	1,630,751	2,484,941	377,927	4,212,767	289,681	8,996,067	6,218,857	55,045	473,000	5,800,902	738,877
Missouri, Kansas & Texas	3,072	7,904,991	3,300,007	11,858,585	1,598,389	1,423,122	258,760	3,906,917	358,305	7,545,493	4,313,092	9,204	430,109	3,873,779	586,143
Nashville, Chattanooga & St. Louis	1,230	3,356,804	1,136,491	4,780,180	760,032	844,594	178,409	1,600,546	111,756	3,495,337	1,284,843	5,398	102,500	1,176,945	120,881
New York, New Haven & Hartford	2,045	12,677,732	11,235,971	26,131,440	2,950,091	2,720,930	135,373	9,303,779	602,182	15,712,355	10,419,085	613,482	1,550,000	9,482,567	2,548,955
New York, Ontario & Western	545	2,718,321	926,339	3,812,308	535,712	549,051	58,228	1,316,254	84,803	2,544,048	1,268,260	14,352	83,333	1,170,575	34,635
Norfolk & Western	1,941	12,310,996	1,783,482	14,543,358	1,489,110	2,448,939	219,861	3,978,965	289,378	8,426,253	6,117,105	8,382	420,000	5,688,723	1,112,606
Northern Central	466	4,231,145	961,980	5,478,979	602,973	1,001,607	68,519	2,249,681	102,596	4,025,376	1,453,603	5,149	123,542	1,334,810	107,499
Oregon Short Line	1,508‖	6,107,534	2,529,430	9,122,957	926,148	673,808	113,649	1,731,642	151,664	3,596,911	5,526,046	13,628	250,000	5,289,674	845,388
Pennsylvania R.R. Co.	4,017	49,867,340	13,806,962	57,880,007	8,073,076	12,128,350	871,999	21,124,199	1,483,776	43,681,400	24,198,607	421,295	987,631	22,789,681	4,390,298
Pennsylvania Co.	1,416	18,698,395	3,428,148	23,753,538	2,789,245	3,484,717	342,064	6,729,433	358,120	13,703,579	10,049,959	13,584	723,390	9,312,985	2,325,169
Pere Marquette	2,330	4,610,258	1,830,303	6,940,648	951,961	891,061	164,583	2,512,418	141,221	4,661,244	2,279,404	7,422	237,950	2,048,876	357,929
Philadelphia, Balto. & Washington	716	3,923,370	3,021,955	7,652,673	1,053,225	1,297,193	114,738	2,846,868	151,291	5,463,315	2,189,358	.....	178,858	2,010,500	227,253
Pittsburgh, Cin., Chic. & St. Louis	1,468	11,390,178	3,392,600	16,527,426	2,239,197	2,717,995	325,376	5,022,149	287,460	10,592,177	5,935,249	4,138	542,244	5,388,867	1,159,152
Southern Pacific Co. Pacific System	6,060¶	25,131,931	13,813,307	41,532,053	4,371,208	5,083,154	566,915	10,057,438	995,856	21,074,571	20,457,482	34,541	1,200,313	19,291,710	4,302,388
Southern Ry.	7,050	15,965,858	6,493,153	24,255,806	2,949,548	4,022,617	566,900	7,649,205	698,919	15,887,189	8,368,617	5,474	789,725	7,584,366	872,546
Texas & Pacific	1,885	4,648,872	1,690,473	6,687,314	777,764	1,004,290	101,935	2,395,311	167,709	4,447,009	2,240,305	26,067	236,534	1,977,704	269,984
Vandalia	827	2,740,132	989,860	4,144,956	620,175	697,061	121,744	1,404,561	92,410	2,935,951	1,209,005	.....	119,587	1,089,418	153,988
Yazoo & Mississippi Valley	1,370	2,941,073	915,958	4,124,823	1,032,169	802,471	81,123	1,315,795	121,938	3,353,496	771,327	15,550	173,700	613,177	252,246

* Mileage operated November 30, 1908—4,407; † Mileage operated November 30, 1908—1,896; ‡ Mileage operated November 30, 1908—893; § Mileage operated November 30, 1908—1,901; ° Mileage operated November 30, 1908—6,850; ‖ Mileage operated November 30, 1908—1,456; ¶ Mileage operated November 30, 1908—5,586. Figures indicates Deficits, Losses and Decreases.

plained to the railway commission. At the hearing counsel for the railway contended that the state commission lacked jurisdiction, as the shipments in question were interstate. The coal dealers, however, contended that the interstate character of the shipments ended when the coal was delivered at Davenport and the dealers paid the transportation charges to the originating carriers, and that the local shipments from Davenport to other points in Iowa were purely state traffic and, therefore, under the jurisdiction of the commission. The commission upheld the contention of the dealers and ruled that under the Iowa law the St. Paul must accept the coal in the cars in which it was brought to it by the originating roads. The initial cause of the controversy appears to have been that the Iowa rate on coal is lower in proportion than the interstate rate and that the shippers by stopping the coal at Davenport and reshipping it from there get a lower rate than they would get by shipping it direct from the mines in Illinois to the actual destinations. The St. Paul objected to this method of cutting the rate and seemingly aimed to prevent it by compelling a transfer of the coal to its own cars.

COURT NEWS.

The Appellate division of the Supreme Court of New York, Third department, has sustained the lower court in upholding the constitutionality of the law of the state requiring railways to pay their employees twice a month.

The Supreme Court of the United States in an opinion by Justice Day holds invalid the ordinance adopted by the City Council of Minneapolis in 1907, requiring the Minneapolis Street Railway Company to sell six tickets for 25 cents. The defense claimed that the ordinance was a violation of the contract implied in its charter, which, issued in 1873, was to run for 50 years and authorized a charge of 5 cents for each ride. The United States Circuit Court for Minnesota declared against the ordinance, and Justice Day's decision sustained that finding, but with modifications.

The Denver & Rio Grande has brought suit in the federal court at Denver to restrain the Interstate Commerce Commission from enforcing a recent order requiring the road to reduce its rate on beer from St. Louis to Leadville Colo., from 42 cents to 30 cents per 100 lbs. The order was issued in the case of Baer Brothers Mercantile Company. The through rate from St. Louis to Leadville was previously the sum of the local rates. The order of the commission fixes a through rate which is less than the sum of the locals. The issuance of this order was opposed by commercial organizations at Denver, Pueblo and other points, on the ground that the rate from St. Louis should continue to be the sum of the local rate in order that the brewers of Colorado could compete at Leadville with those at St. Louis. In contesting the order of the commission the railway will have the assistance of the Colorado brewers and commercial organizations.

Judges McCormick and Selby in the federal court at Galveston, Tex., December 23 decided in favor of the Interstate Commerce Commission in the case against the Southern Pacific Terminal Company. In 1908 Carl Eichenberg filed a complaint with the commission, alleging that the contract entered into by the Southern Pacific Terminal Company in 1905 with E. H. Young, by which the Terminal company's Pier C at Galveston was leased to Young and certain privileges were granted to him with respect to handling and storing cotton seed, meal and cake, was unlawful, in that it gave him undue preference. The commission held that the Terminal company was an integral part of the Galveston, Harrisburg & San Antonio Railway, which is owned by the Southern Pacific Company and was, therefore, subject to the jurisdiction of the commission. It held further that if the Terminal company may make a contract with a shipper of cotton seed and give him certain special privileges, it may make similar contracts with regard to other products and thus secure to favored shippers the control of export business at Galveston. It said that the giving of undue preference to any shipper is condemned by the Interstate Commerce law and it can make no difference that such preference is given by a contract which purports to be a lease of property. The court took the same view.

Railway Officers

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

R. H. Ford has been appointed auditor and paymaster of the Texas & Gulf, with office at Longview, Tex., succeeding S. R. Mealy.

George D. Locke has been appointed vice-president and general manager of the Arkansas, Oklahoma & Western, with office at Rogers, Okla.

L. V. Porter has been appointed assistant auditor of the Mahoning Coal Railroad, a New York Central line, with office at Cleveland, Ohio, succeeding George M. Glazier, who has been promoted.

G. C. Hand, examiner in the Bureau of Statistics and Accounts of the Interstate Commerce Commission at Washington, D. C., has been appointed secretary and transfer agent of the Kansas City Southern, with office at New York, succeeding R. B. Sperry, resigned.

As noted in another column, Daniel Willard, vice-president of the Chicago, Burlington & Quincy, has been elected president of the Baltimore & Ohio, effective January 14. Darius Miller, first vice-president of the Chicago, Burlington & Quincy, in charge of traffic, has been made vice-president in charge of all departments.

E. M. Heigho, whose resignation as vice-president, treasurer, general manager and traffic manager of the Pacific & Idaho Northern at Weiser, Idaho, was announced in the *Railway Age Gazette* November 26, has since been elected president and general manager, with office at Weiser, Idaho, succeeding as president F. R. Cordley, resigned. Samuel Norris has been elected vice-president and general counsel, with office in New York, succeeding J. H. Richards, resigned. James B. Ford has been elected treasurer and John D. Carberry has been elected secretary, both with office at New York, succeeding C. W. Webb, secretary and treasurer, resigned. Wm. Wood has been appointed assistant treasurer, F. S. Miller has been appointed assistant secretary and auditor, and I. F. Smith has been appointed attorney, all with offices at Weiser, Idaho.

John Findley Wallace, whose election as vice-president of the Kansas City, Mexico & Orient, with office at New York, was recently announced in these columns, began railway work in 1869 as rodman on the Carthage & Quincy, and in 1870 was appointed assistant engineer on the Rockford, Rock Island & St. Louis. Both these lines are now a part of the Chicago, Burlington & Quincy. He afterwards returned to college, and from 1871 to and including 1876 he was assistant engineer on river and harbor works, in the service of the United States Army Engineering Corps. From 1878 to 1880 he was chief engineer of the Burlington, Monmouth & Missouri River; in 1881 chief engineer and superintendent of the Peoria & Farmington, now a part of the Iowa Central; 1882 to 1883 superintendent and general freight and passenger agent of the Central Iowa in Illinois; 1883 to 1886 master of transportation and engineer of construction of the Eastern and Illinois divisions of the Iowa Central. In 1887 he went to the Atchison,



John F. Wallace.

Topeka & Santa Fe, taking charge of the construction of the bridge over the Missouri river and doing other bridge work. He became chief engineer of the Illinois Central in 1891 and in 1898 he was elected assistant second vice-president of that road; and from 1900 to 1904 he was assistant general manager and later general manager of the Illinois Central system. From 1904 to 1905 he was chief engineer of the Panama canal, and also during part of this time vice-president and general manager of the Panama Railway & Steamship Lines. He acted as confidential consulting engineer from 1905 to 1906 of the Chicago & North Western in the general design of, and estimates for, the new terminal facilities for that company in Chicago, since which time he has been chairman of the board of directors of Westinghouse, Church, Kerr & Co., engaged in the design and construction of railway terminals, interurban railway lines and power, public utility and industrial developments. During Mr. Wallace's connection with the Illinois Central he planned and carried into execution the World's Fair transportation and track elevation scheme of that company, and, in connection with Messrs. J. T. Harahan and Stuyvesant Fish he had charge of the great expansion of this system from 2,880 miles in 1900 to 5,700 miles in 1904. This included the track elevation in the city of Chicago, new machine shops, depression of tracks on the lake front, and revision of the Chicago freight and passenger terminals; the building up and improvement of terminals at East St. Louis, Ill.; Louisville, Ky.; Memphis, Tenn.; New Orleans, La., and at other places; and construction of the Omaha extension from Fort Dodge, Iowa, to Council Bluffs and Omaha, Neb., 140 miles, which was built within nine months.

Operating Officers.

J. E. Toner has been appointed an assistant superintendent of the Oregon Short Line, with office at Pocatello, Idaho, succeeding E. N. Jacobs, resigned.

F. J. Norris has been appointed acting trainmaster of the Missouri Pacific, with office at De Soto, Mo., succeeding J. T. Nedwideck, resigned to go with another company.

F. I. Cummins, traffic manager of the South Dakota Central at Sioux Falls, S. Dak., has been appointed also general superintendent. S. C. Gardner, superintendent transportation at Sioux Falls, has been transfered to the traffic manager's office, and his former office has been abolished.

J. A. Murphy has been appointed trainmaster of the First and Second divisions of the Fort Worth & Denver City, with office at Wichita Falls, Tex., succeeding J. S. Flack, assigned to other duties. Mr. Murphy will have jurisdiction over the territory from Fort Worth, Tex., to Childress.

F. G. Bement has been appointed trainmaster of the Twenty-fifth district (C. S. & M.), Twenty-seventh and Twenty-eighth districts of the Grand Trunk, with office at Durand, Mich., succeeding O. F. Clark, who is transferred to the Twenty-ninth district, and the P. O. & N. Railway, with office at Pontiac, Mich.

S. H. Barnes has been appointed superintendent of the Fourth division of the Colorado lines of the Denver & Rio Grande, with office at Alamosa, Colo., succeeding P. B. McAtee, assigned to other duties. S. E. Burkhead has been appointed assistant superintendent of the First division, with office at Pueblo, Colo. C. M. Payn has been appointed chief despatcher at Pueblo.

C. W. Kinney, superintendent of the Auburn division of the Lehigh Valley at Auburn, N. Y., has been appointed superintendent of transportation, succeeding R. W. Baxter, resigned. C. J. Shea, assistant superintendent of the Buffalo division at Sayre, Pa., succeeds Mr. Kinney, and J. N. Haines, trainmaster at Auburn, succeeds Mr. Shea. G. B. Minshull has been appointed superintendent of car service, with office at South Bethlehem.

F. A. Harrington, superintendent of the Mohawk division of the New York Central & Hudson River at Albany, N. Y., has been appointed assistant to the general superintendent of the Western division, with office at Albany. Miles Bronson, superintendent of the River division at Weehawken, N. J., succeeds Mr. Harrington, and W. K. McCoy, assistant superintendent of the Mohawk division at Albany, succeeds Mr. Bronson, with office at Weehawken. Fred Williamson succeeds Mr. McCoy, with office at Albany.

M. T. Wright, superintendent of the Middle division of the Michigan Central at Jackson, Mich., has been promoted to the new position of superintendent of terminals. W. H. O'Keefe, assistant division superintendent at Detroit, succeeds Mr. Wright. D. H. Hackett, trainmaster at Jackson, has been appointed division superintendent, with office at Jackson. P. C. Hill, trainmaster at Grayling, Mich., has been transferred to Jackson, and Frank Mahoney, acting trainmaster at Jackson, has been appointed trainmaster at Niles, Mich.

The Lake Shore & Michigan Southern now has two assistant general superintendents. Albert S. Ingalls, with office at Cleveland, Ohio, is in charge of the Eastern, Toledo and Franklin divisions and of the Lake Erie, Alliance & Wheeling, the Dunkirk, Allegheny Valley & Pittsburgh and other adjacent lines. Frank H. Wilson, hitherto superintendent of the Western division, has been appointed assistant general superintendent, with office at Chicago, for the Western, Michigan, Detroit and Lansing divisions. E. B. Cook succeeds Mr. Wilson as superintendent of the Western division.

Traffic Officers.

O. R. Eytel has been appointed a traveling freight agent of the Delaware & Hudson, with office at Pittsburgh, Pa.

C. H. Schutte has been appointed claim adjuster of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex.

J. E. Harrington has been appointed a commercial agent of the Louisiana & Arkansas, with office at Shreveport, La.

E. W. Godbold has been appointed a division passenger agent of the St. Louis Southwestern, with office at Texarkana, Tex.

M. K. Fleming has been appointed general baggage agent of the Kansas City, Mexico & Orient, with office at Wichita, Kan.

W. W. Wilson has been appointed a traveling passenger agent of the Illinois Central, with office at Champaign, Ill., succeeding G. A. Hines, resigned.

G. C. McKinstry has been appointed a traveling freight agent of the Atchison, Topeka & Santa Fe, with office at Hutchinson, Kan., succeeding E. H. Hogueland.

W. C. Bates has been appointed a commercial agent of the Nashville, Chattanooga & St. Louis, with office at St. Louis, Mo., succeeding J. R. Chisman, resigned.

All matters pertaining to the traffic and supply department of the Pacific & Idaho Northern will hereafter be handled by the general manager. See item under Executive, Financial and Legal Officers.

B. E. Morgan, manager of the Traders' Despatch at Chicago, has been appointed general freight agent of the New York, Chicago & St. Louis, with office at Cleveland, Ohio, succeeding James Webster, promoted.

J. P. Gibson has been appointed a traveling freight agent of the St. Louis & San Francisco, with office at Houston, Tex., and J. T. Brooks has been appointed a traveling freight agent, with office at San Antonio, Tex.

J. T. Miller has been appointed claim adjuster of the Southern Kansas Railway Company of Texas, the Pecos & Northern Texas, the Eastern Railway Company of New Mexico and the Pecos River, with office at Amarillo, Tex.

Harry F. West, division freight agent of the Middle district of the New York Central & Hudson River at Syracuse, N. Y., has been transferred to Rochester, N. Y. R. C. Hopkins, commercial agent at Buffalo, N. Y., succeeds Mr. West.

F. E. Hine, district passenger agent of the Cincinnati, Hamilton & Dayton and the Chicago, Indianapolis & Louisville, with office at Indianapolis, Ind., has resigned to become a manager for George L. Shuman & Co., publishers, in Chicago.

Harry Ruben, chief clerk of the baggage bureau of the passenger department of the Toledo, St. Louis & Western, the

Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, has been appointed general baggage agent, with office at Chicago.

Neil Mooney, general western passenger agent of the West Shore, at Chicago, has been appointed general agent of the New York Central & Hudson River at Montreal, Que., succeeding C. Hartigan, appointed general passenger agent of the Rutland Railroad.

W. D. Morgan, contracting freight agent of the Missouri, Kansas & Texas at Houston, Tex., has been appointed traveling freight and passenger agent of the Chicago, Burlington & Quincy, with office at Dallas, Tex., succeeding I. G. Thompson, resigned to accept service with the Rock Island.

Joseph Hattendorf, assistant general freight agent of the Illinois Central and the Yazoo & Mississippi Valley at Memphis, Tenn., has been transferred to Chicago, with authority over these roads and the Indianapolis Southern. J. L. Durrett, commercial agent of the Illinois Central at Jacksonville, Fla., succeeds Mr. Hattendorf. J. J. McManus, commercial agent at Dallas, Tex., succeeds Mr. Durrett. F. P. Redman, commercial agent at Nashville, Tenn., succeeds Mr. McManus, and Willis Hitzing succeeds Mr. Redman.

George R. Browder has severed his connection with the Uniform Classification Committee and will resume his duties as assistant freight traffic manager of the Southern Railway, with office at Washington, D. C. Randall Clifton, general freight agent at Atlanta, Ga., will continue in charge of the Atlanta traffic division and of the general freight office. H. S. Lemmon has been appointed a commercial agent, with office at Memphis, Tenn., and Robert McMechan has been appointed a commercial agent, with office at Little Rock, Ark. G. E. Kirkland has been appointed a soliciting agent, with office at Mobile, Ala., succeeding J. D. Coons, resigned.

H. W. Morrison, general freight agent of the Chicago, Rock Island & Pacific at Little Rock, Ark., has been appointed assistant freight traffic manager, with office at Little Rock, and the position of general freight agent at that place has been abolished. H. A. Snyder, assistant general freight agent of the lines east of the Missouri river at Chicago, has been appointed general freight agent, with office at Chicago, succeeding T. H. Simmons, assigned to other duties. T. A. Gant, chief clerk in the general freight office at Chicago, succeeds Mr. Snyder. R. G. Brown, assistant general freight agent at Minneapolis, Minn., has been appointed general freight agent, with office at Kansas City, Mo., succeeding G. B. Albright, resigned. G. E. White, commercial agent of the Rock Island-Frisco lines at Chicago, has been appointed general agent of the Chicago, Rock Island & Pacific, with office at Chicago, succeeding T. O. Jennings, retained by the Frisco. J. I. Hazzard, soliciting agent, succeeds Mr. White as commercial agent for the Rock Island, with office at Chicago.

In addition to the appointments mentioned in our issue of December 31, page 1322, incident to the dissolution of the Rock-Island Frisco merger, the following appointments have been made on the St. Louis & San Francisco and the Chicago & Eastern Illinois:

C. E. Wynne, Jr., commercial agent at Ft. Worth, Tex., has been appointed division freight agent. W. B. Wells has been appointed commercial agent at Dallas, Tex.; John A. Hulen, commercial agent at Houston, Tex., has been retained. H. C. Franks, commercial agent at San Antonio, Tex., has been retained. Charles Griffith, commercial agent at Paris, Tex., has been retained. F. C. Werner has been appointed district passenger agent at Indianapolis, Ind.

Joint freight and passenger agencies of the St. Louis & San Francisco and the Chicago & Eastern Illinois at the following points have been abolished: Boston, Mass.; Burlington, Cedar Rapids, Davenport and Des Moines, Iowa; Lincoln and Omaha, Neb.; Los Angeles and San Francisco, Cal.; Seattle and Tacoma, Wash.; Pueblo and Colorado Springs, Colo.; Peoria and Rock Island, Ill.; Portland, Ore.; Cleveland, Ohio; Little Rock, Ark.; Minneapolis, Minn.; Topeka, Kan.; Philadelphia, Pa.; St. Joseph, Mo., and Salt Lake City, Utah. Freight agencies at the following points have been abolished: Alexandria, La.; Atchison, Hutchinson and Leavenworth, Kan.; Buffalo, N. Y.; Estherville and Vinton, Iowa; Indianapolis, Ind.; Jonesboro, Ark.; City of Mexico, and St. Paul, Minn. Passenger agencies at the following points have been abolished: Amarillo, Tex.; Chattanooga, Tenn.; Council Bluffs, Iowa; Detroit, Mich.; Hot Springs, Ark.; London, England, and Oakland, Cal.

Engineering and Rolling Stock Officers.

J. E. Mourno has been appointed assistant air-brake instructor of the Chicago, Rock Island & Pacific, with office at Chicago.

L. Fisher has been appointed master mechanic of the Fourth district, Central division, of the Canadian Pacific, with office at Winnipeg, Man.

C. E. Chambers, acting superintendent of motive power of the Central of New Jersey at Jersey City, N. J., has been appointed superintendent of motive power, with office at Jersey City.

J. G. June, assistant engineer of the Erie at Jersey City, N. J., has been appointed engineer of the Buffalo division and branches, with office at Buffalo, N. Y., succeeding R. P. Madill, resigned.

C. S. White has been appointed motive power inspector of the Pennsylvania Lines West of Pittsburgh, Southwest system, with office at Columbus, Ohio, succeeding W. H. Holbrook, transferred.

R. C. Gowdy, resident engineer of the Fort Worth & Denver City at Fort Worth, Tex., has been appointed chief engineer, with office at Fort Worth, and chief engineer also of the Wichita Valley, with office at Wichita Falls, Tex.

W. J. Muff has been appointed a roadmaster of the Atchison, Topeka & Santa Fe, with office at Florence, Kan., succeeding F. Powers. William Turner, recently appointed roadmaster of the Oklahoma division, with office at Guthrie, Okla., has been transferred to Arkansas City, Kan. H. S. Cox succeeds Mr. Turner. E. B. Dehart has been appointed roadmaster of the Colorado division, with office at Pueblo, Colo., succeeding Wm. Davies. D. Bogue has been appointed roadmaster of the Mexico division, with office at Trinidad, Colo., succeeding Charles Ennis. R. R. Black, assistant roadmaster on the Rio Grande division at Vaughn, N. Mex., has been appointed roadmaster, with office at Vaughn, succeeding T. G. McNeill. E. C. Fleming, recently appointed roadmaster of the Rio Grande division, with office at Rincon, N. Mex., succeeds Mr. Black. C. L. McCallister, roadmaster of the Rio Grande division at San Marcial, N. Mex., succeeds Mr. Fleming, and P. Brumbaugh succeeds Mr. McCallister. L. H. McIntire has been appointed roadmaster of the Oklahoma division, with office at Guthrie, Okla., succeeding J. E. Markle.

Alfred Noble has severed his connection with the Pennsylvania Railroad as chief engineer of the East River division of its New York tunnel extension. Since 1902 Mr. Noble has been a member of the Board of Engineers appointed by the late A. J. Cassatt, president of the company, to examine its proposed New York tunnel extension project, pass upon the practicability of the undertaking, and determine upon the best plans for carrying it out. When this work was authorized Mr. Noble was appointed chief engineer of the East River division, which extends from the eastern limits of the New York station at a point in Thirty-second street, Manhattan, 292 ft. east of the west line of Seventh avenue, and at a point in Thirty-third street 502 ft. east of the west line of Seventh avenue; it also includes the excavation work and retaining walls for the station site and yard, to the track level, westwardly to Ninth avenue. It extends eastwardly from the station under Thirty-second and Thirty-third streets through tunnels to permanent shafts a few feet east of First avenue, thence through four single-track tunnels under the East river to the surface in Long Island City, and continues to Woodside, a total of 4.48 miles.

Purchasing Officers.

D. B. Sebastian has been appointed acting fuel agent of the Chicago, Rock Island & Pacific, with office at Chicago, succeeding Eugene McAuliffe, general fuel agent, resigned to go with another company, and the title of general fuel agent is abolished.

Railway Construction.

New Incorporations, Surveys, Etc.

Buffalo, Rochester & Pittsburgh.—A contract has been given to the Miller Construction Co. of Lock Haven, Pa., for work on nine miles of double-track, including grade and line revision, between Newton, Pa., and Mt. Jewett. The work will be very heavy and is to cost about $800,000. These improvements will eliminate the last link of single-track on the main line between Ashford, N. Y., and Punxsutawney, Pa.

Canadian Northern.—According to press reports work was completed during 1909 on 482 miles and grading finished on 398 miles, which is ready for track-laying this spring. In the western prairie provinces 305 miles of track were laid on seven branches and grading has been finished on seven other lines. In Manitoba the Rossburn branch has been extended 50 miles, and from Hallboro 70 miles have been finished through Rapid City to the Saskatchewan boundary. In eastern Canada the Sudbury-Port Arthur line was extended for 30 miles beyond Selliwood, Ont. Ottawa has been connected with the Canadian Northern Quebec by the 58 miles built from Hawkesbury, from which place the company has a line to Quebec City. Work was also started on a second line out of Toronto. About 100 miles of the Toronto-Ottawa line have been let to contractors.

Canadian Roads.—The charters granted to the Northern Empire Railway and the Manitoba & British Columbia have been taken over by a new company, of which Henry Roy, Edmonton, Alb., is the principal promoter. The capital of the company is $4,500,000. The plans call for a line in Alberta via Peace river crossing into Dawson, also for a line from McMurray to Fort Churchill on Hudson bay.

Cherryvale, Oklahoma & Southwestern.—According to press reports financial arrangements have been made and work is to be started at once on the first section of this line from Caney, Kan., south 100 miles. The route is through an oil and coal district of Oklahoma to the white oak lands, where the company expects to secure ties for the remainder of the road. Surveys are made for lines from Cherryvale, Kan., via Pawhuska, Okla., and Guthrie to Geary, 235 miles, as well as from Caney, Kan., to the Grand river, 78 miles. Bonuses have been granted by some of the towns in northern Oklahoma. S. M. Porter, Caney, is the principal promoter.

Chicago & North Western.—This company has work under way on branch lines as follows: From Manitowoc, Wis., on Lake Michigan, through Green bay, which is an important lake port, northwesterly via Gillett and Shawano to Eland junction; from Laona, Wis., north to Saunders, Mich.; Mercer, Wis., east to Fosterville. Two other short lines are now being extended, one from Antigo, Wis., east to Wolf river, and the other northwest from Mercer into the Presque Isle region, near the Michigan state line.

Chicago, Milwaukee & Puget Sound.—The Idaho & Western was recently incorporated in Idaho to build from Plummer, Idaho, northwest to Spokane, Wash. The projected route from Plummer is through the Coeur d'Alene reservation along the west side of the Coeur d'Alene lake to Mica, thence west to Spokane, 75 miles.

Denver & Gulf.—According to press reports this company, which was chartered several years ago, is to be built from Texhoma, Okla., northwest through Texas and Cimarron counties and through Colorado to Lamar, where connection is to be made with the Atchison, Topeka & Santa Fe. This line is to be built on an old survey made by the company through western Oklahoma. It is said that ties and steel are already bought. Another line is to be built southeast across the Panhandle of Texas. F. A. Upstead, president, Minneapolis, Minn.

Gilmore & Pittsburgh.—According to press reports this company has located 40 miles of its proposed line down the Salmon river. The plans call for a line from Armstead, Mont., west via Grant to Junction, Idaho, with a branch from Junction northwest to Salmon and another southeast to Gilmore. Contract let to the McArthur Brothers Construction Co., New York. G. H. Bacon, chief engineer, Machesney building, Pittsburgh, Pa. (June 11, p. 1229.)

Grand Trunk.—This company is said to have under consideration plans for building an extension from Grand Rapids, Mich., south to Kalamazoo, about 50 miles. The work is to be carried out during the coming summer.

Great Northern.—Work on the coast section of the Vancouver, Victoria & Eastern, which will cross the Hope mountains in British Columbia, via the Coquehella divide to the Similkameen extension from Princeton, it is said will be started next spring. It is understood that bids will be asked for the work soon. (Dec. 24, p. 1261.)

Green County Railroad.—An officer writes that this company was chartered in Pennsylvania in May, 1902, since which time surveys have been made and permanent location adopted, but no construction work has been done. A charter was recently taken out in West Virginia for a branch of this company, projected from Waynesburg, Pa., down Dunkard's creek to its mouth, for the purpose of maintaining the rights of the company. S. D. Brady, Parkersburg, W. Va., may be addressed.

Hornell-Bath (Electric).—The New York Public Service Commission, Second district, has granted this company a certicate of public convenience and necessity to build an electric line from Hornell, N. Y., east to Bath, 24 miles. C. Adsit, C. H. Armsted and J. M. Finch, Hornell, and J. F. Turk, Hammondsport, are directors. (Dec. 3, p. 1107.)

Idaho & Washington Northern.—A contract is said to have been let to Grant, Smith & Co., Spokane, Wash., to extend this road from Ione, Wash., north to Metaline, about nine miles. Steel has been ordered for the bridge to be built over the Pond O'Reille river. (Dec. 24, p. 1,261.)

Idaho & Western.—See Chicago, Milwaukee & Puget Sound.

Illinois Traction.—Work is now under way on an extension from Seneca, Ill., east to Morris. The line is ultimately to be extended northeast via Joliet to Chicago. An extension is to be built from Streator southwest to Peoria to connect with the lines on the southern end of the system. Work has been under way for some time on a bridge over the Mississippi river from East St. Louis, Ill., to St. Louis, Mo., and on large terminals. The company now operates about 500 miles of electric lines in Illinois. It is understood that during 1910 improvements will be made straightening curves and reducing grades.

Kansas City, Ozarks & Southern (Electric).—An officer writes that this company recently finished work on eight miles from Bryant river, Mo., to Ava. Plans made for an extension from Ava, southeast, also for another line southwest from Ava. (Nov. 5, p. 894.)

Marshall & East Texas.—See St. Louis & San Francisco.

Mexican Roads.—The San Jose Lumber Co. has graded 30 miles of a narrow-gage line from Santiago bay on the Pacific coast of Mexico, to the San Jose de la Rosa timber tract in the state of Colima. Track laying is to be started about January 15. The line is to be extended through agricultural districts, and is to have a total length of 120 miles. J. H. Clark, chief engineer, Manzanillo. (Oct. 29, p. 828.)

Niagara Falls, Welland & Dunville (Electric).—Application has been made to the Canadian parliament to build an electric line from Niagara Falls, Ont., via Allenburg, thence along the east side of the Welland canal to Port Robinson, through Welland and the Air Line Junction, thence west to Dunville, in all about 50 miles. F. S. Buell, of Buffalo, N. Y., is interested.

Norfolk & Western.—An officer writes that work was started during 1909 double-tracking 46.3 miles of this road in Ohio, and a large part of this is now in operation. The rest of the work is now in progress and will be finished on 18.3 miles between Waverly and Higby and on 14 miles between Delano and Gregg this spring. On both these sections considerable track has recently been laid and is now being

operated. During 1910 double-tracking work will be carried out in Ohio as follows: Between Iron Rock and Wheelersburg, 13.3 miles, which will complete a continuous double-track from the Ohio river crossing to Davis; between Davis and Waverly, 22.6 miles; between Renick and Delano, 5.8 miles, and between Gregg and Cromley, 5.00 miles, a total of 46.7 miles. When all these improvements are finished the road will have a continuous double-track in Ohio between the Ohio river bridge and Columbus.

NORTHERN PACIFIC.—According to press reports plans are under way to build extensions to complete a new line to shorten the distance from Spokane, Wash., to Tacoma and Seattle, about 100 miles. Preliminary surveys are said to be under way for an extension of the Ritzville branch, which is to be built from Ritzville, in Adams county, west to a crossing of the Connell Northern, building from Connell, north to Adrain. The Ritzville line is to be extended further west and will probably join the existing line at Ellensburg in Kittitas county, about 100 miles west of Ritzville. (Oct. 29, p. 828.)

OKLAHOMA ROADS.—Major E. C. Gordon is back of a project to build a line from Chickasha, Okla., northwest to Liberal, Kan. Bonuses have been secured from Weatherford, Anadarko and Chickasha for building 90 miles south of the Canadian river.

OSAGE & WESTERN.—According to press reports the proposed route is from the Missouri, Kansas & Texas at Vinita, Okla., west to Bartlesville, thence westward through Pawhuska and Ponca City to Enid. R. H. Hoss, president, Fairfax, Okla.; C Walters, vice-president and general manager, and E. J. Noonan, locating engineer, both of Muskogee, Okla. (Nov. 5, p. 895.)

OTTAWA, RIDEAU VALLEY & BROCKVILLE.—Application will be made to the Dominion parliament for incorporation to build from Ottawa, Ont., south to Brockville, 60 miles, and to operate a ferry service across the St. Lawrence river from Brockville to Morristown, N. Y. The plans include an extension from Ottawa north to High Falls, Que. D. H. McLean, Ottawa, is solicitor.

PANAMA RAILROAD.—See Panama Roads.

PANAMA ROADS.—According to a consular report a proposition has been made to the Isthmian Canal Commission to build a line from the city of Panama west to David, in the province of Chiriqui, 274 miles, the material and rolling stock to be furnished from the second-hand plant equipment of the Isthmian Canal Commission. The work is to be carried out either by the canal commission or by the Panama Railroad Company.

QUEBEC CENTRAL.—Work on the extension of this road from St. George, Beauce, Que., to Ste. Justine, Dorchester county, is almost finished. It is expected that the line will be put in operation this month. This is to be the first section of a branch to be built towards the Temiscouta Railway, which is 140 miles from St. George. (Oct. 16, p. 1177.)

ST. LOUIS & SAN FRANCISCO.—According to press reports the Marshall & East Texas, which now extends from Winnsboro, Tex., southeast via Marshall to Blocker, 84 miles, is to be extended and used by the Frisco interests as part of a through line from St. Louis, Mo., to southern Texas and Louisiana. The plans include an extension from Paris south to Winnsboro, 50 miles, also an extension from Marshall south about 125 miles to the Orange & Northwestern at Newton.

SOUTHERN.—According to press reports plans are being made to build a line over a new route between Parrish, Ala., and Birmingham. It is expected to have the line in operation in about six months.

VANCOUVER, VICTORIA & EASTERN.—See Great Northern.

WINONA INTERURBAN.—An officer writes that work has been started on the connecting line to close the gap between Mentone, Ind., and Peru. It is expected to have the work finished and cars in operation by the middle of January, 1910. The completion of this line will provide a route for through service from Chicago and points north to Indianapolis as well as through the state of Indiana to Ohio and Kentucky over interurban lines.

Railway Financial News.

CHICAGO GREAT WESTERN.—J. P. Morgan & Co., New York, have sold $18,500,000 first mortgage 4 per cent. bonds of 1909-1959 of the Chicago Great Western. The bonds were offered for subscription at 92.

CINCINNATI, HAMILTON & DAYTON.—Holders of certificates of deposit of the collateral trust 4½ per cent. notes have been notified that they have until January 26 the privilege of dissenting to the terms of exchange given in the reorganization plan of May 24, 1909. Unless holders of 50 per cent. of the notes dissent from the plan it will be binding on all depositors.

DELAWARE, LACKAWANNA & WESTERN.—See an item in regard to the Delaware, Lackawanna & Western Coal Co. under General News.

DETROIT, TOLEDO & IRONTON.—The Central Trust Co., New York, has asked for the appointment of receivers and the sale of the Detroit, Toledo & Ironton, because of default in payment of interest on the $4,500,000 Ohio Southern division bonds. The property is now being operated by receivers appointed after a default in interest on the consolidated mortgage 4½ bonds in February, 1908.

NEW YORK CENTRAL & HUDSON RIVER.—This company has applied to the New York Public Service Commission, Second district, for permission to buy $5,000,000 4 per cent. first preferred stock of the Geneva, Corning & Southern and to issue $5,000,000 N. Y. C. & H. R. 4 per cent. debenture bonds of 1904-1934 in payment therefor. The agreement under which the Central leases the Geneva, Corning & Southern provides that dividends of 4 per cent. shall be guaranteed on the preferred stock of the G., C. & S. by the Central.

NORFOLK & SOUTHERN.—J. W. Van Dyke and others have filed a petition to prevent the delivery of the property of the Norfolk & Southern to the reorganized Norfolk & Southern Railway Co., alleging that the delivery should be made to the petitioners under contract made by the Norfolk & Southern reorganization committee, which provided for $14,000,000 new bonds to replace old securities. The property was bid in for $8,500,000 at foreclosure sale recently by Rathbone Gardner.

PACIFIC & IDAHO NORTHERN.—This road has been reorganized and the following have been elected directors: Edgar M. Heigho, Dr. J. R. Numbers and A. L. Wiley, all with office at Weiser, Idaho; W. H. Truesdale and Samuel Norris, with office at New York.

PORTO RICO RAILWAYS.—The directors have declared an initial quarterly dividend of 1¾ per cent., payable January 10, on the $500,000 preferred stock.

SAN PEDRO, LOS ANGELES & SALT LAKE.—Of the $60,000,000 new first mortgage bonds authorized by stockholders December 21, $48,000,000 are to be issued in the near future. Of these bonds, $40,000,000 are to be used to refund outstanding bonds, $6,000,000 to pay off floating indebtedness, and the remainder for improvements, among which are new shops at Las Vegas, Nev. The bonds were not offered to the public but were taken jointly by President W. A. Clark and the Oregon Short Line.

SOUTHERN PACIFIC.—Of the $76,000,000 preferred stock issued, $74,451,800 has been converted into an equal amount of common stock and the remainder has been redeemed or canceled.

WABASH.—The directors have declared semi-annual dividends of 3 per cent. on the debenture A bonds and 2 per cent. on the debenture B bonds. These dividends were payable January 1. In 1909 6 per cent. annually was paid on the debenture A bonds and 2 per cent. annually on the debenture B bonds.

The government of Chili is said to be considering the electrification of the state railways, one of the arguments advanced for this electrification being the abundant supply of water power, which can be used for generating the electricity.

Supply Trade Section.

Redmond & Co., New York, bankers and security brokers, have opened an office in the new Redmond building, 624 Fifth avenue, New York.

Charles A. Fisher, formerly assistant auditor and assistant treasurer of the Jones & Laughlin Steel Co., Pittsburgh, Pa., becomes treasurer of that company, effective January 1, vice J. B. Laughlin, resigned.

The Isthmian Canal Commission will receive bids until January 24 on steel rail sections, steel shafts, manganese steel chute for rock crushing plant, steel cable, pulsometer pumps, liquid compasses, etc. (Circular No. 551.)

F. Elon Cooper has been appointed manager of the railway department of J. A. & W. Bird & Co., Boston, Mass., with headquarters at the New York office of the company, 31 Union square. Mr. Cooper succeeds C. E. Hoover, who has resigned to go into business for himself.

Frank B. Smith, president of the Crucible Steel Co. of America, Pittsburgh, Pa., died suddenly on December 30 at his home in Sewickley, Pa. At a special meeting of the executive committee held on December 31, Herbert du Puy was elected president to fill the vacancy caused by the death of Mr. Smith.

Geo. L. Kippenberger, for seven years purchasing agent of the St. Louis Car Co., St. Louis, Mo., has resigned that position and since January 1 has been connected with the Forsyth Bros. Co., Chicago. Mr. Kippenberger served as purchasing agent for the American Car Co., St. Louis, Mo., for eleven years before going to the St. Louis Car Co.

The Metropolitan Inspection Bureau, Ft. Dearborn building, Chicago, whose organization was mentioned in the *Railway Age Gazette* of November 19, advises that business is developing satisfactorily. D. W. Schreck, the organizer, has had wide experience as a carpenter, car builder, master mechanic, inspector, superintendent and chief inspecting engineer with a number of companies.

Pursuing the custom established three years ago, the American Blower Co., Detroit, Mich., on Christmas presented each of its employees with a sum, in crisp new dollar bills, equal to the years of their continued service with the company. Accompanying the money was given an illustrated booklet containing a short historical sketch of the company, of which the employees form such an important part.

The American Car & Foundry Co., Railway Exchange, Chicago, has for sale 1,000 forty-ton capacity wooden gondola cars, equipped with cast steel body and truck bolsters, air-brakes, etc. The cars are in first class condition and are ready for immediate delivery. The same company also has for sale twenty-five 87-ton consolidation locomotives about three years old in first class condition and ready for immediate delivery.

Aaron Dean, Jr., formerly western manager of the Federal Signal Co., Albany, N. Y., with headquarters at Chicago, Ill., has been appointed general manager, with headquarters at Albany. H. H. Cade, formerly superintendent of construction, with headquarters at Chicago, has been appointed resident manager, with headquarters at Chicago. C. Henze has been appointed superintendent of construction, with headquarters at Albany.

The Pittsburgh Testing Laboratory, Pittsburgh, Pa., has just purchased property at the corner of Seventh and Bedford avenues, Pittsburgh, on which a five-story fireproof office and laboratory building will be erected during the present year. This new building has become necessary in order to handle the rapidly increasing business of the company. Branch offices at Birmingham, Ala., and Pueblo, Colo., have been established during the past year.

Milliken Brothers, Inc., New York, which placed its affairs temporarily under the protection of the federal courts on June 11, 1907, has now had the receivership terminated. The entire plant and all its assets have been restored to the company. The new officers and board of directors are as follows: E. C. Wallace, president; G. G. Thorne, G. W. McGarrah, E. C. Wallace, A. A. Fowler, C. M. Lewis, W. B. Parsons and C. H. Zehnder, directors. Francis Dykes will be general manager.

N. E. Whitaker, president of the Tyler Tube & Pipe Co., Washington, Pa., died at his home in Wheeling, W. Va., on December 27, after two days' illness of pneumonia, at the age of 71 years. Mr. Whitaker had been prominent in the iron, steel and tin business for over 50 years. He was also president of the Whitaker-Glessner Company, operating the Crescent Iron Works at Wheeling and a nail and sheet plant at Martins Ferry, Ohio, and also a tinplate galvanizing and roofing plant at Wheeling. He was also president of the Portsmouth Steel Co., Portsmouth, Ohio. Mr. Whitaker was also prominent in politics and the political life in West Virginia. He was not only a member of, but was president of the senate for a number of years, and also president of the West Virginia Commission to the Louisiana Purchase Exposition.

Due to the appointment of H. M. Sperry as sales manager of the General Railway Signal Co., Rochester, N. Y., as mentioned in these columns on December 24, M. R. Briney becomes resident manager at New York. Mr. Briney was born at Paxton, Ill. In 1892 he entered the service of the Hall Signal Co., New York, in the construction department. In 1894 he entered railway service with the Chicago & North Western, having charge of construction and maintenance in the signal department. In 1899 he became traffic agent of the Bell Telephone Co., Chicago, and in 1900 he became manager of the Alton Telephone Exchange, Alton, Ill. In 1901 he was made general foreman of the construction department of the Taylor Signal Co., Buffalo, N. Y., and from 1903 to 1906 he was superintendent of construction for the Taylor Signal Co. and also the General Railway Signal Co. at Chicago. In 1906 he became vice-president of the Bryant Zinc Co., New York, and in 1909 entered the employ of the General Railway Signal Co. as construction manager, which position he has held up to the time of his recent appointment.

TRADE PUBLICATIONS.

Buda Calendar.—The Buda Co., Chicago, has distributed a 1910 calendar that is large and attractive, the advertising being limited to small photographs of Buda products on the calendar pad.

Locomotive Erecting Shops.—The Arnold Co., Chicago, has mailed postcards showing four photographs entitled "Half a Mile of Locomotive Erecting Shops." The company in five years has built 12 plants having over a mile of erecting shops and over two miles of erecting pits.

RAILWAY STRUCTURES.

ALTAIR, TEX.—The San Antonio & Aransas Pass is to build a bridge over the Colorado river. The structure will be all steel, having a truss span of 275 ft., two girder spans of 40 ft. and 60 ft., respectively, and 200 ft. of ballasted deck trestles.

ALVIN, TEX.—Work is said to have been started by the Gulf, Colorado & Santa Fe on a new passenger station in Alvin.

DUBOIS, PA.—The Buffalo, Rochester & Pittsburgh will soon start work on the construction of a storage reservoir, with earth fill dam and concrete core wall, on Kyle Run, near Dubois, to supply the Dubois terminal with a continuous gravity supply of pure boiler water. The dam will be 35 ft. high and 1,000 ft. long, and will have a capacity of 500,000,000 gals. The feed line will be 12-in. cast iron pipe, four miles long. Work has recently been finished on a reservoir with a capacity of 100,000,000 gals. for supplying the engine terminal at Punxsutawney, Pa., with pure boiler water.

GALVESTON, TEX.—The Galveston, Houston & Henderson is

building a 14-stall reinforced concrete roundhouse and expects to build a 50-ft. x 120-ft. machine shop soon.

It is thought that the Gulf, Colorado & Santa Fe will spend about $250,000 during 1910 on the proposed new roundhouse, machine shops and turntable. (Oct. 1, p. 616.)

LAS VEGAS, NEV.—See San Pedro, Los Angeles & Salt Lake under Railway Financial News.

LONDON, ONT.—The Canadian Pacific is said to have under consideration the question of putting up a new roundhouse in London this coming spring, also to enlarge its yards.

MARISCAL, MEX.—The Pan-American has applied to the Guatemalan government for permission to build an international bridge over the Suchiate river near Mariscal, Mex. A temporary structure is to be put up pending the construction of a steel bridge.

MONTREAL, QUE.—The Grand Trunk has plans under way for a freight station in the east end to be used at a later time by the Grand Trunk Pacific. To carry out these plans permission has been asked to close the ends of Demontigny, La Fontaine and Logan streets. The proposed station is to be built on St. Catherine street, between Harbor and Frontenac streets. The Lachine, Jacques Cartier & Maisonneuve Railway, a subsidiary of the Grand Trunk, has been granted permission to extend its line through the north and east end of the city, and to close certain streets to reach the site of the proposed freight station on St. Catherine street.

Excavation work is now under way for the foundation of the extension to the Canadian Pacific station on Windsor street. The Foundation Co., New York, and the Bishop Construction Co., Montreal, are the contractors.

OMAHA, NEB.—The Union Pacific has authorized the building of an office building, to be 97 ft. x 177 ft. and 12 stories high. The city ticket offices will occupy the first floor and the remaining floors will be used for the general offices. Jarvis Hunt, Chicago and New York, is the architect, and the building is estimated to cost $1,000,000.

PFLUGERVILLE, TEX.—The Texas State Railway Commission is said to have ordered the Missouri, Kansas & Texas to submit plans within 30 days for a passenger station at Pflugerville.

POINT PLEASANT, W. VA.—It is understood that the Kanawha & Michigan will make improvements to the Point Pleasant bridge over the Ohio river at a cost of $100,000.

SACRAMENTO, CAL.—According to press reports a bridge is to be built over the Sacramento river, to cost about $160,000, at Sacramento. The bridge is to be constructed with a roadway for the Southern Pacific and an overhead structure for highway traffic. The cost is to be borne by the railway company and Sacramento and Solano counties.

ST. LOUIS, MO.—The St. Louis Transfer Co. has opened its new in-bound freight station, which will be used by the Toledo, St. Louis & Western and the Alton lines. The building is 125 ft. wide and 400 ft. long.

Extensive improvements, including the laying of new rails and replacing old bridges with new steel structures, are being made by the Missouri Pacific. Contracts for bridges have been let to the McClintic-Marshall Construction Co. as follows: Eastern division, main line, one beam and 17 plate girder spans for 15 bridges; River line, two girder spans for two bridges; Lexington branch, 12 girder spans for five bridges; Omaha division, two crossings of the Platt river of 20 and 22 spans of 60-in. deck plate girders, and two plate girder spans; Joplin division, 18 plate girder spans for 11 bridges and one through riveted span; Northern Kansas division, one beam span and 13 plate girder spans for seven bridges; Southern Kansas division, three plate girder spans; Central Kansas division, two plate girder spans; Wichita division, 15 plate girder spans for nine bridges; Missouri division, nine plate girder spans for seven bridges; Belmont branch, 23 plate girder spans for 13 bridges; Herrin branch, 15 plate girder spans for eight bridges; White River division, four 60-ft. plate girders for a bridge, and the Black river crossing consisting of a 270-ft. draw span, with one plate girder approach span; Memphis division, White river crossing, a duplicate of the Black river draw span with one 165-ft. truss and two 60-ft. plate girder approach spans.

Late News.

The items in this column were received after the classified departments were closed.

The Pennsylvania is replacing some old machinery in its Altoona shops.

The Barrett Mfg. Co., New York, is in the market for from 50 to 75 tank cars.

The St. Louis, Brownsville & Mexico is in the market for from 30 to 50 forty-ton gondola cars.

The Norfolk & Western is reported in the market for 3,000 freight cars. This item is unconfirmed.

The Ashland Coal & Iron Co., Ashland, Ky., has ordered one locomotive from the Baldwin Locomotive Works.

The Cincinnati, Hamilton & Dayton is taking prices on 1,000 steel underframe Ingoldsby automatic cars.

The New York, Chicago & St. Louis is in the market for 1,000 all-wood 30-ton box cars and 1,000 all-wood 40-ton gondolas.

The Pere Marquette is reported to be in the market for 1,000 or 2,000 all-steel 50-ton gondolas. This item is unconfirmed.

The Chesapeake & Ohio is said to have ordered 1,000 freight cars from the Standard Steel Car Co. This item could not be confirmed.

The Carolina, Clinchfield & Ohio has ordered 12 seventy-foot steel underframe coaches from the Hicks Locomotive & Car Works.

According to press reports the Denver & Rio Grande is planning to complete the double-track on its line from Denver, Colo., south to Pueblo.

The Atlantic Coast Line is said to have ordered the 300 flat cars, mentioned in the *Railway Age Gazette* of November 26, from Barney & Smith. This item is unconfirmed.

The Chicago, Burlington & Quincy expects to buy new machine tools for the West Burlington, Iowa, shops within a few months. A heavy crane may also be added to the equipment.

The American Steel Foundries has let a contract for two additional buildings at its Indiana Harbor, Ind., plant. The foundry will be 118 ft. x 620 ft., and the brick storehouse will be 54 ft. x 100 ft.

Following the resignation of Daniel Willard, second vice-president of the Chicago, Burlington & Quincy, in charge of operation, Darius Miller, first vice-president, has been given charge of all departments.

The Railway Specialty & Supply Co., Monadnock block, Chicago, manufacturers of the P. & M. rail anchor and other railway devices, announce the appointment of Fred A. Preston as general sales agent.

A press despatch from New Westminster, B. C., says that work has been begun on the first gyroscope railway in America. It will encircle Okanagan lake. Branches will be run to points where business warrants.

Directors of the Cleveland, Cincinnati, Chicago & St. Louis have declared a semi-annual dividend of 2 per cent. on the common stock, payable March 1. The last previous dividend was 1 per cent. declared in March, 1908.

C. B. Seger, auditor of the Southern Pacific and the Corvallis & Eastern at San Francisco, Cal., has been appointed general auditor of the Southern Pacific, the Union Pacific, the Oregon & Washington, the Oregon Railroad & Navigation Company and the Oregon Short Line, succeeding Erastus

Young, retired. The general auditing department will be transfered to Chicago from Omaha. A. D. McDonald, secretary and auditor of the Pacific Electric Railway at Los Angeles, Cal., succeeds Mr. Seger.

T. B. Akridge, chief clerk in the traffic department of the Georgia & Florida, has been appointed general freight agent, and Charles H. Gattis has been appointed general passenger agent, both with offices at Augusta, Ga.

The Duluth, Missabe & Northern has ordered 1,000 ore cars divided between the Summers Car Company, Pressed Steel Car Co. and the Clark Car Co. The number and division is the same as for the Duluth & Iron Range order mentioned above.

The Fostoria, Napoleon & Defiance has been incorporated in Ohio with $100,000 capital to build an electric line through Seneca, Wood, Hancock, Henry and Defiance counties. The incorporators include: W. S. Reece, R. T. Betts, C. A. Aten, G. Schrock and C. A. Bliss.

According to a press despatch from Minneapolis the Chicago, Milwaukee & St. Paul is confronted with a serious shortage of coal at all points in that region, and this is true both of the retail dealers and of the coal bins of the railway company itself. The despatch indicates that a scarcity prevails on the other lines as well.

A press despatch from Chicago says that the representatives of the western railways there, after protracted negotiations with the switchmen have agreed with the brotherhood leaders to submit the whole question of pay and working conditions to the government arbitrators, Chairman Knapp and Commissioner Neill.

The Allis-Chalmers Co., Milwaukee, Wis., report the following recent sales of machinery: American Steel Foundries, East St. Louis, an additional generating unit, consisting of a tandem compound non-condensing engine, cylinders 16 in. and 26 in. x 36 in., direct-connected to a 300-k.w., 250-volt, d.c. generator; Southwest Missouri Railway, Webb City, Mo., six two-motor, double-end, railway equipments, together with controllers, wiring, etc., motors being of the interpole type; Waterloo, Cedar Falls & Northern, Waterloo, Iowa, 35 panels of switch board equipment; Jones & Laughlin Steel Co., Pittsburgh, Pa., a vertical steeple cross-compound blowing engine, in addition to the 10 already installed by this company.

Governor Hughes, of New York, in his annual message, sent to the legislature last Wednesday, renews his recommendation that the telegraph and telephone companies be put under the Public Service Commissions law, on the same basis as railway companies. The governor announces that Mrs. Edward H. Harriman has offered to give to the state 10,000 acres of land in Orange and Rockland counties for a state park. Mrs. Harriman also offers a million dollars to be used in making additions and improvements to the park, and the governor announces that individual citizens of New York, New Jersey and Philadelphia have subscribed $625,000 for the Palisades park. The Palisades park enterprise is in the hands of a joint state commission of the states of New York and New Jersey, and this and the proposed Harriman park are treated as a single enterprise.

In the United States circuit court of appeals at Chicago last Tuesday, Judges Grosscup, Baker and Seaman decided that the federal hours-of-labor law, fixing nine hours as the day's work for a telegrapher in a railway office kept open continuously, does not mean that the nine hours shall be consecutive. This reverses a decision of the lower court, Judge Landis, in the case of the Atchison, Topeka & Santa Fe, which was tried last April. It appears that it has been a regular thing on the Atchison for day operators to work 12 hours with three hours out at noon, and night operators 12 hours with three hours out at midnight. Judge Landis held this to be a violation of the law. Judge Grosscup says that the statute was enacted in view of the customs of the land, and that our customs do not include such an intermission as a part of the working hours. The case was remanded to the lower courts and a new trial ordered.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago & North Western has ordered 25 consolidation locomotives from the Baldwin Locomotive Works.

The British Columbia Electric is said to be considering the purchase of motive power early next spring. This item is not confirmed.

The St. Louis Southwestern, as mentioned in the *Railway Age Gazette* of December 3, has ordered six ten-wheeled freight locomotives and 10 consolidation freight locomotives from the Baldwin Locomotive Works.

General Dimensions.

	10-wheel.	Consolidation.
Weight on drivers	145,000 lbs.	173,000 lbs.
Total weight	185,000 lbs.	195,000 lbs.
Diameter of drivers	54 in.	48 in.
Driving wheel base	13 ft. 2 in.	16 ft.
Engine wheel base	24 ft.	24 ft. 6 in.
Water capacity	8,000 gals.	8,000 gals.
Coal capacity	15 tons.	15 tons.

The Atlanta, Birmingham & Atlantic, as mentioned in the *Railway Age Gazette* of December 3, has ordered two 2-8-2 locomotives from the Baldwin Locomotive Works.

General Dimensions.

Weight on drivers	200,000 lbs.
Total weight	260,000 lbs.
Cylinders	25 in. x 32 in.
Diameter of drivers	57 in.
Working steam pressure	170 lbs.
Boiler, type	Wagon top
Boiler, diameter	78¾ in.
Firebox, length	108 "
Firebox, width	78 "
Tubes, number	463
" outside diameter	2¼ in.
" length	19 ft.
Total heating surface	536.6 sq. ft.
Grate area	58.5 "
Water capacity	7,000 gals.
Coal capacity	14 tons

The Duluth & Iron Range locomotives, ordered from the Baldwin Locomotive Works, as previously reported in the *Railway Age Gazette*, will have the following general dimensions and special equipment:

General Dimensions.

Weight on drivers	176,600 lbs.
Total weight engine	198,850 "
Total weight engine and tender	338,000 "
Cylinders	22 in. x 28 in.
Diameter of drivers	54 in. (out), 48 in. (centers)
Type of boiler	Straight
Working steam pressure	200 lbs.
Heating surface, tubes	2,696 sq. ft.
" " firebox	168 "
" " total	2,864 "
Tubes, number	321
" outside diameter	2 in.
" length	16 ft.
Firebox, type	Wide
" length	108 in.
" width	66 in.
" material	Steel
Grate area	49.5 sq. ft.
Water capacity	7,000 gals.
Coal capacity	11 tons

Special Equipment

Boiler lagging	Asbestos
Brakes	Westinghouse
Brake-shoes	Armburst
Brick arch	Hollow
Headlight	Schroeder
Injector	Nathan
Journal bearings	Phosphorus bronze
Piston and valve rod packings	Jerome
Safety valve	Ashton
Sanding devices	Leach
Sight-feed lubricators	Nathan
Steam gages	Ashton
Valve gear	Walschaerts

CAR BUILDING.

The Ann Arbor is said to have ordered 1,000 freight cars, 500 of which are to be steel gondolas. This item is not confirmed.

The British Columbia Electric is said to be considering the purchase of rolling stock early next spring. This item is not confirmed.

The Cincinnati, Hamilton & Dayton, reported in the *Railway Age Gazette* of December 24 as asking prices on 15,000 freight

cars, writes that the company is not in the market for this equipment.

The Duluth & Iron Range, reported in the *Railway Age Gazette* of December 24 as having ordered 1,000 ore cars, has divided this equipment as follows: Pressed Steel Car Co., 150 cars of its own design and 100 cars of the Clark design; Standard Steel Car Co., 750 cars of the Summers design.

MACHINERY AND TOOLS.

The Chicago, Burlington & Quincy is in the market for 30 or 40 machine tools.

The Galveston, Houston & Henderson expects to build a machine shop, 50 ft. x 200 ft., at Galveston, Texas.

The Oregon Short Line has issued a list of 54 machine tools for the Ogden, Pocatello, Salt Lake City and Sparks shops.

The Sandwich, Windsor & Amherstburg, Windsor, Ont., Canada, will probably place contracts in a few days for two 500-k.w., three-phase, direct-connected alternators, and two 750-h.p. engines.

IRON AND STEEL.

The Baltimore & Ohio is in the market for 70,000 tons of rails.

The Missouri Pacific rail requirements for 1910 include 100,000 tons of 85-lb. to 100-lb. sections, ordered from the Carnegie Steel Co. and the Illinois Steel Co.

The Maryland Steel Company have under construction open hearth furnaces for their rail mill at Sparrows Point, and will be ready to deliver open hearth rails during May, 1910.

The Buffalo, Rochester & Pittsburgh has placed orders for 6,000 tons of rails for early delivery, divided 2,000 tons each among the Bethlehem, Lackawanna and Carnegie Steel Companies.

General Conditions in Steel.—Chairman E. H. Gary, of the United States Steel Corporation, in a statement just issued, characterizes the outlook in the steel and iron trade for the year 1910 as firm and hopeful. During the month of December the combined bookings of the subsidiary companies of the corporation have been about 50,000 tons per day, while their capacity is only about 41,000 tons per day. The one concern at the mills is being able to satisfy customers in regard to deliveries. The first two weeks of January are not expected to see heavy buying, as stock-taking is still in progress. Current prices for steel when delivered will be the ruling hereafter, the deliveries up to December 31 being made on prices quoted when the contracts were made.

SIGNALING.

It is the intention of the Chicago Great Western to install automatic block signals between Forest Home, Ill., and Oelwein, Iowa, 235 miles of road. Of this about 75 miles is double track. There will be about 250 signals in all. Indications will be given by three positions in the upper right-hand quadrant. Work will not be started until frost is out of the ground in the spring. The company has in view also a considerable amount of single-track automatic block signaling in other territory. Bids have been asked for from the manufacturers, both for material alone and for installation. Whether or not the railway will do the work itself has not as yet been decided.

Dixon's Graphite Front End Finish.

The ordinary and usual treatment of locomotive front ends has a number of unsatisfactory features. It requires frequent renewal, which means cost of material and labor. Some of the material used is volatile, and when the engine is running and the front end becomes hot offensive fumes blow into the cab. In some cases these fumes effect the eyesight of the engineman.

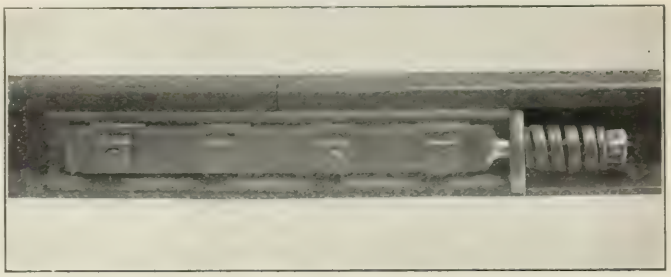
The Joseph Dixon Crucible Co., Jersey City, N. J., recommends its graphite engine front finish, which is said to give a service of from six to nine weeks at each application. It provides the engine front with a durable and attractive coating. The value of this finish is due chiefly to the flake graphite which forms its base. Flake graphite is said to be unaffected by heat or cold and it has durable polishing properties.

Fairbanks-Morse Gasoline Passenger Car.

The International Smelting & Refining Co., Tooele, Utah, has just received from Fairbanks, Morse & Co., Chicago, one of their motor cars for passenger service on the newly built line from Tooele. The car is of the same general type as the one recently sold by this company to the Pennsylvania, and which was fully described in the *Railway Age Gazette* of November 19, page 998. The car has a seating capacity of 35 passengers, and is equipped with a 50-60-h.p. engine of heavy type. Most of the features described in connection with the other car apply to this one. In this car, however, the vibration of the engine has been taken care of by mounting it on the truck frame while the car body is suspended on full elliptical springs.

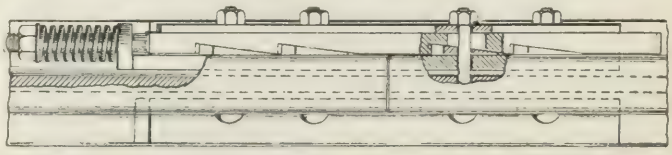
Heber Joint Tightener.

The principal of the Heber joint tightener is evident from the illustrations shown herewith. It is applied to a simple angle bar joint without any change, when the bolts are sufficiently long. A wedge is put over each bolt and a long key, with beveled recesses to slide on the wedges, runs the length



Heber Joint Tightener.

of the angle bar. The key is slotted for each bolt so as to give it longitudinal play. At the end of the key is a helical spring bearing against a stop, which in turn bears against the end of the angle bar on both web and flange. The tension of the spring takes up any wear tending to loosen the joint, so that the bolts are always holding the angle bars snugly against the rail. After the device is first applied and the nuts tightened up, it takes a few weeks for the wearing surfaces to find their proper bearing. The nuts can then be permanently set, the nut at the spring being used for adjustment; and it is



Plan, with Part Sections, of Heber Joint Tightener.

claimed that the joint will then last the life of the rail without further adjustment.

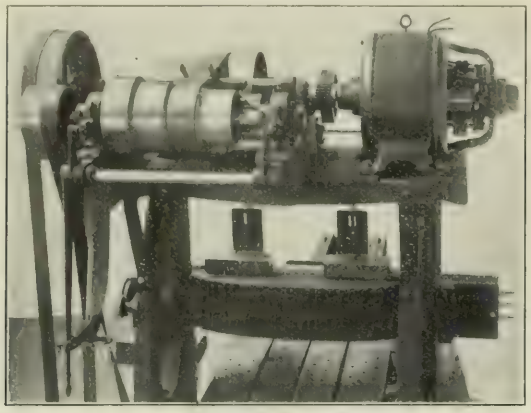
The claims for this device are as follows: The angle bars being held tightly to the rail, the stiffness of the joint is dependent only on the angle bar section; with a properly designed joint there will be no pumping. The fact that all joints are equally tight is an advantage in dealing with rail creeping problems. The contact between key, angle bar and rail is such that the joint has been successfully used in tracks electrified for automatic block signals without the use of bond wires. The improved track surface at the joints and the elimination of lost motion makes it particularly desirable on bridges or any track laid on a metal structure.

The joint is being tested in New York City in tracks of the New York Central & Hudson River and of the Interborough Rapid Transit. It is made by John Heber, New Martinsville, W. Va.

Recent Machine Tools.

Gray Patented Speed Variator.

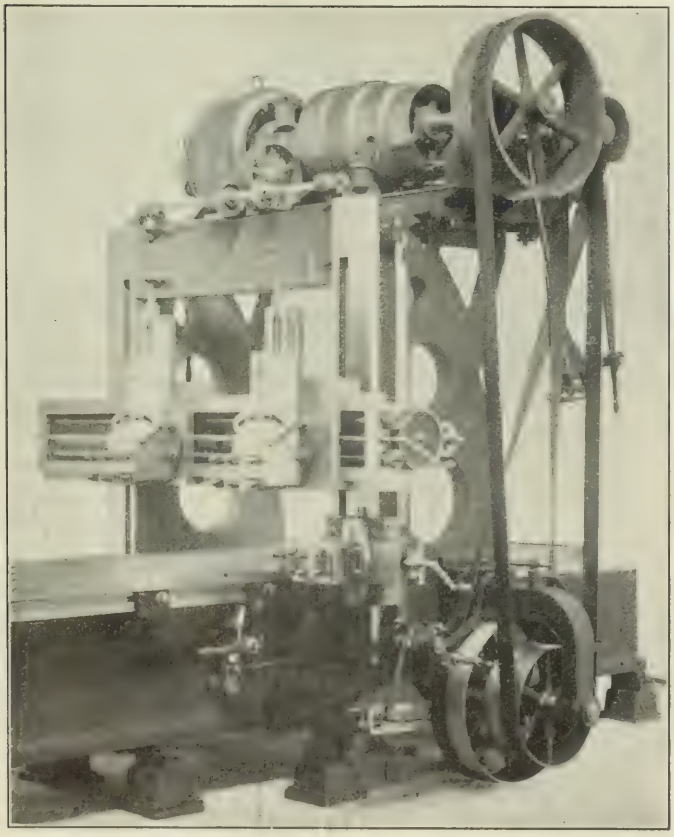
The accompanying illustrations show different views of the Gray patented speed variator. It consists principally of two inversely placed cones, one mounted on the constant speed shaft, on the end of which is the return pulley; the other mounted on the variable speed shaft, on the end of which is the cutting pulley. The constant speed shaft may be driven



Detail of Gray Planer with Speed Variator.

either by belt directly from the line shaft through a pair of tight and loose pulleys, or it may be geared to the motor shaft as illustrated, thus making an entirely self-contained motor-driven equipment. The variable speed shaft is driven from the constant speed shaft by belt.

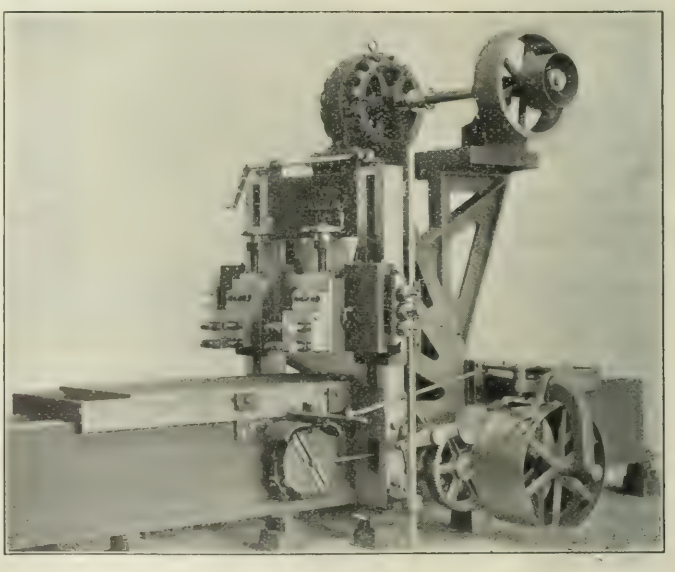
The speed is changed by merely turning the hand wheel at the side of the housing, and this shifts the belt from step to step of the cones. The variable speed shaft is moved to and from the constant speed shaft by means of the long tightening lever, which enables the operator to keep the belt at all times under proper driving tension. This lever also makes it possible to shift the belt when it is slack. The shoulders of the cone steps are beveled off so as to assist the shifting. The mechanism is arranged so that one end of the belt is shifted to the smaller step of one cone before the other end is shifted to the larger step of the other cone. There is thus practically no wear of the belt due to shifting. The hand wheel operates the duplex belt shifter by means of a cam mounted between the cones. Speed can be changed without stopping the motor, and this saves considerable time, since it eliminates the necessity of waiting for the armature and pulleys to come to rest. The momentum of the two cones, supplementing that of the heavy fly-wheel pulley, reduces the strain on the motor at the moment of reversal. The elimination of the usual complication of rapidly running gears not only insures an almost noiseless drive, but also does away with vibration which is found in the self-contained gear devices, especially after they have been in use some time and subjected to the severe duty imposed by planer service. The planers 42 to 56 in. have cutting speeds 22, 30, 37 and 45 ft. and return speed of 90 ft. per minute. This device is made by the G. A. Gray Co., Cincinnati, Ohio.



Gray Planer Fitted with Speed Variator.

Gray Switch and Frog Planer.

The machine here illustrated was designed by the G. A. Gray Co., Cincinnati, Ohio, for the very heaviest kind of switch and frog work. The characteristic features are its enormous power, weight and stiffness. The bed of the machine is 2 ft. deep and is stiffly cross-ribbed by box girders. The table is 32 in. wide and very heavy. It is gibbed under-



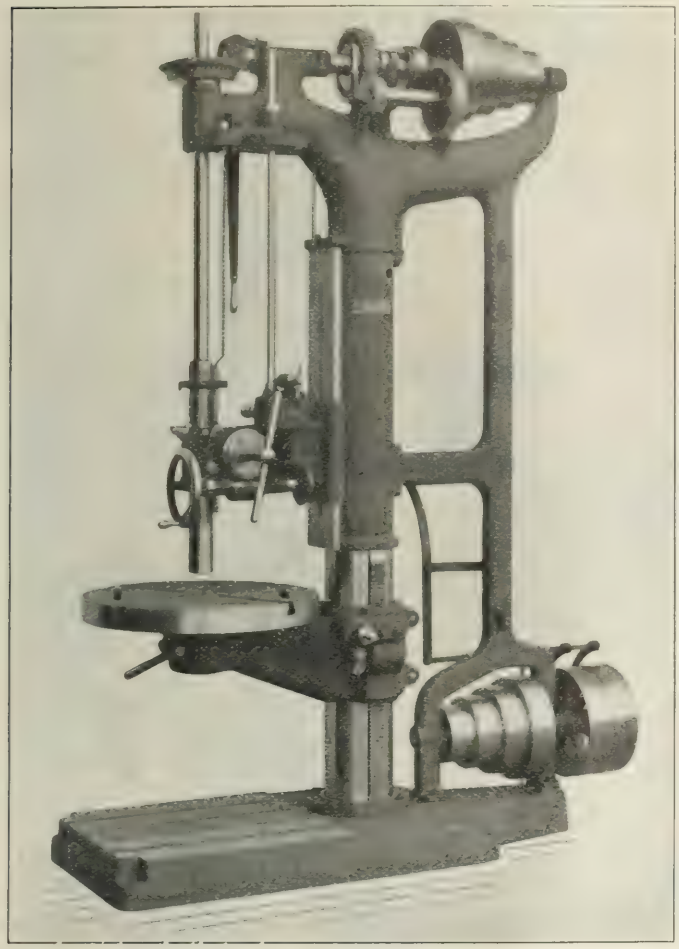
Gray Switch and Frog Planer.

neath, both on the front and rear sides, to prevent direct lifting. In addition to this it is supplied with vertical inside bearings extending the entire length of bed, to counteract the side thrust. It thus becomes impossible to lift the table under the heaviest cuts. The housings are of box form 10 in. wide where the cross-rail takes bearing, thus giving the necessary rigidity to resist the strain of the side tools, which are used almost exclusively for frog and switch work. The cross-rail is 18 in. wide and is double-gibbed; tht is, it is securely fastened to the housings or uprights not only by the regular set of gibbs, but also by an additional set which are bolted to the inside flanges. The saddles have a bearing 24 in. long on cross-rail. The tool boxes are 11 in. wide and have two heavy steel clamps held by 1¼-in. bolts. The gearing and rack are made of crucible steel cut from the solid. The bull wheel and rack are 9-in. face and 2-in. pitch. The driving pulleys carry wide belts. The backing pulley insures a smooth, quick return 4 to 1. The pulley shaft and first intermediate shaft bearings are located in the front housings, thus tying two shafts rigidly together; in fact, the entire driving mechanism

of the machine is rigidly bonded together so as to withstand the enormous strain due to heavy cuts in planing frog and switch rails.

Cincinnati Bickford Upright Drill Press.

Like some of the other large tool manufacturers of Cincinnati, the Bickford Tool Company has for some time concentrated its force and specialized in the manufacture of upright and radial drills only. The business of the concern has outgrown its present shops in the city and it has built in the new industrial suburb of Oakley a new shop, which is especially designed for the manufacture of drill presses. The designs for



Cincinnati Bickford Upright Drill Press.

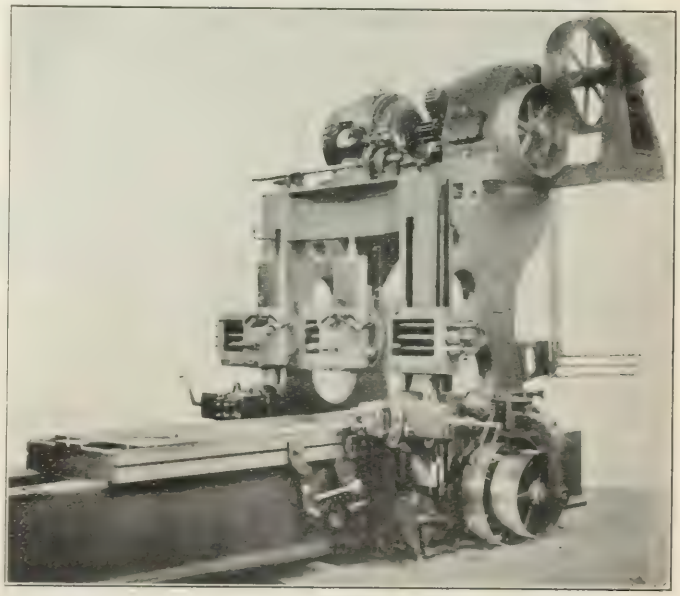
these machines are adapted to the high speeds now required for this class of tools, and they are capable of cutting at the rate of 70 ft. per minute. This is equivalent to 534 revolutions for a ½-in. drill or 267 revolutions for a 1-in. drill. The illustration represents the general design of the heavy pattern sliding head upright drilling machine, which is built in sizes from 24 in. to 42 in.

Among the special features of this design, for which is claimed particular advantage, are the instantaneous stop for the spindle without stopping the machine to make changes of chuck or drills, and the patent gear tapping attachment located directly on the spindle, one of the most important improvements which has been made in the construction of upright drills. The other details in the ordinary make-up of this drill press have been constantly improved, and the following description relates to some of these changes: The column is of large diameter, has a wide face for receiving the head and is supported by a strong back brace. The sliding portion of the column is finished by grinding and insures perfect alinement of the table at any position. The table arm is raised and lowered by means of a rack and pinion driven through a worm and wheel, which arrangement holds the arm in any desired position and makes an accident by dropping of the table impossible. The spindle is provided with ball bearing and jam nuts for adjustment and with an automatic stop, so that any number of holes can be drilled to a fixed depth. The patent positive gear feed box located on the sliding head provides six feeds, graduated in thousandths per revolution of the spindle, any one of which can be used with any speed of the spindle. The friction back gear is a distinctly new feature. It can be left in continuous engagement, and by means of a convenient handle it is placed in operation without stopping the machine. The same lever, when brought to a neutral position, furnishes a stop to the spindle, which has been found to be a most valuable arrangement. On the 42-in. drill the column is 10 in. in diameter and the diameter of the spindle sleeve is $3\frac{7}{16}$ in. The maximum speed of the spindle is 283 revolutions and the power required 3 h.p. The weight of the machine complete is 5,000 lbs.

Forty-two Inch Variable Speed Motor-Driven Forge Planer.

The Cincinnati Planer Company, Cincinnati, Ohio, makes a specialty of one kind of tool and concentrates its energies to the production of a high-class machine. Some of the principal features of its planer are described below.

The bed is made extra long so there is very little overhang of the table when planing full stroke. The table is gibbed underneath by an improved method which insures unusual stiffness. The holes in the table are drilled through so that dirt and chips will fall through and ledges are cast on each side of the Vs to prevent chips falling on the V bearings. The heads on cross rail are of a new shape, the end of the tool block and slide being made circular to avoid projecting corners on angular work. The power elevating device for cross rail is also of new design. It is located at center of arch, thus providing a third bearing for elevating shaft and equal distribution of pull. The shifter reverses without shock or jar, and disagreeable noise from the belts is avoided. The large gears and racks are made from semi-steel casting and the pinion is a steel forging. These planers are built with special reference to high speed steel and are capable of any speed which that material requires. For the return speed the company does not favor the excessive speeds used by some builders. A planer with return speed of more than 80 ft. per minute is subject to undue shock and wear and it is believed that a return of more than 100 ft. per minute will depreciate a machine twice as fast as one returning at 80 ft. A correct speed for all materials and conditions instantly available is the secret of modern planing economy. The 42-in. planer has six cutting speeds, 15, 20, 25, 30, 35 and 40 ft. per minute, with a constant return of 80 ft. For the maximum speed a 15-h.p. motor is required. A variable speed is one of the



Cincinnati Variable Speed Motor-Driven Forge Planer.

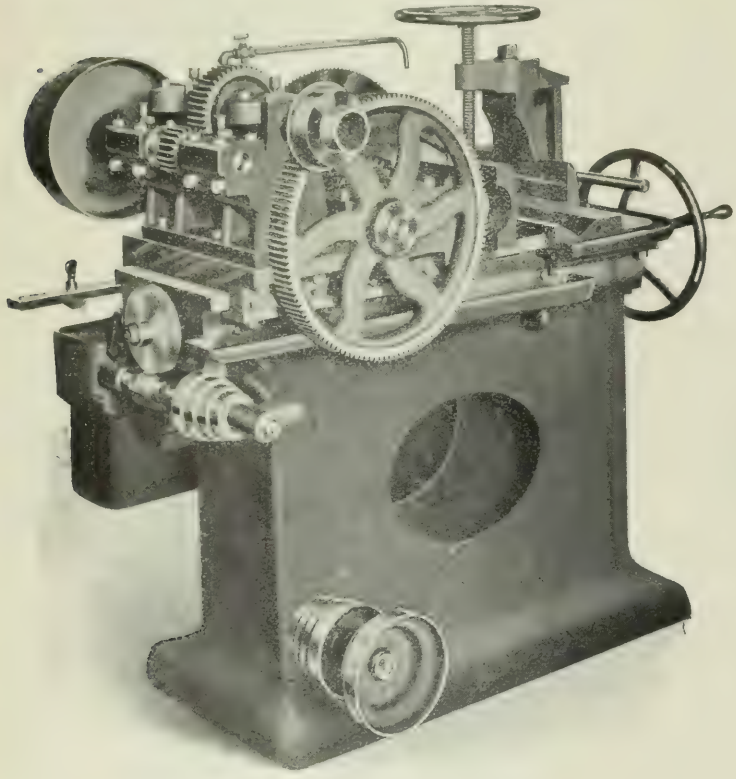
essential features of economy in modern practice, and there is no machine tool which will show a better saving of time than one so equipped. The variable speed used on these planers consists of a speed box mounted on top of the housing. It is completely enclosed and holds several gallons of oil. All the gears and driving hubs are submerged and subject to little or no wear and run noiselessly. This speed variator is adapted to either belt-driven or motor-driven planers. The changes of speed are made by simply moving one of the levers shown at the side of the machine, and the levers are so arranged that it is impossible to engage any two speeds at the same time.

Nutter & Barnes Cutting-Off Machine and Automatic Saw Sharpener.

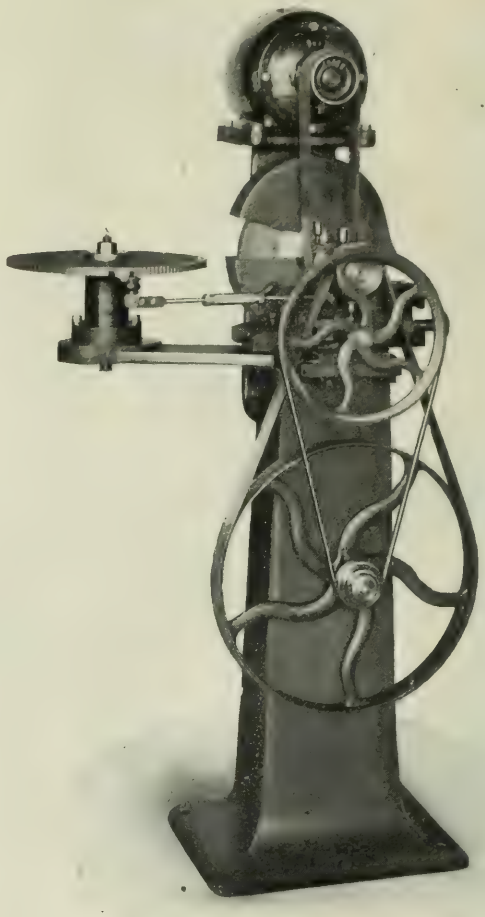
The machine tool builders and those using the harder grades of steel, and especially tool steel, require a form of cold saw which is better than the ordinary ones used for rough bars. The Utter & Barnes saw, which is here illustrated, is well adapted to this purpose and is quite largely used by the tool builders. The special spur-gears in the drive in preference to a worm-wheel drive are used for the purpose of saving the large amount of power which would be otherwise lost in friction. It also enables the use of a small diameter thin saw to cut large bars, thus decreasing the waste of material, which is a large item when cutting expensive steels. The power required to drive a 5½-in. machine is only 2 h.p. and that for the No. 8 machine 3½ h.p. The time required to cut annealed tool steel with a carbon steel saw is, for the machine illustrated, 2 in. diameter, 4 minutes; 4 in. diameter, 8 minutes; 6 in., 13 minutes, and 7 in., 16 minutes. Soft machinery steel is most difficult to cut on account of the liability of the saw to stick, and for this reason a fine feed and high speed of saw is recommended, in some cases as high as 80 ft. periphery speed per minute, and for annealed tool steel 54 ft. per minute. The high carbon and high-speed steel saws furnished with these machines are only ⅛-in. thick for 14-in. diameter, $\frac{5}{32}$-in. for 16 and 18-in. diameter and $\frac{3}{16}$-in. for 20-in. diameter. The driving pulley is 10 in. in diameter, with 3-in. face, making 22 turns of the driving shaft to one of the saw spindle. All the driving gears and shafts are of crucible machinery steel forgings 0.50 carbon. The normal speed of an 18-in. saw is 12 revolutions per minute. This cut-off saw is built more like a machine tool, and is carefully finished with exact fitting, so that the surface of the bar at the cutting end will be not only smooth, but exactly at right angles to the axis of the bar. The weight of this machine is 2,300 lbs.

The same company manufactures an automatic saw sharpener, which is also illustrated. This machine will sharpen cutting saws from 12 in. to 20 in. in diameter. It is fitted with a beveling device, which relieves the tooth one-half of its thickness at its point, the base remaining the full thickness of blade.

This form of tooth breaks up the chips, causes the saw to run much freer and practically eliminates the liability of the saw sticking in cutting soft stock. No full width of the tool is presented to the surface to be cut. A saw $\frac{5}{32}$-in. thick can be operated as easily as one one-half as thick sharpened in the usual way. After one side of every other tooth has been beveled the saw is turned over and alternating teeth treated the same way. The reciprocation of the grinding wheel and the indexing are automatic, but the depth of the cut is regulated by hand. The weight of this machine is 422 lbs.



Nutter & Barnes Cutting-Off Machine.



Nutter & Barnes Automatic Saw Sharpener.

The Nutter & Barnes Company, 326 A street, Boston, Mass., make a specialty of metal saw cutting-off machines and automatic saw sharpeners.

It is said that the British government has approved in principle the American proposal for the construction of the Tsitsikhar Railway from Aigun in Northern Manchuria to Chin Chow Fu. Japan also would agree to participate, but the Chinese officials, it is understood, differ as to the utility of the line, and some of them object to Japan's participation. The railway plan recently was laid before the British government, with a view of inducing British financiers to take a hand in the enterprise.

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PRIZES FOR NEW IDEAS IN TRACK MAINTENANCE.

It is safe to say that every maintenance engineer, every bridge engineer and every engineer of new construction, whose experience extends over a number of years and over diversified pieces of work, has found especially quick and especially economical ways of performing specific tasks that confront him. Each new edition of a civil engineering pocketbook is sure to include some of these efficient methods of procedure, which bear much the same relation to the work of the young civil engineer engaged in field work that the shop kinks bear to the work of the shop foreman. But we are inclined to believe that the collection of these devices already to be found in engineering pocket-books by no means equals the demand for them. Therefore, the *Railway Age Gazette* takes pleasure in offering prizes for such collections, in the hope of bringing valuable ideas to light. For the best single device or collection of devices applicable to track maintenance, we offer a first prize of $50, and for the next best device or collection of devices for track maintenance we offer a second prize of $25. Manuscripts submitted in competition must reach us not later than February 21. They should be accompanied, if possible, by drawings or photographs, or both, and the description should be brief but clear. The winning collection will be published in one of our daily issues, appearing at the time of the Maintenance of Way Convention in March. Collections which are judged worthy of publication, but are not awarded a prize, will be paid for at our regular space rates.

We believe active engineers, having experience with many different kinds of work under diversified conditions, all over the country, can be of much help to each other if they will give us the opportunity of publishing these specially developed methods of practice. If this first competition turns out well, we shall endeavor to extend it to other branches of railway civil engineering work later on.

The Interstate Commerce Commission, in its annual report, urges that a "physical valuation of the interstate railways of this country" shall be made to be used as a test of the reasonableness of government-made rates. Why a *physical* valuation? In the case of Smith *versus* Ames the federal supreme court said that a railway is entitled to earn "a fair return on the fair value" of its property. Out of that statement has grown the demand for a valuation of railways. But the court said nothing whatever about a *physical* valuation. On the other hand, it did say that in ascertaining the value of the railway's property the original cost of construction, the cost of reproduction, the probable earnings (based, necessarily, on the density and nature of the traffic), the operating expenses and the market value of stocks and bonds must be considered. The purport of this is as plain as a pikestaff. It means that in estimating the "fair value" of the railway, not merely the value of its physical property, but also all other factors of its value as a going concern, excepting, perhaps, its existing schedules of rates, must be considered. It is believed there cannot be found in any decision of the Supreme Court or of any other federal court a single word in support of the crude theory of physical valuation. How it originated and gained its widespread currency is incomprehensible. The commission says that some means should "be furnished by which, within reasonable limits, a value can be established which shall be binding upon the courts and the commission." Those who advocate a valuation generally assume that it would be made by the commission. Does the commission think a valuation made by it on a plan that never has been countenanced, but by plain implication has been repudiated, by the Supreme Court, would be "binding" on it or any other federal court? If a valuation is to be made, let it be so made that it will meet the requirements indicated by the language of the Supreme Court. Otherwise, it would seem, it will be a waste of time and public money.

Secretary Knox has proposed that the railways in Manchuria, most of which are now controlled by Japan and some by Russia, shall be turned over to China. The money necessary to finance this transfer he proposes to have furnished by an international syndicate of bankers. The concessions under which Japan and Russia operate the railways in Manchuria expire within thirty years, and the railways revert to China. Although no sum is mentioned, Secretary Knox's proposal implies that Japan shall be compensated for relinquishing what, from the standpoint of Japanese manufacturers, is probably a very profitable monopoly, but which from the government's standpoint is probably an unprofitable business. By turning the control of the railways of Manchuria over to China it is considered that an important step will be taken in the extension of the general principle of an open door for all nations in the Far East. On its face this proposal appears to ask Japan to relinquish one of the important advantages fought for and gained in the Russo-Japanese war. This view, according to quotations from the Japanese press, is the one that the public of Japan took on the first announcement of the proposal. How far, however, the consideration of adequate compensation being paid Japan will change this attitude, it is impossible to say. Naturally, the attitude of the other powers, Germany and England in particular, is that of friendliness

toward the proposal. Incidentally Secretary Knox, in commenting on his proposal, states definitely the facts of the much-discussed loan to China, which a combination of French, German and English bankers were to make, and which the United States Government asked the other powers interested to permit American bankers to participate in. This request, in principle, at least, has now been agreed to by England, Germany and France and by China, and the loan when made will be participated in by the United States as well as the three other countries. The United States, however, has conceded, in the question of the appointment of chief engineers, that England and the two European countries shall settle this matter between themselves, with the understanding that there shall be American engineers on the various engineering staffs. This loan, it will be remembered, is to be made to China for new railway buildings in that country, and has nothing to do directly with the question of the Manchurian railways.

RAILWAY EARNINGS IN NOVEMBER.

Taking at random the returns of 12 roads operating in widely separated parts of the country, it appears that the month of November, 1909, marks a definite advance over the prosperity of 1907. The aggregate operating income in November, 1909, of the 12 roads* selected was $69,180,649. This is an increase over the earnings of these same roads in November, 1908, of $9,936,027, or 14.4 per cent. Every road in the list—and it must be remembered that the 12 were selected entirely at random—has greater gross earnings in 1909 than in 1908. We might expect to find even greater proportional increases in the expenses, because in November, 1908, the roads in general were still making a determined effort to cut down operating expenses to the lowest figure, which would not, on the face of it, be absurdly inadequate.

The figures, however, for November, 1909, do not bear this assumption out. The net operating income, after payment of taxes, for the 12 roads selected, was $25,749,387 in 1909, and the net increase over the corresponding month of 1908 was $3,315,282, or nearly 13 per cent. Of the 12 roads, only two show smaller net operating income in 1909 than in 1908, and of the 12, seven have a lower operating ratio in 1909 than in 1908 and five a higher operating ratio. The general trend toward greater and greater prosperity is shown by the fact that only two out of the dozen roads had smaller net in 1909 than in 1908, and only two had smaller net in 1908 than in 1907. November in 1907 was for the majority of roads a month of very heavy traffic and correspondingly great gross earnings. The increased net in November, 1908, was due to a greater proportional decrease in expenses than in earnings, and the still greater increased net in November, 1909, shows clearly that the roads are profiting by and still practice the economical operation achieved in the lean year 1908.

Operating ratio, while not being of much value by itself in comparing the operations of different roads with each other, is of great value in comparing the operations of one road with itself in previous years. The following table gives the operating ratio in November, 1908, and November, 1909, for the 12 roads whose gross and net earnings we have been comparing:

	November—	
	1909.	1908.
Atchison, Topeka & Santa Fe	65.5	60.9
Chesapeake & Ohio	62.0	66.8
Chicago & North Western	72.4	66.8
Delaware, Lackawanna & Western	52.9	50.3
Erie	62.6	74.2
Great Northern	53.5	48.3
Lehigh Valley	58.5	66.8
Missouri, Kansas & Texas	81.0	76.4
New York, New Haven & Hartford	66.2	73.8
Pennsylvania Railroad	63.6	68.0
Southern Pacific—Pacific System	55.2	57.8
Southern Railway	68.2	70.2

*Atchison, Topeka & Santa Fe, Chesapeake & Ohio, Chicago & North Western; Delaware, Lackawanna & Western; Erie, Great Northern, Lehigh Valley; Missouri, Kansas & Texas; New York, New Haven & Hartford; Pennsylvania Railroad, Southern Pacific—Pacific System, Southern Railway.

MAKING SAFETY LAWS AND ENFORCING THEM.

President Taft includes the pending safety appliance law among the proposals of the Interstate Commerce Commission that he endorses unreservedly in his special message of January 7; and we print in another column a letter from a prominent railway mechanical officer condemning that law as unnecessary. As the ostensible purpose of this bill is to promote the universal adoption of the standards of the Master Car Builders' Association, it would seem the part of wisdom to try to have the bill amended into a more reasonable form instead of denouncing it on the sole basis of the success that has attended the work of the Master Car Builders' Association in the past. The president has been told, no doubt, that the master car builders have progressed as far as it is possible for them to go, and that now the government must take hold. It is true that in most things connected with safety appliances the commission hitherto has refrained from setting up standards not approved by the association; but the trouble with the proposed law is that it will tend to prevent the association itself from making further progress. Under it the commission can take the standards of to-day and make them the inflexible requirements for all time. The association, on the other hand, can revise and improve, year by year, and thus keep its standards abreast of the best practice, as developed under changing conditions; but to get revisions or improvement measures through Congress is likely to be a hopeless undertaking. Such success as the government has had in regulating freight car details in the past has been due to the care which it has taken to demand no more than the best managed roads could reasonably grant. In other words, the government has not devised methods or designed structures, but has regulated and supervised. If, in this matter of grab-irons, running boards and ladders, the commission were authorized to hold the roads up to the standards of their own association it might be performing a useful function, for those standards would always represent the latest fruits of the combined wisdom of the best car specialists of the country. In the matter of hand-brakes so applied as to work in opposition to the air-brakes, the commission would do well to publish at once the names of the roads that have been found perpetuating this very dangerous practice. It is so universally condemned that it is hard to believe that "a great many" such has been found, or that a statute is necessary to cure the evil.

From another letter which we have received it appears that in many cases those railway officers who, like "X. Y. Z," object to the regulating activities of the commission, have in mind not so much the requirements of the law as the way in which they are carried out. They intimate that the inspectors are prejudiced or inefficient. The terms of the present safety appliance acts are quite plain, however, and if an inspector varies from them in the slightest degree it ought to be easy to call him to account without delay. Likewise an inspector who exercises himself to promote the supposed interest of a labor union instead of attending to his proper duties should be denounced in unmistakable terms.

The one safety law proposal that is approved by everybody—that for the investigation of train accidents—is conspicuous in the president's message by its absence. A law of this kind, properly administered, would tend to save lives by the score, whereas the grab-iron law only aims to add a refinement to safety measures that are in a good degree efficient already. We yield to no one in consideration for the brakeman in his dangerous duties, but we love the passenger also, especially when he happens to be a personal friend riding in the rear car on a road poorly signaled. There is only one if about the accident-investigation bill; its whole value depends on the appointment of competent, impartial investigating agents. Railway officers are at one with the public in desiring to have the lessons of accidents made available for all, as witness the action of the Union Pacific in asking outsiders to take

part in the investigation of collisions and derailments. But what kind of investigators would the commission appoint? The British army officers who conduct inspections for the Board of Trade are not always very wise, and their recommendations, in obscure cases, sometimes miss the mark entirely. But their findings are always above any suspicion of influence. If an engineman overruns his signal the blame is not put on the air-brakes. The traditions of British railway service, however, are traditions of carefulness; ours are traditions of chance-taking, and the difference is fundamental.

Investigators of railway accidents in this country detailed from the army would not be as shrewd in their guesses as ex-division superintendents, but guessing is not always necessary; the facts of an accident are apt to be fairly plain, and expert railway testimony is always to be had. With the facts at hand the army colonel would not care for the opinion of organized labor, or of organized capital, or of the Interstate Commerce Commission, or of Congress itself, but would tell the truth, and tell it plainly. Are we so sure about the ex-division superintendent? One inspector would have behind him the training of exact obedience to orders; the other, the habit of compromise with men and methods, and a long list of humiliating experiences where the men he should have discharged *before* the accident happened were protected by the brotherhood.

PER DIEM RATE UNCHANGED.

The American Railway Association by a letter ballot which was ordered previous to the Chicago meeting in November, has voted on a proposal to raise the rate per day for borrowed freight cars to 30 cents, and also on one to make the rate 35 cents and another 40 cents; but all three have been defeated. This leaves in force the present rate of 25 cents, and the whole per diem matter in the rather unsatisfactory and unsettled state that it has been in ever since the present rate was adopted, following the great increase of idle cars caused by the panic of 1907 and the subsequent business depression. The letter ballot again makes prominent the wide difference of opinion between the officers of what have been called the "originating" and those of the "distributing" roads. The originating roads are mainly those between the Missouri river and the Atlantic ocean and north of the Ohio river. The distributing roads include those west of the Missouri river, the New England lines and those in the South. The conflicting opinions and interests of these two classes of railways manifested themselves in the Commission on Interchange of Freight cars* and caused majority and minority reports to be submitted; and the same conflict of opinion and interests caused a quiet but earnest campaign to be conducted for and against the adoption of the 30, 35 and 40 cent rates, the originating roads favoring the 40-cent rate and the distributing roads favoring the 30-cent rate; but not enough roads favored any rate to secure its adoption, a two-thirds vote (measured by cars owned) being required.

The position of the originating roads was that 40 cents a day was no more than a reasonable compensation for the use of a car, based on the actual cost incurred by the owning railway in owning it, with a fair percentage added. The interchange commission made two estimates of the cost of owning a freight car. One was based on the costs of repairs, replacements, etc., for the six-year period, 1902 to 1907, inclusive, and the other was based on the similar costs for the single year 1907. The total estimated cost, based on the figures for the six-year period, was 34.42 cents a day, less 2.5 cents allowed for repairs borne by the borrower, leaving the net cost per day 31.92 cents. The estimated cost of ownership, based on the figures for 1907, was 40.53 cents, less 2½ cents allowed for repairs borne by the borrower, leaving the net cost per day 38.03 cents.

Those who opposed the 40-cent rate contended that the figures for 1907 were not a proper basis because the labor and material costs for that year were the highest ever known; the average cost for the years 1902 to 1907, inclusive, would more nearly represent normal conditions. Based on these latter figures it was contended that a rate of 35 cents a day would more than cover the cost of repairs, replacements, taxes and interest at nearly 8 per cent. on the investment in the car. Of course, the profit derived by the owning roads from the higher rate of 40 cents would have been still greater. A statement was prepared to show that 16 of the leading railway systems, having 874,154 freight cars, or about 40 per cent. of all in the United States, would receive as profit after allowing 5 per cent. interest on the investment nearly $20,000,000 on the 35-cent rate and nearly $36,000,000 on the 40-cent rate; and on the 30-cent rate $3,811,014.

In addition to the fact that, as was contended, the 35-cent or 40-cent rate would be so far above the cost as to yield to the owner roads' excessive profits, it was argued, that their imposition throughout the year would be illogical and unjust both to the roads and the public, as while there is ordinarily a car shortage for about four months in the year, there is ordinarily a car surplus for the other eight months. A high per diem rate is beneficial during one-third of the year when there is a shortage of cars, because it tends to expedite their movement; but it is harmful during the eight months of the year when there is a surplus, because it tends to increase the useless hauling of empty cars home when they might as well stay where they are.

If the distributing roads could freely transfer freight from the cars of the originating roads to their own cars they would be able, of course, to avoid paying the per diem charges. But aside from the cost of reloading, many shippers will not put up with it because of the delay, and also in many cases because of damage. And as a high per diem rate in times of car surplus affords a strong incentive to the originating roads to use to as great an extent as possible their own cars and to send the cars of other roads home empty, the originating roads at such times have a great advantage.

The remedy proposed by Mr. Kruttschnitt and some others was the adoption of a variable per diem rate. Under this plan the rate during times of car shortage would be high, perhaps 40 or 50 cents. Some proper authority representing the American Railway Association would be given power to reduce it to perhaps 30 cents when the car shortage had disappeared or was on the point of disappearing. When the car surplus exceeded the car shortage the rate would be still further reduced. This method would be analagous to that followed in many markets in fixing the rate of interest, or by the Bank of England in fixing the rate of discount. When there is a shortage of loanable capital the banks impose a maximum rate; and as the demand for capital declines the rate of interest is reduced. A variable per diem rate would have a similar effect on the car supply. When the available supply of cars greatly exceeds the demand, the rate should be so reduced that each road would have substantially no more incentive to select its own cars for loading to connecting lines than to select for loading the cars of other roads. By depriving the roads of the incentive to load their own cars rather than those of other roads, the empty mileage would be kept at the minimum, and a free and normal circulation of cars would be secured at all times.

For the time being the "distributors" have won their point; that is, they have kept the rate down. But if, or whenever,

*A special committee appointed in the spring of 1908 to study the whole subject of freight car interchange. It consists of James McCrea, president, Pennsylvania Railroad; Lucius Tuttle, Boston & Maine; W. W. Finley, Southern; Howard Elliott, Northern Pacific; J. Kruttschnitt, Union and Southern Pacific Systems. At the November meeting an elaborate report was presented discussing at length the cost of freight-car construction, maintenance and operation, and recommending that the interchange rate should be 40 cents a day. It was on the basis of this report that the rates proposed in the letter ballot were adopted by the Executive Committee. Two members of the Commission dissented—Mr. Tuttle recommending 35 cents, and Mr. Kruttschnitt 30 cents: hence the three propositions.

business increases so as to make cars generally worth two or three times as much per day as they are now, as occurred in the busy times of 1906, there will have to be another adjustment. If there is not the big lenders will do as they did then—agree among themselves to charge a higher rate. In the meantime Mr. Kruttschnitt, who appreciates the advantages of a freight car pool, is doing valuable missionary work, and his arguments will prove effective as educators in the direction of pooling. He is in the best possible position to act as an apostle of the doctrine of country-wide pooling, because the railways under his own charge cover a territory equal to an empire, and he can speak from experience.

PRESIDENT TAFT'S RECOMMENDATION FOR RAILWAY RATE REGULATION.

It is natural that railway officers should oppose further federal legislation for the regulation of railways. Almost every additional law affecting railways increases governmental authority over and interference with their management, and thereby necessarily restricts the fast narrowing discretion, and increases the duties and difficulties, without at all decreasing the responsibilities, of their executives. For this general reason railway officers are not apt to welcome most of the recommendations affecting railways made by President Taft in his recent message regarding railways and trusts. But even those who look upon Mr. Taft's recommendations with the least favor will be able to console themselves with the reflection that they are much less radical and objectionable than many of the proposals for additional federal railway legislation which are pending in Congress.

(1) Mr. Taft recommends the creation of a United States Court of Commerce composed of five judges, to which all appeals should be made from decisions of the Interstate Commerce Commission. The results of the creation of such a court would depend greatly on its personnel. It may be safely assumed that President Taft would appoint to it men of the same high order of ability and character as generally occupy the federal branch. Such a court would have great advantages over any existing public body for passing intelligently and fairly on cases involving railway rates. It would have the legal knowledge and the entire impartiality that usually charactize the courts; and its members would get by experience the expert knowledge of railway affairs that is acquired from constantly studying and dealing with those affairs by the abler railway commissioners, such as Messrs. Knapp and Prouty. There is great need that the various cases involving railway rates shall be decided promptly, intelligently, and especially on consistent principles, so that both railway managers and the commission shall be left in the least practicable doubt as to what the law is under which they must work. This need would be better met by having all rate cases decided by a Court of Commerce than it is by having them decided by the various circuit courts.

(2) There can be no rational objection to the President's recommendation that the Sherman anti-trust law be so amended as to let railways enter into reasonable agreements regarding rates. Its adoption would merely be legalizing what is now done constantly and with the knowledge and approval of the commission in order to enable it satisfactorily to administer the Interstate Commerce act. Since the commission has been given power to reduce unreasonable rates, to assume that railways by agreements could make and maintain unreasonable rates is to assume that the commission is either unfit for or faithless to its duty.

(3) Under the present law the published rate is the only legal rate. There has been much complaint from shippers because the roads have sometimes mistakenly quoted them rates less than the legal ones, and after sales and shipments have been made on the basis of the rate quoted, the shipper has been forced to pay the higher rate, thereby sustaining loss. It has been objected to the proposition that the roads should be required to quote rates in writing on request, and then protect the rates quoted, that its adoption would open wide the door to unlawful collusion and rebating. As a substitute for this plan, Mr. Taft recommends that in case of misquotation the shipper be required to pay the legal rate, as now, and that the road be fined $250 for its mistake. This plan is not open to the objection that it would open the door to rebating. But is it entirely just or expedient? The present method of making tariffs was devised and put in force by the Interstate Commerce Commission. If it does not present rates in such shape that they can be easily and accurately quoted this is because the rate fabric is itself necessarily so complicated that the commission, with the advice of railway officers and shippers, has been unable to devise a means for making tariffs simple and intelligible. The average shipper handles only one or a few commodities; and he often is better able to figure out the rates on these commodities than is the railway man, whose time and attention are necessarily spread over a vast multiplicity of tariffs and rates. If the proposed legislation were enacted it would make it necessary for the roads narrowly to limit the number of persons who might quote rates in writing; they could not afford to take the risk of having them quoted by so many clerks and agents as at present, and delay would result, about which we may be sure there would soon be loud and numerous complaints. It is a proposition to fine the carrier, not for intentional wrong-doing, but for mistakes. Would men in any other line of business think it fair that fines should be imposed on them or their companies for unavoidable and unintentional errors made by themseives or their subordinates?

(4) Mr. Taft recommends that the commission shall be given the same power to change classifications as to change rates. There really is no fundamental difference between the act of reducing the specific rate on a commodity and the act of changing the place of a commodity in the classification. But it will be noted that when the commission changes a specific rate between specific points the change is far less sweeping than a change of classification, for the latter involves a change in the rates on the commodity affected throughout the large territory in which particular classification is applied.

(5) The advisability of giving the commission the power, as Mr. Taft proposes, to initiate investigations and hearings on its own motion seems very doubtful. If there is any substantial ground for complaint against a railway some shipper or shippers' organization is pretty sure to make it. To give the commission power to start investigations and hearings on its own motion is to enlarge its functions as a prosecuting attorney, and is in direct antagonism to Mr. Taft's wise recommendation that the commission's present duty of conducting proceedings against railways in the courts shall be transferred to the department of justice. If complaints are to be initiated by any governmental authority let the duty be put on the department of justice. Even assuming that the commission is now entirely unbiassed and impartial, it is constantly hampered in its work by the doubt of railway officers as to whether it is so. Such doubts are not to be reduced or eliminated by increasing its prosecuting functions.

(6) The commission has asked that it be given power in its discretion to postpone indefinitely any proposed advance in rates, pending investigation of its reasonableness. The President's recommendation as to this matter is more conservative. He proposes that the commission shall be empowered, when railways file tariffs announcing an advance in rates, to begin at once an investigation of its reasonableness, and to postpone for not more than 60 days the time when it shall become effective. If the commission at the end of this 60 days has not completed its investigation the rates shall go into effect. This plan is less open to objection than that advocated by the commission, but nevertheless it is open to strong objection. Rates must now be filed 30 days before they become effective. Past experience and the commission's own official utterances show that it regards all proposed advances as *prima facie* unrea-

sonable. That either it, on its own motion, or some shipper or shippers, would complain against every proposed advance of any consequence, being certain, and it seems equally probable that the advance would be postponed the full period allowed by law. In other words, practically no advance could be made effective on less than 90 days' notice. Past experience also indicates that in almost every instance the commission would hold the proposed advance partly or wholly unreasonable. The great difficulty railways now have in making any advances whatever in their rates would be much increased. But, as we repeatedly have pointed out, whatever tends to prevent increases will also tend to restrain traffic managers from making reductions and increase the tendency of the rate fabric to become petrified. The public interest not only does not require any further legislation limiting the discretion of traffic managers in initiating rates; but every further enactment in this direction will be against the public interest. The average freight rate per ton per mile in France is 14 mills, in Germany 13 mills, and in the United States 7.59 mills. To the restrictions on the rate-making power of the railway officers of France and Germany and the past unfettered exercise of that power by the railway officers of the United States is largely due the superior adjustment of rates to conditions in this country which alone has made the much lower average rate in this country possible.

Discussion of some of the other recommendations in the message, especially the somewhat complicated plan for restricting the issuance and ownership of railway securities, will be attempted in a later issue. It is sufficient for the present to call attention to the fact that in every instance where governmental security-issue regulation has as yet worked at all it has worked against the public interest.

NEW BOOKS.

The Protection of Railroads from Transmission Line Crossings. By Frank F. Fowle. New York: D. Van Nostrand Co. 69 pages; 35 illustrations. Cloth. Price, $1.50.

The subject matter of this book was first presented in the form of a paper before the annual convention of the Association of Railway Telegraph Superintendents. The early portion is occupied with a discussion, in some detail, of the dangers that surround the use of transmission lines carrying a high voltage and the accidents and destruction of property that may result if they are not properly constructed and protected. As the title indicates, attention is turned directly to the matter of so carrying these lines over the tracks and wires of a railway that there shall be a minimum of danger from falling and crossing the wires beneath. Various types of crossings are discussed, and a few structures are shown in the engravings. For the most part, however, the engravings are half-tones of poles that have failed because of fires set by improperly protected wires. The subject matter is well worth the careful attention that it is probably receiving, though it is doubtful if any electrical engineer will find that any new light has been thrown upon a subject that has already become the subject of careful regulation.

Westinghouse E.-T. Air Brake Instruction Book. By W. W. Wood. New York: Norman W. Henley Publishing Co. 242 pages, 5 in. by 7 in.; 48 illustrations. Cloth. Price, $2.00.

This book deals exclusively, as its title indicates, with the latest design of Westinghouse air brake for steam railways, known as the E.-T. (engine-tender) brake. The Westinghouse brake has grown in the complication of its details from the simple beginning of the straight air brake, until it outclasses the locomotive itself and requires close and uninterrupted attention for a long time before its many details of construction and action can be understood. Therefore, anyone taking up a book on the subject must expect to pay strict attention to the matter if it is the intention to master the subject. The writer of the book in hand, who is an air brake instructor, evidently realizes this, and while the explanations are as simple as it seems possible to make them, the mind cannot wander during the study and get results. The general scheme of the explanations is to take a typical distorted diagram of the several parts of the whole and show the spaces between the casing and moving details, in different colors; these colors representing the various air connections and pressures with which they are filled. The general diagram of the whole apparatus is taken bodily from the instruction book issued by the Air Brake Association with the addition of these colors, which add immensely to the value. In this the various pipes are shown in colors that indicate as to whether they are filled with air at the pressure of the main reservoir, the brake cylinder, the atmosphere, and so on. It is impossible to refer specifically here to all of the parts that are shown, but we may take the distributing valve as an example. There is a diagram of this, with all parts distorted so as to show the working plainly, and this is repeated with the moving details in the several positions that they will occupy in charging, application, service, lap, emergency, emergency lap, recharging, independent application, independent lap and independent release positions. A careful study of the engravings in connection with the text will give any one of ordinary intelligence a good, clear idea of the way in which the valve works, though it will not show the actual construction, which can best be obtained from an examination of the dissected valves that are usually to be found in instruction cars.

The diagrams have been carefully worked out and are clear. Unfortunately the same cannot be said of the reference letters, which are so small that it is with difficulty that one with the best of eyesight can decipher them. They are down to the last limit of size, so that any dimness of the light makes them troublesome. Other than this, the work is to be especially commended. It can be recommended to those who need know about the brake, and it would be well for all such to go through this book carefully and in detail, comparing the text sentence by sentence with the engravings before going into the air brake instruction car at all, and then, when this is done, it will be found that the explanations of the instructor will have a greater significance and clearness. In fact it would be well to take the book into the car for reference and assistance while the lesson is in progress.

Letters to the Editor.

PROPOSED LEGISLATION REGARDING SAFETY APPLIANCES.

To the Editor of THE RAILWAY AGE GAZETTE.

You have noticed the action of the Lower House of Congress in passing a bill (H. R. 5702) to give the Interstate Commerce Commission power to designate the "number, dimensions, location and manner of application" of certain safety appliances on cars, its requirements in this regard to be standard for all railways unless changed by order of the commission. It is to be hoped that before this or any similar measure shall become a law a full and comprehensive view can be had of the situation for the benefit of the public and the legislative and judicial branches of the Government in order that justice may be done.

In the first place, what is contemplated in the existing Safety Appliance acts? The law of 1893, with amendments of 1896, is as follows: Section 1 requires power brakes and train brakes; Section 2 requires automatic couplers; Section 3 defines liability in interchange; Section 4 requires secure handholds; Section 5 defines standard height of draw bars; Section 6 states penalties for violation and duties of prosecuting officers; Section 7, power of commission to extend time; Section 8, employer's liability.

The law of 1903 provides: Section 1 extends operation of the law to the territories and District of Columbia; Section 2 defines percentage of train brakes, gives authority to commission to increase same, and prescribes penalty for violation; Section 3 defines date effective and scope as regards the law of 1893.

What is the present situation? The railways have practically complied with the requirements made on them in Sections 1, 2, 4 and 5 of the law of 1893, having received certain extensions of time as authorized by Section 7. They have also complied with Section 1 of the 1903 law, also with Section 2, which was changed by the commission from a 50 per cent. requirement to 75 per cent., under which railways are now operating. Nearly all cars have now been equipped with air brakes, and air brake equipping may be said to be practically complete.

The work remaining for the railways to do is, therefore, the maintenance of these brakes, couplers, grab irons and handholds, and the work of the commission's inspectors is to see that this is done.

I need not remind you or your readers of the peculiar relations between railways in the matter of interchange of cars. In no other branch of business can there be found such exchange and use of facilities and equipment, with no other bond than a mutual agreement to be governed by a code of rules. These rules, now over 30 years old, make a common freight transportation system so far as the public is concerned. This code of rules has been revised year after year in the annual convention of the Master Car Builders' Association; but all the time retaining the original principle of interchange, that foreign cars would receive the same care and attention as owners' cars.

This is a daring and unique experiment in trust and good faith. It depended on the application of the Golden Rule. This experiment has, however, proved a magnificent success, the proof of this being in the relatively few disputes between roads. The arbitration committee of the Master Car Builders' Association, which is the court of final appeal, gave decisions last year in 35 cases, 34 the year before, and only 16 in 1907. The bills passed between railways in that period for repairs undoubtedly amounted in the aggregate to millions of dollars.

To the railways is due the credit for inaugurating and continuing the interchange of cars that has contributed so much to national prosperity, and the magnificent result achieved is a proof of the wisdom, care, prudence and high mechanical attainment of the Master Car Builders' Association. Its work has no precedent nor parallel in other corporate effort.

Judging by the results obtained, should not the Master Car Builders' Association be considered an expert, authoritative body in matters relating to car construction, maintenance and repair?

Besides the code of rules the work of the association is in part embodied in a voluminous collection of Standards and Recommended Practice, filling nearly 100 pages of text and 60 large sheets of illustrations. These have been revised as the Safety Appliance Acts became effective so that all of the legal requirements were included, and Secretary Moseley has frequently commended the rules. In 1898 he said in a letter to the president of the association (Proceedings, pp. 91-2):

"If time shall demonstrate the necessity of changes in legislation regarding railway equipment in the matter of safety appliances, the advice and experience of that body, of which you have the honor to be the head, will again, as they have in the past, undoubtedly be of the greatest consideration and assistance in determining on what lines and in what degrees the alterations should be made."

In 1902 he made the first of his seven annual addresses, pp. 103-107, in which there are several references to little legislation being necessary if M. C. B. Standards were made compulsory. In 1903 he closed his address, found in Proceedings, pp. 52-60, with the following sentence:

"As I have studied this question, year after year, there is one earnest wish that I would utter; and that is that the recommended practice of the Master Car Builders' Association shall be the actual practice of the railways of the country; and that the Congress of the United States would perfect the law by adding to it a provision which shall require that the standards established by the Master Car Builders' Association shall be the standards upon all railways engaged in interstate commerce."

In 1904, 1905, 1906 and 1907 he spoke in the same strain. In 1908 he called attention to the bills pending to make the M. C. B. standards a part of the law, but did not mention the other bills in which these appliances are to be set forth by the Interstate Commerce Commission. He called attention to new laws and decisions, referring to the ash-pan bill in a way that was particularly exasperating to those who knew something in connection with this matter. He took occasion to laud his inspectors, and, while complimentary to the association, had less to say about the association's authority and more about the law, its present force and probable future scope.

The standards for the protection of trainmen referred to above are those appliances used for getting on and off cars, and used in connection with coupling and uncoupling of cars. These were originally formulated by the association as early as 1888, and were amplified in 1893 and 1896. In the latter year a special committee of eleven members, assisted by representative trainmen and switchmen, determined on a schedule of handholds for the various types of cars, and classed the brakestep, bracket and coupler unlocking rod as satisfactory handholds. The report of this committee was adopted by the convention in 1896, and M. C. B. plate *A* was the first to show the various arrangements of handholds as proposed and adopted. Those remained as Recommended Practice until 1902, when they were advanced to Standard Practice.

In 1907 and 1908 the association took steps to put these standards in still clearer shape, so as to make them susceptible of but one interpretation. Additional plates were made to cover development in car design and construction, notes were added to the plates so that the fullest possible information was made available. These revisions, which in no way altered the original intent of the standards, are all based on the original schedule and arrangement.

The recorded expressions of the Secretary of the Interstate Commerce Commission for seven years were to the effect that these standards were used in construing the law and in some details were more comprehensive than the law; yet the instructions under which the Interstate Commerce Commission inspectors are now working are said to state that M. C. B. Standards do not comply with the law. If such is the case, why was it not known before? It is quite well known that if the Secretary of the Interstate Commerce Commission and his inspectors had their way, practically three-quarters of the M. C. B. safety appliance regulations would be changed.

The development of this sentiment against the standards has occurred since 1908, and it might be pertinent to ask if the inspectors and other advisers of the commission and its secretary are superior in judgment capacity and mechanical attainment to the members of the Master Car Builders' Association, who have developed the standards now claimed to be illegal.

It is well known that these inspectors are men who have had railway training as brakemen, switchmen, and in other like subordinate positions, and while this is no discredit, and no slur is intended to be cast, is it at all likely that they have the capacity to sustain the contention that three-quarters of the M. C. B. standards are wrong, as against the united opinion of such a body as the Master Car Builders' Association? As it is not likely that Secretary Moseley will assume all the responsibility for opinions so adverse to those of the association and which are a complete reversal of his earlier opinions, we are forced to conclude that the power behind all this effort to upset M. C. B. standards and the recognized practice of the railways proceeds from a source that has swayed the secretary and his inspectors to take the stand they do; a stand where they hinder and obstruct rather than help and defend the railways. The railways have equipped their cars and engines with the appliances required by law and are maintaining them; and, when they do not they expect to pay the penalty. They believe, however, that the standards which have been established and accepted as satisfactory for all

those years prior to 1908 should stand as satisfactory at the present time and for the future, except as the evolution in car design may require modification of details. The purpose of the law is beneficent, to maintain the right as well as to punish the wrong. For those who administer the laws to use their official positions to promote the interests of any class of persons to the injury of another class is a prostitution of their public trust. X. Y. Z.

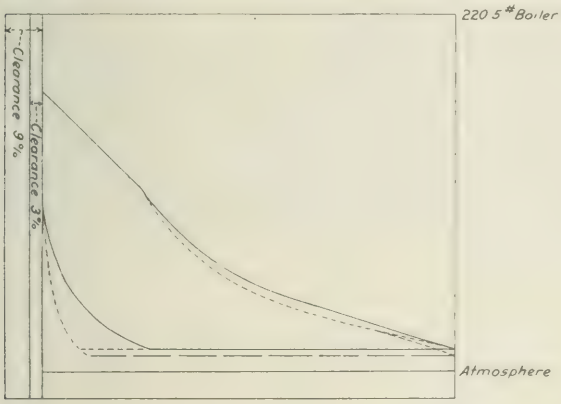
LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Philadelphia, Pa., Jan. 8, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The writer has read with considerable interest the admirable article which appeared on page 1225 of your issue of December 24, 1909, entitled "Limited Speed of Passenger Locomotives." While the article referred to is very exhaustive in certain respects, it seems to the writer that two of the most important factors which affect the high speed performance of locomotives have not been considered.

These are, first, the relation of cylinder clearance volumes to the weight of steam used to develop a given power, which steam has necessarily to pass the exhaust nozzle, and second, the necessarily high piston speeds, both of which have an important bearing on the negative work required to overcome back-pressure and compression.



Theoretical Indicator Diagram.

For the purpose of illustration, the writer has constructed the theoretical indicator diagram herewith. In constructing the diagram above referred to the writer first laid out a Zeuner diagram, assuming a steam lap of 1¼ in. and a steam lead of $\frac{3}{16}$ in. When cutting off at quarter-stroke the maximum openings to steam and exhaust were found to be $\frac{5}{16}$ in. and $1\frac{1}{16}$ in., respectively, the valve having ⅛ in. exhaust clearance.

The exhaust opening event occurs at 66 per cent. of the forward stroke and the exhaust closing event occurs at 74 per cent. of the return stroke. The full line diagram is a card based on the above events, and 9 per cent. cylinder clearance volume, which is usual in locomotive practice. The stroke of the piston has been assumed as 26 in. and the speed as 350 r.p.m. These give a piston speed of 1,516⅔ ft. per minute, at which speed the writer has assumed the back-pressure to be 13½ lbs. per square inch above atmosphere. The reduction of initial pressure and wire-drawing during admission have been figured from tables given in George R. Henderson's "Locomotive Operation." The mean effective pressure of the full line card is 47.54 lbs. per sq. in.

The writer then assumed a cylinder clearance volume of 3 per cent., exhaust opening to occur at 80 per cent. of the forward stroke and exhaust closure to occur at 91⅓ per cent. of the return stroke, wire-drawing and back-pressure are assumed to be the same as in the full line card, and the piston speed remaining the same. The resulting card is shown where it differs from the previous one by dotted lines. The mean effective pressure of this diagram is 49.32 lbs. per sq. in.

The indicated water consumption of the full line diagram is 19.73 lbs. per h.p. hour, while the dotted line diagram is using but 18.5 lbs. The unindicated losses, which affect the water rate with 3 per cent. cylinder clearance volume have been found by experiment to be approximately 25 per cent. of the indicated water rate, and as these losses vary directly with the area of the clearance walls, which with 9 per cent. clearance would be at least 25 per cent. greater than with 3 per cent. clearance, the unindicated losses with 9 per cent. clearance will be close to 31 per cent. of the indicated water rate. On this basis the total water rate for 9 per cent. clearance becomes 25.85 lbs. per h.p. hour, and for 3 per cent. clearance it becomes 23.13 lbs. per h.p. hour.

If we assume a locomotive with cylinders 22 in. in diameter, at a piston speed of 1,516⅔ ft. per minute, the horse-power with 9 per cent. clearance will be 1,661. With 3 per cent. clearance it will be 1,723. Multiplying water rate by horse-power we find that the engine with 9 per cent. clearance will use 42,937 lbs. water per hour, while the one with 3 per cent. clearance will use 39,853 lbs. per hour. Thus it will be seen that although the engine with 3 per cent. clearance will develop 62 horse-power in excess of the one with 9 per cent. clearance, it is done with a water consumption of 3,084 lbs. less per hour. If the water rate of the engine with 3 per cent. clearance would remain the same we could augment its power to 1,856 h.p. with the same total water used to produce 1,661 h.p. in the one with 9 per cent. clearance, while the effect of the exhaust nozzle of the engines on back pressure would be the same, the weight of steam being the same in both cases.

Thus it will be seen, that, although it is not generally accepted as so, clearance volume is probably the largest factor limiting the high-speed performance of locomotives.

Passing to the consideration of piston speed, stationary steam engineers recognize as a fact that back pressure increases directly with the squares of the piston speeds.

The writer has assumed that the stroke of the piston in the foregoing example has been shortened to 24 in. At the same rate of revolution this would give a piston speed of 1,400 ft. per minute, compared to 1,516⅔ ft. per minute with 26-in. stroke. The square of 1,400 is approximately 85 per cent. of the square of 1,516⅔, and it follows that if our friends are correct as to the relation of piston speed to back pressure, we will have but 85 per cent. of the back pressure (28.2 lbs. absolute) of the engine with 26 in. stroke, in the engine with 24 in. stroke, which is 9.27 lbs. per sq. in. above atmosphere. This the writer has indicated on the theoretical diagram by a dashed line. Advancing the exhaust closure so as to give the same terminal pressure of compression, it will be seen that although we have enlarged the diagram with 3 per cent. clearance so that its mean effective pressure is 50.3 lbs. per sq. in., the total water used remains the same, while the indicated water rate becomes 18.14 lbs. per h.p. hour.

Making allowance for the slightly greater range of temperatures we find that the unindicated losses are 26 per cent. of the indicated water rate, making a total water rate of 22.86 lbs. per h.p. hour.

By shortening the piston stroke we decrease the cylinder volume, to make allowance for which it will be necessary to enlarge the bore of the cylinder with 24-in. stroke to 22⅞ in. This will give the same cylinder volume which we had in the cylinder with 22-in. bore and 26-in. stroke and makes the two engines equal in power developed per pound m.e.p. The engine with 22⅞ x 24-in. cylinders at a speed of 1,400 ft. per minute will develop 1,749 h.p., and use a total of 39,994 lbs. of water per hour. Assuming that the water rate of 22.86 lbs. per h.p. hour would hold, this engine could develop 1,878 h.p. on a total water consumption of 42,937 lbs. per hour,

which is the same quantity used to develop 1,661 h.p. in the engine with 22 x 26 in. cylinders and 9 per cent. cylinder clearance, while the weight of steam to pass the exhaust nozzle would be the same.

The above is all pure theory, for the use of which the writer may be criticised, but experience has shown that theory is the best guide to practice. Hence the use of it.

Reverting from theory to practice it is a well-known fact that all of our present valve gears give a very limited opening for steam admission when working at short cut-off, and although it has not been generally noted, as far as the writer's observation goes, the openings for exhaust are equally disadvantageous, for although the opening is large it is at its maximum very early in the stroke and gradually decreases until at half stroke, where the piston speed is at its maximum, it is rarely over three-quarters of an inch. This narrowing of the exhaust port opening will account for the abnormal rise of back pressure found on cards from locomotives at high speeds. It may be argued that this wire drawing of the exhaust is beneficial, as it decreases the water rate of the engine, but as it decreases the m.e.p. at a much faster rate than it does the water rate it may be truly stated that it is a large source of loss.

The writer knows of several devices to obtain the admirable results which he has mentioned in this letter, but they all have inherent defects or weaknesses which preclude their extensive application, and he is now engaged in perfecting a device which he hopes will overcome all objections.

CHAS. F. PRESCOTT,
Mechanical Engineer, Barber Asphalt Paving Co.

NORTHWEST DEVELOPMENT BY GRAND TRUNK PACIFIC.

The United States Consul-General at Winnipeg, Man., says concerning the Grand Trunk Pacific, which is being built across the continent by a company under agreement with the Canadian government:

"During the current year there were in operation 1,017 miles on the main line and 315 miles on branch lines. There are now under construction, to be finished this year, 650 miles, of which 210 are on the main line and 440 on branch lines. Since construction work has sufficiently advanced, settlers' effects have been moved into the different areas along the line, and on September 21, 1909, the first train carrying passengers, for the accommodation of settlers, was inaugurated. To facilitate the grain movement the company in 1908 erected 44 grain elevators, with an average capacity of 40,000 bushels each; and 50 additional grain elevators will be completed to handle this year's crop.

"A terminal storage and transfer elevator under construction at Fort William has a total capacity of about 10,000,000 bushels. The first unit of this elevator is rapidly nearing completion, and will hold 3,800,000 bushels.

"The prairie section of the Grand Trunk Pacific, which extends from Winnipeg to Wolfe Creek, a distance of 917 miles with its branches, serves a large grain-growing and mixed farming country. In addition the railway's route is over the interior plain or plateau of northern British Columbia, between Fort George, on the Fraser river, and Prince Rupert; the entire area, with but few exceptions, being suitable for either farming or ranching to a distance of within about 100 miles of Prince Rupert. The interior plateau referred to is approximately 400 miles long and stretches north to the Peace river and south an approximate distance of 75 miles, containing about 50,000 square miles of territory, 25 per cent. of which is suitable for grain growing and the production of the hardier fruits. There are in this section also considerable mineral deposits and much coal of bituminous and some of anthracite character. The cost of the prairie section has been about $35,000 per mile (figures furnished by the Grand Trunk Pacific officials). There is $2,000,000 worth of heavy bridge work yet to be done in order to preserve the low grades throughout. The Grand Trunk Pacific claims that it will save approximately 500 miles, operating from Prince Rupert to Yokohama, over the present grain-carrying route to the Orient via the Suez canal.

"The Grand Trunk Pacific is now operating three steamers on the Skeena river, and they are busily engaged in transporting supplies for the mining and trading of the interior country. The Skeena river is one of the principal torrential streams of British Columbia, and its fisheries are noted.

"The company has recently placed on the market town sites in Prince Rupert, and has realized excellent prices for the same. It is interesting to note that 80 new town sites have been opened along the main line of the prairie section, between Winnipeg and Edmonton. The work is being hurried with all possible despatch.

"The active work of locating the line of the Hudson Bay Railway commenced October 18 at the Pas Mission. Other parties will be sent out later. The preliminary survey of the road, which was completed this year, has given the engineering staff weeks of labor to figure on grades and the facilities of various routes. Lakes and other difficulties in the formation of the country will furnish engineering problems, but it is the intention to push the location line as fast as possible. The party will work out all winter, receiving supplies by dog trains. Progress is aided by the frost closing up swamps and muskegs, and killing the mosquitoes and sand flies which infest this region. Directness in the lines is aimed at, with a low grade for the grain haul toward the bay. The terminus on Hudson Bay has not yet been decided."

FOREIGN RAILWAY NOTES.

A bill has been introduced in the Orange River Colony legislature providing for the building of a railway from Bethlehem, on the Bethlehem-Harrismith Railway, to Villiers, on the Vaal river, and thence to a point on the Germiston-Volksrust line in the Transvaal.

A consular report says that a Franco-Belgain group of capitalists is seeking a Turkish government concession to establish a regular service of freight and passenger cars drawn by traction engines between Trebizond and Erzeroum, with the privilege of extending the system to the Persian and Russian frontiers. The consul describes the plans: What is known as the "Pierry system" of steam traction engines and cars is to be employed. No rails are required. A French engineer has recently been studying the route. He estimates that the route when reconstructed will be 310 kilometers (192 miles) long from Trebizond to Erzeroum. The road will have to be widened and the curves enlarged. One tunnel about 1,200 meters (1,320 yards) long will be required at Ziganna. He estimates the cost of constructing the road, which the company proposes to do itself, at $579,000 to $772,000, and the total cost, including equipment, at about $1,158,000. Ninety road men would keep the road in repair and act as road police. The steepest grade will be about 13 per cent. He thinks the trains would make about 20 kilometers (12 miles) an hour) an hour. He calculates that at present about 25,600 tons of freight is transported annually from Erzeroum to Trebizond. His figures are nearly double the actual amount at present, but with a good, regular and cheap transportation system the amount of freight would increase considerably in a few years. It appears that about 25,000 tons of freight per annum ,including Persian transit goods, now go from Trebizond to Erzeroum.

THE CLINTON BRIDGE OF THE CHICAGO & NORTH WESTERN.

The new double-track bridge of the Chicago & North Western over the Mississippi river at Clinton, Iowa, has a total length of 4,200 ft., was two years in building, the authority for expenditure having been issued March 21, 1907, and the contracts let the following May.

The Clinton crossing, which was the second bridge to be built across the Mississippi, has an interesting history. The first Clinton bridge was built in 1859 and 1864. As shown by the map and the elevation of the bridge herewith, the river has two channels at this point, the east and the west, separated by Little Rock and Willow islands. The original cross-



Clinton Bridge; 460-ft. Swing Span.

ing of the east channel was built in 1858-9 by the Chicago, Iowa & Nebraska Ry., which connected with the Chicago & Galena Union Ry., the parent line of the North Western system, by a line of 2½ miles up the east bank of the river to Fulton, Ill. Service over the west channel, which, although the narrower, is much the deeper and more important of the two, was maintained by a car ferry. The Chicago, Iowa & Nebraska was leased by the Chicago & Galena Union in 1862, and the west channel was bridged two years later. This first crossing had all wooden spans, except the draw span. The east channel portion was made up of McCallum trusses resting on cut stone piers on a foundation of piling capped with a wooden grillage. The west channel fixed spans were Howe trusses and the swing span was of the Bollman pattern. The center posts, turntable and end posts of the swing span were cast iron, the top chord two 12-in. channels with 12½-in. cover plates top and bottom, and the bottom chord two 6-in. channels with 12-in. cover plates top and bottom. The abutments and piers in the west channel were cut stone and are still in good condition. All of the spans over both channels were renewed from one to three times, the easterly McCallum truss span, for example, being replaced by a 200-ft. pin-connected Pratt truss span in 1869, and heavier spans of similar pattern being substituted again in 1881 and 1898 respectively, making three renewals. The draw span was renewed in 1887, and important repairs made to it in 1901.

As shown by the map herewith, the new bridge was built 40 ft. south of and parallel to the old bridge. This map also shows the location of the high-level highway bridge, seen in some of the photographic views, which crosses over the level of the railway bridge on Little Rock island. All elevations shown on the drawings are from the U. S. Engineers' datum plane, the extreme observed low water elevation being 0.7 ft., and extreme high water 21 ft. above this plane.

The new crossing has three separate steel structures, separated by embankments. The easterly structure is over a slough and is 550 ft. long. In the old bridge this slough was crossed by a pile trestle 1,390 ft. long, which formed the approach to the east channel section. The bed of the slough at the surface is muck a few feet down, below which is sand. There is little or no flow of water below a stage of 10, and standing timber at the head of the slough prevents drift or



West Channel Spans.

ice from being carried through. The bridge consists of 11 double-track plate girder deck spans carried by Cushing cylinder piers on piling. There are 15 to 18 piles to each cylinder, averaging 28 ft. long. The cylinders are 8 ft. in diameter, made of ⅜-in. plates, and capped with white sandstone. The abutments are red rock sandstone on concrete footings supported on piling. The superstructure of plate girders and cross girders was completed in July, 1908.

Between the slough spans and the east channel spans is a sand embankment 778 ft. long, made by a hydraulic dredge from the east channel. It has an average height of 18 ft. and contains 40,700 cu. yds. The embankment between the east and west channel spans, across Little Rock island, was made in the same way and contains about 10,100 cu. yds.

All piers and abutments of the east channel spans are built of dimension stone masonry, and all rest on piling except the westerly abutment, which was carried to rock. The seven westerly spans of the new bridge are the same length as the old, bringing the piers of the two opposite to each other. The riprap around the old piers, which gave a ground line for the new varying from above low water at the upstream end to a depth of 20 ft. or more at the downstream end in some instances, caused a variation in the method of founding the piers. Where the ground surface over the area of the footing averaged only a few feet below the water level, the concrete footing was deposited directly on the piling. Where the water was deep on the downstream side the piles were completely surrounded with riprap to obtain a level bottom, upon which a timber crib was lowered. The first plan was used on piers 13, 14, 16, 18 and 19, and the second on the remainder.

The proximity of the new piers to the old made it necessary to adopt methods in building the former which would disturb the old piers as little as possible. The old bridge was carrying a traffic amounting at times to 150 train movements in 24 hours and it was absolutely necessary, of course, that there should be no interruption to this traffic. All of the piers but one were founded in open cofferdams, the exception being due to the presence in the river bed of the wreckage of a span of the adjacent steel highway bridge, blown there by a heavy wind some years ago. As it would have been necessary to remove this span before steel sheet piling could be driven, piles were cut off under water with a rotary saw and an open caisson landed on them.

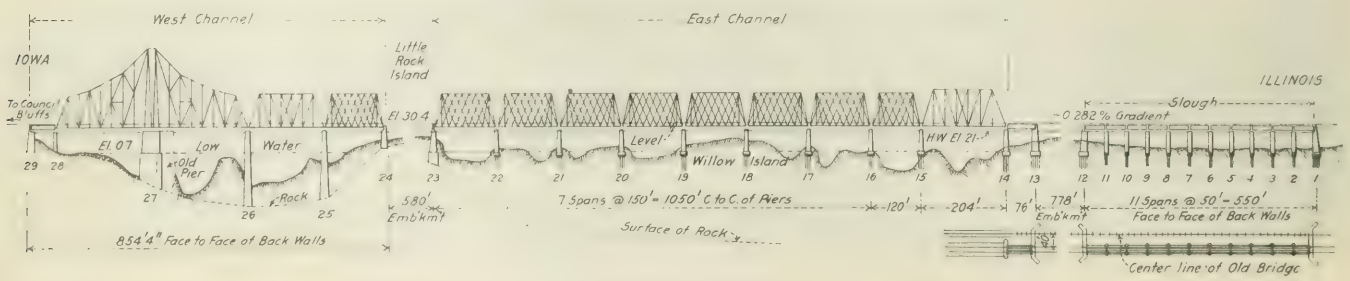
While some settlement of the old piers occurred, in only one instance did the vibration from driving steel sheet piling cause settlement serious enough to require extreme precautions. This was pier 16. To prevent an inflow of material from around the old pier, the piles of the new pier were cut off at 11 ft. below low water and a part of the concrete footing deposited through a tremie pipe before pumping out the cofferdam.



East Channel Spans, Looking East. Old Bridge on the Left.

For handling material for the substructure a temporary double-track pile trestle was built. It has 16-ft. spans, five piles to the bent and caps 28 ft. long. A stiff-leg derrick was set up on piling at each pier, but as far as possible the material was handled by a Brown hoist crane or a derrick car. The east channel structure was begun July 3, 1907, and finished March 14, 1908.

The substructure is composed of ten spans as follows, beginning with the east end: 74-ft. deck plate girder; through riveted Pratt truss span, 202 ft. 3¼ in.; through riveted lattice truss span, 115 ft. 7¾ in.; and seven through riveted



Elevation of Clinton Bridge; Chicago & North Western.

lattice truss spans of 146 ft. 5½ in. A general view of this portion of the crossing is given in the illustrations. The Pratt truss span which is of unusual length for a riveted span, is the longest riveted fixed span on the North Western. The steel work was erected from the falsework described in the previous paragraph without change. The stringers on the falsework were at the proper elevation to have the steel floor beams and stringers blocked up on them at their final level. These members would be laid complete for a span and the trusses then erected in position, supported by the floor beams, the falsework not being wide enough to support them directly. Balance in weight was maintained as nearly as possible by putting up opposite members of the two trusses consecutively. The work was done with a derrick car. It was begun January 27, 1908 and the last of the falsework was removed July 14, 1908.

The west channel, which, as already mentioned, is the deeper and therefore the main channel of the stream, is 600 ft. wide at low water and 850 ft. at high water. As shown on the map, there are two government dams in the river between the east and west channels, built in 1891—one between Little Rock and Willow islands (the latter island is below high water) and the other extending westwardly from the upper end of Willow island. They are built of riprap and brush, extending 2 to 3 ft. above low water, and were designed to increase the flow in the west channel to scour away bars which had formed below the bridge. The map also shows a floating sheer-boom in this channel extending from the draw span protection pier to a point on the west bank about 1,000 ft. above the bridge. There is a strong set of the current from the east towards the west bank in this channel. For this reason timber and log rafts passing down the river use the east channel, except at low stages of water.

The new piers in the west channel are carried down to rock or other firm strata to avoid all danger from scour. Nos. 25 and 27 are on rock and 26 rests on hardened strata of sand and clay. The two abutments and pier 28 were built in open cofferdams, and piers Nos. 25, 26 and 27 were [illegible] by the pneumatic process. Prior to putting down the first two, to minimize disturbance to the adjacent piers of the old bridge a single row of steel sheet piling was driven around each pier to what was thought to be safe depths. Only slight settlement occurred, the maximum being 2 in. at the south end of No. 25. In sinking the caisson for the center pier (No. 27), the east side had to pass through the crib of the old protection pier, while the opposite side was over deep water. This side was supported by a pyramid of sand bags on the river bottom and the air pressure kept carefully adjusted by a gage so as to preserve the proper balance as the caisson went down. Failure thus to maintain the equilibrium before the bed of the river was reached would have resulted disastrously, causing a serious displacement of the caisson. Details of the center pier caisson are shown in the illustrations. The west channel piers and abutments are cut stone masonry.

The superstructure contains four spans: one through riveted lattice span, 146 ft. 5½ in.; one through riveted Pratt span, 182 ft. 5½ in.; one through pin-connected swing span, 460 ft. c. to c. of end floor beams; one deck plate girder span, 52 ft. 7½ in. A temporary wooden pile trestle had been put in for handling the substructure materials, as for the east channel spans, and the fixed spans were erected on this with a derrick car as with the previous spans. The draw span was erected by means of a three-bent double-rail traveler. The work of raising this traveler was begun October 28, 1908. By December 12 the center of the draw span was all in and riveted up and the west arm erected complete. Navigation closed November 15 and the contractors were then free to proceed with the east arm of the draw.



Detail View of Draw Span at Center Pier.

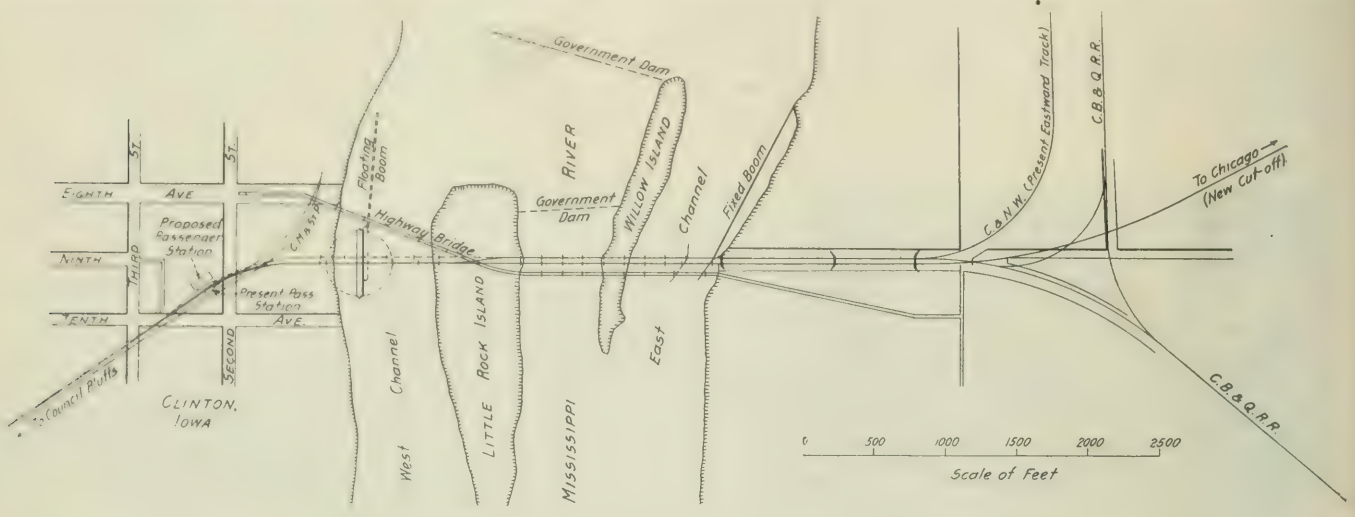


West Portal of Draw Span.

The design of this draw span is worthy of special note, due to the fact that it was governed by a clearance of only 9.4 ft. between highwater line and base of rail. This condition was imposed by, (1) a grade crossing with the Chicago, Milwaukee & St. Paul Ry., about 400 ft. west of the bridge; (2) connections with the Chicago, Burlington & Quincy Ry., adjacent to the west end of the bridge, and (3) a grade crossing of Second street, Clinton. The resident engineer in charge of the construction of the bridge describes the design as follows: "To avoid the questionable expedients of double drums, or an entire center bearing, the weight of each truss

is carried to the drum by four posts arranged in pairs. The girders of the drum are arranged in the form of a square, with additional girders in the inner corners of the square so as to form an octagon. A circular tread is bolted to these outer girders. To the longitudinal outer girders of the drum are riveted a pair of cross girders bearing upon a center which turns upon a lenticular bronze disk. Upon the completion of the span, half of the entire dead weight was transferred to this center by means of hydraulic jacks, the weight transferred being measured by gages on the jacks, and the remaining load is carried by the live ring of wheels."

are located in the operator's house, have change gears for reducing the speed one-half. With the slow speed gearing and one motor, the bridge can be swung with only one engine. For centering and locking the span, air-operated plungers are used at each end, controlled by a four-way valve interlocked with the motor controllers. Air at 90 lbs. is furnished by a 10-h.p. motor-driven air compressor for centering, braking motors when coasting to final position and blowing whistle signals. The end-lift motors are controlled by automatic switches at the ends of the span, which stop the motors independently of the operator at either end of travel by open-



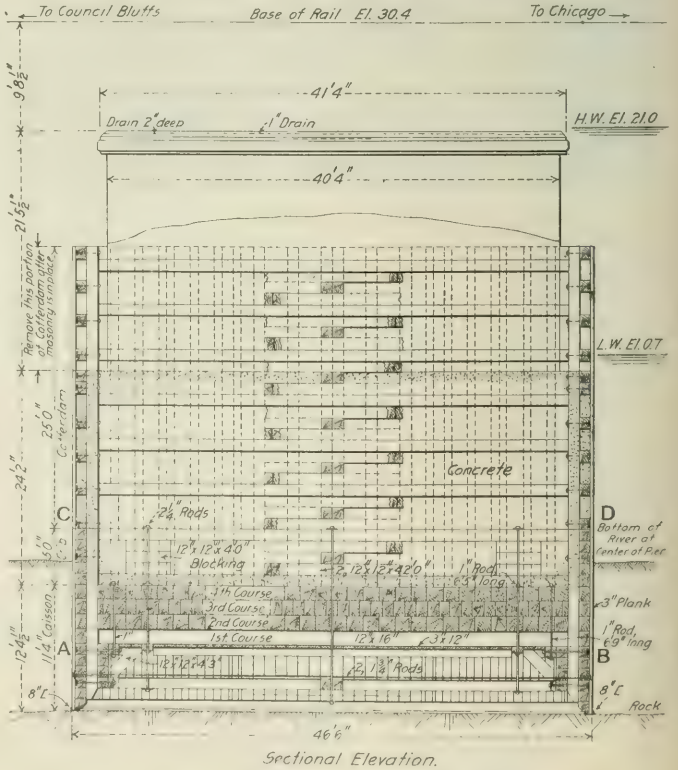
Map Showing Bridge Site and Vicinity.

A departure from previous practice has been adopted in the power installation for moving the swing span, in that the prime mover is located on the adjacent west shore instead of on the bridge. The reason is twofold: First, the size of the engines and their accessories, and, second, to free the span of the vibration which high speed gas engines cause when mounted on the structure. Another feature which determined the land location was the installation in the power plant of a large storage battery. The power house is brick and is 400 ft. from the center pier. As the bridge is swung from the batteries, and only in case of emergency from the engines, the latter are smaller than would otherwise be installed, since they are used ordinarily for charging the batteries only. They are twin cylinder, vertical 50 h.p. Otto gasolene engines, running at 360 r.p.m., direct-connected to Western Electric 300-volt 30-k.w. d.c. generators. The liability of shut-down is minimized through the following electrical combinations on the switchboard: From storage battery; from both engines working in parallel; from either engine separately; from either engine and battery in parallel. As the power may be used for other purposes than swinging the draw, meters are provided on each feeder leaving the switchboard, enabling accurate records to be obtained at all times. The storage battery contains 120 cells, having a total capacity of 640 ampere hours. The cycle of operations from the releasing of the motor controller levers to a full open draw is 1½ minutes, or 15 seconds for lowering the ends and 1¼ minutes for the swing. The battery has capacity for 16 swings at this speed and 8 additional swings at somewhat reduced speed, or 24 swings in all. The signals and derails and the different lights are operated from the battery.

Connection from the power house to the switchboard in the operator's house on the bridge is by means of a submarine cable sunk in the bed of the river. With the draw swinging 90 deg. either way and back, no pivot switch is used, the connection being through a flexible cable. The bridge is swung by two 50-h.p. street railway motors in parallel, and a 20-h.p. motor works each end lift. The swing motors, which

ing the circuit on the distributing board. Indicating lights on the switchboard show the operator when the plungers are in or out, when the ends of the span are raised or lowered, and when the bridge is full opened or nearly closed.

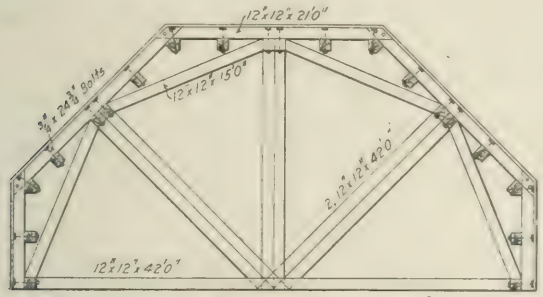
The end lift mechanism is the eccentric rocker type, first used on the Sabula bridge of the Chicago, Milwaukee & St. Paul by C. Shaler Smith nearly 30 years ago. It is the



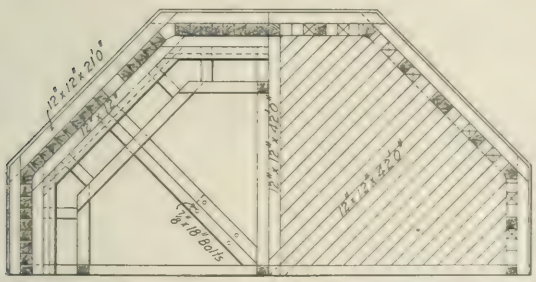
Details of Center Pier for Draw Span.

standard arrangement on the C., M. & St. P., but this is the first time it has been used on the North Western. It is thought that for a draw of this length and weight some advantage in time, and a multiplication of power in lifting the ends, might be obtained by substituting eccentric gears for the circular gears on the rocker shaft. It is estimated that a multiplication in power of about 2½ times could be obtained, and it is possible that this change in the present arrangement may be made later.

The steel superstructure of the bridge throughout is designed for Cooper's E-50 loading for each track. The weight of the deck is assumed at 550 lbs. per foot of track. Impact for moving load stresses is added according to the Pritchard formulas, (1) for stresses resulting from load on one track; (2) for stresses resulting from load on two tracks. The trusses are spaced 32 ft. c. to c., which is wider than ordinary, the purpose being to allow derailed cars to reach the guard timbers without striking the trusses. The minimum lateral

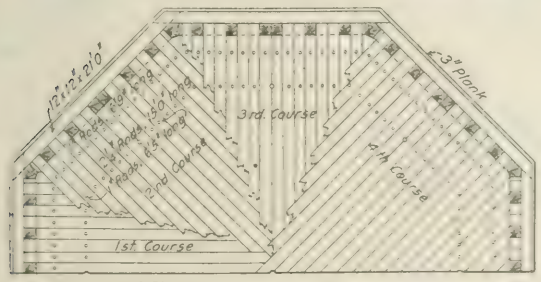


Half Plan Showing Cofferdam Bracing.



¼ Section A-B Showing Bracing Under Deck.

¼ Section C-D Showing Caisson Bracing above Deck.



Half Plan Showing Deck Timber Courses.

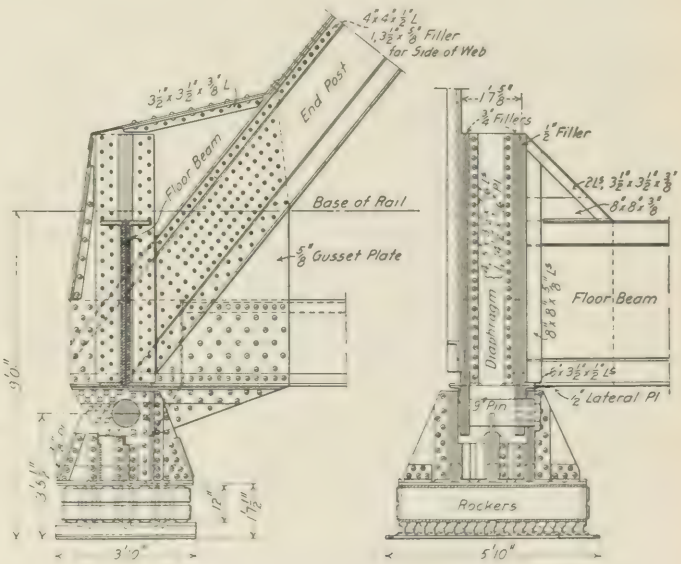
Caisson and Cofferdam.

clearance for trains is 8 ft. from center line of track, and the vertical clearance is 22 ft. 6 in. from base of rail. The tracks are 13 ft. c. to c.

The deck construction, which may be seen in the portal view, follows the standard type of the North Western. The ties are long leaf pine, 8 in. x 8 in., surfaced to uniform thickness of 7¾ in., and 12 ft. long. There is a 10-in. x 12-in. outer guard timber at each end of the ties, laid on edge, dapped 1 in. over the ties, and fastened to each with a ¾-in. bolt. Inside each rail, with the outside of the vertical leg 9½ in. from the inner flange of the rail is a 6-in. x 4-in. x ½-in. angle, with the 6-in. leg on the ties. Backing up this angle is a 4-in. x 10-in. plank laid flat and spiked to each tie. The end is attached to this plank by ½-in. screws, 4 in. long, and to every fourth tie with a track spike. Outside the rail, 4 in. from the inside flange, is another 4-in. x 10-in. plank, similarly spiked to the ties. In cases of derailment the wheels inside the track are carried by the guard angle and the treads of those outside ride the plank, saving the ties. To prevent rail creeping, "L. & S." anti-creepers are used freely, there being two with the traffic and one against it for each 16-ft. panel.

The weights of steel in the superstructure of the different sections of the crossing are as follows: Slough spans, 5,694 tons; east channel spans, 3,214 tons; west channel spans, 3,107 tons; the swing span weighing 2,200 tons. The design and construction of the bridge were done under the direction of E. C. Carter, chief engineer; W. H. Finley, assistant chief engineer, and I. F. Stern, engineer of bridges of the Chicago & North Western. F. H. Bainbridge was resident engineer in charge of the work, and H. M. Spahr, assistant engineer. The contract for the substructure was let to the Foundation Company, New York; for furnishing and erecting the east channel and slough spans, to the Wisconsin Bridge & Iron Co., Milwaukee, Wis.; for furnishing and erecting the west channel spans, to the Pennsylvania Steel Co., Steelton, Pa. The last named sub-let the work of erection to the Missouri Valley Bridge & Iron Co., Leavenworth, Kan.

Besides the main line traffic of the North Western on its



Detail of Expansion Bearing for 202-ft. Span.

Chicago-Omaha line, the bridge is used by the Chicago, Rock Island & Pacific for freight transfer, and by the Chicago, Burlington & Quincy for its lines from Clinton, Iowa, to Mendota, Ill., and to Savanna, Ill. This traffic is included in the total train movements mentioned earlier in the article.

The west channel spans of the old bridge have been removed. It was the intention at first to retain the east channel portion as a third track, but it was decided later that this would not be desirable and these spans also will be removed.

In connection with the bridge work and other improvements to be made at and in the vicinity of Clinton, a cut-off for through trains is being built on the Illinois side of the river. The location at this point was mentioned in the beginning of the article in referring to the connection between the Chicago, Iowa & Nebraska and the Chicago & Galena Union, a line 2½ miles long up the east bank of the river to Fulton. This right-angled location has been maintained up to the present. The new cut-off forms the hypothenuse of the triangle of which the old line is the other two sides. It is 4.95 miles long and shortens the distance 1.2 miles. All through trains will use it, leaving five trains a day each way over the old line through Fulton.

RAILWAY STATISTICS OF THE UNITED STATES FOR YEAR ENDED JUNE 30, 1908.

The Interstate Commerce Commission in the abstract of its annual report sent to Congress Dec. 21, gives statistics for the year which ended 18 months ago, from which the principal items are shown in the table below. The report for the year before, that ending June 30, 1907, was given in our issue of July 24, 1908. Below the table will be found the explanation of some differences in accounting which need to be borne in mind in comparing one year with another.

Railway Statistics for Years Ending June 30.

	1908.	1907.	1906.	1905.
Miles of road completed	233,678	229,951	224,363	218,101
Increase, 12 months	5,930	5,588	6,262	4,197
*In hands of receivers	.....	3,926	3,971	796
Locomotives, number	57,698	55,388	51,672	48,357
Cars, owned, passenger	45,292	43,973	42,262	40,713
Cars owned, freight	2,100,784	1,991,557	1,837,914	1,731,409
Cars owned, total	2,244,357	2,126,594	1,958,912	1,842,871
Employees	1,458,244	1,672,074	1,521,355	1,382,196
Per 100 miles of road	623	735	689	637
Total stock and funded debt	$12,840.1	.....	$14,570.4	$13,805.3
Stock and debt per mile road	57,230.0	.....	67,936.0	65,926.0
Gross earnings, millions	2,393.8	$2,589.1	2,325.8	2,082.5
Average per mile	10,533.0	11,383.0	10,460.0	9,598.0
Passengers carried, millions	890.0	873.9	800.0	738.8
Carried 1 mile, millions	29,082.8	27,718.6	25,175.0	23,800.1
Tons freight carried, millions	1,533.0	1,796.3	1,631.4	1,427.7
Carried 1 mile, millions	218,381.5	236,601.4	215,877.6	186,463.1
Av. rate per ton-mile, mills	7.5	7.6	7.5	7.7
Av. pass. fare per mile, cents	2.0	2.0	2.0	2.0

*Not reported in the present abstract. †In millions.

The mileage of road now reported does not include the lines of switching and terminal companies, and the omission of the statistics of these companies also vitiates the comparison in some of the other items. The total length of track owned by switching and terminal companies is 3,712 miles, of which 1,626 is classed as main lines.

In giving the total amount of stock and bonds, the present report gives the sum "outstanding in the hands of the public," which makes a decided reduction from former years; the same is true of the average per mile of road.

The aggregate length of *track* reported June 30, 1908, by the railways of the country was 333,646 miles, an increase of 8,705 miles over the preceding year. This track is owned by 2,161 companies.

Companies (other than switching and terminal) owning 10,143 miles of line, were reorganized, merged or consolidated during the year. The number of locomotives per 1,000 miles of line, excluding those of switching companies, was 246, and the number of cars 9,680. Statistics of power brakes and automatic couplers show substantially all cars and engines equipped, the few exceptions being those of cars or engines probably not used in general service.

In the total of 1,436,275 railway employees other than those in the service of switching and terminal companies, there were 57,688 enginemen, 61,215 firemen, 43,322 conductors, and 114,580 other trainmen.

The total number of railway employees (disregarding a small number not assigned and those employed by switching and terminal companies) was apportioned among the five general divisions of railway employment, as follows: For maintenance of way and structures, 442,936; for maintenance of equipment, 290,608; traffic, 24,817; transportation, 620,584; and general, 53,439.

The report includes summaries showing the average daily compensation of eighteen classes of employees for a series of years, and also the aggregate amount of compensation returned for the several classes. The total amount of wages and salaries reported as paid to railway employees (including those in the service of switching and terminal companies) during the year was $1,051,632,225.

The par value of the total amount of capital outstanding exclusive of (switching and terminal companies), was $16,767,544,827. Of this amount, $12,840,091,462 was outstanding in the hands of the public. Of the total outstanding, there existed as stock $7,373,212,323, of which $5,910,351,430 was common and $1,462,860,893 was preferred; the remaining part, $9,394,332,504 represented funded debt, consisting of mortgage bonds, $6,610,189,953; collateral trust bonds $1,076,670,441; plain bonds, debentures, and notes, $835,551,354; income bonds, $258,584,016; miscellaneous obligations, $268,743,958; and equipment trust obligations, $344,592,782.

Of the total capital stock outstanding, $2,529,841,583, or 34.31 per cent., paid no dividends. The amount of dividends declared during the year was $386,879,362, being equivalent to 7.99 per cent. on dividend-paying stock. For the year ending June 30, 1907, the amount of dividends declared was $308,088,627. The total amount of funded debt (omitting equipment trust obligations) that paid no interest was $655,598,627, or 7.24 per cent. Of mortgage bonds, $487,372,930, or 7.37 per cent.; of collateral trust bonds, $14,119,518, or 1.31 per cent.; of plain bonds, debentures, and notes, $29,314,941, or 3.51 per cent.; of income bonds, $120,424,356, or 46.57 per cent.; and of miscellaneous obligations, $4,366,882, or 1.62 per cent., paid on interest.

The increase in the number of passengers carried 1 mile for 1908 over the corresponding figure for 1907 was 1,400,098,012. The increase in the number of passengers carried 1 mile in 1907 over that for 1906 was 2,551,313,199 passenger-miles. The number of tons of freight shown as carried includes freight received from connections. The decrease in the number of tons carried in 1908 under the corresponding figure for 1907 was 185,460,810. The increase in the number of tons carried in 1907 over the corresponding return for 1906 was 164,962,440 tons. The passenger train revenue per train-mile was $1.27; the freight revenue per train-mile was $2.65. The number of tons carried 1 mile per mile of road, as computed on the basis used for the year ending June 30, 1908, was 974,654 ton-miles. The average cost of running a train 1 mile was $1.47. The ratio of operating expenses to operating revenues was 69.75 per cent. These averages for a number of reasons are not strictly comparable with those published for previous years.

The following figures present the operating revenues in detail:

Freight revenue	$1,655,419,108
Passenger	566,832,746
Mail	48,517,563
Express	58,692,091
Excess baggage and milk (on pass. trains)	12,838,647
Parlor and chair car revenue, etc.	3,480,738
Switching	19,715,089
Special service train revenue and miscel.	7,082,526
Total, operations other than transportation	21,227,481

The operating expenses assigned to the five general classes were:

Maintenance of way and structures	$329,373,367
Maintenance of equipment	368,353,798
Traffic expenses	48,262,758
Transportation expenses	868,252,168
General expenses	55,179,174
Undistributed	126,611
Total	$1,669,547,876

The operating expenses averaged $7,346 per mile of line.

Accidents—Statistics of accidents are given from the annual reports of carriers differing slightly from those contained in the Quarterly Accident Bulletins. Those not shown in the bulletins are summarized as follows: The total number of persons other than employees and passengers killed was 6,402; injured, 10,187. These figures include the casualties to persons trespassing, of whom 5,489 were killed and 5,756 were injured. At highway crossings, killed, 832; injured, 1,755; at stations, killed, 464; injured, 581; at other points along track, killed, 3,665; injured, 2,118.

Returns indicate that in 1908, 1 passenger was killed for every 2,335,983 carried, and 1 injured for every 77.017 carried; 76,332,905 passenger-miles were accomplished for each passenger killed, and 2,516,687 passenger-miles for each passenger injured.

The following summary of revenues and expenses, taken from another part of the commission's abstract, brings the figures down to July 1, 1909. These statements represent the

aggregate of the monthly financial returns made by the railway companies:

Item.	Year ending June 30, 1909. Amount.	Ratio to total operating revenues.	Average per mile of line a	Year ending June 30, 1908. Amount	Ratio to total operating revenues	Average per mile of line b
		Per cent.			Per cent.	
Freight revenue	$1,682,919,304.82	68.86	$7,232.75	$1,659,055,763.18	68.51	$7,271.30
Passenger revenue	564,302,580.36	23.09	2,421.87	566,245,657.84	23.38	2,481.74
Other transportation revenue	173,634,402.26	7.11	745.20	172,560,040.56	7.13	756.30
Nontransportation revenue	22,455,944.96	.92	38	23,680,643.18	.98	103.79
Total operating revenues	2,443,312,232.40	100.00	10,486.20	2,421,542,004.76	100.00	10,613.13
Less total operating expenses	1,615,497,233.50	66.12	6,933.39	1,687,144,975.74	69.67	7,394.42
Rail operations: Net revenue	827,814,998.90	33.88	3,552.81	734,397,029.02	30.33	3,218.71
Outside operations: Net revenue	4,198,417.87	.....	18.02	5,797,161.11	.....	25.41
Total net operating revenue	832,013,416.77	.....	3,570.83	740,194,190.13	.....	3,244.12
Taxes	89,026,226.18	.....	382.08	83,775,509.26	.....	367.17
Operating income	742,987,190.59	.....	3,188.75	656,418,320.87	.....	2,876.95

a On basis of average mileage operated during the year, 233,002.67 miles; mileage operated at end of year, 234,182.70 miles.
b On basis of average mileage operated during the year, 228,164.80 miles; mileage operated at end of year, 229,952.36 miles.

INTERSTATE COMMERCE COMMISSION REPORT.

The annual report of the Interstate Commerce Commission was noticed last week, page 1,273. Following are abstracts of two chapters for which there was not room at that time:

STATISTICS.

The head of the division of statistics and accounts gives a review of his work during the past year, a principal feature of which has been the publication of monthly financial reports, with which our readers are familiar. This bureau is investigating switching and industrial railways, and a special report will soon be published, telling all about these organizations. There are 2,600 of them in the country, of which only about 150 have hitherto reported to the commission. It is proposed to require all of them to make reports, and there is also under consideration a proposal to require all railways to make separate reports of their terminal and switching services.

Under the comprehensive authority of the Twentieth Section of the law, the commission purposes to make special investigations of all sorts of subjects which may affect its action in any case coming before it. The attention of Congress is called to the desirability of securing statistics of traffic by water. Reports are now required from the express companies. Their business is found to be very complicated, and it has been necessary to proceed with great care in this field. The examiners, who make general examinations of carriers' books, and who also make special examinations, made 112 reports during the year, but it has been difficult to secure competent men for this work and to retain them, when secured, against the competitive offers of private corporations. The report ends with the usual abstract of the statistics for the year ending June 30, 1908, which will be found under another head.

SAFETY APPLIANCES.

The chapter on safety appliances makes a plea for the bill, now before Congress, to establish by law standard steps, ladders and hand brakes. This bill was noticed in the *Railroad Age Gazette* of December 24. In this chapter there is a three-page digest of recent decisions of the federal courts on the safety appliance acts. Since the enactment of the law, the government has recovered $140,000 in penalties for violations, and the number of violations represented in the suits which have been prosecuted is 2,692. During the last fiscal year the number of violations charged was 302, of which 36 have gone to trial, and all but four of which have been decided in favor of the government. The inspectors of the commission still find retaining valves which are not kept in good condition, and "a great many" hand brakes are found which work in opposition to the air-brakes. The inspectors have conducted standing tests of air-brakes, from which it is said that much improvement has resulted. Most of the legal questions which have arisen in the application of the safety appliance acts have been satisfactorily settled, except that concerning the responsibility of employees in case they are injured while moving defective cars for the purpose of repair. Such a movement, to be lawful, must be made independently of any movement of vehicles which are commercially employed, and it is doubtful whether, in the movement of such cars, section 8 of the law gives the injured employee any immunity from his common law responsibility for looking out for his own safety.

COMPARATIVE TESTS OF CONSOLIDATION AND MALLET LOCOMOTIVES ON SOUTHERN PACIFIC.

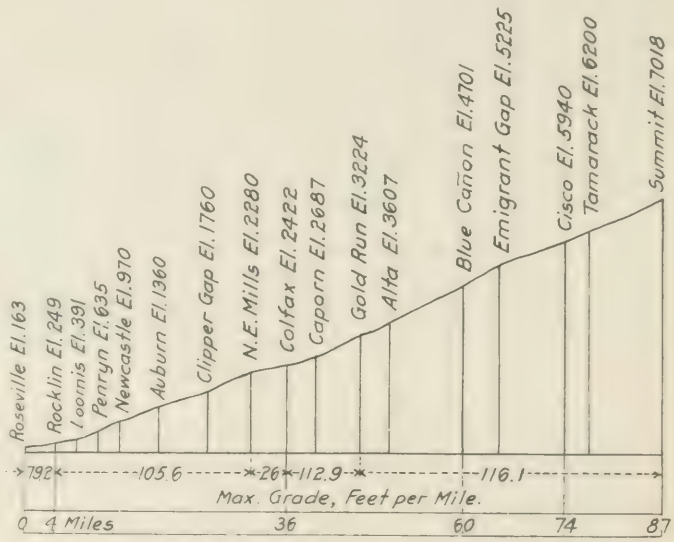
The Mallet freight locomotives built by the Baldwin Locomotive Works for mountain service on the Southern Pacific were fully illustrated in the *Railroad Age Gazette* April 30, 1909, page 933. The engines have compound cylinders 26 in. and 40 in. x 30 in., and the weight on drivers is 394,150 lbs. The consolidation engines have cylinders 22 3/32 in. x 30 in. and weight on drivers 187,000 lbs.

The table below gives other data relating to the two types of engines tested:

TABLE 1.

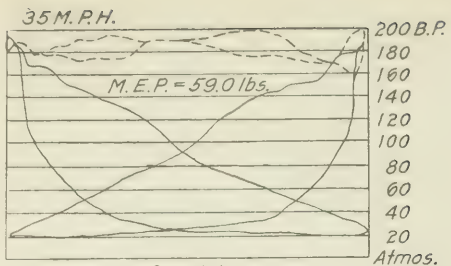
	Mallet.	Consolidat'n.
Engine	No. 4001.	No. 2564.
Size of cylinders	26 & 40 x 30 in.	22 3/32 x30 in.
Diameter of drivers	56 3/4 in. h.p., 56 3/4 in. l.p.	54 7/8 in.
Total weight, locomotive	425,900 lbs.	208,000 lbs.
Weight on drivers	394,150 "	187,000 "
Weight of tender	169,765 "	134,745 "
Total boiler heating surface	6,394 sq. ft.	3,403 sq. ft.
Heating surface, feed-water heater	1,221 "	..... "
" " reheater	655 "	..... "
" " branch pipes	..... "	29 "
Diameter of exhaust nozzle	7 in., 3/8-in. rd. split	5 1/4 in.
Kind of burner	3 1/2 in. Von Boden-Ingles.	

The large Mallet locomotives on the Great Northern have 316,000 lbs. on drivers, and they were illustrated in the *Railroad Gazette* of August 17 and October 12, 1906. An account of their performance on mountain grades was presented to the American Society of Mechanical Engineers by G. H. Emerson, superintendent of motive power, and will be found in the Proceedings of that Society, Volume 30 (1908), page 1029.

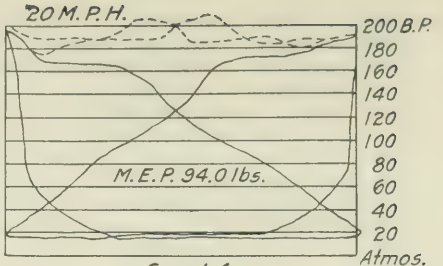


Profile of Road; Roseville to Summit.

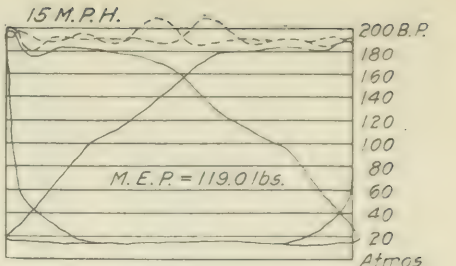
The Southern Pacific Mallet engines were tested in November, 1909, and the consolidation in June, 1909, on the Sacramento division, Roseville to Summit, 87 miles. The first half



Card 1.



Card 4.



Card 5.

Indicator Diagrams from Engine 2564, Class C-57$^{22}_{30}$ 187; Baldwin Simple Consolidation, Without Superheater.

Diagrams taken June 9 and 11, 1909, on Sacramento Division, between Roseville and Summit.
Freight train, Extra, East.

Train consisted of 14.5 cars—481 tons—Engine unaided.

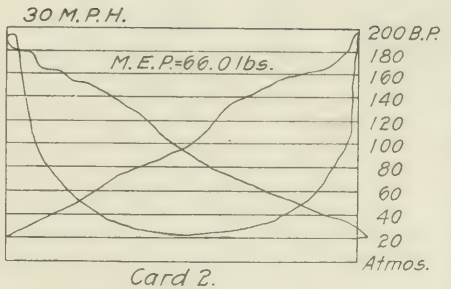
NOTE.—Diagrams taken at working points of cut-off and represent average performance of engine at speeds shown. Cards taken by Crosby indicator, on right cylinder. For chart of fuel consumption, see ML. 1220-21.

Dimensions of cylinder	22$\frac{3}{32}$ in. x 30 in.
Weight of engine, loaded	208,000 lbs.
Weight on drivers	187,000 "
Weight on truck	21,000 "
Diameter of drivers	54 7/8 in.
Total heating surface, boiler	3,403 sq. ft.
Heating surface of firebox	177 "
Heating surface of branch pipes	29 "
Diameter of exhaust nozzle	5$\frac{3}{16}$ in.
Engine equipped with valve	Drawing C.A. 2905.
Type of valve, piston	Inside admission
Dimensions of steam ports	1½ in. x 2$\frac{13}{16}$ in.
Dimensions of exhaust ports	3 in. x 2$\frac{13}{16}$ in.
Exhaust lap of valve	$\frac{1}{16}$ in.
Steam lap of valve	1 in.
Lead at full throw	$\frac{3}{32}$-in.

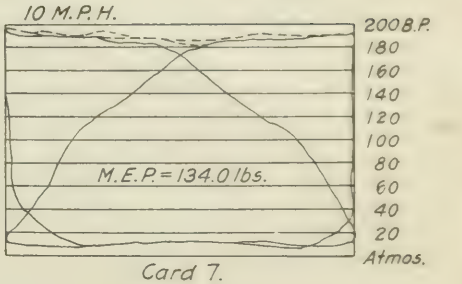
Indicator Spring, 100, *Calibrated.*

NOTE.—Dotted lines on cards are steam chest pressures.

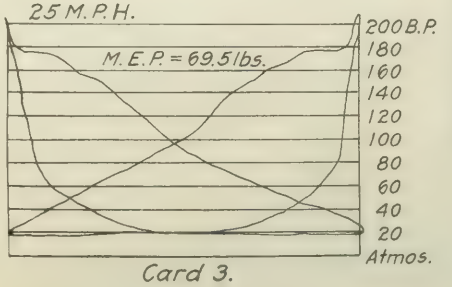
	No. of card—						
	1.	2.	3.	4.	5.	7.	8.
Cut-off	11½ in.	10 in.	8½ in.	11½ in.	13½ in.	14½ in.	22½ in.
Revolutions per minute	215	184	153	123	92	61	31
Piston speed, ft. per min.	1,075	920	765	615	460	305	155
Velocity of train, miles per hour	35	30	25	20	15	10	5
Position of throttle	Full.	Full.	Full.	Full.	Full.	Full.	Full.
Boiler pressure	200	200	200	200	200	200	195
M. E. P. in cylinder	59.0	66.0	69.5	94.0	119.0	134.0	168.0
M. E. P. expressed as per cent. of B.P.	29.5	33.0	34.8	47.0	59.5	67.0	86.2
Indicated horse-power	1,470	1,410	1,237	1,339	1,271	954	598
Tractive power	15,762	17,632	18,567	25,112	31,791	35,798	44,881
M. E. P. on crosshead	22,632	25,318	26,660	36,058	45,648	51,402	64,445
Temperature in steam chest, deg. F.	389	387	387	387	387	385	375



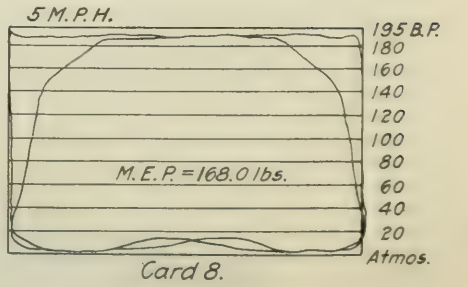
Card 2.



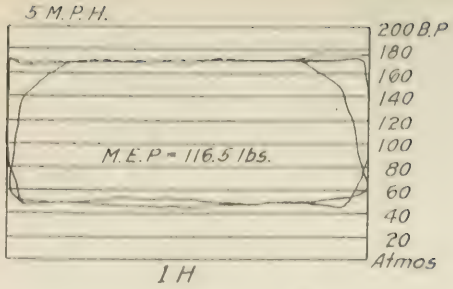
Card 7.



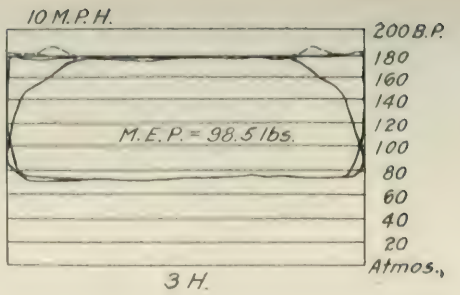
Card 3.



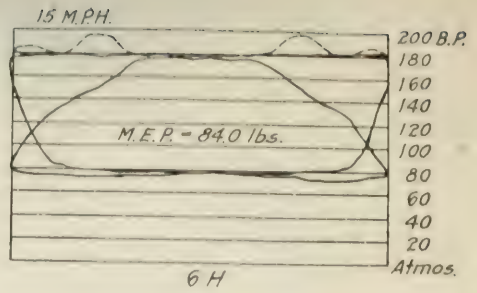
Card 8.



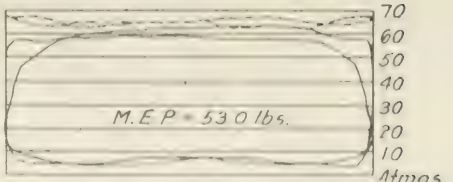
1 H



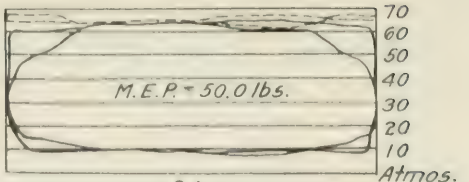
3 H.



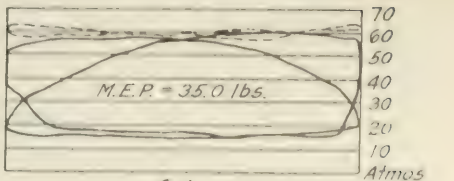
6 H



1 L



3 L.



6 L.

Indicator Diagrams from Engine 4001; Baldwin Compound Mallet Consolidation.

Diagrams taken Nov. 8, 1909, on Sacramento Division, between Roseville and Summit.
Train consisted of 21 cars—1,105.5 tons—Engine unaided.

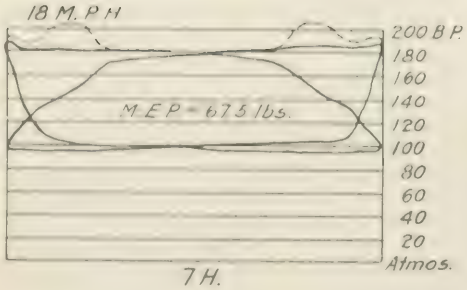
NOTE.—Diagrams taken at working points of cut off and represent average performance of engine at speeds shown. Cards taken by Crosby indicators on right high and low pressure cylinders. Cards taken on high pressure engine denoted by H after the card number and those on the low pressure engine by L. Locomotive equipped with Walschaerts valve motion.

Dimensions of cylinders	26 in. and 40 in. x 30 in.
Weight of engine, loaded	425,900 lbs.
Weight on drivers	394,150 "
Weight on front truck	14,500 "
Weight on trailing truck	17,250 "
Diameter of drivers, h. p. engine	56⅜ in.
Diameters of drivers, l. p. engine	56⅜ in.
Total heating surface, boiler	6,394 sq. ft.
Heating surface of firebox	232 "
Heating surface of boiler tubes	4,941 "
Heating surface of feedwater heater	1,221 "
Heating surface of reheater	655 "
Diameter of exhaust nozzle	7 in. with ⅜ in. round splitt
Valve, piston	Inside admission, see drawing C.A. 6859
Dimensions of steam ports	1½ in. x 36⅛ in.
Dimensions of exhaust ports	3 in. x 36⅛ in.
Exhaust lap of valve	⅛ in.
Steam lap of valve	1 in.
Lead at full throw	2³⁄₃₂ in. back, ¼ in. front
Weight of tender, loaded	169,765 lbs.

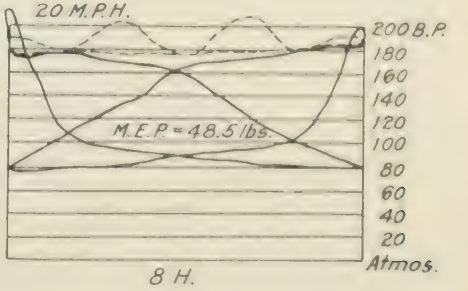
Indicator Springs. 100 *in High Pressure and* 50 *on Low Pressure Cylinders, Both Calibrated.*

NOTE. Dotted lines on cards are steam chest pressures.

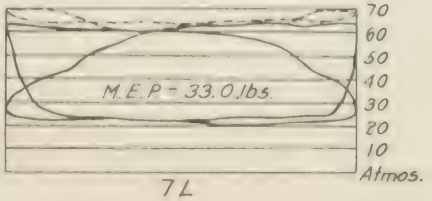
	1 H.	1 L.	3 H.	3 L.	6 H.	6 L.	7 H.	7 L.	8 H.	8 L.
Cut-off, ins.	24¾	25	24	24¼	20	18½	21½	21½	15½	17½
Revolutions per minute	29.8	29.6	59.6	59.2	89.4	88.8	107.3	106.6	119.2	118.4
Piston speed, ft. per min	149	148	298	296	447	444	537	533	596	592
Velocity of train, M. P. H.	5	5	10	10	15	15	18	18	20	20
Position of throttle	Full.	Full.	Full.	Full.	Full.	Full.	Full.	Full.	Full.	Full.
Boiler pressure	200	200	200	200	200	200	200	200	200	200
M. E. P. in cylinder	116.5	53.0	98.5	50.0	84.0	35.0	67.5	33.0	48.5	29.5
M. E. P. expr. as p. ct. B.P.	58.3	26.5	49.3	25.0	42.0	17.5	33.8	16.5	24.3	14.8
Indicated horse power	552	595	934	1,123	1,194	1,179	1,152	1,334	920	1,325
Total I. h.p. of locomotive	1,147		2,057		2,373		2,486		2,245	
Tractive power	41,429	44,626	35,036	42,100	29,879	29,470	24,010	27,786	17,251	24,839
Total t. p. of locomotive	86,055		77,136		59,349		51,796		42,090	
Per. ct. of work in cylinder	48	52	45	55	50	50	46	54	41	59
M.E.P. on crosshead	61,122	66,267	51,678	62,516	44,071	43,761	35,416	41,261	25,445	36,884
Temp. l. p. stm. chest, deg. F.	310		312		310		310		310	



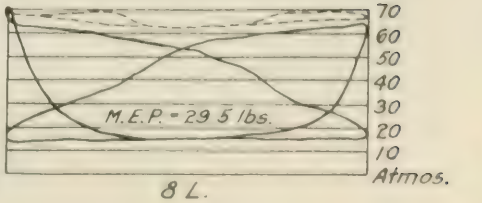
7 H.



8 H.



7 L



8 L.

of the distance has grades 105 to 113 ft. per mile, and for the last 40 miles the grade is 116 ft. per mile. A diagram showing the profile of the road is here presented. The ratio of the weight on drivers for the two classes of engines was 2.1 to 1, and the average weight of train hauled up the 2.2 per cent. grade was 1,056 tons by the Mallet and 481 tons by the consolidation engine. The fuel used by each engine was Kern river oil having the following quality: Gravity, 15.8 B; flash point, 230 deg. F.; fire point, 278 deg. F.; weight per gallon, 8 lbs. The comparative cost of operating the locomotive in freight service between Roseville and Summit is given in the table below:

Table 2.

Detail.	Cost per mile in cents—Mallet—Locomotive-mile.	Mallet—100 gross ton-miles.	Consolidation—Locomotive-mile.	Consolidation—100 gross ton-mile.
Repairs, running only	5.67	.53	5.48	1.14
Fuel	47.72	4.52	26.62	5.53
Enginemen	11.95	1.13	10.96	2.28
Lubricating	.85	.07	.43	.09
Water	2.09	.20	1.11	.23
Total	68.28	6.45	44.60	9.27

The relative cost of locomotive expenses as shown above are 70 for the mallet and 100 for the consolidation. The figure for figures are for actual running time, the equivalent in water, of 15 gal. of oil is allowed per hour while standing. In "gallons and pounds of oil per 1,000 ton miles" and "ton miles per pound of oil burned," a deduction is made of 15 gal. per hour while standing and 3.5 per cent. of total oil for use in evaporating steam for atomizing the oil. In "pounds of steam used for air pump, oil burner, etc.," an allowance of 0.2623 lbs. of steam per cycle of air pump and 3.5 per cent. of total steam for use in burner is made. The quantity of oil burned is corrected to normal temperature of 70 deg. F. Steam temperatures were taken every 5 minutes while engines were working steam. One air pump was used on each locomotive.

The main results of the tests show that the equivalent evaporation per pound of fuel was 7.81 per cent.—the ton miles per gallon of water used in main cylinders 14.04 per cent.—the ton miles per pound of coal burned 22.50 per cent.—and the tonnage handled 119.54 per cent. more for the Mallet than the consolidation. The better evaporation effect of the Mallet boiler was doubtless due to the fact that the final temperature of waste gases in the Mallet was 287.2 deg. less than the waste gases of the consolidation locomotive, while the gain in main steam cylinder efficiency is accounted for by the

Table 3.—*Service Tests of Baldwin Compound Mallet Consolidation Freight Locomotive* 4001, *and Common Standard Simple Consolidation Freight Locomotive* 2564, *on Sacramento Division, June and November,* 1909. *Oil Burning. Two Trips with each Engine, from Roseville to Summit.*

	4001		2564		4001	2564
Number of locomotive	Baldwin, Mallet Compd.		Baldwin, Simp. Cnsldatn.		Mallet Comp.	Simp. Cons.
Builder and kind of locomotive	1	2	1	2	Totals and averages.	
Number of test	Roseville to Summit.		Roseville to Summit.		Roseville to Summit.	
Location of test	Nov.6, 1909.	Nov. 8, 1909.	June 9, 1909.	June 11, 1909.	Nov.6 & 8,'09	June 9 & 11.
Date of test	13 h. 52 m.	15 h. 10 m.	10 h. 16 m.	11 h. 7 m.	29 h. 2 m.	21 h. 23 m.
Total time of test	8 h. 47 m.	9 h. 24 m.	6 h. 29 m.	6 h. 30 m.	18 h. 11 m.	12 h. 59 m.
Actual running time	5 h. 5 m.	5 h. 46 m.	3 h. 47 m.	4 h. 37 m.	10 h. 51 m.	8 h. 24 m.
Time lost standing during test	9.91	9.26	13.42	13.39	9.57	13.40
Average running time between terminals, miles per hour	20	25	17	19	45	36
Number of stops made	200	200	200	200	200	200
Maximum steam pressure (gage), lbs	175	180	185	175	175	175
Minimum steam pressure (gage), lbs	194.0	195.0	197.7	194.6	194.5	196.1
Average steam pressure (gage), lbs	368.7°F.	364.7°F.	383.1°F.	381.3°F.	366.7°F.	382.4°F.
Average temperature of steam, high-pressure steam chest	321.3°F.	324.2°F.	.....	.....	322.7°F.	.....
" " " steam, low-pressure exhaust	315.1°F.	319.4°F.	.....	.....	316.9°F.	.....
" " " exh'st st'm after passing through reheater	304.8°F.	310.5°F.	.....	.....	307.2°F.	.....
" " " steam, low-pressure steam chest	451.3°F.	451.3°F.	727.1°F.	754.7°F.	451.3°F.	738.5°F.
" " " smokebox gases	590.5°F.	590.5°F.	.....	.....	590.5°F.	.....
" " " gases in combustion chamber	53.7°F.	52.6°F.	68.8°F.	68.0°F.	53.2°F.	68.4°F.
" " " feed water	203.7°F.	202.6°F.	218.8°F.	218.0°F.	203.2°F.	218.4°F.
" " " water to fd-wtr. htr. (or boiler) frm inj.	248.8°F.	247.7°F.	.....	.....	248.3°F.	.....
" " " water passing from heater to boiler	45.1°F.	45.1°F.	.....	.....	45.1°F.	.....
Rise in temperature of feed-water delivered to boiler from heater	43,866	47,221	23,662	24,441	91,087	48,103
Gallons of water evaporated (total)	365,550	393,508	197,183	203,675	759,058	400,858
Pounds of water evaporated (total)	3,847.2	3,844.9	2,132.5	2,195.9	7,692.1	4,328.4
Gallons of oil burned	30,778	30,759	17,060	17,567	61,537	34,627
Pounds of oil burned	11.88	12.79	11.56	11.59	12.33	11.58
Pounds of water evaporated per pound of oil burned	14.48	15.62	13.92	13.97	15.04	13.95
Equivalent ditto, from and at 212 deg. F	6.381	6.401	8.700	8.917	6.392	8.809
Pounds water evaporated pr sq. ft. of boiler heating surface pr hr	7.778	7.816	10.475	10.745	7.798	10.610
Equivalent ditto, from and at 212 deg. F	87	87	87	87	174	174
Distance run, miles	22.61	22.63	40.80	39.62	22.62	40.20
Engine-miles per 1,000 gallons of oil burned	1.983	1.842	3.677	3.560	1.910	3,617
Engine-miles per 1,000 gallons of water evaporated	19.0	21.0	9.0	10.0	20.0	9.5
Number of loaded cars in train	9.0	0.0	6.0	4.0	4.5	95.0
Number of empty cars in train	28.0	21.0	15.0	14.0	24.5	14.5
Total number of cars in train	2,013,0	2,211.0	955.8	967.4	2,112.0	962.0
Weight of train in miles	1,006.5	1,105.5	477.9	483.7	1,056.0	481.0
Weight of train in tons	5.109	5.612	5.111	5.173	5.360	5.144
Tons hauled per ton on locomotive drivers	87,566	96,179	41,577	42,082	183,744	83,694
Gross-ton mileage	346,576	373,486	183,903	190,128	720,063	374,031
Pounds steam used in main cyldrs., available for hauling tonnage	41,589	44,818	22,068	22,815	86,407	44,883
Equivalent ditto, in gallons of water	474.94	465.99	530.77	542.16	470.26	536.29
Equivalent ditto, gallons per 1,000 tons-miles	18,974	20,022	13,280	13,547	38,996	26,827
Pounds steam used in air pump, oil burner, etc	2,276.9	2,402.6	1,593.6	1,625.6	4,679.5	3,219.2
Equivalent ditto, in gallons of water	26.00	24.98	38.33	38.63	25.47	38.46
Equivalent ditto, gallons per 1,000 ton-miles	500.94	490.97	569.10	580.79	495.73	574.75
Gallons of water per 1,000 ton-miles (total water used)	41.53	37.68	48.13	48.71	39.51	48.40
Gallons of oil per 1,000 ton-miles	332.24	301.44	385.04	389.68	316.08	387.20
Pounds of oil per 1,000 ton-miles						
Boiler efficiency based on 18,500 B. t.u. per lb., of oil and on above totals and averages					78.52%	72.83%

Relative performance, based on above totals and averages, gain of Mallet Compound over Consolidation locomotive: Equivalent evaporation per pound of fuel, 7.81 per cent.; Ton-miles per gallon of water used for main cylinders, 14.04 per cent.; Ton-miles per pound of oil burned, 22.50 per cent.; Tonnage hauled, 119.54 per cent.

running repairs for the Mallet is too low for a fair average, as the engine was comparatively new.

Table 3 shows the results obtained from service tests of the two locomotives for two trips each, for hill work only. The water and fuel were carefully measured, and the record of temperature measurements of the water, steam and gases is particularly interesting. The locomotives were handled by regular crews. The train weights are for the distance hauled and are exclusive of engine and tender but include caboose. No helper engine was used during the tests. In "water evaporated per square foot of heating surface per hour" the principle of compounding the locomotive, as compared with the simple consolidation.

The British Congo sections of the Cape-to-Cairo Railway have been formally opened. This completes a continuous British line of 2,147 miles from Cape Town. The section now opened is 134 miles from the Chartered Company's terminus at Broken Hill to the southern frontier of the Congo Independent State. Work is already in progress across the frontier on 160 miles of Congo line into Kantanga, which it is expected will be completed in the autumn of 1910.

TRANSPORTATION AND TRAFFIC IN GERMANY.

BY LOGAN G. MCPHERSON.
Traffic Expert with National Waterways Commission.

The Empire of Germany occupies an area about equal to that of the states adjoining the Atlantic seaboard from Maine to Virginia. Prussia occupies an extent equivalent to that of the states of New York, New Jersey, Pennsylvania, Maryland and part of the Virginias; that is, an area very nearly the same as that traversed by the railways embraced in the Trunk Line Association, which are designated as Group II by the Interstate Commerce Commission.

To the north the empire fronts on the North sea, into which from sources far in the interior, with their course in Germany, pour the Elbe and the Weser; and on the Baltic sea, to which is tributary the Oder and the Vistula, a broad but little used stream whose source and mouth are in Russia. The Rhine, which moves a greater traffic than any other river in Europe, flows for the most part through Germany, but finds its outlet through Holland in the North sea. To the west, the south and the east Germany has no direct water outlet, but is bounded by lands occupied by nations with whom it has at various times been at war, and with whom it now either maintains an armed peace or an alliance, as with Austria. Through traffic in any considerable volume between Germany and these adjoining nations is a development of but recent years, and is subject to the customs duties at the various frontiers. An understanding of the traffic of the German Empire must, therefore, be approached through a study of the traffic status as it exists within the empire. To an extent this has been determined by the political and economic development whose roots are in the Middle Ages.

During the feudal period fortresses were erected to guard mountain passes, or fords of streams and at other place of strategic importance. Around these fortresses grew settlements that received supplies of food from the feudal dependents within a small area. Similar settlements arose near the monasteries and other establishments of the church and were likewise supplied by the peasants within a limited range. As handicraft developed it was by the work of the artisans at these settlements; their products were used almost entirely by the dependents of the feudal baron or of a monastery, there being little or no traffic betwen one of these small political entities and another. Throughout the centuries of conflict, as smaller feudal areas were absorbed into a duchy or a principality, such progress as there was in handicraft continued to be that of the local artisan whose raw material did not come from far and whose products did not find a distant sale. That is, the traffic of Germany was local traffic, and the effect of this traditional local traffic is apparent at present in the interior of the empire, where the house trades are still a considerable factor in industry, and in that the average distance over which rail traffic is carried in Prussia is but 71 miles, which is less than one-third of the average haul of 244 miles in the United States.

As the medieval merchants, however, gained that ascendency which made them to an extent independent of the feudal overlords, alliances of different cities were formed, of which the Hanseatic league is the type. The cities of these leagues, with but few exceptions, were on the waterways, which provided channels of communication subject to comparatively slight interruptions from physical obstacles. The one conspicuous trading center that was not located on a waterway was the city of Nuremberg, which focused the land ways from the Mediterranean and made tributary a large region of what is now inland Germany. These land ways, over which its traffic was conducted, were principally the old Roman roads which were maintained during the period of the Holy Roman Empire chiefly for the conveyance of passengers and the post. The merchandise traffic, of which Nuremberg was a center, was largely in luxuries from the Mediterranean and the Orient which did not move in great volume and were used only by the wealthy and the powerful. Indeed, prior to the nineteenth century traffic was in but small quantities, not conducing to the benefit of the masses of the people. It yielded profits not infrequently of from 200 per cent. to 300 per cent. and sometimes of 1,500 per cent., but it was also subject to great losses from marauding highwaymen.

The petty states of what is now the German Empire existed in a condition of mutual hostility which often found expression in armed conflict and was always marked by customs reprisals. This condition affected transportation by water as well as by land. Even in the latter part of the eighteenth century everyone who navigated the Elbe from Hamburg to Madgeburg paid toll 14 times, and along the short reach of the Maine from Hamburg to Mayence were 33 toll stations. Even more hindering than the demand for toll was the loss of time incurred because of traffic often being tied up for hours at a time at these little stations. Cologne even demanded that all passing traffic be unloaded on its wharves and loaded again, that the city might obtain the fullest tribute. A lock is said to have been built at Amsterdam in 1220, and there is definite record of the building of locks in the middle and the fifteenth century. In the middle of the eighteenth century the rivers in what is now the heart of Prussia were connected by canals, which, however, were small and insignificant, being constructed mainly to compete with the land roads for the transport of the short-distance traffic. The imposts placed upon the river traffic by the petty states and municipalities became so burdensome that they led to mutual concessions between one state and another, which finally resulted in the abolition of such exactions. Thus in the early part of the nineteenth century the Rhine became the first great commercial thoroughfare, not only of Germany but of Europe, and tolls on the boats using its waters were forbidden by international conventions.

From 1822 to 1840 2,236 kilometers of new canals were built, among them the important connection of the Rhine and the Rhone in Burgundy. The waterways were, therefore, prior to the introduction of steam railways, the main reliance of the German people for communication. Such artificial waterways as were constructed were for the purpose of connecting the natural waterways. Even at the present time by far the greater extent of the German waterways is of the rivers to whose improvement has been devoted much the greater portion of the expenditure. Of the total length of the inland waterways specified in the government's reports as 8,750 miles 5,041 miles are main streams, 885 miles channeled rivers, 1,369 miles navigable canals and 1,443 miles canals and other connecting waterways between lakes, estuaries, etc. The existing canals in greatest measure serve as such connecting waterways. Exceptions are the Dortmund-Ems canal, built to connect the Rhine with Emden, a German seaport, and the canal projected from western to eastern Prussia, whose extension beyond Hanover has been prevented by the antagonism of the agrarian landlords of the east.

Wooden railways have been used in the Harz district for 500 years, but the building of steam railways in Germany did not begin until their construction was well under way both in England and the United States. The first lines were built to connect towns between which there was no water communication, such as Dresden and Leipzig, Brunswick and Wolfenbuettel, and the early development of the main lines of the railways was in this easterly and westerly direction in the interior. It seems probable that they were built at first in large part to meet the needs of passenger traffic, this accounting for the construction of the railways parallel to the Rhine. As the railways were, however, extended from place to place, interlacing throughout the various states of what is now the German Empire, their freight traffic increased.

The first railways in Prussia were built by private companies, the state being unable to raise large funds for railway construction. Later the government granted concessions to private companies, to whom it sometimes extended aid by the

direct purchase of shares and the guarantee of interest. All such concessions provided that the state could take over the lines at will. About 1850 when larger funds were available, the state undertook the operation of a number of lines that had become bankrupt, and entered upon the construction of a number to serve for strategical as well as commercial purposes. In some of the other German states the railways were built and operated by the government, in others by private companies, while in still others were both state-owned and privately-owned companies.

The tariffs were adjusted from the beginning to meet commercial conditions; that is, rates were made to secure traffic. The railways soon became so efficient in this respect that it was the commonly expressed sentiment that they were destined to supersede the waterways. The making of rates to secure traffic, however, brought about the same discriminations that have been the source of bitter complaint in the United States. Lower rates were charged for the long than for the short haul; lower rates were accorded to large shippers than to small; rates varied for different commodities and for one consideration and another. About 1875 there became rampant in Germany the cry that the railways were throttling the waterways which were the natural channels of communication and that the development and the protection of the waterways was the only safeguard from railway monopoly. Thereupon expenditures were resumed upon the improvement of the rivers and the canals.

Because of the different regulations under which railway transportation was conducted in the different states and the complications of their various tariffs, the traffic of the Empire fell into a seemingly inextricable confusion. A committee of investigation reported that "economic considerations point to the conclusion that all railways should be under the control of the state." Prince Bismarck formed a plan for the purchase of all the railways by the Empire, but to this project several of the states offered such strong opposition that it was abandoned. Bismarck, however, extended by the state the purchase of the railways of Prussia and in 1880, under a previously adopted resolution of the Prussian Diet, the policy of securing entire control was formally inaugurated and within ten years it was practically completed. Prussia not only acquired substantially all of the main railway lines within that state, but gained control of the principal routes in North Germany, even when they extended beyond the Prussian boundaries, thereby gaining that dominant influence over the railway policy of the entire Empire which it still exercises.

The tariffs were remodelled in accordance with popular desire into a system whose rigidity it was quickly found was impeding not only the traffic of the railways but hindering commerce. So many exceptions were made to the tariffs that before long they had apparently relapsed into the condition that during the preceding period had been characterized as chaotic. This led to a further revision, to the adoption of the present system which is a compromise between a strict distance tariff and a tariff to meet commercial needs.

The general tariff scheme of Prussia is in two divisions, the first including piece-goods, i.e., merchandise in lots of less than five tons, which is the minimum upon which a "carload" rate is granted; the second "carloads" of five and ten tons. The first divsion has four classes; the first includes piece-goods in general at fast service taking the highest tariff which is upon a tapering basis up to 500 kilometers or 310 miles, and upon a fixed kilometric basis beyond; the second includes certain perishable foodstuffs, plants, etc., whether they move in less than carloads or carloads, being in this respect an exception to the rule applying to the division; the third includes merchandise in general in less than carload lots. The tariff for the second class and the third class is exactly the same, being one-half that of the first class, that is, it is on a tapering basis at one-half the specified first class rate up to 500 kilometers and upon a fixed kilometric basis, one-half of that for the first class, for greater distances. Shipments of the second class, however, have the fast service and those of the thrd class, ordinary or slow service. The fourth class includes certain exceptions to the third class, mainly heavy and staple merchandise, which are carried at a fixed rate per kilometer up to 726 kilometers or 450 miles, and at a lower fixed rate per kilometer for greater distances. Up to 300 kilometers this rate for the fourth class is less than for the third, from 300 to 400 kilometers it is the same, from 400 to 726 kilometers it is higher and for greater distances it is the same. The first division may be summarized as composed of (1) General Fast Piece-Goods; (2) Specified Fast Piece-Goods; (3) General Slow Piece-Goods; (4) Specified Slow Piece-Goods.

The second division is composed of Class A 1 covering five-ton shipments of general merchandise at a fixed rate of 6.7 pfennigs per ton per kilometer; Class B covering ten-ton shipments of general merchandise at a fixed rate of 6 pfennigs per ton per kilometer; Classes I. and II. covering ten-ton shipments of certain heavy or staple merchandise at fixed rates per ton per kilometer of 4.5 and 3.5 pfennigs, respectively; Class A 2 covering five-ton shipments, at a fixed rate of 5 pfennigs per ton per kilometer, of such articles as are designated in Classes I. and II., and Class III. sometimes designated as the "Raw Materials" tariff, but which has been extended to include various other things. The rate is 2.6 pf. per ton per kilometer up to 100 kilometers and 2.2 pf. for greater distances.

There is an express tariff covering shipments which take precedence of the fast goods at double the ordinary fast goods rate for piece-goods and four times the ordinary carload rate for carload shipments. The parcels post provides for the shipment of parcels up to 50 kilogrammes or 110 lbs. in weight.

For all shipments by freight of whatever kind or class there is in addition to the transportation charge which has been indicated a terminal charge which varies with the dstance over which the shipment is to be carried.

Comparatively simple or comparatively complex according to the point of view as this general tariff scheme may seem, it has not been nearly adequate to meet the needs of the German rail traffic. "Ausnahme" corresponding broadly to what in the United States are known as "commodity" tariffs have been adopted to protect the German ports in competition with those of other nations, particularly to secure traffic through Bremen and Hamburg in competition with Rotterdam and Antwerp; to enable the German manufacturers to hold their own in foreign markets and in a general way to develop industry. Such "Ausnahme" tariffs have been applied to so many commodities, the fuels, ores, wood, oils and other raw materials as well as to iron and steel articles that from sixty to seventy per cent. of the traffic of Germany now moves upon such tariffs. Far lower rates are made upon export and upon much of import than upon local traffic and lower rates upon much of the traffic that crosses Germany from one foreign nation to another. Notwithstanding this prominent business men of Germany say that instead of industry and commerce molding the railway freight rates this industry and commerce has been obliged to adjust itself to the freight rates. This finds substantiation in the fact that the "Ausnahme" tariffs do not as a rule apply to finished products in the interior or intra-national traffic, and that there is not a great deal of flexibility in the general tariff scheme. There do not exist in Germany such concessions as milling-in-transit and reconsignment, privileges which the railways of the United States have extended beyond reason. The ministry contends, however, that through the investigation and upon the recommendation of the advisory councils, it adjusts rates in the public interest. Certan it is that the discovery soon made by Bismarck—if indeed it had not been evident to his mind when he promoted the policy of state control—that the net earnings of the railways afforded a handsome addition to the state revenue has been utilized throughout the subsequent

years in the enhancement of the national exchequer. Competition between the railways of the German states is avoided by pooling agreements, and such agreements are also entered into between the German and other governments as to the routing of certain international traffic.

The passenger tariffs are upon a fixed kilometric basis for each of the four classes with an additional charge for passage upon express trains which, however, cannot be availed of by fourth-class passengers. Hand baggage only is carried free. A fee varying with weight and distance is charged for all that is forwarded in baggage cars. Until within recent years return tickets were sold at a reduction from the price of two one-way tickets, the one-way fare being made half the prior round trip rate and at the same time the additional payment for a seat on an express train was abolished. Coincidentally with this, however, the government imposed a tax upon all tickets and inaugurated the charge upon all luggage. The result of this has been on the whole to make travelling dearer. Passengers have therefore travelled in a lower class than formerly, the receipts from the ticket tax during 1906 being three and a quarter million dollars less than estimated.

In Germany at the present time exist side by side these two instrumentalties for freight transportation, a system of waterways navigable in practice for about 10,000 kilometers, or about 6,200 miles, which, of course, does not include the sea frontage, and a system of railways extending over 58,040 kilometers, or about 39,000 miles. How well this dual system of transportation meets the industrial and commercial needs of the Empire can only be judged by a survey of what constitutes that industry and traffic, what are the sources of supply, the places of manufacture and the markets.

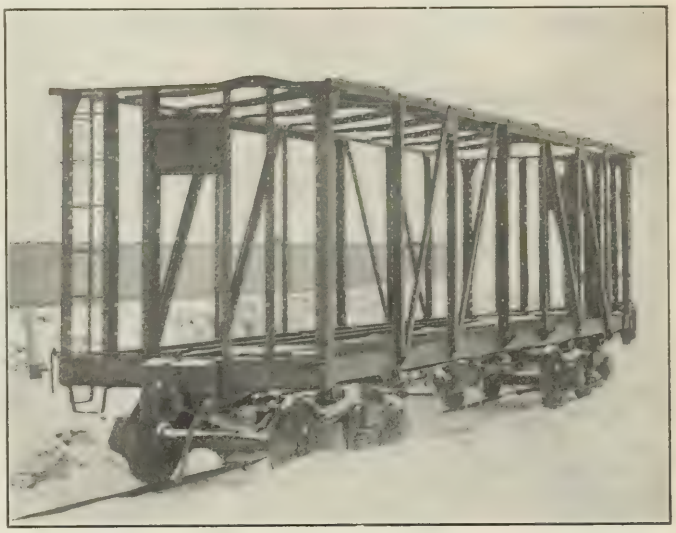
The import and export traffic of Germany moves chiefly through the German ports of Hamburg and Bremen, which are near the mouths of the Elbe and the Weser, through the Dutch port of Rotterdam at the mouth of the Rhine and a portion through Antwerp. Hamburg and Bremen are so similarly situated that each bears about the same commercial relation to the remainder of the Empire as the other. Amsterdam and Antwerp are in similar relation, as also are Duesseldorf and Cologne on the Rhine, which are practically seaports, small steamboats running direct from Cologne to England, as well as between Cologne, Hamburg and other ports of the North and Baltic seas. The Rhine, because of its course through a productive region, because it forms part of the short and direct route therefrom to the ports of England and the North sea, and because of its great navigable capacity early attracted a large share of traffic.

(To be continued.)

STEEL FRAME BOX CAR FOR THE CANADIAN PACIFIC.

The Dominion Car & Foundry Co., Montreal, Que., recently built 500 steel box cars for the Canadian Pacific. These cars differ materially from the usual type of box cars, in that the framing, including the carlines, is of steel and sheathed on the inside with a single course of 1¾-in. lining. This lining is bolted to the members of the steel frame with ½-in. bolts, the holes for which are slotted to provide for shrinkage. Cracks which develop between the planks are pulled together by means of a strap rod, which hooks over the top board and extends through the steel side sill. The lining extends up and overlaps the side plate about 3 in., so that the boards may be drawn down this amount, providing for all possible requirements.

The underframes of these cars are of the usual design, consisting of standard 15-in. channels with ¼-in. cover plates,



Steel Framing of Canadian Pacific Box Car.



Canadian Pacific Steel Frame Box Car.

the side sills being 8 in. and the end sills 10-in. channels. The bolsters and cross bearers are of the built up type with pressed diaphragms and top and bottom cover plates. The floor supports are composed of Z-bars, the floor being bolted to them.

The framing is clearly shown in the illustration. The side members are made of standard 3-in. Z-bars and the corner posts are 5-in. x 5-in. angle iron. The end framing is of unusually strong design, the two center posts being composed of 4-in. and the intermediate posts of 3-in. Z-bars, which are securely riveted to the end sills. To these posts is bolted the 1¾-in. lining, the whole making an unusually strong construction. Chicago-Winslow improved roofs made by the Chicago-Cleveland Car Roofing Co., Chicago, are used.

These cars are particularly adapted for carrying grain, as the inside lining presents a very smooth surface. The cars are built to conform to the standard dimensions of the American Railway Association, being 36 ft. long, inside, 8 ft. 6 in. wide and 8 ft. high, with a 5-ft. door opening.

During their service the cars have been very carefully watched by officers of the road, and they have undoubtedly given very satisfactory service, since a duplicate order for 1,000 cars has recently been placed with the same builders.

THE RAILWAY SITUATION IN CANADA.

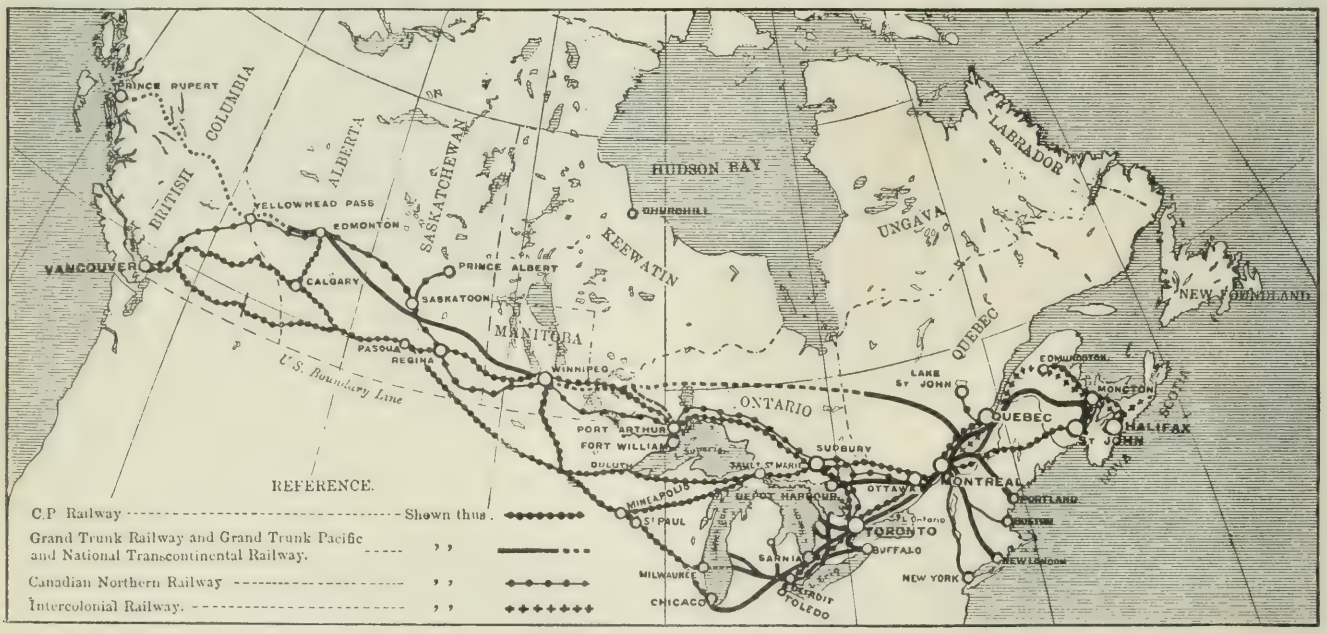
BY J. L. PAYNE,
Comptroller; Department of Railways and Canals.

Canada occupies a unique position among the nations in respect to railways. It has the largest mileage, measured by population; and the smallest mileage, measured by territory.* To hold the former place tells a tale of effort, faith and sacrifices. To be in the latter, suggests the almost boundless field for expansion which must for generations appeal to the energies and resources of the Canadian people.

No other nation has more courageously faced the problem of providing transportation facilities. No other nation has more cheerfully assumed the financial burdens attaching thereto. Out of the Federal treasury $135,549,987 has been paid in direct subventions, the various provinces have contributed $35,588,526, and the municipalities have given $17,825,823. This relatively large sum, however, does not represent half the aid, concrete and otherwise, given toward railway construction. The Dominion and provincial governments have built, and now operate, 2,039 miles of line, at a capital cost of $111,545,903. The Federal government is constructing the eastern section of the Grand Trunk Pacific, the estimated cost of which is $125,000,000. All these expenditures make a total of $425,510,239; or the equivalent of $60 per head for every man, woman and child in the Dominion.

Yet that is not all. The Dominion and the provinces have given 55,116,017 acres of land by way of aid to railways. The money value of these grants cannot be calculated, for obvious reasons; but some notion of the sum they represent may be gathered from the fact that the Canadian Pacific last year sold 376,046 acres at an average price of $13.52 per acre. Ten years ago the selling figure was less than $4. The company still holds 13,000,000 acres; while the Canadian Northern has about 4,000,000. It might safely be estimated that the assistance given in this form will, all told, yield an aggregate of $250,000,000 to the railways which received it. But, of course, the alienation of this vast area of land has not directly involved any loss to the public treasury. The land was comparatively valueless without railways.

Public opinion has been steadily gaining strength in an attitude of hostility to cash subsidies. From 1882 to 1896, practically every railway constructed was given a subsidy of $3,200 per mile, or so many acres of land. When the present Liberal administration took office the policy of giving land grants was discontinued. The money aid, however, was increased from $3,200 per mile to $6,400, under certain prescribed conditions intended to encourage the building of a better class of lines. Up to a cost of $15,000 per mile the government now contributes $3,200 per mile, and 50 per cent. of the cost over $15,000 is allowed up to $6,400 per mile. In other words, the full subsidy of $6,400 would be earned on a road costing $21,400 per mile. The money in all such cases must be specifically voted by Parliament. In recent years, however, the plan of guaranteeing bonds has, to a large extent, taken the place of cash aid, thus creating a liability without any immediate drain on the public treasury. This policy has been applied to the Grand Trunk Pacific and to the Canadian Northern in the west. The outstanding guarantees by the Dominion and provincial governments are at this moment not less than $100,000,000, and engagements have been entered into for at least an equal sum. So that, adding together cash subsidies, land grants and guarantees, a grand total of $875,000,000 is had. For a people numbering at this time 7,500,000, this must be regarded as demonstrating in a substantial way



The Principal Railways of Canada.

*South Australia and West Australia both exceed Canada in these respects.—Editor.

their appreciation of railways as a basic factor in nation building, and their sublime faith in their heritage and themselves.

The railway mileage of Canada was increased by 1,138 miles during the year ended 30th June last.* This brought the total up to 24,104, or about a thousand miles more than that of Great Britain. There is this vast difference, however, in the comparison: While Great Britain has a population of 1,912 to each mile of railway and 19.0 miles of line for each 100 square miles of territory, Canada has but 296 persons to each railway mile and 0.6 mile for each 100 square miles of her area. The United States has 365 persons for each mile of railway, and 6.4 miles of line for each square mile of territory. At the close of the Canadian railway year there were between 3,000 and 3,600 miles under actual construction, at least 1,000 miles of which will be in operation by midsummer of 1910. In the following year the Grand Trunk Pacific is expected to be available for traffic from Moncton, New Brunswick, to Edmonton, Alberta. Meanwhile the mountain section of that line will be pushed to completion, and the Pacific Coast division of the Canadian Northern will be well under way. Canada will, when these undertakings are completed, then have three trans-continental railways.

Up to 1885 there were but a few miles of railway west of Lake Huron. Now there are 10,000 miles in the western provinces, and for some time to come construction work will be chiefly on the prairies and in British Columbia. In the latter Province a general election recently took place on the issue as to whether or not a guarantee of bonds amounting to $23,000,000 should be given to the Canadian Northern. The fact that only three opponents of this measure were elected fairly indicates the strength of western sentiment in favor of railways. Alberta and Saskatchewan were given local autonomy four years ago, yet their guarantees to railways already run into many millions. The West is filling up rapidly, and the majority of settlers appear to constitute an overflow from the United States. Up to ten or fifteen years ago the migration was in the opposite direction. The lure of the world's last area of free or cheap land is, however, irresistible, and it seems not improbable that as a r esult the great plains lying to the north of the 49th parallel must within the next generation be the home of millions of producers. For them, next to the primary and basic necessaries of life, transportation is essential. The dollars and cents aspect of the matter leaves no room for debate on the score of expediency. When the Canadian Pacific was projected in 1881, many able men in Parliament predicted that it would never earn grease for its wheels. To-day it is one of the most prosperous railways in the world.

The capital liability of Canadian railways was increased by $69,186,403 in 1909, bringing the total up to $1,308,481,416. Stocks amounted to $647,534,647, and funded debt to $660,946,769. Jointly, these represent an average of $55,638 per mile of line. These figures do not, of course, include the cost nor mileage of lines owned and operated by government. Next year, however, the capital obligations of railways will be reduced. The basis of computation has not up to this time been sound, and in Canada a revision is in progress along lines similar to those being followed by the Interstate Commerce Commission at Washington. That is to say, an effort is being made to winnow the live capital from that which is dead. The actual extinction of stock and bond liability has been proceeding for years from two causes in chief—the purchase of smaller lines by the larger, and the reconstruction of corporate obligations by process of law. In the former case, the purchasing company pays for the franchise of the selling company by the issue of stock and bonds of its own, thus creating duplication. In the second instance, the order of the court is met by an issue of stocks and bonds by the new owners. Here, as at Washington, it has been the practice to retain in the records of railways the original capital statements, plus all new liabilities under that head. This was sound from the historical point of view; but it was bad bookkeeping. The time is opportune for a recasting of our official capital statement, and the work is under way.

*The *Railway Age Gazette* compilation shows that 1,488 miles were built during the calendar year, 1909.

The public service of railways within the Dominion is shown in the carrying of 32,683,309 passengers and 66,842,258 tons of freight during 1909. There was a decrease of 1,361,683 in the number of passengers, and an increase of 3,771,091 in the freight tonnage. By all the ordinary tests, the passenger business of 1909 was unsatisfactory from the standpoint of the railways; for while there was a falling off in earnings, the train mileage and additions to equipment reveal a substantially better passenger service. In a year of abounding prosperity this result is quite unaccountable. On the other hand, the freight traffic of the country exhibited marked expansion. In 1908 there had been a loss of 794,968 tons. This decline was not only recovered, but a new record was established. The following summary of traffic statistics may be helpful in this relation:

	1908.	1909.
Miles of railway	22,966	24,104
Passengers	34,044,992	32,683,309
Passenger density	90,654	84,342
Average passenger journey, miles	61	62
Average passengers, per train	54	51
Passenger train mileage	31,950,349	32,295,730
Av. receipts per pass., per mile, cents	1.920	1.921
Tons of freight	63,071,167	66,842,258
Tons hauled 1 mile	12,961,512,519	13,160,567,550
Freight density	564,374	545,991
Average haul	206	197
Freight train mileage	40,476,370	40,304,906
Mixed train mileage	6,210,807	7,061,580
Average tons per train	278	278
" cars per train	16.04	16.37
" tons per car	17.33	16.98
Receipts per ton per mile, cents	.723	.727

It may be instructive to point out that the products of agriculture, animals, mines and forests, representing what is regarded as low rate freight, constituted 75.28 per cent. of the whole traffic for 1909. This ratio is practically identical with that which prevailed on the railways of the United States in 1908.

The gross earnings in 1909 amounted to $145,056,336—a decrease of $1,861,977 as compared with the preceding year. Nevertheless, a reduction of $2,704,058 in operating expenses left the net revenue $40,456,252, or $842,080 more than for 1908. The ratio of operating expenses to gross earnings was 72.11. The net earnings were equal to 3.09 per cent. on the total capitalization, to which allusion has been made; but, if the liability of those lines which are only nominally commercial in character were eliminated, and only live capital were included in the equation, the dividend earning power of Canadian railways would be shown to have been considerably higher. Freight service yielded $96,685,076 and passenger service $45,282,326, the former being 66.65 of the total earnings and the latter 31.21. Further information with respect to earnings might be epitomized as follows:

	1908.	1909.
Gross earnings per mile	$6,389.37	$6.017.89
Net earnings per mile	1,724.90	1,678.40
Earnings per passenger	1.175	1.195
" per ton	1.486	1.432
" passenger train mile	1.228	1.150
" freight train mile	2.008	2.041

Operating expenses were $104,600,084, as against $107,304,143 in 1908. The cost of running a train one mile was reduced from $1,364 in 1908 to $1,309. It will be seen from the following distribution of operating expenses that the saving effected in 1909 was not due to economies relating to the upkeep of either way and structures or equipment:

	1908.	1909.
Way and structures	$20,778,610	$21,153,274
Equipment	20,273,626	21,510,304
Traffic	.....	3,798,824
Transportation	62,486,270	54,284,587
General expenses	3,765,636	3,853,094

The new classification, which is identical with that of the Interstate Commerce Commission in everything except the deduction for depreciation, introduced traffic expenses for the first time, and thus disturbed the basis of comparison with

preceding years. The items in that division are, however, taken almost wholly from transportation. It will be seen that the lowered operating expenses were the result of reductions in the cost of conducting transportation. An analysis of the whole expense account reveals the following important percentages: Railway and track 8.09, locomotive repairs 9.01, freight car repairs 5.63, station employees 6.83, road enginemen 6.02, fuel for road locomotives 15.40 and road trainmen 6.29. Since all railway operations turn upon the running of trains, it is significant that within ten years the cost in Canada of running a train one mile has increased from $.664 to $1.309—equal to 51.5 per cent.

The additions to equipment in 1909 were on a modest scale, amounting to 97 locomotives, 2,070 freight cars and 166 passenger cars. These relatively small increases were due to causes which were continental in their sweep. Following in disturbed condition of trade in 1907, two things happened in 1908—large additions to rolling stock and a decline in freight traffic. In that year the largest car surplus in the history of the Dominion was accumulated. Under such circumstances it would have been unreasonable to look for any considerable augmentations to equipment in 1909. The total number of locomotives on 30th June last was 3,969, of freight cars 117,779 and of passenger cars 4,192, representing for each 1,000 miles of line 165 locomotives and 4,887 freight cars. Few cars are now imported from the United States, but the purchase of parts constitutes a substantial item of international trade. During the fiscal year ended 31st March last Canada purchased 113 locomotives from the United States, at a cost of $386,000.

Train mileage increased 1,024,690 during 1909, making a total of 79,662,216. This additional mileage related almost wholly to mixed train service. For some reason, possibly an approach toward regular passenger service on smaller lines, this class of mileage has increased from 5,971,414 in 1907 to 7,061,580 in 1909. During the seven years preceding 1907 there had been decreases. The mileage of revenue freight trains represented 50.59 per cent. of the aggregate. Loaded freight cars had a mileage of 775,543,414, showing an increase of 26,618,594 over 1908. The locomotive mileage was 97,865,325, to perform which 6,832,108 tons of coal were consumed at a total cost of $17,544,449. The cost of fuel per 100 miles by the various classes of locomotives was: Freight $22.65, passenger $14.45, mixed $14.51, switching $12.82 and construction $10.59. The average cost of coal in 1909 was $2.56 per ton.

Railway accidents in 1909 led to the loss of 478 lives and injury to 1,404 persons. Of the killed 36 were passengers, 182 employees, 190 trespassers and 70 classified as other persons. Among the injured were 281 passengers, 897 employees, 95 trespassers, 89 non-trespassers, 25 postal clerks and expressmen and 17 other persons. Collisions caused the death of 6 passengers and 40 employees, while from the same cause 83 passengers and 86 employees were injured. Notwithstanding the almost universal use of automatic devices, 18 employees were killed and 125 injured in coupling and uncoupling cars.

The question of safety at highway crossings comes up perennially in Parliament, and within recent years an organized movement has taken place to reduce the number of level intersections. This year, for the first time, statistics were gathered bearing on the subject. It was found there were in the Dominion 18,272 highway crossings, of which 15,918 were rural and 2,353 urban. Of the rural crossings 492 were protected, and of the urban 587. The protection took the following forms:

	Rural.	Urban.
Gates	34	133
Overhead bridges	190	110
Subways	213	166
Bells	39	77
Watchmen	16	101

Crossing accidents in 1909 accounted for the killing of 76 persons and the injury of 72. Of these victims 33 were killed and 41 injured at urban crossings, and 43 killed and 31 injured at rural crossings. Strange to say, however, the record for the past three years shows that more than half the fatal accidents in cities and towns were at protected crossings. No means seems yet to have been devised to keep venturesome pedestrians from disregarding the gates and attempting to get over crossings in the face of danger. It would appear that this terrible toll of life will be levied so long as level crossings exist at congested points. The Railway Commission has adopted a plan somewhat analagous to that which has for some years prevailed in Massachusetts, under which the Federal government and the municipality affected in each case will contribute a percentage of the cost of subways and overhead structures. By this process the elimination of level crossings is hoped for in course of time.

There were 125,195 persons employed in the railway service of Canada on 30th June last. This number represented an increase of 18,791 over 1908 and of 1,183 over 1907. The total of salaries and wages was $63,216,662, representing 60.3 per cent. of operating expenses. The facts for 1907, 1908 and 1909 show that for all classes of employees there has been a persistent tendency upward in the scale of remuneration. The following comparison between the rates which prevailed in Canada in 1909 and those applicable to the United States in 1908 is instructive:

	Canada.	United States.
General officers	$11.73	$15.18
Other officers	4.59	6.42
General office clerks	1.81	2.35
Station agents	2.09	2.10
Other stationmen	1.65	1.82
Enginemen	4.13	4.46
Firemen	2.52	2.76
Conductors	3.31	3.83
Other trainmen	2.13	2.64
Machinists	2.89	2.95
Carpenters	2.23	2.40
Other shopmen	2.33	2.13
Section foremen	2.15	1.96
Other trackmen	1.59	1.45
Switch tenders, etc.	2.00	1.82
Telegraph operators, etc.	2.09	2.30
Employees, floating equipment	1.26	2.37
All other employees	1.95	1.98

Summing up, it may be assumed in reason that the railway situation in Canada discloses progress, strength and promise. The sympathetic relationship existing between the Dominion and the United States would seem to produce closely corresponding conditions on both sides of the line. This view is confirmed by the periodical reports of the American Car Association. When cars are accumulating in the United States the returns show a growing surplus in Canada. The great problems of transportation are being worked out on either side of the boundary under circumstances practically identical. We are now, however, confronting a situation in the prairie provinces very much like that which the rapid expansion of the western states created south of the 49th parallel twenty-five or thirty years ago. The demand for railways is greater than the power to build. Construction and equipment cannot be carried out in a day. Settlement exhibits the phenomenon of an ever-rising wave; existing lines are doing their best to answer the cry for transportation facilities; two new transcontinental railways are pushing their tracks with all possible haste to the Pacific coast; branches are being spread over the plains; and yet with all this activity the need of the West is growing greater year by year. James J. Hill has run eight lines up into Canadian territory from points along the Great Northern, showing his faith and interest in the development of our West. This he has done without a dollar of aid from government, and, according to the returns, at a considerable annual loss, as between income and outgo. He is regarded, however, as a shrewd appraiser of prospects, and is not asking for condolence in relation to immediate results. As on the southern side of the line, railway operators in Canada find themselves worried by a steadily swelling wages and tax bill on one hand and persistent pressure for lower rates on the other. Thus far they have escaped two-cent passenger rate, although two years ago, following the example of many of the states, a movement in that direction was begun in Parliament. It has apparently subsided.

General News Section.

According to a press despatch from Pittsburgh, the trainmen of the Pennsylvania Railroad have voted down the proposition to join the trainmen on other roads in a simultaneous demand at the present time for an increase in wages.

The Delaware, Lackawanna & Western is to open a school for apprentices at its Scranton shops, the work to be in charge of the Young Men's Christian Association. Spacious rooms have been set aside for the school at the shops.

The Pennsylvania Railroad has renewed for ten years, with the privilege of further renewal, its lease of the property at Cortlandt street, New York City, the terminus of its downtown passenger ferry from Jersey City; and it is planned to build a new ferry house.

The State Railroad Commission of Michigan is inspecting the cabooses of the railways of the state to see how well they comply with the law passed last year, requiring all cabooses to have end platforms and platform steps. There is a penalty of from $100 to $500 for violating this law, but some of the roads are not complying with it.

Under a law of Arkansas the railways of that state are now required to provide within the state hospital accommodation for persons injured on their lines. Officers of some of the roads say that in case of accident at some places near the state line it would be more convenient to take the injured persons to a hospital in another state.

Railway officers having said that 2,500 miles of new road would be built in Oklahoma in the near future but for the restrictions in the state constitution, citizens of towns in that state which are in need of new lines are trying to stir up public sentiment in favor of an amendment to the constitution cutting out the clauses which forbid the sale of an Oklahoma road to a corporation outside the state.

The railway commission of Canada, after a hearing, has decided not to recommend the running of freight trains without brakemen on the tops of the box cars. There was a demand that such a recommendation be made in order to make practicable the building of overhead bridges at a lower elevation, and thus in some cases reduce slightly the cost of putting in such bridges where needed for the abolition of grade crossings.

The Chicago, Milwaukee & St. Paul has secured trackage rights for freight over the line of the Sheboygan Light, Power & Railway Co., from Plymouth, Wis., to Sheboygan, about 14 miles. By this arrangement the Chicago, Milwaukee & St. Paul will be able to compete with the Chicago & North Western at Sheboygan, and will reach the private tracks of a number of factories there.

The Delaware, Lackawanna & Western reports that no passenger has been killed in a train accident on that road within the last ten years (to January 1, 1910). In this time the number of passengers carried has been 193,787,224. The average passenger journey was 19.91 miles, and the total passenger train mileage 65,340,908. Somebody has figured that this equals 19,927 trains from New York to San Francisco daily for 54 years.

According to the *Wall Street Journal*, the principle railways are making up statements so that they will be in position to pay federal corporation income tax, but all intend to protest that the law is unconstitutional. Moreover, they will also protest that the regulations and instructions sent out by the internal revenue office, designed to cure the ambiguities and other faults of the law, are illegal as being contrary to the plain terms of the statute.

Martin A. Knapp, chairman of the Interstate Commerce Commission, and Charles P. Neill, commissioner of labor, on January 6, wired S. E. Heberling, vice-president of the Switchmen's Union of North America, and F. O. Melcher, chairman of the General Managers' Committee of the Chicago railways, acceding to the request to mediate under the Erdman act the differences between the switchmen and the Chicago railways over wages. The first conference was to be held at Washington, January 12.

Press dispatches of January 4 indicate that the damage done to the roadbed of the San Pedro, Los Angeles & Salt Lake in Rainbow Canyon by the floods of January 1 is so extensive that through traffic over the road is likely to be suspended for two months or more. Many important bridges were destroyed, and the diminution of business is so great that large numbers of employees have been laid off. A train load of passengers was held east of Caliente, Nevada, five days.

The name of the "Overland Limited," which runs over the Chicago, Milwaukee & St. Paul and the Northwestern from Chicago to Omaha, and from Omaha to the Pacific Coast over the Harriman Lines, has had its name changed to the "San Francisco Limited." The "Overland Limited," under its present name, has become one of the most famous trains in the country. The change is to be made because another of the crack trains run over the same lines is called the "Los Angeles Limited," and the people of San Francisco could not stand such rank discrimination in favor of a competing city.

B. H. Meyer, chairman of the Wisconsin Railway Commission, has been selected by Chairman Knapp of the Interstate Commerce Commission and Labor Commissioner Neill as the third of the board who will arbitrate the controversy over wages between the Illinois Central and its telegraph operators. The other two arbitrators are Ira G. Rawn, president of the Chicago, Indianapolis & Louisville, representing the Illinois Central, and John A. Newman, representing the telegraphers. The arbitration will be conducted under the provisions of the Erdman act and the first session of the board will be held in Chicago on January 17.

Commenting on the problem of electrification of the Central Pacific over the Sierras, Mr. Kruttschnitt says: "Eastern critics may be inclined to the opinion that we are dallying with this matter. We have found that it pays well to make haste slowly with regard to innovations. Electrification for mountain traffic does not carry the same appeal that it did two years ago. Oil burning locomotives are solving the problem very satisfactorily. Each Mallet compound locomotive, having a horsepower in excess of 3,000, hauls as great a load as two of former types, burning 10 per cent. less fuel and consuming 50 per cent. less water."—*Wall Street Journal.*

The newspapers of Chicago have printed during the past week a good many rather sensational articles, to the effect that that city has been in peril of a coal famine. Inquiry among the coal-carrying roads elicits the information that they have had great difficulty in hauling the usual amount of fuel to Chicago, because of weather of almost unprecedented severity. But there has been some improvement in the weather, and by strenuous efforts the railways during the latter part of last week and the early part of this week substantially increased the city's fuel supply. In a good many cases it was necessary to give coal trains the right of way over ordinary commercial freight. The situation is now well in hand, and if there was at any time a danger of a coal famine it does not now exist.

The Board of Estimate and Apportionment of New York City has taken up the financial questions connected with proposed new subways in Manhattan and Brooklyn, and within the next two months expects to decide whether the city should furnish the money for such construction, or assessments should be made upon property benefited by the new lines, or a franchise should be granted for the construction of the lines by private capital. The new tax assessment just announced increases the powers of the city to borrow money, so that now there will be 76 millions available for subway construction as against 50 millions a year ago. The engineers of the State Public Service Commission have practically completed their plans for the principal new lines pro-

posed. It is expected that consents of property owners and other preliminaries will be completed so that the plans will be ready for bidders by March 1.

An officer of the Atchison, Topeka & Santa Fe gives the following explanation of the changes in through passenger service from Chicago to the Pacific coast that were made by this road on January 9: "Our passenger business has become so very heavy that we have found it necessary to increase our local service considerably in order to relieve through trains, and the California travel necessitates increased service to the Pacific coast. Our train No. 9, leaving Chicago at 9:30 a.m., at present consolidates with train No. 7 at Albuquerque and also has a Denver connection at La Junta. Under the proposed arrangement the train will leave Chicago as now, but at Kansas City will be divided, one train starting from there for Colorado and the other going through to California, which will really mean an additional train on our Coast Lines, Albuquerque west, and the Denver train from Kansas City to La Junta. It will practically mean no difference in our present time to the passengers traveling on this train from Chicago to Los Angeles, as the train will leave Chicago as at present, at 9:30 a.m., and arrive in Los Angeles on the third morning about 7:00 or 7:30 a.m., being scheduled to arrive there on train No. 7 at 7:05 a.m."

The Brooklyn Rapid Transit Co., which has recently announced a plan for paying pensions to superannuated employees, has notified conductors, motormen and guards on both surface and elevated lines of an increase of pay, to go into effect January 28, amounting, in most cases, to 1 cent an hour, together with an elaborate schedule of rates for men in their first, second, third, fourth, fifth and sixth years, by which in January, 1911, there will be a further advance of 5 mills an hour. Under the new schedules first-year men on the surface lines will receive 21 cents an hour. On the elevated lines first-year motormen will receive 26 cents; first-year conductors, 21 cents, and first-year guards, 18.5 cents. The motormen on the elevated lines receive an increase of 5 cents at the end of one year; the conductors an increase of 1 cent after two years, and another cent at the beginning of the third year. The guards on the elevated are advanced half a cent at the end of the second year; 1 cent the next year; then, after two years, 1 cent more. On the surface lines there is an advance of 1 cent at the end of the second year, 1 cent a year later, and then 1 cent two years after that; but the men on the surface lines showing good records can attain the maximum rate one year earlier than the schedule provides. The first-year man, to thus gain time, must have not over 20 demerits; at the end of the second year he must have a record free of demerits; or, if the record is not satisfactory, his promotion will be simply postponed until he clears it. Satisfactory service for a certain length of time has the effect of reducing and finally wiping out a demerit record.

Corrected Record of Rolling Stock Ordered in 1909.

Delayed returns from railway companies show the following orders for rolling stock that were placed during 1909 and were not included in our table of cars and locomotives ordered, published December 31, page 1291:

Purchaser.	Locomotives, No.	Cylinder.	Weight, lbs.	Type.	Builder.
Del., Lack. & West'n....	6	21 x 26	190,000	2-8-0	American.
N. Y. Phila. & Nor.....	4	24 x 28	238,000	2-8-0	Company shops.
N. Y., Phila. & Nor.....	2	20 x 24	144,100	0-6-0	Company shops.

Purchaser.	Freight cars. No.	Kind.	Capacity.	Builder.
N. Y., Phila. & Nor..†115		Box.	100,000	Company shops
Gulf, Texas & Western.	1	Caboose.	.....	Barney & Smith.
Midland Valley *100		Tank.	80,000	Amer. Car & Fdy.
San Rafael & Atlixo....†20		Box.	40,000	Pressed Steel.

The corrected totals are as follows:

Locomotives:	
Total	3,362
Compound	238
Mallet	163
Freight cars:	
Total	189,596
All-steel	74,920
Steel underframe	77,667
Passenger cars:	
Total	4,514
All-steel	1,635
Steel underframe	943

Telephones on the Big Four.

The Cleveland, Cincinnati, Chicago & St. Louis has lately put in service its telephone despatching line between Cincinnati and Columbus, 125 miles. On this line there are 49 telephones, and it is called a "heavy" district. Telephones have been used between Indianapolis and Cincinnati about eight months, and within a month they will be in service from Cleveland to Columbus, and from Galion to Bellefonte. These three districts will make about 425 miles. Each way-station has a single telephone, arranged to be quickly switched from the despatcher's circuit to the circuit used in manual block signaling. This road has put telephones and "fish poles" on all of its wrecking cars. Between Indianapolis and Cincinnati the telephone line is parallel to an electric railway line for about 47 miles, where there are feed wires carrying currents of 33,000 volts; but, by proper transposition, the telephone lines are worked with no trouble whatever from induction, although the high power line is at one point within 12 ft. of the telephone line. The Big Four uses Sandwich selectors.

A German Automatic Stop and Cab Signal.

The *Scientific American* of January 8 describes an automatic train stop which is being tried on one of the lines of the German government railway administration. In consequence of the disastrous crossing collision which occurred on the Berlin Elevated Railway a year or two since, the government has been giving increased attention to automatic stopping devices, and it is said that this one has been "provisionally adopted." Its chief peculiarity is a double tripping device. The trips on the ground are placed in pairs, side by side, one about six or eight inches outside the right-hand rail, and the other the same distance inside the same rail. The lever on the engine, which actuates an air-brake valve fixed on the running board in front of the main driving wheel, and about 5 ft. above the rail, is extended, by a vertical rod, downward to a point about a foot above the rail, where it is held in place by a bracket fixed to the locomotive frame and is forked in such a way as to make two contact bars, one to engage with each of the two trips on the ground. To actuate the air-brake valve both of these contact bars must be moved, and moved simultaneously; and thus if one of them alone is moved, as, for example, by a stone or other accidental obstruction, the valve is not affected. Just how the bars are arranged to accomplish this is not clearly described, although three pictures are given of a passenger engine equipped with the apparatus. The movement of the contact bars, when the trips are in operative position, not only opens the air-brake valve, but also, by closing an electric circuit, gives an audible and a visual signal in the cab, the audible signal being a whistle. In the cab there is also a recording attachment consisting of clockwork, and a paper tape moved by a roller, on which, by dashes and dots, the movements of the stop apparatus are recorded. The power required at the air-brake valve is furnished by a spiral spring, and the function of the trip is to disengage the detent which holds this spring compressed. A pair of the track trips is placed at the distant signal. The engineman may throw the apparatus out of gear and retain control of his train; or it may be locked so that he cannot resume control until a trainman restores it for him. At a home signal there are two pairs of trips, one fixed about 100 ft. in advance of the other. On passing a home signal which is against him, an engineman finds that the apparatus acts the same as at a distant signal, but only during a very short time; and then, on passing the second pair, this effect is reinforced, the trips acting so as to open the brake valve farther.

On approaching a signaling point, the engineman, by making a suitable mark on the sheet of the automatic record, may record the fact that he has duly observed the outdoor visual fixed signal.

A pair of track trips weighs only about 8 lbs., and they are so designed that they can be fixed to the track temporarily at any joint, thus being available where it is desired to have the rear brakeman protect the train. The account says that if the brake lever connection is disabled

by being broken, the fact is automatically indicated on the visual signal in the cab. Moreover, a "specially ingenious construction" enables the apparatus, even then, to work as usual on passing over the next signal!

Progress on New York State Barge Canal.

State Engineer F. M. Williams reports that there have been excavated on the new and enlarged Erie canal more than 25,000,000 cubic yards of material, and over 2,500,000 cubic yards of embankment have been built. There have been laid more than 500,000 yards of concrete. The total value of the work completed since the beginning is $15,800,000, and it is estimated that during the year 1910 work will be completed amounting to $16,000,000. The building of this canal has called into use every type of machinery employed in works of construction, and it is estimated that there is at present invested in operating plant about $7,600,000.

By April 1 next it is expected that the work for the entire length of the canal will be under contract, and it is not unreasonable to expect that at the present rate of progress the entire canal will be completed by the end of 1914. The work is being carried on within the original estimates, and present calculations give assurances that all the construction contemplated by the law of 1903 will be completed within the original appropriation of $101,000,000.

The act provides for the construction of a canal having a minimum bottom width of 75 ft. and a minimum depth of 12 ft. in land line. The locks are designed for boats of 2,000 tons capacity; there will be 53, ranging in lift from 10 ft. to 40½ ft., this latter lift occuring at Little Falls. Fifteen of the large locks are now completed, with the exception of gates and operating machinery, and three of these locks will be used as a part of the state canal system on the opening of navigation next spring. When completed, the barge canal locks, with their immediate approach walls will have cost approximately $16,000,000. There will be 22 fixed dams and 14 movable dams. Of the latter seven are now under construction, two of them nearly completed. By one year from next spring the eight movable dams in the Mohawk river will be in operation and will be used to aid in the dredging of the channel, by retaining water for the floating of the dredging machinery.

Of the fixed dams the largest structure is at Crescent on the Mohawk river, being an arched dam with a spillway 1,487 ft. in length, with length over all of about one-third of a mile. This dam will be completed next summer.

The First Locomotive.

The following extract is reprinted from the American edition of the English book, "A Practical Treatise on Railroads," by Nicholas Wood. The first English edition was printed in 1825; the second in 1831. In 1832 Messrs. Carey & Lee, of Philadelphia, published an American edition, with a preface and some additions edited by George W. Smith. This extract records an early date, 1804, for successful operation of a steam locomotive. It might fairly be called either the first automobile or the first locomotive, because it ran on the street where it was smooth enough, and on a prepared track where there were ruts.

"More than 35 years ago, in 1797, Oliver Evans of Philadelphia discovered the hitherto unsuspected value of railways and published to the world that their merits had been unappreciated, their properties misunderstood, and their capacity for extended usefulness undeveloped. He earnestly maintained that they ought not to be confined to limited districts, as the mere auxiliaries or inferior substitutes to canals; that they were, in fact, greatly superior to the latter for the purposes of general commerce and on the most extended lines. In these just, and now popular opinions, he stood alone—holding them not the less undubitable because they originated with him. No human being, either in Europe or elsewhere, had even dreamed that railways were adapted to the transportation of passengers or merchandise, or that they could be usefully extended beyond a length of a few miles. * * *

"Oliver Evans, who had never heard of steam being applied to this purpose, was early impressed with its importance, and commenced his celebrated experiments in 1784, and finished his first engine in 1801. Poverty compelled him to sell it to be used for another purpose. The other machinery of the carriage was in existence a few years ago. He immediately commenced another engine and carriage, and in the latter part of the winter of 1803-4 he propelled it by steam through the streets of Philadelphia, in the presence of more than 20,000 astonished and hitherto incredulous spectators. No railway then existed in America to test the capacity of this rude but primitive locomotive steam engine; a temporary railway (the first ever attempted in America) was employed to prevent the wheels sinking into the ruts, or inequalities, on part only of the road traversed. This was the humble origin of that wonderful machine which is destined to revolutionize commercial intercourse by land. The plans and numerous drawings of Mr. Evans were sent to Europe by his agent and exhibited to many persons; his suggestions were copied without acknowledgement, and others have reaped the benefit of his discoveries.

"The superiority of railways to canals, even when horses were employed on both, was zealously maintained by Evans before it had been imagined in Europe or this country, and their greater superiority, when locomotive engines should be adopted was repeatedly pressed on the public attention. He endeavored without success to urge the execution of a road from Philadelphia to Pittsburgh and several years afterward of a railway from this city to New York. In the latter he offered to take stock to the amount of $25,000; but he was in advance of the age in which he lived. His projects were regarded as visionary; although at the present moment both of these important roads are in rapid progress and in a few months passengers will be whirled over these railways and gratefully remember their benefactor, Oliver Evans, a man whose projects have been in this instance accomplished, and whose predictions have been fulfilled to the very letter, although a straight jacket was voted to him formerly, almost by acclamation, as the reward of his genius. Fitch, who constructed the first steamboat at Philadelphia in the year 1787 and Fulton of Pennsylvania, who successfully introduced steam navigation, also obtained poverty and ingratitude as the reward of their exertions."

Progress of the B. & O. Since 1896.

President Murray, in statement given out in answer to newspaper criticism of the management of the Baltimore & Ohio, says in part:

"When in 1896 the receivers took charge the property then operated consisted of 2,094 miles of line, of which but 623 miles was double track. Its buildings, structures and terminals were wholly inadequate and the tracks, bridges and roadbed were in urgent need of immediate repairs and renewals. The freight equipment consisted of 26,440 cars, 5,000 of which were idle awaiting repairs, and of the 857 locomotives over 200 were unfit for service.

"The first work of the receivers was to renew and practically rebuild the then property, in which the entire line was relaid with heavy rails, replacement of bridges, etc., but the great work of extension and betterment was in the expenditures for new construction made on the entire system, comprising the original line and lines subsequently acquired and operated. In this there has been expended from 1896 to December 31, 1909, $91,356,582, and to complete construction and betterments now authorized and being actively progressed will require over $10,000,000 additional or a total of over $101,000,000. In addition the expenditures for new and modern equipment of the highest capacity, 1896 to December 31, 1909, have amounted to $60,347,421, and with equipment contracted for and now being delivered, costing approximately $14,000,000, will aggregate over $74,000,000. At present the equipment consists of 1,906 locomotives and 81,978 freight cars, to be shortly augmented by 100 locomotives and 10,000 freight cars, now under contract. The expenditure of $151,704,000 in a period of thirteen years, with the further engagement of $24,000,000, exclusive of expenditures for subsidiary terminals such as the company's interest in the Washington

Terminal, the Chicago Terminal Transfer, etc., aggregating many millions more, are figures which render ridiculous the suggestion that 'the B. & O. has not expanded,' or that its policy has been 'a negative one.'

"The effect of these physical expansions, the improvement and betterment of the roadway and equipment are reflected in the increased traffic of the system.

"The miles of line operated in 1896 were 2,095, and total trackage 3,511 miles.

Gross revenue	$23,944,781
Total revenue tonnage, tons	17,861,927
Bituminous coal tonnage, tons	6,445,417

"For the year ended June 30, 1901, the miles of line operated directly were 3,220, and the total trackage 5,521 miles.

Gross revenue	$47,971,223
Total revenue tonnage, tons	33,528,513
Total bituminous coal tonnage, tons	13,346,700

"In contrast with the foregoing are the figures for the year ended June 30, 1909:

"The miles of line operated directly were 4,000, and total trackage 7,509 miles.

Gross revenue of "income lines"	$71,043,519
Total revenue tonnage, tons	48,223,474
Bituminous coal tonnage, tons	20,956,585

"If the controlled or affiliated lines be included it adds 456 miles of line, trackage aggregating 831 miles, and brings gross revenue up to $76,412,856.

"As is evident, the figures above for 1909 include tonnage of certain lines not controlled or operated in 1896 or 1900, but the contrast affords some conception of the vast territory added and the increased traffic coming under the direct influence of the Baltimore & Ohio; while through the arrangement recently accomplished in connection with the C., H. & D. the sphere of reciprocal relationships is made even more extensive."

Railway Regulation in New Jersey.

In his annual message to the New Jersey Legislature, Governor J. Franklin Fort, discussing means to regulate public utility corporations, says:

"The opposition to such legislation emanates solely from interested sources and corporations which control the franchises for public utility purposes. If the people of the state could fully realize the character of the influence exerted to defeat this beneficent legislation the result would not be doubtful. * * * The law should be clear and stringent against any attempt at the merger of public utility companies, or the issuance of bonds or stock by such companies, except upon the approval of some state board."

The Governor recommends an additional appropriation to continue the work of the commission to revalue the railway property of the state. On this point he says: "For many years there has been much criticism of the valuation of railway property. Whether just or unjust, the matter should be put at rest. The valuation will cost probably one hundred thousand dollars in addition to the sums already spent; but the taxation of railway property should not longer be allowed to be a matter for political discussion, and the fairness and justness of its valuation should be settled at once and for all time. The cost of the revaluation of the railways in other states has not been less in any case than $150,000, and the work of the revaluation of the railway property of the New York Central, which was done some years ago by the road itself, cost in excess of $200,000."

Scherl Monorail Gyroscope Car.

A gyroscope monorail car of the German type, invented by Richard Scherl, is being exhibited in Brooklyn, N. Y. This is the first time that monorail cars have been shown in this country, although both this car and one of the Brennan type had been undergoing tests for some time in England and Germany.

This Scherl car is 18 ft. long and 4 ft. wide, with seats for four passengers, and has two gyroscopes, one in each end of the car. These revolve in vacuum in opposite directions, said to be at a speed of 8,000 r.p.m. The gyroscopes are operated by motors, the current of which is taken from two feed wires at the base of the rail, one on either side. The weight of the car is about 2½ tons, about 5½ per cent. of which is due to the gyroscopes. It is claimed that with a modern passenger car it would be necessary to increase the weight of the gyroscopes, making them about 8 or 9 per cent. of the entire weight.

In case of accident to the motors, it is claimed that the gyroscopes will continue to revolve without current for about an hour and maintain its equilibrium. The car has two trucks, each having two double-flanged wheels. In the demonstration the car kept perfect balance, both while running and standing, at which latter time, however, a slight swaying motion was noticeable.

General Passenger and Ticket Agents.

The annual meeting of the American Association of General Passenger and Ticket Agents will be held at Havana, Cuba, March 28.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa. June, 1910; Niagara Falls, Ont.
American Assoc. of Local Freight Agents' Assn's.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18: New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.
Buffalo Transportation Club.—J. M. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York.; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August: St. Paul and Minn.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 16-18; St. Louis.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Norquist, Chicago.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.
Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The first through train of transcontinental freight over the Western Pacific, 50 cars, mostly loaded with wire and nails from Joliet, Ill., passed through Sacramento, December 28.

The Rogers-Brown Iron Company, of Buffalo, announces that it is going to build new furnaces and coke ovens along the line of the Buffalo & Susquehanna, sufficient to double the quantity of coke to be shipped over that road.

The Omaha Grain Exchange has filed with the Nebraska Railway Commission a complaint alleging that the rates of the Union Pacific and the Burlington on grain to Omaha are unfairly discriminatory as compared with the rates to Kansas City.

The Union Pacific has announced that it will make the same rates on lumber shipments from Washington to points east of Denver as it now makes on lumber from Oregon. This is one of the first traffic moves made by the Harriman lines since gaining access to Puget Sound.

The Baltimore & Ohio will run an agricultural educational train January 18, 19 and 20 from Wheeling, W. Va., to Zanesville, Ohio, and other places in that region. Professor H. C. Price, dean of the agricultural department of Ohio State University, will manage the lectures which are to be given.

The Western Pacific has made traffic agreements with the Southern Pacific and the Atchison, Topeka & Santa Fe by which westbound transcontinental freight over the W. P. will be billed to points on the other lines as far south as Santa Margarita and Bakersfield, as well as to all northern California.

The western roads have been trying vainly to reach an understanding about the making of reduced passenger rates during 1910. At one time it was announced that a decision had been made, but some of the roads kicked over the traces, and now the matter is in an entirely unsettled condition. A two-days' conference was held by the passenger officers in Chicago last week, which resulted in the entire matter being referred to the executive officers.

The Individual Car Owners' Association, of which Robert J. Bailey of Pittsburgh is secretary, has sent its complaints about abuses to the Pennsylvania State Railroad Commission. The complaints of this association concerning the way the cars of its members are treated by the railways have been set forth in the columns of the *Railway Age Gazette*. The letter to the commission says that relief has been asked from railway associations, but in vain.

The State Railroad Commission of Louisiana has before it a petition, presented by the New Orleans Board of Trade, asking that express companies be required to put more effective labels on packages which have been prepaid. The petition sets forth at great length the complaint of large shippers that the habit of collecting charges on packages which have been prepaid is general and persistent. The petitioners cannot understand why the express companies should annoy their customers in this way so much more than do the freight departments of the railways.

The Illinois Central, the Southern and the Cincinnati, New Orleans & Texas Pacific have decided not to renew their traffic agreements with the Tennessee Central, which will expire within a few months. The Illinois Central and the Southern operated the Tennessee Central for about three years, ending in 1908; but they concluded not to make that arrangement permanent, and suits are pending in the courts relative to differences of several hundred thousand dollars in connection with the settlement between the companies which should have been made when the Tennessee Central was turned over to its owners.

The immigrant bureau of the Western Passenger Association has issued the following figures showing the arrivals at the port of New York for the first 11 months of 1908 and of 1909: In 1908, aliens, 245,785; citizens, 26,131; total, 271,916. In 1909, aliens, 687,820; citizens 32,811; total, 720,631. The total revenue derived from the immigrant business by immigration bureau lines in the last five years is given as follows: In 1905, $919,852; in 1906, $1,175,171, an increase of 27.76 per cent.; in 1907, $1,549,687, an increase of 31.87 per cent.; in 1908, $607,248, a decrease of 60.81 per cent.; in 1909, $1,156,575, an increase of 90.46 per cent.

The newspapers announce that a number of changes in rates have been made by the Spokane, Portland & Seattle and the Oregon Railroad & Navigation Company from points between Spokane and Portland. New rates have been made by both roads on packing house products and fresh meats C.L. and L.C.L. from Portland to the Spokane district. The rate on packinghouse products between these cities has been reduced from $1.11 to 90 cents, and the rate on dressed poultry C.L. from $1.63 to $1.25. The rate on pig iron is reduced from $6.50 to $3.50 a ton and the rates on live stock from stations between Portland and Spokane have been reduced 25 per cent. to both cities. Some slight advances are made in the rates on certain other commodities.

The western lines have filed a notice with the Interstate Commerce Commission revoking their concurrence in the rates filed by the eastern roads, effective January 1, on sugar and coffee from New York, Jersey City and Philadelphia to points west of the Mississippi river. This action of the western roads grows out of a small rate war which has been going on between the roads, reaching Chicago from the East and those reaching Chicago from New Orleans. The rates filed by the eastern trunk lines reduce by approximately 7 cents per 100 lbs. the rates from the East to points beyond the Mississippi river. This reduction was made to meet reductions that have been made by the Illinois Central and other lines from the South. The effect of the reduction by the eastern lines is to shrink the proportions received by the western roads more than they feel that they should stand. If this revocation by the western roads stands rates on sugar and coffee from the East to points west of the Mississippi river will have to go on a combination of the rates of the eastern road to Chicago with those of the western roads from Chicago.

Hudson and Manhattan Increased Traffic.

With the 52 per cent. increase of passenger traffic in the month of December over August, putting the yearly rate at 48,643,032, the Hudson & Manhattan, operating the tunnels under the Hudson river between New York and New Jersey, is earning at the present time 4.9 per cent. on its $10,000,000 5 per cent. non-accumulative preferred stock. This is shown as follows:

Gross revenue of 48,643,032 passengers at a 5-cent fare...	$2,432,151
From previous estimates, operating cost, including taxes, will not exceed 40 per cent, or.....	872,860
Net passenger earnings	$1,559,291
Earning capacity of the terminal buildings.....	1,200,000
Advertising and miscellaneous privileges.....	300,000
Total, including passenger earnings	$3,059,291

After deducting $2,567,000 for interest on bonds issued, a surplus of $492.291 is left, equal to 4.9 per cent. on the preferred.

Passenger traffic for the month of December, 1909, showed an increase of 190 per cent. over the corresponding month of the previous year. The average monthly increase since August last has been 10 per cent. From the following table an idea may be obtained of the steady traffic increase since the first part of the system was opened:

	Days.	Passengers per period.	Daily average.
1908—Feb. 26 to June 30.....	126	4,480,320	35,304
July 1 to Sept. 30.....	92	2,427,461	26,385
Oct. 1 to Dec. 31.....	92	3,794,585	41,245
1909—Jan. 1 to March 31.....	90	4,049,319	44,992
June 1 to July 15.....	45	2,104,740	46,992
July 16 to Aug. 1.....	16	1,360,000	85,000
Aug. 2 to Aug. 30.....	29	2,755,000	95,000
Aug. 31 to Sept. 24	25	2,875,000	115,000
Sept. 25 to Oct. 2.....	8	1,128,000	141,000
Oct. 3 to Oct. 10.....	8	920,000	115,000
Oct. 11 to Oct. 31	20	2,360,000	118,000
Nov. 1 to Nov. 30.....	29	3,452,500	122,000
Dec. 1 to Dec. 31.....	30	4,053,586	130,760
Total	610	35,760,511	.....

The eight-day period showing a daily average of 141,000 was during the Hudson-Fulton celebration and cannot be used as a criterion. After the celebration the traffic became normal

and has been steadily increasing since that time. Daily average at the present time is approximately 131,000.

These figures are still based on what the company's officials term a "shuttle service." This is because neither terminus of the system is completed, and it will be several months before the New York line will run to the Thirty-third street extension. It is estimated that the opening of this line will give the company an increase of 30 per cent. in traffic, as the line reaches the heart of the shopping district and is in close alliance with the new Pennsylvania terminal at Thirty-third street.

Work is rapidly progressing on the Jersey side and when completed it is thought that the Henderson street terminus will give a passenger increase of at least 20 per cent.

Most of the property owners consents for the Grand Central extension have been obtained, and that the line should be in operation prior to 1912.—*Wall Street Journal.*

A Contrast.

A prominent manufacturer in Salt Lake City has a freight bill for a carload of cotton piece goods shipped by water from New York to Galveston and by the Santa Fe and Denver & Rio Grande railways to Salt Lake, 60,336 lbs., at $2.25 per 100 lbs., the total of which is $1,357.56. If this same shipment had been consigned to San Francisco, Portland, Seattle, or Los Angeles, the rate would have been $1.10 per 100 lbs., or $663.69, and this, too, for all-rail service. The Salt Lake manufacturer, for the same shipment by rail all the way would have been called on to pay freight charges of $1,773.93. —*Exchange.*

INTERSTATE COMMERCE COMMISSION.

Carrier having for its own convenience furnished shipper two smaller cars instead of one of capacity ordered, it was unreasonable to charge on basis of combined minima of two cars furnished. (17 I. C. C., 322.)

Back Haul Rates at El Paso.

F. H. Bascom Co. v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Harlan.

The defendant, while maintaining an open fifth class rate of 30 cents per 100 lbs. from El Paso back to local points on its line, also publishes and maintains a special rate of 10 cents per 100 lbs. applicable only to merchandise that has come into El Paso, at any time in the past, over its own lines. The rate is unlawful and discriminatory and is not justified or excused by the fact that El Paso is a highly competitive point. Defendant's contention that the 10-cent rate is a proportional rate is not sustained. The rate is a mere concession in the outbound rate and a device to force traffic to El Paso over its own lines by denying its use to merchandise that has come to that point over competing lines.

Ten-Car Rate Referred To.

Carstens Packing Co. v. Oregon Short Line et al. Opinion by Commissioner Harlan.

It is held that defendants' carload rates exacted on shipments of complainant's cattle from Glenn's Ferry, Idaho, and Mountain Home, to Tacoma, Wash., were unreasonable and ought not to have exceeded the rates that were subsequently voluntarily established by the defendants from those two points. Reparation awarded.

The record presents in an emphasized form the question of the validity of a 10-car rate. Because of the long-continued practice of carriers to which the commerce of the country had adjusted itself the commission early in its history accepted as valid and justified a carload rate that was less proportionally than the rate on a less-than-carload shipment of the same commodity. But whether that principle may wisely be extended further so as to justify what may be called wholesale rates—that is to say, rates established by carriers on the theory that a shipper who is able to deliver traffic in 10 or more cars is entitled to lower rates proportionally than a shipper who is able to deliver traffic by the carload only, is a very doubtful question. It has not been argued in this proceeding, although the question is somewhat involved in the issues presented, nor is any ruling on the question necessary to sustain the disposition made of the complaint. It is referred to only because we desire it to be understood that nothing herein said shall be taken either as an approval of or acquiescence in a 10-carload rate, or, to use a convenient phrase, in wholesale rates of any kind beyond the carload rate. (17 I. C. C., 324.)

Damages Due to Delay Left to Court Determination.

H. W. Joynes v. Pennsylvania Railroad. Opinion by Commissioner Harlan.

Petitioner, a dealer in fruits and general produce, charges discrimination, in that the defendant persistently delayed his shipments of fruit in Pittsburgh at the Fifty-fourth street yards where the cars were not accessible to teams and could not be unloaded by him, while at the same time cars of other shippers were promptly placed in position at the unloading platform and were thus given a preferred use of the defendant's terminal facilities, and because of the delay and discrimination petitioner suffered loss through the decay of the fruit and otherwise in the sum of $30,498, for which amount he claims reparation. It is held that the commission is without power under the law to make awards of general damages of that nature.

In cases of the nature involved in the complaint the commission may ascertain whether the discrimination alleged actually occurred or whether the carrier has failed in a duty imposed on it under any provision of the act as charged in the complaint. But the assessment of any resulting damages, other than damages that may be measured by differences in rates, must be left to be determined by action brought in a court of competent jurisdiction.

The language of the act being of doubtful interpretation, the commission, which is a special tribunal of limited powers, ought not to take jurisdiction, but should resolve the doubt in favor of the courts where claims of this nature ordinarily belong. Section 15 is the dominating and controlling expression of the real object and meaning of the act in its present form. It makes of the commission what it was undoubtedly intended to be, namely, a special expert body created for the purpose of dealing with the rates and practices of carriers affecting rates, and not a body to take the place of the courts for the redress of alleged wrongs of the character involved in the complaint. (18 I. C. C., 361.)

STATE COMMISSIONS.

The Michigan State Railroad Commission in drafting rules for demurrage has ignored the views of the Interstate Commerce Commission and has issued an opinion holding that demurrage matters are purely local.

The Illinois Railway Commission has exempted the Indiana Harbor Belt from its rules fixing the rates for switching within the Chicago district. The Indiana Harbor Belt presented statements showing that the rates as applied to it were confiscatory.

The Georgia Railroad Commission has issued an order that no rates now in effect, or which may hereafter be made so, and which are not higher than such as are established by the commission, shall be discontinued or increased except by its order or consent. All railways and public service corporations in the state are required to file with the commission on or before Feb. 1, full schedules of all their charges and copies of all their rules and regulations in dealing with the public.

The New York Public Service Commission, First district, has ordered all railway and street railway corporations that come under its jurisdiction to file with the commission books, records, contracts, documents and other papers, a long list of which is given in the order. Both steam and electric railways operating part of their mileage outside of the jurisdiction of the commission are required to file only documents relating to the business and franchises of that part of their lines under the jurisdiction of the commission. This order supersedes that of August 2, 1907.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1909.
(See also issue of January 7, 1910.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating Income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta, Birmingham & Atlantic	641	$177.256	$48.549	$239,702	$25,303	$34,548	$11,889	$81,024	$8,999	$161,763	$77,939	.....	$17,433	$60,506	$35,576
Baltimore & Ohio	4,198*	5,861,940	1,079,855	7,351,673	830,129	1,421,960	138,310	2,388,122	129,064	4,907,585	2,444,090	— $59,096	190,399	3,194,595	475,046
Bangor & Aroostook	530	175,893	57,917	244,682	37,589	26,008	2,312	68,895	9,951	144,755	99,927	.....	1,500	98,427	27,355
Bessemer & Lake Erie	201	736,490	23,207	768,517	60,504	104,834	5,785	175,876	7,014	354,013	414,504	.....	5,000	409,504	217,334
Buffalo, Rochester & Pittsburgh	567	661,409	73,712	770,663	69,139	165,297	8,965	209,944	12,492	465,837	304,826	212	13,000	292,038	156,125
Central R.R. of New Jersey	668	1,732,438	342,737	2,193,110	178,730	214,884	29,643	546,835	37,810	1,107,902	1,085,208	5,733	92,117	987,358	304,660
Chicago Great Western R.R.	1,486†	794,082	200,787	1,064,992	102,119	105,338	39,885	416,774	32,971	697,087	367,905	4,209	27,319	336,377	.....
Chicago, Indianapolis & Louisville	616	353,426	113,855	509,224	62,110	68,090	13,619	152,681	14,544	311,044	198,180	.....	20,500	177,680	64,618
Chicago, Rock Island & Gulf	529‡	250,052	64,275	325,157	40,668	22,642	6,371	98,709	8,508	176,898	148,259	250	4,550	143,459	73,228
Cincinnati, Hamilton & Dayton	1,036	662,320	131,852	898,533	112,339	134,627	21,099	326,735	20,184	614,984	283,549	.....	25,833	257,716	121,971
Cleve., Cin., Chicago & St. Louis	1,982	1,793,908	567,050	2,584,504	306,579	421,028	75,909	900,794	48,720	1,753,030	831,474	10,879	74,000	746,595	353,035
Denver & Rio Grande	2,553	1,597,506	437,027	2,117,055	241,423	348,176	39,453	752,731	47,908	1,429,691	687,364	— 5,968	71,000	610,396	128,316
Elgin, Joliet & Eastern	770	704,767	5	771,979	67,794	147,370	3,857	224,627	13,035	456,683	315,296	.....	13,500	301,796	112,804
Florida East Coast	583	119,688	63,469	207,785	29,681	35,758	6,348	75,944	10,543	158,274	49,511	.....	11,544	37,967	17,921
Fort Worth & Denver City	454	338,584	134,840	493,502	49,052	56,791	6,364	150,744	14,750	277,701	215,801	1,882	9,300	208,383	38,418
Grand Rapids & Indiana	587	271,794	123,895	425,658	33,181	65,449	10,541	161,116	12,584	282,871	142,787	40	20,737	122,090	30,023
Hocking Valley	350	597,966	71,706	690,909	91,245	126,371	6,815	185,760	10,869	421,060	269,849	13,197	21,909	261,137	89,475
Houston & Texas Central	789	418,778	127,868	582,154	76,190	56,475	16,167	198,237	20,662	367,731	214,423	.....	9,404	205,018	—28,764
Lake Erie & Western	886	385,653	60,550	471,547	68,192	80,874	12,068	156,757	9,333	327,224	144,323	.....	18,627	125,696	66,207
Lake Shore & Michigan Southern	1,663§	2,853,811	770,375	4,092,945	487,451	594,003	89,479	1,230,356	56,354	2,457,643	1,635,302	8,418	125,000	1,501,884	264,438
Louisville & Nashville	1,542‡	3,393,270	857,273	4,540,696	511,798	673,666	90,543	1,345,709	80,515	2,702,231	1,838,465	21,271	125,445	1,691,749	514,557
Maine Central	932	489,568	221,213	755,177	117,357	104,332	6,629	241,605	20,330	490,253	264,924	3,434	39,141	229,217	65,561
Michigan Central	1,746	1,780,783	518,316	2,526,762	304,209	308,994	55,606	898,258	37,622	1,604,689	922,073	7,221	94,000	820,852	279,864
Mobile & Ohio	1,114	685,253	110,335	924,343	114,676	168,358	31,258	282,121	32,663	629,076	295,267	2,895	21,956	270,416	16,685
New York Central & Hudson River	3,587	5,395,226	2,200,319	8,441,637	1,044,226	1,391,353	209,426	2,859,740	133,677	5,638,422	2,803,215	44,487	434,592	2,413,110	628,412
New York, Chicago & St. Louis	559	758,197	116,590	908,126	23,641	125,052	45,371	340,853	15,604	550,521	357,605	1,626	33,000	322,979	106,171
Norfolk & Southern	592	162,234	52,296	228,605	22,976	31,045	3,493	68,939	15,333	141,786	86,819	8	5,900	80,911	17,898
Northern Pacific	5,691‖	4,714,945	1,589,092	6,690,435	723,115	785,171	80,514	2,124,194	88,087	3,801,081	2,889,354	26,606	254,237	2,661,723	—372,520
Oregon R.R. & Nav. Co.	1,327¶	907,361	329,427	1,311,040	153,205	91,273	30,782	429,710	34,351	739,321	571,719	4,349	92,190	475,189	—120,467
Philadelphia & Reading	1,024°	3,242,198	538,467	3,953,650	237,865	881,442	31,716	1,138,941	59,571	2,349,535	1,604,115	1,856	73,386	1,528,873	301,773
Rutland	468	178,203	80,016	287,915	39,599	40,052	6,945	109,440	5,516	201,552	86,363	.....	10,808	75,555	8,712
Pittsburgh & Lake Erie	191	1,470,571	114,510	1,622,722	155,776	122,061	11,611	309,728	18,926	618,103	1,004,619	385	16,000	988,234	534,729
Toledo & Ohio Central	441	324,686	18,228	389,160	48,199	54,627	5,334	111,459	7,187	226,806	162,354	14,505	14,892	161,968	62,436
Trinity & Brazos Valley	455δ	243,189	16,768	263,628	42,096	39,513	5,323	103,563	12,164	202,659	60,969	.....	4,750	56,219	52,245
Wabash	2,515	1,782,950	549,735	2,529,408	350,485	330,991	69,169	877,634	64,755	1,693,034	836,374	4,081	64,495	767,798	332,071
Wheeling & Lake Erie	458△	535,771	13,164	621,756	15,200	144,340	7,900	212,828	13,111	423,379	198,377	8,697	23,217	183,857	155,110
		FIVE MONTHS OF FISCAL YEAR.													
Atlanta, Birmingham & Atlantic	641	$786,754	$229,380	$1,071,871	$130,511	$163,198	$58,176	$408,243	$43,704	$803,832	$268,039	.....	$49,433	$218,606	$29,946
Baltimore & Ohio	4,198*	28,986,557	6,355,220	37,233,833	4,831,183	6,524,967	744,875	11,489,269	641,906	24,232,201	13,001,632	272,382	910,914	11,818,336	1,532,606
Bangor & Aroostook	530	816,727	315,393	1,195,234	185,231	142,975	13,713	328,079	50,090	720,088	475,146	.....	7,500	467,646	66,074
Bessemer & Lake Erie	201	4,097,053	170,023	4,306,126	326,709	557,558	34,295	919,310	33,719	1,871,591	2,434,535	.....	25,000	2,409,535	769,819
Buffalo, Rochester & Pittsburgh	567	3,318,976	463,469	4,002,875	481,897	796,986	44,567	1,021,433	63,804	2,402,687	1,594,188	458	65,000	1,529,646	663,662
Central R.R. of New Jersey	668	7,284,437	2,068,194	9,882,758	907,083	1,590,343	156,401	2,574,214	206,779	5,434,820	4,447,938	201,636	448,021	4,201,552	696,919
Chicago Great Western R.R.	1,486†	2,257,788	659,267	3,162,174	341,155	335,323	113,806	1,197,321	94,709	2,082,315	1,079,859	4,133	81,957	993,769	.....
Chicago, Indianapolis & Louisville	616	1,731,056	663,035	2,603,695	317,388	331,245	67,739	766,043	72,384	1,584,799	1,018,897	.....	101,000	917,897	250,473
Chicago, Rock Island & Gulf	529†	978,601	325,291	1,367,186	200,505	93,952	30,350	458,975	43,578	827,361	539,825	—1,272	27,883	510,670	280,289
Cincinnati, Hamilton & Dayton	1,036	2,970,251	814,419	4,234,782	588,120	685,763	105,593	1,534,601	138,470	3,051,947	1,182,835	.....	129,167	1,053,668	319,449
Cleve., Cin., Chicago & St. Louis	1,982	8,216,963	3,402,560	12,711,101	1,492,717	1,929,316	400,689	4,347,943	223,758	8,394,423	4,316,678	21,838	370,000	3,924,840	909,063
Denver & Rio Grande	2,553	7,384,837	2,734,972	10,555,445	1,315,305	1,543,656	214,139	3,539,000	227,520	6,839,620	3,715,825	39,939	334,000	3,420,864	390,179
Elgin, Joliet & Eastern	770	3,661,308	137	3,948,248	345,521	711,095	20,455	1,045,178	63,548	2,185,797	1,762,451	.....	67,500	1,694,951	721,508
Florida East Coast	583	463,535	295,374	882,577	157,505	177,346	20,596	375,348	39,189	769,984	112,593	.....	57,722	54,871	191,003
Fort Worth & Denver City	454	1,440,411	806,036	2,343,875	255,439	291,351	35,158	659,259	70,926	1,312,133	1,031,742	3,585	46,500	988,827	201,806
Grand Rapids & Indiana	587	1,230,697	847,051	2,220,225	252,677	333,160	55,413	828,611	66,808	1,536,670	683,555	—681	104,973	577,902	—27,321
Hocking Valley	350	2,835,685	416,486	3,353,990	449,266	592,742	37,426	846,664	60,552	1,986,650	1,367,341	90,634	108,540	1,349,435	268,576
Houston & Texas Central	789	1,915,858	659,574	2,739,135	318,100	264,359	87,614	941,696	96,504	1,708,273	1,030,862	.....	67,476	963,386	68,186
Lake Erie & Western	886	1,850,701	410,776	2,381,438	362,096	393,474	63,138	778,550	49,184	1,646,442	734,996	.....	91,712	643,284	255,942
Lake Shore & Michigan Southern	1,663§	13,771,164	4,900,105	20,886,419	2,817,709	2,815,874	491,204	5,842,463	294,532	12,261,782	8,624,637	31,017	625,000	7,968,620	1,635,487
Louisville & Nashville	1,542‡	15,592,925	4,602,167	21,465,413	2,404,471	3,303,548	437,021	6,203,181	414,367	12,762,588	8,702,825	51,545	626,285	8,024,995	1,686,186
Maine Central	932	2,263,201	1,511,598	4,007,329	633,579	513,565	40,113	1,236,322	99,602	2,523,181	1,484,148	21,748	174,168	1,331,727	249,913
Michigan Central	1,746	8,102,876	3,273,738	12,480,047	1,710,638	1,530,637	337,947	4,140,739	196,671	7,916,632	4,563,415	11,191	473,000	4,079,224	1,022,149
Mobile & Ohio	1,114	3,154,714	563,425	4,306,193	522,139	740,982	141,142	1,386,728	152,862	2,943,853	1,362,340	12,818	111,217	1,238,305	—22,151
New York Central & Hudson River	3,587	24,181,465	13,800,149	42,181,033	5,682,413	6,536,717	1,066,659	13,927,047	815,578	28,028,444	14,152,589	142,156	1,951,916	12,342,829	2,027,916
New York, Chicago & St. Louis	559	3,587,374	708,501	4,446,399	380,329	453,360	239,806	1,581,324	67,278	2,722,097	1,724,302	4,799	165,000	1,554,504	419,785
Norfolk & Southern	592	691,296	312,374	1,091,545	128,664	134,510	21,362	329,990	69,789	684,225	407,320	2,659	29,500	380,480	142,214
Northern Pacific	5,691‖	22,178,983	11,543,093	35,681,803	4,794,620	3,915,149	409,460	9,821,874	455,170	19,396,273	16,285,530	349,739	1,355,909	15,279,360	668,403
Oregon R.R. & Nav. Co.	1,327¶	4,290,779	2,131,147	6,787,365	687,353	457,488	154,761	1,900,746	157,662	3,358,010	3,429,355	9,792	260,952	3,178,195	72,606
Philadelphia & Reading	1,024°	14,343,746	2,968,645	18,073,143	1,400,249	3,951,773	199,984	5,126,722	292,175	10,961,903	7,111,540	55,818	367,245	6,800,113	670,351
Rutland	468	795,226	551,150	1,491,676	233,791	190,763	33,352	485,073	26,707	969,686	521,990	.....	50,891	471,099	80,911
Pittsburgh & Lake Erie	191	6,832,928	658,240	7,676,513	711,547	552,991	69,607	1,453,438	99,649	2,887,232	4,789,281	1,625	83,000	4,704,656	1,876,144
Toledo & Ohio Central	441	1,500,156	297,832	1,876,263	260,773	287,976	28,381	544,898	31,096	1,153,124	723,139	57,838	69,363	711,614	—143,004
Trinity & Brazos Valley	455δ	817,997	91,483	926,550	164,199	171,751	25,320	408,348	50,787	820,405	106,145	.....	21,250	84,895	—22,660
Wabash	2,515	8,329,929	3,336,097	12,584,901	1,532,944	1,646,053	385,760	4,358,675	320,965	8,244,397	4,340,504	6,849	333,601	4,000,054	755,258
Wheeling & Lake Erie	458△	2,597,474	273,792	3,092,771	305,279	723,011	37,202	974,559	72,406	2,112,457	980,314	30,492	115,927	894,879	321,198

* From July 1, 1909, includes Cleveland, Lorain & Wheeling Ry., previously reported independently. † Begun operations Sept. 1, 1909; consolidation of Chicago Great Western Ry., Mason City & Fort Dodge, Wisconsin, Minnesota & Pacific. ‡ Mileage operated on Nov. 30, 1908, 492. § Mileage operated on Nov. 30, 1908, 1,508. ‡ Includes Louisville & Atlantic from July 1, 1909, and Frankfort & Cincinnati from Nov. 1, 1909, both previously reported independently. ‖ Mileage operated Nov. 30, 1908, 5,649. ¶ Mileage operated on Nov. 30, 1908, 1,264. ° Mileage operated on Nov. 30, 1908, 1,096 δ Mileage operated Nov. 30, 1908, 422. △ Mileage operated on Nov. 30, 1908, 442. — Indicates Deficits, Loss, and Decreases.

Indiana: Adoption of Uniform Demurrage Rules.

Indiana Manufacturers' and Shippers' Association v. Indiana Car Service Association et al.

The petition asks that the railways of Indiana be required to adopt the uniform demurrage rules recommended by the National Association of Railway Commissioners. The commission finds that these rules are fair and reasonable and that the business of the country demands uniform demurrage rules, and therefore orders the railways doing an intrastate business to adopt the rules recommended by the National Association of Railway Commissioners.

Indiana: Electric Headlights Ordered.

In re condition and efficiency of locomotive headlights.

The commission of Indiana, ordered last year by the legislature to investigate locomotive headlights, has ordered all roads to use them. * * * The railway companies, having appeared and having co-operated and assisted the commission in this investigation, and the commission having examined a great many managers, superintendents, master mechanics, locomotive engineers and trainmen, and having corresponded with the authorities of the states of the Union where this matter has been considered, and having consulted railway men within and without the state and having taken scientific and expert advice, and especially the counsel of the dean of the Schools of Engineering and professors in said schools of Purdue University (a series of physical experiments and tests having been conducted under the direction of said dean), and the commission having made personal investigation by its members on the railways and on locomotives using both oil and electric headlights and being fully advised and after full and laborious consideration, the commission finds:

The oil headlights commonly in use on locomotive engines in this state are inadequate for the protection of persons and property; and that headlights of greater illuminating power would be the most practicable and efficient for all purposes.

It is therefore ordered that every railway * * * shall equip all engines with headlights of not less than 1,500 candle power (switching engines excepted); one-third of the road engines by the 1st of July, 1910, an additional third by the 1st of January, 1911, and the remaining third by the 1st of July, 1911. The railway companies are required to report to the commission the progress they make.

COURT NEWS.

The Baltimore & Ohio Southwestern on January 5 paid a fine of $1,000 in the circuit court at Springfield, Ill., for alleged discrimination in rates in violation of the Illinois state law. The charge was that it made a lower rate on grain from Pleasant Plains to East St. Louis than from Richland to East St. Louis, although the haul from the latter point is shorter.

At Jersey City, N. J., January 6, the Erie Railroad was fined $1,000 for maintaining a nuisance in the burning of soft coal in its locomotives.

In the supreme court of New York, Suffolk county, January 7, a suit of the state forest commission against the Long Island Railroad to recover penalties for failure to cut brush and weeds on the railway company's right-of-way ended in a verdict against the railway. The jury assessed the penalty at $32,200.

Commission Sustained in Distributing Coal Cars.

The supreme court of the United States in a decision by Justice White, January 10, decides the case of the United States against the Illinois Central and the Chicago & Alton, doing business in the Illinois coal mining district, in favor of the government. The case involved the right of the Interstate Commerce Commission to direct the distribution of cars in the interest of independent coal companies and the commission is upheld. In effect the court held that the fuel cars of other companies were to be counted in the quota of each particular mine.

The court declared that the commission was right in the exercise of its administrative functions in disregarding an injunction issued by a federal circuit court to restrain it from carying out its order. The opinion was written by Justice White, who spoke for the entire court except Justice Brewer, who dissented.

In the distribution of empty cars to the mines in times of car shortage the railways have divided the cars into four classes, namely: Those owned by the railways, those used for carrying fuel for the road making the distribution, those owned by the mine, the shipper or the consumer, known as private cars, and cars sent in by other roads for the transportation of their own fuel.

In the pro rata distribution based on either capacity or output of the mines it was usual to count those of the first class in making up the percentages, but make exceptions in the case of one or more or all of the other classes.

The first test case of distribution was brought by the Ohio Railroad Commission in 1907, the Interstate Commerce Commission deciding that the failure of the Hocking Valley road to include foreign railway fuel cars and private cars in the pro rata was a discrimination prohibited by the Interstate Commerce Act. The Illinois Central a few days later put into effect regulations in conflict with this decision and was about to make them conform to the decision when the Majestic Coal Company obtained an injunction against the road.

Then the Illinois Collieries Company made complaint to the commission that the distribution made by the Illinois Central was discriminatory and the commission ordered the road to include private and railway fuel cars, the injunction to the contrary notwithstanding. The company went into court for an order enjoining the commission from enforcing its order, setting up among other things the order of the other court in the Majestic case.

The circuit court, however, found against the road with regard to private cars and foreign fuel cars but against the commission with regard to the cars carrying fuel for the Illinois Central, holding that as the coal was not for commercial purposes it could not be treated as being engaged in commerce. The commission appealed from the last part of the finding.

In announcing the decision this week Justice White considered an objection concerning the delegation of power to the commission, that no such delegation had been made by the interstate commerce law in regard to the distribution of fuel cars as a means of prohibiting unjust preferences and undue discrimination, and the second, that even if such power should be delegated the order was beyond the authority conferred by law. The objection, he said, rested on the erroneous assumption that commerce, in the constitutional sense, embraced only shipment in a technical sense. The cars and engines of a railway company engaged in interstate commerce, included in which are its coal cars, are instruments of such commerce. From this it necessarily follows that such cars are embraced within the governmental power of regulation, which extends, in time of car shortage, to compelling a just and equal distribution and the prevention of an unjust and discriminatory one.

In the suit as originally instituted the courts were asked to enjoin the enforcement of the Interstate Commerce Commission's order as it applied to the distribution of the fuel cars of foreign railways and private cars of other shippers, as well as the cars employed by the initial railway companies themselves in hauling their own fuel. The United States Circuit Court for the Northern district of Illinois sustained the commission with reference to the first two classes, but granted an injunction restraining the enforcement of the regulation with reference to the company owned cars. This, therefore, was the only point involved in the present decision, and on that point the supreme court reversed the trial court, in addition announcing in broad terms its support of the power of the commission.

The case of the Baltimore & Ohio against the Pitcairn Coal Company involving a complaint of unequal distribution of cars by independent coal operators in West Virginia, was technically decided in favor of the railway company on the ground that the complaint should have been made originally to the Interstate Commerce Commission instead of to the courts.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. E. Peyton has been appointed assistant to the president of the Louisville & Nashville, with office at Louisville, Ky.

W. H. Larson has been elected secretary-treasurer of the Alexandria & Western, a new line under construction in Louisiana.

J. W. O'Neal has been appointed assistant auditor of freight receipts of the Pennsylvania Lines West, with office at Pittsburgh, Pa., succeeding W. Parker, retired.

F. H. Wood, assistant attorney of the Kansas City Southern at Kansas City, Mo., has been appointed a general attorney of the St. Louis & San Francisco, with office at St. Louis, Mo.

As was previously announced in these columns, Darius Miller, first vice-president of the Chicago, Burlington & Quincy, in charge of traffic, on the retirement of Daniel Willard, second vice-president, in charge of operation, to become president of the Baltimore & Ohio, has his jurisdiction extended to include the operating department. Mr. Miller was born April 3, 1859, at Princeton, Ill. He began railway work in November, 1877, as a stenographer in the general freight office of the Michigan Central at Chicago. He was then consecutively clerk in the general freight office of the St. Louis, Iron Mountain & Southern; chief clerk to the general manager and then general freight and ticket agent of the Memphis & Little Rock, now a part of the Chicago, Rock Island & Pacific. He left this road to become general freight and passenger agent and then traffic manager of the St. Louis, Arkansas & Texas, now a part of the St. Louis Southwestern. He was later traffic manager of the Queen & Crescent, and then traffic manager of the Missouri, Kansas & Texas. He was elected vice-president of the latter road in September, 1896, and two years later was elected second vice-president of the Great Northern. In January, 1902, he was elected first vice-president of the Chicago, Burlington & Quincy, and his jurisdiction was extended over the Colorado & Southern in March, 1909, after the Burlington acquired control of this property from the Hawley interests.



Darius Miller.

William Mahl, vice-president and comptroller of the Union Pacific and Southern Pacific systems, has been elected president of the Texas & New Orleans, at New York, succeeding E. H. Harriman, deceased. A sketch of Mr. Mahl's railway life was published in our issue of October 29, page 824.

G. W. Kretzinger, general counsel of the Chicago, Indianapolis & Louisville at Chicago, having resigned, that office is abolished, and E. C. Field, vice-president and general solicitor, with office at Chicago, will perform also the duties heretofore performed by the general counsel. H. R. Kurrie, assistant general solicitor, has been appointed general attorney at Chicago.

E. H. Fitzhugh, third vice-president of the Grand Trunk, has been elected first vice-president. William Wainwright, fourth vice-president, has been elected second vice-president; M. M. Reynolds, fifth vice-president, has been elected third vice-president, and R. S. Logan, assistant to second vice-president, has been appointed assistant to president, all with offices at Montreal, Que.

Barrett B. Mitchell, whose appointment as assistant to vice-president of the New York Central Lines at New York was recently announced in these columns, was born September 24, 1846, at Pittsford, Monroe county, N. Y. He was educated in the district public schools and at the Rochester high school. He began railway work June 1, 1867, as a clerk for the Blue line, a fast freight line owned and controlled by the New York Central and the Michigan Central, remaining with the Blue line until January, 1895, when he went to the Michigan Central as general freight agent. In November, 1905, he was made freight traffic manager of the New York Central lines west of Buffalo, with office in Chicago, and the following month was appointed freight traffic manager of the New York Central lines east, with office in New York. In May, 1906, he was appointed general freight traffic manager of the entire New York Central system, with office in Chicago, which position he held at the time of his recent appointment. Mr. Mitchell has been in continuous service with the New York Central interests for over 42 years.



B. B. Mitchell.

C. H. Ackert, vice-president and general manager of the Southern Railway at Washington, D. C., has been elected vice-president, in charge of operation, of the Toledo, St. Louis & Western, the Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, with office at Chicago. Mr. Ackert was born February 19, 1856, in Dutchess county, N. Y. He began railway work in 1872 with the St. Louis, Kansas City & Northern, now part of the Wabash, holding various positions with that company, the St. Louis, Iron Mountain & Southern and the Texas & Pacific until 1883, when he went to the Iowa Central. He was appointed general manager of the Iowa Central in 1888, which position he held until April, 1893, when he went to the Elgin, Joliet & Eastern as general manager, and later was made president of that company and of the Chicago, Lake Shore & Eastern. In March, 1901, he became general manager of the Mobile & Ohio. On March 15, 1902, he went to the Southern Railway as general manager and has been at the head of the operating department of that road ever since, becoming vice-president in 1905.



C. H. Ackert.

Operating Officers.

O. Cornelisen, general superintendent of the Chicago Great Western, at Chicago, has resigned.

F. H. Knickerbocker has been appointed assistant to the

general manager of the Oregon Short Line, with office at Salt Lake City, Utah.

W. G. Mason, assistant superintendent of the Texas & Pacific at Bunkie, La., has been appointed trainmaster of the New Orleans Great Northern, with office at Bogalusa, La.

F. A. Andrews, yardmaster of the Bangor & Aroostook at Millinocket, Me., has been appointed trainmaster in charge of the Southern and Northern divisions, with office at Bangor, Me.

C. A. Clements, trainmaster of the Missouri Pacific at Little Rock, Ark., has been appointed trainmaster, with office at De Soto, Mo., succeeding F. J. Norris, assigned to other duties.

L. A. Wallace has been appointed a trainmaster on the Memphis division of the Missouri Pacific-Iron Mountain system, with office at Wynne, Ark., succeeding J. S. Douglas, resigned.

G. E. Graham, superintendent of terminals of the Canadian Pacific at Fort William, Ont., has been transferred to Vancouver, B. C. B. Armstrong succeeds Mr. Graham, with office at Fort William.

Miles Bronson, who was recently appointed superintendent of the Mohawk division of the New York Central & Hudson River at Albany, N. Y., was born on May 8, 1875, in the village of Gauhati, province of Assam, British India. He began railway work in June, 1890, in the law department of the Grand Trunk, at Detroit, Mich., and held various positions with that company until May, 1895, when he became secretary to S. R. Callaway, president of the New York, Chicago & St. Louis at Cleveland, Ohio. In 1897 he was appointed superintendent of the Buffalo Terminal, which was then under construction. Before the road was opened for business, however, Mr. Callaway went to New York to succeed C. M. Depew as president of the New York Central & Hudson River and Mr. Bronson became his secretary at New York, instead of going to Buffalo. He was later made assistant to the president. In November, 1900, he was appointed superintendent of the Harlem division, which position he held until March, 1907, when he was transferred to the River division, and is now transferred to the Mohawk division.



Miles Bronson.

E. H. Coapman, manager of the Southern at Washington, D. C., has been appointed general manager, succeeding to the duties as general manager of C. H. Ackert, vice-president and general manager, resigned, with office at Washington, in charge of the operating and maintenance departments, reporting to the president, and his former position has been abolished.

Frank H. Wilson, whose appointment as assistant general superintendent of the Lake Shore & Michigan Southern, with office at Chicago, has been announced in these columns, was born November 12, 1873, at Indianapolis, Ind. He received a common school education and began railway work in 1887 as messenger for the Indiana, Bloomington & Western, and for six years from 1888 he was clerk to the trainmaster and superintendent of that road and the Cincinnati, Indianapolis, St. Louis & Chicago, both of which roads are now parts of the Cleveland, Cincinnati, Chicago & St. Louis. He was then made secretary and chief clerk to the general superintendent of the Big Four, and in December, 1902, was appointed trainmaster of the Peoria & Eastern division. For a year from January, 1903, he was special representative of the general manager of the Lake Shore & Michigan Southern, and was then appointed trainmaster, with office at Toledo. In April, 1905, he was made assistant division superintendent at Chicago, and later in the same year was appointed superintendent of the Western division, from which position he has just been promoted.

The Minneapolis & St. Louis and the Iowa Central have been divided into three operating divisions. The Eastern division of the Minneapolis & St. Louis includes Minneapolis terminals and all trackage south of Hopkins and Winthrop, Minn., including Hopkins yard, but not Winthrop yard. C. P. Stembel, superintendent, with office at Minneapolis, has been appointed superintendent of the Eastern division only. The Western division includes all trackage west of Hopkins yard, and J. A. Swygart has been appointed superintendent, with office at Watertown, S. D. H. G. Kruse continues as superintendent of the Iowa Central, with office at Oskaloosa, Iowa. See item under Engineering and Rolling Stock Officers.

Traffic Officers.

Walter J. Moore has been appointed industrial agent of the New York Central lines, with office at New York.

H. F. Daniels has been appointed a commercial agent of the Norfolk & Western, with office at Memphis, Tenn., succeeding N. R. Prichard.

Richard Warren has been appointed general agent of the El Paso & Southwestern and the Morenci Southern, with office at El Paso, Tex.

J. H. Brown has been appointed traffic manager of the Las Vegas & Tonopah, with office at Los Angeles, Cal., succeeding E. W. Gillett, resigned.

Thomas F. Shea has been appointed soliciting agent of the Louisville & Nashville, with office at Atlanta, Ga., succeeding M. C. Browning, transferred.

F. E. Rownd, soliciting freight agent of the St. Louis Southwestern at St. Louis, Mo., has been appointed a traveling freight agent, with office at St. Louis. H. W. McKee succeeds Mr. Rownd.

H. F. Ledlie, commercial agent of the Lake Shore & Michigan Southern at Kansas City, Mo., has been appointed division freight agent of that road and the Pittsburgh & Lake Erie, with office at Youngstown, Ohio.

James S. Bartle, general eastern freight agent of the Atchison, Topeka & Santa Fe at New York, has been appointed assistant freight traffic manager, with office at Chicago, succeeding F. B. Houghton, promoted.

J. A. Martin, general eastern agent of the Minneapolis & St. Louis and the Iowa Central at New York, has been appointed assistant general eastern agent of the Chicago, Burlington & Quincy, with office at New York.

A. J. Parr, assistant freight and passenger agent of the Temiskaming & Northern Ontario at North Bay, Ont., has been appointed freight and passenger agent of this company, with office at North Bay, succeeding W. D. Cunneyworth, resigned.

H. P. Bonner, traveling freight agent of the Trinity & Brazos Valley at Dallas, Tex., has been appointed commercial agent of this company, with office at Galveston, Tex., succeeding J. I. Johnson, resigned to accept service with the Rock Island.

J. E. Bell, traveling freight agent of the Chicago, Rock Island & Pacific at Atlanta, Ga., and J. I. Johnson have been appointed commercial agents, and A. W. Terrell has been appointed a traveling freight agent of the Rock Island lines, all with office at San Antonio, Tex.

E. F. Tillman, joint live stock agent of the Rock Island-

'Frisco system at Ft. Worth, Tex., has been appointed live stock agent of the St. Louis & San Francisco, with office at Ft. Worth, following the dissolution of this system. S. M. Wallace and C. W. Root have been appointed traveling freight agents, both with office at Dallas, Tex.

Stuart A. Allen, general southern freight agent of the Cincinnati, Hamilton & Dayton at Cincinnati, Ohio, has been appointed assistant general freight agent, with office at Cincinnati, and his former office has been abolished. H. G. Alexander, city passenger agent at Indianapolis, Ind., has been appointed district passenger agent, with office at Indianapolis, succeeding F. E. Hine, resigned to engage in other business. George B. Peterson succeeds Mr. Alexander.

The agencies of the Toledo, St. Louis & Western and the Chicago & Alton, and that of the Minneapolis & St. Louis and the Iowa Central at New York have been consolidated, and A. K. Handy, general eastern freight agent of the Toledo, St. Louis & Western and the Chicago & Alton, has had his jurisdiction extended to include all four roads. J. A. Martin, general eastern agent of the Minneapolis & St. Louis and the Iowa Central, has resigned to accept service elsewhere.

W. E. Coman, whose appointment as general freight agent of the Oregon Railroad & Navigation Company, with office at Portland, Ore., has been announced in these columns, was born May 15, 1869, at Portage, Wis. He received a common school education and began railway work in September, 1886, at Kansas City, Mo., in the local office of the Hannibal & St. Joseph, now a part of the Chicago, Burlington & Quincy. He was later until 1888 with the Chicago, Rock Island & Pacific and the Kansas City, Ft. Scott & Memphis, now a part of the St. Louis & San Francisco. He then went to Portland, Ore., where he began work with the Oregon Railroad & Navigation Company, first in the local freight office, and he was afterwards consecutively clerk in the general freight office, assistant chief clerk in the general freight office, traveling freight agent, general agent at Butte, Mont.; general agent of the Oregon Short Line at Portland, and general agent of the Oregon Short Line and the Union Pacific at Salt Lake City, Utah. In September, 1901, he was appointed assistant general freight agent of the Oregon Railroad & Navigation Company at Portland, and in the following year was made general freight and passenger agent of the Southern Pacific Lines in Oregon. In September, 1905, he was appointed first assistant general freight agent of the Oregon Railroad & Navigation Company, from which position he has been promoted to general freight agent.



W. E. Coman.

Gentry Waldo, general agent of the Southern Pacific Steamship Company at Galveston, Tex., has been appointed an assistant general freight agent of the Galveston, Harrisburg & San Antonio, the Houston & Texas Central, the Houston East & West Texas and the Houston & Shreveport, with office at Houston, Tex., succeeding H. C. Reese, deceased. H. M. Wilkins, general agent in the freight department of the rail lines mentioned, at Galveston, succeeds Mr. Waldo. R. H. Carmichael, general agent of the Southern Pacific lines at Monterey, Mex., suceeds Mr. Wilkins. J. C. Brasher, chief clerk in the freight traffic department at Houston, has also been appointed an assistant general freight agent, with office at Houston, a newly created office. S. G. Reed, division freight agent of the Houston & Texas Central at Dallas, Tex., has been appointed as assistant general freight agent of that road, with office at Dallas.

John Frederick Auch, whose appointment as freight traffic manager of the Philadelphia & Reading and subsidiary companies, with office at Philadelphia, Pa., was recently announced in these columns, was born in Montgomery county, Pa. He began railway work in October, 1875, with the Philadelphia & Reading as night operator at West Spring Mills, Pa., later alternating between day and night service at various places until the fall of 1879, when he was appointed station agent at Chalfont, Bucks county, Pa. In the summer of 1885 he was appointed chief clerk to the division freight agent of the Philadelphia & Atlantic City, a part of the Reading system, with office at Philadelphia, Pa. From 1886 to 1888 he was division freight agent at the same place, and in 1888 was appointed traveling freight agent for the Reading. The following year he was made chief clerk to the general freight agent, and in April, 1891, was made division freight agent at Harrisburg, Pa. Three years later he was appointed assistant general freight agent, with office at Philadelphia, and on May 1, 1908, was made general freight agent. He was appointed assistant freight traffic manager December 1, 1909, and now is promoted to the position of freight traffic manager.



John F. Auch.

Richard B. Miller, whose appointment as traffic manager of the Oregon Railroad & Navigation Company and the Oregon & Washington, with office at Portland, Ore., has been announced in these columns, was born April 8, 1870, in Idaho. He received a common school education and began railway work in 1886 with the Oregon Railroad & Navigation Company. He was appointed assistant general freight agent of that road on October 1, 1897, and four years later was made assistant general freight and passenger agent of the Southern Pacific Lines in Oregon. He was appointed general freight agent of the Oregon Railroad & Navigation Company in May, 1902, and in September, 1905, had his jurisdiction extended over the Southern Pacific Lines in Oregon, which position he held until his recent promotion. Mr. Miller retains the title of general freight agent of the Southern Pacific Lines in Oregon.



R. B. Miller.

M. J. McDonough, commercial agent of the Seaboard Air Line at Birmingham, Ala., has been appointed assistant general freight agent, with office at Birmingham, succeeding E. T. Steele, resigned. R. W. Morris, traveling freight agent at Birmingham, succeeds Mr. McDonough. S. K. Hawkins also has been appointed a commercial agent at Birmingham. C. J.

Nalle has been appointed a soliciting freight agent, with office at Memphis, Tenn., succeeding Edgar Estile, resigned.

C. B. Sloat, general agent of the Chicago, Rock Island & Pacific at Kingsville, Tex., has been appointed an assistant general passenger agent, with office at Little Rock, Ark., where he will succeed to the duties of G. H. Lee, general passenger agent, promoted. E. J. O'Neill, commercial agent of the Chicago, Rock Island & Pacific at St. Louis, Mo., has been appointed general agent, with office at St. Louis. G. A. Carter, general agent of the Missouri, Kansas & Texas at Dallas, Tex., has been appointed a traveling freight agent of the Rock Island, with office at Fort Worth, Tex. B. D. Shropshire, Jr., has been appointed a soliciting freight agent, with office at Fort Worth.

Following the dissolution of the Rock Island-Frisco merger, the appointments in the freight traffic department of the Rock Island Lines are as follows: John Fox has been retained as live stock agent, with office at Kansas City, Mo.; R. O. Roy, Alexandria, La.; C. H. Caswell, Davenport, Iowa; A. W. Eberhart, Des Moines; M. M. Knapp, Estherville; J. B. Rishel, Hutchinson, Kan.; P. Portel, Oklahoma City, Okla.; E. F. Strain, Topeka, Kan., and E. B. Hooser, Wichita, have been retained as division freight agents. S. L. Parrott, Boston, Mass.; W. A. Kendall, Burlington, Iowa; G. W. Martin, Denver, Colo.; J. Mallen, Leavenworth, Kan.; De Witt Hammond, Mexico City, Mex.; W. A. Hughes, Milwaukee, Wis.; J. E. Utt, Omaha, Neb.; H. I. Battles, Peoria, Ill.; O. M. Ellsworth, Pittsburg, Pa.; C. A. Hunter, Portland, Ore.; J. G. Doolittle, Salt Lake City, Utah, and G. P. Cave, Seattle, Wash., have been retained as general agents. F. M. Darrah, Atchison, Kan.; V. M. Cluis, Atlanta, Ga.; E. C. Hines, Boston, Mass.; A. S. Collins, Buffalo, N. Y.; W. S. Williams, Cedar Rapids, Iowa; C. C. Spalding, Cincinnati, Ohio; G. W. Teare, Cleveland; A. R. Brasted, Colorado Springs, Colo.; G. W. Williams, Detroit, Mich.; Fred Smith, Kansas City, Mo.; E. O. Miller, Lincoln, Neb.; R. E. Smith, Little Rock, Ark.; B. F. Coons, Los Angeles, Cal.; T. A. Matthews, Jr., Minneapolis, Minn.; E. J. Hennessey, Omaha, Neb.; D. W. Farrow, Philadelphia, Pa.; C. H. Bacon, Pueblo, Colo.; E. L. Goff, Rock Island, Ill.; W. T. Allen, San Francisco, Cal.; R. F. Atwood, St. Joseph, Mo., and J. B. Rayn, St Paul, Minn., have been retained as commercial agents. O. C. Turlington, traveling freight agent at Little Rock, Ark., has been appointed a commercial agent at New Orleans, La., succeeding I. T. Preston, resigned. M. L. Hartley succeeds Mr. Turlington. T. W. Bennett has been appointed a commercial agent at Louisville, Ky., succeeding C. S. Hall, resigned, and F. C. Johnson has been appointed a commercial agent at Memphis, Tenn., succeeding J. H. Doughty, resigned. L. D. Voak, Chicago, has been retained as traveling freight agent, and R. N. Gordon, Tacoma, Wash., has been retained as traveling freight and passenger agent. F. B. Mesick, general eastern freight agent at New York, and F. W. Thompson, general western freight agent, at San Francisco, Cal., have been retained. Freight agencies at the following points have been abolished: Birmingham, Ala.; Fort Smith, Ark.; Chicago Heights, Ill., Danville, National Stock Yards and Salem; Evansville, Ind., and Terre Haute; Fort Scott, Kan.; Cape Girardeau, Mo.; Joplin and Springfield; Sapulpa, Okla.; Chattanooga, Tenn., and Nashville.

Engineering and Rolling Stock Officers.

George D. Fairtrace has been appointed chief engineer of the Bartlett & Florence Railway, with office at Bartlett, Tex.

C. M. Hoffman has been appointed master mechanic of the Denver & Rio Grande, with office at Grand Junction, Colo., succeeding F. B. Mahoney, resigned.

F. G. Jonah, terminal engineer of the New Orleans Terminal Company at New Orleans, La., has been appointed engineer of construction of the St. Louis & San Francisco, with office at St. Louis, Mo.

O. S. Jackson has been appointed master mechanic of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind. W. J. Bennett, assistant superintendent of motive power, having resigned to accept service elsewhere, that office is abolished.

Incident to the new operating organization of the Minneapolis & St. Louis and the Iowa Central (see item under Operating Officers), R. G. Kenly has been appointed engineer maintenance of way and structures, with jurisdiction over both roads. John Hill, master mechanic and master car builder of the Minneapolis & St. Louis at Minneapolis, Minn., has been appointed master mechanic of both the Eastern and Western divisions, with office at Minneapolis. John B. Kelly, general roadmaster at Minneapolis, has been appointed roadmaster of the Eastern division. J. H. Reinholdt, assistant to the chief engineer at Minneapolis, has been appointed roadmaster of the Western division. E. Gagnon, supervisor of bridges and buildings at Minneapolis, has been appointed supervisor of bridges and buildings of the Eastern division only, and J. P. Hixson has been appointed to a similar position on the Western division. C. E. Gossett, master mechanic, and S. J. Johnson, supervisor of bridges and buildings of the Iowa Central, both at Marshalltown, Iowa, retain their present titles, and M. H. Sheeley, general roadmaster at Marshalltown, has been appointed roadmaster.

Purchasing Officers.

H. C. Stevens, assistant to general storekeeper of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed supervisor of stores of the National Railways of Mexico.

Eugene McAuliffe, general fuel agent of the Rock Island-Frisco lines at Chicago, has resigned from the Rock Island and has been appointed general fuel agent of the St. Louis & San Francisco, the Chicago & Eastern Illinois and the Evansville & Terre Haute, with office at Chicago.

OBITUARY.

William A. Gorman, general freight and passenger agent of the St. Louis, Rocky Mountain & Pacific, with office at Raton, N. Mex., died at Raton on January 5.

Hamilton McK. Twombly died at his home near Morristown, N. J., December 11, after an illness of more than a month. He was born in Boston in 1849 and graduated from Harvard University in the class of 1871. A few years later he entered the office of the late William H. Vanderbilt, then president of the New York Central & Hudson River. In 1877 he married Florence Vanderbilt, William H. Vanderbilt's daughter. He was made a director of various New York Central Lines, and on the death of William H. and the succession of William K. Vanderbilt as the head of the Vanderbilt interests, Mr. Twombly became more and more the personal representative of William K. Vanderbilt on the various boards of directors of the New York Central Lines. During Mr. Vanderbilt's frequent absences in Europe Mr. Twombly was considered as expressing authoritatively the Vanderbilt wishes on disputed questions, so that although Mr. Twombly was not an officer of the New York Central Lines, he was nevertheless influential in their management. He was a director of about 60 companies, most of which were railway companies. Among the more important beside the New York Central Lines were the Chicago & North Western, the Chicago, St. Paul, Minneapolis & Omaha, the Delaware, Lackawanna & Western, the Erie and the Philadelphia & Reading.

According to a report from Consul General Bartleman, at Buenos Ayres, Argentina, the Andine Railway has been sold by the Argentine government. The purchasers are the Pacific Railway, the Argentine Great Western Railway and the Central Argentine Railway. The purchase price was $11,602,859 United States currency. The line will be divided as follows: The Central Argentine Railway will have the section from Villa Maria to Rio Cuarto, including freight station; the Pacific will have the section from Rio Cuarto to Villa Mercedes to the junction with the Pacific main line; the Great Western, whose lines are being operated by the Pacific company, will get the section from the junction with the Pacific to Dolores. It is expected that the new owners of this railway will spend large sums of money in the near future on extensions and improvements, as this section of the country is rapidly developing.

Railway Construction.

New Incorporations, Surveys, Etc.

ABERDEEN & ROCKFISH.—A new branch, called the Wagram branch, has been opened from Raeford, N. C., north to Wagram, 12 miles.

ALBERTA & GREAT WATERWAYS.—An officer is quoted as saying that it is expected to begin work this spring. Surveys are now being made and about 200 miles of grading are expected to be finished this year. Contracts said to be let to the McInnis Lumber Co., Edmonton, Alb., for 340,000 ties, 500,000 ft. bridge timber, 150,000 ft. culvert timber and 140,000 fence posts for the first hundred miles, and for similar work on 50 miles to James Walker, Fort Saskatchewan. This will carry the line north to Lac La Biche. Work was started in December at a point 35 miles north of Edmonton. The company was organized last year with a capital of $7,000,000 and office at Edmonton, to build from Edmonton northeasterly to a point near the west end of Lac La Biche, thence north to a point near Fort MacMurray, on the Athabaska river, with a branch from this line near the west end of Lac La Biche to the east end of the lake, and a number of other branches, in all about 350 miles. The incorporators include: W. R. Clarke and B. R. Clarke, Kansas City, Mo.; William Bain, Winnipeg, Man. (Nov. 26, p. 1036.)

ALBERTA CENTRAL.—Organization of this company is said to have been completed and surveys made for the first 75 miles. The plans call for a line from Red Deer, Alb., westerly to a junction with the Grand Trunk Pacific in the Yellow Head Pass country. An extension is to be built from Red Deer easterly to Moose Jaw, Sask., with a branch from this line near the Battle river to Saskatoon or Warman. J. T. Moore, president; J. G. MacGregor, chief engineer, Red Deer. (Dec. 10, p. 1166.)

AMERICAN CENTRAL.—An officer writes that this company proposes to build a line from Winnipeg, Man., to the Gulf of Mexico. The first work to be carried out will be from Miami, Tex., southeast via Mobeetie and Wheeler to Texola, Okla., and through Mangam and Olustee to Vernon, Tex., 160 miles. It is expected to begin work early this coming spring. The route is through a prairie section, mostly level, and the grading work will be easy. The Central Construction Co., with office at Mobeetie, has been organized with $50,000 capital to make the surveys, locate the line and to organize and charter the company. Surveys will be started this month by J. B. Taylor & Co., New York. They will also build and equip the line. W. E. McClintock, chief engineer; M. F. Johnson, secretary of the Central Construction Co., Mobeetie. (Dec. 10, p. 1166.)

ATCHISON, TOPEKA & SANTA FE.—On the Arkansas River division a new line has been opened for business from Lamar, Colo., to Kornman junction, five miles.

ATLANTIC COAST LINE.—According to press reports plans are being made to build an extension from the proposed southern terminus of the Winston-Salem Southbound at Wadesboro, N. C., west to Charlotte. The W.-S. S. is being built by the Atlantic Coast Line and the Norfolk & Western jointly, from Winston-Salem, N. C., south to Wadesboro, 88 miles. O. H. P. Cornell, chief engineer of W.-S. S., Winston-Salem.

BOSTON & MAINE.—According to press reports this company is planning improvements to include a tunnel under Washington street in Salem, Mass. A new station south of the present station may be built at Salem. The old tunnel is to be enlarged and modern appliance for ventilation installed. The cost of these improvements is estimated at $2,000,000. Six miles of track on the Western division will be abandoned between New Market, N. H., and Madbury, and a new line with double-track will be laid, abolishing the large curve on the existing line. In rebuilding the section of the Gloucester branch between Squam river, Mass., and Gloucester station a new bridge will be put up over the stream. A new station is to be put up at Keene, N. H., to cost $50,000, as well as one at Charlemont, Mass., and another at Shelburne Falls, to cost $15,000 each. (Oct. 1, p. 612.)

BROWNWOOD NORTH & SOUTH.—An incorporator writes that a charter will be asked for and work will be started soon on a 30-mile line to connect May, Tex., with Rising Star. J. A. Walker, Brownwood, is interested.

CANADIAN PACIFIC.—Plans are said to be made for building a 50-mile extension in British Columbia. Bids are to be asked for early in February and work started the following month from a point on the Crow's Nest Pass line near Wardner station.

CHICAGO, ROCK ISLAND & PACIFIC.—According to press reports a large amount of money is to be spent for betterment work on the St. Louis-Kansas City line.

DENVER, NORTHWESTERN & PACIFIC.—This company is considering the building of a tunnel under the continental divide on its line now under construction. A subsidiary company has been organized to do the work, but plans have not been definitely decided on. Three general plans are under consideration: A 6.04 mile tunnel at elevation 9,100, a 4.70 mile tunnel at elevation 9,470, and a 2.70 mile tunnel at elevation 9,930.

DETROIT & MACKINAC.—The Hillman division has been opened for business from Alpina, Mich., westward to Hillman, 25 miles.

GARY, HOBART & VALPARAISO (ELECTRIC).—Most of the right-of-way is said to have been secured for a line from Gary, Ind., southeast via Hobart to Valparaiso, 20½ miles. Some of the grading has been finished. The line is eventually to be extended northwest about 25 miles additional to Laporte. A. Keator, Chicago, and B. A. Mapledoran, Laporte, may be addressed.

GILA VALLEY, GLOBE & NORTHERN.—See Southern Pacific.

GREAT NORTHERN.—On the Mesabi division, the Bovey line has been extended from Nashawauk, Minn., westward to Gunn, 22 miles.

The line from Keremos, B. C., to Princeton, 42 miles, is said to be open for freight traffic.

GREENVILLE, SPARTANBURG & ANDERSON (ELECTRIC).—Incorporated in South Carolina, with $300,000 capital and office at Greenville, S. C., to operate an electric line from Anderson, S. C., northeast to Spartanburg, about 65 miles. The tracks of the Anderson Traction Co. will form part of the line. The route from Anderson is to be north via Belton, Williamston, Pelzer and Piedmont to Greenville, thence east via Taylors, Chick Springs, Greer, Duncan, Wellford and Fairforest to Spartanburg.

KANKAKEE & URBANA TRACTION.—Financial arrangements are said to be partly made, and surveys finished, for a line from Kankakee, Ill., south via Urbana to Charleston, 125 miles. Contracts for this work may be let this spring. Plans made for a branch from Chebanse southwest to Piper City, 30 miles. W. J. Brock, president, and W. D. Moore, Jr., chief engineer, Kankakee. (Sept. 10, p. 478.)

KANSAS CITY, MEXICO & ORIENT.—Residents of Del Rio, Tex., have agreed to subscribe for $200,000 in bonds of the K. C., M. & O., in consideration of which the railway company is to finish the line from San Angelo south to Del Rio, about 140 miles, before January, 1913.

LOUISIANA & ARKANSAS.—The Shreveport district has been opened for business from Minden, La., west to Shreveport, 30 miles.

MEXICO NORTH WESTERN.—Work is said to be under way from Temosachic, Mex., north to Madera, 32 miles, replacing the 45-lb. rails with heavier sections.

MINNEAPOLIS & RAINY RIVER.—Passenger service has been extended from Bass lake, Minn., to Stanley, two miles.

MOUNTAIN VALLEY & PLAINS.—According to press reports work is to be started in March on this line. The projected route is from Guthrie, Okla., west to Cimarron, N. Mex., about 450 miles. J. H. Conlan, chief engineer, Dalhart, Tex. (Nov. 26, p. 1137.)

NEVADA-CALIFORNIA-OREGON.—Contract is said to have been given to Nugent & Richardson for grading an extension from

Alturas, Cal., north to Lake View, Ore., 50 miles. (Dec. 3, p. 1108.)

New Mexico Central.—This company, formerly the Santa Fe Central, is said to have given a contract to Charles J. Lantry for extending the line to coal mines in Hagen, N. Mex., 40 miles east of Albuquerque; also to extend the line into Albuquerque. Most of the grading has been finished. (Oct. 29, p. 828.)

Nez Perce & Idaho.—This company is said to be arranging a sale of bonds to secure funds to complete the line from Nez Perce, Idaho, to Vollmer. The company was organized in September, 1908, with $500,000 capital and has grading and bridge work finished on one mile. It is expected to have the line in operation by March, 1910. Z. A. Johnson, president and general manager, Nez Perce.

Omaha, Western & Lincoln.—Incorporated in South Dakota, with $3,000,000 capital and office at Lincoln, Neb., to build from Omaha southwest to Hastings, 200 miles, with a branch south to Lincoln. The incorporators include: F. L. Schaaf and C. Lee, Lincoln; A. P. Tilley, Osceola; C. Butler, Kenesaw, Neb., and E. J. Quirk, Highmore, S. Dak.

Oregon Railroad & Navigation Co.—According to press reports the authorized work to be caried out by this company includes a new line between Yoakum, Ore., and Pendleton, 12½ miles. The plans call for a tunnel about 1,100 ft. long. There will be two crossings over the Umatilla river, which will necessitate putting up permanent steel structures, each having two spans of about 150 ft.

Pittsburgh & Shawmut.—See Pittsburgh, Shawmut & Northern.

Pittsburgh, Shawmut & Northern.—Work is said to be under way by the J. H. Corbett Construction Co., Moncton, N. B., and Kittanning, Pa., on the north end of the Mauk tunnel, which is to be 1,930 ft. long, on the extension of the Pittsburgh & Shawmut. It is said that it will take about two years to complete this work. The line is being extended from Knoxdale, Pa., south along Mahoning creek to Mahoning, thence over the Allegheny river, where a large bridge will be built, and along the west bank of that river to Freeport. W. W. Henshey, chief engineer, Kittanning. (Sept. 24, p. 562.)

Richmond & Chesapeake Bay (Electric).—According to press reports surveys are now under way from Ashland, Va., north to Fredericksburg, and will be continued to Washington, D. C. (Dec. 24, p. 1261.)

Rockingham Railway.—An officer writes that this company was organized to build a line to connect Rockingham, N. C., with the Atlantic Coast Line at Gibson City or some other point, between 20 and 25 miles long. Engineers are now at work and it is expected to begin construction during March. J. P. Leak, president, Rockingham.

Roswell Northern & Gulf.—Incorporated in New Mexico, with $150,000 capital, to build from Tucumcari, N. Mex., north about 100 miles. The incorporators include: C. C. Tannehill, Alvin, Tex.; R. Morrison, Philadelphia; J. F. Hinkle, E. L. Bedell and J. Smith.

Southern Pacific.—A contract is said to have been given to Grant Brothers for heavy tunnel work on an extension of the Phoenix & Eastern northeast to San Carlos, Ariz.

The Gila Valley, Globe & Northern has opened a branch from Globe, Ariz., southward to Miami, 10 miles.

Southern Pacific of Mexico.—The line from Corral, Mex., north to Tufanito, has been extended north to La Dura, 19 miles.

Suwannee River & White Springs.—An officer writes that this company has finished work from Live Oak, Fla., east to Pine Grove, nine miles, and is carrying out work with its own forces on an additional nine miles from Pine Grove to White Springs. W. L. Tedder, president and general manager, Live Oak.

Tehuantepec National.—According to a press despatch from the city of Mexico this company has such a heavy through freight traffic between its Atlantic and Pacific termini that plans for the double-tracking of the line have been made and submitted to the Mexican government for approval. The line is 193 miles long and traverses a comparatively level country. It is operated under lease by S. Pearson & Son, Ltd., of London, England. In rebuilding the line a few years ago the cost was shared equally by the government and by S. Pearson & Son, Ltd.

Texas Roads (Electric).—According to press reports from Galveston, Tex., C. L. Hodges, Chicago, and L. L. McSweeney, New York, represent a syndicate with $26,000,000 capital, organized to build electric lines in Texas. Work is to be started within 90 days.

Tuscarora Railroad.—See Tuscarora Valley.

Tuscarora Valley.—This company, now operating a line from Port Royal, Pa., southwest through Tuscarora valley to Blairs mills, in Huntingdon county, is planning to build an extension under the name of the Tuscarora Railroad, from Blairs Mills to a point in the southern part of Fulton county, near Licking creek, about 45 miles.

Virginian.—Train service on the Winding Gulf branch has been extended from Patterson, W. Va., to Winding Gulf, three miles.

Wautauga Railroad.—According to press reports from Charlotte, N. C., about $200,000 has been spent securing right-of-way for a line from Northwilkesboro, N. C., west to Butler, Tenn., 50 miles. F. R. Linney, E. Coffey and other capitalists of western North Carolina are back of the project.

Winston-Salem Southbound.—See Atlantic Coast Line.

Wisconsin & Northern.—This company is said to have rejected all bids for the construction of the proposed extension from Shawano, Wis., south to Appleton and Neenah. It is understood that the work is indefinitely postponed.

Wyoming Railway.—Incorporated in Wyoming, to build from Clearmont, Wyo., on the Chicago, Burlington & Quincy, southwest to Buffalo, 32 miles. Plans are said to be made to build the line at a cost of about $1,000,000. It is the intention of the company to ultimately extend the line south to a point near Casper, on the Chicago & North Western. Fred Hess, Buffalo, Wyo., is now in Denver, Colo., completing financial arrangements. (See Wyoming Roads, Sept. 3, p. 427.)

FOREIGN RAILWAY NOTES.

It is proposed to build a railway from Lgow, Russia, in the government of Kursh, to Riga, about 500 miles. The object of this line is to open the territory between the two parallel lines, Riga-Orel and Libau-Romny. Surveying will begin at an early date.

The railway department of the Argentine government has been authorized to build a line between Diamante and Crespo. Surveys are also being made for the line from Curuzú Cuatiá to connect with the line from Monte Caseros to Posadas, and for a line from the port of Paraná to Maria Grande. It is said that $289,500 United States currency has been given to this department for this work.

Minister W. F. Sands, at Guatemala City, Guatemala, has been making investigations concerning the proposed connection between the Guatemala Railway and the Pan-American branch of the railways of Mexico. The following statement has been issued by D. B. Hodgsdon, general manager of the Guatemala Central, in this connection: "Concerning the extension of our line towards the frontier of Mexico, we have a surveying party in the field, and it will probably require two or three months to finish the running of the preliminary line incidental to making the final location for the road. As regards supplying materials, our purchasing department in the United States will have exclusive charge of the purchasing of everything that will be required for said line, and all inquiries should be directed to that office. As to construction work, we hope to get organized and under good headway during the dry season now opening up.

Railway Financial News.

BALTIMORE & OHIO CHICAGO TERMINAL.—This is the name of a company chartered in Illinois to take over the property of the Chicago Terminal Transfer. (See Chicago Terminal Transfer.)

BOSTON & MAINE.—The Massachusetts Railroad Commission has given the company permission to sell at auction $569,900 common stock unsubscribed for.

See also New York, New Haven & Hartford.

BOSTON RAILROAD HOLDING CO.—See New York, New Haven & Hartford.

CHICAGO, MILWAUKEE & PUGET SOUND.—The *Wall Street Journal* says that within a short time the C., M. & P. S. is to take over and operate as part of its own line the Montana Railroad, the $3,500,000 stock and $2,000,000 first mortgage bonds of which are owned by the C., M. & P. S. The road runs from Lombard, Mont., to Lewistown, 157 miles.

CHICAGO, MILWAUKEE & ST. PAUL.—See an item in regard to this company in General News.

CHICAGO, ROCK ISLAND & PACIFIC.—Speyer & Co., New York, have bought $3,500,000 first and refunding mortgage 4 per cent. bonds of 1904-1934. These bonds will be offered for public subscription in London, England, by Speyer Brothers.

The Rock Island Company has applied to the New York Stock Exchange for permission to renew its offer of an exchange of its own stock for that of the Chicago, Rock Island & Pacific Railway. The old offer, dated July, 1902, was to exchange for each $100 share of the C., R. I & P. railway stock; $100 4 per cent. bonds of the C., R. I. & P. Railroad Company of Iowa, and $70 in preferred stock of the Rock Island Company and $100 in the Rock Island Company common stock. There was exchanged $70,199,000 out of a total outstanding of $74,850,000, and transfers made in the last few years have reduced the old Railway stock outstanding to about $4,000,000.

CHICAGO TERMINAL TRANSFER.—The property was sold on January 6 under foreclosure for $16,000,000 to H. R. Preston, general solicitor of the Baltimore & Ohio. The sum bid was $860,000 more than the upset price. The B. & O. bought the property subject to two mortgages aggregating $1,044,000.

The United States circuit court on the day before the sale denied the application of the minority common stockholders to intervene.

See Baltimore & Ohio Chicago Terminal.

DELAWARE RAILROAD.—The board of directors have approved the report of the special committee ordering a meeting of stockholders to pass on the question of leasing the property to the Philadelphia, Baltimore & Washington, and on the question of declaring a 70 per cent. stock dividend and an extra cash dividend of 20 per cent.

GULF, TEXAS & WESTERN.—The Texas Railroad Commission has authorized the issue of $1,157,000 mortgage 5 per cent. bonds of 1909-1939, secured by a mortgage on 50 miles of road now in operation from Jacksboro, Tex., to Megarel.

KANSAS CITY, MEXICO & ORIENT.—See item in regard to this company under Railway Construction.

LAKE SHORE & MICHIGAN SOUTHERN.—The company has asked the New York Public Service Commission for authority to issue an additional $15,000,000 4 per cent. debenture bonds of 1906-1931. Of the total authorized issue of $50,000,000 of these bonds there are now outstanding $35,000,000. The Lake Shore also asks permission to guarantee principal and interest on $11,000,000 Jamestown, Franklin & Clearfield bonds.

MCKEESPORT CONNECTING.—This company has increased its capital stock from $40,000 to $1,000,000. The company operates about 16 miles of track in McKeesport, Pa., and does switching service for the various railways entering McKeesport. It is controlled by subsidiaries of the United States Steel Corporation.

MONTANA RAILROAD.—See Chicago, Milwaukee & Puget Sound.

MT. AIRY & EASTERN.—The property of this company is to be sold at auction on January 15. The road runs from Mt. Airy, N. C., to Kibler, Va., 19 miles.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—The directors have declared a semi-annual dividend of 3 per cent., payable February 1. This places the stock on a 6 per cent. annual basis, comparing with 5 per cent. paid in 1909.

NEW YORK, NEW HAVEN & HARTFORD.—Governor Draper, of Massachusetts, in his inaugural address, recommends that bonds guaranteed by the New York, New Haven & Hartford [meaning, apparently, the bonds of the Boston Railroad Holding Co.] shall be made legal investments for savings banks in Massachusetts. The Boston Railroad Holding Co., controlled by the New Haven, owns a controlling interest in the stock of the Boston & Maine.

QUEBEC & LAKE ST. JOHN.—The plan of reorganization following the inability of the company to pay the coupons due January 1, 1910, on the first mortgage bonds is substantially as follows:

New 4 per cent. consolidated perpetual debenture stock, guaranteed, principal and interest by the Canadian Northern, to be created sufficient in amount: (*a*) To exchange the outstanding prior lien bonds (£500,000) at the rate of £100 new stock for every £100 prior lien bonds; (*b*) to exchange the first mortgage bonds (£442,400) at the rate of £60 new stock for every £100 first mortgage bonds; (*c*) to exchange the income bonds (£640,400) at the rate of £10 new stock for every £100 income bonds; (*d*) to exchange the bonds (£10,000) issued by the Lake St. Joseph Hotel Co. and guaranteed by the Quebec & Lake St. John, at the rate of £100 new stock for every £100 hotel bonds; (*e*) to provide for the present floating debt of the company, and (*f*) to provide for additional rolling stock and equipment now required. Interest on the new stock will be payable Feb. 1 and Aug. 1, the first payment for the period from Feb. 1, 1910, to Aug. 1, 1910, to be made on the latter date.

In addition to the guaranty of the Canadian Northern the new stock will be secured by a trust deed constituting the stock a first mortgage on the whole of the property and undertaking of the Quebec & Lake St. John Co., including the Lake St. Joseph Hotel property.

Power to be reserved to the company, subject to certain qualifications, (*a*) to create charges on any new line of railway hereafter constructed ranking in front of the new stock, provided such charges are guaranteed by the government of the Dominion or by one of the provinces of Canada; (*b*) to create additional new stock (ranking *pari passu* with the new stock to be issued as mentioned above) for certain specified purposes.

This plan will be submitted to holders of the prior lien first mortgage and income bonds in London on January 14.

SEABOARD AIR LINE.—The Georgia Railroad Commission has authorized the company to issue $1,380,000 equipment trust notes to pay for additional rolling stock.

WABASH-PITTSBURGH TERMINAL.—The *Wall Street Journal* says that while no action has been taken by any of the committees on the adoption of a plan of reorganization, the general outlines of a plan are being gradually formed, and it is practically agreed that the existing first and second mortgage bonds will have to be replaced with stock; that a new mortgage, under which bonds may be sold for cash, must be placed next the property, and that the securities after the first mortgage bonds will have to be assessed.

"It has been proposed that the first mortgage bondholders be asked to accept 70 per cent. in preferred and 30 per cent. in common stock of the reorganized company, but an alternative plan involving a small cash payment and correspondingly better participation in the new securities is also receiving some consideration. The new bond issue may consist of $15,000,000 5s, and it is expected that a banking syndicate would underwrite this issue at about 80.

"These terms are entirely tentative in this form and may be materially altered before they are presented to the security holders.

Supply Trade Section.

C. Drucklieb, New York, manufacturer of the injector sand blast device, has moved his office from 132 Reade street to 178 Washington street.

John D. Conway, secretary of the Railway Supply Manufacturers' Association, has changed his address to 313 Sixth avenue, Pittsburgh, Pa.

The World Signal Co. has opened an office at 170 Broadway, New York. This will be the main office of the company, with J. H. Wisner in charge.

The Milwaukee plant of the American Bridge Co., New York, was partially destroyed by fire on January 3. The loss is estimated at $200,000.

Frank P. Smith, for 14 years with Manning, Maxwell & Moore, has resigned to accept a position with the Hobart-Allfree Company, Chicago.

The Northern Engineering Works, Detroit, Mich., has bought additional land adjoining the present site on which it is planned to build extensions to the plant.

The Beach Manufacturing Co., Grand Forks, N. Dak., has been incorporated with a capital of $50,000 to make steel culverts, bridges and road-working machinery.

O. C. Gayley has been elected vice-president of the Pressed Steel Car Co., Pittsburgh, Pa., vice J. W. Friend, deceased. Mr. Gayley will be in charge of the sales department.

Edwin Richardson, superintendent of the malleable department of the Crane Co., Chicago, died January 4. He was 57 years old and had been with the Crane Co. for 39 years.

The Roberts & Abbott Co., Inc., Cleveland, Ohio, consulting, supervising and operating engineers, announces that Walter Loring Webb., C. E., has entered the service of the company and will represent it in Philadelphia and vicinity, with office in the Real Estate Trust building.

J. D. Cox was recently elected president of the Cleveland Twist Drill Co., Cleveland, Ohio, to fill the vacancy made by the resignation of F. F. Prentiss, on account of ill health. Mr. Cox was the founder of this company and has always been the practical man in the business.

The National Lumber & Creosoting Co., Texarkana, Ark., reports that its creosoting plant, which was destroyed by fire on September 19, is now in the process of being rebuilt of fireproof construction, with about 50 per cent. greater capacity than that of the old plant, which will be about 2,000,000 ties per year.

The Pilliod Company, Swanton, Ohio, maker of the Baker-Pilliod valve gear, has closed its Chicago office and will open one in New York about February 1. Meantime, all correspondence should be addressed to Swanton. The company reports a growing business, sales for the last few days having amounted to over 200.

H. H. Waldron, of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., who formerly had his headquarters in Chicago, has been transferred to the New York office, located at 1 Wall street, and in charge of F. L. Norton. T. W. Aishton succeeds Mr. Waldron in the Chicago office, which is located at 1714 Fisher building, and is in charge of F. W. Graves.

The Ernst Wiener Co., New York, reports that it has opened the following new offices: Petersburg, Va., 38 Sycamore street; Ocalo, Toronto, Ont., Can.; and Mexico City, Mex. The following are the new addresses of old offices: Los Angeles, Cal., 223 W. H. Hellman building; Philadelphia, Pa., 1103 Land Title building; San Francisco, Cal., 112 Market street.

George F. Brown, who retired from the office of treasurer of the Pullman Company in 1907, died at the Calumet Club, Chicago, January 9, aged 66 years. He served in the quartermaster's department of the Union army during the Civil War, held various railway positions, and entered the service of the Pullman Company in 1871, remaining with it in various capacities until his retirement in 1907.

The Adreon Manufacturing Co., St. Louis, Mo., advises that it has sold about 10,000 of its security rail braces and tie plates, the principal sales being to the Terminal Railroad Association of St. Louis; St. Louis Southwestern; Wabash; Hot Springs Street Railway; Detroit, Toledo & Ironton, and White Pass and Yukon. These rail braces and tie plates are used chiefly on curves and at guard rail and switch points.

J. W. Coyle, recently of the Best American Calorific Company, New York, has entered the service of the Rockwell Furnace Company, New York, as a specialist of oil and gas furnaces for railway work. Mr. Coyle is an experienced railway man, having formerly been master blacksmith on the Lehigh Valley at Wilkesbarre, Pa., and later in charge of the drop hammer and machine department on the Philadelphia & Reading at Reading, Pa.

The Bucyrus Co., South Milwaukee, Wis., reports the following recent sales: Two locomotive pile drivers to the C. & N. W., one 100-ton wrecking crane to the C., M. & St. P., and one rotary snow plow to the Grand Trunk Pacific. The company's shops are at present being worked up to their full capacity, particularly on large steam shovel and dredge orders, for which reason extensive additions to the machine shop have been made.

Rhodes, Curry & Co., Amherst, N. S.; the Dominion Car & Foundry Co., Ltd., Montreal, Que., and the Canada Car Co., Ltd., Montreal, have been sold to a syndicate known as the Canadian Car & Foundry Co. Ltd., with offices in the Eastern Township's Bank Building, Montreal. Officers of the new company are N. Curry, president; W. W. Butler, vice-president; N. S. Reeder, second vice-president; F. S. Skelton, secretary and treasurer, and A. H. Chave, general purchasing agent.

The Watson-Stillman Co., New York, has made several additions to its sales department to meet the increasing business in hydraulic tools and turbine pumps. Edwin Stillman has entered the sales department in connection with the New York State business, while the railway business in the southern states is now in charge of Frank C. Clark. More direct representation has become necessary in the Orient, and F. W. Horn, machinery importer of Yokohama, Japan, will represent the company.

The Commonwealth Trust Co., Pittsburgh, Pa., announces that the manufacturing plant of the General Castings Co. will be offered at receiver's sale on February 2 in the rotunda of the Pittsburgh court house. This property includes 9,435 acres of ground and the buildings include a large steel frame slate roof building, a pattern house, a power house, a tenement house of ten apartments, brick office buildings, etc.; also all the necessary equipment, machinery, furnaces, cranes, etc., used in a plant of this kind.

The board of directors of the Strouse Automatic Stoker Co., Chicago, held its annual meeting at the Palmer House, Chicago, January 4, 1910. This company holds the patents on the automatic stoker invented by W. H. Strouse, Oscalusa, Ia., which was fully described in the *Railway Age Gazette* of February 5, 1909, page 255. The American Automatic Stoker Co., with offices in the Railway Exchange Building, Chicago, and factory at Milwaukee, Wis., is now putting the stoker on the market. Fourteen roads have it in use, the following being included in that number: Chicago & Alton, New York Central lines, Chicago, Milwaukee & St. Paul, Northern Pacific, Great Northern, and Detroit, Toledo & Ironton.

The Crocker-Wheeler Co., Ampere, N. J., advises that recent sales aggregate more than 5,000 h.p. in d.c. motors, and approximately 2,000 k.w. in d.c. generators and 2,000 k.v.a. in a.c. generators. Prominent among these sales is one to the Bethlehem Steel Co., South Bethlehem, Pa., calling for five compound-wound interpole motors, with a total output

of 3,600 h.p. This company has also ordered 19 C W mill motors, with a combined capacity of nearly 800 h.p. Among the orders for a.c. apparatus is one for the plant of the Virginia Bridge & Iron Co. calling for two 200-k.v.a., 200-r.p.m., 60-cycle, three-phase, 2,300-volt synchronous motors. This company has also ordered one 50-h.p. compound wound 230-volt d.c. motor.

William C. Post, vice-president and treasurer of the structural iron firm of Post & McCord, Inc., New York, died on January 5 at Atlantic City, N. J., at the age of 43. Mr. Post was graduated from Stevens' Institute of Technology, class of '86. After graduation he entered the employ of Post & McCord as a draftsman, later becoming chief draftsman, which position he held until the firm was merged with the American Bridge Co., New York, in 1900, when he was appointed contracting manager, having entire charge of the company's business in the vicinity of New York. The present drafting room and shop bill systems used by the American Bridge Company were originated by Mr. Post when in the employ of Post & McCord. In 1904 he resigned from the American Bridge Company to become vice-president and treasurer of the newly organized Post & McCord, Inc., which position he held until the time of his death. Mr. Post was a prominent member of several organizations in the building trades interests, being at one time president of the Building Trades' Credit Association, and at the time of his death a member of the Board of Governors of the Building Trades Employers' Association. He also represented his company in the Iron League Erectors' Association of New York and the National Erectors' Association.

Prof. H. K. Barrows, M. Am. Soc. C. E., and Prof. C. B. Breed, Assoc. M. Am. Soc. C. E., of the Massachusetts Institute of Technology, have recently announced that they have entered the practice of consulting engineering under the firm name of Barrows & Breed, with offices at 6 Beacon street, Boston, Mass. Professor Barrows has been in consulting practice for the past three years, specializing along the lines of hydraulic and sanitary engineering. For several years he has been district engineer for the U. S. Geological Survey for New England and New York, which position he has recently resigned. A rearrangement of districts has been made by which C. C. Covert, Assoc. M. Am. Soc. C. E., will be in charge of the New York work, and Cyrus C. Babb, M. Am. Soc. C. E., will direct the hydrographic work in Maine, and T. W. Norcross, Assoc. M. Am. Soc. C. E., becomes district engineer of the remaining New England states. Prof. Breed's specialties are railway and municipal engineering. He has been connected with several of the large projects for the elimination of grade crossings in Massachusetts and with many cases of litigation involving railways. He is joint author of "The Principles and Practice of Surveying." The new firm will pay special attention to water power and supply, sanitary engineering and railway engineering.

Supplymen's Association at Atlantic City.

John D. Conway, secretary of the Railway Supply Manufacturers' Association, 313 Sixth avenue, Pittsburgh, Pa., has issued a circular announcing the principal features of the arrangements for the Master Car Builders' and Master Mechanics' conventions at Atlantic City, N. J., June 15-22 next. The exhibits and the offices of the association will be located on Young's Pier as before, with the exception of the track exhibits, which will be placed as they were in 1909, on the tracks of the Philadelphia & Reading Railway, about 200 yards from the convention pier. Contract has been let for the erection of exhibit structures. It provides for 69,000 sq. ft. of exhibit space, exclusive of aisles, and 40 cents per sq. ft. will cover the cost of erecting structures and providing the usual facilities. The color scheme will again be green and white. A telephone will be provided between every two exhibitors with free local service from Monday, June 13, to Thursday, June 23. Aquarium Court will have the column construction of previous years. The upper floor of Exhibition Hall will not be used, and the lower floor will have ceiling and walls calcimined white. Eight candle-power electric lamps will be placed 2 ft. apart along each of ten cornice lines and will be lighted throughout the day, so that each aisle will have two rows of these lights and each booth a row at the front and a row at the back. Annex court contains large spaces which may be built largely to suit occupants. The annex will have the column and panel construction substantially as in 1909, but very heavy exhibits cannot be placed on this end of the pier. Exhibits of medium heavy weight can be put in the addition to the hotel men's annex in the side spaces, as these are over concrete piles, but only light exhibits can go in the center spaces.

Power for operating exhibits will be furnished as heretofore. An additional boiler and a larger motor-driven compressor will be installed, and it is expected that with these additions all reasonable demands can be met.

Application for space should reach the secretary by January 31. On February 16, in Pittsburgh, space will be assigned to all exhibitors who have made application prior to that date, and the procedure will be substantially the same as in 1909. The exhibitors, if any, whose requirements, in the judgment of the exhibit committee, make it imperative that they be specially taken care of, will be assigned space first. Lots will then be drawn to determine the order in which exhibitors may choose space. If a representative of the exhibitor is present, he may choose in his turn; if there is no representative present, the application will be used as a guide in assigning the best space possible. The number of advance applications already received indicates a very great demand for space. Mr. Conway gives the prices at which Joseph L. Shoemaker & Co., 926 Arch street, Philadelphia, will rent furniture for the eight days of the conventions, also rates for rugs. A complete list of hotels will be given in a later circular.

Mr. Conway calls attention to the resolution of the executive committee, prohibiting the distribution of souvenirs at the conventions; and also to the rule prohibiting the distribution of advertising matter from booth to booth.

In connection with the conventions the *Railway Age Gazette* will this year print eight daily issues, instead of seven, as heretofore.

TRADE PUBLICATIONS.

Oil Fuel Burner.—The Hauck Manufacturing Co., New York, has just issued a catalogue, series 30, which illustrates and describes the Hauck oil burner for boiler, machine, coppersmith and forge shops and general structural work.

Mining Engineering.—The University of Illinois has issued a circular of information on the department of mining engineering recently established. The new department has the hearty support of the operators' and mine workers' associations.

Gold's Cyclone Ventilator.—The Gold Car Heating & Lighting Co., New York, has issued a leaflet containing a complete description of Gold's cyclone ventilator for passenger equipment cars, which same was fully illustrated and described in the *Railway Age Gazette* of December 10, 1909.

Bucyrus Calendar.—The 1910 calendar which has been distributed by the Bucyrus Co., South Milwaukee, Wis., bears a 16-in. x 20-in. photograph of 15 Bucyrus steam shovels working in the Rio Tinto Mines, Spain. The picture is mounted on a white mat, 24 in. x 36 in., having also a calendar pad.

Winter Resorts.—The Mobile & Ohio has issued a 32-page booklet on the winter resorts surrounding Mobile. The description of Citronelle is especially good, and analyses of the water and records of the weather conditions which are included prove the excellence of the natural conditions existing in the vicinity.

Arc Lamp Operation.—The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has just issued circular No. 1506, which contains a paper entitled "Recent Types of Arc Lamps and Their Operation," which was read by C. E. Stephens before the convention of the National Electric Light Association last June.

Railway and Engineering Association Meetings.—The Storrs Mica Co., Owego, N. Y., is distributing a calendar for January, February and March. Each month has a separate page

on which the dates of the various meetings of the railway and engineering association meetings are noted. Attached to the calendar also is a list of membership of the Railway Business Association.

Coal Screens—Mine Locomotives. The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued catalogue No. 698 fully illustrating and describing Jeffrey revolving coal, stone and gravel screens, tipple shaking screens, etc. Illustrations of a number of installations of this equipment are also given. Bulletin No. 17 contains a large number of illustrations of Jeffrey electric mine locomotives and installations at mines. The Jeffrey electric industrial locomotives for use in shop and lumber yards are also given.

RAILWAY STRUCTURES.

Anniston, Ala.—The Louisville & Nashville is to improve its passenger station at an estimated cost of $35,000.

Charlemont, Mass. See Boston & Maine under Railway Construction.

Chattanooga, Tenn.—The Central of Georgia is said to be at work on a new freight house to cost $50,000.

Cherryvale, Kan.—The Atchison, Topeka & Santa Fe has begun work preliminary to building a new roundhouse.

Crawfordsville, Ind.—The Cleveland, Cincinnati, Chicago & St. Louis is preparing plans for a passenger and freight station.

Ellsworth, Kan.—The St. Louis & San Francisco has authorized the building of a passenger station to replace the one destroyed by fire a short time ago. The roundhouse, which was also burned, will probably be replaced soon.

Fort Morgan, Colo.—The Union Pacific will build a station in Fort Morgan. The company has asked for the passage of an ordinance to close up certain streets and alleys.

Gloucester, Mass.—See Boston & Maine under Railway Construction.

Havre de Grace, Md.—In regard to the new double-track bridge of the Baltimore & Ohio over the Susquehanna river, see item under General News.

Heavener, Okla.—The Kansas City Southern is to build a ten-stall roundhouse and machine shops.

Keene, N. H.—See Boston & Maine under Railway Construction.

Outlook, Sask.—Bids are wanted until January 22 by J. E. Schwitzer, assistant chief engineer of the Canadian Pacific at Winnipeg, Man., for constructing the substructure of a bridge over the Saskatchewan river at Outlook.

Pendleton, Ore.—See Oregon Railroad & Navigation Co. under Railway Construction.

Proctor, Minn.—See Duluth, Missabe & Northern under Iron and Steel.

Salem, Mass.—See Boston & Maine under Railway Construction.

Shelburne Falls, Mass. See Boston & Maine under Railway Construction.

Somerset, Pa.—The Baltimore & Ohio is said to have plans made for putting up a new passenger station, also a new freight house, in Somerset, for which $75,000 has been appropriated.

Terre Haute, Ind.—The Terre Haute, Indianapolis & Eastern Traction Co. plans to build an interurban terminal station. The cost is estimated at $250,000.

Tomah, Wis.—The Chicago, Milwaukee & St. Paul is building a plant for the manufacture of railway bicycles and hand cars.

Watervliet, N. Y.—An officer of the Delaware & Hudson writes that the company has had the question of establishing a shop plant at Watervliet under consideration for some time, but as yet nothing definite has been decided.

Late News.

The items in this column were received after the classified departments were closed.

John McDowell has been elected first vice-president of the Bartlett & Florence Railway, with office at Bartlett, Tex.

A. C. Ridgway, formerly general manager of the Denver & Rio Grande at Denver, Colo., has been appointed assistant to the second vice-president of the Chicago, Rock Island & Pacific, with office at Chicago.

A contract is said to have been given by the Atchison, Topeka & Santa Fe for double-tracking the line between Ash Fork, Ariz., and Winslow, on 90 miles. Similar work is to be carried out later from Albuquerque, New Mex., west to Gallup on 150 miles.

L. S. Berg has been elected president of the New Orleans, Mobile & Chicago; W. F. Oren has been elected vice-president and general manager; G. W. Crary has been elected secretary and treasurer, and H. C. Snyder has been elected assistant secretary and assistant treasurer.

Ashley Pond, formerly for a number of years general counsel of the Michigan Central, died of pneumonia, January 12. Mr. Pond was born at Wilmington, N. Y., in 1827, and lived in Michigan. He was made a director of the Michigan Central in 1878, and the following year was appointed general counsel of the same road.

The Abilene Central has been incorporated in Texas, with $150,000 capital and office at Abilene. The company plans to build from Abilene southeast to Waco, 150 miles. The incorporators include Judge D. T. Romar, Fort Worth, Texas; J. Guitar, J. M. Rayford, M. Jones, H. O. Wooten, H. James and W. G. Swenon, of Abilene.

A court order has been issued authorizing the receiver of the Union Railway Co., New York, to make a contract with the New York Central for the construction of a bridge over the tracks of the New York & Putnam at West 130th street, New York. The receiver is also directed to lay double tracks on the bridge, to complete connections through 130th street, to connect with the existing lines of the Union Railway Co.

According to press reports the St. Louis, Brownsville & Mexico is planning extensions as follows from Brownsville, Tex., south to Tampico, Mexico, 300 miles: From Sam Fordyce, Tex., northwest through the valley of the Rio Grande to Laredo, 125 miles, and from Kingsville west to San Antonio, 160 miles. This is conditional upon the raising of money to carry out the work. It is said the improvements will cost about $25,000,000.

F. P. Abercrombie, superintendent of the New York division, of the Pennsylvania Railroad, C. T. Dabney, superintendent of the Central division, and W. N. Bannard, superintendent of the Maryland division, were delegated to the general manager's office at Philadelphia to assist in the exhaustive investigations being made in various transportation problems. These men, effective January 15, are to be known as special agents on the staff of the general manager. J. B. Fisher, superintendent of telegraph, succeeds Mr. Abercrombie and J. C. Johnson, chief clerk in the office of superintendent of telegraph, succeeds Mr. Fisher.

The tentative plan for the reorganization of the Wheeling & Lake Erie provides for a nominal capitalization of $130,000,000. This consists of $40,000,000 preferred stock, $50,000,000 common stock, $15,000,000 new 4 per cent. bonds and $25,579,500 old bonds and equipment notes of the Wheeling & Lake Erie. The plan calls for a cash assessment of 25 per cent. on the three classes of Wheeling & Lake Erie stock now outstanding and 25 per cent. assessment on the second mortgage bondholders. Of the $40,000,000 preferred stock, $4,779,716 will go to present holders of the Wheeling & Lake Erie's three classes of stock, irrespective of the Terminal company's holdings; $21,165,200 will go to Terminal company's first mortgage bondholders, who have the privilege of subscribing to an additional $4,827,760 at par; $5,000,000 will go to the Terminal company's second mortgage bondholders, and $1,500,000 will be taken for cash by the underwriting bankers.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Missouri Pacific is in the market for 60 locomotives.

The Georgia & Florida has ordered six 10-wheel locomotives from the Baldwin Locomotive Works.

The Missouri, Kansas & Texas is reported in the market for 91 locomotives. This item is not confirmed.

The Newburgh & South Shore has ordered two 0-6-0 switching locomotives from the Baldwin Locomotive Works.

The Rio Grande & Eagle Pass is reported to have ordered one consolidation locomotive from the Baldwin company, cylinders 20 in. by 26 in., weight 150,000 lbs. This item is not confirmed.

CAR BUILDING.

The Staten Island Rapid Transit has ordered 11 passenger cars from the Wason Mfg. Co.

The Harriman Lines are negotiating with the Pullman Co. for 2,000 refrigerator cars for the Pacific Fruit Express.

The Portland Railway, Light & Power Co., Portland, Ore., is in the market for 40 electric cars for August delivery.

The Missouri, Kansas & Texas is reported to be considering new freight and passenger equipment. This item is unconfirmed.

The New York, Chicago & St. Louis has ordered, it is said, ten passenger and five baggage cars. This item is unconfirmed.

The Isthmian Canal Commission will receive bids until January 25 for a number of metal 12-yd. dump cars. (Circular 553.)

The Wrightsville & Tennille, mentioned in the *Railway Age Gazette* of December 17 as expecting to buy one coach and one combination mail and baggage car, has ordered this equipment from the Barney & Smith Car Co.

The Swift Refrigerator Transportation Co., mentioned in the *Railway Age Gazette* of September 17 as expecting to build 200 refrigerator cars, has taken bids on this equipment and it has not yet been definitely decided whether the company will order these cars from a builder or whether it will build them in its own shops.

The Intercolonial, as reported in the *Railway Age Gazette* of December 17, has ordered six baggage cars from the Rhodes, Curry Co. These cars will have a capacity of 80,000 lbs. and will weigh 41,000 lbs. They will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 9⅝ in. long, 9 ft. 1⅝ in. wide and 13 ft. 5 in. high, over all. The bodies and underframes will be of wood. The special equipment includes:

Bolsters, body	Simplex, Barber rollers
Bolsters, truck	Simplex
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Steel back
Couplers	R. E. Janney
Door fastenings	National Safety
Draft gear	Miner tandem
Heating system	Safety Car Heating & Lighting Co.
Journal boxes	McCord
Paint	Pullman green
Roofs	Canvas
Side bearings	Susemihl
Wheels	Steel

The Delaware, Lackawanna & Western, as mentioned in the *Railway Age Gazette* of November 12, has ordered 500 forty-ton steel hopper coal cars and 500 thirty-ton steel underframe box cars from the American Car & Foundry Co. The coal cars will be 34 ft. ½ in. long, 10 ft. wide and 9 ft. 11 in. high, over all; 30 ft. ¼ in. long and 9 ft. 5⅝ in. wide, inside measurements. The box cars will be 40 ft. 1½ in. long, 9 ft. 7 in. wide and 12 ft. 5½ in. high, over all; 36 ft. long and 8 ft. 6 in. wide, inside measurements. The following special equipment applies to both types of cars:

Brakes	Westinghouse
Bolster	Cast steel with Barber roller bearings
Draft gear	Miner, on coal cars; Cardwell on box cars
Wheels	33-in. cast iron

The Delaware, Lackawanna & Western passenger equipment mentioned in the *Railway Age Gazette* of December 17 will have the following specifications and special equipment: The 10 broad vestibule coaches will be 59 ft. 11 in. long over end sills and 9 ft. 8 in. wide over side sills, and will have a seating capacity for 72 passengers. The underframes are to have cast steel double body bolsters, with end platforms cast solid. The center sills will be deep girders riveted to the body bolster, and the metal side sills will be supported from the center sills with cast steel needle beams and cross ties.

Brakes	Westinghouse high-speed
Couplers	Gould
Draft gear	Miner tandem
Heating system	Gold direct
Lighting system	Pintsch gas
Vestibules	Pullman, flush type
Wheels	36 in. Boies, with Midvale steel tires

The 15 suburban coaches will be 60 ft. 7½ in. long over end sills and 9 ft. 8 in. wide over side sills, with a seating capacity for 78 passengers. The special equipment for the suburban coaches is the same as that for the vestibule coaches, except that the lighting equipment will be that of the Commercial Acetylene Co. The 10 express cars will be 60 ft. 9 in. long over end sills, 9 ft. 8 in. wide over side sills, and the special equipment will be the same as for the vestibule coaches.

IRON AND STEEL.

The Atchison, Topeka & Santa Fe has ordered from the American Bridge Co. 346 tons of structural steel for plate girders.

The Duluth, Missabe & Northern has ordered 410 tons of structural steel from the American Bridge Co., for its new car shops at Proctor, Minn.

General Conditions in Steel.—It is understood that the United States Steel Corporation will report this month an unfilled tonnage as of December 31, 1909, of about 6,000,000 tons, the largest reported in several years. On December 31, 1907, the unfilled tonnage of the corporation was 4,642,000 tons, and on December 31, 1908, it was 3,603,000. The increase in tonnage and the gain in net earnings will be the favorable features of the quarterly statement, which it is understood will be issued about January 25.

Phosphate Rock Handling at Grassy Island, Fla.

The Seaboard Air Line recently installed, at Grassy Island, Fla., a plant for handling phosphate rock. This plant handles the rock from cars into storage bins, and thence into the holds of vessels.

The illustration, Fig. 1, shows the heavy grade trestle approach, over which the cars of phosphate rock are drawn to the storage bins by a Hunt double-drum, steam-operated car puller. The car, when brought in the storage bin, is discharged into a track hopper, which empties into a filler feeding a gravity bucket conveyor, by which the rock is conveyed to the top of the bin and discharged into it. The rock is drawn from the bin into the vessel hold by two Hunt swinging and telescopic chutes, as shown on the right-hand side of the illustration, Fig. 2.

Owing to the size and nature of the rock, the use of conveying machinery ordinarily employed for handling coal and other friable materials was not feasible and an especially designed equipment was made for this plant. The flow of rock from the track hopper to the conveyor filler is controlled by duplex cut-off valves and the rock is fed to the conveyor buckets by a special type of conveyor filler. The operating chain for the filler is driven by the conveyor chain, which insures accu-

rate and uniform filling of the buckets and also prevents any waste of material.

The conveyor consists of a double link chain carrying a series of pivoted buckets, so suspended that they maintain a vertical position, regardless of the direction in which the



Fig. 1—Grassy Island Phosphate Rock Handling Plant.

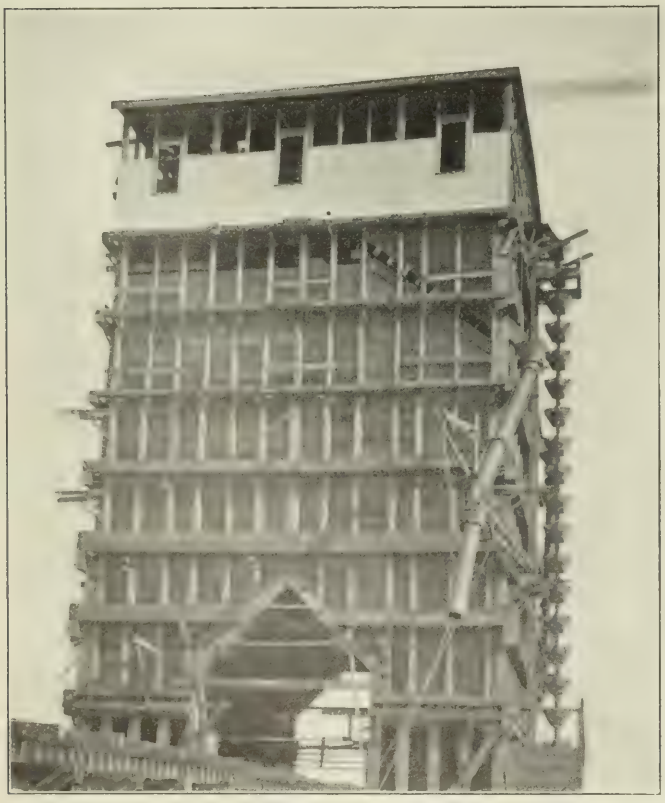


Fig. 2—Near View of Plant Showing Conveyor and Chutes.

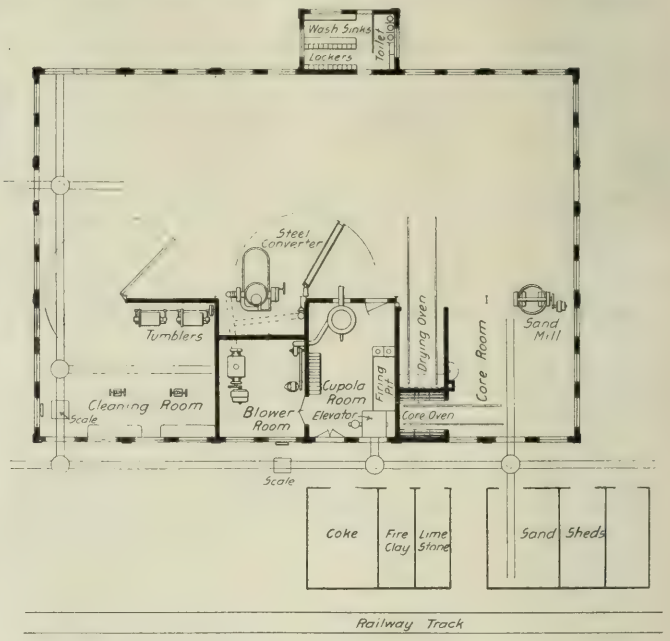
chain is moving. The chain is centrally supported by the driving wheels, which maintain a requisite distance between the links and prevent any alteration or distortion of the track gage. The track for the chain wheels is a standard section rail supported by stands. Changes of direction of the conveyor chain are accomplished by the large radius curves, thus reducing to a minimum the friction and wear at the point of greatest stress. The buckets are dumped automatically over the top of the storage bins. The buckets when emptied immediately right themselves for refilling.

The conveyor is operated by a two-cylinder engine. The driving gear is designed to move the chain by pawls, which successively engage with the studs of the chain, giving an easy and steady motion and reducing chain wear to a minimum. The mechanical equipment in this plant was designed and installed by the C. W. Hunt Co., West New Brighton, N. Y.

New Steel Foundry in Vancouver, B. C.

The demand for steel castings in the western part of Canada has increased rapidly. Machinery used in the lumber and mining industries must be made to withstand very heavy work. Steel castings, which enter largely into the manufacture of this class of machinery, for some time have been shipped from the eastern part of Canada, or imported from the United States, or England, and this has been expensive because of the great distance.

Realizing the growing need in that portion of the Dominion, early in 1909 the directors of the Vancouver Engineering Works, Ltd., Vancouver, B. C., decided to add a steel foundry to their plant. The side blown converter for making steel was adopted, after careful consideration of the most economi-



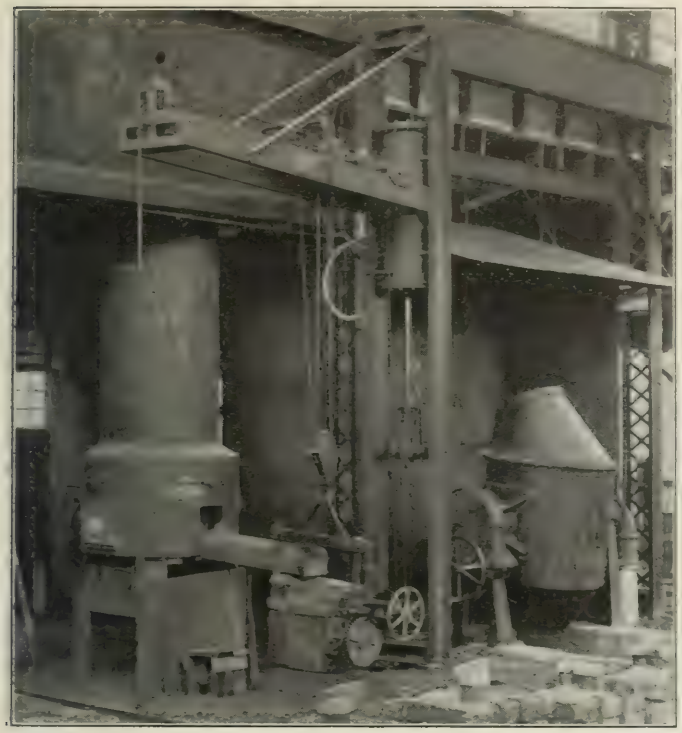
General Plan of Vancouver Foundry.

cal process for producing a light tonnage, and after personal inspection of various plants by F. L. Leighton, general manager of the company. In May, 1909, the Whiting Foundry Equipment Company, Harvey, Ill., was commissioned to design and equip the steel foundry according to the most up-to-date practice. The erection of the plant was begun in June, and the equipment was installed during the following September. The first blow of steel was successfully made October 12, under the supervision of the Whiting Foundry Equipment Company's steel foundry engineer.

The plan is interesting as showing how railways can be supplied with steel castings, by the addition of a small converter to the ordinary foundry outfit, in regions like the west coast, which are a long distance from the larger steel foundries. The plant has at present a capacity of 8 tons per day, and is so designed that extensions for handling double that capacity can be made as required, without interrupting the operation of the present foundry. It is of steel construction throughout, having a main bay 120 ft. long, and 50 ft. wide, with a side bay 120 ft. long and 30 ft. wide. The side bay is designed to provide the most compact grouping of the melting and converting department, the core room, sand

mill, and cleaning department, without interfering with the economical operation of each. In the design every effort was made to secure a continuous system, in order that the raw material might be converted into finished castings without any reverse movements. The steel foundry is so arranged in the plot of the general plant that the movement of all departments is in the direction of the castings store house.

The cupola is the standard Whiting No. 4, the height of which, from floor level to top of the stack, is 35 ft. In order properly to charge the converter, the melting capacity is about seven tons per hour. The cupola charging floor is 22



Cupola and Converter at Vancouver Foundry.

ft. long and 20 ft. wide, and is served by a 2-ton electric elevator, having a lift of 15 ft. An industrial track of 24-in. gage connects the elevator with the stock yard.

Iron is tapped from the cupola into a 6,000-lb. ladle, carried by a pneumatic jib crane of 4 tons capacity. Two taps are made to obtain a full charge for the converter. This is done to avoid holding the molten iron in the hearth of the cupola, where it is exposed to the incandescent coke, from which it will absorb sulphur, especially if the manganese content is low. After the ladle is filled, the jib crane hoists it to the pouring position, and the iron is transferred to the converter, to be blown into steel.

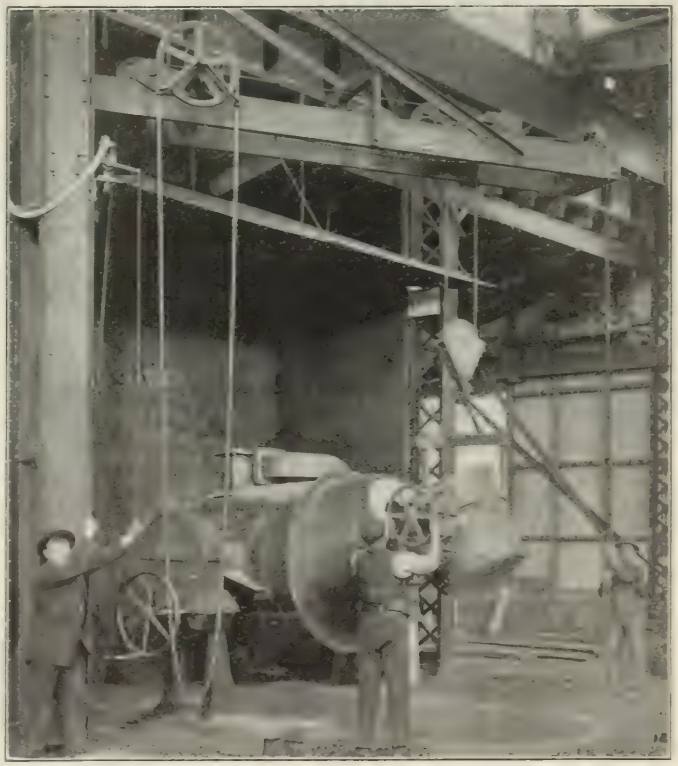
Since no phosphorus or sulphur can be removed, owing to the acid lining of the converter, it is necessary to melt an iron running low in these elements, the maximum limit being 0.04 per cent. each. The manganese content ranges from 0.60 per cent. to 1.50 per cent. The cupola charge is so proportioned as to give about 1 per cent. of manganese, this limit being set because it counteracts the affinity of the iron for the sulphur in the coke, and also minimizes the wear upon the converter lining. As the percentage of silicon in the cupola charge should be from 1.80 per cent. to 2 per cent., in the iron it ranges from 1.20 per cent. to 3.50 per cent. The extensive manufacture of boilers, tanks, etc., gives this company a heavy stock of punchings and clippings to draw upon for the cupola charge.

The 2-ton converter is of the standard Whiting type. It occupies a floor space 20 ft. x 12 ft., and is separated from the remainder of the side bay by a steel curtain wall. It is carried on cast steel trunnions, and spans a concrete pit into which the ladle is lowered to receive the finished steel. A large hood is suspended above the converter to carry the fumes outside the building. The height of the converter is 10 ft. when in blowing position. It is lined with a composition of ganister, sand and fire clay, rammed around a wood form. This lining, if repaired when necessary, will give at least 180 or 200 blows.

Iron from the cupola is poured into the converter, which is then turned to an upright position for blowing. The air pressure ranges from 3 to 5 lbs. a sq. in., being regulated by a valve at the operator's platform. The blowing operation requires from 15 to 20 minutes, varying with the percentage of metalloids in the iron. It is necessary that the time be as brief as possible, as upon the rapidity of the blow depends the temperature of the bath. Reduction in the weight of metal is about 18 per cent. The steel comes from the converter at 1700 deg. C., a temperature insuring sufficient fluidity to yield sharp, sound castings of light section.

Back of the converter, and on a level with the foundry floor, is the blower room, which is equipped with a No. 5 Root positive pressure blower for the converter, and a steel pressure blower for the cupola. The blower is belt-connected to a 75-h.p. Allis-Chalmers Bullock A. C. motor. The steel pressure blower, built by the B. F. Sturtevant Company, Boston, Mass., is a No. 6, belted to a 10-h.p. Allis-Chalmers Bullock A. C. motor. The blast main to the converter is a straight line to insure the minimum loss due to friction. A 14-in. blast pipe connects the cupola with the blower.

The core room, core oven and mold drying oven are in the side bay, adjoining the cupola room, and cover an area 40 ft. long and 30 ft. wide. The mold drying oven, which holds two cars, is 18 ft. long and 10 ft. wide, and is fitted with a Kinnear roller curtain door. The core oven is 10 ft. square, equipped with side shelves for cores, and has a swinging steel plate door.



Filling Converter at Vancouver Foundry.

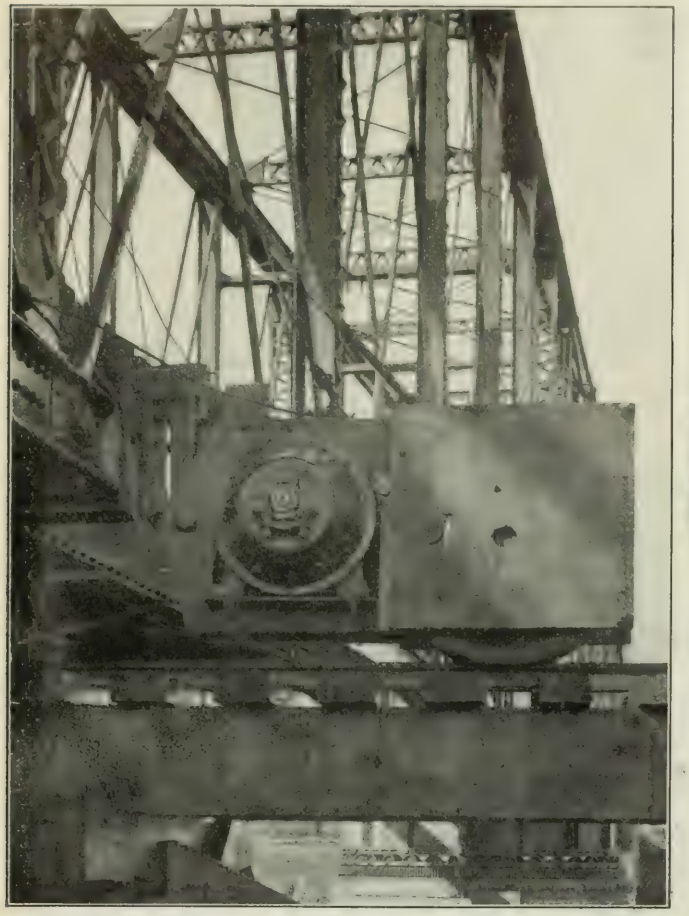
Adjoining the core room, is the sand mill room, with a 72-in. mill, built by the Vancouver Engineering Works, Ltd. This mill is of the undergeared type, and is belt-driven by a 25-h.p. motor.

The cleaning room adjoins the blower room, and opens into the main bay. The equipment consists of a cold saw of the 2-B type, two power hand saws, built by the Q. M. S. Co., Plainfield, N. J., and two type C Diamond emery grinders. Provision has been made for the future installation of an annealing furnace.

The Vancouver Engineering Works, Ltd., manufacture an extensive line of logging and saw-mill machinery, all types of boilers, burners for saw-mills, and mining machinery.

Pilling Tractor for Swing Bridges.

The Pilling tractor for locomotive turntables was illustrated and fully described in our issue of November 19, 1909. A recent application of this device for the purpose of turning a swing bridge is here illustrated. The bridge carries the Niagara, St. Catharines & Toronto Railway over the Welland canal at Thorold, Ont. It is 320 ft. long, with the center pier on the canal bank. A standard Pilling electric turntable tractor was attached to one end of the bridge, and a quadrant



Near View of Pilling Bridge Tractor.

track was built on a trestle, with a 54-lb. rail for the travel of the tractor in turning the bridge. When operated by hand the bridge is open and closed by four men in 14 minutes, while the electric tractor performs the same operation in 4 minutes. The high winds in this region increase the resistance materially, and there was a tendency for the bridge end to lift and raise the traction wheel from the rail. It was, therefore, more heavily weighted than is usual for turntables, and a clamp was provided to hold the tractor down to the rail. This clamp is lined with wooden shoes and is operated by a screw and wheel somewhat like the old cable car grip.

The Pilling tractor is made by the Weir & Craig Manufacturing Company, 2421 Wallace street, Chicago; also by the Canadian Pilling Co., 180 St. James street, Montreal, Canada.

New "Key Route" Passenger Equipment.

The accompanying halftone shows one of the 16 new coaches being completed in the shops of the San Francisco, Oakland & San Jose Consolidated Railway at Oakland, Cal. They were specially designed for the suburban traffic and are proving very satisfactory. The cars are 70 ft. long over the buffers, and 9 ft. wide outside. The most notable features are their large seating capacity, 88 passengers, and the large double platforms, which enable passengers to board or leave the cars quickly.

The underframes are of steel I-beams and channels sandwiched with Oregon pine sills. The bodies are of the usual



S. F., O. & S. J. Passenger Car.

wood construction. The interior finish is of mahogany throughout, rubbed to dull finish. Electric arc lamps, with opal globes, produce an exceptionally well lighted interior for night service. The bodies are mounted on four-wheel all-steel trucks of the M. C. B. type. The total weight of car complete is 60,000 lbs.

The special equipment includes the following:

Axles	Open-hearth, Gould Coupler Co.
Brakes	Westinghouse high-speed
Buffers, steel	Gould Coupler Co.
Brake-shoes	Diamond "S," Am. Brake-Shoe & Fdry Co.
Ceilings	Indestructible Fibre Co.
Center bearings, ball	Symington
Couplers	Gould Coupler Co.
Curtain fixtures	Curtain Supply Co.
Curtain material	Pantasote
Journal bearings	Gould Coupler Co
Lamps,—arc	Southern Ry. Supply Co.
Paint	Lowe Brothers
Roofs	Canvas
Roof paint	Sherwin-Williams
Springs	Union Spring & Mfg. Co.
Trimmings	Adams & Westlake
Varnish	Chicago Varnish Co.
Ventilators	Globe Ventilator Co.
Wheels	36-in. rolled steel, Midvale Steel Co.

These cars are operated in electric trains comprising three to ten cars. The number of passenger trains daily arriving and departing from the pier terminal at Oakland, Cal., is approximately 580.



Niagara, St. Catharines & Toronto Bridge over Welland Canal.

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One of the most significant and encouraging features of the comments of railway officers on the outlook for 1910, which we published in our issue of December 31, was that a large majority of the writers testified to the growing fairness of the railway commissions. The criticism most often made was that many of the commissions are influenced more or less by political motives. The increasing fairness of the commissions is due mainly to two causes. One is that public sentiment toward railways has become much less hostile throughout the central, southern and western states during the past two years. The other is that the strong commissions—those having extensive powers of regulation—many of which have been created or completely reorganized during the past five years, are becoming experienced in the performance of their duties; and it has been almost the invariable rule that the more experience commissions or commissioners have had the fairer they have been. The new commissioner commonly goes to work with the notion that there are a great many perfectly obvious and easily curable shortcomings and abuses in railway management. He wonders that they have not been corrected, and fancies he has a full set of sure remedies. But he usually soon finds that many of what he regarded as shortcomings or abuses are irremediable incidents or even good features of the railway management; and that most of the means with which he intended to set all right are better adapted to set all wrong. Close contact with the railway business substitutes information about it for misinformation; an appreciation is acquired of the complexities and difficulties with which railway managers constantly are wrestling; and these things combined with responsibility generate conservatism. Sometimes when railway men are opposing some new and radical scheme of regulation they are reminded that their past dismal forebodings about measures which subsequently were adopted have not been realized. But one of the main reasons why the dismal forebodings in many cases have not been realized is that the measures apprehended have been invalidated by the courts or that the commissioners, who have been feared, being taught by experience, have failed, with salutary inconsistency, to live up to their advance notices.

Whether the sentiment of the public and the attitude of regulating authorities toward the railways will continue to grow more favorable will depend very largely on how frankly and fairly the railways deal with them.

Delegates representing sixty commercial and manufacturers' associations met in Chicago on January 14 and denounced the so-called "publicity" provisions of the federal corporation tax law. We hold no brief for the corporation tax law. We regard it, as it stands, as an unwise measure. But we cannot refrain from remarking that the meeting in Chicago referred to calls attention anew to the old and familiar circumstance that it makes a deal of difference whose ox is gored. The associations which sent representatives to this meeting have all been very active for years in agitating for a wide variety of legislation to give publicity to, and to subject to drastic regulation, every detail of the railway business. When railway managers have opposed such legislation these associations have denounced them. When the publicity given to railway affairs has disclosed conditions that were not just what they ought to be—or what the professional critics of railways thought they ought to be—these associations have denounced the railways' managers some more and demanded additional regulatory legislation. The law makes the published rate the only legal rate; railway men, being human, sometimes mistakenly quote the wrong rate; and therefore these associations set up a loud outcry and demand that the misquotation of rates shall be made a criminal offense. They applauded when Congress opened railway books to the Interstate Commerce Commission and the commission prescribed a uniform method for keeping them. They applaud when it is proposed to put the financial and operating department as well as the traffic department of railways under the detailed supervision, regulation and control of the Interstate Commerce Commission. But open the books of manufacturing or mercantile corporations to the prying eyes of public officials? Spread their sacred contents before the bawling mob? Merciful Heavens! Commercial associations "turn thought sick at the act." It is an offense to think of it; an outrage to suggest it, and to do it—that would be a most fell and heinous crime, indeed! It is all right to regulate the railways. They are public service corporations; and any concern that has the folly, impudence and turpitude to engage in the business of serving the public deserves all the kicks and contumely that private corporations, which do not serve the public, but merely serve themselves, may demand shall be inflicted. But to disclose what profits private corporations are making and how they are making them—to publish to the world how much they are over-capitalized—to gather from their books, perchance, some significant data touching the reasons for the increases in the cost of living—why, that would be an interference with private enterprise that would destroy our free institutions and establish socialism, bureaucracy or something equally evil. Too bad; isn't it? But then, as we already remarked, it always did make a lot of difference whose ox was gored.

AN INTERNATIONAL CONTRAST.

Just at present our English kindred across the sea are in one of the fiercest political conflicts of their national history. Its issues are several, with sharp cleavages not only between but from the old Liberal and Conservative parties. The leading question may perhaps be described as political and resting on the status and legislative prerogative of the House of Lords. But even that issue springs from an economic condition interpreted in the famous Lloyd-George budget, with sub-branches reaching out into forms of taxation—tariff, excise, land "unearned increment" and the rest. But what, in the great battle of the British electorate, ought to catch the American eye is the complete absence of the "corporation" issue. No anti-trust cry is heard amid the numberless British shouts from the stump or is even suggested by the party cartoons. Railway rates, railway control, regulation, powers of commissions over transportation, "high finance" cut no figure in the great contest. And this exclusion of corporate and railway questions from an intense popular canvass is found in a land of cognate race with our own, with a likeness in its legitimate business methods and where the railways, gridironing a country of dense population, stand to the people in the closest relation of convenience and necessity. And a country, moreover, from which our own fundamental railway statutes have been drawn.

Let us fancy, for a moment, such a great national contest as that in the United Kingdom with economic questions foremost shifted at this time to our own land. Conjoined probably with the tariff issue and intimately woven with it would be the anti-corporation hunt in full cry. We should be hearing from the stump the anathemas leveled at Wall street, the plea for sharper railway regulation, loud declamation on rates, on federal control, on powers of the Interstate Commerce Commission. The "big stick" wielded not long ago at one end of Pennsylvania avenue would be subdivided into hundreds of minor oratorical clubs of the partisan campaigners. Organized railway labor would be actively in the field with its demand for higher wages and probably both parties catering to it—until after election. There would be chills and fevers of railway values, uncertainties in the horoscope of vested interests and prophecies of gloom until the campaign froth settled down into post-election calm, when the triumphant party would face the serious condition of administrative responsibility. The same post-election responsibility, in general character, will be fronted in the mother land whether Liberal or Conservative wins—but with corporate and railway legislative problems left out. As tested by the pending battle at the polls it would seem as though the United Kingdom had worked out her railway law-making to the point at least of popular contentment and where, in our American vulgate, the "stand-pat" policy prevails.

In a broad way this contrast of the two countries teaches us some vital lessons. One, and, perhaps, the most important, is the value of homogeneity in railway law-making. Let me suppose that each county in England had certain extensive powers over railways; that each county had also its own railway commission with functions shifting from year to year; and that by parliamentary decree those powers were constantly jostled by a national railway commission. How long under such complexities would it take to solve transportation problems and would they ever be solved? Yet such, in substance, is the American status to-day with no two states homogeneous in railway law and some states—like Massachusetts and Connecticut—in conflict over the scope of railway charters. And meanwhile the line of demarcation between state and federal power remains vague and undefined and federal authority constantly tinkering with the functions of its own commission. The United Kingdom has had, necessarily, such a centralized commission. But our kin-beyond-sea have relatively had fixity of law and been spared the clashes and complications of the divergent statutes of heterogeneous states. Such a contrast between the two countries was undoubtedly to some extent to be looked for owing to their differences geographical and governmental. But the force of the British example and precedent remains in favor of fixity of law and the harmonies of state law-making.

Historically viewed the United Kingdom has passed in its railway policy through economic situations familiar to us in the United States. There was the "let alone" policy of the second quarter of the last century, based upon the theory of competition of many lines. Next the period of rapid British railway consolidation. Next a period of restrictive law-making, with enforcement left to the courts. And, finally, the commission plan of regulation adopted in 1854, with powers enlarged in 1888 but under supervision of the Board of Trade. In a general way it has been for several decades in the British isles as it would be in the United States were the Interstate Commerce Commission in substantial control of railway traffic with privilege of the companies to appeal to the courts and with no distinction between interstate and intrastate business—the commission thus dropping its interstate character as well as title. But in the British outworking of the relation of the state to the railways there have been other easements than rational unity as distinguished from a federation of states each with its separate body of railway law. There has been the stronger popular respect for the vested right; the exemption of the railway problem from politics, from the spoilsmen, from the legislative "strike"; more powerful forces of publicity, acuter interest and more vigorous action of shareholders; and, lastly but not least, railway questions addressed to the minds of trained men in official authority unswerved by popular spasm or legislative whim. The mother country, in brief, has clarified, if not solved, her problems of railway and state in a spirit of scientific conservatism.

Hence it comes to pass that in our own land at a time of electoral peace the executive and Congress must wrestle with a complexity of railway subjects which reach endlessly into the mists of the future; while, *per contra*, a great economic contest to be fought out at the polls in the British isles is joined without visible trace of the anti-corporation motive or impulse. The striking contrast should not be lost to view as a guide for the American citizen in the directions—harmony of law, official intelligence, conservative action and publicity—in which our national emergence from the maze of railway polity lies.

REGULATION OF THE ISSUANCE AND OWNERSHIP OF RAILWAY SECURITIES.

One of the most important parts of President Taft's recent message regarding regulation of railways and trusts is that relating to federal control of the ownership and issuance of railway securities. If we correctly understand him his principal recommendations are as follows: (1) That railways shall not be disturbed in the possession of stock that they already own in competing roads, and shall be permitted to get complete control of competing roads of which they now have majority control. (2) That every road shall be prohibited from acquiring in future any interest in any competing road in which it has no interest now. (3) That railways shall be prohibited from issuing stock or bonds for less than their par value *in cash*, excepting (4) that they may be issued for less than their par value with the consent of the Interstate Commerce Commission, but not at less than their market value as ascertained by the commission. (5) That it shall be provided that on the reorganization of any railway, after sale at foreclosure or other legal proceedings, it shall not be allowed to be capitalized in excess of the fair value of its property, as ascertained by the commission.

These recommendations are divisible into two classes: (1) those that relate to the common control of the competing lines,

and (2) those that relate to the issuance of the securities.

As to the desirability and practicability of maintaining railway competition there are conflicting opinions. Some regard railways as much like most other industries, and think that the same attempts should be made to prevent the suppression of competition between them as between industrial concerns. Others regard railways as natural monopolies, like waterworks or lighting companies, and think that they should be encouraged to combine, and that the public should rely for protection against excessive and discriminatory rates and bad service entirely on public regulation. These theories are incompatible. Yet the state and national governments have acted on the assumption that both are right; and Mr. Taft favors continuing to do so. On the theory that railway rates and service should be regulated by enforced competition, the Interstate Commerce act prohibits pooling, the Sherman Anti-trust act, as construed by the federal courts, prohibits agreements regarding rates and consolidations of parallel lines, and numerous state laws impose similar restrictions. On the theory that railways are natural monopolies, the nation and the states have passed laws and created commissions to regulate their service and control their charges. Mr. Taft in one part of his message favors allowing competing railways to enter into agreements regarding rates; in another, favors letting existing railway combinations alone; in another, favors legislation to prevent further consolidations; and in still another, favors increasing the control of the Interstate Commerce Commission over rates.

If we are to work out a consistent and beneficial policy of regulation we must recognize the fact that both of the theories referred to cannot be right—that, in fact, in their extreme forms, both are wrong. Each railway is, in a sense, a monopoly at points on its line reached by no other road. A combination of railways is, in a sense, a monopoly in a territory penetrated only by the combined roads. But in another sense no railway or combination of railways is a monopoly. People are prone to think that only parallel lines compete. But competition often is fiercer between roads that reach the same producing, distributing or consuming centers from different or opposite directions than between parallel lines. One of the worst rate wars in the history of this country was waged for the grain traffic of the trans-Missouri country by the lines leading from that section to the gulf of Mexico and the lines leading from there to the Atlantic seaboard. A rate war is being waged now by the roads that haul sugar and coffee to Chicago from New York and those that haul these commodities from New Orleans. Even if all the roads of the country were under one control there would be a modified form of competition. For doubtless the roads would have different traffic managers, each of whom would want to make a good record. To do this he would strive to give such service and rates as would develop the maximum traffic; and in doing this he would be struggling constantly to keep the territory his road served on at least a parity of rates and service with territories served by other roads.

Experience has shown that the nature of railway competition is such that when unrestricted it is sure to be carried to an extreme that exhausts the combatants and causes unfair discriminations between shippers and communities. To stop its being carried to this pernicious extreme the railways early formed pools and later traffic associations, and still later resorted to "community of interest" arrangements and consolidations. Each of these steps was followed by legislation or decrees of the courts to compel a renewal of the cut-throat warfare. These forms of governmental interference have been harmful when they have not been futile, and futile when they have not been harmful. They often have prevented natural and salutary agreements and caused unnatural and illegal combinations.

It would seem, therefore, that experience and reason unite to demand that the government shall entirely abandon attempts to prevent not only railway agreements but also railway combinations. It is very probable that this would not increase the tendency toward combination; and the interest which each road or combination of roads has in developing the territory it serves may usually be much more safely relied on than any statute or public authority for protection against bad service and excessive or unfair rates. Surely, unless the public's confidence in railway commissions is misplaced, they can be relied on for such further protection as its interests require.

(2) The worst abuses in the railway business of this country are found in the administration of the financial affairs of some roads. These abuses are not so prevalent as they were some years ago; but there still are a good many railway directors and managers who have not learned, or who still deliberately violate, their duty to their stockholders, their bondholders and the public. The railway manager and director are trustees in one sense or another for each of the classes named. It is the duty of each to operate railway properties in every particular with an eye to the interests of each of these classes.

When a railway director or manager profitably speculates—we say "speculates," not "invests"—in the stock of his own company, from whence do his profits come? From the pockets of his stockholders, unless his operations are pure gambling; and as it is his duty to use his official position and his knowledge of his company's affairs to make profits *for* his stockholders, not *from* them, his act not only legally is a violation of his trusteeship, but morally is as indefensible as it would be for him to appropriate cash from his company's treasury. It is only too notorious that there are managers and directors who do thus make profit at the expense of their stockholders.

It is often necessary, especially in the case of a new or unprosperous road, to issue securities exceeding in aggregate *par* value the present value of the road. Over-capitalization in any other case does no good and usually does harm. Contrary to the popular belief, it has no effect on rates. But it does often result in loss to innocent investors. It sometimes results, also in the payment in interest or dividends of earnings that should be spent in the maintenance of the property, and in consequent deterioration of the service rendered to the public. Worse yet, it damages the credit of the road, and sometimes closes the money markets of the world to it. While the railways of the United States as a whole are not over-capitalized, there have been not a few cases of gross and entirely unnecessary watering of the stock of railways, even in recent years.

These kinds of misconduct by railway managers and directors have provoked the loud and widespread complaints about the financial management of our railways, and the demands, such as are voiced by President Taft in his message, for public regulation of the issue of securities. The recent disgraceful manipulations of the stock of the Rock Island are good examples of the sort of thing that has exasperated public sentiment. But the adoption of Mr. Taft's recommendations would not prevent those "melon-cuttings" which are accomplished by the sale for par of stocks of a market value more than par, and which are, justly or not, much complained of; in fact, it would have little or no effect on roads whose securities uniformly sell above par. It would not prevent the payment of unearned interest or dividends. It would not prevent managers and directors from speculating in their company's securities, or even with their company's money. It would not cause, or tend to cause, all the money raised by the sale of securities to be honestly and economically spent—as all money thus raised ought to be spent—in extensions of or permanent improvements in the property. Its effects on roads the market value of whose securities is less than par would probably be similar to those produced by a law of Massachusetts which was in effect from 1893 to 1908. This law prohibited railway securities from being sold below par; if they were sold above par it must be for their market value as fixed by the state railway commission. Often after the price was fixed by the

commission the securities declined in the market and they became unsalable. Result: the two principal railways in the state could get no money to make improvements with. The law was doing far more harm than good, and in 1908 it was amended to permit securities to be sold at a price fixed by the stockholders.

Mr. Taft's recommendations do not seem adapted to reach and suppress the real evils in railway financial management. The great desideratum to be aimed at is to influence, and if necessary, to force, railway directors to perform their legal and moral duties. But this force cannot be applied by law. It was observed many years ago that a stern chase is always a long chase, and if directors are minded to wickedness they are sure to be fully as clever as the lawmakers, and, in point of time, to be from six months to four years ahead of them. A defective sense of trusteeship is a thing that cannot be legislated out of existence any more than Tammany Hall can; the only cure for it is public sentiment, kept aroused by the forces of enlightened selfishness. Both the railways and the great municipalities in this country are administered far more honorably than they were a generation ago, and the railway management is, and always has been, tremendously better than the municipal management. Yet city government is hedged about with a mass of legislation, and is placed directly in the hands of the voters for revision every election day. If every detail of railway management were governed by law, and the officers chosen at the polls by the throngs in State street and Broadway, does anybody suppose that the traveling public would be served better or more cheaply than it is at present?

REPORT OF THE NEW YORK PUBLIC SERVICE COMMISSION, FIRST DISTRICT (NEW YORK CITY).

The New York Public Service Commission, First district, which has jurisdiction over the steam and electric railways operating in New York city, in its report for 1909 lays before the legislature its grievances. It says that through the interpretation of the courts, the Public Service Commission law has been so modified as to take away power from the commission which is essential to its efficient control of public service corporations. The courts have held in overruling the first district commission that if it is shown that public convenience and necessity require a franchise to be given to a corporation, the commission's consent cannot be withheld because the commissioners have ideas of their own as to what terms the franchise should provide.

Another grievance of the commission is that the state supreme court, in overruling the Second district commission in its refusal to grant permission to a railway company to issue bonds, held that as the statute specifically states for what purpose bonds and stocks may be issued, it is not left to the judgment of the commission to refuse its approval except in so far as the security issue may run counter to the provisions of the statute. The courts have determined, the report says, "that the words used in the section relating to this subject [the issue of securities] only require the commission to determine whether stocks and bonds sought to be issued come within one of the four purposes stated in the section, i. e., the acquisition of property, construction of its facilities, improvement and maintenance of its service, or the discharge or refunding of its obligations. The result is that this construction of the words used in the act deprives the commission of power to stop stock-watering, for it is easy for the companies to bring within the four legal purposes sums that never should be capitalized, as, for instance, expenses of operation, taxes, replacement or even dividends." Such reasoning is absurd. Even the most superficial reading of the case in which the Second district commission was overruled shows clearly that the court would not for a moment tolerate the issue of securities for any such purposes as are mentioned by the commission. The sum and substance of the supreme court's ruling was that where the issue of securities was clearly legal, the commissioners could not substitute their judgment for that of the owners of the property as to the wisdom of the details of such issue of securities.

Besides the two grievances mentioned the commission recommends that the railway law be so changed as to facilitate the abolition of grade crossings. As the law stands it is difficult for the commission to prescribe any general plan of elimination of grade crossings, as it can only prescribe in specific cases the method of elimination of the crossing. This is a fair criticism of the law, and if the commission could be trusted to order elimination of crossings in a reasonable way, which is doubtful, it would be a wise thing to enlarge its powers in this respect. The commission complains that its power to fix rates is seriously diminished through the action of the courts in reviewing the facts in the case of a rate reduction. The commission claims that its orders should be treated in the same way that an act of the legislature would be treated, that is, be considered binding unless unconstitutional. In theory the United States supreme court takes this attitude toward the Interstate Commerce Commission; in practice the United States courts have been inquiring into the facts as presented to the commission, and have themselves determined whether a rate prescribed by the commission is reasonable or unreasonable, irrespective of its constitutionality.

During the year the New York Public Service Commission, First district, held 111 meetings for formal consideration of matters and considered 271 formal cases, of which 57 were undecided at the end of the year. Of the total 271 cases, 113 were on motion of the commission itself. The most important case dealing with the issue of new securities was the request of the reorganization committee of the Third Avenue to issue $68,516,800 new securities. The commission decided that there was no evidence of the Third Avenue property's capacity to earn interest on this amount of capital, and the reorganization plan was refused the approval of the commission. Since this refusal another plan providing for $54,916,000 securities has been submitted but not passed on.

A good deal of time last year was devoted by the commission to the investigation of fenders and safety appliances for surface cars. The total number of accidents on street, elevated and subways and steam railways within New York city was 56,481 in 1908 and 52,618 in 1909; the number of persons killed in 1908 was 444 and in 1909, 325.

The magnitude of the problem of carrying passengers in New York city during rush hours has been dwelt on in previous reports of the commission. The fact of the matter is that just as soon as any more facilities are added for handling passengers, traffic is at once so greatly increased that it more than taxes the new service to the utmost. In each 24-hour period in New York passengers equal in number to about 85 per cent. of the entire population must be carried. One-third of the entire traffic comes in one-twelfth of the time. The rapidity with which traffic takes advantage of added facilities is well shown in the following table, giving the number of passengers to and from Long Island:

Routes	1907.	1908.	1909.
Brooklyn bridge	423,000	309,783	323,006
Williamsburg bridge	163,000	163,233	206,606
Queensboro bridge (Blackwell's Island)	Not open for traffic.	Not open for traffic.	26,300
Ferries	120,000	175,749	120,841
Interborough subway	Not open for traffic.	159,708	193,784
Total	706,000	827,473	870,537

The returns of street railways and the Staten Island Rapid Transit, which is a steam road, show that in 1909 the car mileage for all companies in New York city totaled 272,369,956. The revenue per car mile was 26.8 cents, expenses 16.0 cents, leaving net revenue of 10.8 cents.

It is expected that early in the present year it will be

possible to open bids for about 38 miles of additional subways, of which 23 are to be in Manhattan and the Bronx, running north and south; one mile of crosstown road in Manhattan, five in Brooklyn; and nine miles extension of the Brooklyn subway to Coney Island. The number of miles of subway now operated by the Interborough Rapid Transit is 25.82.

The commission has made persistent efforts to increase the facilities and service in the present subway, and an order directing the adoption and operation of side-door cars on express trains has already added considerable to the capacity of the subway and has very much improved the service. The efforts of the commission were resisted by the Interborough Rapid Transit and as yet less than half the subway expresses during rush hours are made up of side-door cars. There seems to be, however, no doubt that in this case the commission was right and the Interborough people wrong.

REPORT OF THE NEW YORK UP-STATE PUBLIC SERVICE COMMISSION.

The New York Public Service Commission, Second district, has been making during the past year consistent efforts to reduce the number of formal orders issued and to handle as great a number of complaints by informal proceedings as possible. The commission in its report to the legislature for 1909 says that "where authority to effectively correct abuses is fully conferred by the statute, the changes of rates and provision of better service called for by well-founded complaints can generally be secured by the commission without trial and issuance of orders." This is a tribute both to the spirit in which railways and other corporations under the jurisdiction of the up-state commission are meeting state regulation, and also a tribute to the skill of the commission itself. The confidence in its fairness and disinterestedness which the up-state commission has inspired in railways is in pleasing contrast to the suspicion of ulterior motive or bias which attaches to the orders of so many of the other state commissions.

A good instance of the attitude of the commission is afforded by its comments on the reluctance on the part of certain shippers to bring complaints for fear such action may prejudice them in the minds of railway managers. The commission says: "Of course such fear is entirely unfounded and not likely to exist to any extent after shippers have come thoroughly to realize that common carriers in this state (New York) are required by law to act and conduct their business in conformity with accepted standards of reason and justice." In cases where subordinate railway officers have represented to shippers that the railways could not allow claims because of fear of reprimand by the commission, the commission has done all in its power to correct this impression, and the higher railway officers have denied any responsibility for such statements.

The commission finds, from actual investigation of freight and passenger tariffs, that the trend of rates and fares in the state has been downward.

Of the passenger tariffs changed, 65 per cent. showed reductions. The improvement most noted in tariff construction is in the consolidation of rates applying to the same commodity, into one schedule, the elimination of duplicate tariffs and the arrangement of these tariffs in a plain and concise manner. The efforts of the commission are being directed toward this simplification in the belief that it will greatly reduce the number of complaints from shippers who have had rates misquoted to them by agents of railways.

The supervision of the commission over the financial affairs of railways is described in the report as having extended over companies operating a steam railway mileage of 8,164 miles. The following table shows the aggregate results of operation of these steam railways:

	1907.	1908.	1909.
Gross earnings, operation.	$396,557,982	$402,317,818	$402,265,445
Increase over 1908, pr ct..	8.16	1.45	*0.01
Expenses of operation....	$278,191,841	$282,410,002	$266,852,915
Inc. over preced'g yr., pr ct	10.06	1.51	*5.51
Net earnings, operation...	$118,366,141	$119,907,816	$135,412,530
Inc. over preced'g yr., pr ct.	3.88	1.30	12.93
Tons freight carried.....	265,609,000	248,750,953	247,652,000
Inc. over preced'g yr., pr ct.	6.69	*6.34	*0.44
Ton-miles, freight carried.	37,343,086,000	37,564,347,398	37,530,589,000
Inc. over preced'g yr., pr ct.	9.26	0.59	*0.09
Passengers carried	253,693,000	278,880,817	274,741,000
Inc. over preced'g yr., pr ct.	2.68	9.93	*1.48
Total passenger-miles....	6,010,356,000	6,511,203,679	6,460,505,000
Inc. over preced'g yr., pr ct.	7.39	8.33	*0.80
Total divs. paid during yr	$52,107,722	$42,159,002	$39,215,300

* Decrease.

While the gross earnings of the roads in the fiscal year ended June 30, 1909, was only one-one-hundredth of 1 per cent. less than in 1908, the dividends paid to stockholders in the 1909 fiscal year are less by $2,943,702, or 7 per cent., than those paid in 1908.

The gross earnings of electric railways were $21,194,486 in 1908 and $21,919,652 in 1909. Net earnings were $7,065,336 in 1908 and $7,272,253 in 1909. The total dividends paid were $2,065,242 in 1908 and $2,965,206 in 1909. The commission gives the following very interesting table, taken from the statement of the total 310 corporations under its jurisdiction operating electric railways and electric lighting and gas plants:

Amount of common stock paying no dividend.....	$126,956,530
" " common stock paying dividend.....	53,859,074
" " preferred stock paying no dividend	15,317,400
" " preferred stock paying dividend.....	18,461,072

The commission draws the inevitable conclusion that either large sums of the stock outstanding of these corporations represent no actual cash investment whatsoever and should therefore have never been issued, or else there is something radically wrong with the conditions under which such corporations operate, which prevents public service corporations in New York from earning returns on such enormous sums of money invested in them.

During the year the commission granted authority for the issue of $142,855,035 stock, bonds and other indebtedness. The increase in the amount of capitalization authorized in 1909 over 1908 is 56.6 per cent.

In its supervision over the physical operation of railways the commission has been somewhat hampered by the fact that the act creating the commission does not specifically state whether the commissioner should pay the traveling expenses of inspectors or whether this transportation should be furnished free by the railways. A rather funny case came up last year in connection with the inspection of the Delaware & Hudson. The commission had decided to pay the regular fare for its inspectors. The D. & H. presented a bill to the commission for $2,450 for the use of an observation engine employed in the inspection trip in 1908. The commission had not paid this bill last year, and the D. & H. refused to furnish an observation engine until the bill was paid. The commission, therefore, did not make an inspection last year of the D. & H., although it did of all other roads. It is suggested that the legislature pass a specific law requiring the railways to carry free inspectors when engaged in their duties.

Another recommendation of the commission is that more money be appropriated for the elimination of grade crossings. Only one-quarter of the expense of this work is being borne by the state. Last year no appropriation was made, and the commission spent the remainder of what money was available. In all there has been spent by the state for its one-quarter share of the work $1,617,607 for elimination of grade crossings contracted for or now under construction.

The inspection of equipment on small roads showed serious defects in some cases in the safety appliances, air-brakes and tender wheels. There were 2,575 rail breakages in the ten months of 1909. and in January, February and March, 1909, there were 1,280 breakages as against 3,408 in the corresponding months of 1908. In 1908 there were eight persons killed

and 22 injured by locomotive boiler explosions and other boiler accidents, while in 1909 there were six killed and seven injured. The commission supervises the inspection of one-seventh of the total locomotive boilers in the United States. In every case of a fatal accident investigation showed the cause to be low water. The commission believes that the low water accidents have been reduced by the improvement in the inspection of water glasses, gage cocks and injectors, but it does not favor the appointment by the government of detailed boiler inspectors to duplicate or supersede the inspection work now carried on by the railways, because it believes that the railways themselves should take this responsibility.

The New York Central & Hudson River has asked the commission to change its order directing the complete installation of oil-burning locomotives on the Adirondack lines by April 15, 1910. The Central says that the improvements applied to ash pans, spark arresters, etc., on coal-burning locomotives have been so successful that it is not necessary to adopt the more expensive method of equipping oil-burning locomotives. The Delaware & Hudson, the other road operating through the Adirondacks, has made no objection to the commission's order.

One recommendation of the commission is so sure to meet the hearty support of country newspapers as a whole that it is not entirely above suspicion. The commission recommends that the legislature pass an act requiring railways to publish their time-tables in local papers. The convenience to the public of having these time-tables published in local papers has something to recommend it, but the policy of interfering in a matter so entirely within the jurisdiction of the railway management itself is certainly questionable, and the recommendation of the commission appears to be a bid for support from country papers.

NEW BOOKS.

Electric-Power Conductors. By Wm. A. Del Mar. New York: D. Van Nostrand Co. 339 pages; 7 in. by 5 in.; 69 illustrations. Cloth. Price, $2.00.

This book is handy for a busy engineer to have at his elbow. It will be of value not only to the electrical engineer who is called upon to make close calculations as to cost and constructions, but also to the general engineer who may often wish to reach an approximate result quickly when there is not time to consult a specialist in the matter. It contains a series of tables and formulas adapted to the solution of questions relating to the subject of which the book treats. It is a handbook, that takes up the materials that are used for conductors, and the gages and dimensions in accordance with which they are supplied. There are also brief statements of the electrical properties of these materials. In the fourth chapter, the methods to be employed in the determination of the sizes to be used for a given voltage and drop are treated. This is combined with calculations on the stresses that will be encountered in given spans, and is followed by a chapter on the testing of wires and cables. There are also copies of standard specifications with instruction for the installation of underground and overhead lines, together with information about third rail circuits and rail bonding.

Alternating-Current Motors. By A. S. McAllister. New York: McGraw-Hill Book Co. 322 pages; 6 in. by 9 in.; 138 illustrations. Cloth. Price, $3.00.

This book is not prepared for the student; it presumes a considerable knowledge of electro-magnetic phenomena. For a person not so equipped, it would be quite unintelligible, but if this training has been acquired the author's arrangement and presentation of the subject will be found to be clear and interesting. The book is remarkably free from mathematical formulas, and when these are used they are those of the simpler branches and therefore readily understood. In fact, the major portion of the volume has already appeared as articles in technical papers. It must not be inferred from this, however, that the whole treatment of the subject is a simple one, for that is not the case. A general outline of the contents shows that, starting in with single-phase and polyphase motor circuits, the work covers an outline of induction motor phenomena and performance as well as their use as frequency converters. The methods of applying the graphical treatment to induction motors is discussed, as well the use of these motors as asynchronous generators and transformers, together with their magnetic field. Motors of the repulsion and series types are treated both graphically and algebraically, the closing chapters being on the methods of preventing sparking in single-phase commutator motors and the leakage reactance of induction motors.

Six-Language Technical Dictionaries. Volume 5, covering railway construction and operation. Illustrated; 870 pages. Cloth. $4. Volume 6, covering rolling stock. 796 pages. Cloth. $3. Prepared by K. Deinhardt and A. Schlomann. Published by the McGraw-Hill Book Co., 239 West 39th street, New York.

Two additional volumes of this extraordinary six-language series of illustrated technical dictionaries are now at hand. The other volumes in the series deal with machine details and tools; with electrical engineering; with boilers, steam engines and turbines, and with internal combustion engines. No work comparable with this has ever before been done in making combination-language technical dictionaries. To clarify the meaning of expressions which might otherwise be obscure, each object described is illustrated with a small cut in the center of the page. Around this cut are grouped the words or phrases describing this article, in English, German, French, Italian, Spanish and Russian. Processes are also described, as, for example, "expanding the tube end" or "irregular combustion." Of course, these processes cannot always be illustrated, but wherever illustration is possible it has been attempted. Each book is classified with great care as an additional aid to locating words and phrases, and at the back of each book there is an elaborate index in each of the six languages.

The compilers and the publishers of these excellent books deserve the highest praise for their work, which must have been, at least in the case of the compilers, exceedingly toilsome. We should imagine that these dictionaries will stand as the standard international reference work on technical terms in the engineering field for a great many years.

Contributed Papers.

ROBERTS WALKER.

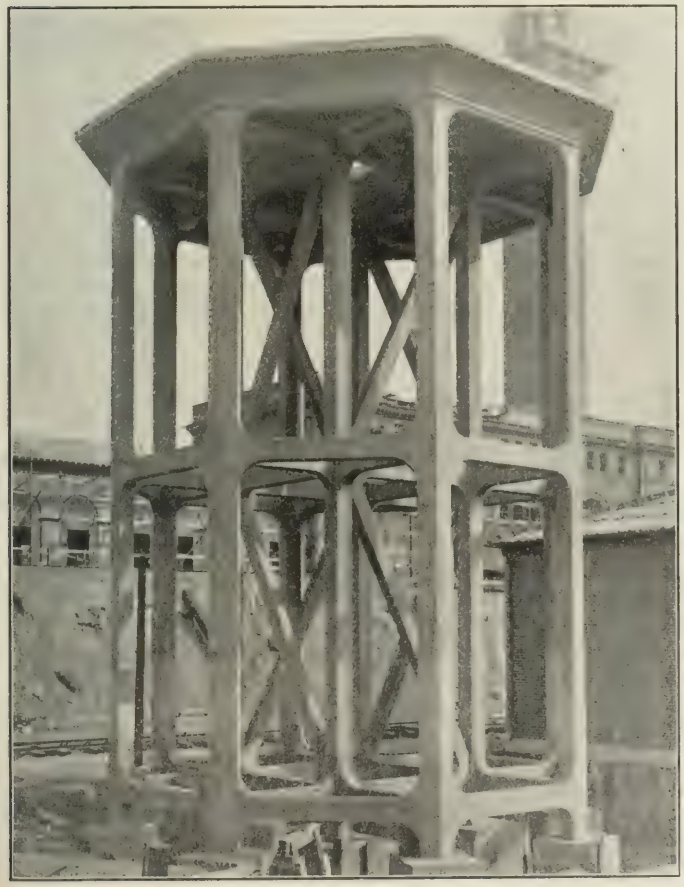
Roberts Walker has been elected general counsel and chairman of the executive committee of the Chicago, Rock Island & Pacific Railway and president of the Rock Island Company. He succeeds Richard A. Jackson as president of the Rock Island Company and D. G. Reid as chairman of the executive committee of the Chicago, Rock Island & Pacific. Mr. Walker entered the service of the Rock Island in 1904 as assistant to Robert Mather, who was then general counsel. He was born in Rutland, Vt., August 24, 1874. His father, Major Aldace Walker, was one of the receivers of the Atchison, Topeka & Santa Fe, taking the place of Mr. Reinhart, who resigned in 1894. On the reorganization of the Atchison in 1895 Major Walker was elected chairman of the board of directors, holding this position until the time of his death in 1901. Roberts Walker went to Amherst College, receiving the degree of A.B. in 1896. He received the degree of LL.B. from the Columbia Law School in 1899 and at the same time received the degree of A.M. from Columbia University. After leaving college he entered the law office of Guthrie, Cravath & Henderson, now Cravath, Henderson & de Gersdorff. While at college, and at the law school, Mr. Walker was naturally in very close touch with railway affairs, especially in the Southwest, because of the work which his father was doing there.

His work, after he joined the Rock Island as assistant to Robert Mather, became more and more of an executive character. He was a first-class assistant, but he had as well initiative and capacity to assume responsibility. He has the rather unusual combination of methodical and hard-working methods and very quick perception and decision.

It is seldom, indeed, that a man as young as Mr. Walker—he is not yet 36—is entrusted with the presidency of a large company and the chairmanship of the executive committee of a railway of 8,000 miles. The resignation of Richard A. Jackson as president of the Rock Island Company and as general counsel of the railway company was apparently very suddenly decided on, and the same is true of the resignation of D. G. Reid as chairman of the executive committee of the railway. Mr. Walker was the man most familiar with the affairs of the Rock Island Company, with the duties of the general counsel of the railway company, and with the general supervision of legal interests of the Rock Island group, and when a sudden emergency arose he was the man selected to fill the gap.

CONCRETE FOUNDATION FOR WATER TANK.

The accompanying photograph shows the concrete foundation for a water tank of the New York, New Haven & Hartford at Waterbury, Conn. A similar foundation has been built for a tank at Naugatuck. The structure is particularly interesting because the reinforcement consists of third rails. These rails were originally used on the Bristol line of the New Haven, but public sentiment against the third rail resulted in action by the Connecticut legislature, and the company some time ago had to install an overhead trolley wire instead. The third rails were taken up, but because of their peculiar section they were useless anywhere else. However, it was found that two of them combined make an excellent column section for a structure of this kind.



Concrete Foundation for Water Tank.

THE WESTERN RAILROAD ASSOCIATION.*

The Western Railroad Association comprises practically all of the large western, southwestern and northwestern railways, the New York Central Lines having their terminals in Chicago, the Erie, the Bessemer & Lake Erie, the Hocking Valley, the Grand Trunk, and the Nashville, Chattanooga & St. Louis. The affairs of the Association are governed by a Board of Directors, an Executive Committee, a President, a General Counsel and Treasurer, and a Secretary. Most of the business is handled by the General Counsel. The expenses, which average about $29,000 a year, are divided among the members in proportion to their gross earnings.

In return for the assessment the Association defends all patent, trade-mark or copyright suits that may be brought against its members; conducts negotiations involved in the settlement of claims; sends out monthly lists of expired patents; passes upon licenses, assignments and other papers, and generally, renders such assistance as it can within its sphere. The Association tends to discourage frivolous lawsuits. Any member is entitled, without any payment beyond its regular assessment, to opinions upon all matters pertaining to patents, trade-marks or copyrights in which it may be interested. * * * While fairly familiar with mechanical drawings by reason of a technical education and 16 years' experience in this office, I often find that a drawing, clear to the man who sends it, is not clear to me because I have never seen the device. Hence the necessity for a description, which should not only include the apparently important points, but the minor points as well. At this day, when nearly a million patents have been issued, one rarely comes out involving a fundamental principle; they are mostly on minor improvements, and therefore the minor details of a device should be particularly described, because more likely to involve infringement.

* * * Some years ago I passed upon a car coupler, advising that it could be safely used. Suit was afterwards begun, but not brought to my notice, resulting in a decision in favor of the patent and against the coupler. I failed to understand how I could be wrong until I discovered that the road was not using the device as shown in the print, but had added a feature which in the opinion of its mechanical department was not patentable. Unfortunately it was this feature which was covered by a valid patent and the vendor of the coupler having failed, the railroad paid $7,000 as a result of a *legal* opinion rendered by the *mechanical* department. You pay your assessment and an opinion costs you nothing additional—therefore why not get an opinion from the Association instead of sending, as frequently happens, some employee to the public library to go through 900,000 patents by main strength to determine a question with reference to which he has had no training.

Failure to properly use the Association has led our members into copying a patented device. For example, suppose you send me drawings of a steel car and that these drawings are not wholly complete because you omit to send figures showing what seem to you minor points, which "minor points" have been copied from some car which you have seen upon your road. Yet these minor points may be precisely what is covered by a patent; one man gets a patent on a gusset plate, another on a rectangular gusset, still another on one that is hexagonal. Of course, all these patents are not valid; in fact, I think many of the claims on steel car construction are wholly invalid as being for nothing but the substitution of metal in commercial forms for wood in forms equally well known, involving mere metal carpenter work. Just the same, it is the desire of our members not to buy lawsuits. Where the copying of a device involves litigation, it is safer and also fairer to use something else, however trivial the particu-

*Extracts from an address delivered before the Western Railway Club at Chicago, September 21, by George S. Payson, General Counsel of the Association.

lar patent may seem. Nothing is more dangerous than copying a patent, relying as a defense upon earlier devices. Suppose this is done and the road is sued and asks me to defend it. The judge is bound to ask me, "Why did you copy this patent?" I reply, "Because it is invalid in view of these old devices." The judge then asks: "Why don't you use the old devices?" The only answer is that we prefer the patented device. If so, it must be because it is better than the old devices open to anyone to use. If by such use we bear the strongest testimony to the utility of the device, we can hardly blame a court for holding the patent valid on account of such utility. I have never known in all my experience of any case where there has been deliberate intentional copying of a patent.

In examining a steel car I read about 20,000 claims, any one of which may be infringed. If a claim is found to be infringed, the question then arises as to whether it is valid, which involves a still more careful consideration of the patents prior to the one in question. While looking for infringement only, it is generally sufficient to read the claims, but when trying to decide whether a claim is good, I have to examine the drawings in detail and read part or all of the descriptive portion of the patent. This may explain why all opinions do not reach you in forty-eight hours after I get your request.

Whenever you decide that a device is worth making standard, or whenever any use of a device will involve considerable expense, you ought to get an opinion before such adoption or use. * * * Almost anything may be patented, and therefore whenever you make a device standard it is advisable to at least apply for a patent merely as a species of insurance. Unscrupulous men are continually appropriating the ideas of others and we have several times been put to great trouble and expense in cases where a man has taken out a patent upon a device invented by someone else—some railway employee for example—and made claim or brought suit against the road using such device. In such case we must prove the theft. This is hard to do and the consequent expense might be avoided if the road made application for a patent at far less cost than that involved in defending a suit.

If one of our members is sued, I want to be notified at once if I am to be in the case, that nothing may happen to affect our interests before I take charge. If you have a serious illness the proper step is to call a doctor at once, not to wait until you have but one chance in a hundred for recovery.

While we have won cases involving many millions of dollars, we have, since my connection with the Association, only lost one case, and that a very small one. As to prophecies with reference to litigation not under our control, we have, so far as I now remember, been right in every instance except one. We may not continue to maintain a standard so accurate, but to enable us to reach the highest possible standard of efficiency, there should be the fullest possible co-operation between our members and the Association.

I have known it to be said that the Association controls prices and that its purpose is to interfere between the railway that wants to buy and the supply-man who wants to sell. Not so. The Association has never, since I have been familiar with its operation, had anything to do with fixing prices, and I cannot conceive of a railway official paying any attention to what I might say on this point. The only time we are concerned with the amounts to be paid is when a question of settlement of some claims arises. In this case I, of course, use my best endeavors to obtain a settlement for the most reasonable price, to which I can see no possible objection.

If by interfering between the supply-men and a railway is meant advising the road, in pursuance to a request for information, that the device in question is an infringement of some patent, there must of necessity be such interference, but if, on the other hand, interference means what I know it has been intended to mean, an improper interference, blocking sales which ought to be made, I deny in a most emphatic manner that there has ever been such intention.

Where I find infringement I am ready at all times to hear the vendor or his attorney in opposition to my opinion. I have frequently voluntarily offered to supply-men an opportunity to present in person or by attorney their views as to their side of the controversy. As a result of such presentation I have sometimes withdrawn opinions already rendered, finding upon the new information given me that my previous opinion was inaccurate. So far as I have any pride of opinion, it consists in getting my opinions right, and as a first step to getting them right, full information is an essential requisite.

I frequently hear that my opinions are considered ultra-conservative. Possibly so. It is my rule never to pass a device that is a bald copy of a patent without an absolutely perfect defense, and this rule has repeatedly received the indorsement of our Executive Committee. It is further my rule that whenever I think a device is an infringement, although not a copy, a defense to the patent must come at least as close to such patent as does the infringing device. If this be ultra-conservative, I cannot help it.

Some time ago it was considered sufficient for a vendor to guarantee the cost of litigation, but such a guarantee is of little value. Suppose you spend $100,000 under a guarantee to protect you against litigation. Suit is then brought against you and your defenses are insufficient. What possible satisfaction is it to you to have the vendor pay the expense of litigation when you know that in the end you have got to come to the patentee's terms or abandon the device. Now, the bond which we require protects us not only against the cost of suit, but also against the expense incurred by having to stop using the particular device. We do not in all cases insist upon protection in the form of a bond. The Association does not solicit patents. If I were to attend to taking out a patent for one of our members, it might well be that later on I would be asked to defend suit brought under it against another member.

FOREIGN RAILWAY NOTES.

There were 47,150,384 passengers and 32,211,007 tons of freight carried on the Argentine railways in 1908. The movement of passengers from 1906 to 1908 has increased 25 per cent.

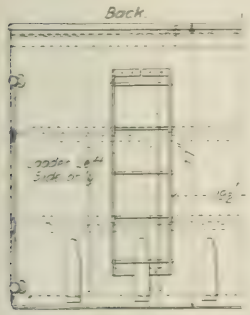
The Central South African Railway management has ordered two special compound engines, for which the chief mechanical engineer has gone to America to arrange. One will be a compound engine of the Mallet type and the other what is called a tenth-class 98-ton passenger engine of the superheater type. The heavy engine will be used for freight traffic and the other for passenger work.

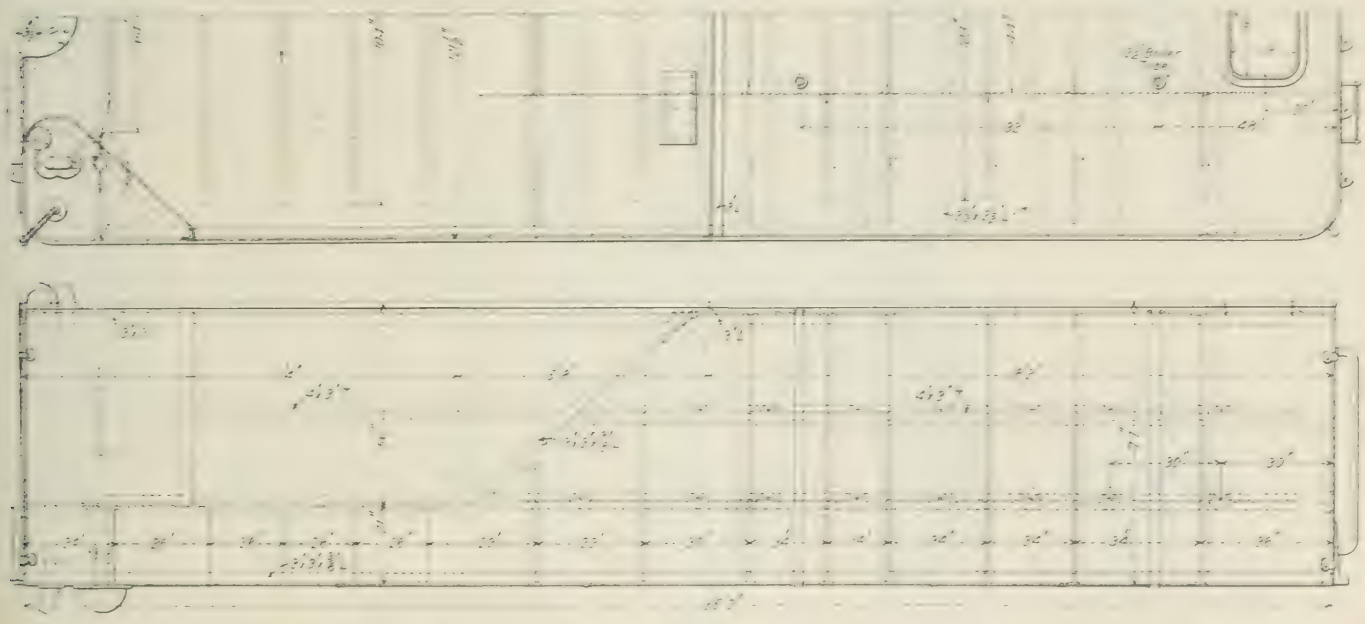
The board of railway directors of Sweden propose to ask the Riksdag for an extra grant of about 6,500,000 kronor (about $1,805,000). Of this sum 2,000,000 kronor is required for the completion of work on the Gellivare-Riksgransen Railway; 700,000 kronor for completing the double-track work on the line from Tomtelopa to Jarfba, and 500,000 for double-tracking the line between Ronninge and Jarna.

One of the last acts of the regular session of the Peruvian Congress was to guarantee an interest of 6 per cent. on the capital to be invested in building a railway from Chimbote to Recuay. This guarantee is limited to the sum of $170,327 gold per year. The railway will tap the most densely populated region of the republic of Peru, the Callejon de Huaylas, which is very rich in minerals and anthracite coal.

TENDER OF 12,000 GALLONS CAPACITY FOR MALLET LOCOMOTIVES, ATCHISON, TOPEKA & SANTA FE.

The *Railway Age Gazette*, November 26, 1909, published a description of the heavy Mallet passenger and freight locomotives that have been built for the Atchison, Topeka & Santa Fe by the Baldwin Locomotive Works. Among the interesting features of these locomotives is the tender, which has the largest capacity yet furnished to any locomotives in the world. This capacity is 12,000 gallons of water and 4,000 gallons of oil, while the total weight in working order averages about 230,550 lbs. There was a two-fold reason for this great capacity—the scarcity of water in the region through which the locomotives are to operate and the excessive requirements of these heaviest of machines. Large tenders have been developed so gradually that it is difficult to realize that it is but a few years since 2,000 gallons was ordinary tank capacity, and 2,500 gallons was large. A thousand gallons have been added at intervals until 7,000 and even 8,000 gallons have become so common as not to attract especial attention. It is not probable, however, that this last maximum will be exceeded for some time, except where water is scarce or of poor quality and it is found to be more economical to haul the quantity needed in the tender than to purify the water or haul it in tank cars.





Water Tank; Mallet Locomotive Tender for the Santa Fe.

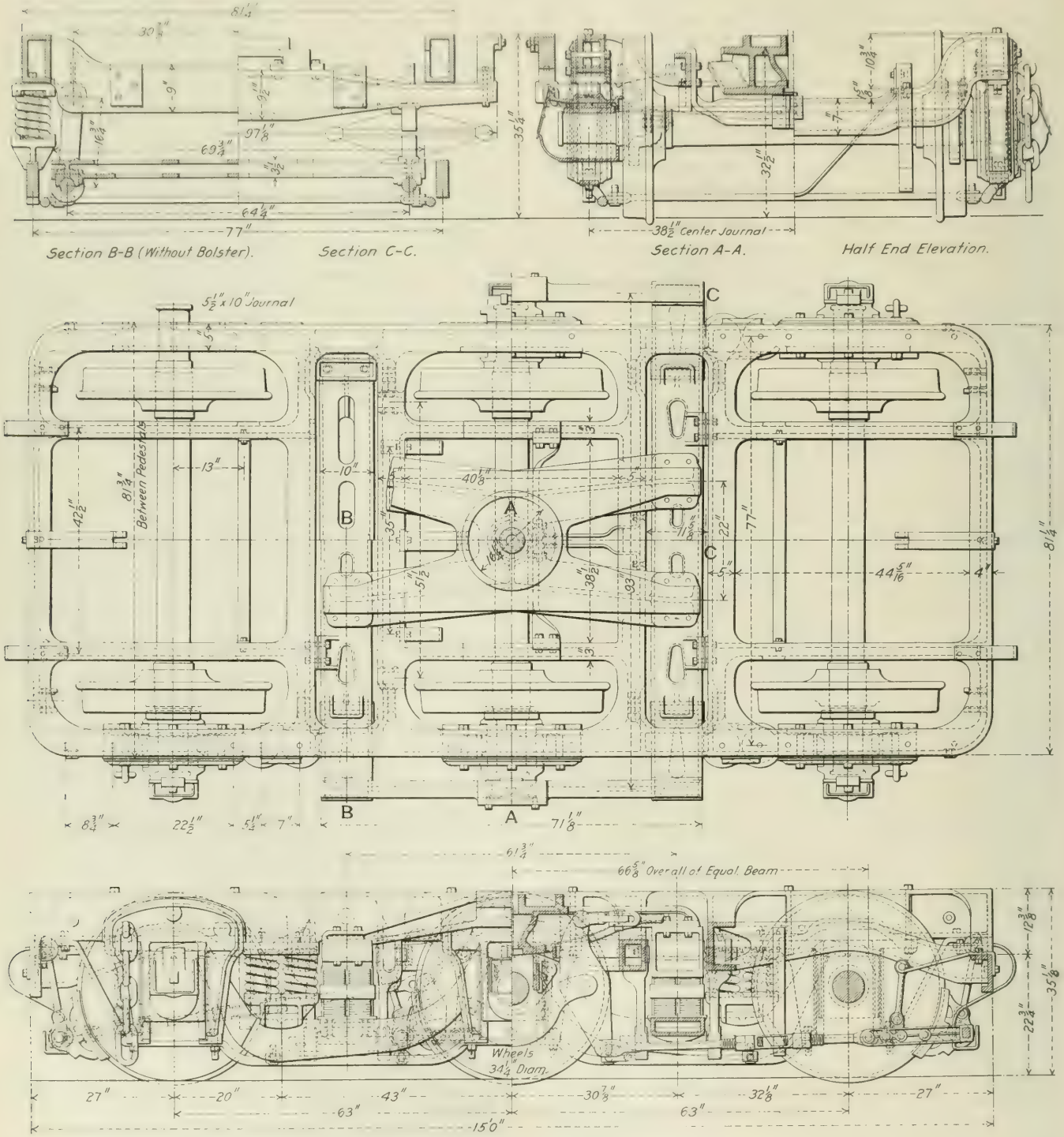
As far as constructional features are concerned, these large water tanks do not differ in general design from the smaller ones in common use, except in their adaptation to receive and carry the oil tank at the front end. As will be seen from the engraving, the back end closely resembles the ordinary tank. There is the same flat-topped body, with the slope at the front down to the top of the double floor. But instead of being bounded by the two legs of the U sides, the slope extends all the way across. At the front corners there are triangular towers that rise to the level of the back and in which are placed the siphon pipes and tank cock. The height of the tank is not excessive, for, of course, this was limited by the operating and clearance requirements, so that the load per sq. ft. of bottom is no more than in other large tanks, for the height is but 6 ft. 2 in. The width over the side sheets, also, is but 10 ft. 1½ in. It has been, therefore, by an increase of length that the desired capacity has been obtained, and this is 35 ft. 2 in. over the end sheets.

As for the details of the construction, the sheets are $\frac{5}{16}$ in. thick at the bottom and at the sides and ¼ in. at the top. The cross bracing is effected by means of angles flattened at the ends and rivetted to Ts that run along the inside face of the side sheets. They are spaced 30 and 32 in. from center to center. The splash plates are set at varying intervals throughout the length. In the double floor at the front they are 26 in. apart. Along the slope they are 29 in. and 30 in. apart, and in the body at the back they are 34 in. apart. In the body there are two 2¼-in. boiler tubes reaching from the top to the bottom plates that serve as drains for any splashing or overflow that may occur when the tank is being filled. Although there are no legs at the sides, as in the coal-carrying tender, the side sheets are run the whole length, thus presenting a smooth and even surface to the outside; sheets that are about 27 ft. long and 6 ft. 5 in. wide. The water tank is held to the frame by six heavy forged angle brackets at the back end and four at the front, as shown on the plan.

The oil tank is made to drop down into the space at the front end of the water tank that is bounded by the slope, the side sheets and the corner towers. It is carried on strips 3½ in. by 4 in., which run across the bottom and which rest on the smooth upper surfaces of the water tank. It is formed of ⅜-in. plates riveted to angles with the usual tank construction and is fitted in the interior with splash or surge plates in exactly the same manner as the water tank. The length of the oil tank is 16 ft. and its width is 9 ft. 6 in. There are two funnel openings by which it is filled, and it is fastened to the water tank by overlapping angles with a bolt passing through the legs in contact, as shown in the detail. These fastenings are located at the bottom in front, where there are four bolts in the angles, and at the back end, where there are two angles set 2 ft. 8 in. apart and with three bolts through each. It is fitted with two sling eyes on each side for lifting in and out of place.

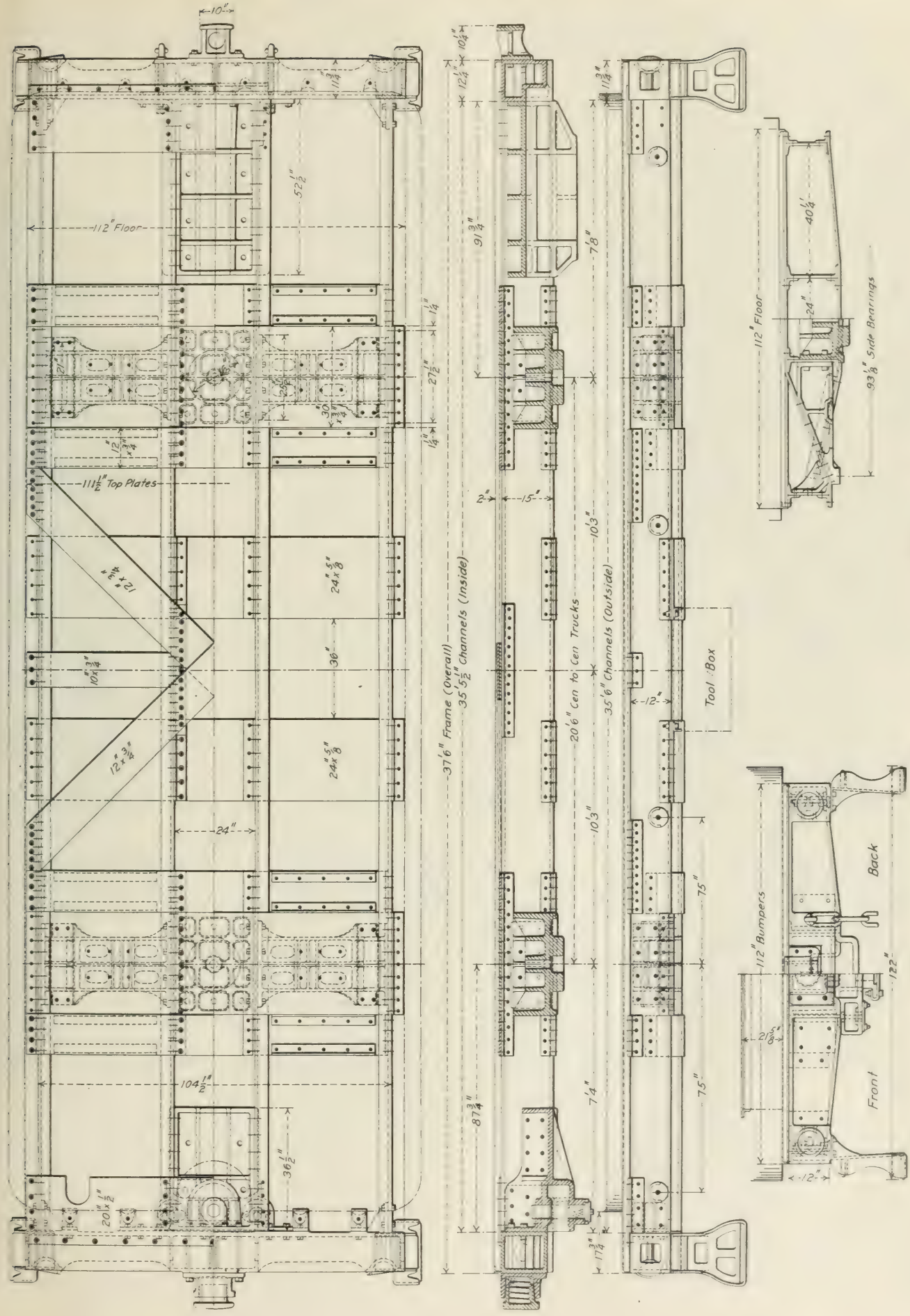
The frame is a composite structure of steel castings and rolled shapes. The length over all is 37 ft. 6 in. and the width 9 ft. 3 in., so that the water tank overhangs about 3 in. on each side. The side sills are of 12-in. channels, weighing 40 lbs. to the foot, and the center sills are 15 in. deep and

weigh 55 lbs. to the foot. There is a central diagonal bracing in the frame, as well as ample cross bracing at short intervals, and the center sills are tied together at the front and back with heavy steel castings. The bolsters are composite of steel castings and plates, as shown in the engraving. There is a heavy steel casting bolted in between the center sills and another between the center and side sills on each side. The side bearings, following the trend of recent practice, are set well to the outside and are spaced 93⅛ in. between centers, which brings them just inside the side sills. On each side of the main bolster there are frame braces that might be called auxiliary bolsters. They are formed of 12-in. by ¾-in. plates that pass beneath the center sills, to which they are riveted, and up to about the center of the web of the



Details of Truck; Mallet Locomotive Tender for the Santa Fe.

latter drops away to the outside so as to permit a heavy cover plate 30 in. by ¾ in. to be laid over the whole and come down from the top of the center to the bottom of the side sills, to which it is fastened by a rolled angle on the outside and a strongly-ribbed casting on the inside. This construction puts the top chord or coverplate in tension with a compression thrust on the bottom plates of the casting. side sills, to which they are riveted. These plates are presumably under compression, and so are stiffened against buckling by 3-in. by 3-in. by ⅜-in. angles riveted to their upper faces. Between these auxiliary bolsters there are two crossties set 36 in. apart, or 18 in. on either side of the center. They are of 24-in. by ⅝-in. plates riveted to the bottom flanges of all four sills. Above these there are two diagonal



Tender Frame; Mallet Locomotive for the Santa Fe.

braces of 12-in. by ⅜-in. plates riveted to angles which are, in turn, riveted to the webs of the channels. Attention is called to this feature of the design. By riveting an angle along the top and bottom edges of all four of the sill channels the drilling of holes in the valuable metal of the flanges is avoided, with its consequent weakening, while the whole is correspondingly stiffened. The only exception is to be found in four holes drilled in the top flange of the center sills close to the back end, to hold a light cover plate.

At the back end the filler between the center sills is a ribbed steel casting 52½ in. long running back from the cast-steel end sill. This extends across the whole end and has the sills abutting against its inside and is fastened to them by means of cast and forged angles. It carries pole pockets at the corners and has a seat at the center for the buffer casting. This filler does not, however, reach back to the bolster, so that all buffing stresses are transferred to and are are carried by the sills.

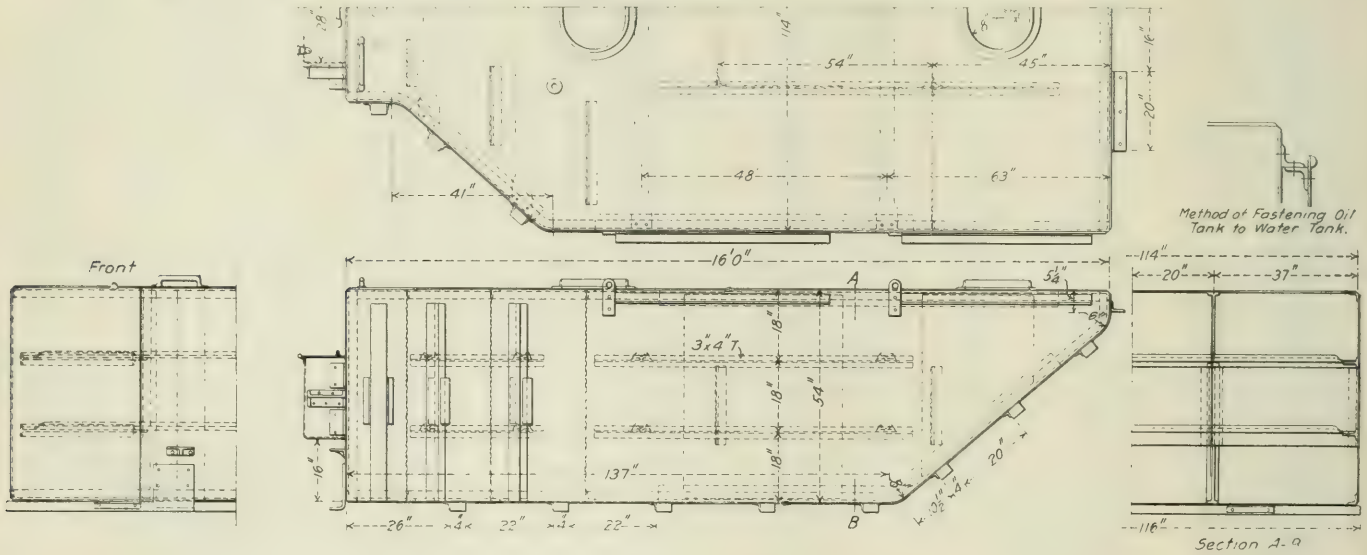
There is a similar arrangement at the front end, with the exception of the details. Here the filler is but 36½ in. long, and the buffer between the engine and tender is of the spring type.

With a weight of 230,550 lbs. to be carried, coupled with the very severe service that all tenders have to meet, it is evident that something better than the ordinary four-wheeled truck had to be provided. And it is here that we meet the real innovation and novelty of the tender. The truck used has six wheels and is a modification of the design of the usual form of six-wheeled truck that is used under passenger cars. In fact, it is a very close copy, the variations lying in the extensive use of steel castings for the framing and bolsters. There is the same arrangement of equalizers and springs and brake rigging that is to be found under Pullman cars, except that a nest of two helical springs set side by side is used on the equalizers instead of the usual single spring.

The frame, including the side pieces, end pieces and transoms, are formed of a single steel casting. This has a total length of 15 ft. and a width of 6 ft. 9¼ in. The transoms and end pieces are of channel section and the side pieces are of the box section. The possibility of getting such a design executed is not the least interesting part of the matter, for it is but a few years ago that a design of the casting presenting about the same problem to the foundryman was offered to a number of manufacturers and an order was declined except at prices that rendered its use out of the question.

The bolsters are box castings and the spring planks are also of cast steel. A steel casting, with four feet resting on the bolsters, is also used for the center-bearing arch-bar, and the center plate is cast solid with it. The truck is, therefore, interesting as an exemplification of the modification of an old design to new uses and new materials, and as marking the introduction of the six-wheeled truck into tender service.

These are the longest tenders that have been built up to the present. The trucks are set 20 ft. 6 in. from center to center and the wheel base is 31 ft., or nearly twice that of the ordinary tender. The action on the track, therefore, should be much easier; there should be less tendency to nose, and as a whole the relationship to the track should be more like that of a passenger coach than that of a freight car or tender.



Oil Tank; Capacity 4,000 Gallons. Mallet Locomotive Tender for the Santa Fe.

THE UNIT SYSTEM OF ORGANIZATION.*

BY MAJOR CHARLES HINE,
Special Representative, Union Pacific System—Southern Pacific Co.

The primary object of this paper is to explain the details of the unit system of organization that is being installed on the Harriman Lines under the direction of Julius Kruttschnitt, director of maintenance and operation, Union Pacific System—Southern Pacific Company. It is not desired so much to theorize as to what might, could, would or should be done, but rather to narrate what has been accomplished in actual practice.

An essential feature of the system for each unit is a senior assistant, who, ranking next to the head of the unit, remains in charge of the headquarters' offices and acts as executive officer. This senior assistant is supposed to see, with common-sense exceptions, all of the incoming and outgoing mail. If the other assistants are present at headquarters, they sign their own mail before it passes over the desk of the senior assistant for the latter's information. If an assistant is absent from headquarters he is represented, not by a chief clerk, but by a man of the wider experience of the senior assistant, who signs the routine mail in his own name. The absent assistant is advised of the action taken by such methods as common sense and courtesy may suggest. Matters highly technical are held for the return of the assistant, who is a specialist in that line.

The most difficult task in any organization of human endeavor is to correlate the activities of the workers on the outside with the necessary requirements of correspondence, records and accounting on the inside. The artisan in the shop,

*A paper read before the Western Railway Club, Chicago, January 18.

the traveling salesman on the road, the soldier in the field, the sailor at sea, the railway man on the line, all have their troubles with the man in the office. When the inside man knows the outside game at first hand such differences in points of view are minimized, friction avoided, and therefore money saved. Railway operation is the most exacting of human tasks. Like the conduct of a household, a farm, a hotel or ship, it is a continuous performance. Unlike those exacting occupations it must maintain its own communications over hundreds or thousands of miles of territory. So complex is its administration that chances should not be taken of losing money through half-baked decisions of partially trained office occupants. Most railway officials flatter themselves that when on the line they maintain a grasp on the office. Yet every hour in their absence action must be taken on matters which, apparently trivial in themselves, have far-reaching results. This statement is not a reflection upon the splendid ability and earnestness of railway officers. It is merely a recognition of the fact that a man can be in only one place at a time; that there are only 24 hours in the day and only 365 days in the year. The salary of one officer is negligible as a percentage of the operating cost of the average unit. Accordingly the system insists that the second best man of the unit, with practical outside training, shall stay at headquarters and sit on the lid. In some cases it has been found necessary to appoint another official to perform the previous outside duties of the senior assistant. In other cases it has been found that the outside work could be divided up among other members of the staff.

In any system of organization the most important unit is the individual. It is claimed that when one man signs the name of another the first by so much loses initiative and individuality. A man's name is his birthright, his signature his patent of enlightened manhood. Long habit on railways has perhaps minimized the pernicious effect of unconsciously building up one individual at the expense of many. Such industrial feudalism, however, can no more permanently endure than did the feudal serfdom of the middle ages. The unit system, therefore, insists that every man shall transact the company's business in his own name. There is nothing new in this. The whole system is really an extended application of the simple principles of train despatching. A train order is addressed impersonally "Conductor and Engineman." Where proper discipline obtains the signatures to the orders are genuine. When the oldest conductor lays off the youngest extra man does not sign the former's name to orders and reports. Addresses in official matters should be impersonal because of the possible difficulty of identification; because of the resulting elasticity in interior administration. One does not ordinarily address a letter to an individual attache of a firm, a bank, a hotel or a newspaper. He does not normally attempt to dictate who shall handle his communication. He leaves that to the intelligence and discretion of the organization that he is addressing. Under the unit system communications are addressed to the office—except when personal. The action taken, however, is by a real live man, whose identity is not concealed. The position is assumed that the recipient of a communication has the right to know what person is responsible therefor. The principle is established that except for a strictly personal staff, as for example, a private secretary, all persons report ordinarily to a headquarters or an office and not to an individual. The authority of such headquarters or office is always exercised by an individual. Authority, in an enlightened organization of society or industry, should be impersonal. Its exercise is highly personal.

The application of the above established principle to the reorganization of an operating division requires that the assistant superintendent shall become the senior assistant. If previously there is no assistant superintendent the trainmaster or most probable successor of the superintendent becomes the senior assistant.

The next step in making the division a complete unit with its head, the superintendent, in effect general manager, is to move the division master mechanic and the traveling engineer (road foreman of engines) to the same building with the superintendent. The division shop as a sub-unit is left in charge of a general foreman. The old theory has been that a master mechanic if located at the shops can better supervise the shop forces. It is believed that the volume of business and complexity of modern conditions have outgrown this theory. It is found in practice that the master mechanic spends much of his time in an office near the shop writing letters to the superintendent, the superintendent of motive power and other officers. Again, human nature is such that the master mechanic so located may unconsciously dwell on the plane of the division shop foreman at the expense of the former's mechanical responsibilities along the road and at outlying terminals. When this results his value as a division officer is diminished. The governing reason for locating the master mechanic and the traveling engineer with the superintendent is not only to gain a closer personal touch. Such contact is largely a matter of personal equation and of training regardless of location. The main object is to eliminate red tape by making possible a consolidation of files in one office of record. It has been demonstrated that, relieved of a bureau of unnecessary correspondence, the master mechanic can and does spend more hours among his men, whether in shops, on the road, or at terminals.

Assuming that the division engineer, the trainmaster and the chief despatcher are already located in the same building with the superintendent, the division is ready for reorganization. The general superintendent and the instructor visit division headquarters where are assembled the division officers and their old chief clerks. In an informal lecture of two or three hours' duration the principles of the system and its unwritten laws are outlined. Explanations are given of the revised standard circular of organization, which reads as follows:

..... RAIL..... COMPANY.
..... DIVISION.

OFFICE OF SUPERINTENDENT.

CIRCULAR NO. ....

..... 191....

Effective ..... 191...., this division discontinues among its officials the use of titles—Master Mechanic, Division Engineer, Trainmaster, Traveling Engineer and Chief Despatcher.

The following named officers are designated:

1. Mr. E. F.....Assistant Superintendent
2. Mr. G. H.....Assistant Superintendent
3. Mr. I. K.....Assistant Superintendent
4. Mr. L. M.....Assistant Superintendent
5. Mr. N. O.....Assistant Superintendent
6. Mr. P. Q.....Assistant Superintendent

They will be obeyed and respected accordingly.

Each of the above named officers continues charged with the responsibilities heretofore devolving upon him, and in addition assumes such other duties as may from time to time be assigned.

Such of the above as are located in the same building have one consolidated office file in common with the superintendent.

All reports and communications on the company's business, originating on this division, intended for the superintendent of for any assistant superintendent, should be addressed simply, "Assistant Superintendent" (telegrams "A. S.") no name being used unless the communication is intended to be personal rather than official, in which case it will be held unopened for the person addressed. It is intended that an assistant superintendent shall always be on duty in charge of the division headquarters offices during office hours. The designation of a particular assistant superintendent to handle specified classes of correspondence and telegrams is a matter concerning only this office. Each official transacts business in his own name, and no person should sign the name or initials of another. The principle to guide subordinate officers and employees is to be governed by the latest instructions issued and received.

Train orders will be given over the initials of the train despatcher on duty.

The modifications of pre-existing organization and methods herein ordered have been carefully worked out to expedite the company's business by the reduction and simplification of correspondence and records. It is expected and believed that officers and employees will insure a

successful outcome by lending their usual intelligent co-operation and hearty support.

Officers and other persons outside the jurisdiction of this division are requested to address official communications, intended for the superintendent or any assistant superintendent, "Superintendent, ... Division, ..." (telegrams "Supt."), without using the name of the superintendent except for personal matter.

C. D., *Superintendent.*

Approved: A. B., *General Superintendent.*

It will be observed that no distinct grade of senior assistant is created. The unwritten law is that whatever assistant is assigned to the charge of the headquarters' office becomes the senior for the time being. It was originally intended that different assistants should be detailed as the senior for certain definite periods. In some cases such a rigid rule may be necessary. The experience of a year indicates that the incidents and casualties of the service may usually be depended upon to let the situation work itself out. This is gratifying, since in such matters self-suggesting procedure is preferable to rigid rules. For example, if an assistant sprains his ankle or mashes his foot the superintendent can assign him to the office and send the then office man out on the road. Vacations and enforced absences afford the superintendent an opportunity to cover the situation by a common sense assignment. On one division the senior assistant was necessarily absent for some weeks. The maintenance assistant who happened to be next in rank was busy outside relaying the division with new steel. The third man, the mechanical assistant, had few troubles of his own in summer, and to him fell the opportunity to be broadened by a tour in the office. The superintendent and the other assistants, including the old traveling engineer, did the engine chasing. No circular was necessary, and there was less confusion than if two dispatchers had exchanged tricks.

In order that their authority may not be restricted when meeting a given emergency it is necessary to give the division officials the uniform title of assistant superintendent, without the limiting effect of a descriptive phrase. If any one can coin titles that will describe duties and not, under railway customs, restrict authority, such titles will be welcome. When a vacancy occurs the circular states, "Mr. ..... is appointed an Assistant Superintendent vice Mr. ....." His assignment to duty by the superintendent is verbal. If a superintendent should find himself with an assistant unfitted by temperament or experience to cope with a wider range of duties he could quietly restrict such assistant to a prescribed limit.

The assistant superintendents when at headquarters, except the senior assistant, have equal rank. On the road they have the relative rank indicated by the circular or the current working time table. In case two or more find themselves together and an interruption to traffic or other emergency requires, the highest on the list takes charge and becomes responsible. The system forces more officials to assume responsibility and by so much increases the protection to the company's interests. More and more is heard about "this division," and "the company" and less and less about "my department."

Most division officers have welcomed the title of assistant superintendent as a real promotion and as an increase in opportunity. Some still feel the loss of a distinctive title. Time alone will prove that railroading has become great enough as a profession to carry its own marks of distinction and to permit of a properly balanced specialization along the lines of greatest aptitude. Men like Julius Kruttschnitt, James McCrea, L. F. Loree, Epes Randolph, J. W. Kendrick, F. A. Delano and W. W. Atterbury, have not lost any reputation as civil and mechanical engineers because of their greater prominence as railway executives. For the same reason that a chief engineer blushingly accepts the title of vice-president, a division engineer should modestly aspire to the position of assistant superintendent. This is one of the features of the unit system that it will take a generation to work out. Eventually an official cannot hope to perform the duties of chief engineer, or superintendent of motive power, until he has had experience in the grade of division superintendent. When superintendents are selected from diversified sources this will be possible. An advantage of the uniform title of assistant superintendent is that, as in the case of vice-presidents, it necessitates speaking of a particular official by name. When any official is away from his headquarters, he is addressed by name.

The unit system makes a distinction between superior or co-ordinate units and subordinate units. Employees address "Assistant Superintendent." If they addressed "Superintendent" there would be an implied obligation on the part of the superintendent to answer. If his personal action is desired he must be addressed by name. Even though "assistant superintendent" is addressed the reply may be signed by the superintendent himself. Subject always to his superior's wishes, the superintendent makes his own office rules as to what he shall personally handle. It is up to him to see all, a part, or nothing for a given period, just as he sees fit. Should the superintendent's letter call for further information from the employee, the latter's reply would still be addressed, "Assistant Superintendent." For all that the sender knows the particular officer may be necessarily absent when the letter is received. Numerous old conductors have expressed their appreciation of the fact that a man knows what official has addressed him, and that it is no longer possible to be jacked up by a clerk using the name of an official.

Communications from superior or co-ordinate authority are addressed to the head of the unit, the superintendent. In his absence routine matters for higher or co-ordinate authority are signed by the senior assistant who appends to his own title the explanatory phrase, "For and in the absence of the superintendent." Going down on the division no such explanation is necessary, as the authority of any assistant superintendent carries over the division itself.

The superintendent being in effect general manager of his division is given charge of division stores as well as division shops. He must, therefore, obey the instructions of the general storekeeper as well as the superintendent of motive power. The general storekeeper has thus placed at his disposal all the administrative machinery of the division. Instead of a lack of practical sympathy between the stores and the users of material, it is made the duty of the superintendent and the assistant superintendents to watch material costs as well as labor costs, to help keep down interest charge on stocks as well as overtime. A railway harnesses the forces of nature, including its divinely human elements, for one purpose, the manufacture and sale of an intangible commodity, transportation. The more closely interwoven the constituent parts of production the more efficient and economical should be the output. When weaknesses develop, when education is needed as to the increased importance of a given element, the remedy is not necessarily the creation of a separate department. A general storekeeper there should be, whatever his title, technically expert in his important specialty, responsible to the general manager and in a position to insist upon efficiency to the extent even of ordering material moved in special trains when it is true economy for the company to do so.

It will be noted that the superintendent, as the representative of all so-called departments on his division, has about as many superiors as he has assistants. The work of these superiors is balanced by the general manager. The scheme will not be fully effective until the unit system is applied to the general offices, making the general superintendent, the chief engineer, the superintendent of motive power, the general storekeeper, the car service agent, the superintendent of telegraph, the signal engineer, and the superintendent of dining cars all assistant general managers with one consolidated office [illegible], and their activities co-ordinated by a senior as-

sistant general manager at headquarters. Thus far only one general office, that of the new Oregon & Washington at Seattle, has been reorganized in accordance with this conception.

The number of divisions now reorganized is twenty-one, with eleven still to follow. The number of assistant superintendents on a division varies from three to twelve. Every superintendent has shown his ability to handle as many assistants as the management may give him. The most gratifying feature of the reorganization is the fact that in all cases the talent at hand has been sufficient. No importations have been necessary. The incumbents of official positions have responded splendidly to the confidence reposed in their ability. Some divisions have gone farther than others. This always has been and always will be the case. Every one, however, has made real progress, some of it unconscious. The human element has been recognized. Division officers who from lack of early breadth of opportunity have not the qualifications for senior assistant are not required to fill the position. Their services to the company have been too faithful to warrant humiliation or elimination. Their grasp of present conditions is greater than could be that of student successors. When, in the course of nature, a new crop of officers matures it will be ripened younger but attain a fuller growth.

Consideration has been shown for the clerical forces affected by the changes. No individual has had his salary cut. As vacancies occur through natural causes salaries are readjusted; some increased, some diminished to meet the new conditions. All of these matters are left to the local officers. Principles are enunciated, suggestions made, but responsibility for details is left to the officials on the ground. The system means more officers and eventually fewer clerks. Probably by a cheese paring effort enough clerks could be eliminated to offset such increases in official salary lists as have been found necessary. The management has felt that increased supervision will warrant the outlay. This liberal policy is justified by good business sense rather than by the prosperity of the Harriman Lines. The poorer a road the more money it should spend for supervision and the development of esprit de corps.

Formerly office work was grouped around officers. This resulted in petty principalities and bureaucratic administration. By tearing down some office partitions there were razed those figurative department walls, which so often operate to keep in the man who is trying to keep the other fellow out. Under the new conception the work is grouped by classes. The technical term among business experts is "the concentration and co-ordination of routine and related processes." At a small roundhouse a handy man may be machinist, boiler maker and car repairer. In a large shop for obvious reasons the boiler makers and machinists are segregated. So, in an office, stenographers may be pooled, accountants segregated and clerks concentrated for the general good of the office work rather than for the fancied importance of a particular phase. The key to success in the unit system is a properly handled file room. It is given preferred attention and whatever force is necessary. When all the clerks of the division are pooled no difficulty is experienced in finding sufficient to handle the file room. Williams' "Railroad Classification" is being installed with a view to uniform filing over the Harriman Lines.

As a general proposition officers at headquarters should not exchange written communications among themselves. Superintendents must apply this principle without hard and fast rules. For example, the superintendent of a heavy division, being on the line some 200 miles from headquarters, very properly addressed a joint letter to each of his ten assistants, calling their attention to a wreck he had just picked up, and as the lesson to be learned enjoined upon them a vigilant enforcement of certain rules. It has been found possible to reduce the correspondence of divisions reorganized from 30 to 50 per cent. Even with reduced clerical forces night and Sunday office work have been eliminated. The great reduction is made possible by the constant presence of the senior assistant, who is alert to discourage the letter-writing propensities of headquarters. It is expected that when all of the units under the Chicago office are reorganized there will be a net saving of at least 500,000 letters per year. Every letter costs a few cents to produce. Its retarding effect upon administration cannot be measured in money. Its dwarfing influence upon the individual initiative of the man below is likewise indeterminate. It is expected also that when the reorganization is completed numerous routine reports can be omitted.

It is not expected that a mere change of title or an assignment by a superintendent will make a man a skilled mechanic or an experienced engineer. For technical questions arising on a division the most expert knowledge available will continue to be utilized. It is claimed, however, that as the average division officer has been in the service at least ten or fifteen years, he cannot fail to have acquired some familiarity with the requirements of the various branches of the work. The old trainmaster may as third trick despatcher have ordered an engine taken down and towed in without awakening the master mechanic. By so much more should he with wider experience be able to say whether or not the company's interests are being best observed in the handling of a locomotive that may happen to come under his notice. The mechanical assistant cannot be everywhere, and any help that his fellow-officials can render the company should receive. Conflict of authority is avoided by the common sense and courtesy of the assistants and by the attention of the superintendent. Nothing makes men so conservative as responsibility. It is claimed that the superintendent on the ground is better able to decide these questions intelligently than is a hard and fast code formulated by a man behind a distant desk. What is construction to-day will be maintenance to-morrow. What is motive power at the turntable becomes transportation at the switch.

Each officer continues responsible for his branch of the work until otherwise indicated by the superintendent. The maintenance assistant is not allowed to plead transportation duties as an excuse for defective track. With him track must come first. When the train stops he cannot inspect track until it resumes. Meantime he may be able to minimize the delay by seeing that employees perform their duties promptly. He is not allowed, except for insubordination, to discharge employees on another assistant's payroll. He is expected, however, tactfully and politely but forcefully, to insist that the rules be obeyed. The faithful old employees need only encouragement to perform their duties well. The young and inexperienced require constant supervision and instruction. Due to its great extent of territory a railway exercises less control over its employees than any other line of organized effort. The safety of lives and property demands the greatest possible intelligent supervision.

Adaptability to changed conditions is largely a matter of temperament. Among his intimates one can usually predict in advance what position a particular person will take on a question of politics, religion or organization. Some men believe in an early convergence of authority, in wide latitude of discretion. Others believe that the best results are obtained by postponing decisions until the highest possible authority is reached. On important questions there are usually two schools of opinion. Nearly every civilized country has two great political parties. On the railways of America there will always be diversity of opinions and practices as to the organization of forces. The executive officers of the Harriman Lines have felt that the individual will be broadened and the service correspondingly improved by the introduction of the elastic methods herein outlined. While many are enthusiastic, not all of the persons affected are convinced. It is to the credit of the latter that in spite of honest doubts all have contributed more or less to the success of the scheme. The work is being kept on a high plane, guided by those exalted ideals of duty: freedom from personalities, and the good of the service.

SCHERL MONORAIL GYROSCOPE CAR.

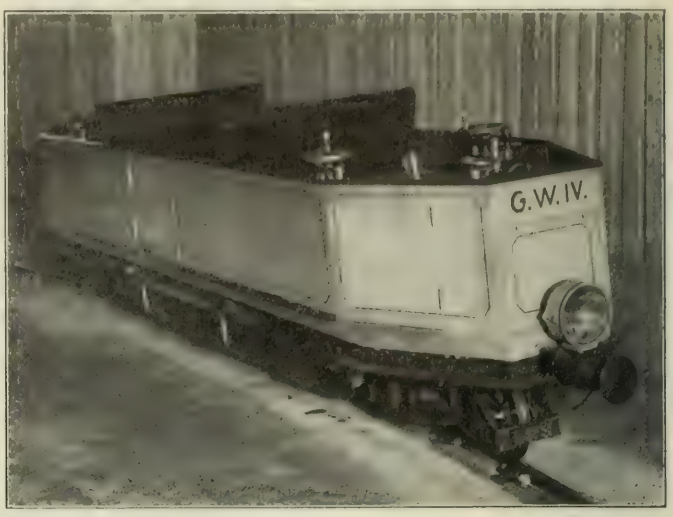
The illustrations herewith show two views of the German gyroscope monorail car, invented by Richard Scherl. This car, shown in exhibitions and trial runs which are now being made in Brooklyn, N. Y., was referred to in these columns last week.

The car has a total seating capacity for six passengers, including the motorman. It is 18 ft. long and 4 ft. wide and weighs 5,500 lbs., about 5½ per cent. of which weight is due to the two gyroscopes. These gyroscopes, which are carried underneath the car body, are operated within steel chambers, the pressure in which is reduced to a vacuum. Each wheel weighs about 110 lbs. and revolves at a speed of 8,000 r.p.m. They revolve in opposite directions and are operated by 115-volt, d.c., shunt-wound motors, of less than ½-h.p. each. These motors have nothing to do with the propulsion of the car, but affect its stability only. Their ability to maintain the car body in an upright position has been demonstrated in the trials at Brooklyn. The gyroscope, it is said, will continue to revolve and maintain the car's equilibrium for about an hour after the current is interrupted. Pertect stability was maintained even when a passenger was carried seated upon the side of the car, running at about four miles per hour on straight track and three and one-half miles per hour on curves. On meeting curves, the car would, of course, incline toward the center, but this movement would not take place until the actual curve was reached. There is apparently no provision for the cars being prepared to meet a curve, a detail which would be of greater importance as the speed is increased. It is not possible with the single rail to prepare the car for a curve as is the case when two rails are used.

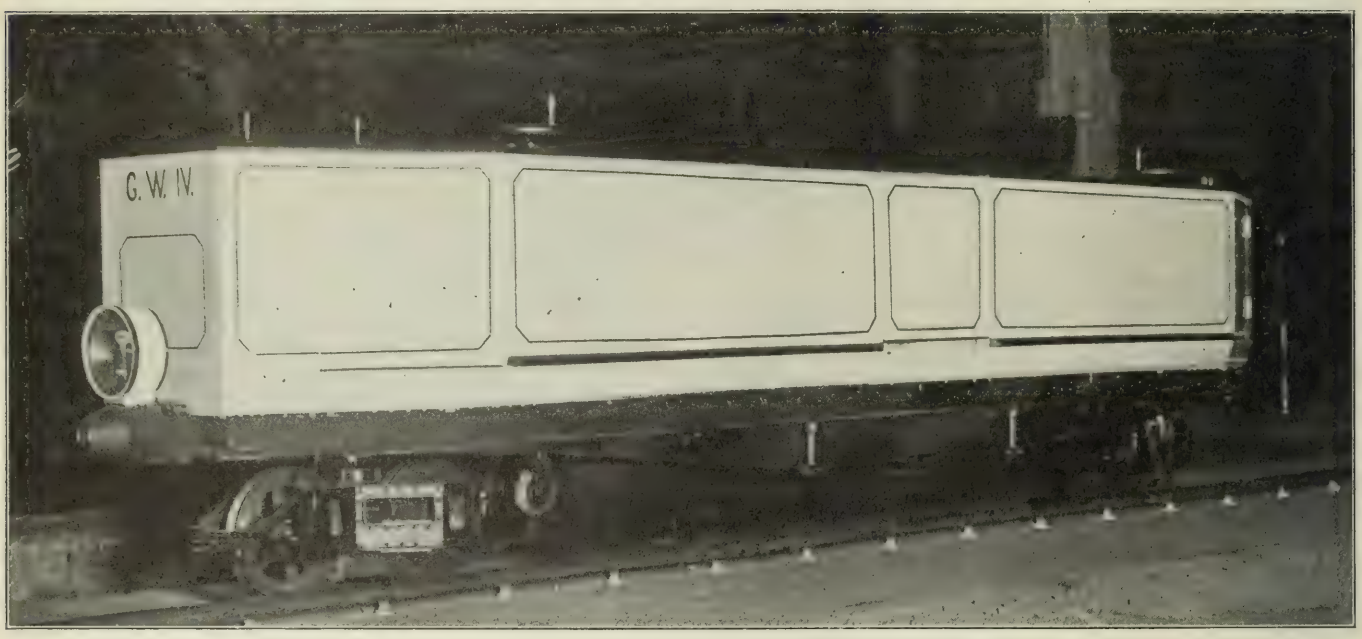
The car is propelled by two 2-h.p., 115-volt, d.c. series motors, through gearing to the wheels of the two-wheel trucks. These wheels are double flanged to conform to the section of the 20-lb. rails. The two current collectors are suspended near the rear wheel of the rear truck, one collector on each side. The two feed wires run along the ties a few inches below the top of the rail. These collectors are shown in the illustrations, as is the general construction of the car body and the truck frames. The truck pin centers are 15 ft. apart and the wheels are 12 in. in diameter. Inside-hung brakes are provided on each truck.

There are four emergency balance rods carrying small rollers which can be dropped to the ground in case of accident. The hand wheels for securing these roller spindles are seen in the illustration.

Gyroscope monorail cars of the Scherl and of the Brennan types have been undergoing tests for some time in Germany and England, but the present demonstrations in Brooklyn are the first which have been made in this country.



Scherl Monorail Car on Curve.



Scherl Monorail Gyroscope Car.

RAILWAY BUILDING IN CUBA.

Active operations in railway building are going on in the provinces of Pinar del Rio, Santa Clara, Camaguey and Oriente, in Cuba, and many thousand men are employed. There appears to be a pronounced tendency to close up the gaps in the lines and to strike out across new territories, so as to give even the most remote corners of the island convenient connections by rail with the largest cities or the smallest towns. With the work on hand finished in the Province of Oriente, the whole southwestern portion of it will be opened up. The general manager of the Cuba Railroad predicted the opening line between Bayamo and Santiago will be opened in June, 1910. President Gomez recommended, in his last message to Congress, the building of a line between Nuevitas and

Caibarien on the north coast of the island, and a bill has since been introduced in Congress to subsidize the construction of this line. At Camaguey a new station is being erected. The new work in Santa Clara Province consists of an extension south from Placetas to Trinidad. This branch is about half finished and runs between and parallel to the Sancti Spiritus and the Cienfuegos branches.

REJECTING LOADED FREIGHT CARS AT INTERCHANGE POINTS.

The paper at the meeting of the Western Railway Club, Chicago, on the evening of October 19 was by William Baird, shop superintendent of the Chicago, Burlington & Quincy, at Plattsmouth, Neb. It was entitled "Twentieth Century Inspection; or, Run, Repair or Transfer," and dealt with the delays caused to loaded cars at terminals by the refusal of receiving lines to take them, owing to defects. Mr. Baird said:

"Substantially one-half of all of the tonnage offered by the patrons for transportation must pass beyond the initial carrier to reach its destination, and much of this interchanged tonnage must be handled by from two to a dozen lines in reaching its journey's end. Upward of 800,000,000 tons per year come under this head. This means that perhaps 100,000 cars every day, in order to move their loads to destination, must pass over several railways on a single trip. We know, also, that this interchange between railways does not take place in the open country where room is plentiful, but occurs in the commercial centers where congestions are easily caused, where room is always at a high premium, and where cost of operation is invariably high. Yet, in these terminals, where the minimum of delay produces the maximum of trouble, it is no uncommon thing to see important trains held for hours to get the through cars from connections, only to find that one-half the cars were refused by the car inspector, and why? Because a roof-board was broken, or a corner knocked off a piece of sheathing, or a wheel had a flat spot that was just to the limit, and had run perhaps 300 miles over the delivering company's line, but as it was just 2½ in. it must go to the repair track, not of the receiving line, but back to the delivering line, to have a pair of wheels applied, resulting in a delay to the contents of 24 hours. What encouragement is this to the freight agent, who has solicited the shipment, telling the shipper if he will only ship by his line he may be assured of prompt service?

"What answer are we mechanical men prepared to make? Who is responsible for the delay? Simply the M. C. B. rules in saying if such and such a defect exist on a car it 'may' be rejected, and rejected it is, regardless of the contents. The car is moved from the transfer back to the delivering line yard, kicked in on a track with a lot of other bad orders, and on the following day is taken to the repair track, but in the meantime is further damaged in switching and perhaps the contents as well, and, in addition to the delay, the railway has a claim to pay, all because a car inspector, who, in many cases, does not give a thought in connection with the movement of equipment other than to look for defects as laid down in the M. C. B. rules; has no idea of the responsibility of the railway to the shipper, and cares less, but just loves to 'get even' with the inspector of the delivering line, who at some time sent cars back to him. While perhaps this method of handling business was all right in its day, it has had its day. The railways and the business world have outgrown such methods, and I believe we are ready for a change.

"At some of our large interchange points local rules have been adopted that keep the loaded car moving forward. When such rules have been in force for any length of time the roads would not think of returning to the set-back plan, but these local rules are not sufficient for the business of the whole country. What is wanted is a rule embodied in the M. C. B. rules in large type, reading somewhat like this: 'LOADED CARS MUST BE ACCEPTED. IF NOT IN A SAFE AND SERVICEABLE CONDITION, THE RECEIVING LINE SHALL REPAIR THE CAR OR TRANSFER THE LOAD.' In other words, we must take the load and 'run, repair or transfer.'

"The writer was a member of the Rocky Mountain Railway Club and tried several years ago to get a recommendation to the Master Car Builders' arbitration committee advocating the universal adoption of the 'run, repair or transfer' plan by revising section 1 of M. C. B. rule 2. A year later a similar recommendation was offered in the Western Railway Club by another gentleman. Both clubs refused to consider them, but I believe the time is now ripe for this club to send in some such recommendation to the M. C. B. Association, and with all its energy urge that twentieth-century inspection become a part of the rules of 1910. The question of whether the delivering or receiving line should stand the cost of transfer is one that will arise, and no doubt will cause some dissension; some will favor charging the cost to the delivering line, and others to the receiving line, but let us not allow anything to cloud the issue or keep us from overcoming the practice of rejecting freight when tendered in interchange between railways.

"If a joint inspector is employed, whose duty it shall be to pass upon the cars and issue authority for transfer, it does not so greatly matter which road stands the expense, just so the practice is uniform throughout the country; but where there is no joint inspector, the writer, after long experience, has noted that at points where expense of transfer is borne by the receiving line, the work is apt to be done more quickly and at much less cost. Besides, all disputes and resulting correspondence are thus avoided. But whatever our individual views may be, the railways have now adopted a uniform rule defining responsibility in case of transfer taking place in transit, and if experience shows the rule can be improved, it is fair to assume changes wil be made. The adoption of this rule fixing responsibility for cost of transfer unties the hands of the M. C. B. Association, and makes it possible to adopt the 'run, repair or transfer' practice.

"It may be pointed out that lines deliver more loaded cars than they receive, but even so, do we ask the wholesale merchant, who delivers his freight at our depots, to transfer it across our freight sheds and stow it in the car? No; we solicit him for his freight and gladly pay for the stowing in our cars. Why, then, expect a railway, which gives you a carload of freight, to stow it in your car because you do not want to run the car in which it is delivered to you?

"Before the day of physical connections between railways, when but little business was destined beyond the initial line, freight was carted across from one railway to another and placed upon a platform, being later stowed into the car supplied by the receiving line. When physical connections were established to meet the demands of a growing business, what rights or privileges were acquired by the receiving line that it did not possess before, and what rights which the delivering line previously enjoyed were taken away from it? What little merit there might at first appear in sanctioning the practice of rejecting loaded cars seems to be removed when it is remembered that all railways are both delivering and receiving railways, and it does not require an expert to see at a glance the folly of road A returning to road B a carload of his customer's freight in order that B may put it in a car suitable to A and then have B return a carload of his customer's freight to A in order that A may place it in a car suitable to B, thus handling two carloads in directions contrary to their destinations, delaying both, congesting terminals, inviting criticism from shippers and demoralizing things in general.

"If this set-back practice could be carried on out in the open country on some branch where other business would not be affected, the result, while fearful to contemplate, would

not so sorely reflect upon us mechanical men as is now the case where we have carried our set-back practice into our crowded terminals, where every inch of space is needed. It is bad enough to have inspectors who will take advantage of the rules. How much worse to have rules officially sanctioning the rejection of business after being accepted from the shipper and started on its journey?"

The secretary read a number of letters from prominent M. C. B. Association members, which indicated a diversity of opinion on the subject of the acceptance of bad order loaded cars.

R. E. Smith (A. C. L.) thought that the present M. C. B. rules should be sufficient to cover the case, and was in favor of making the car owner responsible for defects excepting in brake-shoes, air hose, brasses, draft bolts and draft springs. George A. Hancock (St. L. & S. F.) favored the views expressed by Mr. Baird, and presented some arguments to show that it was best to run, repair or transfer loaded cars in interchange. J. W. Marden (B. & M.) sent a telegram, saying that it is his road's regular rule to accept defective loaded cars and repair them or transfer the load if necessary. J. H. Manning (D. & H.) sent a letter, saying he favors the present M. C. B. rules, and thinks them sufficient to cover the requirements. F. W. Dickinson (B. & L. E.) disagreed with Mr. Baird and favored a strict enforcement of present M. C. B. rules. This sentiment was also expressed in a letter from F. H. Stark, of the Pittsburgh Coal Company.

H. La Rue, of the Rock Island, spoke in favor of the Chicago agreement governing car interchange. It is working successfully, causing little delay to the movement of loaded cars. W. E. Symons (C. G. W.) spoke at length on the variation in the strength of cars as offered in interchange. He gave figures to show the magnitude of the blow delivered by heavy cars in switching and the comparative buffing areas of freight cars, indicating a variation of 400 per cent. in the latter. Mr. Symons believes that in the future there will be a government board of inspectors which will determine on standard construction of freight cars in interchanges and decide which are sufficiently strong for general traffic, just as the present government inspection of ships and steamboats determines whether their construction is safe. Major Charles D. Hine spoke on the value of organization, and thought that many of the difficulties of interchange could be overcome by a better education of the car inspectors. F. W. Brazier (N. Y. C.) said that at many of the large transfer points the troubles complained of by Mr. Baird did not exist, and at the Niagara frontier 40 per cent. of the cars offered in interchange, if defective, are either repaired or the load is transferred.

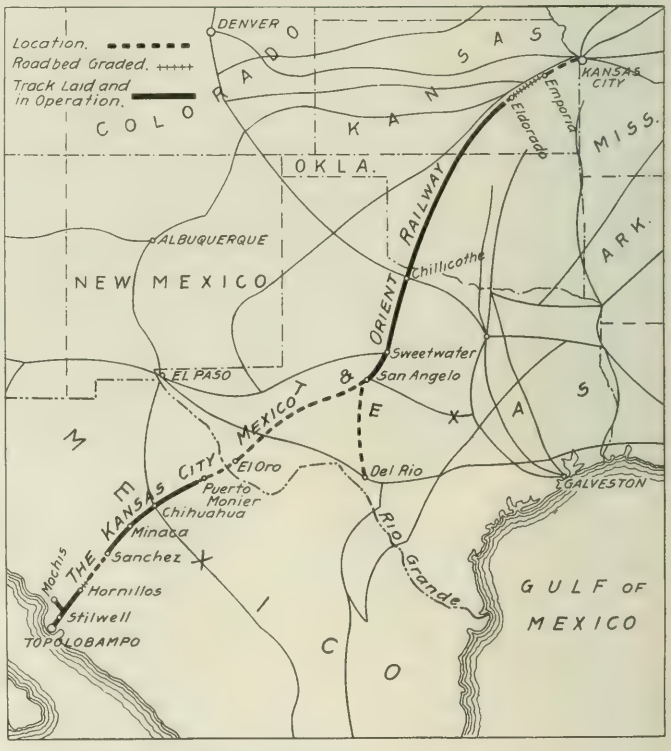
A. E. Manchester (C., M. & St. P.) gave a brief history of the development of the Chicago agreement and of the resons which led up to the changes in the M. C. B. rules requiring the car owners to be responsible for many defects. Le Grande Parish (L. S. & M. S.) said that much of the trouble in interchange is caused by the low capacity, weak wooden cars and the rules should be gradually modified so as to more powerfully discourage the use of weak cars in that service. T. H. Goodnow (L. S & M. S.) said that the use of steel cars in the Chicago district has resulted in 75 per cent. reduction in the number of repair cards required. Arthur Hale, of the American Railway Association, reviewed the discussion in an admirable manner, and said that the present M. C. B. rules really admit of the twentieth-century inspection advocated in Mr. Baird's paper, thought they do not actually prescribe it. He said that the present loaded car movement in the United States amounted to 185,000 cars a day, and of these fully 100,000 are interchanged. Mr. Hale thought that a great effort should be made to avoid setbacks; that is, the return of loaded cars to the offering road instead of having them continue on to destination, and to have the necessary repair or transfer made by the accepting line. The Chicago agreement and those in use at St. Louis, Cincinnati and Niagara are really based on the principles advocated by Mr. Baird, although the rules do not state the case as definitely as Mr. Baird has stated it in his paper.

It was brought out in a further discussion by H. E. Passmore (T. & O. C.) and by Mr. Goodnow that the so-called Chicago agreement governing interchange of cars is working under a system based on written laws or rules, but is so flexible as to admit of the interchange of cars by temporary memorandum or record which the rules did not fully cover and which was designated by several speakers as "local option"—that is, the inspector exercises some discretion in meeting local requirements, and thus facilitates the movement of cars both empty and loaded and prevents the return of many defective loaded cars to the delivering road. The time required to inspect a long train was considered a matter of some interest, and the general impression was that an inspector would require at least one or two minutes for the inspection of one car, but Mr. Parish reported that although they had some idea, at Elkhart it was quite frequently the case that a train of 60 cars was inspected in 12 minutes, which would make an average of only 12 seconds per car.

It was evident that there was a strong sentiment in favor of Mr. Baird's views and a desire that the M. C. B. rules shall be modified so as to meet them.

TRAFFIC REPORT ON THE KANSAS CITY, MEXICO & ORIENT.

At the request of the London finance committee and a large number of American stockholders of the Kansas City, Mexico & Orient, E. Dickinson, vice-president and general manager,



The Route of the K. C., M. & O.

and J. T. Odell, vice-president, have made a report on the probable future earnings and traffic possibilities of the property, which now extends from Wichita, Kan., through Kansas, Oklahoma and Texas to San Angelo, 510 miles.

The report is divided into two parts, estimating future earnings of the entire road in the United States and of the entire line in Mexico respectively. The railway between Wichita and Sweetwater, 432 miles, was finished in January,

1909, and the report was made in November, 1909. Freight and passenger earnings from January to November had to come from the development of an almost virgin territory in the states of Texas and Oklahoma. The chief engineer and the freight traffic manager of the Orient were asked to make an estimate of the earnings of a complete line to the Rio Grande, basing their computations on the earnings of the section now in operation. They figure that the average earnings per mile on the completed line will be $6,951.

They arrive at this figure by using the following facts and assumptions: They figure that there will be 4,593,000 acres of land under cultivation, tributary to the Orient road, made up of 4,400,000 acres of territory at present tributary to the line between Wichita and Sweetwater, this strip being 16 miles wide, of which 75 per cent. is susceptible of agricultural development, from which is subtracted 15 per cent. as the area which may become tributary to the roads built in the future. This leaves 2,805,000 acres tributary to the road between Wichita and Sweetwater. They figure that there will be 408,000 acres of tillable land permanently tributary to the road between Sweetwater and San Angelo, a distance of 78 miles, and 1,380,000 acres of tillable land permanently tributary to the line between San Angelo and the Rio Grande, a distance of 304 miles. The present tillable land tributary to the road yields about one dollar an acre revenue. In estimating the gross earings the total tillable acreage that would be tributary to the computed line is assumed to be of such a nature as to yield the railways sixty cents revenue per acre, making a yearly revenue from this source of $2,755,800. Revenue from live stock shipments, they estimate, will yield $511,000; carload freight, $261,000; l.c.l. freight, $225,000; through freight traffic, $583,000; passenger traffic, $1,221,000, and mail and express revenue, $102,000, making a total of $5,659,000, or $6,951 per mile.

The estimate of revenue from cattle shipments is based on the figures furnished by H. H. Sparks, general live stock agent, who uses the present shipments and an assumption of the new business to be furnished by the completion of the line in figuring the total shipments. There will be shipped, it is estimated, 625 cars of sheep, 90 per cent. of which will go to Kansas City, and when the line is completed these shipments will increase 25 per cent., making the total shipment 780 cars. When the road is completed to the Rio Grande river it is estimated that there will be shipments of cattle amounting to 4,500 cars.

Messrs. Odell and Dickinson say that of the actual tillable acreage between Wichita and Sweetwater, only 800,000 acres, or 25 per cent., are as yet under civilization, and the estimates made are based on earnings and traffic derived from this acreage. For the purpose of handling the traffic from this 800,000 acres, there have been built along the line of the railway, among other industries, 37 grain elevators, 10 standard flour mills, with an aggregate capacity of 3,000 barrels per day, and 53 cotton gins for handling raw cotton, extracting the seed and temporarily baling the cotton for compress. The average yield of one dollar per acre of revenue to the railway was in a time of a severe drought, and while the country, as a whole, was suffering from the effects of the panic.

The Kansas City, Mexico & Orient shortens the distance from San Angelo, which is the distributing point for a territory extending 150 miles west and southwest to Kansas City, by 240 miles. The report says: "The estimated earnings per mile of road in the United States (excluding the Del Rio line) of $6,551 is the result of a most thorough investigation, and we (Messrs. Odell and Dickinson) are willing to assume the responsibility for the statement. In round figures we will call it $7,000, and take the distance from Kansas City to the Rio Grande as 1,022 miles, making gross earnings of $7,154,000. In determining what the net earnings should be we are willing to say 33⅓ per cent. of the gross, provided, however, that the road is equipped with all necessary facilities for the prompt and economical handling of the traffic; otherwise no safe estimate can be made. Therefore, under the conditions of a completed road in all its details the net earnings will be $2,384,666, which is in excess of the interest on the bonded debt of the entire road between Kansas City and Topolobampo."

Of the total distance in Mexico, 242 miles are in operation, as follows: East of Chihuahua, 87 miles; west of Minaca, 77 miles, and east of Topolobampo, 78 miles. In addition, the company has working agreements with the Chihuahua & Pacific to operate over the line from Chihuahua to Minaca, 126 miles, making a total operated mileage of 368 miles.

Of the country to be traversed by the completed road, that from the Rio Grande to Chihuahua, 166 miles, is largely undeveloped and is devoted principally to stock raising. Small tracts are irrigated and are very productive, and there is a large area in the Conchos river and Rio Grande valleys favorably located for irrigation. The recently built smelter of the American Smelter & Refining Co. at Chihuahua has a capacity of 1,000 tons of ore per day.

From Minaca, the western terminus of the Chihuahua & Pacific, for 200 miles west there is a heavy growth of white pine timber. There are also a number of mines in this section, some of which were in operation at the time of Cortez. From the end of the timber belt to the western slope of the Sierra Madre mountains there are a number of cattle ranges, and in the foot hills there are deposits of anthracite and bituminous coal. The western slope of the mountains produces oranges, lemons, bananas, sugar cane, etc.

The harbor of Topolobampo was said by Admiral Dewey, in his report of 1876, to be the best on the west coast of North America south of San Francisco. The deepwater roadstead has 3½ square miles of area that is protected by high hills. The railway company has been granted a large part of the water front, and a contract has been made with the Hamburg-American Steamship Co. for service from Aopolobampo to Asiatic and South American countries. The Orient road will form the shortest line from the Missouri river to the Pacific coast, and through its connection with Mexican railways it will form a line from Kansas City to the city of Mexico equal in length to the shortest line now in operation.

The chief engineer and the freight traffic manager were asked to make an estimate of the probable earnings of the projected line in Mexico. As a basis for this estimate they assume that there will be 600,000 acres of tillable land tributary to the line from the Rio Grande to Chihuahua. The production of 10 bushels to the acre on this land would contribute an annual revenue of sixty cents per acre, or $360,000. Products of mines, it is assumed, will furnish 6,000 carloads per year, and at $40 per car this would equal $240,000; shipments of cattle are estimated at 300 cars at $20 per car, making $6,000; l.c.l. shipments are estimated at 730 cars at $75 per car, or $54,750, and passenger and mail and express earnings are taken at $99,000. Basedon these estimates the total earnings on the line between the Rio Grande and Chihuahua would be $759,750, or an average of $4,577 per mile.

Near the point where the railway crosses the Rio Grande there are deposits of bituminous coal, but in the above estimate earnings from this source are not included. On the line west of Minaca extending 200 miles to Topolobampo, the engineer and traffic manager estimate that there will be 1,380,000 acres of tillable land tributary to the road. This land, it is estimated, will contribute fifty cents an acre in revenue to the railway, making $690,000. It is figured that there will be annual shipments of 7,000 cars of lumber, 3,000 cars of ties and 700 cars of firewood, which would yield the railway $227,000 from the movement of forest products. Mine products, it is assumed, will furnish 4,500 cars of traffic, the revenue from which will amount to $337,500; l.c.l. shipments will furnish $72,000, and passenger, mail and express shipments, $207,000.

This makes total estimated earnings on the line from Minaca to Topolobampo of $1,583,500, or $4,590 per mile.

Messrs. Dickinson and Odell point out that cotton shipments from the south and southwest to China and Japan aggregate approximately 600,000 bales per year, the traffic moving through San Francisco and Seattle, a mean distance by rail of 3,321 miles, from the cotton growing centers. The mean distance from the same territory to Topolobampo when the Orient road is completed will be 1,321 miles, which reduces the rail haul by 2,000 miles and increases the water haul by 1,300 miles.

In a letter commenting on the report of Messrs. Dickinson and Odell, John F. Wallace, vice-president of the Kansas City, Mexico & Orient, says that while reference is made to the quality and abundant quantity of both anthracite and bituminous coal available to the road, no specific credit is given this source of future revenue in the estimate of earnings. This coal, Mr. Wallace says, will not only move northward into Texas, but will find a large market through the connecting railways of Mexico. In Mr. Wallace's opinion, one of the most important features of the road is the location of the western terminus at the port of Topolobampo. The ability of the Orient to furnish coal at this point, which is but little out of the way of the shortest sailing route between Panama and San Francisco and the East, for less than one-half the cost of coaling vessels at Panama or Colon causes the port to be the necessary place of call for all vessels engaged in the Orient trade or between Panama and San Francisco.

TRANSPORTATION AND TRAFFIC IN GERMANY.

BY LOGAN G. MC PHERSON,
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II.

The close of the Franco-Prussian war was coincident with that development of the western grain fields of the United States and the lowering of the transportation charges therefrom which permitted American grain to supply the needs of western Prussia, thereby facilitating the development of manufacturing to which western Prussia was forced by the depression of the landed interests. This impulse towards manufacture was stimulated by the ease of the money markets, caused by the indemnity obtained from France. The principal coal fields of Germany, as well as the ore beds, are in or near the valley of the Rhine, this contiguity of the sources of raw material to established water transportation naturally leading to the establishment and development of the great iron and steel plants along the Rhine and in its vicinity. As the necessity has arisen from the importation of ore from Spain and Sweden, it naturally follows the water course up the Rhine, and the products for export naturally go down the Rhine to the seaports. As other manufactures developed it was but natural that the abundance of coal and of developed means of water transportation should attract them also to the valley of the Rhine. This tendency has continued until at this time considerably more than 60 per cent. of the manufactures of the Empire are produced in this region, which offers a peculiar and felicitous combination of advantage that is almost, if not quite, without parallel. It even seems probable that the future development of the Krupp works will be at the new plants on the Rhine rather than at Essen. This drawing of the people to the neighborhood of the Rhine has caused a vastly greater density of population than in the interior and a far greater appreciation in the value of the land. The attraction of the valleys of the other rivers is not so marked, none of them offering the same economic advantages as the Rhine, and therefore their traffic is much less. Perhaps one-half of the Rhine traffic is of imports and exports and one-half is local. That which is local is principally of the heavy and less valuable commodities—coal, stone, cement and wood.

It is as though the state of New York were an independent nation, the Hudson river navigated by lines of steamboats plying between Albany and Philadelphia, Boston and other ports of likewise independent nations, with whom railway communication were not in an advanced state of development; and, furthermore, as though coal fields and beds of ore were in the vicinity of Newburgh and Poughkeepsie. Under such conditions these towns would become great centers of iron and steel and other manufacture and the Hudson would be freighted with barges carrying coal to West Point, Albany, Troy and to the city of New York.

Manufactured products, the commodities of all kinds that are high in value and low in weight, are chiefly carried by the railways, the transportation of such commodities by water being almost altogether confined to those conveyed between river port and seaport. The railways also carry heavy commodities even in direct competition with the waterways, not only for short distances but for considerable distances. For example, between the Westphalian coal mines and Frankfort the Rhine and the railways are approximately parallel. In 1907 of this coal traffic the railways carried 128,799 tons and the river 450,788 tons. That is, notwithstanding the cheap, heavy, and low-grade character of the freight and the radically lower rates by river, the rail lines carry over a fifth of the traffic. When there is a cessation, because of ice during the winter or low water during the summer, the railways carry the heavy freight that normally goes by water. This happens even in the valley of the Rhine, that river often being frozen or obstructed with ice for a few weeks in the winter and its navigation impaired from drought for a few weeks of the summer.

As the great iron and steel plants are centralized in the lower Rhine district, their products to the extent that they are distributed throughout the empire by rail move on the kilometric basis of rates which does not need to be modified because of the competition of any other producing center, a heavy protective tariff standing in the way of imports. Upon the raw materials used in the making of iron and upon crude iron products the manufacturers of different districts have sought and obtained concessions in rates that serve a purpose similar to that attained in the United States, where the railways have so adjusted their rates that the total transportation charge to the furnaces of different districts on their raw materials is approximately the same.

The imported grain and grain products that come through the northern ports are distributed throughout the manufacturing districts without competition other than arises from the farms in lower Germany, whose product, however, is mostly consumed in the regions where it is grown. The surplus grain from the agrarian region of the East finds its markets in the West to the limit of production. The movement of grain for the supply of the empire is therefore adjusted on a kilometric basis of rates which are not modified because of the competition of grain-producing regions, although at times different districts have sought readjustment in their respective interests. In 1891 reduction was made in the grain rates from eastern Prussia to the Rhine provinces, but the farmers and millers of the western German states brought such vigorous opposition to bear in the Reichstag and the Bundersrath that the reduction was annulled. Grain and flour once moved at the same rates, but upon complaint of the smaller millers that because of the waste from the grain they were at a disadvantage flour was advanced to a higher class.

Beef from North and South America and hams and other pork products come in through the North sea ports and are readily distributed on a kilometric basis. Their market is, however, principally in the manufacturing districts, the people of the interior using little meat other than that grown on the farms and killed in local slaughter-houses.

"AUSNAHME" TARIFFS APPLY ON FERTILIZERS.

Live stock moves from the country to the larger cities, where

it is killed and used for local consumption, there being no great outbound movement of dressed meat as in the United States. "Ausnahme" tariffs are, however, made for breeding animals and for animals carried to grazing grounds. Poultry, principally geese, come largely from Russia and readily move on the kilometric basis, being marketed without competition other than that arising from the geese grown by the German peasants, which find a ready sale.

The great bulk of the fruits and vegetables used in Germany are grown near the places of consumption. Of late years, however, the movement has increased of vegetables from Holland, where the alluvial lands are particularly adapted for their growth, and from France, whence also come peaches and artichokes. The latter, however, are still luxuries consumed principally in the great centers of the population and in the manufacturing districts. Oranges come from Italy and are being more widely distributed year by year, even in the smaller towns, where although the standard of living is far below that of the great centers and the manufacturing districts, the variety of food consumed by even the lower strata of the population has radically increased in the last 20 years.

There are practically no virgin forests in the Empire. The governments of most of the states long ago decreed that for each tree cut down on public lands a new tree be planted. The owners of private forests have followed this custom, and it is these replanted forests that now supply the lumber of local production which is largely used as props in the mines. Wood is not a considerable factor in the construction of the buildings, which are mostly made of stones, brick and concrete. The lumber, of which furniture is made, comes into Germany through the Baltic ports and the North sea ports, the logs being taken by water to Berlin, Magdeburg, Cologne, Frankfort and other cities, where furniture is made and distributed throughout the area tributary to each place of manufacture, there being no occasion to adjust railway rates in order that competing manufacturers may meet in rival markets. It is likewise with the manufacture of cotton goods from cotton that comes from the North sea ports and goes to the mills of Saxony and the East as well as those of the West.

There are coalfields in the Southeast as well as in the West and Southwest, but they are practically equi-distant from Berlin and other great coal-consuming centers, there being no necessity therefore for any particular adjustment of coal rates in order that competing mines may sell their products in rival markets. In the past the operators of different coalfields have endeavored to obtain concessions in order to extend their markets, but their applications have been declined. A reduction from the normal basis is, however, made on coal from the Westphalian mines to the North sea lowlands in order that it may there compete with sea-borne coal from England. At certain places reduced rates are made for coal moving in train loads.

A comparison of the water system and the rail system of transportation must take into consideration other factors than those which bear directly upon transportation. It must be remembered that a large proportion of the expenditure on the German waterways contributes not only to the facility of transportation, but to the reclamation of land, to irrigation, and to the prevention of inundation. Some of the canals, such as the Main-Danube—which is of small capacity and has been outstripped by the railways—have always shown a deficit which in the absence of adequate information it is impossible to apportion among the different functions for which the expenditure was incurred. Other canals that in earlier years produced a large profit now make no more than a respectable living. At Berlin they are still quite profitable. This city is situated on the Spree and around it from one point on the river to another have been built canals in order that freight not destined for or originating in Berlin may pass around instead of going through the city. Berlin is a center of production of high grade manufactures in which are engaged workmen of high intelligence and in which the transportation charge is not a controlling factor either as to the location of the industry or the markets. Such manufactures are therefore readily distributed on a kilometric basis. Manufacturers say, however, that a system of low through rates for large quantities such as exists in the United States would facilitate the keeping of stocks at various distributing centers other than the place of manufacture.

A crucial point of advantage possessed by the waterways in their competition with the railways is that their rates are subject to no sort of government regulation. The water craft pay small tolls for the use of the artificial waterways, that is, the canals, but they do not for the use of the natural waterways, that is, the rivers. These water craft charge what is necessary to secure traffic under commercial conditions, that is, what the traffic will bear, and what is necessary to secure traffic in competition with each other. On one or two of the rivers to the East, where the water traffic is not of large volume, the owners of the boats have been enabled to effect agreements for the maintenance of rates which, however, are never held at a point that yields very much profit. On the Rhine where a multitude of owners ply boats of one kind and another, it does not seem that such agreements can be made effective for any extended periods. Here the competition between the water craft frequently reduces the carrying charge to the basis of bare existence, to what the Germans designate the "self-costs." It is different with the railways, which are obliged to observe the prescribed rates. Under these conditions it is especially significant that in competition with the Rhine the rail lines carry over one-fifth of the coal from the Westphalian mines to the city of Frankfort.

It is held that certain traffic that now moves down a river to the North or the Baltic sea and that is transshipped along the sea to the mouth of another river and thence inland would go by a more direct water route across the Empire if the waterways were more thoroughly extended. Plans have been prepared for a network of canals to further such direct shipment and to facilitate distribution between the places of production and the places of consumption. The carrying out of these plans has been deferred because of the contention that further large expenditure should not be made on the waterways until the natural waterways are made productive of revenue to the governments, that is, until tolls are charged on the rivers as well as on the canals. To this end an amendment of the constitution will be necessary. This will mean a radical change of policy, as it has heretofore been traditional in Germany as in other lands to improve the bays, harbors and rivers, that is, the natural waterways, and to maintain them as national highways, free of toll from water craft. The proposed vast expenditure for the construction of artificial waterways, that is, canals, has also raised the question, over which there has been such controversy, as to whether the nation is justified in expending revenue that comes from the taxpayers as a whole for a purpose that is of particular benefit to a limited region only, that is, to the particular district immediately served by a canal. The tremendous advance of the valley of the Rhine and the far less developed condition of the interior give especial point to this contention.

In estimating the amount of traffic that is likely to come to a proposed canal, and the probable pecuniary return therefrom, a map is made of the "sphere of influence" from which the canal will draw the traffic. Such maps of "spheres of influence" are also made for existing canals, it being possible because of the rigidity of the rail rates to draw a fairly distinct line between traffic that will go by water and that which will go entirely by rail.

Traffic that is destined from a place of shipment contiguous to a river to a distant place of destination also contiguous to that river is frequently hauled by rail to the river, unloaded from the train, loaded on river craft, again unloaded from the river craft and loaded on a train for destination. When

a place of shipment and the destination are farther from a river, it becomes a question as to which is preferable—the triple haul with double transfer or through haul by rail. The policy of the government, however, is to foster the waterways as freight carriers. This is shown by the fact that railways serving manufacturing cities, such as Chemnitz, which is not located directly on a waterway, are obliged to serve simply as means of communication between such cities and the nearest waterways, that is, as branches or feeders of the waterways.

The fact that the water craft are allowed to charge what the traffic will bear, while the railways are held up to fixed and established rates is, of course, a large factor in accounting for the circuitous routes by water, over which traffic is sometimes shipped. To take an extreme example, Heilbronn in Wurtemberg transported a considerable quantity of soda to Tetschen in Bohemia. It was sent by the Neckar to Mannheim and there loaded on a Rhine boat which took it to Rotterdam, whence it was transferred to another vessel which took it to Hamburg, where it was transferred to a boat which took it up the Elbe to Tetschen, the cost of transportation over this roundabout route being less than by rail over the comparatively short distance from Heilbronn to Tetschen direct.

A consideration of prime importance in the governmental control of the railways has not been without influence in the proposals to extend the canals. It is claimed that a complete network of waterways would facilitate the movement of troops and provide means for the conveyance of wounded to hospitals in time of war. Every two years the government asks the owners how many river craft they could place at its disposal in case of war. It is obvious, however, that for the mobilization of troops the waterways can never equal the railways, as they do not afford means for such rapid despatch or distribution in as varied directions. The adaptability of the railways for military purposes was quickly perceived by the government. In 1850 it built a railway for military purposes and after the general purchases of the Prussian railways by the state many extensions were made principally on the same account. That political and national considerations have limited the extension and the possibilities of the service of the railways is demonstrated by the fact that they have been built out to the national boundaries and then their lines have been turned and run along the boundary with little or no consideration for the possibility of developing traffic with other countries. There is at present international communication over comparatively few routes.

One argument advanced for the extension of the German waterways is that railways, especially those in the valley of the Rhine, have reached the limit of their development. This is an amazng statement to anyone familiar with the great American railways that are laid with rails weighing 100 lbs. to the yard, over which pass locomotives weighing 200 tons and over, hauling trains that with their loads weigh in some cases over 7,000 tons. In Germany until within twenty years the freight cars were principally for loads not exceeding 10 tons. Many are now in use carrying 20 tons and the larger manufacturers are demanding still larger cars. One of the foremost of German manufacturers, when in the United States about ten years ago, was shown the great steel cars with a capacity of 40 and 50 tons and asked why he did not introduce such cars into Germany. Upon his return he put the matter before the then railway minister in an andeavor to have the government enter into the use of steel cars with a capacity of even no more than 25 or 30 tons. The minister had formerly been in the employ of the manufacturer and between them were such cordial relations as to assure sincere utterance. The minister said that only the larger shippers could make use of such large cars, that to include them in the equipment would therefore give to large shippers an advantage over small shippers which would, of course, be a discrimination that could not be tolerated. The obvious deduction from this quite accords with the fact that the manufacturers and other shippers of Germany as a rule receive and forward freight in small quantities. This is especially the case in the interior not served by waterways, where the prosecution of house industries is still conspicuous and other manufactures are on a small scale. The ministry, however, points to the fact, that the introduction of the twenty-ton cars has brought the average capacity of the cars in use to almost fifteen tons and claims that this average advance is quite adequate to the average needs of the average advance in industry, stating that a progressive gradual advance is preferable to the industrial dislocation that follows radical and sudden displacement of industrial instruments. The ministry is also not convinced of the economy that would follow the use of larger cars, it being its opinion that, for example, the dead weight in one 40-ton car is not greatly less than that in two 20-ton cars. But notwithstanding all this, as the manufacturing plants increase in size and number, the demand for larger cars must necessarily be more urgent, and the government in the end will undoubtedly be obliged to re-equip and to rebuild the railways, that they may be equal to the demands of traffic that will be conducted on a larger scale. It is significant that two or three of the great manufacturing plants, such as Thysen in northwestern Germany, have their own interior railways connecting their mines and mills and the entire plant with the contiguous waterway, and that over these private railways are run powerful locomotives and freight cars wth a capacity of 40 to 50 tons; that is, a few of the manufacturing establishments have found it economical to adopt the American practice on their private lines. At present, however, with but few exceptions, the mills and factories do not consume raw material in such vast quantties or turn out finished products in such great volume as those of America, the plants not only being not so large, but being not keyed up to so swift a pace.

The great manufacturers admit that canals would not meet the requiremeuts of the American plants, because of this higher development demanding the pouring in of vast quanti ties of raw material and the regular taking away to all points of the compass of manufactured products in great volume. It is impossible to conceive of a great American factory such as those which make textiles and boots and shoes in New England, steel in Pittsburgh, furniture in Chicago, or flour in Minneapolis, being content to remain idle at times of great demand for their products, because of interruptions to navigation. Their costs of manufacture are so closely calculated that they would not moreover be willing to pay radically higher rates by rail than are in effect over the waterways during the period of navigation.

The truth is that because of the traditional fostering of the waterways and also because the government desires to reap as large a net return as possible from the operation of the railways, the possibility of the development of these railways to a standard af efficiency, even approximating that of those of the United States, has practically not received consideration. Notwithstanding, it is admitted by those whose judgment is beyond dispute, that were German railways equipped with locomotives and cars of the great capacity of those in the United States, the cost of hauling by rail in Germany could be so materially reduced as to greatly diminish the present sphere of influence of the waterways. It is also admitted that such development of the railways would lead to the location of certain manufacturing plants at places of greater economic advantage to and from which traffic would move by direct lines, avoiding the shipping, reshipping and transportation by water. The complaints as to railway freight rates and railway facilities in Germany, therefore, come principally from the great and enterprising manufacturers who want to push ahead on a large scale. This is in contrast with the situation in the United States, where under private control the railway rates and railway facilities have been developed to meet the needs

of the great industrial and commercial corporations and where the complaints against the railways have come in larger numbers from the smaller shippers—the men who have not adjusted their business to the changing economic current and are being worsted in the struggle.

That the German government utilizes the net revenue of the railways in its general budget is well known. That is, the income of the railways helps to pay for the support of the educational establishment and other expenditures for which the state is responsible, one-fifth or more of the needs of Prussia being supplied by the profits from railway traffic. The Minister of Public Works reports to the Finance Minister as to all matters of importance affecting either the revenue or the expenditures of the railways. A railway minister once said that it gave him much pleasure to realize that his was the only department of the government in which economies could be effected for the benefit of the national revenue; that the other branches only spent money, while his department made money. The state also receives an income from its lands, forests and mines and other industrial enterprises in which it is engaged, but this is much smaller than its revenue from the railways. The railway minister goes over the annual budget of the railways with the finance minister, and then the finance minister reports the budget to the house of deputies, which votes the annual appropriation for the railway expenditure. In 1907 the railways wanted 350 million marks, but the deputies voted 300 million. Business men claim, but the ministry does not admit, that these processes of appropriation very effectually prevent broad gage expenditure for the purpose of unusual development for the trying of experiments that might seem likely to lead to considerable economies in expediting movement or improving practice.

The operation of the railways of the various states of the German Empire is, in a measure, co-ordinated through the "Bundesrath," a union of representatives of the various states. This is the authority responsible for the regulations in connection with construction and working and traffic that concern the empire as a whole. It has an executive office in Berlin designated the "Reichs-Eisenbahn-Amt."

There is also a "general conference" of the whole of the railways of the German Empire which is convened by the Prussian Minister of Public Works usually once a year. It is assisted by a "standing tariff commission," which is composed of representatives of the different railway administration and directions, and also of representatives of agriculture, industry and commerce.

The official head of the Prussian State Railways is the Minister of Public Works, who is appointed directly by the King. He is the railway minister, and also has charge of the waterways, which are administered by a subordinate department through an officer reporting to him. The administration of the railways is centralized in the department of public works at Berlin, where five officers are respectively in charge of construction, machinery, traffic, finance and general administration.

The immediate conduct of the Prussian railways is through divisions entitled directions, of which there are 21. Each of these is in charge of a president of the direction, under whom are direction officers, respectively, in charge of various phases of the direction conduct. Each of these reports directly to the president of the direction, who communicates in regard to important matters with the respective officers at Berlin, who report to the railway minister.

In connection with each direction is an advisory council, upon which are representatives of agriculture and commerce, and there is a general advisory council for the assistance of the minister, to whom all important questions are referred. The system of advisory councils is an institution in which Germany has much pride. Proposals for the modification of railway tariffs are made to these councils and very thoroughly deliberated upon and discussed by them before their recommendations are made. They have no authority, but their conclusions have great weight with the railway administration. Their avowed purpose when counseling a change in a rate is not to give any shipper or one district an advantage over another, but to promote the development of the nation. They are, of course, powerless to effect any radical and general rate reduction and increase of rates are very few, a rate once established being usually permanent. A reduced rate may become effective at once, but six weeks' published notice must be given of an advance.

It is especially significant that the government has not developed any such statistical system as that now regarded as an absolute necessity by the great railway systems of the United States, through which can be ascertained the efficiency of each division or subdivision of railway line and the comparative cost per unit of maintenance and of operation.

The budget of a direction consists simply of its total revenue and its total expenditure. The absence of information as to the comparative efficiency of a different line and of different directions is part of the policy of the general administration. It does not wish the people of the empire to know how the kilometric system of rates works out in large returns to the railways of the districts with large traffic and small returns to the railways of the districts with sparse traffic, it being feared that the people, if they had this information, would demand a reduction of rates in the districts of dense traffic.

A comparison of the volume of traffic carried respectively by the railways and the waterways is furnished by the following statistics. It is interesting in the first place to note the comparative extension in length. In 1875 there were in Germany 6,214 miles of navigable waterways and 16,467 miles of railways, in 1885 6,214 miles of waterways and 22,992 miles of railways; in 1905, 6,214 miles of waterways and 33,804 miles of railways; that is, the length of the railways has doubled in thirty years, while the length of available waterways has remained stationary. The aggregate length of these waterways is now stated in the government reports as about 8,700 miles. It is upon the highest official authority, however, that the statement is made that there are available for navigation but about 6,200 miles. This is because the length of new canals that have been built from time to time has been counterbalanced by the fall of old canals into desuetude, either because railways have outdistanced them or because their traffic has so dwindled that their maintenance has not been worth while.

In 1882 there were 18,715 canal and river boats, with a capacity of 1,700,000 tons; in 1907, 26,235 boats, with a capacity of 6,900,000 tons. In 1882 there were in Prussia 90,610 freight cars, with a capacity of about 900,000 tons; in 1907, 382,185, with a capacity of about 5,100,000 tons. Larger boats have been built for use on the same waterways, while a vastly greater number of cars have been built for use on double the length of railway. Of the 382,185 freight cars in use in Prussia 35.8 per cent. have a capacity of ten tons, 60.7 per cent. a capacity of 15 tons, and 3.5 per cent. a capacity of 20 tons.

The total traffic measured by tons carried is as follows:

Rail.	1885.	1905.
Import	8,000,000	27,000,000
Export	13,000,000	33,000,000
Local	87,000,000	254,000,000
From one country to another, passing through Germany	2,000,000	5,000,000
Total	110,000,000	319,000,000
Water.		
Import	6,500,000	20,000,000
Export	3,500,000	11,000,000
Local	7,000,000	21,000,000
Total	17,000,000	52,000,000

The total traffic measured by ton-miles is as follows:

	1885.	1905.
Rail	10,315,240,000	27,341,600,000
Water	27,838,720,000	9,321,000,000

That is, although if the traffic of 1905 be measured by ton-miles it would seem that the waterways carry one-fourth of the freight, in reality they carry but about one-seventh of the total mass of freight. This is because the longer haul of

the freight on the waterways, the far more circuitous haul, gives a greater volume of ton-miles than the haul by railway, which is usually over a route that is approximately direct. Although the capacity of the freight cars is substantially the same as that of the water craft, they carry seven times as much freight.

The ton-miles per mile; that is, the density, are as follows:

	1885.	1905.
Rail	278,387	508,926
Water	298,272	1,118,520

The greater density by water than by rail is a natural consequence of the greater volume of traffic on the rivers that are practically estuaries of the North and the Baltic seas, the Rhine carrying in 1905 43 per cent. and the Elbe 24 per cent. of the entire inland water traffic. Its greater ratio of increase follows from the increased volume of traffic over a length of waterway that has remained constant for thirty years, while in that time the length of the railways has doubled, the scant traffic of the sparsely settled regions bringing down the average of the rail density. It would be interesting to know what is the density of the traffic of the railways in the Rhine region, but this the statistics do not show. It will be perceived that this comparison has taken no account of the passenger traffic which moves in great volume upon the railways, but is negligible by water except upon the Rhine, where the greater proportion is of the tourists.

The total capital expenditure of Prussia on its rivers, canalized rivers and canals to 1905 amounts to $132,500,000. The expenditure in improving its rivers has averaged over $30,000 per mile, the average on the Rhine over $60,000 per mile; the expenditure on the canalized rivers and canals has averaged over $40,000 per mile. The total expenditure of Prussia on the maintenance of its interior waterways in 1905 was over $4,000,000; its total receipts in that year from these interior waterways—that is, the rivers, canalized rivers and canals—was about $1,700,000. That is, the revenue from the interior waterways in 1905 was over $2,300,000 less than the expense for maintenance. If thereto be added interest charge on the capital at 3½ per cent., amounting to $4,637,750, it is found that the charge borne without offset by the state of Prussia during 1905 for its interior waterways amounted to nearly $6,500,000.

The capital expenditure on the Prussian railways to 1905 was $2,286,000,000. The receipts for 1905 were $432,315,000, the expenses $262,075,000, leaving a surplus of $170,240,000, equivalent to nearly 7½ per cent. on the capital.

The results of the survey that have been embodied in this report and the official statistics set forth in the immediately preceding paragraphs demonstrate that, notwithstanding that the waterways are the traditional thoroughfares of Germany, notwithstanding the fostering care that the government has bestowed upon them, notwithstanding that the water craft are exempt from tolls on the natural waterways and pay even on the canals tolls not nearly sufficient to cover the cost of maintenance and interest on the invested capital, and are allowed to make such charges for transportation as they please, notwithstanding that the Emperor so strongly favors waterways that railway and other officials of Prussia who have publicly opposed a forward canal policy have been made to suffer for their temerity, these inland waterways of Germany are lagging behind in the race with the railways, inferior in their carrying capacity as these railways are to those of the United States. Were this not so, why should the length of the waterways have remained constant for thirty years while the length of the railways has doubled? Why should not canals have been built instead of railways? That the Rhine and the other rivers which are practically estuaries of the sea, penetrating regions of developed traffic, are, and will remain, useful instruments of transportation is beyond question. But this is because they are estuaries and because they penetrate such regions and not because of the intrinsic superiority of waterways for inland traffic.

There are not lacking great and progressive business men of Germany who say that the canals have outlived their usefulness. That no such admission is made in the Department of Public Works is to be expected. These progressive business men say that in the future the empire must rely more and more upon its railways; that larger locomotives and larger cars must be introduced, and that electricity must be used to a greater extent.

The comparison of the freight rate structure of Germany with that of the United States has already disclosed some radical points of difference. To say that the modification of either system along the lines of the other would inure to the advantage of the industry and commerce of either country would be to make a statement that would be too sweeping unless fortified by a thorough analysis. It is safe to say, however, that the freight classifications of Germany are not so pliant as those of the United States, and the German officials admit that on the whole their freight rates are higher. This is upon a money equivalent. Were the comparison to take account of the lower standard of prices and wages in Germany the disparity in favor of the United States would be far greater.

The German system of freight rates has one effect which has been indicated, but upon which greater stress must be placed. It prevents the growth of distributing centers in the interior of the empire, making the seaports and the manufacturing centers the sources whence supplies are shipped directly to the retail dealer at the place of consumption. In a country where the greatest practical rail distance is less than a thousand miles, and where a great proportion of the manufactures in pursuance to the old-time custom are still made in the different towns for local distribution, this system doubtless does not impede traffic to the extent that it would in the United States, over which a rapidly spreading population, without hindrance from customs duties between one state and another and without commercial rivalry other than that which springs from a desire to increase production and distribution, has developed a transportation system which permits the materials and products of one region to be carried to markets distant one or two or even three thousand miles, which permits stocks of goods to be held at distributing centers every two or three hundred miles wherefrom a local dealer can replenish his stores at short notice, thereby being enabled to offer to his customers merchandise in variety and quantity unknown to the German interior.

It follows from the state ownership, the state monopoly of the German railways, that there are no traffic solicitors, either passenger or freight, such as are an expensive adjunct to the railways of the United States. Since rebates, cut rates and other discriminations have been abolished in the United States the principal function of the freight solicitors has been to place their detailed knowledge of transportation at the service of shippers to figure out routes and rates and attend to a hundred and one details in their behalf. These are services which need to be performed in any country where agriculture, industry and commerce give rise to a large traffic, whether the transportation instruments are administered by the government or by private corporations. Notwithstanding the apparent simplicity of their foundation, the complex development of the German tariffs has made them full of intricacies. The unraveling of these and the tracing out of the direct and least expensive routes demand expert knowledge and specialized attention.

This is performed in Germany by "Spediteurs," who exist in every city and every considerable town. Their services are availed of by shippers, upon whom their fes fall, in addition to the charge of the carriers, entering therefore into the total transportation charge. These "Spediteurs" also undertake the hauling of merchandise to and from the railway stations and perform other functions of the forwarding agent such as exists in certain of the American cities.

HISTORY OF THE BALDWIN LOCOMOTIVE WORKS.

The incorporation of the Baldwin Locomotive Works, taking effect July 1, 1909, marks the passing of one of the largest private firms in America. Measured by the number of employees, it was probably the largest. The public, generally, has long supposed that the Baldwin Locomotive Works was an incorporated company, but such was not the case until the date given above. Individual or firm ownership was the fact for seventy-eight years of its existence. Some account of the men who created and managed the works during that period may, therefore, be of interest.

Matthias W. Baldwin, the founder of the works, cannot properly be said to have deliberately planned the establishment of a locomotive works, but was led into it by circumstances. He was by trade a manufacturing jeweler, but in 1825 went into the manufacture of book-binders' tools and cylinders for calico printing. He was an ingenious mechanic, and having designed and built a stationary engine for his own use, was led to take orders for stationary engines as a part of his business. Thus he became known as an expert in steam engineering, and when, in 1829-1830, locomotives began to be in demand, Mr. Baldwin was called upon to design and construct such machines. His first locomotive for regular railway service was the "Old Ironsides" ordered by the Philadelphia, Germantown & Norristown Railroad Company in 1831, and tried on the line November 23, 1832. Other orders followed, and by 1834 Mr. Baldwin was fully committed to the manufacture of locomotives as his main business. In 1835 he moved his shop to the present location at Broad and Spring Garden streets, where a building had been erected with especial reference to the construction of locomotives.



1832. 1876. 1909.

These Photographs, Grouped to Scale, Show the Progress of 77 Years.

In April, 1839, Mr. Baldwin associated with himself, Messrs. George Hufty and George Vail, under the firm name of Baldwin, Vail and Hufty.

George Vail was the son of Stephen Vail, the founder of the Speedwell Iron Works, at Speedwell, N. J., which company built the first steam engine that propelled a vessel across the Atlantic. George Vail was a member of Congress, and about 1860, went to Glasgow as American Consul. He was a brother of Alfred Vail of telegraph fame.

George Hufty had been an employee of Mr. Baldwin and had been superintendent up to the time of his admission to partnership.

In 1841 Mr. Hufty withdrew and the partnership continued as Baldwin and Vail until 1842, when Mr. Vail also withdrew. Mr. Asa Whitney became a partner and the firm of Baldwin and Whitney was constituted, continuing until 1846, when Mr. Whitney severed his connection with the business to engage in the manufacture of cast iron car wheels, establishing the firm of A. Whitney & Sons. Mr. Whitney had been the superintendent of the Mohawk & Hudson Railroad, and brought to Mr. Baldwin both railway experience and thorough business talent. After Mr. Whitney's withdrawal, Mr. Baldwin conducted the business alone until 1854, when he associated with himself, Mr. Matthew Baird, and the style of the firm was M. W. Baldwin & Co. Mr. Baird learned the trade of a coppersmith with Matthew O'Neill in Philadelphia, and afterwards in New Castle, Delaware. In 1836 he was engaged by Mr. Baldwin and given charge of the boiler, copper and tank shops.

Mr. Baldwin died September 7, 1866, and the business was bought by Mr. Baird, Charles T. Parry and George Burnham, and continued under the name of M. Baird and Company. Mr. Baldwin was remarkable, both as a mechanic and as a Christian. Having been trained to work with his own hands, he retained this habit to the last and even up to the time of his death he had a small lathe and various tools in a little room off the general office of the works, where he spent much time perfecting various mechanical devices. He was happiest when going through the works and personally inspecting the progress of locomotive construction. He was in no sense an office man or a business manager. He is credited with the statement that one hundred clerks could not make a locomotive, and this indicates his disregard of business system. He always had a man as his financial manager and such a person was absolutely necessary. It is said of him that he would go off down town without even money enough in his pocket to pay car fares.

He was a great believer in systematic beneficence and even when his business did not appear to warrant gifts, would make his note for an amount which he desired to bestow for some worthy purpose. He will long be known and remembered in Philadelphia from his work in church building. At least six churches, now large and flourishing, may be credited to his efforts and contributions, either in whole or in part.

Mr. Parry had been connected with the works for many years, having learned his trade as a pattern-maker under Mr. Baldwin. He was the superintendent when entering the firm. He was a man of exceptional mechanical ability; of most pleasing and companionable character, and was so thoroughly rational and systematic in reasoning the mechanical problems that he was familiarly called by his friends "The Philosopher."

George Burnham had been in the employ of Mr. Baldwin in the business department almost from the beginning of the business. He came to Mr. Baldwin when quite young, as a clerk in the office, and in due time was made manager of the financial department and during his active participation in the business as a partner, continued in charge of that branch of the business.

In 1870, Messrs. Edward H. Williams, William B. Henszey and Edward Longstreth were admitted to the firm.

Of Dr. Williams it may be said that he was one of the most widely known men in the railway profession up to the time of his connection with the Baldwin Locomotive Works. Educated in his native state of Vermont for the medical profession, and practising in that profession for a short time, his tastes finally led him to civil engineering and railway work, and after an initial experience on the Caughnawago Railroad of Canada he went west and was connected with the Lake Shore, and subsequently with the Chicago & North Western. Everybody knew "Doc" Williams, and he knew everybody. He would go over the line of which he was superintendent,

and could call almost every section hand by name, and remember almost everything about him up to the number of children which he probably had at home. It is safe to say that he was one of the most genial and popular men in America.

William P. Henszey had been connected with the works since March 1, 1859, as a draftsman and in charge of the drawing room, which position he occupied up to the time of his death, March 23, 1909. So recently has Mr. Henszey been taken away that his friends still retain the most vivid recollection of him and his amiable disposition. As a draftsman, he was a man of exceptional ability and taste, and it used to be said of him that he could put lines on paper faster than any other known draftsman, and whatever he did in the way of locomotive designing was in the direction of graceful lines as well as in the interest of utility. He was one of the men who, with the late William Mason, had done more than any one else to improve the locomotive in an esthetic sense.

Edward Longstreth was born in Warminster township, Bucks county, Pa., June 22, 1839, was educated at the Ercildoun Friends Boarding School and commenced his apprenticeship as machinist with M. W. Baldwin & Co. November 2, 1857; was made assistant foreman before completing his apprenticeship on September 14, 1860; was made foreman of the second floor, Hamilton street shop, May 20, 1861; foreman of erecting shop August 1, 1867; superintendent of the works January 1, 1868. He was a man of exceptional mechanical ability, and had much to do with the establishment of the system of standard gages which is characteristic of the method of manufacture of the works. He withdrew from the business in 1885, due to impaired health, and died February 24, 1905.

In 1873, Mr. Baird sold his interest in the works to his partners, and a new firm was formed under the name of Burnham, Parry, Williams & Co., to which was admitted John H. Converse, who had been in the employ of the establishment since 1870.

Messrs. W. C. Stroud, Wm. H. Morrow and William L. Austin were admitted to the firm in 1886.

Mr. Stroud had been the bookkeeper, and on entering the firm was given charge of the financial interests of the business. He died September 21, 1891.

Mr. Morrow came from the service of the Pennsylvania Railroad where he had to do with the shop accounting. He was made superintendent of the works during his connection with the firm and continued in that capacity until the time of his death which occurred February 19, 1888.

In 1896, Messrs. Samuel M. Vauclain, Alba B. Johnson and George Burnham, Jr., were admitted to the firm, the title of which was then Burnham, Williams & Co.

George Burnham, Jr., had been connected with the works for several years, and on entering the firm was given charge of the finances, in which capacity he served until his retirement, December 31, 1906.

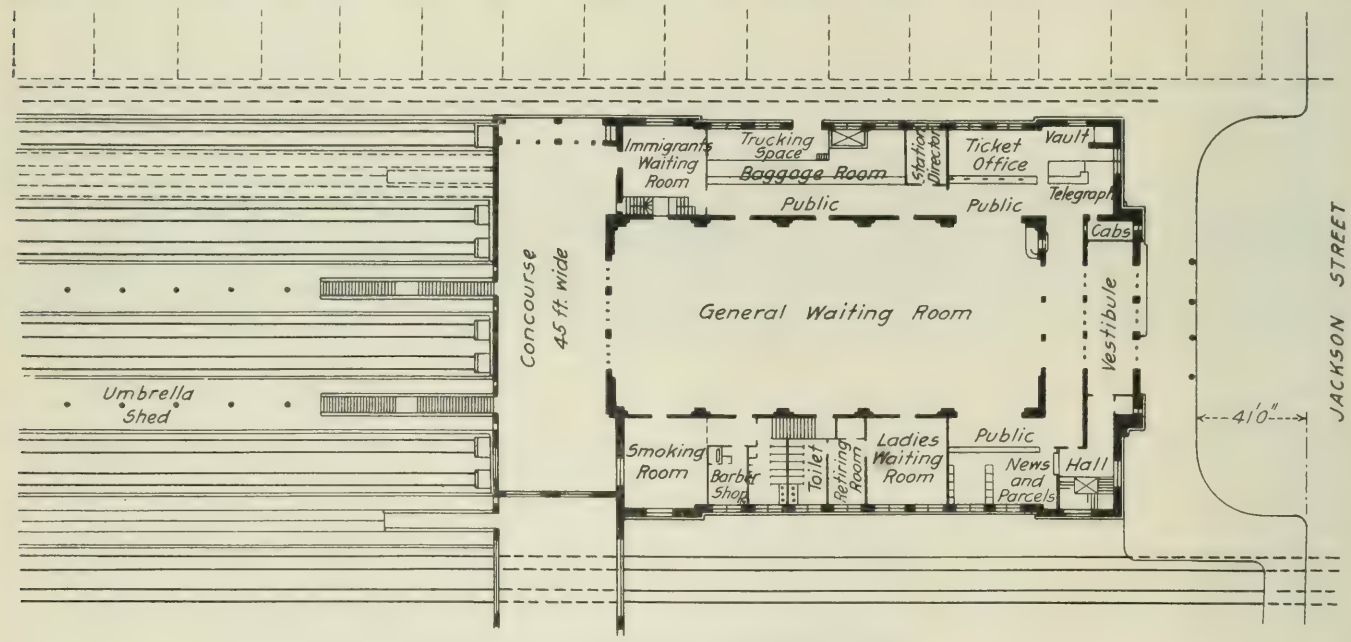
On July 1, 1909, the members of the firm transferred their interest to a corporation called Baldwin Locomotive Works, which now conducts the business under the following organization:

John H. Converse, President.
William L. Austin, Vice-President and Engineer.
Alba B. Johnson, Vice-President and Treasurer.
Samuel M. Vauclain, General Superintendent.
William de Krafft, Secretary and Assistant Treasurer.

OREGON AND WASHINGTON STATION AT SEATTLE.

The Oregon & Washington, now being built from Portland, Ore., north to Tacoma, Wash., and Seattle, has let the contract for a passenger station at Seattle, to cost about $500,000. Work is to begin at once, and it is expected the building will be completed by the time the road is ready for operation.

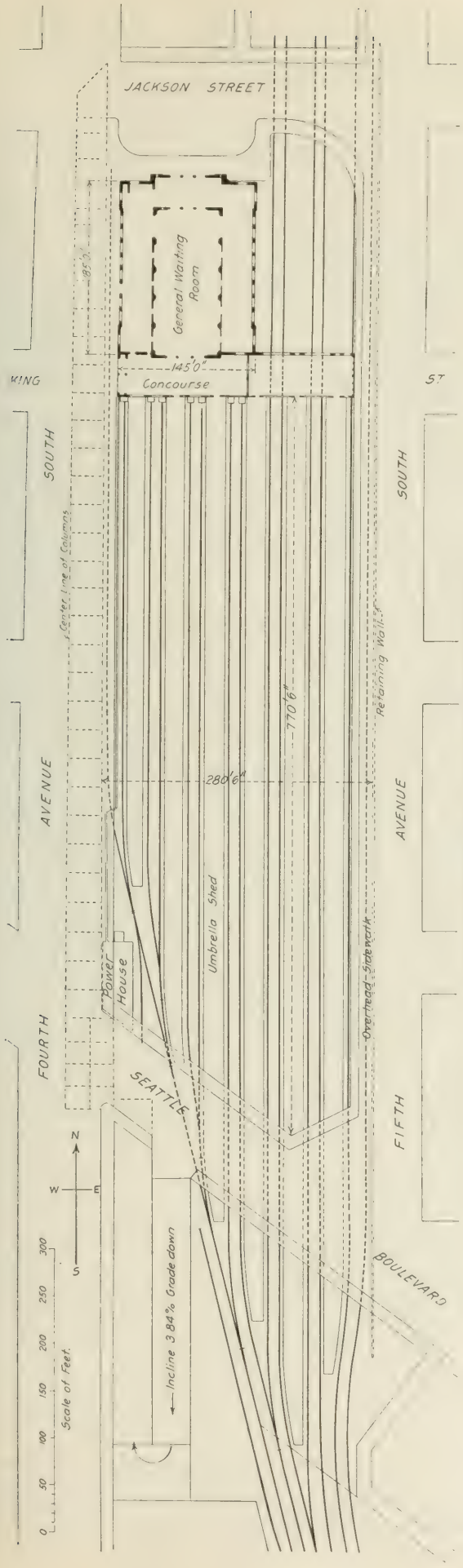
The station is between Jackson and King streets and Fourth and Fifth avenues. It fronts on Jackson street, which is to be widened to 58 ft. between curb lines to carry the increased traffic. The building line is set back 68 ft. from the streets, and 41 ft. of this distance is to be paved for a carriage stand, so that the street need not be obstructed.



Main Floor Plan of Seattle Passenger Station.

The building will have a frontage of 147 ft. on Jackson street and 185 ft. on Fourth avenue. It will have three stories above the ground line and a 24-ft. story below, the tracks being depressed to that level. The construction will be concrete and steel and the exterior walls will be finished with dark red brick and trimmed with white artificial stone. The architectural design is an adaptation of the classical style, the principal feature being the main facade overlooking Jackson street. The main entrances, which are placed in the center of this facade, are protected by a large marquise and reached by three large openings having double acting doors. The central gable is flanked by shallow pavilions and brought more into prominence by the bold projection of pilasters on either side.

The general waiting room will extend through the center the entire length of the street floor, opening through a small



Layout of Passenger Tracks for Seattle Station.

vestibule on the street in front and directly on the concourse in the rear. This room will be 74 ft. wide, with a high vaulted ceiling, tiled wainscoting and floor, and quarter-sawed oak woodwork. The electric lighting is especially designed to eliminate shadows. In general, the offices and waiting rooms are so arranged that they naturally divide travelers who are in a hurry to get to a train from those who have to wait some time in the station. On one side of the general waiting room are the telephone, telegraph and ticket offices and the outgoing baggage room, so that the traveler can transact all necessary business while moving in the same general direction from main entrance to train. On the opposite side of the waiting room will be the smoking room and barber shop, the ladies' waiting and retiring rooms, and news and parcel stands, so that travelers who are not going out at once can read, rest or smoke undisturbed by the crowd that is pushing its way to the trains. The two exceptions to this rule of arrangement are the immigrants' waiting room, adjoining the baggage room, and the dining room and kitchen on the mezzanine floor. The track level and a portion of the mezzanine floor will be given over to baggage, express and mail, elevators being provided to connect the different floors. The second and third floors contain the general offices of the company.

The following table shows the areas of the principal divisions of the station:

General waiting room	16,636 sq. ft.
Women's rooms	1,768 "
Men's rooms	1,570 "
Ticket office	1,140 "
Dining-room and kitchen	2,370 "
Baggage, mail and express	30,202 "
Sundry conveniences	10,209 "
Total	63,895 sq. ft.

The concourse in the rear of the building will be on the street level and will extend over all the tracks. It will be 45 ft. wide and, in addition to the exit from the general waiting room, will open on the streets at both ends, to allow incoming passengers to leave without passing through the station. Easy flights of steps will connect the concourse with the track level. Umbrella sheds cover the platforms, as shown in the drawings.

Reference to the accompanying plan will explain the arrangement of yards and street crossings. A 3.84 per cent. incline leads from the street on Seattle boulevard down to the track level and connects with a teaming space along the tracks built under the street. This will allow express and baggage to be transferred directly between cars and wagons, and will also allow supplies to be delivered by teams to the power house, which is located in the yards at a distance from the station.

The plans for the building were made in the office of H. J. Patterson, architect for the Harriman Lines in San Francisco, and the station will be built under the supervision of J. R. Holman, chief engineer of the Oregon & Washington, to whom we are indebted for illustrations and descriptive matter.

THE CLAIM AGENT SHOULD EDUCATE US.

BY J. F. RUSS.

Education is the greatest power that can be applied by man. Its movement and advance are irresistible. By being properly directed, education has achieved wonders. There should be a community of interest between the people and the railways. How is it? Selfishness seems to be inherent in almost all human beings. For years the people were educated by rebates and passes. During that time the "claim fever" was largely held in check. Education stopped the rebates and cut off the passes, but did not cure the people of selfishness. Not so many years ago claims against a railway company had to have merit and be supported by evidence before they would be paid. But the railways found that they could not get jus-

tice before a county jury, and this, with so much adverse and drastic legislation, led them to pay claims more freely and grant many other concessions to appease adverse agitation.

Has this course been successful? No; on the contrary these efforts to appease the people have only aggravated the disease of claim fever. Claim fever is an old disease, but by this system of education it has steadily grown worse every year, until it has become a serious malady and highly contagious; in fact, an epidemic.

The claim department always has plenty of business on hand. The number and variety of claims presented is simply appalling. Each claim paid educates not only the party who gets it paid, but every other person doing business with the railways that learns of the claim being paid, and the "fever" is being constantly spread by this means of education. No typhoid bacillus could multiply faster. In most cases the slightest pretense of responsibility, the faintest chance to get damages, augments the "fever" and develops a case. A passenger on a train learns that there is a wheel off the track. He may not know it until he finds they have made an unusual stop, but suddenly he discovers his back is injured or he has been sprained in some way. This is the course generally taken by the fever if no visible mark of injury appears.

In case of accident to a passenger train, claim department representatives meet the passengers and secure a release and settle. Mr. A. sees Mr. B. get $10 or $15 for signing a release. He knows that Mr. B. was not injured, but takes advantage of the circumstance to get a little money himself. This course of education increases the number of cases of "claim fever." Warning signs are posted in the coaches for passengers to be seated, but they will stand up in the aisle or sit on the arm of a seat, where any little jar or rough management of the air brakes upsets them, and they are immediately attacked by the "fever."

A passenger will stand up in the end of a car with hand on the door jamb; door swings shut, pinching his fingers, and the company is held responsible for his lack of common sense; and business is created for the claim department.

Passengers will go to sleep in their seats and expect to be awakened and carried out at their destination; and then if they are carried by their station they are immediately afflicted with the malady.

The farmer stacks his hay or straw near the railway and his temperature may be indicated by the distance between the stack and the right of way fence. If it burns, the hay was A-1, and the straw he usually burns each year to get it out of his way has become very necessary and valuable. If fire gets out and runs over his land, everything it touches has a high value, and the probable worth for some time to come is included in his computation of his claim. If any live stock is killed, it is almost always blooded stock with a fine pedigree.

If an accident occurs at a public road crossing or street, the claim will be particularly heavy, for in every case the fact is established that the whistle was not sounded nor bell rung.

The stock man ships a car of cattle. He is furnished transportation to look after it, but he rides in the caboose, and then holds the company responsible for the condition of the animals on arrival at destination. In the meantime the "fever" is working on him and his claim is based on rough handling, delays, shrinkage, and even on a decline in the market. If his fever is not high enough on arrival, the commission firm will increase it by kindly reminding him of his opportunity of at least getting his freight money back. And this in a branch of the business that is not nearly so profitable as it seems. The stock car has to be hauled to shipping point empty and when loaded must be rushed to market; tonnage sacrificed for time. It is hauled at a very cheap rate compared with the cost of transportation and facilities furnished.

The railways' education of the stock shipper has done great things for him. He must be furnished good pens, plenty of water, feed and water troughs, scales to buy his stock over, and have his hogs watered along the road; he must be compensated for bedding the car, which often he fails to do, apparently with a view to justifying some kind of a claim. Some of the more highly educated ones have learned to order a short car, when only large ones are available, and have it billed "short car ordered, large one furnished." This is especially true if the car is not going to run over a track scale.

An elevator man ships a car of grain and his temperature begins to rise; the fever microbe gets to work at once. When he gets returns they do not show as much grain as he figured that he loaded, and he concludes the car must have been leaking; and so he presents a claim for his alleged loss.

Many commodities are shipped in packages made of material entirely too frail to stand the handling they must receive on freight trains. By the laxness of the railway, the shipper has been educated to the point where, by using these frail boxes, he sees he can reduce the weight of his shipment and then hold the company responsible for the damage that is very likely to occur.

Eggs are shipped in cases that only by the most careful handling can be kept whole; and a very large portion of egg shippers have the fever. Claims are being paid on eggs that, so far as can be told from the package, are in perfect condition when delivered, but when the candler goes at them, he finds some cracked eggs, and presents his claim for settlement.

Every hold-up claim paid (and 90 per cent. of them are straight hold-ups) only aggravates and increases the number of cases of claim fever.

Will not more education of employees in regard to claims assist in reducing their number? Educate the car department to give more attention to the hand brakes on cars which before we had air brakes were kept in perfect condition. In switching at stations it is just as necessary to-day as it ever was to have good hand brakes; and thousands of claims are chargeable directly to poor hand brakes. Rules require their being tested before cars are cut off, but any practical man knows that this is often neglected. The trainman will look at the brake, and if it appears to be in good condition, the car is cut off; and then, too late, he finds the ratchet wheel is loose, the dog gone, or the brake rod too long; and he winds up against the staff without setting the brakes. Damage is done to contents of car and often to the car, but it is almost sure to develop a case of "claim fever."

Educate warehousemen to properly load merchandise. Educate shippers to use better and stronger packing and boxing. Educate trainmen to handle merchandise carefully. Get them to realize that every case of damage means a loss to the company. Never couple on a street crossing, nor back over one, without a man there to prevent someone getting in the way. Never go into a team track or a house track without first seeing that some fellow hasn't set his wagon in under a car while loading or unloading freight. Never go into an elevator track without first seeing that the elevator spouts are out of the way, or into a factory track without seeing that everything is clear.

Educate trainmen that extra care should be used with passengers, especially on freight trains, as they are very liable to get hurt if opportunity offers; and they are a high class of traffic to pay claims on. Educate trainmen by means of schools of instruction to be held monthly. Educate the public by only paying legitimate claims. The stock shipper needs educating in a new line badly. He at present wears fine linen and fares sumptuously everyday. Do not pay his claim unless his stock is actually damaged or seriously delayed. Raise the rate on stock and put it on a remunerative basis, considering the movement required and the light haul on the car. If he threatens to ship on the other road, let him do it; and try to get the other road to treat him in the same way. Educate all employees to be pleasant and accommodating to the public and cause the patrons to take the chips off their shoulders. No possible power can bring about these desired results but a thorough system of education.

General News Section.

Representative Mann's bill would restore to railways the privilege of exchanging transportation for newspaper advertising. If Mr. Mann ever aspires to the Presidency he is assured of the support of several thousand country editors.—*Wall Street Journal.*

Daniel Willard was given a farewell dinner in Chicago on January 13 by officers of the Chicago, Burlington & Quincy. Sixty-five officers of the road were present, including President George B. Harris and First Vice-President Darius Miller. Mr. Willard assumed his duties as president of the Baltimore & Ohio on January 14.

Officers of the Long Island Railroad are preparing a plan for the general equalization of wages of employees which will amount to approximately 5 per cent. of the total payrolls of the road, or $260,000 yearly. The classes of men principally affected are train and station men, clerks and expressmen, and the changes are to be dated January 1.

The Gulf, Texas & Western is installing a telephone for train despatching on its line between Jacksboro, Tex., and Benjamin. This is a road 105 miles long, located to the northwest of Fort Worth, Tex., connecting with the C., R. I. & G. and the Wichita Valley at Jacksboro and Seymour. The telephone apparatus was purchased from the Western Electric Co., New York.

Heavy snows in the Middle West again badly interfered last week with railway operation in and around Chicago and in a larger territory west and north of that city. Weather conditions thus far this winter have been more unfavorable to railway operation than in any winter for many years. The manager of one system said that for the first time in the history of his road water tanks had been frozen up and pipes bursted all along the line.

At a meeting of the Illinois Manufacturers' Association in Chicago on January 14 representatives of a large number of manufacturing and mercantile associations passed resolutions denouncing the federal corporation tax law and demanding its repeal. Delegates pledged themselves to "bring all possible influence to bear on the various members of congress to secure such repeal." A committee of 11 was appointed to carry on the campaign against the law and, if deemed advisable, to test its constitutionality in the courts.

The St. Louis Railway Club has adopted a resolution setting forth that at the solicitation of the Municipal Bridge & Terminal Commission of St. Louis the Terminal Railroad Association of that city acquired several million dollars' worth of real estate to supply additional trackage and is seeking to develop the property on terms that are not only fair but liberal to the city. The resolutions, therefore, ask that the city counsel enact the proposed ordinance authorizing the Terminal Railroad Association to go on with its improvement work.

In the past ten years the Pennsylvania Railroad has abolished 673 highway grade crossings on its lines east of Pittsburgh and Erie. Of these crossings 256 were on the main lines from New York to Washington and Pittsburgh, 78 being between Jersey City and Philadelphia. Between Philadelphia and Altoona, 235 miles, where the company has spent many millions in relocating lines, the number of crossings has been reduced in these ten years from 218 to 73. The largest job of this kind now pending is that at Bristol, Pa., where the line is to be changed and ten crossings cut out.

It is said that financial backing has been secured for a large power-development project at Keokuk, Ia. The government has granted a franchise for a dam across the Mississippi at this point and this franchise will expire on the 9th of next month unless actual work is in progress before that time. Hugh L. Cooper has pushed the organization of the company and if the project is carried out as he has planned it, the plant will be among the largest hydro-electric plants in the country. It is said that United Railways of St. Louis and several other light and power companies have already contracted for large amounts of power.

President Shonts, of the Interborough Metropolitan, has given out a statement in which he says that the Interborough is ready to build all the additional subways that there is now a demand and need for in New York, and that through arrangements with J. P. Morgan & Co. it will be possible for the Interborough to borrow $100,000,000 for construction work and for improvements. In a newspaper interview Mr. Shonts says: "We offer to double the present subway facilities and give the people the benefit of it for the same fare. We are now selling more transportation of its kind for a nickle than a nickle will buy anywhere else in the world."

The Pennsylvania Railroad's telegraph school, at Bedford, Pa., opened in September, 1907, is still flourishing. The company is introducing telephones extensively for block signaling, for train despatching and for messages; but, from this announcement about the school it would seem that the officers expect to make extensive use of both the telephone and the telegraph. The Bedford school has had, altogether, 234 students, of which number 126 have been graduated and are now employed as telegraphers. All graduates are offered positions on the road. An automatic sending machine has lately been put in, with which it is said the work of the students in receiving has been improved. The school now has a library of text books on electricity.

The Chicago Federation of Labor has adopted resolutions opposing the increase in second class mail rates proposed by President Taft. The resolutions state that this advance would practically kill all labor journals and periodicals depending upon individual subscription. The resolutions also allege that the government pays the railways 9 cents a pound for hauling second class matter, while the express companies pay the railways but five mills a pound for the same class of matter, and condemn the "questionable business ability and methods of the men at the head of our government who pay the railways 18 times as much as express companies pay for the same service." The resolutions call for a reduction in the price to be paid by the government to the railways for carrying second class mail.

On Monday, January 17, a special train of four cars, run for John Farson, Jr., traversed the distance between New York and Chicago over the New York Central and the Lake Shore & Michigan Southern between 5 o'clock in the morning and about 10 in the evening (or 11 o'clock Eastern time). The train made very fast time as far as Elkhart but west of there was compelled to run slowly at many places on account of fog, so that the actual time through was about 18 hours, 30 minutes, as against an expected record of less than 16 hours. According to newspaper reports, the train cost Mr. Farson $3,075. The number of passengers charged for was 100, although there was only one on the train, and for these an arbitrary charge of two cents a mile, measured by the shortest line, was made. The shortest line between New York and Chicago being the Pennsylvania, the bill was $1,824 (for 912 miles). In addition to this, $150 was charged for a special Pullman car and there was a charge of $1 an hour against each of the imaginary hundred passengers for the fast time, that is to say, for all of the time saved as compared with the standard schedule of 28 hours. The reporter's figures do not correspond in all details; but they show, no doubt, that the train cost Mr. Farson something over $3 a mile.

Worst Railway Washout Ever Known.

No decision has been reached as to the route to be followed in replacing the line of the San Pedro, Los Angeles & Salt Lake along the Meadow Valley Wash in southeastern Nevada, of which almost 100 miles south of Caliente was completely

gutted by floods on December 31. The route was originally chosen, despite its precarious features, because of the great saving in distance. Not long after its construction it was undermined by a storm, which wrought $600,000 or $700,000 of damage. An officer of the road says that the washout was due to remarkable conditions prevailing all over the country, which was covered with snow from southern California to New York. In Nevada the accumulated snowfall by December 28 amounted to eighteen inches. Warm winds coming over the mountains melted the entire precipitation in a few hours and the ensuing rains added so much to the volume of the mountain streams that the Meadow Valley river tore its way through embankments, bridge abutments and everything. Engineers are in the field to locate the best course for the line from the standpoint not only of cost of construction, but also of minimum distance and traffic value of any new section which may be served. Whether the survey shall skirt the Mormon Range on the southeastern side, running into southwestern Utah through St. George, or shall keep to the west of the Meadow Valley Range, running east into Utah through Pioche, is still undecided. The former would cost probably a third more to construct, but would carry the road through fertile virgin territory in southern Utah, whereas Nevada has little to offer aside from the mining sections, which are already served with transportation.

Whatever route may be decided upon, it will be from six months to a year before the road will be in shape to take through traffic. Whatever outlay will be required will depend largely on the chosen route, but the rehabilitation will involve an expenditure of between $10,000,000 and $15,000,000.—*Wall Street Journal.*

Wood Preservers' Association.

The Wood Preservers' Association held its sixth annual meeting at the Auditorium Hotel, Chicago, January 18, 19 and 20. About 60 members were in attendance and the visitors present increased the attendance to 75. The meeting opened Tuesday morning with a business session. Tuesday afternoon, Wednesday forenoon and afternoon and Thursday forenoon were devoted to the reading and discussion of papers. Officers were elected Thursday afternoon, but the result of the election was not known in time to include the list of next year's officers in this report.

Statistics received by the Secretary as to the amount of lumber treated during 1909 were as follows:

Piling and poles	9,591,200	lin. ft.
Lumber	74,381,700	"
Bridge timbers	17,070,770	"
Cross ties	21,521,180	"
Miscellaneous	1,971,140	"

These figures include treatment by all methods, but are not complete owing to the neglect of some companies to send in reports. The totals probably should be increased 10 per cent. to secure the actual output of treated timber in the United States for the past year.

Eighteen subjects for papers were assigned, but some members preferred to substitute a short talk for a written paper.

J. B. Card, superintendent of the Chicago Tie and Timber Preserving Co., read a paper on "What Per Cent. of Creosote Oil Can Be Withdrawn from Wood by Subsequent Vacuum?" He showed by the results of tests made at the plants of the Chicago Tie and Timber Preserving Co. and the Chicago Burlington & Quincy that an average of 10.4 per cent. of the oil can be recovered by using a final vacuum of 26 in. for 2 hours, while an average of 10 per cent. is recovered by merely allowing the ties to drip for two hours. Tests of the use of an initial vacuum showed that its use reduced the average amount of oil recovered by a final vacuum to 4.03 per cent. and by dripping to 3.88 per cent. These tests tend to show the futility of seeking to recover the oil by applying a final vacuum, and Mr. Card expressed the hope that the problem might soon be solved, as it is one of vital importance to all concerned.

J. C. Williams, superintendent of the wood preserving department of the Barber Asphalt Co., spoke on the "Effect of the Time of Cutting Timber on the Rate of Seasoning." He said, in brief, that the time of cutting affects the seasoning and treatment because the moisture content in timber and the weather conditions vary with the season. He recommended spring and summer cutting.

Two papers were presented on the "Advantages and Economy of Various Retort Doors." Samuel M. Rowe spoke in favor of the spider door with ball bearings. David Allerton recommended the single piece cast steel door with cranes as a substitute for the present roller bearing to guide the door into place. He also suggested the use of a vertical swinging door, hinged at the top, to be raised by a suitable hoist.

Prevention of Fires was discussed by H. J. Whitmore, superintendent of the Missouri, Kansas and Texas Railway Wood Preserving Works. He summarized the needed precautions as follows: (1) Never allow leaks in oil pipes; (2) build plant fireproof; (3) never allow open lights around plant; (4) have fire pumps removed from plant and use a high tank of sufficient capacity; (5) allow ample room between buildings; (6) provide steam pipes in pump room to be used to smother fire.

"Results Obtained by Treating with Crude Petroleum," was presented by C. Marshall Taylor, in charge department of chemistry and tests, International Creosoting and Construction Co. Very few results are available as yet and the most of his paper dealt with the method of treatment in use on the National Railways of Mexico and the Atchison, Topeka & Santa Fe. He stated that ties in the Bound Brook division of the Central of New Jersey, treated with "still bottoms," a heavy petroleum residue, had had a life of 30 years. Ties treated by the Santa Fe method have been in service three years and are entirely free from signs of decay.

H. M. Rollins, superintendent of the Texas & New Orleans Wood Preserving Works, spoke on the "Inflammability of Treated Timber." Since the zinc chloride used in burnetizing is widely used in fireproofing compounds, it was conceded that wood so treated is less inflammable than untreated wood, and Mr. Rollins confined his paper to wood treated by creosoting. He showed by reasoning and by the results of tests that wood so treated is at first rendered more inflammable but that it gradually loses this property, finally becoming much less inflammable than the untreated wood. He explained this action as due to the vaporization of the lighter oils and the consequent deposit of the residues on the surface of the wood. Tests on treated and untreated poles showed that the former were only slightly charred, the fire going out of its own accord after about ten minutes, while the latter under similar treatment were completely burned through, the fire continuing for two and one-half hours.

F. J. Angier read a paper on the "Proper Grouping of Timbers for Treating," in which he recommended the division of all woods into three classes based on the per cent. of absorption. The first class would include woods absorbing less than 23 per cent., the second those absorbing between 23 per cent. and 30 per cent., and the third those absorbing more than 30 per cent. These absorptions are to be figured by volume. In dimension timber, Mr. Angier suggests four classes: (1) Sticks 3 in. and under; (2) 4 in. to 6 in. sticks; (3) 8 in. to 10 in. sticks, and (4) all sticks 10 in. and over.

Andrew Gibson, superintendent of timber preservation on the Northern Pacific, in his paper on "Economics of Cables, Electricity and Locomotives in Moving Materials at Plant," recommended, from his own experience, the electric locomotive. The conditions at the plant described are a long haul and a level grade, and Mr. Gibson admits that under opposite conditions the cable might be more economical, but under no conditions would he allow the use of steam or fuel oil locomotives on account of the fire risk.

The "Amounts of Various Antiseptics Required per Cubic Foot to Obtain Good Results for Various Purposes" was briefly discussed by R. L. Allardyce, general superintendent, International Creosoting and Construction Co. He advocated the following amounts in the creosoting process:

Marine work	22 lbs. per cu. ft. up
Round and sheet piling	15 to 20 lbs. per cu. ft.
Caps, stringers, braces	12 " 15 " " "
Decking	15 " 20 " " "
Telegraph and telephone poles	12 " 15 " " "
Ties	10 " " "

In the zinc and oil process he recommended the use of about ½ lb. of zinc chloride and 3 to 4 lbs. of oil per cu. ft. In the burnetizing process he suggested for dry climates the use of ½ lb. of zinc chloride in 15 lbs. of water per cu. ft.

Quadrennial Weighing of Mails in the West.

The regular quadrennial weighing of the United States mails, for the purpose of determining the rates of compensation payable to the railways in the fourth contract section for its transportation for four years from July 1, 1910, will begin early in February, and under the present laws continue for 105 days. The section covered consists of Louisiana, Arkansas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota and all territory in the United States west to the Pacific coast, including also Alaska, Hawaii and the Philippine Islands. This will be the first instance in the history of this territory of the application of the postmaster-general's orders 165 and 412, which require the use of the seven-day divisor in obtaining the average daily weight of mails handled on which the pay to railways is based, instead of the six-day divisor in use heretofore. The orders referred to read as follows:

Order 165:

"Ordered, That when the weight of mail is taken on railway routes the whole number of days the mails are weighed shall be used as a divisor for obtaining the average weight per day."

Order 412:

"Ordered, That Order No. 165, dated March 2, 1907, be, and the same is, hereby amended to read as follows:

" 'That when the weight of mail is taken on railway routes the whole number of days included in the weighing period shall be used as a divisor for obtaining the average weight per day.' "

While the wonderful increase in population and in the development of natural resources in this great territory since the last mail weighing four years ago has resulted in even a greater proportionate increase in volume of mail handled, it is quite doubtful if an increase in compensation to railways will result. This is owing to the use of the seven-day divisor above explained. In support of this a portion of the report of the second assistant postmaster-general to the postmaster-general for the fiscal year ended June 30, 1907, with reference to the weighing and readjustment in the contract section just east of the territory to be weighed this year, and where the postmaster-general's orders 165 and 412 were first applied, is quoted:

"During the fiscal year (ending June 30, 1907) the mails were weighed on the railway routes in the third section, embracing the states of Ohio, Indiana, Illinois, Michigan, Wisconson, Minnesota, Iowa and Missouri. The annual rate of expenditure for railway transportation in that section on June 30, 1907, was $15,772,677.97.

"The result of the readjustment of the pay for railway transportation effective July 1, 1907, in this section for the ensuing four years based upon the reweighing shows a decrease of $45,704.51, being 0.29 per cent. The reduction in transportation rate is due to the application of the provisions of the act of March 2, 1907, reducing the rates of compensation, to the use of the whole number of days in the weighing period as the divisor in ascertaining the average daily weight, and in the withdrawal of equipment and supplies from the mails."

It is of interest to note that the increase in railway compensation in the third contract section mentioned above for the quadrennial period ending June 30, 1907, over the one ending June 30, 1903, was $2,439,112.83, or 18.05 per cent., while as above shown in the following four-year period there was an actual decrease of 0.29 per cent., due almost entirely to the application of the orders of the postmaster-general referred to.

In the fourth contract section the increase in railway mail compensation in the quadrennial period commencing July 1, 1906, based on the weighing of 1906, over the four-year period just preceding, was $3,406,292.28, or 31.10 per cent., which shows the rapid increase in business and in mail handled in that section, and as the development of this section has progressed rather more rapidly in the last four years than in the similar period just preceding, it follows that the amount of mail handled and the rate of pay should show an equal, if not a greater, increase this year over four years ago, but through the application of the postmaster-general's orders referred to none or but little increase in their pay is hoped for by the railways in this section. The report of the second assistant postmaster-general to the postmaster-general for the fiscal year ended June 30, 1906, says:

"During the past fiscal year (ending June 30, 1906) the mails were weighed on the railway routes in the fourth section, embracing the states of Arkansas, Louisiana, Texas, Kansas, Nebraska, South Dakota, North Dakota, Montana, Wyoming, Colorado, Utah, Idaho, Washington, Oregon, Nevada and California, Indian Territory and the territories of Oklahoma, New Mexico, Arizona, Alaska and Hawaii. The annual rate of expenditure for railway transportation effective July 1, 1906, in this section for the ensuing four years, based on the reweighing, was an increase of $3,406,292.28, or 31.10 per cent.

"A year ago in preparing the estimates for the current year this item was placed at 15 per cent., that being approximately the increase shown by the previous quadrennial weighing. In seeking some explanation of the unusual and unexpected increase, based on the weights taken during the weighing period in the fourth contract section, an examination has been made of the increase in gross revenues during the same four-year period at a few of the most important cities in different parts of the section weighed, and Chicago has been included as being the city at almost the eastern edge of the fourth contract section through which so large a part of the mail would pass in going to and from that section. A comparison has been made between the gross revenues of these postoffices for the fiscal years ended June 30, 1902, and June 30, 1906, respectively. The increase shown (omitting fractions) is as follows: Los Angeles, Cal., 134 per cent.; Oklahoma, Okla., 124 per cent.; Fort Worth, Tex., 103 per cent.; Portland, Ore., 101 per cent.; Seattle, Wash., 99 per cent.; Chicago, Ill., 50 per cent.; Denver, Colo., 40 per cent., and San Francisco, Cal., 33 per cent. In view of this total increase in gross revenues, which indicates corresponding increases in the volume of mail handled, it is less surprising that the increase resulting from the readjustment of compensation on the weights last taken for this section should amount to approximately 31 per cent."

It is of interest to note that while the law requiring weights to be taken for 105 consecutive working days was in effect in 1906, the weighing of that year was abruptly brought to an end April 17, 1906, the day preceding the earthquake in San Francisco, which resulted in utter demoralization of the railways in that section of the country as well as seriously affecting business conditions all over the west and resulting in a perceptible falling off in volume of mail handled. By the action of Congress the postmaster-general was authorized to terminate the official weighing at midnight of April 17, 1906, on account of this, and to base the readjustment on the first 57 days of the weighing.

Passenger Station Economy.

Having discussed the passenger station both in its utilitarian and architectural aspects, we must now consider it from the viewpoint of railway housekeeping. Let us assume that a certain city is provided with station facilities that are not quite up to the standard of similar facilities in some other places of approximately the same population and commercial importance. They are not such as the community would like to have, and they are not such as the railway management would consider ideal. The community believes it is entitled to the best of everything. It does not want a station that will be merely as good as one in a nearby town of the same size. It wants a better one. It would like to have the best and most beautiful station of any town of the same relative importance in that whole section of the country, and it does not hesitate to say so through its municipal officers, its commercial organizations and its newspapers.

The railway manager is in much the same position as the housekeeper when the old piano, which is still fairly good as a musical instrument, has had its case battered and scratched and the daughter of the family demands a new one. If he could draw on unlimited supplies of money he would like to provide every city on his line with an architectural monument, and every little way station with an artistic gem. It would be a splendid advertisement of his road, and the American Institute of Architects would hail him as the greatest railway manager the world had ever seen. But, just as the housekeeper who would like to buy a new piano must think first of the monthly grocery bill, of the needs of the family for clothes, of the leak in the roof, and, possibly, of the necessity of an addition to the house, so the railway

manager, whose resources are always strictly limited by the earnings of the road and its credit, must think of his operating expenses, fixed charges, and taxes, and of the need of additional tracks, more cars, and additional and more powerful locomotives. He is glad to contribute to the gratification of the artistic taste of the public, but his first duty is to haul the public and its property over his lines. It may well be that the money which the new station would cost, if expended for additional tracks, would be far more beneficial to their city as a whole than would be the most splendid passenger station to which they could aspire. In that case their interests and those of the railway are identical, and it is better for all concerned that they should put up with the not entirely satisfactory station facilities for a few years longer rather than the more vital improvements should be delayed. Capital invested in passenger stations in excess of the amount necessary to provide adequate and proper facilities for doing passenger business is unproductive. It is probably not unreasonable that a station in the National Capital should bear some relation to the public buildings of the Government, that the building and its appurtenant trackage should be sufficient to handle the inauguration throngs, and that special accommodations should be provided for a single occasional traveler—the President of the United States. The fact remains, however, that the passenger terminal facilities of Washington are such that they are only fully used for a few days every four years, and that the cost of their operation and maintenance, including the fixed charges on the capital investment, are a heavy burden on the railways using it, and all without bringing them an additional dollar of revenue by reason of its use. The members of your association can contribute more than any other set of men to solving the passenger station problem by the evolution of a type of passenger station which will afford the best possible facilities and which will be artistic, without involving expenditures for elaborate ornamentation and decoration.—*W. W. Finley, before American Institute of Architects, December* 16.

The Shoshone Dam.

Press despatches announce the completion of the Shoshone dam in Wyoming, the highest in the world. It has been built by the reclamation service and is 328.4 ft. high. It is situated in the cañon of the Shoshone river, in northern Wyoming. The walls of the gorge are nearly perpendicular, and rise nearly 2,000 ft. above the stream. At its base the width of the gorge (and the length of the dam) is 70 ft. On top the length of the dam is 175 ft., and at the bottom it is 108 ft. wide.

The contract was let for this structure on September 18, 1905, to Prendergast & Clarkson, of Chicago, for $515,730. The contractors defaulted in August, 1906, and the work was then taken up by the sureties. The dam creates an enormous reservoir with a surface area of 10 square miles and an average depth of 70 ft. Its capacity in gallons is 148,588,512,000.

The B. & O. Bridge at Havre de Grace.

The Baltimore & Ohio on January 6 began using its new double-track steel bridge across the Susquehanna river at Havre de Grace, Md. This new bridge was buillt at a cost of over $2,000,000. It is slightly more than a mile in length. The river at this point is divided by Watson's island, upon which about one-third of the bridge rests. The superstructure is double-track throughout and consists of east approach, 80-ft. deck plate girder; 120-ft. deck truss span and 72-ft. deck girder span. Bridge over the east channel: One 380-ft. through truss span, one 520-ft. deck span and one 240-ft. deck span. Viaduct on Watson's island: One 115-ft. deck girder span, twenty-one 90-ft. deck girder spans and one 77-ft. deck girder span. The bridge over the west channel consists of one 520-ft. through truss span and eight 240-ft. deck truss spans. The west approach consists of one 103-ft. deck girder span and one 71-ft. deck girder span. The total weight of the steel is 16,000 tons.

The piers and abutments contain about 25,000 cu. yds. of concrete masonry and 8,800 cu. yds. of stone masonry. In this reconstruction 30 new piers were built and 10 remodeled, widened and raised. Three of the new masonry piers in the west channel were sunk in the bed of the river by the caisson process to solid rock foundation at a depth of 58, 68 and 75 ft. below tide. The work was begun in November, 1907.

The officers in charge of the work were: A. M. Kinsman, chief engineer of the road; W. S. Bouton, engineer of bridges; John T. Wilson, assistant engineer, and E. B. Graham, resident engineer. J. E. Greiner and C. C. Schneider were the consulting engineers.

Railway Matters in Washington.

Washington, January 19.

The House Committee on Interstate and Foreign Commerce has voted to have hearings every Wednesday, but no schedule of subjects has yet been issued. There has been much desultory talk among congressmen concerning the President's railway proposals, but there does not as yet seem to be any crystallization of sentiment, and some observers characterize the situation as one of marked indifference among congressmen generally. On the question of control of capitalization, however, the indications are that a decided difference of opinion will develop and that nothing can be done with that part of the President's message at this session. Probably the power to suspend a rate will be opposed, as will the proposition to establish an interstate commerce court; but there is really little of a definite nature which can be said concerning any of the proposals at present.

The visit of President Lovett of the Union Pacific and other representatives of that company to Washington last week to induce President Taft to withdraw the suit of the government against the Pacific roads appears to have been fruitless. According to reports the railway men made strenuous representations to the President that the suit of the government, which was brought in Utah two years ago, to compel the separation of the Southern Pacific from the Union Pacific was sure to fail because these railways are not competitors in such a sense that their joint operation violates the anti-trust law. The attorney-general, who joined President Taft in conferring with the railway officers, has been considering the subject in detail, but it is said that thus far he has found nothing to justify the government in withdrawing the suit.

Proposed Modification of Pennsylvania Pensions.

The action of several thousand employees of the Pennsylvania Railroad in asking the company to pay larger pensions, the addition to be provided for by contributions from the employees, has already been noticed in these columns. From a correspondent in Harrisburg we have the following particulars, from which it appears that both the officers of the company and large numbers of the employees are favorable to the project, but that some important details are yet to be adjusted. Our correspondent says:

"Present indications rather confirm the impression that the movement started during the fall of 1909 among the Brotherhood employees of the Pennsylvania Railroad to provide larger pensions for the men than are now paid by the company will be successful in the near future. The proposition of the joint brotherhood committee which called upon General Manager Myers in Philadelphia was that each of the 80,000 or more employees of the company contribute from his earnings the sum of two cents a day, or 60 cents a month, and receive from the company after voluntary or compulsory retirement a pension of $25 a month over and above the amount he would receive under the present system, which for one who has served 33 years is one-third of his average pay for about ten years prior to his retirement. For example, a passenger engineer earning $150 a month, who retired last month receives about $55 a month, and under the new plan of paying two cents a day he would receive $80. Papers setting forth the willingness of the company to put the new plan into effect as soon as a majority of the employees have indicated their preference for it have been distributed throughout the system, and one paper in Harrisburg has over 2,000 signatures of assenting employees already. The company would probably require the men to contribute for one year before the $25 additional monthly payment to pensions would be applicable.

It is proposed also to change the retirement age as follows: Voluntary retirement from 65 to 60 years; compulsory retirement from 70 to 65 years. There seems to be some opposition to the new plan on the part of the younger element of the employees, many of whom figure that they would not benefit from the two cents a day payment because of the longer period of payment. To these the reply is made that the retirement five years earlier than at present of the older men would mean more rapid promotion for the younger. Under the new plan it is proposed to allow present pensioners to join in paying the two cents along with employees now on the rolls and to receive the $25 a month. All classes of employees from the engine-wiper and track-hand to passenger engineers and firemen would be required to pay the two cents a day, provided they signed for the new plan."

Commissioner Clark on Railway Valuation.*

"Sometimes when I read or listen to a cleverly conceived and well presented theory I wish that I had been endowed with a nature that did not gravitate so quickly and so directly to the practical. The theory of basing transportation charges upon a valuation of the properties of the carriers and of rewarding reductions in charges with additional dividends was recently suggested. Now, if one company owned all of the transportation lines and the officers of that company, or some regulating body, could arrange a schedule of rates that would be satisfactory to every locality served, together with an equally satisfactory formula for ascertaining the increases and decreases in rates that would be necessary in order to maintain a proper relation between gross earnings and net available for dividends, it would seem an attractive plan; although some jealousies might develop about taxation and as to the localities that should first be accorded new terminals, double-tracking, etc. Clearly reductions in rates would not provide for increased revenue available for extra dividends unless the increase in revenue resulted in increased volume of traffic.

"However, one company cannot own all the lines unless that company be our Uncle Sam. I am sure none of us advocate such ownership, and therefore we must look at this matter from the practical standpoint of actual conditions. There are several lines of railway between Chicago and New York. Some of them have their own lines all the way and some must join with others in order to make a through line. No two of them have just the same physical characteristics. No two of them have the same mileage of second and additional main tracks. No two of them have the same ratio of equipment. No two of them have the same interest bearing debt, capitalization or fixed charges. No two of them have the same valuation, whether that valuation be based upon original cost, reproduction cost or present value as a going concern. And yet their charges must be so nearly the same that any difference therein is fully compensated for in service, or the traffic will follow the line of least resistance, which, in this connection, is the line of lowest charge. What would be a reasonable return on the value or capitalization of one of them might spell ruin for another and riot or riches for still another."

Crude Oil for Tie Treatment.

The Santa Fe began the use of California crude oil for treating pine ties in 1901, and the ties put in the track in February, 1902, are to-day in first class condition without a sign of decay, although untreated pine ties in the same track would not last over two years. Two and a half years ago a lot of pine ties were treated in this way and sent down to the Mexican Central, Tampico branch, which, for ties, has about the most destructive climate to be found in North America. The untreated pine ties which were used there had an average life of something over a year, but the ties treated with California oil when recently inspected were in excellent shape. At Albuquerque, N. Mex., the Santa Fe is using crude oil for all the pine ties used in that territory. It is not used for spruce or the harder woods because this oil will not penetrate these woods in a satisfactory manner. Creosote is therefore used for this class of ties. At the Somerville tie-treating plant of the Santa Fe, some crude oil is used, but only in experimental work, in the way of mixing certain proportions of creosote and crude oil. The results of such mixtures have not yet developed.

*From an address by Hon. E. E. Clark, of the Interstate Commerce Commission, December 29

The Pennsylvania Promoting Good Roads.

Following up its campaign in the interest of good roads in the states through which it operates, the Pennsylvania Railroad has arranged with D. Ward King, the good roads expert, to deliver lectures on methods for making good roads, beginning at Lancaster, Pa., Dec. 27. On November 18 there was a meeting of P. R. R. agents from the Williamsport and Susquehanna division at Williamsport, which was addressed by experts in the use of the King split log drag, a device which farmers themselves make after patterns furnished free by Mr. King. The meeting at Williamsport was followed by a meeting of the general manager's staff in Philadelphia December 17 to discuss methods for improving the roads radiating from the company's stations. The object of all of this campaign is to make the roads to the railway passable so that farmers can receive and deliver freight in all kinds of weather.

There are approximately 99,000 miles of country roads in the state of Pennsylvania, and only 2,000 miles are macadamized. In view of the fact that it will cost approximately $10,000 a mile to macadamize these roads, the solution of the problem lies in the employment of less expensive means. It is to introduce such methods to the farmers that the railway company has undertaken this campaign. Mr. King will lecture at Millersburg, Sunbury, Milton and other places.

American Railway Organization in England.

The Midland Railway of England has recently been reorganizing its staff in what were formerly called the departments of the locomotive superintendent and superintendent-of-the-line. Cecil Paget still continues to hold the office of general superintendent, to which he was appointed in 1907. R. M. Deeley, the locomotive superintendent, resigned in July last, and the works manager, H. Fowler, has been appointed to succeed him, with the title of chief mechanical engineer. Other new offices created in this reorganization, which are unusual on English roads, are: A. J. Owen, superintendent of operation; L. C. Geach, superintendent of motive power; J. Bagwell, superintendent of passenger service, and E. R. Ward, general passenger agent. The titles of indoor and outdoor assistants to superintendents-of-the-line are abolished.

Missouri, Kansas & Texas.

The operating ratio, after payment of taxes, of the Missouri, Kansas & Texas in November, 1909, was 74.2 per cent., and in November, 1908, was 76.3 per cent. This is a decrease in 1909 from the 1908 figures of 2.1 per cent. In the comment in last week's issue of the *Railway Age Gazette* on the railway earnings in November the operating ratio of the Missouri, Kansas & Texas was incorrectly stated.

Western Society of Engineers.

The society installed its newly elected officers at the annual dinner held in the University Club, Chicago, on January 12. The officers for 1910 are: President, J. W. Alvord; first vice-president, O. P. Chamberlain; second vice-president, A. Bement; third vice-president, W. K. Hatt; treasurer, A. Reichmann; trustees, L. E. Ritter, G. M. Brill and W. W. Curtiss.

New York Railroad Club.

George A. Post, president of the Railway Business Association, will address the club at its meeting on Friday, January 21, concerning the work of that organization which has had and is having the thoughtful attention and active interest of both the railway and business world. It is probable that others will have something to say on the same subject and the club

has asked the association, through its officers, to be its guests, so that the occasion promises to be of unusual interest and importance.

Omaha Railway Club.

The annual meeting of the Omaha Railway Club was held on January 10. An amendment to the constitution was adopted, reducing the number of directors from 15 to 7. The following directors were elected: D. B. Allan, Howard Bruner, L. M. Dooley, R. E. Hayward, W. H. Jones, H. C. Piculell and T. Montmorency. The present membership is about 300, and efforts are being made to increase it to 400 or 500.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
American Association of General Passenger and Ticket Agents.—March 28, Havana, Cuba.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa. June, 1910; Niagara Falls, Ont.
American Assoc. of Local Freight Agents' Assn's.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept,; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York.; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—Fourth Saturday in month. Duluth, Minn.
Railroad Club of Kansas City.—Third Friday in month. Kansas City.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 16-18; St. Louis.
Richmond Railroad Club.—Second Monday in month. Richmond, Va.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Norquist, Chicago.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.
Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 3d, Wednesday, except July and August; Chicago.

Traffic News.

The Western Classification Committee met in San Antonio, Tex., last week. A dinner was given to the visitors on the evening of January 14.

The Denver, Laramie & Northwestern opened for traffic its first completed division, that between Denver, Colo., and Milliken, 43 miles, on January 17.

The Great Northern has withdrawn all of the annual passes heretofore held by employment agents doing business in northern Minnesota. Extensive frauds have been discovered in the use of passes by employment agents.

The New York State Public Service Commission, Second District, has issued its report of passenger trains for the month of November, from which it appears that of the 54,981 trains run in that month, 84 per cent. were on time at division terminals.

The Kansas City, Mexico & Orient has filed application with the Oklahoma Corporation Commission for an order relieving it from the 2-cent fare provision of the state constitution. The company lost $100,000 on its passenger business in Oklahoma in the year ending with last June.

A member of the Missouri Railway Commission states that the commission's rate clerk is engaged in working up schedules of rates on different commodities and that when he has finished his work the commission will probably undertake a complete revision of freight rates schedules.

A press despatch from Nashville says that the Tennessee Central has made up its differences with the Illinois Central and the Southern Railway and that through traffic agreements existing between these companies will be continued as at present, notwithstanding the recent notice of probable termination.

The Northwestern Cedarmen's Association, at its meeting in Chicago on January 12, instructed its railway committee to draw up resolutions condemning the decision of the Interstate Commerce Commission in the so-called tap line case, and endorsing the dissenting opinion filed by Commissioner Prouty.

The Illinois Railway Commission resumed on January 11 its hearings regarding the reasonableness of express rates in Illinois. The complaints are directed especially against advances that have been made from Chicago to surrounding suburbs. In February, 1907, the rate was advanced from 30 cents per 100 lbs. to 40 cents, and in September, 1908, to 50 cents. J. C. Zimmerman, general manager of the Adams Express Company, and J. H. Bradley, vice-president and traffic manager of the American Express Company, testified that the increases in rates were made because of increases in operating expenses.

Following up the company's campaign in the interests of scientific farming, the division freight agents of the Pennsylvania are distributing to the farmers throughout the State of Pennsylvania the first booklet dealing with methods for cultivation of alfalfa. Another is entitled "Use of Lime on Land." The use of lime is essential to the cultivation of alfalfa. The booklets contain lists of shippers of agricultural lime, lime stone and fertilizers. The company is educating the station agents along the lines to become agricultural missionaries. In addition, the company has become identified with the good roads movement in the state of Pennsylvania.

Following the flood which washed away 90 miles of the San Pedro, Los Angeles & Salt Lake, the other railways telegraphed to the Interstate Commerce Commission for authority to make an emergency rate of 30 cents per 100 pounds [by another route from Salt Lake to Los Angeles and vice versa] on all goods in transit on this road, the object being to save the perishable freight and help straighten out the tangle of traffic. The commission denied the request. A newspaper despatch from Salt Lake says: "This refusal will result in heavy loss to both the wrecked railway and to shippers, as it is doubtful if the road can be held responsible for all losses under such unavoidable and unforeseen conditions. Freight half way to Los Angeles must be brought back to Salt Lake and shipped west via Sacramento over the Southern Pacific at

full rates, when the Southern Pacific is willing to grant the emergency rate of 30 cents on all traffic from the wrecked road to aid the road and the public."

The Western Fruit Shippers' Association, at its recent meeting in Denver, adopted resolutions declaring that the Interstate Commerce Commission should adopt a uniform classification of freight, to be changeable only by the commission; that published freight tariffs should show in one rate all charges for transportation, including refrigeration; that the commission should have power to fix minimum as well as maximum rates; that federal district attorneys should be required to formulate complaints for aggrieved shippers and to prosecute them before the Interstate Commission at government expense; and that the railways should be required to settle all legitimate claims within 90 days or pay interest.

The Terminal Railroad Association of St. Louis has announced that after March 1 it will make no switching allowances to the Manufacturers' Railway, which serves the Anheuser-Busch Brewing Company; the Des Peres Valley, serving the Scullin-Gallagher Works; the Granite City & Mississippi Valley, serving the Corn Products Company in East St. Louis; the Granite City, Alton & Eastern, serving the Commonwealth Steel Company; the industrial road of the Republic Iron & Steel Company; the St. Louis, Baden & Terminal Railroad, serving the St. Louis Car Company, and the Western Cable, serving the Lemp Brewing Company. After the date mentioned all concerns served by these various industrial lines will be required to pay to the railways the full St. Louis rate on all shipments.

The different railways leading west from New York have been considering a proposition to reduce by 50 per cent. the differentials on westbound freight enjoyed by those lines which are not rated as first-class, such as those which take freight to Baltimore or Norfolk by water; the Central Vermont, taking freight by water to New London, and the New York, Ontario & Western. The reports say that all of the lines except the Grand Trunk have practically agreed to the change, which would raise the rate to Chicago from 65 cents per 100 lbs., first-class, to 70 cents, and the other classes in proportion. The rate by the standard lines, first-class, is 75 cents. In the month of August last the New York, Ontario & Western, it is said, took out of New York as much freight for western points as did the Pennsylvania. For the 11 months ending with last November, the Ontario carried west 147,000 tons of import freight, while the Pennsylvania secured only 324,000 tons, or but little more than twice the quantity taken by the Ontario.

Vice-president C. S. Clarke, of the Missouri Pacific, says that that company, in connection with the agricultural department at Washington, has been investigating farming conditions and giving good advice to the farmers in the Southwest for the past five years—from which it would seem that those railways which have heralded their farming activities in the newspapers so constantly for the last year or two have been securing more than their fair share of the glory. The Missouri Pacific has not said much about its operations. Three years ago 15 farmers made some experiments under the direction of the Missouri Pacific experts, and now there are 5,000 who are following the same course. Thirty-one demonstrators are kept on the road instructing and advising these 5,000 farmers. In many regions where dry farming is possible, one half the arid land has been reclaimed. Land which five years ago sold for $1 an acre is now held at $100 an acre. Severe drought has caused losses in the Southwest during the past six months, but recent rains and snows have restored the lands. These snows have extended 50 miles farther into the desert than ever before in the memory of the inhabitants.

On February 2 through package freight car service will be established from Chicago to Knight's Key, Fla., by two different roads, the Cleveland, Cincinnati, Chicago & St. Louis and the Illinois Central. This service will later be extended to Havana, Cuba. The Big Four's car will leave Chicago daily, going over the Big Four to Cincinnati; from there over the Queen & Crescent to Chattanooga; from Chattanooga to Atlanta over the Southern Railway; from Atlanta to Offerman, Ga., over the Atlanta, Birmingham & Atlantic; from Offerman to Jacksonville over the Atlantic Coast Line and from Jacksonville to Knight's Key over the Florida East Coast. The Illinois Central's car will be run weekly, leaving Chicago every Saturday. It will be run over the Illinois Central to Birmingham, Ala.; from there to Albany, Ga., over the Central of Georgia; from Albany to Jacksonville over the Atlantic Coast Line, and from Jacksonville to Knight's Key over the Florida East Coast. When the Florida East Coast shall have been completed to Key West the cars will be taken to Key West and ferried from there to Havana. Delivery will be made at Jacksonville on the fourth morning, at Knight's Key on the sixth morning and at Havana on the seventh.

Results of Package Car Service from St. Louis.

In a recent address before the Traffic Club of St. Louis, B. M. Flippin, freight traffic manager of the Missouri Pacific, said:

"There are operated daily approximately 1,000 package cars from St. Louis, diverging to all sections of the country. Particularly is this service exceptionally good in the direction of the West and Southwest, affording St. Louis the opportunity of placing any shipment, whether 100 or 1,000 lbs., in this great territory of consumption on a schedule equal to that of the highest class of perishable carload freight. Many a through car is inaugurated that probably in the beginning and perhaps several weeks thereafter does not develop sufficient tonnage to justify the cost, yet the traffic men say to the operating people, 'you must run this car regardless of its tonnage; the shippers will take advantage thereof as soon as they know its advantages.'

"A single St. Louis industry has in no small degree been fostered by superior package car service. I refer to the boot and shoe business. The State Labor Bureau shows that the boot and shoe factories of Missouri furnish employment to more male and female employees than any other industry. St. Louis is the greatest manufacturing and shipping point of boots and shoes in the world.

"The output of St. Louis from 26 factories last year was more than $26,000,000. Elsewhere in Missouri there are 19 boot and shoe factories, mostly near St. Louis. Unquestionably the merits of St. Louis as a distributing point have something to do with this remarkable advance. Great credit is due to the efficient and good service given by the railways in enabling this industry to reach the great West and Southwest, in competition with Eastern or more remote manufacturers. At least 95 per cent. of this enormous traffic moves in less carload shipments. What I have said applies with equal force to stoves, woodenware, furniture, vehicles and hundreds of other articles."

Western Maryland Into Pittsburgh.

A traffic agreement for 99 years has been made between the Western Maryland and the Pittsburgh & Lake Erie, a subsidiary of the New York Central & Hudson River. The contract involves the immediate extension of the Western Maryland line from Cumberland, Md., to a connection with the Pittsburgh & Lake Erie at Connellsville, Pa., and provides for full through traffic arrangements between the two lines, opening lines and terminals of each company to the traffic of the other company and its through connections. The main line of the Pittsburgh & Lake Erie runs from Pittsburgh northwesterly to Youngstown, Ohio. From Pittsburgh south to Connellsville the Pittsburgh & Lake Erie runs over the tracks of the Pittsburgh, McKeesport & Youghiogheny, which it leases. The Western Maryland runs from Baltimore west to Cumberland, and from there southwest to Durbin, W. Va. The new line from Cumberland to Connellsville will apparently be approximately 90 miles long. It is to be single-track, but the grading will be done for double-track. It will be heavy work, costing, it is estimated, between $75,000 and $100,000 a mile. The Western Maryland was taken out of the hands of the receiver and turned over to the present Western Maryland Railway Co. on December 1. The Pittsburgh & Lake Erie is controlled by the New York Central & Hudson River.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1909.
(See also issues of Jan. 7 and 14.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$252,216	$85,410	$368,682	$46,160	$82,616	$9,087	$100,959	$8,323	$247,445	$121,237	- $598	$11,236	$109,402	$59,448
Buffalo & Susquehanna	361	173,302	17,796	201,185	32,055	55,389	1,828	81,289	8,431	178,992	22,193	—26	4,009	18,167	—831
Central New England	278	260,816	25,068	299,449	39,095	23,854	1,215	70,114	2,842	157,103	142,646	....	6,500	136,146	21,938
Central of Georgia	1,916	738,662	277,237	1,117,426	142,204	159,506	29,736	320,394	42,917	694,757	422,669	6,572	55,200	374,041	74,702
Central Vermont	411	224,227	77,067	323,146	32,911	53,502	8,491	131,085	7,455	233,444	89,702	157	10,116	79,743	57,915
Chicago & Alton	998	796,502	329,752	1,215,708	145,284	140,330	38,368	397,366	27,555	748,903	466,805	- 5,275	32,000	429,530	80,853
Chicago & Erie	269	341,120	73,747	451,935	45,630	88,700	15,884	184,742	9,078	344,034	107,901	....	10,938	96,962	82,301
Chicago, Indiana & Southern	341	296,825	21,841	326,253	46,342	45,805	7,344	102,373	8,411	210,275	115,978	175	12,500	103,303	45,723
Chicago, Milwaukee & Puget Sound	1,400*	947,458	78,484	1,044,787	31,546	66,731	20,771	307,532	9,691	436,271	608,516	2,975	20,000	591,491	....
Chicago, Milwaukee & St. Paul	7,511	4,476,013	1,048,180	5,956,752	678,381	702,302	109,635	2,272,249	108,793	3,871,360	2,085,392	9,565	206,636	1,888,321	347,905
Cincinnati, New Orleans & Tex. Pac.	337	635,848	125,506	797,744	111,349	140,951	20,740	197,490	16,736	487,266	310,478	795	20,000	291,273	92,331
Cleveland, Akron & Columbus	210	159,159	40,068	211,703	16,436	55,825	2,739	69,855	3,862	148,717	62,986	....	5,000	57,986	3,859
Colorado Midland	337	198,174	27,673	255,253	25,989	29,309	10,274	93,952	5,475	164,999	90,254	- 1,091	9,350	79,813	14,988
Cumberland Valley	162	190,892	49,416	251,404	35,642	23,983	3,453	76,266	5,081	144,425	106,979	260	4,083	103,156	—1,549
Duluth & Iron Range	168	820,247	25,642	852,569	121,242	57,314	518	165,812	7,962	352,848	499,721	- 84	34,101	465,536	161,951
Duluth, Missabe & Northern	289	1,134,530	35,182	1,177,111	92,025	90,227	1,512	196,900	9,847	390,511	786,600	7,415	48,085	745,930	392,331
Duluth, South Shore & Atlantic	598	171,351	84,847	270,967	36,169	38,121	9,522	103,184	6,191	193,187	77,780	601	16,000	62,381	2,292
Evansville & Terre Haute	310	152,335	49,467	224,219	23,930	36,124	4,588	60,858	6,794	132,294	91,925	—890	8,872	82,163	37,662
Galveston, Harrisburg & San Antonio	1,338	783,860	230,492	1,060,159	117,922	127,537	26,365	353,067	26,220	651,111	409,048	- 2,337	28,179	378,532	98,987
Georgia R. R.	307	186,274	82,344	285,735	29,361	40,018	10,204	107,507	6,622	193,711	92,024	....	2,985	89,039	41,192
Georgia Southern & Florida	395	124,995	64,014	220,719	24,457	43,562	5,784	75,816	8,658	158,277	62,442	1,768	11,632	52,578	19,070
Gulf & Ship Island	307	149,070	40,467	201,027	37,772	31,756	1,166	58,261	7,416	136,371	64,656	....	4,852	59,804	15,431
Kanawha & Michigan	175	217,247	26,152	248,030	46,503	54,039	2,051	55,244	3,915	161,752	86,278	—11	6,979	79,288	44,969
Long Island	391	296,314	372,469	701,464	65,193	105,836	13,479	323,498	19,045	527,051	174,413	51,678	33,232	192,859	104,778
Morgan's La. & Tex. R. R. & S. S. Co.	358	447,282	89,400	558,084	55,951	36,803	10,557	174,707	12,784	290,802	267,282	- 2,242	16,000	249,040	34,741
New York, Phila. & Norfolk	112	213,919	28,849	260,713	22,568	45,214	2,926	97,613	8,148	176,469	84,244	....	6,250	77,994	14,338
New York, Susquehanna & Western	151	157,670	51,066	233,094	24,892	22,503	1,090	88,678	3,655	140,818	92,276	—9,698	11,317	71,261	7,072
Northwestern Pacific	376	115,540	104,275	240,869	42,960	30,490	2,311	92,133	9,489	177,383	63,486	....	10,581	52,905	28,320
Peoria & Eastern	351	203,658	57,297	280,742	35,994	61,898	5,493	95,626	4,465	203,076	77,666	....	8,800	68,866	5,631
St. Louis & San Francisco	4,726	2,507,560	831,222	3,568,703	665,517	560,643	9 . 84	1,198,310	106,318	2,624,472	944,231	....	123,589	820,641	120,940
St. Louis Southwestern	773	561,388	122,207	712,183	105,609	97,528	20,497	147,008	22,403	399,345	312,838	—1,020	23,395	288,423	46,319
St. Louis Southwestern of Texas	697	278,298	68,426	370,265	89,256	66,294	11,508	160,978	16,310	344,346	25,919	—224	8,333	17,362	—49,235
Texas & New Orleans	458	250,405	82,439	353,916	53,774	44,486	6,658	130,783	7,748	243,449	110,467	752	11,600	99,619	40,237
Toledo, St. Louis & Western	451	298,581	34,575	353,044	41,541	45,698	7,015	98,849	9,614	202,717	150,327	....	12,000	138,327	32,333
Union Pacific	3,384†	3,723,905	909,113	4,993,899	406,367	450,723	107,308	1,123,376	98,661	2,186,435	2,807,464	—4,586	142,175	2,660,752	435,036
West Jersey & Seashore	356	145,940	179,093	352,856	67,615	49,114	11,661	178,840	8,419	315,649	37,207	3,489	20,037	20,659	15,474
FIVE MONTHS OF FISCAL YEAR 1910.															
Alabama Great Southern	309	1,066,718	448,208	1,653,686	193,624	419,448	44,199	470,200	44,695	1,172,166	481,520	—2,354	56,180	422,986	54,672
Buffalo & Susquehanna	361	938,260	111,724	1,085,591	185,115	256,924	10,504	383,816	39,365	875,724	209,867	—116	20,000	189,751	9,329
Central New England	278	1,067,952	161,603	1,288,315	223,321	110,399	7,853	367,891	15,515	724,979	563,336	....	32,500	530,836	176,339
Central of Georgia	1,916	3,412,266	1,323,648	5,174,319	727,029	778,921	149,526	1,474,497	201,420	3,331,393	1,842,926	32,824	238,400	1,637,350	261,979
Central Vermont	411	1,041,756	541,837	1,693,611	217,470	244,380	41,970	637,052	34,302	1,175,174	518,437	5,197	50,583	473,051	202,756
Chicago & Alton	998	3,736,151	1,921,989	6,110,578	721,618	616,953	200,480	1,830,428	142,832	3,512,311	2,598,067	—6,407	160,000	2,431,660	54,247
Chicago & Erie	269	1,574,069	371,487	2,113,849	286,087	438,121	76,999	842,357	45,223	1,688,787	425,062	....	54,693	370,369	168,322
Chicago, Indiana & Southern	341	1,310,992	125,736	1,470,695	265,265	243,510	43,680	473,659	39,928	1,066,042	404,653	648	62,500	342,801	168,624
Chicago, Milwaukee & Puget Sound	1,400*	3,131,159	358,646	3,548,756	114,354	193,782	82,231	981,564	46,813	1,418,744	2,130,012	17,121	80,000	2,067,133	....
Chicago, Milwaukee & St. Paul	7,511	20,575,674	6,880,723	29,567,440	4,246,772	3,412,992	558,760	10,481,062	472,907	19,172,493	10,394,947	164,162	1,033,163	9,525,946	—286,739
Cincinnati, New Orleans & Tex. Pac.	337	2,858,293	650,010	3,684,756	434,538	712,635	95,496	996,522	87,611	2,326,802	1,357,954	844	100,000	1,258,798	309,566
Cleveland, Akron & Columbus	210	767,621	238,947	1,073,815	153,387	250,568	14,779	331,582	18,641	768,957	304,858	....	25,000	279,858	3,528
Colorado Midland	337	787,117	199,305	1,122,728	149,139	164,070	50,605	443,309	27,463	834,586	288,142	—562	46,750	240,830	346
Cumberland Valley	162	897,084	285,638	1,234,555	166,841	113,346	19,484	345,033	27,203	671,907	562,648	2,666	20,418	544,896	51,405
Duluth & Iron Range	168	6,189,053	106,699	6,336,973	527,187	316,627	1,767	902,423	42,727	1,790,731	4,546,242	25,243	253,876	4,317,609	1,294,259
Duluth, Missabe & Northern	289	8,520,677	180,171	8,743,007	517,304	513,801	7,785	1,029,003	50,484	2,118,377	6,624,630	33,358	355,733	6,302,255	1,619,287
Duluth, South Shore & Atlantic	598	947,517	462,498	1,483,377	235,377	149,825	47,374	518,136	34,269	984,981	498,396	6,742	80,000	425,138	143,972
Evansville & Terre Haute	310	714,529	268,805	1,085,998	121,088	138,821	25,749	296,938	33,547	616,143	469,855	—4,215	44,360	421,280	105,132
Galveston, Harrisburg & San Antonio	1,338	3,236,720	1,051,722	4,506,729	551,448	620,952	116,361	1,607,397	135,431	3,031,589	1,475,140	—17,033	140,895	1,317,212	19,470
Georgia R. R.	307	875,238	352,129	1,298,539	169,119	191,345	47,459	488,480	34,886	934,289	364,250	....	10,089	354,161	141,592
Georgia Southern & Florida	395	541,996	297,401	957,714	105,586	190,753	27,884	333,615	42,151	699,989	257,725	8,239	43,897	222,067	30,225
Gulf & Ship Island	307	655,213	188,820	899,630	168,266	149,078	5,998	259,350	36,196	618,888	280,742	....	24,260	256,482	107,698
Kanawha & Michigan	175	1,018,509	144,879	1,185,155	225,307	239,683	11,062	276,887	19,775	772,714	412,441	—97	34,662	377,682	118,314
Long Island	391	1,350,911	2,911,016	4,453,841	420,744	524,696	84,849	1,663,046	89,217	2,782,552	1,671,289	466,453	166,162	1,971,579	487,926
Morgan's La. & Tex. R. R. & S. S. Co.	358	1,441,841	459,308	2,007,277	261,409	240,422	49,874	690,767	63,261	1,305,733	701,544	—5,557	80,000	615,987	150,268
New York, Phila. & Norfolk	112	1,142,786	182,509	1,420,006	129,778	229,576	16,661	483,320	42,961	902,296	517,711	....	31,250	486,460	119,742
New York, Susquehanna & Western	151	727,673	284,367	1,127,149	148,595	108,318	7,583	408,800	19,605	692,901	434,248	—30,391	56,583	347,273	2,086
Northwestern Pacific	376	637,536	787,340	1,533,706	250,941	165,980	12,954	486,884	47,293	964,052	569,654	....	52,905	516,749	93,602
Peoria & Eastern	351	989,248	321,149	1,407,091	165,861	226,355	26,783	470,853	24,889	914,741	492,350	....	44,000	448,350	106,518
St. Louis & San Francisco	4,726	11,483,084	4,541,177	17,230,043	2,864,490	2,674,755	392,356	5,550,598	455,393	11,937,592	5,292,451	....	565,709	4,726,742	721,728
St. Louis Southwestern	773	2,462,583	591,541	3,181,308	369,649	457,653	119,349	686,489	105,726	1,738,866	1,442,442	—3,952	108,697	1,329,793	262,027
St. Louis Southwestern of Texas	697	1,164,438	399,515	1,675,301	364,171	342,448	46,083	637,112	76,305	1,466,119	209,182	—895	41,666	166,621	70,061
Texas & New Orleans	458	1,123,966	416,268	1,622,729	226,119	244,064	31,808	593,571	44,569	1,140,132	492,597	7,865	58,000	442,462	106,119
Toledo, St. Louis & Western	451	1,346,445	213,176	1,658,122	199,230	235,782	33,200	494,600	41,812	1,004,624	653,498	....	60,000	593,498	91,527
Union Pacific	3,384†	17,156,043	5,090,136	24,122,947	2,367,530	2,063,059	596,675	5,115,926	479,212	10,622,402	13,500,545	12,602	637,875	12,875,272	1,557,582
West Jersey & Seashore	356	738,181	1,931,806	2,853,172	389,181	290,024	80,979	1,004,017	42,480	1,806,681	1,046,491	16,678	100,185	962,984	139,306

*Began operations on Aug. 1, 1909. †Mileage operated Nov. 30, 1908—3,309. —Indicates deficits, losses and decreases.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 63, giving a summary of car shortages and surpluses by groups from August, 19, 1908, to January 5, 1910, says:

"The grand total figures given in this bulletin show a decrease in the surplus of 6,045, and in the shortage of 10,161, but as will be noted by the group totals, the general situation indicates a lessened demand for cars. This apparent contradiction is due to the fact that the showing made by the grand totals hardly indicates the true condition, as two important roads in group 6 (Northwestern) failed to get their reports to the committee in time for incorporation in the bulletin.

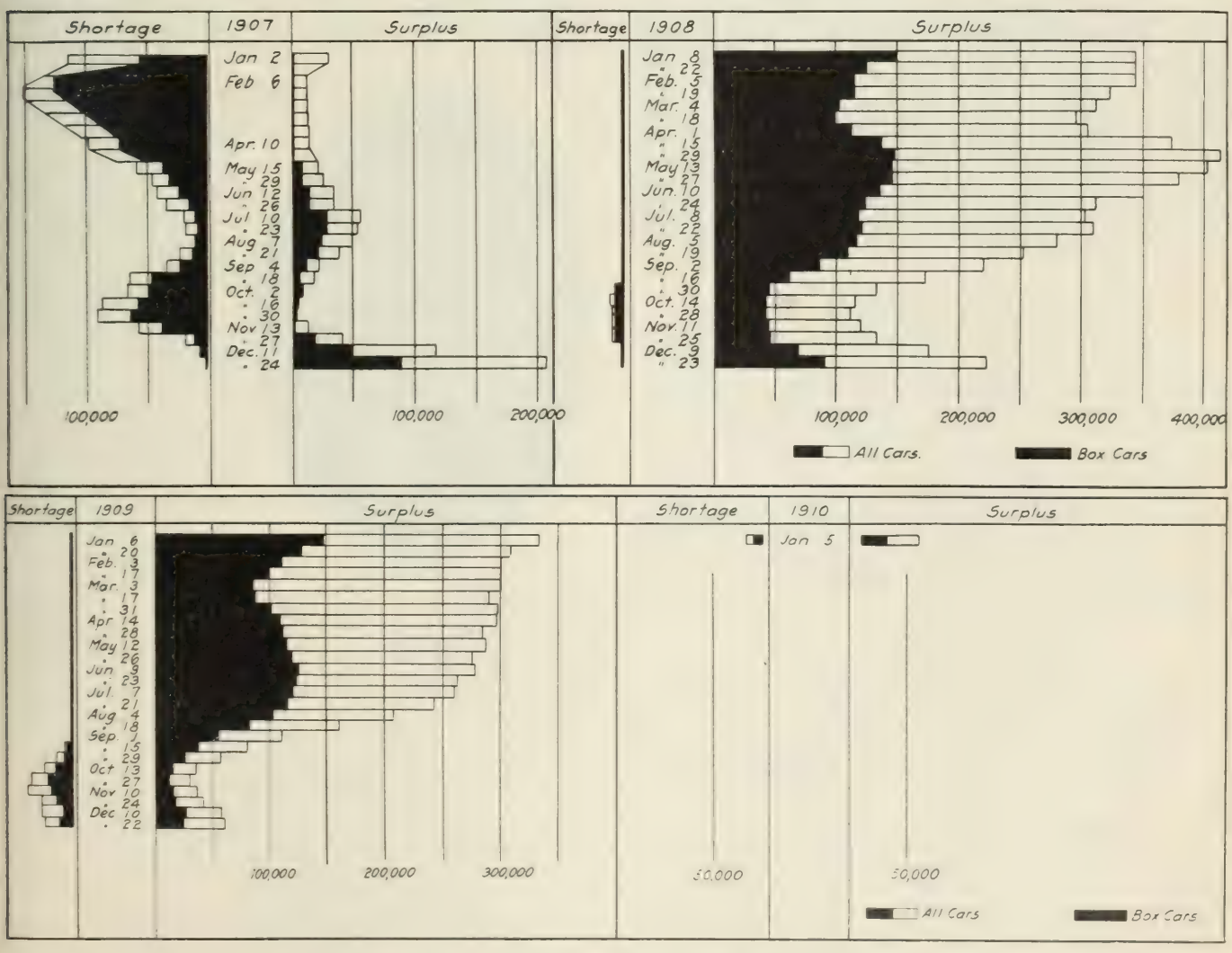
"Aside from group 6, the figures of which cannot be used for comparison, the only group that shows a decrease in the surplus is group 11 (Canadian). This group also shows a slight increase in shortage, being the only one failing to show a decrease in this item. The most notable change in conditions is in group 4 (North Atlantic), where a surplus of 1,482 and a shortage of 8,680 in our last report is changed to a surplus of 7,131 and a shortage of 1,476. This is due apparently to a general slackening of business on the tidewater coal roads lying in that group."

The accompanying table gives the car surpluses and short-

CAR SURPLUSES AND SHORTAGES.

Group*	Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
1	January 5, 1910	8	.....	1,658	238	59	1,955	530	.....	28	54	612
2	" 5, 1910	23	1,494	240	1,181	482	3,397	10	.....	2,081	23	2,114
3	" 5, 1910	22	396	358	652	1,651	3,057	1,523	50	1,751	974	4,298
4	" 5, 1910	10	3,767	596	2,069	699	7,131	1,127	14	335	....	1,476
5	" 5, 1910	21	907	507	482	741	2,637	277	200	535	....	1,012
6	" 5, 1910	19	3,152	498	1,902	2,121	7,673	3,229	35	199	193	3,566
7	" 5, 1910	4	280	122	414	785	1,601	...	...	...	....	.....
8	" 5, 1910	14	3,834	384	979	1,168	6,365	24	2	...	3	29
9	" 5, 1190	10	2,344	361	358	441	3,504	6	35	...	92	133
10	" 5, 1910	18	4,251	1,591	1,907	3,944	11,693	188	8	43	....	239
11	" 5, 1910	5	414	2,136	22	724	3,296	390	...	24	....	414
Grand total		154	20,839	8,451	10,204	12,815	52,309	7,304	344	4,906	1,339	13,893

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota, and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California, and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

ages by groups and the chart shows the total surpluses and shortages bi-weekly in 1907, 1908, 1909 and 1910.

Traffic Club of Chicago.

The annual dinner of the Traffic Club of Chicago will be held at the La Salle Hotel on Tuesday, February 8. The speakers will include U. S. Senator A. B. Cummins of Iowa; Edward Bancroft, general counsel of the International Harvester Company, and Warren J. Lynch, passenger traffic manager of the New York Central Lines. Col. J. S. Taylor, U.S.A., addressed the club on January 18 on the subject "Safe Transportation of Explosives and Other Dangerous Articles."

INTERSTATE COMMERCE COMMISSION.

Icing Charges Reduced.

California Fruit Growers' Exchange v. Santa Fe Refrigerator Despatch Co. et al. Opinion by Commissioner Lane.

Defendants required to maintain in their refrigeration tariffs for two years a rule providing that no charge over the regular refrigeration rate will be made on cars iced before loading at regular icing stations in California and Arizona and set for loading inside switching limits at such points. (17 I. C. C., 404.)

Reduction in Grain Rates to Astoria.

Farmers' Co-operative & Educational Union v. Great Northern et al. Astoria Chamber of Commerce v. same. Opinion by Commissioner Clark.

The commission is asked to establish joint through rates on grain and grain products from producing points in Washington, Oregon and Idaho to Astoria, Ore., the same as the rates to Portland, Ore., and Seattle, Wash., and Tacoma. The fact that defendants have provided themselves with tracks, warehouses, wharves, etc., for handling export grain at Portland, Seattle and Tacoma does not impose on them the obligation of duplicating those facilities at Astoria. However, defendants' rates on grain and grain products from points in Washington and Idaho to Astoria are unreasonable *per se*, and rates shall be established to Astoria not more than 4½ cents per 100 lbs. higher than the rates to Portland. (17 I. C. C., 406.)

Orders for Cars Should be in Writing.

Pope Manufacturing Co. v. Baltimore & Ohio et al. Opinion by Commissioner Harlan.

The petitioner's claim that it ordered cars of definite length for the shipments involved in these complaints is denied by the defendant, and the conflict of testimony is such as to give the commission no clear ground for holding that such demands were in fact made.

In view of the confusion that not infrequently follows the absence of a written record of a demand for a car of specific length for a particular movement, shippers are cautioned to give their orders for equipment in writing or promptly to confirm the orders in writing when given verbally. (17 I. C. C., 400.)

Discrimination in Passenger Service.

Loch Lynn Construction Co. v. Baltimore & Ohio. Opinion by Commissioner Clements.

A carrier cannot justify unreasonable discrimination between localities in refusing to stop its passenger trains at a particular place on certain days by a contract not to do so. A controversy involving a question of such discrimination must be determined independent of the contract.

In the performance of its passenger service a carrier operates in a wide field of reasonable discretion in the adaptation of its service to the infinite variety of circumstances and conditions confronting it. Only such resulting discriminations as are undue and unreasonable are forbidden.

The failure of the defendant carrier to stop its passenger trains at Mountain Lake Park, Md., a station on its line, is not found to be unreasonable discrimination in view of all the facts, circumstances and conditions appearing. (17 I. C. C., 396.)

STATE COMMISSIONS.

The Louisiana Railway Commission has fined the Texas & Pacific $250 for violating the regulations of the commission by failing to have lights in its waiting room at New Roads, La., on the night of November 24, 1909, between 8:45 and 9:30 p.m.

The New York State Public Service Commission, First district, has directed the Interborough Rapid Transit Company to put destination signs on every subway car, at each end and on opposite sides, so that they may be seen from the platforms and the inside of the cars. The order must be obeyed by February 1. The company has also been directed to provide at each station a map of the entire subway system, indicating the streets adjacent to every station.

Indiana: Headlights.

The order of the Indiana State Railroad Commission, requiring all railways in that state to have their locomotives equipped with headlights of 1,500 candle power, was noticed in our last issue, page 108, and the language of our note was copied, correctly, from the official document, but the title, indicating that electric headlights would be required, was wrong. The order does not specify what kind of lights shall be used. As a matter of fact, acetylene headlights are already in use on the railways of Indiana. The Indianapolis Southern has just given an order for acetylene lights.

D. F. Jurgenson, who has been in the employ of the Minnesota Railroad and Warehouse Commission for the last five years, has been appointed engineer for the commission. His duties will cover all work pertaining to the engineering department of the commission, the most important part of which is the continuation of the valuation of railway properties. The physical valuation of railway properties in Minnesota was completed some years ago, but it has been found necessary to continually keep this valuation up to date. Mr. Jurgensen is a graduate of the engineering school of the Minnesota University. After graduation he began railway work in 1890 in the office of the county surveyor in Minneapolis. He was later connected with the bridge engineering department of the city, and in 1895 he was appointed assistant engineer on the Minneapolis & St. Louis. He was later employed in the engineering department of the Chicago Great Western, remaining there until 1904, when he was appointed first assistant to D. C. Morgan, then in charge of valuation of railways for the Minnesota commission.



D. F. Jurgensen.

COURT NEWS.

The supreme court of Michigan has ruled that the mechanics' lien law is not to apply to the construction of railways, and the builders of a power house for the Detroit, Flint & Saginaw Railroad have no valid lien upon the property.

Suit was filed in the United States circuit court at Chicago on January 15 by Fred W. Smith, a stockholder, to restrain the Northern Trust Company from complying with the pro-

visions of the federal corporation tax law. The avowed purpose of the litigation is to test the constitutionality of the law.

Judge Humphrey, of the United States circuit court, on June 15 overruled a demurrer by Attorney-General Stead, of Illinois, in the suit of the Chicago, Peoria & St. Louis at Springfield, Ill., involving the constitutionality of the Illinois 2-cent fare law. The attorney-general contended that the federal court did not have jurisdiction and that the road had not made a prima facie showing that the 2-cent fare is confiscatory.

In the circuit court at Cleveland, Ohio, this week, the litigation between the city of Cleveland and certain railway companies in regard to the ownership of a tract of 40 acres of land on the lake front was decided in favor of the city, the decision of the lower court having been confirmed. The railways will appeal the case to the supreme court of the United States.

Judge Carland, of the federal court, on January 13 issued an order temporarily restraining the South Dakota Railway Commission from enforcing an order issued by it on December 15 requiring Wells, Fargo & Company, the Adams Express Company and the American Express Company to reduce their rates. The companies were ordered to adopt a distance schedule framed by the commission. Judge Carland will give a hearing in the case on January 25.

The supreme court of Missouri has issued a writ prohibiting the Audrain county circuit court from proceeding with the suit filed in it by which it is sought to invalidate bonds and stock issued by the Wabash in 1906. The suit in question was filed by the Continental Securities Company of New Jersey and Clarence H. Venner, holders of $50,000 of debenture mortgage bonds issued in 1889. The complainants allege that the holders of the 1889 bonds, of which it is stated $30,000,000 were issued, were to be permitted, with the stockholders, to elect 12 directors, and that these directors were to choose the president. They allege that the directors of the Wabash failed to set aside any of the net income of the company in Missouri for the payment of interest on the old bonds, and that, therefore, the conditions under which this mortgage was given were violated. They charge that a meeting of the stockholders in 1906, when it was voted to issue $200,000,000 in bonds and to retire all outstanding indebtedness, including the issue of debenture mortgage bonds referred to, was irregular, and they ask the court to restrain the Wabash from setting aside any of its earnings to pay the interest on the new bonds. The attorneys for the Wabash in their petition to the supreme court for a writ of prohibition against the Audrain county circuit court said that if the suit was decided in favor of the complainants a cloud would be thrown upon the validity of $50,000,000 of bonds already issued and in the hands of innocent holders. The writ was made returnable at the April term of the supreme court.

The supreme court of the United States has declared invalid the laws of Kansas, known as the Bush act, which sought to compel outside corporations to pay a charter fee for the benefit of the state schools as a condition of doing business in that state. The decision is by a divided court. The controlling opinion is by Justice Harlan, with concurring opinion by Justice White, Chief Justice Fuller and Associate Justices Holmes and McKenna dissent. The case was that of the Western Union Telegraph Company, plaintiff in error, vs. the state of Kansas. The Western Union has fought the law on the grounds of acquired rights and that the law was unconstitutional, as seeking to impose a burden upon interstate commerce. Justice Harlan declares that "the statutory requirement of a given per cent. of the authorized capital of a telegraph company which represented all its business interests and property inside and out of the state was, in its practical operation, a burden on interstate commerce and a tax on property beyond the limits of Kansas."

In the dissenting opinion, Justice Holmes declared that the state had not undertaken to tax the Western Union, but simply had fixed the condition on which the company could transact state business within the state. "If the license fee is more than the local business will bear it can stop that business and avoid the fee." Justice White concurred in the finding of the majority, but for different reasons, and read an opinion outlining his view.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

O. C. Van Zandt, auditor of the Gulf & Interstate, with office at Galveston, Tex., has resigned.

H. P. McMillan has been appointed auditor of the Texas State Railroad, with office at Palestine, Tex.

H. E. Byram, assistant to second vice-president of the Chicago, Burlington & Quincy, at Chicago, has been appointed assistant to the vice-president.

W. H. Biggar, general solicitor of the Grand Trunk and the Grand Trunk Pacific, at Montreal, Que., has been appointed general counsel of both these companies, and his former position has been abolished.

H. C. Ansley has been appointed treasurer of the Georgia, Southern & Florida, with office at Washington, D. C., succeeding B. C. Smith, deceased. W. P. Hopper, purchasing agent at Macon, Ga., has been appointed local treasurer and assistant secretary, with office at Macon.

Gordon Campbell, vice-president and general manager of the York Railways (Electric) at York, Pa., has been elected president, succeeding W. F. Bay Stewart. Mr. Stewart will continue as a member of the board of directors, also as a member of the executive committee. Lewis C. Meyer, chief engineer, succeeds Mr. Campbell.

A. D. McDonald, whose appointment as auditor of the Southern Pacific and the Corvallis & Eastern at San Francisco, Cal., was announced in the *Railway Age Gazette* in its issue of Jnuary 7, page 72, was born April 14, 1878, at Oakland, Cal. He finished his education at Notre Dame University and began railway work January 8, 1901, with the Galveston, Harrisburg & San Antonio at Houston, Tex. He was then consecutively clerk at Houston, chief clerk of the Southern Pacific at San Francisco, head clerk of accounts with the various Harriman lines at San Francisco and auditor of the Los Angeles Pacific Company at Los Angeles. In December, 1908, he was made auditor of the Pacific Electric Railway, from which position he has just been promoted.

Operating Officers.

T. T. Clark has been appointed superintendent of the Texas State Railroad, with office at Palestine, Tex.

W. W. Ryder, superintendent of telegraph of the Chicago, Burlington & Quincy, at Chicago, has been appointed general superintendent of telegraph of the New York Central lines west of Buffalo, with office at Chicago.

F. M. Luce, auditor of car accounts of the Chicago & North Western at Chicago, having been retired under the pension rules of the company, his duties will be performed by Edward E. Betts, car service agent, with office at Chicago.

O. Cornelisen having resigned as general superintendent of the Chicago Great Western at Chicago, that office is abolished, and the duties heretofore performed by the general superintendent will be assumed by H. J. Slifer, general manager.

R. C. Ten Eyck has been appointed superintendent of the Third division of the Denver & Rio Grande, with office at Gunnison, Colo., succeeding O. J. Ogg, who retains the superintendency of the Second division, with office at Salida, Colo. The office of assistant superintendent of the Third division has been abolished.

Frederick Ely Williamson, whose appointment as assistant superintendent of the Mohawk division of the New York Central & Hudson River at Albany, N. Y., was recently announced in these columns, was born in 1876 at Cleveland, Ohio. Mr. Williamson is a graduate of Yale University, and began railway service in September, 1898, as a clerk in the superintendent's office at Albany, N. Y. In April, 1899, he was made freight claim agent at Albany and the following January

agent at Rome. In July, 1901, he was transferred to Utica as agent, and in April, 1902, was again transferred in the same capacity to Troy. Later he was transferred as chief clerk to the superintendent of freight transportation at New York, and was then appointed car accountant. He was made assistant superintendent of the Harlem division in December, 1906, and appointed superintendent of freight terminals at Albany in August, 1907, which position he held at the time of his recent promotion.

Eugene H. Coapman, whose appointment as general manager of the Southern Railway, with office at Washington, D. C., was recently announced in these columns, was born on August 11, 1865, in Wisconsin. He began railway work on the Chicago, Milwaukee & St. Paul when he was 15 years old. From 1880 to 1883 he was operator and train despatcher, and then went to the Iowa Central as train despatcher. After serving as chief despatcher and superintendent of telegraph he returned to the Chicago, Milwaukee & St. Paul in 1887 as train despatcher. In 1890 he went to the Illinois Central in the same capacity, and was later made chief train despatcher and finally terminal freight trainmaster, leaving that company in 1900 to go to the Atchison, Topeka & Santa Fe as trainmaster. Two years later he went to the Southern as superintendent of the Danville division. In December, 1905, he was made assistant general superintendent of the Eastern district, and in November, 1906, was made general superintendent of the Northern district; about a year later was appointed manager of the Northern and Eastern districts, and later was made manager of the Southern Railway. He is now general manager in charge of the operating and maintenance departments.



E. H. Coapman.

In connection with the promotion of W. N. Bannard and C. T. Dabney, division superintendents of the Philadelphia, Baltimore & Washington to the staff of the general manager of the Pennsylvania Railroad as special agents, the following appointments have been made: A. J. Whitney, Jr., superintendent of the Delaware division of the Philadelphia, Baltimore & Washington, at Wilmington, Del., has been appointed superintendent of the Maryland division, with office at Wilmington, succeeding Mr. Bannard. E. B. John, principal assistant engineer at Wilmington, succeeds Mr. Whitney. A. B. Clark, division engineer of the Maryland division at Wilmington, succeeds Mr. John. J. J. Rhoads, division engineer of the Philadelphia Terminal division of the Pennsylvania at West Philadelphia, Pa., succeeds Mr. Clark. William F. Greene, supervisor of the P., B. & W. at Washington, D. C., succeeds Mr. Rhoads. N. W. Smith, division engineer of the Middle division of the Pennsylvania at Altoona, has been appointed superintendent of the Central division of the P., B. & W., succeeding C. T. Dabney. J. C. Auten, division engineer of the West Jersey & Sea Shore at Camden, N. J., succeeds Mr. Smith, and J. B. Hutchinson, Jr., supervisor at Altoona, succeeds Mr. Auten.

Traffic Officers.

H. Wallace, local freight agent of the Canadian Pacific at Winnipeg, Man., has been appointed general freight agent at Fort William, Ont.

R. B. Hackney has been appointed a commercial agent of the Cincinnati Northern, with office at Cincinnati, Ohio, succeeding J. R. Davidson, resigned.

W. L. Lighthart has been appointed a traveling freight agent of the Chicago Great Western, with office at St. Paul, Minn., succeeding T. H. Hughes, resigned.

E. G. Mustain has been appointed a traveling freight and passenger agent of the El Paso & Southwestern and the Morenci Southern, with office at El Paso, Tex.

W. S. Weber, traveling passenger agent of the Great Northern at Spokane, Wash., has been appointed traveling passenger and immigration agent, with office at Chicago.

I. M. Keller has been appointed a traveling passenger agent of the Missouri Pacific, with office at Chicago, succeeding J. F. Govan, resigned to accept service elsewhere.

F. L. Lewis, traveling auditor of the St. Louis, Brownsville & Mexico at Kingsville, Tex., has been appointed commercial agent, with office at Corpus Christi, Tex. M. M. Smith succeeds Mr. Lewis.

J. B. Muckle, traveling passenger agent of the Wabash at Denver, Colo., has been appointed city ticket agent, with office at Chicago, succeeding N. C. Keeran, resigned to engage in other business.

J. P. Baker has been appointed a traveling freight agent and P. A. Greening has been appointed a soliciting freight agent of the Chicago, Rock Island & Pacific, both with office at Fort Worth, Tex.

E. T. Steele, assistant general freight agent of the Seaboard Air Line at Birmingham, Ala., has been appointed freight traffic manager of the Alabama Great Southern, with office at Birmingham, succeeding L. Sevier.

Charles E. Perkins, assistant general freight agent of the St. Louis, Iron Mountain & Southern at St. Louis, Mo., has been appointed general freight agent, with office at St. Louis, succeeding J. P. Burnett, assigned to other duties.

J. W. Harper, traveling passenger agent of the San Pedro, Los Angeles & Salt Lake at Chicago, has been appointed a traveling passenger agent of the Denver & Rio Grande, with office at St. Louis, Mo., succeeding A. B. Ayers, promoted.

E. L. Mountford, contracting freight agent of the Illinois Central at Birmingham, Ala., has been appointed a traveling freight agent, with office at Birmingham, succeeding Willis Hitzing, transferred. O. F. Redd succeeds Mr. Mountford.

Daniel C. Fisk, Jr., traveling freight agent of the Union Pacific, the Oregon Short Line and the Oregon Railroad & Navigation Co., at New York, has been transferred to Philadelphia, Pa. George J. Needham succeeds Mr. Fisk, with office at New York.

E. A. Cousino, traveling passenger agent of the West Shore, at Chicago, has been appointed general Western passenger agent, with office at Chicago, succeeding Neil Mooney, promoted. M. P. Marsh, city passenger agent at Toledo, Ohio, succeeds Mr. Cousino.

E. D. Forde has been appointed a traveling passenger agent of the St. Louis & San Francisco, with office at Pittsburgh, Pa. J. B. Gibson has been appointed a traveling freight agent and H. H. Scott has been appointed a soliciting freight agent, both with office at Houston, Tex.

H. M. Baker has been appointed a commercial agent of the Grand Trunk (Portland route) and the Central Vermont (New London route). He will also represent the National Despatch fast freight line, the Great Eastern fast freight line and the Canada-Atlantic Transit Co., with office at New York.

C. B. Condon, assistant general freight agent of the Minneapolis & St. Louis and the Iowa Central at Minneapolis, Minn., has been appointed general agent in the traffic department of the Toledo, St. Louis & Western, the Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, with office at San Francisco, Cal.

E. J. Naylor, general agent of the Toledo, St. Louis & Western and the Chicago & Alton at Los Angeles, Cal., has had

his jurisdiction extended over the Minneapolis & St. Louis and the Iowa Central. R. M. Jenks, commercial agent of the Minneapolis & St. Louis at Los Angeles, has been appointed traveling freight agent of all four roads, with office at Los Angeles.

Charles H. Gattis, whose appointment as general passenger agent at Augusta, Ga., of the Georgia & Florida, was recently announced in these columns, entered the service of the Seaboard Air Line at Raleigh, N. C., about 19 years ago as office boy. Mr. Gattis has since that time been consecutively city ticket and passenger agent in Raleigh, traveling passenger agent, and at the time of his appointment was district passenger agent of the same company.

T. B. Akridge, whose appointment as general freight agent at Augusta, Ga., of the Georgia & Florida, was recently announced in these columns, has been in railway service for about 15 years. He was with the Central of Georgia at Atlanta, Ga., and then with the Southern Freight Association. He next went to the Southern Railway in the general freight department, and for the past three years has been chief clerk in the traffic department of the Georgia & Florida.

H. E. Lounsbury, general agent in the freight department of the Southern Pacific Company, the Oregon Railroad & Navigation Company and the Oregon & Washington at Portland, Ore., has been appointed district freight agent of the Southern Pacific Company, with office at Portland, succeeding C. A. Malboeuf, resigned. C. H. Dexter, contracting freight agent at Portland, succeeds Mr. Lounsbury. H. C. Oliver, traveling freight agent of the Oregon Railroad & Navigation Company at Portland, has been transferred to Spokane, and F. R. Dunn succeeds Mr. Oliver.

Gentry Waldo, whose appointment as assistant general freight agent of the Galveston, Harrisburg & San Antonio, the Houston & Texas Central, the Houston, East & West Texas and the Houston & Shreveport, with office at Houston, Tex., has been announced in these columns, was born in Houston September 26, 1874. He finished his education at Yale University and began railway work in 1896 with the Houston & Texas Central. He was then consecutively traveling freight agent at Nashville, Tenn., and later at Houston; division freight agent at Austin, Tex.; general agent of the Galveston, Harrisburg & San Antonio at El Paso, Tex., and then at Galveston, Tex. In November, 1909, he was made general agent of the Southern Pacific Steamship Lines, with office at Galveston, from which position he has just been promoted.

Engineering and Rolling Stock Officers.

H. F. Smith has been appointed a master car builder of the Chicago & Alton, with office at Bloomington, Ill.

J. Murrin has been appointed superintendent of locomotive shops of the Chicago & North Western, with office at Chicago, succeeding Oscar Otto, resigned.

H. P. Johns, chief draftsman of the St. Louis & San Francisco at Springfield, Mo., has been appointed mechanical engineer, with office at Springfield, Mo.

R. S. Miller, general foreman car department of the New York, Chicago & St. Louis, at Cleveland, Ohio, has been appointed master car builder and his former title has been abolished.

J. E. O'Brien, mechanical engineer of the Northern Pacific at St. Paul, Minn., has been appointed superintendent of motive power of the Western Pacific, with office at San Francisco, Cal.

E. W. Kolb, engineer of electric signals of the Chicago, Rock Island & Pacific, at Chicago, has resigned, to become signal engineer of the Buffalo, Rochester & Pittsburgh, at Rochester, N. Y.

C. E. Allen, master mechanic of the Montana division of the Northern Pacific at Livingston, Mont., has been appointed general master mechanic of the Yellowstone, Montana and Rocky Mountain divisions, with office at Livingston. R. P. Blake succeeds Mr. Allen.

R. A. Rutledge, division engineer of the Gulf, Colorado & Santa Fe at Cleburne, Tex., has been appointed grand division engineer of the Gulf lines, with office at Galveston, Tex. This is a new office and Mr. Rutledge has special charge of maintenance and betterments, under the general supervision of F. Merritt, chief engineer, and all division engineers will report direct to him.

Alfred P. Prendergast, assistant master mechanic at the Mt. Clare shops of the Baltimore & Ohio, at Baltimore, Md., has been appointed master mechanic, succeeding C. T. Turner, retired, after 47 years' service in the same shops. Mr. Prendergast entered the service of the Baltimore & Ohio as an apprentice in 1885 at Wheeling, W. Va., and after completing his apprenticeship he was engaged in the steel industry in the Pittsburgh and Youngstown districts. Several years later he returned to the Baltimore & Ohio as gang foreman at Benwood, W. Va., and then became machine shop foreman at Cumberland, Md., where he also served as roundhouse foreman. He was later made general foreman of locomotive and car repairs and then promoted to division master mechanic at Grafton. Two years later he was transferred to the Baltimore and Philadelphia divisions as master mechanic, with office at Riverside, Baltimore, leaving that position two years later to go to the Mt. Clare shops at Baltimore, as assistant master mechanic, which position he held at the time of his recent appointment.

Purchasing Officers.

J. T. Andrus has been appointed purchasing agent of the North Coast Railroad, with office at Spokane, Wash.

J. H. Palmer has been appointed purchasing agent of the Georgia, Southern & Florida, with office at Macon, Ga., succeeding W. P. Hopper, promoted.

Special Officers.

Frederick N. Pease, assistant chemist of the Pennsylvania Railroad, at Altoona, Pa., has been appointed chemist, succeeding Dr. Charles B. Dudley, deceased.

OBITUARY.

Clifford Buxton, chief engineer of the Toledo & Ohio Central and the Zanesville & Western, with office at Toledo, Ohio, died at his home in Toledo on January 12 after an illness of about five weeks. Mr. Buxton was born on June 15, 1844, at Warren, Me. He graduated from the Rensselaer Polytechnic Institute at Troy, N. Y., and entered railway work in 1865, and in 1866 was a rodman on the Troy & Boston, now a part of the Boston & Maine. From 1866 to 1867 he was division engineer of the Allegheny Valley, now a part of the Pennsylvania Railroad, and in 1867 he became the principal assistant engineer of the Knox & Lincoln, now a part of the Maine Central, leaving that position in 1871 to become an assistant engineer in the service of the United States. The same year he was appointed principal assistant engineer on the Cleveland, Mount Vernon & Delaware, now a part of the Pennsylvania Lines West. From 1875 to 1879 he was principal assistant engineer of the Scioto Valley, now a part of the Norfolk & Western, leaving that position to become principal assistant engineer of the Ohio Central, now the Toledo & Ohio Central. In 18881 he was appointed chief engineer of the Toledo & Ohio Central and the Zanesville & Western.



Clifford Buxton.

Railway Construction.

New Incorporations, Surveys, Etc.

Boston & Maine.—An officer writes that a number of changes are under consideration to be made in Salem, Mass. The grade crossings at North, Mill and Bridge streets will probably be abolished and revision work in the tunnel carried out to provide two tracks in place of the existing single track. No details have been prepared, although it is expected that an appropriation of $2,000,000 will be necessary to carry out the work. On the Western division, between Newmarket, N. H., and Madbury, a long tangent will be substituted for several existing curves and a double-track provided, saving about one-eighth mile in distance, 140 deg. of curvature, and 10 ft. of rise and fall. The grades will be reduced from 40 ft. to 26 ft. per mile. On the Gloucester branch second track will be extended from West Gloucester station, Mass., across the Squam river to the east end of Gloucester yard. A new drawbridge will be provided, also a new station at Gloucester, and the grade crossing at Washington street will be eliminated. The company is also planning to put up new stations at Keene, N. H.; at Charlemont, Mass., and at Shelburne Falls. (Jan. 14, p. 113.)

Buffalo, Rochester & Eastern.—The New York Public Service Commission, Second district, has granted a rehearing in the matter of this company's application for a certificate of public convenience and necessity, and for permission to begin construction on the line from Buffalo, N. Y., east to Rochester, thence to Troy, about 300 miles. A former application for such certificate and permission was denied by the commission in March, 1909. (March 26, p. 726.)

Chesapeake & Ohio.—Surveys, it is said, are being made by this company between Charlottesville, Va., and Orange. It is understood that the company is planning to double-track this section of the road.

Chicago, Bloomington & Peoria (Electric).—Incorporated in Illinois, with a capital of $25,000, to build a line to connect Chicago, Bloomington and Peoria. The incorporators include: C. S. Sollars, F. M. Capp and A. A. Hyde, all of Chicago, and V. L. Garnett, Highland Park, Ill.

Chicago, Milwaukee & Puget Sound.—Contract is said to have been let recently for a 20-mile extension of the Tacoma Eastern south from Glenavon, in the state of Washington. (Dec. 17, p. 1214.)

Corvallis & Eastern.—This company has projected an extension from Yaquina, Ore., west to Newport, five miles.

Des Chutes Railroad.—See Oregon Trunk Line.

Estacado & Gulf.—An officer is quoted as saying that this road will build and put in operation 100 miles of line during 1910 from Roby, in Fisher county, Tex., west. W. A. Butts, president, and T. H. Landon, chief engineer, both of Roby.

Fort Smith & Western.—An officer writes that the company is making preliminary arrangements, taking up a former survey, and getting ready to finance and build a line from El Reno, Okla., southwest to a point on the Kansas City, Mexico & Orient, either at Sentinel or at Dill City, about 100 miles. Construction work has not yet been started.

Fort Smith, Van Buren & Eastern.—Incorporated in Arkansas, with $100,000 capital, to build interurban lines from Van Buren, Ark., to various places in Crawford, Franklin, Johnson, Madison, Newton, Boone and Searcy counties. W. F. Keller, president, Van Buren; L. W. Burgett, vice-president; T. A. Bayley, secretary, and S. A. Perrot, treasurer.

Gary, Hobart & Valparaiso (Electric).—An officer writes that work is to be started as soon as weather conditions will permit on a line from Gary, Ind., southeast via Glenpark, New Chicago, Hobart and Wheeler to Valparaiso, about 25 miles. The work will include several small trestles and one concrete under-grade crossing. The company also plans to put up car barns and a powerhouse. J. S. Hopkins, president, 616 Corn Exchange bank, Chicago; B. A. Mapledoram, chief engineer, Hobart. (Jan. 14, p. 113.)

Grand Trunk.—An officer writes regarding the reports that plans are under consideration for a line from Grand Rapids, Mich., south to Kalamazoo, about 50 miles, that at the present time the company does not contemplate building the line. (Jan. 7, p. 68.)

Great Northern.—An officer writes that contracts have been let to J. W. Stewart for grading the Vancouver, Victoria & Eastern from Princeton, B. C., west to Tulameen, 17 miles; also from Abbottsford east to Chilliwack, 20 miles. (Jan. 7, p. 68.)

Surveys are said to be under way for an extension of the Okanogan Valley branch, from Oroville, Wash., north to Penticon, B. C., at the foot of Okanogan lake.

According to press reports this company is planning to build a branch from Great Falls, Mont., west to Augusta, in the northern part of Lewis and Clark counties, about 70 miles. Surveys said to be made.

Announcement has been made that the Board of Railway Commissioners of Canada has authorized the opening for traffic of the section of the Vancouver, Victoria & Eastern from Keremeos, B. C., to Princeton, 41.6 miles.

Hammond, Chicago Heights & Southern Traction.—Incorporated in Illinois, with $500,000 capital, to build from a point near Hammond, Ind., southwest to Chicago Heights, Ill., thence south to St. Anne, in Kankakee county, in all about 50 miles. The incorporators include: W. S. Reed, J. Orr, A. Ward and E. R. Davis, Chicago, and A. Van Steenburg, Lansing, Mich.

Idaho Roads.—According to reports from St. Maries, Idaho, the Blackwell Lumber Co. has finished grading an eight-mile logging line from the St. Maries-Bovill branch of the Chicago, Milwaukee & Puget Sound east to timber properties of the company near Fernwood. It is expected to have track laid this month on the main line to Fernwood. As soon as this work is finished track-laying will be started on a line to Blackwell.

Imperial Valley.—This company, operating a 10-mile line in Texas, is said to have plans ready to begin work soon on an extension along the east side of the Brazos river.

Iowa & Southwestern.—An officer writes that contracts will be let some time this spring for a line to be built from Clarinda, Iowa, southwest via College Springs to Blanchard, in Page county, 20 miles. W. S. Farquhar, president, College Springs, and J. E. Judd, chief engineer, Clarinda. (Dec. 10, p 1167.)

Lancaster & Northern.—Work is said to have been started on a line from Lancaster, Pa., north to Millway, 12½ miles. Riley Williams, president, 165 Broadway, New York.

Mexican Roads.—A syndicate, of which Paul de Vilaine is the representative at Guadalajara, Mex., is said to have been formed to build the Guadalajara-Chamela Railway, on which work is to be begun early this year. The proposed route is from Chamela, Jalisco, on the Pacific coast of Mexico, northeast to La Vega, 43 miles from Guadalajara, about 200 miles, with a branch to Ayutla, 16 miles. The company plans to operate trains over the tracks of the Ameca line of the National Railways of Mexico to Guadalajara.

Oregon Trunk Line.—The general land office at Portland, Ore., has denied a motion for review of the decision awarding the Oregon Trunk Line, a Hill project, exclusive right-of-way on one side of the Des Chutes canyon for a little over 12 miles in Oregon. This is expected to end the litigation between the Hill and Harriman companies, and settles the ownership of the last mile of the section between the Columbia river and the upper end of the canyon, where these rival lines branch apart. The Harriman line is being built under the name of the Des Chutes Railroad. (Oct. 15, p. 727.)

Pittsburgh & Lake Erie.—See an item in regard to this company under Traffic News.

Raleigh & Southport.—According to press reports an extension is to be built from Fayetteville, N. C., southeast to Elizabethtown, Bladen county, about 50 miles.

St. Louis County Belt.—An officer writes that contracts will be let February 1 for grading 50 miles of this line. The

company was recently incorporated in Missouri to build a line in St. Louis county, Mo. E. Whitaker, president; R. McCully, vice-president; J. Houseman, general manager, and W. Nagel, chief engineer, 948 Pierce building, St. Louis. (Oct. 1, p. 614.)

SAN PEDRO, LOS ANGELES & SALT LAKE.—See item regarding this company under General News.

SOUTHERN PACIFIC OF MEXICO.—Work is said to have been started on a branch to connect the Southern Pacific's coal fields in the Barranca district of Sonora, Mex., with the Yaqui river extension at Tonichi.

The line being built from Guaymas, Mex., southeast along the Pacific coast towards Guadalajara has been opened as far as Acaponeta, in the territory of Tepic. The line is ready to be opened as far south as Rosamorada, about 605 miles from Guaymas, and train service, it is expected, will soon be extended to that point soon.

SOUTHWESTERN.—A contract is said to have been given to the Grigsby Construction Co. for work on 30 miles between Henrietta, Tex., and Archer City. It is expected to have this section of the line in operation by the middle of March. (Dec. 24, p. 1262.)

SUMPTER VALLEY.—Work is said to be under way on an extension from Austin, Ore., southwest to Prairie City, 22 miles. (July 9, p. 79.)

TACOMA EASTERN.—See Chicago, Milwaukee & Puget Sound.

TOLEDO, ST. LOUIS & NEW ORLEANS.—According to press reports this company is letting contracts for clearing a right-of-way through the counties of Gallatin, Hardin and Pope, in Illinois. It is expected that grading will be begun about April 1 on a section from Golconda northeast to a point in Gallatin county. N. M. Burns, president, 1622 Peirce building, St. Louis, Mo. (April 30, p. 961.)

UVALDE & LEONLA VALLEY INTERURBAN.—Work will be started soon, it is said, on a line from Uvalde, Tex., southeast to Batesville, about 30 miles. The line will be operated either by electricity or gasolene motor cars. Charles Peterson, president, Uvalde.

VERA CRUZ & ISTHMUS.—A 99-year concession is said to have been granted this company to build lines as follows: From Rives, Vera Cruz, Mex., north to San Andres Tuxtla; from a point on the main line to Cerro Colarado, Canton de Cosamaloapan, and from the same point to San Isidro, on the river Tonto. The company is allowed four years in which to import material free of charge, to be used in the construction of the lines. (Dec. 3, p. 1109.)

WEBBERS FALLS, SHAWNEE & WESTERN.—Organized to build from Webbers Falls, Okla., west to Warner, thence southwest to Shawnee, about 120 miles. The first section to be built will be from Warner to Webbers Falls, 12 miles. The work will include one bridge. The company is said to be asking prices on 60-lb. relaying rails, for delivery at Warner, April 1. The C. E. Hagerty Engineering & Construction Co., engineers. A. R. Peyinghaus, Muskogee, is an incorporator. (Dec. 17, p. 1214.)

WESTERN MARYLAND.—See an item in regard to this company under Traffic News.

WISCONSIN & NORTHERN.—Regarding the reports that this company has rejected bids for the construction of an extension from Shawano, Wis., south to Appleton and Neenah, and that the work has been indefinitely postponed, an officer is quoted as saying that there is no truth in this statement. The company is planning to carry out extension work during this year. Grading work was suspended during the winter months. Last year grading was finished on five miles from Van Ostrand, Wis., the present northern end of the Shawano district, northward to the crossing of the Wolf river. This is on the section between Van Ostrand and Crandon, where there is a gap of 31 miles. On the Crandon end four miles are cleared and about 70 per cent. of the grading finished, leaving about 22 miles upon which grading has been started. The remainder of the excavation on this gap and the section from Shawano to Neenah will be comparatively light work. (Jan. 14, p. 114.)

Railway Financial News.

CUBA RAILROAD.—A dividend of 1½ per cent. has been declared, payable February 1, on the $10,000,000 6 per cent. non-cumulative preferred stock. The only previous dividend was 1½ per cent. paid in August, 1909.

GROVETON, LUFKIN & NORTHERN.—The company has asked the Texas Railroad Commission for authority to register $437,000 bonds and $50,000 stock to be issued on the completed 21 miles of track between Groveton, Tex., and Vair. The road has been completed from Groveton to Lufkin, 36 miles.

LAKE SHORE & MICHIGAN SOUTHERN.—See Pittsburgh & Lake Erie.

LEHIGH VALLEY.—W. H. Moore, D. G. Reid and E. S. Moore have been elected directors, succeeding I. A. Stearns, R. C. Lippincott and G. H. McFadden.

LOUISVILLE RAILWAY.—See an item in regard to this company under Railway Construction.

MISSOURI PACIFIC.—Stockholders on January 18 voted to ratify the making of a refunding mortgage securing $175,000,000 5 per cent. convertible bonds, of which $29,806,000 were underwritten by Kuhn, Loeb & Co., New York, and offered to stockholders at 95. (Nov. 19, p. 993.)

NEW MEXICO CENTRAL.—A press despatch says that C. C. Murphy, treasurer, has been appointed receiver.

NEW YORK CENTRAL & HUDSON RIVER.—See an item in regard to this company under Traffic News.

NORTHERN PACIFIC.—W. S. Tod has been elected a director, succeeding J. R. Kennedy, deceased.

OREGON SHORT LINE.—Otto H. Kahn, Mortimer L. Schiff and William G. Rockefeller were elected directors and members of the executive committee.

PITTSBURGH & LAKE ERIE.—The directors have declared a semi-annual dividend of 5 per cent. and an extra dividend of 40 per cent., payable February 1. The stockholders are offered the privilege of subscribing at par to the extent of 40 per cent. of their holdings for $6,000,000 new stock. Of the $14,999,850 stock outstanding the Lake Shore & Michigan Southern owns $7,500,150.

See an item in regard to this company under Traffic News.

ROCK ISLAND CO.—The *Commercial and Financial Chronicle* says that F. S. Pearson and associates, who control the Mexico & North Western, have bought, it is understood, a large block of the preferred stock of the Rock Island Co. and will work in harmony with the Moore interests, who control the company.

ST. LOUIS & SAN FRANCISCO.—See St. Louis, Brownsville & Mexico.

ST. LOUIS, BROWNSVILLE & MEXICO.—A stockholders' meeting has been called for March 10 to authorize a new mortgage to secure $25,000,000 bonds and to cancel all but $500,000 of the outstanding stock and substitute bonds therefor. On June 30, 1908, of the authorized $3,850,000 stock, $1,221,500 was outstanding. The St. Louis & San Francisco recently took over nearly all of the outstanding stock, most of which had previously been acquired by B. F. Yoakum and associates.

SOUTHERN PACIFIC.—Mortimer L. Schiff has been elected a director and member of the executive committee, succeeding his father, Jacob H. Schiff, resigned.

UNION PACIFIC.—Otto H. Kahn, of Kuhn, Loeb & Co., has been elected a director and a member of the executive committee of the Union Pacific, succeeding Jacob H. Schiff, resigned.

WABASH.—See an item in regard to this company under Court News.

WESTERN MARYLAND.—See an item in regard to this company under Traffic News.

Supply Trade Section.

The Pressed Steel Car Co., Pittsburgh, Pa., has acquired the interest in the Western Steel Car & Foundry Co., formerly held by A. C. McCord & Co., Chicago.

The Merchants Despatch Transportation Co., New York, has let the contract for a new shop at East Rochester, N. Y., for the fabrication of steel underframes for the company's cars.

The Lynch Railway Automatic Brake Co., Kansas City, Mo., has been incorporated in Missouri with a capital of $100,000. The incorporators are James Lynch, G. A. Dehaven and W. H. England.

Geo. A. Post, Jr., has been elected a director of the Standard Coupler Co., New York, to succeed J. E. French, who is also chairman of the board of directors of the Railway Steel Spring Co., New York.

The Modoc Co., Philadelphia, Pa., has opened an office at 109 Chestnut street. Several additional pieces of machinery have been installed at its factory in Fernwood, Pa., which machinery is for the manufacture of car cleaner and soap powder.

The W. N. Best American Calorific Co., New York, has retired from business, and the oil and tar burners, regulating cocks and various types of furnaces formerly handled by this company are now being manufactured and sold by W. N. Best, the inventor, with office at 11 Broadway, New York.

The Commercial Acetylene Co., 80 Broadway, New York City, has received an order for 250 acetylene headlights for locomotives of the Illinois Central, the Yazoo & Mississippi Valley, the Indianapolis Southern and the Central of Georgia. The Boston & Maine has ordered acetylene equipment for 1,000 headlights.

The Blue Island Rolling Mill & Car Co., Chicago, mentioned in the *Railway Age Gazette* of December 31, advises that the company is a consolidation of the Blue Island Car & Equipment Co. and the F. H. Niles Car Co. Four new buildings, two mills, a forge shop and a machine shop, are being built at the plant in Blue Island, Ill.

The National Railway Devices Co., Chicago, advises that its Duplex uncoupler and automatic release is to be used on 100 Clark cars and 150 Pressed Steel Car Company cars for the Duluth, Missabe & Northern, and also on 150 Pressed Steel Car Company cars for the Duluth & Iron Range. These orders were reported in the *Railway Age Gazette* of January 7.

J. E. Osmer has been appointed assistant superintendent of the Hicks Locomotive and Car Works, Chicago Heights, Ill., in charge of the locomotive works. Mr. Osmer has been connected with the mechanical departments of the Iowa Central, the Chicago & Alton, the Chicago & North Western and the Northwestern Elevated, serving as master mechanic of the latter company for the last six years.

Walter D. LaParle has been appointed sales manager of the Chicago Bearing Metal Co., Old Colony building, Chicago. Mr. LaParle has been in the railway supply business for 20 years and has a wide acquaintance among railway officers in the operating and mechanical departments. For 11 years he was connected with the Verona Tool Works, Pittsburgh, Pa., and later organized the Solid Steel Tool Co., now the Western Tool & Forge Co., Brackenridge, Pa.

The Geo. E. Molleson Co. has been incorporated under the laws of the state of New York for the purpose of buying and selling iron and steel products and railway supplies. The officers of the company are: Geo. E. Molleson, president and treasurer; L. M. Shook, secretary. The New York office will be continued at 50 Church street and the Chicago office will be in the Railway Exchange building. Mr. Molleson has been railroad representative for the Tyler Tube & Pipe Company, Pittsburgh, Pa., for the past 17 years, and the Geo. E. Molleson Co. will continue to represent this company, Mr. Molleson giving the business his personal attention.

At the recent first annual stockholders' meeting of the International Steel Tie Co., Altoona, Pa., it was decided to place on the market $50,000 worth of stock to establish the necessary manufacturing facilities for filling orders at present on hand. The assembly factory at Johnstown, Pa., is well under way and will be pushed to completion as rapidly as possible. The buildings will cover about half an acre of ground. The location of the site for the fastener factory has not yet been settled, and for the present the fasteners will be purchased from a firm in Cleveland, Ohio. The following are the present officers of the company: B. A. Oswald, president; George Harpham, secretary; S. M. Hoyer, treasurer, and W. P. Day, manager.

The Slack Manufacturing Company, Springfield, Vt., is making an abrasive metal cutter which is specially adapted to cutting tool steel. It consists of an emery wheel 12 in. in diameter and $\frac{3}{32}$ in. thick. These wheels run at a speed of 4,000 r.p.m. The maximum capacity is 2-in. round or 2-in. square stock. It is claimed that these wheels will cut with ease and despatch high-speed carbon or cold rolled steel, brass, bronze and other metals, either round, flat, square or tubing; that ½-in. square tool steel is cut in 10 seconds and ½-in. steel tubing is cut in two seconds. The wheel is of special advantage in cutting thin or flexible tubing and the surface, after the cut, is perfectly clean and true with no burs, irregularities or uncertainties as to length, as the cut is gaged to a nicety.

Frank P. Smith, mention of whose acceptance of a position with the Hobart-Allfree Co., Chicago, was made in these columns last week, entered railway service in the early seventies as a locomotive fireman on the Milwaukee & St. Paul. He afterwards served in the same capacity on the Toledo, Wabash & Western and the Chicago & North Western, on which latter road he was promoted to engineer. In this capacity he served successively on the Wabash; the St. Louis & Iron Mountain; the Chesapeake & Ohio; the Kentucky Central; the New York, Chicago & St. Louis; the Louisville, New Orleans & Texas, and the Cincinnati Southern. In the early nineties he entered the railway supply business with the C. C. Jerome Metallic Packing Co., and in November, 1895, he entered the service of the Hancock Inspirator Co., which company was in 1900 absorbed by Manning, Maxwell & Moore, New York. He remained in this position until December 31, 1909, at which time he entered the service of the Hobart-Allfree Co., with headquarters at New York City, as previously reported.

Frank Raymond Coates, who on December 1 was elected vice-president of the Inter Ocean Steel Company, Chicago, was born June 20, 1869, at Philadelphia, Pa. He graduated from Lehigh University at Bethlehem, Pa., in 1890, and took a post graduate course at the same school in 1891. He entered railway service on July 1, 1891, as a transitman on the Pittsburgh division of the Baltimore & Ohio. From February, 1892, to January, 1893, he was supervisor on the Wheeling division of the same road. From May, 1893, to December, 1895, he was assistant roadmaster on the New York division of the New York, New Haven & Hartford. In 1893 he devised the scheme of putting the nuts on angle bars alternately in and out, which is now used by the majority of the railways of this country. From December, 1895, to October, 1899, he was roadmaster on the same division of the New Haven. He had direct charge of four-track construction work on the New Haven. From 1900 to 1904 he was chief engineer of the Chicago Great Western and vice-president of the Weber Railway Joint Company. While with the Great Western he rebuilt a great deal of its line. Since 1904 he has been associated with the Stone & Webster Engineering Company, Boston, Mass., and has been engaged in construction and engineering work in the west. He has taken a prominent part in standardizing tools and materials for railway maintenance work and also has been interested in hydro-electric and irrigation engineering. For five years he has been a member of

the entertainment committee of the American Railway Engineering and Maintenance of Way Association. He is a member of the following clubs and associations: Chicago Club, Chicago Athletic Association, Chicago Engineers' Club, Engineers' Club of New York, American Society of Civil Engineers, American Railway Engineering and Maintenance of Way Association, American Street and Interurban Railway Association, Western Society of Engineers, New York Railroad Club and Western Railway Club.

Quinn Refrigerator Patent Sustained.

The United States Circuit Court of Appeals, Third district, Judges Gray, Buffington and Lanning, has affirmed the decree of the Circuit Court for the district of New Jersey, sustaining the validity of the Quinn patent, No. 539,009, on refrigerators, thus deciding in favor of the Seeger Refrigerator Company its suit against the American Car & Foundry Company for infringement. The car company had used refrigerators bought from the White Enamel Refrigerator Company, made under Ames' patents, and the decision is to the effect that Ames infringes Quinn's patents in claims 1, 3 and 7. On appeal the car company contended that the Quinn patent was invalid and that there was not proof of infringement. On the merits of the Quinn patent the court says: "Quinn was the first to put between the ice bunker and the refrigerating room of a refrigerator a partition composed of a series of inverted V-shaped sections so arranged that the open spaces, to use the language of the patent, 'form, as it were, air siphons leading from the refrigerating room into the ice bunker.' It is this series of open air spaces, somewhat resembling siphons, placed between the ice bunker and the refrigerating room, that distinguishes Quinn's patent from all the earlier patents. With the exits of these so-called siphons opening downward to allow the free escape of the air into the vacuum created by the descending currents in the ice bunker, and their mouths opening downward to facilitate the induction into them of the ascending currents of warmer air in the refrigerating room, circulation is promoted in a manner quite new." Player's arrangement of inclined slats does not anticipate Quinn's invention, nor do any of the other prior devices. Ames makes inverted V arrangements similar to Quinn's, and has one of the legs longer than the other. Possibly this is an improvement on Quinn, but that does not justify Ames in appropriating the essence of Quinn's invention. The court held that the car company had not shown by the necessary preponderance of evidence the defense of estoppel claimed. The car company had not relied on or been misled by any act or statement of the complaining manufacturers or of any of their officers.

TRADE PUBLICATIONS.

Rice Lands.—This is the title of a booklet on the Arkansas and Louisiana rice fields issued by the Missouri Pacific-Iron Mountain system. Numerous views of the growing rice and its harvest are used as illustrations of the descriptive matter.

Telephony in Railway Service.—The Western Electric Co., New York, has just issued a number of folders on this subject, one of which describes the use of telephones for railway terminal use, another the Western Electric portable telephones, another the portable composite telephone set, and the fourth the Gill selector as used in connection with the telephone for train despatching.

California.—The Chicago, Milwaukee & St. Paul has published a 16-page booklet entitled "California—Winter's Summer Garden." Each page contains one or more halftones and some description set on a background of lightly tinted scenes of life in California. The covers bear a similarly tinted view of a touring car party passing an old monastery as a background for a copy of a painting of an automobile girl.

Milling Machines.—The Cincinnati Milling Machine Co., Cincinnati, Ohio, has issued a new edition of its catalogue illustrating milling machines and cutter grinders, including a complete line of milling machines, both cone and high power single-pulley type. The latter are made in two styles, plain and universal, horizontal and vertical. The catalogue shows the important improvements which have been made in the No. 1½, 2 and 3 cone-driven machines, especially in the column and feed mechanism. The column is similar to that used on high-power machines in that it is a complete box in form and contains the entire feed mechanism. The high-power single-pulley machines are designed for taking heavy cuts on which fast feeds are permissible. The catalogue contains examples of rapid milling, indicating the great productive capacity of these machines. It also contains a large number of milling machine attachments which are supplied by this company. All these machines are well illustrated and the description and data are unusually complete. The catalogue contains also notes on the erection and care of milling machines and complete speed tables for all the different sizes.

1910 Calendar.—The Bettendorf Axle Co., Davenport, Iowa, has issued a calendar for 1910 in which each month is displayed on a separate card 14 in. x 19 in. in size, the upper half of which bears a large picture. The January illustration is a relief map of the United States, on which is cast the shadow of the Bettendorf one-piece truck frame. The caption is "Coming events cast their shadows before." The February card carries a moonlight view of the Davenport plant with the Mississippi river in the background. June suggests the annual conventions at Atlantic City and the illustration shows a young woman interested in Bettendorf products starting to the convention. August is a month of vacations, and on the card for that month the Bettendorf bears, which have figured in previous advertising for the company, are shown enjoying a rest. December closes the year with a representation of blind justice weighing the one-piece frame against the arch bar frame and pronouncing the fate of the latter in the biblical quotation "weighed in the balance and found wanting." The cards for other months have illustrations of interior views of the Davenport plant. The entire calendar is suspended from a miniature gilded aluminum truck frame.

RAILWAY STRUCTURES.

ALVIN, TEX.—The Gulf, Colorado & Santa Fe has begun work on a brick and concrete passenger station. The building will be 100 ft. long and 40 ft. wide.

BOYLES, ALA.—According to press reports the Louisville & Nashville has appropriated $654,000 for new shops at Boyles. Work is to be started within a few weeks.

CHARLEMONT, MASS.—See Boston & Maine under Railway Construction.

CLEVELAND, OHIO.—According to a schedule filed by the Lake Shore & Michigan Southern with the New York State Public Service Commission, a freight station on Wason street is to be built during the year at a cost of $96,000. This is in addition to the passenger and freight station on 105th street mentioned in the *Railway Age Gazette* of November 26. The schedule also includes a double-track arch over the Grand river at Painesville, Ohio; a new bridge at Nottingham, Ohio, and numerous improvements to the shops at Collinwood, Ohio.

COLLINWOOD, OHIO.—See Cleveland, Ohio.

DENVER, COLO.—The Chicago, Burlington & Quincy has bought a block of land bounded by Nineteenth and Twentieth, Wewatta and New Haven streets. This site is near the present union station and it is reported that plans for a freight and transfer station for the joint use of the Chicago, Burlington & Quincy and the Colorado & Southern are being prepared.

DES CHUTES, ORE.—The Oregon Trunk has a bill before the Washington legislature asking permission to build a bridge over the Columbia river and the Celilo canal, near the mouth of the Des Chutes river. Plans are said to be made for a structure to cost $1,500,000, to connect the Oregon Trunk, under construction into central Oregon, with the Spokane, Portland & Seattle.

EVANSTON, WYO.—The Union Pacific is to build a roundhouse and shops this spring.

GLOUCESTER, MASS.—See Boston & Maine under Railway Construction.

HARRISBURG, PA.—A vote will be taken to decide whether the

city's debt shall be increased to provide funds for improvements. The work includes a new viaduct over the Pennsylvania Railroad at Walnut street, to cost $300,000; also a new bridge over the Philadelphia & Reading at Thirteenth street, to cost $25,000.

Keene, N. H.—See Boston & Maine under Railway Construction.

Kent, Ohio.—The Erie, it is said, will enlarge its shops at a cost of $150,000.

Lewiston, Me.—The Grand Trunk is said to be at work putting up five bridges on the branch between Lewiston and Lewiston junction; two of these, in the Grand Trunk yard, are finished, also the one over the Androscoggin river. There remains one bridge to be built over Taylor brook, and another at Littlefield crossing. It is understood that the old passenger station and freight house at Lewiston is to be replaced by a modern structure.

Marshall, Tex.—In addition to the passenger station and shops previously mentioned in the *Railway Age Gazette*, the Marshall & East Texas expects to build a coal chute and steel turntable.

Meridian, Cal.—According to press reports a bridge is to be built over the Sacramento river at Meridian. The estimated cost is $120,000. The Northern Electric Railway is to pay one-half of this amount. Surveys are being made by the railway company for an extension from Yuba City, in Sutter county, west via Sutter City and Meridian to Colusa, about 24 miles.

Nottingham, Ohio.—See Cleveland, Ohio.

Omaha, Neb.—The Chicago & North Western is to build an addition to its freight house facing on Thirteenth street. When the present building was planned allowance was made for this addition, and actual construction was only delayed until the demand for more room should warrant the expenditure.

Painesville, Ohio.—See Cleveland, Ohio.

Salem, Mass.—See Boston & Maine under Railway Construction.

Shelburne Falls, Mass.—See Boston & Maine under Railway Construction.

Terrell, Tex.—The Texas Midland is building car and locomotive shops in which the power will be furnished by a producer plant and gas engine.

Washington, D. C.—The Senate committee has reported favorably a bill appropriating $5,000,000 for the construction of a memorial bridge over the Potomac river, between Potomac park and Arlington National cemetery.

Yardley, Pa.—The Philadelphia & Reading, it is understood, will build a four-track bridge over the Delaware river at Yardley.

FOREIGN RAILWAY NOTES.

Contracts are to be closed at an early date for building a line from Setubal, Portugal, to Garvao.

A plan for double-tracking the railway from Forli, Italy, to Rimini, has been approved by the Italian State Railways. The cost is estimated to be $540,000.

According to a German consular report the Kobe-Akashi Electric Railway Company, with a capital of $1,050,000, has been formed to build an electric railway from Kobe, Japan, to Askashi. The first five miles of the road is to be double track.

The number of travelers using the Swiss postal coaches over the Simplon Pass was 1,216 in 1907 and 1,428 in 1908; using the Furka Pass, 14,257 in 1907 and 14,693 in 1908; using the Grimsel Pass, 5,622 in 1907 and 5,548 in 1908. This shows that despite the increasing number of railways in Switzerland more people took the coach journeys over the Simplon and Furka passes in 1908 than in 1907.

Late News.

The items in this column were received after the classified departments were closed.

According to press reports, the Atlantic Coast Line will build a bridge over the Roanoke river at Weldon, N. C.

G. M. C. Brown has been appointed European manager of the Canadian Pacific, succeeding Archer Baker, who died on January 16.

The Cincinnati, Hamilton & Dayton announces that it will spend $1,500,000 at Toledo on an ore handling plant, new freight yards and extensive new docks.

L. D. Smith, assistant to president of the Lehigh Valley at New York, has been elected vice-president, in charge of the financial and accounting departments. He will have officers at both New York and at Philadelphia.

John A. Bensel, chairman of the Board of Water Supply of New York, has been elected president of the American Society of Civil Engineers. The other officers elected were J. T. Fanning and Hunter McDonald, vice-presidents; J. M. Knapp, treasurer.

J. W. Robins, vice-president and general superintendent of the Chicago, Rock Island & Gulf and general superintendent of the Southern district of the Chicago, Rock Island & Pacific, at Fort Worth, Tex., has been elected president of the Trinity & Brazos Valley, succeeding R. H. Baker, resigned.

The Committee on Interstate and Foreign Commerce, of the lower House of Congress, of which Representative Mann of Illinois is chairman, will soon hold hearings on the railway bills. The railways will be called on to present their side of the question on Thursday, Friday and Saturday of next week.

The Southern Railway has made arrangements to pay the $15,000,000 three-year, 5 per cent. debenture notes maturing February 1, 1910. Of the amount $5,000,000 will be paid from cash on hand and $10,000,000 will be paid from the proceeds of the sale to J. P. Morgan of $10,000,000 5 per cent. notes of 1910-1913.

At a meeting of the Traffic Club of New York, to be held at the Hotel Astor, on January 25th, Joseph French Johnson, D. C. S., dean of New York University School of Commerce, Accounts and Finance, and W. H. Lough, Jr., A. M., secretary and assistant professor of finance and transportation of New York University, will deliver addresses on "Prices, Rates and Wages."

A press dispatch dated Washington says that the Interstate Commerce Commission has received word that the new car demurrage rules, as recommended by the National Association of Railway Commissioners, will with slight modifications on a few roads, go into effect on April 1 on all railways in the southern territory, that is on all south of the Mason & Dixon's line and east of the Mississippi river. This is the result of a meeting held at Atlanta, January 11, at which all the bureaus were represented.

The Atlantic Coast Line has ordered 200 thirty-ton steel underframe flat cars and 100 forty-ton high-side gondola cars from the Standard Steel Car Co. These cars were not ordered from the Barney & Smith Car Co., as reported in the *Railway Age Gazette* of November 26. The flat cars will weigh 2,700 lbs. and will be 40 ft. long, 9 ft. wide and 4 ft. 1 in. high, over-all measurements. The underframes will be of steel. The high-side gondola cars, which will be used for special logging service, will weigh 3,800 lbs., and will be 37 ft., 3½ in. long, 9 ft. wide and 7 ft. high, inside measurements, and 40 ft. long, 10 ft. 5½ in. wide and 11 ft. 1⅞ in. high, over-all measurements. The bodies will be of wood with steel framing and the underframes will be of steel. The special equipment will be as follows:

Brakes	Westinghouse
Brake-beams	Pennsylvania deck
Brasses	A. C. L. standard
Draft gear	Farlow-Westinghouse
Dust guards	Harrison
Journal boxes	Symington
Side bearings	A. C. L. specifications
Springs	A. C. L. standard
Trucks	A. C. L. standard arch bar

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Hocking Valley is in the market for 23 locomotives.

The Oliver Iron Mining Co., Duluth, Minn., is said to be in the market for 10 locomotives. This item is not confirmed.

CAR BUILDING.

The Grand Trunk has ordered 200 refrigerator cars from the Canada Car Co.

The Denver City Tramway, Denver, Colo., is reported to be figuring on 35 electric cars for 1910.

The Public Service Ry., Newark, N. J., has ordered 100 pay-as-you-enter cars from the Cincinnati Car Co.

The Chesapeake & Ohio is asking prices on from 200 to 600 gondolas, 200 to 600 flat cars and 200 to 600 box cars.

The Hudson & Manhattan has ordered 50 all-steel passenger cars for tunnel service from the American Car & Foundry Co.

The Pere Marquette advises that the company is not considering ordering 1,000 to 2,000 gondolas as reported January 7.

The Harriman Lines, reported in the *Railway Age Gazette* of January 14 as negotiating with the Pullman Co. for 2,000 refrigerator cars, has placed an order for this equipment with this company.

The Barrett Mfg. Co., Chicago, has ordered from the American Car & Foundry Co. 75 tank cars for February delivery. The cars will be all-steel, of 10,000 gallons capacity, mounted on 100,000-lb. capacity trucks.

The New York, Chicago & St. Louis, reported in the *Railway Age Gazette* of January 7 as being in the market for box and gondola cars, has ordered 1,000 all-wood, 30-ton box cars from the Haskell & Barker Car Co., and 1,000 all-wood 40-ton gondola cars from the Hicks Locomotive & Car Works.

The Cincinnati, Hamilton & Dayton, reported in the *Railway Age Gazette* of January 7 as being in the market for 1,000 Ingoldsby dump cars, has ordered 1,500 steel gondolas, divided equally between the Pressed Steel Car Co., the Cambria Steel Company and the Ralston Steel Car Co. This company has also ordered 1,000 steel underframe box cars from the American Car & Foundry Co.

MACHINERY AND TOOLS.

See an item under General News regarding a power plant for the United Railway Co. of St. Louis, Mo., and other roads.

The Sapulpa Steel & Iron Mills has recently ordered from the Allis-Chalmers Co., Milwaukee, Wis., a 28-in. x 48-in. non-condensing, heavy duty, rolling mill engine.

The Texas Midland will require some auxiliary gas producer plant machinery, although the producer and engine mentioned under Railway Structures have already been purchased.

The Portland Railway, Light & Power Co., Portland, Ore., is increasing the capacity of its hydro-electric plant. It has recently ordered from the Allis-Chalmers Co., Milwaukee, Wis., a 3,750-k.w., 11,000-volt, 60-cycle, 3-phase, 360-r.p.m. alternator of the water wheel type. This will be semi-enclosed and of the same general design as the two generators already supplied by this company. A 50-k.w., 120-volt, exciter is to be direct-connected to an extension of the alternator shaft.

IRON AND STEEL.

The Chicago City Railway is in the market for 5,000 tons of girder rails.

The Missouri Pacific is in the market for 4,000 tons of bridge steel.

The Pennsylvania is in the market for 200 tons of bridge steel for maintenance work.

The Merchants Despatch Transportation Co., New York, has ordered from the Lackawanna Bridge Co., Lackawanna, N. Y., 250 tons of structural steel for shops, as mentioned under Supply Trade News.

General Conditions in Steel.—Press reports from Chicago indicate that there is at present a greater activity in the steel business than at any time since the height of the activity in 1907. This same report states that one fabricated steel maker refused a 2,000-ton order due to the overcrowded condition of his plant. The production of bessemer and open hearth ingots by the U. S. Steel Corporation in 1909 amounted to more than 13,000,000 tons. Pittsburgh reports state that the pig-iron output of Pennsylvania and the central west will, during the next 30 days, be increased about 80,000 tons per month by the blowing in six additional furnaces. From present indications, this year will establish new high records in the output of all classes of iron and steel.

SIGNALING.

The Baltimore & Ohio will begin work at once on the new automatic block signals to be put in from Connellsville to Pittsburgh, and from Laughlin Junction to New Castle, Pa., a distance of 112.6 miles. Six miles of this, between Bessemer and Wheeling Junction, will be four-track.

Ward Ideal Heating System.

The Ward Equipment Co., New York, is offering a new system for heating railway cars. It is claimed that this system will maintain any desired temperature in the car, regardless of outside weather conditions. The system is certainly one which embodies some very interesting and notable features, one of the most important of which is Ward's Unotherm, shown in Fig 1. An elevation of the car piping, Fig. 2, with

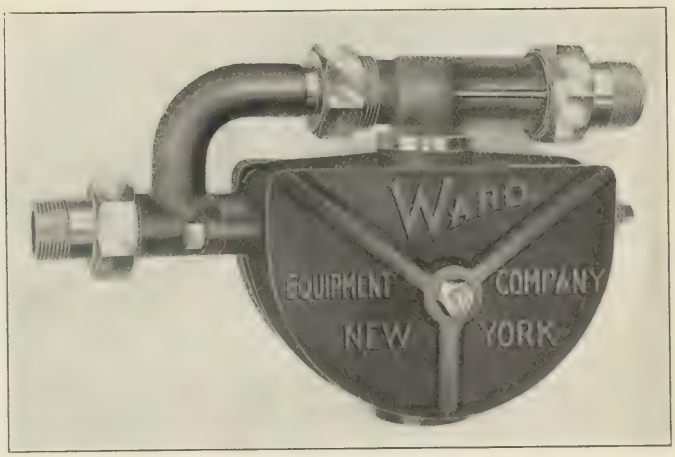


Fig. 1—Ward's Unotherm.

section through the unotherm, shows the connections from the steam train line under the car to the unotherm and thence to the heat radiating pipes. The unotherm is located under a seat near the middle of the coach.

Steam from the train line is admitted to the system by the valve 99, Fig. 2, and passes in the direction of the arrows through the opening at 37 and the valve 42, thence through the pipe 38, the nozzle 45 and into the radiating pipes. In leaving the nozzle 45 and passing through ahe combining tube of the ejector at 46, a suction is developed, which is felt in the chamber E of the unotherm and the pipe D, drawing air through the overflow C and heated fluid from the return pipe B. This heated fluid mingles with the outside air and all is drawn up through the chamber E and combining tube 46 and is then again driven through the system. The action of the unotherm is therefore controlled very largely by the outside air mixed with the return fluid. When sufficiently heated, the thermostatic tube 29 expands and closes the valve 42, thus preventing further entrance of steam into the system.

One of the most attractive features of this system is in the fact that the thermostatic device is subject not only to the heat within the car, but is also affected by the temperature

of a mixture of outside air and heated fluid from the return pipes. The opening and closing of the valve to admit steam to the radiator pipes for maintaining uniform heat, must necessarily be governed by several factors. The temperature of the air inside the car, as well as that of the air outside, are the principal elements with which a perfect car heating system must contend. These two important considerations, together with all the other essential elements, are said to be fully covered by the Ward Company's new system. The valve will be open much more frequently in cold weather than in warm, and consequently a greater amount of steam will be used and a larger amount of heat radiated. As the heat radiates from the pipes within the car and the steam condenses, the resulting water is discharged through the outlet C, and the mixture of fluid from the return and the air from the outside of the car is carried up into the chamber E and thence into the radiating pipes of the system, as above noted. As a consequence of this, no steam escapes at the overflow where the water of condensation is discharged, because everything but the water is carried back into the system and used repeatedly until the full benefit of practically all the heat energy taken from the locomotive is utilized. This naturally means the greatest possible economy in steam consumption, and a big reduction in the demand ordinarily made on the locomotive for train heating should result. The fact that no steam escapes at the outlet also means that the paint and varnish on the sides of the car will not become streaked and destroyed. It is also a very desirable thing to dispense with the unsightly appearance of steam blowing through the outlets.

It is claimed that by the use of Ward's new system a continuous circulation of steam and air is established and a great many advantages result, among which are the following: Freezing is impossible; the escape of steam, particularly disagreeable and sometimes dangerous, in heating of trains is prevented; the heat contained in the steam supplied by the locomotive is conserved; the noise of water-hammer is prevented; an even temperature and one automatically regulated throughout the train is provided; bursting of pipes and leaky joints is impossible; the steam passes through the piping of the car with surprising rapidity, since it is permitted to enter the system at pressure and travel at a greater speed than usual, due to the action of the ejector, which is continually drawing on the return; very simple in design and a small number of pieces; no parts outside the car and no attention required by trainmen.

The Ward Company has equipped a number of cars with this new system, and the recent spell of cold weather has subjected it to a very severe test. Although the cars so equipped have been running in widely different sections of the country the results are said to have been uniformly successful.

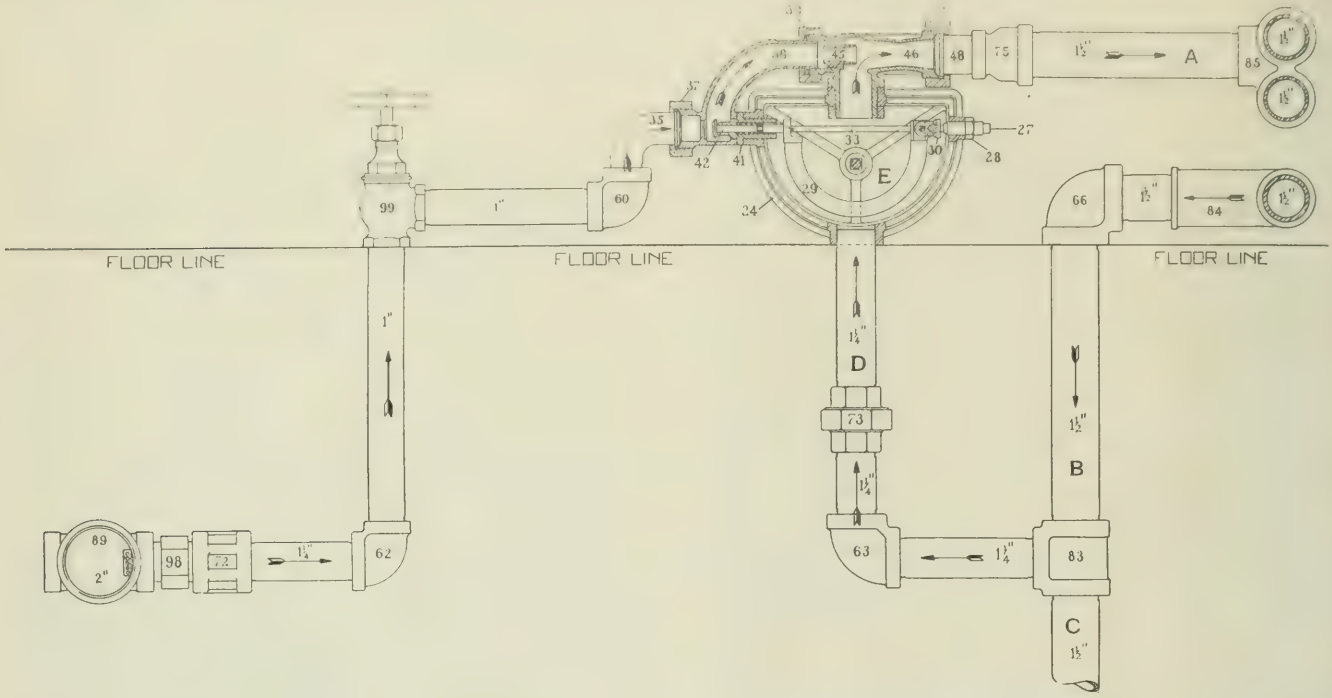


Fig. 2—Elevation of Car Piping, Showing Section Through Unotherm.

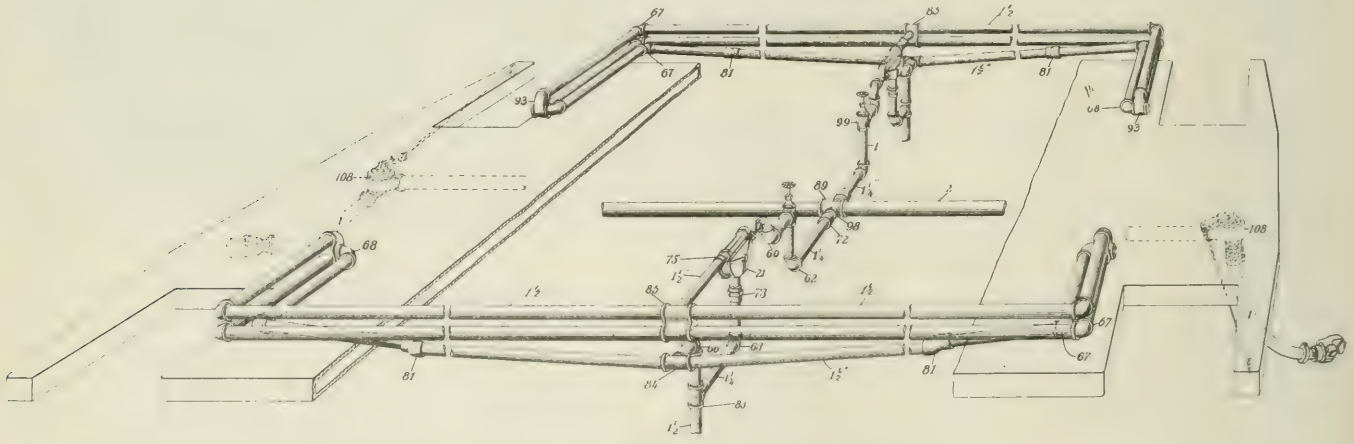


Fig. 3.—Plan of Piping for Ward Ideal Heating System.

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The government signal board has made an elaborate report on an automatic train stop, and the substance of it is printed in this issue. Proprietors of devices of this class have spent their money, many of them large sums, in the expectation that the railways will need to use automatic apparatus extensively to prevent those collisions which are due to enginemen's carelessness, or else that Congress will compel such use. Thus far both of these expectations have proved groundless; and there are still no signs of a change. The apparatus described in another column is shown, not because it is now of more interest than it has been during the past 15 years, but because it is the text on which is based a careful and intelligent report on the general subject of automatic train stops. The Railway Signal Association has grappled with this subject as an academic question and has produced only a set of requisites which are so rigid as to exclude every known plan. This leaves the impression that the association does not want anything to do with automatic stops—which is not far from correct. The government board presents its theories with equal or greater rigidity—but has the sense to call them desirable, instead of necessary, and concludes with a cautious and qualified approval of a mechanically operated stop which is installed in duplicate in such a way that a failure of the apparatus is pretty sure to stop the train. In calling the board's approval "qualified" we do not refer particularly to the faults in principle or design which are mentioned in the report, for these can be corrected; but severe and long continued corrective treatment is necessary for inventions that have to do with high-speed railway operation. The clause, "well inspected and maintained," is the vital qualification. Excellent and costly inspection and maintenance have made the apparatus successful in the Interborough subway, but the belief that such a standard of up keep is not practicable under ordinary "out door" railway conditions is one of the main elements in the universal disinclination among railway men to use automatic stops.

The recent washout on the San Pedro, Los Angeles & Salt Lake took out substantially all the track on the main line between Acoma, Nev., and Rox, about 90 miles. The line here is in the Meadow Valley wash, which for the greater part of the year is dry or carries a very small stream. It is for the most part canyon, but the valley widens at certain points and in these bottom lands the stream does not keep to its channel. The drainage area is large, and there is high land at each side. The recent flood is the third in five years. In 1905 traffic was blocked for two weeks, and in 1907 six weeks. Both of these came at the end of the winter when the snow melted. There were no cloudbursts. After the 1907 washout the line was rebuilt. It was put, supposedly, out of reach of ordinary flood water, steel bridges were erected and about $1,000,000 was spent in riprap. This year the water came at an unprecedented time and its volume is estimated as being five times as much as in 1907. There had been heavy snow, and during the last days of December there was a warm rain. As the ground was frozen, all the water came down into the wash, none of it soaking in. The stream began to rise on New Year's eve and on the next day telegraphic communication was broken. The water stayed up for several days, being 12 ft. deep over the tracks at places. The current was so swift that it took out bridges, track and embankment bodily; between the two points mentioned there are only a few short stretches of track left. The water rose comparatively slowly. There was no loss of life at the ranches in the bottom lands, but one track-walker was killed. An eastbound passenger train was caught at Eccles and the passengers were taken out on wagons. Near Caliente, a few miles west of Eccles, a 26-car freight train was caught and the track was later washed out from under it and the train ditched. Cars were also caught in the Caliente yards. About 130 freight cars, which were en route when the washout occurred are being detoured via the Southern Pacific, the Tonopah & Goldfield and the Las Vegas & Tonopah. No further arrangements for through business have been made. Eastbound traffic originating on the western part of the line will, presumably, be turned over to the Southern Pacific and the Santa Fe. Local trains are being operated on the lines east and west of the washout. A locating party is already in the field locating a new line. It cannot be built in less than six months or a year.

GOVERNMENT CONTROL OF SAFETY APPLIANCES.

A bill is now before Congress which proposes to hand over to the Interstate Commerce Commission control of the mechanical details of the safety appliances on cars.

During the many years in which Secretary Moseley was invited to address the Master Car Builders Association at its annual meeting there was one refrain which ran through all that he had to say. It was that the master car builders constituted the court of final appeal for everything pertaining to the construction and maintenance of a car, and that the whole effort of the commission was to strengthen the position of the association and to insure the adoption of such standards as

it might adopt. The commission's action, thus far, has been quite in accord with these protests. It has had laws enacted providing, for example, for the application of automatic couplers and air brakes, but it has not had the hardihood to specify that the couplers should be of the Janney type, or to mention the name of Westinghouse in any of its statutes. Very properly, it has left these things to men who were skilled in the art, merely requiring that their construction should comply with certain requirements. Couplers could be placed on car corners or on the roof, for all the law cared; it was simply necessary that they should be automatic in their action. Nor has strength been so much as hinted at.

The commission's advocacy and support of the M. C. B. standards has been based upon the desirability of uniformity, which is accepted by every railway officer in the land. It is because of this fact that the present standards have been adopted. According to the report of the proceedings of the Master Car Builders' Association, the history of the adoption of the safety appliances is this:

"In 1893 a recommended practice was adopted on safety appliances under the subheads given. In 1896 some changes were made, especially in regard to handholds, and by the elimination of various details from the drawing. In 1902 it was changed to standard.

"In 1905 sheet M. C. B. 19 was revised to define more clearly the location of safety appliances on cars. Also, the lower round of the end ladder with wooden rails was made straight instead of having an offset.

"In 1906 the position of the brakeshaft and location of the roof handholds were modified.

"In 1907 sheet 19 was devoted entirely to illustrating these standards.

"In 1908 a thorough revision was made of both text and drawings in order to make their meaning and intent clear and adaptable to all existing types of car equipment, and to be capable of but one interpretation."

Of course the commission does not believe that the final word has been said; that no future change will be found desirable, and that a year's trial has been sufficient to demonstrate this and to warrant crystalizing the present safety appliance rules into statute, from which there can be no change except through the slow process of an appeal to the commission. What is to be gained by the proposed legislation, then? A non-technical commission could not possibly specify any dimensions for safety appliance locations on its own initiative. It would have to rest on the judgment and experience of the car builders in any case. Consequently, there is no obvious gain to be derived from a law compelling the railways to do what they are already doing.

If the value of the proposed law is nebulous, however, the harm and danger of it should be apparent to all. In the first place, it proposes to vest technical responsibility in a non-technical body; a process which naturally results in hindrance to changes in the direction of progress. In the second place, it means that the initiative of changes would rest largely with the inspectors—and the commission has never yet been able to forget political considerations in appointing these agents, who ought to be unimpeachably beyond the reach of outside influences. In practice, inspectors are now nominated by the labor unions and ratified by the commission; every extension of the inspectors' power is therefore clearly against public policy, since the unions are interested neither in the safety of the traveler nor in the team work of their own members for purposes of efficient railway operation. The labor union is very glad to supply the commission with safety appliance inspectors; in case of labor trouble with individual roads the union inspector has in his power tremendous weapons for delay and annoyance, since he is enforcing a statute resting on the observance of technical requirements, of which he is, in effect, the sole judge.

Our position should be understood in this matter. We believe the government can, and ought to, increase the safety of travel by investigating railway accidents automatically, of its own initiative, but we believe the investigation should be done by army officers, since this is the only apparent method of getting discipline enforced against the negligent employee as well as against the negligent corporation. We believe that the national habit of taking chances has more to do with our appalling accident record than any other contributory cause, and that this chance-taking can usually be brought straight home to engineman, brakeman, flagman, despatcher or operator. But a corps of labor-union inspectors, whether engaged in inspecting accidents that have happened, or safety appliances intended to safeguard the individual employee, will find some way of laying responsibility on the corporation, always; on the employee, never. The need for better safety in American railway working is so grave, and the methods of bringing it about are now so well understood, that every effort to introduce politics, the evil of the democracy, into government inspection ought to be resisted sturdily. Yet the bill to give the commission control of the mechanical details of the safety appliances on cars is largely a political measure.

HIGH SPEED AND HEAVY ROLLING EQUIPMENT.

A valued correspondent in Paris, who is the technical representative of one of our locomotive companies, has written in regard to the editorial on "Limited Speed of Passenger Locomotives" in our issue of December 24, 1909, and we publish his letter on another page. Mr. Fry first takes exception to the statement that "our best locomotive will not haul a train of six modern cars at speeds much above 60 miles per hour," and thinks we do less than justice to the steam locomotive. The statement may come as a surprise to those living abroad who have not taken account of the large increase in weight of American passenger equipment in recent years, and who still regard a coach weighing 25 or 30 tons and Pullman cars weighing 43 tons as representative of present practice. The editorial referred to the speed of trains composed of modern American steel cars, while our correspondent's speed references relate to fast runs with equipment used 12 years ago, in 1898.

We have before us the weights of the cars and locomotive used in the Atlantic City run which he mentions, and they are as follows:

1 combination car	57,200 lbs.	
4 coaches, each 59,200 lbs.	236,800 "	
1 Pullman car	85,500 "	
Total, 6 cars	379,500 lbs.	= 189.75 tons.
Atlantic locomotive	227,000 "	= 113.50 "
	606,500 lbs.	= 303.25 tons.

In contrast with this we mention the fact that new steel coaches with wood inside finish just received by one of the Chicago lines weigh 139,000 lbs. New buffet library cars for another western line weigh 153,000 lbs. In the design for new sleepers for the Pennsylvania it is difficult to limit the weight to 160,000 lbs., and 75 to 80 tons may be taken as the weight of modern sleeping cars. The 70-ft. steel coaches which are being built in large numbers, are so heavy that it is necessary to use six-wheel trucks under them, and these alone weigh over 40,000 lbs. for two trucks.

This increase in weight of passenger cars and the large number of cars in a train has resulted in the use of the Pacific locomotive with six coupled wheels in place of the Atlantic type with four coupled wheels. The latter engine is better suited to high speed service than the former, but it cannot accelerate heavy trains to running speed nor maintain speed on grades as well as the Pacific. The internal friction of the Pacific engine is much greater than that of the Atlantic, and it reaches its speed limit sooner. This larger and more powerful locomotive has not enabled our railway managers to materially increase the speed of limited trains or give us a real

high speed service. The average scheduled speed of New York Central's 18-hour train, New York, to Chicago, is 53.5 miles per hour, including stops, and of the Pennsylvania's 18-hour train between the same points, 50.6 miles per hour, including stops.

A train was recently made up for test purposes which was intended to represent modern express equipment which could be hauled at high speed on level track. The six cars weighed 350 tons and the Pacific locomotive 194 tons, total 545 tons. It will be seen that the weight of these six cars is nearly twice as great as that of the six cars on the Atlantic City run reported by Mr. Fry, and the locomotive weighs 63 per cent. more than the Atlantic, which was used in the 1898 test. The writer rode on the heavy six-car train weighing 350 tons when an effort was made to attain high speed, but the Pacific locomotive, which was selected for its good record on that line, was not able to accelerate the train to more than a fraction above 60 miles per hour on a straight level track where atmospheric conditions were normal. This actual experience under the most favorable conditions seemed to warrant the statement referring to the limited speed of passenger locomotive to which Mr. Fry has taken exception.

His letter says that many other portions of the article are highly debatable. This may be true, and if so, let us debate them. Most questions about locomotive operation are debatable; if they were not, our business would not be interesting and progress might cease. We purposely made our statements strong to see if they would stand without a protest, and with the hope that protest might enlighten. If we debate them let us do it with the purpose of stimulating improvement by suggestion and not simply to show who is right and who is wrong. The one example of a debatable statement cited by Mr. Fry is "that with a balanced compound with only one valve for two cylinders the steam distribution is less satisfactory than on the Euporean type with a valve for each cylinder." This statement had reference to four-cylinder engines for high speed service, where, we believe, there must me an advantage gained in large port area obtained by four valves for the admission and exhaust of steam at high velocity, for with such large boilers and ample steam supply the only apparent reason for limited speed is the contraction of the valve opening at high velocity, and whichever arrangement provides the largest port area at a given speed must be most satisfactory. If a single valve can be made to provide as large a port area at short cut-off as two valves and work satisfactorily, then it is to be preferred on account of its simplicity. After a long and large experience with four valves on four-cylinder engines by the French railways, we believe the latest designs retain them. This is seen in the new Pacific locomotive for the Western Railway of France, which was fully illustrated in our issue of December 10, 1909, page 1144. In this instance the inside valves are driven by the outside valve gear and the complication due to inside eccentrics and valve gear is avoided. The new Pacific four-cylinder locomotives for the Paris, Lyons & Mediterranean, illustrated in our issue of January 7, 1910, page 23, have four valves and they must have some good purpose or they would not be retained.

Finally, our correspondent refers to the remarkably high speed reported for the new three-cylinder simple locomotive on the Atlantic City division of the Reading. While no official records of the performance of this locomotive have been made public, it is understood that its speed performance exceeds that of the other locomotives now in that service. The fact that this locomotive was designed and built by the Reading at its own shops is in itself an expression of that protest against the self-satisfaction and lack of enterprise on the part of locomotive builders which is manifest in their failure to produce a locomotive which will haul modern passenger trains at high speeds, that is, exceeding 65 or 70 miles per hour. Surely they are not keeping pace with the rapid progress so characteristic of the present times when it is necessary to go back 12 years to find a record of creditable high speed performance.

On several railways in the West it was for a time thought that it would be necessary to electrify the mountain divisions in order to attain speeds which would carry the large volume of traffic over the grades and avoid congestion and blockade. The Mallet locomotives have overcome this difficulty and their remarkable performance has for the time rendered the electric locomotive on mountain lines, where there are no long tunnels, unnecessary. There is, we believe, a general feeling that for faster schedules in passenger service the electric locomotive will be necessary. Cannot locomotive builders again rise to the occasion and make some radical improvement in the passenger locomotive which will better adapt it to high speed service, or must we conclude that the steam locomotive has about reached its limit of speed in dealing with heavy express trains? The only change that is being made from year to year is an increase in size of the boiler and the cylinders and the use of four cylinders instead of two, but it has no new device to adapt it to higher speeds. The engine is made larger and heavier and it has become so large and heavy that at 60 miles per hour a large proportion of its power is expended in driving itself. There is no improvement in valve gear or steam passages having special reference to high speed work. These enormous locomotives are really fast freight engines with a capacity to haul heavy trains, but not at high speed.

We suggest, therefore, that if this discussion is to continue the concrete question be considered, "What can be done to so improve a locomotive which reaches its limit of speed of 60 miles per hour on straight level track that it will haul the same train at 70 miles per hour?" In our editorial we suggested several methods which might accomplish the purpose. Some of them may be regarded as unpractical or visionary; perhaps they are so; but they will amply serve their purpose if they stimulate others to think of some means for the purpose which will be practical and successful.

NEW YORK CENTRAL AND WESTERN MARYLAND.

The traffic agreement for 99 years, which has been made between the Western Maryland and the Pittsburgh & Lake Erie, controlled by the Lake Shore & Michigan Southern, provides for the immediate building of a line from Cumberland, on the Western Maryland, to Connellsville, the southern terminus of the Pittsburgh & Lake Erie. With this connection built, the New York Central will be in a strong position to compete with the Baltimore & Ohio for western business from Baltimore and on export freight business to the port of Baltimore. It will give the New York Central three of the most important ports on the Atlantic—New York, Boston and Baltimore.

The Western Maryland when it went into the hands of a receiver in March, 1908, was a Gould property, separated from the other Gould properties by over 100 miles of country, through which it would have been extremely expensive to build, and moreover it was a property very heavily capitalized. The company was taken out of the hands of the receiver last December. The capitalization of the reorganized company was still high for a road which could depend only on the development of local traffic and on coal traffic in a highly competitive territory.

The plan of the reorganization committee called for the issue of $33,959,560 stock and left outstanding $50,951,950 bonds and funded debt. This on the owned and leased mileage, as given in the 1907 annual report, was at the rate of about $94,000 of funded debt per mile and $63,000 stock per mile. The annual fixed charges call for $2,184,598, or about $4,000 a mile.

By the present agreement the management of the Western Maryland apparently have definitely recognized the undesirability of developing the road only as a local property, and they

have apparently decided that the difficulties of making a connection with the other Gould roads were so great that it was more expedient to make an alliance with some other railway interest. By making this alliance with the New York Central the natural disposition of the Gould roads to compete with the Pennsylvania and the Baltimore & Ohio is given a new turn.

That the new alliance will create keen competition, especially with the Baltimore & Ohio, is apparent from a glance at a map.

The Western Maryland runs from Baltimore to the Elkins coal fields of West Virginia, via Cumberland. It reaches Cherry Run by a route which carries it up as far north as the Pennsylvania state line. The Baltimore & Ohio, on the other hand, reaches Cherry Run via Washington, D. C., so that the roads serve different local territories between Baltimore and Cherry Run. From Cherry Run to Cumberland the two roads directly parallel each other, the Western Maryland running most of the way on the north bank of the Potomac river and the B. & O. for the most part on the southern bank. The B. & O. divides at Cumberland, one line running north through Pittsburgh to Chicago, the other west to Cincinnati. From Cumberland to Connellsville via the Baltimore & Ohio it is 93 miles. The country is mountainous for the most part, and the Baltimore & Ohio's route is by no means an air line. From Connellsville to Pittsburgh the Pittsburgh & Lake Erie parallels the Baltimore & Ohio closely. After leaving Pittsburgh the Pittsburgh & Lake Erie runs north to Youngstown, Pa., where it connects with the Lake Shore & Michigan Southern.

The great preponderence of freight on the Baltimore & Ohio between Cumberland and Baltimore moves east and a good part of it is coal. The westbound traffic on the Baltimore & Ohio consists largely of merchandise freight, limestone and oysters. It will be noted that this traffic, with the exception of the limestone, is fast freight, the oysters being handled in solid fast trains. The Western Maryland should be able to bid for this freight, routing it over the Western Maryland, the Pittsburgh & Lake Erie and the Lake Shore & Michigan Southern. Previously the Western Maryland has been turning a large part of its westbound freight over to the B. & O. at Cumberland.

There will probably not be any great amount of ore shipped down from the lakes over the Pittsburgh & Lake Erie and Western Maryland, because the New York Central already has lines over which it can ship this ore to tidewater, and on which the grades are probably less than will be those of the new line. On the other hand it appears quite likely that the P. & L. E. will turn over to the W. M. considerable quantities of its coal destined for tidewater, and also considerable export freight. It may be recalled that the Chesapeake & Ohio at one time had a line of steamers running from Newport News to Europe (though we believe it was never very profitable), and it is conceivable that the Western Maryland might try some like experiment from Baltimore, but as yet it is understood that no definite plans have been made for such a line. By being able to solicit import freight destined for all points on the New York Central lines, the Western Maryland probably hopes to develop considerable import traffic. The advantages to the City of Baltimore of the development of both this import and export traffic by the Western Maryland should be considerable.

From a financial standpoint, the announcement of the traffic agreement and the immediate extension of the Western Maryland some 80 or 90 miles through heavy country where construction costs may reach as high as $75,000 or $100,000 per mile, leads to speculation as to where the money will come from to build this line. The Western Maryland's first mortgage, under which there are $42,500,000 bonds outstanding, is really a closed mortgage, because the further issue of bonds is reserved to retire prior liens. The Western Maryland had a second mortgage before reorganization but preferred stock was substituted for it. The new line will probably have to be financed by making a mortgage on the line to be built. This is frequently done, especially in cases where the parent road is in a strong financial position and can lend a construction company the money necessary for building and reimburse itself by the sale of bonds after the new line has been completed. It appears unlikely that the Western Maryland can raise the cash necessary for building without the resort to some sort of short term notes, and it speaks well, indeed, for the faith of bankers in the earning power of the Western Maryland if it can raise five or six million dollars so soon after reorganization on short term notes. The reorganization plan was underwritten by Blair & Co., New York, and they undertook to furnish any part of the $8,000,000 cash necessary for the carrying through of the reorganization plan that was not subscribed by stockholders in the old company.

The Western Maryland has been often spoken of as a Standard Oil property as well as a Gould property. The making of a strong traffic agreement with the New York Central's Pittsburgh & Lake Erie would in itself be a great help toward persuading bankers to advance the necessary money, even if the Pittsburgh & Lake Erie does nothing itself toward helping to build the new line; and this does not mean to imply that there has been any suggestion on the part of the New York Central interests that they do intend to help in any way in building the new line.

NEW BOOKS.

Elements of Machine Design. By Dexter S. Kimball and John H. Barr. New York: John Wiley & Sons. 446 pages; 6 in. by 9 in.; 196 illustrations. Cloth. Price, $3.00.

The authors of this book are, or were, professors of machine design at Cornell University, and it is the outgrowth of their work with the students. The first three chapters are devoted to the theoretical and mathmetical discussion of the subject in which the general principles are laid down. In this there is no attempt at special applications of design, nor in fact is there throughout the book as it is a treatise by which the student is to be grounded in methods and principles. This is not taken as meaning that there is nothing to show how these principles should be applied, for in every case there is an example showing in outline how the theory and practice are brought together.

With the fourth chapter we are introduced to what might be called the details of design in the consideration of friction, lubrication and efficiency. The method of treating this topic may be taken as an example of all. First, there is a discussion of the general principles of friction with the effects of projected areas and the intensity of pressure and then the subject is taken up in detail covering dry rolling friction, static friction and lubrication and the effects of imperfect lubrication. In dealing with this and all the other subjects, the authors do not confine themselves to the set information of text books or to their own investigations, but quote freely from the work of other investigators, giving either summaries of what has been done or complete results, and in every case referring the reader to the sources of information where the subject can be studied more thoroughly if it is desired. For example, in this matter of lubrication, the text enters somewhat fully into the experiments that were made by Tower a number of years ago, giving his general results and then refers to the original publications in which his complete work can be found.

A similar treatment is afforded to springs, riveted fastenings, screws, cotters, tubes, shafting, belts, clutches, gearing, fly-wheels and frames. So that the volume is not only a convenient book of instruction but serves as a reference and index for work that lies beyond the limits that are available in it. It, therefore, becomes not only valuable to the student, but to the practicing engineer and designer as well.

Letters to the Editor.

"LIMITED SPEED OF PASSENGER LOCOMOTIVES."

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The editorial in your issue of December 24 on the "Limited Speed of Passenger Locomotives," will, I think, come as "a surprise and a disappoinment" to your readers, for it seems to do less than justice to the steam locomotive. You say that the best efforts in locomotive building have not yet produced an engine which will haul five or six modern cars at much over 60 miles an hour. This seems to underestimate the speed capacity of the modern express locomotives by at least 25 per cent., for where the physical conditions of the road permit, and where the traffic makes it desirable, speeds of 75 miles an hour can be easily attained in regular service. I quote a few instances, which happen to lie before me. On July 1, 1898, a Vauclain compound Atlantic type locomotive ran the 55 miles from Camden to Atlantic City with five cars, at the average speed of 72.8 miles an hour from start to stop. On this trip 45 miles were done at the average speed of 81.8 miles, and 36 miles at the average of 82.8 miles an hour. During the following two months similar engines made the run daily with from five to seven cars, and at speeds averaging from 64.0 to 74.4 miles an hour, start to stop, the highest speed being made with six cars. On August 20 the train consisted of seven cars with 505 passengers, and the speed averaged 71.2 miles an hour from start to stop. Again, the three cylinder Atlantic type locomotive of the Philadelphia & Reading, to which you refer, has, I believe, recently shown its ability to haul five cars in regular service, seventeen miles over an undulating grade at the average speed of 79 miles per hour.

I think that many other portions of your article are highly debatable, as for example, the statement that with a balanced compound locomotive with only one valve for two cylinders, the steam distribution is less satisfactory than in the European type with a valve for each cylinder. O. Busse, Director of the Danish State Railways, after extensive experiments with an Atlantic type locomotive modeled after the Vauclain balanced compound, sums up the results of his experience as follows (Organ für die Fortschritte des Eisenbahnwesens, May 15, 1909): "For high speed service the four-cylinder locomotive is undoubtedly the locomotive of the future, and the Vauclain type, by using only one valve for two cylinders, avoids the disadvantage of complication. The indicator diagrams obtained at St. Louis in 1904 and in Denmark show that this arrangement gives quite as good a steam distribution as can be obtained with a valve for each cylinder."

LAWFORD H. FRY.

COAL CAR DISTRIBUTION.

New York, Jan. 21, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The decision of the Supreme Court enables me to substitute facts for some of the speculations in my article on coal car distribution which you printed on September 17, 1909.

In this article I called attention to the claim of the railways that the purchase of fuel from mines at points on their lines was not commerce, and consequently in supplying cars therefor they were not subject to the Interstate Act. The Supreme Court brushes this contention aside in the following words:

"It may not be doubted that the equipment of a railway company engaged in interstate commerce, included in which are its coal cars, are instruments of such commerce. From this it necessarily follows that such cars are embraced within the governmental power of regulations."

As a result of the Supreme Court's decision the order of the Interstate Commerce Commission stands. Under this order all cars are divided alike—with one exception, which authorizes a railway company to deliver to a particular mine all the foreign railway fuel cars, the private cars and the company fuel cars consigned to it, even though the number thereof might exceed its pro rata share. This exception is a recognition of the claim that only *undue* advantage is forbidden by the act, and that a certain advantage in car distribution is due to car owners. This advantage is a small one, but it is something.

The results of this decision may be considered under the five headings used in the article mentioned above.

First, in regard to railway fuel. There are a number of cases now where railways buy the total output of certain mines. It is likely that this practice will increase, as it would seem to be the only way in which railways can secure fuel at present prices. This will have a tendency toward concentrating the railway fuel orders in the hands of a limited number of shippers.

Certain railways have been trying to divide their fuel orders among their shippers in proportion to the commercial shipments made. It seems probable that this practice will be broken up. If this occurs, it is very possible that the shippers and the railways may unite in appealing to the commission to change its order as to fuel cars.

Second. Foreign fuel orders will also probably be concentrated in the same way, when the cars of the foreign railway are used.

Third. The operators whose mines are usually shut during periods of car surplus will probably receive a somewhat larger supply of cars in periods of car shortage, but not, by any means, so large an increase as they expect. The counting of the fuel and private cars in the total will of course make a larger supply for distribution *pro rata*, but the concentration of these cars at the fuel mines will have an opposite tendency, and that a very material one.

Fourth. The operators who ship all the year round will receive a slightly smaller car supply during car shortages.

Fifth. The owners of private cars will be deprived of all advantage from them except in those cases where they own enough cars to do all their business, when they can obtain the advantage described under the first heading. To get any advantage from their private cars they must, in practice, give up the use of railway cars altogether.

It seems certain that this advantage in distribution will not be sufficient to make it profitable to own private coal cars. If the owners of the cars succeed in selling them to the railways there will of course be an advantage to the shippers of coal who do not own cars; but if the private car owner goes ahead using his private cars until they are worn out and does not renew them, any present advantage to the non-car owner will gradually disappear.

As I said in my former article, "these private cars are of no advantage to the owners during periods of car surplus. The mileage paid by the railways is not enough to keep them in repair and pay for interest and depreciation. They are bought solely to supplement the regular supply in periods of car shortage," and are bought only by the coal operators who have an all-year-round business, who take contracts for a regular supply of coal and who feel bound by these contracts.

The Interstate Commerce Commission has, in practice, said that this private car method shall not be adopted by shippers of coal in order to make it possible for them to ship coal regularly. The Supreme Court has said the Interstate Commerce Commission has the right to make such a decision.

If the private car question were solely a question of coal cars another reference of the question to the Interstate Commerce Commission might be expected, but the commission has so plainly intimated that it does not favor any confusion between the relations of the car owner and shipper that no change in the order can be anticipated.

This leaves still unsolved the coal car question (raised only where there is insufficient storage) which may be put in this way: "How can consumers of coal be sure of getting a regu-

lar supply, and how can shippers of coal be sure of making regular shipments?"

The railways, of course, claim that coal should be stored like other commodities and held at points convenient for the consignee, so that the daily movement of coal from mine to industry need not be essential to the continuance of the industries of the country.

The shippers and consumers claim that the railways should always have such a supply of cars as to enable them to meet any demand. There are obvious objections to both of these courses, and some compromise will doubtless be worked out. Meanwhile, there has been no decision as yet in the cases which involved methods for rating mines, and possibly when the decision comes from the Supreme Court it may help along the situation. Here the essential question is: "Shall a mine be rated on the amount of coal which can be physically taken out of it in a day, or shall it be rated on its past shipments?" A decision that past shipments are a proper element in rating coal mines would help considerably the settlement of the coal car question. ARTHUR HALE.

LEGISLATION RELATING TO SAFETY APPLIANCES.

To the Editor of the Railway Age Gazette:

Referring to my communication entitled "Proposed Legislation Regarding Safety Appliances," printed in your issue of January 14, 1910, I beg to question somewhat a statement in your editorial comment printed on page 78 of that issue. It was not my purpose to denounce the proposed bill "on the sole basis of the success that has attended the work of the Master Car Builders' Association in the past." Furthermore, it is not the ostensible purpose of this bill to promote the universal adoption of the standards of that association, for, if it were, this and my preceding communication would be unnecessary. The Esch Bill H.R. 5702, Sec. 3, reads as follows:

"That within six months from the passage of this act the Interstate Commerce Commission, after hearing, shall designate the number, dimensions, location and manner of application of the appliance provided for by Sec. 2 of this Act and Sec. 4 of the Act of March 2, 1893, and shall give notice of such designation to all common carriers subject to the provisions of this Act by such means as the commission may deem proper, and thereafter said number, location, dimensions, and manner of application as designed by said commisison shall remain as the standards of equipment to be used on all cars subject to the provisions of this Act unless changed by an order of said Interstate Commerce Commission, to be made after full hearing and for good cause shown;" etc.

It is difficult for one having any knowledge of the manner of administration of the Safety Appliance acts to believe that the purpose of the proposed law is in any way to recognize the M. C. B. Association or its work, or, in fact, the present practices of the railways which are based on the M. C. B. standards.

The only quasi-legal standing that the M. C. B. Association standards have was their mention by name in an order of the President of the United States dated January 6, 1909, extending to the Canal Zone and railways in navy yards, docks and government property, and requiring that the various appliances for the protection of trainmen as designated in the existing standards of the Master Car Builders' Association, should be used on all freight cars in the above described territory. Up to that time link and pin couplers and any old arrangement of handholes, etc., had been deemed good enough for cars on government territory, while the railways of the country had under severe penalties been compelled to use specified appliances for ten years. It was worth waiting ten years, however, to have the M. C. B. standards recognized by name, although that is about as far as it got in some respects. A code of rules was drawn up by the commission for the Panama Railroad, and a comparison of these and the M. C. B. standards shows many radical differences and is a very significant indication of what the commission would do with M. C. B. standards if they were given the opportunity by law to designate "the number, dimensions, location and manner of application" of the devices. It would take too much time and space for a complete statement and analysis of the differences between M. C. B. practice, and that provided by the commission for the Panama Railroad, but a few examples may suffice for the present.

One is that four sill steps are required per car, while the M. C. B. practice requires two, located on opposite diagonal corners. A few years ago the legislature of Ohio passed a four-step law which was commented on by Secretary Moseley at the 1906 convention in the following language (see page 62 of the M. C. B. Proceedings, 1906):

"People do not realize that the national law is simply putting in force the rules and regulations which you, the Master Car Builders, have adopted as to many of them, thirty years, at least. Now the Master Car Builders' Association, in regard to the question of sill steps, require a sill step, as I understand it, and it is certain, where there is a ladder you need a sill step, or, if you have projecting sill you would need steps on both sides where the ladder is in the center of the car. To give a man a handhold and a sill step, and then for the man to get up there and find that he is there and cannot get down because of obstructions, perhaps, on the line of the road, and he cannot get up because there is no ladder, leaves him in a bad predicament. For that reason, unless you have a ladder he can reach, then you have hung him. It is for that reason, the desire of seeing no legislation which would conflict with the views of the Master Car Builders and their rules, that we take the position we do in regard to it. I would be glad to see any state pass a law that the rules and regulations of the Master Car Builders' Association should be law until such time as the Master Car Builders' Association in their wisdom see fit to change them."

As they do not require four ladders per car it is hard to justify four sill steps on house cars unless possibly constructed with projecting end, which, as the secretary says, might have ladders in the center, but the writer knows of no house cars so constructed.

Another point is the denial of the use of the uncoupling lever, the bracket of a brake step or the posts or railings of open platform cars as effective handholes when located within the proper zone and with proper clearances. It is difficult to understand what reasonable objection can be urged against the M. C. B. standard practice of allowing the use of substitute devices equally as effective, instead of requiring duplicate devices for the same purpose to bewilder and confuse when a quick choice must be made. It is possible that the commission's instructions on these points is based on some court decision, but, if so, the court certainly did not take into account the standing of the M. C. B. Association or look up the origin of the custom and practice of the roads in establishing these devices. If such is the case the legal departments of the railways are at fault in not making use of the value of the association, as the expert authoritative body that made up the original schedule of these devices and for years has maintained and built up regulations for their use, following the evolution in car building by adopting the principles originally framed for their use. The commission permits use of the bottom round of a ladder as an effective handhold, but why not other equally effective substitutes?

A number of other points might be cited but these suffice to show the mind of the commission as regards the details of the appliances as they would have them, regardless of the M. C. B. standards, railway companies' practice or precedent. The M. C. B. standards were all very good until 1908, but since then are very bad, although they are the same to all intents and purposes.

Were the secretary and the commission hoodwinked and deceived for all these years when there was such a profuse bouquet of compliments handed out each year by the genial secretary at the annual conventions of the association? The change has been since 1908, and why? Probably the honorable commission and its secretary would disclaim personal knowledge of these details, as they are not car builders, but get their information and advice from their corps of inspectors, for, as far as is known, they have no other mechanical advisors. These inspectors' views were probably incorporated in the commission's instructions to the Panama Railroad regarding safety appliances, and, if the proposed bill should become law and the commission be given the right to designate "the number, dimensions, location and manner of application"

of these devices, is there any doubt that the opinions of these inspectors would be enforced on the railways as the designation of the commission as to these appliances?

Now, a critic may say, why should not the opinion of an inspector who is among these things all the time be most valuable, especially as these inspectors were formerly trainmen, switchmen and the like, and have personal knowledge and understanding of the matter? The above contention should be granted on its own premises, but not in this case, and for the following reasons: The President of the United States issued an order extending the use of the M. C. B. appliances for the protection of trainmen to the Canal Zone. The commission, in preparing their instructions, ignored the President's instructions and the M. C. B. standards and put in their own ideas, and does any one doubt they came from the inspectors? Also, if these changes or departures from M. C. B. standards were few or minor in character less would be thought of it and an endeavor would be made to reconcile the conflicting views and opinions. When, however, the expression of their views on careful analysis shows a desire for changes in about three-quarters of the items under the M. C. B. standards for freight safety appliances it discloses a situation on which there can be no compromise except complete surrender, and that I believe the Master Car Builders' Association will never do. It is not possible, or reasonably consistent to state that the standards which were lauded year after year by Secretary Moseley and pronounced by him as "more complete than the law itself" are now three-quarters wrong and that almost every car in the country needs two additional sill steps, a number of additional handholds and the alteration of the position of some of the appliances now on the cars. All these things, and more, are required by the Panama Railroad rules and quite possibly would be under the provisions of the Esch bill.

While the writer cannot speak generally for the railways, so far as his information goes, it is believed that they would welcome the inclusion in the Safety Appliance acts of the Master Car Builders' standards with such provisions as to elasticity as to permit their ready adaptation to new types and developments of car construction and compel all railways to rigidly conform to these standards. They would then have the merit of being equally good or equally bad instead of being, as at present, of quite uncertain nature and merit, owing to the fact that one U. S. judge construes the law one way and another some other way, their interpretations being strictly technical and literal views of the language and the grammar of the Safety Appliance acts instead of being based on the customs, practices, origin and development of these devices. Custom and practice are said to make law; but they do not make Safety Appliance law.

X. Y. Z.

Contributed Papers.

CAR INTERCHANGE AT NIAGARA FRONTIER.*

In presenting a subject of such importance I want to compliment Mr. William Baird (C., B. & Q.) for the very determined stand that he made and the favorable impression made by him in his paper read at the October meeting of the Western Railway Club [*Railway Age Gazette*, January 21, page 139]. If his recommendations were carried out it would mean an enormous saving in time at transfer points. But it is necessary to go a great deal further than Mr. Baird's recommendations. The immense increase of freight passing through the country, the vast increase in the capacity of rolling stock and the service expected of it, bring us face to face with new conditions so rapidly that no country would have generals equal to the task of meeting them.

*From a paper by W. O. Thompson, Master Car Builder, N. Y. C. & H. R., read before the Central Railway Club at Buffalo, January 13.

The Niagara Frontier Car Inspection Association, which is in effect on the Niagara Frontier, from Buffalo to Suspension Bridge, and embraces all railroads interchanging, was put into effect some nine years ago. The foundation of this agreement is to expedite traffic and create honest methods. All cars are inspected and repaired by a force maintained by the receiving line. No cars make a backward movement, either for transfer or repairs, except for safety appliance defects, which are looked after and repaired before delivery. An Arbitrator is employed, who is under the direct supervision of an Executive Committee, and his services are paid pro rata by the roads in the agreement, and his duties are to look after the interests of the roads so far as carding and expense are concerned. Being connected with the Executive Committee, I have carefully noted the working of this arrangement for the past two years; and with an average interchange of 400,000 cars every 30 days, have found little or no cause for complaint from any point of view. Under ordinary conditions the inspection of the car is completed before the work of taking seals, destination, weight, etc., is covered by the Operating Department.

No greater force, for the welfare of the public and railways, has ever been produced than the Master Car Builders' Association, which with persistent energy and brain power has placed the rolling stock of this nation on the present high plane, and made possible the interchange of all cars with a small percentage of expense. This organization can be relied upon to meet future emergencies and the following suggestions must, sooner or later, be taken up and worked out:

The car owners shall be responsible for any and all necessary repairs required to keep their cars in service, either loaded or empty, no matter under what conditions the repairs become necessary.

Any road having in its possession a car, the property of another company, such car being in need of repairs, no matter whether the repairs needed to place the car in first-class serviceable condition be of light or medium nature, or whether the car is in need of general heavy repairs, the company having the car in its possession, to have the authority to make such repairs without consulting the owner and bill the owner for complete cost thereof, no matter whether the road making the repairs is located in California and the owner in Maine, or vice versa. The need is to have standard cars of each type in use throughout the country, in the construction of which standard types and uniform quality of materials be used, and with a universal pooling system in effect.

Maintain a committee something similar to Mr. Arthur Hale's Committee on Car Service to establish and maintain a ratio of equipment per mile of road.

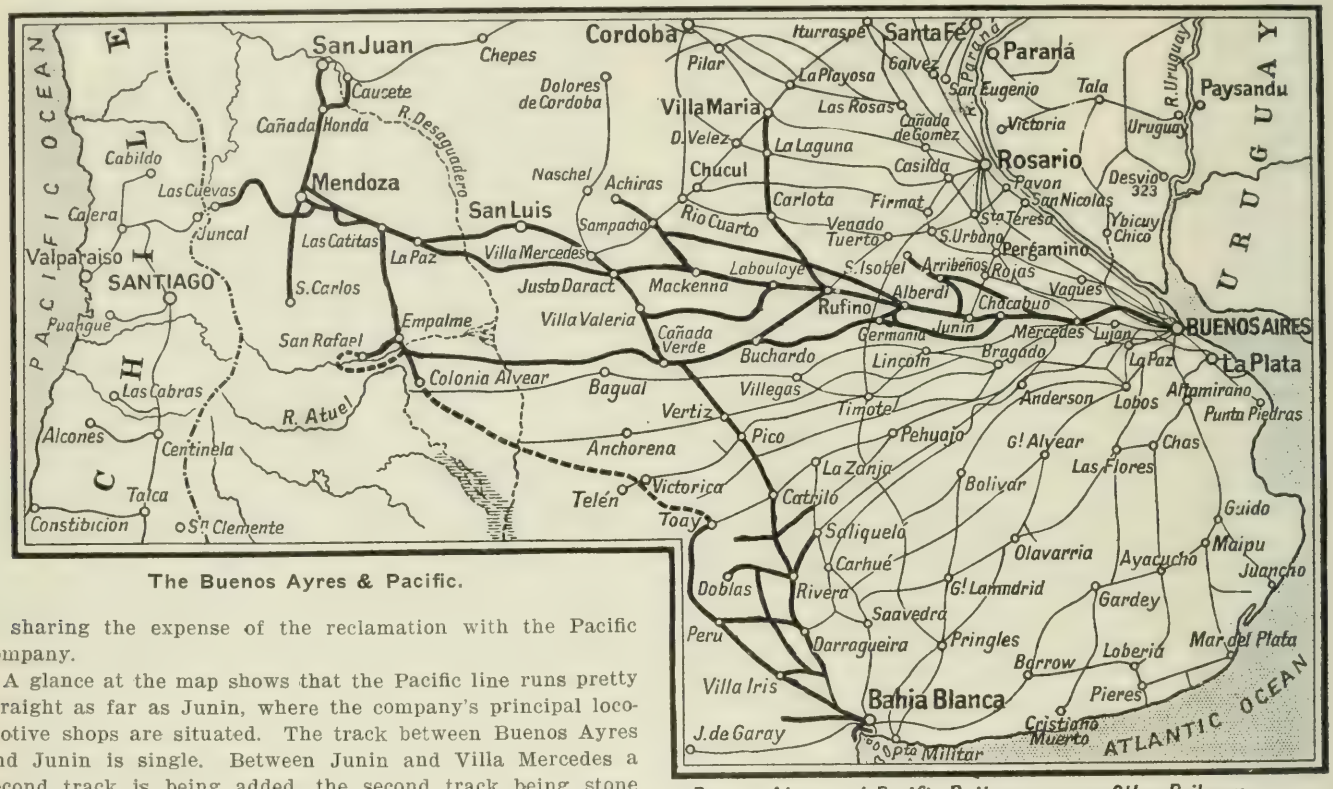
Maintain a Board of Arbitration, whose duties shall be to dispose of all charges covering repairs made, and to organize and direct a corps of traveling inspectors, the organization of which shall be similar to that of the Interstate Commerce Commission, and whose duties shall be to see that all roads maintain a common standard of materials and workmanship on all cars of all roads.

It is impossible, at this time, to even estimate the millions of dollars that can be saved, but enough saving is in sight from traffic, accounting and inspection standpoints alone to justify a careful consideration of the recommendations. With each car averaging 22.6 miles per day we have a total annual mileage per car of 8,249 miles. With the above suggestions in effect, the same car could reach 28 miles per day, making a total annual saving of 70 days per car.

BUENOS AYRES & PACIFIC.

The accompanying map shows the Buenos Ayres & Pacific lines, which, in connection with the Trans-Andian Railway, were described in the *Railway Age Gazette* of November 22, p. 919. The trip from Buenos Ayres to Mendosa, however,

deserves a description by itself. Leaving the Retiro station at Buenos Ayres the first part of the line runs between the ugly river on the right and the beautiful park on the left, and the viaduct which the railway company was obliged to build, so as not to spoil the view of the park, is a very fine, and, incidentally, an expensive one. The line passes through the most beautiful part of the city, Palermo and Belgrano containing some of the finest private houses. On the right of the line the company is carrying out great improvements and reclamation works which involve among other things the raising, by about 25 ft., of a square mile or so of country which is being reclaimed from the river; this forms part of the great scheme for the high-level entry of the Pacific company into the port of Buenos Ayres, for the construction of a terminus, quays, diversions of sewers and many other works which need a separate description. The raising of the level is being done by pumping mud on to the site and draining the water, the mud being obtained from dredgers engaged in the excavating of the channel; the Cordoba Central (B. A. P. extensions)



The Buenos Ayres & Pacific.

Buenos Aires and Pacific Railway——— Other Railways———

is sharing the expense of the reclamation with the Pacific company.

A glance at the map shows that the Pacific line runs pretty straight as far as Junin, where the company's principal locomotive shops are situated. The track between Buenos Ayres and Junin is single. Between Junin and Villa Mercedes a second track is being added, the second track being stone ballasted and laid with 100-lb. rails, now the standard practice on the Pacific company's main-line system. The stone ballast has to be carried great distances from the company's quarries at Sampacho, and the average total cost for ballasting is about $4.75 per yard; hence it can only be gradually introduced. On certain parts of the line a kind of soft rock or earth, of a pink color, is being tried in layers of 3 to 4 in. for the purpose of preventing dust.

Barbed wire fences are standard, often slung on posts of quite rough wood. Sufficient right of way is usually acquired between the fences for double the track.

From Junin the journey is continued along the famous 217-mile "tangent," often noted as being the longest and straightest piece of line in the world. The track is laid with 100-lb. rails and about 2,104 ties per mile.

From Justo Daract there is a double line as far as La Paz, the lower loop or "cut off" having been recently built with a maximum gradient of 0.5 per cent., the San Luis or northern branch (A.G.W.) having a maximum gradient of 1.25 per cent. The lower loop has only just been completed and the stations are not all named. Doubtless much of it would not have been built had the Argentine Great Western and Pacific companies agreed earlier.

Among the various problems which the Pacific company has to study, water and its lack provide some of the worst. Between Justo Daract and La Paz there is hardly any water for about 113 miles, and the district is at present almost uninhabited. Boring is taking place at a number of the wayside stations, but it is rash to predict what the future of such a district might become should water be found or irrigation introduced or a change of climate be brought about. At some places water was being piped 13 miles to the station, but by far the greater quantity is being carried in tanks, of which the company has over 30, the largest holding 8,448 gallons.

From La Paz the ground slopes gradually up to the Andes and the district is widely irrigated from the river Mendoza. Although the latter is small, and the methods adopted very wasteful, the gentle slope of the country and the impervious nature of the soil nevertheless enable an enormous area to be irrigated. This will probably be largely increased, for the railway company has an irrigation expert of its own, Mr. Kennedy, who has had experience in India. As it is, this part of the country is green and full of vineyards with poplars and willows in quantities, reminding one at times of northern Italy and at times of Belgium.

The light repairs to locomotives are done at Mendoza, the center of the western district, the heavy repairs being done at Junin. The eight-wheeled coupled engines are the standard freight engines on the Buenos Ayres & Pacific. The six-wheeled coupled is used as their standard passenger engine, they have also some new Kitson tank engines.

In the winter there is comparatively little traffic, but in the busy season there are quite a number of trains a day. The development of the district on each side of the line is helped in every way by the company. The limit of distance which it pays to bring wheat to the railway by cart probably does not average more than 10 miles, owing to the roughness of the roads.

No wood fuel is used in this part of the country, wood being too scarce, although coal costs over $12 per ton.

THE TRACTIVE POWER OF SIMPLE AND COMPOUND LOCOMOTIVES.

BY SIDNEY C. CARPENTER.

The accompanying diagrams, Figs. 1 to 4, enable the tractive power of simple locomotives to be very closely approximated without calculation and also enable any factor in the formula to be found when the others are known.

The tractive power for simple locomotives is obtained from the formula $\frac{D^2 L .85 p}{d}$, where D = cylinder diam. in inches, L = stroke in inches, p = boiler pressure and d = diam. of drivers in inches. Diagram Fig. 1 gives the value of $\frac{L}{d}$, Fig. 2 gives the value of $\frac{D^2 L}{d}$, and this value is multiplied by 85 per cent. of the boiler pressure, in Fig. 3, to obtain the tractive power. Diagram Fig. 3 carries this value up to 350 and the tractive power up to 75,000 lbs.

A number of examples are given below to show the use of the diagrams.

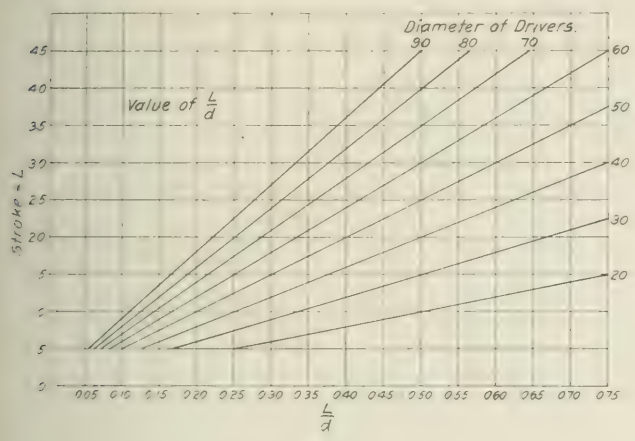


Fig. 1.

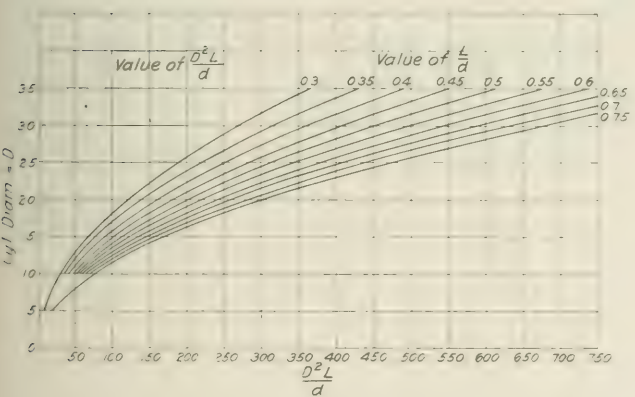


Fig. 2.

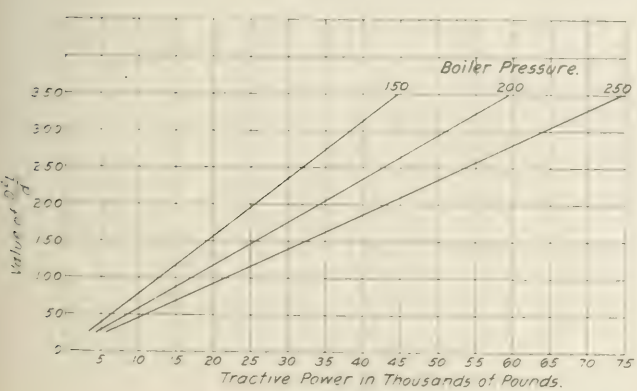


Fig. 3.

Find the tractive power for an engine with the following dimensions:

Cylinders, 20 in. x 28 in.

Drivers, 80 in.

Boiler pressure 200 lbs.

In diagram Fig. 1 find the 28-in. stroke at the left, following horizontally to the diagonal for 80-in. drivers and down to the value of $\frac{L}{d}$ which equals approximately 0.35. In diagram Fig. 2 find the cylinder diameter, 20 in., at the left, follow horizontally to the diagonal 0.35 and read at the bottom the value of $D^2 \frac{L}{d}$ which equals 140. In Fig. 3 find 140 at the left, run over to the 200-lb. diagonal and down to the

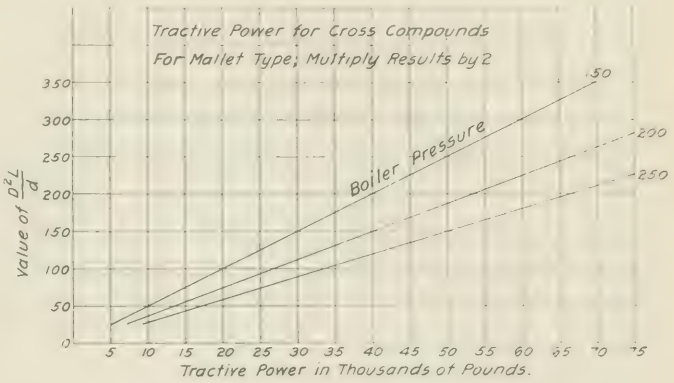


Fig. 4.

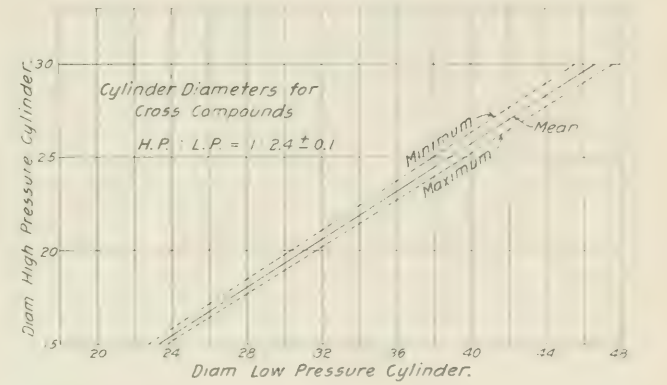


Fig. 5.

tractive power, which is 24 or 24,000 lbs. Calculation gives about 23,800 lbs.

An engine is required to develop 19,000 lbs. tractive power. The boiler pressure is 200 lbs. and the drivers are 50 in. diameter. What should be the diameter of the cylinder if the stroke is 22 in.?

Referring to the diagram, Fig. 1, we find the value of $\frac{L}{d}$ to be about 0.44. Referring to Fig. 3 we find the value of $\frac{D^2 L}{d}$ to be about 110. Now referring to Fig. 2 we find from 110 at the bottom and the diagonal 0.44 that the cylinder diameter is about 15½ in. or 16 in.

An engine has cylinders 19 in. x 24 in. and a boiler pressure of 180 lbs. What must be the diameter of drivers to give a tractive power of 19,500 lbs.?

From diagram Fig. 3 run vertically from 19,500 lbs. to a point a little less than half way between 150 and 200 lbs. and find the value 125 at the left. On Fig. 2, from 125 at the bottom and 19 in. at the left find 0.35 as the value of $\frac{L}{d}$. On diagram Fig. 1, from 0.35 at the bottom and the 24-in. stroke the diameter of drivers is found to be about 68 or 69 in.

The boiler pressure and stroke can be found in the same way.

Diagram Fig. 4 is similar to diagram Fig. 3, but applies to cross compound locomotives. In the calculation of this diagram the Baldwin Locomotive Works formula is used. This is $\frac{D^2 L \times 3}{d}$ where the letters have the same meaning as in the first formula. To apply this diagram to Mallet compounds, multiply the final result by 2.

Diagram Fig. 5 gives the proper relation between the high and low pressure cylinders. According to the Baldwin Locomotive Works the ratio of the high and low pressure piston areas should be 1 to 2.4 with an allowable variation of .1 either way. The diagram gives the maximum, mean and minimum diameters as figured on this basis.

LOCOMOTIVE BOILER PRACTICE IN FOREIGN COUNTRIES.

The report on "Improvements in Locomotive Boilers," presented at the eighth session of the International Railway Congress, was written by B. H. Fowler, locomotive works manager, and L. Archbutt, chemist, Midland Railway, England. The report covers 100 pages of the proceedings pamphlet, and includes descriptions and illustrations of locomotive practice on the principal railways of Great Britain, India and South Africa. The following are the principal conclusions drawn from the replies to the committee's questions and the discussion at the Congress:

Probably the greatest change in boiler construction which has taken place in recent years on the lines reported upon is in the largely increased use of Belpaire fireboxes, the majority of newly designed engines having this type. One great advantage derived from this change is that the disuse of roof-bars leaves the space over the top of the firebox clearer and more easily washed out, and some of the lines which have not adopted the Belpaire box have in their later boilers fitted radial stays with the same object in view. There seems to be less trouble with a copper tube-plate when fitted in a Belpaire than in a round-topped box, but this point is perhaps open to question.

A few of the lines employ wide, comparatively short, fireboxes which are placed over the frames, and the Great Northern Railway of England is getting particularly good results with this type. It readily allows a large grate area and facilitates the renewal of any defective stays, but with passenger engines at all events, entails a small uncoupled trailing wheel.

The weight of the engine, as a whole, has an important bearing upon the design of the boiler, for in order to keep the load per wheel down it has frequently been found necessary to slope the door-plate forward, so as to prevent the load per unit of area on the trailing journals becoming too great, and this in spite of the fact that these bearings are sometimes as much as 10 in. in length and 8¾ in. in diameter.

In spite of its high and at times excessive price, copper is still very generally used for fire-boxes on the railways reported upon, and no consistently good results seem to have been obtained with any other material, although one or two lines use steel for goods or secondary engines which are not heavily worked. It is interesting to note that although two lines have tried cylindrical steel fire-boxes, they have not extended their use. This seems largely due to the difficulty of raising steam in them, owing to the poor circulation due to a considerable body of the water in the boiler being below the source of heat and, therefore, not affected by the convention currents set up.

One of the reasons for the abandonment of steel fire-boxes has been the trouble from corrosion, and to endeavor to meet this, nickel steel has been experimented with, but up to the present has not been found satisfactory.

The advantages of employing high pressure steam are becoming more and more realized, and a number of lines use 200 lbs. per sq. in., whilst with two it rises to 220 and 225 lbs. In one of the latter, they employ it in compound engines, whilst the other, on which the engines are simple expansion, use the highest pressure met with, viz., 225 lbs. These higher pressures, as might be anticiptated, tend to accentuate boiler troubles, and render more imperative the employment of good water and the selection of tubes and longitudinal stays which will not cause excessive distortion of the tube-plate. Some lines have found that the troubles associated with higher pressures have not been compensated by the advantages gained, and have returned to a lower maximum.

The question of weldless barrel-plates is of considerable importance, and a large firm of steel makers in Sheffield have put down extensive plant for the manufacture of these plates, which are being tried by one line, at least in England.

On the whole, it may be said that the proportion of steel and iron tubes to copper and brass is growing, and several of the British lines have wholly dispensed with the latter expensive metals. In India it may be noted that brass is very extensively used, and pitting just inside the ferrule, due to mechanical action from the coal, does not seem to give the trouble it does on some lines. As might be expected, steel and iron are much more liable to corrosion than the other metals, especially near the fire-box, and nearly all who use these materials arrange for the renewal of this end of the tube when the corrosion has rendered it unfit for further use. Copper ends and sleeves are occasionally employed to prevent this defect.

Considerable attention is now paid to the expansion of the tube into the tube-plate, this being generally carried out by mechanical means. Attention has also been given to the order of expanding, various procedures being adopted to prevent, as far as possible, the distortion of the tube-plate caused by the work put on it during expansion.

Opinions are still divided as to the relative merits of the arrangement of tubes in vertical or horizontal rows, but the former seems to be gaining ground, as it keeps the boiler cleaner, allows steam to rise more readily when working, and scale to fall more freely during washing-out.

Attention is being given in many quarters to the better regulation of the admission of air to the fire, and this should lead to improvement in the maintenance of the firebox tube-plates; no full particulars are, however, yet available. The question of a forced draught on the "plenum" principle is also being considered, but nothing practical has yet been evolved, and although such a system would effect a great improvement, the quantity of air to be admitted with an express engine is very great, rising in some cases to at least 8,000 cubic feet per minute.

The increase of pressure and harder work to which modern boilers are subjected, has led to more attention being paid to the arrangement and spacing of tubes and stays, especially with a view of giving greater flexibility at the corners where cracking usually takes place.

Although "extended" smoke-boxes are only used by a few of the lines, yet there is an increasing tendency to enlarge these boxes with a view to equalizing the "draw" through the tubes and preventing to a certain extent the ejection of sparks. Little has been done with regard to water-tube boilers, and the use of water-tubes in the fire-box of the Drummond type has not met with general favor; but, in addition to the cases mentioned in the report, the Japanese State Railways are adopting these water-tubes to a certain extent.

At the time of writing this report, there are only two lines in the countries reported on which are using superheaters to any large extent. There are, however, a number of others who are experimenting with this type of engine, and it is probable that their use in the countries dealt with will shortly be considerably extended. The replies received show that the

practice of the different lines in regard to water-softening varies greatly, some having adopted it extensively and others practically neglecting it. The softeners in use include the following: Archbutt-Deeley, Desrumaux, Kennicott, Pulsometer, Reisert, Porter-Clark and Wollaston. In one case Mirrlees-Watson Yaryan Distillers are used. The chemicals used in softening are invariably lime and soda.

When the proportion of soluble salts in the concentrated boiler-water reaches 150 to 350 grains per gallon the amount varying with the type of boiler, rate of steaming, and nature of the salts, foaming of the water is sufficient to cause serious priming, and for this reason it is found necessary to limit the amount of soda used in softening. To overcome this difficulty, some railways have tried barium compounds in place of soda or soda-ash in softening, but the cost has always been found to be prohibitive; in fact, with some waters it may be as cheap or cheaper to distil the water and thereby remove all impurities as to soften with barium salts.

The experience of those railways which have adopted water-softening shows that great saving is effected thereby in the cost of re-tubing boilers, replacing broken stays, and removing scale, while leakage is practically stopped. Two lines record a large saving by being able to soften and use water which can be obtained cheaply, instead of purchasing expensive water of better quality.

Since the date of the last report (1900), the use of water-softening plants has considerably extended among the railways reported on, and we do not doubt that it will continue to extend as the saving which is capable of being thus effected becomes better realized. One reason why progress in the past has been slow, is the fact that water-softeners were regarded as machines which required no scientific control and could be efficiently run by the laborer in charge. Most railways now employ chemists, and it is realized that the water-softeners should be placed under the supervision of the chemical as well as of the engineering staff. Those railways which have been working on these lines, find that the results obtained well repay the cost entailed by water-softening.

To obtain the best results, water-softening should be used in conjunction with a system of changing the water in the boilers before it has become too concentrated in regard to sodium salts, or saturated as regards that part of the calcium sulphate which cannot be economically removed without unduly charging the water with sodium salts. To enable the water to be changed with the necessary frequency, and without engines spending too much time in the shed, the boilers must be filled up with hot water. When the amount of sodium salts or calcium sulphate in the original water is excessive, undue concentration can only be prevented by the use of blow-off or scum-cocks, of some description. The practice adopted must be based upon and controlled by a systematic chemical analysis of the principal waters used by the locomotives in each district.

Disincrustants are used in the boilers by a few railways, those most commonly employed being preparations containing tannin or soda alone, or a mixture of the two. The experience of some lines has been unfavorable, others have given up the use of disincrustants in favor of water-softening.

For the prevention of corrosion, some railways obtain good results by coating the boiler plates with Portland cement; but in one case it was found that in the boilers in which this was used it washed off and was a failure. A coating of graphite and boiler linseed oil has been tried, but was found to percolate through the seams and joints and cause leakage. On one line the boilers are painted inside with tar and graphite. Zinc plates and plugs have been tried by several railways, with unsatisfactory results. Some lines have found the addition of a definite excess of slaked lime to the water distinctly advantageous in preventing corrosion, especially in the case of natural soft waters.

The majority of the railways still use cold water for washing-out boilers, and the use of hot water is extending.

On many lines the use of blow-off cocks or scum-cocks to prevent priming is necessitated by the bad quality of the water which has to be used.

There seem to be no special features in the replies to questions on cracks, pitting, grooving and general surface corrosion, as all the lines suffer more or less from these defects in much the same manner and in the same position in the boilers. Although various steps have been taken to prevent these troubles, none seem to be universally satisfactory. Efforts are being made to increase the water-spaces around the sides of the fire-box to prevent breakage of stays and corrosion of fire-box plates; to give larger radii at corners and prevent the tubes from coming into close proximity to the edge of the tube-plate to lessen the chance of cracking, etc., and these doubtless help to minimize the troubles; while water-softening and mechanical cleaners also help in this direction.

Practically two, and only two, types of material are employed for boiler stays, viz., copper, and a bronze (Stone's), containing copper with nickel, manganese and iron. (For analysis see table 6, reply from Midland Railway.) The latter material is stronger at boiler temperatures than copper, but the head of the bronze stay tends to burn off more readily than copper, and some lines state that the heads are liable to break off in the fire-box plate.

There does not seem to be a great deal of trouble with stays fracturing, except at the top front corner of the fire-box, and even here the trouble is not marked enough to cause the special flexible stays, as used in America, to be adopted.

DISCUSSION OF THE HINE SYSTEM OF ORGANIZATION.

Major Charles Hine's paper on "The Unit System of Organization," which was published in the *Railway Age Gazette* of January 21, called forth an interesting discussion when it was read by the author at the meeting of the Western Railway Club on January 18. As is known to most readers of this paper, Major Hine worked out this system as it is being applied by Mr. Kruttschnitt on the Harriman lines.

Prof. Wallace, of Purdue University, sent a letter commending the Hine system as designed to secure much needed co-ordination between the different branches of the operating department. He said in part: "I have closely watched the development of the unit system of organization and I have been impressed with its importance. Its advantages are despatch, flexibility, fairness, broadening effect upon the individual and upon the organization as a whole, and, lastly, a chance to show one's individuality. The mere fact that all correspondence is to be signed by the individual and not by some other person is itself a very strong point. If the employee is assured that all communications are signed in person I feel confident that better results will be obtained. I recall that when I was in railway service I would often wonder whether a particular communication was really signed by the supposed writer or by some stenographer or clerk. I feel that with the principle enforced that the signature attached must be bona fide much injustice will be eliminated. One of the strongest features of the system, as I see it, is the broadening effect it must have upon the individuals who make up the division unit. The very principle is one of education and improvement. The assistant superintendent representing the mechanical department will be a much stronger and broader man from coming in contact with the problems of the engineer, the despatcher and the division superintendent. It is a foregone conclusion that anything that tends to make the individuals of an organization more proficient also makes the organization as a whole more proficient. I therefore conclude that the unit system will ultimately produce an intelligent and efficient organization. There can hardly be a question about this system being more flexible in many respects than was the old way of doing things. As pointed out by the

speaker, the saving in correspondence and the clothing with authority of the man on the ground, whoever he may be, must expedite and curtail the expense of the company's business.

M. K. Barnum, general inspector of machinery and equipment of the Burlington, raised the question how, when there are several assistant superintendents on a division, each having general jurisdiction over all branches of the service, the giving of conflicting instructions is to be avoided. For example, might not the assistant superintendent, who formerly was chief engineer, give instructions regarding mechanical matters which were not in accord with the best mechanical practice? Major Hine replied that this question suggested the weakest point in the unit system. He believed, however, that the superintendent would be able to maintain the proper balance between his subordinates. It had been found on the Harriman lines that there was more trouble in getting officers to interest themselves in branches of the service besides their own special one that in keeping them from so encroaching on each other's specialties as to make trouble. The advantage of the system, he said, is that while it lets each man continue to give most of his attention to the branch of the service in which he is an expert, it also enables each to exercise more or less supervision over other branches. For example, under the old system, if the division engineer was riding on the rear of a train and criticized the flagman for not having gone back far enough when the train stopped, the flagman probably would tell him to "go to thunder." If, then, the division engineer made a complaint against the flagman the trainmaster was apt to constitute himself counsel for the defendant flagman because the flagman was "his man." The unit system prevented this sort of thing by making all the various assistant superintendents the superior officers of the flagman and enabled them to administer a sort of summary police court justice. The extent to which the different officers were disposed to assert their new authority under the unit system differed with individuals. For example, the engineer of one division who was rather conservative, had remarked that about the only result of its establishment affecting himself that he had observed was that the train crews no longer smoked cigarettes in his presence.

W. L. Park, general superintendent of the Union Pacific, spoke briefly regarding the working of the new organization on his road, where it was first tried. As illustrating how it has worked he said that after it was adopted on one division the general roadmaster walked over to the office of the chief train despatcher and jokingly said to him: "Now, Mr. McGinnis, I am an assistant superintendent, and don't you ever dare to say another word back to me." He believed that the various assistant superintendents under the new organization were using their increased authority for the good of the entire service.

C. A. Seley, mechanical engineer of the Rock Island, said that he could see where better co-ordination of the different branches of the operating department is desirable and necessary. The writing of letters to the fellow across the hall has been carried to an extreme in all departments. He raised the question as to where one occupying an office such as his would find himself if the new method of organization were extended logically over the entire railway system. Major Hine, in reply, drew a distinction between staff officers and line officers in the railway service. The line officer handles men. The staff officer deals with things. In the mechanical department the superintendent of motive power is the line officer, and the mechanical engineer is his expert adviser, and, therefore, a staff officer. Under the unit system, his work, and probably his title, would remain substantially unchanged. Under the old system on the Harriman lines the rules said that the master mechanic would report to the superintendent of motive power on purely technical matters, and to the superintendent on other matters. Unfortunately, differences of opinion arose as to what were purely technical matters. Under the present system the master mechanic reports to the superintendent on all matters, and the superintendent reports to the superintendent of motive power on technical matters, or, in other words, the master mechanic reports *through* the superintendent to the superintendent of motive power on technical matters. The question was raised as to whether the change in title of mechanical and engineering officers would not militate against their receiving offers of promotions from other railways. Major Hine, in reply, called attention to the fact that Mr. Kruttschnitt is the only man who bears the title of director of maintenance and operation, and yet this has not prevented anyone from understanding exactly what work he does.

W. E. Symons expressed the view that the unit system of organization makes practicable a broad gage, common-sense use of all the operating forces of a railway. Much time, he said, is lost to the railways because officers run over the road without full tonnage. A master mechanic, for example, may have to go from one end of a division to another to attend to some matter which had just as well be attended to by some officer of corresponding rank who is already there. The unit system of organization making assistant superintendents of all division officers of similar rank with authority over all branches, makes it possible to take up this lost motion. The highest educated man is the most useful man. Therefore, the man on the railway who can perform only one duty is not as useful as he would be if the scope of his work were broadened. Mr. Symons did not think that men who are trained under the unit system of organization would have less difficulty in getting promotions to other roads, for he believed that any road would rather have a master mechanic or division engineer who had had transportation experience than one who had not.

Replying to various questions, Major Hine said that in applying the unit system of organization on the Harriman lines there had been no changes in salaries; nor had any man lost his position on account of the change. The plan is being considered of providing for progressive increases in salaries, based on length of service. In the past railway salaries have depended too much on how many friends a man might have on other roads who would offer him positions. It was originally thought that under the unit system of organization the chief clerk could be dispensed with, but it had generally been found more expedient to bring the various clerks of division general officers together at the general office, where are also concentrated the offices of the assistant superintendents, and to place them in charge of one man who usually bears the title of chief clerk. In one case the chief clerk has been given the title of "senior clerk."

ECONOMICAL WOOD PRESERVATION.

BY ROBERT HAYS.
San Diego Southern Railway.

Despite the numerous methods introduced within the past few years for materially reducing the cost of timber preservation, there are still many railway, telephone, mining and industrial companies, and a multitude of individuals, who regard the cost of such preservative treatment as prohibitive, even though they may admit its desirability and appreciate its economy in the resulting decreased annual charge during a cycle consisting of a number of years.

The use of crude oil or petroleum for the hot or preliminary bath in the open tank or absorption process will very considerably lessen the cost of such treatment in the regions where crude oil is low in price. This especially refers to the western and southwestern states, which annually produce many millions of barrels of crude petroleum, and in which states, by reason of their distance from the principal centers of American and European creosote production, creosote com-

mands a comparatively high price. In these sections crude petroleum may be bought for as low as 60 cents per barrel. Ninety cents per barrel, equivalent to $.0028 per pound, is perhaps an average price, while crude or commercial creosote, even in moderately large quantities, costs something like 20 cents per gallon or $.023 per pound.

Except in occasional instances, tests and experiments innumerable have demonstrated that crude petroleum possesses very little value as a preservative against the attacks of wood destroying fungi, yet for the first, the hot or preliminary bath in the open tank method of timber protection, whose function is merely to evaporate the moisture in the wood cells and expand the air in the cells and intercellular spaces, the writer has found that petroleum serves almost equally as

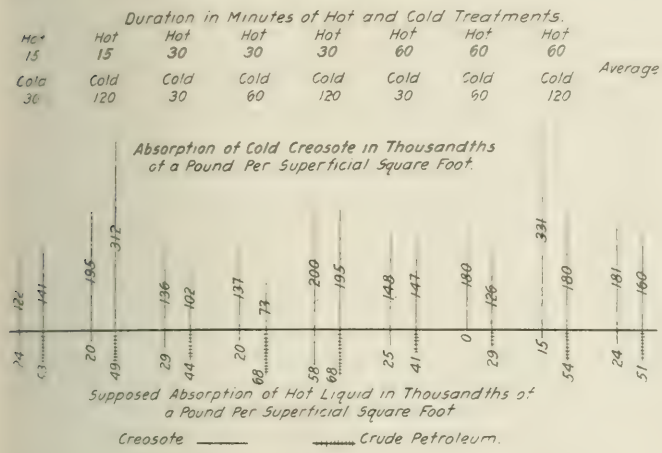


Fig. 1.

well as the more expensive creosote in so far as preparing the timber for successive immersion in cold preservative. The schedule here shown indicates that the absorption of creosote during the subsequent cold bath given the timber varies inconsiderably when either crude petroleum or creosote are used for the preliminary treatment. By weight, however, more crude oil is absorbed during the preliminary bath than creosote, conditions and duration of application being the same, but it should be remembered that, according to the figures presented earlier in this article, crude petroleum costs but one-eighth as much. The slightly greater absorption of cold liquid apparent in some of the tests in which creosote was exclusively used, and in the average of all tests, is probably due to variations in the structure and closeness of the wood.

The writer's tests were made on Douglas fir or Oregon pine. This wood does not lend itself readily to the open tank method of treatment, and it was desired to make the experiments under the most unfavorable conditions likely to be encountered in actual practice. Unfortunately, no really proper tanks or other appliances for treating timber of any considerable size were available, so small sawn blocks were used. The liquids were heated by electricity, as the low flash point of the petroleum employed (about 60 deg. F.) prevented the use of any flaming heat. The temperature of the hot solutions was maintained between 212 deg. and 225 deg. F. As the test specimens were small, and the periods of immersion short, resulting in the absorption of a relatively small amount of liquid, Troy weights (7,000 grains per avoirdupois pound) were used to insure greater accuracy. It was deemed unnecessary to lengthen the treatment into a number of hours, such as would be accorded timber in actual practice, as the absorption and penetration of different woods, in many different stages of seasoning, and under a multitude of different conditions, have been amply demonstrated by exhaustive experiments, and the object of this particular test was solely to obtain figures relative to the comparative absorption of creosote when the treatments were commenced with hot baths of petroleum and creosote.

The resulting obsorption is expressed in pounds per superficial square foot. The superficial square feet of a piece of timber are the total area in square feet of its several surfaces. It has long been deplored that the cubic foot should have entered into calculations involving the surface or superficial application of a preservative to lumber, in which the cubical contents of the timber are not a factor. Unless the sizes of timber are given, one gets no idea of the amount of preservative actually absorbed when figures are presented like "ten pounds per cubic foot." No person would undertake to determine the cost of sweeping the streets of a city, or contract to paint a house, on a cubic foot basis; such a unit is foreign to calculations of this character, and equally foreign to calculations of the absorption of creosote by timber, when such creosote penetrates but a relatively short distance into the wood. The only exceptions might be in the case of small cross arms of soft wood, and paving blocks, in treatment of which the preservative fluid would probably be expected to completely impregnate the timber. Of course, in the case of railway ties, poles and piling, the discrepancies are less apparent, on account of a lesser variation in the sizes of these commodities, but with bridge, trestle or mining timbers the differences are great. Each piece of lumber in the illustration contains exactly 6 cu. ft., yet the 12-in. x 12-in. x 61 ft. block measures 26 superficial sq. ft., while the 6-in. x 12-in. x 12 ft. board exposes 37 superficial sq. ft., a difference of 11 superficial sq. ft. Were these two pieces of lumber of the same species, having the same attributes in the way of hardness, closeness and moisture content, and should they be treated together in the same vat or vats, and for a similar period, the board 12 ft. long would undoubtedly absorb 42 per cent. more preservative than the 6-ft. piece, despite the fact that their cubical contents are precisely the same. It is to be hoped and urged that those interested in the preserva-

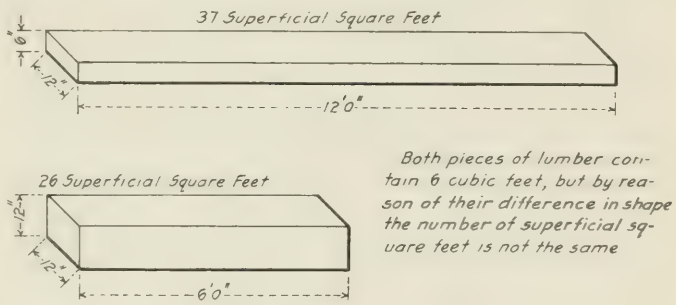
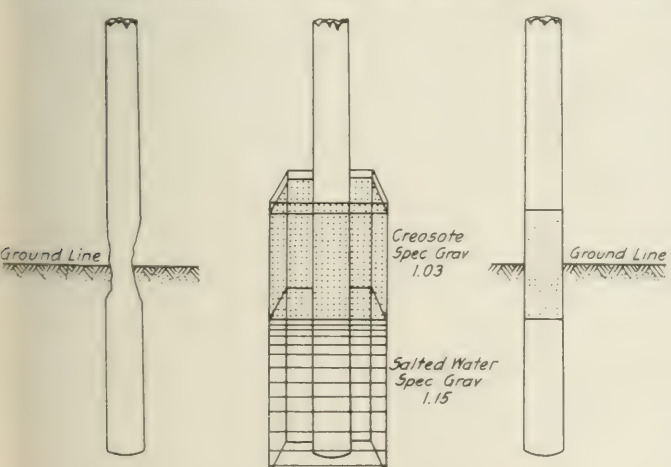


Fig. 3.



Pole showing point of attack by wood-destroying fungi, at or near ground line.

Pole immersed in cold bath of salted water and creosote, showing segregation of liquids.

Treated pole showing creosoted portion above and below the ground line.

Fig. 2.

tion of timber will adopt a unit of measurement more expressive and explicit under the circumstances than the customary but grossly sufficient term of cubic foot.

In the treatment of poles, fence posts and similar lumber products, a considerable saving may be effected by the use of salt (sea) or salted water in conjunction with creosote and crude petroleum. The fact that the wood-destroying fungi which we must combat demand four requisites for their existence has been repeatedly proven. These necessaries are food, air, moisture and heat. Deprived of any one of them, life is impossible.

Except in very moist climates, the upper portion of a pole—that section extending from a point 18 ins. or 2 ft. above the ground line to the top—rarely decays unless attacked by dry rot, on account of the lack of moisture. The tip itself, otherwise very vulnerable because of the exposed grain, is usually either beveled or pointed, and often painted, so that moisture has almost no chance to collect or penetrate here. That portion of a pole or post which is 2 or more ft. below the surface of the ground is seldom surrounded by sufficient air to permit of the existence of wood-destroying fungi. There remains but one region, therefore, subject in most cases to attack: That section extending from approximately 2 ft. below the ground line to a point about 2 ft. above the surface, and this portion usually has in close proximity all the necessary elements for the life and the nefarious work of wood-destroying parasites. It may be conceded then that any preservative fluid introduced at other points of the pole or post are, if not unnecessary, at least of much less value than the solution injected at the vulnerable point at or near the ground line. The open tank process, which, if desired, treats only the butts, instead of the entire pole as in the pressure or closed retort process, was the great beginning of a cheaper form of effective preservation. The process here outlined, and illustrated in the accompanying drawing (No. 2) should, if adopted, reduce the cost of pole and post treatment to such an extent as to place it within the reach of many corporations and individuals who now refrain from adopting protective measures.

The hot or preliminary treatment given the test specimens in the experiments conducted by the writer consisted of a bath in hot crude petroleum, as outlined above. The cold bath was as follows: Taking into consideration the displacement of the timber, a receptacle was partially filled, to a certain height, with water in which sufficient salt had been dissolved to raise the specific gravity of the solution to 1.15. This sufficed to sustain easily the creosote, which was then added and whose specific gravity was 1.03, and the timber was then placed in the receptacle and allowed to remain for the required period of time. The result was a stick with a belt or girdle of creosoted cells at a point which on a pole would correspond with the region about the ground line.

As it is well known that most of the preservative in the open tank process is absorbed during the second or cold immersion, it will be readily seen that the substitution of salted water, the cost of which is infinitesimal when compared with that of dead oil of coal tar or creosote, for the extreme lower portion of a pole or post will very materially tend to still further decrease the cost of treatment—may even reduce it 40 or 50 per cent. below the present relatively low cost already attained through the employment of the open tank or non-pressure process. It might be explained that the use of salted water, when seawater was obtainable, was on account of the more apparent readiness with which fresh water absorbed salt and attained the required specific gravity. Undoubtedly seawater will prove more practicable in regions where it may be obtained, and where sufficient time is allowed for it to absorb the required amount of surplus salt to increase the specific gravity to the requisite point.

It may be contended that the impregnation of the butt of a pole or post with water is undesirable, when all recognized authorities are insistent that timber be as dry as possible before treatment and preceding its use. But it should be remembered that in the open tank method capillary action and the partial vacuum created by the expansion and contraction of air in the wood cells are the agencies by which the solution is drawn into the wood, and the penetration, even under most favorable conditions, does not usually exceed 1 in. This water must not be compared with sap, which is much thicker and heavier, more tenacious and much less readily evaporated, for it will quickly pass off during a brief period of subsequent seasoning. Even were it to remain in the timber, it is questionable if, on account of its situation in the butt, buried in the earth, its presence would prove harmful. If the ground in which the pole or post is set is moist, it would partake of some of the moisture in any event, and if the surrounding earth be dry, the soil will absorb a portion at least of the moisture content of the timber.

THE DEVELOPMENT OF CANADA.

C. W. Peterson, general manager of the Canadian Pacific Navigation & Colonization Co., in describing, at the Royal Colonial Institute, the plans of C. P. R. for colonization, said in part:

"Having in view the possibilities of the small farm under irrigation, and realizing the expediency of a much stronger effort towards directing British immigration to Canada than that put forth in connection with the movement of people from other countries, Sir Thomas Shaughnessy formulated the broad lines of an agricultural holdings plan which, it is expected, will have precisely that effect, and whereby 'ready-made farms' will be provided for British colonists under the most favorable conditions consistent with good business administration.

"In submitting the main features of this project, it might be well to point out that while, to a certain degree, imperialistic as well as philanthropic considerations enter into Sir Thomas' project, it rests on a distinctly business foundation. It would not be successful under any other conditions. It may, therefore, be taken for granted that the class of colonists the railway company will endeavor to interest in its project is one that gives reasonable promise of being successful and independent. The conditions and restrictions surrounding the scheme will be designed with that end in view. The company believes in the small farm. For that reason the holdings will be limited to from 80 to 100 acres of irrigable land, or 160 acres of non-irrigated lands situated in the more humid belt of the West.

"It is the intention of the company to erect all absolutely necessary buildings in advance of the arrival of the colonist. These buildings will be designed to house the settler and his live stock for the first few years, and until such time as he is able to provide more commodious structures himself, when the original buildings may be utilized by him for other necessary purposes. These structures will be of the class generally erected by the newcomer. Placing contracts for these buildings in a wholesale way will, it is reasonable to suppose, enable the company to obtain the closest possible prices for work and material, of which, of course, the individual colonist reaps the benefit.

"The initial period is generally the critical one. Colonists often become discouraged, after settling on the virgin prairie, during the time which elapses before a cash revenue begins to come in. Through inexperience many settlers overestimate the effectiveness of their capital, and a promising career is at times brought to a sudden termination owing to such miscalculation. To make the colonist almost immediately revenue-reproducing, it will be the aim of the company to break up a portion of each holding, probably from 40 to 60 acres, the year prior to his going into occupation, so that there may be a crop available in a few months after he has taken possession. This crop ought to provide a cash income

during the first season, varying from £100 ($500) to £250 ($1,250), according to the season and the state of the grain market.

"The total cost of putting up the necessary buildings, preparing the crop, providing domestic water supply, and enclosing the holding with a suitable fence, will be added to the regular price list of the land, and the settler will be given the opportunity of repaying the amount in ten equal, annual instalments, with the usual rate of interest on the unpaid balance.

"It would be the company's intention to settle the colonists in units up to sixteen families. This would give a sufficient population to have school facilities provided at once in each settlement. A main road would be graded through the settlement, and a site arranged for school and church at the most central point.

"A somewhat paternal policy has been adopted by the Canadian Pacific in connection with the colonization of the vast area of land controlled by that corporation tributary to its system. The company is the largest landowner in Canada, and has incurred enormous expenditure in the construction of irrigation works to further enhance the productiveness of its lands. The company is vastly concerned in the success of every individual purchaser or settler, who at once becomes a patron of the road.

"The company realizes that the bulk of the settlers coming into occupation, particularly upon its irrigated lands, will be more or less ignorant of the proper methods of handling and applying water and of Western Canadian farming practice generally, and it therefore places at their disposal advice and assistance through its own staff of lecturers and experts. The company also operates at central points farms devoted to demonstrating the agricultural possibilities of the irrigated tract. On some of these farms are maintained pure-bred sires for the free use of the settler, and advanced work is also being done in seed selection and distribution. The company distinguishes between mere land-selling and advanced colonization and development work, and realizes that a somewhat paternal administration accelerates the results the company are striving for—viz., the greatest possible volume of traffic in the shortest possible time.

"Considerable detail has as yet to be worked out by the company's officers before it is possible to deal definitely with the financial phase of the scheme. Indeed, it may be expected that the preliminary programme will be considerably amended after we commence active operations on the new plan and have an opportunity of studying the class of colonists we shall be dealing with. It is at present expected that the holdings will vary in area from 80 to 160 acres. In some cases they may be slightly larger. The prices at which the company's lands are at present disposed of vary from $15 to $40 per acre. It would perhaps be safe to estimate the land value of the average holding at from $3,000 to $3,750. It is estimated that the cost of erecting the necessary buildings, placing other improvements on the land, breaking, seed, &c., will amount to about $1,500. To this extent the company proposes to bear the entire financial burden on a 10-year repayment plan.

"The settler's own capital might advantageously be expended as follows: For the purchase of the necessary live stock, $500; for furniture, household expenses, and horse feed, about $125; one-half the total cost of implements (the balance being repayable to the dealer at a future date), $250; transportation to Canada, about $125—or a total of $1,000.

"It is perhaps fair to state that, realizing the enormous importance of the individuality of the colonist, the company proposes, in working out the detailed administration of the new project, to exercise due care and judgment in the selection of the settlers, so as to eliminate, as far as possible, the incident of failure. Decided preference will be given to married men with families. The company feels that while a man may be laboring under a handicap during the first struggle when settling in the ordinary way in a new country, with the facilities offered under the company's project a settler's family would be of great assistance to him. The project is practically an invitation to approved colonists with agricultural experience to go into partnership with the Canadian Pacific, and it would be poor business judgment indeed if that corporation did not exercise care in the selection of its partners.

"I might here add that it is intended that the colonists shall be accompanied on their trip to Western Canada by one of the company's officers, who will remain there until each party is comfortably settled; and the company's staff at headquarters will, of course, be available to render every assistance in locating the various parties as quickly as they arrive.

"To put the case in concrete form, the main features of the company's plan are:

"1. That a home may be ready for the settler and his family immediately on his arrival in Canada.

"2. That all the preliminary work to make the farm productive at the earliest possible moment will have been performed prior to his arrival.

"3. That the company will augment the settler's capital by practically making him a loan, to be expended by the company, in providing necessary improvements."

COMMENTS ON THE ELECTRIC RAILWAY SITUATION.*

BY EDWIN S. WEBSTER, OF THE FIRM OF STONE & WEBSTER, BOSTON.

The problem of securing an adequate revenue from passenger fares appears to be the most serious issue now confronting the electric railway industry. In the early days of electric transportation the 5-cent fare unit was, on the whole, appropriate to the standards and cost of service rendered. The rolling stock was composed of small, light cars, usually of the single-truck type; the speed of operation was relatively low; the power demands per car were moderate; the cost of labor and materials was far below present figures; comparatively light roadbed, track and line construction met the requirements of the traffic, and the investment per mile of track varied from one-half to one-sixth that of the present, depending upon the size of the community served and other local conditions. Even in the larger cities the transfer facilities were greatly limited, and the average haul per passenger was much shorter than to-day.

The standards and costs of service now rest upon an entirely different plane. The expansion of city systems into suburban territory has raised the average length of haul independently of other causes. The transfer situation has become serious, through its extension beyond reasonable limits. The purchasing power of the nickel from the standpoint of the passenger has greatly increased. From the point of view of the operating company, however, the nickel pays for the conduct of considerably less transportation and for the maintenance of less service and equipment than a few years ago. The cost of power has been reduced to some extent by improved technical administration of generating and distributing equipment, but not enough to offset the enlarged demands of heavier cars operated at increased speeds. The growth in the size and weight of cars has increased the rolling stock investment account and necessitated the expenditure of large sums of money for physical plant, including heavier track and more permanent roadbed construction, multiplied capacities in power stations and lines and enlarged facilities for the economical maintenance of equipment. The advances of the past few years in the cost of labor and material have placed a premium upon new construction work and have narrowed the margin between receipts and expenses. Under the early conditions, average fares of from 1 to 1¼ cents per mile enabled the companies to make progress; to-day these returns are insuffi-

*From the annual statistical number of the *Electric Railway Journal*.

cient to provide a reasonable dividend in many properties and maintain the most modern standards of service. The increased length of ride now possible upon a single fare of 5 cents makes it difficult for the larger city properties to earn a reasonable dividend, and only in a less degree does this condition bear upon the companies of smaller size. The relatively great density of traffic in the larger city is insufficient to offset the burdens of the transfer, the extension of lines into outlying districts and the rising cost of operation.

In the larger cities there must be some change in the transfer situation in order to secure a fair return to the companies. Scientific administration of properties is insufficient to meet the rising costs of service rendered to the traveling public. The average haul per fare must be reduced, through the restriction of the transfer privilege or the imposition of some sort of a charge for transfers issued. The policy of selling fares at reduced rates must be closely scrutinized, and in many instances abolished. The fare unit in itself will have to be raised to 6 cents or over in cases where it is clear that a line cannot be operated with reasonable profit on a 5-cent fare basis, or else the fare zones will have to be shortened. Otherwise, a line honestly capitalized will have to reduce its capital to a point below the actual investment in the property. Denial of a reasonable return upon a proper investment and insistence on the highest standards of service closely approach confiscation. The maintenance of a reasonable return through adequate fares and controlled transfer situations, through economical administration and a liberal executive policy is to the advantage of the public as well as of the companies, for in the last analysis the cost of an unsuccessful utility operation and the benefits of a profitable public service fall upon the community supplied with facilities. So long as present fare limitations apply, the expansion of existing systems and the development of new enterprises can only be retarded.

HARLEM RIVER BRANCH IMPROVEMENTS; NEW YORK, NEW HAVEN & HARTFORD.

The Harlem river branch of the New Haven runs from New Rochelle, N. Y., on the main line, southwest 11 miles to the Harlem river freight terminals at Willis avenue and East One Hundred and Thirty-second street, New York. This line has been used almost entirely for freight business, although there is local passenger traffic, and a few through passenger trains for Washington and the South are operated over it. The freight carried is that which is to go west and south over the railways having terminals near New York, as well as the Long Island Railroad. The cars are transferred on car floats to the water terminals of the various roads; about 2,000 cars a day are transferred in this way.

The branch has had four tracks for several years. In 1904 it was decided to six-track it and also abolish all grade crossings. The additional tracks will be needed not only to handle present traffic comfortably, but to take care of the additional traffic which will develop when the New York Connecting Railroad, owned jointly by the New Haven and the Pennsylvania Railroad, builds the all-rail line from the Harlem river station south over Hell Gate to Long Island City, connecting with the Long Island Railroad and the Pennsylvania tunnels. The Harlem river branch will eventually be electrified.



Scherzer Spans over Bronx River.

About two miles of the line is outside of New York City. The bridges carrying the load over streets on this section have open floors, with ties resting on the top flanges of deck girders or on stringers of half-through girders. They are designed to carry a load, on each track, of two 200-ton consolidation engines, followed by a train weighing 5,000 lbs. per foot. The clearances require that girders be comparatively shallow, resulting in heavy flanges to get the necessary section. For



Foot-Bridges at Taylor and Garfield Streets.



Unionport Road.



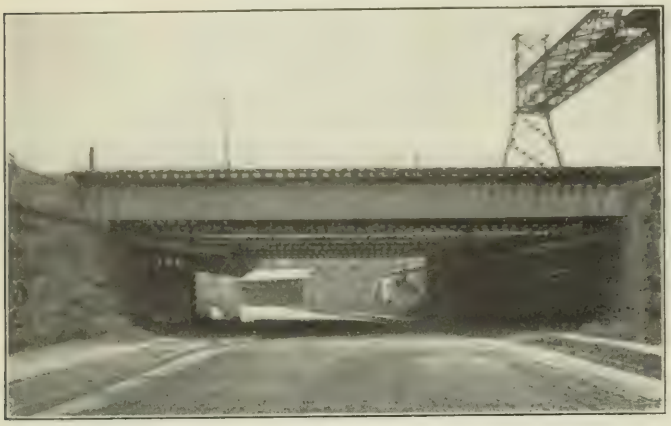
Hunts Point Station.



Bear Swamp Road.

half-through bridges, there are seven girders, spaced 13 ft. on centers. The floor-beams, usually about 10 ft. apart on centers, rest on the lower flanges of the girders. The stringers, which are 6 ft. 6 in. on centers, are riveted between the floor-beams, running on the bottom flanges of the latter.

The bridge over the Boston Post Road, near Woodside station, shown herewith, is an example of a half-through girder



Webster Avenue.



Westchester Avenue Station.



Boston Post Road, Woodside.

bridge. It rests on trestles close to the curb lines of the street, making a center span of 79 ft. 2 in. with 19-ft. stringers over each sidewalk. This bridge crosses the street at an angle of about 33 deg. The trestle posts are built up H sections, latticed. Between the posts are rigid sway frames. The trestle caps have two 40-in. webs, designed to take the load of the stringers and floor-beams. Each web is stiffened by inside angles where the girder or stringer crosses the web, and diaphragms or cover plates are placed under the stringers and floor-beams so as to distribute the load equally between the two webs.

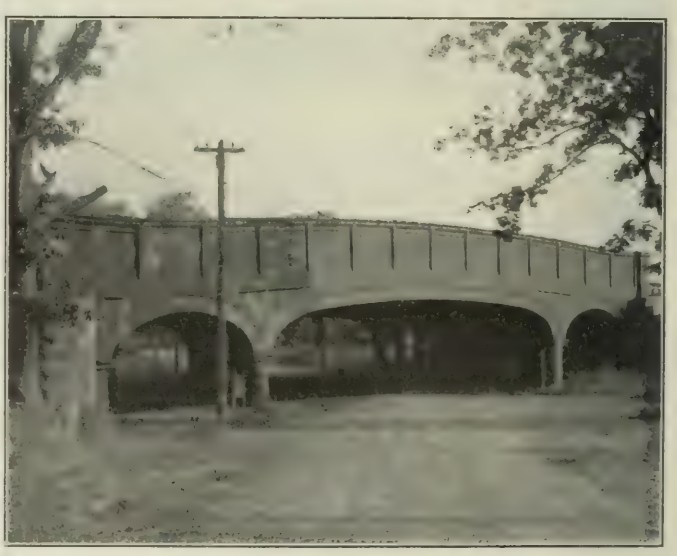
The Pelhamdale avenue bridge has a similar trestle, but the sway frames are omitted.



Baretto Street.



Pelham Manor Station.



Pelham Lane.

Within the limits of New York City it was required by the city that bridges have watertight floors, and there were other restrictions making it necessary to use fully ballasted tracks. The Bear Swamp road bridge is typical. This bridge carries the track on a 30-minute curve across a 100-ft. street at an angle of about 41 deg. The girders are supported on



Port Morris Station.



Pelhamdale Avenue.



Port Morris Crossing.

the abutments and on three trestles, one in the center of the street and one near each curb line. Through flooring is used, the troughs being spaced 2 in. on centers. They are built up of 12-in. vertical webs and 12-in. channels and cover plates. The troughing rests on shelf angles riveted to the girders 4 in. above the bottom flanges. The troughs are filled with concrete, leaving a smooth surface for a 2-in. layer of waterproofing on which the ballast is put.

The Eastchester road bridge is similar to the Bear Swamp road bridge, except that it is skewed the other way and made to carry the tracks in groups of four and two, the tracks being spaced for an island station. The Pelham Lane bridge is of similar construction, in general, to the other half-through girder bridges. This bridge, however, was subject to the approval of the commissioner of parks, who required that steel mask girders be added on each side, giving the effect of three arches appearing to rest on cast iron columns, in line with the trestles, and on columns bolted to the face of the abutments. This mask was made very light and the space between it and the main bridge girders enclosed with plates, which can easily be removed for inspecting, cleaning and painting the structure.



Eastchester Road.

(To be continued.)

TRANSPORTATION AND TRAFFIC IN BELGIUM.

BY LOGAN G. MC PHERSON,
Traffic Expert with the National Waterways Commission in Europe.

The area of Belgium is 2,945,502 hectares, or 11,373 square miles, about equal to that of Maryland and Delaware combined. The population in 1831 was 3,785,814, in 1907 7,317,561. The country does not produce enough of food stuffs to supply its people or of raw material for its manufactures, the major portion of which must find a market in other countries. To but a small extent does the traffic of Belgium with other countries move by rail, the food supplies and raw material coming in and manufactured products going out through the one port of Antwerp, which, therefore, focusses all the avenues of transportation, both the waterways and the railways. Grain from Russia and America comes in through Antwerp; grain from Hungary is loaded at Trieste on vessels which bring it to Antwerp. Cotton and other materials from America, as well as certain machinery and other merchandise from England, America and other countries are imported through Antwerp, and through this port the laces and other fabrics, the glass, pottery, rifle barrels and machinery of Belgian manufacture go out.

The rivers of Belgium are the Scheldt, which flows into the North sea, its broad mouth permitting ocean ships to ply to and from Antwerp, and the Meuse, which flows from France through Eastern Belgium by the city of Liege, and thence through Holland by Rotterdam to the sea. These rivers to but a small extent supply the transportation needs of Belgium, neither of them being available for deep-sea transportation very far inland, and they offer no special advantages to attract industries to their banks. The coal fields of Belgium are to the south, where have arisen the manufacturing towns of Charleroi and Mons; and in the southwest where is the manufacturing center of Liege. The heavy products of Belgium come from these three cities, Brussels, Ghent and other centers producing for export laces, gloves and kindred products that are high in value and light in weight. At Verviers, from wool imported from England and Australia and cotton from America, is made cloth, which is exported to England, and, in lesser quantities, to America. The manufactures of the other cities of Belgium are furniture, and the simpler articles of general use, which are sold in local markets.

It follows from the geographical configuration, the industrial characteristics, and the political boundaries of Belgium that a transportation system to supply its needs must provide for the conveyance of raw material from Antwerp to the places of manufacture, and of manufactured products therefrom to Antwerp for export; of coal from the mines to the manufacturing centers and throughout the kingdom for general consumption, and likewise from place to place within the kingdom of cement, brick and wood. The traffic in the higher grades of merchandise between place and place in Belgium is small. Local tailors make the clothing for the men, the women the clothing for themselves and their children; the people, as a whole, being exceedingly industrious, the old time self-sufficiency of the household being preserved to a greater degree than in nearly any other of the countries of modern civilization. The households in the smaller towns and the country raise their own truck in their small gardens; the larger towns and cities are supplied by truck farmers who bring to the markets by hand-cart, by donkey-cart, by wagon, and by tramcar the produce from within a limited radius. In the smaller towns and the country the lower classes eat but little meat. Brussels and the larger cities are well supplied with fish brought by quick train service from the North sea. There is a limited movement into Belgium of fruits and vegetables from France and from Northern Italy.

In 1830, at the time of the contest with Holland that resulted in the attainment of national independence by Belgium, there were in this state 1,618 kms. of inland waterways, 10 per cent. of which belonged to the government, 64 per cent. to provinces, 7 per cent. to communes and 19 per cent. to concessionaries. In 1840 there were 1,707 kms.; in 1850, 1818 kms.; in 1860, 1,919 kms.; in 1870, 1,976 kms.; in 1880, 2,022 kms.; in 1909, 2,077 kms., or 1 290 miles. Since 1870, 83 per cent. have belonged to the state, 7.5 per cent. to provinces, 4.5 per cent. to communes and but 5 per cent. to concessionaries. It will be perceived that the waterways have extended but little more than 300 kms., or 186 miles, since the building of railways really began, and that their length is practically the same today as it was thirty years ago, the small extension made during that time having been principally to afford connection

here and there between one waterway and another. Many even of the existing canals were constructed primarily for drainage, but the waterways that are navigable form a network throughout the kingdom, over which the greater quantity of the raw materials and a considerable proportion of the manufactures are conveyed. In 1905 the total ton miles were 708,361,000, of which 27.7 per cent. were coal and coke, 18 per cent. building materials, 17.5 per cent. agricultural products and 12 per cent. industrial products, including pottery and glass.

In the southwest the traffic of the waterways arises principally from the French and Belgium coal fields; in the northeast from the large cities and industrial districts; and much traffic moves on the waterways connecting Rotterdam and Antwerp with the Rhine.

From the first tolls have been charged for the use of the waterways. They have been reduced and standardized at various times and are now very small. The boats charge what they please for transportation, the boat owners or brokers in their behalf bidding for traffic on the floor of the Antwerp Exchange. In nearly every case the boat is navigated by the owner and his family, who live upon it. The boatmen make somewhat more money than the ordinary working man, but never a very high profit. These men are helped by an association, which under a government law is permitted to loan money on mortgage on a boat after it has been built. Because of a certain movement of traffic on the inland waterways between France, Holland and Belgium there is an agreement as to the size of the boats in order that those of either country may go through on the canals of another. In 1904 were registered in Belgium 9,370 boats, in 1908, 10,779, with capacity ranging from 70 to 500 tons. Although of recent years the waterways have not been extended, they have been well maintained and improved, the government annually expending large sums of money for this purpose. The capital expenditure on these waterways has been from $55,000 to over $450,000 a mile, the total to 1905 being $79,050,000. The average annual charge for current improvements and maintenance is $445,000. The receipts for 1905 were $400,000. If to the deficit in meeting the current expenditures for that year be added interest on the capital at 3½ per cent. or $2,766,750, it is found that the total charge borne without offset by the State of Belgium on account of its waterways for the year 1905 amounted to over $2.800,000.

The first railways in Belgium were built by the state. In 1835 was opened the first line, that from Brussels to Malines. The state continued in the construction until about 1840, but their operation yielded so little profit that charters were granted to private companies for the construction of further railways that were needed.

The rates of the state railways from the first were specifically fixed on a definite basis. The charters of the private railways specified a maximum, and the rates of these railways were for some time in some places higher than those charged on the railways operated by the state, but the private companies after a time found it advisable to adopt the same tables of rates as the state—that is, the same nominal scale prevailed over both systems. This was partly brought about by a popular complaint that the private roads were not as accommodating as those owned by the government, that they did not make the same efforts to serve the poor people, but bent all their energies to securing as high profits as possible. Certain it is that their returns were far greater than those operated by the State. As they could do but little in the way of increasing traffic by a reduction of the rates, it was but natural that they should charge as much as they could, and should keep down the expense of operation. This they were so successful in doing that their operating expenditures were markedly less than those of the state roads.

The state owned and the privately owned lines found themselves in vigorous competition. Especial rates were accorded individual shippers and preferential contracts made of one kind and another by both systems. This situation was an important factor in causing the Belgian government to enter about 1870 upon the purchase of the private lines. Another factor was the difficulty of transportation over routes formed in part by state and in part by private lines, obstacles in the way of transhipment arising at the junctions and causing delay in the movement of traffic. The government also feared that the privately owned railways might be purchased by foreign financiers, especially those of Germany, and that political complications would ensue.

When it is considered that the government now owns all the railways with the exception of less than 300 miles and practically all of the waterways, and it does not allow the railways to compete with the waterways, and that the longest distance for which rail rates are quoted in Belgium is a little more than 300 kms. or less than 200 miles, it is evident that the rail rates for the Belgian local traffic can be maintained upon a symmetrical mathematical basis. These rates are seldom changed. Certain exceptions to the formal traffic are made on import and export traffic to protect the Belgian ports against foreign competing ports of the North sea. For example, special rates are made on coal from the Liege district, which is contiguous to Germany, in order that it may move out through Antwerp instead of going through Germany to the sea. In local service a rate cannot be advanced except upon three months' notice, but a rate can be reduced upon notice of a fortnight.

In 1880 the length of all of the Belgium railways was 4,112 kms., in 1900, 4,552 kms., in 1907, 4,562 kms., or 2,828 miles. The total capital expenditures in 1905 for the government lines were Frs.2,295,000,000, or about $459,000,000. For many years the operation of the government railways showed a deficit, but recently they have produced a surplus that averages throughout the entire period a return of over 4 per cent. on the capital. In 1906 the gross receipts were Frs.259,336,991; the expenses were Frs.251,919,949, which, deducted from the amount of the gross receipts, leaves a profit of Frs.7,417,042.

In 1880 on the government lines were 1,281 locomotives and 36,150 freight cars; in 1900, 2,744 locomotives and 66,060 freight cars, and on the private lines 283 locomotives and 6,703 freight cars. The capacity of the freight cars is from 10 to 15 tons. A few cars of 20 tons have been tried, but these are larger than the requirements of the consumers, which—the manufacturing establishments included—are not equipped for the reception or the loading of cars of even this capacity.

The traffic statistics show that in 1907 were carried on all the Belgian lines 71,407,230 tons of heavy freight, the kind ordinarily carried by the waterways. In addition to this were 695,262 tons of light freight, together with horses and cattle, and certain other traffic not rated by the ton.

The present classification of freights has endured for more than thirty years.

Tariff No. 1 is for light package freight, carried usually on passenger trains; this corresponds to the express traffic of the United States.

Tariff No. 2 (quick service) is for shipments of 200 kgs. or less. Packages weighing up to 60 kgs. (132 lbs.) and which are paid on departure by means of railways stamps, are transported from one point to another of the kingdom at prices varying from Frs.0.50 to Frs.1.10, according to the weight; those that are prepaid are submitted to a tax varying from Frs.0.70 to Frs.1.30.

Shipments weighing from 60 kgs. (132 lbs.) to 200 kgs. (440 lbs.) are taxed according to weight and distance.

The rates for 100 kgs. (220 lbs.) are the following:

10 kilometers....1.00 frs	100 kilometers.....2.70 frs.
50 kilometers....1.80 frs.	300 kilometers.....4.90 frs.

Tariff No. 3 (petite vitesse) is applicable to heavy goods shipped by ordinary goods trains. It includes four classes.

The first class includes less than carload shipments above 200 kgs. (440 lbs.), as well as carload shipments of merchandise delegated to this class in the table of classifications, such as copper boilers, printing type, furniture, tinware and machinery. The rate is Frs.10.60 for 100 kms. and Frs.21.60 for 300 kms. The second class embraces notably polished iron and old machinery, the rate being Frs.8.00 for 100 kms. and Frs.12.50 for 300 kms. The third class includes notably melted iron and iron in bars, beaten, laminated or drawn, but not polished, paying Frs.6.25 for 100 kms., and Frs.8.50 for 300 kms. The fourth class includes cast iron, coal, rough stone, bricks, and fertilizers, etc., paying Frs.4.50 for 100 kms. and Frs.6.50 for 300 kms. Under this class of Tariff No. 3 is moved the great bulk of the freight.

Tariff No. 4 includes gold and silver, coin and bullion, which is moved at rates that vary with the value of the shipments.

Tariff No. 5 concerns shipments of horses and cattle, which are charged either per head or per wagon. An ordinary car load of ordinary cattle will pay Frs.51.50 for 300 kms.

Tariff No. 6 includes the ordinary road vehicles, carriages and wagons.

The rates given above cover both the transportation and the terminal service. The railway employees load and unload less than carload shipments of tariffs 1, 2 and 3. For shipments of tariffs 1 and 2 the costs of handling are included in the rate. For merchandise of tariff 3, less than carload shipments, a charge of Frs.0.10 per 100 kgs. is made for loading and unloading; shipments of the other classes are loaded and unloaded by the shippers and the receivers.

These classifications and the rate structure as a whole are less complicated than those of the United States, but they doubtless suffice for the traffic of a people of simple needs, living within a small area. For the local and mixed Belgian traffic there exist numerous special tariffs and exceptional tariffs applicable to raw products of great necessity, such as coal, minerals, stone, castings, fertilizers, agricultural products, etc. Special tariffs apply furthermore to import and export traffic that moves in full carloads.

It has been perceived that the freight tariffs are upon a tapering kilometric basis. The passenger tariffs are upon an exact kilometric basis, the rates regularly increasing with distance.

The one-way rate for first class traffic is 9.4 centimes per km., that for second class traffic 6.4 centimes per km., and that for third class traffic 3.8 centimes per km. Return tickets are sold at 20 per cent. reduction from double the one-way fare; they are good for two days, Sundays and holidays not being counted. Where there is commutation traffic season tickets are sold. Special tickets are sold for the commutation travel of working men, good during the week for six days or for seven days as may be desired. For the accommodation of working men, who leave their homes on Monday and do not return until Sunday, one return ticket is sold. For certain kinds of travelers are reduced rates. For instance, a reduction of 50 per cent. is accorded for children from three to eight years of age (children of less than three years are carried free of charge), for soldiers, for emigrants, for regularly organized associations of at least 20 members, for the scholars of established schools, traveling at least 10 in number and with their teacher, for workmen employed temporarily outside of the frontiers and for excursion trains.

The first and second class tariffs apply to different compartments in the same car, which afford very nearly the same accommodation, the only difference being, so far as a casual observer can tell, in the color of the upholstery, and even that is not always a definite indication. The third class tariffs apply for travel in compartments usually in separate cars, which are fitted with wooden seats. The workingmen's tickets cover travel in what would be considered as little if any better than freight cars in the United States.

An extraordinary arrangement, the like of which probably exists in no other country, is that under which a person can buy a ticket for Frs.61.50 first class, Frs.41 second class or Frs.23.50 third class, which will allow him to travel at will over the entire Belgian railway system for a period of 15 days. This concession brought an outcry from the poorer classes, who said that they had but a short holiday each year and should be granted a corresponding concession of which they could avail. This led the Government to concede tickets at Frs.30.75 first class, Frs.20.50 second class and Frs.11.75 third class, which give the purchaser the run of the entire Belgian Railway System for a period of five days.

The framework of the Belgian tariffs has been set forth in some detail because these tariffs have been held up as models of simplicity which the railway managers of the United States would do well to emulate. These railway managers of the United States may with equal propriety point out that a still simpler system of charges was that of the old-time wagoners, who charged so much by the cubic foot for articles light in weight and so much per one hundred pounds for articles heavy in weight per twenty miles. It may not be an exaggeration to say that the needs of the traffic of Belgium for a complicated rate structure no more exceed those of the days of the old stage wagons than the variety and complexity of the traffic of the United States exceeds that of Belgium.

It is evident that the commercial and industrial characteristics of Belgium are entirely peculiar. Were it not for its import and export traffic the nation could not exist, and although there is connection by canal between Ostend on the North sea, Bruges and Ghent, it has really but the one port of Antwerp. This is connected by both rail and canal with the regions to which the imported commodities need to be carried, and with the manufacturing cities where the export traffic originates. The industrial plants, which do not in any place consume raw material or turn out manufactured product in anything approaching the quantities characteristic of the great manufacturing establishments of the United States, have their transportation needs apparently well enough supplied by the existing railways and waterways. Notwithstanding this, the prominent and progressive business men of Belgium condemn the increasing expenditure of vast sums upon the waterways, and severely criticise the management of the railways, which they say impedes their development along lines of greater service to advancing industry.

These prominent and progressive business men of Belgium have formed themselves into a Superior Committee of Industry, which is charged with the study, the analysis of all matters pertaining to the commercial and industrial development of the kingdom. From an officer, than whom none stands higher in the councils of this committee, was obtained the free and frank expression of its opinion that, while the canals serve for the movement of heavy traffic to meet the present needs, it will be folly to expend considerable sums for their extension, as the railways can be developed to the more efficient performance of the service; that the desire to make Brussels a seaport is a dream, its practical realization meaning the expenditure of a sum so vast that the government would better transport the freight moving between Brussels and Antwerp free of charge, as the expense necessary for this purpose would probably not equal the interest on the investment required to expand the canal for the accommodation of large ocean-going steamers.

Steamers of small capacity now ply, however, between Brussels and London, and tramp vessels of considerable capacity sometimes come to Brussels. The popular desire for the extension of the canals arises from the feeling of this town and that town that commercial prosperity would surely come to it if it had water transportation or increased water transportation, a feeling that doubtless in great measure is inspired by the fact that the great cities of the world, for the most part, are on great water highways. This

popular desire finds expression in Parliament, whose members are always sensitive to the wishes of their constituents.

By this Superior Committee of Industry the conduct of the railways is criticised as being notoriously inefficient. They are administered by government officials, who have permanent tenure of their offices, and, therefore, little care whether the operation produces a surplus or a deficit. These men have no incentive to pursue economies in practice, but are notoriously wasteful in their expenditures, erecting structures that are not at all designed to meet the needs of the future, and employing a far greater number of men than are necessary. As the government has come into the ownership of private railways it has increased the number of employees three to one. The routine of the administrative offices is enveloped in red tape. For example, the dropping of a lighted match on the floor of a storehouse of employees' uniforms started a destructive fire. A board of investigation instituted a series of hearings, of which eleven have been held at this writing. Notwithstanding that the cause of the fire and the extent of the damage were readily ascertained, the hearings continue.

This Superior Committee of Industry, as well it may, regards the rates of the Belgian railways at present as satisfactory in the main to the industrial and commercial interests of the country, but it foresees that the wasteful extravagances of the operations will, if not checked, result in the course of a few years in a deficit so large that there will be forced an increase in the rates that will be injurious to the business interests.

GOVERNMENT RAILWAY CONTROL IN MEXICO.

BY E. H. TALBOT.

On the 26th day of December, 1906, the Mexican Congress, by formal act, authorized the "taking over and uniting of the properties of the National Railroad Company of Mexico (already practically controlled by the government since 1902) and the Mexican Central Railway Company, Limited," and the deed incorporating the new company, now known as the "Ferrocarriles Nacionales de Mexico" (Northern Railways of Mexico), was finally executed on the 28th of March, 1908; but the actual transfers of the properties were not made until January 1, 1909, for the National Railroad Company of Mexico, including the Hidalgo & Northeastern Railroad Company, Limited, and February 1, 1909, for the Mexican Central Railway Company, Limited. The purpose of this important move by the Mexican government, as stated by Minister of Finance Limantour, in a carefully prepared report to the Congress in November, 1908, may be briefly stated as:

1st. To prevent the possible absorption of the properties named, at some future time, by one or more of the great transportation systems of the United States.

2nd. To insure greater efficiency and a financial reorganization of the two companies which will render possible important extensions necessary to the proper development of the country's natural resources.

3rd. To relieve the Mexican Central Railway of financial embarrassments which had existed for several years and were "growing daily worse and worse," exposing it to the cupidity of any individuals or corporations that might aspire to its possession.

4th. To bring about more economical management and operation, with a view to the interests both of the stockholders and of the public.

5th. To put an end to rivalries which were diverting vast sums from the "penetration of new territory and the betterment of existing lines" to "the wresting of traffic from other companies or the acquiring of lines already constructed."

6th. To reduce general expenses, cut down the list of high-salaried officers, compel the routing of traffic over lines the physical conditions of which are the most favorable to economical operation, insure the most effective use of rolling stock, the compact loading of freight and other like purposes.

7th. To render possible the securing of funds with which to "repair and improve the roads, to purchase needed rolling stock and to undertake the construction of new lines.

Broadly and in general terms, the purpose of the Mexican government in adopting the policy of national control of its railway system, as stated by Minister Limantour, "does not aim at absorbing all the railways," but simply at securing the greatest possible efficiency of the country's transportation facilities, the certain and permanent protection of owners and patrons alike, the uninterrupted continuance of the era of commercial and industrial development inaugurated by the Diaz régime more than a quarter of a century ago, and of "non-intervention in the economic and political life of the nation."

That the reader may better understand and appreciate the



National Railways of Mexico.

importance of the two great railway systems, including their leased and controlled roads covered by this much-discussed "merger," it should be stated that they involve a total mileage of 7,075 miles of main line and branches as officially reported in June of last year, and extend from Laredo, Eagle Pass and El Paso, Texas, to Mexico City, serving the important cities of Chihuahua, Torreon, Zacatecas, Aguascalientes, Guanajuato, Leon, Queretaro, Monterey, Saltillo and San Luis Potosi; from Monterey to Matamoros and from Monterey to Tampico; from San Luis Potosi to Tampico; from Mexico City to Toluca, Morelia and Uruapan; from Mexico City to Pachuca and Cuernamca and Balsas, also to Puebla, Jalapa and Vera Cruz; and from Irapuato, on the Central division, to Guadalajara and Manzanillo.

These cities constitute only the more important points reached.

The total number of stations maintained exceeds 1,200; and the states penetrated include Chihuahua, Zacatecas, Aguascalientes, Guanajuato, San Luis Potosi, Queretaro, Jalisco, Mexico, Durango, Colima, Nuevo Leon, Michoacan, Coahuila, Tamaulipas, Morelos, Hidalgo, Veracruz, Puebla and Tlaxcala, to which must be added the Federal District, in which the national capital is situated.

That the control of a system of communication so far reaching and favorably distributed, will enable the government to dominate the railway business of the republic for many years to come, without necessitating the purchase of another mile of existing or contemplated track, cannot be doubted. That the power acquired under the terms of the "merger" will be used wisely, and for the best interests of all concerned, is equally certain. Every consideration based on fact or reason would lead to this conclusion even if the government had not in so many words given assurance that it "would not make indiscreet or arbitrary use of the dominant position which the control gives it."

At the time of the proposed merging of the properties the capital stock of the National Railroad of Mexico consisted of the following securities, of which about 47 per cent. had been in the hands of the government since 1902:

	Authorized.	Issued.
Preferred stock	$32,000,000	$28,832,925
Second preferred stock	22,233,333⅓	22,030,600
Deferred stock	11,116,666⅔	11,015,300
Common stock (old)	.....	304,100
Total issued		$62,182,925

The capital stock of the Mexican Central Railway consisted of common stock, authorized, $100,000,000; issued, $59,127,100.

Total capital stock issued by both companies, $121,310,025.

The total "prior lien" bond issues called for by law or agreements with bankers amounted to $231,000,000, of which sum $129,500,000 was to be used for the immediate exchange of bonds and other securities of the two companies named, and as a reserve to be tendered later in exchange for other securities, and to be sold to meet expenses of incorporation, repairs and betterments; $47,500,000 to be issued after January 1, 1910, for betterments and equipment, at the rate of $2,500,000 annually for 19 years; $38,000,000 for constructing or acquiring additional lines; $10,000,000 for building the proposed short line from Tampico to Mexico City, and $6,000,000 to take up and retire bonds of the Mexican International Railroad Co., if deemed "advantageous."

Another issue, known as "general mortgage bonds" and amounting to $186,000,000 is to be used as follows:

To be exchanged for bonds of old companies and to provide cash resources	$85,500,000
For betterments and equipment, after January, 1910	49,500,000
For building or buying other lines	19,000,000
For Tampico Short Line and for building bridges	6,000,000
To take up bonds of the International Railroad	26,000,000
	$186,000,000

Of the $230,000,000 stock of the National Railways of Mexico the government holds $115,023,590.

The National Tehuantepec and the Veracruz & Pacific lines were omitted from the merger because already the exclusive property of the nation. The Interoceanic Railway of Mexico (an English corporation) was also left out of the actual merger because it was already controlled by the National R. R. Co. of Mexico, which company acted as manager of the property. The Hidalgo & Northeastern, the Coahuila & Pacific, the Mexican Pacific and several other and less important roads which were controlled either by the National or the Central are also part and parcel of the "merger." Add to these the Mexican Southern, recently leased by the Interoceanic, and extending from Puebla to Oaxaca, a distance of 228 miles, and from Esperanza to Tehuacan, 32 miles, with 38 miles under construction beyond Oaxaca soon to be completed, and we have a grand total of 7,373 miles. This outline of the chief features of the two great railway lines of Mexico and of their consolidation into one system and their transfer to government control will give to the reader a basis on which to estimate the importance of this transaction.

But in this case government control must not be construed to mean government operation in the ordinary sense of the term, for the active management and operation of the merged lines are and will continue in the hands of experienced and thoroughly competent American executive and operating officials. Naturally, however, the rank and file—the station agents, despatchers, clerks, conductors, brakemen, engineers, firemen, track men and ordinary laborers—will be chosen from the native population so far as this can be done without detriment to the service. In fact, it is proposed to establish at once a number of schools for the instruction of Mexican employees in the duties of these positions. These will be located in Mexico City and at Gomez Palacio, Puebla, Jalapa, Chihuahua, Aguascalientes, Acambaro, Dona Cecilia, San Luis Potosi and Monterey, which are important division headquarters. Already one has been established at Guadalajara.

There will be no politics in the control of the National Railways of Mexico—at least, not for many years to come—only the safeguarding of their stockholders and the public, the preventing of ruinous competition, the securing of needed extensions and improvements, the creation and maintenance of desirable credit in the world's money markets, and the fostering of the country's commercial and industrial interests in every department of human activity. That it is succeeding even beyond the expectations of the government or the officers of the merged lines is amply proven by the results already achieved, which show a material advance in security values, a considerable decrease in operating expenses and a corresponding increase in net earnings, improved physical conditions, new financial strength and brilliant promise for the future.

A comparison of the earnings and operating expenses of the merged lines for the first six months under the new order of things, with those for the last six months under independent control, and a critical examination of the hundred and one other elements which enter into this new departure in the problem of railway control, leave no doubt of the wisdom of the Mexican experiment now being tried, and which is attracting much interest throughout the business and financial world. Only the canker of graft or the blight of political interference can possibly cause failure where now everything points to the most gratifying results.

It has always been the policy and the practice of the Mexican government to exercise a general supervision over the railways of the country through its "Department of Communications," in the interest of safety to life and limb and with a view to safeguarding the rights alike of stockholders and the public. In so far, therefore, as Mexico is concerned, the recent purchase of a controlling interest in the two principal railway systems of the country does not mean the adoption of a new policy, but the systematic and permanent enforcement of an old one. [It is generally understood that the actual merging of the properties was suggested to President Diaz by E. H. Harriman, who stood ready to take over the Mexican Central if the government did not exercise its option. —Editor.]

In Mexico there are more serious problems of railway operation and management than in the United States, and they require the best brains and most thorough and far-reaching experience in their handling. Fortunately, these qualifications were already at hand when the merger was consummated, and the government wisely utilized them in making up the first official roster of the consolidated system. Especially is this true of president E. N. Brown, vice-presidents D. P. Bennett and C. R. Hudson, A. Clark, general manager, and C. W. Fish, general freight agent, all of whom had long been prominently connected with the railway business of the country, are thoroughly familiar with local conditions and needs, and possess exceptional ability.

General News Section.

Alexander Johnson, who has been acting as consulting engineer, has been appointed chief engineer of the bridge department of New York City, with a salary of $10,000.

A fire, which occurred in the Erie yards at Jersey City, N. J., on January 21, destroyed the ice house and a tank of oil. The gas-house and office building were damaged. These were all frame structures. The estimated loss is $23,000.

Officers of the Baltimore & Ohio Southwestern and the representatives of the telegraphers on the company's lines have agreed to a plan of arbitration of questions about wages, and have asked Messrs. Knapp and Neill to act as mediators.

According to a St. Louis newspaper, the Board of Public Improvements of that city, reporting on the subject of grade crossings, finds that the expense to the railways of eliminating all the grade crossings in St. Louis by depression or elevation of tracks would be $8,000,000.

The Rock Island Lines, in conjunction with the Missouri Pacific, have established through passenger service from St. Louis to Los Angeles, which materially reduces the time through. Through standard sleeping and tourist cars leave St. Louis daily at 12:20 p.m. over the Missouri Pacific and at Kansas City are attached to the Rock Island's California special, leaving at 10 p.m. The time between St. Louis and Los Angeles is 69 hours. These trains have dining cars the entire distance.

Col. J. S. Taylor, special agent of the bureau of explosives of the American Railway Association, addressed the Traffic Club of Chicago on January 18. He gave steropticon illustrations of proper and improper methods of handling explosives and of disasters that had resulted from their improper handling. He said that 250,000 tons of explosives were made in this country in 1909, the greater part of which was transported by the railways. Every day an average of 6,000 freight cars are used in hauling these deadly materials. Effective legislation and the efforts of the American Railway Association have very greatly reduced the danger of accidents from this source.

The attorney-general of Texas has rendered an opinion interpreting the Texas statute which makes it unlawful for any railway to permit any conductor, fireman, engineer or brakeman to be on duty for a longer period than 16 consecutive hours. The railways require engineers and firemen to be at their engines 30 minutes before the time fixed for the departure of their trains. It is the duty of such employees during this 30-minute period to see that proper supplies have been placed on the engines, to oil the machinery, etc. The state labor commissioner asked whether, in computing the 16-hour period, this 30-minute period should be included. The attorney-general in reply referred to an interpretation which has been placed by the Interstate Commerce Commission on the federal 16-hour law, in which it is held that the employee goes on duty at the time he begins to perform service or at which he is required to be in readiness to perform service. The attorney-general finds that this opinion is reasonable, and, therefore, holds that under the Texas law the 16-hour term of service begins at the time the employee reports for duty under the rules or requirements of the company, and not when the train actually begins to move.

Telephone Train Despatching.

The Great Northern now uses telephones for train orders on 2,100 miles of its road, the Spokane division having lately been equipped. The Spokane division extends from Troy, Mont., to Leavenworth, Wash., 337 miles. On this division there are two despatching districts. Western Electric telephones and Gill selectors are used. The Western Electric has provided a testing switchboard which is installed throughout the Great Northern. This is a panel somewhat similar to the well-known telegraph peg switchboard, but containing telephone jacks and plugs. The circuits entering an office, both telephone and telegraph, are wired through these jacks and by the operation of two keys and using the plugs at the despatcher's orders it is possible to patch up a line in case of trouble, to interchange circuits, to locate a break or a cross to the nearest station—in fact, to make all the simple tests ordinarily required. These test panels have been found very useful and they are so simple that they may be operated by the most inexperienced. On the Spokane division 70 siding telephones are to be installed. With these the despatchers can take advantage of all changes in the movements of trains, prevent congestion and keep traffic moving; and the saving effected in one emergency will sometimes more than pay the cost of the installation. With the last installation the Great Northern wil have telephone train despatching lines the entire distance from Minneapolis to Seattle, with the exception of two short sections.

The Lehigh Valley is using telephones for train despatching on the Mahanoy & Hazleton division, the despatcher being located at Hazleton, Pa., and will soon use them on the Lehigh division, 54 miles, with 15 stations. On the first named division there are ten telephones at side tracks for use in cases of emergency. All the equipment is from the Western Electric Company. Gill main line bridging selectors are used for calling. The way stations have each a swinging arm with the transmitter and receiver mounted in a fixed position on a yoke. When the operator pulls the arm forward a switch closes the telephone circuit, and to talk he depresses a foot switch, which closes the primary circuit through the transmitter. A storage battery is used for operating the circuits and the despatcher's transmitters.

Disastrous Wreck at Webbwood, Ontario.

In the derailment of westbound passenger train No. 7 of the Canadian Pacific at the bridge over Spanish river, near Webbwood, Ont., 48 miles west of Sudbury, on January 21, about 1 p.m., 40 or more passengers were killed and 32 passengers and three or more trainmen were injured. A part of the train was derailed just at or before its entrance on a steel bridge over the river, and one passenger car fell through and was completely submerged in the river; the dining car was two-thirds submerged. The second-class passenger car was broken in two, the forward portion remaining on the bridge, with the baggage car, express and mail cars and locomotive, and the rear portion falling to the river with the two passenger cars which were behind it. The cars which fell into the river broke through a thick coating of ice, making clean-cut holes the size of the bodies of the cars, and the day coach was completely submerged or so nearly so that every person in it was drowned. The dining car rested partly on the bank, and the conductor of the train, Thomas Reynolds, who was in this car, by heroic efforts saved eight of its occupants. This car sank slowly and Reynolds, by diving beneath the water and reaching a window, succeeded in rising to the surface of the river outside the car, where a hole in the ice enabled him to gain a solid footing. He had no tools, but succeeded in breaking open the roof of the car.

Passengers in the day coach were imprisoned by the ice so that even if they escaped from the car they were drowned outside of it. The half of the second-class car which remained on the bridge took fire, apparently from the stove used in the car by passengers for heating their food, and nearly all of the occupants of this part of the car were burned to death. The latest despatches say that the known dead number 37, but it is likely that some bodies are yet in the river, and the number burned to death is unknown. There were about 80 passengers on the train.

The cause of the wreck thus far has been stated only vaguely as probably a broken rail or a broken wheel. A mail clerk who was in the car next to the engine says that he felt by the motion of the train, before reaching the bridge,

that some car in the rear part was off the track, and he also felt the air-brakes applied before the final disaster. It would seem that the car which was first derailed, probably the second-class car, ran against the end post of the bridge and knocked it down. At the time of the disaster, or soon after, the weather was extremely cold, the temperature going down to about 20 deg. below zero, and visitors the next day found the wrecked cars frozen as solidly into the river as though apparently they had been there a month. The bodies of some of the dead were also frozen solidly into the ice. The number of persons taken to the hospitals at Sudbury and elsewhere was about 30.

Dinner to Virgil G. Bogue.

San Francisco celebrated the advent of the Western Pacific Railway by a complimentary dinner given to its resident executives on the evening of January 8. Two hundred and fifty of the prominent men of San Francisco were present, including the mayor and other city officials. The dinner was in the nature of a farewell to Virgil G. Bogue, retiring vice-president and chief engineer, and a welcome to Vice-Presidents Charles H. Schlacks, Charles M. Levey and T. M. Schumacher, Secretary W. J. Bruen, Resident Counsel Warren Olney, Jr., General Auditor J. F. Evans, Chief Engineer T. J. Wyche and Traffic Agent W. J. Shotwell. Letters were read from George J. Gould and President E. T. Jeffery. Speeches were made by James McNab, Mayor Taylor, Mr. Schlacks, Mr. Bogue, Henry T. Scott on behalf of Governor Gillett, of California, and Warren Olney, Jr.

High tribute was paid to Mr. Bogue as the chief resident official and engineer in charge of construction during the past four years. Mr. Bogue expressed his appreciation of the many friendships he had formed in California and in reviewing the great work of building the Western Pacific gave due credit to all those who had aided him. Mr. Schlacks assured the diners of the good will and co-operation of the Western Pacific. Mr. Gould in his telegram voiced the earnest endeavor of the company to make the new railway worthy of the support of the business interests of San Francisco. Mr. Jeffery gave assurance that, with the Denver & Rio Grande, the Western Pacific would be maintained as an independent artery of commerce to be open on equal terms to all, and that the policy of the company would be to place all connections on an equality and to welcome the support and co-operation of all for the mutual benefit of the state of California, the city of San Francisco and of the railway's interests.

Mr. Bogue will resume his practice as consulting engineer in connection with large railway undertakings and will make his headquarters in New York.

Uniform Demurrage Rules.

The Chicago Demurrage Bureau on January 19 adopted without change and by unanimous vote the code of uniform demurrage rules recommended by the National Association of Railway Commissioners, to be put into effect March 1.

The Missouri Valley Demurrage & Storage Bureau on January 10 adopted a resolution favoring the adoption of this code of rules, effective March 10, and submitted the matter to letter ballot of the roads belonging to the bureau.

The action of the southern and southeastern roads and of the demurrage bureaus to which these roads belong, at Atlanta, January 11, has already been noticed. All the roads represented at the meeting declared their purpose to adopt the rules except the Nashville, Chattanooga & St. Louis and the Norfolk & Western, which will adopt them with certain modifications. The Nashville, Chattanooga & St. Louis will adopt rule 2, class B, section 1, amended so as to provide that, except at Nashville, 48 hours' free time will be allowed on cars containing grain, grain products and hay when held for reconsigning instructions. Both of the roads named decided to add to rule 1, section B, the words "or such cars when so loaded and held for original billing instructions." The managers of the demurrage bureaus were instructed to call attention to the requirement in rule 1 making it obligatory to insert in the notice of freight arrivals sent to consignees the point of shipment, as this has not been heretofore a requirement. The bureau managers were instructed to communicate with the proper officers of their various lines with a view to having this information inserted in all billings and to request that the matter be brought before the Association of American Railway Accounting Officers. The managers were also appointed a committee to present the new rules to the various state commissions and to press their application on state as well as interstate business.

The Indiana Car Demurrage Bureau adopted the uniform rules on January 6.

Respect for the Red Flag.

Passengers by a local train running between Deal and Dover yesterday afternoon saw on the heights some of the followers of the East Kent Foxhounds who had met some six miles from the town. As the train rounded a bend of the line the driver came upon the whole of the pack in a deep cutting, with the master and huntsmen on foot, and the fox, which had just been killed, in the middle of the hounds. The huntsman took off his red coat and waved it, and the driver brought the train to a standstill. After some little delay the master secured the fox, and the hounds were taken past the train, which waited until the master could climb out of the cutting to rejoin his field. The train then proceeded, having afforded its passengers a full view of the finish.—*London Times.* And just to think that the sacred sport of fox-hunting —the noble sport of sporty nobles—should be subject to such possibilities of interruption! Would that our British cousins could have the benefit of one of our prairie heroines and her red petticoat.

Hankow-Szechuan Loan.

Settlement has finally been reached in the matter of the Hankow-Szechuan railway loan of $30,000,000, and it is expected allotment of the bonds will be announced in the near future. England, France, Germany and America are each to secure a one-quarter interest, or $7,500,000.

J. P. Morgan & Co., who are representing the American syndicate in the negotiations, have agreed to reimburse the old Macy-Hawley syndicate, who held the original concession from the Chinese government, for all actual outlays heretofore made in cash and give them a substantial participation interest in the new loan.

The promise of the Chinese government of a half participation in this loan, should foreign capital for the construction of this line be necessary, was secured in 1902 by A. W. Bash, representing a syndicate composed of Messrs. Macy, Barney, Hawley and others who were to float the bonds. It has been the claim of this syndicate which has held up the loan negotiations in recent months. When the negotiations for the present loan were being conducted by the English, French and German bankers, the American government suddenly remembered this American concession and through the state department at Washington turned the matter over to the firm of J. P. Morgan & Co., who put in a claim for American participation.

The Morgan firm in 1905 had conducted the negotiations with the Chinese government by which the contract with the old American-China Development Co. for the construction of the Hankow-Canton line had been canceled and such work as had been done on the line, which consisted of 32 miles of railway and about 50 miles of earthwork, was taken over by the Chinese government on payment of $6,750,000 gold, $3,000,000 of which was claimed to have been expended in cash and a further sum of $3,750,000 was claimed as compensation for the loss of valuable rights. Chinese officials have assumed a friendly attitude toward the Macy-Hawley syndicate and have placed every obstacle in the way of the new negotiations until assured that its claims would be taken care of by the new Morgan syndicate.

The Hu-Nan gentry, representing the landed owners, were the ones who felt the burden of raising the money which represented the profits of $3,750,000, which went to the former syndicate, headed by Morgan & Co., who had the concession for the line between Canton and Hankow. These gentry threatened a rebellion if the present loan was executed with-

out their revision and if the claims of the Macy-Hawley syndicate were not recognized.

Since the concession for the Hankow-Canton railway was canceled and the Chinese government compelled to pay $6,750,000 gold for 32 miles of railway and some 50 miles of earthwork, the gentry have been much opposed to Morgan participation in any other concession in their territory. For this reason it has been a difficult matter to complete the present negotiations.

The new line, for which the $30,000,000 loan is now arranged will run from Hankow to I-Chang, thence to Chung-King and Chung-Tu in the province of Szechuan. The railway which had been planned to extend southward from Hankow to Canton has been given up for the present and the new line will extend to the westward instead, into one of the most thickly populated provinces of China. It is estimated that the province of Szechuan contains a population of seventy million.—*Wall Street Journal.*

Railway Matters in Washington.

Washington, Jan. 26.

A Senate resolution, passed two years ago, calling for the investigation of alleged violations of the conditions of the land grant to the California & Oregon Railroad, has been again brought up, Senator Chamberlain of Oregon offering a resolution, which the Senate has passed, calling upon the attorney-General for information as to why the government has not carried out the instructions of the earlier resolution. The basis of this inquiry was a charge that the railway company held two million acres unlawfully, refusing to sell land to settlers at the prices named in the grant.

At the conference of state governors held here last week Governor Eberhart of Minnesota offered a resolution which he proposed to have sent to Congress looking to a change in the federal statutes which would forbid taking railway cases concerning intrastate questions to the federal courts until the authority of the state courts should have been exhausted.

Men from Chicago, who have been here during the past week, say that they are going to renew the agitation for publicity of railway receipts and expenses in detail, to counteract what they say is a determination, already become general among the railways, to advance by 5 per cent. or more the rates on freight from Chicago in all directions.

Alleged Frauds in Purchases of Real Estate for Chicago & Western Indiana.

The board of directors of the Chicago & Western Indiana filed a petition in the Cook county circuit court at Chicago on January 19 asking that Benjamin Thomas, former president of this road; Charles R. Kappes, formerly its real estate agent, and John C. Fetzer, a real estate dealer, be required to make an accounting of unlawful profits which it is alleged they have derived from purchases of real estate made on behalf of this road. At the same time the state's attorney of Cook county, John E. Wayman, began an investigation to determine whether the three men mentioned should be indicted for the frauds which it is alleged that they have committed.

Mr. Thomas was president of the Chicago & Western Indiana until June, 1908, when his resignation was asked for and received by the board of directors. Mr. Kappes at the same time was discharged from the service of the company.

According to the petition filed in the circuit court the unlawful profits of the three men mentioned from the real estate deals referred to amounted to about $850,000. The transactions involved a total of about $3,000,000. Purchases of real estate for team tracks in South Chicago, at Rockwell street, at West Twelfth street and at Twenty-third street was authorized about four years ago, and were made in 1906 and 1907. It is charged that after the purchases were authorized Kappes proposed to Fetzer that the latter should buy the various pieces of property needed and turn them over to the company. Whenever the board of directors decided to buy a particular piece of property "Thomas and Kappes," says the petition, "being enabled to do so because of their official relations, procured the employment of Fetzer to make such purchases and that they caused the moneys and bonds of the company to be placed in the hands of Fetzer to be used in making such purchases and that Fetzer purchased the real estate with the money or bonds and fraudulently reported to the company that he had expended a sum greatly in excess of the amount actually expended by him therefor, and that Thomas and Kappes, taking advantage of their relations with the company, caused the Fetzer account on the books of the company to be credited with the amounts in this manner falsely reported by him. The difference between the amounts actually expended by Fetzer and the amounts so reported by Fetzer to have been expended were divided between the said Thomas, Kappes and Fetzer and certain other persons who are to your orator unnamed."

The bill of the complainant is very voluminous, containing almost 60 typewritten pages, and it sets forth in detail each transaction which is alleged to have been made and the profits which are said to have been secured and divided. In all cases, according to the allegations, the profits derived by the defendants were very large, and in some cases the property was turned into the company at twice as much as had been paid for it to its true owners. It is alleged that in order to prevent detection of the fraudulent nature of the transactions, the property in many cases was transferred from its true owners to "dummies" representing Fetzer and then retransferred from these dummies to the company. It would appear from the allegations that in many cases the dummies in question did not know that their names were being used.

It is alleged that when Thomas and Kappes were removed they destroyed or removed from the offices of the company large quantities of books and papers, among them being those relating to the transactions with Fetzer. On account of the removal or destruction of these papers complainant states that it is unable to say with great particularity just what reports were made by Fetzer in reference to the purchase of some of the property. The petition says that as a result of the orator's investigation "it is believed and therefore charged that the difference between the amount of your orator's said moneys and bonds turned over to the said Fetzer and the actual amounts actually paid out therefor by the said Fetzer to the true sellers of the real estate was not less than $850,000. Your orator believes and charges that this sum was, in fraud of your orator, divided between the said Fetzer, Thomas and Kappes and certain other persons whose names are unknown, and now is due and owing to your orator from them."

It was suspected that Thomas, Fetzer and Kappes kept some of their alleged profits in the form of bonds of the company, and Judge Windes, of the circuit court, therefore issued an injunction restraining every known safety deposit company in Chicago from permitting any of the defendants or their wives or other persons from taking out of any box or boxes which they may have rented any securities or papers.

On January 21 a civil suit was brought against Thomas, Fetzer and Kappes, which also involves Henry Hafer, a Chicago coal dealer. The bill in this case alleges that in 1907 Fetzer bought with money belonging to the railway several lots from T. C. Keller, paying him $200,000, and assuming incumbrances of $120,000, making a total of $320,000. Later the incumbrance was liquidated with 120 Western Indiana bonds. At about the same time, it is alleged, Fetzer bought from Mr. Hafer with the railway's money some lots, paying for them $75,000 in cash and assuming an incumbrance amounting to $205,000. This incumbrance also was soon liquidated with 205 of the railway's bonds. According to the allegations of the bill, Fetzer later represented that the lots previously bought from Keller were not needed at that time and had been given to Hafer as additional consideration for the property purchased from him. It is stated in the bill that Fetzer actually had Keller transfer these lots to Edward H. Peters, Fetzer's partner, that Peters conveyed them to Joseph P. Fleming and that Fleming conveyed them to Fetzer. It is alleged that in 1909 the directors of the Western Indiana decided that they needed these lots, that Fetzer was instructed to get them, that on March 12 he filed a deed dated 1907 conveying them to Henry Hafer, and then almost immediately bought them back from Hafer for $460,000 supplied by the railway. The bill filed by the railway says that the proceeds of this last sale were divided between Fetzer, Hafer, Thomas and Kappes,

and asks the court to order this $460,000 to be returned to the railway on the ground that the railway had already paid $320,000 for the lots in 1907.

William J. Henley, who was vice-president and general counsel of the Chicago & Western Indiana while Mr. Thomas was president, was elected president to succeed him. Immediately following the bringing of the civil action Mr. Henley resigned, and E. B. Pryor, vice-president of the Wabash, was elected president of the Chicago & Western Indiana, and George G. Yeomans, assistant to the president of the Wabash, was elected vice-president. It is officially stated that Messrs. Pryor and Yeomans were elected merely to operate the property temporarily.

It appears that the directors of the Chicago & Western Indiana have suspected for a long time that all was not just as it should be in relation to these real estate transactions and that they have been quietly making a thorough investigation for a long period. Following Mr. Thomas' enforced resignation as president of the Chicago & Western Indiana he was elected chairman of the General Managers' Association of Chicago. His election was resisted by officers of some of the roads which owned the Chicago & Western Indiana, and as a result of it the Grand Trunk, the Wabash, the Erie and the Chicago Great Western withdrew from the General Managers' Association. The fact that they had withdrawn did not become public until the filing of the suits referred to. Besides the roads just mentioned, the Chicago, Indianapolis & Louisville and the Chicago & Eastern Illinois were stockholders in the Chicago & Western Indiana, each of the five owning $1,000,000 of its capital stock. The Chicago, Indianapolis & Louisville and the Chicago & Eastern Illinois did not withdraw from the General Managers' Association, nor did the Atchison, Topeka & Santa Fe, which is one of the lessees of the property.

The Illinois Central is also affected by the real estate deals in question to the extent of about $100,000. The Western Indiana and the Kensington & Eastern, the latter of which is owned by the Illinois Central, occupy the same right of way near Hegewisch, Ill., and it is stated that the Western Indiana acquired this property and the Illinois Central paid for half of it.

The accused men have given interviews to the newspapers making general denials of the allegations against them.

On January 24 W. L. Reed, general attorney of the Chicago & Western Indiana, was relieved from duty until February 1, it being stated that the management desired meantime to make an investigation of his office.

Mr. Thomas on January 24 sent his resignation as chairman of the General Managers' Association to J. W. Kendrick, chairman of the executive committee of the association. In his letter of resignation Mr. Thomas branded the various charges against him as "wickedly false, unjust and untrue." Henry Hafer issued a statement admitting that he had sold some lots to the Western Indiana, but absolutely denying that he was a party to any frauds on the company or that he had any knowledge of any frauds that had been committed.

Albemarle Sound Bridge.

On Sunday last the Norfolk & Southern began running regular trains across its Albemarle Sound bridge, 29,000 ft. long. This bridge spans the beautiful and placid Albemarle Sound, between Edenton, N. C., and Mackey's Ferry. Hitherto passenger and freight cars have been transferred between Edenton and Mackey's Ferry by the steamer "John W. Garrett," which now gives place to the longest continuous bridge across navigable waters in the world. Passenger trains cross the bridge in 28 minutes, a saving of one hour and thirty-two minutes over the old time, and on freight there is a saving of eight hours and twenty minutes. Four million feet of lumber, 1,000 carloads of cypress piles, 250 carloads of steel and a trainload of spikes and bolts were used in the construction of this overwater railway. The piles are all 70 ft. or more in length—the longest being 95 ft. These piles are driven at a slight angle into the bed of the sound 40 to 65 ft., and braced and bound firmly at the top. At high tide the deck of the bridge is 13 ft. 2 in. above the water. There are two large draws and five smaller gas-boat spans in the bridge. At the Scherzer roller lift draw there is 140 ft. open space, and at the swing draw there is a clearance of 35 ft. The completion of this bridge places Norfolk, Virginia, and Suffolk, Virginia, and all North Carolina in the closest relationship.

The Name of the Overland Limited.

An officer of the Chicago & North Western writes as follows concerning the change in name of the "Overland Limited:" "In the general news section of the *Railway Age Gazette*, January 14, 1910, we note a statement that the name of 'The Overland Limited' has been changed to the 'San Francisco Limited.' So far as the 'Overland Limited' on the Chicago & North Western is concerned, we retain that name which has been made famous the world over by continual advertising for many years. The only change that has been made, so far as the through electric lighted train which runs over the Chicago & North Western, the Union Pacific and the Southern Pacific is concerned, is that we add the name 'San Francisco' and the train is now called *The San Francisco Overland Limited*, and is so advertised the world over."

International Master Boilermakers' Association.

The annual convention of the International Master Boilermakers' Association will be held at the new Clifton hotel, Niagara Falls, Ont., May 24-27, 1910.

Central & Western Association of Car Service Officers.

The next meeting of the Central & Western Association will be held at the Palmer House, Chicago, February 17, at 10 o'clock sharp. In order to enable the secretary to prepare a suitable programme, members will kindly forward to him any suggestions as early as possible.

Reading Veterans.

The annual meeting of the Veteran Employees' Association of the Philadelphia & Reading Railway was held at Harrisburg, Saturday, January 22, with about 600 members present, including Messrs. Baer, Voorhees, Dice, Paisley and other officers. The president of the association for the ensuing year is William B. Conrad.

American Institute of Electrical Engineers.

The meeting, specially arranged for the South Atlantic states, will be held at the Selwyn hotel, Charlotte, N. C., March 30-April 1, 1910. This Charlotte meeting will not take the place of the Institute's annual convention, which will be held as usual later in the year at a place not yet decided upon.

Wood Preservers' Association.

The Wood Preservers' Association closed its annual meeting with a banquet at the Chicago Athletic Club, in Chicago, on Thursday evening, January 20. Summaries of the papers read at the meeting were given in last week's issue of the *Railway Age Gazette*, page 152. At the closing business session it was decided to hold next year's meeting in Chicago, and the following officers were elected for the next year: President, Walter Beuhler (re-elected), St. Louis, Mo.; first vice-president, C. W. Berry, Laramie, Wyo.; second vice-president, David Allerton, Madison, Ill.; third vice-president, C. D. Chanute, Chicago, Ill.; secretary and treasurer, F. J. Angier, Galesburg, Ill.

In addition to the regular program, H. F. Weiss, of the United States Forest Service, spoke briefly on the problems of wood preservation that the Forest Service proposes to investigate at the new forest products laboratory at Madison, Wis. He read a list of 39 problems that have been suggested by railways, timber treating companies and others interested in this work, and requested the members of the association to discuss and suggest additions to the list. The following subjects of investigation are of particular interest to railway officers: The determination of the amount of oil to be injected in various species of ties to secure a deterioration from

decay that will exactly equal the mechanical abrasion; the determination of a satisfactory method of treating wood for refrigerator cars and stave factories; the determination of the resistance of treated timber to the passage of electric curent, and the determination of the durability of treated timber when surrounded by concrete.

American Railway Engineering and Maintenance of Way Association.

A meeting of the board of direction of the American Railway Engineering and Maintenance of Way Association was held in New York January 18, and the following were nominated for officers for the current year: President, L. C. Fritch, chief engineer, Chicago Great Western; vice-president, Chas. S. Churchill, chief engineer, Norfolk & Western; secretary, E. H. Fritch; treasurer, Chas. F. Loweth, engineer and superintendent bridges and buildings, Chicago, Milwaukee & St. Paul. The directors to serve three years each are: F. S. Stevens, superintendent, Philadelphia & Reading; Robert Trimble, chief engineer maintenance of way, Northwest System, Pennsylvania Lines West.

The nominations for members of the committee of arrangements are: W. A. Wallace, chairman; Frank R. Coates, T. L. Condron, J. B. Cox, L. C. Fritch, John C. Sesser and O. J. West.

International Railway Fuel Association.

The second annual meeting of the International Railway Fuel Association will be held at Hotel La Salle, Chicago, May 23-26, 1910. The papers to be read at the meetings and the committees in charge are as follows:

Papers 1 and 5 consolidated.—"Grade of fuel most suitable for locomotive use, considering cost per unit of traffic and best interests of producer." "Recommended methods of preparing coal as to size for locomotives." J. G. Crawford, chairman, fuel engineer, C., B. & Q., Chicago; Le Grand Parish, S.M.P., L. S. & M. S., Cleveland, Ohio; Curtis Scovill, A.G.S.A., Central Coal & Coke Co., Dallas, Tex.

Paper No. 2.—"Standard uniform blank for reporting all items of cost in connection with fueling stations and handling fuel, for all types of stations and conditions." R. Emerson, chairman, Asst. to Genl. Mgr., Lehigh Valley, South Bethlehem, Pa.; F. V. Hetzel, chief engineer, Link Belt Co., Nicetown, Pa.; A. E. Averill, editor, *American Engineer & Railroad Journal*, New York; N. M. Rice, G.S.K., A., T. & S. F., Topeka, Kan.

Paper No. 3.—"Accounting for fuel consumed. Individual records of performance." W. E. Symons, chairman, C. & G. W., Chicago; E. A. Foos, C. C. Fuel, Rail & Tie Dept., C. B. & Q., Chicago; E. J. Roth, Jr., fuel inspector, B. & O., Baltimore, Md.

Paper No. 4.—"Methods of purchasing fuel with regard both to traffic conditions and to producers' interests. Relation between producer and railway." W. H. Huff, chairman, V.P., Victor-American Fuel Co., Denver, Colo.; L. L. Chipman, G.S.M., Fidelity Coal Mining Co., Kansas City, Mo.; W. K. Kilgore, fuel agent, C., M. & St. P., Chicago.

Paper No. 6.—"Methods of supervision, instruction and encouragement in locomotive operation to secure greatest efficiency in fuel consumption." D. Meadows, chairman, Asst. Div. M.M., Michigan Central, St. Thomas, Ont.; W. C. Hayes, Supt. locomotive operation, Erie, New York; J. McManamy, R. F. of E., Pere Marquette, Grand Rapids, Mich.

Special paper "A."—"Character of membership that should be encouraged in the association and steps to secure that membership." S. L. Yerkes, fuel agent, Queen & Crescent, Lexington, Ky.

Special paper "B."—"Methods of kindling locomotive fires." C. F. Richardson, Asst. to G.S.M.P., C., R. I. & P., Chicago.

Omaha Railway Club.

The following officers have been elected by the Omaha Railway Club for the ensuing year: Chairman of the board of directors, H. C. Piculell, commercial freight agent, Baltimore & Ohio; president, Wm. L. Park, general superintendent Union Pacific; first vice-president, Everett Buckingham, general manager Union Stock Yards; second vice-president, W. A. Dilworth, general attorney Chicago, Burlington & Quincy; secretary, A. H. Christiansen, soliciting freight agent Northwestern Line. Chairmen of the standing committees: House, D. B. Allan, Union Pacific; entertainment, R. E. Hayward, C., B. & Q.; auditing, F. Montmorency, C., B. & Q. The club has about 300 members in good standing but as about 500 are needed in order to place it on a sound basis the directors have considerable work in sight, and, therefore, will hold weekly meetings during the next two or three months. The club was originally organized by railway men, but, following the course pursued by the New York Railroad Club and similar organizations, it has decided to admit persons who are connected with business enterprises closely allied with the railways.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna, Co., Toledo, Ohio
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope.

Traffic News.

Commissioner Clark resumed at Chicago on January 25 the hearings which the Interstate Commerce Commission is conducting on the subject of billing in transit. The purpose of the investigation is to determine whether, by a manipulation of billings, shippers of grain and other commodities are enabled in effect to cut the rates.

The Grand Trunk has notified its competitors and connections in the middle West that for the meeting of the National Educational Association in Boston, next summer, it will make a rate of one fare for the round trip, or about 25 per cent. less than has been made for similar meetings in the past. It is said that the roads west of Chicago are offering a similar reduction to induce the association to hold its meeting on the Pacific coast.

Switching rates in Superior, Wis., are now on the same basis as those in Duluth; to points within the city limits, excepting Allouez and Itasca, 15 cents a ton instead of 25 cents; to Allouez, Itasca and Pokegama Junction reduced from 30 cents to 25 cents; and the carload maximum will be 40,000 lbs., instead of 60,000. The demand for lower switching rates was made by the Superior Commercial Club, and the railways, rather than let the matter go before the state railway commission, agreed to grant the demand.

This week the Pennsylvania Railroad ran a farmers' instruction train over the Pope's Creek branch of the Philadelphia, Baltimore & Washington. Co-operating with the company will be the Farmers' Institute of Maryland, with the director, William Lee Ames, in charge. The Pennsylvania began its good-farming campaign two years ago, and since that time has run instruction trains and steamboats giving "good roads" lectures, and distributed farm literature. In addition, the company has recently established an experimental farm on the Delaware peninsula.

The Erie and the Delaware, Lackawanna & Western have announced that on April 1 they will reduce westbound freight rates to the basis of 69 cents first-class New York to Chicago. The present rates are on the basis of 75 cents. This action follows a reported failure of negotiations which have been going on for some time past, which it was hoped would lead to an advance of the rates by the differential lines. If the change is carried out and if the differential lines make no change, the difference between the Erie on the one hand and the Lackawanna and the differential lines on the other will be reduced from 10 cents, first-class, to four cents.

The last silk train to arrive at New York came through from Seattle in four days 22 hours, and the goods were ready to unload 14 hours before the arrival of the mail from the same Japanese steamer; and as the bills of lading, on which the goods were to be delivered, were in this mail, the extra fast time was of no benefit except as an advertisement of the very fine performances of the locomotives. These shipments, which filled five cars, came over the Chicago, Milwaukee & St. Paul; but the press agent of the road or roads east of Chicago must have been napping, as the reporters seem to be oblivious to the fact that the St. Paul road ends at Chicago.

The Pennsylvania Railroad is distributing thousands of copies of the pamphlet just issued by the Department of Commerce and Labor, entitled "Packing for Export." The Pennsylvania estimates that in 1908 it paid out $185,000 in damage claims, which arose from poor and insecure packing. The present pamphlet describes in detail the so-called packing evils and is profusely illustrated with photographs of typical samples of poor packing. The annual freight loss and damage in the United States is estimated at $20,000,000. The loss in the foreign trade is not included in the twenty million, but aggregates a large sum. Reports from consuls show not only loss in the articles shipped, but a loss of trade because of carelessness in packing. Out of 1,000 bags of cottonseed meal shipped to a European port, 800 were badly torn and damaged because of inadequate wrapping. Machinery is frequently received at foreign ports in a ruined condition because sent in thin pine boxes instead of being knocked down and properly guarded. There is great loss in cotton bales because of inadequate covering, although cotton shipped from Egypt rarely sustains any loss. The Pennsylvania has recently been educating shippers by taking parties of them to freight stations to see the poor condition in which many packages of freight are received. This campaign of education is to be extended to cover the entire railway.

Western Classification Committee.

The Western Classification Committee adjourned its meeting at San Antonio, Tex., on January 21. It decided to hold its next meeting at Glenwood Springs, Colo. It considered and disposed of a large number of questions.

One of the most important is that of ratings on returned shipments. The provision in the Western Classification has been that returned shipments would be transported for one-half of the rate for the original shipment. An administrative ruling of the Interstate Commerce Commission being unfavorable to this practice, the committee decided to make the rates on returned shipments the same as on original shipments, except in the case of empty carriers.

A full line of rates for aluminum and all articles manufactured from it was provided. Only a few rates have been fixed for aluminum and its products heretofore, articles not otherwise specified being charged first class.

A large representation of shippers appeared before the committee to ask that allowance be made in future for actual dunnage instead of as at present for 500 lbs. of dunnage per car. It was argued that in many cases where articles are shipped on flat cars the dunnage actually amounts to from 1,000 to 1,500 lbs., and it was contended that this should be considered merely a part of the car rather than a part of the shipment. The committee decided, however, to retain the present rule.

Wooden box manufacturers appeared to ask that wooden cases be made standard. It was understood that they would ask that a penalty be fixed for goods not shipped in wooden cases. The manufacturers of wooden boxes, however, withdrew their proposition with the understanding that it would be presented again at the next meeting of the committee.

Manufacturers of agricultural implements asked that provision be made for an increase in the number of mixed carloads, especially in the case of hand instruments, but their application was rejected.

A proposition to eliminate ratings on bulk bottles and to require that in future all bottles shipped should be crated was rejected. The rule of the Official Classification regarding the loading of bottles was adopted.

A proposition, the adpotion of which would have permitted the mixing of all kinds of canned goods in carloads, was favored by the representatives of large eastern jobbing houses and opposed by the representatives of western jobbing concerns. The Committee decided to reject the application.

A material change was made in the classification of candy. Candy makers contended that putting all candy worth more than 10 cents in first class and all valued at less than 10 cents as third class is unreasonable. The Committee decided to make candy third class when invoiced at 15 cents a pound or less, and first class when invoiced at more than 15 cents.

The classification of brass and iron beds was changed from fifth class (carload minimum, 30,000 lbs.) to fourth class (carload minimum, 40,000 lbs.) subject to rule No. 6 B.

The Committee made new ratings on church glass. It provided that cathedral glass, when it does not exceed 20 united feet, shall be 1½ times first class, and, when exceeding 20 united feet, double first class. Pane glass or glass that is colored or of straight line or angle pattern is made second class when its united measurement is under 20 ft. and first class when over 20 ft.

Roasted coffee when packed in burlap bags lined with waterproof paper was reduced from third to fourth class. It was proposed to require all shipments of rugs to be boxed, but the protest received against this was so strong that action was deferred until the next meeting.

It was proposed to provide in the Classification that the railways should notify the consignor of a consignee's refusal

or failure to accept a consignment. It has been customary for railways to give such notification. Objection was made to making it obligatory, however, and the proposed change was rejected.

Revenues and Expenses of Railways.

Summary of monthly reports of revenues and expenses of railways in the United States filed with the Interstate Commerce Commission, Bureau of Statistics and Accounts, before November 30, 1909, is as follows:

Item.	SEPTEMBER. 1908 Amount.	1908 Per Mile of line.	1908 Ratio p. ct.	1909 Amount.	1909 Per Mile of line.	1909 Ratio p. ct.
Rail operations:						
Freight revenue	$146,351,718	$645	68	$167,670,796	$710	68
Passenger revenue	53,683,528	232	25	60,674,687	257	25
Other transp. rev.	14,049,265	61	6	15,573,388	66	6
Nontransp. rev.	1,929,192	8	1	2,147,085	9	1
Total oper. revs.	$219,013,703	$946	100	$246,065,956	1,043	100
Maint. way & struc	$28,720,258	$124	13	$33,486,237	$142	14
Maint. equipment	31,691,646	137	14	34,315,106	145	14
Traffic expenses	3,957,381	17	2	4,575,761	19	2
Transp. expenses	67,738,498	293	31	72,884,895	309	30
General expenses	5,043,207	22	2	5,357,965	23	2
Unclassified exp.	4,154	..	..	2,036	..	..
Total oper. exp.	$137,155,143	$593	63	$150,622,000	$638	61
Net oper. rev.	$81,858,560	$354	37	$95,443,956	$404	39
Outside operations:						
Total revenues	$4,195,125	$18	..	$5,180,042	$22	..
Total expenses	3,625,543	16	..	4,626,900	20	..
Net revenue	$569,582	$2	..	$553,142	$2	..
Total net rev.	$82,428,142	$356	..	$95,997,098	$407	..
Taxes (⅓ an'l amt.)	7,439,414	32	..	7,994,148	34	..
Operating income	$74,988,728	$324	..	$88,002,950	$373	..
Number reports	856	..	..	882	..	..
Mileage operated	231,411	..	..	236,033	..	..

NOTE.—The amounts for September, 1908, here given, represent the 1908 returns as restated by the carriers on the 1909 reports, to provide a true basis for comparison. Changes and corrections made subsequent to the filing of the original September, 1908, reports during the succeeding twelve months may affect the totals and averages somewhat, and additional slight differences may arise from the necessary omission of a number of reports which are not yet available for tabulation.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, presenting statistical bulletin No. 60, covering car balance and performance for July, 1909, says:

"The per cent. of unproductive cars was lower than in June, the decrease in surplus being more than sufficient to offset the increase in shop cars. The adjusted performance is as follows:

	Average miles per day. Inc. surp. cars.	Average miles per day. Exc. surp. cars.	Average ton-miles per car per day. Inc. surp. cars.	Average ton-miles per car per day. Exc. surp. cars.	Average earnings per car per day. Inc. surp. cars.	Average earnings per car per day. Exc. surp. cars.
December, 1907.	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908.	19.7	23.8	271	328	1.82	2.20
March, 1908.	21.2	25.5	290	348	1.95	2.34
April, 1908.	19.6	24.5	258	324	1.88	2.29
May, 1908.	19.3	24.8	254	329	1.72	2.22
June, 1908	19.6	24.7	276	347	1.88	2.37
July, 1908.	20.0	24.8	275	342	1.84	2.26
August, 1908.	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908.	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909	21.7	25.9	306	365	2.04	2.43
March, 1909	22.7	27.2	330	393	2.19	2.61
April, 1909.	22.4	26.8	310	371	2.13	2.54
May, 1909.	22.5	26.8	304	362	2.05	2.45
June, 1909.	22.4	26.5	314	371	2.13	2.52
July, 1909	22.0	25.8	309	362	2.09	2.45

"The average miles per day for active cars, although somewhat lower than during the months immediately preceding, is one mile per day higher than the average for July, 1908. The daily ton-miles per car and the average earnings also show a fair advance over the previous year's figures. The cars at home decreased slightly, falling from 75 per cent. in June to 74 per cent. in July, with an increase in the loaded mileage from 67.8 per cent. to 68.3 per cent. The shop cars increased from 7.73 per cent. to 7.91 per cent., while the average tons per loaded car remained at 20.7."

The accompanying table gives car balance and performance in July.

FREIGHT CAR BALANCE AND PERFORMANCE IN JULY, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,307	666,139	251,613	131,789	174,934	374,963	16,882	130,792	27,007	110,619	99,159	2,059,204
Average number of system cars on line	55,321	476,041	197,241	93,986	130,798	305,025	7,642	98,176	16,836	67,083	83,104	1,531,253
Railroad owned cars: Av. foreign on line	25,988	168,497	60,774	28,272	30,285	81,702	11,775	33,454	16,219	41,848	15,257	509,071
Total cars on line	81,309	644,358	258,235	117,258	161,083	386,727	19,417	131,630	33,055	108,931	98,361	2,040,544
Excess	6,092	.....	6,622	.....	.....	11,764	2,523	838	6,048	.....	.....	.....
Per cent. cars on line to total owned:												
Home	73	72	79	71	75	81	45	75	62	60	84	74
Foreign	35	25	24	18	17	22	70	26	60	38	15	25
All railroads	108	97	103	89	92	103	115	101	122	98	99	99
Private cars on line	3,355	38,121	9,101	2,653	6,272	14,213	1,400	7,774	1,741	7,212	3,159	94,971
Total, all cars on line	84,664	682,659	267,336	119,911	167,355	400,940	20,817	139,374	34,796	116,143	101,520	2,135,515
Per cent. of cars in shop	6.73	7.57	7.33	8.37	8.74	6.47	4.56	14.79	6.19	6.48	12.37	7.91
No. of freight engines owned	1,113	9,995	3,584	2,225	2,555	6,239	459	2,507	754	2,226	2,110	33,767
Av. cars on line per freight engine owned	76	68	75	54	66	64	45	56	46	52	48	63
Total freight-car mileage	42,639,048	469,409,759	168,733,113	78,947,155	108,378,303	274,462,844	24,652,710	83,740,628	26,262,265	99,747,987	72,522,026	1,449,529,695
Average miles per car per day	16.2	22.2	20.4	21.2	20.9	22.2	38.2	20.3	24.3	27.7	23.0	22.0
Per cent. loaded mileage	70.9	65.6	65.7	67.5	68.8	71.2	74.1	70.1	66.8	70.0	74.1	68.3
Ton-miles of freight, Inc. Co. freight	434,330,732	7,022,370,869	2,532,371,675	1,083,638,757	1,409,837,124	2,190,754,384	355,733,703	1,125,264,486	269,811,529	1,429,385,626	871,089,687	18,724,588,592
Average ton miles, including Co. freight:												
Per car-mile	10.3	15.0	16.1	13.7	13.1	12.8	14.9	13.4	11.5	14.3	12.0	14.1
Per loaded car mile	14.5	22.8	24.5	20.3	17.9	18.2	20.1	19.2	17.5	20.5	16.2	20.7
Per car per day	167	332	340	292	276	276	600	263	269	397	277	309
Gross freight earnings	$5,130,638	$42,692,276	$14,327,152	$7,035,323	$9,413,117	$19,394,325	$3,093,183	$9,537,479	$2,863,926	$12,565,176	$6,360,922	$132,413,517
Average daily earnings: Per car owned	$2.20	$2.07	$1.84	$1.72	$1.75	$2.14	$5.91	$2.35	$3.42	$3.67	$2.07	$2.16
Per loaded car mile	2.04	2.14	1.79	1.94	1.90	2.09	5.14	2.34	2.79	3.72	2.09	2.19
Per railroad owned car on line	1.97	2.02	1.73	1.89	1.83	2.00	4.79	2.21	2.66	3.49	2.02	2.09

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1909.
(See also issues of January 7, 14, and 21.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decrease) compared with last year.
Alabama & Vicksburg	143	$98,614	$46,128	$155,264	$20,123	$19,229	$3,652	$43,332	$5,080	$91,416	$63,848	.....	$4,250	$59,598	$19,363
Ann Arbor	301	106,960	39,515	157,907	26,560	20,831	3,642	48,504	4,244	103,781	54,126	$1,995	12,330	39,801	297
Atlantic & St. Lawrence	167	110,250	23,024	141,864	33,472	15,126	3,121	43,177	2,856	97,752	44,112	.....	6,436	37,676	55,565
Charleston & Western Carolina	340	108,653	29,947	145,485	33,239	16,579	3,347	39,794	3,768	96,727	48,758	.....	4,475	44,283	25,517
Chicago, Cincinnati & Louisville	285	109,210	22,015	141,743	26,511	21,407	8,403	58,639	5,775	120,735	21,008	.....	3,495	17,513	29,772
Chicago, Peoria & St. Louis	255	134,746	24,922	166,576	25,744	27,997	6,535	60,859	5,541	126,676	39,900	.....	4,150	35,750	27,080
Cincinnati Northern	248	85,979	15,366	106,336	12,332	21,012	2,870	48,956	2,905	88,075	18,261	.....	4,100	14,161	26,086
Cleveland Terminal & Valley	93	80,638	15,714	125,685	13,098	12,302	1,399	43,517	1,698	72,014	53,671	.....	3,403	50,268	30,632
Detroit, Grand Haven & Milwaukee	190	113,414	41,666	182,774	21,726	23,924	4,899	66,785	3,234	120,568	62,206	23	2,727	59,456	45,799
Detroit, Toledo & Ironton	441	119,999	12,874	143,142	32,285	29,632	2,939	65,712	3,966	134,534	8,608	.....	6,510	2,098	—7,393
Grand Trunk Western	336	341,653	135,974	512,104	55,059	75,681	17,855	198,179	16,573	363,347	148,757	—1,966	29,190	117,601	22,430
International & Great Northern	1,159	653,264	172,982	875,668	157,221	113,028	19,658	328,356	22,043	640,306	235,362	.....	22,000	213,362	15,556
Iowa Central	558	255,193	41,458	308,350	41,500	33,983	7,177	124,305	7,976	214,941	93,409	.....	7,382	86,027	82,648
Louisiana Ry. & Nav. Co.	350	90,925	17,375	119,950	29,011	12,937	4,811	46,557	6,055	99,371	20,579	.....	4,250	16,329	14,419
Midland Valley	324	88,523	28,461	122,755	17,807	23,313	1,783	31,131	4,387	78,421	44,334	184	8,000	36,518	38,529
Minneapolis & St. Louis	1,027	375,855	88,394	492,127	46,275	57,730	11,880	179,286	16,857	312,028	180,099	55	20,911	159,243	44,699
Missouri Pacific	3,881*	1,664,466	364,784	2,238,279	352,226	322,233	51,492	894,301	59,420	1,679,672	558,607	2,867	80,401	475,339	.....
Mobile, Jackson & Kansas City	403	116,948	27,344	153,026	23,746	13,651	2,311	45,921	8,812	94,441	58,585	.....	6,708	51,877	—8,515
New Orleans & North Eastern	196	218,219	49,510	291,550	28,739	46,302	8,230	91,640	10,906	185,818	105,732	.....	8,500	97,232	10,404
New Orleans Great Northern	275†	82,439	28,261	117,381	20,981	18,689	1,950	29,062	4,427	75,109	42,272	—99	700	41,473	38,563
Pecos & Northern Texas	152	126,832	20,292	151,492	23,764	19,653	1,979	44,290	4,153	93,840	57,652	.....	1,369	56,283	52,923
St. Joseph & Grand Island	319	93,448	34,420	137,466	33,292	16,638	6,727	55,149	5,038	116,844	20,622	124	6,619	13,879	—27,892
St. Louis, Brownsville & Mexico	456	101,916	37,581	145,543	39,280	10,703	2,850	40,619	7,071	100,523	45,020	.....	3,600	41,420	29,270
St. Louis, Iron Mtn. & Southern	2,610	1,821,359	409,755	2,420,798	297,794	279,611	50,629	684,986	64,754	1,377,774	1,043,024	—3,665	70,366	968,993	278,714
San Antonio & Aransas Pass	727	276,710	90,349	385,724	61,059	44,776	4,620	132,194	8,377	251,026	134,698	.....	9,000	125,698	7,247
San Pedro, Los Angeles & Salt Lake	1,105	407,449	191,188	641,198	114,769	110,483	29,688	219,366	15,999	490,305	150,893	—3,711	24,604	122,577	—4,873
Santa Fe, Prescott & Phoenix	257	96,251	31,651	134,352	18,917	9,623	3,864	31,624	5,074	69,102	65,250	.....	10	65,240	5,881
Seaboard Air Line	2,987‡	1,236,181	344,239	1,734,707	227,048	238,437	57,942	530,096	53,839	1,107,362	627,345	—5,395	59,418	562,532	182,056
Southern Indiana	237	109,625	14,096	124,966	16,099	18,480	3,118	32,072	4,628	74,392	50,574	— 26	6,928	43,619	14,005
Southern Kansas Ry. of Texas	125	131,338	18,580	153,305	20,892	24,747	1,804	44,188	3,745	95,376	57,929	.....	1,772	56,157	32,487
Spokane, Portland & Seattle	420§	224,036	62,421	298,435	53,380	29,365	3,711	100,017	7,349	193,822	104,613	—11,869	39,332	53,412	37,940
Tennessee Central	292	93,455	29,476	129,027	18,717	15,065	2,993	38,240	8,202	83,217	45,810	.....	4,199	41,611	29,582
Texas Central	268	77,285	31,494	115,597	11,803	12,169	1,573	31,388	3,820	60,753	54,844	.....	3,074	51,770	—11,449
Vicksburg, Shreveport & Pacific	171	76,100	44,206	131,098	23,431	25,365	3,115	34,767	4,571	91,249	39,849	.....	6,300	33,549	4,407
Virginian	444‡	143,218	17,736	169,732	27,776	31,193	6,138	50,684	7,630	123,421	46,311	388	15,000	31,699	.....
Western Maryland	543	486,543	56,918	569,809	69,940	73,971	7,057	170,857	17,500	339,325	230,484	.....	17,500	212,984	53,505
FIVE MONTHS OF FISCAL YEAR.															
Alabama & Vicksburg	143	$447,372	$203,688	$698,725	$114,004	$107,959	$17,815	$213,513	$25,586	$478,877	$219,848	.....	$21,250	198,598	$67,769
Ann Arbor	301	483,002	233,671	773,892	124,051	85,723	21,765	254,128	21,313	506,980	266,912	$14,596	61,653	219,855	17,638
Atlantic & St. Lawrence	167	338,702	158,954	543,553	198,733	60,145	14,111	144,171	12,993	430,153	113,400	.....	32,178	81,222	44,888
Charleston & Western Carolina	340	468,321	139,824	643,516	149,208	82,201	14,771	209,791	17,866	473,837	169,679	.....	22,375	147,304	35,198
Chicago, Cincinnati & Louisville	285	508,702	151,394	696,047	133,600	103,720	44,266	283,464	29,339	594,389	101,657	.....	17,025	84,633	122,885
Chicago, Peoria & St. Louis	255	582,406	155,413	771,353	109,228	150,483	31,980	271,477	25,951	589,119	182,234	.....	20,750	161,484	72,512
Cincinnati Northern	248	424,358	106,492	557,163	80,960	99,026	14,863	183,885	13,295	392,029	165,134	.....	20,500	144,634	88,971
Cleveland Terminal & Valley	93	383,515	81,906	552,148	82,075	65,308	7,994	202,724	9,774	367,875	184,273	.....	17,015	167,258	23,765
Detroit, Grand Haven & Milwaukee	190	502,074	285,554	897,520	132,190	118,556	29,387	330,163	31,869	642,165	255,355	182	13,636	241,901	40,571
Detroit, Toledo & Ironton	441	576,510	76,534	702,716	144,558	107,897	15,298	305,791	20,516	594,060	108,656	—127	32,552	75,977	—16,107
Grand Trunk Western	336	1,575,935	853,872	2,593,717	323,551	365,231	114,258	893,675	69,781	1,766,496	827,221	—2,629	145,950	678,642	52,319
International & Great Northern	1,159	2,702,947	836,815	3,762,963	655,515	579,857	91,785	1,442,007	105,441	2,874,605	888,358	.....	106,000	782,358	—84,556
Iowa Central	558	1,156,733	257,099	1,476,450	208,641	210,211	44,558	558,808	43,832	1,066,050	410,400	.....	37,018	373,382	106,081
Louisiana Ry. & Nav. Co.	350	422,847	80,597	560,035	112,641	63,879	24,131	223,576	26,839	451,066	108,969	.....	18,650	90,319	106,204
Midland Valley	324	394,281	138,615	560,623	92,699	111,291	9,414	148,772	22,579	384,755	175,858	—434	40,000	135,434	109,706
Minneapolis & St. Louis	1,027	1,563,867	614,229	2,318,736	243,113	229,638	66,131	793,350	67,463	1,399,695	919,042	—544	101,149	817,348	138,563
Missouri Pacific	3,881*	6,499,645	1,683,850	8,977,303	1,272,991	1,320,859	218,134	3,236,113	221,270	6,269,367	2,707,936	—13,070	301,504	2,393,362	.....
Mobile, Jackson & Kansas City	403	486,952	140,521	674,180	106,044	64,168	10,774	204,627	43,005	428,618	245,562	.....	21,235	224,327	40,915
New Orleans & North Eastern	196	1,037,225	257,383	1,399,612	141,799	228,691	42,150	472,610	50,732	935,982	463,630	.....	42,100	421,530	89,760
New Orleans Great Northern	275†	367,871	149,994	547,539	111,023	76,301	9,713	140,194	22,797	360,028	187,511	—427	4,500	182,584	135,095
Pecos & Northern Texas	152	569,733	120,555	715,452	107,922	90,618	8,317	190,228	19,564	416,649	298,803	.....	6,502	292,301	94,866
St. Joseph & Grand Island	319	498,247	193,950	748,870	161,260	77,078	32,195	264,664	21,751	556,948	191,922	346	27,189	165,079	—99,650
St. Louis, Brownsville & Mexico	456	360,411	177,109	572,352	152,496	52,988	12,882	194,017	31,796	444,179	128,173	.....	18,000	110,173	19,476
St. Louis, Iron Mtn. & Southern	2,610	8,015,075	2,229,296	11,098,837	1,619,993	1,556,236	272,686	3,249,989	331,212	7,030,116	4,068,721	—23,549	353,330	3,691,842	658,240
San Antonio & Aransas Pass	727	1,262,428	456,213	1,807,810	243,963	214,840	22,622	626,005	44,235	1,151,665	656,145	.....	45,000	611,145	—37,494
San Pedro, Los Angeles & Salt Lake	1,105	1,905,712	1,353,578	3,469,245	561,450	513,623	140,377	1,068,302	81,742	2,365,494	1,103,751	—7,165	132,324	964,262	244,179
Santa Fe, Prescott & Phoenix	257	414,552	147,681	599,100	95,711	44,015	14,752	148,334	25,367	328,179	270,921	.....	174	270,747	21,956
Seaboard Air Line	2,987‡	5,388,528	1,665,371	7,761,266	1,122,631	1,053,298	275,422	2,427,474	259,752	5,138,577	2,622,689	—12,728	297,090	2,312,871	766,156
Southern Indiana	237	517,999	78,010	604,566	78,299	82,341	11,107	151,322	24,505	347,574	256,992	—823	34,642	221,527	90,631
Southern Kansas Ry. of Texas	125	569,397	105,545	691,874	82,588	104,858	8,699	207,538	17,763	421,446	270,428	.....	8,420	262,008	152,747
Spokane, Portland & Seattle	420§	1,068,930	348,248	1,468,353	229,333	117,355	14,950	453,551	30,089	845,278	623,075	—8,840	135,143	479,092	429,114
Tennessee Central	292	445,201	174,226	649,897	83,640	75,299	18,000	199,516	40,942	417,397	232,500	.....	20,998	211,502	62,694
Texas Central	268	251,256	163,619	448,170	91,211	65,071	8,111	138,964	19,003	322,360	125,810	.....	15,037	110,773	—64,243
Vicksburg, Shreveport & Pacific	171	350,259	203,933	600,397	100,220	110,543	16,731	169,741	21,236	418,471	181,926	.....	31,500	150,426	30,663
Virginian	444‡	621,413	91,223	751,053	136,113	136,609	29,504	213,548	36,598	552,372	198,681	2,488	53,000	148,169	.....
Western Maryland	543	2,340,856	442,287	2,910,553	390,430	382,501	48,511	837,047	69,146	1,727,635	1,182,918	.....	87,500	1,095,418	144,662

* Began operations Aug. 9, 1909, consolidation of Central Branch Ry. and Missouri Pacific Ry. and branches. † Mileage operated Nov. 30, 1908, 113. ‡ Includes Atlanta & Birmingham Air Line; Catawba Valley Ry.; Tallahassee, Perry & Southeastern Ry.; Plant City, Arcadia & Gulf Ry., and Florida West Shore Ry. from Nov. 1, 1909. § Mileage operated Nov. 30, 1908, 272. ‡ Began regular operations July 1, 1909. — Indicates Deficits, Losses and Decreases.

Need of Science and Economy in Farming.

I have noted with regret expressions of satisfaction and self-congratulation upon the part of the press over the fact that the aggregate value of farm products has increased from $4,417,000,000 in 1898 to $8,760,000,000 in 1909, unmindful of the disturbing fact that this increase in value is the result almost entirely of increased acreage and a startling increase in price per bushel, and not the result of an increased yield per acre. This failure to increase the production of the nation's farms by increasing the number of bushels per acre is steadily and rapidly increasing the cost of living. Given the same intelligent methods of seed selection, fertilization and cultivation, our lands will produce as large crops as those of any other nation; but during the last ten years our farms have produced an average yield of wheat of less than 14 bushels per acre. England produces more than 32, Germany about 28, the Netherlands more than 34, and France approximately 20. It is the same with other crops. Potatoes are a food staple of the poor man. Our average yield is 85 bushels per acre, while Germany, Belgium and Great Britain produce 250 bushels. Germany, with an arable area no greater than some of our largest states, produces approximately two billion bushels of potatoes annually, while the aggregate crop of the United States averages barely 275 million bushels; and in the year ended June 30, 1909, we imported 8,400,000 bushels. The only salvation for the country is an immediate awakening to an appreciation of the overshadowing importance of this condition, followed by a systematic campaign of education.

I am going to ask President Schurman to furnish men among the Cornell graduates to direct the work of developing the abandoned and wornout farms in this state, which the railway company was buying. The movement is not a philanthropic one, it is one of self-preservation. As soon as we have sufficiently improved one farm we shall sell it and take up another in an adjoining county. The value of farm products could be doubled without increasing the acreage and New York should be a leader in this work. Maine has raised 225 bushels of potatoes an acre, as against 82 bushels an acre in New York. There should be a first-class manual training school to every high school, college or university, providing accommodation therein for every child in the community with attendance compulsory. —*W. C. Brown*, at Cornell University.

INTERSTATE COMMERCE COMMISSION.

The commission in concluding its annual report on the street railways of the District of Columbia says: "We renew our recommendation of a year ago that this commission be relieved of the duty of supervising the street railway service of the District of Columbia. The Interstate Commerce Commission is charged with the responsibility of regulating the great interstate carriers of the country, an undertaking of sufficient magnitude to demand all of the time and personal attention of the members of the commission. The supervision of a city's local street-car service presents a problem essentially different in character and entirely foreign to the purpose for which this commission was established. Moreover, as pointed out in our last report, the members of the commission must necessarily be absent from Washington for extended periods throughout the year, thus rendering impossible that intimate touch with local conditions which is believed to be necessary if the intent of the act of May 23, 1908, is to be effectuated. These considerations prompt us to strongly urge that Congress place this work and responsibility in some other hands."

Amending Original Proceedings.

Louis Werner Saw Mill Co. v. Illinois Central. Opinion by Commissioner Clements.

The rates having been found to be unreasonable, complainant subsequently filed its petition for reparation, but upon its application the case was dismissed without prejudice. Upon motion for reinstatement *nunc pro tunc* it was so ordered.

The commission has no authority to permit a complaint to be amended to make the original proceedings embrace a new cause of action even though relating to the same subject matter.

The commission has no jurisdiction to deal with complaints for reparation in any way unless filed with or presented to it within the period specified in the statute.

The commission is not vested with the powers of a court of equity to relieve from hardships resulting from improvident arrangements between the parties. (17 I. C. C., 388.)

Increased Rates on Cotton Seed Oil Reasonable.

Memphis Cotton Oil Co. et al. v. Illinois Central et al. Opinion by Commissioner Harlan.

The long-continued maintenance of a lower rate raises no presumption of law that a newly established higher rate is unreasonable. The fact that the lower rate remained undisturbed for many years has probative value and considered merely as evidence must ordinarily have much weight, in the absence of some explanation showing the propriety and need of an increased rate. But in every case all pertinent facts must be considered before an increased rate may be held to be unreasonable and therefore unlawful. On the facts shown of record the present increased rates on cotton-seed oil from Memphis to Louisville, Cincinnati and Chicago are not found to be unreasonable, although lower rates between those points had been in effect for many years. (17 I. C. C., 313.)

Des Moines Case Decision Followed.

Ottumwa Commercial Association v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Harlan.

The through charges under the class rates from points east of the Indiana-Illinois state line to Ottumwa, in the state of Iowa, found to be unreasonable and excessive; it is also found that the through charges are unreasonable and excessive because of the excessive proportional class rates applicable from the Mississippi river crossings of the defendants on through movements to destination. Defendants are therefore required to reduce the latter rates for the future. *Greater Des Moines Committee v. C., R. I. & P. Ry. Co.*, 17 I. C. C., 54 and 57, cited and followed. (17 I. C. C., 413.)

Reduction in Cotton Rate from Jackson, Tenn.

Railroad Commission of Tennessee v. Ann Arbor et al. Opinion by Commissioner Prouty.

Covington, Brownsville and Jackson, in Tennessee, are situated upon a line drawn east from the Mississippi river, Covington 16 miles from the river, Brownsville 20 miles east of Covington, and Jackson 25 miles east of Brownsville; the present rate on compressed cotton to New England mills is 60½ cents from Covington, 60½ cents from Brownsville and 70 cents from Jackson. The complaint is that this adjustment of rates is an unjust discrimination against Jackson. Looking at the entire situation, the present adjustment of rates between Brownsville and Jackson unduly discriminates against Jackson, and the rate to New England destinations from Jackson ought not to exceed that from Brownsville by more than 5 cents per 100 lbs. (17 I. C. C., 418.)

Jurisdiction Over Station Facilities.

William C. Snook v. Central of New Jersey. Opinion by Commissioner Harlan.

The general rule that a tribunal, whose authority is invoked by a complaint filed before it, must determine whether the subject matter is within its jurisdiction before it may consider the merits of the controversy does not in all cases necessarily control an administrative body like this commission.

Following the course pursued in *Jones v. St. Louis & San Francisco*, 12 I. C. C., 144, and without determining at this time whether the commission has jurisdiction to require interstate carriers to erect or to continue to maintain station facilities at particular points, the facts of record here have been examined for the purpose of ascertaining whether, assuming such power to exist in the commission, enough has been shown to warrant an order requiring the defendant to

continue to maintain station facilities at Roycefield, N. J. On all the testimony of record the discontinuance of the defendant's agency station at the point in question cannot be regarded as a violation of the act to regulate commerce. (17 I. C. C., 375.)

STATE COMMISSIONS.

The Chicago, Rock Island & Pacific, the St. Louis & San Francisco, the Midland Valley, the Atchison, Topeka & Santa Fe, the Missouri, Kansas & Texas and the Kansas City Southern have been cited for contempt by the Oklahoma Corporation Commission because they have not complied with the order requiring them to keep their accounts according to a method prescribed by the commission. The charge is that they did not separate the revenue derived both from state mail and express business from that derived from interstate mail and express business. At a hearing on January 13 accounting officers of the roads testified that it is impossible for them to comply with the commission's order. They stated that the mail and express accounts were kept for the entire system and the cost apportioned to each state and that the roads had never tried to ascertain the relative revenue from state and interstate express and mail business.

Wisconsin: Shipper's Duty to Inspect Tariffs.

F. Mayer v. Illinois Central and the Chicago & North Western.

Petition alleging overcharge on a carload of scrap iron from Monroe, Wis., to West Bend, Wis. Through an error petitioner had been quoted a joint rate of 7 cents per 100 lbs., instead of 10 cents, the lawful published rate.

It is held that the petitioner was not justified in relying on the erroneous quotation, and that he should have examined the tariffs which the railway is required to keep in every station. The rate charged, however, was above the level under which heavy and low grade articles will move, higher than the ordinary commodity rates on scrap iron, and higher than the cost of transportation warrants; a joint rate of 8 cents per 100 lbs. would have been a reasonable charge. Refund ordered on this basis. (3 W. R. R. C., 268.)

Wisconsin: Relation of Concentration Rates to Other Rates.

G. C. Fergot v. Chicago & North Western.

Petition claimed that the rate of 4½ cents per 100 lbs., exacted by the respondent from the petitioner for a carload of wood bolts from Embarrass to Menasha, was unreasonable and excessive in comparison with a rate of 1½ cents per 100 lbs., which had heretofore been charged for such shipments and which was still in effect from other points producing wood bolts. Respondent contended that the 1½-cent rate was a transit rate and therefore not comparable with the regular class rate of 4½ cents.

The commission holds that concentration rates are not independent rates in and of themselves, and that they depend on the rates on the products out. Where such products cannot be shipped over the same line it is not unjust discrimination on part of the carrier to demand higher rates; but the rate in this case was higher than the value of the commodity warranted and higher than the rates charged for other commodities of a similar character. It was also higher than the cost of the transportation warranted. The respondent is ordered to reduce its rate of charge on the carload of bolts involved from 4½ cents to 3 cents per 100 lbs. and refund to the petitioner the difference between these two rates. (3 W. R. R. C., 248.)

COURT NEWS.

Judge John F. Philips in the United States circuit court at Kansas City January 22 issued an order restraining the Missouri, Kansas & Texas from refusing to accept liquor shipments consigned to Kansas and Oklahoma. This road sometime ago issued an order directing its representatives to refuse shipments of liquor for Oklahoma and Kansas, which are prohibition states. Judge Philips held that as it is a common carrier it cannot refuse such consignments.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

A. S. Steirer has been elected assistant secretary and auditor of the Gulf & Interstate, with office at Galveston, Tex., succeeding O. C. Van Zandt, resigned.

Frank H. Moore has been appointed assistant attorney of the Kansas City Southern, with office at Kansas City, Mo., succeeding F. H. Wood, resigned to accept service elsewhere.

W. J. Shotwell, general agent of the Western Pacific and the Denver & Rio Grande at San Francisco, Cal., has been appointed assistant to the vice-president in charge of traffic of the Western Pacific, with office at San Francisco.

L. V. Porter has been appointed assistant auditor of the Lake Shore & Michigan Southern, the Lake Erie, Alliance & Wheeling, the Chicago, Indiana & Southern, the Indiana Harbor Belt and the Mahoning Coal Railroad, with office at Cleveland, Ohio, succeeding G. M. Glazier, promoted.

Edward M. Wise, whose appointment as vice-president and general manager of the Pan-American at Gamboa, Oaxaca, Mex., has been announced in these columns, was born on October 31, 1871, at Decatur, Ala. He was educated in the common schools of Morgan county, Alabama, and began railway work in February, 1890, with the Louisville & Nashville, since which time he has been consecutively to August, 1893, operator and agent of the North and South Alabama division of the Louisville & Nashville. On September 15, 1893, he went to the Chicago, Rock Island & Pacific at Fort Worth, Tex., as operator and bill clerk, and in December of the same year he was made operator and claim clerk of the Gulf, Colorado & Santa Fe at Galveston. In October, 1894, he became joint foreman of terminals of the same company at Galveston, leaving that position in February, 1899. The following month he went to the Mexican Central, now a part of the National Railways of Mexico, as chief clerk and agent at Tampico, Mex., and two years later was made agent at Mexico City of the National Railroad of Mexico, also now a part of the National Railways of Mexico. From June to October, 1902, he was terminal superintendent of the Tehuantepec National at Puerto, Mex., leaving that position on October 20 to become terminal superintendent of the Interoceanic Railway, now part of the National Railways of Mexico, at Vera Cruz. In March, 1903, he returned to the Tehuantepec National as superintendent, with office at Rincon Antonio, Mex., and from August 1, 1904, to November 20, 1908, was superintendent of the Mexican Railway at Mexico City, leaving that position to become assistant to the president of the Pan-American at Gamboa, from which position he was promoted to vice-president and general manager.



Edward M. Wise.

William Hodgins Biggar, whose appointment as general counsel of the Grand Trunk and the Grand Trunk Pacific was recently announced in these columns, was born on September 19, 1852, at Murray, Ont. Mr. Biggar was educated in the Trenton high school and later attended Canada college at Toronto. He was a law partner of the solicitor of the Grand Trunk in 1881, and became assistant general counsel of the

Grand Trunk on January 1, 1903. He was appointed general solicitor on December 1, 1904, which position he held at the time of his recent appointment.

H. E. Byram, assistant to the second vice-president of the Chicago, Burlington & Quincy at Chicago, has been appointed assistant to the first vice-president, and will have jurisdiction over the operating departments. C. G. Burnham will continue as assistant to the first vice-president and will have jurisdiction over the traffic departments.

Robert S. Logan, whose appointment as assistant to president of the Grand Trunk has been announced in these columns, is also assistant to president of the Grand Trunk Pacific, with office at Montreal, Que. Mr. Logan was born on February 13, 1864, at St. Louis, Mo. He was educated in the St. Louis grammar schools and began railway work on October 1, 1885, as a clerk in the general manager's office of the Wabash, St. Louis & Pacific, now a part of the Wabash. He was appointed secretary to the general manager of the Wabash on December 1, 1890, and went to the Grand Trunk on July 1, 1896, in the same capacity. He was made assistant to the general manager of the same company on December 1, 1900, and the following March was elected vice-president and general manager of the Central Vermont. On March 17, 1902, he was appointed assistant to the second vice-president of the Grand Trunk, which position he held at the time of his recent appointment.

Operating Officers.

C. T. Dabney, whose appointment as special agent on the staff of the general manager of the Pennsylvania Railroad was recently announced in these columns, was born in Hanover county, Va. He began railway service in June, 1867, since which time he has been consecutively to August, 1881, with the Chesapeake & Ohio as agent and operator, traveling auditor and chief clerk to the general superintendent. From August, 1881, to June, 1887, he was with the Virginia Midland, now a part of the Southern, as chief clerk and master of transportation, and from June, 1887, to August, 1889, he was superintendent of the Eastern division of the Chesapeake & Ohio. From August, 1889, to June, 1890, he was general manager of a street railway at Richmond, Va., and from November, 1890, to August, 1900, was superintendent of the Buffalo and Rochester divisions of the Western New York & Pennsylvania. He entered the service of the Pennsylvania in August, 1900, when the Western New York & Pennsylvania came under the control of the Pennsylvania. Mr. Dabney was superintendent of the Chautauqua division until 1903, when he was made superintendent of the River and Low Grade divisions. In April, 1907, he became superintendent of the Central division of the Philadelphia, Baltimore & Washington, which position he held at the time of his recent appointment.



C. T. Dabney.

J. H. McCloughlin has been appointed an assistant superintendent of the Montana division of the Oregon Short Line, with office at Pocatello, Idaho, succeeding C. P. A. Lonergan, resigned to accept service elsewhere.

J. B. Harris, trainmaster of the Chesapeake & Ohio, at Thurmond, W. Va., has been appointed chief car distributor at Hinton, in charge of coal car supply and distribution on the entire line. S. E. Dearien, assistant trainmaster at Thurmond, succeeds Mr. Harris, and E. G. Chambers has been appointed road foreman of engines and assistant trainmaster of the New river coal district, succeeding Mr. Dearien.

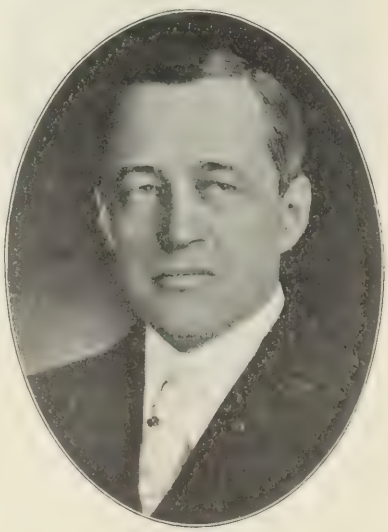
William M. Whitenton, whose appointment as manager of the Southern and Choctaw districts of the Chicago, Rock Island & Pacific, with office at El Reno, Okla., has been announced in these columns, was born September 22, 1867, in Victoria county, Texas. He received his education in the public schools and began railway work in 1883 as water boy on a work train with the Missouri, Kansas & Texas. He learned telegraphy and then became operator and agent. In 1885 he was made despatcher and later acted as chief despatcher and conductor on the Missouri, Kansas & Texas, the Texas & Pacific and the Mexican Central. In 1900 he was made chief despatcher and a year later trainmaster of the Choctaw, Oklahoma & Gulf, now a part of the Rock Island. He was appointed superintendent of the Pan Handle division of the Rock Island in October, 1903, and was transferred to the Arkansas division in July of the following year. A year later he was transferred to the Missouri division, and in September, 1907, was promoted to the general superintendency of the Choctaw district at Little Rock, Ark., from which position he was promoted in December, 1909, to the position of manager of the Southern & Choctaw districts of the C., R. I. & P.



W. M. Whitenton.

F. N. Melius, assistant trainmaster of the New York Central & Hudson River, has been appointed trainmaster, with office at Poughkeepsie, N. Y., succeeding D. W. Hempstead, resigned. W. Williams succeeds Mr. Melius, with office at New York.

W. K. McCoy, whose appointment as superintendent of the River division of the New York Central & Hudson River at Weehawken, N. J., was recently announced in these columns, was born in Allegheny City, Pa., about 40 years ago. He was educated in the common schools of Ohio and later attended the Northwestern University. He began railway work with the West Shore in July, 1885, as telegraph operator and clerk at Buffalo, N. Y., and was promoted to train despatcher in 1887, with office at Newark, N. Y. In 1889 he was made passenger conductor, and the following year became chief train despatcher at Syracuse, with jurisdiction over the line from Ravena to Buffalo. He was appointed trainmaster of the Mohawk division of the West Shore in February, 1897, at Syracuse, and in March, 1903, was transferred to Utica, in charge of the Mohawk & Malone; part of the New York Central & Hudson River. In October, 1906, he was made assistant superintendent of the Mohawk division



W. K. McCoy.

of the New York Central & Hudson River, the West Shore and the Mohawk & Malone, with office at Albany, which position he held at the time of his recent appointment.

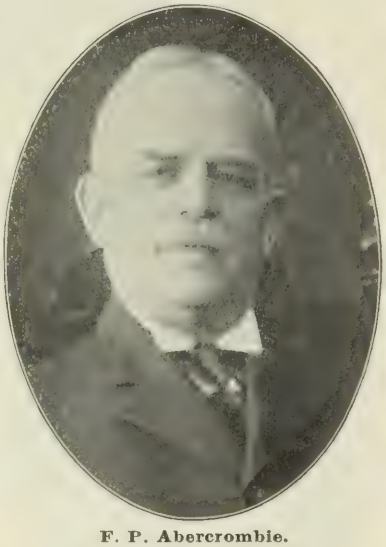
V. T. Kissinger, assistant superintendent of telegraph of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed superintendent of telegraph, with office at Chicago. He succeeds as superintendent of telegraph W. W. Ryder, resigned to go with another company.

W. N. Bannard, whose appointment as special agent on the staff of the general manager of the Pennsylvania Railroad was recently announced in these columns, was born on December 30, 1848, at New York. He graduated from the Massachusetts Institute of Technology, Boston, in 1869, and entered the service of the Pennsylvania as rodman in September of the same year. From 1872 to 1875 he was resident engineer of the West Jersey & Seashore, leaving that position in 1875 to become engineer maintenance-of-way on the same road. In 1883 he was appointed superintendent of the Camden & Atlantic, and the following year was made superintendent of the Amboy division. He was appointed superintendent of the Altoona division in 1891, and in June, 1895, was made superintendent of the Maryland division of the Philadelphia, Baltimore & Washington, which position he held until his recent appointment.



W. N. Bannard.

F. P. Abercrombie, whose appointment as special agent on the staff of the general manager of the Pennsylvania Railroad was recently announced in these columns, was born at Fort Towson, Okla., and graduated from the Rensselaer Polytechnic Institute, Troy, N. Y., in 1873. After graduation he entered the service of the Pennsylvania as assistant supervisor, and in 1875 he was made assistant supervisor of the New York division. The following year he was appointed assistant supervisor of the Baltimore & Potomac, and in January, 1877, was made supervisor. In August, 1880, he was made supervisor of the West Jersey & Sea Shore, and the following December was appointed assistant engineer of that road. He became assistant engineer of the Sunbury and Shamokin divisions in 1885, and in 1891 assistant engineer of the Eastern and Susquehanna divisions, becoming superintendent of the Bedford division in 1896. Three years later he was made superintendent of the Cambria and Clearfield divisions, and the following year superintendent of the Amboy division. In February, 1902, he became superintendent of the New York division, from which position he has been promoted to special agent and assigned to the general manager's office.



F. P. Abercrombie.

J. C. Johnson, whose appointment as superintendent of telegraph of the Pennsylvania Railroad at Philadelphia, Pa., succeeding J. B. Fisher, was announced in the *Railway Age Gazette* in its issue of January 14, page 118, was born on April 26, 1866, at Curtin, in Center county, Pennsylvania. He entered the service of the Pennsylvania Railroad on January 5, 1885, as a telegraph operator on the Schuylkill division. In June, 1887, he was appointed train despatcher of the Schuylkill division, and on January 1, 1903, was made assistant trainmaster of the same division. He was appointed division operator and assistant trainmaster of the Schuylkill division on November 16, 1905, remaining in that position until October 24, 1907, when he became chief clerk to the superintendent of telegraph at Philadelphia, which position he held at the time of his recent appointment.



J. C. Johnson.

J. B. Fisher, whose appointment as superintendent of the New York division of the Pennsylvania, succeeding F. P. Abercrombie, was recently announced in these columns, entered the service of the Pennsylvania Railroad as a clerk in the general superintendent's office at Altoona in 1883. He remained in this position until 1900, when he was made chief clerk to the freight trainmaster of the Middle division, and two years later was appointed assistant freight trainmaster. In 1903 he was appointed freight trainmaster of the Middle division and on April 1, 1907, was made superintendent of telegraph at Philadelphia, which position he held at the time of his recent appointment.



J. B. Fisher.

Traffic Officers.

L. Sevier has been appointed a general agent of the Alabama Great Southern, with office at Birmingham, Ala.

H. A. Willie has been appointed a traveling freight agent of the Wabash, with office at Salt Lake City, Utah.

C. W. Hay has been appointed a traveling freight agent of the Louisville & Nashville, with office at Frankfort, Ky.

H. M. Gregory has been appointed general freight agent of the Jonesboro, Lake City & Eastern, with office at Jonesboro, Ark.

J. H. Geagan has been appointed general freight and passenger agent of the Tremont & Gulf, with office at Winnfield, La., succeeding Alfred Mead, resigned.

E. C. Robinson has been appointed industrial and immigration commissioner of the Louisiana Railway & Navigation Company, with office at Shreveport, La.

H. Page has been appointed general agent of the Missouri,

Kansas & Texas, with office at Dallas, Tex., succeeding G. A. Carter, resigned to accept service with another company.

L. B. Williams has been appointed a soliciting freight agent and I. Benson has been appointed a traveling freight agent of the St. Louis & San Francisco, with office at Cincinnati, Ohio.

J. E. Gosling, contracting freight agent of the New York Central lines at Salt Lake City, Utah, has been appointed agent of the Kanawha Despatch, with office at Salt Lake City.

L. A. Robinson, general passenger agent of the Pittsburgh & Lake Erie, at Pittsburgh, Pa., has been appointed also general passenger agent of the Lake Shore & Michigan Southern, effective February 1.

C. K. Junkins, formerly general agent of the El Paso & Southwestern at San Francisco, Cal., and J. C. Caniff have both been appointed contracting freight agents of the Western Pacific and the Denver & Rio Grande, with office at San Francisco.

William Albert Terry, whose appointment as assistant freight traffic manager of the New York Central Lines West of Buffalo, with office at Chicago, has been announced in these columns, was born March 20, 1864, in Huron county, Ohio. He began railway work in 1879 as telegraph operator on the Canada Southern, now a part of the Michigan Central, since which he has been consecutively to February, 1886, in the train despatcher's office on the Ft. Wayne & Jackson, now a part of the Lake Shore & Michigan Southern, at Jackson, Mich.; in the freight department of the Wheeling & Lake Erie at Marietta, Ohio; train despatcher at Cambridge, Ohio, and ticket agent at Marietta, Ohio, with the latter road. From September, 1890, to January, 1891, he was in the office of the master car builder of the Pittsburgh & Western, now a part of the Baltimore & Ohio, and he was then made commercial agent of the Wheeling & Lake Erie at Pittsburgh. Four years later he went as commercial agent to the Cincinnati, Hamilton & Dayton and the Cleveland, Lorain & Wheeling, now a part of the Baltimore & Ohio. He was made assistant general freight agent of the Pittsburgh & Lake Erie in September, 1897, and in January, 1903, became general freight agent, which position he held until his recent appointment as assistant freight traffic manager of the New York Central Lines West of Buffalo.



W. A. Terry.

T. C. Clifford, superintendent of dining cars of the Erie at Jersey City, N. J., has been appointed also general baggage agent of the Erie and controlled lines, with offices at Jersey City, effective February 1.

G. A. Mitchell, assistant general passenger agent of the Northern Pacific at St. Paul, Minn., has been appointed an assistant general freight agent, with office at St. Paul, succeeding J. O. Dalzell, assigned to other duties.

T. E. Eismann has been appointed chief of the tariff bureau of the Michigan Central, with office at Detroit, Mich., succeeding N. D. Chapin, transferred to a position in the freight traffic department of the New York Central Lines in New York.

J. W. Daly, general passenger agent of the Lake Shore & Michigan Southern, at Cleveland, Ohio, has been appointed to the new position of assistant passenger traffic manager of the New York Central Lines west of Buffalo, with office at Chicago, effective February 1.

R. M. Baumgardner has been appointed New England freight agent of the Toledo, St. Louis & Western, the Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, with office at Boston, Mass. F. B. Townsend has been appointed coal freight agent, with office in Chicago.

Bernard Edward Morgan, whose appointment as general freight agent of the New York, Chicago & St. Louis, with office at Cleveland, Ohio, has been announced in these columns, began railway work October 1, 1884, with the New York, Chicago & St. Louis. In March, 1888, he was appointed contracting agent of the Interstate Despatch Line at Chicago, and three years later went with the Traders' Despatch as traveling freight agent at Chicago. In September, 1893, he was made western freight agent of the New York, Chicago & St. Louis at Omaha, Neb., which position he held until February, 1901. He was then made commercial agent and later assistant general freight agent, with office at Chicago, and in September, 1909, was appointed manager of the Traders' Despatch, from which position he has recently been promoted.



B. E. Morgan.

Eugene Fox, whose appointment as general freight and passenger agent of the El Paso & Southwestern and the Morenci Southern, with office at El Paso, Tex., has been announced in these columns, was born January 18, 1877, at Winterset, Iowa. He was educated in the public schools at Stuart, Iowa, and Hutchinson, Kan., and began railway work at Hutchinson in June, 1898, with the Chicago, Rock Island & Pacific as a yard clerk. He was then consecutively weigh master, ticket clerk, bill clerk and cashier for the freight department. In September, 1899, he became traveling freight agent, with office at Salt Lake City, Utah, and the following year was transferred to St. Louis, Mo. In October, 1902, he was appointed joint traveling freight and passenger agent of the Rock Island and the El Paso & Northeastern at El Paso, Tex. When the El Paso & Northeastern and the El Paso & Southwestern were consolidated, in June, 1905, he was appointed general agent for both lines at Los Angeles, Cal., and the next year he was appointed general agent at Chicago, which position he held until May, 1909, when he was made assistant general freight agent at El Paso, from which position he has recently been promoted.



Eugene Fox.

Charles E. Perkins, whose appointment as general freight agent of the St. Louis, Iron Mountain & Southern, with office at St. Louis, Mo., has been announced in these columns, was born March 31, 1871, in Chicago. He prepared for college at Williston Seminary, North Hampton, Mass., and spent two years at Amherst College. He began railway work in October, 1891, with the Kansas City, Ft. Scott & Memphis, now a

part of the Frisco, and remained in the tariff department of that road for five years. He then became chief clerk to the general agent of the St. Louis & San Francisco at Kansas City, and in October, 1897, became chief tariff clerk for the Kansas City, Pittsburgh & Gulf, now the Kansas City Southern; he was then promoted to chief clerk and later to assistant general freight agent. In March, 1909, he was appointed assistant general freight agent of the St. Louis, Iron Mountain & Southern, at St. Louis, which position he held until his recent promotion.

Engineering and Rolling Stock Officers.

P. C. Withrow has been appointed mechanical engineer of the Denver & Rio Grande, with office at Burnham station, Colo.

Richard Lanham, road foreman of engines of the St. Louis, Iron Mountain & Southern, at De Soto, Mo., has been appointed a master mechanic, with office at Paragould, Ark.

Arthur Caldwell has been appointed an assistant division engineer of the Baltimore & Ohio, with office at Washington, Ind., succeeding F. J. Parrish, resigned to engage in other business.

W. J. Bohan, electrical engineer of the Northern Pacific at St. Paul, Minn., has been appointed mechanical engineer, with office at St. Paul, succeeding J. E. O'Brien, resigned to go with another company.

W. L. Madill, supervisor of the Erie at Thompson, Pa., has been appointed supervisor of the Northern of New Jersey; the New Jersey & New York and the Piermont branch of the Erie, with office at Jersey City, N. J.

J. F. Sheahan, master mechanic of the Southern Railway at Knoxville, Tenn., has been appointed master mechanic of the International & Great Northern, with office at Palestine, Tex., succeeding F. S. Anthony, promoted.

J. W. Snyder, assistant supervisor of signals on the Pittsburgh division of the Pennsylvania Railroad at Pittsburgh, Pa., has been appointed supervisor of signals of the Conemaugh division, with office at Pittsburgh, succeeding B. F. Oler, transferred. Guy Toft succeeds Mr. Snyder, with office at Pittsburgh. G. M. Ball, Jr., has been appointed supervisor of division No. 9 on the Middle division, succeeding J. B. Hutchinson, Jr., promoted.

R. J. Arey, division engineer of the Atchison, Topeka & Santa Fe Coast Lines at San Bernardino, Cal., has been appointed engineer of the Grand division of the Coast Lines, with office at Los Angeles, Cal. This is a new office and Mr. Arey's territory is commensurate with that of the general superintendent's; he will relieve the chief engineer of direct charge of all division work. M. C. Bryan, assistant division engineer, succeeds Mr. Arey.

D. S. Watkins, division engineer of the Buffalo, Rochester & Pittsburgh at Du Bois, Pa., has been appointed engineer of construction, in charge of construction of new lines, relocation of existing lines and such other duties as may be assigned, with office at Du Bois. W. F. Pond, assistant engineer of bridges, at Rochester, N. Y., has been appointed office engineer, with office at Rochester. E. W. Hammond has been appointed division engineer of Divisions 1 and 2 and the Erie division, with office at Rochester, and G. C. Cleaver, assistant engineer of track, has been appointed division engineer of Divisions 3, 4 and 5, with office at Du Bois. The division engineers will have charge of track, bridges, buildings and water service. The offices of assistant engineer of track, and assistant engineer of bridges and buildings, have been abolished.

Purchasing Officers.

J. H. Guess, purchasing and fuel agent of the National Railways of Mexico at City of Mexico, Mex., has been appointed general purchasing agent of the Mexican International and the Interoceanic, with office at City of Mexico, and his former title has been abolished. A. Herrera has been appointed purchasing agent, with office at City of Mexico, succeeding Carl H. Smith, resigned. Henry Mel, material agent at Beaumont, Tex., has been appointed assistant purchasing agent, with office at Beaumont, and William Hollis has been appointed material and fuel agent of the National Railways of Mexico and the Mexican International, with office at Ciudad Porfirio Diaz, Mex.

OBITUARY.

Archer Baker, general European traffic manager of the Canadian Pacific, with headquarters in London, Eng., died on January 15 of congestion of the lungs and pneumonia at the age of 64 years. Mr. Baker was born in England, and came to Canada in 1871. He held several important positions in connection with the Canadian Pacific and other railways before he was appointed traffic manager in London. He was successful in organizing the emigration movement to Canada among foreigners.

E. P. Bryan, for about eight years, 1900-1908, vice-president of the Interborough Rapid Transit Co., at New York, died on January 23 at San Juan, Porto Rico. Mr. Bryan was born in Ohio in 1847. He began railway work in 1865 as telegraph operator on the Louisville & Nashville at Lebanon, Ky., and remained in the service of that company until 1895. Previous to August, 1891, he was agent at Frankfort, and from August, 1891, to the following March was superintendent of terminals at Louisville. He was appointed superintendent of terminals of the same company at St. Louis, Mo., in March, 1892, remaining in that position until November, 1895, when he was made vice-president and general manager of the Terminal Railroad Association of St. Louis. In May, 1900, he was chosen vice-president of the Interborough Rapid Transit Co., New York City, and organized the operating department of the subway lines, which were opened for business in the autumn of 1904. He was afterward promoted to the position of president. He resigned in 1908.

William Buchanan, superintendent of motive power of the New York Central & Hudson River for 18 years up to 1899, and one of the best known mechanical officers in the country, died last week Thursday, at his home in South Norwalk, Conn. Mr. Buchanan was born in Scotland, March 6, 1830. He came to this country when a boy and began railway work in the summer of 1847. In 1849 he was an apprentice in the shops of the Albany & Schenectady, but soon went to the Hudson River road, where he remained the rest of his active life. For three years he was machinist and shop foreman. In 1853 he became master mechanic, and in April, 1880, was made superintendent of motive power of the Hudson River and Harlem divisions. From April, 1881, to his resignation in May, 1899, he was superintendent of motive power and rolling stock of the whole system—the New York Central & Hudson River, the West Shore, the Rome, Watertown & Ogdensburg and the Dunkirk, Allegheny Valley & Pittsburgh. Mr. Buchanan was nearly, if not quite, the finest example of an early type. Beginning at the bottom, without preliminary education, he went to the top of the same department of the same railway and served the same employers, and their successors, for 52 years. While he never lost his ancestral inheritance of caution, persistence and some obstinacy, nevertheless this self-made Scot was not nearly so bigoted as such men are liable to be. He was probably prevented from becoming a bigot by his sweet kindliness and his strong liking for his friends and for human beings generally. This inevitably resulted in an increase of respect for the opinions of others. Buchanan's place as a designer of locomotives is a highly important one, in spite of his fundamental defect of a lack of such theoretical knowledge and training as would have enabled him to make independent scientific investigations. He is most often remembered as the man who developed to its utmost the efficiency of the American type (4-4-0) locomotive. He undoubtedly clung too long to that type when its availability was unequal to the economic requirements of increased power. When the West Shore railway was building, 28 years ago, it was to be a damaging rival of the New York Central, but it is an instance of Buchanan's broadminded scientific spirit that he gave to Howard Fry, the superintendent of motive power of the West Shore, every facility for studying New York Central locomotive operation. Howard Fry was a great scientific man, and the writer recalls Fry's judgment after spending a week in riding on Buchanan's freight locomotives between New York and Buffalo: "Nobody gets more out of a pound of coal than Buchanan does."

Railway Construction.

New Incorporations, Surveys, Etc.

ALGOMA CENTRAL & HUDSON BAY.—According to press reports work is to be started soon on the extension of this road north to a connection with the Canadian Pacific, about 200 miles. Surveys have been made from the present end of the track at Chippewa river, mile 69, in Ontario, north to Michipicoten, mile 103.65.

BOISE-BUTTE.—Incorporated in Idaho to build a line through Boise, Custer and Lemhi counties, in Idaho, thence northeast to Butte, Mont. S. H. Bracer, F. A. Dolph, G. T. Wiswell, C. Blackburn, all of Chicago; J. W. Gilbert, New York; J. P. Hornaday, Pittsburgh; J. E. Bell, Addison, Mich., and F. Weeks, Boston, Mass., are interested.

CHICAGO, MILWAUKEE & PUGET SOUND.—According to press reports contracts have been let to the Lorimer & Gallagher Co. and the J. H. Flick Co., both of Chicago, for filling in many of the wooden trestles with earth and rock, reducing grades, lessening curves and putting in heavier rail on the line between Plummer, Idaho, and Seattle, Wash. The work is to be started this spring and finished by October for the operation of through passenger trains and fast mail service.

COLEMAN, LLANO & SOUTHERN.—This company, which was said to be securing rights-of-way from Coleman, Tex., south to Brady, about 45 miles, has been incorporated in Texas with $500,000 capital and headquarters at Coleman. The plans call for a line from Coleman south to San Antonio, about 175 miles. The directors include: H. N. Beakley, J. A. S. Miller, H. R. Starkwater, J. E. Roogostock and R. A. Lane.

CYNTHIANA & PARIS.—Organized to build from Cynthiana, Ky., south via Lair to Paris, 14 miles. There will be several small bridges and a 1,200-ft. crossing of the South Licking river. R. H. Rees, Cynthiana, is engineer in charge; W. H. Lail, Cynthiana; F. L. Fuller, New York, and R. W. Day, Scranton, Pa., are said to be interested.

DES CHUTES RAILROAD.—See Oregon Trunk Line.

GALVESTON-HOUSTON (ELECTRIC).—This company is said to have given a $5,000,000 mortgage to the City Trust Co., Boston, Mass., to secure funds for the construction of the line from Houston, Tex., southeast to Galveston, 51 miles. The company is backed by the Stone-Webster syndicate, Boston.

KANSAS NORTHWESTERN.—Contract is said to have been let to the Electric Traction Construction Co. to build this line. The first section to be built will be from Great Bend, Kan., southeast to Calista, about 70 miles. The plans include an extension from Calista east to Wichita or south to Oklahoma City, Okla. On the northern end the line is to be eventually extended northwest to Benkelman, Neb., in all about 330 miles. W. R. Crompton, Great Bend, may be addressed. (Dec. 10, p. 1167.)

METROPOLITAN STEAM & ELECTRIC RAILWAY.—This company, which was recently organized under the laws of Delaware, with headquarters at San Antonio, Tex., to build a system of electric interurban lines in south Texas, has completed surveys between San Antonio, Tex., and New Braunsfels, 30 miles. Surveys are now being made for other lines. It is said that the project has been financed and that construction work will be started soon. The first section to be built will be from San Antonio northeast to New Braunfels, which will be continued to Austin, about 85 miles. A line is also to be built from New Braunfels east via Seguin to Gonzales, about 60 miles. The company proposes to eventually extend this line to Houston. E. L. Squire, Wilmington, Del.; J. C. Marmion, San Antonio, and M. Kauffman, Yorktown, are stockholders.

NORTHERN ELECTRIC.—See Scranton & Binghamton.

NORTHERN PACIFIC.—The Toppenish, Simcoe & Western is said to have surveys made for the line from Toppenish, Wash., southwest to Goldendale, and contracts are let for work on the first 17 miles. The line is eventually to have a total length of about 90 miles. (Dec. 24, p. 1260.)

OAKLAND & ANTIOCH (ELECTRIC).—Work will be started at once, it is said, from Oakland, Cal., northeast via Berkeley, Walnut Creek and Concord to Bay Point, 34 miles. H. A. Mitchell, president, 347 Grant avenue, San Francisco.

OKLAHOMA CITY & FORT SMITH TRACTION.—Incorporated in Oklahoma, with $100,000 capital, to build about 200 miles of line. The projected route is from Oklahoma county, Okla., east to Fort Smith, Ark. The directors include: B. S. Bath, P. M. Mowry, F. M. Wood, A. M. Gaston, G. L. Wood and J. Wils, all of Oklahoma City.

OREGON RAILROAD & NAVIGATION CO.—According to press reports $700,000 has been appropriated to build a cut-off between Stanfield and Coyote in Oregon. It is said that improvements are also to be made on the road between Pendleton and Yoakum. (Jan. 14, p. 114.)

OREGON TRUNK LINE.—According to press reports the Hill and the Harriman interests have reached an agreement regarding rights-of-way from the Columbia river south through the Des Chutes valley into central Oregon. The Des Chutes Railroad, which is being built by the Harriman interests, will be built along the east side of the Des Chutes river, and the Oregon Trunk, under construction by the Hill interests, will be built along the west side, and each line may use the right-of-way of the other over certain portions of the route. (Jan. 21, p. 164.)

OSAGE WESTERN.—An officer writes that grading will be started about February 1 on a line from Vinita, Okla., west via Nowata, Bartlesville, Pawhuska, Fairfax and Bliss to Billings, Mont., about 178 miles. The line will have 0.6 per cent. grades, 3 deg. of curvature, and is to be laid with 70-lb. rail. A bridge is to be put up over the Arkansas river, also another over the Verdigris river. A roundhouse will be built at Vinita and another at Enid. The Overland Construction Co., Fairfax, are the contractors. The general offices of the company are at Vinita. R. H. Hoss, president, Fairfax; E. J. Noonan, chief engineer, Vinita. (See Osage & Western, Jan. 7, p. 69.)

PAN-AMERICAN.—This company has applied to the Guatemalan government for a concession to build a short line from the Suchiate river to Caballo-Blanco. Work on the international bridge over the Suchiate river is to be pushed, and it is expected to have it in operation by April 1. It is said that the company is planning to build several branch lines in the state of Chiapas, Mex.

PINE PASS RAILWAY.—Application has been made to the Dominion parliament for incorporation to build from Edmonton, Alb., northwesterly to the confluence of the McLeod and the Athabasca rivers, thence via Pouce Coupe Prairie, thence southwesterly to Fort George, on the Fraser river, B. C. The capital of the company is to be $1,000,000, and the headquarters will be at Edmonton. The provisional directors include: M. Kimpe, J. Smith, T. W. Lines, A. R. Chisholm and B. J. Saunders, all of Edmonton.

PORTLAND, EUGENE & EASTERN (ELECTRIC).—This company is planning to build 40 miles of line east to the McKenzie river timber district.

PRAIRIE FARM & SOUTHWESTERN.—Incorporated in Wisconsin to build from Prairie Farm, Wis., southwest to St. Paul, Minn., and Minneapolis. G. E. Scott, president.

QUEBEC CENTRAL.—A consular report says that the 30-mile extension of this road from St. George, Beauce, Quebec, to St. Justine, Dorchester county, has been opened for traffic. (Jan. 7, p. 69.)

REID-NEWFOUNDLAND.—According to press reports a contract has been entered into between this company and the Newfoundland government for the construction of five branch lines, in all about 300 miles. The lines are to be built from Shoal Harbor to Bonavista bay, 75 miles; Broad cove to Heart's Content and Grete's cove, 62 miles; Ransford bridge to Trepassy, 70 miles; Country Chance to Fortune bay, 48 miles, and from Bay of Islands to Bonne bay, 42 miles.

ROGUE RIVER VALLEY.—This company is said to have plans made for building an extension, from Jacksonville, Ore., southwest to Ruch, nine miles.

SCRANTON & BINGHAMTON TRACTION CO.—Application will

be made for a charter to operate a line from Binghamton, N. Y., south to Scranton, Pa., 62 miles. The Northern Electric, which now operates about 19 miles between these two places, it is understood, will be acquired and form part of the through line. J. K. Griffiths and C. H. Campbell are said to be interested. George R. Bedford, Wilkesbarre, is solicitor for the company.

Shawnee (Electric).—An officer is quoted as saying that work is to be started at once on this line. The projected route is from Shawnee, Okla., northeast to Muskogee, thence west via Oklahoma City to El Reno. It is expected that the section from Oklahoma City to Shawnee will be in operation by September of this year. A. Hardgrave is said to be general manager at Shawnee.

Stockton Terminal & Eastern.—Right-of-way is said to have been secured, and work is now under way, from Stockton, Cal., northeast via Linden and Bellota to Jenny Lind, 28 miles. M. J. Gardner, president; J. E. Adams, manager, Stockton.

Texas Roads.—According to press reports from Pecos, Tex., the construction of a line from Pecos southwest via Saragosa, Balmorhea and the Toyah valley to the Davis mountains, about 60 miles, is assured. W. L. Carwile, Dallas, Tex., and C. W. Swenson are said to be interested.

Texas Roads (Electric).—A system of electric lines is to be built out of San Benito, Tex., aggregating about 30 miles, connecting that place with several points in the lower Rio Grande valley. Preliminary surveys for the main line from San Benito south to the Rio Grande, about 10 miles, have been made. Bonuses for about $100,000 have been pledged to aid the project. S. A. Robertson, representing a syndicate of St. Louis, Mo., and Pine Bluff, Ark., capitalists, is interested.

Surveys are now being made for a line from Realitos, Tex., on the National Railways of Mexico southeast to Falfurrias, thence northeast via Kingsville to Corpus Christi, about 85 miles. It is proposed to use gasolene motor cars and at a later time electricity may be used as the motive power. Burton & Danforth, San Antonio, who own large tracts of land in that section, are said to be back of the project.

Toppenish, Simcoe & Western.—See Northern Pacific.

Tri-City & Northwestern.—New surveys are said to be under way for a line from Rapids City, Ill., southwest via Hampton to Watertown. The company is said to have options on a right-of-way from Albany southwest to Watertown. W. Treichler, chief engineer, Rapids City.

Trinity Valley & Northern.—See an item regarding this company under Railway Financial News.

Union Pacific.—According to press reports this company has filed maps covering the route of a proposed extension of the branch now ending at Northport, Neb. The route from Northport is west through Nebraska, entering Wyoming south of the North Platte river, and passes about nine miles south of Wheatland and 85 miles north of Cheyenne, thence west to a connection with the main line at Medicine Bow, Wyo. At Black Hills a series of tunnels are to be pierced, one of which is to be about 15,000 ft. long. The branch to Northport and the proposed extension west are to form part of a new main line. The company has for a long time had under consideration the building of this cut-off, which will not only reduce its main line mileage, but will enable it to avoid some steep grades. It is understood that the line will be 40 miles shorter than the existing line and will save a climb of about 1,000 ft. The construction of the line has not yet been authorized.

Vera Cruz & Isthmus.—A consular report says that work is now under way on a 44-mile branch from Rives, Vera Cruz, on the main line, north to San Andres, Tuxtla, crossing the San Juan river at Cuatotolapam. A 16-mile branch is being built from the main line at Brisbin, about five miles south of Los Naranjos, to Cerro Colorado, on the Papaloapam river. This branch is to be extended to Cosamaloapam, 28 miles from the main line. Large forces of men are now at work on both lines, and it is expected to finish the line to the San Juan river by March, 1910, and the other branch about the same time. (Dec. 3, p. 1109.)

Railway Financial News.

Atlanta & West Point.—Stockholders have voted to authorize an increase in the capital stock from $1,232,200 to $2,500,000. The new stock is to be offered to shareholders at par and the proceeds of the sale will be used to retire $1,232,200 6 per cent. debenture certificates.

Atlantic Coast Line.—The New York Stock Exchange has listed $1,000,000 addition first consolidated mortgage 4 per cent. bonds of 1902-1952 and has authorized the listing of $17,453,700 additional common stock on notice of exchange for 4 per cent. convertible bonds. The proceeds of the $1,000,000 bonds listed have been used as follows: For rolling stock, $470,000; for new terminals, real estate, shops and double-track, $529,000; to retire certificates of indebtedness, $1,450.

Stockholders of the Winston-Salem Southbound are to vote February 1 on the question of authorizing a mortgage securing $5,000,000 bonds. The bonds, it is said, are to be guaranteed jointly by the Atlantic Coast Line and the Norfolk & Western. (Aug. 6, p. 259.)

Beaumont & Great Northern.—The company has filed a mortgage securing $1,000,000 5 per cent. bonds of July 1, 1909-1939. The bonds are secured by a mortgage on the road at the rate of $40,000 per mile of line. The road runs from Trinity, Tex., to Livingston, 33 miles.

Boston & Maine.—The $569,900 common stock sold at auction on January 19 was bid in by Frank Seabury & Bro. at 143½. It is said that this stock was bought in the interests of the Boston Railroad Holding Co.

Boston & Northern.—See Massachusetts Electric.

Boston Railroad Holding Co.—See Boston & Maine.

Canadian Northern.—Wm. A. Read & Co., New York, and the Dominion Securities Corporation, Toronto, Canada, have bought and resold a new issue of $500,000 imperial rolling stock equipment 4½ per cent. bonds, series U, dated November 1, 1910, and due $50,000 annually to 1919.

Chicago & Southern Traction.—A bill has been filed in the circuit court asking for the appointment of a receiver. The company has 71 miles of track, its main line running from Chicago to Kankakee, Mich. There are now outstanding $2,500,000 bonds and an equal amount of stock.

Chicago, Rock Island & Pacific.—The $3,500,000 first and refunding mortgage 4 per cent. bonds taken by Speyer Brothers, London, were offered to the public at 95 and were over-subscribed for, it is said.

Detroit, Toledo & Ironton.—The general lien and divisional first mortgage 4 per cent. bondholders' committee, Otto T. Bannard, chairman, says that more than 85 per cent. of these bonds have been deposited with it, and the time for depositing bonds has been extended to January 21, 1910.

Kansas City Southern.—Sutro Brothers & Co., New York, are offering a block of Kansas City Southern refunding and improvement mortgage 5 per cent. bonds of 1909-1950 at 103, yielding 4.85 per cent. on the investment. The proceeds from the sale of these bonds was applied in part to the payment of $5,100,000 collateral notes and the balance is being spent for reduction of grades, additional terminal facilities, ballasting, etc.

Lake Shore & Michigan Southern.—See New York, Chicago & St. Louis.

Massachusetts Electric.—Wm. A. Read & Co., New York, are offering $3,700,000 of a new issue of collateral trust 4½ per cent. notes of the Massachusetts Electric Companies at 97⅝, to yield 5¼ per cent. The new notes are issued to fund $3,500,000 4½ per cent. notes maturing July 1, 1910. They will be the only funded debt of the company and are secured by deposit of stocks of the Boston & Northern Street Railway or the Old Colony Street Railway of a par value at least 25 per cent. in excess of the total of the outstanding notes. Both the Boston & Northern and the Old Colony

are paying 6 per cent. on their preferred and 5 per cent. on their common stocks. The Boston & Northern and the Old Colony operate the electric railways in the north and south, respectively, of Boston, and they control about 900 miles of electric railways in eastern Massachusetts.

MISSOURI PACIFIC.—An officer says that nearly all of the $29,806,000 5 per cent. first and refunding convertible bonds offered to stockholders at 95 have been subscribed for, and that Kuhn, Loeb & Co., New York, who underwrote the issue, will have to take few, if any, of these bonds.

NEW ORLEANS, MOBILE & CHICAGO.—The following have been elected directors of this company, which took over the property of the Mobile, Jackson & Kansas City: C. K. Beekman, L. S. Berg, Brayton Ives, G. R. Sheldon, F. E. Fried, R. W. K. Anderson, John McLeod, R. B. Scandrett, W. C. Sproul, S. Wexler and Alexander McDonald.

NEW YORK CENTRAL & HUDSON RIVER.—W. K. Vanderbilt, Jr., and L. C. Ledyard have been elected directors, succeeding H. McK. Twombly and D. O. Mills, both deceased.

NEW YORK, CHICAGO & ST. LOUIS.—Directors have declared an initial dividend of 3 per cent. on the $14,000,000 common stock. The Lake Shore & Michigan Southern owns $6,240,000 of this common stock.

W. H. Newman and L. C. Ledyard have been elected directors, succeeding H. McK. Twombly and D. W. James, both deceased.

NORFOLK & WESTERN.—The directors have voted to declare dividends quarterly instead of semi-annually, as has been the practice heretofore.

See Atlantic Coast Line.

NORTHERN CENTRAL.—A committee consisting of Michael Jenkins, chairman; Harry Walters, Norman James, A. L. Snowden, Samuel Rea and H. Tatnall has been appointed by the directors to consider a more permanent and remunerative operating arrangement with the Pennsylvania Railroad. The Pennsylvania owned on January 1, 1909, $10,577,200 out of a total of $19,342,569 stock of the Northern Central. Stockholders now receive 8 per cent. annual dividends.

OLD COLONY.—See Massachusetts Electric.

OREGON RAILROAD & NAVIGATION CO.—Otto H. Kahn, Mortimer L. Schiff, William G. Rockefeller and R. L. Gerry were elected directors, and Otto H. Kahn, Mortimer L. Schiff, H. C. Frick, William Rockefeller and William G. Rockefeller were elected members of the executive committee, the number of which is increased from five to seven.

PAN-AMERICAN CO.—George D. Cook & Co., New York, are offering the unsold portion of $300,000 6 per cent. collateral trust notes of October 1, 1909-1914, at 97½, yielding about 6.63 per cent. The total outstanding issue of these notes amounts to $1,600,000. The company, incorporated in Maine in 1909, owns $9,600,000 of the total $10,000,000 stock of the Pan-American Railroad. The Pan-American Railroad operates a line between San Geronimo and the border of Guatemala under a 99-year concession from the Mexican government.

PENNSYLVANIA COMPANY.—Directors have declared a dividend of $16.67 a share, payable in stock of the company to represent a portion of surplus income heretofore spent for betterments and capital expenditures. All the $60,000,000 capital of the Pennsylvania Co. is owned by the Pennsylvania Railroad, and the stock dividend amounts to about $20,000,000.

PENNSYLVANIA RAILROAD.—See Northern Central and Pennsylvania Company.

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.—Directors have authorized a stock allotment of 12½ per cent. at par to stock of record Feb. 5.

QUEBEC & LAKE ST. JOHN.—See Canadian Northern.

SOUTHERN INDIANA.—An order of the court has been made directing the receiver to pay the instalment of interest which was due February 1, 1909, together with 5 per cent. interest on the interest instalment on the first mortgage 4 per cent. bonds. There were outstanding at last accounts $7,537,000 of these bonds, of which up to July, 1909, there had been deposited with the protective committee, A. G. Hodenpyl, chairman, $6,813,000.

SOUTHERN RAILWAY.—Kissel, Kinnicutt & Co., New York, are offering $500,000 of the new issue of three-year 5 per cent. notes of the Southern Railway dated February 1, 1910, due 1913. This is part of the authorized issue of $10,000,000, of which the total amount was recently sold by the railway to provide for the retirement of $15,000,000 5 per cent. notes maturing February 1, 1910, of which $5,000,000 had already been bought by the company. The offering price is 98¾, yielding about 5.45 per cent.

TRINITY VALLEY & NORTHERN.—A press despatch says that the stockholders have authorized an issue of $150,000 bonds. The company has 10 miles of line in operation from Dayton, Tex., on the Texas & New Orleans, to Fonts, and is authorized to build from Fonts to Cleveland.

UNDERGROUND ELECTRIC OF LONDON.—Bills are to be submitted to the British parliament providing:

(1) For the amalgamation of the Baker Street & Waterloo; Charing Cross, Euston & Hampstead, and Great Northern, Piccadilly & Brompton from July 1, 1910; (2) for the change of name of the Great Northern Company to the London Electric Railway Company; (3) for the increase of the capital by £7,195,000 ($35,975,000) to £12,600,000 ($63,000,000), divided into £3,150,000 ($15,750,000) 4 per cent. preference stock (dividend contingent on profits of each half-year) and £9,450,000 ($47,250,000) in ordinary £10 ($50) shares (with power to divide into preferred and deferred half-shares); (4) for an increase in the authorized amount of 4 per cent. debenture stock to £4,200,000 ($21,000,000); (5) for the termination of the guarantee (Act 1908) by the Underground Railways Company of London on shares and stock of the Brompton company; (6) for the conversion of each Brompton preference share into £10 ($50) preference stock and of every £100 ($500) Brompton ordinary shares into £17 12s. 4½d. preference stock ($88.09) and £82 7s. 7½d. ($412) ordinary shares; (7) for the exchange of Baker Street preference and "A" ordinary shares (held by public) into preference stock in the proportions of 100 and 75 per cent. respectively; Baker Street "B" ordinary shares (held by Underground Company) and Charing Cross shares to be treated in like manner to Brompton ordinary shares.

Metropolitan District Railway.—For the creation of £187,500 ($937,500) additional 4 per cent. guaranteed stock ranking *pari passu* with the existing stock, and carrying interest from July 1, 1910. Of this amount £184,375 ($921,875) is to be used in paying £14 15s. ($73.75) in new stock for the arrears on the existing stock and £2,058 ($10,290) is to be given for arrears on some of the Bow & Whitechapel stock. In addition to the above payments in stock, 10s. ($2.50) is to be paid in cash on August 15, 1910; February 15, 1911; August 15, 1911, and February 15, 1912. The maximum dividend on the 5 per cent. first preference stock is to be reduced to 4½ per cent.

UNION PACIFIC.—The *Boston News Bureau* says: "Well posted financial authorities in New York are advised that Union Pacific has recently acquired between $16,000,000 and $17,000,000 additional Southern Pacific common or enough to give the Union Pacific 51 per cent. of Southern Pacific stock. Union Pacific has owned for some years about 45 per cent. of Southern Pacific's combined common and preferred stocks. The story has this element of plausibility, that the legislation which President Taft has recommended provides that where a road already owns 51 per cent. of the stock of another company it may acquire the balance. Obviously, unless Union Pacific moves quickly, it must be forever debarred from securing absolute control of Southern Pacific."

WINSTON-SALEM SOUTHBOUND.—See Atlantic Coast Line.

The South Australian Royal Commission on Eyre's Peninsular Railways recommends, in addition to the extension from Yeelanna, South Australia, to Minnipa Hill, that a railway with 3 ft. 6 in. gage be built from Cummings railway station to a point northeast of Drake's Peak, a distance of 78 miles. The estimated cost, not including ballast and rolling stock, and providing that second-hand 41-lb. rails are used, is $970,000.

Supply Trade Section.

The Buda Co., Chicago, announces the election of L. M. Viles as vice-president and treasurer in charge of manufacturing, and Wm. P. Hunt, Jr., as vice-president and secretary in charge of sales.

The American Car & Foundry Co. plans to build an addition to its present steel coach plant at St. Charles, Mo., which will be 120 ft. wide and 1,800 ft. long. A new power house has been built and electric power is to be installed.

J. E. Buker, superintendent car department of the Illinois Central, has been elected first vice-president of the Chicago Car Heating Company, Chicago, with headquarters at the Railway Exchange building, effective February 1.

I. W. McConnell, recently a supervising engineer, U. S. Reclamation Service, and also identified with the Gunnison tunnel, has joined the staff of hydraulic and irrigation engineers of J. G. White & Company, Inc., New York.

The American Automatic Railway Brake Co., Baker City, Ore., has been incorporated with a capital stock of $500,000 to manufacture an automatic brake which applies the air to the whole train when any car leaves the track. The incorporators are F. W. Eppinger, H. A. Mitchell and E. B. McDaniels.

The Automatic Steel Grain Door Co., Wichita, Kan., advises that communications will be welcomed from firms equipped for the manufacture of all-steel non-destructible grain doors. Delivery is desired on 2,000 of these doors at the earliest possible date, and a permanent contract for future orders will be made.

A. D. McAdam, formerly vice-president of the Damascus Brake-Beam Co., Cleveland, Ohio, has resigned and has been elected vice-president of the St. Louis Surfacer & Paint Co., St. Louis, Mo., with headquarters at 1101 Fisher building, Chicago. Mr. McAdam was for several years connected with the American Car & Foundry Co. and the Michigan Malleable Iron Co., Detroit, Mich.

Leroy M. Harvey, sales manager of the Milwaukee district office of the Allis-Chalmers Co., Detroit, Mich., died January 19, at Augusta, Ga., where he had gone for his health. Mr. Harvey was about 37 years old. He was born in Oak Park, Ill., graduated from the University of Michigan in 1898, and was connected with the Westinghouse Electric Co., Siemens & Halske, and the Northern Electric Manufacturing Co. before entering the sales department of the Allis-Chalmers Co.

Fayette Brown, president of the Brown Hoisting Machine Co., Cleveland, Ohio, died at his home in Cleveland January 20. Mr. Brown had been connected with the iron and machinery trade since the close of the civil war, in which he served as paymaster for the Union army. In addition to the machinery company of which he was president, he was connected with the Stewart Iron Co., Ltd., the Union Steel Screw Co., the National Chemical Co., the G. H. Kuhlman Car Co. and several Cleveland banks.

F. A. Hall, who has been for the past 12 years manager of the chain block and hoist department of the Yale & Towne Manufacturing Co., New York, has resigned to accept an election as vice-president and treasurer of the Cameron Engineering Co., Brooklyn, N. Y. R. T. Hodgkins, who for the past several years has been Mr. Hall's chief assistant, will become manager of the chain block and hoist department. In his new connection, Mr. Hall expects to make a specialty of trolleys and appliances for overhead handling of materials, in which connection Yale & Towne blocks and hoists will be used.

U. S. Steel Corporation Earnings.

The United States Steel Corporation's report for the quarter ended December 31, 1909, shows total earnings of $40,971,309, after deducting all expenses incident to operations, including those for ordinary repairs and maintenance of plants and interest on bonds and fixed charges of subsidiary companies.

The above earnings compare with previous quarters as follows:

Quarter ended—	Total earnings.
September 30, 1909	$38,246,907
June 30, 1909	29,320,491
March 31, 1909	22,921,268
December 31, 1908	26,225,485
December 31, 1907	32,534,191
December 31, 1906	41,750,125
December 31, 1905	35,216,062
December 31, 1904	21,466,631
December 31, 1903	15,037,182
December 31, 1902	31,985,759

The unfilled orders on hand December 31, 1909, were 5,927,031 tons. This compares with previous quarters as follows, in tons:

Quarter ended—	Unfilled orders.
September 30, 1909	4,796,833
June 30, 1909	4,057,939
March 31, 1909	3,542,595
December 31, 1908	3,603,527
December 31, 1907	4,624,553
December 31, 1906	8,489,718
December 31, 1905	7,605,086
December 31, 1904	4,696,203
December 31, 1903	3,213,123
December 31, 1902	5,347,253

The balance of surplus of the United States Steel Corporation and subsidiary companies at the close of the quarter ended December 31, 1909, after charging off dividends on United States Steel stock, and amounts written off on account of capital expenditures for special funds, and for sundry adjustments and accounts, was $160,754,684.

The unfilled orders on hand on December 31, 1909, were 5,927,031 tons, an increase of 1,130,198 tons from September 30, 1909, and an increase of 2,323,504 tons from December 31, 1908.

Surplus for the year ended December 31, 1909, after all charges, appropriations, additions, betterments, etc., $27,339,430.—*Wall Street Journal.*

TRADE PUBLICATIONS.

Water Softening.—The L. M. Booth Co., New York, has just issued a circular describing its type "F" Booth water softener.

Car Roofing.—The H. W. Johns-Manville Co., New York, has just issued a small leaflet describing its J-M Car-Best-Us car roofing, which is a composite asbestos roofing made especially for railway cars.

Auto Car.—The Railway Auto Car Co., New York, has issued bulletin No. 101, descriptive of its steam motor car. Complete specifications of a 250-h.p. car are given, along with a halftone and line illustration.

Arctic Water Box.—The W. K. Kenly Co., First National Bank building, Chicago, has issued a four-page circular describing a cheap, durable and efficient water box for the use of section and gridge gangs, work trains and other laborers cut off from a water supply.

Roof Reinforcement.—The Brown Hoisting Machinery Co., Cleveland, Ohio, has just issued its 1910 Ferroinclave catalogue, descriptive of its sheet metal used as a reinforcement for concrete roofs, floors, side walls, partitions, stairs, coal bins, highway bridges, culverts, tanks, etc.

Conveyors-Elevator Buckets.—The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued booklet No. 33 describing the Jeffrey wire cable conveyor, and booklet No. 34 describing Jeffrey standard elevator buckets. The illustrations show this equipment in both detail and installation illustrations.

Steam Traps-Fans.—The American Blower Co., Detroit, Mich., has issued bulletin No. 267 on Detroit steam traps; bulletin No. 263 on A B C steel plate fans, and bulletin No. 264 on A B C cone fans. These bulletins contain a large amount of valuable information on these subjects, including a large number of half-tone and line illustrations.

Gasolene Electric Generating Sets.—The General Electric Co., Schenectady, N. Y., has just issued its catalogue No. 4,707 descriptive of its gasolene electric generating sets for use in lighting plants where electric power is not otherwise provided.

The engines and generators comprising these sets are designed and built by the General Electric Co. for operation as complete units.

Dry Kilns.—The American Blower Co., Detroit, Mich., has just issued its catalogue No. 265 descriptive of A B C moist air dry kilns, including natural and forced circulation kilns of the progressive and apartment types. The catalogue contains a large amount of information which is both interesting and valuable. The illustrations show both plan and elevation illustrations of these kilns and also the miscellaneous equipment used in connection with them.

Mallet Locomotives.—The American Locomotive Co., New York, has just issued bulletin No. 1,000 on Mallet articulated compound locomotives, which shows a number of different designs built by this company for roads in this country and abroad. These designs, shown both in half-tone and line engravings, cover a wide range of weight and power and show the adaptability of this type to a great variety of service conditions. This is the first of a new series of bulletins, one of which will be issued each month, suitable for filing in a loose leaf cover.

Chloride Accumulators.—The Electric Storage Battery Co., Philadelphia, Pa., is distributing bulletin No. 118, which describes an installation of its chloride accumulators on the road of the Otsego & Herkimer Electric Railway, the batteries being for the regulation of an a.c.-d.c. system. This road operates heavy interurban cars with a constantly changing load on the generating apparatus, and the storage battery with its regulating apparatus is designed to relieve the generating machinery of the severe load fluctuations. The apparatus is particularly rugged and requires no expert attention to maintain its adjustment.

RAILWAY STRUCTURES.

AUGUSTA, GA.—The Augusta-Aiken Railway & Electric Co. expects to build passenger and freight terminals. Plans are not yet completed but a two-story building, 165 ft. x 80 ft., to cost $20,000, is being contemplated.

BARSTOW, N. MEX.—The Atchison, Topeka & Santa Fe has asked for bids on a new concrete passenger station of the Mission type.

BELOIT, KAN.—The Missouri Pacific, it is reported, is to replace the old passenger station now in service with a modern brick building.

BLUFFTON, IND.—The Bluffton, Geneva & Celina Traction Co. will build during the coming summer a power plant to use steam turbines as prime movers.

DALLAS, TEX.—The Dallas county commissioners have under consideration plans for a concrete viaduct to be used for highway and street railway traffic. The structure is to be built from Dallas, Tex., over the lowlands and the Trinity river, to Oak Cliff. The cost of the structure will be about $500,000.

ENID, OKLA.—See Osage Western under Railway Construction.

GRANT'S PASS, ORE.—The Southern Pacific will build a stone and tile passenger station and convert the present passenger station into a freight depot during the coming year.

MARYSVILLE, CAL.—The Southern Pacific is contemplating building a new passenger station.

NEW YORK.—It is understood that contracts have been let for a large (probably about 12 stories) commercial office building to be built over the Grand Central station property. It is probable that the structure will be a joint work of the New York, New Haven & Hartford and the New York Central & Hudson River.

TACOMA, WASH.—The Oregon & Washington, in addition to the tunnel, viaduct, passenger station, freight yards and repair shops previously mentioned, will, during 1910, dredge a 300-ft. waterway in the Middle channel of Puget Sound to facilitate deep sea shipping. Warehouses will be built along this channel.

VINITA, OKLA.—See Osage Western under Railway Construction.

Late News.

The items in this column were received after the classified departments were closed.

Directors of the Pittsburgh, Cincinnati, Chicago & St. Louis have authorized the issue of $4,000,000 series G consolidated 4 per cent. bonds.

Stockholders of the Atlantic Coast Line Co. have voted to issue 40 per cent. additional stock amounting to $5,040,000. (Dec. 31, p. 1320.)

The Union Station Co., of St. Paul, Minn., is said to be making plans for terminal improvements at St. Paul. The work will include a large union passenger station.

Thomas M. Osborne, one of the two Democratic members of the New York Upstate Public Service Commission, has resigned. John N. Carlisle, a Democrat, has been appointed to succeed Mr. Osborne.

According to press reports, the Union Pacific will soon have a force of about 2,000 men at work building a 40-mile extension to Fort Collins, Col., to complete a through line from Denver to Fort Collins of about 70 miles.

The Pennsylvania Equipment Co., Philadelphia, Pa., has ordered one 19-in. x 24-in. six-wheel switching locomotive from the Baldwin Locomotive Works and two 18-in. x 24-in. six-wheel switching locomotives from the American Locomotive Co.

At the thirtieth annual meeting of the Engineers' Society of Western Pennsylvania the following officers were elected for the ensuing year: President, E. K. Morse; vice-president, J. O. Handy; treasurer, A. N. Frost; directors, A. R. Raymer, Willis Whited.

The Gulf, Colorado & Santa Fe, it is said, will spend about $400,000 making improvements at Temple, Tex., and along the road to Brownwood. It is said an appropriation of $160,000 has been made to pay for widening the roadbed and raising the grade between Temple and Brownwood. The main track from Temple to Lampasas and north of Zephyr to Brownwood is to be rock ballasted at a cost of $240,000.

Residents of western Florida and southern Alabama are said to be back of the Gulf, De Funiak & Northern, which proposes to build from deepwater, on Choctawhatchee bay, Fla., north via De Funiak Springs, Glendale and Lakewood to Florala, Ala., about 54 miles. The plans include taking over a number of logging roads along the right-of-way to form part of the line. The offices of the company are at De Funiak Springs.

The Interstate Commerce Commission has issued an order to all carriers subject to the act warning them that a false entry as to date or otherwise on a bill of lading is a misdemeanor, and hereafter criminal prosecution of those responsible will be requested. The commission makes this order because of numerous cases brought to its attention of changes in dates of bills of lading made by carriers at request of shippers.

Press reports from Baltimore, Md., indicate that the addition of 250 locomotives, reconstruction of bridges, the building of a third track over the Alleghanies in order to facilitate the movement of trains and enlarged switching facilities is the promise of President Willard of the Baltimore & Ohio to the delegation from the Shippers' League of West Virginia, which called upon him on Wednesday relative to what they declared was inadequate service on the part of the company.

According to press reports, the Fox River Valley Railway is negotiating for a right-of-way to build an electric line from Milwaukee, Wis., north via Cedarburg, Plymouth, Elkhart, Kiel and Chilton, thence west to Stockbridge, and then north and west to Appleton. The plans call for a branch from Stockbridge south to Fond du Lac. There are also to be north and south branches from Appleton to Kaukauna, Neenah and Menasha, in all about 135 miles. Eastern capitalists are back of the project. J. A. Mesiroff, president of the Western Engineering & Construction Co., is said to be interested.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, Rock Island & Pacific is in the market for 25 Pacific and 50 consolidation locomotives.

The Carolina, Clinchfield & Ohio has ordered six Mallet locomotives from the Baldwin Locomotive Works.

The Norfolk & Western advised that it will acquire, during 1910, 40 freight and 10 passenger locomotives. Bids are now being asked.

The Oliver Iron Mining Co., Duluth, Minn., has ordered eight six-coupled switching locomotives from the Baldwin Locomotive Works.

The Delaware, Lackawanna & Western, reported in the *Railway Age Gazette* of December 17 as being in the market for 48 locomotives, has ordered this equipment from the American Locomotive Co.

The Buffalo & Susquehanna, as reported in the *Railway Age Gazette* of December 31, has ordered 10 consolidation locomotives from the American Locomotive Co.

General Dimensions.

Weight on drivers	167,000 lbs.
Total weight	185,000 lbs.
Cylinders	21 in. x 28 in.
Diameter of drivers	51 in.
Type of boiler	Wagon top
Working steam pressure	200 lbs.
Heating surface, tubes	2,497 sq. ft.
" " firebox	179 "
" " total	2,676 "
Tubes, number	375
" outside diameter	2 in.
" length	12 ft. 9⅞ in.
Firebox, type	Wide fire
" length	107 in.
" width	73¼ "
Grate area	54.4 sq. ft.
Tank capacity	6,000 gals.
Coal capacity	12 tons

Special Equipment.

Boiler lagging	Magnesia boiler
Brakes	New York Air Brake L. T. auto. control equip.
Brake-beam	2½ National hollow
Brake-shoes	Am. Brake-Shoe & Fdry Co.
Couplers	Sharon
Driving boxes	Steel, with grease cellars
Headlight	16 in. Dietz side door
Injector	No. 10 Simplex
Journal bearings	Magnus
Piston and valve rod packing	Jerome soft rod
Safety valve	Coale
Sanding devices	Leach
Sight-feed lubricators	Nathan bull's-eye
Springs	Union Spring & Mfg. Co.
Staying	Radial
Steam gages	Ashcroft
Tires	Midvale
Tubes	Charcoal
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The Chesapeake & Ohio is asking prices on 1,500 freight cars.

The Detroit United Railway is reported in the market for 100 cars.

The Virginian has ordered 1,000 gondola cars from the Pressed Steel Car Co.

The Southern is said to be figuring on 2,600 car bodies to be placed on second-hand trucks.

The United Fruit Co., New York, has ordered 75 twenty-ton flat cars from the Middletown Car Co.

The Swift Refrigerator Transportation Co. has ordered from the Western Steel Car & Foundry Co. 100 thirty-ton produce cars.

The Missouri, Kansas & Texas is in the market for 50 caboose cars, 100 flat, 500 coal, 200 automobile, 300 furniture and 1,000 box cars.

The New York, Chicago & St. Louis is said to have ordered 10 passenger coaches and five baggage cars from the American Car & Foundry Co. This item is not confirmed.

The St. Louis, Brownsville & Mexico, reported in the *Railway Age Gazette* of January 7 as being in the market for from 30 to 50 forty-ton gondola cars, has ordered 40 Hart convertible cars from the American Car & Foundry Co.

MACHINERY AND TOOLS.

The Pittsburgh & Lake Erie is to install a turbine in its Pittsburgh power station.

The Pennsylvania is in the market for 6 radial drills and several other small lots of tools.

The Baldwin Locomotive Works have ordered three 70-ton traveling cranes from the Braun & Stewart Co., Philadelphia, Pa.

The Bethlehem Steel Co., South Bethlehem, Pa., has ordered, from the Crocker-Wheeler Co., Ampere, N. J., five compound-wound, interpole motors and 19 mill motors.

The Baltimore & Ohio has issued a list of machine tools which includes 7 planers, 34 lathes, 14 grinders, 6 punches and a number of shears, boring machines, driving wheel lathes, axle lathes and other tools.

The Tennessee Coal, Iron & Railroad Co., Bessemer, Ala., has ordered, from the Mesta Machine Co., Pittsburgh, Pa., one 40-in. x 60-in. four-valve engine. This is in addition to the machinery mentioned in the *Railway Age Gazette* of October 15.

IRON AND STEEL.

The Pennsylvania is taking prices on 400 tons of bridge steel.

The Central of Vermont has ordered 285 tons of bridge steel from the Phoenix Iron Co.

The Harriman Lines have ordered 3,500 tons of rails from the United States Steel Corporation.

The Missouri, Kansas & Texas has ordered 14,000 tons of rails from the United States Steel Corporation.

The New York, New Haven & Hartford is in the market for 400 tons of bridge steel for a Providence, R. I., bridge.

The Great Northern has ordered from the Wisconsin Bridge Co., Milwaukee, Wis., 360 tons of bridge steel for a draw span.

The American Car & Foundry Co. has ordered from the Kenwood Bridge Co., Chicago, 800 tons of structural steel for shops.

The American Rolling Mill Co., Middletown, Ohio, has ordered 4,000 tons of structural steel from the American Bridge Co.

The San Antonio & Great Northern is in the market for rails, ties and material for four 40-ft. bridges. J. H. Ransom, Davidson, Okla., is president and general manager.

The Davenport Locomotive Works, Davenport, Iowa, has ordered from the McClintic-Marshall Construction Co., Pittsburgh, Pa., 600 tons of structural steel for shop additions.

General Conditions in Steel.—The outlook of the steel industry, based upon the unfilled tonnage at the present time, is encouraging. It is said that eight of the large steel companies, including the U. S. Steel Corporation, Jones & Laughlin Steel Co., Bethlehem Steel Corporation, Republic Iron & Steel Co., Cambria Steel Co. and Lackawanna Steel Co. have booked at the present time a total of about 11,000,000 tons of unfilled orders. This large unfilled tonnage indicates that the first six months of this year will set a new high record in earnings, even though prices are lower than in 1907, as the cost of production is, in many instances, lower than it was then. The annual dividend increase from 3 per cent. to 5 per cent. by the Cambria Steel Co. was not generally expected.

FOREIGN RAILWAY NOTES.

A consular report says that an Ecuadoran concession has been granted to the Lignite Mining Company to build a short railway from the lignite mines or beds in the parish of San Antonio, province of Pichincha, to the city of Quito.

The line must be begun within one year from October 28, 1909, and finished within two years.

The Argentine Central Railway has been authorized to build a branch line from Carmen northeasterly 47 miles.

The railway extension bill of British South Africa provides for building eight new lines of railway. These projects include lines from Vryheid to Empangeni, and from Eshowe to Ginginhlovo. The last three named places are important towns in Zululand.

The rates on the various railways of Peru are in proportion to the cost of the road, which is high, as in the case of the Trans-Andean. As an example, the rates on the Oroya road—for 140 miles—horses $2.50, cattle $2 (if over five $1.50), groceries 25 cents per 100 lbs.

Definite progress is being made in the matter of railway building in Turkey in Asia. The Bagdad railway is to be extended from the present terminus at Eregli, and Aleppo is to be covered by the main line, instead of by a branch extension. The concession for the Tripoli-Homs line has been granted to the French company which already owns and operates railways from Beirut to Aleppo and Damascus, and work is to begin at once.

Recent Incorporation.

The John W. Rapp Co., New York, has recently been incorporated with a capital stock of $1,000,000, of which $800,000 is paid in. For a number of years past Mr. Rapp has carried on an extensive business as a patentee and manufacturer of art metal trim. Due to the increased demand for this production the reorganization of the company has been necessary. The factory is located at College Point, N. Y., and the sales department and show rooms at No. 1 Madison Avenue, New York, with branches in Boston, Denver, Duluth, Kansas City, Los Angeles, New Orleans, Philadelphia, Pittsburgh, San Francisco and Seattle. Following are the officers of the new company: John W. Rapp, president and treasurer; Charles J. Hale, vice-president; A. J. Connell, second vice-president; Carl Leonardi, secretary.

A New Berth Lamp.

The general adoption of the Tungsten bulb by railways, which is now playing an important part in electric car lighting, has brought about, to some extent, the necessity for new conditions in the design and construction of electric car-lighting fixtures. The Safety Car Heating and Lighting Co., New York, has introduced a new berth lamp, which, in addition to giving excellent results from the standpoint of illumination, permits the use of the standard G-18½ Tungsten bulb. The construction of the lamp is said to prevent the possibility of broken filaments caused by the passengers' usage of the fixture.

Fig. 1 shows a type of this new berth lamp designed for use in the corner formed by a partition between the section and the outside wall of the car; also a view showing the interior arrangement of the lamp. A standard electrolier socket is held by means of a spring clamp designed to give a firm support for the socket and still permit its easy removal. The electric bulb is of the standard G-18½ type, suspended in a vertical position, thus insuring maximum life for the Tungsten filament. This bulb is optically located in relation to the prismatic glass lens, so that the light is correctly distributed, directly or by reflection from the polished reflector back of the bulb. The front of the lamp is removably attached to the back frame and carries the prismatic lens, which is securely held by a ring. By removing the lock screw at the top of the fixture the front can readily be removed for replacing the electric bulb. To light or extinguish the lamp the passenger uses one of the buttons of the switch seen as a part of the lamp.

These fixtures are, of course, made for use on flat surfaces also, but the one illustrated is designed to avoid the necessity of cutting the woodwork of the car to apply the fixture. The following advantages are claimed for these berth lamp fixtures: Use of standard bulbs and sockets; minimum breakage of metallic filaments, since neither bulb nor any part of the fixture moves when the lamp is lighted or extinguished; ease of manipulation by passengers; use of properly designed glassware for correct distribution of light; compactness and

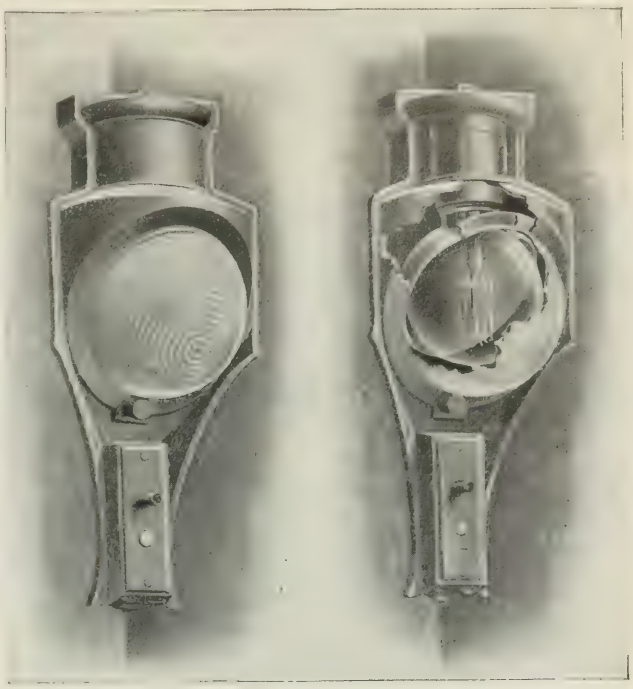
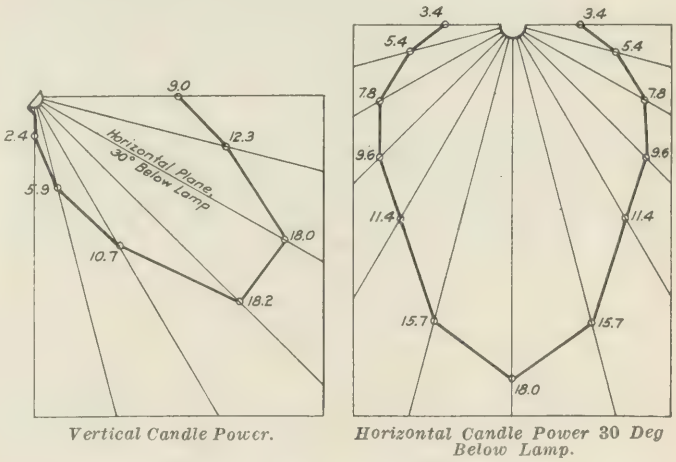


Fig. 1—Corner Berth Lamp.

economy of space both when lighted and when extinguished; use of most efficient type of electric lamp; ideal physiological effects, as the occupants of the opposite seat are subjected to no glare; the use of a prismatic diffuser entirely obviates any source of discomfort from glare as is the case where a plain bulb is placed directly in line of vision. This new lamp insures, therefore, a soft mellow light, well distributed and restful to the eyes, as will be strongly emphasized by the accompanying photometric curves shown in Fig. 2.



Vertical Candle Power. *Horizontal Candle Power 30 Deg Below Lamp.*

Fig. 2—Photometric Curves.

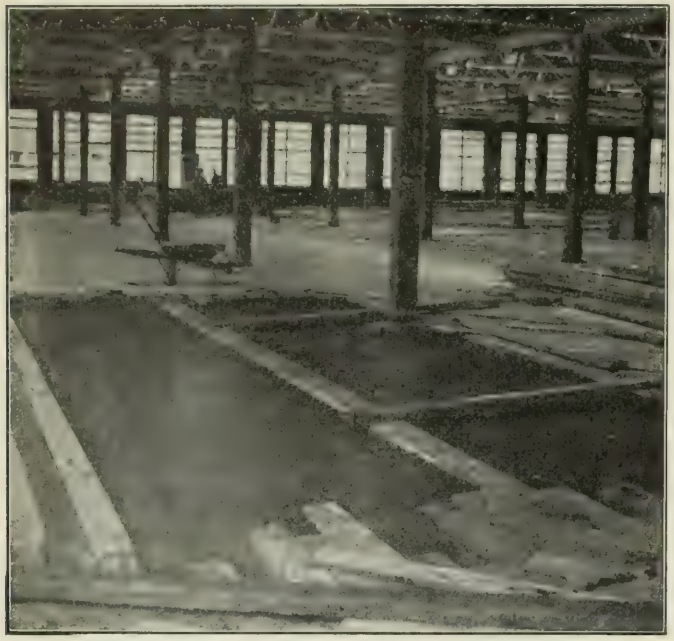
Factory Flooring.

For a number of years it has been the practice, where a wooden floor is required to be placed directly upon the ground, to omit floor sleepers and place the plank on from one inch to two inches of sand mixed with heavy coal tar. This method not only protects the planks against decay, but the creosote oil in the tar acts as a wood preservative.

The foundation has often been of concrete, but more usually

of cinders or broken stone or gravel, mixed with sufficient tar to make a composition that would compact well and provide a good, true and level surface for spreading the sand and tar. The mixture of sand and tar provides a perfect bedding for the planks. These planks are fastened together by the hard wood wearing surface which is laid at right angles or diagonally.

The adoption of this plan on the second floor of the Blake & Johnson factory at Waterville, Conn., is shown in the accompanying illustration. In this case the foundation of reinforced slab was in place and a surface on which to bed the planks was alone required. Sand alone would not suffice, as the vibration would cause it to shift. By mixing tar with the sand this danger was overcome and the protection afforded



Factory Flooring in Process of Construction.

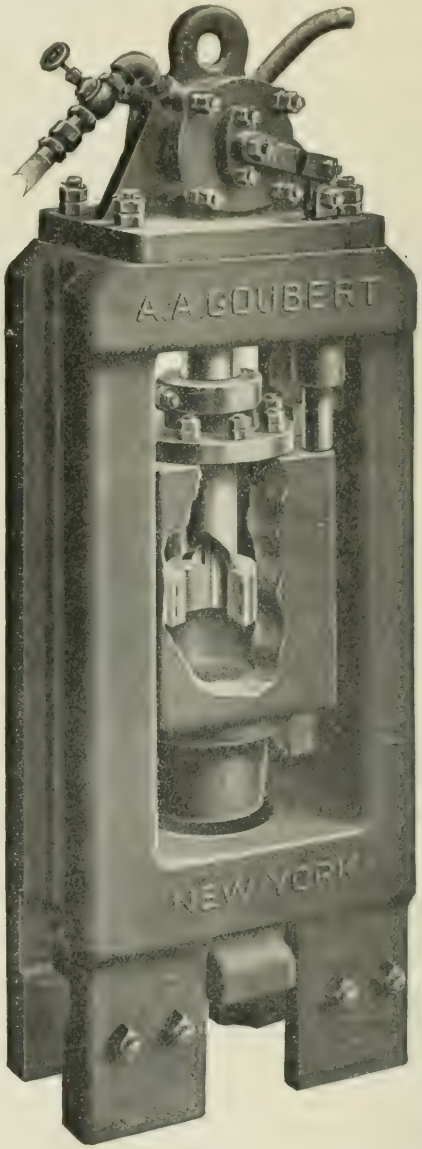
by creosote oils was obtained through the use of Barrett's sub-floor tar, about 50 gals. of which were mixed with each cubic yard of sand. The mixture was spread about 1⅛ in. thick, to be one inch when compact. While still warm and soft the planks were laid on it and tamped until the proper level and stability were obtained. After the 2-in. plank a ⅞-in. rough pine board was laid and then a surface of 1¼-in. square edged maple. It is expected that the planks in this floor will last as long as any other part of the building. Should the hardwood wearing surface wear through in places, repairs will be easily made. The sub-floor tar used in this connection is a special product of the Barrett Manufacturing Co., New York.

Goubert Pile Driving Hammer.

The illustration herewith shows a Goubert pile driving hammer. In this machine the heavy solid steel cylinder strikes the blow. It slides freely on guides, which are integral with the frame, and its mass is such as to absorb the effect of the percussion. Its lower, or pene end, strikes upon a loose anvil or steel dolly block on the top of the pile, and the pene is of such large area as not to be injuriously upset by the effect of repeated blows.

The piston and its rod are stationary and rigidly connected to the valve chest, which is securely bolted to the frame. Ports through the piston rod admit steam alternately above and below the piston, the admission of which is controlled by a rotary valve in the chest above the piston rod. The valve is actuated by a radial arm, to the end of which is hung a heavy plunger. The cylinder has no permanent connection with the valve gear. At the end of the up-stroke it strikes the plunger, rotating the valve and admitting steam under the piston. The cylinder is then propelled downward to strike the blow. The percussion causes the plunger to suddenly fall, reversing the valve, opening the exhaust and admitting steam for the up-stroke. A buffer spring relieves the fall of the plunger.

All of the parts, including the frame, are made of open hearth steel. The frame is arranged to slide on leaders, if required, and an eye is provided from the top of the chest for suspension from a derrick. The length of the dolly block permits driving two interlocking sheet piles at the same time,



Goubert Pile Driving Hammer.

and as it is made in the form of a cross, it is readily used for driving corner piles. Round piles from 9 in. to 20 in. may also be driven.

This hammer is manufactured by A. A. Goubert, New York.

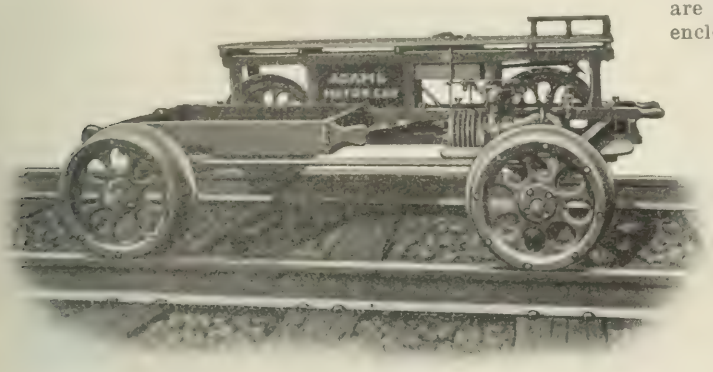
Plant of the Lackawanna Bridge Company, Buffalo, N. Y.

The initial plant of the Lackawanna Bridge Company at Buffalo, N. Y., was completed December 1. Most of the machinery has been installed and operations were begun in a portion of the plant on December 15, and it is now in full operation. The site, which is adjacent to the Lackawanna Steel Company's works and those of the New York State Steel Company, contains 23 acres, and is located on Abby street and the South Buffalo Railway, a switching and terminal road controlled by the Lackawanna Steel Company and which connects directly with all of the railways entering Buffalo from the east, south and west.

The new plant was projected and built by the Worden-Allen

Company interests in Milwaukee, of which B. L. Worden is president. He wished to establish a fabricating and distributing plant for the eastern markets and regarded Buffalo as an advantageous point for its location.

The main building, just completed, is 610 ft. long and 200 and 250 ft. wide, is of steel and brick construction with tile roof and is divided into sections, without partitions, comprising a machine shop, template shop, turntable shop, construction department and layout shop. All machinery is electrically operated by direct-connected motors, the company generating its own power. The crane equipment, which is operated the full length of the building on two main runways and one side bay and one yard runway, consists of six Pauling & Harnischfeger, Milwaukee, Wis., traveling cranes, one of 20



Adams Motor Inspection Car.

tons, two of 15 tons, one of 10 tons and two of five tons capacity, including the five-ton crane for the yard runway and also two wall jib cranes and two small gantry cranes in the machine shop. There are 12 Reamer gantrys of the Worden-Allen Company's make and 16 radial drills of Pawling & Harnischfeger's make.

The punch and shear equipment consists of 16 punches, two angle shears, one 8 in. x 8 in. x 1¼ in., and one 6 in. x 6 in. x 1 in., and two plate shears, one 60 in. x 1¼ in., and one 48 in. x 1 in. There are also two rotary planers, one 20-ft. plate planer and two bar-bending and straightening machines. The 18 compressed air riveting machines with which the plant is equipped, 12 of 70-ton and six of 50-ton capacity, were furnished by the Hanna Engineering Works, Chicago.

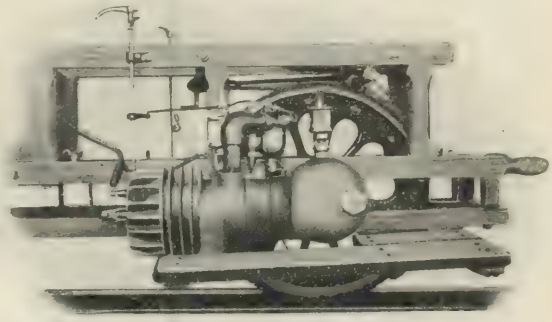
The equipment also includes one 1,500-lb. Lane steam hammer, one Bradley hammer, lathes, shapers, drill presses, rivet-making machinery, oil furnaces, etc. The power plant comprises a 500-h.p. Allis-Chalmers Corliss engine, a 240-volt Bullock generator, direct-connected; a Nordberg two-stage air compressor, cross compound 12 in. x 20 in. x 36 in.; two boilers and all the accessories of an up-to-date power plant.

The company has already booked and in work a number of important contracts. It will carry at its plant a stock of plates and shapes of about 5,000 tons. This carrying of warehouse stock of structural material is a new feature for the Buffalo district, as it has been heretofore supplied from Pittsburgh and Cleveland.

W. A. Hazard is manager of the plant and A. Freiburger, general superintendent. The officers of the company are: B. L. Worden, president; J. P. Nicholas, vice-president; F. H. Bottum, assistant secretary. Jason Paige is contracting engineer with offices at 50 Church street, New York. The general offices of the company are at 626-628 Fidelity building, Buffalo, N. Y.

Adams Motor Inspection Car.

The Adams inspection car is designed for the use of signalmen, linemen, lampmen, roadmasters and inspectors. The four-wheel standard, shown in the illustration, when equipped with the iron tray, weighs 270 lbs. and a similar car having three wheels weighs 245 lbs. This weight is well balanced so that the car can be readily handled by one man. The frame is of white ash rails, braced and bolted, the cross arms being iron bound. The gasolene motor is illustrated in the accompanying cut. It is a two-cycle, reversible, air-cooled motor, direct-connected to the rear wheel. It is equipped with dry cells, sight feed oil cups and Schebler carburetor and is controlled by a throttle lever, spark lever, and compression relief lever for starting and coasting. The cylinder head and crank case are ground, metal to metal, and all other working parts are enclosed to insure cleanliness. By locking the box containing



Gasolene Motor for Adams Inspection Car.

the batteries, spark coil, switch and tools, the car is effectively protected against being started in the owner's absence. The builders can limit the speed to anything under 30 miles an hour without decreasing the power developed. It is said that 70 to 90 miles can be run on each gallon of gasolene.

The car is being placed on the market exclusively by Burton W. Mudge & Co., Chicago.

The Rowell-Potter Safety Stop.

The report of the Block Signal and Train Control Board of the Interstate Commerce Commission on this apparatus was briefly noticed in the *Railway Age Gazette*, of December 31, page 1302. Herewith we give the main parts of those paragraphs of the report which deal with the stopping apparatus proper.

The devices of the Rowell-Potter Safety Stop Company were installed in October, 1908, on 5 miles of the Chicago, Burlington & Quincy single-track line between Sugar Grove and Big Rock, Ill., and on 2 miles of double track east of Aurora. Two locomotives used in local freight service were

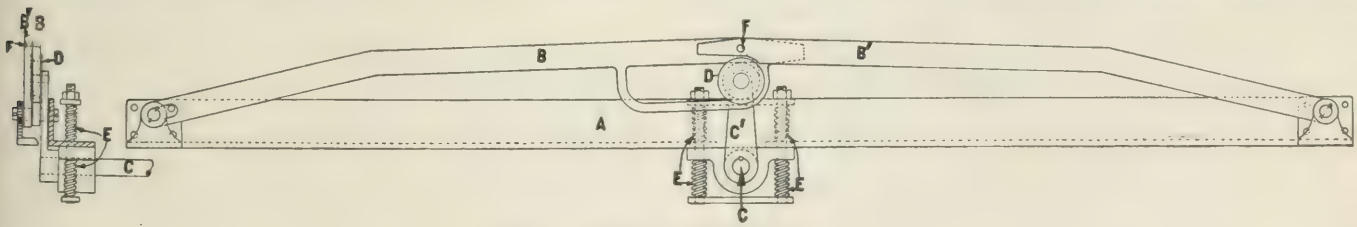


Fig. 1—Track Instrument.

fitted with the apparatus to apply the air-brakes. These engines were in regular service throughout the winter, and the inspector of the board observed the behavior of the apparatus in cold weather and at times when there was deep snow on and around the ground apparatus. The Rowell-Potter train stop is a mechanical trip. A bar lying parallel and close to one of the rails of the track is lifted a short distance above the rail, whenever the visual signal is set in the stop position; and this bar, coming in contact with an air-brake valve (suspended from the equalizer of one of the trucks of the tender) opens the valve and applies the brakes. Bars at the side of the track are provided in dupli-

cate at each signal location, the two being rigidly connected to each other in such a way that one bar must always be in engaging position (to stop a train) and the other depressed. One is 180 feet in advance of the other, and if the first one fails to go to the stop position behind a passing locomotive, the second one remains up and stops the train. Power to operate the stop as well as to operate the semaphore signals of the system is derived from the pressure of the wheels of passing trains on levers fixed close to the rails, these levers serving to wind up a coil spring. This power apparatus is one of the principal features of the Rowell-Potter system as presented. Track circuit control is provided as in ordinary automatic block signaling.

The first installation of the Rowell-Potter system was made in 1891 on the Boston, Revere Beach & Lynn. The second was made in 1893 on the Intramural Railway at the World's Fair, Chicago, there being 21 automatic block signals, all being equipped with automatic trip devices. This installation remained in service during the fair period. The third was made in 1893, consisting of 37 automatic signals and trip devices, on the Chicago & South Side Rapid Transit (elevated line), remaining in service several years. The fourth was made during 1894 and 1895 on the Metropolitan West Side Elevated of Chicago, consisting of 36 automatic signals and track trips, remaining in service several years. The fifth was an automatic interlocking plant at Hawley, Ill., at the crossing of the St. Louis, Peoria & Northern with the Peoria, Decatur & Evansville. The sixth was on the Chicago, Mil-

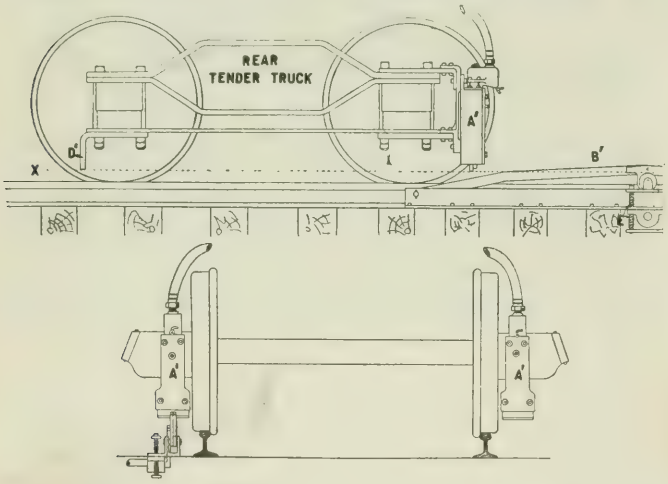


Fig. 2—Track and Engine Instruments.

waukee & St. Paul. * * * It remained in service from May to December, 1902.

Power-storing machine.—The arrangement of the bar, levers and storing machine is such that the passing of an engine with two cars will store sufficient power to operate the apparatus for the next train. The capacity of the springs is such that upon being completely wound up sufficient power is stored to operate the apparatus from thirteen to twenty-three times. A cut-out is provided in connection with the winding apparatus to throw it out of operation when the springs are fully wound. It is thrown in again when a certain predetermined amount of power has been used, both operations being automatic. A lock is provided to automatically lock the apparatus in the normal position (signals at stop) should the power become exhausted.

Track instruments.—The track instrument or trip for the engine valve consists of two iron bars lying parallel to the track rail near the ends of the track ties, being lapped and joined by a pivot at the center and fulcrumed at the other ends, being so connected by a rocker shaft and cranks to the power machine as to be raised into or lowered out of position to open an air-brake valve mounted on the locomotive-tender truck. The trips are in duplicate, the two being connected by rigid mechanical connections. A train upon approaching a clear signal finds the first trip lowered out of engaging position, and upon passing over it sets the signal to the stop position, which raises the rear trip and lowers the one in advance of the signal. Should the signal fail to go to the stop position the second trip would not be lowered, and not being lowered it would open the train valve. This feature thus provides for stopping the train in the event of the home signal sticking in the clear position.

Engine apparatus.—The air-brake valve is fastened to the axle box on the front end of the rear tender truck. Guards or scrapers are placed on the forward end of the forward tender truck and rear end of rear truck (D^1) to prevent any obstruction beside the trip striking the valve plunger. Whenever a trip is encountered in the raised or tripping position, it is first engaged and depressed by the scraper and restored by springs to its raised position in time to engage the engine valve.

The trip has an incline of 1 inch in 30 inches and the valve plunger, which moves vertically, is provided with a lock which is released by the raising of a second plunger placed directly back of the valve plunger. The two plungers are so arranged that when engaging the track trip the unlock plunger will be raised first, unlocking the valve plunger, allowing it to be raised. The valve upon being opened is

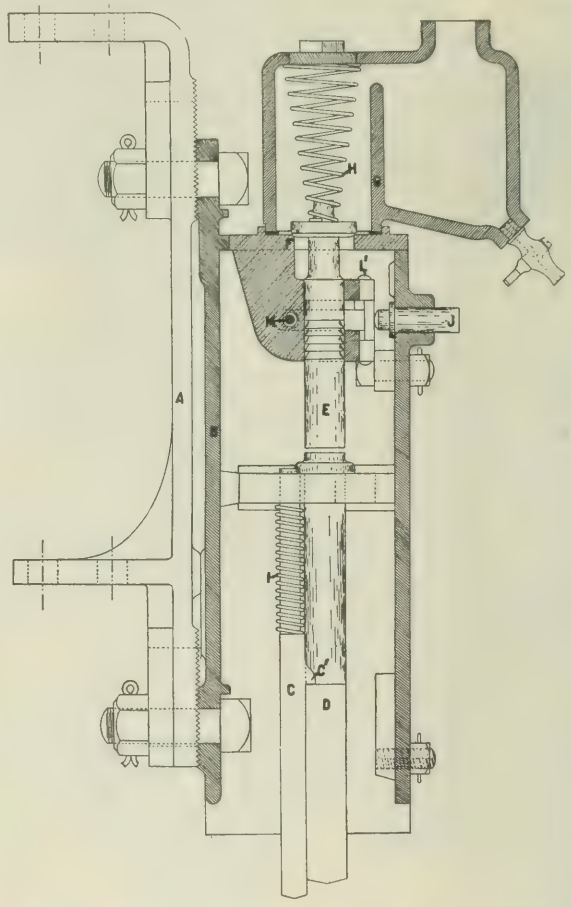


Fig. 3—Engine Instrument; side view, in Section.

locked in this position until released by a plunger. This release can be effected only by a man on the ground.

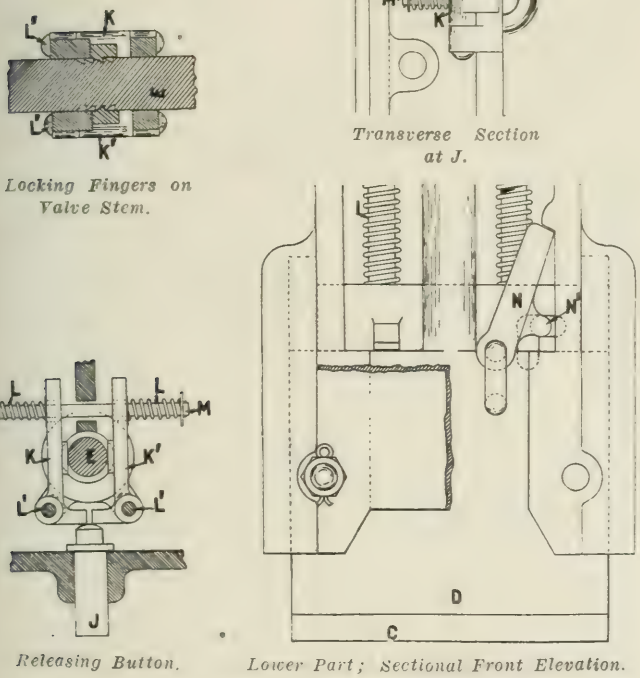
Tests.—The tests were continued through five months. During that period there were recorded 48,352 signal movements with 89 signal failures, and 31,013 automatic stop movements with 11 failures, showing one signal failure in 543 signal movements and one automatic stop failure in 2,820 movements. * * * A bald statement of the number of signal and stop movements per failure indicates a rather unsatisfactory showing, but an analysis of the results places the mechanisms in a more favorable light.

The report then goes on to explain and discuss in detail all faults of design and construction of apparatus or of management and operation, reaching conclusions favorable to the apparatus on all the principal points except as noted in the closing paragraphs (See below). In all cases of failure of the visual (semaphore) signal in the clear position the second track-trip was in position to stop the train. The general subject of train stops is then taken up as follows:

Mechanical-trip train stops of the ground type have been

used for some years and with a considerable measure of success on electric railways situated on elevated structures or in subways in Boston and New York, and more recently in Philadelphia, but so far as the board is aware no devices embodying the principal features of the Rowell-Potter system have had extended use under the conditions of steam surface railway operation. Hence there is very little precedent or data upon which to base comparisons, and it is, therefore, necessary to consider the system presented from the standpoint of the characteristics which it is believed any automatic train-control system should possess.

The art of automatic train control is, as compared with most other arts, new, and while the board has never adopted any definite statement of requisites to which an automatic train-control system should conform, it believes that there are certain desirable features which every such system should possess in order to meet fully the requirements of safety, of reliability, of flexibility and of economy of operation which the best railway practice would impose. Devices might operate satisfactorily in one situation under known and fixed conditions which would be quite unsuitable for other situations. Doubtless a considerable number of collisions that have occurred upon railways in this country could have been prevented by the use of an extremely simple form of mechanical trip. * * * To obtain the greatest possible benefit from its use, and in order to be wholly desirable, the board believes that any system of automatic train control should possess the following characteristics: (1) The apparatus should be so constructed that the removal or failure of any essential part would cause the display of the stop signal and the application of the train brakes. If electric circuits are employed they should be so designed that the occurrence of a break, cross or ground or a failure of the source of energy in any of the circuits would cause the display of the stop signal and the application of the train brakes.



Locking Fingers on Valve Stem. *Transverse Section at J.* *Releasing Button.* *Lower Part; Sectional Front Elevation.*

Fig. 4—Details of Engine Instrument.

(2) The apparatus should be so designed that it may be used upon the open roadway, on bridges or elevated structures, in tunnels or subways, and where either steam or electricity is used as the propelling power.

(3) The apparatus should be so constructed as to conform to recognized standards of clearance for rolling equipment and structures, so that those portions of the apparatus placed upon the roadway will not be subjected to damage by rolling stock or engines, nor those portions placed upon the vehicles be damaged by any structures permitted to exist upon the roadway; and at the same time all vehicle parts and roadway parts which may have to come into operative relation should be so designed that proper operative relation will be assured under all conditions of speed, weather, wear of track or vehicles, oscillation and shock.

(4) The system should operate under all weather conditions which permit the operation of trains.

(5) The system should be capable of control by the ordinary means used for indicating the condition of the block about to be entered, such as electric track circuit.

(6) The engine apparatus should be so constructed as to prevent release of brakes after an application has been made until the train has been brought to a stop, or the obstruction or other conditions which caused the application have been removed.

(7) The system should be so designed that should operating conditions require it speed control may be used; that is, provision should be made for a train to pass an automatic stop in tripping position without the application of the brakes, provided the speed is less than a predetermined number of miles per hour.

(8) The system should be so designed that when no cause for stopping a train exists, a definite and positive clear or proceed indication will be given at every point where a stop indication would be given or the brakes applied when adverse or dangerous conditions existed.

(9) The system should provide, at least for use under congested traffic, for a continuous display of indications rather than for their intermittent display at certain definite points, as of course is necessary with fixed signals.

It is possible that other conditions may develop as the result of the use of automatic train-control systems, which it will be found necessary to meet, and it is possible that experience will develop the necessity for a modification of some of the characteristics described.

Examination and study disclose the following facts in regard to the system when examined in the light of the desirable characteristics above referred to.

Characteristic No. 1.—It is doubtful if any form of mechanical trip device can completely possess this desirable characteristic. It is obvious that if the ground trip is broken off or removed it can not stop the train, and to this extent mechanical trip systems would fall within the category of what would be called in an electric system "open-circuit" devices. Nevertheless, it is believed that by proper design and construction, and especially by the duplicate principle here employed, mechanical trips can be made to operate with a very considerable degree of reliability, even under adverse weather conditions.

This system appears to possess the desirable features of characteristic No. 1 to a greater degree than any other mechanical trip examined by the board to date. The failures due to the valve closing after being opened are, it is believed, the most serious; and it must be said that the engine air valve used does not possess characteristic No. 1 to a proper degree. It is the opinion of the board that no valve should be used for this purpose except one in which the train-line pressure will tend to open it and hold it open. The electrical features of the test installation do not possess characteristic No. 1, in that the line circuits are improperly designed. This, of course, is not inherent in the system, as the arrangement of batteries and apparatus in the circuits could probably be changed to a satisfactory one without difficulty.

Characteristic No. 2.—The apparatus conforms to characteristic No. 2, though some changes would probably be necessary in the arrangement of the connections between the track and the power-storing machine if the system were to be used on elevated lines or in subways.

Characteristic No. 3.—Apparently the question of clearance has been well taken care of in the test installation. Modifications in clearance would undoubtedly have to be made to suit the requirements of special situations.

Characteristic No. 4.—Inspection reports show but one failure due to sleet or ice during the tests. The connections between the trips and the power machines were not housed in. It is probable that with proper housing of these connections and of the power-storing machines themselves failures from severe weather conditions would not occur.

Characteristic No. 5.—The system as installed takes full advantage of the use of the electric track circuit.

Characteristic No. 6.—With the apparatus arranged as shown it might be possible for a trainman to drop to the ground and release the engine air valve before the train had come to a full stop, yet the speed of the train would be so reduced that for all practical purposes the desired result would be obtained notwithstanding.

Characteristic No. 7.—The system as presented makes no provision for speed control, though it appears to be capable of having any one of several forms of speed-control devices applied to it to permit the train to pass a stop in tripping position without a brake application, provided the speed is reduced below a predetermined number of miles per hour.

Characteristic No. 8.—The system provides no indication upon the engine to denote that a train is passing a point at which a brake application might be made were the conditions favorable. While, as presented, it is intended to be used only in connection with a system of fixed signals, it is the opinion of the board that the giving of a definite and positive clear or proceed indication at every signaling point, when no cause exists for stopping the train, is a very desirable characteristic. In a cab-signal system unaccompanied by fixed signals the possession of this characteristic would be an absolute requisite.

Characteristic No. 9.—One of the most desirable objects which may be accomplished by the production of effects on the engine by signaling or controlling devices along the track is the production of a continuous effect rather than the mere display of an intermittent indication, such as is inherent with any system of fixed signals. The length of time any fixed signal is within view of the engineman of a moving train is comparatively short. He remains in his cab continuously while the engine is running, and any system which aims to produce effects upon the engine should, in order to be of maximum benefit, produce these effects continuously, or so long as the conditions which cause them exist. There is undoubtedly a large field for devices which exercise control or display indications upon the engine intermittently, but the value of such devices would undoubtedly be enhanced if the control could be exercised or the indications displayed continuously.

CONCLUSIONS.

Train-operated power-storing machines.—The board assumes that a sufficient number of these installations has not as yet been made to determine what their cost would be if the apparatus were manufactured in considerable quantity. The board is concerned with the element of cost only in so far as it has to do with the ability of railways to install appliances or systems for the promotion of safety in their operation. It is obvious that the first cost of installation of this system would be very considerable, but it is not known to what extent this cost would be offset by the diminished cost of operation. The board has no data as to the ultimate relative economy of this system as compared with any others.

Automatic block system.—As an automatic block-signal system the Rowell-Potter devices, aside from probable decreased cost of operation, cannot be said to possess exceptional merit. It is the opinion of the board that in any system of automatic block signaling without the use of automatic stops gravity is the only force permissible for restoring the signal to the stop position. This system requires the use of power from the coil springs to restore the signal to the stop position. While it is recognized that the air-brake will be applied by the train stop in the event of the signal sticking at clear, it is held that the system would be much more commendable if the power machine were used only for clearing the signal and if the signal were arranged to go to the stop position by gravity whenever the electrical controlling device becomes de-energized.

Mechanical-trip train stops.—The duplicate arrangement of two train stops so connected that one is always in the engaging position while the other is withdrawn is a very commendable feature for use with an automatic block system or wherever operating conditions permit its use. It is believed that the design of the trips is good in that they move vertically into tripping position and present an inclined surface to the engine valve, and in that their fin-like construction affords ample stiffness to resist impact and a minimum of resistance to movement through snow or sand. The introduction of springs in the connections used to move the stops into tripping position can only be considered as affording a desirable degree of safety when the springs are so designed, as those under consideration appear to be, that a breakage of the springs will not affect the movement of the trips sufficiently to prevent the engine valve being opened.

Engine air-brake valve.—The board's opinion is that the engine valve of the Rowell-Potter installation worked well in spite of, rather than because of, its design. It is theoretically unsound in that spring pressure and the train-line air pressure tend to hold it closed rather than to open it. There appears to be no reason why a valve of the same general design but constructed on correct principles should not work better.

The system as a whole.—As regards the system taken as a whole, the board concludes that if the faults herein mentioned were remedied, and it sees no reason why they should not be substantially overcome, and if the apparatus were well inspected and maintained, the system would be safe and reliable and its use would tend materially to promote safety of operation on a railway using it. As to its economy, there are not sufficient data from which to form a conclusion of any real value.

ILLUSTRATIONS.

Fig. 1 shows the track instrument. The main plate A is an angle bar bolted to the ties. Bar B has a loop at its inner end in which roll D is confined. E. E. are springs which hold C firmly against the base of A. The object of this arrangement is to provide a means of raising bars B B′ in the center to form an inclined plane and lower them to a level with the rail. The rotating of shaft C ninety degrees does this. Shaft C has on its outer end an arm to which the propelling power is attached. The object of springs E is to provide a flexible instrument, *i. e.*, a greater load than the sustaining power of springs E being placed upon bars B B′, springs E would be compressed and bars B B′ pressed down instead of being broken. Shaft C has a universal bearing at its outer end to permit of this. The loop on B for this installation was welded; some trouble was caused by poor welds. For permanent service bars B and B′ would be drop forged in solid metal and the character of steel specified.

Fig. 2 shows the brake-setting attachments of the engines and the track instruments in their relative positions. Brake-setting attachments A′ are bolted to the forward end of the rear tender truck, one on each side. D′ D′ are guards for A′. They are fastened to the forward end of the front truck and the rear end of the rear truck. The imaginary line, X X, is parallel to and 3½ inches above the rail.

Fig. 3 shows the engine instrument. In this C is the locking plunger which locks main plunger D in its normal position. C′ is a lug fast to C and resting on top of D. D is the main plunger. The valve casing, G, has two compartments. Air is admitted to the outer compartment and passes over a partition to get to the valve, which prevents moisture from getting to valve and freezing. J is the releasing button. K, K′ (Fig. 4) are locking fingers in the form of right-angle cranks pivoted at L′. LL are springs on M, whose strength is exerted to press KK′ together and cause them to bear on either side of E. M is a floating arbor for LL. N is locking dog on D, which locks D in its normal position. It has a lug N′, which extends into a right-angle slot in C. The top of slot bears upon the top of N′ and holds it in the locked position, as shown on Sheet 8.

Plunger C extends below D the proper distance, so that an incline of 1 in. in 30 in. will raise C a sufficient distance to cause the lower part of slot in C to press upward on N′ and rock N out from under the lug on B before coming in contact with D. D is then free and both C and D are forced upward. The travel of D forces E upward off its seat and allows the air to escape down through the machine. The object of allowing the air to blow down through the machine is to keep the machine clean. When E is forced upward KK′ being pressed inward by the pressure of springs LL catch in ratchet teeth on E and hold it up. To close this valve it is necessary to press button J, which rocks KK′ on their fulcrums. L′ disengages them from E and allows it to drop. The object of lock N on plunger D is to prevent the machine from being operated by anything except the instrument that was intended to operate it.

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We print this week a collection of shop kinks secured by F. E. Lister, associate editor of the *Railway Age Gazette*, at the Mt. Clare shops of the Baltimore & Ohio. All drawings, photographs and manuscripts for our next prize competition must be in our hands by February 7, and the winning collections will be published in our issue of March 4.

In another column will be found the third of the articles dealing with the arrangement of the new machine shops of the Delaware, Lackawanna & Western at Scranton, Pa. They are interesting because they show not only the tendency of the times but also the tendency, as applied to the equipment of a machine shop, of making a careful study of requirements before a step is taken in execution, and then blazing the way by carefully considered plans. The new plan does away with the old method of depending upon someone's judgment as to about how many lathes and planes will be required for a certain maintenance, a judgment that may have been based on experience in a shop poorly equipped, and grown from small beginnings by innumerable accretions that possessed no semblance of unity. At Scranton the scheme was worked out upon the fundamental basis, in the first place, of a thorough analysis of the time and tool required for the execution of each and every movement that enters into the maintenance and construction of a modern locomotive. This done, these movements or elements of the work were segregated and classified in groups so that work on similar or related parts should be done in the same place, and, as far as possible, with the same tools. The exact relationship between these groups was then studied, and they were so arranged that material which must necessarily pass from one to the other could do so with the least possible resistance and with no retracement of its movement. Finally, the machines of each group have been so arranged with reference to each other that there shall be a steady progress of the work through from one tool to another as it is changed from its rough to its finished condition. That this has been done in the best possible way, and that the last word has been said in the matter, the men who inaugurated and executed this plan would probably be the last to claim. But this much is certain: up to the present no one has made a more thoroughly scientific study of shop layouts, and the result is at least deserving of the most careful and scrutinizing attention of all who may have a similar problem to solve.

We publish in this issue a new specification for steel tubes for locomotive boilers which has just been adopted by the Pennsylvania Railroad, and differs from that of the Master Mechanics' Association in several particulars. The latter was adopted in 1904, when few steel tubes were in use and the manufacturers were not fully informed as to the actual requirements. Since then steel tubes have become more generally used, and their quality has been materially improved, especially their capacity to resist corrosion. Tubes made of steel which is not homogeneous are liable to pit, probably by electrolytic action, and this has been one of the principal objections to them. At present steel tubes for locomotives are made of a fine quality of steel which is specially purified and made uniform in composition, so that their service in respect to pitting compares favorably with the best charcoal iron tube. The Master Mechanics' specification for steel tubes requires them to be cold drawn and seamless, while the new Pennsylvania Railroad specification admits cold and hot drawn and lap welded steel tubes, indicating that the precautions which were thought necessary in 1904 in limiting the process of manufacture to one method, and the most expensive one, are no longer required. The hydrostatic pressure test prescribed by the Pennsylvania Railroad is 750 lbs. per sq. in. for lap welded tubes and 1,000 lbs. for seamless tubes. The lower pressure is amply sufficient for a strength test, but the higher figure is used to detect any defects which would cause leakage in the tubes. The Pennsylvania Railroad specification has very simple chemical requirements, covering only phosphorus and sulphur, and for the latter .04 per cent. is made the upper limit, while the M. M. specification requires the sulphur content to be below .03 per cent. It also specifies the desired per cent. of carbon and manganese, but the Pennsylvania evidently finds this unnecessary, as the strength tests are sufficient to disclose any excess of these elements. The M. M. crushing test requires a section of tube 2½ in. long to be crushed to a height of 1⅛ in. without splitting or cracking, while the Pennsylvania requires the specimen to be crushed flat. The item of 1⅛ in. in the M. M. specification is evidently wrong or obsolete, as it is the common practice to crush these tube test pieces until they are completely flattened. There are other changes in the more recent specification for tubes which might be incorporated in the M. M. specification, and the attention of the committee on Revision of Standards is called to the desirability of doing this. The Pennsylvania specification contains instructions for handling tubes received for inspection and for disposing of rejected tubes, which will be found suggestive.

"COST OF SERVICE" AND THE ALTON CASE.

At a recent dinner of the New York Economic Club, Commissioner Clements, of the Interstate Commerce Commission, attacked the excessive inflation of the securities of the Chicago & Alton, but he attacked it, as usual, on the wrong grounds, while Francis Lynde Stetson defended it, on almost the only grounds upon which it was indefensible.

Referring to the refinancing of the Alton, after the change of management in 1899, and to the stock exchange scandal when John W. Gates got control of the Louisville & Nashville and had it subsequently bought away from him at a large profit to himself, "in both these cases," said Mr. Clements, "the added amount in stocks and bonds was taken out of the pocket of the public in increased rates." We wonder if Commissioner Clements has ever chanced to observe that the Chicago & Alton, running from Chicago to St. Louis and Kansas City, is not the only railway serving these points. As a matter of fact, the territory between Chicago, St. Louis and Kansas City is perhaps the most highly competitive territory in the country, and we beg to inquire what the Wabash, the Illinois Central, the Cleveland, Cincinnati, Chicago & St. Louis, the Chicago, Burlington & Quincy, the Chicago & Eastern Illinois and the Pan Handle-Vandalia were doing while the Chicago & Alton was taking the amount of its increased capital out of the pocket of the public in increased rates between Chicago and St. Louis. It would be interesting, also, to know who chloroformed the Wabash, the Chicago, Rock Island & Pacific, the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fe, the Chicago, Milwaukee & St. Paul and the Chicago Great Western while "the added amount in stocks and bonds was taken out of the pocket of the public in increased rates" between Chicago and Kansas City.

Of course, the contention that an isolated road in a highly competitive group can raise its rates for any cause whatever, whether based on its own stern necessities or on the pleasure of the chase, and still do business, is arrant nonsense, and the man that made such a statement is conspicuously unfit to be a member of the Interstate Commerce Commission.

But when Mr. Stetson rose to reply, he attempted to defend the Alton and the Louisville & Nashville financing on moral grounds, which was hopeless. Why there should be so much obscurity in people's minds over so plain a subject as this, is beyond us. In regions where there is either actual or potential railway competition, over-capitalization cannot affect the rates; it can seriously damage the minority stockholder, and, therefore, is wrong morally; it has a bad effect on the financial credit of the railway which is the victim of it, and therefore is bad railway practice. The public using the Chicago & Alton Railway has not been damaged to the extent of one cent by the over-capitalization of this property, but the wings of the Alton were clipped when the transaction took place, because it was thereby denied, for a long period of time, the privilege of obtaining new funds in the world's money market—except at prohibitive cost. Therefore, actual damage was done to the company's credit, but no harm was done, or could possibly have been done, to the traveler and the shipper.

We have discussed the case of the Alton rather than that of the Louisville & Nashville because the principles involved are more sharply pointed. In the Louisville & Nashville affair, the over-capitalization was not serious—a fact conclusively demonstrated by the company's high financial credit at the present time. But the Louisville & Nashville could no more take the increased capitalization out of the public in the form of higher rates than the Alton could. The Louisville & Nashville is a less simple and compact property than the Alton; it has one kind of competition between Cincinnati and New Orleans and another kind between the Birmingham district and the Atlanta district, while, between Louisville and Memphis or Nashville and Memphis, it has still a different kind of competition. But in the whole Louisville & Nashville system there is not one single line which has not some effective competitor, unless we except two or three minute branch lines which are not important enough to attract competition. What would the Queen & Crescent, or the Illinois Central, or the St. Louis & San Francisco, or the Mobile & Ohio have done if the Louisville & Nashville had attempted to increase its rates at the cost of the public? They would have taken all the company's business, and left a very handsome railway entirely idle.

We take this opportunity again to thresh over familiar ground because we are determined to drive from Ireland the snake named "cost of service." Rates are not made in accordance with what the work costs the railway or what the railway would like to earn; they are made on a basis which will permit the traffic to compete effectively in the markets of the world. Oranges from California, Florida and Jamaica compete in New York City, but they are sold on a quality basis, not on a distance basis; the buyer is not at all interested in protecting the railway companies from any loss they may have incurred in competing with a steamship company. If rates were made on the "cost of service" theory there could be no competition in the country at all, since the line with the lowest operating costs would get all the business, and the other lines serving the same points would get none whatever.

THE PER DIEM QUESTION.

The Per Diem Question has always been an obscure one. It only interested railway men, and in its details it interested very few railway men.

One would think that a question as important as this would be fully understood by these few men who were especially interested in it, but unfortunately most of them viewed the question from prejudiced eyes.

As has been said before in these columns, railways can be classified on this car question as "originating roads" and as "distributing roads." The originating roads are those which originate more traffic than they receive. The distributing roads receive more traffic than they originate. The movement of freight enforces the flow of cars from the originating road to the distributing road, and there is nothing to take the empty car back but the per diem rate.

In consequence, the officers of the originating roads feel that the per diem rate should be high; the officers of the distributing roads feel that the per diem rate should be low.

In periods of car surplus, such as we have had recently, the distributing roads are right. The originating roads in general refuse to accept any empty cars except their own and are continually flooding the distributing roads with loaded cars which the distributing roads cannot use after unloading. The distributing road has a continual surplus of its own empty cars standing, which it would like to use, and while it is unable to use these cars it is compelled to pay a per diem rate for unwelcome foreign equipment which is forced upon it. The distributing road is right in feeling that it ought not to have to pay a high per diem rate for cars which it does not want.

But when the situation changes, as it did last fall—when cars become scarce, this position is wrong. The officer in charge of the distributing road then has the whip-hand. He gets a full car supply and he ought to pay a high per diem rate for it. This he will not admit, as he is still suffering from the grievance which he has experienced. Of course, grievances are remembered longer than good fortune.

On the other hand, the officer of the originating road feels his grievance keenly when cars are scarce. He thinks he should have a high per diem rate on the cars which he could use if the distributing roads would only return them. In this

he is right. But when a period of car surplus comes and he is able to relieve himself largely of stored cars he is not prompt to realize that the per diem rate should go down. On the only occasion when this happened it was vigorously resisted by the most distinctively originating railways.

The action of the American Railway Association in proposing that two rates go into effect—a 30c. rate during the months when a car surplus is usual, and a 35c. rate for the months during which car shortages usually appear—is an indication that both originating and distributing roads are beginning to appreciate the justice of each others' claims. There is every reason why the per diem rate should be high when cars are scarce; there is every reason why it should be low when cars are plenty.

To be sure, this proposition of the association is tardy and grudging. The difference in rate is only 5 cents. It ought to be much more, and it is hoped it will be much more; but the principle at last is recognized that there are two sides to the per diem question, and this is extremely gratifying. It is hoped that the proposition will be promptly carried in the letter ballot which is now being taken.

IMPROVED BEARINGS FOR MACHINE TOOLS.

During the past few years machine tool builders have given their principal attention to improvements in standard machines so as to adapt them to the feeds and speeds made possible by motor drives and the new tool steels. The developments in this direction are such that the requirements and possibilities are well understood and have been realized in many ingenious designs. The process has been carried so far that some tools are burdened with details which wear out or break, and the annoyance caused by such mishaps has resulted in a reaction, and there is now a decided movement toward simpler machines built for a specific purpose with proportions suitable for maximum capacity.

In this new movement more attention will be paid to the material and form of the bearings and to better means of lubrication, as the power consumed and the wear of the parts become more important with high speed and higher pressures. The principal bearings of machine tools may be simply classified as flat and circular. The flat bearings are mainly in the housings and bed plates, and as these often require considerable finish, if the wearing quality is not regarded they will be made of soft cast iron. The tests made at the University of Illinois under the direction of Prof. Breckenridge showed that the average cutting force required to machine soft cast iron was 50 tons per square in., and for hard cast iron 80 tons per square in. It was also shown that any of the new tool steels can work in very hard cast iron at the rate of 25 ft. per minute, but they begin to wear rapidly at 125 ft. per minute. Cast iron or medium hardness can be cut at 125 ft. per minute just as readily as at 70 ft. per minute as far as any injury to the tool is concerned. The aim, therefore, should be to use in the castings for machine tools which are subject to wear a grade of iron as hard as will admit of finish at a reasonable cutting speed, and not to use a soft iron because it can be finished rapidly.

Foreign tool manufacturers have given more attention to the grade of cast iron used for bearing portions, and the complaint of foreigners is that our machine tools generally are made of soft iron. However, some of our manufacturers have regarded hardness for flat wearing surfaces so essential that they have chilled portions of lathe shears and other guiding surfaces, and with the makers of large grinding machines this practice is regularly established. Grinding machines themselves become efficient means of finishing such chilled surfaces. For revolving parts not subject to heavy pressure cast iron, when it becomes glazed, forms the best kind of a bearing, and for this purpose need not necessarily be very hard.

Wrought iron and steel shafts and spindles which run at high speeds should be case-hardened and ground in order to avoid cutting and rapid wear. Shafts or spindles subjected to heavy pressure should have ball bearings. The reduction in friction of shafts by ball bearings was demonstrated in the tests reported by Henry Hess in his paper read at the last meeting of the American Society of Mechanical Engineers. The results of these tests showed that the co-efficient of friction of the counter shaft is usually about three times that of line shafts, and the co-efficient of line shafts fitted with ordinary bearings is about 20 times that of the same shafts when fitted with ball bearings. When ball bearings are used on counter shafts the saving may amount to 70 per cent. of the bearing friction. This is the per cent. of friction work lost in the plain bearings and not of the total power transmitted. The excessive friction of counter shafts is due to the grinding of the hubs, which are usually small, and the pressure per square inch unduly high. These tests also call attention to the advantage of direct motor drive as the best method of eliminating the friction due to counter shafts.

While the internal friction in machine tools is not so important in small tools it must be reckoned with in the larger tools designed for maximum output, and in them there is a combination of high pressure and high speed, and the work performed and horsepower required increases with the speed. The friction loss of a 72-in. boring mill or a 20-in. lathe, when running empty, amounts to about 3 h.p., while a 60-in. planer shows a momentary consumption of 25 h.p. at the time of high speed reverse. Tests of the friction loss of 50 motor drive machine tools in a locomotive machine shop, when doing no useful work, showed an absorption of 40 h.p. in the motors and 20 h.p. in the machine tools, while the same tools at their usual work only required an additional 40 h.p. to drive them.

The other obvious method of reducing friction in machine tools is by improved lubrication, and the substitution of gear wheels for cone pulleys has resulted in radical changes in lubricating methods. The ordinary oil cups are no longer adequate; the gear boxes are made tight and the gears are submerged in oil. This applies not only to the speed mechanism of ordinary lathes, but has been applied to the driving gear of axle lathes and car wheel boring machines, where phenomenal outputs have been obtained. In other machines forced lubrication is used or there is a constant circulation of oil by means of a pump, and in other cases the hollow spindle in the driving head forms an oil chamber, from which the lubricant is distributed to the bearings.

SUPREME COURT'S ATTITUDE TOWARD THE INTERSTATE COMMERCE COMMISSION.

"In considering section 15 in the case of the Illinois Central versus the Interstate Commerce Commission just decided, it was pointed out that the effect of the section was to cause it to come to pass that courts, in determining whether an order of the commission should be suspended or enjoined, were without power to invade the administrative functions vested in the commission, and therefore could not set aside an order duly made on a mere exercise of judgment as to its wisdom or expediency." This, taken from a later case, is the Supreme Court's own view of its ruling in the coal car distribution case, which is printed at some length in our news columns. The coal car distribution case, important in itself, has been given added interest and weight by the opportunity it has afforded for the Supreme Court of the United States to indicate its attitude toward the Interstate Commerce Commission. This is especially timely because of the discussions pending in Congress on President Taft's recommendation for a special court of appeals which will consider only cases involving rulings of the Interstate Commerce Commission.

While the Interstate Commerce Commission has consistently claimed that the courts have had power only to inquire into

the law and not into the facts of an order made by the commission, this view has not been sustained by the various circuit courts of the country. The prevailing opinions of the circuit judges has been that the question of whether an order of the commission is reasonable or unreasonable is a judicial question and not an administrative question. In the coal car distribution case the Supreme Court does not meet this issue perfectly squarely. The general language of the opinion written by Justice White appears, however, to lean strongly toward the view of the commission; that is, that the question of reasonableness or unreasonableness of an order is an administrative question and not a judicial one, and therefore is not subject to appeal and should be finally decided by the commission. This may or may not be a proper interpretation of the court's ruling, but if the law as it is now worded must be so interpreted, it may seriously be questioned whether the people really want such a law. The Interstate Commerce Commission acts as prosecuting attorney as well as judge and jury. A better simile, even, is that between grand jury and petit jury. The Interstate Commerce Commission not only brings indictments, but also sits as a jury to determine whether these indictments are properly or improperly brought. It is humanly impossible for a body of men to act in these two capacities and not be influenced in their action in one capacity by their action in the other.

If the opinion of the Supreme Court in holding "that the powers [of the courts to pass on the unconstitutionality, etc., of a statute] lend no support whatever to the proposition that we may under the guise of exerting judicial power usurp merely administrative functions by setting aside a lawful administrative order upon our conception as to whether the administrative power has been wisely exercised" means that the Act to Regulate Commerce has given to the commission power to determine, without possibility of appeal, the reasonableness of its own order, then the opportunity which may be afforded by a law creating an interstate commerce court for amending the original Interstate Commerce Act, it is to be welcomed.

If such a court was considered necessary when it was thought that the courts would reserve to themselves the power to pass on the reasonableness of the Interstate Commerce Commission orders, it now becomes necessary under our interpretation of the Supreme Court's ruling not only that a new court shall be created, but that it shall be vested with powers to pass judgment on the reasonableness of the Interstate Commerce Commission's orders, and that in so far as the commission itself now has this power, it should be taken away from it. Far, therefore, from lessening the necessity for an Interstate Commerce Commission court, the present opinion of the Supreme Court adds as well the necessity for a legislative curtailment of certain powers of the commission and the transfer of these powers to a court.

It has been assumed so far that the Supreme Court has definitely decided how far the power of the commission extends, but this is by no means an unquestionable assumption. In the coal car distribution case the court was wholly with the commission on the facts in the case. In the opinion of the Supreme Court the commission was right, and the Illinois Central and other roads following its method of coal car distribution were wrong. When, therefore, the court was so fully in accord with the ruling made, it is reasonable to suppose that in writing the opinion of the court Justice White permitted himself to discuss in a general and somewhat oratorical way the principles involved in the Act to Regulate Commerce. But in a case where the court thought the commission wrong on the facts it might hesitate to dismiss the appeal of the railway company on the ground that, although plainly wrong in making an order, the commission would not be overruled because the order in question, while unreasonable, was an administrative one.

Although there is nothing in the opinion to bear out such an assumption, nevertheless it may be highly important that the case is one in which discrimination as to service is involved and not one in which the reasonableness or unreasonableness *per se* of *rates* is involved. The Missouri river rate case, which will be argued late in February when the court convenes after the adjournment, will probably afford far better information as to the Supreme Court's attitude toward the Interstate Commerce Commission than does the present case.

FINISHING LOCOMOTIVE DRIVING WHEELS AND AXLES.

The increase in weight on locomotive driving wheels to 28,000 to 30,000 lbs. per wheel, increased speeds, higher tractive power and larger mileage have combined to wear the driving tires and journals rapidly, and the repairs to these constitute one of the largest items in the maintenance of locomotives. This has been recognized in many locomotive shops by the purchase at a large expense of new and powerful driving wheel lathes, boring mills and hydraulic presses even when appropriations have been denied for smaller tools which are also needed. In pursuing our inquiry as to the output of the principal machine tools in locomotive repair shops we have sent out circulars to many of the principal lines requesting information as to the work performed under normal conditions in ten hours on the above tools, and we have a sufficient number of replies to exhibit a fair representation of present practice on driving wheel work.

The driving wheel lathe has been in recent years wonderfully improved, and when driven by high power, direct-connected electric motors and operated by the new tool steels, its output compared with former practice is something phenomenal. In the past two years we have illustrated tools of this kind made by two of the principal builders. Each of these tools has merits of its own; and tests have been made showing their maximum performance, from which it can be estimated what should be expected from them in every day practice. One of these lathes was driven by a 50 h.p. motor, with a cutting speed of 13 ft., the cut being ⅜ in. and the feed ½ in.; the horsepower consumed at the point of the tool was 27. The lathe was capable of higher speeds with the same cut, but at that time no tool steel was found adequate for the work. A demonstration was made in which the lathe was set complete with a pair of 78-in. wheels ready for work in 12 minutes; the tires were turned in 19 minutes and placed on the floor in 4 minutes, making the total time from floor to floor 35 minutes. In another test with 67-in. wheels and a cut ⅜ in. deep, the total time required was 38 minutes. It is fair to expect, therefore, that this lathe could turn tires up to 78 in. in regular work at a rate of one pair in 45 minutes, and 80-in. tires at the rate of a pair per hour, making 10 per day for large tires and 12 to 14 per day for smaller tires.

This rapid work is materially assisted by the use of special cutting tools shaped to form the finished flange by direct pressure in a right line, instead of the slower work by sharp-nosed tools. The work done by the new lathes is as fast as could be desired, and in many shops one of them would be sufficient. The limiting point is in the cutting tool. Not only does this become heated under heavy cuts, but the pressure due to ½-in. cut, with ⅜ to ½-in. feed, produces a transverse load which requires a large sectional area to resist it, and when very heavy work is attempted the cutting tool is often broken in the shank. Another circumstance which limits the output of high power driving wheel lathes is that the actual cutting is done so rapidly that it is necessary to change the tools frequently, either for dressing or for shaping the flange and rim.

The Wm. Sellers Company has made a radical change in the tool post to overcome this objection, and has placed the different shaping tools in a turret which revolves on the

post. The Niles-Bement-Pond Company abandoned the old tool post with four bolts, and has designed a new tool clamp which has only one screw and permits the tools to be changed rapidly without much labor on the part of the attendant. A sure grip and powerful driver for revolving the driving wheels are also necessary, and these also have been improved and made adequate for the heavier service.

Turning Worn Driving-Wheel Tires

Tool maker.	Output, 10 hrs.
Niles-Bement-Pond, 1905, 80-in., 72-in. diameter outside	5 pairs
" " " 1901, 84-in., 50-in. diameter outside	7 "
" " " 1909, 90-in., av'ge. diam. large and small	4 "
" " " 1906, 90-in., 62-in. diameter outside	5 "
Putnam, 1903, 90 in., 50-in. diameter outside	4 "
Niles-Bement-Pond, new, 1909, 90-in., all sizes, average	7 "
" " " 1904, 90-in., 70-in. diameter outside	8 "
Putnam, 1906, 100 in., 50-in. diameter outside	3 "
Niles-Bement-Pond, 1903, 90-in., 56-in. to 74-in. diam. outside	5 "
" " " 1907, 90-in., 69-in. diameter outside	5 "
" " " 90-in., 56-in. diameter outside	3 "
" " " 1908, 90-in., 62-in. diameter outside	5 "
Putnam, 1907, 90-in., 56-in. diameter outside	4 "

The output of the new driving wheels lathes depends largely on the convenience and rapidity with which the wheels can be placed in the lathe, chucked and removed, as only 50 per cent. of the total operation is actually employed in the work of the cutting tool.

The time required for turning also varies with the diameter and with the irregularity and depth of wear. Comparisons should be made for some certain size, but the wear must be regarded as an average condition. The majority of our records relate to the smaller tires averaging 62 in. Under test conditions the best new tire lathes would turn 12 pairs in 10 hours, but the normal output under ordinary conditions is about 8 pairs of 62-in. tires; and 6 tires of 62-in. diameter is a good average for tire lathes without the most recent improvements. Our reports show that a majority of the shops are turning an equivalent of 5 pairs of 62-in. tires in 10 hours, while a number of them with comparatively new lathes are only getting out 3 or 4 pairs. If the amount of work is so large as to require several lathes which are working at this rate, there is an opportunity to improve conditions, either by forcing the machines to greater output or by the substitution of a new lathe for 2 or 3 old ones.

Tire boring is not such heavy work, as the tires are rolled close to finished size. A large number of tires can be bored per day, and the boring mill is available for turning driving wheel centers. The reports on this work show a wide variation, from 6 or 8 to 40 or 45 tires being bored in 10 hours. Good work should show an output of 30 to 40 tires per day. Forty-five per day is about the practicable maximum.

Boring Steel Tires.

Tool maker.	Output, 10 hrs.
Niles-Bement-Pond, 1905, 50-in. diameter inside	6 tires.
Betts, 1908, all	28 "
Niles-Bement-Pond, 1898, 50-in. diameter inside	20 "
Betts, 56-in. diameter inside	14 "
Niles-Bement-Pond, new, 62-in. diameter inside	11 "
" " " 1900, 72-in. diameter inside	17 "
" " " 1903, 56-in. diameter inside	12 "
" " " 1905, 73-in. diameter inside	45 "
" " " 1906, 81-in. diameter inside	30 "
" " " 1906, 62 to 72-in. diameter inside	40 "
Betts, 1905, 69-in. diameter inside	15 "
Niles-Bement-Pond, 56-in. diameter inside	8 "

The roughing process in turning steel driving wheel centers is heavy work and calls for a strong machine with a powerful drive, and it is this work which has stimulated the improvements in boring mills. Our reports show that two to four 62-in. cast iron centers can be finished per day, and one to one-and-a-half 62-in. steel centers represent average work. This work depends on the roughness of the casting and the hardness of the steel, and two steel 62-in. centers should be regarded as very good work.

Turning Driving Wheel Centers on Boring Mill.

Tool maker.	Output, 10 hrs.
Craven, 1904, 63-in. diameter	1½ steel.
Craven, 1904, 63-in. diameter	2 cast iron.
Betts, 72-in. diameter	1½ steel.
Betts, 56-in. diameter	3 iron.
Niles-Bement-Pond, 66-in. diameter	1 steel.
Niles-Bement-Pond, 44-in. diameter	1½ iron.
Betts, 56-in. diameter	2½ steel.
Betts, 56-in. diameter	4 iron.
Niles-Bement-Pond, new, 62-in. diameter	1 steel.
" " " new, 62-in. diameter	1¼ iron.
Niles-Bement-Pond, 50 in. diameter	1 steel.
" " " 1900, 62-in. diameter	½ steel.
" " " 1900, 62 in. "	1 iron.
" " " 1903, 62-in. "	⅔ steel.
" " " 1903, 44 in "	1¼ iron.
" " " 1903, 72-in. "	2 steel.
" " " 1903, 57 in. "	3 iron.
" " " 1906, 72 in. "	1 steel.
" " " 1906, 52 in. "	1¼ iron.
" " " 1905, 56-in. "	1.4 steel.
" " " 1905, 56 in. "	1.5 iron.
Betts, 1905, 44-in. diameter	1½ steel.
Betts, 1905, 44-in. diameter	3 iron.
Niles-Bement-Pond, 56-in. diameter	1 steel.
Niles-Bement-Pond, 60-in. diameter	1½ iron.

Turning New Driving Axles.

Tool maker.	Output, 10 hrs.
Niles-Bement-Pond, 1903, Journal, 9 x 12½ in.	4 steel.
" " " 1901, " 9½ in.	3½ "
" " " 1909, new" 8 in.	3 "
Bullard, 1902, Journal, 10 in.	1 in 10 hrs., 1 in 6½ hrs.
Butmann, Journal, 9½ in.	2 steel.
Lodge & Shipley, Journal, 10 in.	2 "
J. Bertram & Son, 1904, Journal, 9 in.	3½ "
Niles-Bement-Pond, 1888, Journal, 10 in.	1 "
" " " 1888, " 10 in.	1 iron.
" " " 1905, " 8 and 9 in.	3 steel.
" " " 1896, " 10 in.	4 "
Sellers, 1883, Journal, 9 in.	3 "
Sellers, 1883, Journal, 7¼ in.	4½ iron.
Bullard, Journal, 8½ in.	1 steel.

Our records for 12 shops which rank among the best in the country include one which reports 4 steel axles 9 in. in diameter, one which reports 3½ axles 9 in. in diameter, two which report 3 steel axles 8 in. and 9 in. in diameter, and one which reports 4½ iron axles 7¼ in. in diameter. Four of the shops report only 1 steel axle in 10 hours, and some others report only 2. This variation of from one to four in the output shows the vast possibilities for improvement in about one-half the shops. That the reports disclose that 50 per cent. are well up to the mark set as the capacity of new tools is certainly a good showing. For turning new driving axles many repair shops use the ordinary lathe built years ago for miscellaneous work, but the belt is narrow and the gears weak, so that heavy cuts cannot be taken. Special lathes for locomotive axles built in recent years have 5½-in. belts, with driving gear wheels in proportion. When driven by a direct connected electric motor the capacity of the motor is 25 h.p., and an axle lathe which can use nearly this amount of power should finish axles rapidly. These lathes have two tool posts, so that both ends of the axle can be turned at once. When kept in nearly continuous operation, with few delays in changing axles or fitting the cutting tools, these lathes should turn out 4 to 5 steel axles with 9½-in. to 10-in. journals in 10 hours; their normal output will be 3½ to 4 axles.

Mounting Driving Wheels and Axles (Hydraulic wheel press).

Tool maker.	Time.	No. of men.	Total cost
Putnam, 1902, 90 in.	1½ hrs.	2	$0.25
R. D. Wood, 1909	½ "	2	.15
Niles-Bement-Pond, 600 ton	¾ "	2	.36
Putnam, 1903, 300 ton	1 "	0	.60
Niles-Bement-Pond, 400 ton	... "	4	.95
" " " new, 600 ton	1 "	4	.68
" " " 1901, 300 "	2 "	3	.90
" " " 1904, 400 "	½ "	3	.34
" " " 1908, 400 "	1¼ "	2	.65
Chambersburg Eng. Co., 1906, 600 ton	1 "	2	.30
Putnam, 1906, 300 ton	1½ "	4	1.32
Putnam, 1905, 400 ton	1 "	2	.62
Hydro Press Co., 1907, 600 ton	1¼ "	2	.50

In mounting cast iron centers and driving axles up to 9 in. diameter there is little difficulty with 300-ton machines, but the steel centers and 10-in. axles require higher pressures, and the more recent machines have a capacity of 600 tons. There is more difficulty in pressing off the steel centers with the low power presses, and the variation in time required for this work is due to the necessity of drilling the axle or heating the center. The lack of sufficient pressure also accounts for the longer time required by some roads to mount driving wheels and axles, and here, too, the methods of handling the wheels at the press largely affect the time required for the work. The actual time the press is in operation is only a few minutes, while the time reported for mounting is usually over one hour. One shop reports as low as one-third hour and a cost of only 15 cents, while with others the time is one and one-half to two hours and the cost 65 to 90 cents.

With the high power presses there should be no difficulty in mounting the largest axles with steel centers in a half hour at a cost of 25 cents.

Tire Heating.

Fuel.	Diameter of tire.	Time, minutes.	No. of men.	Cost.—Fuel.	Wages.	Total.
Oil	56 in.	35	2	$0.15	$0.29	$0.44
"	63 "	30	3	.86	.38	1.24
"	All	45	2	.20	.24	.44
"	72 in.	120	2	.30	1.00	1.30
Gas	62 "	21	2	.30	.20	.50
Oil	All	..	3	.10	.42	.52
Gasolene	.....	..	3	.21	.45	.66
Gasolene	72 in.	45	3	.51	.50	1.01
Gasolene	56 "	45	2	.58	.42	1.00
Oil	79 "	60	2	.05	.30	.35
Gas	56 "	30	2	...	.50	...
Gasolene	62 "	90	2	.44	.70	1.14
Gas	56 "	60	3	2.25	.56	2.81

The reports relating to tire heating are interesting, as they show a variety of methods and a wide variation in costs. The time consumed varies from a half hour to two hours, and the cost from 35 cents to $2.80. A fair average for good work may be taken as 45 minutes with a cost of fuel of 30 cents and of labor of 50 cents, or a total cost of 80 cents.

We have not included in our inquiry the auxiliary work on drivers which is performed in the quartering machine or that in cutting key ways. The average time on quartering machines may be taken as 3 hours per pair of drivers; and in cutting key ways by double key way cutters one hour per axle may be regarded as good work.

NEW BOOKS.

Watkins on Shippers and Carriers. By Edgar Watkins, LL.B., of the Atlanta (Ga.) Bar. T. H. Flood & Company, Chicago, 1909. 578 pages; 6⅛ in. by 9⅝ in. Price, $6.

The law governing the relations of shippers and carriers has, within recent years, attained in the United States an unprecedented interest and importance for the traffic managers as well as for the counsel of both railways and all classes of industrial and mercantile concerns. Mr. Watkins states that it was his purpose to write a book that would be of equal use to the lawyer and the traffic man. He deals, however, not with the broad subject of the law of commerce, but with the somewhat narrower one of the law governing the transportation of interstate freight.

The law of shippers and carriers is at once one of the oldest and one of the newest parts of Anglo-Saxon jurisprudence. The very essence of this part of the law is, and always has been, the requirement that the rates of carriers shall be reasonable; yet what constitutes reasonableness in rates is being litigated in numerous cases now pending in the courts of this country. In this state of the law it is not possible for the text-writer to make dogmatic statements about many important matters. Mr. Watkins has recognized this fact, and instead of attempting to deduce exact principles from the various inconsistent and often conflicting decisions, he has generally quoted from the decisions themselves, and left the reader to put his own interpretation on them. When the decisions of the courts have not covered a particular point he has resorted to the opinions of the Interstate Commerce Commission for light. The chapter headings indicate the scope of the work. They are: "Validity and Scope of the Act to Regulate Commerce"; "All Charges for Services Rendered by Common Carriers Must Be Just and Reasonable"; "Equity in Rates"; "Enforcement of the Act by the Commission"; "Enforcement of the Act by the Courts, Including a Discussion of the Effect Given by the Courts to the Orders of the Commission"; "Power of the Courts of the United States to Prevent an Illegal Advance in Rates"; "State Laws or Regulations Affecting Interstate Transportation," etc. Mr. Watkins does not confine himself to the "Act to Regulate Commerce," but treats of all federal statutes affecting interstate commerce, including the safety appliances acts, the Sherman anti-trust act, and the 28-hour law.

Letters to the Editor.

RUN, REPAIR OR TRANSFER.

Chicago, Jan. 26, 1910

To the Editor of the Railway Age Gazette:

I read with interest in your issue of January 21 the report of the paper read at the meeting of the Western Railway Club, Chicago, on October 19 by Wm. Baird, shop superintendent of the C., B. & Q., entitled "Twentieth Century Inspection" or "Run, Repair or Transfer," dealing with the delays caused to loaded cars at terminals by the refusal of receiving lines to accept them, owing to defects.

In the discussion following I observed that no reference was made to the important point as to who should assume the expense in connection with the transferring of the loads in bad order cars. To my mind, the only objection to our present "Chicago" rule is the fact that the receiving line must, in addition to making the transfers, in all cases assume the expense incidental to so doing.

There are instances when it is necessary for the receiving line to send out its wrecking derrick in order to get damaged loaded cars received from their connections to thier repair or transfer tracks, and men well versed in Chicago interchange have questioned the intent of Rule No. 3 of the General Superintendents' Association's rules governing interchange of cars in Chicago, as to whether, in such cases, the receiving line should be expected to accept these cars and assume all the expense in connection with the transfer. The rule is clear, however, and covers all loaded cars, irrespective of their condition, and it would not be questioned if the rule went further and made proper disposition of the expense involved in handling such transfers and charging it to the delivering line.

Formerly, the Chicago rule did not require the receiving line to accept bad order loaded cars when the cars were consigned within the switching district, but if the present rules are observed all such cars must now be accepted, and if the car is unsafe to handle and cannot be repaired under load the receiving line must bear the expense of the transfer, notwithstanding the only revenue it receives is the small switching charge. In view of this, it occurs to me as particularly important that rules be promptly adopted to make a fair disposition of the expense involved in transferring loads, for while it is true the reciprocity consideration to some extent offsets this injustice, it is nevertheless a fact that under existing conditions the burden of this expense falls more heavily on some roads than it does on others.

Car Service Rule No. 15 of the American Railway Association, covering the disposition of the cost of transferring loads, could not be more equitable or consistent, but the difficulty with this rule in its present shape is that it is only optional and is therefore not generally observed.

The rule of "Run, Repair or Transfer" as a factor in reducing delays is gaining favor each year, and in the near future the Master Car Builders' Association will doubtless insert in its Code of Interchange Rules a rule requiring the acceptance of all loaded cars at all interchange points. As a suggestion, when this is done let the rule be to the effect as follows:

Loaded cars offered in interchange must be accepted.

(If, on account of bad order, transfer of load is necessary, the cost shall be borne as provided in car service rule 15.)

Eliminate the optional phrase of car service rule 15 by omitting the words, "unless otherwise agreed" and make the rule read as follows:

The cost of transferring the lading of freight cars at junction points shall be settled as follows:

First—The delivering road shall pay cost of transfer.

A—When transfer is due to defective equipment that is not safe to run according to M. C. B. rules.

B—When transfer is due to contents being improperly loaded or overloaded according to M. C. B. rules.

C—When transfer is due to delivering line not desiring its equipment to go beyond junction points.

Second—The receiving road shall pay cost of transfer.

D—When cars exceed load limit or cannot pass clearances or be moved through on account of any other disability of receiving line.

E—When receiving road desires transfer to save cost of mileage or per diem.

Would not this be the means of making the desirable rule of "Run, Repair or Transfer" mandatory at all interchange points; consequently reducing delays, and at the same time place the burden of expense covering the cost of transferring the loads of bad order cars where it rightfully belongs?

F. G. CHAPLIN.
Chicago & North Western Ry.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Boston, Mass., Jan. 31. 1910.

To the Editor of the Railway Age Gazette:

Nothing that has appeared with reference to locomotives for high speed passenger service in any railway publication is more important and apropos than your recent article on the limited speed of passenger locomotives. There has been, apparently, no appreciation among locomotive designers of the importance of obtaining more cylinder capacity from locomotives by some other means than by a mere increase in size. As far as I know there has been only one American who appreciated this, and that was the late George S. Strong, who spent many years in exploiting a four-valve locomotive. Mere increase in size of cylinders is not only objectionable *per se*, but it carries with it extra work for propulsion due to friction, back pressure and excessive compression on augmented piston area, to say nothing of inertia effects. It also means increased wire drawing because the piston area increases with the square of the diameter and the port area can hardly keep pace with it.

In 1888 I wrote a paper on the distribution of steam in the Strong locomotive for presentations to the American Society of Mechanical Engineers, and which was printed in Vol. 9 of the Transactions. In that paper I called attention to the importance in high speed work of fuller indicator diagrams than those given by the single valve, and illustrated the matter with typical diagrams from the Strong and common locomotives. The Strong diagrams in some cases showed about double the area of the common locomotive diagrams.

The Strong locomotive received but little consideration from railway companies and builders, but it had in view correct ideals. The design was carried out in such a manner that it was bound to be troublesome, and in the case of the four cylinder balanced compound locomotive the trouble was worse than with the two cylinder locomotive. The most serious trouble with the steam using parts was leakage of the steam around the valve seats, each valve having a removable seat, and in the compound the seats were very unstable. This was because there were in one cavity three valves and three seats. This engine ran well and economically for a short time after the valve seats were fitted. The valves used by Strong were of the gridiron type and were meritorious in themselves, and the actuating gear was not troublesome. The inlet and exhaust valves had independent motions and there were two reverse levers in the cab. Familiarity rendered the latter unobjectionable.

I believe that locomotive designers should now realize that an express locomotive is a large steam engine and should be designed with the same objects in view that are constantly before the designer of a high-class stationary engine, viz., economy and a full indicator diagram. I do not advocate the Strong locomotive, but I do advocate one which shall accomplish all that Strong had in view. To do this I advocate the Corliss valve, with two inlet and two exhaust valves for each cylinder. The Walschaerts link should be used and should be double so as to have one sliding block for the inlet valves and alongside of it another for the exhaust valves. Two rods should run forward from the blocks and take hold of the lap and lead connection from the crosshead, and thence two rods should connect with the valve cranks. The valves would, of course, be on top of the cylinder and would be double or triple ported. There would be two reverse levers, one for the inlet and the other for the exhaust valves. The former should have a closely and continuously notched quadrant in order to change the cut-off as desired, and the other should have a center notch and one or two notches at each end. The valves could be easily balanced by means of strips similar to those used on the Richardson valve, if thought desirable.

By means of a mechanism of this kind the inlet functions will not be mixed up with the exhaust. Late exhaust with full exhaust port opening could at all times be realized. There would also be late exhaust closure and consequent absence of excessive compression. The sum total of these features would be to produce an indicator diagram that is fuller than those from the present locomotive on the steam line, that holds on to the steam better at the end, and that has a lower exhaust line and a full heel. At high speed I should anticipate nearly twice the area of the typical indicator diagram. These valves should be made with as much lap as possible in order to remain tight a long time.

There is no reason for anticipating any difficulty from a valve gear of this kind. The valves can be made of the hardest iron and ground to perfect shape and finish, and with a special boring mill the ports can be rapidly and accurately bored. If it is desired, the valve seats can be made of special iron.

Now, who will be the first to build such a locomotive?

F. W. DEAN.

Reading, Pa., Jan. 31, 1910.

To the Editor of the Railway Age Gazette:

I have noted recent articles in the *Railway Age Gazette* regarding the high speed of American trains, also the editorials on the limit of speed of passenger locomotives, and in each it is claimed that with the ordinary locomotive we cannot run trains much above 60 miles per hour, sustained speed.

I have also noted that in the comments defending the high speed made at different times in this country it is necessary to go back twelve years for a record on the Atlantic City Division of the Philadelphia & Reading Railway between Atlantic City and Philadelphia to cite an instance of sustained speed of 70 miles per hour.

The case cited was in 1898, when the lightest and flimsiest passenger equipment was in service, and, although the train consisted of five cars, the total weight of same, including engine and tender, was only 303 net tons. The time for the trip from start to stop was 47½ minutes, or an average maintained speed of 70.8 miles per hour, while the record given shows that the fastest mile was made in 42¾ seconds.

In 1906 ten heavy Atlantic type engines were built at the Reading's own shops, having cylinders 22 in. in diameter by 26-in. stroke, carrying 235 pounds of steam and having driving wheels 86 in. in diameter.

In the summer of 1907, or the second year that these engines

had been in regular service, the 1 o'clock train out of Camden on the Atlantic City Railroad was 9 minutes late in starting, nevertheless it arrived at Atlantic City—55.6 miles distant—exactly on time, or at 5 p.m., making the run in exactly 41 minutes, which is equivalent to an average sustained speed of 81.3 miles per hour.

The train consisted of one six-wheel-truck combination car, five six-wheel-truck coaches and two Pullman cars. The weight of the entire train, including engine and tender, was a little over 605 net tons.

In this case we have practically doubled the weight of the train which was run in 1898; the speed has been increased from a trifle over 70 miles per hour to 81.3 miles per hour, and the run was made in exactly six and one-half minutes less time.

I hardly think the position taken by some of the writers in your paper is justified by facts. These large Atlantic type engines frequently run a mile in 36 seconds, which is at the rate of 100 miles per hour.

The latest design of engine—the three-cylinder Atlantic type—has yet to be tested out to its fullest capacity; nevertheless, it has already demonstrated that it can outrun and outpull the engine that I have above cited, which maintained an average speed of over 80 miles an hour in regular service. an average speed of over eighty miles an hour in regular service.

H. D. TAYLOR,
Supt. M. P. & R. E., Philadelphia & Reading Ry.

Land Title Building, Philadelphia, Jan. 29, 1910.

To the Editor of the Railway Age Gazette:

The writer is greatly pleased to note that the subject "Limited Speed of Passenger Locomotives" has been deemed of sufficient importance to warrant a discussion, as is evidenced by the letter of Lawford H. Fry and your reply entitled "High Speed and Heavy Rolling Equipment."

Notwithstanding the notable instances of high speed performance to which Mr. Fry has called attention, the writer believes it to be a fact that our modern passenger locomotives are incapable of high speed with the heavy trains of the present, although at moderate speeds they are very efficient.

As your editorial makes clear, the performance of the Vauclain compound locomotives on the Atlantic City Railroad, although creditable, would not meet the requirements of the present, for the reason that the total weight of a modern train with accommodations for the same number of passengers would probably be 60 per cent. greater than those mentioned. The recent remarkable performance of the three-cylinder simple locomotive on the Philadelphia & Reading can probably be ascribed to the following reasons: the total weight of the engine is very slightly greater than that of the 21 in. by 24 in. two-cylinder engines of that line; the balancing must be superior with three cranks at 120 degrees, both of which would tend to a reduction of internal resistance, while the total cylinder volume has been augmented by approximately 16½ per cent. In this three-cylinder engine, piston valves have been employed and the bore of the cylinders relative to the stroke of the pistons has been greatly reduced.

These features should produce somewhat lower percentages of cylinder clearance volume, so that it is probable that, although the total cylinder volume and power have been augmented by 16½ per cent. the weight of steam used has not been measurably increased. Hence, the gain in power at high speed.

The writer believes that Mr. Fry's contention that a satisfactory steam distribution in a balanced compound locomotive can be had with a single valve for both high and low pressure cylinders, is questionable, although it is true that this arrangement makes a very good make-shift.

With a single valve, long, tortuous port passages are a necessary evil, which not only involves large clearance volumes, amounting to, in one case, which came to the writer's notice, 18 per cent. and 12 per cent. respectively of the piston displacement of the high and low pressure cylinders, but must create considerable frictional resistance to the passage of steam, as well as large condensation losses, due to the large areas of the enclosing walls.

The writer is heartily in accord with the editor and believes that a separate valve for each cylinder is far the better arrangement, as with individual valves the cylinder design can be worked out in such a manner that all necessary heat losses can be reduced to a minimum.

You have indicated that the only changes from year to year have been in the nature of enlargements, which have entailed large increases of internal resistance and call attention to the fact that no improvements in steam passage or valve gears have been made, and in your concluding paragraph you suggest that in the discussion which is to follow, the concrete question "What can be done to so improve a locomotive which reaches its limit of speed of 60 miles per hour on straight level track that it will haul the same train at 70 miles per hour?" be considered. This question suggests to the writer, that if the locomotive be using all the steam which can be passed through its cylinders and exhaust nozzle at the given speed, something must be done to improve the use of the steam between the throttle valve and the exhaust nozzle. The above conclusion eliminates the boiler from consideration and assumes that it is capable of supplying all the steam which can be used.

It is a well-known and recognized fact that clearance is a large source of loss in air compressors and, as a consequence, the valves are located in the cylinder heads and every detail which conduces to low clearance volume is carefully looked after in the design. Whatever applies to the air compressor applies with equal, if not greater force to the steam engine, where condensation losses are large at the best. The writer endeavored in a communication, which was published in your issue of January 14, to make clear that it is possible to augment the power of a given locomotive as much as 12 per cent. without any increase in the weight of steam used and while his former communication was purely theoretical, he firmly believes that it is possible to do this and even more if we only employ the proper means.

In order to get the maximum available power from a given weight of steam, it is imperative that clearance volumes be reduced to the lowest possible limits, so as to get the largest possible piston displacement for a given total clylinder volume, and at the same time to so design our cylinder that the port passages shall be short and direct, exposing the least possible areas of enclosing wall surfaces on which the steam will condense.

But with the valve events of our present gears it is not advisable to reduce the percentage of cylinder clearance below 7 per cent. or 8 per cent. of the piston displacement, with which sufficient compression results to suit the mechanical needs of the engine. Therefore, as we are limited as to clearance by our present valve gears, it becomes necssary to devise a mechanism by means of which valve events suitable to a reduced clearance may be had before any marked improvement in the efficiency of high speed locomotives can be expected.

Suitable valve events have been obtained with at least one gear of which the writer has knowledge, but as the mechanism did not prove durable in service, they have never been extensively applied. However, the writer thinks that the problem is one which will readily yield to careful study and good designing, and, in fact, is confident that he already has the solution. Nothing now remains but a demonstration, which the writer hopes to have an opportunity to make in the near future.

CHAS. F. PRESCOTT,
Mechanical Engineer.

Shop Kinks.

FROM THE MT. CLARE SHOPS OF THE BALTIMORE & OHIO.

BY F. E. LISTER,
Associate Editor of the *Railway Age Gazette.*

A number of tools and methods of doing work in the locomotive and car departments of the Mt. Clare shops of the Baltimore & Ohio are given in this issue. In this connection, we are greatly indebted to A. P. Prendergast, master mechanic, who extended every possible courtesy, advising his separate shop foremen, who successively assisted in the individual shops.

To W. P. Spade, shop specialist, we are also greatly indebted. In this position he is especially interested in shop kinks, which, broadly speaking, are along the line of his particular endeavor. It has been due to his energy and resourcefulness, the result of several years of valuable experience as a mechanic and supervisor in a number of railway and industrial machine shops, that many changes in tools and methods looking to greater efficiency have been instituted in these shops. Mr. Spade was particularly courteous, and has since forwarded photographs and drawings and valuable data, which are included.

It has been thought of more advantage to show tools by halftone illustrations rather than by line cuts, and this has been done where possible. Our belief is that the shop foreman is in search of working ideas more than actual detail drawings, which latter easily follow to accord with the specific shop conditions.

STRAIGHTENING STEEL UNDERFRAMES.

Steel underframe and all-steel car construction has necessitated, on the part of the repair department, some additional thought and scheming to keep down the cost of repairs. At the Mt. Clare shops of the Baltimore & Ohio they have a scheme for straightening steel underframes of wooden box cars, which is not only cheap in material, but is also so in point of time. For instance, a certain car had been in a fire and had lost its entire superstructure. When the car arrived at the shops it was found that its underframe had drooped considerably. To dismantle the frame for individual straightening of the members would have taken about six days.

The method used in this instance was to turn the frame upside down and rest it upon three rails placed, at the ends and in the middle, across and a few inches above the track. A wood fire was then made under the drooped section of the frame, and when heated sufficiently it became straight, due to the action of its own weight. This same method has been used with frames which would not straighten of their own weight, in which cases it is but necessary to lift the frame by both ends and allow it to fall upon the rails, which later act as a face plate. An underframe is straightened in this way, using six men, including crane hands, in about ten hours, at a cost of a little more than 10 per cent. of that it would cost to dismantle the frame, straighten the individual members separately and reassemble the frame.

STRAIGHTENING CENTER SILLS OF STEEL TANK CARS.

Steel tank cars are often sent to the repair yard with about 6 in. of clearance at the truck bearings on one side of the car, while those on the opposite side are tight together. This is, of course, on account of a twisting of the center sills due either to a derailment, rolling down an embankment, rough handling by the wrecker, or all combined. Were it necessary to remove the center sills it would require holding the car out of service about a week.

At Mt. Clare such a job of repair work requires only about five hours' time. The two high corners of the car are chained to the rails. The low corners are then jacked up until they are on a level with the high corners, all measurements being made at the side bearing. A wood fire is then made under the section of the center sills where the twist occurs, and when sufficiently heated the metal responds to the strain put upon it by the chains and jacks. An oil burner may also be used for the heating. The twist usually comes about the middle of the car where the frame bracing is the least.

WASTE PRESS.

Probably one of the greatest oil losses about a railway shop is that which results in connection with its use for journal box waste packing. The common method is for a man to obtain, by requisition, several pounds of waste and a quantity of oil. He then saturates the waste and packs the journal boxes, after squeezing out by hand what he considers to be the unnecessary oil. The judgment of different men varies widely as to the necessary oil content, with a consequent loss in most cases.

The press shown herewith, Fig. 1, is one which was first gotten up at the Mt. Clare shops, but is now used in all the

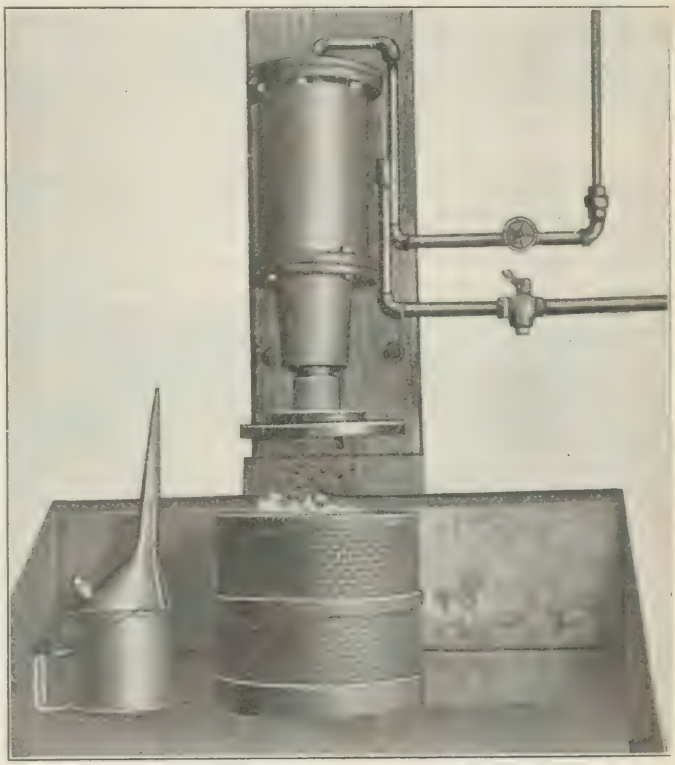


Fig. 1—Waste Press.

shops of the Baltimore & Ohio. The wire basket, into which the saturated waste is placed, is about 14 in. high and 16 in. in diameter. An ordinary 8-in. freight car brake cylinder is mounted on a rack above the wire basket. A piston is secured to the end of the rod, and this is driven down upon the basket filled with oily waste. The basket sits on a tinned floor which drains into an open oil tank. Air pressure at about 60 lbs. is used. On being taken from the basket the waste is thoroughly soaked with oil, but there is no loss from drippings. By this method, all waste for journal boxes is alike as regards the oil it carries, and only about 60 per cent. of the oil formerly used is required. The waste press, also, is in charge of the oil house man, which provision alone tends toward a saving.

TABLE FOR PAINTING SASHES.

Probably the last place to find a shop kink is in the paint shop, as there seems to be but very little occasion for them, as the painting of coaches and parts does not permit of many short cuts. The illustration herewith, Fig. 2, however, is one which seems rightly a kink, for it is certainly a cheap,

home-make device for facilitating work. It is used for painting sashes. The sash is placed upon the four rubber rests so that the woodwork does not come in contact with them. The stem of the top plate provides for revolving the sash so

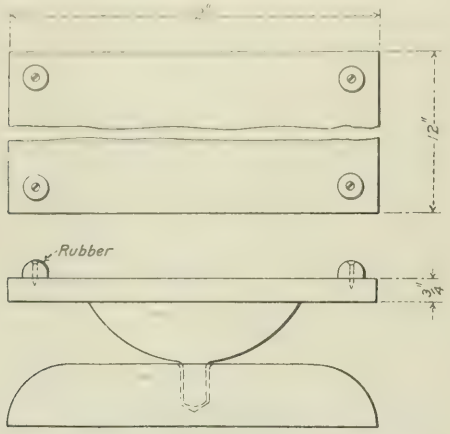


Fig. 2—Table for Painting Sashes.

that the workman is not required to reach around it, but revolves the sides successively for painting.

ELLIPTICAL SPRING COMPRESSOR.

The half-tone illustration, Fig. 3, and the detailed drawings, Fig. 4, show a passenger coach shop kink, which is undoubtedly one which should find a place in every shop where there is not some better scheme for compressing the elliptical springs

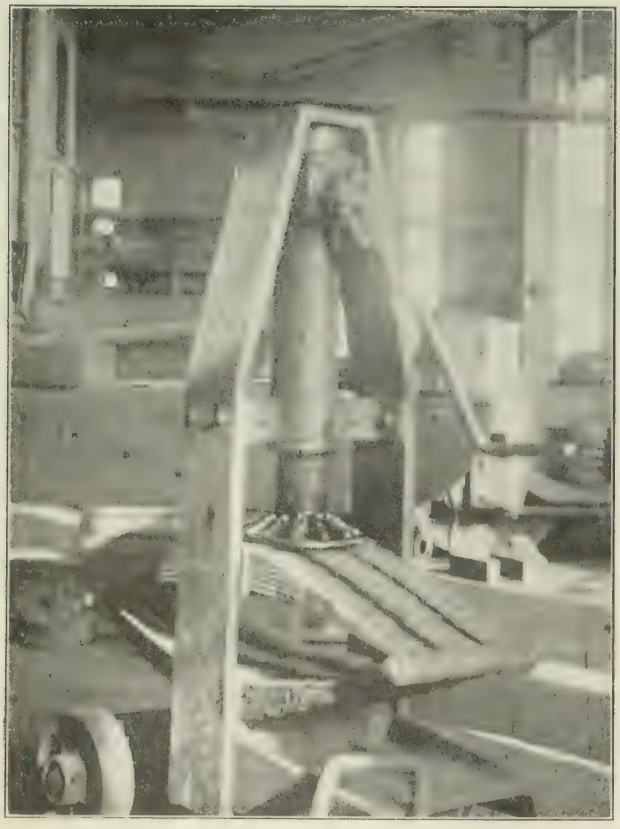


Fig. 3—Elliptical Spring Compressor.

for coaches before placing them in the trucks. It is a matter of hard work, with screw or hydraulic jacks, to place a spring in a truck without some method of compressing and holding it to its loaded height.

The detailed drawings show this compressor to be a tool easily and cheaply made, comparatively little machine work being necessary. The main machining is confined to beveling off the flanges on one side of the I-beam section from which the base plate is made. The upright is made of 1-in. x 6-in. wrought iron, forged to the shape shown, with the ends meeting on the under side of the base plate, to which it is securely

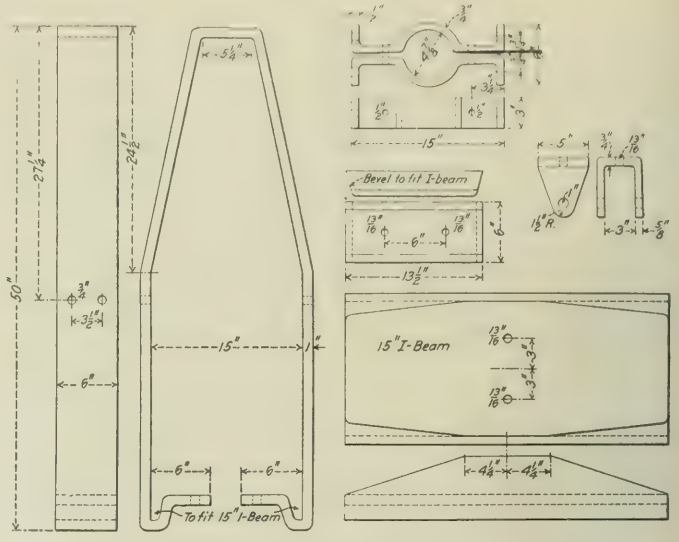


Fig. 4—Details of Elliptical Spring Compressor.

fastened by ¾-in. bolts or rivets. The inverted jack is fastened at the top and also held by the double clamp.

A spring is compressed slightly below its loaded height and then two solid round iron links are slipped over the end of the springs. These links, one of which is shown in the illustration, hold the spring compressed, while placing it in its position in the truck. After it is finally placed and the weight of the truck upon it, the links are easily removed.

Being mounted on wheels, the spring compressor is easily taken to any part of the shop.

MATERIAL AND TOOL CHECKING CASE.

The system of material and tool checking used in the tin and pipe shop at Mt. Clare is a departure from those generally found.

In the illustration, Fig. 5, is shown a case containing 200 pigeon holes, each 2 in. x 2 in. x 4⅞ in. When a man desires a tool, he writes the name of the tool on a 1¾-in. x 4¾-in. ticket and signs it. Each ticket has been previously dated by the tool room attendant. Before delivering the desired tool, the attendant gives the mechanic its number, who indicates this on the ticket before releasing it. Each tool is also stamped "Pipe Shop" in large letters. This prevents their being turned in at other tool rooms by mechanics, with whose tools they have been gathered up in other shops. The lower portion of the case is alphabetically arranged, and the ticket is deposited in a pigeon hole under the letter of the mechanic's name. When the tool is returned to the tool room the card is given to the mechanic, who destroys it and places the pieces in a box inside the tool room window placed there for that purpose. All tools are returned at quitting time each day, and if needed again are drawn out on the following morning.

With this system there is no chance for changing, commonly called switching, of tools, as all are numbered and when returned must correspond to the number and kind of tool drawn. For instance, a man drawing a 14-in. Stillson wrench, No. 41, must return the same tool, and is prevented from substituting another wrench, although it be of the same kind. This same rule, of course, also applies to stocks, dies, cutters, monkey wrenches, screw drivers, chisels, hammers, chain tongs, and all tools used in the pipe shop, as they are all numbered and marked.

Another very creditable feature in this system is that when

tools are lost or mislaid the mechanic can find out, at the tool room, the tool's number and make a systematic search for it, at the same time notifying the tool room attendant that he has lost or mislaid the tool. It is then listed on the "lost tool sheet," and the tool room attendant watches for the tool's being returned by another mechanic. The result is that but very few tools are lost, as they are eventually found and returned.

The same case is also used to record all material charges to locomotives, cars and general shop orders. It effectually prevents wrong charges being made. An instance in point was illustrated when a man gave a locomotive number which did not correspond to any locomotive in the shop at that time.

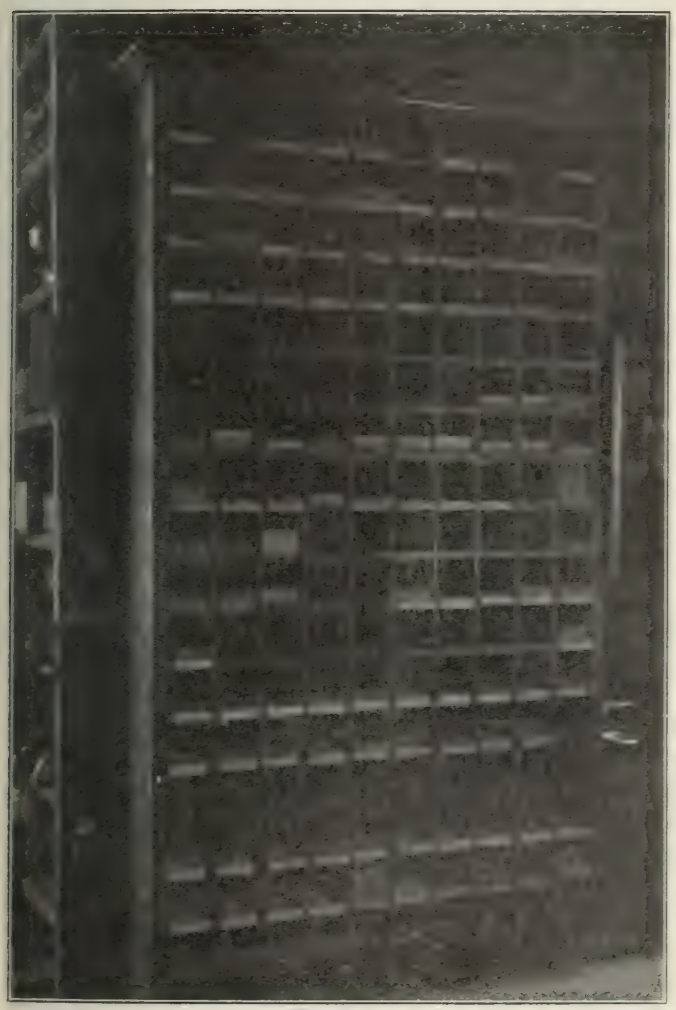


Fig. 5—Material and Tool Checking Case.

He had transposed the figures, but this mistake was caught by the tool room attendant.

The upper portion of the case is reserved for orders on locomotives, cars, and for special shop orders of all kinds. When it is desired to get material from the storehouse the man writes a list of the material required on a ticket, or tickets if necessary, with the proper designation number. The tool room attendant compares this designation with the numbers in the case, and if it does not appear, the man asking for material is required to correct it. The order is written on the storehouse material card by the tool room attendant, who gives this order to the one wanting the material, and files the original ticket in the case. By this method charges are correctly kept, no improper charges being permitted to pass the tool room window. When the shop, locomotive or car order is closed, the tickets are placed on file for future reference, which gives the shop a record in each case.

This system was devised by Wm. Magee, foreman pipe shop, who supplied the description given above.

AIR HOSE NIPPLE TESTING MACHINE.

Air hose nipples are tested in the pipe shop on the device here illustrated, Fig. 6. The air cylinder is used merely to get an air tight joint in closing the ends of the nipple. After the nipple is in place air is admitted into it. The nipple is

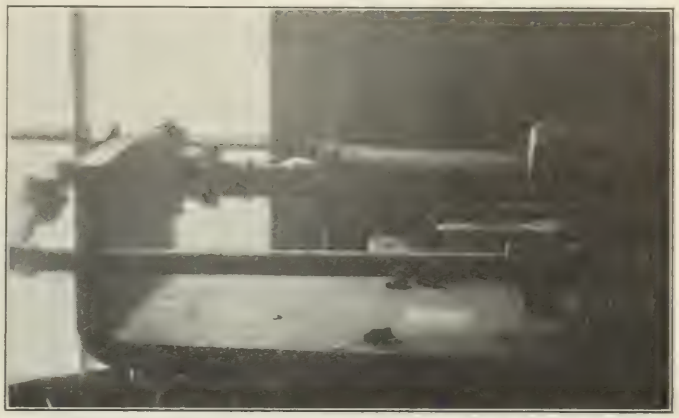


Fig. 6—Air Hose Nipple Testing Machine.

then coated with soapy water and any leaks in the metal at once make themselves evident.

This is probably as simple and yet effective test as could be devised, and the machine itself is made from practically discarded material.

SPRING BAND STRIPPING PRESS.

Spring bands are stripped from the leaves with the machine, or press, shown in Fig. 7. The spring is placed as shown



Fig. 7—Spring Band Stripping Press.

and these two metal plates are clamped against the sides of the spring by a solid U-clamp. These plates bear against opposite sides of the band and extend to contact with the hydraulic piston. The photograph shows a stepped stop for taking various sized springs.

BLACKSMITH SHOP FORGINGS.

The illustration shown in Fig. 8 is of a case in the Mt. Clare blacksmith shop, which contains samples of the standard forgings used on locomotives and cars. A collection of the actual forgings in a case which is accessible to every blacksmith in the shop, is certainly far better than a file of blue prints of the pieces, as a mechanic in the shop can more easily

make a forging from a sample one than he can from a blueprint.

Each forging is numbered and these numbers correspond to the names of the pieces given on the following list. The list shows a comparison between the cost of making these forgings by hand and the cost when making them by machines. As the actual amount of money involved in each case is not necessary for this comparison, we have expressed the machine forged cost saving in per cent. of the hand-forged cost, the latter being considered 100 per cent. in each case. In those cases of pieces which are still hand-forged or always have been machine forged, no cost savings are, of course, given. Small forgings are listed in lots of 100 pieces.

SPRING CHAMFERING ROLLS.

The ends of spring leaves are chamfered at Mt. Clare on the machine here illustrated, Fig. 9. It was made entire at these shops and consists of two cast-iron uprights which carry the bearings of the rolls and support the gearing, belt and flywheel. The rolls are supplied with elliptical bases which are set to close upon the spring leaf at the same time. The end of the leaf is first heated in an oil furnace and chamfered sufficiently by three blows of the rolls, resulting in an even draw of the metal.

CORNER OF SPRING SHOP.

The half-tone, Fig. 10, shows a corner of the spring shop at Mt. Clare. In the background is seen the face plate table and in the foreground, the air cylinder arrangement for giving the leaves their proper set. This machine will set two leaves at a time, after which they are passed into the tempering bath without further heating. The testing department

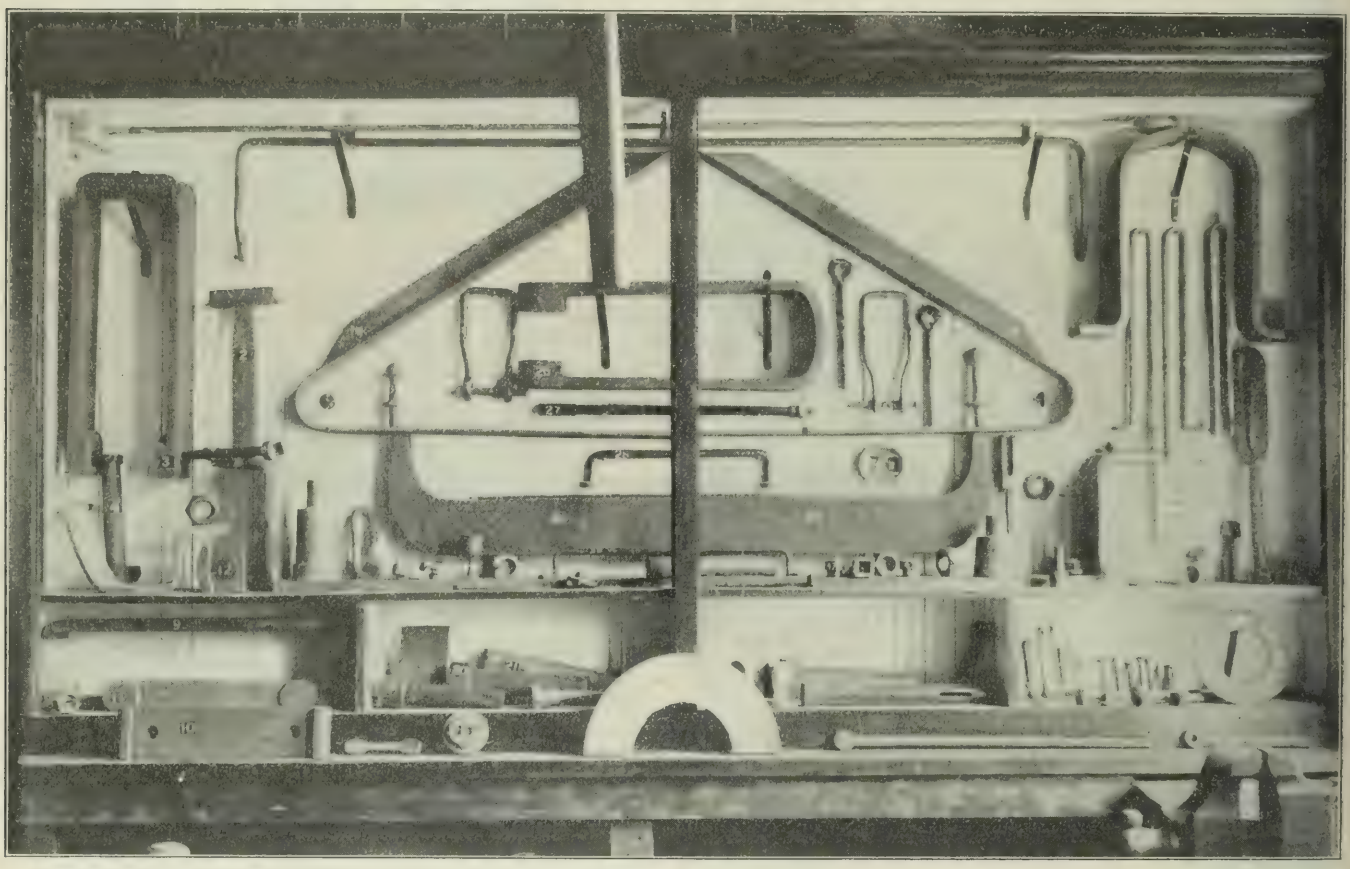


Fig. 8.—Blacksmith Shop Forgings.

List Showing Numbers of Forgings, with Per Cent. Saving when Machine-Made, Hand-Forged Cost Being 100 Per Cent.

No.	Name of parts.	Pieces.	Mach.-frgd, per cent. saving
1.	Uncoupling lever for engine and tender	1	64.3
2.	Boiler brace crow foot	1	50.0
3.	Tender draw-bar yoke	1	80.7
5.	Collar nut, Class E-24	1	60.4
6.	Brake-shaft stands, Class M-8 cars	1	92.7
7.	Knuckle-pin and cross-head pin nuts	100	93.1
8.	Top bolster piece, Class 3-A 5-6	1	76.5
9.	Miner draft-gear yoke, Class M-11	1	91.3
10.	Carrier iron, Miner draft-gear	1	75.0
11.	Boiler sling brace	1	66.6
12.	Radial yoke end	..	....
14.	Pilot band	1	75.4
15.	Socket wrench	1	68.3
16.	Crank-pin bolt	100	99.0
17.	Truck and body lever connection—B. P. 12458	1	50.0
18.	6-in. and 12-in. jack screws	100	96.1
19.	Radial drawbar yoke end	..	....
20.	3-in. hexagonal head bolts	100	90.6
21.	Dead lever guides—B. P. 6911	100	....
22.	Boiler plug	1	95.3
23.	Flexible staybolt spuds	100	....
24.	Crown bar, Class E-16	1	40.0
25.	Compression grease cup	1	60.0
26.	Westinghouse draft-gear yoke	1	73.4
27.	Radial staybolts	100	....
28.	Round lever guide for tender	1	83.3
29.	⅞-in. brake-hanger eyes, bent & welded 1 heat	100	53.1
30.	⅝-in. grab iron for all freight cars	100	50.0
31	Flexible staybolts forged instead of turned.	100	....
32.	Knuckle-pin	1	1.7
33.	Flue-welding job on machine	..	....
34.	Tail-pins punched	100	75.0
35.	3-in. square head bolts	100	95.5
36.	Blow-off cock handle	1	94.9
37.	Follower plate	100	....
38.	Fulcrum jaw for caboose car	1	72.9
39.	Hand-rail column	1	57.1
40.	Steel car spring hanger, Class N-8 9	1	92.0
41.	Live lever guide with collar	1	84.6
42.	Live lever guide without collar	1	86.3
43.	Drawbar loop	..	....
44.	¾-in. brake-beam hanger output, increased from 900 to 2,150 per day, the loop of hanger increased from 450 to 1,000 per day	100	22.2
45.	Brake-hanger key bolt punched	100	95.2
46.	Flexible staybolt cap nut	100	93.7
47.	Flexible staybolt spud	100	....
48.	Radial staybolt cap nut	..	....
49.	Westinghouse air pump valve	1	....
50.	Welded eye bolt	100	64.0
51.	Bent eye bolt	100	62.5
52.	Boiler safety cap	1	52.4
53.	Boiler rivets	100	....
54.	Crown-bar bolts	100	....
55.	Center plate liners	100	....
56.	¾-in., ⅞-in. and 1-in. patch bolts	100	92.0
57.	Fire rakes	1	58.5



Fig. 9—Spring Chamfering Rolls.



Fig. 10—Corner of Spring Shop.



Fig. 11—Bulldozer for Light Work.

must pass on every spring before it goes into service. Each spring is placed, inverted, upon a table and pressed until the band reaches the table. After being released, a spring is sent back to the blacksmith shop for resetting if it be ¼-in. too high or ⅛-in. too low.

BULLDOZER FOR LIGHT WORK.

The bulldozer shown in Fig. 11 is a cheap but very effective tool for handling light wrought iron shapes. An ordinary brake cylinder is mounted between the two I-beam sections, such that the dies will slide on the face plate. Various shapes of dies may be used, the one shown being for making right angle bends. This work is handled cold, as are the shapes down in the background. Other pieces handled are car steps, brake staff steps, coupling pin lifter rods, engine hooks, chain links, angle iron reinforcing bars, etc.

STAYBOLT BREAKER.

The staybolt breaker, shown herewith in half-tone illustration, Fig. 12, and in line drawings, Fig. 13, is a boiler shop kink which shows a high state of perfection. At first glance, one would say that the device is too large and heavy, but as



Fig. 12—Staybolt Breaker.

it is intended to be handled by a crane and suspended on chains when being used, its weight is of no moment.

This breaker differs from the general run of such tools, which remove the staybolts by striking a blow, as it breaks the bolts by exerting a pulling strain until the metal shears. The pulling rod, shown in the upper left hand corner of the sketch, has A dimensions of 4 ft., 6 ft., 9 ft., 12 ft. and 15 ft., and are made in rights and lefts. The main part of this rod is made of wrought iron with a tool steel end welded on, which latter forms the hook for taking hold of the bolts. The rough wrought iron sleeve slides on the puller rod. With the wrought iron steel pin, this sleeve is quickly made fast at any desired point along the rod, and the pull is effected by this sleeve bearing against the sides of the stirrup-shaped end of the lever.

In using, the breaker assumes about the position shown in the half-tone. The rod is then run through the stirrup and the hook placed over a stay bolt. The sleeve and pin are then slipped into position and air admitted to the cylinder. When used on the short bolts in the waterleg, the hook is placed at about the middle of the bolt, which bends a little and then shears off at both sheets. In the case of the long radial stays, however, the hook is placed as near as possible to the outside

sheet and the bolt shears at this sheet only. The bolt, therefore, remains in the firebox sheet, but as the box is to be removed and usually scrapped, this makes no difference. The ends of the bolts remain as plugs of the holes of the outside sheets, but these are easily knocked out afterward.

It will be noted on the drawing that the ⅞-in. eye bolts, by which the breaker is handled, are cast in, making them permanent, with no danger of loosening, due to the heavy strains which come upon them.

The wrought iron lever at its power end fits loosely into the stirrup on the end of the piston rod. The breaker is made for using on either side of the boiler, it being necessary only to remove the fulcrum bolt and shift the lever to the other side.

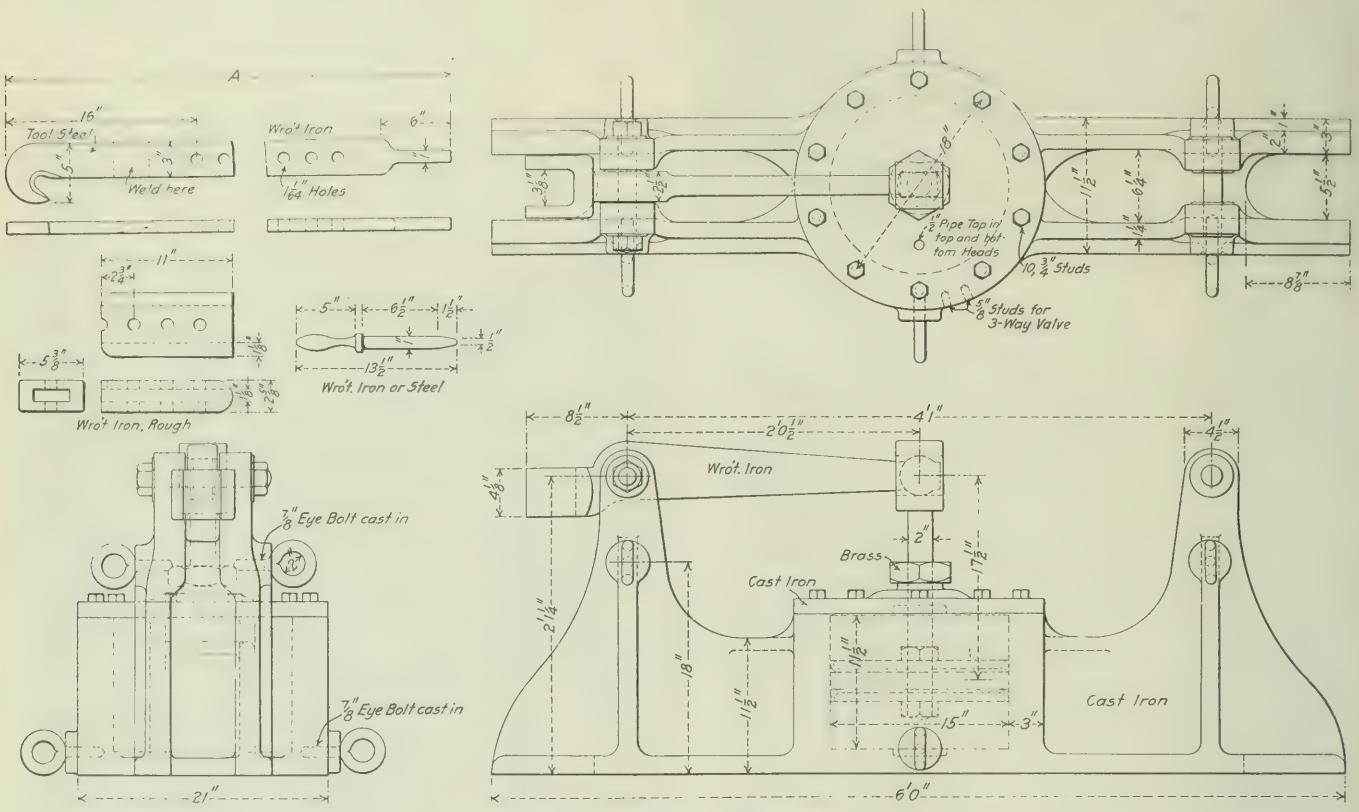


Fig. 13—Staybolt Breaker.

The air-controlling valve, shown in the half-tone illustration, is a three-way valve, moving 60 deg. on either side of the central or lap position. These two extreme positions open communication with opposite ends of the cylinder.

With this breaker, a box having 1,800 bolts may be cut out in 14 hours. New men are used on the job, the newer one of the two required operating the air valve.

CROWN BEARING GAGE.

The customary way in a large number of shops for laying off crown bearings for driving boxes preparatory to slotting or turning them for the box fit is to place the brass on the box in the position which it will assume for pressing into place and then scribing off on the edge of the brass the line of fit. This method is generally satisfactory, but it is almost impossible to press the brass into the box without using a file to get the proper angle at the retaining shoulder.

The gage here shown, Fig. 14, which, in reality, is an inside caliper with three legs, is designed for laying off the proper angle of the retaining shoulder. The three legs are adjustable to the requirements of any brass for from 6-in. to 10-in. journals. The central adjustable leg always moves along a radius line, being guided by a fixed pin, while the other two legs are free to be adjusted to obtain the proper angle at the retaining shoulder. It will be noticed, from the sketch, that these latter legs are adjustable in two directions. The plate is made of sheet iron about ⅛-in. thick.

All driving box brasses at these shops are turned on a lathe for the circular fit, using a specially designed mandrel. Brasses are much more easily turned to size on a lathe than machined on a slotter, since it is impossible for the mechanic to caliper the finished sizes of the brass on a slotter until an entire cut has been made, while in the case of a lathe, it was only necessary to make one or two revolutions in order to caliper the bearing.

CENTERING AND DRILLING MACHINE.

The accompanying half-tone, Fig. 15, shows an old 30-in. Bement-Dougherty lathe, which had served the purpose for which it was originally designed, and was lying idle in the shop, although it was in a fair state of repair.

Crank pins in this shop are roughed out of old engine axles, leaving about ⅛-in. to finish. At this rate each axle will make from three to four crank pins. The axles are first nicked in as far as possible with a cutting-off tool on the

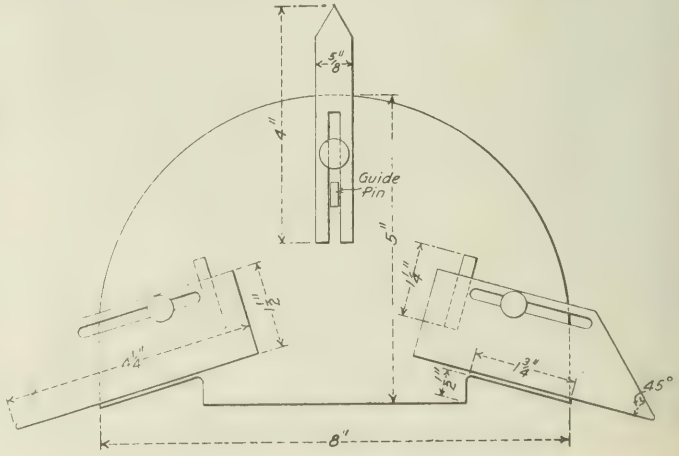


Fig. 14—Crown Bearing Gage.

roughing lathe and are then broken apart with a hammer. It was the usual practice then to center them at the drill press. A great many of the pins required a 1⅜-in. hole to be drilled through them for the washer bolt. This, when drilled on the lathe, caused considerable trouble in placing and removing the steady rest and also in locating the clamps to hold the pin on the line center during the drilling operation.

This old machine was fixed up to overcome the unnecessary



Fig. 15—Centering and Drilling Machine.

work of the old method and also to save time and labor in the process. A heavy 21-in. geared scroll chuck is seen on the spindle. The steady rest is free to be moved along the ways to accommodate any length of work up to the full capacity between the centers. The jaws of this steady rest are moved in and out by a scroll ring, making them self-centering. A crank pin is placed in the chuck on the spindle, the jaws of which are then closed tightly. The jaws of the steady rest are then closed and locked with a clamping screw, after which the pin is faced to the finished size. The tail spindle, carrying a drill, is then brought into use and the center drilled and reamed, after which the pin is ready for the lathe, which will finish the body. In case the pin requires a 1⅜-in. hole through it, it is first faced and counter-bored for the nut space. The tail stock carrying the drill is then used for drilling. The drill feed is geared so as to make very rapid movement of the drill in withdrawing it for cleaning. The four outside spokes on the hand wheel facilitate this operation.

Should the centers in piston rods require drawing, this machine is also very useful by placing a flat pointed drill in the tail stock spindle fit. The center is quickly drawn, avoiding the use of a gouge. Although this machine has been in use but a short time, new kinds of work which it will handle and at about 50 per cent. of their cost on other machines, are continually being found. The cost for drilling crank pins has been reduced about 60 per cent. This machine is, of course, kept in readiness for doing this kind of work only, so that the heavy geared scroll chuck and the steady rest chuck are always in place.

The illustration herewith shows a crank pin and a drill in place.

SHOE AND WEDGE CHUCKS.

In the accompanying half-tone, Fig. 16, is shown a method of holding locomotive shoes and wedges for the final operation of planing the face and edges after the castings have been returned, popmarked, from the erecting shop.

Much difficulty has been experienced in these shops in the matter of setting and holding shoes and wedges to the popmarks, as the faces of the frame legs do not always wear at right angles, often being as much as $\frac{1}{64}$-in. and $\frac{1}{32}$-in. out of true. This necessitates the use of wedges and chims in chucking, which on account of the repeated blows of the planer tool, are very difficult to keep in place. This method also requires considerable time in setting the job.

The chuck here shown was designed by W. P. Spade, shop specialist at the Mt. Clare shops, to overcome these difficulties and it meets the requirements admirably. The chuck is made of cast iron, and, as is seen in the illustration, tongues are cast integral, which fit the T-slots of the planer bed. The chuck is made in two pieces so that it can be opened or closed to accommodate castings from 12 in. to 24 in. in length, or, in fact, of any required length. This arrangement permits of chucking the work at its ends to obtain the greatest holding power. Instead of using the regular round-pointed pins for the outside set screws, pins shaped similar to a flat chisel are used. This provides more holding surface than would the round pins, and the flat surfaces do not leave unsightly marks, which is especially the case when using pointed pieces on brass shoes and wedges. The flat pins effectively prevent slippage, which is more pronounced when working soft metal such as brass. Round points forge into the metal from the continual shocks of the tool, especially when it is cutting at a rate of about 40 ft. per minute. The pins are forced against the work by ordinary set screws and the opposite sides bear against the sharpened edges of steel plates, which are held in place by this pressure and grooves cut in the center section of the chuck. These plates, which point slightly downward, are 4 in. long and 1 in. wide. Their position is shown in the illustration.

The vertical adjustment of the castings is obtained through four set screws, by which the strips upon which the casting rests, are raised or lowered. Spreader bolts are placed be-

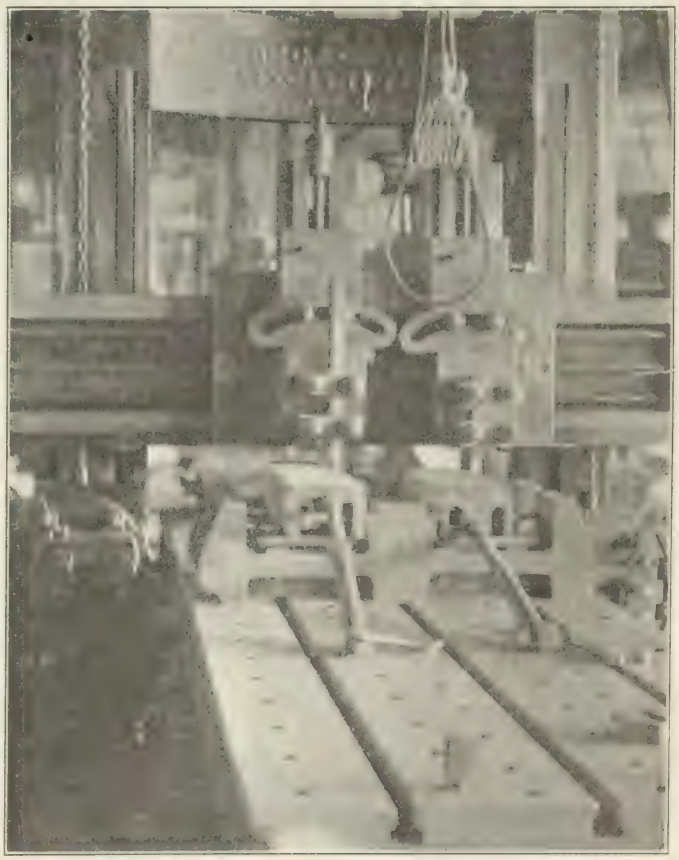


Fig. 16—Shoe and Wedge Chucks.

tween the flanges to prevent the possible spring of the flanges. The jacks seen in the foreground are used merely to absorb the shocks of the tool and have no particular effect in holding the castings in place. These are made of 1-in. bolts and pieces of 1-in. pipe.

An increase of 80 per cent. in output and much better work has resulted from the use of these chucks.

CLOSE QUARTER RATCHET.

The detailed drawings herewith, Fig. 17, show a design of

3¾-in. close-quarter ratchet. It was designed in a Baltimore & Ohio shop where it was not possible to work in closer quarters than 5 in. with the ratchets in stock, and these 5-in. ratchets were useful only with forged square shank drills. It was also designed to make use of the short twist drills which had accumulated as a result of their long service.

The Morse taper socket, the ratchet and the feed screw, are seen to be in one piece. The tang of the drill extends through a slot into a counterbore to provide for removing the drill. The hardened center in the feed sleeve has a left-hand thread and a hexagon nut which seats upon the top of the sleeve. This center is freely fit into the sleeve as it is necessary to

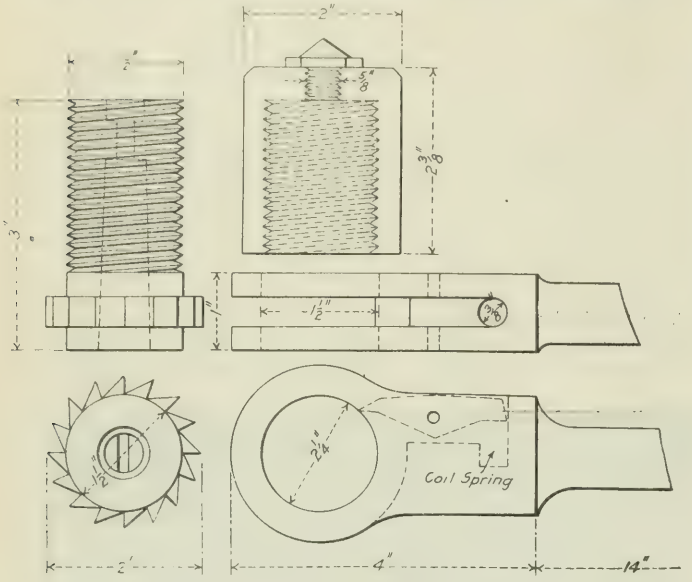


Fig. 17—Close Quarter Ratchet.

remove the center when knocking out a drill. The ratchet dog is fulcrumed on a $\frac{3}{16}$-in. pin, extending through both sides of the head, and it is held in contact with the ratchet wheel by pressure from a ⅜-in. coil spring, as indicated. The handle in one side of the head is made in one piece, while the other side of the head is a separate plate, riveted or securely bolted in place.

CHUCK FOR SHAPING DRIVING ROD BRASSES.

The assembled and detail drawings herewith, Fig. 18, show a chuck for machining driving rod brasses on a shaper.

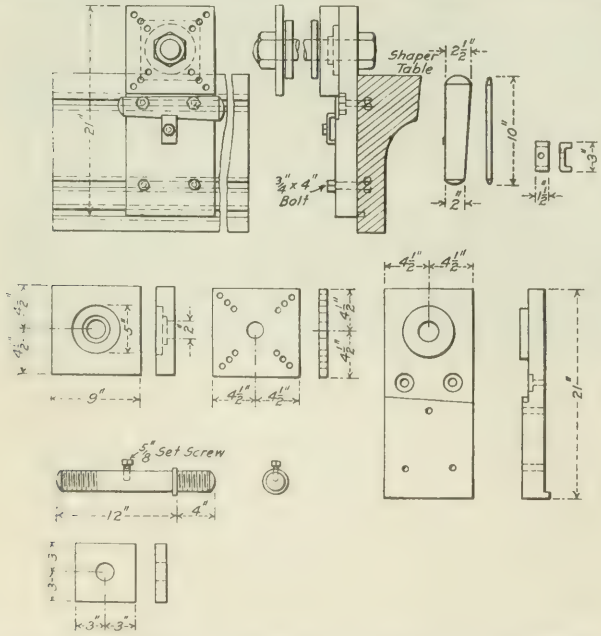


Fig. 18—Chuck for Shaping Driving Rod Brasses.

The chuck is secured to the verticle side of the shaper table by four ¾-in. x 4-in. bolts, the heads of which fit into the T-slots. The brass is held between the two 9-in. x 9-in. plates which are drawn tightly together by the 2-in. nut, running on the stud which is secured to the back plate. The lower portion of this back plate is made to fit the shaper on which the chuck is to be used, the ¾-in. x ¾-in. lip fitting into a T-slot next below the one used for the lower bolts. The 10-in. taper key is driven in under the rear clamping plate and along the seat shown. This key is then secured against loosening by the small keeper. The front clamping plate is provided with 12 tapped holes for ¼-in. set screws which assist in holding the brass between the plates. A ⅝-in. set screw in the 2-in. pin, or stud, provides a means for holding the brass in position while clamping. This set screw is run up against the lower side of the brass.

GANG TOOL FOR CUTTING PISTON PACKING RINGS.

Piston packing rings may be cut from the finished stock very rapidly with the tool shown in Fig. 19. The 2-in. square shank is held in the tool post in the usual manner. The body of the tool is made of steel, with a 1¼-in x 6¼-in. slot machined through it. There are five 1¼-in. x 6½-in. blocks, tapered from ¾-in. at the top to $\frac{37}{32}$-in. at the bottom, and two blocks, having this same taper on one side but being square

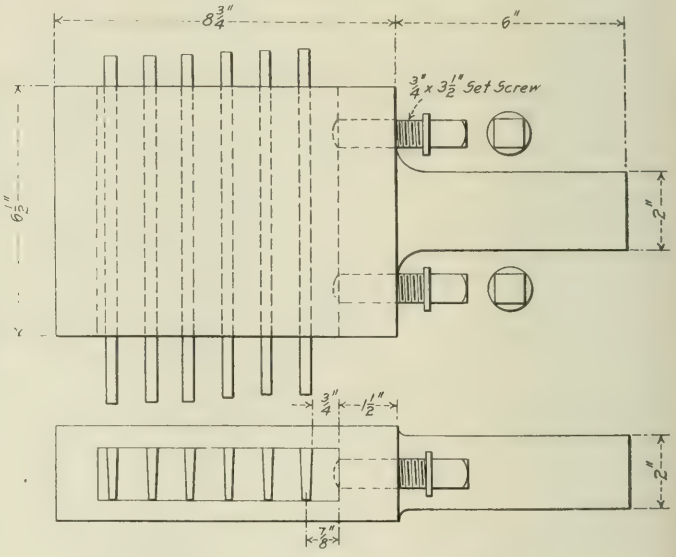


Fig. 19—Gang Tool for Cylinder Rings.

with the top and bottom on the other. These two latter blocks fit at the ends of the slot in the tool body, while the tapered ones lie on 1-in. centers along the slot. The five cutters, of high speed steel, are made 10 in. long with tapering slides to fit against the tapered filler blocks. The cutting tools and filler blocks are held in place by the two ¾-in. x 3½-in. set screws. Before tightening the set screws, the ends of the cutters should be adjusted at slightly varying distances from the work, that cutter farthest from the tool post being in advance of the others. This provides for the rings being cut off successively, working from the end of the stock.

FLAT DRILL CHUCK.

Flat drills, when used in drill presses or with air motors, are generally very unsatisfactorily held, usually with a set screw or even nothing but a square socket to take the rough forged shank. The chuck here shown, Fig. 20, consists of two main pieces and two semi-circular steel blocks which grip the round shank of the drill. In the drawing, the top view of these steel blocks shows also the relative position of the flat portion of the drill, the round not being shown. These blocks fit into the head of the chuck and are held from falling, in case the lower cap be removed, by a ½-in. dowel pin. After placing the round shank into the chuck and forc-

ing it up between the steel blocks, the lower cap is then screwed up and the taper faces of the blocks, fitting against similar tapers in the cap and head of the chuck, cause the blocks to firmly clamp the shank of the drill.

Flat drill shanks from ¼-in. to ⅜-in. in diameter may be

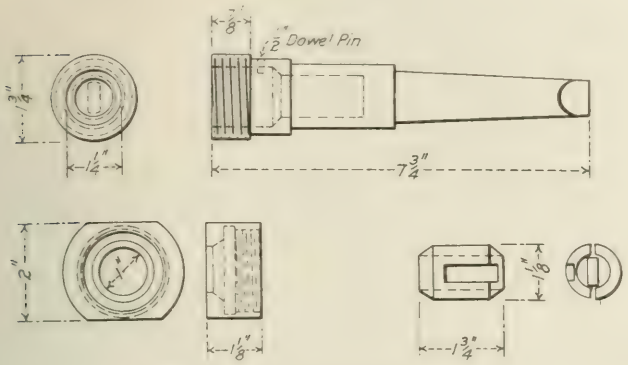


Fig. 20—Flat Drill Chuck.

used with a chuck of the dimensions here shown. The Morse taper shanks in this case is made to fit a No. 3 sleeve.

GAGE FOR LINING TWO-BAR GUIDES.

The lower bar of two-bar guides is usually lined up with the aid of inside calipers. It is necessary, in this instance, however, to use a square or straight-edge in truing the guide bar in the lateral direction, and it also very often happens that a mechanic's calipers change from being knocked upon the floor by other men who may be working in the vicinity of the guides.

The gage here shown, Fig. 21, was made especially for lining the lower bar. Being of brass, it is light, easily handled and easily made. The upright may be fastened to the base in any convenient way. The pointer is arranged for adjustment

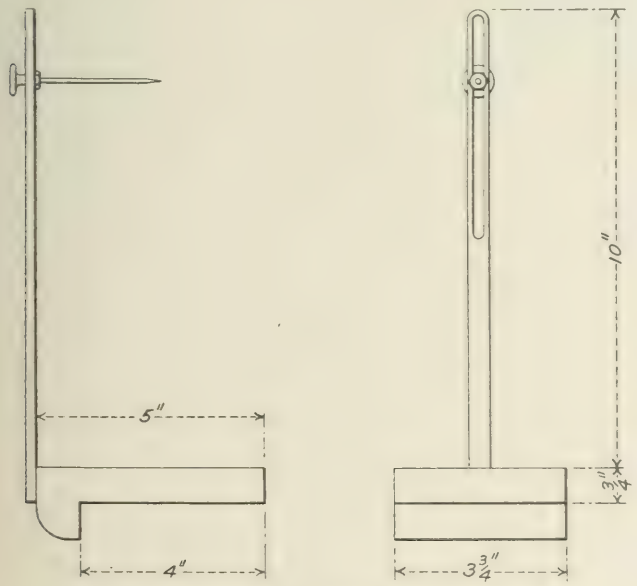


Fig. 21—Gage for Lining Two-Bar Guides.

in two directions by sliding in the slot of the upright and moving horizontally through the thumb screw and lock nut shown. The height of the pointer is set at ¾-in. less than half the distance between crosshead bearing surfaces, this ¾-in. being the thickness of the base. The shoulder guides the gage along the bar and the pointer is set out to the line through the cylinder.

TOOL FOR SCRIBING CIRCLES ON DRIVING AXLES.

There is an advantage in having, of a standard size, the circles which are scribed on the ends of driving axles, from which the prick punch marks are made when tramming the wheels for the side rods. These circles are usually cut in new axles on the lathe, but they become partly obliterated after the axle has been in service for some time. The tool illustrated, Fig. 22, is used for truing up an old circle or for making one in an axle which has not been previously cut on

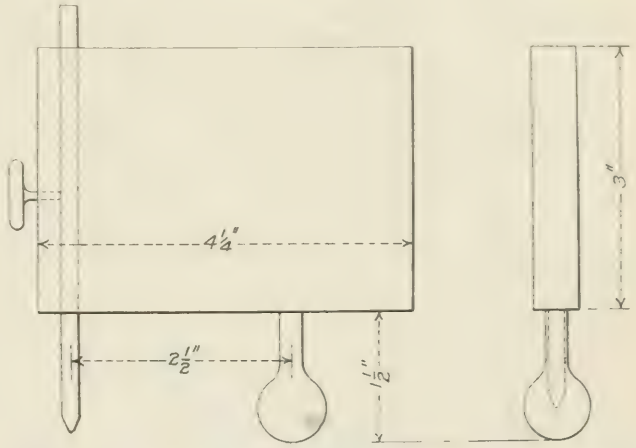


Fig. 22—Tool for Scribing Circles on Driving Axles.

the lathe. The body of the tool is made of wrought iron and the ball center and the scriber of steel. The ball is placed in the large center in the axle and the tool used as a pair of dividers.

TOOL FOR MAKING WEDGE POP MARKS.

In laying off shoes and wedges it is necessary to do a large amount of work with trams, straight-edges, parallel strips, etc. The shoe pop marks must be layed off with long, adjustable trams. The wedge pop marks, however, being layed off from their respective shoe pop marks, require only a short tram, and again, as these points do not affect the rod lengths, absolute accuracy is not necessary. The tool here illustrated, Fig. 23, is designed for this latter work.

The main part of the tool is made either of wrought iron

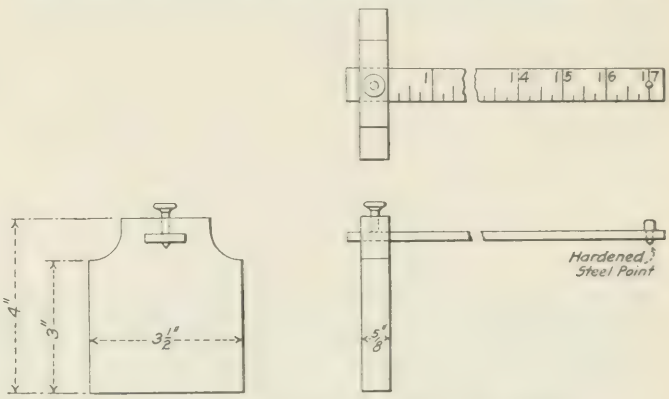


Fig. 23—Tool for Making Wedge Pop Marks.

or soft steel, though the latter is preferable, as there is less chance of its being affected by rough usage. The scale may be run through the head, as shown, or it may be clamped against the head with a stirrup bolt, the design shown, however, being preferable. For use the scale is set to the length desired and the head held against the shoe face, as in the plan view. By lightly tapping the hardened steel pointer the desired pop mark is made. This method is at once seen to be much quicker than using a small pair of trams to locate the point and then use a prick punch for making the pop mark.

The scale may be layed off to suit any conditions, and in both directions if desired.

This tool may also be used in a variety of cases as a depth gage or laying off frame holes, but it was designed especially for the purpose above described.

FLEXIBLE OLD MAN.

Probably one of the simplest substitutes for an old man in drilling holes in a boiler shell is the device shown herewith, Fig. 24. It is always a matter of difficulty, also, to place an old man for drilling, since very seldom it is that a suitable fastening can be obtained. This device consists merely of a metal plate and sufficient chain attached to it to extend around the boiler. After passing the chain around the boiler and allowing sufficient length for the air motor and drill,

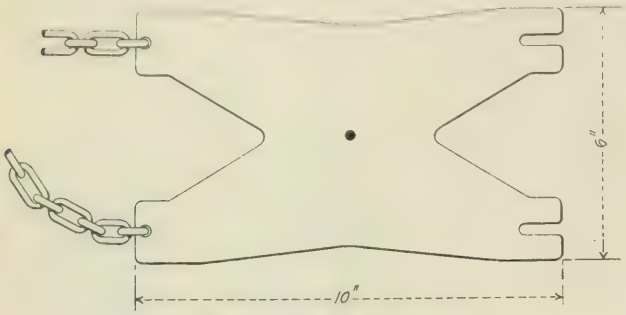


Fig. 24—Flexible Old Man.

links are slipped into the openings shown. The feed center of the motor operates against the center mark in the plate. This device is especially handy in roundhouse work, saving a large amount of time which is usually consumed in arranging for the ordinary old man. For the loss of a better name we have termed this tool a flexible old man, as it so effectively overcomes the many difficulties which are met in using the ordinary old man, due in great part to its limits as to flexibility and adjustment.

SPRING PULLER BLOCK.

There is probably more temper lost, especially in the roundhouse when the locomotive is fired up and due out, in connection with spring pulling, than with any other job on the locomotive. Various spring pullers have been devised, using chains or plates or a combination of both, but the block here shown, Fig. 25, is probably one of the most effective ones which can be devised. This block is used with two plates

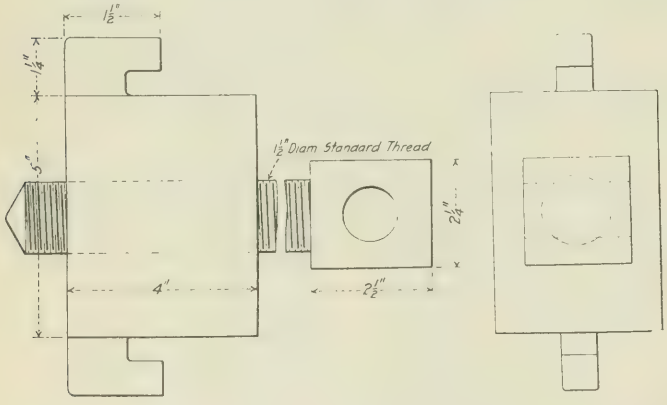


Fig. 25—Spring Puller Block.

which extend up to the top of the spring. A bolt is used across the spring and the hooks of the block are inserted in slots in the lower ends of the plates, which are sufficiently long to permit the screw working against the under side of the lower frame rail. This tool's lightness, simplicity and effectiveness are the points which particularly recommend it.

WRENCH FOR DRAWING STUDS.

The sketch herewith, Fig. 26, shows a very effective form of wrench for drawing studs. It is made of steel, the stirrup and the indicated portion of the bar being finished. The stirrup here shown will take studs up to 1¼ in. in diameter. The adjustment is rapid and the sketch shows the design to be that of a tool which is exceedingly useful.

END PLAY OR LATERAL MOTION GAGE.

The end play or allowance which is made for the lateral motion of locomotive drivers is usually measured with a stick and a rule. This method may be accurate, but it will bear close watching. It is almost compulsory that two men hold

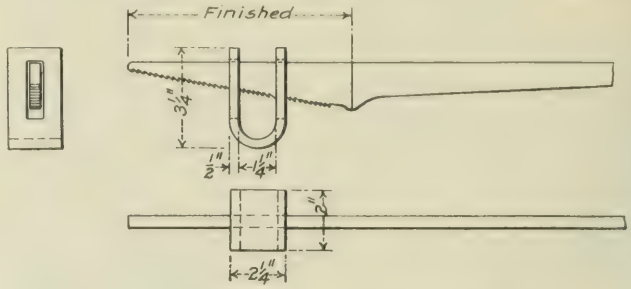


Fig. 26—Wrench for Drawing Studs.

the stick, one at either end, as it is necessary to hold a straight-edge against the outside of the frame on shoe on one side. The tool here shown, Fig. 27, is in reality merely a specially designed scale for making this measurement. The

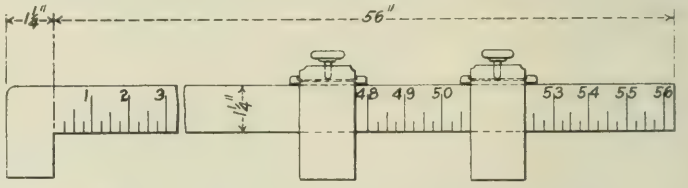


Fig. 27—End Play or Lateral Motion Gage.

square shoulder makes the second man with the straight-edge unnecessary.

The outside adjustable head is set to the distance between the hub plates. In case the finished shoe castings are in place, the gage, when held up with the inside of the square shoulder against the shoe casting, indicates the exact amount which must be taken up by two box flanges, plus the side play of lateral motion allowance. Two sliding heads are provided, as there are a variety of ways by which a man may get the desired lateral motion allowance.

CHILL FOR MOLDING ANCHOR PINS FOR CROWN BEARINGS.

Brass anchor pins, when turned, tapering, from stick brass, are expensive, and the process also requires the time of a mechanic and a machine when other work may need their time. If it is possible to mold these taper anchor pins in a

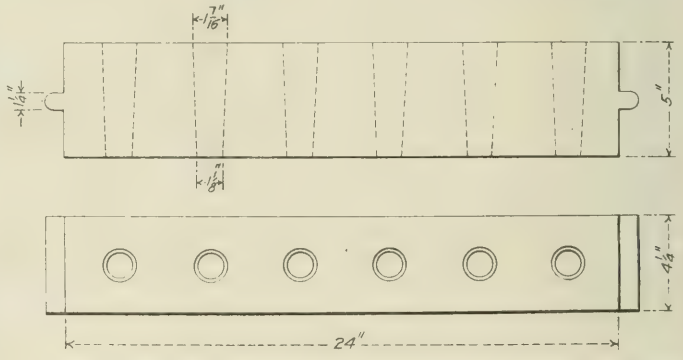


Fig. 28—Chill for Molding Anchor Pins for Crown Bearings.

metal chill and have them sufficiently true for use without machining, a considerable saving can be made.

The chill shown in the accompanying sketch, Fig. 28, was designed with this end in view, but as it has not yet been tried out, its value is not yet definitely known. There seems every reason, however, for saying that the method should be satisfactory.

The chill is to be made of cast iron, having six holes tapered down from 1 7/16 in. to 1⅛ in. in diameter. A polished

metal face plate is to be used with the chill, the larger end of the tapered holes being closed by the face plate. The metal is to be poured into the small ends. This precaution is taken so that if there be any piping in the metal during cooling, this piping, with the dirt which it may contain, will not be on the end which comes in contact with the journal.

PLANER STOP.

The usual practice in planer stops is to drive tapered plugs into the cast openings in the planer bed. This arrangement makes a good, steady stop, but the repeated driving in and drawing of the tapered plug results in knocking off the corners of the openings, making an unsightly planer bed.

The stop here shown in sketch, Fig. 29, may be made of

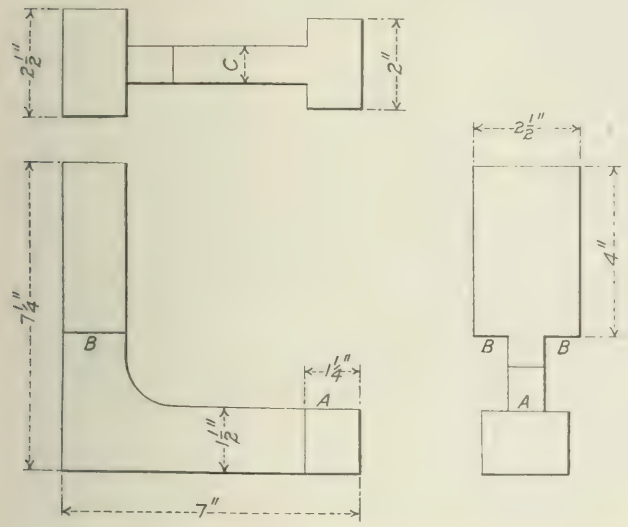


Fig. 29—Planer Stop.

cast or wrought iron. The side elevation shows the position which it assumes when being used. The surface A bears against the under side of the bed plate, while the shoulders at B rest on the top surface. The dimension C is made slightly less than that of the slots in the bed plate.

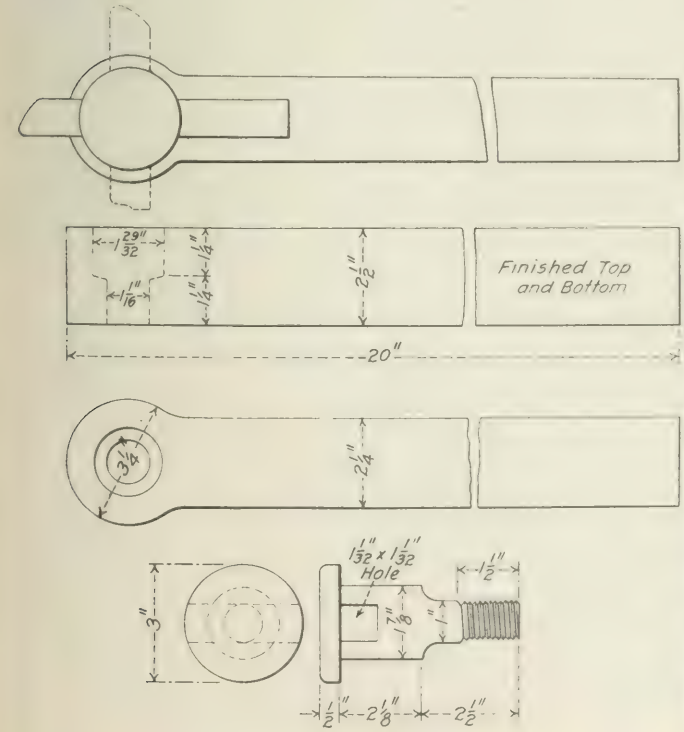


Fig. 30—Planer Tool Bar.

PLANER TOOL BAR.

The planer tool bar shown, Fig. 30, was designed to overcome the necessity of resetting, on the clapper plate, of a planer tool when readjusting in changing the direction of cut. It is also useful in permitting the use of small tool steel cutters.

The cutter is held in position by the bolt, through the head of which it passes. The cutter may be easily and quickly turned at any desired angle, which adjustment is much more easy and rapid than readjusting the entire tool at the clapper plate. The bar is finished on its top and bottom surfaces.

CYLINDER BUSHING CHUCK.

The line cut herewith, Fig. 31, shows one view of a cylinder bushing chuck which is easily and quickly adjusted in the bushing and one which grips the bushing firmly. The four dogs on each cone are first set for the bushing diameter and

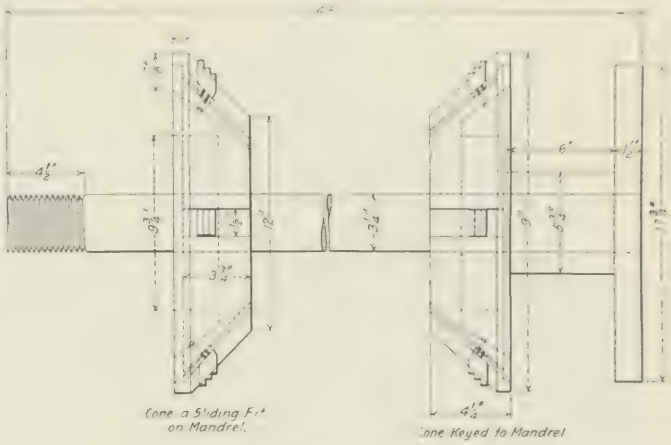


Fig. 31—Cylinder Bushing Chuck.

fixed in place by the tap bolts shown. One cone is keyed in place, while the other is a sliding fit and is clamped against the bushing by a large nut.

But two cuts are necessary in machining a bushing, the roughing cut removing about ¼-in. of metal all around. The finishing cut takes out any spring which may have resulted from the first cut.

AIR MOTOR HOLDER FOR VALVE-FACING MACHINE.

In setting up a rotary valve-facing machine the mechanic usually has no particular method for holding the air motor. A very common method is to rest the machine on a wooden strip extending up from the floor, and to prevent side motion by guying the feed screw handle with a couple of ropes. This

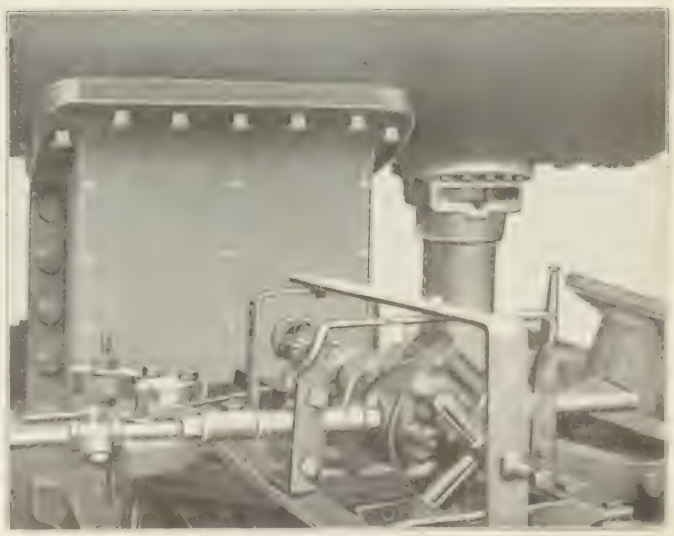


Fig. 32—Air Motor Holder for Valve Facing Machine.

method answers the purpose, but it consumes time arranging it.

The half-tone, Fig. 32, shows a holding device which is made of rough strips of iron shaped to the general outline of the air motor. It is secured in place by being bolted at the steam chest stud holes. Arrangement is also provided for a stop against which the feed screw bears.

This device is a time saver and is kept in the tool room, where it is gotten by check the same as any other tool.

SCREW JACK FOR PLACING AIR RESERVOIRS.

A well perfected shop kink is shown herewith in the drawing, Fig. 33, of a screw jack for raising locomotive air reservoirs into position. Close inspection reveals a large amount of necessarily accurate machine work, increasing the jack's first cost over one of simpler design, but the points of decided advantage which result would seem to offset the cost.

The jack is mounted on four cast-iron wheels, the forward pair of which are mounted on a swiveling axle. The radius of the wrought iron stirrup is 7 in., which provides for taking any sized reservoir in use. The 16-in. hand wheel rests upon 17 ball bearings, ⅞-in. in diameter. These balls run upon a ¼-in. thick steel liner, shaped to conform to the runway. The 2-in. diameter, vertical steel screw is single square threaded, ½-in. pitch, for about 3 ft. 5 in. of its length. The screw permits a maximum lift of 2 ft. 9½ in., which is an ample provision. The 1-in. diameter, horizontal steel screw is double square threaded, ½-in. pitch. This screw is used for side adjustment, so that it is easily possible to shift the reservoir horizontally to place the stirrup bolts.

The additional merit which the ball bearings give in elevating a reservoir is emphasized by the fact that the weight of the screw and its stirrup is sufficient to cause the hand wheel to revolve and the screw to descend. The collar plate, which holds the base flange of the hand wheel against the balls, is made in two halves.

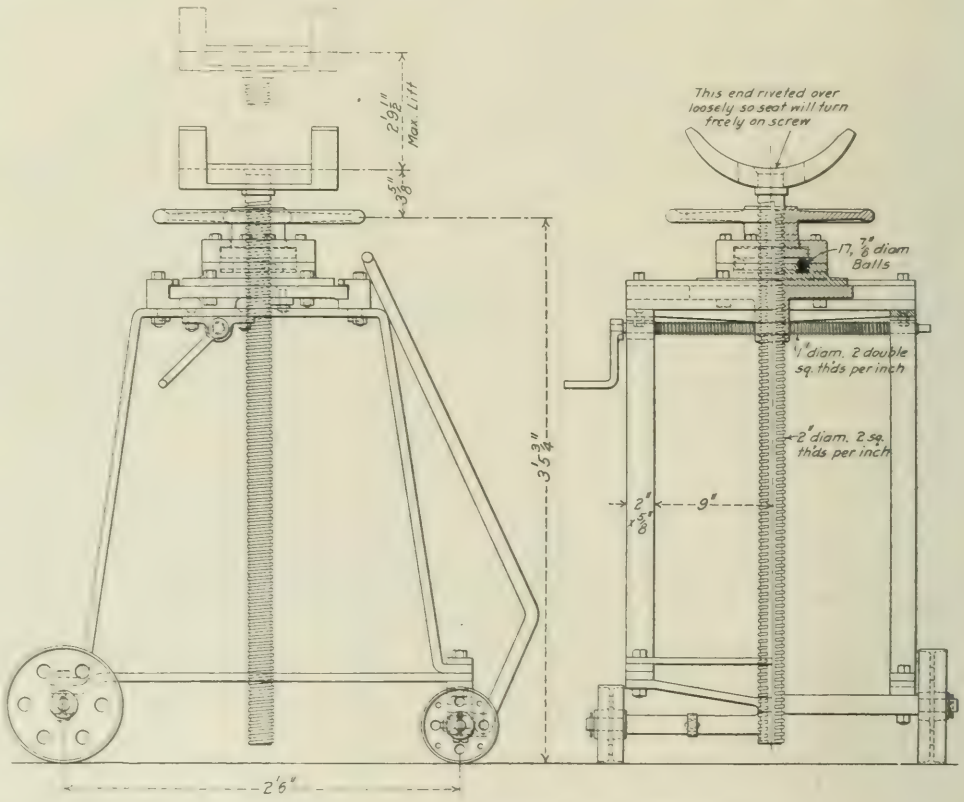


Fig. 33—Screw Jack for Placing Air Reservoirs.

CROWN BEARING CHUCK.

Crown bearings, or driving box brasses, may be machined to the press fit sizes in a lathe to better advantage than on a slotter. On a slotter it is necessary to allow the tool to pass completely around the bearing—or at any event, to make at least a few cuts on either end of the diameter of the brass—in order to caliper the size. When machining on a lathe, a few revolutions of the work suffice to give the desired measurement.

The chuck shown in the machine, as illustrated in Fig. 34, is the design used in turning brasses at Mt. Clare. The chuck has two cones, one of which is adjustable on the spindle. Besides being held by the cones, set screws are also driven into the brass. These chucks will take bearing for from 8-in. to 10-in. journals, the cones being well supplied with set-screw holes.

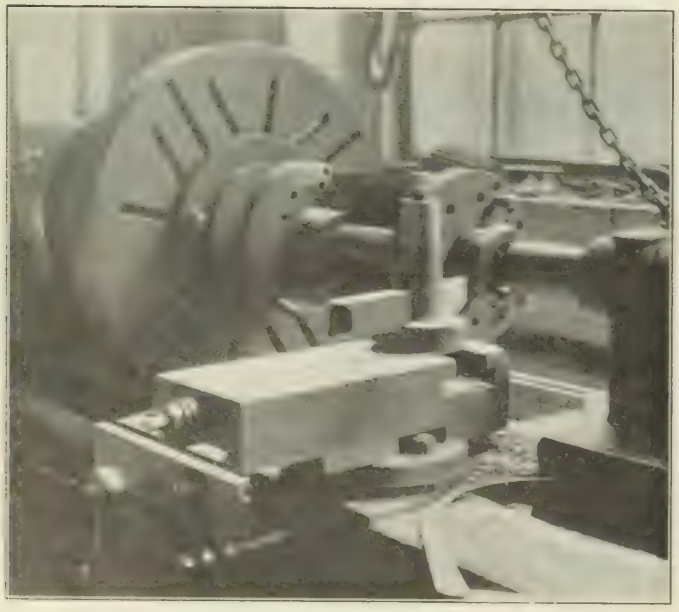


Fig. 34—Crown Bearing Chuck.

AIR PUMP CYLINDER HEAD CHUCK.

In the accompanying half-tone illustration, Fig. 35, is shown an air pump top cylinder head, chucked in position for boring out the bushing in the main valve chamber. It is a difficult thing to rebore these bushings without some special design of chuck and the one shown here is as simple, and still as effective, a one as could well be devised.

The chuck is made of cast iron and consists of two disks and two space pieces, all cast into one piece. One of the disks is threaded for screwing onto the face place, while the other disk is provided with bolt holes for securing the cylinder head by means of bolts through the valve chamber flanges. This arrangement assures perfect alinement of the bored bushing, as the joint surface forms the bearing against the plate of the chuck.

MACHINE FOR TRUING MAIN PISTON CYLINDERS OF TRIPLE VALVES.

The kink here shown in half-tone, Fig. 36, is rather extensive as such, but is classed as a kink, since the machine

is home made, and the idea is one which was worked out in machine shop No. 2 at Mt. Clare, where it is used. The casting is screwed onto a threaded boss of the horizontal face plate and is revolved by a belt which passes around a wheel inside the lower part of the machine. The small emory disk revolves in a direction opposite to that of the casting and is moved up and down through connection with the horizontal arm shown. As the amount of truing which is generally necessary is very slight, the emory disk is about ½-in. less in diameter than the cylinder and when in operation only a small portion of the disk is in contact with the bushing wall.

This machine leaves the cylinder walls in condition to be finished up when grinding in the packing rings.

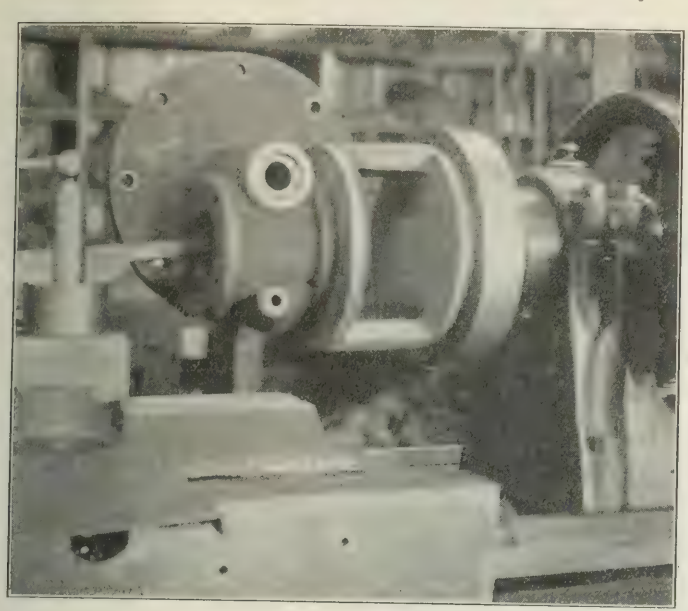


Fig. 35—Air Pump Cylinder Head Chuck.

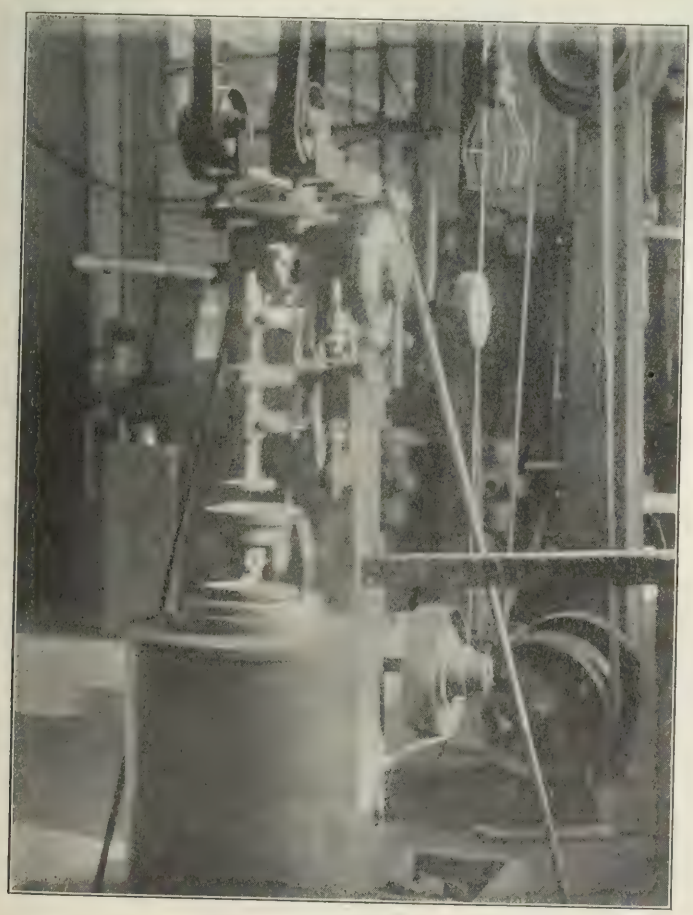


Fig. 36—Machine for Truing Main Piston Cylinders of Triple Valves.

MACHINE FOR GRINDING TRIPLE VALVE PISTON PACKING RINGS.

This machine is another rather extensive shop kink. It is used for grinding in the packing rings in the main piston of triple valves. It is made to operate on two sets of rings at a time and the design permits of this number being increased to any convenient number. The triple valve is held in the position shown and the end of the piston connects with a horizontal rod which is actuated in a reciprocating and a revolving motion simultaneously. This insures equal grinding all around, on both packing rings and cylinder walls.

All parts of the machine, Fig. 37, were made and assembled at Mt. Clare at little cost. The bed, or base plate, is an old wrought-iron steam chest cover.

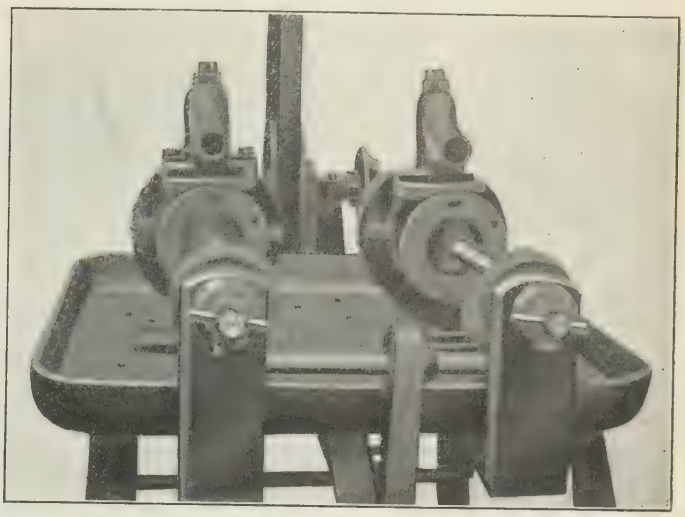


Fig. 37—Machine for Grinding Triple Valve Packing Rings.

METALLIC PISTON PACKING.

The designs of the metallic piston packing rings and vibrating cups for the greater number of the class E locomotives on the Baltimore & Ohio are shown in the accompanying line cut, Fig. 38. The point ring in the lower design is seen to rest in a brass ring which is made in halves and secured in place by dowel pins.

The vibrating cups are made 1/64-in. larger than the smallest diameter to which the rods of the particular class locomotive will be turned. When applying new cups, they are

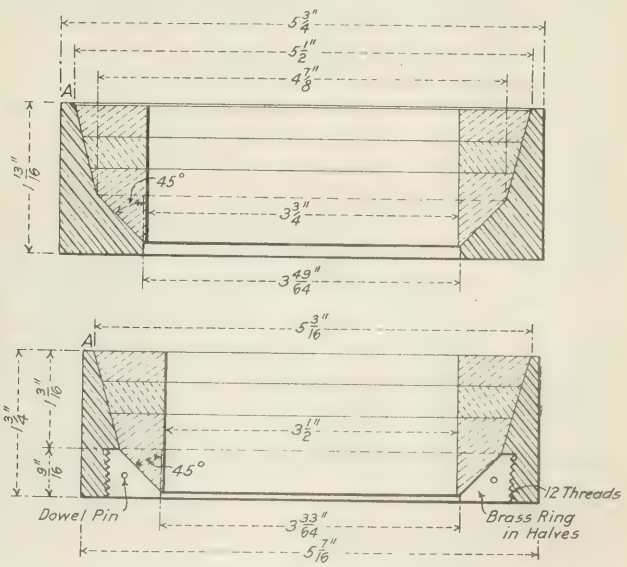


Fig. 38—Metallic Piston Packing.

bored out $\frac{1}{64}$-in. larger than the piston rod. When worn rods are turned down, a new cup and set of rings will be applied, and those removed are placed in stock for use on suitable sized rods. In some cases the cups are thickened to allow for rods of smallest diameter, in which cases the washer in the bottom of the stuffing box or the spring must be reduced to suit.

The babbitt rings, when made for stock, will be bored for the smallest diameter to which the piston rod of that class locomotive will be reduced. When applying in the shop the rings will be bored out to fit the piston.

These babbitt rings are cast separately in iron moulds or chills and are machined on a special expanding mandrel. Formerly these rings were cast in one piece and cut apart on a machine. The present method has reduced the cost of machining them by about 90 per cent. As high as 380 sets have been machined in a day and the average does not fall far short of this number.

BABBITTING DRIVING AND TRUCK BOXES.

For some time it was the custom at Mt. Clare to babbitt the hub faces of driving and truck boxes within the machine shop. No particular arrangement for leveling up the boxes was provided, so that a large amount of time was consumed in leveling up each individual box. This work is at present handled on a platform just outside the erecting shop. At the edge of the platform, between it and the wall of the shops, two rails are laid, about 10 in. apart, on a concrete foundation. The boxes are trucked from the shop to this platform and placed directly upon the parallel rails. No further leveling up is necessary. Engine truck boxes are handled in a similar way.

REPAIRING SHOE AND WEDGE FACES OF DRIVING BOXES.

The same parallel rails which are used in babbitting the hub faces of driving boxes are also used for pouring brass on their shoe and wedge wearing faces. The leveled rails provide for setting the boxes in position, and it is but necessary to provide the barriers at the ends of the box to retain the molten brass.

The brass, and babbitt also, is heated in a vertical, cylindrical, brick lined furnace, using oil. After the brass has cooled the boxes are taken to a planer for correcting the box size and then to a drill press, where the oil ways are cut. Three circular oil ways are cut on each face, the tool used being so set that these circular ways intersect at one point each. By this arrangement, the oil may pass from the top to the bottom of the box face, but by circular paths. The oil, therefore, does not run down the box face so rapidly as it would with verticle, or even with slanting, oil ways, and the circular ways prevent the formation of shoulders in the wearing faces of the shoe or wedge.

LOCATION OF CYLINDER HEAD BREAKING RING.

A shop kink does not necessarily imply the creating of a new tool or device for doing a piece of work, but the mere changing of a method to increase efficiency may well be considered a kink. The changing of the cylinder head breaking ring from the outside to the inside face is an instance of a kink which saved 33⅓ per cent. of the cost of machining a head from a new casting. With the breaking on the inside, one setting of the casting is saved and the ring, of course, serves the same purpose regardless of its position.

DARIUS MILLER.

Darius Miller, who until recently was first vice-president of the Chicago, Burlington & Quincy, in charge of traffic, and whose authority was extended over the operating department when Daniel Willard left the Burlington to become president of the Baltimore & Ohio, has now been elected president of the Burlington. Mr. Miller takes his place among the railway presidents who are traffic men, and this class includes such men as Finley of the Southern, Ripley of the Santa Fe and Winchell of the St. Louis & San Francisco. W. H. Newman also belonged to this class. The operating officer is a line officer and the traffic manager is a staff officer. For this reason the traffic manager is not so directly in the way of promotion to the presidency of a railway as is the operating officer. It is often said, therefore, that it requires more downright ability for a traffic manager to reach the top than it does for the officer in the other departments.



Darius Miller.

That great judge and developer of men, James J. Hill, took Mr. Miller from the Missouri, Kansas & Texas eleven and a half years ago and made him second vice-president of the Great Northern. It is well known that ever since that time Miller has had the confidence of Mr. Hill to an extraordinary degree. Mr. Miller is a great traffic manager, which means that he is a great business getter. He combines suavity with sagacity and unfailing tact. He is never in a hurry, and, like a highly developed piece of machinery, he accomplishes an astonishing amount of work without developing any friction. The Burlington has long had the distinction of being one of the best managed railways in the West, as well as one of the most prosperous ones. The election of Mr. Miller as its president probably indicates a general policy of bringing all the Hill roads into closer harmony.

Mr. Miller was born April 3, 1895, at Princeton, Ill. He began railway work in November, 1877, as a stenographer in the general freight office of the Michigan Central at Chicago. He was then consecutively clerk in the general freight office of the St. Louis, Iron Mountain & Southern; chief clerk to the general manager, and then general freight and ticket agent of the Memphis & Little Rock, now a part of the Chicago, Rock Island & Pacific. He left this road to become general freight and passenger agent and then traffic manager of the St. Louis, Arkansas & Texas, now a part of the St. Louis Southwestern. He was later traffic manager of the Queen &

Crescent, and then traffic manager of the Missouri, Kansas & Texas. He was elected vice-president of the latter road in September, 1886, and two years later was elected second vice-president of the Great Northern. In January, 1902, he was elected first vice-president of the Chicago, Burlington & Quincy, and his jurisdiction was extended over the Colorado & Southern in March, 1909, after the Burlington acquired control of this property from the Hawley interests.

NEW SHOPS OF CENTRAL OF GEORGIA AT MACON, GA.

[WITH AN INSET.]

During the past two years the Central of Georgia has been building new locomotive and car shops at Macon, Ga., and a portion of the plant is now completed. This railway has three shops, one at Columbus, one at Savannah and one at Macon, and in selecting a site for a new shop, Macon was regarded as the most central point and the best location. The work was commenced early in 1907 with authority to build the freight car department and power plant, which would not interfere with the old shops. These having been completed and put in operation in July, 1908, by using a portion of them for locomotive repairs, it was possible to tear down the old shop and commence the new locomotive shop. It was deemed advisable in every way to keep the shop location in the heart of the city, where favorable labor conditions obtained, rather than to go outside where perhaps more room could be had and a better arrangement of the different shops might have been made. It was decided also that it was not necessary to have any large amount of intercommunication between the freight car department and the locomotive department, and for these reasons the grading was allowed to take the natural contour, which left the car department about 9 ft. lower than the locomotive department, thus saving considerable money in preparing the site by eliminating considerable filling. The only connection between the two departments is a narrow gage industrial railway from the main shops, for forgings, bolts, etc., to be delivered to the car department. The new roundhouse, the engine terminal and the power house have been completed, the roundhouse being used for locomotive repairs, temporary shafting having been erected and tools from the old shop moved into it so as to vacate the old property.

The storehouse, office and working shop are completed; the blacksmith shop about half completed, and the foundation for the main, machine, erecting and boiler shops are about completed. All tools, cranes, structural steel, etc., have been purchased and are being delivered, and it is expected to complete the buildings early in the spring of 1910.

CAR DEPARTMENT.

In working out the general plan of this plant, a great deal of study was given to the handling of material in the most economical manner, in many plants this being the most expensive item on account of lack of facilities. The lumber is brought from the storage yard to the mill, and after passing through the mill, by a Hunt system of narrow gage railways is sent to either the heavy repair shop or the light repair yard. Wheels from the machine side of the freight car repair shop are handled in a similar manner on a special truck, to any car in either the light repair yard or the heavy repair shop. All scrap and second-hand material is assorted and handled by use of a magnet, under a 15-ton gantry crane outside the heavy repair shop. All material and scrap, as it is gathered up around the car yard, is brought to the assorting platform, where all good, second-hand material that can be



Storehouse of the Central of Georgia.



Car Shop, Showing Gantry Crane and Repair Tracks.

straightened up and used again is assorted and repaired, and put in proper bins. All bolts are also separated, and where possible are cut off and re-threaded to smaller sizes. All bar iron stock that is of sufficient length to be used for bolt stock is also assorted and put into another compartment. For better facilitating the handling of second-hand and scrap material, a motor driven alligator shear is located at the side of the assorting platform. At the present time there is being installed an Ajax scrap re-rolling roll, it being the intention to handle all heavy No. 1 wrought scrap for re-rolling, where it is of sufficient size to warrant such, using up old arch bars, draw-bar straps and other similar material, and working it down to the standard sizes most used.

The car shop building is of brick, with slow burning wooden roof. It is composed of two central bays, 45 ft. each, for heavy repair work, provision having been made, if found expedient later to put in traveling cranes in these two bays. On one side is a 60-ft. bay devoted to mill work, and on the other side, nearest the light repair yard, is a 40-ft. bay, in one end of which is an office and a tool and store room. All bolts and other small supplies of a like nature are carried in this special storeroom for the car department. The central part of this bay is occupied by such machine tools as are necessary for the car department, including the wheel department. The opposite end is occupied by a blacksmith shop, where foreign forgings are made for repair work, and also second-hand material straightened and put in shape, only a sufficient force of men being used at this class of work to handle the straightening of material and making of odd forgings that are not standard, all standard material being handled in the main boacksmith shop by forging machines.

Sawdust and shavings from the lumber mill are carried across the street by a fan system, and fed direct to one of the boilers in the power house. The building is well lighted in the daytime, the main bays having a saw-tooth roof with northern exposure. For winter, when the days are short and it is necessary to use artificial light, Nernst lamps will be used inside the shop and Magnetite lamps outside.

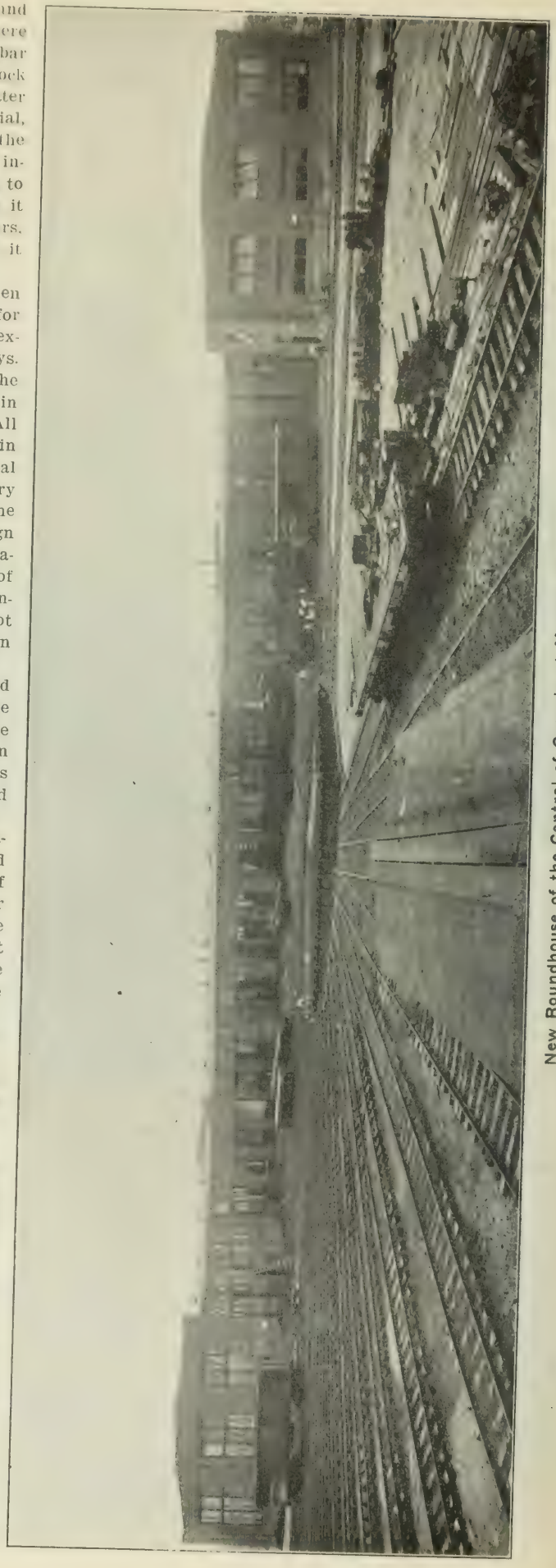
All employees of the car department enter through a lavatory and locker room, where the races are separated and time clocks are provided for checking in. On either side of the entrance lockers for storing clothes and platforms for storing tools have been arranged. On the extreme ends of the building lavatories are provided for each race. These are not connected with the locker rooms, and the locker rooms are only accessible to employees at such times as the shops are not in operation.

The main car shop is heated by exhaust steam radiators and fans for distributing hot air through an overhead pipe system. The fans are located in the second floor of small annexes, one on either side of the main shop, the lower floors of these annexes being utilized for lavatories and closets.

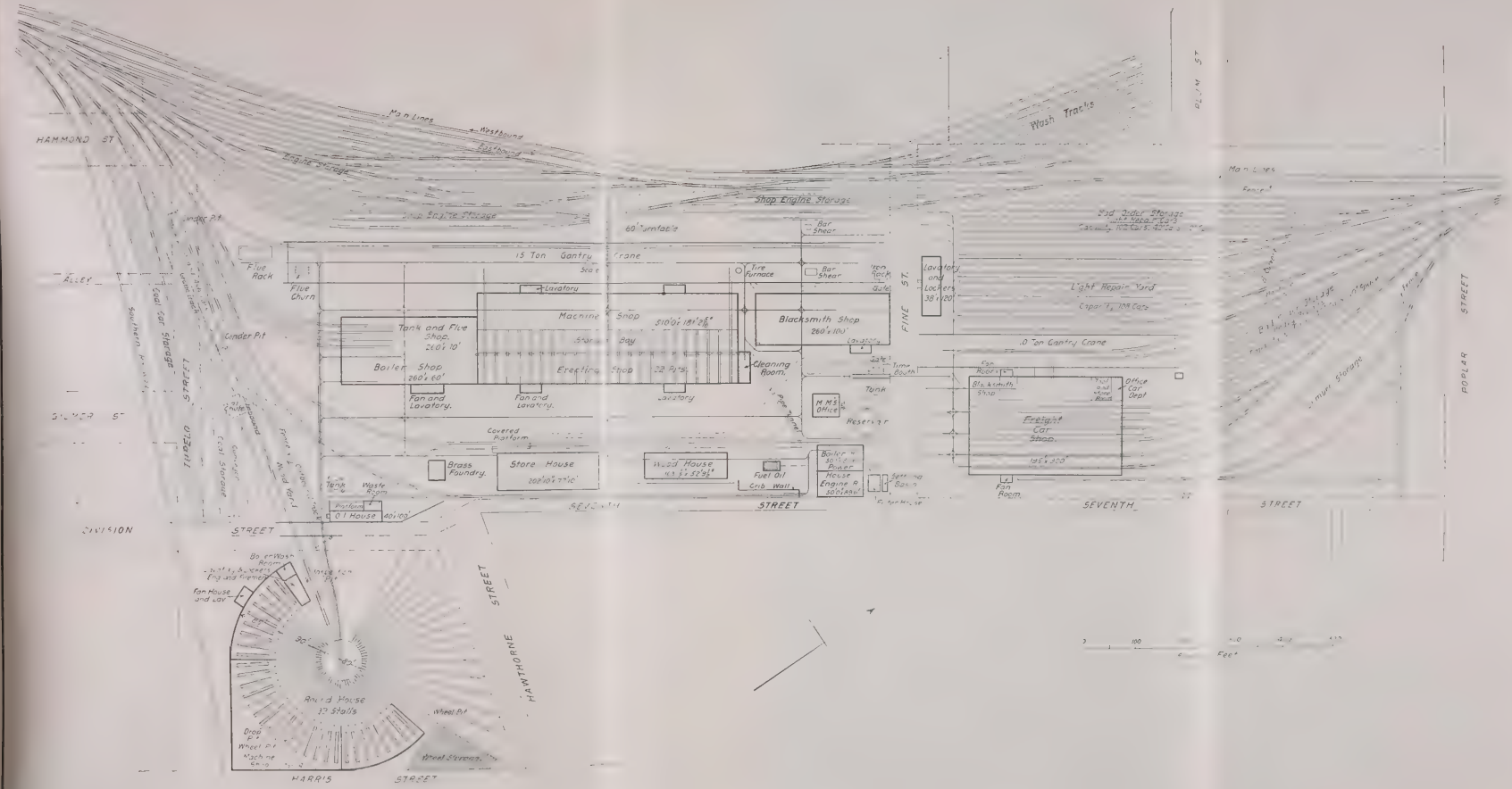
POWER PLANT.

The power house is of brick and steel construction. The grade of the property was taken advantage of, in this instance, so as to get a very high basement under the engine room, and and at the same time not have the floor undesirably high above the grade of the plant. The street is about 9 ft. below the grade of the locomotive department property, so that a high basement, with light on three sides, was obtained under the engine room.

In the boiler room there are five 250-h.p. Stirling boilers, with an underground flue running to an outside stack 9 ft. in diameter and 175 ft. high. There is space reserved in the boiler room for two additional units, whenever the plant has grown to such a size as to require their use. Coal is delivered in front of the boilers by an elevated trestle, and ashes removed at the present time by a narrow gage railway running to standard ash cars and dumping outside the power house. Later, if the amount of power required makes it economical to install automatic stokers, provision has been made for the



New Roundhouse of the Central of Georgia at Macon, Ga.



GENERAL LAYOUT OF BUILDINGS AND YARDS OF THE NEW SHOPS OF THE CENTRAL OF GEORGIA, AT MACON, GA.

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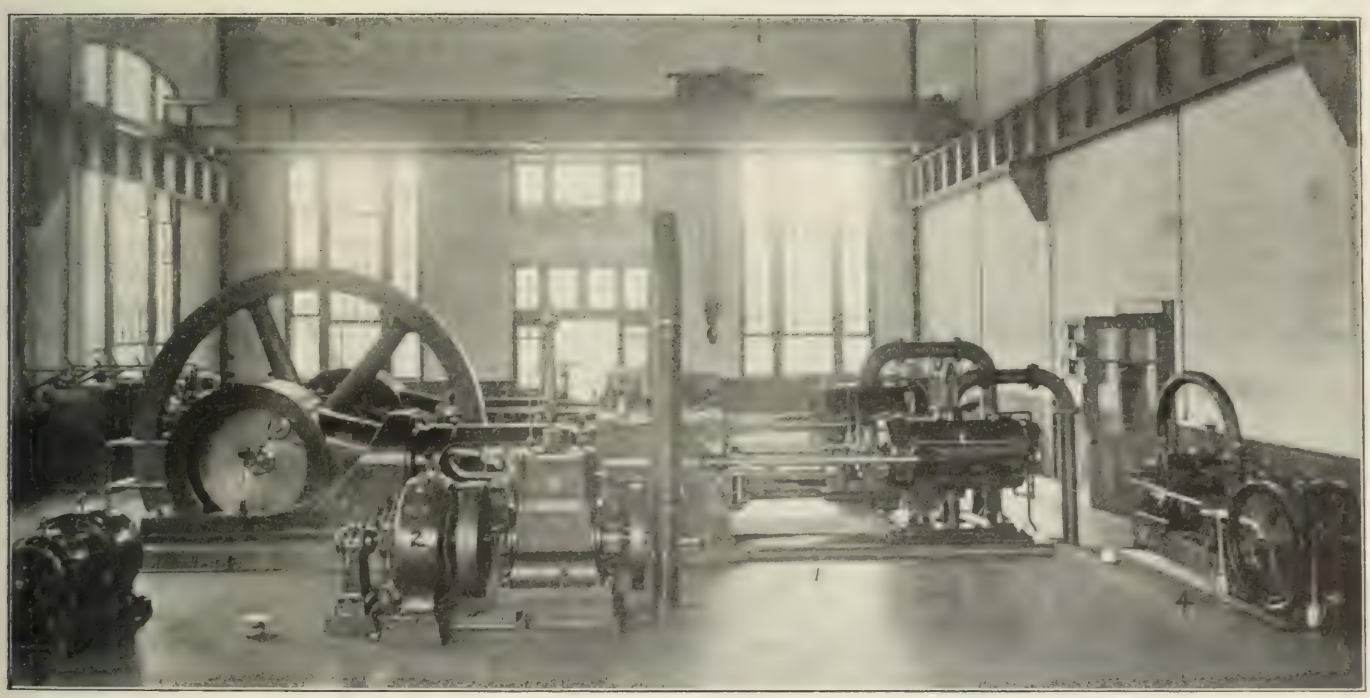
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same ir the building itself, and a tunnel has been built under the floor in front of the boilers for the use of a conveyor. At the present time fully one-third of all power generated is furnished from shavings and scrap wood from the car department.

The municipal water supply, being the only water available near-by, was found to be too expensive for use in this plant, and the company therefore provided its own water supply by going about three-fourths of a mile along the right-of-way to the Ocmulgee river, at which point a concrete well was built on the bank of the river with the bottom 6 ft. below the lowest water. Three motor-driven pumps were installed in this well, pumping through a 16-in. line to a large reservoir situated just outside the power house. The pumps are operated and controlled entirely from a switchboard in the power house, and it is only necessary to go to the river occasionally for furnishing oil to the pumps and motors. From the reservoir circulating pumps take the water to the condensers on the tunnel running to the freight car repair shop. The line to the roundhouse is carried above ground on the fence at the property line.

Both the turbines and air compressor are arranged to run condensing, but are so piped up that in the winter-time, when it is desirable to have exhaust steam for heating, any or all of these units may be run non-condensing, and the exhaust steam used for heating purposes. The auxiliaries, such as vacuum pumps, circulating pumps, boiler feed pumps, filter pumps, etc., are steam driven and the exhaust carried to a feed water heater. All of the auxiliary units, with the exception of the vacuum pumps, are located in the basement, and the filter pumps in a filter house located just outside the main power house.

Fire protection has been provided for the plant; first, by a high service 50,000-gal. tank standing near the power house; second, by a 1,000-gal. Underwriters' pump in the basement



No. 1. 2,000 ft. Compressor. *No. 3. Motor Generator Exciter.*
No. 2. Engine Driven Exciter. *No. 4. Oil and Vacuum Pump.*

Engine Room; Central of Georgia Shops.

various units, and after being used as condensing water a certain amount is retained and treated with alum to settle the mud, run through a settling basin, and then through mechanical filters. This water is not only used for the make-up water for the power plant, but also for the locomotive supply of the entire terminal.

In the engine room the generating units consist of one 300-k.w. and one 500-k.w. Westinghouse turbines, direct connected to a.c. generators, with space reserved for an additional unit when required. There is an engine-driven exciter, also a motor-generator set, which is used as an exciter, it being the practice to start up the plant with the engine set and run it with the motor-generator set. A rotary converter furnishes 300 k.w. direct current for the day load, and a 100-k.w. motor-generator set direct current at night. In addition to lighting the shop property and shop buildings, this plant also lights the entire yards, warehouses and depot at this point. Besides the generating units in the engine room, there is also a 2,000-ft. Corliss cross-compound air compressor, built by the Chicago Pneumatic Tool Co., Chicago. The air is taken directly from the compressor through an after-cooler, and then through the power tunnel to the various buildings for distribution, the main tunnel running to the erecting shop, with auxiliary of the power house, and third, in case of emergency, the service pumps in the filter plant may be by-passed into the fire system.

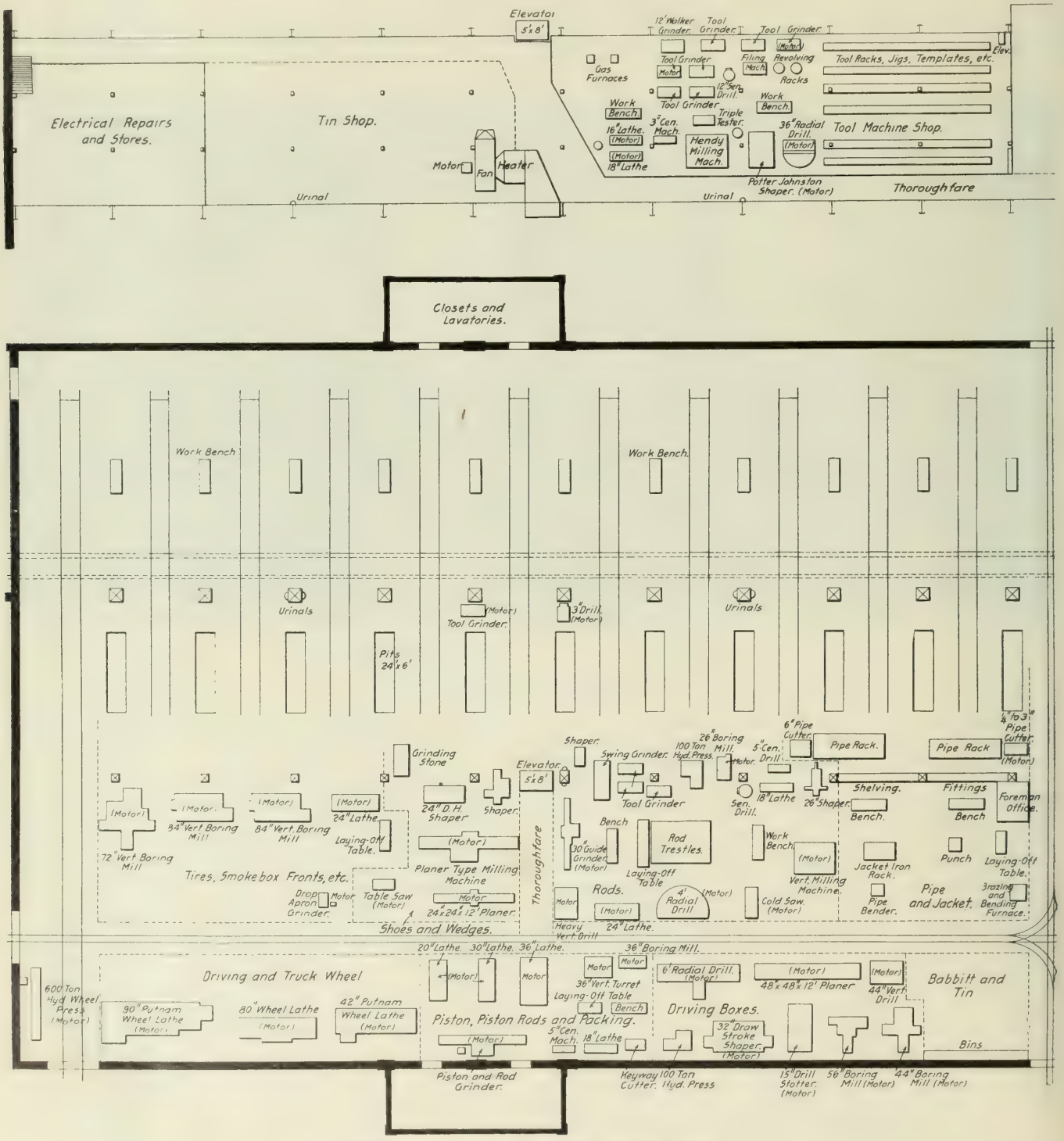
ROUNDHOUSE.

While apparently the location of the roundhouse is somewhat contrary to the generally pre-conceived idea that it must be in close touch with the main shop, there are good reasons why, in a fairly large plant, this should not be so, and why it is better, for a great many reasons, to keep the roundhouse somewhat separated from the main shop buildings. A different class of employees is worked in each department, and the running to and fro between the shop and roundhouse causes a great deal of lost time. While, to a certain extent, the location was forced by the property lines, yet this is a very satisfactory solution of the problem, as provision has been made, by carrying out the outside walls at two points tangent, to form a rectangle, the corner of which is utilized as a machine shop for the roundhouse. In this there are all the tools necessary for the handling of roundhouse work, with a blacksmith forge in addition, so that there is little or no necessity for carrying work to and from the main shop, except heavy forgings occasionally. All standard material can be brought from the storehouse by narrow gage railway, and delivered at the machine shop in the roundhouse. In addition

to the machine shop, there is a motor-driven drop table, upon which all the drivers of an engine may be dropped at one time, or as many as require dropping. An electric monorail hoist has been provided for moving to and from the drop pit and wheel lathe in the machine shop such wheels as may require truing of journals. In addition to the drop pit, two other tracks are equipped with wheel pits for handling single wheels, while outside is a small pit for handling tender wheels.

There are 32 stalls in the roundhouse, making little over half a circle. The full circle has not been built, because first, it is thought that possibly future developments might require longer stalls than in the existing house and, second, it is not the intention to use the house for storing engines in any way whatever. Engines will be brought in over the cinder pits, given coal and water, and then placed on an inspection pit. After inspection, if no work is found necessary on the engines, they will be turned and at once run out on storage tracks which have been provided for this purpose. Only such engines will be taken into the roundhouse as require either boiler washing or repairs.

Beyond the roundhouse proper, and occupying about the area of one stall, a room has been provided for a locker room and lavatory for the engineers and firemen; also the back end of this annex being used for the hot water boiler washing system, with its reservoirs, pumps, etc. The first one-third of the house itself it is proposed to use for boiler washing,

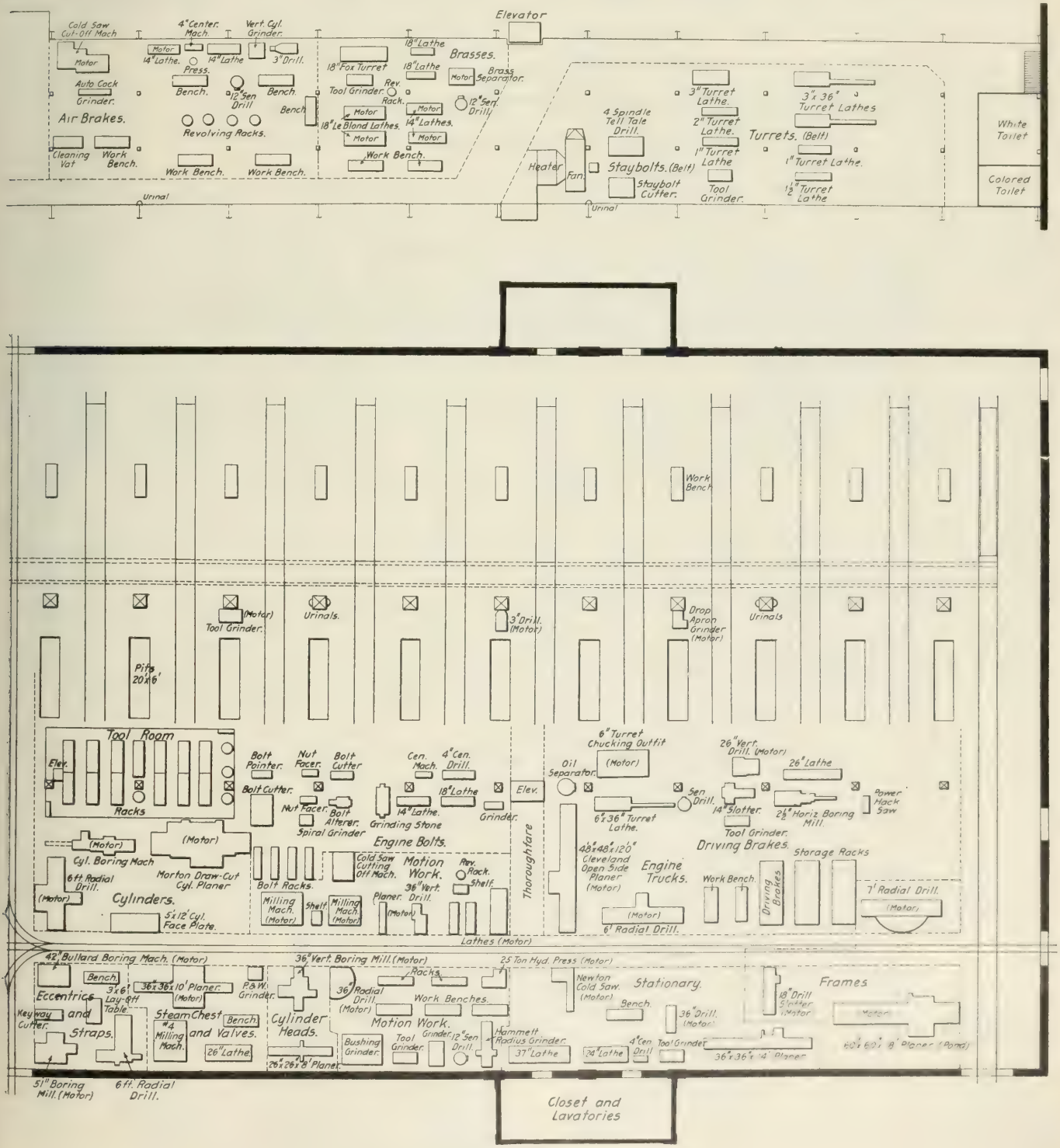


Machines not otherwise indicated, are belt-driven.

Plan and Tool Layout, South Half of Machine Shop.

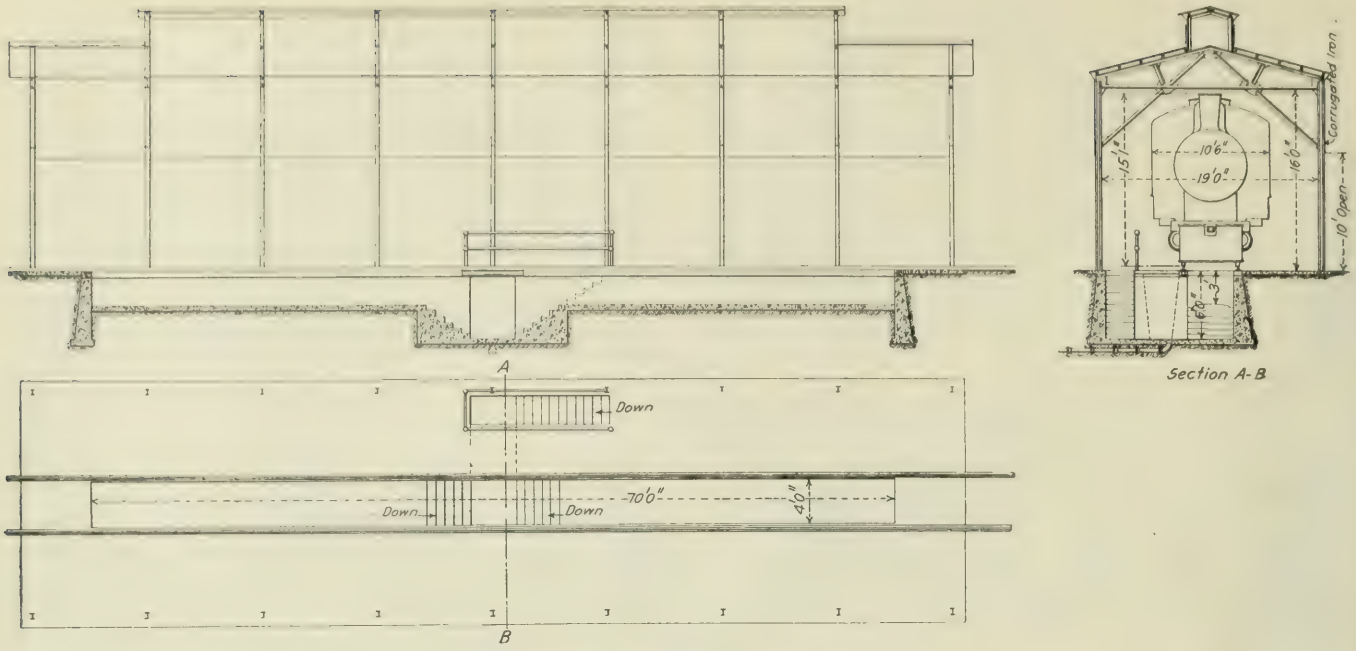
with plugs at every post for blowing out, filling and washing. The remainder of the house is equipped with drops at every other post for filling and blowing out. The pumps on the filling lines are motor-driven turbine pumps, and can be operated by a switch from any post on the round house. The roundhouse will be heated by exhaust steam from the power house, the fan being located on the second floor of a small annex. The hot air passes through a large duct running around the outer circle, to the various pits and the machine shop. The lower floor of the annex is utilized, as in other buildings, for closets and lavatories. Day lighting has been amply provided for by having the outer wall built unusually high and making it nearly all glass. Night lighting has been provided for by placing about 5 ft. above the floor, a vertical Cooper-Hewitt lamp for each pit. This throws the light on the running gear and outside parts of the engine, and makes a very pleasant light by which to work. Additional incandescent lights have been provided for by plugs at every post. There are also outlets on every post for two air hose attachments, and for steam for blowing up fires. Located at suitable intervals are receptacles for plugging in on the direct current line for a small variable speed motor mounted on a truck, which is used for driving the cylinder boring bar and valve setting machines.

There are two ash pits provided at the engine terminal, with cross-overs between, so that it is possible to get out any

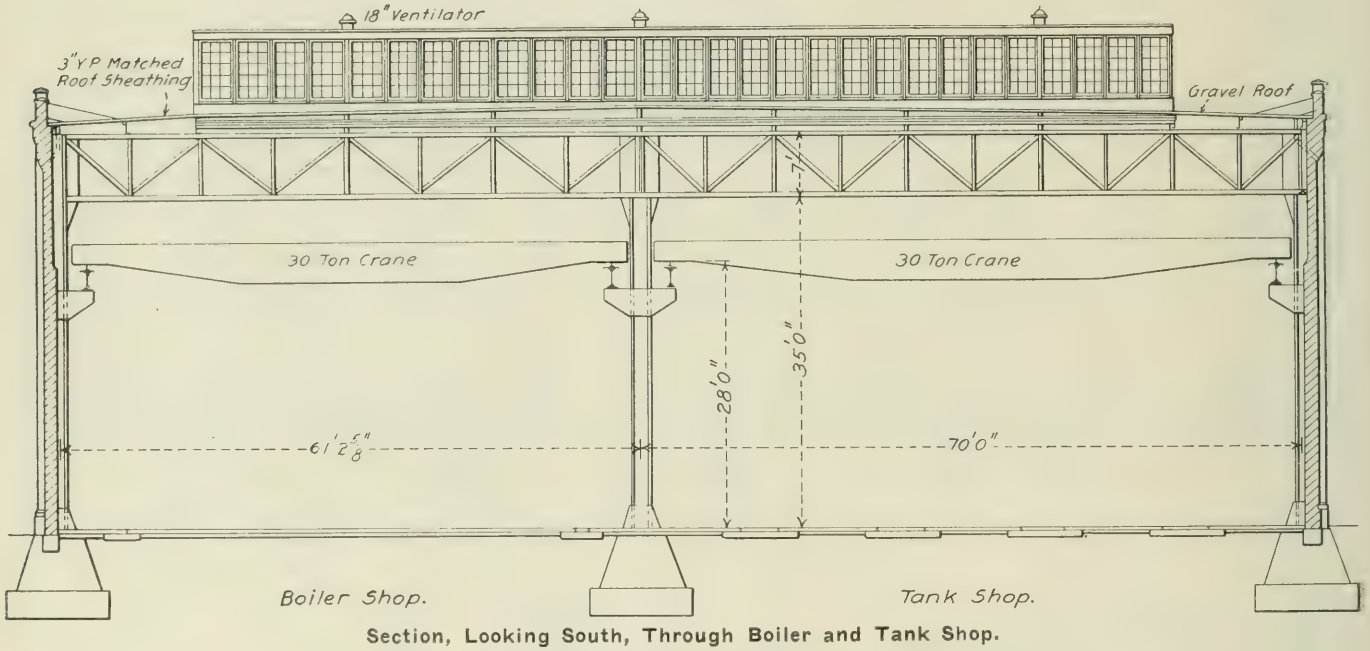


Machines not otherwise indicated, are belt-driven.

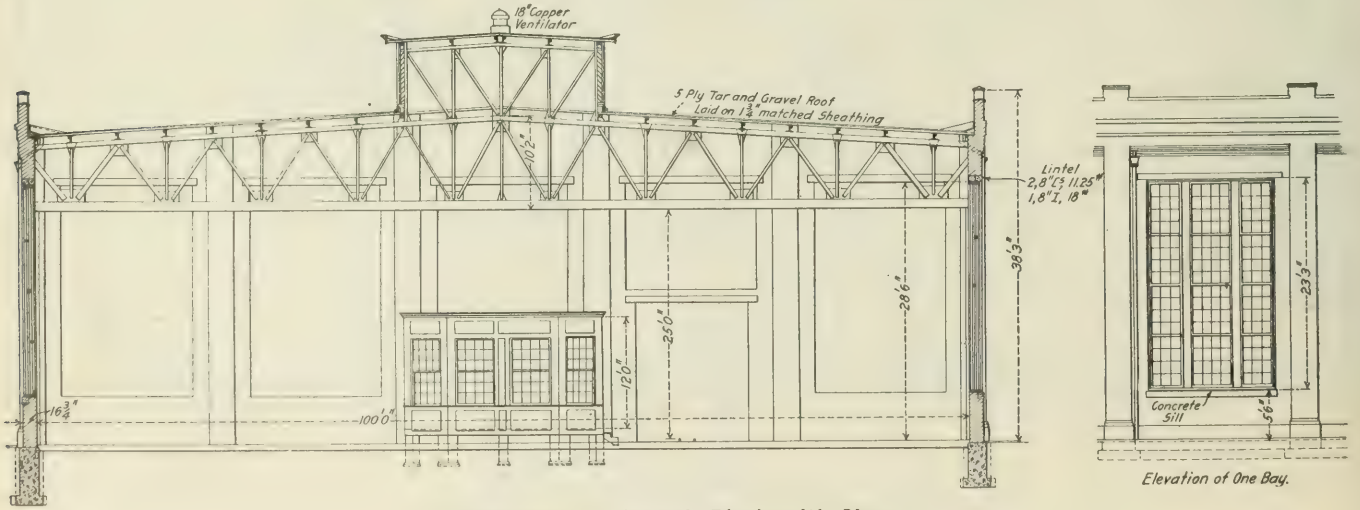
Plan and Tool Layout, North Half of Machine Shop.



Elevations and Sections of Inspection Pit.



Section, Looking South, Through Boiler and Tank Shop.

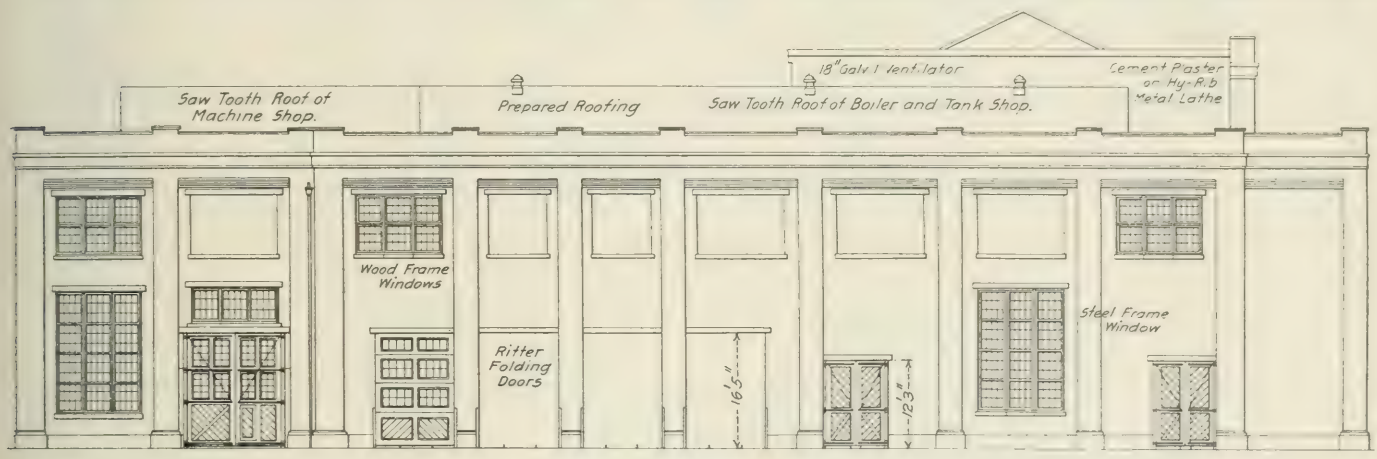


Cross Section Through Blacksmith Shop.

engine and give it attention out of its regular order when the occasion requires. The coaling station is a link belt storage arrangement which has been in use previously but is moved to a new location. Water cranes have been provided so that they will be available for both incoming and outbound engines, as well as engines leaving the storage tracks. Ashes from the cinder pits are to be handled by a locomotive crane with bucket; the crane will also be used for the shifting of coal to the chute and for other miscellaneous work around the plant.

The oil house is of brick and steel construction, with concrete roof and floors. It will be heated by exhaust steam from the power house. The delivery system is the Bowser self-measuring and indicating oil pump outfit. The oil from tank cars is delivered to the storage tanks through filling lines brought out to the track at the platform, and barreled oils are delivered to the tanks through filling holes in the platform.

The wood-working shop will be used for miscellaneous wood-work around a locomotive plant, such as repairing cabs, pilot beams, etc. It is of brick and steel construction, one story, with an industrial track leading to the shops.



South End Elevation of Boiler and Tank Shops.

LOCOMOTIVE SHOP.

The erecting shop contains 22 pits and one thoroughfare, on 22-ft. centers, with 13 ft. between center of outside tracks and wall, making the building 510 ft. long. This shop is 60 ft. wide. The storage bay, which runs between the erecting and machine shop, is 45 ft. wide, and the main machine shop is 70 ft. wide. The entire building is of brick and steel construction.

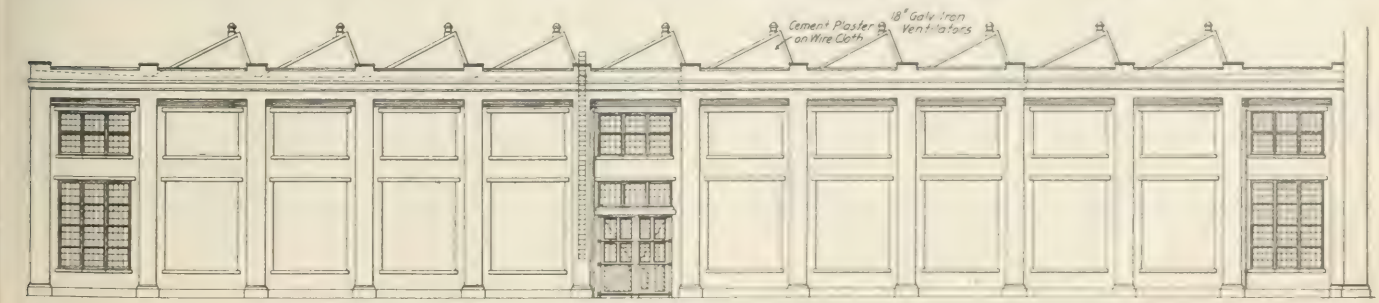
In the erecting bay there are two crane runways, the upper for a 125-ton crane and the lower for a 10-ton crane. The lower crane runway is continuous into the boiler shop and also into the small annex at the other end of the shop, which is to be used as a cleaning room. This arrangement allows the crane in the boiler shop to move into the erecting shop, pick up a boiler and take it into the boiler shop without any rehandling. All material stripped from the engines can be picked up by the 10-ton crane and taken to the cleaning room, cleaned, and returned either to the storage bay or machine shop, and to any other department if work is required. The entrance for engines into the erecting shop is by means of a turntable and a service track running through the middle of the shop.

The present arrangement is one-half of the future plant, provision having been made to double the whole plant when necessary, at which time the gantry crane material platform will be located between the storehouse and the present erecting shop. At present it has been considered advisable to keep the gantry crane platform near the machine shop.

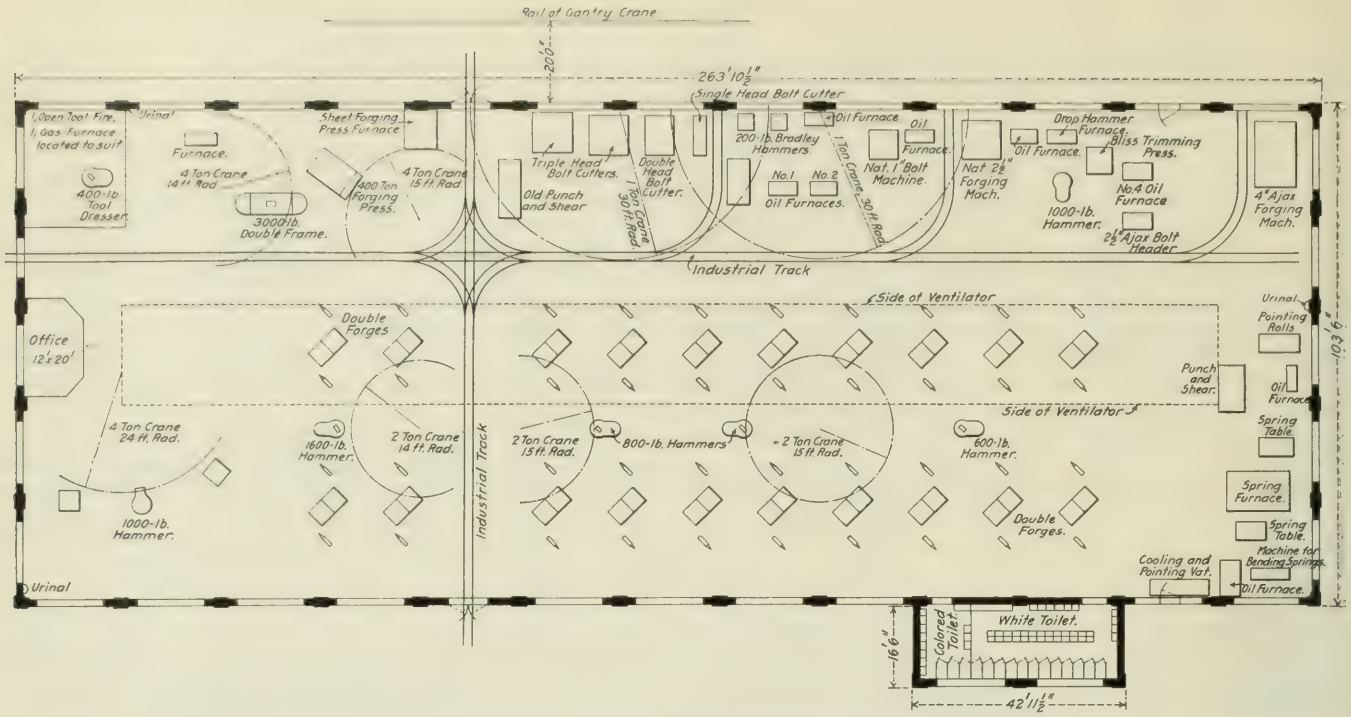
At the end of the pits in the erecting shop is a power tunnel from the power house, running through the entire bay. Provision has been made to provide connections for air, steam, oil and water, with suitable outlets at the pits for each.

Between the erecting shop and the main machine shop is a storage bay 45 ft. wide, with two floors, the lower floor being used for the storage of driving wheels and for fitting up driving boxes preparatory to wheeling an engine. This is served by two 7½-ton cranes operating on either side of the thoroughfare. Between each of the tracks is located a storage pit for the storing of material when stripping engines, until such time as it is required to assemble again. The upper floor of this bay will be used as a light machine shop bay, and will have a manufacturing tool room connected with the tool storeroom on the main floor of the machine shop by a small elevator. It will also have a department for electrical repairs, tin shop, air brake repair department, injector, lubricator and gage repair department.

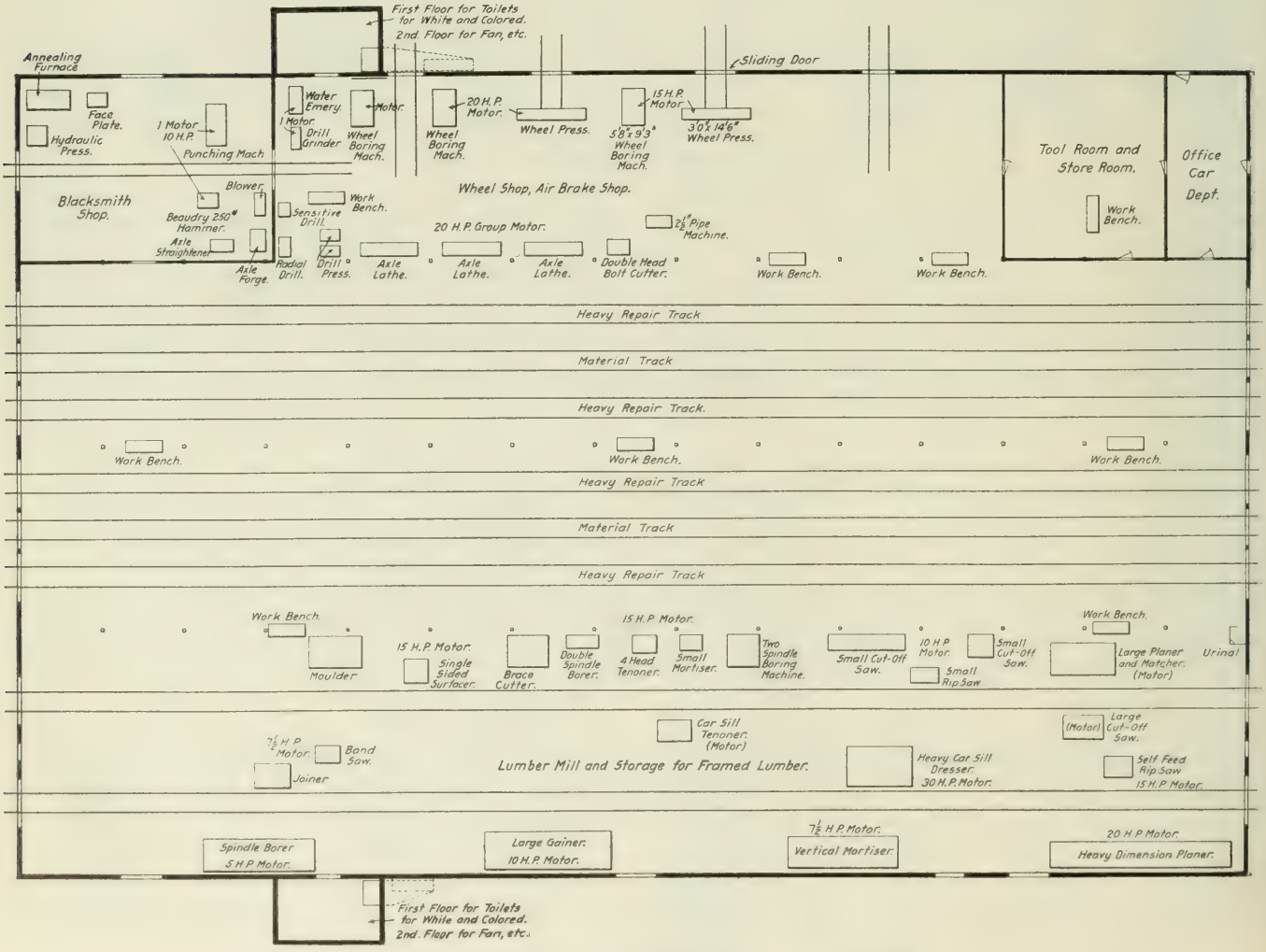
There will be two electric elevators for handling light material from the first floor to the second, heavy material being handled on a platform extending over the thoroughfare at the middle and served by the main machine shop crane. The machine shop is served with a 20-ton crane. There is a tool room for the storing and giving out of standard tools only, on the first floor. The general tool arrangement in the machine shop, as previously alluded to, has been with the idea of grouping rather by classes of work than by classes of tools, tools being



East Side Elevation of Boiler and Tank Shop.



Plan and Tool Layout, Blacksmith Shop.



Plan and Tool Layout; Freight Car Shop and Lumber Mill.

provided in each group for the class of work handled. This is to prevent, as much as possible, the re-handling of material from tool to tool.

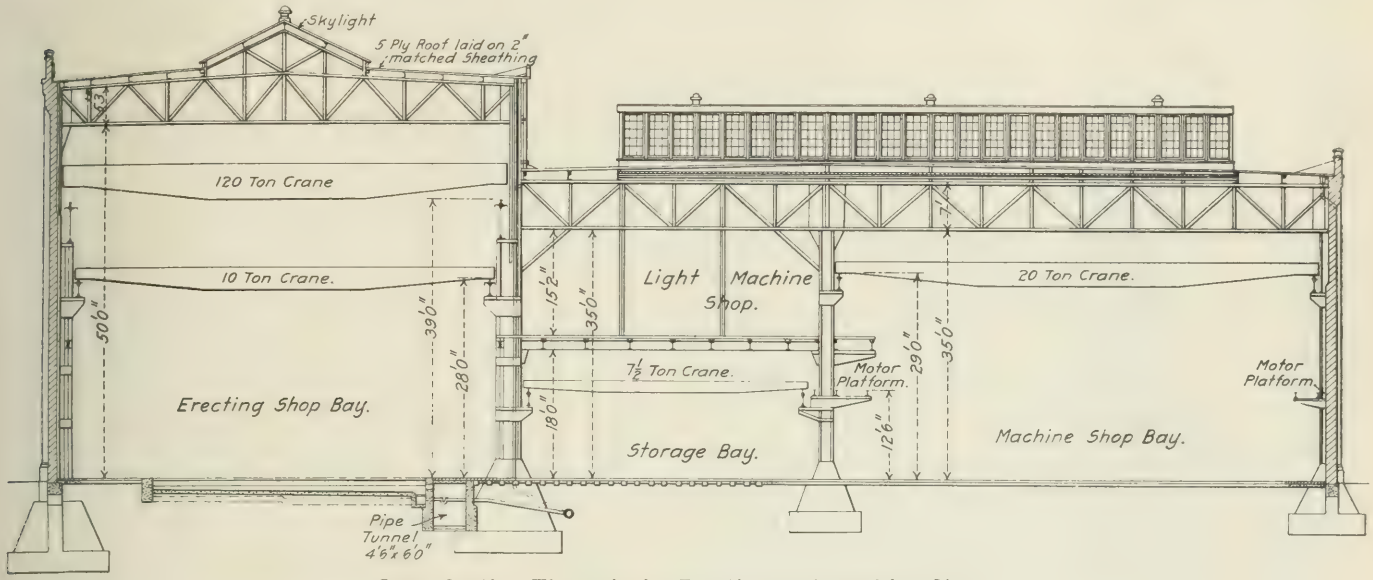
Both the erecting shop and the machine shop are heated by exhaust steam, the heater and blower arrangements being located on the second floor in the light machine tool bay. Small annexes are located on each side of the building for closets and lavatories.

BLACKSMITH SHOP.

This building is of steel and brick, 100 ft. wide and 260 ft. long. There is a small two-story annex at one side—the first floor being used for closets and lavatories and the second floor for the housing of the volume and pressure blowers. No overhead cranes have been provided in this building, but a series of jib cranes at the heavy forges swing from the fires to a narrow gage railway which has been provided. Bar iron is stored in a rack and under the gantry crane, and a heavy guillotine shear is provided adjacent to the narrow gage railway for shearing heavy bars and billets. Round bar iron for standard bolt stock is stored beyond the gantry crane platform on a series of standard gage trucks located on an independent track. It is intended to handle directly from cars into the trucks and store the iron on the trucks, moving the trucks as the iron is required, opposite the small guillotine shear. This saves re-handling, and it will allow of any size iron being moved about on this truck and brought to the shear when required.

BOILER AND TANK SHOP.

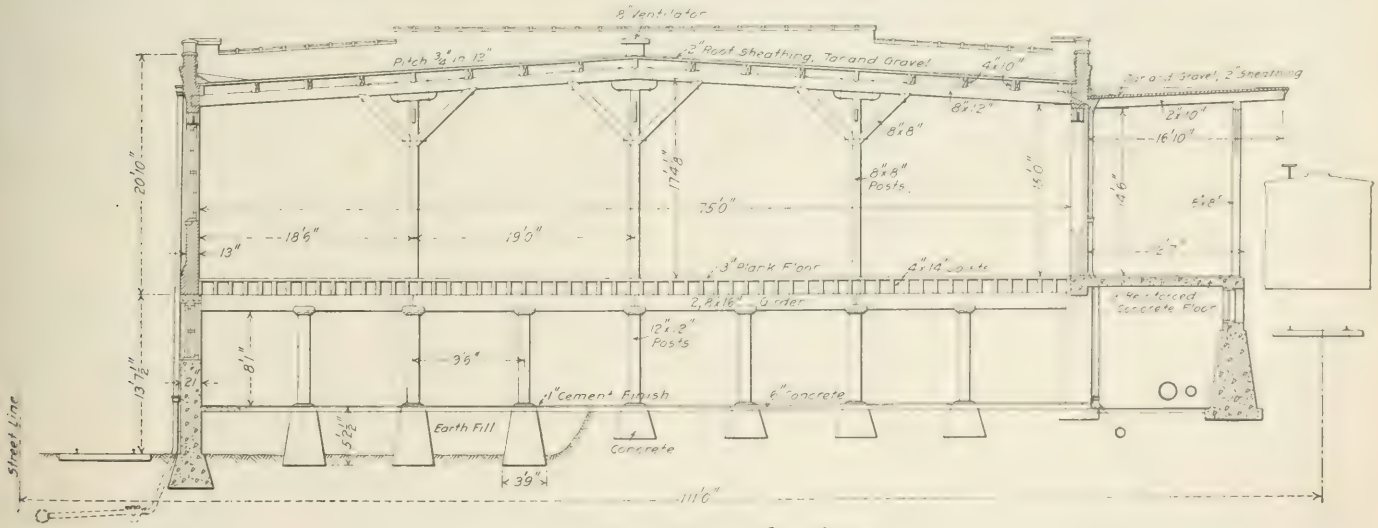
The boiler and tank shop consists of two bays, 260 ft. long, the boiler erecting shop being 60 ft. wide and the other bay 70 ft. wide. The end nearest the erecting shop, in the 60-ft. bay, will be used for boiler repairs, while the other end will be used for flue work. In the 70-ft. bay the end nearest the erecting shop will be used for flanging, punching, shearing, etc., material for boiler and tank repair work. The opposite end of this bay will be used for tender and tank repairs. Both bays are served by 30-ton cranes. The one in the 60-ft. bay opposite the erecting shop has a continuous runway with the lower runway in the erecting shop. There will be a wall 10 ft. high separating the boiler shop from the erecting shop, the room above having been left for the crane running between the two departments.



Cross Section Through the Erecting and Machine Shop.

MATERIAL PLATFORM.

A material platform, with a 15-ton gantry crane, including magnets for handling both scrap and plate, runs in front of the machine shop, boiler and blacksmith departments. All heavy material and supplies for these departments will be received and unloaded on this platform. All scrap will also be stored and handled by the crane on this platform. The tire furnace opposite the driving wheel group in the machine shop



Cross Section Through Storehouse.

will also be located here. At one extreme end of this platform the flue rattler has been located, the flue rattler itself being the old cylindrical type, but with provision made for automatically filling with flues when lifted into the cradle above the churn by the gantry crane; the flues, after cleaning, being delivered automatically to the lower cradle, where they can again be gathered up and handled by the crane.

Connecting all departments, as well as the roundhouse and storehouse, is a Hunt industrial narrow gage railway for the handling of material where crane service is not available.

All new tools purchased are motor driven, and the old tools that will be utilized will be placed in small groups and driven by an independent motor.

The general layout arrangement, size of buildings, etc., have been worked out by the motive power department of the road. The buildings have been designed by, and are being



Power House, High Pressure Tank and Office Building Under Construction.

erected under the supervision of the chief engineer. We are indebted to F. F. Gaines, superintendent of motive power, for the drawings, tool lists and this very complete description of the new plant.

MACHINE AND ERECTING SHOP EQUIPMENT.
GROUPED BY DEPARTMENTS.

CYLINDER HEADS AND CASINGS.

Planer, 26 in. x 26 in. x 8 ft.	Niles-Bement-Pond.	Belt.
Boring Mill, 36 in. vertical turret	Bullard	Motor.

STEAM CHESTS AND VALVES.

Lathe, 26 in.	Lodge & Davis	Belt.
Planer, 36 in. x 36 in. x 10 ft.	Niles-Bement-Pond.	Motor.
Miller, No. 4	Brown & Sharpe.	Belt.
Grinder, magnetic chuck	Pratt & Whitney.	Motor.

TIRES, WHEEL CENTERS, AXLES, SMOKEBOX FRONTS.

Wheel lathe, 80 in. quartering and journals	Niles-Bement-Pond.	Motor.
Boring mill, 84 in.	Niles-Bement-Pond.	Motor.
Boring mill, 84 in.	Niles-Bement-Pond.	Motor.
Tire lathe, 90 in.	Putnam	Motor.
Axle lathe, driving, 24 in.	Schumaker & Boye	Motor.
Boring mill, 72 in.	Niles-Bement-Pond.	Motor.
Wheel press, 600-ton	R. D. Wood	Motor.
Surface plate		
Lathe, 42 in. steel tired car wheel	Putnam	Motor.
Oil furnace, heating tires	Ferguson	Motor.
Keyseater, driving axle	Ryerson	Motor.

ROD WORK.

Shaper, 26 in., keys and liners	Morton	Belt.
Lathe, 24 in., rod brasses	Reed	Motor.
Lathe, 18 in. x 8 ft. crosshead pins	Le Blond	Belt.
Sensitive drill, 12 in.	Knecht	Belt.
Guide grinder, 30 in.	Bridgeport	Motor.
Shaper, 32 in., single head	Cincinnati	Belt.
Boring bill, 36 in., rod bushings	Bullard	Motor.
Grinder, No. 12 spiral groove, shear cut	Gardner	Belt.
Grinder, No. 6, spiral groove, shear cut	Gardner	Belt.
Hydraulic bushing press, 100 ton	Watson Stillman	Belt.
Radial drill, 4 ft. 0 in., back geared	Niles Bement Pond.	Motor.
Vertical miller, 66 in. small table and crane	Niles-Bement-Pond.	Motor.
Swing frame grinder, No. 2	Springfield	Belt.
Floor grinder, No. 8D	Blount	Belt.
Cold saw, No. 16 Higley	Blount	Motor.
Vertical drill, 44 in. heavy	Foote-Burte	Motor.
Center drill, 5 in. stock	Packard	Belt.
Laying off surface plate		
Two work benches, standard, with Merritt 6 in. vises		

LINK WORK.

Link grinder	Hammett	Belt.
Universal grinder (bushings)	Brown & Sharpe	Belt.
Radius planer attachment	Underwood	
Crank planer, 16 in. x 24 in. x 40 in.	Niles-Bement-Pond.	Motor.
Lathe, 24 in. x 10 ft.	Reed	Motor.
2 lathes, 14 in. x 5 ft.	Reed	Motor.
Sensitive drill, 12 in.	Knecht	Belt.
Vertical drill, 36 in.	Foote-Burte	Motor.
Miller, 5-B, heavy plain	Le Blond	Motor.
Link grinder, heavy	Hamett	Belt.
Grinder, double spindle, horizontal attachment	Springfield	Belt.
Miller, No. 5 vertical	Ingersoll	Motor.
Bushing press, 25-ton hydraulic	R. D. Wood	Motor.
Cut-off saw, No. 16 Q. & C.	Higley	Motor.
Three work-benches, standard Merritt 6-in. vises		
Three shelves, 36 in. x 20 in.	New Britain.	
Radial drill, 3 ft.	Niles-Bement-Pond.	Motor.
4 Arbor presses, No. 3½	Bartlett.	

BRASS FOUNDRY.

Melting furnace, No. 360	Steele-Harvey.	
Ladle heater	Steele-Harvey.	
Pressure blower	Steele-Harvey	Motor.
Tumbling barrel and sieve cap	Globe M. & S.	Belt.

DRIVING BOXES.

Shaper, 32 in., special draw-stroke	Morton	Motor.
Bushing press, 100-ton	Watson-Stillman	Belt.
Vertical drill, 44 in. compound table	Foote-Burte	Motor.
Boring Mill, 56 in.	Bullard	Motor.
Slotter, 15 in. high speed movement	T. C. Dill	Motor.
Planer, 48 in. 48 in. x 12 ft., 4-head	Woodward & Powell	Motor.
Boring mill, 44 in., old car wheel with double chuck	Rogers	Belt.
Radial drill, double base, 6 ft. semi-radial	Bickford	Motor.

PIPE GROUP

Pipe threader, 6 in.	Wieland.	
Pipe bender, pneumatic	Underwood	Air.
Pipe threader, 3 in.	Coxe	Motor.
Oil furnace, small brazing and bending	Ferguson	Oil.

BABBIT AND TIN WORK.

Furnace, heating metal	Tate-Jones	Oil.
Furnace, melting off and heating	Tate-Jones	Oil.

PISTONS, PISTON PACKING AND PISTON RODS.

Grinder, piston rod	Landis	Motor.
Vertical turret, 36 in.	Bullard	Motor.
Lathe, 18 in. x 5 ft.	Schumaker & Boye	Belt.
Vertical turret, 36 in.	Bullard	Motor.
Lathe, 36 in., to swing 23 in. over carriage	Niles-Bement-Pond.	Motor.
Lathe, 20 in. high speed reducing	Le Blond	Motor.
Center drill, 5 in. stock	O. L. Packard	Belt.
Keyway mortiser	Niles-Bement-Pond.	Belt.
Lathe, 30-in.	Le Blond	Motor.

STAYBOLT GROUP.

Bolt threader, 4 spindle	Lassiter	Belt.
Tell-tale drill, 4 spindle	Lassiter	Belt.

ENGINE BOLTS—DOWN STAIRS.

Lathe, 18 in.	Lodge & Shipley.	Belt.
Lathe, 14 in.	Lodge & Shipley.	Belt.
Center drill, small	Pratt & Whitney.	Belt.
Bolt pointer, 2 in.	National	Belt.
Bolt cutter, ½ in. x 3 in. triple head	National	Belt.
Grinder, No. 12 spiral groove	Gardner	Belt.
Nut facer, ⅜ to 1½ in.	Victor	Belt.
Nut facer, 1½ in. to 3 in.	Victor	Belt.
Bolt alterer	Foster	Belt.
Center drill, 2-spindle, 4 in.	Whiton	Belt.
Bolt machine, 4 spindle	Lassiter	Belt.
Grindstone	C. of Ga.	Belt.
3 shelves, 36 in. x 20 in.	New Britain.	
Grinder, double spindle, horizontal attachment	Springfield	Belt.

TURRET LATHE GROUP.

Flat turret, 2 in.	Jones & Lamson	Belt.
Flat turret, 3 in.	Jones & Lamson	Belt.
Flat turret, 3 in.	Pratt & Whitney.	Belt.
Heavy turret, 6 in.	Niles-Bement-Pond.	Belt.
Turret, chucking outfit, 6 in.	Steinlee	Motor.
Turret, set screws	Pratt & Whitney.	Belt.
Turret, 1 in. set screws	Pratt & Whitney.	Belt.
Turret, 1½ in., patch bolts	Pratt & Whitney.	Belt.
Turret, 3 in.	Warner & Swazley	Belt.
"D" grinder	Springfield	Belt.
8 shelves, 36 in. x 20 in.	New Britain.	

AIR BRAKES—LUBRICATORS.

Steam gage tester	Crosby.	
Auto cock grinder, 8 spindle (For Car Shop)	Crosby	Belt.
2 triple rollers	Westinghouse	Hand.
2 triple racks (1 for car shop)	Westinghouse	Hand.
Vertical cylinder grinder	Saxon	Belt.
Sensitive drill, 12 in.	Knecht	Belt.

Lathe, 14 in., taper attachment	Le Blond	Motor.
Lathe, 14 in. taper attachment	Lodge & Shipley	Belt.
Vertical drill, back geared	Foote-Burte	Belt.
Center drill, 2 spindle, 4 in. stock	Whiton	Belt.
Cut off saw, No. 16	Q. & C.	Motor.
Test rack, air pumps	Westinghouse.	
Test rack, injectors	Westinghouse.	
Test rack lubricators	Westinghouse.	
Test rack, engineers' valves	Westinghouse.	
6 work benches, standard	C. of Ga.	
4 revolving racks, No. 172	New Britain.	
Cleaning vat	C. of Ga.	

DRIVING BRAKES.

Vertical drill, 36 in	Foote-Burte	Belt.
Lathe, 26 in	C. of Ga.	Belt.
Sensitive drill, 12 in	Knecht	Belt.
Floor grinder, D	Springfield	Belt.
1 work-bench, standard	C. of Ga.	

CYLINDERS.

Planer, special draw-stroke cylinder	Morton	Motor.
Drill, 6-ft. semi-radial	Bickford	Motor.
Cylinder boring machine, plain	Newton	Motor.

SHOES AND WEDGES.

Cold saw, No. 20, 36 in	Higley	Motor.
Shaper, 24 in. D. head	Cincinnati	Belt.
Miller, 36 in. x 36 in. x 12 ft. (Locate near rods)	Ingersoll	Motor.
Planer, high speed 24 in. x 24 in. x 12 ft.	Niles-Bement-Pond.	Motor.
Grindstone	C. of Ga.	Belt.

ENGINE TRUCKS.

Drill, 6-ft. semi-radial	Bickford	Motor.
Planer, 48 in. x 48 in. x 12 ft. open side	Cleveland	Motor.

BRASS WORK.

Turret lathe, 18 in. brass	Fox	Belt.
Turret lathe, 18 in. Fox, brass	Fox	Belt.
"D" grinder	Blount	Belt.
Lathe, 18 in. quick change gear	Le Blond	Motor.
Lathe, 18 in. quick change gear	Le Blond	Motor.
Brass separator, electro-magnetic	Gen'l Electric	Motor.
Lathe, 14 in. taper attachment	Niles-Bement-Pond.	Motor.
Lathe, 14 in. taper attachment	Niles-Bement-Pond.	Motor.
Sensitive drill, 12 in	Knecht	Belt.
Turret, 18 in. Fox	Warner & Swasey	Belt.
6 Shelves, 36 in. x 20 in	New Britain.	

FRAMES.

Slotter, 18 in. (2 independent tools)	T. C. Dill	Motor.
Planer, low rail, 60 in. x 60 in. x 18 ft., 4 heads	Niles-Bement-Pond.	Motor.
Radial drill, 7-ft. heavy, double base	Dresses	Motor.

TOOL ROOM.

Tool room grinder, universal	Walker	Belt.
Cutter grinder, No. 2	Cincinnati	Motor.
Grinder, twist drill	Wm. Sellers	Belt.
Grinder, tool, universal	Wm. Sellers	Motor.
Tool room grinder, 12 in. universal	Walker	Motor.
Miller, universal, rack cutting	Hendy	Belt.
Sensitive drill, 12 in	Knecht	Belt.
Radial drill, 3-ft	Niles-Bement-Pond.	Motor.
Shaper, 15 in. universal	Potter & Johnson.	Motor.
Grinder, double spindle, horizontal att.	Springfield	Belt.
Lathe,, 16 in	Hendey-Norton	Motor.
Lathe, 18 in	Hendey-Norton	Motor.
Center drill, 3 in. single spindle	Whiton	Belt.
Filing machine, No. 2	Cochrane-Bly	Belt.
Grinder, staybolt dies	Modern	Belt.
Grinder, auto saw	Higley	Belt.
8 racks, No. 172, revolving	New Britain.	
4 shelves, 36 in. x 20 in	New Britain.	

ECCENTRIC STRAPS AND BLOCKS.

Eccentric mandrel	Underwood.	
Boring mill, 51 in	Niles-Bement-Pond.	Motor.
Boring mill, 42 in. rapid reduction	Bullard	Motor.
Keyway morticer	Morton	Motor
1 laying-off table	C. of Ga.	
1 work-bench, standard	C. of Ga.	
Radial drill, 6-ft	Niles-Bement-Pond.	Belt.

MISCELLANEOUS—STATIONARY.

Lathe, 37 in	C. of Ga.	Belt.
Planer, 36 in. x 36 in. x 14 ft.	Niles-Bement-Pond.	Belt.
Boring mill, horizontal	Niles-Bement-Pond.	Belt.
Lathe, 24 in	Le Blond	Belt.
Drill, 36 in. vertical	Foote-Burte	Motor.
Power hack saw, small	Q. & C.	Belt.
Belt lacer	Jackson	Hand.
Cold saw, 14 in. combination	Newton	Motor.
Slotter, 14 in	Wm. Sellers	Belt.
Oil separator	American Cent.	Belt.
Scale, 5-ton, compound suspension	Fairbanks.	
Center drill, 4 in. stock	Whiton	Belt.
3 time recorders	International.	

ERECTING.

2 vertical drills, 36-in	Foote Burte	Motor.
Portable furnace, braces, etc	Ferguson	Oil.
2 floor grinders, "D"	Springfield	Motor.
Valve setter	Farrington-Mills	Air.
Crank pin press, 100-ton, hydraulic	Dudgeon.	
Dome facer	Underwood.	
Crank pin turner	Underwood.	
Valve seat facer	Underwood.	
Cylinder boring bar, 4 in	Ryerson	Motor.
4 air drills, close corner, No. 8	"Thor."	
1 air drill, No. 6, non-reversible	"Thor."	
2 air drills, No. 1 piston	"Thor."	
1 air drill, No. 2 piston	"Thor."	
1 breast drill, No. 10	"Thor."	
3 chipping hammers, No. 5	"Thor."	
21 work-benches, special, with 2 in. Merritt 6 in. vises each		
6 vise stands, 5 in. portable	New Britain.	
1 burner for testing locomotives	Tate-Jones	Oil

ROUNDHOUSE EQUIPMENT.

Lathe, 24 in	Le Blonde	Motor.
Volume blower, heating system	American	Motor.
Lathe, 14 in	Reed	Motor.
Vertical drill, 36 in	Foote-Burte	Motor.
Hydraulic press, 100-ton	Watson-Stillman	Motor.
Shaper, 30 in. draw-cut	Morton	Motor.
Cylinder and valve seat facer	Underwood	
Air-valve setter	Farrington-Mills.	
Hydraulic crank pin press	Watson Stillman	
Sensitive drill, 12 in	Knecht	Belt.
Turret head, bolt cutter, No. 4	Pratt & Whitney.	Belt.
Pipe machine, 3 in	Bignall & Keeler.	Belt.
Drop apron grinder, No. 5	Bridgeport	Motor.
Punch and shear, No. 17	White	Motor.
Double head grinder	Bridgeport	Belt.
Center drill, 2-in. 2-spindle	Pratt & Whitney.	Belt.
Saw, No. 16	Higley	Motor.
Crank pin turner	Underwood.	
Dome facer	Underwood.	
Boring mill, 72 in	Niles-Bement-Pond.	Motor.
Wheel lathe, 80 in	Niles-Bement-Pond.	Motor.
Rolls, No. 1	Hilles & Jones	Motor.
Vertical turret, 36 in	Bullard	Motor.
Pipe bender	Underwood	Air.
Bolt alterer	Potter & Johnson.	Belt.
Motor (New Shop), 15 h.p	Westinghouse.	
Motor (Tool Room), 15-h.p	Westinghouse.	
Motor, portable, 3 h.p	Westinghouse.	
Crane, 5-ton trolley	Niles-Bement-Pond.	Motor.
Vacuum pump, heating system	Ill. Engr. Co.	Steam.
2 turbine pumps, boiler washing	Alberger	Motor.
Grease forming machine	Underwood.	Air.
Hose mounting outfit, 20th century	Baker & Carr	Air.
Turntable tractor	Nichols.	Motor.
Sand dryer	Robertson.	
2 time recorders	International.	
Boiler tester	Bellfield.	
4½ in. boring bar	Underwood	Belt.

BOILER SHOP EQUIPMENT.

Vertical drill, 44 in	Foote-Burte	Motor.
Horizontal flange drill	Beaman & Smith.	Motor.
Radial drill, 6-ft	Bickford	Motor.
12-ft. plate planer	Cleveland	Motor.
Large annealing furnace	Ferguson.	Oil.
2 hydraulic pumps, triplex	R. D. Wood	Motor.
Hydraulic accumulator	R. D. Wood	Hydr.
Hydraulic flanging press, 200-ton	R. D. Wood	Hydr.
Hand clamps	C. of Ga.	Hand.
Bending rolls, 12-ft	Cleveland.	Motor.
Horizontal punch	Cleveland.	Motor.
Punch, 60 in. cap	Cleveland.	Motor.
Shear, 60 in. cap	Cleveland.	Motor.
Angle shear	Long & Allstatter.	Motor.
Rotary bevel shear	Lennox	Motor.
Punch, ½ in. plate	Lennox	Motor.
Friction saw	Ryerson	Motor.
Rotary shear	Kling	Motor.
Rollers, 8-ft		Belt.
Drill grinder, No. 1½	Champion.	Belt.
Sensitive drill, 12 in	Knecht.	Belt.
Vertical drill, 36 in	Foote-Burte	Motor.
Hand rolls	C. of Ga.	
Grinder	Springfield	Motor.
2 flue cutters	Fox	Motor.
Welding machine, flues	McGrath	Air.
Welding furnace, flues	Ferguson	Oil.
Safe end furnace, flues	Ferguson	Oil.
2 rivet furnaces	Calorex	Belt.
Rivet furnace (tanks)	Ferguson.	Oil.
Flue rattler	C. of Ga.	Motor.
2 portable rivet furnaces	Ferguson	
Mud ring riveter	Ryerson	Hy.-Ar
Staybolt nipper	W. H. Foster	
Double punch and shear, tanks	Hilles & Jones	Belt.
Drill grinder, No. ½	Champion.	Belt.

BLACKSMITH SHOP TOOLS.

Steam hammer, 3,000 lbs	Niles-Bement-Pond.	Steam
Steam hammer, 1,000 lbs	Niles Bement Pond.	Steam
Steam hammer, 800 lbs	Niles-Bement-Pond.	Steam
Steam hammer, S. F., 800 lbs	Ryerson	Steam
Steam hammer, S. F., 600 lbs	Ryerson	Steam
Steam hammer, S. F., 400 lbs	Minningham	Steam
2 steam hammers, S. F., 200 lbs., treadle	Ryerson	Steam
Steam hammer, 1,000 lbs	Chambersburg	Steam
Steam hammer, 1,600 lbs	Chambersburg	Steam
Gorging press, 400 ton	Chambersburg	St-Hy.
Scrap rolls	Ajax	Motor.
Guillotine shear, outside stock	Hilles & Jones	Motor.
Guillotine shear (gantry)	Hilles & Jones	Motor.
Trimming press, No. 7	White	Motor.
Forging machine, 4 in	Ajax	Belt.
Forging machine, 2½ in	National	Belt.
Forging machine, 1 in	National	Belt.
Bolt cutter, 2 in. triple head	Acme	Belt.
Pressure blower (furnaces), 45-h.p	American	Motor.
Volume blower (forges), 25 h.p	American	Motor.
Eye bender, No. 2	Obermayer	Hand.
Eye bender, No. 3	Obermayer	Hand.
Bolt bender, 2½ in.	Ajax	Motor.
2 oil furnaces, No. 1	Ferguson	Oil.
Oil furnace, No. 184 (for 400-ton press)	Ferguson	Oil.
Oil furnace, No. 143 (for 3,000-lb. hammer)	Ferguson	Oil.
Oil furnace, No. 136 (for 1,000-lb. hammer)	Ferguson	Oil.
Oil furnace, No. 3 (for bolts)	Ferguson	Oil.
2 oil furnaces, No. 2 (for bolts)	Ferguson	Oil.
Oil furnace (spring banding)	Ferguson	Oil.
Oil furnace, bulldozer (scrap rolls)	Ferguson	Oil.
Oil furnace, combined case-hardening and spring	Ferguson	Oil.

Oil furnace, special for spring plg. rolls	Ferguson	Oil.
Punch and shear (spring work)	Evans	Motor.
Pointing rolls (spring work)	Evans	Motor.
Gas furnace, No. 60, Chloro, (tool dresser)	Stewart	Gas.
Gas furnace, No. 1 preheater (tool dresser)	Stewart	Gas.
Gas furnace (high-speed steel-tool dresser)	Chicago	Gas.
Pyrometer (tool dresser)	Hoskins.	
Punch and shear	Hilles & Jones	Motor.
Air bender		
Spring bending machine		
Bolt cutter, triple head	Acme	Belt.
Bolt cutter, single head	National	Belt.
Oil furnace, No. 135	Ferguson	Oil.
Bolt cutter, double head	Steele-Harvey	Belt.

WOOD WORKING TOOLS.

Mortiser, 6 in. horizontal	Greenlee	Belt.
Post borer, 2-spindle	Niles-Bement Pond.	Belt.
Shaper, 2-spindle, No. 85	F. & E.	Belt.
Hand jointer, 16 in	Greenlee	Belt.
Grinder, revolving oilstone	Mummert.	Belt.
Grindstone	C. of Ga.	Belt.
Knife grinder	F. & E.	Belt.
Mortiser, 6 in. horizontal	Greenlee	Belt.
Cut off saw, 24 in	C. of Ga.	Belt.
Rip saw, 28 in	F. & E.	Belt.
Band saw, 16 in	F. & E.	Belt.
Tenoner, No. 12 double	F. & E.	Belt.
Planer, 7 in. x 30 in	F. & E.	Belt.

TOOLS FOR NEW CAR SHOP.

Sensitive drill, 12 in	Knecht	Belt.
2 pressure blowers, blacksmith	American	Motor.
Heating fans	American	Motor.
2 shaving exhaust fans	Sav'nah Blow-Pipe	Motor.
Furnace, Ferguson, No. 146	Ferguson	Oil.
Furnace, No. 105	Ferguson	Oil.
Wet grinder	Heald	Belt.
Emery grinder, No 1½	Champion	Belt.
Knife grinder, 30 in. diamond	Diamond	Belt.
Power hammer	Beaudry	Belt.
Lathe, 14 in	Lodge & Davis	Belt.
Lathe, axle, double head, No. 4	Putnam	Motor.
Bushing press, 100-ton	Chambersburg	Motor.
Punch and shear, No. 1	Long & Allstatter.	Motor.
Pipe threader, 3 in	Wieland	Belt.
Pipe threader, 6 in	Wieland	Belt.
Nut tapper, 4 in. spindle	National	Belt.
Emery grinder and buffer	C. of Ga.	Belt.
Triple valve tester	Westinghouse	Belt.
Pipe bender	Pedrick & Smith	Air.
Wood turning lathe	C. of Ga.	Belt.
Boring mill, wheel, 42 in	Rogers.	Belt.
Axle lathe	C. of Ga.	Belt.
Riveting machine, column	Pittsburgh	Air.
Small press (brake beams)	C. of Ga.	Hydr.
Axle lathe (straightening)	Wm. Sellers	Belt.
Bender (brake hangers)	C. of Ga.	Air.
Lathe, 14 in	C. of Ga.	Belt.
Wheel press, 130-ton	Niles-Bement-Pond.	Belt.
Wheel press, 300-ton	Niles-Bement-Pond.	Motor.

CAR SHOP YARD.

15-ton electric traveling crane	Shaw	Motor.
Alligator shear	C. of Ga.	Motor.
Rolls	Ajax	Motor.
Bulldozer furnace	Ferguson.	
Hammer furnace	Ferguson.	

PLANING MILL EQUIPMENT.

Post borer, double spindle	S. A. Woods	Motor.
Post borer, 5-spindle, No. 163	F. & E.	Motor.
Gainer	Green.	Motor.
Core machine, pattern shop	Fox.	
Mortiser, 14 in. upright	F. & E.	Belt.
Mortiser, hollow chisel		Motor.
Molder, 6 in. x 10 in	S. A. Woods	Motor.
Molder, 2-spindle upright	F. & E.	Belt.
Jointer, 30 in	F. & E.	Motor.
Planer, 24 in.	F. & E.	Motor.
2 planers, 4-side matcher	S. A. Woods	Motor.
Cut-off saw, swing, No. 235	Berlin	Group.
Cut-off saw, swing	Berlin	Motor.
Cut-off saw, 46 in	Greenlee.	Motor.
brace cutter	Greenlee	Belt.
Rip saw, 14 in	F. & E.	Belt.
Rip saw, self feed, No. 426	Greenlee	Motor.
Rip saw, self feed	Greenlee	Belt.
Band saw, 44 in	Atlantic	Group.
Tenoner, 4 in. x 6 in	F. & E.	Motor.
Tenoner, No. 525 vertical	Greenlee	Motor.
Trimmer (pattern shop)	Oliver	Hand.

EXPERT VIEWS ON SIGNALING.

At the hearing on the Croton collision,* which was held by the New York State Public Service Commission in New York City, January 17 and 18, the commissioners, Chairman Stevens and Mr. Sague, questioned a number of signal engineers at length as to what are the best practices in block signaling. We give below the principal answers of Messrs. Azel Ames, of the Block Signal & Train Board of the Interstate Commerce Commission; A. H. Rudd, of the Pennsylvania Railroad; F. P. Patenall, of the Baltimore & Ohio; H. S. Balliet, of the Grand Central terminal, New York City, and W. H. Elliott, of the New York Central & Hudson River.

*Rear collision at Croton, N. Y., on the New York Central, December 31. Details will be given in our accident record next week.

MR. AMES.

Mr. Ames said that he had been signal engineer on the Boston & Albany, the Lake Shore and the New York Central altogether about six years.

Q. Which is the safer, the controlled manual block system or the automatic?

A. The automatic is a very safe system because it discloses broken rails, misplaced switches, cars on sidings which stand foul of the main track, etc.

Q. How about the rules?

A. In the controlled manual the stop indications are positive, and the engineman cannot run past such a signal except by a written order. With automatic signals there is no signalman to issue the written order or card, and, as a signal may fail in the stop position and thus delay a train, the rules provide that after coming to a stop at a stop signal, a train may proceed with caution through the block.

Q. How are the two systems adapted to a dense traffic?

A. With short block sections a signalman cannot give the signals rapidly enough for trains following closely, and therefore the automatic is the only satisfactory system. There is no installation in this country of the controlled manual with short blocks and a dense traffic. [Such an installation was recently superseded by the automatic in Park avenue tunnel, New York.]

Q. Is there not an advantage in having a signalman to check carelessness on the part of enginemen?

A. The principal advantage in having signalmen is not to check the enginemen, but to observe passing trains and call attention to anything which may be wrong about the cars, etc.

Mr. Ames described the overlap and its functions and, replying to a question, said that enginemen, when not properly disciplined, do probably take advantage of the overlap to run past stop signals, knowing that, because of the overlap, such disregard of the signals is not likely to cause a collision. The disadvantage of the overlap is that it reduces the capacity of the road. The principal reason actuating those companies which have introduced the overlap appears to have been to make possible the use of the automatic stop. The New York Central (in the Park avenue tunnel) and the Pennsylvania (at one or two places experimentally) are about the only roads which have used the overlap without automatic stops. Mr. Ames would hesitate to recommend the overlap unless it were intended to use automatic stops.

Q. Is the ordinary American practice of visual signals (only) for the home signal at the entrance of each block section and a distant signal in the rear, to be looked upon as good practice?

A. Yes, it must be, because it is the general practice.

Q. What are the merits of automatic stops?

A. None as yet has had sufficient trial to make it such a device as the railways would want to use.

Q. What is the objection to an efficient automatic stop?

A. Speaking of railways generally and excluding the elevated and tunnel lines, which are protected from bad weather conditions, the objections are the difficulty of keeping the apparatus in order when there is deep snow, and the complications incident to a dense and complicated traffic [as distinguished from the simple traffic conditions on city passenger railways].

Asked further to compare controlled manual and automatic block signaling, Mr. Ames said that with signalmen there is introduced the liability to human error and also to tampering by operators from mere inquisitiveness; but he admitted that if the apparatus were properly locked and sealed, the chance that operators would juggle with the apparatus was remote. But where the apparatus is not well maintained and

frequently gets out of order, signalmen will become lax and not strictly obey rules. With the automatic system there is only one man to deal with in this connection, and that is the maintainer of the apparatus. There is no chance of collusion between the signalman and the maintainer because there is no signalman.

Q. Why was the overlap adopted in the Park avenue tunnel, New York City?

A. That tunnel has a history, and the company put in everything that could be thought of, including a cab signal which now would be classed as a poor one.

Q. Summing up, is there any objection to the overlap except that it diminishes the capacity of the line?

A. I think the impairment of discipline is the principal objection.

Q. Does the track circuit surely detect broken rails?

A. Yes, except where there is a good deal of foreign current in the rails.

Questioned as to cab signals, Mr. Ames said that he did not recommend any such signal. Asked if it were safe and proper to stop a train with its rear car only 12 ft. beyond a home signal, as was the case at Croton when this collision occurred, Mr. Ames said that he knew of no rule forbidding such a stop.

Q. Is the flagging rule insisted on more generally under the controlled manual system than where automatic signals are used?

A. I know of no difference in the rules as between the two systems.

After describing the general practice in Great Britain where the majority of lines have no controlled manual apparatus and no track circuit protection (but where manual block signaling is done by means of apparatus having visual indicators fixed on the signalman's table, so that he has constantly before him an indication showing what his last operation was) Mr. Ames was asked to compare English with American practice, and replied that either the controlled manual or the automatic, as used according to the best American practice, was better than the English practice described. The controlled manual is liable to be inoperative at times because of difficulty with the electric circuits.

Q. What are the advantages of moving the semaphore in the upper quadrant?

A. First, accumulations of ice and snow tend to move the signal to the stop position, thus making the signals safer than those in which ice and snow on the arm tend to move it to the clear position; and, second, it permits the introduction of the three-position principle on a road where the two-position lower-quadrant practice has been in vogue, without the disadvantage of some inconsistency in the aspects which would be involved if a change were to be made from the two-position to the three-position arrangement, while still keeping the movements in the lower quadrant.

Q. How serious is the danger from snow with the lower quadrant signals?

A. Very little unless there has been a previous sleet storm causing the snow to stick.

Q. Have you known of cases where signals were forced to the clear position by the weight of snow or ice?

A. Yes.

Q. What is the remedy?

A. To use the upper quadrant.

Q. How long has this danger from snow been known?

A. Twenty or thirty years.

Q. Why has nothing been done about it until recently?

A. With signals worked manually the counterweight could be increased, thus tending to overcome the difficulty from the weight of snow; but, with the general introduction of power signals where excessive counterweight was impracticable or costly, the difficulty with snow became more pronounced.

Q. Where is the upper quadrant used?

A. It is used on new work by the New York Central, the New York, New Haven & Hartford, the Pennsylvania and the Baltimore & Ohio.

MR. PATENALL.

F. P. Patenall, signal engineer of the Baltimore & Ohio, said that he had held that position 21 years. He has used the controlled manual system only on a few short sections; has used three-position automatic signals six years.

Q. What is the advantage of the controlled manual as compared with automatic?

A. You have the signalmen in the cabins to watch trains as they pass and call attention to anything that is out of order.

Q. What are the disadvantages of the controlled manual?

A. The additional machinery, introducing liability to failure and temporary suspension of the safeguards of the system; controversy and perhaps strife between the signalmen, who complain of defective machinery, and the maintainer who is employed to keep the machinery in order.

Q. What are the merits of the overlap?

A. We do not favor the overlap. Several years ago on our New York division we had overlaps and no distant signals, but where we have distant signals, we do not use the overlap. We are about to install signals on 160 miles, but without overlaps. Our standard signal apparatus and practice are substantially the same as the New York Central's. The objection to the overlap is that with it the signals tell the engineman a lie.

Q. Do enginemen take chances running past signals where there is an overlap?

A. When we had the overlap (20 years ago) they did.

Q. If the overlap had been in use at Croton the collision would not have occurred?

A. I do not concede that.

MR. RUDD.

A. H. Rudd, signal engineer of the Pennsylvania, began on that road in 1886. After a short time he went to the New York Central and thence to the New Haven and the Lackawanna, returning to the Pennsylvania six years ago. The Pennsylvania has no controlled manual except on six miles of single track. Overlaps are being tried on a short section near Pittsburgh, but thus far the trial has shown that the lengthening of the interval between trains causes congestion at interlockings.

The controlled manual, with continuous track circuit, as it is arranged on the New York Central, is about as safe as anything that can be found; but the expense is so great that it cannot be afforded where the blocks must be short. And, besides the expense, there is from 15 to 30 seconds' loss of time on each signaling operation, as compared with the automatic, and where trains are run close together this delay is cumulative, soon causing congestion.

Q. Is the automatic system as safe as the controlled manual?

A. Yes. The controlled manual was formerly safer because the signalman watched the engineman, but now the surprise checking, holding enginemen to their duty, takes the place of the signalman in this respect.

Q. Would the overlap have prevented the Croton collision?

A. Possibly so; no one can say.

The Pennsylvania lines west of Pittsburgh have the overlap in use on short sections of double track line. We believe that the safest way to manage trains is to keep them moving, and to do this those block sections in which there are interlockings must be made short. With overlaps this shortening of sections is made difficult. If you begin to predicate the arrangement of your signals on the assumption that enginemen will disregard them, there is no end to the chain of safeguards that must be added.

Q. How about the overlaps in the Park avenue tunnel?

A. As the tracks in the tunnel are free of switches, it is not objectionable; but the Hudson division, from New York to Albany, has many interlockings.

Mr. Rudd said that the three-position upper-quadrant normal-clear automatic signals put up by him on the Central division of the P., B. & W. four years ago, had proved highly satisfactory. The whole installation has worked six months at a time without failure.

Q. At Croton the signals may be said to have been in the transition state, the automatics being installed in the place of the controlled manual; was this an element in causing the accident?

A. I cannot see how it could be, if the engineman understood his signals.

Q. How can enginemen be made to understand and obey signals?

A. On the Pennsylvania surprise tests are being made all the time. The trainmaster, the assistant road foreman of engines and the supervisor of signals go out together, so that there is never any question of veracity in regard to a test. Four or five thousand tests are made monthly.

Q. Is the flagman an important element in safeguarding trains?

A. Our flagmen are held to their duty. If, however, the flagman can see the next signal in the rear and see that it indicates stop, he is not prompt in going back; that is hardly necessary. Out on the road where freight trains are run permissively the flagman do go back. In a bad storm they go back. On suburban lines where passenger trains are regular and frequent the block signals are depended on.

Q. What is the best method of insuring that an engineman will heed a stop signal?

A. Provide him with a good visual signal fixed alongside the track.

Q. Why not have something erected along the side of the track to indicate the approach to a distant signal?

A. That is not impossible; but there is always the liability at night that lights used for this purpose will be confused with other lights. Enginemen know their landmarks; they do not have to guess at the location of signals.

Q. What about audible signals?

A. A bell was used in the Park avenue tunnel when I was on the Central 15 years ago, but the sentiment of the signal engineering world is unfavorable to bells, for the introduction of such signals divides the engineman's attention. Bells get out of order and do not ring. This is the argument also against cab signals.

Asked about the upper-quadrant, three-position signal on the Central division of his road, Mr. Rudd thought that they had never had a false clear signal there.

Asked about torpedo machines, his objection was that sometimes the torpedo does not explode, and very often the magazine gets empty. The correct principle is to depend absolutely on visual signals, unless an automatic stop is to be used. We have not yet found a reliable automatic stop. I think we would all like to find one.

WILLIAM H. ELLIOTT.

Mr. Elliott has been signal engineer of the New York Central for six years and before that had long experience on the Chicago, Milwaukee & St. Paul. He was questioned about the relative merits of controlled manual and automatic signals, and in general expressed views in consonance with those of Messrs. Ames and Rudd. The automatic is simpler and therefore more reliable. If the controlled manual apparatus fails, the signalman is pretty apt to be guided by the indicator, and therefore the control apparatus does not have the effect of causing the human element to check the working of the apparatus. In the past the monitorship of the signalman in the cabin has been regarded as an additional safeguard, but the witness thought that on the whole the way to secure vigilance in enginemen was to maintain discipline rather than depend on either the control apparatus or a man in the cabin.

The permissive rule, under the automatic system, whereby trains do not wait at a stop signal, but "keep moving," conduces to safety, as if we have a rear collision it does not do such serious damage as when a train at rest is run into. Except with continuous track circuits throughout the block section and power-operated signals, the controlled manual is not anywhere near as safe as the automatic.

Asked about the overlap, Mr. Elliott said the chief objection to it was at interlockings, where, if a signalman has to change a switch unexpectedly, which necessitates setting in the stop position a signal (perhaps 3,000 ft. away, and out of his sight) which otherwise would indicate clear, he may thus suddenly display a stop signal immediately in front of an approaching train. If this is a long freight train the engineman will apply his emergency brake and quite likely cause a derailment thereby, and perhaps obstruct another track; and in such cases enginemen boast of how quickly they have applied the brakes. Mr. Elliott would not use the overlap unless he were to use automatic stops.

In the Park avenue tunnel the blocks are 1,200 ft. long and the speed limit is 45 miles an hour. The best practice in automatic signaling on single track is to stagger the signals 500 ft. to 1,000 ft.

Q. Considering safety alone, which is the most perfect system?

A. The automatic.

Mr. Elliott presented statements of failures of automatic signals on the New York Central in 1908 and 1909. The number of signals in 1908 was 757; number of failures, 397. The ratio was one failure to 25,646 movements.

The main element of superiority in the three-position signal is that the engineman does not have to remember the aspect of a signal which he has passed, but can be guided wholly by the single signal that is before his eyes.

MR. HULL.

S. P. Hull, engineer of maintenance of signals of the New York Central, gave testimony as to conditions on the Hudson division. Asked what causes had produced false clear signals he said that a piston of a dash pot had got slightly out of place, but this faulty design had been corrected. Armatures of track relays have been known to stick, but a relay has now been designed in which this difficulty is overcome, so that practically this trouble never occurs, "judging from our records."

MR. BALLIET.

H. S. Balliet, engineer of maintenance of way of the Grand Central terminal and signal engineer of the electric division, has had charge of the signals here for five years, and before that had long experience on the Lehigh Valley. As to the relative merits of controlled manual and automatic signals, his views were substantially similar to those before given. His experience with full block overlaps (1,200 ft. blocks) leads him to believe it hardly desirable to stop trains so often as is necessary under that arrangement.

The limit of speed in the Park avenue tunnel is 35 miles an hour.

The trouble at interlockings where the overlap is used, as described by Mr. Elliott is not serious, the witness thought. The putting of the signal to the stop position momentarily while a switch is turned is the same as putting out a flagman to be ready to stop the train in case the switch should stick before its stroke could be completed.

Mr. Balliet's experience with bells in the tunnel during the past five years has been unfavorable; the contacts got burnt and were clogged with grease. With the Miller cab signal also the relay contacts caused trouble.

HARLEM RIVER BRANCH IMPROVEMENTS; NEW YORK, NEW HAVEN & HARTFORD.

II.

There are two six-track Scherzer rolling lift bridges. The one shown herewith is that over the Bronx river. A similar bridge crosses the channel of Pelham bay.

The bridges carrying highways over the railway were designed for a 4-in. pavement of asphalt, or a 3-in. wood block pavement on a 1-in. cushion, carried on concrete arches between the stringers. The design of these bridges was made more difficult than usual because of the clearance requirements, resulting in shallow girders with thick webs and large angles. The sidewalks are carried on brackets, which had to be made so shallow that reinforced plates were used outside the flange angles, and plates on the top flange were carried through the main girders and secured to the floor-beams, giving sufficient anchorage. The photograph of the roadway on the Main street, Baychester, bridge, shows the peculiar curb used. Because of the slope of the roadway and the thickness of concrete at the crown of the concrete arches, etc., the curb had to be made so high as to interfere with the hubs of wheels. It was therefore made in two steps, as shown, giving an offset sufficient to clear the hubs. This was also used on girder spans for the sake of uniformity, although since the main girders separate the roadway from the sidewalk, it was necessary only when through trusses, such as the Main street bridge, were used.



Signal Tower at New Rochelle.

At the outside of the sidewalks a fascia girder, riveted to the brackets, extends up to the top of the sidewalk. Above this is a light girder set 3 in. clear above the sidewalk, with a pipe railing above.

It was first intended to extend the concrete, forming the arches between stringers, down so as to encase all metal on the underside of the bridge, and also to make a level concrete ceiling hung from the stringers by rods hooked through the webs of the I-beams. The purpose of this flat ceiling was to cover all pockets where gases and smoke might collect. The clearance limits, however, prevented this, and, as built, the bottoms of girders, floor-beams and stringers are exposed. For the Baretto street bridge there was enough clearance to use a deck girder bridge. Five girders were used, the support of sidewalks on brackets being unnecessary. Westchester avenue crosses the tracks on a curve, another street joining it at the bridge, so that the structure is 188 ft. wide at the west abutment and 117 ft. at the east abutment. The tracks here are on a 3-deg. curve and a 0.6 per cent. grade, this being the steepest grade on the branch, and, with one excep-



Interior of Morris Park Station.



Bridge Over 134th Street.

tion, the sharpest curve. The specifications for thickness of pavement, crown of street and provision for a pipe 36 in. outside diameter made the design of this bridge a serious problem. It was not practicable to raise the street, so finally it was decided to lower the tracks and spread them so that two trestles could be built to carry the structure. The trestles rest on curved piers. The bridge consists of 20 stringers, each of which rests on both trestles and overhangs 8 ft. on each side toward the abutments. From these cantilever ends 15-in. stringers extend to the abutments. The girders at the sides carry the ends of the stringers cut off by the skewed sides of the bridge.

The Leggett avenue bridge is a three-span bridge, crossing the tracks at the north end of the Oak Point yards. It carries a 100-ft. road.

The stations are of concrete, on steel framing, except the one at Pelham Manor, which is of stone. They are unusual in general design and in decorative details. As the photographs show, the character of each is dependent on its location. The Hunts Point station is carried entirely on a bridge. It was therefore made as light as possible and was also designed to give an impression of lightness. This effect is gained, in part, by the high, peaked roof and dormer windows. The decorative tiling on the outerside walls preserves the lines of the steel framework. The Port Morris station, on the other hand, is built on solid ground and is correspondingly massive. At Westchester avenue both ideas are present. Part of the building is on a bridge and part on the ground, and the design of each part is in keeping with its foundation. Pelham Manor station was built of stone to harmonize with an existing retaining wall which was a feature of the station approach.

The design of the signal towers is in accordance with the



Woodside Station.



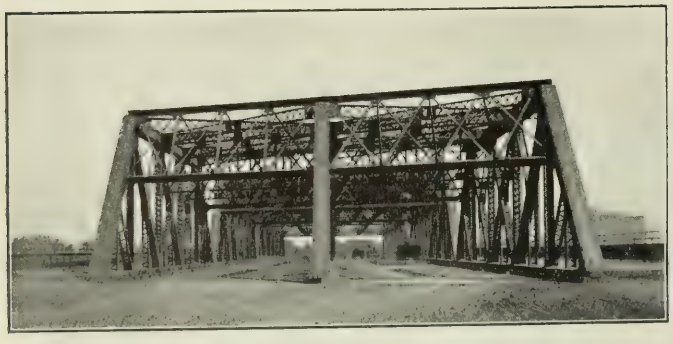
Westchester Avenue Station from Street Level.



Interior of Hunts Point Station.



Morris Park Station.



Leggett Avenue.



East 172d Street.



Westchester Avenue.



Hunts Point Station, from Street Level.



Main Street Bridge, Baychester.

new New Haven standards. Several have been erected at different points on the New York, New Haven & Hartford, and it is intended to gradually replace old structures with them. These fireproof structures are easy to maintain, and it would seem most desirable to have a safe building for housing the expensive apparatus which is put inside of it. The pagoda roof is not only in keeping with the general style of the building, but is also required for practical reasons. Deep eaves of some kind are necessary to keep the sun out of the windows, as shades or awnings obstruct the clear outlook which the tower men require. The forms used for placing the concrete were of wood, but lined with galvanized iron. This made it simple to mold the rounded corners and gives the concrete a smooth surface. Unlined wooden forms seem to act like blotting paper, absorbing water from the concrete before it sets. This may make the concrete softer; at least, concrete which has set against the iron surface is harder than usual.

The umbrella sheds shown in several of the photographs are standard on the Harlem river branch. The columns are built up of a web and angles, flaring apart at the top as shown. The roof is of corrugated asbestos lumber, with gutters at the eaves discharging to down-spouts set alongside columns at intervals. These sheds cost about the same per linear foot as ordinary wooden sheds, and their life is indefinite.

We are indebted for photographs and information to E. H. McHenry, vice-president of the New Haven, and to Cass Gilbert, who designed the stations; and for bridge details to a paper presented before the Brooklyn Engineers' Club in October, 1908, by H. C. Keith, who designed them.

TOOL LAY-OUT FOR THE SCRANTON SHOPS OF THE DELAWARE, LACKAWANNA & WESTERN.

BY GEORGE L. FOWLER,
Associate Editor of the *Railway Age Gazette.*

[WITH AN INSET.]

In the *Railway Age Gazette* for December 3, 1909, there was published the list of tools that have been specified for use in the new Scranton shops of the Delaware, Lackawanna & Western; a list that is probably the most complete and most scientifically worked out of any in existence. Through the courtesy of T. S. Lloyd, superintendent of motive power, and the assistance rendered by S. S. Riegel, mechanical engineer for the company, under whose direction the drawing was prepared, it is now possible to present the arrangement and grouping of the tools on the floor of the shop.

By referring to the list published on December 3, it will be seen that, in the analysis of the work to be done accompanying the list of tools, it was grouped under the natural heads into which it would fall in the construction and repair work of the locomotive. For example, there are such groups as tire and wheel center work, frames, axles, rods, crossheads, valves and motion work, engine and tender trucks and so on. So, in the arrangement of the tools the same grouping has been followed, with the result that the shop, as a whole, is built up of a number of components, each complete in itself, and each devoted to its own speciality. This arrangement of tools required quite as much of systematic analysis as did the preparation of the original list. In the making of the latter it was only necessary to take up each step of the work to be done, decide upon the time which it would require and select the proper tool to do it. It could be considered by itself and, where of sufficient quantity to warrant the purchasing of a special tool, with entire independence of everything else. But, in locating the machine it was necessary to look at it with reference to its connection with other tools. It must be placed with special reference to the other classes of work with which it is to be associated. The groups must be so arranged with reference to each other that they can co-operate and pass material along. In short, it was quite as necessary that there should be good team work not only between the various groups, as well as the elements of each group as it is that it should exist in any other organization from football up.

Therefore, after the tools had been selected, there was a long period of careful study and of adjustment and readjustment in this location. Each machine was plotted in its outside clearances and fitted into its place on the plan with the group in which it was associated. Then, when the office force and the responsible officers had done what they could the foremen were called in and each turned loose to criticize and suggest. The purpose of the grouping was explained and the method of handling material shown, and then these men who are to have the immediate supervision of the work proposed such changes as seemed desirable. Finally, when all were satisfied that they had done their best, the arrangement shown was adopted and the setting of the machines commenced.

With this preliminary work done, the rapidity of installation has been greatly enhanced. The thing is settled. There is nothing further to be discussed. There is no waking up with a start at the realization that something has been overlooked. The plan is made, and the only thing to do is to follow it blindly, with full confidence that the desired results will be attained.

It is the final solution of this problem of grouping that is shown by the accompanying inset. It will be seeen that the arrangement of the list has not been necessarily followed on the floor. That is to say, two groups following each other in the list may be somewhat widely separated in the shop. For example, the group for frame work, No. 1, is separated by the width of the shop from the axle group, No. 10. It would be well, however, for those who wish to make a systematic study of the methods followed in this layout to read and examine in connection with the issue of December 3, 1909, as this will greatly facilitate a proper understanding of the method followed.

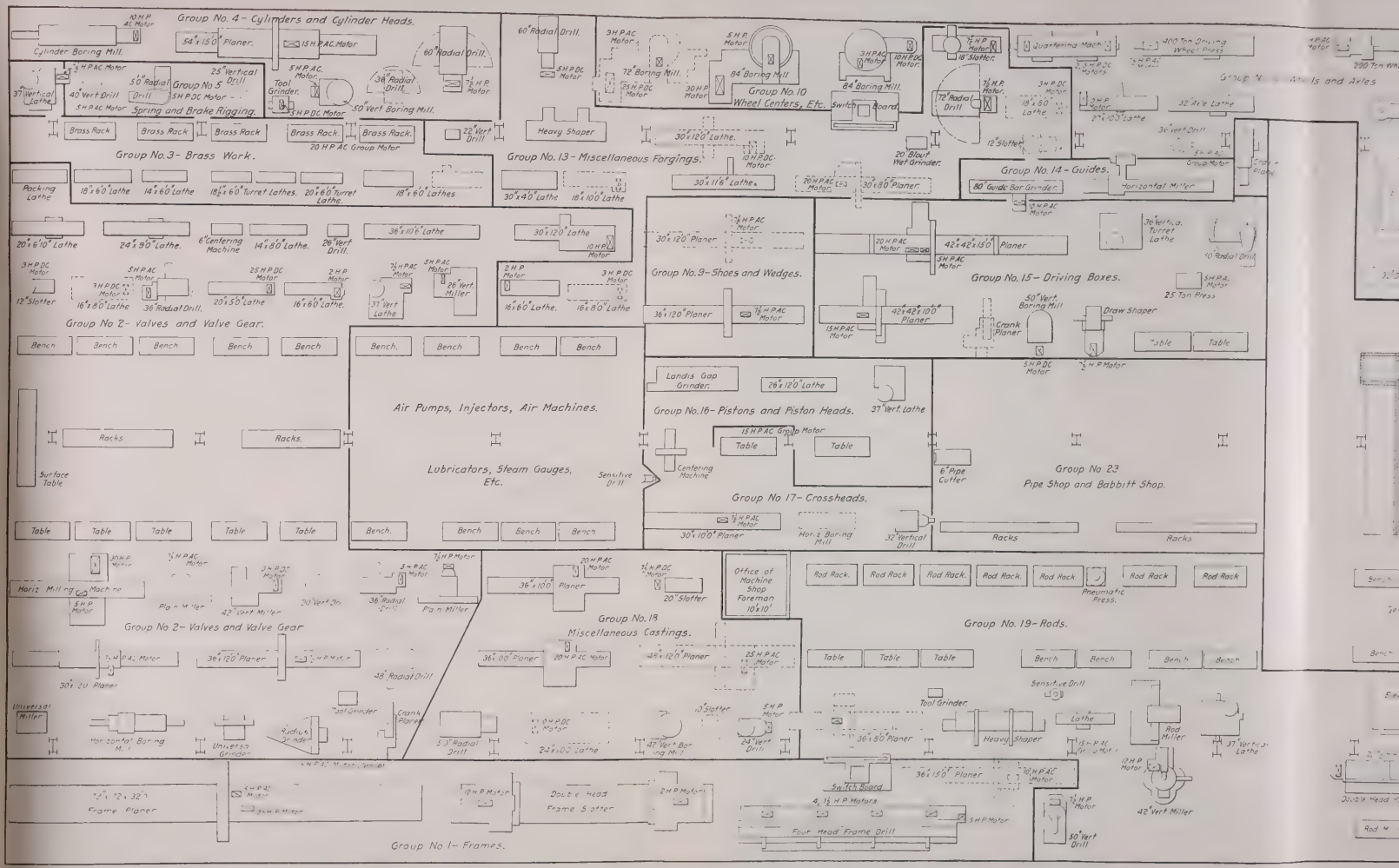
Before entering into the details of the tool arrangement, attention is called to the methods of material distribution that are available. From the description of the shops published on November 5, 1909, it will be recalled that each bay of the shop is served by one or more traveling cranes, which span it, and that these is also a series of subways by which material may be brought in from the blacksmith shop or foundry, raised to the floor level by elevators and thence carried to the several tools by the cranes.

Starting in, then, with the group of frame finishing machines, we find from the list that the work is done on three machines, a planer, a slotter and a 4-head drill. These form the first group and are located in the northwest corner of the floor, in the bay next the erecting pits, served by high-capacity cranes. They are set in line so that the rough frame may be placed upon the planer, then taken to the slotter and finally to the drill without doubling back. To these machines a fourth will probably be added later, a 36-in. by 15-ft. planer, as shown in dotted lines, No. 67.

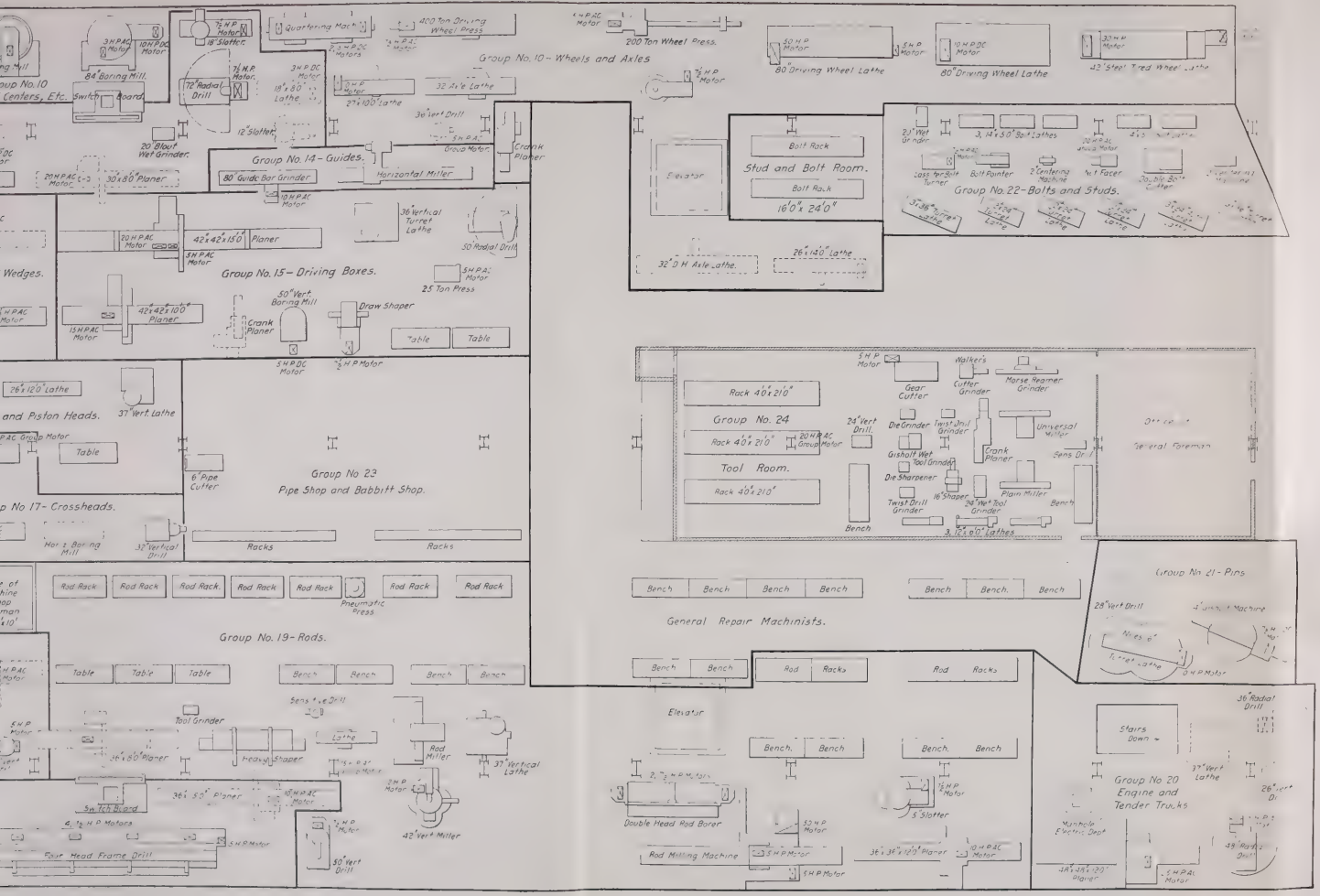
In this plan the tools to be set at once are indicated by full lines and the proposed tools by dotted lines, and each group is shown surrounded by a heavy black line.

This proposed planer, No. 67, was not included in the original tool list, but has been provided for in case the heavy machine should be overtaxed or it should appear to be more economical to use a lighter one for front and back rails and light frames. After finishing, the frames can be picked up and carried direct to the proper erecting pit if on the same side of the shop. If not, they are loaded upon a car, carried across to the other side and there handled by the corresponding traveling crane.

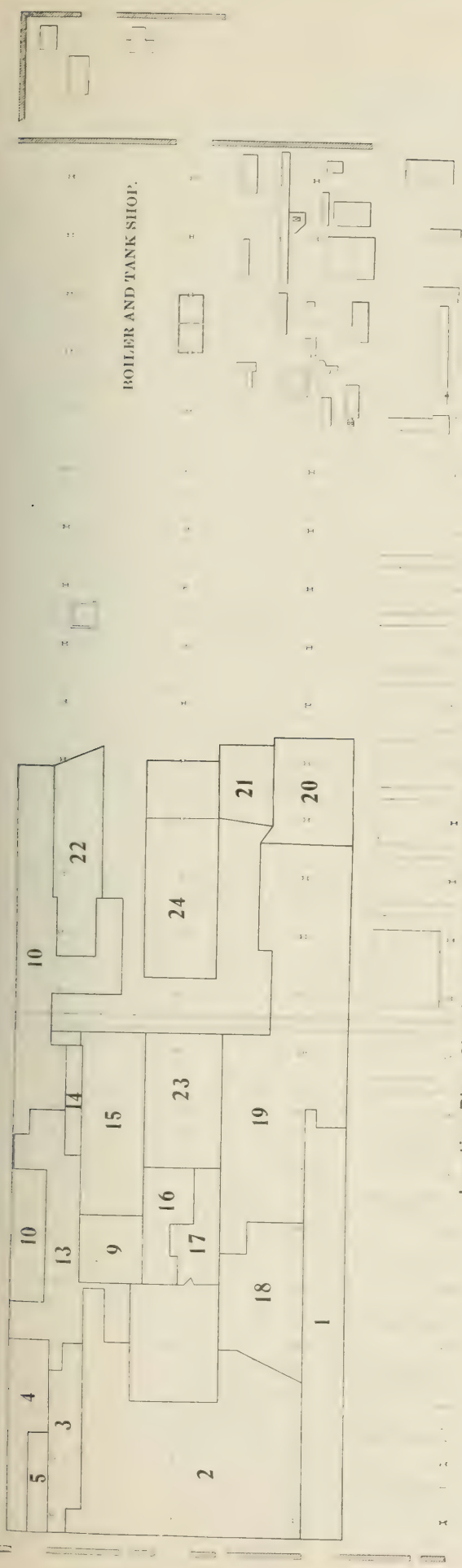
Moving on from these exceedingly simple operations em-



PLAN ILLUSTRATING TOOL LAYOUT AND GROUPING IN THE NEW LOCOMOTIVE SHOPS OF THE DELAWARE, LACKAWANNA & WESTERN, AT SCR



UT AND GROUPING IN THE NEW LOCOMOTIVE SHOPS OF THE DELAWARE, LACKAWANNA & WESTERN, AT SCRANTON, PA.



Location Plan, Showing Relation of Machine Tool Grouping to the Boiler and Tank Shops.

braced in the frame work, we come to group No. 2, which is the largest and most complex in the shop. It is that of the valves and valve gearing, and includes not only a great variety of work, but an equally varied number of operations. It includes the work on the valves themselves, the lifting shafts and boxes, union bars for the Walschaerts gear, the valve rods, eccentric cranks, throttle and reverse lever quadrants, reverse lever, throttle and reverse lever latches, valve yokes and rods, eccentrics, with the straps and rods, radius bars, transmission bars and their hangers, links, rockers and rocker shafts, link saddles, bell yoke, dry pipe sleeves, stand pipe, dome caps, pins, bushings, cylinder heads, rocker boxes, throttle boxes, filling blocks, driver brake fulcrum, chafing blocks, combination levers, guide bars and box, reach rods, with some work on the pistons and glands.

Here we have an exemplification of the team work required. The machines of the valve group not only do all the work of that group, but, as they are possessed of some surplus capacity, they also help out other departments that may be temporarily short. Thus the tools of this group comprise plain and crank planers, universal and radius grinders, horizontal and vertical boring mills, plain, vertical and horizontal milling machines, vertical and radial drills, packing and ordinary lathes, a slotter, centering machine and tool grinder. The floor space not only interlocks with the other groups nearby, but includes a space in its center for benches, racks and tables. It is, therefore, a fully equipped machine shop, especially adapted to the particular work for which it is intended. It exemplifies not only a wide departure from, but a close adherence to, the recognized system of tool arrangements. The departure is shown by the fact that instead of sorting and grouping all tools of a kind for the whole shop whereby the lathes, planers, drills, etc., are each placed together, thus separating the several operations on a single piece, they are here scattered among the different groups according to requirements; so that two identical tools may be widely separated because of the different classes of work upon which they may be engaged.

The adherence to the old principle of arrangement is shown by the segregation of the machines in each group, by which the millers, planers and lathes are brought together.

Group No. 3, for brass work, is a simple one, including merely a few turret and ordinary lathes with racks for the holding of the material and finished work.

Group No. 4, for the cylinders and heads, includes a cylinder boring machine, a planer, a vertical boring mill, a radial drill and a tool grinder with provision for the future insertion of a second but smaller radial drill. It is on the opposite side of the shop from the frame group and is served by the corresponding high capacity traveling crane. Here the group is cut down in its allotment of tools, because, as already indicated, a portion of the work can be carried by group No. 2, which is separated from it, physically, by a very short distance.

It was, of course, desirable to locate the heavy cylinder machines well out beneath the crane. This left a vacant space between them and group No. 3, which has been filled by the location of the small group handling the spring and brake rigging where the work is done by drills alone, of which there are three, one being of the radial type.

The irregularity of the floor space of these groups is straightened out by the insertion of the floor for the fitting up of the air pumps, injectors, lubricators, steam gages and other minor and delicate machines. In this the benches are set in line with those in group No. 2 so as to give a symmetry to the shop, and a casual inspection might regard them as one for, of course, there are no partitions to create a physical separation, and the heavy lines on the engraving merely indicate imaginary lines of demarcation.

Extending down the east side of the shop in continuation of the heavy tools in the cylinder department is group No. 10,

which is cut into and divided by the location of a heavy slotter, radial drill and lathe belonging to group No. 13, which handles the heavy forgings. This group, No. 10, does all of the work on the wheels and axles. First there are two boring mills with provision for a third, where wheel centers and similar work is cared for. Then, set somewhat back in the bay, but still served by the heavy crane, are two axle lathes, with two more in the light work bay back of the elevator. All of these tools, it will be seen, are adjacent to the wheel presses, while there is a quartering machine next to the one of 400 tons capacity. The car wheel borer is next the smaller press. This arrangement keeps all of this class to work together and, at the same time, requires the minimum of movement from one tool to the other with an easy and quick delivery of finished parts. Beyond these tools are the two driving wheel lathes and the one for truck and tender work. These might be regarded as a separate department, and wheels on axles can be brought to them without interfering in any way with other tools of the same group.

The group for handling miscellaneous forgings, No. 13, partially surrounds No. 10, so as to throw its heavy machines out under the high capacity machine, while the lighter ones are just within the limits of the light work bay. This group of tools includes radial drills, shapers, lathes, planers and a slotter, and handles the miscellaneous mass of forgings that, while perhaps belonging to specific classes of work, can be more economically dealt with in a single group than by scattering throughout the shop. It is another case of individual tools having too great a capacity to permit being kept exclusively on one job, so that work from a variety of otherwise natural groups can best be brought to them. The same holds for the group of miscellaneous castings. The idea of putting related groups next each other is also shown in Nos. 9 and 15, devoted to shoes and wedges and driving boxes respectively. In the former there are two planers that can be made to supplement or can be supplemented by those intended for driving boxes. In No. 15 there are two planers, one of which is 42 in. by 15 ft., so that the gang planing of boxes can be done, a vertical turret lathe, a radical drill, boring mill, draw shaper, driving box press, tables for assembling and provision for a crank planer. These two groups thus have a clean, self-contained sweep and cover a floor space of 26 ft. by 102 ft., which allows ample room for the storage of material.

Directly in the center of the shop is group No. 23, where pipe work and babbitting is done. The pipe work is, of course, complete in itself and requires simply a cutter and threader to make it independent of its surroundings, but the babbitting department is dependent upon other groups for its work. It is, therefore, made the center of five others, each of which is tributary to it: the groups of driving boxes, pistons, crossheads and rods, while across the central aisle is the floor of the general repair machinists, who will require more or less babbitting to be done in crossheads, rocker boxes, guide boxes, rods and so on. To care for the parts that may be brought in the babbitting department is furnished with racks for holding material. This arrangement of the groups facilitates the delivery of the work, which is brought in and taken away with a minimum of distance to be covered.

These groups are not all, however, complete in themselves. Group No. 16, for pistons and heads, contains a grinder, a lathe, a vertical lathe and a cottering machine, not enough to do all of the work, but we have already seen that a portion of it is cared for in group No. 2, where the lathes and drills of the valve gear group have a surplus of capacity, and which are but a few feet away.

The same statement holds for the crosshead group, No. 17, where the first installation will consist of only a planer and a vertical drill with provision for a horizontal boring mill and access to the cottering machine which stands on the border line between this and the crosshead group. The rod group, No. 19, comes next and covers a large amount of floor space. It has a total length of 152 ft. and a width of 50 ft., but owing to its irregularity of form, where it is encroached upon by other groups, the actual floor area is but 6,300 sq. ft., a fairly good sized shop in itself. The first tools to be installed will be a pneumatic press for rod brasses, a heavy shaper, lathe, two rod millers, a vertical lathe, a vertical miller, vertical drill, double-headed rod borer, slotter and a planer with provision for a second planer, with about half the floor space devoted to racks and benches. The group is not only next the babbitt group, but the general repair machinists.

At one end, back of the wheel group, is that for bolts and studs, No. 22. The machinery will consist of five turret lathes with provision for a sixth, one bolt turner, one bolt pointer, two centering machines, one nut facer, one double bolt cutter and one wet grinder with provision for five bolt lathes. This group has a total length of about 75 ft., of which 20 ft. at one end is occupied by a bolt storage room. The two remaining groups are No. 20 for trucks and No. 21 for pins. They occupy small spaces, and in the former there are one vertical and two radial drills, a vertical lathe and a planer. In the pin group there are one vertical drill and two turret lathes.

This completes the machine shop tool equipment, which is estimated to be sufficient to build four new locomotives and make general repairs on thirty locomotives per month. In addition to the tool equipment there will be two tire floors, each about 30 ft. square, located, as indicated, next the main cross aisle and in the bay for heavy work. One of these floors is next the wheel and axle group, where it would ordinarily be placed, and where the regular work will be done. The other, on the opposite side of the building, will be used as an auxiliary floor, where tires are to be removed or put in position that do not need to go to the wheel lathes. On each side there will also be a large lye pit. These pits will be of sufficient size and depth to permit a pair of drivers on their axle to be submerged and cleaned. They are located in the outer part of the heavy work bay, and are only partially indicated on the engraving.

Outside of these are the erecting bays which extend the length of the shop on either side, but which, falling outside the subject of this article, are merely indicated on the engraving, which does not reach out to the walls of the building.

The tool room has been located at about the center of the building, with the idea that, as the work of the shop increases and the floor area covered by machine tools is extended, it will finally be in a central location relatively to the whole. It is a concrete building, erected at the point located with the tool room on the first floor and toilet rooms above. The equipment will consist of a gear cutter, cutter grinder, reamer grinder, die grinder, two twist drill grinders, a wet grinder, die sharpener, vertical drill, crank planer, universal miller, plain miller, a sensitive drill, a shaper, wet tool grinder and three lathes, with the usual complement of benches and racks.

Separating the machine shop floor from the boiler shop there will be a vacant space of about 120 ft. extending the full width of the building which will be used as an assembly floor for the boiler and other heavy work.

The boiler and tank shop occupies the whole south end of the building for a width of about 125 ft. The tools for the ordinary work are installed in the southwest corner and are adapted for heavy work. They consist of two 60-in. throat punches, and one flange punch, a 30-ft. plate planer, 8-ft. and 15-ft. bending rolls, a four-spindle mud ring drill, a universal sectional flanging press, a flange furnace, a power clamp and straightening block, with a flange fire, an automatic punching and shearing machine, a combination shear and punch, a vertical and radial drill, a set of bevel shears and a tool grinder, with laying-out tables for tank, boiler and firebox work. In the grouping of these tools those for the boiler and firebox work are in the bay for heavy work, while those

for tank work are in the light work bay, but so closely associated as to make the shop a unit.

The shell riveting is done in the southeast corner of the building where there is a 14-ft. gap riveter with an accumulating pump and accumulator to furnish the power needed for operation. The shells are, of course, handled by an overhead crane that is not shown in the drawing. In the engraving, for the purpose of saving space, this riveting floor is shown set in on a line with the machine shop, whereas it really occupies space in the southeast corner of the building on a line with the erecting floor.

From previous articles that have appeared regarding these shops the reader understands that an electric drive is to be used throughout. This layout shows the method of distribution and the location of the motors. It will be seen that a very large proportion of the tools are given an individual drive. This is always the case with the large tools and with many of the smaller ones. In some cases every machine of a group has its individual drive. This is the case, for instance, with the frame group, No. 1; the wheel and axle group, No. 10: cylinders and cylinder heads, No. 4; shoes and wedges, No. 9; crossheads, No. 17; rods, No. 19; trucks, No. 20, and pins, No. 21. In the others there are small group-driven tools where the maximum horsepower developed will be about 20. As far as possible these tools will be arranged in line so that their driving shafts may be connected by clutches, whereby, in the case of the failure of any motor its work can be done by those adjacent to and in line with it. It would be useless and confusing to attempt to catalogue the motors used and their arrangement, but for purposes of reference the engraving will give complete data regarding all motors used and the individual tools or groups to which they will be applied. In this the same care has been exercised as in the selection of the tools, with the result that as far as development of the plans and foresight into the future are concerned the shop layout, as illustrated, is one of the most scientifically executed designs of a shop arrangement that has thus far been brought out.

PENNSYLVANIA RAILROAD SPECIFICATIONS FOR STEEL BOILER TUBES AND SAFE ENDS.

MATERIAL.

(1.) This specification covers cold and hot-drawn and lap-welded steel tubes and safe ends. The material must be open hearth steel. Tubes containing more than .03 per cent. phosphorus or more than .04 per cent. of sulphur will be rejected.

ORDERING.

(2.) Tubes will be ordered in lots of 100 or multiples thereof, and for each 100 ordered, 101 must be furnished.

Safe end material will be ordered as the demands of the service require, and for each 1,000 feet or fraction thereof ordered, two extra feet must be furnished free to test.

In ordering, the outside diameter and thickness must be specified, as per table of weights in section 5 of this specification.

Safe end material will be subjected to the same conditions of marking, inspecting and testing as govern boiler tubes.

MANUFACTURERS' TESTS AND MARKS.

(3.) Before shipping, each seamless tube must be subjected by the manufacturer to an internal hydrostatic pressure of 1,000 pounds per square inch, and lap welded tubes must be subjected to an internal hydrostatic pressure of 750 pounds per square inch.

Each seamless tube must be plainly marked in the middle: "Seamless Steel Tested to 1,000 Pounds Pressure," with the manufacturer's name. Lap welded tubes must be marked "Lap Welded Steel Tested to 750 Pounds Pressure," with the manufacturer's name.

INSPECTION.

(4.) On receipt at the shops, the tubes will be inspected for surface defects. They must have a smooth surface and be free from cracks, blisters, laminations, or pits, both internally and externally, and must also be free from kinks, bends, buckles, or evidence of injury during manufacture. Seamless tubes must be of uniform thickness throughout, and must be round within .020 in., the mean diameter and thickness being within .010 in. of the size ordered. Lap welded tubes must be within .01 in. of the thickness specified except at the weld, where .015 in. additional will be allowed. They must be round within .02 in., and the mean diameter must be within .015 in. of the size ordered. Tubes must not be less than the length ordered, but may exceed it by .125 in.

MINIMUM WEIGHT.

(5.) The minimum weights of various diameters and thicknesses, which will be accepted, are as follows:

Outside diameter.	Thickness, ins. .095-in.	.110-in.	.120-in.	.125-in.	.134-in.	.150-in.
1.75 in.	1.63 lbs.	1.87 lbs.	2.03 lbs.	2.11 lbs.	2.25 lbs.	2.49 lbs.
2.00 "	1.87 "	2.15 "	2.34 "	2.43 "	2.59 "	2.87 "
2.25 "	2.12 "	2.44 "	2.65 "	2.75 "	2.94 "	3.26 "
2.50 "	2.37 "	2.73 "	2.96 "	3.08 "	3.29 "	3.65 "
3.00 "	2.86 "	3.29 "	3.58 "	3.72 "	3.98 "	4.43 "
3.50 "	3.35 "	3.86 "	4.21 "	4.37 "	4.68 "	5.21 "
4.00 "	3.85 "	4.44 "	4.83 "	5.02 "	5.37 "	5.98 "

STORING.

(6.) On receipt at the shops, the tubes will be piled in lots of 101 and safe ends in lots of 1,000 feet. Each lot will be tagged with the requisition number, lot number and name of manufacturer; one lot to be used for each 101 tubes, and one lot for each 1,000 feet of safe end material. No lot of tubes shall be used until the results of test are known.

SAMPLING.

One tube from each lot will be selected at random, and a piece 24 inches long must be cut from it and stamped with the manufacturer's name, together with the designating requisition and lot numbers of the lot to which it belongs. The remaining portion of the tubes from which the test pieces were taken, must be preserved until test report is received.

Sample tubes will be properly tagged, tag giving the same information as stamped on the samples, which will then be shipped to Engineer of Tests, Altoona, Pa., where they will be subjected to the following tests:

EXPANDING TESTS.

(7.) A section of the tube 12 inches long must expand cold to 1 1-6 times its original diameter without splitting or cracking; the expansion to be obtained by forcing the small end of a tool steel pin, tapered 1½ in. to the foot, into the tube by means of light blows with a ten-pound hammer, or by a suitable press or expanding machine. In making this test, care must be taken to have the end of the tube smoothly trimmed.

CRUSHING TEST.

(8.) A section of the tube 2½ in. long placed vertically shall crush cold, flat on itself without splitting or cracking in any direction. This crushing test may be made by placing the tube vertically on the anvil of a steam hammer and subjecting it to a series of light blows, or it may be made in a suitable quick-acting hydraulic press. Light surface cracks on the outside of the bend will not be considered as condemning cracks, and one or two surface cracks shall not be considered as a failure, but if the cracks are more numerous, or if they penetrate, the tube will be considered to have failed on this test.

FLATTENING TEST.

(9.) A test piece of tube 6 inches long, when flattened cold sideways, flat on itself, must not show any splits or cracks.

ETCHING AND NICKING TESTS.

(10.) Etching and nicking tests will be made in case of doubt as to the quality of the material in the tube after the

various tests have been made. The etching test must show a perfectly homogeneous surface, and the nicking test must not disclose laminations or any seam or cavity longer than ¼ of an inch.

REJECTION.

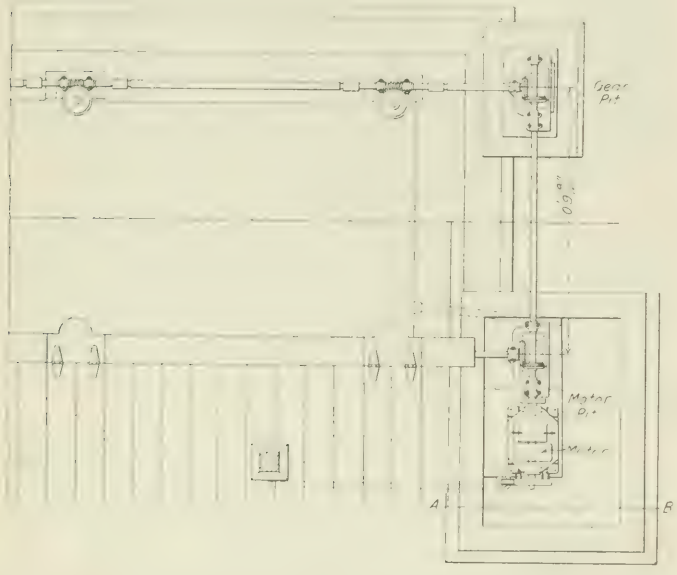
(11.) In order that any shipment from one manufacturer shall be accepted, it is required that 75 per cent. of the samples from such shipment shall pass the above described tests without question. If the other 25 per cent. show results close to the requirements, shipments may be accepted at the option of the company. All tubes and safe ends are subject to the conditions of paragraph 12.

(12.) In adition to the above tests, individual tubes, which, when being inserted in the boiler, split or break, while being expanded or beaded, and also individual tubes which fail to pass the surface inspection, will be rejected.

(13.) Rejected tubes and safe end material will be returned to the manufacturer, who must pay freight charges both ways. The test samples representing the rejected tubes or safe ends will be preserved at the test room one month from date of test report. Accordingly, in case of dissatisfaction with the results of test, manufacturers must make claim for a rehearing, should they desire to do so within that time. Failure to raise a question for one month will be construed as evidence of satisfaction with the tests, the samples will be scrapped, and no claim for rehearing will be considered.

DESIGN OF ENGINE DROP PIT AND TABLE IN ROUNDHOUSE OF THE CENTRAL OF GEORGIA.

Engine drop pits and tables of the design here shown, with the exception of the motor drive, are in use in the Lehigh Valley shops at Easton and Wilkes-Barre, Pa., and in the old shops at Sayre, Pa. At Easton, the table is driven direct from a small stationary engine, and at Wilkes-Barre and Sayre it is driven from the shop line shafts. There are also,

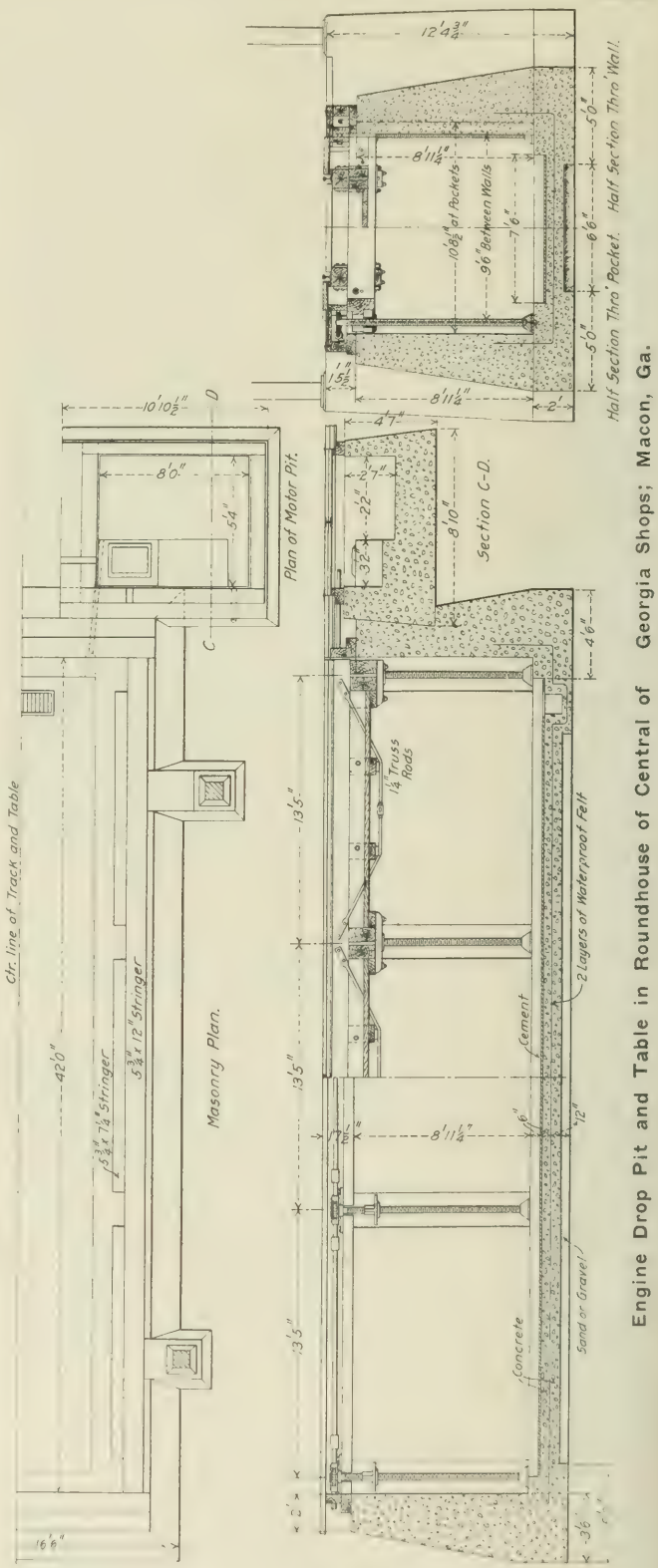


Part Plan of Driving Arrangement of Drop Pit and Table.

on the Reading, installations of this same design, with motor drive. One of these is located at the Reading, Pa., shops, two at Port Richmond, one at Tamaqua, Pa., and one at Rutherford, Pa. One of these drop pits has also recently been installed, with motor drive, in the roundhouse of the new shops of the Central of Georgia at Macon, a description of which shops appears in this issue.

This type of drop table is superior to a bridge, in that all of the working parts are below the floor level and out of the way, and do not encroach upon the working space of the shop proper to as great an extent as does a bridge. It is generally desirable, in connection with these tables, to have either an air hoist or a monorail electric crane to pick the wheels out of the pit and place them directly on the driving wheel lathe.

When the operators have become familiar with handling this



Engine Drop Pit and Table in Roundhouse of Central of Georgia Shops; Macon, Ga.

table very rapid work can be done in dropping wheels and re-wheeling locomotives. In large shops where overhead cranes may be used, these pits and tables would not be considered, but in small shops they are the best arrangement where crane service is not available.

We are indebted to F. F. Gaines, superintendent of motive power, Central of Georgia, for the dates and drawings given.

General News Section.

The Georgia Railroad is to introduce telephones for train despatching on the main line and the Macon branch, 42 stations.

Train auditors are now employed on the passenger trains of the Texas & Pacific running into Marshall, Tex. They have been employed for some time on certain other runs.

Three cents is said to be the fare now on seven street car lines in Cleveland, Ohio. The franchises of these lines expired January 25, but the fare was voluntarily reduced by the companies on that day from five cents to three cents.

The St. Louis *Globe-Democrat* says that the western railways entering St. Louis are considering a plan for the establishing a union city ticket office, owing to the high rents that are being asked for the renewal of leases in desirable locations.

The New York Up-State Public Service Commission has approved a plan, suggested by certain property owners in Brooklyn, for the construction of an extension of a subway in Livonia avenue, Brooklyn, by assessing the cost on the real estate, adjacent and nearby, which is to be benefited in value by the construction of the line.

According to a Pennsylvania paper, a trainmaster of the Philadelphia & Reading has been obliged to issue a notice forbidding the use of "Pennsylvania Dutch" in issuing orders to men on or about trains, misunderstandings having caused trouble. It was generally reported that this reform of language was decreed several years ago. Evidently the men do not stay reformed.

A report of the ship building industry of the United States for the year 1909 shows a total tonnage built of 281,271; and of this 31 per cent., or 87,951 tons, was built by the American Shipbuilding Company (on the lakes). There has been an enormous increase in traffic on the great lakes, and the American has so many orders ahead that it is receiving premiums for prompt execution.

April 1 is the day now announced as that on which trains on the Long Island Railroad will run through the Pennsylvania tunnel to the new terminal at Seventh avenue, Manhattan, New York. From this terminal trains will run to all points on the Long Island to which the electrified lines extend. Not until June or later will trains from New Jersey run to the Manhattan terminal.

The railways of Indiana have asked the state railway commission for a rehearing on the commission's order requiring the installation of headlights of 1,500 candle power or more on all passenger and freight engines. The petition states that the railways have additional evidence that they desire to place before the commission. It also states that the orders entered preclude the use of acetylene lights and restrict the roads to the use of electricity.

According to the *Providence Journal*, recent examinations by the federal civil service boards, in that city and Boston, of candidates for the position of examiner of railway accounts for the Interstate Commerce Commission, resulted in the rejection of all the candidates; and it is reported that there were similar failures at many other cities where examinations were given. The commission wants 105 examiners, but it is said that the test was a very "stiff" one.

A newspaper despatch from Mexico City says: "The demands made upon the management of the National Railways by the American engineers and conductors are to the effect that employees retained shall be competent to the end that danger to train crews and to the public may be eliminated as far as possible. The men have asked that at least 50 per cent. of engineers and conductors to be hired in the future shall have had actual experience in the line of the duties they are to perform, leaving not a larger proportion than 50 per cent. to be advanced from subordinate service. The question of nationality is said not to have figured in the negotiations.

The trustees of the Pennsylvania State College have decided that the college, in connection with the Pennsylvania Railroad, shall establish a college for apprentices in the mechanical department of the Pennsylvania shops at Altoona. The school will begin with 30 students from the four-year apprentices at the shops. It will be started about the middle of February and continued for three and one-half months. Instruction is to be given two afternoons each week.

The American Express Co. on April 1 will begin operation on the lines of the Union Pacific, the Oregon Short Line, the Oregon Railroad & Navigation Co. and the San Pedro, Los Angeles & Salt Lake. This will add a total of 7,000 miles to the operated mileage of the American Express Co., this new mileage previously having been operated by the Pacific Express Co. It is said that this change is due to the fact that the Pacific Express Co. is to operate over the Western Pacific.

A press despatch from the City of Mexico states that the management of the National Railways of Mexico has notified the joint committee of American conductors and engineers that the demands which it has made will not be granted. The men had been told that they would be treated fairly and that only in cases where applicants for positions or promotions were of equal merit will preference be given to Mexicans over Americans. The American employees ask that the unions be given the right to appoint two men on the examining boards to the railway's one. This was flatly refused. Officers of the railway say they hope the statement of its position will prove satisfactory to the employees. If it does not it is intimated that unionism on the Mexican lines will be ended, as the roads would prefer to operate with reduced forces until they can import non-union men or train native Mexicans to fill positions, rather than be dictated to by labor unions.

The monthly financial report of the Atchison, Topeka & Santa Fe for December, 1909, shows that this road's operating expenses during December were $1,371,016 larger than during the same month of 1908, while its gross operating revenue increased only $221,696. The very large increase in operating expenses is attributed to the abnormally severe weather in December, and when the figures are available it is probable that similar increases in expenses will be disclosed on other roads. A circumstance which also tended to increase operating expenses much more than gross earnings was that the severe weather caused a very large increase in the movement of coal, which, while it increased expenses substantially as much as corresponding increases of other traffic would have done, did not yield as great an increase in the revenue owing to the relatively low rates on coal.

A bill has been introduced in the New York legislature to carry out the recommendation of the State Public Service Commission, Second District, that railways be required to publish their time tables in local newspapers. In first and second-class cities the commission shall designate the papers; in smaller places the time tables must be printed in all newspapers of general circulation. The penalty for violation is $25 a day. The bill, as drafted, also requires complete time tables to be posted both in passenger and in freight stations, showing all trains stopping at such station, which evidently would include local freights; and empowers the commission to excuse a road from publishing in a village paper of small circulation. It may excuse also in case a paper charges higher than its minimum rate for general advertisements occupying the same space. The intent of the law seems to be to require the publication of time tables in the same manner as was formerly common; that is to say, a list of trains in each direction with their principal destinations.

The Postal Telegraph Company.*

In 1881, the Western Union Telegraph Company, under the leadership of Jay Gould, acquired control of all the commercial telegraph lines in the United States. The smaller companies that had previously been built up had proved unprofitable and impossible of permanent maintenance, every one of them having been founded upon mistaken notions of living on local business and of various so-called improvements in methods of transmission, reduced rates, rebates and other forms of bidding for business, which soon proved to be ruinous. It was a common belief that competition in the business was at an end, but the demand for competition resulted in building up between the years 1881 and 1885 a more extensive, diverse and damaging competition than had ever before existed. The "Mutual Union," the "American Rapid," the "Bankers & Merchants," the "Baltimore & Ohio," the "Southern," the "Board of Trade," the "Pacific Mutual," and the original "Postal" were formed, and all were competing with each other as well as with the Western Union in the most wasteful manner.

In this chaotic condition my father, John W. Mackay, came into the control of the property bearing the "Postal" name. He built rapidly and built good lines in all directions. The Postal Company was organized in 1886 and immediately began to build telegraph lines and also purchase various lines which had become insolvent. The Postal began a stormy existence by being met with a war of telegraph rates. Prior to its entry into the telegraph field, the rates were very high. The following table speaks for itself:

	Rate	
	Old.	Present.
New York and Arkansas	$1.00	$0.60
" " " California	1.50	1.00
" " " Colorado	1.25	.75
" " " Kansas	1.00	.60
" " " Montana	1.50	.75
" " " North Carolina	.75	.50

[Other states proportionately reduced.]

It has been necessary to maintain the corporations of which ownership was acquired, as separate corporate entities, and to form new corporations in States where the property was not already owned by a local corporation, and to have each company own and operate the property in the State in which it is organized. This policy has been necessary for a number of reasons, among them being that new telegraph companies were obliged to build their lines on highways (the Western Union having practically monopolized the rights of way along railways under exclusive contracts with railways), and were frequently compelled to condemn rights of way. In many States city ordinances are granted only to domestic corporations, and only domestic corporations may condemn rights of way. It was necessary to incorporate five companies in building a line from Denver westward, in Colorado, Wyoming, Montana, Idaho and Utah. * * * The percentage of tolls going to each company handling inter-state business must vary, because the cost of handling business varies. The expense of maintaining lines in what is known as the "sleet belt," around Chicago and Buffalo, is very high compared with the expense of maintaining lines in other sections where sleet is unusual or unknown. The Postal Company has been free and independent from the time of its organization in 1886 and proposes to remain so. It has not the slightest influence or control over the American Telephone & Telegraph Company, or the Western Union Telegraph Company. It took no part in the recent purchase of the Western Union by the American Telephone & Telegraph Company, and was not consulted and knew nothing about it until after it had been accomplished. We shall not take part in the combination and we feel confident that we shall be able to retain our telegraph business, and even to increase it gradually, by extensions and by good service. We have great trouble in obtaining rights of way on railways over the pathless deserts of the West, where there are no highways on which to erect our lines. However, we are gradually forcing our way, and during this past fall we built an entirely new pole line on a new route from Sacramento, California, to Reno, Nevada, crossing the Sierra Nevada mountains, and for many months past we have been trying to make progress in condemnation proceedings to acquire a right of way eastward from Reno to Salt Lake City.

We are no longer seeking the old-time contract with railway companies, under which the telegraph company furnished everything, and received little or nothing, outside of a right of way, in return; and we find that our freedom from those contracts enables us to keep our wires free from the great burden of railway deadhead business. But we are seeking, and we are making from time to time, what we call "connecting line" arrangements with railway companies, where, under joint and equitable arrangements for exchange of traffic, we are able to extend our service into remote sections of the country. If the Postal Company were united with the Telephone and Western Union there would never be another competing telegraph company, because no telegraph company can succeed unless it reaches every State and every important city and town, and not only would that require a vast sum of money but it would be physically impossible, inasmuch as in many of the great cities there is no room left in and under the important streets, and entrance could not be obtained. Between many of the important commercial centers, as for instance, between New York and Philadelphia, it is impossible now to find another right of way on the highways for a through line. The Postal Telegraph Company will be the last competitor in telegraphy, and when that competition ceases there will be a choice only between monopoly and Government ownership.

We claim that we are giving the fastest and best telegraph service ever given in the world. Good telegraph service is given in some parts of Europe, but in Great Britain there is a large deficit each year in the Government telegraph service, which the Government has to pay. We have increased the efficiency of our staff, and except in time of storm or stress we are handling messages from customer to customer, between all important points in 20 minutes, and as a rule, we make even better time. We are giving this fast service between all the larger commercial centers and are extending it further. This very fast service has improved wonderfully the service to the smaller places. It costs much more than what the service cost a year ago. We are satisfied that we can continue it, however, and intend to do so. We attach as closely as possible to the company the loyalty and enthusiasm of the army of employees by an Employees' Association, the unique and essential features of which are that there are no dues to be paid by the employees, and no debts are to be incurred. The company itself pays to the members of the association or their beneficiaries, certain cash allowances in case of their sickness or death. Pratically all of our employees have become members of the association. The plan is a new one in many of its features, and has worked harmoniously and to the great satisfaction of the employees and of the company.

We have no objection to being placed under the Public Service Commission if that is desired by the State; but about seven-eighths of the telegraph business of New York State is inter-state, over which, I suppose, the Public Service Commission would have no jurisdiction. Nevertheless, if the State desires it, we have no objection.

*Extracts from the testimony of Clarence H. Mackay, January 21, before a committee of the New York Legislature.

Increase of Pay.

The Interborough Rapid Transit Company, operating the subway and elevated railways in Manhattan, New York City, has advanced the pay of its employees, beginning February 1, in the gross sum of $160,000 a year. Trainmen and stationmen receive increases in most cases of 10 cents a day. The directors are considering the question of establishing a pension system.

The Philadelphia & Reading has increased the wages of enginemen, beginning February 1, to the basis in vogue on the other principal roads of the country. The increase will average about 13 per cent., and about 12,000 men will be affected.

Pennsylvania papers report Vice-President Voorhees, of the Reading, as saying that increases in pay are soon to be announced for conductors and brakemen, as well as enginemen. There has been no formal demand on this road through the Brotherhood of Trainmen. One report says that the increase

for conductors and brakemen will apply only in the anthracite coal districts.

Increases of five to ten cents an hour have been made by the Delaware, Lackawanna & Western in the pay of 1,500 to 2,000 men in the shops of the company at Scranton.

Representatives of the Brotherhood of Railroad Trainmen have held conferences this week with officers of the Grand Trunk, the Canadian Pacific, the Baltimore & Ohio and the New York Central. It is said that the leaders of the enginemen's and trainmen's brotherhoods are making a strenuous effort to get the eastern roads to establish a committee to deal with the chief officers of the brotherhoods instead of carrying out the purpose, expressed by some of the roads, to deal only with separate committees on each railway. One brotherhood representative tells a reporter that they are going to strive to get the eastern roads to pay uniform rates, as is done by the roads in the West. The situation in the East, where certain roads pay higher wages than certain others, is very annoying to this representative.

Railway Matters in Washington.

The House Committee on Monday gave a hearing to J. C. Lincoln, of St. Louis, on the clause in the pending bills imposing a penalty on a railway where a freight agent quotes a rate to a shipper incorrectly. Mr. Lincoln presented a mass of testimony to show the extent of the inconvenience suffered by shippers on account of erroneous rate quotations.

President Taft, acting on a voluminous report made to him by the attorney-general, has decided to press the suit of the government against the Union and the Southern Pacific to condemn their joint control as illegal. The goverment has finished presenting its testimony in this case, and the defense will begin presenting evidence in April. The suit was begun in the federal court in Utah, but will go to a special tribunal of four judges, as provided for by the Anti-trust Act.

The Senate Committee will hold hearings on the railway bills this week Friday and Saturday, but sentiment among both senators and representatives appears still to be in a nebulous state. No announcement has yet been made as to who will be first heard at the hearing; but large numbers of railway men are in the city.

Moral Standards of a Railway Officer.

"The railway lobbyist (using the term in its offensive sense) is a thing of the past. The designation, once a term of reproach, will in the future be proudly borne by thousands of men who will represent sturdily the rights of their properties before the assemblies of the people's elect, and who will, I am serenely confident, command respect and attention in the degree that they respect themselves.

"Years of right dealing in this respect alone can rehabilitate the railways in the public estimation, but there can be no doubt that this will be done. A far-sighted railway official to-day desires nothing more earnestly than a square accounting with its vast clientele—the public—and the honest and efficient administration of laws which protect as well as punish. Measured by correct political standards, the railway man of the past has not risen to his opportunities.

"Every employing official ought to feel the great responsibility that inevitably goes with the selection of men. Perfection in this will never be attained, but should be always sought. The men who never make mistakes are those who attempt nothing.

"Careful selections are oftentimes thwarted by conditions which could not have been humanly foreseen, and it should comfort that employer, smarting under a particularly aggravating failure in this respect, that the First Gentleman of the World, the Saviour of mankind, was similarly afflicted in His chosen twelve.

"There is not a railway employee who has not his circle of influence and in which his railway is good or bad as he reflects those attributes in his daily life. It is a historical fact that enduring success cannot be attained by any cause to which wrong attaches. It remains, therefore, that to secure respect (for with respect will come the kindred attributes of regard and affection) the railway man of the present and future must so conduct himself as to silence doubt, confute slander, and, walking as he does in the full noon of public knowledge, justify by his private and official life the fullest confidence in the probity and morality of his official motives, and then—and not until then—will he be taken at his own estimation of himself."—*C. R. Gray* (St. L. & S. F.) before St. Louis Railway Club.

Eight Passengers Killed at Stoats Nest, England.

Press despatches of Saturday last report the derailment of an express train on the London, Brighton & South Coast at Stoats Nest, near London, on that day, in which eight passengers were killed and about 30 injured. The train, which was from Brighton, bound for London, was passing the station at about 40 miles an hour when two third-class carriages were wrecked and thrown against the station, knocking down a part of that structure, and a Pullman parlor car was thrown high up in the air so that it fell partly on the station. There is no clear account of the cause of the derailment. One statement seems to indicate that the trouble was at a switch, while another says that a coupling broke.

The Proposed Hudson River Bridge.

The Interstate Bridge Commission of the state of New York, appointed in 1906 to act jointly with a commission of the state of New Jersey, in considering the project for a bridge across the North river at New York City, has made its third annual report, recommending that a bridge be built at One Hundred and Seventy-ninth street. This is about six miles north of Sixtieth street, the point which has been the New York terminus most frequently considered in previous proposals. At One Hundred and Seventy-ninth street there is high rocky land on both sides of the river. The main span would not have to be over 1,400 ft. long and no long approaches would be necessary. The estimated cost is $10,000,000 for a bridge to carry a highway and to carry trolley cars at high speed. It is estimated that at any point farther south the cost would be three times as much, and a crossing farther north would be out of the question on account of the increased width of the river. West One Hundred and Seventy-ninth street is nearly on a line with the Washington bridge across the Harlem river.

International Asbestos Association.

The International Asbestos Association was recently organized at a meeting held in New York. Its membership is composed of representatives of American and Canadian mine owners and manufacturers. Included in the association are the largest producers and users of asbestos in the United States and Canada, among them the Amalgamated Asbestos Corporation, Ltd., Keasbey & Mattison Co., Philip Carey Mfg. Co., Asbestos Protected Metal Co., Franklin Mfg. Co., H. W. Johns-Manville Co., Sall Mt. Asbestos Mfg. Co., Ling Asbestos Co. and the United States Asbestos Co. The following were elected officers of the association: T. F. Manville, president; R. V. Mattison, Jr., vice-president; R. P. Doucet, secretary.

It is announced that the purposes of the association are the general exploitation of the uses of asbestos, particularly in the field of fireproof construction, cooperation between consumer and producer, cultivation of new markets, and development of processes whereby the wastes in the industry may be rendered commercially valuable. The association will establish a bureau that will be devoted to the aforementioned purposes.

Omaha Railway Club.

D. C. Buell, educational director of the Harriman Lines, has been elected a director of the Omaha Railway Club, vice R. E. Hayward (C. B. & Q.), resigned. The club will have regular meetings at its rooms in the Barker block on the second Wednesday of each month. It will have as guests at its meeting on February 9 those attending the meeting of the Trans-Missouri Freight Association, which will be held in Omaha on February 8 and 9. W. E. Bock (C., M. & St. P.) has been elected treasurer of the club.

American Society of Mechanical Engineers.

The New York monthly meeting for February will be devoted to the dedication of a bronze memorial tablet to Dr. Robert H. Thurston, the first president of the society. All associates and former students of Dr. Thurston are earnestly invited to attend these exercises to show their esteem for him as a friend and in recognition of his brilliant career as an engineer and educator.

Addresses will be given upon Dr. Thurston as a man, and his life work, by speakers of wide reputation who knew him intimately. These addresses will touch upon his experience as an engineer of the navy during the Civil War; his work as an educator at Stevens Institute of Technology and at Cornell University; his achievements as engineer and investigator; as an author; and his long relationship with the society.

Among those who will participate are Prof. John E. Sweet; Col. E. A. Stevens; President J. G. Schurman of Cornell University; Prof. Albert W. Smith, and Mr. William Kent, consulting engineer. It is expected that Mrs. Thurston will attend. Dr. Alex. C. Humphreys, president of Stevens Institute, will be the chairman.

The beautiful memorial which is to be unveiled is the work of Herman H. McNeil, a former student and personal friend of Dr. Thurston. It is a replica of the memorial tablet presented to Sibley College, Cornell University, by alumni and students of the university. The tablet was placed in the rooms of the society through the generosity of members and their devotion to Dr. Thurston.

Robert Henry Thurston was born in Providence, R. I., in 1839 and died in 1903. His father, Robert L. Thurston, as partner with John Babcock in 1834, formed the Providence Steam Engine Co., the first steam engine establishment in New England. Robert H. Thurston thus inherited his mechanical tastes. He graduated from Brown University and later received advanced degrees as the result both of study and of his accomplishments as a teacher and engineer. He was an engineer in the United States Navy, professor of mechanical engineering at Stevens Institute, director of Sibley College, the first president of The American Society of Mechanical Engineers, at various times a member of boards of engineers and committees, government representative and a recipient of other important appointments. He conducted extensive research work of lasting value, was prominent in many engineering and scientific societies and was an author of world wide reputation whose works included many of the best known text books and a large number of papers and memoirs contributed to this and other societies.

American Society of Civil Engineers.

At the meeting held on February 2, 1910, two papers were presented for discussion as follows: "Underpinning the Cambridge Building, New York City," by T. Kennard Thomson, M. Am. Soc. C. E., and "Building Agreements," by William B. Bamford, Assoc. M. Am. Soc. C. E. Both of these papers were printed in Proceedings for December, 1909.

Bureau of Explosives

A meeting of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles will be held in New York City, February 24, to take the place of the fourth annual meeting, the date of which was February 1.

American Railway Association.

At a special session of this association held in New York, January 27, resolutions were adopted making the National car demurrage rules, adopted by the state railway commissioners at Washington last autumn, the rules of the A. R. A.; and requesting members of the association to furnish copies of instructions which they issue to their agents in connection with the new rules. The committee on relations between railways will undertake to formulate a uniform set of instructions to agents.

At the same meeting it was resolved to at once take a letter ballot, to be closed February 19, on the adoption of two per diem rates for freight cars; 30 cents a day for March, April, May, June and July, and 35 cents for the remaining seven months of the year. The vote is to be taken under the same conditions as that of last year; namely, to adopt the resolution there must be the votes of a majority of the members, controlling two-thirds of the cars.

General Managers' Association of New York.

J. C. Stuart, vice-president and general manager of the Erie, has been made chairman of the General Managers' Association of New York, succeeding W. G. Besler.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis

American Association of Demurrage Officers. A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.

American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.

American Ass'n of Railroad Superintendents.—O. G. Felter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.

American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.

Buffalo Transportation Club.—J. N. Sells, Buffalo.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn

Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.

Railroad Club of Kansas City.—Third Friday in month; Kansas City.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Society of Railway Financial Officers.—C. Norquist, Chicago

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traffic Club of New York.—C. A. Swope

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.

Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago

Traffic News.

Reporters in New York gather that at a meeting of the Trunk lines this week the Erie and the Lackawanna were induced to refrain from reducing freight rates to the West on April 1, as they have said they would do.

At its recent meeting in Chicago the Transcontinental Passenger Association considered the subjects of summer tourist, home seekers' and colonist rates. No change will be made from the rates of last year. The summer tourist rates will remain on the basis of $72.50 for the round trip from Chicago to the Pacific coast, and the one-way colonist rate will be $33.

S. S. Pratt, secretary of the Chamber of Commerce of New York City, reports that the vessel tonnage entering the port of New York in the foreign trade in the year 1908 amounted to 12,154,780 net registered tons. This is claimed to be larger than the movement of vessels in the foreign trade at any other port in the world, Antwerp coming second, London third and Hamburg fourth. The increase at New York in ten years was 56.4 per cent.

The Iowa Commercial Coal Association has petitioned the Iowa Railway Commission to reduce the rates on coal in Iowa. Its petition states that the coal mined within the state is transported under the Iowa distance tariff, which was established over 20 years ago. It is alleged that this tariff is unreasonable and excessive and is higher than rates for like service voluntarily made by the railways, in consequence of which coal mined outside of Iowa is shipped into the state at lower rates, and sold with more profit to the producers, than coal mined in Iowa. The commission has set a hearing on the subject for March 9.

Westbound Trunk Line Shipments.

According to figures printed in the *Wall Street Journal*, the New York, Ontario & Western has, during the past year, made a marked increase in its westbound freight shipments at the expense of its competitors. In December, 1908, the Pennsylvania carried 23.4 per cent. of the total westbound tonnage forwarded from New York by nine standard lines. In December, 1909, this was reduced to 19.6 per cent. On the other hand, Baltimore & Ohio increased from 8.0 per cent. in 1908 to 9.7 per cent. in 1909; New York, Ontario & Western from 5.8 per cent. in 1908 to 7.6 per cent. in 1909, and the Lehigh Valley from 13.8 per cent. to 14.1 per cent. For the full 12 months the figures are as below.

The New York, Ontario & Western's tonnage increased from 83,884 tons in 1908 to 158,730 tons in 1909, an increase of 89.2 per cent. It is said that the other standard lines have forced the Ontario to agree to the elimination of its differential and that hereafter it will be on the same footing as the other all rail lines.

The total westbound tonnage, all classes, forwarded from New York by nine standard lines, and the proportion to the whole which each carried in the month of December and in the year ending December 31, were as follows:

	1909		1908	
	Tons.	Per cent.	Tons.	Per cent.
Month of December.				
Pennsylvania	28,674	19.6	29,645	23.4
New York Central	25,352	17.3	21,815	17.3
Erie	16,133	11.0	13,714	10.8
Baltimore & Ohio	14,103	9.7	10,176	8.0
West Shore	8,237	5.6	7,141	5.7
Lackawanna	18,529	12.7	16,046	12.7
Lehigh Valley	20,547	14.1	17,511	13.8
N. Y., Ont. & Western	11,077	7.6	7,275	5.8
Central of New Jersey	3,474	2.4	3,191	2.5
Total	146,126	100.0	126,514	100.0
For the Year.				
Pennsylvania	353,928	18.9	305,769	19.0
New York Central	334,415	17.9	297,503	18.5
Erie	232,245	12.4	211,728	13.1
Baltimore & Ohio	151,977	8.1	118,384	7.3
West Shore	108,208	5.8	114,326	7.1
Lackawanna	243,900	13.0	233,570	14.5
Lehigh Valley	240,399	12.8	209,121	13.0
N. Y., Ont. & Western	158,730	8.5	83,884	5.2
Central of New Jersey	49,490	2.6	37,556	2.3
Total	1,873,292	100.0	1,611,841	100.0

December's total westbound tonnage carried by the nine roads increased 15.5 per cent. over 1908. Trunk line traffic men say that up to the third week of January indications point to business for the entire month in as large a volume as was reported for December.

Exports of Farm Products from 1851 to 1908.

A report on the annual exports of farm products from the United States from 1851 to 1908, inclusive, about to be published by the department of agriculture, shows that in 1851-1855 the average value per capita of the agricultural exports of the United States was $5.85, in 1901-1905 it was $10.88, and since 1905 it has been still greater. The chief agricultural products exported in the past half century have been cotton, grain and grain products, and packing-house products.

In 1851-1855 cotton made nearly two-thirds of the value of all agricultural exports, but in 1901-1905 between one-third and one-half only, although the average quantity exported increased from 1,026,000,000 lbs. in 1851-1855 to 3,577,000,000 lbs. in 1901-1905, while in 1907 the maximum of 4,518,000,000 lbs. were sent out. In quantity exported per capita, the five-year period 1856-1860 was highest; there were then exported 44.8 lbs. of cotton per capita. The nearest approach to this was 44.5 lbs. per capita in 1901-1905. Cotton-seed products, such as cotton-seed oil, oil cake and oil-cake meal have assumed considerable importance in the export trade of the United States in recent years; that is, beginning about 1876. The value of cotton-seed products exported averaged during the past several years from $25,000,000 to $30,000,000 a year, the highest being in 1907, about $34,000,000.

Grain and its products come second in order of value. They increased from a yearly average of $25,000,000 in 1851-1855 to $194,000,000 in 1901-1905, and in 1908 were $215,000,000. The period of largest grain exports was 1896-1900, since which time there has been a decline. The per capita exports of wheat and flour were largest in 1881-1885, when they were equivalent to 2.6 bu. per capita; in 1901-1905 the average exports per capita were 2 bu., and since 1905 have been less than 2 bu. In corn the maximum limit was reached in 1896-1900, when an average of 2.4 bu. per capita was exported.

Exports of packing-house products have increased much more rapidly in the last half century than cotton or cereals. The average value of packing-house products exported in 1851-1855 was $10,000,000 a year, and in 1901-1905 it was $183,000,000, while in 1908 the value was $196,000,000. The principal items of this group are pork, lard, beef and oleo oil.

The largest exports of beef and oleo oil (those in 1901-1905) amounted to 408,000,000 lbs. a year for beef and 146,000,000 lbs. for oleo oil. Since 1905 there has been a marked decline in exports of beef, the average for 1906-1908 being only 349,000,000 lbs. a year, or less than for any five-year period since 1886-1890. On the other hand the average exports of oleo oil during the three years ending with 1908 exceeded the average for 1901-1905 by nearly 60,000,000 lbs.

Tobacco, which a century ago was among the most important of our exports, still holds a prominent place. Exports of unmanufactured tobacco have averaged since 1891-1895 more than 300,000,000 lbs. a year, with an average yearly valuation of about $30,000,000. The per capita exports of this product declined from 5.3 lbs. in 1851-1855 to 4.1 lbs. in 1901-1905, while during 1906-1908 the average was less than 4 lbs.

The value of exports of fruits increased from $71,000 in 1851 to $20,000,000 in 1904, and subsequently ranged from $14,000,000 to $17,000,000.

The Potato Limited.

Officers of the Oregon Short Line have recently made a triumphal tour through northern Utah and south Idaho with a potato and soil special; in other words, a farmers' instruction train in which the lecturer dealt chiefly with the art of growing potatoes. Previous to the trip the general passenger agent had offered $500 in prizes for the four best exhibits of potato fields of one-fourth acre, one-half acre, one acre and five acres. Last year 1,731 cars of potatoes were shipped out of Idaho, 309 of which went as far as Texas and 303 to Missouri and points east of there.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net	Taxes.	Operating income (or loss).	Increase (or decrease) compared with last year.
Alabama & Vicksburg	142	$100,203	$48,027	$158,130	$19,448	$22,987	$3,902	$44,254	$5,392	$95,983	$62,147	. . .	$4,901	$57,246	$13,550
Arizona & New Mexico	108	67,054	6,761	75,538	13,964	4,059	165	12,521	1,605	32,314	43,224	. . .	2,583	40,641	—13,095
Bangor & Aroostook	546*	159,085	49,944	220,436	36,387	26,857	3,141	66,834	10,717	143,936	76,500	. . .	1,500	75,000	15,664
Bessemer & Lake Erie	201	342,527	22,236	374,104	70,286	85,391	8,813	127,483	32,968	324,941	49,163	. . .	44,210	4,953	—4,437
Buffalo, Rochester & Pittsburgh	567	601,950	78,242	701,834	53,175	153,234	9,293	210,368	13,859	439,929	261,905	842	13,000	248,947	77,980
Central New England	278	204,886	26,919	247,196	47,425	22,058	1,805	75,646	2,951	149,885	97,311	. . .	6,500	90,811	10,584
Chicago & Eastern Illinois	965	840,443	155,946	1,046,620	95,982	195,053	20,914	384,929	34,108	730,986	315,634	—1,284	20,041	294,309	3,786
Chicago Great Western R.R.	1,486†	599,281	212,681	884,893	91,806	111,634	43,166	421,024	34,621	702,251	182,642	513	27,319	154,810	. . . . .
Chicago, St. Paul, Minn. & Omaha	1,739	680,678	345,613	1,102,151	91,702	144,424	24,965	504,856	28,625	794,572	307,579	—1,249	53,008	253,322	—109,756
Chicago Southern	114	37,870	. . . . .	38,013	3,129	3,213	2,010	10,405	2,458	21,215	16,798	. . . .	2,175	14,623	15,504
Cincinnati, Hamilton & Dayton	1,036	533,546	129,816	743,159	67,562	129,897	22,611	345,770	22,038	587,878	155,281	. . . .	25,833	129,448	44,688
Coal & Coke	191	43,792	13,220	59,193	8,381	15,916	849	16,702	2,223	44,071	15,122	9,234	3,500	20,856	5,289
Colorado & Southern	1,248	636,046	113,046	792,231	87,897	123,246	12,346	274,869	21,677	520,035	272,196	—762	21,625	249,809	—16,934
Cumberland Valley	162	185,449	46,303	241,860	34,046	19,950	4,593	73,360	9,167	141,116	100,744	712	4,084	97,372	15,483
Delaware, Lackawanna & Western	931‡	2,264,809	548,778	2,998,097	140,483	432,307	56,828	851,007	61,177	1,541,802	1,456,295	30,157	151,600	1,334,852	—11,974
Detroit & Mackinac	347	56,860	25,176	86,939	18,677	17,194	2,014	33,006	3,070	73,961	12,978	99	19,040	—6,160	16,843
Evansville & Terre Haute	310	130,741	52,333	201,624	23,746	36,668	4,127	64,028	6,551	135,120	66,504	1,284	8,872	56,348	8,500
Fort Worth & Denver City	454	292,776	153,850	465,630	37,460	52,035	5,556	138,642	14,934	248,627	217,003	423	20	217,406	66,742
Fort Worth & Rio Grande	196	64,391	27,818	97,713	15,305	13,051	4,301	36,579	4,281	73,517	24,196	. . . .	1,948	22,248	—39,847
Gulf & Ship Island	307	135,104	38,840	187,082	35,680	29,132	1,656	35,095	7,648	129,211	57,871	. . . .	4,927	52,944	6,282
Kansas City Southern	827	581,134	127,594	789,855	83,661	96,667	25,626	274,951	31,457	512,362	277,493	. . . .	25,831	251,662	—4,038
Lehigh Valley	1,440	2,592,923	330,788	3,022,794	281,651	497,792	74,079	926,431	67,549	1,847,502	1,175,292	14,999	94,600	1,065,693	384,754
Maine Central	932	412,225	203,691	662,884	82,188	109,045	7,157	251,525	35,496	485,411	177,473	570	39,235	137,668	19,719
Midland Valley	324	88,646	31,851	126,356	18,175	21,915	2,179	34,936	4,872	82,077	44,279	289	8,000	36,568	34,421
Mississippi Central	164	52,316	18,251	73,970	10,991	12,435	1,050	16,412	4,656	45,544	28,426	. . . .	1,500	26,926	9,923
New Orleans & North Eastern	196§	205,678	58,293	288,166	30,577	42,875	8,896	93,552	11,294	187,194	100,972	. . . .	6,724	94,248	3,387
New Orleans Great Northern	275	84,985	32,206	123,927	18,795	19,349	2,940	34,171	5,544	80,799	43,128	—60	1,200	41,867	34,847
New York, New Haven & Hartford	2,045	2,482,842	1,957,458	4,949,623	495,467	588,837	17,150	1,992,253	140,589	3,234,296	1,715,327	96,614	355,000	1,456,941	517,658
Norfolk & Southern	592	141,560	61,728	216,436	22,790	27,953	2,955	69,039	15,594	138,331	78,105	. . . .	6,200	71,905	7,298
Pere Marquette	2,330	936,013	295,746	1,326,495	136,500	160,460	33,408	542,535	32,996	905,899	420,596	4,917	47,073	378,440	140,459
St. Louis, San Francisco & Texas	132	52,308	11,808	67,294	18,400	16,315	3,241	47,073	3,349	88,378	—21,084	. . . .	852	—21,936	—19,866
Southern Indiana	236	98,986	14,485	115,124	14,139	18,535	2,033	35,799	4,665	75,171	39,953	—14	6,928	33,011	13,756
Tennessee Central	292	82,228	30,868	119,234	17,685	11,276	3,689	41,270	7,752	81,672	37,562	. . . .	4,199	33,363	7,231
Union R.R. (Pennsylvania)	31	. . . . .	. . . . .	244,530	32,306	59,034	101	121,265	11,435	224,141	20,389	4,525	18,842	6,072	—4,117
Vicksburg, Shreveport & Pacific	171	75,176	52,643	137,398	26,644	22,718	3,456	37,089	4,737	94,644	42,754	. . . .	8,241	34,513	—994
Wichita Valley	257¶	59,368	27,740	90,863	9,793	1,384	383	30,898	3,214	45,673	45,191	. . . .	2,796	42,395	16,652
SIX MONTHS OF FISCAL YEAR.															
Alabama & Vicksburg	142	$547,575	$251,715	$856,856	$133,452	$130,946	$21,718	$257,767	$30,978	$574,861	$281,995	. . . .	$26,151	$255,844	$81,319
Arizona & New Mexico	108	423,845	43,787	480,871	49,284	25,022	423	72,950	9,713	157,392	323,479	. . . .	8,665	314,814	—4,049
Bangor & Aroostook	546*	975,812	365,337	1,415,670	221,618	169,832	16,854	394,913	60,807	864,024	551,646	. . . .	9,000	542,646	81,739
Bessemer & Lake Erie	201	4,439,581	192,259	4,680,231	396,995	642,949	43,108	1,046,794	66,687	2,196,533	2,483,698	. . . .	69,210	2,414,448	765,381
Buffalo, Rochester & Pittsburgh	567	3,920,926	541,712	4,704,709	535,073	950,219	53,860	1,231,801	77,663	2,848,616	1,856,093	8501	78,000	1,778,594	741,642
Central New England	278	1,272,838	188,523	1,535,511	270,745	132,458	9,658	443,537	18,466	874,864	660,647	. . . .	39,000	621,647	186,924
Chicago & Eastern Illinois	965	4,752,380	963,308	6,018,725	548,809	1,084,033	132,878	1,936,333	194,610	3,896,663	2,122,062	—8,480	182,041	1,931,541	457,121
Chicago Great Western R.R.	1,486†	2,857,069	907,948	4,047,067	432,961	446,957	156,972	1,618,346	129,330	2,784,566	1,262,501	—4,646	109,275	1,148,580	. . . . .
Chicago, St. Paul, Minn. & Omaha	1,739	4,908,696	2,388,974	7,790,841	1,087,240	891,219	143,037	2,737,956	165,678	5,025,130	2,765,711	1,165	318,047	2,448,828	48,242
Chicago Southern	114	202,109	. . . . .	203,053	21,247	13,576	7,708	47,586	13,929	104,046	99,007	. . . .	12,350	86,657	70,856
Cincinnati, Hamilton & Dayton	1,036	3,503,798	944,236	4,977,942	655,682	815,660	128,203	1,879,771	160,509	3,639,825	1,338,117	. . . .	155,000	1,183,117	364,158
Coal & Coke	191	281,160	84,779	380,432	61,653	99,856	5,413	97,877	13,118	277,918	102,514	44,806	21,000	126,321	30,685
Colorado & Southern	1,248	3,746,590	936,739	4,932,427	666,169	774,613	85,455	1,514,847	126,151	3,166,736	1,765,692	—1,548	129,750	1,634,394	159,055
Cumberland Valley	162	1,082,533	331,942	1,476,416	200,887	133,296	24,077	418,394	36,370	813,024	663,392	3,378	24,502	642,268	66,889
Delaware, Lackawanna & Western	931‡	13,615,245	3,776,274	18,487,874	1,716,349	2,392,683	321,469	4,798,752	333,071	9,562,324	8,925,550	195,987	804,100	8,317,437	754,328
Detroit & Mackinac	347	403,308	163,978	601,010	101,549	93,712	12,659	189,419	15,759	413,098	187,912	1,340	54,346	134,906	20,959
Evansville & Terre Haute	310	845,270	321,138	1,287,622	144,834	175,489	29,875	360,967	40,098	751,263	536,358	—5,498	53,232	477,628	118,722
Fort Worth & Denver City	454	1,733,187	959,887	2,809,505	292,898	343,387	40,714	797,901	85,861	1,560,761	1,248,744	4,009	46,520	1,206,233	268,547
Fort Worth & Rio Grande	196	300,825	162,177	496,199	96,823	67,332	19,765	190,742	22,363	397,025	99,174	. . . .	9,811	89,363	—125,946
Gulf & Ship Island	307	790,317	227,661	1,086,713	203,947	178,211	7,654	314,445	43,843	748,100	338,613	. . . .	29,187	309,426	101,416
Kansas City Southern	827	3,393,140	732,114	4,598,759	525,179	618,308	152,424	1,516,490	179,028	2,991,429	1,607,330	. . . .	152,780	1,454,550	—114,430
Lehigh Valley	1,440	15,221,828	2,368,251	18,237,719	1,912,402	2,982,733	452,007	5,139,198	357,230	10,843,570	7,394,149	40,045	567,600	6,866,594	1,123,631
Maine Central	932	2,675,426	1,715,289	4,670,213	715,767	622,610	47,270	1,487,848	135,097	3,008,592	1,661,621	21,177	213,403	1,469,395	269,632
Midland Valley	324	482,928	170,466	686,980	110,874	133,207	11,593	183,707	27,451	466,832	220,148	145	48,000	172,003	143,693
Mississippi Central	164	294,320	99,027	413,501	69,530	65,113	6,395	91,053	22,136	254,227	159,274	. . . .	8,100	151,174	61,045
New Orleans & North Eastern	196§	1,242,903	315,677	1,687,779	172,376	271,566	51,046	566,163	62,026	1,123,177	564,602	. . . .	48,824	515,778	93,147
New Orleans Great Northern	275	452,857	182,201	671,466	129,817	95,650	12,653	174,365	28,342	440,827	230,639	487	5,700	224,452	189,943
New York, New Haven & Hartford	2,045	15,160,574	13,193,429	31,081,064	3,445,557	3,309,767	152,523	11,296,033	742,772	18,946,652	12,134,412	710,096	1,905,000	10,939,508	3,066,614
Norfolk & Southern	592	832,857	374,102	1,307,981	151,455	162,462	24,317	398,938	85,383	822,556	485,425	2,659	35,700	452,385	149,513
Pere Marquette	2,330	5,546,271	2,126,049	8,267,143	1,088,461	1,051,521	197,991	3,054,953	174,217	5,567,143	2,700,000	12,340	285,024	2,427,316	498,388
St. Louis, San Francisco & Texas	132	372,107	71,820	467,631	100,679	91,691	15,775	244,463	20,767	473,375	—5,744	. . . .	3,641	—9,385	—37,076
Southern Indiana	236	616,985	92,497	719,690	92,438	100,877	13,140	187,121	29,169	422,745	296,945	—836	41,571	254,538	104,388
Tennessee Central	292	527,429	205,093	769,132	101,325	86,575	21,688	240,786	48,695	499,069	270,063	. . . .	25,198	244,865	69,925
Union R.R. (Pennsylvania)	31	. . . . .	. . . . .	2,299,225	179,275	302,213	674	652,966	23,295	1,158,423	1,140,802	30,669	21,342	1,150,129	538,787
Vicksburg, Shreveport & Pacific	171	425,436	256,577	737,795	126,865	133,260	20,187	206,830	25,973	513,115	224,680	. . . .	39,750	184,940	29,668
Wichita Valley	257¶	266,627	137,924	421,851	50,089	18,747	1,703	135,352	11,971	217,862	203,989	. . . .	12,176	191,813	43,144

*Mileage operated December 31, 1908, 514. † Began operations September 1, 1909. ‡ Mileage operated December 31, 1909, 893. § Mileage operated December 31, 1908, 117. ¶ Mileage operated December 31, 1908, 174. — Indicates Deficits, Losses and Decreases.

Hearing on Milling-in-Transit.

Commissioner Clark, of the Interstate Commerce Commission, took testimony at Chicago last week in the investigation which the commission is making of alleged abuses of the transit privilege. The testimony indicated that by means of shipping out from points where the transit privilege is granted commodities different from those shipped in on the through billing, shippers in many lines of business are, in effect, getting the benefit of lower freight rates than those named in the published tariffs.

W. J. Tomkins, who is both traffic manager of the International Salt Company and general manager of the Michigan, Illinois & Indiana Transportation Company, a lake boat line which is understood to be owned by the salt company, told how shipments to the salt company's docks at Milwaukee, Wis., are stored and mixed there and held for two to 13 months and then shipped out under through rates. The rate across the lake from Ludington and Manistee, Mich., is 2⅓ cents. Nevertheless, the boat line is allowed by the railways a division of 4⅔ cents on through shipments. Cargoes are held at the concentrating point subject to the order of the shipper. Shipments are billed as having come from Ludington or Manistee, regardless of their actual point of origin. In this way the boat line gets its division of the through rate whether the salt has actually been hauled by it or not.

Testimony showed that eggs, poultry and butter may be shipped into a concentrating point and shipped out from it a year afterward on the through billing. Commissioner Clark called attention to the fact that under this system eggs might come in on the billing and chickens go out on it!

L. R. Richards, traffic manager of the Quaker Oats Company, contended that substitution of commodities should be allowed when the rate on the article which comes in on a through billing is the same as on the article which goes out on it. In response to questions by Commissioner Clark, however, he indicated that he had in mind merely the substitution, for example, of one kind of grain or grain products for another kind of grain or grain products; for example, that corn should be allowed to be shipped out on a wheat billing or that even corn products should be allowed to be shipped on a wheat billing, but that vegetable products should not be allowed to be shipped out on a grain billing.

A good deal of the testimony related to the use of the transit privilege on grain. The proportional rate out of any given point, Chicago, for example, on grain differs according to the point of origin of the grain. For example, the proportional rate east of Chicago is less on grain from a point, say, in Nebraska than on grain originating at a point farther east. Now, if a dealer ships into Chicago grain from both Nebraska and Illinois and sells his Nebraska grain in Chicago he has left two through billings, one for the Nebraska grain and one for the Illinois grain, on either of which he may ship out his Illinois grain. He will naturally use his Nebraska billing for shipping out the Illinois grain, because in that way he will get a lower freight rate out. The same thing would happen if, instead of selling his Nebraska grain locally in Chicago, he shipped it out by boat.

W. M. Hopkins, manager of the transportation department of the Chicago Board of Trade, contended that such substitution does not effect a cut in the rate. Suppose, for example, grain comes to Chicago from Kansas City and also from some point in Illinois. By shipping out the Illinois grain on the Kansas City billing and the Kansas City grain on the Illinois billing the shipper gains in two ways. The local rate from Kansas City to Chicago is 12 cents and from Chicago to Louisville 7 cents, a total of 19 cents. On through shipments from Kansas City via Chicago to Louisville the rate is 13 cents. The consequence is that by shipping out Illinois grain on the Kansas City billing the shipper is enabled to get grain from Kansas City to Chicago and from Chicago to Louisville for 6 cents per 100 lbs. less than if paid the local rate on grain from Kansas City to Chicago and the local rate from Chicago to Louisville. But Mr. Hopkins contended this did not hurt the railway because there is a lower adjustment via Peoria than via Chicago, and if the grain could not be handled this way through Chicago there would be no movement from Kansas City via Chicago to Louisville; the Chicago dealer would lose the business and the railway the tonnage.

William Ellis, commerce counsel of the Chicago, Milwaukee & St. Paul, testified that he recently had found that many grain shippers at Milwaukee have been shipping out under their billings more grain that they have credit for on the transit accounts.

Attorney John H. Marble, of the commission, called attention to other abuses of the transit privilege. In malting barley, for instance, there is a loss in weight of 25 to 30 per cent. The legitimate tonnage out on transit would, therefore, be less than the amount of the tonnage moved in. This difference has been taken advantage of, he said, by making up the deficit of tonnage from barley brought in on local rates.

INTERSTATE COMMERCE COMMISSION.

Intervention of Commission in Misrouting Cases.

Larrowe Milling Co. v. Chicago & North Western et al. Opinion by Commissioner Harlan.

The principal defendant has two routes from Janesville, Wis., to Chicago, a direct one of 91 miles and an indirect one through Waukesha and Milwaukee of 162 miles. On shipments moving from Janesville to Cattaraugus, N. Y., and Windber, Pa., over the direct route to Chicago, charges were based on the local rate to Chicago via that route and the through rate beyond, although the local rate over the indirect route through Waukesha, added to the through rate to destination

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF SEPTEMBER, 1909.

Name of company. Mileage of all lines cov-	Adams Express.	American Express.	Canadian Express.	Can. Nor. Express.	Globe Express.	Great Nor. Express.	National Express.	Northern Express.	Pacific Express.	Southern Express.	United States Express.	Wells, Fargo & Co.	Western Express
...ned: Rail lines....	30,958	46,295	7,078	3,164	1,900	7,171	1,664	6,497	22,645	34,048	23,804	56,355	3,452
Other lines	3,488	2,069	2,792	22	.....	211	292	261	608	2,695	611	4,844	4
Operating revenues:													
Express	$2,606,296	$2,933,754	$244,348	$29,973	$71,566	$223,991	$99,354	$314,595	$709,174	$925,774	$1,398,726	$2,295,765	$67,390
Misc. transportation..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	118	182
Nontransportation	13,301	124,162	4,299	1,007	435	1,114	350	5,191	9,300	12,164	22,263	38,756	945
T'l receipts, operation.	2,619,597	3,057,916	248,642	30,980	72,002	224,204	99,704	319,786	718,474	937,937	1,420,989	2,334,639	68,517
Exprs. privileges—Dr..	1,345,231	1,394,030	124,054	11,491	35,692	90,451	37,239	154,233	348,146	439,935	654,953	1,112,724	28,522
Total	$1,274,366	$1,663,886	$124,588	$19,489	$36,310	$133,753	$62,465	$165,553	$370,328	$498,002	$766,035	$1,221,915	$39,995
Operating expenses:													
Maintenance	$58,915	$62,937	$1,850	$57	$590	$1,256	$236	$2,153	$10,925	$21,936	$38,392	$66,739	$455
Traffic	6,088	18,662	944	132	1,024	1,242	5	1,865	6,815	5,262	10,155	13,793	1,670
Transportation	895,537	1,122,566	76,242	9,078	13,972	51,393	44,734	71,725	212,556	325,959	593,643	811,725	19,171
General	64,218	101,918	8,045	1,433	2,618	8,171	2,820	3,750	12,468	17,541	45,173	55,321	2,869
Total	$1,024,758	$1,306,080	$87,070	$10,696	$18,194	$60,062	$47,775	$79,021	$242,056	$369,828	$687,363	$947,578	$24,165
Net operat'g rev. or def.	$249,613	$357,806	$37,519	$8,793	$18,116	$77,690	$14,690	$86,521	$128,272	$98,175	$78,672	$274,337	$15,830
Taxes	$13,219	5,009	1,150	130	550	3,328	5	3,500	4,948	9,983	7,756	16,624	461
Operating inc. or loss...	$236,394	$352,796	$36,369	$8,662	$17,566	$74,362	$14,685	$83,021	$123,325	$88,192	$70,916	$257,713	$15,368

from Chicago, made a lower combination. In the absence of a specific through rate, the case is controlled by rule 215 of conference rulings bulletin No. 4, and the complainant is entitled to reparation for the resulting overcharge. The commission intervenes in misrouting cases only when, as the result of the failure to obey the shipper's routing instructions, or as a result, without such instructions, of moving a shipment over a route carrying a higher rate than the rate in effect over another route reasonably available, additional transportation charges accrue. In these cases no such damage followed the routing of the shipments directly to Chicago, for the reason that under the rule referred to the lower combination of rates over the other route was applicable. (17 I. C. C., 443.)

Rebating Through Refund.

Armour Car Lines v. Southern Pacific Co. Opinion by Commissioner Clements.

Complainant contracted to furnish ice to defendant at sundry points on its line to be used in the refrigeration of perishable fruit shipments. It was agreed by the parties that a $1.90-per-ton rate should be established for shipments of ice from Los Angeles, Cal., to Yuma, Ariz. The published rate between the points named was $3 per ton. The $1.90 rate was not published until some months after the contract was made and not until 71 cars of ice had been shipped under the contract. On claim for reparation of the difference between the $1.90 rate and the $3 rate it is held that such a transaction is repugnant to the provisions of the act to regulate commerce, opens the door for the grossest form of favoritism and rebating, and presents no basis for reparation. (17 I. C. C., 461.)

Administrative Rulings.

The commission, recognizing the great benefits to be derived from uniformity of car service rules, endorses the code which was reported to the National Association of Railway Commissioners and by that association recommended to the state and interstate commissions, it being understood that this action is of course subject to the right of the commission to inquire into the legality or reasonableness of any rule or rules which may be the subject of complaint, and that announcement to that effect be made with the code of demurrage rules.

Rule 6 of the Southern Classification provides that where the tariff offers a reduced rate based on a certain fixed valuation a release, in the form specified in the tariff and containing the agreed valuation, must be written and signed by the shipper on the face of the bill of lading. As applied to a case where the shipper endorsed the released valuation on the bill of lading, but, not knowing the requirements of the rule, omitted to endorse the special form across its face, it was held that the rule is unreasonable and that it is the carrier's duty to secure the shipper's signature to such a release on the bill of lading when it has reasonable notice of his desire to take advantage of the lower rate on a released valuation.

It is the view of the commission that exchange bills of lading ought to show specifically the point of origin of the shipment and the route over which it has moved. (Adm. Rule.)

The rules governing the sale, use and redemption of mileage books should be a part of the tariff under which they are sold. If a carrier deems it wise to provide in such rules for the redemption of unusued portions of such books on the basis of the mileage rate for the portion used, it will be recognized by the commission as redemption "at the full tariff rates" within the meaning of Rule 76, conference rulings bulletin No. 4, when the books were sold under tariff authority and on the basis of a specific sum per mile. (Adm. Rule.)

Two carriers desiring a joint operation of their combined lines between two points propose that they shall be operated by a new and separate company which shall handle as its own, and under its own tariffs, all local business between those points, and shall handle all other business under some arrangement with the two lines which does not permit it to participate in the earnings on the through traffic. Rule 180, conference rulings bulletin No. 4, entitled "Lessee road not serving as common carrier," does not apply and that the road operating between the two points must concur in the through rates over its line.

As the agent of an intermediate carrier has no means of knowing just why a shipment has been routed through particular junctions he has no right to substitute his own judgment as to routing for the specific routing instructions accompanying the shipment. In a stated case the initial carrier issued bills of lading showing particular routing but no rate; the transfer billing subsequently issued to a connecting line showed the routing and a 10-cent division of a 33-cent rate that did not apply through the junctions named but through another junction; and the agent of the connection therefore diverted the shipment through the latter junction to destination. It subsequently appeared that because of the diversion the shipper had lost a transit right at a given point on the route specified, which was necessary to effect the sale of the shipment at destination. As tariffs are permitted to contain rules providing that they are subject to the transit privileges shown on the tariffs of individual carriers on file with the commission, the intermediate line was responsible to the shipper for the difference between the rate paid in order to get the shipment back to the transit point and the legal rate over the route directed by the shipper.

A bill of lading showed a rate of $1.55 per ton and routing in care of a connecting line. Through one junction the two carriers had a joint through rate of $1.75 per ton; through another junction equally direct but carrying no joint rate, the combination through rate was $1.55 per ton. While an initial line is not chargeable always with knowledge of the rates of its connections, yet having accepted a shipment and a bill of lading on which the consignor had noted a definite rate it was its duty to find that rate and route the shipment accordingly or to call on the consignor for further instructions; and failing to do either it is liable for the excess in transportation charges resulting from routing the shipment through one junction when through another junction equally direct the locals make a through charge of the amount named in the bill of lading.

The commission has expressed the view that a transit privilege extending through a period of more than one year is *prima facie* unreasonable. (Rule 204, conference rulings bulletin No. 4.) Experience has shown, however, that as applied to the creosoting of lumber a period of 18 months is not unreasonably long, provided the full local rates on the inbound material are required to be paid.

On inquiry as to the legality of a practice permitting the stoppage of shipments of perishable commodities at points short of destination to partly unload, it was held that the practice is legal only when authorized under proper tariff rules.

A carload shipment routed by the consignor in order to get particular delivery at destination reached the wrong delivery tracks. Instead of demanding delivery on the right tracks the consignee moved the contents of the car by dray, although the car could have been switched to the proper tracks without additional expense to the shipper had he given the carrier the opportunity to do so. It was held that no reparation could be allowed.

Certain shipments were delivered at destination as actually routed by the consignor, but there was a general understanding with the carrier, not covered by tariff provision, that traffic should be diverted at a certain point in order to accommodate consignees located near certain team tracks on the delivering line. The agent having failed to divert the shipments at that point the consignees were subjected to extra drayage charges. The claim for a refund must be rejected.

The commission adheres to Rule 68, conference rulings bulletin No. 4, to the effect that it is not a proper practice for railways to adjust claims immediately on presentation and without investigation. The fact that shippers may give a bond to secure repayment in case, on subsequent examination, their claims prove to have been improperly adjusted does not justify the practice. Carriers that have adopted that practice will be expected promptly to discontinue it.

A car of coal was forwarded to the destination named in

the bill of lading, but the carrier not being able to find the consignee and learning that a company of the same name at a nearby point was tracing a coal shipment, reconsigned it to that point without consulting the consignor, and that subsequently proved to be the correct destination. A refund might be allowed on showing that the additional transportation expense fell on the consignor. In this connection the general principle is expressed in the following rule: If a shipper sends a shipment to an erroneous destination he should have the right to guard, so far as possible, against resulting loss by disposing of the shipment at that point. The carrier should not, therefore, forward such shipment to another destination with attendant additional transportation charges without having made reasonable effort to secure disposition instructions from the shipper.

If a limited passenger ticket is lost or destroyed before being used (and no error or neglect of a carrier's agent is involved), it is not unlawful for the carrier, after the limit of the ticket has expired, to refund to the passenger the extra fare paid as a result of such loss or destruction, provided the loss or destructon, the identity of the claimant as the original holder, and the fact that the extra fare was paid for travel by the original holder over the route and within the limit of the lost ticket, are clearly and definitely proved in a form that becomes a part of the record in the case; and provided it is clearly shown that such ticket has not been used or redeemed by any other person. Such action should be withheld for a sufficient period of time properly and reasonably to guard against the lost ticket being redeemed or used by some person other than the original holder.

A carrier in reissuing a tariff brought forward certain rates originally named in a previous tariff, and also slightly increased the rates named between the same points on the same commodity in a supplement to the previous tariff. Where a tariff contains conflicting rates the lower or lowest of the rates so published is the legal rate.

The yardmen of an interstate carrier being under the impression that a loaded car was empty delivered it to a switching road by which it was switched to a loading point, and the error being there discovered it was thence switched back. While the switching line may treat the shipment as analagous to an astray movement and on that account may waive its charges if it desires to do so, it may nevertheless lawfully demand and collect of the carrier that made the error its lawful rates for the service performed.

A canal boat line carrying traffic moving from New York city to Canadian points under an arrangement for through movement, the traffic being transferred to a rail line at Buffalo by its own agents or the agents of the railway, is a common carrier under the act and must file tariffs with the commission.

A shipment was routed through a certain junction by the consignor but on the papers presented to the commission it did not clearly appear whether he also named the rate that had been available through that junction but was canceled shortly before the movement. The instructions were complied with by the carrier and the new and higher rate applied. This was a shipper's error and the higher rate must be collected unless he also named in the bill of lading the lower rate legally in effect through another junction, in which case carrier was liable.

Rule 61 of Tariff Circular 17-A and Rule 65 of Bulletin No. 3 are hereby withdrawn and the previous ruling of February 4, 1908, is restored. The original rule (now reported as rule 26, conference rulings bulletin No. 4), is here repeated for general information, as follows:

If title to property, such as postal cards, passes to the government at the point of manufacture, the carrier may agree upon a rate to be applied for transporting it for the government to another point, without filing a tariff with the commission. But if the manufacturer under his contract is required to deliver to the government at such other point the transportation must be under the published tariff rate. In other words, if the shipment is made directly by the government, this rate may be fixed by the carrier without posting and filing the tariff, but not otherwise.

There is nothing in the provisions of section 22 of the act relating to free or reduced rate transportation to warrant carriers in according free transportation to scientists or other employees of a public museum.

While it is the policy of the commission to entertain complaints instituted on behalf of shippers by traffic or credit bureaus in all such cases where reparation is awarded the order will require payment to be made by the defendant carriers either to the consignor or the consignee, as their interests may appear.

Through error a carrier's agent so punched a round-trip ticket to New York as to limit its use to October 14 instead of October 17. The holder at destination requested a correction, and the ticket being sent back for that purpose by the passenger agent, was lost in the mails. The initial carrier's agent at New York secured from its connection a return ticket in lieu of the lost ticket. It now asks that its connections be authorized to accept report of this ticket without revenue. It is held that the initial carrier must pay the cost of the return ticket.

STATE COMMISSIONS.

The State Railroad Commission of Georgia has ordered the railways centering in Atlanta to publish a joint passenger train time-table in at least one of the daily papers of the city.

A. W. Campbell, deputy minister of public works of Ontario, Can., has been appointed deputy minister of railways and canals of Canada, succeeding N. J. Butler, recently resigned.

The State Railroad Commission of Georgia has issued an order requiring the railways to report each week all late passenger trains, and also to report by wire or by other prompt method, every accident causing death or injury. Monthly reports of accidents are required, for each month, within ten days after the close of the month.

The New York State Public Service Commission, First district (New York City), has asked the legislature to appropriate $600,000 for the elimination of grade crossings within the limits of New York City. It is proposed to divide this sum between the different counties within the city as follows: Queens, $400,000; Kings, $50,000; Richmond, $50,000; New York, $100,000.

The South Dakota Railway Commission has issued an order fixing a distance tariff on coal hauled in the territory west of the Missouri river in South Dakota. The following figures indicate the extent of the reduction: Fifty miles, present rate $1.60, new rate $1.20; 100 miles, present rate $2.60, new rate $1.90; 200 miles, present rate $4, new rate $2.80; 300 miles, present rate $5, new rate $3.50; 400 miles, present rate $6.10, new rate $4.30; 500 miles, present rate $6.60, new rate $4.70.

The New York Upstate Public Service Commission has appointed Charles R. Vanneman as steam railway inspector to succeed Jefferson D. Shultz, who resigned. Mr. Shultz had been in the employ of the board of railway commissioners and the public service commission continuously since February 1, 1899. Mr. Vanneman is a graduate of the College of Civil Engineering of Cornell and began work in the maintenance of way department of the Pennsylvania Railroad. He was promoted to assistant supervisor of the Northern Central at Elmira in January, 1906. From 1907 to 1909 he was engineering examiner and principal assistant to the chief examiner of the State Civil Service Commission at Albany, and was later acting chief examiner for that commission. At the present time he is employed as assistant engineer in the department of state engineer and surveyor.

New York: Extra Fare on Train Approved.

James Morris v. the Buffalo, Lockport & Rochester. Opinion by Commissioner Decker.

An interurban railway is entitled to make proper regulations for the collection of its fares, and requiring a passenger at a ticket station to purchase a ticket for delivery to the conductor with provision in case of failure for collection of an excess charge of five cents to be refunded at any ticket office on demand is reasonable.

A time limitation for redemption of duplex excess fare re-

ceipts should be sufficiently long to cover inadvertent omissions to promptly present the duplex receipts for redemption. Respondent's time limitation of 30 days for redemption of its duplex excess fare receipts held unreasonable and unjust, and such time limitation to be reasonable and just should not be less than three months from the date of issue and should be plainly shown on respondent's duplex receipts.

COURT NEWS.

The supreme court of Minnesota has rendered a decision upholding the constitutionality of the Minnesota reciprocal demurrage law. The decision was made in the case of the Chicago, Rock Island & Pacific versus the Hardwick Farmers' Elevator Company. The elevator company sued the railway under the provisions of the reciprocal demurrage act for $218 for delay in furnishing cars.

Judge T. S. Maxey, of the federal court, made a ruling at San Antonio, Tex., on January 28, that the lease of the Galveston, Harrisburg & San Antonio to the Southern Pacific Company "is contrary to public policy, null and void." The ruling was made in the case of Thomas H. Hubbard et al. versus the Galveston, Harrisburg & San Antonio, a suit filed for interest on $2,000,000 of the second mortgage bonds of the G., H. & S. A., which, it was alleged, has not been paid since the Southern Pacific leased the road in 1885. The court was asked to decree that the earnings of all of the roads controlled by the Southern Pacific Company be applied to the payment of this interest. The court held that the Galveston, Harrisburg & San Antonio Company had no power to lease the property of this road to the Southern Pacific and that, therefore, the complainants had no claim upon the earnings of any other property controlled by the Southern Pacific. As the suit was not brought for the purpose of determining the legality of the control by the Southern Pacific of the G., H. & S. A., the ruling is collateral, and will not have any direct effect on the relations of the two companies.

United States Supreme Court: Car Distribution.

The Interstate Commerce Commission, appellant, v. the Illinois Central. Appeal from the circuit court of the United States for the Northern district of Illinois. Opinion by Justice White.

Whether a duty rested upon the Illinois Central Railroad Company to obey an order made by the Interstate Commerce Commission is the question here to be decided.

On the ground that preferences were created and discriminations engendered by regulations established by the railway company concerning the daily distribution of coal cars to mines along its line in periods when the supply of such cars was inadequate to meet the demand upon it for the movement of coal, the order in question commanded the railway company to desist from enforcing the regulations found to be preferential, and for a future period of two years to deliver cars to mines along its line in conformity with the rule announced by the commission.

A clearer perception of the questions to be considered will be afforded by giving a brief statement of the cause of car shortage referred to, accompanied with a mere outline of the steps generally taken by carriers to deal with the subject and the particular method applied by the Illinois Central prior to the date when the complaint was made against it, concerning which the order previously referred to was entered.

It is conceded in argument that bituminous coal mines, which are the character of mines here involved, must dispose of their product as soon as the coal is delivered at the surface, as it is not practicable for an operator to store such coal, and the amount that a mine will produce is therefore directly dependent upon the quantity that can be taken away day by day. As a result of this situation it is also conceded that railways upon whose lines coal mines are situated pursue a system by which daily deliveries of cars, based upon requisitions of the respective mines, are made to such mines to permit of the removal of their available output for that day.

Notwithstanding full performance by railway carriers of the duty to have a legally sufficient supply of coal cars, it is conceded that unforeseen periods arise when a shortage of such cars to meet the demand for the transportation of coal takes place. * * *

It is disclosed that the railways of the United States generally, at various times, put in force regulations for the distribution of coal cars. Generally speaking, these regulations provide for fixing the capacity of coal mines in order to determine the number of cars to which each might normally be entitled to daily move its output of coal. And these regulations also provide for a method of determining the *pro rata* share of the cars daily allotted for distribution in times of car shortage. Neither the method by which capacity was to be ascertained nor the regulation for daily distribution upon the basis of such capacity in case of shortage were identical among the various railway systems of the United States. * * *

In a general sense, however, all the regulations of the various railways, either for ascertaining the capacity of coal mines or in order to determine the *pro rata* share for daily distribution of cars to the respective mines in case of shortage dealt with four classes of cars: 1, system cars, that is, cars owned by the carrier and in use for the transportation of coal; 2, company fuel cars, that is, cars belonging to the company and used by it when necessary for the movement of coal from the mines on its own line, and which coal had been bought by the carrier and was used solely for its own fuel purposes; 3, private cars, that is, cars either owned by coal mining companies or shippers or consumers, and used for the benefit of their owners in conveying coal from the mines to designated points of delivery; 4, foreign railway fuel cars, that is, cars owned by other railway companies and which were by them delivered to the carriers on whose lines mines were situated, for the purpose of enabling the cars to be loaded with coal and returned to the company by whom the cars had been furnished, the coal being intended for use as fuel by such foreign railway companies.

The various regulations, irrespective of minor differences between them, fell upon one or the other side of this broad line of division. One system took into account class 2, the fuel cars of the carrier, class 3, the private cars, and class 4, the cars of foreign railways, and deducted from the rated capacity of the mine the sum of coal delivered by that mine in such cars, and upon the basis thus resulting apportioned ratably in case of shortage the system cars, that is, those embraced in class 1. On the other hand the other class of regulation not only took no account of the cars in classes 2, 3 and 4, as a means of rating the capacity of the mine, but moreover did not charge against any mine, for the purpose of ascertaining the daily *pro rata* of the cars to which such mine was entitled, any car whatever furnished such mine on such day embraced within classes 2, 3 and 4, that is, any company fuel car, foreign railway fuel car or private car. * * *

Previous to 1907 the railway commission of the state of Ohio filed with the Interstate Commerce Commission two complaints against the Hocking Valley and another railway company. These complaints were based upon the ground that the failure of the railways in times of car shortage to include in the *pro rata* of cars for distribution foreign railway fuel cars and private cars, and to charge the mines which had received such cars with the same as part of their distributive share, created an undue preference and worked unjust discrimination in violation of the act to regulate commerce. On July 11, 1907, the report and opinion of the commission was announced in the cases referred to. 12 I. C. C., Rep. 398. It was declared that the complaints were well founded, and the relief prayed was awarded. Nine days afterwards—presumptively in ignorance of the finding of the commission just referred to—the Illinois Central promulgated rules governing the distribution of cars to coal mines. Although by these rules foreign fuel cars, private cars and company fuel cars were not taken into account in ascertaining the capacity of a mine or mines, such cars were expressly directed not to be counted for the purpose of the daily distribution of cars among the respective mines. * * *

On October 31, 1907, the Illinois Collieries Company filed with the Interstate Commerce Commission a complaint against the Illinois Central. The regulations of the railway company as to the distribution of coal cars were assailed as unjustly

discriminatory in violation of the act to regulate commerce, particularly as respected the practice of not taking into consideration foreign railway fuel cars and private cars in determining the distribution of coal cars among the various coal operators along the lines of the railway on interstate shipments of coal. It appears that the complaint just referred to was heard before the commission, with two other complaints against other railways involving the same general subject. In its report, which was filed in all three of the cases on April 13, 1908 (13 I. C. C., Rep. 451), the commission held that not to count in times of car shortage when the daily distributions were made against the mine receiving the same company fuel cars, foreign railway fuel cars and private cars was a violation of the act to regulate commerce. In announcing this conclusion reference was made to the previous opinion of the commission in the Hocking Valley case, *supra*, and it was declared that the Illinois Central Railroad Company on the hearing before the commission had conceded the controlling effect of the previous ruling of the commission. Considering the temporary injunction [restraining the Illinois Central from putting in effect the rules of the I. C. C.] issued by the circuit court of the United States for the Northern district of Illinois, the commission declared that in view of the decision of this court in the case of the *Texas & Pacific Railroad Company v. Abilene Cotton Oil Co.*, 204 U. S. 426, it was the duty of the commission to order the carrier to desist from the unlawful discrimination. * * *

The order of the commission, as heretofore stated, therefore not only directed the desisting from the practice of failing to take into account the foreign railway fuel cars, private cars and the company fuel cars, but also required the carriers to establish regulations for a period of two years from July 1, 1908, providing for the counting of all such cars. The general scope of the order was, however, qualified by expressly authorizing a railway company to deliver to a particular mine all the foreign railway fuel cars, the private cars and the company fuel cars consigned or assigned to said mine, even although the number thereof might exceed the *pro rata* share of the cars attributable to said mine when ascertained by taking into account all the cars which the order required to be considered. Where, however, the number of such cars was less than the *pro rata* share of the mine the order only permitted the carrier to add a sufficient number of system cars to make up the rightful *pro rata* number.

Being unwilling to comply with the order of the commission, the Illinois Central Railroad Company commenced the suit which is now before us to enjoin in all respects the enforcement of the order of the commission. * * * Besides charging that the order to count the company fuel cars was unjust, unreasonable, etc., it was averred that the attempt of the commission to deal with such cars was beyond its power, and was but an effort to deprive the company of its lawful right to freely contract for the purchase of the fuel necessary for the operation of its road. * * * The commission answered by asserting the validity in all respects of the order by it made, substantially upon the grounds which had been set out in its report and opinion announced when the order was made. All the averments in the complaint as to want of power were traversed and it was expressly charged that the subject of the distribution of coal cars as dealt with by the order was within the administrative power delegated to the commission by the terms of the act to regulate commerce. * * * The question was submitted at the same time with one brought by the Chicago & Alton, involving a similar question, to a circuit court held by Judges Grosscup, Baker and Kohlsaat. A single opinion was announced in both cases. While deciding that the complainants were not entitled to relief in so far as the order of the commission concerned the counting of foreign railway fuel cars and private cars, it was yet held that the railway companies were entitled to an injunction restraining the enforcement of the orders of the commission in so far as they directed the taking into account of the cars employed by the company in hauling its own fuel. The conclusion on this latter subject was based upon the theory that, as the railway companies took the coal which they bought for their own use from the tipple of a coal mine, and thereafter moved it for their own account and not for commercial purposes, that the cars used for that purpose could not be treated as being engaged in commerce, as "commerce under these circumstances ends at the tipple." * * *

And in accord with this reasoning it was in conclusion remarked that the complainants as to the cars used for hauling their fuel were entitled to an injunction "against their being compelled to take fuel cars into consideration except as a means in determining the true capacities of the mines to tender coal to them for transportation in commerce."

From the final decree enjoining the commission from enforcing its order, in so far as it directed the taking into account the company fuel cars in the distribution of coal cars in times of car shortage and in so far as it directed the future taking such cars into account, the Interstate Commerce Commission appeals. * * *

In consequence of one of the comprehensive amendments to the act to regulate commerce, adopted in 1906 (Sec. 15, Act June 19, 1906, 34 Stat. 589), it is now provided that "all orders of the commission, except orders for the payment of money, shall take effect within such reasonable time, not less than 30 days, and shall continue in force for such period of time not exceeding two years, as shall be prescribed in the order of the commission, unless the same shall be suspended or set aside by a court of competent jurisdiction." The statute endowing the commission with large administrative functions, and generally giving effect to its orders concerning complaints before it without exacting that they be previously submitted to judicial authority for sanction, it becomes necessary to determine the extent of the powers which courts may exert on the subject.

Beyond controversy, in determining whether an order of the commission shall be suspended or set aside, we must consider, *a*, all relevant questions of constitutional power or right; *b*, all pertinent questions as to whether the administrative order is within the scope of the delegated authority under which it purports to have been made; and, *c*, a proposition which we state independently, although in its essence it may be contained in the previous one, viz., whether, even although the order be in form within the delegated power, nevertheless it must be treated as not embraced therein, because the exertion of authority which is questioned has been manifested in such an unreasonable manner as to cause it, in truth, to be within the elementary rule that the substance, and not the shadow, determines the validity of the exercise of the power. *Postal Telegraph Company v. Adams*, 155 U. S. 688, 698. Plain as it is that the powers just stated are of the essence of judicial authority, and which, therefore, may not be curtailed, and whose discharge may not be by us in a proper case avoided, it is equally plain that such perennial powers lend no support whatever to the proposition that we may, under the guise of exerting judicial power, usurp merely administrative functions by setting aside a lawful administrative order upon our conception as to whether the administrative power has been wisely exercised.

Power to make the order and not the mere expediency or wisdom of having made it, is the question. While, as we have seen, the court below reasoned that the transportation of coal bought from a mine by the railway company for its own use, after delivery to it in its coal cars at the tipple, was not commerce, because "commerce under these circumstances ends at the tipple," it yet reasoned that such coal was within the control of the interstate commerce law to the extent that a regulation compelling its consideration, for the purpose of rating the capacity of a mine as a basis for fixing its *pro rata* share of cars in times of shortage, would be valid. Because of this reasoning, it is insisted, it appears that the court below but substituted a regulation which it deemed wise for one which it considered the commission had inexpedientely adopted, and this upon the assumption by the court that its authority was not limited to determining power. Without intimating an opinion as to the merits of the proposition, we put it aside as irrelevant, since we must decide whether the action of the court below was correct, irrespective of the reasoning by which such action was induced. * * *

We think the issues for decision will be best disposed of by at once considering the contentions advanced by the railway company to establish that there was a want of power in the commission to make that portion of the order which the court below enjoined. The contentions on this subject are

stated in argument in many different forms, and if not in some respects contradictory, are, at all events, confusing and often illusive, since, while seemingly addressed to power, they virtually intermingle power and expediency as if they were one and the same thing. We shall not, therefore, in making an analysis of the contentions, follow their mere form of statement, but shall treat them all as reducible to two propositions, viz.: First.—That the act to regulate commerce has not delegated to the commission authority to consider, where a complaint is made on such subject, the question of the distribution of company fuel cars in times of car shortage as a means of prohibiting unjust preference or undue discrimination. Second.—That even if such power has been delegated to the commission by the act to regulate commerce, the order whose continued enforcement was enjoined by the court below was beyond the authority conferred by the statute. * * *

When coal is received from the tipple of a coal mine into coal cars by a railway company, and the coal is intended for its own use and is transported by it, it is said there is no consignor, no consignee and no freight to be paid, and therefore, although there may be transportation, there is no shipment, and hence no commerce. In changed form these propositions but embody the reasoning which led the court below to its conclusion that, under the circumstances, commerce ended at the tipple of the mine. The deduction from the proposition is, as the movement of coal under the conditions stated is not commerce, it is therefore not within the authority delegated to the commission by the act of Congress, as all such acts have relation to the regulation of commerce, and do not, therefore, embrace that which is not commerce. It is to be observed, in passing, that if the proposition be well founded, it not only challenges the authority of the commission, but extends much further, and in effect denies the power of Congress to confer authority upon the commission over the subject. In all its aspects the proposition calls in question the construction given to the law by the commission in every case where the subject has been before it, and also assails the correctness of numerous decisions in the lower federal court, to which we have previously referred, where the subject, in various forms, was considered. * * *

Under these conditions, it is clear that doubt, if it exist, must be resolved against the soundness of the contentions relied on. But that rule of construction need not be invoked, as we think, when the erroneous assumption upon which the proposition must rest is considered, its unsoundness is readily demonstrable. That assumption is this, that commerce in the constitutional sense only embraces shipment in a technical sense, and does not, therefore, extend to carriers engaged in interstate commerce, certainly in so far as so engaged, and the instrumentalities by which such commerce is carried on, a doctrine the unsoundness of which has been apparent ever since the decision in *Gibbons v. Ogden*, and which has not since been open to question. It may not be doubted that the equipment of a railway company engaged in interstate commerce, included in which are its coal cars, are instruments of such commerce. From this it necessarily follows that such cars are embraced within the governmental power of regulations which extends, in time of car shortage, to compelling a just and equal distribution and the prevention of an unjust and discriminatory one.

The corporation as a carrier engaged in interstate commerce being then, as to its interstate commerce business, subject to the control exerted by the act to regulate commerce, and the instrumentalities employed for the purpose of such commerce, being likewise so subject to control, we are brought to consider the remaining proposition, which is:

Second.—*That even if power has been delegated to the commission by the act to regulate commerce, the order whose continued enforcement was enjoined by the court below was beyond the authority delegated by the statute.*

In view of the facts found by the commission as to preferences and discriminations resulting from the failure to count the company fuel cars in the daily distribution in times of car shortage, and in further view of the far-reaching preferences and discriminations alleged in the answer of the commission in this case, and which must be taken as true, as the cause was submitted on bill and answer, it is beyond controversy that the subject with which the order dealt was within the sweeping provisions of section 3 of the act to regulate commerce prohibiting preferences and discriminations. But it is contended that although this be the case, as the order of the commission not only forbade the preferences and discriminations complained of, but also commanded the establishment of a rule, excluding such discriminations for a future definite period of not exceeding two years, the order transcended the authority conferred upon the commission. This proceeds upon the assumption that section 15 of the act to regulate commerce, as enacted by the act of June 29, 1906, while conferring upon the commission the authority, upon complaint duly made, to declare a rate or practice affecting rates illegal, and to establish a new and reasonable rule or practice affecting such rates for a term not exceeding two years, has no relation to complaints concerning preferences or discriminations, unless such practices, when complained of, are of a character to affect rates, which it is insisted is not here the case. * * *

The contention gives to the words found in the earlier part of the section [in question] "any regulation or practice whatsoever of such carrier or carriers affecting such rates," a dominant and controlling power so as to cause them to limit every other provision in the section, however general in its language. We do not stop to critically examine the provision relied upon for the purpose of pointing out, as a matter of grammatical construction, the error of the contention, because we think, when the text of the section is taken into view and all its provisions are given their natural significance, it obviously appears that the construction relied upon is without foundation, and that to sustain it would be to frustrate the very purpose which it is clear, when the entire provision is considered, it was designed to accomplish, and thus would be destructive of the plain intent of Congress in enacting the provision. The antecedent construction which the interstate commission act had necessitated, and the remedial character of the amendments adopted in 1906, all serve to establish the want of merit in the contention relied upon. In addition, to adopt it would require us to hold that Congress, in enlarging the power of the commission over rates, had so drafted the amendment as to cripple and paralyze its power in correcting abuses as to preferences and discriminations which, as this court has hitherto pointed out, it was the great and fundamental purpose of Congress to further.

Conceding, for the sake of the argument, the existence of the preferences and discriminations charged, it is insisted, when the findings made by the commission are taken into view and the pleadings as an entirety are considered, it results that the discriminations and preferences arose from the fact that the railway company chose to purchase its coal for its fuel supply from a particular mine or mines, and that, as it had a right to do so, it is impossible, without destroying freedom of contract, to predicate illegal preferences or wrongful discriminations from the fact of purchase. But the proposition overlooks the fact that the regulation addresses itself, not to the right to purchase, but to the duty to make equal distribution of cars. The right to buy is one thing and the power to use the equipment of the road for the purpose of moving the articles purchased in such a way as to discriminate or give preference are wholly distinct and different things. * * * At best, these arguments but suggest the complexity of the subject, and the difficulty involved in making any order which may not be amenable to the criticism that it leads to or may beget some inequality. Indeed, the arguments just stated, and others of a like character which we do not deem it essential to specially refer to, but assail the wisdom of Congress in conferring upon the commission the power which has been lodged in that body to consider complaints as to violations of the statute and to correct them if found to exist, or attack as crude or inexpedient the action of the commission in performance of the administrative functions vested in it, and upon such assumption invoke the exercise of unwarranted judicial power to correct the assumed evils. It follows from what we have said that the court below erred in enjoining the order of the commission, in so far as it related to company fuel cars, and its decree is therefore reversed, and the case remanded for further proceedings in conformity with this opinion.

Justice Brewer dissents.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. F. Holden, vice-president and general manager of the Midland Valley, with office at Muskogee, Okla., has resigned to accept service elsewhere.

W. L. Greenhalgh, auditor of the Mississippi Central, with office at Hattiesburg, Miss., has resigned to become assistant auditor of the Wiggans Ferry Company at St. Louis, Mo.

H. M. Andrews, assistant to the general solicitor of the Erie at New York, has been appointed an assistant general solicitor, with office at New York, succeeding John W. Dixon, resigned, to go to another company.

L. H. Attwell, Jr., secretary and auditor of the Trinity & Brazos Valley, with office at Houston, Tex., has been appointed also auditor of the Galveston Terminal Railway, succeeding James Van den Broeck, resigned to accept service elsewhere.

H. M. George, secretary and treasurer of the Delaware & Eastern at New York, has been elected vice-president, G. A. Hilton has been elected secretary, A. S. Brown has been elected treasurer, and E. T. Allwood has been appointed auditor of freight and passenger receipts, all with offices at New York.

W. M. Whitenton, manager of the Southern and Choctaw districts of the Chicago, Rock Island & Pacific, at El Reno, Okla., has been elected vice-president and general manager of the Chicago, Rock Island & Gulf, with office at Fort Worth, Tex., succeeding J. W. Robins, resigned. A photograph and sketch of Mr. Whitenton's railway life was published in our issue of January 28, page 205.

As noted in another column, Darius Miller, first vice-president of the Chicago, Burlington & Quincy, and the Colorado & Southern, has been elected president of both companies, succeeding George B. Harris, who remains as chairman of the executive committee; H. E. Byram, assistant to first vice-president, of the Chicago, Burlington & Quincy, with jurisdiction over the operating departments, has been elected vice-president of that company and the Colorado & Southern, succeeding Darius Miller and C. G. Burnham, assistant to first vice-president of the C. B. & Q., with jurisdiction over the traffic departments, has been elected vice-president of both companies, succeeding Daniel Willard, resigned, to become president of the Baltimore & Ohio.

The accounting department of the New York Central & Hudson River has been reorganized as follows: Richard A. White, auditor at New York, has been appointed general auditor; Charles H. Chambers, auditor of disbursements, succeeds Mr. White; James H. Foulds, Jr., succeeds Mr. Chambers, and Malcolm R. Connell has been appointed assistant auditor of disbursements; Arthur L. Linn, Jr., has been appointed auditor, also auditor of subsidiary lines; Robert L. Calkins remains as freight and claim agent, and John K. Lovell has been appointed assistant freight claim agent; William T. McCulloch, auditor of freight accounts, has been appointed auditor of revenue; Frank E. Briggs succeeds Mr. McCulloch; James L. Ferris remains as auditor of passenger accounts, and John L. Snow has been appointed assistant auditor of passenger accounts; John F. Fairlamb, general passenger agent, has been appointed auditor of miscellaneous accounts; William A. Cormier has been appointed assistant auditor of miscellaneous accounts, and Charles L. Cormier has been appointed chief traveling auditor, all with offices at New York.

Operating Officers.

W. C. C. Mehan, superintendent of the Grand Trunk Pacific at Melville, Sask., has been appointed a general superintendent, with office at Prince Rupert, B. C.

C. A. Brunn, superintendent of the Buffalo division of the Erie at Buffalo, N. Y., has been appointed also manager of the Union Steamboat Line, which is operated by the Erie.

W. A. Carney has been appointed trainmaster of the Southern for lines east of Huntingburg, Ind., with office at Louisville, Ky., succeeding J. F. Sheridan, resigned, to go to another company.

James Van den Broeck, auditor of the Galveston Terminal Railway at Galveston, Tex., has been appointed general manager of the Bartlett & Florence, with office at Bartlett, Tex.

W. H. Powley has been appointed assistant superintendent of the Chicago Southern and the Southern Indiana, with office at Terre Haute, Ind. The office of C. A. Wilson, trainmaster, has been abolished.

P. J. O'Brien, division superintendent of the Chicago & North Western at Baraboo, Wis., has been appointed superintendent, with office at Chicago, succeeding W. D. Beck, resigned. G. B. Vilas, assistant superintendent at Baraboo, succeeds Mr. O'Brien, and F. J. Byington, chief train despatcher at Boone, Iowa, succeeds Mr. Vilas.

G. Stoner, trainmaster of the Missouri, Kansas & Texas at Denison, Tex., has been appointed superintendent, with office at Denison, succeeding W. G. Koch, resigned to accept service elsewhere. C. H. Hurdleston, superintendent of the Trinity division at Trinity, Tex., succeeds Mr. Stoner, and W. P. Danforth, traveling engineer, succeeds Mr. Hurdleston.

John William Dean, whose appointment as general superintendent of the Denver & Rio Grande, with office at Pueblo, Colo., was announced in these columns some time ago, was born January 15, 1867, near Lexington, Mo. He received a common school education and began railway work as a messenger boy on the Chicago & Alton in 1877. He was later operator and agent on the Alton, and in 1882 went with the Kansas City, Ft. Scott & Memphis, now a part of the Frisco, first as operator and later as brakeman. For three years from 1883 he was with the Missouri Pacific as copy operator in the despatcher's office. In 1887 he was operator, and was afterwards consecutively brakeman, yardmaster, despatcher, chief despatcher and trainmaster on the Atchison, Topeka & Santa Fe until 1902, when he was appointed trainmaster and superintendent of terminals of the Denver & Rio Grande. In 1903 he was made superintendent of the Colorado & Southern, and he was superintendent of the National Railroad of Mexico from 1904 to 1905, when he became trainmaster of terminals of the Illinois Central at Memphis, Tenn. Later in the same year he was made superintendent of the Missouri Pacific at St. Louis, Mo., from which position he was promoted in November, 1909.



John W. Dean.

J. L. Truden, superintendent of the Boston & Albany at Springfield, Mass., has been appointed general superintendent, with office at Boston, succeeding William J. Fripp, promoted. S. H. Clark, trainmaster at Albany, N. Y., has been appointed superintendent of the Albany division, with office at Springfield. Thomas G. Welch has been appointed a trainmaster, with office at West Springfield, and J. H. Relyea, trainmaster at Springfield, has been transferred to Rensselaer, N. Y.

The operating department of the Norfolk & Southern has been divided into three divisions, to be known as the Northern, Southern and Electric divisions. The Northern division will include all the territory north of Washington, N. C.; the Southern division all the territory south of Washington, N. C., and the Electric division will remain as at present. The jurisdiction of R. S. Anderson, superintendent at Norfolk, Va., has been extended to Washington, N. C., in charge of the Northern division. J. B. Hutchins has been appointed trainmaster of the Northern division, with office at Edenton, N. C.,

and R. E. Mason has been appointed chief train despatcher of the Northern division, with office at Norfolk.

O. M. Laing, superintendent of the Central New England at Hartford, Conn., has been appointed general superintendent, with office at Hartford.

W. J. Fripp, general superintendent of the Boston & Albany at Boston, Mass., has been appointed general superintendent of the Eastern district of the New York Central & Hudson River, with office at Albany, N. Y., succeeding Charles F. Smith, promoted. The Mohawk division has been transferred from the Western district to the Eastern district.

The Fort Wayne division of the New York, Chicago & St. Louis has been divided into two districts and will in future be known as the Fort Wayne district and the Chicago district. H. N. Williams has been appointed trainmaster of the Fort Wayne district, including Fort Wayne yard, and E. S. Kirby has been appointed trainmaster of the Chicago district, both with offices at Fort Wayne, Ind.

E. P. Bracken, general superintendent of the Wyoming district of the Chicago, Burlington & Quincy at Alliance, Neb., has been appointed assistant general manager of the lines east of the Missouri river, with office at Chicago. E. E. Young, superintendent of the Sheridan division, with office at Sheridan, Wyo., succeeds Mr. Bracken. F. G. Robbins, superintendent at Sterling, Colo., succeeds Mr. Young, and C. D. Peckenbaugh, trainmaster at Sheridan, succeeds Mr. Robbins.

Charles F. Smith, general superintendent of the Eastern district of the New York Central & Hudson River at New York, has been appointed general superintendent of passenger transportation of that company and the Boston & Albany, with office at New York. Mr. Smith was born on June 17, 1873, in New York, and from 1879 to 1886 attended the public schools in that city. He has been on the New York Central since November 11, 1886, when he began railway work as a messenger boy. The following year he was made a clerk in the superintendent's office of the Harlem division, and in 1889 he became stenographer to the assistant general superintendent and the general superintendent. A year later he was appointed clerk and timekeeper of the Hudson division, remaining in that position until 1893, when he was appointed secretary to the general manager. Two years later he was appointed chief clerk to the superintendent of the Western division, and in 1898 became chief clerk to the general superintendent. From 1902 to 1903 he was superintendent of passenger transportation, when he became assistant general superintendent. Leaving that position in 1906 he became general superintendent of the Eastern district, which position he held at the time of his recent appointment. He will have charge of passenger schedules and the distribution and assignment of all passenger train equipment, as well as general supervision of train service in the handling of baggage, express and United States mail, reporting to the assistant general managers of transportation of the above lines.



C. F. Smith.

Traffic Officers.

J. W. Thomas, general freight agent of the Jonesboro, Lake City & Eastern, with office at Jonesboro, Ark., has resigned.

H. B. Bryning has been appointed a traveling passenger agent of the Northern Pacific, with office at Kansas City, Mo.

Woodworth Clum has been appointed industrial agent of the Buffalo, Rochester & Pittsburgh, with office at Rochester, N. Y.

Charles J. Helber has been appointed a traveling passenger agent of the Wabash, with office at Denver, Colo., succeeding J. B. Muckle, promoted.

J. L. Bridges, city passenger agent of the Pennsylvania Lines at St. Louis, Mo., has been appointed a traveling passenger agent, with office at Dallas, Tex.

F. M. Williams has been appointed general freight and passenger agent of the St. Louis, Rocky Mountain & Pacific, with office at Raton, N. Mex., succeeding W. A. Gorman, deceased.

B. F. Nevins, commercial agent of the Denver & Rio Grande at Salt Lake City, Utah, has been appointed general live stock agent of the Western Pacific, with office at San Francisco, Cal.

F. H. Stocker, agent of the New York, Chicago & St. Louis at San Francisco, Cal., has been appointed manager of the Traders' Despatch, with office at Chicago, succeeding B. E. Morgan, resigned to accept service elsewhere.

M. J. Hannam, commercial agent of the Minneapolis & St. Louis and the Iowa Central at St. Paul, Minn., has been transferred to Minneapolis, Minn. B. F. Moffatt, traveling freight agent at Marshalltown, Ia., succeeds Mr. Hannam, and R. F. Salter succeeds Mr. Moffatt.

Robert H. Mills, general agent freight department of the Atchison, Topeka & Santa Fe at Philadelphia, Pa., has been appointed general eastern freight agent, with office at New York, succeeding James S. Bartle, promoted. C. D. Buxton, traveling freight agent, succeeds Mr. Mills, with office at Philadelphia.

Gerrit Fort, assistant to vice-president in charge of traffic of the New York Central & Hudson River, the Boston & Albany and the West Shore, at New York, has been appointed general passenger agent, succeeding J. F. Fairlamb, transferred. L. F. Vosburgh, general eastern passenger agent, has been appointed assistant general passenger agent, both with offices at New York.

George W. Squiggins, district passenger agent of the Baltimore & Ohio, at Baltimore, has been appointed assistant general passenger agent, with jurisdiction over district and traveling passenger agents east of Parkersburg, Wheeling and Connellsville, and will perform such other duties as may be assigned to him. E. A. Walton, formerly secretary to the president, succeeds Mr. Squiggins, both with offices at Baltimore.

R. W. Hockaday, general freight and general ticket agent in Kansas of the Missouri, Kansas & Texas at Parsons, Kan., has been appointed industrial commissioner, with office at St. Louis, Mo., and he has been appointed to a similar position on the Texas line, with office at Dallas, Tex. L. B. Chipley, commercial agent at Oklahoma City, Okla., succeeds Mr. Hockaday, and J. J. Hartnett, traveling freight agent at Oklahoma City, succeeds Mr. Chipley.

Charles I. Allen, general eastern agent of the Chicago, St. Paul, Minneapolis & Omaha at New York, having resigned, that office has been abolished. F. D. Robinson, traveling freight agent at Mankato, Minn., having resigned, H. N. Drummond, traveling freight agent in other territory, has been temporarily placed in charge of the freight traffic on the Minnesota & Iowa division north of Worthington, Minn., exclusive of St. Paul, Minneapolis and Minnesota transfer, with office at Mankato.

J. C. Burnett, division freight agent of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed an assistant general freight agent, with office at Topeka. B. F. E. Marsh succeeds Mr. Burnett. R. H. Mills, general agent in the freight department at Philadelphia, Pa., has been appointed general eastern freight agent, with office in New York, succeeding J. S. Bartle, promoted. Cameron B. Buxton, traveling freight

agent, succeeds Mr. Mills. W. P. Matchette has been appointed general agent, with office at Trinidad, Col., succeeding W. M. Smith, deceased.

Roland G. Brown, whose appointment as general freight agent of the Chicago, Rock Island & Pacific, with office at Kansas City, Mo., has been announced in these columns, was born June 9, 1865, in New York City. He received a high school education and began railway work in November, 1883, as messenger boy in the claim department of the Minneapolis & St. Louis at Minneapolis, Minn. He was then consecutively voucher clerk, investigator, rate clerk, chief clerk in the general freight office, traveling freight agent and assistant general freight agent. From April to June, 1902, he was secretary for the Wells Flour Mill Company at Wells, Minn. He then returned to railway work with the Burlington, Cedar Rapids & Northern at Cedar Rapids, Iowa, and went to Minneapolis a few days afterward as general northwestern agent of the Chicago, Rock Island & Pacific, when that company absorbed the Burlington, Cedar Rapids & Northern; in January, 1903, he was made assistant general freight agent at Minneapolis, which position he held until his recent promotion to general freight agent at Kansas City.



R. G. Brown.

James Webster, whose appointment as assistant freight traffic manager of the New York Central Lines West of Buffalo, with office at Chicago, has been announced in these columns, was born December 14, 1856, near Owen Sound, Ont. He began railway work in 1874 as telegraph operator on the Toronto, Grey & Bruce, now a part of the Canadian Pacific, and later went with the Great Western of Canada, now a part of the Grand Trunk. In 1882 he became a rate clerk for the New York, Chicago & St. Louis, and was then consecutively chief clerk, commercial agent and assistant general freight agent at Cleveland, Ohio. In July, 1904, he was made general freight agent at Cleveland, from which position he has recently been promoted to assistant freight traffic manager of the New York Central Lines West of Buffalo.



James Webster.

Engineering and Rolling Stock Officers.

J. C. Miller, district master mechanic of the Chicago, Milwaukee & St. Paul, with office at Milwaukee, Wis., has retired.

R. A. Klein has been appointed a supervisor of Division No. 1 of the West Jersey & Seashore, with office at Haddonfield, N. J., succeeding G. M. Ball, Jr., promoted. R. L. Kell has been appointed assistant supervisor of Division No. 3, with office at Millville, succeeding E. C. Silvius, transferred.

W. R. Hastings, general signal inspector of the Chicago, Rock Island & Pacific, has been appointed engineer of electric signals, with office at Chicago, succeeding E. W. Kolb, resigned, to go to another company; S. Misskelly, supervisor of signals at Rock Island, Ill., succeeds Mr. Hastings; G. W. Trout, acting signal supervisor at Trenton, Mo., succeeds Mr. Misskelly, and C. F. Duffy succeeds Mr. Trout, with office at Trenton.

J. E. Buker, having resigned as superintendent of car department of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, to become first vice-president of the Chicago Car Heating Co., his former position has been abolished, and the duties of this position have been assumed by the superintendent of machinery. The position of J. M. Borrowdale, assistant superintendent car department, has also been abolished and Mr. Borrowdale will report to the superintendent of machinery and perform such duties as may be assigned to him.

L. A. Richardson, master mechanic of the Missouri division of the Rock Island lines at Trenton, Mo., has been appointed master mechanic of the Chicago terminal and the Illinois division, with office at Chicago, succeeding D. H. Speakman, transferred. R. L. Stewart, master mechanic of the Kansas City terminal and the St. Louis division at Armourdale, Kan., succeeds Mr. Richardson. E. J. Harris, master mechanic of the Iowa and Des Moines Valley divisions at Valley Junction, Iowa, succeeds Mr. Stewart. H. J. Osborne, master mechanic of the Nebraska and Colorado divisions at Goodland, Kan., succeeds Mr. Harris, and D. H. Speakman succeeds Mr. Osborne.

Purchasing Officers.

C. H. Kenzel has been appointed assistant purchasing agent of the Elgin, Joliet & Eastern, with office at Chicago.

H. A. Fabian, assistant to president of the New York, New Haven & Hartford and the Central of New England at New Haven, Conn., has been appointed to the new position of manager of purchases and supplies of the New York, New Haven & Hartford and the Boston & Maine, with office at Boston, Mass., effective March 1. He also holds the same position on the controlled lines of the New York, New Haven & Hartford, namely, Central New England, New England Navigation Co. and the street railways, the Connecticut Co., New York & Stanford Ry. Co., Rhode Island Co. and the Housatonic Power Co. as well as for the controlled lines of the Boston & Maine, namely, Maine Central, Washington County and the Sommerset Railway Co.

OBITUARY.

George B. P. Jackson, general attorney for Missouri of the Missouri, Kansas & Texas, with office at St. Louis, Mo., died in St. Louis on January 26.

Jackson Smith, vice-president of the Oregon Trunk Line, with office at Portland, Ore., died on January 28, at Portland, of heart disease. Mr. Smith was born in 1862 at Marion, S. C., and at one time was in the traffic department of the Atlantic Coast Line, and later was with the Isthmian Canal Commission in charge of the labor department at Ancon, Canal Zone, Panama.

James Keys, assistant engineer in charge of the bridge department of the Union Pacific, died at Excelsior Springs, Mo., on December 27, 1909. After graduating from the Lehigh University Mr. Keys entered the employ of the American Bridge Co. at Pencoyd, Pa., leaving that company to enter the bridge department of the Great Northern at St. Paul, Minn. In March, 1901, he was a designer in the bridge department of the Union Pacific, and had charge of that department at the time of his death. Mr. Keys was also vice-chairman of the committee on wooden bridges and trestles of the American Railway Engineering and Maintenance of Way Association.

Railway Construction.

New Incorporations, Surveys, Etc.

Arizona Eastern.—See Southern Pacific.

Buckhannon & Northern.—An officer writes that it has not yet been definitely decided when work will be started on a line from the west side of the Monongahela river in Pennsylvania at the West Virginia state line, southwest via Morgantown, W. Va., and Rivesville to Fairmont, about 35 miles. There will be a number of small bridges. J. T. Blair, president, and S. D. Brady, chief engineer, both at Parkersburg, W. Va.

California Roads (Electric).—C. E. Skinner, of Eureka, Cal., who is associated with residents at that place, is back of a project to build an electric railway from Eureka east to Redding or to Red Bluff. It is understood that the line will cost $7,000,000.

Canadian Pacific.—According to press reports from Winnipeg, Man., the Canadian Pacific is planning to spend $30,000,000 in western Canada during 1910 for extensions into new settlements, bridges, shops and double-tracking the main line.

Chicago, Memphis & Gulf.—An officer of this company, which was formerly known as the Dyersburg Northern, is quoted as saying that an extension is to be built from the southern terminus at Dyersburg, Tenn., south via Memphis to a point in Mississippi. Work is said to be under way from the northern terminus at Tiptonville, Tenn., northeast to Hickman, Ky., 21 miles. (April 9, p. 820.)

Chicago, Rock Island & Pacific.—An officer is quoted as saying that the company intends to eventually ballast the entire line between St. Louis, Mo., and Kansas City. The work includes widening all embankments, taking out depressions and filling in many long and high trestles. Some reinforced concrete culverts will be put in and about 100 miles of 85-lb. new rail will be laid. (Jan. 14, p. 113.)

Clarion & East Brady (Electric).—It is understood that the construction of this line is assured. The projected route is from Clarion, Pa., southwest via Reidsburg, Sligo and Rimersburg to East Brady. Connection is to be made at Reidsburg with the Franklin & Clearfield. There is to be a 600-ft. trestle at Reidsburg and three other trestles. (Aug. 16, p. 871.)

Dyersburg Northern.—See Chicago, Memphis & Gulf.

East Texas Traction.—Organization has not yet been completed by this company, which proposes to build from Dallas, Tex., east to Terrell, 33 miles. S. B. Marchall, president, Mesquite, Tex., and W. Crooks, engineer in charge, Scollard building, Dallas.

Gulf, Colorado & Santa Fe.—According to press reports, bids were recently opened for the construction of about 100 miles of line from Lometa, Tex., via San Saba and Brady to a point near Eden. Surveys have been finished and it is thought that the construction work will be pushed to early completion.

International & Great Northern.—According to press reports the Gould interests have under consideration the question of building an extension from Laredo, Tex., into Mexico, southeast through the states of Tamaulipass and Vera Cruz. It is thought that the line may be continued to the port of Tampico on the Gulf, or further south to the City of Mexico. It is said that about 120 miles of grading was furnished some years ago from Nuevo Laredo, Mexico, to a point on the Soto la Marina river, by the Gould interests. The government concession for the proposed line has lapsed. The line is to be built to control traffic which may otherwise be diverted over the St. Louis, Brownsville & Mexico, through a direct connection with the National Railways of Mexico via the international bridge now being built over the Rio Grande river from Brownsville, Tex., to Matamoras, Mex. Reports indicate that the bridge will be completed and ready for service about June 1.

Lackawanna & Wyoming Valley.—A contract is said to have been given to P. T. McGowan, of Avoca, Pa., for relocating about one mile of this company's line between North Pittston, Pa., and Dupont station. The work, it is understood, will include filling in about 25,000 cu. yds.

Memphis, Paris & Gulf.—According to press reports, contracts have been let for an extension from the present southern terminus at Ashdown, Ark., southwest to Clarksville, Tex., including a bridge to be built over the Red river. (Sept. 10, p. 478.)

Mexican Roads.—A consular report says that a concession has been granted by the Mexican government to John Henderson and P. Sandoval, both of Nogales, Sonora, Mex., for a line from Port Lobos, on the Gulf of California, northeast via Coborca to Sasabe, on the international boundary. The concession provides that no other railway shall be built within a zone of 29 miles wide, along the entire length of the line, and includes Port Libertad, the only adjacent available harbor in that section. Track must be laid on 20 miles by April, 1911. It is understood that construction work will be started early this year. (Oct. 29, p. 828.)

Minneapolis, St. Paul & Sault Ste. Marie.—Surveys are said to be under way for cut-offs as follows, between New Richmond and Sommerset, Wis., and between Owen and Marshfield. It is said it will take about two years to finish the work.

Muscatine North & South.—An officer writes that a franchise has been granted by the city council of Burlington, Iowa, and work can now be started on extension of the road from the southern terminus at Elrick Junction, Iowa, south to Burlington, about 25 miles.

New York Subways.—A report in favor of a double-decked subway for the Lexington avenue section of the Broadway-Lexington avenue route, which is projected from the Battery, in the borough of Manhattan, north to the borough of the Bronx, has been filed with the appellate division of the supreme court by the commissioners appointed to consider that particular change in the plans originally prepared. It is necessary for the appellate division to approve the change to obviate the necessity of again getting consents of abutting property owners. (June 25, p. 1545.)

Norfolk & Western.—According to press reports, this company has authorized improvements in the Columbia district to cost $1,500,000. This includes double-tracking work between Davis Station, Ohio, which is 10 miles north of Portsmouth to Piketown; change of line from Chillicothe to Delano, and extension of culverts, etc., along the entire line. Contracts for the work were to be let early this week. It is expected to have the double-tracking finished this year. (Jan. 7, p. 68.)

Oregon & Washington.—The Oregon & Washington has made public its plans for improvements on its Seattle, Wash., terminals this year. They include the completion of the main line into Seattle, the construction of terminal yards and freight tracks, the completion of the new passenger station at Jackson street and Fourth avenue south, and also the construction of twin piers with extensive dock and wharf facilities on the company's waterfront property between King and Weller streets. The work, it is estimated, will call for an expenditure of $4,000,000. At the Argo terminal yards 15.7 acres are being graded to the adopted grade. The requisite 140,000 yards of embankment are being hauled from the main line between Black River Junction and Argo. Fifty-nine thousand lineal feet of track will be laid here at the present time. A reinforced concrete roundhouse, machine shop, brick storehouse, yardmaster's house, turntable, pumping station with a complete water system for the terminal facilities, coaling plant and shop machinery will be installed. Grading on the main line from Black River Junction to Argo will be completed by March 1. The track will be in and the road in operation in April. There remains approximately $100,000 to be expended to complete this work. The main line into the passenger sta-

tion is already graded for a double-track from Argo to Canal Waterway, and this embankment will be extended north on Fifth avenue to the passenger station during the summer. The plans require an embankment containing 180,000 cu. yds. Coach cleaning and switching yards will be provided on this line so that when service is inaugurated into the permanent depot such equipment will not have to go into the Argo yards, as at present. Freight yards will be provided in the territory bounded by Dearborn and Atlantic streets, Railroad avenue and First avenue, including a modern reinforced concrete freight house 50 x 880 feet in size and a two-story office building fronting on First avenue and Dearborn street. Over five miles of track will be provided in the freight yards, as well as a Gantry crane, scales and all other accessories. The total expenditure on these facilities will be $250,000. Further extensions of branches and spurs will be built this year from the Argo yard to Kitsap avenue, extending to the harbor line between East and West waterways; a line will be constructed from the Argo yard north on Railroad avenue to the freight yards, and service tracks and switching tracks to a total of seven miles will be put in. The most extensive and modern interlocking plant in the northwest is being designed for crossings and will be installed within the next six months. The road is proceeding with all despatch in obtaining the right-of-way for the extension into Ballard, and recently received a permit from the War Department for its proposed bridge across the Salmon Bay waterway. This extension will necessitate the early commencement of the work on the long tunnel under Seattle, and involves some extremely extensive and heavy work around the precipitous bluffs west of Ballard. The length of this Oregon & Washington tunnel under Seattle will be 6,765 ft. It will be double-track. The estimated cost is $1,600,000. The contract for the passenger station on Jackson street, between Fourth and Fifth avenues, was let on October 15 to the Thompson-Starrett Company and all material is now on the way. The depot is expected to be completed by January 1, 1911. The present plans exceed in extent and design any of those formerly considered and the station is expected to furnish terminal facilities for many years to come. In conjunction with building the depot, steel viaducts in Seattle boulevard, Fourth avenue, Jackson street and Main street are to be constructed at a total cost of $295,000, which, with the depot building, paving, umbrella sheds, driveways, etc., makes the total expenditure for passenger facilities alone $800,000.

As part, to some extent, of the terminal plans, the extensive retaining wall along the west line of Fifth avenue is to be constructed this year. Plans are complete and now in the hands of the city building department for inspection. It is proposed to make the wall of reinforced concrete, 1,681 ft. in length and of a maximum height of 49.4 ft.; it will contain 7,400 yds. of concrete and 766,000 lbs. of steel. Along its west side will be constructed a reinforced concrete bridge, with overhanging sidewalk. The total cost of this work will approximate $375,000. The final and detailed plans for the dock and wharf facilities between King and Weller streets are now receiving attention and requests for bids will be mailed within the next few weeks. Twin piers are planned, each 129 ft. wide and 800 ft. long, with a slip between of sufficient width to berth at the same time two of the largest vessels plying into Seattle. Each pier will have constructed upon it a modern warehouse, 95 ft. in width, containing the most modern appliances for the economical handling of freight and passengers. The slip will be dredged to a minimum depth of 40 ft., the material so dredged to be used in filling behind a bulkhead to be constructed well out beyond the present water line. Piling and all timbers subject to attack by teredos will be creosoted so that the work will be of the most permanent nature. The estimated cost of this work is $400,000. (Sept. 24, p. 564.)

PECOS VALLEY SOUTHERN.—Under this name a company was recently organized to build the line from Pecos, Tex., south to the Davis mountains, about 60 miles. The first section to Balmorhea, 36 miles, is expected to be finished by June of this year. A contract is said to have been entered into with W. L. Carwile, Dallas, to build the line. F. W. Johnson, W. D. Cowan, R. S. Johnson and H. Robins are said to be interested. (See Texas Roads, Jan. 28, p. 210.)

PENNSYLVANIA ROADS (ELECTRIC).—According to press reports a nine-mile electric line from Scranton, Pa., east to Moose lake is to be finished by May 1. The American Railways Co., Philadelphia, Pa., and Burke Bros. are said to be back of the project.

PRAIRIE FARM & SOUTHWESTERN.—An officer writes that contracts are to be let this spring to build from Prairie Farm, Wis., southwest to Glenwood or to Emerald, about 20 miles. Connection is to be made on the northern end with the Minneapolis, St. Paul & Sault Ste. Marie. The work includes three small bridges. G. E. Scott, president, Prairie Farm. (Jan. 28, p. 209.)

RALEIGH & SOUTHPORT.—Interests identified with this company are said to be making surveys from Fayetteville, N. C., southeast along the Cape Fear river for about 50 miles. It is understood that construction work is to be started about the middle of February. (March 19, p. 657.)

ROCKLAND COUNTY (ELECTRIC).—The New York Public Service Commission, Second district, has authorized this company to issue bonds amounting to $3,000,000. The company is also authorized to issue $1,050,000 of common stock. Of this, $415,700 is to be used for expenses in organizing and promoting the project, as well as for legal and engineering expenses. The proceeds of the balance of the stock and the bonds authorized are to be used for the construction and the equipment of the line. The company was organized to build 41.12 miles in the state of New York and 8.5 miles in New Jersey. B. A. Hegeman, Jr., president, and W. H. Coverdale, chief engineer, 66 Broadway, New York City. (Sept., p. 479.)

ST. LOUIS, BROWNSVILLE & MEXICO.—An amendment to the charter of this company is said to have been filed, authorizing two extensions, one from Bloomington, Victoria county, Tex., south to Port O'Connor, Calhoun county, 40 miles, and another from San Fordyce west to Roma, 35 miles. (Jan. 14, p. 118.)

See International & Great Northern.

SOUTHERN PACIFIC.—This company is said to have incorporated the Arizona Eastern, in Arizona, with a capital of $40,000,000. The incorporators include R. S. Lovett, E. Randolph, E. S. Ives, C. Walker, G. Taylor, of Tucson, Ariz.; B. Titus, D. H. Kadezie, M. M. Crocker and O. S. Lordsburg. The company proposes to take over the property and rights of the Arizona Eastern, Maricopa & Phoenix, Arizona & Colorado, Phoenix & Eastern and the Gila Valley Globe & Northern. The new company is to build from a point on the main line of the Southern Pacific through Arizona and western New Mexico to Durango, Colo., where the company has large coal deposits. Other lines are to be built to important cities in Arizona.

TOLEDO, ST. LOUIS & NEW ORLEANS.—An officer writes that contracts may be let in March to build this line. The projected route is from Carmi, Ill., south via Ridgway, Lawler, Karber's Ridge and Galconda to Brookport, opposite Paducah, Ky., about 95 miles. A branch is to be built from Galconda, west via Big Bay, Oaktown and Tamms to Thebes, about 50 miles. The work will be heavy and includes considerable solid rock work and some loose rock work. Grades will be $^{2}/_{10}$ per cent. northbound and one-half of 1 per cent. southbound. Maximum curvature will be 2 deg. on the Prairie division and 4 deg. on the Mountain division. There will be five steel trussed bridges and eight deck girders, also a tunnel 2,100 ft. long. N. M. Burns, president, 941 Pierce building, St. Louis, Mo. (Jan. 21, p. 165.)

TRINITY VALLEY & NORTHERN.—An officer is quoted as saying that an extension is to be built from Fouts, Tex., north to Rayburn, 15 miles. (Jan. 28, p. 213.)

UNION SPRINGS & NORTHERN.—Contract is said to have been given to J. W. Wright, Jr., Union Springs, Ala., for grading, track-laying and bridging on an extension from Fort Davis, Ala., northwest to Milstead, about 20 miles. The work is to be finished within four months.

WISCONSIN ROADS.—According to press reports from La Crosse, Wis., William Burke, of Witoka, Minn., is back of a project to build an interurban line from La Crosse west via Witoka, Minn., and Fremont to a point in southern Minnesota.

Railway Financial News.

Atchison, Topeka & Santa Fe.—See an item in regard to this company in General News.

Aurora, Elgin & Chicago.—Hayden, Miller & Co., Cleveland, have bought from the company $550,000 first and refunding 5 per cent. bonds. This makes a total of $1,950,000 of these bonds outstanding.

Buffalo & Susquehanna.—Fisk & Robinson, New York, who have acted as fiscal agents of the Buffalo & Susquehanna and a number of other properties, filed a petition in bankruptcy on February 1. The cause of the failure was stated to be that their properties were not developed far enough yet to carry themselves, and the firm, which was one of the very conservative bond houses of New York, was not able to dispose of the securities of its properties or to profitably dispose of high grade bonds which it largely dealt in. The firm owned $1,200,000 bonds of the Buffalo & Susquehanna Railway and $800,000 preferred stock of the subsidiary company, the Buffalo & Susquehanna Railroad. Other properties in which the firm took a large interest include the Gulf & Ship Island, the Louisiana & Arkansas, Kansas City Viaduct & Terminal and the New Orleans Great Northern.

Canadian Northern.—See Quebec & Lake St. John.

Erie.—E. H. Gary, chairman of the board of directors of the United States Steel Corporation, has been elected a member of the executive committee of the Erie.

Grand Trunk Pacific.—The company offered in London on January 13-19, £1,000,000 ($5,000,000) 4 per cent. debenture stock, ranking *pari passu* with £3,000,000 ($15,000,000) debenture stock outstanding. Interest is guaranteed on this debenture stock by the Grand Trunk on condition that the Grand Trunk itself has sufficient net income to pay such interest.

Great Northern.—Baring Bros. & Co., London, have bought and resold £2,000,000 ($10,000,000) St. Paul, Minneapolis & Manitoba Pacific extension 4 per cent. bonds of the Great Northern. This is the remainder of the £6,000,000 ($30,000,000) authorized in 1890. The proceeds of the bond sale are to be used to pay for work in progress and proposed.

Green Bay & Western.—The directors have declared an annual dividend of one-quarter of 1 per cent. on the $7,000,000 class B debentures, and regular dividends of 5 per cent. on the capital stock and class A debentures. In February, 1909, three-eighths of 1 per cent. was paid on the class B debentures and in February, 1909, one-half of 1 per cent. was paid.

Gulf & Ship Island.—See Buffalo & Susquehanna.

Illinois Traction Co.—See St. Louis, Springfield & Peoria.

Kansas City Viaduct & Terminal.—See Buffalo & Susquehanna.

Louisiana & Arkansas.—See Buffalo & Susquehanna.

New Orleans Great Northern.—See Buffalo & Susquehanna.

New York City Railway.—Receiver Ladd has brought suit against the Interborough-Metropolitan Co. as a stockholder of the Metropolitan Securities Co. to recover $7,348,000. The suit is the outcome of the receiver's failure to collect a judgment against the Metropolitan Securities Co. The suit against the stockholders of the Metropolitan Securities Co. is brought on the ground that the $30,000,000 stock of the company is not fully paid.

New York, Susquehanna & Western.—Holders of the Midland Railroad first mortgage bonds, which mature April 1, 1910, are offered the privilege on the payment of $95 in cash per $1,000 bond of extending these bonds to April 1, 1940, the extended bonds to bear interest at 5 per cent. J. P. Morgan & Co. offered to buy at par and interest prior to March 1 bonds of holders who do not wish to extend.

Quebec & Lake St. John.—A statement made by the Canadian Northern says in substance: The Quebec company has always been an unsuccessful undertaking. In 1901 its securities were reorganized and $2,433,333 4 per cent. prior lien bonds were authorized, the proceeds being applied to the reinstatement and maintenance of rolling stock and various other purposes. After a year's experience and a careful investigation of the accounts since 1901 we are satisfied that the position can only be gradually improved, even by the expenditure of a large amount of new capital, in extending the line and purchasing new rolling stock, and that not only is there no prospect of the company being able for some years to come to pay the interest on the prior lien and first mortgage bonds, but that it has not, in fact, earned the above interest in any year since 1901. We have carefully considered the present value of the assets, and are satisfied that, including the terminal and hotel properties, they are not worth more than the amount of the prior lien bonds. During the years 1901 to 1906 over $33,000 out of the prior lien bond moneys were used to pay rent for use of rolling stock and credited to operating revenue, thus increasing the gross receipts, and large charges to betterment account were met from the proceeds of prior lien bonds instead of being charged to revenue account, thus decreasing the charges against revenue. These charges include such items as interest on notes and mortgages. We do not wish to criticize the methods of the late management, but we would show the impossibility of any comparison between the accounts for the earlier years and the results achieved during the 18 months that we have had the management. (Jan. 14, p. 115.)

St. Louis, Springfield & Peoria (Electric).—This is an Illinois corporation, organized in December, 1909, which has bought and consolidated the St. Louis & Springfield, the St. Louis & Staunton, the Tri-City Traction and the St. Louis & Northeastern. The main line of the consolidated company runs from Springfield, Ill., to Venice, opposite St. Louis, 92 miles, with branches totaling 24 miles, a total mileage of 116 miles.

N. W. Halsey & Co., New York, bought from the company and resold $1,600,000 first and refunding 5 per cent. bonds of 1909-1939, principal and interest unconditionally guaranteed by the Illinois Traction Co.

Southern Pacific.—See an item in regard to this company in Court News.

Third Avenue (New York).—The sale of this property, which was originally fixed for September 2, 1909, and has since been adjourned from time to time, has now been ordered on March 1. The sale will be under the foreclosure of the first consolidated mortgage, which secures $37,560,000 4 per cent. bonds outstanding, interest payments on which have been in default since July 1, 1907.

Union Pacific.—See an item in regard to the American Express Co. in General News.

Wisconsin & Michigan.—The property of this company has been sold for taxes amounting to $67,990. The selling price just covered the taxes and interest. This road runs from Iron Mountain, Mich., to Menominee, 70 miles, with a branch to Peshtigo Harbor.

FOREIGN RAILWAY NOTES.

The government of Orange River Colony has decided to build the Sannah's Post-Wepener Railway. A line is also to be built from Bethlehem northward to the Transvaal.

Because of steep grades and sharp curves on the Cordoba & Northwestern, South America, the railway company has been authorized to relay its tracks with rails weighing 35 kilograms per meter (about 70 lbs. per yard).

The Minono Arima Electric Railway proposes to build an electric railway from Osaka, Japan, to Takaradzuka, about 15 miles, with a three-mile branch to Minoma. The work will cost, it is estimated, about $1,500,000.

Supply Trade Section.

The Griffin Wheel Co., Tacoma, Wash., is to enlarge its plant adjoining the Great Northern car shops.

S. G. Johnson has been appointed general sales manager of the Union Switch & Signal Co., Swissvale, Pa., with headquarters in New York.

The Illinois Steel Co. is to build a two-story office building at 1317 to 1325 Wabansia avenue, Chicago. The estimated cost of the building is $24,000.

The Atlantic Equipment Company, New York, has opened an office in Pittsburgh, Pa., at 2101 Beaver avenue, which will be in charge of H. Kleinhans, manager.

Callaway, Fish & Co., New York, on February 1, formed a co-partnership for the transaction of a general banking and commission business in stocks, bonds and investment securities, with offices at 37 Wall street.

The Covington Machine Co., Covington, Va., reports an increased demand for combination punches and shears. It has recently sold a triple combination machine to the Maryland Steel Co. for its plant at Sparrow's Point, Va. Arrangements have been made with the Wiener Machinery Co., New York, for managing the eastern sales office of the Covington company. A large stock of machines will be carried in Jersey City, N. J., in order to be able to make prompt deliveries.

The Isthmian Canal Commission will receive bids until February 14 for piles, split-sheave pulleys, cold-rolled shafting, car wheels, gear cutters, valves, pipe fittings, etc. (Circular No. 555.) Until February 21 for oil for locomotives, cars, stationary engines, marine engines, air compressors, etc. (Circular No. 557.) Until February 28 for boilers, pumps, universal grinder, steam trap, cable, vanadian steel chain, spiral riveted pipe and fittings, valves, etc. (Circular No. 558.)

Joseph E. Buker, who has been elected first vice-president of the Chicago Car Heating Co., Railway Exchange, Chicago, as stated last week, was born in 1859, and went to work in a railway shop on the Michigan Central at the age of 17. He served the Michigan Central for about 10 years and was then employed by the Atchison, Topeka & Santa Fe for about two years. His next position was with the Consolidated Cattle Car Co., a private car line located in Chicago, whose assets were later taken over by the Street's Western Stable Car Line. After about eight years in the service of this company Mr. Buker accepted a position in the mechanical department of the Illinois Central, in whose service he remained until February 1, 1910. In August, 1909, he was made superintendent of the car department. Mr. Buker has a wide acquaintance among railway and supply men.



J. E Buker.

A. L. Whipple has incorporated the Whipple Supply Company, New York, which was established in October, 1909. The new company, organized under the laws of the state of New York, has a capital stock of $50,000. The officers are: A. L. Whipple, president and general manager; R. L. MacDuffie, vice-president; H. E. Oesterrick, secretary and treasurer. Among the specialties controlled is the Hedley anti-climber. This device is applicable to steam railway passenger equipment and freight cars. In the application to freight cars the device will be in the form of the dead-woods formerly used prior to the adoption of the M. C. B. coupler. The company has offices at 50 Church street, New York.

RAILWAY STRUCTURES.

ASHDOWN, ARK.—See Memphis, Paris & Gulf.

BEAVER, PA.—The Pittsburgh & Lake Erie plans to rebuild its passenger and freight terminals.

BELLE PLAINE, IOWA.—Press reports state that the Chicago & North Western has prepared plans for a new roundhouse.

EDMONTON, ALB.—According to press reports the Canadian Pacific high level bridge to be built over the Saskatchewan river from Edmonton to Strathcona is to be 2,687 ft. long and 166 ft. from the river bed to the rail base. It will be supported by four main piers of concrete to the bridge seat, and on the Strathcona side there are to be 10 steel towers on concrete pedestals; a retaining wall is to be built at each end. The total estimated cost of the structure is $1,500,000. (Dec. 10, p. 1172.)

EVANSVILLE, IND.—A company has been incorporated in Indiana to build a bridge across the Ohio river above Evansville. The stockholders of the Evansville Electric Ry. are interested in the company and the bridge is to be used largely by this line.

GALVESTON, TEX.—An officer of the Gulf, Colorado & Santa Fe is quoted as saying that the company will make improvements at a cost of $100,000 at Galveston this year. This includes the construction of wharves on a portion of the company's 1,500 ft. of water front, which extends from Fifty-first street west to Fifty-seventh street.

JOHNSTOWN, PA.—The Baltimore & Ohio is said to be making plans for improvements, to include freight and passenger stations at Bedford and Baumer streets, and an extension of the freight shipping facilities at Washington and Franklin streets, in Johnstown. The work, it is understood, will be started soon and pushed to completion. The new freight and passenger stations will cost about $1,000,000.

NEW YORK.—Plans have been filed, for an addition to the large car house and inspection headquarters of the Interborough Rapid Transit Co., at Lenox avenue and 148th street. A two-story concrete annex, 95½ ft. long x 62 ft. wide, will be constructed. The improvements will cost about $30,000.

OMAHA, NEB.—The Omaha & Council Bluffs Street Ry. Co. has prepared plans for an addition to its car shops. The present shops are to be used for repair work and the addition, which will be practically a duplicate of the present plant, will be used entirely for new work.

OUTLOOK, SASK.—The Canadian Pacific has given a contract to the J. D. McArthur Co., Ltd., for the erection of a bridge over the South Saskatchewan river at Outlook. The bridge will be over 3,000 ft. long and 146 ft. in height, with 106 piers and pedestals. (Jan. 14, p. 118.)

REDDING, CAL.—The Southern Pacific plans to build a new passenger station during the year.

ROSEVILLE, CAL.—The Southern Pacific has prepared plans for three car shops, each 400 ft. x 500 ft. An additional roundhouse is also contemplated.

SEATTLE, WASH.—See Oregon & Washington.

TACOMA, WASH.—According to press reports plans have been made by the Harriman lines for extensive yards and car shops at South Tacoma. The improvements are to cost about $1,000,000.

TOLEDO, OHIO.—According to press reports, the Cincinnati, Hamilton & Dayton has started work on a new dock and is improving the yards at Toledo. The cost will be about $1,000,000.

Late News.

The items in this column were received after the classified departments were closed.

Directors of the Cincinnati Northern, controlled by the Cleveland, Cincinnati, Chicago & St. Louis, have declared an initial dividend of 3 per cent., payable March 1.

W. Hamilton has been appointed master mechanic of the western division of the Grand Trunk, with office at Battle Creek, Mich., succeeding E. D. Jameson, assigned to other duties.

The Norfolk & Western, reported in the *Railway Age Gazette* of January 7 as being in the market for 3,000 freight cars, has ordered 300 gondolas from the American Car & Foundry Co.

C. W. Goodyear, president of the Buffalo & Susquehanna, says that the officers of the company, knowing of the impending value of Fisk & Robinson, turned over some days ago to the Knickerbocker Trust Co. of New York drafts for the interest payments due February 1.

The Baker City interurban is said to have let contracts for work on the first section of a projected line from Baker City, Ore., and to form part of an interurban belt line 45 miles long in Baker valley. T. B. Neuhausen, president; F. A. Kribs and T. S. McGrath, all of Baker City, are interested.

The Wasioto & Black Mountain is now building from Wasioto, Ky., along the Cumberland river to the head of Tom's Creek in Harlan county, 12 miles. The line is eventually to be extended from Tom's Creek through a coal and timber section to Harlan, 24 miles. A. B. Gloster, chief engineer, Middlesboro. (Dec. 17, p. 1214.)

According to reports from Delta, Colo., contracts are to be let in about 60 days for a line from Delta through Surface Creek valley to Cedaredge, about 18 miles. An extension south is projected to Montrose and eventually into Paradox valley, as well as an extension on the northern end. The Delta County Business Men's Association, associated with northern Colorado capitalists, are said to be back of the project.

The Missouri, Oklahoma & Gulf is said to have given a contract recently to extend this line south to Denison, Tex. The contract includes building a combined highway and railway bridge over the Red river, to be finished by June 1. A site of about 50 acres of land is said to have been secured east to Denison for the tracks and buildings. When this work is finished the road is to be extended from the northern terminus toward Kansas City. (Dec. 24, p. 1261.)

Harold A. Haines, freight solicitor of the Pennsylvania Railroad at Reading, Pa., has been appointed Canadian freight agent, with office at Toronto, Ont., succeeding Louis J. Fox, resigned. John B. Large, district freight solicitor at Providence, R. I., succeeds Mr. Haines, with office at Reading, Pa. Walter S. Wells, traveling freight solicitor at Boston, Mass., succeeds Mr. Large, with office at Providence, and John T. Windsor succeeds Mr. Wells, with office at Boston, Mass.

The Philadelphia & Reading advises that no new equipment has been recently ordered, but that the company now has under contract the following equipment:

One thousand steel 55-ton coal cars, American Car & Foundry Company; 1,000 steel 55-ton coal cars, Standard Steel Car Company; 1,000 box 40-ton cars, American Car & Foundry Company; 500 steel low side 50-ton gondola cars, Cambria Steel Company; 20 vestibule passenger coaches, five vestibule combination cars, 25 open platform passenger coaches, five open platform combination cars and eight baggage cars, Harlan & Harlingsworth. All the above passenger equipment cars are to have steel underframe and steel superstructure sheathed in wood, making an entire composite car. The company is building in its own shops at Reading, Pa., 62 engines, as follows: Two Atlantic type passenger engines, 20 light consolidation engines for mine work, 10 four-wheel switching engines, weighing 56 tons each; 10 heavy ten-wheel engines, for fast freight service, weighing about 106 tons each; 20 heavy consolidation engines, weighing about 115 tons each, and 100 high-class refrigerator cars.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Baltimore & Ohio is asking prices on a number of locomotives.

The New York, Ontario & Western is in the market for six locomotives.

The New York, New Haven & Hartford is taking prices on 10 switching locomotives.

The Chicago, Milwaukee & St. Paul has authorized the building of 25 switching engines at the company shops.

The Commonwealth Edison Co., Chicago, has ordered one switching locomotive from the Baldwin Locomotive Works.

The Prairie Farm & Southwestern, Prairie Farm, Wis., a new railway building in Wisconsin, expects to buy motive power next fall.

The North Coast has ordered, from the Hicks Locomotive & Car Works, two 70-ton passenger locomotives. Delivery is specified for February.

The Chesapeake & Ohio is reported to have ordered two Shay locomotives from the Lima Locomotive & Machine Co., and one Mallet compound locomotive from the American Locomotive Co. This report is unconfirmed.

CAR BUILDING.

The Missouri, Kansas & Texas is making inquiries regarding 15 chair, 5 dining and 5 postal cars.

The New York, Ontario & Western has ordered 300 gondola cars from the American Car & Foundry Co.

The Missouri & North Arkansas has ordered 20 forty-ton freight cars from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific has ordered 400 50-ton Hart convertible ballast cars from the Rodger Ballast Car Co.

The North Coast has ordered, from the Hicks Locomotive & Car Works, two 60-ft. combination coaches for immediate delivery.

The Missouri Pacific is said to be considering the purchase of a large number of freight cars, but early action is not expected.

The Prairie Farm & Southwestern, Prairie Farm, Wis., a new railway building in Wisconsin, expects to buy rolling stock next fall.

The Boston & Maine, reported in the *Railway Age Gazette* of December 10, 1909, as negotiating with the Laconia Car Co. for a number of cars, has ordered 2,000 freight cars from this company.

The National Railways of Mexico are in the market for 600 freight cars. The types include box, stock, gondola and flat cars. Four hundred are to be of 40 tons capacity and 200 of 50 tons capacity.

The Denver, Laramie & Northwestern is in the market for 50 forty-ton steel underframe box, 30 thirty-ton steel underframe stock, 50 forty-ton National dump and 20 fifty-ton Hart convertible cars.

The Swift Refrigerator Transportation Co. has ordered 100 thirty-ton produce cars from the Haskell & Barker Car Co., instead of from the Western Steel Car & Foundry Co., as reported last week. This company is now in the market for 75 tank cars.

The Pere Marquette advises that it is negotiating with the Pullman Co. for 20 first-class coaches, 8 baggage and 2 mail and baggage cars. These cars are to be 78 ft. long over platforms, 70 ft. over sills, and will have steel underframes. The company is also building in the Ionia, Mich., shops three first-class coaches with the same general dimensions as those mentioned above but with wooden underframes.

The Missouri, Kansas & Texas is in the market for 2,150 cars, as mentioned in the *Railway Age Gazette* of January 28. The number and types of cars included are as follows: 1,000 thirty-ton box, 300 thirty-ton, 50-ft., furniture, 200 thirty-ton automobile, 325 fifty-ton gondolas, 175 forty-ton gondolas, 100 fifty-ton flats and 50 cabooses. The flat cars and the fifty-ton gondolas will have steel underframes and the other cars will be all wood.

MACHINERY AND TOOLS.

See Isthmian Canal Commission under Supply Trade News.

The Hudson & Manhattan is in the market for a small number of machine tools.

The Chicago Great Western is in the market for five or six machines.

IRON AND STEEL.

The Boston & Maine is taking prices on 200 tons of bridge steel.

The Chesapeake & Ohio is reported to have ordered 1,000 tons of 100-lb. rails and 8,250 tons of 90-lb. rails from the Maryland Steel Co., and 11,350 tons of 100-lb. rails from the Illinois Steel Co.

The Delaware, Lackawanna & Western is in the market for 84 small signal bridges.

The Great Northern is in the market for 9,000 tons of steel for ore docks at Allouez Bay, Wis.

The Wabash-Pittsburgh Terminal Ry. is to be in the market soon for 500 tons of structural steel for a viaduct.

The Philadelphia & Reading has ordered 25,000 tons of rails and steel for 18 bridges for the Perkiomen Railroad.

The New York, New Haven & Hartford is in the market for 400 tons of bridge steel for a bridge at Sandy Hook, Conn.

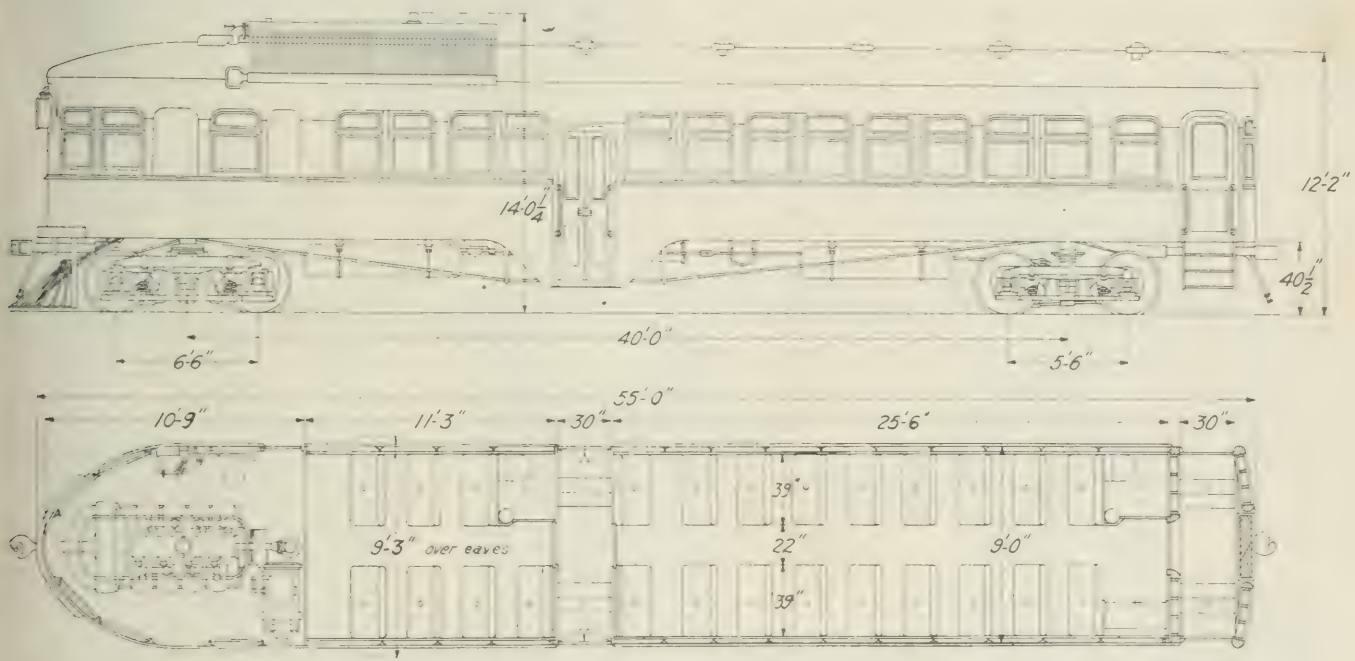
General Conditions in Steel.—There is a belief that the reports of the falling off of steel business in January have been greatly exaggerated, as is generally the case during periods of fluctuations in the stock market. It is said that steel manufacturers declare new business in January was up to expectations and that the tonnage received was but little short of the capacity of the mills. A lull in steel orders is always expected during January.

Gas Electric Motor Car for the Southern.

A brief description of gas electric motor cars, recently purchased by the Southern Railway from the General Electric Co., Schenectady, N. Y., and now under construction, will prove of interest to those railways which have similar service. These cars were designed with special reference to traffic conditions in the South.

The car is divided by a center entrance, the seating capacity forward of this entrance being 14 passengers and back of it 38. A rear entrance is also provided, thus completely dividing the forward and rear passenger compartments. The car body is 55 ft. long over bumpers, and of this length the engine compartment will require 10 ft. 9 in. The car body will have a steel frame, sheathed with steel plates and mahogany interior finish. The truck under the engine compartment will have a wheel base of 6 ft. 6 in., and will be equipped with M. C. B. 33-in. steel wheels. On each axle of this truck will be mounted a standard 100 h.p., 600-volt, box frame, commutating pole railway motor, type GE 205, thus giving the car a motor capacity of 200 h.p. The rear truck will have a wheel base of 5 ft. 6 in.

A direct-driven, eight-cylinder, type K, engine generating set will be placed in each compartment. Direct coupled to this engine will be an eight-pole, 600-volt generator, provided with commutating poles. This set will be mounted on a cast iron base, all parts being above the floor line and readily accessible. Current from the generator will be supplied to the motors through a controller, the function of which is to place the motors progressively in series and in parallel, and to vary the resistance in the shunt field of the generator by numerous steps, thereby varying the impressed voltage on the motors.



Plan and Elevation of Gas Electric Motor Car for the Southern.

The ignition is furnished by low tension magneto and magnetic spark plugs. The carburetor is of the overflow type, hot water jacketed. Compressed air is used for starting the engine, this being supplied through the several cylinders in succession through a distributing valve. Compressed air is supplied from a pump, direct-driven by the main crank shaft. A small auxiliary gas engine will drive an auxiliary pump to supply compressed air to the main reservoir. This gas engine is also direct-connected to a generator for lighting the car.

Combined straight and automatic air-brakes will be furnished, together with the usual auxiliary apparatus, and in addition to these brakes an auxiliary ratchet and handbrake is also supplied for emergency use.

The radiator is placed on the roof of the car, which provides sufficient means of cooling the engine on the thermocyphon principle. During cold weather hot water from the

engine circulating system will be by-passed through the passenger compartments.

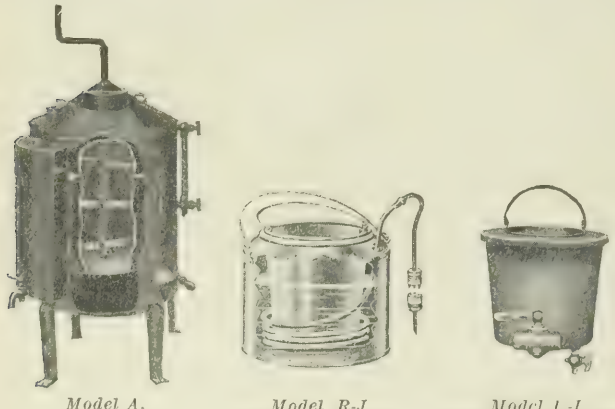
Although these cars can be geared for a speed of about 60 miles an hour on level track, such speeds are not usually required on branch line service, and the Southern car will be geared for a somewhat lower maximum speed. It is claimed that control and smoothness of acceleration are prominent features of this type of equipment, and that they are secured solely by reason of the gas electric drive principle which it embodies. As there is no mechanical transmission between the engine and the axle, the speed of the engine is not a function of the speed of the car; consequently, the gas engine may be operated so as to give its maximum output, irrespective of the speed of the car, a characteristic of the value in case of emergency or heavy work. It has been found that the electric equipment, consisting of the generator, controller and motors, and that which takes the places of the gears, chains, sprockets, clutches and other mechanical means of transmitting the power of the gas engine to the axle, is subject to very little maintenance expense, and the efficiency of this electric drive is said to be high. The feature, perhaps, which will appear most strongly to railway men is the simplicity of the control and the ease and certainty with which it can be handled by an unskilled operator.

Wetmore Glue Room Appliances.

In the accompanying half-tones are shown two designs of glue heaters and a glue pot warmer.

The important characteristic of the model A steam heater is that it reduces the preparation and handling of glue from guesswork to a certainty. It is also claimed that it prevents glue from becoming sour; evaporation, with a consequent thickening of the glue; overheating, and formation of gum and crust. It keeps the glue clean and free from dirt and dust, and enables the operator to prepare and handle the glue in the shortest possible time. As the heater is made of copper and brass, very little wear results, except from misuse.

The model U-I glue pot warmer is for use at the benches of the various workmen. The warmers are attached to a steam pipe running from the boiler room. This heater is arranged so that the steam passes though a separate steam chamber and the piping so that any pot may be used while the others are turned off. The steam supply is regulated by a brass three-way valve. The glue pot, being made of copper,



Model A. Steam Heater. *Model R-J. Electric Heater.* *Model U-I. Glue Pot Warmer.*

Wetmore Glue Room Appliances.

is easily heated and kept clean. They are made in sizes having capacities from one quart to two gallons.

Model R-J electric heater is double jacketed, made of copper. The particular advantage of this electric glue pot warmer is in its having a third jacket which surrounds the water jacket. The space between the two outside jackets is packed with mineral wool, which serves to retain the heat. Electric current is turned on for from 15 to 35 minutes in the morning, and the glue is reduced to a liquid and remains in such a condition for several hours, when the current may again be turned on for five or ten minutes at a time.

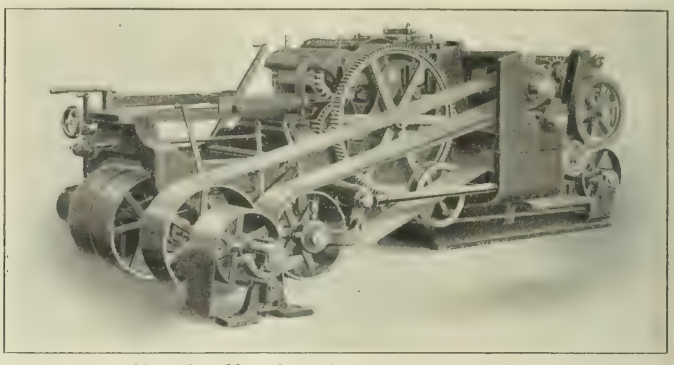
These Wetmore glue room appliances are manufactured by the Advance Machinery Co., Toledo, Ohio.

Recent Machine Tools.

A Departure in Planing Machine Construction.

The rapid production and high grade finish demanded in the output of the modern planing mill and car shop has made necessary and induced the adoption and development of new features of construction. The possibilities of perfect cutterhead work and rapid feed have only been appreciated within a comparatively short time, and the development of planing machines to take advantage of the latest devices is still more recent.

One of the obstacles to securing perfect cutterhead work was the difficulty of maintaining the cutterhead journals in



Woods' No. 20 Planer and Matcher.

perfect condition. The pull of the cutterhead belts under the strain may be as high as 1,500 lbs., and the speed 3,200 ft. per minute. It was found that under these conditions, with the increased size of belt necessary for fast feed, accuracy of adjustment of cutterheads was soon lost by the wear on the journals, proper lubrication of long boxes being difficult.

Another element of the difficulty was experienced in the vibrations and jars of the cutterheads caused by the belts on the shafts, this factor being one of the most serious and difficult of elimination. It was not unusual to see the mark left by the belt lacing on the stock each time that it went over the pulley. The difficulty of making two belts run alike also added to the troubles attending the method of belting cutterheads. The importance of the factor of belt slippage in the problem will be appreciated when it is considered that a difference of 0.01 of an inch in the diameter of the cutterhead pulleys means a difference of from 10 to 12 ft. in the amount of belt travel at the ordinary planing mill speeds, the difference being exaggerated by variations in thickness and tension of belts.

The necessity of the operator's working about the cutterheads in truing them off while they are running at full speed made their belting on the front or operating side of the machine somewhat dangerous, and accidents to operators have resulted from the breaking of belts while the operator was in the line of belting.

Convenience and accessibility on the operating side of any machine, allowing the removal of the cutterheads, taking out defective pieces of stock, etc., are desirable. To accomplish these results, to eliminate the objectionable features of belting upon the cutterhead direct, and of belting troubles generally, the S. A. Woods Machine Company, Boston, Mass., has developed its one-side coupled drive, in which one belt is used for each cutterhead, and the belts are placed on the back side of the machine, each driving a cutterhead pulley supported by boxes entirely independent of the cutterhead itself, a connection being made between the two by a flexible coupling. This coupling is claimed by the Woods company to effectually absorb all vibrations transmitted to the pulley by the belting, thus leaving the cutterhead journals without the strain of the belts or other disturbing influences. This improvement permits the use of very short journals upon the cutterhead, these journals being efficiently lubricated by improved oiling devices, thus rendering easy the maintenance of ideal running conditions. This design also makes possible the instant detaching of the cutterhead from the spindle,

leaving it free to be turned when setting up and without disturbing the belts in any way.

Though the driving of a planing machine from one side may be considered a radical departure from the construction in use so many years, this arrangement is said by the Woods company, which has embodied this and many other new features in its No. 20 planer and matcher, to be not only satisfactory, but decidedly an advanced step. This machine is built in two sizes, to work pieces 9 in. and 15 in. wide by 6 in. thick.

The S. A. Woods Machine Company has concentrated its attention upon wood planers, and the No. 20 is the practical result of this specializing and a concrete demonstration of the higher efficiency to be attained through such concentration. Millmen who are contemplating the installing of planers will do well to look into this new type of machine.

Niles-Bement-Pond 48-in., 300-Ton Double Car Wheel Press.

The pressure required for mounting and unmounting steel wheels on 50-ton axles is so high that the work is done very slowly by the old machines which were built for smaller axles and cast iron wheels. In designing a new car wheel press the Niles-Bement-Pond Company, New York, has made its maximum capacity 300 tons and provided a pump and plunger on each head so that the work can be done more rapidly and two wheels can be pressed on or off at the same time. The illustration shows that the tie bars are divided in the center; consequently, when two wheels are to be removed simultaneously, the couplings are removed from the tie bars and pressure applied to both rams which starts the cylinder beams back on the base plate, carrying the tie bars resistance post and the two wheels away from the axle. The cylinder beams themselves and the resistance posts are gibbed down to the base plate and slide on it.

In order to readjust the cylinder beams in the right position for removing another pair of wheels from their axles, auxiliary cylinders are cast in the main cylinder beam and are located just above the base plate, and by the use of city water pressure or compressed air the main cylinder beams are returned to their initial position.

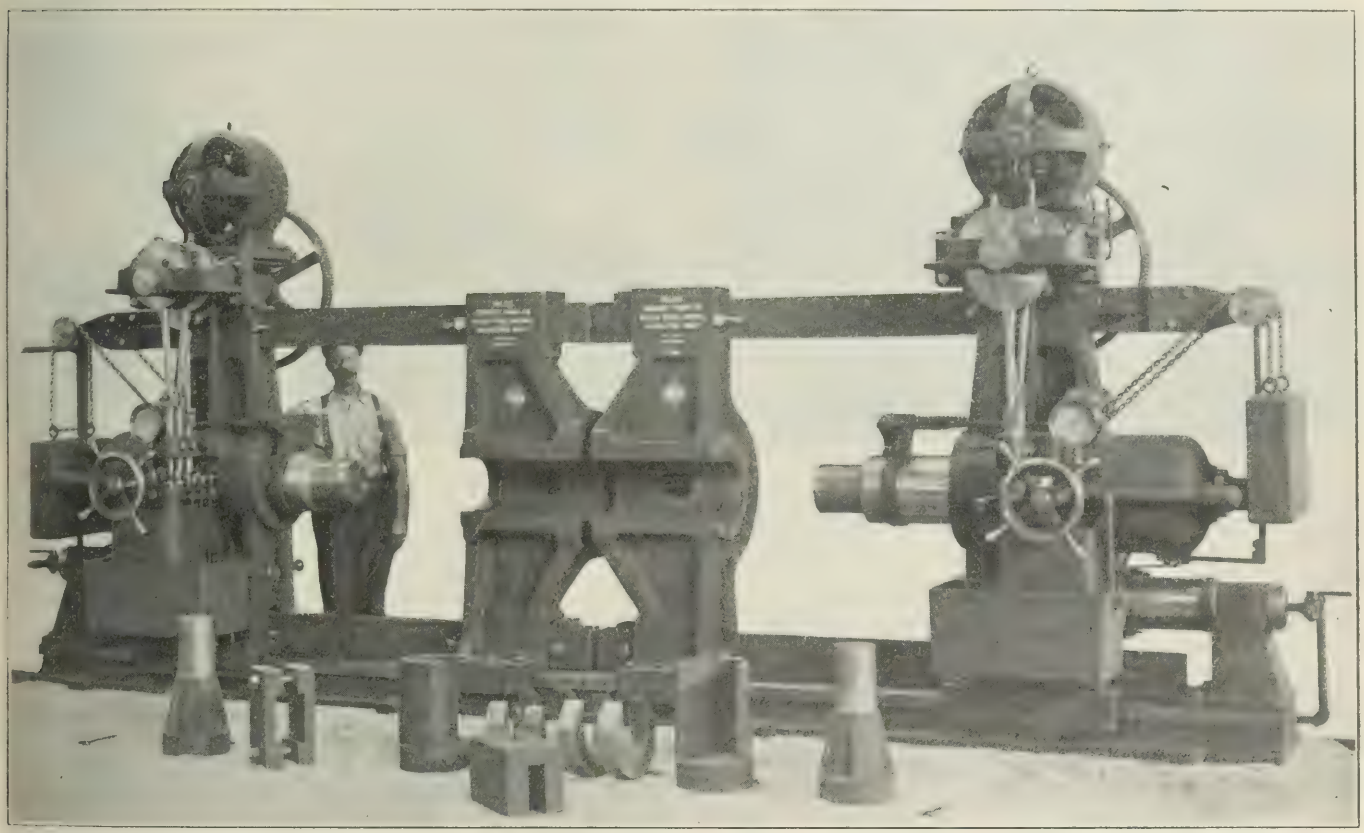
When two wheels are to be pushed on to their axles, the tie bars are coupled together and the work proceeds as in an ordinary press, except that there are two advancing rams at work simultaneously in place of one. The machine is shown arranged for this operation in the illustration.

The cylinders and sliding heads are steel casting, the cylinders being lined with copper tubing spun into place. Pistons are 11 in. diameter and are counterweighted for quick return when release valves are opened. Each ram is operated by a three-plunger pump, ¾-in., 1¼-in. and 1¾-in. diameter plungers, 4½-in. stroke, giving a variety of pressures that may be exerted on the ram with a maximum of 300 tons.

Each plunger is fitted with a weighted safety valve, which may be set to release at any pressure within its range, and each plunger is also fitted with a trip so that the advance of the ram is under perfect control without the starting or stopping of the motor.

The opening in the resistance head is 9 in.

The equipment includes forcing blocks for the rams for use when pressing off wheels as well as for pressing on wheels, operating valves for the control of city water or compressed air for adjusting the cylinder beams, also pressure gages, piping, water tanks, etc. The drive is by two 7½-h.p. motors, one mounted on each cylinder beam, transmitting power directly to the eccentric shafts.



Niles-Bement-Pond Double Car Wheel Press.

Tools for the Steel Passenger Car Shops at Pullman.

In the equipment of the steel passenger car shop, which was finished at Pullman, Ill., last year, there was a number of new and special designs for the Long & Allstatter, Hamilton, Ohio, tools used on steel sheets and structural shapes, some of which are here illustrated.

One of the largest and most interesting of these is illustrated in Fig. 1, the I-beam punching and coping machine, which is used principally for the long sills. This tool has a capacity for punching 8 holes $\frac{13}{16}$ in. through ½-in. material at each stroke.

It is equipped with an automatic variable feed spacing table for handling material 75 ft. long, which will space in multiples of $\frac{1}{16}$ in. up to 8 in. The machine has eight gag punch holders and an automatic index which shows the spacing of the punches to be used at the next stroke. The quadrant and levers, shown in the foreground, are operated in accordance with the figures in the index, and in this way the punches are properly spaced. The tool has a device for raising all the supporting rollers at the same time by power. It has also an auxiliary gag operating device which greatly facilitates the handling of the gags. The machine is directly driven by an electric motor.

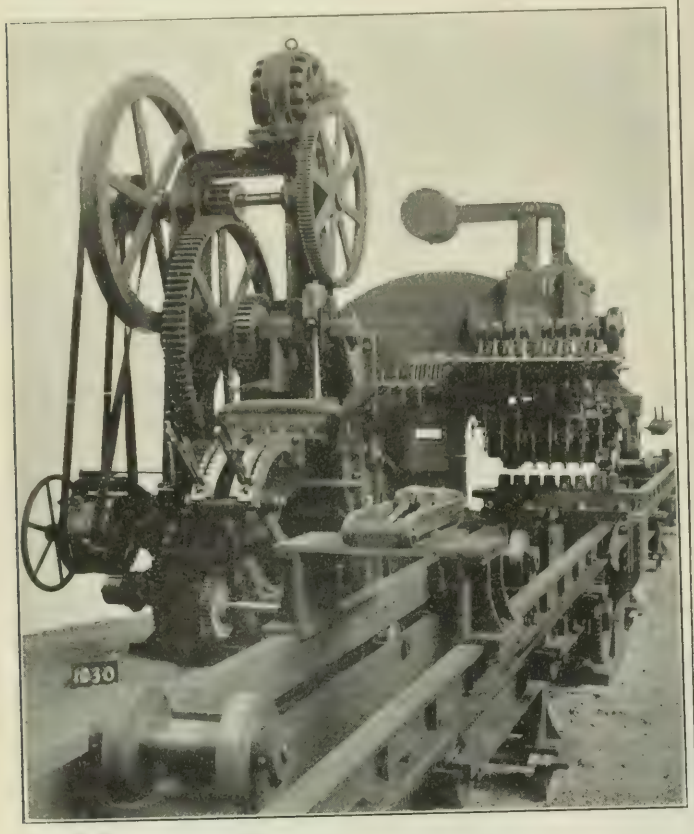


Fig. 1—I-Beam Punching and Coping Machine.

The horizontal punching machine shown in Fig. 2 is of special construction and has a capacity to punch a $\frac{7}{8}$-in. hole through $\frac{3}{4}$-in. material. Fig. 3 shows an angle iron shear mounted on a turntable. It has a capacity to cut 6-in. x 6-in. x 1-in. angles and is motor driven. Fig. 4 is an upright punching machine with a throat 50 in. deep. It has a capacity to punch 1-in. holes through 1-in. steel, and has 3 gag punch holders, an architectural jaw and overhanging die block. It is provided with a crane and is motor driven. The new Pullman equipment includes another similar punching machine, but with a throat 36 in. deep.

In the same shop there are a number of punches and shears built by Hilles & Jones Company, Wilmington, Del., which have special improvements adapting them to the work of building steel passenger cars, and some of them are here illustrated.

Fig. 5 illustrates one of three machines designed especially for punching plates, I-beams and channels. The depth of throat is 24 in. and the end punches are adjustable from $2\frac{1}{2}$-in. minimum to 26-in. maximum distance, center to center. Each sliding head carries eight punches, and each punch is controlled by separate hand gag so that any single punch or any group of punches can be used as the work demands. The driving of each machine is by independent 12-h.p. motor di-

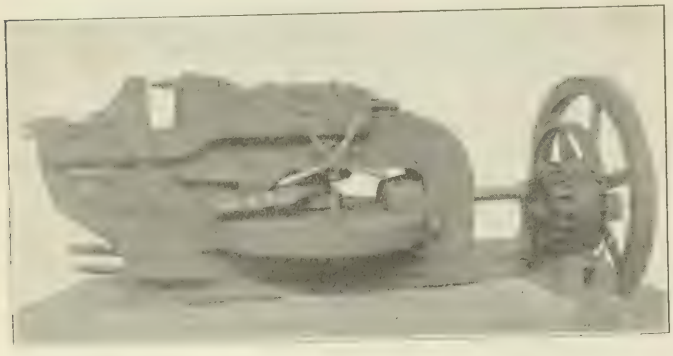


Fig. 2—Horizontal Punching Machine.

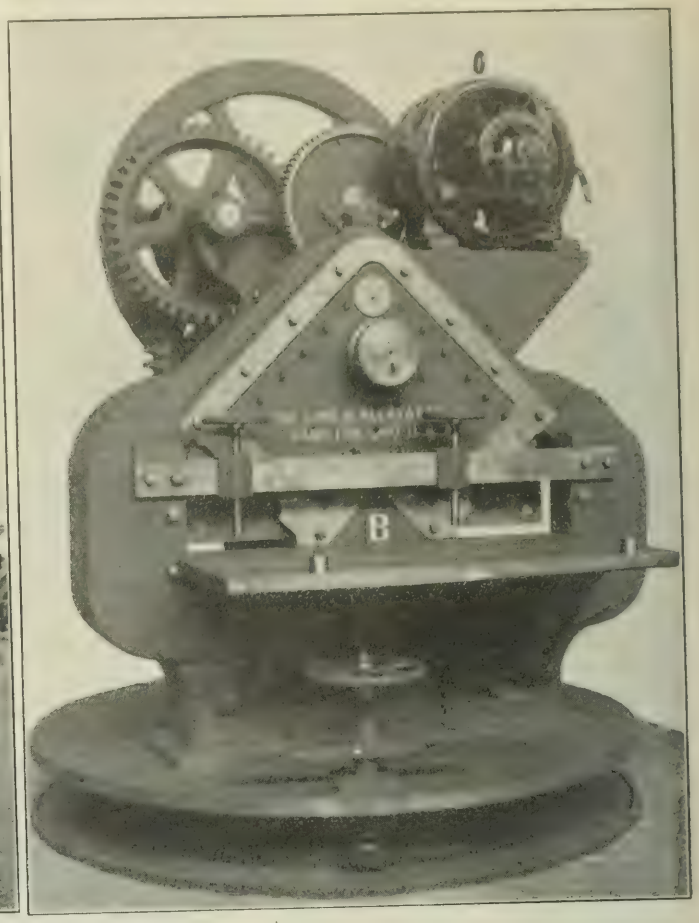


Fig. 3—Angle Iron Shear.

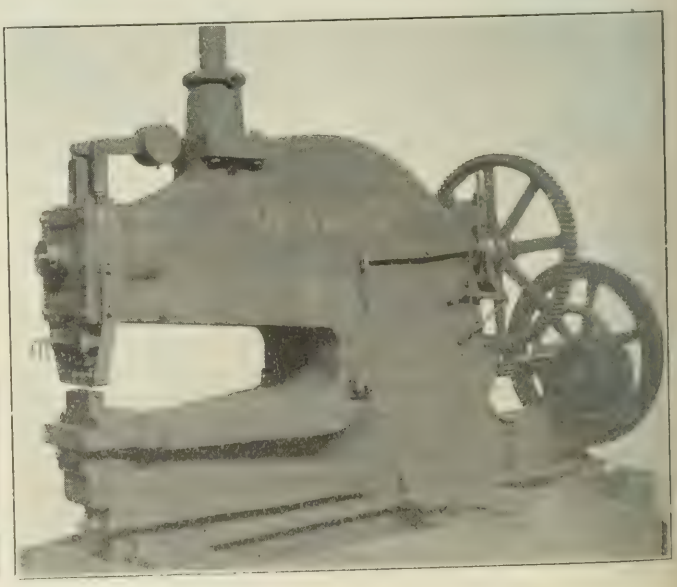


Fig. 4—Upright Punching Machine.

rectly connected to the fly-wheel shaft through cut gearing and friction clutch. This clutch allows the motor to be started and run to full speed before starting the machine proper. The clutch is controlled by an automatic stop operated by foot treadle and hand lever. The eccentric shaft is of forged steel

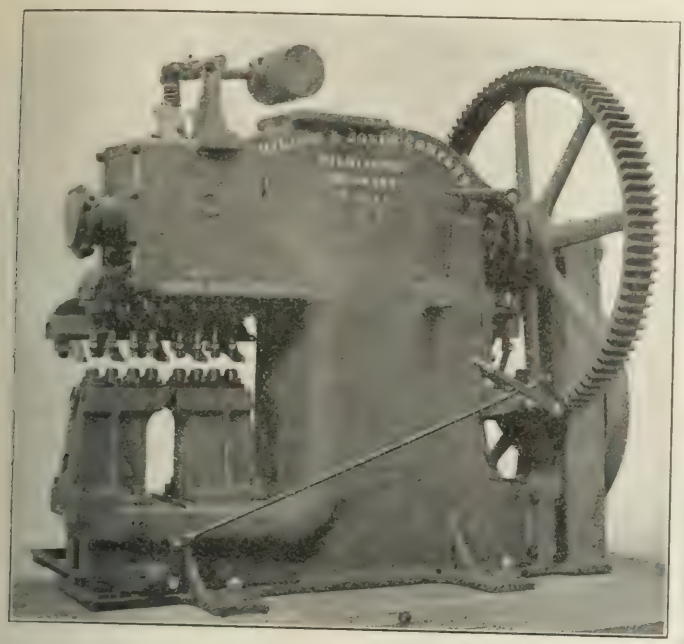


Fig. 5—Multiple Punching Machine.

running in bronze bushed bearings, the back end of the eccentric shaft being provided with substantial support bolted to the base of the machine. In addition to the eight punching attachments, one of these machines has a set of coping attachments for coping I-beams and channels up to 24-in. sections, inclusive. All of these machines were made duplicates with interchangeable punching and coping fixtures.

Fig. 6 illustrates a No. 1 single punch with 16-in. throat

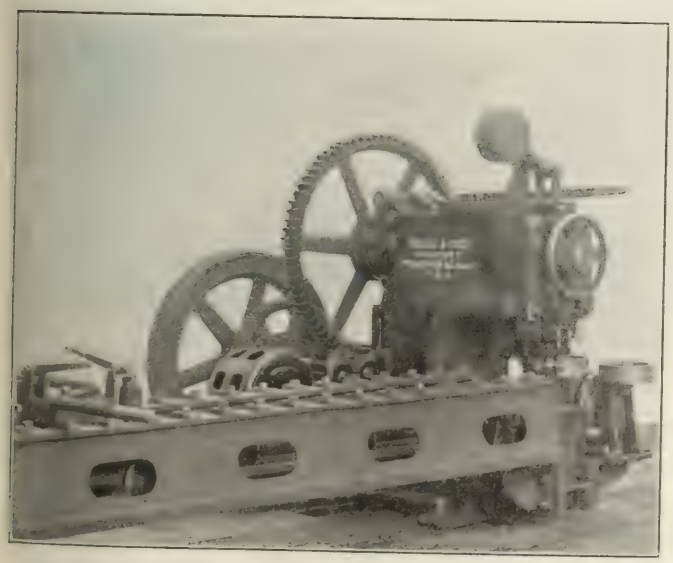


Fig. 6—Punch with Spacing Table.

depth, in connection with a special hand operated spacing table 75 ft. long. The punch itself is driven by a 5-h.p. motor directly connected to the driving shaft through cut gearing. The sliding head on this machine carries three punches and dies of different diameters so that an angle or plate could be punched with three different sizes of holes without loss of time in changing punches and dies. The spacing table is provided with two sets of adjustable stops so that one leg of an angle can be punched on the forward motion and the other on the return. The table is free-running and capable of being propelled by one man.

No. 7 shows a shear with 25-in. thoat, fitted with a revolving shear head and having a capacity equal to shearing 1-in. plates. Both the upper and lower blades are stamped

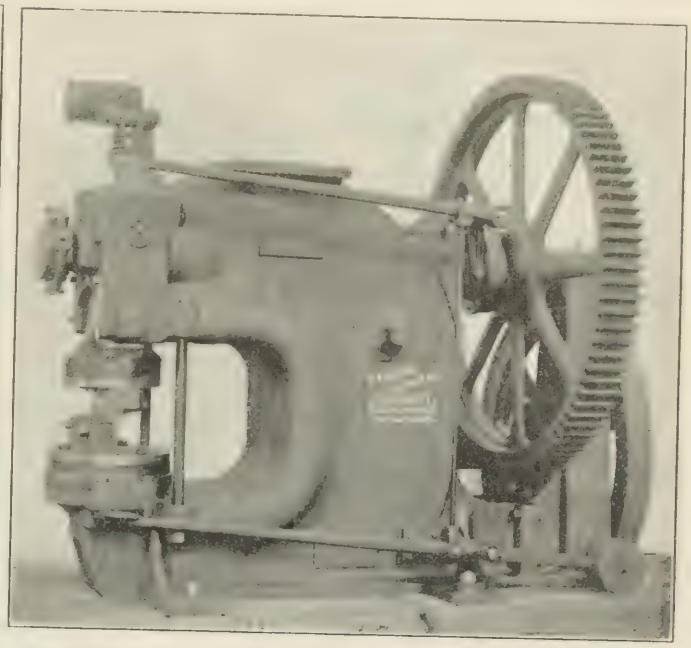


Fig. 7—Shear with Revolving Head.

with corresponding graduations and the detail of the head is clearly shown in the cut. This machine is driven by a 12-h.p. motor directly connected through cut gearing, the motor being on the opposite side from the view shown.

Another machine of interest in this plant is the gate shear which has a distance between housings of 146 in., and capacity to cut ¾-in. plates 12 ft. long at one stroke. It is driven by a 40-h.p. motor directly connected to the fly-wheel shaft through cut gearing and friction clutch. There is also a 25-in. throat punching machine of sufficient capacity to punch a 2¼-in. hole through 1⅛-in. thick plate. The sliding head is controlled by automatic stop so that the punch can be stopped automatically at any desired distance above the die.

American Triumph Planer, Matcher and Molder.

The accompanying illustration shows a planer, matcher and molder adapted for saw mills and small planing mills having limited room and power, and ones in which a machine is required for a large variety of work, such as planing and matching, beading, working flooring, ceiling, siding, casing, wainscoting and a large variety of molding and trim. The machine is very compact, being designed to economize space and withstand the hardest usage. Vibration, so common in small planers of this class, is reduced to a minimum, and the work turned out is said to be uniform and equal in quality to that of large expensive machines.

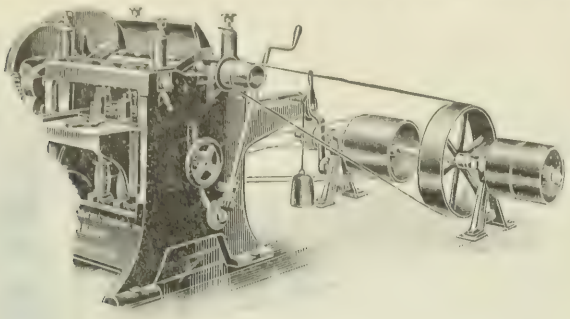
The main frame is amply proportioned and strongly ribbed, designed to insure the greatest strength and stiffness.

The table is cast in one piece and is deep and strong, being heavily ribbed and having arched braces on the under side. It is planed on top and has raised edges to prevent the material from leading against the side frames. The sides are long and placed far apart, being fitted to the outer edges of the main frame to which they are gibbed, thus securing the greatest rigidity and least possible wear.

The cylinder is made of special grade steel and is accurately milled on four sides, two of the sides being slotted to carry beading and molding knives in addition to the regular planing knives, which do not have to be removed when beading and molding is being cut.

The matcher spindles are unusually large and run in long,

babbitted boxes, ample provision being made for thorough lubrication. The matcher frames are also strong and are carried by 1 1/16-in. round steel guides at top and bottom, provision being made to easily take up any wear or lost motion. One of the matcher spindles is adjustable by a hand wheel at the



can Triumph Planer, Matcher and Molder.

side of t ..achine and has an eccentric clamp for securing it in any ·sired position. The matcher heads are made of bronze of standard design and will carry matcher, edger or molding bits 1/8-in. thick and up to 2½ in. wide. Shimer heads can be used when desired. Molding knives can also be used on the main cylinder where the cut is not over ⅞ in. deep. A heavy adjustable chip breaker is placed in front of the cylinder, which also acts as a hood. It may be swung back to expose the knives. Each matcher head has a chip breaker, one of which is self-adjusting.

An adjustable pressure bar prevents any vibration of material between the cylinder and matcher heads. This pressure bar and the front chip breaker may be set close to the cylinder for special smooth surfacing and can be set out so as to clear molding bits when used.

The feed is very simple, powerful and positive, with steel rolls 3 in. in diameter turned from the solid; the top feeding-in roll being fluted. The feed is driven by a belt from the countershaft, to which a belt tightener is attached, so that the operator can stop or start the feed at will. Two rates of feed, 35 ft. and 42 ft. per minute, are provided, and the change from one to the other can be quickly and easily made.

The illustration shows the machine double geared with both top and bottom rolls driven, but it is also furnished single-geared with the top rolls only driven. This machine is made by the American Saw Mill Machinery Co., Hackettstown, N. J.

Locomotive Cylinder and Piston Valve Chamber Boring Machine.

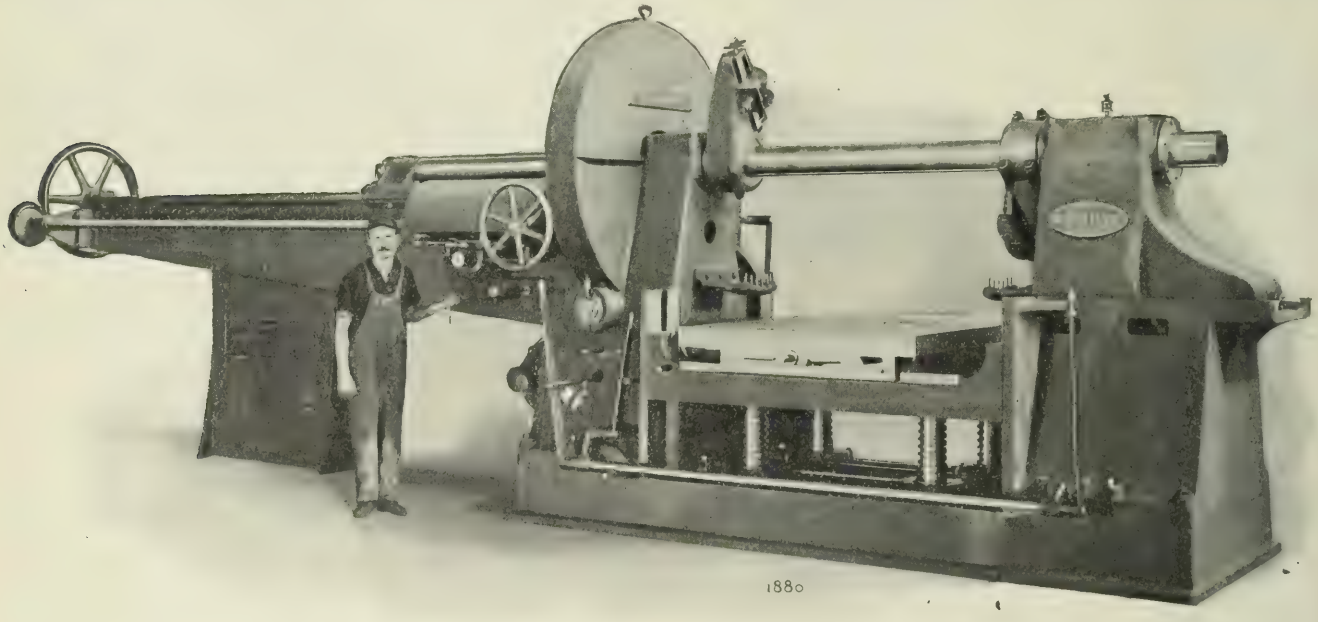
The accompanying illustration shows a machine designed to bore and face both ends of a locomotive cylinder at the same time, and it is one which will take cylinders up to 60 in. in length. The boring bar is a steel forging 7 in. in diameter, with a continuous traverse of 11 ft. by hand and a fast power traverse in either direction. The boring feeds, six in number, are automatic and reversible, and are actuated by a screw through a protected nest of gears. They are engaged, changed or reversed by conveniently placed levers. The screw feed is especially adapted for boring the interrupted parts of piston valves.

The main table is supported on four elevating screws, the nuts of which are revolved either by hand or power. The cross table is 54 in. wide in the direction of the machine's length and 72 in. long transversely. The top surface of the table has the necessary T-slots for clamping the work. It has a cross movement of 30 in. and a longitudinal movement of 18 in. The minimum distance from the center of the boring bar to the table is 30 in. and the maximum is 5 in.

The facing heads are provided with tool slides having compound motion, and they are clamped to the end of the sleeves with the boring bar. The automatic star feed is provided, and when not in use may be allowed to hang in place. The minimum distance between the facing heads is 20 in. and the maximum distance 60 in. The boring heads may be provided of various sizes to meet requirements.

The machine is driven by a 20-h.p. motor, geared directly with the reversing controllers. The raising and lowering of the table and the fast traverse of the boring bar is accomplished through this same motor.

This machine is made by the Niles-Bement-Pond Company, New York.



Niles-Bement-Pond Locomotive Cylinder and Piston Valve Chamber Boring Machine.

The absolute necessity for abundant coal supplies to use on warships and other vessels make the discovery of coal in Peru an incident fraught with importance. Some 1,500,000 tons are needed on the American Pacific coast for such purpose. Heretofore English and Australian coal has been used, the former costing $16 per ton and the latter about $14. Peruvian coal, 86 per cent. fixed carbon, found in large measure near the surface and within 75 miles of the coast, can be bought for from $4 to $6 per ton. This coal has been found to be satisfactory on the merchant marine and is now being experimented with on war vessels.

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In another column Mr. York submits for discussion a rail section with a supported joint. He does not attempt to carefully design that rail section; his drawing might be called a conventional drawing or suggestion for a tendency in designing. He proposes to return nearly to the old pear-headed section, to hold the rail in line with fish bars only, and support the joint firmly and directly at its base. Being a rolling-mill man, his main aim is to make it easier and cheaper to roll a good rail. It is obvious that to preserve the same height as present rails and also to insure the same strength as a girder, additional metal is needed in this proposed section. Mr. York calculates it at about 10 per cent. increase, and this increase he believes to be balanced by longer life. It is noticeable in this connection that ferrotitanium rails, which are believed to be more enduring, cost about 10 per cent. more than ordinary rails. Mr. York is probably wrong in thinking that this section "does not entail any radical changes for its installation." A good deal of study and skill will be needed to adapt it to present methods of frogs, switches, detector bars and the like, and, in the matter of bonding for electric circuit the difficulties seem to be great. Nevertheless, this subject seems worthy of further study and criticism.

The milling-in-transit—or, more briefly, the transit—privilege has grown up to meet commercial needs. It has served, and still serves, a useful purpose. It could not be abolished without effecting a revolution in methods of doing business that would cause much harm. But the recent hearings before the Interstate Commerce Commission show that the privilege is being widely and grossly abused. Under cover of it not only the spirit and intent, but also the very letter, of the Interstate Commerce act, are being flagrantly violated. It is being constantly used as a means of getting rebates. These violations of the law seem sometimes to be accomplished with the connivance of the railways. In most cases, they seem to be accomplished despite and in fraud of the railways. The conditions disclosed amply justify the commission in entering on a through investigation of the entire use and abuse of the transit privilege. While it ought not to be abolished, while perhaps the rules regulating it that the commission lately adopted are not practical, it is evident that some restrictions must be imposed on it, if it is not to be employed to effect wholesale unfair discrimination and rebating. If the necessary restrictions impose hardship on commercial interests, those interests will have no one to blame but themselves; it is they who have made restrictions necessary. No doubt, the most effective way of making unnecessary vigorous restrictions, which would interfere as much with legitimate as with illegitimate transactions, would be for the commission to institute prosecutions that would result in the severe punishment of many of those who have been deliberately and knowingly violating the law. The punishment of those who violate the law, whether railway men or shippers, is needed, not only to secure obedience to the law, but to protect the large majority of shippers and railway men, who sincerely wish to obey its spirit as well as its letter, against those who are willing, in order to gain a temporary advantage over competitors, not only to take the risk of going to prison themselves, but to excite further public hostility against railways and invite further restrictive legislation that will be equally injurious to shipper and carrier.

The fact that returning prosperity seems to be bringing with it the usual crop of labor troubles warns us that we have not yet solved the problem of using human labor efficiently, and we ask ourselves if we have really made much progress in this direction. The earliest method of utilizing human labor was that of slavery, where the stronger compelled the service of the weaker, and the theory that "might makes right," so long the guiding principle of all human action, gives place very slowly to the more modern conception that fair treatment of the individual is in the long run best for the community in general. The workman who feels that his job is the best he can get, and the employer who feels that he has the best man he can get for the job, form a combination which insures harmony, efficiency and prosperity. The real labor problem is how to bring about this combination. Under these conditions the workman tries to make his job permanent by complying with the wishes of his employer, and the employer is careful to avoid actions that tend to make the workman dissatisfied. Failure to regard the problem from this standpoint, and a disposition to regard the hiring of labor as being in the same category as horse trading, in which each party tries to get all he can regardless of what he gives, is the great obstacle to co-operation between employer and employee. As long as the employer asks only how cheaply he can get his workmen, they in turn ask what is the minimum amount of work they can do and hold their jobs. This is the normal condition under our present system of handling labor, and we should not only not be surprised at the difficulty of procuring efficient workmen under it, but rather that our labor troubles are so few. Under any reasonable system of management it is not the cheap workman who

is most profitable, but the trained, high-priced workman who renders efficient service. This has been so thoroughly demonstrated that many companies are now carefully training workmen for even the most subordinate positions. The habit of disregarding individual efficiency and limiting the pay of good men by what the poorer ones can earn, must be modified before we can really start to solve labor problems.

Shippers of dressed poultry, butter and eggs have complained to the Interstate Commerce Commission about the rates charged them on shipments from the Missouri river to Chicago and the East. The rates of which they complain are 45 cents on mixed carloads of dressed poultry, butter and eggs from the Missouri river to Chicago, and 75 cents, Chicago to New York, making a total of $1.20 from the Missouri river to New York. On butter and eggs the rate, Chicago to New York, is 65 cents, making a total on these commodities, Missouri river to New York, of $1.10. These rates are compared by the complainants with those on dressed meat. The local rate, Missouri river to Chicago, on dressed meat is 23½ cents. The proportional rate, Missouri river to Chicago, is 18½ cents; to which is added the local rate, Chicago to New York, of 45 cents, making a total rate, Missouri river to New York, of 63½ cents. The complainants allege that the rates charged them are unduly high as compared with those on dressed beef. And they are undoubtedly right. The vice of the situation, however, is not in the rates on dressed poultry, butter and eggs, which are not excessive, but in the rates on dressed meat from the Missouri river to Chicago, which, as repeatedly has been pointed out in the *Railway Age Gazette*, are too low. These rates on dressed beef were fixed by a contract entered into by the Chicago Great Western and the packing companies some years ago. In consideration of the reduction then made by the Great Western the packers agreed to give it a certain percentage of their shipments for five years; and other roads, of course, had to make similar reductions. There never was any justification for the cut made by the Great Western in the rates, except that its management could thereby get a larger share of the business. The original contract has expired. The Great Western has passed into the hands of a new management. The time, therefore, it would seem, is ripe for a reasonable advance in rates on dressed meat. The existing rates always have been, and are to-day, indefensible on any fair principle of rate-making, and are unduly discriminatory in favor of the meat packers and against the shippers of other commodities. As long as they exist they will be made the basis for invidious comparisons with other and higher rates. It will be alleged, and truly, that if they are high enough, then the rates, not only on dressed poultry, but on fresh fruits and other perishable articles, must be too high. It will be charged, and perhaps truly, that the main reason why they are kept in is that their main beneficiaries are certain large concerns which, because they are large, have more "pull" with the railways than would a more numerous body of small concerns shipping equal quantities of the same commodities. If the rates on dressed beef were to-day as much as 25 cents and 35 cents, and a complaint should be filed with the Interstate Commerce Commission asking their reduction to the present basis of 18½ cents and 23½ cents, does anyone doubt that the railways would oppose the reduction? It is beyond serious question that they would say that it would work unfair discrimination against shippers of perishable commodities and compel them to render an unusually expensive service for unremunerative rates. As long as the railways keep in, here and there, rates which every traffic manager knows are too low, and which often exist mainly or solely for the benefit of large shippers, they will find it difficult to prevent reductions in other rates which are not too low, and impossible to defend themselves against the charge of unjust discrimination.

FURTHER POWERS FOR THE RAILWAY COMMISSIONS.

We print this week part of an important address by Professor Emory R. Johnson on government regulation of railway corporations. Professor Johnson is not only a sound student of railway affairs, but his habit of mind is conservative and he is not apt to be led astray by temporary and fluctuating economic situations. His review of the trend of railway regulation in this country is admirably clear and concise. Yet when he urges various increases of power for the Interstate Commerce Commission because they are logical, it seems to us that his argument scarcely rests on sound practical grounds. The logical, in government affairs, carries a very low quotation and there is often no market for it at all. Our own belief is that the great value of all our railway regulating commissions, state and national, lies in their service in taking away the feeling of public oppression at the hands of the corporations. The people in this country never have been oppressed by their corporations, but there have been countless cases of small wrongs which have become magnified into great popular causes because the ordinary processes of law were well out of the reach of the smaller shipper. But when actual control of the public relations of the railway corporations was placed in the hands of a commission which was chosen directly or indirectly at the polls, a great part of this popular resentment died out, and it ought nearly all to disappear in the next five or ten years, just as it has nearly disappeared in England.

The farmer and the small shipper now have only their own commissions to blame if the railways act in a manner which seems to them unfair, and they must take out their wrath on the commissioners and not on the corporation. This is a wholesome situation, and is by far the most important service which the commissions perform. The actual effect of their rate making will probably be to cause the general level of rates throughout the country to be slightly higher than it would be if there were no commissions at all, because railway managers are slow to make reductions for temporary or special reasons if they are going to be obstructed in restoring rates to former levels; the more rates are controlled by commissions the less railway managers will be inclined to try experiments with them for purposes of development. The shadow of the Railway and Canal Commission has frightened away many reductions in British rates.

We also disagree with Professor Johnson's advocacy of government regulation of railway capitalization. Professor Johnson speaks of the admirable work done by the Massachusetts Railroad Commission; perhaps he forgets the report of the special commission on commerce and industry. The Massachusetts Anti-Stock-Watering Act of 1894 provided that whenever a steam railway, a street railway, or a gas, electric lighting, aqueduct, water, telegraph or telephone company should increase its stock by an issue exceeding 4 per cent. of the existing capital stock, the amount necessary for the contemplated purpose should be offered to shareholders at its market value at the time, as determined by the Board of Railroad Commissioners, but that no share was to be sold or issued at less than par. The feeling throughout the state gradually became widespread that while this law effectually prevented stock-watering, it was a millstone around the neck of industry, and in the summer of 1907 an exceedingly able commission was appointed by the legislature to find out whether this law or some other thing was opposing the material development of the state.

This commission reported in March, 1908. It found, first, that when the state prescribed a price above par as the minimum basis on which new stock could be offered, it thereby put itself in an impossible position with regard to any subsequent efforts to determine what was a fair rate upon investment, and consequently impaired its own efforts to control the service performed by the corporation. It found, also,

that capital had been kept away from the legitimate enterprises of the state by the requirements of the law, and it placed emphasis on the point of view that the concern of the public with what a railway earns is very slight, whereas its concern with what the railway does is very great. The commission also added a modest recommendation that the idea of punishment be left out of new corporation legislation entirely.

Public regulation of railway capital cannot affect freight charges, as we have often pointed out; it can only serve as a protection for the individual investor, and as a safeguard for the community against the general disadvantages arising from the presence of an insolvent corporation. But it is almost, if not quite, impossible to frame laws rigid enough to accomplish any useful protection of this kind without incidentally doing vastly more harm than good. After all, laws to prevent overcapitalization are much like laws to prevent usury, or to fix the price of corn; if enforced at all, they usually have an opposite effect from what was intended. The railway which is allowed to issue no capital except for the actual cost of specific additions and betterments, for example, will see to it that no additions and betterments escape uncapitalized. But it is just this practice which is bringing the British railway system closer to insolvency every year! Parliament has always scrutinized closely all railway share and debenture issues, yet the British railway system is seriously overcapitalized; our government does not scrutinize railway securities at all, and yet it is quite certain that the railways of the United States could not be replaced for the sum total of the securities issued against them.

THE CLOSE OF A RAILWAY COMEDY.

"At the date of my annual report for 1908 there were pending four cases which arose out of the controversy between the commonwealth and the New York, New Haven & Hartford Railroad Company. Two of these cases were bills in equity against the Worcester & Webster and Webster & Dudley street railway companies. * * * Since the ownership and control (of the Boston & Maine shares) have been expressly sanctioned by the legislature there is no further merit in the pending information already referred to; and that proceeding, as well as the bill in equity directed against the Worcester & Webster and the Webster & Dudley street railway companies, respectively, may properly be dismissed."—Report of Attorney-General Malone of Massachusetts for the year ending January 19, 1910.

A few months only have gone by since Attorney-General Wickersham, of the United States, announced the discontinuance of the federal suit against the New York, New Haven & Hartford to prevent that corporation's control of the Boston & Maine. Attorney-General Malone, of Massachusetts, now announces the discontinuance of the state suit aimed at the same corporation's control of a large group of the Massachusetts street railways. Both the attorneys-general, federal and state, have assigned, as ground for dismissal of the suits, respectively, the Boston Holding Company plan ratified by the Massachusetts legislature last year; and, in both cases, the reasoning, even to the laical mind, is delightfully illogical. In the federal case at bar what had a state's action to do with questions of restraint of trade and of competition in New England raised by the Sherman act and when there had been absolutely no change in the physical relations of the railway lines? And what had the state suit bearing upon the trolley holdings to do with the Boston Holding corporation expressly organized to take over a specific and limited set of steam railway shares? In both these cases, one involving the substantial railway monopoly of New England, the other the ownership or control of some 500 miles of Massachusetts trolleys, the two prominent law officials have obviously used the Boston Holding Company act as a very tenuous screen for a retreat.

So ends, for the time being at least, a railway comedy which, but for the magnitude of the interests involved, would have elemental humors worthy of opera bouffe and the melodious strains of an Offenbach. Through its mazes reaching over years of time memory absorbs a few of its most salient incidents. There was the original legislative outburst following the New Haven's purchase of the 110,000 shares of the Boston & Maine; next the restraining act which tied up the main situation; then the grist of lawsuits leveled at both the Boston & Maine control and the Massachusetts trolley holdings, the findings of the state courts, the legal battle of the Connecticut and Massachusetts charters of the defendant corporation, reams of briefs, tons of legal verbiage, fat fees of the lawyers. Massachusetts politics kept hot pace with the courts. The "merger," with the trolleys annexed, was the focal point of a warm state campaign with voluminous and high flown oratory on the stump. But the humor of backsight with its broad smile pauses longest on the Massachusetts chase for legal and proven ownership of the Boston & Maine shares and of the trolleys, and the defendant schemes of masking that ownership. Never on English hunting ground was chase for the elusive fox more ardent than the Bay state's search for that statutory ownership "direct or indirect" under the terms of the law. The New Haven stockholder, pro rata owner of certain securities representing many millions, went to bed almost daily without knowledge where next morning those interests would vest. But at last they found refuge in "individual" ownership—the trolleys in the separate hands of controllers of the New England Investment & Security Corporation, the Boston & Maine stock in the hands of John L. Billard, of Meriden, Conn. who, from the lowly eminence of a local financier, leaped with sudden bound to the peak of a great fiscal railway magnate. The final compromise and the transfer of the Billard shares to the new Boston Holding Company are too recent and familiar to need review.

Out of the mixed gravities and humors of this New England railway tale, big with future events, come two important suggestions. One is the apparent effectiveness of individual ownership fortified by complete technical title, as a bar to legal procedure directed at corporation ownership. The corporation ownership may be a practical, as distinguished from a technical fact. But the transfer to an individual if unattended with contract, resting on agreement merely implied, the purchase money passing and the whole transaction founded upon a "sympathetic" relation looks like a serious stumbling block to prosecution, whether such prosecution is laudable or the reverse. In the New Haven suits, now at an end, one of which was for a time a depressing force in Wall street, it cannot, of course, be positively asserted that the private holding device was an element in the dismissal. But the outcome at least strongly denotes it. A "sympathetic relation" in stockholding cannot be sued, enjoined, replevined, courts cannot issue decrees against a sensation or motive. But the plan has its counter dangers. The "sympathetic relation" may itself change. It is founded on an uncertain personal equation. It is the victim of disputes and disagreements which may spell antagonism instead of concord and with vast powers in the individual hand. And, beyond, lie such perilous contingencies as death, the tying up of estates and interests and equal menace to heirs and to the corporation which has risked the personal chance of death or survival. In the New Haven suit, for example, the death of Mr. Billard, a man well advanced in years, would have created a situation interesting not to say calamitous. On the whole we are unlikely, in the future developments of railway litigation in this country, to see the "personal" transfer employed save possibly as a temporary device and in extreme emergencies.

The bigger and broader lesson of the outcome in Massachusetts is the arrant absurdity of injecting acute and demagogical politics into a matter, however important, of railway readjustment. Indeed the more vital such a readjustment is the more imperative does it become that it should be referred to cool brains and the trained intelligence. Massa-

chusetts had its period of legislative and popular upheaval over the New Haven suits and for a brief while entered upon almost volcanic conditions. Facts and figures went by the board and shouting folly went to the masthead. Politics in one shape or another has delayed for years an adjustment which with justice and protection both for the corporation and the state might have been arranged in a fortnight. In the end the stage got tired over the snarl of litigation and the labyrinth of controversy, and the settlement followed of which the legally illogical but wise withdrawal of the trolley suits marks a final stage. The conflict has been long, costly, vexatious. It has left behind some side questions like the scope of conflicting railway charters of Massachusetts and Connecticut yet to be clarified. But as precedent and warning with its teaching for scientific instead of emotional treatment of big railway disputes the lesson, with its final gains, may be worth its intermediate loss.

THE CROTON COLLISION.

The rear collision at Croton, N. Y., December 31, reported in another column of this issue* has been the subject of much notice; first, because it was near New York City and caused the death of a prominent man, and second, because it occurred on a road where the block system is well managed. As the Public Service Commission of the state is investigating the case, and especially as one important detail, the qualifications of the engineman, has not yet been inquired into, we shall not undertake at this time to draw final conclusions concerning it; but certain features may be noticed.

First is the investigation. The officers of the road made their own inquiry, of course. The coroner made his, and has held Engineman Flanagan for the grand jury, to be charged with manslaughter in the second degree. He released the fireman and the flagman, holding them blameless. He made some useless recommendations about signaling. The grand jury will, no doubt, make a searching inquiry, for, it is said, the heirs of the passenger who was killed, Spencer Trask, a distinguished citizen and banker, are going to press vigorously for adequate punishment. The State Public Service Commission has already held two all-day hearings, and its members visited the scene of the collision. They also had a special train run to illustrate the use of power brakes. Four commissioners, salaries fifty dollars a day, took part in these hearings, though only one of them is acquainted with railway operation. Two of their technical assistants asked a very few questions. All of the useful functions of the coroner, the district attorney and the four commissioners could be much better performed by one, or at most two, expert examiners. In England one investigator serves in nearly all cases, with very satisfactory results. Legislatures nowadays seem to want special commissioners to deal with all sorts of petty details and the New York State Commissioners seem disposed to carry out that wish. The latest proposition in the legislature at Albany is that the commission shall decide, in each country village, whether each local newspaper has enough circulation to justify the state in compelling the railways to advertise in it!

The second obvious conclusion from the facts in this case is that investigations of accidents not only should be made by a single competent body, but should go deeper than any state railway commission ever goes. The message sent by the despatcher to Engineman Flanagan, with the despatcher's and the engineman's testimony, indicate that enginemen are not very strictly disciplined, and that when discipline is administered the job is not always skilfully done. A train of special importance should be entrusted only to a man specially well qualified; at least well qualified enough to be trusted to use his own judgment throughout a single trip. If a runner were dull, a message like that here shown would be more likely to "rattle" him than to safely improve his speed. If Flanagan's failure to run fast enough was due to lack of explicit instructions the fact would seem to indicate loose practice at the starting point. The testimony of the fireman indicates that the rule requiring both enginemen and firemen to observe fixed signals was not carefully carried out; and the testimony of other witnesses tends strongly to discredit the statements of the men on engine 2153 that signal 35.21 was clear. In short, the only satisfactory investigation in a case like this is one which goes thoroughly into the character, conduct and ability of the engineman, and all who are vitally concerned, for several years back; far enough back to show what basis there is for the conclusion that each employee was fully fitted for his responsibilities.

The subject of flagging was illuminated significantly. The passenger train had been stopped four or five minutes. The flagman could see a clear road 2,000 ft. back and could see the semaphore signal properly displayed at stop. The rule gives the flagman considerable discretion (unless the conductor is at hand and instructs him). If any discretion is to be allowed at all, what better exercise of it could be expected than resulted in this case? Is it any wonder that the coroner let the flagman off? As to enforcing a flagging rule which allows no discretion to the flagman, everybody knows that it is a failure. The general and utter absurdity of our flagging rule is shown by the passenger conductor's testimony, that passenger trains were habitually stopped at block stations, yet that flagman did not go back. That was before this collision occurred. Since that date flagmen are as energetic as dynamite bombs. One passenger train, in running from Buffalo to Albany, 300 miles, left nine flagmen behind, one after another, the conductor repeatedly telegraphing ahead for fresh men to take the places of those left. The testimony at the hearings showed that the flagging rule was managed on the Pennsylvania about the same as on the New York Central. If two of the biggest and richest roads thus experience difficulty, what can be expected of the "average" road? The simple fact that the rule has a different effect immediately after a collision from what it has immediately before one, condemns the whole principle. It is high time to perfect the space interval and to give up the attempt to secure safety by the combination of the space interval and the time interval—two things that will not mix.

The fact that three-position signals had been substituted for two-position north of Croton a few weeks before will be made the subject of considerable discussion in connection with this collision; but it is doubtful if there can be any profit in such discussion. We do not understand that either the engineman or the fireman claims to have been deceived or confused by the new arrangement, but there will be those who will say that such may have been the case nevertheless. So far as this particular collision is concerned the point can hardly be called important, for Flanagan had a clear view of the home signal at stop—an aspect which is the same under the new as under the old system—as well as of the rear end of the rear car of the standing train, for full 2,000 ft. before reaching them; and against an engineman who runs into a preceding train under such circumstances there is a strong presumption of carelessness—unless his mind had failed. The fireman's testimony that he thought the engine would stop before striking the passenger train lends color to the theory that in the engineman's mind there was a definite intention to stop at the home signal, but that he simply overestimated his brake power, having been used to running long trains and having never before had occasion to brake one like this—a heavy engine and only 13 cars.

But on the general question of changing these aspects there can hardly be two opinions. If the three-position upper-quadrant arrangement is superior to the two-position lower-quadrant in sufficient degree to warrant the expectation of a considerable increase both in safety and economy, it is the duty of railways generally to adopt it; and this is so even if it were necessary to limit the speed of trains temporarily. That

*Some of the testimony that was given at the investigation of this accident will be found on page 254, last week's issue.

every engineman (and fireman) should be thoroughly instructed on the aspects, and repeatedly tested, goes without saying. Indeed, taking things as we find them on most roads —a considerable percentage of enginemen possessing only imperfect knowledge of the signal aspects with which they have to deal—all enginemen ought to be thoroughly instructed on general principles; a change in aspects ought to be welcomed by the trainmaster as a valuable opportunity to invigorate his general discipline. A number of roads already have adopted the upper quadrant and it seems reasonable to assume that its use will constantly spread. There is no possible reason for confusion if the engineman has three seconds to think; and the occasions when the engineman of a freight train does not have five times that length of time to think, and when a mistake would lead to a collision, are so rare that they need not be considered. In the old system 45 deg. downward means all-clear (because through slipshod management 45 deg. is accepted as meaning the same as 60 deg.); in the new the only diagonal aspect (45 deg. upward) means all-clear for a limited distance; but the upward position certainly is violently different from the downward; and the limited length of road signaled clear under the new arrangement after all is, in practice, the same as the distance which was cleared under the old. That is to say, if an engineman, seeing 45 deg. under the new, mistakenly assumes that it is a clear signal under the old, he should naturally assume a clear track only to the next signal, which he is free to do—because in assuming the signal to be one of the old style, he is also bound to assume that it is a home signal, not a distant, for it does not have a fishtail end. This is assuming daylight experiences. At night the new 45-deg. indication does not resemble the old all-clear indication.

Another fact sustaining the view that changing from two-position to three is not a severe tax on the engineman is the experience of the Pennsylvania Lines west of Pittsburgh, where, on 25 miles of busy four-track road, the change was made ten years ago without difficulty, and without changing from lower to upper; the lower quadrant practice was (and is) retained.

In considering the seriousness of the tax on the engineman's mind it must be remembered that, with reasonable discipline, the problem of seeing and interpreting signals in a very short time and under exciting circumstances does not occur except in academic discussions. In actual practice the runners who travel at high speed and who must meet these theoretical perplexities are bright men who meet them successfully without any coaching. They are level-headed runners of long experience. If they are not men of good quality the superintendent is the man who is responsible; for there is no justification for entrusting fast trains to any but tried enginemen.

Letters to the Editor.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Boston, Mass., Feb. 4, 1910.

To the Editor of the Railway Age Gazette:

In my letter to you published February 4 on the above subject I quoted some matters from a paper of mine before the American Society of Mechanical Engineers relating to the performance of the Strong locomotive from memory, thinking that I remembered them correctly. After sending you the letter, however, I looked them up and found that I had overstated the matter.

The sentence referring to the increase in the indicator diagram area should have given this as 35 per cent. in excess of diagrams from the ordinary locomotive, and in another place I should have stated that at high speed I should anticipate nearly 50 per cent. more area than the typical indicator diagram.

F. W. DEAN.

"COST OF SERVICE" AND THE ALTON CASE.

New York, Feb. 5, 1910.

To the Editor of the Railway Age Gazette:

I have read with very great interest the article on "Cost of Service." It is a matter for regret that you could not have had the opportunity to make this altogether lucid and sane comment in direct reply to Mr. Clements before the Economic Club the other evening.

Indeed, it seems to me that the argument may be fairly pressed even further; for, even in the case of railways furnishing exclusive service to a territory, such roads are almost invariably engaged in the process of building up a contributory traffic. Their problem is to create business, and I believe the facts will show that in railway practice that is done by processes of inducement and not by the imposition of the highest possible traffic rates. I have, for instance, in my own experience, seen a ranch territory brought up in value from about a dollar and a half to eight dollars per acre in the course of some six years by a long spur line operated without any kind of competition. To me it all appears to be a plain question of supply and demand and you have illustrated this very incisively in your comments on the Alton and the L. & N. roads. Mr. Clements' views reminded me very much of an evening I once spent some years ago in a little hotel in Texas, listening to the damning of the railway by a group of cattlemen who owed pretty much all they had, and it was considerable, to the railway which had brought their lands into touch with the market.

C. F. GODDARD.

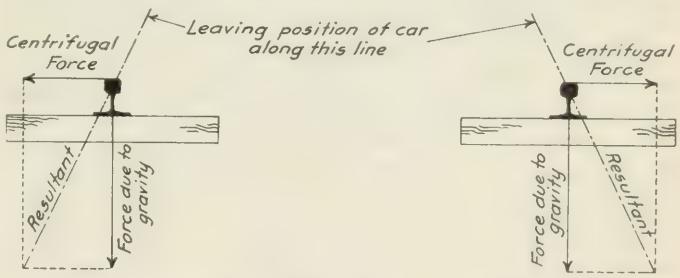
GYROSCOPIC ACTION ON CURVES.

New York, Feb. 3, 1910.

To the Editor of the Railway Age Gazette:

Referring to your article on the Scherl Monorail Gyroscope Car in your issue of January 21, 1910, I beg to quote the following: "There is apparently no provision for the cars being prepared to meet a curve, a detail which would be of greater importance as the speed increased. It is not possible with the single rail to prepare the car for a curve as is the case when two rails are used."

You, no doubt, have in mind single curves only. It would seem that if the curves were spiralled or eased off on the ends, that the car could be prepared to meet the curve, and



Gyroscopic Action on Curves.

that the speed could be increased, and that it would then be possible with the single rail to prepare the car for a curve, as is the case when two rails are used.

As I understand gyroscopic action in the monorail car, all things being equal, on tangents, the resultant of the forces due to gyroscopic action would be vertical and the car would assume a vertical position; on curves, the resultant of the forces due to gyroscopic action would act along the resultant due to the forces of gravity and those of centrifugal motion, and the car would lean toward the center of the curve, this leaning position being controlled by the speed of the car and by the degree of curvature.

Should the gyroscopic monorail car take a curve which

had been spiralled or eased on each end, beginning at zero curvature and gradually increasing the curvature until the full degree of simple curve is reached the following conditions would obtain: The center of gravity would *tend* to move outward with increasing rapidity until the simple curve was reached, the force due to gravity would remain constant, the force due to centrifugal motion would increase from zero to the centrifugal force, as for the simple curve, and the lean of the car would be a gradual process from the perpendicular position obtained on tangents to the leaning position obtained on the simple curve. The leaning position (all things being equal, and by the use of the hydraulic jack, which changes the phase-difference of the two kinds of forces) should be along the line of the changing resultant, and the center of gravity would therefore remain at all times above the point of support.

HERBERT H. CANTWELL.
New York Central & Hudson River Railroad Co.

STEEL RAILS; RELATION OF DESIGN TO STRENGTH.

New York, Feb. 4, 1910.

To the Editor of the Railway Age Gazette:

In a recent paper on "The Evolution of the Metal Tie, or Sleeper," I explained why engineers in the past had adopted iron and steel sections, for engineering purposes, that were not best suited to meet the highest requirements. The reason being that a proper section could not be rolled at that time.

In the early stages of railway construction iron was the metal used for rails and, owing to its weaker nature, when



Fig. 1.

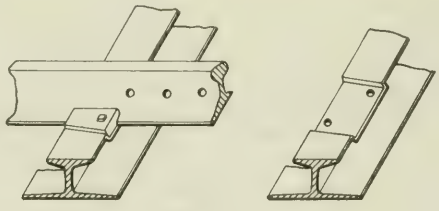


Fig. 2.

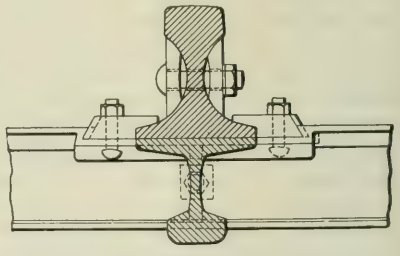


Fig. 3.

either hot or cold, the rails were designed on entirely different lines; that is to say, the flanges were both narrower and thicker. This kind of rail design was made necessary by the supposed impossibility of rolling rails of more modern dimensions. The advent of steel, with its much greater strength, at rolling heat, permitted many changes in rail design, especially in adopting wider and thinner flanges. These changes were chiefly for economizing in weight of rail, by leaving all the metal possible in the head of rail where the direct wear is centered. It may be asserted that these changes have not produced all the advantages expected by the engineers that designed them.

The railway engineer, when designing a rail section, naturally has in mind the various functions that a rail has to perform, also, as far as his knowledge goes, the practicability of rolling the rail itself. The steel manufacturer generally looks at the entire transaction from a commercial standpoint. The consequence is that the railway officers find out, when it is too late, that the rails are not giving the satisfaction expected.

The recent experience of railway officers with broken rails and the consequences entailed thereby, justify a few suggestions toward bettering these conditions.

Rails, as now produced, have to be shaped so that they will provide the necessary angle under the head, to transmit to the angle joint the downward pressure occurring at the end of the rail. The designing of the rail section to meet these conditions results in producing a rail that is inherently weak in structure. In practice it is well known that any angle rolled in a steel bar is a great source of weakness, especially where the section is submitted to shock, as in rail service. Another defect in the present rail design is that in rolling the angle part of the metal it never gets proper rolling action, but is drawn through the rolls at a different surface speed, resulting in permanent stresses left in the rail. The question naturally arises: Can a rail be designed and rolled, having the best physical qualities of steel to meet the requirements called for in modern railway traffic? Yes, if the angles under the head and on top of flange be eliminated, and a suitable joint and rail be substituted for present design.

Within my own experience the function of the joint was to keep the ends of the rails in alinement and the joints were simple bars, fitted to the web without coming in contact with either the head or flange, but as axle loads increased it was found necessary to provide bars that would resist the bending action of the rails. This was secured, in a measure, by widening the fish-plates, so that they would have a bearing against the under side of head and top of flange. This resisted, in a degree, the bending movement of the rail ends, by the vertical stiffness of the angle bars themselves, but it was found that unless the angle in the rail (under the head) was sufficiently acute to transmit the pressure through the bars, the joint bolts had to sustain the load, which was the function of the angle bars. Angle joints have been increased in weight and the design modified until it is stated that they give 100 per cent. efficiency in a joint. If this is true, we have the acme of angle joints and cannot expect further improvement in joints that depend for their application on the weakening of the rail at least one-third of its effective strength.

I have designed a rail (Fig. 1) that, in my opinion, overcomes the objections referred to.

First.—It has much greater resistance to fracture from its design, which gives it the greatest strength and toughness for its weight.

Second.—It is much simpler to roll.

Third.—It will have, from its greater depth of head, the capacity for much longer life in service and freedom from split heads and battered ends.

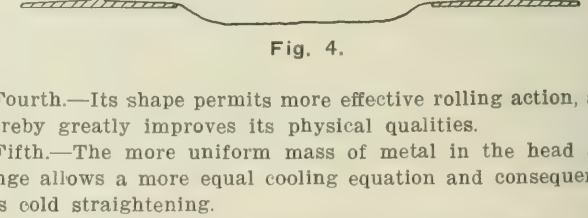


Fig. 4.

Fourth.—Its shape permits more effective rolling action, and thereby greatly improves its physical qualities.

Fifth.—The more uniform mass of metal in the head and flange allows a more equal cooling equation and consequently less cold straightening.

Sixth.—The section can be rolled without leaving in the rail inherent stresses, which is impossible in the usual rail section.

Seventh.—This design neutralizes, to a great extent, the

physical defects inherent to the present methods of making rails.

The adoption of this rail section does not entail any radical changes for its installation. Wooden ties can be used, except at the joint, and the rail can be used in connection with the usual rails, as there is no change from the standard sections in height or width of head.

It is proposed to use two York steel tires, with recessed seat for rail (Fig. 2), an dthereby furnish the most efficient joint yet introduced, that can beadapted to any possible axle load. Its simplicity, strength and adaptability to sustain the load, also its easy method of adjustment, should commend it to those who have had experience with the many failings of the present type of railjoint. Figs. 3 and 4 show the three elements in combination: rail, tie and joint.

JAMES E. YORK.

Contributed Papers.

TRAIN ACCIDENTS IN DECEMBER.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of December, 1909. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
2.	Ft. W. & D.	Wichita Falls.	bc.	P. & P.	1	5
3.	Tex. & Pac.	Waggaman.	rc.	P. & Ft.	1	1
3.	Louis. & Nash.	Birmingham.	xc.	P. & Ft.	1	5
6.	C., R. I. & Pac.	Caston, Okla.	bc.	P. & Ft.	1	7
6.	N.Y., N.H. & H.	Clinton, Conn.	xc.	P. & Ft.	0	2
†13.	Lk. Sh. & M. S.	North East, Pa.	rc.	P. & P.	3	18
16.	Minn. & St. L.	Perry.	xc.	Ft. & P.	1	0
†16.	A., T. & S. F.	Winona.	rc.	P. & P.	1	18
17.	Cent. Ga., M.&B.	Harris City.	xc.	P. & P.	3	0
17.	C., M. & St. P.	Pingree.	rc.	Ft. & Ft.	1	2
18.	Chic., B. & Q.	Seneca, Neb.	bc.	Ft. & Ft.	2	0
18.	Lk. Sh. & M. S.	Cleveland.	xc.	P. & Ft.	5	12
18.	Ill. Central.	Hawthorne, Ill.	rc.	P. & Ft.	0	10
19.	C., M. & St. P.	Blakeley.	bc.	P. & Ft.	2	0
21.	Lk. Sh. & M. S.	Hillsdale.	bc.	P. & Ft.	1	3
27.	Balt. & O. S.W.	Ft. Ritner, Ind.	bc.	Ft. & Ft.	5	4
†31.	N. Y. C. & H. R.	Croton.	rc.	Ft. & P.	1	2

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
3.	P., C., C. & St.L.	Lewisville.	d. switch.	Pass.	0	6
8.	Wabash	Belleville.	unx.	Pass.	1	6
8.	Den. & Rio G.	Blanca.	boiler.	Ft.	1	2
10.	Chic., B. & Q.	Gilson, Ill.	b. rail.	Ft.	3	0
10.	Chic., B. & Q.	Exeter, Neb.	unx.	Pass.	0	8
†12.	Chic. & N. W.	Chicago.	d. track.	Pass.	2	4
13.	N. Y. C. & H. R.	Yonkers.	landslide.	Ft.	1	1
†15.	Southern	Greensboro.	b. rail.	Pass.	9	2
15.	C., M. & St. P.	Bayard, Ia.	unx.	Pass.	0	12
18.	Great Northern.	Monticello.	d. rail.	Pass.	1	..
18.	Chic., B. & Q.	Western Spgs.	d. rail.	Pass.	0	12
19.	South. Pac.	Benson.	unx.	Pass.	2	13
20.	Penn.	Massillon.	acc. obst.	Pass.	1	3
20.	Central Ga.	Weems, Ala.	unx.	Pass.	0	3
*22.	C., M. & St. P.	Good Thunder.	d. track.	Pass.	0	40
27.	Southern Pac.	Halley.	b. rail.	Pass.	0	2
31.	C., C. & St.L.	Dawn.	malice.	Pass.	0	2
†31.	C., R. I. & P.	Trenton, Mo.	unx.	Pass.	3	43

The collision at Clinton, Conn., Monday, December 6, occurred about 4 o'clock in the morning. A westbound passenger train ran past a stop signal and into the side of a freight train which was backing across to the opposite main track. Five freight cars were wrecked. One passenger and the fireman were slightly injured. The engineman of the passenger train admits that he was asleep. The newspapers printed, with variations, a statement that he had been on duty, or, at any rate, had been without sleep, 48 hours, and had expressed unwillingness to begin this trip. One statement said that he had had only a very few hours' sleep in the past 58 hours. An officer of the road, however, says that the engineman was off duty on Sunday from 4:50 a.m to 4:55 p.m. At 4:55 p.m. he began his run from New Haven to Boston, completing the journey at 8:40 p.m.; then, after three hours 20 minutes, he began the return journey at midnight from Boston to New Haven, and the collision occurred at 4 o'clock Monday morning.

The rear collision of passenger trains at Northeast, Pa., about 1 o'clock on the morning of the 15th resulted in the death of three passengers. The leading train was at a standstill, having been delayed by trains ahead, and these three passengers were in the rear car of that train. Seven passengers were seriously injured. The second train, which was one of the fastest on the road, had passed a distant and a home automatic block signal set against it. Besides this the flagman of the standing train was back a considerable distance. The air was filled with snow.

The collision at Cleveland, Ohio, on the morning of the 18th, about 2 o'clock, was between westbound passenger train No. 1 and a switching engine. Both enginemen, one fireman and two members of the switching crew were killed, and ten passengers were slightly injured. The switching engine was crossing the main track diagonally; the passenger engine was overturned.

The collision at Hawthorne, Ill., on the 18th, about 6 p.m., was due to the absence of the rear brakeman from the freight train. This train entered a siding at Hawthorne to make way for the passenger train which was following it; but the rear brakeman, who should have set the switch straight for the main track, after his train had cleared it, had fallen from or been thrown from, the steps of the caboose, two miles back. He was not so severely injured but that he got up and tried to stop the passenger train, when it came along, by swinging his lantern, but the light was blown out by the wind, and so the passenger train ran over the misplaced switch and into the rear of the train. The engineman of the passenger train saw the switch about 300 ft. before he reached it, but was unable to bring his train to a stop. He jumped off and was painfully injured.

The butting collision near Fort Ritner, on the 27th, was between heavy freight trains moving at good speed. The trains met on a sharp curve and both engines and many cars were wrecked. One engineman, both firemen and two brakemen were killed, and four trainmen were injured, suffering severely from cold before relief arrived. The men in charge of the westbound train were running on a time order and overlooked the time at Fort Ritner.

In the rear collision at Croton, N. Y., on the 31st, a southbound special freight train of 13 cars ran into a preceding passenger train (No. 62, second section), which had been stopped, but had just got started again, and the rear car of the passenger train was wrecked for over half its length. One passenger in that car was killed and two porters were injured. The car was pushed violently forward and badly damaged the one ahead of it. The line of the road at this point is straight for about 2,000 ft. back from the point of collision. The passenger train had been stopped by the advance block signal at Croton, because of a train in the block ahead, and had been standing about four minutes, with its rear end twelve feet ahead of the home signal. This home signal was set against the freight, as was the first automatic signal north of this, which is 3,843 ft. away. The home signal was worked by the signalman, but north from Croton the signals are automatic, installed about November 1, in place of the controlled manual signals heretofore used. The new signals are three-position, upper quadrant. The rear of the passenger

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

train, as well as the home signal, could be seen by the engineman for the whole 2,000 ft. of the straight line. The flagman had gone back a distance of about 200 ft.

It is believed that the immediate cause of the collision was the mistake of the engineman in misreading the distant signal (the automatic signal) or in assuming that it indicated clear when it actually indicated caution.

In the investigation of this accident by the New York State Public Service Commission this engineman, Eugene Flanagan, said that the distant signal indicated clear and that he was running at only about 30 miles an hour as he passed it; and that he applied the brakes 1,700 ft. from the passenger train so as to make an emergency application; and that at the moment of collision his engine was running about six miles an hour.

Flanagan said that he had been a freight engineman two years, and before that a fireman, all on this division. He had had 21 hours rest before beginning this trip. This was his first trip running such a light train at such high speed. Asked as to what speed was prescribed he had an impression that 30 miles an hour was about the proper rate for a fast freight. The only instruction he had as to speed on beginning this journey was that it was a "silk train"; that is, a train containing cars loaded with silk from the Pacific coast, which freight seems always to be rushed through at the highest speed. Having no special instructions on starting he did not run fast enough to suit the despatcher, who sent him the following telegram, signed by the superintendent:

> Engineer 2153: "You have made a very poor run with the train you have, considering its size and importance. What has been the cause of this poor time? Want you to try and do better, as your train is wanted in New York just as soon as possible. Second 62 is right behind you."

This was delivered to Flanagan two or three hours before he reached Croton and while he was still ahead of the passenger train which afterwards passed him. Questioned as to his standing at the time he was examined for promotion from fireman to engineman he said that in the mechanical management of his engine, in the management of air brakes and on the questions relating to running compound locomotives, he received percentages varying from 85 to 96, but as to train rules no percentages were mentioned; he thought he had missed one or two questions.

The despatcher who sent the message calling for higher speed testified that he sent such message whenever he thought necessary; might find occasion to send such a message every night.

Following are additional details of the testimony given before the Public Service Commission:

W. H. Elliott, signal engineer, presented a sketch of the situation at Croton. The passenger train stopped at or near the signal cabin (Tower 32). Stop signal No. 19 was 12 ft. back of the rear of the train. The next signal in the rear, No. 35.21, is 3,843 ft. back, and this signal (35.21) is visible from a southbound train 750 ft. farther back. From signal 35.21 back to signal 35.91 the distance is 3,547 ft. The water trough, between the rails of the track, is between signals 19 and 35.21. It is 1,412 ft. long. A southbound train, after passing signal 35.21 about 1,500 ft. comes to the beginning of the water trough, and at about the same point signal 19 comes into view. Signal 18, some distance south of the standing passenger train, is the starting signal. Signals 18 and 19, as well as the new automatic signals to the north, are all power operated and semi-automatic. The signalman cannot clear any of these wrongfully, as they are controlled by the track circuits. By throwing lever 5 to clear the dwarf signal for reverse movement the signalman would change signal 35.21 to the stop position. Mr. Elliott concluded that the last named signal was in either the caution or the stop position against the silk train, because it was observed to be in the caution position when the passenger train was approaching. Signal 35.21 is 842 ft. farther north than the former distant signal, used there before the automatic system was installed.

J. K. Bellew, signalman, thought the passenger train had been standing about five minutes when the collision occurred. As the engineman reversed his engine to take the slack, Bellew cleared a dwarf signal (lever No. 5) which is provided for reverse movements, for the purpose of setting in the stop position the automatic signal 3,843 ft. in the rear, this signal being controlled by a circuit breaker connected with lever No. 5. He did this as a general precaution, not because he saw or heard the freight approaching. Having done this his indicator in the cabin showed that the signal, which was No. 35.21, was in the caution or the stop position.

L. D. Killmer, conductor of the passenger train, testified that in the baggage car of his train the shock of the collision was not severe; so light in fact that he was astonished when he saw the wreck of the rear car. Asked about the flagging rules, he said that in former years, when he was flagging, it was the rule to "go back till we met something." Asked about the present rule, and as to what was the meaning of the term "a sufficient distance," he replied: "Well, I have thought that over a good deal myself; I can't say as I could answer that." Asked about the present practice, and replying especially with reference to southbound trains in the morning, when suburban passenger trains are frequent, the witness said that trains were stopped so frequently at the block stations that flagmen did not go back much; that is to say, his train was not called upon to stop to pick up flagmen of preceding trains.

Eugene Flanagan, engineman of the freight, has been a freight engineman two years, and before that a fireman seven years, all on the Hudson division. He thought the temperature on the morning of the collision was below zero. Signal 35.21 was clear as he approached it; "right up in the air, 90 degrees."

Q. How far away were you when you saw signal 19?

A. Probably 1,400 or 1,500 ft.

Q. How fast were you going?

A. About 30 miles an hour. Reversed the engine when about 500 ft. from the passenger train and struck that train at about six miles an hour. Flanagan said that on seeing signal 19 against him he made an emergency application of the brakes. Questioned as to whether he did not make a partial application, allowing the catch to stop in the notches, he said that he did not. He pulled the handle right around, the full stroke. Asked why he reversed his engine when the rule required that he should not reverse when the driver brakes were set, he said that he thought there was a chance that that would hasten the stop, and that it was his duty to take the chance.

Fireman Knapp, of the freight train, eight years a fireman, was first aware of danger by seeing the flagman violently waving his flag. Knapp stayed on his engine and "really did not think that it would strike" the train ahead. He had not seen any signals from Crugers until he came to 35.21 on account of the frost on his windows. He had the windows shut because he was sweating. At signal 35.21 he had to open his window to locate the water trough, and then he saw the signal. It indicated clear. He did not call it out to the engineman, as the engineman himself was looking out.

Mr. Benson, mechanical superintendent of the Pullman Company, testified as to the construction of the sleeping car which was wrecked. This car was built at Buffalo in 1893, and the siding was last taken off in November, 1905. It had no steel sills, but was stiffened with steel plates at the ends. The outside sills were 5 in. or 5½ in. x 8 in., stiffened at the ends for about 18 ft. with ½-in. iron plates. Practically all Pullman cars are built on the same plan as this one. Steel underframes are being considered, but have not yet been put in use.

Conductor Shufelt of the silk train thought his speed was not over 30 or 31 miles an hour anywhere from Albany to Croton. The speed was not increased after passing over the

water trough. He did not feel any emergency application of the brakes.

The train derailed at Western Springs, Ill., on the morning of the 18th, about 4 o'clock, was the Oriental Limited Express, eastbound, No. 52, and the three rear cars, two of them sleeping cars, were overturned and dragged along the ditch, but they were not much damaged, though the train was running about 50 miles an hour. The newspaper accounts say that some of the passengers in the sleeping cars had stuffed clothing around the windows to protect themselves from the cold, and that these improvised cushions mitigated the injuries which they suffered from the shock of the derailment. The cause of the accident was a broken rail, and the rail was found to be piped. The outdoor temperature at the time of the accident was about zero. Nineteen passengers and three employees were injured, few of the injuries being serious.

The derailment at Benson, Ariz., at 4 o'clock on the morning of the 19th, was due to excessive speed on a curve of 10 deg. The engineman and fireman were killed, and six employees and 49 passengers were injured. This train was the "Golden State Limited," eastbound, which is run in connection with the Chicago, Rock Island & Pacific. The engine and first four cars jumped the track about 200 feet after entering the curve and cleared the rails entirely, allowing the remaining four cars of the train to continue along the track without hindrance. These cars ran about 700 feet before they were stopped by the automatic action of the air brakes. This circumstance, and the momentum with which the engine and leading cars evidently were driven along the ground after leaving the track, were taken by the investigators as conclusive evidence that the train was running at very high speed. The elevation of the outer rail of the curve was 4½ in., and according to the rule the speed at this point should have been limited to 25 miles an hour. The track was found in good condition after the derailment. Nothing wrong was found in or about the wheels of the engine or the tender. The rails of the track were not damaged, except that one rail was kinked. The ties and the signal bond wires were all found unbroken. The engineman was one of long experience on this line.

The derailment at Trenton, Mo., on the 31st occurred while the train was running at high speed, and the first vehicle to leave the track was the tender. Two passengers and the fireman were killed, and nine employees, 27 passengers and five other persons were injured. The wreck took fire very soon after the derailment and was mostly burnt up.

Of the 13 accidents to electric cars, of which we have found accounts in the newspapers in the month of December, four are reported as causing fatal injuries, the total number of persons killed or fatally injured being nine. One runaway is attributed to the sudden death of the motorman from heart disease. In one collision the superintendent of the company was acting as motorman and he himself was killed. One derailment, killing two passengers, was caused by running at full speed around a sharp curve, and the reports say that the motorman was new at the business.

THE DIVISION SUPERINTENDENT'S OFFICE AND THE SUPERINTENDENCY.

BY C. A. CANDEE,
Former Chief Clerk in Division Superintendent's Office, Philadelphia & Reading Railway.

In every department of railroading there are employees upon upon whose shoulders, as they think, rest the burden of that department. It is needless to argue that this idea does not prevail among chief clerks in the operating department, for if the *Railway Age Gazette* has not said as much in actual words, it has at some time or other solemnly intimated that the belief is prevalent. For the time being I shall try to stifle that idea and let my thoughts flow from an unbiased mind.

In the early days before the event of the typewriter, when it was thought unnecessary to keep extensive records of employees as to promotions, seniority rights, discipline, etc.; when methods of accounting were in the initial stage, office management was a less complex problem than in these days of minute detail in every branch of the service, when federal and state supervision prevails, and when the gross earnings of our important iron thoroughfares run from the fifty million to the one hundred and fifty million mark.

The perfection of the typewriting machine, while it has rendered great service to mankind in simplifying and making possible the accomplishment of important work, has seriously complicated matters in other respects. There are many prolific writers among railway officers, some of whom would make even our greatest message-writing president look to his laurels. It has been said of one general manager in particular that every time he passed a telegraph pole while out on the road in his private car, a heavy cloud of disappointment would spread over his features if he could not find some excuse to frame a telegram. It is generally conceded that a very large proportion of letter-writing is unnecessary. In some offices it is altogether probable that if proper records were maintained and referred to when information is required, the services of at least one stenographer might be dispensed with. Such a procedure would, however, be highly unsatisfactory to many, for does not a large staff of clerks denote a huge business! And who does not like to feel that the correspondence and business of his department is heavier than that of any other! Volume instead of merit is too often the slogan.

STATION AGENTS' REPORTS.

If one is determined to reduce correspondence, it can be done. A few years ago our agents were required to submit weekly letters giving a summary of the work done at their respective stations. It was soon found that the superintendent gave little heed to the statements that the farmers had begun cutting their oats, or that a carload of grain had been received for John Smith. Figures showing the business handled were useless, as there was no comparison, and if there had been weekly comparisons at the major portion of stations would prove of little or no benefit. After a time these reports were discontinued and a monthly statement substituted giving information of this order:

Carload freight:
- Cars received
- Tons received
- Cars forwarded
- Tons forwarded

Package freight:
- Tons received
- Tons forwarded

Coal:
- Tons received
- Cars received

Revenue:
- Anthracite coal
- Bituminous coal
- Merchandise forwarded
- Merchandise received
- Tickets
- Telegraph
- Car service
- Miscellaneous

Pieces Baggage handled:
- Outbound
- Inbound

No. Waybills issued:
- Local
- Joint
- Company

No. Tickets sold:
- Milk
- Local
- Foreign
- Excursion
- Commutation

No. Messages handled:
- Company forwarded
- Others forwarded
- Company received
- Others received

The contents of these monthly sheets are tabulated in a book which gives a complete story of each agency for the past six years. These figures are especially helpful in measuring the work of a station, or when additional assistance is wanted at any one point, instead of depending upon delusive theories as to why it should be forthcoming, the superintendent refers to the book, and if the request is unwarranted, as can usually be told at a glance, he so informs the agent and gives the reason therefore. This alone has considerably reduced the incoming mail and affected a large saving in stationery.

Another method of reducing to the minimum unnecessary letters pertaining to that all important subject, the delay of cars at stations, is by requiring agents to submit to the division office tissue or carbon copies of the daily car reports they forward to the car record department. While it is, of course, a duty of train despatchers to keep cars moving, the receipt of these reports by the superintendent gives an additional impetus to the work, and he is at all times in position to know if quick car movement signifies as much to all concerned as it should.

These reports show the number and initial of all cars, date of arrival and release, and the cause of any unusual delay. The information obtained is so very complete that only a comparatively few cases really demand investigation.

THE FILES.

It is truly wonderful what an hypnotic influence the single word "file" has in a railway office. It is probably the most used word in the railroaders' lexicon, for it is file this and file that from morning to night until scarcely a paper enters an office which does not eventually find its way to the file clerk's desk. Adopted with a view of making office work practical, it too frequently brings dire confusion. There are many subjects which no two men will file alike, and which no man will file alike on two successive days. Hence, simple little words that it is, apparently incapable of provoking any man's wrath, it has, nevertheless, much to answer for in the reckless use of language it frequently incites.

One reason which has led to the indiscriminate filing of a vast mass of papers is not so much the difficulty of separating the chaff from the wheat, but the assumed necessity of recording every telegram, every letter and every document received by the office that in the event of their being called for they may be produced. Whether or not the papers are found when required depends on the system used in filing and the fitness of the file clerk for his work. A first-class file clerk must like details; he must have patience to wade through large batches of papers and seek for other subjects than the one which first greets his eye. Trouble frequently follows because a clerk lacks this patience. Often there are two or more subjects covered by one file—a trap which correspondents unwarily and sometimes unavoidably lay. To cross index a file under every possible subject it may cover is the only remedy that brings real peace of mind to the file clerk. A file clerk must also have ingenuity to invent schemes by which he can by proper records relieve himself of responsibility for loss of files that when loaned are not returned, although it may in some cases be policy for him to accept the blame without remonstrating.

We have known of instances where files have been put away most painstakingly, the bundles even being decorated with pink ribbon. In the course of time they were transferred to the storage room to make space for new arrivals. Later, when the call came for certain papers among those stored, the clerk from indifference or haste, would leave those he did not want loose on the shelf. Other clerks (having access to the files) in search of papers in the storage room would not feel called upon to remedy someone else's negligence by tying up and replacing the papers; instead, if the loose papers hindered their progress, the whole lot would be deliberately thrown on the floor. It is to be hoped that such cases are rare; but it is generally feared that considerable indifference characterizes the work in filing departments which brings much deserved reproach upon filing methods.

Undoubtedly, the best method of filing that has come to the attention of the writer is the decimal classification system, copyrighted by W. H. Williams. Some there are who think it a failure, but I have not been well impressed with their treatment of it. We have tried several schemes and closely observed the workings of others; but thus far are convinced that the decimal system above referred to, intelligently applied to the requirements of each particular office and used in conjunction with the vertical filing cabinet, excels any other in vogue. One of its best features is the ideal classification of subjects; another is that files can be revised time and again as the correspondence grows—a little here, a little there; papers of real value can always be kept at hand, while those of doubtful value can be assigned to the storage room. Ready reference files do not become burdensome, and it is as easy to get the first batch of papers filed at the last.

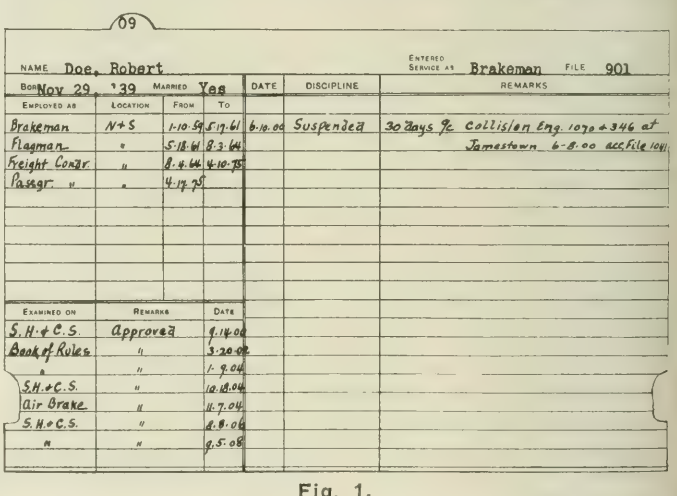
AGREEMENTS.

The matter of filing agreements is of great importance. There are probably few offices which do not follow the traditional method of folding each agreement and writing the subject matter on its back—an excellent practice, perhaps, where original agreements are kept. In this office no original agreements are filed, but typewritten copies are made of all such as pass through it, and these with blue-print plans are placed in loose leaf books. Where sidings are laid without agreement, of if any transfer of property is made where the deed or agreement does not come to this office, copies of all correspondence pertaining thereto are placed in the agreement book, thus giving in concise form a parmanent record of such transactions. A decimal index is used which makes it feasible to classify together agreements entered into with any one party, as well as those bearing upon certain districts. These volumes are kept on the writer's desk, so that he has instant access to any one of the several hundred agreements in the office. Such a scheme makes it practically impossible to lose or misplace important documents, and, what is also essential, curtails clerical work.

The agreement books, together with plue-print plans and physical characteristics of the division, enable the office to decide many questions without consultation with other departments, another means of materially reducing correspondence and telegrams.

EMPLOYEES' SERVICE RECORDS.

Service records of employees are kept on cards, as shown in Fig. 1. On the tab figures are inserted to indicate the year in which each employee is eligible for the pension list. To pick out annually those who are to be pensioned would be an onerous task without the aid of such a scheme. Its application is simple in the extreme. For instance, all 1909 men are shown by table in one vertical column bearing the numerals '09. The 1910 men follow in the next parallel row, and so on. Space in the vertical filing cabinet is assigned to papers pertaining to men, each employee being given a folder. When a man leaves the service his card is placed with the ex-employees' cards and his folder transferred to the storage file for records. If he re-enters the service his card and folder are placed in the


09

NAME Doe, Robert — Entered Service as Brakeman — File 901

Born Nov 29, '39 — Married Yes

Employed as	Location	From	To	Date	Discipline	Remarks
Brakeman	N+S	1-10-59	5-17-61	6-10-60	Suspended	30 Days & Collision Eng. 1070 & 346 at Jamestown 6-8-00 acc File 104
Flagman	"	5-18-61	8-3-64			
Freight Condr	"	8-4-64	4-10-75			
Passgr "	"	4-17-75				

Examined on	Remarks	Date
S.H.+C.S.	Approved	9-14-00
Book of Rules	"	3-20-02
"	"	1-9-04
S.H.+C.S.	"	10-18-04
Air Brake	"	11-7-04
S.H.+C.S.	"	4-8-06
"	"	9-5-08

Fig. 1.

"live" file. Thus we have in compact form a continuous and complete record of every employee. In addition a roster is maintained on bulletin boards showing the seniority of men in the train service. This leaves no loophole for anyone to claim another out, as yard, road, passenger and freight men are classified by themselves, so they know at all times just where they stand.

Agents and operators are not overlooked as regards their standing with the company, their seniority in service being also a matter of record. But in making promotions one's ability to assume charge of important agencies must always be demonstrated.

A card record is also maintained of all members of the relief association as shown in Fig. 2. This record a few years past was kept in book form. The chief objection to the book was

that owing to the association's constantly changing membership it was always in deplorable condition and had to be rewritten at least every year or two. Its mixed condition was always a source of irritation, as the attempt to show the names in accordance with their location on the payrolls proved impossible. Since the introduction of the cards this trouble is obviated. Now, if a man is transferred from one district to another, his card is changed accordingly, which greatly facilitates the pasting or deductions on the payrolls. No effort is made to keep the cards alphabetically arranged, for the tabs (containing the first two letters of the surname) are sufficient guides to find any desired card.

Name Doe, Robert Occupation Conductor

Class	A. D. B.	Date Application in Effect	Age	CERTIFICATE OF MEMBERSHIP Delivered	To Whom	Number	MEMBERSHIP CEASED Date	Cause
1		12-1-88	49	12-10-88	R D	370		

YEAR	DEC.	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	REMARKS
1907	75	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
1908	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
1909	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
19													
19													
19													

DISABLEMENT RECORD.

FORM 14 R. A. Number	Date	First Day no Time	Issued by	FORM 36 or 28 R. A. Acc. or Sick	To Sup't R. A.	Able to Return to Duty	Returned	FORM 39 R. A. BENEFICIAL From	To	Amount	To Sup't R. A.	BENEFIT CERTIFICATE Date	Number	REMARKS
15979	3/8/09	3/8	F H H	5	4	4/7/09	4/7	3/15	3/31	6 80	4/1	4/7	B 7092	
								4/1	4/6	2 40	4/8		"	

Fig. 2.

Records are kept in book form showing the cost of lights, water, telephones, etc., at various stations; the cost of maintenance of crossings and interlocking plants at junction points, etc.; of books of rules, switch keys, watches and uniforms furnished employees.

STATION AGENTS' INSTRUCTIONS.

It is altogether probable that agents have been more severely taxed mentally than any other employee. They receive all sorts of instructions from accounting, freight, passenger, baggage and car record departments, division superintendents, and possibly a half-dozen other sources. As a general proposition, there is little or no method of governing the issuance of these instructions, although since the Interstate Commerce Commission has become a power in the railway world system is being introduced, particularly as regards tariffs. If men who have grown gray in the service become bewildered now and then by the never-ceasing output of instructions, it would be little short of the marvelous if the younger generation were able to familiarize themselves with all the rules and regulations. Every superintendent's office should realize this fact and endeavor to make instructions emanating from it as lucid and brief as possible. One way that comes to mind (while simple, it acts as an illustration) is in issuing embargo notices. Embargoes are constantly being placed and canceled. But there are always some which remain in force indefinitely, some as long as two or three years. For this reason an embargo notice is issued at least once each month, containing in concise form all embargoes in existence. Agents acknowledge their receipt by endorsing and returning to the superintendent the preceding notice, thus making confusion impossible. All embargoes placed meanwhile are issued in supplemental form. This relieves agents of any excuse for overlooking an embargo and at the same time frees his mind of the fear of being called to account for the infraction of at least one set of instructions.

LOSS AND DAMAGE CLAIMS.

The tremendous loss railways sustain from claims is occasionally made public. It is pointed out by freight claim agents that a large proportion of such loss is the result of carelessness and indifference on the part of employees. This office recognizing this condition has set itself the task of assisting the claim department to reduce losses from this source by requiring agents to submit to it copies of all damage reports. These damage reports are carefully scrutinized, especially the seal records and the general nature of the damage sustained. If they plainly indicate that the damage was caused by ill usage of employees who handle the shipments, the cases are investigated. When negligence is apparent on other divisions the reports are forwarded to the superintendents of those divisions for such steps as they wish to take. It is interesting to note the effect of this action. At certain transfer houses agents have stated that the continual receipt of these reports has led them to pay particular attention to shipments destined to our territory. The decreased number of complaints received warrant the belief that their statements are true, as well as demonstrates the fact that division employees are beginning to exercise better judgment in handling freight.

THE CHIEF CLERKSHIP.

In the selection of a chief clerk it is obvious that the superintendent must look for the *persona grata* qualification first. After this discreetness, dignity and diplomacy. If a chief clerk drops no injudicious hints out of school; if he makes a good impression upon patrons of the road who enter the office for business reasons, and favorably impresses employees with whom he may come in contact; if he is resourceful and refuses to recognize the fact that there is such a thing as defeat, he gains the confidence and good will of his superiors.

In office management he should be the ruling spirit. He must have executive ability, enthusiasm, clearness of vision and patience in explaining details of work. An infallible memory is a valuable possession, but the chief clerk who is unfortunate in this respect may have recourse to helpful devices. The writer has a loose leaf reference book in which he keeps copies of all important notices, letters of instruction from various departments, etc. The rapidity with which these special instructions accumulate may be partly understood, when it is stated that this book now contains in the neighborhood of 500 pages, many of which bear a half-dozen

or more items. The indexing is simplified by using the decimal system in vogue in filing the general correspondence.

It is needless to say that while a chief clerk may not thoroughly know all the rules and instructions in force, it is essential that his knowledge of them should be sufficiently extensive to enable him to handle a large variety of questions. To this end he must have at hand the book of rules, the powder and inflammable rules, freight and passenger department rules, car service and accounting rules. As regards the last named, since the Interstate Commerce Commission has decreed that roads must conform to certain methods of accounting, the various accounting books issued by the commission with which division offices must be familiar, number about 450 pages.

It is the duty of the chief clerk to know that credit is given for service performed; that bills are carefully checked to prevent improper charges being made against the division. It is his duty to know that all junction points, sidings and crossovers are properly covered by agreements or documents, that his road may not be unduly charged with their maintenance, and that other roads and individuals may be billed for all work performed which is rightfully chargeable to them. (In one city alone on this division there are 25 crossings with other roads, which indicates in a measure the magnitude of the problem.)

Copies of special train arrangements are made for the chief clerk and retained on his desk in date order, so that each day he knows just what extra trains are running. A copy of all forms covering the employment of temporary help is also made for him that he may see that the services of such men are terminated when the time limit expires. He keeps, moreover, a copy of the bridge engineer's annual report and checks off bridges which are reported from time to time as having been repaired in accordance with the requirements, that in case questions arise as to the condition of structures he may be in position to give the facts.

THE SUPERINTENDENT.

As "the dwarf sees farther than the giant, when he has the giant's shoulders to mount on," it is not a difficult thing for a chief clerk to discern the true and the false steps a superintendent may make, but it is not to be denied that the "dwarf's" mind may be sadly out of tune with the times and his view thereby perverted.

Close observation of various superintendents whom I have met leads to the belief that the man of executive initiative wins in the long run. The true executive, if he cannot always select the best men to assist him, develops the talent at his command, or wisely weeds out the disturbing, unreliable factors and promotes men who will strengthen his organization. He may safely lack knowledge of technicalities if his judgment does not betray him in the choice of subordinates.

An official lacking executive ability demoralizes his organization by want of faith in his fellow-creatures, and misplaces his confidence by putting it in men, who though good "bluffers," offer naught but a crop of caterpillars when harvest time comes. He is inclined to be set in opinions which are not infrequently wrong. If he be a specialist his head may contain vast knowledge; he may know intimately the construction of a locomotive; he may be able to figure down to a fraction the tractive power of that locomotive; he may know how to build a bridge or surmount difficult engineering feats, but the mere capacity to accomplish these things is without efficacy unless a superintendent has the natural appitude to apply to his knowledge a very considerable degree of common sense in his dealings with employees.

Officers addicted to profane and boisterous language are rapidly becoming a memory of bygone days.

Criticism is universal, and good, honest criticism is beneficial. The man who knows not how to receive it was not born to command; neither is he a good leader who can see only the flaws in one's work. It frequently happens, though, that the undiscerning critic comes into power. Such a man may drive men by the lash of his sarcastic weapons, but he stifles enthusiasm, without which first-class work cannot be accomplished; he is apt to instill hatred and the desire for revenge into hearts which otherwise would have been true to the core. Organizations thus built are a serious drain on the corporation's pocketbook.

A forceful yet calm and fair attitude should always be maintained in one's relation towards a body of men. There are innumerable ways that men have of pleading their cases. Great pressure is sometimes brought to bear to restore dismissed men, and it is creditable to officers that they can often resist the intense pleadings of not only the men themselves, but of wives, and, in days now happily passing, of politicians. A man disciplined for good cause is in very much the same predicament as a visitor to a session of a supreme court. Venturing in to the wrong room he was politely but firmly requested to withdraw. Failing to gain the coveted honor of remaining with the learned judges, he remonstrated at the door.

"Sir," admonished the aged negro who had been doorkeeper for years, "think it over. Don't do no persiflagin' 'bout that co't. If you get in contempt of 'em you ain't got nobody to appeal to but the Almighty."

There are men in authority who, it is true, make hasty and consequently ill-judged decisions; but I believe the majority of railway officers endeavor to give cases brought before them the fairest and most impartial consideration.

THE LINE OF PROMOTION.

The line of promotion is a much-mooted question. Each department has many good arguments why it is the logical training-ground for the superintendency. If a debate were to decide the question once for all it is quite apparent that the chief clerks would gain the laurels. For, if men of equal ability could be chosen, one to be appointed trainmaster, another chief train despatcher, another division engineer, a fourth road foreman of engines, while still another chief clerk, it is reasonable to suppose that the man in the superintendent's office, through whose hands pass every conceivable question, and who stands close to the department head, would naturally acquire such an intimate knowledge of the direction of all affairs on the division as would enable him easily to outdistance his friends in the sub-departments, who, by reason of their specialized work, can only come in contact with a small proportion of the division business, and that alone which pertains to their particular work. But in the nature of things this assumed case never exists, and the writer does not for a moment entertain the idea that promotions should be made exclusively through the clerical department. Neither can they be safely assigned to any other single department. Some chief clerks have been advanced and merited well the promotion; others have made sad failures. So division engineers, motive power men and trainmasters have mounted the ladder, many to fall ignobly and others to gain greater heights. It would be manifestly out of the question to debar any one department because it had furnished incompetents for exalted positions. If such a scheme were attempted rails would soon rust and roadbeds become grass-covered mounds. The fit only should rule. How to try men out is probably the greatest problem the appointive power has to meet. Whether or not the Harriman Lines are on the right track remains to be seen, but the idea looks reasonable. The opportunity will at least be offered the man of merit to achieve; greatness will not be thrust upon anyone uness perchance some keen mind perceives that there lies dormant within a subordinate—a power that needs only to be awakened to make of him a great executive.

Men in the clerical department, like those in other departments, are not all born to govern large bodies of men. They have a niche which, if filled to the best of their ability, may be their highest duty. It would be folly to rob a department of a first-class clerk to make of him a poor trainmaster or superintendent. If, however, men in the clerical department could feel that their work was observed and their talents measured by the higher officials, it would be some compensation for the loss of greater rewards.

THE NEW PANAMA RAILROAD.*

BY R. F. HOFFMARK.

The old Panama Railroad now in operation was built as a single track road in 1850-1855 at a cost of about $160,000 per mile. This has since been double-tracked for almost its entire length to facilitate the movement of spoil or dirt trains carrying canal excavation to dumping grounds, and to accommodate the increased traffic due to canal work. The old location with the exception of a few minor changes and cut-offs has been adhered to. This location rises from the Atlantic on the natural slope of the Chagres river valley to the summit at Rio Grande, 263 ft. above mean sea level. From this point it descends to the Pacific on the natural slope of the Rio Grande valley.

With the adoption of the minority report for an 85-ft. summit level lock canal came the necessity of an entirely new Panama Railroad. The dam at Gatun, only seven miles from the Atlantic, will convert the Chagres river valley into Lake Gatun, the borders of this lake following the 85-ft. contour. Thus the present line will be under water from Gatun to Bas Obispo, 25 miles. At Bas Obispo the roadbed reaches an elevation of over 85 ft. above mean sea level, but from this point to Paraiso, 8.7 miles, the line is on the west side of the canal. As both terminals, Colon and Panama, are on the east side, and a crossing of the canal is impracticable, this stretch, although above the water level of the lake, is of no value to the re-located line. From Paraiso to Miraflores, four miles, the greater part of the operated line is again below the 85-ft. level. For these reasons it was necessary to re-locate the line with a minimum elevation of 90 ft. above mean sea level from Gatun to Miraflores.

The re-location work had to conform to the following requirements: (1) The location for its entire length to be on the east side of the canal. (2) Sub-grade in no place to be lower than 92 ft. above mean sea level, 7 ft. above the water level of Lake Gatun. (3) The location to be, for construction purposes, as near the operated line as possible. (4) The maximum curve to be 16 deg. (5) The engineers to endeavor by locating long, deep embankments, to supply dumping grounds for excavation from canal.

Since an almost unlimited amount of material for embankments was available, it was decided to have a level grade from Gatun to Bas Obispo. From Bas Obispo to Pedro Miguel, 9.53 miles, it was decided to put the road on the east berm of the canal, sub-grade at 95.00, ten ft. above the water level of the canal, and for this stretch canal excavation and roadbed building will be one operation. Bas Obispo is the dividing point between Lake Gatun and the Culebra cut.

On the Pacific side it was decided to use the same entrance into Panama City, the re-located line joining the operated line near Corozal, 2.5 miles from the terminal. The Atlantic end of the operated line was available from Colon to Mindi, 4.72 miles.

These lines are shown on the accompanying maps.

Preliminary locations were begun in October, 1906, and were completed the following May. Two parties were in the field, one locating the Atlantic and Pacific connections with the operated line, and the other locating from Bas Obispo north toward Colon. The engineers were fortunate in having accurate and fairly complete topographical maps of the Chagres river valley, basin of Lake Gatun and a 100-ft. contour sketch map of the Chagres river and its tributaries. Even with the help of maps, however, locating in the tropics is quite a different proposition from the same work in more northern countries.

In the canal zone there is almost no land under cultivation, there are no roads, no open prairies, nothing but mountainous, broken country covered with a dense, tangled jungle. Reconnoissance is impossible, Panama having but few wretched trails, over-grown with creepers, brush and palm trees. Very little knowledge can be gained of the topography of the country by walking over likely locations by these trails. The system used on the Panama Railroad work was to project a preliminary line on the maps at hand and then "plug" it through. In un-mapped stretches of country a flying transit and level party was used to run a 92-ft. elevation line. Exploration lines were thrown out in places where high ridges or low flats were encountered. The borders of Lake Gatun on one side and the prohibitive distance of wide detours on the other, limited the location of the line to a comparatively narrow stretch of country, so rapid progress was made with the system used.

Just south of Gatun the line struck the Gatuncillo river valley, 8 to 10 ft. above mean sea level, soft, swampy and over 1¼ miles wide from support to support. To cross this would require an embankment 84 ft. high, which, upon the closing of the Gatun spillway, would be through an arm of Lake Gatun, 1¼ miles wide. Although an embankment of this nature, assuming a 40-ft. top width and two to one slopes, requires 4,250,000 cu. yds. of material, the yardage was not considered prohibitive. The flat, marshy nature of the bottoms, however, gave poor promise of sustaining a load of 3½ tons per square foot. The valley was, therefore, sounded thoroughly, the results showing that a crossing at this point, if not impossible, was at least impracticable. The sounding was done with one Sullivan drill outfit and one gas pipe wash drill outfit. The rods were washed down by hand pump to 220 ft. below mean sea level, where rock was encountered. Above this rock there are layers of decayed vegetable matter, loose sand and shell mixture and light surface soil. Such is the consistency of the whole that a 1½-in. wash drill bit was driven 222 ft. in nine hours, including the time taken up in connecting new joints of pipe to the drill rod. In many places a 20-ft. joint of pipe was washed down in three minutes.

An estimate was then made for a steel viaduct spanning the valley. The estimated cost of such a structure was $800,000. It was finally decided to keep to the east side of the Gatuncillo to a point above Monte Lirio, then across the valley and follow the location "D" and "E" shown on the accompanying map. As it was desirable to have Gatun on the main line, and not on a spur line only, it was decided not to run the line from Mt. Hope directly southeast, although this would have saved a long detour. As it was found necessary to throw the line farther and farther away from the canal axis to insure a safe crossing of the Gatuncillo, the level grade project was abandoned and a balanced location was made as far as possible.

From Mindi to Gatun, 2.2 miles, the line rises by a series of broken grades from elevation 5 to elevation 95. Construction was pushed on this stretch. From Gorgona to Bas Obispo, 2½ miles, the line is a side hill location following the high bluffs of the Chagres river. This part was accepted and work was begun in December, 1907. At Bas Obispo the line enters the canal prism at elevation 95.00 and seeks its own location after leaving the canal berm at Pedro Miguel. The location from this point to the junction with the operated line just north of Corozal and four miles from Panama, was accepted after a number of lines had been run out with hopes of finding a low saddle in Miraflores river. It was finally decided to drive a tunnel through this ridge to avoid a 130-ft. open cut, approximately 800 ft. long. This tunnel, the only one on the line, is 815 ft. long, of which 400 ft. is through solid rock.

The maximum grades occur on the Atlantic and Pacific approaches to the high levels, absolute maximum being near Gatun, a short stretch of 1.3 per cent. compensated. From Gatun to San Pablo, 27 miles of balanced location, the maximum grade is 0.45 per cent. compensated, this being maximum for a single engine and train, assuming that pushers will be used on the approaches. From Mindi to Bas Obispo, 26.7

*From an article in the *Purdue Engineering Review.*

miles, the re-located line has 34 curves, there being 2,400 ft. of 7 deg. curves, 3,900 ft. of 6 deg. curves, 2,500 ft. of 4 deg. 30 min. and 4 deg. curves, and 2,500 ft. of 3 deg. 30 min. and 3 deg. curves, the remaining curves being less than 3 deg. Talbot's spiral is used on all curves of 2 deg. or over. The re-located line has about one-half of the curvature of the operated line.

Construction was begun in June, 1907, at Gatun and Miraflores. The construction engineer on the isthmus has eight or nine months of the year to contend with daily rains, and exceptionally heavy rains occur every three or four days, the new earth embankments becoming so saturated that slides frequently occur. The surface soil is mostly of soft red loam, which, when dry, is ideal for excavating, either by hand or steam shovel, but the slightest amount of moisture makes it semi-liquid. Although all of the work on the Panama Railroad is not over 90 ft. above mean sea level and only 9 deg. 12 min. north of the equator, the ocean breezes temper the tropical heat so that construction work is no more trying



Panama Railroad Relocation.
Atlantic side of the Isthmus.

than similar work in the United States during the hot months.

The lack of roads and the topography of the country prevent the use of teams and scrapers. For the same reasons it was found necessary to put in an unusually large number of spur lines, temporary tracks connecting the old main with the re-located line, used for equipment, material and canal haul.

West Indian negroes are being used as laborers of all kinds, including track gangs, excavating gangs, steam shovel pit crews, culvert gangs and piledriver crews. Each gang has one or two white foremen, although in a few exceptional cases the foreman is a negro. This class of labor, while far from ideal, is somewhat better than generally assumed.

The excavation is done either by hand, with one-half yard Decauville cars (pan cars) or by steam shovel supplied with contractors' or standard equipment. All large cuts are taken out by steam shovels, hand gangs being used in short cuts only, a 400-ft. haul being the maximum. Where a large cut is encountered, which, if allowed to stand until track and shovel reach that point, will delay the work, a temporary line is cut through by hand on a high grade, thus pushing track continually ahead of steam shovels. This method also enables the pile drivers to be in advance of final roadbed, thus supplying a firm dumping track for railway or canal excavation. Culvert and bridge material can thus be unloaded where desired.

At present about 17 miles of main line have been constructed, also 18 spurs varying in length from 750 ft. to 9,560 ft. Spur No. 19, 6,800 ft. long, is now under construction. This spur will enable construction to be started north and south from station 746 to join the work as it is being pushed north from station 1,000 and south from station 205. The Pacific end of the re-location is practically complete.

The work south from Gatun (station 121) is for the first four miles side hill work, and a pioneer shovel is benching in and casting over. As soon as a roadbed is made to station 300 in this manner the side hills will be used as borrow banks to fill in the Gatuncillo river crossing. This is made on two earth and rock embankments from 60 to 70 ft. high and 3,600 and 4,400 ft. long. These embankments alone will require 2,485,000 cu. yds. of material. It would take the entire output of the Culebra cut force, consisting of some 56 steam shovels, two months to build these embankments. This part of the work is not being rushed at present, the equipment of the railway being insufficient to undertake this particular stretch, but upon completion of the excavating work of the Pacific division (canal work) the shovels and rolling stock of this division can be used to good advantage by the Panama Railroad. There is practically no limit to the borrow banks, assuming maximum haul at 3½ miles. Efforts are still being made to eliminate these large embankments, but the fact that grades must be kept at or above 92.00 makes this a difficult proposition.

The forces working north towards Colon are now at station 1,000; work on this residency was begun December, 1907, at Gamboa, near station 1,360, and at San Pablo, station 1,080, in July, 1908. The work from station 1,360 to 1,000 has re-

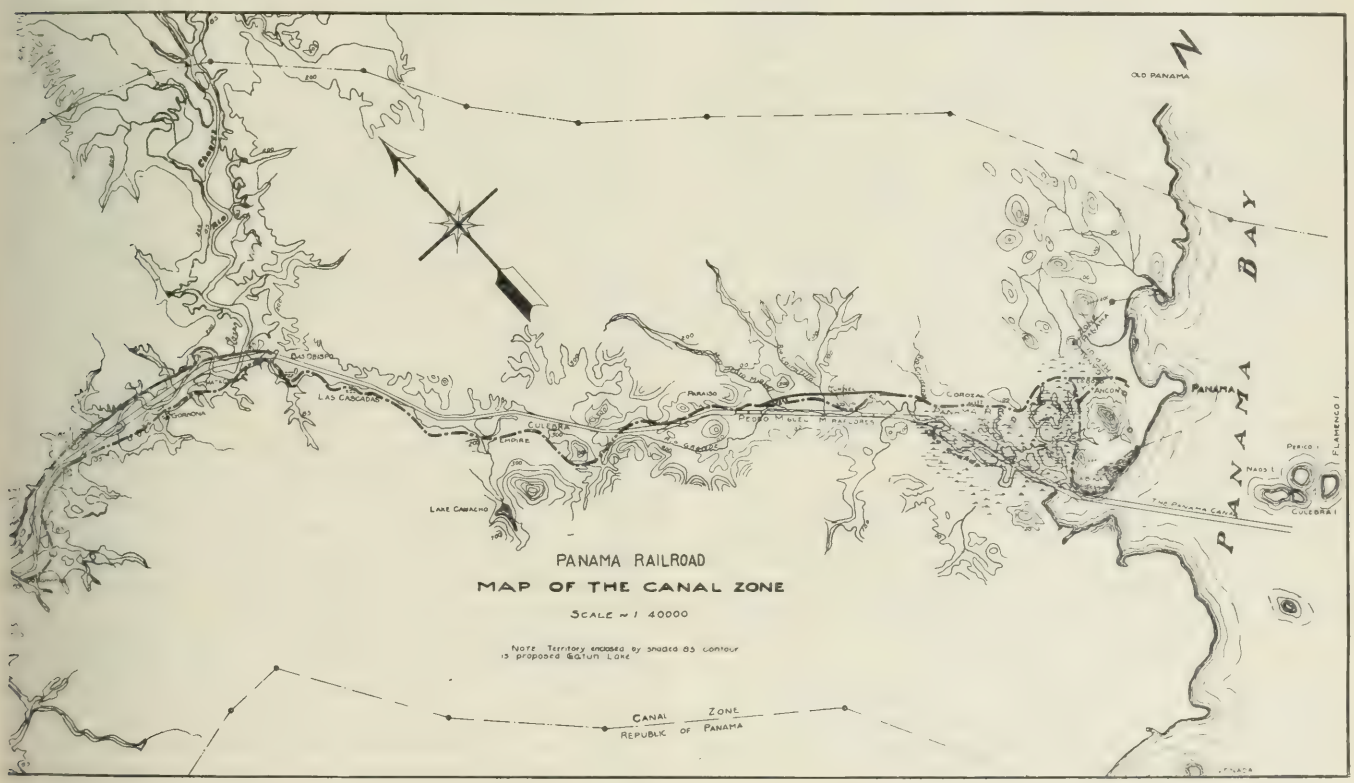
quired three spur lines, spur No. 7, at San Pablo, being the longest, 9,500 ft. long. Spur No. 13, at Gorgona, was the most difficult to construct. The line here is located on the high bluffs of the Chagres river (stations 1,360-1,190). Spur No. 7 connects with the re-location at station 1,080, and as the work between stations 1,360 and 1,080 is exceptionally heavy, it was found necessary to have also a connection between these points. Near station 1,244 the operated line has a dry season gravel pit in the Chagres river, the end of the gravel pit track being just across the river from the re-located line, but the difference in elevation is 50 ft. The spur constructed has 18 deg. as the maximum degree of curve and a maximum grade of 8 per cent. It was found necessary to use an island to find support for a switch back, the new line being reached from here by a trestle driven over the river on a 10 deg. 46 min. curve and a 5 per cent. grade. This spur was operated very successfully and proved to be an economical connection.

There are five long embankments in this residency, all over 3,500 ft. long and from 30 to 55 ft. high. This residency has a direct connection with the canal tracks near Bas Obispo on one end and San Pablo on the other, and the embankments are splendid dumping grounds for the spoil from canal excavation.

All these embankments will be submerged to within 7 ft. of the top when Lake Gatun reaches its proposed elevation of 85 ft. above sea level. All slopes of submerged embankments are 2 to 1. For heights from 10 to 30 ft., top width is 20 ft.; heights from 30 to 50 ft., 30-ft. top width; heights greater than 50 ft., 40-ft. top width. Standard dry embankments have a 20-ft. top width, with a 1½ to 1 slope. In cuts the roadbed has a standard width of 29 ft., with wide V shaped ditches to carry the heavy rainfall.

The culverts on the re-located line are with a few exceptions placed from 20 to 35 ft. above the bottom of the stream. When Lake Gatun is formed, all land on both sides of the line lower than elevation 85 will be permanently flooded, so the most important function of these culverts is to establish connection between Lake Gatun proper and the flooded river valleys east of the re-located line. For this reason they are placed high enough to be above the sedimentary deposits of streams feeding the lake. Streams in small valleys which will not be land-locked are taken care of by pipe culverts large enough to carry the wet season discharge. These are expected to clog up in the course of three or four years and be utterly useless, consequently a light grade of corrugated galvanized iron pipe is being used. Vitrified clay pipe was tried, but due to the fact that the embankments are, for the most part, filled in from high trestles, it was too easily broken.

Concrete culverts are of two types. For openings from 6 sq. ft. to 56 sq. ft. the standard rail top box is used. This is made of gravel concrete strongly reinforced with old rails. For openings larger than 56 sq. ft., semi-circular arches are being used, with rail reinforcement in the foundation in the footings and ¾-in. rod reinforcement in the arches and side walls.



Panama Railroad Relocation.

Pacific side of the Isthmus.

There will be two bridges on the re-located part of the line. One is completed, the Chagres river bridge at Gamboa, which spans the opening through which the Chagres flows into the basin of Lake Gatun. This bridge has a total length of 1,320 ft., consisting of eleven 80-ft. span, plate girders at the north approach, a 200-ft. riveted Warren truss as the main span, and three 80-ft. span, plate girders for the south approach.

The piers rest on grillage piles driven to rock. The other steel bridge, plans for which have not been published, will span the Gatuncillo river. The policy of the road is to have as few steel spans as is practicable, concrete culverts and bridges supporting the ordinary track and roadbed being considered far superior.

The road is 5 ft. gage and the total length is 48 miles. It is expected that running time from the Atlantic side to the Pacific side will be 1 hour and 30 minutes or less. R. Budd is Chief Engineer and F. Mears is the engineer in charge of construction.

GOVERNMENT REGULATION OF RAILWAY CORPORATIONS.*

BY EMORY R. JOHNSON,
Professor of Transportation and Commerce, University of Pennsylvania.

The regulation of railways is a perennial problem, because it is concerned with the maintenance of equity, with the establishment of just relations among places, among persons and among commodities. These relationships are, as every one knows, determined by economic and social conditions, and thus are certain to change with every alteration of those conditions. Thus, what is just to-day as regards services and charges may have been unjust ten years ago, and may not be in accordance with the public welfare a year hence.

The force of this truth is clearly illustrated by the struggle which has been waged for more than a generation between the north Atlantic seaports in regard to the rates on import and export traffic. In the early 80s the bitter warfare of these ports with each other, and of their respective railway lines with one another, was temporarily ended by arbitration proceedings establishing the well-known seaboard differentials. The rates accorded each of the ports were made to harmonize as closely as practicable with the economic advantages and the commercial and shipping facilities possessed by each of the rival cities. That adjustment, however, as was to have been expected, proved to be only a temporary one. Transportation conditions on the ocean and on the land changed year by year, and the facilities for handling traffic at the several ports underwent alterations. The industries in the traffic background tributary to each of the ports developed along varying lines. Thus we find that New York has twice, since 1882, insisted upon a modification of the seaboard differential rates. The differentials were changed by the Interstate Commerce Commission in 1898 and again in 1905. For a year past the trunk lines have been on the verge of a rate war because the city of Boston, supported by its railway lines, is demanding a more favorable treatment than has been accorded to it in times past.

I refer to this struggle of the rival Atlantic seaports, not to pass judgment upon the merits of the questions in controversy, but merely to show that as long as these great rival trade centers advance along independent lines of industrial progress, frequent readjustment of rates will be unavoidable. It is equally certain that future experience as well as that of the past will require the adjustment of these rates by intervention of the government. The great problem of railway regulation, not only in this case but in every case, is the equitable adjustment, by public authority, of the relative rates to and through the great centers of industrial and trade competition.

Can the government, however, promote justice? Is it possible so to regulate inter-railway relations as to promote the public welfare and to maintain a greater degree of equity than can be secured by leaving unregulated the clashing economic forces? The best and largest answer to this profound question is given by the experience of the states and the federal government during the past four decades. The American people, like other people, may be wrong at times and may err in detail; they may, under the strain of a severe contest, be unduly radical for a while; but in the main the people of this country decide public questions rationally and wisely. In the long run we are not a radical but a conservative people; and the very fact that for four decades practically all the states, as well as the national government, have moved steadily forward towards a progressively increasing regulation of railways is indisputable proof of the fact that such action is not only desirable but effective and wholesome.

The necessity for government regulation is thus no longer a subject for debate. The practical question is not whether the government shall regulate, but how. During the past 40 years two kinds of regulation have been thoroughly tried out, and it is fairly clear now which kind is best adapted to American conditions. When the states, about 1870, began to enact laws affecting the relations of the railways with each other, with the public and the government, many of the states in the East, led by Massachusetts, established commissions with power to investigate the railways and to report the results of their investigations, with recommendations, to the attorney-general of the state and to the legislatures.

These commissions had no power to establish rates, to issue mandatory orders, or to enforce their decrees by process in the courts. On the other hand, numerous states in the West and some in the South created railway commissions endowed not only with power of investigation, but with authority to establish or change rates, to issue orders and to secure the enforcement of their orders by appeal to the courts. This latter type of legislation has been called the "granger" laws, and it has often been held up to ridicule not only by railway officials but by impartial students of transportation. While the granger laws were being enacted the severe panic of 1873 overwhelmed the country and caused serious depression of business for a period of fully six years. The granger laws had not caused the panic, and, as a matter of fact, they had comparatively little to do with the unfortunate position of the railways which suffered, together with all business enterprise, during the period of the depression. Naturally enough, however, all the ills of the railways were attributed to the granger laws, with the consequence that Wisconsin and Iowa and some, but not all, of the states that had established mandatory commissions repealed their stringent lews and replaced their strong commissions with weak ones without power to regulate railway charges.

For somewhat over a decade preceding 1890 there was comparatively little effort made by the states to bring the railways under effective national regulation; but in the later 80s the growing prevalence of flagrant discriminations as between persons, places and commodities began to arouse the states to activity and caused the federal government to enact the Interstate Commerce Act of 1887. From that time to the present—roughly speaking during the past 20 years—the trend of government regulation has been steadily towards the re-enactment of the principles of the granger laws.

Ten years ago 30 of the states had railway commissions, but by that time the substitution of strong commissions for weak ones had progressed so far that only one-third of the states had commissions without power over rates. At the present time 40 states have commissions and only five of them adhere to the advisory type. During the five years ending in 1907, 15 states created or reorganized their commissions, and all but two of the 15 states—Pennsylvania and New Jersey being exceptions—established commissions with power to issue orders and to adjust rates.

The trend of national legislation during recent years has run parallel with that of the states. The act of 1887 did not definitely define the powers of the commission over rates, but for nine years the commission, with the support of the courts, interpreted the law in such a way as to give the commission power to change rates. In 1896 this power was questioned by the Supreme Court, which, in the following year, definitely held such power not to have been granted to the commission by Congress. When this decision was reached by the Supreme Court the United States was passing through a period of business depression, and there was, consequently, little disposition to subject railway charges to effective government control. With the return of normal business conditions and with the rising tide of prosperity, there arose an imperative demand for the real regulation of interstate railways. The response to that demand was the enactment of the Elkins Act in 1903, and the Hepburn Act of 1906.

With the passage of these two laws the national government

*From an address before the Economic Club of New York, Jan. 28, 1910.

took three long steps forward in the regulation of railways. By the Elkins Act the principle was established (1) that the published rate is the only legal rate; that the charges for the public service of transportation shall be public, and that any secret deviation from this public rate shall be a criminal offense. (2) By the Hepburn Act of 1906 the Interstate Commerce Commission was definitely given the power to adjust these public rates with a view to making them just and reasonable. The principle was laid down that the rates for the public service of transportation shall be reasonable and that the legislative authority of the United States, subject to the higher criticism of the courts, and not the railway corporations, shall have final decision as to the reasonableness of those charges. (3) The other great feature of the Hepburn Act was the establishment of publicity in railway management. By requiring the railways to keep their accounts according to a uniform system, and by making the books of the corporations open at all times to inspection by officers of the Interstate Commerce Commission, Congress laid down the principle that the railway business was henceforth to be a public one in the fullest sense of the term.

This brief reference to the trend of state and federal regulation of railways shows clearly that the American people, after experimenting with different methods, have decided in favor of real regulation, and have practically abandoned reliance upon the advisory supervision of railway corporations. This, however, by no means fully states the change that has taken place during recent years in the government control of transportation companies.

Railway regulation may be either negative and punitive or it may be positive and administrative. Until recent years the laws of the states and of Congress have been based mainly upon the principle of the necessity of prohibiting railway abuses and of punishing the railways for engaging in certain objectionable practices. Such legislation is negative in character. We are now entering upon an entirely different phase of government control; we are realizing that the function of the government should be not merely to prohibit, but that it should seek, by administrative regulation, to bring about better conditions. This relatively new phase of railway regulation is illustrated by the numerous safety appliance laws that have been enacted during the past decade; and the disposition of Congress to deal administratively with the problem of railway control is shown by its giving the Interstate Commerce Commission power to prescribe uniform accounts and to inspect the books of the railways.

The states have gone even further than has the United States in the administrative regulation of railways, and it is noteworthy that it has been the conservative states like Massachusetts, New York and Ohio, as well as such states as Wisconsin and Texas, which are less trammeled by conservative traditions, that have done most to bring the railways under administrative control. As yet the states and the nation are in but the beginnings of this movement towards administrative control of railways. Ultimately this part of government regulation will far exceed in importance the measures taken to prohibit undesirable practices and to punish the railways for crime.

The president of the United States, building upon the basis of experience, is now asking Congress to advance the corrective and administrative regulation of railways several steps beyond the point it has thus far reached. He makes five major recommendations:

(1.) The creation of a United States court of commerce.

(2.) The authorization of associated action of the railways in the making of competitive rates.

(3.) The granting of power to the Interstate Commerce Commission to investigate rates upon its own motion, and to inquire into justice of proposed rates before they shall be put in force.

(4.) The prohibition of the lease by a railway company of a competing line, or the purchase of its stock.

(5.) The government regulation of railway capitalization.

It is to be expected that differences of opinion will exist as to the merits of some or all of the President's recommendations. The President is, however, to be commended for placing before Congress and the American people for serious and thoughtful consideration a definite legislative programme. Ultimately, if not immediately, most, and possibly all, of the President's recommendations will be embodied in law. I venture this prophecy because the propositions put forth by the President seem in the main to harmonize with our experience; by which I mean that the trend of regulation seems to point in the direction which the President proposes to lead.

The establishment of a United States court of commerce would undoubtedly expedite the work of the Interstate Commerce Commission, would bring about the more speedy settlement of controversies, and would give unity to the judicial interpretation of the interstate commerce laws to the advantage both of the railways and the public.

Congress should have long since modified the Sherman anti-trust law, as it was interpreted by the Supreme Court in 1897 in the Trans-Missouri Freight Association and in the Trunk Line Association cases, so as to permit railways to work out their competitive rates openly and legally through their traffic associations. Everybody knows that it is absolutely necessary for the railways to agree upon their competition rates, and the present practice of the railways, while not in violation of the letter of the law, transgresses its spirit and does so by common consent. It is unwise as well as unjust to maintain laws that prohibit what are known to be necessary and desirable practices.

Doubtless the President's proposition to confer upon the commission the power to investigate rates upon its own motion and to suspend the levy of proposed rates during such reasonable period as the commission may require for investigation into the justice of the changes proposed, will be debated more earnestly than any other of the five suggestions. If, however, it be conceded that the Interstate Commerce Commission should possess power to adjust rates so as to minimize unreasonable discriminations, it logically follows that such a grant of authority should be given the commission as will enable it to accomplish its purpose. Personally, the proposition seems to me sound in principle and one that will work advantageously in practice.

As to the advisability of prohibiting the lease of one railway by another and of making it unlawful for a railway to purchase the stocks of a competing line, I have doubts. The past efforts of the states and of the federal government to prevent the integration of business have been almost futile. It seems to me that the large enterprise is taking the place of the small one as the result of the working out of economic laws. If this be true, statutes to check railway amalgamation will doubtless be evaded; if they could be enforced, the effect would be of questionable public advantage. The purpose of this provision of the law would be to check monopoly, but the way to deal effectively with railway monopoly is to regulate services and charges. The present law, as amended in the manner suggested by the President, would subject the railways to effective regulation and the prohibition of railway integration seems unnecessary.

The government regulation of railway capitalization, on the other hand, is highly desirable. The admirable work done by the Massachusetts Railroad Commission, and what is being accomplished by the railway commissions of New York, Wisconsin and other states, makes it clear that the federal government should, without further delay, establish effective regulation of railway capitalization. It is claimed by those opposed to this policy that capital cannot be secured for new enterprises, and possibly not for the extension of existing systems if speculation and stock watering practices are made illegal.

On the other hand, it may be urged with even greater force that measures which will tend to make railway securities attractive to those who are seeking relatively safe investments will enable the railways to secure practically an unlimited amount of funds for the development of our transportation system.

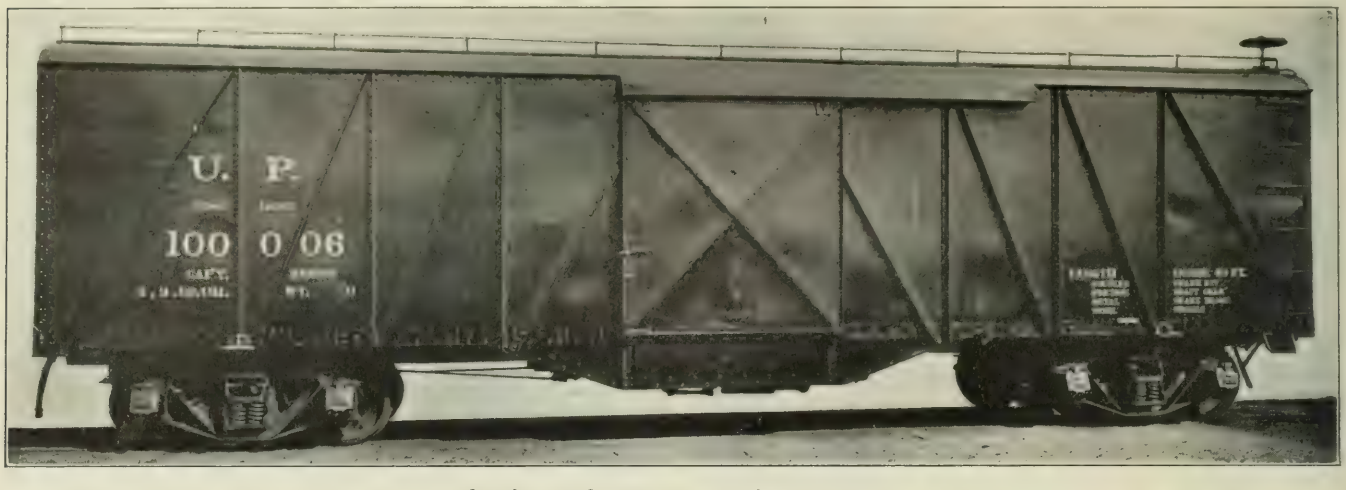
From certain quarters the plea is heard that this is not the time to enact laws widening the scope and increasing the certainty of government regulation of railways; that time must be given the carriers to adjust themselves to the requirements that have already been imposed upon them; that the urgent need of the public is for more railway mileage and that further government control of the railways will check their prosperity.

This argument might be given weight if it were true that our railways were not now highly prosperous, or if the proposed legislation would in any way interfere with their healthy growth. As a matter of fact, however, the tide of railway traffic is rising, and the revenues are yielding good profits. Nor can it be shown that the legislation proposed by the President would either bring about unreasonably low rates or diminish the flow of capital seeking investment in railway securities. Indeed, it seems certain that the railway corporations, as well as the public, will in the long run gain much if the ethical ideals back of the regulative measures now under consideration are embodied in effective legislation. Laws that are fair to all do no one harm, and they promote the common good; they aid the steady advance of order and harmony under the broad shield of justice.

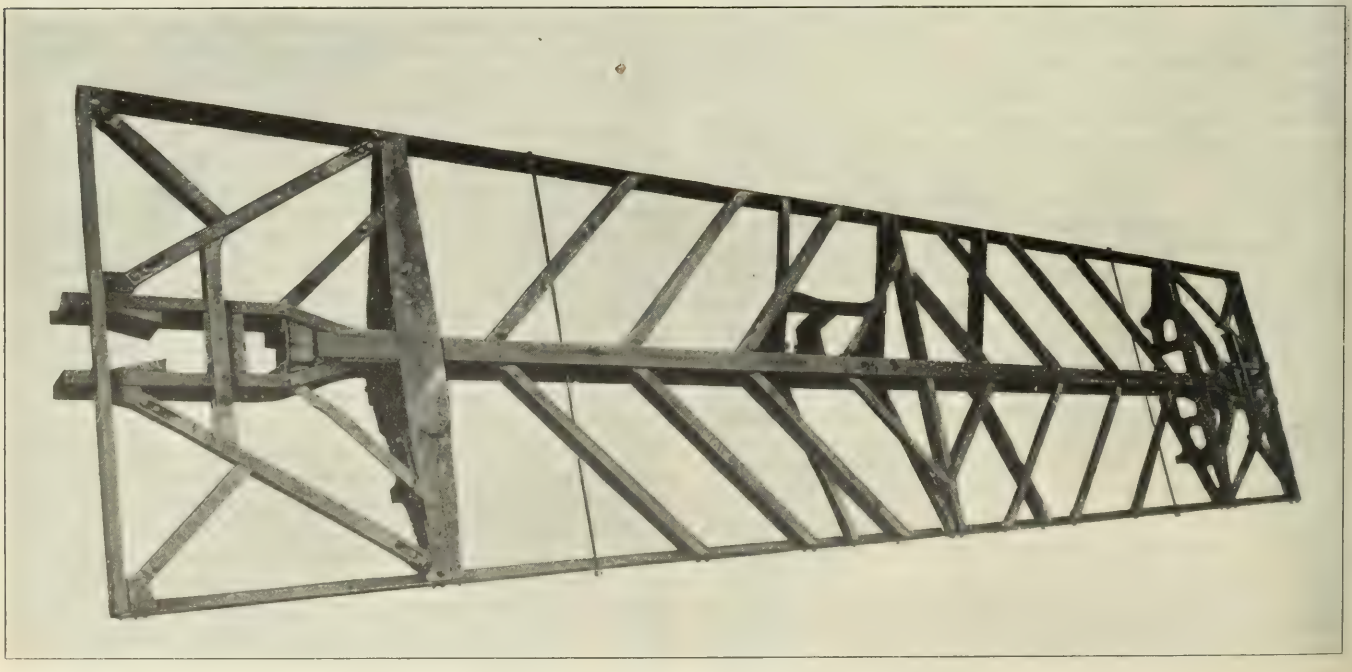
STEEL BOX CAR FOR THE UNION PACIFIC.

Two sample steel box cars were built at the Omaha shops of the Union Pacific early in 1907 and were illustrated in the *Railroad Gazette* February 22, 1907, page 250.

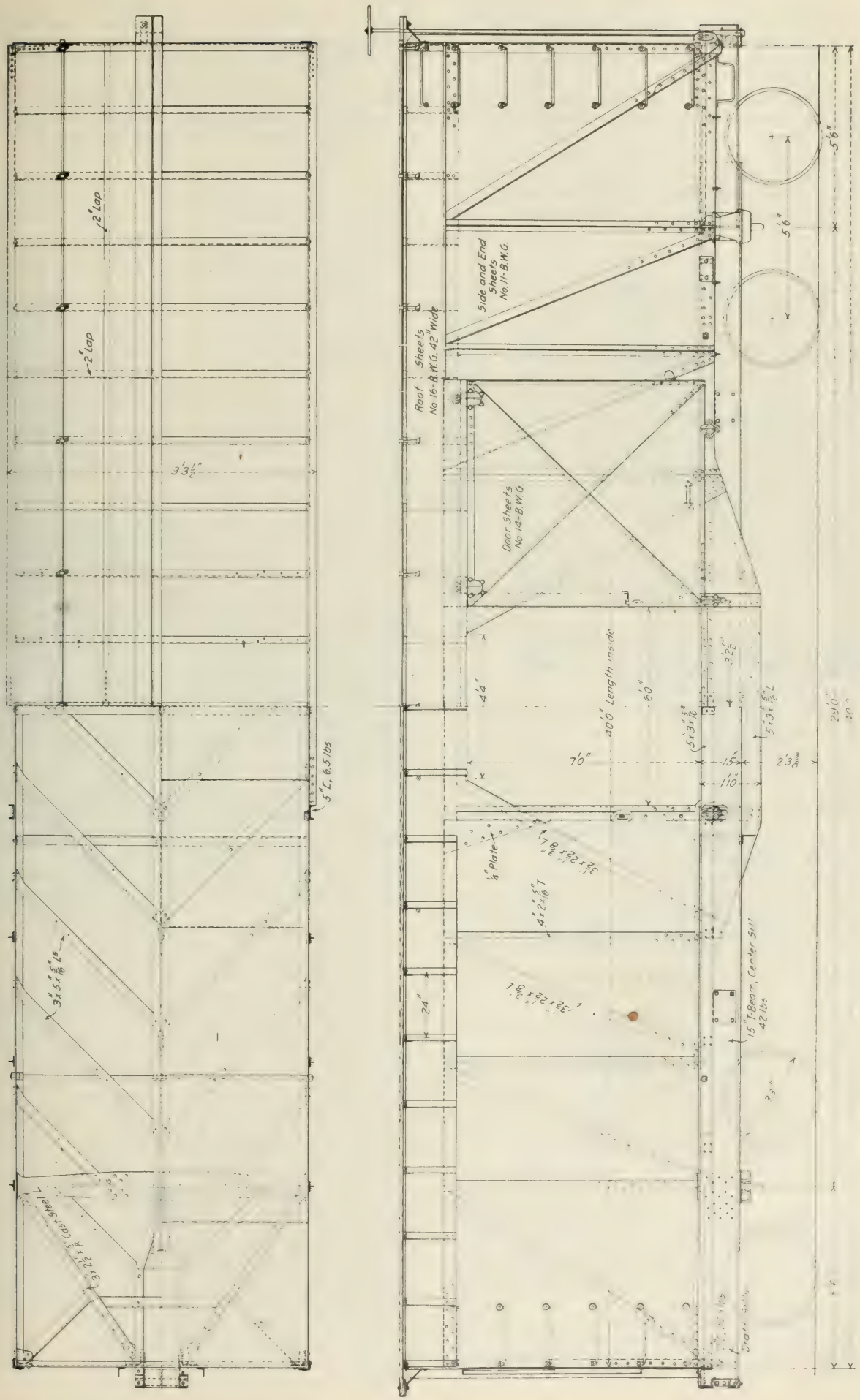
Another steel box car has been recently built at the same shops much on the same lines as the previous ones, and it is here illustrated. The principal change is in the diagonal bracing of the sides, which, in the former cars, extended from the top of the door-way to the post over the body bolster, while in the new car there is a diagonal brace between each pair of posts. These braces are steel angles 2½ x 3½ x ⅜-in. There is also some attempt to lighten the car and the diagonal braces in the underframe and the angles at the side sills have been changed from 3½ x 5 x $\frac{5}{16}$-in. to 3 x 5 x $\frac{5}{16}$-in. The thickness of the sheet metal for the sides of the new car remains the



Steel Box Car for the Union Pacific.



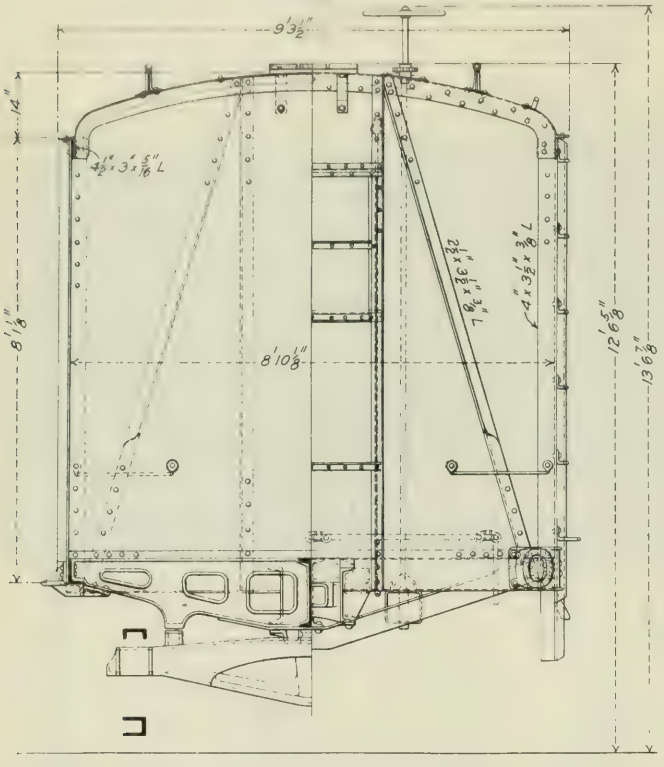
Underframing of Steel Box Car; Union Pacific.



Plans and Elevation of Steel Box Car: Union Pacific.

same as in previous cars. No. 11 B.W.G. 12 in., and the thickness of the roof sheet is ⅜ in. as before. At the time the first steel box cars were built it was thought by some that the effort to keep down the weight by making the side sheets 0.12 in. thick was carried too far and the sheets should be thicker, but the experience of three years with the first cars seems to have warranted the use of sheets the same thickness in the new cars.

The wheels of the new car are heavier than those on the old one, the weight of the two new trucks being 14,320 lbs., while the old ones weighed 13,100 lbs. The new car body includes pushpole pockets, roping and jacking castings which



End Elevation of Steel Box Car; Union Pacific.

were not on the old car. With the changes here indicated the difference in the weights are as follows:

Car 72851, prviously illustrated: body, 25,350 lbs.; truck, 13,100 lbs.; total, 38,450 lbs. The new car, here illustrated, weighs: body, 23,480 lbs.; truck, 14,320 lbs.; total, 37,800 lbs. The weight of the car body has been reduced 1,870 lbs.

TRACTIVE POWER OF LOCOMOTIVES.

BY WILLIAM N. ALLMAN.

The tractive power of a locomotive decreases as the speed of the locomotive increases. It is therefore evident that the maximum effort is available at starting, and that it gradually decreases as the piston speed increases, due to the fall in mean effective pressure, increase in friction, capacity of the boiler, the means used for admitting steam and exhausting it from the cylinders, condensation and leakage in the pipes and cylinders, the back pressure on the pistons, and the resistance of the train.

The tractive power is based entirely upon the capacity of the cylinders, and it is assumed that the weight on driving wheels will be sufficient to develop a corresponding adhesion. The hauling capacity of a locomotive can only be determined by knowing the tractive force as well as the resistances which retard the movement of the train.

There is a limit to the tractive power of the locomotive; it cannot possibly be greater than the tractive power of adhesion, which is the weight on driving wheels at the rail multiplied by the coefficient of static friction between the wheels and rails; nor can it be greater than the cylinder tractive effort, which varies with the steam pressure, the diameter and stroke of the cylinder and the diameter of driving wheels. The fact that the adhesion of the driving wheels to the rails must be used sets a limit to the tractive effort of the locomotive; if the cylinder power is increased beyond a certain limit, slipping of the wheels will occur and the trac-

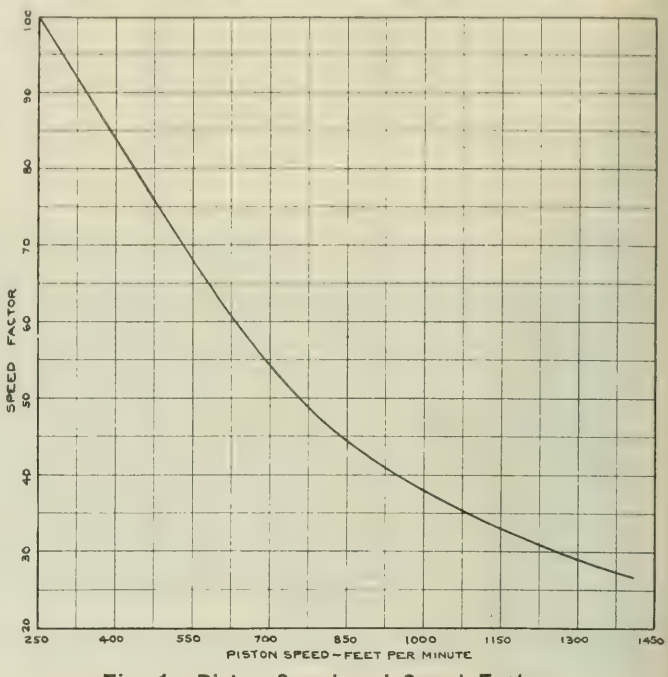


Fig. 1—Piston Speed and Speed Factors.

tive power will not increase, but, to the contrary, will actually diminish. It is therefore evident that the tractive power is limited, independently of the power given out by the cylinders, by the weight on the driving wheels, and by the friction between the wheels and the rails. It has been found that as high as 28 to 30 per cent. of the weight on drivers at the rails has been utilized as tractive effort; this occurred, however, only under first-class conditions and on well-sanded rails. In ordinary practice this percentage usually proximates 22 to 25 per cent. of the weight on driving wheels.

The power developed is measured by the product of two factors, the tractive force and the speed in miles per hour, as

$$P = T \times V \times .00266 +$$

where P = Horse-power,
T = Tractive power in pounds,
V = Speed in miles per hour.

The maximum horse-power which the engine can develop is fixed, when the grate is of sufficient size, by the steam-producing qualities of the heating surface and steam consumption of the cylinders; the efficiencies of both, however, are slightly increased when the speed is increased.

It is desirable to make the grate area about one-sixtieth of the total heating surface, which will give enough heating surface to absorb the heat produced at the grate by combustion, with proper efficiency. If the heating surface is much less than 60 times the grate area more heat will be produced at the grate than can be transferred to the water, and the boiler will lose part of its efficiency, while if the heating surface be much above 65 times the grate area, the increase in heat-absorbing power will, in most cases, be so slight that the increase in boiler efficiency will not compensate for the increase in weight which is involved.

It has been the practice to reckon the locomotive on tractive power rather than horse-power, since the latter is dependent upon speed, which is a variable quantity, and any figures as to the horse-power of locomotives are liable to be misleading.

A simple rule for deriving the horse-power when the tractive power is known is to multiply the tractive force in pounds by the speed in miles per hour at which the locomotive can handle its heaviest loads, and multiply this product by .00266.

It is noteworthy that the tractive power of locomotives, comparing those built in the period of 1892 to 1895, with the present types, has increased about 60 per cent. in passenger service and 80 per cent. in freight service, while the average train loads in tons of 2,000 lbs. have increased about 68 per cent.

The effective tractive effort—that is, the force necessary to haul the train independent of the locomotive and tender—may be determined by deducting from the total available tractive force the force necessary to overcome the resistance of the locomotive and tender. This resistance may be determined from the following formula, which is slightly modified from that proposed by von Borries:

$$R = 8 + .087\ V + .0036\ V^2$$

where R = the resistance in pounds per ton (2,000 lbs.) of engine and tender.

V = speed in miles per hour.

In the calculation of tractive power the full boiler pressure is never realized, but it is occasionally used for purposes of

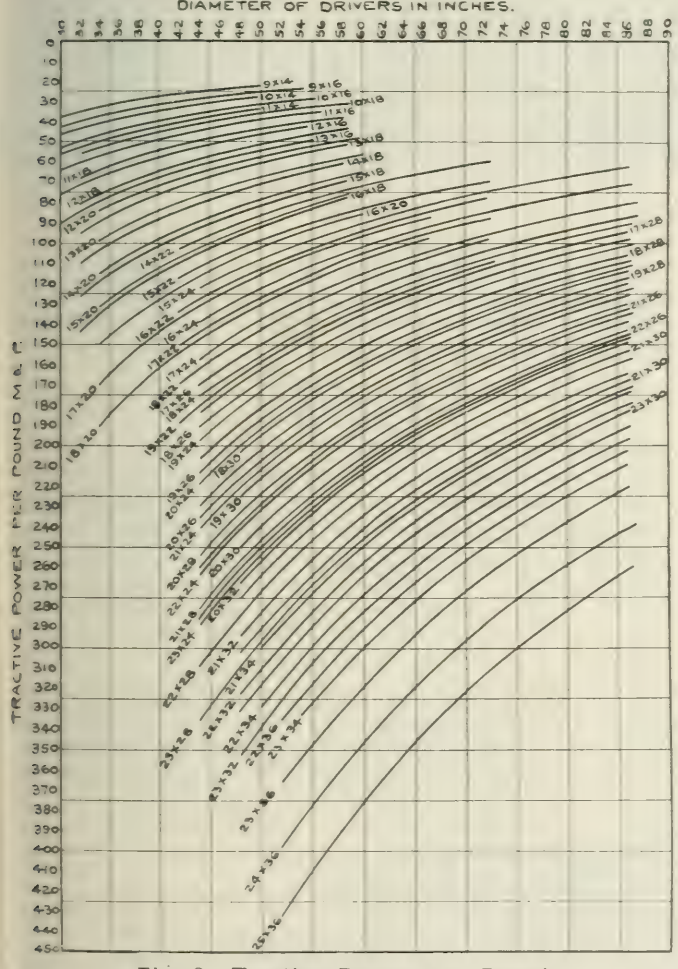


Fig. 2—Tractive Powers Per Pound.

comparing different locomotives. The usual percentage now generally accepted is 85 per cent. of the boiler pressure at piston speeds not exceeding 250 ft. per min. Some authorities consider, however, that the maximum should not be more than 80 per cent. of the boiler pressure.

The tractive power of a simple locomotive is obtained from the following formula:

$$T.P. = \frac{.85\ P\ d^2 s}{D}$$

where T.P. = Tractive power in pounds.

P = Boiler pressure,

d = Diameter of cylinder in inches,

s = Length of stroke in inches,

D = Diameter of drivers in inches.

The above formula is the one that is generally used, and the writer is of the opinion that there are a great many who do not know the rule as written out in full, and it will be noted

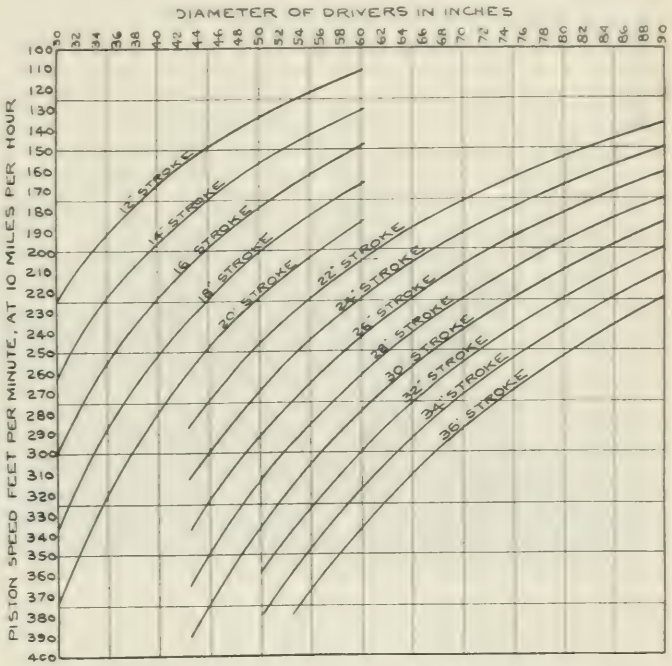


Fig. 3—Piston Speeds at 10 Miles Per Hour.

that the constants for the number of cylinders and the number of strokes in one cycle cancel out, and therefore do not appear in the general rule, which, when written out in full, is logically constructed thus: Area of cylinder multiplied by twice the stroke multiplied by two for the pair of cylinders, multiplied by the mean effective pressure, divided by the circumference of the driving wheel, and in the form of a mathematical equation stands:

$$T.P. = \frac{d^2 \times .7854 \times 2 \times s \times 2 \times P}{D \times 3.1416} = \frac{d^2 \times s \times P}{D}$$

The formula for calculating the tractive power of a shay-geared type of locomotive, as given by the Lima Locomotive & Machine Company, is as follows:

$$T.P. = \frac{d^2 \times s \times 1.5 \times P \times G}{D \times p}$$

where T.P. = Tractive power,

d = Diameter of cylinder,

s = Length of stroke in inches,

P = Mean effective pressure.

G = Number of teeth in gear run.

D = Diameter of driving wheel in inches.

p = Number of teeth in pinion.

In this formula the Lima Locomotive & Machine Co. use and recommend for the value of P or the "M.E.P." 75 per cent. of the boiler pressure.

It will be noticed that this formula is similar to the formula for the simple rod locomotive with the exception of the constant 1.5 (which is introduced because there are three cylinders used) and the geared ratio which for the Shay locomotive is about 2 to 1.

There is one thing to be noted regarding the tractive power of a locomotive; that is, as the engine grows older in service it becomes stronger, due to the wear on the tires thereby de-

creasing the diameter and the wear in the cylinders, and such increases as these may bring about slipping. It is the general practice when making calculations to use the dimensions of the new parts.

As mentioned above, the M. E. P. taken as 85 per cent. of the boiler pressure holds good up to 250 ft. per min. for piston speed, but as the speed increases beyond this point the M. E. P. is materially reduced.

Diagram No. 1 shows the piston speed and the speed factors corresponding to it; for example, we have a locomotive with a tractive power of 38,000 lbs. at a piston speed of 250, then if it is desired to obtain the tractive power for some other speed greater, say 550, we simply multiply the tractive power by .68 or $38{,}000 \times .68 = 25{,}840$ pounds. This curve is based on the information as published by the American Locomotive Company in its pamphlet on Train Resistance and Power of Locomotives, which was calculated from indicator tests of locomotives.

Diagram No. 2 shows the tractive power per pound M. E.P. for cylinders from 9 x 14 to 25 x 36 and for driving wheels 30 to 86 in. diameter; it is possible to obtain the tractive power of any simple locomotive by taking the results found from this diagram and multiplying by the M. E. P., as shown in table No. 1.

Diagram No. 3 shows the piston speed in feet per minute at engine speed of 10 miles per hour. Greater speed can be determined by multiplying the results of the proper factor indicated by the speed required. It might be fitting to state that in locomotive practice it has been found that the maximum piston speed should not exceed 1,600 ft. per minute. The economical speed may be placed at about 1,100 ft. per min.

With the three diagrams mentioned and table No. 1 it is possible to obtain the tractive power for any desired speed.

The formula generally employed for compound locomotives of the 4-cylinder type is:

$$\text{T.P.} = \frac{C^2 \times S \times \frac{2}{3} P.}{D} + \frac{c^2 \times S \times \frac{1}{4} P.}{D}$$

where T.P. = Tractive power.
C = Diameter, high pressure cylinder in in.
c = Diameter, low pressure cylinder in in.
S = Stroke in in.
P = Boiler pressure.
D = Diameter drivers in in.

Formula for 2-cylinder or cross-compound, assuming that the work done on the two sides is equal; it is only necessary to consider the high pressure cylinder in the calculations, allowing a sufficient decrease in boiler pressure to compensate for the necessary back pressure.

The formula as given by the Baldwin Locomotive Works is shown below:

$$\text{T.P.} = \frac{C^2 \times S \times \frac{2}{3} P}{D}$$

where T.P. = Tractive power.
S = Stroke in in.
P = Boiler pressure.
D = Diameter drivers.

Table No. 1.—*Mean Effective Pressure Based on 85 Per Cent. of the Initial Boiler Pressure.*

Initial boiler pressure.	M.E.P.	Initial boiler pressure.	M.E.P.
100	85.0	190	161.5
120	102.0	195	165.75
125	106.25	200	170.0
130	110.5	205	174.25
135	114.75	210	178.5
140	119.0	215	182.75
145	123.25	220	187.0
150	127.5	225	191.25
155	131.75	230	196.5
160	136.0	235	199.75
165	140.25	240	204.0
170	144.5	245	208.25
175	148.75	250	212.5
180	153.0	255	216.75
185	157.25	260	221.0

The *Railway and Engineering Review* shows in its issue of December 31, 1904, the following formula for compound locomotives which were used for making comparison of the different locomotives on exhibition at the St. Louis Exposition in 1904.

For two-cylinder compounds:

$$\text{T. P.} = \frac{.8\ L^2\ S\ P}{(R + 1)\ D}$$

where T.P. = Tractive power.
L = Diameter of low pressure cylinder.
S = Stroke in in.
P = Boiler pressure.
R = Ratio of low pressure to high pressure piston area.
D = Diameter drivers in in.

This formula gives a result about 18 per cent. lower than the Baldwin Locomotive Works formula for two-cylinder compounds, which shows plainly that the data taken from tests run under the supervision of different authorities differ, evidently due to the general dimensions, steaming qualities and conditions under which the tests were made. This variation is not a serious one, and the experience of the designer can readily lead him to make his own deductions.

For four-cylinder compounds:

$$\text{T. P.} = \frac{1.6\ L^2\ S\ P}{(R + 1)\ D}$$

For tandem compounds:

$$\text{T. P.} = \frac{P\,S}{D}\ (.62H^2 + .25L^2)$$

where H. = Diameter of high pressure cylinder.

Mallet compound locomotives. A formula devised and recommended by the American Locomotive Company for the calculation of tractive power of Mallet compound locomotives when working compound is thus:

$$\text{T. P.} = \frac{d^2\ C\ P\ S}{D}$$

where T.P. = Tractive power.
d = Diameter of low pressure cylinder.
C = Constant, slightly variable with the variation of cylinders, usually taken as .54.

The recommended formula of the Baldwin Locomotive Works is thus:

$$2 \times \frac{C \times P \times d \times s}{(r + 1)\ D}$$

where C = a constant usually assumed to be equal to between 85 and 90 per cent., representing the percentage of the boiler pressure which will be obtained as M. E. P. in an equivalent single expansion engine.
P = Boiler pressure.
d = Diameter low pressure cylinders.
s = Stroke.
r = Ratio of high to low pressure cylinders.
D = Diameters of drivers.

From the above formulas it can be clearly observed that the authorities do not exactly agree on a set rule for the calculation of tractive power; but the variation on a comparative basis is slight and any of the formulas may be used without bad effect. It will be observed that the weight on drivers does not enter into the calculation of tractive power at all, it being assumed that the weight is sufficient to balance the tractive force developed, of course, as otherwise the driver must slip before the cylinder power is developed. The ratio of the weight on drivers to the tractive power generally runs from four to five.

FUEL IN ECUADOR.

The Guaymie & Quito Railway intends to change the fuel used on their engines in the near future. Fuel is the main difficulty now in the operating of the road; heretofore coal has been used, it being brought from Pennsylvania, costing $7.50 per ton when laid down in Durand. By the time it has been put on the cars and distributed over the terrific grades it stands the company $35 per ton. This item forms 90 per cent. of the non-revenue paying expenses and 60 per cent. of the operating expenses of the road. With growing trade it is felt that for economic reasons oil is the proper fuel, this doing away with long voyages, steamship freight, etc., oil being found in large quantities in the neighborhood of the road.

NEW LOCOMOTIVES FOR THE CHICAGO GREAT WESTERN.

Under the new administration of President S. M. Felton, the Chicago Great Western is improving its locomotive equipment by the purchase of a number of large passenger and freight engines from the Baldwin Locomotive Works. The order includes 20 consolidation, 4 ten-wheel and 10 Mallet; and all but the Mallets have been delivered.

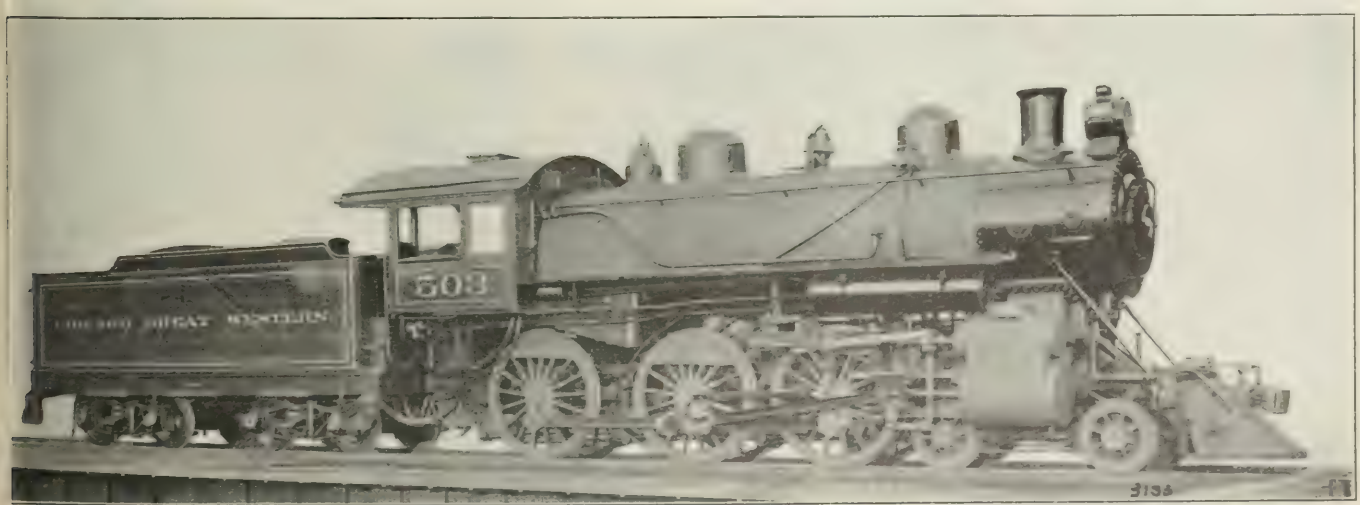
The consolidation engines have cylinders 24 in. x 30 in., 63-in. drivers and a weight of 187,000 lbs. on the drivers; the other principal dimensions are given in the table below. The engines have wide fireboxes, 66⅛-in. wide, extending over the rear drivers, and the valves are operated by the Walschaerts gear.

For passenger service on this line between St. Paul and Chicago it was decided that a 10-wheel locomotive with about 142,000 lbs. on the drivers would be the most suitable for the purpose, and the half-tone shows one of the four engines of this type which were ordered. These engines have cylinders 26 in. x 28 in., with piston valves and Walschaerts valve gear. The drivers are 73 in. in diameter and the firebox is 66⅛ in. wide. Other principal dimensions are given in the table. The passenger engines are equipped with Emerson's superheater with a superheating suface of 460 sq. ft. The boiler pressure is only 150 lbs. We expect to illustrate the Mallet locomotives later.



New Consolidation Freight Locomotive; Chicago Great Western.

	Consolidation.	Ten-wheel.
Cylinders	24 in. x 30 in.	26 in. x 28 in.
Driving wheels	63 in.	73 in.
Driving wheel base	17 ft.	15 ft. 3 in.
Boiler diameter	80 in.	70 in.
Boiler pressure	200 lbs.	150 lbs.
Tubes, number	413	24, 5-in., 203, 2-in.
Tubes, length	16.4 ft.	16 ft.
Firebox, length	108 1/16 in.	107 13/16 in.
Firebox, width	66⅛ in.	66⅛ in.
Heating surface, firebox	171 sq. in.	149 sq. in.
" " tubes	3,514 "	2,206 "
" " total	3,685 "	2,355 "
Grate area	49.8 sq. ft.	49.5 sq. ft.
Tank capacity	8,000 gals.	8,000 gals.



New Ten-Wheel Passenger Locomotive; Chicago Great Western.

THE RAILWAYS OF SPAIN.

The first railway in Spain was opened for traffic in 1848. It was a line of 17½ miles between Barcelona and Mataro. In later years this mileage was added to rather rapidly. By 1880 there were, according to the official reports, 4,645 miles of line in the country, which in 1884 had increased to 5,586 miles, in 1898 to 8,020 miles, in 1903 to 8,606 miles, and in 1907 to 9,104 miles.

But of this mileage only about 6,210 miles can be fairly regarded as standard railway. The lines all belong to private companies, but have been built in part by subvention from the government, so that as in France they are to revert to the state in 99 years. When new lines are undertaken the concession goes to the company which bids for the smallest subvention.

The total amount of subvention contributed by the state up to 1896 was reported to be about 800,000,000 francs ($160,000,000). The gage is different from that of the French lines, for obvious strategic reasons. In addition to the standard gage lines there are about 2,500 miles of narrow-gage roads in the country.

This railway mileage, of course, represents a large expenditure of capital. About 70 per cent. of the private capital invested in Spanish railways is foreign—much of it French, and accordingly several of the principal companies have their financial headquarters in Paris. A still larger proportion of the capital of the tramways and narrow-gage lines throughout the country is foreign. While there are some fairly good lines in Spain, as, for example, those in particular connecting Madrid with Paris and Barcelona with Madrid, the lines upon the whole are badly constructed and poorly and indifferently operated. The foreign capital, however, takes fairly good care of itself, the operation being generally profitable.

On the other hand, the commerce and industry of the country are crippled by the insufficiency and inefficiency of the railway system. Much additional mileage is needed to bring Spain up to the average of other countries in western Europe.—*Charles F. Beach and Henri Segnitz, in Moody's Magazine.*

TOOLS AND SUPPLIES FOR CABIN CARS.

The list of tools and supplies for cabin cars given herewith is taken from circular No. 98, issued by the motive power department of the Pennsylvania Railroad. From this list the division superintendents must prepare and issue a division general notice, approved by the superintendent of motive power, specifying only such tools and supplies as are required for cabin cars in service on their respective divisions. When local conditions require articles other than those specified on this list their use must be authorized by the general superintendent motive power. This list does not include hand lamps, flags and C. T. stationery charged directly to trainmen.

Basin—Wash	*1	Hose—Back-up, Complete	1
Board—Transfer	1	Hooks—Packing	2
Bolts, Nuts and Clevises	†..	Irons—Sponging	2
Box—First Aid	1	Knuckles—Coupler, assorted	5
Box—For Tripoli	1	Knuckles—Emergency	2
Broom	1	Knuckle—Pin, large	1
Brush—Scrubbing	1	Knuckle—Pin, small	1
Buckets—Large	2	Lamps—Cabin (bracket)	1
" —Small	1	" —Deck	1
" —Sponging	2	" —Rear End Marker	2
Burner—Deck Lamp	1	" —Hand, Red	1
" —Hand Lamp	1	Lye	1 lb.
" —Marker Lamp	1	Matches—Boxes	1
Cans—Oil, 1-gal. or 2-gal.	2	M. P. 276	6
Chains—		M. P. 277	6
Long, with hook and link	1	M. P. 401—A	6
Short, with Two Hooks	2	M. P. 183	6
Chisel—12-in.	1	Padlocks	*..
Cups—Drinking	4	Pinch Bar	1
Cushions—Long	3	Poker—Stove	1
Cushions—Short	4	Replacers—Car (pair)	1
Flags—Green	2	Shovel—Fire	1
Flags—Red	2	Soap—Pieces	2
Flag Holders	2	Torpedoes	24
Fusees	12	Truck—Transfer	1
Gaskets—Air-brake coupler, 1¼-in.	6	Tripoli	½ lb.
Globes—Hand Lamp—Red	1	Waste—Cotton	½ lb.
Globes—Hand Lamp—White	1	Wicks—Deck Lamp	1
Hammer	1	" —Hand Lamp	3
Hose—Air-brake	3	" —Marker Lamp	2
		Wrench—18-in. Stillson	1

* Furnished when required and where no other style is provided.
†A limited asortment of these articles will be permitted.

CHICAGO & NORTH WESTERN TERMINAL.

The accompanying photographs, taken for the *Railway Age Gazette* February 3, show progress on the new Chicago & North Western terminal station at Chicago. This will be one of the great terminals of the West, when completed.



Approach, Looking South; Chicago & North Western Passenger Station.



Approach, Looking North; Chicago & North Western Passenger Station.



Appearance of Station on February 3.

FAST FREIGHT LINES.

BY G. G. HUEBNER, PH.D.[1]

THROUGH SERVICE PRIOR TO THEIR ORGANIZATION.

One of the most urgent problems of the early railway companies and shippers was the rapid handling of through traffic. There was, in fact, no "through traffic" as it is known at present. The railway net work consisted of a large number of small independent carriers, each of which confined itself to the handling of freight from one point to another on its own line. On shipping freight to distant points each link in the route of independent lines became a separate receiving company. They took receipts[2] from each other on delivery to each other. Bills of lading were as a rule issued only to the end of the individual railways. In a few exceptional cases through bills were issued but they were so "hedged in and surrounded by limitations as to the liability of each railway"[3] that in the event of loss, damage or overcharge the shipper was obliged to seek redress from the particular line on which the offense was committed. Cars, moreover, both because of the danger of not having them returned and because of the difference in track gage were not interchanged, and cargoes were transferred from car to car at the end of each separate line.

The difficulty and delay involved in the handling of through freight soon resulted in the organization of numerous "forwarding firms." Such, for instance, were the early firms of Leech & Company, Clark & Company, Borbridge & Company and many others. These firms had agencies at the points where freight was transferred from car to car and at the principal cities. They made special arrangements with railways, canals, steamboat companies and wagon lines so as to get continuous routes between distant points. They contracted for through rates and frequently, as distinct from the railways, issued through bills of lading. They saw that their customers' freight was taken from consignor to consignee over the myriad of transportation lines, and the shipper paid them a stipulated price for the service. Some of them were commission merchants as well as forwarders, receiving produce, forwarding it to markets and selling it on commission.

The service rendered by these firms was usually efficient and they did much to facilitate through shipments. But it soon appeared that in spite of anything they might do to facilitate business arrangements there could be no solution of the through freight problem unless cars were carried from consignor to consignee without breaking bulk at the end of each receiving railway. Not only did the carriers refuse to have their equipment pass beyond their lines, but the difference in gage made it impossible for the prevailing type of car to do so.

RISE AND ORGANIZATION OF PRIVATE FAST FREIGHT LINES.

To diminish the delay and damage resulting from transshipment of goods through routing became a public necessity. As a result separate and independent car companies known as *fast freight lines* were organized to handle through traffic. These companies made contracts with the carriers so as to obtain a continuous line between distant points, and they had their own cars. Many of their cars were equipped with adjustable trucks or wide flange wheels so as to be suited to different gages.[4] The first private fast freight line was Kassan's[5] Despatch, organized in 1855 or 1856; the Great Western Despatch was organized in 1857; the Western Insurance & Transportation Co. (Star Union Line) was incorporated in 1856 and organized in 1863; and many others followed.

The organization and working of the Star Union Line may be regarded as typical. In 1856 it was incorporated as the Western Insurance & Transportation Company, and in 1863 was organized as the Union Insurance & Transportation Company. The well-known ★ "Union Line" was adopted as its name. It purchased 55 cars from the little Miami Railroad and handled its first freight in February, 1864. Not only did it provide a through route between the east and middle west, but it insured the time of goods in transit. An additional 25 cents per 100 lbs. on dry goods, for instance, was charged between Chicago and New York to insure five days' transit. Difficulties arising from this practice and from the claim that the insurance covered also the safety of the freight resulted in the abolition of the insurance feature in 1865, and a change in the company's name to "Union Railroad & Transportation Company."

Aside from the ownership of cars, the nature of the line is seen in its varied activities. It established car floats between Jersey City and New York in 1866; it had its corps of freight solicitors at appropriate points to induce shippers to ship their freight in Union Line cars and to take charge of the shipments, and it carried mail for the federal government. Gradually, however, the Pennsylvania Railroad Company acquired control of the roads over which the Star Union Line operated and the Pennsylvania Company was organized to manage the western lines. As a result there was no longer any need for a private fast freight line to handle through business, and the Pennsylvania Railroad served notice that the contracts would be terminated. Thereupon the Star Union Line offered to sell all its properties, good will and rights to the Pennsylvania Company. The transfer was made in 1873 for 60,000 shares of common stock of the Pennsylvania Company and the Star Union Line as a distinct freight company ceased to exist, although the line has been perpetuated and continues its functions as the recognized through freight line of the Pennsylvania Railroad system between the east and the west.

The Empire Transportation Company known as the ⬅ Empire Line, is another typical fast freight line which in its early stages was a private company. This company was particularly interesting as regards its varied activities. It was organized in [1]1865 primarily to develop the traffic over the Philadelphia & Erie Railroad. It, however, made contracts with other carriers and soon obtained a through route from New York to Chicago.[2] To handle the oil traffic in and around Oil City it organized the "Green Line" to operate its tank cars. It also acquired various oil pipe lines soon after that method of transportation proved feasible. In 1866 it purchased a controlling interest in the Titusville Pipe Company, in 1872 purchased the entire property of the Mutual Pipe Line Company and of the Union Pipe Company, in 1873 it constructed the Butler Pipe Line, and in 1875 the Olean Pipe Line. At the time the Empire Transportation Company was purchased by the Pennsylvania Railroad it operated over 400 miles of pipe.

The Empire Line moreover constructed extensive terminal facilities to handle its traffic; it operated river floats at New York and a number of grain elevators at its seaboard terminals. To extend its service on the Great Lakes it organized the Erie & Western Transportation Company, commonly spoken of as the ⚓ "Anchor Line," and thus operated a fleet of freight and passenger steamers. As in the case of the Union Line, however, its work as an independent company was made unnecessary by the consolidation of railways and in 1877 it was purchased by the Pennsylvania Railroad.

The arrangements of the private fast freight lines with the railways were various and peculiar. The Union Line, for example, had a contract with the Pennsylvania Railroad pro-

[1] Instructor in Transportation and Commerce, Wharton School of Finance and Commerce, University of Pennsylvania.
[2] Hepburn Committee Investigation of N. Y. (1879), Vol. III., 2960.
[3] Ibid III. 2960.
[4] Report of Joint Special Committee to Investigate the Vermont Central R. R. management, p. 46.
[5] Hepburn Committee Report (1879) III, 2960; Weld, p. 76.

[1] "Theory and Practice of the American System of Through Fast Freight Transportation as Illustrated in the Operation of the Empire Transportation Co. (Philadelphia, 1876).
[2] N. B. Wilson, "History of Pennsylvania R. R. Co.," Vol. II. 66-68.

viding for a fixed sum per car. The freight rates were collected by the Union Line, while the railway regardless of lading received $72 per car between December 1 and May 1 for hauling them to Philadelphia and Baltimore. During the remainder of the year these payments were $56 and $45 respectively. Likewise from New York to Pittsburgh between December 1 and May 1 the Union Line paid $110 per car and from Philadelphia and Baltimore $85, while during the remainder of the year the payments to Pittsburgh were $100 and $75 respectively. West of Pittsburgh there was a different arrangement. Here a percentage arrangement prevailed, fixing the payments for certain weights on the basis of a total weight of 16,000 lbs. The freight line received the difference between the payments it made to the railways and the freight charges it collected, but also received mileage from the railways at the rate of 2 cents per mile.

Omitting exceptional contracts, the financial arrangements between the private freight lines and railways passed through two[1] stages. In the first the prevailing method was that a fixed sum per car hauled was paid by the freight line to the carrier, while the freight line received the freight charges from the shipper and a mileage charge from the carrier. In the second stage the freight line made no payment to the railway but was paid in various ways for the use of its cars and the solicitation of business. The principal method of payment was a percentage of the freight rate and the lines came to be known as "commission lines." On westward traffic the commissions ranged from 15 per cent. on the first three classes of freight, 10 per cent. on the fourth class and 8 per cent. on specials, down to 10 per cent. on the first three classes and 5 per cent. on the fourth class and specials. On eastbound traffic they usually were 12 per cent. on the first three classes, 10 per cent. on the fourth class and 8 per cent. on specials. Other roads settled on a mileage basis. The Vermont Central, for example, and all other lines over which the "National Despatch" operated, except the Michigan Central[2] paid to this line a mileage of first three and then two and one-half cents per car-mile.[3] Still others paid the freight lines a fixed per diem allowance. The United States Rolling Stock Company, for instance, received 75 cents per day for 300 days per year and repairs were made by the carriers.

While many of these early private freight lines fulfilled a much needed service complaint arose that in some instances they unduly diverted profits from the stockholders of the railways. The bitterest opposition appeared in the case of those freight lines whose stockholders consisted largely of railway officials. In the case of the National Car Company or "National Despatch" and the Vermont Iron & Car Company, for example, it was admitted[4] that their stocks were largely held by officials of the Vermont Central, Vermont & Canada, Grand Trunk, Boston & Lowell and other railways. At times the cars of these freight lines were given preference over those of the Vermont Central. Their cars were built in the car works of the Vermont Central, some of them but little more than the cost of construction. The National Car Company[5] paid first 10 per cent. and then 12 per cent. dividends on the par value of its stock and the Vermont[6] Iron & Car Company paid 10 per cent., while the Vermont Central Railroad was in the hands of a receiver.

Partly because of such abuses, but more generally because the consolidation of the railways into extensive systems made an independent freight line unnecessary, the movement on the part of the railways to purchase them gained ground so rapidly that by 1875 they had almost entirely disappeared.[7]

[1] Windom Committee report (1874), II, 361-2; Hepburn Committee Report (1879), III, 2961-2.
[2] Michigan Central paid two cents.
[3] Special Investigation of Vermont Central, etc., p. 46.
[4] Special Investigation of Vermont Central, etc., pp. 7, 76, 93, 117, 126, 128, etc.
[5] Ibid. p. 89.
[6] Ibid. p. 119.
[7] Weld, p. 77; Ringwalt, Development of Transportation Systems in the United States, p. 192.

PRESENT DAY FREIGHT LINES.

The rapid disappearance of the private fast freight companies was the signal for new forms of freight lines. There are at present two general types, first the co-operative and second the company fast freight line. The co-operative lines made their appearance even before the private lines had largely disappeared. Such, for instance, were the early lines known as the "Purple Line," "Orange Line," "Planet Line," Blue, Red or White lines. The usual arrangement was and still is for each road interested to contribute a portion of the equipment, and the total earnings are pro-rated between the members just as in the case of interline freight shipped without the medium of co-operation freight lines. A board of managers consisting of an official from each railway interested selects a general manager and his assistants. Agents are then located at the leading terminals to solicit business, and all they succeed in getting is consigned over the particular route represented by the co-operative line. The only cost to the participating carriers is the actual expense involved; the entire profit goes to them just as though no freight line had been organized. Co-operative freight lines, in fact, have no earnings separate from those of the carriers interested. A contract[1] with such a line means a contract with the parent railways. Co-operative lines are merely through routes so organized as to consign interline traffic over the railways interested. Typical examples of the present time are the White Line, Traders' Despatch, Lackawanna-Grand Trunk, Lehigh and Wabash Despatch and various others.

With the further consolidation of the railways even the co-operative lines have lost ground. But instead of wholly abandoning the fast freight line, *company freight lines* have in many instances been organized. There are in general two subtypes of company freight lines, those which really consist of little more than departments or bureaus of a railway, and those which are companies owned by the carrier but with separate identity. In a sense many of these freight lines are also co-operative, but they differ from the purely co-operative lines in that wherever more than one railway is interested the railways are affiliated so as to really constitute a single large system.

Of the former type of company freight lines numerous illustrations may be cited, and their organization is not always identical. The Star Union Line, for instance, is still co-operative in the sense that the Pennsylvania lines east and west of Pittsburgh are interested. But when in 1873 it was purchased by the Pennsylvania Company it lost its separate identity and became a sort of bureau or agency with few expenses and no earnings of its own. Its fluctuations are few as compared with what they were when it was a private line. It is an accounting[2] bureau for through freight; its auditor audits the accounts of through freights for the Pennsylvania Lines. He is practically the manager of a clearing house supervised by a board of control which consists of himself and the comptrollers of the Pennsylvania lines east and west of Pittsburgh. In addition to this the concern has, however, not entirely lost its functions as a freight line. It has agents located at different points to solicit traffic. Such agents are directed by the manager and superintendents of the Union Line, but are in reality employees of the Pennsylvania system. The soliciting is done through the Union Line, for to the shipper that represents a definite through route. It acts as a trade mark, the use of which tells the shipper exactly how his goods will be routed. A certain good will, likewise, is attached to it as to any well established trade mark.

The Pacific Fruit Express Company is another company freight line of this general type but is organized in a somewhat different manner. It is a corporation and was formed in 1906 by the Harriman Lines for the definite purpose of

[1] Windom Committee Report, II, p. 128.
[2] A. C. Wright, General Freight Agent, "Freight Solicitation." Y. M. C. A. Transportation Lectures, 1905-6; etc.

handling the fruit business. It is spoken of as a refrigerator line but is in reality but a separate department[1] of the Union Pacific. The 6,600 refrigerator cars which the Harriman Lines ordered in 1906 were turned over to this department instead of to the traffic department. The reasons for the formation of a separate company were that the traffic department, it was thought, could not devote sufficient time to the necessary special service and study required in the movement of fruit, and that an extra corps of men is needed to ice the cars, locate the icing stations and generally supervise the refrigerator service.

The Merchants' Despatch Transportation Company (M. D. T.) may be cited as an example of the second form of company freight line. It is a separate company but its stock is owned by the New York[2] Central Lines. It owns about 6,000 cars, has agents[3] located at numerous large cities to solicit freight and sees to the icing of refrigerator cars billed under its care. Very similar to this is the American Refrigerator Transit Company (A. R. T.), which is a separate corporation but is subsidiary to the Wabash, St. Louis, Iron Mountain & Southern and the Missouri[4] Pacific railways. It owns 4,500 cars and operates them on these roads, solicits freight and ices its refrigerators. The Santa Fe[5] Refrigerator Despatch is also a company freight line, but is so closely subsidiary to the Atchison, Topeka & Santa Fe that it is sometimes regarded merely as a department of the railway. Instead of owning its equipment it leases about 6,000 refrigerator cars from the Atchison, paying 5 per cent. of their value annually for their use. Its earnings come from the refrigeration charges and the mileage which it receives from the foreign railways over which the cars are consigned.

It appears, therefore, that there are two general types of fast freight lines at the present time and numerous variations. They range everywhere from those which merely signify a through route to those which own equipment and operate as subsidiary corporations. It naturally follows that the financial arrangements between the freight lines and the railways are even more variable than the types of freight lines.

In the case of the co-operative lines it is chiefly a matter of pro-rating the earnings. The number of cars which each railway furnishes is first arranged, and then the members agree upon the portion of the through rate which each receives. The earnings never reach the freight line but are collected by the receiving or delivering railway and are pro-rated in the usual way. Whatever expenses are incurred by the freight line are likewise pro-rated between the interested carriers. The arrangement in the case of company lines which are merely bureaus or departments is similar, as they are frequently but co-operative arrangements between the affiliated roads of a great system.

The usual arrangement in the case of company freight lines which own cars is in the form of a contract with the controlling railways. Compensation is usually made in the form of mileage and the payment of a commission[6] on the freight rate. This type of organization is, in fact, sometimes still called a "Commission Line." The contract of the Santa Fe Refrigerator Despatch is peculiar in that the freight line receives neither mileage nor commission from the parent road. It pays to the railway 5 per cent. of the value of the cars which it has leased and pays[7] for all the repairs, expenses of operation and other expenses out of the earnings from the icing service and the mileage paid by foreign roads.

The financial arrangements with foreign railways over which the freight line cars are consigned are as yet unsettled. All such cars are really railway equipment and yet the code of per diem rules is not in every case applied to them. The Santa Fe Refrigerator Despatch, Merchants Despatch and American Refrigerator Transit Company collect mileage from foreign roads in the same way that private car companies do. The A. R. T., moreover,[1] in some instances receives commissions of 12½ or 10 per cent. of the freight rate from foreign carriers. Some of the eastern roads such as the Pennsylvania,[2] Erie and Baltimore & Ohio, have applied an optional rule. They have given their connecting lines the choice of paying either per diem or mileage on the refrigerator cars according as in each instance they find the one or the other cheaper.

In conclusion it may be noted that the term "fast freight line" is in most cases misleading. Some of the lines are refrigerator companies and in reality handle fast freight, but fast freight lines should be distinguished from the fast freight arangements which the railways are making to handle high class and perishable goods. They usually constitute through routes and received their popular name in the early sixties, when the lack of through routes was the greatest hindrance to rapid transportation. Their functions as freight solicitors, trade marks, accounting bureaus, and in some cases as car owners and refrigeration agencies are likewise foreign to any idea of "fast freight." A fast freight line may handle grain, hay, lumber or any other freight that habitually is not carried on fast trains or schedule time.

It is in the region tributary to the Atlantic coast ports that the fast freight lines are most numerous. In 1905[3] as many as 84 furnished through routes from the west and south to these ports. Their number is due chiefly to the fact that through shipments to these ports from the west or south must usually pass over several different carriers. The Atlantic ports, moreover, lead in the export business, and many of the fast freight lines act as special agencies to furnish through routes to foreign[4] destinations. Relatively few freight lines terminate at either the Gulf or Pacific coast ports. While movements here frequently involve more than one carrier they have not been sufficiently complicated to result in a host of fast freight lines. It is significant that when the Atchison and Harriman Lines took over the fruit refrigeration service, they immediately organized freight lines similar to some of those found in eastern territory.

FOREIGN RAILWAY NOTES.

Very little coal is used on locomotives in Peru, oil, of which there is abundance, being found cheaper and better.

On the Finnish railways—all save a few short roads are state controlled—the brakemen get 60 marks per month and the engineers 200 marks. (A mark equals 19 cents.)

In Peru there are 2,242 km. of railway in actual operation, 747.6 in construction and 3,010 projected. Of the road in operation 1,544 kms. are state-owned road leased for 56 years to the Peruvian corporation.

Work was vigorously pushed on the Yalu river bridge of the Antung-Mukden line last summer, seven of the 18 piers being almost completed. The bridge is to accommodate a railway track, a footpath and a driveway. It will require more than another full year to complete it at a cost of $1,500,000 gold, but the plan is to have the bridge built by the time the longest tunnel of the railway is completed. The road will probably be open for traffic by January 1, 1911.

[1]Weld, p. 29.
[2]I. C. C. hearings, (1904), p. 137.
[3]Ibid, p. 139.
[4]Ibid, p. 143; Weld, p. 30; Elkins Committee hearings, III, 2278.
[5]I. C. C. hearings (1904), p. 145; Weld, p. 148.
[6]I. C. C. hearings (1904), p. 144, etc.
[7]Weld, p. 148; I. C. C. hearings (1904), p. 145.

[1]I. C. C. hearings (1904), p. 104.
[2]Weld, p. 89.
[3]List of Through Fast Freight Lines operating from Eastern Port Cities to Western and Southern States with names of railways and steamships over which such lines operate.—Penn. Railroad (F. D. No. 174, Record File 775).
[4]See "Methods and Routes for Exporting Farms Products." U. S. Department of Agriculture, Bureau of Statistics, Bulletin No. 29 (1904) for list of fast freight lines handling merchandise for foreign delivery.

General News Section.

In New York last week the Interstate Commerce Commission took testimony on the complaint of B. E. Sundberg, of Kennedy, Minn., that the four large express companies have an agreement to keep up prices.

The government of Chile, South America, has adopted as the standard time of the country that of the seventy-fifth meridian west of Greenwich, the same as Eastern time in North America.

Mr. and Mrs. T. Rice Smith, who have lately retired from duty in the ticket office of the Wabash Railroad at Jacksonville, Ill., had together served the Wabash and its predecessors 108 years. Mr. Smith began with the Sangamon & Morgan on April 1, 1850, and Mrs. Smith began in 1860. Mr. Smith has now been appointed city passenger agent at Jacksonville.

Five miles from Pittsburg, Kan., on the night of February 5, the passengers on a train of the Missouri Pacific were robbed by three men who "held them up" while the train was in motion, and without putting on masks. It is said that they took about $400 in money as well as some jewelry. The men left the train at Cornell and rode away quickly into the hills.

The officers of the Southern Pacific are considering the expediency of raising the grade of the approaches to the trestle across Great Salt Lake and of the embankments, which have settled somewhat since they were originally grated, and which were originally built to a grade level 5 ft. below that of the trestle. To some extent the consideration of these changes is suggested by the fact that the water in the Great Salt Lake recently has been rising. It is not true, as has been reported, that the question of raising the trestle itself is under consideration.

According to a press despatch from Trenton, N. J., the Pennsylvania Railroad is offering for sale in that region real estate aggregating in value more than $100,000. The property consists of lands and houses which were bought in connection with the straightening and widening of the road several years ago, the company having been compelled in many cases to buy larger tracts than were actually needed. The property was bought through a real estate company, and therefore can be sold without affecting the rights of the holders of the railroad company's mortgage bonds.

Train despatching is now done by telephone on the main line of the Lehigh Valley between Easton and Penn Haven Junction. Plans to extend the system still further are already made, and will soon be carried out. The amount expended in equipping this line and the Mahanoy and Hazleton division with telephones was about $30,000. The numbers of trains and engines and the names of stations must first be pronounced distinctly and then spelled out in full. Since the installation of telephone service on the Mahanoy and Hazleton division, December 6, there has not been a single failure among the 36 selectors on that division.

The Michigan Demurrage Bureau has decided to adopt the new national demurrage rules, notwithstanding the action of the railway commission of that State, looking to the establishment of a different code, because of the belief, on the part of the commissioners, that the national code will not work for the interests of the State. The Interstate Commerce Commission, announcing this news from Michigan, says that the national rules will probably be put into effect also at Pittsburgh, Pa. With Michigan and Pittsburgh in line, the New England States will be the only part of the country where the uniform rules will not be in effect.

The insurance department of the Pennsylvania Railroad system reports that during 1909 the company's employees extinguished 321 fires, the loss from which amounted to only $20,000. The company's organization for fighting fires has been further developed by training of employees, and additional yard locomotives have been equipped with apparatus for use in case of fire. During the year there were 929 fires on the entire system, east and west of Pittsburg, involving a loss of only $402,615, which was comparatively small, as the value of the property was more than $260,000,000. Forty fires, entailing a loss of $11,079, started on adjacent property.

A New York railway man, speaking of the efforts now being made to fix the responsibility for higher prices, calls attention to the fact that the railways have not in any way been responsible for the increase in the cost of living. They have been the victims of high prices without benefiting from them at all. If beef or pork or flour or any other commodity costs more now than it cost ten years ago not the fraction of a cent of the increase can be charged to transportation. The statistics of the Interstate Commerce Commission show that the level of freight rates has declined steadily. In 1897 it cost a little less than four-fifths of a cent to ship a ton of freight one mile; eleven years later, in 1908, the ton-mile rate was still lower, being about three-quarters of a cent. Bradstreet's index numbers for 96 commodities show that the increase in the prices of these commodities, on the average, from January 1, 1890, to January 1, 1909, was 21.4 per cent. If freight rates had increased during the same period at this ratio the gross freight receipts for the year ended June 30, 1908, would have been $243,536,407 greater than they actually were. This sum represents what was saved to the public in transportation costs by reason of the price of transportation not advancing along with other prices, and, while rates have declined, everything that a railway buys has advanced.

State's Attorney Will Not Act in Western Indiana Case.

John E. W. Wayman, state's attorney of Cook county, Illinois, has announced that he will not proceed criminally against Benjamin Thomas, John C. Fetzer and Charles R. Capps for alleged real estate frauds on the Chicago & Western Indiana (See *Railway Age Gazette*, January 28, page 197) unless someone representing the Western Indiana will sign and swear to the complaint in the municipal court. Walter L. Fisher, counsel for the railway, made a statement in reply in which he said that the management would continue to push the case against Messrs. Thomas, Fetzer and Capps, but he could not say as to just what method would be pursued. He added that the fact that Mr. Wayman had called so many witnesses in other cases would make it impossible for the road to go before the January grand jury, which had only three more days to sit.

A story was put in circulation to the effect that the money of which it was alleged that the railway had been defrauded had been used to get a bill through the last legislature validating a bond issue of $50,000,000. This story was ridiculed by the directors of the road, who said that they would hardly have instituted civil suit against Messrs. Thomas, Fetzer and Capps if they themselves had illegitimately applied the road's funds.

R. H. Aishton, general manager of the Chicago & North Western, has been elected also chairman of the General Managers' Association. Mr. Aishton, unlike his predecessor, will serve without pay. Mr. Thomas having retired, the Wabash, the Erie and the Chicago Great Western have now renewed their membership in the association.

Headlight Question Goes to the Courts.

The Indiana Railroad Commission heard argument last week by railway attorneys for a modification of the order requiring brilliant headlights on locomotives, but the order stands.

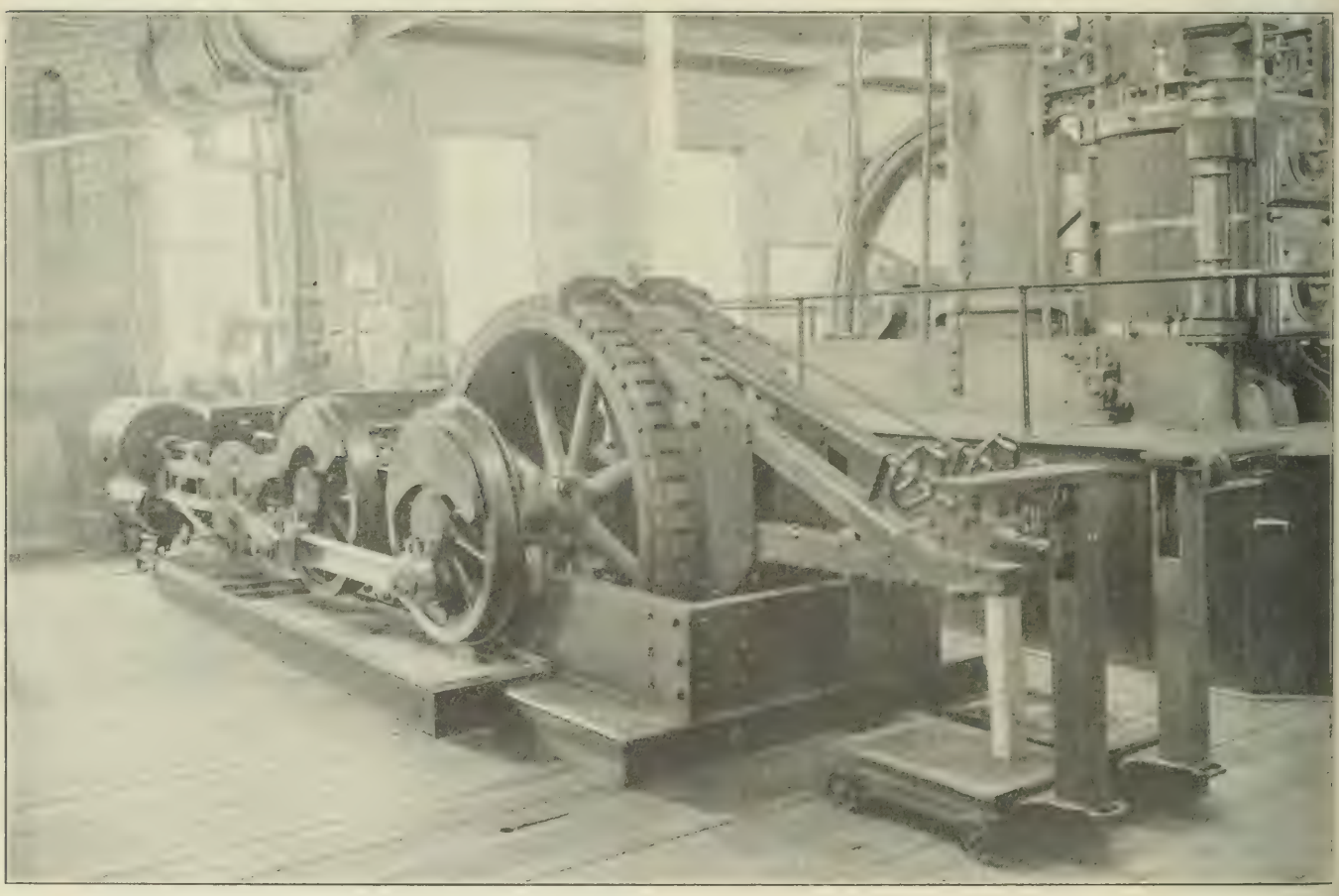
The railways will contest the order in the courts. They will attack the constitutionality of the clause making the commission the judge of the efficiency and practicability of a light. The Baltimore & Ohio has already filed suit in the

Federal Court to enjoin the enforcement of the order. It is declared that the use of head'lights such as are recommended by the commission would place the enginemen in danger of mis-reading signal lights. The road's business is largely of an interstate nature, and the Congress of the United States is the only body which has the right to regulate such matters. It is further alleged that to carry out the order of the commission would entail an expenditure of about $20,000, and that unless the commission is restrained the company will be subjected to a multiplicity of penalties.

Remodeled Vauclain Compound Running Gear at Purdue University.

In 1894 the Baldwin Locomotive Works presented to Purdue University the frame and running gear of a Vauclain compound locomotive. The equipment included everything necessary for running the engine with but one pair of drivers. The lack of room between the driving axle and the frame made it impracticable to use a brake of sufficient size and capacity to absorb the power of the engine.

Through the generosity of the American Locomotive Com



Remodeled Vauclain Compound Running Gear at Purdue University.

pany and the kindly interest of Vice-President Ball, in 1908 an additional pair of drivers, together with suitable boxes and side rods, was presented to the university for the purpose of extending and completing the equipment. The frame has been extended so as to accommodate the boxes for the additional axle and the old frame stiffened by bracing and by its connection with the concrete foundation adapted for the transmission of the full power of the engine. On the supplementary axle two cast-iron pulleys 6 ft. in diameter by 14-in. face have been mounted. These are fitted with internal flanges to hold water, and two Prony brakes of exceptional size and strength, with wooden rubbing blocks and weighing lever. When running backward ordinary platform scales will receive the load, and when running forward calibrated springs will prevent the lever from rising. This brake is designed to take care of 500 or 600 h.p. under ordinary running conditions, with a possible miximum of 800 h.p. for a short time.

Thus equipped, the locomotive will be a valuable piece of apparatus for students of railway engineering. Being of the four-cylinder compound type, it gives a good opportunity for a study of the steam conditions and distribution under various loads.

The possession of this piece of apparatus, in addition to the Schenectady No. 3, which is mounted on friction wheels in the locomotive laboratory, gives the student of railway engineering a particularly good equipment for the study of locomotive problems. It is expected that some interesting research work will be done with this engine during the coming year.

Railway Matters in Washington.

Washington, Feb. 9, 1910

Senator Newlands, of Nevada, who some time ago presented a bill in Congress to provide for incorporation of railways by the federal government, has asked the committee on interstate commerce to give a hearing on his bill. The bill proposed by President Taft deals mainly with industrial corporations, while Senator Newlands proposes to have his bill confined to common carriers. The President's bill was introduced in Congress on Monday. It is expected to meet with severe criticism and prolonged discussion in committee.

The Senate Committee in its hearings on the Elkins and Townsend bills to amend the Interstate Commerce law has listened to J. C. Lincoln, of St. Louis, agent of the National Industrial Traffic League, and R. C. Butler, of Chicago, representing a number of mercantile associations. Mr. Lincoln, in addition to arguments which he has presented before, proposed an amendment to make the proposed laws applicable to express companies as well as to railway companies. Mr. Butler desired modifications in those clauses of the proposed law

which will establish an Interstate Commerce court. He thought that applications for injunctions should be heard by three judges, and wanted to make clearer the provision allowing a shipper to appeal to the proposed court from an order of the Interstate Commerce Commission. H. G. Wilson, of the Kansas City Commercial Club, presented an argument in favor of the clause in the proposed law which gives the shipper the right to route his freight.

Senator Overman, of North Carolina, on Monday introduced a joint resolution to postpone the enforcement of the corporation tax law, with a view to relieving corporations from the payment of taxes until the validity of the law shall have been passed upon by the Supreme Court of the United States.

Attorney General Wickersham is making further changes in the Administration's railway bill. He has changed it many times already, but he is supposed to be trying now to meet certain criticisms of members of the Senate Committee. This committee will probably hold further hearings this week.

Secretary Ballinger, of the Interior Department, has issued instructions to throw open 1,400,000 acres of land in eastern Montana to white settlers. This land was withdrawn about two years ago with the expectation that it would be allotted to Indians. This land is very fertile. It will be opened under the usual homestead laws, instead of the lottery system. Settlers may go on the land any time after March 1 and may make entry at the Glasgow (Mont.) land office March 31 and thereafter. The Great Northern has issued folders with maps showing the location of the lands. There are over 8,000 160-acre homesteads in this tract, which is considerably more than the combined total in the Flathead, Spokane and Coeur d'Alene reservations, which were opened to settlement last summer.

At a meeting in this city last week representatives of a number of coastwise water transportation companies discussed the proposition to extend the powers of the Interstate Commerce Commission over steamship lines. A pamphlet was circulated showing how the growth of the merchant marine in the coastwise trade might be severely checked if hampered by a law like that which binds the railways. Tramp steamers probably could not be controlled and they could kill much of the business of the regular lines.

Legibility of Shipping Orders and Expense Bills.

Arthur Young & Co., certified public accountants, endorsing the work of the freight traffic committee of the Chicago Association of Commerce, says: "For years we have advocated to our clients the maximum of legibility of these matters. A fair degree of success has already followed the efforts of the carriers in large shipping centers to persuade shippers to use writing machines in making bills of lading, etc. It is to the credit of the carriers that they have taken a wholesome dose of their own medicine, and are increasing the use of writing machines. This applies to express companies also.."

Conductor and Engineman Acquitted.

At Newton, N. J., last week, F. E. Vance and Thomas O'Neill, engineer and conductor of a freight train on the Lehigh & Hudson, were acquitted of the charge of manslaughter, on which they had been tried, before a court and jury, in connection with a collision which occurred January 6 at Woodruff's Gap, causing the death of a fireman. The jury was deliberated on the case all night. The press despatches indicate that the acquittal was due to the feeling on the part of the jurymen that the men had been required by the railway company to work excessively long hours without rest. It appears that the two men, in charge of a freight, started from a side track, where they had been waiting, when the second of two trains which they were ordered to keep out of the way of, had not arrived. The forward brakeman set the switch for the freight to pass from the side track to the main line, and the engineman carelessly acted on the brakeman's hand signal. As to the overwork, it appears from the testimony of the engineman that he went on duty about 5 p. m., January 5. After reaching the end of this trip, some time in the evening, he lay down to sleep in the caboose of his train, but, in consequence of the noise of passing cars, he slept only a few minutes at a time, until, at 2 a. m., he and the other members of the crew were called out by mistake. Thereafter he was unable to rest, and at 5 a. m. he had to begin his return trip. He was then on duty until the time of the collision, about noon. This was more than 19 hours from the time that he had left his home. The counsel for the defendants alleged at the trial that the railway company knew the men were working without sufficient rest, yet neglected to relieve them. The engineman, in his testimony, said that he could not explain how he came to start his train out from the side track, except on the supposition that his mind must have been a blank, because of the long hours he had been at work.

Massachusetts Still in the Lead.

There is one matter of real importance that I want to call to your attention, a very remarkable statement, I think. It is a tremendous tribute to the capacity and ability of the men who handle the great railways in this section of the country. It is this: Taking 10 years from 1898 to 1907 inclusive, and taking the average of deaths of passengers without their own fault on our railways in Massachusetts for those 10 years, if you should take up your abode on a train, never getting off of it night or day, and travel at the rate of 250,000 miles a year, the equivalent of about 10 times around the earth, or about 20,833 miles a month, or about 29 miles an hour, if you had average luck you would not be killed oftener than once in 2,039 years. (Laughter and applause). You may think that is funny, but it strikes me as being a mighty consoling proposition.—*Governor E. S. Draper*, before New England Railway Club, Boston.

New York Central Automatic Signals.

In addition to the "Expert Views on Signaling," published last week, some strikingly positive statements were made at the Public Service Commission's hearing on the Croton collision by Mr. Rudd, signal engineer of the Pennsylvania.

"I believe that the practice on the Hudson division of the New York Central, and I know the division pretty well, with the number of interlockings they have, is just about right the way that they have it now, with the three-position upper quadrant automatic signal."

Q. Then in your opinion the New York Central has done everything that could be reasonably expected in the installation of this new signal system to secure safety; is that right?

A. Yes, sir. * * * We have installed the three-position upper quadrant system at Washington and at Broad Street Station, Philadelphia.

Q. Enginemen like it over there, do they?

A. They protested against the installation when it was put in and the general manager asked them to give it a trial before they decided against it; and a poll a short time ago was 143 for and one against; so it seems to be popular.

Q. What are you going to do to guard against mistakes of the engineman? What is the best you ever observed in practical use? Put yourself right in the position of the engineman who is looking out, who is careful, but who has to look at his engine, look at a variety of things, and, if by any accident he misses a single order, what is the very best thing?

A. I believe frankly that the system that the New York Central is just installing is the best system.

"The Value of Courtesy."

The educational bureau of the Union Pacific, of which D. C. Buell is chief, has issued a pamphlet entitled, "The Value of Courtesy," which is being distributed among the students of the bureau and also among passenger train employees and station and ticket agents. The pamphlet very strongly enjoins on all employes the need for treating patrons of the company with the most thoughtful consideration. It says in part:

"Questions must be answered carefully and correctly, and with a cheerfulness that does not repel nor discourage the questioner. They may seem irritational, or even silly; it must be remembered, however, that the railway, with its

complex and changing rules and schedules, is, to a greater or less extent, a mystery to some eighty millions of people—even the experts are put to their wits' end to avoid mistakes or misunderstandings.

"A kind word to those in the waiting-rooms who may be too timid to ask questions, shows thoughtfulness, and is received with appreciation. Courtesy of this kind is seldom vouchsafed, and when such interest is not manifested the impression may be given that the company's representative is taciturn and sour, although the contrary may be the case. The agent is looked upon as the company itself. He has the right to know that patrons are satisfied, and no offense can be given or taken through a polite inquiry as to whether anything can be done to assist the traveler. With the waiting-room full of people, a few minutes spent among its occupants in this way may bring many dollars to the company in return.

"On the train the conductor has many opportunities to increase the value of his services with a little personal effort that costs him nothing, and wins smiles of approval that are certainly more desirable than frowns of disapproval or sneers of contempt. Many very prominent and learned men have been flattered by a word of recognition from the conductor; in what esteem, then, must his affability be held by those of less importance or fewer attainments?"

The Railway Labor Situation.

On February 2 the general managers' committee, which has been negotiating with the representatives of the Brotherhood of Firemen at Chicago, refused to grant certain demands for changes in conditions of employment and advances in wages, and negotiations were terminated. On February 5 negotiations between the general managers and representatives of the Brotherhood of Railway Trainmen were similarly terminated This has created a railway labor situation in the West which cannot be regarded as serious, but which, nevertheless, is of considerable interest and importance.

The demands of the Switchmen's Union of North America presented last September in the Northwest were for changes in conditions of employment and also advances in wages which, in the aggregate, amounted to from 40 to 45 per cent. Failure to reach any agreement, and the precipitate action of President Hawley, of the Switchmen's Union, before mediation by the Erdman act could be resorted to, led to a strike by the switchmen of the Northwest. The railways have won this strike. Many of the men belonging to the union have gone back to work at Butte, Duluth, Seattle, Spokane and less important places. About 2,500 men struck. Of these about one-half have been re-employed, and the places of most of the rest have been filled.

The ill-success of this strike in the Northwest led the representatives of the Switchmen's Union in other parts of the country to act somewhat conservatively. After the strike in the Northwest, S. E. Heberling, vice-president of this union, made demands on the railways for switchmen working at Chicago, Buffalo, St. Louis and a number of other places similar to those which had been made in the Northwest. Conferences lasting about 30 days were held and as no agreement was reached the different committees representing the switchmen offered to arbitrate. This was about two weeks ago. The railways accepted the agreement. C. R. Gray, vice-president of the St. Louis & San Francisco, was appointed to represent the railways and Mr. Heberling to represent the switchmen. Messrs. Gray and Heberling have failed to agree upon a third arbitrator, and Chairman Knapp, of the Interstate Commerce Commission, and Labor Commissioner Neill have been asked, in accordance with the provisions of the Erdman Act, to appoint one.

After negotiations between representatives of the Switchmen's Union at Chicago and other points and of the railways began, the Brotherhood of Railway Trainmen, which includes large numbers of switchmen, also asked the railways for changes in their conditions of employment and advances in wages. Conferences were then begun with the representatives of this union, headed by F. A. Whitney, vice-president. Agreement was reached regarding 27 out of 40 of the proposed rules. Two of the proposed rules were withdrawn by representatives of the union. There was disagreement regarding the other 11. At the last conference on February 5 the representatives of the railways said that in the event an agreement was found impossible they desired to submit the differences between them and their employees to arbitration. A poll of the members of the Brotherhood is now in progress on the question of authorizing the committee headed by Mr. Whitney to determine whether the entire matter shall be submitted to arbitration or a strike shall be declared. The only roads directly concerned in the negotiations with the Brotherhood of Railway Trainment are 13 roads in the Chicago switching district. These are: The Santa Fe, Belt Railway, Baltimore & Ohio, Alton, St. Paul, North Western, Burlington, Chicago Junction, Erie, Monon, Indiana Harbor, Illinois Central and Wabash. The number of men involved is about 3,600. The situation in which Mr. Whitney and the union he represents find themselves is rather unusual. As stated, members of the Brotherhood of Railway Trainmen are switchmen. Now, the demands made by the Switchmen's Union are in a fair way to be arbitrated. A determination of their demands would naturally be reached before those of the Brotherhood of Railway Trainmen could be arbitrated. Consequently, if the Brotherhood of Railway Trainmen should decide to arbitrate it probably would be met with the statement by the government officials acting under the Erdman act that the questions it has raised have already been settled by the arbitration of the demands of the Switchmen's Union. As the switchmen in both unions often work in the same yards, it is out of the question to make two different settlements.

Before opening negotiations with the railways the Brotherhood of Firemen took a vote to determine whether their officers should represent them in the negotiations as a union or as the employees of individual railways. The members voted in favor of the latter. Negotiations, therefore, were first begun with the railways west of Chicago. About 20,000 firemen on 190,000 miles of railway are concerned. The employees demand an increase in wages of 22½ per cent. Agreement being impracticable, the railways offered to arbitrate. This proposition was refused and the question of authorizing officers of the union to declare a strike has been submitted to a vote of its members, the result of which will probably not be known before March 1.

The arbitration, under the Erdman act, of the differences between the Illinois Central and its telegraphers has come to an end. The result cannot be considered a victory for either side. If it is a victory at all, it is a victory for arbitration as provided for by the Erdman act. The telegraphers asked for a 10 per cent. increase in wages and also for reductions in working hours. The road would not grant the request. The employees then offered arbitration under the Erdman act, which was accepted. I. G. Rawn, president of the Monon, was selected to represent the Illinois Central, and John Newman, vice-president of the Order of Railroad Telegraphers, to represent the telegraphers. As they were unable to agree on the third member of the board, Chairman Knapp, of the Interstate Commerce Commission, and Labor Commissioner Neill, acting under the Erdman act, appointed B. H. Meyer, chairman of the Wisconsin Railway Commission. The award made by this board on February 7 denies the telegraphers the increase in wages asked for. It favors the granting of the following demands: Telegrapners at all offices on the system working 10 hours a day or more shall receive 15 days' leave of absence annually on full pay. The hours of all operators employed in train despatching offices shall be reduced from 10 to 9 hours a day without any reduction in their daily pay. The hours of work of operators employed in the three relay offices—at Chicago, Memphis and New Orleans—shall be reduced from 10 hours a day to 8 hours without any reduction in their daily pay. Telephone operators employed in train despatching service shall be placed on the same footing as telegraphers. A thousand men are affected.

Developments show a distinct disposition on the part of both the railways and their employees to resort to arbitration under the Erdman act when unable to reach an agreement. It will be noted that the railways offered arbitration to the trainmen, the firemen and the switchmen (at St. Paul); while the Switchmen's Union at other cities and the telegraphers on the Illinois Central offered arbitration to the railways. In both cases, where arbitration was tendered by the employees, the railways accepted it. The switchmen of the

Northwest agreed to arbitrate but repudiated their agreement. In view of the fact that the Erdman act was passed mainly at the instance of the railway brotherhoods, the circumstance that the railways have been more willing to resort to arbitration under it than their employees is perhaps not without significance.

Western Railway Club

At the meeting of the Western Railway Club at the Auditorium hotel in Chicago on the evening of February 15, E. T. Adams, manager of the gas and mill engine department of the Allis-Chalmers Company, will read a paper on the "Development of the Gas Engine."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.

AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.

AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.

ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y.

BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Irregular, usually weekly; Montreal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn

NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.

OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.

RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Vandalia Railroad has this week run a "seed and soil special" over its lines in Illinois, stopping at 21 cities and towns. Lectures were given by representatives of the Agricultural Department of the University of Illinois.

Records kept by the Merchants' Exchange of St. Louis show that the total tons of freight received at St. Louis in the years 1908 and 1909 are as follows: 1908, local, 16,691,158, through, 7,179,949; 1909, local, 18,179,856, through, 9,146,982.

The Adams Express Co. announces that on March 1 that company will absorb the New York & Boston Despatch Express Co., Earle & Prew's Express and the Hatch Express Co., of New Bedford. This will give the Adams a monopoly in southeastern New England. It is said that the Adams has owned the New York & Boston Despatch for 20 years.

The Traffic Bureau of the Merchants' Exchange of San Francisco will send William R. Wheeler, its manager, and Seth Mann, its attorney, to Washington, to appear before the Senate committee on oceanic canals on February 10 to advocate the inauguration of a government steamship service between Panama and San Francisco similar to that now operated between New York and Colon. This additional service, it is claimed, is necessary as a means for regulating freight rates.

The Southern Railway announces that its land and industrial department will at once resume active work in the promotion of immigration to the southern States. The extensive work of the company in this direction previous to 1908 was severely curtailed during the business depression, but now it is believed that the local situation warrants a renewal of the campaign. The company will make use of newspapers in the North and West and of fairs; and will pursue a somewhat similar policy in northern Europe. The company has a land and industrial office in London.

The Indiana Railroad Commission has announced that it will take up the question of equalizing rates, a matter that was begun nearly two years ago. The resumption of the question is due to the insistence of shippers. Shippers object to the plan of charging one rate in one direction from Indianapolis and a different rate for the same class of freight when shipped in another direction. The commission will endeavor to equalize conditions in the state and to secure the adoption of the Central Freight Association rates and agreement by the roads operating in Indiana.

It is given out at New Haven that the New York, New Haven & Hartford will raise its freight rates from New York and New England to the West, over the Canadian Pacific and over the New York, Ontario & Western, to the basis of 75 cents per 100 lbs. (first-class) New York to Chicago. These rates at present are on the basis of 69 cents (first-class) New York to Chicago. The increase will put these lines on the same basis as the standard lines and, it is said, will make the Erie and the Lackawanna willing to refrain from making their proposed reduction of their rates to the basis of 69 cents.

The receivers of the Washington, Baltimore & Annapolis Electric Railway announce that on March 1 they will increase the through fare between Baltimore and Washington to $1, and the round-trip rate from $1.25 to $1.50. On the same date cars will begin running through to the corner of Fifteenth and G streets, N. W., in Washington. At present the terminus is in the northeastern part of the city. There will be a limited car every half hour in both directions, in addition to the present local service, and transfers will be given on all of the intersecting lines of the Washington Railway & Electric Co., so that passengers will be carried without additional charge to all parts of the city.

The annual dinner of the Traffic Club of Chicago was held Wednesday evening of this week. The toastmaster was F. B. Montgomery and the speakers were Senator A. B. Cummins, of Iowa; E. A. Bancroft, counsel of the International Harvester Company, and Warren J. Lynch, passenger traffic manager

of the New York Central Lines. The attendance was about 300. Senator Cummins spoke on the propositions now before Congress to give more power to the Interstate Commerce Commission and called for progressive action. The power of the government to regulate railways is no longer in question. The problem is how to exercise power justly. If there are some railways that are earning more money than they ought, there are also some not earning as much as they ought. The public is beginning to understand that the railway is entitled to adequate revenue. Why, then, is there any conflict between the railways and the people generally? Fair discussion will evolve equitable laws.

J. H. Kane, traffic manager of the Spokane (Wash.) Merchants' Association, has written a letter to E. D. Sewall, vice-president of the Chicago, Milwaukee & Puget Sound, indicating that it is his opinion that this road should agree to fix certain rates to Spokane before it shall be given a franchise to enter that city. Mr. Sewall, replying in a letter dated January 25, indicated to Mr. Kane that the road is not disposed to make any such arrangement. He calls attention to the fact that the matter of rates to Spokane is now before the Interstate Commerce Commission and says that pending the decision it would be improper for the Chicago, Milwaukee & Puget Sound to take any action. He says he does not believe that the citizens of Spokane think that the granting of a reasonable franchise to his company should depend on its obligating itself in advance to any definite rate situation. It is the policy of the company to make such rate adjustments as will be fair and reasonable to all jobbing points along its lines and it certainly will have no other policy for the city of Spokane.

The New York Central has bought the first of a series of three demonstration farms. It is a "run-down" farm, situated within a few rods of the station at West Bergen, Monroe county. The road does not seek to equip anything even remotely resembling an agricultural school or a scientific experiment station. It is the purpose simply to show by inexpensive methods how the greatest yield at the greatest profit to the farm owner can be obtained. When the farm is developed to its highest degree of efficiency the road intends to sell it and start to build up some other "run-down farm" in western New York. The company's farm superintendent is T. E. Martin, of West Rush, N. Y., a practical farmer. He took his Genesee Valley farm several years ago, when it was yielding 60 bushels of potatoes to the acre, and by common-sense methods brought its yield up to an average of more than 300 bushels to the acre. Opportunity will be given to the graduates of the agricultural schools to serve as managers. Of the two other farms, one will be located in the Mohawk Valley and another on the western slope of the Adirondacks. The West Bergen farm is a "cold farm," so called, and will require the best efforts of the agriculturists. Their efforts will be concentrated to develop its four present crops—potatoes, cabbage, alfalfa and wheat. Experiments will be conducted with and without fertilizers and spraying, so as to show the greatest possible cash yield in proportion to actual expenditure.

When Commissioner Harlan of the Interstate Commerce Commission recently was in Chicago he was informed by William Ellis, interstate commerce counsel of the Chicago, Milwaukee & St. Paul, that this road probably had violated the letter of the Hepburn act by selling coal which it had transported during the recent period of severe weather. It is well known that other roads did like the St. Paul. Many of the western roads own coal mines, the product of which ordinarily is either consumed by the railway or sold by it at the mine. This method of handling the business does not violate the law as interpreted by the Supreme Court of the United States. During the recent severe weather, however, it became necessary for the roads to choose between selling coal which they had hauled for themselves or of seeing industries which they served shut down from lack of fuel. In a good many cases they chose the alternative of violating the law and thereby saved many industries from heavy loss. Mr. Ellis stated that the St. Paul had charged the consumer just what the coal had cost the company to produce it plus the full tariff freight rate, and he asked the commission to issue an order formally relieving the railway of liability, or at least placing its sanction on what it had done. Mr. Harlan told Mr. Ellis and the other railway men that it was his personal opinion that it would not be wise for the commission to take any action in reference to the matter, but that he would favor legislation to permit railways to sell their own coal during an emergency.

Hearing Regarding Relations of Railways to Coal Mines.

G. N. Brown, special examiner of the Interstate Commerce Commission, took testimony in Chicago last week in the investigation of the relations between the railways and coal mines which is being made by the Interstate Commerce Commission under the provisions of the Tillman-Gillespie resolutions. Previous testimony taken in this hearing has shown that various railway officers are stockholders in coal mines along their lines.

At the hearing in Chicago last week Thomas J. O'Gara, president of the O'Gara Coal Company, read a list of names of men who own stock and bonds of his company. The O'Gara company operates 14 mines in Saline county, Illinois, on the Cleveland, Cincinnati, Chicago & St. Louis, and produces 18,000 tons of coal a day. It has outstanding $5,000,000 common and $1,000,000 preferred stock and $2,750,000 in bonds. Mr. O'Gara said the books of the company show that at the time it was organized in 1906 5 per cent. gold bonds were issued to officials of the New York Central in the following amounts: W. C. Brown, president, $62,500; W. C. Brower, chief clerk to Mr. Brown, $10,000; J. Carstenseon, vice-president, $10,000; J. F. Deems, general superintendent of motive power, $25,000; C. F. Daly, vice-president, $25,000; E. T. Glennon, general attorney, $87,500; G. J. Grammer, late vice-president, $25,000; E. T. Henson, former chief clerk to Mr. Brown, $10,000; C. E. Schaff, vice-president, $25,000. The bonds were sold at 90 and interest has been paid on them regularly. Mr. O'Gara said that considerable stock was given as a bonus to the railway officers who bought bonds. The testimony showed that various other railway officers were stockholders in the O'Gara Coal Company.

Thomas C. Hughes, secretary of the Saline County Coal Company, whose mines are situated on the Big Four, testified that President Brown of the New York Central owned $91,000 of his company's bonds on October 15, 1909, and that C. E. Schaff, vice-president of the New York Central, owned $76,000. Mr. Hughes is secretary also of the Big Creek Coal Company, whose mines are situated on the Chicago, Burlington & Quincy, and he testified that F. C. Rice, general inspector of transportation of the Burlington, owns 100 of the shares of this coal company. F. R. Crawford, secretary of the Clover Leaf Coal Mining Company, said that G. H. Ross, vice-president of the Hawley Lines, owns 100 shares of the stock of this company, whose mines are located on the Toledo, St. Louis & Western at Coffeen, Ill.

Mr. O'Gara testified that Capt. G. J. Grammer, deceased, vice-president in charge of traffic of the New York Central, had reduced the rate on the coal of this company from Williamson county, Ill., to Chicago from $1.15 to $1 per ton, but that this involved no discrimination, as it was merely to place the mines on a parity with competing mines that enjoyed a rate to Chicago of $1.

STATE COMMISSIONS.

The Indiana Railway Commission has formally refused to modify its order requiring the railways of that state to equip their freight and passenger locomotives with headlights of at least 1,500 candle power. See an item in regard to this in General News.

The express companies doing business in Louisiana (American; Southern; Wells, Fargo & Co.; Pacific and United States) have been ordered by the Louisiana Railway Commission to supply their agents with pasters and tags printed in heavy type and bearing the words "Charges prepaid by

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1909

(See also issue of February 4.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations net	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,458	$4,551,233	$1,701,756	$6,854,989	$1,245,312	$1,093,265	$157,679	$2,186,159	$167,509	$4,849,924	$2,005,065	. . .	$283,753	$1,721,312	-1,214,182
Atlantic Coast Line	4,483*	1,985,950	672,706	2,892,844	337,800	348,150	44,273	794,178	75,077	1,599,478	1,293,366	.....	95,380	1,197,866	253,738
Boston & Maine	2,243	2,093,381	1,064,076	3,436,361	357,916	478,256	44,071	1,807,431	94,304	2,781,978	654,383	$4,744	182,128	476,999	9,580
Central of Georgia	1,916	706,757	303,375	1,116,631	140,124	155,151	29,120	315,863	42,994	683,552	133,079	5,588	54,857	383,810	69,243
Central of New Jersey	668	1,549,281	332,894	1,982,805	153,318	300,311	23,040	560,539	40,378	1,077,586	905,219	—5,555	142,926	756,738	60,924
Chesapeake & Ohio	1,939	1,968,531	413,930	2,505,449	220,503	468,263	48,101	716,695	53,154	1,506,716	998,733	4,393	67,500	935,626	126,196
Chicago & North Western	7,638	3,488,546	1,422,798	5,340,465	785,512	797,095	116,133	2,613,516	112,763	4,425,049	915,416	11,239	228,000	676,147	852,928
Chicago, Burlington & Quincy	9,021	4,243,424	1,735,303	6,561,481	859,494	1,370,049	145,182	2,412,991	182,156	4,969,872	1,591,609	19,247	215,511	1,356,791	769,412
Chicago, Milwaukee & Puget Sound	1,400†	721,340	59,893	800,977	25,042	56,436	24,618	292,280	11,378	409,754	391,223	1,040	20,000	372,263	.....
Chicago, Milwaukee & St. Paul	7,511	2,920,851	989,662	4,345,147	620,515	649,689	128,687	2,187,826	103,123	3,690,140	655,007	6,516	199,965	461,558	1,170,957
Chicago, Rock Island & Pacific	8,034	2,994,604	1,457,265	4,751,132	767,940	714,055	137,219	2,055,856	150,156	3,825,226	925,906	10,808	222,478	692,620	560,461
Delaware & Hudson Co.	845	1,512,898	195,136	1,758,679	5,144	210,305	17,865	612,466	41,745	917,525	841,154	1,901	21,468	817,785	20,413
El Paso & Southwestern Co.	867	491,985	90,544	611,620	103,756	80,795	8,172	170,814	23,533	387,110	224,510	2,323	29,711	192,476	46,234
Elgin, Joliet & Eastern	770	670,952	.....	732,264	76,756	160,392	4,334	263,641	36,816	541,939	190,325	.....	13,500	176,825	37,189
Erie	1,961‡	2,932,984	677,745	3,907,262	360,200	727,922	82,475	1,359,880	81,003	2,611,480	1,295,782	−84,403	108,930	1,102,449	178,475
Great Northern	7,100§	2,539,989	984,810	3,819,886	565,418	562,055	72,400	1,515,560	79,522	2,794,955	1,024,931	12,948	253,158	784,721	563,079
Gulf, Colorado & Santa Fe	1,518	727,468	276,604	1,074,640	216,945	166,048	26,046	411,896	31,904	852,839	221,801	.....	43,393	178,408	220,881
Illinois Central	1,550	3,313,063	1,009,544	4,905,335	388,471	1,194,830	120,822	1,764,021	102,479	3,570,623	1,334,712	3,447	291,874	1,039,391	521,573
Louisville & Nashville	4,598‖	3,229,056	948,426	4,483,844	441,304	721,180	99,657	1,378,467	91,877	2,732,483	1,751,361	7,429	125,445	1,633,345	303,550
Missouri, Kansas & Texas	3,072	1,461,068	694,887	2,298,254	325,664	260,022	62,469	928,740	77,677	1,651,572	643,682	2,290	102,178	539,214	11,731
Mobile & Ohio	1,114	680,659	116,682	915,068	97,897	170,936	32,873	289,853	31,588	623,447	291,921	2,256	21,956	267,709	17,029
Nashville, Chattanooga & St. Louis	1,230	633,128	226,856	918,367	135,190	131,279	37,105	333,239	23,289	660,102	257,965	1	20,500	237,466	10,684
Norfolk & Western	1,942	2,355,599	335,592	2,786,558	281,254	458,800	42,959	862,120	57,144	1,705,277	1,081,280	1,266	84,000	996,014	181,558
Northern Central	466	875,537	173,400	1,115,831	96,404	215,318	13,827	500,722	21,294	850,566	265,265	241	24,708	240,798	103,963
Pennsylvania Co.	1,415	3,052,052	598,106	4,014,803	481,068	684,715	68,554	1,536,629	87,226	2,858,392	1,156,411	3,211	173,273	979,927	198,269
Pennsylvania R. R. Co.	4,017	10,058,968	2,497,769	13,531,925	1,623,447	2,299,915	168,589	4,723,518	352,771	9,168,270	4,363,655	89,411	197,526	4,076,718	981,728
Philadelphia & Reading	1,024	3,149,355	566,523	3,879,738	244,461	737,838	35,343	1,189,945	64,937	2,272,527	1,607,211	9,024	73,369	1,543,766	37,651
Philadelphia, Baltimore & Washington	716	684,595	590,780	1,445,328	183,278	223,055	23,364	590,642	36,730	1,057,069	388,259	....	35,771	352,488	63,078
Pittsburgh, Cincinnati, Chic. & St. L.	1,468	2,366,332	608,858	3,333,061	389,549	518,239	69,015	1,207,260	68,927	2,283,020	1,050,041	866	119,981	929,194	165,262
St. Louis & San Francisco	1,726	2,204,560	881,978	3,331,935	415,276	506,193	78,186	1,229,367	120,832	2,350,154	981,781		121,012	860,769	37,433
St. Louis Southwestern	773	465,840	136,309	630,260	94,343	83,159	28,031	137,571	22,715	365,822	264,438	1,292	22,458	240,688	51
St. Louis Southwestern of Texas	697	203,507	81,891	306,361	80,904	60,929	10,774	143,366	17,748	313,721	7,360	300	10,090	17,750	39,190
Southern Ry.	7,050	3,272,676	1,313,066	5,028,486	516,930	810,760	110,120	1,674,713	157,265	3,270,088	1,758,398	7,177	185,942	1,579,633	227,922
Texas & Pacific	1,885	1,034,526	378,962	1,655,169	137,151	173,739	19,299	618,979	31,792	983,960	671,209	1,582	67,394	602,233	129,479
Vandalia	827	536,897	186,758	810,595	112,599	138,180	25,216	319,657	19,469	615,421	195,174	...	24,089	171,085	26,772
Yazoo & Mississippi Valley	1,370	714,443	260,387	1,029,302	103,847	161,899	17,640	315,063	22,319	620,768	408,534	2,153	42,740	368,247	75,258
SIX MONTHS OF FISCAL YEAR.															
Atchison, Topeka & Santa Fe	7,458	29,564,121	10,425,052	43,324,830	7,019,741	6,361,197	834,604	11,794,055	916,681	26,926,278	16,398,552		1,585,242	14,813,310	760,180
Atlantic Coast Line	4,483*	9,822,784	3,154,756	13,973,645	1,956,848	2,088,649	234,839	4,247,132	373,417	8,900,885	5,072,760		567,500	4,505,260	1,043,865
Boston & Maine	2,243	12,988,971	8,110,034	22,756,189	2,967,905	2,569,187	256,996	9,313,228	476,777	15,584,093	7,172,096	46,818	1,034,825	6,194,089	317,448
Central of Georgia	1,916	4,119,024	1,627,023	6,290,951	867,153	934,371	178,646	1,790,361	244,414	4,014,945	2,276,006	38,411	298,257	2,021,160	331,222
Central of New Jersey	668	8,833,718	2,401,089	11,865,562	1,060,401	1,890,654	179,441	3,134,753	247,157	6,512,406	5,353,156	196,081	590,947	4,958,390	655,995
Chesapeake & Ohio	1,939	12,378,780	2,653,273	15,654,715	1,706,049	2,935,792	267,275	4,032,670	287,113	9,228,899	6,425,816	903	405,000	6,019,913	1,115,823
Chicago & North Western	7,638	26,055,745	10,141,305	39,165,191	6,309,449	4,680,735	712,807	14,368,816	598,525	26,670,332	12,494,859	18,805	1,368,000	11,108,054	−1,157,547
Chicago, Burlington & Quincy	9,021	29,572,652	12,246,340	45,410,617	8,553,390	7,722,789	862,157	13,482,195	1,069,853	31,690,384	13,720,233	83,973	1,298,547	12,342,713	806,904
Chicago, Milwaukee & Puget Sound	1,400†	3,852,500	418,540	4,349,734	139,396	250,218	106,849	1,273,844	58,192	1,828,499	2,521,235	18,161	100,000	2,439,396	.....
Chicago, Milwaukee & St. Paul	7,511	23,496,525	7,870,385	33,912,588	4,867,287	4,062,681	687,448	12,668,888	576,330	22,862,634	11,049,954	170,678	1,238,128	9,987,504	1,457,697
Chicago, Rock Island & Pacific	8,034	20,621,865	10,176,742	32,673,625	5,333,376	4,052,195	744,842	11,429,459	835,717	22,395,589	10,278,036	83,093	1,223,625	8,971,318	816,205
Delaware & Hudson Co.	845	8,091,387	1,739,956	10,301,183	619,035	1,286,754	130,005	3,374,841	221,602	5,632,237	4,668,946	186	201,468	4,467,664	261,687
El Paso & Southwestern Co.	867	2,893,998	518,827	3,573,877	485,152	467,133	68,179	953,298	135,951	2,104,713	1,469,164	5,564	124,546	1,339,054	46
Elgin, Joliet & Eastern	770	4,332,255	137	4,680,512	422,277	871,487	24,789	1,398,819	100,364	2,727,736	1,952,776	...	81,000	1,871,776	78,697
Erie	1,961	17,728,422	4,702,465	24,160,973	2,867,394	4,184,229	529,578	7,522,981	486,217	15,590,399	8,570,576	59,337	631,067	7,880,172	1,300,909
Great Northern	7,100§	25,274,432	7,874,029	34,898,507	5,261,749	3,637,732	447,088	8,783,416	497,409	18,627,394	16,271,113	231,775	1,744,098	14,758,789	2,266,690
Gulf, Colorado & Santa Fe	1,518	4,517,313	1,607,002	6,515,389	1,209,465	937,066	140,670	2,318,559	177,065	4,782,825	1,732,564	..	264,960	1,467,605	539,225
Illinois Central	1,550	19,466,296	6,193,510	29,150,275	1,369,138	6,794,227	635,787	9,547,299	593,164	21,939,615	7,210,660	21,297	1,318,083	5,871,280	165,183
Louisville & Nashville	4,598‖	18,821,982	5,550,594	25,949,258	2,845,776	4,021,728	536,678	7,581,648	506,242	15,495,072	10,154,186	44,116	741,780	9,658,340	1,989,736
Missouri, Kansas & Texas	3,072	9,366,059	3,994,895	14,156,839	1,924,053	1,683,144	321,229	4,835,658	435,981	9,200,065	4,956,774	11,493	532,287	4,412,994	564,874
Mobile & Ohio	1,114	3,835,372	680,107	5,221,262	620,037	911,918	174,014	1,676,581	184,450	3,567,000	1,654,262	15,074	153,478	1,506,044	5,122
Nashville, Chattanooga & St. Louis	1,230	3,989,932	1,303,347	5,698,548	895,221	975,873	215,814	1,933,786	135,045	4,155,740	1,542,808	5,596	123,000	1,414,412	131,565
Norfolk & Western	1,942	14,666,596	2,119,074	17,329,916	1,773,364	2,907,738	262,821	4,841,085	346,522	10,131,530	7,198,386	9,648	504,000	6,684,738	1,293,565
Northern Central	466	5,106,682	1,135,380	6,594,410	699,377	1,216,925	82,346	2,750,403	126,891	4,875,942	1,718,468	5,390	148,250	1,575,608	211,462
Pennsylvania Co.	1,415	21,750,448	4,026,554	27,768,342	3,270,313	4,169,432	410,818	8,266,062	445,346	16,561,971	11,206,371	16,796	896,063	10,292,912	2,523,138
Pennsylvania R. R. Co.	4,017	59,926,309	16,304,782	81,411,982	9,696,523	14,428,265	1,040,587	25,847,747	1,836,548	52,849,670	28,562,262	510,706	1,185,157	26,866,399	5,372,027
Philadelphia & Reading	1,024	17,493,101	3,535,168	21,953,182	1,644,713	4,689,612	226,327	6,316,666	357,112	13,234,430	8,718,752	65,742	440,615	8,344,859	708,200
Philadelphia, Baltimore & Washington	716	4,007,965	3,612,736	9,098,001	1,236,504	1,520,248	138,101	3,437,510	188,021	6,520,384	2,577,617		214,629	2,362,988	270,331
Pittsburgh, Cincinnati, Chic. & St. L.	1,468	13,756,511	4,001,459	19,860,488	2,628,746	3,266,284	391,421	6,229,409	356,387	12,875,197	6,985,291	5,004	662,225	6,318,062	1,324,414
St. Louis & San Francisco	1,726	13,687,645	5,426,156	20,561,977	3,279,765	3,181,218	470,542	6,779,965	376,225	14,287,715	6,274,262	..	686,572	5,587,510	684,294
St. Louis Southwestern	773	2,928,424	727,850	3,811,568	463,992	540,812	147,383	824,059	128,141	2,104,687	1,706,881	244	131,156	1,570,181	262,078
St. Louis Southwestern of Texas	697	1,367,944	181,407	1,981,602	445,075	403,377	56,857	780,478	84,053	1,779,840	201,822	1,196	51,756	148,870	30,870
Southern Ry.	7,050	19,238,535	7,836,220	29,284,292	3,166,479	4,836,377	677,320	9,323,918	856,184	19,157,278	10,127,014	12,057	975,667	9,163,999	1,100,468
Texas & Pacific	1,885	4,688,399	2,069,436	8,342,481	914,915	1,178,929	121,234	3,014,290	782,502	5,130,970	2,911,511	27,660	303,927	2,579,937	140,705
Vandalia	827	3,277,029	1,176,618	4,955,551	732,774	885,511	146,960	1,724,218	111,879	3,551,372	1,404,179	..	143,676	1,260,503	180,600
Yazoo & Mississippi Valley	1,370	3,665,517	1,176,346	5,154,126	1,136,916	964,370	98,762	1,630,859	144,257	3,971,264	1,179,862	18,003	216,449	981,425	176,988

* Mileage operated on December 31, 1908, 4,108. † Began operations on August 1, 1909. ‡ Mileage operated on December 31, 1908, 1,888. § Mileage operated on December 31, 1908, 1,901. ‖ Mileage operated on December 31, 1908, 4,808. ¶ Mileage operated on December 31, 1908, 4,802.

Indicates Deficits, Losses and Decreases

shipper. Agent at destination must collect no charges." This tag is required to be placed on all packages on which charges have been prepaid.

Suits attacking the constitutionality of the Colorado law creating a railway commission have been withdrawn and the commission will be able to operate peacefully. But it is said that if it tries any drastic measures against the carriers the question will again be taken into court by a renewal of the proceedings now discontinued.

Pennsylvania: Refusal to Stop at Small Stations.

John A. Stanton et al. v. Pennsylvania Railroad.

This complaint is from merchants and milk shippers of New Stanton and Ruffsdale, stations on the Southwest branch of the Pittsburgh division of the Pennsylvania Railroad, protesting against the discontinuance of the stopping of trains 101 and 108. The road answered that the traffic to and from the stations referred to had been very light, and that the stops still being made at Tarr, one mile south of Ruffsdale and Youngwood, 2½ miles north of New Stanton, afforded reasonable facilities; also that the change was made for the purpose of furnishing faster service for the larger communities at the southern end of the line. It appears that the revenue from ticket sales and from milk shipments is inconsiderable, and that the quickened service has been much appreciated by the communities thus served. * * * The question seems to be whether or not the increasing patronage from the more distant communities should be permitted to outweigh the demand of the people of New Stanton and Ruffsdale. * * * One portion of a community must sometimes submit to inconvenience or loss of facilities in order that others may have reasonable accommodation. In Massachusetts the state commission in the Amherst case held it to be no ground of complaint that one express train each way per day had been withdrawn for the purpose of insuring close connections at important points. * * * The decision depends upon the balance of convenience between the petitioners and those desiring rapid traveling. * * * From the evidence before the commission, as well as their personal observation along the route traversed by trains Nos. 101 and 108, it clearly appears that, by far, the greater demand is for the faster service now afforded by those trains, and failure to meet the demand for this faster service would be a greater injustice to the public than is the refusal to stop those particular trains at New Stanton and Ruffsdale. The petition was dismissed.

COURT NEWS.

Judge Hook, of the federal court, has issued an interlocutory injunction forbidding the enforcement of the Oklahoma constitutional provision fixing a 2-cent fare and of 11 orders of the State Corporation Commission reducing freight rates, as they apply to the Missouri, Kansas & Texas, the Atchison, Topeka & Santa Fe and the Gulf, Colorado & Santa Fe. In the cases of the Midland Valley and the Kansas City Southern the examination of the records has not been completed. The Katy and the Atchison are required to give bonds of $250,000 each and the Gulf, Colorado & Santa Fe a bond of $50,000 to indemnify any who may be injured by the injunction.

In the federal court at St. Louis February 2 Judge Hook issued a restraining order enjoining the Illinois Central and the Southern Railway from putting into effect rates which it is alleged would be injurious to the Tennessee Central. The proceeding was instituted by the Tennessee Central, based on the action of the Illinois Central and the Southern, which in December summarily notified the Tennessee Central of changes in freight rates effective February 15, which would injure the business of the plaintiff by making it impossible for it to quote the through rates hitherto in effect from its shipping points to points on the Illinois Central and the Southern, which are the main outlets of the Tennessee Central and formerly jointly operated it. The Tennessee Central asks that the two roads be perpetually enjoined from putting the rates into effect. A hearing will be held this week.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

F. M. Johnson has been appointed auditor of the Ft. Dodge, Des Moines & Southern, with office at Boone, Iowa, succeeding W. Chamberlain.

See an item in regard to the officers of the various companies which have been consolidated and merged into the Arizona Eastern under Arizona Eastern in Financial News.

Howard G. Hetzler, president of the Metropolitan West Side Elevated of Chicago, has been elected president of the Chicago & Western Indiana. Britton I. Budd, succeeds Mr. Hetzler.

F. W. Corcoran, general freight and claim agent of the Williamsport & North Branch, has been appointed general auditor, with office at Hughesville, Pa., succeeding Charles E. Mosser.

Joseph M. Bryson, assistant general counsel of the Missouri, Kansas & Texas at St. Louis, Mo., has been appointed temporarily also general attorney for Missouri, with office at St. Louis, succeeding George P. B. Jackson, deceased.

W. A. Wildhack, auditor of the Lake Erie & Western at Indianapolis, Ind., has been appointed auditor of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Cincinnati, Ohio, succeeding P. A. Hewitt, transferred.

J. F. Holden, vice-president and general manager of the Midland Valley at Muskogee, Okla., has been elected vice-president in charge of traffic of the Kansas City Southern, with office at Kansas City, Mo., succeeding E. F. Cost, resigned.

F. B. Montgomery, vice-president and general manager of the Illinois Northern at Chicago, has been elected president and general manager. S. D. Snow has been elected vice-president and W. M. Gale has been appointed treasurer, all with offices at Chicago.

C. G. Burnham, whose election as vice-president of the Chicago, Burlington & Quincy and the Colorado & Southern, with office at Chicago and jurisdiction over the traffic department, has been announced in these columns, was born on June 20, 1879, in England. After attending high school he began railway service in 1895 with the Great Northern as a clerk in the general freight department, remaining in that position until February, 1902, when he became chief clerk to the foreign traffic agent of the Chicago, Burlington & Quincy at Chicago. He was appointed general agent of the Great Northern Steamship Company February 1, 1904, and the following April he was made foreign traffic agent of the Chicago, Burlington & Quincy. In December, 1906, he was appointed assistant to Darius Miller, first vice-president of the Chicago, Burlington & Quincy, which position he held at the time of his recent appointment.



C. G. Burnham.

Carl M. Gage, vice-president and general manager of the Huntingdon & Broad Top Mountain, has been elected president and general manager, succeeding Samuel Bancroft, Jr., who becomes chairman of the board. Joseph Bancroft has been elected vice-president, all with offices at Philadelphia, Pa.

We announced in this column last week that W. M. Whitenton, manager of the Southern and Choctaw districts of the Chicago, Rock Island & Pacific at El Reno, Okla., had been elected vice-president and general manager of the Chicago, Rock Island & Gulf, with offices at Fort Worth, Tex., succeed-

ing J. W. Robins, resigned. We wish to correct this statement by saying that Mr. Whitenton has been elected vice-president only of the Texas line and that he will retain the office of manager of the Southern and Choctaw districts of the Chicago, Rock Island & Pacific. T. H. Beacom, general superintendent at Little Rock, Ark., has been appointed general superintendent also of the Choctaw and Southern districts.

W. H. Elmendorf, assistant auditor of the Lake Erie & Western at Indianapolis, Ind., has been appointed auditor, with office at Indianapolis, succeeding W. A. Wildhack, resigned to accept service elsewhere. John P. Hart succeeds Mr. Elmendorf. J. A. McDonald is appointed auditor of disbursements.

H. E. Byram, whose election as vice-president of the Chicago, Burlington & Quincy and the Colorado & Southern has been announced in these columns, was born November 28, 1865, at Galesburg, Ill. He began railway work in 1881 with the Chicago, Burlington & Quincy at Galesburg as a call boy; he was later a stenographer in the general superintendent's office and chief clerk to the superintendent of terminals at Chicago. For five years from 1889 he was out of railway service. He then went with the Great Northern, first as clerk in the general manager's office and later as chief clerk in the vice-president's office. In 1898 he was made assistant general superintendent of the Montana Central at Great Falls, Mont., and the following year was made superintendent of the Cascade division of the Great Northern. He was then made assistant to the first and fourth vice-presidents of the Chicago, Rock Island & Pacific at Chicago, and in 1904 became general superintendent of the Southwestern district of the Rock Island at Topeka, Kan. Later in the same year he was appointed general superintendent of the Nebraska district of the Burlington, and in May, 1909, was appointed assistant to the second vice-president, with office at Chicago, from which position he has just been promoted.



H. E. Byram.

Operating Officers.

W. C. Bradley has been appointed superintendent of the Pan-American, with office at Tonala, Mex.

C. H. Beatty, general superintendent of the Salt Lake & Ogden, at Salt Lake City, Utah, has resigned.

W. A. Sours has been appointed superintendent of the St. Paul & Des Moines, with office at Des Moines, Iowa.

E. H. Holden has been appointed superintendent of the Texarkana & Fort Smith, with office at Texarkana, Tex., succeeding I. H. Luke.

W. M. McDonald, superintendent of the Southern division of the Florida East Coast at Fort Pierce, Fla., has been transferred to Miami, Fla.

W. C. Ranous has been appointed superintendent of transportation of the Minneapolis, St. Paul & Sault Ste. Marie, with office at Minneapolis, Minn.

G. G. Grundy, superintendent of the Temiscouata Railway, has been appointed general manager, succeeding D. B. Lindsay, with office at Rivier du Loup, Que.

B. W. Steele, assistant general manager of the Atlanta & St. Andrews Bay at Dothan, Ala., has been appointed general manager, succeeding W. R. Beaupree.

D. J. Nelson has been appointed a trainmaster of the Chicago, Burlington & Quincy, with office at Sheridan, Wyo., succeeding C. D. Peckenpaugh, promoted.

See an item in regard to the officers of the various companies which have been consolidated and merged into the Arizona Eastern under Arizona Eastern in Financial News.

W. B. Drew, car accountant of the Maine Central at Portland, Me., has been appointed superintendent of car service with office at Portland, and his former position has been abolished.

G. W. Kirtley, superintendent of car service of the Erie at New York, has been appointed superintendent of transportation, with office at New York, and his former position has been abolished.

E. W. Hoffman, general yardmaster of the Cincinnati, Hamilton & Dayton at Indianapolis, Ind., has been appointed a trainmaster, with office at Indianapolis, succeeding H. F. Reynolds, who succeeds Mr. Hoffman.

C. P. A. Lonergan, assistant superintendent of the Oregon Short Line at Pocatello, Idaho, has been appointed an assistant superintendent on the Oregon division of the Oregon Railroad & Navigation Company, with office at Portland, Ore.

S. E. Burkhead, recently appointed assistant superintendent of the Colorado lines of the Denver & Rio Grande at Pueblo, Colo., has been appointed superintendent of the Utah lines, with office at Salt Lake City, Utah, succeeding A. B. Apperson, resigned.

D. K. Townsend, superintendent of the Williamsport & North Branch, has been appointed assistant general manager, and H. A. Knipe, superintendent of the Eagles Mere branch, has been appointed general superintendent and purchasing agent, both with offices at Hughesville, Pa.

W. H. De Witt, superintendent of the Missouri & North Arkansas, with office at Leslie, Ark., having resigned, that office is abolished. H. R. Irvine, general roadmaster at Searcy, Ark., has been appointed an assistant superintendent, with office at Searcy, and W. D. Danley has been appointed an assistant superintendent, with office at Leslie. The position of general roadmaster is also abolished.

E. B. John, whose appointment as superintendent of the Delaware division of the Philadelphia, Baltimore & Washington has been announced in these columns, entered the service of the Pennsylvania Railroad on June 24, 1895, in the office of the division engineer of the Philadelphia division, since which time he has been in the operating department. In 1897 he went to the office of the division engineer of the Tyrone division, and two years later was transferred to the office of the principal assistant engineer at Altoona, Pa. In 1900 he was made assistant supervisor of the Pittsburgh division, and a year later was transferred to the New York division. The following year he was made supervisor of the Delaware division, and in 1904 was transferred to the Maryland division, remaining there until 1905, when he was again transferred to the Middle division. In 1908 he was made division engineer of the Delaware division, and on March 24, 1909, was appointed principal assistant engineer of the Philadelphia, Baltimore & Washington, which position he held at the time of his recent appointment.

Traffic Officers.

J. G. Perrin has been appointed a traveling passenger agent of the International & Great Northern at the City of Mexico, Mexico.

H. N. Page has been appointed general agent of the Chicago, Milwaukee & Gary, with office at Rockford, Ill., succeeding J. H. Miller.

L. R. Jones has been appointed a traveling freight agent of the Missouri, Kansas & Texas at the City of Mexico, Mexico, succeeding A. P. Japp.

John C. Emig has been appointed industrial agent of the Cleveland, Cincinnati, Chicago & St. Louis and the Cincinnati Northern, with office at Cincinnati, Ohio.

Wyn Morris, city passenger agent of the Pittsburgh & Lake Erie at Pittsburgh, Pa., has been appointed an assistant general passenger agent, with office at Pittsburgh.

See an item in regard to the officers of the various companies which have been consolidated and merged into the Arizona Eastern under Arizona Eastern in Financial News.

Engineering and Rolling Stock Officers.

E. C. Anderson has been appointed mechanical engineer of the Colorado & Southern, with office at Denver, Colo.

C. H. Montague has been appointed superintendent of motive power of the St. Paul & Des Moines, with office at Des Moines, Iowa.

See an item in regard to the officers of the various companies which have been consolidated and merged into the Arizona Eastern under Arizona Eastern in Financial News.

T. J. Wyche, division engineer of the Western Pacific at Elko, Nev., has been appointed chief engineer, with office at San Francisco, Cal., succeeding Virgil G. Bogue, retired.

W. Alexander, assistant district master mechanic of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., has been appointed district master mechanic, with office at Milwaukee, succeeding J. C. Miller, resigned.

James T. Wallis, superintendent of motive power on the Erie division of the Pennsylvania Railroad and of the Northern Central, has been appointed acting superintendent of the West Jersey & Seashore also of the Philadelphia & Camden Ferry, with office at Camden, N. J., succeeding D. H. Lovell, granted leave of absence.

N. N. Boyden, master mechanic of the Southern Railway at Atlanta, Ga., has been transferred to Knoxville, Tenn., succeeding J. F. Sheahan, resigned to accept service elsewhere. George Akans, master mechanic at Birmingham, Ala., succeeds Mr. Boyden; E. M. Sweetman, master mechanic at Sheffield, Ala., succeeds Mr. Akans, and Frank Johnson, general foreman of locomotive repairs at Knoxville, succeeds Mr. Sweetman.

J. W. Stone has been appointed acting division engineer of the Philadelphia division of the Pennsylvania Railroad, with office at Harrisburg, Pa., succeeding G. H. Brown, granted leave of absence; N. B. Pitcairn, assistant supervisor of Division 6, on the Middle division, has been appointed supervisor of Division 1, on the Conemaugh division, with office at Verona, Pa., succeeding H. C. Bolenius, transferred; E. C. Silvius succeeds Mr. Pitcairn, with office at Mifflin, Pa. T. K. Minsker has been appointed assistant supervisor of Division 13, on the Pittsburgh division, with office at Pittsburgh, Pa., succeeding R. A. Klein, promoted.

Purchasing Officers.

W. J. Souder, auditor and superintendent of the St. Paul & Des Moines at Des Moines, Iowa, is now auditor and purchasing agent, with office at Des Moines.

See an item in regard to the officers of the various companies which have been consolidated and merged into the Arizona Eastern under Arizona Eastern in Financial News.

B. J. Yungbluth, storekeeper of the Lake Erie & Western at Lima, Ohio, has been appointed general storekeeper of the Pittsburgh Railways Co., with office at Pittsburgh, Pa. W. J. Given succeeds Mr. Yungbluth, with office at Lima.

OBITUARY.

A. B. Adams, general roadmaster of the Wabash, with office at Peru, Ind., died at Peru on February 22.

J. V. Parker, formerly assistant general freight agent of the Kansas City, Ft. Scott & Memphis, assistant general freight agent of the Union Pacific and traffic manager of the Toledo & Ohio Central, but for the last ten years in private business, died in Chicago on January 22.

John F. Barnard, formerly a well-known railway executive, died at Los Angeles, Cal., on February 6. Mr. Barnard was 81 years old and was in railway service in various capacities from 1850 to 1905. He was general manager of the Hannibal & St. Joseph, now a part of the Burlington, from 1884 to 1887, and from 1886 to 1892 was with the Ohio & Mississippi, now a part of the Baltimore & Ohio Southwestern, first as president and later as general manager also. He was then made receiver of the Omaha & St. Louis, now a part of the Wabash, and later was receiver and then president of the St. Clair, Madison & St. Louis, now the Missouri & Illinois Bridge & Belt Company, which is the last position he held.

Railway Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—An officer writes that contracts have been let for 30 miles of second track changes incident to reducing grade on the east end of the Albuquerque division, and on 37 miles of second track from Flagstaff, Ariz., to Williams, on the same division, as well as on 22 miles of second track from Cottonwood, Cal., east via Barstow to Daggett. (Jan. 14, p. 118.)

Brownwood North & South.—This company has been incorporated in Texas, with $30,000 capital, to build from Brownwood, in Brown county, to May, 20 miles. The incorporators include J. A. Walker, J. J. Timmins, H. Ford, J. C. Weakley, B. Smith and others, of Brownwood, Tex. (Jan. 14, p. 113.)

Canadian Northern Ontario.—This road has been extended from Sellwood Junction, Ont., northward to Gowganda Junction, 30.7 miles.

Canadian Pacific.—The Battle river section on the Central division has been opened for business from Wilkie, Sask., westward 131.3 miles to Hardisty, Alb. On the Western division, the Lacombe branch of the Edmonton section, has been extended from Stettler, Alb., eastward to Castor, 35 miles. A new branch called the Forward branch has been opened for business from Weyburn, Sask., on the Portal section, Westwood to Forward, 25.9 miles. The Carmangay branch has also been opened for business from Kipp, Alb., on the Crow's Nest section, northward to Carmangay, 28 miles.

This company will probably double-track its main line during 1910 from Winnipeg, Man., west to Portage la Prairie, 56 miles. It is understood that next year the double tracking will be continued west to Brandon.

Canadian Roads.—It is said that the Canadian government will start work this spring on the proposed line from The Pass, Kew., north to Hudson Bay. It has not yet been definitely decided whether the northern terminus will be at Fort Churchill or Fort Nelson. (Dec. 24, p. 1261.)

Chicago & Elmhurst.—Incorporated in Illinois, with a capital of $5,000 and office at Chicago. The plans call for a line from Oak Park, Ill., westerly to the township of Addison, in Du Page county, about 15 miles. The incorporators and directors include H. I. Williford, Jr., F. D. Kailmer, F. W. Pringle, H. L. Fearing and W. A. Ranson.

Coal & Coke.—A new branch has been opened for business from Gassaway, W. Va., east to Sutton. (Nov. 26, p. 1036.)

Crystal City & Uvalde.—This road is open for traffic from Uvalde Junction, Tex., to Crystal City, 41 miles. (Nov. 26, p. 1036.)

Dakota, Kansas & Gulf.—Surveys are said to be under way from Beloit, Kan., southwest to Kearney, about 200 miles. W. H. Mitchell, president, Beloit.

Denver & Gulf.—According to press reports from Denver, Colo., a new outlet from that place to the Gulf of Mexico will be provided over the Denver & Gulf. This company was incorporated in Colorado with $1,000,000 capital to build from Texhoma, Okla., northwest into Colorado, connecting with the Union Pacific at a point near Limon. The plans call for a line from Texhoma, south to Dallas, Tex., from which point traffic arrangements are to be made over an existing line to the Gulf. Grading is said to be under way on about 100 miles. The promoters are Chicago capitalists. Franklin A. Umsted, president, formerly at Chicago, and now at Texhoma.

Duluth, Rainy Lake & Winnipeg.—Capital is said to have been secured by the Duluth, Winnipeg & Pacific. Contracts are to be let this spring to build from Virginian, Minn., south to Duluth, 74.4 miles. H. T. Hazen, chief engineer, room 619, Lyceum building, Duluth. (Dec. 3, p. 1107.)

Duluth, Winnipeg & Pacific.—See Duluth, Rainy Lake & Winnipeg.

Lackawanna & Wyoming Valley.—An officer writes that work is now under way by B. T. McGowan, building a temporary line about 3,000 ft. long near North Pittston, Pa. (Feb. 4, p. 280.)

Louisville & Nashville.—On the Henderson division a new line has been opened for business from Atkinson, Ky., to Ellmitch, 53.2 miles.

Manistee & North Eastern.—Train service has been extended on the Manistee River branch from Walton, Mich., northeast to Sigma. (Nov. 19, p. 991.)

Mexican Southern.—A new branch has been opened for business from Oaxaca, Mex., southward to San Pablo, 18 miles. (Aug. 13, p. 297.)

Michigan Central.—According to press reports, this company has decided to build an additional track from Buffalo, N. Y., west to Detroit, Mich., making that division over 200 miles a three-track system. It is said the improvements are to be made to accommodate the expected increase in traffic, following the opening of the Detroit tunnel.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes that contracts are to be let the later part of February or early in March for improvements as follows: Cut-off from New Richmond, Wis., west to Whitrow, Minn., 17 miles, maximum grades are to be $^{6}/_{10}$ per cent. with light curves; cut-off from Spencer, Wis., west to Owen, 19 miles, maximum grade to be $^{6}/_{10}$ per cent. with light curves. The work includes putting up a steel bridge over the St. Croix river. (Feb. 4, p. 280.)

The First district of the Duluth-Superior line is in operation from Onamia, Minn., northeast to Superior, Wis., 98.3 miles. (July 23, p. 168.)

Missouri, Oklahoma & Gulf.—This road has been extended from Wapanucka, Okla., southward to Durant, 29 miles. (Dec. 24, p. 1261.)

New York Subways.—Plans for the Broadway-Lafayette subway in the borough of Brooklyn are completed, and as soon as the necessary legal formalities are complied with bids are to be asked for the work. The route is from the Williamsburg bridge along Broadway to Lafayette avenue, then through Lafayette avenue to a junction with the Fourth avenue subway at Atlantic avenue.

Norfolk & Western.—An officer writes that the principal improvements to be carried out are as follows: 49.7 miles of second track in Ohio on improved line and grade, which will complete the continuous double-track between Kenova, W. Va., and Columbus, Ohio; 11.5 miles of second track between Wyoming, W. Va., and Devon, and 5.4 miles of second track between Vivian, W. Va., and Huger, including four tunnels. (Feb. 4, p. 280.)

Contracts were let February 4 for some of the second-track work in Ohio and West Virginia, also on 3.2 miles of the Indian Creek branch as follows: D. W. Flickwir, Roanoke, Va., 3.2 miles of branch line on Indian creek above Cedar Bluff, including tunnel; J. R. Serpell & Son, Louisville, Ky., three miles of double-track, including tunnels, east of Huger, W. Va.; Luck Construction Co., Roanoke, Va., three miles of double-track west of Wyoming, W. Va.; Carpenter & Boxley, Roanoke, Va., 3.5 miles double-track, west of Wharncliffe, W. Va.; Moorman Bros. Co., Lynchburg, Va., 3.5 miles double-track, east of Devon, W. Va.; The Ryan Co., Lexington, N. C., 11 miles double-track in Ohio, west of Davis; E. G. Nave Bros. Co., Portsmouth, Ohio, seven miles double-track, east of Piketon, Ohio; Sturm & Adams, Columbus, Ohio, six miles between Renick and Delano, Ohio. The rest of the second track work will be carried out by the company's forces.

Northern Pacific.—This company is said to be planning to build a number of lines in the Olympic peninsular, in the state of Washington. The Port Angeles & Olympia was surveyed about two years ago, and follows a water grade from Olympia north to Port Angeles. The Olympic Peninsular has been surveyed from Port Angeles west through the valley of the Soleduck river to a point near the Pacific coast, thence south to the Northern Pacific at Moclips, Wash. It is said right of way is now being secured for this line. The officers of both these companies and the Port Angeles Peninsular are said to be identified with the Northern Pacific.

Oklahoma Roads.—According to press reports from Chattanooga, Okla., J. H. Ransom is promoting a line from the southern terminus of the Chicago, Rock Island & Pacific branch line at Chattanooga, southwest to Davidson, about 30 miles. This is thought to be a project of the Rock Island. It is understood that a number of short branch lines are also to be built.

Olympic Peninsular.—See Northern Pacific.

Pittsburgh, Butler, Slippery Rock & Grove City (Electric).—Organized in Pennsylvania to build an electric line from Butler, Pa., to Slippery Rock, 20 miles. The directors include W. C. Thompson, J. A. Smith, Dr. W. C. McCandless, A. M. Reiber, of Butler, and J. C. Kerr, Slippery Rock. F. E. Barrett, Pittsburgh, is in charge of surveys.

Port Angeles & Olympia.—See Northern Pacific.

Port Angeles Peninsular.—See Northern Pacific.

Quanah & Gulf.—A contract is said to be let for building the first section of 12 miles to Medicine Mound, Tex. The projected route is from Quanah, Tex., south via Medicine Mound to Crowell, thence southeast via Seymour and Graham to Waco. Plans are under consideration to build the section south of Graham via Stephenville, Glen Rose and Cleburne to Waco. Address L. E. Walker, Quanah. (Sept. 17, p. 521.)

San Antonio, Gulf & Tampico.—Incorporation has been asked for by this company in Texas, with a capital of $90,000. The plans call for a line from San Antonio, Tex., southwesterly to a point in LaSalle county, about 90 miles. J. F. Edwards, of San Antonio and St. Louis, Mo., is the principal promoter. The incorporators include A. B. Hedden, Plainfield, N. J.; G. S. Simons, New York; H. M. Aubrey and A. L. Mattlock, of San Antonio.

San Diego, El Cajon & Escondido (Electric).—Surveys are said to be made and capital secured for an electric line from San Diego, Cal., north to Escondido, about 40 miles. Contracts for the work, it is understood, will be let about April 1. F. M. Fairchild, chief engineer, Oakland, Cal.

Santa Fe, Liberal & Englewood.—See Santa Fe, Raton & Eastern under Railway Financial News.

Santa Fe, Raton & Des Moines.—See Santa Fe, Raton & Eastern under Railway Financial News.

Santa Fe, Raton & Eastern.—See this company under Railway Financial News.

Scranton, Dunmore & Moosic Lake.—See American Railways under Railway Financial News.

Southern Pacific.—The San Joaquin division has been extended from Mabel, Cal., northward to Haiwee, 13 miles.

Union Pacific.—According to press reports this company will carry out improvements to secure a shorter route from Denver, Colo., east to Fort Morgan. This is to be accomplished by building a new line, which will reduce the distance over the present route by about 25 miles. (Sept. 17, p. 521.)

Utah Roads (Electric).—Application has been made for a charter by Jesse Knight to build from Salt Lake City, Utah, south about 50 miles to Provo. Application has also been made by another company represented by A. J. Evans, S. L. Chipman and others for permission to start work at once, over the same route, on a line to cost about $3,000,000.

Virginian.—A new line has been opened for business on the Winding Gulf branch, from Loop Junction, W. Va., to Pemberton, six miles. (Aug. 6, p. 259.)

Westchester & Northern.—Incorporated in New York with $1,000,000 capital to operate a steam or electric railway from a connection with the New York, Westchester & Boston, at White Plains, N. Y., to Danbury, Conn., 45 miles, of which 35 miles are to be in the state of New York, and 10 miles in Connecticut. There is also to be a branch from Pound Ridge, Westchester county, to the line of the New Haven, in Putnam county, 14 miles. Robert T. Bird of Hartford, Conn., is a director.

Railway Financial News.

American Railways (Electric).—This company has taken a perpetual lease of the Scranton, Dunmore & Moosic Lake, a steam road running from Scranton, Pa., northeast 10 miles. The American Railways Co. proposes to electrify the road and operate it in connection with the Scranton railways.

Arizona & Colorado.—See Arizona Eastern.

Arizona Eastern.—The property, equipment and franchises of the Maricopa & Phoenix, the Gila Valley, Globe & Northern, the Arizona & Colorado, the Arizona Eastern and the Arizona Eastern of New Mexico have been consolidated under the name of the Arizona Eastern Railroad, and all business for these roads will hereafter be transacted by the Arizona Eastern Railroad. All officers and employees of the companies which have been absorbed will continue in like capacity with the Arizona Eastern Railroad.

Arizona Eastern of New Mexico.—See Arizona Eastern.

Boston & Maine.—See Boston Railroad Holding Co.

Boston Railroad Holding Co.—It is understood that the company has bought sufficient additional Boston & Maine stock to give it a majority of the $31,991,490 outstanding common and preferred stock.

Buffalo, Rochester & Pittsburgh.—The New York Up-State Public Service Commission has given the Buffalo, Rochester & Pittsburgh permission to sell $1,277,000 additional consolidated mortgage 4½ per cent. bonds. This will make $6,012,000 of these bonds outstanding. Of the new bonds $500,000 have been sold and the remainder will be sold from time to time, the proceeds to be used for improvements.

Chicago, Burlington & Quincy.—Howard Elliott, president of the Northern Pacific, has been elected a director, succeeding Daniel Willard, resigned.

Chicago City Railway.—The directors have declared a regular quarterly dividend of 1½ per cent. on the $18,000,000 stock and an extra (annual) dividend of 4 per cent., payable March 2. This extra dividend of 4 per cent. compares with an extra dividend of 3 per cent. paid a year ago.

Detroit, Toledo & Ironton.—H. B. Hollins & Co., New York, have sold their holdings of about $1,700,000 5 per cent. notes of the D., T. & I. to the D., T. & I. noteholders' protective committee. The notes are secured by the deposit of a controlling share of the stock of the Ann Arbor, and in addition by the deposit of $5,000,000 consolidated bonds of the Detroit, Toledo & Ironton. It is understood that this purchase will give the noteholders' committee sufficient influence to increase its representation on the board of directors of the Ann Arbor, and it appears to open the way for a reorganization of the Detroit, Toledo & Ironton.

Galveston, Harrisburg & San Antonio.—In the suit brought by Thomas H. Hubbard and the Crocker estate to foreclose $6,354,000 Western division second mortgage income bonds, the court has held that the lease of the G., H. & S. A. by the Southern Pacific is *ultra vires* of the G. H. & S. A. charter, and that therefore the Southern Pacific cannot be held responsible for the interest on the income bonds. The Southern Pacific does not depend on the lease for control, since it owns $27,056,600 of the $27,084,372 outstanding stock of the G., H. & S. A.

Gila Valley, Globe & Northern.—See Arizona Eastern.

Hudson & Manhattan.—The Hudson Companies have sold through Harvey Fisk & Sons to a syndicate including J. P. Morgan & Co. $5,500,000 5 per cent. three-year notes, secured by the deposit of Hudson & Manhattan bonds, at the rate of $1,500,000 bonds for every $1,000 notes. There are outstanding $3,554,500 6 per cent. notes of the Hudson Companies which mature in 1910.

Louisiana & Arkansas.—The interest coupons due March 1 will be paid at the Standard Trust Co. offices, New York. The former fiscal agents of the company were Fisk & Robinson. (Feb. 4, p. 2821.)

Maricopa & Phoenix.—See Arizona Eastern.

New Orleans Great Northern.—The interest coupons due February 1 were paid at the Knickerbocker Trust Co. offices, New York. Heretofore these interest payments were made at the offices of Fisk & Robinson. (Feb. 4, p. 2821.)

Pittsburgh, Westmoreland & Somerset.—There was sold at auction at New York $353,700 par value of stock, which constitutes a majority of the total stock, for $1,200. The road runs from Ligonier, Pa., to Somerset, 25 miles.

Santa Fe, Liberal & Englewood.—See Santa Fe, Raton & Eastern.

Santa Fe, Raton & Des Moines.—See Santa Fe, Raton & Eastern.

Santa Fe, Raton & Eastern.—The reorganization plan of the Yankee Fuel Co., which has been affiliated with the Santa Fe, Raton & Eastern, the Santa Fe, Raton & Des Moines and the Santa Fe, Liberal & Englewood, contains the following information and recommendations in regard to the railway companies:

The Yankee Fuel Co. and the Santa Fe, Raton & Eastern can be put in operation by an expenditure of from $200,000 to $500,000, and although the price of coal in this district is low, the properties could be operated at profit. The Santa Fe, Raton & Des Moines and the Santa Fe, Liberal & Englewood should be abandoned, with the possible exception of that portion of the S. F., R. & D. M. between Carisbrook and Cunningham.

The Santa Fe, Raton & Eastern is a short road now built from Raton east to the Yankee mine, about nine miles, and has almost no other traffic than that furnished by carrying coal from the mine to a connection with the Atchison, Topeka & Santa Fe at Raton. It is said that there has been actually spent on the property $203,800.

The Santa Fe, Raton & Des Moines is a road partly under construction, running from Carisbrook southeasterly to the Colorado & Southern at Des Moines, 39 miles. It is reported that $569,715 has been actually spent on the property and eight miles of track has been laid, while the roadbed has been graded for the entire distance. The road is paralleled for 30 miles by the St. Louis, Rocky Mountain & Pacific, so that by building nine miles from Carisbrook to a connection with the St. Louis, Rocky Mountain & Pacific all need for the remainder of the line would be obviated.

The Santa Fe, Liberal & Englewood has a line projected eastward from Des Moines through Liberal to Englewood, Kan., thence southeasterly to Woodward, Okla., 310 miles. There has been actually expended, it is said, $171,175. Fifteen miles of roadbed has been graded and one mile of track laid near Woodward.

Savannah, Augusta & Northern.—It is said that this property is to be sold on March 15 to satisfy a claim of about $300,000 by William J. Oliver, the contractor.

Scranton, Dunmore & Moosic Lake.—See American Railways.

Southern Pacific.—Stockholders are to vote April 6 on the question of making a mortgage for $50,000,000 to cover the franchises and property now owned or hereafter acquired in the city and county of San Francisco, Cal. Officers of the company say that there is no intention of immediately issuing the bonds.

It is said that the company has sold its Wells, Fargo & Co. (express) stock, which amounted on June 30, 1909, to $1,530,000, but which since has increased to $4,590,000 through the 200 per cent. stock dividend. At present prices of the Wells, Fargo & Co. stock this sale would have brought the Southern Pacific about $8,000,000, but it is reported that the railway company received considerably more than this.

See also Galveston, Harrisburg & San Antonio.

The Congress of Ecuador has authorized the municipality of Guayaquil to construct a railway to connect the City of Guayaquil with some of the coast towns. A certain proportion of the internal revenue taxes of that municipality is to be used to pay the expenses of the survey and the cost of construction. The terminus of the railway has not yet been selected.

Supply Trade Section.

The Ewald Iron Co. has moved its main office and warehouses from St. Louis, Mo., to Louisville, Ky.

The Pilliod Company, with works at Swanton, Ohio, has opened an office at 30 Church street, New York, where R. H. Weatherly, president, will make his headquarters.

The Midvale Steel Co., Philadelphia, Pa., has let the contract to the Riter-Conley Mfg. Co., Pittsburgh, Pa., for a one-story, 66-ft. x 135-ft., steel frame addition to its plant on Wissahickon avenue. The estimated cost of the work is $20,000.

D. A. Bonitz, formerly railway representative of Philip Carey & Co., Cincinnati, Ohio, has entered the supply trade under the firm name of D. A. Bonitz & Co. The company, which has established an office in the Fisher Building, Chicago, will deal in railway and mill supplies.

The Western Electric Company, New York, has adopted a new trade name for those types of telephones which have heretofore been known as Intercommunicating or Private Line Telephones. These are henceforth to be known as "Western Electric Inter-phones," and the word inter-phone is to be used to the exclusion of the old designations.

The Titan Steel Casting Company, Newark, N. J., has purchased the business of Benjamin Atha & Company and will continue to operate the plant as in the past, giving special attention to the production of cast steel bolsters, manganese steel railway motor gears and pinions and other car and locomotive castings. The following are the officers of the new company: Benjamin Atha, president; Louis A. Shepard, vice-president and general manager; Henry G. Atha, treasurer, and C. W. Owston, Jr., secretary.

Henry J. Bellman, secretary of the American Hair Felt Co., New York, and manager of hair felt sales for the H. W. Johns-Manville Co., New York, died suddenly on Sunday night, February 6, at his home in New York. Mr. Bellman was born in Pennsylvania about forty-one years ago. He first entered the hair felt trade in Sharpsburg, Pa. From 1900 to 1909 he was manager of the railway department of the American Hair Felt Co. He was a Mason, a member of several clubs and widely known among the railway men and car builders.

Frank A. Foster, mechanical engineer, 25 Kenyon street, Providence, R. I., a graduate of the Worcester Polytechnic Institute and at the present time in the employ of the American Locomotive Co., expects to leave, about March 1, for China to accept a position in which he will have considerable to do with machinery and the mechanical departments of railways. He is desirous of obtaining catalogues and general information concerning American machinery and manufactures. Mr. Foster expects to sail from Seattle, Wash., March 22. His address in China will be Davenport Road, Tientsin, care Albert C. Lee.

Lee Higginson & Co., Boston, Mass., the Royal Securities Corporation, Ltd., Montreal, and the Dominion Securities Corporation, Ltd., Toronto, are offering $2,350,000 first mortgage 6 per cent. bonds of 1909-1939 of the Canadian Car & Foundry, at 102½, yielding 5.80 per cent. The total amount of bonds outstanding, including those now offered, is $3,500,000, and there is reserved for future capital expenditures at 75 per cent. of cost thereof, $4,000,000, making a total authorized issue of $7,500,000. The bonds are secured by a first mortgage on the properties, estimated to have a replacement value of over $7,500,000. President Curry estimates that of the total capacity of car building companies in Canada the Canadian Car & Foundry Company's plant comprises more than 85 per cent.

The Merchants' Steel & Supply Co., Chicago, has been organized with a capital stock of $100,000. The company will buy and sell scrap iron and steel, new and relaying rails, cars and locomotives and railway supplies and equipment. Headquarters have been established in the Marquette Building, and a yard capable of handling large quantities of material with all modern equipment will be established in Chicago. The officers of the company are: W. K. Kenly, president and treasurer; W. T. Twomey, vice-president and general manager; L. W. Parker, secretary. The directors are: W. H. McDoel, ex-president of the Monon railway, chairman of the board; F. Fisher, vice-president Massillon Bridge Co., Massillon, Ohio; E. M. Allen, vice-president American Refractories Co., Chicago, and Messrs. Kenly and Twomey.

A number of manufacturers of railway supplies whose shops are situated in the district in Chicago represented in Congress by James R. Mann, chairman of the House committee on interstate commerce, are circulating a petition asking Mr. Mann to use his influence to stop the agitation in Congress for drastic legislation affecting railways. Mr. Mann himself has introduced some of the most radical measures pending in the house. The petition says: * * * Without questioning the merits or demerits of the railway legislation proposed by you, or others, we believe that no harm can be done by limiting much of the proposed railway legislation and giving the railways opportunity to work out or demonstrate their intention of carrying out railway legislation already in effect. We have suffered greatly in our business during the last two years, largely on account of the poor financial condition of railways. The chief promoters of the petition are the following: "American Steel Foundries, American Brake-Shoe & Foundry Company, Blue Island Rolling Mill & Car Company, By-Products Coke Corporation, Dearborn Drug & Chemical Works, Federal Furnace Company, Featherstone Foundry & Machine Company, Griffin Wheel Company, Iroquois Iron Company, Pickards, Brown & Co., Rogers, Brown & Co., Railway Steel Spring Company, Sherwin, Williams & Co., Willard, Sons & Bell Company."

At the annual meeting of the board of directors of the Standard Coupler Company, New York, Edmund H. Walker was elected a vice-president. Mr. Walker entered the service of the company in February, 1905, as assistant to President George A. Post. Subsequently he was made general sales manager and now becomes vice-president. He is widely and favorably known in railway and supply circles, and this announcement of his promotion will be read with interest and pleasure by all who know him. Prior to his connection with the Standard Coupler Company, Mr. Walker had 16 years' experience in railway service on the Great Northern; Atchison, Topeka & Santa Fe; Chicago, Burlington & Quincy; Minneapolis, St. Paul & Sault Ste. Marie, and Bismark, Washburn & Great Falls Railways in the operating, traffic, accounting and construction departments.



E. H. Walker.

TRADE PUBLICATIONS.

Steel Truck Side Frame.—The McConway & Torley Co., Pittsburg, Pa., has just issued a pamphlet descriptive of the Buhoup steel truck side frame.

Great Northern.—A pamphlet has been prepared to advertise the homesteads to be opened to settlers March 1, 1910, in the Rocky Boy Indian lands in northeastern Montana.

Pocket Voltmeter.—The Electric Storage Battery Co., Philadelphia, Pa., has just issued bulletin No. 119, which describes its low reading pocket voltmeter, designed especially for battery testing.

Vanadium Metals in Railway Service.—The Vanadium Metals Co., Pittsburg, Pa., has just issued a small booklet containing general information and tabulated data regarding the use of Vanadium metals in railway service.

Goheen Mfg. Co.—The Goheen Mfg. Co., Canton, Ohio, has published a booklet containing 14 views of steel structures protected by its carbonizing coating. The views include railway bridges, elevated structures, roundhouses and mining and smelting plants.

Leach Sanders.—The American Locomotive Sander Co., Philadelphia, Pa., has just issued a catalogue showing the various styles of Leach sanders, of which this company has been sole owner for more than 10 years. These catalogues will be sent to anyone interested upon receipt of a request.

Exhaust Fans.—The American Blower Co., Detroit, Mich., in bulletin No. 271 describes the "A B C" cast-iron exhaust fans, type V, and in bulletin No. 272 the Dixie exhaust fan. These bulletins contain both half-tone and line illustrations of these fans, along with general information and data regarding their speed, capacity and horse-power.

Motors, Generators, Telephones, Etc.—The Western Electric Co., New York, in bulletin No. 5131 describes its type "IL" motors and generators; in bulletin 5230, its polyphase induction motors; in bulletin 1001, its magneto non-multiple switchboards with self-restored line signals; in bulletin 1002, its magneto non-multiple switchboards with manually restored line signals; in bulletin 1105, its selection, installation and wiring of intercommunicating telephone systems. All of the foregoing bulletins are the Western Electric Co.'s standard 8-in. x 11-in. size, printed on heavy glazed paper and containing a large number of half tone and line illustrations, with very complete descriptions of the equipment. The following smaller sized booklets and post card folders have also been issued: Bulletin 1153 on the manufacture of lead-covered cable and booklet 1106 on automatic intercommunicating telephones for business and residence service. Another small booklet contains a detailed description of Hawthorn arc lamps, both carbon and flaming, and another describes No. 1317 type magneto telephone sets.

RAILWAY STRUCTURES.

Barstow, Cal.—The Atchison, Topeka & Santa Fe has prepared plans for a concrete passenger station of the Mission type, which it is estimated will cost $250,000. Mention was made of this work in last week's issue under the heading, Barstow, N. Mex.

Bath, N. Y.—An officer of the Delaware, Lackawanna & Western is quoted as saying that the company will put up a new brick passenger station in Bath, to cost between $20,000 and $35,000.

Beach Grove, Ind.—The Cleveland, Cincinnati, Chicago & St. Louis is to spend $1,000,000 for car shops, in addition to the new locomotive shops, at Beach Grove, near Indianapolis.

Bradford, Pa.—The Buffalo, Rochester & Pittsburgh has let the contract to Allis-Chalmers, Milwaukee, Wis., for a tie treating plant.

Evansville, Ind.—The Evansville & Terre Haute expects to build coal docks on the Ohio river between Wabash and Twelfth avenues. Plans are not yet completed.

Ft. William, Ont.—A consular report says that the excavation work, piling and concrete footings have been finished for the union station being built jointly by the Canadian Pacific and the Grand Trunk Pacific. The building will have a frontage of 272 ft. and is to be partly three stories high. It is to cost about $100,000. (Oct. 29, p. 832.)

Galveston, Tex.—The Chicago, Rock Island & Pacific expects to begin work during the coming year on new docks. At least two piers will be built on the tide lands which the company now owns.

Goldfield, Nev.—According to press reports, the Tonopah & Goldfield is securing land as a site for shop buildings and a new roundhouse to be built in Goldfield.

Hoisington, Kan.—See Kansas City, Kan.

Jefferson, Ohio.—It is said that the Lake Shore & Michigan Southern will build a 170-ft. bridge.

Kansas City, Kan.—The Missouri Pacific has filed a statement of the proposed expenditures for the coming year, which includes: $266,000 for a bridge over the Kaw river, $36,000 for a new passenger station and $435,000 for yards and shops at Hoisington, Kan.

Kansas City, Mo.—The Chicago Great Western has completed arrangements to enter the proposed union depot. By the terms of the agreement the company will bear one-twelfth of the cost and own one-twelfth of the property. The Chicago Great Western is the last of the roads entering the city to join the project, so that it is now assured that all trains entering the city will use the new station.

Kearney, Neb.—The Union Pacific is to build a new four-track steel coaling station.

La Junta, Colo.—Press reports say the Atchison, Topeka & Santa Fe is planning to build a new freight house, coal chutes and possibly car repair shops.

Laredo, Tex.—According to press reports the National Railways of Mexico will let contracts soon, and start work within 60 days, on the new steel and reinforced concrete bridge over the Rio Grande river. (Oct. 8, p. 665.)

Liberal, Kan.—The Chicago, Rock Island & Pacific is to build a machine shop 40 ft. x 60 ft. and some additional yard tracks.

Los Angeles, Cal.—Application has been made by the Los Angeles Interurban railway to the United States Engineers for permission to build two trestle bridges over the Cerritos Slough north of Long Beach Harbor. The petition has met some opposition and the final action is still in doubt.

Montreal, Que.—Work is now under way on the St. Louis boulevard subway, to be 900 ft. long, and to have a roadway of 50 ft., with 10-ft. sidewalks, under the Canadian Pacific tracks, the roadway to carry double tracks for street railways. The roadway of the Canadian Pacific is 80 ft. wide and crosses the boulevard at an angle of about 35 deg. A steel superstructure will cover the entire width of the roadway. The estimated cost of the improvements is $200,000. (Nov. 26, p. 1041.)

According to press reports, the Canadian Northern is planning to open a passenger station in the up-town section of Montreal.

New Richmond, Wis.—See Minneapolis, St. Paul & Sault Ste. Marie.

Norfolk, Va.—An agreement has been entered into between the Norfolk & Western and the Norfolk & Southern for the construction of a union passenger station and an eight-story office building, to be used jointly by these companies and the Virginian Railway. The structure is to be put up on property already owned by the Virginian. (July 16, p. 129.)

Pueblo, Colo.—The Atchison, Topeka & Santa Fe plans to abolish the Union avenue crossing and increase its facilities for handling freight.

Rutland, Vt.—Plans, it is said, are being made by the Rutland Railroad to put up a new boiler shop. The cost of the improvement, with the necessary equipment, will be about $60,000.

Sapulpa, Okla.—The St. Louis & San Francisco has completed plans for a 500-ft. car repair shed. Work is now under way on new freight transfer sheds.

Scottsburg, Ind.—The Indianapolis & Louisville has let the contract for a new freight and passenger station at the junction with the proposed Cincinnati, Madison & Western traction line. The building will be two stories high and will contain the offices of both companies.

Wallace, Idaho.—The Northern Pacific is to build a new roundhouse to replace the one destroyed by fire last fall.

Walla Walla, Wash.—The Northern Pacific, according to local press reports, is planning for a new passenger station of pressed brick.

Watertown, S. Dak.—The Minneapolis & St. Louis is to build a new passenger station, estimated to cost $165,000.

Weldon, N. C.—According to press reports the Atlantic Coast Line will build a new freight house in Weldon. The structure is to be of brick construction with granite trimmings.

Late News.

The items in this column were received after the classified departments were closed.

The Grand Rapids Electric has ordered 12 city street cars from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific freight car inquiry includes 825 steel underframe, forty-ton box cars.

The Idaho & Washington Northern is said to have ordered 100 flat and 100 box cars. This item is not confirmed.

The Chicago Great Western has ordered 10 combination cars from the Pullman Company and 200 refrigerator cars from the American Car & Foundry Co.

The Grand Trunk five Pacific locomotives, specifications for which were given in the *Railway Age Gazette* of December 17, were ordered from the Baldwin Locomotive Works.

The National Railways of Mexico and their American enginemen and conductors have reached a satisfactory settlement in the differences which recently threatened a strike.

Surveys are said to be made by the Lake Shore & Michigan Southern for a new route to secure minimum grades from Ashtabula Harbor, Ohio, south to Carson, about five miles.

The Denver, Laramie & Northwestern, reported in the *Railway Age Gazette* of February 4 as being in the market for freight equipment, is said to have ordered a number of box cars from the American Car & Foundry Co.

A. D. Parker, vice-president of the Colorado & Southern at Denver, Colo., has been elected also president and director of the Colorado Midland and president of the Colorado Springs & Cripple Creek District, with office at Denver.

Surveys are shortly to be started for a line from Beeville, Tex., or Kennedy west via Oakville and Cotulla. It is expected to have construction work under way by September. Lee Frisby, of Austin, represents a syndicate which will build the line.

It is said that the reorganization plan of the Wheeling & Lake Erie and the Wabash-Pittsburgh Terminal, recently under consideration by the bankers interested in these properties, has been abandoned because of legal difficulties. (Jan. 14, page 118.)

The Great Lakes Connecting is to be built in the western part of Pennsylvania as an independent freight and passenger line. The projected route is from Ellwood City, Pa., northeast to Raymilton, 42 miles. The line will form a connecting link between several trunk lines.

The directors of the Peoria & Eastern have declared an annual dividend of 4 per cent., payable April 1, on the outstanding $4,000,000 4 per cent. non-cumulative income bonds. The full 4 per cent. was paid on these bonds from 1902-1908, inclusive, but no interest was paid in 1909.

Plans have been filed for a new car depot to be built by the Interborough Rapid Transit (New York) at the northeast corner of Spuyten Duyvil road and Two Hundred and Forty-second street. The building will be two stories high, 530 ft. long, 89 ft. wide, and is to cost $100,000.

It is understood that all the large railways entering Portland, Ore., Seattle, Wash., and Tacoma, will in the near future be extended to Vancouver, B. C., and that the Canadian Pacific and probably three of the larger Canadian roads will extend south from Vancouver, B. C., into Seattle and Tacoma and possibly to Portland.

By a vote of 3,007 to 91, switchmen, members of the Brotherhood of Railroad Trainmen, voted late on February 9 to strike. The switchmen are employed on 18 railways entering Chicago, and it is estimated that the strike will affect about 4,000 men. The vote to strike followed the refusal of the railways to grant an increase of five cents per hour in wages of switchmen.

The U. S. Court at Trenton, N. J., has issued an order for a foreclosure sale of the Camden & Trenton Railway property. The date for the sale will be fixed in the next few days by the master. This action is favorable to the reorganization plan agreed to by the first and general mortgage bondholders' committee.

Application has been made in Rhode Island for a charter by the Southern New England Railway Co., which is to be a new branch of the Grand Trunk. The plans call for a line from Palmer, Mass., to which point the Grand Trunk now has a connection through Rhode Island, connecting Woonsocket, Valley Falls and Pawtucket with Providence, reaching tidewater at the Providence river. It is understood that the cost of the work in Rhode Island will be $5,000,000.

The Louisville & Nashville is said to have given a contract to the Callahan Construction Co., of Knoxville, Tenn., to build an extension of 25 miles under the name of the Wasioto & Black Mountain. The projected route is from Pineville, Ky., through Bell and Harlan counties, to Harlan. It is said the contract is worth over $500,000, and includes piercing a 600-ft. tunnel. It is expected to have the work finished in about seven months. (See Wasioto & Black Mountain, Dec. 17, p. 1214.)

Charles H. Phillips, district freight and passenger agent of the El Paso & Southwestern and the Morenci Southern at Los Angeles, Cal., has been appointed a general agent, with office at Los Angeles. F. B. Winship has been appointed a general agent, with office at San Francisco, Cal., succeeding G. F. Herr, general agent Pacific coast, resigned to accept service elsewhere. O. S. Huntington, contracting agent at San Francisco, has been appointed traveling freight and passenger agent, with office at San Francisco.

The Central Idaho has been incorporated in Idaho and expects to have 220 miles finished by the end of 1911. The proposed route is from Owinza, Lincoln county, Idaho, on the main line of the Oregon Short Line northwesterly through Lincoln, Elmore and Ada counties to Boise, and to a connection with the Payette Valley, at New Plymouth, in Canyon county. The line is to be built by the Oregon Short Line to eliminate the heavy grades on the Glens ferry section of the present line, and to put Boise on the main line.

The Chicago, Burlington & Quincy, it is said, will at once start 20 construction crews at work on the Creston division. The work to be carried out includes the completion of the double-tracking from Red Oak, Iowa, west to Balfour. This is the only section between Chicago and Pacific junction at present without double tracks. Work is under way on another section of the road putting up a bridge near Conway. A large number of bridges are also to be built to replace the present wooden bridges with steel and cement structures.

The Boise & Western has applied for permission to build through government lands in Oregon, along the Malheur river, to the eastern part of Harney county, and it is expected that surveys through the Malheur canyon into Harney valley will be filed shortly. The line follows the route of the Oregon Eastern, a Harriman line, for a considerable distance, and crosses it at several points. The officers are: Col. C. E. Wood, president; J. McI. Wood, secretary; William Hanley, of Burns; C. W. Mallett, J. W. McCulloch, Ontario, Ore., and D. C. O'Reilly, Portland, are directors.

The annual report of the Department of Railways and Canals of Canada for the fiscal year April 1, 1908, to March 31, 1909, which has just been issued, says that out of the total of 915 miles, which constitute the prairie section of the Grand Trunk Pacific, 861 miles are graded and bridged and the track has been laid on 697 miles, of which 92 miles have been fully ballasted, 90 miles have had two lifts of ballast put under it, and 414 miles have received one lift of ballast, leaving 101 miles of skeleton track. The total expenditure on this section up to March 31, 1909, for material and work was $25,814,378, and the net interest on bonds was $1,099,557. The estimated cost of the prairie section, including interest on bonds, is placed at $33,007,449. The expenditure on the mountain section up to March 31, 1909, amounted to $3,768,826. The total estimated cost of the mountain section is $67,056,000.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Central Railroad of New Jersey has ordered 10 ten-wheel locomotives from the Baldwin Locomotive Co.

The Ft. Worth Belt Railway has ordered one six-wheel switching locomotive from the American Locomotive Co.

The Denver, North Western & Pacific is said to have ordered 20 locomotives from the American Locomotive Co. This item is not confirmed.

The Mississippi River & Bonne Terre has ordered two consolidation freight locomotives from the American Locomotive Co. Delivery is specified for May, 1910.

The New York, Ontario & Western, reported in the *Railway Age Gazette* of February 4 as being in the market for six locomotives, has ordered this equipment from the American Locomotive Co.

The Groveton, Lufkin & Northern has ordered, from the American Locomotive Co., one 4-6-0 locomotive for May delivery. The engine will have cylinders 18 in. x 26 in. and a total weight of 130,000 lbs.

The Chicago, Rock Island & Pacific, reported in the *Railway Age Gazette* of January 28 as being in the market for 25 Pacific and 50 consolidation locomotives, has ordered this equipment from the American Locomotive Co.

The Norfolk & Western, reported in the *Railway Age Gazette* of January 28 as figuring on locomotives for 1910 delivery, has ordered 40 freight locomotives from the Baldwin Locomotive Works, and 10 passenger locomotives from the American Locomotive Co.

The Chesapeake & Ohio, as reported in the *Railway Age Gazette* of February 4, has ordered two Shay locomotives from the Lima Locomotive & Machine Co. and one Mallet from the American Locomotive Co. The Mallet will be made to a design of the builders and the Shay locomotives will have the following dimensions and special equipment:

General Dimensions.

Weight on drivers	300,000 lbs.
Total weight	300,000 lbs.
Cylinders	Three; 17-in. x 18-in.
Diameter of drivers	46 in.
Type of boiler	Extended wagon top
Working steam pressure	200 lbs
Tubes, number	310
" outside diameter	2 in.
" length	13 ft. 6 in.
Firebox, type	Sloping crown
" length	114 in.
" width	61¼ in
Grate area	48.48 sq. ft.
Water capacity	8,000 gals.
Coal capacity	18,000 lbs.

Special Equipment

Bell ringer	Western
Boiler lagging	Franklin, magnesia
Brakes	Westinghouse No. 6 E. T.
Headlight	16 in., C. & O. standard
Injector	Hancock, No. 10
Piston and valve rod packings	Jerome
Safety valve	Phillips
Sanding devices	Watters
Sight-feed lubricators	Nathan
Steam gages	Ashcroft
Tires	Latrobe
Tubes	Charcoal iron
Valve gear	Stevenson
Wheel centers	Cast steel

CAR BUILDING.

The Western Maryland is in the market for 500 to 1,500 freight cars.

The Boston & Maine is said to be in the market for 100 passenger cars. This item is not confirmed.

The Detroit United Railway, reported in the *Railway Age Gazette* of January 28 as being in the market for 100 cars, is now reported to be figuring on 75 pay-as-you-enter and 17 interurban cars. This item is not confirmed.

The Central of New Jersey has ordered the 10 open platform coaches, one vestibule combination car and four vestibule coaches, reported in the *Railway Age Gazette* of December 3, from the Harlan & Hollingsworth Corporation.

The Chicago, Rock Island & Pacific is in the market for 70 passenger cars of various types. Coaches, combination, baggage, postal and dining cars are included in the inquiry. The company is also in the market for 1,600 freight cars, including box, refrigerator, automobile and cabooses.

The Norfolk & Western, reported in the *Railway Age Gazette* of January 7, in an unconfirmed item, as being in the market for 3,000 freight cars, advises that it has ordered 500 gondolas and 1,500 hopper cars from the Western Steel Co., and 500 stock and 500 coke cars from the American Car & Foundry Co.

The Boston & Maine, as reported in the *Railway Age Gazette* of February 4, has ordered 2,000 steel underframe, 30-ton box cars from the Laconia Car Co. These cars will weigh 37,000 lbs. and will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. 2 in. high, inside measurements, and 40 ft. 2¼ in. long, 9 ft. 5 in. wide and 14 ft. high, over all. The special equipment includes the following:

Bolsters, body	Pressed steel
Bolsters, truck	Cast steel
Brakes	Westinghouse
Brake-beams	6-in. I-section
Brake shoes	Steel back, Am. Brake-Shoe & Fdy. Co.
Brasses	M. C. B. standard, 4¼-in. x 8-in
Couplers	Gould on 1,500 cars; Simplex on 500 cars
Doors	Side
Door fixtures	Camel Co.'s Security No. 5
Draft gear	Miner
Dust guards	Wood
Journal boxes	Gould on 1,000; Symington on 1,000
Paint	B. & M. standard
Roofs	Chicago-Cleveland, Winslow Improved
Side bearings	B. & M. standard
Springs	O. H. steel, Railway Steel-Spring Co
Trucks	Arch bar
Wheels	33-in. chilled

The Intercolonial, as reported in the *Railway Age Gazette* of December 24, has ordered five first-class day coaches from the Preston Car & Coach Co. These cars will have a seating capacity for 78 passengers and will weigh about 105,000 lbs. They will be 71 ft. 1½ in. long, 8 ft. 9 in. wide and 7 ft. 7¾ in. high, inside measurements, and 79 ft. 10¼ in. long, 10 ft. 2 in. wide and 10 ft. 2 in. high, over all. The bodies and underframes will be of wood. The special equipment includes:

Bolsters, body	Cast steel double
Brakes	Westinghouse
Brake beams	Simplex
Brake shoes	Steel back
Brasses	M. C. B., I. R. C. standard
Couplers	Janney; McConway & Torley
Curtain fixtures	National Lock Washer Co.
Curtain material	Pantasote
Draft gear	Miner tandem
Heating system	Safety Car Htg. and Ltg. Co.
Journal boxes	McCord
Lighting system	Safety Car Htg. and Ltg. Co.
Platforms	Standard Coupler Co.
Roofs	Canvas
Side bearings	Chicago Ry. Equipment Co.
Springs	Montreal Steel Works
Vestibules	Pullman (wide)
Vestibule diaphragms	Ajax
Vestibule trap doors	Dayton
Window fixtures	National Lock Washer Co.

MACHINERY AND TOOLS.

The Great Northern has issued a list of 149 tools.

The Bethlehem Steel Co. is in the market for a large list of machine tools, including some heavy machines.

The Upson Nut Co., Cleveland, Ohio, has ordered from the Wellman-Seaver-Morgan Co., Cleveland, Ohio, 11 Hughes gas producers for its proposed steel plant.

The West Penn Railways Co. has ordered from the Westinghouse Electric & Manufacturing Co. two 12,000-h.p. steam turbines, two 200-h.p. turbines and 18 sets of 300-h.p. railway motors.

The Pressed Steel Car Co. has ordered from Jos. T. Ryerson & Sons, Chicago, a number of heavy multiple punches for steel underframe work. The machines are to be motor-driven and will weigh 200,000 lbs.

The Merchants' Despatch Transportation Co., East Rochester, N. Y., has ordered from Jos. T. Ryerson & Sons, Chicago, hydraulic and pneumatic machines, punches, shears, saws, pumps, etc., to equip its new car plant.

The Republic Iron & Steel Co. has ordered from the Wm. Tod Co., Youngstown, Ohio, a twin tandem compound engine, cylinders, 44 in. and 76 in. x 60 in. The engine is designed for the company's new blooming mill at Lansingville, Ohio.

IRON AND STEEL.

The Pennsylvania has ordered 200 tons of bridge steel from the American Bridge Co.

The Kansas City Southern has ordered, from the Lackawanna Bridge Co., 600 tons of bridge steel.

The Idaho & Washington Northern has ordered from the Pennsylvania Steel Co. 950 tons of bridge steel for the Pend d'Oreille bridge.

The Harriman Lines have ordered 16,000 tons of rails from the Tennessee Coal, Iron & Railroad Co. and 32,000 tons from the Illinois Steel Co.

The New York, New Haven & Hartford is in the market for 2,000 tons of structural steel for stations and track elevation work at Worcester, Mass.

The Philadelphia & Reading has ordered 200 tons of structural steel from the Jones & Laughlin Steel Co. for stations at Tioga, Pa., and Nicetown.

The Spokane & Inland Empire has ordered 200 tons of bridge steel from the American Bridge Co. and 5,000 tons of rails from the Carnegie Steel Co.

The Baltimore & Ohio has ordered 25,100 tons of rails from the Maryland Steel Co., 24,850 tons from the Carnegie Steel Co., 21,700 tons from the Illinois Steel Co., and 7,150 tons from the Bethlehem Steel Co.

General Conditions in Steel.—There seems every reason to think that the steel business will show favorable returns for the first quarter of the present year. The earnings of the corporation will probably show an increase. Although January was generally a poor month and February has but 28 days, there seems reason to believe that the March returns will reach $15,000,000. In 1907 the March earnings were $14,137,000 and in 1906 $13,819,000. Structural steel and rails have been bought in some good quantities during the past two weeks.

SIGNALING.

The Union Pacific is installing automatic block signals on its line between Topeka, Kan., and Salina, a distance of 118 miles. About 50 per cent. of the material required for this construction has been received, and about 8 per cent. of the work has been done.

The Chicago & North Western has awarded to the General Railway Signal Co. the contract for the interlocking signals to be installed at the new terminal passenger station of that road in Chicago. The interlocking will be "all-electric." There will be five cabins with an aggregate of 530 working levers.

The Chicago & North Western expects to install in the near future an 80-lever electric interlocking plant at Mayfair, Chicago. There will be electric locking in addition to detector bars on all main line tracks, and electric locking without detector bars on sidings. The plant will protect a crossing of the C., M. & St. P. and C. & N. W., and, in addition, a junction of the North Western's St. Paul line with the cut-off between Evanston and the Fortieth street yards.

The North Western will install with its own forces a mechanical interlocking plant at the junction of two and three main tracks at Willmette on the Evanston track elevation.

The North Western has just put in service a mechanical interlocking plant at Bluffs, Ill. This is a 28-lever Saxby & Farmer machine with 24 working levers. The plant protects the east junction of the Fulton cut-off. The work was done by the General Railway Signal Company.

The North Western has just put in service home and distant disk automatic normal-clear block-signals on the Lee county cut-off, 12 miles, double-track, between Nelson, Ill., and Nachusa, Ill. All signals are on bridges over the tracks, and the home and distant signals are on separate bridges. The work was done by the Hall Signal Company.

Woods' Center and Side Bearings.

Anti-friction center and side bearings, made by Edwin S. Woods & Co., Chicago, are shown herewith.

As the movement of the center plates is small, a 2½-in. diameter roller is required to turn through but about one-eighth of its circumference to accommodate the movement of the plates for a 70-ft. car on a 35-deg. curve. Sufficient rolling movement can therefore be obtained by using a flat-sided roller of from ¾-in. to 1 in. wide.

The center plate shown, Fig. 1 and 2, is said to be the result of a series of investigations of rollers under load, both above and below their elastic limits. The aim has been to

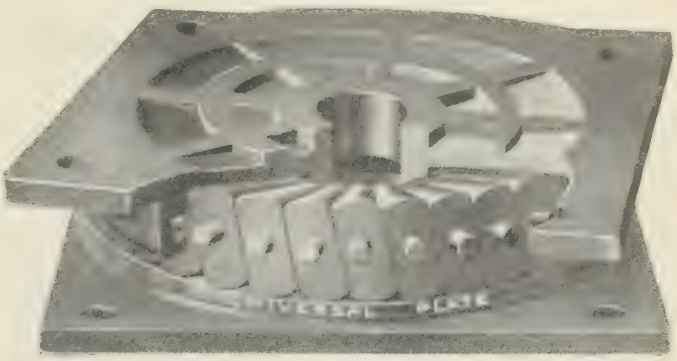


Fig. 1—Center Bearing with Universal Plate in Normal Position.

devise a plate wherein the stresses will always be below the limit of elasticity, which condition seems necessary in order to obtain longest possible life of the bearing.

The plate shown is 12 in. in diameter and carries 40 rollers, each 2½ in. high and 3½ in. long. If this same plate were filled with rollers of circular cross section, 2½ in. in diameter, it would hold but 14 rollers. Thus it seems very evident that by the use of flat-sided rollers the carrying capacity of the plate is greatly increased. It is also claimed that the end thrust of each roller, due to coning, is greatly reduced.

A plate about ½ in. thick is interposed between the rollers and the base plate. The top portion of this interposed plate slants to coincide with the cone of the rollers, while the bottom part is vertical to coincide with the top of the base pate. This universal plate, therefore, within reasonable limits of tilting of the truck bolster prevents any one or two of the rollers being subjected to the entire load. It is said that un-

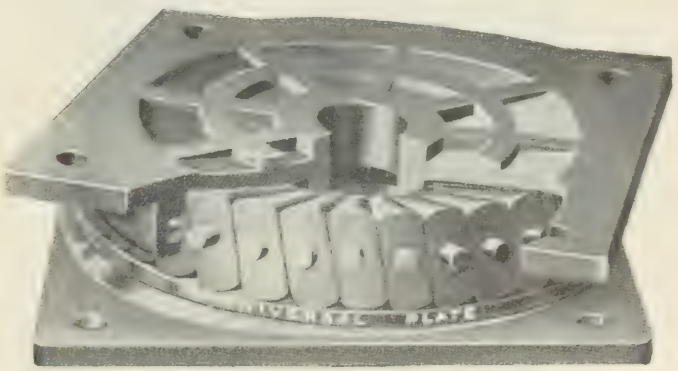


Fig. 2—Center Bearing with Universal Plate in Tilted Position.

der a load of 60,000 lbs. the bearing shown in the illustration develops a load per roller of 1,500 lbs. and an end thrust per roller of 625 lbs., while the load per inch diameter—inch length of roller is 240 lbs. The resistance to turning in this type of plate is substantially the same as any other thrust-bearing of the same general design which has full circular coned rollers, as the greater the cone of the rollers the more resistance the plate will develop in turning. It is said that a force applied 40 in. from the center of one of these plates requires about 230 lbs. to move a 40,000-lb. load. This is said to be about 85

per cent. less than would be required to move an ordinary friction type center plate of equal diameter.

In Fig. 3 is shown one of the newer types of Woods' side bearings, adapted to six-wheel passenger truck construction. The body bearing consists of three parts, a roller, a casing and a steel bar, the bar covering the open top of the casing through which the roller is introduced. The load is transmit-

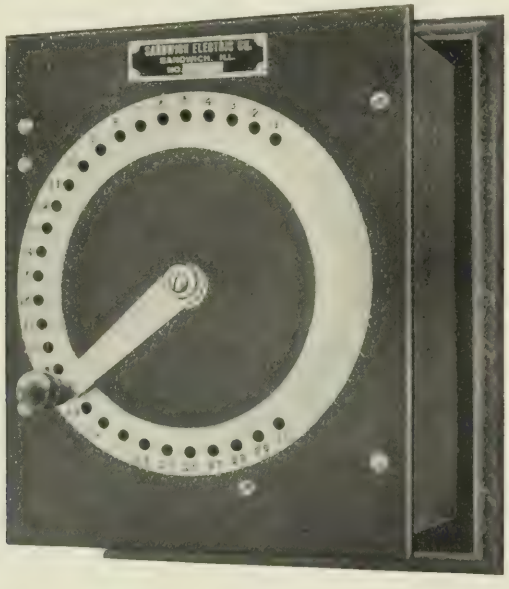


Fig. 3—Woods' Side Bearing for Passenger Trucks.

ted directly through the body of the roller, which centers in the casing by gravity when released from contact with the roller-bearing surface. This bearing is made in both single and double roller type.

The Sandwich Selector.

The Sandwich selector, used extensively on the Cleveland, Cincinnati, Chicago & St. Louis for calling way stations on telephone lines, is a "step-by-step" apparatus. This principle has been in use several years in automatic telephone systems but is comparatively new for telephone train despatching use. As adapted to this use it consists of a mechanism to send out a predetermined number of electrical impulses to the line. The automatic call box accomplishes this. The way station mechanism is designed to receive these impulses in a relay which steps up a notched sector one step for each impulse.



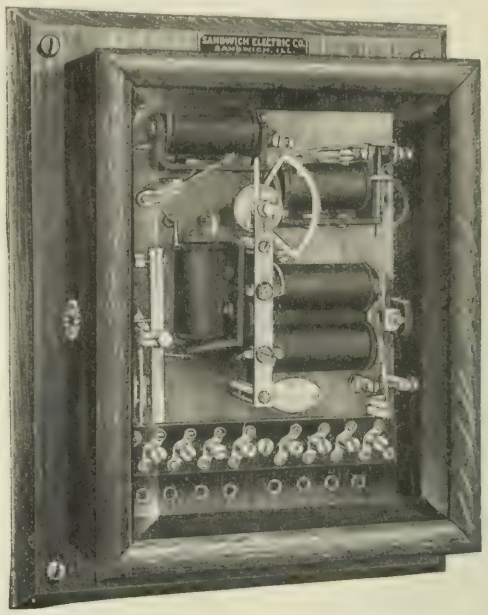
Sandwich Automatic Call Box.

Attached to the sector is a pointer which can be set to engage a contact spring after the sector has been stepped up the desired number of steps. Operating from this contact spring is a balance bar which consumes a definite amount of time before closing the vibrating bell circuit. This allows the selector to be stepped up to and past the number it is set for without ringing its bell. As the sector steps up it stops but a small fraction of a second on each notch while the step finger returns to engage the next tooth. This interval of time that the pointer is in contact with the contact spring is too short to allow the balance bar to fall over and ring the bell. Hence it is possible to step past without danger of a false ring.

To ring the bell it is only necessary to stop with the pointer in contact with the contact spring long enough to allow the balance bar to fall over. This rings the bell. Then the sector can be restored to normal, ready for another call.

The automatic call box which accomplishes this consists essentially of a notched wheel which engages a contact spring to send out to the line the current impulses. The front of the box has a dial with holes around the edge numbered to conform to the teeth on the notched wheel inside and which is rigidly fastened to the shelf. A simple mechanism allows the wheel to be rotated in one direction without sending any impulses and closes the circuit when the handle reaches a stop and is released. A spring, acting through gears, drives the mechanism, when released, at a constant speed, regulated by a governor.

The selectors at the way stations operate from a polar relay, current in one direction stepping up the sectors and a



Sandwich Selector—Receiving Instrument.

reversal of the current operating a release relay which trips the holding spring and sets the selector back to normal.

In calling a station, number 10 for example, the call box handle is placed in hole number 10 and the dial turned clockwise until it hits a stop. This operation sends out a release impulse that will set at normal any selector that may have been stepped up by any cause. Now, by releasing the handle and the spring, which has been wound up in turning the dial to the stop, the despatcher revolves the character wheel anti-clockwise and thereby sends out 10 impulses, the last or tenth impulse being prolonged—a dash. Then comes a reversal of current which sets the selectors to normal.

The 10 impulses to the line step up every selector on the line 10 steps, but the one at station 10 is the only one whose pointer is set to make contact at the tenth point, and because the tenth impulse is long it allows the balance bar at station 10 to fall over and ring the bell. To continue the ring, or in other words, to give a long ring, it is only necessary to hold the dial and allow the last impulse to continue. The selectors on the numbers between one and 10 are stepped up so fast that their bells get no chance to ring.

The call box sends the impulses at the rate of 20 in four seconds, so that on an average line where there are not more than 25 stations any call can be made in less than six seconds.

A later type is arranged without the polar relay. As soon as the impulses stop, the release relay automatically sets the sector back to normal, the step up relay taking current direct from the line. This minimizes the consumption of local battery, which in this case is used only to operate the bell.

The main features claimed for the Sandwich system are flexibility, simplicity and high speed.

This equipment as furnished to the C., C., C. & St. L. includes an adjustable arm telephone with head band receiver. There is also provided a cordless jack box, which is made in two styles. The despatcher has the breast transmitter and head band receiver.

The Sandwich apparatus is made by the Sandwich Electric Company, Sandwich, Ill.

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Every railway president, director or general manager who is not thoroughly up-to-date in his knowledge of apprenticeship systems in railway shops and other educational measures for railway employees should have on his desk a copy of the book on this subject by J. Shirley Eaton, which has just been issued by the government,* and which can be had, presumably, for the asking. Mr. Eaton has gathered everything on railway education that is worth putting into a book, and has arranged the matter in readable and convenient form. He has sound views on the philosophy of education, and so knows what to select; and he has had long experience in the railway service, so that he gives his work the right color. In some places his theories are elaborated too minutely for pleasant reading, and the practical railway officer will revolt—as he would if the president of the Idaho Northern or the New Mexico Central should engage the Broad Street Station at Philadelphia, with its 500 office rooms, as a place in which to carry on the management of his short railway. But Mr. Eaton's theories are sound, if they are a trifle too rich for the common appetite, and in one sense they are the most valuable part of his work, for they are much needed. What we mean is this: The pamphlet contains facts as to what has been done and theories of what ought to be done. The facts are pretty well known, and all that is needed is to bring them to mind with sufficient force and frequency. No one can deny the value of what has been done in, for instance, the mechanical department of the New York Central and of certain other large roads. But the education that is still waiting to be taken up, such as the training of station agents, telegraphers, track repair men, locomotive runners, trainmasters, and others is not sufficiently appreciated, and it is well to have its importance set forth in any way possible. Many railway officers have hardly given it a serious thought. A prophet in the wilderness, like Mr. Eaton, performs, therefore, a very useful function. Being in a wilderness—a wilderness of indifference—he has little to inspire him to go into all the details of his subject, and he has not done so. It would scarcely be profitable if he did, for the first task is to awaken his audience. This the pamphlet is well calculated to do, if the men who have responsibilities in this field will read it. Moreover, Mr. Eaton has not made this compilation for profit, and probably could not afford to give the time necessary to explore his subject as it ought to be explored. But he has brought together some very plain statements, and if these are weighed with the necessary care there is no need that any author should spend further time in philosophizing; the need rather is that railway managers should act.

*United States Bureau of Education, Washington: Bulletin No. 10, 1909

Mr. Eaton's summary of conclusions is given on another page. Here, as in the body of his work, much of his language is rather dogmatic, but we do not blame him. We cannot conceive that broad-minded railway men will deny any of his dicta. Who will say that in the exacting conditions of modern railroading all classes of officers should not be well trained? Who will question the declaration that any scheme of railway education should be continued for a series of years? We cannot see but that all such schemes now established ought to be continued indefinitely. For the past 50 years superintendents, locomotive runners, station agents and others have for the most part trained themselves; for the next 50 these classes ought to have systematic training, which means education by the company. Mr. Eaton's plea for two grades of apprentices, for changing men around, and for more thorough examinations is only another way of saying, what we all know, that in many individual cases more could be made out of a man than usually is made, even by the best railway educational agencies now known. The idea of a superintendent of education for a whole railway system, who should recruit employees, somewhat after the manner of the Federal Civil Service Commission, is a logical and necessary part of any scheme for training. Such an officer on a large railway could secure the accomplishment of all the advantages of the government's system while avoiding its disadvantages. In recommending an "efficiency wage" and a seniority wage, to be computed or awarded separately, Mr. Eaton only recognizes, what everybody knows, that horizontal advances or reductions and blind adherence to labor union schedules often do injustice to many individuals, and in the case of others do injustice to the employer. In short, our author has only put in systematic and vigorous form what many railway officers have already thought of vaguely or have tried timidly. One manager, Mr. Kruttschnitt, has begun to carry out most of these advanced ideas in systematic fashion. There would seem to be no good reason why many others should not follow his example. Surely no one should neglect to do so on the plea of being less able than the Harriman lines to appropriate the money, for there can be no doubt that the training of employees in efficiency is as wise for a poor road as for a rich one. A poor road is less able than a rich one to get along with inefficient men, and as a matter of fact the managers of

weak lines have often shown their wisdom by paying higher salaries to get competent officers away from a strong road. It would be equally wise to spend the money for the slower improvement that may be had by making the younger employees in all departments more efficient. In his closing paragraph Mr. Eaton predicts a millennial condition of railway life; but there is nothing to hinder any manager from beginning at once to help in the bringing in of that millennium.

The general indictment of some features of American railway permanent way made by Mr. Drinkwater in a letter in another column is interesting. It escapes being commonplace, although it formulates what everybody knows. Mr. Drinkwater is district roadmaster of the Temiskaming & Northern Ontario Railway, has had long experience and tells his woes simply. His letter was accompanied by a sketch, which we do not publish, showing a standard section of rail with the web bent inward a quarter of an inch to the end of producing something like an inward cant, and provide more direct resistance to spreading or overturning. On all British railways the rail is so blocked in its chair as to stand with an inward cant of about one in 20. The wheel treads also are coned about one in 20. This, undoubtedly, is an improved way of using the material for the sole result of resistance to spreading or overturning. It has two indirect results; one good and one bad. Comparing the brake trials made in England and in America, with everything in both cases in as good order as possible, better results have been gotten there than here, and it has been commonly assumed that their quicker stops were due to these coned wheels and canted rails. On the other hand, British trains, running at a uniform speed, quickly develop swaying from side to side, uniformly and rhythmically—a feature in train riding which is not often observable in this country. It does not seem to be dangerous, but it is somewhat disagreeable. There is, in this country, an increasing difficulty due to a tendency to spread the rail and resulting in either considerable cutting of the tie by the outer portion of the base of the rail or bending of the tie plate when it has not been reinforced, or other similar manifestations of the tendency. On one considerable road this has become so marked that the order has been given to set the tie plates out until the inner edge is flush with the inner base of the rail. Of course this requires tie plates with spike holes properly placed for this purpose. In this case the tie plates used are heavily reinforced by ribs, and it is believed that their resistance to bending will to a considerable extent overcome the tendency of the rail to tip outwardly. On another road, for the same purpose, they have designed and are using a shoulder tie plate that is $\frac{1}{16}$ of an inch thicker on the outside than it is on the inside. This is easily rolled and produces a slight cant of the rail inwardly, and would seem at first sight to be rather an attractive way of overcoming the tendency, although one might say that if any thickening of the tie plate on the outer side were justifiable the amount should be considerably more than $\frac{1}{16}$ of an inch. What is the objection to canting the rail inward? It is not believable that it would be accompanied by that transverse oscillation observed on English railways, and probably due to their coned wheels. It may be said that the wheel flange curves will not fit a rail so tilted; it may also be said that such a fit is not extremely desirable.

In his speech at the annual dinner of the Traffic Club of Chicago on February 8 United States Senator Cummins of Iowa expressed the opinion that railway freight rates in this country on the average are reasonable. Most complaints at present are that there are discriminations between communities. The Interstate Commerce Commission cannot raise rates. It can only correct discriminations by reducing them. Mr. Cummins said he did not think the law in this respect is fair. The commission should be given power to correct discriminations by raising rates that are too low as well as by reducing rates that are too high. The *Railway Age Gazette* has several times pointed out the injustice of the law as it stands and advocated increasing the commission's power as Senator Cummins suggests. Not only is the existing law unjust to the railways, but under it the commission cannot permanently stop, and any discrimination that a railway may be determined to continue, as if the commission reduces rates to one community which are relatively too high, the railway may reduce rates to a rival community and thereby restore the relation of rates that the commission has condemned. The desirability of giving the commission power to readjust rates by raising as well as by reducing them seems so plain that it is inexplicable that this change is not among the numerous modifications of the law that are proposed in the bills the administration has caused to be introduced in Congress or in any of the numerous other bills for the amendment of the Interstate Commerce act that have been introduced, including that presented by Senator Cummins himself. The Interstate Commerce Commission has asked for various increases in its power but it never asked for this one. If it could be thought that the commission was inspired mainly by political motives it might be suspected that it wished to leave to the railways all the odium for making advances in rates, but it is not to be doubted that if it possessed the power to advance railway rates it would at times exercise it in a salutary and effective way.

The report, summarized in another column, of the Massachusetts special commission on the relations with that state of the New Haven company is conservative in tone and, to some extent, suggests a temporary working hypothesis. But it leaves unanswered certain basic questions in a controversy which reaches out into broad and deep dimensions of law. Given in two or more states separate charters of the same railway corporation, to which state is the corporation amenable when the railway statutes of those states conflict? Is the corporation under the jurisdiction of one state or all? Is the jurisdiction of one of the states exclusive as to local acts of the corporation, and where is the distinction to be drawn between general acts and local acts? One can see the distinction between an issue of new stock and the local erection of a railway station, or the abolishment of a railway crossing, and argue, reasonably enough, state control of the latter. But the validity, under multiple state charters, of new stocks or bonds to build, say, a big terminal, is liable to be much more confusing when statutes clash. To make the illustration more realistic, Massachusetts holds that the New Haven company must ask her permission to finance the Harlem improvements. The New Haven, on the contrary, claims the power to finance them under its Connecticut charter; and the Supreme Court of Connecticut, in a case very recently decided, has found that the New Haven is held by its contracts, whether in violation of Massachusetts law or not. Whether the New Haven will accept as a peace offering the plan of the Massachusetts commission we do not know. But it would be an acceptance and acknowledgment of a scope of Massachusetts jurisdiction which the company, resting always on its Connecticut charter, has steadily rejected. Indeed, the corporation has gone further and intimated more than once in the past that it would be glad to forfeit its Massachusetts charter covering, as then asserted, only six miles of owned road between Springfield and Connecticut state line. Such are a few of the elements in an acute controversy filled with interstate law points which, if they might speedily reach the higher courts for settlement would project light into obscurity.

RAILWAY MARKET GARDENING.

The Long Island Railroad market gardening experiment stations are this year expected to be self-sustaining; that is, the sale of fruit and vegetables are expected to about cover cost, and this remarkable result may interest other railways which are in various ways undertaking to teach people along their lines how to get money out of the ground. In the central and easterly portions of Long Island the great acreage of barren land attracted the attention of Ralph Peters, the president of the railway. It was sparsely covered with scrub oak and jack pine, was dry and unproductive and commonly called $15-an-acre land. Mr. Peters believed that it ought in some way to be made capable of producing a living for those gardeners who went at it in an intelligent and scientific way. He believed that it was the company's duty to find out the truth and make it known. He made a moderate investment in two pieces of land, established Mr. and Mrs. Loring in charge of these experimental stations, as they were called, and evidently made a wise selection. It had all the elements of pioneer farming, beginning by cutting the trees, blowing out the stumps, driving wells, building, plowing and planting. In choosing fruits and vegetables for planting the Lorings searched the whole world, judging as far as possible beforehand what garden products were adapted to the climate and soil, and then planting and caring for them, not in a highly artificial way, but in such fashion as an average farmer or gardener would be quite equal to, if they were shown how.

After two years of experimenting it was quite clear that the barren lands on Long Island could be cultivated at a profit, and further that the present market gardens on Long Island could be made to pay a very much larger profit than they were paying. The accounts had been carefully kept and this much was plain. The company then authorized a fortnightly publication called *The Agronomist*, edited by the Lorings and made bright and neighborly, and these publications were given away to Long Island citizens and sent to prospective market gardeners everywhere. This magazine has since become a monthly and a really valuable publication.

To one who knew Long Island five years ago and who examines the country now, no statistics are needed to show a tremendous improvement, both in the quantity of ground under cultivation and of the quality of the cultivated areas. Furthermore, the exhibits which the company makes at the fairs show fruits and vegetables of a quality possibly never before known in this country. The number of Long Islanders engaged in market gardening has increased, the improved quality of their product results in the best prices and the tonnage and other earnings of the company, identified so far as possible as being due to this market gardening work, have largely increased. It is during this period of five years that the Long Island has developed from a summer road to an all-year-round road; that is, it has arrived at a point where it earns its expenses in the winter time, which it never did before. A considerable part of this result—how much cannot definitely be said—is due to the development of the products of the soil. It is quite possible for figures on this subject to be misleading because, due to climatic reasons, the potato crop or the cauliflower crop has either partial failure or unusual success in any one year. Nevertheless, taken as a whole, the tonnage record of berries and three kinds of vegetables for a series of years is strong collateral proof of the results of observation.

Comparative Shipments by Freight for the Six Months Ending Dec. 31. in Tons of 2,000 lbs.

	1903.	1904.	1905.	1906.	1907.	1908.	1909.
Berries	651	242	366	616	214	327	328
Cauliflower	12,715	8,968	9,849	4,678	8,784	11,346	17,770
Cucumbers	516	360	167	722	832	1,282	2,683
Potatoes	29,993	41,198	35,701	38,570	40,070	41,894	55,961
Total	43,875	50,768	46,083	44,586	49,900	54,849	76,742

Shipments by express are not included.
Total number of carloads 1909..... 5,200
Total number of carloads 1908..... 3,585

The records for the years 1903-1907 are given as indicating no material increase in that period before the experiments were a factor. The variants are such as might be expected from different seasons. The increase of 40 per cent. in 1909 over 1908 is believed to be largely due to the experiment station work.

EFFICIENT LABOR.

Really efficient labor can only be obtained and continuously maintained when the three following conditions are fulfilled, viz:

That the method of working is the best we can devise.

That the workman is trained to become expert in following that method.

That he is rewarded liberally for success.

If these three conditions are intelligently adhered to the employer can pay his workman higher wages than any union will ask.

We all know that unless workmen are trained alike, hardly any two will do the same piece of work by exactly the same method. There is a best method of doing everything, but we seldom arrive at it without careful study. As a matter of fact, the only way to find the best way of doing a piece of work is to analyze it into its elementary operations and determine separately the best way of doing each element. We can then find the time needed for each element and hence the time needed for the whole operation.

Having found the best way to perform each elementary-operation, and the time needed, we have but little difficulty in persuading a workman to do as we wish, provided a patient teacher directs him and a suitable reward is given him for success.

Not all that try will succeed at first, but those that succeed quickly will act as an incentive to the others, many of whom will gradually acquire the necessary skill and fixity of purpose. The writer has seen workers who took eight months to acquire the necessary ability to perform a task, but when they had acquired the ability they became absolutely reliable and steady.

The reward needed to cause workmen to subject themselves to this course of training varies with the difficulty of the task from 20 per cent. in addition to their day's wages to 100 per cent. If the work is such as does not cause the worker to be physically tired at the end of the day, but requires only more attention to his work, a bonus of 20 per cent. is sufficient.

If, however, the work is such as not only requires his constant attention, but causes him to become physically tired he requires a larger bonus; and if in addition the conditions under which he has to work are disagreeable he requires a larger bonus still, which may reach as much as 100 per cent.

Analyzing an operation into its elements and studying them is not easy. It presupposes a trained mind and a patient and accurate observer. Unless this work is done well the money spent on it is wasted, and to put a stop watch in the hand of the ordinary clerk with instructions to study a job excites only the ridicule it deserves.

When, however, the work is done by a trained observer, and the workman has gotten into sympathy with it, the results are beneficial to a degree that is almost unbelievable.

Proper study is absolutely essential to highest efficiency. The method of compensation is not so material, provided the amount for success is liberal and the workman does not have to sacrifice his day's wages while acquiring proper skill and habits of work.

The fact that properly trained workmen will often do three times as much work as those whose training has been poor, and that the extra compensation needed to get the efficient work is very rarely over 50 per cent., is the best argument for systematically training workmen.

As a matter of fact, money spent in properly studying pro-

cesses and training workmen brings a return far in excess of any other investment, for not only is the wage cost per piece often cut in half and the output trebled, but the increased output is often gotten with practically no permanent increase of "overhead expense."

If the reader wishes to understand what this really means in the way of profits, let him figure out what it would represent in his own business.

BRITISH LOCOMOTIVE PRACTICE.

Foreign motive power officers have frequently favored the profession with complete descriptions of their locomotive practice, usually in formal papers for the Institution of Mechanical Engineers. Notable among these are the paper by Mr. Johnson, which gave a technical description of the locomotives on the Midland Railway and their performance, and those by E. Sauvage, which include valuable data on the performance of 4-cylinder compound locomotives on the French lines. Prominent also are the papers of Mr. Aspinall, who was chief mechanical engineer of the Lancashire & Yorkshire Railway before becoming general manager, and more recently, his mechanical successor, George Hughes, has presented a paper on the locomotives designed and built at Horwich, with the results of their service. This paper contains valuable data about recent locomotive practice in England and a brief summary of some of the principal facts and figures may be found of interest to American motive power officers.

The large locomotive plant at Horwich was completed in 1889, and more than 1,000 locomotives have been built there, the total equipment of the road consisting at present of 1,517 locomotives. With the exception of a few of the smaller engines and motor cars these have been standardized so that there are now only twelve principal classes of locomotives, and the majority of them are fitted with the Joy valve gear. It has been found possible to use the same sized gear for engines having 17½-in. cylinders up to the larger ones with 21½-in. cylinders. On this line corrugated tube fireboxes were extensively used, but not with very satisfactory results. Mr. Hughes states that the circulation in this type of boiler is poor and compares unfavorably with the stayed firebox boiler in this respect. It is also objectionable on account of its tendency to prime. Halpin's thermal storage heater is also used on six engines. This device is found economical where stopping places are frequent on rising gradient and results in a saving of 12 per cent. of water. When, however, the engines take their turn on other sections of the road the showing is not so favorable. The Schmidt superheater has been applied to 25 locomotives, and gives the advantage of higher initial pressure in the cylinder and therefore a greater range of expansion, while condensation is less. Engines which ordinarily had 18-in. cylinders were increased to 20 in. when built for the superheater, and at the same time the maximum steam cut off was reduced to 70 per cent.

The type of locomotive adopted for heavy passenger and express freight service on this line is a 4-cylinder, simple 10-wheel engine, which has a number of advantages from a mechanical standpoint, such as the division of stresses in the driving machinery, the superior balancing and the greater range of expansion obtainable with the simple engine at the higher speeds. The slide valves are operated by the Joy valve gear on the inside main rods and the outside valve stems are moved by horizontal levers extending from a small crosshead or slide block on the inner valve stem. The Belpaire boiler is standard on this line and is preferred on account of its advantages in increased steam and water space, additional surface on the back head for mountings, and the direct staying of the crown. Copper and steel tubes are used and in a period of 8 years their respective lives averaged as follows: Copper, first period, 110,000 miles; second (stretched), 80,000 miles; third (pieced), 50,000 miles. Steel tubes, first period, 80,000 miles; second (pieced), 40,000 miles. Copper fireboxes average 150,000 to 275,000 miles. The author gives an instructive account of his experience with crank axles, and states that in 1901 it was necessary to abandon the solid forged crank axle on account of the heavy stresses due to larger power, and the built-up type was then adopted as standard. In 1905 rectangular keys for these built-up cranks were abandoned and screw keys 1½ in. in diameter, six threads per inch, were successfully introduced. The crank axles are made of .035 carbon steel with straight webs. The shrinkage for an 8¼-in. hole is .018 in., which amounts to 1/458 part of the diameter. The heating of journals or crank pins in built up crank axles must be carefully safeguarded as it is apt to cause trouble. The minimum thickness of tires is 1½ in. up to 68 in. and 1¾ in. above this. The greater thickness was found necessary on account of loose tires. The hardness and strength of the tire steel was also increased from 84,000 lbs. to 96,000 lbs. per sq. in. Previous to 1908 the tire shrinkage was not quite proportional to the diameter, being too large for small tires and not sufficient with large tires. The rule was then revised and now stands at 1/750 of the wheel center diameter for all sizes. In the same year, 1908, the American Master Mechanics' Association adopted two shrinkage figures, allowing 1/80 in. per foot below 66 in. and 1/60 in. for 66 in. and over. For the larger tires this is equal to 1/720 of the wheel center diameter and very close to the English practice.

Mr. Hughes' paper contains the results of experiments relating to smoke box draft appliances, brick arches and ash pans, and he says that while attempts have been made in America to standardize the front end fixtures, and with some degree of success, yet he believes that each new design of locomotive demands some experimental work in order to arrive at the best steaming position of the blast pipe diameter of chimney, etc. He concluded that a long smokebox is desirable as it tends to equalize the draft and his tests with the exhaust pipe at various distances from the tube sheet showed that a position midway between the door and tube sheet was preferable. In recent designs for British locomotives is seen a disposition to use a baffle plate and it will be interesting to find that when foreign practice forces the locomotive to maximum power as in America, the baffle plate will be found necessary and the draft appliances may resemble those which have been slowly evolved in this country.

A design for an improved ash pan which is illustrated in Mr. Hughes' paper has a wide air duct connecting the front and rear portions where they are divided by the axle guard so that the air current from the front damper may pass to the rear grate. The paper is illustrated by handsomely engraved cuts of Lancashire & Yorkshire locomotives and their details, with tables and diagrams, which give one a good idea of the service and performance of English locomotives. It is the kind of a paper we should like to see presented occasionally to the American Society of Mechanical Engineers by some of the superintendents of motive power of our American railways.

NEW BOOKS.

Accounting Every Businessman Should Know. By Elisha Ely Garrison. Published by Doubleday, Page & Co., New York, 1909. 188 pages; cloth. Price, $1.20.

Mr. Garrison has had a wide experience in practical accounting, and he writes this book with the avowed purpose of explaining away the obscurity which frequently hides the real values and objects of accounting. His chapters cover the origin and foundation ideas underlying accounting systems; the transition to modern methods; the reorganized ledger system; opening the ledger; closing the ledger; account characteristics; valuation and reserves; the inventory ledger; department costs; the principles of cost accounting; devising of systems; statement of results; accounts and the manager,

and accounts and the directors. The author recognizes the fact that his work involves a good deal of repetition, but this is rather helpful than otherwise to the reader who is not an accountant. This book is quite sure to be helpful to the factory manager or the office manager or the production manager in almost any kind of business, unless this man has been thoroughly trained as an accountant, and it would help a good many accountants to make their reports understandable to non-technical owners and directors.

Letters to the Editor.

METAL TIES AND CAST-IRON CHAIRS.

Guadalajara, Mexico, Jan. 19, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

A question has recently come up among some members of our small foreign club, and we have decided to apply to you, as authority on all railway matters, for the answer.

Mr. Newel, a well-known member of the American colony here, is the inventor of a metal sleeper or chair for securing railway rails in proper position, and when the accounts came of two recent costly disasters, one on the "Southern" and one on the "Rock Island" roads, caused by insecure fastenings, it started the discussion: Why do not the roads use metal sleepers and chairs, as in England and on the continent, to secure the rails?

One argument was that it was too expensive, but the account says either of the derailments named will approximate $100,000 loss. Now that amount will provide 100,000 chairs @ $1 each, or 28,371 metal sleepers @ $3.50 each.

Allowing 100 sleepers to the curve, it will provide for 283 curves. Allowing 200 chairs to the curve, it will provide for 500 curves, and this small number of either sleepers or chairs to each curve will give a factor of safety at least ten times greater than is now obtained with spikes alone, hence the argument of expense does not seem tenable.

So we respectfully refer the question to you.

HENRY LEYTON.

[Sir Henry Leyton asks two questions. The use of metal sleepers, or ties, and the chair system is separable. Metal ties have not yet shown good results with heavy axle loads and high speed combined. They do apparently good service on the Bessemer & Lake Erie with heavy loads at low speed, and good service in Europe with light loads and high speed. In this country the inverted-trough ties have broken down, and those of rigid forms have developed dangerous tendencies. The breakage of fastening clips has been alarming and in some cases disastrous. These clips have been designed to hold the rail firmly to the ties, with no elasticity and, indeed, with no resiliency. The upward wave traveling along the rail in front of the rolling load probably needs to be reckoned with. In frozen ballast, with the ties firmly held, and with rigid clips that are strong enough, the upward wave has some dangerous work to do.

The English chair system has so many economical advantages that it has always been attractive. The rail being raised about an inch and three-quarters above the tie enables the trackmen to tamp up the sleepers and maintain good surface with much greater precision and in much less time than where the rail bears directly on the tie. The maintenance cost of chair renewals is minute. The worn out and broken chairs are melted and new castings made at the cost of only a few cents each, and they last a great deal longer than does a tie plate. The trouble is that cast-iron chairs probably cannot be made strong enough for heavy high-speed.

About 20 years ago the Pennsylvania Railroad was supplied by the London & North Western Railway Company (England) with one mile of rails, chairs, fastenings and metal sleepers, and another mile of the same material with wooden sleepers. Also, the London & North Western sent over a few skilled men to see to the installation of this track in the Pennsylvania Lines. It was only a very short time before it was completely broken up.—EDITOR.]

MODERN SIGNALS ON WESTERN ROADS.

Chicago, Feb. 7, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I note in your synopsis of the testimony of Mr. Ames before the New York State Public Service Commission on the Croton collision (February 4, page 254) that Mr. Ames, replying to a question, said that the upper quadrant indication of signals is used on the New York Central, the New York, New Haven & Hartford, the Pennsylvania and the Baltimore & Ohio. Perhaps it is just as well to call the attention of the public to the fact that progress and modern methods in signaling are not confined to the country east of the Allegheny mountains. During the past year the Rock Island alone has installed upper quadrant automatic block signals on over 300 miles of line. The C., M. & St. P., the Santa Fe, the Soo Line, the Great Northern, the Northern Pacific, the Chicago Great Western and the Frisco, the latter with 720 miles in service or under construction, are a few examples of western roads that have adopted the upper quadrant.

If you have reported Mr. Ames correctly it may be charitably assumed that he was simply thoughtless; but the statement as it stands sounds very much like some assertions made at Chicago last March, when eastern signal engineers attempted to belittle western ideas and methods, at the meeting of the Railway Signal Association. V. C.

EDUCATION IN POLITENESS.

Rochester, N. Y.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I read in the daily papers that the Union Pacific has opened a school for deportment and etiquette. It is said to be under the management of D. C. Buell, who is going to educate the employees of the company as to how they should best conduct themselves when meeting the public. Nearly 1,000 employees are now enrolled in the school, and additional applications are being received daily. It is said that the management will try to develop men who are good at reading human nature and capable of being a "mixer."

There are several funny things in this announcement. Why so few as 1,000 pupils? Aren't there about 20,000 on the U. P. who need to be refined? If not it is unlike all other roads. What do they mean by "applications"? Who ever heard of a railway employee that voluntarily moved toward a higher standard of courtesy? And then those last two requirements! Do they expect to cultivate the qualities of the railway lawyer and the general passenger agent in the lower grades? Think of a passenger brakeman who is a good mixer! In one sense, however, some of them are too expert in this respect already.

But I am not writing to criticize, or to ridicule. It is a good scheme. I suggest, for the first lesson, that passenger trainmen and baggage agents be notified that they will be fined 50 cents every time they address a woman as "lady" instead of "madam." G. C. S.

AMERICAN RAILWAY APPLIANCES IN THE SOUTH AMERICAN MARKET.

Buenos Ayres, Argentina, Jan. 2, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In view of the interest which is now being taken by the United States in the South American market it may be of interest to you to have some particulars of the market for railway appliances as it strikes me out here.

The first thing that strikes one when starting in to ex-

amine this proposition is that Argentina is in a class by itself. Here the railways are preponderatingly British, both in their stockholders and in their management, and are practically controlled from London. There are, of course, a number of narrow gage lines under government hands and controlled by French companies. These, however, do not cut a very large figure at present with the broad gage lines.

In Chile, Peru and Brazil, however, the proposition is different. In Chile the lines are state owned, in Peru they are worked by the Peruvian Corporation, an Anglo-American corporation, while in Brazil, Canadian and American investors are all the time getting a stronger control although there are a number of British controlled lines also.

The important thing about the railway exhibition to be held here this year is that the operating officers of all these lines will visit it, not only the general managers who get to Europe every year, but the officers of the smaller systems who do not often get a chance to see up-to-date plant.

At the present time there is not a great deal of American rolling stock in use on the Argentine railways, nor a great deal of machine tools, though heavy wheel lathes and specialties of that kind are very popular.

The British section at the Exhibition will, of course, be the largest, but an energetic American committee under the presidency of Pemberton Smith, the local representative of the United States Steel Corporation, has been formed, and it is hoped that a fairly good American exhibit will be shown. The lack of business hitherto has not been due to any particular unreasonable prejudice against our own products as is seen by the fact that the steel structure for the Railway Clearing House, which is, of course, a British controlled concern, has recently been purchased from the United States Steel Corporation. In my travels, moreover, I have met more than one American built locomotive, though not many of recent type.

Those of our manufacturers who are prepared to go to the expense of exhibiting at the exhibition and follow up the enquiries they obtain will, I think, be able to do good business. Even if they will not go to the expense of running a stall themselves they can share part of one with another firm or, even more modest still, they can exhibit a line of photographs of some of the most recent orders they have carried out. Failing this they can probably, with advantage to themselves, obtain considerable publicity among the exhibition visitors by advertising in the official organ to the exhibition.

It is said out here that 75 per cent. of the British exhibits have already found buyers in the country, and I believe the same to be true of the German exhibits also. Very few houses out here carry a big line of machine tools, for instance, and a very good machine tool that comes out here and is seen at work, like a good motor car, is generally bought pretty soon, but, of course, it must be a tool that is suited to the conditions of the country. Full automatic machinery is not so suitable as semi-automatic as the class of labor to be obtained is not very skilled, neither is it excessively expensive, nor is the run of identical things to be turned out sufficiently big to warrant the use of much automatic machinery.

Electric current or gas is being supplied at the exhibition at fairly stiff rates, but electric light is free. There is also a small charge for water. The British Board of Trade has appointed a special commissioner to look after British interests and he has already been out here once and is expected out here again. American interests would have been better served had a similar appointment been made, but it is now rather late to do this as the exhibition opens in May, although it will not probably be in full swing until July. Lists and advertisements should be produced in Spanish and photographs of plant supplied to English-speaking countries and companies will, I think, owing to certain inter-racial prejudices in South America, do more good than descriptions of plant supplied to other South American states.

TRAVELER.

BAD TRACK.

Englehart, Ontario, Canada, Feb. 7, 1910.

To the Editor of the Railway Age Gazette:

Without being too pessimistic or preaching blue ruin, and while I believe in making use of every known device that will accomplish ends expediently and save labor, nevertheless I believe there are matters of great importance facing everyone interested in the maintenance of way on our Canadian railways. At least I am inclined to believe that we have nothing that should be called permanent way, a term that is very often applied to what we call track.

I have seen track for the past 35 years being built and put up in what was called first-class shape, and in a very short time it had gone to pieces only to be gone over and rebuilt.

The old 56 and 60-lb. rail have given place to the 80 and 85-lb., and in some places the 100-lb. rail, but we find that the same lack of permanency exists as did with the lighter rail and our track is practically no better than it was 25 years ago.

Tie plates have been introduced to save ties, but they do not save them. The only increase the life of the tie possibly 15 or 20 per cent. The rail of the heaviest weight does not do its work.

We find after a few months' service it is canted over on its outer corner and the remedy is to cut the tie to pieces to straighten it up again. Every day we hear talk of adzing down on this curve and that curve before the rail gets too badly canted.

Every year it is necessary to take a piece here and there on a division and practically rebuild it in order to keep it in shape to do business. Every five or six years it is necessary to relay rails, taking out rails that should have been good for 25 years.

This, to a great extent, is for the want of proper joint fastening. Then our rails are made symmetrical, while all the force against them in on the inner side, and they must, and will, and do roll over on to the outer lower flange or base. Then we get hundreds of broken rails, which is far in excess of failures by breaking in any other class of railway equipment, yet they are, to a great extent, the standard section adopted by the American Society of Civil Engineers.

They are not a bit better than the old ones. What we really need is a rail that will stand up in its place and do its work with sufficient weight and stability so as not to squirm under its load as if it was made of rubber. Then we want a joint fastening that will support the rail ends from underneath (there are several of those on the market that does this fairly well); then so long as we use wooden ties we must put enough of them under the rails to support them whether tie plates are used or not.

I am perfectly safe in saying that the track of railways is their very weak member compared with other equipment of all classes, and track will never be what it should be until there is equalization given to the rail itself to counteract the force against the inside of it, and this can never be done with the present rail section; and before we get any more devices to do track work with we should get track to work on different to what we have at present.

One great trouble with track is spreading. Numerous derailments have taken place from this cause, and requires, during the winter season, constant vigilance to avoid accidents.

Entire passenger trains, with the exception of the engine and some of the forward cars, have been ditched by track spreading.

The cause of this is lack of stability in the track, showing clearly that our tracks are not all in keeping with other appliances on our railways.

J. DRINKWATER.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Having read your editorial and Mr. Fry's letter to the Editor January 28, and being a mechanical engineer who has devoted considerable time to the study of locomotive construction, both in America and Europe, I am unable to resist the temptation to enter this discussion.

I wish, first, to agree with Mr. Fry to the extent that the above editorial humiliates the modern express locomotive somewhat more than the actual facts appear to warrant; second, to present some simple data on the ratios of tractive effort to train weight in 1898 and 1910, and third, to discuss briefly the means at hand for enabling the passenger locomotives of to-day to better cope with the more and more exacting conditions which are daily forced upon them.

The editorial states that a 6-car train was recently made up for test purposes which was intended to represent modern express equipment, and that the Pacific locomotive, which was selected for its good record on the line in question, was unable to accelerate the train to move more than a fraction above 60 miles an hour on level road with favorable weather conditions obtaining.

There can be no question as to fact in this instance, but there is a reason for this poor performance of a modern Pacific locomotive, and it must be looked for in the locomotive, since the track was level, the train normal, and the weather conditions satisfactory. Furthermore, if the name of the road in question and the principal dimensions, weights, etc., of this locomotive were known there is not the slightest doubt in the writer's mind that the poor performance could be quickly explained.

I have made many trips between New York and Chicago on the "Twentieth Century Limited," and I have ridden mile after mile in 50 seconds or less when the train consisted of six and seven cars and was hauled by a Pacific locomotive weighing about 261,000 lbs., with 79-in. driving wheels, 4,195 sq. ft. of heating surface and 22-in. x 28-in. cylinders. This equipment, while not built of steel, is certainly not out of date, and, furthermore, to one sitting in the buffet car next to the engine, everything showed that the locomotive was not worked to the limit to hold 72 miles an hour with such a train.

If this can be done on one road with a certain type of engine it can be done on any other road with the same engine and substantially the same road conditions.

Many observers are therefore inclined to the belief that the speed of modern express trains in general is limited more by traffic conditions and schedule agreements with competing roads than by the locomotives.

On the Atlantic City runs in 1898 the trains weighed on the average about 190 tons. The locomotives used on these runs had a tractive effort of 14,350 lbs. when working compound. The ratio of train weight to tractive effort is therefore 26.7.

Taking the weight of a modern sleeper as stated in the editorial as 75 tons, five of such sleepers would weigh 375 tons, and with one buffet car of 50 tons the total weight of train would be 425 tons. The tractive effort of the locomotives which handle the "Twentieth Century Limited" is 29,200 lbs., and the ratio of train weight to tractive effort is 29.1. It is true that the above tractive efforts are not realized at high speed, but as they are both determined for the same M. E. P. (per cent. boiler pressure) the comparison is not mitigated.

From the above ratios we should expect the present day Pacific locomotive with a modern train to maintain a speed that was 95 per cent. of the speed averaged on the Atlantic City runs in 1898 which I believe averaged 72 miles per hour when the train started late. We should, therefore, expect our 1910 Pacific locomotive to maintain 95 per cent. of 72 or 68.4 miles per hour, and this on the assumption that there has been no improvement in locomotive performance for twelve years.

The writer has known the above described Pacific locomotives to take a train consisting of five Pullmans and three day coaches 43 miles up grade all the way and reach the latter point in 48 minutes from a dead stop. Not once, but many times. It is needless to say that such a performance requires that a speed in excess of 60 miles per hour must be maintained up hill after the train is under way a few minutes. Many other instances could be cited but such is not the purpose of this article.

In view of the above there is some justification in refusing to believe that our modern locomotives cannot maintain a speed of 70 miles an hour with a 6-car train on level track.

Let us presume, however, that our locomotives of to-day cannot maintain 70 miles an hour on a level road with a normal 6-car train. What can we do to improve the locomotive? If the Mallet locomotive was successful in meeting the requirements of higher speed for heavier freight trains, perhaps the Mallet type of passenger locomotive would do equally well in the passenger field. But before resorting to the Mallet, or better still, simultaneously with that course, let us be certain that we have exhausted the possibilities of the Pacific locomotive, for instance.

It is generally conceded that a four-cylinder locomotive with two cylinders between the frames is better adapted to high speed work than any other type at present in use. One of the principal reasons for this is the fact that reciprocating parts of the inside cylinders can be made to counterbalance those of the outside cylinders.

If an engine has four cylinders it should certainly have four valves if it is intended for high speed service. If it has four high-pressure cylinders four valves will give double the port area to any one cylinder that two valves would permit, and port area is a most important property. Four valves also permit less tortuous passages. If the locomotive in question is a compound, four valves are needed so that the ratio of cut-off in the high pressure to that in the low pressure may be varied. It is useless to argue that a fixed cut-off ratio in a compound engine can give as good results as a cut-off ratio which may be varied to meet different conditions, be the engine bolted to a foundation or mounted as a locomotive. One might almost as well expect a simple locomotive with its cut-off fixed at ½ stroke to perform equally as well as one having the usual means of shortening the valve travel. As stated in the January 28th editorial the latest locomotives on the French roads maintain the four-valve arrangements and not long ago the writer was afforded an opportunity to ride on a French de Glen compound between Calais and Paris on the Nord Ry. on the fastest train on that road when the value of four valves and double valve gear was demonstrated to him in a manner not to be soon forgotten. When the subject of the greater complication of four valves was mentioned to the French engineers they replied that the American air brake was "very much" complicated and asked who would consent to reduce complication at the cost of loss in efficiency.

We must admit that the P. L. M. de Glen Pacifics illustrated in the *Railway Age Gazette* of January 7, 1910, are a splendid example of modern locomotive construction along the line of meeting increased speed and weight requirements. If these machines are fitted with double valve gears and four valves there is "food for thought" for American locomotive designers.

German practice is very similar to the French, and in England there are Pacific locomotives with four 15-in. high-pressure cylinders, and if I am not mistaken the London & South Western has 4-6-0 locomotives with four 16-in. high-pressure cylinders.

The American locomotive designer has little to learn from English locomotive practice that is applicable to his needs, but this cannot be said of French and German locomotive designs. If it is true that our present locomotives have reached the limit of speed, and if that speed is 60 miles per

hour with normal trains, it is time to look well around us; to recognize and take advantage of the experience which others have gained, and the lessons they have learned, and to apply them to the solution of our problems wherever possible. If necessary build locomotives with double valve gears or four high-pressure cylinders and try them out, but I venture to say that the present day Pacific if correctly designed and operated has not quite reached its limit.

To those who persist in heralding loudly the near approach of the time when the electric locomotive shall overlap the suburban field to displace the steam locomotives on longer runs I would direct attention to the remarks of Mr. Kruttschnitt on the problem of electrification of the Central Pacific over the Sierras as follows [*Railway Age Gazette*, January 14, page 101]:

"Eastern critics may be inclined to the opinion that we are dallying with this matter. We have found that it pays well to make haste slowly with regard to innovations. Electrification for mountain traffic does not carry the same appeal that it did two years ago. Oil burning locomotives are solving the problem very satisfactorily. Each Mallet compound locomotive, having a horsepower in excess of 3,000, hauls as great a load as two of former types, burning 10 per cent. less fuel and consuming 50 per cent. less water."

If the reader fears that the locomotives of to-day are soon to be driven from their field by the electric locomotive a perusal of the splendid paper on the subject of "Electrification of Trunk Lines," by L. R. Pomeroy, in the same volume of proceedings (an abstract of this important paper will be found in another column), will do much to alleviate his fears if not remove them entirely for some time to come.

Finally, granted we had locomotives that could maintain a speed of 90 or 100 miles an hour, would we be permitted to use them? Would it not first be necessary to look well to the curves and the roadbed, and to devote a great deal of attention to the traffic conditions where such speed would be taken advantage of?

If our locomotives were capable of such a performance, and I hope the day will come when they are, even though regular 90-miles-an-hour schedules were denied us, it would be a source of the greatest gratification to know that the locomotives could meet the demand when it was made.

EDGAR LOGAN HILL,
Am. Soc. M. E.

Contributed Papers.

COLFAX GRADE REVISION; SOUTHERN PACIFIC.

BY BRADFORD BOARDMAN,
Associate Editor of the *Railway Age Gazette.*

The Southern Pacific is building a low-grade line up the foothills of the western slope of the Sierras from Rocklin, Cal., east to Colfax. The present main line between these points is 31.6 miles long. It has a maximum grade of 2.2 per cent., compensated, opposing eastbound traffic, and a maximum curvature of 10 deg. This line will be used for westbound traffic, having no opposing grade, and eastbound traffic will move over the new line, 30.8 miles long, with 1.5 per cent. grades and 4 deg. maximum curvature. On the present line there is 18.5 miles of curve track, a total of 5,493 deg. The new line will have 14.2 miles of curve, amounting to 1,344 deg.

At present the eastbound rating for consolidation engines is 480 tons behind tender, and for the Mallet compounds, 1,000 tons. The ratings on the new line, eastbound, will be 905 tons for the consolidations and 1,855 tons for the Mallets. There is very little drag tonnage moved over this district, most of the lading being high-class freight which is given a schedule requiring a smaller train load. The loads now average, therefore, eastbound, 455 tons and 915 tons, respectively, for the two types of engine. Proportionately, when the new line is finished the average loads will be 860 tons and 1,695 tons. Over the present line the power for the heavier freight trains consists of two consolidation locomotives in front and a Mallet about two-thirds of the way back. This revision of grades is to be continued, eventually, all the way over the mountains, but the plans are not yet finished.

The present line is being relocated wherever the new line



Fig. 1—Crossing at Applegate Before Building Subway.

This shows the usual form of trestle and incidentally some of the cheap but effective bracing that can be put in when the foundation of the trestle is undermined.

touches it. In these relocations the curves are reduced to a maximum of 6 deg. No attempt is made to reduce grades, as there are and will be none opposing westbound traffic. In fact, in some cases grades are increased on the relocated line. All curves on the present line are to be reduced to 6 deg., but this will not be carried out until the new line is in operation, except where the lines are together, and at a few points where relocations can be made now without disturbing traffic.

Throughout the work the rock is close to the surface. The hardest rock occurring in large quantities is serpentine. The softest is the slate and clay shale. There is also quartzite,



Fig. 2—Applegate Crossing; Subway Nearly Completed.

granite, disintegrated granite, porphyry and clay. In dry weather some of the clay becomes a sort of hard-pan and has to be blasted. On the other hand, the clay shale can sometimes be handled directly by steam shovel. This is unusual, however. It crumbles rapidly after exposure to the air and eventually takes about a 1½ to 1 slope. Hand drills are used in all tunnels except Nos. 13, 7, 5, 4½ and 4, and in all cuts except in one near Bowman. Where the cut work is particularly heavy, a well drill is used, as described below.

The irrigation system adds to the expense of the work. There are storage reservoirs all through the hills and from them ditches run down to the valleys. Where the new grade interferes with them they must be taken care of. This means an unusual number of culverts, and in many cases the ditches have to be diverted for some distance. Sometimes new ditches may be dug, but frequently it is necessary to carry them across depressions in flumes. The pipe lines from ditches to farms are easily handled, being carried directly through fills and over cuts on wire suspension bridges, or on a highway bridge if convenient. There was also a great deal of work done in changing the channels of natural streams. Where one paralleled the line it often had to be moved away to protect the toe of the embankment. This is expensive, as most of the slopes are steep, so that a deep cutting is required for the new channel. Where the line crosses a stream on a fill it was often found practicable to cut a new channel in the side hill so as to take the stream through where the embankment was low and avoid a long culvert under the highest part of the fill. Because of the steepness of the slopes the new channel does not have to be carried far upstream before the stream can be diverted into it, and the drainage area at the bottom of the valley is so small that what water does fall on will seep through the fill without damage.



Fig. 3—Slide in a Heavy Cut.



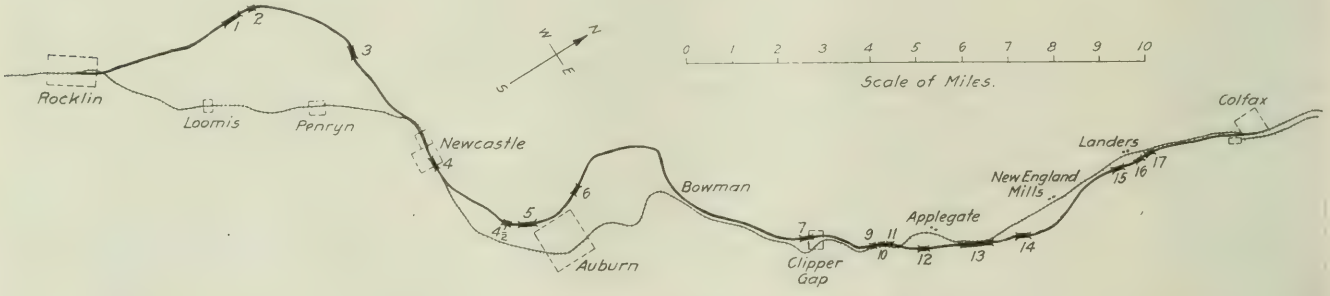
Fig. 4—Timbering at West Portal of Tunnel No. 13.

Where practicable, grade crossings of highways are avoided. The railway bears all the expense of the necessary relocation of highways. There has been considerable difficulty in getting the necessary right of way at reasonable prices. The people would be willing to give it away for a new line, but take just the opposite course when the improvement of an existing line is concerned. A result is that the company has to buy much more land than it needs. At points the original 400-ft. right of way of the Central Pacific had been encroached on, and this resulted in a good deal of trouble. Most of the right of way negotiations are now, however, completed; the company even succeeded in acquiring a corner of a churchyard.

The hardest part of the work is on the portions where the new line is adjacent to the present line and construction has to be carried on without disturbing traffic. The trouble is that in most cases the lines are on different levels. Where they are on the same level and the curvature of the old line is such as can be followed by the new one, the work is simply that of double-tracking. As a matter of fact, however, these conditions obtain only at a few places, except for the first two miles west from Colfax. No construction trains are run on the present operated line, as train service is so frequent that there would be many delays; the electric train staff system being in use, work trains cannot be operated on the main line by flagging. This means that a lot of construction track must be built, and it is often expensive. All grade crossings of construction track and main line track are protected by all-electric interlocking. There are spurs from the operated line to construction camps and to tunnels and heavy cuts for delivery of materials and supplies. These spurs are of the same construction as main line track, i. e., 75-lb. rail, tie plates throughout, with four spikes in each plate on heavy curves, first-class ties, etc., except that the spurs are not ballasted and there are only 14 ties to the rail. There are a number of tunnels and cuts, however, some distance from the present operated line, to which no spur was built, and all equipment was hauled overland, sometimes 2½ miles. At Auburn, for example, locomotives, cars and steam shovels were hauled fills is brought from San Francisco, both poles and dressed timbers. The timber which grows nearby is of poor quality, being for the most part a soft, knotty pine.

Electric lights are used in much of the tunnel work, current being supplied by a private power company which has transmission lines through this district. At tunnel No. 13, however, the contractors have their own plant. Electric power was wanted at some points for uses other than lighting, but the power company demanded too high a price.

The Utah Construction Co., Ogden, Utah, has the general contract for the 11 miles from Colfax west to Clipper Gap. It does the tunneling itself, but sublets some of the cut and fill work. Concrete work is let separately by the railway company. From Colfax to tunnel No. 17, two miles, a double-track line is being built. The present line, which crosses the new grade frequently in this section, will be abandoned. At tunnel No. 17 the old and new lines diverge, meeting again at Applegate. The cuts on the double-track section are not very heavy. The material is clay, clay shale and slate. The clay shale is usually too hard to be handled without shooting. On the larger cuts a 3-in. hole is driven by a well-driving machine from the top down to the grade line. At the bottom of the hole a pocket is formed by exploding a small charge of black powder. A heavy charge of dynamite is then put in this pocket; this will shake up a great amount of the shale, so that it is easily handled by steam shovel. This method is



Colfax-Rocklin Grade Revision.

Small scale map, showing present line and new eastbound line, but not the relocations of the westbound line, nor the numerous crossings of new line and present line between Clipper Gap and Colfax.

through the town for a mile and a half. Track was laid ahead of them and the shovels pulled themselves up hill by cables by their own power.

On the new line there are only two important bridges; these are the ones over the Auburn ravine and over Antelope creek, near Rocklin. Culverts are plain concrete arches, all paved, the smallest having a 4-ft. opening and the largest 12-ft. There are no pipe culverts except some concrete pipe culverts, which have 3-ft. and 2-ft. openings. Culverts have to be of ample size to take care of the volume of water which comes from even a small drainage area in this region. There is, however, no trouble from melting snow, there rarely being more than 3 in. on the ground west of Colfax. Highways are crossed on short girder spans resting on concrete abutments. Waterways are never carried through these subways, separate culverts being built for them. There is no grade crossing of the old and new lines. At Applegate the new line passes under the old line, and at Rocklin it passes over it. From Applegate to Rocklin trains will be operated left-handed.

The contractors use Italian, Swedish and some American laborers. Unskilled labor costs from $2.25 to $2.50 a day, and tunnel men get $3.50.

The free haul in scraper work is 200 ft., from center of excavation to center of mass of fill. Beyond this distance the contractor gets an additional amount per yard. Material is handled with scrapers for a maximum distance of about 1,600 ft., dump cars being used for hauls longer than this. The greater part of the timber for the trestles used in making

used in many cuts on the line, but not in hard rock. No scrapers are used except to make grade for construction track ahead or around the shovel and at points where cuts are quite shallow or short, or where there is considerable burrowing.

There is only one double-track tunnel; this is No. 4. Tunnels are all Southern Pacific standard section. Portals are granite. Tunnels are lined with concrete for 50 ft. and the rest is timbered. Timbers and lagging are redwood. On the Utah company's work headings are driven with two drifts at the springing lines. The bench is taken out by trapping. A drift is driven in the center at grade line and roofed with loose timbers. The bench is blasted out above this and the muck dropped down into dump cars in the drift through openings made by removing the roof timbers.

Of the 17 tunnels on the line, nine are east of Clipper Gap. (A cut has been substituted for tunnel No. 8, and tunnel No. 4½ replaces a cut near Auburn). Nos. 12 to 17 are driven from both ends. No. 17 is 760 ft. long; it was driven through hard slate with a ledge of quartz, in five months. No. 16 is 435 ft. long, through hard slate, and was also holed in five months. No. 15 is 771 ft. long, and was holed in six months. The rock is black quartzite. It is easily broken up, but is hard on drills. These three tunnels are now nearly all timbered and the concrete lining and the portals are being put in. No. 14 is through soft clay shale and slate; it is 1,000 ft. long and has just been holed after nine months' work. No. 13 is the longest on the line, being 3,200 ft. The material is clay shale at each end, with slate in the center, and there is now (Janu-

ary) about 400 ft. yet to do, after 15 months' work. A power plant was built by the contractor to supply air to the drills, power for electric lights, for pumps, and for ventilation. Smoke hangs badly in this tunnel. A suction pipe is carried clear up to the heading. After a shot, air is turned on from a valve in the pipe leading to the drills and the suction fan is started. This clears the tunnel very slowly. It is believed that better results would be obtained by having the suction pipe reach only to a point 400 ft. from the heading, which is about as far back as the smoke gets, letting the compressed air in close to the heading, or perhaps omit the suction and blow the smoke all the way back. An ammonia cartridge is being tried with the dynamite. The ammonia fumes neutralize those of the nitro-glycerine, the amount of ammonia being varied with the amount and strength of the dynamite. The heading is driven in the usual way, described above, except that a small air-operated shovel is used in taking out the bench. The concrete lining is carried in for several hundred feet at each end. Work was started when it was intended to line all tunnels with concrete throughout, so the first part was driven with that expectation. Also, the roof is thin at the west end and there is water in the rock at the east end, making more than the usual length of lining desirable.



Fig. 5—West Portal of Tunnel No. 13.



Fig. 7—Side-Hill Cutting by Trap Method.

Tunnel No. 12 is 846 ft. long, through shale, limestone and

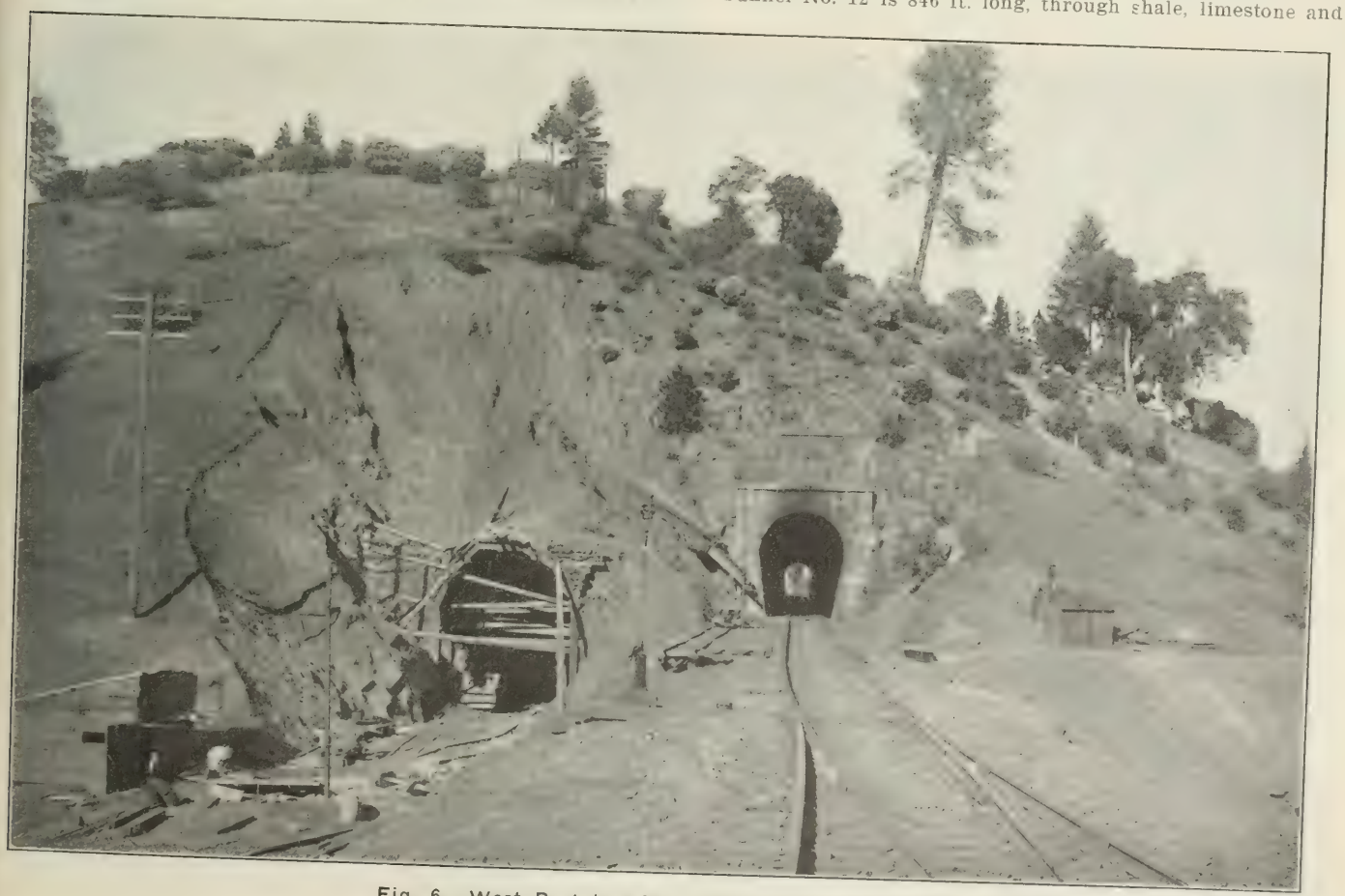


Fig. 6—West Portal of Tunnel No. 9 Before Slide.

Illustrating the danger of building a new tunnel adjoining an operated track.



Fig. 8—View Looking East, Toward West Portal of Tunnel No. 7.

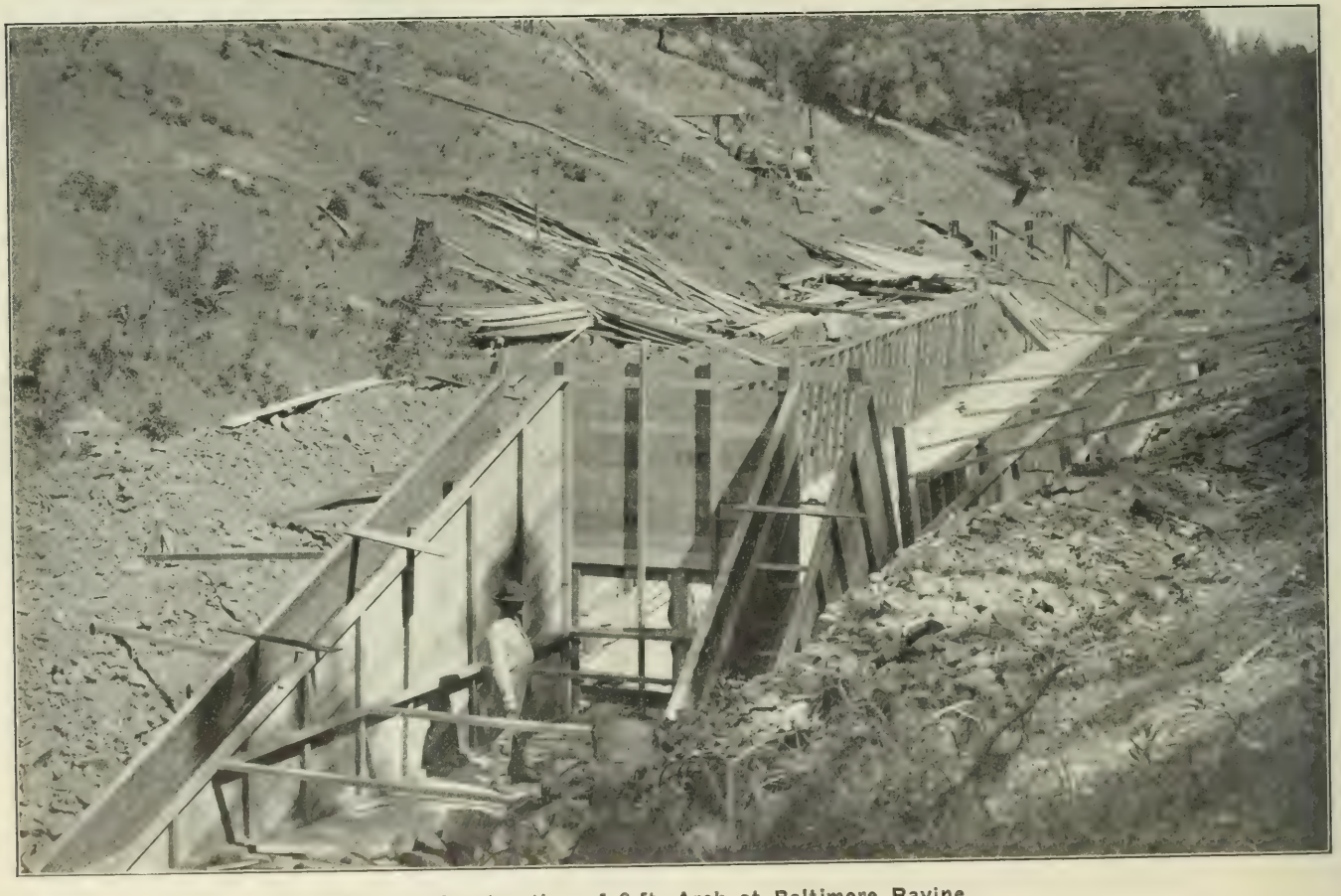


Fig. 9—Construction of 8-ft. Arch at Baltimore Ravine.

some serpentine. After five months' work about 150 ft. remains to be driven.

Near the east portal of tunnel No. 11, at Applegate, the old line is on an embankment and the new line goes through it on a skew in a concrete subway with granite portals, the base of rail being about 30 ft. below base of rail of the old line. This was built with the cut-and-cover method, the old line being temporarily carried on a pile trestle. Where the piles were in the way of the arch and walls of the subway they were boxed and the concrete placed around them, the holes being filled with concrete after the piles were withdrawn. The roof of the subway, over the arch, is reinforced with I-beams, at



Fig. 10—West End of Tunnel No. 3, Showing Granite Boulders and Disintegrated Granite.

right angles to the axis of the new line. The temporary trestle has been filled in and the old track is now on stringers resting on the concrete. The stringers will be replaced with ballast. Tunnel No. 11 is 763 ft. long, through limestone, and work on it has not been started.

From here to Clipper Gap, two miles, is the most troublesome work on the line. The old line constantly interferes with the new eastbound location. It crosses it a number of times, as in the two miles west from Colfax, but the lines are on different levels, so that it is not a simple double-tracking proposition. As a result the old line has to be swung away from its present location at many places, in order to keep it always south of the new line and avoid another cross-over. This eliminates many sharp curves, but it is expensive. In locating the new line and relocating the old line, allowance was made for 1 to 1 slopes and 18-ft. roadbeds. At places the roadbed is as wide as 24 ft., to allow for material eventually taking more than a 1 to 1 slope. To make two approximately parallel lines, on levels varying from 20 ft. to 30 ft. apart, without disturbing traffic on the present operated line, gave rise to several problems.

Just west of tunnel No. 11 the new line requires a cut so close to the cut through which the present line goes that it could not be excavated without spilling material on the present track. A shoo-fly was therefore built around the south side of this work to carry the old line temporarily. In spite of this, rocks were thrown on the shoo-fly track once when a charge was exploded, due to a fault in the rock formation. This is the only place where a shoo-fly was used. There are several places where the lines are so close together that the work, while not so cramped as in this case, cannot be carried on by steam shovels without running risks of blocking the operated line. At these points excavation is by hand, using the trap method described above in connection with tunnel work. The heading of the drift is kept advanced well ahead of the face of the cut, so that a string of dump cars can be run into it and spotted, one after another, under the trap or opening in the roof timbers. Making a cut in this way is usually not much more expensive than if steam shovels were used; the added cost is certainly less than would be the cost of detouring the operated line on a shoo-fly so as to allow the use of steam shovels. No. 10 is 292 ft. long, through limestone. Working from one end, 90 ft. has been driven in two months.

The west portal of tunnel No. 9 was originally 75 ft. west of the present tunnel on the old line, which it parallels. The wall between the new tunnel and the approach cut to the old tunnel was thin. The soft shale through which this part of the new tunnel was driven got so shaken up by the blasting that it slid and, the new tunnel being only timbered, the concrete lining not yet being in, and the thin wall not giving enough support, about 30 ft. of the tunnel collapsed. The 75 ft. of tunnel was therefore replaced with a side cut and the portal advanced even with the portal of the old tunnel.

At Clipper Gap the new line cuts across the old line, forming a chord to the present sharp curve on which the old line rounds the shoulder of a hill. This shoulder has been cut away so as to keep the old line south of the new line and also make a flatter curve. This required a deep side hill cut 120 ft. wide at the bottom. The material was clay shale and it took four months to remove the total 72,000 cu. yds.

Erickson & Petterson, San Francisco, Cal., have the general contract from Clipper Gap to Rocklin, 20 miles. Tunnel No. 7 is 1,024 ft. long, through black quartzite, and 325 ft. of it has been driven in seven months, working from one end only. These contractors usually drive tunnels with only one drift above. This is centered and from it the arch of the tunnel is widened to full section, down to about the springing line. One or two drifts are driven at the grade line and the greater part of the bench is blown down directly into cars in drifts.

Just west of Bowman is a situation somewhat like that at Clipper Gap. Here, however, the old line was moved so far south that separate cuts were made for the old and new lines, the level of the latter being 25 ft. below that of the



Fig. 11—West End of Tunnel No. 1, Showing Soft Granite.

former. The cut for the new line is 3,500 ft. long, 45 ft. maximum depth, and the 199,000 cu. yds. of excavation was completed in seven months. The relocation and straightening of the old line required a cutting of 40,000 cu. yds.

The heaviest cut between Bowman and tunnel No. 6 is 2,400 ft. long, 35 ft. maximum depth, and containing 103,000 cu. yds., which was excavated in six months. The material was shale and serpentine. Steam drills were used. Tunnel No. 6 will be 1,200 ft. long, through serpentine. It will be driven from one end only; no work has been done yet because of difficulty in getting right of way, but these negotiations have just been completed.

Auburn ravine will be crossed by a 540-ft. trestle, 90 ft. above the stream, on a 3-deg. curve. There are six 60-ft. deck-girder spans, the five steel towers carrying 30-ft. girders. The towers are supported on concrete pedestals. There is a 1,200-ft. cut east of the bridge, and tunnel No. 5 is just west of it. This tunnel will be 1,239 ft. long and will be driven from one end only. Serpentine and a still harder rock, almost like a flint, will be encountered, but work has not yet started. West of this tunnel there is a short fill, then a cut, and then a 600-ft. fill, 120 ft. deep, across Baltimore ravine. The building of the 380-ft. culvert at the bottom of this fill is shown in the photograph. This will require 183,000 cu. yds. Work has been under way for seven months, but has been slow because of the lack of material. Tunnel No. 4½, just west of the fill, has only a few feet to go. When it is through a steam shovel will start work on cuts west of it and the material will be hauled back to the ravine. The fill is being made with a track carried on cables stretched across the ravine. It is a crude arrangement, no towers being used, but the cables being simply anchored to posts and ties bolted directly to them. This makes such a steep slope that at the outer ends of the fill (work is proceeding from both ends) the cables are supported on cribwork to get a level track, and a bumping post is built on top. When the fill is up to grade at the cribwork dumping has to stop until the bumping post and cribwork is moved further out. This has not, so far, delayed the work, since, as noted above, the material has been delivered so slowly, the rock cutting to the east and the tunnel to the west being the only sources of supply. Probably towers will be put up under the cables and a level track hung from them, so that the work will be faster and safer. Towers are being erected at a fill near Newcastle, the only other place where this cable system is



Fig. 12—View at Newcastle, Looking East, Before Work Was Started.



Fig. 13—Antelope Creek Crossing; Grade of Relocated Westbound Line in Foreground.

used. Tunnel No. 4½ is 368 ft. long, through black quartzite, and is nearly through, as mentioned above, after five months' work from one end only. The cuts and fills from here west are not balanced, and a great deal of material has to be borrowed. The biggest fill requires 190,000 cu. yds.

The two lines come together again near Newcastle. The new line approaches tunnel No. 4 on a 2,500-ft. fill, 70 ft. high, maximum, and containing 225,000 cu. yds. Much of this is being borrowed with scrapers. The old line is now on a higher level, but it will be carried down to the grade of the new line and pass through tunnel No. 4, which is double track. As the present operated line lies north of the tunnel, a temporary crossing is necessary. The operated line is carried across on a pile trestle, erected under traffic as at Applegate. Driving each pile took about 45 minutes, and it was hard to get this time between trains. The time includes the time of getting the piledriver down from the spur near the block station at Newcastle, no work train, of course, being allowed on the main line without a train staff. Tunnel No. 4 will be 991 ft. long, through clay shale, with some hard granite boulders. An air shovel is about to be put in here. Because of the width of this tunnel and the character of the ground, the roof is temporarily supported with curved I-beams while putting in the timbering. Work has been under way for one month. From the west portal of the tunnel to Newcastle station there will be a double-track fill 1,000 ft. long and 65 ft. high, requiring 112,000 cu. yds. This fill will be made single track at first. When this is done and the tunnel completed the operated line will be swung over on it and the additional material necessary to make it double track will be borrowed from the old embankment, probably by scrapers. The accompanying photograph, taken last spring, shows this old embankment. The west portal of the tunnel will be near the water tank in the distance.

West from Newcastle the new line diverges to the north, and there will also be about two miles of relocation of the westbound line, eliminating some curvature and keeping it south of the eastbound line. The only other relocation of any account is at Rocklin, as described below. The work on the eastbound line is heavy for about seven miles west from Newcastle. It is a succession of cuts and fills, the heaviest cut being 70 ft. deep, 84,000 cu. yds., and the heaviest fill, 2,000 ft. long, requiring 157,000 cu. yds. Borrowing is necessary for most of the way. The ground is mostly a soft granite, which is disintegrated to a sort of coarse sand for usually 6 to 8 ft. on top. Some of this disintegrated granite is fairly hard, so usually it is all shot before being handled by the steam shovels.

Tunnel No. 3 is 1,639 ft. long, and after five months' work, from one end only, 1,300 ft. remains to be driven. Hard granite was encountered at about the springing line of the arch, but the rest of it is soft granite. No. 2 will be 769 ft. long, through soft granite and conglomerate; work has not yet begun. No. 1 is through about the same material as No. 2. Of the total 1,896 ft., about 900 ft. has been driven in seven months.

At Rocklin the new line would cross the old line at grade. To get a separate crossing the westbound line is being relocated to the north, passing under the new Antelope creek bridge. This relocated line is 6,000 ft. long, on a 6-deg. curve, all within the Rocklin yard limits, the land being fairly level. The grade for it is shown in the foreground in the photograph of Antelope creek bridge. This bridge consists of one 60-ft through girder span over the relocated line, three 60-ft. deck girder spans, and one 125-ft. through riveted truss over the stream. The steel work rests on concrete piers, about 30 ft. high.

The following tables show the average amount of equipment and number of men used each day.

EQUIPMENT AND MEN USED PER DAY BY ERICKSON & PETTERSON.

Grading Force.

Foreman	40.0	Craneman	8.0
Laborers	332.0	Fireman	8.0
Drillers	115.0	Pitmen	34.0
2-horse team and driver	25.0	Watchman	10.0
4-horse team and driver	4.0	1-horse carts and driver	12.0
6-horse team and driver	1.0	Car repairer	2.0
Horses	4.0	Dinkey:	
Dump cars	61.0	Dinkey	8.0
Plows:		Engineer	8.0
4-horse plow, holder & T.	4.0	Brakeman	8.0
6-horse plow, holder & T.	4.0	Blacksmith	4.0
8-horse plow, holder & T.	2.0	Blacksmith helper	4.0
2-horse scraper and driver	24.0	Powderman	5.0
4-horse fresno and driver	18.5	Drills:	
2-horse slip and driver	2.0	Drills	4.0
2-horse fresno and driver	4.0	Drillers	4.0
3-horse snatch and driver	4.0	Helpers	4.0
Steamshovel:		Boilers	4.0
Shovel	8.0	Fireman	4.0
Engineer	8.0		

General Force.

Timekeeper	10.0	Machinist	3.0
Cook	18.0	Watchman	3.0
Waiters	35.0	Driving horses	3.0
Blacksmith	17.0	2-horse supply team	7.0
Blacksmith helper	12.0	4-horse supply team	6.0
Carpenter	6.0	6-horse supply team	1.0
Carpenter helper	6.0	Camp boss	5.0
Saddle horse	6.0	Labor	26.0
Saddle horse	5.0	Clerks	6.0
Foreman	7.0		

Tunnel Force.

Foreman	15.5	6-horse team and driver	3.5
Headingmen	78.0	Drills:	
Breastmen	26.0	Drills	4.0
Laborers	184.0	Drillers	11.0
Cornermen	8.0	Drillers' helper	8.0
Benchmen	12.0	Unloading and hauling lumber:	
Boiler	2.0	Labor	12.0
Boiler fireman	2.0	2-horse team and driver	3.0
Carpenter	4.0	4-horse team and driver	3.0
Carpenter helper	2.0	Dump:	
Blacksmith	10.0	Cars	30.0
Blacksmith helper	9.0	Horses	20.0
Dumpmen	5.0	Drivers	2.0
4-horse team and driver	1.0	1-horse cart	2.0

Masonry Force.

Foreman	14.0	Carpenter helper	8.0
Mixers	39.0	2-horse team and driver	8.0
Tampers	17.0	4-horse team and driver	30.0
Labor	94.0	Mixer	5.0
Carpenter	19.0	Engineer	5.0

EQUIPMENT AND MEN USED PER DAY BY UTAH CONSTRUCTION CO.

Grading Force.

Foreman	20.0	Watchman	4.0
Laborers	213.0	Dinkey:	
2-horse team and driver	2.0	Locomotives	8.0
4-horse team and driver	2.0	Engineers	8.0
6-horse team and driver	1.0	Brakeman	8.0
Drillers	29.0	Carpenters	3.0
Dump:		Carpenters' helper	5.0
Dump cars	73.0	Powderman	3.0
Horses	12.0	2-horse scraper and driver	4.0
Drivers	8.0	4-horse fresno and driver	6.0
Steamshovels:		4-horse plow, holder and T.	9.0
Steamshovel	4.0	6-horse plow, holder and T.	3.0
Engineer	4.0	Hoist engine	1.0
Craneman	4.0	Hoist engineer	1.0
Fireman	4.0	Signalman	1.0
Pitmen	15.0		

General Force.

Foreman	10.0	2-horse supply team	7.0
Timekeepers	8.0	4-horse supply team	5.0
Cooks	14.0	6-horse supply team	1.0
Waiters	23.0	Clerks	3.0
Blacksmith	2.0	Camp boss	1.0
Blacksmith helper	2.0	Laborers	11.0
Carpenters	2.0	Machinist	2.0
Carpenters' helper	1.0	Corral boss	3.0

Tunnel Force.

Foreman	14.0	Drillers	32.0
Headingmen	24.0	Drillers' helpers	8.0
Breastmen	14.0	Unloading and hauling lumber:	
Laborers	82.0	Foreman	2.0
Pumps	3.0	Labor	12.0
Compresor	2.0	2-horse team and driver	1.0
Compressorman	2.0	4-horse team and driver	5.0
Electrician	1.0	Dump:	
Fireman	1.0	Cars (dump)	31.0
Boilers	2.0	Horses	7.0
Sawmill	1.0	Drivers	7.0
Sawmill operator	1.0	Shovel:	
Sawmill laborer	2.0	Steamshovel	1.0
Carpenters	6.0	Engineer	1.0
Carpenters' helpers	2.0	Craneman	1.0
Blacksmith	6.0	Dinkey:	
Blacksmith helper	2.0	Locomotives	2.0
Fans	1.0	Brakeman	2.0
Drills:		Engineer	2.0
Drills	8.0	Hoists	4.0

Masonry Force.

Foreman	4.0	Carpenters' Helper	6.0
Mixers	15.0	4-horse team and driver	6.0
Tampers	5.0	2-horse team and driver	3.0
Hod carriers	6.0	Mixer	1.0
Laborers	30.0	Gasolene engine	1.0
Carpenters	4.0	Engineman	1.0

The work is now about 40 per cent. finished. No rails have been laid.

We are indebted for material for the above description to William Hood, chief engineer; A. J. Barclay, assistant engineer, who is in charge of the work, and J. C. Christy, engineer in charge of right of way purchases.

TRAIN ACCIDENTS IN JANUARY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of January, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
1.	Great Northern	Oxford, Mont.	rc.	P. & Ft.	2	20
1.	C., B. & Q.	Judith Gap.	bc.	P. & Ft.	3	3
2.	Bost. & M.	Charlestown.	rc.	Ft. & Ft.	1	1
3.	C., M. & St.P.	Roscoe, S.D.	bc.	Ft. & Ft.	6	2
5.	Balt. & Ohio	W. Alexandria.	bc.	P. & Ft.	2	3
†5.	Ore. R.R. & N.	Cascade Locks	rc.	Ft. & Ft.	2	5
6.	Lehigh & H.	Woodruff's Gap	bc.	Ft. & Ft.	1	3
7.	L. S. & M. S.	Harbor Creek.	....	P. & Ft.	1	2
†9.	Texas & Pac.	Shreveport.	bc.	P. & Ft.	5	0
12.	Ore. Sh. Line	Arcadia.	rc.	P. & Ft.	1	3
†16.	C., M. & St. P.	Keystone.	bc.	P. & P.	2	9
16.	Ill. Central	Pinckneyville.	rc.	P. & Ft.	1	10
17.	Southern Pac.	Lemay.	xc.	P. & Ft.	3	3
17.	Denver & R. G.	Leadville.	bc.	Ft. & Ft.	2	3
23.	Mobile & Ohio.	Carroll, Tenn.	bc.	P. & Ft.	2	2
29.	L. S & M. S.	Ashtabula.	rc.	P. & P.	0	3
31.	L. S. & M. S.	Swanton, O.	rc.	P. & Ft.	1	2

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
15.	Colo. Mid.	Leadville.	unx.	Ft.	4	3
18.	Northern Pac.	Blue Grass.	b. rail.	Pass.	0	4
19.	T., St. L. & W.	Panama.	unx.	Ft.	3	0
20.	Den., N.W. & P.	Antelope.	runaway.	Ft.	3	2
22.	C.,C.,C. & St. L.	Riverside.	eq.	Pass.	5	15
25.	N. Y. Central	St. Johnsville.	neg.	Pass.	2	0
25.	Denver & R. G.	La Veta.	boiler.	Ft.	2	3
27.	Penn.	Titusville.	unx.	Ft.	4	2
27.	Caro., C. & O.	St. Paul, Va.	acc. obst.	Ft.	4	3
31.	Texas & Pac.	Jefferson.	b. rail.	Pass.	0	6

The butting collision near Roscoe, S. D., on the third, was between two trains, neither of which had the right of way, one being a freight and the other a work train. Three Bulgarian workmen were killed and 8 others were injured. The crew of the work train were engaged in clearing the track of snow. The freight was running at 15 miles an hour at the moment of the collision, and the engine of the work train was overturned. The collision was due to misunderstanding of orders on the part of the work train.

The conductor and engineman responsible for the collision at Woodruff's Gap, N. J., on the sixth were arrested and tried on a charge of manslaughter, but were acquitted. A brief account of the trial was given in the *Railway Age Gazette* of February 11, page 321. The case is of interest as being one in which lack of sleep was presented as a reason for the negligence of the men, while yet there had been no violation of the hours of labor law and apparently no intentional misuse of time on the part of the negligent engineman.

The collision at North East, Pa., on the seventh resulted in the killing of three and the injuring of 10 employees on a work train. Westbound passenger train No. 23 collided with this work train, badly damaging two of its cars. The work train was occupying the main line while the men of the crew were engaged in repairing telegraph and signal wires which had broken down in the severe sleet storm of January 5. The passenger train had run past an automatic block signal which was set against it.

The collision at Shreveport, La., on the ninth occurred on a yard track. A Texas & Pacific passenger train, No. 53, was moving backward toward the station and was met by a switching engine of the Kansas City Southern, and the leading car of the passenger train, a sleeping car, was wrecked for fully half of its length. The conductor and one passenger standing on the rear platform of this car—that is to say, on the leading end of the train—were killed, as was a trainman on the switching engine, and two other passengers were slightly injured.

In the rear collision at Ashtabula, Ohio, on the twenty-ninth, in daylight, the westbound Lake Shore Limited, which had stopped for the purpose of taking on a dining car, was run into at the rear by the following Boston & St. Louis express, and the observation car of the limited, the rear half of which was empty, was wrecked. Four sleeping cars next ahead of this were knocked off the track. Only one passenger was seriously injured, but the total number of injuries reported was: passengers 56, employees 13, other persons 14. The St. Louis express had run past distant and home automatic signals set against it.

The derailment near Leadville, Col., on the fifteenth is reported as due to the train becoming uncontrollable on a steep grade, a cause which is very familiar in the railway history of Colorado; but an officer of the road is quoted as saying that the cause was a broken rail.

The train derailed at St. Johnsville, N. Y., on the twenty-fifth was the eastbound Twentieth Century Limited express, and the engineman and fireman were killed. It occurred at 5.40 a. m. In consequence of the presence of a slower train east of St. Johnsville the signalman at that point set his switches to turn the express from track No. 1 to track No. 4, the eastbound freight track, intending to have the train run on that track to the next station; and the derailment was caused by excessive speed through the three crossover tracks. The engine was not derailed until it reached the third or last crossover, but then it was quickly overturned, and the engineman and fireman were crushed to death beneath it. Three of the cars of the train were derailed, but they were not badly damaged, nearly all of the windows remaining unbroken. As the distant signal is 3,500 ft. west of the home signal, and its light was clearly visible, being obscured by nothing except that a very light snow was falling, there is no explanation of how the engineman came to enter the crossovers at such high speed. The engineman, 35 years old, is said to have been one of the best on the division.

The train derailed near Titusville, Pa., on the twenty-seventh had one engine at the front and two at the rear, and the immediate cause of the derailment is said to have been some trouble at a switch, which ditched the leading engine; but the disastrous character of the accident is attributed to the fact that the two engines at the rear continued pushing for some seconds after the leading engine ran off the track, this overturning that engine and pushing it into a bank at the side of the road. The four men killed and the two injured were all on this leading engine.

The train derailed at Jefferson, Tex., on the thirty-first was the second section of southbound passenger train No. 3, and the wreck accurred about 4 a. m. Five passenger cars were overturned and ditched, but they were not badly wrecked, and it is said that none of the personal injuries were of a dangerous character.

The train derailed at St. Paul, Va., on the twenty-seventh was a work train moving backward. It ran into a rock which had fallen on the track. The collisions on the Boston & Maine on the second and on the Southern Pacific on the seventeenth were due to misplaced switches, and that on the Denver & Rio Grande on the seventeenth to a mistake in orders. The three persons killed in the derailment at Panama, Ill., on the nineteenth were trespassers, smothered to death in a car of grain.

Of the 11 accidents to electric cars reported in the newspapers as occurring in the United States in the month of January two were butting collisions on interurban roads, one of which is reported as causing two fatal injuries. One rear collision in New York City caused one fatal and three non-fatal injuries.

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[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained—— derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

THE ELECTRIFICATION OF TRUNK LINES.

BY L. B. POMEROY.*

It is assumed from a physical and mechanical viewpoint that electric traction can meet all the demands and requirements of railway service. Therefore, whether electricity will replace steam traction or not is entirely a commercial problem.

It may be stated at the outset that whatever system of electrification is adopted a very large outlay has to be faced, and no case for electrification can be made out unless an increase in net receipts can be secured sufficient to more than pay interest on the extra capital involved. This increase may be brought about either by decreasing the working expenses for the same service, by so modifying the service as to bring in a greater revenue, or by a combination of these.

However, there is hardly a steam road in existence to-day which does not have divisions or sections, where distinctly local traffic can be handled more profitably by light, comparatively frequent electric service, than as now, with heavy steam trains. Both steam and electric service can be operated over the same tracks without detriment or embarrassment to either. In so doing each kind of service would be appropriately handled in a manner best suited to the conditions of each.

The fundamental principle, based on the present state of the art, seems to be that if you cannot accomplish something by means of electricity that is now possible by steam traction, there is nothing to justify the change; the mere substitution of one kind of power for another merely to obtain the same result is not commercially warranted.

There are certain inherent advantages in electrical operation that have shown up very well, because the increase in business has absorbed the increased interest account, but these cases hardly apply to trunk line conditions, as the law of induced travel has no bearing on freight train operation, the principal business of trunk line roads.

In heavy work the limiting feature of the steam locomotive is the boiler, and the maximum adhesion can be utilized only at low speeds. For example, a 2-8-0 locomotive with 180,000 lbs. on the drivers has a tractive force, at 10 miles per hour, of about 40,000 lbs., or 4.5 to 1. At 30 miles per hour the tractive force becomes 13,250 lbs., or 30.2 to 1. As tractive force governs the tonnage hauled, the ability of the electric locomotive to utilize almost indefinitely power proportional to the maximum adhesion and produce a drawbar pull entirely independent of the critical speed of a steam locomotive, as limited by the boiler, is a marked feature.

In heavy grade work the ability to increase the speed shows up favorably to the electric locomotive as enlarging the capacity of a given section, but here also the business has to be sufficient to absorb the increase in fixed charges.

With steam locomotives a coal consumption, when running, of 4 to 5 lbs. per i.h.p. hour really means 6 or 7 lbs. at the rail, when the losses due to firing up, laying by in yards and sidings, blowing off at the pops and consumption of the air pumps are taken into account. Whereas, under electric operation, with an efficiency of 65 to 70 per cent. between the power house and the rail, a coal consumption of 4 lbs. per kilowatt hour at the rail can be counted on.

The writer is informed that the Metropolitan Street Railway station (1903), with a 40 per cent. load factor, produced power at the switchboard at the rate of 4.7 mills per kilowatt hour (or 3.5 mills per h.p. hour), and with a load factor of 55 per cent., which prevails in the winter time, the cost is at the rate of 4.43 and 3.3 mills, respectively. These costs cover all expenses and repairs except fixed charges. The coal consumption is 2.9 lbs. per kilowatt and 2.16 per h.p. hour.

L. B. Stillwell is authority for the statement that the Interborough is producing power at the rate of 2.6 lbs. of coal per kilowatt hour, or 3 lbs. at the drawbar.

Another authority gives the following figures for the elevated roads for cost of power, $0.005 per kilowatt hour at the switchboard, $0.0066 at the third rail shoes, or $0.0089 at the rims of the drivers. These figures are exceptional and hard to duplicate, and as the fixed charges are not included the writer would consider 1¼ cents per kilowatt hour at the rail a conservative figure, and will use this cost in the following computations.

RELATIVE COST OF COAL FOR STEAM AND ELECTRIC OPERATION.

It may be fair to assume that where average coal is used we can count on about $2.25 per ton for locomotive coal on the tender, while a much cheaper grade can be used in the power house, costing, with modern coal handling facilities, about $1.50 per ton. At this rate the relative difference in the cost of the coal at the rail would be represented by the following figures:

Electric power station $\frac{2.5 \text{ lbs.}}{50 \text{ per cent. off}} \times \$1.50 \ldots$	$7.50
Steam locomotives 7 x $2.25	15.75

or 50 per cent. in favor of electricity. The following results of the Mersey Tunnel operation are pertinent: Under electric operation one ton of coal at $2.10 yields 2.29 ton-miles at 22½ miles per hour, while with steam one ton of coal at $3.84 yields 2.21 ton-miles at 17¾ miles per hour. The difference, amounting to 55 per cent., is in favor of the electric operation.

On mountain grades or in heavy freight service, where the boiler of the freight locomotive is forced to the limit and the boilers are designed for this particular purpose, the showing is still more favorable to the electric side. Especially is this true when the steam locomotive is detained on side tracks for as long a period as it takes to make the run, which is very frequently the case, since under these conditions the cost for fuel becomes a larger proportion of the total operating expense. A 2-8-0 locomotive with 50 sq. ft. of grate surface burns 300 lbs. of coal per hour while lying on side tracks. Reports from Mallet locomotives indicate that from 600 to 800 lbs. are burned per hour under the same conditions.

The cost of a unit of power with the steam locomotive becomes relatively higher under maximum than minimum boiler demands, while with electricity the cost per unit is at a uniform rate, whether working under extreme or light power demands.

An express passenger locomotive of the Atlantic (4-4-2) type, with the following data: Cylinders, 21 by 26 in.; boiler pressure, 200 lbs. per sq. in.; weight on drivers, 102,000 lbs.; heating surface, 2,821 sq. ft.; grate surface, 50 sq. ft.; rate of combustion, 150 lbs. per sq. ft. of grate surface per hour; speed, 70 miles per hour.

$$\frac{7,500 \times 2.85 \times 20 \times 1,000}{2,000 \times 70 \times 80\% \times 5,350} = 80.71$$

Under electric conditions we have

$$\frac{20 \times 2 \times \$0.01\frac{1}{4} \times 1,000 \text{ tons}}{1,000 \text{ watts}} = \$0.50$$

or 28½ per cent. less.

These figures apply only to average conditions on an undulating profile, when coasting is occasionally possible. With the benefits of momentum grades, also, the figures would be relatively less, but the electric locomotive would respond and benefit accordingly, so that the percentages would be approximately the same.

When steam locomotives are loaded to their capacity, as is generally the case where tonnage rating is practised, the rate of combustion of 150 lbs. of coal per square foot of grate surface per hour will still hold good and remain constant, the tons hauled being the variable, responding or being modified by the speed or physical conditions of the road.

SAVINGS CLAIMED FOR ELECTRIFICATION.

In view of the foregoing the following extract from an article by C. L. De Muralt will be of interest. The figures are

*Abstract of an address before the Engineering Society of Columbia University.

from the annual report of 1903 of the roads named:

Cost of Operating Trunk Lines.

	Penn. R.R.	N. Y. Cent.
Fuel for locomotives	$6,000,135	$4,635,877
Water for locomotives	335,286	295,583
Other supplies for locomotives	382,548	334,673
Wages: Enginemen and roundhouse men	5,716,848	4,928,443
" Other trainmen	4,442,127	2,991,335
" Switchmen, flagmen and watchmen	3,900,427	2,511,552
Other expenses of conducting transportation	14,540,542	11,607,538
Repairs to locomotives	4,412,983	3,608,972
" other equipment	10,674,726	5,661,992
" roadbed	8,542,935	6,145,341
" structures	4,122,018	2,454,691
General expenses	1,858,319	1,786,494
Total	$64,928,894	$46,962,491

Mr. De Muralt then applies the figures found during the course of his investigation, which would lead to the following reductions if electricity was adopted as a motive power:

	Penn. R.R.	N. Y. Cent.
Fuel, 10 per cent.	$600,013	$463,388
Water saved entirely	335,286	295,583
Other supplies, 50 per cent.	191,274	167,336
Wages, enginemen, etc., 25 per cent.	1,429,212	1,207,361
Repairs to locomotives	2,206,492	1,804,486
Total amount saved.	$4,762,277	$3,942,154

The saving in water alone capitalized at 5 per cent. equals $6,750,000 for the former and nearly $6,000,000 for the latter road. As large as these alleged savings are, yet they would not amount to more than 2½ to 3 per cent. on the necessary increase in capital to electrify the roads on which the foregoing savings apply.

While the first cost for power stations and electric equipment represents a large outlay, yet such items as the cost for repairs of locomotives and shops, expensive hostlering at terminals, coaling and water stations, and the incidental labor charge and repairs thereto will, in the aggregate, be materially reduced. The comparative saving in repairs will be indicated by the following figures:

Repairs.	Per cent. Steam.	Per cent. Electric.
Boiler	20	0
Running gear	20	20
Machinery	30	15
Lagging and painting	12	5
Smokebox	5	0
Tender	13	0
Total	100	40

OTHER COMPARISONS BETWEEN STEAM AND ELECTRIC LOCOMOTIVES.

It is further claimed that, with electric operation, greater mileage is possible with the electric locomotive and that fewer units are necessary to perform the same service. Great stress is laid on the fact that the ordinary freight locomotive makes only 3,000 miles per month, or 100 miles per day, against which is put forward the ability of the electric locomotive to perform practically continuous service, suggesting the propriety of comparing electric and steam operation on the basis of ton-miles per annum each is able to make and also the relative weight on driving wheels and not their total weight.

The operating efficiency of a steam locomotive in freight service is so low, averaging about 3,000 miles per month, that it is generally thought due to limitations, *per se*, in the locomotive, whereas it is mainly due to operating and traffic conditions, which limitations would apply with equal force to the electric locomotives, so that, barring some increase in speed, the electric locomotive can make no greater mileage than its steam competitor in equivalent service, consequently its splendid ability to perform almost continuous service cannot be realized in practice for reasons aforesaid.

The time for which the mechanical department is responsible = 22 per cent.; the average time the locomotive is performing useful work = 28 per cent—i. e., actually pulling trains, 3,000 miles per month, 100 miles per day; while the period or balance of the time that the locomotive is under steam, with crew, and ready to go, and represents the time at terminal yards, side tracks and awaiting orders, etc. = 50 per cent.

It is just here that our electrical friends make the great mistake of claiming "greater capacity" for the electric locomotive over its steam equivalent. It is conceded that under electric conditions the 22 per cent. may be reduced as much as one-half and perhaps, owing to greater speed, the 28 per cent. may be increased, but the "lost motion" period due to traffic and operating causes will be relatively the same for both. The percentages are from an actual three months' test on a trunk line reported in 1904 in the proceedings of the American Railway Master Mechanics' Association by the committee on time service of locomotives.

The only cases where electric operation is commercially justified is in congested local passenger situations where the conditions closely approach those of a "moving sidewalk" and the records show that these cases have been profitable only when a large increase in business has been realized.

POWER STATION CAPACITY.

The impression is quite prevalent that if 100 steam locomotives are required to operate a certain division, if operated electrically, a power station capacity the equivalent of 100 locomotives would be necessary, whereas the generator capacity, barring the installation of spare units, would be of such size as to meet the average load. This average can be determined by laying down a train sheet, from which the load at any hour in the day can be seen and the peaks located.

For ordinary computations the number of trains to provide for is, approximately:

$$\frac{\text{The total train-miles per hour}}{\text{Mean speed}}$$

Consider the example of a road or division 100 miles long on which a given train requires 2,000 h.p. to keep it in motion. If 20 cars take a maximum of 100 h.p. each, the electrical conductors and distributing apparatus will never be required to deliver more than 100 h.p. at any one point. If, on the other hand, the entire traffic of the line must be concentrated in a single train, the electrical conductors and distributing apparatus must deliver the full 2,000 h.p. at each and every point. In other words, with the concentrated load, the capacity of the distributing apparatus at each and every point must be 20 times as great as the capacity when 20 cars are used to give the same total load. Electric traction has proved its superiority for distributing loads, but concentrated loads are still handled almost exclusively by steam locomotives.

SOME ADVANTAGES OF ELECTRIC LOCOMOTIVES.

With steam locomotives the most economical average speed for freight service, is 12 to 15 miles per hour, where there is ample track space for the free movement of trains. With dense traffic this free movement can only be obtained by higher speed and if the large train tonnage be maintained more horse-power is required of the engine and boiler. It difficult to increase the size of steam freight locomotives without resorting to the Mallet compound articulated type, and here we have the equivalent of two locomotives in one machine.

With the electric locomotive it is possible to develop a much greater horse-power and a large percentage of overload at the time when needed and to do it more economically than with steam. The New York Central electric locomotive has a maximum peak horse-power of 3,000, which is 25 per cent. above normal. This maximum is about double the power which can be obtained from the New York Central standard Atlantic (4-4-2) type locomotive. Similar proportions can be obtained for electric freight locomotives and their size and power are not limited by boiler capacity. If the steam locomotive is capable of developing 30,000 T. F. at the drawbar at 25 m.p.h. or

$$\frac{30{,}000 \times 12 \text{ m.p.h.}}{375} = 960 \text{ h.p.}$$

and it is required to increase the speed of the train to 60 m.p.h. and maintain the same tonnage, then 1,600 h.p. will be required, which means the employment of a much larger locomotive or double heading.

The advantage of the overload capacity on short mountain grades or for strategic peaks is one of the strong points in

favor of the electric machine and would make electric operation applicable to special cases rather than a universal substitute, in the broad light of commercial considerations.

GENERAL CONCLUSIONS.

Our conclusion, from this survey of the situation, is that the rapid development of suburban passenger traction by electricity will require large power houses at large cities, and these can gradually be made sufficient for working the line on further stretches in each direction, handling congested terminals, or used where commercially practicable, until it may be desirable to electrify the entire division.

Electric operation as compared with steam shows to greatest advantage in urban and suburban passenger service. Here, if multiple unit trains are employed, so that a considerable fraction of the total weight is carried on the driving wheels, thus permitting a high rate of acceleration to be used, a schedule speed quite impracticable in steam operation can be maintained. Moreover, a more frequent service can be given without a proportional increase in expense, while in times of light traffic small trains can be run, the energy consumption per train in such service being almost in proportion to the number of coaches. The law of induced travel, however, applies to urban and suburban passenger service, but does not hold for trunk lines and especially freight service.

TO DETERMINE WHETHER IMPROVEMENTS ARE JUSTIFIABLE.

Under trunk line conditions the only thing that interests railway managers is the traffic available at the present, relatively speaking; the future is too indefinite to be capitalized to any great degree in advance. It is more in the line of insurance companies to "capitalize expectations."

In grade revision the authorization for expenditure is based on the saving in train-miles capitalized. The following is a concrete case from a western road, or rather the summation of the engineers' report as to just what the proposed rearrangement would amount to. The rate of 50 cents per train-mile is to cover those items of cost directly affected by the change.

$$\left.\begin{matrix}\text{Number of}\\ \text{trains per}\\ \text{day—7}\end{matrix}\right\} \times \left\{1 - \frac{\text{1,350 tons present conditions}}{\text{1,600 tons proposed}}\right\} \times \left\{\begin{matrix}\text{Div. of}\\ \text{225}\\ \text{miles}\end{matrix}\right\} \times 50\text{c.} \times \left\{\begin{matrix}365\\ \\ \text{days}\end{matrix}\right\} = \$45{,}990.$$

Under the circumstances it will be seen that the value of 1 per cent. reduction in train mileage per mile per train, amounts to $1.95 per annum. The total amount capitalized at 5 per cent. equals $919,800. In some such manner the steam railway manager arranges the proposition of the electric scheme and decides accordingly.

SOME EXAMPLES.

In a paper before the American Society of Civil Engineers, by W. J. Wilgus, some interesting data concerning New York Central operation were given:

Cost of coal per 2,000 lbs. anthracite steam loco. terminal service	$4.46
" bituminous coal, road service	3.12
" bituminous coal, power station	2.72
Water per 1,000 gallons—	
Power station	13.5 cts.
Road service	5 "

The cost of current, when power station designed load is attained, is 2.6 cents per kilowatt hour delivered at contact shoes. This includes all operating and maintenance costs, interest on the electrical investment required to produce and deliver current, depreciation, taxes, insurance and transmission losses. The following table summarizes the data:

Items.	Operating costs.	Fixed charges.	Total.
Power station	0.58 cts.	0.44 cts.	1.02 cts.
Transmission losses	0.19 "	0.15 "	0.34 "
Distribution systems substations	0.32 "	0.92 "	1.24 "
Totals	1.09 cts.	1.51 cts.	2.60 cts.

In a discussion by G. R. Henderson (page 102, Vol. LXI, Trans. A. S. C. E.), are given road service costs per 1,000 car ton-miles:

	Steam.	Electric.
Supplies	$2.03	$1.37
Wages	0.28	0.31
Interest, depreciation and repairs to locomotive	0.46	0.34
Total	$2.77	$2.02

The item "Electric Supplies" is composed of operating expenses and fixed charges and may be analyzed thus:

53.3 kw. hour at $0.0109, $0.58 operation.
52.3 " " " 0.0151, 0.79 fixed charges
52.3 " " " 0.026, 1.37

$$\text{[Fixed charges} = \left\{\frac{0.79}{1.37}\right\} = 57 \text{ per cent. of operating expenses.]}$$

The brackets are ours. The difference in cost between steam and electric traction in road service is $2.77 — 2.02 = $0.75 per 1,000 car ton-miles.

The fixed charges on the power plant and the transmission system are $0.79 per 1,000 car ton-miles, or about the same as the saving, so that if the train movement were but one-half the assumed amount (averaging 6,000 horse-power at the rails, or 6,000 kilowatts at the station) the cost for electric service would be slightly higher than for steam, or $2.81 as against $2.77 per 1,000 car ton-miles.

There has just been reported the four years electric operating results of the Mersey tunnel road connecting Liverpool and Birkenhead. The net profit, allowing interest, etc., on the increased capital due to electrification, amounted to 15 per cent., but it took an increase in traffic of 55 per cent. to make this operating result possible. Ton-miles increased from 43 to 67 million, or 55 per cent. Total expenses, including interest on electric capital (but not depreciation) equal $0.586 per ton-mile. Interest equals $0.106 per ton-mile, or 22 per cent. of operating expenses.

President Harahan, of the Illinois Central, reports the results of the investigation that has been made relative to the proposed electrification in the following words:

"Our suburban traffic is the only service which would in any degree be adapted to electric operation, but even in this particular service it can be readily shown to be unjustifiable at the present time. I submit below a statement of the results which are estimated to accrue if the entire suburban service were electrified, compared with the present steam operation:

"Results of operation of suburban business at Chicago for fiscal year ending June 30, 1909:

Gross earnings		$1,056,446
Operating expenses (82.9 per cent.) plus taxes		946,734
Net revenue		$109,712
"Estimated results under electrification:		
Gross earnings		$1,056,446
Operating expenses (66 per cent.)	$697,254	
Taxes	74,427	
		$771,681
Net revenue (electric operation)		$284,765
Net revenue (steam operation)		109,712
Increase		$175,053
Estimate cost of electrification		$8,000,000
Interest and depreciation, 10 per cent.		$800,000
Saving in operation under electrification		175,003
Deficit		$624,947

"Our suburban traffic is not sufficiently dense to warrant the expense necessary to electrify these lines, and it is evident from the foregoing figures that even under electrification there would not be an increase in traffic sufficiently large to offset the annual loss from operation. It simply proves that under present conditions of cost of electrification of steam railways, where it means a replacement of a plant already installed, and serving the purpose, it is not justifiable to electrify either in whole or in part your Chicago terminal at this time."

The suburban district of the Illinois Central covers about 50 miles of road and carries in round numbers 15,000,000 suburban passengers per annum, or an average of 41,150 per day, or 1,700 per hour. An increase of 100 per cent. in earnings would not enable the road to break even.

The Boston & Albany reports the result of their study and estimates the requirements as follows: A power station of 6,000 kilowatts will be necessary, with storage batteries to handle the peak load. The total cost of the installation is estimated at $4,000,000, and the interest, taxes and depreciation at 9 per cent., or about $400,000 per annum. A stock argument for electric operation is the saving to be made in operating expenses, but concerning this the following statement is made:

"Some slight economies would accrue in the transportation expenses under this operation, which would be substantially absorbed by the additional expenses to be incurred for the maintenance of the additional apparatus installed, and the net economies would be so small as to be inappreciable in the consideration."

Another stock argument of the advocates of electric locomotives is the growth of traffic which is supposed to result from

electric operation. This argument is met as follows in the report:

"Considering now the possibilities of increasing the traffic, the statistics of the B. & A. R.R. show substantially the following number of passengers handled in the above territory per annum:

1891	4,552,918	1899	3,897,364
1894	4,799,578	1907	4,435,841

"The absence of any material increase in traffic is probably due to the fact that the circuit is occupied as a high-class residential district not susceptible of rapid subdivision of property, and more particularly to the fact that suburban lines are being rapidly extended into all such outlying districts and afford a more advantageous means of collecting and distributing local travel through the commercial and residential districts than could possibly be afforded by a railway constructed and operated upon private right of way and devoted largely to long haul operations."

EXAMPLE TO ILLUSTRATE A CONCRETE CASE.

The following illustration representing a concrete case is selected because of its elementary character, more especially as the case is so simple that all the variables affecting the comparison are eliminated and the amount of coal to perform the operation is directly known:

Conditions: Trailing load 1,600 tons; average grade, 1.3 per cent.; distance, 8 miles; speed, 15 miles per hour for electric and 14 miles per hour for steam locomotive.

(*a*) Electric

1,600 net tons
190 locomotive (2) tons
1,790 gross tons

$R =$ 1.3% grade x 20 = 26 lbs.; 5° curves. . . . . 3 "; Level . . . . . 6 "; 35 lbs.

$$\frac{\text{Gross tons} \times R \times \text{distance}}{500} = \text{kw.-hr. at the rail}$$

Substituting values:

$$\frac{1{,}790 \times 35 \times 8}{500} = 1{,}000 \text{ kw.-hr. (at rail.)}$$

Equivalent kilowatt load at power house =

$$\frac{\text{Tons} \times R \times \text{m.p.h.}}{500 \times \text{efficiency \%}}.$$

Where the efficiency between the rail and generators equals 65 per cent. substituting as before:

$$\frac{1{,}790 \times 35 \times 15}{500 \times 65\%} = 2{,}900 \text{ kw}$$

For this particular case current can be purchased from an adjacent power house at the very low rate of 1 cent per kw.-hr. at the rail.

At this rate the power cost per trip will be 1,000 kw. at 1 cent = $10.

(*b*) Under steam conditions we have the same as before, 1,000 net tons plus weight of two locomotives, 300, or 1,900 gross tons.

The coal consumption for this particular run is 6,000 lbs.

The price per ton to equal the electric cost for power is:

$$\frac{6{,}000 \times \text{price per ton}}{2{,}000} = \$10.00.$$

Transposing:

$$\frac{2{,}000 \times 10}{6{,}000} = \$3.33.$$

But as coal for this particular case costs the road $1.70 per ton, the relative cost, coal against power, is

$$\frac{6{,}000 \times \$1.70}{2{,}000} = \$5.10.$$

There is a difference in ton-mile hours, in favor of the electric locomotive, due to speed and reduced gross tonnage, as follows:

1st Electric $\frac{1{,}790 \times 8 \times 8}{15} = 7{,}640$ gross ton-mile hours.

2d Steam $\frac{1{,}900 \times 8 \times 8}{14} = 8{,}690$ gross ton-mile hours.

To make the comparison correct the coal consumption of the steam locomotive should be proportioned on the ton-mile hours produced, and the cost of coal then becomes:

$$\frac{\$5.10 \times 8{,}690}{7{,}640} = \$5.80.$$

Adding to the foregoing the other operating costs the relative expense becomes

(*a*) *Electric.* Power	$10.00
Lubrication, supplies, repairs, crew at $0.1158 per 1,000 ton-miles, or $\frac{0.1158 \times 1.790 \times 8}{1{,}000}$	1.66
Interest and depreciation, taxes, insurance, etc., at 10 per cent.	1.46
	$13.12
(*b*) *Steam.* Coal as above	$5.80
Lubrication, supplies, water, repairs, enginemen at $0.25 per 1,000 ton-miles, $\frac{\$0.25 \times 1{,}900 \times 8 \text{ miles}}{1{,}000}$ =	3.80
Interest and depreciation, 10 per cent. (2 locomotives) $\frac{\$34{,}000 \times 10\% \times 8}{365 \times 24 \times 14}$ =	0.22
	$9.82

Cost per trip in favor of steam, $3.30, or 25 per cent. less.

The idea is all too prevalent with the public, and even with some of the bodies that have been given legal power of supervision over railway companies, that any expenditure which can be forced upon the railway companies is just so much gain for the public. Never was there a more absolute fallacy. In the long run, the cost of every bit of railway improvement must be paid for by those who buy tickets and ship freight. Economy in the administration of our railways is just as important in the interest of the general public as if the railways were actually under government ownership.

THE MASSACHUSETTS-NEW HAVEN CONTROVERSY.

The report of the special commission, consisting of three state railway commissioners, the state tax commissioner and the state bank commissioner of Massachusetts, appointed to consider the relations of the New York, New Haven & Hartford to the state, has been handed in to the Massachusetts legislature. The report opens with a reference to the report made last year by the Attorney-General of the state, reciting several points at which the New Haven corporation had violated Massachusetts law and involving the merger with the Consolidated Railway Company of Connecticut and issues of stock and bonds. These violations, the commission says, raise two questions: (1) Should the New Haven company be compelled to forfeit its Massachusetts charter, and (2) if not, what action should be taken?

Expressing the emphatic opinion that forfeiture of the charter should not now be forced, the commission gives its grounds for that conclusion. It cites the large capitalization and plant of the corporation; that Massachusetts savings banks hold $25,459,600 of its bonds and notes, and Massachusetts stockholders to the number of 8,110 hold $35,544,800 of the shares; and that the corporation for thirty years reported to the Massachusetts railway commissioners its various consolidations without encountering resistance from the state, which thus, for that time, slept on its rights. Attention is called also to the facts that the New Haven company is an interstate carrier, that cutting its corporate lines at the state boundary would injure seriously the whole system, would be detrimental to stockholders of leased Massachusetts lines, and that the legalization of the new Boston Holding Company, organized specifically in the interest of the New Haven corporation, may fairly be held to be a legislative answer against the repeal of the charter.

But, if the New Haven is to continue a Massachusetts corporation, the commission argues that the state should be secured in control of such powers as do not fall within the exclusive jurisdiction of another state, and the relation should be established clearly. Past strained relations, in the commission's opinion, have been due to the exercise of privileges granted by the corporation's Connecticut charter, which, if conceded by Massachusetts, would make the New Haven a non-supervised Connecticut holding company outside of Massachusetts' jurisdiction. The New Haven company, on the contrary, ought to be under the control and supervision of the Massachusetts authorities, not only in its acts localized to that state, but its general acts as a corporation, including its general financing, though the authority of other states should be recognized as to matters in their exclusive jurisdiction.

A solution of the problem suggested by the commission is uniform legislation in the interested states, which would necessarily modify Massachusetts statutes and policy, but result in a common rule of corporate conduct. This leads the commission to a brief consideration of the policy of federal control and to the statement that President Taft's recommendations as to restriction on the issue of stocks and bonds by interstate carriers will, if enacted into law, solve some of the questions at issue.

As a final conclusion the commission says that the company, having committed acts in violation of law, should petition the Massachusetts legislature for a healing act, in accord with the

past policy of the Boston & Albany and Boston & Maine corporations. When the petition is filed the legislature should ascertain whether the outstanding obligations of the New Haven are, in the aggregate, secured by the aggregate assets. By this, the commission says, it intends no reflection on the financial soundness of the company, but it is proper for Massachusetts authorities to inquire into the financial affairs of certain of the company's subsidiary corporations. The company should bear the expense of the examination, and the tribunal having authority should select the necessary experts. The legislature will then have the fiscal facts at hand and, if it finds the obligations of the company well secured, a substantial case will have been made out for validating the company's securities. But no securities should be legalized if issued for property other than for transportation or incidental purposes. Also provision should be made for the company's exercise of franchise by appeal to authority without, in each instance, obtaining approval of the legislature. This would give the company a quick and efficient method while securing the supervisory rights of the state. But proceeds of securities to be expended outside the state should be relieved, on presentation of an affidavit, from such restriction. The matter of securing outstanding debentures of the corporation by mortgage upon its property should also be considered. But, the commission concludes, if the company continues to exercise without legislative authority franchises not recognized by Massachusetts, no course remains open other than the repeal of its charter. With effect, "both on the existing leases of the company, its bonds and stocks, and its rights with respect to the Boston Holding Company too apparent for discussion."

All five members of the special commission sign the report.

MALLET ARTICULATED COMPOUND LOCOMOTIVE FOR THE COLOMBIA NATIONAL.

The American Locomotive Company built two Mallet articulated compound locomotives with side tanks for the Colombia National Railway, one of which is shown in the accompanying illustrations.

These engines will be operated on a track of 3-ft. gage, laid with 45-lb. rails. They have a total weight in working order of 127,000 lbs., and will exert a tractive power, working compound of 23,400 lbs., which illustrates very clearly the possibilities offered in the Mallet articulated type for obtaining an engine of large hauling power within the narrow limits of axle load suitable for a light rail.

They will be used in regular road service and are designed to haul 100 long tons on a 4 per cent. grade, compensated for 22-deg. curves, at a speed of 12.5 miles per hour.

Previous to the obtaining of these locomotives, the consolidation type has been used exclusively on the Colombia National, but the Mallet articulated compound type is now being used to obtain greater hauling power.

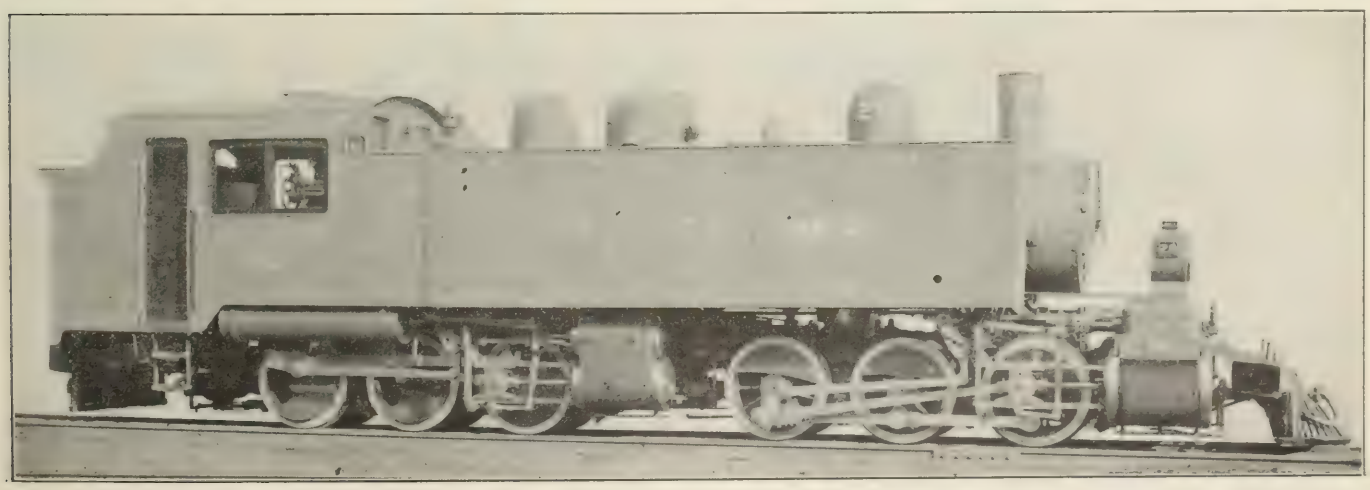
The following tabular comparison between the locomotive here illustrated and some of the consolidation type now in service on this road, built in 1907 by the same company, shows the increase in hauling power obtained with practically the same weight per wheel on the rail. In comparing the two types, it must be borne in mind that while the maximum tractive effort of the Mallet engine, working compound, is 23,400 lbs., this can be increased, in emergencies, to 28,100 lbs. by working the engine simple:

	Mallet.	Consolidation.
Type	0-6-6-0	2-8-0
Diameter cylinders	h.p.13; l.p.20½	16 in.
Stroke	20 in.	20 in.
Boiler pressure	200 lbs.	180 lbs.
Diam. driving wheels	38 in.	38 in.
Total weight	127,500 lbs.	94,000 lbs.
Weight on drivers	127,500 lbs.	85,300 lbs.
Av. load per wheel on rail	10,625 lbs.	10,660 "
Tractive effort:		
Working compound	23,400 "	.....
Working simple	28,100 "	20,600 "
Factor of adhesion	5.45	4.14
Rigid wheel base	7 ft. 8 in.	10 ft. 11 in.

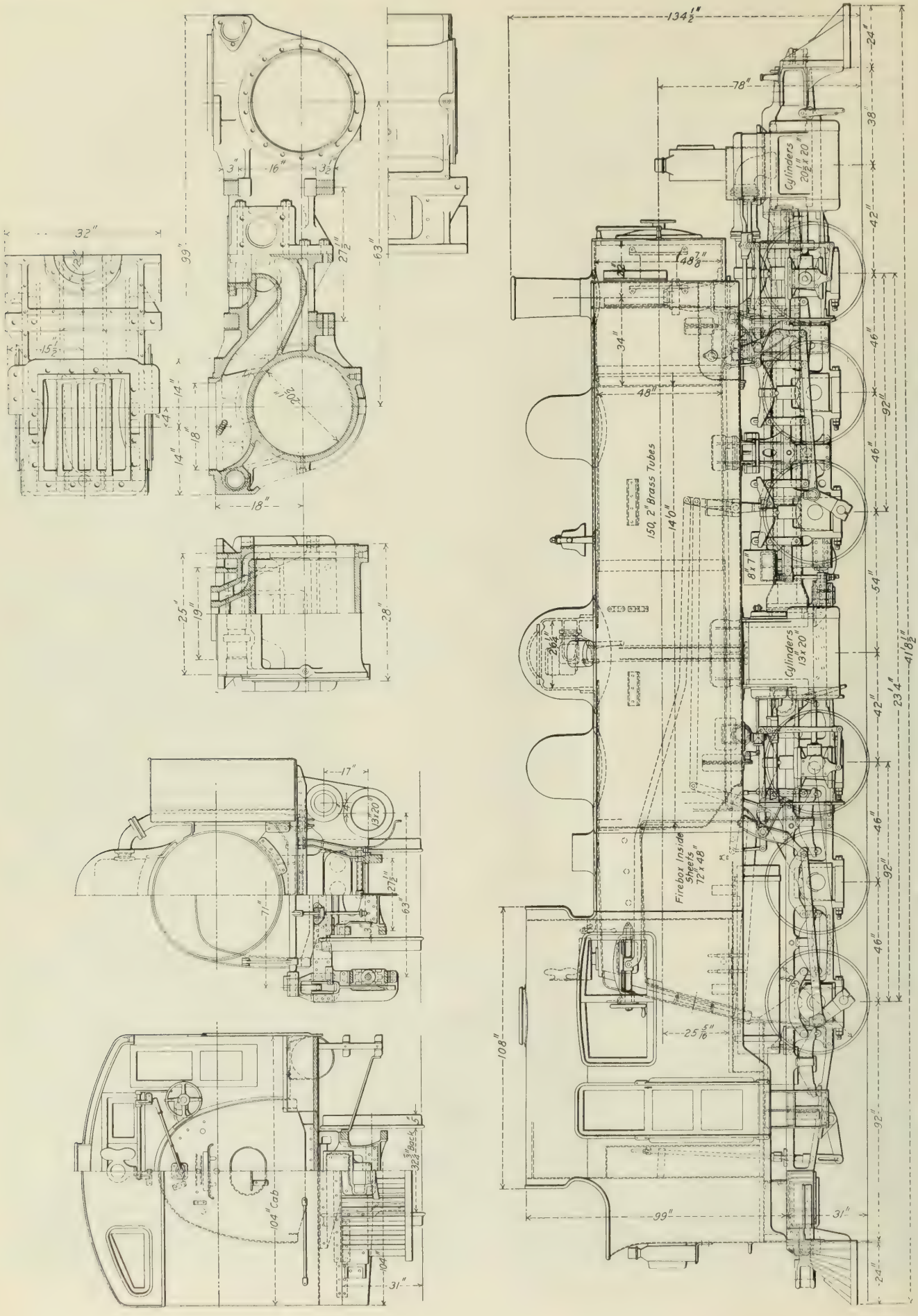
As far as the characteristic features of this type of engine are concerned, such as the arrangement of steam pipes to high pressure cylinders, design of high and low pressure cylinders, flexible receiver pipe connections between high and low pressure cylinders, and flexible exhaust connections between low pressure cylinders and the exhaust pipe in the smoke box, the engines here under consideration are miniatures of previous ones of the articulated type, constructed by the same builders.

The boiler is of the straight top radial stayed type, and is 48 in. in diameter, outside, at the first ring. It is fitted with 150 two-inch brass tubes, 14 ft. long and provides a total heating surface of 1,160 sq. ft., of which the tubes contribute 1,090 sq. ft. and the firebox the remainder. The firebox is 72 in. long and 48 in. wide, extending out over the driving wheels and provides a grate area of 24 sq. ft. The inside sheets are of copper, as are also the staybolts in the water legs, while the radial stays are of wrought iron to the builders' specifications. Wrought iron frames, 3 in. wide, are used throughout. There is a single articulated connection between the front and rear engines which is formed by a cast steel radius arm, bolted to a heavy crosstie between the lower rails of the front frames, and coupled by a vertical pin to a pocket casting secured ahead of the high pressure cylinders between the lower rails of the rear frames. The two groups are equalized together, in the usual manner, by vertical bolts fitted with ball joints, connecting the upper rails of the front frames with the lower rails of the rear frames.

That part of the weight of the boiler and tanks which is



Mallet Articulated Compound; Colombia National Railway.



Elevations, Sections and Low Pressure Cylinder Details; Colombia National Mallet.

carried on the front system is supported by a self-adjusting sliding bearing, located between the second and third pair of drivers, which normally bears all the load. There is also another sliding support, located between the first and second pair of driving wheels, which bears weight only in case of a change in alinement of the frames, due to inequalities of the track or unusual conditions.

This last support is provided with a spring centering device for bringing the front group into line after leaving a curve. Both supports are provided, as usual, with safety straps to prevent the front frames falling away from the boiler in case of derailment.

The high pressure cylinders, which are 13 in. in diameter by 20 in. in stroke, are equipped with piston valves; while the low pressure cylinders, which are 20½ in. in diameter by the same stroke, have Allen-Richardson slide valves. The Mellin system of compounding is used, the intercepting valve being located in the left high pressure cylinder casting. A wrought iron pipe with universal joints leads from this valve to the exhaust pipe in the smokebox, through which the exhaust from the high pressure cylinders is diverted to the smoke stack, when the engine is working simple.

Both sets of valves are operated by the Walschaerts valve gear, reversing being effected by a screw and hand wheel. A new and interesting arrangement of reversing mechanism has been employed. The reversing screw is connected by a reach rod to the arm on the end of the main reverse shaft, which is carried in bearings secured to the shell of the boiler a little ahead of the center of the rear driving wheels of the front group. Connected to the same arm is a reach rod, which extends back along the side of the boiler and is connected to the shaft which operates the valve gear of the high pressure engines. This shaft is carried in bearings, cast integral with the link supports. The reverse shaft, for the low pressure valve gear, is supported in a similar manner on the front frames, and the reach rod from it to the main reverse shaft extends along the center line of the engine and is connected by a double jaw, or universal joint, to a downward extending arm in the center of the main shaft. In this way, the necessary flexibility in the reversing connections is provided, so that the lateral displacement of the front group relative to the boiler when the engine is curving, does not affect the motion of the valves.

With this arrangement of reversing mechanism, the link blocks of both sets of valve gear are raised when being thrown into forward gear. As the low pressure valves have outside admission, and the high pressure valves inside admission, the eccentric crank thus follows the main pin in the first case, and leads it in the latter.

The two side tanks have a combined capacity of 1,800 Imp. gals., and the coal bunker, at the rear of the cab, has a capacity of 100 cu. ft.

The engines are equipped with Westinghouse-American automatic air brakes, operated by a 9½-in. pump. In addition to the air brakes, all four cylinders are equipped with Le Chatelier water brakes.

Some of the principal dimensions of the design are as follows:

Cylinder diameter	13 in. and 20½ in.
Piston stroke	20 "
Boiler, diameter	48 "
Steam pressure	200 lbs.
Firebox, length	72 in.
" width	48 "
" thickness, crown and back	½ "
" water space, front	4 "
" water space, sides and back	3 "
Tubes, material	Brass
" thickness	No. 12 B. & S. gage with No. 10 ends
" number	150
" diameter	2 in.
" length	14 ft.
Heating surface, firebox	70 sq. ft.
" " tubes	1,090 "
" " total	1,160 "
Grate area	24 "
Wheels, diameter, driving	38 in.
Journals, driving	6 in. x 7 in.
Wheel base, driving, each engine	7 ft. 8 in.
Wheel base, total	23 ft. 4 in.
Weight on drivers	127,500 lbs.
Tank capacity, water	1,800 Imp. gals.
Tank capacity, coal	100 cu. ft.
Tractive effort	23,400 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.45$$

$$\frac{\text{Tractive effort} \times \text{diameter drivers}}{\text{Heating surface}} = 766.55$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 48.33$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 6.03^*$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 109.91$$

$$\frac{\text{Displacement of 2 equiv. simple cyls.}}{} = 4.74$$

$$\frac{\text{Heating surface}}{\text{Displacement, 2 equiv. simple cyls.}} = 245.0$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 equiv. simple cyls.}} = 5.06$$

*Per cent.

VALUATION OF RAILWAYS IN WASHINGTON.

BY J. C. LAWRENCE.
Member Washington Railway Commission.

The method by which the Railway Commission of Washington determined the reasonableness of rates consisted of the following principal steps: (1) Finding the market value of the property used by the railways for the public convenience; (2) dividing the value of the property in accordance with the value of its use for state and interstate purposes; (3) dividing the earnings, freight and passenger, on state lines; (4) dividing the operating expenses on state lines; (5) segregating operating expenses between freight and passenger traffic; (6) dividing the operating expenses, passenger and freight, between state and interstate use; (7) reaching a conclusion as to the reasonableness of a schedule of rates.

After careful study it was determined that in order to find the market value of the railway property, it would be necessary to have the following elements:

(1.) *The original cost of construction.*—This included unit quantities, to which were added the improvements and betterments.

(2.) *Cost of reproduction new.*—This cost was secured by multiplying the construction quantities as previously determined by the prevailing unit prices of labor and materials at the date of determination, applied to every element entering into the construction and operation of the road.

(3.) *The depreciated value.*—This was secured by deducting from the cost of reproduction new such depreciation as was consequent on the use of the property.

(4.) *The amount and market value of outstanding stocks and bonds.*—With this was included a full financial history of the road showing the various sources from which the moneys for construction and improvements had been derived and how expenditures had been made.

(5). *The density of population and traffic.*

(6.) *The nature and permanency of population and traffic.*—This would show whether increasing or diminishing and, if the latter, the probable life.

(7.) *Facilities for doing business.*—This includes station facilities, terminal facilities, established industries along the line, warehouses used in connection with traffic movement, and, in general, the ability of the carrier to conduct business as a going concern.

(8.) *The physical conditions* under which the road was operated, such as grades, curvatures, fuel supply and other conditions affecting the cost of conducting transportation, and

such other conditions as would appeal to an intending purchaser.

The original cost of construction was secured from the engineering and accounting records of the railways.*

From such investigation the construction quantities were secured. The commission thus ascertained the unit quantities of material and labor. With such quantities, together with the improvements and betterments, a basis of cost of reproduction was secured without the necessity of surveys in the field further than necessary to check the quantities thus found.

COST OF REPRODUCTION.

Having secured the unit quantities of construction, the cost of reproduction new was ascertained by applying prevailing unit prices of material and labor at date of determining cost of reproduction. The cost of reproducing right-of-way and terminal was estimated on the basis of market value of adjacent property, plus the additional amount experience has shown a railway company must pay for consequential damages in securing such property. Such additional percentage of cost above the market value of the property was found to vary in different localities, and, for this reason, careful consideration was given to such varying conditions. The percentage added to market value to ascertain cost of reproduction varied from 15 per cent. in cities of high values to 1,000 per cent. in country right-of-way where the market value of land was only $2 or $3 an acre.

The unearned increment was allowed in the cost of reproduction. This may be either in the cost of construction of roadbed, structures and equipment or in the right-of-way and terminals. To fail to allow such increased value would be as unfair to the public as to the railways. Take, for instance, the terminals of an established road in an important city which were acquired at a low value, say for a million dollars; a new line is constructed and, to acquire its terminals contiguous to and of equal value to that of the established road, pays, say, $10,000,000. If the latter road were not allowed the value it paid then it would be deprived of a return on the amount actually and necessarily invested in acquiring its property, and in that way deprived of the property itself, for the value of the use of the property is in reality the property itself. If this value were allowed to the latter road and denied to the former, then traffic tributary to the one would have an advantage over the other and the construction of additional and competing roads would be discouraged.

DEPRECIATION AND APPRECIATION OF VALUE.

During the investigation a great deal of attention and study was given to the item of depreciation of value. It was estimated that the ties in a road which had been in use for a long number of years were only one-half their value new and that a similar depreciation extended to rails and rail fastenings, bridges, structures and equipment. A good deal of time and money was spent in securing this depreciated value and ascertaining the point to which such depreciation would be carried and what weight should be given to the item of depreciation in making up the market value of the property. The commission concluded that on an established road, maintained to a proper standard of efficiency, there would be no continuing depreciation; that on a newly constructed line there would be a rapid depreciation of certain elements during the first few years. This would apply particularly to ties, and, in a lesser degree, to wooden structures and equipment. On the other hand, there would be an appreciation of roadbed on a new line, due to the seasoning and hardening which follows its use, attributable, not only to settling of embankments, thus rendering the condition of the roadbed more permanent and safe, but to the necessary labor involved in raising and widening embankments, cleaning out and widening cuts, safeguarding them from slides and remedying the defects occurring in construction and the contingencies which necessarily follow. Such appreciated value of roadbed would largely offset the depreciation in the value of the other items.

The appreciated value of the roadbed was added to the estimated cost of reproduction new, and from this sum deductions were made to cover the depreciation of all other items. The depreciation of all other elements, such as ties, rails, bridges, buildings, equipment, etc. was ascertained by the method of mortality tables, the cost being multiplied by the percentage of the years in use to the life of each element. But the depreciated value of a road in profitable operation does not equal its market value. To this depreciated value must be added a sufficient amount to cover the enhanced value due to building up a successful transportation business. It is inconceivable that the value of such a business enterprise

DETAILS OF APPRAISALS OF CERTAIN RAILWAYS IN THE STATE OF WASHINGTON, MADE BY THE RAILROAD COMMISSION, AS OF JUNE 30, 1908.

Account.	Great Northern.	Northern Pacific.	Oregon R. R. & Nav. Co.	Bellingham Bay & B. C. R. R.
Engineering and superintendence	$1,077,601	$2,510,580	$363,206	$35.330
Right of way and real estate	17,105,692	32,862,872	2,248,170	931,189
Grading	14,020,087	20,085,057	3,931,280	319,138
Tunnels	4,261,200	3,143,030	129,545	.....
Bridges, Trestles and Culverts	4,210,692	7,276,348	1,415,160	86.602
Ties	1.432,200	3,117,875	828,472	91,956
Rails	3.929.480	8,904,680	2,276,879	224.918
Track fastenings	767,279	1,714,583	412,095	39.281
Frogs and Switches	82,640	233.000	67,990	10.080
Ballast	879,960	1,981,000	381,457	40,670
Track laying and surfacing	668,360	1,543,675	405,962	48.237
Fencing right of way	80,371	227,682	127,297	18,500
Crossings, Cattle guards and signs	185,774	122,232	23,899	1,063
Telegraph lines	56,622	248,835	15,129	3,486
Station buildings and fixtures	872,365	1,776,748	142,429	41,060
Shops, roundhouses and turntables	300,805	967,803	82,533	19,826
Fuel and water stations	238,200	445.503	100,438	1.254
Shop tools and machinery	181,280	353,408	23,021	23,000
Grain elevators and storage warehouses	125,200	.....	56,214	20,504
Docks and wharves	648,869	1,416,680	.....	.....
Miscellaneous structures	458,174	522,943	187,713	19,863
Legal and general expenses	307,886	502,116	107,678	10.094
Interest during construction	1,758,705	2,911,215	547,970	31,712
Stores on hand	360,904	530,667	241,335	6,378
Unclassified A. & B., June 30, 1906-8	3,002,996	.....	.....	.....
Joint work in Seattle (Accounting records)	91,591	1,535,000	.....	.....
Equipment	4,569,624	14,634,377	1,560,688	268,700
Total cost of reproduction	$61,674,557	$109,267,909	$15,676,561	$2,292,841
Original cost, Company records	$47,029,939	$85,301,693	$14,244,241	$1,739,169
Depreciated value	56,887,079	98,016,645	13,933,672	2,029,148
Market value	59,577,212	110,308,450	19,500,000	1,100,000

[The mileage of the Great Northern in Washington being 806 miles, its average market value per mile, as found by the commission, is $73,900; the mileage of the Northern Pacific in Washington being 942 miles, its average market value per mile, as found by the commission, is $106,500; and the mileage of the Oregon Railroad & Navigation Company in Washington being 501 miles, its average market value per mile, as found by the commission, is $38,900.—EDITOR.]

*The original railway commission act of Washington, passed in 1905, provided that the commission should as early as practicable ascertain the amount of money expended in the construction and equipment per mile of every railway in the state. The commission concluded that the ascertainment merely of the cost of the railways would be of little or no use in regulating rates. It decided that a valuation to meet the views of the Federal Supreme Court must take into consideration "every element that a prudent investor would consider in determining the market value of the property." It, therefore, recommended, and the legislature in 1907 passed an amendment to the commission law authorizing an appraisal based on all these elements.

The commission began carrying out the original statute before the amending act was passed. In its attempts to ascertain the original cost of the roads it was met by some with the statement that their records were incomplete,and that it was impossible to furnish even approximately complete statements regarding the original investments. The commisison hired accountants and engineers to get as nearly as might be the data desired. The results were unexpectedly satisfactory. Old papers were found in all manner of out-of-the-way places; and when the data obtained were pieced together they showed in almost complete detail the original cost of every railway in Washington. It is claimed that Washington is the first state to ascertain the original cost of its railways.—EDITOR.

under efficient management should depreciate from a market standpoint.

FACTORS AFFECTING MARKET VALUE.

The market value of the outstanding stocks and bonds is an element required to be taken into consideration by the courts. It is a question as to what extent such consideration should govern in the final result. There is seldom any actual original investment in the stocks of a railway. The funds to meet construction are usually secured from the sale of bonds. A full knowledge of the financial history of a road is important in making up a final determination of market value.

The density of population of the country tributary to a railway is a necessary factor in making up the market value. The density of population is a local condition, but an important factor bearing on the value of the property. The density of traffic is the gage of volume of business. The location of a railway with reference to the density of population is the exercise of judgment on which, other things being equal, the value of the property will be largely contingent.

The amount, permanency and class of traffic handled determines largely the earning power of the road. If the chief commodity handled is forest products coming from an area not adapted to agricultural or other use, the value of the property is low and will diminish according to the life of the traffic. This is true of any other short-lived, low-class commodity. If, on the other hand, the country served is capable of sustaining an increasing population to an indefinite period with a haul of high-class as well as low-class commodities, the property must have a correspondingly increased value.

The value of the facilities for doing business on an established road is an item of great importance. It takes years to build up the business of the carrier. On two roads of the same cost of construction, one new and the other in operation for years, all other things being equal, the older road, with its established business, with grain warehouses along its line in the agricultural communities, flouring mills, saw mills and manufacturing establishments, its perfected terminal facilities and all other facilities which enable it to do business as a going concern, makes it of far greater commercial or market value than the new line. The new road will have such facilities in course of time, but in the meantime, lacking the facilities, it will fail in doing the full volume of business, and would not be, from a business standpoint, of equal value. On a well-established road, well located, with permanent conditions as to population and traffic, such enhanced value would appear to be in excess of any degree of depreciation which would still leave the road in a degree of efficiency for economical operation with safety to the public.

PHYSICAL AND OPERATING CONDITIONS.

Consideration was given to the physical conditions under which a road is operated. If the preponderance of its tonnage movement is down grade, it is a better property than if the reverse were true; and the lower the grade and lighter the curvature, other things being equal, the more cheaply can the road be operated. Hence these are items entering into the determination of value.

Fuel supply is an important item, both as to point of supply and price paid. If a company owns directly or through a subsidiary corporation an ample supply of fuel at a convenient point, value is added to its property. Or where a road has electrified its operations over mountain grades by use of water power which it owns, cheaping and safeguarding operations, it adds to its market value. Or where the tonnage hauled down grade continues on a similar grade in another state, with valuable terminal facilities in another state, all this must be taken into consideration in fixing the market value of the property.*

From a consideration of all of these elements the market value of the property was determined. In one instance[1] it was more than 20 per cent. in excess of the estimated cost of reproduction new; in another[2] about 1 per cent. above the cost of reproduction new; in another[3] it was between the cost of reproduction new and the depreciated value; in still another instance[4] less than one-half the cost of construction new. In the latter case the only commodity of importance was forest products, one-half the life of which had passed. It is a question of the exercise of judgment in determining what a purchaser having the money to invest would pay or an owner willing to sell, but not under compulsion to sell, would take.

All the data on which the determination of the value of the property was based were put in the form of testimony, reduced to writing at the hearings held before the commission to which the roads had been cited to appear and where they did appear and were represented by their attorneys and witnesses. After the testimony was transcribed and exhibits examined, the commission made its findings of fact, which were published, showing in minute detail every item of construction, improvements, betterments, operating expenses, amount and cost of traffic movement, with its conclusions fixing the market values of the properties.

DIVISION OF VALUE, STATE AND INTERSTATE.

The next important step was the division of value of the property as thus found according to its use for state and interstate purposes. Such a division is necessary in order to determine the reasonableness of a state rate. A railway is devoted to two uses; one the conduct of interstate business; the other the conduct of state business. The state commissions have no jurisdiction over interstate rates, and the federal commission has no jurisdiction over state rates. Therefore, unless two returns are to be allowed, one return on the value of the property for state purposes and another return on the same value for interstate purposes, a division of that value must be made. To allow two returns on the same value would be unfair to the shipper. To say that the value is not capable of division is to entirely negative rate regulation by the state, or for that matter by a federal commission, unless the latter assumes jurisdiction over both state and interstate rates. The question of the division of value is difficult and abstruse. Like any question involving rate-making it cannot be understood by a novice. Little surprise, therefore, need be felt because it is a subject little understood, or that it is a subject on which there can be a difference of opinion.

The separate use to which the property is devoted can be easily ascertained. That moving entirely within the state is state business. All other business is interstate. It is, therefore, easy to distinguish between the two different classes of business. The measure of the volume of freight movement is the number of tons hauled one mile, not the tonnage hauled. The unit of measurement of freight is one ton hauled one mile; that of passenger movement one passenger hauled one mile. For convenience, and with substantial accuracy, all items connected with the movement of passenger trains were considered in connection with the passenger movement so as to leave only the two principal items of freight and passenger

* The commission found, for example, that the Northern Pacific controls the Northwestern Improvement Company, which owns large deposits of coal lands in close proximity to the summit of the Cascade mountains, from which it is hauled down grade to points of consumption at a very low cost. These circumstances enabled the Northern Pacific to get its coal for $1.85 a ton in 1906, and $2.00 a ton in 1907, whereas the Great Northern had to pay $2.70 and $2.92; the Oregon Railroad Navigation Company, $3.41 and $3.80; the Tacoma Eastern, $2.68 and $2.57; and the Bellingham Bay & British Columbia, $3.61 and $3.93. The commission held that these conditions tended to enhance the value of the Northern Pacific. In the same way the commission took into account the fact that while the large shops of the Oregon Railroad & Navigation Company, at Portland, are outside of Washington, their existence is a factor in the value of its lines in Washington.—EDITOR.

[1] Oregon Railroad & Navigation Company.

[2] Northern Pacific.

[3] Great Northern.

[4] Bellingham Bay & British Columbia.

movement to be considered. Such uses have two considerations: value and volume.

If all freight moved were of the same classification, and moved at the same cost, then the division of value as far as freight traffic is concerned would be on the volume of the movement as measured in ton-miles, or, in passenger traffic, in passenger-miles. But this is not true. State traffic of low class, such as logs and other forest products, might have little or no interstate movement. High class interstate traffic, such as silks, teas, etc., may have little or no state movement. It is difficult to compare the value of a ton-mile haul of silk with a ton-mile haul of coal, especially where one is state and the other interstate. To make an intelligent division of such value two steps are necessary.

After securing the volume of movement in ton-miles in the different classes and commodities, it is necessary, for the purpose of comparisons, to put them on an equality as to classification which largely governs the rate charged, thus making up a large item of the value of the movement. All such classes and commodities can be reduced to the basis of first-class, say under the general distance tariff, by multiplying the volume of movement of each class and commodity, state and interstate, expressed in ton-miles, by the percentage of the rate charged to the first-class rate. The result, in ton-miles, gives the movement equalized to the basis of the first-class.

If the cost of moving a ton one mile were the same on the shorter state haul, with its larger percentage of main line movement, then the result already obtained would be a sufficient basis for division. But the cost is not the same. Hence the value of a ton-mile is not the same until equalized by the relative cost of the haul.

The method of obtaining the cost of haul is to multiply the ton-mile product obtained by the relative cost of the state to the interstate haul in the different classes and commodities. This gives the ton-miles equalized both as to the classification and cost of haul, and must therefore represent the relative value of the use. It is necessary to keep the ton-miles in the different classes and commodities separate until consideration is given to the relative cost of the haul, as the cost varies in each class and commodity for the reasons given in the paragraph devoted to the cost of traffic movement. The same process applies to a consideration of the passenger traffic.

This method of division is illustrated by the table taken for one of the roads in Washington.

There is necessarily a great deal of labor attached to this method of division, as the ton-mile movement, percentage of rate to first class and relative cost of service must be obtained. After the above table was prepared and the division made, it was found that the ton-miles hauled, state and interstate, multiplied by the average rate, multiplied by the average cost, gave substantially the same result. This method could be used with substantial accuracy and greatly lessened the labor and expense in making the division. The latter items are easily obtainable. The table will serve, however, to explain the method of division used by the commission, although the result might be reached in the other way.

The division of operating expenses on state lines is not so difficult, as railways usually keep their operating expenses by operating divisions, and this divided between main line and branch line, and the expenses or money expended under or by direction of the division superintendent is charged direct to the operating expenses of each division. Such expenses include nearly all amounts expended for "Maintenance of Way and Structures," "Transportation" and "Repairs and Renewals of Equipment." Any item of expense that cannot be allocated to a division, such as "General Office Expense," etc., is apportioned on an arbitrary basis, usually the same on all roads, and where a difference exists the final result in dollars is not materially changed.

	Ton-miles handled.		Percentage of rate to first-class.		Product of ton-miles by percentage of rate		Relative cost of ton-mile haul.		Product of ton-miles as equalized by relative cost.	
	State.	Interstate.	State.	Interstate.	State.	Interstate.	State.	Interstate.	State.	Interstate.
Less carloads	1,031,474	1,546,384	.471	.420	485,824	649,481	3.9423	1.00	1,915,263	649,481
Grain	12,711,744	1,664,937	.147	.117	1,868,626	194,798	.8820	1.00	1,648,128	194,798
Lumber	2,123,708	34,851,693	.121	.109	256,969	3,798,835	1.4499	1.00	372,579	3,798,835
Logs, etc.	1,159,634	341,097	.056	.075	64,950	25,582	1.6635	1.00	108,028	25,582
Coal	442,144	928,624	.112	.055	49,520	51,074	1.8235	1.00	90,300	51,074
First class	30,568	680,769	.373	.272	11,402	185,169	1.2065	1.00	13,757	185,169
Second class	3,886	243,776	.343	.313	1,333	76,302	1.2065	1.00	1,608	76,302
Third class	99,474	1,668,514	.204	.398	20,293	664,069	1.2065	1.00	24,484	664,069
Fourth class	226,408	404,488	.390	.250	88,299	101,122	1.2065	1.00	106,533	101,122
Fifth class	576,281	5,732,289	.213	.140	122,748	802,520	1.2065	1.00	148,095	802,520
A	96,724	3,359,668	.213	.140	20,602	470,354	1.4287	1.00	29,434	470,354
A	110,068	1,309,627	.288	.261	31,700	341,813	1.2065	1.00	38,246	341,813
B	38,625	546,685	.288	.261	11,124	142,685	1.8258	1.00	20,310	142,685
C	45,592	227,525	.265	.263	12,082	59,839	1.2065	1.00	14,577	59,839
D	5,699	111,957	.140	.164	798	18,361	1.2065	1.00	963	18,361
D	498,303	2,807,675	.122	.110	60,793	308,844	1.2065	1.00	73,347	308,844
E	97,506	653,950	.122	.110	11,896	71,935	1.3836	1.00	16,459	71,935
E	336,732	213,426	.078	.068	26,265	14,513	1.2065	1.00	31,689	14,513
	424,609	97,163	.078	.068	33,120	6,607	1.8574	1.00	61,517	6,607
Total									4,715,317	7,983,903
Per cent.									37.13	62.87

	Passenger miles.		Rate per mile.		Percentage cost per mile.			
	State.	Interstate.	State.	Interstate.	State.	Interstate.	State.	Interstate.
	41,733,908	21,145,473	.028863	.028107	.8781	1.00	1,057,729	594,336
Per cent.							64.02	35.98

Total freight earnings were 70.83 per cent. and total passenger earnings were 29.17 per cent.

Hence: State freight..... .3713 x .7083 = .2630 } 44.97 per cent. state.
State passenger... .6402 x .2917 = .1867 }
Interstate freight. .6287 x .7083 = .4453 } 55.03 per cent. interstate.
Interstate pass'gr. .3598 x .2917 = .1050 }

In order to arrive at the operating expense by state lines, the formula for apportioning to operating divisions is applied, and the boundaries of the state become the limit of the division, except that the "terminal" and "assembly expense" are apportioned to one-half the entire interstate haul and prorated in the state on a straight ton mileage basis.

The earnings on state business are easily ascertained, but the interstate earnings must be assigned to the state.

Having divided the operating expense between state and interstate in the manner heretofore given, the earnings from interstate business can be divided on a straight ton-mileage prorate.

Several methods of dividing the operating expenses between freight and passenger business have been used. A careful examination of the various methods when applied to the same conditions shows a variation of only about 1 per cent. between all of them. The method used by the Railroad Commission of Washington was the simplest of all. Assume that the cost of movement of two average empty freight cars equals the cost of movement of one average loaded freight car, and of two average loaded freight cars equals the cost of movement of one average passenger car. Then reduce the

freight car mileage to the basis of the movement of a passenger car, and compare the mileage thus obtained with the passenger car mileage. The division of operating expenses as thus made was compared with the method of division adopted by the Minnesota commission, with a difference of result of only about three-fourths of 1 per cent.

The division of operating expenses between state and interstate business was made as follows:

The average cost of moving the net and gross ton-miles was ascertained. Then a careful study was given to the relative cost of movement of the various classes and commodities. The aid of an experienced railway accountant and traffic man was secured for this purpose. In order to form an intelligent judgment, attention was given to the average distance each class and principal commodity was hauled, the net weight of the contents of the car, the empty car movement connected with each haul, the manner of movement, whether in train loads or smaller shipments, whether moving continuously or for a short time; the place of movement, whether over branch line with heavy cost of operation, or cheaply operated main line, with percentage of haul on each, and the cost of moving an average gross and net ton over the branch lines and main line in each division. By procuring the average distance the average net ton is hauled, the average net weight of the contents of the car carrying same, the proportion moving over branch and main line on the different divisions, a basis of comparison was obtained. It was found that the cost of moving the average ton one mile was several times greater on the branch line than on the main line in certain instances. This was due to the physical conditions of grade and curvature, empty car movement, assembly charges chargeable to branch line operation, the smaller initial movement on branch lines, as compared with full train tonnage on main line haul, and other reasons, varying with specific instances.

The data for such determination was obtained from the received abstracts and settlement sheets with connecting lines in the office of the general auditor, showing all freight moving to and from each station in the state, the total length of haul, proportion within and without the state, the class and commodity, the position of the line by divisions and branches such freight passed over, all as to freight forwarded and received and freight passing entirely through the state. From such data was obtained the percentage which the ton-mile of each class and commodity, state and interstate, bore to the total ton-miles hauled, the average distance hauled, state and interstate, the distance interstate freight was handled within and without the state, the relation of branch line to main line haul, and, in short, every element of fact connected with the movement of each class and commodity which the commission felt should be considered in estimating the relative cost of movement.

With information showing the distance the average ton of freight moved, state and interstate, the average net tons per car, that the ton-miles were made up of a given percentage of lumber, of grain, of logs and other forest products, or iron and and steel articles, of coal and similar information as to each commodity making up the total ton-miles hauled; the percentage of the empty car mileage to the total car mileage, the percentage of the empty car mileage connected with the haul of each commodity to the total car mileage, etc., the commission was able to determine the relative cost of movement of each class and commodity compared with the cost of moving the average net ton-mile. The commission did not adopt a theory for dividing operating expenses, state and interstate, but made the division on facts applicable to each particular case.

The cost of freight and passenger movement having been previously segregated, the cost of passenger operation, state and interstate, was divided in proportion to the state and interstate passenger miles. This was considered equitable, for the reason that there were no through interstate trains operated in this state, all passenger trains handling both state and interstate passengers.

DETERMINATION OF REASONABLENESS OF RATES.

The determination of the reasonableness of rates is a condition to be drawn from the facts found and enumerated. That portion of the value of the property found to be devoted to state use was regarded as the capitalization on which the company was entitled to earn a reasonable return. The amount of such returns was not definitely fixed, but assumed at 7 per cent. To this was added that portion of operating expenses chargeable to state traffic. This amount was deducted from the earnings on state traffic, the remainder showing the excess over what was determined to be reasonable earnings. On final analysis the result was only approximate.

The period of investigation covered an average of five years. Such period is too short to include all possible or probable contingencies. Allowance must be made to cover the unusual, the extraordinary conditions. The period of investigation was that of unusual prosperity. It is necessary to take into consideration the lean years as well as the fat—periods of depression as well as periods of prosperity. Rates cannot be increased during hard times to meet operating expenses and fixed charges. It is only the part of prudence and good business judgment to lay up a surplus in prosperous times to meet the contingencies, not only of decreased traffic, but increasing operating expenses. It is hard to fix a rule by which this may be done. It is a question of the exercise of sound business judgment. The state cannot limit the earning power of the railway to a fixed amount one year and leave it without funds to pay the operating expenses and fixed charges of the ensuing year. The right to earn a reasonable return on the value of the property means a right to such return each year. A year of deficits must be provided for by a surplus from prosperous periods. Such surplus should not eventually exceed the deficits. Allowance must be made, too, for the perfection of roadbed and equipment. Such expenditures which might not reasonably be required during construction period must be met out of earnings. The earnings of a railway are measured by the rates charged.

COST OF SERVICE AND VALUE OF SERVICE.

The considerations enumerated apply to a schedule of rates, not to a particular rate. The former may be measured, or approximated, from the considerations given, but in making up a particular rate many other items must be considered, so that the cost of performing the particular service is only one of many elements considered in the making of a particular rate. The failure to make this distinction has led to a great deal of controversy on the subject of rate regulation. The theory of cost of service applies to a consideration of an entire schedule of rates with due allowance for contingencies. The application of this theory to the making of particular rates may prove entirely impracticable. The making of such rates calls into use the best judgment and matured experience of traffic men. The inter-relation of the complex system of rates in effect on a given road requires a thorough knowledge to master, and cannot be properly regulated without the exercise of the same knowledge and judgment as possessed by the men who are charged with making them.

If an entire schedule of rates shows earnings in excess of reasonable requirements, after allowing for all contingencies mentioned, then a reduction in rates is due. Such reduction would have to be apportioned among the different classes and commodities. To make such a distribution of reduction requires the exercise of the greatest care and judgment. The commission must investigate the entire fabric of rates so as to give an intelligent consideration before taking action. Business thrives on fixed conditions. A fluctuation of rates tends to disorganize business. The railways are entitled to reasonable returns and the public is entitled to pay no more than fair rates. From the very nature of the business, in the

variation of the amount of traffic and fluctuating conditions from year to year, there will necessarily be a fluctuation in the net revenues of a railway company.

An attempt to make a new regulation with each increase in net returns would be disastrous to business conditions. When the commission has made a determination of the reasonableness of a schedule of rates which effects a reduction in rates, that reduction should be promptly apportioned to the various classes of traffic and then a reasonable period of time should follow before a re-determination is attempted. What that period of time is the Washington commission has not attempted to say. An average period of five years on a railway in existence 15 years is a short period of time. A period of 15 years would not cover the extraordinary contingencies likely to arise either in the amount of the traffic or cost of conducting transportation. It will be long years before the time comes that conditions have become so fixed that such contingencies should not be allowed for.

In the final conclusion reached by the Railroad Commission of Washington, a reduction in grain rates approximating $750,000 per annum on the railways in Washington was made. Consequent reduction in the adjoining states, owing to the inter-relation of rates, increased this amount to about $1,250,000 per annum. These rates became effective November 1, 1909. From the findings of facts by the commission, as previously explained, no appeal was taken by any of the railways affected, and the decision of the commission, under the laws of Washington, became final. On the final order making a reduction in rates named, no appeal was filed by any of the railways, and the reduction became effective as stated.

UNIT SYSTEM OF ORGANIZATION ON CENTRAL SOUTH AFRICAN RAILWAYS.

A unit system of organization very similar to the Hine system has been established on the Central South African Railways (Transvaal and Orange River colonies) as a result of a report by the Colonial Railway Commission. The *South African Railway Magazine* for September says:

"The principal alteration has been the amalgamation of the traffic, locomotive running and maintenance engineering departments, which were formerly controlled and worked under the departmental system, into the transportation department, administered under what is known as the divisional system.

"The traffic and locomotive running departments were amalgamated in May, 1908, and further amalgamated with the maintenance engineering, open lines, in May, 1909. To provide for the new conditions of working, a scheme of organization which has been introduced embraces all the principles of the divisional system, and modified slightly so as best to suit the local requirements of South Africa. Titles such as assistant chief engineer, personal assistant, traffic manager, assistant traffic manager, locomotive superintendent, assistant locomotive superintendent, resident engineer and district engineer, previously in use on the C. S. A. R., have been abolished, and the principal officers are now uniformly styled superintendents or assistant superintendents.

"The organization, as is stated, has been designed to facilitate and afford opportunity by the principal executive officers of the railway to acquire an all-round knowledge and training; to develop the best ability of the staff; to encourage officers to assume responsibility for their actions, and to give each superintendent or assistant superintendent a common interest in the whole of the working of the transportation department.

"Railway working under the departmental system where the traffic manager is concerned only with the conveyance of passengers and goods, the locomotive superintendent with the running of engines, and the district engineer with the maintenance of the line, is being gradually altered despite the conservative policy of many railway officers.

"Under the divisional transportation system, each divisional officer becomes a general manager (in miniature) of his section; he carries the responsibility of the complete working of his unit, and both he and the officers associated with him have the interests of the whole division placed under their combined care. At headquarters (Johannesburg) each superintendent or assistant superintendent is responsible direct to the assistant general manager (designated general manager or general superintendent on other railways) for the particular section of work delegated to him.

"The professional and technical officers are as far as practicable relieved from office detail in order that they may devote the major portion of their time to their legitimate professional and technical duties. The correspondence is mainly conducted in the commercial and administrative branch, under the control of the superintendents responsible for the particular section of work concerned. Separate files of correspondence are abolished, and such matters and correspondence as the professional and technical officers concerned should see or be consulted upon are referred to them by personal consultation or endorsement on the file for advice or decision.

"The policy of decentralizing authority in one large office by placing specific responsibility on certain appointed officers directly responsible to the head of the department has been applied successfully for some years in the traffic department of the Central South African Railways, under the departmental system of working, and the further combination of offices at headquarters, with consequent reduction in the number of supervising officers from 24 to 11, has manifested clearly the wisdom of extending the principle.

"Uniformity of policy on the several districts is achieved by the central authority, and by frequent meetings of the controlling staff.

"Under the proposed scheme, one of the objects in view has apparently been to cut out red tape and eliminate as much as practicable management by office deputy or chief clerk.

"The organization of the transportation department on most of the American railways covers the movement of traffic (operating) and maintenance of the line only. The commercial work of the railway is usually performed by an entirely different department, termed the 'traffic' department, responsible for the development of traffic and for the tariffs, fares and generaliy for the commercial advancement of the railway. In the organization adopted on the Central South African Railways, the commercial and administrative work is controlled from the same office. The great necessity for adopting in South Africa a scheme of the kind outlined has been apparent for some time. The main characteristics of this country require treatment different to the working in America, with its vast population and the largest transport of traffic in the world. South Africa has an enormous but thinly populated territory, in which railways occupy an important part in the development of the country, and the only traffic which corresponds in any way to the larger railway systems of the world—and even then the traffic is comparatively small—lies in the industrial center of the gold-mining area, and at Capetown and Durban in their suburban traffic. With these main exceptions the traffic is dealt with on a single line of railway, and the administration cannot be divided into the several administrative positions followed by other administrations in the shape of departments for passengers, goods, mineral, operating and other similar divisions, having due regard to economy, but provision has been made in the system for these changes as and when expansion of work renders it expedient.

"It is thought that the present organization will result in greater efficiency, while the reduction in the working costs under the transportation system is estimated to be not less than $1,250,000.

"The organization is such as to be capable of extension to the whole of the railways of South Africa, covering nearly 8,000 miles, when unified under the provision of the act for the Union of South Africa, to be controlled by a board of three commissioners and a cabinet minister as chairman."

General News Section.

The Boston & Maine has made an increase of 10 per cent. in the wages of 470 clerks employed in the general offices at Boston.

John F. McNamee, editor of the *Firemen's Magazine*, is going to establish a school in Indianapolis for instructing engineers and firemen.

The Governor of Ohio has revoked the commission of Oscar Rickey, a railway detective, on complaint of citizens that he was guilty of cruel treatment of persons arrested.

A press despatch from Cincinnati says that the Cincinnati, New Orleans & Texas Pacific has made a new agreement with its telegraphers, by which there will be an increase of about 10 per cent. in wages.

The Chicago & North Western has just taken title to the land which has been bought within the past few years to make up the site of its new terminal passenger station in Chicago; and the gross amount paid was $9,537,890.68.

The Louisville & Nashville contemplates using telephones for train despatching on its Knoxville division. It already has this system in operation on the New Orleans & Mobile division, 140 miles, and on its Cincinnati & Louisville division, 110 miles.

An officer of the Delaware, Lackawanna & Western says that his company is going to buy and establish experimental farms, following the example of the New York Central. The company will be willing to turn the farms over to the New York State Department of Agriculture.

About 30 suits have been filed by the railways of Indiana contesting the validity of the order issued by the State Railway Commission requiring them to equip their locomotives with headlights of not less than 1,500 candle-power. Governor Marshall has decided to back the commission in its defense of the suits, which means that the Governor will draw on his contingent fund to help pay special attorneys to assist in the defense.

The legislature of Massachusetts has before it a bill to require an annual tax of $300 on each railway dining car on which liquor is sold. At a hearing before the legislative committee last week the representative of the New York, New Haven & Hartford said that the profits enjoyed by that company from the sale of liquor on its 13 dining cars amount to 85 cents a day. If a high license should be imposed the company would simply abolish the sale of liquor on the cars.

The Rock Island and the St. Louis & San Francisco have arranged for segregation of their coal properties. The Consolidated Indiana Coal Company, controlled by the Rock Island, has taken over the sale of its own output, which has been handled by the Brazil Block Coal Company, controlled by the Chicago & Eastern Illinois. The following officers of the Consoidated company have been elected. President, H. U. Mudge; vice-president, Carl Scholz; comptroller, F. Nay; treasurer, G. H. Crosby. All are officers of the Rock Island.

According to a press despatch from Guadalajara, Mex., James A. Cook, an American, a conductor of a freight train on the National Railway, must go to prison on a sentence of two years and six months, because freight was stolen repeatedly from cars on his train. The reports indicate that the freight was stolen by the Mexican brakemen and that Cook did not participate in the robberies, but he was held, nevertheless on a charge of criminal negligence. It is said that it will be possible for a prisoner in a case like this to get his sentence reduced one-half.

The Mackay companies have decided to sell their holdings of American Telephone & Telegraph stock, amounting to $8,200,000. In a statement given out by the company it is said that this policy has been adopted because after the recent purchase of control of Western Union by the American Telephone & Telegraph, public opinion has viewed with suspicion the relation between the Postal Telegraph Co., which is controlled by the Mackay companies, and the Western Union, and therefore the Mackay companies will divest themselves of all interest in the Western Union. The Postal Telegraph Co. will continue to be operated as an independent company.

The Interborough Rapid Transit Company, operating the subway and elevated railways in Manhattan and The Bronx, New York City, including also a line to Flatbush avenue, Brooklyn, reports that during the year ending December 31 last the total number of passengers carried was 543,172,774, which is about 48 millions more than in the preceding year. The gross revenue was $27,963,376, or about two and one-half millions more than in the year preceding; operating expenses, $10,759,738, a decrease of about $110,000; net operating revenue, $17,203,638; taxes, $1,692,651; other income, $737,689; total income, $16,248,676, an increase of $2,351,698 over the preceding year. The deductions are: $10,468,035 for interest, rent, etc., and $3,150,000 for dividends; surplus for the year, $2,630,641; surplus preceding year, $538,447.

Representatives of railway brotherhoods say that questions of increase of pay will not be pressed on the eastern railways generally until it is seen what can be done with the Baltimore & Ohio, with which negotiations are now going on. It is the purpose of the brotherhoods to secure as high rates of pay in the East as in the West, and the Baltimore & Ohio is a good road on which to begin the campaign because a number of the wage schedules on that road are already on the western basis. A statement is published showing the pay of through freight conductors and brakemen per 100 miles on five prominent roads, as follows:

	Conductors.	Brakemen.
Baltimore & Ohio	$3.465	$2.31
Cleve., Cin., Chic. & St. Louis	3.25	2.20
Lake Shore	3.20	2.20
Delaware, Lackawanna & Western	3.20	2.20
New York Central	3.00	2.15

At the office of the New York State Public Service Commission last week, Thursday, 50 representatives of the Brotherhood of Locomotive Engineers called on the commissioners and conferred with them. The report of the conference indicates that an exchange of compliments was the principal thing done, but the engineers presented a few "criticisms" of railway practice in the state. One of these was to the effect that signal lights were not always bright enough, and the commission promised to investigate the subject. It was declared that the elevated roads in New York City were insufficiently signaled, and the chairman of the commission said that he would refer the matter to the commission having authority in that district. Complaint was made that on certain roads the number of tail lights on freight trains has been reduced from four to three. The engineers spoke in favor of the 16-hour labor law—that passed by Congress and that passed by the legislature of New York being substantially alike—and said that runs ought to be arranged so that an engineer would not have to rest at unpleasant places remote from his home. The degree of safety to be attained in the operation of engines with defective parts was discussed.

Prospective Surpluses for Dividends.

Estimates of the surplus earnings of the principal railways of the country during the calendar year 1909 bring to light some surprising results. Balances applicable to dividends on common stocks have in some cases dwindled to even lower figures than those of the year of depression, 1908, while in other cases the year was one of notably good profits.

The former conditions, that of unsatisfactory earnings on stock, applies chiefly to roads which have been issuing large amounts of new stock, representing construction and other investment not yet fully productive. Improved financial returns are evident in a few cases in which the railways concerned were most critically affected by the financial conditions succeeding the end of 1907. Erie and Wabash are instances in point.

Below are given the actual earnings and the closely esti-

mated surpluses for common dididends of twenty railways whose securities are actively traded in on the Stock Exchange:

	Gross earnings.	Surplus for common divs.	Earn'gs on stock, per cent.
Atlantic Coast Line	$27,892,100	$5,835,000	11.6
Atchison	100,001,000	16,792,000	10.3
Baltimore & Ohio	78,149,250	12,290,000	8.0
Chesapeake & Ohio	28,882,500	5,154,500	8.2
Chic., Mil. & St. Paul	61,300,000	5,430,700	4.7
Delaware & Hudson	23,398,500	5,180,000	12.2
Denver & Rio Grande	22,332,000	711,600	1.8
Erie	52,819,700	1,844,000	1.6
Great Northern	57,780,400	19,145,000	9.1
Illinois Central	58,962,300	7,600,000	6.9
Louisville & Nashville	47,925,500	10,500,000	17.0
Missouri Pacific	49,411,000	2,832,000	3.5
New York Central	93,171,000	14,000,000	7.8
New Haven	57,778,000	11,292,000	11.2
Northern Pacific	70,778,200	21,135,000	8.6
Pennsylvania	153,565,000	24,100,000	10.5
Southern Railway	54,893,200	1,550,000	1.3
Southern Pacific	127,692,700	31,500,000	11.5
Union Pacific	83,961,200	39,500,000	18.2
Wabash	27,432,000	900,000	*2.2

*On preferred, which is entitled to 7 per cent.

Some of these figures require explanation. Thus, 10 per cent. on Atchison looks small, but this figure is based on $163,000,000 common stock, the amount now outstanding. On $125,000,000 stock, which is about the average amount outstanding during 1909, the balance over preferred dividends would be equal to 13 per cent.

St. Paul's balance, too, looks incredibly small, but it is figured on all the increased amount of stock now outstanding. It takes in earnings of the Puget Sound road, to finance which the new stock was issued, for only six months, and most of that period before the extension had had time to develop traffic or get itself shaken down to smooth operation.

The New Haven percentage is based on $100,000,000 stock, the amount outstanding in the hands of the public most of the year. There is $21,000,000 more of the stock in the treasury of the New England Navigation Co., or was, at last official accounts, but if dividends are paid on this stock, the money will sooner or later find its way back into the New Haven treasury.

Union Pacific's percentage, 18.2 per cent., is based on $216,500,000 common stock outstanding January 1 last. As is known, the road is earning and receiving from its investments the equivalent of considerably more than that rate now. An official income account for the first five months of the fiscal year, those ended November 30, 1909, showed 23 per cent. on the present volume of common stock.—*Wall Street Journal.*

The International Railway Congress.

Delegates to the International Railway Congress, Eighth Session, to be held at Berne, Switzerland, July 3-16, have been appointed by about 60 American railway companies. The six delegates appointed by the United States government are: Franklin K. Lane, of California, Interstate Commerce Commissioner; Edgar E. Clark, of Iowa, Interstate Commerce Commissioner; Fairfax Harrison, vice-president, Southern Railway Company; W. A. Garrett, formerly general manager, Seaboard Air Line; J. A. Brown, vice-president of the Railway Equipment and Publication Company; Colonel H. S. Haines, formerly president of the American Railway Association.

Education for Railway Service.

The Bureau of Education, Department of the Interior, at Washington, has issued a pamphlet of 159 pages on "Education for Efficiency in Railroad Service," by J. Shirley Eaton, which forms a compendium of information on the subject named which is quite unique. The author has carefully gathered up the salient features of all of the important enterprises of this kind that are to be found on American railways, including the elaborate plan which has recently been put in force on the Union and Southern Pacific under the direction of Mr. Athearn, and with which the readers of the *Railway Age Gazette* are familiar.

Mr. Eaton opens with 20 or 30 pages of introduction and philosophy, and then gives synopses of the curricula and methods of the principal railway educational enterprises. He tells of the apprenticeship systems in the mechanical departments of the New York Central, the Pennsylvania, the Atchison and other roads, and of the Elmira Telegraph School, fostered by the Erie. Notice is given of the work of McGill University, Purdue, Cornell and Chicago Universities, the University of Illinois and Dartmouth College. The plans and methods of the International Correspondence School and of the School of Railway Signaling are set forth. In addition to these and other chapters, dealing somewhat in detail with each institution, there is at the end a tabular summary, filling 10 pages, in which the main points are given concerning every railway apprenticeship system that was heard from. Sixty-seven railways are represented in this table.

A notice of this book will be found on the editorial page, and below we give the conclusions with which Mr. Eaton sums up his work.

Railway financial managements should incorporate an educational scheme as a definite part of their policy, on the ground of business prudence. Such policies should be inaugurated for periods of not less than five years, preferably ten; otherwise the money appropriated will be largely wasted.

Railways should extend the principles of definite apprenticeship to every department of the service, and should provide for two or more grades of apprentices in order to take account of differences in capacity and work done elsewhere, either in properly accredited schools or by experience, and leading to different grades of service.

There should be formal provision for movement among departments under proper conditions, and the comity of railways should be so far extended as formally to provide for some interchange of officials under special restrictions.

In executing the policy of education announced by the directors, there should be a superintendent of education reporting directly to a higher official, such superintendent to be thoroughly informed of the educational policy of the railway and the broad considerations on which it rests. His department should systematically recruit the employees throughout the service and certify on request to their records and general efficiency in the early stages of promotion.

Efficiency should be recognized by an efficiency wage, stated distinctly apart from the seniority wage.

Employees should be encouraged to take outside courses of instruction or experience without forfeiting their tenure, and, so far as possible, the educational department should systematically turn to account every outside educational agency by suggesting courses, uniting in co-operative courses and recognizing the work done in these courses, to the end that theory and practice be joined.

The educational opportunities of the service should be utilized to the utmost by encouragement of perfect freedom of study and criticism and interchange of ideas concerning accidents, bad work and all the details of practice. Annual or semi-annual meetings of employees by classes of work and the preparation and circularization of papers and discussions should be a feature.

The time will come when railway employ for every man in the service will not mean drudgery, nor sinecure, nor accidental opportunity, but an enlightened, stimulating, highly efficient service of highest earning power, least uncertainty from accidental causes, largest freedom for individual initiative, entire self-respect and thoroughly democratic spirit.

Arbitration of Demands of Chicago Switchmen.

The railways in the Chicago switching district and representatives of the Brotherhood of Railway Trainmen have agreed to arbitrate their differences before the Illinois Board of Arbitration. This agreement involved a very substantial concession by the railways. The general managers originally proposed arbitration under the Erdman act. The employees made a counter proposal of arbitration before the Illinois board. The railways at first rejected but later accepted this proposition. Their reason for hesitating to accept it was that B. F. Shadley, chairman of the board, is a member of the Brotherhood of Railway Trainmen. Besides Mr. Shadley the board is composed of Harry M. Powell, editor of the *Peoria Star*, and Charles Piez, president of the Link Belt Machinery Company of Chicago. As a result of conferences

subsequent to those referred to in our issue of last week, page 322, the number of questions to be arbitrated has been reduced to three. These are the demands of employees (1) that they be given an increase in wages of 5 cents an hour, which would make the pay of yard conductors 40 cents an hour for day work and 42 cents an hour for night work, and that of brakemen 37 cents an hour for day work and 39 cents an hour for night work; (2) that overtime shall be paid for at the rate of time and a half, and any switchman who works a fraction of an hour shall be paid for a full hour's work, and (3) that yard men taken out of the service shall be given a hearing within three days, and if the hearing is delayed longer than this he shall receive regular pay for the additional time.

Steel Passenger Cars on the Pennsylvania.

The Pennsylvania Railroad now has in service on its passenger trains 324 steel cars, and the illustration given herewith is from a photograph of the first complete train embracing steel cars of all classes—coaches, dining car, Pullman car and baggage car. The label on this photograph states that this is the first train of the kind ever made up. The first order for all-steel passenger cars given by the Pennsylvania was issued in November, 1906, and called for 100 cars. Since then other cars have been ordered, making up the number above mentioned, and with still other orders now being filled the company will have 630 all-steel cars, including 385 coaches, 44 dining cars, 69 combination (passenger and baggage), 33 baggage cars, 60 postal cars, 27 mail storage cars and 11 combined baggage and mail cars. In addition to these the Pullman Company is building 500 steel sleeping and parlor cars to be used on the Pennsylvania road. With these and with steel cars to be ordered by the Pennsylvania during the current year there will be 1,400 steel cars in service. As our readers know, these cars have steel frames, steel sheathing and steel inside finish, leaving nothing combustible except the cushions.



First Composite Passenger Train of Steel Cars.

Railway Matters in Washington.

Washington, Feb. 16.

A sub-committee of the Senate Committee gave a hearing last Monday on the bill providing for federal inspection of locomotive boilers. Representatives of the enginemen's and other railway brotherhoods spoke in favor of the measure, and officers of a number of the principal railways opposed it.

Representative Mann, chairman of the House Committee on Interstate Commerce, expects that his committee will report out the administration railway measures by March 1.

At the House committee hearing on the Townsend and Mann bills last week, Roberts Walker, chairman of the executive committee of the Chicago, Rock Island & Pacific, made a strong argument against the proposal to prohibit one railway from acquiring stocks or bonds of a competing line. Following are some of his points:

"I am, by inheritance and by training, a believer in the interstate commerce act as thus far enacted. The carriers of the country must be required to adjust themselves to the policy, adopted by the federal government in 1887 and of increasing importance with the growth of the gap between large businesses and small ones, that all shall be served alike and at the same rate. All railway men yield without demur to the successive applications of this principle. Every degree of regulation of rates and of service, no matter how drastic as long as the essentials of equality to the shippers and just remuneration to the carriers are kept uppermost, is for the best good of the nation and the railways alike. It is the spirit of our institutions that all businesses and all men engaged in business or professional activities shall be free and unfettered. We have inherited from the earliest days of the common law an abhorrence of arrangements resulting in restraints of trade. . . .

"Mr. Townsend's bill prohibits every railway from acquiring the stock or property of any other railway. This is nothing short of enacting that no man shall buy the house or the farm of any other man. It puts the nation in the position of restraining trade to a far greater degree than was ever attempted by any human being or corporation. It robs the public in advance of the saving and advantage that always follows the absorption of one line by another accruing from decreased expense of superintendence, greater aggregate supply of equipment to adapt to the needs of the enlarged mileage, increased uniformity of operation and better opportunities to improve the property out of the combined resources.

"It will hurt the public, much more than the owners of railways, to take away the incentive to increase railway systems and to upbuild and improve them. Capital can, of course, seek other fields, but the lack of interest in railways by the men of large means and large views will soon show itself in neglected equipment, perilous roadbeds and wretched operations. But the most portentous feature is the curb and restraint to be put upon initiative and ambition. Mr. Townsend's phrase is to the effect that no railway shall acquire the stock or property of any railway which competes with it; but as every carrier competes with every other carrier every conceivable acquisition is forbidden. For example, the Denver, Northwestern & Pacific, as part of a through route from Chicago to Steamboat Springs, formed in conjunction with the Burlington route, is in competition with the Rock Island as part of another through route from Chicago to Steamboat Springs. Hence, neither the Burlington nor the Rock Island must buy the Denver, Northwestern & Pacific, though it is a natural extension of each and in nowise parallels either. Again, the Louisville, Henderson & St. Louis, as part of a through route in conjunction with the Chesapeake & Ohio from Washington to Kansas City, competes with the Missouri, Kansas & Texas as part of another through route via the Baltimore & Ohio between the same points. Hence the 'Katy' must not purchase the Louisville, Henderson & St. Louis, though it is an obvious extension of its route and in no sense parallels it. The clause is so inclusive that no one can fortetell what, if any, limitations the courts will put upon its meaning. Were I advising a client, I should tell him the words could mean all that I have indicated.

"Even if the words finally enacted cover only lines that are both parallel and competing, I do not concede that the policy of such a law would be sound or wise. What we are working for is low rates and good service. If there are three parallel lines, for instance, the acquisition of one by another does not destroy competition as long as the third remains separate; and at the same time such acquisition will result in many economies that will tend to bring down rates on the detached third line. Economists, indeed, have long argued that compulsory combinations are the true remedy for our difficulties. By such a method, the public would be saved the expense of duplication of officers and of all elaborate machinery for soliciting and advertising for business. With the interstate commerce act still in force, fair and reasonable rates could still be adjudicated and enforced, and on a lower level because of the economies mentioned. Compulsory combination, or unrestricted right of combination, would be far more in keeping

with our American ideas than this new commandment, 'Thou shalt not enlarge thy business.'

"The several states granted charters to the railways. These charters are contracts, subject to amendment by the states, and only by the states. Many, if not most, of the powers granted by the states have no relation whatever to interstate commerce. They are as readily applicable to a corporation running a crossroads blacksmith shop. Among such powers are the power to acquire extensions and the power to emit and negotiate stocks and bonds. In the face of these well-known, firmly established facts, can it be that Congress intends to oust the several states from their exclusive control of these matters and announce a new universal policy in the making of which their legislatures shall have no voice? . . . Consider for a moment the investor. He has bought his investment in reliance upon a state statute. Whether he owns stocks or bonds, he hopes for an added margin of safety through growth in mileage and tonnage. Likewise he looks to the state to protect him from misuse of the right to negotiate securities. This proposed legislation will destroy all the things on which investors have relied, and will substitute rules that they did not choose. What has the federal government to do with the investor? If the avowed purpose of the law is to protect investors, then the statute will be unconstitutional from the outset.

"The proposed restrictions upon the issuance of stocks and bonds will not have the slightest effect in the direction of reducing rates. If they have any effect whatever it will be in the direction of raising rates. A rate never is, and probably never was, fixed by taking into account the capitalization of the corporation fixing the rate. I greatly doubt whether the principal traffic man of any important railway could correctly or even approximately state the securities that the railway has outstanding or the amount of such securities. I can guarantee that none of them ever considers the securities when trying to determine a rate on a given commodity from one point to another."

Mr. Walker here read an editorial on this subject from the *Railway Age Gazette* of February 4, and in closing said:

"As between shippers and carriers the carrier is the great conserving force. The carrier is the one thing that stands between the small dealer and the large monopoly or trust. Hence anything that can be done in the way of making rates fair to the shippers and to the carriers should be done, and it should be done by the federal government. But stocks and bonds are things for sale. They are commodities, and the federal government has no more business to fix a method of determining the rate at which those things should be sold than it has to fix the price, locally, of corn, or hides, or the product of the mines, or any other product that you can think of. I believe that the regulation of stocks and bonds will result in the increase of rates. Whatever is done in the way of hampering railroads in their financing (which already is beset with many difficulties) will tend to force the weaker railways to the wall, and to bring about the acquisition of such lines by their connections. (I am assuming that the provisions against such acquisition will be interpreted in such a way as to permit the acquisition of non-parallel extensions.) This process, if carried to its logical limits, would shortly result in the centralization of all of the railways of the country in a very few hands, with the result that competition will be lulled to a minimum in many districts. If competition is removed, it can hardly be expected that the railway managers, in their desire to upbuild and maintain their properties and to show good returns upon the funds invested in them, will not raise rates when opportunities occur. It is my hope and expectation that your committee will conclude that there is no relation between the interstate commerce functions of a carrier, on the one hand, and its chartered rights on the other hand, and will refuse to report these features of the bill."

Cowards in Congress.

That the commerce of our times cannot be fitted to a box and fastened in by the carpentry of legislation is illustrated by every legislative act of the past two decades. Boxes are for dead men. You cannot put the living into them without killing the man or splitting the box. We have a box that we know ought to be torn apart. Nothing has ever fitted it nor ever will. To force the business of railways and commerce into the Sherman act would be to destroy every form of corporate business in the country, and yet we have a lot of cowards in Congress who do not dare touch that box. To them it is a veritable ark in the wilderness of confusion upon questions too great for them. So they bow down in idolatrous political worship of their anti-trust ark. They have taught the people to say amen. This shows me that our greatest men are not grappling with the tremendous questions of our material development. Either we have not men sufficient for their time with the creative power of the men of the earlier republic, or, if we have such men, the allurements of business or the misguided franchise has kept them out of legislative halls.—*Chancellor Day, of Syracuse University, in Leslie's.*

The Four Great Transcontinental Roads of the Northwest.

The *Wall Street Journal*, in its issue of February 3, publishes an interesting map of the four great railways of the Pacific Northwest, showing the branches under construction by the Chicago, Milwaukee & Puget Sound. A comparison of the earnings, market price of the stock, fixed charges, etc., of the Great Northern, the Northern Pacific, the Canadian Pacific and the Chicago, Milwaukee & St. Paul accompanies the map, and we reprint the table showing the figures for the four roads reduced to a per mile basis. The 700 miles of branch lines, however, of the St. Paul were not taken into consideration in preparing the table:

Year to October 31, 1909.

Per mile:	Can. Pac.	Gt. Nor.	Nor. Pac.	St. Paul.
Gross earnings	$8,200	$8,460	$12,660	$7,840
Net earnings	2,650	3,570	5,535	3,040
Operating ratio, per cent.	67	57	58	61
*Charges and taxes	$880	$692	$1,050	$733
Surplus	1,770	2,878	4,485	2,307
Dividends on pf. stock	213	†...	‡...	913
Balance for common	1,557	2,878	4,485	1,394
Common stock outstanding.	15,200	30,000	43,730	13,000
Earned on par, per cent.	12.4	9.5	10.3	10.7
§Market value stock	$27,300	$40,500	$51,160	$19,240
Earned on market value, per cent.	5.7	7.1	8.8	7.2

*Less other income.
†All Great Northern stock is one class, technically called preferred.
‡None.
§Canadian Pacific at 180, Great Northern at 135, Northern Pacific at 137 and St. Paul at 148.

Commerce Commissioners and Expansion.

A sympathetic critic of the *Wall Street Journal* takes exception to the following statement in the editorial columns of this paper of February 2:

"If new capital had been in the position of waiting for the authorization of a government commission, the United States would have ended at the 'Great American Desert.'"

He believes that the Interstate Commerce Commission is made up of Americans, who are, therefore, likely to be sympathetic with railway expansion and enterprise, even if undertaken at considerable risks.

This newspaper has been a consistent advocate of the regulation of railways. The only alternatives were unfettered monopoly or government ownership. With all due respect to the Interstate Commerce commissioners, it may be submitted that they are essentially human. At the outset they may imagine that the purpose of the commission is to regulate the railways. Later they lose sight of the fact that it is regulation which is essential, and not the commission. The commissioner, no doubt innocently and unconsciously, tends unduly to magnify his office. The railways may be doing all that efficient regulation requires, but the natural consequence is the stimulation of legislative activity which will expand the functions of the commission.

It need hardly be said that when we support regulation, we do not mean management. If the Interstate Commerce Commission is to take over the management of the railways, particularly in the matter of financing, who is to be responsible to the stockholders for mistakes? At present, the officers and directors of the roads are morally, financially and criminally responsible. What recourse is the stockholder to have where

the decisions of the management of his own selection have been overruled?

Mr. Taft's special message to Congress recommended that the authorization of the Interstate Commerce Commission should be required for the issue of new stock below par. A moment's reflection on the way our railway enterprises have often been financed will show what danger lurks in this recommendation. A railway whose stock is selling below par sees an opportunity, by offering liberal inducements to capital, to extend into a field not yet served or settled, but one which may attract dangerous competition. As it starts with nothing but a franchise and a right of way, it is obvious that the new stock, and even the bonds for a time, will constitute what is loosely called water. The Interstate Commerce Commission, objecting to water, prohibits the enterprise. Another and stronger railway, which need not ask permission because its stock is selling above par, builds into the territory in question and bankrupts the first road.

Who is to indemnify the ruined holder of the road's securities?—*Wall Street Journal.*

American Society of Civil Engineers.

At the meeting held on February 16 two papers were presented for discussion as follows: The Effect of Alkali on Concrete, by George Gray Anderson, M. Am. Soc. C. E.; and Precarious Expedients in Engineering Practice, by John Hawkesworth, Assoc. M. Am. Soc. C. E. Mr. Gray's paper was printed in Proceedings for December, 1909, and Mr. Hawkesworth's in the Proceedings for January, 1910.

Western Canada Railway Club.

At the regular monthly meeting held in the Royal Alexandra hotel, Winnipeg, Can., on Monday, February 11, a paper entitled The Evolution of Paint Manufacturing and Advantages of Standardizing in Railway Work, was read by W. S. Fallis, manager of the western branch of the Sherwin-Williams Co., Cleveland, Ohio.

Railway Storekeepers' Association.

The following subjects have been assigned for the seventh annual convention to be held at the Planters' Hotel, St. Louis, Mo., May 16-18, 1910.

G. 1. By What Unit of Measure is the Efficiency of a Storekeeper Properly Determined? H. C. Pearce, G. K. S., Southern Pacific, San Francisco, Cal., and C. H. Drazy, S. K., C. B. & Q., Aurora, Ill.

G. 2. Economy and Mechanical Contrivances for Handling Material. J. F. Slaughter, S. K., M. K. & T., Denison, Tex.

G. 3. Economy of the Piece Work System in the Handling of Supplies. D. C. Curtis, Piece Work Inspector, C. B. & Q., Chicago.

It is expected and the executive committee requests that every general storekeeper will have one of his storekeepers or store department men prepare an article on some one of the above subjects. Especial attention is called to subject G. 3., on piece work. This is a very interesting and important subject at this time, and it is hoped that it will bring out considerable discussion.

Railway Telegraph and Telephone Appliance Association.

At a meeting in New York, February 9, of representatives of manufacturers of telegraph and telephone apparatus and supplies, the Railway Telegraph and Telephone Appliance Association was organized, with the following officers: Chairman, P. W. Miller, Kerite Insulated Wire & Cable Co., 30 Church street, New York; vice-chairman, A. P. Eckert, National India Rubber Co., 42 Broadway, New York, and secretary and treasurer, Hiram M. Buck, Railroad Supply Co., 30 Church street, New York. The executive committee will be announced later.

The constitution and by-laws adopted by the association are very much like those of the Signal Appliance Association. The main object of the Railway Telegraph and Telephone Appliance Association is to provide an exhibition of appliances in connection with the annual meetings of the Railway Telegraph Superintendents' Association.

New York Railroad Club.

At the regular meeting held on Friday, February 18, F. J. Angier, of Galesburg, Ill., superintendent of timber preservation, C., B. & Q., will present a paper on The Seasoning and Preservative Treatment of Wooden Cross-ties.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASS'N.—H. M. Buck, Secy.-Treas., 30 Church street, New York.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN & SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The state railway commission of Nevada announces that the Wells-Fargo Express Co. has agreed to make a general reduction of its rates in that state.

Shipments of anthracite coal for the month of January aggregated 5,306,618 tons, which is 223,273 more than in January of the previous year. The Reading, the Lackawanna and the Pennsylvania show large increases, and all other roads decreases.

The publicity committee of the Traffic Club, of Chicago, has issued an attractive booklet regarding this club, and particularly regarding its quarters in the La Salle Hotel. The booklet is illustrated by eight photographs of the interior of the club and of views from its windows.

The Wisconsin State Railway Commission is investigating charges that the Chicago & Northwestern, the Chicago, St. Paul, Minneapolis & Omaha, the Minneapolis, St. Paul & Sault Ste. Marie, the Chicago, Milwaukee & St. Paul, and the Green Bay & Western are not furnishing sufficient cars for shippers.

The New York, Ontario & Western has filed with the Interstate Commerce Commission its new freight tariffs from New York to the West, based on a rate of 75 cents first-class to Chicago. They go into effect March 15, and the Lackawanna and the Erie have withdrawn their notices of a proposed reduction.

R. R. Darwin, rate expert of the Michigan Railway Commission, in a memorandum filed with the Commission, says that of 1855 freight tariffs and supplements applying to rates on staple commodities which were filed with the railway commission during 1909, 83 per cent. contained reductions and 17 per cent. advances in rates.

It is given out in Philadelphia that the cities of Boston, New York, Philadelphia, Baltimore and Richmond will jointly establish a traffic bureau, the chamber of commerce or other prominent commercial body of each city appointing two representatives, and it is said that N. B. Kelly, freight commissioner of the Philadelphia chamber of commerce, will probably head the new bureau.

Several conferences which have been held by railway traffic men and lumber shippers of the Northwest on the subject of the transit privilege on lumber have failed to result in agreement, and it has been decided to leave the settlement of the questions involved to the Interstate Commerce Commission. The railways now grant the right of diverting shipments at certain transfer and storage points on the original waybill. The jobbers of lumber insist that this privilege shall not be abolished, while the manufacturers of lumber seek its abolition on the ground that it gives entire control of the lumber retail trade to the jobbers. The railways were unwilling to decide between these conflicting elements.

Resolutions have been introduced in both houses of the Oklahoma legislature condemning Judge Hook, of the federal court, for issuing injunctions restraining the enforcement of the 2-cent fare provision of the Oklahoma constitution and freight rate orders issued by the State Corporation Commission. The tenor of these resolutions and the apparent sentiment of most of the legislature were expressed by Representative Wortman, of Claremore, in a speech in the House, in which he said that he hoped the time would come when federal judges would place the interests of the people above the interests of property and would allow the will of the millions to prevail in the fixing of railway rates. Besides the resolution denouncing the action of Judge Hook a resolution was introduced in the Senate favoring an amendment to the federal constitution to make federal judges elective.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 62, covering car balance and performance for August, 1909, says:

"With 8.72 per cent. of the total cars reported in the surplus

Freight Car Balance and Performance in August, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,246	664,841	198,073	165,177	169,819	374,748	16,794	131,213	27,340	115,252	99,398	2,037,991
Average number system cars on line	53,736	459,686	146,429	112,701	119,811	297,278	7,181	90,594	16,063	65,954	82,780	1,452,213
Railroad-owned cars: Av. foreign on line	25,101	174,288	58,865	34,222	37,228	91,136	12,164	43,735	18,913	47,788	15,153	558,610
Total cars on line	78,837	633,974	205,294	146,923	157,039	388,414	19,345	134,329	34,993	113,742	97,933	2,010,823
Excess	3,591	.....	7,221	.....	.....	13,666	2,551	3,116	7,453	.....	.....	.....
Per cent. cars on line to total owned:												
Home	72	69	74	68	70	80	43	69	58	57	84	71
Foreign	33	26	30	21	22	24	72	33	69	42	15	28
All railroads	105	95	104	89	92	104	115	102	127	99	99	99
Private cars on line	3,277	38,927	8,333	1,960	6,020	16,751	1,769	8,481	1,886	7,335	3,325	98,064
Total, all cars on line	82,114	672,901	213,627	148,883	163,059	405,165	21,114	142,783	36,879	121,077	101,258	2,108,887
Per cent. of cars in shop	6.67	7.46	7.92	8.44	9.87	6.41	5.19	13.13	6.62	6.54	11.47	7.89
No. of freight engines owned	1,108	10,011	2,588	2,964	2,522	6,221	459	2,506	757	2,346	2,197	33,583
Av. cars on line per freight engine owned	74	67	83	50	65	65	46	57	49	52	48	63
Total freight-car mileage	42,310,346	489,284,076	138,270,134	110,470,758	110,751,802	295,694,462	28,766,725	90,844,810	27,987,177	111,641,991	74,243,015	1,520,265,296
Average miles per car per day	16.6	23.1	20.9	23.9	21.9	23.7	43.9	21.5	24.5	29.7	23.7	23.2
Per cent. loaded mileage	72.3	68.2	69.8	65.5	71.4	72.3	72.3	71.8	69.7	72.4	73.2	70.1
Ton-miles of freight, inc. Co. freight	431,046,040	7,492,362,886	2,066,459,101	1,711,754,007	1,530,023,839	2,489,236,539	416,894,981	1,292,412,536	316,744,430	1,559,115,382	932,533,697	20,238,383,438
Average ton-miles, including Co. freight:												
Per car-mile	10.2	15.6	16.6	15.5	13.9	13.5	15.0	14.2	12.5	14.2	12.6	14.6
Per loaded car-mile	14.1	22.8	23.7	23.6	19.55	18.8	20.7	19.9	18.3	19.6	17.2	21.0
Per car per day	169	359	356	371	304	301	706	305	292	420	297	340
Gross freight earnings	$5,272,933	$45,039,951	$12,723,981	$9,608,674	$9,936,520	$21,794,477	$3,372,907	$10,957,889	$3,333,667	$14,213,429	$6,535,213	$142,789,641
Average daily earnings: Per car owned	$2.26	$2.19	$2.07	$1.88	$1.90	$2.41	$6.49	$2.69	$3.90	$4.04	$2.12	$2.36
Per railroad-owned car on line	2.16	2.30	2.00	2.11	2.05	2.35	5.63	2.63	3.07	4.16	2.15	2.40
All cars on line	2.07	2.16	1.92	2.08	1.98	2.23	5.16	2.48	2.92	3.91	2.08	2.29

column, and with 'excess' shop cars equalling 2.87 per cent. of the total, the general averages for performance compared quite favorably with net averages for the earlier months of 1908. Deducting the idle equipment, the averages are quite satisfactory, and indicate a marked improvement over the performance for the same month in 1908. The regular comparative summary follows:

	Average miles per day.		Average ton-miles per car per day		Average earnings per car per day.	
	Inc.surp. cars.	Exc.surp. cars.	Inc.surp. cars.	Exc.surp. cars.	Inc. surp. cars.	Exc. surp. cars.
December, 1907.	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908.	19.7	23.8	271	328	1.82	2.20
March, 1908....	21.2	25.5	290	348	1.95	2.34
April, 1908....	19.6	24.5	258	324	1.83	2.29
May, 1908.....	19.3	24.8	254	329	1.72	2.22
June, 1908 ...	19.6	24.7	276	347	1.88	2.37
July, 1908.....	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909	21.7	25.9	306	365	2.04	2.43
March, 1909 ..	22.7	27.2	330	393	2.19	2.61
April, 1909.....	22.4	26.8	310	371	2.13	2.54
May, 1909.....	22.5	26.8	304	362	2.05	2.45
June, 1909....	22.4	26.5	314	371	2.13	2.52
July, 1909	22.0	25.8	309	362	2.09	2.45
August, 1909..	23.2	26.3	340	384	2.29	2.59

"There was an active outward movement of cars, the home cars dropping from 74 per cent. in July to 71 per cent. in August. The loaded mileage increased from 68.3 per cent. to 70.1 per cent., which is the highest average reached since November, 1907, with the exception of October, 1908. The shop percentage again shows a decrease that brings it down to 7.89 per cent., an excess of only 2.87 per cent. over the normal.

"The tons per loaded car average 21.0, an increase of .3 tons over July."

The accompanying table gives car balance and performance for the period covered by the report.

Annual Dinner of Traffic Club of Chicago.

Oscar F. Bell, the president, presided at the annual dinner of the Traffic Club of Chicago on February 8. Frank B. Montgomery was toastmaster. Senator Cummins, whose remarks were partly reported last week, criticized the method of basing rates on what the traffic will bear; he believes that the only fair way to make rates is on the basis of cost of service. He does not favor a valuation of railways. Assuming the present gross capitalization of American railways at sixteen billions, he was sure that a valuation based on the cost of physical reproduction would amount to twenty billions. He contended, nevertheless, that the railways are overcapitalized to the extent of at least six billions.

Edgar A. Bancroft, general counsel of the International Harvester Company, in his talk on "Co-operation and Its Dangers," said that one of the greatest dangers to the country is the growth of group consciousness and group morals. The moral code of a group of men, he said, is always lower than the moral code of any individual composing it. Men organized in corporations or trade unions will commit acts which each of them would condemn as wrong if done by an individual. To the solution of the great economic and industrial problems of this country it is essential, he said, that we should cease to substitute group morals for individual morals and that we should recognize the fact that an act which it is wrong for one man to do is just as wrong for any number of men to do.

Warren J. Lynch's facetious address on the subject of "A Statistical Elaboration of the Fundamental Principles of Practical Rate-Making" did not deal with rate-making, either practical or otherwise.

Union Pacific Merger Hearing.

On Tuesday Harriman officials began the submission of evidence to show that the government's case against Union Pacific is without foundation. Hearings are held at the New York Customs House before Judge Sylvester G. Williams, of Denver, the special examiner appointed by the United States Circuit Court, eighth district, before which the suit was instituted.

Testimony for the railway must be concluded by April 1, after which the government may present evidence in rebuttal.

Attorney-General Bonaparte instituted the present proceedings on Jan. 27, 1908, by filing a bill in equity before the United States Circuit Court at Salt Lake City, to set aside control by the Union Pacific and its subsidiaries of the Southern Pacific and the San Pedro, Los Angeles & Salt Lake. On June 30, 1909, the Oregon Short Line owned $124,200,000 S. P. stock, and $4,760,000 S. P. convertibles, or 38.75 per cent. of the securities of the company with actual or latent voting power, and $12,500,000 or 50 per cent. of the stock of the Salt Lake line. The suit to compel the disposal of these securities resulted from testimony taken during the investigation into Harriman affairs begun Jan. 4, 1907.

Mr. Stubbs was the first witness called, Counsel Dunne examining. Mr. Stubbs said that he had been engaged in railroading in an official capacity since 1869. In 1872 he was made general traffic manager of the Central Pacific. In 1901 he became director of traffic for the Union as well as the Southern Pacific.

Mr. Stubbs traced the development of the various transcontinentals, Union Pacific being joined with Central Pacific at Promontory Point, May 9, 1869. The Southern Pacific's through line to New Orleans was connected up in 1883. In 1885 the lease of the Mojave to the Needles division of the Southern Pacific was made to the Atchison, giving it a through line to San Bernardino. By 1900 Atchison had acquired a right of way over the Southern Pacific's subsidiary, the San Joaquin Valley Railroad, to Stockton, and constructed its own line from Stockton to San Francisco. Canadian Pacific was completed to Vancouver in 1887.

Previous to the opening of the Central Pacific in 1869 trans-

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF OCTOBER, 1909.

Name of company.	Adams Express.	American Express.	Canadian Express.	Can. Nor. Express.	Globe Express.	Great Nor. Express.	National Express.	Northern Express.	Pacific Express.	Southern Express.	United States Express.	Wells, Fargo & Co.	Western Express
Mileage of all lines covered: Rail lines....	30,958	46,205	7,078	3,164	1,900	7,232	1,094	6,497	22,106	31,162	23,894	56,413	3,452
Other lines	3,488	1,820	2,792	22	.....	211	292	261	608	2,995	611	4,844	4
Operating revenues:													
Express	$2,857,130	$3,071,351	$218,625	$33,031	$53,960	$216,895	$96,208	$307,049	$766,468	1,167,363	$1,491,713	$2,452,601	$64,796
Misc. transportation..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	171	183
Nontransportation	15,617	119,151	4,280	1,651	471	1,289	416	5,660	11,391	15,644	21,877	45,151	1,111
T'l receipts, operation.	2,872,747	3,190,502	222,905	34,682	54,431	218,184	96,624	312,708	777,859	1,183,007	1,513,591	2,497,924	66,091
Exprs. privileges—Dr..	1,479,867	1,476,861	109,022	13,005	27,074	87,809	36,816	149,357	376,584	556,849	686,294	1,182,680	29,420
Total	$1,392,880	$1,713,642	$113,883	$21,677	$27,358	$130,375	$59,808	$163,351	$401,274	$626,157	$827,296	$1,315,243	$36,671
Operating expenses:													
Maintenance	$78,617	$138,838	$1,451	$100	$263	$1,300	$757	$3,012	$11,791	$24,635	$47,923	$68,462	$412
Traffic	7,676	19,093	1,254	122	946	946	...	1,743	6,478	6,027	12,929	15,149	842
Transportation	925,274	1,143,409	75,341	9,588	14,210	62,025	44,747	74,181	212,676	365,554	605,128	820,209	18,896
General	63,137	104,325	6,880	1,338	2,610	3,156	2,835	5,939	15,660	44,545	41,451	59,562	1,713
Total	$1,074,703	$1,405,666	$84,926	$11,147	$18,028	$67,427	$48,340	$84,874	$246,606	$440,759	$707,431	$963,382	$21,864
Net operat'g rev. or def.	$318,177	$307,976	$28,957	$10,529	$9,330	$62,948	$11,468	$78,477	$154,669	$185,398	$119,865	$351,861	$14,806
Taxes	15,124	70,831	1,150	130	550	3,191	3	3,500	4,948	9,878	5,011	16,577	461
Operating inc. or loss...	$303,053	$237,145	$27,807	$10,399	$8,780	$59,757	$11,465	$74,977	$149,721	$175,510	$114,854	$335,284	$14,345

portation to the coast was by clipper ships around the Horn, or over the Panama Railroad. The considerable difference in rates via Cape Horn and via the Isthmus led merchants to ship all goods that were possible via the Horn. Freight service via Panama required on the average 45 days, passenger service 26 days. By way of the Horn, Atlantic-Pacific traffic consumed from 90 to 180 days. This required carrying large stocks by merchants, six months' supply being on the sea.

When the Central-Union Pacific was first opened the transcontinental rate was $8 per 100 lbs. Because of the indisposition of a merchant to change his custom the railway had difficulty in securing business. The rate in 1870 was reduced to $6 per 100 lbs.

In 1877 railways proposed the contract system, a lower all-rail rate being offered for the guarantee of the business of the individual merchant for one year. At first different rates were given to different shippers. This system induced all but one of the important merchants on the coast to give the railways their business in 1878. After this first year under the contract plan the rates were harmonized and published. Development of manufacturing in the West reduced the sharpness of water competition, and the railway was gradually gaining ground.

Mr. Stubbs testified that the "Sunset Route" between New York and San Francisco over the Southern Pacific was opened in February, 1883. Owing to the bad service offered by the all-rail routes and dissatisfaction among merchants with the contract rate plan, the time was propitious for the opening of a rail and water route under one control. As against 45 days sometimes required by the all-rail line, the "Sunset Route" carried traffic from New York to San Francisco in 18 days, which was then remarkable time. Moreover, overcharges and damage claims were settled promptly, and the merchants on both coasts were glad to send their goods over the "Sunset Route."

Asked what was the effect of the unity of management on the "Sunset Route" as against the diversity of management on the all-rail lines, Mr. Stubbs said that on the all-rail lines damage claim settlement, for instance, required six months, as against immediate settlement by the Sunset. From 1870 to the opening of Atchison's own line the matter of California rates was determined by the Central Pacific. Mr. Stubbs said that there had been no time since 1881 when any California all-rail rates were made without consent of the Central Pacific when proposed and the Santa Fe on the advent of the rates.

Witness brought out the point that the Union Pacific, together with the Oregon Short Line and Oregon Railroad & Navigation Co and the latter's steamship line from Portland to San Francisco had never been anything but a paper route, because it was unable to carry California traffic at rates perfectly practical for the Central Pacific. Mr. Stubbs said that the completion of the Great Northern and Northern Pacific had no appreciable effect on the California business of the Southern Pacific, which, since 1885, had controlled the Central Pacific through a 99-year lease. Canadian Pacific once established a 10 per cent. differential on California business, but withdrew it after incurring considerable losses.

Mr. Stubbs brought out the fact that the Union Pacific has been only an intermediate line, with no way into California from Ogden or Portland save over the Central Pacific and the Southern Pacific or Atchison rails; also that the distance from Ogden to Portland over Union Pacific's affiliated lines is greater than from Ogden to San Francisco; that Ogden traffic for San Francisco, via Portland, would require four or five days more than over the Central Pacific, aside from any question of extra handling and damage to goods. Witness said that no shipper to California points would use the Union Pacific to California route, via Portland, except in return for inducements which could not be made, as the route via Portland was obviously at a disadvantage as regards cost of haul.

Mr. Stubbs stated that never since he had been connected with the Central Pacific in 1870 had he had any reason to pay attention to competition on part of the Union Pacific for California business via the Portland gateway simply because that was an unprofitable route and no attempt was made by Union Pacific to employ it.

At this point witness called attention to the fact that while Union Pacific had only the Central Pacific as an outlet to California points, the Southern Pacific had at Ogden an eastern connection in the Denver & Rio Grande, to which the Southern Pacific could have deflected all of its business, and that undoubtedly it would have done so had Union Pacific tried to use a steamship line from Portland to San Francisco to divert business from the Central Pacific. Mr. Stubbs stated Union Pacific officers recognized the costliness of such a move too well ever to attempt or think of attempting such diversion. Mr. Stubbs said that the amount of Missouri River or through traffic filtering through Portland to San Francisco from Canadian Pacific, Great Northern and Northern Pacific is so small as to indicate that traffic managers of these lines do not go after this business with enthusiasm, obviously because of the realization that they have not a practical route to the California ports.

In 1895 Southern Pacific carried 79 per cent. of the traffic to Western coast points. By 1901 the proportion had fallen to 39 per cent., caused only partially by falling off in the Sunset's tonnage, chiefly because of the increase in the business carried by roads to the Northwest, due to the development there.

After the recess Mr. Stubbs continued his testimony, stating that for the year ended June 30, 1901, Oriental traffic amounted to about 34,000 tons. Union and Southern Pacific's earnings from this traffic for that year were about $375,000. In his opinion the importance of Oriental traffic has always been overrated.

Union and Southern Pacific organized the Occidental & Oriental Steamship Co. to carry business to and from San Francisco, each owning a half interest. At that time Southern Pacific had no interest in the Pacific Mail Steamship Co. Although Union and Southern Pacific were thus jointly interested in a through line from the Missouri River to the Orient prior to 1901, the Union Pacific constantly worked the Portland route preferentially.

In 1901 the Portland & Asiatic Steamship Co. initiated a service to the Orient to care for the flour business to Portland over the Union Pacific. Without this service Puget Sound would have received this traffic over the Northern Pacific. Earnings of the Portland & Asiatic Steamship Co. have never paid cost of operation, save during the year of the Russo-Japanese war. Inward-bound Asiatic business, so far as Portland is concerned, moved almost wholly through San Francisco over the Central and Union Pacific.

At the continuation of the hearing on Wednesday, Vice-President J. C. Stubbs was recalled to the stand. Comparing westbound Asiatic traffic via Union Pacific through Portland and via the Sunset Route, the witness stated that for the year ended June 30, 1901, this traffic over the Union Pacific amounted to 262 tons, and via the Sunset Route for the year ended June 30, 1900, the 1901 records having been destroyed in the San Francisco fire, was 1,098 tons. Mr. Stubbs brought out the fact that before the so-called merger of the Union and Southern Pacific transportation business between San Francisco and Portland was non-competitive, because the Southern Pacific found after opening the "Shasta Route" it could not take this business from the steamship lines operated by the O. R. & N. In the year ended June 30, 1901, the latter company's business between these cities amounted to 76,700 tons, as against 25,879 tons over the Shasta Route.

With reference to the alleged competitive business between Atlantic ports and Utah and Colorado points, witness brought out the fact that Southern Pacific had never been an active competitor with Union Pacific for this business, its line to the points being 270 miles longer than Union's. On cross-examination by Mr. Severance, Mr. Stubbs insisted that any competition entered into by the Southern Pacific was with lines east of the Missouri river, not with Union Pacific. Mr. Severance asked whether before 1901 Union and Southern Pacific were soliciting eastern business for Utah and Colorado points each for itself. Mr. Stubbs replied that they were.

Defining his use of the term "competition" as used in all of his testimony, Mr. Stubbs stated that he referred to competition which is in restraint of trade. On direct examination by Mr. Dunne, Mr. Stubbs testified that the business of the steamship lines between San Francisco and Portland had in no wise been affected by the heavy traffic over the Shasta Route, and that the railway would have advertised the Shasta Route in the same way had there been no steamship service. In other words, the Shasta line had created its traffic.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1909.

(See also issues of February 4 and 11.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$233,935	$99,440	$370,268	$51,738	$67,269	$9,278	$107,849	$8,913	$245,047	$125,221	—$639	$11,236	$113,346	$34,345
Atlanta, Birmingham & Atlantic	641	161,014	53,668	228,645	24,657	36,100	13,308	84,325	9,106	167,496	61,149	.....	13,832	47,317	13,137
Baltimore & Ohio	4,198*	5,281,481	1,127,564	6,836,786	843,688	1,371,004	147,956	2,462,555	127,827	4,953,030	1,883,756	—40,429	221,800	1,621,527	—158,038
Chicago, Indianapolis & Louisville	616	312,007	110,489	462,197	58,734	64,560	12,493	165,311	14,734	315,832	146,365	.....	20,500	125,865	44,830
Chicago, Indiana & Southern	341	298,129	20,618	325,934	27,179	70,125	6,442	108,872	8,709	221,327	104,607	259	12,003	92,345	2,858
Chicago, Rock Island & Gulf	529†	176,045	64,109	253,737	70,298	17,741	5,956	103,975	8,617	206,587	47,150	237	3,340	43,573	—69,064
Cincinnati, New Orleans & Tex. Pac.	337	580,464	137,046	757,836	69,052	139,564	20,093	214,109	17,766	460,584	296,252	760	20,000	276,492	64,460
Cleve., Cin., Chicago & St. Louis	1,982	1,597,811	616,081	2,438,616	254,356	508,799	85,574	977,791	52,149	1,878,669	559,947	—8,969	64,328	486,650	225,782
Denver & Rio Grande	2,553	1,383,340	348,528	1,815,330	183,403	372,146	38,239	693,894	48,646	1,336,328	479,002	5,266	71,000	402,736	48,898
Florida East Coast	583	150,599	93,678	273,816	37,309	39,185	3,918	85,523	12,365	178,300	95,516	.....	11,544	83,971	12,990
Galveston, Harrisburg & San Antonio	1,338	666,109	221,715	933,753	124,814	136,569	29,364	338,473	76,985	656,205	277,048	1,058	36,813	239,175	—73,563
Grand Rapids & Indiana	587	299,830	117,865	447,839	54,881	68,588	11,026	168,662	13,500	316,660	131,179	2,387	21,413	107,379	50,613
Houston & Texas Central	789	329,846	129,634	494,376	61,214	64,776	17,005	191,353	20,059	354,408	139,969	.....	16,221	123,748	—34,302
International & Great Northern	1,159	533,278	185,146	767,441	99,321	109,024	18,685	334,144	21,200	582,374	185,067	.....	22,000	163,067	—24,476
Lake Erie & Western	886	407,000	65,480	495,209	41,268	92,782	11,730	176,520	11,621	333,921	161,288	.....	18,632	142,656	80,060
Lake Shore & Michigan Southern	1,663‡	2,608,595	908,926	3,979,469	306,378	733,218	112,718	1,397,794	73,123	2,623,231	1,356,238	8,307	83,905	1,264,026	124,446
Long Island	391	241,572	350,598	626,545	36,625	84,346	11,953	334,083	19,664	486,671	139,874	64,147	33,232	170,789	95,239
Morgan's La. & Tex. R. R. & S. S. Co.	358	438,072	115,031	578,493	56,254	48,677	11,090	173,753	13,180	302,953	275,540	874	26,520	249,895	13,831
New York Central & Hudson River	3,587	4,786,769	2,247,519	7,931,957	815,649	1,377,145	182,741	3,105,096	173,643	5,654,274	2,277,683	53,520	294,627	2,036,576	778,400
New York, Chicago & St. Louis	558	823,309	103,303	958,333	75,590	86,925	47,589	365,115	13,875	589,094	369,239	1,699	33,109	334,431	28,499
Northwestern Pacific	376	89,368	101,071	210,752	41,358	29,503	2,970	85,217	10,547	169,595	41,157	.....	10,988	30,169	14,666
Oregon R. R. & Nav. Co	1,476§	822,488	299,998	1,195,562	115,350	175,317	28,844	427,068	41,218	787,797	407,765	838	92,992	315,611	158,160
Oregon Short Line	1,508‡	1,183,290	383,979	1,660,373	150,838	213,772	36,387	411,731	37,175	849,903	810,470	3,657	115,952	690,861	172,637
Peoria & Eastern	351	202,011	61,195	283,411	25,495	61,849	5,300	100,205	5,417	198,266	85,145	.....	7,794	77,351	19,082
Pittsburgh & Lake Erie	191	1,215,389	123,917	1,379,791	134,775	123,773	13,096	353,038	22,573	647,255	732,536	361	15,636	716,539	321,010
Rutland	468	131,900	79,904	240,700	19,725	42,147	6,061	107,716	8,091	183,740	56,960	.....	10,159	46,801	19,538
San Antonio & Aransas Pass	727	223,878	87,712	330,929	61,002	39,433	4,738	134,482	8,876	248,531	82,398	.....	9,000	73,398	10,373
San Pedro, Los Angeles & Salt Lake	1,105	350,234	236,764	631,596	80,473	112,119	30,629	242,417	17,390	483,029	148,567	7,247	20,443	120,878	60,178
Seaboard Air Line	2,997	1,169,728	414,416	1,746,036	214,593	241,021	60,281	551,363	46,128	1,113,386	632,650	3,293	59,418	569,939	100,134
Southern Pacific Co.—Pacific System	6,060°	4,695,111	2,439,638	7,622,607	1,059,381	1,046,286	156,965	2,045,021	222,273	4,529,926	3,092,681	25,861	240,062	2,826,758	122,733
Texas & New Orleans	458	203,956	86,452	308,931	47,669	55,884	9,017	119,380	8,530	240,180	68,451	1,501	18,295	51,657	8,451
Toledo & Ohio Central	441	290,398	48,387	351,310	47,464	65,258	6,348	126,081	7,263	252,415	98,895	340	15,315	83,240	51,647
Trinity & Brazos Valley	455♁	192,569	23,989	220,870	33,417	25,774	6,259	95,393	13,904	174,747	46,123	.....	603	45,520	3,541
Union Pacific	3,384△	2,835,567	836,450	4,038,872	361,038	600,547	113,443	1,203,053	110,927	2,389,008	1,649,864	4,919	167,151	1,477,794	384,680
Wabash	2,514	1,623,875	533,010	2,345,847	275,141	235,043	75,470	979,101	78,888	1,743,643	602,204	1,751	64,495	535,958	10,457
Wheeling & Lake Erie	458✪	467,790	47,859	554,112	52,477	107,531	6,846	208,686	12,182	387,722	166,390	7,361	22,541	151,209	69,232
SIX MONTHS OF FISCAL YEAR.															
Alabama Great Southern	309	$1,300,653	$547,648	$2,023,955	$245,362	$486,717	$53,477	$578,171	$53,187	$1,417,214	$606,741	—$2,994	$67,416	$536,331	$89,017
Atlanta, Birmingham & Atlantic	641	947,769	283,049	1,300,517	155,168	199,298	71,484	492,569	52,811	971,329	329,188	.....	63,265	265,923	43,083
Baltimore & Ohio	4,198*	34,268,039	7,462,785	44,070,619	5,674,871	7,895,971	892,832	13,951,824	769,733	29,185,231	14,885,388	312,811	1,152,714	13,439,863	1,374,567
Chicago, Indianapolis & Louisville	616	2,043,063	773,524	3,065,893	406,122	395,806	80,232	931,354	87,117	1,900,631	1,165,262	.....	121,500	1,043,762	295,303
Chicago, Indiana & Southern	341	1,609,122	146,353	1,796,630	292,444	313,635	50,122	582,531	48,637	1,287,369	509,261	389	74,503	435,147	171,483
Chicago, Rock Island & Gulf	529†	1,154,646	389,401	1,620,923	270,803	111,693	36,306	562,950	52,195	1,033,947	586,976	1,510	31,223	554,243	211,225
Cincinnati, New Orleans & Tex. Pac.	337	3,438,757	787,057	4,442,592	503,590	852,199	115,589	1,210,631	105,377	2,787,386	1,655,206	84	120,000	1,535,290	374,027
Cleve., Cin., Chicago & St. Louis	1,982	9,814,775	4,018,641	15,149,717	1,747,073	2,438,116	486,263	5,325,733	275,907	10,273,092	4,876,625	30,807	434,328	4,411,490	1,134,845
Denver & Rio Grande	2,553	8,768,178	3,082,601	12,370,776	1,498,707	1,915,803	252,379	4,232,894	276,165	8,175,948	4,194,828	33,772	405,000	3,823,600	341,281
Florida East Coast	583	614,134	389,051	1,156,393	194,815	216,531	24,514	460,870	51,554	948,284	208,109	.....	69,267	138,842	203,993
Galveston, Harrisburg & San Antonio	1,338	3,902,829	1,273,438	5,439,983	676,262	757,521	145,725	1,945,870	162,417	3,687,795	1,752,188	18,093	177,708	1,556,387	54,093
Grand Rapids & Indiana	587	1,530,527	964,916	2,668,065	307,561	401,748	66,439	997,274	80,308	1,853,330	814,735	3,068	126,385	685,281	23,292
Houston & Texas Central	789	2,245,695	789,209	3,233,512	379,314	329,135	104,618	1,133,050	116,564	2,062,681	1,170,831	.....	83,698	1,087,133	33,883
International & Great Northern	1,159	3,236,226	1,021,962	4,530,404	754,836	688,881	110,470	1,776,151	126,642	3,456,980	1,073,424	.....	128,000	945,424	109,033
Lake Erie & Western	886	2,257,702	476,257	2,876,647	403,364	486,256	74,867	955,070	60,805	1,980,363	896,284	.....	110,344	785,940	335,103
Lake Shore & Michigan Southern	1,663‡	16,379,760	5,809,031	24,865,888	3,124,086	3,549,092	603,923	7,240,257	367,655	14,885,013	9,980,875	39,324	708,905	9,232,646	1,759,933
Long Island	391	1,592,484	3,261,615	5,080,386	457,369	609,042	96,802	1,997,129	108,881	3,269,223	1,811,163	530,600	199,394	2,142,369	583,165
Morgan's La. & Tex. R. R. & S. S. Co.	358	1,879,914	574,340	2,585,771	317,663	289,099	60,964	864,519	76,442	1,608,687	977,084	4,683	106,520	865,881	164,099
New York Central & Hudson River	3,587	28,968,234	16,047,969	50,112,991	6,498,093	7,913,862	1,249,400	17,032,142	989,221	33,682,718	16,430,273	195,676	2,246,543	14,379,406	2,806,316
New York, Chicago & St. Louis	558	4,410,684	811,804	5,401,733	455,918	540,285	287,395	1,946,440	81,153	3,311,191	2,093,542	6,499	198,109	1,888,934	448,284
Northwestern Pacific	376	726,905	888,412	1,744,459	292,298	195,483	15,924	572,101	57,840	1,133,647	610,812	.....	63,893	546,919	108,268
Oregon R. R. & Nav. Co	1,476§	5,113,268	2,438,145	7,982,928	802,704	632,806	183,604	2,327,814	198,880	4,145,808	3,837,120	10,630	353,944	3,493,806	85,553
Oregon Short Line	1,508‡	7,290,825	2,913,409	10,783,330	1,076,986	887,580	150,036	2,143,373	188,839	4,446,814	6,336,516	9,970	365,952	5,980,535	672,751
Peoria & Eastern	351	1,191,259	382,344	1,690,503	191,356	288,204	32,084	571,058	30,306	1,113,008	577,495	.....	51,794	525,701	125,601
Pittsburgh & Lake Erie	191	8,048,317	782,158	9,056,305	846,322	676,765	82,703	1,806,476	122,222	3,534,488	5,521,817	1,986	98,636	5,421,195	2,195,155
Rutland	468	927,127	631,055	1,732,377	253,515	232,911	39,413	592,790	34,798	1,153,427	578,950	.....	61,051	517,899	100,450
San Antonio & Aransas Pass	727	1,486,307	543,926	2,138,739	304,965	254,273	27,360	760,487	53,111	1,400,196	738,543	.....	54,000	684,543	47,778
San Pedro, Los Angeles & Salt Lake	1,105	2,255,946	1,590,343	4,100,842	641,924	625,742	171,006	1,310,719	99,132	2,848,523	1,252,319	14,412	152,767	1,085,140	184,001
Seaboard Air Line	2,997	6,558,257	2,079,787	9,507,302	1,337,224	1,294,318	335,703	2,978,837	305,881	6,251,963	3,255,339	16,021	356,508	2,882,810	866,290
Southern Pacific Co.—Pacific System	6,060	29,827,043	16,252,945	49,154,661	5,430,589	6,129,440	723,880	12,102,459	1,218,129	25,604,497	23,550,164	8,680	1,440,376	22,118,468	4,425,121
Texas & New Orleans	458	1,327,923	502,720	1,941,660	273,787	299,948	40,825	712,952	53,100	1,380,612	561,048	9,366	76,295	494,119	97,668
Toledo & Ohio Central	441	1,790,555	316,219	2,227,574	308,237	353,234	34,730	670,979	38,359	1,405,539	822,035	57,498	84,678	794,855	91,358
Trinity & Brazos Valley	455♁	1,010,566	115,472	1,147,421	197,616	197,525	31,579	503,741	64,691	995,152	152,269	.....	21,853	130,415	26,152
Union Pacific	3,384△	19,991,610	5,926,586	28,161,820	2,728,568	2,663,606	710,118	6,318,979	590,139	13,011,410	15,150,410	7,682	805,026	14,353,065	1,172,902
Wabash	2,514	9,953,805	3,869,108	14,930,748	1,808,085	1,981,096	461,230	5,337,776	399,853	9,988,040	4,942,708	8,600	398,096	4,536,012	765,715
Wheeling & Lake Erie	458✪	3,065,264	321,651	3,646,883	357,756	830,542	44,047	1,183,246	84,588	2,500,179	1,146,704	37,853	138,469	1,046,088	326,810

* Mileage operated December 31, 1908, 3,992. † Mileage operated December 31, 1908, 492. ‡ Mileage operated December 31, 1908, 1,508. § Mileage operated December 31, 1908, 1,264. ♁ Mileage operated December 31, 1908, 1,456. ° Mileage operated December 31, 1908, 5,586. ♁ Mileage operated December 31, 1908, 429. △ Mileage operated December 31, 1908, 3,309. ✪ Mileage operated December 31, 1908, 442. Indicates Deficits, Losses and Decreases.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 65, giving a summary of car shortages and surpluses by groups from September 30, 1908, to February 2, 1910, says:

"There is little change in the situation as reported in our last bulletin. The surplus shows a decrease of only 236 cars, with an increase in the shortage of 1,633. There was an increased demand for box cars, the surplus decreasing and the shortage increasing. In coal cars the situation was just the reverse, indicating a lessened demand for this class."

The accompanying table gives surpluses and shortages by groups for the period covered by this report, and the charts show total surpluses and shortages in 1907, 1908, 1909 and 1910.

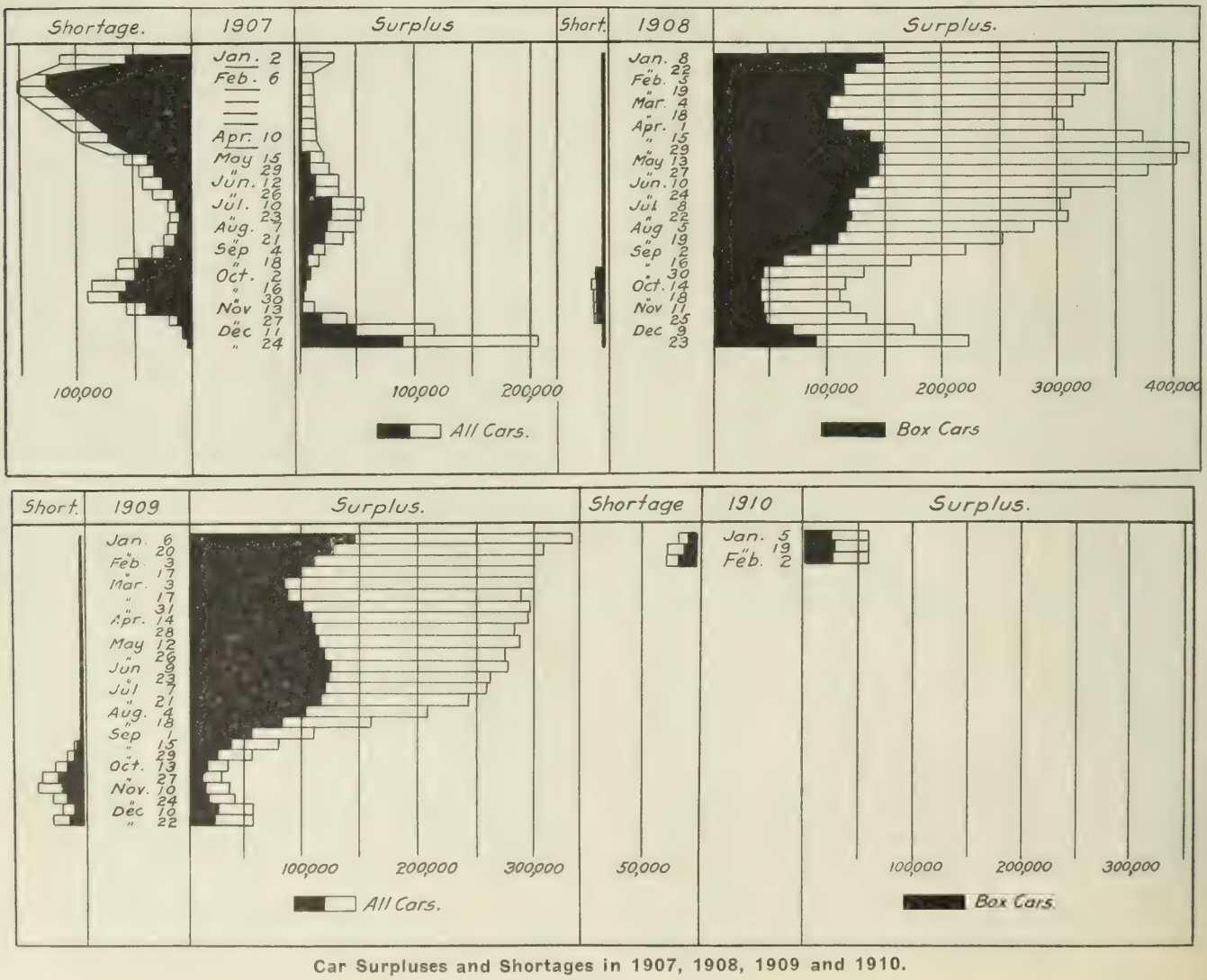
CAR SURPLUSES AND SHORTAGES.

Group*	Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
1	February 2, 1910	8	.....	1,802	539	86	2,427	621	..	50	203	874
2	" 2, 1910	22	383	262	1,304	705	2,654	325	2	1,285	33	1,645
3	" 2, 1910	23	385	286	490	1,599	2,760	4,146	106	1,982	1,801	8,035
4	" 2, 1910	10	2,527	85	391	679	3,682	1,644	229	3,400	500	5,773
5	" 2, 1910	18	605	542	237	266	1,650	2,489	482	1,290	197	4,458
6	" 2, 1910	19	5,749	940	1,600	2,373	10,662	2,895	13	89	806	3,803
7	" 2, 1910	4	500	118	682	1,144	2,444	.....	..	.....	..	.....
8	" 2, 1910	13	3,938	515	630	898	5,981	701	15	..	60	776
9	" 2, 1910	11	1,590	500	167	555	2,812	37	..	2	..	39
10	" 2, 1910	17	3,427	999	2,046	4,778	11,250	390	5	38	..	433
11	" 2, 1910	5	2,248	1,689	87	1,254	5,278	745	..	.....	44	789
Total		153	21,352	7,738	8,173	14,337	51,600	13,993	852	8,136	3,644	26,625

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota, and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California, and Arizona lines; and Group 11—Canadian lines.

A Good Word for the Carriers.

Rapid handling of the crops of Western Canada by the railways and lake vessels during the shipping season just closed has caused a feeling of general satisfaction among grain men at Toronto and other Canadian centers. The ability of the transportation lines to carry grain and produce shipments promptly has enabled the farmers to reach the markets at opportune times. High prices have been obtained, and as a re-



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

sult confidence in the good will and the efficiency of the railways and lake lines has been more firmly established than ever before.

Grain that brought in the market more than $75,000,000 was delivered by the railways to Lake Superior ports alone, and from there taken by a fleet of eighty-one Canadian vessels to various markets. The wheat crop reached the total of more than 138,000,000 bushels in the three western provinces—Alberta, Saskatchewan and Manitoba. There was no car shortage, as there has been at times in years past, although the crops were much larger.—*Journal of Commerce* (New York).

INTERSTATE COMMERCE COMMISSION.

The commission find that rates of $1.35 per 100 lbs. in carloads and $1.85 per 100 lbs. in L. C. L. on brass-covered iron tubing from New York City and neighboring points to San Francisco, Cal., found unreasonable, and $1.25 in carloads and $1.75 in L. C. L. prescribed as maximum rates. Reparation awarded. (17 I. C. C., 475.)

STATE COMMISSIONS.

Private Cars in Pennsylvania.

The Pennsylvania State Railroad Commission has declined to entertain the complaint of the Individual Car Owners' Association concerning the burdens put upon private car owners by the railways. The association, which has its headquarters at Pittsburgh, laid before the commission its complaint about excessive bills for repairs and other things, which have been frequently mentioned in the columns of the *Railway Age Gazette*. The substance of the commission's decision is that the controversy should be taken to the courts, or perhaps to the Interstate Commerce Commission.

At the hearing on this complaint Arthur Hale, general agent of the American Railway Association, gave some facts concerning the practice of the railways with freight cars owned by outside parties, and incidentally offered a gentle reminder that the private car owners in claiming to control 50,000 cars in Pennsylvania were exaggerating their figures. He also told the private car owners in substance that their troubles with the railways were no worse than those of the railways with each other. Mr. Hale thinks that there are not over 134,000 private cars in the country. The latest statistics available show that 170 of the principal railways had on their lines 94,000 private cars. As to the rates he said:

From experience I have learned that the private car question is not one question, but a number of questions. The refrigerator cars open one question, the tank cars another question, and so on. When we paid three-fourths of a cent a mile for cars there were a number of private box car lines which paid. The reduction of the rate to six-tenths of a cent made these lines unprofitable, and there are now practically no private box cars. There are fewer stock cars than there were. There are more coal cars. Some coal shippers find it more profitable to own their own cars, because they can—or could, at least—secure larger shipments. The mileage rate is not compensatory. It would not pay anybody to build coal cars for the mileage rates. The cost of the repairs is too heavy.

COURT NEWS.

The officers of Jefferson county, Kentucky, have again failed in their litigation to compel the Southern Pacific Company, which is a Kentucky corporation, to pay a tax on a sum representing the whole of its property. The assessment was $50,000,000. The State Court of Appeals has declared this illegal and says that the correct assessment is $500,000.

Judge Hook, of the federal court at St. Louis, has dismissed the injunction suit brought by the Tennessee Central to restrain the Illinois Central and the Southern Railway from putting into effect certain changes in freight rates. (See *Railway Age Gazette*, Feb. 11, page 326.) The defendants demurred to the petition on the ground that as the Illinois Central is an Illinois corporation and the Southern a Virginia corporation, suits would have to be brought against them in the states of their origin, and this contention was upheld.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

L. D. P'Poole has been appointed auditor of the Atlantic & St. Andrews Bay, with office at Dothan, Ala., succeeding W. F. McClellan.

C. K. Moffett has been temporarily appointed to act as counsel for the Texas Mexican, with office at Laredo, Tex., succeeding E. A. Atlee, deceased.

W. H. Elmendorf, whose appointment as auditor of the Lake Erie & Western, with office at Indianapolis, Ind., has been announced in these columns, was appointed also auditor of the Ft. Wayne, Cincinnati & Louisville and the Northern Ohio.

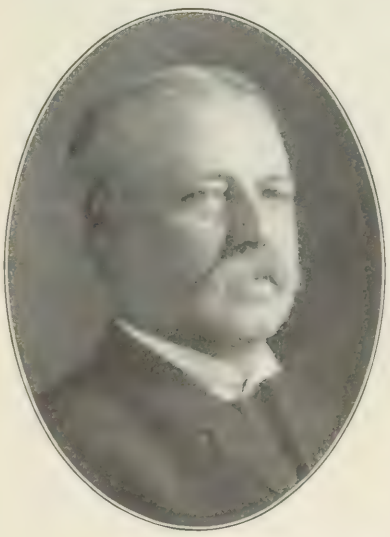
Daniel Willard, president of the Baltimore & Ohio, has been elected also president of the Baltimore & Ohio Southwestern, succeeding Oscar G. Murray, resigned. A history of Mr. Willard's railway life was published in our issue of January 7, page 49.

C. P. Crawford, auditor of the Erie at New York, has been appointed the principal officer in charge of the accounts of that company, succeeding M. P. Blauvelt, comptroller, resigned to become head of the accounting department of the Illinois Central.

Ernest F. Haubold has been appointed assistant auditor of freight accounts of the New York Central & Hudson River. Arthur L. Linn, Jr., assistant auditor and auditor of subsidiary lines, has also been appointed auditor of the Merchants Despatch and the Western Transit Co., both with offices at New York.

H. D. Foster, assistant auditor of the Chicago, Burlington & Quincy at Omaha, Neb., has been appointed assistant general auditor, with office at Chicago, succeeding George B. Dunbar, resigned on account of ill health. J. D. Shields, auditor of freight accounts at Chicago, succeeds Mr. Foster, and J. W. Newell succeeds Mr. Shields, effective March 1.

E. H. Fitzhugh, whose election as first vice-president of the Grand Trunk has been announced in these columns, was born on February 1, 1853, at Danville, Montgomery county, Mo. He began railway work in 1873 as a clerk in the office of the master car builder of the St. Louis, Kansas City & Northern, now a part of the Wabash, at St. Louis, Mo. After serving in the car accountant's office of the same company he was made chief clerk to the superintendent of the Western division of the Wabash, remaining in that position until 1889, when he became master of transportation for the lines west of the Mississippi river on the Wabash at Moberly, Mo. In January, 1896, he was appointed secretary to the general manager of the Grand Trunk at Montreal, Que., and the following July was made superintendent of the Middle division at Toronto, Ont. From May, 1899, to March, 1901, he was vice-president and general manager of the Central Vermont at St. Albans, Vt. He was appointed assistant to the president of the Southern Pacific in May, 1901, at San Francisco, Cal., remaining in that position until November of the same year. The following February he returned to the Central Vermont as vice-president and general manager, and on January 1, 1905, was elected third



E. H. Fitzhugh.

vice-president of the Grand Trunk, and also retained his office of vice-president of the Central Vermont, which positions he held at the time of his recent election as first vice-president of the Grand Trunk, retaining also the vice-presidency of the Central Vermont, as well as the vice-presidency of the Detroit & Toledo Shore Line.

M. P. Blauvelt, comptroller of the Erie and the New York, Susquehanna & Western at New York, N. Y., has been appointed comptroller of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago, succeeding C. F. Krebs, resigned. He will have charge of the accounting, treasury and freight claim departments.

Howard G. Hetzler, whose election as president of the Chicago & Western Indiana and the Belt Railway Company of Chicago, has been announced in these columns, was born in 1863 at La Moille, Ill. He graduated from the University of Michigan in 1886, and began railway work in the same year in the engineering department of the Chicago, Burlington & Quincy. From 1891 to 1892 he was engineer of maintenance of way of the Louisville, New Albany & Chicago, now a part of the Chicago, Indianapolis & Louisville, and was then for six years roadmaster of the Burlington at Chicago. In 1898 he was made superintendent of freight terminals and five years later superintendent of the Chicago division. He was elected president of the Metropolitan West Side Elevated Railroad in May, 1905, which position he held until his recent election.

Richard A. White, whose appointment as general auditor of the New York Central lines east of Buffalo has been announced in these columns, was born in June, 1860, at Hartford, Conn. Mr. White graduated from the Hartford public high school in 1877, and from Trinity College at Hartford in 1881. He began railway work as ticket agent and freight clerk in the spring of 1882 at the Harlem river station, New York, of the New York, New Haven & Hartford, and about two years later entered the office of the general auditor of the New York, West Shore & Buffalo. On the reorganization of that company in January, 1886, as the West Shore he became chief clerk to the auditor of disbursements. He was in charge of statistics in the comptroller's office of the New York Central & Hudson River in October, 1889, and was appointed auditor of disbursements in May, 1893, becoming auditor on February 1, 1906, which position he held at the time of his recent appointment. Mr. White has been appointed also general auditor of the Rutland Railroad, the Rutland Transit Co., the Merchants Despatch and the Western Transit Co.

Operating Officers.

M. H. MacLeod, general manager of the Canadian Northern at Winnipeg, Man., has been transferred to Vancouver, B. C.

W. S. Fraser has been appointed trainmaster of the Eastern division of the Louisiana Railway & Navigation Co., with office at Baton Rouge, La., succeeding R. B. Foss, resigned.

G. Radetzki, general superintendent of the Houston & Texas Central, the Houston East and West Texas and the Houston & Shreveport, with office at Houston, Tex., has resigned to engage in other business.

J. T. Wallis, superintendent motive power of the Pennsylvania Railroad at Williamsport, Pa., has been appointed acting superintendent of the West Jersey & Seashore, with office at Camden, N. J., succeeding D. H. Lovell, granted leave of absence on account of ill health.

J. E. Hood, trainmaster of the Chicago, Milwaukee & Puget Sound at Alberton, Mont., has been appointed acting superintendent, with office at Missoula, Mont., succeeding C. H. Marshall, granted leave of absence on account of ill health. W. C. Stephens has been appointed acting trainmaster, succeeding Mr. Hood.

A. B. Stevenson, superintendent of the Utah division of the Oregon Short Line at Salt Lake City, Utah, has been appointed superintendent of the Idaho division, with office at Pocatello, Idaho, succeeding W. H. Jones, assigned to other duties. A. F. Brewer, car service agent at Salt Lake City, succeeds Mr. Stevenson.

Edward E. Young, whose appointment as general superintendent of the Chicago, Burlington & Quincy, with office at Alliance, Neb., has been announced in these columns, was born November 7, 1859, at Bloomington, Ill. He received a common school education and began railway work in 1879 with the Burlington as a freight brakeman on the Creston division, and was later a conductor. Beginning in 1884 he was about a year at Red Oak, Iowa; then 12 years at Pacific Junction, Iowa, and nine years at St. Joseph, Mo., in charge of yards. In April, 1906, he was made a trainmaster at Lincoln, Neb., was transferred to Denver, Colo., in the latter part of that year, and a month later was made superintendent of the McCook division. In November, 1908, he was transferred as superintendent to the Sheridan division, which position he held until his recent promotion.

N. W. Smith, whose appointment as superintendent of the Central division of the Philadelphia, Baltimore & Washington has been announced in these columns, began railway work on the Pennsylvania as a rodman on the Sunbury division of the Philadelphia & Erie on April 24, 1893. The following year he was made assistant supervisor and was later transferred, serving at various times on four other divisions in the same capacity. In 1899 he was put in charge of experimental track work on the Middle division. In 1900 he was appointed supervisor of the Eastern division, and two years later was made supervisor of the Philadelphia division. In 1905 he was transferred to the office of the principal assistant engineer as supervisor at Altoona, and the following year was made assistant to the principal assistant engineer at that place, remaining in that position until April 1, 1907, when he was made division engineer of the Middle division, which position he held at the time of his recent appointment.

A. J. Whitney, Jr., whose appointment as superintendent of the Maryland division of the Philadelphia, Baltimore & Washington has been announced in these columns, was born October 11, 1862, at Harrisburg, Pa., and was educated in the public schools and at Harrisburg academy. He began railway work in June, 1881, and entered the service of the Pennsylvania as a rodman on the Lewisburg & Tyrone. In 1884 he was assigned to special work in the principal assistant engineer's office at Philadelphia. Four years later he was made assistant supervisor at Altoona, and the following year was transferred to the Philadelphia, Baltimore & Washington in the same capacity, since which time he has been consecutively: 1893 supervisor on the Tyrone division; 1897 supervisor of the Pittsburgh division; 1901 assistant engineer Western Pennsylvania division; 1903 assistant engineer West Jersey & Seashore; 1905 principal assistant engineer Pennsylvania Railroad division, and since April 1, 1907, superintendent of the Delaware division, from which position he has just been promoted.

Traffic Officers.

H. H. Smith has been appointed a soliciting agent of the Louisville & Nashville, with office at Chicago.

C. E. Benjamin, general agent of the Canadian Pacific at Chicago, has been appointed general tourist agent, with office at Montreal, Canada.

H. M. Griggs, assistant general coal and ore agent of the New York Central Lines at Cincinnati, Ohio, has had his office changed to Chicago.

H. C. Ewing has been appointed Pacific coast agent of the Traders' Despatch, with office at San Francisco, Cal., succeeding F. H. Stocker, promoted.

C. R. Sirkosky has been appointed a traveling freight agent of the Missouri, Kansas & Texas, with office at Oklahoma City, Okla., succeeding J. J. Hartnett, promoted.

Victor Jones, city passenger and ticket agent of the Great Northern at Sioux City, Iowa, has been appointed a traveling passenger agent, with office at Des Moines.

Samuel T. Stephens has been appointed a traveling passenger agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Sandusky, Ohio, succeeding G. C. Tolman, retired.

F. E. Roesler, traveling passenger and immigration agent of the Kansas City Southern at Kansas City, Mo., has been appointed industrial and immigration agent, with office at Kansas City, Mo.

Howard M. Biscoe, general freight agent of the Boston & Albany at Boston, Mass., has been appointed assistant freight traffic manager, with office at Boston, and his former position has been abolished.

P. E. Meany has been appointed general agent of the Great Northern, with office at Milwaukee, Wis., succeeding H. J. Stolz, resigned to become general manager of the Bartles Oil Company at St. Paul, Minn.

F. M. Cole, commercial agent of the New York Central Lines at Peoria, Ill., has been appointed general agent, with office at Kansas City, Mo., succeeding H. F. Ledlie, promoted. G. H. McHugh succeeds Mr. Cole.

H. Page has been appointed a general agent of the Missouri. Kansas & Texas of Texas, succeeding G. A. Carter, resigned, and R. W. Hockaday, general ticket agent at Parsons, Kan., has been appointed industrial commissioner, both with offices at Dallas, Tex.

J. G. Morrison, assistant general freight agent of the Chicago Great Western at Chicago, has been appointed assistant to the vice-president, with office at Chicago. F. S. Hollands, chief of the tariff bureau of the Chicago & Alton at Chicago, succeeds Mr. Morrison.

John W. Byrne, traveling freight solicitor of the Vandalia at Terre Haute, Ind., has been appointed commercial agent, with office at Peoria, Ill., succeeding J. E. Fenelon, appointed special agent in the freight department at St. Louis, Mo. M. P. King succeeds Mr. Byrne.

Milton M. Beekman has been appointed southeastern passenger agent of the Halifax & Southwestern, the Canadian Northern Quebec and the Quebec & Lake St. John, and H. R. Stevens has been appointed a traveling passenger agent, both with offices at Washington, D. C.

W. H. George, traveling freight agent of the Chicago, Milwaukee & St. Paul at Peoria, Ill., has been transferred to Chicago; C. B. Wilser, commercial agent at Minneapolis, Minn., has been transferred to Rapid City, S. Dak.; C. E. Mumford succeeds Mr. Wilser, with office at Minneapolis.

C. C. Anderson, traveling passenger agent of the Rock Island Lines at Peoria, Ill., has been appointed district passenger agent, with office at St. Louis, Mo., succeeding H. P. Mantz, resigned to become vice-president and business manager of the Mississippi Valley Advertising Company at St. Louis.

C. J. Pearson, commercial agent of the Chicago, Burlington & Quincy at Pueblo, Colo., has been transferred to Denver, Colo. A. S. Cuthbertson, commercial agent of the Colorado & Southern at Pueblo, has been appointed also commercial agent of the Burlington, succeeding Mr. Pearson, the freight offices of the two roads having been consolidated.

W. E. McGee, traveling passenger agent of the Southern, at Augusta, Ga., has been appointed division passenger agent, with office at Charleston, S. C., succeeding John C. Lusk, resigned to become assistant to president of the Jemison Real Estate & Insurance Co. at Birmingham, Ala. A. H. Acker, city passenger and ticket agent at Savannah, succeeds Mr. McGee, with office at Augusta.

Benjamin R. Boggs, division freight agent of the Philadelphia & Reading at Harrisburg, Pa., has been appointed assistant general freight agent of that company and controlled lines, with office at Philadelphia, Pa. Edgar D. Hilleary, division freight agent of the Philadelphia & Reading and the Atlantic City Railroad, succeeds Mr. Boggs, with office at Harrisburg, and Harry C. Stauffer, succeeds Mr. Hilleary, with office at Philadelphia.

The following have been made traveling freight agents of the St. Louis & San Francisco: H. A. Wheeling and J. A. Hawkins, with office at Memphis, Tenn.; F. D. Royce in New York; K. M. Custis at Pittsburgh, Pa.; J. E. Branch and L. E. LeFaivre at Atlanta, Ga., and E. W. Trott at Joplin, Mo. F. E. Webster and H. C. South have been appointed traveling freight agents of the Chicago & Eastern Illinois, the Evansville & Terre Haute and the Evansville & Indianapolis, with office at Milwaukee, Wis.

J. W. Daly, whose appointment as assistant passenger traffic manager of the New York Central Lines West of Buffalo, with office at Chicago, has been announced in these columns, was born June 2, 1868, at Canton, Ill. He began railway work in 1882 as a telegraph operator on the Wabash, St. Louis & Pacific, now a part of the Wabash. He was then consecutively telegraph operator at Horton, Kan., ticket agent at Burlingame and later at Augusta, Kan., and at Springer, N. Mex., on the Atchison, Topeka & Santa Fe; chief clerk in the local office and chief yard clerk with the Wisconsin Central at Chicago; chief clerk in the general office of the Jacksonville Southeastern, now a part of the Chicago, Peoria & St. Louis; general passenger and ticket agent of the Jacksonville, Louisville & St. Louis, now a part of the Jacksonville & St. Louis. In April, 1901, he was appointed southern passenger agent of the Lake Shore & Michigan Southern at Cincinnati, Ohio, and a year later general eastern passenger agent at Buffalo, N. Y., He was then made chief assistant general passenger agent of the Lake Shore and the Michigan Central at Buffalo, and in January, 1907, was appointed general passenger agent of the Lake Shore at Cleveland, Ohio, from which position he has just been promoted.



J. W. Daly.

Gerrit Fort, whose appointment as general passenger agent of the New York Central & Hudson River, the Boston & Albany and the West Shore, was recently announced in these columns, was born on November 12, 1865, at Cedar Rapids, Iowa. He began railway work in the fall of 1884 and was later clerk to the superintendent of the Burlington, Cedar Rapids & Northern, now a part of the Chicago, Rock Island & Pacific at Cedar Rapids, remaining in that position until January 1, 1887, when he became clerk to the auditor of the Wabash at Chicago. In September, 1889, he was appointed assistant rate clerk in the general passenger department of the New York Central & Hudson River at New York, and two years later was made chief clerk in the same department. He became secretary of the Central Passenger Association at Chicago on January 1, 1897, remaining in that position until September, 1900, when he was made assistant general passenger agent of the Union Pacific at Omaha, Neb. In June, 1907, he went to New York as assistant to C. F. Daly, vice-president of the traffic department of the New York Central Lines, which position he held at the time of his recent appointment.



Gerrit Fort.

George T. Foyes, traveling passenger agent of the Northern Pacific at Cincinnati, Ohio, has been appointed traveling immigration agent, with office at Chicago. J. C. Eaton has been

appointed traveling immigration agent, with office at Cincinnati. J. J. Gartner, traveling passenger agent at Atlanta, Ga., succeeds Mr. Foyes, and M. J. Costello succeeds Mr. Gartner.

L. W. Landman, general western passenger agent of the Lake Shore & Michigan Southern at Chicago, has been appointed general passenger agent of the Lake Erie & Western, with office at Indianapolis, Ind., succeeding C. L. Hilleary, appointed general agent of the New York Central Lines, with office at St. Louis, Mo. L. D. Heusner, general western passenger agent of the Michigan Central at Chicago, succeeds Mr. Landman, and I. P. Spining, general northern agent of the Cleveland, Cincinnati, Chicago & St. Louis at Chicago, has been made general agent in the passenger department of the Big Four and the Michigan Central at Chicago.

Engineering and Rolling Stock Officers.

W. R. Thomas, road foreman of engines of the Cincinnati, New Orleans & Texas Pacific, has been promoted to general foreman of the mechanical and car departments, with office at Ludlow, Ky.

W. C. Smith, engineer maintenance of way of the Northern Pacific lines east of Paradise, Mont., at St. Paul, Minn., has been appointed chief engineer of maintenance of way, with office at St. Paul.

M. H. Wickhorst, engineer of tests of the Chicago, Burlington & Quincy, with office at Aurora, Ill., has been granted a leave of absence for one year to become chief chemist in charge of rail tests by the American Railway Engineering and Maintenance of Way Association. W. A. Derby succeeds Mr. Wickhorst.

J. B. Hutchinson, Jr., whose appointment as division engineer of the West Jersey & Seashore has been announced in these columns, was born at Bristol, Pa., on March 3, 1876. He entered the services of the Pennsylvania Railroad in January, 1898, as a rodman, and the next year was transferred to the office of the principal assistant engineer at Altoona, Pa., since which time he has been consecutively, November 1, 1899, assistant supervisor, West Penn division; February 2, 1900, assistant supervisor Pittsburgh division; July 20, 1901, supervisor West Penn division; July 1, 1905, supervisor Middle division.

William F. Greene, whose appointment as division engineer of the Philadelphia Terminal division of the Pennsylvania Railroad has been announced in these columns, was born at Philadelphia, Pa., on March 11, 1876. He entered the service of the Pennsylvania Railroad January 6, 1899, as a rodman on the Maryland division of the Philadelphia, Baltimore & Washington. In April, 1901, he was appointed transitman in the office of the principal engineer at Altoona, Pa., and the following month was made assistant supervisor on the Baltimore division. In December, 1902, he was transferred to the Pittsburgh division. He was appointed supervisor on the Buffalo division in June, 1904, and the following May was transferred to the Maryland division of the Philadelphia, Baltimore & Washington, which position he held at the time of his recent promotion.

A. B. Clark, whose appointment as principal assistant engineer of the Philadelphia, Baltimore & Washington at Wilmington, Del., has been announced in these columns, was born at Green Village, Pa., on October 1, 1867. He entered the service of the Pennsylvania Railroad in July, 1889, in the office of the assistant engineer at Harrisburg, Pa., and about two years later was transferred to the office of assistant engineer of the Philadelphia division. In January, 1894, he was put in charge of the storage and repair yards at Paoli, Pa., becoming acting assistant supervisor on the Philadelphia division in May, 1895, at Paoli. The following November he was transferred to the office of the principal assistant engineer at Altoona, Pa., leaving that position in July, 1896, to become assistant supervisor at the same place, and was later transferred to the Pittsburgh division. In July, 1900, he was appointed supervisor on the Baltimore division of the Northern Central, and about a year later was made supervisor on the Pittsburgh division, which position he held until December 15, 1905, when he was made assistant engineer of the Middle and Western divisions and the Philadelphia and Erie divisions, leaving that position in April, 1907, to become assistant engineer of the West Jersey & Seashore. He was appointed division engineer of the Maryland division on November 16, 1908, which position he held at the time of his recent promotion.

J. J. Rhoads, whose appointment as division engineer of the Middle division of the Pennsylvania Railroad has been announced in these columns, was born at Bellefonte, Pa., on August 23, 1868. He entered the service of the Pennsylvania Railroad in March, 1889, as a rodman and levelman on construction work. In June, 1892, he was in the office of the engineer of maintenance of way at Philadelphia, Pa., and the following year was made assistant supervisor of the Amboy division. He was later transferred in the same capacity to the Maryland division of the Philadelphia, Baltimore & Washington. He was appointed a supervisor on the Amboy division in April, 1899, and two years later was transferred to the New York division, remaining in that position until July 1, 1905, when he became assistant engineer of the Eastern and Susquehanna divisions. In April, 1907, he was made division engineer of the Philadelphia Terminal division, which position he held at the time of his recent appointment.

J. C. Auten, whose appointment as division engineer on the Maryland division of the Philadelphia, Baltimore & Washington has been announced in these columns, was born on August 31, 1870. He entered the service of the Pennsylvania Railroad as a rodman in the office of the assistant engineer of the Sunbury division on Aug. 17, 1887, and was later in charge of the drafting room at that place. He was made acting assistant supervisor of the Philadelphia and Erie divisions in April, 1894, and the following November was made supervisor on the same division. In October, 1898, he was appointed supervisor of the Baltimore division of the Northern Central, and in December, 1901, was transferred as supervisor to the Maryland division of the Philadelphia, Baltimore & Washington. He was appointed assistant engineer of the Elmira and Canandaigua division of the Northern Central in April, 1902, and the following June was transfered in the same capacity to the West Penn division, becoming assistant engineer of the Eastern and Susquehanna division in April, 1907. He remained in this position until November, 1908, when he was made division engineer of the West Jersey & Seashore.

Purchasing Officers.

Henry Mel, material agent of the National Railways of Mexico at Beaumont, Tex., has been appointed assistant purchasing agent, with office at Beaumont.

Harry A. Fabian, who has been appointed manager of purchases and supplies for the New York, New Haven & Hartford, for the Boston & Maine and for the subsidiary companies of the two corporations, with headquarters at Boston, was born at Montreal Oct. 16, 1876. He received a common school education and at the age of 12 years became messenger in the dining car department of the Canadian Pacific, afterwards serving as a junior clerk in the president's office and as advertising clerk in the passenger department. Following later service as passenger agent at Montreal of the Chicago, Rock Island & Pacific he went to St. Paul, Minn., to become tax commissioner and soon after land commissioner of the Northern Pacific. He next became secretary to President Mellen, of the Northern Pacific, who, after becoming the head of the New York, New Haven & Hartford, called him to the place of assistant to the president. In that capacity Mr. Fabian has had exceptionally large and responsible duties, including the organization of the New Haven's Rhode Island trolley system, supervision of the navigation properties, of the Connecticut trolleys, of the Central New England lines and the management of the New Haven Company's store department, where he introduced successful economies. His duties as assistant to the president at New Haven will be taken by Vice-President E. G. Buckland, whose headquarters have been at Providence, R. I.

OBITUARY.

E. S. Jewett, general agent in the passenger department of the Missouri Pacific, with office at Kansas City, Mo., died at Kansas City on February 13.

Railway Construction.

New Incorporations, Surveys, Etc.

ALBERTA ROADS.—According to press reports from Edmonton, Alb., a 50-mile line, to open up the coal fields of the Yellow Head Pass Coal & Coke Co. west of Edmonton, will be built this year. Contracts are to be let soon. W. O'Brien, Renfrew, Ont., is said to be interested.

ARIZONA & COLORADO.—According to press reports from Farmington, N. Mex., plans are taking definite shape for the construction of a line from Farmington south to Gallup, thence south to Lordsburg, and west to Globe, Ariz. J. W. Reagan, Farmington, is the engineer in charge. (Aug. 6, p. 258.)

ARKANSAS, OKLAHOMA & WESTERN.—An officer writes that construction work is now under way on an extension from Rogers, Ark., southeast to Huntsville, 35 miles. (March 19, p. 651.)

ATCHISON, TOPEKA & SANTA FE.—Contract is said to have been given for a new branch from Lometa, Tex., on the Gulf, Colorado & Santa Fe, west to a point near Eden, about 100 miles. The contract is said to be worth about $2,000,000. The line will traverse the valley of the San Saba river for 30 miles, and then run through the Brady Creek valley, passing through the towns of San Saba and Brady. (Dec. 17, p. 1212.)

BALTIMORE & OHIO.—Work, as outlined by President Willard, is to be immediately placed under way. The general plan has been approved and provides for expenditures aggregating something over $8,000,000. Of this, $5,000,000 is to be used on the roadway, largely for improving operation at points where congestion is most liable to occur. Much work is to be done on the mountain sections of the road, where two tunnels are to be eliminated and third running tracks laid at the approaches to others, that will greatly facilitate passage through them. To provide sufficient water supply, a 90,000,000-gal. reservoir, with a pipe system, will be constructed. The enlargement and reconstruction of yards, new helper stations, etc., are included in the improvements. The company has $16,000,000 available for road improvements and as much more for new motive power and equipment.

BURRARD INLET TUNNEL & BRIDGE CO.—Incorporation has been applied for to the Dominion parliament. The plans call for a tunnel under the first narrows of Burrard inlet and a bridge over the second narrows with the necessary approaches from the south shore at Vancouver, B. C., to the opposite shore. The company also proposes to build lines of railway not exceeding 10 miles. The bridge and tunnel will be constructed for the operation of steam and street railways, as well as highway traffic. Permission is also asked to build a line from the northern ends of the bridge and tunnel, easterly along the shore line of North Vancouver to Deep Cove, on the north arm of Burrard inlet, and westerly along the shore line of North Vancouver to Horseshoe bay, on Howe sound. Burns & Walkem, Vancouver, are solicitors for the company.

CANADIAN PACIFIC.—William White, second vice-president, announces that the western extensions to be undertaken this year will be principally colonization lines and links connecting existing lines; the total mileage will be 621 miles. Of this 346 miles will be in Saskatchewan, 45 miles in Alberta and 174 miles in British Columbia. The section of the main line between Winnipeg, Man., and Portage la Prairie, 56 miles, will be double-tracked. The work will be pushed as rapidly as possible, but it is possible that all the work may not be completed within the year. The estimated expenditure for road construction is between $8,000,000 and $10,000,000. In addition, other improvements will be made, including new stations. The station at Regina, Sask., is to be 480 ft. long, part of which is to be four stories high, and is to cost over $500,000. A large bridge will be built over the South Saskatchewan river at Outlook, to cost $1,000,000. (Feb. 4, p. 280.)

CHICAGO & NORTH WESTERN.—According to press reports active construction work has been started on extensions in Monroe county, Iowa, through coal fields near Albia.

CHICAGO, BURLINGTON & QUINCY.—According to press reports this company is planning to build an extension from Cheyenne, Wyo., south to Wellington, Colo., about 35 miles.

CHICAGO, MILWAUKEE & PUGET SOUND.—Work is now under way on the line from Monckton, Wash., northwest to Everett, about 50 miles. Contract has been let to H. C. Henry. (Nov. 26, p. 1036.)

CHICAGO, ROCK ISLAND & PACIFIC.—This company is said to be making plans for a cut-off from Atlantic, Iowa, west to Council Bluffs. The new line is to have easier grades and will be about 45 miles long as compared with 60 miles on the existing line.

CINCINNATI, HAMILTON & DAYTON.—Announcement is said to be made that contracts for improvements to cost $8,000,000 will be carried out during 1910. Of this amount $2,000,000 is to be spent on the Cincinnati, Ohio, terminal; $1,000,000 reducing grades and curves, and $1,000,000 for a new ore dock at Toledo. New terminal yards are also to be constructed at Toledo, at a cost of $750,000, and a new freight warehouse is to be put up, to cost $250,000. About 75 miles of line will be relaid with 85-lb. rail and eight bridges will be renewed.

DENVER, LARAMIE & NORTHWESTERN.—According to press reports this company is planning to make extensive improvements and expects to build about 200 miles of line this year. (Oct. 1, p. 613.)

ESTACADA & GULF.—An officer is quoted as saying that material is being assembled at Roby, Tex., for the completion of the line into that place. Grading has been finished from McCaulley west to Roby and track has been laid within four miles of Roby. The line is to be extended west 100 miles from Brady. T. H. Landon, chief engineer, Roby. (Jan. 21, p. 164.)

GRAND TRUNK PACIFIC.—According to press reports bids for the remaining 135 miles of the branch from Tofield, Alb., south to Calgary, are to be let this week, and it is expected to have the entire line finished during 1910. (Nov. 19, p. 990.)

GULF, DELTA & NORTH WESTERN.—Incorporated in Louisiana, with $2,000,000 capital, to build from Port Barre, La., north to Moreauville, about 35 miles. O. H. Williams, New Orleans, La.; D. C. Scarborough, Natchitoches; S. Chesney, St. Louis, Mo., and J. T. McElroy, Odessa, Tex., are directors.

KANSAS, LAWTON & GULF.—This company has amended its charter, permitting it to build an additional branch line 300 miles long from the southern part of Comanche county, Okla., northeast through Stephens, Grady, McClain, Cleveland, Oklahoma, Logan, Payne, Pawnee and Osage counties, to the Kansas state line. The company was originally organized with $5,000,000 capital, and office at Walter, to build from Randlett, in Comanche county, northwest to the northern part of Harper county, at the Kansas state line, 250 miles. The directors include: A. W. Green, C. M. Bechan, H. F. Crossman and E. F. Sawyer, Walter and J. M. Bellamy, Lawton.

LACLEDE, DALLAS & WESTERN.—Incorporated in Missouri, with $600,000 capital, to build from Phillipsburg, Laclede county, Mo., west to a point eight miles west of Buffalo, 30 miles. S. T. McDermott, B. B. Joffee, C. M. Blackman, C. W. German and W. F. Farren, all of Kansas City, are interested.

LANSING & NORTHEASTERN (ELECTRIC).—Incorporated in Michigan, with $500,000 capital, to build electric lines in eastern Michigan. The first line to be built will be from Lansing northeast to Owosso, about 30 miles, and it is expected that this section will be finished by October 1. The route from Lansing parallels the Grand Trunk to Morrice, then runs north to Owosso. An extension is projected from Morrice east through Durand, thence northeast to Flint. An extension is also projected from Owosso, northeast to Saginaw. The incorporators include: G. G. Moore, K. Lathrop and S. W. Ladd, Detroit, and T. W. Atwood, Caro. All the incorporators are said to be interested in the Michigan United Railways Co., Lansing.

MINSTER & LORAMIE.—See Western Ohio (Electric).

MISSOURI PACIFIC.—Improvements are to be made by this company in Kansas at a cost of $4,000,000.

Missouri Roads (Electric).—F. C. Yentsch, Mount Vernon, Mo., is trying to interest Springfield, Mo., capitalists in a project to build an interurban line from Springfield west via Hazeltine, Halltown, Paris Springs, Mount Vernon and Stotts City to Carthage, about 65 miles. The Springfield Traction Co. is said to have surveys made over a different route for a line between these two places.

New York Central & Hudson River.—About April 1 the executive officers of the New York Central line will vacate their present quarters in the west wing of the Grand Central station, which has been in use for the past 35 years, and move into the new office building on Lexington avenue. At about the same time the four tracks remaining on the old level under the train shed will be torn up, permitting the work of demolishing the station building and the excavation. The old annex on the east side of the main building has already been torn down. Excavation for the whole terminal plant is more than half finished and track-laying is about half finished. On the main station level 22 tracks are ready out of a total of 42, and on the suburban level 10 tracks are in place, out of a total of 24. Up to the present time the company has spent upon terminal work, electrification and connected improvements a total of about $43,000,000, roughly classified as follows: Grand Central terminal construction, $15,000,000; real estate, $10,500,000; electrification of road, $10,700,000; four-tracking and station improvements, $6,000,000, and elimination of grade crossings, $500,000. These figures include $4,000,000 for the big post office and office buildings, including the northeast corner of the station building proper. Electrification has been finished as far as Mount Vernon, N. Y., on the Harlem division, and as far as Yonkers, on the Hudson division. It is expected that all train service on the Harlem division as far as White Plains, the limit of the electric zone, will be electrically operated in March. The extension of electric operation north of Mount Vernon, involving the construction of two new sub-stations, is rapidly approaching completion. The extension of electric suburban service beyond Yonkers on the Hudson division is less definite because of the large amount of heavy work included in the improvements on that division. Preliminary work is being pushed at all important points between Spuyten Duyvil and Harmon. The electrification has resulted in other improvements being made, including the elimination of grade crossings and the building of a large number of new stations within the electric zone. The four-tracking on the Hudson division already authorized will greatly increase the transportation capacity in and out of New York and will make it possible for a considerable separation of passenger and freight trains, as well as the operation of express and local trains, without interference with each other. At Spuyten Duyvil preliminary work is well advanced for four-tracking and for correction of alinement. Otherwise the four-tracking has been completed from Mott Haven to Hastings, with provision for two additional freight tracks from Spuyten Duyvil to Yonkers, and similar work is well advanced at Hastings. A new passenger station and new freight yards are to be added at Hastings. The four-track work is finished through Dobbs Ferry and is well under way at Ossining. Grading for the fourth track is under way between Dobbs Ferry and Harmon. It is expected that the total cost of the terminal and electric zone improvements will be between $90,000,000 and $100,000,000. All the real estate has been bought and work on the terminal proper is about half finished.

Northern Electric.—According to press reports rights-of-way have been secured in Tehama county, Cal., for an extension from Chico, northwest to Los Molinos, and eventually to Red Bluff, in all about 45 miles. The company is also planning to build from Yuba City west through Meridian to Colusa, thence north to Hamilton City. (Dec. 3, p. 1108.)

North Western Corporation.—This company is said to be planning to build an electric line between Salem, Ore., and Eugene, and probably between Salem and Portland. Negotiations are said to be under way which may result in the immediate construction of the Salem-Eugene line. A. Welch, general manager, Fenton building, Portland, Ore.

Ohio River & Northern.—According to press reports, construction work is to be pushed this spring on a line from Lorain, Ohio, on Lake Erie, southwest to Wellsville. Work on this road was started some years ago and was abandoned in 1908. Connection will be made with the steel works at Lorain. The line will pass near Lisbon, in Columbia county, running south via West Point to Wellsville. The line is projected east up the Ohio river to East Liverpool and via Smith's Ferry to Midland, Pa. Later an entrance is contemplated into Pittsburgh. Joseph Ramsey, Jr., Orange, N. J., is back of the project. The original promoters included P. F. Smith, W. P. De Arnitt, Pittsburgh, Pa., and J. L. Francis, Chicago.

Ottawa, Montreal & Eastern.—A railway bill to incorporate this company has been reported with a number of amendments. The company is to have a capital of $2,000,000, with office at Montreal, Que., and plans to build 230 miles of railway from St. Agnes, on Lake Megantic, in Compton county, Que., west. The proposed line is to run through the counties of Wolfe, Athabaska, Richmond, Drummond, Yamaska, Bagot, Richelieu, St. Hyacinthe, Vercheres and Chambly, to a crossing of the St. Lawrence river, where either a tunnel is to be pierced or a bridge built at or near Longueuil, continuing to Montreal, thence westerly through the counties of Hochelaga, Jacques Cartier, Laval, Terrebonne, Two Mountains and Argenteuil, crossing the Ottawa river to Prescott county, Ont., and extending on the south side of the river west through Russell and Carleton counties to Ottawa. The incorporators include: W. I. Bishop, A. Jarvis, C. E. Cutler, V. Cusson and M. Tetreau, all of Montreal. (Dec. 10, p. 1168.)

Pacific Railway & Navigation Co.—Passenger train service on 25 miles of completed line at the western end between Tillamook, Ore., and Vosburg, will be inaugurated on April 1. Work trains are now in operation over this portion of the line. The company was organized to build from Hillsboro, west to Tillamook, 91 miles, and track has been laid on 46½ miles. Contracts are let to the J. W. Sweeney Construction Co. and Robert Wakefield, both of Portland, on 41 miles between Timber and Garibaldi. About 800 men are now at work between Hillsboro and Tillamook. The principal work now under way is the construction of bridges and tunnel and rock work excavations. Tunnel number one, at a point 24½ miles west of Hillsboro, 1,400 ft. long, has been finished. On the western end of the line track has been laid on 31½ miles. (Dec. 3, p. 1108.)

South Carolina & Western.—Incorporated in South Carolina, with $500,000 capital, to build from McBee, S. C., southeast via Hartsville to Florence, about 40 miles. The incorporators include J. E. Hancock, W. R. Bonsal and S. Lawrence, Hamlet, N. C.

Springfield Traction Co.—See Missouri Roads (Electric).

Temple & Northwestern.—Organized to build from Temple, Tex., north to Hamilton. Negotiations said to be pending between W. G. McDaniel and residents of Temple to build the line, and as soon as the contract is signed work is to be started. F. F. Downs, J. E. Ferguson and C. M. Campbell, all of Temple, are said to be interested. (Dec. 24, p. 1261.)

Toppenish, Simcoe & Western.—Work is said to be under way by Contractor Leonard, building across the Yakima Indian reservation, in the state of Washington. The contract calls for the completion of the work by July 1. The company was organized to build from Toppenish, Wash., west to Ft. Simcoe, about 30 miles. Frank A. Williams, president, Toppenish. (Dec. 24, p. 1261.)

Trinity Valley & Northern.—An officer writes that contracts have been let to L. S. Powell, Fouts, Tex., and to P. Razor, Dayton, for building 10 miles from Fouts, north. Maximum grades will be 1 per cent. and maximum curvature 3 deg. The grading work involves the handling of from 5,000 to 20,000 cu. yds. per mile. There will be five trestles, ranging from 100 ft. to 276 ft. each. Track has been laid on five miles. (Feb. 4, p. 281.)

Western Maryland.—See an item in regard to this company in Financial News.

Western Ohio (Electric).—According to press reports this company has incorporated the Minster & Loramie and is securing right-of-way for a line from a point on the Western Ohio at Minster, Ohio, south to Loramie, about five miles.

Railway Financial News.

ALBANY & NORTHERN.—This road, extending from Albany, Ga., to Cordele, 36 miles, has been sold to the Georgia Southwestern & Gulf, which will immediately extend the line to Saint Andrews Bay, Florida, on the Gulf of Mexico.

CANADIAN NORTHERN.—See Quebec & Lake St. John.

CANADIAN PACIFIC.—The directors have declared the regular semi-annual dividend of 2 per cent. on the preferred stock and 3 per cent. on the common stock for the half year ended December 31, 1909, and have declared in addition a dividend of one-half of 1 per cent. on the common stock, to be paid from the proceeds of land sales.

CHICAGO & NORTH WESTERN.—See an item in regard to this company in General News.

CRYSTAL CITY & UVALDE.—This company has asked the Texas Railroad Commission for authority to issue bonds at the rate of $15,000 per mile. It recently completed its road from Uvalde, Tex., where it connects with the Galveston, Harrisburg & San Antonio, south to Crystal City, 41 miles.

DELAWARE & EASTERN.—The New York Up-State Public Service Commission has authorized the Delaware & Eastern to issue $400,000 bonds, to be sold at 85, the proceeds to be used to pay off indebtedness incurred in construction work now under way on the line between Schenectady, N. Y., and Hancock. The company has previously been authorized to issue $2,050,000 stock and $4,575,000 50-year 5 per cent. bonds.

DELAWARE RAILROAD.—The directors have voted to make a new lease of the road of the Philadelphia, Baltimore & Washington at a guaranteed rental of 8 per cent.; a stock dividend of 70 per cent. and a cash dividend of 20 per cent. to be paid now in addition.

FLORIDA RAILWAY.—Stockholders have authorized an increase of $2,000,000 in the stock, bringing the total authorized amount up to $4,000,000.

GEORGIA SOUTHWESTERN & GULF.—See Albany & Northern.

GULF & SHIP ISLAND.—The interest coupons on the first refunding and terminal 5 per cent. bonds are to be paid at the Bankers Trust Co., New York, instead of at the office of Fisk & Robinson, as heretofore.

HUDSON COMPANIES.—Harvey Fisk & Sons, New York, are offering $11,000,000 Hudson Companies 6 per cent. secured convertible notes, due 1913, at par. These notes are secured by the deposit of $1,500 4½ per cent. bonds of the Hudson & Manhattan for $1,000 notes. This issue of notes provides for all obligations of the Hudson Companies maturing in 1910, and for advances to the Hudson & Manhattan for the completion of its lines. Harvey Fisk & Sons have issued a circular containing a copy of a letter by President McAdoo, describing the Hudson river tunnel system and the financial condition of the Hudson companies. The circular is accompanied by a map of the lower part of New York City, showing the Hudson tunnels completed and the proposed extensions to the Grand Central station.

IRON MOUNTAIN RAILROAD OF MEMPHIS.—See Union Railway of Memphis.

PHILADELPHIA, BALTIMORE & WASHINGTON.—See Delaware Railroad.

PITTSBURGH & SHAWMUT.—See Pittsburgh, Shawmut & Northern.

PITTSBURGH, SHAWMUT & NORTHERN.—The company has filed a mortgage securing $12,000,000 5 per cent. bonds, and Hallgarten & Co., New York, have arranged to place $3,000,000 of these bonds, the remainder of the issue to be sold from time to time for payment on construction work. The Pittsburgh & Shawmut is an extension of the Pittsburgh, Shawmut & Northern, which latter is now in the hands of a receiver, and it is planned, when the Pittsburgh & Shawmut is completed, that the P., S. & N. will be reorganized and the two properties will be combined.

QUEBEC & LAKE ST. JOHN.—The proposed reorganization plan submitted by the Canadian Northern having been rejected, A. J. Gorrie has been appointed receiver.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—See Union Railway of Memphis.

ST. LOUIS, ROCKY MOUNTAIN & PACIFIC.—The interest coupons on the first mortgage bonds and secured notes are to be paid at the Hanover National Bank, New York, instead of at the office of Fisk & Robinson, as heretofore.

UNION PACIFIC.—In an application to list on the New York Stock Exchange $8,402,000 additional first lien and refunding 4 per cent. bonds, the company says that $4,902,000 of these bonds have been issued since June 30, 1909, the balance having been sold prior to that date and accounted for in the last annual report. The proceeds of the sale of $8,402,000 bonds listed were used to reimburse the Union Pacific to the extent of $3,833,568 for advances for construction of the Lane cut-off in Nebraska, known as the South Omaha & Western; for improvements to main line, aggregating $2,921,813, and for 450 freight train cars and 23 passenger train cars, costing $497,021 and $243,408, respectively.

UNION RAILWAY OF MEMPHIS.—Stockholders are to vote March 28 on the question of making a contract with the St. Louis, Iron Mountain & Southern and the Iron Mountain Railroad of Memphis, whereby the Union Railway will lease and operate the terminal properties of the Iron Mountain Railroad of Memphis.

WESTERN MARYLAND.—A member of the executive committee says that a bill is to be introduced in the Maryland legislature to empower the company to sell its unissued treasury stock amounting to $26,040,440. If this bill is passed it will enable the company, it is said, to build and equip its proposed line from Cumberland, Md., to a connection with the Pittsburgh & Lake Erie at Connellsville, Pa., 83 miles. It is estimated that the cost of building and equipping this line will be about $12,000,000.

WINSTON-SALEM SOUTHBOUND.—The stockholders have voted to authorize a mortgage securing $5,000,000 bonds. (Jan. 28, p. 210.)

The New Japanese Railway.

A consular report describes the progress of the new Japanese railway through Manchuria from Antung, on the Yalu river, where the Korean railway line terminates. Thirty-three miles of the Antung end of the line were opened for traffic on November 3, the Mikado's birthday. The line is completed to Shihchiaotzu. The roadbed of this section has already been ballasted and is in good condition. In sections all along the line the grade has been finished or is nearing completion, while of the total length of 166 miles it is estimated that 45 per cent. of the grade work, in point of miles, has already been completed. This does not mean that 45 per cent. of the actual work has been completed, because of the numerous and, in some places, difficult tunnel work. Except the 33 miles already completed the route of the line lies almost wholly in a mountainous and very rough country. The new line will have some 12 or 15 tunnels, varying in length from one mile—the longest—to 100 yds. There will be required some 300 bridges, the longest of which will be over 2,000 ft., while upwards of 50 bridges will be at least 500 ft. in length. The work of tunneling will be pushed as rapidly as possible with the methods employed. There is not a steam shovel or pneumatic stone drill in the work along the line. Even the work of pile driving is being done by hand in the most primitive manner. It is estimated that the longest tunnel will be completed in a little more than one year from November last, and the completion of this tunnel will mark the completion of the entire line. It is hoped to have the 40-mile section from Antung to Fenghuangcheng completed and in operation by July 1, next.

Supply Trade Section.

From the returns of the first two months of the fiscal year of the Western Electric Co., New York, it is estimated that the year 1909-1910 will show a gross business of about $61,000,000. If this estimate is realized the current year will be the second best in the history of the company. The gross earnings in 1906 were $69,000,000.

Green, Hook & Co. has been organized to manufacture and sell chemicals for boiler treatment. Jacob W. Hook and Stanley K. Green are interested in the company. The main office will be in the Hudson Terminals building, New York; the main laboratory and works at Jersey City, N. J., and a branch laboratory at Baltimore, Md. Sales offices will be located in Boston, Mass.; Philadelphia, Pa.; Baltimore, Md.; Norfolk, Va., and Havana, Cuba.

W. C. DeArmond has taken over the business of the Protectus Company, Philadelphia, Pa., having become owner by purchase of the company from the receivers. The manufacture of the same high grade paints for the protection of metal and wood, marine compositions and insulating paints will be continued under the trade name of the Protectus Paint Co. The new company will also furnish a full line of enamels, japans, dryers and reducing oils.

The Isthmian Canal Commission will receive bids until March 7 for hoisting engine, capstans and engine, pumps, boring machine, steel castings, dipper bails, gear cutters, milling tools, slitting saws, stocks and dies, twist drills, bits, chisels, open links, tacks, chain blocks, gages, oil cups, steam whistles, unions, bellows, rubber belting, wick packing, gage glasses, rakes, steel tapes, water-closets, filing cabinets, chair bottoms, coal tar, etc. (Circular No. 561.)

A feeling of confidence as to the prospective business for 1910 in electric motors, generators and transformers was manifested by the district and branch office managers of the Crocker-Wheeler Co., Ampere, N. J., during their convention held last week in the main office and works of the company at Ampere, N. J., and in New York. As this company preserved its personnel and organization during the season of dull business, it now considers itself in better condition than before to manufacture and market its line of a.c. and d.c. motors, generators and transformers.

At the annual stockholders' meeting of the King-Lawson Car Company, Middletown, Pa., on February 9, the following directors were elected for the ensuing year: Thomas Lawson, G. O. Draper, Edward Bailey, Harold C. Hansen, Paul A. Kunkel, Arthur King and Howard W. Bible. At the directors' meeting, called immediately after the adjournment of the stockholders' meeting, the following officers were chosen for 1910: Thomas Lawson, president and general manager; Howard W. Bible, vice-president; Harold C. Hansen, treasurer, and Paul A. Kunkel, secretary.

The annual conference of managers and agents of the Ingersoll-Rand Co., New York, was held on February 1-5, inclusive. The executive officers of the company and the heads of departments from the home office in New York were present, while the general sales force was represented by managers and agents from all of the domestic and several of the foreign offices. The company's plants at Easton, Pa.; Phillipsburg, N. J.; Painted Post, N. Y., and Athens, Pa., were visited by the entire attendance during the first three days, and the last two days were given over to business meetings held at the Hotel Astor, New York. About 50 representatives of the company were present during the several meetings. Foreign representatives were present from London, Paris, Milan, Mexico City and Montreal.

Lucian C. Brown, second vice-president of the Ralston Steel Car Co., Columbus, Ohio, has resigned. Mr. Brown has been identified with the company since its organization in 1905. His plans for the future are indefinite. Mr. Brown is a graduate of the Ohio State University. After leaving college he entered the employ of the Morgan Engineering Co., at Alliance, Ohio, as an apprentice in the shops, and worked his way through the several departments, and was night superintendent at the time he left to go with the Ralston Steel Car Co. at Columbus. During the last few years he has been identified with the committee work of the Railway Supply Manufacturers' Association in connection with the M. M. and M. C. B. annual conventions, and is now chairman of the transportation committee of that association.

At a meeting of the board of directors of the Pullman Company, Chicago, held February 10, it was decided to call a special stockholders' meeting for March 21, at which would be submitted a proposition for capitalizing the surplus assets of the company to the extent of $20,000,000. The considerations influencing this action were said to be that the increased investment in the manufacturing facilities of the company had been so material and considerable as to justify the directors in the belief that it should be represented in additional capital stock. There were certain reserve accounts in the manufacturing department, hitherto held in abeyance to meet possible contingencies, but which present conditions render improbable. These items, together with the existing surplus as shown in the published statement of the last fiscal year, and the current results of operation, are regarded by the board as a justification for making this recommendation.

The annual report of the Chicago Pneumatic Tool Co. for the year ended December 31, 1909, shows total profits of $558,928. This compares with total profits of $289,625 for 1908. Last year there was written off for depreciation, including repairs and renewals to buildings and plants and developing and perfecting new tools, $140,168, comparing with $92,000 written off for depreciation, repairs and renewals in the previous year. After the payment of interest on bonds and sinking fund instalments there was a balance of $250,610 carried to surplus in 1909, as against $21,500 in 1908. Of the total profits in 1909 but $186,468 was earned in the first half year, leaving $372,460 profits earned in the second half year. The balance sheet of December 31 shows cash in hand amounting to $118,296, and accounts and bills receivable, less reserves, amounting to $1,909,032. Accounts and vouchers payable amounted to $106,981 and bills payable to $60,000. The president's report, dated February 11, says that at the present time virtually all of the plants are being operated to their full capacity.

The American Car & Foundry Co., New York, is offering for sale a number of freight locomotives and wooden gondola cars. Both the locomotives and cars have been thoroughly overhauled. The locomotives are class 2-8-0 and the principal dimensions are as follows:

Weight on drivers	154,500 lbs.
Total weight	174,500 "
Cylinders	19½ in. x 28 in.
Diameter of drivers	57 in.
Working steam pressure	200 lbs.
Heating surface, tubes	2,210 sq. ft.
" " firebox	156 "
" " total	2,366 "
Tubes, number	302
" outside diameter	2 in.
" length	14 ft.
Firebox, length	95 in.
" width	67 in.
Grate area	44 sq. ft.
Water capacity	5,000 gals.

The locomotives were built to burn soft coal. The American Car & Foundry Co. will repaint and reletter the locomotives as desired. The gondola cars are of 80,000 lbs. capacity and measure 37 ft. 4 in. long, 8 ft. 2 in. wide and 3 ft. 8 in. high over all; 36 ft. 6 in. long and 9 ft. wide inside. The flooring is 1¾-in. thick. The cars have the following special equipment:

Bolsters	Am. Steel Fdries' cast steel, body and truck
Brake-beams	Chicago Railway Equipment Co.
Couplers	Monarch
Draft gear	Miner type D 209-210
Dust guards	Symington
Journal boxes	Symington
Wheels	33-in., 650 lbs., cast iron

The cars, like the locomotives, will be repainted and re lettered to suit the purchaser, and they will be guaranteed t pass M. C. B. interchange. Detailed specifications and price may be had by addressing the American Car & Foundry Co at New York, Chicago or St. Louis.

Changes in the Organization of the McGraw Publishing Company.

James M. Wakeman, for the past 11 years vice-president of the McGraw Publishing Company, resigned this office at the recent annual meeting of the company. While not in serious ill health Mr. Wakeman feels it desirable to be relieved from business cares in order to recover his former physical condition, and his future plans include a visit of a year or more to Europe for a complete rest. After a successful connection of some years with the *American Machinist* and *Locomotive Engineering*, Mr. Wakeman joined the McGraw Publishing Company at its formation in 1899 and was one of its incorporators. As the chief assistant in the management of the company he has been a strong factor in the success which it has achieved and has guided its business career along the broadest lines and with rare ability. The departure of Mr. Wakeman will be a source of the keenest regret to his associates, and without doubt also to the host of friends he has made in the electric railway field. Mr. Wakeman will not retire immediately but will continue for several months as a director of the company and in active work.

Hugh M. Wilson will occupy the office of vice-president of the McGraw Publishing Company made vacant by the resignation of Mr. J. M. Wakeman. The greater part of his active business of 23 years since graduation from college has been passed in technical journalism and as publisher of the *Railway Age* and the *Electric Railway Review* he gained an enviable reputation as an enterprising, successful and constructive manager of newspaper properties. He sold his interest in these publications early in 1908 and later became vice-president of the Barney & Smith Car Company, Dayton, Ohio, an office which he has just resigned to take up his present work. A biographical sketch of Mr. Wilson was published July 9, 1909, page 64.

TRADE PUBLICATIONS.

Brake-Beams.—The Buffalo Brake-Beam Co., New York, has just issued a new catalogue containing a large number of halftone and line illustrations of its brake-beams.

Great Northern.—The Great Northern has issued a 24-page booklet on the "Fertile Flathead Valley, Montana." The advantages of this region for fruit raising are fully described by photographs and descriptive matter.

Chicago & North Western.—The Chicago, Union Pacific and Northwestern line has issued a folder describing the through train service from Chicago to Colorado, Utah, California and the Pacific coast, also one giving through passenger train schedules from Chicago.

Alternating Currents in Railway Signaling.—The paper on this subject by W. K. Howe, chief engineer of the General Railway Signal Co., which was read at the meeting of the Railway Signal Association in New York City last June, and which was printed in the *Railroad Age Gazette* of July 9 and 16, has been reprinted by the Signal Company in *Bulletin No. 16.*

RAILWAY STRUCTURES.

ARGENTINE, KAN.—The Atchison, Topeka & Santa Fe is building a new brick roundhouse at a cost of $40,000. The building will contain 27 stalls designed to receive the largest engines in use. Thirteen of the stalls are to be done in a few weeks and the completed building will be ready for use about June 1.

BEECH GROVE, IND.—The Cleveland, Cincinnati, Chicago & St. Louis has completed plans for the new car shops mentioned in the *Railway Age Gazette* of February 11. The plans call for 12 buildings, including coach shop, paint shop, planing mill, separate repair shops for wood and steel freight cars, a foundry, an addition to the power house, an oil house and a concrete reservoir with a capacity of 350,000 gallons. The construction is to be of brick and steel with slate roofs.

BIRMINGHAM, ALA.—Plans have been started for the erection of extensive shops at Boyles, on the outskirts of Birmingham, Ala., by the Louisville & Nashville. They will consist of nine separate buildings, including a power house, to be built on a 120-acre tract and will cost $655,000. The plant should be finished by early fall.

BLAIR, NEB.—The Chicago & North Western is building a new passenger station at a cost of $30,000. The building is of brick with slate roof, 28 ft. wide and 175 ft. long, and has two waiting rooms, ticket office, baggage, express and toilet rooms. It is to be ready for occupancy about April 1.

CINCINNATI, OHIO.—See Cincinnati, Hamilton & Dayton under Railway Construction.

FORT WILLIAM, ONT.—The Canadian Pacific bridge, to be built over the Kaministiqua river, is to be a lift structure with double deck. The estimated cost is $750,000. It is expected to have the work finished by October 15. A bridge to be built over the McKeller river is also to be a lift structure, and is to cost about $300,000.

GLIDDEN, TEX.—The Southern Pacific has let the contract to a contracting firm in Houston, Tex., for a 24-stall roundhouse. The building is to be of concrete and brick and the cost is estimated at $32,000. An 80-ft. turntable will be installed.

HASTINGS, N. Y.—See New York Central & Hudson River under Railway Construction.

MADISON, WIS.—The Chicago & North Western will start work May 1 on a new passenger station at Madison, to cost $200,000. The building will be built on the site of the present station, and is expected to be finished by December. A temporary station is to be used while the new building is being put up.

MONTREAL, QUE.—See Ottawa, Montreal & Eastern under Railway Construction.

MEXICO CITY, MEX.—Fire in the yards of the National Railways of Mexico on February 9 destroyed property valued at $150,000, according to press estimates, including a gas plant and a number of loaded box cars.

NEW YORK.—See New York Central & Hudson River under Railway Construction.

OUTLOOK, SASK.—See Canadian Pacific under Railway Construction.

PORTLAND, ORE.—The Oregon Railroad & Navigation Co. has petitioned the city to close certain streets to allow the building of a freight house and terminal yards in the east part of the city.

REGINA, SASK.—See Canadian Pacific under Railway Construction.

RENO, NEV.—In addition to the office building mentioned in the *Railway Age Gazette* of November 26, the Nevada-California-Oregon has let the contract to local contractors for a roundhouse and carpenter shop.

ST. PAUL, IND.—The Cleveland, Cincinnati, Chicago & St. Louis advises that it plans to renew the superstructure of the bridge over Flat Rock creek. The new work will consist of four deck plate girder spans.

SOUTH BARTONVILLE, ILL.—The Peoria Terminal Railway is to let the contract soon for building new car shops to replace those destroyed by fire last fall. The estimated cost is $30,000.

TERRE HAUTE, IND.—The Southern Indiana, according to press reports, will build a new roundhouse at an estimated cost of $100,000.

TOLEDO, OHIO.—The Cincinnati, Hamilton & Dayton has let the contract to the Great Lakes Dredge & Dock Co., Chicago, for the new ore docks mentioned in the *Railway Age Gazette* of February 4. The Wellman-Seaver-Morgan Co., Cleveland, Ohio, will build the ore handling machinery. (See Cincinnati, Hamilton & Dayton under Railway Construction.)

TORONTO, ONT.—According to press reports work will be started about May 1 abolishing grade crossings between Bathurst street and the Humber. It is expected to have the work finished within two years at a cost of $2,000,000. The Grand Trunk, it is said, will elevate four of its tracks. The city is to pay one-third of the cost of elevating two tracks.

Late News.

The items in this column were received after the classified departments were closed.

Henry Graves, Jr., has been elected a director of the Central of New Jersey, succeeding H. McK. Twombly, deceased.

Preliminary surveys are to be made at once for an extension of the Caro Northern from Mount Enterprise, Tex., northeast to Pinehill, about 15 miles.

Contracts are said to be in for building a 10-mile cut-off on the Norfolk & Western around Petersburg, Va. The improvements are to be made to eliminate the heavy grades on the present line.

Basil Magor has resigned from the firm of Wonham, Magor & Sanger, New York, to become president of the Wonham-Magor Car & Manufacturing Co. The name of the first mentioned firm will be changed to Wonham, Sanger & Bates.

Announcement is said to be made that the Canadian Northern will build between 500 and 600 miles of line in the western part of Canada, including the British Columbia line during 1910. It is expected that work will be started soon on the line north of Lake Superior.

Directors of the Minneapolis, St. Paul & Sault Ste. Marie have declared a semi-annual dividend of 3½ per cent. on the common stock, placing the stock on a 7 per cent. per annum basis. The regular semi-annual dividend of 3½ per cent. was declared on the preferred stock, payable April 15. In 1908 and 1909 6 per cent. was paid on the common stock.

President Taft, in a letter dated February 16 to the secretary of the treasury, says that through an oversight of Congress the appropriation of $100,000 for the collection of the corporation net income tax cannot be used for indexing and putting on public record the returns made by corporations, and that therefore the publicity provision of the corporation tax will have to be abandoned until Congress makes a specific appropriation for this work.

The New York Connecting Railroad has filed with the Public Service Commission the necessary property consents required for its franchise. The New York Connecting is controlled jointly by the Pennsylvania Railroad and the New York, New Haven & Hartford, and plans to build a road from a connection with the Long Island Railroad across the East river at Randall's and Ward's islands, thence over little Hell Gate to the Bronx, where connections will be made with the New York, New Haven & Hartford.

W. G. McAdoo, president of the Hudson & Manhattan, in commenting on the sale of $11,000,000 notes of the Hudson Companies, says that the tunnel to Twenty-third street and Sixth avenue, New York, is being rapidly extended to Thirty-third street and will be completed early in the fall. The line to Jersey City is being extended and will shortly reach the business section of the city. On the completion of the system there will be $64,500,000 Hudson & Manhattan bonds outstanding, but for two years the Hudson Companies agree to have interest paid on $5,000,000 of these bonds only if net earnings of the Hudson & Manhattan company are sufficient to pay this interest.

The profits of the Pressed Steel Car Co. for the year ended December 31, 1909, including the sales of the Canada Car Co. stock, amounted to $1,954,583, as compared with $265,478 in 1908. There was written off for depreciation and renewals $120,000 last year and $110,000 the year before, leaving in 1909 a balance of $1,834,583, which, after subtracting $875,000 in dividends on the preferred, left a surplus for the year of $959,583, which equals 7.67 per cent. earned on the $12,500,000 common stock. After payment of dividends on the preferred in 1908 there was a deficit of $719,522. The 1909 balance sheet shows accounts receivable amounting to $2,157,671; inventory, $2,842,075, and cash, $987,360. These figures compared with the 1908 balance sheet as follows: Accounts receivable, $668,105; inventory, $246,509, and cash, $2,837,990. Accounts and bills payable totaled $1,639,361 on December 31, 1909, and $169,532 on December 31, 1908.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Virginian Railway is in the market for eight Mallet, 11 Mikado and one switching locomotive.

The Washington, Idaho & Montana advises that one Prairie and one consolidation locomotive have been ordered from the American Locomotive Co.

The Baltimore & Ohio, reported in the *Railway Age Gazette* of February 4 as asking prices on a number of locomotives, will order 30 Mallets, of 420,000 lbs. weight each, and 120 consolidation locomotives of 227,000 lbs. weight each.

The Great Northern has ordered 40 ten-wheel and 25 Mallet locomotives from the Baldwin Locomotive Works. They will be equipped with superheaters and the Mallets will also have feed water heaters. The ten-wheelers will be divided in two types of 20 each, as shown by the following general dimensions:

	Mallet.	20 10 wheel.	20 10 wheel.
Weight on drivers	350,000 lbs.	155,000 lbs.	134,000 lbs.
T'l weight (inc. tank)	518,200 lbs.	358,200 lbs.	292,000 lbs.
Cylinders	23 & 35 x 32 in.	26 in. x 30 in.	22 in. x 28 in.
Diameter of drivers	55 in.	73 in.	73 in.
Boiler, type	Belpaire.	Belpaire.	Belpaire.
Working stm. press.	200 lbs.	150 lbs.	150 lbs.
Heating surf., tubes	3,683 sq. ft.	3,153 sq. ft.	2,400 sq. ft.
" " firebox	225 "	201 "	195 "
" " total	5,651 "	3,354 "	2,595 "
Tubes, number	382	314	244
" outside diam.	2¼ & 5½ in.	2 & 5½ in.	2 & 5½ in.
" length	15 ft. 8 in.	17 ft.	16 ft. 6 in.
Firebox, type	Belpaire.	Belpaire.	Belpaire.
" length	117 in.	120 in.	120 in.
" width	96 in.	66¼ in.	40¼ in.
Grate area	78 sq. ft.	55 sq. ft.	33.5 sq. ft.
Water capacity	8,000 gals.	8,000 gals.	8,000 gals.
Coal capacity	13 tons.	13 tons.	13 tons.

The Chicago, Rock Island & Pacific, as reported in the *Railway Age Gazette* of February 11, has ordered 25 Pacific and 50 consolidation locomotives from the American Locomotive Co. Delivery is specified for May and June, 1910.

General Dimensions.

	Pacific.	Consolidation.
Weight on drivers	148,000 lbs.	180,000 lbs.
Total weight	227,000 "	201,000 "
Cylinders	23 in. x 28 in.	23 in. x 30 in.
Diameter of drivers	73 in.	63 in.
Boiler, type	Wagon top.	Wagon top.
" working stm press.	185 lbs.	185 lbs.
Heating surface, tubes	3,375 sq. ft.	2,427 sq. ft.
" " firebox	180 "	168 "
" " total	3,555 "	2,595 "
Tubes, number	328	340
" outside diameter	2 in.	2 in.
" length	19 ft. 9 in.	15 ft. 6 in.
Firebox, length	109 in.	120 in.
" width	61 in.	60 in.
" material	Steel.	Steel.
Grate area	45 sq. ft.	50 sq. ft.
Water capacity	7,500 gals.	7,000 gals.
Coal capacity	13 tons.	15 tons.

These locomotives will be equipped with electric headlights and Walschaert valve gear. The Pacifics will have the Gold steam heat equipment and superheaters.

CAR BUILDING.

The Michigan United Railways are in the market for 20 city cars.

The Arkansas, Oklahoma & Western is in the market for 12 twelve-yd. air dump cars.

The Cleveland, Cincinnati, Chicago & St. Louis is building at its Brightwood, Ind., shops 25 standard caboose cars.

The Nova Scotia Steel & Coal Co., New Glasgow, N. S., has ordered 25 thirty-ton hopper bottom gondola cars from the Pennsylvania Equipment Co.

The Grand Rapids Electric Railway Co., Grand Rapids, Mich., has ordered 12 electric city cars from the American Car Co. This item was incorrectly reported in the late news of last week.

The Southern Pacific, previously mentioned as being in the market for electric cars, is understood now to be ready to close a contract for about 100 cars, including motor, trailer and express cars.

The Missouri & North Arkansas has ordered 20 thirty-ton furniture cars from the American Car & Foundry Co., as reported in the *Railway Age Gazette* of February 4. These cars will weigh 45,000 lbs. and will have wood bodies and composite underframes. They will be 50 ft. 9⅝ in. long and 9 ft. 7⅝ in. wide, over all, and 49 ft. 10⅛ in. long, 9 ft. wide and 9 ft. high, inside measurements.

The Denver, Laramie & Northwestern, previously mentioned in the *Railway Age Gazette* as being in the market for freight equipment, has ordered 50 forty-ton steel underframe box and 30 thirty-ton steel underframe stock cars from the American Car & Foundry Co. These box cars were referred to in the late news column last week. The same company has ordered 20 fifty-ton Hart convertible ballast cars and 40 National dump cars from the Rodger Ballast Car Co.

The Boston & Maine, reported in the *Railway Age Gazette* of February 11 as being in the market for 100 passenger cars, has ordered this equipment from the Laconia Car Co. These cars will be of non-vestibule type, 60 ft. 2 in. long and 9 ft. wide, inside measurements, and 68 ft. 3 in. long, 10 ft. 2¼ in. wide and 14 ft. 4 in. high, over all. The bodies will be of wood and underframes composite. The special equipment includes:

Bolsters, body	Cast steel
Bolsters, truck	Cast steel
Brakes	Westinghouse, 1412 high speed
Brake-beams	Diamond special
Brake-shoes	Diamond "S" flanged
Brasses	5 in. x 9 in., M. C. B.
Buffing device	Forsyth
Centering device	Chaffee
Couplers	Tower
Curtain material	Pantasote
Draft gear	Miner
Dust guards	Wood M. C. B.
Heating system	Vapor system
Journal boxes	Malleable iron
Lighting system	Pintsch
Paint	B. & M. standard
Platforms	Comb. bolster and platform; Commonwealth
Roofs	B. & M. standard
Seat covering	Plush
Side bearings	B. & M. standard
Springs	B. & M. standard
Trucks	Cast steel; Commonwealth Steel Co.
Ventilators	Automatic
Wheels	No. 5 Midvale
Window fixtures	B. & M. standard

MACHINERY AND TOOLS.

See Toledo, Ohio, under Railway Structures.

See Isthmian Canal Commission under Supply Trade News.

The Arkansas, Oklahoma & Western, Rodgers, Ark., is in the market for some drilling machines.

The Baltimore & Ohio is reported to have ordered a number of the tools for which it was reported in the market in the *Railway Age Gazette* of January 28.

The Mt. Vernon Car Manufacturing Co., Mt. Vernon, Ill., has ordered from the Standard Bridge Tool Co., Pittsburgh, Pa., one Thomas automatic spacing table.

IRON AND STEEL.

The Southern is reported in the market for 45,000 to 60,000 tons of rails.

The Public Service Ry., Newark, N. J., has ordered 1,800 tons of girder rails from the Pennsylvania Steel Co.

The Lake Superior & Ishpeming has ordered from the Lackawanna Steel Co. 200 tons of structural steel for a viaduct in Ishpeming, Mich.

The Wabash-Pittsburgh Terminal Ry. has ordered from the McClintic-Marshall Construction Co. 400 tons of structural steel for the viaduct mentioned in the *Railway Age Gazette* of February 4.

General Conditions in Steel.—A slight improvement in the steel business is reported for this week and orders will probably reach considerable proportions within the next six weeks if the present conditions prevail. The recent purchase, by the U. S. Steel Corporation, of 25,000 tons of Bessemer pig iron from the Bessemer Pig Iron Association is generally thought to indicate that the Corporation anticipates activity for its mills into the summer months. The recent purchases of and inquiries for rails and equipment by the railway companies is a very favorable feature in the steel industry.

SIGNALING.

The following are some of the details of the interlocking and block signal work to be installed on the North Western's Chicago terminal by the General Railway Signal Co. There will be five interlocking towers aggregating about 550 levers, of which 225 will control signals and 292 switches, derails and movable frogs. The signal company's model 4 movement will be used on switches and the model 2 movement on derails. All interlocking signals will give indications in the upper right-hand quadrant and will be three-position dwarfs of the model 2-A type. All signals will be lighted by electric lamps. Detector bars will be used throughout, in addition to electric detector and route locking. The electric locking will contain many novel features especially designed for this installation. All wires will be contained in lead-covered cable. There will be electric lights above the levers in the machines to show the approach or recession of a train separately, and illuminated diagrams will also be provided to show the condition of the track. All apparatus will be operated from storage battery and a separate rotary converter will be provided at each block signal bridge for charging. There will be 55 disk automatic block signals of the Hall type between Noble street and Clinton street, and between Division street and Clinton street. It is intended to make the whole equipment the best and most complete that it is possible for signal engineering to devise.

Colored Roofing Patent Decision.

It is now unlawful to use any colored, except by painting, "flexible weatherproof prepared roofings" other than that made by the Standard Paint Company, New York. This is the sum of the decision, January 24, 1910, by Judge Ray, of the U. S. Circuit Court. The decision, about 10,000 words, is such a minute examination of the history of materials and processes that it is near to being a treatise on the art of roofmaking. The two patents on colored ruberoid, dated November 22, 1904, cover both the product and the processes by which it is made. Both of these general claims are upheld with an enthusiasm born of exhaustive study:

"The process pointed out in the patent which varies from the prior art was successful. The prior art was not. All the constitutent elements of a product, a new article of manufacture, may be old, as of course these were, but this product as a complete article of manufacture was new, and it was better than any that had gone before. I think the evidence establishes that the first successful colored roofing upon the market was this colored ruberoid made in accordance with the claims of the patents in suit. They are popular and have an extensive and increasing sale. They are pleasing and attractive in appearance to those who desire a colored roof and who use a roofing of this character. It is shown that these roofings are durable and serviceable, and that the coloring is permanent."

T. A. Griffin on Radical Railway Regulation.

A pamphlet entitled "Radical Railroad Regulation," by T. A. Griffin, president of the Griffin Wheel Company, Chicago, is being given very wide circulation. Mr. Griffin points out that the threat of further radical railway regulation is making itself evident by retarding the return of prosperity. There is hesitation felt by the greater part of the business community, and Mr. Griffin explains this as follows:

"The one great and most apparent element which has caused this hesitation is that the railway corporations of this country have stopped the purchase of anything beyond their immediate necessities, so much so that betterments which had been projected (which are not only betterments, but in a great many cases are almost, or soon will be, necessities) amounting to over $500,000,000, have been held up. It is customary for railways to prepare their budgets of expenditures January 1. If these budgets had been prepared on the lines of necessities the outlook for general business, particularly among manufacturers, would be exceptionally good for 1910. These budgets

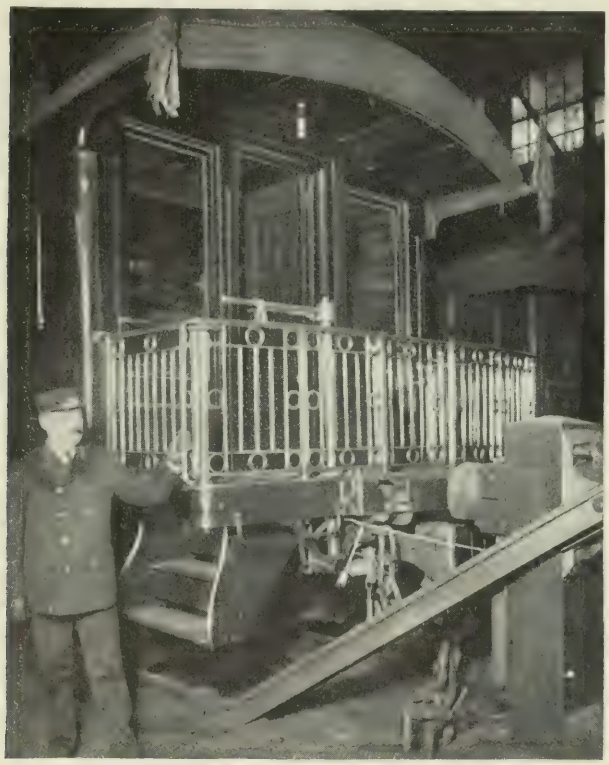
have not been presented, and are not within the call, or even within the sight, of those who would gladly welcome them, and it is doubtful when we will be able to make any reasonable forecast in the manufacturing and commercial world. It is unquestionably true that the railways would gladly enter into a year of liberal expenditure, but as matters stand now, it is quite possible that they will be compelled to drop back into the condition they were in the latter part of 1907 and during the year 1908, that is, purchase nothing except that which is absolutely essential, and the reasons are exactly the same as those that existed in the early part of 1907, that is, 'Radical Railroad Regulation.'"

The remedy for this situation, Mr. Griffin says, is not merely to prevent further radical railway regulation but to stop the agitation for it, and he suggests that business men should tell their representatives in Congress and the state legislatures that a halt must be called on radical railway regulation.

Telephone Equipment on the Twentieth Century Limited.

In the lounging cars on the Twentieth Century Limited, telephones are installed for the use of passengers who, on arriving at their destinations, desire to make business or other engagements before leaving the train. The telephone is arranged for connection to a jack box at each station where the length of stop warrants, thus connecting the train to the local exchange. The standard Bell grade telephone apparatus, made by the Western Electric Co., New York, is used.

The manner in which the connection is made at the Albany station on the route of the Twentieth Century Limited is



Manner of Making Telephone Connection.

shown in the illustration. The observation cars are wired for telephone service, and the connection is made through the private railway branch exchange switchboard. The circuit from a jack in this switchboard is run to the bumper post at the end of the track and thence into a protection box. The jack has a spring shutter, which automatically closes when the connection is withdrawn, thus protecting the contacts from dust and moisture while the train is in motion. From this jack the wiring, enclosed in piping, passes through the car to a point directly under a desk in the observation end of the car.

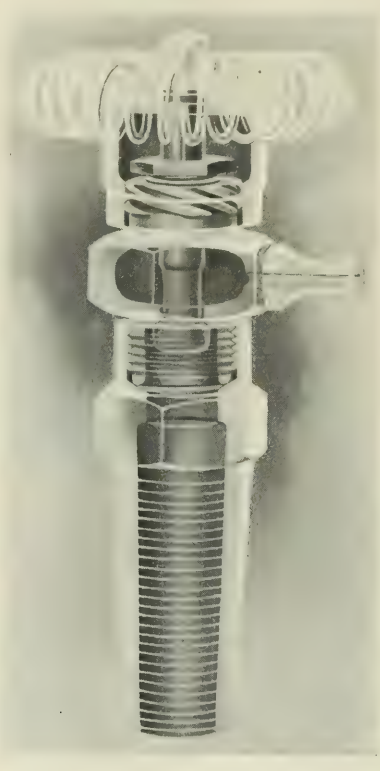
The telephone is in charge of the porter and is stored in a closet when not in use. When the train enters a station the telephone connection is made and remains connected until within one minute of leaving time.

The Boston & Albany allows its patrons free local use of the telephone at Albany. The New York Central & Hudson River has similar arrangements for use at New York and Chicago.

Gaco Automatic Locomotive Gage Cock.

The locomotive gage cock shown herewith is one for which the following advantages are claimed: simple in operation, quick in action, self-controlling, non-leaking, and designed so as to be free from incrustation.

The tendency of enginemen to neglect the sufficiently frequent use of gage cocks may be said to have occasioned the one of the design here shown. The chief feature of it is that the valve opens against the pressure rather than with it, as is the case in the compression cock. In using, it is but necessary to give the hand wheel a quick turn. The closing is automatic and saves the 20 or 30 seconds of time usually consumed by the engineman, who is required to close a gage cock after he is satisfied as to the water height. This feature is also a unique and satisfactory one in keeping the valve seat clean, thus prolonging the length of its life. Excessive wear of the seat, due to too tight closing, is prevented, as the valve is seated by the boiler pressure only. As the seating is accomplished with, rather than against, the boiler pressure, less force is necessary to close the valve. Each successive seating of a hand-operated valve, operating against the pressure, may have to be at least slightly tighter than the preceding one. This continued tightening against the seat tends to distort and destroy it.



Gaco Automatic Locomotive Gage Cock.

It is also possible to regrind the valve without removing it. In case of leakage, it is quite possible that this is due to scale or sediment lodging on the seat of the valve. This can be removed and the seat reground by simply revolving the stem.

This gage is also designed with the particular object of protecting the boiler tappings and making repairs easier and less expensive. The gage cock is made in two parts, a threaded shank and separate body. The shank is screwed into the boiler, and the body, which contains the valve, the seat and all the working parts, is screwed into this shank. These bodies are made interchangeable, and each has a common seating position, so that when screwed into a shank the nozzle will be in its correct position. All of the other parts are also made interchangeable to provide for replacement in case of accident.

The handle is made of high-grade steel wire nickle plated to prevent rust. This wire construction in a handle is particularly advantageous as it affords an easier and more secure grip.

These gage cocks are made by the Pittsburgh Gage & Supply Co., Pittsburgh, Pa., and are also handled by Willis C. Squire, dealer in railway supplies and specialties, Western Union building, Chicago.

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The differences between the railways centering at Chicago and their employees over wages and conditions of employment are being submitted rapidly to arbitration. The switchmen's strike in the Northwest has been won by the railways; and there is at present no reason to fear that any more strikes will take place. This satisfactory situation has been brought about mainly by two causes. One is, that while the railway managers have refused to grant unreasonable demands for increases in wages, they have met employees in a conciliatory spirit, have indicated a disposition to give them all that is fair, and have proved their fairness by showing uniformly a willingness to submit the determination of what is fair to arbitration. The second cause, is the policy of publicity that the railway managers have adopted. Heretofore, the managers and the representatives of the employees usually have agreed not to tell the press anything about the progress of their parleys. Every newspaper man who has "covered" such conferences knows that the railway men have conscientiously kept these agreements and that the artful representatives of labor have systematically broken them. Press and public having only labor's side of the controversies, they naturally have usually been against the railways. This time, the general managers, through O. L. Dickeson, special inspector transportation of the Burlington, have from day to day frankly taken press and public into their confidence. The results have been that the railways usually have got a "square deal" from the press and that public and railway employees have understood the matters in controversy. The labor leaders, in consequence, have feared the effects of and have avoided such arbitrary and reckless action as precipitated and lost the switchmen's strike in the Northwest. The developments indicate that the railways often in the past have made tactical blunders by fearing and avoiding publicity. It is always apt to be suspected that when men love darkness their deeds are evil. When the railways have right on their side they can afford much oftener than their managers have been disposed to think to let in the sunlight on their affairs.

The last quarterly government accident bulletin (for July-September, Bulletin 33) reprinted in this issue, records 56 passengers killed in train accidents, which is eight times as many killed in the last preceding quarter (April-June), and 6 per cent. larger than the number reported in July-September quarter of 1908. Persons who may have assumed that the very low record of passengers killed (7) in bulletin 32 indicated a decided permanent improvement will now have a rude awakening. The three principal accidents in bulletin 33 are the colision on the Spokane & Inland at Gibbs, Idaho, July 31, in which 16 passengers were killed; on the Denver & Rio Grande at Husted, Colo., August 14, killing eight, and on the Pittsburgh, Cincinnati, Chicago & St. Louis at Chicago, September 28. The circumstances of these and other collisions in this bulletin call attention to the fact that with all the progress that has been made in block signaling during the past few years the old custom of trying to get along without it still prevails in many places. The Spokane & Inland is an electric road and, like most other electric roads, seems to have assumed that by some special dispensation of Providence such roads could employ the methods of 50 years ago without incurring the penalty which, under the same circumstances, would be visited on a steam railway for taking the same risks. The Denver & Rio Grande is a road which, at last accounts, had not seen fit to adopt the block system on a single mile of its lines. The details given in this bulletin of one of the collisions in Table 2-A (collision No. 12) illustrate in a striking manner the complicated combination of chances that trainmasters and train despatchers will take, even with passenger trains, when they are under stress, in order to move a large number of passengers over a line not provided with adequate facilities. Colision No. 3 shows how easy it is to run trains into each other, even on a road where the space interval is in use, unless the most rigid regulations are prescribed for all possible emergencies. The collision in which the six drovers were killed occurred within the city of Chicago, on a line where the methods of operating appear to be much the same as when the stock yards were established, in our grandfathers' day. The butting collision on the Nashville, Chattanooga & St. Louis September 15 (reported in our list for that month) appears to be entered in the bulletin table as No. 24; an appalling disaster, yet requiring only four lines (28 words) to tell all that the government can learn about its cause. Another bad collision which appeared in our record, that at Majave, California, August 25, killing 12, seems to have been omitted from the bulletin; for the reason, probably, that most of the persons killed were trespassers. Casualties to trespassers are not reported to the Interstate Commerce Commission until the end of the year.

THE RAILWAY AS ULTIMATE CONSUMER.

These are days when the "ultimate consumer" is bulking big in the political economy of the land. He is portrayed, and with much essential truth, as a kind of ulterior victim against whom is projected, as a kind of economic buffer, every item in the cost and distribution of a product until it is consumed. A more logical conception, however, of the final consumer is derived from the metaphor that likens him to one of many segments of a circle in which production and consumption blend. Take, for example, the worker on a salary. He eats food, he wears out clothing, he is a consumer in many other

ways. But, on the other hand, he produces and sells service; and that service, in turn, is elemental in the ultimate price of a product after it has run its round of processes and reaches a market, to be bought by the consumer out of salary or wages. Ideally in this endless chain of production and consumption the links should be alike in such matters as profit, comforts, satisfactions. In practice they are not alike and never will be. Equations in the vast and complicated round of things produced and things consumed is impossible. But there may be inequalities so unjust that the consumer, as such, has a right to complain and seek a remedy—not as "ultimate" consumer exactly, but as one who finds himself the victim of unjust economic ratios.

Using, however, the ultimate consumer as denoting an idea rather than a rigid fact, then that idea manifestly applies to corporations as well as to individuals. The chartered body is consumer and producer like the human body. And in that double character it is interesting to note where the railway stands.

The railway corporation is, in first analysis, the creator of a simple product—transportation of freight and passengers—and the secondary analysis does not much modify the proposition. A few railway corporations own coal mines and directly or indirectly sell the product. Others may own street railways and power houses, and incidentally sell power and light. Still others may own different properties that involve mercantile transactions. But all these are mere fringes on the main business of transportation. A single product with almost no by-product is the output of the railway's business. This does not mean that the business itself is simple. On the contrary, it is most intricate, reaching out into manifold processes and problems. We are referring to the railway, not as an organization but as measured by the one single commodity, transportation, that it sells, while a single factory may make and sell a hundred commodities or one commodity in a hundred forms. Or, turning to the mercantile side, contrast the one product of a railway with the output of a big department store.

But how about the railway as consumer? If any consumer owns the "ultimate" adjective prefix, surely it is the railway. The range of its consumption is limitless, and more so probably than of any other corporation, big or little, that can be named. It covers iron, steel and wood in endless variety and amount; service on a great scale expressed in wages and salaries; the infinity of materials that enter into a great station, bridges or rolling stock; coal, not in tons but in hills, rivers of lubricating oil, electric consumption on a scale that requires new units of measurement. The 97 mighty pages of the new tariff lie before us. They contain 14 schedules enumerating more than 3,000 commodities, counting different grades of the same commodity; and in the 14 schedules the railways are large consumers of more than half. The railway's consumption, too, is well-nigh absolute, and there is no salable residuum except from the scrap heap. In that respect the railway is not far removed from that "ultimate" consumer of foodstuffs who is just now so vividly in the limelight.

To summarize the economic case, the railway, simple and limited as a producer, with but one commodity on its counter, is, as a consumer, expansive, varied, ramified. The study might lead further and with much more suggestive sequels. One may fitly ask, for example, how far the railway, while carrying the consumer's burden, has been denied the producer's remedy and offsets. While consumption has steadily increased its price, how about the price of the railway product, transportation! Has or has not the railway been allowed to "level up" to other producers, and has it not, under the compulsion of authority and a public feeling quite the reverse of altruistic, been forced the other way and downward? But such queries are trite. More impressive is the wider generality that through a long period the railway has been hit by both the producing and consuming powers. The "ultimate" consumer individualized is just now in bold perspective. But is he really more to be considered as a mere food-eating personality than as stockholder in a railway whose dividends buy his food? And will he, as citizen, deny to the railway, bearing as consumer the same burdens, the redress which he claims for himself? The reasoning shows the whole distance between the shipper who protests against higher freight rates and the union that demands from the railway higher wages while it boycotts high-priced beef.

SENATOR BAILEY ON COST OF SERVICE VERSUS VALUE OF SERVICE IN RATE REGULATION.

United States Senator W. J. Bailey, of Texas, is recognized as one of the ablest constitutional lawyers in the country. The duel between him and Senator Spooner of Wisconsin over the constitutional phases of certain parts of the Hepburn bill was the most memorable debate in Congress in recent years. On January 20 Senator Bailey delivered before the New York Bar Association an address on "The Power to Regulate Transportation Charges by Statutory Enactment," which deserves to be read by every railway lawyer and traffic manager and by every railway commissioner. He reviewed the decisions of the Supreme Court of the United States bearing on the regulation of the charges of public service concerns from Munn *vs.* Illinois down to Cotting *vs.* Godard. As a result of this review he arrived at the same conclusion that was reached by the *Railway Age Gazette* in an editorial entitled "What is a Reasonable Rate?" which was published in our issue of October 29. This is, that the true test, under the federal constitution, of the reasonableness of rates is not whether in the aggregate they yield to the railway a large return or a small return, or perhaps any return at all on the value of its property, but that the true test is whether each charge made by the railway is reasonably proportionate to the value of the specific service for the rendering of which the specific charge is made.

"In my judgment," said Senator Bailey, "a reasonable rate must mean one which affords the railway *a just compensation* for its *service*. If it means more than that, neither the legislature of any state, nor the Congress of the United States, has any right to compel the people to pay it, and if it means less than that, neither the legislature of any state, nor the Congress of the United States, has any power to compel the railway to accept it. In other words, I believe that the constitutional provision which restrains the railway when it comes to condemn my property restrains me when I come to use the railway's property."

The point made in the last sentence is of vital importance. It goes to the root of the entire matter. The states and the nation may restrain the railway from making unreasonable charges, while they may not regulate the prices of the merchant or the manufacturer, because the railway's service is public, while the merchant's or the manufacturer's business is strictly private. Since the states and the nation may regulate the rates of the railway, why may they not so regulate them as to prevent it from earning any return at all? Why may they not compel it to serve the public for nothing? The reason is, that the Fifth Amendment to the Constitution prohibits the federal government from taking private property without just compensation, and the Fourteenth Amendment prohibits any state from denying to any person within its jurisdiction the equal protection of its laws. Now, while the service which the railway renders is public, its property is private; and the Supreme Court holds that to deprive it of all return from the use of its property would be to take its property without just conpensation and to deprive it of the equal protection of the laws.

It is contended, however, that while the railway may not be required to render its service for nothing, it may be limited to a "fair return"; and in order to so limit it, it is proposed to make a valuation of its physical property, and then allow it subsequently to earn only the current rate of interest on this valuation, plus any additional investments that may be made

in the property in future. The theory that this may constitutionally be done is based in the language of the Supreme Court in Smyth *vs.* Ames, where it said that what the railway is entitled to receive is "a fair return upon the value of that which it employs for the public convenience."

But those who reason thus overlook two very important facts. One is, that the court did not say that this is *all* the railway may be entitled to earn. The other is, that the constitutional prohibition against taking private property without just compensation applies to the property of the railway in exactly the *same way* and to precisely the *same degree* that it applies to every other species of private property. The constitution does not say that "private property may not be taken for public use without just compensation; provided, that when railway property is taken a smaller compensation will be considered just than when other property is taken." Regardless of the use or ownership of private property "just compensation" for it must always mean the *same thing.* Now, if to provide, that a valuation shall be placed on a railway's property, and thereafter it shall be limited to a specified return on this valuation plus any additional cash investment it may make, is to provide for "just compensation" to the railway, then, it must also be that the private property of every other corporation and individual may be dealt with in the same way. Under such an interpretation of the Constitution, legislation may be passed providing that a valuation shall be made of all the real estate in the country, and that in future its owners' return from it shall be limited to the current rate of interest on this valuation plus any investment that may be made in future in permanent improvements. Because the railway serves a public use, it may take property by the exercise of the power of eminent domain. As pointed out by Senator Bailey, the constitutional inhibitions which disable the public from requiring the railway to render its service without reward are the same, and the only ones, which disable the railway from condemning land without paying for it; and, therefore, if these constitutional provisions shall be so interpreted as to enable shippers and travelers to force the railway to sell them transportation at rates based, not on the value of the service to the shipper or traveler, but on the cost of the service to the railway, then the very same interpretation will authorize the railway, when it exercises the power of eminent domain, to pay prices for the land which it takes which are based not on the value of the land, but on what it cost those from whom it is taken. As Senator Bailey remarks, "a good rule must work both ways!"

Many of those who oppose the basing of rates entirely on the value of the service do so on the ground that it may be almost impracticable to ascertain what is the exact value of any specific service. On this point Senator Bailey says in part:

> "It is undoubtedly true that we cannot determine the value of a railway service with the same certainty that we can measure cloth or weigh grain; but it is equally true that we cannot fix values and damages with absolute precision in any proceeding to condemn private property for a public use; * * * but it never occurred to me that we ought on that account to abrogate the rule which gives the owner the fair value of his property, and substitute, on account of its simplicity, a rule giving him his original investment with a fair profit. To reject the ancient and constitutional rule that guarantees private property against being taken for a public use without just compensation, and to accept this new and indefensible one of a fair profit on the investment because it is simpler and easier of application, is equivalent to saying that we will adopt an illegal and unconstitutional test for the purpose of relieving ourselves from the performance of a very tedious and somewhat difficult duty. * * * I believe I can demonstrate that the rule which we are asked to approve because it is a practicable one will produce almost endless confusion and injustice. It will permit the most palpable favoritism to some shippers and the grossest injustice to others; it will invite discrimination between communities and commodities; it cannot be equally and impartially applied to all railways, and an attempt to do so would disorganize our entire railway system and bankrupt many railway companies."

Senator Bailey has given the public what we believe to be the soundest and ablest exposition of the constitutional and economic phases of railway regulation ever made by a public man. That the views which he expresses ultimately will be adopted by the Supreme Court of the United States, if properly presented to it, can hardly, it would seem, be open to rational doubt. Their adoption by the Court would destroy the entire theory of valuation of railways and raise an insurmountable obstacle to all future attempts to deny to the railways the equal protection of the laws by arbitrarily limiting their earnings while imposing no restrictions on the earnings of most other classes of business concerns.

TWO GREAT NEEDS OF AMERICAN RAILWAY ORGANIZATIONS.

The tendency is toward the establishment of larger and larger railway systems. This makes ever more pressing two great needs of American railway organizations. One is the adoption of means for the development of increasing numbers of broad executives. The other is the decentralization of management.

On the railway of 100 miles the same man may be general manager, traffic manager and several other things, and get a wide variety of experience. A railway 1,000 miles long requires a specialist at the head of every department. The management of a railway system of 10,000 miles must carry specialization of the functions of its officers yet farther. Because it can do so, and can get or develop the best specialists, is one of the main reasons why it can be more economically and efficiently operated than ten railways of 1,000 miles each. But specialization can be carried too far; and on American railways it very commonly is. Special branches and departments must be well co-ordinated to produce the best results. That they may be so co-ordinated there must be convergence of authority over them somewhere; and this convergence must take place not only in an *office* with adequate power over the various branches or departments, but in a man in that office big and broad enough to give ample effect to its purposes. Such men will not often be developed haphazard, any more than will specialists in mechanical or engineering matters, or in the handling of freight or passenger traffic; and what is produced haphazard, whether roadway, rolling stock or men, will seldom be what it would have been if produced by intelligent provision. The only way afforded by the railway business to produce men who are big enough to be not merely freight or passenger men, but real *traffic* managers, not merely transportation, mechanical or engineering experts, but real *general* managers, is to give numerous men the opportunity to get a broader experience than can be gained in any special branch, and then to select for the higher executive offices those who best avail themselves of the opportunity, regardless of their special line.

This is not generally done now. The passenger man seldom has a chance to learn much about the handling of freight traffic, or the freight man about the handling of passenger traffic. The freight traffic of most American roads is much the more important. Consequently, when a traffic manager or vice-president in charge of traffic is to be chosen the ranking freight traffic officer usually is selected. In his higher position he is pretty sure to devote most of his fostering attention to his first and favorite child, the freight business. He is apt to underestimate the importance and possibilities of the passenger business: Perhaps this natural inattention f the higher traffic officers to the passenger business is the main reason why the managements of most steam roads overlooked the immense amount of latent local passenger business there was in the country until the electric lines came along and developed it, and also wrested from the steam roads a large part of their existing local business.

Similarly, in the operating department the mechanical and engineering officers seldom are given a chance to learn much about strictly transportation matters. Getting trains over the road is the main work of the operating department; all other

branches of its work are auxiliary. It naturally results that the transportation men usually are made superintendents, general managers and vice-presidents in charge of operation. But the transportation man usually knows no more about mechanical and engineering matters than the mechanical and engineering men do about transportation matters. He is apt, therefore, to not fully appreciate the need, as a means of getting trains over the road, of getting and keeping the track and rolling stock in the fittest condition or to know the best methods for doing this at the minimum cost. He is apt during periods of hard times—as was done on the many roads after the panic of 1907—to make cuts in the expenditures on track and rolling stock branches where they can least be borne, and will cause serious deterioration of the service given to the public and later increases in expenses out of all proportion to the savings temporarily effected.

The second need referred to—decentralization of management—grows in geometrical proportion to the increase in size of railway systems. No matter how able railway directors, chairman, presidents, vice-presidents, general managers and traffic managers, nature and perfected railway organization may unite in producing, there will always be a limit to the amount of business that these officers can expeditiously and efficiently transact; and the bigger railway systems grow the more matters they must, for the good of themselves, of the railways and of the public, leave to the final disposition of their subordinates. There are too many railway chairmen, presidents and vice-presidents in this country who are working themselves to death handling details which could and should be disposed of by general officers, or perhaps even by division officers. The main function of the higher officers is to think out and plan and direct what others are to do; and no man can do his best thinking and planning, not merely for to-day but for ten or twenty years ahead, when chronically burdened with the handling of a mass of current details. Excessive centralization seriously interferes with the establishment and maintenance of satisfactory and salutary relations between the railways and the public. Compelling the higher officers to immure themselves in their offices, it prevents them from coming in that frequent contact with the leaders of commerce and of public sentiment in their respective communities which is essential to enable them to get the public's point of view regarding railway affairs. When the people of a community ask for another local passenger train or switching track centralization of authority often makes it necessary for the division officers to refer the request to the general officers; for the general officers to refer it to the executive officers; and perhaps for the executive officers to refer it to the president, the president to the chairman, and the chairman to the board. If favorable action be finally taken the people of the community are incensed because it was not taken sooner. If unfavorable action be taken the people who have made the request, and who perhaps live somewhere in the Dakotas, or Kansas, or California, or Washington, feel that it is because the officers of the railways in Chicago or New York do not appreciate the deserts and needs, or care nothing about them, except to wring from them the maximum of money for the minimum of service. In many cases there are good grounds for the public's complaints. It is not possible for the chairman or directors of a railway, residing in New York or New England, to be familiar with local conditions in Kansas or Arizona, and the results would be much better if local officers were oftener allowed promptly to settle local matters.

It is the great merit of the unit system of organization which has been worked out by Major Hine and is being tried by Mr. Kruttschnitt in the operating and maintenance department of the Harriman Lines, that, if consistently applied, it will secure an early convergence of authority which will tend both to develop a larger number of board executives and to secure decentralization of railway management. It gives the transportation, mechanical and engineering men opportunity to learn something about each other's branches of work. Applied to the traffic department, it would give the freight and passenger men of every division and outside agency an opportunity to learn something about each other's work. Logically carried out, it would cause most purely divisional matters to be handled promptly and finally by division officers; most matters affecting only a single road in a system to be settled finally by the officers of that road, or by its ranking officer, whatever his title; and only matters of unusual importance affecting a single road and matters affecting the entire system to be handled by officers of the entire system. Of course, subordinate officers would, in each case, exercise their authority only in furtherance of a general policy laid down by their superiors, and would be held strictly responsible for the use or abuse of their enlarged discretion. Becoming experienced in assuming larger responsibility and exercising larger authority, they would be better fitted for promotion to higher positions; and the business of the road would be transacted with more despatch and efficiency, and more satisfaction to the public. No doubt there are many railway managers who question if Major Hine has struck the keynote of a more symmetrical and efficient railway organization. The experience of the Harriman Lines will throw light on this. That most railway organizations need to be substantially remodeled, especially those of large systems, and that Major Hine, under the direction of Mr. Kruttschnitt, is putting into effect a theory of first-rate importance, can hardly be seriously questioned.

NEW BOOKS.

Railway Signaling in Theory and Practice. By J. B. Latimer, Signal Engineer of the Chicago, Burlington & Quincy. Chicago: Mackenzie-Klink Publishing Co. 5 in. x 8 in.; 420 pages. Price, $2.50.

The title of this book is misleading; for one is led to expect an exhaustive treatise on the art of railway signaling, whereas, as a matter of fact, there is very little of theory or science in the book until the last chapter is reached. This chapter is by far the best part of the book, containing in brief form the opinions of the author on signaling in general. These opinions have been formed in the course of a long experience on the Burlington. Though his conclusions may seem reactionary, and though they are in a great measure opposed to the modern tendencies of the art, as exemplified in the doings of the Railway Signal Association, yet Mr. Latimer will find many sympathizers with his views. Moreover, many of these views have a good deal of force; as where he says that American railways would often do well to use a little money to get better men instead of spending large sums on machinery with a view to getting along with low grade men. But the questions on which Mr. Latimer differs with the majority of signal experts cannot be discussed in the brief space that he devotes to them, and what he says is, therefore, in effect, simply an announcement that he is an opposer. For a real discussion the reader must continue to wait. Finding no satisfactory constructive criticism, while yet finding some "reactionary" views which will repel him, the reader, seeking for knowledge, will find little satisfaction. All this, as we have intimated, refers to the last chapter of the book.

The first part of the book is taken up with detailed descriptions of the apparatus and mechanism of signaling, and, while full of detail, leaves much to be desired through lack of explanation of the reasons for providing the apparatus described, and of its actual use in service. Several chapters are prefaced by lists of some of the facts of electrical engineering, axiomatically stated, a feature which might better have been omitted. That part devoted to alternating current is vague. Many facts are also concealed in a maze of words, leaving the reader bewildered.

The illustrations are not well placed and the good ones are far too few in number. Too much is left to the reader's

imagination, especially in connection with circuits. The chapter on electric locking is particularly deficient; only one class is mentioned, and that is a class useful only at isolated plants. Again the description of indicating devices for power interlocking is separated by several chapters from the rest of the subject.

The book shows that it has been written by a master of mechanical interlocking and it is greatly to be regretted that it did not have the benefit of more careful editing.

Letters to the Editor.

RUN, REPAIR OR TRANSFER.

Cleveland, Ohio, Feb. 5, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

"Twentieth Century Inspection" or "Run, Repair or Transfer" no doubt will be under discussion at the next Master Car Builders' convention, and should be adopted as a rule of the association. It is as fair a proposition as any of the present rules. The question, it seems, is: "Who is to stand cost of transferring contents of cars?" This question is answered by the present M. C. B. rules. Car owner, delivering and receiving road, same as is done with cost of making repairs to cars at the present time, with a few exceptions. Car owner to pay when cars have failed under "fair usage," and when repairs cannot be made under load in a reasonable time. Delivering road to pay when car has been damaged by "unfair usage" or overload or improper load. The receiving road to pay when transferring is done to suit its requirements, or when car is in transit between interchange points, car owners to be held responsible for cost of transferring contents of cars when cars are interchanged on interchange points only. It is what is needed, and places the burden of cost where it properly belongs.

H. G. RANDE.
Newburgh & South Shore Ry.

COST OF SERVICE AND THE ALTON CASE.

New York, Feb. 16, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Only to-day has my attention been called to your reference to my remarks at the recent dinner of the New York Economic Club concerning the Chicago & Alton transaction, in which, without intended unkindness, though in error, you remark that I defended it on almost the only ground which was indefensible, namely, the moral ground.

As to the Alton transaction, I was careful to state, in answer to an inquiry from the floor, that I had no information as to the conditions of the transaction, and I distinctly declined to express any opinion as to the moral quality of transactions as to which I was not fully informed. I did, however, ask certain questions, namely:

1. Were the rates on the Alton before its reorganization less than those of the roads with which it was in competition?

2. Were the rates after reorganization higher than before, or higher than those of the roads with which it was in competition?

3. Had the new securities failed to pay their interest and dividends, or had they declined in value?

I stated that I was not qualified to answer any of these questions and yet an affirmative answer to each question was necessary to determine whether or not the transaction had injured the public, either as purchasers of transportation or as purchasers of securities. So far as I can observe, this is exactly your own contention, and, as to the Alton transaction, I made no other comment or contention.

But, as to the Louisville & Nashville transaction, I did state that I had knowledge, and that at least so far as concerned my clients I was prepared to sustain the proceedings, fully disclosed in the winter of 1903 before the Interstate Commerce Commission, which never yet has formally passed thereon, though an important member of the commission personally advised me that, so far as my clients were concerned, the transaction was not only legally, but morally, right; a view which does not seem to be inconsistent with the position taken in the fourth paragraph of your article.

Finally, I made a declaration essentially the same as that well put in the fifth paragraph of your article, namely, that the principal ground for just objection to so-called over-capitalization is its injurious effect on the financial credit of the corporation, constituting a waste of corporate assets and deprivation of corporate ability thereafter to obtain new funds upon reasonable terms for actual capital requirements.

Indeed, your summary presentation of the general principles of railway capitalization is so sound that I regret that this communication, instead of being an unqualified endorsement of your article, is modified because of my wish (perhaps not unnatural) not to be held responsible for an opinion which I did not express and have not formed.

FRANCIS LYNDE STETSON.

TRAIN RESISTANCE ON THE VIRGINIAN RAILWAY.

Iowa City, Iowa, Feb. 19, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The recent accounts of heavy trains hauled on the Virginian Railway suggest an interesting question as to train resistance. The train authoritatively mentioned in your issue of October 22 weighed 7,562 tons behind the tender, and the locomotive weighed about 213 tons, making a total of 7,775 tons. Mr. Sanderson says that the adverse grades were too long to be considered momentum grades, and I understand that they are 2/10 of 1 per cent. If they are handled as straight ruling grade, we cannot get away from 4 lbs. per ton grade resistance, or 31,100 lbs. for the train. The engine had 207,450 lbs. on the drivers and in ordinary service it would not exert more than ¼ of this weight as tractive effort; but whether it did or not is also an interesting question. One-fourth the weight on the drivers is 51,852 less the 31,100 for grade resistance leaves 20,762 for train resistance—but a trifle under 2.7 lbs. per ton, at an average speed of something like 14 miles an hour. This is certainly much less than anybody would think of suggesting, and I wonder whether it is correct, or whether the tractive effort was more than ¼ the weight on the drivers, or if the grades were in point of fact momentum grades.

But the later account of a train carrying 6,000 tons of coal in 120 cars is still more astonishing. Adding the caboose and the locomotive and assuming the cars to weigh the same as in the regular train, the total appears to be about 8,683 tons. The grade resistance for this train would be 34,732 lbs., which subtracted from the 51,862 lbs. of tractive effort leaves 17,730 for train resistance, or but a trifle over 2 lbs. per ton. Can this be, and if not what is the explanation?

WILLIAM G. RAYMOND.
Dean of the College of Applied Science, State University of Iowa.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Philadelphia, Jan. 12, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I firmly believe that in order to improve the high speed performance of locomotives it is necessary for someone to devise a valve gear which will give a Corliss steam distribution without troublesome complication so that clearance spaces can be reduced. This would result in a larger percentage of the total cylinder volume being made effective. There is now pending at Washington an application for letters patent to cover the result of the writer's earnest study of the problem, which he hopes will prove to be the correct solution. C. M.

Mendenhall, formerly of the Philadelphia, Baltimore & Washington, has looked over the drawings and expressed himself as well satisfied that the device is worthy of a trial. It is very simple and is not thought to contain any element which would prove objectionable in locomotive service.

The letter of F. W. Dean was of considerable interest to the writer as he is quite familiar with the Strong device which Mr. Dean mentions, having handled one of the engines on a line of the Atchison, Topeka & Santa Fe Railway some years ago. I cannot agree with Mr. Dean's suggestion to use what would practically be two sets of valve gear on a locomotive, with separate valves for admission and exhaust and two reverse levers, as it is a well known fact that enginemen are very much averse to any device which will increase their labors. In fact, the writer has known of cases where the introduction of innovations has nearly resulted in labor trouble. For the above reason, if there were no other, we should stick to simplicity in our efforts to keep the steam locomotive at the head of the railway procession, where the writer thinks it justly belongs, excepting, perhaps, in some cases where it is necessary to use electricity to avoid nuisance. Again there is the objection that the arrangement of four valves at the top of a steam cylinder with their connecting ports would involve clearance spaces larger than are desirable from the standpoint of economy, as well as the fact that there would of necessity be a large number of joints to develop lost motion, which would be a serious drawback.

I propose to accomplish all which could be done in the way of improved steam distribution, with a single flat valve and a very simple attachment, by means of which, the events of an ordinary valve motion can be so altered that a very much reduced clearance space could be consistently used. In addition to the improved events, the port opening would be augmented for admission by 29 per cent. over the opening given by any of the usual gears, when working at short cut-offs and the opening for exhaust at the center of the stroke, where the piston speed is at its maximum, would be at least 75 per cent. greater than with the usual gears. I am of the opinion that were the device of which he writes tried out in service it would be found that a very great stride had been made.

The instances cited by H. W. Taylor of the Reading are merely the result of largely augmented power with present methods, and not due to any improved form of mechanism. We can achieve fully as good results with much lighter engines if we improve our methods and thereby get better performance by decreasing the internal resistance.

I am thoroughly in accord with you in the belief that modern locomotives have not kept pace with modern requirements, and I believe that the near future will bring some valuable improvements.

CHAS. F. PRESCOTT.

WAGES, EFFICIENCY AND BROTHERHOODS.

Chicago, Ill., Feb. 4, 1910.

To the Editor of the Railway Age Gazette:

The rather general demand on the part of certain branches of the railway service, namely, the enginemen, trainmen, switchmen and telegraph operators, for increased pay has attracted the notice of the public to a considerable degree. It has also developed a considerable spirit of inquiry among the scattered, smaller holders of railway securities and the rank and file of railway employees in other branches of the service as to the extent to which the demands are justified. There is a widespread and growing belief on the part of the latter that railway managers have not given a due regard to the scales of justice in their wage dealings with the employees of all departments, and that organized employees have been unduly, and unnecessarily, favored at the expense of the others.

The causes that may have led to such discrimination, if it exists, have been variously ascribed. A strike, real or impending, has a depressing effect on the stock market, and it is an indubitable fact that in the past the operating head who launched into a serious conflict with any of the larger orders has usually "killed" himself. The courage of right against self-interest is vouchsafed to but a few men, hence one of the causes may be the lack of that courage. Another one of the ascribed causes in the West is that the line officers; that is, the trainmasters, superintendents and sometimes general superintendents, having risen from the ranks of one or the other of the orders, have retained their former affiliations, and thereby have been influenced to a course not compatible with the best interests of all employees of the service nor of the stockholders. Granting this to be a fact, it would go a long way to explain the growing irreverence for governing rules, and the decreasing force of discipline. Employees, or aggregations of employees, who can rely more on power than merit to enforce their own terms, will lose in respect for their employers, and employees who feel that merit not allied with power is inadequate to secure consideration will deteriorate in loyalty.

However, let us waive matters that are largely speculative, and hence may be the subject of dispute. In a desire to ascertain to what extent, if any, there has been an uneven distribution in the increase of wages in the different branches of the railway service, the relative increase in efficiency, and the relating increase in cost of living which equally affects all, I was led to compile the following tables:

Table 1.—*Classified Comparison of Number of Railway Employees for 1893 and 1907, and Per Cent. of Increase.*

	1893.	1907.	Per cent. of increase.
Station agents	28,019	36,549	20
Other station men	75,181	152,929	103
Telegraph operators and despatchers.	22,619	39,193	73
Section foremen	29,699	41,391	40
Other trackmen	180,154	367,277	104
General office clerks	27,584	65,700	138
Engineers	38,781	65,298	68
Firemen	40,359	69,384	72
Conductors	27,537	48,869	77
Other trainmen	72,959	134,257	84
All other employees and laborers*...	324,100	638,171	97
Total	866,992	1,658,118	91

* Officers excluded.

Table 2.—*Relative Number of Classes of Employees per 100,000,000 Tons Carried One Mile (Passengers carried one mile reduced to tons one mile on basis of one passenger one mile. Two tons one mile).*

	1893.	1907.	Per cent. of increase in efficiency.
Station agents	23	12	92
Other station men	62	52	19
Telegraph operators and despatchers.	19	13	46
Section foremen	25	14	79
Other trackmen	150	125	20
General Office Clerks	23	22	5
Engineers	32	22	45
Firemen	34	24	42
Conductors	23	17	35
Other trainmen	61	46	33
All other employees and laborers.*...	269	218	23
Total	720	564	28

* Officers excluded.

Table 3.—*Classified Comparison of Wages Per Day of Railway Employees for 1893 and 1907, and Per Cent. of Increase.*

	1893.	1907.	Per cent. of increase.
Station agents	$1.83	$2.05	12
Other station men	1.65	1.78	8
Telegraph operators and despatchers..	1.96	2.26	15
Section foremen	1.75	1.90	9
Other trackmen	1.22	1.46	20
General office clerks	2.25	2.30	2
Engineers	3.68	4 30	17
Firemen	2.06	2.54	23
Conductors	3.10	3.69	19
Other trainmen	1.92	2.54	32
All other employees and laborers.*...	1.84	2.10	14

* Officers excluded.

Table 4.—*Relative Retail Price of the Principal Articles of Food—Per Cent. of Base or Standard Price Selected by Bureau of Labor.*

	1893.	1907.	Per cent. of increase.
Beef, fresh	99.6	120.6	21.0
Bread	100.1	104.5	4.4
Butter	109.9	127.6	17.7
Eggs	108.1	137.7	29.6
Flour	96.1	117.7	21.6
Pork, fresh	107.0	142.5	35.5
Potatoes	112.3	120.6	8.3
Sugar	101.5	99.6	1.9
Coffee	104.8	95.0	9.8
All food			15.5

The accuracy of the foregoing figures can be readily established by reference to the *Statistical Abstract of the United States* for 1908. The two years selected, viz., 1893 and 1907, are peculiarly suited to a comparison on account of the analogy of traffic conditions which prevailed during both of these years. In 1893, the railways handled a greater volume of traffic and paid more in dividends than in any previous year or in any of the next four or five succeeding years. The conditions of 1907 are still well remembered.

With respect to the comparison as to efficiency, the enactment of the Hepburn Bill has somewhat influenced the result for certain classes. This appears most clearly in the general office clerks, the number of which was greatly increased in the traffic and acounting departments in order to comply with the new requirements. The increase in efficiency of engineers and firemen is due largely to an actual increase in service rendered. The more powerful engines hauling longer trains and the extension of block and signal systems have added much to the responsibility and required vigilance of the engineer and to the labor of the fireman. On the former, more than perhaps the rest of the entire train crew, depends the safety of the train. On the other hand, as the block and signal systems and air brakes have placed more responsibility on the engineer, the burden of the conductors and brakemen has been correspondingly lightened. In addition, where roads have found it expedient to place on trains collectors or auditors to handle transportation, the conductors have been relieved of that duty.

Bearing these conditions in mind, the comparisons lead to the following deductions:

That the increase in wages of the classes of railway employees now demanding higher wages has kept pace with the increase in cost of living.

That the increase in wages of conductors and other trainmen has been greater than that accorded to any class of employees in the service, and is excessive if relatively considered with respect to increase in efficiency.

That, viewed from a standpoint of rights only, it does not appear that operating managers can consistently accede to the demands of the classes of organized employees who are seeking higher wages unless prepared to grant a substantial increase to those classes of employees not members of orders who in the past have not been favored equally with organized employees.

That the stockholders that is, the actual owners of the properties in conservation of their own interests, must require at the hands of their operating officers equitable treatment for all classes of their employees in order to secure the co-operation and good will of all necessary to profitable railway operation in future.

X. Y. Z.

Contributed Papers.

THE VARIABLE PER DIEM RATE.

The announcement made by Mr. Allen, general secretary of the American Railway Association, that the letter ballot on the per diem rate has resulted in favor of the adoption of a variable rate, gains interest from the accompanying extracts from various reports, which would seem to show that the idea of variable per diem originated in this country with Mr. Daly of the Illinois Central Railroad in the year 1906; and it appears to be certain that Mr. Daly gave that idea to Mr. Lane of the Interstate Commerce Commission.

It will be remembered that in 1906 there was a very considerable car shortage. The original rate of 20 cents per day was changed to 25 cents by letter ballot, taken in the early part of 1906, and the rate of 25 cents went into effect on July 1 of that year. The car shortage was such that this rate became very unsatisfactory, and the demand for cars resulted in a demand for very high rates of per diem—some of the rates named being enough to consume the whole net earnings of the car. The 50-cent rate, which was adopted by some roads in December, 1906, and by the rest of the roads on July 1, 1907, seems high now, but it was thought very moderate at the time when it was adopted.

If anything like the car shortage of 1906-7 recurs there will probably be another demand for a very high per diem rate. It is hoped that the principle of "variable per diem" having been established, the high rate can be confined to the months when it is needed.

Mr. Allen's note on car interchange and demurrage, published in the last bulletin of the International Railway Congress, shows that a variable per diem rate is in effect between two French railways—the Southern Railway and the Orleans Railway.

Between these roads the high rate applies for only four months of the year and is nearly a dollar per day. For the other eight months the rate is less than 20 cents per day.

Extract from proceedings of meeting of the Association of Transportation and Car Accounting Officers, held in May, 1906.

J. M. Daly of the Illinois Central Railroad, in a discussion of the report presented by the association's committee on car service, said in part:

"The remedy to apply and which will protect the car owner in enjoying the use of his car during the busy season is to raise your per diem rates to a point where they will compensate the owner for his equipment during the busy season, for which period it was constructed. The thought was discussed this way: Why could not the American Railway Association set a date that would strike the beginning of the busy season for railways throughout the country, on which date the rate per day per car would be increased?

"When the business gets dull then you drop down to 20 cents a day in order to prevent the necessity for transferring cars to avoid settling on the high basis. The result of that would be that the railways that have been living on other companies' equipment and doing business during the busy months with cars against the owners' wishes, giving them no return traffic in the cars, would find it to their advantage to build equipment to take care of themselves during the busy season, and if everybody does that then you have free interchange of cars."

Extract from minutes of the hearing in Chicago, Dec. 20-21, 1906, of the Interstate Commerce Commission, in the matter of car shortage.

Commissioner Lane: "Suppose you adopted some such plan as this—that during the last six months of the year you raised the per diem rate to $1.25?"

Mr. Daly: "That is a very proper suggestion, and it is one that I worked out in committee at Denver at the last meeting. That is, I believe there should be two rates, for two reasons; one is, because the road that builds cars for the busy season should be protected in the busy season with them.

"I do not want to advocate $1 per day the year around, for the reason that that would be sufficiently high to act as an incentive to the receiving roads in the dull season to stop a commodity in transit and transfer the contents into their car, thereby delaying shipments and congesting terminals, and where there is such a shortage of labor it would make it even still shorter.

"We, in turn, when the foreign car is delivered to us, would transfer its contents into an empty that we would have there, and that would be burning up money for no good. But, if the rate were 50 cents per day for the six dull months and a dollar a day for the six months of business, then it strikes me that you are meeting the proposition on a business basis, from a business man's standpoint and in a proper manner."

Extract from report of the Interstate Commerce Commission in December, 1906, in the matter of car shortage.

Commissioner Lane said in part:

"A rule might be adopted fixing a minimum of 50 cents per day during those months of the year when traffic is light, and increasing this possibly fourfold during the latter half of the year when cars are most needed."

CONCRETE VIADUCT AT NEW HAVEN.

The accompanying photographs show a concrete viaduct recently built by the New York, New Haven & Hartford at New Haven. It runs from Chapel street, which is east of the station, about a quarter of a mile parallel with the steam railway tracks to a point near the New Haven station. It is



Street Railway Viaduct at New Haven.



Viaduct, Looking West from State Street.

built to carry the street cars which formerly ran from Chapel street to the station via State street, which is parallel to the tracks and a block or two north of them. This was done to relieve the congestion of State street, which carries heavy vehicular traffic. As shown in one of the photographs, the structure allows access of abutting property owners to service tracks for loading cars.

MAKING A RAILWAY REPORT.

BY CHARLES F. SPEARE.

Only about one-hundredth part of the available data laid before the president and the general manager of a railway concerning the financial operations, the transportation and traffic features and the physical changes of their road during the year find a place in the annual report. As this is the season when railway stockholders are trying to size up their respective properties and their managements from the mass of statistics contained in the usual annual exhibit, it may be of value to indicate the lines on which reports might be built to provide shareholders with a knowledge of their plant, and also to specify some of the best features already existing and those which companies that do not present them may well copy.

First of all, a railway report should contain a good map of the territory served by the line and the country tributary to it in a traffic sense. This will immediately permit the stockholder to visualize the most important physical aspect of his property, viz.: its geographical position. Where a road is a part of a general system, as in the case of the Burlington, or the Missouri Pacific, or the Chesapeake & Ohio, or the Big Four, to go no further, a map showing its family alliances ought to be presented, as this will clearly indicate the value, or lack of it, of this member of the system to other parts of it, and their place as feeders or links in a continuous chain joining one section of the country to another. As an attachment to the map a condensed profile would serve to illustrate the main physical features of the line.

Mileage in different states, if a road is an interstate proposition, is essential as a part of a report. Wherever expansion has been in progress it is valuable for a management to indicate to stockholders the sections of greatest mileage increase, for in this way it can readily be ascertained whether the traffic of the new territory will pay for the expense of building new lines or whether new capital advanced against this mileage is to be productive within a reasonable time. Having a map and a division of mileage by states the geography of a system becomes established in the shareholder's mind, assuming that he has not taken the trouble to personally inspect the property. Now he is ready to look into the more intimate physical features which the road presents.

Here we enter a rather barren field. Only a very few railways include in their report the primary physical features, such as grades and curvature. These are to be found in reports of the Delaware & Hudson, Chicago & Alton and the Texas & Pacific. By itself such a description might, perhaps, have little value to the average stockholder, but relative to a table of similar sort giving changes over a period of years, it would be one of the most informing of features in this day of intensive railroading when the demand is for as straight track and as low grade as possible and a road is measured among its competitors, and by bankers who are called upon to finance it, by the work it is doing and has done to lower its cost of transportation. Akin to this is the need of a very clear and a comparative statement of weight of rail, character and mileage of ballast, miles of stone or steel bridges in contrast to wooden structures and miles of trestle work. Fortunately, most railways give a great deal of this information. Those that do not are cheating their stockholders of facts that are absolutely essential to the knowledge of the physical character of a road, not only as it stands to-day, but as a measure of how far it has progressed or stood still. While many railways indicate the number of tons of certain weight rail laid down in a year or the number of miles of ballast spread, they do not show the percentage of light to heavy rail in past years compared with the percentage to-day, or the number of miles of unballasted line compared with that in ballast now. This is most important. It could easily be given and would be of immense significance to owners of the road. Equally important are tables showing the yearly changes from wooden bridges to bridges of permanent type and the number of miles of road where permanent fills have replaced trestle work. Several of the Gould lines set this information out in very good shape. It would seem as though data of this sort might more properly be given than so much detail about trivial expenditures which play no part in the larger development and efficiency of a property and which occupy such a great amount of space in the average report of to-day.

Modern railroading has been reduced to a small number of efficiency standards. We want first to show if a road is strong, what are its grades and curves and then the sort of equipment it possesses and the condition and capacity of that equipment. Until a road is built on a firm foundation it is useless to provide it with 100 and 150-ton engines and 40 and 50-ton cars. But, given a road that will stand the test of the new standards of equipment, there is really no limit* to what can be built or driven or hauled in the way of engines and cars and maximum weight units and tractive power play one of the leading parts in the successful railway of the twentieth century. Naturally, therefore, a stockholder should find in the report directed to him each year a concise statement of the size and capacity of his cars and the weight and tractive power of his engines and the relation they bear now to the road's equipment in other years. This feature is almost fundamental in any report worth while in these days, as so much depends on equipment to produce satisfactory net earnings. It is one of the first statements that a road that is doing good work in this direction ought to set forth and the last that another road that is backward should, for policy's sake, expose. The New York, Ontario & Western makes a great feature of this, going back for a period of 20 years. This is hardly necessary, as the transaction from light or moderate to heavy power only dates from ten or a dozen years ago. The Atchison and, more particularly, the Harriman roads indicate in a way that shows their pride in what they have done the record of the company in this particular direction. It is unfortunate that roads like the Great Northern and Northern Pacific in the West, and the Chesapeake & Ohio and the Norfolk & Western in the East, have not given attention to this field, for they have obtained such plendid tonnage results by means of their greatly increased power and car capacity.

Where a road is extending its facilities in the way of second or third track and sidings it is very important that this be indicated, as it is one of the most direct means of reducing the cost of moving traffic after a line has reached about maximum as a one-track proposition.

Having given the leading physical features of a railway, the stockholder naturally turns to that part of his report which deals with the tonnage classification. It is surprising to find in so complete and well-ordered a report as that of the Union Pacific an absence of this most informing feature. Neither do the Hill roads contain it, to their discredit, while the companies that abbreviate the classification to so much percentage of merchandise, or coal, or agricultural products greatly limit the field of resource of the investigator into the means of a road's revenues. There is all the difference between permanent success and occasional success in a road that has traffic of one character. A stock or bondholder, therefore, ought to be able to know just what his road is carrying. Furthermore, it is well to indicate, from year to year, the changes in the character of traffic. This the Delaware & Hudson does most

*Except that arising from the relation of line clearances to boiler and cylinder capacity.—EDITOR.

admirably, and its tables, which are unique, give at a glance a splendid picture of the traffic progress of that system over a 10-year period. The trend of traffic is also of great value in measuring the earning power of a railway, and certainly the relation between loaded and empty car mileage ought never to be omitted from a report. Where managers fail to give it stockholders should demand that it be inserted, as it is one of the best checks to inefficient administration. The percentage of local to through traffic and the average length of haul are requisites.

In dealing with betterments and improvements and work charged to income or to capital account, the tendency is to err either on the side of scanty information or profuseness. For instance, the 1909 report of the Baltimore & Ohio occupies 10 pages, with a detailed description of every major and minor bit of work done with the aggregate cost under $5,000,000, while the report of the Union Pacific sums up work that costs nearly twice as much in the space of one page. It has been found that roads that give a great deal of space to this feature are very deficient in other equally suggestive statements, notably the Hill lines and the Missouri Pacific. The Chicago & Alton rounds out its report in about the best manner of any of those that treat different departments in a detailed fashion.

We come now to features of a railway report that deal directly with costs. Here the stockholder enters a somewhat technical field. The majority will probably need a guide to steer a straight course through the mazes of ton mileage, ton mile cost, revenue mileage and the details involved in the reduction of cost of repairs, labor, lubricants, etc., to exact unit measurements. These are absolutely essential and fortunately, American railways, for the most part, set out this information in liberal style. The main advantage that it offers to the layman is as a basis of comparison of results one year with those of the preceding year or some year further back from which it is desirable to obtain a proper perspective of a railway's management. The greatest use of this sort of data is to railway men themselves, in comparing their work with that of men on other lines and gaining a certain standard of efficiency or a fixed ideal of operation. The difference in units of measurements are so abrupt, as from billions of ton miles to the separation of revenues per ton per mile into units of a mile, that the ordinary man cannot grasp their meaning and flounders in a mass of unintelligible statistics.

As a railway is, first of all, a physical organization, and secondly, a machine whose work it is to move freight and passengers, the chief things to be known of it bear on the two matters of physical condition and transportation ability. However, the railway has certain marked financial aspects without a knowledge of which no estimate could be placed on the value of its securities, even were all to be known about its condition and its traffic. Railway reports might almost be divided into those that feature the financial side of the company and those that bring forward most conspicuously the physical and operating characteristics. Companies like the Pennsylvania Railroad and the Union Pacific, which possess enormous equities in the shape of securities of other lines, and whose income from investments is no less important than that from operations, most naturally deal in great detail with financial accounts. For the average railway, however, a complete balance sheet, not too much confused by entries that have no bearing on the main question of assets and liabilities, a table of funded debt and interest charges, the leases and rentals contracted or guaranteed, holdings of stocks or bonds of controlled companies, and, above all, a description of each separate mortgage, covers the ground. Few reports now contain this last-named feature, but where it is given, as in the case of the roads of the Rock Island system, it indicates a true conception of what security-holders ought to possess. Naturally, an income account is to be looked for in every report, but unfortunately many roads do not take the trouble to place one year's figures in contrast to those of the previous year, so it is difficult to immediately determine the results covering the 12 months.

These seem to me to be the leading points toward which the compiler of an informing railway report should direct his attention, and for which the stockholder should look in forming a basis of information of his company's doings. Railway reports can be too verbose. There is before me a report of the International & Great Northern, covering 135 pages, which would require a week's time to analyze thoroughly. This, however, is compiled by the receiver for a special purpose and does not represent the normal plan of the report. The number of stockholders in American railways is increasing rapidly from year to year, and as control of these properties is reduced to smaller units of ownership, it is more necessary than ever that presidents and general managers and comptrollers, in arranging their yearly statements, should cover thoroughly the field of their endeavors and leave no important result and the manner of its making or any new policy and its effect out of his annual statement to the real owners of the property.

RAILWAY MAIL PAY.

Julius Kruttschnitt, Lucius Tuttle, Ralph Peters, C. A. Wickersham and W. W. Baldwin, constituting a committee appointed at a meeting of railway officers held in Chicago, have issued a circular giving numerous facts about the compensation received by the railways from the government for carrying the mails, tending to show the unreasonableness (and absurdity) of claims which have been published to the effect that the deficit in the post office department for the past year was due to excessive sums paid to the railways. This committee represents 139 railways, operating 193,000 miles of lines. Readers of the *Railway Age Gazette* will recognize the members as officers respectively of the Union-Southern Pacific, the Boston & Maine, the Long Island, the Atlanta & West Point and the Burlington. The circular, in substance, follows:

RAILWAY MAIL PAY AND THE POSTAL DEFICIT.

Recent Acts of Congress and orders of the Department having the force of Law, have reduced the compensation, though pronounced not excessive by Congressional committees, by the following amounts:

1. The Act of Congress March 2, 1907, reduced pay on all routes moving more than 5,000 lbs. a day and also reduced the rates for furnishing and hauling railway post office cars. The effect of this Act was a loss of $2,676,468 annually, or 6 per cent. of the total received for both classes of service.

2. Act of Congress June 26, 1906, withdrew from the tonnage of mails on which pay was allowed empty mail bags and certain supplies thereafter to be shipped by freight or express. The effect was to cut a million dollars annually from the pay of the railways with no reduction of space facilities required to be furnished.

3. Postmaster-General's order of June 3, 1907, changed the methods of computing average weights, resulting in reduction of $4,500,000 per annum, or nearly 10 per cent.

4. Postmaster-General's orders further reduced railway postal car pay, causing reduction in annual pay to the railways of $345,287.

All of these reductions, aggregating $8,500,000 per annum, or 17 per cent. of the total railway mail pay for the year ending June 30, 1909, were made in the face of large increases in the cost of labor and materials.

The message of the President of December 7, 1909, on second class mail matter has inspired those enjoying these very low rates to try to show that the deficit is due to improvident railway mail pay contracts, rental and haul of railway post office cars, and to grossly discriminatory rates in comparison with those paid by express companies.

HANDLING SECOND CLASS MAIL MATTER.

In 1907 the postal deficit was $6,653,283. In 1909 it was

$17,441,719, an increase of 162 per cent. During the same period the postal revenues increased $19,977,378, from $183,585,005, to $203,562,383, or 19 per cent., and as tonnage of second class mail was practically the same the deficit was due to other causes than increase in second class mail. The pay to the railways was the same in both years, although the ton miles of service increased 14 per cent. The total increase of expenses in 1909 over 1907 was $30,765,814. Only about ¼ of 1 per cent. of this went to the railways. As neither tonnage of second class mail nor railway mail pay increased, we must search elsewhere for the causes of the increased deficit from $6,600,000 to $17,400,000; or, put in another way, why it cost the Department $30,765,814 in increased expenses to earn $19,977,378 more revenue.

A study of the revenues and expenditures of the Post Office Department, by classes of mail handled, in 1909, as shown in the Postmaster-General's report, shows that on first class mail the government received a revenue of 84 cents a lb. The total expense of handling was 49.92 cents, of which 5.56 cents or only 11 per cent. was paid to the railways and 89 per cent. for other expenses. On second class mail the total expense per pound was 9.23 cents, of which 3.19 cents or 34 per cent. was paid to the railways and 66 per cent. for all other expenses. In the case of the first class mail matter the government pays the railways 6.6 per cent. of the gross earnings for handling, in the case of the second class mail 290 per cent. of the gross earnings. Newspapers and magazines have claimed with much force and justice that, while the government may distribute them at a loss, they stimulate so much letter writing that the carriage of the first and second class matter should be considered as joint and not a separate traffic. Consolidating the first and second class, the total revenue becomes 14.88 cents per pound and total expenditures 15.98 cents per pound, of which 3.22 cents is paid the railways and 12.76 cents for other expenses. The railway pay is 20 per cent. of the total cost and rural delivery 19 per cent. The free Departmental and Congressional mail, if charged for at the same rate as the combined first and second class matter, would add $7,086,385 to the revenue of the Department, with which it should justly be credited.

The figures of the Postmaster-General's report of 1909, pages 29 and 58, show that the actual amount paid for transporting second class matter by railways (including post office car pay) is only 3.19 cents per pound of mail matter, *excluding weight of mail equipment also carried by railways* under the same preferential and discriminatory service accorded the mail itself. The universally misquoted rate of 9.23 cents per pound covers *all of the cost of handling mail, including rural delivery, administration expenses, etc.* (page 32). As the government requires the railways to carry ¾ of a pound of equipment with every pound of mail, the real rate of 3.19 cents computed on mail alone is equal to 1.9 cents per pound of weight carried.

The apportionment of expenses to second class matter by the Department is open to criticism as of the total loss claimed from this matter nearly $14,000,000 is attributed to rural delivery, which the magazines claim is not required by them, and $7,000,000 for salaries of railway postal clerks and car pay, while the amount charged for transportation is too high, for if this matter were removed from the mails the railway pay per ton mile would become higher while postal car service could be only slightly reduced. Again, the cost of "Free in County" delivery of a large tonnage of newspapers is charged against the paying tonnage, while if the expenses were apportioned on basis of weight of mail and equipment instead of mail only the charge against second class matter would be largely reduced.

IMPROVIDENT RAILWAY MAIL CONTRACTS.

It is the popular impression that the compensation paid the railways for railway post office cars is a rental simply. Nothing could be more erroneous. The pay covers not only the exclusive use—a very small part indeed of the expense to the carrier—but the very burdensome and expensive duty of hauling the car—a fully equipped post office on wheels—in fast passenger trains in which mail is assorted and distributed en route by a corps of clerks to expedite its delivery at intermediate points and terminals. These cars are hauled in trains, next to baggage cars [which baggage cars have] ample cubic capacity to carry all mail tendered, and to earn all transportation charges prescribed by law, but for public convenience the Department provides these moving post offices, weighing 12.4 per cent. of the average passenger train. For the use and cost of hauling this car ridiculously inadequate railway post office pay is allowed.

For a 60-foot railway postal car the carriers receive 5.5 cents per mile hauled, according to the scheduled railway post office car rates. These cars weigh about 50 tons, so the average earning per gross ton mile hauled is 1.1 mills. The Department on many lines uses the car one way only forcing the carriers to haul it back empty, so that on such lines the car mile earning would be reduced to 2.8 cents or about the same earnings per mile as from 1½ first-class passengers, and the ton mile earning to 6-10 of a mill. From published railway tariffs we find that for hauling empty passenger cars, which weigh much less, the railways receive 11 cents a car mile, or 2.4 mills a ton mile; that to haul empty baggage, express and mail cars in passenger trains they receive 8 cents to 15 cents a car mile or from 2.2 mills to 4.2 mills per ton mile—twice to four times as much as they receive from the government. *To move empty freight cars in freight trains carriers receive more than they receive for moving postal cars in passenger trains*, and when the revenue accruing from moving loaded freight cars in freight trains is considered the disparity becomes almost incredible.

The average haul of second-class mail matter (Report of 1907 Special Weighing of the Mails, page 58) is 610 miles, the average rate paid the railways for transporting a pound of this matter, including railway postal car pay, is 3.19 cents, and for transportation of mails and packages containing it (to make it comparable with express) 1.83 cents per pound, or 6 cents per ton mile. The merchandise express rates from Chicago to points named below are as follows for contents and packages:

Chicago to	Distance, miles.	Rate per 100 lbs.	Rate per ton miles.	55% paid railroads.
Marshalltown, Iowa	280	$1.75	12.5 cts.	6.87 cts.
Cincinnati, Ohio.....	285	1.50	10.5 "	5.77 "
Omaha, Neb.	491	2.00	8.1 "	4.45 "
Grand Island, Neb.....	645	3.25	10.1 "	5.55 "
New York, N. Y.....	907	2.50	5.5 "	3.02 "
San Francisco, Cal.....	2,267	11.50	10.1 "	5.55 "

On short hauls express rates are lower than second-class postal rates because postal rates are made regardless of distance, while express rates take account of distance carried. Therefore, for long distances express rates are much higher, and the only fair comparison that can be made is one based on average hauls.

Considering the conditions and reciprocal obligations, express is far more attractive and remunerative than mail traffic and would be so though the ton mile earnings from express were far less. Bearing in mind that economical train operation means good car loading and good train loading, express is handled with baggage in cars loaded to full capacity; mail requires a post office on wheels with space for mail racks and postal clerks working en route, loaded with an average of but two tons, or one-seventh full weight capacity. The design and specifications of the post office car are made by the Department regardless of expense, as the carrier pays, and, therefore, because of its special fittings for post office use is much more costly to build, equip, maintain and haul in trains, as its dead weight is 50 per cent. greater than baggage and express cars. On the other hand, it brings in less revenue as its net carrying capacity for mail is not more than 2½ tons, while express cars, having no space taken up with special fittings and equipment, can be loaded to 15 or 20 tons. Mails are handled on the fastest trains, often compromising their schedules, and special expenses are imposed on the carriers to transfer at junctions, handle free at terminals and into intermediate stations, fines and deductions are made for delay,

etc., all of which are charges against gross mail revenue. In the case of express the carriers' compensation is increased by services rendered by express companies, such as free carriage of remittances and packages, express messengers acting as baggagemen, joint station agents and employees, etc.

Under existing contracts the carriers are paid from 50 per cent. to 55 per cent. of the gross earnings of express companies for the transportation service rendered by the carriers. If the railways were to offer the Post Office Department the more favorable contracts which it is thought the express companies enjoy, the railways would expect say 50 per cent. of the gross earnings of the Department and their pay from all sources for the carriage of mail would be raised from $49,700,000 to over $102,000,000. Express companies pay the railways 50 per cent. to 55 per cent. of their gross earnings for transportation; the Department pays only 24 per cent. The Department retains 76 per cent. of its gross earnings and shows a large deficit yearly; the express companies retain 45 per cent. of theirs and after paying all expenses of collecting, delivering, messenger hire, etc., pay handsome dividends to their stockholders. The Post Office Department conducts its traffic regardless of all well-founded principles of economy—and very properly so—solely for public convenience, and the beneficiary should expect to foot reasonable bills for the service. The express companies are required by the carriers to handle their traffic with strict regard to economy.

Any comparison of mail with express or freight rates is valueless unless all conditions are considered and valued, such as average haul, character and flexibility of contracts and of service rendered. The higher ton mile rate may when modified by conditions be the less remunerative to the carrier. On the average passenger train carrying mail, express and passengers, 12.4 per cent. of the weight of the train is devoted to post office features not needed by the carrier to accommodate mail tonage, and is therefore a special charge demanding a much higher ton mile rate for mail alone to yield the same net return as express and passengers. In 1908 passenger train earnings from all sources were $674,042,400; 12.4 per cent. of the weight of trains should have yielded the railways $83,581,258, whereas the total payment for handling mail was but $49,737,519.

Mail traffic is of a class distinctly higher than express, and on account of light loading, only 2 tons average per car, must be class as *less than carload* business, while express traffic in full carloads, with no special additional equipment, approximates carload business. Wide differences in ton mile rates are sanctioned by law because of classification and size of load.

A greater disparity in rates is found in freight trains. Coal or ore is moved in the same train with silk, hops, automobiles, willow-ware, yet the carriage of low grade commodity might yield a larger net return to the carrier because of the much heavier load in the car, less exactions of the shipper, less risk of damage, etc. The following illustrates the wide range of ton mile rates in freight service:

Freight rates Per 100 Lbs., Chicago to St. Paul.

Pasenger vehicles	L.C.L.	$2.10	Agricultural implem'ts	C. L.	.20
Motor cycles	"	1.50	Bar iron	L.C.L.	.25
Chairs	"	1.20	Bar iron	C. L.	.14
Dry goods	"	.60	Pig iron	"	.14
Sugar, coffee	"	.25	Hard coal	"	.10
Agricultural impl'm'ts	"	.40			

Rates per ton-mile for transporting freight on freight trains are often higher than rates charged for hauling and furnishing post office car facilities on passenger trains for carriage of mail, as the following indicates:

Freight Rates Omaha and Kansas City to Denver.

		Rate— Per 100 lbs.	Per ton-miles.
Passenger vehicles	L.C.L.	$4,275	14.6 cts.
Motor cycles	"	3.125	10.4 "
Automobiles, mus. instrmts., chairs	"	2.50	8.3 "
Railroad earnings on second-class mail matter *on passenger trains*		1.80	6.0 "

The postal deficit and its great increase in the last two years in the face of an increase of $20,000,000 in postal revenue cannot be allocated to either increases in payments to the railways or losses on increased tonnage of second-class mail matter, both of which remained stationary. Other expenses, however, of the Post Office Department absorbed the larger revenue by increasing over $30,000,000. This was in part due to extending the rural delivery (which increased $9,000,000) and for increased forces and salaries due to higher cost of living (increase $20,000,000).

Postal revenue has been increasing at the rate of $10,000,000 annually and if postal expenses are controlled they should increase much more slowly and in two or three years the deficit should disappear—unless the greater revenue is used for further improvements in service, and if it is the public should be willing to foot the bill. The railways are now underpaid and are receiving less and less of the postal revenue for greater measures of service rendered. Ten years ago, in 1899, of each dollar of postal revenue 38 cents was paid to the railways; in 1909 only 24 cents, a decrease of 14 cents, or 37 per cent. The 1909 postal deficit was 8 cents per dollar of revenue, so that had the 14 cents saved from the railway proportion (or the equivalent of $29,000,000 on basis of 1909 revenue) been used to reduce expenses instead of further serving the public it would have wiped out the deficit and left a surplus of 6 cents per dollar, or $12,000,000. Instead, however, the $29,000,000 wrung from the railways was applied to various purposes with the resulting deficit.

Whether the service shall be improved with an annual deficit or remain stationary with no deficit, or with a surplus, depends on whether further improvement of the service or a favorable financial showing is to be the paramount consideration. The able men in charge of our postal service can easily bring about either result. It is for the public to decide which they want, but in deciding we appeal for justice and a square deal for the railways.

FOREIGN RAILWAY NOTES.

The Belgian State Railways in 1909 earned 10,869,000 francs ($2,173,800), or 4 per cent. more than in 1908.

The Argentine government, acting under authority of Congress, consummated in November, 1909, the sale of the Andine Railway to the Pacific Co. and the Argentine & Great Western railways, the consideration being $12,024,320, or $27,328,000 national money. The property was delivered on November 5, the purchasing companies becoming responsible for the existing obligations and contracts relating to the exploitation of the line pending at the time of the transfer.

January 1 the railway from Khartum southward along the west bank of the Blue Nile was opened for 120 miles to Wadi Medani, the residence of the governor of the province of Blue Nile, and headquarters of a Sudan regiment. Work is progressing on an extension for 50 miles further south. Thence the line is to turn westward, cross the White Nile at Kosti, where a bridge is going up, and eventually reach El Obeid, in Kordofan.

The Chinese government has temporarily held up the negotiations for the participation of an American syndicate headed by J. P. Morgan & Co., in the loan to build to the Hankow-Szechuen Railway. It is said that the action of the Chinese government is due to pressure brought to bear by the China Investment & Construction Co. syndicate, which has severely criticised Secretary Knox for favoring the Morgan syndicate, and which claim that the original promise of China to permit American participation in loan was made to the investment company, and that the investment company should have a share in this loan. China is understood to be friendly to the investment company.

THE ALBEMARLE SOUND TRESTLE OF THE NORFOLK & SOUTHERN RAILWAY.

BY F. L. NICHOLSON,
Chief Engineer.

The reasons for the Norfolk & Southern trestle across Albemarle sound from Edenton to Mackey's Ferry will be better understood after a brief study of the map showing the territory served, together with a statement of the growth of the property.

The region served by the Norfolk & Southern embraces the counties of Princess Anne and Norfolk in Virginia, and thirteen counties in eastern North Carolina, covering an area of 4,000 square miles. While no portion of the United States is better served with waterways than this section of the Atlantic coast, yet, prior to 1903, railway construction had been spasmodic and very limited in extent.

The Atlantic & North Carolina, which is at present the Beaufort division of the Norfolk & Southern, was built in 1858, extending from Goldsboro via Kinston and New Bern to Morehead City. The present stem of the Norfolk & Southern system was completed from Berkley via Elizabeth City to Edenton on the north side of Albermarle sound, a distance of 73 miles, in 1881. In 1887 there was built from Mackey's Ferry on the south shore of Albemarle sound and opposite Edenton, 30 miles of road extending southward to Belhaven on the Pungo river. These three lines, together with the road from Norfolk to Virginia Beach and from Clapham junction to Munden point in Virginia, embraced all the railway mileage in the whole territory now served by the Norfolk & Southern.

Within this almost virgin field the Norfolk & Southern since 1903 has created a system of lines, owned and leased, amounting to 602 miles of standard gage railway.

Without going into the details of growth, the following extensions since 1903 may be noted from the map of territory served:

From Virginia Beach via Cape Henry to Norfolk; from



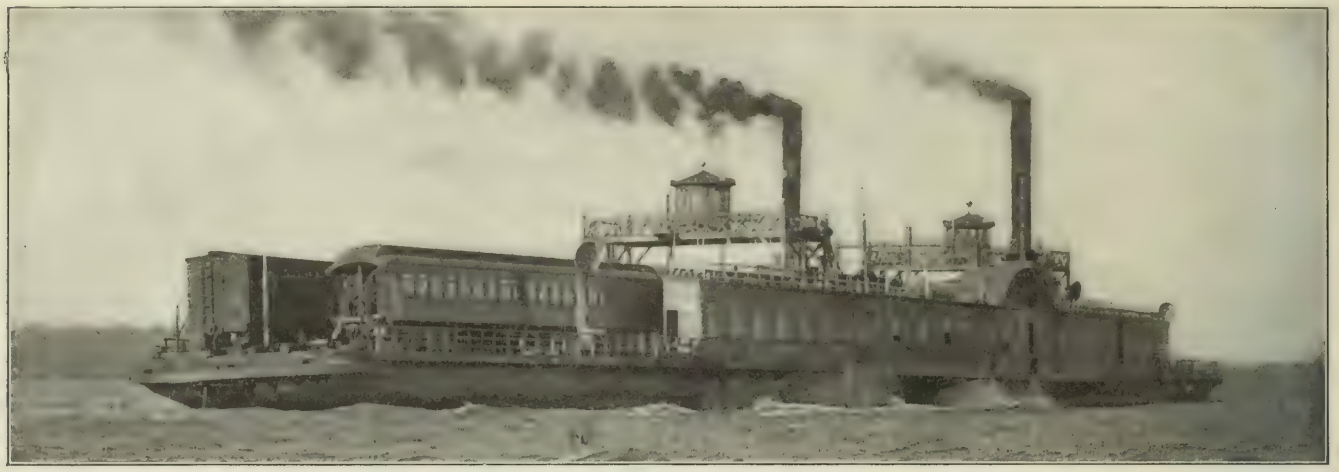
Map of the Norfolk & Southern Railway, Showing Location of Albemarle Sound Trestle.

Clapham junction to Providence junction; from Mackey's Ferry to Plymouth; from Plymouth to Washington; from New Bern via Chocowinity to Raleigh and Washington; from New Bern via Bayboro to Oriental; from Pinetown to Bishop's Cross; from Suffolk to Edenton, and from Beckford Junction to Elizabeth City.

All traffic collected south of Albemarle sound was transferred from Mackey's Ferry to Edenton by transfer steamer *John W. Garrett*, which has a carrying capacity of 23 loaded freight cars, and consumes two hours and thirty minutes for round trip. The management of the Norfolk & Southern

saw as early as 1906 that the extension of railway lines into a richly timbered and rapidly growing agricultural section would enormously increase traffic, and would soon overtax the transfer facilities at Albemarle sound. To add another transfer steamer would nearly double the cost of operation across the sound without shortening the time for passenger and freight service, and would only postpone the day when freight movement would be congested. The time had arrived when the amount of traffic justified bridging the sound, saving one hour in time of passenger service and from six to twelve hours in freight service.

Accordingly, plans were prepared for a pile trestle which, according to U. S. Government requirements, would have two large movable spans for the accommodation of navigation, and in addition, five fixed spans, which would provide passageways for motor boats. The work of construction was begun July 20, 1907, but suspended Nov. 18 on account of financial stringency, and not resumed until Feb. 20, 1909, since which time it has gone forward without interruption, and the trestle was completed and opened for traffic Jan. 17, 1910, a train carrying officers of the road passing over on Jan. 1, 1910.



Transfer Steamer John W. Garrett, in Service 1899-1910.

LOCATION.

The new line leaves the old Suffolk & Carolina, now Norfolk & Southern, tracks at King street, in Edenton, and passing on a pile trestle over Johnson's creek, follows the shore of Edenton bay to the north shore of Albemarle sound at Skinner's point, a distance of 3.6 miles. From Skinner's point it crosses the sound on a trestle bearing S. 18 degrees, 34 min. 30 sec. W. to the south shore at a point 1,300 feet east of the mouth of Mackey's creek, a distance of 26,668 ft. out to out of stringers. The track then passes through Davenport's swamp and over Mackey's creek to join the old Norfolk & Southern tracks at Mackey's Ferry station, a distance of 3,378 ft. from the south end of bridge. On the north side of the trestle from Edenton to Skinner's point the ground was high and the soil sandy. The earthwork consisted of shallow cuts and fills and offered no construction problems of unusual interest. On the south side the track had to be built through a very soft, boggy swamp. The foundation for the roadbed was first mattressed with logs and brush and then filled. As anticipated, the fill sank, but on account of the mattress it sank uniformly and the track was raised. After running construction trains over it for six months the mattress of logs has now reached firm foundation and there is no longer appreciable settlement of the fill.

DEPTH OF WATER.

The average depth of water is 21 ft. for 19,000 ft. of the length, shoaling at each end to an average of 4 ft.

PILE TRESTLE.

The trestle bents are spaced 12 ft. 6 in. center to center,



North End of Albemarle Sound Trestle.

with six piles to the bent. The piles are untreated long leaf pine or cypress, not less than 12 in. at a point 8 ft. below the butt nor less than 7 in. at the small end with not less than 9 in. of heart at the cut off and cary in length from 55 to 97 ft. The piles are cut off 10 ft. 2½ in. above mean water line. They were all battered and driven to safe bearing as computed by *Engineering News* formula $\frac{2\ W\ H}{S\ plus\ 1}$ and according to this formula will sustain a load of 16 to 20 tons per mile.

The minimum penetration in the bottom of the sound was 20 ft., the maximum 60 ft., the average being 40 ft. The caps



Route Map, Albemarle Sound Trestle.

are of long leaf pine 12 x 12 in., 14 ft. long, fastened to piles by ¾ x 22-in. drift bolts. Each bent is braced transversely by two horizontal braces 3 x 12 in. at mean water line, and two diagonal braces 3 x 10 in. running from outer end of cap to connection with outer piles just above jam of horizontal braces.

All braces are of long leaf pine, fastened to the outer piles by ¾-in. bolts and to the intermediate piles by ½ x 8-inch boat spikes. The bents are braced longitudinally in alternate bays by horizontal braces 4 x 10 in., 14 ft. long, fastened to top of caps at outer ends by ⅝ x 10-in. boat spikes, and diagonal braces 3 x 12 in. in plane of batter piles fastened to piles and at crossing by ¾-in. bolts. The stringers are of long leaf pine in two lines 8 x 16 in. under each rail fastened to caps by ¾ x 24-in. drift bolts.

The two lines of stringers are separated from each other by 2-in. cast-iron spools and held together by ¾-in. bolts. The stringers are designed for Cooper's E 40 loading, but provision is made for an additional line of 8 x 16 under each rail whenever it is desired to use Cooper's E 50 on the road, for which latter loading the steel spans to be later described are designed. The ties are of long leaf pine, 7 x 8 in., 9 ft. long, spaced 14 in. center to center, dressed on one side to uniform depth and each tie secured to alternate line of stringers by ½-in. boat spikes. Guard rails are of long leaf pine, 6 x 8 in., dapped to 5 in. over ties and fastened to alternate ties by 5 x 8-in. boat spikes and bolted at the joints with ¾-in. machine bolts. All boat spikes securing ties are left ½ inch high so as to be easily withdrawn by bar, facilitating repairs. Refuge platforms for accommodation of hand cars and workmen are built on extended ties at intervals of 1,000 ft.

PLATE GIRDER SPANS.

The United States Army engineers required the railway to provide, for the purposes of navigation, in addition to a clear opening of 140 ft. at the north channel of the sound and a 35-ft. waterway at the south channel, five passageways for motor boats, each giving 35 ft. clear waterway and 12 ft. of clear height above low water. It was decided that the requirements for motor boat traffic could be best met by the construction of through plate girder fixed spans 51 ft. 6 in., end to end of girder, giving a clear waterway of 35 ft. from inside to inside of fender piles.

Two of these fixed spans are located 3,000 ft. apart between the north shore and the north channel of the sound. Two other fixed spans, 3,887 ft. 6 in. apart, are located between the channel spans. The fifth fixed span is 3,000 ft. from the south shore. The girders are 15 ft. center to center, and are designed for Cooper's E 50 loading. The piers for girders are each formed by two trestle bents, 5 ft. center to center, eight creosoted piles to the bent. The bents are braced longitudinally, transversely and diagonally by 3 x 12-in. braces. The



One of the Spans.

caps are 12 x 12 in., 22 ft. long, supporting ten stringers, 7 x 16 in., 7 ft. 6 in. long. These stringers support five transverse pieces, 7 x 16 in., 19 ft. long, upon which the girders rest. The same methods of fastening caps, stringers and braces are here used as described above for the trestle.

The draw openings at the south channel are given by a deck plate girder swing bridge 94 ft. end to end of girders, giving 35 ft. clear opening on each side of the pivot pier from inside to inside of protection piles. The girders are spaced 6 ft. 6 in. center to center, and are designed for Cooper's E 50 loading. The pivot pier, which was founded on hard bottom, is 15 ft. 6 in. by 15 ft. 6 in., built of concrete reinforced with corrugated steel bars. It carries a turntable 13 ft. 6 in. in diameter.

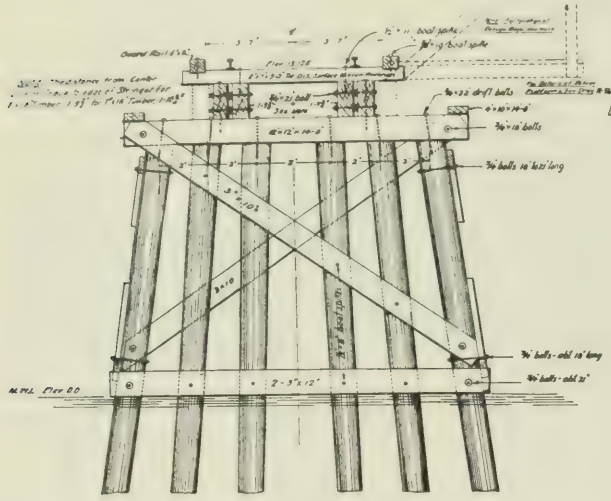
SCHERZER ROLLING-LIFT BRIDGE.

The center of the bascule span over the north channel of the sound is 9,003 ft. from the north shore. It is a single track, three-cylinder gasoline engine of the Fairbanks-Morse type, 30 horsepower, worked in duplicate. The engines are equipped with self-starters and provided with speed-regulating devices capable of changing to desired speed at any time, the slow speed gears lifting bridge to full height in 1¾ minutes. The bridge is also equipped with hand-power appliances for operating the leaf.

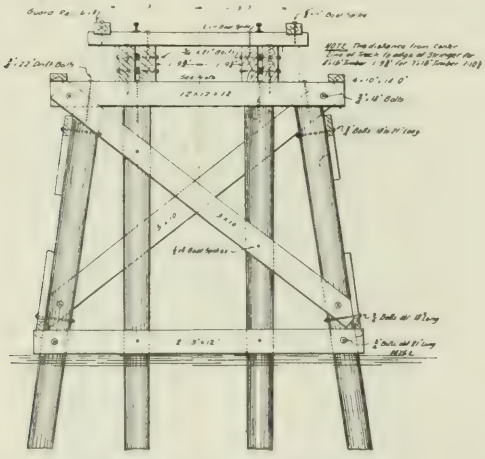
The entire work was designed in accordance with the general specifications for steel railway bridge of the American Railway Engineering & Maintenance of Way Association, 1906, for Cooper's E 50 loading.

CONCRETE PIERS—SCHERZER BRIDGE.

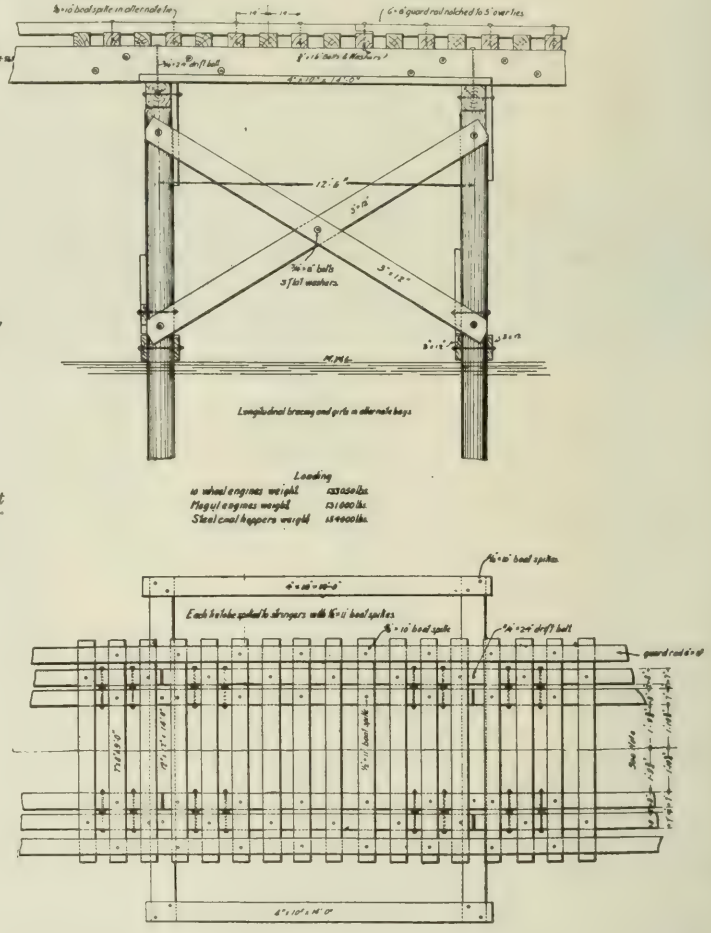
On account of the very soft material of which the sound bottom was composed, it was determined to dredge to depth required to secure satisfactory bottom on which to deposit concrete and to give necessary stiffness to pile foundation, not only to sustain the loads, but to prevent as much as possible



Six-leg bents used between the abutments of the extreme east and west girder spans and in other places where depth of water exceeds 10 ft.



Four-leg bents for use where depth of water is less than 10 ft.



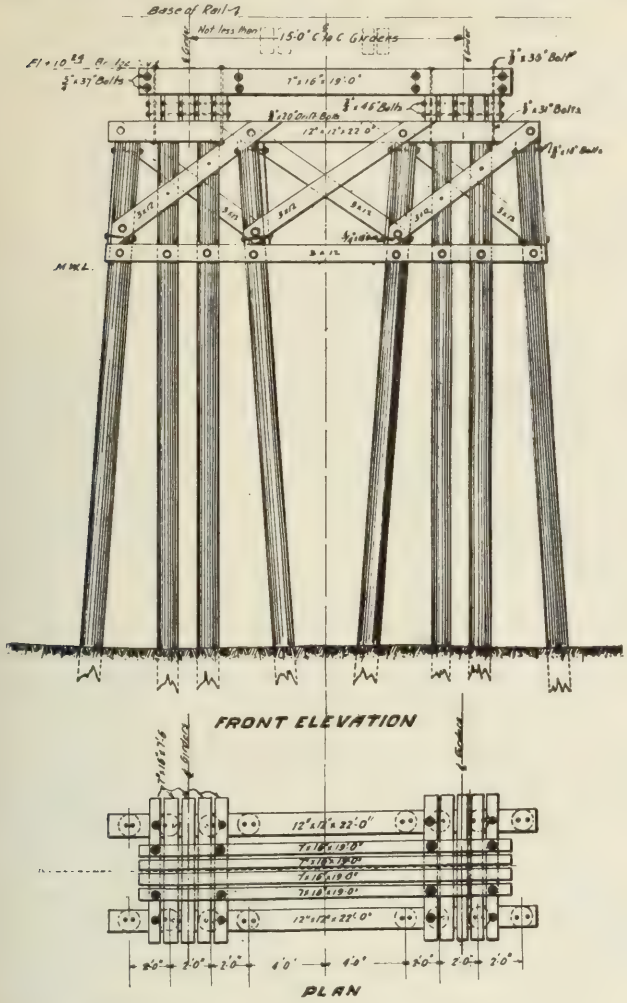
Longitudinal elevation and deck plan.

Details of Pile Trestle.

single-leaf through bridge of the Scherzer rolling lift type, 170 ft. 3 in. long, center to center of bearings, and 17 ft., center to center of trusses. The clear channel for navigation allowed for this span is 140 ft., measured at right angles with the channel of the sound, which makes an angle of 90 deg. with the center line of the bridge. The track girders upon which the bascule span rolls, have a depth of 6 ft. 10 in., and are supported directly by concrete piers reinforced with corrugated steel bars. The front end of the bascule span when closed is carried by a reinforced concrete pier built to the full height of the under side of the trusses. The bridge is operated by one

any movement of piers under strains while operating lift at this exposed position. To do this it was necessary to dredge to depth of 16 ft. below the bottom of the sound, the depth of water at this point being 21 ft. Coffer dams of timber were driven and properly braced, enclosing space required for each pier; the soft bottom material was removed and foundation piles driven, a 2,500-lb. hammer was used, and the piles were driven to resistance, the average penetration below bottom of dredged area being 19 ft. They were then sawed off by drivers to an elevation of 2 ft. above original sound bottom. The bottom of the dredged area being of gummy material, com-

posed of sand, clay and mud, a bed of sand 2 ft. thick was laid on which to deposit the concrete. On this was placed a concrete filling of proportions 1-4-8; on this was deposited concrete proportions 1-2½-5 for 3 ft., after which the coffer dam



Details of File Piers for Girder Spans.

Loading:

10-wheel engines	133,050 *lbs.*
Mogul engines	131,000 "
Steel coal hoppers	154,000 "

was pumped out and balance of concreting completed. The concrete coping was mixed in proportions 1-1-2.

The design and construction of the whole work, including pile-trestle, steel spans, piers and foundations was executed under the direction and supervision of the Engineering Department of the Norfolk & Southern Railway Co.

EIGHT-WHEEL ENGINES WITH SUPERHEATERS FOR THE WESTERN RAILWAY OF HAVANA.

The American Locomotive Company has recently completed two eight-wheel passenger locomotives for the Western Railway of Havana, one of which is shown in the accompanying illustrations.

The chief feature of interest in connection with these engines lies in the fact that they are equipped with the builders' latest design of fire tube superheater with side headers and are the first superheater engines to be built for this road.

The superheater is of the same type as that applied to a consolidation locomotive recently built for the Wabash-Pittsburgh Terminal Railway by the same company and is arranged to give a moderate degree of superheat.

Briefly, this design of superheater consists of two steam headers "A," located one on either side of the smokebox and secured to a box casting bolted to the side of the smokebox. A curved pipe "B" connects the saturated steam compartment of the header with the tee-head, while the superheated steam compartment is connected directly to the steam passages in the cylinders by a pipe "C" cast integral with the header, thus reducing the number of joints.

There are twelve large boiler tubes "D" 5¼ in. in diameter outside, each of which contains four seamless steel superheating tubes "E" 1½ in. in diameter. The superheater tubes are arranged in pairs, the two tubes in each pair being connected at the back ends by cast steel return bends "F." The ends of the superheater tubes are bent around horizontally to meet the steam headers. This arrangement allows complete freedom for the expansion and contraction of the superheater tubes due to variations in temperature and thus serves to prevent leaking of the joints. The ends of the superheater pipes are upset and machined to form a ball which is ground into its seat in the header. A gland connects the ends of the two pipes in each superheater unit and they are secured to their seats by means of a single bolt which passes through the header and box casting with the unit on the back end. These bolts are thus protected from corrosion by the hot flue gases, and covered openings are provided in the side of the smokebox to give access to them from the outside. A damper is provided for controlling the passage of the gases through the 5¼-in. tubes and around the superheating pipes. This damper is automatically operated by a steam cylinder which has a pipe connection to the steam chest. When the throttle is open the pressure in the steam chest opens the damper which is closed again by a counter weight as soon as the throttle is closed.

Because of the use of superheated steam the engine carries a low boiler pressure of 165 lbs.

The cylinders are 18½-in. diameter by 24-in. stroke. Superheated steam is distributed to the cylinders by means of



Passenger 4-4-0 Locomotive for Western Railway of Havana.

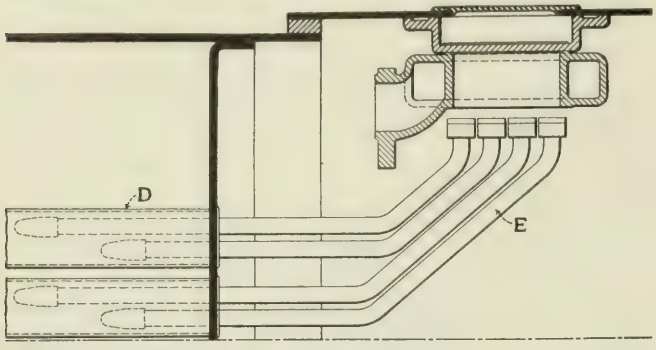
piston valves having inside admission and operated by a simple arrangement of Walschaerts valve gear.

Reversing is affected by means of a screw and hand crank.

The boiler is of the straight top type with Belpaire firebox and the barrel measures 55 in. diameter inside at the first course.

It contains 135 tubes 2 in. in diameter and 10 ft. 10½ in. long, and, as before stated, 12 tubes 5¼ in. diameter which contain the superheated tubes.

The total heating surface of the boiler is 1,071 sq. ft., of which the tubes contribute 939 sq. ft. and the remainder, or 12.3 per cent. of the total, is provided by the firebox.

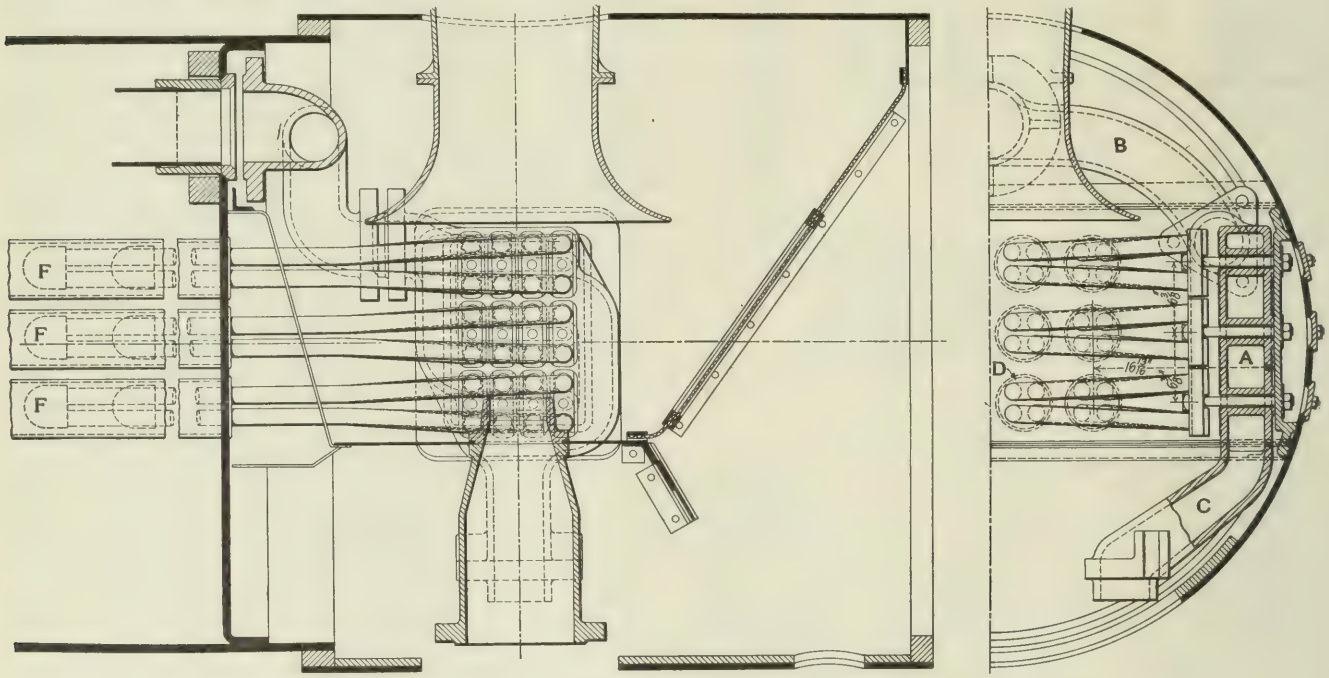


clearly shown in the accompanying illustrations of the side elevation and cross sections.

The tender is provided with a tank having a water capacity of 4,000 gallons and space for 6½ tons of coal. The tender frame is of steel, the center and side sills being constructed of 10-in. channels. The trucks are of the 4-wheel arch bar type.

The following are some of the principal dimensions of these engines:

Cylinder, diameter	18½ in.
Piston stroke	24 "
Wheel base, driving	8 ft. 6 "
" " engine	23 " 5 "
" " engine and tender	47 " 10 "
Weight on drivers	69,000 lbs.
" on front truck	114,500 "
" engine and tender	208,100 "
Heating surface, tubes	939 sq. ft.
" " firebox	132 "
" " total	1,071 "
" " superheater	158 "
Grate area	17.8 "
Journals, driving	7½ in. x 8½ in.
" truck	5½ " x 12 "
" tender	5 " x 9 "
Boiler diameter	56 "
Steam pressure	165 lbs.
Firebox, type	Belpaire
" length	75½ in.
" width	34 "
" thickness, all sheets	½ "
" water space, front	4 "
" water space, sides and back	3 "
Tubes, material of 2-in.	Charcoal iron
" " " 1½-in.	Seamless steel



Part Plan, Elevation and Sections of Firetube Superheater; Western of Havana.

The superheater has a heating surface of 158 sq. ft., which is 16.8 per cent. of the tubes heating surface. The superheater tubes extend to within about 32 in. of the firebox tube sheet.

The firebox is narrow and is placed between the frames. It is 75½ in. long and 34 in. wide, and provides a grate area of 17.8 sq. ft.

The inside firebox is of copper with the exception of the firebox tube sheet which is of steel, which explains the uniformity of the thickness (½-in.) of the metal of all the sheets.

All the staybolts in the side and back are of bronze while those in the throat are of wrought iron as are also the crown stays.

A departure from American locomotive practice will be noticed in the design and location of the sand box. This is placed just ahead of the front driving wheels underneath the boiler and is supported on the frames. The construction is

Tubes, material of 5¼-in.	Seamless steel
" number of 2-in.	135
" " " 1½-in.	48
" " " 5¼-in.	12
" length of 2 in. and 5¼ in.	10 ft. 10½ in.
Smokestack diameter	14 in.
Smokestack, above rails	13 ft. 7 "
Tank capacity, water	4,000 gals.
Tank capacity, fuel	6½ tons.
Valve travel	5½ in.
" lap	⅞-in.
" exhaust clearance	⅛-in.
" lead	3/16-in.
Wheels, diameter, driving	68 "
" " truck	33 "
" " tender	33 "
Tractive effort	17,000 lbs.

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 61.13^*$$

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.06$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 6.73$$

* Per cent.

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 107.9$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 60.1$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface.}\dagger} = 12.32*$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 64.4$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 106.91$$

Displacement, 2 cylinders, cu. ft. = 7.46

*Per cent. †Exclusive of superheater.

THE GERMAN FREIGHT CAR POOL.*

PARAGRAPH 1.—*Object and Extent of the Association.*

1. The Prussian-Hessian State Railways forming the Prussian State Freight Car Association, the Imperial Railways, the State Railways of Oldenburg and Mackelenburg unite with the Bavarian State Railways (including the Railways of the Palatinate), the State Railways of Saxony, Wurtemberg and the Grand Duchy of Baden to form jointly a "German State Freight Car Association" for the purpose of furthering the traffic and simplifying and decreasing the cost of management and accounting, by the common use of their freight cars.

2. The railways forming the Prussian State Freight Car Association join this agreement as independent covenanters but are represented by the Prussian-Hessian State Railways concerning all legal relations with regard to the compensation for the use of cars and the increase of the rolling stock.

3. The management of the association is incumbent on the board of directors of the Prussian-Hessian State Railways within the limits covered by this agreement and the by-laws of the association as agreed to.

PARAGRAPH 2.—*The Rolling Stock.*

1. The cars remain the property of the railways members of the association which have furnished them.

2. The rolling stock which each railway must contribute to the association consist of (exclusive of work and special cars):

379,669 freight cars for the Prussian & Hessian State Railways and the Imperial State Railways.
3,291 freight cars cars for the State Railroads of Mecklenburg.
2,323 for the State Railroads of Oldenburg.
42,391 for the Bavarian State Railways, including those of the Palatinate.
30,865 for the State Railways of Saxony.
10,097 for the State Railroads of Wurtemberg.
17,485 for the State Railroads of the Grand Duchy of Baden.

Total, 486,121

3. Should the total rolling stock of any of the railways of the association be less than the aforesaid numbers on April 1, 1909, its quota must be completed within the three consecutive years following, exclusive of the increase prescribed in Paragraph 12.

PARAGRAPH 3.—*Use of Freight Cars.*

1. Each railway member of the association can use the freight cars of the other railways members thereof, in accordance with the rules agreed upon relative to the use of freight cars.

2. The exchange of the freight cars among the railways members of the association is no longer recorded, nor the route followed. The interchange reports formerly required showing the passing of the cars from one railway to another are no longer necessary even for freight cars not belonging to the association.

PARAGRAPH 4.—*The Distribution of Freight Cars.*

The arrangements for placing freight cars are primarily incumbent upon each management upon its own lines. The distribution of the cars as needed and their apportionment are left under the regulations relative to cars to the group of distributing stations agreed upon for the several administrative districts and between the latter and the principal office at Berlin. (See par. 13, sect. 2.)

The guiding principle in this agreement is to secure the greatest possible satisfaction in supplying the wants of the lines within the limits of the Association. With this object in view the principal car office at Berlin is authorized to direct the transfer of cars to the several districts independent of the needs of the districts ordered to furnish them.

PARAGRAPH 5.—*Facilitating the Circulation of Cars.*

The railways belonging to the association shall always regulate the circulation of freight cars in accordance with the principle prescribed and whenever a scarcity of cars occurs they shall not recoil from extraordinary expense, but shall act for the common good in conformity with the best known methods of operation and improvement in construction, obtainable within the limits of good management.

PARAGRAPH 6.—*Compensation for the Use of the Cars of the Association.*

1. Each railway member of the association pays to the latter a fixed amount, according to the number of axle kilometers run by the cars. The axle kilometers are ascertained from the rules fixed in the regulation relative to freight cars.

2. The income of the association (section 1) is distributed in proportion to the annual average of freight cars kept at the disposal of the association by each railway.

PARAGRAPH 7.—*Accounting with Railways Not Members of the Association.*

The expenses for and receipts from the renting of cars, etc., used in the traffic with railways not members of the Association are pro-rated among the association railways in proportion to the average expenses and receipts of the latter in such traffic, during the years from 1903 to 1907.

PARAGRAPH 8.—*Keeping Cars in Good Order.*

1. Each railway of the association must maintain in good order the cars of other association railways the same as it does its own cars, in conformity to the rules agreed upon regarding this matter.

2. The inspection of the cars prescribed by the railway construction and the traffic regulations shall be done as a rule, and until otherwise ordered, in the workshops of the home railway.

3. When changes are made in the construction of the cars the assent of the home railway is required.

4. Each association railway is bound to maintain the working capacity of its shops in such a way as to be able to perform the required repairing and inspection work in a reasonable time.

5. The insepction of cars, whether of the association roads or otherwise, at interchange points, is no longer required within the limits of the association.

PARAGRAPH 9.—*Accounts for the Maintenance of Cars.*

1. The work of repairing, inspection and of necessary alteration needed on cars must be done at the expense of the home railway unless the cost of it can be recovered from a third party by recourse (inclusive of non-association administrations). No compensation is obtainable for the work done by the car inspectors.

2. The home railway may pay for the cost of material and wages, and is further debited with an amount agreed upon as compensation for general work and expenses.

3. The payment of salvage for old material is waived; it becomes the property of the association railway that has done

* From a paper by W. F. Allen, in the *Bulletin* of the International Railway Congress.

the work, with the exception of the wheels and axles, which must be returned to the home railway.

4. Repair material and wheels which are to be returned must be forwarded freight free.

5. Each association railway must keep a book account of the cost of the repairs made to cars belonging to another association railway. The ascertainment of the cost is left to it, but the accounts shall be kept in such a way that the railway charged shall be able to test the accuracy of the charges by means of the papers sent in support of the claim. The railway debited with the cost has the right of examination of the accounts.

6. Bills for the cost must be presented quarterly on standard printed blanks. No further particulars can be exacted from a railway excepting the test of accuracy mentioned in section 5.

Paragraph 10.—*Uniform Construction of Cars and of Replacing Parts.*

1. The association railways must furnish cars of uniform shape, especially as regards the loading space of each kind of car, their brakes, etc.

2. They must further restrict in due course the number of patterns for the parts most frequently replaced.

Paragraph 11.—*Condemnation of Cars.*

1. Cars are destroyed by the home railways or with their express consent in accordance with uniform principles, agreed upon. Each association railway must replace its own destroyed cars.

2. The association railways must declare unfit for use any car when its employment and maintenance have become evidently difficult.

Paragraph 12.—*Continuous Increase of the Rolling Stock.*

1. The rolling stock of the association shall constantly be increased so as to render it sufficient even in time of extraordinarily large traffic. Therefore the association railways must agree on the percentage of annual increase.

2. The number of cars to be annually built shall be fixed for each association railway in proportion to the rolling stock assigned to it. (See par. 2.) As regards the quota of each type of car, the association railways must reach an understanding upon the lines to be agreed upon.

3. This agreement shall be made promptly in order to enable each association railway to appropriate the necessary amount.

Paragraph 13.—*Organization.*

1. The management of the association is incumbent upon the Royal Prussian Central Administration of Railways at Berlin. Connected with it is the Central Administration of Freight Cars, which has charge of the distribution of the cars to the entire group of railways, according to the existing stock and the supply required (see par. 4).

2. The State Railways of Bavaria, Wurtemberg, Saxony and the Grand Duchy of Baden appoint each one delegate to the Central Administration of Railways who makes reports to his own administration concerning its business.

3. The mileage accounts, etc., to be collected for the use of cars by non-association railways are kept at the Prussian car accounting office, to which the State Railways of Bavaria, Saxony, Wurtemberg and the Grand Duchy of Baden are entitled also to appoint a certain number of functionaries.

4. Amendments to the rules relative to freight cars (par. 3), may be made by the vote of the majority of those present at the assembly of the car association, in which the executive central board and each separate board of directors represented have one vote. These decisions are binding upon all members of the association, unless rejected by a majority of all members within four weeks after the mailing of a copy of the proceedings. Here again each railway of the association has one vote for each 10,000 axles in the association.

5. The rules relative to the construction, maintenance and condemnation of cars may be amended by committee, on which the non-Prussian railways shall each have one representative entitled to one vote. The decisions made by the committees become binding, unless rejected by a majority within eight weeks after the mailing of the copies of the proceedings. The number of votes to which each association railway is entitled is fixed in section 4. The amendment of the rules relating to condemned cars and the execution of the decisions concerning the objects of paragraph 10, section 2, requires the consent of the interested association railways.

6. The executive central board has the right to make sure of the uniform execution of the rules of the association by visiting the stations and looking into the local distribution of cars. The boards of the railways interested must be previously informed of such visits.

Paragraph 14.—*Expenditures of the Association.*

The association railways bear the expenses of the central car office caused by the administration of the business of the association in proportion to the number of axle kilometers run by the association cars in their tracks; but the expenses of the office for car accounting with non-association roads is divided in proportion to their share of the receipts and expenses in such traffic. See paragraph 7. The central car office and the accounting offices are credited with the amounts received by the non-Prussian employees.

Paragraph 15.—*Former Agreements are no Longer in Force.*

In the traffic between association railways the rules of the agreements concerning freight cars and all private arrangements based on them are abrogated, as far as the freight cars of the association are concerned.

Paragraph 16.—*Putting in Force or Repealing the Agreement.*

This agreement will take effect on April 1, 1909. It can be repealed on any March 31 by giving notice one year in advance, but such appeal will not become come effective before March 31, 1912.

Should a railway, member of the association, be unable to fulfil its obligation concerning the furnishing of cars, the agreement may become effective with regard to such railway, at any time after serving a three months' notice, by order of a majority vote in accordance with paragraph 13, section 3.

ACCIDENT BULLETIN NO. 33.

The Interstate Commerce Commission has issued accident bulletin, No. 33, of railway accidents in the United States during the three months ending September 30, 1909. The number of persons killed in train accidents was 193, and of injured, 3,752. Accidents of other kinds bring the total number of casualties up to 20,093 (852 killed and 19,241 injured). These reports deal only with employees on duty and passengers.

Table No. 1.—*Casualties to Persons—July, August and September,* 1909

Causes.	Passengers Kil'd.	Passengers Inj'd.	Employees Kil'd.	Employees Inj'd.	Tot'l persons reported Kil'd.	Tot'l persons reported Inj'd.
Collisions	39	1,393	70	592	109	1,985
Derailments	17	894	54	462	71	1,356
Miscellaneous train accidents	..	38	13	373	13	411
Total train accidents	56	2,325	137	1,427	193	3,752
Coupling or uncoupling	..	...	38	633	38	633
Other work abt trains or switches	..	...	31	3,960	31	3,960
In contact with bridges, etc.	1	16	28	291	29	307
Falling from cars or engines or while getting on or off	32	971	136	2,858	168	3,829
Other causes	15	1,101	378	5,659	393	6,760
Total, other than train ac'd'ts.	48	2,088	611	13,401	659	15,489
Total, all classes	104	4,413	748	14,828	852	19,241

The only favorable indication that can be discerned in the statistics of the quarter is that afforded by the fact that the totals of employees killed in train accidents and in coupling cars do not show such decided increases as do those of employees killed from other causes. These last named items might be expected to increase, because of the general increase

of traffic, and on this supposition the absence of increase in the others indicates improved conditions. Five accidents—collisions 14, 16, 24 and 1 and derailment No. 19—caused 47 deaths. The causes of these and of others in which the circumstances were notable or unusual are given in connection with Table No. 2A.

TABLE No. 1A.—*Comparisons of Principal Items with Last Bulletin and with One Year Back.*

	Bulletins		
	No. 33.	No. 32.	No. 29.
1. Passengers killed in train accidents	56	7	53
2. Passengers killed all causes	104	44	110
3. Employees killed in train accidents	137	92	138
4. Employees killed in coupling	38	34	39
5. Employees killed, all causes	748	544	624
6. Total passengers and employees killed	852	588	734

The total number of collisions and derailments in the quarter now under review was 2,751 as below:

TABLE No. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	261	$273,195	17	516
" butting	171	328,155	63	1,024
" train separating	110	61,924	1	39
" miscellaneous	746	382,631	28	406
Total	1,288	$1,045,905	109	1,985
Derailments due to ·				
Defect of roadway, etc.	268	$211,301	9	281
Defects of equipment	671	544,745	9	149
Negligence	84	37,996	3	75
Unforeseen obstruction of track	83	122,800	17	351
Malicious obstruction	14	36,149	3	68
Miscellaneous causes	343	317,118	30	432
Total	1,463	$1,270,109	71	1,356
Total collisions and derailments	2,751	$2,316,014	180	3,341
Total for same quarter of 1908	2,567	1,950,408	176	2,729
Total for same quarter of 1907	4,279	3,605,696	309	4,534

TABLE No. 2A.—*Causes of Forty-three Prominent Train Accidents.*

[NOTE.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

Collisions.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars, & roadway.	Reference to record.	Cause.
1	R.	P. & F.	6	3	$600	76a	Failure to flag (See note in text.)
2	B.	P. & P.	1	9	1,820	38	Southbound train ran over misplaced switch and collided with northbound standing on sidetrack; porter of northbound had set switch straight, and afterwards went back and set for siding; cannot explain. Engineman of standing train was killed. Time, 2 p. m.
3	B.	F. & F.	0	2	3,000	69	Operator overlooked order; block signal not properly managed. (See note in text.)
4	M.	P. & F.	0	0	3,378	74	Passenger train ran into side of freight backing into sidetrack. Passenger had been flagged, but seeing automatic block signal clear, engineman resumed speed, though flagman had not been called in. Automatic signal had been cleared by foreign electric current in rails. It remained clear only a few seconds, and, according to the report, had turned again to the stop position before the engineman passed it.
5	B.	P. & P.	0	52	3,500	67	Collision of northbound extra electric car with southbound regular. Conductor of extra, while his car was on sidetrack, tried (by hand motion only) to instruct conductor on regular car passing him, bound in same direction, to hold southbound at next meeting point; but his message was not understood. Communicating orally in this way was contrary to rules.
6	B.	F. & F.	4	4	4,500	63	Despatcher gave conflicting meeting order to extra train running south and work train running north. Despatcher of 2 years' experience, but in service at this place only two months.
7	B.	F. & F.	1	2	4,520	78	Mistake in copying despatcher's order. (See note in text.)
8	B.	P. & F.	2	43	4,740	45	Extra engine, eastbound encroached on time of regular passenger train, No. 51, westbound. Engineman of extra thought the day was Sunday, on which day No. 51 does not run. Conductor was equally negligent, but offered no excuse. Brakeman had neglected to examine time table. One passenger killed.
9	R.	P. & P.	2	11	6,000	66	Passenger train (4 a.m.) delayed seriously, but flagman did not go back to protect from train following; neither did he use fusees; time interval at last preceding station, 5 minutes.
10	B.	F. & F.	1	3	6,355	72	Despatcher, in issuing an order to supersede a previous order, sent it to only one of the two trains that had had the first order.
11	B.	F. & F.	0	4	7,094	37	Conductor and engineman of northbound train forgot meeting order.
12	B.	P. & F.	3	17	8,600	7	Conductor and engineman of westbound extra train neglected to identify themselves and give proper explanation to eastbound. (See note in text.)
13	M.	P. & F.	0	0	10,000	70	Freight on siding on 3 per cent. grade accidentally started and ran against passing passenger train. Engineman moved throttle (same not being latched) when he pulled whistle.
14	B.	P. & P.	16	167	12,300	4	Westbound extra encroached on time of eastbound regular train. (See note in text.)
15	R.	P. & P.	0	43	12,775	35	Failure of block signalman to put signal in stop position after passage of passenger train, combined with inefficient flagging. (See note in text.)
16	B.	P. & P.	9	40	14,101	36	Disregard of meeting order. (See note in text.)
17	R.	F. & F.	0	0	14,200	87	Misunderstanding of orders.
18	B.	F. & F.	0	4	14,485	76	Operator failed to deliver meeting order. (See note in text.)
19	B.	P. & F.	2	7	15,000	6	Agent failed to deliver order; fireman misunderstood order as to movement of train, given by word of mouth. (See note in text.)
20	B.	P. & P.	3	6	19,000	3	Southbound ran over misplaced switch and collided with northbound standing on side track. The northbound usually held the main line at this point, and the brakeman (experienced and of good character), who went forward to the switch, set it for the side track; cannot explain.
21	B.	P. & P.	0	59	19,101	64	Westbound, 3 hrs. late, encroached on time of eastbound superior train. Conductor and engineman of westbound overlooked the fact that eastbound was superior; they also had neglected to stop at B to make entry on register. Eastbound train would have left main line at B.
22	M.	F. & F.	0	0	22,000	32	Train broke in two and rear portion, left on grade without hand brakes being set, ran back and collided with another train.
23	M.	F. & F.	4	1	29,065	43	Runaway on steep grade; 15 cars had been taken on at a way-station and the angle-cock of the air-brake pipe had not been opened at the rear of the 15 cars. Men in charge of train failed to test brakes as required by rule.
24	B.	P. & F.	8	23	29,521	75	Conductor, engineman and fireman of passenger train forgot meeting order. Engineman was killed. Conductor and fireman can give no explanation. order had been in their hands 17 minutes.
Total			62	500	$265,655		

(*To be continued.*)

The shipments of grain westward from stations on the Siberian Railway amounted last year to 74,700,000 bushels, chiefly wheat. There were besides considerable shipments eastward.

THE SEASONING AND PRESERVATIVE TREATMENT OF WOODEN TIES.*

BY F. J. ANGIER.

In 1908 the steam roads purchased, according to a Forest Service statement, 10,565,925 treated ties, and in addition they treated at their own plants 12,590,643, making a total of 23,156,568 for the year, or 21.8 per cent. of the total number purchased.

To-day there are upwards of seventy timber treating plants in this country. Many of them are either owned or their output contracted for by the railways, and are engaged almost entirely in treating ties.

KINDS AND QUANTITY OF WOOD USED.

It is estimated that the requirements for renewals alone amount to more than one hundred million ties annually, nearly one-half of which are of oak, about one-quarter of pine, and the balance of fir, cedar, chestnut, cypress, tamarack, etc.

Up to within a few years ago, nearly all ties were made of white oak and longleaf pine. They were obtained in large quantities, at a low cost, and combined strength with great durability. These woods are each year becoming more scarce, are rapidly advancing in cost, and as a result, the railways are turning to the so-called inferior woods, such as the red and black oaks, lodgepole, shortleaf and other pines, and the maples, gum, hemlock, beech, etc., for their supplies. The latter are not nearly so durable as the former, especially when brought in contact with the ground, and therefore require some kind of treatment to prevent decay.

It has been proved beyond all doubt, that these inferior woods can be chemically treated so that their life will be prolonged several years, making them last as long, or even longer, than the best white oak untreated.

SEASONING.

For the best results, ties, as well as other timber, should be seasoned before applying a preservative. This can be done naturally or artificially, and no doubt the former way is much to be preferred; in fact with some methods of treatment it is absolutely necessary.

Woods vary considerably in their seasoning properties. The coniferous woods check and split slightly as compared to some of the broad-leaved woods. For this reason they may be piled in more open piles and seasoned more rapidly. Such woods as ash, elm, hickory and beech seem to have a great tendency to check in rapid seasoning, and these ties should be piled closer together, and the seasoning retarded to some extent. A good plan is to place "S" irons in the ends of these ties as fast as they give evidence of splitting.

The time of the year in which ties are cut is said to have considerable influence in proper seasoning. Ties cut during the fall and winter are preferred to those cut during the summer, and some roads specify that ties will be accepted only when cut between October and the following April.

Ties should be piled at the treating plant in such a manner as to expose the greatest surface to the free circulation of the air, as the object is to dry the wood so that it may be in proper condition to take the treatment. Ties piled in open cribs season much more rapidly than when piled in solid cribs. This may be well illustrated by the following test made with green lodgepole pine ties:

	Solid Pile (9 x 9)			Open Crib Pile (7 x 2)		
	Weight. Per tie.	Loss.		Weight. Per tie.	Loss.	
Date of weighing.	Lbs.	Lbs.	Per ct. of loss.	Lbs.	Lbs.	Per ct. of loss.
June 9.....	152.75	....	....	155.39	....	....
June 30.....	130.93	21.82	14.28	108.06	47.33	30.45
July 15.....	114.77	37.98	24.86	99.30	56.09	36.09
Aug. 13.....	104.24	48.51	31.75	95.71	59.68	38.46
Sept. 10.....	101.33	51.42	33.66	93.44	61.95	39.86

A study of these results shows that in three weeks the loss in the open crib pile was more than twice as much as in the solid pile, or nearly as much as the solid pile lost in two months. At the end of three months there was a difference of more than 6 per cent. in favor of the open pile.

*From a paper read before the New York Railroad Club, Feb. 18.

PRESERVATIVE TREATMENT.

There are a number of different processes, or methods, of treating timber. Nearly all of them employ heavy oil of coal tar (commonly called "creosote"), or chloride of zinc, either separately or in combination. Among the more prominent processes used in this country, may be mentioned the following:

Burnett ..... Using Zinc Chloride
Bethell ..... Using Creosote
Rueping ..... Using Creosote
Lowry ..... Using Creosote
Allardyce ..... Using Zinc Chloride and Creosote
Card ..... Using Zinc Chloride and Creosote
Non-Pressure or Open Tank

The "Burnett," or as it is commonly called, the "Burnetizing" or straight zinc chloride process was introduced in 1838 by Sir William Burnett. Either seasoned or unseasoned timber may be treated, but with this, as well as nearly every other process, is it much better to have the timber thoroughly air seasoned. After the wood is prepared for treatment by air seasoning or steaming, a vacuum is usually created, then a water solution carrying from 2 per cent. to 6 per cent. of zinc chloride is introduced, filling the retort. A pressure pump is then used to pump in more solution until 100 to 150 pounds is registered on the gauge, and this pressure is maintained until the required absorption is obtained, after which the solution is withdrawn and the timber taken out.

It is generally the practice to use a solution of such strength that after the wood has absorbed all that can be forced into it within a reasonable time, it will retain about one-half pound of pure zinc chloride to the cubic foot of timber.

It is best to use ties treated with this process in comparatively dry climates, on account of the solubility of the zinc chloride, and the subsequent leaching of the zinc salts.

The "Bethell," or straight creosote process, was invented in 1838 by John Bethell. This consists of first creating a vacuum in the treating cylinder, or retort, followed by the introduction of creosote, and then applying a pressure to force the creosote into the wood.

The "Rueping" process was patented in September, 1902. Only thoroughly air-seasoned timber can be treated. The wood is first subjected to an air pressure of about five atmospheres, so that all the cells and cavities are filled with compressed air after which, while maintaining the air pressure, the impregnating liquid, under a still higher pressure is introduced into the receptacle in which the material treated is placed. The air in the receptacle is allowed to escape. The material, now being entirely covered with the liquid, pressure can be raised with a pump, thereby forcing it into the wood. After a certainty quantity is absorbed, the pressure is released, and the liquid discharged. The air, first forced into the wood cells, expands, thereby expelling the surplus oil, and this may be aided by a final vacuum. It is claimed that about 50 per cent. of the oil can be regained by this method, and enough is left in the wood to insure it against decay during the mechanical life of the tie.

The "Lowry" process was patented September, 1906. It consists of placing the ties in a retort or cylinder and closing the doors air tight. The retort is then filled with creosote and pressure applied by forcing more oil in with a suitable pump. This pressure is continued until the wood takes up a certain amount of oil, after which the free oil is quickly withdrawn. The next step is to produce a quick and high vacuum, the object being to regain a portion of the oil which was first injected into the wood, thus leaving the cell walls painted with the preservative but the cells themselves practically empty.

It is claimed that a red oak tie requires about 4½ gallons of oil, and a pine tie about seven gallons to completely saturate it, and after a quick and high vacuum, representing about 25 to 27 inches of mercury, is maintained for from one and

one-half to two hours the quantity of oil left will be about two and one-half gallons in either case, all of which is thoroughly absorbed and taken up by the fibres. This means that in the case of oak ties, about 44 per cent. is regained, and in the case of pine ties about 64 per cent. is regained by means of the final vacuum. Some tests were made to show how much oil could be regained in actual practice, and the results will be shown in another part of this paper.

With the "Allardyce" process, both zinc chloride and creosote are used. Ties are first impregnated with zinc chloride, as in the Burnetizing process, after which creosote is introduced, and a pressure applied, until two or three pounds per cubic foot are injected. The object of the after treatment of creosote is to prevent the leaching of the zinc salts.

The "Card" process was patented in March, 1906. This, as well as the Allardyce, employs both zinc chloride and creosote, but both in one solution. The creosote is mixed with the zinc chloride, in varying proportions, and is kept thoroughly mixed, under pressure, by a centrifugal pump. It not only has the advantage of a one movement process, but the oil is probably carried farther into the wood and more evenly distributed, the light soluble oils going into the heartwood with the water solution of zinc. Either seasoned or unseasoned wood may be treated.

The non-pressure process is coming more and more into use, and, as stated by W. F. Sherfesee, of the U. S. Forest Service, it provides a cheap and efficient method of treating certain of the more porous classes of timber in isolated locations, and is well suited to the small users to whom the expense of the commercial pressure plants is prohibitive.

When ties are thoroughly air seasoned, steaming is generally unnecessary, and in fact may be detrimental. When green, containing considerable sap or pitch, or when completely water soaked from lying in the water a long time, it is often necessary to resort to artificial seasoning to get a good absorption of the preservative. This is usually obtained by subjecting the timber to a steaming process, at temperatures varying from 10 to 20 pounds of steam pressure for ties or smaller timber, to 30 or more pounds for piling and large dimension material. The duration of steaming may extend over a period of from two to five or more hours, depending entirely upon the condition of the wood.

The claim made for the steaming operation is that certain elements contained in the wood are more or less liquified and are expelled by the heat generated in the cells, thereby increasing the permeability of the cell walls.

PHYSICAL EFFECTS OF TREATMENT.

Prof. Hatt, civil engineer, forest service, has made extensive tests on the effects of treatment of timber, and the following are his conclusions:

1. "A high degree of steaming is injurious to wood. The degree of steaming at which pronounced harm results will depend upon the quality of the wood and its degree of seasoning, and upon the pressure (temperature) of steam and the duration of its application. For loblolly pine the limit of safety is certainly 30 pounds for four hours, or 20 pounds for six hours.

2. "The presence of zinc chloride will not weaken wood under static loading, although the indications are that the wood becomes brittle under impact.

3. "The presence of creosote will not weaken wood of itself. Since apparently it is present only in the openings of the cells, and does not get into the cell walls, its actions can only be to retard the seasoning of the wood."

HEWED VS. SAWED TIES.

The Forest Service Department says:

"In 1908 the steam and eectric railways of the United States purchased 112,463,499 cross ties. Of this number 81.8 per cent. were hewed and 18.2 per cent. were sawed. Over 42 per cent. of the total number of ties purchased were oak, and nearly 88 per cent. of these were hewed.

"About 95 per cent. of the hewed ties and 91 per cent. of the sawed ties were purchased by the steam railways. The steam railways prefer the hewed ties, owing largely to their lower cost and greater durability, and to the better surface they afford for the frequent or periodic tamping necessitated by heavy traffic. The average cost of the sawed ties was two cents greater than of hewed ties."

In 1905 the International Railway Congress addressed the managements of all American railways asking them to state the average length of life of sawed ties as compared with hewed ties of the same kind, and if there was any difference, to what they attributed it. The replies received showed that opinions were divided. Some said they knew of no difference, while others said that hewed ties lasted somewhat longer than sawed ties. The majority, however, reported in favor of the hewed ties, stating, that as a rule, they last about two to three years longer than sawed ties. One of the reasons given was that when ties are sawed, the fibres are cut across leaving a rough surface which absorbs water with more readiness than the clean cut surface formed when a tie is hewed.

The objection to the sawed tie is no doubt true to a greater or less extent when it is used untreated, and perhaps also when treated with a water soluble preservative, but when treated with creosote, which is insoluble in water, it would seem that this argument would not hold good, and that therefore, from a preservative standpoint the sawed tie should give as good results as the hewed tie.

LIFE OF TREATED AND UNTREATED TIES.

One of the most frequent questions asked is "How long will a treated tie last?" Many points must be considered in attempting to answer such a question, as for instance, the kind of wood treated, process used, amount of preservatives injected, locality where tie is used, condition of roadbed, etc.

For comparison we should first want to know how long an untreated tie will last. Along the Burlington road in the states of Wyoming and South Dakota an untreated pine or fir tree will give a general average life of six or seven years; while in the states of Iowa, Illinois, Missouri and Eastern Nebraska, the average life may not be more than five years. A good white oak tie will last possibly nine or ten years.

Leaving white oak entirely out of the question, and considering only the inferior oaks and other short lived woods requiring treatment, it will no doubt be safe to say that the average life of untreated ties in the states named is six years, and that a good treatment costing between 15 and 20 cents per tie will easily double the life.

In certain sections of the South an untreated loblolly pine tie will not last a year. Prof. Alleman says he has seen Burnettized ties placed in Texas and after three years of service, removed on account of decay. Records kept on 5,000,000 ties on the Atchison, Topeka & San Fe Railway prove that longleaf, shortleaf and loblolly pine ties when properly treated with zinc chloride had a life of about ten and one-half years.

Out of a total of 1,929,855 ties treated with zinc chloride by the Chicago Tie Preserving Co. for the C. & E. I. Ry., 21,882 were removed for all causes, and only 12,678 removed account of decay after nine years, or less than one per cent. These ties were all mixed oaks, no white oak included.

The Burlington road treated 5,620,340 ties with the Burnettizing process during the nine years including 1900 to 1908. A careful record kept of these ties shows 38,431 removed for all causes, and 32,100 removed account of decay. This is less than one per cent. removals after nine years. These ties consisted almost entirely of lodgepole and Bull pine, and Douglas fir, and were used only in the dry climate of Wyoming, South Dakota and Western Nebraska.

LEACHING OF ZINC SALTS AND EFFECT OF IMPROPER DRAINAGE.

A series of leaching tests were made to test the rate with which zinc chloride leaches from timber treated with the Burnettizing process. Lodgepole pine and Douglas fir ties were used. Some of the ties were seasoned six months after

treatment and before the test for leaching was begun, and others were freshly treated and were full of the water solution.

To carry out this test a number of pans were constructed large enough so when filled with water an entire tie could be submerged. The object of the test was to determine whether zinc chloride would leach out from ties as rapidly as we were inclined to think would be the case, and also the relative leaching of seasoned over freshly treated ties.

The ties were first carefully treated, weighing before and after treatment, to find, as nearly as possible, the number of grains of pure zinc chloride absorbed by each tie.

To determine the amount of zinc chloride leached out, each tie was placed in the pan filled with water and left 24 hours, after which it was taken out and allowed to dry six days. This process was repeated continuously for many months After each soaking a measured quantity of the water was taken out from the pan and the amount of zinc chloride determined.

A study of these results shows that in carrying out a leaching test in this way, less than 30 per cent. of the zinc chloride can be gotten out of the wood in nearly a year's time, and that the largest part is leached out in the first 70 days, or approximately 18 per cent. It also shows that with the freshly treated ties, the leaching was much more rapid, almost the entire loss being within 70 days.

Dr. Von Schrenk, in Bulletin 41, Bureau of Forestry, has shown very clearly the manner in which salts soluble in water leach out, and the tests given above serve to emphasize the recommendations he has made that all zinc treated ties should be thoroughly dried before being laid in the track.

If more care were given to the proper drainage of the roadbed, no doubt the ties would give a greatly increased life, and the money spent for labor in doing this might return good interest on the investment. While this especially applies to ties treated with a water soluble salt it is no doubt true to a greater or less extent with ties treated with any preservative.

COMPARATIVE COST OF TREATING SEASONED VS. UNSEASONED TIES.

With some processes, air seasoned ties only can be treated, while with others either seasoned or unseasoned ties may be treated, the latter being artificially seasoned in the retorts by steaming. The question is often asked as to whether it is more economical to first season the ties in the yard, or to artificially season them in the retorts, and thereby treat them immediately as delivered to the plant.

This is a somewhat difficult question to answer, as there are so many factors to be taken into consideration, and what would apply to one locality may not necessarily apply to another. First, we would have to decide what is a seasoned tie. In the South a pine tie may be seasoned thoroughly in two months. In the northern states it may require three to six months, and even longer. For an illustration, let us take a plant situated in one of the northern states, say Illinois, for I am better acquainted with that climate. We will assume that we have a plant with a capacity of treating 1,800,000 seasoned ties annually, and that it will require an average of six months to air season the ties for treatment, necessitating the storing of 900,000 ties continually. Of course, ties will season more rapidly in warm weather than in cold weather, and some kinds of wood more rapidly than others, but the average may not be far from six months. We must further assume that we are using a process which can be adapted to either seasoned or unseasoned timber. We will also say that thoroughly seasoned ties can be treated in six hours, and that unseasoned ties will require nine hours, or in other words it will require one-half longer time to treat unseasoned timber. Of course, this will vary one way or the other, but this is no doubt a fair average.

Seasoned Ties.—*Capacity of Plant*, 1,800,000 *Per Year.*

Unloading from cars to ground to season at 0.0070 each	$12,600
Loading from ground to trams after seasoning at 0.0055 each.	9,900
Switching trams from yard to retorts at 0.0020 per tie	3,600
Loading treated ties out at 0.0065 each	11,700
Fixed expenses	28,800
Preservatives at 0.150 per tie	$270,000
Fuel (assume ⅓ less for seasoned over unseasoned ties)	6,000
Insurance on 900,000 ties (estimated)	3,000
Interest on 900,000 ties, or, say, 5 per cent. on $450,000	22,500
	$368,100
600,000 more seasoned ties treated than unseasoned worth 0.0451 each. (See part 12)	27,060
	$341,040

$0.1895 per tie.

Unseasoned Ties. *Capacity of Plant*, 1,200,000 *Per Year.*

Unloading one-sixth from cars to ground to enable prompt releasing of cars, and to insure a continuous supply so as not to delay plant at 0.0070 each	$1,400
Loading 1,000,000 ties from cars to trams for treatment, and 200,000 ties from ground to trams at 0.0055 each	6,600
Switching 200,000 ties from yard to retorts at 0.0020	400
Loading treated ties out at 0.0065	7,800
Fixed expenses	28,800
Preservatives at 0.150 per tie	180,000
Fuel (estimated)	9,000
Insurance on 200,000 ties (estimated)	665
Interest on 200,000 ties, or, say, 5 per cent. on $100,000	5,000
	$239,665

$0.1997 per tie.

From the above statement results show that to treat thoroughly season ties, the cost is 0.1895 per tie; whereas, the unseasoned cost 0.1997 per tie, or a difference of 0.0102 in favor of seasoning. This multiplied by 1,800,000, the capacity of the plant, represents a saving of $18,360 per year.

In addition to this saving, there would no doubt be other advantages, such as a better penetration by the preservatives and thereby getting a greater life out of the ties, and reducing the liability of weakening the timber from excessive steaming. Another important factor is that in steaming there is always a large amount of sewage to dispose of, while in non-steaming there is practically none. The disposition of sewage is always a difficult problem at any plant, because no matter how you handle it, it will eventually get into the rivers or creeks and pollute the water supply to such an extent that damage suits may result sooner or later.

RECORD OF TIES.

A record should be kept of treated ties to show what life is obtained under different conditions as compared with untreated ties. This is usually done by driving a dating nail, with the year stamped in the head, into each tie when it is placed in the track. A better way, perhaps, is to drive these nails in the ties immediately after they are treated at the treating plant. This will, at least, insure that every tie has a dating nail, whereas, if it is left to several hundred section men many ties will be put in the track without dating nails.

Section foremen should be instructed to make a monthly statement giving the number of treated ties laid and removed, with dates treated, and should give cause of removal, whether from decay, rail cut, broken, burned, etc. At the office where the permanent records are kept (preferably at the timber treating plant) these monthly statements should be recorded, keeping a separate record for each section. An annual report can then be made to the management showing results of the treatment.

No reliable information can be expected from the section men as to the different kinds of timber, because probably not one in fifty can tell one kind of wood from another, especially after it is treated. In order that accurate knowledge may be obtained as to the relative life of the different kinds of wood, special tests should be made. On the Burlington Road this was done by treating twenty kinds of wood with several different processes; one thousand ties were carefully treated and placed on each of the eighteen divisions of the system. Each kind of wood and each process was marked with a special nail so that the tie could be identified at any future time. Each lot of 1,000 ties were placed in one continuous stretch of track, and the different kinds of wood grouped together, alternating with the different processes and every seventh tie was untreated.

While the number of ties used in this test is comparatively small, it is hoped the results obtained will give a fairly good idea of the relative value of the different kinds of wood used for cross-ties.

COST OF TREATMENT AND RETURNS ON INVESTMENT.

A plant consisting of three treating cylinders, each six feet in diameter and 132 feet long, will have a capacity of about a million and one-half ties annually. Estimated cost of plant, $175,000. The life of such a plant is estimated to be at least fifteen years.

To arrive at the cost of treating ties, the following items are considered:

First—Interest. $175,000 invested at 5 per cent. compound interest for fifteen years represents an annual charge of $12,587.

Second—Depreciation. Estimating the life of the plant at fifteen years, we will charge off 6 2-3 per cent. or $11,666 annually.

Third—Insurance. The stock of ties, as well as the building should be insured and a reasonable estimate may place the annual premium at $5,000.

Fourth—Freight on Ties to Plant. It would not be right to charge all freight on ties to the treatment, but it may be reasonable to assume that every car of ties for treatment is hauled on an average of 100 miles, and we can base the freight haul on a rate of ½ cent per ton per mile. Also estimate that cars will hold an average of 390 ties each, and that the ties will average 135 pounds in weight. Thus, a million and a half ties will require 3,846 cars to haul them to the plant, and these ties weigh 101,250 tons. This represents an annual expenditure of $50,625.

Fifth—Switching. To switch 3,846 cars of ties, plus approximately 500 more containing preservatives, fuel, etc., or say a total of 4,346, in and out of plant at 50 cents per car, will cost $2,173.

Sixth—Per diem on Cars. It is not always possible to unload ties the same day received; in fact, it often happens that they are delayed a week or more from one cause or another, in which case we are called upon to pay a per diem charge of 25 cents or 50 cents. For our present purpose it may be reasonable to estimate $1 per car or an annual cost of $3,846.

Seventh—Operating Plant. This will include all labor and material other than itemized above, estimated $300,000.

Summary of Above.

	Total cost per year.	Cost per tie.
First—Interest	$12.587	$0.0084
Second—Depreciation	11,666	.0078
Third—Insurance	5.000	.0033
Fourth—Freight on ties	50,625	.0337
Fifth—Switching	2,173	.0014
Sixth—Per diem on cars	3,846	.0026
Seventh—Operating plant	300,000	.2000
	$385,897	$0.2572

We do not know just what life these ties will give, but it may be fair to assume twelve years for treated ties, and six years for untreated ties, or in other words, treating will double their life. For our purpose of comparison we will not consider tie plates in either case.

Untreated Ties.
(Life assumed as 6 years.)

First cost of tie (estimated)	$0.500	
Insurance, interest, freight, etc. (as per statement "A")	.0435	
Cost of puttin in track	.150	
Cost of tie in track		$0.693
5 per cent. compound interest on investment for six years	$0.2320	
Second renewal end of six years	0.6935	
5 per cent. compound interest on first investment for six years and 5 per cent. on second investment for six years	0.5503	
		$1.4758
Total cost of tie for period of 12 years		$2.1693
Average cost per tie per year		0.1808

Treated Ties.
(Life assumed as 12 years.)

First cost of tie (estimated)	$0.7572	
Cost of putting in track	0.15	
Cost of tie in track		$0.9072
5 per cent on $0.9072 for 12 years		.7220
Total cost of tie for 12 years		$1.6292
Average cost per tie per year		.1357
Saving per tie per year		$0.0451

Taking capacity of plant at 1,500,000 ties, this would show an annual saving of $67,650, which is nearly 39 per cent. on the original investment of $175,000.

Untreated Ties.
(Statement "A.")

Insurance (assumed to be the same as with treated ties)	$5,000.00	$0.0033
Freight (assumed to be one-half as much as with treated ties)	25,312.50	0.0169
Switching 3,846 cars of ties in and out of storage yards at 50 cents per car	1,923.00	0.0012
Per diem on cars (assumed to be the same as with treated ties)	3,846.00	0.0026
Handling ties in storage yard (unloading 1,500,000 ties from cars to ground at $0.007 each, and loading from ground to cars at same rate)	21,000.00	0.0070
Interest on 750,000 ties, or 5 per cent. on $375,000 (assuming that one-half the ties are in the storage yard constantly)	18,750.00	0.0125
	$75,831.50	$0.0435

RAILWAYS IN CENTRAL AND SOUTH AMERICA.

The railways of North America, from the Grand Trunk Pacific, in Canada, to the southernmost branch of the National Railways of Mexico, are properly spoken of as a system. On the other hand, the railways of South America, disregarding Central America, cannot properly be grouped together. This is almost equally true of the railways of Central America. The reasons for this are in the first place geographical. Mountain ranges and rivers in South America and mountain ranges in Central America so cut up the country that it would be entirely impracticable to build a network of lines binding together the whole country.

Another reason for the lack of through routes is the fact that in Central America the country is divided in large and small politically independent and not always friendly nations. One country has a 3-ft. gage as a standard; another has a meter gage, and possibly the next country will have no recognized standard gage. This, of course, makes any interchange of cars, even where physical connection exists, impossible.

While there has been no recognizable trend to the general development of South American roads as a whole, it is possible to trace the direction of development in railway building in the separate countries. Usually this development is an attempt to give the inland territory an outlet by rail to the nearest good seaboard. In some cases inland centers are connected by rail, but this connection generally forms part of some route to the seaboard. The reason for this is obvious enough. The production of raw materials, either for home consumption, with as little manufacturing as possible, or for export as raw materials, forms by far the greater part of the industry of Central and South America. Home consumption of home manufactured articles is almost unknown.

The bulletin published by the *International Bureau of American Republics*, in its annual review number, gives the latest obtainable statistics for commerce and railways in the Central and South American republics. Most of the figures given are for the calendar year 1908. This shows roughly 35,000 miles of railway in operation in Central and South America, exclusive of Mexico and the Island republic.

Starting with the northernmost republic, Guatemala, we find that this country has about 480 miles of line in operation, of which 195 miles were built in 1908. At present there is no connection by railway between Mexico and Guatemala City, but a railway is projected from Caballo Blanco, on the Occidental Railway, to Coatepeque, at which point an extension is to be made to Ayutla, connecting with Mexican roads.

Going no further south than Guatemala, the impossibility of a Pan-American railway as a through route is plain. For instance, all the railways of Guatemala are 3-ft. gage. Guatemala City is connected with both the Pacific and the Atlantic ocean, being 75 miles by railway from San Jose, on the Pacific, and 189 miles from Puerto Barrios, on the Atlantic. No freight, however, destined from the eastern coast of the United States to the western coast is routed through Guatemala. The principal product of Guatemala is coffee, and about 70,000,000 lbs. are produced annually. The Ocos Railway, which is 24 miles long and connects the coffee producing districts of

Tumpador and San Marcos with the port of Ocos, handles over 15,000,000 lbs. of coffee annually.

Honduras, lying just to the southeast, has only a few miles of road in operation. A railway from Puerto Cortez to La Pimienta, 57 miles, is in operation and has been leased to a private company. Quite a number of small railway concessions have been approved by the government, and early in 1908 the Vaccaro Company, of New Orleans, completed and opened the first 32 miles of line of a road which they are building from the Atlantic coast into the banana lands near Ceiba. The principal industry of Honduras is the raising and export of cattle, but since the sanitary regulations prohibit the importation into the United States of cattle from Central America, most of the beef shipped is to South American countries lying further south.

El Salvador, extending along the Pacific coast south and west of Honduras, is a thickly populated country producing coffee, cocoa and some rubber. There is in operation at present about 100 miles of railway, and work has been contracted for for building a line from Santa Ana, in the northeastern corner of the country, to the Guatemalan frontier.

The principal road of Nicaragua is the National Railway of Nicaragua, about 171 miles long in all, with a main line extending from Corinto to Granada. There is under construction a line from Monkey Point, on the Atlantic, to San Miguelito, 116 miles. Coffee is the principal product exported, 19,400,000 lbs. being shipped in 1906.

Costa Rica, which has only an area of 18,400 square miles, has about 400 miles of railway. With the completion of the Pacific Railway, of which the last 12 miles are now under construction, the country will have an inter-oceanic line 170 miles long. The Atlantic section of this line runs from Port Limon to San Jose, the capital, 103 miles. The Pacific section runs from San Jose to Puntarenas, on the Pacific, 67 miles. The Atlantic section is owned by an English corporation and is leased to the Costa Rica Northern, an American corporation, controlled by the United Fruit Co. The Pacific section is owned by the Costa Rica government. Both sections are well built for that section of the country and have a 3-ft. 6-in. gage. The Costa Rica Northern has been carrying out improvements and extending branch lines into the banana districts. The importation, free of all duties, of materials and supplies, including rolling stock, for an electric trolley line between Cartago and San Jose has been authorized.

East of Costa Rica lies Panama, governed, with the exception of the Canal Zone, by the republic of Panama. The only railway of any importance is that running from Colon, on the Atlantic, to Panama, on the Pacific, 47 miles. The road now handles a very large business for the workers on the canal, and also handles considerable freight shipped from New York to San Francisco and other Pacific coast ports in the United States. Of the $8,500,000 merchandise carried by this road from the Atlantic ocean to the pacific, $2,750,000 worth was destined for western ports of the United States and $5,750,000 for ports on the Pacific coast of South America or of Mexico. The merchandise shipped eastward (north) was valued at only about $1,000,000 and was shipped entirely from San Francisco to New York.

The northern section of South America is occupied by Venezuela on the east and Colombia on the west. Colombia is rich in both mineral and agricultural products. High mountains and plateaus give it a varied climate, the low lands being well adapted for raising tropical fruits, especially bananas, and the higher and cooler lands producing quite a variety of agricultural products. The country is much in need of railways to carry its products to the coast. In 1907 a rough estimate gives the mileage in operation as 450. Concessions have been granted for 1,570 miles additional. In February, 1909, the Girardot Railway was completed to Factativa. This gives Bogota, the capital, a rail connection with Girardot on the Magdalena river. The Pacific Railway, which is to connect the port of Buenaventura, on the Pacific coast, with Cali, is now under construction, and has been open for traffic as far as Papagayeros.

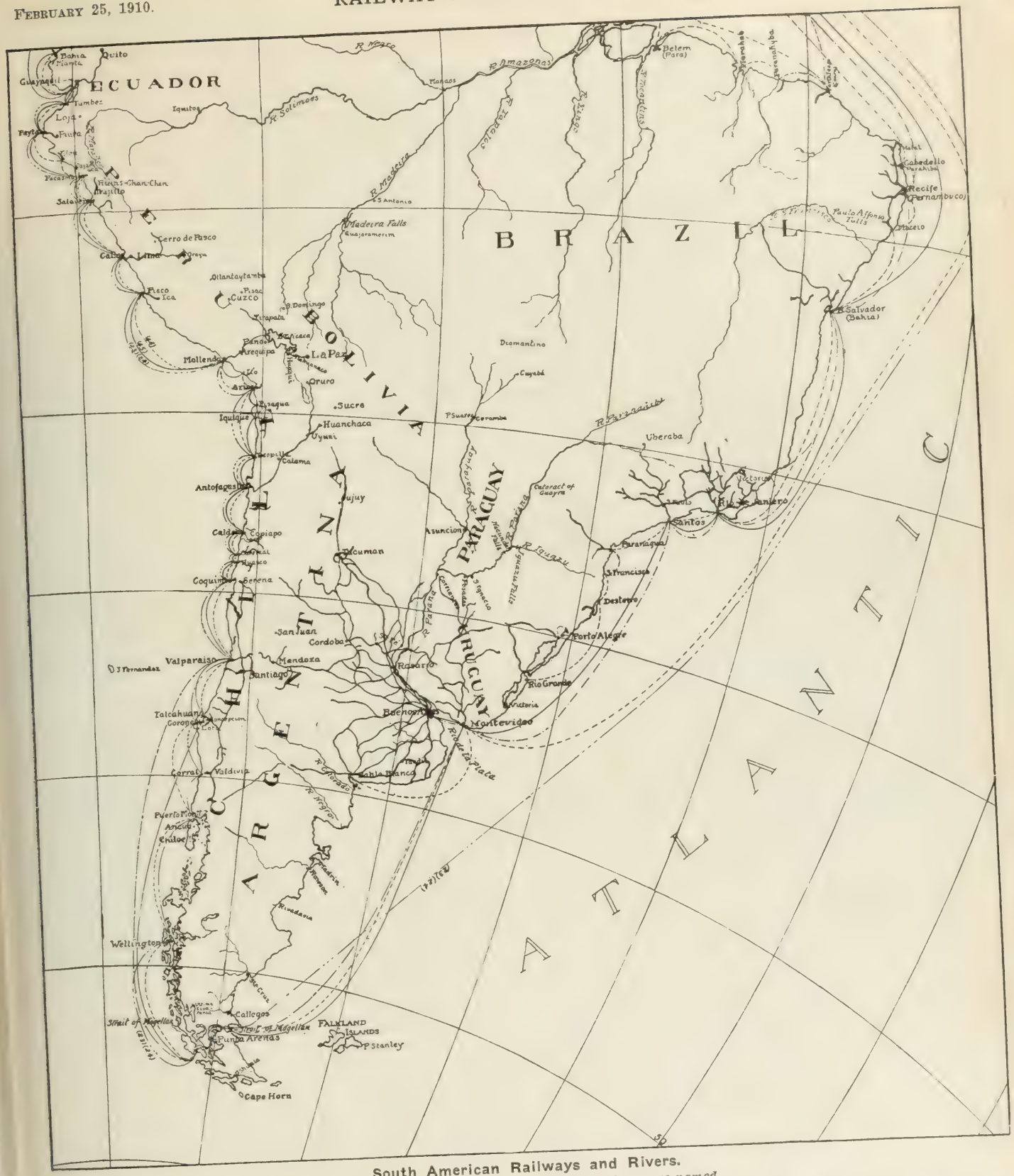
The development of quartz mining depends almost entirely on the opening up of new lines of railway. The mountains are thought to be rich in gold, and as soon as modern means of transportation are established, it is expected that the mining industry of the country will become of great importance. Deposits of coal have recently been discovered between the Atrato and Leon rivers. It is thought that large coal deposits exist, but the few mines that are being worked at all are only developed in a superficial way.

Venezuela's trade consists almost entirely of the production and export of raw materials. The total mileage of railways in operation is about 540 miles. There are a number of new lines under construction. The Central Railway of Venezuela is building a line which it is expected will eventually reach Santa Lucia. Although construction is now going on, there are some questions that have arisen between the government and the companies which have not as yet been settled.

Ecuador is accessible only from the Pacific ocean, communication by land with Brazil on the southeast and with Colombia on the north being nearly impossible because of dense forests and the high altitudes of mountain ranges. The most important port on the Pacific ocean is Guayaquil, which



Central American Railways and Rivers.



South American Railways and Rivers.

Lines without lettering show railways; rivers are named.

is connected by a railway with the capital of Ecuador, Quito. This line from Guayaquil to Quito was opened for operation in June, 1908, and in August of that year preliminary work was started on a line from Huigra to Cuenca. This new line will open up a rich mining and agricultural country lying in the southern section of the republic. A line is projected from Bahia de Caraquez to Quito, paralleling the line now in operation for part of its distance, but having a terminal 100 miles nearer to Panama than the Guayaquil-Quito line. There is also a branch of this Guayaquil-Quito line projected extending into a fertile district producing cacao, rubber and bananas. Cacao is the most important commercial commodity exported, and in 1908 64,000,000 lbs., valued at $6,400,000, was shipped abroad, a little more than one-fifth of this amount going to the United States. The coal mining industry has developed rapidly in recent years owing to the opening of new railway lines. In 1908 there were about 316 miles in operation, of which 297 miles is main line of the Gu

Quito. Regular passenger and freight trains run between these two cities, the passenger trains running only during the day and making the trip in two days.

Peru, on the south, on the Pacific ocean, is divided into three distinct zones. One, called the zona seca, or dry zone, extends along the coast to the foot of the Andes, and in it nothing can be raised without irrigation. In this zone are located the larger commercial centers. Coffee, cacao, sugar cane and Peruvian cotton are the principal agricultural exports, and the mines of the country, which are very rich, produce gold, silver, copper, iron, coal and petroleum. In 1907 the total mineral output of the country was valued at $17,495,285. In 1904 vanadium was discovered, and from June, 1906, to January, 1909, there were produced and shipped to the United States 1,800 tons of oxidized ores, containing 20 per cent. vanadic oxide. Of the total 1,471 miles of railway in operation, 844 miles is managed by the Peruvian Corporation. The Central Railway is the most important line and runs from Callao to Oroya, 140 miles, with branches to the Cerro de Pasco district. A line is ultimately to be built connecting Huancayo with Aya cucho. Second in importance to the Central Railway is the Southern Railway, running from Mollendo to Puno on Lake Titicaca, 300 miles. At the lake it connects with a line of steamers running to the Bolivian lake port of Guaqui. The connecting up of the Central Railway and the Southern Railway will require about 300 miles of new line running from Cuzco to Huancayo. A line is projected from Lima to Huacho, 157 miles, and it is estimated that it will cost, including rolling stock, $3,610,925. There are a number of short spurs from minor ports runing up the river valleys for short distances and used for the transport of agricultural products. Rolling stock on the Peruvian roads is supplied almost entirely from the United States. The Peruvian Corporation, which buys the greater part of this rolling stock, through an arrangement with the government, is extending several of the existing lines, and a contract has been let for building a line from Ilo to Moquega. There is also under consideration the question of building a railway in the eastern part of Peru, to connect with some point on the navigable section of the Maranon.

Brazil, on the Atlantic ocean, probably has the longest navigable waterways of any country in the world. There are over 10,000 miles of waterways open to navigation by river steamers and ocean-going vessels, and 20,000 miles additional open to navigation for light draft vessels and flat bottom boats. Agriculture is the principal industry of the country and coffee the principal crop. At the close of 1908 there were 11,940 miles of railway in operation, of which 633 miles were opened in 1908. Of this mileage open for traffic in 1908 the federal government owned 487 miles and the State governments 146 miles. The Madeira-Mamore, which will connect the Mamore river with the Madeira river, will make possible a direct commercial route from Bolivia to the Atlantic ocean. Besides the extension of existing lines, the transfer of freight and passengers in several of the rural districts by automobile is under consideration. Most of the larger cities have electric railways, and there is a new suburban line to be built by Brazilians to connect Petropolis with the capital.

South of Bolivia, on the Pacific ocean, lies Chile. The exports of the country are principally mineral products, which in 1908 were valued at $99,082,573. The greater part of these mineral products exported are nitrates. An effort is being made to open up extensive coal fields in the province of Arauco, and it is said that an excellent grade of coal is found in the interior, and that it can be profitably mined in considerable quantities as soon as a railway is built into this section of the country. On January 1, 1908, there were 1,590 miles of line in operation, 612 miles under construction, and 1,444 miles projected. During the year there yere 648 miles of government railways built, costing about $9,837,000. The Transandine Railway was described in the *Railway Age Gazette* of November 12, 1909, page 919. Owing to the long coast line and to the comparatively narrow extent of the country inland, a great deal of the transportation of goods is done by means of coastwise steamers. There are also a number of navigable rivers having a total of about 972 miles of waterways open to navigation.

On the east, the Argentine Republic extends to the Atlantic ocean, and the Transandine Railway has its Atlantic outlet at Buenos Ayres. The Argentine Republic produces large quantities of wheat, and in 1908 exported more corn than the United States. In 1907 the Mitre law was enacted, consolidating the various concessions made for the import of railway material, and previous to the inauguration of this law the railway companies had imported large quantities of supplies, so that in 1908 the imports of these materials were considerably less than in the year before. The country is well covered with railways, there being 15,476 miles of line in operation, of which nearly 1,000 miles were added in 1908. The total receipts during the year were estimated at $101,391,000, and the expenses were estimated at $61,368,000, leaving a profit of a little over $40,000,000. There were 48,592,600 passengers carried and 31,930,600 tons of freight hauled. Most of the lines are owned by private companies, and the total capitalization of all lines is $788,964,416, or at the rate of about $50,000 per mile.

The three government railways are the Central Norte, the Argentino del Norte and the Andean Railway, with an aggregate mileage of 1,838 miles. Buenos Ayres is the principal port, and from this city there are trunk lines running to Rosario 186 miles, to San Juan 745 miles, to Cordoba 433 miles, and a line running southeasterly into the territories of Neuquen and Tampa, 785 miles. During the 1908 year the Argentine Congress granted concessions for about 325 miles of railway, which it is estimated will involve an expenditure of nearly $25,000,000. The lines in the south are being extended to develop trade with Patagonia.

In Paraguay most of the industry of the country is confined to the production of raw material. The principal crop is maté (Paraguay tea), of which about 17,600,000 lbs. are treated annually, and about half of this amount is exported. Quebracho wood is also produced in considerable quantities and is used for tanning and for railway ties. The only line of railway in operation through the interior is the Paraguay Central, which has 155 miles in open. There is an extension of this road projected to Encarnacion, 70 miles, which when built will connect with the Argentine Northern Railway, which is now being extended to Pasadas. Building will begin on the Paraguay extension as soon as plans have been approved by the government, and material is already on the ground. Another project is for a line to run from Asuncion in a southeasterly direction to the banks of the Alto Parana, in the vicinity of the Yguazu falls. The two most important navigable rivers are the Paraguay river, with 1,800 miles open to small vessels, and the Parana river, with 676 miles open to vessels drawing 12 ft. and 600 miles additional to smaller vessels.

Uruguay is largely long rolling plains, occasionally broken up by low mountain ranges. The country is well suited to stock raising, and this is the principal industry. There are a number of packing houses, the best known one probably being the Liebig's Extract of Meat Co. Of the total 1,447 miles of railways, 780 are under State guarantee. Early in 1909 work began on the Midland branch of the Central Uruguay Eastern, running from Algorta to Fray Bentos, and also on an extension to La Sierra. Gross revenues in 1908 of the railways amounted to $4,362,666, with net earnings of $1,783,057. A bill has been introduced in Congress providing for building a railway to connect the port of Colonia with the Brazilian railways on the north. When this line is built it is estimated that a trip between Rio de Janeiro and Montevideo will be reduced to four days.

General News Section.

A press despatch from Minneapolis says that the Chicago, Milwaukee & St. Paul has laid off 1,000 shop men in that city.

The Boston & Albany is now using coke on all trains leaving Boston, both passenger and freight, for several miles out of the terminal.

On February 16 the Pennsylvania Railroad moved past Gallitzin, 12 miles west of Altoona, 180 freight trains, consisting of 7,630 cars, the highest number on record for 24 hours.

The Rock Island is now laying 100-lb. steel rails on those portions of its line where the traffic is especially heavy. The first section is the Illinois division, Chicago to Rock Island, 113 miles. The rolling of the rails for this division will begin at once.

A press despatch from Salt Lake City reports the Western Pacific as blockaded for at least a week because of extensive damage to its track throughout the 10 miles of line lying along the southern arm of Great Salt Lake, where the roadbed is built in many places in the shallow water of the lake.

The St. Louis & San Francisco has issued a pamphlet entitled "How to Ship," which describes its method of handling fast freight and tells the shipper how to get his goods to destination in the shortest time. The Frisco's method of handling fast merchandise was described in an article in the *Railway Age Gazette*, October 29, 1909, page 799. The pamphlet contains the loading schedules from the various stations and hours at which deliveries are usually made at all destinations.

The Interborough Rapid Transit Co., New York City, has been ordered by the State Public Service Commission to run in the subway the maximum number of trains throughout the day, from 6:11 a. m. to 40 minutes past midnight. In other words, the commission believes that the rush-hour service is necessary at all hours of the day and evening. The Interborough, acting on an order of the commission, is to put in all its cars running in the subway storage batteries to supply light in emergencies. At present the cars are dependent for light on the same source as that used for power.

The Western Union Telegraph Co. now has a general manager, in the person of Belvidere Brooks, hitherto general superintendent of the Eastern division. Until this appointment the duties of general manager were performed by the president. Mr. Brooks was born in Texas in 1859 and began his telegraph service as a messenger for the Western Union at Navasota, in that state, at the age of 12. He worked for two years as operator on the Houston & Texas Central, but for the last 31 years has been in the service of the Western Union. He was manager of the office at Denver, Colo., in 1890, and assistant superintendent in 1893.

Cleveland now has three-cent street-car fares with a charge of one cent extra for transfers. This is the result of an election last week wherein by a large majority the voters of the city granted a franchise. The franchise now adopted by the people has 25 years to run; and the company is entitled to no more than a 6 per cent. return on its investment as fixed by appraisal and recorded in the bond. If a trial of eight months shows that the company can earn 6 per cent. on the basis of three-cent fares and one cent for transfers, these rates will continue. Otherwise the fares can be raised to four cents each or seven tickets for 25 cents, but that is to be the maximum.

Press despatches from Baltimore last Tuesday say that the Baltimore & Ohio has rejected most of the demands made by the committees of conductors and brakemen who have been asking for higher pay, and that the leaders of the brotherhoods, rejecting all of the counter propositions made by the road, have reported to their constituents for instructions; and that there will be no further conferences until a vote shall have been taken, which will require a period of ten days. The negotiations of the brotherhood leaders with the Canadian Pacific and the Grand Trunk appear to have reached substantially the same result as on the Baltimore & Ohio, and at about the same time.

W. F. Allen, secretary of the American Railway Association, announces that the proposed change in the per diem rule whereby the interchange rate for freight cars is fixed at 30 cents for March, April, May, June and July of each year and at 35 cents during the remaining seven months has been ratified by a letter ballot, and the secretary declared the new rule to be effective March 1. The membership of the association is 340 roads, owing and controlling 2,250,007 cars. The majority requisite for approval was 171 roads and 1,500,005 cars. The result was: Yes—224 memberships, representing 1,767,162 cars; No—87 memberships, representing 419,851 cars; Not voting—29 memberships, representing 62,994 cars.

The St. Louis House of Delegates has passed the proposed ordinance fixing a maximum rate of $2 per car to be charged by the Missouri, Kansas & Texas Terminal Company for switching cars between points on its own tracks. The M., K. & T. proposes to build a terminal system in St. Louis which, it is reported, will cost $7,000,000. The proposed ordinance requires the company to file a bond of $50,000 to carry out its provisions and to pay $140,000 in cash into the city treasury within ten days after the ordinance becomes effective. The measure is carefully worded to prevent the road from attempting to nullify it by litigation. It provides that if a court of competent jurisdiction shall declare the switching rate unfair the company may charge the rate fixed by the court, and to prevent the road from taking the question into court on its own initiative it is provided that no suit may be filed by the company nor in its interest, and that if a suit is brought by other parties the city councilor, and he only, may try the case for the company and the city.

Post-Mortem Diagnosis.

Two professors of political economy representing well-known universities are reported as forecasting financial panics. No one need feel alarmed. They might have been heard from to greater advantage three years ago. The whole world has been appraised, through the break in security prices, of the unsoundness of the "boom" which was in progress during the latter part of 1909. The reactionary tendency in both trade and finance has now become so distinct that it bids fair to restore business to a sound basis, and to defer panics indefinitely.

A comparison between the crest of the last boom, 1906, last year and our brief experience of 1910, is illuminating:

	1906. Highest.	1909. Highest.	1910. Lowest.
Monthly avg. N. Y. int. rates, per cent.	8.31 Dec.	5.10 Dec.	*4.15
Average price 32 stocks	$125.10 Jan.	$121.25 Aug.	$106.42 Feb. 7
Max. rate of trade exp., per ct.	18.7 Jan.	32.3 Aug.	†11.7 Jan.

*For month ended Feb. 8. †Partly estimated.

According to averages based upon railway earnings, foreign trade, bank exchanges, mineral production and other returns, the volume of general trade is now less than 12 per cent. in excess of that of a year ago—whereas the annual rate of expansion in January, 1906, was nearly 19 per cent., and in August last more than 32 per cent. The slower pace clearly represents more normal conditions, and these are reflected in a fall of nearly 1 per cent. since December in the monthly average level of New York interest rates.

Reaction in both financial and mercantile business has already produced a more conservative feeling among the buyers and consumers of commodities and merchandise, and the consequent general lessening of the demand for goods is more than likely to have its effect upon prices—although it is noteworthy that any considerable fall in commodity prices does not usually occur until three or four months after the volume of general trade begins to decline. The London *Economist's* index number has already begun to react, thanks to the drop in cotton prices; and further decline, resulting from the cur-

fulfilment of the volume of trade, should do much to strengthen the weakest link in the business situation, namely, high commodity prices and high operating costs.

A general reaction in a broad view seems almost an unmixed blessing, since it promises to restore sound conditions before financial resources are strained. The trade reaction of 1903-'04 postponed a threatened crisis for four years, and similar results may fairly be expected from the reaction now in progress.—*Wall Street Journal.*

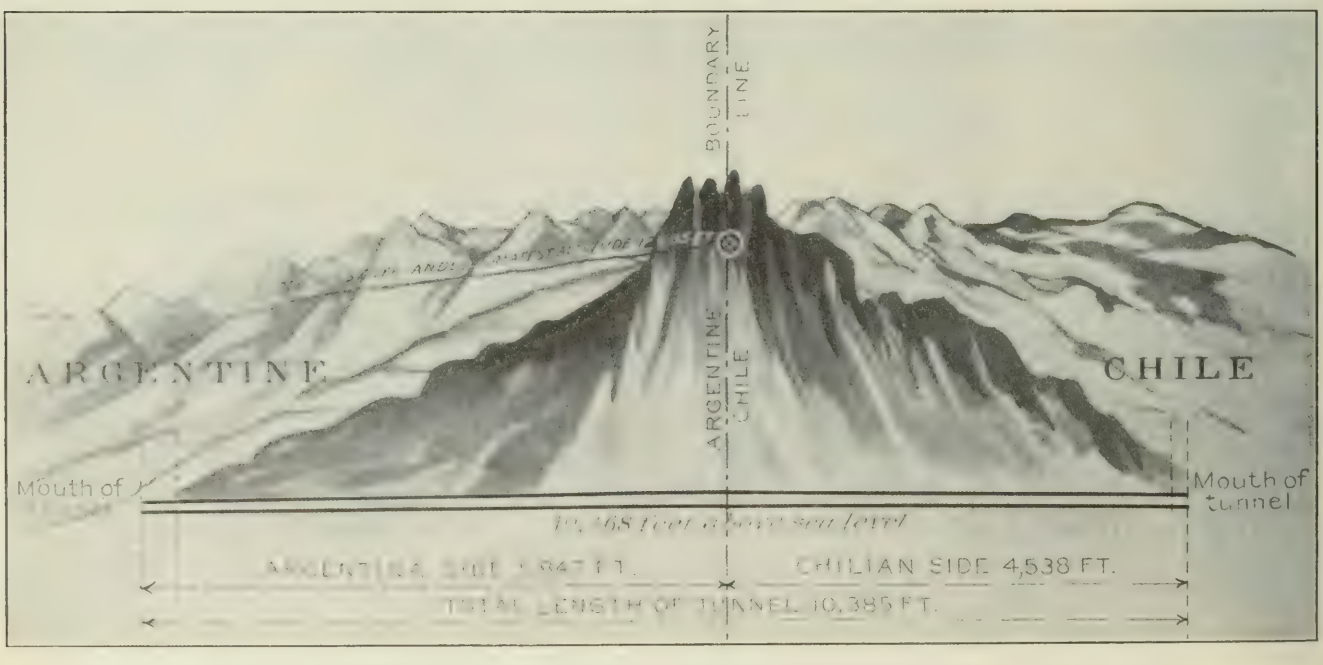
Railways in Japan.

A notable event in the history of railway development in Japan took place a short time ago, in the completion of the railway between Hitoyoshi and Kagoshima, forming as it does the last link in the Trans-Empire trunk line. Now Nayori, of Hokkaido, in the north, is in direct communication with Kagoshima in the south by a railway of 1,750 miles, and the fact has been a matter of great satisfaction and gratification to all classes in Japan. The long distance from north to south can now be traversed in five days and nights. Taking into account the conditions in Japan, the development of the railway system has been wonderful. The initiative in the construction of railways in the country was undertaken by Horatio Nelson Lay, who in 1869 arrived in Tokyo with proposals to offer a loan to the government on behalf of certain British capitalists, to be used in the construction of railways. Mr. Lay's financial arrangements fell through, and the business was taken in hand by the Oriental Bank, with R. Vicars Boyle, C. S. I., as chief engineer, and Dr. William Pole as consulting engineer in London. The first railway was opened in 1872 between Tokyo and Yokohama. The part between Kobe and Osaka was then proceeded with, but for some years the work of railway construction was slow. When, however, the Imperial College of Engineering began to turn out men who were able to assist in the work, and when others who were trained abroad returned to Japan, it proceeded more rapidly. The people of Japan quickly appreciated the importance of railways in the development of the country, and private companies were formed for railway construction. In 1896 and 1897, immediately after the war with China, there was something approaching a railway mania, like that in England during the early days of railways, and much money was lost in speculation. For some years the work of railway construction was carried out almost entirely by private enterprise, but about four years ago the Imperial Diet passed laws nationalizing the most important railways, the purchase money being in government bonds bearing 5 per cent. interest. At the end of the financial year 1907-8 the mileage of state railways open to traffic was 4,452 miles, and of private railways 445 miles. The lines have been laid out not only with a view to the development of trade and industry, but also to the defense of the country. The ports most convenient to China are connected by railway to the important centers of commerce and industry, so that not only can the resources of that huge Empire be utilized for manufacturing purposes, but the finished products can be returned for the use of the people. The lines which are necessary from a military point of view have now been pretty well provided, and in future it will be possible to look almost entirely to commercial and industrial requirements.—*Engineering.*

Electric Railways in Great Britain.

The length of tramways and light railways open for use in Great Britain and Ireland at the beginning of the year 1909 was 2,526 miles, of which the length worked by electric power was 2,360 miles, leaving 166 miles worked by horses, by steam, by cable or by gas motors. This statement, together with statistics of capital and of traffic, is published in a parliamentary paper, No. 324, which has just been issued by the Board of Trade. Of the 298 railway establishments included in this report 176 belong to towns or cities and 122 belong to companies or other parties. Of the 1,680 miles of line owned by local authorities, 1,490 miles are worked by those authorities, and the remaining 190 miles are worked by lessees. Ten years ago, when railways of this character were worked mostly by steam locomotives, the length of line open was 1,064 miles; and 30 years ago, which is called the horse period, it was only 321 miles. A comparison of the present with the steam period shows an increase of about 70 per cent. in the capital expenditure per mile of single track (from £10,469 to £17,345); a decrease in the percentages of expenses to receipts from 76.93 to 63.64, a decrease in the average receipt per passenger from 1.23d. to 1.09d., and an increase in the passengers carried per mile of line open from 806,703 to 1,053,049.

In the last year reported (1908) the net receipts of municipalities which operated their railways amounted to £3,268,514, of which £964,010 was applied to the reduction of tramway debt and £280,225 was applied to relief or rates (taxes). This leaves £680,202 in reserve and renewal funds. Four municipalities and four companies reported for the year an excess of operating expenses over gross receipts. The total capital expenditure reported on the 2,526 miles open in 1908 was £71,023,239.



Profile of the Trans-Andine Tunnel Between Chile and Argentina, Opened Nov. 27, 1909.
(*Bureau of American Republics.*)

Railway Matters in Washington.

Washington, Feb. 23.

Chairman Weeks, of the House Committee on Post Office, has reintroduced the elaborate bill which was presented last year for reorganizing the post office department and establishing the office of director of posts.

The Senate Committee has made a favorable report on Senator Beveridge's bill to establish a court of patent appeals with five justices.

The Senate Committee on Interstate Commerce has made favorable reports on the bills, already passed in the House, to give the Interstate Commerce Commission increased authority over details of construction of freight cars, and to amend the accident law so as to require all railway accidents to be reported monthly, and to empower the commission to investigate accidents. These bills, introduced in the House by Mr. Esch, of Wisconsin, were noticed in our issues of December 17 and 24.

The claim of the Southern Pacific for reimbursement for its expenditures in connection with the controlling of the Colorado river at the time of the break in 1906 is again before Congress, and a hearing is to be given March 11 by the House Committee on Claims. The Southern Pacific expended $1,600,000 in closing the break in the river, and thereby prevented the destruction of the farms and property in the Imperial Valley.

The administration bill to revise the Interstate Commerce law and to establish an interstate commerce court, has now been rewritten by the attorney-general for the ninth time, and was again introduced in the House last week by Mr. Townsend as H. R. 21,232. The changes made seem to be designed mainly to meet the objections of various critics. Chairman Knapp, when he was before the committee last week, suggested many changes in detail, designed to make the proposed new provisions more readily workable. The railways have continued to be conspicuous by their silence, the protests presented by officers of the Rock Island last week being about the only definite statements made by any carriers. It is said that Senator Cummins, of Iowa, who introduced a rival bill, will, supported by LaFollette and other insurgents, together with some democrats, make some objection in the Senate, and Senator Cummins may submit a minority report; nevertheless, the impression seems to be that a strong majority of the committees, both in the Senate and the House, will make harmonious and favorable reports. The principal changes that have been made are the following:

A company is left free to acqire stock and bonds of a non-competing line, provided the aggregate amount of stock and bonds issued for such acquisition shall not exceed the fair value of the property as ascertained by the Interstate Commerce Commission, or the aggregate par value of the stock and bonds acquired without increase in the aggregate interest payable on such bonds.

The stock and bond provision is amended so as to permit the reorganization of a company and the merger of railways is not directly prohibited.

The act establishes the general principle that no stocks shall be issued by railways except at par, and no bonds except at their reasonable market or selling value as ascertained by the Interstate Commerce Commission, and where either stock or bonds is paid for in property, the fair value must be ascertained by the commission.

Where notes or other obligations made in conformity with the act are secured by the pledge of bonds, a sale of the pledged bonds to enforce the loan must be had at public auction; and notes may be made convertible into pledged bonds on the basis of the reasonable market or selling value of the bonds, as approved by the commission.

Among the further changes desired by Chairman Knapp is a provision that the proposed commerce court shall not stay an order of the commission, except by a majority vote. Another proposal is that the commission shall have 120 days instead of 60 days in which to suspend a proposed advance in rates. The commission thinks that the clause forbidding one road to acquire an interest in another should be extended to apply to competing water lines.

At the hearings before the House Committee last week on the administration bills General Manager C. W. Kouns, of the Atchison, Topeka & Santa Fe, presented an argument against the proposed law to compel the running of live stock trains at 16 miles an hour. He showed that to make even the lower average rates of speed now common it was necessary in many places to run 40 and 50 miles an hour, and declared that these speeds were injurious to the animals. Many claims for damages for injuries to animals are the result of excessive speed. The live stock traffic is costly even at present speeds. Trains have to be run long distances with but few cars. One reason why animals suffer in transit is that shippers put them into the cars when they need both food and water, and Mr. Kouns recalled one case where a whole carload of animals died, within 28 hours, from weakness due to lack of nourishment.

Among those who appeared before the House Committee to present objections to the proposed laws was T. F. Barrett, president of the Philipsburg & Susquehanna Valley. Mr. Barrett emphasized the unfavorable effect on railway investments of the severe laws now in force in New York. These laws may have been needed in New York, because in that state there had been much abuse; millions of stocks and bonds had been issued against what was "purely blue sky"; but now the state has gone to the other extreme, and railway construction enterprise has been brought to a standstill. Mr. Barrett emphasized the irrational character of a law which should require the people of Texas or California to come to Washington to get authority to use their own capital to develop their own resources.

F. S. Masten, representing the Detroit & Cleveland Navigation Company, presented objections to the provision in the proposed law empowering the commission to establish through routes and rates over a rail and water line. Under the present law this power can be exercised only when there is "no other reasonable or satisfactory" through route. These words have now been eliminated in the bill under consideration, and it looks as though the commission would have power to compel a regular steamboat line to accept rates without regard to its own interests, and without regard to the damage which tramp steamers not under the control of the government can inflict on regular lines.

E. H. Duff, representing the 17 principal steamship associations on the Atlantic coast, and E. E. Olcott, of the Hudson River Day Line, reinforced Mr. Masten's arguments.

On the last day of the hearings before the Senate Committee, President Post and other representatives of the Railway Business Association presented strong arguments supporting a general appeal for conservative action.

Merger of Arizona Roads.

The Arizona Eastern Railroad Company incorporators are: Robert S. Lovett, president; Epes Randolph, Eugene S. Ives, Charles E. Walker and Gibson Taylor, of Tucson; Benjamin Titus, D. H. Kedzie and M. M. Crocker, of Lordsburg, N. Mex. The purposes of the corporation are to take over all the Southern Pacific properties in Arizona known as "The Randolph Lines," and to build additional mileage to make the total length of the railways 1,877 miles. The properties taken over are the Arizona Eastern, the Gila Valley, Globe & Northern, the Maricopa & Phoenix, the Arizona & Colorado and the Phoenix & Eastern. The capital set aside for the acquirement of the existing lines is $5,321,400, leaving approximately $35,000,000 authorized capital to be issued in the future.

The articles of incorporation outline the contemplated plans of the new company as follows: A new line from a point on the Southern Pacific near Yuma to Phoenix, 160 miles; from Phoenix easterly and southeasterly through Arizona and New Mexico to Lordsburg, of which 250 miles are in Arizona and 30 miles in New Mexico, this line probably to include the present Phoenix & Eastern line, now operated to Winkleman, and possibly a section of the Gila Valley, Globe & Northern; a branch from the second section from Solomonville to a point near Bowie, 35 miles long; a line from San Carlos to Globe, thence through New Mexico to the Colorado border at a point on Las Animas river, this line known as the Globe-Durango, 428 miles, of which 270 are in Arizona and 158 miles in New Mexico, and of which line a section is in operation between San Carlos and Globe. There are branches from this line con-

templated as follows: A line 35 miles long from San Juan county, N. Mex., to the point of intersection of the La Plata river and the New Mexican and Colorado boundary; from Talklai, Gila county, Ariz., northeasterly to the point where this line crosses the Arizona and New Mexico boundary, a distance of 200 miles; small branches from Globe to the Live Oak mining camp and other important ore producing districts, these branches aggregating 20 miles; a branch from Globe to the Black Hawk mine and back to the main line near the Old Dominion mine; a branch from the second described line at a point near the San Francisco river, Graham county, Ariz., by way of Clifton on through New Mexico to a point on the main line between Farmington and Aztec, N. Mex., approximately 410 miles, of which 345 are in New Mexico.

The plans also describe lines to be completed from Cochise to Douglas, part of which was constructed recently from Pearce and Cochise to Courtland, Gleeson and Forrest, this line to be extended to Bisbee, Black Diamond and Turquoise, 69 miles in all; a branch from Mesa to Hansen; a branch from Florence to Casa Grande, 26 miles to the south; a branch from Florence to Maricopa, and another to Superior, and a connecting link from a point near Winkleman up San Pedro river to Benson, on the main line of the Southern Pacific.

The trans-continental Southern Pacific line is to be pushed through from the east by way of Phoenix and Yuma. Epes Randolph, president of the Randolph lines, has laid particular stress on the importance of this line. The company has submitted maps to the territorial authorities, asking permission to build a low grade line up the box canyon of the Gila river. This line would reduce the grade now encountered between Lordsburg and Mescal, and send the main line directly through the capital of the territory. Eastern capitalists, however, have desired to build a big dam at San Carlos, which would back the water up in the Box canyon, and force the railway company to take a higher grade line, which President Randolph says would mean the abandonment of this section. The people of Globe and Phoenix have been holding meetings, and seem to prefer the building of the Southern Pacific railway to the completion of the irrigation project. Government Engineer Louis C. Hill has made a report on the irrigation dam, and gives five reasons why it would not be practical. He states that there is a heavy flow of silt in the river at this point and that before the irrigated land would pay heavily on the investment, the dam would be much reduced in capacity by the deposits. He also reports a fault in the site, and that rock bottom foundations could be obtained only after extremely heavy excavation work. The irrigation project advocates claim the dam would irrigate 100,000 acres, while others reduce this estimate to one-half the acreage. If the dam promoters win out the main line through Phoenix may be abandoned.

The second big project which the Southern Pacific announces will be carried through is the completion of the line between Cochise and Douglas, which will thence be pushed on into Mexico to connect with the Yaqui river line built from Guaymas to Tonichi. Engineers are now located a few miles from Douglas, in the Sulphur Springs Valley, awaiting orders to run the line from Forrest, a distance of only 15 miles, into the smelter city.

Street Railway Strike in Philadelphia.

Traffic on the surface street car lines throughout the city of Philadelphia was stopped last Saturday by a strike of the conductors and motormen, and on Sunday there was rioting throughout the city. Similar conditions continued on Monday and Tuesday. The company succeeded in getting some new men and ran some cars, but the cars which were run carried few passengers. On Tuesday the mob attacked a train on the elevated line, which is operated by the same company. The police were powerless in innumerable cases, and on Tuesday the militia was overpowered. The mayor and other officers seem to have been in doubt whether or not to call for additional help from the state. The following summary of the situation by the *New York Herald* on Wednesday morning appears to correctly estimate the situation:

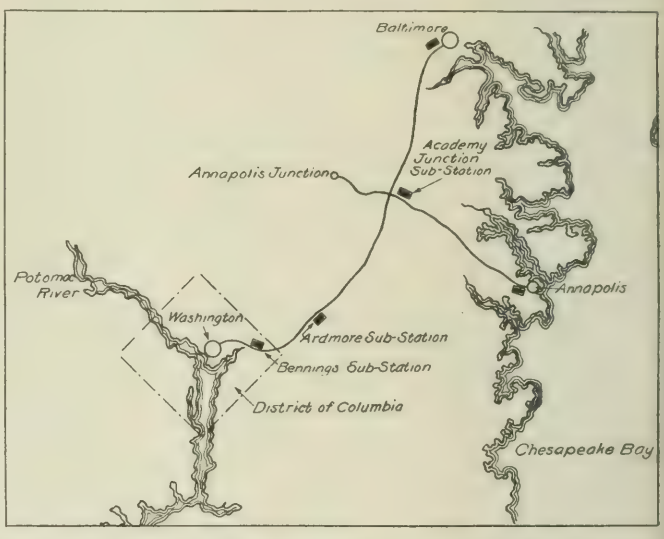
"It is a strange plight in which the order-loving old city of Pennsylvania finds itself to-night (Tuesday). With her lines of surface traffic palsied, her police derided and defied, the first detachment of her troops who were sent to restore order ingloriously beaten and disarmed, Philadelphia stands humiliated and affrighted, the butt of a mob that hourly grows more arrogant and lawless."

Record Change of Railway Installation.

On the morning of the 15th of February the Washington, Baltimore & Annapolis Railway changed its system of operation from 6,600 volts single-phase a.c. to 1,200 volts d.c., the change being made with absolutely no interference with the regular operation of the road or the maintenance of its schedule.

The decision of the railway company, some eight months ago, to make this change attracted general interest owing to the fact that it was one of the largest and most important interurban installations of a single-phase railway system.

The company's 60-ton cars, equipped for operation on the single-phase system, could not enter Washington, since, owing to the limited strength of the yokes which support the city tracks, the maximum weight of the cars was restricted to 40 tons. The railway company, now that it desired to run to the heart of the city, was confronted with the problem of securing a car of this weight equipped with motors of sufficient size to provide the high-speed and particularly high-class service required by the character of its patronage. A careful investigation of the engineering features invoived showed that it was impossible to meet these requirements with their single-phase equipments.



Route Map; Washington, Baltimore & Annapolis Railway.

A contract was made with the General Electric Company in accordance with which the latter company was to provide and install the necessary equipments for both cars and substations, with the understanding that the railway company's regular service should not be interfered with in any way.

The change was actually made without any accidents. At 1:15 a.m. on the morning of the 15th the last a.c. car was taken off, and at 5:20 a.m. the first d.c. car was started. The records made under the new system substantiate the claims made by the manufacturers of the apparatus. During the first day of operation the cars ran over 4,500 car-miles, not a trip of the regular schedule being lost. Moreover, a saving of over 25 per cent. in power is indicated by the wattmeter records of the first few days.

The contractors successfully built, delivered and installed the large amount of apparatus (involving many new designs) in eight months, without any interruption of service on the line.

The Cleveland Construction Co. were the consulting engineers. They also supervised the changes in the transmission system, overhead work and changes in the substation buildings required to adapt them to the new apparatus.

What a Passenger Encounters Out West.

"Politeness" is the subject of an article in the *North Western Bulletin*, from which we take the paragraphs printed below. For the most part, however, they deal with the opposite quality, and they seem to indicate that the same kind of boorishness which used to be common among conductors and station agents 25 years ago still flourishes. It is hard to believe this concerning a road which, like the Chicago & North Western, has had volumes of fine things said about the "public servants" who wear its blue uniforms; but the *Bulletin* is an official paper and the fact that the article is admitted to its columns must be taken as evidence that the publication of such a picture is needed. This being so we guess it is needed elsewhere, so we copy. In fact, the title which we have adopted is applicable, we have no doubt, with its last two words cut off.

Railway people are tempted to be less than civil by their opportunities. Each employee represents in himself a great corporation, a very catapult of wealth and power. Work is to do; they are there to do it—all they can't slide out of some way—and every nervous query answered at ticket window or gate, every piece of baggage asked about, every extra step taken to fully satisfy a shipper or passenger, means that much more on the day. And railroading is hard work—mighty hard work. From the president down—from the waterboy up, not an employee sees anything approaching an easy time. Not if he does his duty, does what he draws his pay for.

Simmered down, the public is the employer. Contrary to the general rule, it is the employer who gets black looks, curt answers, scant information; there is a complete reversion of the ordinary relations between the spender and the receiver—employer and employee—the man who travels and the man who runs the travel wagon. Once more—if nobody traveled or shipped, there would be mighty little use for shining locomotives or upholstered coaches or long lines of freight cars. *Then* whose occupation would be gone? Answer *that*.

These complaints and downright accusations that are always coming in, they couldn't *all* spring from mistake or fiction you will acknowledge. No; their foundation is bedrock truth, not to be slewed 'round by explanations that don't explain, nor denials that fail to convince. Besides, few cases get to "the carpet," that grand final judgment seat. If each case of incivility, boorish inattention or plain, cool insolence could be immediately reported and at once acted upon, why railway service would take such a spring upward that it would be "out of sight."

To very many people who travel, the conductor is a high and mighty being, to be timorously approached and gently entreated, if at all. He knows it; he is no stranger to the idea that "if they want anything off'n him they gotter go about it the right way, that's all." He soon gets the habit of being superior to most men and women, so that the more abjectly they grovel, the more scornfully oblivious to the small needs of passengers does he become. This is the conductor—and his trainman is like unto him. Every time they come in they slam the heavy door. When they go out they slam it again for luck. It was made to be shut. If nervous passengers choose to jump nearly out of their hides, all right; it's up to them.

In cases of accident or delay, how much anxiety and often heart-wringing anguish could be spared if only one of these Great and Onlys would stoop to explain a little. Part of every trainload of through passengers will be people on their first long journey—timorous women, whose idea of travel has hitherto been bounded by the two ends of a day's trip from Chicago to Harvard and back. Now these are capable people at home, influential in their own sphere, but they are fearful when they start, because they are on unknown ground trying a new experience. They hardly know how to get a drink of water, or where the toilet is, or whether, even when there are plenty of chairs, it is admissable to move, for rest, from one to another. They do not really know how to reach the diner or to order a meal when there. They lack greatly what a railway man has to have—self-assurance.

Now then, to their timidity you add the horrors of the unknown, when, like Uncle Remus, "Dey dunno what minit gwine to de nex"—then indeed is the cup of their apprehension full. But you let somebody with the company's uniform on pass through the car, fully explaining that of danger there is none, and the delay will be slight—a freight is off, or an engine stalled, or the despatcher gave the block to let a cattle train pass, and see the difference. That explanation, backed by the uniform, is sufficient guarantee. The president, the passenger traffic manager and all their helpers could do no more.

Without doubt God made all men free and equal—the Constitution says so. But equally without doubt he early added a few touches extra to those fore-ordained to be ticket sellers and gatekeepers (and, perhaps, to sleeping car porters and dining car men). Not Solomon, in all his glory, was any harder to get at than some of them are. Their hearts are adamant—so are their faces.

All the shortcomings are not with the men on the trains, either, not by a long jump. For just let some farmer body out between Bertrand and Elk Hill try to get the section boss up to the point where he will arrange, cause, or allow to be arranged, a crossing so that Kenrick and Olaf and Friega and little Ole can get safely across to the district school (the school houses, by some mysterious dispensation, are always on the other side of the track)—just let him try it and you will think there is a hair-pulling contest in the vicinity. The farmer will get the crossing, eventually—probably with a postscript like this:

"Crossin's is ut? To the divil wid your crossin's—and you 'at can't spell your name in good American, but puts a 'Y' where Johnson begins wid 'J.' You'll set harrd workin' min at crossin's—min 'at was shwimmin' bogs before ye larnt to catch 'n' eat raw fish. Aw thin!"

McDonald don't mean anything—it's just his way. He repairs the crossing, but not until he has harrowed up the feelings of those who don't understand—those who spell Johnson with a "y."

The country agent will let a passenger stand and wait two hours and never chirp if he can help it—never breathe a word of how the connecting line has had bad luck at the junction, so that your own particular 11.13 can't possibly come along before 3.30. He knows it perfectly well, and will admit it if you drag it from him word by word. But couldn't he just as well have said to the intending passenger something like this: "I'm sorry, Mr. Mann, but the G. & L. ran in onto our main line this morning over a switch their people neglected. There's likely to be some block-up, and I'll telephone up to the hotel when things are clear."

The Telephone for Local Message Work.

Our experience on the Burlington with the telephone, as a substitute for the telegraph in train despatching, early suggested using it on message circuits. Therefore, as soon as possible after securing a train despatching circuit, we provided a second circuit and equipped it with similar selectors, using the single set of telephones in common with the train despatching circuit. The results were far beyond our expectations, it being found possible to handle as high as 350 ordinary messages in a nine-hour day on a circuit cut into thirty-two offices; and of these messages one-third were Western Union, which are always repeated but only count as one message.

One reason we were able to handle so large a number of messages was the greater promptness of the operator in answering calls. Then, too, the operator on a busy telephone circuit while finishing with one office puts out a call for the next one desired, and keeps right on working with the first office; and the second man is waiting when the first finishes.

As soon as the way station operators and the operators in the relay offices become acquainted with the slightly different methods of handling the business, especially in regard to reading the message in phrases—one phrase at a time, so that the receiving operator has the advantage of not only hearing each word spoken, but getting the sense of the message in addition—the ordinary business can be handled at the rate of one message a minute, and on the shorter ones sometimes a speed of two a minute can be attained. The average message, except where it contains hard names or difficult combinations of figures and letters, is not spelled out, but is read in phrases,

a pause being made at the end of each phrase for the receiving operator to finish putting it on paper whether by pen, pencil or typewriter. In handling Western Union messages where more frequently hard names and code words occur, these are spelled out carefully, and in addition all Western Union messages are repeated back.

We insist that the operators in relay offices be first class typists and they have a speed in receiving of not less than sixty words a minute, while some of them run up to eighty words a minute. As in train despatching, the telephone circuits frequently work through bad weather or other troubles where the telegraph is absolutely inoperative.

So great has been our success in handling the message circuits, that we are now endeavoring in every instance to secure a message circuit wherever we install a telephone for despatching. Frequently this is easily accomplished by simply using the abandoned train wire and the message wire.

With greater speed, at least equal accuracy, and ability to work the circuits through more unfavorable conditions, I feel the telephone scores again heavily over the telegraph, and I predict a rapid extension of its use for message work.

The Burlington system now has in operation twenty-six telephone despatching circuits of a total length of 2,387 miles out of a total mileage of 8,948 for the entire system. The total number of stations thus equipped is 457. There are also 25 message circuits with a total length of 2,333 miles and 429 offices on such circuits; and 2,287 miles of block wire with 474 offices are equipped with telephones.—*W. W. Ryder, in Telegraph Age.*

Telephone Despatching on the Santa Fe.

The Western Electric Company has issued in pamphlet form a reprint of an article on this subject by C. H. Gaunt, assistant general manager of the Atchison, Topeka & Santa Fe, which first appeared in the *Santa Fe Employees' Magazine.* It appears that on the Santa Fe lines nearly 2,000 miles of telephone train despatching circuits have been in use for a year, and that this will soon be increased to 3,482 miles, all consisting of metallic circuits of copper wire weighing 210 lbs. per mile. One of these circuits, from Fresno, Cal., to San Francisco, is 203 miles long, and a part of it is in the fog belt adjacent to San Francisco, where telegraph lines are usually worked with difficulty. On this line there are 32 stations. Mr. Gaunt agrees with other railway officers who have written on this subject that the telephone is not only a complete success in train despatching, but is a great improvement over the telegraph. The despatcher has fully three times as much time in which to make his calculations as under ordinary telegraph conditions. This greatly improves the accuracy and general value of his work in regulating the trains, and reduces the liability of error on his part. The pamphlet contains the following list of railways which are using the Western Electric Company's telephones for train despatching:

Atchison, Topeka & Santa Fe.
Atlantic Coast Line.
Boston & Albany.
Boston & Maine.
Carolina, Clinchfield & Ohio.
Chesapeake & Ohio.
Chicago, Burlington & Quincy.
Chicago & Northwestern.
Chicago, Milwaukee & St. Paul.
Cumberland Valley.
Delaware, Lackawanna & Western.
Denver & Rio Grande.
Denver, Laramie & Northwestern.
Erie.
Great Northern.
Illinois Central.
Lake Shore & Michigan Southern.
Lehigh Valley.
Louisville & Nashville.
Michigan Central
Missouri Pacific
N. Y. Central & Hudson River.
N. Y., New Haven & Hartford.
New York, Chicago & St. Louis.
Norfolk & Western.
Northern Pacific.
Pennsylvania (East).
Pennsylvania (West).
Richmond, Fredericksburg & Potomac.
St. Louis & San Francisco.
Seaboard Air Line.
Southern Railway.
Southern Pacific.
Union Pacific.
Virginian.

A Contented People.

The State Railroad Commissioners held a session in this city to-day all by themselves. Nobody had a word to say about freight rates or anything else pertaining to their official functions. The commissioners occupied Judge Hughes' courtroom, staying about the place from 10 o'clock until noon, when they left for the next town which the law says they must visit. The Traffic Association had nothing to place before the commission, and nobody else seemed to care a snap of their finger for railway rates, so there was nothing to do but exchange bear stories with County Clerk Hamilton.—*Sacramento* (California) *Bee.*

Pig Iron Production.

The total production of pig iron in the United States in the last calendar year, according to the Bulletin of the American Iron and Steel Association, was 25,795,471 gross tons. For the last five years the production has been in round numbers (millions):

1909.	1908.	1907.	1906.	1905.
25.8	15.9	25.8	25.3	23.0

The number of furnaces in blast on June 30 last was 258; on December 31 it was 338, or 72 per cent. of the total number of furnaces.

Single Phase Success in England.

Owing to the success of electrical operation on its London Bridge-Victoria line the London, Brighton & South Coast Railroad Company is considering the question of extensions on the single-phase system. The electrical train service commenced on December 1, and in the first month there was an increase of 55 per cent. in traffic, and in the second month 71 per cent. Smooth and regular running, with no breakdown of consequence, is recorded. The company has got back nearly the whole of the traffic that it had previously lost to tramways, etc., on the section.

Railway Signal Association.

The papers which are to be presented at the meeting of this association in Chicago, March 14, are the following: Lightning Protection, by Otto Holstein, Government Railways, Peru, South America; Soda Copper Oxide Primary Cells on Track Circuits, by E. L. Marshall, National Carbon Company; Portable Storage Batteries, by H. M. Beck, Electric Storage Battery Company; Design of High Tension Lines for A.C. signaling, by Messrs. Rhea and Kimball, General Electric Company.

Station Agents.

The Order of Railroad Station Agents held its biennial convention in Albany, N. Y., last week. The president for the ensuing year is E. H. Morton, Greenwood, Mass.; secretary, W. D. Carleton, North Plymouth, Mass. The place selected for next year's meeting is Rochester, N. Y.

Engineers' Society of Western Pennsylvania.

At the regular meeting on February 15 a paper entitled "The Government Testing Station in Pittsburgh" was presented by J. C. Roberts, assistant chief engineer, technical branch, U. S. Geological Survey.

International Railway Master Blacksmiths' Association.

The annual meeting of this association will be held August 16-18 at Detroit, Mich. A. L. Woodworth, secretary, Lima, Ohio.

Air Brake Association.

The seventeenth annual convention will be held at the Dennisson Hotel, Indianapolis, Ind., May 10-13. The following subjects will be considered: Air Brake Instruction, Examination and Rating; Air Pump Piping, Fittings and Connections; Best arrangement of Air Pump and Main Reservoir Capacity for 100-Car Train Service; Brake Cylinders and Connections and Recommendations for Overcoming Troubles Due to Cylinder Leakage; Inspection and Cleaning of Triple Valves and Brake Cylinders; Past Year's Developments in

Air Brakes; Questions and Answers on New York Brake Equipment; Questions and Answers on Westinghouse Equipment, and Recommended Practice.

Central Railway Club.

At the annual meeting, to be held on March 11, a paper entitled "Electric Car Lighting" will be presented by J. R. Sloan.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30 April 1; Charlotte, N. C.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A. T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 806 Fulton Bldg., Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 14; Chicago
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASS'N.—H. M. Buck, Secy.-Treas., 30 Church street, New York
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN & SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The leading commercial bodies of New York city are to form a permanent league or combined organization to deal with the question of freight rates, a suggestion for such union having been received from the Trunk Line Association. The bodies joining in this league are the Chamber of Commerce, the Board of Trade and Transportation, the Produce Exchange and the Merchants' Association. Whether or not these bodies will go farther and unite with other seaboard cities in a larger organization, as has been reported probable, does not appear.

The Denver & Rio Grande has issued an interesting booklet on the growth of fruit and vegetable traffic in its territory. From Colorado, Utah and New Mexico shipments of green fruits this past season have already aggregated 7,713 carloads. In addition there have been shipped 2,000 carloads of potatoes and vegetables. It is estimated that the total output of fruit and vegetables for the 1909 season will be 11,500 carloads, and, in addition, 2,500 carloads of sugar beets were shipped to the beet sugar factory at Grand Junction, Colo., and twice as much more to Utah factories.

Advances in Rates on Fresh Meat.

Most of the railways from Missouri river points to Chicago have filed tariffs with the Interstate Commerce Commission announcing advances in their rates on fresh meat. The rates in effect were discussed in an editorial in the *Railway Age Gazette* of February 11, page 292. There was one misstatement of fact in that editorial. The present rates from Missouri river points to Chicago are: Local, 20 cents; through, 18½ cents. When advanced both the local and the through rate will be 23½ cents. But there are at least two roads which do not concur in the advances—the Chicago & Alton and the Wabash from Kansas City—so that as the tariffs now stand the rates will be raised from Omaha, while it will still be practicable to ship dressed meats at the old rates over these two roads from Kansas City. The advance is effective March 20.

The C. V. Bug Train.

The state zoologist of Pennsylvania, with four assistants, spent four days last week on the Cumberland Valley Railroad instructing the farmers along the line how to deal with the insects and diseases that infest fruit trees in that region. The title of this paragraph is the expressive name which is given, locally, to the special train, furnished by the railway company, on which the lecturers traveled.

Traffic Club of New York.

At the regular meeting held at the Hotel Astor, New York, on February 24, E. O. McCormick, assistant traffic director, Union and Southern Pacific lines, Chicago, read a paper entitled "The Importance of Passenger Business to the Railway."

Cost of Transportation Ignored.

The retail price of eggs during the season of shipment seldom exceeds by more than 5 cents the price received by the western farmer. During times of scarcity it may run up to 20 cents a dozen higher than the farmer receives. The rate of transportation does not change. The railways receive 30 cents a case for bringing eggs in refrigerator cars from Indiana and Illinois, and 60 cents from Texas and Minnesota. That is, the railways bring eggs a thousand miles to New York for a cent or a cent and a half a dozen, and 2,000 miles or so for about two cents and a half a dozen. The transportation charge that is paid the railways has no bearing whatever on the retail price in New York. If the railways performed their service gratis the consumer in all probability would pay just as much for his eggs. The average price at wholesale in 1906 was 19 cents a dozen, and the total valuation of the eggs received in Greater New York, both for domestic consumption and for export, was $24,067,439.—*Evening Post*, New York.—The foregoing is from a long article on the cost of living. The reference to the cost of transportation is merely incidental.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1909.

(See also issues of Feb. 4, 11 and 18.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance — Way and structures.	Maintenance — Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations net.	Taxes.	Operating income (or loss).	Increase (or decrease) compared with last year.
Ann Arbor	301	$106,482	$37,096	$155,523	$18,503	$24,072	$3,594	$55,329	$4,076	$105,574	$49,949	$4,369	$12,339	$33,249	$14,847
Buffalo & Susquehanna	361	149,607	16,658	172,832	30,735	65,808	2,126	77,830	7,922	184,421	11,589	45	4,000	15,634	25,552
Canadian Pacific lines in Maine	233	89,786	34,160	132,495	10,098	19,462	5,251	53,214	1,254	89,279	43,216		5,000	38,216	6,946
Charleston & Western Carolina	340	105,714	34,450	147,300	29,664	16,043	3,516	50,162	3,395	102,778	44,522		4,475	40,047	1,402
Chicago & Alton	998	669,229	333,031	1,689,575	193,153	141,063	35,891	428,162	32,438	830,707	258,868	1,549	32,000	225,319	121,471
Chicago & Erie	269	325,738	68,170	434,113	33,921	88,850	15,790	194,351	9,293	342,205	91,908		10,938	80,970	22,537
Chicago, Cincinnati & Louisville	284	90,171	23,169	121,172	16,133	26,112	7,825	65,769	6,344	122,183	—1,011		3,405	4,416	15,072
Chicago, Peoria & St. Louis	255	124,741	21,207	152,119	23,374	32,264	6,942	65,014	4,900	132,494	19,625		4,150	15,475	2,672
Colorado Midland	337	135,425	24,613	184,849	16,058	33,354	11,373	93,096	5,706	159,587	25,262	1,028	9,350	14,884	24,629
Detroit, Toledo & Ironton	441	106,050	12,945	129,162	24,998	34,589	2,788	66,516	3,733	132,624	—3,462		6,510	9,972	19,958
Duluth & Iron Range	168	107,780	26,886	139,362	99,192	48,615	326	75,497	29,264	252,894	—113,532	—5,525	48,419	167,476	64,996
Duluth, Missabe & Northern	289	176,737	35,739	218,669	102,138	60,925	1,434	71,398	30,020	265,915	—47,246	—491	88,878	136,615	29,967
Duluth, South Shore & Atlantic	600	139,633	81,966	236,364	29,760	29,305	8,406	89,187	7,543	164,201	72,164	1,277	36,146	37,294	14,122
Georgia	307	180,268	85,643	282,259	34,661	43,381	10,005	98,126	7,578	193,751	88,508		2,639	85,869	38,377
Georgia Southern & Florida	395	118,244	71,799	227,831	18,367	44,570	5,659	79,665	8,559	156,820	71,011		8,812	62,199	17,860
Hocking Valley	350	457,376	71,116	550,233	80,066	103,254	7,488	183,320	9,470	383,598	166,635	—4,031	20,502	142,102	81,104
Iowa Central	558	214,446	40,903	267,027	30,054	44,486	8,398	125,714	8,223	216,875	50,152		7,418	42,734	4,679
Kanawha & Michigan	175	169,613	27,098	201,486	45,230	52,171	2,992	56,884	4,585	161,862	39,624	11	6,780	32,833	44,034
Louisiana & Arkansas	225	81,760	16,571	102,266	10,778	17,579	1,798	26,356	4,178	60,689	41,577		1,760	39,817	7,545
Louisiana Ry. & Nav. Co	350	81,291	17,552	110,546	26,281	12,277	4,982	44,625	5,783	93,948	16,599		4,250	12,349	8,886
Louisiana Western	198	117,448	54,840	180,863	18,381	32,096	6,198	52,449	6,896	116,021	64,842	1,747	19,138	52,957	—32,982
Minneapolis & St. Louis	1,027	236,516	84,347	347,215	35,634	55,869	11,760	163,090	12,237	278,590	68,625	100	17,433	51,292	60,828
Missouri Pacific Ry	3,881*	1,403,594	366,999	1,973,893	344,073	295,100	52,793	908,209	61,021	1,661,196	312,697	—2,192	80,401	230,104	.
New York, Ontario & Western	546	529,637	82,351	636,951	46,053	110,577	10,484	260,634	16,025	443,773	193,178	—3,818	16,667	172,693	36,535
New York, Susquehanna & Western	151	152,971	51,770	234,140	26,106	21,925	1,274	84,460	3,415	137,180	96,960	3,231	11,317	82,412	11,743
Northern Pacific	5,838†	2,669,540	1,380,718	4,389,907	549,168	735,094	89,102	1,939,039	96,701	3,409,104	980,803	211,599	166,816	1,025,586	—1,437,295
Pittsburgh Shawmut & Northern	240	92,742	8,676	103,078	11,984	23,388	975	34,871	3,105	74,323	28,755		1,592	27,203	14,556
St. Joseph & Grand Island	319	77,662	28,805	115,721	38,680	15,950	6,121	56,833	5,819	123,403	—7,682	250	6,618	—14,550	—52,061
St. Louis, Brownsville & Mexico	455	83,638	42,789	134,269	35,526	10,391	2,451	47,038	7,169	102,575	31,694		1,080	30,604	14,613
St. Louis, Iron Mtn. & Southern	2,610	1,605,419	486,096	2,274,841	306,013	281,957	51,858	718,009	69,953	1,427,790	847,051	2,420	70,376	774,255	867
Santa Fe, Prescott & Phoenix	257	84,806	25,545	117,559	18,028	10,304	1,925	33,109	5,711	69,077	48,482		10	48,472	3,131
Spokane, Portland & Seattle	420‡	155,287	60,055	226,294	47,971	30,242	3,896	97,230	7,449	186,788	39,506	343	39,368	—205	—43,766
Texas Central	268	63,657	34,883	106,873	12,058	11,557	1,704	31,536	4,228	61,083	45,790		3,076	42,714	—10,820
Toledo, Peoria & Western	248	65,178	34,078	103,760	19,232	18,478	2,238	38,975	2,864	81,787	21,973		5,000	16,973	2,173
Toledo, St. Louis & Western	451	261,070	37,864	317,747	28,282	43,244	5,752	107,621	9,742	194,642	123,105		12,000	111,105	—10,605
Western Ry. of Alabama	133	56,107	40,690	104,153	15,440	16,441	5,315	26,174	5,448	68,817	35,336	—386	3,766	31,184	13,867
SIX MONTHS OF FISCAL YEAR.															
Ann Arbor	301	$589,485	$270,768	$929,416	$142,554	$109,795	$25,359	$309,458	$25,389	$612,555	$316,861	$10,226	$73,983	$253,104	$32,486
Buffalo & Susquehanna	361	1,087,867	128,382	1,258,423	215,850	322,733	12,630	461,646	47,286	1,060,145	198,278	161	24,000	174,117	—40,022
Canadian Pacific lines in Maine	233	265,855	127,250	439,610	123,742	71,846	27,700	196,126	16,927	436,341	3,269		30,000	26,731	—19,522
Charleston & Western Carolina	340	574,035	174,274	790,817	178,872	98,244	18,285	259,954	21,261	576,616	214,201		26,850	187,351	36,660
Chicago & Alton	998	4,405,380	2,255,020	7,199,953	914,770	758,015	236,371	2,258,591	175,271	4,343,018	2,856,935	—7,956	192,000	2,656,979	—67,224
Chicago & Erie	269	1,899,807	439,657	2,547,962	320,008	526,971	92,789	1,036,708	54,516	2,030,992	516,970		65,631	451,339	190,860
Chicago, Cincinnati & Louisville	284	598,874	174,564	817,218	149,733	129,831	52,091	349,234	35,683	716,572	100,646		20,430	80,216	107,813
Chicago, Peoria & St. Louis	255	707,148	176,621	923,472	132,602	182,748	38,922	336,491	30,851	721,614	201,858		24,900	176,958	69,900
Colorado Midland	337	922,543	223,919	1,307,578	165,196	197,424	61,978	536,405	33,170	994,173	313,405	—1,590	56,100	255,715	—24,274
Detroit, Toledo & Ironton	441	682,561	89,480	831,878	169,557	142,486	18,086	372,307	24,248	726,684	105,194	—127	39,062	66,005	—36,065
Duluth & Iron Range	168	6,296,833	133,585	6,476,335	626,378	365,242	2,094	977,920	71,992	2,043,626	4,432,709	19,718	302,295	4,150,132	1,229,263
Duluth, Missabe & Northern	289	8,697,414	215,911	8,961,675	619,443	574,726	9,219	1,100,400	80,504	2,384,292	6,577,383	32,867	444,611	6,165,639	1,598,320
Duluth, South Shore & Atlantic	600	1,087,151	544,465	1,719,742	265,138	179,130	55,780	607,323	41,812	1,149,182	570,560	8,019	116,146	462,433	158,095
Georgia	307	1,055,506	437,772	1,580,799	203,781	237,725	57,464	586,606	42,465	1,128,041	452,758		12,727	440,031	179,730
Georgia Southern & Florida	395	660,240	369,200	1,185,545	123,954	235,323	33,543	413,249	50,710	856,809	328,736	6,442	52,709	282,469	46,288
Hocking Valley	350	3,293,061	487,602	3,904,224	529,332	695,996	44,913	1,029,985	70,022	2,370,248	1,533,976	86,602	129,042	1,491,536	349,680
Iowa Central	558	1,371,179	298,002	1,743,477	238,695	254,697	52,956	684,521	52,056	1,282,925	460,552		44,436	416,116	101,402
Kanawha & Michigan	175	1,188,123	171,977	1,386,641	270,537	291,855	14,054	333,770	24,359	934,575	452,066	—107	41,443	410,516	162,348
Louisiana & Arkansas	225	525,571	88,774	639,083	99,777	106,120	9,599	156,096	25,863	397,455	241,628		10,610	231,018	96,484
Louisiana Ry. & Nav. Co	350	504,138	98,149	670,581	138,921	76,155	29,113	268,202	32,622	545,013	125,568		22,900	102,668	86,300
Louisiana Western	198	698,618	306,138	1,055,764	102,741	164,997	34,347	282,938	40,444	625,467	430,296	—1,826	35,138	393,332	—2,028
Minneapolis & St. Louis	1,027	1,800,383	698,573	2,665,952	278,747	285,507	77,892	956,439	79,700	1,678,285	987,667	—444	118,583	868,640	77,735
Missouri Pacific Ry	3,881*	7,903,240	2,050,850	10,951,197	1,617,064	1,615,959	270,927	4,344,323	282,291	7,930,564	3,020,633	—15,263	381,904	2,623,466	.
New York, Ontario & Western	546	3,247,958	1,008,690	4,449,259	581,765	659,627	68,712	1,576,888	100,828	2,987,820	1,461,439	—18,171	100,000	1,343,268	1,900
New York, Susquehanna & Western	151	880,644	336,137	1,361,289	174,702	130,243	8,857	493,260	23,020	830,082	531,207	—33,622	67,900	429,685	13,829
Northern Pacific	5,838†	24,848,523	12,923,812	40,071,710	5,343,787	4,650,243	498,562	11,760,913	551,871	22,805,376	17,266,334	561,338	1,522,725	16,304,947	—768,801
Pittsburgh Shawmut & Northern	240	516,083	60,138	586,601	84,974	149,881	6,384	184,009	19,807	444,155	142,446		9,433	133,013	142,870
St. Joseph & Grand Island	319	575,909	222,755	864,592	199,939	93,029	38,317	321,497	27,570	680,352	184,240	97	33,808	150,529	—151,712
St. Louis, Brownsville & Mexico	455	444,050	219,898	706,621	188,022	63,379	15,333	241,054	38,966	546,754	159,867		19,000	140,867	34,090
St. Louis, Iron Mtn. & Southern	2,610	9,620,494	2,715,392	13,373,679	1,926,007	1,838,193	324,544	3,967,998	401,165	8,457,907	4,915,772	—25,969	423,706	4,466,097	657,372
Santa Fe, Prescott & Phoenix	257	499,359	173,226	716,659	113,739	54,320	16,677	181,443	31,077	397,256	319,403		184	319,219	18,825
Spokane, Portland & Seattle	420‡	1,224,218	408,304	1,694,647	277,305	147,598	18,846	550,781	37,537	1,032,067	662,580	—9,183	174,510	478,887	385,348
Texas Central	268	314,914	198,502	555,044	103,270	76,628	9,815	170,500	23,231	383,444	171,600		18,114	153,486	—75,063
Toledo, Peoria & Western	248	347,052	218,738	597,060	106,028	98,898	13,264	206,182	19,052	443,424	153,636		25,000	128,636	13,943
Toledo, St. Louis & Western	451	1,607,516	251,041	1,975,869	227,511	279,027	38,952	602,221	51,554	1,199,265	776,604		72,000	704,604	80,922
Western Ry. of Alabama	133	330,165	217,494	593,738	94,511	101,613	31,458	152,936	29,255	409,773	183,965	—2,358	22,873	158,739	33,099

* Began operations August 9, 1909; succeeding Missouri Pacific Ry. and Branches, and Central Branch Ry. † Mileage operated on December 31, 1908, 5,681. ‡ Mileage operated on December 31, 1908, 272. — Indicates Deficits, Losses and Decreases.

Harriman Lines Merger Hearing.

John A. Munroe, freight traffic manager of the Union Pacific, with office at Omaha, Neb., testifying in the Harriman merger case, said that he had been connected with Union Pacific since 1882.

As the result of a controversy between the Oregon Short Line and receivers of the Union Pacific as to the division of revenue, the Oregon Short Line in 1897 threatened to open the Ogden gateway to the Rio Grande. The receivers of the Union Pacific decided that the demands of the Oregon Short Line were excessive and would not comply with them. As a result the Union Pacific installed a special train to serve Portland via the Central Pacific and Shasta routes, this train running three times a week. It was taken off, however, as an impracticable venture, after the settlement of the difference with Oregon Short Line some 90 days later.

During his connection with the Oregon Short Line proper and Union Pacific between 1886 and 1897, Mr. Munroe said, there was almost no attempt to route business over the Short Line and Navigation Line to San Francisco via Portland, chiefly because the line to Portland itself is as long as the line through to San Francisco over the Central Pacific.

Mr. Munroe said that, aside from the prohibitively longer haul to San Francisco via Portland, there was the fact that any inducements, such as change of rates, absolutely necessary to open the Frisco route via Portland would have been suicidal. Southern Pacific would have deflected business from Union Pacific to the Denver & Rio Grande, and in such bulk as to have brought Union Pacific to terms.

Shortly after the rails were connected between Denver and Fort Worth, early in 1889, the Union Pacific consolidated with this line several of its branches, including that from Julesburg to La Salle, forming the Union Pacific, Denver & Gulf line, succeeded by the Colorado & Southern in 1893. Business has been and is accepted over this route, although the Council Bluffs gateway to Denver, a 569-mile line, or the Kansas City gateway to Denver, a 640-mile line, were worked preferentially, both yielding a much greater net return than the line via the Southern Pacific's Morgan steamship service to New Orleans and rails to Fort Worth, then to Denver.

In 1905 Union Pacific found it essential to open a rail and water route to Denver. From Savannah the Central of Georgia was used to Birmingham, then the 'Frisco system to Kansas City. This arrangement worked well until the 'Frisco notified Union Pacific that its relations with the Rock Island system necessitated giving the latter preference as to connections as against Union Pacific. Thereupon Union Pacific officials cast about for a new eastern connection, and made arrangements via Norfolk over the Norfolk & Western and connections.

On cross examination witness stated that rates appearing in the Transcontinental Bureau tariff sheets are largely made in conferences of representatives of lines west of the Missouri, whose acts are concurred in by eastern connections. In the matter of California rates Union Pacific would accord with Southern Pacific, and with Atchison on traffic out of Chicago. Union Pacific works the San Pedro to southern California points preferentially. Mr. Munroe said that this was not in competition with Southern Pacific, but with other lines. Southern Pacific being a virtual partner with Union Pacific in seeking this business. Mr. Munroe said that the division of revenue on through business to San Francisco, 54 per cent. to Union Pacific and 46 per cent. to Southern Pacific, was fairly justified by the Union's grade difficulties in Wyoming, which largely offset Southern's over the Sierras.

On direct examination, conducted by N. H. Loomis, general solicitor of the Union Pacific, Mr. Munroe stated that prior to 1901 the San Pedro not being in operation, Union Pacific worked all California business in conjunction with Southern Pacific, which was in a position to make rates to California, irrespective of the extent or position of other lines west of the Missouri. On cross examination by Mr. Severance, Mr. Munroe insisted that the reason for not attempting to open the Portland route to California points was not that arrangements with the Southern Pacific were satisfactory, but that the attempt to open the Portland route would ultimately have cost the Union Pacific an impossible amount. Otherwise, witness declared, the Portland route would have been opened in a moment.

Government's counsel asked whether the opening of the Portland route, which must have resulted, as witness testified, in a general rate war, would not have meant great loss to Southern Pacific on the large tonnage over the Sunset route, and whether this was not a club in the hands of Union Pacific over Southern Pacific.

Witness answered that it was a club over Southern Pacific, but a heavier one over Union. "It was a club," said Mr. Munroe, "in the same sense that I may hold a razor which enables me to commit suicide."

"Couldn't you slash the other man first?"

"Yes. He'd be slashed and I'd be dead."

Julius Kruttschnitt, vice-president of the Union and Southern Pacific lines and director of maintenance and operation of the merged lines, told at length of the improvement in the two roads since the merger. His testimony tended to show that far from being in restraint of trade, as is held by the government, the merger had stimulated commerce and had been the means of affording greater facilities for transportation across the continent.

Mr. Kruttschnitt said that in consequence of the work done in the last eight years to improve the system which he represents it is to-day in the highest state of efficiency. He testified that prior to the merger of 1901 the Southern Pacific as compared with the Union was in poor condition. Since then vast improvements had been made in rolling stock, rails and roadbed.

Improvements on Union Pacific and Southern Pacific from 1901 to 1909 were as follows:

On Union Pacific new locomotives to the number of 522; freight cars, 12,499; new steel rails laid, 2,428 miles; ties renewed, 17,220,000, equivalent to 6,146 miles; track ballasted, 1,455 miles; wooden bridges replaced, 88,256 lineal feet; iron and concrete bridges installed, 54,398 lineal feet.

On Southern Pacific, new locomotives, 920; passenger cars, 881; freight cars, 26,471; new steel rails, 3,970 miles; cross ties renewed, 24,372,000, equivalent to 8,555 miles of track; new sidings, 1,231 miles; old sidings taken up, 269 miles; wooden bridges repplaced, 136,411 lineal feet; iron and concrete bridges installed, 49,826 lineal feet.

Mr. Kruttschnitt stated that passenger service on the Sunset Route is fully up to that on the Union Pacific save as to frequency.

By reason of heavier locomotives and longer trains the Union and Southern Pacific ran their freight trains in 1909 at an average speed of 16.8 miles per hour, exclusive of stops, against 17.2 miles per hour in 1902, despite the great increase in traffic, which would otherwise have increased the number of trains and meeting points to an extent prohibitive of any movement on a single-track line.

On the Union Pacific line between Omaha and Ogden traffic density increased 180 per cent. between 1896 and 1909. During this period train density (the number of trains moved) increased only 80 per cent., due to the heavier car and train loading. For the same reason meeting points increased only 230 per cent. as against 680 per cent., which would have been the increase in difficulty of moving trains had there been no increase in train capacity. Explaining the increase in time in the freight train schedules between Council Bluffs and Ogden, which was 60 hours and 30 minutes in 1901, and 100 hours and 45 minutes in 1907 and since, Mr. Kruttschnitt pointed out that the company had increased its train load greatly and had done all possible to expedite the movement of traffic which had grown so decidedly in volume.

He said that the schedules of earlier years were not taken seriously, and that the schedules of recent years are the best possible service that can be given under the conditions, keeping in mind the increase in the price of labor and materials and the inability to increase rates. Mr. Kruttschnitt pointed out that the public had received a $154,000,000 bonus in the form of saving in cost of transportation, which has not advanced with wages and other prices, a decided offset to the increased freight train schedules.

Mr. Kruttschnitt stated that Union Pacific's average freight train speed between Council Bluffs and Ogden, which is 10 miles per hour, including stops, is a notably creditable per-

formance, considering the 8,000-ft. rise over the Rockies, as against the 15 miles per hour running time of the New York Central between New York and Chicago with level route and double or even quadruple tracks. Witness stated that 60 per cent. of the Union Pacific's line to Ogden is still single track. He also pointed out the retarding effect on freight movement of Federal laws regulating the continuous time crews may be kept at work, the inspection of cars, etc. In comparison with an average movement of 22.1 miles per day for all freight trains in the United States on the Union Pacific between Council Bluffs and Ogden, the average movement per freight train per day during 1909 was 41 miles, as against 32.7 miles on the Southern Pacific lines west of El Paso and 22.9 miles east of El Paso.

Mr. Kruttschnitt stated that the chief reason for the poorer showing on the Southern Pacific is the fact that it has four tidewater terminals, which he characterized as the graveyards of freight cars, shippers being allowed to keep goods in cars at tidewater a much longer period than elsewhere.

Mr. Kruttschnitt said that the passenger service has been greatly improved on the Sunset route since 1901. By transferring the terminus from New Orleans to Galveston the Sunset's freight service was greatly improved, owing to the better dock facilities, which expedited the exchange of freight.

During June and July of 1900 average time on Sunset route from New York to San Francisco for freight cargoes was 15 days and 7 hours, and in 1909 15 days and 5 hours. Via the Union Pacific the average time consumed in hauling freight from New York to San Francisco was 13 days.

The abandoned Algiers docks at New Orleans had a capacity of four steamers and 248 freight cars, as against a capacity of 14 steamers and 1,225 cars of the new docks at Galveston.

In 1900 steamers of the Sunset route had a gross tonnage of 43,478 tons against 87,968 tons in 1909, shortly to be increased to 113,568 tons by the addition of four large steamers now building. The older vessels were 12½ knot steamers, and averaged 160 hours between New York and Galveston, compared with 120 hours required by the latest seven ships, which have a speed of 16 knots. Since 1901 the tonnage added represented an expenditure of $8,782,000. Three large modern passenger steamers, 16 knot, were added to the Sunset service, New York to Galveston, in 1906 and 1907.

Comparing the elevations and curvatures to be overcome in moving freight from Portland to Ogden via Roseville, Cal., and Huntington, Ore., Mr. Kruttschnitt submitted evidence showing that the route from Portland to Granger, Wyo., via Huntington, Ore., as compared with that via Roseville, had an excess of 19,324 ft. rise and fall, 50,313 degs. of curvature, 542 miles actual distance, but that because of sharper grades via Roseville the cost of hauling one ton of freight that way is $5.94 against $2.75 per ton via Huntington.

On cross examination by Frank B. Kellogg, special counsel for the government, Mr. Kruttschnitt stated that from 1902 to 1907 many of the railways of the country expended large sums of money improving their property.

Asked regarding certain sums said to have been spent by the Pennsylvania and B. & O. in this period, Mr. Kruttschnitt disclaimed knowledge of the extent of expenditures on these lines. In comparison with an expenditure of $128,000,000 by the Atchison, witness said that Southern Pacific had spent over $250,000,000. Denying that he knew that all the railways of the country had made large expenditures for improvements since 1902 Mr. Kruttschnitt declared that he knew that a great many had not.

Asked why he selected 1897 as the first year in making the comparison with 1908, showing an increase of 17 per cent. in wages paid by Union Pacific on all classes of labor, witness repeated that the figures were those previously compiled for another case, the Salt Lake case, in which the railway was asked to show why certain rates were not too high and that that year was chosen because it showed the lowest point in the scale of prices after 1890. Questioned whether he thought there should be the same percentage increase in gross revenue from rates as in cost of labor and materials, Mr. Kruttschnitt said:

"No, railway men have come to expect so little that naturally I would not think that." Witness said that he did think, however, that there should be an increase in rates to somewhat offset the increased cost of operation.

Asked whether he considered 10 per cent. a reasonable dividend rate, Mr. Kruttschnitt said: "Yes. In comparison with 12 per cent. to 15 per cent. paid by banks, a 12 per cent. and 13 per cent. return on farm values, I do not think that a 10 per cent. dividend on a railway stock, only 6 per cent. of which represents railway earnings proper, the other 4 per cent. being a return on investments, as at all excessive."

Mr. Kellogg called attention to the increase in net earnings of the Union Pacific system from approximately $13,000,000 in 1899 to $38,234,814 in 1909, fiscal year. Explaining the decrease in the operating ratio from 57 per cent. in 1899 fiscal year to 47 per cent. in 1909, Mr. Kruttschnitt pointed out that in 1908 the operating ratio or proportion of gross expended in operation was 54 per cent. In the fiscal year ended June 30, 1909, all railways were still skimping expenses.

Witness agreed that in 1909 Union Pacific's gross earnings were more than double those of 1899, and that the expenditures for grade and curve elimination, ballasting and the best of equipment had been made to increase net under unchanged rates.

Q. "You did not make these expenditures for charity then?"

A. "No. But as it turned out they enabled us to be very charitable indeed, the railways bearing the brunt of the 1907 panic, the Union and Southern Pacific alone benefiting the public to the extent of $154,000,000, paid out as increase in wages and cost of materials without any increase of rates."

Counsel for government emphasized the importance of reduction of 90 miles in distance between Council Bluffs and San Francisco since 1901, elimination of grades and curvatures, and increase of traction power, as regards running time. Witness stated that no man could keep running time of trains nine years ago at his command, but was perfectly willing to have schedules prepared.

Mr. Kruttschnitt stated that he did know that the passenger service at present is highly satisfactory to the public, and with that condition achieved he did not concern himself with ancient history.

Mr. Kruttschnitt under cross examination said that the 100-hour freight train between Council Bluffs and Ogden had been on time 89 per cent. over a long period of time of its runs, and that Salt Lake merchants in large majority were on record as perfectly satisfied with this service.

Asked whether the law had not increased the period during which live stock may be carried without watering, from 28 to 36 hours, tending to decrease delay due to government regulation, Mr. Kruttschnitt stated that there were provisos which made it dangerous for the company to take advantage of this additional eight hours. Witness called attention to the fact that federal regulation of inspection has added six hours and six minutes since 1901 to the running time between Council Bluffs and San Francisco.

Referring to the increase of 89 per cent. in taxes on the Union Pacific between 1901 and 1909, Mr. Kruttschnitt stated that there had undoubtedly been an increase in the value of the property, but he could not undertake to say whether it had been proportionate to the tax increase. Between 1899 and

NEW YORK CITY RAILWAYS EARNINGS IN THE THREE MONTHS ENDED SEPTEMBER 30.

	Total operating revenue.		Total operating expenses.		Operating income.		Net corporate income.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
Hudson & Manhattan	$374,400	$128,607	$196,097	$134,239	$325,267	$97,985	†$17,513	†$60,009
Interborough Rapid Transit, Elev. Div.	3,469,627	.....	1,445,187	.....	*1,620,486	.....	.....	.....
Interborough Rapid Transit, Subway Div.	2,826,941	.....	1,086,910	.....	*1,685,811	.....	.....	.....
Both divisions	.....	5,507,316	.....	2,675,710	.....	2,433,980	*787,629	91,189
Brooklyn Rapid Transit	5,773,539	5,165,990	3,239,020	3,085,552	2,207,380	1,851,520	766,648	618,088
Metropolitan Street Railway System	3,743,739	3,609,953	2,391,339	3,343,252	1,004,392	†107,831	378,765	†608,077
Third Avenue System	2,107,329	1,864,956	1,148,281	1,258,997	867,112	537,957	660,795	330,250

*Subject to deduction for depreciation of way and structures and equipment, which was not charged to operating expenses. †Deficit.

1908 the capital invested in railways in the United States increased 52 per cent.

Mr. Kruttschnitt declared that he was unable to see the relation of the magnitude of the dividend rate to the subject of freight tariffs as regards one or two lines, since any reduction in freight rates on Union and Southern Pacific would simply crowd their lines with business and bankrupt other roads.

At this point Mr. Kruttschnitt's testimony was concluded, and Vice-President A. L. Mohler, general manager of the Union Pacific, was sworn.

Mr. Mohler, under direct examination by N. H. Loomis, counsel for the Union Pacific, enumerated the changes of line made on the Union Pacific after its acquisition by the present management. Over 150 miles of the old line were abandoned and 188 miles reconstructed. Two tunnels were bored; the Aspen tunnel, 6,100 ft. long, and the Sherman tunnel, 1,800 ft. long on top of the Rockies, reducing the highest elevation of the Union Pacific, at Sherman, to 8,011 ft., a saving of 247 ft.

Mr. Mohler cited extensions of the Union and the growth of the double-track from 69 miles in 1900 to 459 miles now in operation, beside which 226 miles are under actual construction, it being absolutely necessary to double-track the main line as rapidly as possible. Block signals are in operation over the entire line from Council Bluffs to Ogden, and to Denver, and from Kansas City to Topeka, while additional mileage under block signals is being added rapidly between Topeka and Salina, Kan., and between La Salle, Colo., and Cheyenne, Wyo.

Mr. Mohler stated that the block signal system costs the company about $225,000 annually, the average cost for operation being $80 per signal per annum, Union Pacific having 1,459 miles of electrically guarded road in operation.

At the present time 45.36 per cent. of the company's freight equipment is steel or steel underframes. Beginning with 1906, over 80 steel passenger cars have been purchased. In 1907 orders were given that all passenger equipment procured should thereafter be of steel, this type costing 50 per cent. more and adding nothing to revenue, but being a safeguard against injury of passengers. Traction power has been increased 39 per cent. since 1901; the observation car equipment has been increased twelvefold, and the number of dining cars from ten to forty.

Ton-mileage between Council Bluffs and Ogden increased 113 per cent. between 1900 and 1909. Passenger train mileage during the same period increased 69.5 per cent., and the number of passenger trains per day from 7.31 in 1900 to 12.38 in 1909, or 68 per cent. This increase in traffic compelled a slowing down in the schedules of trains, increasing the number of meeting points.

Mr. Mohler testified that the train dispatchers' sheets for 1900 to 1903, taking random dates in June and October as the lightest and heaviest traffic months, show that the fast freight train, with a 54 hour and 30 minute schedule, consumed anywhere from 58 to 108 hours in 1900, 65 to 129 hours in 1901 and 78 to 108 hours in 1903 for the run from Council Bluffs to Ogden. The schedule was lengthened to 58 hours, 25 minutes in 1901, 64 hours in 1902 and 101 hours in 1907.

Commenting on the greater difficulties to be met in operating the Union Pacific as compared with eastern lines, Mr. Mohler pointed out that in the first 500 miles out of Council Bluffs Union Pacific trains have to be lifted over 1¼ miles.

In 1901 Union Pacific moved a few cars faster and many slower than at present, the officials having endeavored to remove a great deal of discrimination, with the effect that all freight between Council Bluffs and Ogden moved at the rate of 41.5 miles per day between January, 1907, and February, 1909, against 26.7 miles on the Santa Fe from Chicago to Kansas City, Denver and Albuquerque; 21.5 miles over Great Northern, St. Paul to Seattle; 21.4 miles over Northern Pacific, St. Paul to Portland; 29.6 miles over Burlington, Chicago to Denver; 24.7 miles over the St. Paul, Chicago to Seattle; 23.9 miles over Pennsylvania and 25.2 miles over the New York Central, New York to Chicago.

On cross-examination by Mr. Severance, Mr. Mohler agreed that shortening the Council Bluffs-Ogden line 40 miles, eliminating grades and curvatures and adding double track had a general effect of expediting operation, but that all of the improvements made to a recent date had been absorbed in the more than proportionate increase of traffic. The chief reason that the Kansas City-Denver line is not being double tracked is that a cut-off to the main line has been developed by building from Menoken to Marysville, Kan., where connection is made with the St. Joseph & Grand Island, over which traffic runs to Grand Island on the main division. This shortens the line between Kansas City and Cheyenne 120 miles, as compared with the Kansas City-Denver-Cheyenne route.

The Possible Strike of Coal Miners.

A man who is in very close touch with the coal trade tells the *Railway Age Gazette* that owing to various circumstances a strike of the United Mine Workers of America on April 1 is not improbable. He sums up the situation as follows:

Owing to the severe weather of the last few months the railways have been unable to haul the usual amount of coal to the markets. The consequence is that the amount in storage is much smaller than usual at this time. The retail coal dealer, the manufacturer and the railway are about out of coal. The western railways, for example, usually supply their own demands from mines along their lines, but several roads have recently bought large quantities of coal in Pennsylvania which must yet be hauled to them. In order to accumulate supplies of coal before April 1, when the contracts of the operators with the mine workers will expire, it will be necessary for the railways to haul much more coal than they usually do in the same length of time. The mine workers know the situation and are showing a strong disposition to take advantage of it. They have asked for an advance in wages of 10 cents a ton for pick-mining coal and a corresponding advance in wages for mining coal which is produced by machinery.

The miners in Ohio apparently hold the key to the situation. The mines in that state are operated by union labor. The mines in West Virginia are operated by non-union labor. The mine operators of Ohio say that they cannot increase wages and compete with the operators in West Virginia unless the latter also raise wages, and the latter are so situated that it may not be necessary for them to raise wages. The consequence would be that the mine operators of Ohio would have to refuse an advance. At the last meeting of the United Mine Workers of America at Indianapolis it was agreed that no settlement with the operators in any district would be made unless the same settlement was made with them in all districts, the districts usually being states. Consequently if no settlement should be reached in Ohio none could be made anywhere else, and a general strike would result. It is less than 40 days until the question of wages in the coal fields must be settled.

Advance in Coal Rates in Illinois.

The railways hauling coal from Illinois mines to Chicago have decided to raise the rates, effective April 1, an average of 10 cents a ton. The advances from the various groups of mines are shown by the following figures, giving the new and the old rates:

	Old.	New.		Old.	New.
Harrisburg	$1.05	$1.07	Danville	.67	.77
Carterville	.98	1.10	Clinton	.70	.80
Springfield	.75	.85	Brazil	.70	.80
Northern Illinois	.50	.60	Linton	.80	.88
Fulton County	.65	.75			

The coal traffic is an important item in the traffic of the roads affected. The quantity hauled from the Illinois mines to Chicago in the nine months ended June 30, 1909, was 8,000,000 tons. The rates above given are those from the various groups of mines to Chicago. Similar advances will be made from other points in northern Illinois.

INTERSTATE COMMERCE COMMISSION.

Rules providing for demurrage and storage charges at New Orleans on shipments of forest products shipped on local bills of lading "for export" after ten days of free time, the same as on other commodities shipped under like conditions, is found by the Interstate Commerce Commission to be neither

unlawful nor unreasonable, nor unjustly discriminatory as compared with rules which do not provide for demurrage or storage charges on shipments that are moved under through export bills of lading. (17 I. C. C., 496.)

Service performed by a private railway within an industrial plant is held by the Interstate Commerce Commission to be a plant facility. It further is held that the expense of operating such a line must be borne entirely by the owners of the manufacturing or industrial plant, and that no railway under the guise of the absorption of a switching charge may lawfully sustain the private road. (17 I. C. C., 514.)

Rates on Colorado Coal Reduced.

Cedar Hill Coal & Coke Co. et al. v. Colorado & Southern et al. Opinion by Commissioner Clements.

Complainants are engaged in the operation of coal mines in southern Colorado in what is known as the Walsenburg district, located along the lines of the Colorado & Southern and the Denver & Rio Grande. This district is about 44 miles south of Pueblo, and extends north and south about 15 miles.

The defendants admit that there are no joint through rates on coal from complainants' mines to points on the Santa Fe. Neither do we understand that any serious claim is made that the present arrangement by which through billing is denied and rebilling is required at junction points constitutes a "reasonable or satisfactory" through route.

In the opinion of the commission the record in these cases shows that no reasonable or satisfactory through routes exist for this traffic except to certain points reached by other carriers where there are joint rates in effect; leaving out these points, an order will be issued requiring the establishment of through routes from the complainants' mines to points on the lines of the defendant carriers as petitioned for in each of these complaints. That is, joint through routes from complainants' mines in the Walsenburg district, to points in Texas and New Mexico, on the Southern Kansas, Eastern of New Mexico, Pecos & Northern Texas, and Pecos River Railroad, via the Colorado & Southern to Texline, Tex., and the Fort Worth & Denver City to Amarillo, Tex.; joint through routes from complainants' mines to points on the Santa Fe and the Eastern Railway Company of New Mexico in New Mexico and Texas, via Trinidad, Colo.; joint through routes from complainants' mines to points on the line of the Santa Fe in Kansas, via Pueblo, Colo. There will be excepted certain points which already have through routes and joint rates over the lines of other carriers, and no points in Oklahoma will be included, as the record is not conclusive as to whether those points should be reached via the Amarillo gateway or via Pueblo.

The complainants include in their petition figures showing what they conceive to be the proper joint rates on this traffic. The following table gives the absolute rate and the per-ton-per-mile rate from Walsenburg and from Cañon City to representative points throughout the markets covered by the petition. There are also shown the rates asked for in the petition.

After careful consideration of all the facts, circumstances and conditions bearing upon the questions involved, we conclude that joint rates should be accorded by defendants on coal from the Walsenburg district to points on the Santa Fe lines in Kansas, and those points in Texas east of but not including Joel, which should not exceed those shown in schedules on file of rates between Cañon City, Colo., and those points, and referred to by tariff number in the order. To points in Texas and New Mexico west of and including Joel, Tex., but not including points in New Mexico on the line running north of Belen, we find that the rates should not exceed the rates to these points from Trinidad, Colo., shown in tariff schedules specifically referred to in the order, plus a differential of 30 cents per ton; while to points north of Belen the rates should not exceed the rates to said points from Trinidad, Colo., shown in tariff schedules specifically referred to in the order, plus a differential of 25 cents per ton. These differentials are the same as those maintained generally by the defendants in corresponding territory where they have rates from both Cañon City and Trinidad.

Rate on Coal, Per Ton of 2,000 Pounds.

To—	1. From Walsenburg district via Amarillo.	2. Distance.	3. Rate per ton per mile.	4. From Cañon City district.	5. Distance.	6. Rate per ton per mile.	7. Rates asked from Walsenburg.	8. Distance.	9. Rates asked per ton per mile.
Panhandle, Texas	$6.60	358	$0.0184	$3.60	737	$0.0049	$3.10	358	$0.0086
Plainview, Texas	6.80	370	.0183	3.80	839	.0045	3.40	370	.0092
Roswell, N. Mex.	11.60	497	.0233	4.35	976	.0045	3.50	497	.0070
Artesia, N. Mex	11.60	549	.0211	4.60	1,018	.0045	3.75	549	.0069
Pecos, Texas	9.80	671	.0146	5.05	1,140	.0044	4.20	671	.0063
Garden City, Kan.	.....	...	.....	2.75, 2.25*	597	.0046, .0038*	2.50	613	.0040
Emporia, Kan.	.....	...	.....	3.50	533	.0065	3.25	549	.0059
Kansas City, Mo.	.....	...	.....	3.75	646	.0058	3.50	642	.0054
Guthrie, Okla.	.....	...	.....	3.25	627	.0051	....	...	.....

*Nut.

STATE COMMISSIONS.

The Railroad Commission of Louisiana proposes to amend its Order No. 781, applying on household goods and immigrants movables, so as to provide that in case of loss or damage the carrier's liability shall be limited to $10 per 100 lbs. on household goods instead of $5, as now provided.

The Railroad Commission of Louisiana proposes to adopt an order requiring that all second-hand machinery to be used for building or reconstruction purposes shall be transported between points within the state at one-half the regular tariff rates applying on new machinery, except in cases where special commodity tariffs now in effect carry a lower rate.

COURT NEWS.

The federal court at Springfield, Ill., has issued an injunction restraining the attorney-general of Illinois and the various state's attorneys from interfering with the Chicago, Peoria & St. Louis raising its passenger fare from 2 cents to 3 cents a mile. An amended petition filed by the receivers, John P. Ramsey and Henry M. Merriam, states that the value of the property used for passenger business in Illinois during the period from July 1, 1907, to June 30, 1909, was $800,000, and that a reasonable return on its value would be at least $48,000 a year. The total earnings from passenger service during this period are given at $510,230, and the expenses incident to the service, including no fixed charges except taxes, as $529,121, leaving a deficit of $9,890.

The Supreme Court of the United States has sustained the Supreme Court of South Carolina in holding that the law requiring railways to pay a penalty of $50 for failure to adjust claims for losses within 90 days is valid, as applied to intrastate traffic only.

Reversing the decision of the Supreme Court of Alabama, the Supreme Court holds unconstitutional, as applied to the Southern Railway, the Alabama statute levying an annual franchise tax on foreign corporations doing business in the state. The court held the act to be an improper discrimination against foreign corporations. The same decision was given in the suits of the Louisville & Nashville and other roads for the recovery of taxes paid under the law.

In a suit of the state of Kansas against the Missouri Pacific the Supreme Court sustains the right of the state railroad commissioners to compel the road to run a passenger train on the Madison branch, where only mixed trains were run, notwithstanding the fact that the operation of the train might prove unprofitable. The decision was by Justice White. The railway, in its defense, claimed that if the deficit from the operation of an unprofitable branch were to be met by using the profits arising from business on other parts of the line, the property of the road would be taken by the state in violation of the constitution.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Charles Ehlers has been appointed auditor of the Mississippi Central, with office at Hattiesburg, Miss., succeeding W. L. Greenhalgh, resigned to accept service elsewhere.

L. S. Price, Jr., has been appointed assistant secretary and assistant treasurer of the Gulf Line, with office at Sylvester, Ga., succeeding C. H. Reynolds, resigned to go to another company.

George A. Kyle, chief engineer of the Oregon Trunk Railway at The Dalles, Ore., has been elected vice-president, with office at Portland, Ore., succeeding Jackson Smith, deceased. Ralph Budd, formerly engineer maintenance of way and bridges and buildings of the Panama Railroad at Colon, Panama, succeeds Mr. Kyle.

Operating Officers.

R. Emerson, assistant to general manager of the Lehigh Valley at South Bethlehem, Pa., has resigned, to go to the Atchison, Topeka & Santa Fe.

R. W. Edwards has been appointed superintendent of terminals of the Kansas City Southern at Kansas City, Mo., succeeding W. J. Donovan, resigned to engage in other business.

P. Sorenson has been appointed an assistant superintendent of the Montana division of the Oregon Short Line, with office at Pocatello, Idaho, succeeding T. W. Jackman, assigned to other duties.

P. H. McFadden, general roadmaster of the Grand Trunk Pacific at Melville, Sask., has been appointed superintendent of the Prairie division, with office at Melville, succeeding W. C. C. Mehan, transferred, and the office of general roadmaster is abolished.

Paul A. Hewitt, auditor of the Cleveland, Cincinnati, Chicago & St. Louis, the Cincinnati Northern and the Peoria & Eastern at Cincinnati, Ohio, has been appointed manager of the Central Railway Clearing House, with office at Buffalo, N. Y., succeeding Ernest F. Haubold, transferred.

R. R. Auerbach, roadmaster of the Second district, Montana division, of the Northern Pacific at Livingston, Mont., has been appointed trainmaster of the First district, with office at Livingston, succeeding C. E. Shepard, granted an indefinite leave of absence. A. Larson succeeds Mr. Auerbach, with office at Livingston.

C. T. Mason, assistant superintendent on the Birmingham sub-division of the St. Louis & San Francisco at Birmingham, Ala., has been appointed assistant superintendent on the Tupelo sub-division, with office at Amory, Miss., J. F. Liston, trainmaster of the Birmingham terminals and the Bessemer branch, suceeds Mr. Mason, and F. J. Lee succeeds Mr. Liston.

Bushrod W. Taylor, superintendent of the Louisville division of the Pennsylvania Lines West of Pittsburgh at Louisville, Ky., has been appointed a general agent operating department of the Pittsburgh, Cincinnati, Chicago & St. Louis, with office at Louisville. F. J. Kron, superintendent on the Northwest system at Cambridge, Ohio, succeeds Mr. Taylor, with office at Louisville, and J. C. McCullough, trainmaster at Pittsburgh, Pa., succeeds Mr. Kron, effective March 1.

Traffic Officers.

Thomas F. Farmer has been appointed a commercial agent of the Texas Central, with office at Waco, Tex.

G. C. Brown has been appointed a commercial agent of the Chicago Great Western, with office at Cleveland, Ohio.

John F. Ryan has been appointed a traveling freight agent of the New Orleans, Mobile & Chicago, with office at Memphis, Tenn.

E. W. Schneider has been appointed a contracting freight agent of the New York Central Lines, with office at Salt Lake City, Utah.

G. W. Boogher, traveling agent for the Chicago & North Western, with office at St. Louis, Mo., has resigned to engage in other business.

James M. Seibert, statistician of the Missouri Pacific-Iron Mountain system, has been appointed general agent in the passenger department, with office at St. Louis, Mo.

R. A. Belding, general agent in the freight department of the Chicago Great Western, with office in New York, has been appointed an assistant general freight agent in New York.

G. F. Herr, general Pacific coast agent of the El Paso & Southwestern at San Francisco, Cal., has been appointed general agent of the Denver & Rio Grande, with office at Los Angeles, Cal., succeeding S. C. Nash.

W. C. Connor, Jr., general freight and passenger agent of the Trinity & Brazos Valley at Houston, Tex., has been appointed traffic manager of the St. Louis & San Francisco lines east of Houston, with office at Houston.

W. F. Morris, Jr., traveling passenger agent of the Great Northern at Pittsburgh, Pa., has been appointed a traveling freight agent, with office at Buffalo, N. Y., succeeding P. E. Meaney, transfered to Milwaukee, Wis., as general agent.

J. L. Martin, freight agent of the Asheville lines of the Southern Railway at Louisville, Ky., has been appointed a traveling freight agent of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern, with office at Atlanta, Ga.

General agents have been appointed in the passenger department, Atlantic service of the Canadian Pacific's steamship lines, as follows: H. M. MacCallum, with office at Chicago; S. J. Sharp, with office at Winnipeg, Man., and I. E. Suckling, with office at Toronto, Ont., effective March 1.

Engineering and Rolling Stock Officers.

The title of W. L. Ekin, engineer of maintenance-of-way of the Michigan division of the Vandalia at Logansport, Ind., has been changed to division engineer.

J. W. Small has been appointed superintendent of machinery of the Kansas City Southern, with office at Pittsburg, Kan., succeeding F. R. Cooper, resigned.

D. M. McKenna has been appointed foreman of the car department of the International & Great Northern, with office at Palestine, Tex., succeeding W. E. Looney, resigned.

J. E. Schiller has been appointed a roadmaster on the Minidoka Roadmaster's District (Idaho division) of the Oregon Short Line, with office at Pocatello, Idaho, succeeding Frank McGonigle, resigned.

L. M. Perkins, division engineer of the Northern Pacific at St. Paul, Minn., has been appointed engineer of maintenance of way of the lines east of Paradise, Mont., with office at St. Paul, succeeding W. C. Smith, promoted.

R. M. Conley has been appointed a road foreman on the Western division of the Western Pacific, with office at Sacramento, Cal., and W. D. Gilliott has been appointed a road foreman on the Eastern division, with office at Elko, Nev.

OBITUARY.

George W. Storer, assistant general passenger agent of the Boston & Maine at Boston, Mass., died on February 17 at his home in Arlington. Mr. Storer was born in May, 1850, at West Cambridge (now Arlington) and began railway work in February, 1867.

E. J Randall, engineer of maintenance-of-way of the Union Railroad at Port Perry, Pa., died at his home on February 11. Mr. Randall was born in 1860 and was educated in Nova Scotia. He began railway work in 1880 and served at first on the New York & New England and later on the Leavenworth, Topeka & Southwestern, and the Boston, Hoosac Tunnel & Western. In 1887 he was made assistant engineer of the Toledo, St. Louis & Kansas City, now the Toledo, St. Louis & Western, and in 1890 was appointed assistant engineer of the Denver & Rio Grande, returning two years later as engineer to the Toledo, St. Louis & Kansas City. On this road he was later engineer of maintenance-of-way and then land and tax agent. In September, 1901, he went to the Bessemer & Lake Erie as principal assistant engineer, and four years later was appointed engineer maintenance-of-way of the Union Railroad.

Railway Construction.

New Incorporations, Surveys, Etc.

Arkansas, Oklahoma & Western.—An officer writes that work is now under way in Arkansas by the W. R. Felker Construction Co., Rogers, building a connecting line about seven miles long east to a connection with the Monte Ne branch, and from the eastern terminus of that line at Monte Ne east via Canuck, thence southeast to Huntsville, 29 miles. The line will pass through a rough, mountainous country. The work includes two steel bridges, one over White river and the other over War Eagle creek. (Feb. 18, p. 379.)

Atchison, Topeka & Santa Fe.—According to press reports the branch of the Gulf, Colorado & Santa Fe that now runs from Temple, Tex., west to San Angelo, is being extended northwesterly to Sterling City, about 50 miles, thence west to Pecos, where connection is to be made with the Pecos Valley line of the Santa Fe, a total of 200 miles. Construction work is also under way on other lines in western Texas. The grade for the Texico-Coleman cut-off is finished from Coleman northwest to Sweetwater, 80 miles, and about 25 miles of track has been laid. This cut-off will be 310 miles long. Between Sweetwater and Lubbock, 125 miles, part of the grade is finished. Construction work is said to be under way on a line from this cut-off at a point about 15 miles south of Lubbock, south to Stanton, about 100 miles, thence southeast to Sterling City, an additional 75 miles. It is said that the branch now under construction from Lometa, west up the valley of the San Saba river and the Brady creek will be continued west to San Angelo, 125 miles. An officer writes that contracts are let on about 100 miles from Lometa west to Eden. According to press reports contracts have been let to the Morey-Faulhaber Construction Co., St. Louis, Mo., for the first 30 miles from Lometa west; to Levy & Owens, Galveston, Tex., for the second 30 miles, and to the C. H. Sharp Construction Co., Kansas City, Mo., for the last 40 miles. (Feb. 18, p. 379.)

This company has finished 26 miles of new double-track on the Illinois and Missouri divisions since July, 1909, and has authorized and under construction or contract 253 miles on the Illinois, Missouri and Albuquerque divisions and further west, of which 100 miles is nearing completion. It will take about one year to finish all the work. The plans provide for second track at most congested portions of the line like that between Winslow, Ariz., and Seligman, where there is a frequent meeting of freight and passenger trains. A cut-off on this section shortening the distance 12 miles, will be completed next fall. Double-tracking east of Kansas City, Mo., is nearing completion. There are stretches of second and third track between Kansas City and Newton, and the Abo Pass line which will provide two routes to Albuquerque, N. Mex.

Brownwood North & South.—This company is said to be asking bids up to March 10 for clearing and grading about 18 miles of line from Brownwood, Tex., north to May. J. J. Timmins, H. Ford and others, of Brownwood, are incorporators. John Mead, chief engineer. (Feb. 11, p. 328.)

Canadian Pacific.—The new lines to be built in western Canada during 1910 are as follows: Regina, Sask., southeast to Griffin, 73 miles, on the Weyburn-Stoughton line, it is intended ultimately to carry this line further to the southeast to a connection with the line being built westerly from Lander, Man.

Regina north to Bulyea, 50 miles; this line will give direct connection between Saskatoon and Regina, and will be built on the east side of Last Mountain lake.

Outlook, Sask., to Macklin, 147 miles; this is a section of the Moose Jaw-Lacombe line, which is finished from Moose Jaw northwest to Outlook. The extension will run west from Outlook for 93 miles, then northwesterly for 54 miles to a connection with the Saskatoon-Wetaskiwin line at Macklin station, and will provide direct connection from Moose Jaw to Edmonton, Alb.

Regina, northwest to Colonsay, 110 miles. This line will run on the west side of Last Mountain lake to a point about 40 miles east of Saskatoon, on the Pleasant Hills branch at Colonsay.

Weyburn branch, in southern Saskatchewan, has been extended west of Weyburn for 26 miles and will be further extended west for 25 miles.

A branch from Langdon, Alb., which is just east of Calgary, has been built northwards for 32 miles, and is to be extended east 30 miles into the irrigation belt.

A new line will also be built into the fall wheat district of southern Alberta. This line from Kipp, Alb., just west of Lethbridge, has already been built for 28 miles from Kipp northward to Carminigay, and is to be extended north 30 miles.

Work will also be started on the Kootenay valley line from Golden, B. C., on the main line in the Rocky mountains, south towards Fort Steel junction, on the Crow's Nest Pass, on about 20 miles. This makes a total of about 517 miles to be built this year. The company will also put up two large bridges, one over the North Saskatchewan river from Strathcona, Alb., to Edmonton, to cost $1,500,000, and the other over the South Saskatchewan river at Outlook, Sask., to cost $580,000. (Feb. 18, p. 379.)

Central Idaho.—According to press reports this company has been organized in Utah by the Oregon Short Line interests to build from Owinza station, Idaho, on the main line of the Oregon Short Line, northwest to Boise, thence via Middletown and New Plymouth to Ontario, Ore., about 220 miles. W. H. Bancroft, president; J. A. Reeves, vice-president, and G. H. Jenkinson, treasurer, all of Salt Lake City, Utah.

Chesapeake & Ohio.—Announcement is made that plans covering improvements for 1910 will call for an expenditure of about $5,000,000. Most of the money will be spent for double-tracking and other additions to facilities.

An officer writes that complete plans for a yard at Silver Grove, Ky., have not yet been finally adopted. Contracts have been let for a small portion of the grading to Langhorne & Langhorne, Lynchburg, Va. Other work recently let is as follows: Five miles of branch line on Horse creek, a branch of the Coal River line in West Virginia, to Johnson & Briggs, Richmond, Va.; an 11-mile extension of the Guyandotte Valley branch from Dingess Run to the mouth of Buffalo creek, in West Virginia, to Boxley Bros. & Frazier, Logan, W. Va.

Chicago, Burlington & Quincy.—According to press reports this company will spend a large amount of money for improvements in Wyoming and the Yellow Stone Park section. The plans provide for several new branch lines and track betterment work at a number of points. Considerable improvements are to be made in Nebraska on the Omaha and Lincoln divisions. This will include double-tracking the Omaha division between Lincoln and Waverly. Ballasting on 65 miles between O'Neill and Sioux City, and extensive bridge rebuilding and track betterment work is also to be carried out. Eighty-five miles of the main line near Lincoln will be laid with new 90-lb. rail and west of Lincoln ballasting will be carried out on 100 miles. Improvements are also to be made on the Denton cut-off, the Milford line and on several other branches. It is understood that all this work will be completed during 1910.

Chicago, Rock Island & Pacific.—An officer writes that it is the intention of the company to fully ballast the entire line between St. Louis, Mo., and Kansas City, 297 miles. The work includes widening all the embankments preparatory to ballasting, taking out sags wherever necessary, filling in all the long and high trestles and putting in reinforced concrete boxes to take care of the water-way. The company also expects to lay about 100 miles of new 85-lb. rail on this line. (Feb. 4, p. 280.)

Regarding the reports that plans are being made for a cut-off from Atlantic, Iowa, west to Council Bluffs, about 45 miles, an officer writes that he has not been officially advised that this work will be carried out. (Feb. 18, p. 379.)

Cleveland, Cincinnati, Chicago & St. Louis.—According to press reports work is to be started in June on the Evansville, Mount Carmel & Northern from Mount Carmel, Ill., south to Evansville, Ind., 43 miles. The McGarth Construction Co., it is said, will have charge of the work. (Nov. 5, p. 894.)

Columbus, Mississippi & Western Alabama.—Plans are nearing completion to build from Winfield, Ala., southwest via Vernon to Columbus, Miss., about 50 miles. The line will

provide Columbus with direct connection to the Alabama coal fields. Charles F. Sherrod, Columbus, is said to be interested. (See Alabama Roads, Dec. 10, p. 1166.)

Denver, Laramie & Northwestern.—See Denver, Laramie & Northwestern Railway under Railway Financial News.

Duluth, Rainy Lake & Winnipeg.—An officer writes that contracts are to be let this spring to build the Duluth, Winnipek & Pacific from Virginia, Minn., south to Duluth, 74.4 miles. Thirty miles of the work will be heavy. There will be bridges over the St. Louis, White Face, Clouquet and Midway rivers, also over a number of streets in West Duluth, and one tunnel 500 ft. long. The company also plans to put up ore docks and shops in West Duluth. (Feb. 11, p. 329.)

Duluth, Winnipeg & Pacific.—See Duluth, Rainy Lake & Winnipeg.

Evansville, Mount Carmel & Northern.—See Cleveland, Cincinnati, Chicago & St. Louis.

Fort Smith & Interurban.—Incorporated in Arkansas, with $100,000 capital, to build a line from Greenwood, Ark., northwest via Bonanza to Fort Smith, about 25 miles. George Sengel, president.

Gainesville Midland.—An officer writes that there is no truth in the press reports that this company will build an extension into North Carolina in the near future. The company has finished a preliminary survey for an extension of 50 miles north of Gainesville, Ga., to timber lands, and there is a possibility of this line being constructed during the next year.

Gulf, Colorado & Santa Fe.—See Atchison, Topeka & Santa Fe.

Intercolonial.—This company is asking for bids to build eight miles between Chatham, N. B., and Nelson.

Bids are wanted by A. W. Cambell, chairman of the Government Railways Managing Board at Ottawa, Ont., until March 15, for building a line between George's river, N. S., on the Intercolonial and Sydney Mines, 9.09 miles. Plans are at Sydney Mines and at the office of the chief engineer, Moncton, N. B.

Kanawha & Michigan.—Improvements are to be made to eliminate heavy grades and sharp curves. The work includes elevating the tracks and straightening the line at Kanauga, Ohio, on the west bank of the Ohio river opposite Point Pleasant, W. Va. The improvements will cost about $100.000. (Oct. 8, p. 661.)

Kansas City, Mexico & Orient.—Contracts have just been let to build the branch from San Angelo, Tex., south to Del Rio, 165 miles. Work is to be started March 1. (Jan. 14, p. 113.)

Lake Shore & Michigan Southern.—An officer writes that such work as may be carried out during 1910 will be at various points where additional tracks are most required and will not be continuous. The work will be done by the company's own forces.

Midland Pennsylvania.—Incorporated in Pennsylvania, with $430,000 capital, to build from Millersburg, Dauphin county, Pa., northeast via Gratz and Gordon to Ashland, in Schuylkill county, 43 miles. W. E. Harrington, president; J. H. Williams, C. G. Shadle, H. B. Reeves, J. F. Romberger and H. J. Sulliman are directors.

Minneapolis, St. Paul & Sault Ste. Marie.—Announcement is made that this company will spend $8,000,000 for improvements during 1910. Of this amount $3,000,000 is to be spent upon the Chicago division and the remaining $5,000,000 for improvement of the main line and the branch into Duluth. (Feb. 11, p. 329.)

Missouri, Kansas & Texas.—This company has grade revision work under way on a 90-mile section between the Red river and McAlester, Okla. When the improvements are completed the total expenditure on this work will be about $5,000,000. (Aug. 6, p. 259.)

Norfolk & Western.—An officer writes that the contract has been let to Joseph H. Sands, Roanoke, Va., for all roadbed construction necessary for the low-grade cut-off around Petersburg, Va. The line is to be 8.91 miles long. (Feb. 18, p. 384.)

Northern Pacific.—According to press reports from Tacoma, Wash., construction work will be started soon on a new water grade line from Tacoma northwest via Point Defiance and the narrows. There is to be a tunnel at Point Defiance 900 ft. long. It is said a number of changes will be made in the Tacoma yards. Peter Sims, Spokane, is to have charge of the work on a percentage basis.

Ohio Electric.—This company has given a mortgage to raise funds, part of which are to be used for extensive improvements, including double-tracking part of the line.

Oklahoma City & Pan-Handle.—Incorporated in Oklahoma, with $250,000 capital and headquarters at Oklahoma City, Okla. Plans call for a line from Oklahoma City southwest to the western boundary of Oklahoma, about 160 miles. The estimated cost of the line is $2,000,000. The directors include: J. B. Johnson, A. Key, S. P. Bennett, T. R. Anderson and E. J. Dupree, Oklahoma City, and H. E. Chapman, Altus.

Ontario Roads.—Residents of Niagara-on-the-Lake, Ont., are interested in a project to build a line from that place south to Queenstown, about 10 miles. George Pettit, Welland, is the principal promoter.

Oregon & Washington.—Contract is said to have been given to Dibble & Hawthorne, Tacoma, Wash., for constructing yards at a point between the Northern Pacific drawbridge and the Prescott yards. (Feb. 4, p. 280.)

Oregon Railroad & Navigation Co.—An officer writes that contracts have not yet been let for work to be carried out on a change of line between Yoakum, Ore., and Pendleton, 13 miles. The work will be heavy, with several channel changes of the Umatilla river. Maximum grades will be 31.7 ft. per mile and maximum curvature 4⅓ deg. There will be three steel bridges, each with two 150-ft. spans, and one tunnel 500 ft. long. (Jan. 28, p. 209.)

Oregon Short Line.—See Central Idaho.

Pennsylvania Roads (Electric).—Charters have been granted in Pennsylvania to six companies, each with a capital of $5,000, and offices at York, Pa. The incorporators of all the companies are: G. A. Greenawalt, J. J. Gerry and H. B. Waltman, York. The companies are to operate electric lines in Hellam, Manchester, Dover, Mount Wolf, North York and West York, all in York county, Pa., and each company will take the name of the town in which its line is to be located.

San Antonio, Rio Grande & Tampico.—An officer writes that contracts are to be let about March 1 and work will then be started on this line. The plans call for a line from San Antonio, Tex., southwesterly to a point in La Salle county, about 90 miles. There will be three bridges. The Harrison Engineering Co., 42 East Twenty-third street, New York, are the general engineers and contractors. J. F. Edwards, president; W. A. Cullen, general manager, and G. W. Nock, chief engineer, San Antonio. (See San Antonio, Gulf & Tampico. Feb. 11, p. 329.)

Temiskaming & Northern Ontario.—The government will be petitioned to build an extension from North Bay, Ont., southwest to Parry Sound, about 75 miles. The cost of the line is estimated at $50,000 a mile. (Nov. 26, p. 1038.)

Bids are wanted for grading one mile of line in Ontario between mile post 60 and mile post 61.

Texas & Pacific.—According to press reports a proposition has been made to residents of Monahans, Tex., Grandfalls and Fort Stockton, to build a branch from the Texas & Pacific at Monahans south via Grandfalls to Fort Stockton on the Kansas City, Mexico & Orient, 58 miles.

Texas Roads.—According to press reports G. B. Miller, Falfurrias, Tex., is back of a project to build a line from a point west of Realitos, on the National Lines of Mexico, southeast to Falfurrias, thence northeast via Kingsville to Corpus Christi, 96 miles. The estimated cost of the line is $1,000,000. (Jan. 28, p. 210.)

Washington & Tidewater.—A promoter writes that a charter has not yet been granted. The plans call for a line from a point in the District of Columbia, southeast to tidewater, in St. Marys county, Md., about 60 miles. W. Bannard Duke, Baltimore, may be addressed.

Railway Financial News.

Albany & Northern.—See Georgia, Southwestern & Gulf.

Boston & Maine.—This company has asked the authority of the Massachusetts Railroad Commission to buy a majority of the capital stock of the Worcester, Nashua & Rochester, a leased line.

See Boston Railroad Holding Co.

Boston Railroad Holding Co.—This company has asked the Massachusetts Railroad Commission for authority to issue $680,400 additional stock and to buy $2,786,800 additional common stock of the Boston & Maine and $71,700 preferred stock of the B. & M. The Holding company is to pay $125 in 4 per cent. bonds and $30 in stock for each share of B. & M. common, and $125 in bonds and $37 in stock for each share of preferred. With the present issue of stock there will be outstanding $3,102,000 Railroad Holding company stock.

Canadian Pacific.—This company has leased the property of the Orford Mountain Railway, and after March 1, 1910, the Orford Mountain will be operated as the Orford Branch, District 1, Eastern division of the Canadian Pacific. The Orford Mountain runs from Winsor Mills, Que., to Eastman Junction, 28 miles.

Chesapeake & Ohio.—An officer is quoted as saying that there are negotiations now pending by which the Chesapeake & Ohio will acquire control of the Hocking Valley. This statement is said by the company to be "premature and unauthorized." The C. & O., the Erie, the Baltimore & Ohio and the Lake Shore & Michigan Southern own each a sixth share of the stock of the Hocking Valley, and the Pittsburgh, Cincinnati, Chicago & St. Louis owns the remaining two-sixths shares.

Chicago & North Western.—This company will pay off in cash its $1,500,000 underlying Northern Illinois Railway 5 per cent. first mortgage bonds. The company takes this method of retiring this issue rather than refunding same by issuing new general mortgage bonds, a sufficient amount of which are reserved for the purpose. Although the outstanding general bonds bear 3½ per cent. interest, any new bonds under the same mortgage may bear not to exceed 5 per cent. The 3½s are now selling at 88¾ and were marketed at about 10 points above that figure.

Dallas, Cleburne & Southwestern.—The Missouri, Kansas & Texas has bought all the securities of this company, whose road runs from Egan, Tex., to Cleburne, 10 miles. There are $10,000 stock and $150,000 bonds outstanding. The road has previously been operated by the Missouri, Kansas & Texas under contract, terminable at 30 days' notice.

Denver, Laramie & Northwestern Railway.—Stockholders have voted to transfer the property of this company to the Denver, Laramie & Northwestern Railroad, which has been incorporated in Wyoming and has authority to extend the line to Seattle, Wash.

Georgia, Southwestern & Gulf.—This company has gained control of the Albany & Northern, whose road runs from Albany, Tex., to Cordele, 37 miles.

Grand Trunk.—The directors have declared in addition to the full 4 per cent. dividend on the guaranteed stock and the full dividends on the first preference stock, a dividend of 5 per cent. for the calendar year 1909 on the second preference stock. This compared with 2½ per cent. paid from the earnings of 1908.

Gulf Line Railway.—Control of this company, which leases the Hawkinsville & Florida Southern, has been sold to eastern capitalists, who, it is said, will extend the line from Bridgeboro, Ga., to Camilla, 40 miles. The Gulf Line and the H. & F. S. run from Hawkinsville, Ga., to Bridgeboro, 79 miles.

Hawkinsville & Florida Southern.—See Gulf Line Railway.

Joplin Union Station.—This company has sold to George C. White, Jr., & Co., New York, and the Philadelphia Trust, Safe Deposit & Insurance Co., Philadelphia, $750,000 first mortgage 4½ per cent. bonds of 1910-1940. The station when completed will be used by the Atchison, Topeka & Santa Fe, the Kansas City Southern, the Missouri, Kansas & Texas and the Missouri & North Arkansas, which jointly own the entire $40,000 outstanding stock.

Kansas City Terminal.—This company has sold $10,000,000 of its authorized $50,000,000 4 per cent. 50-year bonds to a syndicate headed by Lee, Higginson & Co., Boston; J. P. Morgan & Co., New York, and the Illinois Trust & Savings Bank, Chicago.

Missouri, Kansas & Texas.—See Dallas, Cleburne & Southwestern.

New York, New Haven & Hartford.—George F. Baker has been elected a director, succeeding H. McK. Twombly, deceased.

Northern Central.—The annual report of this subsidiary of the Pennsylvania Railroad shows that the company earned $12,264,770 gross in the calendar year 1909, as compared with $11,264,986 in 1908. Total operating expenses were $9,581,499 last year and $8,715,291 the year before. This left net earnings from operation after payment of taxes of $2,326,433 in 1909, as compared with $2,228,920 in 1908. After the payment of fixed charges and the regular 8 per cent. dividends, there was left a balance of $996,215 in 1909, from which $800,000 was deducted and transferred to extaordinary expenditure account, leaving a surplus to the credit of profit and loss of $196,215.

The freight-ton mileage in 1909 totaled 1,543,516,513 miles. This is an increase of nearly 11 per cent. over the freight-ton mileage in 1908. At the same time freight-train mileage increased less than 5 per cent. and totaled 2,997,872 in 1909. Earnings per ton per mile averaged 0.616 cents in 1909, a decrease of 0.006 cents from 1908. The freight density was 3,302,346 in 1909, an increase of just about 10 per cent. over 1908. The average trainload last year was 514.87 tons, an increase of 28.49 tons over the year before. The passenger mileage totaled 105,705,834 in 1909, an increase of 7 per cent. over 1908, and passenger-train mileage at the same time decreased a little over 2 per cent., totaling 2,169,494 in 1909. Earnings per passenger per mile averaged 1.985 cents in 1909, an increase of 0.023 cents over 1908, or slightly over 1 per cent.

Maintenance of way cost $1,496,153 in 1909, an increase of $551,469, and maintenance of equipment cost $2,354,673, an increase over 1908 of $126,330. Transportation cost $5,323,939, an increase of $171,939.

Current assets amounted to $4,944,452 December 31, 1909, of which $2,730,224 was cash and $1,247,056 was due from individuals and companies. This is an increase over the amount of cash on hand December 31, 1908, of $399,287, and an increase in sums due from individuals and companies of $930,685. Current liabilities amounted to $2,777,398 last year, the principal increase over the year being in vouchers and pay roll checks, which amounted in 1909 to $1,239,861, or $487,367 more than in 1908.

Orford Mountain Railway.—See Canadian Pacific.

Pittsburgh, Shawmut & Northern.—Edwin Hawley has been elected a director of this company. It is said that Mr. Hawley became a member of the board at request of Gen. Thomas H. Hubbard, and that his election does not indicate any pending changes in control.

Reading Company.—George F. Baker has been elected a director of this company, the Philadelphia & Reading Railway and the Philadelphia & Reading Coal & Iron Co., succeeding H. McK. Twombly, deceased.

Texas & Pacific.—No interest payments have been made on the second income mortgage bonds since 1908, when 3½ per cent. was paid. The preliminary statement of earnings, it is said, show a balance sufficient to pay interest on the second income bonds, but the directors prefer to devote this surplus to paying off a part of the floating debt, which amounted December 31, 1908, to $5,865,397.

Wabash-Pittsburgh Terminal.—The receivers have asked the United States circuit court for authority to issue receivers' certificates to buy 500 steel hopper cars at a cost of $512,500.

Supply Trade Section.

Fire damaged the plant of the Mt. Vernon Bridge Co., Mt. Vernon, Ill., on February 14. The loss is estimated at $125,000.

Burton W. Mudge & Co., Commercial National Bank building, Chicago, announces the appointment of Otto P. Hennig as sales manager, in charge of sales, advertising and purchasing.

The Gold Car Heating & Lighting Co., New York, has received orders for the heating equipment for the 30 passenger coaches now building at the Pullman works for the Pere Marquette.

W. D. Beck, formerly division superintendent on the Chicago & North Western at Chicago, has resigned to become general manager of the Aurora Automatic Machinery Company, Aurora, Ill.

The Bettendorf Axle Co., Davenport, Iowa, has let the contract for a brick and concrete foundry. The plans for this addition to the plant were mentioned in the *Railway Age Gazette* of August 20, 1909.

Hotchkiss, Blue & Co., Railway Exchange, Chicago, has incorporated in Illinois with a capital of $60,000. The officers of the new company are the same as the members of the old partnership, having the same name.

J. H. Horn, formerly with the American Locomotive Co., New York, has entered the employ of the National Lock Washer Co., Newark, N. J. He will handle both curtain fixtures and lock washers in a sales capacity.

John B. Given, formerly assistant to the vice-president of the Duplex Metals Company, New York, has resigned and is now connected with C. H. Whall & Co., makers of fiber insulators and fuses, with office at Boston, Mass.

Henry Pearson, president of the Wason Manufacturing Co., Springfield, Mass., will resign to become general consulting engineer for the J. G. Brill Co., Philadelphia, Pa. Mr. Pearson remains a director of the Wason Manufacturing Co. Samuel M. Curwen, a vice-president of the J. G. Brill Co., will become president of the Wason Manufacturing Co.

L. G. Parker has entered the sales department of the Cleveland Frog & Crossing Co., Cleveland, Ohio. Mr. Parker was, for a number of years, connected with the engineering department of the Lake Shore & Michigan Southern at Cleveland and at Toledo, after which he was similarly engaged with the Chicago Terminal Transfer Railroad at Chicago.

The Williamsport Gas Engine Works, Williamsport, Pa., has reopened the plant of the Williamsport Gas Engine Co., which has been shut down during the past year. The new company will continue to manufacture the complete line of gas and gasolene engines as did the old company. The management is looking for active agents in all sections of the country.

The Gulick-Henderson Co., inspecting engineers, metallurgists and chemists, Pittsburgh, Pa., Chicago and New York, announces that J. W. Henderson, treasurer, has resigned to become manager of the Verona works of the Standard Steel Car Co., New York. The metallurgical and foundry department of the Gulick-Henderson Co., which has been under Mr. Henderson's supervision, will in the future be managed by W. G. Ireland.

Due to the increase in business, both the Chicago and the Baltimore, Md., branches of the H. W. Johns-Manville Company, New York, will on March 1 be moved into larger quarters. The Chicago branch will occupy the four-story and basement building at 27-29 Michigan avenue. The offices, store and stock rooms will occupy 32,500 sq. ft. of floor space. The Baltimore office, store and ware house will be moved to 30 Light street. A complete line of the J-M products will be carried, and the company will be in much better position than ever before to give orders prompt attention.

The Virginia Bridge & Iron Company, Roanoke, Va., is at the present time building 2,000 all-steel hopper cars for one company and 500 steel underframes for another. During the past year this company has built about 8,000 gondola cars and underframes, and it is at the present time making preparations to handle a much larger volume of business. This car work is handled in addition to the company's regular output of bridges and structural steel, and it has recently installed a large amount of new equipment, which gives the Roanoke plant a capacity of about 60,000 tons per year, including car work.

The report of the Union Switch & Signal Co. for the year ended December 31 shows net profits on the combined $497,600 preferred and $2,000,000 common stock amounted to 13.05 per cent., as compared with 3.12 per cent. in 1908, and 41.03 per cent. in 1907. Gross sales increase $507,938, or 24.1 per cent., and net profits $248,135, equivalent to 317.9 per cent. over 1908. The following table shows current assets and liabilities.

	1909.	1908.
Current Assets.		
Material in stock	$1,416,505	$986,473
Bills and accounts receivable	1,057,134	702,364
Cash	61,126	695,456
Total	$2,534,765	$2,384,293
Current Liabilities.		
Bills and accounts payable	$394,554	$135,978
Unclaimed dividends	2,544	2,145
Total	$397,098	$138,123
Working capital	$2,137,667	$2,246,170

1910 M. M. and M. C. B. Conventions.

The drawing for exhibit space on Young's Million Dollar Pier for the June conventions was held at the office of the secretary, in Pittsburgh, last week, under the direction of the Exhibit Committee, Messrs. B. E. D. Stafford, S. P. Bush and Chas. P. Storrs. Fully 95 per cent. of the entire space available, as shown on the diagrams of the association, was assigned to applicants. This is record work, as in previous years the allotments at the time of drawing have been nothing like that amount. As experience has shown that a considerable number of applications for exhibit space are made within a few weeks of the date of the opening of the convention, and as the capacity of the pier is limited, the probability is that the pier itself will have to be widened if the late comers are to be accommodated.

Railway Appliances Exhibit.

The exhibition of the latest improvements in devices used in the construction and maintenance of American railways, which will be held at the Coliseum in Chicago March 14-19, the week that the American Railway Engineering and Maintenance of Way Association will hold its annual convention, will be more complete than the one which was held last year and which was declared to be of a more highly educational nature than any exhibition of like nature ever held before.

The main floor of the Coliseum contains 45,317 sq. ft. of space. Allowing 12,800 sq. ft. for aisles, leaves 32,517 sq. ft. for exhibits. In addition to this there are 6,138 sq. ft. available in the annex. All of the main floor has been taken by exhibitors, and all but about 400 sq. ft. in the annex. This will be sold before the exhibit opens. Last year the attendance of railway officers was much greater than was expected, and a large number who did not realize the importance of the exhibition and did not attend have expressed an intention not only to be in attendance this year but to instruct their subordinates to attend, believing the knowledge they obtain will be of great value to the different departments of the railways. Following is a list of exhibitors listed to date, along with their respective space numbers:

Adams & Westlake, Co., Chicago....83-84
Alexander Continuous Crossing Co., Clinton....204-5-8-9
Allith Mfg. Co., Chicago....116
American Concrete Co., Chicago....15
American Guard Rail Fastener Co., Philadelphia, Pa....118
American Hoist & Derrick Co., St. Paul, Minn....189-90-91
American Loco. Co. and Atlantic Equip. Co., Chicago....30
American Railway Device Co., Chicago....177

American Railway Signal Co., Cleveland, Ohio 22-23
American Rolling Mill Co., Middletown, Ohio 75-76
American Steel & Wire Co., Chicago 69-70, 50-51
American Valve & Meter Co., Cincinnati, Ohio 130-131
American Well Works, Aurora, Ill 12-13
Cortlandt F. Ames, Chicago 115
Armspear Mfg. Co., New York 184
Asphalt Ready Roofing Co., New York 168
Atlas Portland Cement Co., New York 146
Alamo Mfg. Co., Hillsdale, Mich 81
Adreon Mfg. Co., St. Louis, Mo 109
American Railway Steel Tie Co., Harrisburg, Pa 217-218
American Rail Joint Co., Toronto, Can 194
Barrett Mfg. Co., New York 106
Beaver Dam Malleable Iron Co., Beaver Dam, Wis 166
J. A. & W. Bird & Co., Boston, Mass 140
Blocki-Brennan Refining Co., Chicago 169
W. E. Bossert Mfg. Co., Utica, N. Y 137
Bryant Zinc Co., Chicago 153-4-5-6
Buda Co., Chicago 87-88-89-90
Buff & Buff Mfg. Co., Chicago 94
Bausch & Lomb Optical Co., Rochester, N. Y 135
Badger Brass Mfg. Co., Beaver Dam, Wis ..... ½ of 220
Card & McArdle, Waukegan, Wis 21
Philip Carey Co., Cincinnati, Ohio 170
Carnegie Steel Co., Pittsburg, Pa 71-72, 52-53
H. Channon Company, Chicago 160
Chicago Steel Tape Co., Chicago 94
Cleveland Frog & Crossing Co., Cleveland, Ohio 102-3-4
Jas. B. Clow & Sons, Chicago 33
Central Electric Co., Chicago 203, 210
Conley Frog & Switch Co., Memphis, Tenn 34
Coulter Paxton Co., Hammond, Ind 172
Crerar Adams Co., Chicago 95-96
Detroit Graphite Co., Detroit, Mich 167
Detroit Hoist & Machine Co., Detroit, Mich 193
Paul Dickinson, Inc., Chicago 186
Eugene Dietzgen Co., Chicago 97
Dilworth, Porter & Co., Pittsburgh, Pa 26
Jos. Dixon Crucible Co., Jersey City, N. J 117
Dressel Railway Lamp Works, New York 5
Duntley Mfg. Co., Chicago 99-100
Duplex Metals Co., New York 38-39
G. Drouvé Co., Bridgeport, Conn 158
Eastern Granite Roofing Co., Chicago 129
Economy Separable Switch Point Co., Louisville, Ky 187
Edison Mfg. Co., Orange, N. J 151
O. M. Edwards Co., Syracuse, N. Y 150
Electric Storage Battery Co., Philadelphia, Pa 149
Fairbanks, Morse & Co., Chicago 35-36-37, 54-5-6
Federal Signal Co., Troy, N. Y 93
Ford & Johnson, Chicago 159
Frank M. Foster, Columbus, Ohio 138
Forsyth Steel Tie Co., Pittsburg, Pa 1-2, 16-17
Franklin Mfg. Co., Franklin, Pa 6
General Railway Signal Co., Rochester, N. Y 57-8-9-60
Goheen Mfg. Co., Canton, Ohio 109
Peter Gray & Sons, Boston, Mass 175
Greenlee Bros., Chicago 7-8
Grip Nut Co., Chicago 40-41
Hall Signal Co., New York, N. Y 80
Handlan-Buck Mfg. Co., St. Louis, Mo 125
Hart Steel Co., Elyria, Ohio 101
Hayes Track Appliance Co., Geneva, N. Y 139
Heath & Milligan, Chicago 179
Hobart-Allfree Co., Chicago 148
Indianapolis Switch & Frog Co., Springfield, Ohio 182
Interlocking Nut & Bolt Co., Pittsburgh, Pa 185
H. W. Johns-Manville Co., New York 144
Joyce Cridland Co., Dayton, Ohio 77
Kalamazoo Railway Supply Co., Kalamazoo, Mich 24-25
W. K Kenly Co., Chicago 78-79
Kennicott Water Softener Co., Chicago Heights, Ill 74
Kerite Insulated Wire & Cable Co, New York 61-62
Keuffel & Esser Co., Chicago 98
Keystone Driller Co., Beaver Falls, Pa 188
Kerlin Auto. Post Machine Co., Delphia, Ind 212-213
Lackawanna Steel Co., New York 31-32
Lidgerwood Co., Chicago 196
Link-Belt Co., Chicago 128
Lufkin Rule Co., Saginaw, Mich 121
David Lupton & Sons, Philadelphia, Pa 92
Lutz-Lockwood Co., Aldene, Union County, N. J 133
Mackenzie-Klink Pub. Co., Chicago 136
O. C. Mann, Chicago 176
C. F. Massey Co., Chicago 134
W. N. Matthews & Bros., St. Louis, Mo 142
Miracle Pressed Stone Co., Minneapolis, Minn 14
Morden Frog & Crossing Co., Chicago 86
Burton W. Mudge & Co., Chicago 113-114
Municipal Engineering & Contracting Co., Chicago 19
Maintenance of Way Supply Co., Beaver Dam, Wis 206-207
A. Milburn Co., Baltimore, Md 216
National Lock Washer Co., Newark, N. J 124
National Malleable Castings Co., Cleveland, Ohio 145
National Roofing Co., Tonawanda, N. Y 195
Geo. F. Nichols & Bro., Chicago 173
Spencer Otis Co., Chicago 122-141
Otto Gas Engine Works, Chicago 49-68
Pacific Timber Preservative Co., Spokane, Wash 11
W. W. Patterson Co., Pittsburgh, Pa 147
C. F. Pease Blue Print Mchy. & Supply Co., Chicago 161-2-3-4
Pennsylvania Steel Co., Steelton, Pa 45-6-7-8, 64-5-6-7
Pittsburgh Steel Co., Pittsburgh, Pa 197
Pocket List of Railroad Officials, New York 26
D. & A. Post Mold Co., Three Rivers, Mich 132
Q. & C. Company, New York 119-120
Rail Joint Co., New York 82
Railroad Fence Works, Chicago 165
Railroad Supply Co., Chicago 85
Railway Age Gazette, New York 63-64
Railway and Engineering Review, Chicago 20
Railway List Publishing Co., Chicago 112
Railway Specialty & Supply Co., Chicago 105
Ramapo Iron Works, Hillburn, N. Y 91-110
Roberts & Schaefer Co., Chicago 73
Railway Specialty Co., Atchison, Kan 202
Scherzer Rolling Lift Bridge Co., Chicago 178
Sellers Mfg. Co., Chicago 123
Standard Asphalt & Rubber Co., Chicago 174
Strauss Bascule Bridge Co., Chicago 157
Streeter Amet Weighing Co., Chicago ..... 199 ½ of 200
Strobel Steel Construction Co., Chicago 180
St. Louis Surfacer Co., Chicago 214
St. Louis Steel Foundry, St. Louis, Mo 3-4
Templeton, Kenly Co., Chicago 126
Union Fibre Co., Winona, Minn 171
U. S. Metal & Mfg. Co., New York 18
Union Switch & Signal Co., Swissvale, Pa 42-43
U. S. Wind Engine & Pump Co., Batavia, Ill 111
Weir & Craig Co., Chicago 143
Weisell Nut-Lock Co., Chicago 201
C. H. Whall & Co., Boston, Mass 127
Wm. Wharton, Jr., & Co., Philadelphia, Pa 27-8-9, 9-10
Winans Rail Joint Co., Portland, Ore 185-½
Winters-Coleman Co Springfield, Ohio 107-108
Yale & Towne Mfg. Co., New York 152

TRADE PUBLICATIONS.

Great Northern.—The Great Northern has distributed three mailing cards advertising the company's three daily trains to the Pacific coast, the special colonist, settlers and homeseekers rates to the northwest, and the trans-Pacific service of the Ss. Minnesota.

RAILWAY STRUCTURES.

Columbus, Ga.—The Central of Georgia is to build a bridge over the Chattahoochie river. The superstructure will consist of plate girders which have been ordered from the American Bridge Co. The piers will be of concrete and the bids for this work have been received.

Greensburg, Ind.—The Cleveland, Cincinnati, Chicago & St. Louis has built an impounding reservoir with a capacity of 25,000,000 gals.

Indianapolis, Ind.—The Indianapolis Union Ry. has ordered improvements made on the union station to cost about $75,000. No change in the size of the building is to be made, but the interior arrangement is to be improved so as to greatly increase the capacity.

Outlook, Sask.—See Canadian Pacific under Railway Construction.

Stockton, Cal.—The Atchison, Topeka & Santa Fe contemplates the building of a new freight depot at a cost of about $20,000, on land now owned by the company. (Dec. 24, p. 1264.)

Strathcona, Alb.—See Canadian Pacific under Railway Construction.

Temple, Tex.—The Gulf, Colorado & Santa Fe is to build a Harvey hotel and eating house at a cost of $140,000.

Valdosta, Ga.—The Georgia, Southern & Florida is said to have bought 14 acres of land in the southern part of Valdosta as a site for extensive repair shops. Work is to be started soon filling in the lowland to raise the grade several feet. The improvements include a 20-stall roundhouse. Work is now under way raising the grade about eight feet on five acres of land west of the passenger station; the site will be used to increase the capacity of the yards.

Waco, Tex.—The Citizens' Railway plans to build a car shop and barns at an estimated cost of $75,000.

West Duluth, Minn.—See Duluth, Rainy Lake & Winnipeg under Railway Construction.

At the ten freight stations in Berlin 60,636,000 gallons of milk were received last year, which is 5 per cent. more than in 1908. More than half of the increase in receipts came from Denmark. In the same year the Berlin receipts of coal and coke were 2,609,541 short tons, slightly more than half coming by water. Of the coal 1,040,712 tons was English, which has water transportation up the Elbe and the small but very useful Havel, on which Berlin is situated. A slightly larger tonnage came from Silesia, far to the southeast. Besides this Berlin received 1,495,093 short tons of liquite ("brown coal"), nearly all by rail. It is an inferior fuel, weighing about three-fourths as much as stone coal per cubic yard.

Late News.

The items in this column were received after the classified departments were closed.

George F. Baker has been elected a director of the Delaware, Lackawanna & Western succeeding H. McK. Twombly, deceased.

The Castalia Portland Cement Co., Pittsburgh, Pa., has ordered one 10-in. x 16-in. saddle tank locomotive from the Vulcan Iron Works.

An increase of 10 per cent. in salaries has been granted by the Western Maryland to its telegraphers. More than 300 operators will be affected by the advance.

According to press reports, the branch of the St. Louis, Brownsville & Mexico, from Bloomington, in Victoria county, Tex., southeast to Port O'Connor, 39.72 miles, is to be opened for business March 1. (Oct. 22, p. 778.)

Engineers, firemen and telegraphers on the Delaware & Hudson have presented demands for increased pay. The demands range from 5 per cent. to 70 per cent., but the average calls for a general increase approximating 20 per cent.

An officer of the Wichita Falls & Northwestern writes that this company has bought from the Altus, Roswell & El Paso part of their grade from Altus, Okla., west to Hollis. The new owners expect to build about 60 miles at once to complete this line to Hollis. (Dec. 24, p. 1261.)

The Philadelphia & Reading announce that on account of falling off in volume of traffic and consequent loss of revenue the company has issued orders reducing the hours of labor in all locomotive and car shops to eight hours a day, beginning on February 28. This will effect a reduction in shop expenses of about 15 per cent.

The Cleveland, Cincinnati, Chicago & St. Louis will lay second track this year from Indianapolis, Ind., to Anderson, on the Indianapolis division. Also, second track from Shelby, Ohio, to Greenwich, on the Cleveland division, as well as build a 7½-mile cut-off from Middletown, Ohio, to Miamisburg, on the Cincinnati division. The new line from Mt. Carmel, Ill., to Evansville will also be built this year.

E. M. Alvord, general superintendent of the Missouri, Kansas & Texas, at St. Louis, Mo., has been appointed general manager of the Midland Valley, with office at Muskogee, Okla. J. W. Walton, acting general superintendent of the Missouri, Kansas & Texas of Texas, at Dallas, Tex., has been appointed general superintendent of the Missouri, Kansas & Texas system, with office at St. Louis.

Samuel Moody, general passenger agent of the Pennsylvania Lines West, at Pittsburgh, Pa., has been appointed to the new position of assistant passenger traffic manager of the Pennsylvania Lines West and of the Vandalia, with office at Pittsburgh. J. M. Chesbrough, general passenger agent of the Vandalia at St. Louis, Mo., succeeds Mr. Moody, and J. B. Modisette, assistant general passenger agent of the Pennsylvania Lines West, at Pittsburgh, succeeds Mr. Chesbrough.

A McKeen motor car, No. 90, built for the Norfolk & Southern, will leave the shops of the McKeen Motor Car Co., Omaha, Neb., on February 25 under its own power for Richmond, Va. It will go over the following route: Omaho to Chicago, via Chicago, Burlington & Quincy; Chicago to Indianapolis, via Chicago, Indianapolis & Louisville; Indianapolis to Cincinnati, via Cincinnati, Hamilton & Dayton; Cincinnati to Washington, via Baltimore & Ohio, and from Washington to Richmond, via Richmond, Fredericksburg & Potomac.

At a meeting of directors of the Chicago Pneumatic Tool Co., Chicago, on February 23, a resolution was passed that it was the opinion of the directors that on March 22, a quarterly dividend of 1 per cent. should be declared, payable April 25 to stock of record April 15. At the last previous meeting it was voted to declare a dividend at the next regular meeting. The meeting on Wednesday, however, was merely an organization meeting at which officers were re-elected. In 1907 dividends which had been at the rate of 4 per cent. per annum were passed.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Texas Central has ordered four 2-8-0 locomotives from the American Locomotive Co.

Roman & Bennett, Toston, Mont., have ordered six contractors' locomotives from the Vulcan Iron Works.

The Toledo, Peoria & Western has ordered two consolidation locomotives from the Baldwin Locomotive Works.

The Richmond, Fredericksburg & Potomac is said to be asking prices on 20 locomotives. This item is not confirmed.

The San Antonio, Gulf & Tampico, San Antonio, Texas, recently incorporated, advises that it will buy locomotives about May next.

The Colorado & Southern is in the market for 15 locomotives and will also order seven locomotives for the Fort Worth & Denver City.

Quinlan & Robertson, railway contractors, Montreal, Que., have ordered four 12-in. x 16-in. contractors' locomotives from the Vulcan Iron Works.

Scott Bros., Railway Contractors, Baldwinsville, N. Y., have ordered two 14-in. x 20-in. double-end saddle tank locomotives from the Vulcan Iron Works.

The Enterprise Mfg. Co. of Pennsylvania, Philadelphia, Pa., has ordered one 16-in. x 24-in. saddle tank switching locomotive from the Vulcan Iron Works.

The Ferguson Contracting Co., New York, has ordered one 14-in. x 20-in. double-end saddle tank locomotive of standard gage from the Vulcan Iron Works.

The Hocking Valley, reported in the *Railway Age Gazette* of January 21 as being in the market for 23 locomotives, has ordered 10 consolidation locomotives from the American Locomotive Co.

The New York, Ontario & Western, as reported in the *Railway Age Gazette* of February 11, has ordered six simple consolidation locomotives from the American Locomotive Co.

General Dimensions.

Weight on drivers	182,000 lbs.
Total weight	205,000 lbs.
Cylinders	21 in. x 32 in.
Diameter of drivers	55 in.
Type of boiler	Straight top, radial stay
Working steam pressure	200 lbs.
Heating surface, fire tubes	3,013 sq. ft.
" " arch tubes	22 "
" " firebox	183 "
" " total	3,218 "
Tubes, number	398
" outside diameter	2 in.
" length	14 ft. 6½ in.
Firebox, length	107⅛ "
" width	67¼ "
" material	Carbon steel
Grate area	49.8 sq. ft.
Water capacity	7,000 gals.
Coal capacity	11 tons

Special Equipment.

Axles	Nickel steel
Bell ringer	Sanson
Boiler lagging	Ehrets sectional magnesia
Brakes	American
Brake-beams	Kewanee
Brake-shoes	Perfecto; Am. Brake-Shoe Co.
Couplers	Gould pilot
Driving boxes	Cast steel, sectional bronze bearings
Headlight	18-in. Dressel
Injector	No. 10 Simplex
Journal bearings	Cyprus bronze
Piston and valve rod packings	King
Safety valve	Consolidated, 3-in.
Sanding devices	Hanlon
Sight-feed lubricators	Nathan, No. 9
Springs	Railway Steel-Spring Co.
Staying	"Tate" and "Breakless" bolts
Steam gages	Ashcroft, 6¾-in.
Tender frame	Comonwealth cast steel
Tires	Midvale, flanged
Tubes	Spellerized
Valve gear	Baker-Pilliod
Wheel centers	Cast steel

The Delaware, Lackawanna & Western locomotives previously reported as ordered from the American Locomotive Co. include the following: Twenty-four consolidation, five 10-wheel passenger, five eight-wheel passenger, nine six-wheel switch, two eight-wheel hump yard and one eight-wheel transfer engine. The consolidation, 10-wheel passenger and eight-wheel

transfer locomotives will be equipped with Walschaerts valve gears, while the others will have Stephenson link motion.

General Dimensions.

	Consolidation.	10-wheel.
Type	Consolidation.	10-wheel.
Weight on drivers	169,500 lbs.	168,000 lbs.
Total weight	190,000 lbs.	214,000 lbs.
Cylinders	21 in. x 26 in.	22½ x 26 in.
Diameter of drivers	57 in	69 in.
Type of boiler	Straight top.	Straight top.
Working steam pressure	200 lbs.	215 lbs.
Heating surface, tubes	2,573 sq. ft.	3,178 sq. ft.
" firebox	173 "	247 "
" total	2,747 "	3,425 "
Tubes, number	337	398
" outside diameter	2 in.	2 in.
" length	14 ft. 5⅞ in.	15 ft. 3 in.
Firebox, type	Semi-wide.	Wide.
" length	8 ft. 6 in.	11 ft. 6 in.
" width	6 ft. 3 in.	9 ft.
" material	O. H. basic.	O. H. basic.
Grate area	53.4 sq. ft.	103.5 sq. ft.
Water capacity	6,500 gals.	7,000 gals.
Coal capacity	10 tons.	10 tons.
Tractive power	34,197 lbs.	34,861 lbs.

	8-wheel	6-wheel.
Type	8-wheel	6-wheel.
Weight on drivers	100,000 lbs.	133,000 lbs.
Total weight	150,000 lbs.	133,000 lbs.
Cylinders	20 in. x 26 in.	19 in. x 24 in.
Diameter of drivers	69 in.	51 in.
Type of boiler	Straight top.	Straight top.
Working steam pressure	185 lbs.	180 lbs.
Heating surface, tubes	1,961 sq. ft.	1,690 sq. ft.
" firebox	179 "	164 "
" total	2,140 "	1,854 "
Tubes, number	280	269
" outside diameter	2 in.	2 in.
" length	13 ft. 4½ in.	12 ft.
Firebox, type	Wide.	Semi-wide
" length	10 ft. 6 in.	7 ft. 6 in.
" width	8 ft. 4 in.	6 ft. 3 in.
" material	O. H. basic.	O. H. basic.
Grate area	87.6 sq. ft.	46.3 sq. ft.
Water capacity	5,000 gals.	3,300 gals.
Coal capacity	10 tons.	7 tons.
Tractive power	23,701 lbs.	26,000 lbs.

The following special equipment is common to all types:

Special Equipment.

Axles	Driving wheels, Cambria steel, main 9½ x 12, other 9 x 12; Tender axle, Cambria steel, 5 x 9
Bell ringer	Gollmar
Boiler lagging	Sectional magnesia
Brakes	Westinghouse-American
Brake-beams	Westinghouse
Brake-shoes	Perfecto type on drivers
Couplers	Cast steel, Gould Coupler Co.
Draft gear	Session friction, type C, on tender, with Acme uncoupling device
Driving boxes	Cast stl, with Elvin,type 4,grease cellars
Headlight	Dressel
Injector	Hancock composite inspirator
Journal bearings	Magnus bearings
Journal boxes	Symington 5x9 M.C.B. on tender, with torsion lids
Piston and valve rod packings	United States
Safety valve	Two 3-in. consolidated, one muffled, one encased
Sanding devices	Leach air and hand sander
Sight-feed lubricators	Nathan
Springs	O. H. steel, D., L. & W. specification
Staying	Tate flexible bolts in breaking zone
Steam gages	Ashcroft
Tires	3½ in. thick Midvale flanged; all 5½ in. wide.
Tubes	Spellerized steel
Wheel centers	50-in. cast steel

CAR BUILDING.

The Hilo Railway, Honolulu, H. I., is in the market for 10 forty-ton box cars.

The Mexican Railway has ordered 14 sleeping cars from the Barney & Smith Car Co.

The Chicago Great Western is in the market for 200 steel underframe forty-ton box cars.

The Mexico North Western is said to be in the market for 260 freight cars. This item is not confirmed.

The San Antonio, Gulf & Tampico, San Antonio, Texas, recently incorporated, advises that it will buy cars about May next.

The Cleveland Municipal Traction Co., Cleveland, Ohio, for which franchise negotiations are now pending, will buy a number of city cars in case the negotiations are successful.

The Delaware, Lackawanna & Western, reported in the *Railway Age Gazette* of December 17 as being in the market for 10 express, 15 suburban and 10 broad vestibule coaches, has ordered 10 broad vestibule coaches and 10 suburban coaches from the Barney & Smith Car Co.

The Hill Lines have ordered 4,000 freight cars from Haskell & Barker. The equipment includes 3,500 box and 500 automobile cars. It is understood that the Chicago, Burlington & Quincy will get 1,500 of the box cars and that it will soon be in the market for passenger equipment.

The National Railways of Mexico, reported in the *Railway Age Gazette* of October 15 as being in the market for 10 first-class coaches; five second-class coaches; eight baggage, mail and express cars and three express cars, has ordered this equipment from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific, reported in the *Railway Age Gazette* of February 11 as being in the market for 825 forty-ton steel underframe box cars, has ordered this equipment from the Western Steel Car & Manufacturing Co. The original inquiry included 1,600 cars, so that there are still 775 cars unplaced.

The Buffalo, Rochester & Pittsburgh has ordered from the McKeen Motor Car Co. one 70-ft. gas motor car of all-steel, center entrance type, having baggage, smoking and passenger compartments. The company has also ordered from the General Electric Co. one 70-ft., all-steel, center entrance gas electric car, with the same arrangement of compartments as the McKeen car.

The New York, Ontario & Western, as reported in the *Railway Age Gazette* of February 4, has ordered 300 forty-ton double hopper gondola cars from the American Car & Foundry Co. These cars will weigh 37,200 lbs. and will be 33 ft. long, 8 ft. 11½ in. wide and 5 ft. ⅜ in. high, inside measurements, and 34 ft. 6½ in. long, 9 ft. 8½ in. wide and 9 ft. 4½ in. high, over all. The bodies will be of wood and the underframes of steel. The special equipment will include:

Bearings	Barber roller device
Bolsters, truck	Cast steel
Brakes	Westinghouse
Brake-beams	Buffalo special section
Brake-shoes	Steel back, gray iron
Brasses	Brady Brass Co.
Couplers	Sharon
Coupler carry iron	Flory
Doors, drop	Dunham
Draft gear	Miner and Farlow
Dust guards	Symington
Journal boxes	Symington
Springs	Railway Steel-Spring Co.
Trucks	Gould Coupler Co.
Wheels	American Car & Foundry Co.

The New York, Chicago & St. Louis, as reported in the *Railway Age Gazette* of January 28, has ordered 10 passenger and five baggage cars from the American Car & Foundry Co. The passenger cars will weigh 92,400 lbs. and will have the following dimensions: Inside, length, 60 ft.; width, 9 ft. 8 in.; height, 7 ft. 8 in. Over-all, length, 69 ft. 5 in.; width, 10 ft. ½ in.; height, 14 ft. 6¾ in. The baggage cars will have a capacity of 30,000 lbs., will weigh 78,750 lbs., and will have the following dimensions: Inside, length, 60 ft.; width, 8 ft. 11 in.; height, 7 ft. 8 in. Over-all, length, 64 ft. ½ in.; width, 10 ft. ½ in.; height, 14 ft. 7 in. All the cars will have wood underframes and bodies and will have the following special equipment:

Axles	Steel
Bolsters	Built up
Brakes	Westinghouse
Brake-beams	Waycott
Brake-shoes	American Brake-Shoes Co.
Brasses	Magnus
Couplers	Tower
*Curtain fixtures	Curtain Supply Co.
*Curtain material	Pantasote.
*Door fastenings	Blount
Draft gear	Gould friction
Heating system	Chicago Car Heating
Journal boxes	Franklin
Lighting system	Pintsch
*Platforms	Gould
*Seat covering	Plush
Side bearings	Woods roller
Springs	Railway Steel Spring
Trucks	Company standard metal
*Vestibules	Pullman
*Vestibules diaphragms	Ajax
*Vestibule trap doors	Edwards
Wheels	Paige steel tired

*Equipment specified on passenger cars only.

The Detroit United Railways advise that orders have recently been placed for the equipment for which they were reported in the market in the *Railway Age Gazette* of February 11. The order was divided as follows: Fifty double truck pay-as-you-enter cars from the G. C. Kuhlman Car Co. and

25 similar cars from the Niles Car & Mfg. Co., the trucks for the 75 cars to be furnished by the Standard Motor Truck Co. and the motor equipments by the Westinghouse Electric & Mfg. Co. In addition to these cars, an order was placed with the Niles Car & Mfg. Co. for 14 interurban cars to be equipped with Baldwin trucks and Westinghouse motors.

MACHINERY AND TOOLS.

The Bethlehem Steel Co. has ordered the machinery for which it was reported in the market in the *Railway Age Gazette* of February 11. It is understood the order was divided among three companies.

The Cedar Rapids & Marion City Railway Co. has ordered from the Allis-Chalmers Co. a complete generating unit, consisting of a 22-in. and 46-in. x 48-in., heavy duty, cross-compound engine, direct-connected to an 800-k.w., 600-volt, 100-r.p.m. generator.

The New York Central Lines have ordered from Joseph T. Ryerson & Sons, Chicago, a 60-in. punch designed to punch 2-in. holes in 1-in. material, and a special friction metal saw designed for railway shop work by the Ryerson Co. The tools are to be installed in the shops at Depew, N. Y.

IRON AND STEEL.

The Northern Pacific has ordered 440 tons of bridge steel for a lift bridge.

The Pennsylvania Lines West have received bids on 900 tons of steel for signal bridges.

The Metropolitan Street Railway, New York, has received bids on 3,550 tons of girder rails and 880 tons of conductor bars.

The Alabama, Birmingham & Atlantic has ordered from the Lackawanna Bridge Co. 150 tons of bridge steel for three small bridges.

The Great Northern has ordered from the American Bridge Co. 9,000 tons of structural steel for the ore docks at Allouez Bay, Wis. The company's steel requirements for this work were mentioned in the *Railway Age Gazette* of February 4.

General Conditions in Steel.—The annual report of the Lackawanna Steel Co. for 1909 shows an increase in gross earnings over 1908 of $10,208,000. Although manufacturing expenses rose $7,845,000, a surplus of $778,000 was saved after paying royalties, rentals, etc. This is in marked contrast to the deficit of $1,326,000 at the close of 1908. The annual report of the Southern Iron & Steel Co. shows that the company is making pig iron at a rate of approximately 20,000 tons per month, and at a cost materially below the estimates.

SIGNALING.

The Northern Pacific will soon put in service automatic block signals on 100 miles of line between Livingston and Laurel, in Montana. The signals are the General Railway Signal Co.'s Model 2-A type, three position, upper quadrant. The Northern Pacific is also ready to ask for bids on automatic block signals for 300 miles of double track to be installed on various parts of the road. Upper quadrant, three-position signals will be used throughout.

Telephones for Train Despatching.

The Boston & Maine is to use telephones for train despatching from Concord, N. H., to White River Junction, Vt., 70 miles, and from Concord to Woodsville, N. H., 95 miles. Each circuit will have 25 way stations. The first telephone train despatching circuit on the Boston & Maine was that between Boston and Fitchburg, 51 miles, installed last September. The officers of the road are reported to be planning to equip the entire system with telephones.

The Western Electric Company, which furnished the apparatus for these lines, reports that it has recently received orders from six important roads in the southern states: The Georgia Railroad, the Southern Railway, the Chesapeake & Ohio, the Norfolk & Western, the Seaboard Air Line and the Atlantic Coast Line. That of the Georgia Railroad was noticed in these columns last week. The Chesapeake & Ohio has completed the equipment of its Cincinnati division and expects soon to equip three other divisions.

Positive Hose Coupler Lock.

The Gold Car Heating & Lighting Company, New York, has recently developed a positive lock for steam train line couplers which can be very quickly tightened and loosened without the use of tools. It is a generally accepted notion that the couplers for air, signal and steam connections between cars should automatically separate in case the cars are

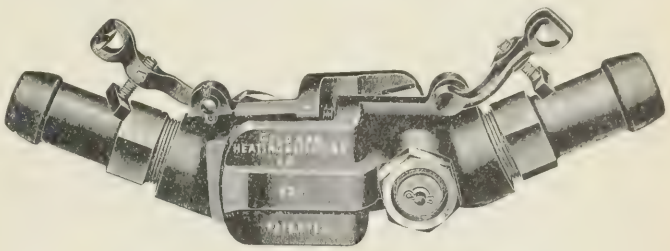


Fig. 1.

uncoupled or a break in two occurs. Most roads, however, require their trainmen to separate the hose couplings by hand when trains are broken, as pulling apart of couplings is more or less injurious to the hose. The shape and weight of the coupler heads in connection with the angle at which the hose is attached ordinarily maintains the gaskets in close contact when coupled, but at the same time permits automatic uncoupling.

The high speed of modern trains, together with the increased steam pressure often carried in the train line for operating electric generators in the baggage car, makes a positive lock, one that cannot be loosened and caused to leak by vibration or excessive pressure, desirable between engine and tender and also between engine and baggage car. The new lock here shown is designed to meet this requirement. Fig. 1 shows the couplers connected but not locked, Fig. 2 shows the lock in place, while Fig. 3 is a detail view of the locking pieces.

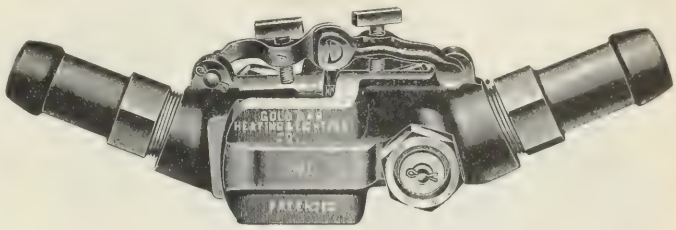


Fig. 2.

In the eye, cast in the coupler immediately over the gravity



Fig. 3.

relief trap and where the chain was sometimes attached, is inserted the pin-shaped end of the lock, which is secured with a cotter pin, as shown. The screws force the locks upwards when engaged, operating to pull the couplers tightly together as a toggle joint. The point of the screw bears against the body of the coupler and is riveted over to prevent working out of the lock. This malleable iron lock has sufficient play in the eye of the coupler to allow of ready connection. A few

turns of the screws, which have large T heads, binds the couplers firmly together.

These locks are made for each size of coupler and are so designed that where couplers of different sizes will couple the locks will also operate properly. It is not necessary to confine these locks to the couplings at the head end of trains, however, and they may be used when desired between the various cars. This has been done on some of the large lines in the Northwest, where it was found that the additional security against leakage was more important than the automatic uncoupling if the train should part.

The cuts show the gravity relief trap which has been so favorably known for a number of years. It has been recently improved by widening the seat so that the gasket will maintain a smooth surface against the seat, preventing leakage due to wear. As this trap is operated by gravity, it simply falls open when pressure ceases, allowing the water of condensation in the train line to flow to the ground and avoid freezing. It also provides for reducing the time required to get steam at the rear of the train even in moderate weather, as there is no water in the pockets which would have to be driven to the end of the train line. Trainmen can always tell if pressure is on the line by simply tapping the valves, thus avoiding being scalded by hot steam when uncoupling. With this trap it is unnecessary to separate the hose coupling when the train is laid up, and in case of an unexpected cold night the hose it not ruined nor is delay caused when steam is turned on the next day. The life of the hose is also increased by reducing the amount of the twisting and bending necessary in the process of coupling and uncoupling.

Randall Graphite Sheet Lubricator.

The modern theory of lubrication is based upon the principle that the journal and bearing are slightly separated by the film of oil. Oil and greases simply form a temporary glaze, which must be in a continuous flow or they will wear,



Bearing Set with Randall Graphite Sheet Lubricator.

burn or be rolled out. Many efforts have been made to obtain this separation by the intervention of a softer material than the bearing itself, and the Babbitt metal manufacturers have spent large sums of money in the endeavor to mix graphite and soft metal. Engineers generally agree that graphite is an excellent lubricant, but the trouble has been to get it in the right place in the bearing and keep it there, especially in long bearings. With Randall's graphite sheet lubricator we have an ideal method of lubrication and remarkable results have been obtained. It is composed of pure graphite in the form of small tapered cones, which are held in bond and attached by hydraulic pressure to a fine copper wire screen. This mat with the raised cones of graphite is placed in the bearing and held tightly against it with a mandrel, after which the Babbitt metal is poured in. The illustration shows the appearance of the bearing when set with the graphite cones and after a service of 23,000 miles. It is claimed that this method of using graphite increases the life of Babbitted bearings 300 to 400 per cent., and it has been found possible to save 75 to 90 per cent. of the oils and grease necessary under the old method. This material is replacing bronze bushings in machinery and sheaves, and it is being adopted by machinery transmission manufacturers, steam railways for journal brasses on cars and locomotives, and steam and interurban railways for wheel and journal brasses and armature bearings.

There is strong testimony from experts as to the value of soft bearings for journals. One prominent motive power officer has said that the wear of car journal bearings is approximately 1 lb. of metal for every 25,000 miles. The wear of axles is about one-third as fast, and a deduction has been reached which shows that the aggregate cost of metal wear of axle journals is six times the amount of money spent to lubricate them, and the cost of the coal burned in overcoming their friction is double the cost of their lubrication. Therefore, in considering the running expense of machinery and the relief to be afforded in the matter of lubrication by the introduction of graphite bearings, the cost of oil must not only be considered but also the cost of the power and of the wear of metal from the bearing and journal themselves. The uniformity and permanency of graphite lubrication qualify it well for railway service where the element of friction is such an important matter. Further testimony from Prof. Denton is to the effect that if brasses are lined with some of the soft anti-friction metals the crushing down of grooves by a smooth journal does not cause excessive friction, and herein lies the true advantage of these metals. The chances of heating are less with soft anti-friction metals than with bare brass or hard white metal. To these may be added the testimony of Dr. Dudley, who said, "Alloys which may be called the softest give the best wear and with less loss of metal under the same conditions than harder or more brittle alloys."

The Randall graphite lubricator has been used on engine truck, trailer, tender and car bearings on the Southern Pacific lines in Oregon and other railways. It is also being used extensively on suburban electric lines. This lubricator is sold by the Strong, Carlisle & Hammond Company, 334 Frankfort avenue, Cleveland, Ohio, who is the sole selling agent for the United States.

Car Lighting Equipment.

The Safety Car Heating and Lighting Company, New York, is operating over 70 gas plants throughout the country, and owing to the large number of equipments sold during the past year and the great activity in transportation the gas sales are now the largest in the history of the country. A very large number of the railways are still exclusively using Pintsch gas, a product controlled by this company. There is at present a demand for electrical equipment for car lighting, and the Safety company has received a large portion of this business during the past year. This company makes an axle-driven dynamo, having a very efficient battery, which is said to meet all the conditions of service. The company's plants are equipped for storing and general repairs to the electric equipment in service, utilizing its present force and making a rental proposition which is said to be in practice quite generally among the leading railways of the country.

This company has, since January 1, taken contracts from the government for Pintsch buoys to the extent of several hundred thousand dollars. Its latest steam heating equipments are being applied very generally throughout the country, and it is said to have recently received one of the largest orders ever placed for steam heating equipment. This general increase has led to the company's making large increases in its manufacturing establishments in New York, Jersey City, N. J.; Pittsburgh, Pa.; St. Louis, Mo.; Montreal, Can., and Mexico City, Mex.

This company makes a specialty of designing railway gas and electric fixtures, and the increased demand for this product during the past year has been met by a new plant built exclusively for meeting the requirements of high-class fixtures to harmonize with the interiors of present day coach equipment.

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VALUATION AND RATE REGULATION.

After subsiding somewhat for a while, the agitation for subject of valuation of railways has been revived by a resolution adopted by the National Association of Railway Commissioners at its last meeting favoring a valuation by the federal government and by the recommendation by the Interstate Commerce Commission in its annual report of a "physical" valuation. These things give timely interest to an article by J. C. Lawrence, a member of the Washington Railway Commission, which we publish in another column, describing the method used by this commission in making its recent valuation.

The Washington valuation differs from all others in an important particular. It is the first valuation ever made for the purpose of regulation of rates which is based on the market, or actual, value of the railways. The Interstate Commerce Commission in 1904 made a "commercial" valuation; but it was not made as a basis for fixing rates. The Minnesota commission has made a valuation expressly to be used as a basis for regulation of rates; but it is merely a "physical" valuation. Even if those are right who contend that rates should be based on the value of the property, it seems highly probable that if any commission or legislature should seek, by means of a valuation based on the cost of physical reproduction alone, like that of Minnesota, to defend low rates it had fixed, the Supreme Court of the United States would hold its valuation worthless and disregard it. For the court, in the oft-quoted case of Smyth *vs.* Ames, mentioned several other factors that should be considered. One is the "probable earning capacity of the property under particular rates prescribed by statute." But the probable earnings cannot be estimated without considering the nature and density of the present and probable future traffic. Another is the "sum required to meet operating expenses." Still another is the "amount and market value of the bonds and stock." As has been said in the past by the *Railway Age Gazette*, it is hard to understand how, since the court specifically said that these things must be considered, the idea can have grown up that it will hold valid any valuation, such as that in Minnesota, in which they are ignored.

The Washington commission acted in accordance with the views expressed in Smyth *vs.* Ames. In addition to ascertaining the cost of reproducing the physical properties it took a large amount of evidence and made specific findings regarding the conditions and costs of operation, the densities and natures of the traffic, the market values of the stocks and bonds of the various railways, etc., and to the estimated present value of the physical properties of the roads the commission made additions on account of their present and future characters as going concerns, and found the respective market values per mile of the principal roads in Washington to be as follows: Northern Pacific, $106,500; Great Northern, $73,900; Oregon Railroad & Navigation Company, $38,900. Of course, the additions to be made to ascertain the market values necessarily were arrived at by more or less arbitrary exercise of the commission's judgment. The average capitalization per mile of the entire Northern Pacific Railway is $59,000; of the Great Northern, $45,000, and of the Oregon Railroad & Navigation Company, $41,000. Construction in Washington is relatively costly. But as the Minnesota commission also found that the average cost per mile of reproducing the physical properties of the Northern Pacific and Great Northern in Minnesota, where construction is comparatively cheap, would exceed the average capitalization per mile of these roads in their entirety, the conclusion is inevitable that a fair valuation of these roads in their entirety would demonstrate that their aggregate values far exceed their total capitalizations.

The members of the Washington commission agreed on all other details of their valuations, but disagreed entirely on how they should be divided for state and interstate business. Assuming that both interstate and state rates are reasonable it is obvious that the proper way to divide a valuation is on the basis of net earnings. But the fundamental assumption of those who make valuations is that they may show that the state or the interstate rates, or both, are unreasonable, and that, therefore, the net earnings are unreasonable. If the net earnings cannot be used, what basis can be? The division cannot be made at all on the cost of physical reproduction, because the same roadway and equipment are used for the transportation of both state and interstate business. It cannot be based on gross earnings. They are derived from the application of the rates whose reasonableness is under determination; and gross earnings are no index of value, any way, except when considered in connection with the expenditures necessary to produce them.

The method of division favored and adopted by a majority of the commission, Messrs. Lawrence and Jones, is given in some detail by Mr. Lawrence in his article elsewhere. Chairman H. A. Fairchild vigorously dissented. He contended that the valuation should be divided according to earnings. He pointed out, among other things, that the consequence to the Great Northern of the division according to the theory of the majority was the conclusion that, assuming the road was entitled to earn 6½ per cent. on its valuation, its interstate rates were too low, while its state rates were excessive. He said that it probably could not raise its interstate rates to recoup itself for the loss that would be caused by the reduction of its state rates, and in consequence it would be disabled from earning any return on over $10,000,000 of its valuation. On the basis of division he favored none of its rates would be reduced, and it could continue to earn 6½ per cent. on its entire valuation.

A railway is an integral whole; and if valuations are to be made and used for the regulation of rates the only fair and rational method is to have them made by the federal government and then either have rates regulated exclusively by the federal government, or divide the valuation for state and interstate purposes on some basis agreed on by the interstate and state commissions, which will enable each road to earn a return on its entire valuation.

It has been supposed in the past that rate-making is an exercise of judgment. It seems to be assumed by many that after a valuation has been made it will be merely an exercise in mathematics. Suppose the value of a railway for state purposes is $50,000,000. Then, on this theory, all that will have to be done will be to multiply this amount by 6 per cent. —or whatever may be regarded as a fair return—and so adjust the rates as to enable the road to earn, say, $3,000,000 a year. But how are the specific rates to be fixed? A great majority of those who advocate valuation say that they should be based on the cost of the service. The proper method, then, would be to ascertain the exact cost of hauling each commodity and then base rates on these ascertained costs, making them just high enough to allow the road a fair return. At present the rates for long hauls and cheap bulky commodities are usually less in proportion to the cost of the service than the rates for short hauls and more valuable commodities. On the cost theory the rates for long hauls and low grade commodities would have to be advanced, and those for short hauls and the more valuable commodities reduced. But the railways make relatively lower rates for long hauls and cheap and bulky commodities mainly because the traffic managers have found that the long haul and the cheap, bulky traffic cannot bear higher rates. If these kinds of traffic cannot bear higher rates, obviously an advance in the rates on them would curtail the traffic afforded by them. Many producers and shippers would, in consequence, be injured. It might easily happen that owing to this reduction of traffic the railways would fail to earn a fair return on their valuation. Then it would be necessary to make a general advance in rates. Then more traffic might be destroyed, and it might be necessary to make further advances.

The theory of basing rates absolutely on the cost of the service is unjust and impracticable. This was the conclusion of the Washington commission. It is the view of every traffic manager and every intelligent rate regulating body, including even the Texas commission. This commission said in its first report: "This (the mileage principle) is the only equitable and just principle on which freight rates can be based." After three years of effort to apply the mileage basis, the Texas commission said:

"This we believe to be the proper basis for rate making where it can be applied, but there are so many circumstances affecting traffic, necessitating modifications or changes in mileage rates, that the theory is in many cases destroyed in practice. So varying are the conditions surrounding the roads in the different parts of the state and so diverse are the circumstances affecting traffic that no iron-bound rule of action can be prescribed in the making of freight tariffs."

It is said by some that while rates cannot, taking the valuation as a basis, be fixed absolutely on the cost of the service, the valuation can at least be used as a measure of the return to which the railway is entitled. But there is only one other principle on which rates can be fixed. This is the value of the service. If they cannot be fixed by mathematical calculation they must be fixed by the exercise of judgment, according to what the traffic will bear. If they are to be made by the exercise of judgment, whose judgment is more apt to be correct—that of the traffic manager of the railway who, with his numerous subordinates, is engaged in the constant study of the conditions and needs of the territory in which his road operates, or that of railway commissions whose members lack opportunity to keep so closely in touch with conditions, and who, as they usually enter office with little or no knowledge of the railway business, and as they are constantly changed, usually never acquire expert knowledge?

It is replied that the fixing of rates by the traffic manager of the railway on the basis of the value of the service is objectionable because it involves an inquiry by the railway into the profits of the shipper. But the shippers who constantly are coming to the traffic manager and asking him to reduce their rates on the ground that on the present rates they cannot make a profit, invite such inquiry. If the traffic manager in fixing rates ought to take into consideration the disadvantages under which shippers on his line labor and the smallness of their profits, is he not entitled, when they get to doing better, to take into consideration their advantages and the larger profits which they have come to enjoy? The critics of the value of the service theory attack it as if it were a theory of extortion; in fact, it is a theory of moderation; it fixes rates in proportion to the needs of the shippers.

Some concede that the various specific rates must be based mainly on the value of the service, who yet contend that valuation is a fair measure of the reasonableness of a railway's earnings. But neither the common law nor the statutes of the United States or of any state authorizes the regulation of a railway's earnings. They authorize only regulation of rates. Disregarding, however, the legal phases of the subject, what probably would be the economic effects of attempting to limit railway net earnings to a "fair return on a fair valuation?" Net earnings may be increased either by advancing rates on commodities whose movement will not thereby be curtailed, or by reducing rates on commodities whose movement will thereby be greatly increased; and net earnings may be reduced either by reducing rates already so low that no further reduction will increase the movement of traffic, or by advancing rates on commodities which cannot bear an advance. If, therefore, the object is merely to curtail railway earnings, it may be as easily attained by advancing some rates as by reducing others.

Of course, the main aim is to reduce rates as low as practicable. But it is easy to see how, in many cases, limitation of railway earnings might actually have the effect of preventing reductions in rates. Suppose a railway is earning on its state valuation the exact return to which the commission considers it entitled. It has an empty car movement in one direction. A shipper brings to its traffic manager's attention the fact that if it will make him a low rate that will enable him to reach a certain market he can give it traffic which will load its empty cars and yield revenue somewhat exceeding the additional expense incurred in handling the additional traffic. The railway makes him the rate requested and thereby so increases its net earnings as to make them exceed what the commission considers a "fair return." It is assumed that the commission will do its duty as it sees it and compel the road to make enough further reductions in its rates to lop off its excess earnings. The railway will then have gained nothing; it will handle a larger traffic for the same return. When another shipper comes for a reduction in rates, will the traffic manager be so willing to make it? Why should a road which is earning all it is allowed to reduce its rates in a vain effort to earn more?

The effect of carrying out this plan in the way that is being very widely advocated would be to prevent investments in improvements in prosperous roads, to bankrupt the unprosperous and to stop the construction of new lines. The more prosperous roads are earning more than the percentage to which those who advocate a valuation think that railways should be limited. Why should they invest money to reduce operating expenses when warned that all of their net returns above a certain low percentage will be appropriated by reductions in rates? In every part of the country there would be found some road or a class of roads that was earning larger net returns than competing lines. If the rates of these roads were so reduced as to prevent them from earning more than a "fair return" the less prosperous competing roads would be prevented from earning a "fair return" or perhaps any at all.

The length to which those who advocate the "near-confisca-

tion" theory of regulation are prepared to go is illustrated by the attitude of the complainants in the cases involving freight rates in the West which are now pending before the Interstate Commerce Commission. The complainants in the Spokane rate case contend that all that the Northern Pacific and Great Northern are entitled to is a small percentage of return on their actual value, and that the fact that the effect of reducing their earnings to a "fair return" would be to prevent the Harriman Lines, which reach Spokane by a circuitous route, from making any money at all from their Spokane business, is no valid reason why it should not be done. The weakest line involved in the Salt Lake rate case is the Denver & Rio Grande; and in this case the complainants vigorously argue that the Union Pacific, which is the strongest line, should be restrained from earning more than what they consider a fair return, even though the certain effect be to bankrupt the Denver and Rio Grande. The weakest road involved in the Portland rate case is the new road of the Hill lines, the Spokane, Portland & Seattle, which recently has been built at very heavy cost and which has not yet had time to build up a substantial traffic. With reference to this road counsel for the complainants in the Portland case said:

"From any standpoint the returns on this particular road should have no consideration as affecting the reasonableness of the rates involved in these cases. Considered as a separate road, if extravagantly or imprudently constructed, poorly located, or if there are more roads than business at fair rates, then it must rely upon the future earnings for its returns The public cannot be charged for such mistakes. * * * In any event, it cannot be used as a lever for maintaining unreasonable rates."

There was great rejoicing at Portland and other western points on the advent of the Spokane, Portland & Seattle. But, while the people of that section welcomed the increased transportation facilities supplied by the newcomer, the statements of counsel indicate that in order to limit the earnings of the older roads they are perfectly willing to entirely destroy the earning capacity of the new one. A new road is necessarily built at a greater expense than was an old one. It necessarily, for many years, will have less traffic. If, in addition, it is to be limited to rates which will barely return the current rate of interest on the older roads, the demand for new railways in the less developed parts of the country is apt speedily to outstrip the supply.

If, on the other hand, the policy should be adopted of so regulating rates as to enable the weakest roads to earn a "fair return," not only would no reductions be made for years to come in most parts of the country, but many advances would be requisite. Meantime, of course, the more prosperous roads would earn much in excess of a "fair return" if, as is contended, this be the current rate of interest on good securities.

It is impossible to see how a valuation of railways, even though made with the intelligence and fairness that characterize the Washington commission, could be of any considerable aid either to railway managers or to regulating authorities in making rates. The Interstate Commerce Commission seems to concede this in its recent annual report. At the same time it indicates the way in which it thinks a valuation would be useful. It says:

"Even assuming that the valuation of our railways would be of no assistance of this commission in establishing reasonable rates, it is necessary, if those rates are to be successfully defended when attacked by the carriers, that some means be furnished by which, within reasonable limits, a value can be established which shall be binding upon both the courts and this commission."

But why is it necessary, in order that "reasonable" rates fixed by the commission may be successfully defended, that a valuation shall be made, or that the value of the railway shall be taken into consideration at all? It would seem that the necessity for taking into consideration the value of the property can never arise in court except when the contention is made that a public authority is seeking to confiscate the property. Then the question is not whether rates are reasonable, but whether they are confiscatory; which is a very different matter, unless, as is assumed by a great many persons, any rate is excessive which more than barely escapes the constitutional prohibition against confiscation. If the true test of the reasonableness of rates is the value of the service, not the value of the property by which it is rendered, no valuation is necessary to defend in the courts rates made by the Interstate or any other commission. It can be needed only on the theory that it is to be the policy to so regulate rates as constantly to raise the question, not of reasonableness, but of confiscatoriness.

It seems beyond serious question that a fair valuation would demonstrate that the present value of the railways exceeds their aggregate capitalization; the removal of the gross misapprehension on this subject from the public mind is very desirable. Past experience has shown that legislatures and railway commissions, with a few exceptions, are strongly prone to fix rates which are not only unreasonably low, but are absolutely confiscatory; a fair valuation would be a restraint on attempts at this sort of regulation and a preventive of their success. It is believed it would tend to show that railways are entitled to advance their rates rather than that they ought to reduce them. Whether these results would justify the large public expenditure necessary to make a valuation, which probably would be out of date before it was finished, and which might very possibly be unfairly made and unfairly used, seems rather doubtful.

Letters to the Editor.

ADVANCED SIGNALING PRACTICE IN THE EAST AND IN THE WEST.

New York, Feb. 21, 1910.

To the Editor of the Railway Age Gazette:

Your correspondent, V. C., whose letter dated Chicago, Feb. 7, 1910, is shown among other letters to the Editor, on page 341 of the *Railway Age Gazette* of Feb. 18, called attention to the fact that in testifying before the New York State Public Service Commission recently I did not mention the names of any western roads, when referring to the use of the upper quadrant for displaying signal indications.

I wish to acknowledge the courtesy of V. C.'s charitable assumption that I was simply thoughtless in naming only the New York Central, New York, New Haven & Hartford, Pennsylvania and the Baltimore & Ohio, as roads that were using the upper quadrant. As a matter of fact it was not thoughtlessness that led to the omission of the names of the other roads, but a desire (1st) to cite the roads near New York and familiar to the members of the commission, and (2d) to make the list as brief as possible, having at that time been on the stand somewhat more than an hour. As schoolboys I think we all learned to say the names of the states, beginning with Maine and working down the coast, and thence west, and in naming a list of railways it comes natural, at least to a New Englander, to start up in that corner of the map.

I am very glad that V. C. has called attention to the fact that progress and modern methods in signaling are not confined to the country east of the Alleghenies. The west needs no champion, (first) because its accomplishments speak for themselves, and (second) because the country is big enough and its railway men should all be broad enough so that the question of points of the compass ought not to arise in the discussion of matters so important to our railways as is the question of signaling. There is too much work to be done in safeguarding traffic and in other lines of railroading to afford to have an ounce of energy wasted on sectional disputes. The Railway Signal Association should, I believe, frown most severely upon anything that savors of sectionalism

in its discussion. It has no more to do with the pressing technical question before it for solution than has the color of the hair of the gentleman who may be discussing the matter.

To-day is a good time to recall some of the words of Washington, and a paragraph of his reply to the suggestion made by Colonel Nicola in 1782, that the General should make himself a king, can, I think, be well addressed to anyone who permits other considerations than those of safety, reliability and economy to enter into his consideration of questions before the association. The last paragraph of General Washington's letter reads as follows:

"Let me conjure you, then, if you have any regard for your country, concern for yourself or posterity, or respect for me, to banish these thoughts from your mind and never communicate as from yourself or anyone else a sentiment of the like nature." AZEL AMES.

ACCIDENT RECORD CORRECTION.

Chicago, Feb. 25, 1910.

To the Editor of The Railway Age Gazette:

I notice on page 352, February 18, in your list of train accidents in January, the C., B. & Q. is charged with a collision at Judith Gap, Montana. This is incorrect, as our line ends at Billings, about 114 miles southeast of Judith Gap. . .

H. E. BYRAM,
Vice-President, Chicago, Burlington & Quincy.

[Judith Gap is on the Great Northern. The Associated Press used the term "Burlington road" when it meant, doubtless, "Burlington train," the Seattle train that runs through over the Burlington & G. N. Our conductor and engineer both "forgot to look at the register."—Editor.]

Contributed Papers.

EQUIPMENT DEPRECIATION AND RENEWAL.

BY WILLIAM MAHL.
Vice-President, Union Pacific and Southern Pacific Systems.

In an article by the writer dealing with equipment depreciation (*Railroad Gazette*, Oct. 11, 1907), attention was called to the difficulties which would be encountered in dealing with equipment renewals and depreciation as proposed by the Interstate Commerce Commission and the hope was expressed that the commission would amend, for the present at least, the classification of operating expenses about to be promulgated by omitting therein the provision for "Depreciation" and amending the provision for "Renewal" to the effect that the latter would represent the current cost of replacing all equipment vacated. In the meantime the commission could collect data from which it could be determined how far the use of any fixed per cent. of depreciation would be of practical application or possess any practical value. Understanding then that the main object of these provisions by the commission was to control undercharges to operating expenses by charging equipment vacated to capital expenditures and, conversely, to overcharges to operating expenses by additions to equipment which should have been charged to capital expenditures, I suggested to the commission the simple remedy of a suitable primary account in their classification of operating expenses to which should be charged the amounts which the railways had included in the operating expenses for equipment vacated. The proportion that the amounts thus charged for locomotives and for cars vacated would bear respectively to the total number of locomotives and of cars owned would furnish a unit for comparing these charges to operating expenses of one railway with those of another, as, in a general way we compare the cost per mile of road or track for maintenance of way and structures and thus determine from our knowledge of these matters whether or not the charges are above or below a fair and reasonable cost for maintenance and renewals. Statements Nos. 2, 3, 4 and 5, again submitted, afford a fair illustration of the practicability of these suggestions. The statements submitted in October, 1907, have been supplemented with the results for two additional years, and there is now submitted a statement (No. 1) showing annually for three years the amount and the per cent. which the cost of the equipment vacated bears to the total cost of the equipment in service, the amount and the per cent. thereof charged to operating expenses, and the amount and the per cent. of the salvage value.

The cost of the equipment of the Southern Pacific Company and transactions in respect thereof have been selected for the purpose of illustration. The constituent companies have complete records of the cost of their equipment, and, since 1885, they have dealt with the replacement of their equipment as they have dealt with the replacement of anything else which was destroyed, worn out, or otherwise disposed of, by charging to operating expenses the current cost of replacing in kind such equipment.

These records are complete for twenty-five years, and it may be reasonably assumed that the depreciation in recent years is about the normal average for these companies. The results shown on statement No. 1 are therefore of interest in illustrating the complications and confusion in accounting which would result from the adoption of any fixed per cent. other than for a mere temporary expedient to distribute an estimated amount equally over the twelve months of the fiscal year, this amount to be adjusted at the close of the fiscal year to the actual facts. The per cents. in this statement are the average of equipment owned by fifteen separate companies, and the per cent. of each company for any class of equipment differs materially from that of the other. The wide range of these average per cents. demonstrates the fact that, in these replacements, the railways are governed by conditions other than depreciation and that, irrespective of any arbitrary per cent. which may be fixed or adopted, the retirement of equipment will be governed solely by that which it is believed will be best for the service at the time.

Pending the collection of satisfactory data on which to base a fairly accurate per cent. of depreciation on the cost of the equipment, the Southern Pacific Company, in its desire to comply with the requirements of the Interstate Commerce Commission's classification, has, since July 1, 1907, charged to the primary account of "Renewals" the original cost (estimated if not known) of all equipment vacated, less salvage value. Prior to that date, for a period of twenty-two years the companies had charged to their operating expenses the cost of replacing. Since 1898 the cost of replacing has been at least one-third greater than the original cost, an important difference.

From statement No. 1 it will be seen that the per cent. which the actual replacements on "Depreciation" bears to the original cost of the equipment differs materially from that of the preceding years, and it must be evident from these results that the use of any arbitrary per cent. will be misleading as to facts unless a readjustment be made annually to conform to the facts. The increasing number of cars of metal construction will materially change all our estimates of depreciation. In discussing with railway officers in charge of their motive power, the writer was surprised to learn that, on the railways on which freight cars of metal construction had been in use for over a decade, the replacements compared to the number of cars in service had been so small as to be an unimportant factor in an estimate of depreciation as distinguished from repairs and renewals. It is not at all unlikely that the depreciation in metal cars will not be much above that for locomotives (in which obsolescence has been about the only item), as locomotives are repaired and rebuilt

so long as they can be profitably employed in the service to which they are adapted or assigned. As an illustration of this the reader is referred to the annual report of the Colorado & Southern Railroad Company for the year 1907 in which locomotive No. 145 is reported as placed on the road in 1868. Until recently there were some locomotives in service on the Illinois Central Railroad that were placed on the road in 1857, and there are no doubt instances of this kind on other railways.

In concluding, the writer again expresses the hope that the Interstate Commerce Commission will amend its classification of operating expenses by substituting the primary account of "Replacements" for "Renewals" and for "Depreciation," and by permitting the railways to charge to "Replacement" the current cost for reproducing in kind the equipment vacated or in capacity in the instances in which the companies desire to do so. The sum thus charged to "Replacement" will show the expenditures by the railways in maintaining the standard of their equipment suitable to their traffic and as may be permitted by their means. The commission in its classification for additions and betterments provides that, as equipment is condemned, destroyed, sold or otherwise disposed of, the capital account should be reduced by the cost of equipment vacated and, conversely, that all equipment acquired should be charged to the capital account. This is a simple and business like disposition of the matter and the integrity of the capital account in respect of equipment is thus fully maintained. It now remains only for the commission to make a similar disposition of the equipment vacated, i. e., to charge the difference between the cost to replace, less salvage, in the operating expenses to a suitable primary account.

A railway differs from an industrial enterprise in this that to give satisfactory service to the public it must maintain the physical condition of its property in a high degree of efficiency, as any neglect therein is quickly reflected in its payments for casualties. Therefore the expenditures must be of necessity sufficient to fully make good the annual depreciation.

No. 2.—*Locomotives.*

Year.	Average serviceable number.	Expenditures and charges for— Repairs.	Vacated.	Per locomotive per annum. Repairs.	Vacated.
1909.....	1,846	$5,488,840	$385,335	$2,973	$208.74
1908.....	1,818	5,798,950	80,969	3,090	44.54
1907.....	1,691	5,717,666	271,826	3,381	160.75
1906.....	1,655	5,042,967	767,407	3,047	463.69
1905.....	1,637	5,179,486	143,377	3,164	87.59
1904.....	1,516	5,370,649	70,334	3,543	46.39
1903.....	1,419	4,412,410	197,382	3,110	139.10
1902.....	1,323	3,528,199	237,848	2,667	179.78
Av. 8 yrs.	1,613	$5,067,396	$269,310	$3,122	$166.32

No. 3.—*Passenger Train Cars.*

Year.	Average serviceable number	Expenditures and charges for— Repairs.	Vacated.	Per car per annum. Repairs.	Vacated.
1909.....	1,759	$1,601,276	$91,289	$910	$51.90
1908.....	1,742	1,688,727	125,022	894	71.77
1907.....	1,700	1,361,829	120,889	801	71.11
1906.....	1,624	1,194,668	146,950	736	90.48
1905.....	1,566	1,221,568	102,301	780	65.53
1904.....	1,483	1,094,459	128,248	738	86.48
1903.....	1,349	1,013,262	315,930	751	234.19
1902.....	1,300	963,747	124,680	741	95.90
Av. 8 yrs.	1,565	$1,267,441	$144,413	$810	$92.28

No. 4.—*Freight Train Cars.*

Year.	Average serviceable number.	Expenditures and charges for— Repairs.	Vacated.	Per car per annum. Repairs.	Vacated.
1909.....	44,011	$4,561,715	$838,277	$104	$19.05
1908.....	44,312	4,011,716	1,036,482	92	23.39
1907.....	43,562	3,875,956	1,058,274	89	24.24
1906.....	44,172	3,173,773	1,269,492	72	28.74
1905.....	44,887	2,893,135	562,053	64	12.52
1904.....	44,571	3,031,840	524,882	68	11.78
1903.....	41,982	2,779,309	512,697	66	12.21
1902.....	38,625	2,380,410	465,372	62	12.04
Av. 8 yrs.	43,265	$3,338,482	$783,441	$77	$18.00

The per cent. of freight-train cars vacated to the total number of freight-train cars in service at the beginning of each year for the past 19 years was as follows:

Year.	Per cent.	Year.	Per cent.	Year.	Per cent.	Year.	Per cent.
1891...	3.44	1896...	2.87	1901...	3.13	1906...	6.83
1892...	3.75	1897...	2.28	1902...	3.53	1907...	6.67
1893...	3.00	1898...	3.54	1903...	3.15	1908...	6.45
1894...	2.57	1899...	4.41	1904...	3.01	1909...	5.49
1895...	3.41	1900...	3.02	1905...	3.48		

Including the large number of cars vacated in the year 1906, the average for the 19 years is 3.89 per cent.

The following statement shows the number of locomotives and cars vacated in each of the eight years, the amount credited to the replacement fund the amount charged to operating expenses, and the amount of salvage.

No. 1.—Per Cent. of Cost of Equipment Vacated to Total Original Cost.

	Original cost.	Equipment condemned, destroyed, sold or otherwise placed out of service during the year: Credited to replacement account (original cost).	Per cent. on cost.	Charged to operating expenses.	Per cent. on cost.	Salvage and am'ts received from other companies.	Per cent. on cost.
Locomotives:							
Year ended June 30, 1909	$23,384,711	$478,459	2.05	$385,335	1.65	$93,124	0.398
" " " 30, 1908	24,260,769	252,025	1.04	80,969	.33	171,056	.71
" " " 30, 1907	21,815,471	357,474	1.64	201,850	.93	155,624	.71
Total	$69,460,951	$1,087,958		$668,154		$419,804	
Average for three years	23,153,650	362,653	1.57	222,718	0.96	139,935	0.61
Av. per cent. of salvage to original cost of equipment vacated							38.59
Passenger Train Cars:							
Year ended June 30, 1909	$10,359,072	$204,765	1.98	$91,289	0.88	$113,477	1.10
" " " 30, 1908	10,274,615	264,653	2.58	125,022	1.22	139,632	1.36
" " " 30, 1907	10,046,121	210,944	2.10	139,928	1.39	71,016	.71
Total	$30,679,808	$680,363		$356,238		$324,125	
Average for three years	10,226,603	226,787	2.22	118,746	1.16	108,042	1.06
Av. per cent. of salvage to original cost of equipment vacated							47.64
Freight Train Cars:							
Year ended June 30, 1909	$33,032,484	$1,328,441	4.03	$844,467	2.56	$483,974	1.47
" " " 30, 1908	32,705,781	1,637,358	5.01	1,025,122	3.14	612,237	1.87
" " " 30, 1907	33,164,958	1,768,416	5.33	1,136,919	3.43	631,497	1.90
Total	$98,903,222	$4,734,215		$3,006,508		$1,727,708	
Average for three years	32,967,741	1,578,072	4.79	1,002,169	3.04	575,903	1.75
Av. per cent. of salvage to original cost of equipment vacated							36.49
Work Equipment:							
Year ended June 30, 1909	$3,587,470	$91,470	2.55	$52,473	1.46	$38,947	1.09
" " " 30, 1908	3,131,657	68,434	2.19	40,079	1.28	28,355	.91
" " " 30, 1907	2,641,313	95,142	3.60	67,116	2.54	28,026	1.06
Total	$9,360,441	$254,996		$159,667		$95,329	
Average for three years	3,120,147	84,999	2.72	53,222	1.70	31,776	1.02
Av. per cent. of salvage to original cost of equipment vacated							37.38
Total:							
Year ended June 30, 1909	$70,363,736	$2,103,085	2.99	$1,373,564	1.95	$729,522	1.04
" " " 30, 1908	70,372,822	2,222,471	3.16	1,271,191	1.81	951,280	1.35
" " " 30, 1907	67,667,863	2,431,976	3.59	1,545,813	2.28	886,163	1.31
Total	$208,404,422	$6,757,532		$4,190,567		$2,566,965	
Average for three years	69,468,141	2,252,511	3.24	1,396,856	2.01	855,655	1.23
Av. per cent. of salvage to original cost of equipment vacated							37.99

No. 5. *Summary of Replacements.*

Year.	Locomotives	Train cars—Passenger.	Train cars—Freight.	Road service cars.
1909	45	51	2,434	533
1908	29	78	2,810	183
1907	34	63	2,949	148
1906	127	47	3,389	103
1905	29	28	1,556	78
1904	17	32	1,367	56
1903	34	78	1,270	33
1902	53	51	1,266	50
Total number vacated	368	428	17,041	1,184
Average for 8 years	46	54	2,130	148
Per cent. to total number in service	2.85	3.45	4.92	3.83
Credited replacement fund	$3,164,164	$1,733,558	$9,484,266	$425,358
Charged to Operating expenses	2,154,478	1,155,308	6,262,359	270,268
Scrap value or price realized for equipment sold	1,309,686	578,250	3,221,907	155,090
Average price per loco. or per car credited to replacement fund	9,413	1,050	557	359
Average price per loco. or per car charged to Operating expenses	5,855	2,699	367	228
Av'ge proceeds, sale or salvage	3,559	1,351	189	131
Per cent. of salvage	37.80	33.35	33.97	36.45

Total credited to replacement fund $15,107,346
Total charged to Operating expenses 9,842,413
Total scrap value or salvage 5,264,933

ACCIDENT BULLETIN NO. 33.

(*Continued from page* 407.)

Table No. 2A. (*Continued.*) —*Causes of Prominent Derailments.*

Note.—D stands for derailment; P for passenger train; F, freight and miscellaneous trains.

Derailments.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars, & roadway.	Reference to record.	Cause.
1	D.	P.	2	7	.....	11	Train consisted of a single electric car, which became uncontrollable on steep grade because of slipper track and unexplained failure of air-brake. One passenger killed.
2	D.	F.	1	3	$35	25	Cars of circus train not fit to run over sharp curve; speed very low.
3	D.	F.	2	2	170	20	Car of eastbound freight knocked off track by car in westbound freight, which had been derailed by the pulling out of a drawbar, following sudden application of air-brakes because of bursting of a hose. Two men riding in car (in charge of horses) killed.
4	D.	P.	0	96	300	53	Car in excursion train, full of passengers, too heavy on inside of 16-deg. curve; sill of car rested on wheels, preventing truck from curving freely. Speed, 6 miles an hour.
5	D.	P.	0	3	2,454	55	High speed on 7½ deg. curve; superelevation of outer rail 8 in.; speed, 55 to 60 miles an hour; tender was first vehicle to run off track. Tender had side bearings for rear truck, but not for front. It ran 4,700 ft. off the rails before fact was noticed. Track in good condition.
6	D.	P.	1	61	5,000	22	Washout; 3 p.m.; train moving very slowly. Track foreman held at fault for not stopping train.
7	D.	P.	1	14	5,138	19	Unexplained; derailment at switch; tender first vehicle to run off track. One passenger killed.
8	D.	P.	0	14	5,845	23	Washout; engineman and also assistant roadmaster, riding on engine, held at fault for lack of caution in running. Derailment occurred at midnight; section foreman not on duty.
9	D.	F.	0	0	10,600	30	Unexplained; speed, 25 miles an hour on 6-deg. curve. Bridge damaged.
10	D.	F.	0	0	11,000	27	Excessive speed
11	D.	F.	0	0	12,250	51	Excessive speed.
12	D.	F.	0	5	12,450	26	Runaway on steep grade; 1:40 a.m. Engineman, 9 months in service, started train before train pipe of air-brake system was fully charged.
13	D.	P.	0	13	12,500	12	Broken rail.
14	D.	F.	0	0	13,000	24	Maliciously misplaced switch; wreck partly destroyed by a fire which started in a car containing matches.
15	D.	F.	1	1	13,465	21	Runaway on steep grade. (See note in text.)
16	D.	P.	0	3	16,250	50	Bridge weakened by fire; situated on curve where view was very short.
17	D.	P.	3	48	16,375	82	Rail joint maliciously removed and rail pulled out of place.
18	D.	F.	0	0	24,050	15	Loose wheel; derailed truck knocked down a bridge.
19	D.	P.	8	57	26,730	31	Embankment undermined by flood. Track inspected and in good order at 6 p.m. Derailment occurred at 10 p.m. Engineman and fireman killed; 6 passengers killed.
Total			19	327	$187,612		
Grand total.			81	827	$453,267		

Collision No. 14, killing 16 passengers and injuring 165 passengers and 2 trainmen, was between a westbound special passenger train and an eastbound regular passenger train, the special having run only about 1½ miles from its initial point. Both trains were heavily loaded. The special had no right to the road as against the regular. It had received an order from the despatcher to meet an eastbound special at a point 5 miles farther on, and it appears that the motorman, not having read the order with sufficient care, had in his mind the impression that the eastbound train specified in the order was the regular (against which, in fact, he had no rights). When the special train was ready to start, the eastbound regular train, which was already due, had not arrived, and the conductor told the motorman to move forward a short distance (within the yard limits) to the switch at which the incoming regular train would clear the main line, the conductor's intention being to wait there until the eastbound train arrived. Having given this information, and the train having started, the conductor at once went into the first car of the train and began taking up tickets; and while thus engaged, the train went on and passed the switch (at which it should have stopped) without his knowledge. The westbound train was running 20 or 25 miles an hour a moment preceding the collision, and for this speed the motorman is held blameworthy, as he might have seen the eastbound train in time to apply the brakes some 500 ft. farther east. The eastbound train had been stopped or nearly stopped before the collision. Both trains having electric motor cars in front, with no separate locomotive, the brunt of the collision was borne by cars occupied by passengers.

Collision No. 16, killing 8 passengers and 1 employee, was due to carelessness on the part of the men in charge of the northbound train. This train, drawn by two engines, was ordered to meet the first section of the southbound at B and the second section at C. On arriving at B the first section of the southbound was found on the siding and passed. On arriving at C no stop was made and the second section of the southbound was met 300 ft. beyond the farther switch. The men in charge of the northbound train—the conductor and two enginemen—offer the explanation that an engine standing on the side track at C was mistaken by them for the second section (which they were to meet), but this "explanation" still leaves these men chargeable with gross negligence as the engine standing on the side track had white flags displayed (showing that it was not a regular train) and it was of a different number from that of the engine of the regular train which was to be met and the number of which was named in the meeting order. Both trains were running at full speed when they met.

Collision No. 1, in which six drovers, riding in the caboose of a freight train, were killed, occurred about midnight on a line which is used by the trains of several companies, and on which it seems the trains are run under somewhat peculiar rules. The freight train, belonging to road A, and consisting

of cars of live stock, was running over the track of line B, its trip over these tracks being for a distance of about four miles. It is the duty of the men in charge of all such freight trains to be constantly on the alert to protect their train from any train following; but it does not appear that they are required to keep themselves posted as to the times when following passenger trains are due. On the other hand, the rules limit the speed of passenger trains to 25 miles an hour. The passenger train belonged to road B. It had left the last preceding station about seven minutes behind the freight. According to the testimony before a coroner's jury (as reported by the railway company) the stock train was running at from 1 to 6 miles an hour at the time of the collision and the passenger train at from 12 to 40 miles an hour. From this last finding it would appear that the jury was unable to reach a definite conclusion, from the testimony, as to the speed of the passenger train. The only witness who thought that it was running at anything like 40 miles an hour was one of the drovers in the caboose of the freight train. The report of the railway company indicates that the flagman of the freight had neither made any effort to flag the passenger train nor thrown off any fuses; and that the engineman of the passenger train was running his train at a moderate speed, from which he could have stopped within 500 ft. if he had been flagged; and that he was keeping a good lookout. He had shut off steam preparatory to reducing speed to 12 miles an hour a little farther on. The conductor and the flagman of the freight appear not to have been well acquainted with the road. They declare that their train was moving at 10 or 12 miles an hour, but the coroner's jury evidently discredited this statement. The engineman of the passenger train and the conductor of the freight were men of long experience; the flagman of the freight, 23 years old, had been in the service about one year.

Collision No. 3 occurred on a double-track road about 3 a. m., and was due to errors of block-signal operators in arranging for the sending of a train east on the westbound track. Extra train 6 was to run eastward from B to C and an order was sent to C which required the telegrapher at C to hold all westbound trains until the arrival of extra train 6 at C. Just as this train left B, the signalman at C allowed a westbound train to pass toward B. The signalman at B accepted this westbound train for the reason, as he said, that he thought it was on the eastbound track. The superintendent, however, holds that there is no reason to justify such an impression on his part. The operator at B was 21 years old and had been in the service about one month. The operator at C was 22 years old and had been in the service of the company about six months.

Collision No. 7 was between southbound and northbound regular freight trains. An order was delivered that the northbound would wait at F until 12.20 a. m. for the southbound; then another order was sent to the effect that it would wait at B until 12.40 a. m. for the southbound; then a third order was sent saying that it would wait at F until 12.50 a. m. for the southbound, and "orders 140 and 135 are annulled." In delivering this order the operator wrote "40" in place of "140," though the superintendent is satisfied that in repeating it to the despatcher he repeated correctly; and the order was delivered so soon after it was received that it is not likely that the operator had time to rewrite it. The conclusion seems to be that in repeating the order he discovered his error and intended to add the figure "1" before delivering it; but he did not do so. By this mistake order No. 140 was left in force, and this caused the collision, as the other train affected by this annulled order had received a correct copy of the annulling telegram and was thus relieved from complying with that order.. The conductor and the engineman of the southbound are held at fault for accepting an order annulling another order which they had not received. It should have occurred to them that something was wrong. The operator who made this mistake had had four months' experience. The conductor and engineman who accepted the suspicious order had had several years' experience.

Collision No. 12, occurring on a single-track line about 3 a. m., was due to the neglect of trainmen to exactly and properly identify each other's trains at a meeting point. Several extra passenger trains were to be run west from G. Some of these were run as sections of a regular train, and then, when the schedule of this train was 12 hours old, four additional passenger trains were run as specials. After the despatcher had issued his orders, making a number of meeting points for these four specials, it was decided to run a fifth. The fifth was run from one station to another ahead of the third and on the rights of the third. This was an irregular proceeding made apparently by the conductor of the train on his own authority, but in accordance with rule 94 of the standard code. This fifth train, now become the third, may be designated as No. 81. (A special passenger train is designated by the number of its engine.) It was running on the rights of No. 82, and the men in charge of it were taking care that no eastbound train should encroach on the rights of No. 82. On meeting an eastbound extra freight the engineman of No. 81 spoke to the engineman of the freight, describing the situation. The conductor of No. 81 was nearby, but did not participate in this conversation and did not know exactly what was said. The conversation between the enginemen should have been participated in and confirmed also by the conductor of the eastbound freight; but he, with a brakeman, was on the rear of his train, and although they noticed, on passing the westbound, that the engine was not the correct number that they expected, they assumed that their engineman had received suitable assurances from the man on the westbound and they took no action to prevent their engineman from proceeding toward the next station; and the collision occurred in three or four minutes afterwards. The primary trouble appears to be that the engineman of the eastbound had fixed in his mind the four westbound specials which were to be met, and did not realize that he had been informed that there were five trains.

Collision No. 15 was due to the neglect of a block signalman and of a flagman. An eastbound freight train was stalled at S, and a passenger train, following, was coupled to the freight in order to assist it up a grade. While the two trains were being coupled the flagman of the passenger went back with a red light. The coupling having been completed, the engineman of the passenger train sounded two blasts of the whistle, for the release of the brakes, and then repeated the signal. The flagman, wrongfully assuming that the sounds of the whistle authorized him to return to his train, did so return; but the combined train was slow in moving and the flagman went back a second time. Before he had gone far, however, he met a following passenger train running at 40 miles an hour, and the engineman of this train was unable to stop it before striking the one ahead of it.

The rear of the stalled passenger train was about 1,100 ft. ahead of a semaphore signal, which should have been set to stop the second passenger train, but which was left in the clear position. For this the signalman is held grossly negligent. From the next station in the rear, up to this signal, the manual block system was in effect, but that section of the line ahead of the signal and occupied by the stalled trains, being in the yard, was not worked under the block system. The operator who had left the signal wrongfully in the clear position had kept his distant signal set against the approaching train, but as the engineman could plainly see the home signal, he, of course, did not slacken speed at the distant. The signalman saw the second passenger train in season to have set the home signal against it, but he became confused and did not think to take such action. The engineman of the second passenger train is held blameworthy for not being properly alert approaching the station. The testimony shows that he

did not shut off steam until nearly or quite the moment at which he struck the train ahead.

Collision No. 18, between westbound freight train No. 33 and eastbound freight train No. 34, occurred one-half mile west of the station where the trains should have met, and was due to the failure of an operator to deliver the meeting order to the westbound train. Having a number of orders to deliver to that conductor, he delivered all but one of them. The despatcher was also held blameworthy because, in receiving the acknowledgment from the station operator of a number of orders for train No. 33, he failed to note that the particular order in question was not acknowledged. This despatcher had had eighteen years' experience—ten as an operator and eight as a despatcher. The station operator is 22 years old and has had eight years' experience, during the last four of which he has handled train orders. This collision occurred at 2 o'clock a. m. and the operator had been on duty about two hours. He declared that he was not sleepy.

Collision No. 19 was due to the failure of a station agent to deliver a meeting order, and to a misunderstanding in connection with an oral order given by the conductor to the fireman. Passenger train No. 3, northbound, and freight train No. 6, southbound, were to meet at S. An order had been issued to this effect, to be delivered to the passenger train at D, a station 7 miles short of S; but this order the agent at that point failed to deliver. The collision, however, is not to be charged wholly to this failure, because a part of the freight train had arrived at S before the passenger train reached that point. The freight train had been stalled about 2 miles before reaching S, and a part of its cars had been left standing on the main track, while the engine and the front part of the train went on to S. As this front portion was obliged to pass beyond the station at S, a flagman was sent forward to stop the passenger train, which he did. The passenger train after being flagged moved forward to the station. When ready to start its conductor spoke to the fireman, only about 30 ft. away from him, giving instruction that the train should be moved forward and then set back on to the siding to wait for the freight, the engine of which had gone back to haul in the rear portion of its train. The freight flagman, standing with the passenger conductor, also made a hand motion to the fireman, indicating the same thing. The fireman (who was subsequently killed in the collision) nodded his head and the train was started. When its rear end passed the switch, the conductor dropped off to turn the switch and then was astonished to find that the train, instead of stopping, kept on; and it soon collided with the freight train. The passenger engineman, as well as the fireman, was killed. Both engineman and fireman were experienced men and had worked together four years. Both men being killed, there is no explanation of how they came to misunderstand the situation and the orders given. The collision occurred at 3.25 p. m.

The agent at D, who failed to deliver the order to the passenger train, had resigned his position and was to leave the service the next day. He took this message and then seems to have depended on his prospective successor to deliver it, but without telling him to do so; and when the train came was out on the platform talking with an acquaintance, entirely forgetful of the order. There was no train-order signal at the station as, until a short time before that, the universal practice was to send all train orders by telephone direct to conductors, and always simultaneously to both of the conductors for which a meeting order contained instructions. The flagman who flagged the passenger train at S did not explain to the engineman the reason why the flag had been displayed.

Derailment No. 15 was due to mismanagement of the air brakes on a train consisting of 2 engines and 33 cars. The air-brake pipes were properly connected throughout the train. Parts of two trestle bridges were knocked down by the derailed cars, a car in the middle of the train being derailed first, at a curve, causing the derailment of the cars behind it, which were piled up in the ruins of a bridge which was encountered at that point and which was wrecked; and the forward part of the train ran some distance farther, when that also was derailed at a bridge, with the exception of the leading engine, its tender and the second engine, the tender of the second engine going off the track. Some little time after passing over a summit, the engineman of the leading engine, attempting to apply the brakes, discovered that there was no air pressure available. He sounded his whistle for the application of the hand brakes, and then went back to the second engine, but found that it was impossible to check the speed of the train there. By this time the train was running so fast that it was impossible for the brakemen to get from one car to another. It is the conclusion of the officers of the company that at the time the leading engine was attached to the train, for the purpose of assisting it up a grade, its engineman neglected to "cut in" his brake valve, so that for some distance the brake valves of both engines were cut out. During this time the air leaked from the train line, but so very slowly that the brakes were not applied by the reduction of pressure. The engineman of the leading engine was blameworthy in not noticing the condition of the air pressure, and also for not making the running test required by the instructions. The engineman of the second engine is at fault for not having seen that the leading engineman made the test as required. The conductor, who was in the caboose, neglected to notice the air gage. When the whistle was sounded for the application of the brakes, the conductor suddenly discovered that there was no pressure in the train line.

MOGUL LOCOMOTIVES FOR THE TIENTSIN-PUKOW RAILWAY, CHINA.

The Baldwin Locomotive Works have recently shipped to China two mogul locomotives intended for general road service on the Tientsin-Pukow Railway. The track gage is standard, and when compared with many six-coupled locomotives used on American roads this design appears of moderate capacity, as the tractive force developed is 22,100 lbs. The engines are, however, admirably adapted to the service required. It may be noted in this connection that while comparatively few mogul locomotives are being built for the principal American lines, there is a steady demand for this class of power from foreign roads.

The engines under notice have straight topped boilers with inside fireboxes of copper. The crown and sides are in separate pieces, and the tubesheet is increased in thickness from ½ in. to ¾ in. over the area where the tubes are inserted. The staybolts are of copper. The firedoor opening is formed with a ring which is riveted between the inside and outside sheets. The barrel is composed of two courses, and except for the construction of the dome, presents no unusual features. The dome body is of pressed steel and is bolted to the dome base. As the body can be easily removed, the throttle valve and its operating mechanism are readily accessible. The dry pipe is of copper.

The boiler is equipped for burning bituminous coal. The grate is of the rocking type with drop plate and the firebox contains a brick arch supported on studs. The smokebox is extended and is fitted with netting, an adjustable diaphragm plate and a high double nozzle. The stack is straight, 18 inches in diameter.

In many respects the most interesting features of these locomotives are the frames and running gear, which are designed, to a large extent, in accordance with foreign practice. The frames are of mild steel plate, 1¼ in. thick, and rolled in one piece for each side. With this construction the firebox can be placed above the rear driving axle and between the frames. It can thus be made of ample depth and of nearly the same width as the usual type of narrow firebox when placed on top of bar frames. The frame pedestals are bolted in place and, together with their binders, are of cast

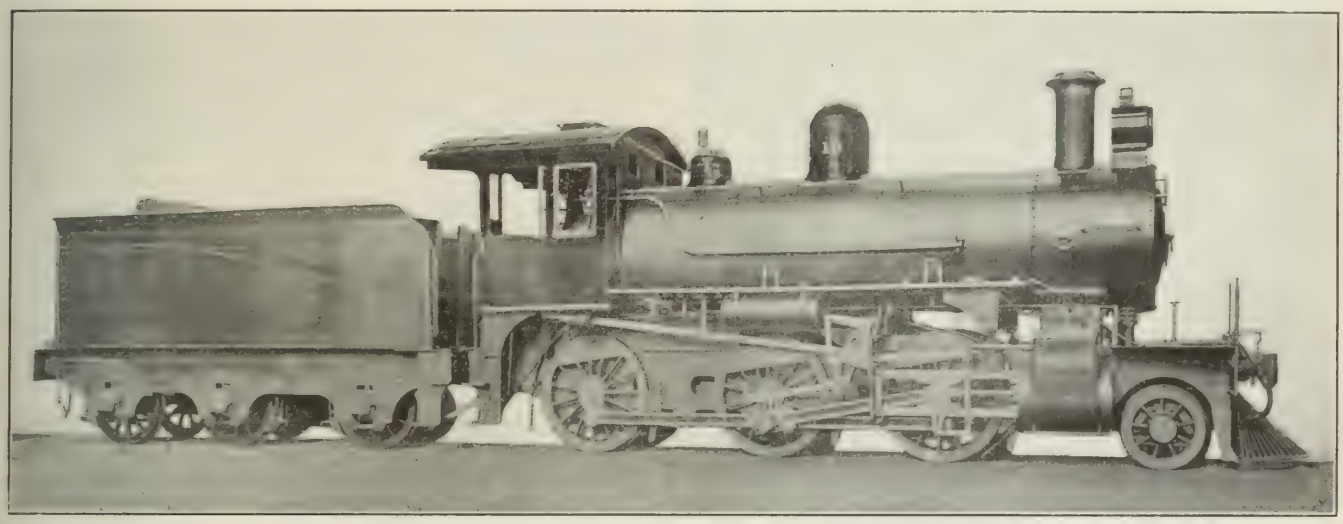
steel. The driving springs are underhung, and the loads on the main and rear drivers are equalized through beams fulcrumed under the frames. These beams are of cast steel, with an I-section. The front drivers are equalized with the engine truck as in American practice.

The driving boxes are of steeled cast iron and the driving wheel centers are of cast steel. The truck wheels are steel-tired, with cast steel centers.

Each cylinder is a separate casting, and the saddle, which supports the boiler and occupies the space between the frames, is made in one piece. The cylinders and saddle are lipped on top of the frames and securely held together by horizontal bolts. The steam distribution is controlled by Richardson balanced slide valves, driven by Walschaerts motion. The links are trunnioned on castings bolted to the guide bearers. The latter are of cast steel, each being formed in one piece with a broad vertical foot which fits up against the outside of the frame and is securely bolted into place. Between the guide bearers the frames are braced transversly by a deep cross tie. Similar ties are placed under the front of the firebox and ahead of the main driving axle. The frames are bolted, at the rear, to a cast steel foot plate.

The engineman is located on the right-hand side of the cab and the general arrangement of the fittings is similar to

Boiler, diameter of shell	61¾ in.
Boiler, thickness of sheets	⅝-in.
Steam pressure	180 lbs.
Fuel	Soft coal
Firebox, material	Copper
" length	87 in.
" width	40 "
" depth, front	75½ "
" depth, back	65½ "
" thickness, side and back sheets	½-in.
" " crownsheet	⅝ in.
" " tubesheet	⅝ in. and ½ in.
" water space, front	3½ in.
" " " sides	2½ "
" " " back	3 "
Tubes, material	Iron
" thickness	No. 12
" number	238
" diameter	2 in.
" length	12 ft. 0¼ "
Heating surface, firebox	140 sq. ft.
" " tubes	1,489 "
" " total	1,629 "
Grate area	24.2 "
Wheels, diameter driving	60 in.
" " truck	36 "
" " tender	45 "
Journals, driving	8 in. x 10 in.
" truck	6 " x 10 "
" tender	6¼ " x 10 "
Wheel base, driving	15 ft.
" " engine	23 ft. 3 in.
" " engine and tender	46 " 3 "
Weight on driving wheels	101,800 lbs.
" on truck	23,150 "
" total engine	124,950 "
" engine and tender	221,000 "
Tank capacity, water	4,800 gals.
Tank capacity, coal	7½ tons



Mogul Locomotive for the Tientsin-Pukow Ry., China.

American practice. Two sand boxes are provided, and they are placed under the running boards, immediately in front of the leading drivers. The equipment includes British Westinghouse automatic quick-acting air brakes. Whitworth threads are used on all bolts, nuts and staybolts.

The tender is carried on three pairs of wheels and the loads on the second and third pairs are equalized. The frames consist of steel plates; they are placed outside the wheels and are strongly braced transversely between the axles. Steel plates are also used for the bumpers. The tank is wedge shaped and carries 4,800 gallons of water. The fuel space has a sloping floor throughout its entire length and accommodates 7½ tons of coal. The tender wheels, like those of the engine truck, are steel tired with cast steel centers, and were manufactured by the Standard Steel Works Company.

In general outline these engines present a pleasing appearance. They are simple in construction, and as the valve motion is entirely outside the wheels, the plate frames in no way prevent access to the working parts. The engines combine, to a marked degree, the flexibility of the American locomotive, with various structural features which are characteristic of European practice.

The following are some of the principal dimensions of the engine:

Gage	4 ft. 8½ in.
Cylinders, diameter	19 "
Piston stroke	24 "
Service	Passenger and freight
Tractive effort	17,351 lbs.

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 81.47^*$$

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.98$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 7.20$$

$$\frac{\text{Tractive effort} \times \text{diameter drivers}}{\text{Heating surface}} = 638.95$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 67.31$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 8.59^*$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 62.49$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 76.70$$

$$\frac{\text{Displacement of 2 cylinders, cu. ft.}}{\text{Heating surface}} = 7.87$$

$$\frac{\text{Heating surface}}{\text{Displacement, 2 cylinders}} = 207.0$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 3.07$$

* Per cent.

THE FACING POINT LOCK.*

BY W. H. ARKENBURGH.

Conservatism is the force which keeps alive many usages which might be relegated to the rubbish heap. We do a great many things because our fathers did them before us. Consider a mechanical interlocking switch. It is operated by a line of connections, of 1-in. iron pipe, from a lever. When the lever is thrown it pushes or pulls the pipe and thereby moves the switch points. To prevent the points from getting out of place by reason of lost motion a facing point lock is added. This is a plunger, working in a casting, operated by another lever in the same manner as the switch. When the facing point lock lever is reversed the plunger is forced through a hole in a lock rod which is attached to the switch points more or less securely and passes through the plunger casting at right angles to the plunger. When the lever is put normal the plunger is withdrawn. There are in the lock rod two holes, so that the plunger may pass through either and thus may hold the switch points in either position. Yet this is not enough. A bolt lock is provided (where convenient), so that in case the switch points fail to move and the plunger goes back into the same hole from which it was withdrawn, it will be impossible to clear a signal. Thus the mechanism of an interlocked switch consists of a means of throwing the switch, a means of locking it in both positions, and means of indicating its position.

Yet even when so equipped, is a switch reasonably well safeguarded? Records of performance would seem to indicate that it is; yet we find occasionally that some one of the three devices fails to act. The weakest point is the bolt lock. To most of the switches in any given route it is cumbersome and expensive to apply. Without the bolt lock we must depend on the facing point lock altogether, with the result that our trust may be betrayed in a number of ways. Pins can and do work out, despite cotter keys and other checks. Pipe lines sometimes break, as do also crank and compensator stands. These stands can work loose from their foundations or the foundations may move. From any one of these causes a switch may not respond to its lever, thus allowing the lock plunger to re-enter the hole in the lock rod from which it was withdrawn. Again, a switch may not complete its stroke, and a break in the facing point lock connections, or a loose part will allow the lock lever to be thrown. In either event the signalman has no intimation that anything is wrong. The lock rod or plunger or any other part of the mechanism can be removed, as in making repairs, and the working of the levers not be affected. In other words, nearly any failure through breakage, by removal of a part, or by reason of lost motion is what is known in block signal practice as a *clear failure*—it is not on the side of safety.

Now it is possible and feasible to provide a reliable check on the working of a mechanically interlocked switch. In one system of electric interlocking, that made by the General Railway Signal Company, a device is used which insures that a switch must be fully thrown and locked before an indication is received at the lever. If the plunger re-enters the hole from which it was withdrawn, i.e., if the lock rod does not move, no indication will be received at the lever. If any part is removed, as the lock rod or plunger, no indication will be received at the lever. This is accomplished by making the stroke of the indication controlling contacts dependent on the movement of the lock rod itself through its full stroke, and of the plunger through the hole in the lock rod. The stroke of the controller is completed by the end of the plunger after it has passed through the hole. To make protection complete only one thing further is necessary; that is to make the governing signal, when clear, lock the switch, and the switch, when unlocked, lock the signal in the stop position.

These safeguards may properly be called an electric bolt lock and they can be easily applied to a mechanically interlocked switch. A switch so equipped could be operated by a switch and lock movement, thereby doing away with one line of connections from the tower to the unit. One method of application would be to provide an electric lock on the signal lever to lock the latch down when the lever is normal and the lock de-energized. The circuit for the lock would pass through two controllers, one actuated by the locking plunger or plungers on the switch-and-lock movement and one by the lock rod itself. The controller actuated by the plunger should be carried on the dog of an electric lock situated at the switch and so arranged that when de-engerized the dog will drop into a notch in the end of the locking plunger when the plunger is in locking position and close the circuit when in this position only; when raised out of the notch or when dropped below it, because of the absence of the plunger, the circuit should be open. The circuit for this lock should be carried through a normally closed controller on the signal arm, a normally closed controller on the signal lever latch and a controller on the latch of the switch lever, so arranged as to be closed only with the latch up, but to be open with the latch down and the lever in either position.

With this arrangement the operation would be as follows: In lifting the latch of the switch lever the circuit for the electric lock on the plunger would be energized, raising the dog from the notch and releasing the plunger. This would open the circuit of the electric lock on the signal lever at this point, it being already open at the controller on the lock rod. The switch could now be thrown, closing the circuit of the signal lever lock through the controller on the lock rod; at the end of the stroke the latch, being lowered, would open the circuit of the plunger lock, allow the dog to drop into the notch, close the circuit of the signal lever lock through the contacts on the dog, and release the signal lever. Clearing of the signal would open the circuit of the plunger lock at both the lever and the blade, thereby holding the plunger in place. Any failure of any part of the apparatus, except an electrical cross, would prevent the movement of one of the levers concerned, thereby instantly calling attention to the fact that something was wrong. Absence of the plunger or lock rod would have the same effect.

In the case of power operated or slotted signals the lock on the signal lever might be omitted and the signal control circuit taken through the controllers as described for the lock circuit. The reason for making the lock at the switch act on the plunger rather than on the lock rod or some other part is that there is no strain on the plunger, consequently the dog would not be likely to jam; also it is desirable to detect the presence or absence of the plunger.

One great advantage of the arrangement here described would lie in its adaptability to use with electric detector locking. All the locks on switches in a single route or section of route could be combined on one circuit and be actuated by the latch on a route or key lever, or by a floor push, thus minimizing the amount of electrical apparatus needed in the tower; and the combined control circuit could be taken through the point of a track relay. Thus the presence of a train in the section would lock the plungers of the switches themselves, which is the theoretically correct method (compare with detector bar).

There is the matter of cost yet to be considered. It would be expensive to equip all signal levers with electric locks, but by suitable mechanical locking, a key lever could be provided which would have to be reversed before any dwarf or low-speed signal could be cleared and a lock attached to such lever. In that case more protection would be afforded than is now had when dwarf and low-speed signals are rarely bolt locked: as a matter of fact, even high-speed signals are usually bolt locked only with such *facing points* as occur between the signal and the tower; and when power signals are used there

*An article by Mr. Arkenburgh on "Bolt Locking" was published in our issue of April 3, 1908, and one on "Switch Adjustment," December 10, 1909.

is no equivalent of the bolt lock at all (a switch box merely controls the signal, it does not lock the switch). In many cases there would be an actual saving, in that, by doing away with the separate facing point lock, there would be fewer levers with their attendant connections between the tower and switches. Thus there would be economy of levers, pipe line and tower room. The saving probably would be comparatively small, however, as it is safe to say that the cost of the electrical apparatus would equal that of the mechanical material displaced. Perhaps there would be a saving of money in the size of tower needed in large plants. However, in view of the added safety and reliability secured, even an additional expenditure would seem warranted.

There is still another factor to consider, namely—operation. By the concentration of functions, fewer levers are needed for any given route, consequently fewer movements are required to set up a route. This would result in economy of time, which is frequently an important matter.

By adopting some such arrangement of apparatus as above suggested the following results would be gained at probably no additional cost over present practice. (a) Failures would be on the side of safety. (b) The equivalent of an *absolute* bolt lock would be secured for all signals. (c) Failures would be promptly detected. (d) Electric detector locking could be applied at the vital point, i. e., the locking plunger of the switch. (e) Fewer levers and their connections would be required, resulting in—(f) Economy of time in setting up routes, thus facilitating train movements.

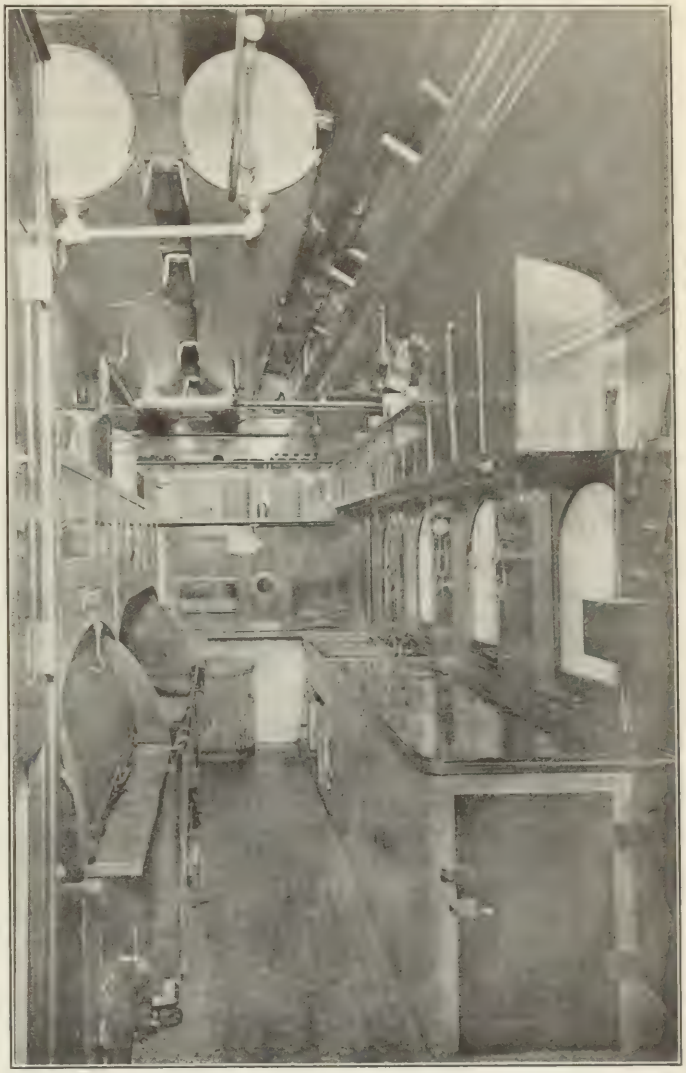
NEW YORK CENTRAL DINING CAR.

Dining car No. 405, recently completed at the West Albany shops of the New York Central & Hudson River, made its first trip from New York to Albany on the Lake Shore Limited on February 16. It will be used on this train and on the eastbound Twentieth Century Limited. This car incorporates some very novel features and may well be considered as near to perfection in the car builders' art.

It is 72 ft. 6 in. long and 9 ft. 8 in. wide over end and side sills, and 80 ft. 8¼ in. long overall. The dining room is 32 ft. 3 in. long, with five four-seat and five two-seat tables, giving an accommodation for 30 persons in all. The interior is finished in light mahogany and the decorations are light green. The beam ceiling design and the absence of protruding wall and ceiling decorations gives a large and roomy appearance, There are 15 electric lights in the dining room, arranged along the upper and lower decks.

The kitchen and pantry occupy a portion of the car 26 ft. 5 in. long and 6 ft. 8¾ in. wide. As the pantry is but 6 ft. 8 in. long, it leaves 19 ft. 9 in. for the kitchen alone, which is probably as great in length as any dining car kitchen in use. The half-tone illustration gives a very good idea of the kitchen arrangement. Just inside the door and to the left are several lockers, next to which is the broiler, then the range and the steam table. On the right side, as seen in the illustration, is, first the general work table, which also houses the egg trays, vegetable boxes, etc., and just beyond this are two sinks. A 12-in. table extends across the partition between the kitchen and pantry, and there are two small openings through this partition for passing the cooking to the pantry, where it is finally delivered to the waiters.

It will be noticed that one end of the car is apparently blind. This is so only on one side, there being but two side-vestibule entrances to the car instead of four. The space



Interior of Dining Car Kitchen.

thus gained is, on the kitchen end, used as an ice-box, which is charged from the roof. Adjoining the box is a 3-ft. 2½-in. x 2-ft. 10-in. refrigerator, which opens into the kitchen. The space gained in the vestibule on the opposite end of the car is devoted to a locker for water bottles.

This car requires a crew of 13 men, including one steward,



Dining Car No. 405; New York Central & Hudson River.

one cashier, one chef, four cooks, one pantryman and five waiters. The following special equipment has been used:

Curtain fixtures	Curtain Supply Co.
Couplers	Tower
Draft gear	Miner
Exhaust fan in kitchen	Diehl
Heating system	Ward Vapor
Refrigerator	Gohn
Steel underframe	Commonwealth Steel Co.
Steps	Standard Steel
Trap doors	Edwards steel
Ventilators	Garland
Window fixtures	Edwards

FREIGHT CAR SERVICE THROUGHOUT THE WORLD.

The conditions and rules under which freight cars are interchanged between different railways and under which this service is paid for, and demurrage is collected from consignees, form the subject of a note by W. F. Allen, secretary of the American Railway Association, which has been prepared for the next session of the International Railway Congress, and is printed in the *Bulletin* of the Congress. This "note" fills 225 pages of the *Bulletin*, and that it is full and detailed goes without saying.

Mr. Allen has gathered data from the managers of 430,000 miles of railway, using 3,800,000 freight cars, of which 250,000 miles of line and 2,200,000 cars are in North America (including Canada and Mexico). In this North America territory there are 80,000 towns and the freight cars belong to 900 owners, though four-fifths of the cars are owned by 56 companies. From one-fourth to one-half the cars are at all times away from home; that is to say, on the roads of companies other than their owners.

The problems connected with the car service seem to be the same throughout the old world that they are in the new. Elaborate regulations have to be made to compel railways to deal in perfect fairness with each other, and the shipper and consignee who take an unreasonably long time to load or unload a car are found in every clime.

In some countries borrowed cars are paid for by a combination of mileage and per diem rates, and again rates sometimes vary with the tonnage capacity. In Great Britain the mileage rate for cars running over 278 miles is less than one-half the rate charged for 58 miles or less. In some parts of Europe cars are charged for by 12-hour periods, or even one-hour periods, though in general the day of 24 hours is the unit. Since April 1 last a general freight car pool has been in effect in Germany.

In Russia the system of interchange is based on a rule of "car for car." An agreement between the Southern Railway of France and the Paris-Orleans Railway provides that differences, if less than 300 cars, shall be disregarded in balancing. In South Africa the Central South African Railway and the Cape Government Railway have a freight car pool for through traffic and no car hire is levied. A similar arrangement, dealing only with coal cars or ore cars, is found in America. The custom of allotting a certain period of time for the journey of a car and charging a per diem rate after that time is in quite general use, and in some cases there is also a heavy addition mileage charge.

The report goes quite fully into the question of rates in the principal countries, and an instance has been found in this country where the interchange rate is higher during the four heavy months of the year than during the eight light months.

Under the head of demurrage the report sets forth the complicated problem with which the railways of North America have had to deal, such as restrictions imposed by the laws of 49 legislatures, the unbusinesslike practices of the roads themselves in the past, the existence of over 100,000 cars not owned by the railways, and the great difference in the size and value of different cars. With all this our readers are familiar. In England the railways seem to be able to collect demurrage and keep it, and in times of car shortage "all applications for refunding demurrage are refused." Penalties for wrongful diversion seem to be very generally prescribed and, so far as can be judged by the report, these penalties are enforced. Elaborate statistics are given showing the average value of cars of different kinds in all parts of the world, but in the absence of information as to the size and capacity of cars these figures give little information. Under another head similar statistics are given showing the capacities of cars. In general it may be said that in European countries charges are adjusted much more closely to the actual or estimated value of the service than in this country. On the Midland Railway of England, for instance, no demurrage is charged on coal wagons, but after four days there is a charge of six pence a day for the use of the track. On the Caledonian Railway of Scotland, the demurrage on an ordinary car being three shillings a day, the rate rises to 12 shillings in the case of a car of 20 tons capacity and 20 shillings (or $4.85) on a car carrying 30 tons or more.

TRANSPORTATION OF PERISHABLE FREIGHT.

The question of "suitable measures for developing traffic in perishable freight" constitutes subject No. 16 for discussion at the eighth session of the International Railway Congress, which comes off at Berne, Switzerland, next July, and the report on the subject for English-speaking countries, by J. M. Culp, vice-president of the Southern Railway, is published in the December number of the *Bulletin* of the Congress. Mr. Culp discusses only briefly questions relating to loading and precooling, holding that this is a duty resting on the shipper; and he gives little information from countries outside the United States, because he was able to get only a few satisfactory answers to his questions; but as a review of the condition of American practice at the present day the report is very full and detailed. It fills over 80 pages in the *Bulletin*. Complete details are given of refrigerator car arrangements for the transportation of fresh meat, dairy products, vegetables, fish, eggs and beer, with drawings of cars, descriptions of methods and copies of regulations. Incidentally, much information is given concerning the progress of the last 20 years among shippers and merchants in this department of transportation. Statistics are given, as between important centers, of the volume of traffic in fresh beef, fruit, milk and other commodities. Notice is given also of the heating arrangements for shipping potatoes in winter. Shipments of potatoes from northeastern Maine in 1908 were over 15,000,000 bushels, or five times as many as in the year 1900.

In summing up Mr. Culp says that the protection of perishable property by ventilation and refrigeration has become an obligation on the carrier. The Railroad Refrigerator Service Association, made up of the most important carriers of perishables, has published a circular describing the whole business. The principal lessons emphasized by Mr. Culp are: first, that all heat must be thoroughly expelled from highly perishable animal and vegetable substances before shipment, and that the best information on the subject of refrigeration and preservation should be thoroughly disseminated among producers and handlers. The United States Department of Agriculture has issued a bulletin (No. 123) giving valuable information. Mr. Culp has not investigated the subject of rates of transportation because, he says, the rates in force have been fixed chiefly, if not entirely, by commercial conditions; by which he means, no doubt, that in other countries as well as in the United States the railways have been obliged to develop the traffic in fruit and vegetables at great expense, and have then been obliged to accept comparatively low rates in order to establish or stimulate that degree of consumption of these foods which will justify their transportation over long distances.

General News Section.

S. W. Johnston, station agent of the Pennsylvania at Mifflinburg, on the Lewisburg & Tyrone branch, is to retire next month, having reached the age of 70 years, and 75 agents at other stations have filed applications for his place.

The cars of the United States Express Company are now taken through from New York to St. Louis over the Baltimore & Ohio by special fast train leaving New York at 9 p. m., and arriving in St. Louis on the second morning at 2 a. m.

Two searchlights are now in use in the freight distributing yard of the Pennsylvania Railroad at Harrisburg, Pa. The use of these lights to facilitate the breaking up of incoming freight trains is said to have proved very satisfactory.

The St. Louis & San Francisco has given 45 scholarships for the short winter course of the agricultural college at the University of Missouri. These scholarships will amount to $100 each and will be given to those students in each of the 45 counties through which the road passes who make the best grades in taking the course mentioned.

The Interstate Commerce Commission announces that two men, J. S. Vaughn and —— Clark are fraudulently representing themselves as safety appliance inspectors for the commission in the Southwestern States. All inspectors of the commission carry credentials, which will be shown on request. No inspector has authority to interfere with the movement of traffic by giving directions to railway officers or employes.

The opening of the Pennsylvania Railroad's East river tunnel (New York) for passenger business will be delayed because of difficulty in getting materials, and the date now set for the running of the first passenger train is May 30. Trains will be run from the station at Seventh avenue and Thirty-second street, Manhattan, to Sunnyside, L. I., which is the eastern end of the tunnel, but through trains over the lines of the Long Island road will not be put on until a later date. The running of trains into the Manhattan station from the West will not be begun before September.

The Southern Pacific Co. has lately bought 600,000 acres of oil lands in Mexico. The company already owns 14,000,000 acres of land, which has been bought with a view to development of oil wells. According to the *Wall Street Journal*, the value of oil lands belonging to this company is $100,000,000. The locomotives of the company are now using 30,000 barrels of oil a day, more than half of which comes from wells other than those belonging to the company. Crude oil is now selling in California at about a dollar a barrel, as compared with 60 cents a year ago. Industrial establishments in California are now rapidly adopting the use of oil as fuel.

J. F. Wathey, formerly railway and financial editor of the *St. Paul Dispatch*, has been placed at the head of the recently organized department of the Great Northern for the supervision of passes. Following the revelation that the Great Northern and other roads had been mulcted largely in the issuance of trip passes, L. W. Hill, president of the road, determined to stop the illegal use of passes. Mr. Wathey began work the first of March and every officer who issues passes will report to him; and he reports to the president alone. He will scrutinize all passes and investigate all apparent irregularities. Mr. Wathey has been connected with Twin City newspapers for a number of years.

The Atchison, Topeka & Santa Fe has shortened the schedule of its westbound California Limited by 3 hours and 30 minutes, making the time of arrival at Los Angeles, Cal., 2:30 p. m., instead of 6 p. m., and the actual running time from Chicago to Los Angeles 68 hours and 30 minutes. This is nearly the same schedule that was in effect prior to the congestion of freight traffic in 1907, on account of which the schedule of this train was lengthened. There is to be no change in the eastbound schedule. The train will continue to leave Los Angeles at 10 a. m., and arrive in Chicago at 12 noon of the third day. Newspaper statements have been printed that on its revised schedule the California Limited will make the run between Los Angeles and Chicago in 20 hours' less time than any special ever has made it. This is absurd. The so-called "Scotty special," July 9, 1905, ran from Los Angeles to Chicago in 44 hours and 54 minutes.

The year book for 1910 of the American Society of Mechanical Engineers contains both a complete alphabetical list of the membership with information regarding the business, the membership of the society and the business and home addresses of each member, and also a geographical list with sufficient information regarding the business and address of each member to make the list useful to one traveling or to those who desire to correspond with members in any particular city or with a particular firm. The book also contains general information about the society, including the constitution, by-laws and rules and is issued in a size convenient either for the desk or to carry in traveling. It is bound in substantial board covers.

Parker & Bridge, New York, railway press agents, have issued a pamphlet showing the reasons why, in the face of a steady decline in rates and a steady advance in the cost of operation, the railways cannot afford to grant general increases in pay of employees. General increases were made in the latter part of 1906 and the early part of 1907, and there was no subsequent decrease, as there was in other industries, at the time of the 1907 panic. While the general average of freight rates has declined year by year, the price of everything a railway buys has gone up. The price of labor, it is declared, has moved upward along with all other prices, periodical advances in wages having been made by the railways. The average yearly earnings of railway employees, including laborers, according to the latest report issued by the Interstate Commerce Commission, amount to $641. The average yearly earnings of trainmen, including enginemen, firemen and conductors, on the eastern railways, according to the same report, are $908. Skilled workmen in other industries, according to the report of the Massachusetts State Labor Bureau, earned in 1907 average wages for the year ranging from $442 in the cotton goods industry, to $613 in the machinery trades.

Railway Matters in Washington.

Washington, March 2, 1910.

The administration railway bill has been so far agreed to by the House Interstate Commerce committee that it will be reported probably this week; and after but little discussion; but the provision for a commerce court was approved in the committee by a vote of 10 to 8. The strength of the minority would seem to indicate that there will be considerable discussion of the bill on the floor of the House. Mr. Mann, of Illinois, chairman of the committee, is one of those who voted against the commerce court provision.

The Senate committee considered the bill last week and ordered a favorable report, but in the Senate committee, as in the House committee, there was a strong minority, the vote on the bill being 6 to 4. The majority will recommend the passage of the bill practically as presented the last time, but it seems likely that there will be extended discussion on the floor of the Senate.

The Legislative Budget at Washington.

Washington is still engaged in the none too edifying process of reducing the number of measures it intends to pass into law. The administration is not likely to get much of what it has recommended, but among the possibilities is the amendment to the interstate commerce act, giving the commission power over the issue of new capital to be sold under par. This confers upon the greater railways a dangerous monopoly in freeing them from the fear of smaller competitors by limiting expansion to those roads whose securities sell above par. The administration apparently does not want to know the facts in this matter, and perhaps the most exasperating phase of the

situation is that real public interest is sacrificed to the end of offering something which will look imposing when presented to the people in the coming congressional campaign. President Taft has complained that the newspapers misrepresent him. They would soon cease to do so if he demonstrated that he was bigger than his party. The criticism to which he objects is largely due to a belief that he regards the Republican machine as something as important as the presidency of the United States. No one will receive more severe or deserved criticism than Senator Aldrich in the coming campaign, but he gets more considerate treatment than the President. He earns the respect due to one who really knows what he wants. He may not be entitled to it, but the American people have little patience with the politician who only knows what he does not want.—*Wall Street Journal.*

Wages.

The Western Maryland has made an increase of 10 per cent. in the pay of telegraph operators.

The Delaware & Hudson has received applications for increases in pay from enginemen, firemen and telegraphers.

The Baltimore & Ohio increased the pay of its telegraphers an average of 9 per cent. and has made other concessions, which include a reduction to nine hours a day for 10-hour operators; 15 days' vacation yearly with pay to the 12-hour men and an agreement providing that where the telephone supersedes the telegraph for dispatching the telegraphers shall be transferred to the telephone service, with the same salaries and privileges. About 1,500 operators are affected by these changes.

The chief officers of the brotherhoods of conductors and trainmen report that numerous railways, including 25 companies in the South, reject the demands which the employees have made for increases in pay; but the understanding appears to be that negotiations will be continued, with a view to seeking agreement on some of the points at issue. President Daniel Willard, of the Baltimore & Ohio, has expressed willingness to submit to arbitration the questions relating to wages which have been presented by the conductors and trainmen of that company.

Forestry and Timber Preservation on the Pennsylvania.

The Pennsylvania Railroad has planted 3,482,186 trees since it undertook forestry work on a comprehensive scale, as shown in the table below. Prior to last year, the Pennsylvania's forestry operations were confined to a limited area between Philadelphia and Altoona, but in 1909 about 7,800 trees were planted at Pomeroy, Pa., 188,200 at Vandyke, Pa., 35,000 near New Brunswick, N. J., 352,000 near Eyer, Pa., 30,000 on the right of way near Metuchen, N. J., 161,825 at Denholm, Pa., 204,500 at Conewago, Pa., and 74,500 at Parkton, Md.

The total number of plants shipped during last year from the company's forest nursery at Morrisville, Pa., was 1,240,381. Ornamental shrubbery, for use around stations, is raised at the nursery. There are now 56,000 trees and shrubs growing there. The Pennsylvania Railroad's forestry enterprise is declared to be the largest ever undertaken by any corporation. The record shows:

Year.	No. of trees planted.	Year	No. of trees planted.
1902	13,610	1907	448,226
1903	43,364	1908	300,530
1904	223,656	1909	1,054,010
1905	597,165		
1906	801,625	Total	3,482,186

Under the direction of the forester, a large pressure timber-treating plant has been in operation at Mount Union, Pa., since July 1, 1909, and a small experimental non-pressure plant has been installed at Greenwich Point, Philadelphia. A second pressure plant is now under construction at Greenwich Point, and with all three in operation the total output will be about a million and a half ties yearly. There have been creosoted up to December 31 at Mount Union, 182,352 ties, 80,000 ft. of bridge timbers, 25,000 lineal ft. of trunking and capping for signal wires, and 25,000 wood paving blocks. The non-pressure plant at Greenwich Point has turned out ties and timber equivalent to 432,000 ft., also 5,000 fence posts and 25,000 paving blocks.

Workmen's Insurance and Benefit Funds.

There are in the United States 1,200 insurance and benefit funds, of which 84 are connected with national organizations, such as railway brotherhoods and other labor unions. All of these pay death benefits; the amounts range from $15 to $4,500. The most common figure is $100. Nineteen of these organizations pay temporary disability benefits, mostly less than $6 a week. Four have superannuation benefits and five others intended (in 1907) to establish these.

Of the local labor organization funds, as distinguished from national, 530 were investigated, representing about 90 trades. A few of these, in highly paid occupations, grant benefits as high as $10 or $15 a week, but the most common rate is $5. Of the railway relief funds there are 50, of which 14 have connected with them pension systems maintained entirely by the employing companies.

Over 400 funds have been found connected with factories, mines, street railways, etc., most of which are managed by the employees, though 32 are managed by the establishments and 88 jointly. A number of railways and industrial establishments maintain hospital funds, mostly supported by the contributions of the workmen.—*Twenty-third annual report,* Commissioner of Labor, Department of Commerce and Labor.

International Railway Congress.

W. F. Allen, of New York, secretary of the American Section, reports that about 75 or 80 officers of American railways are likely to attend the eighth session of the Congress, which is to be held at Berne, Switzerland, July 3 to 16. American railways are entitled to send about 400 delegates. Most of the roads have appointed a full list in order to receive the reports, and it is possible that some of these appointees will be able to attend. The government of the United States has the appointment of eight delegates, and the announcement of six of these—Franklin K. Lane, E. E. Clark, Fairfax Harrison, W. A. Garrett, H. S. Haines and J. A. Brown—has been noticed in these columns. The American Railway Association sends its president and general secretary and six others. The appointments so far decided are Arthur Hale, J. F. Wallace and Wm. Mahl.

The following named delegates of their respective roads are expected to attend:

Atchison, Topeka & Santa Fe Railway.—J. W. Kendrick, vice-president; Max E. Schmidt, consulting engineer.

Central Railroad of New Jersey.—W. G. Besler, vice-president and general manager.

Chesapeake & Ohio Railway.—Geo. W. Stevens, president.

Chicago, Burlington & Quincy Railroad.—F. H. Clark, general superintendent motive power.

Chicago, Indianapolis & Louisville Railroad.—W. H. McDoel, director.

Chicago, Peoria & St. Louis Railway of Illinois.—C. H. Warren, chairman executive committee; W. W. Wentz, director; J. P. Ramsey, chief executive officer.

Chicago, Rock Island & Pacific Railway.—H. U. Mudge, president; John Sebastian, third vice-president; J. B. Berry, chief engineer.

Chicago & Alton Railroad (Minn. & St. Louis R.R.).—L. F. Day, director.

Cumberland & Pennsylvania Railroad.—C. L. Bretz, general manager.

Cumberland Valley Railroad.—M. C. Kennedy, vice-president and general superintendent.

Delaware & Hudson Company.—L. F. Loree, president; C. S. Sims, second vice-president and general manager; C. E. McKim, general superintendent transportation; G. H. Burgess, chief engineer; J. H. Manning, superintendent motive power; W. J. Mullin, general traffic manager.

Delaware, Lackawanna & Western Railroad.—E. E. Loomis, vice-president.

El Paso & Southwestern Railway.—A. C. James, vice-president; C. H. Dodge, vice-president; H. J. Simmons, general manager.

Erie Railroad.—C. W. Buchholz, consulting engineer.

Grand Trunk Railway.—E. H. Fitzhugh, first vice-president.

Illinois Central Railroad.—J. T. Harahan, president; J. H. Mallory, general European agent; J. Ogden Armour, director; J. G. Shedd, director; Cornelius Vanderbilt, director; Chas. A. Peabody, director; R. S. Lovett, director; Robert Walton Goelet, director.

Kansas City, Mexico & Orient Railway.—E. Dickinson, vice-president and general manager; A. E. Stillwell, president.

Lake Shore & Michigan Southern Railway.—C. E. Schaff, vice-president.

Lehigh & New England Railroad.—R. H. Wilbur, vice-president and general manager; W. J. Turner, vice-president and general counsel.

Long Island Railroad.—J. A. McCrea, general superintendent.

New York Central & Hudson River Railroad.—A. H. Smith, vice-president and general manager; J. F. Deems, general superintendent motive power, rolling stock and machinery; P. H. Dudley, consulting engineer.

Norfolk & Western Railway.—N. D. Maher, second vice-president and general manager.

New Orleans, Mobile & Chicago Railroad.—W. F. Owen, general manager.

Pennsylvania Lines West of Pittsburgh.—W. C. Cushing, chief engineer maintenance of Way.

Pennsylvania Railroad.—R. M. Patterson, superintendent freight

transportation; G. W. Creighton, general superintendent; H. A. Jaggard, superintendent Elmira division.

Philadelphia & Reading Railway.—Theo. Voorhees, vice-president; A. T. Dice, general superintendent; H. D. Taylor, superintendent motive power and rolling equipment; C. H. Ewing, engineer maintenance of way; J. S. Ward, resident engineer.

Pittsburgh, Shawmut & Northern Railway.—F. S. Smith, receiver; F. B. Lincoln, assistant to receiver.

Quebec Central Railway.—E. Dent, president; Alex. Bremner, F. H. Norman.

Richmond, Fredericksburg & Potomac Railroad.—Wm. H. White, president.

St. Louis Southwestern Railway.—F. H. Britton, vice-president and general manager.

Staten Island Rapid Transit Railway.—G. H. Campbell, vice-president

Southern Railway.—Fairfax Harrison, vice-president; J. M. Culp, vice-president; A. H. Plant, comptroller; A. Stewart, general superintendent motive power and equipment.

Union & Southern Pacific Systems.—Wm. Mahl, vice-president.

In addition to the foregoing the following reporters on subjects to be considered at Berne are expected to be present: D. F. Crawford, Pennsylvania Lines West of Pittsburgh; Wm. Garstang, Cleveland, Cincinnati, Chicago & St. Louis, and R. L. Ettenger, Southern Railway.

The American Railway Association has secured rooms for headquarters of the American delegates on the first floor of the Bernerhof (hotel), which immediately adjoins the Parliament building, at Berne, in which the sessions are to be held.

Testimonial to Thomas Reynolds.

Thomas Reynolds, conductor of the Candian Pacific passenger train which was wrecked at Webbwood, Ontario, on January 21, was called to Montreal on Monday last to receive, at the hands of Sir Thomas G. Shaughnessy, president of the road, a gold watch and a check for $500. Conductor Reynolds, though himself seriously hurt, succeeded in saving eight passengers from one of the submerged cars by diving beneath the surface of the water, breaking a window and rising to the surface on the outside of the car. President Shaughnessy said that the gift was designed to express the company's appreciation of a conductor who understood that self-sacrifice and devotion to duty are a part of the railway man's life as well as of the soldier's.

The Erie's Cows.

The "Milk Production Special" is the latest novelty. It is a product of the genius of the industrial commissioner of the Erie. He is to furnish a train to carry lecturers from the New York States School of Agriculture around among the farmers of the southwestern part of the state. Cows "of different kinds" will be taken along on the train so that the audiences cannot possibly miss any of the points made by the lecturers. The first trip will be made April 12. For fear that the lecturers' supply of subjects may run out before the railway men's enthusiasm is appeased, we suggest that some road ought to give the farmers' wives a little attention. Why not the Washing Machine Express or a course of lectures on Butter making and Bulb culture?

The Ticker, with Music.

The Rock Island Lines on March 1 established a telegraphic news service on the Rocky Mountain Limited between Chicago and Colorado points, similar to that previously established on the Golden State Limited. These trains also have Victrola musical recitals and complete stock market quotations.

General Passenger and Ticket Agents.

The Fifty-fifth Annual Convention of the American Association of General Passenger and Ticket Agents will be held at the Centro de Dependientes, Padro 61, Havana, Cuba, March 28. The subjects to be discussed are: Association Ticket Paper; Uniformity in Prepaid Ticket Orders; Ticketing Special Baggage Cars for Interline Movements; Relations with Accounting Officers' Association; Standard Ticket Contracts; Uniform Interline Tickets and Minimizing the Use of Exchange Orders.

There will be a proposition to amend the constitution to provide that the name of the association be changed to read American Association of Passenger Traffic Officials. The principal address will be given by Alexander Hilton, general passenger agent of the St. Louis & San Francisco. The secretary of the association is C. M. Burt, Boston.

American Society of Civil Engineers

At the meeting held on March 2, a paper was given by John H. Gregory, M. Am. Soc. C. E., entitled, "The Improved Water and Sewage Works of Columbus, O." This paper was printed in proceedings for January, 1910.

Southern and Southwestern Railroad Club.

The Southern and Southwestern Railroad Club, Atlanta, Ga., has elected the following officers for the ensuing year: President, F. F. Gaines, Central of Georgia; first vice-president, A. J. Poole, Seaboard Air Line; second vice-president, J. F. Emerson, Central of Georgia; third vice-president, C. H. Rey, Louisville & Nashville; secretary, A. J. Merrill; treasurer, Horace Parker; executive committee, J. H. Watters, chairman, Georgia Railroad; E. H. Barnes, secretary, and J. J. Hanlin, Seaboard Air Line.

Omaha Railway Club.

At the meeting of the Omaha Railway Club on the evening of March 9, Joseph B. Sheldon, superintendent of telegraph of the Union Pacific, will read a paper on "Despatching Trains by Telephone." He will be followed by Dr. Frederick H. Milliner, experimental electrician of the Union Pacific, who will make an address on the "Possibilities of Handling Railway Trains by Wireless Telegraphy." This is a subject to which Dr. Milliner has been giving his attention for some time.

Mechanical and Electrical Engineers.

The American Society of Mechanical Engineers and the American Institute of Electrical Engineers will hold a joint meeting in the Engineering Societies' building, New York, on March 8, with a paper by H. G. Stott, member Am. Soc. M. E., superintendent of motive power of the Interborough Rapid Transit Co., New York, and R. J. S. Pigott, entitled "Tests of a 15,000-kw. Steam Engine-Turbine-Unit." The paper relates to the installation of low-pressure turbines at the 59th street station of the Interborough Rapid Transit Co., New York, and presents a discussion of the most important development in steam engineering since the commercial introduction of the steam turbine.

American Society of Mechanical Engineers.

The next monthly meeting in Boston will be held Friday evening, March 11, in the auditorium of the Edison Electric Illuminating Co. The Boston Society of Civil Engineers and the Boston Section of the American Institute of Electrical Engineers will co-operate in the meeting. The paper, "The Training of Men—A Necessary Part of the Modern Factory System," will be presented by M. W. Alexander, member Am. Soc. M. E., who has been so long identified with the educational work and the training of the apprentices at the works of the General Electric Co., West Lynn, Mass.

The spring meeting of the society will be held at Atlantic City May 31 to June 3, with headquarters at the Marlborough-Blenheim. On Wednesday evening, June 1, honorary membership will be conferred upon Rear-Admiral Geo. W. Melville, U. S. N., retired, past-president of the society.

The Spokane Transportation Club.

The leading railway men of Spokane have formed a social organization with the following officers: Executive committee, Waldo G. Paine, Spokane & Inland Empire; J. T. Andrus, North Coast; H. N. Kennedy, Northern Pacific; H. G. Hawkins, Chicago Great Western, and H. S. Collins, Chicago & North Western. The executive committee elected Waldo G. Paine, president; J. T. Andrus, first vice-president; H. N. Kennedy, second vice-president, and also named J. W. MacIntosh, S. & I. E., as secretary, and R. L. Ford, Chicago, Milwaukee & St. Paul, as treasurer.

The aim of the new organization is to promote friendship and sociability, and it was decided that all railway officers, including chief clerks, shall be eligible to membership. The new club will meet at luncheon the second and fourth Saturdays of

each month. At the next meeting, March 8, the new organization will entertain the North Pacific Coast Passenger Agents' Association, which will be in session in Spokane on that day.

At the first regular meeting of the new organization, held on Feb. 22, much enthusiasm was shown, over 50 railway men being present. Every steam and electric railway at present doing business in Spokane was represented.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10 13; Indianapolis.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; Havana, Cuba; March 28.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31—June 3; Atlantic City.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A. T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 14; Chicago
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
Railway Telegraph and Telephone Appliance Ass'n.—H. M. Buck, Secy.-Treas., 30 Church street, New York.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Norquist, Chicago.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Chamber of Commerce of Buffalo, N. Y., has established a traffic bureau, and the director of the bureau is William H. Fredericks.

The National Railways of Mexico and the Mexican Railway have pooled their traffic between Vera Cruz and Mexico, and the office of the Mexican Railway in New York City has been closed.

Sleeping cars between Nashville, Tenn., and Knoxville, over the Southern and the Tennessee Central, which had been taken off, have been put back in service, the Southern Railway announcing that this is done in deference to the request of the State Railroad Commission.

The New York, New Haven & Hartford has filed with the Interstate Commerce Commission new tariffs on freight to the West by way of the Canadian Pacific, showing increases throughout the list from the basis of 69 cents per 100 lbs. (first-class) from Atlantic coast points to Chicago, to 75 cents.

The Carolina, Clinchfield & Ohio, which has completed its line to Spartanburg, S. C., has made a traffic agreement with the Southern Railway for shipment of coal from the mines on the C. C. & O. line to Charleston, S. C. It is said that rates will be the same to Charleston as by other roads to Norfolk, Va.

The differences between the trunk lines and the New Orleans lines concerning carload rates on sugar to central western points were considered at a conference in New York City this week. A tentative plan of settlement has already been adopted, but, as in the past, the prospects seem much better for protracted negotiations by correspondence than for a settlement.

The Missouri, Kansas & Texas on Feb. 23 raised its passenger rates in Oklahoma from two cents a mile to three cents. This followed the issuance of an injunction by Judge Hook of the Federal court, restraining the officers of the state from enforcing the two-cent fare provision of the state constitution. It is understood that the Santa Fe is now revising its tariffs and will advance its fares as soon as the revision is done.

The Western lines have announced the same advance in their rates on fresh meats from St. Joseph, Mo., and from points west of the Missouri river as they previously had announced from Omaha (*Railway Age Gazette*, Feb. 25, page 421). They have also announced the same percentage of advances in the rates on these commodities from St. Paul and Minneapolis. Corresponding advances are to be made in the rates on live stock. The live stock rate from St. Joseph and Omaha, like that on fresh meat, will be 23½ cents. Rates from the Missouri to the Mississippi river will be advanced from 13½ to 14¾ cents. The live stock interests at Chicago are protesting because the increase from the Missouri river to Chicago is so much greater than to St. Louis.

The Manufacturers' Railway of St. Louis, which is controlled by the Anheuser-Busch Brewing Co., has filed a petition in the Federal court at St. Louis for an injunction to restrain the 14 railways composing the Terminal Railroad Association of St. Louis, and five other lines, from discontinuing through rates in connection with the Manufacturers' Railway. Several manufacturing concerns join in the petition. The railways served notice December 31 that the through rates would be discontinued March 1. The reason assigned was that the divisions of through rates which were being given to this company was really "tap line" allowances such as have been condemned by the Interstate Commerce Commission. The Manufacturers' Railway declares that this statement is an evasion, and that the action of the road is prompted by the fact that D. M. R. is becoming a competitor of the St. Louis, Iron Mountain & Southern.

The Chicago, Rock Island & Pacific and the St. Louis & San Francisco on February 24 filed suits in the United States circuit court for the Western district of Oklahoma to enjoin the enforcement of the 2-cent fare provision of the Oklahoma constitution and 11 freight rate orders that have been issued by the Corporation Commission. These suits are similar to

those in which the Missouri, Kansas & Texas, the Atchison, Topeka & Santa Fe, the Gulf, Colorado & Santa Fe and the Midland Valley already have got injunctions. The Frisco claims that in the year ended June 30, 1909, it was able to earn but 3.02 per cent. on the value of its property devoted to the handling of state passenger traffic and only 3.52 per cent. on the value of its property devoted to the handling of state freight traffic. The Rock Island alleges that it is losing about $1,000,000 a year on its state business in Oklahoma, the loss being about equally divided between freight and passenger business.

The Traffic Club of Chicago was addressed by E. E. Clark, Interstate Commerce Commissioner, at its monthly meeting on March 1. The annual election of the club will take place on Tuesday evening, March 29, and will be followed by an informal smoker.

The nominating committee, of which L. J. Herbison is chairman, has nominated the following officers for the ensuing year: President, John T. Stockton; first vice-president, Frank P. Eyman; second vice-president, W. M. Hopkins; third vice-president, C. L. Lingo; treasurer, John H. Grace; secretary, Guy S. McCabe; directors for two years, O. F. Bell, J. Charles Maddison, W. H. Johnson and George E. White.

Mr. Stockton, who has been nominated for president, is president of the Joseph Stockton Transfer Company, and has been secretary of the club since its organization. Probably he did more to put it on its feet and to make it a success than any other member, and his nomination for president is a mark of the members' appreciation.

The Chicago Board of Trade on February 28 got an order from Judge Kohlsaat, of the federal court, restraining the railways entering Chicago from putting ino effect on March 1 the uniform code of demurrage and storage rules. These rules, as is well known, were formulated by the National Association of Railway Commissioners and recommended for adoption by this association and by the Interstate Commerce Commission. The Chicago grain interests have always objected to them because of the fact that in Chicago as elsewhere they restrict the time for unloading cars to 48 hours. Heretofore the grain dealers at Chicago have been allowed 48 hours in which to reconsign grain and 72 hours in which to unload it at the elevators. The new rules, besides reducing the time for unloading to 48 hours, also reduces the time for reconsigning to 24 hours. The grain men say it will be impossible for them to conduct business on the proposed basis. It is necessary, they say, for them to have two sessions of the board of trade subsequent to the inspection of grain in which to sell and reconsign it, and that the volume of grain handled at the Chicago market is such that unloading in 48 hours is impracticable. The railway managers contend, on the other hand, that if the handling of grain requires more time than the handling of other commodities, the grain men, and not the railways, should bear the expense. Arguments on the question of making the injunction permanent will be heard on March 15.

James C. Clow, of James P. Clow & Sons, Chicago, has published an article opposing President's Taft's recommendation for legislation to fine a railway $250 for the misquotation of a rate. Mr. Clow advocates legislation to require the carrier to quote rates in writing. Instead of fining a road for making a mistake he would have the law provide that in case of a mistake the shipper should pay the legal rate and then file and collect the claim for the difference between the rate charged him and the legal rate through the Interstate Commerce Commission. Mr. Clow says in part: "Everyone will therefore probably agree with Mr. Taft that a carrier should quote its tariffs, but of what use will such quotations be to shippers if they have no legal claim against the carrier in case of error? Mr. Taft proposes to fine a railway for making an error in quoting a rate for the avowed purpose of making it more careful. But it isn't care the shipper wants; he wants a rate he can depend upon. He doesn't want revenge—he wants redress. Fines can never prevent mistakes, and a fine that accrues to the government is no benefit to the person injured. Nor is a fixed fine equitable. Everyone is liable to err; and whatever care may be taken, wrong rates will sometimes be quoted. Is it then fair that an error causing a loss of say $5 should be punished by a fine of $250? This doctrine is in keeping with the popular principle of supervision of railways: When in doubt, fine them. The only excuse for a fine when there is no criminal intent is to render mistakes profitless, and for the purpose of defraying the cost of maintenance of the tribunals those mistakes alone necessitate it being just and proper that the wrong rather than the right should bear the burden the wrong creates."

Harriman Lines Merger Suit.

At the continuance of the Harriman merger suit hearing W. L. Park, superintendent of the Union Pacific, resumed his testimony, telling first of a fast freight train, called the Nellie Bly Special, operated in 1897 between Council Bluffs and Ogden.

This train, adopted in connection with Central Pacific as a war measure against the Oregon Short Line, was operated on a 32-hour schedule for about 60 days, thereafter on a 53-hour schedule until 1900. On descending grades this train frequently made a speed of 50 miles an hour. Inspection was curtailed, and engines and cabooses were exchanged without stopping the train by the use of flying switches. Mr. Park characterized this train as entirely impracticable unless other freight and many passenger trains were to be sidetracked. Mr. Park pointed out, in reply to query of N. H. Loomis, counsel for Union Pacific, that movement of freight was greatly retarded during the making of improvements under traffic after the advent of Mr. Harriman, also after the San Francisco disaster.

On September 1, 1907, the fast freight, with a schedule of 74 hours and 30 minutes, left Council Bluffs on time, and arrived at Ogden 93 hours late; on September 5, 54 hours late; on September 15, 55 hours and 40 minutes late. After the lengthening of the schedule to 100 hours and 45 minutes, out of 20 trips this train was on time 11 trips, and only 5 hours and 54 minutes late on an average the other nine trips.

By lengthening schedules, engines were enabled to haul greater loads, the only practical solution of the problem of congestion. Mr. Park stated that, in his opinion, considering the volume of traffic and high altitudes, with heavy winds and generally adverse climatic conditions, the ideal speed for freight trains between Council Bluffs and Ogden is between 10 and 12 miles an hour, requiring a speed on certain divisions of between 15 and 20 miles an hour.

Mr. Park contrasted Union Pacific's train load of 1,538 gross tons in 1909 with that of 901 gross tons in 1901.

Counsel again brought out the significance of precautions against accident, reducing the number of train accidents per million locomotive miles between 1902 and 1907 from 20 to 10. Mr. Park ascribed much of this result to the Union Pacific school train of three cars, which is kept constantly on the road for training employees in the handling of trains and to enable a continual physical examination of the men. In 1907 the proportion of employees killed in accidents was only one in 418.

Mr. Park characterized the signal and interlocking system on Union Pacific as better than that on any other Western road. He declared that efficiency has always been the paramount issue in the development of Union Pacific, that efficiency has never been subordinated to economy.

On cross-examination by Mr. Severance, for the government, Mr. Park agreed that at present there are no roads in the country whose condition is comparable to that of the original Union Pacific, which witness described Wednesday in denoting improvements made since.

Between 1885 and the receivership about $4.000,000 were expended on additions and betterments. During the receivership a comparatively small amount was expended on improvements, a fact due largely to the coincident heaviness in the business world generally. Mr. Severance recalled the fact that the Union Pacific receivership was one under which no receivers' certificates were issued.

Witness agreed that the increasing of train load to solve the problem of congestion, in the fall of 1907, was an economic as well as a strategic measure. Mr. Severance asked whether Union Pacific had not put into operation every possible economy during the panic period. Witness stated that considerable economies were effected, but not at the expense of maintenance of the properties in perfectly safe condition.

Mr. Park described the electric staff machines used by Union Pacific over the single track line on the crest of the Rockies, enabling trains to run from Cheyenne to Laramie without train orders. There being no east-bound train on the single track section, a staff is taken by the train crew from the machine at Cheyenne, whereupon the current is broken at the western terminus and no staff can be extracted from the machine until the west-bound train has arrived and the staff has been placed in the machine there. Until recently, when this system was installed at points on the Lehigh Valley, the Union Pacific was the only road on which it was employed.

Witness recalled that as late as 1881 President Clark, on a trial trip to test the air-brake, which failed because not properly operated, declared that the hand-brake was much preferable.

Explaining the fact that despite a reduction of 40 miles on the Council Bluffs to Ogden line since 1900, the schedule of the Overland Limited has for several years been about two and a half hours longer than in 1900, Mr. Park stated that the construction of bridges, ballasting, etc., had retarded trains of this class on an average of three hours for the run to Ogden. The Overland's schedule was reduced Feb. 20, 1910, to 30 hours, 15 minutes Omaha to Ogden. As to the effect of reducing grades, Mr. Park stated that running time was not necessarily reduced thereby, as before the grades were cut helper engines were used.

Witness said that the Union Pacific's system runs no scheduled through freight train east from Portland because of irregularity of the offerings of tonnage. Regarding the 80-hour fruit train schedule from Ogden over Union Pacific, Mr. Park said that he knew of no contract with shippers, and in fact knew that the shippers had endeavored to secure a better schedule.

Mr. Park brought out the fact that the Fast Mail out of Omaha to San Francisco and Portland is the heaviest mail train in the United States. As of Feb. 20, 1910, its schedule, Omaha to Ogden, was 26 hours, 47 minutes.

In connection with the recent reduction in the running time of the Overland Limited Mr. Severance asked whether this was affected by the washout on the San Pedro, compelling the discontinuance of the Los Angeles Limited, whose time between Ogden and Omaha had been three hours less than that of the Overland. Mr. Park answered that he could not say.

Asked whether the fastest time of Union Pacific passenger trains is not slower than that of Eastern lines, Mr. Park said that Union Pacific engines exert fully as much power as the Eastern lines. Supplementing other causes of slowing passenger trains schedules since 1900, Mr. Park stated that in 1907 the number of passenger trains per day over Union Pacific was 7.3, in 1908 was 11.70 and in 1909 was 12.28, denoting a large increase in traffic density.

William David Lincoln, general car agent in charge of transportation and train schedules for Union Pacific, was the next witness produced. Mr. Lincoln recounted the difficulties in moving traffic subsequent to the San Francisco disaster. Cars were used for storage purposes by jobbers, warehouses having been destroyed, until a great blockade of cars was caused, which was not cleaned up for many months, and their return seriously clogged Union Pacific lines. Witness testified that in his judgment the best speed for freight trains between district terminals, at which engines are changed and inspection made, would be about 11 miles an hour. That is, that the 100-hour freight schedule under present conditions as to single track, traffic density, etc., is the best schedule possible.

Asked whether Salt Lake merchants did not receive better service in 1900 than at present, Mr. Lincoln declared that all Salt Lake merchants are receiving better service to-day than in 1900. He said that it was more desirable for the merchant to be able to depend on a regular service, though it be slower, than to have a fast service which he could not depend upon.

Witness stated that schedule freight trains are not held over to make up a load, but that additional sections are necessarily held over for this purpose, although given a reasonable number of cars a train would be run out of Council Bluffs at any time.

On cross-examination by Mr. Severance, Mr. O'Brien testified that he has been connected with the O. R. & N. Co. for 17 years, and its general manager for five years, his connection with the Southern Pacific lines in Oregon dating from 1904.

Mr. O'Brien testified that Harriman forces have been laying track on the Des Chutes river line for the last 60 days. Within 30 days 50 miles of road will be ready for track, which will be laid at once. The witness stated that no track has been laid by the Hill forces or the parallel Oregon Trunk line.

Asked whether it was not the activity on the part of the Hill interests which induced initiation of work on the Des Chutes line, Mr. O'Brien testified that he had had authority from the executive board to build this line, and an appropriation at his disposal, over a year before there was any rumor of Hill intentions on the territory; but that the work was held up by tardiness on the part of the government in approving the maps filed.

Mr. O'Brien declared that there is plenty of room along the Des Chutes for two lines.

Q. "And is there not plenty of business in Central Oregon for two lines?"

A. "No, sir. In my opinion there is not, and for several years will not be better than slim picking for one line, to say nothing of two."

Witness stated that the line from Hillsboro to Tillamook, a timber line from Portland to the Pacific, will be completed by August next. The Oregon Railway & Navigation Company is now running four through passenger trains each way daily, via Huntington, against one train each way in 1900. Witness testified that the through freight train to Portland is scheduled to make the run of about 450 miles from Huntington in 35 hours, a little under 12 miles an hour, including terminal stops. Over the spurs of the Blue mountains about 28 miles of this westward haul necessitated negotiation of a grade of approximately 116 feet to the mile.

Asked how the train could maintain a 12-hour schedule, despite such obstacles, Mr. O'Brien pointed out that Oregon Railway & Navigation traffic density is probably not more than 50 per cent. of that on Union Pacific proper, and that the fast freight business into Portland is expedited by trimming train loads about 25 per cent.

After the noon recess E. E. Calvin, vice-president of the Southern Pacific and general manager of the Pacific system, was put on the stand.

Mr. Calvin testified that shortly after taking charge of the Southern Pacific's Pacific system he had argued against building branches south of the Columbia river further than would care for grain traffic on the plateau. Instead he recommended construction of an east and west line and the Siskiyou cut. When completed the junction with Southern Pacific California main line will be at Black Buttes, some 15 miles south of Weed.

The present line has a maximum grade of 3.3 per cent. in both directions, which will be reduced on the new line northbound to 2.3 per cent. and southbound to 1.5 per cent., the distance also being reduced 15 miles. This will prove an economy in hauling freight. Mr. Calvin also answered, in reply to a query, that only a few miles of the east and west line through Central Oregon had been built.

Thornwell Fay, vice-president and general manager of the Southern Pacific lines east of El Paso, with headquarters at Houston, followed Mr. Calvin. He recounted improvements on the Atlantic system since 1901, including raising of the standard of rail from 75 to 90 pounds, new ballasting, steel bridges, etc., also the new docks at Galveston, on which $2,118,935 has been expended to date.

Mr. Fay testified that in December, 1909, freight moved between New York and El Paso via Galveston in eight days and 22 hours, against nine days and six hours in December, 1900. Between 1902 and 1909, inclusive, fiscal years, the amount expended on improvements and new equipment, charged to capital account, was $12,683,061, against an outlay of $8,766,125 between 1894 and 1901.

From Jan. 1, 1904, to Dec. 31, 1906, when 26,350,990 passengers were carried over 1,658,794,090 passenger miles over the New Orleans to San Francisco lines of the Southern Pacific only one passenger was killed, a remarkable record of safe transportation.

R. B. Miller, general freight agent of the O. R. & N., asked why lower class rates between San Francisco and Portland had been materially increased in 1905, said that the rates had been and still are too low; lower, in fact, for the 756 miles than are the class rates for the 400 miles between Chicago and St. Paul. As to water competition, these rates always have been influ

enced by the fact that the ocean is there; but while too low for the service performed, they are too high to secure the business from the steamship lines.

Mr. Severance asked how it was that the O. R. & N. and the Oregon Short Line could carry business from Portland to Ogden, destined for Chicago, receiving only 19 cents a hundred as its proportion, if they could not afford to carry Oregon common points business to Utah common points for 25 cents for the haul between Portland and Ogden.

Witness stated that the former business involved no interchange or back haul, but being reminded by Mr. Severance that the Roseville gateway via the Shasta route has been closed to all business for points east of Ogden, originating in the Willamette Valley south of Portland, although this compels a haul north to Portland and then south over the Navigation and Short Line, Mr. Miller said that personally he believed the Shasta-Central Pacific route over the Siskiyous and Sierras is impracticable as compared with the route via Portland, even for business between points south of Portland and those west of Ogden.

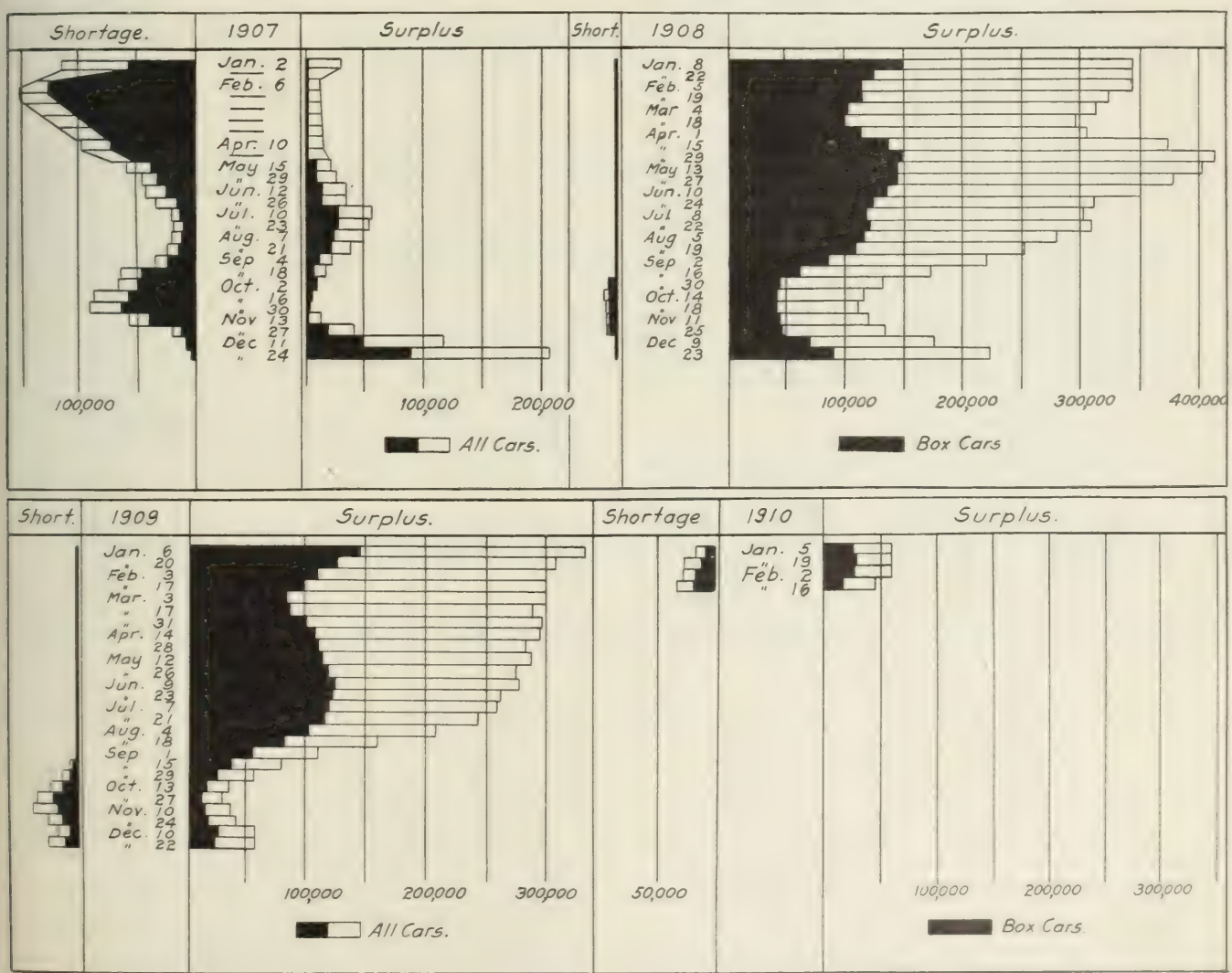
G. W. Luce, general freight agent for the Southern Pacific, at San Francisco, testified that during the time between 1891 and 1894, when he represented the Union Pacific as general agent at San Francisco the Southern Pacific was never considered a factor with regard to San Francisco to Portland business, which went by water as the natural route; there may have been some solicitation of Portland-San Francisco business by Union Pacific freight agents at Portland, but never any at San Francisco. Witness also testified that while he represented Union Pacific it solicited San Francisco-Montana business, and carried the bulk of it, via Ogden and the Short Line, its line being the shortest route between these points.

The Bow River Valley.

The Canadian Pacific during the past three years has sold and colonized over 1,000,000 acres of rich agricultural land in the Bow river valley, Alberta. In order to prove the merit of its farming proposition the road established on this tract a large number of demonstration farms on which were grown every product of the north temperate zone. Over 1,000 miles of irrigation canals have been constructed in this tract of land; one branch line of railway running north from the main line at Langdon is now in operation for about 40 miles and another branch extending east the full length of the 3,000,000-acre project will be built in 1910. This region, recently inhabited only by cattle, antelope and coyotes, is now dotted over with new homes, the purchasers in the Bow river valley being mostly Americans. The company estimates that at least 1,500,000 acres of the 3,000,000-acre tract can be put under irrigation at a total cost of perhaps $9,000,000, and the 3,000 miles of canals, ditches and laterals necessary for the irrigation of the project will be completed by 1915. The thousand miles of canals already built are now in use. The principal products of the Bow river valley tract are winter and spring wheat, oats, barley, flax, timothy, alfalfa, vegetables of all kinds, small fruits and all kinds of forage. Seven new towns have sprung up on the main line east of Calgary as a result of this railway colonization, and over 20 grain elevators are in operation in the district.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in pre-



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

senting statistical bulletin No. 65-A, giving a summary of car shortages and surpluses by groups from October 28, 1908, to February 16, 1910, says:

"The bulletin shows a decrease in the surplus of 6,087 cars, with an increased shortage of 4,579 cars. The decrease in surplus is principally in box, while more than half of the increase in shortage is made up of coal cars. The demand for the latter class has been quite active, weather conditions and congestions attributable thereto having retarded the movement to such an extent as to seriously effect the car supply. The principal surplus is still in the West and Northwest, while the eastern, middle and southern territory report the largest shortages."

The accompanying table gives surpluses and shortages by groups for the period covered by the report and the diagrams show total surpluses and shortages bi-weekly in 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Group	Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group 1	February 16, 1910	8	31	1,300	511	26	1,868	421	..	..	149	570
" 2	" 16, 1910	21	236	141	568	528	1,473	510	16	3,970	19	4,509
" 3	" 16, 1910	22	275	284	640	1,619	2,818	3,777	515	2,336	1,519	8,147
" 4	" 16, 1910	10	1,373	57	362	372	2,164	2,174	96	3,679	500	6,449
" 5	" 16, 1910	22	1,296	310	219	592	2,417	2,630	510	768	266	4,174
" 6	" 16, 1910	17	2,739	814	2,434	3,444	9,431	4,273	23	61	971	5,328
" 7	" 16, 1910	4	278	152	559	793	1,782	.....	...	...	...	.....
" 8	" 16, 1910	13	2,030	339	422	1,606	4,397	474	...	21	144	639
" 9	" 16, 1910	10	1,452	300	122	1,022	2,896	50	40	...	...	90
" 10	" 16, 1910	16	3,505	1,232	2,736	4,273	11,746	100	49	36	..	185
" 11	" 16, 1910	5	1,755	1,518	87	1,141	4,521	1,039	...	...	74	1,113
Grand total		148	14,990	6,447	8,660	15,416	45,513	15,448	1,243	10,871	3,642	31,204

"Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alamaba, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.

Bridge Arbitraries at St. Louis.

A committee representing the shoe manufacturers and jobbers of St. Louis has asked the municipal assembly to reject the pending ordinances for the vacation of certain streets which the Terminal Railroad Association of St. Louis desires to occupy, and that a committee of the commercial interests of St. Louis be appointed to confer with the railways with a view to securing the elimination of the arbitraries on freight and passenger traffic across the Mississippi river bridges. The committee, headed by J. C. Johnson, visited Chicago, Davenport, Rock Island, Omaha, Kansas City, the Twin Cities and Cincinnati and studied the conditions at these places. The result of its study was the conclusion that the existing bridge arbitraries at St. Louis are unjust.

These arbitraries apply on traffic originating within a radius of 100 miles of St. Louis. The conditions at the cities mentioned were studied because their situations with reference to rivers are similar to that of St. Louis. Davenport, Ia., and Rock Island, Ill., which are on opposite sides of the Mississippi, have the same merchandise rates to all interior points in both Illinois and Iowa. Minneapolis and St. Paul, which are on opposite sides of the river, also have the same merchandise rates in both directions. They concluded that within a zone of 25 miles St. Louis is at a disadvantage as compared with all the other cities mentioned, except Kansas City, of 1.5 to 12.5 cents per 100 miles; that in a 50-mile zone St. Louis is at a disadvantage as compared with other cities, except Kansas City, of from 1.6 to 13.3 cents, and that in a 100-mile zone St. Louis is at a disadvantage as compared with other cities, except Kansas City, of from 3 to 7.6 cents. It was also found that St. Louis is at a disadvantage as compared with Davenport, Rock Island, Omaha and Cincinnati, while it has an advantage as compared with Kansas City, and has about the same advantages as Minneapolis and St. Paul.

The bridge arbitraries at St. Louis, it is contended, also put that city at a disadvantage as compared with other cities, in rates on coal, the comparison being chiefly with Chicago, to which, however, the average haul of coal is very much longer than to St. Louis. It is shown that the average rate per ton per mile on coal to East St. Louis is 1.2 cents and to St. Louis 1.749 cents, while the average rate to Chicago is 7.69 mills, but the minimum mileage to Chicago is 65 miles, while the average distance to East St. Louis is 26.75 miles and to St. Louis 29.75 miles. The committee contends that the city of St. Louis should deal with the individual railways which own the Terminal Railroad Association, rather than with the association itself. It contends that at present the city is being injured by the rates charged by the Terminal Railroad Association.

INTERSTATE COMMERCE COMMISSION.

Following the decisions in *Rice, Robinson & Witherop v. W. N. Y. & P. R. R. Co.*, 6 I. C. C. Rep., 455, and in *Dallas Freight Bureau v. G., C. & S. F. Ry. Co.*, 12 I. C. C. Rep., 223, the commission declines to now award reparation under a decision formerly rendered in a case in which such reparation was not prayed for. (17 I. C. C., 491.)

Rates of Florida Fruits Unreasonable.

Florida Fruit & Vegetable Shippers' Protective Association v. Atlantic Coast Line et al. Opinion by Commissioner Prouty.

Complainant's allegations in case No. 2566 do not properly notify defendants of the things complained of, and the commission cannot properly undertake to establish rates to the territory not embraced in case No. 1168. In some way the rates to be dealt with by the commission must be definitely specified in the complaint. The thing found fault with should definitely appear.

The present proportional rates from Florida base points on citrus fruits to territory north of the Ohio river, west of the Buffalo-Pittsburgh line and east of the Missouri river are unreasonable, and should not exceed the rates named in the report. The present carload rates from Florida base points on vegetables to Baltimore, Philadelphia, New York and Boston are unreasonable, and should not exceed the rates named in the report.

While the commission takes into account competitive conditions in passing upon the reasonableness of rate adjustments, it does not feel that, in the present instance, it can properly require defendants to maintain rates from Florida base points to Ohio river crossings on vegetables of less than 30 cents per crate, and the commission cannot therefore condemn the advances. Carriers may sometimes do, as a matter of policy, what this commission would not require.

Maximum rates for the transportation of pineapples and citrus fruits from points of production upon the Florida East Coast Railway to Jacksonville when destined for points beyond, in carload and less-than-carload quantities, prescribed. Local rates from Florida base points may properly exceed the proportional rates established by 2 cents per crate in case of vegetables, 3 cents per box in case of citrus fruits and pineapples, and 4 cents per 100 lbs. where the rate is named in that manner.

Mixture of fruits and vegetables from Florida points should be allowed in carloads, but the rate and minimum should be that of the article which takes the highest rate. This gives to the carrier the earnings which it should make on an entire carload of that commodity, and permits the vegetables to be handled in the most economical manner. (17 I. C. C., 552.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1909.

(See also issues of February 4, 11, 18 and 25.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating Income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlantic & St. Lawrence	167	$116,611	$22,818	$150,392	$18,523	$12,967	$4,300	$66,439	$4,596	$106,824	$43,568	.....	$6,436	$37,132	—$7,471
Atlantic City	167	49,615	34,628	89,111	25,539	14,292	901	58,711	602	100,045	—10,934	$3,491	7,000	—21,425	—4,978
Belt Ry. Co. of Chicago	21	.....	.....	144,533	12,861	21,151	616	87,522	5,515	127,665	16,868	.....	5,000	11,868	—54,969
Butte, Anaconda & Pacific	46	82,224	6,082	94,319	8,423	20,319	574	43,404	2,092	74,812	19,508	.....	2,318	17,189	—14,879
Carolina, Clinchfield & Ohio	225*	71,665	10,300	84,066	10,983	12,163	5,636	22,821	7,777	59,380	24,686	.....	4,000	20,686	21,178
Central Vermont	411	198,190	65,398	284,953	20,089	129,208	7,994	125,238	8,992	291,521	—6,567	485	10,117	—16,199	—34,486
Chicago Terminal Transfer	90	.....	1,894	105,809	18,194	25,604	349	51,830	5,435	101,412	4,397	742	10,055	—4,916	3,456
Cincinnati Northern	248	75,262	16,117	95,897	10,043	15,590	2,657	35,088	2,707	66,085	29,812	.....	4,500	25,312	30,246
Cleveland, Akron & Columbus	210	147,363	39,480	201,397	26,334	74,487	3,089	67,739	3,607	175,256	26,141	.....	6,041	20,100	—31,540
Cleveland Terminal & Valley	93	65,881	14,042	100,684	7,949	13,050	1,571	57,613	1,498	81,681	19,003	.....	3,403	15,600	—6,884
Detroit, Grand Haven & Milwaukee	190	106,617	39,521	173,041	15,251	22,857	5,390	72,730	1,410	117,638	55,403	45	2,727	52,631	27,928
Eastern Ry. Co. of New Mexico	227	40,757	32,504	77,422	19,649	13,232	1,066	21,764	2,575	58,286	19,136	.....	3,376	15,760	—10,345
Grand Trunk Western	336	327,003	146,678	507,156	45,087	70,707	16,583	202,117	6,219	340,713	166,443	1,232	29,190	136,021	—3,955
Houston, East and West Texas	191	81,211	31,981	119,152	21,688	9,358	2,485	37,607	3,272	74,410	44,742	.....	2,280	42,462	—7,090
Indiana Harbor Belt	105	.....	.....	157,039	39,962	20,442	1,745	97,727	4,540	164,416	—7,377	3,907	5,159	—16,443	—20,745
Lehigh & Hudson River	96	118,151	3,480	122,775	10,021	13,763	1,079	50,497	4,751	80,111	42,664	.....	2,750	39,914	—25,320
Louisville, Henderson & St. Louis	218	57,906	33,617	97,789	14,724	9,037	3,563	32,648	3,115	63,087	34,702	230	2,500	32,432	—1,887
Michigan Central	1,746	1,560,890	540,358	2,345,051	266,431	339,360	74,589	950,455	46,727	1,677,562	667,489	566	84,532	583,523	66,016
Minneapolis, St. Paul & S. S. Marie	2,495†	727,209	233,446	1,025,377	85,200	117,318	16,976	361,373	17,493	598,360	427,017	1,704	52,225	373,088	73,646
Nevada Northern	165	98,460	15,644	118,411	4,884	11,031	247	27,674	3,945	47,781	70,630	.....	3,254	67,376	1,266
New York, Philadelphia & Norfolk	112	204,904	32,201	255,062	26,419	52,189	4,435	94,925	10,312	188,280	66,782	.....	6,250	60,532	6,968
Pecos & Northern Texas	152	79,004	20,065	104,689	26,176	17,987	1,924	36,826	4,147	87,060	17,629	.....	3,980	13,649	5,298
Richmond, Fredericksburg & Potomac	83	100,673	64,678	188,882	23,351	29,395	2,193	64,447	4,918	124,304	64,578	.....	200	64,378	20,227
St. Louis Merchants Bridge Terminal	9	.....	6,365	156,978	17,452	3,814	384	68,524	4,683	94,857	62,121	.....	5,545	56,576	19,798
Southern Kansas Ry. of Texas	125	104,365	17,821	126,248	15,177	22,211	2,021	41,794	3,976	85,180	41,068	.....	2,406	38,662	30,995
Southern Ry. Co. in Mississippi	280‡	62,278	43,210	112,828	19,239	5,757	3,156	35,813	3,949	67,914	44,914	.....	4,259	40,655	.....
Spokane & Inland Empire	168	36,784	42,693	84,737	9,806	6,493	1,820	27,874	7,721	53,714	31,023	6,947	2,700	35,270	7,716
Spokane International	141	69,260	17,307	88,437	7,258	4,149	1,931	24,489	2,494	40,321	48,116	.....	2,294	45,822	25,130
Terminal R.R. Ass'n of St. Louis	34	.....	272	226,075	22,981	18,320	591	82,432	5,738	130,062	96,013	15,469	26,113	85,369	—11,513
Ulster & Delaware	129	50,849	14,405	69,005	7,664	14,649	923	32,547	2,622	58,405	10,600	216	3,200	7,616	1,731
Union R. R. Co. of Baltimore	9	102,994	18,829	124,317	7,821	.....	618	5,225	1,988	15,652	108,665	.....	4,465	104,200	27,816
Virginia & Southwestern	188	78,389	12,186	94,383	12,194	21,198	1,291	31,832	3,660	70,175	24,208	.....	4,400	19,808	—5,630
Virginian	444§	137,442	19,126	162,137	20,514	28,878	6,004	50,610	7,388	113,394	48,743	434	13,667	35,510	.....
Washington Southern	35	33,310	31,355	85,762	7,763	9,329	964	32,951	2,375	53,382	32,380	.....	2,345	30,035	382
West Jersey & Seashore	356	126,145	163,745	315,122	90,177	58,019	11,227	184,696	8,993	353,112	37,990	—350	20,037	58,377	—44,575
Wisconsin Central	1,030	416,163	110,842	568,845	105,789	93,299	21,057	235,448	14,749	470,342	98,503	448	28,837	70,114	—50,430
SIX MONTHS OF FISCAL YEAR.															
Atlantic & St. Lawrence	167	$455,314	$181,772	$693,946	$217,257	$73,112	$18,411	$210,609	$17,589	$536,978	$156,968	.....	$38,613	$118,355	$37,416
Atlantic City	167	371,700	660,463	1,078,036	161,013	86,464	14,969	477,496	6,739	746,681	331,355	$21,630	42,000	267,725	61,696
Belt Ry. Co. of Chicago	21	.....	.....	1,119,770	81,969	145,833	3,300	448,435	37,523	707,060	412,710	.....	30,000	382,710	—9,350
Butte, Anaconda & Pacific	46	530,486	57,743	622,989	61,484	122,002	3,060	241,973	12,415	440,934	182,055	.....	12,919	169,136	39,646
Carolina, Clinchfield & Ohio	225*	398,017	74,617	488,097	64,372	81,092	28,572	113,508	37,241	324,786	163,312	.....	19,500	143,812	141,390
Central Vermont	411	1,239,946	607,236	1,978,565	237,558	373,589	49,964	762,291	43,294	1,466,696	511,869	5,683	60,700	456,852	168,240
Chicago Terminal Transfer	90	.....	14,267	620,535	90,913	151,328	3,432	283,917	29,994	559,584	60,951	5,205	100,330	—34,143	3,222
Cincinnati Northern	248	499,621	122,610	653,060	91,093	114,616	17,520	218,973	16,002	458,114	194,946	.....	25,001	169,945	118,317
Cleveland, Akron & Columbus	210	914,985	278,427	1,275,213	179,722	325,055	17,868	399,320	22,248	944,213	331,000	.....	31,042	299,958	—28,012
Cleveland Terminal & Valley	93	449,397	95,948	652,832	90,023	78,358	9,566	260,337	11,272	449,556	203,276	.....	20,419	182,857	16,881
Detroit, Grand Haven & Milwaukee	190	608,691	325,075	1,070,561	147,441	141,413	34,777	402,893	33,279	759,803	310,758	137	16,363	294,532	68,499
Eastern Ry. Co. of New Mexico	227	279,367	211,260	519,226	111,655	59,252	5,615	131,656	14,630	322,808	196,418	.....	20,675	175,743	21,424
Grand Trunk Western	336	1,902,938	1,000,550	3,100,873	368,638	435,938	130,841	1,095,792	76,000	2,107,209	993,664	3,861	175,140	814,663	28,363
Houston, East and West Texas	191	458,189	175,308	668,904	117,955	48,905	10,664	212,070	20,200	409,794	259,110	.....	10,464	248,646	7,013
Indiana Harbor Belt	105	.....	.....	984,276	207,362	114,221	9,837	493,726	27,778	852,924	131,352	10,244	22,459	98,649	84,421
Lehigh & Hudson River	96	695,745	24,661	730,349	108,085	75,672	6,669	243,487	21,868	455,781	274,568	.....	16,425	258,143	119,917
Louisville, Henderson & St. Louis	218	341,808	218,098	594,706	116,394	48,492	21,777	182,083	18,112	416,858	177,848	2,132	15,000	164,980	4,776
Michigan Central	1,746	9,663,767	3,814,095	14,825,098	1,977,068	1,869,998	412,536	5,091,194	243,398	9,594,194	5,230,904	10,625	557,582	4,662,747	1,088,166
Minneapolis, St. Paul & S. S. Marie	2,495†	5,972,792	1,992,805	8,375,219	711,964	761,681	142,511	2,217,959	132,845	3,966,960	4,408,259	107,960	484,929	4,031,290	1,129,254
Nevada Northern	165	622,695	91,561	738,506	38,156	64,261	1,964	141,576	20,596	266,553	471,953	.....	18,136	453,817	156,228
New York, Philadelphia & Norfolk	112	1,347,692	214,711	1,675,069	156,197	281,765	21,096	578,245	53,273	1,090,576	584,493	.....	37,500	546,993	126,711
Pecos & Northern Texas	152	648,737	140,621	820,142	134,098	108,605	10,241	227,054	23,712	503,710	316,432	.....	10,482	305,950	89,567
Richmond, Fredericksburg & Potomac	83	563,022	336,771	1,019,038	176,981	129,529	14,500	338,510	27,886	686,506	332,532	.....	1,200	331,332	63,016
St. Louis Merchants Bridge Terminal	9	.....	30,978	873,242	135,807	23,452	4,370	329,294	28,731	521,654	351,588	.....	28,545	323,043	100,805
Southern Kansas Ry. of Texas	125	673,762	123,367	818,122	97,765	127,069	10,720	249,332	21,739	506,625	311,497	.....	10,827	300,670	183,742
Southern Ry. Co. in Mississippi	280‡	293,090	180,641	512,820	115,719	34,644	14,735	195,664	20,453	381,215	131,605	.....	27,550	104,055	.....
Spokane & Inland Empire	168	252,722	436,232	724,889	68,722	37,704	12,515	172,128	41,554	332,634	392,255	93,756	16,200	469,811	247,006
Spokane International	141	318,322	137,481	468,798	63,118	26,427	11,492	131,714	15,475	248,226	220,572	.....	13,427	207,145	82,300
Terminal R.R. Ass'n of St. Louis	34	.....	1,500	1,373,682	207,398	90,958	6,239	427,989	35,131	767,715	605,967	86,789	132,113	560,643	1,885
Ulster & Delaware	129	377,883	239,778	644,563	77,153	69,414	7,707	235,902	14,644	404,820	239,743	762	19,200	221,305	44,078
Union R. R. Co. of Baltimore	9	591,000	116,475	718,435	76,685	.....	3,087	29,575	11,444	120,791	597,644	.....	26,792	570,852	105,916
Virginia & Southwestern	188	524,417	72,627	616,589	88,964	118,350	8,349	177,310	20,361	413,334	203,255	.....	23,900	179,355	44,388
Virginian	444§	758,860	110,349	913,290	156,627	165,487	35,509	264,157	43,987	665,767	247,424	2,923	66,667	183,679	.....
Washington Southern	35	196,558	168,376	480,031	47,457	54,218	6,213	172,443	12,728	293,057	186,974	.....	14,069	172,905	30,618
West Jersey & Seashore	356	864,326	2,095,551	3,168,294	479,358	348,043	92,206	1,188,713	51,473	2,159,793	1,008,501	16,328	120,223	904,606	94,730
Wisconsin Central	1,030	3,149,102	839,105	4,244,334	562,630	582,187	137,104	1,412,262	98,042	2,792,225	1,452,109	4,789	173,482	1,283,416	72,454

* Mileage operated December 31, 1908, 107. † Mileage operated December 31, 1908, 2,395. ‡ Figures included in Southern Ry. prior to January 1, 1908. § Mileage operated December 31, 1908, 204. under construction. — Indicates Deficits, Losses and Decreases.

Discrimination Against Montgomery.

Montgomery Freight Bureau v. Louisville & Nashville et al. Opinion by Commissioner Clark.

Complaint alleges that the adjustment of rates from and through the Ohio and Mississippi river crossings is unjustly discriminatory against Montgomery, Ala., and unduly preferential to Pensacola, Fla., and Mobile and Birmingham, Ala.; held, that it is not unlawful for defendants to maintain lower rates from said river crossings to Pensacola and Mobile than to Montgomery, but that no rate from or through said river crossings to Montgomery may lawfully exceed the combination on Mobile; and held further, that circumstances and conditions do not warrant establishing at Montgomery the same rates that apply to Birmingham. (17 I. C. C., 521.)

Lower Rates Ordered on Powder.

E. I. Du Pont de Nemours Powder Co. v. Pennsylvania Railroad et al. Opinion by Chairman Knapp.

Complainant is subjected to undue prejudice and disadvantage in the transportation of common black powder from Montchanin, Del., through Chadd's Ford Junction to points local to the Pennsylvania Railroad in Pennsylvania and to certain points in Ohio local to the Pennsylvania Company. For the future the rates from Montchanin to such points should not exceed the rates contemporaneously in effect from Philadelphia rate basis territory to the same points. (17 I. C. C., 544.)

STATE COMMISSIONS.

The railway commission of Nevada has ordered extensive reductions in freight rates on the Southern Pacific. The order does not go into effect for at least 30 days, and there is talk that the railway will resist the order.

John A. Taity, road foreman of engines of the Delaware, Lackawanna & Western, has been appointed assistant supervisor of equipment, at a salary of $2,400 per year, of the New York Up-State Public Service Commission. He began railway work as a freight brakeman, later becoming locomotive engineman, air-brake inspector and then road foreman of engines.

The Illinois Railway Commission has rendered a decision in which it holds that the railways must so route freight that it will be handled with the least possible cost to the shipper. The decision was rendered in a proceeding brought by Bregman & Company against the Chicago & North Western for the collection of alleged excessive freight charges. This company billed a car of scrap iron from Evanston to Kewanee. It was sent by the way of Sterling and the charge was $1.40 per ton. The concern said it directed the car to be sent by the way of Chicago and via the Burlington road, which would have made the rate 95 cents.

The New York State Public Service Commission, Second district, having made some investigation of street railway conditions in Rochester, and making recommendations to the railway company and to the mayor, goes into details in the following thorough-going fashion, the recommendation being directed to the single object of relieving congestion of cars on Main street during the evening rush hours: Cars to stop on the far side instead of the near side of transverse streets; adopt a certain specified roundabout route for interurban cars so as to relieve Main street; put in crossover tracks so as to turn back certain cars during the rush hours; employ six additional inspectors on Main street; adopt detailed rules for the government of motormen, conductors and inspectors; have an emergency wagon at a convenient point during the rush hours; all of these changes to become effective within five days. The commission suggests to the mayor that the city should clear off snow and slush so that passengers can get on and off cars in comfort and convenience.

COURT NEWS.

At Cincinnati on Monday of this week in the United States district court the Lake Shore & Michigan Southern was fined $1,000 for violation of the rate law in connection with a shipment of railway ties from Ozone, Tenn., to Bryan, Ohio.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Hale Holden, general attorney of the Chicago, Burlington & Quincy at Chicago, has been appointed assistant to the president, with office at Chicago.

O. M. Colston has been appointed assistant to the vice-president of the Fort Worth & Denver City and the Wichita Valley, with office at Fort Worth, Tex.

L. F. Linney has been appointed auditor of the Arkansas, Louisiana & Gulf, with office at Hamburg, Ark., succeeding L. E. Smart, resigned, to go to the Chicago Glossit Co.

Andrew M. Moreland and W. B. Trowbridge have been appointed receivers for the Delaware & Eastern Railroad Co. and the Delaware & Eastern Railway Co., with offices at New York.

The following officers of the Southern Indiana and the Chicago Southern have been elected: President, E. K. Boisot; treasurer, F. O. Wetmore; secretary, E. M. Tourtelot, all with office at Chicago.

Richard A. Jackson, formerly vice-chairman of the executive committee and general counsel of the Chicago, Rock Island & Pacific, has been appointed general counsel of the Great Northern, with office at St. Paul, Minn., succeeding W. R. Begg, resigned some months ago. A photograph of Mr. Jackson and a sketch of his railway career were published in the *Railway Age Gazette* of December 10, 1909, page 1165.

Operating Officers.

W. D. Perkins has been appointed a trainmaster of the Southern Pacific, with office at Sacramento, Cal.

C. L. Pratt has been appointed superintendent of dining and sleeping cars on the Great Northern, with office at St. Paul, Minn., succeeding W. O. Chase.

F. C. Coulter has been appointed trainmaster of the Pittsburgh division of the Pennsylvania Lines West, with office at Pittsburgh, Pa., succeeding J. C. McCullough, promoted.

T. Walsh has been appointed an assistant superintendent of the Washington division of the Oregon Railroad & Navigation Co., with office at Spokane, Wash., succeeding H. L. Buchanan, resigned.

F. M. Falck, division engineer of the Philadelphia & Reading, at Reading, Pa., has been appointed assistant superintendent of the Philadelphia & Reading and subsidiary companies, with office at Reading.

J. A. Gordon, formerly general superintendent of the Cincinnati, Hamilton & Dayton, at Cincinnati, Ohio, has been appointed superintendent Southern district of the Chicago Great Western, with office at Des Moines, Iowa, succeeding L. M. Shipley, resigned.

W. H. DeWitt, superintendent of the Missouri & North Arkansas at Leslie, Ark., has been appointed trainmaster of the Hoisington district of the Missouri Pacific, with office at Hoisington, Kan., succeeding R. W. Edwards, resigned to accept service elsewhere.

J. T. Carey, superintendent of the Shenandoah division of the Norfolk & Western, at Roanoke, Va., has been transferred to the Scioto division, with office at Portsmouth, Ohio, succeeding E. A. Blake, who in turn is transferred to the Shenandoah division, with office at Roanoke, succeeding J. T. Carey.

The statement made in these columns on February 18, page 376, that G. Radetzki, general superintendent of the Houston & Texas Central, the Houston East & West Texas and the Houston & Shreveport, with office at Houston, Tex., has resigned to engage in other business, is erroneous.

Henry J. Curry, day chief despatcher of the Boston & Albany, at Boston, Mass., has been appointed a trainmaster, with office at Beacon Park, with supervision over that part of the Boston division east of Worcester, including branches. Frederick F. Williams, acting night chief despatcher, succeeds Mr. Curry, with office at Boston, and George A. Church succeeds Mr. Williams.

Traffic Officers.

W. T. Billings has been appointed an industrial agent of the Maine Central, with office at Portland, Maine.

B. W. Taylor, superintendent of the Pennsylvania Lines West at Louisville, Ky., has been appointed a general agent, with office at Pittsburgh, Pa.

W. I. Laird, general agent of the Chicago Great Western at Pittsburg, Pa., has been appointed general agent of the St. Joseph & Grand Island, with office at Chicago.

J. T. Crawford has been appointed a traveling passenger agent of the Chicago, Rock Island & Pacific, with office at Peoria, Ill., succeeding C. C. Anderson, promoted.

O. F. Townsend, traveling freight agent of the Chicago, Milwaukee & St. Paul, at Pittsburgh, Pa., has been appointed assistant general freight agent of the Chicago Great Western, with office at Pittsburgh.

I. M. Griffin, general cotton agent of the International & Great Northern, at Palestine, Tex., has been appointed division freight agent, with office at Fort Worth, Tex. He will continue as general cotton agent in charge of solicitation of cotton and cotton seed products.

A. G. Little, traveling freight and passenger agent of the Union Pacific at Kansas City, Mo., has been appointed division freight and passenger agent of the Southern Pacific, with office at Lake Charles, La. Julian Nance, traveling freight agent at Kansas City, succeeds Mr. Little, and W. W. Johnson, soliciting freight agent at Kansas City, succeeds Mr. Nance.

F. C. Fletcher has been appointed general live stock agent of the Missouri Pacific-Iron Mountain system, with office at Kansas City, Mo., succeeding James L. Harris, resigned to engage in other business. R. R. Trimble has been appointed a commercial freight agent, with office at Joplin, Mo., succeeding O. M. Odell, resigned to engage in other business.

Engineering and Rolling Stock Officers.

F. H. Neward, master mechanic of the Pontiac, Oxford & Northern (Grand Trunk), with office at Pontiac, Mich., has resigned.

F. E. Whitcomb has been appointed engineer maintenance of signals of the Boston & Albany, with office at Boston, Mass., succeeding J. M. Fitzgerald, promoted.

Louis Yager has been appointed division engineer of the Northern Pacific, in charge of engineering matters on the lines east of Mandan, N. Dak., with office at St. Paul, Minn.

G. M. Ball, Jr., supervisor of Division No. 9 of the Pennsylvania Railroad, has been transfered to Division No. 7, on the Middle division, with office at Huntingdon, Pa., succeeding M. I. Ward, deceased. J. O. Heap succeeds Mr. Ball, with office at Haddonfield, N. J.

J. M. Fitzgerald, engineer maintenance of signals of the Boston & Albany, at Boston, Mass., has been appointed assistant signal engineer of the New York Central & Hudson River and the Boston & Albany, with office at Albany, N. Y., succeeding W. A. Peddle, resigned to go to another company.

Lewis Kingman, assistant chief engineer of the National Railways of Mexico, the Mexican International and the Interoceanic at Mexico City, Mex., has been appointed engineer maintenance of way, with office at Buenavista, succeeding C. G. Delo, resigned. H. B. Reese, division engineer at Chihuahua, succeeds Mr. Kingman, with office at Mexico City.

OBITUARY.

William E. Dunn, paymaster of the St. Louis & San Francisco, died in St. Louis, Mo., on February 24. Mr. Dunn was born in 1858 and began railway work in 1879 as clerk to the general manager on the Kansas City, Fort Scott & Gulf, and was later with the Kansas City, St. Joseph & Council Bluffs, also the Atchison & Nebraska and the Kansas City, Laurence & Southern. From 1888 to 1897 he was clerk in the office of the president and general manager of the Kansas City, Fort Scott & Memphis, the Kansas City, Memphis & Birmingham, the Kansas City, Clinton & Springfield and the Current River Railroad, and in 1897 was made cashier and paymaster of these companies. He was appointed paymaster of the St. Louis & San Francisco in 1901.

Late News.

The items in this column were received after the classified departments were closed.

The Chicago, Milwaukee & Gary has ordered from the American Car & Foundry Co. six cabooses.

The Waterloo, Cedar Falls & Northern has ordered six electric cars from the McGuim-Cummings Mfg. Co.

The St. Louis, Brownsville & Mexico has ordered from the American Car & Foundry Co. four coaches, three passenger and mail cars, two baggage cars and six cabooses. The company expect to order soon 100 steel underframe box cars.

Bids are wanted up to April 15 by C. N. Coburn, chief enengineer, Sault Ste. Marie, Ont., for the clearing, grading and bridge work on a 31-mile section of the Algoma Central & Hudson Bay, between Hawk Lake junction, Ont., and Hobon, on the Canadian Pacific.

Officers of the American Railway Engineering & Maintenance of Way Association have assurances that President Taft will address the convention at Chicago March 17 (Thursday). The President will speak at the hall in Congress Hotel some time between 2 and 4 o'clock.

The Governor of Maryland has signed the bill recently introduced in the Maryland legislature to authorize the Western Maryland Railroad to issue the balance of its unissued stock, amounting to approximately $26,000,000, below par, for the purpose of constructing the new extension from New Haven, Pa., to Connellsville.

A contract has been given to the Engineering Construction & Securities Co. to build an extension of the Atlantic Northern & Southern. The company plans to have the shortest line between Sioux City, Iowa, and St. Joseph, Mo. The first section of 17 miles is now in operation. The next section of 38 miles on the south connecting with the Burlington at Villisca, Iowa, will cost about $500,000 to build.

The opposition of the grain interests of Chicago to the new uniform demurrage code promulgated by the National Association of Railway Commissioners and recently adopted without change by the roads entering Chicago, has resulted in an injunction granted by Judge C. C. Kohlsaat, of the United States Circuit Court, restraining every Chicago road doing an interstate business from putting in effect the new schedule of free time allowances giving grain dealers less time to unload cars. The board of trade and a number of grain firms are the complainants. The court ordered a hearing March 15.

Disastrous Avalanche Near Cascade Tunnel.

Press despatches from Everett, Wash., on Wednesday of this week report the wrecking of two passenger trains of the Great Northern, which were standing near the station at Wellington, Wash., the west portal of the Cascade tunnel, in a disaster which will result in the loss of probably 60 lives. In addition to the dead, it is said that 20 or more persons were injured.

It appears that, in consequence of unusually warm weather and severe floods, a number of trains had been blockaded at Wellington, and that the whole of the trains at this point were swept into a canyon 150 ft. below the level of the track. The business car of Superintendent J. H. O'Neill was attached to one of the trains wrecked, and three men in this car are reported among the killed: A. R. Blackburn, trainmaster; A. E. Longcoy, secretary to the superintendent, and Louis Walker, cook. The road is so seriously blocked that relief parties from division headquarters were expected to reach the scene of the wreck only by going on foot. There was a snow slide also at Drury, on the eastern side of the mountain, which destroyed the station and killed a watchman. Rescue parties are in constant peril from snow slides.

Press despatches from San Francisco, Ogden and other places indicate that the Northern Pacific and the Ogden-Oakland route of the Southern Pacific are also blockaded by floods or snow slides. Many Southern Pacific trains are at a standstill in northeastern Nevada.

Railway Construction.

New Incorporations, Surveys, Etc.

Abilene Central.—It is said that bids for building this line will be asked for at once. The projected route is from Abilene, Tex., southeast to Waco, 150 miles. D. T. Bomar, Fort Worth; M. Jones, H. James and W. G. Swenson, Abilene, are interested. (Jan. 14, p. 118.)

Arizona & Colorado.—See Southern Pacific.

Arizona & Swansea.—This road has been finished from Bouse, Ariz., northeasterly to Swansea, 22 miles. (Nov. 19, p. 989.)

Arizona Eastern.—See Southern Pacific.

Bartlett-Florence.—According to press reports this road was opened March 1 on a section of 11 miles from Bartlett, Tex. The company is building about 84 miles to complete a line from Lampasas, southeast to Milano, with a branch from a point on the main line near the eastern end southeast to Rockdale. G. W. Hubbard, president, Bartlett.

Canadian Northern.—The railway committee of the Canadian House of Commons has agreed to the construction of new lines by the Canadian Northern, as follows:

From a point at or near Dundee, Man., northerly and easterly to a point on the Winnipeg river in or near township 18, range 10, east of the principal meridian.

From a point at or near Portage la Prairie, Man., southeasterly to a point on its line near Ridgeville, in or near township five, range seven, w2.

From a point at or near Moose Jaw, Sask., southeast on the west side of Moose Jaw creek and the Souris river, to a point in or near township two, thence easterly to a point at or near Bienfait, with a branch from a point near Estevan to Roche Percee in township one, range six, w2.

From a point on the Qu' Appelle, Long Lake & Saskatchewan line of the Canadian Northern between Davidson, Sask., and Disley, westerly and northwesterly to the Saskatoon-Calgary line in township 30, range 14, w3.

From a point on the main line at or near Lashburn, Sask., in township 48, range 23, w3, thence in a generally westerly and northwesterly direction to a point on its authorized line between Edmonton, Alb., and Camrose, in or near township 50, range 22, west of the fourth meridian.

From a point on the Saskatoon-Calgary line, in or near township 28, range 6, w4, northwesterly to a point near Rocky Mountain House, Alb., on the North Saskatchewan river.

From a point on the Saskatoon-Calgary line at or near the crossing of the Red Deer river, in or near township 28, range 19, w4, northwesterly, passing through or near Innisfail, Alb., and Rocky Mountain House to the head waters of the Brazeau and McLeod rivers, and then to a point on its authorized line at or near Yellowhead Pass.

From a point on the existing line near Winnipegosis, Man., southeasterly to a point on the line near the south end of Lake Manitoba.

From a point on the authorized line between Prince Albert, Sask., and Battleford, in or near township 49, range 31, w3, northwesterly to a point near the Slave Lake.

From a point on the authorized line east of Lake Manitoba, Man., westerly via The Narrows to a point on the existing line between Grandview and Roblin.

An officer is quoted as saying that the plans call for building 600 miles of new track during 1910. The line from Edmonton, Alb., west to Vancouver, 800 miles, will be started at once. Work will be begun at both ends simultaneously, and it is hoped that the line will be completed before 1915. The line is to have lower gradients than any other railway and will be free from the danger of snowslides. Only a small amount of actual construction on the Pacific coast line, it is expected, will be done this year, as the time will be fully taken up with the locating. (Feb. 18, p. 384.)

Canadian Pacific.—An officer writes that bids are to be asked for soon to build extensions during 1910 as follows: Outlook, Sask., northwest to Macklin, 147.7 miles. This work involves the crossing of the Saskatchewan river at Outlook on a steel viaduct approximately 3,000 ft. long. Maximum grades will be 0.4 per cent., maximum curvature 6 degs.

From Regina, on the main line, southeast to Griffin, on the Stoughton-Weyburn line, 79 miles. Maximum grades will be 0.4 per cent., maximum curvature 4 degs.

From Craven, connecting the section of the Regina-Bullyea line, already built, with Colonsay, on the Lanigan section, 110.3 miles. Maximum grades will be 0.4 per cent. and maximum curvature 6 degs.

A continuation of the 26-mile line already built from Weyburn, Sask., west towards Lethbridge from Forward, west for 25 miles. Maximum grades will be 0.4 per cent. and maximum curvature 4 degs.

From Kipp, Alb., northwest, mile 28 to mile 58, 30 miles. This is a continuation of the branch built last year from Kipp northwest. Maximum grades will be 0.5 per cent. and maximum curvature 6 degs.

From Tilston, Man., west for 24 miles. This is a continuation of the branch built two years ago from Lauder, Man., on the Estevan section, west. Maximum grades will be 0.4 per cent. and maximum curvature 6 degs.

Second-track is to be laid from Winnipeg west to Portage la Prairie, a part of the Brandon section, 55.6 miles. (Feb. 25, p. 428.)

Chambersburg, Green Castle & Waynesboro (Electric).—This company is said to be planning to build extensions as follows: From Pen Mar, Pa., southeast to Highfield, Md.; from Greencastle, Pa., west to Mercersburg, and from Chambersburg northeast to Shippensburg. (April 9, p. 820.)

Chicago, Rock Island & Pacific.—According to press reports this company has appropriated $4,000,000 for reconstructing and shortening its road between St. Louis, Mo., and Kansas City, 297 miles. (Feb. 25, p. 428.)

Colorado & Southern.—See Denver & Rio Grande.

Denver & Rio Grande.—According to press reports this company and the Colorado & Southern will build jointly a new line connecting Pueblo, Colo., and Walsenburg, 56 miles. The new line is to be built several miles to the eastward of the present Denver & Rio Grande line for most of the way, and will have easier grades than the existing road. It is estimated that it will cost about $45,000 to build the line.

Denver, Northwestern & Pacific.—This company does not contemplate building an extension of the road beyond Steamboat Springs, Colo., which is 214 miles west of Denver, in the immediate future. No branch lines are being built by the company, although private interests are constructing short spurs into the mining and lumber sections, through which the road passes. The company was organized to build from Denver, Colo., west to Salt Lake City, Utah, 490 miles. (March 19, p. 653.)

Enid, Ochiltree & Western.—According to press reports this company, building from Dalhart, Tex., east to Ochiltree, 112 miles, has amended its charter authorizing it to build an additional 55 miles from Ochiltree east to the Oklahoma state line. The plans call for a further extension east to Enid, Okla., about 120 miles. (Dec. 17, p. 1213.)

Grand Trunk.—Announcement has been made that 100-lb. rail has been laid on 200 miles between Montreal, Que., and Napanee, Ont., and contracts have been given for 100-lb. rail for the section between Napanee and Toronto, 133 miles. The company intends ultimately to lay 100-lb. rail on the entire line from Montreal to Chicago.

Grand Trunk Pacific.—According to press reports a contract for building the remaining 135 miles of the Tofield-Calgary branch has been let to the J. D. McArthur Co., Ltd., Winnipeg, Man. This company already has a contract for work on this line. It is expected that the entire line will be finished during the summer of 1910. The section from Tofield, Alb., south to Camrose, 40 miles, was recently finished. Foley, Welch & Stewart were the contractors on this section. (Feb. 18, p. 379.)

Kentucky Highlands.—See Louisville & Nashville.

Lehigh Valley Traction.—Plans are said to have been made by this company for improvements, including extensions and a number of new bridges. It is probable that a new line will

be built from Hellertown, Pa., south to Quakertown, to connect two sections of this road.

Long Island.—The plans submitted for rebuilding the station at Jamaica, N. Y., and increasing the track facilities on that part of the road call for an expenditure of about $3,000,000. The improvements include the elimination of a number of grade crossings in Jamaica. The company is now carrying out grade crossing removal work between Jamaica and Long Island City. On this part of the work the city has been asked to pay $600,000 towards the cost of these improvements. (Nov. 19, p. 991.)

Louisville & Nashville.—Bids, it is said, are being asked for building an extension of 9.5 miles on the Kentucky Highlands, from the present southern terminus, southeast, to complete the line to Versailles, Ky. It is expected to have the work finished by September. (See Kentucky Highlands, Dec. 3, p. 1107.)

Mexican Roads.—According to press reports from Monclova, Mex., a contract has been let for building a line between Monclova, Coahuila and Chihuahua, 410 miles, and work is to be started as soon as the necessary equipment and the laborers can be obtained. The new line will reach extensive coal fields, 120 miles west of Monclova, the entire output of which, it is said, has been contracted for by the Monterey Iron & Steel Co. Miguel Cardenas, former governor of the state of Coahuila, and Ed. Hartman, a large coal mine operator, are back of the project.

Minneapolis, St. Paul & Sault Ste. Marie.—According to press reports surveys are being made for a branch from Thief River falls, Minn., southwest to Grand Forks, N. Dak., about 45 miles. (Feb. 25, p. 429.)

Missouri, Kansas & Texas.—A contract is said to have been given to the Patton-Gibson Co. for a change of line and double-tracking from Atoka, Okla., north about 20 miles to Limestone Gap. (Feb. 25, p. 429.)

Missouri, Oklahoma & Gulf.—This company, which was incorporated in October, 1904, to build from Wagoner, Okla., south to Denison, Tex., has been finished to Durant, Okla., and now has 200 miles in operation, including branch lines. It is expected that the extension from Durant to Denison will be ready for operation by July 1. (Feb. 11, p. 329.)

Missouri Pacific.—An officer writes that the $4,000,000 to be spent during 1910 are for improvements in Kansas. The work will consist principally of ballasting, strengthening bridges for heavier rolling stock, putting in heavier rail and other improvements to roadway. Other improvements to be made on the road have not yet been entirely determined upon. (Feb. 18, p. 379.)

Mountain Valley & Plains.—Organized to build from Cimarron, N. Mex., east through the Panhandle of Texas to Guthrie, Okla., thence south to Oklahoma City, about 400 miles. According to press reports, permanent location has been made and grading work is under way from Guthrie west to Kingfisher, 30 miles, and surveys are being made from Kingfisher west towards Hitchcock, in Blaine county. Construction is also under way from Cimarron east. J. H. Conlin, chief engineer, Dalhart, Tex. (Aug. 20, p. 339.)

Nevada Roads.—Surveys are said to be under way for a line from Winnemucca, Nev., north to Paradise Hill, thence through the Quinn river canyon to the camp at National and via McDermitt to Caldwell, Idaho, where connection will probably be made with the San Francisco, Idaho & Montana, which has already started work on a line from Caldwell south via a point in Oregon to Winnemucca. R. E. Tilden is in charge of the surveys.

New York Subways.—The appellate division of the supreme court has approved the plan for making the proposed Broadway-Lexington avenue line double deck from Houston street, Manhattan, to 103d street, and from 113th street to the Harlem river. The cost will be $10,000,000 less than if the tracks were to be laid all on one level. The proposition originated with the Public Service Commission and has been approved by the Board of Estimate and Apportionment. Four tracks on one level on this route would have occupied a width of 65 ft., and as Lexington avenue is only 75 ft. wide the work would have interfered with the buildings and abutting property and necessitated the condemnation of private property for station sites. (July 9, p. 79.)

Nueces River Valley.—Bids are to be asked for about April 1, it is said, to build from Beeville, Tex., west via Oakville, Tilden, Cotulla and Carrizo Springs to Eagle Pass, about 175 miles. There are to be three bridges over the Nueces river and one over another stream. C. K. Conant, Fort Worth, has a contract for some of the work. W. A. Frisby, president, Simmons, and L. Frisby, general manager, Austin.

Quanah, Acme & Pacific.—This company, which now operates 43 miles of railway from Quanah, Tex., west via Acme to Paducah, in Cottle county, is said to have finished preliminary surveys for an extension west. The proposed route from Paducah is west via Yoakum county, Tex., thence to Roswell, N. Mex., about 310 miles. A further extension is projected from Roswell, southwest, about 180 miles, to El Paso, Tex. (Dec. 17, p. 1214.)

Rural Railway of Manitoba.—A bill has been introduced to incorporate this company, with a capital of $200,000 and headquarters at St. Boniface, Man. The plans call for a line to be operated either by steam or electric power from St. Boniface, south along the east side of the Red river to the international boundary at or near Emerson, about 65 miles; also for a line from a point at or near Winnipeg south, on the west side of the Red river to the international boundary near Emerson. Dr. Albert Galliot, Notre Dame des Lourdes; P. Gevaert, N. Bernier, J. A. Beaupre, St. Boniface, and F. Deniset, Winnipeg, are the provisional directors.

San Pedro, Los Angeles & Salt Lake.—According to press reports this line will be rebuilt through Meadow valley wash. It has not yet been decided whether the line will remain permanently in the wash after rebuilding, as this depends upon the final report of the engineers. There are many bridges and stretches of undamaged track in the valley that can still be used, whereas a new route would necessitate heavy construction work. (Jan. 28, p. 171.)

San Francisco, Idaho & Montana.—See Nevada Roads.

Southern Pacific.—The Arizona Eastern, which was recently organized, has taken over a number of the subsidiary lines of the Southern Pacific. Plans said to be made to build connecting links and a number of branches for a new route from Denver, Colo., to Los Angeles, Cal. According to press reports from Farmington, N. Mex., that place has raised a bonus of $25,000 for building the Arizona & Colorado, under construction from Gallup, N. Mex., north via Farmington to Durango, Colo., which is to form part of the Arizona Eastern. (Feb. 4, p. 281.)

Springfield Traction.—Incorporated in Illinois, with $10,000 capital and office at Springfield, Ill. The plans call for a line from Springfield southeast via Pana to Vandalia, about 75 miles. The incorporators include: E. H. Helmle, G. B. Gillespie, G. Riordan, all of Springfield, and C. E. Hazlett, Rochester.

Temple & Northwestern.—According to press reports a contract has been given to D. J. Grigsby, Dallas, Tex., for building 80 miles of this line. The projected route is from Temple northwest to Hamilton. F. F. Downs and C. M. Campbell, Temple, are said to be interested. (Feb. 18, p. 380.)

Virginia & Carolina Southern.—An officer writes that a contract has been given to Wade & Clower, St. Pauls, N. C., and grading work is now under way on an extension from St. Pauls southeast to Elizabethtown, 30 miles. (Dec. 24, p. 1261.)

Western Allegheny.—According to press reports this company is planning to extend its line on the western end to West Pittsburgh. An extension is also projected on the eastern end from Kaylor, Pa., northeast to Reidsburg, 16 miles. (Sept. 3, p. 427.)

Western Maryland.—According to press reports active construction work on the branch from Cumberland, Md., northwest to a connection with the Pittsburgh & Lake Erie at New Haven, Pa., about 83 miles, is to be started within the next 60 days and pushed to completion. (Feb. 18, p. 380.)

Railway Financial News.

Alabama, New Orleans, Texas & Pacific Junction.—A dividend of 2½ per cent. on the preferred A 6 per cent. cumulative stock of this company, which controls the Alabama & Vicksburg, has been declared. The first dividend of 3½ per cent. was paid on this stock in March, 1908. After the payment of the dividend now declared it appears that there are accrued dividends due amounting to 159½ per cent.

Allegheny Valley.—Holders of the $9,998,000 first mortgage 7 per cent. bonds, due April 1, 1910, are offered the option of receiving cash for their bonds or exchanging them at par for general mortgage 4 per cent. bonds of the Allegheny Valley, due 1942, guaranteed principal and interest by the Pennsylvania Railroad.

Brooklyn Rapid Transit.—A judgment for a total of $3,356,938 has been rendered in favor of the Brooklyn Heights Railroad against the Brooklyn City Railroad. The Brooklyn Heights Railroad leased the property of the Brooklyn City Railroad in 1893, and the Brooklyn City Railroad agreed to spend $6,000,000 in improvements and betterments. In the trial it was claimed that the entire $6,000,000 had not been spent on improvements, and that therefore the amount and interest still remaining to be spent should be paid the lessee company. The Brooklyn Heights Railroad, whose stock is owned by the Brooklyn Rapid Transit, pays an annual rental of $1,200,000 to the Brooklyn City Railroad, so that by withholding this rental it can make sure of collecting the judgment.

Chesapeake & Ohio.—*The Wall Street Journal* says that while the Chesapeake & Ohio is negogiating for control, it is in a position to avail itself of an alternative proposition, and that through the friendship of Newman Erb and Edwin Hawley the Detroit, Toledo & Ironton could, if necessary, be made to serve as the Chesapeake & Ohio's short line to the Great Lakes.

Chicago & Eastern Illinois.—The New York Stock Exchange has listed $2,238,000 additional 4 per cent. refunding and improvement bonds of 1905-1955. The amount received from the sale of these bonds has been used for payments on equipment covered by American Car & Foundry Co. notes, series A, and equipment bonds, series B and F.

Chicago City and Connecting Railways.—The Chicago City Railway, the Calumet & South Chicago, the Southern Street Railway, the Hammond, Whiting & Chicago and the Chicago Western have been consolidated under a trust agreement without the organization of a new company. Of the entire stock of these companies 95 per cent., amounting to $23,843,900, has been deposited under the agreement.

Chicago, Rock Island & Pacific.—Speyer & Co. have bought from the company $11,000,000 Rock Island, Louisiana & Arkansas 4½ per cent. bonds. The bonds are secured by a first mortgage on 346 miles of road, and principal and interest are unconditionally guaranteed by the Chicago, Rock Island & Pacific.

Chicago Southern.—See Southern Indiana.

Delaware & Eastern.—Searing & Co., New York, who have been financing this company, having failed, the Delaware & Eastern Railway and the Delaware & Eastern Railroad have been placed in the hands of a receiver. The Delaware & Eastern Railroad has a line of railway running from Arkville, N. Y., to East Branch, 38 miles, and the Delaware & Eastern Railway leases this road and had planned to build extensions to Schenectady.

Detroit, Toledo & Ironton.—Interest coupons of the Detroit Southern, Ohio Southern division first mortgage 4 per cent. bonds, due September 1, 1909, and those due March 1, 1910, were paid on March 1 at the Central Trust Co., New York. See Chesapeake & Ohio.

Grand Trunk.—Sir W. H. White has been elected a director of the Grand Trunk.

Metropolitan Street Railway (New York).—The United States Circuit Court of Appeals has confirmed in most respects Judge Lacombe's order of sale of the property of the Metropolitan Street Railway, and has fixed an upset price of $10,000,000, the successful bidder to receive the property free of any lien.

Michigan Central.—Moffat & White, New York, are offering $1,500,000 4 per cent. Grand River Valley Railroad bonds of the Michigan Central at 97½, yielding about 4⅛ per cent. The bonds are secured by a first mortgage on that part of the Michigan Central's lines running from Detroit, Mich., to Grand Rapids, 84 miles. The bonds are outstanding at the rate of $17,901 per mile, and the remaining authorized $3,000,000 can be issued only to provide funds for betterments and improvements or additions and extensions to the property.

New York Central & Hudson River.—Justice D. Cady Herrick, referee appointed by the New York supreme court, reports that the New York Central is entitled to the injunction which it has asked for to restrain the city from removing the tracks of the company in Eleventh avenue, New York. These tracks are used mostly by freight trains, running at very low speed, but there have been a good many fatal injuries to pedestrians. Referee Herrick holds that the franchise of the Hudson River Railroad, under which these tracks were laid, passed to the New York Central & Hudson River on the consolidation of the Central and the Hudson; that the franchise runs 500 years from 1869, and that the plaintiff will suffer ireparable injury if the tracks are torn up.

Norfolk & Western.—It is reported that the Pennsylvania Railroad has bought an actual majority of the Norfolk & Western stock. On December 31, 1908, the Pennsylvania owned $9,492,000 stock of the Norfolk & Western, and the report just published shows that on December 31, 1909, the Pennsylvania owned $28,500,800 stock. The total stock outstanding (preferred and common having equal voting power) is $89,000,000.

Northern Central.—A committee representing the minority stockholders has been formed to make some rearrangements in the relations of the property to the Pennsylvania Railroad, and to try to secure better terms for the minority stockholders. The committee consists of Joseph Moore, Jr., C. S. W. Packard, Edward B. Smith, R. Lancaster Williams, W. P. Hayward, John M. Nelson and John C. Schmidt.

Pennsylvania Railroad.—See Allegheny Valley and also Northern Central.

Southern Indiana.—This road and the Chicago Southern have been reorganized, and the following directors have been elected: E. K. Boisot, F. O. Wetmore, E. M. Tourtelot, J. C. Hutchins and O. A. Bestel. This marks the passing of these properties from the control of John R. Walsh and his associates. The directors whom they succeed were the following: John R. Walsh, J. W. Walsh, E. C. Ritsher, W. T. Abbott and F. D. Meacham. See Elections and Appointments.

Toledo & Ohio Central.—William Salomon & Co., New York, have bought and resold $1,200,000 Toledo & Ohio Central car trust 4 per cent. certificates. The notes were offered to the public at a price yielding about 4.75 per cent.

Western Maryland.—On March 8 this company is to sell at auction, under a decree of the United States circuit court dated October 9, 1909, $999,650 stock of the Georgia's Creek & Cumberland, $22,750 stock of the Union & Wheeling Shore Line, $100,000 stock of the Buxton & Landstreet Co., and $200,000 stock of the Davis Coal & Coke Co.

Wisconsin Central.—There have been no dividends declared on the non-cumulative 4 per cent. preferred stock since October 15, when 1 per cent. was paid. It is understood that the Minneapolis, St. Paul & Sault Ste. Marie, which operated the Wisconsin Central as its Chicago division, will make no further dividend payments for a while on the Wisconsin Central preferred stock, using instead the surplus earnings for improvements to the property.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Lancaster & Chester has ordered one ten-wheel locomotive from the Baldwin Locomotive Works.

The Boyne City, Gaylord & Alpena has ordered two Mogul locomotives from the Baldwin Locomotive Works.

The St. Louis, Brownsville & Mexico has ordered six 10-wheel locomotives from the Baldwin Locomotive Works.

The Missouri & North Arkansas has ordered two Mikado and two 10-wheel locomotives from the Baldwin Locomotive Works.

The Miller Construction Co., Eldred, Pa., has ordered one 10-in. x 14-in., 36-in. gage saddle tank locomotive from the Vulcan Iron Works.

CAR BUILDING.

The Southern is asking prices on 3,000 coal, 500 coke and 100 flat cars.

The Northern Pacific is in the market for 25 passenger refrigerator cars.

The Chicago, Burlington & Quincy is in the market for 1,000 fifty-ton gondola cars.

The Harriman Lines are asking for tentative bids on a number of passenger cars.

The Erie is said to be asking prices on passenger equipment. This item is not confirmed.

The Southern Pacific has ordered ten 70-ft. gasolene motor cars from the McKeen Motor Car Co.

The Chicago, Rock Island & Pacific has ordered 10 baggage cars from the American Car & Foundry Co.

The Western Fuel Company has ordered 50 hopper bottom gondola cars from the Pennsylvania Equipment Co.

The Missouri & North Arkansas has ordered two second class passenger coaches from the American Car & Foundry Co.

The Public Belt Railroad of New Orleans has ordered 18 dump cars from the McGuire-Cummings Co., Chicago. This report is not confirmed.

The Chicago, Rock Island & Pacific has ordered one 70-ft. gasolene motor car from the McKeen Motor Car Co. This order is the result of a five months' test of one of the 55-ft. cars.

The Western Maryland, reported in the *Railway Age Gazette* of February 11 as being in the market for freight cars, has ordered 400 all steel hopper from the Cambria Steel Co. and 500 steel underframe gondola cars from the Standard Steel Car Co.

The Southern Pacific has ordered 125 electric cars for operation on its Oakland and Alameda lines, inquiries for which have been reported in the *Railway Age Gazette* from time to time. The order includes 40 motor coaches, 25 motor combination coach and baggage cars and 60 trailer coaches. The bodies are 58 ft. long and will be built at the St. Charles, Mo., shops of the American Car & Foundry Co. The trucks will be furnished by the Baldwin Locomotive Works, and the motor and control equipment by the General Electric Co. The contract specifies that delivery shall begin August 15, 1910.

IRON AND STEEL.

Grand Trunk. See under Railway Construction.

Isthmian Canal Commission. See under Supply Trade News.

The Chicago, Indianapolis & Louisville has ordered 5,000 tons of rails from the Illinois Steel Co.

The Mexico Northwestern has ordered 10,500 tons of rails from the Tennessee Coal, Iron & Railroad Co.

The Louisville & Nashville has ordered 5,250 tons of rails from the Tennessee Coal, Iron & Railroad Co.

The Atchison, Topeka & Santa Fe has ordered 26,250 tons of rails from the Tennessee Coal, Iron & Railroad Co.

The New Orleans & Northeastern has ordered 1,500 tons of rails from the Tennessee Coal, Iron & Railroad Co.

The Pennsylvania has ordered from the Jones & Laughlin Steel Co. 1,200 tons of structural steel for the Baltimore, Md., train sheds.

General Conditions in Steel.—All reports indicate a steady improvement in steel shapes and rails. During the past two weeks there have been a large number of car and locomotive orders placed and the steel market is showing the effect of a demand for steel shapes. Specifications for structural steel in the building trades have been held up on account of bad weather. Better conditions in this respect are accountable for an increased activity in structural steel specifications.

SIGNALING.

The contract for signaling the Detroit River Tunnels has been awarded to the General Railway Signal Co.

TRADE PUBLICATIONS.

Engineers' Tape Reel.—Kolesch & Co., New York, has issued a small leaflet descriptive of the Lewis ideal tape reel for engineers and surveyors.

Janney X Coupler.—The McConway & Torley Co., Pittsburgh, Pa., has just issued a catalogue containing a detailed description of its Janney X coupler.

Spiral Conveyor.—The Jeffrey Manufacturing Co., Columbus, Ohio, in pamphlet No. 36 gives a large amount of information regarding the Jeffrey spiral conveyor.

Industrial Railways.—The Ernst Wiener Co., New York, has issued a new catalogue, No. 155, regarding the equipment for industrial railways which it manufactures.

Hawthorne Fan Motors.—The Western Electric Co., New York, has just issued bulletin No. 5,252, suitable for a loose leaf folder and containing detailed descriptions of its Hawthorne fan motors.

Fuel Oil and Gas Burning Appliances.—The W. S. Rockwell Co., New York, has just issued catalogue No. 3, containing a large amount of information valuable to those interested in fuel oil and gas burning appliances.

Lifting Magnet.—The Cutler-Hammer Clutch Co., Milwaukee, Wis., has issued a folder containing a complete description of its Cutler-Hammer lifting magnets. Both half-tone and line illustrations show the construction of this magnet and its use.

Brake-Beams.—The Buffalo Brake-Beam Co., Buffalo, N. Y., has just issued a 9-in. x 12-in. catalogue, printed on heavy glazed paper, containing a large number of half-tone and line illustrations, with descriptions, of its brake-beams and attachments.

Woodworking Machinery.—The S. A. Woods Machine Co., Boston, Mass., has just issued a four-page folder containing excellent illustrations and detailed descriptions of woodworking machinery, including No. 19 eight-roll floorer and No. 20 six-roll floorer.

American Statesmen Series.—The Carborundum Co., Niagara Falls, N. Y., has just issued in small pamphlet form an amusing satire on the life of George Washington. This is one of a series of similar satires by F. W. Haskell, president, is very amusing and well worth reading.

National Motor-Driven Air Compressors.—The National Brake & Electric Co., Milwaukee, Wis., has published a 36-page booklet on the type "3VS" motor-driven air compressors. There are 16 pages of photographs and complete descriptions of the details of both motors and compressors.

Steamship Service in the Tropics.—The United Fruit Co., New York, has issued a pamphlet on its steamship service to the tropics, fully describing the vessels and the points of interest on the trip. The company has also issued a folder giving the sailing dates for all its vessels and connections on the railways owned by the company.

Car Window Screen.—The Imperial car window screen, recently placed on the market by the General Railway Supply Co., Chicago, is illustrated and described in a small folder recently published. The screen allows car windows to be raised to their full height, thus affording passengers fresh air and an unobstructed view while protecting them from dust, cinders and flies.

Uncoupler and Automatic Release.—A full description of the latest developments of the Duplex uncoupler and automatic release is given in a four-page folder issued by the National Railway Devices Co., 490 Old Colony building, Chicago, the makers of the device. Mention was made of this uncoupler in the *Daily Railway Age Gazette* of June 22, 1909, and a full description of its operation was published in the issue of December 24, 1909, page 1265.

Turret Lathes, Boring Mills, etc.—The Gisholt Machine Co., Madison, Wis., is sending out a handsome pamphlet describing its turret lathes, boring mills and tool grinders. It contains exterior and interior views of the large shops at Madison and handsome halftone engravings illustrating the various developments of its turret lathe. This lathe is now built in sizes to swing from 13 in. up to 41½ in., and some of them are combination lathes adapted for large bar as well as for chuck work. These are known as the big bore lathes. The pamphlet illustrates some of the locomotive work which has been done on this type of turret lathe, especially the finishing of eccentrics and crank pins. There is a comparative dimension table for all these different sizes of lathes. The company also manufactures vertical boring and turning mills, and the sizes now furnished range from 30 in. to 84 in. Some of these are illustrated in this catalogue, but the company publishes a special pamphlet devoted to that class of tools. It has reference also to horizontal boring mills and universal tool grinders which the company manufactures. Most of these machines are arranged to be motor-driven and quite a number of the illustrations show them arranged in that way.

RAILWAY STRUCTURES.

Altoona, Pa.—Arrangements have been made for putting up a bridge over the Pennsylvania tracks at Seventh street, in Altoona. The cost of about $75,000 is to be divided equally between the Pennsylvania Railroad, the city of Altoona and the City Passenger Railway Co.

Buffalo, N. Y.—The New York Central & Hudson River has submitted a proposition to the city authorities to improve its passenger and terminal facilities in Buffalo by building a new passenger station at the Terrace, making this the principal station in the city. This site is bounded by the Terrace on the north, the Erie canal on the south, Church street on the west and Erie street on the east. The Lehigh Valley at the same time submitted a proposition, either to join with the New York Central or to build a new station on the Hamburg strip near the present L. V. station in Washington street. It is thought in Buffalo that this plan of the N. Y. C. is more definite than anything thus far proposed, and that an agreement will be reached between the city authorities and the railways. The Central proposal includes plans for using the present Exchange street station for freight.

Canyon City, Tex.—The Pecos & Northern Texas contemplates building a new passenger station to cost $12,000. The present building will be removed and converted into a freight house. The work is to be completed during the present year.

Cedar Rapids, Iowa.—The Chicago, Milwaukee & St. Paul is to build a new roundhouse, yard office, coal chute and sand drying house. The total cost is estimated at $50,000.

Elkhart, Ind.—The Lake Shore & Michigan Southern has announced its plans for building locomotive car shops to cost about $3,000,000. According to local press reports the locomotive shops will be larger than the Collinwood, Ohio, shops, and will employ 3,000 men. (Oct. 8, p. 665.)

Frankfort, Ind.—The Toledo, St. Louis & Western has appropriated $250,000 for new shops and repairs to old buildings. A machine shop and a coach shop are included in the plans for new work.

Hagerstown, Md.—The Cumberland Valley, it is said, will co-operate with the other railways entering Hagerstown in building a new union passenger station at that place. The company also has plans made for abolishing all grade crossings through the city. A roundhouse is to be built outside the city limits, and the company's tracks are to be removed from Walnut street.

Houston, Tex.—About 800 tons of structural steel are on the way, to be used in the construction of the terminal station which is being built by the Houston Belt & Terminal Co. The American Construction Co. has the contract for building the station, and it is expected that work will be completed in December. The improvements will cost about $500,000.

Jamaica, N. Y.—See Long Island under Railway Construction.

Joplin, Mo.—The Joplin Union Depot Co. has been organized to build the union station mentioned in the *Railway Age Gazette* of September 17, 1909. The interested roads are the Gulf, Colorado & Santa Fe, the Kansas City Southern, the Missouri & North Arkansas and the Missouri, Kansas & Texas.

Lebanon, Pa.—The Philadelphia & Reading, it is said, will put up a new passenger station in Lebanon. Other improvements are to be made, including an electric interlocking signal at the Cornwall Railroad crossing. The estimated cost of the improvements is $50,000.

Omaha, Neb.—The Union Pacific has let the contract to the Thompson-Starrett Construction Co., Chicago, for the new office building mentioned in the *Railway Age Gazette* of January 7. The contract price is $1,339,000.

Ritzville, Wash.—See Toppenish, Wash.

St. Louis, Mo.—The Rock Island has plans made for a large independent terminal system in North St. Louis, covering several acres of land. The company proposes to make St. Louis one of its freight and passenger traffic centers, and will spend a large amount of money for improving its facilities.

Sedalia, Mo.—The Missouri, Kansas & Texas has appropriated $175,000 to build a steel freight car shop and lighting plant.

Toppenish, Wash.—The Northern Pacific, it is said, will start work soon on a passenger station, to cost $20,000, at Toppenish, and will also begin work soon on a brick station at Ritzville.

Toronto, Ont.—Property, it is said, is being bought by the Canadian Northern as a site for a new terminal station on Carlton street in Toronto.

A contract is said to have been given to the Hamilton Bridge Co. for building a steel viaduct over the North Wabie river for the Temiskaming & Northern Ontario.

Winnipeg, Man.—It is said that the Canadian Pacific will spend $4,000,000 in 1910 for improvements to be made in the province of Alberta, exclusive of new lines, extensions and the revision of grades and the high level bridge between Edmonton and Strathcona. The plans call for new stations, roundhouses, freight sheds, machine shops, improving the old roadbed and other general improvements. It is also planned to put up a new station at Regina, Sask., and probably one at Moose Jaw. At one of these places $200,000 is also to be spent for new yards, new freight sheds, etc. New 85-lb. rail is to be laid from Calgary, Alb., southward to Macleod, also north to Edmonton, and a large amount of ballasting work is to be carried out. At Macleod an addition is to be built to the roundhouse and the yard capacity increased, at a cost of $50,000. The station at Lethbridge, Alb., is to be enlarged, and at Coleridge, Alb., a roundhouse with six stalls will be built. Terminal facilities will be improved at Weyburn, Sask., also at Swift Current and at Medicine Hat, Alb., $50,000 has been set aside for improvements, including a new machine shop. A new brick station is also to be put up at Red River and 15 or 20 new stations will be constructed at various places. The improvements at Calgary, Alb., will cost about $633,000. This includes an addition to the new station building, to cost $80,000, and a new machine shop, $20,000. A freight car repair shop is to be built, and plans are made for a new freight yard east of the Elbow, Sask., to include a 24-stall roundhouse.

Shop Edition

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On March 1, Roy V. Wright, for several years editor of the *American Engineer & Railroad Journal*, became a member of the staff of the *Railway Age Gazette*, with direct supervision of the mechanical department and the Shop Edition.

We take pleasure in announcing that the first prize of $50 in our shop kink competition has been awarded to Elmo N. Owen, general foreman of the Southern Pacific Company at Bakersfield, Cal., and the second prize, $25, to William G. Reyer, general foreman, and J. W. Hooten, foreman of repairs, Nashville, Chattanooga & St. Louis shops at Nashville, Tenn. The geographical distribution of these prizes is interesting; in the three competitions we have held the firsts have been awarded twice in California and once in Indiana; the seconds in New Mexico, Pennsylvania and Tennessee. The prize winners have been employed on the Southern Pacific (two), the Atchison, Topeka & Santa Fe, the Cincinnati, Hamilton & Dayton, the New York, Susquehanna & Western, and the Nashville, Chattanooga & St. Louis. We have printed collections of kinks gathered in California, Florida, Illinois, Indiana, Kansas, Maryland, Massachusetts, Minnesota, Missouri, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Tennessee and Canada, by employees of the Atchison, Topeka & Santa Fe, Baltimore & Ohio, Canadian Pacific, Cincinnati, Hamilton & Dayton, Delaware, Lackawanna & Western, Erie, Lake Shore & Michigan Short Line, Nashville, Chattanooga & St. Louis, New York, Susquehanna & Western, Northern Pacific, Northwestern Elevated, Pennsylvania, Rutland, Seaboard Air Line, Southern Pacific, and Terminal Association of St. Louis.

We announce a new competition, as follows: We will give a first prize of $50 and a second prize of $25 for the best article on the subject "How the Foreman Can Promote Shop Efficiency." Each manuscript in competition must be from one thousand to three thousand words long, and must be in our hands by April 15 for publication in the issue of May 6. Manuscripts worthy of publication but not awarded a prize will be paid for at space rates.

This is a subject to which every progressive foreman and shop specialist has given more or less study. A change in the organization of the shop, a new method of handling the work, a rearrangement of equipment or the providing of special facilities often add greatly to the efficiency of a shop, and in some cases have been known to save a railway the expenditure of large sums for providing new or larger shops or additional and expensive equipment.

Tell us just how you have improved the efficiency and output of your shop or department. The shop kinks competitions have brought out a large number of devices, all of which have added to the shop efficiency, but the new competition is intended to have a wider scope as indicated above.

THE PROBLEM OF THE MANAGER.

The greatest problem before engineers and managers to day is the economical utilization of labor. The limiting of output by the workman and the limiting by the employer of the amount a workman is allowed to earn are both factors which militate against that harmonious co-operation of employer and employee which is essential to their highest mutual good.

Well designed plants and efficient labor-saving devices that are to be seen on every hand bear testimony that the engineer is doing at least a portion of his work well. When, however, it comes to the operation of these plants and the utilization of these labor-saving devices the lack of co-operation between employer and employee very much impairs their efficiency. Increasing efficiency is essentially the problem of the manager.

In considering the subject of management we must recognize the fact that in this country so long as a man conforms to the laws of the state he has a right to govern his own conduct and to act in such a manner as his interests seem to dictate. This fact bars coercion, and it follows that any scheme of management, to be permanently successful, must be beneficial alike to employer and employee, for neither those labor unions that regard their interests as essentially antagonistic to that of employers, nor those associations of capitalists whose only effort is to oppose force with force, can ever effect a permanent solution of the problem of the proper relations between employers and employees. The solution will be one in which employer and employee co-operate for their mutual good. It is the problem of the manager to bring about this condition, and the only type of manager that can accomplish this is the manager who is also an engineer. He can stand between the capitalist and laborer, and understanding the problems of each, do much to effect their solution.

A system of management has been defined as a means of causing men to co-operate for a common end. A permanent system is one that causes them to co-operate also for their common good.

We have outlined in our previous articles the means by which such co-operation can be established, and the intelligent development of these methods will do much for the cause of both employer and employee. It is not a problem to be solved by second-rate men, or by good men at odd times, but one that requires the best efforts of the best men.

THE NEW HAVEN MECHANICAL ORGANIZATION.

In these days of large interests and wide consolidations we hear many comments and some lamentations over the fact that departmental heads of railways are so busy with the executive duties of their positions that they have no time to look after minor matters, and thus lack that personal intimacy with the details and acquaintanceship with the members of their force that was characteristic of the old-time superintendent and master mechanic. That these relations are desirable everyone concedes; that they are attainable even on large systems seems to be proven by the analysis of the organization of the mechanical department of the New York, New Haven & Hartford, in another column. It may be that the short distances existing on this system and the peculiar conditions and density of the traffic render an organization possible that would be impracticable where distances were greater and local conditions different. Still, the methods followed and the means adopted to bring the head of the department into close personal touch with his subordinate, and to keep him posted as to the details of their work are worthy of the most careful consideration, especially by officers who find themselves losing their grip on these things.

A marked feature of the organization is the existence of the staff, with special or assignable duties, whose members are the direct personal representatives of the mechanical super-

intendent and bring to him verbal reports of what they see and do. This serves to do away with much correspondence and facilitates mutual understandings, which means a facilitation of the work to be done and the development of hearty team co-operation. That it does this is shown by the condition of the desks of the master mechanics and their clerks. They are clean, the work is out of the way, and it looks as though they were on the way to realize that ideal of the late E. H. Harriman, who expressed the wish to see his managers sitting back in their chairs before an empty desk thinking—thinking.

Much of the expedition of the work on the New Haven must, of course, be attributed to the extensive use that is made of the telephone, which cuts out a great deal of letter writing, but the main underlying idea of the organization is to put the man in charge close to his work and in close relationship with his subordinates and then give him a free hand and full control, and hold him responsible for results. The offices are in the yards, shops and roundhouses, where physical contact cannot be avoided, and the advantages accruing from the system are shown in the constantly increasing efficiency of the locomotives, the reduced cost of maintenance, the fewer engines required for the work to be done, and above all by the admirable team work that seems to characterize the relations existing between the heads of the sub-departments.

PIECEWORK.

In the term piecework may be included all the various schemes for compensating men *for what they do*, instead of *for the amount of time they work*. It may be divided into two general classes.

1. That in which a price for a job is set from previous records, or from the estimate of the foreman, who generally considers his duty done when he has set the price.

2. That in which a time and a method are set for doing a job after an investigation by the best expert available, other than the foreman, whose duty it is to teach the workmen to do the work in the best manner and the shortest time he finds reasonable.

If in the second case the workman does the job by the method and in the time prescribed, he is paid substantial compensation in addition to his day's pay, which he gets in any case. His foreman and others that supply him with work all get additional compensation when he is successful. The responsibility of the expert in this case does not cease with setting the task, but he must find or train a man to perform it properly. In this he has the co-operation of the foreman, to whose interest it is that the workman should learn promptly.

The first method is the one which until recently has been almost exclusively employed, but in recent years some of the features of the second have been very generally included in order to avoid the troubles that have so frequently followed piecework in the past. The following reasons seem to be amply sufficient to account for all the troubles that have been caused by the first form of piecework.

Records of what has been done are only a very poor indication of what can be done by a capable and industrious workman, and still may be far beyond the possibilities of an ordinary workman who has not had special training in the work.

Estimates.—The judgment of a busy foreman as to how long it should take to do a new job must necessarily be inaccurate, and rates set by his estimates are practically guesses. After the workmen have become skilled their earnings will increase greatly and will often be out of all proportion to the exertion put forth.

Under these conditions an adjustment of the prices based on the new records is made; as the workmen become more skilful it is done again. Thus the more skilled the workman becomes, and the more progress he makes, the greater the penalty he has to suffer, for his prices are being continually reduced so that he earns but little more than the incompetent man, who has never been able to do his work in such a manner as to greatly exceed the old records.

The effect of this method of penalizing the good workman in proportion to his increased effort is to so discourage him that he learns ultimately to limit his output by that of the poor workman. This result is so natural that we should not be surprised at it, nor should we condemn it, unless we make it to the interest of the workman to do otherwise.

The second method, which we recommend, has exactly the reverse effect, and when properly operated provides for a complete system of instruction, compensation and advancement which creates a strong spirit of harmony and co-operation. The essentials of this system are:

Investigation.—To find out before setting a task the best method we can devise for doing a piece of work with the appliances available.

The Task.—When the investigator satisfies himself that he has the best appliances available, and has determined the best method he can devise, to set for the work such a time as he would need if he worked continuously on it at such a speed as he could keep up day after day.

Teaching.—To teach the ordinary workman to do the work by the method developed and in the time set.

Compensation and Co-operation.—To compensate liberality the workmen and all concerned in obtaining the high efficiency that has been shown to be possible.

Experts.—To find among workmen who have learned the best ways of doing work some that can investigate on their own account, and thus gradually get recruits for the corps of experts, so that the system may become self-perpetuating.

Duties of Exports and Foremen.—The foreman of a shop must be an executive, and invariably is so busy attending to his routine duties that he has but little time to make investigations into the best method of doing any piecework. He is usually obliged to give his instructions according to the experience he has had in the past, or according to the knowledge he may pick up at odd times. Again, he frequently feels compelled to allow work to be done inefficiently because he has no man that can do it better and no time to train a new man. For these reasons it is desirable that the development of improved methods, the setting of tasks in accordance with these methods, and the training of workmen to perform these tasks should be in the hands of someone other than the foreman.

For this purpose the best expert mechanic available should be selected. Such a man may not have qualities at all fitting him to be a foreman—in fact, the best expert usually makes but a poor foreman—whose principal function is administration; but he is usually so absorbed in the mechanical operations themselves that the improvement of them becomes a passion with him, and nothing pleases him more than to see numbers of mechanics operating at their highest efficiency, the result of his work. On the other hand, the foreman with this kind of a mind often sacrifices other sources of efficiency for this object.

The expert must be a good mechanic, with fair education. He must have industry, originality, patience, persistence and an ability to remove obstacles, not once, but repeatedly.

Such an expert in a shop will study the machines individually and bring each up to its highest efficiency.

The expert then studies the best way to do each job and makes out a set of detailed instructions for doing it. These instructions are written on a card and are so specific that an intelligent workman can readily follow them. Moreover, the time actually needed for performing each operation is given,

so that the workman may know at each step whether he is doing what the expert expects.

The next function of the expert is to teach the workman to follow his instructions, for few workmen can follow them at first, no matter how clear they may be. Many are willing to try, however, provided they are given proper assistance and assured additional compensation for success. In all cases the workman should have his day's pay, so that he has all to gain and nothing to lose by following the instructions of the expert.

A fair method of compensation is to allow the workman pay for the time the expert needs to do the work plus 25 per cent. of that time. If the workman needs more than 25 per cent. in addition to the time needed by the expert, he should get his day's pay until he acquires proper skill or demonstrates his inability to acquire it. If, on the other hand, he does the work in the time allowed, or less, he should be paid more than 25 per cent., say 30 per cent.

To take a specific case: If the expert sets four hours as the time allowed, the workman would get five hours' pay if he did it in any time between four and five hours. If he took over five hours he would get his day's pay. If he took four hours or less he would get 5.2 hours' pay.

Such a system of instruction and compensation not only attracts good men but stimulates all workmen to make the most of their opportunities, with the result that the shop soon becomes filled with high-grade workmen, who are ambitious to become experts.

If in addition to an equitable system of setting rates and compensating workmen, the foremen, crane men and truckers receive additional compensation based on that received by the workmen, we have a complete system of co-operation, which is the basis of economic production.

CAR SHOPS, OLD AND NEW.

There is perhaps no department of railway work where the contrast between the old methods and the new is more striking than in that of car building, especially freight car building. In the old days there was no mechanical department. There were office force, clerks, timekeepers and the like, and there was a shop force. Draftsmen were a scarcity, if not unknown, and in some large establishments freight cars were built for years without drawings. Sticks were cut to lengths and decorated with a variety of notches, each of which meant something to the man who cut them, until he forgot. Instead of drawings there was a collection of these sticks pushed up over cleats nailed to the second floor joists. All materials were carried about on the shoulders of men or were pushed by hand on lorry cars from point to point. The buildings were light sheds or were sheltered only by the canopy of heaven, and could hardly have been more primitive. Such a thing as a traveling crane was unknown, and there were constant checks to the movement of material, and blockades were the source of continual annoyance.

The material framed under such circumstances did not always fit as well as it might, and holes in adjoining pieces did not always come fair, so that the burning iron was a part of the regular equipment, and the sight of a man rushing from the blacksmith shop to the erecting shed or yard with a red-hot bar was a frequent one.

The change has come gradually, but so steadily that the whole system has changed. In the car building establishment of the present day such things are unknown. The economy and effectiveness of labor is kept in mind at all times. Starting with the drawing room, everything is provided for and there are no missteps in the process. Materials are bought where they can be obtained in the cheapest manner. It does not necessarily follow that a shop in the north, away from the source of supply, can take rough lumber and work it up into sheathing or flooring as cheaply as it can be bought and delivered ready for use. Hence many companies purchase these materials from the southern mills, and no work is required other than the cutting to length. Sheathing may be bought ready for laying and floor and roof boards that can be nailed in place and then cut to the body line with a portable saw. This work, which was formerly done by hand, is now performed with a power saw in a tenth of the time and with a hundredth of the exertion. It is strange that the use of templates capable of quick adjustment and marking was so long in coming to the front. Now, with these appliances, one man can do the laying out for from twenty to twenty-five cars a day and do it in a manner far more intelligible to the workman than in the old method of cross-marking and indexing. Of course the work is itself greatly facilitated by the modern boring and mortising machines. Where adjustments can be made in two planes and heavy material moved by power the time required for the performance of any piece of work is greatly reduced. Aside, however, from size and capacity there has been comparatively little done in the way of the production of new woodworking machines applicable to the car shop for a number of years. It is in the wrinkles and methods that the great improvement has been made.

There are, of course, some special machines, such as the belt-rail checker, where, after the machine has been set, belt rails can be cut or checked at the rate of from two to three a minute, so that it must be a large output indeed that can keep it busy. The same machine can also be adapted to do equally rapid work on carlines and end plates where the former are of wood. Then there are the portable saws, to which reference has been made, as well as the portable boring machines. These latter are not, however, used as extensively as they were a few years ago, now that the system of laying out all parts has been more elaborated. This is especially true for new work, for the portable boring machine is still indispensable in the repair yard.

One of the greatest economies of the modern car shop arises from the introduction and extended use of the traveling crane. It has served a double purpose; it affords a rapid means of transportation of heavy materials from the point of production to the point of use, and has supplanted the lorry car with its limited field of operation, confined, as it was, to the rails upon which it must run. Then this combination has done away with the blockading of the material routes. With the crane serving both the machines and the erecting floor, quantities of material can be picked up and distributed in half the time that would have been required to load it on the cars, and each machine operator can utilize the floor space about him to the best advantage without a thought whether or not he is blockading his fellows. Of course, the traveling crane in such a shop would be an impossibility if shafting transmission was in use, because of the interference with the belting. But with electric transmission the crane can move freely. In fact, the introduction of the traveling crane in the car shop, as well as in the machine shop, has depended directly upon the prior introduction of the individual tool drive. At present there seems to be no question about the desirability of this individual drive, and, in the light of what is being done it is strange that the economies to be effected in the handling of material was not realized and urged before they were, as an additional inducement to the doing away with belts and shafting.

There is one point of economy that does not seem to be fully realized, though it was learned years ago in the machine shop. It is that physical comfort goes hand in hand with speed and efficiency of working. The old idea that a cold shop was an incentive to the workman to hustle and exert himself so as to keep warm has been exploded long ago. A warm shop increases the output, and it is recognized that economy demands a high output with piece work as well as with day

work. It is strange that so many car shops are allowed to be cold in winter when so good a dividend could be obtained on the cost of warming them. Sometimes even the paint shops are run without heat, and lack of light is also not unknown. As for the methods of painting, the three coats are regarded as sufficient, and a quick-drying article is invariably used; something that will dry hard enough for the following coat in ten hours. But in the application of the paint we are back to the methods of the early days, with the exception of the width of the brush, which has grown to whitewash proportions. We tried the mechanical method of spraying a few years ago, and it appeared to be so successful that almost universal adoption was the result. But even the paint on a freight car must be laid with some care, and the admixture of the water of condensation with the compressed air cut down longevity to such an extent that the process was discredited, to say nothing of the waste of material and blistering, with the rapid incapacitating of the workman because of the atmosphere he was obliged to breathe. So car painting is back to about where it was years ago, except that some spraying is still done on trucks, and a few pieces are treated to the abomination of dipping. In the iron work the machinery is simple and of limited variety. Hand work in the blacksmith shop has almost entirely disappeared, and in its place we have the header, forging machine, steam hammer and bulldozer for making even the most complicated shapes. And, when the quantity of the output is considered, it is surprising to see what a very small addition is made to the pound cost of the iron or steel used. Where a man will work up a ton and a half of material a day into bolts, the added cost is well within the cent. The die has taken the place of the hand hammer, and as we saw in connection with some of our blacksmith kinks, has cut the cost down from dollars to cents.

Piecework is a highly important element, if not the most important element, in the reduction of car construction costs. Its introduction is universal, and it would be difficult to find a railway or private shop where it is not in full force and operation. This is one of the best examples of the working out of the modern economies of shop practice, and it has resulted in such an enormous increase of efficiency that its value cannot be estimated. Indeed, it is only by the combination of all these elements, increased capacity of tools, facility in handling material, and placing the individual upon his own merits and paying him for what he does that it has been possible to keep car construction costs down to what they are and so to counterbalance the increase in cost of materials and labor that deliveries can be made for what the railways can afford to pay.

FINISHING PISTONS AND DRIVING BOXES.

Continuing our investigation of the time required to finish locomotive details, we have returns from enough representative shops to indicate the variation between good and poor practice in finishing piston rods, piston heads, driving boxes and driving shoes.

Table 1. *-Piston Rods. (Turning includes cutting thread.)*

Shops.	Diameter.	Hours— Turning.	Grinding.	Total.
A	4 in.	4	4	8
B	4 "	6	1	7
C	4 "	3	1/3	3 1/3
D	4 "	1 1/3	1/3	1 2/3
E	3 "	2 1/2	..	3
F	4 "	3 3/4	3/4	4 1/2
G	4 "	2 1/4	1/2	2 3/4
H	3 3/4 in.	3	2	5
I	4 in.	3 1/2	1/2	4
J	No grinding	7	0	7
K	No grinding	4 "	4 1/2	0	4 1/2
L	4 "	2	1/3	2 1/3
Average		3.6	1	..

A 4-inch plain steel piston rod is assumed for purposes of comparison, and the work of finishing includes turning from the rough forging, grinding and cutting the thread on one end. On some piston rods the taper end is larger than the body of the rod, and there is a collar with fillets on each side. These require extra time, which accounts in a measure for some of the large differences found in the reports. Thus, one of the best locomotive shops, that is, one well managed and provided with modern tools, reports the largest number of hours, and is one of those which does not grind rods. It is possible that the time required to finish the rod smoothly and polish it on a lathe is so much longer than that required if finished by a special grinder that it appears excessive. The time required to turn a piston rod is reported as high as 6 to 7 hours, and the average time is 3.6 hours. This average includes several low figures which are evidently reported for a smaller amount of work than is usually required, and 4 hours can be taken to represent time required for lathe work in finishing a 4-inch piston rod of ordinary shape.

Most of the reports indicate that grinding machines of some form are employed for finishing piston rods, and the various times given is perhaps an index of the character of the machine used or else a larger amount is left to be ground than is necessary. The time reported for grinding averages 1 hour, though one shop reports 2 hours and another 4 hours. With a good modern grinder and good judgment as to the amount left to be ground, the work should be easily done in three-fourths of an hour and a number of roads report doing it in a half hour.

Table 2. *Piston Heads. Boring and Turning.*

Shops.	Hours— Cast iron.	Cast steel.
A	3	5
B	..	4 1/2
C	4	..
D	1 1/2	..
E	2 3/4	..
F	2 1/2	..
G	2	2 1/2
H	1 3/4	..
I	8	9 1/2
J	2 1/2	..
K	1 1/2	..
L	..	4 1/2
M	..	4 1/2
Average	3	4 1/2

While there is some variation in the shape of locomotive piston heads on different roads, the majority of them are like a thick hollow disk with a slight tapering of thickness at the circumference. The time for finishing includes the turning of the outside surface, the cutting of grooves for packing rings and boring the taper fit for piston rod and the counter bore for the large nut. The majority of these heads are cast iron, this being used because it is less liable to cut the cylinder than cast steel, though several roads report the use of cast steel also. The average time reported for cast iron heads is 3 hours and for cast steel 4½ hours. Individual reports show 4 to 8 hours for cast iron heads and two shops report only 1½ hours. The latter can only be attained by the most improved machine, and corresponds to the best performance of a vertical turret lathe working with two cutting tools at once. The average of the reports, 3 hours for finishing a cast iron head, shows good work for this detail when it is performed on a horizontal lathe. When the work is done on a boring mill it may be reduced to 2½ hours and on a horizontal turret

Table 3.—*Finishing Cast Steel Driving Boxes.*
(Planer, finishing sides and shoe fits; slotter, for brass and cellar fit; lathe, turning driving brass; boring machine for driving brass; shaper, finishing cellar.)

Shops.	Hours— Planer.	Slotter.	Shaper.	Lathe.	Boring.	Total.
A	6	1 3/4	1 1/4	1	3/4	10 3/4
B	4	3 1/2	3/4	1/2	1/2	9 1/4
C	3	1 1/2	1/2	1/2	1/2	6
D	1 1/2	1	1/2	1/2	1/2	4
E	3	2	3/4	1/2	3/4	7
F	..	3	1	1	1	..
G	1 1/2	1 1/2	3/4	1/2	1/2	6 1/4
H	4	2 3/4	1/2	1/3	2/3	8 1/4
I	3	1	3/4	3/4	1	6 1/2
J	3	2	1/2	1/3	1/2	6 1/3
K	1 1/2	1 1/2	1/3	1/3	1/2	3 2/3
L	3	4	1/2	1/2	3/4	7 3/4
M	4	1 1/2	1/2	3/4	1/2	6 1/4
Average	3	2	.65	.6	.65	7

lathe to 2¼ hours, and the shortest time is required when the head is finished on a vertical turret lathe, when 1½ hours is regarded as a good performance for finishing a locomotive piston head 27½ in. in diameter.

The majority of railways are now using cast steel driving boxes, and we have confined our inquiry entirely to this material. These castings are so rough and the amount of surface is so large that there is a tendency to dispense with finish as far as possible, and in a number of shops it is now the practice to cast the brass bearing and the hub liner directly on to the rough box, thus saving not only the cost of finishing that part of the box, but of finishing the one face of the liner also. This practice effects an economy of about 75 cents per box, or about 25 per cent. of the finishing cost. On a few roads the practice is carried still farther, and bronze liners are cast directly on to the bearing surface for the shoe and wedge, and this bronze is finished more rapidly than the hard scale of the cast steel. By placing a large number of boxes on a long planer, it is possible to take almost a continuous cut over a large surface and the rate per box becomes small, so that although the milling machine would appear to be a more economical one for finishing the outer faces and shoe bearings of driving boxes, it has not been used for this purpose to any extent. The time required for the planer work as ordinarily performed in finishing boxes is reported to average 3 hours, some shops taking as high as 4 to 6 hours. To finish a steel driving box on a planer in 3 hours is very good work, and about the only way to reduce the cost is to dispense with much of the work and cast the bronze face directly on to the steel. The circular fit for the journal bearing is usually finished on a slotter, and the time as we report it is based on that method. This work can also be performed on a planer with a special revolving cutting tool and the draw cut shaper is often employed to advantage for this operation. The average time reported for slotting is 2 hours and the maximum is 4 hours. It is doubtful if this average time can be much reduced, though it is claimed for the draw cut shaper that it will effect a saving of 25 to 40 per cent. over ordinary methods. The brass bearing is required to be turned and bored, though the outer surface is often finished on a slotter or a shaper. The draw shaper is also well adapted to this operation. The time reported for shaping the outside of the bearing averages .65 hours, though a number of shops report ½ of an hour, which is more nearly correct for good work, and the same is true for the lathe work in boring brass for journal fit. The total time for finishing a driving box complete, including brass fitted, averages 7 hours, which represents very good practice.

TABLE 4.—*Driving Wedges and Shoes—Planing or Milling.*

Shops.		No. finished.*	Shops.	No. finished.*
A		12	I	8
B		21	J	30
C		9	K	22
D	On milling machine..	40	L	15
E		20	M	20
F	Mill frame fit.....	9		
G		10	Average	18
H		24		

* In 10 hours.

The finishing of shoes and wedges is a plain, straight operation which would appear to be an ideal one for a milling machine, yet only one shop reports the entire finish of wedges and shoes by milling, and it finishes the largest number, 40 in ten hours. Another shop, which mills the frame fit only, does not derive much advantage from the use of that method, as it reports only 9 shoes in ten hours, while the average for all shops reporting is just double that, 18. This average must be regarded as very good work when the ordinary methods are used, that is, finishing on the planer or shaping machine. The heavy cuts and rapid work now performed by milling machines should make it possible to double the average output here reported and finish up 35 to 40 shoes or wedges in 10 hours.

Contributed Papers.

THE ORGANIZATION OF THE MECHANICAL DEPARTMENT, NEW YORK, NEW HAVEN & HARTFORD.

BY GEORGE L. FOWLER,
Associate Editor of the *Railway Age Gazette.*

In these days of large interests the methods of the old regime are unsuited to the requirements of the situation, and in every department there must be an executive head who is responsible for every detail and yet to whom the personal attention to these details is an impossibility. The result has been that, in American railway affairs, there has grown up a statistical department upon which the executive head is dependent for guidance. There is a difference, however, between reading cold statistics that are offered without comment and being in close touch with the men in the field who furnish the data for those statistics. The atmosphere of the situation is lost, for it is axiomatic that the closer the leader can be associated with the workers the more efficient will be this leadership. It is, therefore, for the purpose of keeping up this closeness of touch and of providing a means of direct communication between the subordinate and the head of the department, that the mechanical organization of the New York, New Haven & Hartford is based.

The main idea is to put every shop and roundhouse into personal relationship with the mechanical superintendent and avoid the filtration of reports through a number of channels before they reach their destination, and so receive the inevitable coloring that must result from such a filtration. That the mechanical superintendent should be in close personal touch and communication with these innumerable points of local activity is, of course, out of the question, and it therefore becomes a matter of moment to make the means of communication between the two as direct and as free from circumlocution as possible.

PERSONAL STAFF.

For this purpose the mechanical superintendent has surrounded himself with a personal staff, men to whom certain duties are assigned and who can be detailed for special services. They have no one directly responsible to them and they report directly to the mechanical superintendent. They stand in the same position to him as the aides and staff officers of an army do to the general in command. They have no direct commands themselves, but they are the message bearers of the chief and have authority to act in emergencies. By this means the most remote of the roundhouse foremen are put in direct personal communication with the head of the department and are thus in a position to demonstrate local conditions and receive instructions with the minimum of red tape and prejudice.

This arrangement does away with some of the subordinates that are usually to be found on American railways, such as assistant superintendents of motive power, who stand between the general superintendent of motive power, or mechanical superintendent, and the line, and to whom all or nearly all subordinates usually report, and by whom these reports are sifted and only that which the assistant may consider necessary is transmitted on to the head of the department. The New Haven organization cuts this out and reduces it to its simplest form.

It is not claimed, of course, that this organization is the best or that it would be possible of application on other and larger systems. The New Haven line is peculiar in that it is a large system, occupying a small territory; that it has one short main line but 233 miles long; that it is a perfect spider web of branch lines, and that though it has a mileage of 2,044, the extreme point to which these lines run, Provincetown, Mass., is but 323 miles from headquarters in New

Haven, Conn. This compactness greatly facilitates the work of intercommunication and reduces the number of telegrams and letters that must be transmitted, for the whole system is covered by telephonic communication, and any officer can sit at his desk and speak with not only any other officer but with any subordinate. In addition to this, at each center or terminal the company has an arrangement with the local telephone company through which connection is made with any subscriber, thus completing the system and putting each officer in touch with the outside world.

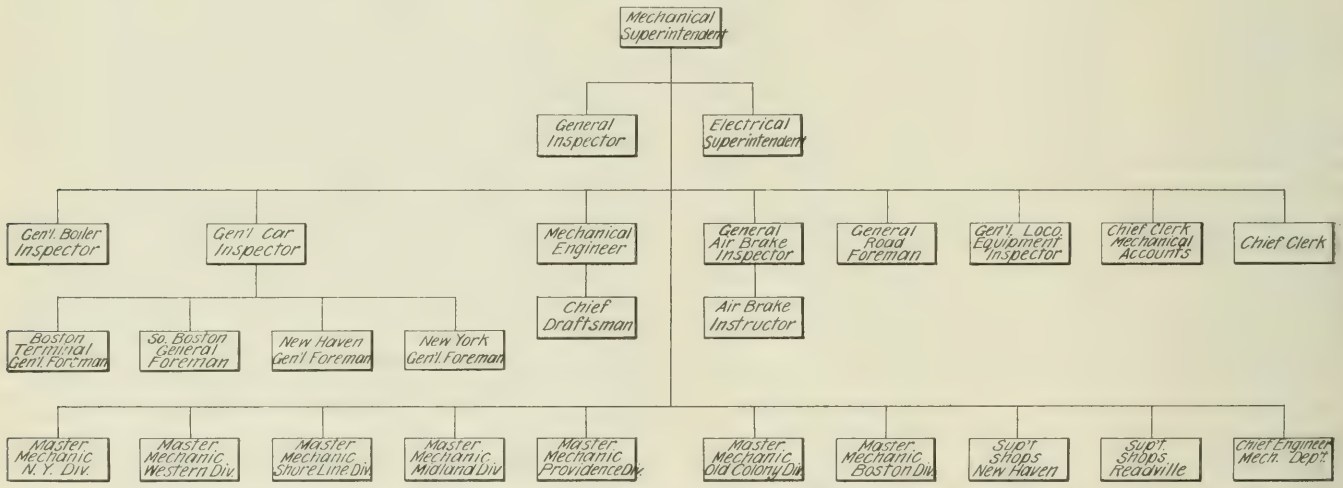
Hence, in case of emergency the mechanical superintendent can get at once into direct personal touch with any of his employees and obtain a quick, first-hand report of the situation as it exists. This possibility has done away with the necessity of those personal interviews and meetings that are usually held at stated intervals on most roads and which owe their existence solely to the fact of that underlying principle of business that, if you have anything of moment to transact, it is best to see your man. So, where an executive head is separated by hundreds, perhaps thousands of miles from his subordinates, and it means a journey of days to meet, periodical interviews or meetings are a necessity to good management. But where the head of the department can spend most of the morning at his own desk and the afternoon at any one of the important points on the whole system, these visits to and fro become such matters of daily or frequent occurrence that set dates for meetings would be superfluous, so that there are no regular meetings of the line and staff of the mechanical department on the New Haven road.

The one seeming disadvantage of this method is that men of the same rank, such as master mechanics, are not forcibly brought together and so led to discuss matters of common interest to the benefit of themselves and the service. But it will be seen later that the territories under the immediate control of these men dovetail into each other to such an extent that there must be a large amount of direct communication between them, so that each is cognizant of what the other is doing, and the density of the passenger service and the shortness of the distances is such that personal interviews may be made as frequently as an occasion may arise. In fact, any master mechanic could visit any other, or one shop superintendent another, and his absence from his own office be hardly noticed. Keeping this possibility of instant telephonic communication in mind, it appears, then, that the whole organization is in the position of being constantly in meeting session without the formality of actually coming together. This does not mean, however, that there are no meetings of the staff. For while there are no regular assemblings, still, from time to time as occasion demands it the master mechanics and superintendents of shops, in fact the entire staff of the mechanical superintendent, are brought together to discuss matters of mutual interest.

ORGANIZATION OF THE MECHANICAL DEPARTMENT.

The department of the mechanical superintendent includes the charge of all locomotives and other rolling stock, the shops, roundhouses, elevators, power houses and vessels, the latter including not only tugs and lighters, but the passenger train transfer steamers plying between the Harlem river terminal and Jersey City in the through Boston-Washington service. The mechanical superintendent reports direct to the general manager, who in turn reports to the president, while the subordinate officers report to the mechanical superintendent. There are a number of these, however, who make dual reports. For example, the electrical superintendent, who is shown on the diagram as reporting to the mechanical superintendent, also reports to the division superintendent and to the engineer of maintenance of way. To the mechanical superintendent he reports on matters relating to the machinery under his charge; to the division superintendent on all traffic matters, and to the engineer of maintenance of way on all matters pertaining to that officer's department, such as catenary construction, rail bonds and the like. These reports are separate and distinct and do not in any way conflict with each other. Nor do they imply a divided authority and responsibility. The same thing holds true of the master mechanics, who report, as on other roads, to the superintendent as to traffic matters and to the mechanical superintendent on mechanical affairs.

We are dealing, however, now with the mechanical department only, and so, in the diagrams, the cases where dual or triple reports are called for will not be indicated, as they may be considered outside the province of this discussion.



General Organization of the Mechanical Department; New York, New Haven & Hartford.

The preliminary distribution of the responsibility is shown, then, in the diagram of the general organization. In this the president stands at the head, to whom the general manager reports. The mechanical superintendent reports to the general manager, and he in turn receives reports direct fom the master mechanics, the electrical superintendent, the superintendents of shops, the superintendent of the marine department and his own staff.

As this staff is one of the main characteristics of the whole organization it will be well to consider it first in detail. Referring to the diagram of the men reporting direct to the mechanical superintendent, it will be found to consist of ten individuals and two classes. The individuals are the general inspector, mechanical engineer, electrical superintendent, general car inspector, general air brake inspector, general boiler inspector, general road foreman of engines, chief clerk, chief clerk of mechanical accounts, and tool equipment inspector. The two classes are the master mechanics and superintendents

of shops. Of the individuals some are free lances, detailed for special work, endowed with authority to act and give orders, responsible directly to the mechanical superintendent, and having no employees or subordinate officers directly responsible to them. No one reports to them and no one looks to them for instructions, but any line officer may receive instructions and orders direct, or the same may be given direct to their subordinates, supplemented with a statement to the official as to what has been done. Others, such as the mechanical engineer and chief clerk of mechanical accounts, have other employees under them and are sub-departmental heads.

With this general statement as to the conditions obtaining attention is directed to the specific duties of the individuals reporting direct to the mechanical superintendent.

GENERAL INSPECTOR.

The general inspector might perhaps be called an assistant to the mechanical superintendent in locomotive affairs. His duties are to look after all roundhouse operation, to see that the general policies and instructions of the mechanical superintendent are carried out, and for this he has the authority to issue orders, that instructions be followed, but not to make any changes. In cases of emergency he has authority to issue orders. No one reports to him and no one looks to him for instructions, and he reports to no one but the mechanical superintendent. While his work is officially confined to the locomotives and roundhouses, he is also expected to report and comment upon anything relating to the car department that may be brought to his attention. In case, also, it appears to him that there should be any changes made in the methods of work, either locally or as a whole, he will make his recommendations to the mechanical superintendent, who will himself issue the orders accordingly. His regular duties may then be summed up in the statement that he is expected to so look after roundhouse methods that they are kept up to the top notch of possible efficiency. In addition to this regular work the general inspector is also subject to assignment to special services by the mechanical superintendent, and this may cover anything in the wide domain of the department. He has an office but no office force, not even a stenographer. His written reports are few and meager; any letters that he may desire to write are dictated in the office of the mechanical superintendent, to whom he usually makes his reports verbally.

GENERAL CAR INSPECTOR.

The general car inspector occupies the same position as to the car department that the general inspector does to the locomotive work, with the exception that he is in direct personal charge and is directly responsible for the work done on the cars at the New York and South Boston terminals and in New Haven. At these points he has charge of all car cleaning and repairs. At other places he has control and supervision of car repairs. Because of these duties and because of his immediate supervision over the three points named he is obliged to keep certain records and maintain more or less of correspondence, so that he has an office force of one clerk and one stenographer, at Boston and New Haven.

The mechanical engineer's duties are those usually pertaining to the position. He is in direct personal control of the drawing room, where he has a chief draftsman to take control in his absence. He, of course, works out all new designs and sees to it that the standards of construction are maintained in the shops. In addition to this he checks off all material and requisitions to see that both are in accordance with specifications and standards. No departmental heads report to or through him, and he has no authority to change practices or standards. If such changes are to be made the suggestions are made by the interested official to the mechanical superintendent, who then takes it up with the mechanical engineer for working out. This does not mean, of course, that there is no prior consultation between him and other subordinate officials before it is presented to the mechanical superintendent. For it is quite possible to have these prior conferences and reach a mutual decision as to what may be recommended, and so reduce the time required to reach a final decision.

ELECTRICAL SUPERINTENDENT.

The electrical superintendent has charge of the locomotives and electrical equipment in use on the New York division. As already stated, he reports to the superintendent and engineer of maintenance of way on traffic and construction matters, respectively, and to the mechanical superintendent on those things relating purely to the mechanical details of the locomotive construction, maintenance and operation.

GENERAL AIR BRAKE INSPECTOR.

The general air brake inspector has charge of the air brake equipment of the road, and this includes the air brake instruction car. Of the latter the details are under the charge of an air brake instructor, whose duties are of the regulation sort and for whom an instruction car is provided. The general air brake inspector works alongside the general car inspector, the duties of the two interlocking, but not conflicting, and each reports to the mechanical superintendent.

GENERAL BOILER INSPECTOR.

The general boiler inspector looks after the condition and care of the locomotive boilers. This involves the responsibility of attending to it that the boilers are washed and inspected at regular intervals so as to comply not only with the regulations of the company as applicable to the New England service, but also with those of the New York state law. For the latter a special record is kept. It is simple, and in addition to the cards sent in from the roundhouses where the work is done, there is a board in his office marked off into vertical columns and numbered from 1 to 31 for the days of the month. In these columns there are holes for pins, the head of which carries an engine number. These numbers are those of the locomotives assigned to runs that enter New York. The board is further divided into halves by a horizontal line. When a boiler is washed and reported the corresponding pin is placed in a hole in the column of the day on one side of the horizontal line. As the law requires that this washing shall be done at least once a month it is evident that, at the end of each calendar month, all of the pins are on the same side of the line. They are then moved over to the other side for the next month as each is washed and reported. In this way quick track can be kept of every locomotive in the service. In addition to the washing the general boiler inspector also looks after the repairs. He sees to it that the boilers are kept up to the specified standard of condition, that the tubes are tight, that patching is properly done, and that they are in a safe and efficient condition.

GENERAL ROAD FOREMAN OF ENGINES.

The general road foreman of engines supplements the work of the division road foreman and also interlocks with the duties of the general inspector. It is his duty to oversee the engines of the whole road, paying particular personal attention to those that are in through service, which run beyond the bounds of any one division. For example, a locomotive hauling a through train from New Haven to Boston runs over the Shore Line, the Providence and the Boston divisions, and so passes through and beyond the jurisdiction of any one division road foreman of engines. He also serves as a check on these division foremen, supplementing their work and serving as a means of supervising what they have done. His work also interlocks with that of the general inspector. His duties are to see that the engines are kept neat and clean and in a proper state of repair, so that he is apt to see and call attention to any neglect that may have escaped the general inspector. He reports to the mechanical superintendent and his, with those of the division road foremen, are thus brought together, so that the head of the department knows at all times what engines are receiving

attention on the road and what each foreman has done and is doing during the month.

CHIEF CLERK.

The chief clerk is, of course, the buffer between the mechanical superintendent and the outside world, as well as the routine work of the department. On him devolves the necessity of attending to all of the correspondence and of relieving his superior from the many details that must be taken care of in the daily routine of the office.

CHIEF CLERK OF MECHANICAL ACCOUNTS.

The chief clerk of mechanical accounts has charge of the accounting room. It is here that the reports of locomotive performance are drawn up, where costs are estimated, the payrolls checked, and the other details of car and locomotive accounting cared for.

GENERAL EQUIPMENT INSPECTOR.

The general equipment inspector looks after the tool equipment of the locomotives. In this he supplements the work of the road foreman of engines, who also sees to it that the locomotives are in proper condition for service.

EFFICIENCY OF THE ORGANIZATION.

It will thus be seen that the mechanical superintendent is brought into close contact and touch with the details of the work, and yet is spared the strain and consumption of time that would be involved were he to attend to these matters in person. The members of his staff are freelances, who can go and come as necessity may dictate, and who can give a first-hand, unprejudiced report as to the conditions existing on the road. This is really the key to the efficiency of the organization, that it enables the mechanical superintendent to be the head of his department not only in the matter of general policy and the conduct of affairs, but also in the refinement of the details, without being burdened and overwhelmed by the necessity of personal attention to and care of those details. This work falls upon the shoulders of the staff, as we have seen. Someone once said, in commenting on the Old Colony Railroad, that it was a great system, composed of a mass of branches and no main line. If we except the direct line between New York and Boston, the same statement holds fairly well for the present New Haven or consolidated system. The map presented shows how these numerous branches interlock and cut across each other, forming a complete spider-web of rails over the whole of Connecticut, Rhode Island and eastern Massachusetts, with tentacles reaching northward up the valley of the Connecticut river to Turner's Falls and to Pittsfield in the Berkshires, and westward to New York. The suitable arrangement of this territory and network into working and workable divisions was quite different from that of an ordinary railway that can be cut up into suitable lengths of from 100 to 150 miles. Here there were the multiplicity of interests and movement of trains to be taken into consideration, and that with an engine and car movement even more complicated than that of the trains.

THE DIVISIONS.

Speaking broadly, the New York, New Haven & Hartford may be divided into two grand divisions, one tributary to Boston and the other to New York, and the dividing line between them may be taken to pass through Willimantic and Saybrook, Conn. A brief study of timetables and train movements would show, however, that such a typical division would not be practicable for working purposes. Therefore, the whole has been split up into a number of minor parts. The reasons for the particular arrangement adopted involve too much of complicity to be dealt with here, so that the mere physical facts will be given, with an occasional underlying reason therefor.

The road is divided into seven operating divisions: the New York, Western, Shore Line, Midland, Providence, Old Colony and Boston, each of which is indicated by special lining on the map. The New York and Boston divisions cover the smallest areas and the densest traffic. The New York division simply includes the electrified section extending on the main line from the Grand Central station to Stamford and thence up the electrified branch to New Canaan. The Shore Line division takes up the main line at Stamford and holds it through to New London and Springfield, as well as on the old New Haven and Northampton line, which now extends up to Shelburne Falls and Turner's Falls. It also takes in a few branches as well as the line from Hartford to Fenwick. The Western division takes in the network of lines to the west of the Connecticut river and to the west and north of the Shore Line. The Providence division takes up the continuation of the main line at New London and holds it to the limits of the Boston division at Readville, including the two main lines between Boston and Providence, as well as branches extending to Worcester and Fall River. It cuts out into and interlocks on the west with the Midland division. Its tentacles are, however, few, and it is mostly confined to a narrow strip of territory bounding the main line.

With the exception of the old New York & New England, which forms a through air line between New Haven and Boston, the Midland division is a branch line road and fills the same position east of the Connecticut river that the Western division does on the other side. A third division of the same character is the Old Colony, which covers the whole Cape Cod territory with the main line between Boston and Fall River, with long tentacles cutting through the Providence division and reaching to Fitchburg and Lowell in the northwest. The last is the terminal division of Boston, which includes all of the territory within a radius of about 15 miles from the terminal station. A study of the map will show that this arrangement is a natural one and that the divisions are so arranged that through cars and engines cover the minimum number and that there are the fewest possible interchanges of power.

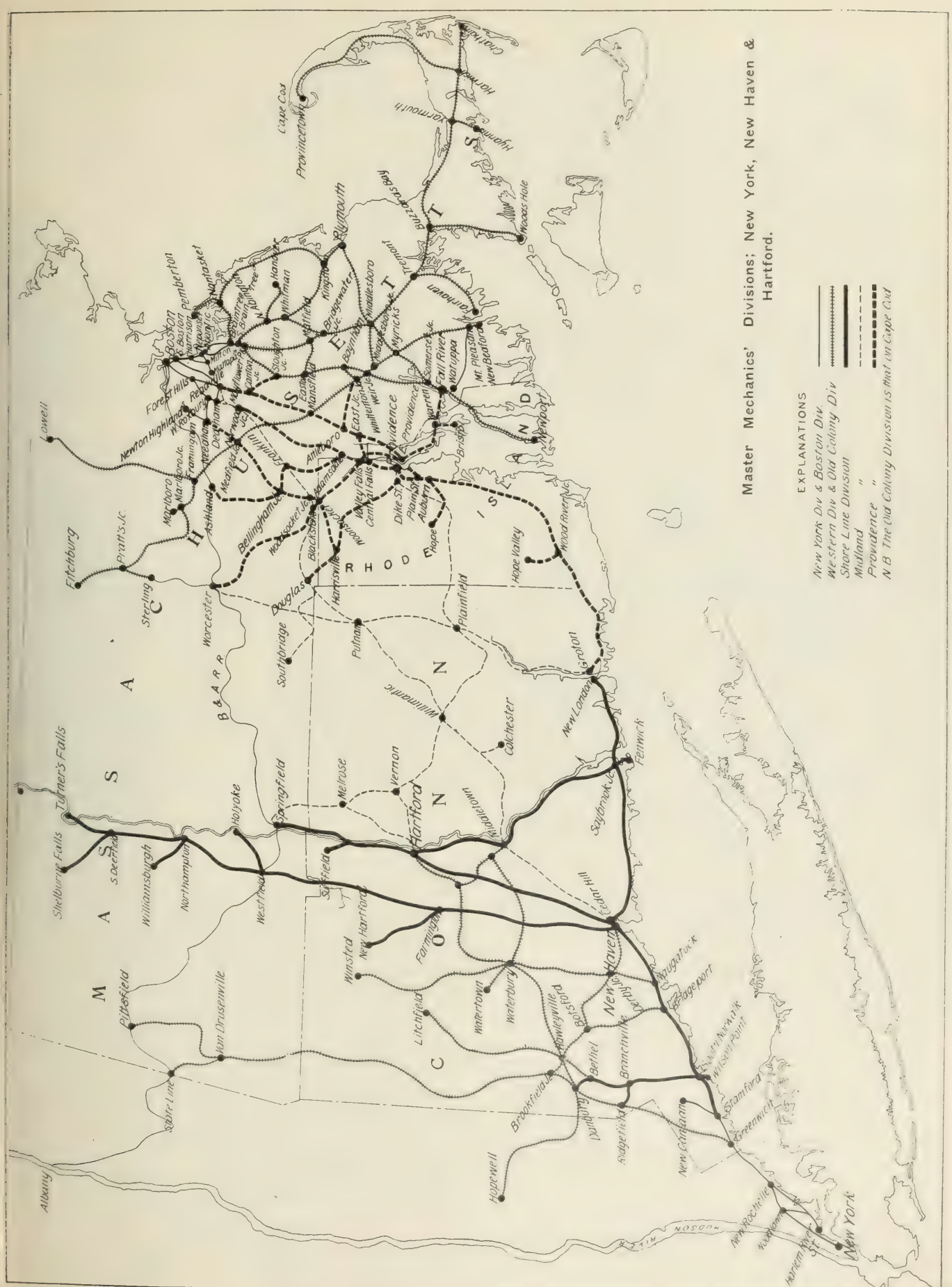
THE DIVISION ORGANIZATION.

A master mechanic is in charge of all motive power and cars on each of these divisions, whose duties correspond to those of the same position elsewhere. He is held responsible for the condition of the rolling stock and is in immediate control of all roundhouses and repair yards, reporting direct to the mechanical superintendent on all matters mechanical and to the division superintendent on traffic. His force, in addition to his personal assistants in his office consists of the roundhouse foreman and their men. He has reporting to him the roundhouse foreman, the road foreman of engines of his division, the car foreman, the car inspectors. In the case of the master mechanic of the New York division there are two road foreman of engines, one for the electric and the other for the steam locomotives. On the Providence division he receives reports from the chief engineers of the Providence, Warren & Bristol power house and the Providence station. In the case of the Boston division the master mechanic's jurisdiction also includes the chief engineers of the Nantasket and Back Bay stations with the coal docks at South Boston and Dover street.

This organization of the master mechanics' department is clearly shown on the diagrams, and its effectiveness is indicated by the fact that in no case is an inspector, engineer or foreman more than once removed from the mechanical superintendent. This broadening of the work on the divisions puts each master mechanic in close personal touch with every man in his employ with the resultant increase of the efficiency as a whole.

The number of places in charge of a master mechanic varies with the division and, to an extent, inversely with the density of traffic. The largest number of roundhouses on any one division are on the Old Colony where there are 22. Still, the distances are so short that it is a comparatively easy matter to reach any one of them.

The master mechanic, then, is responsible for the cars and


Master Mechanics' Divisions; New York, New Haven & Hartford.
EXPLANATIONS
New York Div & Boston Div.
Western Div & Old Colony Div
Shore Line Division
Midland "
Providence "
N B The Old Colony Division is that on Cape Cod
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
Albany
New York
Hudson River
Harlem River
New Rochelle
Port Chester
Greenwich
Stamford
South Norwalk
Wilson Point
Bridgeport
New Haven
Derby Junction
Ansonia
Birmingham
Derby
Naugatuck
Waterbury
Watertown
Litchfield
Winsted
New Hartford
Farmington
Hartford
Windsor Locks
Windsor
Suffield
Springfield
Westfield
Holyoke
Chicopee
Indian Orchard
Palmer
Monson
Thorndike
Three Rivers
Warren
Brookfield
Spencer
Leicester
Worcester
Millbury
Grafton
Milford
Hopedale
Bellingham
Medfield
Dedham
Readville
Boston
Forest Hills
Roxbury
Newton Highlands
Newton
Waltham
Lowell
Framingham
Ashland
Marlboro
Hudson
Fitchburg
Pratts Jct.
Sterling
Clinton
Shrewsbury
Westborough
Grafton
Whitinsville
Uxbridge
Millville
Blackstone
Woonsocket
Manville
Pawtucket
Central Falls
Valley Falls
Dike St.
Olneyville
Providence
Pawtucket
Warren
Bristol
Fall River
Somerset Jc.
Myricks
Middleboro
Taunton
Whitman
Bridgewater
Brockton
Stoughton
Canton Jct.
Mansfield
Attleboro
Plainville
Auburn
Hope
Hope Valley
Wood River Jct.
Wyoming
Hopkinton
Ashaway
Carolina
Westerly
Mystic
Stonington
Watch Hill
Niantic
Groton
New London
Saybrook Jct.
Old Saybrook
Clinton
Madison
Guilford
Branford
Cedar Hill
Fair Haven
Mt. Pleasant
New Bedford
Wareham
Buzzards Bay
Woods Hole
Hyannis
Yarmouth
Harwich
Chatham
Provincetown
Cape Cod
Pittsfield
North Adams
Adams
Hoosac Tunnel
Shelburne Falls
Turners Falls
Williamsburgh
Northampton
Easthampton
Chester
Huntington
Becket
Washington
Lee
Lenox
Stockbridge
Great Barrington
Canaan
Salisbury
Lakeville
Kent
Cornwall
Bridge
Housatonic
Canaan
Falls Village
Kent
Danbury
Bethel
Redding
Ridgefield
Wilton
Norwalk
New Canaan
Darien
Noroton
Stamford
Greenwich
Port Chester
New Rochelle
Mount Vernon
Harlem River
New York
Hudson River
Albany
State Line
Brookfield
Dunbarton

locomotives while they are in service. He receives them from the main repair shops, cares for them in the matter of running repairs until they need to be returned to the shop for general overhauling. He has nothing to do with the machine when it has passed the repair shop door, with one exception, until it emerges again for another period of service. But in this case he must see to it that engines are always ready and available for all of the services for which they may be required. This involves the usual multitude of details, of cleaning fires, sanding, water, wiping and light repairs. That the work may be properly done requires an organization as complete and as complex as that of the main organization of which it forms an important part. These organizations vary from point to point dependent upon the amount of traffic handled on the division as well as the character of that traffic, a condition that is clearly set forth in the divisional diagrams.

BOSTON DIVISION.

As the first example, take the master mechanics' organization of the Boston division. The territory covered is the smallest of any on the road, and the total mileage is but about 46, yet the train mileage is the greatest of any, and the rapidity of movement is very great. At the South Boston terminal, for instance, there are periods of the day when as many as ninety trains are received and despached in an hour. The division, too, is large enough to include much of the suburban work; that is the whole of the run, so that, in spite of the limited area where the most distant point is but 16 miles from the terminal, there are a number of roundhouses falling within the jurisdiction of the master mechanic in charge. There are two at South Boston and one each at Cohasset, Dedham, Glenwood avenue, Matteapan, Needham, Roxbury, South Braintree and Allerton. Of the lot those at Roxbury and South Boston are the most important. At Roxbury are the old shops of the Boston and Providence R. R. where moderately heavy repairs, classified as Nos. 4 and 5, to be explained later, are made. Here there is a general foreman reporting direct to the master mechanic and to whom, in turn, the foreman of the several departments of the shop and the roundhouse with the engine despatchers report. On the diagram it will be seen that there are four gang foremen taking orders from the foreman machinist. There are the erecting gangs, and they differ somewhat in their organization from those in the erecting shop at Readville as will be noted later. Each of these gangs is complete in itself. That is to say, it can and does do all of the work upon a locomotive instead of parceling it.

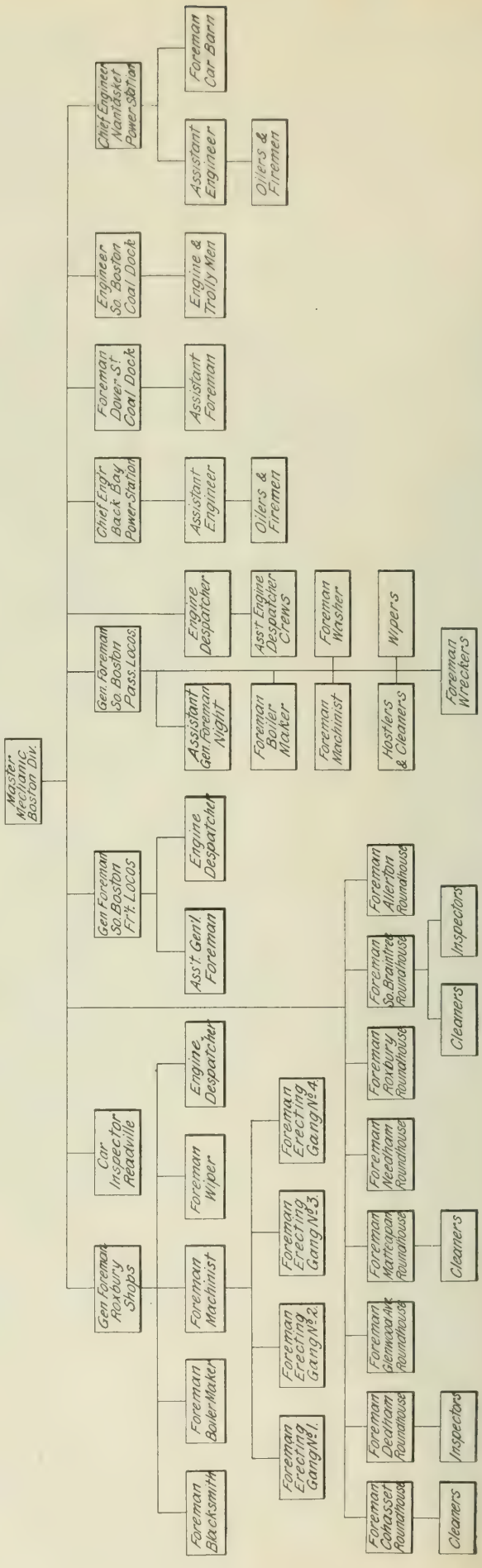
At the South Boston passenger roundhouse there is an assistant general foreman who is in charge of night work, to whom all subordinates are represented as reporting, but it will be understood that in his absence, during the day, all of these subordinates receive orders from and report direct to the general foreman.

At the South Boston freight roundhouse the same condition exists.

Then there are the smaller roundhouses scattered over the division, eight in number. The men in charge report direct to the master mechanic. At some of them there are wipers or inspectors or both, and in others merely a man in charge with a helper or two.

On the Boston division there are also some side issues outside the locomotive work in the shape of electric power houses at Back Bay and for the Nantasket Beach branch, as well as coal dock engines at South Boston and Dover street, the men in charge of all of which report direct to the master mechanic.

Finally, there are the foreman of car repairs and an inspector at Readville. The result is a far reaching organization, but one which is closely clustered about the head, who is thus kept in touch with the details of all work on the division and in personal contact with the men, in a way that



resembles that of the general organization of which it forms a part.

OLD COLONY DIVISION.*

The Boston division is, as we have seen, the terminal, the originating division as it were, delivering trains for breaking up and distribution to many points. Of the three receiving from and delivering trains to the Boston division, the Old Colony presents, perhaps, the greatest complications. It includes practically the whole of the original Old Colony R. R., comprising the network of roads spread over all of eastern Massachusetts, the Cape Cod territory. It is arbitrarily divided into two districts, numbered 1 and 2. No. 1 is formed of all roads lying to the eastward of a line drawn northward from New Bedford to Middleboro, and thence to Mayflower Park, including the road between the two latter points. To each of these districts a road foreman of engines is assigned.

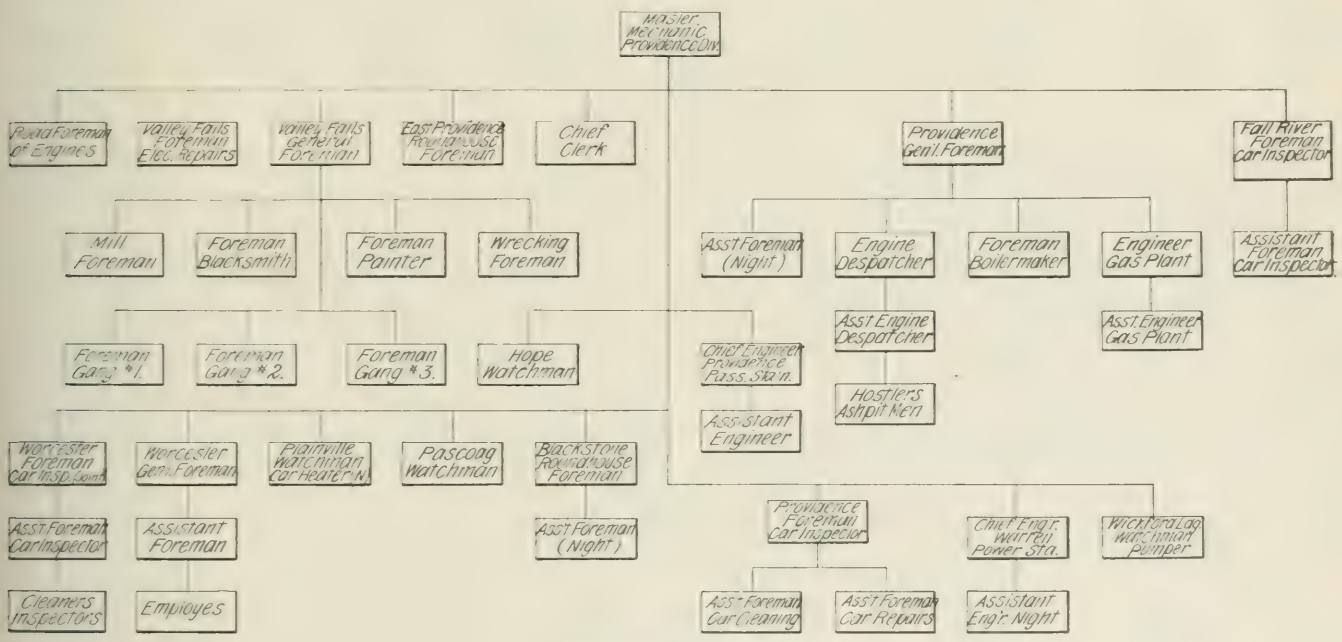
Now, while the division has a large mileage (about 460 miles) there are no large terminals and many of them are provided merely with a turntable and house where the locomotives can be sheltered for the night under the care of a watchman. For that reason, at the more distant points, these watchmen are placed under the orders of a foreman located at some other point nearby. For example, the foreman at Hyannis is in charge of the watchman at Provincetown, Chatham, Buzzards Bay and Woodshole, or the whole of the real Cape area. So the watchman at Fair Haven reports to the foreman at New Bedford, and the one at Marlboro to the foreman at So. Framingham. In looking over the diagram it will be seen that the force is meager and yet, with the exception of the cases cited, even the watchmen are next to the master mechanic.

The only shops on the division are at Taunton, and these are small. At Lowell there is no force at all. The one previously existing has been disbanded and all of the work on the New Haven locomotives is done, under agreement, by the Boston & Maine. At Taunton there is an arrangement by which all messages to the master mechanic from points on the dvision come through the general foreman, simply because he is always there and so acts as the representative of the master mechanic in the latter's absence.

PROVIDENCE DIVISION.

The Providence division has to provide for the heavy passenger work between New York and Boston, and is the connecting link between the Boston and Shore Line divisions. It covers a narrow strip of territory from New London to the limits of the Boston division. It is narrow and is cut by both the Old Colony and Midland dvisions which have lines passing through it. Here, owing to the density of the traffic the foremen at all points report direct to the master mechanic. There are two small shops on the division, one at Valley Falls and one at Providence. At Valley Falls all repairs are made on the electric passenger cars running on the Providence, Warren & Bristol branch between Providence & Fall River. The same thing is also done in the matter of the electrical repairs on the cars of the Nantasket Beach branch. In addition to this repairs are also made on the regular passenger and freight equipment. These electrical repairs are made under the personal supervision of the foreman of electrical repairs, who has under him a force of armature winders, machinists, inspectors and barn men.

At Providence there is a complete classification of the men employed and each checks in and out according to his work, whether machinist, boilermaker, helper, watchman or any one of the twenty-five or more classes into which the force is divided. In some of the smaller places only a night watch-



Providence Division.

man is on duty, and here, as in the case of other divisions where the wachman is under a distant foreman, the station agent at the point is called upon to check the time. It will be noticed, too, that there is one drawbridge engineer reporting to the master mechanic. In this respect the practice is not uniform throughout the whole length of the system. In some cases the drawbridge engineers report to the mechanical department and, in others, to the superintendents.

MIDLAND DIVISION.

The Midland division includes the territory east of the Connecticut river and west of that of the Providence division. It is a network covering nearby points with the division headquarters at East Hartford on the Connecticut river, where there are shops devoted chiefly to car repairs. The only comment needed as to its organization is to say that each gang works on all parts of the car and they are territorily separated because of local conditions.

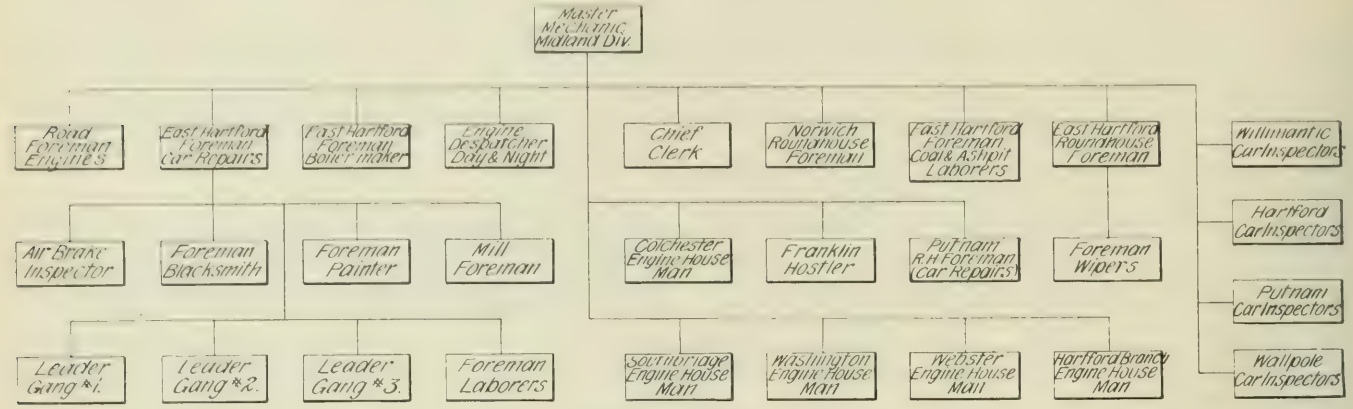
SHORE LINE DIVISION.

The arrangement of the Shore Line division more nearly coincides with that of a through line than any other division on the road with the exception of the New York. It comprises that portion of the main line between New York and

*See diagram, page 486.

Boston lying between Stamford and New London and New Haven and Springfield, together with the old Northampton division, with its extension northward to Shelburne Falls and Turner's Falls. The division headquarters are at New Haven, so that there are a number of distant outlying points that are small and which are, therefore, made subordinate to others that are larger. For example, at Westfield, Mass., there is a foreman of the engine house. North of Westfield there are the minor points of Holyoke, Northampton, Shelburne Falls and Turner's Falls. At each of these places there is an engine house watchman who reports to the foreman at Westfield.

The same holds true of the car inspector at Northampton, but the foreman car inspector at Shelburne Falls reports direct to the master mechanic. It will be seen, too, from the diagram, that all along the line there is usually an independence between foremen stationed at the same place, so that each is brought into direct contact with the master mechanic.



Midland Division.

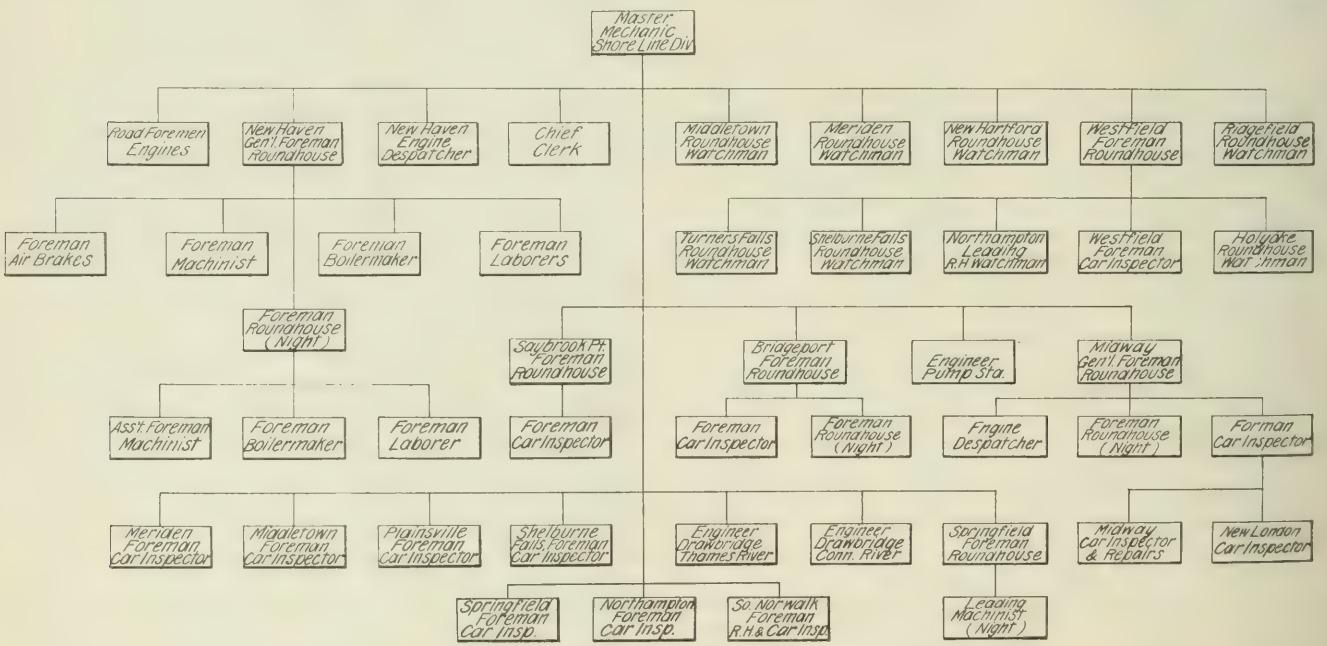
WESTERN DIVISION.

The Western division includes the territory lying to the west and north of the Shore Line division and east of the New York state line. This is also a network division, and, as will be seen from the diagram, there are a number of the smaller places where the hostler in charge of an engine house is made subordinate to a foreman at a neighboring place, while the car inspectors at the same point report direct to the master mechanic, as at State Line. In other respects the organization is identical with the other division. There are no shops other than those of the roundhouses for effecting running repairs.

It will be noticed that there is one floating watchman who apparently has no connection with the master mechanic. This man is located at Ridgefield, near Danbury, and though he is an employee of the Shore Line division, he reports to the foreman of the roundhouse at Danbury, which is on the western division. This is because of local conditions that make this the most convenient method of handling that point.

NEW YORK DIVISION.

The New York division being the simplest in its outline has also, naturally, the simplest organization. From the map it will be seen that it extends in a single line from the Grand Central station to Canaan, Conn., and from the Harlem river terminal to New Rochelle. At Stamford connection is made with the Shore Line division. There is a local passenger traffic between the Harlem river and New Rochelle that is operated with steam locomotives, and it is over this part of the division also that the through Boston-Washington trains are run. This branch is also used for all through freight trains, and large yards are maintained at Harlem river, Oak Point and Westchester. It is on the main line from the Grand Central station to Stamford that the regular through

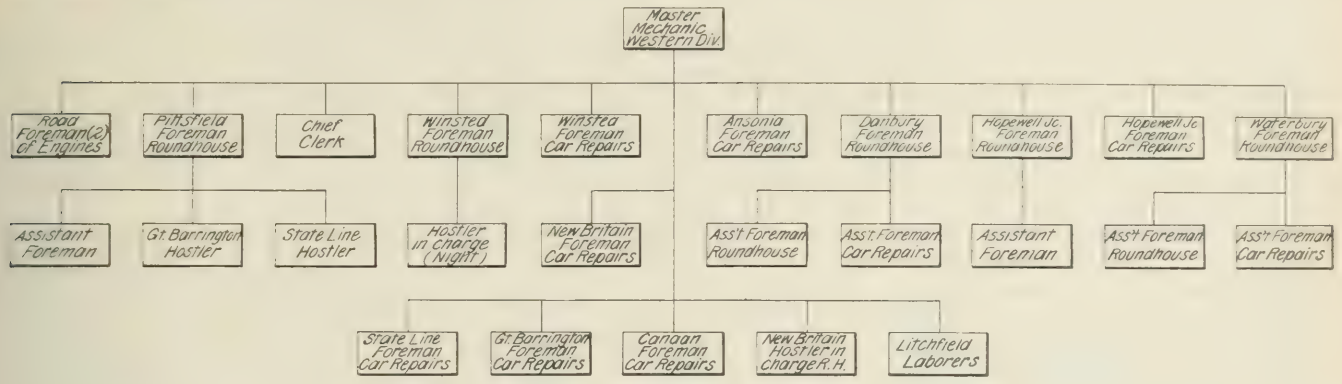


Shore Line Division.

and local passenger traffic is maintained and which is operated with electric locomotives. There are no shops of any magnitude about the roundhouses that are fitted for light running repairs. Of these, those at the Harlem river and New Rochelle alone have to do with steam locomotives. The combination, then, of a short direct line, only 55 miles long, accounts for the simplicity of the master mechanics' organization.

ROAD FOREMAN OF ENGINES.

In the organization of each master mechanic's division it is the road foreman of engines who stands next to the master mechanic himself. He has authority over the



Western Division.

general foreman of roundhouses in matters pertaining purely to the locomotive, but in nothing that has to do with the shop or its work. Yet neither of these men reports to the other. As has been repeatedly emphasized, these men, as well as others, work together in consultation and plans, and yet are quite independent.

MARINE EQUIPMENT.

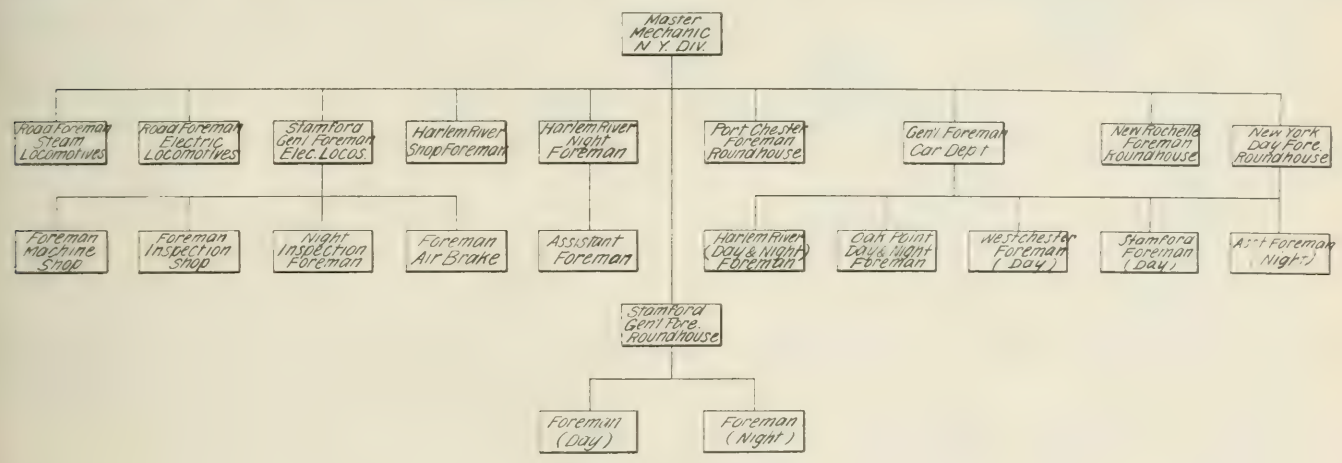
The mechanical superintendent has charge also of the marine equipment of the road in New York and Boston harbors. As it owns no dry docking facilities, the organization, like that of the New York division master mechanic, is very simple. There is a chief engineer of the marine district whose position corresponds with that of the master mechanic and who is responsible to the mechanical superintendent for the proper conduct of the department. He has reporting to him a surveyor and the several foremen noted on the diagram. The surveyor's work is that of examining into all damages to the equipment, as well as that done to it by, or by it to, foreign equipment, while that of the foreman is that of caring for and maintenance of the vessels.

ELECTRICAL SUPERINTENDENT.

Finally there is the electrical superintendent, with headquarters at Stamford, Conn. He has charge of all matters relating to the electrical equipment, and as such has a triple responsibility, as previously noted, namely, to the superintendent on traffic matters, the engineer of maintenance of way on track and overhead construction, and the mechanical superintendent as to things mechanical. In the electrical department he has a corps of men covering the whole field; signal engineer, electrical inspector, bridge supervisor, assistant roadmaster, emergency crews, patrolmen, workmen in the repair shops, such as armature winders, air-brake inspectors, switch and battery inspectors, helpers, etc. In this group the road foreman of electric locomotives should also be placed, as he reports on things electrical to the electrical superintendent and on mechanical matters to the master mechanic of the New York division. The roundhouses on the New York division are also shown in charge of the master mechanic, so that his organization, in so far as it relates to that of the mechanical department, is confined to that of the power house, which is shown on the diagram, and is essentially that belonging to any large plant.

FOREMEN.

In all this it will be seen that the master mechanics are very close to their foreman. This holds not only in the matter of reports, but as to physical location as well. In each instance the office of the master mechanic is located in the yard and close to the shops or roundhouse, so that he is in constant personal touch with the men under him at headquarters, while the telephone puts him in easy communication with those at a distance, a condition that has an important bearing on the efficiency.



New York Division.

SHOP ORGANIZATIONS.

Attention will now be directed to the shop organizations, of which there are two on the system, one at New Haven, Conn., and the other at Readville, Mass. The Readville shops form a large modern establishment and it is here that the heaviest work is done. The New Haven shops are older and

not well adapted to handle the heavy present day power, so that it is only the lighter character of general repairs that are done there. It follows, from this, that there are also minor differences in the organization at the two places, as indicated on the diagrams. Each is in charge of a shop superintendent, reporting direct to the mechanical superintendent, and without having any necessary relationship with each other.

The internal organization of the two shops differ slightly from each other, as indicated on the diagrams, and will be taken up in detail. At each shop there are the locomotive and car departments, each under its own general foreman, reporting direct to the superintendent of shops.

At Readville (see diagram page 486) after the grade of foreman has been passed there are a number of men classified as gang leaders. This is an old term that has been in use upon the road for many years, and is synonymous with that of "working foremen." These leaders have charge of certain branches of the work, and on them falls the assignment of its details to the men of the gangs with which they are working and of which they are the heads.

SUB-DEPARTMENTS.

The division of the shop into sub-departments is along the lines usually employed. There are the four main divisions of the erection, smith, boiler and machine shops, each with its independent organization, and coming together in the general foreman. In the case of the erecting shop there are the foreman and the engine inspector and below them are six gangs, numbered from one to six, each with its foreman, besides the foreman of tender repairs. Each of these six gangs performs certain specific duties in the erecting of the locomotive, and each works upon every locomotive passing through the shop. In this the organization differs from that of the Roxbury shop, where a gang is competent to do all the work required on a locomotive. This is possible at that place because of the light character of the repairs done, which do not go beyond Nos. 4 and 5. As shown on one of the shop report forms, the repairs are classified as follows:

No. 1. New boiler and general repairs to machinery, cost $3,500 or more.

No. 2. New firebox, flues and repairs to machinery, cost $1,500 to $3,500.

No. 3. Resetting flues and repairs to machinery, cost $500 to $1,500.

No. 4. Resetting flues, turning tires and slight repairs to machinery, cost $300 to $500.

T 6000 A

The New York, New Haven and Hartford Railroad Company.

DAILY REPORT OF BAD ORDER CARS ON HAND AND CARS REPAIRED

At _____ 19

CARS REPAIRED 24 HOURS ENDING 6 P. M. THIS DATE.

	CLASS 1		CLASS 2		CLASS 3		CLASS 4		CLASS 5		TOTAL	
	H	F	H	F	H	F	H	F	H	F	H	F
BOX	AB		BA		CA		DA		EA		GA	
COAL	AC		BC		CB		DB		EB		GB	
FLAT	AD		BD		CD		DC		EC		GC	
BALLAST	AF		BF		CF		DF		ED		GD	
REFRIGERATOR	AG		BG		CG		DG		EG		GE	
CABOOSE	AH		BH		CH		DH		EH		GH	
TOTAL	AX		BX		CX		DX		EX		GX	

CARS ON HAND AT 6 P. M. THIS DATE.

	CLASS 1		CLASS 2		CLASS 3		CLASS 4		CLASS 5		TOTAL	
	H	F	H	F	H	F	H	F	H	F	H	F
BOX	HA		JA		KA		MA		NA		OA	
COAL	HB		JB		KB		MB		NB		OB	
FLAT	HC		JC		KC		MC		NC		OC	
BALLAST	HD		JD		KD		MD		ND		OD	
REFRIGERATOR	HF		JF		KF		MF		NF		OF	
CABOOSE	HG		JG		KG		MG		NG		OG	
TOTAL	HX		JX		KX		MX		NX		OX	

CLASSIFICATION OF FREIGHT CAR REPAIRS.

1. Includes the rebuilding of car, such as trucks repaired or rebuilt, underframing renewed or straightened and superstructure renewed.
2. Includes renewal of one or more longitudinal sills, end sills and draft timbers in conjunction with renewal of longitudinal sills, new roof in conjunction with above work and other repairs to car body or trucks. When requiring more than 36 hours and less than 72 hours labor to repair.
3. Includes either splicing of longitudinal sills, renewal of end sills, renewal of roof in conjunction with other repairs to car body and trucks. When requiring more than 20 and less than 36 hours labor to repair.
4. Includes renewal of end sills or draft timbers or body bolsters in conjunction with light repairs to roof, floor or car body and trucks. When requiring more than 10 hours and less than 20 hours labor to repair.
5. Includes the application of wheels, couplers, doors, brake rigging and other light repairs to cars. When requiring more than one hour and less than 10 hours labor to repair.
6. Includes running repairs or such repairs as can be made in yards without shifting to repair tracks.

NOTE. No. 6 Repairs not to be reported as bad order cars on hand.

Daily Report of Bad Order Cars on Hand and Repaired.

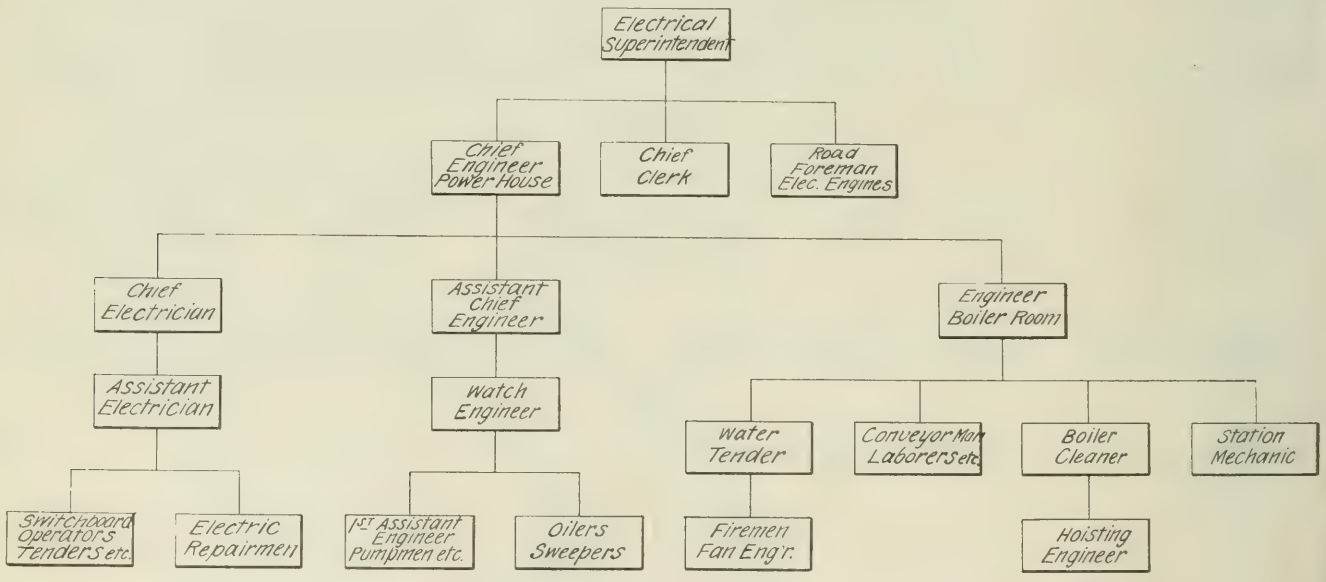
No. 5. Slight repairs to machinery such as facing valves, turning journals, etc., cost $75 to $300.

At Roxbury the repairs are limited to Nos. 4 and 5, though they occasionally creep into the No. 3. It is evident then that there must be a different organization of the erecting gangs at Readville, where the heavy repairs are made. The six gangs in the erecting shop are each given a special line of work, which is classified as follows:

ERECTING SHOP GANGS.

Gang No. 1 handles the steam and dry pipes, the boiler fronts, hand-railing, sand boxes, headlights, ashpans and grates and attends to all grinding. This last item includes the steam pipes, throttle valves and all similar joints.

Gang No. 2 has the cylinders and frames. Its work in-



Electrical Superintendent's Organization.

cludes the back cylinder heads, foot plates, frame braces and pads.

Gang No. 3 cares for the shoes, wedges and binders, the trucks, buffer beams, pilots and arch braces.

Gang No. 4 does all work on the valve motion and steam chests, handling everything from the eccentric or eccentric crank to the valve. This includes the rods, guides, crosshead and pistons with the front cylinder head.

Gang No. 5 is a stripping gang that does all of the wheeling and unwheeling.

Gang No. 6 is a cab gang, and is charged with removal and application of all boiler fittings, the safety valves, whistle, bell, injector, gages, stack and brake rigging.

Hence each gang works on every locomotive passing through the shop.

The blacksmith shop organization is exceedingly simple and is shown on the diagram. There are merely two divisions, the forge and frog shop, each under its own assistant foreman.

In the boiler shop a similar statement holds, there being, however, two parallel erecting gangs, each of whom has the care of 15 pits.

In the machine shop there are two assistant foremen to each of whom special duties are assigned. Assistant foreman No. 1 has charge of all work on the air-brakes, injectors, brass and bolts. No. 2 looks after ricker boxes, steam chests and valve motion. Below them are a tool-room foreman and leaders of wheel, piston, rod, brass, bolt, motion work and air-brake repair gangs.

Then there are the foremen of the minor departments, such as carpenter, painter, copper, pipe and tinsmith, laborers and watchmen, each reporting direct to and receiving orders from the general foreman.

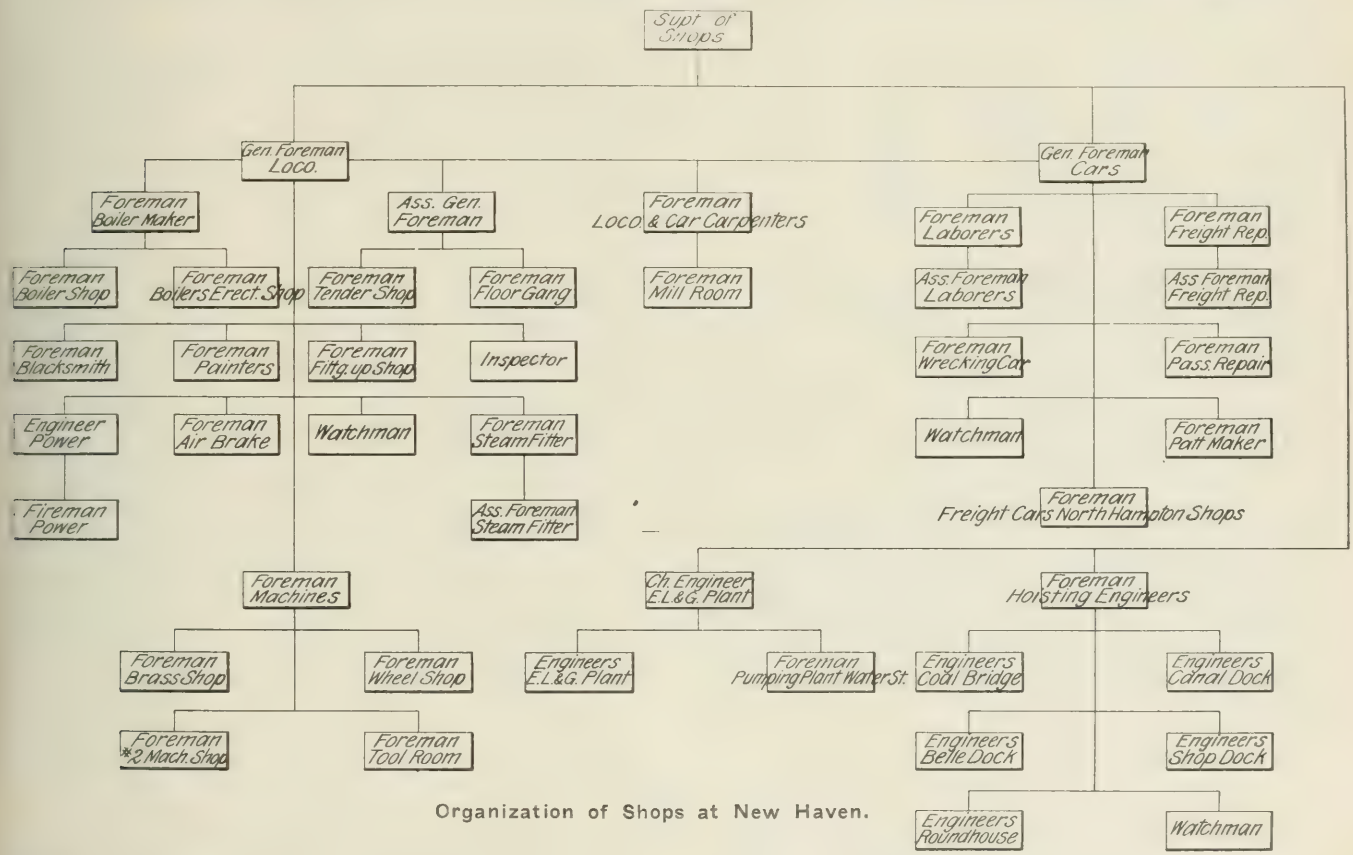
The shop demonstrator, also reporting to the general foreman, has general oversight of the apprentices and demonstrates the methods to be used to a workman who is to be trained in a special line of work.

CAR DEPARTMENT.

In the car department there is a division of the work into two parts: that relating to passenger and that relating to freight car repairs. A reference to the diagram here will show that the gang leader is very much in evidence and that in comparison with the number of sub-divisions of the work the foremen are few in number, their places being filled by the gang leaders, of whom there are many in the sub-divisions of the labor that is used. None of these leaders, however, reports direct to the general foreman, but they always reach him, in the routine execution of the work, through a foreman or assistant foreman who is in direct charge of the department.

Regular weekly meetings are held of the foremen of the shops at which the condition of the work and the needs of the several departments are discussed, and arrangements are made for taking care of future requirements. In this way the foremen are kept in touch each with the other's work, and can plan his own accordingly, so that the locomotives or cars can be turned out at the time specified.

At the New Haven shops the organization is smaller, but on the same general plan as at Readville, except that there are no leaders or working gang foremen. The foremen and assistant foremen have taken their places. These shops also include within the jurisdiction of the shop superintendent the hoisting engines and other machinery belonging to the docks and the electric lighting and gas plants. As at Readville, there is a general foreman of the locomotive and car departments, respectively, to whom the several sub-foremen report. Some of the latter have assistants. Besides the shop forces there are the electric and gas plants and the hoisting engineers, each with its own distinct organization and each reporting direct to the shop superintendent.



Organization of Shops at New Haven.

Having thus outlined the organization in its detail,

By following the lines of the diagram it will be seen that the general foremen are very close to the work and that the shop superintendents are in touch with every department, thus adhering to the main feature of the general organization of putting the man in charge in contact with the men and the details beneath him, without hampering and burdening him with a personal attention to them.

attention is now directed to the methods of its working.

LOCOMOTIVES.

The care and maintenance of the locomotives is, of course, the principal reason for its existence, and it is the efficiency in this direction that will show its strength or weakness. A railway differs from a manufacturing establishment in that it has no orders ahead. It knows nothing of future deliveries, but takes its traffic as it comes from day to day, depending upon the average to keep it in motion. As its business is but a day-to-day affair it is quite necessary that its officers should, at all times, know the exact condition of the rolling stock

Readville Shops, Jan. 18, 1910.

Mr. G. W. Wildin,
Mechanical Superintendent.

Engines in shop for repairs, awaiting repairs, etc:

Engines.	Class.	Division.	Date in Yard.	Date in Shop.	Class Rprs.	To be Out.
243	P 2	West.	1-2	1-4	3	1-28
335	K 1 B	West.	1-8	1-11	3	2-3
342	K 1 B	West.	1-7	1-7	3	1-31
762	N 3 B	Prov.	11-12	12-21	3	1-15
967	G 3	Prov.	12-21	12-24	3	1-15
1845	D-8	Prov.	12-13	12-27	3	1-17

Above engines being broken in

Engines in yard awaiting repairs:

Received.	Engines.	Class.	Division.	Repairs.
Jan. 10.....	704	N 1	Prov.	3
Jan. 4.....	730	N 2	Mid.	3
Dec. 31.....	761	N 3 B	Prov.	3
Oct 1.....	767	N-3-B	Mid.	3
Jan. 5.....	972	G 2-C	Prov.	3
Jan. 10.....	1,532	G-3-C	Bn.	3
Jan. 10.....	1,546	G 3-C	Bn.	3
Jan. 10.....	1,644	C-1-A	Bn.	3
Jan. 8.....	1,690	C-2	Prov.	3
Jan. 5.....	1,856	D 9	Bn.	3
	10			

Engines in yard awaiting disposition (None).
Engines in yard condemned, but not removed (None).
Engines in foreign shops (None).

Engines Ordered.	Class.	Division.	Repairs.	Forwarded.
..				
..				
..				
..				
..				
..				
5				

Supt. of Shops.

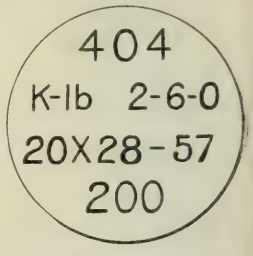
Daily Telegraphic Engine Report from Shops.

by which the business is to be handled. That the mechanical superintendent may have that information, so as to be prepared for instant action in case of an emergency as well as be able to plan ahead for future conditions a series of reports are rendered whose purpose is to keep him posted as to these essential details.

The first point upon which he must have information is the condition of the locomotives. This covers both the main shops and the roundhouses, and from each telegraphic reports are received every morning showing the numbers of locomotives and the kind of repairs that are being made. From the New Haven and Readville shops he receives a report like that shown in the blank of the Daily Telegraphic Engine report from shops. This report, which, from Readville, shows between 35 and 40 engines in the shop, with from 10 to 15 waiting entrance, is sent in duplicate to the general superintendent, the general boiler inspector, the engine despatcher at New Haven, the superintendent at Boston and to all of the division master mechanics. In addition to this a similar report "X-1" (see page 485) is received from each roundhouse where running repairs are made, so that, with the two, there is complete detailed information at hand regarding every engine on the road. These two reports are considered of the first importance and are scanned before anything else is done in the morning.

Of next importance is the report also received early in the morning giving a Statement of Engine Failures for the preceding 24 hours for each division. This is sent to the general manager, general superintendent and mechanical superintendent, and if the same engine is reported more than once for a specific failure steps are immediately taken to remedy the defect.

In addition to these reports of engines scheduled for repairs, and the failures of those in service, there is kept in the mechanical superintendent's office a complete record of the probable condition and location of every locomotive on the road. The tangible record is in the form of a large board, divided as shown in the engraving and containing a wooden plug for each engine on the system. The head of the plug shows the number and classification of the locomotive, both by the road's and the Whyte nomenclature, the size of the cylinders, the diameter of the driving wheels and the steam pressure carried. An example of the markings on one such plug is shown in an engraving. In this case it is engine 404, of the K-1b road classification; or a 2-6-0 of the Whyte nomenclature, with cylinders 20 in. in diameter and 28 in. piston stroke; the driving wheels are 63 in. in diameter and the steam pressure 200 lbs.



Pin for Locomotive Record Board.

REPORTS AND RECORDS.

The board is divided by vertical lines to correspond to the divisions, which, it will be seen, include the sub-divisions of

T 559

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY

STATEMENT OF ENGINE FAILURES.

TO { Vice President / General Manager / General Sup't. / Mechanical Sup't.

*A*_____ *DIVISION.*

*B*_____ *19* __

Following is report of Engine Failures and Causes for 24 Hours ending midnight.

Office to or from	Sender	Receiver	Time Transmitted M	Time Filed M

Engine C	Train D	Engineer E	TIME AT TERMINALS BEFORE STARTING Hrs. F	Min. G	Place H	Hour Left Terminal J	FAILURE REPORTED Time K	Place N	TIME LOST Hrs. Q	Mins. R	Miles Made U	CAUSE OF FAILURE V	REMARKS W

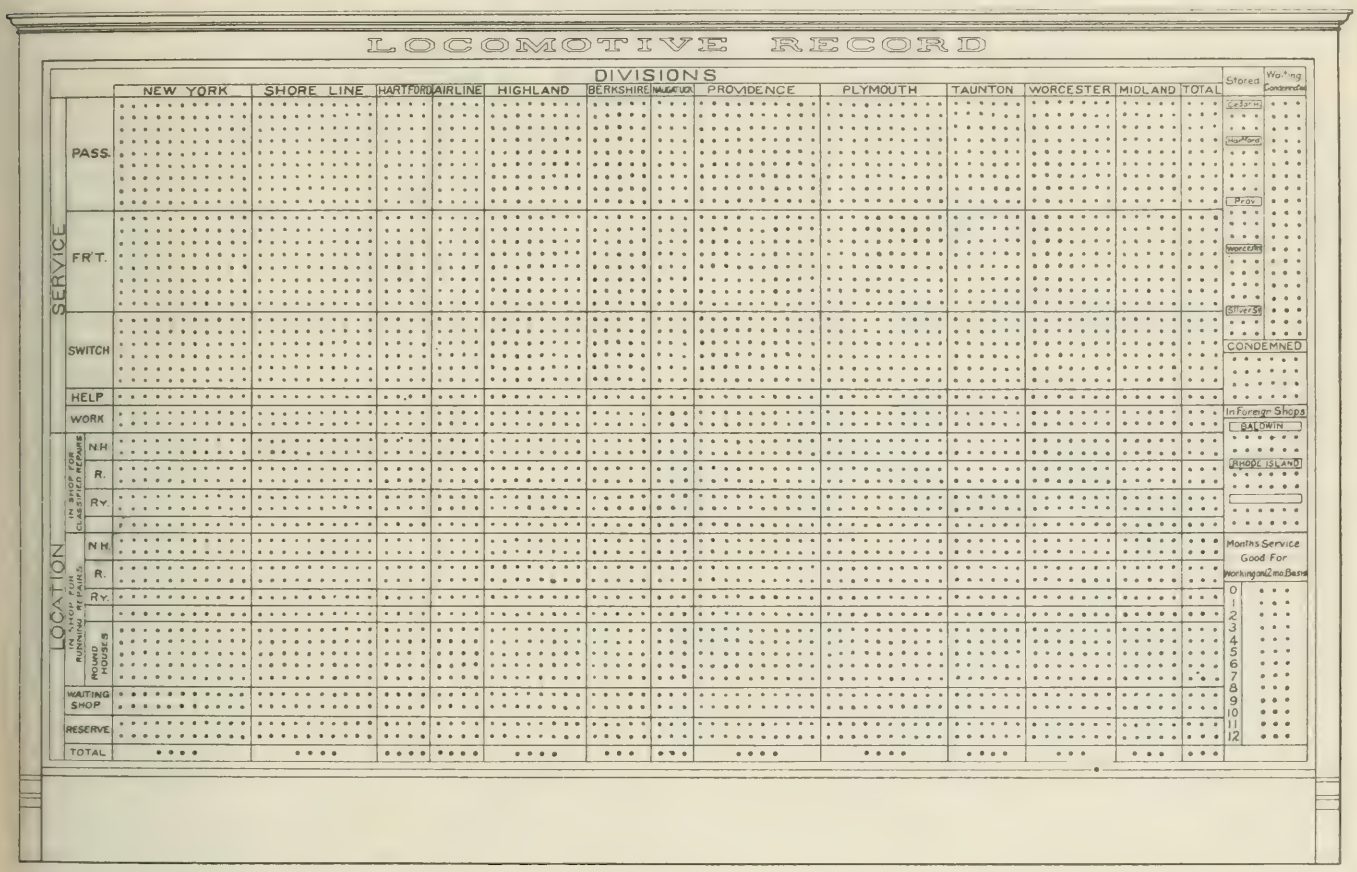
Remarks:_____

Daily Report of Engine Failures.

the territory covered by the jurisdiction of the master mechanics, and whose width depends upon the traffic that must be cared for. The upper half of the board is for engines in service and is divided by horizontal lines to separate the various classifications of passenger, freight, switching, helper and work. The lower half is devoted to the shops and here are indicated those engines in the shops at New Haven, Readville and Roxbury for classified and running repairs, respectively, the latter including the roundhouses. Then at the bottom are those held in reserve and waiting their turn to enter the shop, with a total of the engines assigned to each division at the bottom. At the right are holes for the plugs of stored and wornout engines, as well as those condemned. And finally in the lower right-hand corner is a space reserved for plugs carrying numerals showing the number of engines

The mechanical superintendent thus has constantly before him a record showing the location and approximate condition of every locomotive on the system, and it is from this record that the engines are sent to the shop. The master mechanics merely report on condition and the mechanical superintendent personally orders to the shop, specifying to which it shall be sent. On arrival at the shop the engines ordinarily enter in the order of their reception, but with the understanding that this rule is to be varied so as to give preference to the heavy power.

Then, too, in the making of repairs, the aim is to send the engines out well balanced for 12 months of service. For example, if it is found that the tubes might be good for six months, they are not sent out in that condition, but are renewed on the basis that it is better to incur a small extra



Locomotive Record Board in Mechanical Superintendent's Office.

that are good for the several months of service up to 12. And this refers back to the general system of shaping engines in use on the road.

When an engine is turned out after having received the No. 1, 2 or 3 classification of general repairs, it is considered to be good for 12 months of service. Its plug is put in the proper place on the board, and on its stem are two cards. These are 1⅜ in. square and the front one is red, with a white strip across the top for special notations. Where flues have been put in the red card is used. Otherwise a white one. This outside card has the lower right-hand corner clipped off showing a corresponding portion of the back card. On this corner a number is stamped corresponding to the number of months of service that should be expected from the engine. When it leaves the shop the number 12 is shown. This is changed each month, until but one month of service apparently remains before the engine must be sent in for general repairs. The locomotive is then carefully inspected in order to ascertain whether or no this time can be lengthened. If it can and it is estimated that two or three more months of service can be obtained, the card is changed.

expense at the time rather than lose the service of the engine later for flue work only.

The roundhouse repairs, too, are of the character to relieve the main shops of much extra work. For this purpose many of the houses are equipped with wheeling pits so that driving boxes can be refitted without sending the engine away. It frequently happens that two or three months' extra service can thus be obtained.

All of this information is tabulated and arranged on the basis of the daily reports that have been noted.

The passenger and freight car situation is also telegraphed in every morning from the several shops and repair yards on the forms shown. This keeps the mechanical superintendent posted as to conditions and enables him to take whatever measures may seem necessary in order to avoid congestion.

Finally, there is a daily report known as the X-4, which shows the cars on hand and the engine situation at five in the morning. This is filled out in the superintendent's office from telegraphic reports and serves as a record. Under ordinary conditions this report is only used for reference, but the moment there is danger of a shortage of power or a conges-

tion at any point it becomes of great value as a means of straightening out the situation.

The monthly reports cover the condition of the engines as well as comparisons between present and past conditions One form gives a resumé of the engines on each division and should check with the general indications of the locomotive record board in the office of the mechanical superintendent. It shows the dates of leaving the shop and of testing the boiler and staybolts; the condition of the boiler, firebox, flues, tires, machinery and the machine as a whole. To this is added a statement of the probable date of general repairs and their classification.

Readville Shops.....

Mr. G. W. Wildin,
Mechanical Superintendent,
New Haven, Conn.

Dear Sir:

Following is report of passenger cars received at shop and awaiting shop, for this date:

Received To-day.	Awaiting Shop.	In Shop.
Minor Rps.....	Minor Rps.....	Minor Rps.....
General.....	General.....	General.....

Total shop cars on hand to-day.....
Cars for running repairs received to-day.....
Cars for running repairs awaiting shop.....
Cars for running repairs in shop.....
Total .....

Yours truly,

G. DONOHUE,
Supt. of Shops.

Daily Report of Passenger Cars Awaiting Repairs.

THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD CO.
Office of Mechanical Superintendent.
Condition of Locomotives, month ended.....1910.

		Good.	Fair.	Bad.
Boilers	This Month Last Month Year Ago			
Firebox	This Month Last Month Year Ago			
Flues	This Month Last Month Year Ago			
Tires	This Month Last Month Year Ago			
Machinery	This Month Last Month Year Ago			
General	This Month Last Month Year Ago			

Monthly Report of Condition of Engines.

The monthly reports cover the condition of the engines as well as comparisons between present and past conditions One form gives a resumé of the engines on each division and should check with the general indications of the locomotive record board in the office of the mechanical superintendent. It shows the dates of leaving the shop and of testing the boiler and staybolts; the condition of the boiler, firebox, flues, tires, machinery and the machine as a whole. To this is added a statement of the probable date of general repairs and their classification.

ENGINE FAILURES.

Close track is also kept of all engine failures and their causes. Two reports bearing on this subject are made each month. In one the cause is specified in a general way as due to heating, steaming, leakages, breakages, etc., and is made on the form M. 199. The other enters into the matter in great detail, covering nearly every part of the engine and by divisions. This last form is the one that served as a model for that specified for use on New York railways by the public service commission. In the first especial emphasis is put upon the indication of the engine-house from which the locomotive started on the trip on which it failed and the foreman is held responsible and required to explain why he allowed it to go out in a condition where failure was apt to occur. The idea is to inculcate into the men the spirit of loyalty and team work. That it is the good of the whole road they are working for and not that of their own division alone. So

M 199

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

Engine Failures for the Month of_____19____ _____Division

INSTRUCTIONS:—Make each entry in the form of a fraction, the numerator showing character of failure—1, Heating; 2, Steam; 3, Leaking; 4, Broken; 5, Other. When Engines are out of service, indicate by "X" The denominator showing the engine house from which the engine started. Use red ink for failure in Passenger Service.

ENGINE	DATE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total this Month	Total last Month
TOTAL																																	
Total last month																																	
Total this month last year																																	

SIGNED BY_____

Monthly Report of Engine Failures.

FORM T 56v

The New York, New Haven and Hartford Railroad Company.

Daily Report of Bad Order Cars on hand and Cars Repaired_____19___, _____Division.

	KIND	STATIONS	H	F	H	F	H	F	H	F	H	F	H	F	H	F	H	F	H	F	H	F	H	F	H	F	H	F	H	F	TOTAL H	TOTAL F
CLASS I	BOX	AB																														
	COAL	AC																														
	FLAT	AD																														
	BALLAST	AF																														
	REFRIGERATOR	AG																														
	CABOOSE	AH																														
	TOTAL	AX																														

Daily Report of Bad Order Cars and Cars Repaired.

This form is made large enough to include cars repaired 24 hours ending 6 p. m., and cars on hand at 6 p. m. This includes under each heading the five classifications of repairs as well as the several types of cars, namely: Box, coal, flat, ballast, refrigerator and caboose, as well a totals. The report is made to cover each repair yard on each division.

Form M 173

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

MONTHLY REPORT OF CONDITION OF LOCOMOTIVES.

_____ *Division, Month of* _____ *190*____

ENG NO.	LOCOMOTIVES IN SERVICE.										REPAIRS.		REMARKS
	DATE LEFT SHOP RECEIVING CLASS 1 TO 4 REP.	DATE BOILER LAST TESTED	DATE STAY BOLTS LAST TESTED	CONDITION OF							MONTH WILL PROB. NEED REPAIRS	CLASS REPRS. THEN NEEDED	
				BOILER	FIRE BOX	FLUES	TIRES		MACH. GENL	LOCO. GENL.			
							WEAR IN 32's	THICK-NESS					

SUMMARY { No. in Good Cond / " " Fair / " " Bad "

NOTES CONDITION—G, denotes in good condition; F, in fair condition; B, in bad condition. Summary should be made on last sheet only and cover all locomotives reported.

To determine whether an engine should be shown as in Good, Fair or Bad Condition, the following rules must be followed.
If engine requires nothing heavier than No. 5 repairs, condition must be shown as GOOD.
If No. 4 repairs are needed within 30 days, condition must be shown as FAIR.
Engines needing heavier than No. 4 repairs must be shown as in BAD condition.
All locomotives on the Division must be reported whether assigned to the Division or not.
This report must be forwarded to the General Master Mechanic on the 24th day of each month, and MUST BE SIGNED PERSONALLY BY THE MASTER MECHANIC.

CORRECT_____
Master Mechanic.

Monthly Report of Locomotive Condition.

A 403

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

COMPARATIVE PAY ROLL STATEMENT

AND ENGINES TURNED AT_____ ROUND HOUSE WEEK ENDING_____

EMPLOYEES OF EACH CLASS	THIS WEEK		LAST WEEK		THIS WEEK LAST YEAR		
	No. Men	Amount	No. Men	Amount	No. Men	Amount	
Air Brake Inspector							
Air Brake Repairers							
Yard Switchmen							
Total Pay Rolls							
DISTRIBUTION OF EXPENSES							
1. Steam Locomotives—Repairs							
2. Electric Locomotives—Repairs							
3. Other Maintenance Charges							
4. Total Maintenance Equipment							
5. Engine House Expenses—Yard							
6. Engine House Expenses—Road							
7. Other Transportation Expenses							
8. Total Transportation Expenses							
9. All Other Expenses							
10. Total Pay Roll (same as above)							
NUMBER OF ENGINES TURNED							
Freight							
Passenger							
Switch							
Total							
Average Cost per Engine Turned							
Repairs—Item 4							
Transportation—Item 8							
Total Cost per Engine							

NOTE 1.—A locomotive will be considered as turned when it leaves the turntable, coal track or water plug for its train, or the yard, or transfers light to some other point on the line.

NOTE 2.—Number of employees shown should be based on the total hours worked by that class of labor, divided by nine or the working hours of the roundhouse for any particular class of labor, so as to get number of employees working full time.

Weekly Report of Cost of Engine Turning.

Includes also the following employees:

Air-brake repairers' helpers
Ashpit men
Blacksmiths
Blacksmiths' helpers
Boilermakers
Boilermakers' helpers
Boiler washers
Brakemen
Clerks
Carpenters
Carpenters' helpers
Callers
Engine checkers
Engine despatchers
Engine-house men
Engine inspectors
Engine preparers
Front-end inspectors
Flue cleaners
Fire cleaners
Foremen
Fuel handlers
Hostlers
Headlight men
Hoisting engineers
Handy men
Laborers
Locomotive crane operators
Machinists
Machinists' helpers
Oilers
Painters
Painters' helpers
Pipers
Pipers' helpers
Pumpers
Stationary engineers
Stationary firemen
Steam-heat men
Sparkers
Sand dryers
Tinsmiths
Tinsmiths' helpers
Telegraph operators
Tool checkers
Tank repairers
Tool-room men
Turntable men
Water tenders
Wipers
Watchmen

T 364 A
"X-4 REPORT"

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

Report of cars on hand and engine situation at 5.00 A. M. Operation report for the 24 hours ending midnight, _____ 19

WESTBOUND

	ENGINES				RECEIVED				FORWARDED				CARS ON HAND				DIVISION	TERMINAL		CARS ON HAND				FORWARDED				RECEIVED				ENGINES				SWITCHING SERVICE			Weather	
	Boarded	Ready for Service	In Sight to Turn	In for Light Repairs	Trains	Loaded	Empty	Total	Trains	Loaded	Empty	Total	Through Loads	Local Loads	Empty	Total				Through Loads	Local Loads	Empty	Total	Trains	Loaded	Empty	Total	Trains	Loaded	Empty	Total	Boarded	Ready for Service	In Sight to Turn	In for Light Repairs	Engines in Use	No. of Shifts	No. of Crew Fitness		
	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RM	RN	RO	RP	RS				A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	Q	R	S	U		
DA																		Midway																					
DB																	DA	Shore Line Div.	DA																				DA
DC																	DB	Providence Div	DB																				DB
DD																	DC	Midland Div.	DC																				DC
																	DD	Total	DD																				DD
DE																		Providence																					
DF																	DE	Shore Line Div. 1st Dist.	DE																				DE
DG																	DF	" " " 2nd Dist.	DF																				DF
DH																	DG	Midland Div. 3rd Dist.	DG																				DG
DI																	DH	Old Colony Division	DH																				DH
																	DI	Total	DI																				DI
DJ																		Worcester																					
DK																	DJ	Providence Division	DJ																				DJ
DL																	DK	Midland Division	DK																				DK
DM																	DL	Boston & Maine R. R.	DL																				DL
DN																	DM	Boston & Albany R. R.	DM																				DM
																	DN	Total	DN																				DN

Providence Div.

"BS" BOAT SERVICE. Days Worked.

STEAMERS		No.	Days	Hours	Mins.
		A	B	C	D
Maryland	WA				
Express	WB				
Company Tugs	WC				
Outside Tugs	WD				
Total	WE				

"BM" BOAT MOVEMENTS To and From Connections

		No. of Steamers	Loaded Short of Capacity East	Loaded Short of Capacity West	No. of Floats	Loaded Short of Capacity East	Loaded Short of Capacity West	Delayed at Foreign Bridges Hours	Delayed at Foreign Bridges Mins.
		A	B	C	D	E	F	G	H
Penna. R. R.	WF								
L. V. R. R.	WG								
C. R. R. of N. J.	WH								
L. I. R. R.	WJ								
Total	WJ								

"MS" HARLEM RIVER. Misc. Cars

Classified Cars, East	SA	Shop Cars	SG
Unclassified Cars, East	SB	Transfer Cars	SH
Total	SC	Cars Transferred	SI
Classified Cars, West	SD	Transfer Cars Left Over	SJ
Unclassified Cars, West	SE	Company Coal	SK
Total	SF	Other Co. Freight	SM

"HG" HARLEM RIVER. Hold Grain

LOCATION		On Hand	Forwarded	Delivered Last
		A	B	C
Harlem River	SN			
Oak Point	SO			
Westchester	SP			
Total	SQ			

"OG" HOPEWELL. Hold Grain

On Hand	Forwarded	Grades Last
A	B	C

* FLOATS AND STEAMERS

This report must be prepared and forwarded promptly to the Division Offices and to the General Office, "NH" so that it will reach the latter office not later than 7.00 A. M. The signals "X-3" and "X-4" will have preference over all signals excepting "Train Order Signal, "95" and "97."

Cars on Hand and Engine Situation at 5 a. m.

The points listed under Division Terminal on this form include also five points in the East Providence district, and a total of 25 points in the Mansfield, Taunton, Middleboro, South Framingham, South Boston, East Hartford, Willimantic and Putnam districts, omitted here.

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY

DETENTION TO TRAINS DUE TO ELECTRIC LOCOMOTIVE FAILURES DURING MONTH OF _____ 19

| DIVISIONS | HEATING | | | | | BROKEN | | | | | | | | | | | | | | | | | | |

that if an engine is received in one division roundhouse that belongs in another, and repairs are found to be necessary for satisfactory operation, they are to be made then and there regardless of who may be responsible for the general maintenance of the machine.

In connection with the reports on engine failures there are two (Forms T. 418 and M. 145) that must be filled out by each crew working a train that is delayed and sent to the master mechanic of the division on which is occurs. Form T. 416 must be signed by both the conductor and engineer, so that they thus express an agreement as to the cause. Form M. 145 must be made out by the engineer, and in it he reports on the detail of the mechanical defects only that were the cause of the failure.

M 124. THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

REPORT OF INTERIOR EXAMINATION AND REPAIRS TO BOILERS

ENG No _____ SHOP _____ DATE _____ 190

No.	PARTS EXAMINED	CONDITION FOUND	REPAIRS MADE
1	WHEN BOILER WAS BUILT		
2	BUILDER		
3	BACK HEAD		
4	R. SIDE SHEET		
5	L. SIDE SHEET		
6	THROAT SHEET		
7	ROOF SHEET		
8	DOME		
9	CONNECTION OR GUSSET SHEET		
10	BARREL OF BOILER		
11	SMOKE BOX		
12	EX. FRONT		
13	FIRE BOX NEW OR OLD		
14	DOOR SHEET		
15	R. SIDE SHEET		
16	L. SIDE SHEET		
17	FLUE SHEET		
18	CROWN SHEET		
19	STAY BOLTS		
20	MUD RING		
21	FRONT FLUE SHEET		
22	FRONT FLUE SHEET BRACE		
23	BACK HEAD BRACE		
24	CROW BAR BRACE		
25	DOME BRACE		
26	CROSS BRACE		
27	SLING STAYS		
28	CROW FEET OR TEES		
29	RIVET SEAMS		
30	NO. OF FLUES IN BOILER		
31	LENGTH OF FLUES		
32	NO. RESET		
33	NEW OR PIECED		
34	GRATES PAT NOS.		
35	GRATES BAR PAT NOS. R. & L.		
36	ASH PAN		
37	TENDER TOP		
38	TENDER BOTTOM		
39	R. SIDE		
40	L. SIDE		
41	BACK		
42	COPING		
43	COAL SPACE R. & L. SIDE		
44	THROAT SHEET		
45	FRONT END R. & L.		

Boiler Washed _____ *Date* _____ *190* *Signed* _____ *Inspector*
Boiler Tested _____ *Lbs* *Date* _____ *190* *Signed* _____ *Foreman*
Steam Pressure Allowed _____ *Lbs* *Correct* _____ *M. M.*

Report of Individual Boiler Inspection.

TURNING ENGINES.

Finally, there are weekly reports from each roundhouse showing the cost of turning engines at that point. This is a

NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY.
Office of Mechanical Superintendent.
Engines in service week ending 190

Division	Class of repairs required 1	2	3	4	Total Requiring Repairs	Total in Service
New York						
Shore Line						
Western						
Midland						
Providence						
Old Colony						
Boston						
Total						
Total last week						

Weekly Report of Engines in Service.

T 558

"X-I REPORT"

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

_____ Shops. _____ 19

To _____

_____

ENGINES IN SHOP FOR REPAIRS

Engine No.	Date Received at Shop	When to be Ready for Service	NATURE OF REPAIRS
(A)	(B)	(C)	(D)

(E) _____
Master Mechanic.

Roundhouse Repairs.

M 145

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

Detention Report Division
Date of Report Date of Failure 19
Train No. Engine No.

Detained at	Hour	Min.	Cause of Detention

For additional space, use other side.

Engineman Fireman

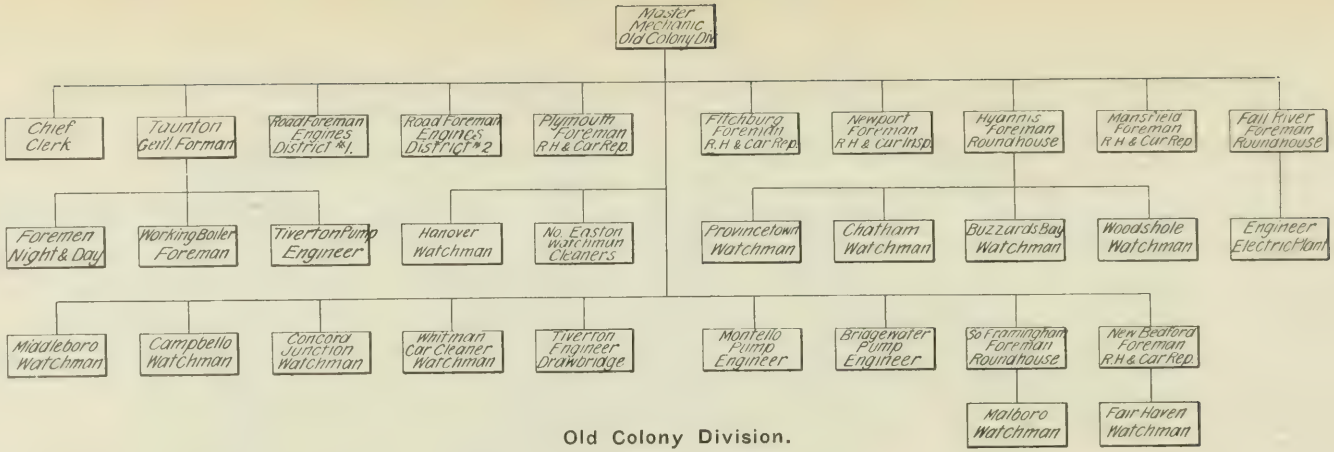
Enginemen will fill out this report at the end of each trip, giving cause and full particulars of all mechanical failures; depositing same in a box provided for the purpose.

M 144.
Loco. No.....
.....19.....
Station Date
Boiler Tested.....19.....
Sta. Date
Lagging removed.....19.....
Sta. Date
Stay bolts tested.....19.....
Sta. Date
.....Broken .....Renewed.
Boiler washed, steam gage tested, gage cocks and water glass cocks cleaned .....19.....
Sta. Date
Safety valves tested and set to pop at .....lbs. .....lbs. .....lbs.
Hydrostatic pressure applied.....lbs.
Signature .....
Inspector.
Drawbar and pins.....

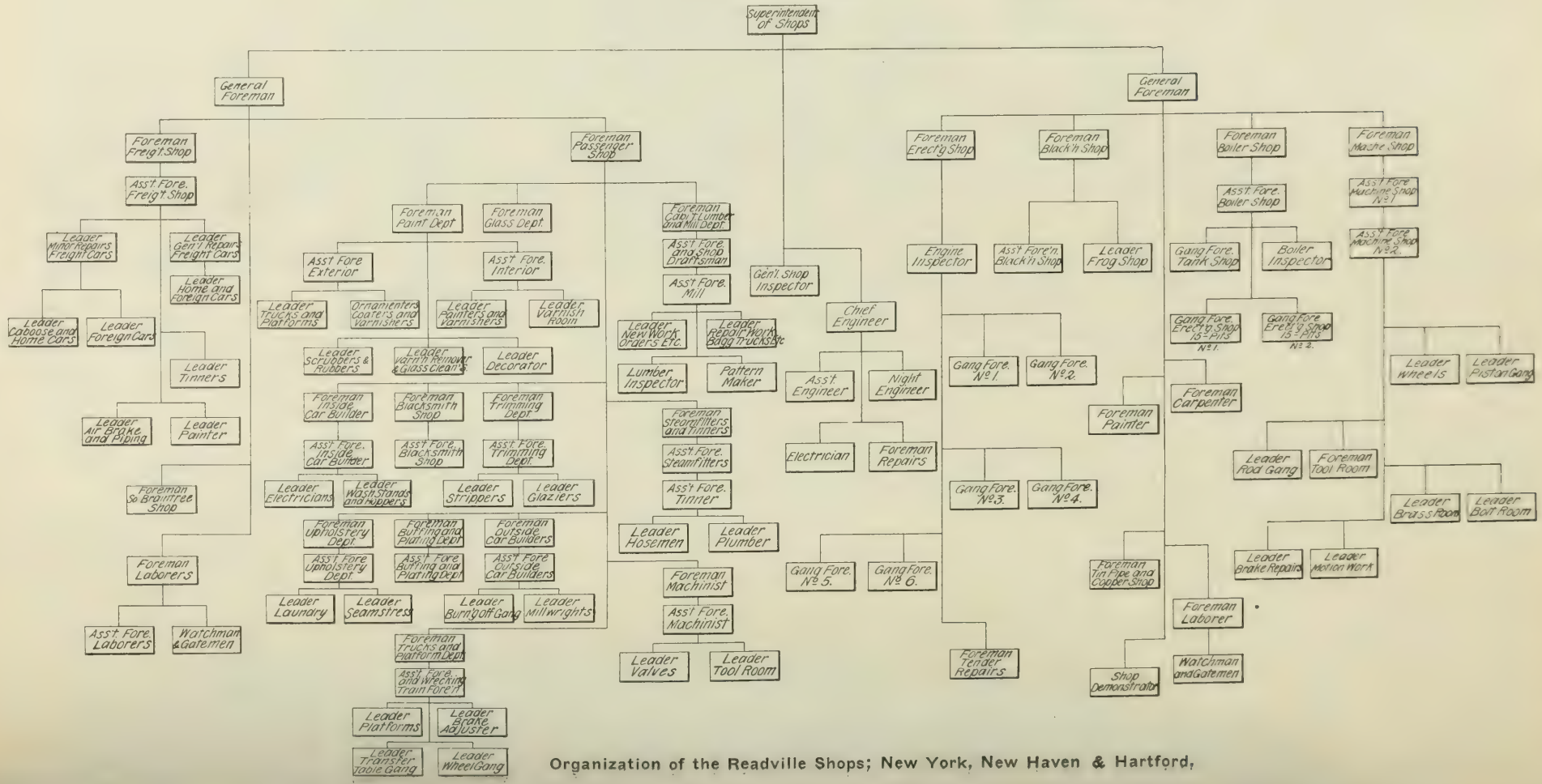
M 144
THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD CO.

Loco. No..... .....19.....
Station Date
Boiler tested..... .....19.....
Station Date
Lagging removed..... .....19.....
Station Date
Stay bolts tested..... .....19.....
Station Date
Boiler washed, steam gage tested, gage cocks and water glass cocks cleaned.. ....19.....
Station Date
Safety valves tested and set to pop at.....lbs .....lbs .....lbs
Hydrostatic pressure applied.....lbs
Signature .....
Inspector.
Correct .....
Master Mechanic.
Drawbar pins.....

Boiler Inspection Certificate.



Old Colony Division.



Organization of the Readville Shops; New York, New Haven & Hartford.

modification of the payroll and shows the time worked by each class of workman and the wages paid. The expenses are distributed under ten heads, as well as itemized in detail. The list includes all classes of labor that may be employed in and about a roundhouse, though, of course, no house has them all and most of them but a small percentage. These figures are of no value so far as comparisons between the different houses on the system are concerned, but do serve to check up the operations of each house with itself from month to month and week to week.

BOILER REPORTS.

There is one more class of reports that are of great importance. They are those of the general boiler inspector, to whose duties allusion has already been made. One comes in the usual form of a diagram illustrative of the broken staybolts that inspector may have disclosed and which is not reproduced, as it is duplicated on nearly every road. A second is that of the interior inspection (M. 150) made at the shop, and which enters into the minute details of the condition. The third is the card certificate that is required to be made out once a month for all engines running into New York state by the public service commission.

The reports, then, bear out the general plan of the mechanical organization, of simplicity and a reduction in number. The weekly and monthly reports are records upon which the broad policy of the management may be based, while the daily telegraphic reports are those upon which action depends and which indicate what should be done at once. They are part of the working of the plan by which the mechanical superintendent is brought into close touch with his subordinates and the work that they are doing, and thus neutralize the effect of the non-resident overlord who might be so burdened with executive duties that he would fail to know what is going on and gradually becomes enmeshed in a mass of red tape; a condition that does not exist here.

For this exposition of what is being done acknowledgment must be made to George W. Wildin, the mechanical superintendent, through whose courtesy and that of his assistants the data upon which it is based was collected.

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY.

DETENTION TO TRAINS DUE TO ENGINE FAILURES DURING MONTH OF_____190__

| DIVISIONS | HEATING | | | | | | STEAM | | | | | | LEAKING | | | | | | | | | | | | BROKEN | | | | | | | | | | | |

The most widespread complaint is that their relations with the officials amount largely to "nothing said when all goes well; discharge or condemnation when mistakes are made." Therefore, many of them feel that they are whipped into doing right rather than encouraged to do so through the channel that most men prefer to be appealed to—their intellect. Of course, the men are being paid amply for loyal service, but a fixed salary buys only a fixed amount of work and loyalty.

It is not necessary in thus appealing to the men that they should be impressed with the idea of a possible superintendency or general managership awaiting them. Why does the small boy work with such zeal when his teacher picks him out as monitor, or so diligently apply himself after school hours, giving up his outdoor play, when she asks him to stay and help her? It is because his pride is stirred. It is not because he ever expects or wants to govern the school room. Why does a man who has been attending club meetings for years in a disinterested fashion suddenly develop great zeal and interest when he is delegated to serve on a committee or as an officer of that club? It is because his mental usefulness has been recognized; it is not because he is expecting any financial gain or particular glorification.

If an employee goes along every day doing his work to the entire satisfaction of an official and sufficiently well to merit his pay check, the lack of punishment should not be the only indication of your appreciation of him—he should occasionally be discreetly commended; he should be acknowledged as a competent force in the operation of the road and made to feel that he is such.

The craving for fame and the plaudits of our judges is a potent factor in all human nature. Turn where you will, the successful official, who inspires voluntary zeal on the part of his men and is loved of them, is the one who recognizes this trait of human character—not the one who expects to secure discipline through strenuous coercion. The fear of discharge does not deter many of the younger employees from doing wrong things after they have become belittled with the seeming unimportance of themselves. Frank intercourse between officials and employees has wrought wonderful results in the right direction.

The fact is often bemoaned on large railways that the employees are not as loyal as they were twenty or thirty years ago, or rather when the railways were in their constructive period and the number of employees small. Has there been a radical change in the characteristics of humanity, or is it because the family of employees has become so large that the men have lost their identity? Is it not a fact that when a man is thus swallowed into the ranks of an army of fifteen thousand workers, his ambition is deadened by the comparative oblivion into which he is forced? Was he not, during the constructive period, a vital necessity to his employers; was he not called upon by his superiors, as well as by the primitiveness of the railways over which he operated, to use his brain power and ingenuity more; was it not that which maintained his interest? Is it not the routine of his present occupation and virtual loss of individuality that is exterminating personal zeal?

In the United States the day has passed when men are ruled by fear of their employers, although they do more or less surrender their independence to presumed injustices when a wave of commercial inactivity sweeps the country and creates a dearth of positions. The control of man has passed through three phases; he was once controlled by superstitious fear; then by the fear of absolute power; to-day his continued loyalty and employment is largely dependent upon his own satisfaction with the position occupied and with the employer. He was once loyal to the individual from whom he got his daily bread. With jobs plentiful he can pick and choose and conduct himself quite independently. If fear does not create loyalty, what does?

I mention kindliness last, not that it is by any means least, but to emphasize its absolute essentiality to all successful endeavor to call forth from mankind the best it possesses. Its pervading influence stands out clearly wherever there is contentment, loyalty and zeal. Kindliness should be the prevailing and first principle of discipline. If this in itself will not bring about the desired results a judicious amount of sternness added may, but anyone who is habitually abusive and uncongenial will always wind up his career as an unsuccessful disciplinarian. . . Slason Thompson, in his report for the year 1908, said:

"A study of accident statistics shows that their control is a matter of men. We have been multiplying laws and regulations and have been neglecting the obvious training and discipline of the only force that has the remedy for accidents literally and figuratively in its hands. And by discipline here is meant, not the discipline that punishes and penalizes, but the discipline that instructs, perfects and rewards competence, obedience and automatic vigilance."

T 418

The New York, New Haven & Hartford Railroad Co.

CONDUCTOR'S AND ENGINEMAN'S JOINT REPORT.

_____ *19*____

*Train*_____

*Left*_____ *at*_____ *M.*

*Arrived*_____ *at*_____ *M.*

*Engine*_____

*Conductor*_____

*Engineman*_____

*Total Cars*_____

*Loaded Cars Handled*_____

Empty " " _____

Special " " _____

Through " _____

*Through Passsengers*_____

*Signals from*_____ *to*_____

*Causes of Delays*_____

_____

_____

_____

_____

_____

_____

_____

_____ *Conductor*

_____ *Engineman*

Conductors of all trains leaving and arriving at any terminal station, will fill out this blank and leave it in telegraph office for transmission to the Superintendent's Office. If any delays occur, the causes must be agreed to and this report personally signed by both the Conductor and Engineman, and a copy promptly forwarded to both the Superintendent and Master Mechanic of the division on which the delays occur.

Conductor's and Engineman's Joint Report.

Russian press despatches say that a regulation has been issued by the minister of communications which provides for the payment of one rouble (50 cents) per day for food to each first and second-class passenger during delays to passenger trains resulting from snow storms, floods or any kind of accident. Third-class passengers receive 50 kopecks (25 cents) and fourth-class passengers and emigrants 40 kopecks (20 cents). Children are paid one-half.

Shop Kinks.

NINETEENTH COLLECTION (FIRST PRIZE.)

BY ELMO N. OWEN,
General Foreman; Southern Pacific, Bakersfield, Cal.

ADJUSTABLE FOOT FOR BAR.

In Fig. 1 is shown an adjustable foot to be used with a bar as indicated in the drawing. This device is very convenient for roundhouse work, and it is used continually by

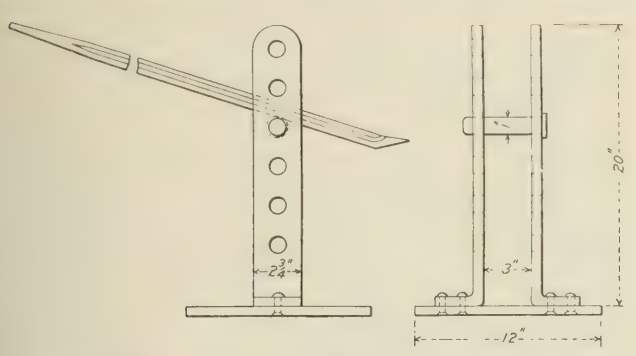


Fig. 1—Adjustable Foot for Bar.

the man who works on brake rigging. It overcomes the necessity of, and loss of time in, hunting for blocks. Being adjustable for different heights, it is particularly advantageous for a large variety of work, such as putting up shoes and wedges.

PORTABLE FORGE.

The portable forge shown in Fig. 2 is designed for the use of a blacksmith when working on small parts in the erecting

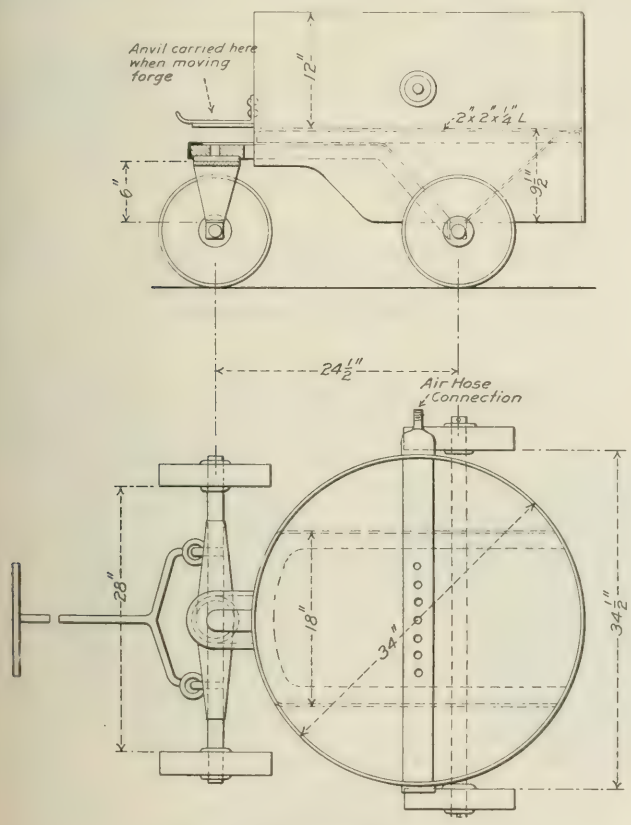


Fig. 2—Portable Forge.

shop, such as setting running board brackets. Otherwise it is necessary to head these pieces in the blacksmith shop and carrying them, hot, to the erecting shop. An anvil is carried on the bracket shown, but is placed upon the floor when being used.

CHECK AND BRANCH PIPE JOINT REAMER.

In Fig. 3 are shown the details and in Fig. 4 an assembled view of a device for reaming the joints of a branch pipe or injector check ball joints. These joints often become so damaged that it is necessary to machine them, and

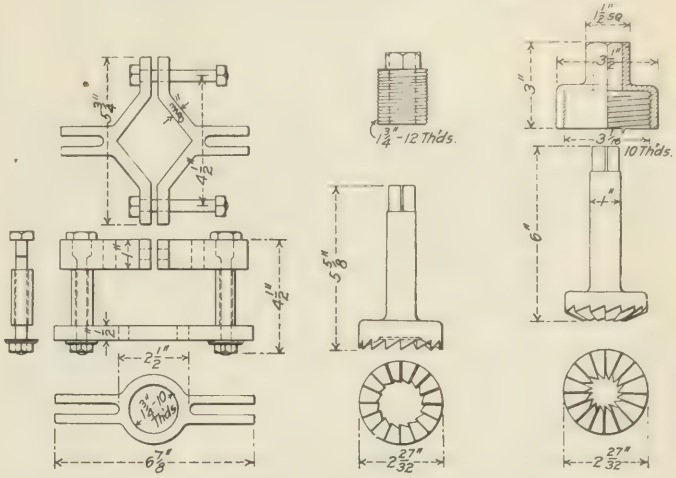


Fig. 3—Details of Check and Branch Pipe Joint Reamer.

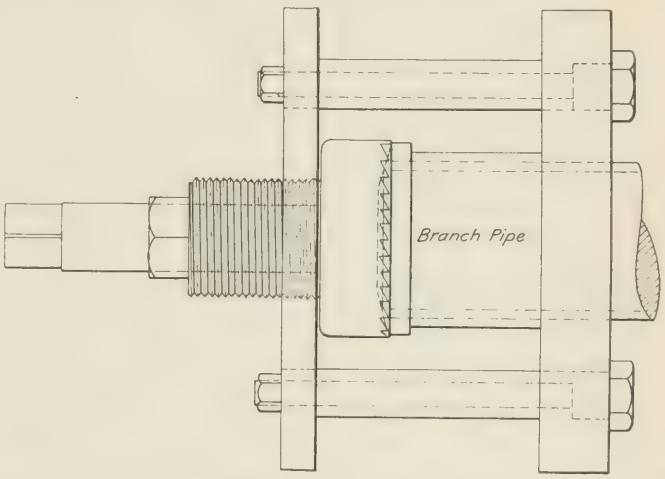


Fig. 4—Assembled View of Check and Branch Pipe Joint Reamer.

this device was designed by Fred Benz, tool room foreman at Bakersfield, so that these joints could be repaired without removing the check or pipes from the locomotive. The assembled view shows the device in place on a branch pipe.

PORTABLE ROUNDHOUSE BENCH.

In Fig. 5 is shown a portable bench, designed for use in the roundhouse. The top is covered with a sheet of No. 16 iron and a vise is secured to the end as indicated. The 20-in. x 20-in. x 5-in. drawer is sufficiently large to carry all small tools required, while larger ones are placed on the inside of

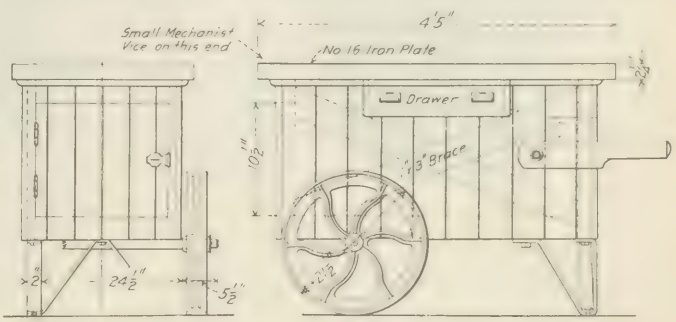


Fig. 5—Portable Roundhouse Bench.

the bench itself. This bench will be found a very handy and time-saving device by machinists in the roundhouse.

TWENTIETH COLLECTION (SECOND PRIZE.)

BY WM. G. REYER,
General Foreman: Nashville, Chattanooga & St. Louis, Nashville, Tenn.
Collection Signed also by J. W. Hooten, Foreman Repair Work.

VALVE STRIP CHUCK.

The line cut, Fig. 6, shows a simple chuck for clamping slide valve balance strips for planing. The strip is clamped, as shown, so as to counteract, as much as possible, any tendency to spring. The hook-shaped clamps grip the ends of the strip and are tightened by the nuts on the under side. This chuck is very light and easily made.

TOOL HOLDER FOR PLANING VALVE STRIPS.

The sketch shown in Fig. 7 is of a three-bar tool holder for use on a planer with the chuck shown in Fig. 6. Two cutters may be used for the roughing cut only, machining both sides of the strip simultaneously. One set of cutters may be used for the finishing cut only with which to maintain a standard size of strip. The tool holder is fastened to the plate of the clapper box by a bolt, and either set of cutters may be revolved in position quickly. This tool is a labor-saver and does very accurate work.

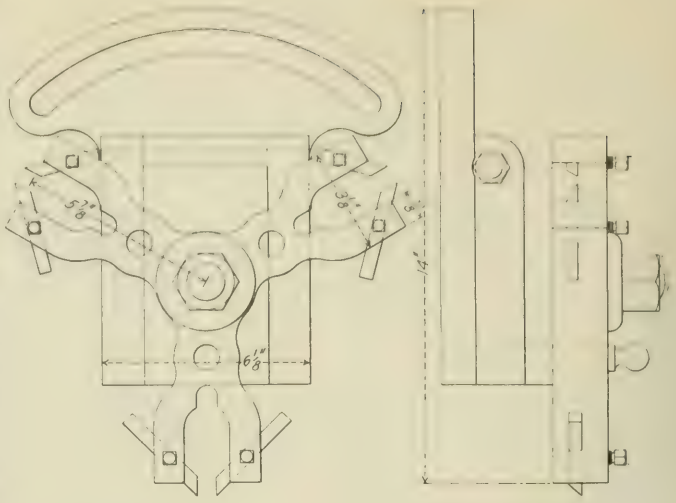


Fig. 7—Tool Holder for Planing Valve Strips.

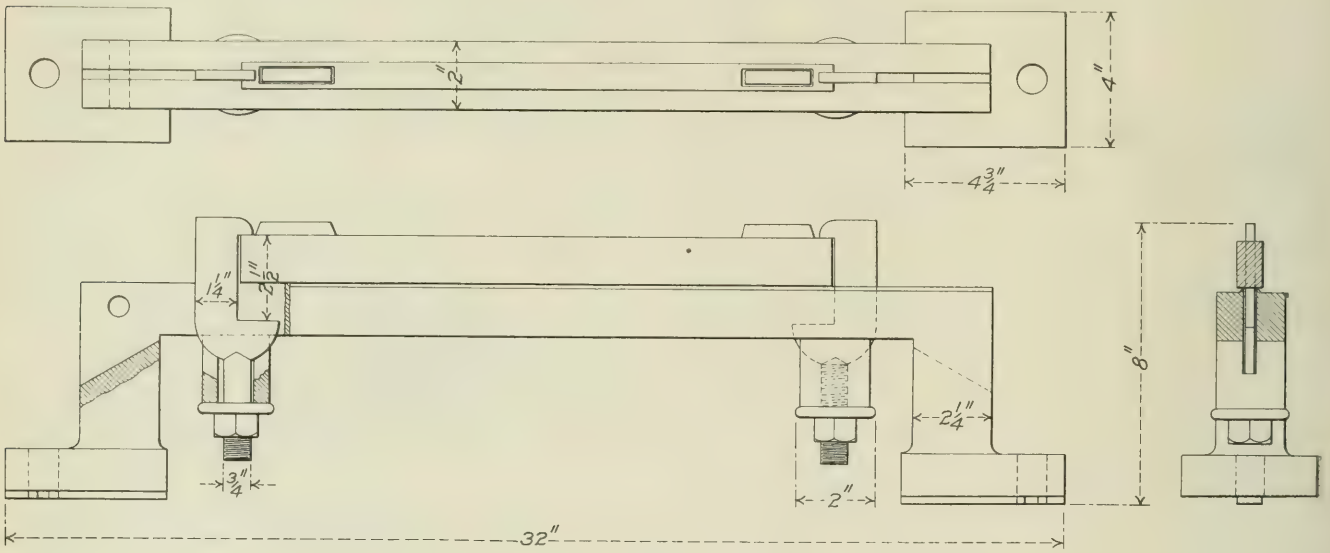


Fig. 6—Valve Strip Chuck.

BOLT MACHINE ATTACHMENTS.

The half-tone illustration, Fig. 8, shows three very useful

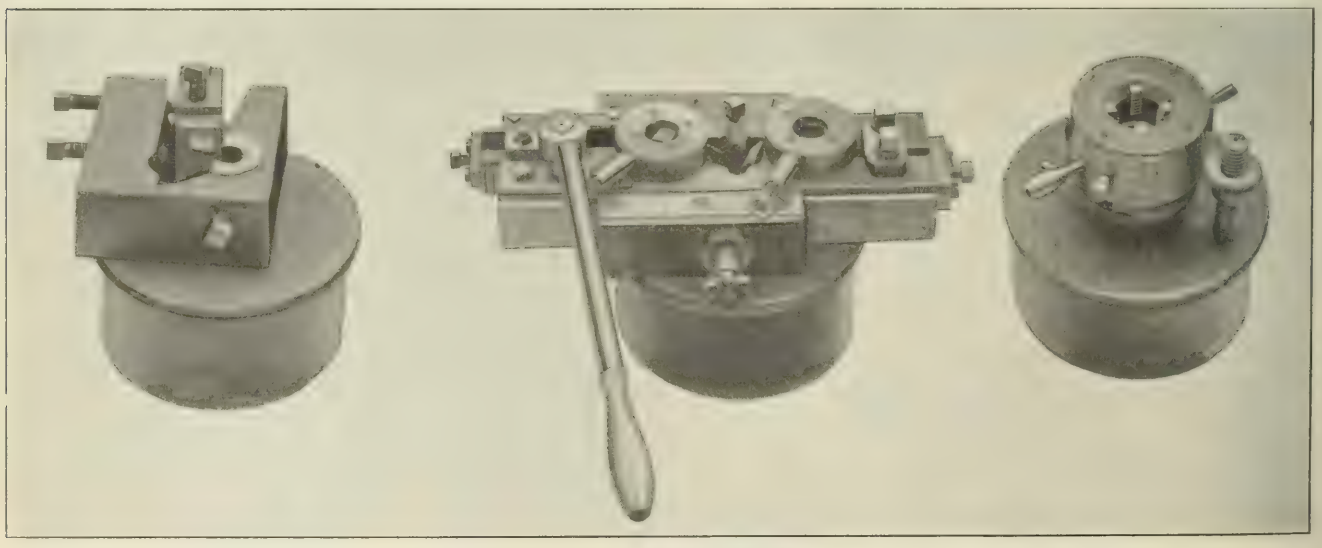


Fig. 8—Bolt Machine Attachments.

labor-saving attachments for use on a four-spindle Lassiter bolt machine. The attachment to the left of the illustration is used for roughing cuts or turning straight bolts. The attachment in the center is used for cutting off taper or straight bolts, and the hollow mill shown in the center is used for sizing bolts for threading. The attachment to the left is used for pointing and turning teats on the ends of bolts. The dies are tripped from the under side by the thumb screw shown and can be adjusted for any length of thread.

With these attachments, bolts are handled direct from the heading machine, requiring no centering. These attachments are also adapted for use on a drill press.

PLANER TOOL HOLDER.

The line cut, Fig. 9, shows a double planer tool holder for machining the inside faces of the flanges of shoes and

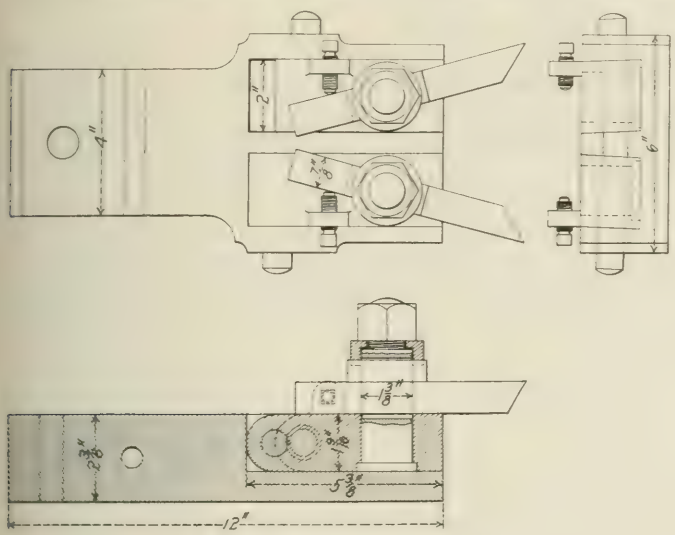


Fig. 9—Planer Tool Holder.

wedges, driving boxes, cross-head gibs, etc. The tools are inserted through slots in the bolts and drawn down tightly against the clapper plates and adjusted by small set screws.

TWENTY-FIRST COLLECTION.

BY W. H. SNYDER.
Asst. Gen'l Foreman; N. Y., Susquehanna & Western, Stroudsburg, Pa.

DEVICE FOR COMPRESSING PISTON PACKING RINGS.

The accompanying line drawing, Fig. 10, shows a very handy device for compressing packing rings in a solid piston head while applying it to the cylinder. Ordinary wedges, the tang of a file, etc., are often used for this work. This device is placed around the piston head and over the rings and tightened up by the small key and latch, which latter acts as a ratchet to mesh in the lock and hold the band tightly. The band is made of No. 16 sheet iron, 3 in. wide. The lugs shown prevent it from slipping into the cylinder. In using, the band is tightened until the rings are flushed with a piston head, and as it passes into the cylinder the band is pushed off by the lugs.

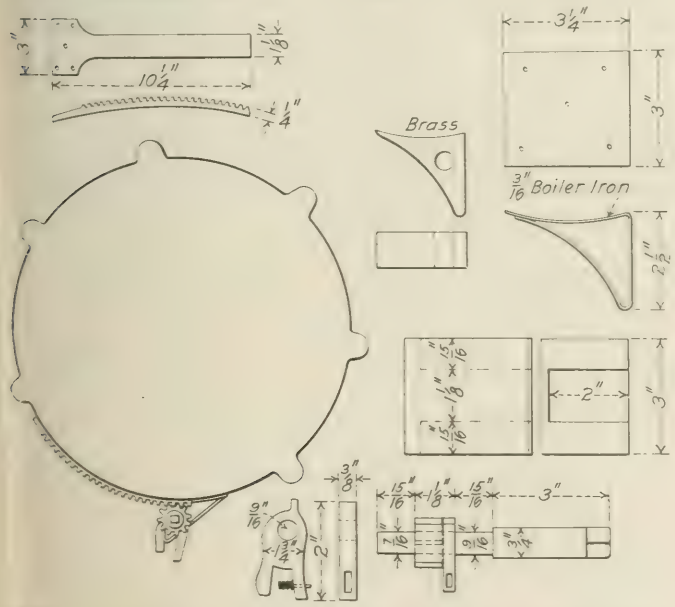


Fig. 10—Device for Compressing Piston Packing Rings.

PATCH BOLT COUNTER-SINK.

The illustration, Fig. 11, shows a very useful patch bolt counter-sink for boiler work, and one which has been successfully used in the New York, Susquehanna & Western shops at Stroudsburg, Pa., for a number of years. The stud, which acts as a guide, is screwed into the tapped hole in the boiler

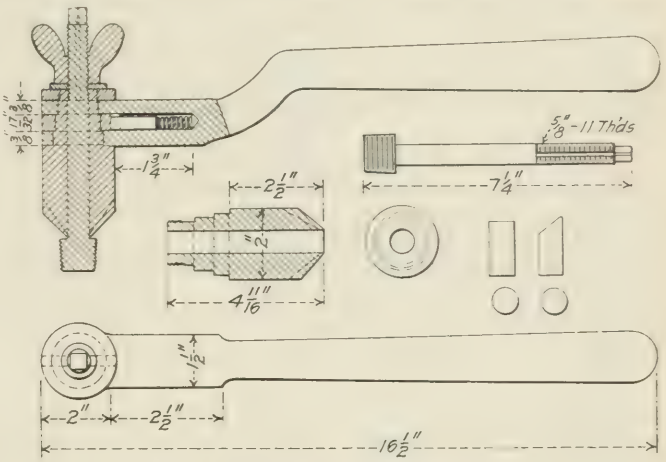


Fig. 11—Patch Bolt Counter-sink.

sheet. The cutter is then slipped over the stud and the counter-sink for the patch bolt is made square with the tapped hole. The cutters are fitted into the sheet by tightening the two winged nuts. Several different sizes of studs, to suit the various patch bolts, are carried in stock, such as $\frac{13}{16}$-in., $\frac{7}{8}$-in., $\frac{15}{16}$-in. and 1-in. After using this tool the counter-sink of the patch bolt will make a perfect fit and will draw down square with the tapped hole.

DEVICE FOR APPLYING FIRE HOSE COUPLINGS.

A device for applying fire hose couplings to hose is shown in Fig. 12. The nut or sleeve is first screwed on and adjusted. Two sleeves of different length are required, as the two couplings of fire hose are not the same length. After the sleeve has been adjusted the expanding nut is slipped into position and the threaded end of the pin run into place. The

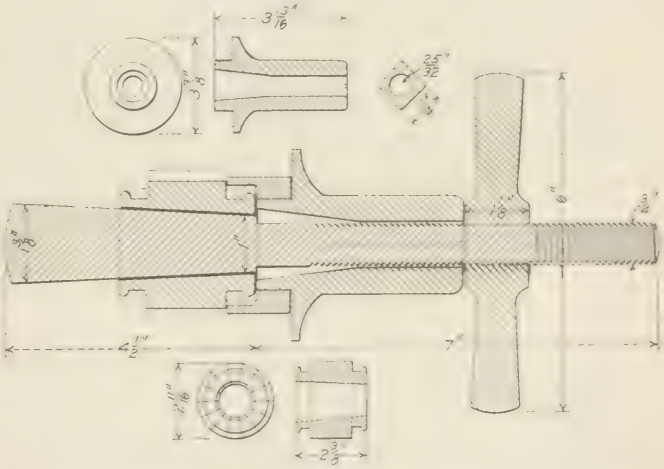


Fig. 12—Device for Applying Fire Hose Connections.

brass ferrule is then placed into the hose and expanded by screwing up on the nut.

HEAVY DUTY BORING BAR.

The accompanying drawing, Fig. 13, shows a boring bar for heavy duty, used for boring and slotting locomotive driving wheels on a 90-in. Niles boring mill, having a slotter attachment. A feature of this bar is in the clamp at the bottom

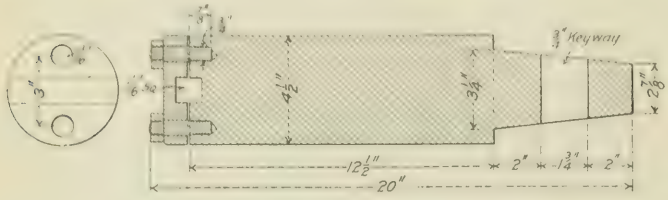


Fig. 13—Heavy Duty Boring Bar.

which secures the tool. This clamp, or bottom plate, has two ¾-in. studs running through it, which provides for securely holding the tool much more firmly than is possible with a set screw. It is also possible to make the square slot between the two pieces easier than making a square hole through the end of a solid bar.

CROWN BEARING ANGLE PLATE.

A very useful angle plate for slotting the edges of driving box brasses is shown in Fig. 14. The V of this angle plate insures the brass being machined square with the turned crown. In those shops which have not better facilities for

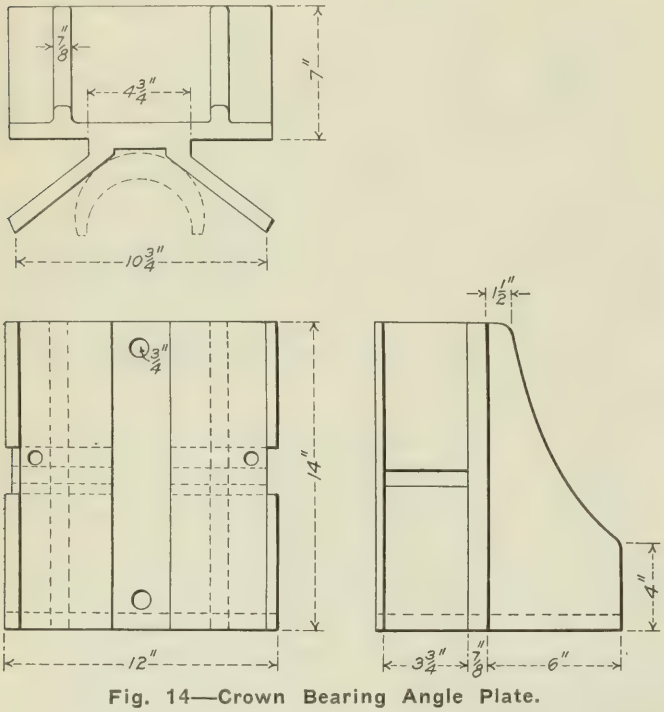


Fig. 14—Crown Bearing Angle Plate.

machining crown bearings, this angle plate will be found to be a very handy device for use on a slotter or a lathe. When used on a lathe an ordinary angle plate is bolted across the carriage to which the angle plate here shown is fastened.

TWENTY-SECOND COLLECTION.

BY C. C. LEECH.
Foreman, Pennsylvania Railroad, Buffalo, N. Y.

PACKING RING MANDREL.

The mandrel shown in Fig. 15 is designed for use on a lathe for turning brass or metallic piston rod packing rings. The mandrel A has a shoulder against which the part B bears, being shrunk on. This part is also tapered as shown to receive the cone C, which is driven against the end of the cutters, causing them to move out against the packing ring. The six jaws are held in place by the plate F, which is bolted to the face by six screw-head bolts. This chuck is designed to take different sizes of jaws, the travel being only ½-in. If desired, this chuck can be made so as to fit into the sleeve

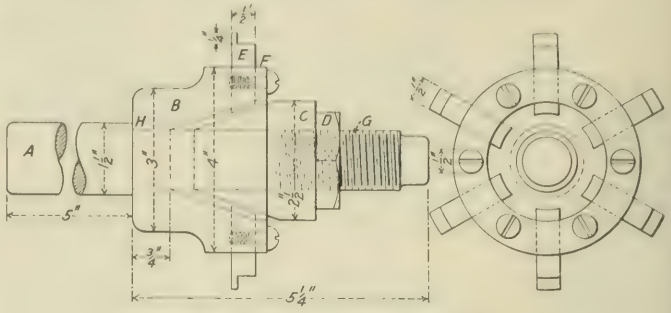


Fig. 15—Packing Ring Mandrel.

of the live center of the lathe, which makes a carrying dog unnecessary. This same chuck may be used for turning steam pipe joint rings, by having a set of long jaws.

ADJUSTABLE BORING TOOL.

The tapered end of this tool, Fig. 16, is made to fit the sleeve in the lathe tail stock. A ⅜-in x 1-in. slot receives the two cutters, which are held in position by the plate, secured by screw-head bolts. These cutters are adjusted by the fluted

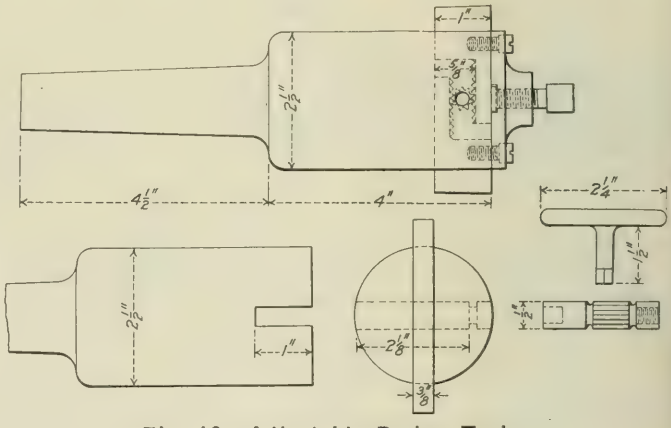


Fig. 16—Adjustable Boring Tool.

section of the spindle, operated by a small wrench. After the required adjustment is obtained the cutters are secured in position by the set screw shown. The cutters are made of tool steel and the body of the tool of soft steel.

PISTON PULLER.

A simple but effective piston puller is shown in Fig. 17. The main block is made to conform to the taper of the pin fit in a crosshead, and has a tapered slot planed through it to receive the key. The block, which bears against the end of

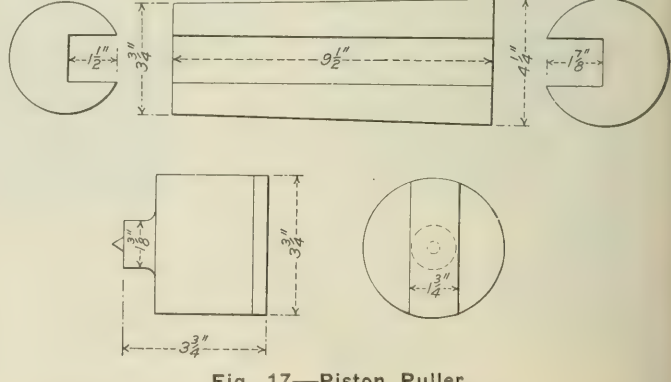


Fig. 17—Piston Puller.

the piston rod, has a round boss in the center on one end and a tapered tongue on the other. This tongue extends into the slot of the pin portion and is tapered to correspond to the key.

SUCTION CLEANER.

A simple arrangement for cleaning car seats, cushions, carpets, etc., is shown in the accompanying line cut, Fig. 18. Air, at about 75 lbs. pressure, is admitted as indicated, and is directed along the hose to cause a suction at the nozzle which is held on the seat or carpet. The nozzle is made of galvanized iron and has an opening ⅛-in. x 6-in. The 1¼-in. pipe coupling is soldered to it, making a permanent joint and preventing the entrance of air. An ordinary globe valve, with its interior partitions removed, is used as a three-way connection, through which air is run into the pipe. The right angle

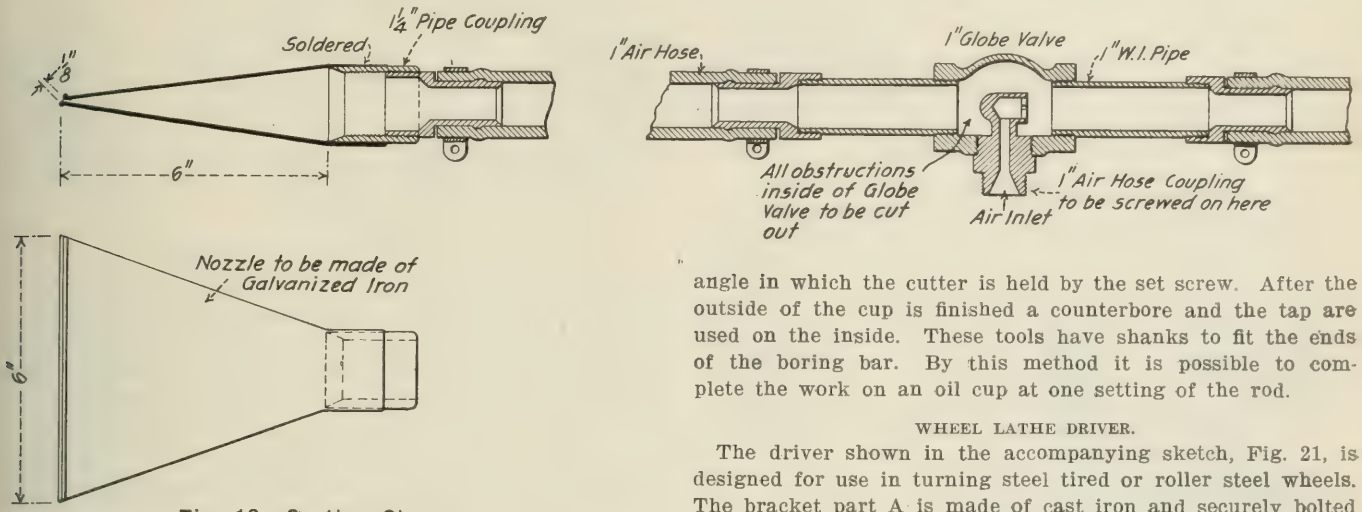


Fig. 18—Suction Cleaner.

jet has five 7/64-in. round holes through which the air passes.

CHUCK FOR DRILL PRESS USE.

Fig. 19 shows a handy chuck for using square shank taps or reamers on a drill press. The body A is bored out to receive the collet C, which has a square opening to fit over the top of the reamer or tap. A set of these collets should be

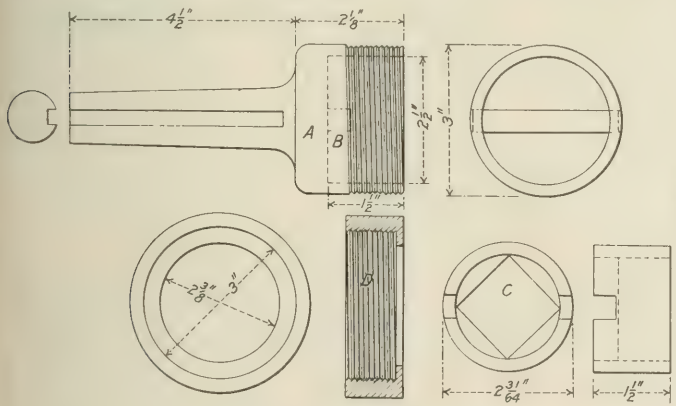


Fig. 19—Chuck for Drill Press.

made having squares ranging from ¾ in. to 1½ in. After placing the collet in the retaining collar D, it is screwed on to the body, clamping the collet firmly. The dowel pin, indicated at B, prevents turning. The collets are made of tool steel, the other parts of soft steel.

TOOL FOR MACHINING SOLID SIDE ROD OIL CUPS.

This tool, Fig. 20, is designed for use on the boring bar of a horizontal milling machine for finishing solid side rod oil cups. The tool is held on the bar by a ½-in. x ¼-in. key. The arm of the tool has a 1-in. slot cut through it on an

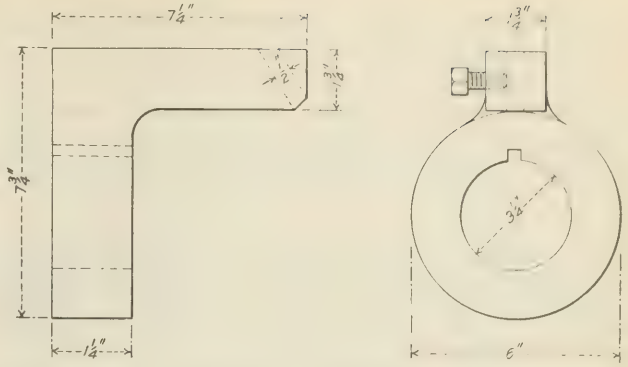


Fig. 20—Tool for Machining Solid Side Rod Oil Cups.

angle in which the cutter is held by the set screw. After the outside of the cup is finished a counterbore and the tap are used on the inside. These tools have shanks to fit the ends of the boring bar. By this method it is possible to complete the work on an oil cup at one setting of the rod.

WHEEL LATHE DRIVER.

The driver shown in the accompanying sketch, Fig. 21, is designed for use in turning steel tired or roller steel wheels. The bracket part A is made of cast iron and securely bolted to the face plate of the lathe. Part B, made of steel, and containing the toothed steel dog and key, is securely bolted to the cast iron portion of the driver. The dog is driven

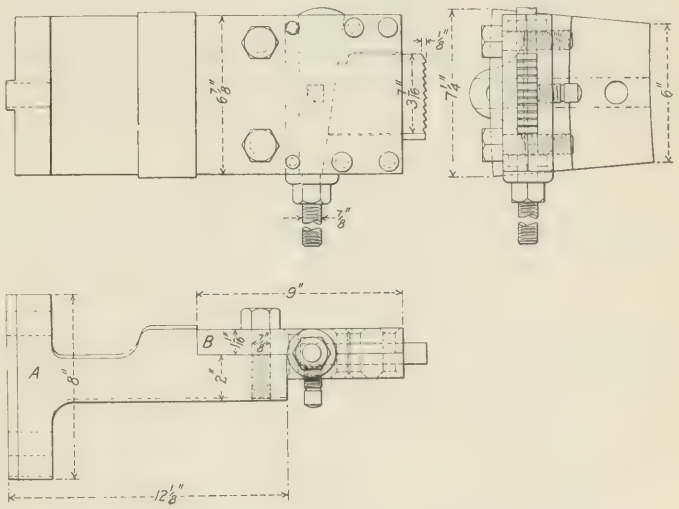


Fig. 21—Wheel Lathe Driver.

against the rim of the wheel by the key, which is drawn against the back of the dog by the nut shown. Six of these drivers constitute a set, three for each wheel.

SLOTTER TOOL BAR.

The slotter tool bar, shown herewith, Fig. 22, is made of soft steel, 24 in. long. The lower end, which holds the tool, is made 2¾ in. square and slotted to receive the movable block in which the tool steel cutter is held. This block moves on the ⅜-in. pin shown. When making the downward, or cutting, movement the steel spring holds the block in position, but on the upward, or return, stroke the block takes the posi-

tion indicated by the dotted lines. This relieves the cutting edge of the tool, which ordinarily drags against the work on the upward stroke.

BRACE AND REAMER FOR RESEATING INSIDE BOILER CHECKS.

The device, Fig. 23, shows a very effective method for reseating inside boiler checks. The brace, made of 1¼-in. x 1¾-in. soft steel, is clamped in a bench vice. The boiler check body, shown dotted, is then fastened to the brace

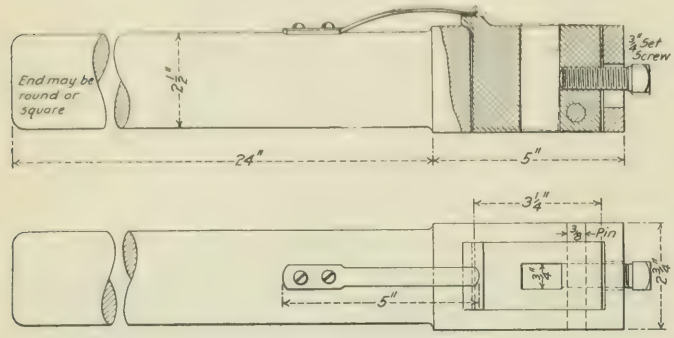


Fig. 22—Slotter Tool Bar.

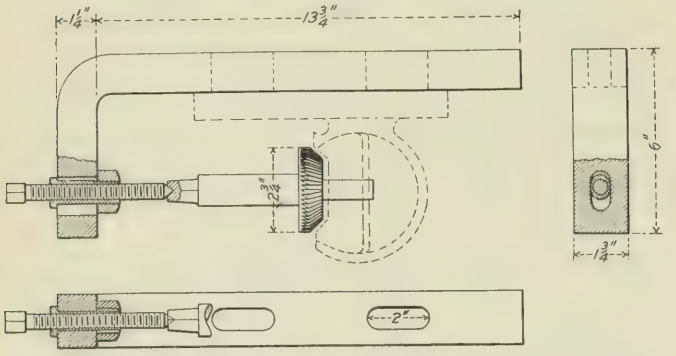


Fig. 23—Brace and Reamer for Reseating Inside Boiler Checks.

through holes in the casting and the slots in the brace. The tool steel reamer is then put in position and adjusted by the screw, which is later clamped in position by the lock nut. The slotted hole seen in the elevation allows for the vertical adjustment. The reamer is then revolved by using an ordinary wrench.

TWENTY-THIRD COLLECTION.

BY E. J. M'KERNAN,
Tool Supervisor; Atchison, Topeka & Santa Fe, Topeka, Kan.

HYDRAULIC PRESS FOR ROD WORK.

In the accompanying line cut, Fig. 24, is shown a hand-operated hydraulic press for rod work. This press is capable of exerting a pressure of 25 tons, and is especially adapted to all rod work for pressing in and removing bushings, for

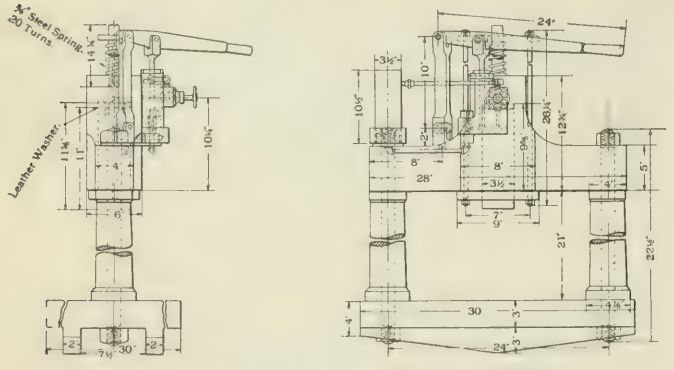


Fig. 24—Hydraulic Press for Rod Work.

applying driving box brasses, etc. For rapid heavy work this press is far superior to the hand screw press ordinarily used. It occupies a very small space as compared with the usual design of press, and owing to the rapidity with which it works, it is an especially desirable roundhouse appliance. It may be built of ordinary material found about a locomotive shop and at a very reasonable cost.

FLUE-CUTTING MACHINE.

The illustration, Fig. 25, shows very clearly the construction of a machine for cutting off the ends of flues. It does not differ greatly from other machines used for this work, although it does show a very efficient arrangement. A 6-in.

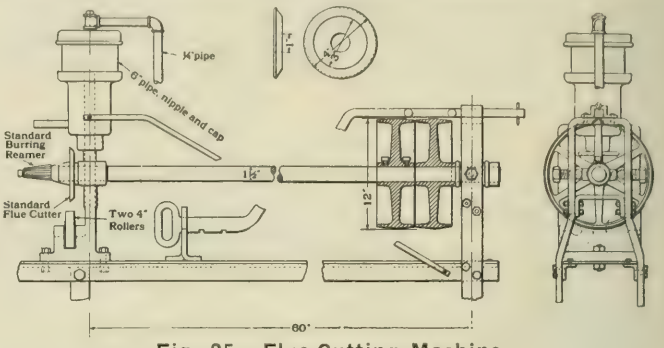
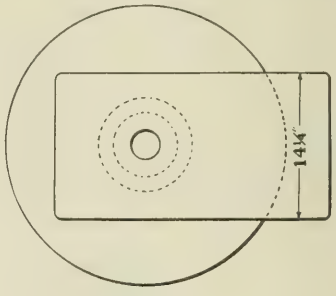


Fig. 25—Flue-Cutting Machine.

air cylinder operates the cutter, which is mounted on a 1½-in. shaft. On the end of this shaft is placed a high speed reamer, used for removing the burrs or for tapering the ends of the flue for welding. The belt shifter is placed in a handy position, the handle being located as shown in the sketch.

ROUNDHOUSE VISE STAND.

A vise stand for roundhouse use is shown in Fig. 26. It is made of cast iron and of a suitable size for placing between



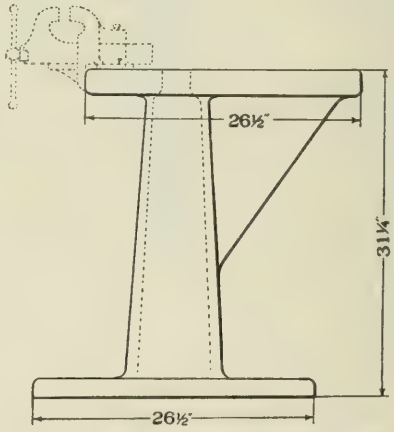


Fig. 26—Roundhouse Vise Stand.

or at the ends of the pits. This bench is especially useful for roundhouse work, and much more convenient than a wooden bench placed against the wall. It occupies very little space, and at the same time is very rigid and more substantial than

any form of wooden bench. The top may be used for straightening bolts, rods, etc., and the design of base provides no place for scrap material to accumulate.

KNUCKLE AND WRIST PIN CHUCKS.

Slightly different designs of chucks for turning knuckle and wrist pins are shown in Fig. 27. They are designed for screwing on the main spindle of the lathe, and are notched, as shown, to facilitate removing by the use of a block and hammer. The outer end of the casting is threaded

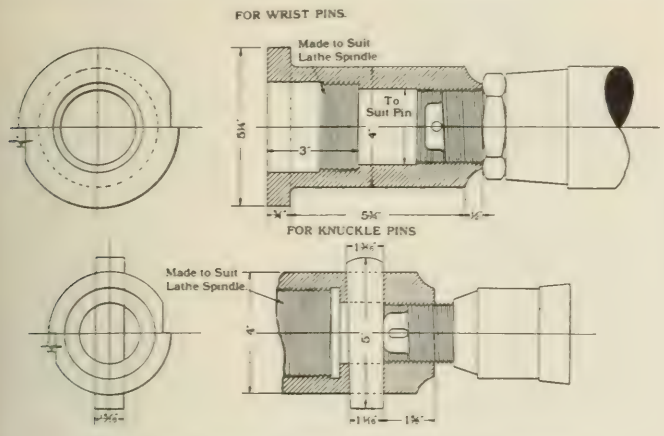
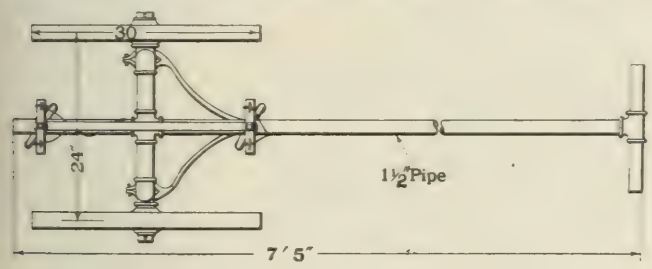


Fig. 27—Knuckle and Wrist Pin Chucks.

to correspond to the threads of the knuckle or wrist pin. The wrist pin chuck is arranged for securing the pin against a nut as shown, while the knuckle pin chuck has a key which bears against the end of the pin. These chucks are extremely convenient for this class of work and are very easily and cheaply made.

CAR WHEEL AXLE TRUCK.

Fig. 28 shows a car wheel axle truck, which, with the exception of the wheel, is made entirely of 1½-in. iron pipe



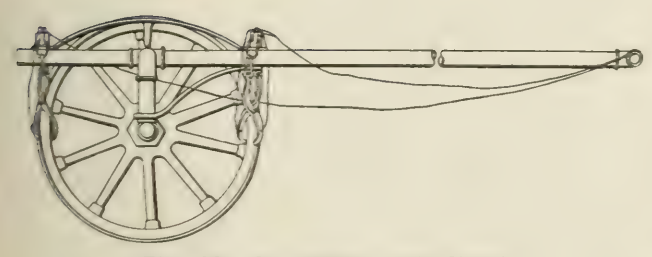


Fig. 28—Car Wheel Axle Truck.

and fittings. By raising the handle and opening the hooks by means of the rawhide cords the axle is gripped by the hooks. The truck is operated by one man and will handle any size of car axle. This truck is easily made at a cost not to exceed $10. The axles are balanced so that the weight comes entirely upon the truck axle.

VALVE SETTING MACHINE.

In Fig. 29 is shown an arrangement for rotating driving wheels for locomotives while setting the valves. An air motor drives a set of gears which rotate the shaft carrying the rollers. The wheels may be rotated in either direction

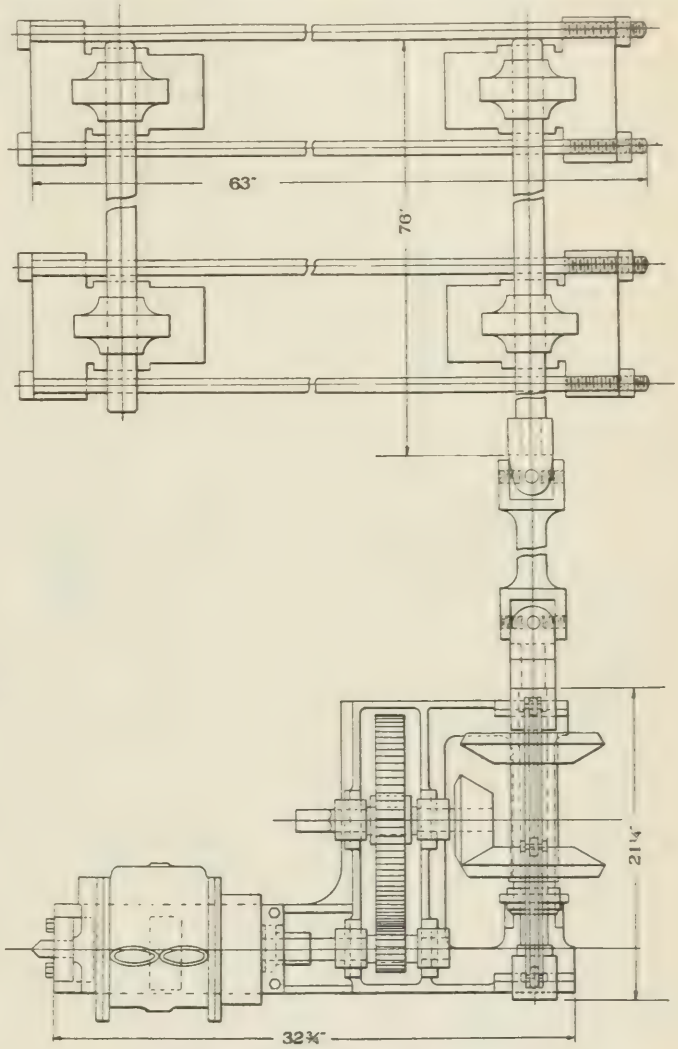


Fig. 29—Valve Setting Machine.

by shifting the gears, provision for which is provided as illustrated. The weight of the engine should be taken off of the main driver by blocking between the saddles and frame in the usual manner.

GREASE FORMING PRESS.

The accompanying illustrations and details, Fig. 30, show a press for forming grease for the Alvin driving box grease cellars or sticks for use in side or main rod cups.

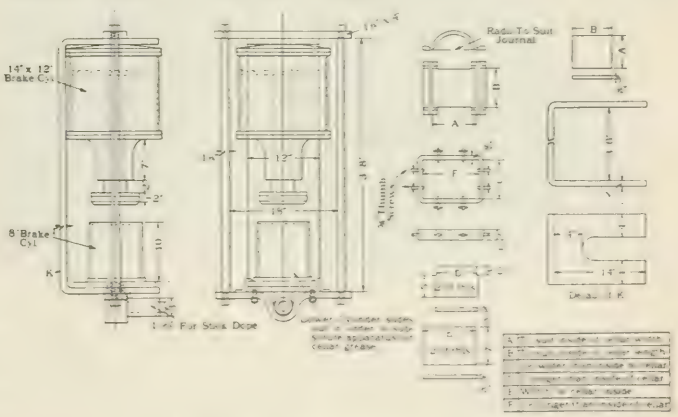


Fig. 30—Grease Forming Press.

A 12 in. x 14-in. brake cylinder is mounted on a frame in a vertical position, as indicated. Adjustable forms are made to suit the various sizes and designs of journals and driving box cellars. The illustration shows the machine arranged with forms for making dope sticks for rod cups. This press is usually located in the oil houses at large division points.

PORTABLE OIL RIVET FORGE.

The illustration, Fig. 31, shows an efficient design of portable oil rivet forge. The frame work is made of sheet steel and angle irons and is mounted on three wheels, the leading one of which carries a tongue for hauling the forge about the shop. A tank, 16½ in. in diameter and 33 in. high, is mounted at the rear for storing the crude oil. The oil is

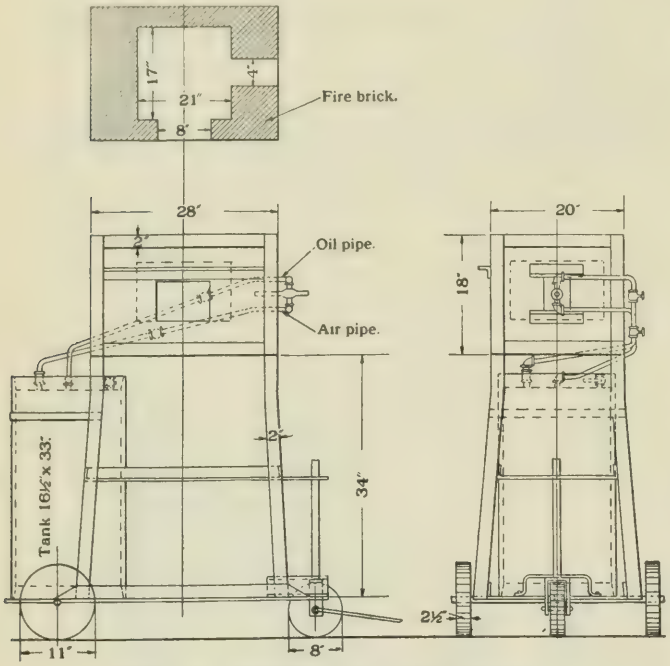


Fig. 31—Portable Oil Rivet Forge.

forced to the burner by air pressure, and the oil and air are mixed at the burner in proper proportions for complete combustion. The interior of the furnace is 17 in. wide by 21 in. long and has an 8-in. opening. The interior of the furnace is lined with fire brick. A very intense heat can be obtained in a short time, and provision is made for close regulation. This forge will heat rivets for several gangs at the same time.

TRIPLE VALVE PACKING RING GRINDER.

Fig. 32 shows a triple valve packing ring grinder designed for operating on four valves at the same time. These valves are placed over the vertical bolts and held in position by keys. The valves are revolved in a horizontal direction, and the cam shaft seen at the bottom of the illustration gives a

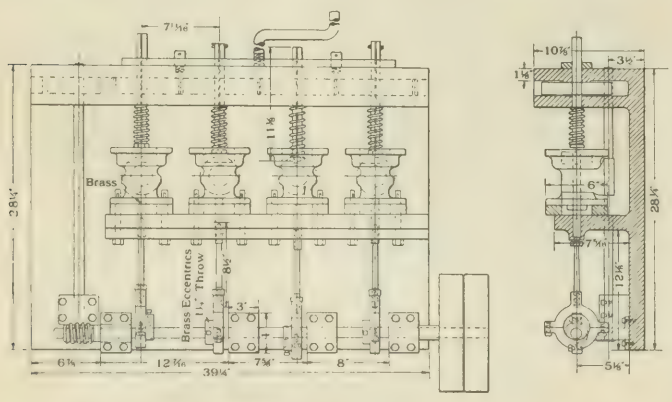


Fig. 32—Triple Valve Packing Ring Grinder.

vertical reciprocating motion to the piston, which combination of motions grinds the packing rings in a very satisfactory manner. This machine has a capacity for 50 triple valves per hour.

CART FOR BOILER WASHERS.

The plan and elevation drawings, Fig. 33, show a cart to be used by boiler washers in the roundhouse. It is made of steel and arranged to hold all the necessary tools and equipment for boiler washing. The hose is carried on the rear, and

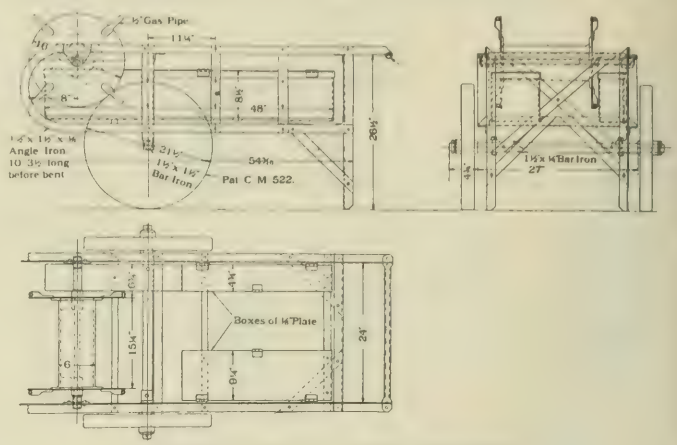


Fig. 33—Cart for Boiler Washers.

the boxes, arranged along the inner side of the cart, carry the various wrenches, nozzles, etc. Locks are provided for the boxes so that the equipment is kept in the cart rather than in various cupboards.

WRENCH PUNCHING AND FORMING DIES.

Fig. 34 illustrates a set of dies and holders for punching and forming flat wrenches in a bulldozer. The first operation in making these wrenches is to cut the blank, and the dies for this operation are shown at the left of the drawing.

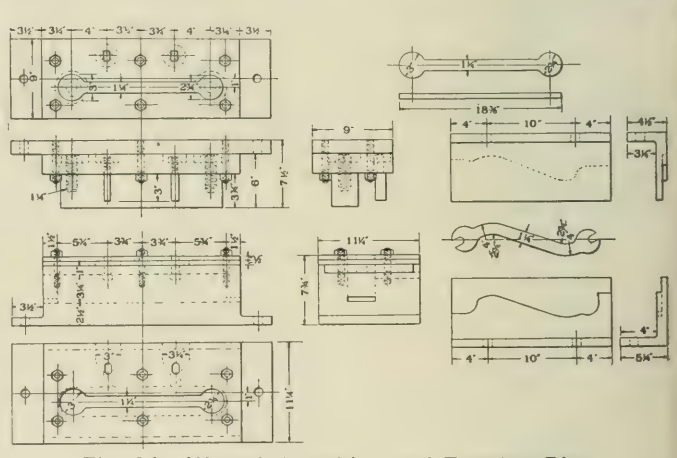


Fig. 34—Wrench Punching and Forming Dies.

The second operation is the bending of the blank to the desired shape, and the forming dies for this process are shown on the right of the sketch. The third and final operation is the cutting out of the opening for the jaws. All three operations are done with one heating. This device will make wrenches for ⅜-in. to 1-in. nuts at a rate of 250 an hour with two men.

TWENTY-FOURTH COLLECTION.

BY C. J. DRURY,
General Roundhouse Foreman, A., T. & S. F., Albuquerque, N. Mex.

DEVICE FOR LOADING CAR WHEELS.

In the accompanying illustration, Fig. 35, is shown a very efficient device for loading car wheels. As the hoist raises a

pair of wheels, the skids move up also, and when sufficiently high the wheels roll out of the head and into the car without

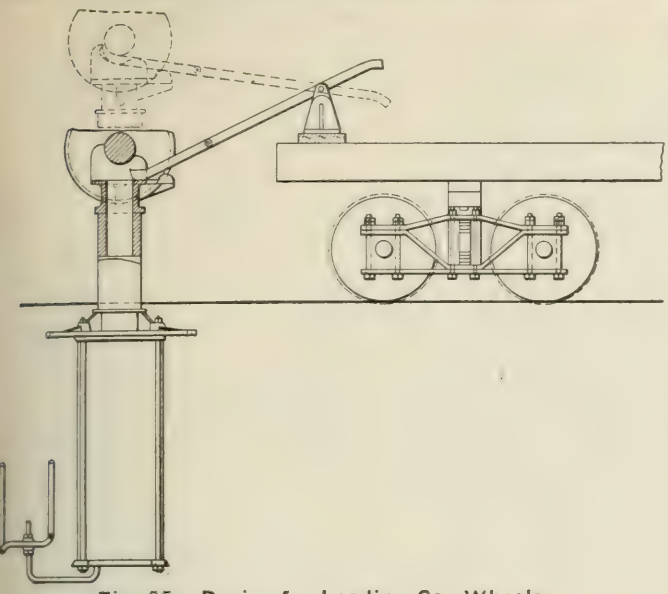


Fig. 35—Device for Loading Car Wheels.

any handling. By this method it is only necessary to roll the wheels in position over the hoist and apply the air.

DEVICE FOR REMOVING TANK BRASSES.

In removing tank brasses two hydraulic jacks are generally used. By this method the wheel is often raised, preventing the brass from being removed. In this case it is necessary to use a pry on top of the wheel, which requires extra help to remove a defective brass. By the device here shown, Fig. 36, one man can readily remove a brass in four or five min-

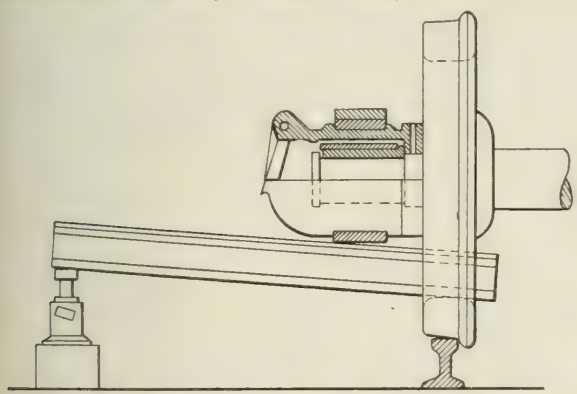


Fig. 36—Device for Removing Tank Brasses.

utes. A small screw or hydraulic jack is placed about 4 ft. from the wheel and a piece of rail used as a lever.

STEAM SAND DRYER.

In the accompanying line cut, Fig. 37, is shown a steam sand dryer, which is very simple and does the work of two

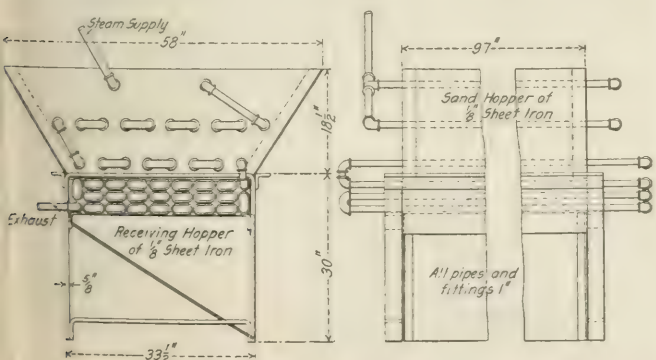


Fig. 37—Steam Sand Dryer.

stoves. The hopper is about 4 ft. x 8 ft. and has a bed of pipes in the bottom. These pipes are placed close together and will not allow the sand to pass through while wet or damp, but when dry, it falls through readily without any shaking or sifting. All of the joints of the piping are made outside, and, in case of a leak, the sand in the hopper is not moistened.

TWENTY-FIFTH COLLECTION.

BY D. P. KELLOGG,
Master Mechanic, Southern Pacific, Los Angeles, Cal.
Collection Signed also by W. F. Merry and G. H. Goodwin, General Foreman and General Gang Foreman.

STEEL FRAME REPAIR TABLE.

The line drawings, Figs. 38 and 40, and in the half-tone, Fig. 39, show a table designed for repairing all classes of steel frames. This work is coming to require more and more attention, as the number of steel cars in use is rapidly increasing.

The table is substantially built of concrete, reinforced with rails held in place by a number of anchor bolts. The top

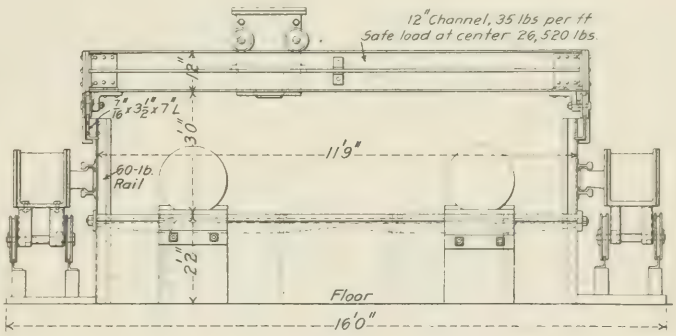


Fig. 38—Elevation of Steel Frame Repair Table.

surface is composed of sectional plates, which form a face plate. A number of T-slots for holding down the work are provided. There are two movable cylinders on each side of the table, which may be placed in any position to exert side pressure. The end cylinders are stationary for exerting pressure on the opposite corners in case of the frame being out of



Fig. 39—Steel Frame Repair Table.

square. These cylinders are held in place by lugs bolted to the upper rails. An 18-in. cylinder, having a capacity of 19,000 lbs. downward pressure, can be moved in any position, its carriage traveling lengthwise of the table, while the cylinder itself travels across the carriage. With this cylinder ordinary

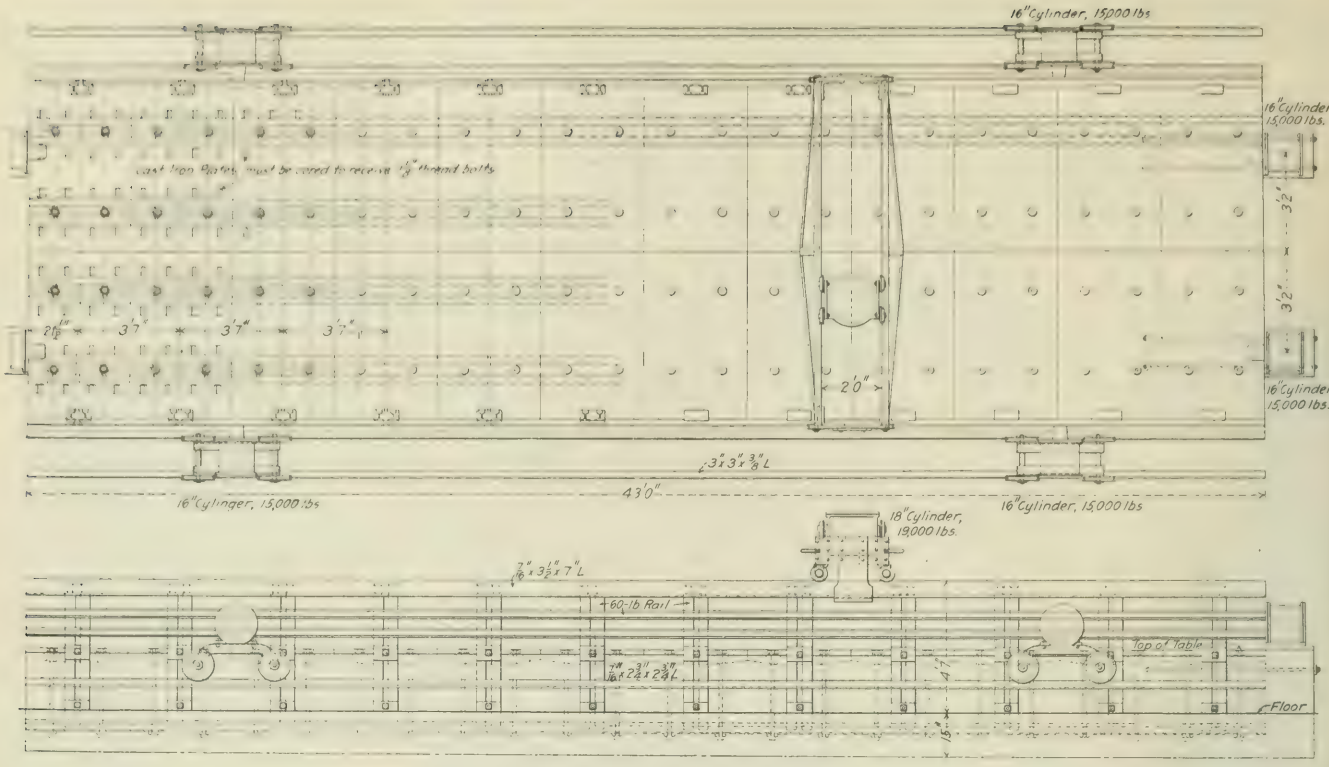


Fig. 40—Plan of Steel Frame Repair Table.

bends may be straightened cold. In case of sharp kinks in the frame it is heated before applying the pressure.

This table is a new departure in these shops and is found to be very valuable in taking care of steel car work.

ECCENTRIC BLADE BENDER.

In Fig. 41 is shown a very light and effective eccentric blade bender. It is capable of bending a plate 1¼ in. thick and 4 in. wide. It is easily adjusted for bending in either direction, it being only necessary to reverse the block. It will also be noticed that the key is detachable. A particular point of merit in this kink is in the fact that it may be used without disconnecting the eccentric blade, and in case of emergency, it can be used as a blade twister by placing a chisel of piece of iron under one edge of the block.

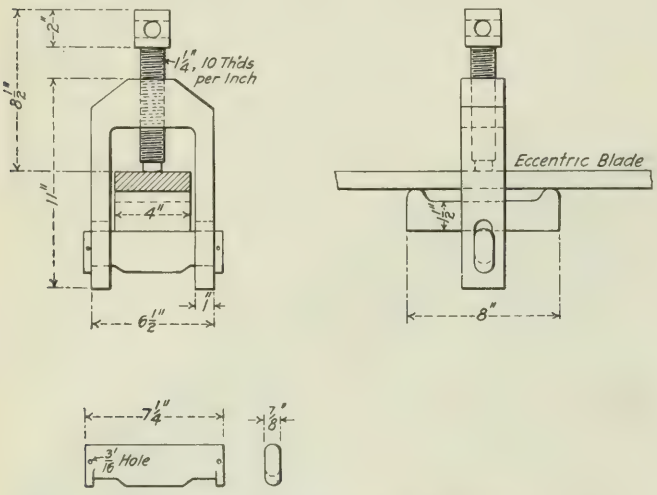


Fig. 41—Eccentric Blade Bender.

TOOL FOR DRILLING SQUARE HOLES.

Fig. 42 illustrates a combination for drilling square holes on a drill press. There has been several articles printed on this subject, but the device shown is one which was made and is used in the Southern Pacific shops at Los Angeles, Cal., for drilling square holes in crank pin collars. The collar is placed on two parallel strips and the soft steel cap is then adjusted and clamped in position. This cap centers the work, being bored out to fit over the collar. Inserted in the cap is a hardened steel guide, secured by four pins. This guide has a square of the same size as the intended square hole. The drill is made of a long piece of steel, as shown, which allows it to give the necessary spring when in operation. The cutting end of the drill is triangular in shape, with a cutting edge on

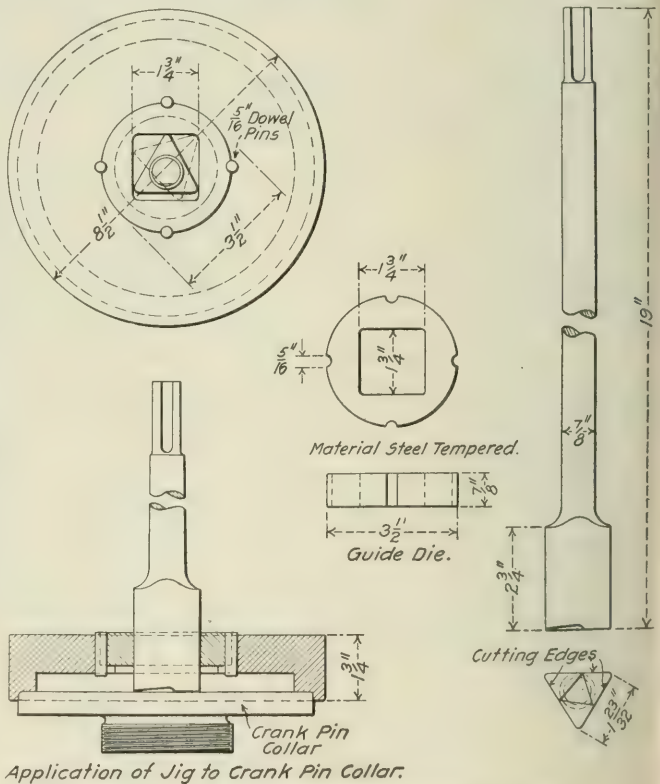


Fig. 42—Tool for Drilling Square Holes.

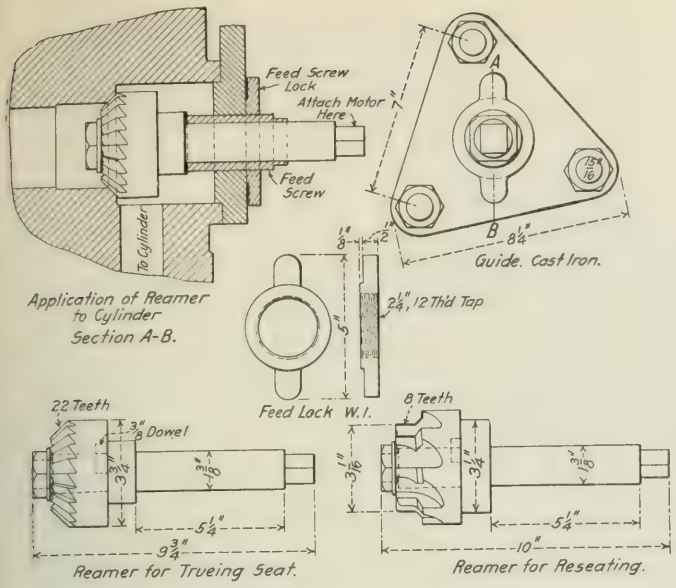


Fig. 43—Circulating Valve Reamers.

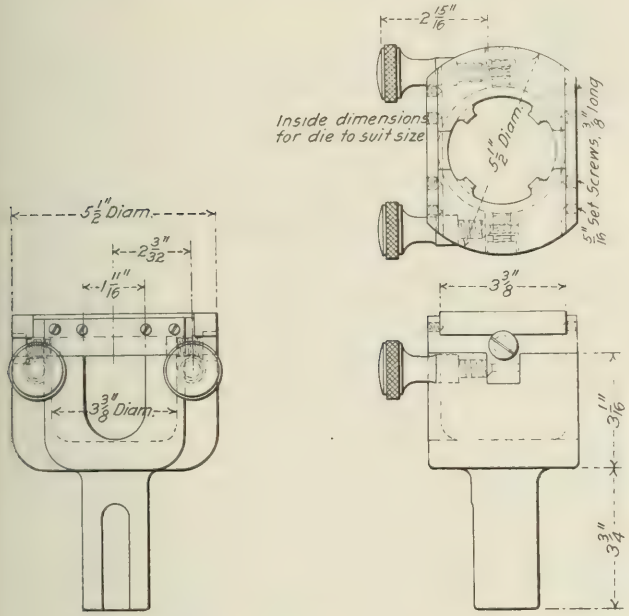


Fig. 44—Combination Die Holder.

each corner, and is fitted to the guide block so that it will turn free at the four corners. The drawing shows this combination designed for drilling 1¾-in. holes ⅞ in. deep.

CIRCULATING VALVE REAMERS.

The illustration, Fig. 43, shows two styles of reamers and their application in reaming circulating valve seats. To do this satisfactorily two reamers are required, one of which is called the reseating reamer, which provides the correct width and the other reamer is a finishing tool. Care should be taken that the width of the seat in the casting is smaller than that of the valve. A slow running motor may be applied for power, but a good ratchet is satisfactory, especially when a workman has but one engine on which to do this work.

COMBINATION DIE HOLDER.

In Fig. 44 is shown a combination die holder, used principally on the turret lathes for brass work. This style of die holder has given perfect satisfaction, and as it is adjustable, the dies can be reground without changing the size of the holder. The die is removed from the cage by loosening the knurled screws. A large number of dies can be used with the one holder. The size shown is for use on standard hose nipples, water car nipples or any work between 2 and 3 in.

TAPER ATTACHMENT.

Fig. 45 shows detail views and Fig. 46 the position on a machine of an attachment applied to an Acme staybolt cutter

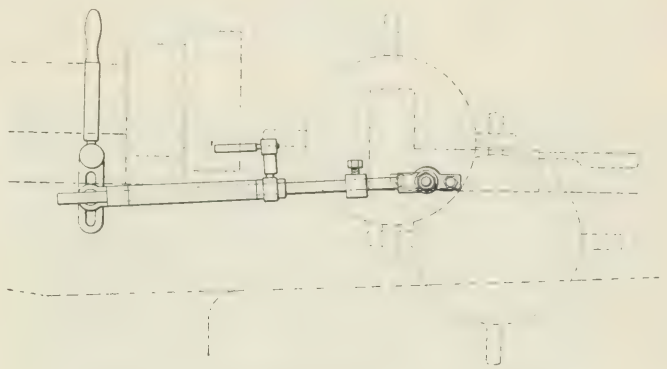


Fig. 46—Taper Attachment in Position.

for cutting taper threads on crown or radial staybolts. This was designed as a shop kink, but it proved so valuable, especially where there was a large number of taper bolts to be cut, that it was patented by H. Neville, tool room foreman of the Southern Pacific at Los Angeles, Cal., and is now being handled by the Acme Machinery Co., Cleveland, Ohio. The device confines the bolts to one machine, where they are finished with both straight and taper threads. Previous to having this

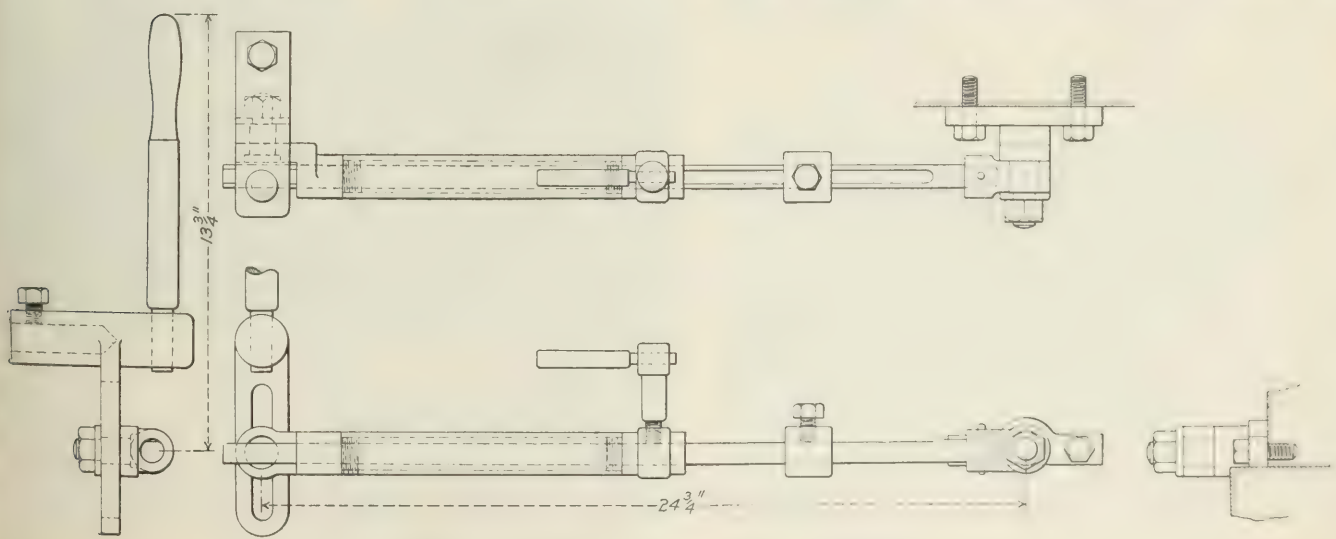


Fig. 45—Detail View of Taper Attachment.

attachment, two machines were used for this work. By the use of this attachment the cost of cutting threads on stay-bolts has been reduced 60 per cent. A novel feature of this attachment is that it can be adjusted to cut any taper from 1/2-in. to 2-in. in 12-in. It can be operated automatically and may be adapted to other arrangements in cutting both brass and iron.

TOOL FOR CUTTING FLUE SHEET HOLES.

In Fig. 47 is shown a tool for cutting holes in flue sheets. The particular feature of this holder is the small amount of high speed steel required, being only two pieces 3/8-in. x 3/4-in. x 2 1/8-in. The cutters are sawed to their proper length and then placed in a special jig in the lathe, four at a time, turned to the proper diameter with clearance, and bored with clearance on the inside. Another special feature is the provision

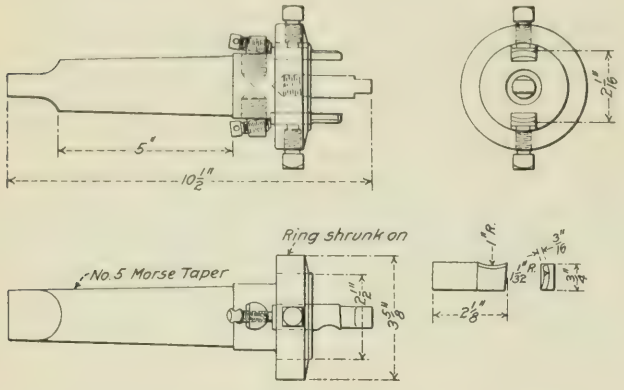


Fig. 47—Tool for Cutting Flue Sheet Holes.

for breaking the sharp corners on the flue hole. This is done by leaving a fillet in the cutter. The steel cutters are held rigid in the holder, which is provided with thrust screws, by which accurate adjustment of the cutters can be obtained.

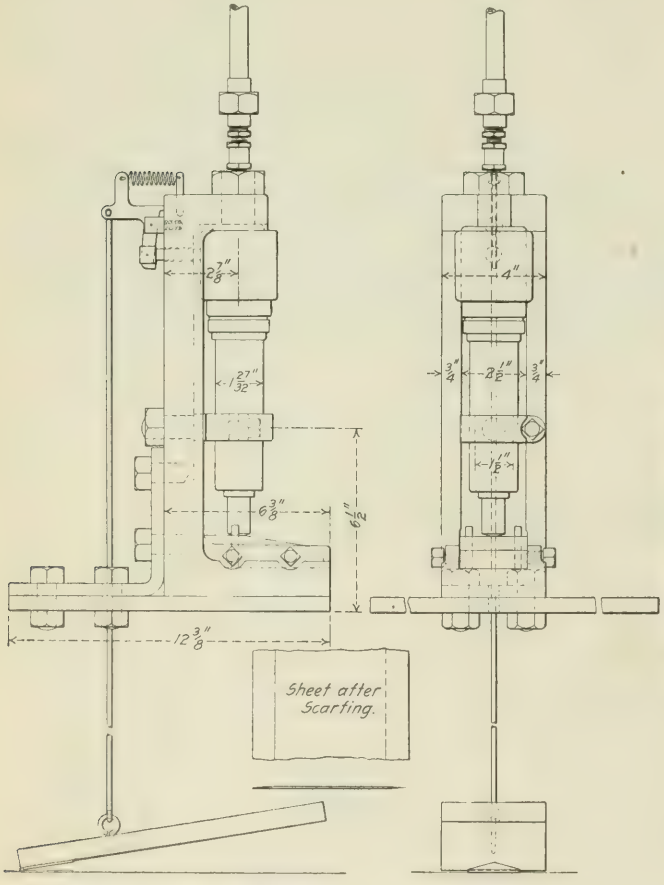


Fig. 48—Pneumatic Scarfing Hammer.

With this tool the flue holes are cut out in the corners chamfered in one operation at the rate of 60 holes per hour.

PNEUMATIC SCARFING HAMMER.

Fig. 48 shows a pneumatic scarfing hammer for making flue ferrules. Previous to having this machine this work was done by the use of a hammer, anvil and stool. Strips of galvanized iron were cut of a width equal to the circumference of the flue hole and about 24 in. long, and the edges were then hammered down by hand, after which the strips were cut into widths to suit the flue sheet. With the pneumatic hammer, however, which is bolted to a substantial bench, the strips are cut as mentioned above, but are fed through the hammer at a very rapid rate. The air is controlled by a pedal.

CHECK LIFTER.

Fig. 49 shows a very handy check lifter. The drawing shows the lifter as used on a consolidation engine check with flat seat. It very often occurs after the engine is steamed up

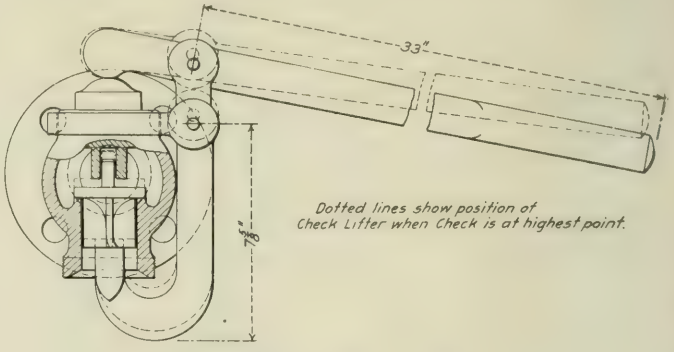


Fig. 49—Check Lifter.

that a chip or piece of scale lodges under the valve and prevents its closing. In this instance the check lifted is used and is applied by merely disconnecting the flange pipe. With this lifter it is possible to open a check against 200 lbs. boiler pressure.

ROLLS FOR JACKET IRON.

Fig. 50 shows a set of rolls used to form the round part of jackets for boiler heads. All of the Southern Pacific locomotives have their boiler heads covered with lagging jackets. Ordinarily planished iron is used, and forming the round part

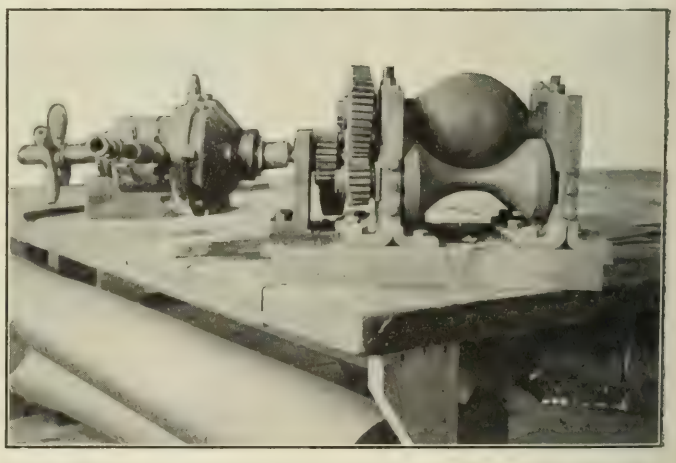


Fig. 50—Rolls for Jacket Iron.

by hand was a considerable job. The rolls are operated by an air motor, and a variety of radii may be obtained by adjusting the rolls. It will be noticed that heavy gears are required.

SHOP LOCOMOTIVE.

Fig. 51 shows a small locomotive that was originally used on one of the suburban runs. The cab was removed and a





Fig. 51—Shop Locomotive.

large saddle tank applied to give additional weight on the drivers. The stack is used as a mast for the 2½-ton crane, and suitable roller bearings are bolted on the inside of the stack to facilitate swinging the crane when carrying a load. An 8-in. air pump furnishes power to run the 2½-ton motor, which is bolted to the lower end of the boom. A ½-in. cable runs through the pipe over the sheave at the outer end of the boom. The turn-table at Los Angeles accommodates this engine and one of the larger ones at the same time, and it is used for transferring locomotives from one pit to another in the roundhouse. The crane is sufficiently strong to lift a pair of steel tired tender wheels, and sufficiently high to lift a pressed steel boiler front into place or handling cabs. It is also extensively used for loading and unloading material.

DRAWBAR AIR LIFT.

In Fig. 52 is shown a handy air lift, mounted on a low wagon and used to remove defective drawheads and replace new ones on tenders, cars, etc. The wagon is rolled under the tender or car and the pistons run up against the drawhead and yoke. The nuts are then easily removed and the drawhead lowered. The phantom illustration shows both the high and low positions of a drawhead on this lift.

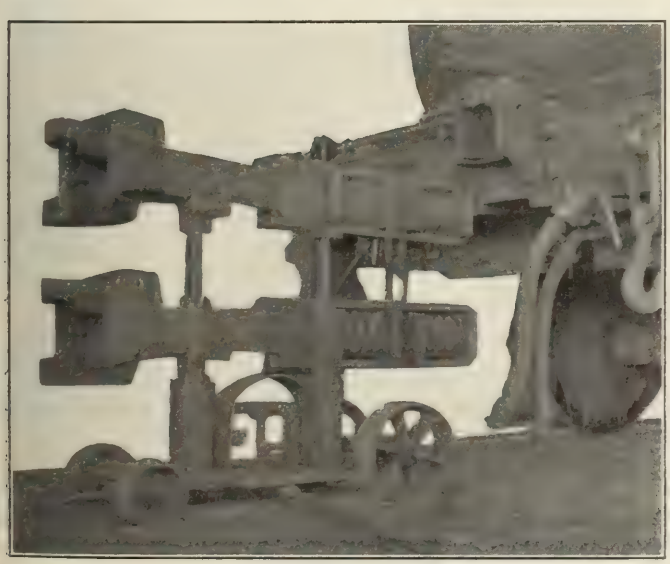


Fig. 52—Drawbar Air Lift.

DEVICE FOR PLACING WHEELS IN A LATHE.

Fig. 53 shows an air lift attachment to a coach wheel lathe for placing and removing wheels. The half-tone shows two



Fig. 53—Device for Placing Wheels in Lathe.

positions of the lift. The lower provides for running the wheels on to the lift, after which air is applied, causing the wheels to roll along the lift into position in the lathe.

AIR LIFT FOR TURNING WHEELS.

In Fig. 54 is shown an air lift set on the floor to turn



Fig. 54—Air Lift for Turning Wheels.

wheels from a pit track to the track along the center isle of the shop. One of these lifts is placed at the rear of each of the 24 pits. The sills are 18 in. in diameter and will take the heaviest driving wheels.

PNEUMATIC PRESS FOR FORMING GREASE CAKES.

Fig. 55 shows a pneumatic press for forming grease cakes. A feature of this device is the convenient way of refilling the cylinders after the grease has been pressed out. The cylinder is hinged, to be dropped down by removing a pin, after which the grease is easily removed. Three grease cakes for a 10-in. x 12-in. driving box journal can be made with one filling of the cylinder. The cake, 36 in. long, is pressed out at one end of the cylinder through a forming nozzle on to a table, where it is cut into suitable lengths with a knife attached, on a sliding hinge, to the back side of the table. The different sizes of nozzles are quickly placed, no screws being used to fasten them. The grease cylinder is made of 10-in. pipe, 17 in. long, and an ordinary 12-in. x 12-in. air cylinder.

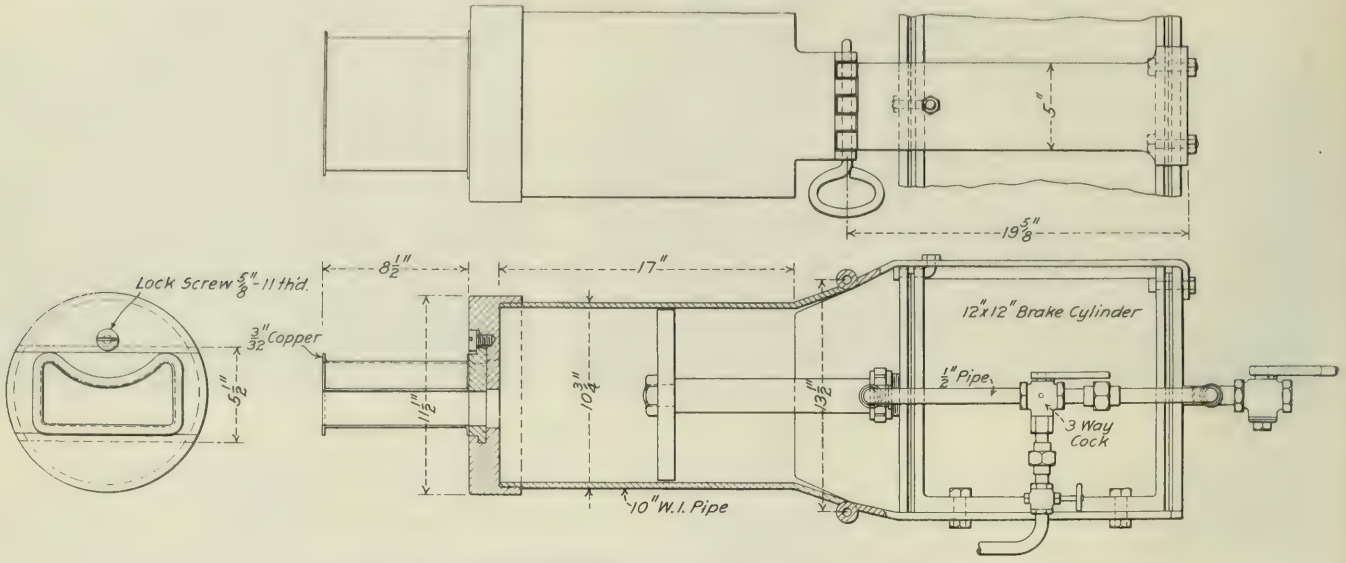


Fig. 55—Pneumatic Press for Forming Grease Cakes.

TWENTY-SIXTH COLLECTION.

BY L. M. GRANGER,
Asst. Gen'l Foreman, Erie Railroad, Galion, Ohio.
Collection Signed also by John Todd, Machine Foreman.

ECCENTRIC BLOCK JIG.

This chuck, Fig. 56, consists of a flat plate held in place on the boring mill by lugs which fit into the slots of the table. A boss is turned on the fact to enable finishing the eccentric at one chucking. The mandrel is securely held in position by a bolt inserted through the center of this boss, and is prevented from turning by a key. The eccentric block is then slipped on to the mandrel and is held by set screws.

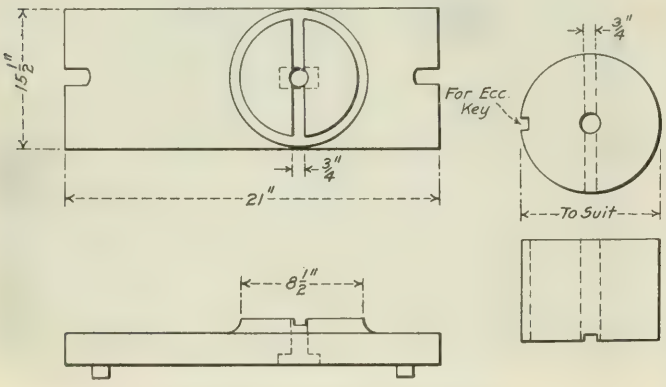


Fig. 56—Eccentric Block Jig.

CHUCK AND GAGE FOR CROWN BEARINGS.

Fig. 57 shows a V-block for setting crown bearings on a planer bed. This block is made from an ordinary pedestal casting, and is held in place on the planer by the lug which is cast on the bottom and machined to fit the slot in the platen. The brass, which has been previously machined on the lathe or on a vertical mill, is placed on the V-block, as indicated, and held in position by a long clamp and bolts, which latter also hold the V-block to the planer. The tool for obtaining the size of the brass from the box is also shown. It is adjusted to the box size by the thumb screws, and the end lugs are adjusted to the proper angle of the retaining shoulder. After the tool is adjusted to size it is placed against the end of the brass and the size transferred.

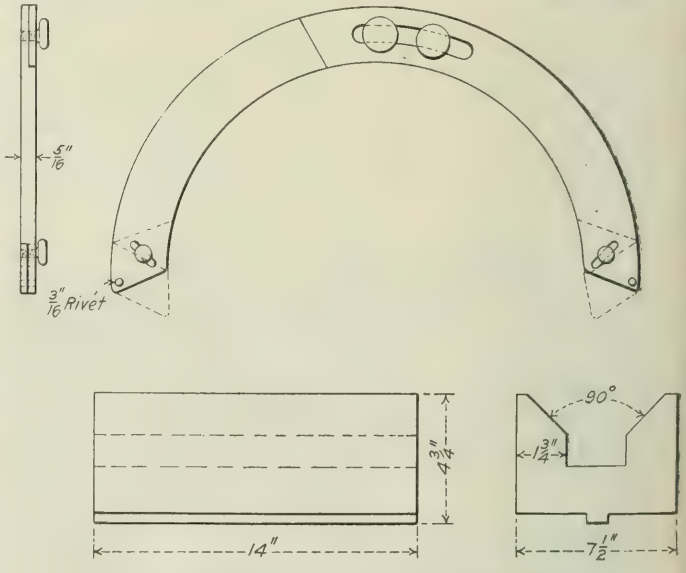


Fig. 57—Chuck and Gage for Crown Bearings.

SHOE AND WEDGE CHUCK.

This chuck, Fig. 58, is made of a forging. Lugs on the bottom fit into the grooves of the platen, and the clamps are inserted through the openings shown. The two sizes of chucks of this design are sufficient to accommodate all of the shoe and wedge sizes used in the Erie shops at Galion, Ohio.

The shoe or wedge is adjusted to position by four set screws, making it unnecessary to use shims. The construction of the chuck is such that these set screws are easily accessible. The

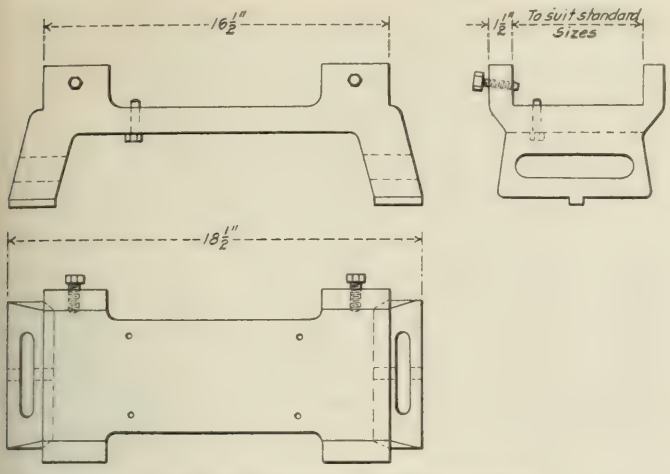


Fig. 58—Shoe and Wedge Chuck.

castings are held by the set screws, which engage it at an angle as shown.

TIRE WEAR GAGE.

The tire wear gage, shown in Fig. 59, is a very simple and

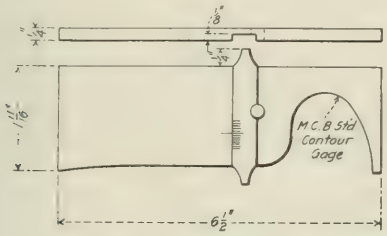


Fig. 59—Tire Wear Gage.

effective tool. The sliding blade, which is adjusted by means of a lock and nut bolt, is located one inch from the throat of the flange. The gage is placed in position over the flange, and the sliding blade pressed down to contact with the tire, the wear being indicated on the graduations. The straight side of the gage is used for measuring the wear of plain tires in a similar manner.

HORIZONTAL MILL GAGE.

This gage, Fig. 60, consists of a V-shaped block similar to the base of an ordinary surface gage. A needle or pointer is secured to the base and adjusted by the thumb screw and

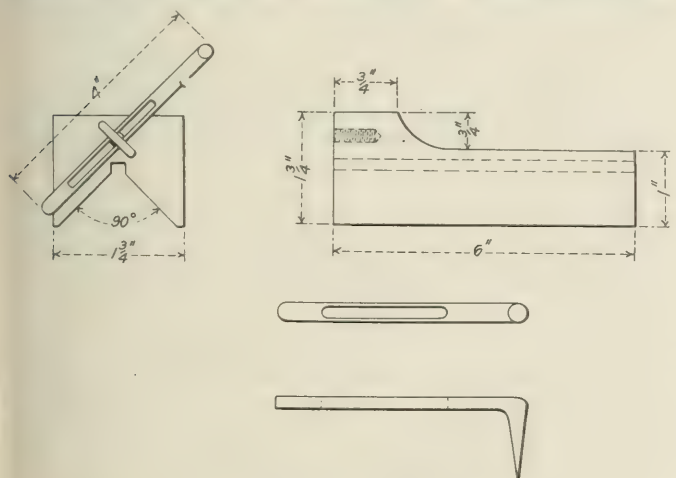


Fig. 60—Horizontal Mill Gage.

slot as shown. This tool is used for truing work similar to a surface gage.

MISCELLANEOUS KINKS.

BY JAMES STEVENSON.
Foreman, Pennsylvania Railroad, Olean, N. Y.

TEMPORARY RECEPTICLE FOR SAND.

The arrangement here shown, Fig. 61, is for use when repairing locomotive sand boxes. Two holes are drilled through the top of the barrel and an iron rod is run through it. Another hole is bored in the bottom, as shown, and a sheet iron valve is arranged for closing. When it is necessary to draw the sand from the box it is run into the barrel and repairs are completed, the barrel is lifted up over the sand box and the sand allowed to run into the box by opening the small valve shown.

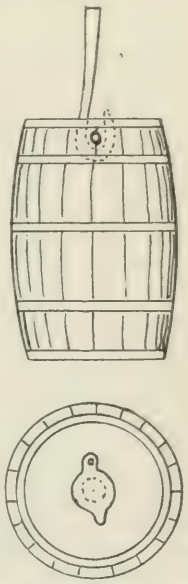


Fig. 61—Temporary Receptacle for Sand.

BY C. V. FRISK, CHICAGO.

METHOD OF DETERMINING RADII.

It is frequently necessary to obtain the radii of irregular parts of machinery, piping or patterns, and a templet of wood or cardboard is often used for this purpose. An easier and more rapid method is to use a piece of soft solder or wire, especially when the work is small. Before using, the wire should be straightened and freed of kinks. A stick, shaped on the end, as shown, is then used to form the wire to the desired shape. The portion of the circle may then be laid off on any flat surface and the radius easily determined.

The illustration, Fig. 62, shows wire used in this manner for obtaining the large radius of a steam pipe, and also for obtaining the small radius of the cross section.

Another method of obtaining the large radius of a steam pipe is also shown in the illustration. By this method it is possible to make a working sketch of such a pipe without re-

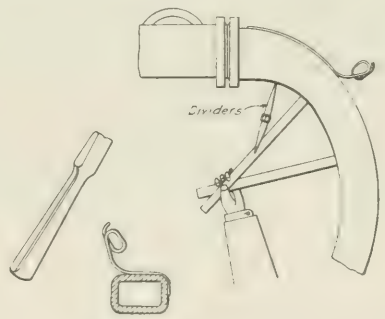


Fig. 62—Method of Determining Radii.

moving it from the engine. Two pieces of wood are held, as shown, to form a steady support, which is easily obtainable by placing the points of contact at some distance from each other. A pair of dividers is then adjusted, supporting one leg on one of the sticks as indicated. By marking the points of contact at several different points along the pipe the required center may be obtained.

NOTES FROM THE COLLINWOOD SHOPS OF THE LAKE SHORE.

The locomotive shop of the Lake Shore & Michigan Southern at Collinwood, Ohio, has 18 live pits for engine repairs, and its capacity has been gradually increased so that the output in general repairs is 50 engines per month or nearly

three engines per pit. It was not so long since one engine per pit was regarded as a high development of shop operation, but it was soon found possible to double this output, and under the high pressure of modern methods, three engines per pit is made possible. The shop capacity is no longer measured by pits but by machines, men and methods behind the pits and the degree to which they are forced to maximum capacity.

The locomotive builder and the manufacturer of railway supplies when required to increase capacity do not immediately build on an addition to the shop, but after it is keyed up to maximum output for the day, it is put on overtime, or a night shift is organized. This plan has been followed at Collinwood, and the large output has been made possible by a balancing of the different departments so that no one is waiting for the other, and material is always at hand ready for all who require it. When all such methods are applied, and some one or two departments are still behind the others, they are made to balance up by working increased hours and a night shift is put on.

The Lake Shore is one of the few railways which has nearly all its locomotives, including switch engines, fitted with the brick arch, and its success is largely due to the use of bricks in small units supported on arch tubes. These small units are easily handled; they are not liable to break, and can be readily removed and replaced for staybolt or tube repairs. The advantage of the brick arch as a smoke preventer is generally recognized, and when this can be obtained with a saving in fuel, an improvement in the water circulation and a large reduction in tube failures, it becomes a very important factor in locomotive practice. The experience of the Lake Shore with the Security brick arch for nearly three years has demonstrated these advantages beyond all doubt. It is estimated that the saving in fuel per annum amounts to nearly one-half million dolars, and the saving due to the reduction in tube repairs is also large. The average life of the arch in passenger engines is one month; freight engines, 1½ months, and switch engines, 4 to 5 months. The saving in fuel necessary to defray the expenses of the brick arch is 1.7 per cent. for passenger engines, 1 per cent. for freight engines and 0.5 per cent. for switch engines. The brick arch thus pays for itself in saving of fuel several times over, while the railway secures at the same time the advantages of reducing the smoke nuisance and tube failures. The arch tubes are kept clean by the use of a hydraulic tube cleaner made by the Liberty Manufacturing Co., Pittsburgh, Pa.

Another practice which is used perhaps more largely in the Collinwood shops than in others is the use of bronze bushings for the link motion, both Stephenson and Walschaerts, in place of case hardened bushings. The bronze bearings are not so liable to cut, they are quickly and easily made, and are much cheaper than the hardened bushing. This practice has been carried so far as to make the link block itself of bronze. The use of bronze shells and hub liners for steel driving boxes has already been illustrated in our pages, but a bronze face for the wearing portion next the wedge and shoe we have not before noticed, and it is now the general practice of this railway. These faces are cast on in the brass foundry as a separate operation after the shell and hub liner are cast.

The wooden pilot is being rapidly replaced on this railway by a short, stubby, pressed steel pilot which appears to answer all purposes and costs less to make and maintain. Railway tracks in the East and the Middle West are now so well protected that the long, slanting cow catcher is no longer necessary, and the pilot is growing shorter as this requirement is lessened, and we may before long reach a condition where the pilot will be abandoned and the two horn bars, seen on the side of European front bumpers, will answer our purpose also.

The number of apprentices at Collinwood given special instruction in both the school and the shop is unusually large, as more than 100 of them are here being prepared for the various trades in railway shops.

In each department a shop instructor devotes his entire time to the instruction of the apprentices in the use of tools, and a record is kept of their time on different machines. Each boy is given two hours' instruction two days per week in the drawing room and many of these drawings are for shop use. They are traced and sent to the mechanical engineer's office, where they are properly titled and issued as standard blueprints. It is not unusual for an apprentice to use in the shop a drawing which he made while in the drawing room and this is certainly a good example of the direct application of the school to industrial occupation.

The roundhouse at Colinwood is a busy place, as there are turned here 100 engines per day. The house contains 49 stalls and it is equipped with a modern hot water washing plant. On an average 18 engines are washed per day, or 540 per month, and the time consumed in washing each boiler is two hours. The number of men employed on strictly roundhouse work is 265.

The shop surgeon's office, with a complete hospital operating outfit, is located in the upper story of the shop office and it is found a great benefit to have such facilities conveniently at hand. Accident cases receive immediate attention from the surgeon and chances for infection which often exist in a dirty shop are, in a great measure, obviated. The time ordinarily lost in going to a doctor's office, and the often long wait there, are also avoided. An important part of the shop surgeon's duty is to make such investigation of shop accidents as to make practicable, if proper safeguards are installed, the avoidance of their occurrence. The surgeon makes a study of safety appliance laws and inspects and criticizes the shops with a view of complying with these laws. Sanitary conditions are also kept under constant inspection and intelligent suggestions are made where improvements are thought necessary. The surgeon also formulates laws regulating the workman's presence at the plant if contagious diseases exist at his home and if suspicious cases of tuberculosis are found a proper decision as to its disposal is made.

FOREIGN RAILWAY NOTES.

An 80-year concession for building and operating an electric funicular from Coyre, Switzerland, to Mittenberg, has been granted. The line is to be single track meter gage.

The total number of passengers carried by Argentine railways during 1908 was 47,150,384, and of cargo 32,211,007 tons were transported. During the past ten years merchandise traffic has increased 22 per cent.

The estimates of the Prussian State Railways for the coming year provide for the purchase of 141,000 tons of steel ties and 3,200,000 timber ties, the cost of the steel being about $200,000 less than that of timber ties.

Of 900 locomotives ordered, or to be ordered, for the coming year for the Prussian state railways, 397 are to be equipped with the Schmidt superheaters. Of the engines for passenger service, 270 out of 363 are to be superheaters, of the freight engines, 127 out of 537.

Beech ties, preserved with tar oil, have been coming into use in Germany, where there is a surplus of this timber (which differs from the American beech), largely because it was considered unfit for ties. An advocate of this wood claims that it costs $2,300 less per mile than iron ties and $1,150 less than pine ties, the latter requiring iron tier-plates, while hardwood tie-plates are used with beech. A further advantage is that beech ties can be laid in gravel ballast, while broken-stone ballast of the best kind is required for iron ties.

Supply Trade Section.

The Minnequa plant of the Colorado Fuel & Iron Co. at Pueblo, Colo., was destroyed by fire February 22. The loss is estimated in press reports at $500,000.

Walter H. Cottingham, president of the Sherwin-Williams Co., Cleveland, Ohio, has accepted the position of executive member of the Railway Business Association.

The Northern Engineering Works, Detroit, Mich., has recently delivered three 15-ton and one five-ton Northern cranes to the Globe Arizona plant of the Miami Copper Co., New York.

W. A. Ten Winkle, who for the last five years has been publicity manager of the Electric Controller & Mfg. Co., Cleveland, Ohio, has resigned to become affiliated with the Penton Publishing Co., Cleveland, Ohio, as a special representative.

Harry W. Finnell, for the past four years connected with the Chicago Railway Equipment Co., Chicago, has resigned to accept a position with the Carbon Steel Co., Pittsburgh, Pa., with headquarters at 30 Church street, New York. His resignation is effective March 1.

George P. Heinz & Co., Denver, Colo., have been appointed western selling agents for David Lupton's Sons Co., Philadelphia, Pa. The new agents will handle the territory west of the Missouri river in the sale of Lupton factory specialties, including the steel sash, rolled steel skylight, Pond operating device and Pond continuous sash.

The Isthmian Canal Commission will receive bids, until March 14, for hose, packing, gaskets and rubber belting (Circular No. 563), and until March 21 for a hoisting engine, pumps and motors, spiral riveted pipe and fittings, foot valves, dredging sleeves, push cars, revolving screen sections for rock crusher, steel, iron, switches, track frogs, tie plates, angle bars, track bolts and spikes, wooden tie plugs, piles, etc. (Circular No. 564.)

The McKeen Motor Car Co., Omaha, Neb., advises that its cars are now in operation in 18 states on 28 roads. Sixty cars are now in service, 55 of which are west of the Missouri river. The company makes a practice of delivering the cars on their own wheels and under their own power. One 70-ft. car for the Norfolk & Southern has recently made the trip in this manner from Omaha, Neb., to Norfolk, Va. Two cars for the Oregon Railroad & Navigation Company were sent in the same manner from Omaha to Portland, Ore.

The Oliver Iron Mining Co., Duluth, Minn., users of about 150 steam shovels, has just placed an order for class 80-18-3 Atlantic steam shovel equipment for the coming season with the Atlantic Equipment Co., New York. The conditions under which these steam shovels are operated, in stripping the overburden from the Missabe range ore deposits, are very severe. The material is glacial drift, consisting mainly of stiff, hard clay full of boulders as large as 100 cu. yds. in volume. The shovels are in service summer and winter, and are worked double shift. The temperature is often as low as 50 deg. below zero. This year's order for steam shovels was placed with the Atlantic Equipment Co. after a season's test of one of the new design, class 80-18-3 Atlantic shovels in the Mountain Iron and Burt-Pool mines during 1908-1909.

The railway department of the International Correspondence Schools, Scranton, Pa., has been engaged in revising its railway courses so as to keep them up to date. This year the work was begun earlier than usual, as it was desired to get instructions into the hands of students embodying the latest information on the construction, operation and care of the E. T. locomotive brake equipment, the K and L triple valves, Mallet compounds and other new apparatus, besides giving instruction regarding the locomotive and locomotive running which conforms to present practice. The revision is being made at the school's instruction rooms, 5037 Cottage Grove avenue, Chicago, and will not be finished for some weeks. Representatives have been sent by the railways with which the schools have contracts, so as to make sure that the instruction, when revised, will cover the conditions of service on the different railways, both in this country and in Canada. The representatives sent by the railways include traveling engineers, air-brake superintendents and instructors and engineers. The schools have found from past experience that the best results are obtained when revisions are made by representatives of the railways to whose employees the instruction is to be given. It is expected that the revised instruction will be ready for distribution by about May 1.

C. C. Steinbrenner, the new vice-president of the Galena-Signal Oil Co., New York, was born in Cleveland, Ohio, September 20, 1863, and was educated at the public schools of that city. From 1877 to 1880 he served as printer's apprentice in the German Baptist Publication Society of Cleveland and attended night school at the Spencerian Business College, where he studied bookkeeping and stenography under the founder of that system. In the spring of 1881 he was employed as stenographer and assistant clerk in the office of motive power department, C. & P. division of the Pennsylvania Railroad. Due to the removal of this office to Wellsville, Ohio, he resigned in the fall of the same year to accept a position as clerk in the office of the county auditor at Cleveland. In the spring of 1882 he returned to the Pennsylvania at Wellsville as assistant shop clerk, which position he resigned in the following September to become assistant clerk in the office of the superintendent of machinery of the Cleveland, Columbus, Cincinnati & Indianapolis at Cleveland. In 1885 he was promoted to be secretary to that officer and stenographer to the general attorney of the same road. In 1890 he was moved to Indianapolis and promoted to be chief clerk in the motive power department of the Cleveland, Cincinnati, Chicago & St. Louis. He resigned that position in May, 1893, and moved to Chicago to become chief clerk in the motive power department of the Illinois Central, which position he resigned in the following December to accept the position of auditor of the railway department of the Galena-Signal Oil Co., which he held until his election to the vice-presidency on February 10. General Charles Miller, president; Samuel A. Megeath, first vice-president and general manager, and L. J. Drake, vice-president, were re-elected on the same date.



C. C. Steinbrenner.

Truck Bolster Patent Decision.

The Simplex Railway Appliance Co., Chicago, has been confirmed in its ownership of an important detail, in truck bolsters, by a recent decision of Judge Hazel, of the United States District Court. The Kelley & Bauer patent, owned by the Simplex Company, was for an improvement on the Waldo H. Marshall car truck bolster, consisting of an upper compression member, an under tension member and a king post. The Marshall patent was defective in being weak at the ends where the compression and tension members were riveted together. The Kelley & Bauer patented design made these end fastenings strong enough by the simple method of bending the compression member to a line parallel with the approaching tension member, and then bending and overlapping the tension member and using a small strengthening piece. The judge had no difficulty in disposing of the claims of prior invention. He had, however, some apparent difficulty in meeting the contention that the invention was simply an "obvious mechanical expedient." The importance of the result, however, seems to overwhelm this contention. "The invention, concededly, was

not a big discovery, but it is satisfactorily shown that Bauer devised means to relieve the tension member from the stress of severe strain, with the result that the imperfections of the Marshall metallic bolster were obviated. To this extent he advanced the art, and by his adaptation achieved a new result." "Bauer's form of construction, as has already been said, was the first which was capable of obviating the imperfections of the Marshall bolster and in fulfilling the purpose of the invention."

Railway Business Association Represented at Washington.

At the hearing before the Senate Committee on Interstate Commerce, Feb. 18, George A. Post, president of the Railway Business Association, presented the following list of the members of the association:

Acme Machinery Co., Cleveland, Ohio
Adams & Westlake Co., Chicago.
Ajax Force Co., Chicago.
Ajax Mfg. Co., Cleveland, Ohio.
Allis-Chalmers Co., Milwaukee, Wis.
American Bank Note Co., New York.
American Brake Co., St. Louis.
American Brake-Shoe & Foundry Co., New York.
American Hoist & Derrick Co., St. Paul, Minn.
American Locomotive Company, New York.
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
American Radiator Co., Chicago.
American Steel Foundries, Chicago.
American Valve & Meter Co., Cincinnati, Ohio.
Anglo-American Varnish Co., Newark, N. J.
Baldwin Locomotive Works, Philadelphia, Pa.
Barney & Smith Car Co., Dayton, Ohio.
Barnum, Richardson Co., Lime Rock, Conn.
Bass Foundry & Machine Co., Fort Wayne, Ind.
Beaver Dam Malleable Iron Co., Beaver Dam, Wis.
Bettendorf Axle Co., Davenport, Iowa.
Block-Pollak Iron Co., Chicago.
Blue Island Car & Equipment Co., Chicago.
Bordo, L. J., Co., Philadelphia, Pa.
Bosley, D. W., Co., Chicago.
Boston Belting Co., Boston, Mass.
Bourne-Fuller Co., Cleveland, Ohio.
Bowser, S. F., & Co., Inc., Fort Wayne, Ind.
Bradley, Osgood & Sons, Worcester, Mass.
Bridgeport Malleable Iron Co., Bridgeport, Conn.
Brill, J. G., Co., Philadelphia, Pa.
Brooker, Chas. F., Ansonia, Conn.
Brown Car Wheel Works, Buffalo, N. Y.
Buckeye Steel Castings Co., Columbus, Ohio.
Bucyrus Co., South Milwaukee, Wis.
Buda Co., Chicago.
Buffalo Brake-Beam Co., New York.
Buffalo Car Wheel Foundry Co., Buffalo.
Camel Co., Chicago.
Central Coal & Coke Co., Kansas City, Mo.
Champion Rivet Co., Cleveland, Ohio.
Chase, L. C., & Co., Boston, Mass.
Chicago Bridge & Iron Works, Chicago.
Chicago Car Heating Co., Chicago.
Chicago Pneumatic Tool Co., Chicago.
Chicago Railway Equipment Co., Chicago
Chicago Varnish Co., Chicago.
Cleveland Copper Ferrule Co., Cleveland, Ohio.
Cleveland Frog & Crossing Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland, Ohio.
Clow, James B., & Sons, Chicago.
Columbia Nut & Bolt Co., Inc., Bridgeport, Conn.
Commonwealth Steel Co., St. Louis, Mo.
Consolidated Car Heating Co., Albany, N. Y.
Crerar, Adams & Co., Chicago.
Curtain Supply Co., Chicago
Cyclops Steel Works, Titusville, Pa
Dayton Malleable Iron Co., Dayton, Ohio.
Dayton Manufacturing Co., Dayton, Ohio.
Dearborn Drug & Chemical Works, Chicago.
Decatur Car Wheel Co., Atlanta, Ga
Devoe, F. W., & Raynolds, C. T., Co., New York.
Dickson Car Wheel Co., Houston, Tex.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Dressel Railway Lamp Works, New York.
Dudgeon, Richard, New York.
Eccles & Smith Co., San Francisco, Cal.
Edwards, O. M., Co., Syracuse, N. Y.
Ehret Magnesin Mfg. Co., Philadelphia, Pa.
Electric Railway Journal, New York.
Elliot Frog & Switch Co., East St. Louis.
Faessler, J. W., Mfg. Co., Moberly, Mo.
Fairbanks, Morse & Co., Chicago.
Featherstone Foundry & Machine Co., Chicago.
Flannery Bolt Co., Pittsburgh, Pa.
Flood & Conklin Co., Newark, N. J.
Forsyth Brothers Co., Chicago.
Franklin Mfg. Co., Franklin, Pa.
Franklin Railway Supply Co., Franklin, Pa.
Galena-Signal Oil Co., Franklin, Pa.
General Electric Co., New York
General Railway Supply Co., Chicago.
Gifford-Wood Co., Hudson, N. Y., and Chicago.
Gray, Peter, & Sons, East Cambridge, Mass.
Gold Car Heating & Lighting Co., New York.
Gould Coupler Company, New York
Griffin Wheel Co., Chicago.
Hale & Kilburn Mfg. Co., Philadelphia, Pa.
Hall Signal Co., New York.
Hammett, H. G., Troy, N. Y
Hart Steel Co., Elyria, Ohio.
Hartshorn, Stewart, Co., East Newark, N. J
Haskell & Barker Car Co., Michigan City, Ind.
Heath & Milligan Mfg. Co., Chicago.
Hewitt Mfg. Co., Chicago.
Hibbard, Spencer, Bartlett & Co., Chicago.
Hickman, Williams & Co., Chicago.
Hines, Edward, Lumber Co., Chicago
Hunt, Robert W., & Co., Chicago.
Hunt Spiller Mfg. Corporation, Boston, Mass.
Hutchins Car Roofing Co., Detroit, Mich.
Independent Pneumatic Tool Co., Chicago.
Inland Steel Co., Chicago.
International Steam Pump Co., New York.
Interstate Iron & Steel Co., Chicago.
Iroquois Iron Co., Chicago.
Jenkins Brothers, New York.
Johns-Manville, H. W., Co., New York.
Joseph, Isaac, Iron Co., Cincinnati, Ohio.
Joyce, Cridland Co., Dayton, Ohio.
Joyce-Watkins Co., Chicago.
Kay & Ess, Dayton, Ohio.
Keasbey & Mattison Co., Ambler, Pa.
Keith Car & Mfg. Co., Sagamore, Mass.
Kerite Insulated Wire & Cable Co., New York.
Kirby Equipment Co., Chicago.
Laconia Car Company, Boston, Mass.
Lake Erie Iron Co., Cleveland, Ohio.
Lidgerwood Mfg. Co., New York.
Lobdell Car Wheel Co., Wilmington, Del.
Locomotive Finished Material Co., Atchison, Kan.
Long, Chas. R., Jr., Co., Louisville, Ky.
Lowe Bros. Co., Dayton, Ohio.
Lufkin Rule Co., Saginaw, Mich.
Magnus Metal Co., New York.
Manning, Maxwell & Moore, Inc., New York.
Marshall Car Wheel Foundry Co., Marshall, Tex.
Marshall-Wells Hardware Co., Duluth, Minn.
Marvin Manufacturing Co., Ltd., Franklin, Pa.
Maryland Car Wheel Works, Baltimore, Md.
McConway & Torley Co., Pittsburgh, Pa.
McCord & Company, Chicago.
McQuesten, Geo., Co., Boston, Mass.
Metal Plated Car & Lumber Co., New York.
Midland Steel Company, Philadelphia, Pa.
Milwaukee Coke & Gas Co., Milwaukee, Wis.
Miner, W. H., Co., Chicago.
Missouri Malleable Iron Co., East St. Louis, Ill.
Morden Frog & Crossing Works, Chicago.
More-Jones Brass & Metal Co., St. Louis, Mo.
Mott, J. L., Iron Works, New York.
Mound City Paint & Color Co., St. Louis, Mo.
Mt. Vernon Car Mfg. Co., Mount Vernon, Ill.
Murphy Varnish Company, Newark, N. J.
Nathan Manufacturing Co., New York.
National Machinery Co., Tiffin, Ohio.
National Malleable Castings Co., Cleveland, Ohio.
National Lock Washer Co., Newark, N. J.
New York Air Brake Co., New York.
New York Belting & Packing Co., Ltd., New York.
New York Car Wheel Co., Buffalo, N. Y.
Niles-Bement-Pond Co., New York.
Northwestern Fuel Co., St. Paul, Minn.
Pantasote Co., New York.
Parkesburg Iron Co., Parkesburg, Pa
Patterson-Sargent, Co., Cleveland, Ohio.
Peerless Rubber Mfg. Co., New York
Pettibone, Mulliken & Co., Chicago.
Pickands, Brown & Co., Chicago.
Pittsburgh Forge & Iron Co., Pittsburgh, Pa.
Pittsburgh Spring & Steel Co., Pittsburgh, Pa.
Pneumatic Gate Co., Chicago.
Poole Bros., Chicago.
Portland Iron & Steel Co., Boston, Mass.
Pratt & Lambert, Inc., Buffalo, N. Y.
Pratt & Letchworth Co., Buffalo, N. Y.
Pyle-National Electric Headlight Co., Chicago.
Quaker City Rubber Co., Philadelphia, Pa.
Railway Age Gazette, New York.
Railroad Supply Co., Chicago.
Railway Steel Spring Co., New York.
Ramapo Foundry & Wheel Works, Ramapo, N. Y.
Ramapo Iron Works, Hillburn, N. Y.
Rand, McNally & Co., Chicago.
Rank & Goodell, St. Paul, Minn.
Republic Iron & Steel Co., Pittsburgh, Pa.
Robinson, Cary & Sands Co., St. Paul, Minn
Rodger Ballast Car Co., Chicago.
Rogers, Brown Co., Chicago.
Ryerson, Jos. T., & Son, Chicago.
Safety Car Heating & Lighting Co., New York.
Schieren Company, Charles A., New York.
Scully Steel & Iron Co., Chicago.
Seattle Car Mfg. Co., Seattle, Wash.
Sellers, William, & Co., Inc., Philadelphia, Pa.
Sherburne & Co., Boston, Mass.
Sherwin-Williams Co., Cleveland, Ohio.
Simmons Hardware Co., St. Louis, Mo
Sipe, James B., & Co., Pittsburgh, Pa
Soper Lumber Co., Chicago.
Spring Lake Iron Co., Fruitport, Mich.
Standard Car Truck Co., Chicago.
Standard Car Whheel Co., Cleveland, Ohio.
Standard Coupler Co., New York.
Standard Forgings Co., Chicago.
Standard Paint Co., New York.
Standard Railway Equipment Co., Pittsburgh, Pa.
Standard Steel Car Co., New York.
Standard Steel Works Company, Philadelphia, Pa.
Storrs Mica Co., Owego, N. Y.
Symington, T. H., Co., Baltimore, Md.
Taylor, W. P., Co., Buffalo, N. Y.
Titan Steel Casting Company, Newark, N. J.
Treat, C. A., Mfg., Co., Hannibal, Mo.
Tyler Tube & Pipe Co., Washington, Pa.
Tyler, W. S., Co., Cleveland, Ohio.
Union Draft Gear Co., Chicago.
Union Steel Casting Co., Pittsburgh, Pa.
Union Switch & Signal Co., Swissvale, Pa.

United Supply & Mfg. Co., Chicago.
U. S. Metal & Mfg. Co., New York.
U. S. Metallic Packing Co., Philadelphia, Pa.
Upham & Agler, Chicago.
Walsh, P. T., Davenport, Iowa.
Walworth Manufacturing Co., Boston, Mass.
Ward Equipment Co., New York.
Warner & Swasey Co., Cleveland, Ohio
Waterous Engine Works, Co., St. Paul, Minn.
Western Electric Co., New York.
Western Railway Equipment Co., St. Louis, Mo.
Westinghouse Air Brake Co., Pittsburgh, Pa.
Westinghouse, Church, Kerr & Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Westmoreland Coal Company, Pittsburgh, Pa.
White Enamel Refrigerator Co., St. Paul, Minn.
Whiting Foundry Equipment Co., Harvey, Ill.
Willard Sons & Bell Co., Chicago.
Wood, Guilford S., Chicago.
Worth Brothers Co., Coatesville, Pa.
Wyckoff Pipe & Creosoting Co., New York.

Mr. Post called the attention of the committee to the fact that the association represents an investment of capital of over $800,000,000. He pointed out that the supply manufacturers were the ultimate consumers of the discipline which Congress is imposing on the railways; they employed about 1,500,000 workmen, supporting families aggregating five or six million individuals, and all these people were affected when investors became convinced that railway regulation was proceeding too fast, and hesitated to lend their money.

Mr. Post further said: We earnestly urge that you, acting as trustees for us and those dependent upon us, may scrutinize each of these proposed provisions with the same anxious care as you would if it were your own business which was to be regulated. Commerce at best is beset with uncertainties. We who gain our livelihood by purveying to public utility enterprises have the greatly exaggerated uncertainty of never knowing very long in advance under what statutes we may be obliged to operate. If you should demonstrate, by your moderation in the present congress, that you sympathize with our difficulties and necessities and hold a purpose to proceed gradually rather than abruptly, you would give courage and confidence to those whose courage and confidence mean everything to us.

May we not respectfully suggest for your consideration this test to be applied to each legislative proposal: Is it absolutely necessary in the public interest, at this time, when business conditions are not yet fully restored to normal, to enact this provision?

M. M. and M. C. B. Conventions.

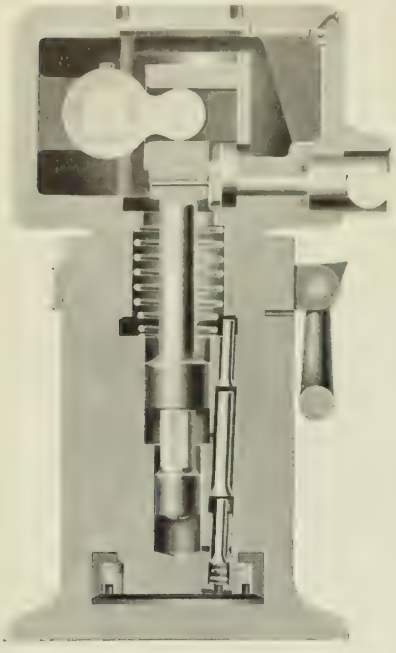
Last week we noted the drawing for exhibit space in connection with the June conventions of the American Railway Master Mechanics' and Master Car Builders' Associations, at which 95 per cent. of space available on the Million Dollar Pier at Atlantic City had been allotted. Following is a list of those to whom definite locations were assigned:

Acme White Lead & Color Works, Detroit, Mich.
Adams & Westlake Co., Chicago.
American Balance Valve Co., Jersey Shore, Pa.
American Brake-Shoe & Foundry Co., New York.
American Car & Foundry Co., New York.
American Engineer and Railroad Journal, New York.
American Joxyl Co., New York.
American Mason Safety Tread Co., Boston, Mass.
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
American Radiator Co., Chicago.
American Steel Foundries, Chicago.
Armstrong-Blum Mfg. Co., Chicago.
Armstrong Bros. Tool Co., Chicago.
Barney & Smith Car Co., Dayton, Ohio.
Besly & Co., Chas. H., Chicago.
Bettendorf Axle Co., Davenport, Ia.
Bird & Co., J. A. & W., Boston, Mass.
Bowser & Co., S. F., Fort Wayne, Ind.
Boyle & Co., Inc., John, New York.
Buckeye Steel Castings Co., Columbus, Ohio.
Buffalo Brake Beam Co., New York.
Burroughs Adding & Listing Machine Co., Detroit, Mich.
Butler Drawbar Attachment Co., Cleveland, Ohio.
Carborundum Co., Niagara Falls, N. Y.
Carnegie Steel Co., Pittsburgh, Pa.
Chase & Co., L. C., Boston, Mass.
Chicago Car Heating Co., Chicago.
Chicago Railway Equipment Co., Chicago.
Chicago Steel Car Co., Chicago.
Chicago Varnish Co., Chicago.
Chisholm & Moore Mfg. Co., Cleveland, Ohio.
Cleveland Car Specialty Co., Cleveland, Ohio.
Clew & Sons, Jas. B., Chicago.
Commercial Acetylene Co., New York.
Commonwealth Steel Co., St. Louis, Mo.
Consolidated Car Heating Co., New York.
Consolidated Railway Electric Lighting & Equipment Co., New York.
Continental Railway Equipment Co., Chicago.
Crane Company, Chicago.
Crosby Steam Gage & Valve Co., Boston, Mass.
Curtain Supply Co., Chicago.
Damascus Brake Beam Co., Cleveland, Ohio.
Davis Solid Truss Brake Beam Co., Wilmington, Del.
Dearborn Drug & Chemical Works, Chicago.
Detroit Hoist & Machine Co., Detroit, Mich.
Detroit Lubricator Co., Detroit, Mich.
Dickinson, Inc., Paul, Chicago.
Dixon Crucible Co., Joseph, Jersey City, N. J.
Dressel Railway Lamp Works, New York.
Duff Mfg. Co., Pittsburgh, Pa.
Durbin Auto. Safety Car Coupler Co., Fort Scott, Kan.
Edwards Co., O. M., Syracuse, N. Y.
Electric Hose & Rubber Co., Wilmington, Del.
Electric Railway Journal, New York.
Electric Storage Battery Co., Philadelphia, Pa.
Faessler Mfg. Co., J., Moberly, Mo.
Fairbanks, Morse & Co., Chicago.
Flannery Bolt Co., Pittsburgh, Pa.
Flower Waste & Packing Co., New York.
Forsyth Bros. & Co., Chicago.
Ford & Johnson Co., Michigan City, Ind.
Foster Co., Walter H., New York.
Franklin Mfg. Co., Franklin, Pa.
Franklin Railway Supply Co., New York.
Frost Railway Supply Co., Detroit, Mich.
Galena-Signal Oil Co., Franklin, Pa.
Garlock Packing Co., Palmyra, N. Y.
General Electric Co., Schenectady, N. Y.
General Railway Supply Co., Chicago.
Gold Car Heating & Lighting Co., New York.
Goldschmit Thermit Co., New York.
Gould Coupler Co., New York.
Gray & Sons, Inc., Peter, Boston, Mass.
Greene Tweed & Co., New York.
Grip Nut Co., Chicago.
Hale & Kilburn Mfg. Co., Philadelphia, Pa.
Hammett, H. G., Troy, N. Y.
Harrington, Son & Co., Inc., Edwin, Philadelphia, Pa.
Heywood Bros. & Wakefield Co., Wakefield, Mass.
Hobart-Allfree Co., Chicago.
Home Rubber Co., Trenton, N. J.
Hunt-Spiller Mfg. Corporation, Boston, Mass.
Hutchins Car Roofing Co., Detroit, Mich.
Illinois Malleable Iron Co., Chicago.
Independent Pneumatic Tool Co., Chicago.
Jenkins Bros., New York.
Johns-Manville Co., H. W., New York.
Joliet Railway Supply Co., Joliet, Ill.
Joyce-Cridland Co., Dayton, Ohio.
Kerite Insulated Wire & Cable Co., New York.
Keystone Drop Forge Works, Chester, Pa.
Keystone Lantern Co., Philadelphia, Pa.
King Automatic Car Platform Co., Washington, D. C.
Landis Machine Co., Waynesboro, Pa.
Landis Tool Co., Waynesboro, Pa.
Linde Air Products Co., Buffalo, N. Y.
Lupton's Sons Co., David, Philadelphia, Pa.
Macleod & Co., Walter, Cincinnati, Ohio.
Manning, Maxwell & Moore, Inc., New York.
Mason Regulator Co., Boston, Mass.
Massachusetts Mohair Plush Co., Boston, Mass.
McConway & Torley Co., Pittsburgh, Pa.
McCord & Co., Chicago.
Midvale Steel Co., Philadelphia, Pa.
Modoc Soap Co., Philadelphia, Pa.
Molleson Co., Geo. E., New York.
Nathan Manufacturing Co., New York.
National-Acme Mfg. Co., Cleveland, Ohio.
National Lock Washer Co., Newark, N. J.
National Malleable Castings Co., Cleveland, Ohio.
National Railway Devices Co., Chicago.
Nelson Valve Co., Philadelphia, Pa.
Newhall Engineering Co., Geo. M., Philadelphia, Pa.
Nichols & Bro., Geo. P., Chicago.
Nickelized Castings Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York.
Norton, Inc., A. O., Boston, Mass.
Norton Company, Worcester, Mass.
Pantasote Co., New York.
Parkesburg Iron Co., Parkesburg, Pa.
Pittsburgh Equipment Co., Pittsburgh, Pa.
Pocket List of Railroad Officials, New York.
Pressed Steel Car Co., Pittsburgh, Pa.
Railway Age Gazette, New York.
Railway and Engineering Review, Chicago.
Rapp Co., John W., New York.
Restein Co., Clement, Philadelphia, Pa.
Revolute Machine Co., New York.
Royersford Foundry & Machine Co., Royersford, Pa.
Safety Car Heating & Lighting Co., New York.
Scully Steel & Iron Co., Chicago.
Sellers & Co., Inc., Wm., Philadelphia, Pa.
Spencer Turbine Cleaner Co., Hartford, Conn.
Standard Car Truck Co., Chicago.
Standard Coupler Co., New York.
Standard Steel Car Co., Pittsburgh, Pa.
Standard Steel Works Co., Philadelphia, Pa.
Stoever Foundry & Mfg. Co., New York.
Storrs Mica Co., Owego, N. Y.
Symington Co., T. H., Baltimore, Md.
Taylor Mfg. Co., J. I., Bloomfield, N. J.
Taylor Co., W. P., Buffalo, N. Y.
Templeton, Kenly & Co., Ltd., Chicago.
Titan Steel Casting Co., Newark, N. J.
Toledo Pipe Threading Machine Co., Toledo, Ohio.
Trenton Malleable Iron Co., Trenton, N. J.
Underwood & Co., H. B., Philadelphia, Pa.
Union Draft Gear Co., Chicago.
Union Fibre Co., Winona, Minn.
Union Mfg. Co., New Britain, Conn.
Union Spring & Mfg. Co., Pittsburgh, Pa.
U. S. Metallic Packing Co., Philadelphia, Pa.
U. S. Metal & Mfg. Co., New York.
Vanadium Metals Co., Pittsburgh, Pa.
Vanadium Sales Co. of America, Pittsburgh, Pa.
Ward Equipment Co., New York.
Watson-Stillman Co., New York.
Welsbach Company, Philadelphia, Pa.

West Disinfecting Co., New York.
Western Railway Equipment Co., St. Louis, Mo.
Westinghouse Air Brake Co., Pittsburgh, Pa.
Wheel Truing Brake Shoe Co., Detroit, Mich.
Whipple Supply Co., New York.
Yale & Towne Mfg. Co., New York.

Car Inspector's Jack.

The Dudgeon universal plain type car inspector's hydraulic jack shown in section is said to be the latest improved type of car inspector's jack made. The advantages of this jack over others used by car inspectors are in its speed, lightness and compactness. By referring to the sectional view it will be seen that the jack has two pumps, so that the ram may be run out to meet a load or can lift a light load with double the speed that would be possible with a single pump jack. When it is desired to throw out the auxiliary pump, the valve handle, shown on the side of the cut, is given a quarter turn. The auxiliary pump is then thrown out and the jack has the action of a single pump jack. It will also be noticed that the pistons are arranged in tandem instead of side by side, as is usual in the case of a double pump jack. It will readily be seen that this gives a direct thrust of the operating lever, doing away with the side strain which exists when two pistons are placed side by side and one only is in use. The valves are also placed in tandem, which has the advantage that either piston or any valve may fail and the jack continue operating to the extent of its capacity. All parts of this jack are interchangeable. The small parts are made by automatic machinery, so that they are easily replaceable.



Car Inspector's Jack.

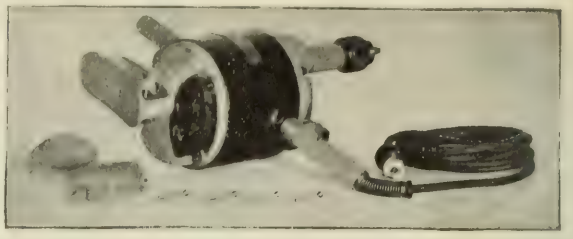
It will be seen that the ram, pump and head containing the reservoir are made in one piece, and that the cylinder and bottom are made in one piece. This greatly reduces the number of parts and consequent joints.

Only two of the three valves are used at a time. If the double pumps are used, the top and the bottom valves are used. If the upper pump is thrown out, the middle and the lower valve only are used. This type of jack contains the universal system of valves and valve control, which has the following distinct advantages: A double pump; a single pressure valve; but three valves in all; one pressure valve, which lowers by means of an independent lowering device; jack lowers by means of both the lever and the valve handle; the position of the valve is indicated by means of the lowering device; the jack can be used horizontally with lever working at an angle; it has superimposed valves and pistons; is provided with valves and pistons that will perform each other's work in case of necessity; the pump may be used while the valves are open, and access to the valves is obtained by the removal of one bonnet. The ball air valve permits the escape of air, but prevents the loss of fluid with which the jack is charged, regardless of the position in which it may be placed. The jack is the 15-ton size, 11 in. high, lifts 5 in. and weighs 43 lbs. It is made by Richard Dudgeon, New York.

Alternating Current Portable Drill.

The direct-current portable breast drill, designed by the General Electric Co., Schenectady, N. Y., is said to have met with such favor that the company is now manufacturing an alternating-current drill, which possesses all the superior features of the direct-current drill and permits the use of this device where alternating-current only is available.

The ruggedness of the design required to withstand hard usage has been duly considered and the drill's weight has been reduced to 21 lbs., which allows its being handled by one person with great ease and rapidity. Two nurled side handles and a breast plate provide ample means for holding the drill securely in position, and an indicating control switch for starting and stopping the motor is located conveniently near the right handle, so that the drill can be operated without releasing the hold. Hand holes provide easy access to the commutators and brushes for inspection and repairs.

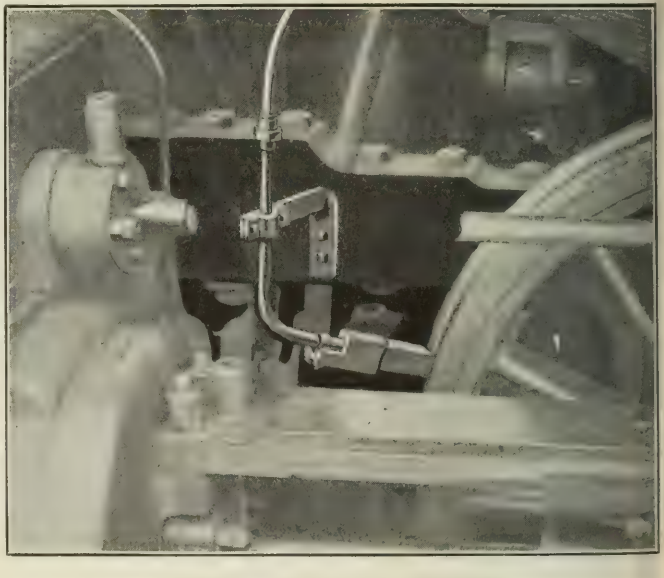


Alternating Current Portable Drill.

The drill is fitted with a Jacobs chuck to take drills up to and including ⅜-in. in diameter. It is said that this machine will drill a ⅜-in. hole, 1 in. deep, in cast iron, in 27 seconds, and the same hole in machine steel in 95 seconds; also, that it will satisfactorily operate a ¾-in. wood bit. It is designed for operation on a 110 or 220-volt, 60-cycle circuit, the connection being made to an ordinary lamp socket plug.

Martin Wheel Flange and Rail Lubricator.

With the increased size and weight of locomotives there has been an increased amount of wear on the flanges and rails, due largely to the rolling motion caused by the height of the locomotive above the rail and to the additional length of rigid wheel base, both of which contribute materially to excessive wear between the fillet of the flange and the inner wearing surface of the rail head. The effect has become particularly noticeable in cost of repairs incidental to changing wheels and tires for turning, and also in rail renewals.



Martin Lubricator in Position.

The Martin wheel flange and rail lubricator shown in the accompanying half-tone has an oil receptacle with gravity sight feed located in the engine cab and connected by suitable piping leading along either side of the boiler to the distributing shoe placed near the flange. This shoe feeds the lubricant at the point of contact with the inner wearing surface of the rail. A bracket, clamped to the piping, holds

the distributing shoe at an angle of about 45 deg. with the center line of the engine. The lower end of the shoe is about 1 in. from the flange and 4 to 6 in. above the horizontal center line of the wheel. In case the wheel flange is worn the insert in the end of the shoe should be shaped to conform.

A statement in detail of the results obtained by the application of this device to the forward driving wheels on 69 consolidation engines on the Southern Pacific Railway was published in the *Railway Age Gazette* of January 15, 1909, page 119. From this data it appears that there is a notable saving in tender as well as driving wheel flanges.

This lubricator is patented by J. C. Martin, 210 Balboa building, San Francisco, Cal.

Fairbanks-Morse Inspection Car.

The following record of a run made by a Fairbanks-Morse, Chicago, motor inspection car, illustrated herewith, is an abstract from an article in the Brisbane, South Queensland, *Telegraph*. C. Evans, who is referred to, is an officer of the South Queensland Lines, the company owning the car:

"C. Evans, general traffic manager, started from Brisbane last Monday morning to inspect the line, traveling by the Fairbanks-Morse railway motor inspection car. The car worked splendidly, and without any trouble whatever climbed the main range at a speed of 12 to 15 miles an hour, which rate, Mr. Evans says, could have been greatly increased, if necessary. At various places the road was inspected, stops being made at places where work is in progress. Most of the trip was made in a heavy rain, and as the line is laid on sticky black soil and is unfenced, the traveling was exceedingly difficult, as the car had to plow its way through mud that had been carried onto the rails by teams of bullocks crossing and re-crossing the tracks. At Toowoomba the party was advised that the Bell line was blocked by floods, so after consulting with the district engineer Mr. Evans decided to go out on it. They accordingly made the run to Dalby, where they found that the Bell train had not arrived. A gang was sent out on a pump trolley and the inspection car followed. For about the first six miles they ran through three or four inches of water and the traveling was made slower by the sludge on the rails. Mr. Evans and his party found the delayed train at an intermediate point, sent it ahead and proceeded to Bell. Mr. Evans said this morning, when he returned to Brisbane, that the motor car was given a very severe test, covering nearly 600 miles, some of the traveling being exceedingly heavy, and it was generally agreed that it performed excellent service and proved its suitability as an inspection car."



Inspection Car on the South Queensland Lines.

A full description of this car was given in the *Railroad Gazette* of Dec. 6, 1907.

Double-Acting Door Check.

Doors equipped with double-acting spring hinges, permitting them to swing in both directions, oscillate a number of times before coming to rest when they are closed. This action is dangerous to those passing through, is noisy and permits drafts. To overcome this the Yale & Towne Mfg. Company, New York, has designed the Yale double-acting door check, which causes the door, when closing in either direction, to move quietly, but quickly, to the neutral position, and then to stop. It is constructed on the same principles as the Blount door check for single-acting doors except that it is, of course, a checking device only.



Double-Acting Door Check on Door Opened In.

The check consists of a short vertical cylinder, through the top of which projects the spindle, to which is attached the main arm. To the outer end of the latter is attached the adjusting arm, the other end of which is fastened to the door jamb, so that as the door moves the spindle is caused to rotate.

By an ingenious construction of the main arm bracket the door is free to swing in both directions, the arms dropping below the soffit of the door frame when the door swings to the side opposite to that on which the door check is attached, and passing over the top of the door when the latter is moved in the contrary direction.



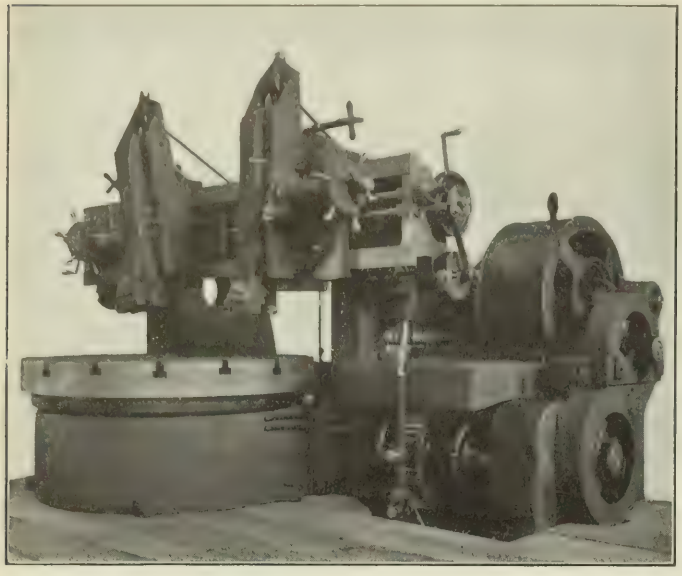
Double-Acting Door Check on Door Opened Out.

The horizontal transverse cylinder at the bottom contains the liquid chamber, the piston, and the regulating valves by which the action of the door may be controlled independently in each direction, according to the varying conditions of wind pressure. The non-freezing liquid is hermetically sealed within the liquid chamber, and a third regulating valve controls the resistance of the door to motion in either direction from its closed position.

Recent Machine Tools.

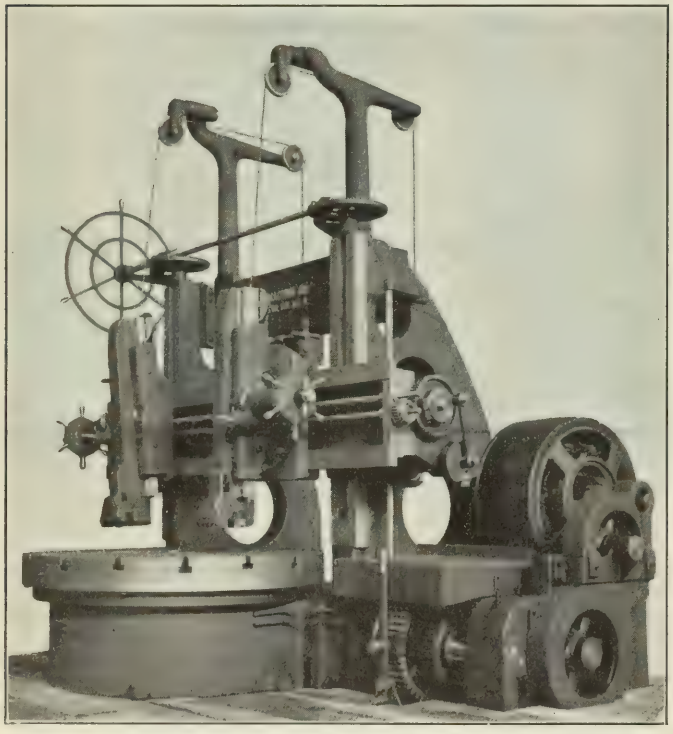
Betts Tire Mills.

The Betts Machine Company, Wilmington, Del., has recently built, from special designs, a number of tire-boring mills for the Inter-Ocean Steel Co., which has just completed its new works at Chicago Heights. The 66-in. tire mill is severely plain and massive in design, and is intended for the heaviest



72-In. Betts Tire Mill with Cross Rail.

work in boring tires and turning wheel centers. The cross rail is fixed and at a sufficient height to clear a variety of locomotive details. The handles for adjustment are all conveniently located, so that all those for one head can be reached from one position. Feeds from $^1/_{64}$ in. to $^3/_4$ in. can be instantly obtained while the machine is in motion. The machine will swing 70 in. in diameter and takes work 18 in. high. A 25-h.p. motor, having speed variation from 325 to



66-In. Betts Tire Mill.

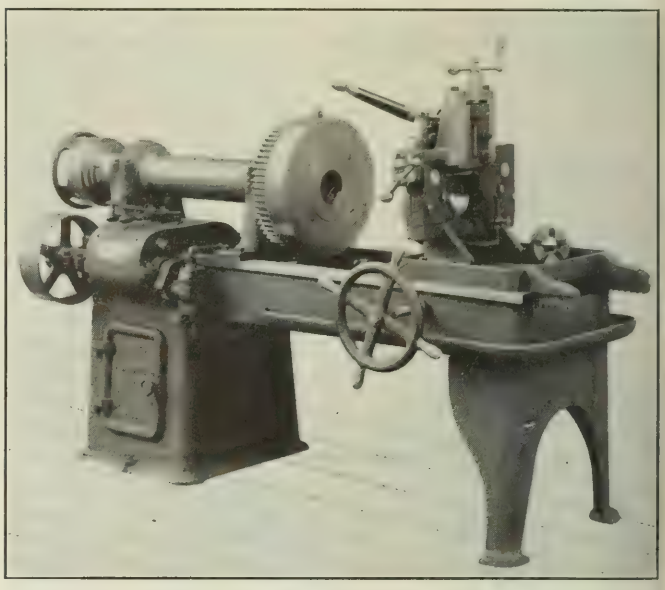
975 revolutions per minute, is used for driving, giving a large power factor for heavy cuts. By means of two sliding gears a cutting speed of 30 ft. per minute is obtained for diameters 6 in. to 66 in. The motor and driving gears are carried on a massive cast plate which is bolted to the upright. All gears are cut from the solid and many of them are steel. The face plate is driven by a steel internal gear bolted to the plate, an arrangement which gives it a stronger and smoother drive and prevents the chip from getting into the gearing. Special care has been taken to protect the operator; all gears are thoroughly guarded and his necessary movements are confined to the front of the machine.

The 72-in. tire mill, which is also illustrated, has a movable cross rail, but it is similar in design in many details to the 66-in. mill above described. It swings 76 in. and takes work 50 in. high under the rail.

A New 3-in. Pipe Machine.

The trend of modern tool design is to eliminate cone pulleys and the use of shifting belts. By using a single driving pulley a constant belt speed is obtained, which is suitable for heavy work. The machine may also be placed parallel to, or at right angles with the counter-shaft. These features have been incorporated in the No. 3 Peerless improved pipe machine, built by the Bignall & Keeler Manufacturing Co., Edwardsville, Ill., an illustration of which is shown herewith.

Threading the smaller sizes of pipe at a uniform speed



No. 3 Peerless Pipe Machine.

requires a machine with a greater speed range than one for threading the larger sizes. For instance, to thread at a speed of 15 ft. per minute a ¼-in. pipe should revolve 106.5 times; a ⅜-in. pipe 84.9 times; a ½-in. pipe 68.2 times, and a 3-in. pipe 16.3 times. In the larger sizes the speeds decrease only in tenths of a revolution. In the machine here shown the speeds are obtained by shifting gears. These gears are made of steel, machine cut, and run in oil. A speed plate is attached to the box for setting the levers by which to obtain the various speeds.

The die head is equipped with the Peerless adjusting mechanism, which is simple, self-locking and reliable. A separate set of dies is furnished for each size of pipe, 10 sets in all. The gripping chuck is of the universal type, and consists of a sliding frame and one upper and two lower jaws and screw, all encased in the chuck shell. The oil pump is direct-connected. The counter-shaft has two loose pulleys for open and cross belts, one rigid and one driving pulley of a 3½-in. belt.

A pipe machine usually receives little consideration in the majority of shops and is probably the most abused of any one in use, and must, therefore, be built to withstand this hard usage and at the same time be as simple in construction as possible.

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RAILWAYS' RIGHTS IN CITY STREETS.

The decision by a referee that the New York Central has a 500-year right to occupy and operate its lines in New York city, although the city had "assented" to such occupancy by the original corporation organized to exist only 50 years, was reported briefly in these columns last week. The decision by D. Cady Herrick, referee, seems to be so fully supported that it will be probably affirmed by the higher courts. It involves matters of general interest to railways having city terminals.

The Hudson River Railroad Company was incorporated in 1846 to exist for a term of 50 years. It derived from the state the right of location in New York city streets, "provided the assent of the corporation of said city be first obtained." The city gave that assent. The consolidation of the lines between New York city and Buffalo, under the name of the New York Central & Hudson River Railroad Company, was authorized by the state in 1869 and its term of existence was fixed at 500 years.

On May 28, 1909, the president of the borough of Manhattan, under direction of the Board of Estimate and Apportionment of the city of New York, ordered the New York Central to remove its tracks from certain named streets and avenues in the city within 30 days, and this, coupled with a notice that if the company failed to remove within 30 days, he would remove those tracks. The railway company immediately began an action to have the resolution of the Board of Estimate and Apportionment adjudged null and void and to enjoin any interference by the city with the tracks or the operation of the railway.

The city's action seems to be based on two grounds—First, its assent to occupancy for only 50 years; second, that the operation of the railway on the city streets was a nuisance. Judge Herrick disposes rather briefly but finally of the nuisance charge and cites many decisions which apparently fully justify his conclusion that the state has absolute control over the streets and highways, whether in the country or in the city, in granting rights of way, limited only by the exception in the state constitution as to street railways. In this matter his opinion is summed up in two sentences:

"When the new corporation was formed for a period of 500 years, all the franchises and rights-of-way of both corporations were transferred to such new corporation, and the power and the right to exercise and use those franchises and rights-of-way were conferred, or extended, for a like period of time. That the state had the authority to make such an extension, and, so far as it included the occupancy of the streets and avenues of the City of New York, without the consent of such city, I think cannot be questioned."

SUSPENDING ADVANCES IN RATES.

The administration's bill to amend the Interstate Commerce act provides that when a railway announces an advance in rates the Interstate Commerce Commission, either on complaint of a shipper or on its own motion, may at once begin an investigation of the reasonableness of the advance. If it should not have finished its inquiry on the date the new rates are effective it may suspend them for 60 days. When Chairman Knapp appeared for the commission before the Senate committee on interstate commerce on February 17 he suggested that the period for which the commission could suspend the advance be lengthened to 120 days. This added to the 30 days' notice now required of a change in rates would make a period of five months between the time notice of an advance was given and when it could go into effect.

The fact that the commission asks authority to suspend the advance so long shows that it does not think that ordinarily it could make adequate investigation in less time. There is little doubt that the measure as it stands would be a temptation to the commission to make hasty inquiries and half-baked orders. The discussions of this subject at the hearing before the House and Senate committees indicated that few of the witnesses or of the members of the committees had carefully considered the possible or even probable effects of such legislation. Railway officers are human and subject to like temptations as other men. If the commission were authorized to suspend advances in rates for either 60 or 120 days it would be practicable for railway managers to so take advantage of the legislation as practically to nullify the commission's power to reduce rates. Being human, they might do so. We may be sure that every proposed advance of consequence would be resisted by shippers. Investigation of each would take some of the commission's time. Such investigations would have to be given precedence over hearings of petitions for reductions, because the time within which the commission would have to decide cases involving proposed advances would be limited, while the time it has to decide proceedings involving proposed reductions is unlimited. If the proposed advances were numerous their investigation would take up practically all of the commission's time. The railways would have an incentive to create such a situation. It would be more to their interest for the commission to devote its time and energies to preventing them from making advances than to hearing and acting on the petitions of shippers for reductions.

When a railway traffic manager voluntarily reduces a rate he does so in the hope that the amount of traffic will be so increased that the road will get a larger profit from it than it is getting from the smaller traffic on the higher rate. But he always takes the chance that the traffic will not be increased as much as he hopes and that, in consequence, the profits of the road will be decreased. At present he can raise a rate which experience has shown to be too low. Under the proposed law he probably could not raise it without a

fight. Therefore he probably would not reduce it in the first place.

The proposed legislation aims to keep rates down. It would seem its tendency would be to keep them up. The result of its disclosing this tendency would, of course, be agitation for further increases in the commission's authority. It would be said, as it is said now, that further legislation is needed logically to "round out" the Interstate Commerce act. There is but one place where this logically "rounding out" process can stop. That is where the commission is given complete power to initiate all rates. The time will never come when many shippers and politicians will be satisfied with the way that railways make rates. They will never be any nearer satisfied than the average man is with his income or with the bills he receives from his doctor, butcher and grocer. And rates made by the commission will be equally subject to attack until they are put on an absolute mileage basis, so that the commission can say to each complainant, "You have the same rate per mile as every other man who ships and, therefore, you have no well-founded grievance." If it is desired to get a logical and conclusive answer for every complaint about rates that is the way to get it. Perhaps commercial interests would rather have rates that are defensible on mathematical grounds than rates on which they can ship. If they would, we advise them to continue to countenance and encourage agitation for more and more governmental regulation.

A CURE FOR A SMALL GRIEVANCE.

Why not have three grades of rates for the transportation of merchandise, based on relative speed? We now have, for most classes, two rates; express (by passenger train) and freight, in which each shipment takes its chances with all other shipments. There is need for an expedited rate; or, more precisely, a rate which will warrant giving a shipment by freight train preference in speed. Shippers of live stock and fruit have this preference already, and, theoretically, they pay for it, though in practice the shippers of large quantities have made out to incite such strenuous competition between the railways that they get their preference for nothing; that is, they get extremely low rates. Large shippers in any line—grain, for instance—get special expedition on occasion, without paying for it.

The demand for an arrangement for putting one shipment ahead of another is not loud and insistent, nor would it affect a large part of the freight traffic of the country; but it is one the granting of which would be popular, if the price were made reasonable. The railways have been very persistent in charging customers a high price for assuming risks (on breakable goods) which cost very little; they would do well to offer them at a moderate price something the value of which they could appreciate.

Almost everybody has had experience of exasperatingly slow freight movement. When a shipment of silk is rushed across the continent by special freight train and the railways brag about it, the average citizen indignantly compares the speed with that which was made by his last short-distance shipment, perhaps 10 miles a day. When the New York Central, to head off the threatened rival road, the Buffalo, Rochester & Eastern, told of what fine service it was giving, shippers arose to say that the time required to get a barrel of apples from Syracuse to New Haven was 14 days. When Mr. Hale feeds the public with his skilfully prepared averages of freight car service, individual shippers shut their eyes to the averages and fix their attention on single shipments that have been stopped long enough at each transfer point to gain a legal residence there, if only they could vote. A recent critic of the railways says that they could easily get for their freight trains millions of dollars' worth of traffic that now fattens the express companies. That is not the correct view, but it is true that much freight could be carried faster, to the profit both of the carrier and the consignee. Instead of taking some of the express companies' traffic and carrying it a little slower, some of the freight in the freight trains should be separated and carried a little faster.

The grievance of the public in regard to the speed with which freight travels has the same basis as the public's grievance against the telegraph companies—the necessity of treating all shipments and all messages on an equality. When a message travels a thousand miles in five minutes, people begin to demand that all messages shall be transmitted with that degree of celerity; whereas the only fair demand is that, reasonable facilities being provided, all messages shall be sent and delivered as soon as possible; and with another message, the next day, this may mean ten times as many minutes, because of pressure of business or some slight accident.

The thing needed is to give everybody the benefit of such special treatment as a railway gives the package freight between two given cities, when it is endeavoring to draw business away from a rival line between those cities. In such cases cars are loaded up to the last hour, are sent by the same train every day, whether full or only quarter full, and are quickly looked after if they break down, or are delayed from any cause. The only question about furnishing such prompt and intelligent care for any shipment, anywhere at any time, is as to what extra amount ought to be charged for it in order to remunerate the carrier and avoid injustice to the owners of the slow freight, which, theoretically, might occasionally suffer because of the preference given to those shippers willing to pay a higher price. But that could be easily settled. Or, the Interstate Commerce Commission would cheerfully tackle the problem.

THE PORTLAND GATEWAY DECISION.

The Supreme Court of the United States in its decision in the Portland gateway case (Interstate Commerce Commission vs. Northern Pacific) holds, in effect, that the Hepburn act leaves railways the right to choose their own connections, subject only to the requirement that the right must be exercised with due regard to the convenience of the public. The mere fact that numerous travelers may wish to make a journey, or shippers to send their goods, according to a certain route, is no good ground for requiring a railway to open that route when it already has established a route which is more profitable to itself and just as good and convenient for travelers or shippers. The Interstate Commerce Commission itself found in the Portland gateway case that "the passenger could travel as quickly and as comfortably via the Northern Pacific and Great Northern lines, by which a joint through route already existed, as he could (on the Harriman lines) via Portland." But it "also found that great numbers of persons for various causes desired to use the more southern routes, which brought them through Portland," and it was "of the opinion that this desire was a reasonable one and that, accordingly, with respect to such travelers, there was no reasonable through rate in effect." In other words, the commission proved that a reasonable route was already in existence and then held it was unreasonable because some people preferred another one. As in the Missouri river jobbers' case, the commission found the existence of a certain state of facts and then held that these facts did not exist. With such logic the commission could entirely repeal the proviso in the Hepburn act which authorizes it to establish joint routes and through rates only when "no reasonable or satisfactory through route exists." The view the Supreme Court took of its reasoning is indicated by the caustic remark of Justice Holmes that "the condition in the statute is not to be trifled with." The law as interpreted by the court protects the public and at the same time enables the railway to protect itself. It does not allow

any railway to stand in the way of the establishment of *some* through route and joint rate which will give reasonable and satisfactory service to the public. On the other hand, it does not enable a road whose interests perhaps are entirely contrary to those of another road—for instance, an electric line connecting with one of the other road's branches—to compel that other road to enter into through traffic arrangements with it which will cause loss to the latter and profit to the former and confer no substantial benefit on the public. The commission in commenting in its annual report on the Portland gateway case said that the railway which is required to establish a through route and joint rate which give it the short haul upon business on which it would otherwise obtain the long haul may protect itself in the division of the through rate. But if a railway can get a division of the through rate which adequately protects it it usually makes the rate, as has been done by the Northern Pacific through the Portland gateway since the litigation began. If it refuses to make the rate it is a pretty sure sign that it has not been offered a division which will adequately protect its interests, a matter of which it is the best judge

THE MALLET LOCOMOTIVE IN SERVICE.

When it is claimed, or even suggested, that a Mallet articulated compound locomotive can be maintained as cheaply as an ordinary simple engine of half its capacity, the statement must be attributed to enthusiasm or ignorance. The Mallet is, to all intents and purposes as far as repairs are concerned, two complete and independent locomotives with the exception of the boiler. That it should be possible to maintain these two engines as cheaply as one does not stand to reason and is not borne out in practice. Records show that a Mallet costs something more than twice as much per mile run for repairs as a consolidation of about two-fifths its tractive effort. The saving in repairs on two boilers is offset by the expense for the extra parts, such as jointed receiver and low-pressure exhaust pipes. To put the matter definitely, it costs about 23 cents a mile for repairs on heavy Mallets as compared with from 7 to 10 cents for consolidations of less than half the tractive power, and they are out of commission from 20 to 25 per cent. of the time.

Still, they are economical where a heavy power is required and they can be made to take the place of two lighter engines. They cut the wages in two, and the compound feature effects a saving in coal of from 15 to 20 per cent. per horsepower produced; the repairs drop to about 2 cents per 1,000 ton-miles instead of 3.5 cents with heavy consolidations. From an operating standpoint also it is very evident that one engine is better than two, especially if it can be handled as readily as one of the smaller units, and this is the case. The largest of the Mallets can be spotted as easily as any smaller engine and may be handled with any desired degree of delicacy.

Whether it will be possible to extend their radius of action from short pusher runs to regular road service is quite another question. It is all very well to assert that they are free steamers and that the fireman has no difficulty in holding his pressure, which is quite true in limited action. An engine that carries a pressure of from 200 to 215 lbs. may be held up to the blowing-off point over the average pusher grade, and, using some latitude in the phrase, "without difficulty." But this is very far from saying "without exertion," for it does require an exertion of the most strenuous kind. No one who has seen the work done by a stalwart fireman in taking one of these engines up eight or ten miles of a 1 per cent. grade would care to wager on his ability to maintain the pace over a division of from a hundred to a hundred and fifty miles. When working to its full capacity one of these big fellows will evaporate 7,000 gallons of water an hour, which means that about four tons of coal must be shoveled. With the slow speed that usually obtains the footplate is steady and there are no surges of the machine to add to the labor. The constant shoveling is interrupted only by raking and leveling and without an interval for the taking of breath. The rate of combustion must be kept at the highest pitch and the heat from the opened door is scorching in its effect. It is here that the mechanical stoker becomes a necessity if the run is to be extended to cover a division. There is but one mitigating circumstance in its use for road service, and that is, under ordinary conditions, the engine would not be crowded so hard continuously. In pusher service the reverse lever is dropped down in the corner and left there; whereas on a road run it would be hooked back, easing off on the consumption of steam per revolution, but probably requiring quite as rapid a rate of evaporation per hour.

Of course, where oil is used as a fuel the whole situation is changed and the physical strain on the fireman is avoided and the suggested limitation of the radius of action does not exist as far as the man is concerned, but it remains to be seen whether a locomotive boiler can be built within available dimensions that can meet the evaporative demands of a big Mallet when pulling a heavy train at road speeds.

As for the action of the engines upon the track, it appears that they have lived up to the claims made for them by their designers. While it is not known as to just how they distribute their lateral stresses upon the track, any more than it is of other locomotive types, still where one Mallet has been substituted for two or more consolidations on a pusher grade, the wear of the rails has been lessened, from which it has been inferred, whether rightly or not cannot be stated, that these new locomotives are easier on the track.

Mallet locomotives are capable of making from 30,000 to 40,000 miles between general repairs, and in some instances the latter figure has been exceeded. An examination of the 0-4-4-0 locomotives that have been out of the shop for four months shows that the tires are in remakably good condition. There is no perceptible flange wear on any of the wheels, except the leading pair of the front engine, which show a decided tendency to run sharp. This is probably due to the fact that the engine is working hard when run forward, as half of the mileage is made when running backwards light.

The internal resistances of the engine are somewhat higher than those of the ordinary types. A Mallet locomotive will not drift down a 1 per cent. grade. An Atlantic would attain a high speed in such a place and a consolidation would run faster than would be allowable; whereas steam must be used with the Mallet in order to get down at all. As to what percentage of the total power developed this amounts to, accurate data is not available, but when added to that required to raise the weight of the engine and tender up the grade it must be a goodly proportion of the drawbar pull available at the back of the tender.

Again, the wear of the connections between the front and rear units seems to indicate that there is not always that harmony of action between the two that is to be desired. It may be the effect of imagination but there seems to be a surging action when the engine is at work, closely resembling that felt on ordinary engines when they are not properly counterbalanced. This is especially noticeable on the firing platform, but is scarcely perceptible in the engineer's cab except when running light. Unless the connections are made far stronger than any calculations would indicate to be necessary, there is apt to be a breakage and a separation of the castings. When the engine is pushing the action is not so apparent, for then the front unit is pushed back by the load and the after one tends to run up on it, so that the two are brought together; but when pulling the forward unit can surge away from the rear one with the full force of the maximum power that it can exert. This movement is especially noticeable when the engine is running light. It ought to be met by putting an excessive strength into the connecting parts.

Very little leakage occurs at the ball and expansion joints

of the receiver and exhaust pipes, and no serious trouble has been experienced. Evidently the designers looked upon it as a place requiring especial attention, and by giving it have obtained very satisfactory results.

The cab must necessarily be one-sided. As the fireman is away in the rear, and communication from one side to the other is out of the question, everything must be on the right-hand side; this includes the throttle and reverse levers, two injectors, two cylinder lubricators, two sets of cylinder cock levers, two sanders, engineer's brake valve and straight air-brake valve, water glass and cocks, whistle and bell cords, steam valves for oilers, and emergency valve for converting to simple action. With the wide firebox and the limited space available, there is not much left for the man when all of these appliances are in place. Still the arrangement is quite convenient and because of its air reversing gear the engine is easily handled.

Under ordinary conditions of service the emergency exhaust of the intercepting valve is rarely opened, even when starting a heavy train. There is usually enough slack to be obtained for the high-pressure cylinders to exhaust once or twice before the full load comes upon the engine and then the low-pressure unit is at work.

Hence whether the Mallet is regarded from the standpoint of the mechanical, operating or track departments, or of the engineer in the cab, the locomotive must be considered a very satisfactory machine. The only man who has serious objections to it is the fireman who is called upon for such strenuous exertion; for him the mechanical stoker ought to solve the problem, and thus relieve him of what seems to be an impossible task.

PENNSYLVANIA RAILROAD.

In 1909 the management of the Pennsylvania Railroad was able to turn its entire attention to the operation of the road, with the result that economies in transportation expenses were effected to a greater degree than ever before. The program of improvements and betterments, additional facilities and the addition of great terminals, with the exception of the New York tunnel extension, had been completed before 1909. It was a fact that last year the Pennsylvania handled nearly as large a tonnage as in 1907, but did it without any congestion. There were no improvements to speak of in use in 1909 that were not already in operation in 1908, but the operating force had become accustomed to the improved machine which they were handling and were able to get more out of it.

Of the total earnings of $154,000,000 in 1909 transportation expenses consumed but 34 per cent. as against 38 per cent. in 1908. This was the result indirectly of improvements made in previous years; directly it was brought about by higher operating efficiency on the part of the force itself. In 1907 the general officers' desks were piled high with matters needing immediate attention. Operating officers were so busy getting trains through that they could not stop to pay attention to the niceties of their work. In 1908 the general officers cleared their desks; the superintendents were able to spare enough time from their work of pushing trains over their divisions to weed out their force and to make a study of the needs of their line.

In 1907 the Pennsylvania management began running a dynamometer car over the lines. This work was entirely completed in 1908, with the result that train loading has improved in the last two years enormously. In 1907 the average train load was 574 tons; in 1908 it had increased to 602 tons, and in 1909 there was a further increase of 54 tons, making the average train load last year 656 tons. Almost any unit of transportation expenses that one may select for comparison with previous years tells much the same story as is told by the increase in train load. The operating forces were learning to use the improvements that had been made to the plant in such a way as to get the best results. An engineman who for years has taken water in one way did not at first learn how to make the most of an improved device for taking water, and the economies that should have resulted from the installation of these improvements were not at first apparent. After a time the engineman, especially if he is not driven to the limit of his capacity by overwork, learns how to get the best out of the new device, and then follow the cheaper transportation costs.

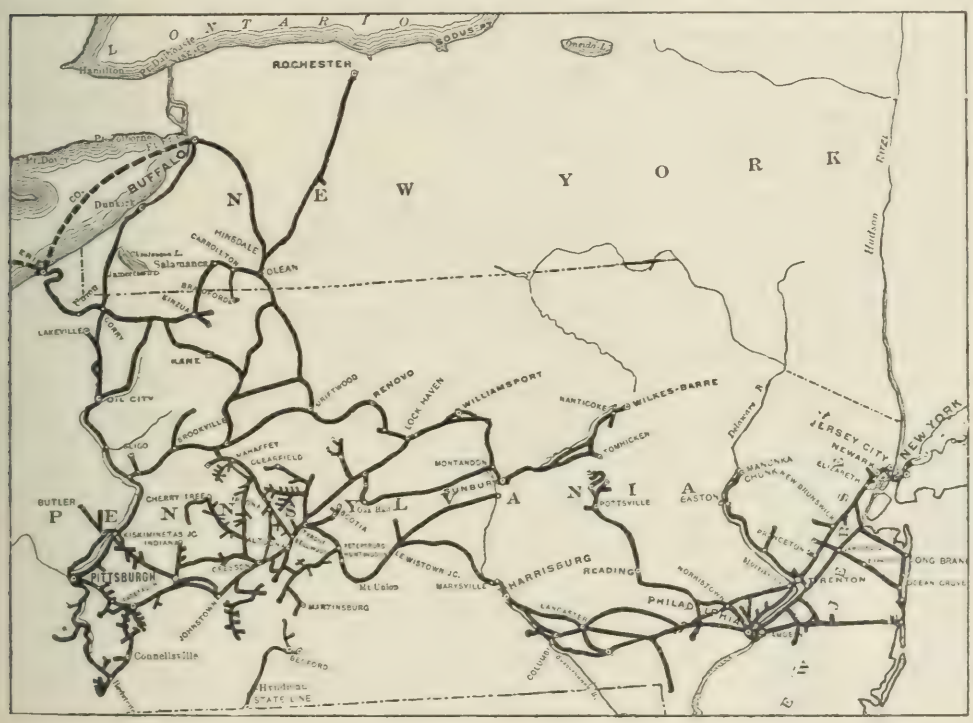
In 1901 President Cassatt, in discussing the program of expansion of the Pennsylvania, said that the motive power and rolling stock of the company were sufficient to handle a much greater tonnage than could be actually taken care of by the track and terminal facilities. Since that time the company has spent on its lines $355,000,000 on capital account and sums comparatively as great charged to income, while adding but 100 miles to the road mileage operated. In 1909 the Pennsylvania hauled 19,017,965,601 tons one mile; in 1907 it handled 21,473,176,903 tons one mile, and at that time congestion was the nightmare which haunted every operating officer on the line. Now the ton mileage of the road could probably be increased 10 per cent., or even 12 per cent., without causing serious congestion on any line, with the possible exception of the company's line between Buffalo and Pittsburgh. Last year the company was not really using all of the facilities which have been provided, and the first thing which will put a check to handling increased traffic will be the congestion at terminals due to shippers failing to unload cars promptly. If this difficulty could be eliminated the road could probably handle an increase of as much as 15 per cent. in its traffic without passing the line of greatest operating efficiency and economy.

The problem of freight terminals is of a serious nature. Even the expenditures of such sums as are available to the management of the Pennsylvania Railroad cannot adequately take care of the growing needs of the railway. The price of land has become so high, and the demand for concentrated shipping and receiving terminals so great, that it seems safe to predict that the efforts of the managements of the eastern trunk lines will be mainly directed toward making better use of the track that they now have, rather than trying to add any new tracks. The success of this effort will depend largely on the success of the railways in forcing shippers to unload their cars promptly, and in forcing them to provide their own warehouses and not make a storehouse of the railways' terminals tracks and cars.

The extent to which the industry of the country as a whole has recovered from the panic is given point by the statement of earnings of the Pennsylvania Railroad in 1909. Gross revenue totaled $153,600,000, an increase of $17,300,000 over the previous year. Nearly all of this increase came from larger freight earnings. In 1909 freight revenue amounted to $112,300,000, comparing with $97,300,000 in 1908. Total operating expenses, including taxes, amounted to $111,900,000 in 1909 and $101,400,000 in 1908. This left net operating revenue, after the payment of rentals paid roads operated on a basis of net revenue, of $37,500,000, which is greater by $5,300,000 than the net revenue in 1908. The Pennsylvania last year was carried along on the upward wave of prosperity, and it was getting all the benefit of its past slack period without the disadvantages attendant on the flood tide of business activity. Since the close of the year there have been signs of these disadvantages, the demands of labor being the most important.

Income other than earnings were somewhat larger last year than the year before, and after the payment of fixed charges, which were just about the same in the two years, the company had net income of $35,160,000, comparing with $28,200,000 in 1908. Dividends of 6 per cent. were paid on the stock and $5,600,000 was spent on the extraordinary improvements; $4,000,000 additional was spent on the New York tunnel extension and $2,000,000 was transferred to extraordinary expenditure account, leaving $400,000 credit to profit.

Of the total freight tonnage, amounting in 1909 to 214,941,159 tons, 81,596,198 tons were furnished by bituminous coal. This is greater by 5,989,433 tons than in 1908. It is interesting to note that the tonnage of products of agriculture as a whole decreased last year and the tonnage of products of animals increased only slightly, while products of mines, products of forests and products of manufactures furnished much greater tonnage in 1909 than in 1908. In particular the tonnage of grain fell off materially. The fact was that the annual grain movement on the Pennsylvania never materialized, due probably partly to the holding back of grain by the farmers and partly to the bid that the Grand Trunk and New York, New Haven & Hartford have been making for the export grain traffic. As was to be expected, the raw materials used in manufactures furnished very much greater tonnage for the Pennsylvania in 1909 than in 1908; the most notable increases being that already mentioned in bituminous coal, an increase of 6,997,866 tons in coke, and an increase of 1,844,737 tons in the tonnage of pig and bloom iron. Building materials also furnished a much large tonnage last year than the year before. Stone, sand, etc., furnished 14,476,754 tons, an increase over 1908 of 5,883,318 tons; and bar and sheet metal furnished 7,376,262 tons, an increase of 2,088,677 tons.



Pennsylvania Railroad.

As we have said, operating expenses as a whole were greater by $9,700,000 in 1908 than in 1909. But the increases in expenses came in maintenance and not in transportation. Maintenance of way cost $19,100,000, or about $4,000,000 more than in 1909, and maintenance of equipment cost $29,100,000, also about $4,000,000 more than in 1908. Transportation cost $52,900,000 last year, an increase of $1,400,000 over the year before. The following table shows the unit costs of maintenance:

	1909.	1908.
*Maintenance of way per mile.....	$2,502	$1,983
†Repairs per locomotive.....	2,694	2,646
" " passenger car	898	793
" " freight car	64	58

*Per mile of first, second, third, etc., track, the cost of two miles of sidings and switch tracks being taken as equal to the cost of maintenance of one mile of main track.

†This includes repairs only and does not take into account renewals, depreciation or superintendence.

If charges for depreciation were taken into consideration the increases in unit maintenance costs would be even more striking. It is rather curious that when the charge for depreciation was first introduced the roads generally strongly opposed it and the Interstate Commerce Commission strongly insisted on it. Recently the Pennsylvania asked the commission for a depreciation account for maintenance of way and structures and the commission refused.

The expenditure for construction, equipment and real estate on the main line between New York and Pittsburgh, including $7,000,000 on account of principal of car trusts and $600,000 on account of principal of water trust certificates, was $14,300,000, of which $5,000,000 was charged to capital account and $9,200,000 to income. This does not, of course, include the $4,000,000 spent on the New York tunnel extension. It is expected that this extension will be open for operation in the fall. All of the tunnels, bridges and open work on the entire line have been completed, and the laying of track, the installation of interlocking signaling and the electrification of the line and yards are now under way. At present a considerable part of the passenger traffic originating in New York reaches the Jersey City terminal of the Pennsylvania via the Hudson tunnels. Arrangements were made by the Pennsylvania for the carriage by the Hudson & Manhattan of passengers holding Pennsylvania Railroad tickets without any additional fare. When the Pennsylvania's own tunnels to Thirty-fourth street are opened the Hudson tunnels are to be extended through Jersey City to a connection with the Pennsylvania lines at a point east of Summit avenue. The Pennsylvania is to be electrified from that connection to the new station at Harrison, N. J., and a new branch is to be built from Harrison into the city of Newark. A joint rapid transit service will then be operated between the Hudson Company's Church street terminals, in the downtown district of New York, and Park Place station, Newark. The station at Harrison will provide facilities for passengers desiring to transfer between this rapid line and all trains on the Pennsylvania. It will be possible, therefore, for passengers coming from the west and for those living in the suburbs along the lines of the Pennsylvania to reach downtown, New York, without taking street cars after reaching Manhattan.

Up to December 31, 1909, the total cost, including real estate not permanently required for use, of the New York tunnel extension amounted to $102,500,000. Of this amount $57,500,000 was charged to capital account, $35,000,000 was charged against surplus income, and $10,000,000 was furnished by the Pennsylvania Company and charged against its profit and loss account. The Pennsylvania Railroad has not as yet received any additional operating revenues as a result of the expenditure of this money, except incidentally through the advertising that the undertaking has given the road. Nevertheless, last year it was able to earn over 8 per cent. on its stock after paying fixed charges. With the exception of the New York tunnel extension and the Harrisburg station work under the plan of improvement outlined by President Cassatt in 1901 has been about completed. The total first-track mileage in 1901 was 3,672 miles, and in 1909 3,773 miles. In 1901 there were 1,621 miles of second, third and fourth-track and 2,375 miles of sidings. In 1909 there were 2,133 miles of second,

third and fourth-track and 3,457 miles of sidings. Thus, during the eight years the company has added 500 miles of second, third and fourth-track and over 1,000 miles of sidings.

During the year the company offered to stockholders the privilege of subscribing to new stock at par to the extent of 25 per cent. of their holdings. At the beginning of the year there were $19,980,000 10-year 3½ per cent. convertible bonds (convertible at $70 per $50 share) outstanding, and of these, $9,758,000 were converted into stock during the year. There were also $99,615,000 10-year 3½ per cent. convertible bonds (convertible at $75 per $50 share) outstanding. Of these, $12,708,000 were converted into stock during the year. These conversions of bonds, together with the stock allotment, increased the stock outstanding by $86,500,000, bringing the total amount outstanding on December 31 up to $401,064,800. The cost of securities held by the company was $270,343,957, and the direct revenue received from these securities amounted last year to $13,214,757, being about 4.89 per cent. interest on the cost.

On December 31, 1909, the company had $107,700,000 cash on hand, and, in addition, since the close of the fiscal year it has received, or will receive, $20,000,000 as dividends from its holdings of Pennsylvania Company stock. Part of this cash will be required for the payment of $60,000,000 three-year notes due March 15, 1910.

As to the future, if the Western Maryland builds its 80-mile line from Cumberland to a connection with the Pittsburgh & Lake Erie, the Pennsylvania, along with the Baltimore & Ohio, is bound to be more or less affected. Heretofore the Baltimore & Ohio and the Pennsylvania have been able to divide Baltimore business between themselves. If the New York Central gets into Baltimore over an independent line it will unquestionably make a strong bid for a share of the import and export business to the port of Baltimore, and the Pennsylvania and the Baltimore & Ohio will have to depend on the general increase in business to make up for the business that the New York Central will be able to take away from them.

The following table compares the results of operation for 1908 and 1909:

	1909.	1908.
Mileage operated	3,841	3,862
Freight revenue	$112,330,124	$97,269,260
Passenger revenue	30,677,704	29,492,144
Total operating revenue	153,564,527	136,296,871
Maintenance of way	19,104,548	15,177,314
Maintenance of equipment	29,111,443	25,113,455
Traffic	1,977,620	1,811,574
Transportation	52,906,863	51,462,479
Total operating expenses	107,136,131	97,412,016
Taxes	4,767,029	3,988,977
Net operating revenue	41,661,367	34,895,878
Gross corporate income	53,430,764	46,577,895
Net corporate income	35,159,088	28,207,661
Dividends	19,173,743	18,875,681
Extraordinary expenditures	9,581,810	4,538,981
Surplus	6,403,535	4,792,999

NEW BOOKS.

Congress and the Railways. Published by the Railway Business Association in pamphlet form, 7 x 10 in.; 20 pages. 1910.

This useful bulletin gives a digest of 83 railway bills now pending in Congress. The bills are well abstracted and well classified, and are presented in accordance with the general policy of the association in urging a restriction of new law making of a kind calculated to do harm to the railways and all connected interests.

The First Principles of Railway Signaling. By C. B. Byles, Signal Engineer of the Lancashire & Yorkshire Railway. 5 in. x 7½ in.; 146 pages. London: The *Railway Gazette,* Queen Anne's Chambers, Westminster, 1910. Price, 3 shillings.

Mr. Byles, who is both an accomplished signal engineer and a lucid writer, has written a treatise strictly in accordance with his title. He sets forth and discusses the principles of signaling as developed in Great Britain, and does not attempt to give a picture of what is to be found, or of what is being done, on all the railways of the kingdom. At the same time the book is not a mere primer. The author elucidates first principles and at the same time gives a good idea of details and of ultimate principles. The reader is agreeably introduced to the subject by a dozen pages of history, and in the next hundred pages he will find an admirably condensed view of the present state of the signaling art in the most thoroughly signaled country in the world. As is proper in a country in which the railways are so closely watched by the government, a good deal of space is devoted to the functions of the Board of Trade, and the regulations of that body are fully set forth, together with a synopsis of legislation affecting railway operation. There are only 15 pages of illustrations, but these epitomized the whole subject. The American reader will find sensible and candid comments on some of those features of signaling in which British practice differs from ours. There is not the slightest trace of a controversial or narrow spirit, and Mr. Byles had, doubtless, no other purpose than to set forth dispassionately the essential considerations in relation to each point discussed; but he has made a book that will certainly be interesting to American railway men. There is a full index.

Traffic History of the Mississippi River System. By Frank Haigh Dixon, Professor of Economics, Dartmouth College. Pamphlet; 70 pages; 5½ x 9 in. Government Printing Office, Washington. 1910.

Professor Dixon has covered a branch of traffic history which had been very little exploited. His investigations go back to the earliest developments, and his pamphlet, although not a long one, ought to be a standard reference on the subject for a good many years.

Exporter's Encyclopedia. New York. Exporters' Encyclopedia Co., 80 Broad street. Price, $5.

The sixth edition of this useful work has just appeared in a volume of 776 pages—too many of which, however, are devoted to advertisements interspersed with the reading matter. As in the case of another well-known reference book, considerable mental effort is required on the part of the reader to keep his mind on the business in hand, when every other page is filled with display advertisements. Moreover, the advertisements in the encylopedia are not placed uniformly on the left-hand page.

As in former editions, the information concerning shipping routes from New York City to all foreign countries, the customs regulations, information about bills of lading, the cost of various services, etc., is full and complete. Monthly correction notes are sent to every purchaser to be inserted at the pages where they belong, and the price of the book includes also a subscription to the monthly *Exporters' Review.* Shipping routes are given, not only from New York, but also from Boston, Philadelphia, Baltimore, Norfolk, Savannah, Mobile, New Orleans, Galveston and the Pacific coast.

Letters to the Editor.

RAILWAY EDUCATION AT THE UNIVERSITY OF MICHIGAN.

Ann Arbor, Mich., Feb. 27, 1910.

To the Editor of the Railway Age Gazette:

Your recent comment upon Mr. J. S. Eaton's report concerning Education for Efficiency in Railroad Service leads me to suggest that there is at least one point at which that report is incomplete. We have at Ann Arbor an attempt to fill the demand for education in railway administration which proceeds from a foundation in Economics. (Mr. Eaton states that the object of railway construction is net earnings, which is an economic object.) Students are required to take a course in the principles of economics, followed by such special

courses as corporation finance and transportation. Then there is a group of more technical or semi-professional courses added to this groundwork: Railway organization and operation, railway statistics and accounts, railway tariffs and railway finance. Work in elementary and advanced accounting and auditing is also required in the economics department.

Though the foundation of the courses is thus economic—as it seems to me should be the case—we are far from neglecting the technological side. Among such courses which are rerequired are shop practice, surveying, prime movers and specifications and contracts, the plan being to give an insight into physical fundamentals and to train men to deal more intelligently with engineers in the various fields, with their technical problems and plans and their special nomenclatures. We have for some time been training a promising young man of wide scientific training to manage this part of the work. He begins with a course in drawing and projections, and the supervision of a course in railway engineering in which professors from the engineering department lecture.

Finally, special courses in contracts, bailments and carriers and railway law are arranged for in the law department. Thus economics, engineering and law are focussed upon the work of giving an all-around training for the service of railway administration. The consistent emphasis of the administrative point of view with its immediately economic foundation, supported by the necessary technics and jurisprudence is the unique feature. As Mr. Eaton says (p. 130): "The final bar before which all questions of policy must be settled is the income account."

LEWIS H. HANEY,
Assistant Professor of Political Economy, University of Michigan.

Contributed Papers.

PENSIONS ON AMERICAN RAILWAYS.

The table given herewith shows the principal facts concerning pensions on the 22 American railways which now pay pensions to superannuated employees. The last statement of this kind published in these columns contains the names of only seven companies (counting the whole Pennsylvania system as one), from which the rapid growth of the idea may be seen. The present table includes three Canadian roads and three street railways. In all of the cases represented in this table the pension fund is supported wholly by the employing company, except on the Bessemer & Lake Erie and the Intercolonial. In the case of the Bessemer & Lake Erie the fund is a gift from Andrew Carnegie. On the Baltimore & Ohio and the Brooklyn Rapid Transit lines the pension privilege is conditioned upon being a member of the relief department, which imposes assessments on the employees for the support of the relief funds.

The first American railway pension system was that of the Grand Trunk (1874), which, however, at the time applied only to a small class of employees. The first important pension system in the United States was that of the Baltimore & Ohio, but this also was only partial. The first simple system, with what may be called the first complete freedom from conditions, was that of the Pennsylvania, which still remains by far the largest system, measuring by the sum of the annual appropriations.

In general, all of the roads here shown base their pensions on a percentage of the employee's wages, multiplied by the number of years that he has been in the service. For example, the rate on the Pennsylvania is 1 per cent. A man having worked 40 years receives a pension equal to 40 per cent. of his average salary for the ten years preceding retirement. Rates which are more or less than 1 per cent. are given in the notes below. Most of the companies include in their rules a reservation of the right to vary the rate of the pensions, if the total requirements of any one year shall demand more than a predetermined gross amount. We do not learn that this right has ever been exercised; and, as will be seen, some companies make no limit; pensions are paid out of the general fund the same as salaries. In some cases the gross appropriation shown in the table is a sum far beyond what has thus far been required in any one year.

All of the companies, in counting time, include years of service under other companies bought by or consolidated with the present one. Short breaks in the service, not due to any fault of the employee, or due to a minor fault, involving suspension, are generally overlooked. On all of the roads a pensioner may engage in other business, but on the Canadian Pacific only by consent of the company. The stipulation that the pension regulations do not give any employee a right to his job is practically universal, as is the clause forbidding a pensioner to assign his claim. Voluntary retirement from the service cuts off the employee from all claim to a pension. Those roads which have fixed a limit of 35 years as the age of new employees modify this to read 45 in the case of men experienced in railway work.

The following notes supplement the information given in the table:

Atchison, Topeka & Santa Fe.—The rate on which pensions

PENSIONS ON AMERICAN RAILWAYS.

Name of company. *See notes in text.*	Established.	Age of retirement. Compulsory.	Age of retirement. Optional.	After years' service.	Approximate number employees.	No. of pensioners.	Yearly appropriation.	Age limit new employees.
Atchison, Topeka & Santa Fe	1907.	.....	65	..	60,000	156	No limit.	.....
Atlantic Coast Line	1904.	70	61	10	17,686	67	$18,000	45
Baltimore & Ohio	1885.	None.	65	..	62,000	622	129,247[1]	45
Cleveland Terminal & Valley	1895.	None.	65	..	1,123	5	1,375	45
Bessemer & Lake Erie	1906.	60	..	15	.....	.....	.....	..
Brooklyn Rapid Transit Co.	1910.	70	65	..	12,500	50[2]	.....	..
Buffalo, Rochester & Pittsburgh	1903.	65	60	20	5,023	34	25,000	35[3]
Canadian Pacific	1903.	65	60	10	.....	361	80,000	40
Chicago & North Western	1901.	70	..	..	51,261	534	200,000	35
Chicago, St. Paul Minneapolis & Omaha	1906.	70	..	..	7,000	34	50,000	35
Chicago, Rock Island & Pacific	1910.	70	65	20	50,000	50[2]	No limit.	35[3]
Delaware, Lackawanna & Western	1902.	70	60	..	22,000	267	85,000	Various.
Grand Trunk	1874	70	55	15	26,153	459	90,000	50
Illinois Central	1901.	70	Various.	10	34,800	295	.....	35[3]
Intercolonial and Prince Edward's Island	1907.	None.	60	15	7,133	452	.....	35[3]
Metropolitan Street Railway, New York	1902.	70	65	25	7,500	19	.....	45
New York Central Lines	1910.	70	..	10	125,000	800[2]	450,000	None.
Pennsylvania	1900.	70	65	30	121,184	2,298	600,000	45
Pennsylvania Lines West of Pittsburgh	1901.	70	65	..	58,000	862	222,500	45
Philadelphia & Reading	.....	70	..	..	27,212	241	.....	45
Philadelphia Rapid Transit Co.	1910.	None.	..	..	9,000	40[2]	No limit.	..
Southern Pacific	.....	..	..	..	.....	.....	.....	..
Lines east of El Paso	1903.	70	..	..	17,000	67	18,408	45
Union Pacific	1903.	70	61	20	23,000	83	.....	35[3]
Oregon R. R. & Navigation Co.	.....	70	..	..	6,200	13	No limit.	35
Oregon Short Line	.....	..	..	..	.....	..	.....	..

[1] This sum, $129,247, represents the payments to 586 pensioners in the year ending June 30, 1909. [2] Estimated [3] Experienced persons may be employed if under 45 years of age.

are based is 1¼ per cent. for each year of service, on the first $50 of the highest average monthly pay during any consecutive ten years, and three-fourths of 1 per cent. on the excess of such pay above $50. The minimum pension is $20 a month and the maximum $75 a month. There is no official age limit in the employment of new men in the service of the company, but those entering the service who are 50 years old or over are not eligible to pensions.

Atlantic Coast Line.—The age of compulsory retirement fixed for "active" employees is 65 years; for sedentary employees the age is 70.

Baltimore & Ohio.—The basis for computing pensions on this road is calculated in accordance with the extent to which the employee participates in the support of the relief department, and not according to the amount of pay that he has received from the company.

Bessemer & Lake Erie.—The pensions enjoyed by the superannuated employees of this company come from an endowment fund given by Andrew Carnegie for the benefit of employees of all establishments which are a part of the Carnegie Steel Company, of which this railway company is one. The original endowment of this fund was $4,000,000, which, however, provides accident and death benefits as well as pension allowances.

Boston & Maine.—An elaborate plan for the payment of pensions to the employees of this company was formulated last summer, the employees being the prime movers. A special act of the legislature was procured and the employees were to participate in the support of the pension fund. The department has not yet been established, but it is expected that action will be taken by the directors of the road in the near future. (See *Railroad Age Gazette*, volume 46, page 35.)

Brooklyn Rapid Transit.—The granting of pensions on this road is made contingent on membership in the employees' benefit association, which was established by the company a short time ago, but old employees who by reason of age or physical condition are not eligible to membership in the benefit association are put in a special class, and will receive the same pension as if they had become members of the association.

Buffalo, Rochester & Pittsburgh.—The appropriation of $25,000 yearly has thus far been more than was needed, and the accumulations in the pension fund now aggregate $129,236.

Canadian Pacific.—The pension reserve fund now amounts to $680,318. The minimum pension is $20 a month. Men are retired from the service either on the first of January or the first of July, and not at any other date.

Chicago & North-Western.—Minimum pension $12 a month.

Chicago, Rock Island & Pacific.—The privilege of retiring at 65 is granted under the usual conditions, but applies only to men in the locomotive, train, yard and roadway service. Individuals who have been in the service and have become permanently incapacitated may be retired and pensioned regardless of age. The minimum pension is $20 a month and the maximum $150 a month.

Delaware, Lackawanna & Western.—Age limits in the employment of new men have been established only in certain departments, namely, apprentices in the motive power department, 16 to 21 years; locomotive enginemen and firemen, 21 to 32 years; telegraphers, 18 years; trainmen, 21 to 28 years.

Grand Trunk.—Since 1908 the pension benefits have been made available for all employees. Previous to that time the system applied only to clerks, agents, etc. The company now bears the whole of the expense. The minimum pension is $200 a year.

Illinois Central.—The optional age of retirement for enginemen, trainmen, trackmen, etc., is 65, but officers and employees of all grades may be retired as young as 61, if incapacitated. The last resolution in regard to the amount of pensions limited the annual payment to $100,000 a year, but that sum has not yet been reached. On this road the pension department has a considerable fund, the original appropriation having been $250,000.

Intercolonial.—This is a government railway, and the pension fund is supported one-half by the employees and the other half by His Majesty, the King of Great Britain; that is to say, by the railway. The employees contribute monthly 1½ per cent. of their pay, though at the beginning they were assessed 3 per cent. in order to establish a fund. The minimum pension is $20 a month and the maximum two-thirds of the average pay for the eight years preceding retirement. The government contribution has thus far been limited to $100,000 a year, but this limit has not been reached. The allowance is 1½ per cent. of the average pay for the eight years preceding retirement, multiplied by the number of years that the employee has been in the service. New employees must begin contributing to the fund at once, but they must serve six months on probation, and then pass a medical examination, as well as an examination as to competency, before being entered as fully eligible under the pension regulations. Provision is made in the rules for refunding payments to employees leaving the service.

Metropolitan Street Railway (New York).—The pension rules of this company exclude employees whose pay is over $1,200 a year. New men must belong to the Metropolitan Street Railway Employees' Association. The rates of pensions are as follows: To those who have been in the service 35 years or more 40 per cent. of the average salary for —— years preceding; to those who have been in the service 30 years and less than 35 years, 30 per cent.; 25 years and less than 30 years, 25 per cent. The gross amount available annually for pensions is limited to $50,000.

The stipulation that an employee shall have been in service 25 years applies only in the case of those who desire to retire under the age of 70. The rule in this respect seems to be the same as on the Pennsylvania.

New York Central.—The benefit of the recently established pension department of the New York Central system is available for the employees of the New York Central & Hudson River; the Boston & Albany; the St. Lawrence & Adirondack; the New York & Ottawa; the Lake Shore & Michigan Southern; the Dunkirk, Allegheny Valley & Pittsburgh; the Lake Erie, Alliance & Wheeling; the Michigan Central; the Cleveland, Cincinnati, Chicago & St. Louis; the Cincinnati Northern, and the Peoria & Eastern, and the figures given represent the total for the whole of these lines.

Under the New York Central rules any employee may be retired at any age if he is unfit for further service and if he has been employed 20 years.

New York, New Haven & Hartford.—This company has no pension department, but President Mellen has lately stated publicly that the company is paying out about $200,000 a year to 200 superannuated employees.

Pennsylvania.—The figures given include the Northern Central; the Philadelphia, Baltimore & Washington; the West Jersey & Sea Shore, and all lines east of Pittsburgh and Erie.

The stipulation that an employee shall have been in the service 30 years applies only in the case of those who desire to retire under the age of 70. In the case of employees retired at the age of 70, the rules do not specify any length of service; evidently this matter is left to the discretion of the pension board.

Southern Pacific.—Both this company and the Union Pacific pay pensions throughout their lines and the lines of controlled companies, but we have no definite figures except as shown in the table.

On the lines in Texas and Louisiana the company supports an extensive hospital system, the benefits of which are available for sick as well as injured employees and for members of their families as well. For this privilege each employee pays 50 cents a month. The company has prepared plans for a hospital building at Houston, which will cost about $150,000.

SUBAQUEOUS TUNNELS.*

BY R. B. WOODWORTH.
Engineer with Carnegie Steel Company, Pittsburgh.

A rational classification of tunnels is not a very simple matter. They might be classified in accordance with the purpose for which they are used into steam railway tunnels, subways, sewer tunnels, intake tunnels, drainage tunnels, mine headings, etc., but a classification on this basis would not be of any more value than if they were classified into straight, curved or crooked, or into large, medium and small. It being premised all the time that tunneling is essentially a mining operation, a rational classification appears to be rightly based on the classes of material through which they penetrate, as after all that is the essential feature in the method of attack and the character of the equipment required for their construction. These materials are rock, rock and earth and all earth, and these three classes may also be divided as to the

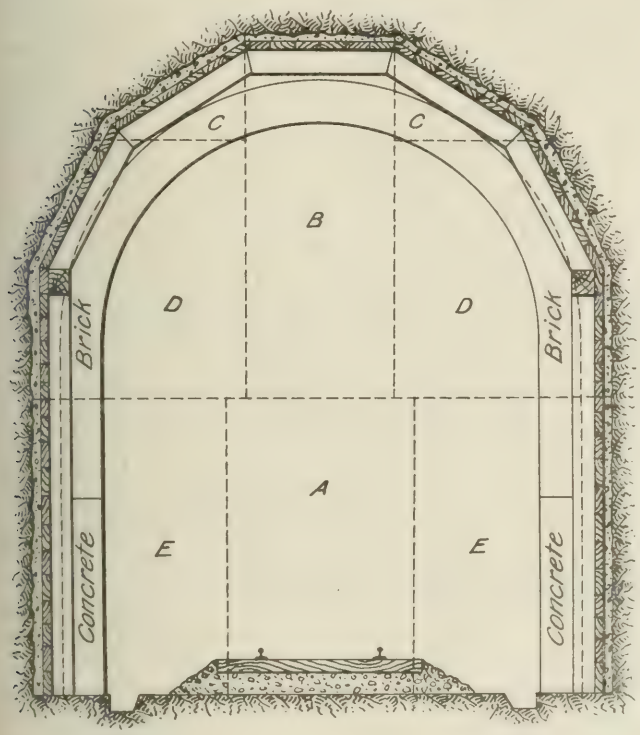


Fig. 1—Typical Design of Single Track Railway Tunnel Driven Through Rock.

presence or absence of water bearing strata. Where there are water bearing strata the use of compressed air may or may not be necessary, which would compel a further subdivision, making in all nine classes of operations, each calling for the solution of special problems.

Again, tunnels through water bearing strata are likewise subject to different conditions as to whether the water comes from the sides of the excavation or from above. In tunnels under streets and in many railway operations the water may be confined to such as percolates through the sides where its pressure is comparatively light. Tunnels may be built under bodies of water, becoming subaqueous in deed and truth, and may penetrate through all rock, part rock and earth and all earth, and may be driven in such subaqueous conditions by the use of a shield with compressed air or without compressed air, also without a shield with compressed air and without compressed air. Problems of various kinds will arise conditioned on whether or not the rock covering is stable and thick or whether it is fissured, broken or thin. The material above the rock is also an element of some concern.

In the construction of an extensive railway terminal system it is possible that materials of all these kinds will be encountered and that all the various methods of construction might be called into play at some point of the operation, and indeed in a tunnel through a hill the excavation might pass from earth through earth and rock to solid rock. In this condition, however, the ordinary practice is to excavate the approaches to the tunnel by the open cut method and to use mining methods only after the portals have been passed. For the purposes of this paper, however, a rational classification of tunnels will be into rock, soft ground and subaqueous in accordance with the following detailed definitions:

1. *Rock tunnel.* A more or less horizontal underground passage driven through stable material by the ordinary mining methods of drilling and blasting with or without timbering or lining, where such water as may penetrate through the material can be taken care of by within tunnel drainage.

2. *Soft ground tunnel.* A more or less horizontal underground passage driven through yielding material by ordinary mining methods of excavation with or without a shield and at normal or low air pressures, water percolation under gravity head being disposed of by within tunnel drainage.

3. *Subaqueous tunnel.* A more or less horizontal underground passage driven under a body of water through yielding material by ordinary mining methods of excavation with or without a shield at high air pressures against hydrostatic head, ingress of water being prevented more or less absolutely.

These definitions are based on the distinction between mining methods of blasting and excavation and ordinary open cut methods and, therefore, treat the whole system of tunneling as a branch of the art of mining. They are strictly in line with the definition adopted for a tunnel at the outset. If, however, it is maintained that a subway excavated under city streets or elsewhere by the open cut and cover method is to be looked upon from the standpoint of the completed work as distinguished from the methods involved in its construction, then we may have a fourth class of tunnels, viz.:

4. *Open cut tunnel.* A more or less horizontal underground passage driven through hard or soft materials by ordinary methods of excavation and covered by a flat or curved roof after the excavation is completed.

It is apparent that a tunnel shaft may be driven through soft or hard materials with or without lining by mining methods, but an essential feature of the designation tunnel is its more or less horizontal character.

5. *Rock tunnels.* The rock tunnel is the simplest application of the methods of mining to the construction of underground passages and modern advances have been due not to any radical change in the methods of attack but to the introduction of high explosives, power drills driven by steam or compressed air and modern methods of transportation with electricity or compressed air.

METHODS OF ATTACK.

Mining methods reflect to a large degree national characteristics. In England mine shafts are usually circular; in the United States almost always rectangular; in England long wall methods are common; in the United States almost unknown. These differences are due in part to natural conditions and in part to diverse experience and more or less familiarity with machine methods; consequently the differences which exist in the art of mining exist also in the branch of tunneling. Fig. 1 shows a typical design of a single track railway tunnel driven through rock and lined with brick supported on concrete side walls. It is subdivided into sections lettered to correspond with various methods in which material is removed. Tunnel excavation usually begins by the driving of a heading either at the top or bottom of the excavation.

In the Austrian or drift method of excavation the heading is driven at the bottom of the tunnel through section A, track laid for mine cars and advanced some distance ahead of the full section excavation. This advance heading is followed by the removal of sections B, C, D and E in their respective order,

*From a paper read before the Railway Club of Pittsburgh.

and if invert is to be made below the general level of the tunnel, it is completed as a final excavation.

The German method is to begin with the top heading through section B and to follow with C and D, completing the excavation down to a level and leaving a bench extending the entire width of the tunnel. This bench is then next attacked by two side headings in the bottom through E, leaving a firm central pillar A to be removed at the completion of the cross section excavation, but permitting mine cars to be run on each side thereof for prompt removal of material.

In soft ground the German method is to drive side headings at the bottom of E, which are usually subdivided into three parts and removed in successive layers by caving into the cars below. After both lower side sections E have been removed, a top heading is driven through B to be followed in turn by the excavation of C and D. During the progress of this excavation the lining of the tunnel is put in and the timbering erected thereon, leaving the solid central pillar A to be removed, as in the German method of rock excavation.

The English system is to drive a top heading in B from which sections C are excavated and crown bar timbering placed. A heading is then driven in the bottom of A and excavation proceeds, as in the Austrian or drift method, by the removal of the lower part of D sections as a bench and the excavation of top of A and the side sections E.

The Belgium method is to drive a top heading likewise and to excavate side sections C and D down to the level, timbering by the crown bar method as in English practice. The central section A is then removed to be followed in turn by the lower side sections E.

The American method, if any exclusive system may be designated by that name, has ordinarily been to divide the tunnel into three transverse benches and to remove them in order from the top down by taking out, viz., the side sections C, the top of B, the lower portion of B, the side sections D and the lower sections A and E; thus in a measure applying to tunnel work methods which are more common in open cut excavation.

The indications are that the most economical method of tunnel construction is the Austrian or drift method which drives a bottom heading first and permits the construction and maintenance of a transportation system in proper position for constant use without the necessity of track removal. A miner also in mining coal in successive levels works always to the heading below, shoveling his material downhill wherever possible.

DRIVING RECORDS.

The interest in speed records in rock tunneling is due to the fact that the time needed to complete the entire tunnel, and consequently the period during which vested capital lies idle, is wholly dependent on the speed with which two small headings can be put forward; only a small party of men can work in each heading and concentration of working forces is not possible; therefore, engineering construction looks upon speed of work in tunnel driving as an item of supreme importance. High efficiency of tools and methods and careful attention to the prevention of delays of whatever character are the main features in the determination of tunnel progress. Natural conditions may, of course, affect the work, such as unfavorable direction of strata, fissured rock, presence of water, etc. Where the rock is firm, solid and dry, one month's work may be double the ordinary rate of advance. The record for high tunnel driving is now held by the Alpine tunnels, such as the Simplon, the Arlberg and the Loetschberg. The greater length of these tunnels and the possibility of installing a more perfect plant and a more thorough organization may account in some measure for the comparative supremacy over English and American records. A few of these may be worth our attention,

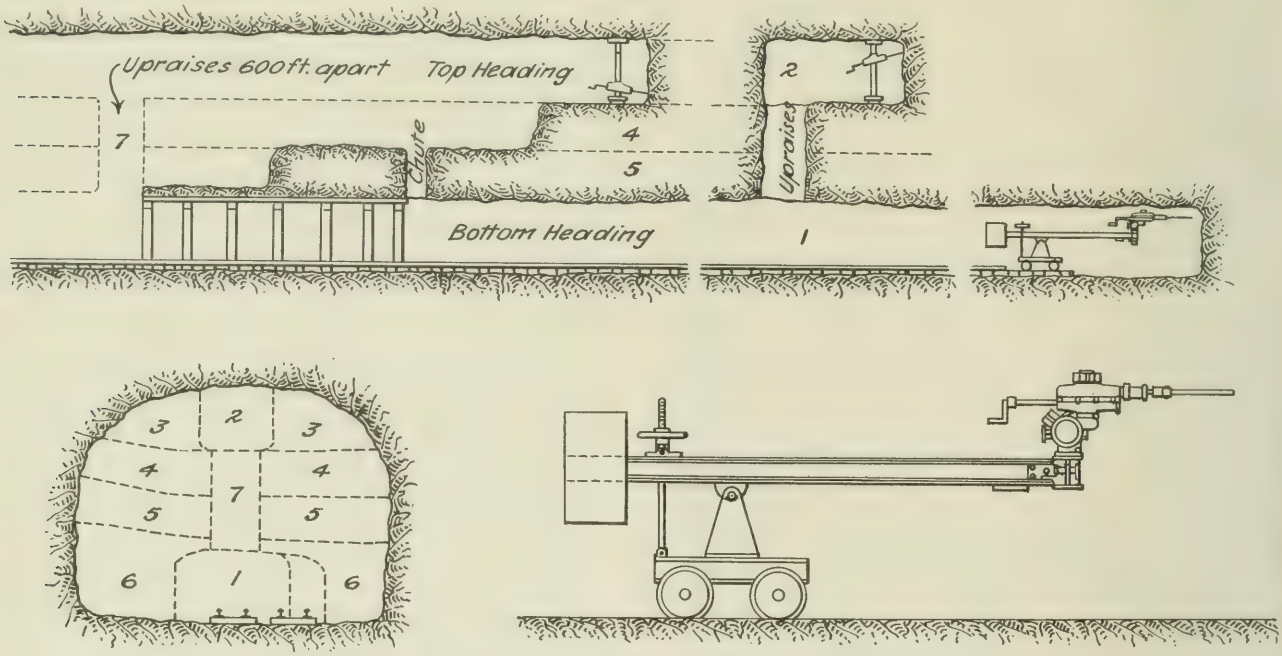


Fig. 2—Method of Driving the South Heading of the Loetschberg Tunnel.

it being remembered all the time that the kind of rock, its hardness and specific gravity, the presence of joints, seams, cleavage planes or other lines of structural weakness, and the size of the heading itself, are elements of large importance in any comparison.

The Joker drainage tunnel, Red Mountain, Colo., 5,055 ft. long, was driven 282 ft. in its best month, July, 1904, through Andesite breccia. The heading was 12 ft. by 11 ft. timbered 8 ft. 6 in. by 7 ft. Drilling was done with water Leyner drills and material was mucked by men in iron cars hauled by mules, though later transportation was effected by twelve electric locomotives.

The drainage tunnel at the Iron Mountain mine, Superior, Mont., 5,853 ft. long, was driven in 7 ft. x 6 ft. heading through quartzite 288 ft. in one month, January, 1907. Average rate for the entire tunnel 233 ft. per month. Cost per foot, $14.50.

The 6 ft. x 9 ft. heading of the Newhouse drainage tunnel, Idaho Springs, Colo., 22,000 ft. long, was driven 290 ft. in May, 1906, through granite and gneiss.

The best progress made in the construction of the Roosevelt drainage tunnel at Cripple Creek, Colo., 15,550 ft. long, was 435 ft. in January, 1909. Average monthly advance for twelve

months 292 ft. The heading 10 ft. wide by 6 ft. high with a 3 ft. x 6 ft. drainage ditch on one side of the floor, was driven through Pikes Peak granite by water Leyner drills, No. 9, mounted on a horizontal cross bar wedged against the sides of the bore, two drills being operated in each heading. The muck was taken out in steel cars of 36 cubic ft. capacity on a single track railway in trains of 10 to 12 cars hauled by mules.

The Gunnison tunnel, an essential part of the Uncompahgre valley reclamation project, is the longest irrigation tunnel in the world. It is 30,582 ft. long and the headings were driven to a meeting point on July 6, 1909, as the culmination of 54 months' continuous work. The best record made was the driving of an 8 ft. x 12 ft. heading 842 ft. in one month in soft shale. The best record in granite for any single month for one heading was 449 ft., January, 1908. In the hard granites the Sullivan 3-in. piston drill was used; in less refractory ground Sullivan 2½-in. drill; in the shales the Jeffrey coal auger, air driven, was used with highly satisfactory results; the Leyner drill was also used in certain classes of the work. The record headings were driven by the under-cut method.

The Elizabeth tunnel of the Los Angeles Water Works, California, 26,860 ft. long, was driven 466 ft. in granite in October, 1908. The heading 12 ft. x 12 ft. was driven with a model 6-A water Leyner drill, the mucking being done by hand and the tramming by electric motors. Cost per foot, $31.81.

An excellent record in driving a railway tunnel was made in 1908 on the Bitter Root tunnel of the Chicago, Milwaukee & St. Paul, through the Bitter Root mountains, Montana. The tunnel was driven by the regular top heading method and was advanced 563.5 ft. in May of 1908, the average advance for the three months of March, April and May being 499.7 ft. The rock is a quartzite somewhat laminated and the heading is the full roof arched section for a double track tunnel.

The new Croton aqueduct has a length of 30.87 miles, of which 29.63 miles is in tunnel, being horseshoe in form, 13.53 ft. high and 13.6 ft. wide and carrying an estimated capacity of 318,000,000 gallons of water per day. This is the longest tunnel in the world. It was driven from shafts about a mile and a quarter apart along the length of the line, and the best record in any one heading was 550 ft. per month. This was in hard rock in an unusually large heading and the ordinary progress was about 175 ft. per month.

Fig. 2 shows the method of attack and the sequence of operation in driving the south heading of the Loetschberg tunnel, which is being built in Switzerland on the line of the railway to connect Berne with the Simplon tunnel route to Italy. This tunnel when completed will be about 8½ miles long. The bottom heading 6 ft. 6 in. high by 10 ft. wide is driven by machine drills mounted on drill carriages, and the rock encountered varies from granite to gneiss and is hard drilling. Compressed air is furnished by two electrically driven Ingersoll Rand compressors of the cross compound two stage type. The record in this tunnel is 574 ft. in September, 1907. Average speed for five months, 555 ft. per month.

A record of 579 ft. during the month of May, 1909, has been made in the Fernando tunnel, located about 25 miles north of Los Angeles and driven in connection with the construction of the Los Angeles intake through soft sandstone. The tunnel has a section of 10 ft. 8 in. x 11 ft. 2 in., and the whole section is carried forward in one operation by three shifts of 16 men each. The completed tunnel will be 9,112 ft. long.

The Arlberg tunnel, in the Alps, 33,696 ft. long, was advanced through schist and gneiss 641 ft. in July, 1883, by the use of Brandt rotary drills. The average speed of driving for 40 months was over 400 ft. per month.

The world's record for rapid tunnel driving is held by the Simplon tunnel, 64,818 ft. long, in building which a heading 6 ft. 6 in. x 9 ft. 8in. was driven through schist and gneiss 755 ft. This figure was made in July, 1904, in the south heading, the best speed in the north heading being made in December, 1902, at the rate of 682.2 ft. In both headings the work was interrupted and delayed by bad rock, the average rate of speed of 426 ft. per month for 76 months being exceedingly good.

If now we compare these records with that of the Hoosac tunnel, 4⅔ miles long, driven in 1865-1873, it will be noted at once how great the improvements have been in tunnel methods. The best record of the Hoosac tunnel was 184 ft. per month with machine drilling. It will also be noted how far short we come of the best European records, the secret of which appears to be that a very careful study has been made of the various causes of delay in the successive processes of drilling, blasting, mucking out and setting up the drills again, with the result that a radically different method of mounting the drills in the heading has been employed and also a different system of blasting used from that practiced in the United States.

Fig. 2 shows that the bottom heading in the Loetschberg tunnel, on which the speed of the tunnel depends, is driven by a machine drill mounted on its own separate drill carriage, which permits the speediest possible removal for blasting and renewal of work after blasting is over. This bottom heading is supplemented by the regular pneumatic drills in the other headings which blasts material down into the bottom for speedy removal. Excavators have been invented and used to some extent in the United States. The Jackson tunneling machine, described in *Engineering News* for February 22, 1908, is intended rather for use in clay. The Mersey tunnel, however, was bored in part with a Beaumont machine cutting to a diameter of 7 ft. 6 in., and doubtless we have not yet come to the full development possible in the way of multiple drills and drilling machines.

LINING.

However stable the rock may be, very few tunnels are now allowed to stand without some form of lining, as the best rock is liable to swell and to fall, making track maintenance more difficult. In the olden days timber lining was common and has not yet entirely gone out of fashion in such sections as there is still a supply of good timber close at hand. The Bitter Root tunnel of the Chicago, Milwaukee & St. Paul is lined with timber made up of 12 in. x 12 in. longitudinal sills and wall plates with 16-ft. posts and a five-segment arched rib spaced according to the character of the material to be supported, usually 3 to 4 ft. center to center, but in many cases the material necessitated putting the timbers closer together. Two inch lagging is used on the side of the tunnel and 4 in. on the arch.

There is always in a timber lined tunnel danger of fire from locomotives, and the same considerations which seem to forbid the presence of timber in mine shafts apply as well to its use as a permanent tunnel lining material, consequently it has been to a large extent superseded by brick. The Mt. Washington tunnel, of the Pittsburgh Railways Company, is a very good example of a two-track brick lined tunnel driven through stable material. Water works tunnels are to a large extent lined with brick, a most noteworthy example of which is the land tunnel for the new water works, Cincinnati, Ohio, built in 1903. This tunnel is 22,264 ft. long and carries treated water from the shaft at the clear water reservoir to that of the city pumping station. It is 7 ft. in diameter in the clear and 9 ft. 6 in. over all, and is lined with two rings of specially made radial pressed vitrified shale brick laid with close joints and backed with concrete, the minimum thickness of the concrete being 6 in. Where the tunnel passes beneath the Little Miami river the lining is reinforced by rings of ¾ in. round steel bars 2 ft. center to center. The tunnel was driven through limestone and shale rock and the few streams of water encountered were taken care of by driving pipes into the seams so as to discharge the water within the tunnel.

The Raton Hill tunnel, of the Atchison, Topeka & Santa Fe, at Raton Pass, on the Colorado state line, built in 1908, 2,790 ft. long, is lined with reinforced concrete varying in thickness from 2½ ft. at the base to 2 ft. at the springing line of the arch. The arch ring also has a thickness of 2 ft.

These dimensions apply to soft ground. In loose rock the thickness is 2 ft. at the base, 18 in. at the spring line and 18 in. in the arch ring. Irregularities between the excavation and the outside limits of the concrete were filled with loose stone packing laid by hand.

The Bergen Hill tunnel, of the Lackawanna Railroad, is likewise lined with concrete and the rails of the double track are carried on concrete laid on the rock bottom of the tunnel. The concrete tunnel lining is 2 ft. in thickness.

The Gunnison tunnel is a timber lined tunnel with a concrete facing, but differs quite a good deal from ordinary railway tunnels in the fact that the tunnel itself is intended as an aqueduct and the tunnel lining forms a flume for the passage of the water. This flume is built in the ordinary manner with timber sets 3 ft. center to center lagged with planking and wedged tightly against the excavation by cordwood. The whole wooden structure is filled within with concrete to the finished dimensions, thus providing a structure of maximum resistance to stress and of a waterproof character.

The tunnel profile shown in Fig. 1 is drawn after that of the Langsville tunnel of the Kanawha & Michigan, and the permanent lining consists of a reinforced concrete wall 8 ft. high on each side, with brick masonry above and with brick arch. The reinforcement of the side walls consists of old rails and truss rods from old cars. The rails were set in holes drilled in the bottom of the tunnel and built into the brick walls above, thoroughly tying the brick work, concrete and tunnel floor together. After the reinforcement and forms were in place the concrete was mixed in a Smith mixer run by compressed air and mounted on an ordinary flat car, and was dumped from the car directly into the forms of the walls. The bricks were laid with Portland cement mortar with as thin joints as possible, the harder burned bricks being selected for the exposed courses.

The Duluth tunnel, of the Wisconsin Central, is lined with an arch and side walls of concrete, which is mixed in the proportions of one part Universal Portland cement, three parts bank sand and five parts gravel, mixed in a one-yard Smith mixer. Flat cars were operated from a narrow gauge track laid on the cross braces between the wall plates and the tunnel timber. A short piece of track was laid on the deck of each of these cars to carry a small hopper car in which the concrete was transported, which permitted the delivery of the concrete directly to the top of the wall forms. The concrete for the arch was shoveled into place from the cars.

The concrete used in the lining of these tunnels was put in place by the use of ordinary removable wooden forms. Modern methods for the mixing and placing of concrete by the use of removable steel forms are to be seen in the Blue Island Avenue tunnel, city of Chicago, built under the supervision of George W. Jackson, president and chief engineer of George W. Jackson Company, Inc. The Jackson lagging ribs are built of 5 in., 9-lb. channels bent to the radius of the circle required to bring the lagging to the proper curve, with the flanges of the channels out. Each rib is made of four sections, each section being a 90-degree arc of a circle, the inside diameter of the tunnel being 8 ft. The lagging used with these ribs consists of 3-ft. lengths of ¼ in. plates 12 in. wide. These plates have a light steel angle riveted along both sides and both ends so as to form a rim entirely around the plate flush with the edges of the latter. The angles on the sides of the plates are notched to fit over the flanges of the channels of the ribs, which can thus be spaced accurately by placing a few of the lagging sections. At the same time the joints between the edges of the adjacent sections of lagging can be made quite smooth and tight enough to hold concrete. As fast as the mining is carried ahead of the finished tunnel lining, the concrete in the lowest part of the invert is generally placed to provide for the erection of the steel lagging ribs. When the ribs are placed, the lagging for the lower part of the circle is set and the invert lining finished up part way on each side. The spoil-car track and shoveling platforms can then be laid on cross ties formed of a horizontal angle attached to each lagging rib, and the concrete lining can be completed at leisure. After the concrete is set the removal of the form is very readily accomplished by simply loosening the bolts at the top and side joints of the lagging ribs and by knocking out the wedges. The forms are then carried ahead and re-erected, only a sufficient amount of steel ribs for lagging being provided in each heading to permit the concrete to set the required time. That these forms are practically indestructible under service is indicated by the fact that upward of a half mile of concrete tunnel lining has been placed with each set of them in use.

(*To be continued.*)

COST OF TIES ON SOUTH AMERICAN RAILWAYS.

Recent information from South American railway officers on this subject is interesting for a variety of reasons, even if not directly valuable.

In Argentina the railways are restricted by law to the use of native hardwood ties. The effect of this is typical of all government interference with trade. The hardwood ties cost from $2.40 to $2.50, gold, each. The compensation for this high price is that some of the native hardwood ties do not decay, and spike holes and checking are the only causes of shortening life. Quebracho colorado grown in the northern provinces is the most nighly esteemed timber for this purpose.

Brazil has a great variety of tie timber and it is not unduly costly. This has given a chance for a good deal of experiment, and creosoted ties are used by some companies, for example, the Rio de Janeiro Light & Power Company. The Leopoldina Railway uses hardwood ties from a variety of timber trees, which cost about 70 cents gold each, and last about ten years.

In Uruguay, with easy access to a variety of native hardwoods, they have nevertheless experimented with creosoted ties obtained from England, and probably originating in Norway. They have also imported pine ties from southern United States. Both of these sources have been abandoned. The native hardwoods, quebracho, lapacho and curupai, are in great favor, but, nevertheless, still in active competition with the famous jarrah wood obtained from Australia. Jarrah ties are delivered at $1.50 gold each, native lapacho ties are quoted at $1.85 gold each. Brazilian hardwood ties are quoted at $1.60 gold each. On the Ferro-Carril Central del Uruguay they have been using jarrah ties for nine years, with no sign of deterioration. The jarrah ties require to be kept covered with ballast; if exposed to air and weather on one side only they are liable to check. Quebracho ties in the road for 30 years are reported to be still perfectly sound.

Paraguay has no seaboard and necessarily relies entirely on native hardwoods. Those used are curupai, lapacho, urundaymi and tat a yiba. The average life of these ties is given as 20 years, a satisfactory result considering that the present price is only 50 cents gold.

In Venezuela, on the north coast, they have also experimented with imported creosoted ties, with the result of returning to their native hardwoods, balsamo, algarrobo, vera and roble. They cost about 70 cents each and last 12 or 14 years.

In Ecuador, on the Pacific coast, they have been importing pine ties, untreated, from California at a cost of 85 cents gold. They have only recently developed the use of a native hardwood, guayacan. This wood is so hard that holes have to be bored for the spikes. On the Guayaquil & Quito Railway this is believed to be the best tie timber known, and no limit has yet been found to its life.

In Peru the native supply of timber of all kinds is deficient. Redwood ties are imported from California at a cost of $1.30 gold, and on the coast, where the climate is dry and traffic

light, the redwood ties last from 15 to 20 years. On the Oroya Railway, which runs from the coast, where it never rains, to an elevation of 16,000 ft., where rain is pretty nearly continuous, the average life of ties of the whole line is from six to seven years. Some Oregon pine and douglas fir ties are used. Treated Oregon pine ties cost $1.12 gold. Some experiments have been made importing guayacan ties from Ecuador at a cost of 46 cents gold and pellin ties from Chile at a cost of 54 cents gold. From Chile some roble ties have been imported at a cost of 91 cents gold. The name roble is probably a corruption of the word robur, as the timber seems to correspond quite exactly with red oak. The only native tie is the algarrobo, made from a very crooked, scrubby, hardwood tree, which grows to a height of about 25 or 30 ft. Holes have to be bored for spiking. This timber endures fairly well in wet climates in the high mountains. On the coast the white ants destroy it very soon.

INVESTIGATION OF DEFECTIVE OPEN HEARTH RAILS.*

BY ROBERT JOB.

During the past few years the proportion of open hearth rails rolled has increased rapidly owing to the fact that by cutting down the phosphorus to a minimum a great increase in toughness results, rendering possible a much higher carbon content than is safe in a high phosphorus bessemer rail, and hence a higher elastic limit, with increased hardness and capacity for wear.

With good mill practice very favorable service results may be obtained, and we have known of instances in which such rails have averaged only one-third the wear found with the usual bessemer rails when laid in track end to end with the others and under exactly the same conditions of service.

As has been pointed out repeatedly the name, "open hearth," is no talisman for production of rails certain to give good service, and it is well known that rails of this method of manufacture are subject to the same general defects which may be found in bessemer rails, and hence require equal care during the process of manufacture. In the study of causes of failure of rails, striking instances occasionally occur which are of especial interest in view of the results in service. An example of this type took place not long ago.

An open hearth rail had broken in service into about 40 pieces, derailing a train, but, fortunately, causing no loss of life, and a critical examination was made to determine the exact cause of the failure. In the preliminary investigation we found that a blowhole began near the receiving end of the rail about one-half inch below the top of the head, parallel with the surface of the latter, and extended clear to the running-off end of the rail. Within a short distance from the start the unwelded seam spread from one side of the head to the other with oxidized surfaces. In the unbroken rail no defect could have been visible, and even after the fracture the only sign of defective condition on the contour of the unbroken pieces was a faint line like a roll mark along the side of the head, generally covered with mill scale. When the fracture came, evidently the half-inch layer on the top of the head cracked, throwing the end against the opposing wheels and thus causing the derailment, the remainder of the rail being ground into pieces by the force of the impact and the pounding of the wheels.

In order to study the condition of the steel a transverse section was cut at a point about three feet from the receiving end of the rail, and an analysis made of the borings taken with a ⅝-in. drill about ½ in. below the top of the web showed the following composition:

	Per cent.
Carbon	1.070
Phosphorus	.031
Manganese	.758
Sulphur	.025

*From a paper read before the twelfth annual convention of the American Society for Testing Materials.

The heat average was about as follows:

	Per cent.
Carbon	0.75
Phosphorus	.090
Manganese	.76
Sulphur	.095

In order to note the extent of segration in the section, borings were taken with the ⅝-in. drill about ½ in. to the side of the center of head at a distance of 1½ in. from the location of the first borings and the following composition was found:

Carbon	0.918 per cent.
Phosphorus	0.027 "

From the above it is clear that radical segration of the ingot existed and accounted for a decided difference in the physical properties of the steel in closely adjacent places. The granular structure of the steel was about normal, showing that burning or overheating had not occurred.

As the next step in developing the physical character of the metal we polished the surface of the section and found that the steel contained a large number of porous, spongy spots, as shown in Fig. 1, taken in the natural size of the web. The condition of the head of the section is shown in Fig. 2, with the blowhole extending across the head. Etching the steel slightly with alcoholic iodin we found additional indication of the unsound condition of the steel, as shown in Fig. 3, proving that the defects were not local, but extended throughout the section. The fracture was unquestionably caused by the large blowhole across the head, but even though this had not been present short life would have been certain to result owing to the general condition of unsoundness, for the fact has been demonstrated so often that it has become an axiom that good service can not be expected from an unsound rail.

In many cases of unsoundness the general location and character of the defect is indicated by the service which is given and the manner in which the rail begins to fail. When great porosity exists or when much slag and other matter is present, as in Fig. 4, slivering generally follows after a short life, and the steel on the outside edge of the head begins to flow, and ultimately sloughs off, and is called "soft steel" by the trackmen, although this action gives no indication of the carbon contents; it is simply a consequence of unsoundness. Fig. 5, is a somewhat similar case of failure after a short service, though in this instance the rail fractured in track. In Fig. 6, fracture resulted owing to presence of porosity in the upper portion of the head. Indeed, as stated several years ago, we have found that the service suffers severely when unsoundness exists near the upper portion of the head, and fracture may occur or the slivering and mashing down which has been shown above. When the same defects are somewhat below the surface, leaving a layer of sound steel a quarter of an inch or so in width, good service often results until the sound metal has worn away.

The gradual course of failure of these unsound rails is interesting to follow. Fig. 7 shows a porous steel which has begun to sliver at the top and side of the head, showing also an unwelded seam down from the top of the head, In Fig. 8 the same general defective condition of the steel exists though a plane of weakness has begun to develop in the short split in the right hand corner of the head. In Fig. 9, another similar rail, the crack has extended almost through the head, while in Fig. 10, we see the action completed, and the side of the head completely split off. In all of these instances the general condition of the steel to the naked eye appears normal, but by developing the structure the defective character is readily seen.

In the investigation of broken rails a characteristic form is occasionally found of the general type shown in Fig. 11. A sharp pronounced cut appears on the top of the head of the rail with a straight sheer cut extending into the steel an eighth of an inch or so, and then a smooth, split-off appearance extending well down toward the web. This condition



Fig. 1.



Fig. 4.



Fig. 6.

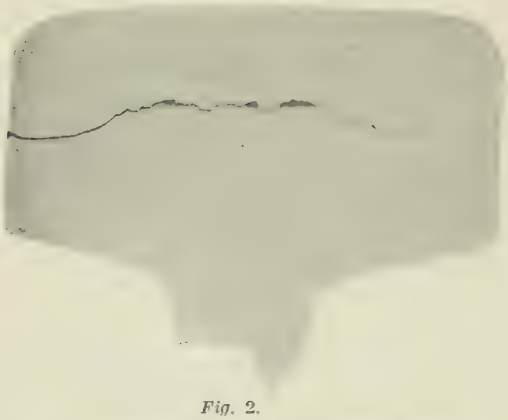


Fig. 2.



Fig. 5.



Fig. 8.

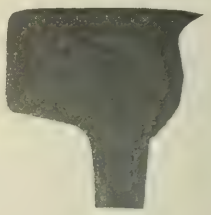


Fig. 10.

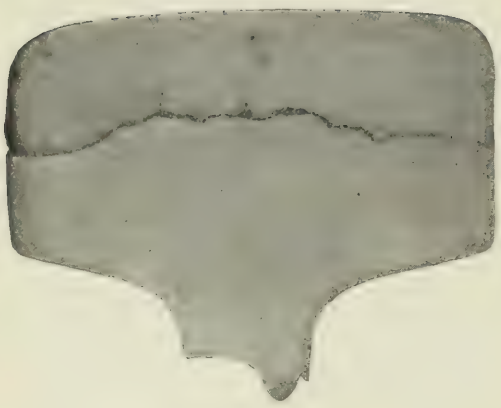


Fig. 3.



Fig. 7.



Fig. 9.



Fig. 11.



Fig. 12.

Cross Sections of Rails.

All rails are open hearth steel except Fig. 12. *For explanation of these illustrations see note at the end of the article on page* 525.

has been caused by a blow from a sharp edge of a defective wheel, and we have known of instances in which scores of rails have been put out of commission, each with the distinctive mark, by a single defective wheel. The final fracture may not occur until the lapse of some little time after the damage has been done, but the plane is gradually extending from the original cut and on some sudden stress the rail is broken at the injured point.

As a contrast to present rail conditions, Fig. 12 indicates the method of manufacture of one of the earliest types of steel rails, called "German Steel." This metal, as is well known, was composed of alternate layers of iron and of steel as is shown in the light etching above, and is of interest as in illustration of one of the early steps taken years ago in the development of the steel rail.

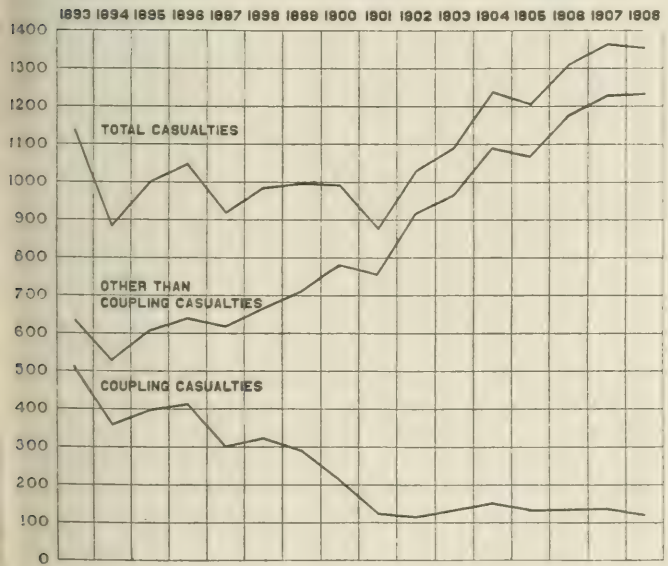
Fig. 1. Web polished. Fig. 2. Head, polished, showing blowhole. Fig. 3. Same as Fig. 2, etched lightly with iodin. Fig. 4. Unsound steel, showing effect of short service. Fig. 5. Unsound and porous—fractured in track. Fig. 6. Head, polished—porous. Fig. 7. Unsound, running edge slivered. Fig. 8. Unsound, beginning to split. Fig. 9. Unsound, split head. Fig. 10. Unsound, split head. Fig. 11. Characteristic fracture by defective wheel. Fig. 12. "German Steel"—layers of iron and of steel, an early type of rail.

LIVES AND LIMBS SAVED BY AUTOMATIC COUPLERS.

The diagram printed herewith, showing for 16 years the number of trainmen killed and injured in the United States by all causes and a comparison with the totals due to coupling accidents, has been issued by the Interstate Commerce Commission, to show the beneficent results of the safety appliance law. The total numbers of trainmen employed each year, with the totals of killed and injured in coupling and uncoupling cars, are shown in the following table:

Casualties in Coupling and Uncoupling Cars; Years ending June 30.

Year.	Number— Employed.	Killed.	Injured.
1893	179,636	310	8,753
1894	160,033	181	5,539
1895	157,731	189	6,077
1896	162,876	157	6,457
1897	161,397	147	4,698
1898	170,708	182	5,290
1899	178,851	180	5,055
1900	191,198	188	3,803
1901	209,043	163	2,377
1902	225,422	141	2,457
1903	253,660	211	3,023
1904	253,834	269	3,506
1905	265,175	217	3,316
1906	285,556	266	3,590
1907	317,808	272	4,062
1908	281,645	198	3,116



Casualties to Trainmen in the United States Per 10,000 Employees.

The ratios of these casualties, the killed and the injured columns being lumped together, are shown in the lower line of the diagram. The increase in accidents to trainmen due to other causes than coupling—from about 550 per 10,000 in 1894 to 1,230 in 1908, is a remarkable showing which the circular does not explain. It is generally agreed that when business is dull, as was the case in 1894-1897, the weeding out of the less competent men and the easier conditions of work due to the smaller degree of pressure on the facilities, tend to reduce the proportion of casualties, but the increase since 1897 seems large. The still more rapid increase since 1901 may perhaps be due to more careful reporting of injuries. It was in that year that the railways began making monthly reports, with details of casualties.

The commission also prints a table showing the ratio of employees killed to the total number employed (all classes), from which we take the following:

Casualties to Employees, Per Thousand Employed; Years ending June 30.

Year.	Total number railway employees— On pay roll, June 30.	During year— Killed.	Injured.	Per 1,000 employed— No. killed.	No. injured.
1895	785,034	1,811	25,696	2.307	32.73
1896	826,620	1,861	29,969	2.251	36.26
1897	823,476	1,693	27,667	2.056	33.61
1898	874,558	1,958	31,761	2.239	36.32
1899	928,924	2,210	34,923	2.379	37.59
1900	1,017,653	2,550	39,643	2,506	38.96
1901	1,071,169	2,675	41,142	2.497	38.41
1902	1,189,315	2,969	50,524	2.497	42.48
1903	1,312,537	3,606	60,481	2.747	46.08
1904	1,296,121	3,632	67,067	2.802	51.75
1905	1,382,196	3,361	66,833	2.431	48.36
1906	1,521,355	3,929	76,701	2.583	50.43
1907	1,672,074	4,534	87,644	2.712	52.42
1908	1,458,244	3,470	83,367	2.380	57.17

The much greater increase in the "injured" column than in the "killed" column would seem to confirm the supposition that the difference is one of reporting rather than one of fact.

In 1903 the coupling accidents constituted 44 per cent. of all casualties, while in 1908 they constituted less than 9 per cent.

The commission also shows that the tons of freight carried one mile per trainman employed has increased from 500,000 in 1894 to about 750,000 in 1906; and in 1908 it was still higher. This ratio increased with considerable regularity from 1894 to 1900, when it was nearly as high as in 1906. In the five years between 1900 and 1906 it was considerably less.

THE AMERICAN RAILWAY CLEARING HOUSE.*

BY ARTHUR HALE,
Chairman.

Most clearing houses, so called, are self-contained; that is, their sole function is to determine balances between their members. Of this class are the bank clearing houses and the exchange clearing houses. There is, however, another kind of clearing house, although it is not often so called, which, besides determining balances between its members, acts as agent for them in dealing with others. In this way the Pennsylvania Railroad Company clears balances between the constituent lines of its system and also acts as agent for these allied lines in settlements with other parties. Other large railway companies do the same.

When the American Railway Clearing House was asked by two of its members to handle their car hire balances, it naturally adopted the method of the Pennsylvania Railroad, and of the other systems which handle their balances in the same way, and besides clearing the balances between these two railways, it undertook successfully to clear their balances with all the other railways and car owners. As more railways have joined the clearing house, it has been found that the additional work of making entries becomes proportionately less with the advent of each new subscriber as a certain proportion of the entries are already made, that is, those covering its relations with old subscribers.

This reduction of labor will increase as more railways join, and if the time ever comes when all the railways except one are members of the clearing house, that railway, under the present system would have all the advantages of the clearing house without being obliged to make any subscription.

It seems possible, therefore, that a time may come when it

*Paper prepared at the request of the Committee on Clearing House Settlements of the Society of Railway Financial Officers.

will be desirable for the clearing house to reverse its policy and clear only for its subscribers.

It was fortunate that the first clearing work undertaken by the clearing house covered an account like car hire, which is settled on the basis of acknowledgments of indebtedness. Everyone is willing to accept an acknowledgment of indebtedness, if only on account, and for this reason balances based on such acknowledgments of indebtedness can be promptly cleared without any prior agreement between debtor and creditor.

If an attempt had been made to settle car repair accounts through a clearing house, it would very probably have failed. Accounts, such as car repairs, which are settled on the basis of bills, are frequently disputed and are never accepted without checking. As it is we have a good deal of difficulty in settling switching reclaims and passenger car hire bills.

Our experience in car accounts has shown that a clearing house, such as this, which has no original reports and no method of disciplining the clerks who make reports, is at great disadvantage in any attempt to correct errors. Indeed, to attempt to correct errors through a clearing house is frequently only adding an unnecessary handling of papers; therefore, when railways discover errors in each other's reports, the clearing house always insists upon their correcting them direct. When the error is straightened out, the debtor includes the amount in his next report.

From the above it can be concluded that a clearing house, such as this, can successfully balance all accounts based on acknowledgment of indebtedness for any railway which desires to join it without any preliminary agreement.

If it is desired to settle balances based on bills, it would seem necessary to arrange for an agreement under which the bills would be accepted on their face and corrected in subsequent accounts. It would also seem necessary to confine the clearing and settlements of such accounts to members of the clearing house.

It is true that car repair bills are usually less in amount than the car hire due in the same periods, so that it is usually practicable to subtract the car repairs from the car hire and make a settlement of the balance due. This has been done with success by certain railways in settling with private car owners, but it is considered an arbitrary method and could hardly be adopted unless the clearing house had the solid backing of a large majority of the railways.

The work of the clearing house is very simple. A railway reports that it owes certain amounts to certain parties. The clearing house clerk simply distributes these amounts to the accounts of the proper parties, when a balance can be immediately struck between each party concerned and the clearing house. The practical difficulty in securing these balances lies solely in the imperfections of the clerks, who are bound to make some errors. The use of adding machines, careful checking and a proper sub-division of the accounts so that errors can be promptly located appears to be sufficient to overcome this difficulty.

The expenses of the clearing house are charged out to the subscribers at an agreed rate per month, which is kept as stable as possible, and is based roughly on the rate of two and one-half cents per entry. This rate was established on the understanding that the American Railway Association would provide supervision and quarters. The charges under this rate vary from $1 per month to $15 per month.

It is thought that if 50 per cent. of the railways would join the clearing house this rate would be sufficient to cover rental and supervision, as well as all other expenses.

The experimental nature of the whole movement and the necessity for economy made it impracticable to appoint a treasurer and to arrange for the direct handling of funds. Arrangements have therefore been made with banks in Chicago and New York, under which they act as depositories.

The chairman of the clearing house draws upon the roads which owe it money, but only in favor of the depositary. The roads to whom the clearing house owes money draw upon the depositary, and thus the clearing house itself handles no cash at all except for its necessary expenses.

The difficulties in settlement have been less than were anticipated. Certain railways are not settling their accounts promptly for obvious reasons, and it was felt on this account that the clearing house might be unable to make prompt settlement in full. It has, however, developed that on the whole there is more delay in settling by the railways to which the clearing house owes money than by the railways which owe the clearing house money. This unanticipated circumstance has enabled the clearing house to make prompt settlements in

C. H. 41.
Copy for

AMERICAN RAILWAY CLEARING HOUSE.
GRAND CENTRAL STATION, CHICAGO, ILLS.
SUMMARY OF PER DIEM AND MILEAGE EARNINGS.

JANUARY, 1910.

SUBSCRIBERS	AMOUNT DUE To Clearing House	AMOUNT DUE By Clearing House	SUBSCRIBERS	AMOUNT DUE To Clearing House	AMOUNT DUE By Clearing House
Arizona & Colorado R. R.					
Atlanta & West Point R. R.			Maricopa & Phoenix R. R.		
			Maryland Steel Company		
Baltimore & Ohio R. R.			Minneapolis & St. Louis R. R.		
			Morgan's Louisa. & Tex. R. R.		
Balto. & Sparrows Point R. R.			Morgantown & Kingwood R. R.		
Chicago & Alton R. R.			Naperville Junction Ry.		
Chicago & Illinois Midland Ry.			Narragansett Pier R. R.		
Chicago, Rock Island & Gulf Ry.			Norfolk & Western Ry.		
Chgo., Rock Island & Pacific Ry.					
Chicago Term. Transfer R. R.			Oregon & Washington R. R.		
Chicago Union Transfer Ry.			Oregon Railroad & Nav. Co.		
Coal & Coke Ry.			Oregon Short Line R. R.		
Columbia, Newb. & Laurens R.R.					
Corvallis & Eastern R. R.			Pennsylvania Steel Company		
Cumberland & Penna. R. R.			Phoenix & Eastern R. R.		
			Pitts., Lisbon & Western R. R.		
Delaware & Hudson Company					
Denver, Nor.-West. & Pac. Ry.			Quebec, Montreal & Sou. Ry.		
Erie & Mich. Ry. & Nav. Co.			R., F. & P. R. R.—W. So. Ry.		
El Paso & S. W. System					
			St. Joseph & Grand Island Ry.		
Galv., Harr. & San Ant. Ry.			St. Louis, Rocky Mtn. & Pac. Ry.		
Georgia Northern Ry.			Sonora Railway		
Gila Valley, Globe & No. Ry.			Southern Pac. Co.—Pac. Sys.		
Groveton, Lufkin & No. Ry.			Sou. Pac. R. R. Co. of Mexico		
			South Georgia Ry.		
Houston & Brazos Valley Ry.			Staten Isl. Rapid Transit Ry.		
Houston & Texas Central R. R.			Sunset R. R.		
Houston, East & West Tex. Ry.					
			Texas & New Orleans R. R.		
Iberia & Vermillion R. R.			Toledo, St. L. & Western R. R.		
Iowa Central Ry.					
			Union Pacific R. R.		
Kansas City Southern Ry.			Western Allegheny R. R.		
			Western Ry. of Alabama		
Lake Charles & Northern R. R.			Wheeling & Lake Erie R. R.		
Lehigh & New England R. R.					
Little Kanawha R. R.			Wisconsin & Michigan Ry.		
Louisiana & Northwest R. R.					
Louisiana Western R. R.			TOTAL,		
			BALANCE,		

The total amount shown above should be charged against **American Railway Clearing House**, and all amounts due these companies for per diem or mileage should be credited to **American Railway Clearing House**, and not to the individual roads as heretofore.
If balance is in your favor, please fill out first column of this blank and attach to your draft
Full instructions are shown on page 12, Official Railway Equipment Register.

ARTHUR HALE,
Chairman.

*Included in W. Ry. of Ala

Form C. H. 41.

full and also to carry balances on which it has drawn certain amounts of interest.

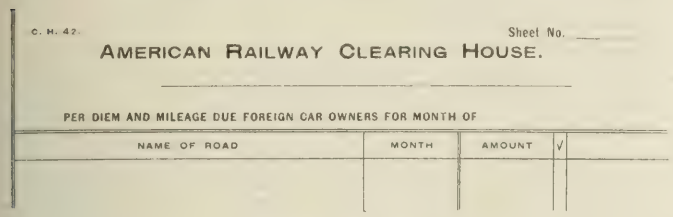
At the same time there is an injustice worked against the railways which are prompt in settlement by the railways which are dilatory, and if the time should come when the clearing house is operated under an agreement it seems probable that one of the provisions in the agreement should be that a penalty should be paid on delay in settlement, as is done in the English railway clearing house.

If the roads to which the clearing house owe money should show any disposition to draw more promptly than they do at the present time, the clearing house would be obliged to name a settling day on which it would make its own drafts and before which it would not accept drafts. The clearing house has done this, so far as private car lines are concerned, for its own protection, but it has not found it necessary to do so for non-subscribing railways.

One chief reason for the continued growth of the clearing house has been that it does not operate under any hard and fast agreement. The clearing house acts as the servant of each of its subscribers and accepts its each and every instruction without question. It cannot pay out any money for a sub-

scriber without detailed instructions, and, if any subscriber withholds its reports for any particular month or road, the clearing house is powerless to act for it.

Every road retains full particulars as to its accounts and the reports to the clearing house are merely duplicates of reports which are now made on every road by the car accountant to the auditors. These reports to the clearing house are considered as confidential communications, and it would be as impossible for an outsider to gain information as to the affairs of a railway from the clearing house as it would from its own officers. When a road subscribes to the clearing house,


C. H. 42. Sheet No. ____

AMERICAN RAILWAY CLEARING HOUSE.

PER DIEM AND MILEAGE DUE FOREIGN CAR OWNERS FOR MONTH OF

NAME OF ROAD	MONTH	AMOUNT	√

Form C. H. 42.

it does not lessen the authority or responsibility of any of its officers. It simply hires a new, though expert clerk, to do the old work better and cheaper.

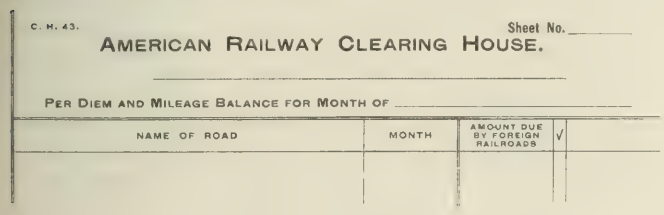
HISTORICAL.

The American railway clearing house commenced operations in January, 1907, under the auspices of the committee on car efficiency of the American Railway Association, the expenses being taken care of by subscription of several large railways.

The first object of the clearing house was to keep a junction record of freight cars so that the extreme car shortages which then existed, and which afterward were largely increased, might be located, and an endeavor made to supply cars where shortages existed. It was also the thought that eventually the record thus started could be used to compute the per diem earnings of subscribers and clear the balances between them.

Unfortunately, just at the time the clerks were trained and becoming efficient, the panic of 1907 arrived and retrenchment in expenses caused this work to be abandoned. The subscribers, however, left an unexpended balance of $3,547 in the hands of the committee to be used as a working fund.

The experience gained by the work has, however, been very


C. H. 43. Sheet No. _____

AMERICAN RAILWAY CLEARING HOUSE.

PER DIEM AND MILEAGE BALANCE FOR MONTH OF _____

NAME OF ROAD	MONTH	AMOUNT DUE BY FOREIGN RAILROADS	√

Form C. H. 43.

valuable and among other things developed the fact that accurate car balances can only be arrived at from per diem settlements.

During this operation of the clearing house an arrangement was made of settling the per diem balance for two small roads, one owning 250 box cars and the other 250 coal cars, and when the larger work of the clearing house was abandoned they requested that this and other work be continued for them.

Several other roads joined this feature of the clearing house in March, 1908, including the so-called Randolph lines, comprising six roads and two other roads, the Narragansett Pier and the Chicago Union Transfer Railroad.

In June, 1908, the Baltimore & Ohio placed the Staten Island Rapid Transit in the clearing house and the result was evidently satisfactory to them as the entire Baltimore & Ohio system came in on January 1, 1909. The Morgantown & Kingwood also subscribed as of June 1, 1908, and the Cumberland & Pennsylvania as of July 1, 1908.

The next accession to the clearing house was in September, 1908, when the Wheeling & Lake Erie came in. This gave the clearing house a chance to develop the saving in work to a road in a receiver's hands as all settlements with roads outside of the clearing house could be made as one total and the collections and payments of the Wheeling & Lake Erie divided only with that company. This plan has worked out satisfactorily.

On December 1, 1908, the Delaware & Hudson with its allied lines, the Quebec, Montreal & Southern, and Napierville Junction, subscribed to the clearing house, being the first large eastern system to come in. The Chicago Terminal Transfer also subscribed this month and the clearings for December, 1908, were $257,000.

In January, 1909, the Baltimore & Ohio, Southern Pacific, Union Pacific, Oregon Short Line, Oregon Railroad & Navigation Company, Southern Pacific Lines in Texas, Richmond, Fredericksburg & Potomac, Coal & Coke Railroad, Lehigh & New England, St. Joseph & Grand Island Railway, Corvallis & Eastern and our first private car line, the Fairmont Coal Company, commenced their per diem settlements through the clearing house and the settlement for January, 1909, involved $1,200,000.

The next large road to come in was the Norfolk & Western as of March, 1909; the Kansas City Southern, May 1; the El Paso & Southwestern System, September, 1909; the Iowa Central and Minneapolis & St. Louis, November, 1909, and the Chicago & Alton, Toledo, St. Louis & Western and the Western Ry. of Alabama in December, 1909.

For November the full figures aggregated $2,134,796.

The Rock Island Lines joined the clearing house as of January 1, 1910, and with a number of other smaller roads that have joined from month to month the clearing house is now settling the per diem balances for 64 companies, not including settlement of the accounts of allied lines.

A most excellent example of the advantages of the clearing system was afforded by the results on one of the large clearing house roads in its November, 1909, balance. The road in question reported through the clearing house per diem and mileage credits to 429 railways and private car lines, aggregating $280,522. The clearing house received reports to the credit of this road from 500 railways aggregating $286,090, the net balance for which draft was honored by the clearing house being $5,569, or less than 1 per cent. (.09 per cent.) of the total amount involved.

An analysis of these accounts develops the fact that settlement by individual roads, assuming that such settlements would have been for balance in each instance, would have required the honoring of 258 drafts for $114,400, and the making of 425 drafts for $119,968.

The total ledger accounts necessary under the individual plan would have been 708, and the number of ledger entries, including the drafts made and honored, 1,612. Under the clearing house plan there was but one ledger account, that with the American Railway Clearing House, and but three entries; the total debit, the total credit and the draft for the net balance.

But more important is the fact that this road, although a net creditor to the amount of $5,569, would have been compelled to honor drafts for $114,300, while collecting the balance due it in 425 separate drafts, averaging less than $300 each, drawn on cities in all parts of the United States, Canada and Mexico.

WORKING.

The car accounting offices of the subscribers prepare their per diem reports as heretofore, and instead of mailing them to the individual roads, make one bundle of the reports and express them to the clearing house. A summary is written up on a form furnished by the clearing house (C H 42) to accompany the reports and a duplicate copy is sent to the accounting department, where the total amount is credited

to the clearing house as one item instead of to the individual roads as heretofore.

The reports from foreign roads showing per diem earnings of subscribers cars are sent to the clearing house and are there assembled for the subscriber roads. On the fifth day of the second month the account is closed; thus on January 5 the per diem reports for the month of November for the various subscribers are listed on a form C. H. 43 and with reports forwarded to the subscribers, and the total amount thus reported by the clearing house is charged by them against the clearing house. Draft for balance is made, either by subscriber or the clearing house.

In this way the subscriber retains all the details of his accounts and can check the amounts collected for him against the reports furnished by roads using his cars. The clearing house also accepts all instructions as to withholding settlement of any accounts and acts in all cases as the agent and employee of the subscriber.

It has been feared that if settlement is not made until the 8th to 10th of the month the subscribers will not get their money as promptly as if accounts were handled in the old way, but as the larger roads of the country do not send out their reports until the last day of the month, and in many cases not until the fifth and sixth day of the second month, this argument does not hold good. Again a great many roads do not accept draft until the 20th to 25th of the second month, and these roads, too, are large car borrowers, so that the delay in collection of these amounts would more than offset any delays due to the clearing house.

The clearing house is beginning to feel an increase in collection charges and a number of methods have been resorted to to overcome this. In some cases roads have remitted in New York, Chicago, Philadelphia or Baltimore funds, and arrangements have been made by which subscribers in the same city have accepted each other's drafts in settlement of complete net balances.

The clearing house has solicited criticism of its workings and methods but so far no subscriber has found fault with our methods, neither has any road withdrawn, although a number stated when they joined that they would do so on trial. This would seem to indicate that the service performed has been satisfactory, and some letters received from accounting officers now in the clearing house are very complimentary.

Total Amounts Handled by the American Railway Clearing House for Year Ending December, 1909.

Month.	Dr.	Cr.	Total.	Expense.
January, 1909	$633,649	$566,536	$1,200,185	$145
February, 1909	574,473	536,127	1,110,601	145
March, 1909	715,317	680,471	1,395,787	159
April, 1909	708,881	671,100	1,379,981	161
May, 1909	727,606	685,670	1,413,276	166
June, 1909	722,054	667,010	1,389,064	168
July, 1909	755,368	713,143	1,468,512	173
August, 1909	817,335	776,201	1,593,536	175
September, 1909	941,310	795,865	1,737,175	188
October, 1909	1,062,151	924,952	1,987,103	189
November, 1909	1,120,111	1,014,685	2,134,796	197
December, 1909	1,207,545	1,151,423	2,358,968	211

FINANCIAL QUESTIONS ARISING IN CLEARING HOUSE PRACTICE.

First.—Should a draft be declined if amount shown is in error due to omitted credit or straight error on part of drawer of draft?

Second.—Should not draft be drawn on railway company instead of naming officer of railway company? This is a growing custom and saves considerable time looking up to see if name of officer has changed.

Third.—Should not letter be sent in each case that a draft is declined giving full reason for declining draft so that error can be corrected if necessary?

Fourth.—Should not each draft plainly state on face or on papers attached full information as to how amount of draft is arrived at end of month?

Fifth.—Is it not better practice when a draft is accepted with an error and balance is habitually in favor of drawer of draft, to request that error be adjusted in next draft instead of drawing draft to adjust error?

TRANSPORTATION AND TRAFFIC IN FRANCE.

BY LOGAN G. MCPHERSON.
Traffic Expert with the National Waterways Commission in Europe.

The great high roads of France have been the admiration of travelers for more than two hundred years. The organization of the principal thoroughfares, of which the old Roman roads were the basis, was begun by Sully in the first half of the seventeenth century, furthered by Colbert, and continued by the engineers of roads and bridges during the reign of Louis XV. Funds from the royal treasury were liberally devoted to the maintenance, which was also upheld by the compulsory co-operation of the people. Napoleon reorganized the service, charging upon the departments all the expenses incurred for roads of secondary importance, and the work has been continued during the various succeeding governmental regimes. The total expenditure for the establishment of the highways, rural roads and streets since 1820 has been about $850,000,000 and the cost of maintenance, of which part —for other than the highways—is paid by the local governments, is $50,000,000 per annum. Over the present network of about 236,741 miles of national highways passes an annual traffic of 950,742,000 ton-miles. The traffic of the smaller roads, about 250,000 miles long, is unknown.

The rivers of France are not as easily navigable as those of northern and eastern Europe. The difference of current is indicated by the fact that a height of 328 feet above the level of the river mouth is attained by the Rhone at a distance of but 133 miles, by the Seine at 345 miles, by the Rhine at 385 miles, by the Elbe at 411 miles, by the Volga at 1,242 miles. From the mediaeval period the rivers of France have been used for navigation, the traffic at first paying taxes to the feudal lords, who gave themselves no concern about their improvement, but bargemen finally grouped themselves into corporations which purchased from the king exemption from these exactions. In the seventeenth century began under private enterprise the building of canals, whose cost it was endeavored to regain by charges on navigation. These tolls were suppressed by the Revolution and the canals confiscated by the government, but the tolls were again established by Napoleon.

Under the restoration, in 1821 and 1822, the government prepared a program of waterways for the construction of which it devised a system of loans, the investors to have as security the tolls to be exacted on the new waterways. The impulse thus given was furthered by the creation in 1857 of an extraordinary fund for the direct construction of waterways by the national government, the expenditure for new works from 1823 to 1847 averaging nearly $4,000,000 per year. From 1847 to 1860 this annual expenditure was reduced to $1,600,000, the government and public opinion in general being almost exclusively occupied with the construction of railways.

The impetus toward the further extension and improvement of the waterways originated in 1860 and found its culmination in the marvelous return of prosperity that followed the Franco-Prussian war. In 1879, under the program prepared by de Freycinet, it was decided to enlarge existing canals, to build about 1,240 miles of new canals and to repurchase by the government such canals as were under concession. Expenditures rapidly increased from year to year until they had reached about $14,400,000 for the year 1883. Then came the financial crash that rendered impossible further continuous borrowing by the government and led to more thorough calculation, showing that the hasty estimates made at the inception of the great programme would have to be at least doubled. The construction of many of the proposed lines was abandoned, but not until 1888 could the expenses be so reduced as to be included in the governmental budget without borrowing. Their annual total during the nine years of the extraordinary budget averaged over $10,-

000,000. During the succeeding nine years ending with 1907 this average annual expenditure has been brought down to a little over $3,000,000. Notwithstanding, however, that the programme of 1879 had not been carried to completion, a new programme involving an expenditure of about $40,000,000 was sanctioned in 1903.

The grand total of the governmental expenditure for the construction, the improvement and re-purchase of waterways from 1821 to 1906 is about $320,000,000, of which about half has been expended since 1879. Upon the network of lines of the north and east, which carries about half of the total traffic of interior navigation, has been expended $16,000,000, an average of over $64,000 per mile. Upon the network of almost equal length, constituted of the navigable parts of the Saone and its branch lines, upon which the traffic is but a third of that on the lines of the north and east, has been expended $24,000,000. One of the least expensive canals has cost over $74,000 per mile, another nearly $235,000 per mile and another, estimated at first at $8,800,000, has cost $17,200,000, or about $200,000 per mile. These are expenditures for the construction of canals. The improvement of rivers has not cost so much, but still a very mediocre way upon part of the Rhone has cost over $74,000 per mile.

These expenditures upon the works to facilitate interior navigation have been defrayed almost entirely by the national government, which is also under an annual charge of between $3,500,000 and $4,000,000 for their maintenance.

In 1880 the government abolished the tolls which formerly contributed to an appreciable extent towards meeting its expenditure upon the waterways. As an offset to these expenditures the government has now but the dominical revenues, those obtained for fishing privileges, from plantations, for water taken from the rivers and from the tax on passenger boats, which all told do not equal $650,000 a year, or not more than one-sixth of the annual expenditure for maintenance, leaving the expenditure for construction and improvement entirely without offset.

The traffic over the rivers and canals is under free competition, the carriers charging what they please for their service, or rather what they are obliged to charge under the competitive conditions. In many places, however, the charges are maintained at a fairly uniform level. In rarely exceptional cases does the proprietor of the merchandise transported own the craft. The industry is still that of the small enterprise. Of the boats, other than steamboats, two fifths both as to number and tonnage belong to boatmen, each of whom has only one boat and sails that boat himself. This proportion, however, has fallen in ten years from one-half. Another fifth of the boats is composed of those which to the number of two or three belong to one boatman, who almost always sails one of them himself. Really important enterprises, each possessing twenty boats or more, scarcely represent more than one-tenth of the actual total tonnage. The boatmen live on their boats with their families; 13,300 boats are provided with cabins, which were shown by the last census to be inhabited by 18,600 men, 10,800 women and 16,200 children, this floating population having no other home. Nearly 3,000 of the boats are provided with stables, sheltering their draught animals, 2,400 horses, 150 mules and 1,950 donkeys.

It is very difficult to arrive at an average of the charge made by the river and canal craft for transportation. A very small fraction conducted by regular service sometimes pays four and six, or even eight centimes per ton-kilometer. On the canals of the center and south of France, where the traffic is scant, and where the navigable conditions are not good, the charges per ton kilometer is usually two centimes or two and one-half centimes. On the canals of the North and East the great improvement during the last thirty years in the location of the waterways and the organization of haulage has brought about a great reduction in the charges, which now vary perhaps between one centime and one and one-half centimes per ton kilometer.

As one centime per metric ton kilometer is equivalent to two hundred and ninety-two one-thousandths of a cent per ton of two thousand pounds per English mile, it will be perceived that two centimes per metric ton kilometer is equal to .584 cents per net ton mile, a rate not exceeded by that paid by much of the coal carried by rail in the United States, while two and one-half centimes per metric ton kilometer is .73 cents per net ton mile, which is about the average rate received by the railways of the United States on all their traffic.

It is estimated that the total traffic of the rivers and canals of France exceeds 5,000,000,000 of ton kilometers from which the boatmen derive a revenue of from $12,000,000 to $16,000,000 annually. The government receives none of this. But let it be supposed that from the higher figure be deducted $3,500,000 to cover the annual expense of maintenance incurred by the government, there is left but $12,500,000. Interest at 4 per cent. on $320,000,000 expended by the government upon the construction and improvement of these waterways would amount to $12,800,000 a year. This is leaving out of the question the investment in the craft, the expenditure necessary for their maintenance and operation and for the living of the boatmen and their families.

That is, the government has made a capital investment of $320,000,000 upon which it not only derives no interest, but pays an annual maintenance of over 10 per cent. By reason of this investment and maintenance is obtained a bare livelihood by the boatmen and their families whose entire revenue is less than the maintenance and the interest, were that interest calculated at 4 per cent.

As five billion ton kilometers are equal to a little over three thousand four hundred and twenty-five million ton miles, and if the charge borne by the government be—$3,500,000 maintenance plus $12,800,000 interest less $650,000 revenue—$15,650,000 it will be perceived that the charge borne by the French government on account of its waterways is over 4½ mills per ton mile. If the watercraft receive an average of but a centime and a half per ton kilometer the waterway traffic of France bears a charge of nearly nine-tenths of a cent per net ton per English mile, which considerably exceeds the average received by the railways of the United States on all their traffic.

The origin of railways in France is found in the two lines built in 1823 and 1826, with horses as the motive power, to connect the coal field of Sainte Etienne with the Rhone on the one side and the Loire on the other. Concessions for lines between Paris and St. Germain and Versailles were awarded in 1835 and 1836. Then the nation spent seven years discussing what should be done next. As everywhere, one party wished to make the railways a governmental institution and another to give them the character of private enterprise. By 1842, 3,100 miles of railways had been built in the United States, and as many in Europe, of which but 356 miles were in France. A law was enacted on June 11, 1842, which ordered the construction of the nine lines that constitute to-day the main arteries of the French network. Seven of these lines focus at Paris, one from Nancy and Strassburg, one from Marseilles and Lyons, one from Toulouse and Bourges, one from Bayonne, Bordeaux and Tours, one from Nantes, one from Havre and Rouen, one from Belgium and Lille, and there are two transverse lines, one from Bordeaux to Marseilles by way of Toulouse, and one from Mulhouse to Dijon.

To attain the establishment of these lines the government offered concessions, stipulating that the government was to build the roadbed and the structures, that the localities through which the lines were projected were to pay two-thirds of the cost of acquiring the real estate, and the concessionnaire companies were to provide the track and its appurtenances, the rolling stock, and to conduct the operations. At the end of each concession the permanent way and equipment were to be taken over by the government at an expert valuation.

The first hindrance to the carrying out of this beautiful

conception was the outcry of the communities who found that meeting even two-thirds of the cost of the real estate was giving rise to excessive claims and placing them under heavy burdens. The government therefore, in 1845, relieved the communities by assuming the entire purchase of the real estate. The public infatuation led to such a wholesale demand for securities of the companies that promoters entered into unreasonable competition to obtain concessions, in instances accepting concessions for but 27 years and in others accepting the expense of providing the roadbed and structures, even reimbursing the government for expenses which it had already incurred for such provision. Speculation became so rampant that laws were passed to repress the trading in what were only promises of shares and finally prohibiting the promoters from receiving more than the payment of advances actually made by them. Notwithstanding these restraints the headlong mania led to depreciation, which found a crisis in the panic of 1847. A number of the companies found it impossible to collect the capital necessary for the prosecution of the enterprises to which they were pledged. While not considering itself obliged to assume the losses of speculation, the government believed it to be to the general interest that it should not allow the railway bonds to radically depreciate, as they were an instrument necessary to the development of the railways and it desired to reduce as much as possible the losses incurred by those who in good faith had invested their capital for the purpose of constructing works of public utility. The government therefore in 1847 extended the periods fixed for the completion of several of the lines and extended aid to the concessionnaires in various ways, at times even by advancing money. Even such liberal aid did not serve to place all of the companies on their feet, the government, for example, even taking over the railway from Paris to Lyons, paying back to the shareholders the capital expended.

At the inauguration of the Empire it was desired to conciliate the large business interests and as one measure to this end the duration of the railway concessions was extended to ninety-nine years. At the same time the companies were charged with the total expense of construction for roadbed and structures as well as for roadway and equipment. It was believed that at the end of the extended period the government by reason of the development of traffic and the amortization of capital would come into possession of the properties without other expenditure than that for the equipment, tools and material.

The nine lines of railway planned in 1842 served well enough as main arteries, but they did not meet the demands of the traffic of various sections of the interior, especially of places that needed connection with these main arteries. This had led to the construction of a large number of secondary lines under divers concessions. The easier conditions brought about by the extension of the main concessions was a large factor in leading the principal companies to absorb into their systems the secondary lines and also to accept concessions for numerous other branches from the main arteries. These lines although increasing the traffic of the main systems were often not profitable in themselves. The great companies had accepted so many concessions for the construction of such secondary lines that during the six years ending with 1857 they had expended more than $400,000,000 upon their prosecution and would need to expend as much more before their completion. The enormity of these amounts and uncertainty as to the traffic which would come to the secondary lines created public apprehension and then came the panic of 1857 leading in relation to these secondary lines to a repetition of the phenomena which had characterized the situation in regard to the main lines during the crisis of ten years before. Again the companies found it difficult to place the bonds necessary to continue their works and again it was necessary to appeal to the government, which by way of relief and encouragement allotted the guarantees of interest which still underlie the financial regime of the railways of France.

Upon the premise that the new secondary railways were necessary to the development of the country and that the crisis was due to their prosecution under the concessions calling for their construction, the government separated the old network of the main arteries from the new network of the secondary lines. For the old network no guarantee was made. its net revenue was, however, reserved to the companies until the accumulation of sums necessary (1) to pay the charges on bonds issued to cover construction; (2) to pay dividends on the stock. The remainder of any surplus income of the old network was to be applied to the new network to reduce the amount for which the government was liable in order to meet its guarantee. For the new network the state guaranteed to the companies until 1914 a net annual revenue sufficient to secure the interest and amortisation. The guarantees paid by the government were to be considered not as grants but as advances, bearing interest at 4 per cent. When the net income of the two networks combined should exceed the sum of the revenue reserved for the old network and the interest guaranteed for the new, the excess was to be turned over to the government annually until it had received the complete repayment of its advance for capital and interest. As security the government required mortgage on the equipment and the plant. It was also stipulated that if the companies after having extinguished their debt towards the government, should realize a considerable net income, one-half of this surplus beyond a certain amount should accrue to the government. The government considered the arrangement wise, inasmuch as the companies were obliged to construct and operate the conceded lines and to pay back the capital whether they won or lost. It moreover wished to consolidate their credit, to assure the public of their solvency.

The arrangement quickly advanced the credit of the companies, enabling them not only to prosecute the lines already conceded, but to obtain a series of new concessions, including lines traversing rough country of scant traffic, where construction would be costly and revenue small. To build these lines under the guarantee of interest would have increased the amount of the companies' "Advance Account" and would have prolonged the period during which they would be bound to the government. They therefore accepted such concessions with grants which, though covering but a part of the expenses, were really important subsidies. These companies frequently borrowed capital on the basis of these grants, the government binding itself to pay the interest and the amortization of the bonds thus issued.

The guarantee of interest was also extended to capital employed in additional and complementary works built as the traffic of the lines increased. The government considered that, inasmuch as it had become a partner in the financial result of the operation, it had every interest to encourage it. It is moreover evident that the companies would not have extended their systems if the charges on the capital expended therefor had had to be borne by the shareholders while the increase in the revenue had gone to the government. The guarantee of interest was also extended to include the participation of each company in the belt line around Paris, and the Company of the East was indemnified for the losses sustained during the Franco-Prussian War.

The constant demand of regions not traversed by railways for such means of communication led the government to grant still further concessions. The great companies had learned that it was not advisable to include in their networks too many lines of small productive power, and therefore the government passed a law in 1865 giving the departments the power to participate in the construction of a number of such railways designated as lines of local interest. The public treasury, however, usually subscribed from one-quarter to one-half of the capital, and in some cases, where no concessionnaire offered conditions that seemed acceptable,

the government itself undertook the construction of new lines, reserving the right to decide later as to their operation. By 1875 the want of traffic brought these local lines into financial difficulties of the same kind as had during previous crises confronted the larger companies. Wild hopes and imprudent speculations had given place to realization that the idea of deriving an adequate revenue from them was a dream. Two or three of the larger companies absorbed a few of the bankrupt roads, but the government was appealed to for aid to others. Again it was considered that the government, which would in any event have insured the construction of these railways, ought not to profit by the imprudence of those who had furnished the funds for their establishment. At this time it was also much exercised by the complaints as to the tariffs of the railways. The Chamber of Deputies of 1877 refused to allow the Orleans Company incorporate the Charente lines unless it would agree that the state should be given absolute control over the tariff. The company declined to accept such a stipulation, which would have abrogated the terms of its charter. The state thereupon purchased this and certain tributary lines of a total length of 1,615 miles.

Thus a governmental network of lines was created in the west and southwest of France, which from time to time has increased, forming a disconnected and incoherent system here and there in competition with lines operated by the concessionaire companies. A board of directors is named by the government and the annual budget is voted by the Chamber of Deputies as a schedule attached to the general budget.

These governmental railways were organized during the ministry of de Freycinet, who also occupied himself very diligently with extending the network then existing. The law of 1879, in addition to the construction of railways previously referred to, provided for the extension of new lines of railways over 5,468 miles, mostly through remote and mountainous country where construction was extraordinarily expensive. Many of these lines were projected not to meet commercial needs, but because of the political pressure brought to bear in the Chamber of Deputies by the representatives from the different departments.

It was estimated that these lines would cost $700,000,000 and would be completed within ten years. It was a time of great prosperity and loans were readily placed, the expenditures reaching nearly $250,000,000 for the three years, 1880-1-2. The new construction, in addition to the lines purchased by the government, made it directly responsible by this time for the 9,942 miles of lines scattered over the country, not connected one with the other, but enclosed in the networks of the great companies. During this period of prosperity the receipts of all the railway lines had radically increased, and all but one of the great companies had begun repayment to the government of the advances received from it. There was another crash, however, in 1882. Repayments by the railways to the government stopped, and it was found that the cost of the lines projected in 1879, instead of $700,000,000, would be $1,300,000,000. The governmental budget could not have its burden increased; it was necessary to appeal to the great companies if the works promised to the population were to be completed.

Thereupon were made the conventions of 1883, which, with subsequent modifications, still regulate in almost all respects the financial relations between the companies and the government. The companies incorporated in their networks the greater part of the lines, projected under the program of 1879, either already built or to be built. As many of these lines could never pay, the companies took over only the rolling stock and the works at $8,045 per mile, agreeing to borrow the further capital necessary, under the guarantee that the government should pay to them the interest and the amortisation. All distinctions between the old and the new systems were effaced, the state undertaking to advance the necessary funds to insure, besides payment of interest and redemption of bonds, a fixed dividend for shareholders. The war of tariffs between the government lines and the concessionnaire lines came to an end, competitive traffic being apportioned between the different systems. Special measures were taken under governmental guarantee to insure the completion of a number of smaller lines difficult of construction, costly in operation and of but little productivity which the concessionnaire companies did not care to take over. The methods of this assurance have led to grave evils.

The government assumed rigid control over the operation of the railways. It levies a tax of 12 per cent. upon all revenue from the sale of tickets and carrying of baggage, a tax of 14 cents upon each ordinary bill of lading, which severely burdens small shipments; a tax of seven cents upon each express bill of lading and one cent upon each parcels bill of lading.

Independently of the taxes which they pay, the railways are bound to the performance of certain public services at reduced rates, or even, in certain cases, gratuitously. They are bound to transport, under ordinary circumstances, soldiers and marines at one-quarter of the legal tariff, and in times of the concentration of troops must put all their facilities at the disposal of the government for one-half the regular rates. In time of war the railways may be absolutely monopolized by the military authorities. They are bound to carry gratis the employees of the postal service, to devote gratuitously on each passenger train two compartments to the postal service and, if these are not sufficient, to attach a special carriage free of charge, and, moreover, to run for the postal service a special train gratuitously each day in each direction over the entire length of the line on such schedule as the administration may indicate, which may not in the least correspond with the needs of the commercial traffic. They are obliged to transport gratuitously almost all the staff and material of the telegraph system. They are obliged to transport the special carriages of the prison administration at half the price applicable to a passenger of the third class for each prisoner and each guard carried. They are obliged to transport the employees of the Customs service gratuitously.

The management of the railway companies is absolutely subordinated to the minister of public works, who is assisted by a general board of roads and bridges; a commission of verification of accounts, composed of councillors of the Government, and delegates from the ministries of public works and of finance; a committee of technical exploitation including representatives of the ministries of war and of the postal service; a consultative committee of railways, which deliberates on issues of bonds, complaints as to the service and the tariffs submitted for ministerial approval or homologation, as this approval is technically designated. The number of persons taking part in these deliberations is 150, embracing representatives of the administration, directors of the ministry, councillors of the government, inspectors general of roads, bridges and mines, delegates from the ministries of commerce, agriculture, finance, post and telegraph, the colonies, the interior, members representing agriculture, commerce, industry, the senate, the chamber of deputies, the chambers of commerce, agricultural societies as well as civil engineers and the administrators of different companies. To expedite the transaction of business that is urgent, a permanent section of 68 members has been chosen from these 150. This committee embraces representatives of such various interests, each seeking their own benefit, that it accomplishes little that is positive while obstructing much that would be beneficial.

A large staff of inspectors, agents and employees follows in all details the operation of the railways. The minister of public works can modify and must approve every proposal for the establishment or construction of a line; he fixes the number of stations, their localities, their arrangement; he passes upon the creation of storehouses, changes in signals, orders

for rolling stock, rules for the employees and regulates the number of trains and their schedules.

The foregoing statements are almost in their entirety a radical condensation of the chapters treating of the same subjects in the book "Transports and Tariffs," by Clement Colson, inspector general of bridges and highways, councillor of state, formerly director of railways in the ministry of public works. Two or three statements have been incorporated from an article on "The Freycinet Program," by M. Guyot, in *The Spectator* of September 11, 1909, while the comparisons are by the writer. Many of the prominent business men of France were consulted as to the transportation status in their country. One after another began by asking if the writer had read Mr. Colson's book on "Transports and Tariffs" and one or two deferred the interview while sending a clerk for a copy of the book to be placed in his hands. Each and every one of these men said that Mr. Colson's attitude is entirely correct and his statements absolutely reliable. If any further certificate is desired of the accuracy of the foregoing condensations from this book it may be afforded by the statement that they were scrutinized word for word, revised in some minor respects, and finally approved by the distinguished author in person.

It will have been perceived that these are plain statements of fact without comment. Further information with abundance of comment is obtained from a pamphlet entitled "*The Crisis of Transport*," by Ives Guyot, a prominent French economist, a publicist of the highest standing, and minister of public works from 1889 to 1892. From this pamphlet are made the following condensations:

The public authorities bestow all their sympathy upon the waterways. The interior navigation is exempt (1) from all remuneration and all amortization of the $320,000,000 spent in the construction and improvement of the interior waterways, (2) from the payment of any of the expense of maintenance, (3) from the payment of any expense of management, (4) from all service to the government, such as the transportation gratis or at reduced rates of soldiers and sailors, prisoners or the post.

All of such burdens, however, are borne by the railways. The tax on the revenue from tickets and baggage amounted in 1904 to over $12,500,000; that on bills of lading and similar documents to $7,620,000; that on the railway shares to over $10,800,000; that on property and licenses to nearly $1,000,000, and the custom duties on coal and iron consumed by the railways amount to $800,000.

The saving by the gevernment, because of the service performed gratuitously or at reduced rates by the railways, amounts annually in the case of the post to over $9,600,000; in the case of the telegraphs to over $1,600,000; for the transportation of soldiers and sailors to $7,000,000; for the agents of the customs to $600,000; for war transportation to $320,000. The total saving to the government amounts to nearly $2,000 per mile; yet the receipts of the railways for 1907 stand at $13,760 per mile. If a corresponding burden were placed upon the boats they would all be at the bottom of the canals.

The navigable waterways serve but a limited portion of the area of France. The physical conditions are such that they cannot cross the central districts, extend to Normandy, penetrate Brittany or the Alpine regions. The greater part of the population cannot make use of them.

If the respective tonnage of the waterways and the railways of France be compared upon the same basis as for Germany, it is found that the kilometric tonnage in 1905 for the railways was 17,676,000,000 and that for the interior waterways 5,085,000,000. That is, the waterways carried 22 per cent. and the railways 78 per cent. of the ton kilometers. If allowance be made for the longer distance caused by the circuitous routes of the waterways, it will be found that they carry but 11 per cent. and the railways 89 per cent. of the traffic. Itis not one-seventh of the railway lines that the waterways can compete for traffic.

M. Guyot points out that the works proposed in the program of 1903 are not progressing in accordance with the program and that the expense is constantly increasing; that of the de Freycinet program for the improvement and extension of maritime ports there were to be paid on the first of January, 1908, 19,000,000 francs on the seventeen enterprises then in progress, while to their credit remained but 10,000,000 francs, and their completion was estimated for 1906; that at the same time ten enterprises, in connection with the interior waterways of the program of 1903 are being prosecuted with a credit of 10,000,000 francs, although after January 1, 1908, would be required an expenditure of 64,000,000 francs. He points out that works designed for the improvement of the port of Havre, the estuary of the Seine and the port of Marseilles, involving an expenditure of 130,000,000 francs, which are useful works, have been delayed because of the interference of useless programs and projects, but that, notwithstanding, the increase over the estimates in the expenditures already made has completely exhausted the resources of the city of Marseilles, which was pledged to participation in the program. He states that when the canal was projected from Marseilles to the Rhone, it was stated that the merchandise which at that time went around by Gibraltar would go directly from Dunkirk to Marseilles by the canal and the river, but that a slight detail had been overlooked, namely, that the Rhone is not navigable. In the debates upon this project Admiral Cuverville, a waterway enthusiast, admitted that since 1879 50,000,000 francs had been thrown away upon this enterprise without result. Mr. Gourju said in reply that there had been a result, that the work done had suppressed the use of the river for small boats, as the stakes driven in the banks in order to concentrate the current in the deeper channel had made the towing paths useless. Marseilles, obligated to co-operate in the completion of this project, is obliged also to improve its docks, and therefore is financially in a most deplorable condition.

M. Guyot continues that the improvement of the waterways and the ports will serve for imports and not for exports; that in 1906 for every 100 kilograms imported, 275 were exported. The imported ton is worth on the average only 174 francs, whereas the exported ton is worth 453 francs. The export traffic, which is of merchandise high in value and low in weight, does not move by the waterways.

The entire situation is reflected in the governmental budget. In the ten years from 1897 to 1906 the government paid on account of its guarantees of interest over $27,000,000. The budget for the seven years from 1900 to 1906 showed a deficit balance of $49,000,000, the budget of 1908 a deficit of $18,000,000, and the announcement has been made that that of 1909 will exhibit a deficit of $40,000,000. The government has been obliged to issue bonds to obtain the funds wherewith to pay the interest on its outstanding obligations. How it will obtain the money necessary to defray the expenditure upon the works to the prosecution of which it is pledged is a question to which no answer is at this time forthcoming. As M. Guyot puts it, "Certain ministers and certain members of parliament are as regards public works great idealists. They see canals and rivers, they see fleets of pinnaces and boats arriving from all the four corners of the globe in magnificent ports, their goods crossing France on water roads penetrating the whole of Europe. They become enthusiastic over these ideas, taking into account neither geographical conditions nor economic conditions. They cry out in oratorical outbursts that France is lost if their projects are not immediately executed. They stigmatize those who do not give their immediate support. In opening the door to expenditures by the billions, the waterway enthusiasts pretend to be adding to the wealth of the country. But where are we to obtain the funds necessary to carry out their projects?"

That portion of the Freycinet program of 1879 for the extension of the railways which was to have been completed

in ten years, although in part abandoned, remains unfinished to-day, and that portion which provided for the improvement of ports and waterways and was to have been completed in a dozen years also remains unfinished, the expenditures of the government on March 1, 1909, having exceeded the total estimate by 30 per cent.

"Nevertheless, the program which led to so much disappointment and to such heavy expenditure has not diminished M. de Freycinet's prestige. If a private business man had undertaken an enterprise under such conditions he would have become bankrupt. Statesmen have the privilege of getting taxpayers to fill up the deficits they create, and if they do not fulfill their contracts they are not forced to do so by legal proceedings. M. de Freycinet published his program and bequeather, to his successors the difficult task of applying it and the loss of popularity resulting from inability to realize unattainable hopes. To justify M. de Freycinet's program it has been repeated overand over again that 'the state should take over the direction of French savings.' Deputies and journalists created and kept up the illusion that the execution of public works necessarily created wealth. Now any enterprise the use of which does not insure with profits the power to redeem the capital expended therein spells loss. Any private individual knows that; governments ignore it. Once more we see a justification of Ada Smith's declaration, 'Great nations are never impoverished by private, though they are sometimes by public prodigality and misconduct.'"

The interior waterways of France classed as navigable have a length of 10,372 miles. The length really available for navigation is but 7,378 miles, and over about half of these is carried 90 per cent. of the interior waterway traffic. The waterways with this great density of traffic are the Seine between Havre and Paris; those portions of the Seine and the canals directly serving Paris with the coal, cement, stone, brick and a portion of the grain and wine consumed by that city; the canal of the north carrying coal to and from Belgium and the canals carrying coal to and from Germany.

The other interior waterways of France, the one-half of those that are really available for navigation but only carry about 5 per cent. of the traffic, are occupied with the transport of coal for general consumption, of wood, cement, brick, and in some cases of wine in large packages. The remainder of the traffic moves by rail. Its requirements are met in most cases by the small cars of ten and fifteen tons, because there is not a great deal of traffic between one place and another, the old mediaeval custom of the self-sufficiency of the community still prevailing throughout the country. The local artisan manufactures clothing, furniture and other articles of general use for his neighborhood. The manufactures of France that find export markets are mainly the products *de luxe*, the laces, textiles, ceramics and other articles that are high in value in proportion to their bulk and weight, the full load of a 10-ton car comprising the output that represents the long labor of skilled artisans and a very high value. An exception to the use of small cars is found in the transport of coal from the northern fields of France to the great bed of iron ore that lies partly in France, partly in Belgium, and partly in Germany, where are its richest deposits, has led to the railways from the northern coal fields installing and using freight cars with a capacity of 40 or 50 tons, such as are used in the United States. This facilitation of the coal supply from the fields of northern France has led to certain of the great iron manufacturing companies in Germany establishing plants at the ore fields, whence their products are taken to the markets by rail or to the Rhine for transshipment in case of export. This is an economic development similar to that which is widespread in the United States, where the facility and the cheapness of transportation by rail has led to the location of manufacturing establishments at places of greatest natural economic advantage.

But little food is brought from great distances, the farms of France in recent years having so greatly increased their product that the country is obliged to import but little grain. The grain of local production is mostly ground into wheat at nearby mills for local consumption in accordance with the ancient custom. In recent years, however, larger mills have been established, but even they do not make flour in sufficient amounts to be marketed beyond the confines of the department. Very large mills in the vicinity of Paris produce the flour used in that city. Vastly the greater proportion of even the eggs, poultry and produce consumed in this great city is brought by farmers in wagons which they may have driven for the greater part of the previous day and night that they might display it for sale at one or another of the markets of the city the following morning.

It is likewise with the supply of meat, live stock being sent by rail to the local abattoirs of the various towns, where it is killed for local consumption. The manager of one of the railway companies endeavored to effect a greater centralization in this respect, but his efforts were unsuccessful, as the different towns levy the octroi upon the local abattoirs, and not one of them was willing to suffer the deprivation of revenue that would result from the inhabitants obtaining their meat from a large abattoir of another town.

In the concessions originally granted for the nine main lines of railway in 1842 were specified the maximum rates that they would be allowed to charge for passengers and for freights. Even then four classifications of freight were specified in the concessions. The rates charged by the railways rapidly fell below the maxima as the tariffs were adjusted to stimulate traffic, in some cases competing with and taking traffic from the waterways. The different lines being operated by different companies, there was some attempt to extend the markets of a place of production on one line in competition with another place of production on another line. Therefore arose an inequality of rates, different prices being charged for the same commodity over the same distances in different places. This led to popular complaint, which increased as this policy of the railways continued. When the government assumed far-reaching control over the operations of the railways there arose a tendency, which has continued, to make the tariffs uniform. Among other reasons for this was the fact that the members of the chamber of deputies found it difficult to discuss railway tariffs of that variety and complexity which are brought about by adjustment to commercial needs. It is much easier to talk about a tariff on a simple distance or a tapering basis.

The consultative committee which passes upon the homologation of tariffs existed almost from the first, but up to about 1880 it was composed of councillors of state who studied the commercial needs of the country and endeavored to adjust the tariffs to its development. The chamber of commerce of one city sought representation on this committee, and then the representative of the chamber of commerce of another city, and so on, until it has become the cumbersome and unwieldy body of 150 members of to-day. In this body the tendency of the conflicting interests is toward the so-called simplification of tariffs upon the kilometric tapering basis. While applications for slight and unimportant changes frequently receive prompt attention, its deliberations over a proposition for the change of a rate to meet particular needs frequently extend over three or four months, and now and then over a year, the occasion for the making of the rate oftentimes having passed before a decision is reached. The railways no longer have any incentive to try to adopt experimental rates to develop traffic, as a reduced rate once placed in effect can never be advanced, even although it does not have the desired influence in increasing the movement, and a reduced rate in one part of the country is urged as a reason for making similar reductions in other parts. That this status sometimes works to the injury of commerce is admitted by the railway officers. Reduced rates, for example, are not made from the coal fields

of France to the lowland along the English channel to compete with the English coal under the conditions under which such rates are made in Germany. It is sometimes contended that in years of plentiful vintage, if the railways were allowed to make temporary lower rates, the use of wine could be increased in northwestern France, where beer is the principal beverage. They are, however, not allowed to try the experiment, with the result that in such years the price of wine undergoes a serious decline.

The freight tariffs cover *grande vitesse*, or especially accelerated transportation, and *petite vitesse*, or ordinary transportation. For the former there are two classes, one comprising general merchandise for which quick shipment is desired and the other foodstuffs, including produce and milk. These tariffs are upon a kilometric tapering basis, which does not allow these foodstuffs to be brought from very far. Even the milk consumed in Paris comes from within a limited radius and is very expensive. The *petite vitesse*, which covers the freight of ordinary transportation, is of six classes. Perhaps 90 per cent. of this freight, however, is carried upon exceptional tariffs that nominally are an inheritance of the old regime, but which in nearly all cases have been so modified that they are likewise upon a tapering kilometric basis which applies from any place of shipment in the country. The entire tendency is to stereotype the rates of the railways of France into a rigidity from which there is little departure and which keeps them in general at a level higher than in the United States, although certain rates for short distances may be less. Especial reductions in rail rates apply on much traffic for export. Such reductions were formerly also made upon import traffic, but they have gradually been nullified.

That rigidity of railway rates is an inevitable result of governmental control has frequently been argued. That the argument has foundation is abundantly proved by the situation in France. There is but little attempt, even in the case of international traffic by rail, to make an adjustment of through rates in accordance with commercial needs. One exceptional example of a water and rail rate to meet all water competition is that applying on wine from Algiers to Paris in competition with the all-water route via Gibraltar, but this rate was not favorably reported by the consultative committee until the railway company agreed to reduce its rates on wines from all the stations on its system to Paris.

The attitude of the consultative committee toward propositions for changes in rates, as well as the general favoritism toward the waterways, is shown in a paper by R. Waddington, a senator and president of the Rouen chamber of commerce. It should be premised that proposals for changes in rates must always come from the railway companies, although they are often instigated by the shippers, who make application to the railway; and that in practice the consultative committee allows a difference of 20 per cent. in favor of the waterways. In 1904 the railways leading from the ocean to Marseilles were prohibited from reducing their rates on foodstuffs because the reduction proposed would not allow the customary difference of 20 per cent. in favor of the waterways. It was proposed by the railways forming a through route from Spain into France that their rates on fruit be reduced, that they might carry entirely by rail some four thousand tons of fruit which moved by rail from Arragon to Barcelona and thence by sea to Marseilles. The consultative committee on June 27, 1906, refused to allow the reduction, on the ground that the difference in favor of water transportation would be less than 20 per cent. One member said that French shipping should not be hindered in its competition with Spanish vessels. In August, 1903, the consultative committee refused to allow a proposed reduction on chalk, on the same ground. It refused, moreover, to allow a reduction on cement that would still have allowed the waterways a difference of 33 per cent, because the railway was evidently trying to attract to its lines traffic which really belonged to the waterways, and such competition was not tolerable.

This policy is further exemplified in the attitude of the government toward the Western Railway. This line was placed in difficulties by the canalization of the Seine, a great deal of the traffic between Havre and Rouen and Paris, and not low-class traffic only, which formerly went over its line now going by water. The company naturally desired to make special rates to compete with the waterway, but governmental consent was uniformly refused. The company was told that if it saw fit to reduce its rates over its whole system it might do so, but special competitive rates could not be sanctioned. The company could not afford to make reductions over its lines through the barren and backward districts of Brittany, and the upshot of the matter is that the government, because of this and political reasons, has been obliged to take over the entire Western Railway system.

The commercial and industrial conditions of the country prevent this rigidity of rates from impeding commerce to any such extent, as a similar condition would hinder and even destroy traffic in the United States. The men of business admit, however, that to an extent these rates do impede traffic. They also state that the governmental control of all the railway operations leads to a general inflexibility against which it is hopeless to contend, that the necessity for referring every proposition to the deliberation of a bureaucratic committee prevents departure from established routine.

The bureaucratic interference of the French government with the very details of existence extends to a degree almost incomprehensible to an American citizen whose traditions and environment stimulate that personal striving which leads to individual advancement, which, notwithstanding excesses that have been patent and under the ban of public opinion are diminishing, leads also in the long run, not only to the material, but to the moral advancement of the nation. Instead of entering with zest upon the struggle of life it is the utmost ambition of untold thousands of Frenchmen to enter the government employ, to become a "fonctionnaire," wear a frock coat upon a starvation salary and look forward to a pittance of a pension. This leads the political party in power to increase the number of government positions that its patronage may be augmented. This was a large factor in the decision to purchase the Western Railway, whose plant and equipment it is said were allowed during the negotiations to fall into a condition of shocking dilapidation. The pall of bureaucracy which is deepened by such realization of socialistic aspiration as has been attained in France tends to the stagnation of industry and commerce. It tends to prevent that social advance which it is supposed to further.

The capital of the railways of France is very nearly $135,000 a mile. Their length in 1905 was 24,459 miles, an increase of 71 per cent. since 1880. The total tonnage carried was 139 millions, an increase of 72 per cent. since 1880. This contrasts with a tonnage of 34 millions on the waterways, an increase of 90 per cent. in the same period. The ton-miles on the railways were 7,490 millions and the average haul 79 miles. The ton-miles on the waterways were 2,155 millions and the average haul 92 miles. The average distance by water is 60 per cent. greater than by rail.

In 1904 the waterways carried 9.8 million tons of coal, the railways 38.9 millions; the waterways 11.8 million tons of building materials, the railways 17.3 millions; the waterways 3.8 million tons of agricultural produce and foodstuffs, the railways 15.9 millions.*

The average revenue per ton kilometer received in 1905 was equivalent to almost one and one-half cents per net ton per English mile. If to this be added the interest on the advances made by the government under its guarantees, it will be found that the average charge per ton per mile for freight on the railways of France is nearly two cents.

*Doubtless the metric ton of 2,200 lbs.—Editor.

General News Section.

The Lehigh Valley has made increases of 10 per cent. and more in the wages of certain passenger enginemen; and advances have been made in the pay of certain other enginemen and also of conductors.

The San Pedro, Los Angeles & Salt Lake announces that its line in Nevada, lately damaged for many miles by floods, will be repaired, temporarily, in season for the resumption of through traffic by June 1.

William Frye, a gate keeper at Water street, Skowhegan, Maine, on the Maine Central, has been in the service of that company and its predecessor for 62 years. He was born in Ireland and is now 78 years old.

Preparations for changing the switches and signals so that trains may run on the right-hand instead of the left-hand track are now being made on the Lake Shore & Michigan Southern between Buffalo and Cleveland.

Charles P. Neill, United States labor commissioner, called to Baltimore by the Baltimore & Ohio Railroad as mediator between the road and its conductors and brakemen, has this week been holding long conferences with the representatives of the employees and of the railway company.

On March 1, 1910, the St. Louis, Brownsville & Mexico began the operation of its new branch line from Bloomington, Tex. (formerly Shepley), to Port O'Connor. The line extends south from Bloomington to Seadrift and thence east to Port O'Connor on Matagorda Bay and is 39 miles long.

The Interborough Rapid Transit Company, New York city, is now running trains on its express tracks for three hours in the morning and for three hours 30 minutes in the afternoon at the rate of 33⅓ trains an hour. This means that in three hours 100 trains start from Ninety-sixth street southward at intervals of one minute 48 seconds.

The Pennsylvania Railroad has made a new contract with the company which runs cabs to and from its stations in Philadelphia, and after July 1 motor cabs will be used (displacing horses) at all of the company's stations in that city where cab stands are now maintained. It is 30 years since the Pennsylvania introduced hansom cabs in Philadelphia.

The Gulf, Colorado & Santa Fe has contracted for its supply of fuel oil from the Gulf Pipe Line Company. The contract amounts approximately to $3,000,000. It is for a two years' supply beginning July 1, 1910, and the maximum average daily delivery will be 5,342 barrels. The price has not been divulged, but is presumed to be between 80 and 85 cents a barrel, on the cars.

Bills to put telephone and telegraph companies under the authority of the State Public Service Commission have again been introduced in the legislature of New York. A bill has been introduced also amending the Rapid Transit Act of New York city so as to provide for building and operating moving platforms; so as to allow companies operating railways in the city to buy electric power, and to allow the Public Service Commission to lease property for rapid transit purposes.

The Colorado Railway Commission in its annual report for 1909, which has just been issued, recommends the passage of a law to require the installation of the block system on the railways in the state. It does not specify in the bill which it has drawn up the time within which it would require all the roads to be provided with signals, but its plan is similar to that which is before Congress, to require each road to install the system on one-fourth of its line at a time until completed. It would require signals to be installed on lines of heavy traffic within two years.

The 83 railway bills which were pending before Congress on February 21 have been listed in a digest published by the Railway Business Association. The substance of each bill is described in one or two sentences, except that the comprehensive administration bill to amend the interstate commerce law and a few others, are set forth at somewhat greater length. In the preface to this digest the Railway Business Association appeals to the congressional committees to avail themselves of the knowledge and experience of railway men on the technical questions at issue before passing bills which may seriously impair railway prosperity. The wide disparity of opinion among members of Congress, as shown by the great variety of bills introduced, gives evidence that the people at large are also perplexed; and, therefore, the only judicious course is to proceed with great caution.

The Illinois board of arbitration has been taking testimony for several days on the question whether the wages of switchmen belonging to the Brotherhood of Railway Trainmen employed in Chicago should be raised. The switchmen have introduced a large amount of testimony to show that their work is very hard, their hours long and their pay so small that it is difficult for them, owing to the prevalent high cost of living, to support their families. The railways are now introducing their testimony, among those who have testified being A. M. Schoyer, general superintendent of the Pennsylvania Lines West; W. J. Jackson, vice-president and general manager of the Chicago & Eastern Illinois; George Hannauer, superintendent of the Indiana Harbor Belt; F. A. Leland, chairman of the Southwestern Tariff Committee, and George B. Schrand, trainmaster freight terminals of the Chicago & North Western. The general trend of the testimony introduced by the railways is that as rates are now regulated it is impracticable for the railways to pay higher wages for labor. Statistics were introduced regarding railway earnings and the effect that would be produced on railway revenues by an advance in wages.

E. E. Mote, manager of the Pacific Car Service Bureau, San Francisco, reports that shippers and consignees, though at first dissatisfied, are coming rapidly to favor the six-dollar demurrage rate. This is given on the authority of railway superintendents of whom Mr. Mote has made inquiry. One superintendent writes:

"The new rate has increased track room to a very marked extent; in fact, in large yards it is estimated that the increase effected in this way has amounted to 30 per cent. It has also reduced switching service correspondingly.

"A further result has been that prompt unloading on team tracks has made it unnecessary to disturb strings of cars that were being loaded or unloaded in order to switch out empties. In this manner a threefold purpose is accomplished. First, it increases the track room; second, it reduces the expense of switching. and, third, it facilitates the work of shippers in loading and unloading by allowing cars to remain undisturbed. Again, it has proved very advantageous by reason of the fact that it has been possible to determine very closely the time at which cars will be unloaded, so that they can be counted upon for reloading at a given time. It was impossible to make any estimate of this under the old rate, as it depended almost wholly upon the caprice of consignees."

Railway officers in Chicago who are in close touch with the coal situation are disposed to scoff at the suggestion that there is serious danger of a strike of coal miners soon after April 1. They say that the mine operators systematically start such talk at about this time of year for the purpose of influencing the railways and other concerns to store large quantities of coal. The operators, it is said, gain by this policy in this way: They have contracts with the railways to furnish them a certain amount of coal within a given period. When the railways store coal they have to buy more during the period that they are storing it than their contracts provide for. The operators insist on being paid a premium on this excess amount. This in itself yields the operators a profit. Then the extra demand of the railways for coal limits the amount that can be supplied to manufacturers and other concerns and thereby enables the operators to exact a premium from these other concerns also. The argument used by the operators in defending their course in exacting

a premium is that their mines are apt to be shut down while the adjustment of the wage difficulty is going on. Meantime, they must keep the mines open and free from water, and they need the money which they get as a premium on the coal to pay the expense of keeping their mines in condition during this time. The railways claim, however, that about 10 per cent. of the premium that the operators get is used in keeping the mines in condition and the other 90 per cent. is clear profit. The consequence is that railway men are discouraging the idea of storing large quantities of coal upon the theory that this plays directly into the hands of those who are trying to hold up the railways and other concerns.

The ordinances providing for the vacation, in behalf of the Terminal Railroad Association of St. Louis, of a number of streets in the so-called Ranken tract were on March 1 defeated in the St. Louis house of delegates by a vote of 17 to 10. The defeat of these ordinances was preceded by a fight in which all the newspapers and commercial interests of the city took a hand. The contents of the ordinances and the improvements which they were intended to enable the Terminal Association to make were given in an article in the *Railway Age Gazette* of September 10, 1909, page 461. As stated then, the Terminal Association has bought about 25 acres of land in the Mill Creek Valley district, west of the union passenger station, at a cost of between $2,500,000 and $3,000,000. If the Terminal Railroad Association was able to carry out its plans for developing this tract it would be able to increase its passenger facilities 62 per cent. and its freight facilities 141 per cent. The reason for the successful opposition to the ordinances was that it was felt by many business men that the question of the abolition of the bridge arbitraries charged on traffic to and from places within 100 miles of St. Louis should be settled before or at the same time as the question of what grants shall be made to the Terminal Association. Many business men of St. Louis felt that these were two entirely different questions and that the matter of the bridge arbitraries should be taken up directly with the individual railways, while the Terminal Association should be given its franchise on reasonable terms, regardless of the bridge arbitrary matter. This was also the view taken by the Municipal Bridge & Terminals Commission and its expert advisers, but these conservative counsels did not prevail.

Railway Disasters in the Cascades and Elsewhere.

The number of persons killed in the wrecking of a Great Northern train by an avalanche, at Wellington, Wash., a brief report of which was given last week, page 459, appears, according to the latest despatches, to be over 100. In the list of missing, all of whom are believed to be dead, there are about 50 passengers and 35 railway employees, including the three men on the superintendent's car, Messrs. O'Neill, Blackburn and Longcoy; and, in addition to these 20 or more laborers, names not yet known, were burned in the wreck. It appears that one of the two trains which was wrecked was a mail train, in which there were no passengers. In addition to the two trains, other cars and some buildings were swept away, and also four electric locomotives, four steam locomotives and a rotary plow. One report says that the power house, furnishing electric current for the propulsion of trains through the tunnel, was swept away, together with the station and the water tank. The passenger train which was wrecked had been waiting at the station two days on account of blockades along the line.

The search for the dead in the ruins, all buried in deep snow far below the track, was carried on amidst great difficulties. One man was rescued alive after being buried 60 hours. The searchers could work only in the day time. Over 700 sacks of mail were carried away by the avalanche. There is no trace whatever of one mail car and seven clerks and weighers. In some places cars are buried under 70 ft. of trees, snow, earth and rocks. Superintendent O'Neill is quoted as estimating the loss to the road by destruction of property at $1,000,000. The work of recovery has been hampered by constant fear of snowslides.

The Oriental Limited Express of the Great Northern was derailed March 2 at Milan, Wash., east of Spokane, by a rock which had fallen from the mountain at the side of the road. The wreck took fire and four cars were burned up. The engineman and a trespasser were killed.

A press despatch from Seattle March 5 estimated the total damage by the floods and avalanche to the railways of the state at $2,500,000.

The damage to the roadbed of the Southern Pacific in Nevada by the floods of March 1 was so serious that for several days through passenger trains between California and Utah were run by way of Portland, Oregon, a bit of a detour which is 851 miles longer than the direct route.

Press despatches from Revelstoke, B. C., March 5, report that the crews of two rotary snow plows were buried by an avalanche near Rogers Pass, two miles east of Glacier, on the Canadian Pacific, at 1 o'clock on the morning of that day, and the total number of persons killed is given as 92. This includes Roadmaster J. J. Fraser, five foremen and a number of trainmen, 24 white persons all told, and the rest Japanese and Hindus. The men were engaged in clearing away a small slide which had blocked the track at 6 o'clock on the night before. Passengers on train No. 96, which was stalled at Glacier, told the reporters that a mob of foreigners tried to lynch one of the foremen, as being responsible for requiring the men to work at night.

Cost of a Tunnel Across Boston.

T. E. Byrnes, vice-president of the New York, New Haven & Hartford, speaking last Monday before a committee of the Massachusetts legislature, said that the New Haven and the Boston & Maine were ready to spend $16,000,000 to make an underground connection between the two roads in Boston; that is to say, a subway from the north to the south station. The roads would like to build a tunnel as nearly in a straight line as possible, but to do this would necessitate the purchase of $10,000,000 worth of real estate. If the city or the state would buy the necessary land and authorize a boulevard, the railway company would build its four-track line beneath the boulevard, build the boulevard itself and pay to the city (or the state) two millions for its underground rights. If such a straight, or nearly straight, line is not built the proposed connection between the two stations will have to go under Atlantic avenue, which is roundabout. This would cost about 16 millions. It has been estimated that the cost of a direct line would be as follows: Tunnel, 5½ millions; land at the termini, 4½ millions; cost of terminal structures, two millions; payment to the city, two millions; net cost to city (10 millions for land minus two millions paid by the railway), eight millions.

Mr. Byrnes said that by the time a tunnel could be finished, which would be at least three years hence, the New Haven road probably would have electric traction in use on some or all of its suburban lines.

New Subways to be Built in New York City.

The New York State Public Service Commission, First District, which has been considering New York City rapid transit proposals for the last two years, is now ready to proceed with the building of about 43 miles of lines (including the Fourth avenue subway in Brooklyn, on which work has already been begun) as soon as the officers of the city have decided on a plan for raising the necessary money. The chief engineer of the commission has prepared detail plans and estimates, and these are now being printed. The four routes on which it is proposed to begin work this summer are

	Miles.	Cost.
Broadway-Lexington line	22.64	$75,000,000
Fort Hamilton extension	9.17	18,000,000
Broadway-Lafayette line	4.96	13,000,000
Canal street line	1.0	7,000,000
Total	42.77	$113,000,000

It is expected that advertisements will be published in about a month, asking for bids for construction of these lines or parts of them by private capital; but in those parts of the city less thickly settled, it is probable that money will be raised by assessing the real estate to be most directly benefited by the construction of the line. The location of the four routes above named is as follows:

Broadway-Lexington Avenue.—Beginning at the Battery and running under Church street to Vesey, to Broadway, thence

to Ninth street, under private property and the Interborough Subway to Lexington avenue at Fourteenth street; under Lexington avenue to the Harlem river and 138th street. Thence one line eastward under 138th street to Southern boulevard and then up Westchester avenue to Pelham Bay Park, and one under Mott, Gerard and River avenues to Jerome avenue. This is an elevated line from the junction of River and Jerome avenues to Woodlawn cemetery.

Canal Street.—This line extends from the North river to the Manhattan end of the Manhattan Bridge, near Centre street.

Broadway-Lafayette, Brooklyn.—From the Brooklyn end of the Williamsburg Bridge under Broadway, Brooklyn, to its intersection with Lafayette avenue, there turning and following a return course under Lafayette avenue to Flatbush avenue, connecting with the Brooklyn Fourth avenue subway, now under construction.

Fort Hamilton Extension.—Branches of the Fourth avenue subway from the Fourth avenue subway at Fortieth street to New Utrecht avenue, to Eighty-sixth street and thence as an elevated line to Coney Island on one branch and as a subway to Fort Hamilton on the other.

Railway Matters in Washington.

Washington, March 9, 1910.

The House Committee has been giving further attention to the administration railway bill and by an almost unanimous vote has voted to practically destroy Section 12. By this section a railway owning more than one-half of the stock of another might buy the remainder and one holding a lease for 20 years or more might renew the lease or acquire reversionary ownership. Representative Townsend protested that these provisions were put into the bill to meet President Taft's demand that minority stockholders should not be deprived of a market for their shares, but his was the only adverse vote. The committee also voted to add a provision prohibiting directors and officers of one railway corporation from holding similar positions in another. This clause was carried by a vote of 11 to 5. Section 12, as left by the committee, prohibits absolutely the purchase or lease of a competing road. The committee also cut out the proviso excluding street and electric railways from the operation of the proposed new law, so these lines are left on the same status as steam roads.

Senator Newlands of Nevada has again brought before the Senate his proposal for the federal incorporation of railways. The senator embodies his views in a report on the administration railway bill, which contains no such provision.

The Senate Committee has published its report on the administration bill, giving prominence to its approval of the court of commerce feature. Supreme court decisions are cited to show that the power of the proposed court in reviewing the commission's orders will be no greater than that now possessed by the circuit court. The claim that there will not be business enough to occupy a special court is held to have no weight. The committee thinks that 60 days is a sufficiently long time to allow the commission to challenge a proposed advance in rates.

The administration bill will probably be taken up in the Senate within a few days, but senators estimate all the way from three to six weeks as the length of time which will be required to discuss it.

Representative Murphy of Missouri has introduced in the House a bill to provide an eight-hour day for the employees of all common carriers.

Canadian Society of Civil Engineers.

At a meeting of the mechanical section Thursday, March 10, Wm. C. Brown, of the McDougall Caledonia Iron Works Co., will give an illustrated address on turbine pumps in municipal work.

Roadmasters' Association of Texas.

This association was organized at Austin, Texas, February 28. Fifteen roadmasters were present and became charter members. The officers elected were: President, F. T. O'Dowd (G. C. & S. F.), Cleburne; vice-president, B. E. Mosher (I. & G. N.), Palestine; secretary and treasurer, H. Hempkens (St. L. S. W.), Waco.

A committee on constitution and by-laws was chosen and instructed to make a report at the first annual convention of the association, which will be held at Waco June 15.

There are about 500 roadmasters in Texas.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; Havana, Cuba; March 28.

American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.

American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.

American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31—June 3; Atlantic City.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.

Buffalo Transportation Club.—J. N. Sells, Buffalo.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.

International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.

Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.

Railroad Club of Kansas City.—Third Friday in month; Kansas City.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 14; Chicago

Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.

Railway Telegraph and Telephone Appliance Ass'n.—H. M. Buck, Secy.-Treas., 30 Church street, New York.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Society of Railway Financial Officers.—C. Norquist, Chicago.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.

Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg. Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Metropolitan Steamship Company, a new corporation organized in Maine, has taken the business of the Metropolitan Steamship Company of New Jersey, and will run steamers daily between New York and Boston.

The Pennsylvania Railroad will run a farmers' special instruction train in southern New Jersey this week, three days, co-operating with the State Board of Agriculture and the State Agriculture College. Twelve farmers' trains have been run by the Pennsylvania within the past year.

A small rate war which has been going on between the lines from Chicago to the Northwest has been settled. The Chicago Great Western started it by attempting to establish a differential passenger rate between Chicago and the Twin Cities. The upshot of it was that the C. G. W., the Minneapolis, St. Paul & Sault Ste. Marie and the Minneapolis & St. Louis announced a rate of $4 between Chicago and the Twin Cities, $7 between Chicago and Duluth and $6.90 between Chicago and Superior for parties of five or more. These rates will not take effect until March 28 and their cancellation has already been announced by the roads putting them in.

In the federal court at Buffalo last week, Judge Hazel granted a temporary injunction against a proposed increase in freight rates on coal and coke from Pennsylvania coal regions to Buffalo. The suit was brought by a number of steel and iron makers, and was directed against all of the railways interested in this traffic. The complaint declares that since July 1, 1909, when the rate from Connellsville, Pa., to Buffalo was raised, the rates from the same shipping point to Pittsburgh, Pa., and to Gary, Ind., are much lower per ton per mile than to Buffalo; and the proposed increase will increase this difference; and this discrimination, it is declared, is unjust.

At the suggestion of J. G. Woodworth, traffic manager of the Northern Pacific, lumbermen and railway officers in the Northwest have decided to ask the Interstate Commerce Commission to investigate the transit privilege given on lumber in that section and make a ruling regarding its reasonableness and legality. It is a common practice for forest products to be shipped unsold and to be sold while they are in transit or after they have been held by the carriers in storage. There is a difference of opinion between the manufacturers and the wholesale dealers as to how this privilege should be modified or whether it should be forbidden. The railways did not desire to undertake to settle their differences, as, no matter how they settled them, they would get into trouble with one or the other faction.

H. C. Barlow, traffic director of the Chicago Association of Commerce, and P. W. Coyle, commissioner of the Traffic Bureau of the Business Men's League of St. Louis, have asked the western railways to make reductions in freight rates from Chicago and St. Louis to points in Texas which will enable the merchants of these cities to compete in the Texas markets with those of New York. This demand is a result of the rate war between the steamship companies plying between New York and Galveston. The Texas Steamship Company is carrying first-class freight from New York to Galveston for 25 cents per 100 lbs. and the Morgan and Mallory lines have made a 50-cent rate. The ocean rate formerly was 85 cents. The first-class railway rate from Chicago to Texas is $1.67 and from St. Louis $1.47.

The industrial agent of the Erie reminds us that his road was a pioneer in running special trains to carry instruction to the farmers, and not an imitator or follower, as might appear from our reference last week to his cows. The Erie, in connection with Cornell University, was the originator of agricultural instruction trains in New York State. The milk production special has proved popular not only in New York State but also in Indiana. In the latter state the educational work of the Erie in this line is carried on in connection with Purdue University. The train with the two cows aboard made stops at 29 stations in that state. Three coaches were provided so that three lectures could be going on at the same time. The different cows were shown to illustrate the importance of selecting animals which will produce a profit. Two cows, one of which produced milk profitably and the other without profit, looked about alike. Another comparison showed one cow which was most useful in making butter as compared with another which gave larger quantities of milk, but milk of a kind not so valuable for butter.

The Corporation Commission of Oklahoma evidently intends to exhaust every resource to keep the railways from winning their fight against the 2-cent passenger fare and the freight rate orders of the commission. Its latest move is to summon a large number of the presidents and other principal officers of the railways doing business in Oklahoma to appear before it in Guthrie on March 15 as witnesses in its investigation. The commission will try to get these officers on record as to the valuation of the various railway properties in Oklahoma. The railway officers summoned are the following: George J. Gould, Iron Mountain; J. A. Edson, Kansas City Southern; E. P. Ripley, Santa Fe; B. L. Winchell, St. Louis & San Francisco; H. U. Mudge, Rock Island; George H. Crosby, Rock Island; F. H. Hamilton, Rock Island and St. Louis & San Francisco; C. N. Whitehead, Missouri, Kansas & Texas; A. C. Torbert, Gulf, Colorado & Santa Fe; Frank Kell, Wichita Falls & Northwestern; A. H. Calef, Iron Mountain; G. C. Hand, Kansas City Southern; A. A. Allen, Missouri, Kansas & Texas, and F. G. Pettibone, Gulf, Colorado & Santa Fe.

Judge Elmer B. Adams, of the Federal Court, has denied the injunction asked by the Manufacturers' Railway of St. Louis to restrain 19 railways entering St. Louis from canceling certain rate arrangements with it, and the cancellation of the rates went into effect on March 1. The Manufacturers' Railway will take the matter before the Interstate Commerce Commission. Judge Adams in refusing the injunction indicated that the proceeding should be brought before the commission. The roads contended that the court had no jurisdiction and their demurrers were sustained. G. F. Moore, president of the Manufacturers' Railway, stated in an interview that the gross earnings of his road were about $200,000 a year. Of this amount $180,000 is received from the railways as divisions of through rates. The railways having canceled the tariffs; the charges for the services rendered by the line must in future be collected from the shippers that it serves. The technical question involved is whether the Manufacturers' Railway is a "tap line" or a common carrier. It is well known that it gets most (but not all) of its business from the Anheuser-Busch Brewing Company and that it is owned by the same interests that control the brewery.

Crop Conditions.

The crop reporting board of the department of agriculture estimates that the quantity of wheat in farmers' hands on March 1, 1910, was about 23.5 per cent., equivalent to 173,344,000 bushels, of last year's crop, as compared with 21.6 per cent. (143,692,000 bushels) of the 1908 crop on hand March 1, 1909, and 23.8 per cent. (152,571,000 bushels), the average for the past ten years of the quantity on hand on March 1. It is estimated that about 59.3 per cent. of the crop will be shipped out of the counties where grown, as compared with 59.2 per cent. of the 1908 crop, and 56.6 per cent., the average for the past ten years, so shipped out.

The quantity of corn in farmers' hands on March 1, 1910, is estimated as 37.9 per cent., equivalent to 1,050,865,000 bushels, of last year's crop, as compared with 39.3 per cent. (1,047,763,000 bushels) of the 1908 crop on hand March 1, 1909, and 38.2 per cent. (925,386,000 bushels), the average for the past ten years of the quantity of the crop on hand March 1. It is estimated that about 23.1 per cent. of the crop will be shipped out of the counties where grown, as compared with 21.3 per cent. of the 1908 crop, and 20.0 per cent., the average for the past ten years, so shipped out. The proportion of the total crop which is merchantable is estimated as 82.6 per cent. of the 1909 crop, as compared with 88.2 per cent. of the 1908 crop, and 83.6 per cent., the average of the past ten years.

The quantity of oats in farmers' hands on March 1, 1910,

is estimated as 36.1 per cent., equivalent to 363,159,000 bushels, of last year's crop, as compared with 34.6 per cent. (278,847,000 bushels) of the 1908 crop on hand March 1, 1909, and 36.4 per cent. (310,763,000 bushels), the average of the past ten years of the quantity of the crop on hand March 1. It is estimated that 32.7 per cent. of the crop will be shipped out of the counties where grown, as compared with 30.3 per cent. of the 1908 crop, and 28.7 per cent., the average for the past ten years, so shipped out.

The accompanying table shows the estimated percentages of last year's crops of wheat, corn and oats in farmers' hands on March 1 in leading grain-producing states, with comparisons:

States.	Wheat			Corn			Oats.		
	1910, P.ct.	1909, P.ct.	10-yr. av. P.ct.	1910, P.ct.	1909, P.ct.	10-yr. av. P.ct.	1910, P.ct.	1909, P.ct.	10-yr. av. P.ct.
New York	28	25	28	29	31	30	40	40	43
Pennsylvania .	36	34	35	29	40	38	35	40	41
Texas	6	12	13	24	35	32	11	16	17
Ohio	27	27	29	40	38	36	37	35	36
Michigan	29	25	26	33	34	34	38	36	38
Indiana	21	23	22	39	39	39	33	29	30
Illinois	21	19	20	42	47	41	34	32	35
Wisconsin	31	34	33	33	33	31	44	43	42
Minnesota	26	24	28	36	33	32	40	36	41
Iowa	32	34	30	42	43	39	35	37	36
Missouri	17	20	21	36	38	37	35	32	34
Kansas	20	15	21	35	31	33	35	28	35
Nebraska	26	25	28	44	40	39	40	38	39
South Dakota..	26	22	26	39	32	35	40	37	44
North Dakota..	25	20	21	23	19	21	46	45	47
California	7	11	14	10	15	16	13	14	14
United States..	23.5	21.6	23.8	37.9	39.3	38.2	36.1	34.6	36.4

Harriman Lines Merger Suit Hearing.

Ernest Oliver McCormick, assistant traffic director of the Harriman lines, with headquarters at Chicago, was the first witness called March 3. Mr. McCormick first gave a brief resume of the passenger service over the Southern Pacific, showing the improvement from 1894.

Regarding the discontinuance of the Sunset Limited in 1902 Mr. McCormick testified that the traffic department decided in the summer of that year that the service was insufficient, and that a daily train should displace the Sunset Limited, which operated at most three times a week, and only during the winter months. The substituted train's speed was made slower to give better accommodation in the way of making connections.

Mr. McCormick brought out the point that the afternoon lay over of this train at Los Angeles, instead of being considered an inconvenience, is widely advertised and has proven a considerable attraction to the class of passenger traffic which predominates over the low altitude and scenic route of the Southern Pacific. Arrangement is made for passengers who desire to continue to San Francisco without delay. Witness also stated that the Southern Pacific is the only system invading trunk line territory which runs through tourist cars to California, there being four of these cars a week out of Washington, D. C., and others once a week from other eastern cities.

Otto H. Kahn, of Kuhn, Loeb & Company, member of the executive committee of the Union Pacific, was then called to the stand.

Mr. Kahn, who is one of the defendants with Union Pacific, was accompanied by Paul D. Cravath, counsel for Kuhn, Loeb & Company. Mr. Kahn stated that he had been a member of the firm of Kuhn, Loeb & Company since 1897, that he was a member of the board and executive committee of Union Pacific from the time of its reorganization to 1906.

Witness said that of the $100,000,000 Union Pacific first lien convertible bonds authorized in 1901, $60,000,000 had been purchased by his firm, none of this block of shares being taken by the public. Mr. Kahn stated that, apprehensive of a rupture of the long established relations between Union and Southern Pacific, Mr. Harriman had for some time prior to Collis P. Huntington's death, endeavored to obtain control of Central Pacific. Overtures were made by Union Pacific for the purchase of the Central Pacific, but this proposition was rejected. After Mr. Huntington's death, the threatened break in the relations became more imminent and when opportunity was afforded for securing a controlling interest in Central Pacific, by purchase of the Southern Pacific's stock, it was gladly taken advantage of, although the executive committee would have preferred to secure Central Pacific alone.

Mr. Kahn stated that the executive committee never considered the idea of any competitive features between Union and Southern Pacific, this matter being so insignificant as never to have constituted a reason for Union's obtaining control of Southern Pacific. The one vital and only reason for Union Pacific's desire and purpose to gain this control of Southern was the fact that Union had to have Central Pacific as an outlet to the coast or lie at the mercy of the Central Pacific interests.

Asked why Union Pacific issued $100,000,000 of convertible bonds in 1901 when only $40,000,000 was needed to purchase the 750,000 Southern Pacific shares. Mr. Kahn said that it was because of what Mr. Harriman considered a threatening situation with regard to the Burlington. If Union Pacific succeeded in securing representation in the Burlington, it would involve a considerable amount of money. If the effort to secure this representation failed, there must be some sort of fight which, again, would require funds.

"Such a fight," said Mr. Kahn, "always requires brains, courage and money. Mr. Harriman was not in need of the first two factors, but he would need money, and this authorization of the additional $60,000,000 was to provide it in case the occasion should arise."

In respect to relations existing between Mr. Harriman and Mr. Perkins, of Boston, and others in the management of the Burlington, Mr. Kahn stated that there had always been the best of feeling between them, both being in favor of the policy of live and let live. Mr. Harriman's negotiations for securing from 10 per cent. to 15 per cent. of the Burlington stock, which failed because of the price asked by New England holders of the available shares, were actuated solely, Mr. Kahn stated, by Mr. Harriman's desire to perpetuate the existing relations, and prevent Mr. Hill's acquisition of too great an interest in the Chicago, Burlington & Quincy to the detriment of the Union Pacific, which was a natural competitor of the Burlington.

When Mr. Hill acquired the Burlington stock by paying for the controlling interest the price Mr. Harriman had refused to pay for the 15 per cent., Mr. Harriman and the executive committee decided that they could not afford to stand by quietly bearing the ills they had, rather than to fly to others that they knew not of, especially when the dispenser of those ills was Mr. Hill. When the issue of convertible bonds was placed at $100,000,000 there was no idea of ever purchasing Northern Pacific stock, else the issue would have been made $25,000,000 more.

After Mr. Harriman's demand for approximately 50 per cent. of the Burlington stock had been flatly refused, and only then, said Mr. Kahn, did he and the Union Pacific executive committee conceive the idea of purchasing stock of the Northern Pacific, which held one-half of the Burlington's. This purchase, Mr. Kahn testified, was merely a defensive measure, a move to accomplish by indirection what they were unable to accomplish otherwise to protect Union Pacific's interests as against the hostile management of the Burlington.

Mr. Kahn stated that Union Pacific interests had not the remotest idea of acquiring the Northern Pacific stock with the idea of monopolizing transcontinental transportation. Had this been the purpose, said Mr. Kahn, the natural move would have been to take the line of least resistance and acquire the Atchison, whose control was easily available by Kuhn, Loeb & Company prior to 1900, and several years thereafter.

Or, again, the Chicago, Rock Island & Pacific was offered to Mr. Harriman outright in 1901, but was refused on the ground taken by the executive committee that the economic operation of a transportation system was limited by the size of the organization.

In any case the Northern Pacific, held by the very strongest interests in the land, was the last instead of the first whose control would have been attempted for the purposes of monopolizing transcontinental traffic.

Regarding the investment in $10,000,000 Atchison preferred in July, 1906, Mr. Kahn stated that this and similar purchases grew out of the fact that Union Pacific had on its hands a large profit on the Hill securities, and out of the disadvantages of keeping the money in the form of cash and inviting ac-

cusations of market manipulation, or of using it to take up outstanding bonds.

The purchase of the securities, in other words, was actuated chiefly by the necessity of employing the funds to reasonable advantage; secondarily, to give Union Pacific the voice going with ownership of considerable blocks of stock of roads which turned over to Union Pacific considerable traffic.

On cross-examination by Mr. Severance, Mr. Kahn said that Kuhn, Loeb & Co. purchased the bulk of the first 750,000 shares of Southern Pacific sold to Union Pacific, from the Huntington estate. The other 150,000 common shares acquired later were purchased in the market. Asked why Union Pacific purchased the additional 150,000 shares, Mr. Kahn recounted the attempt of interests dominated by James R. Keene, to force the declaration of dividends on Southern Pacific before the Union Pacific interests deemed such action wise. The additional stock was purchased to preclude loss of control by Union Pacific through the action of stockholders who also were agitating declaration of dividends.

Asked whether Kuhn, Loeb & Co. have purchased any Southern Pacific stock for Union Pacific in the past 90 days during which Mr. Kahn has been back on the Union Pacific board and executive committee, Mr. Kahn stated that he would prefer not to answer this question before consulting counsel, and the answer was postponed until after the recess.

Asked regarding his knowledge of the volume of business carried by the Sunset Route at the time when acquisition of the Southern Pacific by Union Pacific was under consideration, Mr. Kahn said that he was thoroughly conversant through long observation with the intrinsic value of the Southern Pacific, but paid little attention to details of its operation, however; that in 1901 he considered the Sunset Route a nuisance, involving a great outlay to put it into shape, and constant attention to thousands of additional miles of line, and that he would have been glad had Union Pacific been able to secure Central Pacific free of the Sunset line. Meanwhile, the Sunset has, through Mr. Harriman's genius and the outlay of a vast sum of money, become a paying proposition.

Mr. Kahn testified that 74,000 shares of the Southern Pacific were bought by the Union Pacific in January of this year because of the bill before Congress regarding the holding of 50 per cent. of the stock of subsidiary companies.

As this provision was afterward dropped from the bill the buying of Southern Pacific stock was discontinued about January 10. Mr. Harriman had sold 50,000 shares of the Short Line's Southern Pacific stock during the summer, so that the total Short Line holdings had been increased 24,000 shares.

The present Short Line holdings amount to 46 per cent. of the outstanding Southern Pacific stock. To secure 50 per cent. of the Southern Pacific stock the Short Line would have had to increase its holdings by 184,000 shares.

Mr. Kahn testified that in 1900 one of the interests reliably reported to be after the Southern Pacific stock of the Huntington estate was Mr. Gould. It was recognized that as the Huntington estate's stock was in the market, Union Pacific was confronted by what was the opportunity or its danger according as it did or did not secure this stock and Southern Pacific control. Mr. Severance asked the witness whether the recent purchase of 74,000 shares of Southern Pacific stock was not determined upon with the idea of defeating the purpose of the present suit. Mr. Kahn replied, "No; Union Pacific officials are perfectly satisfied that they will win this suit on its merits."

Mr. Kahn said that efforts were made at that time to induce the Burlington to purchase the Huntington estate holdings of Southern Pacific. Asked whether Mr. Harriman did not seek control of Burlington through proposed purchase of 15 per cent. of the Burlington stock held by President Perkins, Mr. Kahn said that that percentage of the stock would not give control; that control was not sought; but that 15 per cent. of the stock of any company carries a safeguard against a stampede of the stockholders, which was all Union Pacific desired, that it might secure continuance of the then existing relationship with the Chicago, Burlington & Quincy. Beyond that Union Pacific expected to have no voice in the management of the property.

Mr. Kahn declared that the Union Pacific management was perfectly aware that neither Burlington shareholders nor the Government would have brooked the active control of Burlington by Union Pacific. The demand made for 50 per cent. of the Burlington stock after Mr. Hill secured control was forced by the change in conditions which altered the measure necessary to protect Union Pacific's interest.

Asked whether the securities purchased for investment in 1906 could not have been sold to provide funds for improvements instead of more company securities being issued, thus relieving Union Pacific of an encumbrance, Mr. Kahn said that these investments were far from being an encumbrance, contributing 4 per cent. per annum of the 10 per cent. dividend on Union Pacific common stock.

In reply to Mr. Severance, Mr. Kahn denied that the intent in purchasing Southern Pacific stock was to place Union and Southern Pacific under one management, with the purpose of restraining trade. He repeated that the sole intent was to keep the Central Pacific out of unfriendly hands.

Regarding the purchase in 1904 of $30,000,000 of Atchison stock by interests allied with Union Pacific, Mr. Kahn said that this stock was purchased simply because the stock was considered cheap. Mr. Severance noted that shortly after this purchase these interests asked for representation on the Atchison board. Mr. Kahn smilingly admitted that the fact that the representatives chosen were simultaneously directors of the Union Pacific was not considered detrimental.

The Atchison interests were advised of the sale of this stock eighteen months later, but Mr. Rogers and Mr. Frick remained on the board, although the slightest intimation that their presence was not desired would at any time have secured their resignations.

William Mahl, controller of the Union Pacific, was the final witness called March 8 at New York before adjournment was taken. Adjournment was taken until March 28, at which time the defense may put in additional testimony if desired. Then the hearing will reconvene on April 4 to allow the government opportunity for rebuttal.

Statements submitted by Mr. Mahl showed that the Union Pacific held $23,700,000 of the stock of the Illinois Central Railroad and owned 99.93 per cent. of the stock of the Railroad Securities Company, which in turn owns $9,200,000 of Illinois Central stock, making the stock in this road controlled by the Union Pacific an aggregate of $32,900,000. The direct holding of Union Pacific in the Illinois Central was shown to have increased from $18,623,100 in 1901 to $23,700,000 now. The holdings of Chicago & Northwestern, held in the name of the Oregon Short Line, he testified, has increased from $2,572,000 to $4,750,000, and the New York Central holdings, also in the name of the Oregon Short Line, from $14,285,745 to $17,857,125. There had been no change in the stock ownership by the Union Pacific in the Chicago & Alton or the Baltimore & Ohio.

It appeared that at the present time the Union Pacific owns $126,610,000 of the stock of the Southern Pacific out of a total of $272,672,205, or 46.40 per cent.

INTERSTATE COMMERCE COMMISSION.

Package Freight Handling at Chicago.

Wholesale Fruit & Produce Association v. Atchison, Topeka & Santa Fe et al. St. Paul Board of Trade v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Prouty.

Complainant in case No. 2110 asks that the commission extend its order in the former case as to compelling carriers at Chicago to furnish assistance in unloading carload shipments of fruits and vegetables so as to include all kinds of produce in packages; and complainants in cases Nos. 2237 and 2271 ask that carriers at St. Paul and Minneapolis be required to unload carload shipments of fruits and vegetables at those cities; held that under existing circumstances the present rule should not be disturbed. Complaints dismissed.

There is no good reason why ordinary package freight, which is loaded and unloaded upon the team track or at the private siding, should not be handled into and out of the car by the shipper in the same manner that bulk freight is. It appears that in many instances these fruits and vegetables are allowed to remain in the car for a considerable time after its arrival, and are delivered by the consignee from the car

itself to the purchaser. Where this custom prevails it would impose a hardship upon the carrier to require it to furnish help for the unloading of the car at whatever time the shipper might require such services.

It is urged that by leaving in force the order of the commission in the original case and dismissing these complaints the commission creates a discrimination in favor of fruits and vegetables at Chicago as against other kinds of freight, and in favor of Chicago as against other localities; held, that if discrimination can be predicated upon these facts, it is not in the present case undue. The handling of package freight at Chicago would be in no respect benefited if the handlers of fruits and vegetables were required to unload their traffic, nor are the handlers of fruits and vegetables benefited by the fact that other produce in packages is not unloaded by the carriers. Conditions applying to the handling of fruits and vegetables at Chicago are not the same as those applying at St. Paul and Minneapolis. (17 I. C. C., 596.)

Rates to Points in Mexico.

Black Horse Tobacco Co. v. Illinois Central et al. Opinion by Commissioner Prouty.

The minimum weights imposed by defendants upon complainant's shipments of leaf tobacco in hogsheads from points in Kentucky and Tennessee to points in Mexico found to be excessive and reparation awarded. The commission has no authority to establish a rate of transportation in Mexico, nor to order the maintenance of a rate for the future from a point in the United States to a point in Mexico, but it may require the American carriers to cease and desist from continuing to apply a joint through rate or any rule, regulation or practice in connection with their joint through rate; and it may, where such rate has been voluntarily maintained, inquire whether it has been reasonable, and if found unreasonable, award damages.

If an initial carrier files and posts a tariff naming joint rates from stations upon its line to destinations upon a connecting line, in which tariff the connecting line does not concur, the initial line thereby becomes responsible to the shipper under its tariff. If the shipper is compelled to pay, under rates legally in effect, a greater transportation charge than that named in the tariff, he may recover from the initial carrier the difference, certainly if the rate posted by it is found to be reasonable.

Every carrier party to a joint rate is jointly and severally responsible for that rate, and those carriers who actually participate in the transportation under a joint rate are jointly and severally liable in damages for the unreasonableness of that rate. A complainant is not deprived of his right to a reasonable rate by the fact that the defendants, through neglect of the rules of this commission as to the publication of their tariffs, had failed to establish that rate in legal form. (17 I. C. C., 588.)

STATE COMMISSIONS.

The Kentucky State Railroad Commission has adopted for use in that state the National Demurrage rules adopted at Washington last November, and recently adopted by the American Railway Association.

The Wisconsin Railroad Commission has ordered the Chicago & North Western, the Chicago, Milwaukee & St. Paul, the Minneapolis, St. Paul & Sault Ste. Marie and the Illinois Central to stop applying that portion of their rule 27 which compels shippers to mark with the full name of consignee each bundle and piece of freight in L.C.L. lots.

COURT NEWS.

The West Virginia Court of Appeals has this week held the 2-cent fare law of that state valid as a general regulation, but confiscatory as applied to the Coal & Coke Railroad. The lower court had held the law unconstitutional as well as confiscatory. The attorney-general will now proceed in the courts to secure an order restoring 2-cent fares on the other railways which have contested the law.

In a Virginia court at Norfolk, March 1, the suit of a shipper against the Norfolk & Western (the initial carrier) to recover for losses on a shipment of freight which occurred beyond the Norfolk & Western line, was decided in favor of the plaintiff, the court holding that the Interstate Commerce law, as amended in 1906, making the initial carrier responsible to the shipper in such cases, is constitutional.

Judge C. E. Wolverton, in the United States circuit court for Oregon, has again decided in favor of the defendant, the State Railroad Commission, in the suit of the Oregon Railroad & Navigation Co. to enjoin the commission from carrying out its order reducing freight rates between Portland and points east of The Dalles. The suit was begun in May, 1908. September 28, 1909, Judge Wolverton, after discussing at length the questions raised, sustained the general demurrer made by the commissioners. The plaintiff, however, was allowed to file an amended bill and a restraining order was issued. On February 21 of this year the defendant's demurrer to the amended bill was sustained and the suit was dismissed. The road claimed that the act establishing the commission was unconstitutional because it conferred executive, legislative and judicial powers, and because of excessive penalties prescribed; that no adequate remedy for review of the commission's orders was provided; that the order gave the commission power over interstate commerce, and that the rates named in the order on which the suit was based were unreasonably low. The court decided against the plaintiff on all these points.

The supreme court of the United States has decided against the Interstate Commerce Commission in its suit to compel the Delaware, Lackawanna & Western to comply with an order of the commission to make a track connection with the Rahway Valley Railroad. The supreme court sustains the Lackawanna in its contention that an order of this kind could not be issued except on the complaint of a shipper; a complaint from a railway is not enough. When the Lackawanna refused to join in making a physical connection with the Rahway Valley at Summit, N. J., the R. V. made a complaint to the Interstate Commerce Commission. That body eventually issued an order to compel the granting of the connection. While the court held that the commission could not require a connection on the complaint of the road, it did not decide the question of whether the Rahway was a "lateral branch line" within the meaning of the law. Justice Holmes said: "There certainly is force in the contention that the words of the statute mean a railway naturally tributary to the line of the common carrier ordered to make the connection and dependent upon it for an outlet to the markets of the country, but it would be going far to lay down the universal proposition that a feeder might not be a lateral branch road of one line at one end and of another at the other."

The supreme court of the United States has decided against the Interstate Commerce Commission in its suit to compel the Northern Pacific to join the Union Pacific, the Oregon Short Line, the Oregon Railroad & Navigation Company and the Chicago & North Western in making through rates from eastern points to places on Puget sound, by way of Portland. The order of the commission in this case was reported in the *Railway Age Gazette* of May 28 and June 11, 1909. The decision of the supreme court is by Justice Holmes, who holds that the reasons assigned by the commission for holding that the existing route from the east to Puget sound which is provided by the Northern Pacific was not reasonably satisfactory could only be maintained by giving the words of the statute an artificial meaning. The court in substance approves the dissenting opinion which was presented by Chairman Knapp, of the Interstate Commerce Commission, and concurred in by Commissioner Clark. The Northern Pacific has declined to enter into a joint rate agreement with the Union Pacific and its connections for passengers from the East to Tacoma and similar points via Portland, claiming that it already provided a satisfactory and reasonable route from the East to Tacoma over its own main line. The commission finally ordered the making of joint rates via Portland. To persons who might object to the climate of the Northern Pacific route, or who wanted to stop over along the southern route for purposes of seeing the scenery or for business, the commission held that the northern route might not be satisfactory and reasonable.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,458	$4,291,960	$1,699,498	$6,598,822	$1,279,647	$1,186,575	$148,937	$2,283,808	$148,222	$5,047,189	$1,551,633	.....	$273,816	$1,277,817	—$846,746
Atlantic Coast Line	4,482	1,720,650	634,820	2,566,712	342,291	339,534	46,871	832,118	66,799	1,627,613	939,099	.....	95,500	843,599	95,985
Baltimore & Ohio	4,198*	5,096,729	955,820	6,421,839	787,681	1,373,752	143,973	2,490,598	137,130	4,933,134	1,488,705	$70,591	192,287	1,225,827	60,155
Boston & Maine	2,242	2,010,907	959,955	3,219,478	280,811	482,848	39,423	1,574,318	88,578	2,465,978	753,500	—3,778	182,053	567,669	—15,423
Chesapeake & Ohio	1,938	2,092,138	353,764	2,541,852	201,344	461,783	41,647	756,291	49,252	1,510,317	1,031,535	—4,898	67,500	959,137	329,591
Chicago & Eastern Illinois	965	844,106	146,500	1,041,663	104,953	215,523	20,302	401,230	33,045	775,053	266,610	—1,216	30,583	234,811	43,412
Chicago & North Western	7,638	3,271,773	1,217,387	4,973,025	769,501	852,409	121,375	2,615,895	116,773	4,475,953	497,072	—8,869	228,000	260,203	—818,818
Chicago, Burlington & Quincy	9,021	4,740,517	1,586,877	6,935,802	707,088	1,398,454	137,165	2,597,807	191,993	5,032,507	1,903,295	—18,592	215,571	1,669,132	94,152
Chicago, Rock Island & Pacific	7,393	3,127,479	1,314,426	4,737,526	733,662	724,797	146,296	2,067,717	162,190	3,834,662	902,864	—13,758	236,552	652,554	—271,585
Cleveland, Cincinnati, Chicago & St.L.	1,982	1,600,959	529,930	2,324,237	167,878	409,677	73,914	1,015,009	51,397	1,717,875	606,362	—10,333	74,000	522,029	151,471
Colorado & Southern	1,248	679,646	104,381	824,662	84,381	130,729	13,123	286,583	18,935	533,751	290,911	—819	21,625	268,467	52,884
Delaware & Hudson	843	1,155,822	169,702	1,375,986	73,154	231,085	20,496	581,588	41,481	947,804	428,182	—298	35,000	392,884	—92,084
Delaware, Lackawanna & Western	930	2,166,300	472,695	2,829,290	123,192	385,127	46,407	867,916	66,244	1,488,887	1,340,403	—7,267	118,650	1,214,486	123,826
Denver & Rio Grande	2,542	1,345,711	307,687	1,722,955	196,943	380,772	37,760	746,805	51,397	1,413,677	309,278	—6,353	71,000	231,925	—50,309
Erie	1,961	2,673,834	563,315	3,528,116	293,583	730,836	96,825	1,360,377	77,641	2,559,262	968,854	—55,184	108,930	804,741	163,536
Great Northern	7,129†	2,938,132	864,826	4,062,844	549,490	640,327	69,360	1,612,890	81,667	2,953,734	1,109,110	10,680	370,404	749,386	713,145
Gulf, Colorado & Santa Fe	1,518	660,343	235,250	951,420	235,732	163,518	26,278	396,611	33,837	855,976	95,444	.....	55,758	59,686	—204,433
Illinois Central	4,550	3,274,734	933,806	4,862,973	476,756	1,077,487	101,661	1,759,355	97,688	3,512,947	1,350,026	—5,307	206,645	1,138,074	—88,205
Lake Shore & Michigan Southern	1,662‡	2,599,032	827,606	3,873,876	303,592	597,800	84,520	1,511,639	62,516	2,560,067	1,313,809	—3,753	135,000	1,175,056	75,213
Lehigh Valley	1,440	2,327,669	266,464	2,700,144	270,746	487,622	73,977	961,114	57,940	1,851,399	848,745	—24,987	94,600	729,158	8,916
Louisville & Nashville	4,599§	3,297,169	851,676	4,421,361	760,418	693,170	95,685	1,417,135	83,971	3,050,379	1,370,982	—3,218	128,580	1,239,184	139,358
Michigan Central	1,746	1,493,159	455,171	2,158,105	201,757	314,980	70,661	988,688	38,380	1,614,466	543,639	—9,959	100,000	433,680	24,008
Missouri, Kansas & Texas	3,072	1,330,104	642,756	2,115,584	327,265	319,959	54,824	851,680	74,283	1,628,012	487,572	—2,161	95,000	390,411	26,154
New York Central & Hudson River	3,587	4,592,724	2,080,892	7,421,396	760,197	1,323,947	177,453	3,186,384	212,846	5,660,827	1,760,569	—8,052	388,715	1,363,802	278,625
New York, New Haven & Hartford	2,044	2,255,370	1,810,115	4,503,933	460,070	574,085	28,446	1,974,232	124,952	3,161,785	1,342,148	113,486	350,000	1,105,634	372,735
Norfolk & Western	1,941	2,396,126	291,670	2,782,491	247,758	480,407	43,379	861,512	61,781	1,694,837	1,087,654	1,040	92,800	995,894	264,479
Pennsylvania Company	1,416	3,015,020	572,314	3,974,369	570,921	701,085	67,645	1,495,423	76,157	2,911,231	1,063,138	—3,066	143,875	916,257	481,843
Pennsylvania R. R. Co.	4,017	9,716,302	2,284,786	12,908,158	1,639,418	2,601,964	148,736	4,851,756	304,740	9,546,614	3,361,544	—138,361	197,526	3,025,657	693,066
Pere Marquette	2,331	825,050	234,650	1,146,294	110,766	166,226	33,394	585,225	33,236	928,847	217,447	—4,512	63,251	149,684	—58,582
Philadelphia, Baltimore & Washington	716	642,561	561,139	1,376,658	225,457	246,197	24,146	598,878	30,284	1,124,962	251,696	.....	35,771	215,925	88,811
Pittsburgh, Cincinnati, Chic. & St. L.	1,468	2,410,889	576,321	3,361,038	461,246	580,253	72,586	1,238,036	60,711	2,412,832	948,206	—1,031	111,975	835,200	340,488
St. Louis & San Francisco	4,726	2,081,992	796,034	3,104,274	368,716	398,593	81,457	1,213,031	106,580	2,168,377	935,897	.....	122,458	813,439	55,004
Southern Ry.	7,050	2,974,861	1,134,867	4,480,219	525,013	788,164	119,463	1,642,278	146,105	3,221,024	1,259,195	2,087	172,235	1,089,047	130,361
Texas & Pacific	1,885	930,108	316,580	1,361,282	157,371	219,156	22,551	539,782	36,740	975,600	385,682	—1,932	48,562	335,188	33,782
Union Pacific	3,411‡	2,735,227	823,758	3,932,561	302,536	566,104	102,735	1,192,513	93,363	2,257,251	1,675,310	—11,820	123,250	1,540,240	163,377
Yazoo & Mississippi Valley	1,370	597,845	206,293	880,001	121,365	156,280	16,419	317,435	22,667	634,166	245,835	2,444	34,930	213,349	—6,216
SEVEN MONTHS OF FISCAL YEAR, 1910.															
Atchison, Topeka & Santa Fe	7,458	33,856,381	12,124,550	49,923,652	8,299,388	7,547,772	983,541	14,077,863	1,064,903	31,973,467	17,950,185	.....	1,859,058	16,091,127	—86,567
Atlantic Coast Line	4,482	11,543,434	3,789,576	16,540,357	2,299,139	2,428,183	281,711	5,079,250	440,216	10,528,499	6,011,858	.....	663,000	5,348,858	1,149,851
Baltimore & Ohio	4,198*	39,364,768	8,418,604	50,492,459	6,462,552	9,269,723	1,036,804	16,442,423	906,863	34,118,365	16,374,094	—383,402	1,325,001	14,665,691	1,434,723
Boston & Maine	2,242	14,999,878	9,099,990	25,975,668	3,248,717	3,052,035	296,419	10,887,546	565,355	18,050,072	7,925,596	53,040	1,216,878	6,761,758	902,024
Chesapeake & Ohio	1,938	14,470,919	3,007,037	18,196,567	1,907,394	3,397,574	308,923	4,788,961	336,365	10,739,216	7,457,351	—5,800	472,500	6,979,051	1,445,324
Chicago & Eastern Illinois	965	5,596,487	1,109,808	7,060,389	653,761	1,299,556	153,180	2,337,564	227,656	4,671,717	2,388,672	—9,696	212,624	2,166,352	500,534
Chicago & North Western	7,638	29,327,518	11,358,693	44,138,217	7,078,950	5,533,145	834,182	16,984,711	715,298	31,146,286	12,991,931	—27,674	1,596,000	11,368,257	—1,976,366
Chicago, Burlington & Quincy	9,021	34,313,170	13,833,218	52,346,420	9,260,478	9,121,243	999,322	16,080,003	1,261,846	36,722,892	15,623,528	—102,566	1,509,117	14,011,845	—712,752
Chicago, Rock Island & Pacific	7,393	23,749,344	11,491,168	37,411,152	6,067,038	4,776,993	891,138	13,497,176	997,906	26,230,251	11,180,901	—96,851	1,460,177	9,623,873	574,620
Cleveland, Cincinnati, Chicago & St.L.	1,982	11,415,734	4,548,572	17,473,955	1,914,951	2,847,792	560,177	6,340,742	327,305	11,990,967	5,482,988	—41,140	508,328	4,933,520	1,286,317
Colorado & Southern	1,248	4,426,237	1,041,121	5,757,089	750,550	905,342	98,578	1,800,930	145,086	3,700,486	2,056,603	—2,366	151,375	1,902,862	211,940
Delaware & Hudson	843	9,247,209	1,909,659	11,677,169	692,189	1,517,839	150,500	3,956,429	263,083	6,580,040	5,097,129	187	236,468	4,860,848	172,603
Delaware, Lackawanna & Western	930	15,781,546	4,248,969	21,317,164	1,839,541	2,777,810	367,876	5,666,668	399,315	11,041,210	10,265,954	188,720	922,750	9,531,924	878,154
Denver & Rio Grande	2,542	10,113,890	3,390,288	14,093,731	1,695,651	2,296,574	290,138	4,979,699	327,563	9,589,625	4,504,106	27,419	476,000	4,155,525	281,971
Erie	1,961	20,402,256	5,265,781	27,689,092	3,160,977	4,915,065	626,403	8,883,358	563,858	18,149,661	9,539,431	—114,521	739,996	8,684,913	1,464,245
Great Northern	7,129†	28,212,564	8,738,855	38,961,351	5,811,240	4,278,059	516,447	10,396,306	579,076	21,581,128	17,380,223	242,455	2,114,502	15,508,176	2,979,835
Gulf, Colorado & Santa Fe	1,518	5,177,656	1,842,253	7,466,809	1,445,197	1,100,584	166,948	2,715,169	210,903	5,683,801	1,828,008	.....	240,717	1,587,291	—743,659
Illinois Central	4,550	22,741,030	7,127,317	34,013,248	4,845,894	7,871,714	737,448	11,306,654	690,852	25,452,562	8,560,686	—26,604	1,524,728	7,009,354	—493,489
Lake Shore & Michigan Southern	1,662‡	18,978,791	6,636,638	28,739,764	3,427,678	4,146,892	688,443	8,751,896	430,171	17,445,080	11,294,684	—43,076	843,905	10,407,703	1,835,146
Lehigh Valley	1,440	17,549,498	2,634,716	20,937,863	2,183,148	3,470,355	525,984	6,100,312	415,170	12,694,969	8,242,894	15,058	662,200	7,595,753	1,132,548
Louisville & Nashville	4,599§	22,119,152	6,402,270	30,370,619	3,606,194	4,717,898	632,363	8,998,783	590,213	18,545,451	11,825,168	—47,335	880,310	10,897,523	2,129,094
Michigan Central	1,746	11,156,926	4,269,267	16,983,203	2,178,825	2,184,978	483,197	6,079,882	281,779	11,208,660	5,774,543	—20,584	657,532	5,096,427	1,112,174
Missouri, Kansas & Texas	3,072	10,696,163	4,637,652	16,272,424	2,251,319	2,003,102	376,054	5,687,337	510,265	10,828,077	5,444,347	—13,655	627,287	4,803,405	624,028
New York Central & Hudson River	3,587	33,560,958	18,128,862	57,534,387	7,258,290	9,237,809	1,426,854	20,218,526	1,202,067	39,343,546	18,190,841	187,623	2,635,257	15,743,207	3,084,941
New York, New Haven & Hartford	2,044	17,415,945	15,003,544	35,584,997	3,905,627	3,883,852	180,969	13,270,265	867,724	22,108,437	13,476,560	823,582	2,255,000	12,045,142	3,399,349
Norfolk & Western	1,941	17,062,722	2,410,745	20,112,408	2,021,122	3,388,145	306,200	5,702,597	408,303	11,826,367	8,286,041	—8,608	596,800	7,680,632	1,498,044
Pennsylvania Company	1,416	24,765,469	4,598,869	31,742,712	3,841,234	4,870,517	478,463	9,761,485	521,503	19,473,202	12,269,510	—19,802	1,040,538	11,209,169	3,065,281
Pennsylvania R. R. Co.	4,017	69,642,611	18,589,518	94,220,091	11,335,941	17,030,229	1,189,323	30,699,504	2,141,287	62,396,284	31,923,807	—649,067	1,382,683	29,892,056	6,065,093
Pere Marquette	2,331	6,371,322	2,360,700	9,413,438	1,199,227	1,217,747	231,386	3,640,178	207,453	6,495,991	2,917,447	7,828	348,275	2,576,999	444,806
Philadelphia, Baltimore & Washington	716	5,250,526	4,173,875	10,474,660	1,461,960	1,766,446	162,247	4,036,388	218,305	7,645,346	2,829,314	.....	250,401	2,578,913	359,142
Pittsburgh, Cincinnati, Chic. & St. L.	1,468	16,157,400	4,577,780	23,221,526	3,089,991	3,846,488	467,007	7,467,445	417,098	15,288,029	7,933,497	—6,035	774,200	7,153,262	1,664,903
St. Louis & San Francisco	4,726	15,769,637	6,222,191	23,666,252	3,648,482	3,579,840	551,999	7,992,996	682,806	16,456,123	7,210,129	.....	809,179	6,400,950	739,299
Southern Ry.	7,050	22,213,396	8,971,087	33,764,511	3,991,492	5,621,540	796,784	10,966,196	1,002,289	22,378,302	11,386,209	14,739	1,147,902	10,253,046	1,230,829
Texas & Pacific	1,885	6,613,508	2,386,017	9,703,766	1,072,286	1,397,185	143,786	3,554,071	239,242	6,406,570	3,297,196	—29,581	352,490	2,915,125	174,287
Union Pacific	3,411‡	22,726,837	6,750,345	32,094,381	3,031,104	3,229,710	812,852	7,511,493	683,502	15,268,661	16,825,720	—4,138	928,276	15,893,306	1,336,279
Yazoo & Mississippi Valley	1,370	4,253,362	1,382,640	6,034,128	1,257,381	1,120,649	115,182	1,948,294	166,924	4,608,430	1,425,698	20,446	251,370	1,194,774	170,771

*Mileage operated on January 31, 1909, 3,992. †Mileage operated on January 31, 1909, 6,899. ‡Mileage operated on January 31, 1909, 1,511. §Mileage operated January 31, 1909, 4,388. ‡ Mileage operated on January 31, 1909, 3,310. — Indicates Deficits, Losses and Decreases.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Edgar A. de Meules has been appointed general attorney of the Midland Valley, with office at Muskogee, Okla.

H. R. Woods has been appointed auditor of the Laramie, Hahn's Peak & Pacific, with office at Laramie, Wyo.

A. C. Durfee has been appointed assistant treasurer of the Buffalo, Rochester & Pittsburgh, with office at Rochester, N. Y.

H. P. Lingo has been appointed auditor of the Tennessee Railway, with office at Oneida, Tenn., succeeding H. S. DeVault, resigned.

C. A. Higbee has been elected treasurer of the Tonopah & Goldfield, with office at Philadelphia, Pa., succeeding R. H. Rushton, deceased.

Jefferson Justice, assistant to comptroller of the Pennsylvania Railroad at Philadelphia, Pa., has been retired, having reached the age limit.

W. N. Rockwell has been appointed auditor of the Quincy, Omaha & Kansas City, with office at Kansas City, Mo., succeeding W. S. Thompson, resigned to accept service elsewhere.

J. W. Grippen has been appointed acting auditor of the Georgia Northern, of Georgia, with office at Moultrie, Ga., succeeding B. H. Groover, granted an indefinite leave of absence on account of ill health.

W. L. Park, general superintendent of the Union Pacific at Omaha, Neb., has been elected vice-president of the Illinois Central, with office at Chicago, succeeding I. G. Rawn, resigned some time ago to become president of the Chicago, Indianapolis & Louisville.

W. S. Thompson, auditor of the Quincy, Omaha & Kansas City at Kansas City, Mo., has been appointed auditor of freight and ticket accounts for the Chicago, Burlington & Quincy Lines West of the Missouri river, with office at Omaha, Neb., succeeding J. W. Newell, transferred to Chicago.

Joseph Wood has been elected president of the Pittsburgh, Chartiers & Youghiogheny, succeeding J. M. Schoonmaker; E. B. Taylor has been elected vice-president, succeeding J. G. Robinson, who remains as treasurer, and H. J. McElheny has been appointed assistant treasurer, all with offices at Pittsburgh, Pa.

Martin Post Blauvelt, whose appointment as comptroller of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago, has been announced in these columns, was born February 25, 1865, at Suffern, Rockland county, N. Y. He was educated at the Goshen Collegiate Institute, and began railway work in 1885 as clerk in the freight office of the Delaware, Lackawanna & Western at Hoboken, N. J. Two years later he became a clerk in the office of the auditor of traffic of the New York, Lake Erie & Western, now the Erie, and he was then consecutively clerk in the office of the third vice-president and auditor of that road; general bookkeeper for the Chicago & Erie; chief clerk in the accounting department, assistant auditor, auditor and general auditor for the Erie. In January, 1904, he was made comptroller, which position he held until his recent appointment. He was also at the time of his appointment to the Illinois Central comptroller of the New York, Susquehanna & Western, the Bath & Hammondsport and the Buffalo Creek Railroad, with office at New York.

Operating Officers.

J. Fortin, acting superintendent of the Quebec Central, has been appointed superintendent, with office at Sherbrooke, Que.

J. T. Long has been appointed general manager of the Williamsville, Greenville & St. Louis, with office at Kansas City, Mo., succeeding C. D. Rogers, transferred.

Frank Hoffman has been appointed superintendent of the Raritan River, with office at South Amboy, N. J., succeeding Charles M. Bloom, acting superintendent, transferred.

L. L. Kensinger, acting superintendent of terminals of the Missouri Pacific-Iron Mountain system at St. Louis, Mo., has been appointed superintendent of terminals at St. Louis.

T. W. Rickard has been appointed an assistant superintendent on the Idaho division, Oregon Short Line, with office at Nampa, Idaho, succeeding J. P. Folger, granted leave of absence.

F. N. Reynolds has been appointed trainmaster on the Northern division of the Chicago Great Western, with office at St. Paul, Minn., succeeding E. H. Campbell, assigned to other duties.

W. H. Collins, general superintendent of the Fonda, Johnstown & Gloversville, has been appointed general manager, with office at Gloversville, N. Y., and his former position has been abolished.

D. W. Ryder, superintendent of the Kansas City Belt, has been appointed general superintendent of the Kansas City Terminal, with office at Kansas City, Mo. The Kansas City Belt is now owned and operated by the Kansas City Terminal.

W. H. Hall, assistant superintendent of telegraph of the Missouri, Kansas & Texas at Denison, Tex., has been appointed superintendent of telegraph, with office at Denison, succeeding S. K. Bullard, retired on account of ill health.

P. H. Houlahan, general manager of the Chicago & Alton and the Toledo, St. Louis & Western, with office at Chicago, has resigned. A. H. Westfall, general superintendent of the Southern Railway at Greensboro, N. C., has been appointed general superintendent of the Alton and the Clover Leaf, with office at Bloomington, Ill.

G. W. Vanderslice, superintendent of the Western division of the Chicago Great Western at Clarion, Iowa, has been appointed superintendent of the Northern division, with office at St. Paul, Minn., succeeding C. E. Dafoe, resigned. M. Dailey, superintendent of terminals at Oelwein, Iowa, succeeds Mr. Vanderslice, and P. B. Vermillion, trainmaster of the Southern division at St. Joseph, Mo., succeeds Mr. Dailey. F. R. Blunt succeeds Mr. Vermillion. W. G. Hunter, trainmaster at Des Moines, Iowa, has resigned.

H. W. Stanley, superintendent of transportation of the Seaboard Air Line, with office at Portsmouth, Va., has been appointed general superintendent of transportation, and his former position has been abolished. Mr. Stanley was born at Petersburg, Va., in February, 1874. He began railway work in 1890 as telegraph operator on the Norfolk & Western and later served as agent, towerman, roadway clerk and stenographer until December, 1895, when he left that company to become chief clerk to the superintendent of the Southern Railway at Knoxville, Tenn. In May, 1897, he went to the Seaboard Air Line as secretary to the general superintendent, since which time he has been consecutively chief clerk to general superintendent and general manager, trainmaster, superintendent, assistant general superintendent and superintendent of transportation, from which position he is now promoted.



H. W. Stanley.

J. C. McCullough, whose appointment as division superintendent on the Pennsylvania Lines West, with office at Cambridge, O., has been announced in these columns, was born in Ohio in 1865. He received a common school education and began railway work in September, 1881, on the Pittsburgh division of the Pennsylvnia Lines West at Dennison, O., as a machinist helper. He was later a fireman and then

engineman and for three years from April, 1898, was assistant road foreman of engines. He was then made trainmaster and road foreman of engines on the Marietta division and a year later was transferred to the Pittsburgh division as trainmaster, from which position he has just been promoted to superintendent of the Marietta division at Cambridge.

Traffic Officers.

A. L. Bishop has been appointed a commercial agent of the Pere Marquette, with office at Cleveland, Ohio.

C. W. Neihuss has been appointed general traffic manager of the El Dorado & Wesson, with office at Wesson, Ark.

W. S. Saunders has been appointed assistant general freight agent of the Virginian Railway, with office at Norfolk, Va.

W. S. Merchant has been appointed a traveling freight agent of the St. Louis & San Francisco lines, with office in New York.

J. G. Perin has been appointed a traveling passenger agent of the Wabash, with office at Mexico City, Mex., succeeding A. N. Magnon.

H. B. Shaw has been appointed traffic manager of the Licking River, with office at Cincinnati, Ohio, succeeding F. A. Brennan, resigned.

C. D. Rogers, general manager of the Williamsville, Greenville & St. Louis, has been appointed traffic manager, with office at Greenville, Mo.

H. Y. Williams, traveling passenger agent of the Atchison, Topeka & Santa Fe, with office at San Antonio, Tex., has resigned to go into other business.

V. C. Tompkins, commercial agent of the Seaboard Air Line, at Raleigh, N. C., has been appointed an assistant general freight agent, with office at Savannah, Ga.

Thomas Smith, in charge of the Liverpool office of the Canadian Pacific, has been appointed general freight agent, with office at London, England, succeeding H. D. Annable.

Edward P. Stanton has been appointed a traveling agent of the Chicago & North Western, with office at St. Louis, Mo., succeeding G. W. Boogher, resigned to go into other business.

W. M. Orr, commercial agent of the Queen & Crescent at Charlotte, N. C., has been placed in charge of the new Pacific coast agency of this company, with office at San Francisco, Cal.

The headquarters of C. C. Johnston, southwestern passenger agent of the Atlanta & West Point and the Western Railway of Alabama, have been changed from Waco, Tex., to Houston, Tex.

S. W. Meyers has been appointed a traveling freight and passenger agent of the Southern Pacific lines in Louisiana, with office at New Orleans, La., succeeding G. E. Guedry, transferred.

C. R. Coughlin has been appointed coal agent of the Southern Indiana and the Chicago Southern, with office at Chicago, succeeding J. E. Windsor, resigned to accept service elsewhere.

J. A. Brown has been appointed assistant general freight agent of the Trinity & Brazos Valley, with office at Houston, Tex., succeeding J. E. W. Fields, resigned to go with the Frisco lines.

John T. Richards, contracting freight agent of the Rock Island lines at Pittsburgh, Pa., has been appointed a traveling freight agent, succeeding J. M. Sweeney. C. S. Gerber succeeds Mr. Richards.

J. G. Carlisle, commercial agent of the Central of Georgia, at Macon, Ga., has been appointed a division freight agent, with office at Macon. D. F. Brady, traveling freight agent at Macon, succeeds Mr. Carlisle.

W. P. Postorious has been appointed a traveling freight agent of the Macon, Dublin & Savannah, with office at Jacksonville, Fla. R. W. Phillips, soliciting agent at Jacksonville, having resigned, that office is abolished.

F. H. Thompson, agent of the Ontario Central Despatch and Rutland Central Michigan line at Detroit, Mich., has been appointed industrial agent of the Michigan Central, with office at Detroit. W. D. McVey succeeds Mr. Thompson.

J. W. Kearns, traveling passenger agent of the Pere Marquette at London, Ont., has been appointed district passenger agent, with office at Detroit, Mich., succeeding H. W. Jameson, resigned to engage in other business. W. M. Hood succeeds Mr. Kearns.

R. R. Trimble has been appointed a commercial agent of the Missouri Pacific System, with office at Joplin, Mo., succeeding O. M. Odell, resigned to go into other business. F. C. Fletcher has been appointed general live stock agent, with office at Kansas City, Mo., succeeding James L. Harris, resigned.

Ernest E. Jones, contracting freight agent of the Chicago, St. Paul, Minneapolis & Omaha at Minneapolis, Minn., has been appointed a commercial agent, with office at Minneapolis, succeeding Frank W. Teasdale, resigned to go into other business. W. A. Jackson suceeds Mr. Jones, with office at Minneapolis.

A. D. Daniel, passenger agent of the Atlanta, Birmingham & Atlantic, at Birmingham, Ala., has been appointed a traveling passenger agent, with office at Atlanta, Ga., succeeding H. C. Hunt. J. N. Norris succeeds Mr. Daniel, with office at Birmingham, Ala., and H. J. Mead has been appointed a commercial agent, with office at Greensboro, N. C.

B. R. Brenan has been appointed general agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Springfield, Ohio. H. H. Squire, traveling freight agent at Cleveland, Ohio, has been appointed agent of the Central States Despatch fast freight line, with office at St. Louis, Mo., succeeding John C. Emig, appointed industrial agent of the Big Four at Cincinnati. H. B. Wood succeeds Mr. Squire.

W. F. Greaves, division freight agent of the Cleveland, Cincinnati, Chicago & St. Louis at Louisville, Ky., has been appointed commercial agent, with office at Dallas, Tex., succeeding S. E. Thomas, resigned. E. L. Roederer, general agent at St. Louis, Mo., succeeds Mr. Greaves. Joseph Rankin, commercial agent at Kansas City, Mo., has been appointed commercial agent at St. Louis. C. W. Smith, commercial agent at Toledo, Ohio, succeeds Mr. Rankin, and T. F. Hartnett succeeds Mr. Smith.

J. A. Hulen, commercial agent of the St. Louis & San Francisco at Houston, Tex., has been appointed general freight and passenger agent of the Trinity & Brazos Valley, with office at Houston, Tex., succeeding W. C. Connor, Jr., resigned to accept service elsewhere. S. J. Tucker, city passenger agent of the Chicago, Rock Island & Pacific and the Trinity & Brazos Valley at Dallas, Tex., has been appointed assistant general passenger agent of the latter road, with office at Houston.

C. B. Brownell has been appointed a general agent of the St. Louis, Iron Mountain & Southern, with office at Natchez, Miss. Dan Jacobs has been appointed assistant general freight and passenger agent, with office at Alexandria, La. George W. Housley has been appointed general agent in the freight and passenger departments, with office at Hot Springs, Ark. J. W. Hailey, commercial freight agent of the Missouri Pacific-Iron Mountain system at Alexandria, La., has been transferred to Lake Charles, La.

Samuel Moody, whose appointment as assistant passenger traffic manager of the Pennsylvania Lines West and of the Vandalia, with office at Pittsburgh, Pa., was announced in the *Railway Age Gazette* in its issue of February 25, page 433, was born August 24, 1853, at Brooklyn, N. Y. He received a common school education and began railway work in December, 1885, with the Pennsylvania Lines West as a traveling ticket seller on commission. In January, 1887, he was made district passenger agent at Pittsburgh, and six years later was appointed assistant general passenger agent at Cincinnati. He

was out of service on account of ill health from July, 1894, to January, 1895, when he became assistant general passenger agent at Pittsburgh. In May, 1904, he was appointed general passenger agent, and the next year his jurisdiction was extended over the Cleveland, Akron & Columbus, from which position he has recently been promoted.

C. W. Strain, assistant general passenger agent of the Colorado Southern, New Orleans & Pacific, and general passenger agent of the St. Louis & San Francisco lines in Texas at Beaumont, Tex., has resigned the former position and will hereafter give all his time to the Frisco lines. R. W. Terrell, general freight and passenger agent of the Beaumont, Sour Lake & Western, the Colorado Southern, New Orleans & Pacific and the Orange & Northwestern at Beaumont, Tex., has been appointed assistant general freight and passenger agent of the Frisco lines at New Orleans, La. C. C. Lewis, commercial agent of the Trinity & Brazos Valley at Houston, Tex., has been appointed commercial agent of the Frisco lines at Houston. C. R. Markland succeeds Mr. Lewis. The following appointments on the Frisco lines have also been announced: J. N. Steele, soliciting freight agent, and J. B. Gibson and H. H. Scott, traveling freight agents.

Walker C. Connor, Jr., whose appointment as traffic manager of the Frisco Lines east of Houston has been announced in these columns, was born June 14, 1874, at Dallas, Tex. He received his education at the A. & M. College and at St. Edward's College and began railway work in 1895 in the office of the auditor of the St. Louis & Southwestern at St. Louis, Mo. He was later in the local freight office of the St. Louis & San Francisco at St. Louis and in 1897 went to Dallas, Tex., as soliciting freight agent. The next year he was transferred to Houston, Tex., as commercial agent, where he remained for eight years, and he was made general freight and passenger agent of the Trinity & Brazos Valley at Ft. Worth, Tex., in 1906, from which position he has recently been promoted. Mr. Connor's headquarters will be at Beaumont, Tex., instead of at Houston, as previously announced.

C. D. Fortney, traveling freight agent of the Chicago & Alton and the Toledo, St. Louis & Western at Pittsburg, Pa., has been appointed a commercial agent of the Iowa Central and the Minneapolis & St. Louis, with office at Cleveland, O., succeeding A. L. Bishop, resigned to accept service elsewhere. C. F. Vigor, traveling freight agent of the Iowa Central and the Minneapolis & St. Louis at Cincinnati, O., succeeds Mr. Fortney. C. E. Harris succeeds Mr. Vigor. H. G. Thompson has been appointed a commercial agent of the Minneapolis & St. Louis and the Iowa Central, with office at Chicago, succeeding F. B. Townsend, assigned to other duties. J. W. Graham has been appointed chief of the tariff bureau of the four Hawley roads, with office at Chicago, succeeding F. S. Hollands, resigned to accept service elsewhere. Morell Law, commercial agent of the Minneapolis & St. Louis and the Iowa Central at Omaha, Neb., has had his jurisdiction extended over the Chicago & Alton and the Toledo, St. Louis & Western, with office at Omaha.

John M. Chesbrough, whose appointment as general passenger agent of the Pennsylvania Lines west of Pittsburgh, with office at Pittsburgh, Pa., was announced by the *Railway Age Gazette* in its issue of February 25, page 433, was born March 26, 1850, at Forestville, N. Y. He began railway work in July, 1865, as office boy and clerk in the office of the auditor of the Atlantic & Great Western, now a part of the Erie, at Meadville, Pa. Four years later he was made a clerk in the office of the auditor of the Erie at New York and he was then consecutively clerk in the passenger department of the Union Pacific at Omaha, Neb., and later chief clerk; rate and division clerk with the St. Louis, Kansas City & Northern, now a part of the Wabash, at St. Louis, and then chief clerk; assistant general passenger agent of the Vandalia at St. Louis, general passenger agent of the Baltimore & Ohio Southwestern at St. Louis and at Cincinnati, northeastern passenger agent of the Queen & Crescent Route at Detroit, Mich., and again assistant general passenger agent of the Vandalia at St. Louis. In 1905 he was made general passenger agent of the Vandalia at St. Louis, from which position he has recently been promoted.

Engineering and Rolling Stock Officers.

S. J. Hungerford has been appointed superintendent of rolling stock of the Canadian Northern, with office at Winnipeg, Man.

J. W. Lowery has been appointed master mechanic of the Tombigbee Valley, with office at Calvert, Ala., succeeding P. P. Brooks.

L. O. Jackson has been appointed mechanical superintendent of the Beaumont & Great Northern, with office at Onalaska, Tex.

John Nash has been appointed a district foreman of the Oregon Short Line, with office at Kemmerer, Wyo., succeeding A. R. Lambert, resigned.

H. C. Stevens has been appointed master mechanic of the Fourth division of the Denver & Rio Grande, with office at Alamosa, Colo., succeeding J. H. Farmer, transferred.

H. E. Bertelot has been appointed supervisor of Division No. 26 on the Philadelphia division of the Pennsylvania Railroad, with office at Columbia, Pa., succeeding J. O. Heap, promoted.

J. Farquhar, roadmaster of the Quebec Central at Sherbrooke, Que., has been appointed general roadmaster and superintendent of bridges and buildings, with office at Sherbrooke.

G. H. Herrold, engineer maintenance-of-way on the Eastern division of the Chicago Great Western at Chicago, has been transferred to the Northern division, with office at St. Paul, Minn., succeeding M. A. Zook, transferred. C. G. Delo, engineer maintenance-of-way on the National Railways of Mexico at Mexico City, succeeds Mr. Herrold.

Special Officers.

D. E. Willard, formerly professor of geology at the state agricultural college of North Dakota, has been appointed development agent of the Northern Pacific, with headquarters at St. Paul, Minn. This is a new position, created to gather information about the country tributary to the railway and to furnish information to the land, freight, passenger and immigration departments.

OBITUARY.

H. H. Purcell, general freight agent of the American Refrigerator Transit Co., with office at St. Louis, Mo., died in St. Louis on March 4.

W. S. Wood, assistant superintendent of telegraph of the Chicago, Rock Island & Pacific, with office at Chicago, died in Chicago on March 3.

C. L. Gilpatrick, assistant superintendent of the Boston & Maine's Terminal division, died on February 28 at Somerville, Mass., at the age of 54 years.

S. B. Grimshaw, formerly superintendent of telegraph of the Denver & Rio Grande and later connected with the Santa Fe Central at Santa Fe, N. Mex., died at Santa Fe on February 27.

George W. Hunt, a railway builder and organizer of the Northwest, died in Portland, Ore., on February 26. Mr. Hunt was prominently identified with the development of the Corvallis & Eastern, and branches of the Northern Pacific in Eastern Washington, which comprised what was formerly known as the Hunt system, and was interested in other railway projects in that section.

Richard Henry Duesberry, formerly purchasing agent of the Mobile & Ohio, with office at Mobile, Ala., died in St. Louis, Mo., on March 5. Mr. Duesberry was born January 7, 1842, at Richmond, Va., and received his education at Burress Academy. He began railway work in 1865, from which year to 1882 he was purchasing agent of the Richmond & Danville, now a part of the Southern Railway. He was then for five years engaged in the railway supply business in Richmond, and was appointed purchasing agent of the Mobile & Ohio in 1887, from which position he retired in May, 1909, on account of ill health.

Railway Construction.

New Incorporations, Surveys, Etc.

Alabama, Tennessee & Northern.—A contract is said to have been given to M. N. Sykes, Panola, Ala., to build an extension southward for about 25 miles.

Aransas Terminal.—Organized in Texas to build a terminal railway to connect Aransas Pass, Tex., with the proposed deepwater harbor near that place. The incorporators include: E. A. Burton, A. J. Bell, San Antonio; J. J. Welder, Victoria; J. F. Green, Gregory; D. F. Picton, Rockport; R. P. Clark, Galveston; F. L. Alvord and T P. Boyd, Fort Worth.

Artesian Belt.—Grading has been resumed, it is said, on the extension south of Macdona, towards the Rio Grande. The road is now in operation on the first 43 miles from Macdona south to Christine. (Aug. 20, p. 339.)

Augusta, Lincolnton & Northern.—Organized in Georgia, with $1,000,000 capital, to build from Augusta, Ga., northwest via Lincolnton and Tignall to Danielsville, in Madison county, about 80 miles. S. L. Wilkes and J. C. Groves, Lincolnton, are interested.

Baltimore & Ohio.—A contract is said to have been given to Robert Grace & Co., Cleveland, Ohio, for grading new yards at Chicago Junction, Ohio, and work is to be started at once. The improvements will cost about $1,500,000. About 500 men are to be put to work on the new reservoir, which is to form part of the improvements. (Feb. 18, p. 379.)

Bartlett-Florence.—An officer writes that track has been laid on 12 miles and grading finished on 23 miles on the line under construction from Lampasas, Tex., southeast via Bartlett to Milano, with a branch from a point on the main line near the eastern end southeast to Rockdale, in all, 84 miles. The Bowers Construction Co., Bartlett, are the contractors. (March 4, p. 460.)

Beaumont & Great Northern.—This company is said to have amended its charter, authorizing it to extend its line from Trinity, Tex., northwest to Jewett, about 60 miles, where connection is to be made with the International and Great Northern. The work is to be started at once.

Brownwood Southwestern.—Incorporated in Texas, with $30,000 capital, to build from Brownwood, Tex., southwest through Brown and Coleman counties, to the north bank of the Colorado river, 30 miles. The incorporators include: R. A. Love, Kansas City, Mo.; B. Smith, D. F. Johnson, Brownwood; J. C. Kerbey, A. J. Filers and F. M. Covert, Austin, Tex.

Canadian Northern.—Negotiations are pending between the British Columbia government and the Canadian Northern. In consideration of the Provincial government guaranteeing the bonds of the company to the extent of $35,000 a mile, the railway will build 80 miles of line on Vancouver island within four years. The lines are to be built from English Bluff, near Vancouver, B. C., to connect with the Canadian Northern lines at the eastern boundary of the province, and from Victoria to a point on Barkley sound.

Canadian Northern Quebec.—The St. Jacques branch of the Montreal section has been extended from St. Jacques, Que., west four miles to Rawdon junction.

Carlton & Coast.—Incorporated in Oregon, with $500,000 capital and principal office in Carlton, Ore., to build from Carlton northwest via Fairdale to Tillamook bay, about 45 miles. The incorporators include: W. D. Dennis, F. Russell and S. B. Linthicum.

Cherryvale, Oklahoma & Southwestern.—Financial arrangements have been made for building this line from Caney, Kan., south through Oklahoma and Texas to the Gulf of Mexico, and work is to be started at once. An extension is eventually to be built from Caney, north to Kansas City. S. M. Porter, of Caney and Independence, Kan., is the principal promoter. (Jan. 7, p. 68.)

Chesapeake & Ohio.—According to press reports work is to be started at once on the double-track improvements between Cincinnati, Ohio, and tidewater at Newport News, Va. Most of the $5,000,000 appropriated will be spent for double-tracking work on the Cincinnati division. (Feb. 25, p. 428.)

Chicago, Rock Island & Pacific.—According to press reports contracts have been let and work is to be started as soon as the weather will permit, putting in 100-lb. rail on about 150 miles of the line between Chicago, Ill., and Moline.

Chicago, Weatherford & Brazos Valley.—The Mitchell & Pigg Construction Co., it is said, will build 30 miles of line for this company, from Weatherford, Tex., north to Bridgeport. Residents of Weatherford are said to have subscribed $60,000 towards the project. Col. R. E. Bell and J. W. Hicks, Weatherford, may be addressed. (May 21, p. 1099.)

Cleveland, Cincinnati, Chicago & St. Louis.—According to press reports this company has received bids for building the branch from Mt. Carmel, Ill., south to Evansville, Ind., about 43 miles. The line is surveyed and most of the right-of-way has been secured. (Feb. 25, p. 433.)

Coleman, Llano & Southern.—Financial arrangements are said to have been made and right-of-way secured from Coleman, Tex., south to Brady, 45 miles. H. N. Beakley, H. R. Starkweather and R. A. Love, are directors. (Jan. 28, p. 209.)

Craig Mountain.—According to press reports, this company has finished the line from Craig Junction, Idaho, which is four miles west of Vollmer, south to Winchester, 5.5 miles. The A. E. Grant Co., Spokane, Wash., were the contractors. J. E. Fleming, chief engineer, Lewiston. (Oct. 8, p. 660.)

Eastern Oklahoma Traction.—Incorporated in Oklahoma with $100,000 capital and headquarters at Muskogee, Okla. The plans call for an electric line from Muskogee, northwest to Tulsa, 48 miles, with branches as follows: Muskogee north to Wagoner, nine miles, thence to Verdigris river, an additional 10 miles; Tulsa, southwest to Sapulpa, 14 miles; Muskogee, southeast to Webbers Falls, 23 miles; Muskogee, southwest to Checota, 21 miles; Muskogee, west to Okmulgee, 39 miles, thence to Oklahoma City, an additional 87 miles; in all, 251 miles. It is estimated that it will cost $26,000 a mile to build the line. The directors include: H. B. Spaulding, R. N. Eggleston, J. W. Mattox, L. R. Kershaw and G. Bowman, all of Muskogee. An auxiliary company, to be known as the Railway Construction Co., has also been incorporated, with $50,000 capital and headquarters at Muskogee. R. N. Eggleston, W. R. Robison, L. R. Kershaw and J. B. Furry, Muskogee, and W. P. Keegan, Tulsa.

Enid, Ochiltree & Western.—An officer writes that the company has amended its charter, authorizing it to build an additional 55 miles from Ochiltree, Tex., east to the Oklahoma state line. The route has not been definitely decided upon and a further extension is contemplated, with Enid, Okla., as the eastern terminus. A contract has been given to the Panhandle Construction Co., New York, represented by Fred L. Brant, manager and assistant treasurer, at Dalhart, Tex. Work is now under way from Ochiltree, west via Hansford, thence southwest via Jarvis and Parksdale to Dumas, thence northwest to Dalhart, 111 miles. Connection tracks with the Fort Worth & Denver City and the Rock Island, at Dalhart, have been finished and track is laid on about four miles of the main line. The work is not difficult. Maximum grades 0.50 per cent. and maximum curvature three degrees. At Dalhart and at Ochiltree the company will put up shops, roundhouses and general office buildings. (March 4, p. 460.)

Florida Railway.—An officer writes that contracts have been let to the Florida Construction & Realty Co., Jacksonville, Fla., for an extension from Live Oak, Fla., east to Jacksonville, and then north to Fernandina, about 100 miles. There will be four steel bridges, also some docks, shops and station buildings.

Georgia, Florida & Alabama.—A contract is said to have been given to J. H. Hening, Birmingham, Ala., to build the extension from Kimbrough, Ga., north to Richland, 26 miles. (Dec. 24, p. 1269.)

Great Northern.—The Sixth district of the Cascade division has been extended from Cloverdale, B. C., south to Hazelmere, five miles.

Idaho Central.—See Oregon Short Line.

Idaho Northern Railroad.—Train service has been extended on this road from Murray, Idaho, east to Monarch, 4.4 miles.

Illinois Oil & Coal Belt.—Incorporated in Illinois, with $1,000,000 capital, to build from Terre Haute, Ind., southwest via Robinson, Ill., Olney, Fairfield and McLeansboro to Cairo, about 200 miles. The incorporators include: J. R. Campbell and I. H. Webb, McLeansboro; C. C. Boggs, Fairfield; A. Knoph, Olney, and J. B. Crowley, Robinson.

Isothermal Traction Co.—An officer writes that this company was organized in North Carolina, to build an electric line from Rutherfordton, N. C., east to Gastonia, 50 miles. K. S. Finch, president, Rutherfordton.

Kansas City, Mexico & Orient.—An officer writes that a grading contract has been let to Roach & Stansell, Memphis, Tenn., for building 45 miles of line south of San Angelo, Tex., on the San Angelo-Del Rio branch. Maximum grades will be 1.0 per cent. and maximum curvature 4 degs. (Feb. 25, p. 429.)

Knoxville, Sevierville & Eastern.—See Tennessee Central.

Laramie, Hahns Peak & Pacific.—This road has been extended from Albany, Wyo., south to Foxpark, 14 miles.

Little Rock, Maumelle & Western.—This road has been extended from Douglas, Ark., northwest to Maumelle, five miles.

Mexican Pacific.—According to press reports Judge G. W. Bartch, Salt Lake City, Utah, associated with New York capitalists, recently incorporated this company in Delaware, to build from Salina Cruz, Oaxaca, Mex., northwest to Manzanillo, about 700 miles. Joseph Castlelot, vice-president, Mexico City. (See Mexican Roads, Sept. 10, p. 478.)

Mexican Roads.—According to press reports from Mexico City, Mex., a concession has been granted by the Federal government to William P. Wood to build a connecting line of about 650 miles between Mexico City and Merida, Yucatan. From Santa Lucrecia, in the state of Vera Cruz, the line will pass through the states of Chiapas, Tabasco, Campeche and Yucatan. Northern and eastern capitalists, it is said, are interested in the project and work is to be started at once.

Middle Georgia Interurban.—This company has asked permission to issue bonds to secure funds for an electric line from Griffin, Ga., east to Jackson, thence northeast to Social Circle, about 70 miles. Some grading has already been finished between Jackson and Indian Springs. L. W. Roberts, president, Atlanta.

Minneapolis, St. Paul & Sault St. Marie.—An officer writes that this company is not making surveys for a branch from Thief River falls, Minn., southwest to Grand Forks, N. D., about 45 miles. (March 4, p. 461.)

Montana Rapid Transit.—According to press reports right-of-way has been secured and grading is two-thirds finished on a line between Helena, Mont., and Butte, about 55 miles. Residents of Helena are said to be back of the project.

Montreal Underground & Elevated (Electric).—According to press reports from Montreal, Que., application has been made to the Quebec Legislature for permission to build elevated and underground railways, tunnels, etc., through the city and the island of Montreal. The company will have an office in Montreal. C. W. MacLean, Fulford place, Brockville, Ont., will probably be president. Howard R. Richey, 209 Board of Trade building, Montreal, is working out details in connection with the organization of the company.

Niagara, St. Catharines & Toronto.—The Railway Commission of Canada has approved the route for an extension of this road from Welland, Ont., south to Port Colborne, on Lake Erie, thence east to Bridgeburg, about 30 miles. Construction work is already under way between Welland and Port Colborne, and as soon as weather conditions permit work will be started on the section from Port Colborne to Bridgeburg, on the Niagara river. (Nov. 26, p. 1037.)

Northern Electric.—See Vallejo & Northern (Electric).

Northwestern Railroad.—See Oregon Short Line.

Oklahoma & North Texas.—Surveys are said to be made for this line, projected from Durant, Okla., southeast to Paris, Tex., 65 miles. D. A. and L. S. Powers, Durant, are interested. (Dec. 3, p. 110)

Oregon Short Line.—An officer writes that the Idaho Central was recently incorporated to build from Owinza, Idaho, on the Oregon Short Line, east of Shoshone, in a general northwesterly direction via the Camas Prairie country and Boise, to a connection with the main line of the Oregon Short Line at Payette. Surveys were started recently. (See Central Idaho, Feb. 25, p. 428.)

The most important branch line now under construction by this company is the Northwestern Railroad, building from Huntington, Ore., north along the Snake river towards Lewiston, Idaho. Connection is to be made at Lewiston with the Oregon Railroad & Navigation Co. (March 19, p. 656.)

Paris & Southern.—Incorporated in Idaho with $100,000 capital and headquarters at Harrison, Idaho. The plans call for building a line from Harrison to Bell creek, thence to the head of that stream, and then south to the Chicago, Milwaukee & Puget Sound. P. H. Wall, M. K. Wall and A. A. Crane are interested.

Pecos Valley Southern.—A grading contract is said to have been given to Tom Brigance, Fort Worth, Tex., and work is to be started at once on this line. The projected route is from Pecos, southwest to the Davis mountains, about 60 miles. It is expected to have the line finished as far as Balmorhea, in the Toyah valley, 36 miles, by June. (Feb. 14, p. 281.)

Philadelphia & Reading.—An officer writes that a contract has been given to the McNichol Paving & Construction Co., Philadelphia, Pa., for building third and fourth track between Valley Forge, Pa., and Perkiomen junction.

Pittsburgh & Lake Erie.—This company will establish classification yards at McKees Rocks, Pa.

St. Louis & San Francisco.—Grading and track laying are now under way on an extension from Brady, Tex., southwest to Menardville, about 30 miles. It is said that work will be started soon on an extension from Brady to San Antonio, about 150 miles. (Oct. 8, p. 662.)

St. Louis, Kennett & Southeastern.—This road is now open for freight and passenger traffic from Kennett, Mo., northwest to Piggott, Ark., 19 miles.

Shawnee Electric.—An officer writes that the projected route is from Shawnee, Okla., northwest via Dale, McLoud, Harrah, Choctaw City and Spencer to Oklahoma City, about 50 miles. The Shawnee Railway Construction Co. are the general contractors. A grading contract has been given to the Davis Construction Co. Maximum grades will be 1.5 per cent. and maximum curvature 3 degs. There will be two steel bridges over the Canadian river. C. F. Edwards, president, and A. Hardgrave, chief engineer, Shawnee.

Tennessee Central.—Surveys have been made for an extension of this road from Harriman, Tenn., south, and then east via Kingston to Knoxville, about 45 miles. It is said that the company has options on most of the right-of-way. From Knoxville a further extension is eventually to be built via Sevierville, through North Carolina to the Atlantic seacoast. The Knoxville, Sevierville & Eastern, which is to have a 30-mile line between Knoxville and Sevierville, may form part of the through line. (Sept. 17, p. 521.)

Texas Central.—An officer writes that this company is locating a branch from De Leon, Tex., westerly through Sipe Springs and Rising Star to Cross Plains, about 40 miles. The rails, ties, bridges and other material to build this branch have been arranged for. A grading contract for 28 miles has been let to Garner Brothers, and the work is to be started at once. Maximum grades will be 1 per cent. and maximum curvature 4 degs. There will be a 100-ft. steel bridge and several plate girders. Since last fall the company has been making preliminary surveys from the present northwest terminus at Rotan, in Fisher county, Tex., west. It is the intention of the company to build about 100 miles in the near

future, and the work will be started as soon as the permanent location is decided upon. Col. C. H. Sharman, chief engineer, Rotan. (Dec. 10, p. 1168.)

Texas North & South.—Incorporated in Texas, with $360,000 capital, to build from Seymour, Tex., southeast via Coleman, Tex., to San Antonio, about 360 miles. The incorporators include: W. A. Coulson, L. E. Collins, W. H. Stephens, J. E. Bogg-Smith, J. C. Dibrell and D. A. Paddleford, all of Coleman.

Texas Roads.—The Business Club, of Stiles, Tex., is negotiating with residents of Big Spring, Garden City and Ozona, to secure funds to build a line through these towns, about 120 miles.

Tioga & Southeastern.—This road has been opened for freight traffic from Tioga, La., northwest to Viola, 15 miles.

Tucumcari, Portales & Gulf.—The citizens of Pyote, Tex., and surrounding county have completed negotiations with the Tucumcari, Portales & Gulf for the immediate construction of the first section of 25 miles of that road from Pyote to Duval, in Winkler county, and contractors' bids for this work will be received by M. J. Healy, president and general manager, Pyote, Tex. This projected route is from Tucumcari, N. Mex., southeast through the counties of Quay and Roosevelt, in New Mexico, and Bailey, Cochran, Yoakum, Gaines, Andrews and Winkler in Texas to Pyote, and from there to Del Rio.

Vallejo & Northern (Electric).—Incorporated in California to build from Vallejo, Cal., northeast to Woodland, thence southeast to Sacramento, about 70 miles. It is said the line will be built this year, and will form part of the Northern Electric. T. T. C. Gregory is acting president.

Western Allegheny.—An officer writes that the company is building with its own forces an extension from the present terminus at Newcastle, Pa., southwesterly to West Pittsburgh, 3.75 miles. About one mile of track remains yet to be laid to complete the improvements. (March 4, p. 461.)

Western Maryland.—Contracts for the branch from Cumberland, Md., northwest to a connection with the Pittsburgh & Lake Erie at New Haven, Pa., about 83 miles, have not yet been let. The new line will be single-track and will be graded with a view of eventually making it a double-track line. Construction will be commenced as soon as the necessary details now being worked out can be arranged, and it is expected to have the line finished and in operation within 18 months or two years. The construction work will be heavy and will include several long tunnels. (March 4, p. 461.)

Wichita Falls & Northwestern.—The Wichita Falls & Wellington is said to have been incorporated in Texas, with office at Wichita Falls, Tex., to build a line from Frederick, Okla., west to Wellington, Tex., about 100 miles. The incorporators include: J. A. Kemp, F. Kell, M. M. Murray, T. R. Orth and R. E. Huff, all of Wichita Falls. (Feb. 25, p. 433.)

Wichita Falls & Wellington.—See Wichita Falls & Northwestern.

Wichita, Kinsley, Scott City & Denver Air Line.—A contract is said to have been given to T. Lutguerding and work is to be started May 1 on this line, both east and west, from Turon, Kan. The projected route is from Wichita, west via the towns of St. Mark, Ost, Pretty Prairie, Sego, Laredo, Turon and Fellsburg. W. F. Brown, president, Turon, and R. E. Edwards, treasurer, Kinsley. (See Kinsley, Scott City and Denver Air Line, Dec. 3, p. 1170.)

Illustrating the increase in working expenses on the German railways it appears that from 1907 to 1908 these expenses increased from 71.7 to 72.32 per cent. of the gross earnings on the Bavarian, from 68.35 to 74.06 on the Saxon, from 72.65 to 85.92 per cent. on the Baden State Railways. This was chiefly due to a general increase in the pay of employees, which continue dalso in 1909. The increase in wages alone will make the expenditures of all the German State Railways, taken together, some $24,000,000 more in 1910 than in 1907. Any further increase is considered as for the present impossible, and great efforts are made to effect savings by simplifying methods, etc.

Railway Financial News.

Baltimore & Ohio.—The company has sold to Kuhn, Loeb & Co. and Speyer & Co., both of New York, $10,000,000 one-year notes, and it is understood that the bankers have disposed of these notes at prices yielding approximately 4⅜ per cent.

Boston & Maine.—This company has asked the Massachusetts Railroad Commission for authority to buy $1,663,400 Worcester, Nashua & Rochester stock, held by the Mutual Life Insurance Co., New York. The total outstanding stock of the Rochester road amounts to $3,099,800. The property of the company is leased to the Boston & Maine.

Canadian Northern.—Press despatches from Winnipeg say that the Mackenzie-Mann interests, controlling the Canadian Northern, have bought the Vancouver island coal lands, known as the Wellington collieries, for $11,000,000.

Chicago City Railway.—A quarterly dividend of 2½ per cent. has been declared, payable March 30, on the $18,000,000 stock, and it is announced that this stock is now on a regular 10 per cent. annual basis.

Chicago, Rock Island & Pacific.—Speyer & Co., New York, are offering at 96, to yield about 4¾ per cent., the present issue of $11,000,000 Rock Island, Arkansas & Louisiana first mortgage 4½ per cent. bonds of March 1, 1910-1934, which they recently bought from the railway company. The bonds are guaranteed unconditionally principal and interest by the Chicago, Rock Island & Pacific Railway (the old company), which now operates the line under lease. A letter from the chairman of the executive committee of the C., R. I. & P. says in part:

"The Rock Island, Arkansas & Louisiana was organized in 1905 and is now operated under lease by the Chicago, Rock Island & Pacific Railway Co., which owns the entire capital stock, except directors' shares, and will unconditionally guarantee both principal and interest of the above bonds. The road constitutes a through connection from the Memphis-New Mexico line (Choctaw, Oklahoma & Gulf) of the C., R. I. & P. to the New Orleans-Houston line of the Colorado Southern, New Orleans & Pacific (owned by St. Louis & San Francisco), thus affording the Rock Island lines a route to both New Orleans and to Houston and Galveston. The line traverses the timber belt of Arkansas and Louisiana, and is of standard construction, with low grades; adjacent to it are timber lands estimated to contain 7,000,000,000 feet of pine and 2,500,000,000 feet of hardwood timber, with a large number of mills creating profitable tonnage. The land is capable of growing cotton and other staple crops, fruits, vegetables, etc.

A quarterly dividend of 1¼ per cent., payable April 1, has been declared. The previous quarterly dividends have been 1½ per cent. The following statement has been given out by the company:

"The dividend was made 1¼ per cent. instead of 1½ per cent., the rate declared at this time last year, because it was intended only to cover interest requirements of the Chicago, Rock Island & Pacific Railroad Co. By the retirement in February of the bonds for which St. Louis & San Francisco common stock was pledged as collateral, the interest requirements were cut down somewhat, so that the 1¼ per cent. declared to-day will be sufficient to meet them. The dividend, except the proportion paid to scattered stockholders, will be applied to interest on the 4 per cent. bonds of the Railroad company due in May, and the interest on its $7,500,000 debentures authorized in connection with the retirement of the other issue already mentioned.

Cincinnati, Hamilton & Dayton.—The company has arranged to spend about $8,000,000 on improvements during 1910. Of this amount part will be provided by the sale of $5,000,000 first and refunding 4 per cent. bonds guaranteed by the Baltimore & Ohio.

Cleveland Railway.—The receivers having been discharged and the debts of the Municipal Traction Co. having been provided for, the Cleveland Railway Co. on March 1 will

resume possession of the street railway lines of Cleveland under the ordinance of December, 1909. The company has been given authority by the city council to issue 10 per cent. ($1,467,500) additional stock to provide for improvements. The new stock is to be offered pro rata to stockholders.

Delaware & Eastern.—The receivers, A. M. Moreland and W. P. Trowbridge, have been continued by the United States circuit court and have been authorized to issue $30,000 6 per cent. receivers' certificates. In the petition for the appointment of receivers it is said that the road has heretofore been operated at a loss of $25,000 a year, and that the interest on the bonds has not been paid. The receivers say that since they have taken charge of the property it has paid expenses.

Detroit, Toledo & Ironton.—Newman Erb has bought the Ann Arbor notes, said to be about $500,000, heretofore represented by T. H. West on the noteholders' committee. Mr. West is to retire from the committee and his place is to be taken by a nominee of Mr. Erb.

Kansas City Belt.—A deed has been filed transferring all of the property of this company to the Kansas City Terminal Railway. See that company.

Kansas City, Mexico & Orient.—The Texas Railroad Commission has authorized the company to sell $1,295,000 bonds in addition to the $2,883,000 bonds already issued on the completed line in Texas. This line runs from Red River to San Angelo, 239 miles, and the commission's engineer has placed a value of $4,414,471 on it.

Kansas City Terminal Railway.—J. P. Morgan & Co., New York; Lee, Higginson & Co., Boston, and the Illinois Trust & Savings Bank, Chicago, are offering at 97¾ $12,500,000 first mortgage 4 per cent. bonds of the Kansas City Terminal, guaranteed principal and interest unconditionally by the Atchison, Topeka & Santa Fe; Chicago & Alton; Chicago, Burlington & Quincy; Chicago, Milwaukee & St. Paul; Chicago, Rock Island & Pacific; Missouri, Kansas & Texas; Missouri Pacific; St. Louis & San Francisco; Union Pacific and the Wabash. Each of the railway companies is to pay one-tenth of the principal and interest when due, and if any company fails to meet its obligation, the other companies must make up all deficiencies ratably. The Kansas City Terminal Railway was incorporated in 1906 to own and operate a unit passenger station and freight and passenger terminals in Kansas City. All its capital stock is held in the interest of the ten railways that guarantee its bonds. The total authorized issue of these bonds is $50,000,000, of which $15,000,000, including the $12,500,000 now offered, are issuable against the property already owned, consisting of the Kansas City Belt Railway and the real estate for the union station and terminals; $2,500,000 bonds are reserved to retire first mortgage bonds of the Belt railway, due July 1, 1916; the remaining $32,500,000 bonds are reserved for construction and additions. The existing and contemplated improvements include:

1. A union passenger station, centrally located, between Wyandotte and Main streets and Twenty-first and Twenty-fourth streets, covering about 51 acres, to contain at the outset 18 parallel tracks with space for six more, a total of 24 tracks, capable of accommodating 48 trains simultaneously. The estimated cost of the station building, exclusive of land and tracks, is $5,700,000.

2. A six-track line about 6.61 miles in length through the heart of the city from east to west, on the site of the present Belt railway. This line will afford an entrance to the union passenger station in both directions.

3. A four-track line about 2.36 miles in length extending from a junction with the westerly end of the above six-track line to a junction with the main line of the Chicago, Burlington & Quincy at the Missouri river.

4. A four-track line about 6.25 miles in length along the northerly side of the city, extending from the easterly end of the above six-track line to a junction with the four-track line described in item 3.

5. Two double-track lines extending from the westerly end of the above six-track line, about 6.72 miles through Kansas City, Kan., reaching the stock yards, packing houses and other industries, and connecting with various railways to the west.

Lake Shore & Michigan Southern.—The directors have declared an extra dividend of 6 per cent. on the $49,466,500 stock, of which $45,289,200 is owned by the New York Central & Hudson River. The dividend is payable March 30. Presumably this extra dividend is to be paid from sums received as extra dividends from subsidiary companies. In February the Pittsburgh & Lake Erie declared an extra dividend of 40 per cent.; on March 1 the Mahoning Coal Railroad paid an extra dividend of 50 per cent., and the Chicago & St. Louis paid its first dividend of 3 per cent. on the common stock in February. These payments brought in $3,615,210 to the Lake Shore, and the extra 6 per cent. dividend calls for the payment of $2,967,990.

Manufacturers' Railroad.—The stock of this company has been increased from $5,000 to $5,000,000.

Minneapolis, St. Paul & Sault Ste. Marie.—This company has bought from the Cuyuna Range Iron Co. the Cuyuna Range Railroad in northern Minnesota, 36 miles.

Missouri Pacific.—Cornelius Vanderbilt has been elected a director, succeeding H. B. Henson.

New York Central & Hudson River.—The directors have declared a quarterly dividend of 1½ per cent., placing the stock on a 6 per cent. basis, an increase of 1 per cent. per annum. In 1908 the dividend was reduced from 6 per cent. to 5 per cent. per annum.

See Lake Shore & Michigan Southern.

Norfolk & Western.—It is reported that the company will soon issue bonds, possibly $15,000,000 in amount, to provide for new construction and extensions.

Public Service Investment.—Stone & Webster, Boston, Mass., are offering $500,000 of an authorized issue of $1,500,000 6 per cent. cumulative prefered stock at 98½, yielding about 6.10 per cent. The property of the company consists of stock of electric railway companies under the management of Stone & Webster.

St. Louis, Brownsville & Mexico.—The entire issue of first mortgage 5 per cent. bonds of 1904-November 1, 1910, have been called for redemption on May 2 at par. There were $3,000,000 of these bonds outstanding recently. The stockholders are to vote on March 10 on the question of authorizing a mortgage to secure $25,000,000 bonds for construction, completion and improvement of the road and payment of outstanding debts and canceling outstanding stock.

St. Louis, Iron Mountain & Southern.—Kingdon Gould has been elected a director, succeeding Alexander Cochran.

Third Avenue (New York).—The property of this company has been sold under foreclosure of the first consolidated mortgage for $26,000,000 to John M. Bowers, representing the reorganization committee.

Twenty-eighth and Twenty-ninth Street Crosstown (New York).—The sale of this property at foreclosure is to take place on March 23. The upset price is $50,000.

Washington, Baltimore & Annapolis.—The time for payment of the interest coupons due March 1 on the $1,703,000 guaranteed Baltimore Terminal 5 per cent. bonds has been extended by the United States circuit court for 90 days.

Western Maryland.—Press despatches from Baltimore say that the sale of the $26,000,000 stock which the Maryland legislature approved is to be underwritten by a syndicate headed by Blair & Co. and the Equitable Trust Co., both of New York.

Worcester, Nashua & Rochester.—See Boston & Maine.

By a decree of October 28, 1909, the "South American Railway Construction Co. (Limited)" has been authorized to operate in Brazil. The company has for its objects the construction and administration of railways and public works of all kinds. This is an English company, capitalized at £100,000 ($500,000.)

Supply Trade Section.

The Griffin Wheel Co., Chicago, has bought 17 acres of land in Salt Lake City, Utah, and contemplates building a new plant at that place.

A. S. Henry has been elected a vice-president and Scott R. Hayes has been appointed general sales agent of the Railway Steel-Spring Co., New York.

Harold A. Hegeman has been appointed a salesman in the railway department of the U. S. Metal & Manufacturing Co., New York, succeeding John Wolfe, resigned.

At a meeting of the directors of MacArthur Brothers Co., New York, held on February 15, David Sloan was appointed consulting engineer and W. G. Sloan chief engineer.

H. F. Wardwell, formerly of the Hicks Locomotive & Car Works, Chicago, has resigned to become chief clerk to H. G. Hetzler, president of the Chicago & Western Indiana Ry.

F. O. Bailey, who has been connected with the Hicks Locomotive & Car Works, Chicago, for several months, has been made sales manager of that company, with office in the Fisher building, Chicago.

Owing to the increased demand for second-hand contractors equipment, the Barron & Cole Company, New York, have opened a special department to handle this line. Geo. E. Ray, formerly of the Russell Contracting Co., New York, has been made manager of the new department.

The Robins Conveying Belt Co., New York, announces that the removal of its executive offices, sales, engineering and purchasing departments to the Park Row building, 13 Park Row, New York, will be completed by March 12. The branch office at 30 Church street will be discontinued.

W. A. Peddle, formerly assistant signal engineer of the New York Central & Hudson River and the Boston & Albany, has been appointed signal engineer of the Hall Signal Co., New York. He will have charge of the estimating and circuit department and the construction work east of Buffalo, N. Y., and Pittsburgh, Pa.

Lewis L. Clarke, president of the American Exchange National Bank, has been elected a director in the American Locomotive Company, to succeed his father, the late Dumont Clarke. C. B. Denny, formerly treasurer, has been elected secretary and treasurer. J. O. Hobby, assistant treasurer, has been elected assistant secretary and treasurer.

Richard C. Oliphant, president of the Trenton Malleable Iron Company, died at his home in Trenton, N. J., on March 4. He was born in Uniontown, Pa., in 1852. His family has been identified with the iron industry for many years, his grandfather having established the first hot blast furnace in this country. He is survived by his wife and two sons, Ross Gould and Donald Creigh Oliphant.

The A. P. Witteman Company, of Philadelphia, with works at Chester, Pa., has taken over the equipment of the Portsmouth Forge Company, Portsmouth, N. H. They will remove such of the equipment as they may be able to use at the Chester plant and will offer the remainder for sale. To accommodate the additional equipment plans are being prepared for a new forge shop and an addition to the machine shop at Chester.

The first annual report of the president of the Southern Iron & Steel Co. shows that approximately 20,000 tons of pig iron are being produced a month. In April, 1909, this company acquired the properties of the Southern Steel Co., the Chattanooga Iron & Coal Co., the Lacey-Buek Iron Co. and the Georgia Steel Co. The work of reorganization and rehabilitation has been pushed and in addition a new mill is being constructed at Alabama City, which will have a capacity of 350 tons of wire products and 100 tons of miscellaneous finished products per day.

The Union Switch & Signal Company has declared regular quarterly dividends of 3 per cent. on the common and preferred stocks, payable April 9 to stock of record March 31. At the annual meeting this week George Westinghouse, president of the company, said that since the beginning of this year business had considerably improved, the earnings for January alone exceeding the amount of the first quarter's dividend. Vice-President Prout said that for the first six months of 1909 the company ran just even, earnings being about the same as expenses, and the earnings shown in the statement were the profits made from the business of the six months beginning with July. There are now over $2,000,000 of unfinished orders in the shops.

M. M. and M. C. B. Conventions.

Leonard J. Hibbard, member of the entertainment committee of the Railway Supply Manufacturers' Association, having charge of the matter of providing for the annual game of baseball in connection with this year's conventions of the two mechanical associations, has appointed Frank Martin, Jenkins Bros., 71 John street, New York, captain of the eastern team, and J. D. Ristine, Union Draft Gear Company, Monadnock block, Chicago, captain of the western team. The plan is that the two teams shall be made up of both railway men and supply men; and, as Mr. Hibbard puts it, "it will be no burlesque, but a game for blood." Those who would like to join in the game should address either Mr. Martin, Mr. Ristine or Mr. Hibbard. Mr. Hibbard's address is The Crescent Athletic Club, Brooklyn, N. Y.

TRADE PUBLICATIONS.

Scaffolding and Ladder Equipment.—The advantages of all-steel adjustable scaffolding and all-steel step ladders are considered in a pamphlet issued by H. B. Fuller, St. Paul, Minn.

Copper-Clad Steel Wire.—The standard specifications for hard drawn copper-clad steel wire and for copper-clad steel bond wires are contained in a booklet published by the Duplex Metals Company, New York.

Rubber Belt Conveyors.—Booklet No. 35, from the Jeffrey Manufacturing Co., Columbus, Ohio, illustrates a number of applications of rubber belt conveyors and presents detail information as to the various parts of such equipment.

Symons Crushers.—The T. L. Smith Co., Chicago, has issued a catalogue describing the Symons crushers, revolving screens, chain and belt elevators and quarry cars. Both general and detailed illustrations of the machinery are included.

Car Heating.—The perfected Thermo jet system of car heating is illustrated and described in a new section of The Safety Car Heating & Lighting Company's (New York) loose-leaf catalogue. This system combines in one an air system below 212 degs., a vapor system at 212 degs. and a pressure system above 212 degs.

Construction Methods.—A booklet from the Ernst Wiener Company, New York, contains a reprint from *Concrete Engineering*, describing the construction methods employed in building a concrete dam across the Connecticut river at Bellows Falls, Vt. An industrial railway was used to advantage in connection with this work.

Jacks.—A 48-page booklet has been published by Fairbanks, Morse & Co. which describes and illustrates the following types of jacks: Forged steel hydraulic, track, ball-bearing screw, roller bearing, automobile and lowering, car and journal, geared ratchet lever and telescopic. This catalogue is for free distribution to interested parties.

Chain Belt Concrete Mixer.—The Chain Belt Co., Milwaukee, Wis., is distributing a booklet containing photographs, descriptions and testimonials to call attention to its chain belt mixers and concrete handling machinery. The 23 full-page illustrations cover the various types of mixers, views of actual

installations, and detail views of the working parts of the machines.

Smith Mixers.—The T. L. Smith Co., Old Colony building, Chicago, has issued a 35-page catalogue describing all the types of Smith mixers, the Smith side-gate concrete car and the Smith concrete elevators. There are 13 full-page illustrations, showing mixers and handling machinery in use, and line drawings of mixers and elevators with tables of dimensions and power required for use in planning installations of concrete mixing plants.

Chicago, Burlington & Quincy.—The Land Seekers' Information Bureau of the Burlington Route has issued a folder on the free government lands in Nebraska, Wyoming, Colorado, Montana and South Dakota. A large map of the territory is included, and the information given relates to the dry farming methods in use in that region. The company has also distributed a folder giving answers to questions about government land, letters from satisfied settlers and a list of the company's land publications.

The Iron and Steel Department Store.—A handsomely engraved and printed pamphlet, under the above title, has been received from Joseph T. Ryerson & Son, Chicago. The illustrations show different parts of the new general offices and warehouses, which cover 750,000 square feet of floor space and afford storage and handling facilities for 150,000 tons of material. With such facilities it is possible to make practically immediate shipment on receipt of orders. The stock includes structural steel, sheet steel, plates and bars, boiler tubes, rivets and machinery and specialties.

Power Transmission Machinery.—A 270-page, cloth-bound, catalogue from the Jones & Laughlin Steel Company, Pittsburgh, Pa., describes and gives complete information concerning the power transmission machinery manufactured by it. This includes cold-rolled steel shafting, couplings, hangers, pulleys, fly-wheels, etc. The book contains a considerable amount of engineering information, including tables showing the horse-power transmitted by single, double, triple and four-ply belts; also tables giving the transmitting efficiency of steel shafting under various conditions.

Steel Culverts.—Several pamphlets have been received from the Canton Culvert Company, Canton, Ohio. A general catalogue, M-11, describes the "Acme" corrugated metal culverts (nestable). These are constructed of No-Co-Ro metal, which is not subject to corrosion. A special railway brochure, R-11, illustrates and describes applications of these culverts of special interest to steam and electric railways. A booklet, C-11, tells of the advantages of No-Co-Ro metal and gives data of tests demonstrating its value for resisting rust and corrosion. A small folder contains excerpts from a bulletin on "The Preservation of Iron and Steel," issued by the U. S. Department of Agriculture.

Albany, Ashland, Cottage Grove and Sheridan are four towns in Oregon possessing remarkable attractions for fruit growers, sheep raisers and other farmers, and each has issued a very handsome colored pamphlet describing its fields, soils, forests and natural advantages, and also its people. "Homeseekers" may not be very numerous among the readers of the *Railway Age Gazette*, but we print this notice in recognition of the tasteful design of the pamphlets and the skill with which they have been prepared. One cannot help protesting, however, as is often necessary in reading the advertising pages of the monthly magazines, that the great American advertising expert goes too far; he is easily able to prove more than is required. By long experience he has acquired such deftness in praising things that constantly he is applying more superlatives than the subject justifies. The skilful editor and the artist of unlimited resources have in these pages made farming actually beautiful. We are cold hearted enough to believe that there is still a good deal of hard work about it, even where Nature is most lavish, hence our displeasure at being hypnotized by the advertising expert. The railway industrial promoter who has visited these local promoting agencies and has put them up to it, modestly keeps his own personality in the background. The pamphlets are full of halftone photographic cuts, each picture a work of art, and the easterner who does not have his ambition aroused by these vivid presentations of the prosperity which is ready to fall into one's lap in the great Northwest must be dull indeed. To a person unacquainted with the map of Oregon a single criticism suggests itself—the map furnished with each pamphlet should be at the beginning instead of at the tail end. Then the reader would feel as though he knew what he was reading about.

RAILWAY STRUCTURES.

BOSTON.—See an item in general news.

DALHART, TEX.—See Enid, Ochiltree & Western.

DE LEON, TEX.—See Texas Central under Railway Construction.

EL ORO, TEX.—The Kansas City, Mexico & Orient has filed an application to buy 240 acres of school land near its crossing of the Rio Grande river. The land is to be used for terminals as the new town of El Oro will be made a district terminal.

GREENVILLE, PA.—According to press reports the Bessemer & Lake Erie will spend about $200,000 putting up new buildings in Greenville during 1910 and installing new machinery.

HILLYARD, WASH.—The Great Northern will spend $500,000, it is said, enlarging its shops at Hillyard.

LEBANON, PA.—An officer of the Philadelphia & Reading writes that the company is installing a new manual interlocking machine at the Cornwall Railroad crossing, but is not carrying out any other work at Lebanon. (March 4, p. 464.)

LIVE OAK, FLA.—See Florida Railway under Railway Construction.

MCKEES ROCKS, PA.—See Pittsburgh & Lake Erie under Railway Construction.

MADISON, WIS.—Negotiations are pending between the Chicago, Milwaukee & St. Paul, the Illinois Central and the city officials for the elimination of a grade crossing in Madison and building an undergrade crossing.

OCHILTREE, TEX.—See Enid, Ochiltree & Western.

OKLAHOMA CITY, OKLA.—According to press reports work has been started by the Selden-Breck Co., contractors, St. Louis, Mo., on a new terminal building in Oklahoma City for the Oklahoma Railway Co. It is expected that the work will be finished by December, 1910. (Oct. 8, p. 666.)

PHILADELPHIA, PA.—An officer of the Philadelphia & Reading writes that work is now under way by the James McGraw Co., contractors, rebuilding an office building in Philadelphia, which was recently destroyed by fire.

PLATTEVILLE, WIS.—The Chicago & North Western is said to be making plans for putting up a new station at Platteville, to cost $25,000.

SEDALIA, MO.—An officer of the Missouri, Kansas & Texas writes that plans are now being made for improvements to shop buildings in Sedalia. This includes building an extension of about 75 ft. to the old building, which is now 60 ft. x 200 ft.; putting in a new boiler and power plant and making other improvements. (March 4, p. 464.)

SHREVEPORT, LA.—A contract is said to have been given to Casey & Miller for building the joint passenger terminals for the Louisiana & Arkansas and the St. Louis Southwestern. The new station building is to be of brick and cost between $40,000 and $50,000.

UNO PARK, ONT.—Contracts have been given by the Temiskaming & Northern Ontario to the Hamilton Bridge Works for the material and erecting a number of steel bridges over the Wabie river, to include four 35-ft. spans, two 45-ft., two 55-ft. and one 125-ft. The greatest height of any of the bridges will be 45 ft.

WICHITA, KAN.—The Kansas City, Mexico & Orient has let the contract to Westinghouse, Church, Kerr & Co., New York, for the new shops mentioned in the *Railway Age Gazette* of August, 27, 1909. The total cost is estimated at $400,000. An erecting shop, car shop, planing mill, power house, store house and roundhouse are included in the plans.

Late News.

The items in this column were received after the classified departments were closed.

The roadway of the Southern Pacific in Nevada, which was damaged by floods, is being repaired rapidly, and it is expected that the line will be in operation by March 13.

Walter F. Schleiter, secretary of Dilworth, Porter & Co., Pittsburg, and president of the Railroad Supply Company of United States, has been appointed delegate to represent the United States at the International Railway Congress.

Car ferry No. 1, of the Ann Arbor Railroad, was burned to the water's edge at the Northwestern slip, Manitowoc, Wis., March 8, with a full load of cars. The vessel was just about to leave for Frankfort when the fire was discovered. The loss is estimated at $200,000.

The Pennsylvania Railroad is soon to offer for sale a large number of its wooden passenger cars. The first consignment which is to be disposed of consists of 140 coaches, 13 dining cars, 5 cafe cars, 39 postal cars, 1 baggage car, 22 combined passenger and baggage cars and 4 baggage and mail cars.

The movement of loaded cars on the New York Central Lines during February totaled 1,586,328 car loads, which is an increase of 230,166 loads over the same period of last year. The movement exceeds that of February, 1908, by 383,820 loads, that of February, 1907, by 162,746 loads, and that of 1906 by 116,927 loads.

The Louisville & Nashville has taken over the twenty-five miles of railway built in Cullman county, Alabama, by the Cullman Coal & Coke Company. This road is a portion of a big colonization scheme which involves the bringing of a large number of German families to Cullman county, where Germans are already in abundance.

The Pennsylvania Railroad has placed orders with the New York Shipbuilding Company for two 250-ft. standard steel car floats. Orders have also been placed with William Cramp & Sons for four 145-ft. standard steel car floats. The New York, Philadelphia & Norfolk Railroad has placed an order with the New York Shipbuilding Company for one steel harbor barge.

H. E. Hutchens, general superintendent of the Western district of the Southern at Birmingham, Ala., has been appointed general superintendent of the Northern district, with office at Greensboro, N. C., succeeding A. H. Westfall, resigned to go to another company. W. R. Hudson, superintendent of the Birmingham division, at Birmingham, succeeds Mr. Hutchens, with office at Birmingham.

Contracts are to be let in May by the Sterling & Northern, to build an electric line from Sterling, Ill., north through Emerson, Coleta, Milledgeville, Hit, Brookville, Haldane, Forreston, Baileyville and Dunbar to Freeport, about 50 miles. There will be a 150-ft. steel span, a 75-ft. concrete arch and a 500-ft. trestle, also a number of smaller concrete arches. William Usborne, chief engineer, Sterling.

A second writ of habeas corpus has been issued by Judge Rogers for William N. Cott, treasurer of the Hocking Valley, already out on one writ. The second writ was issued because Cott refused to answer questions and produce for inspection the books of the Hocking Valley in the suit of Prosecutor Crosser, of Perry county, against the company. Cott, who insists the books are out of his control, will have a hearing on March 18.

The House Committee on Interstate and Foreign Commerce, after a lively executive session discussing Townsend administration railway bill, adopted a motion to make the Interstate Commerce Commission instead of the proposed court of commerce the tribunal to receive and pass on applications of railways desiring to acquire other roads. This, of course, refers to roads that are not included under the general prohibition of the bill as in the competitive class.

Charges that the Southern Railway and the Illinois Central exact unjust and discriminatory rates on coal have been made to the Interstate Commerce Commission by the Alabama Coal Operators' Association. The complaint alleges that the coal operators in the Alabama field have lost a large volume of business in Georgia, South Carolina and Florida, since by reason of the small differentials allowed they are unable to compete with the operators in the coal creek field of Tennessee.

J. P. Morgan & Company, New York, have bought the $11,000,000 first mortgage 4 per cent. bonds of the Jamestown, Franklin & Clearfield, the issuance of which was authorized by the New York Up-State Public Service Commission some weeks ago, simultaneously with the authorization of $15,000,000 Lake Shore & Michigan Southern debentures. Some $8,000,000 of the bonds, which are guaranteed principal and interest by the Lake Shore & Michigan Southern, have thus far been placed on approximately a 4.20 per cent. basis. The balance is being offered publicly at 95 and interest.

Preparations are being made by the Bessemer & Lake Erie for the biggest season in the road's history. All the company cars loaned to other roads during the winter are being recalled to be ready for the spring rush. All employees who have been given leave of absence have been ordered to report for duty and some twenty firemen who have passed the necessary examinations for promotion to the right side of the cab have been given engines. New equipment is being added and an order has been placed for early delivery of 15 passenger coaches to be put in the excursion business.

Firemen and enginemen on about fifty railways throughout the West have voted to strike unless additional concessions in wages and working conditions are granted. More than 86 per cent. of the union employees were opposed to accepting the offering of the railway managers committee and more than 89 per cent. of the non-union employees also voted against it. Nevertheless conferences between the managers committee and a committee representing the men will be resumed. Although the strike has been authorized, it is said, the men are willing to submit their grievances to arbitration.

In Philadelphia, where the street railway employees have been on strike 20 days, about 1,100 cars were running on March 9, compared with 1,076 the day before. The company is receiving more men every day, many arriving from Reading, Washington and other cities. Between 300 and 400 strike-breakers from St. Louis passed through Columbus, Ohio, on Wednesday, bound for Philadelphia to take the places of the striking street car men in that city. At the meeting of the state federation of labor at New Castle, a resolution was passed endorsing a state-wide strike, if further arbitration is refused by the Philadelphia Rapid Transit Company.

The New York Up-State Public Service Commission has denied the application of the New York Central & Hudson River for an extension of one year on the order requiring the operation of oil-burning locomotives in the Adirondack forest preserves. The commission, however, has amended its order, which required the complete installation of oil-burning locomotives on April 15, as follows: Two oil-burning locomotives are to be placed in service April 15, three on May 1, ten on June 1, ten on July 1 and the remainder by August 1. The order is also amended so that coal-burning locomotives used at night are permitted to be used through to destination if the trains to which they have been attached are not more than two hours late.

Governor Fort, of New Jersey, has sent to the legislature a special message relative to revaluation of railway property, accompanied by a report of the special commission. The commission has expended the $50,000 appropriated a year ago, and the work is only partly done. In the case of floating equipment of the Pennsylvania Railroad, the assessed revaluation by the commission is $4,331,000, as against a valuation fixed by the company of $2,669,000. In the case of certain second class railway property, the commission shows a revaluation of $874,000, as against $185,000 reported by the State Board of Assessors. The Governor estimates the entire cost of revaluation at from $150,000 to $200,000, and says that this work should be funded and the needed appropriation made.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, Burlington & Quincy is asking prices on 25 six-wheel switching engines.

The Western Maryland has ordered six consolidation and two Mallet locomotives from the Baldwin Locomotive Works.

The Virginian, reported in the *Railway Age Gazette* of February 18 as being in the market for eight Mallet, 11 Mikado and one switching locomotive, has ordered this equipment from the Baldwin Locomotive Works.

The Missouri, Kansas & Texas, reported in an unconfirmed item in the *Railway Age Gazette* of January 14 as being in the market for 91 locomotives, is said to have placed an order for 40 locomotives. This item is not confirmed.

The Colorado & Southern, as reported in the *Railway Age Gazette* of February 25, is in the market for five consolidation, five switch and five Pacific locomotives, and will also order for the Fort Worth & Denver City five Pacifics and two switch engines.

The Hocking Valley locomotives, mentioned in the *Railway Age Gazette* of February 25 as having been ordered from the American Locomotive Co., are for delivery in June and July:

General Dimensions.

Weight on drivers	210,000 lbs.
Total weight	240,000 "
Cylinders	23 in. x 30 in.
Diameter of drivers	57 in.
Type of boiler	Radial stayed. E. W. T.
Working steam pressure	205 lbs.
Heating surface, tubes	3,328 sq. ft.
" " firebox	202 "
" " total	3,520 "
Tubes, number	412
" outside diameter	2 in.
" length	15 ft. 6 in.
Firebox, type	Wide
" length	108⅛ in.
" width	73¼ "
" material and maker	Steel, Otis Steel Co.
Grate area	55 sq. ft.
Water capacity	7,500 gals.
Coal capacity	16 tons

Special Equipment.

Axles	Otis Steel Co.
Bell ringer	Golmar
Boiler lagging	85 per cent. Magnesia, sectional
Brakes	Westinghouse E. T. equipment
Brake-beam	Simplex Railway Appliance Co.
Brake-shoes	Am. Brake-Shoe & Foundry Co.
Couplers	Buckeye Steel Castings Co.
Driving boxes	Cast steel, with Franklin Railway Supply Co.'s lubricators
Headlight	Dressel Railway Lamp Works.
Injector	Ohio Injector Co.
Piston and valve rod packings	U. S. Metallic Co.
Safety valve	Consolidated Safety Valve Co.
Sanding devices	Hanlon Loco. Sander Co.
Sight-feed lubricators	Ohio Injector Co
Springs	Railway Steel-Spring Co. on drivers
Staying	Brown & Co., Sligo Iron & Steel Co.
Steam gages	Crosby Steam Gage & Valve Co.
Tires	Railway Steel Spring Co.
Tubes	Detroit Seamless Steel Tubes Co.
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The Mineral Range has ordered 100 ore cars from the American Car & Foundry Co.

The Missouri Pacific has ordered 100 fifty-ton gondolas from the American Car & Foundry Co.

The Mexican Railways are asking prices, through the Barney & Smith Car Co., for 10 coaches.

The Maryland & Pennsylvania is said to be in the market for 20 box cars. This item is not confirmed.

The Cincinnati Abattoir Co., Cincinnati, Ohio, has ordered 75 refrigerator cars from the American Car & Foundry Co.

The Baltimore & Ohio is said to be in the market for 12 steel postal and 28 steel baggage cars. This item is not confirmed.

The Pittsburgh Railways Co., electric, is reported in the market for 100 motor and 50 trailer cars. This report is unconfirmed.

The Duluth, Missabe & Northern is placing 350 steel underframes under old box cars. The work is being done in company shops.

The Southern Railway is reported as being in the market for 10 combination baggage and passenger cars. This item is not confirmed.

The New York Central is about to build 1,000 forty-ft., 40-ton box cars at the East Rochester shops of the Merchants Despatch Transportation Company.

The Mather Horse & Stock Car Co. has ordered from the Haskell & Barker Car Co. the 250 automobile cars mentioned in the *Railway Age Gazette* of December 17.

The Grand Trunk is taking prices on 1,000 thirty-ton box, 500 forty-ton box, 500 thirty-ton furniture and 500 thirty-ton automobile cars. All these cars are to be equipped with steel underframes.

The Denver, Northwestern & Pacific has ordered from the Pullman Co., 275 fifty-ton coal, 150 thirty-ton box, 50 thirty-ton stock, 25 forty-ton flat, six 30-ton refrigerator and 12 caboose cars.

E. R. & R. G. Hutchins, Great Northern building, Chicago, advise that they will buy in the near future several center dump or convertible ballast cars of standard specification for the Booth-Kelly Lumber Co.

The Harriman Lines are said to be asking prices on 1,500 box, 1,000 automobile, 1,000 flat, 1,000 stock, 800 gondola, 150 hopper and 55 caboose cars in addition to 205 passenger equipment cars. This item is not confirmed.

The Chesapeake & Ohio, reported in the *Railway Age Gazette* of January 28 as being in the market for 1,500 freight cars, has ordered 600 steel twin-hopper gondolas from the Pennsylvania Equipment Co. of Philadelphia.

The Colorado & Southern is in the market for 500 dump gondolas, 300 box, 250 dump stock, 125 narrow gage box, 50 narrow gage stock, 50 narrow gage coal, 15 caboose and one dining car, and will order for the Fort Worth & Denver City 200 stock, eight passenger and four baggage cars.

The Chicago, Rock Island & Pacific advises that the division of the 775 freight cars for which it is in the market is as follows: 250 refrigerator, 500 automobile and 25 caboose cars. Current reports that passenger equipment has been ordered from the Pullman Co. are premature. This order is still under consideration and no contracts have been made.

The Western Maryland, as reported in the *Railway Age Gazette* of March 4, has ordered 500 fifty-ton steel hopper cars from the Cambria Steel Co. and 400 forty-ton gondola cars from the Standard Steel Car Co. The hopper cars will be 30 ft. 5 in. long and 9 ft. 6 in. wide, inside measurements, and 32 ft. 3 in. long, 10 ft. ⅜ in. wide and 10 ft. 8 in. high, over all. The gondola cars, having four doors, will be 41 ft. long, 8 ft. 11 in. wide and 3 ft. 4¼ in. high, inside measurements, and 43 ft. long, 9 ft. 11 in. wide and 7 ft. 8 in. high, over all. The bodies will be of wood and the underframes of steel.

The St. Louis, Brownsville & Mexico, as reported in the *Railway Age Gazette* of March 4, has ordered from the American Car & Foundry Co. four 70-ft. steel underframe coaches, three 60-ft. steel underframe combination passenger and mail cars, two 60-ft. steel underframe baggage cars, to be built at the St. Charles, Mo., works. The coaches will be equipped with electric light. The American Car & Foundry Co. is also building six cabooses for this company at its Jeffersonville, Ind., plant. The recent order for Hart convertible cars was for 50 instead of 40, as stated in the issue of January 28. An order will probably be placed by the St. Louis, Brownsville & Mexico in the near future for 100 steel underframe box cars.

MACHINERY AND TOOLS.

The Chicago & North Western is in the market for 47 machine tools, a list of which has recently been issued to the dealers.

The Baltimore & Ohio has ordered from Joseph T. Ryerson

& Sons, Chicago, two double-end punch and shear machines, one No. 3 Lennox bevel shear, and one Ryerson flue welder.

The Chippewa Valley Railway, Light & Power Co., Eau Claire, Wis., has ordered, from the Allis-Chalmers Co., Milwaukee, Wis., a complete hydraulic equipment for its power plant, consisting of one 3,600-h.p. generator unit with complete hydraulic governor and a 170-h.p. exciter unit. The ultimate capacity of the plant will require four generator units and two exciter units.

IRON AND STEEL.

The Great Northern is in the market for 2,000 tons of bridge steel.

The Atlantic Coast Line has received bids on 2,500 tons of bridge steel.

The Cincinnati, Hamilton & Dayton has received bids on 2,500 tons of bridge steel.

The Delaware, Lackawanna & Western is in the market for 45,000 pairs of angle bars.

The Cleveland, Cincinnati, Chicago & St. Louis has taken bids on 600 tons of bridge steel.

The Stone & Webster Engineering Corporation is in the market for 700 tons of girder rails.

The Chicago Terminal Transfer has ordered from the Chicago Bridge & Iron Co. 1,000 tons of structural steel for track elevation work.

The Chicago, Burlington & Quincy has ordered 225 tons of steel for track elevation work from the McClintic-Marshall Construction Co.

The Chicago, Milwaukee & St. Paul has ordered, from the Wisconsin Bridge & Iron Co., 170 tons of structural steel for track elevation work.

The Merchants Despatch Transportation Co. has ordered, from the Lackawanna Steel Co., 15,000 tons of shapes and plates for steel car underframes.

General Conditions in Steel.—A number of orders for bridges have been released by the railways, and while most of them are small the total tonnage is fairly large. The Pittsburgh mills report that they are running at full capacity. The demand for rails is said to be stronger than at any time during the year and many of the railways are expected to enter the market for rails and track supplies in the near future.

Reinforced Waterproofing Felt.

For most waterproofing or damp-proofing work five plies of first quality tarred felt and coal tar pitch will be sufficient, as far as the strength is concerned. This material is not satisfactory where the waterproofing work is stopped and the laps and joinings are left exposed while other work is being carried on; there is danger of the laps being torn off or damaged, in which case it is difficult and often impossible to make proper connections.

For work of this nature the Barrett Manufacturing Company, New York, has devised a reinforced waterproofing felt known as Tartex. It is made of Barrett felt reinforced by a strong, closely woven cotton drilling. The coal tar pitch unites as closely with this as it does with the felt, thus forming a tough, pliable waterproofing material.

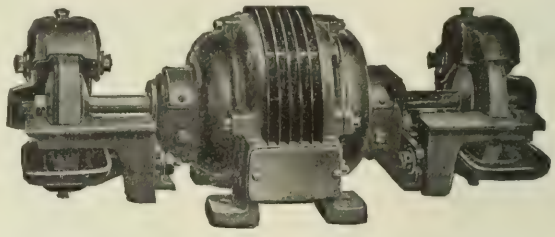
Dearborn Drug & Chemical Works Removal.

On May first the Dearborn Drug & Chemical Works, Chicago, will move their general offices and chemical laboratories from the Postal Telegraph building, where they have been located since the organization of the company more than 20 years ago, to the new McCormick building, on Michigan avenue and Van Buren street. The extensive growth of the business of the company has made necessary this removal, and the general offices and laboratories will occupy the greater portion of the top floor of one of the finest office buildings in Chicago. The Dearborn company will have the entire frontage on Michigan avenue for its offices and laboratories, with a total floor space of more than 5,000 sq. ft.

The company extends a cordial invitation to old and new friends to visit it at its new headquarters. From no place in Chicago can a better view be had of the city and Lake Michigan, or more valuable information be obtained pertaining to the successful treatment of boiler feed waters. The Dearborn company is to be congratulated upon the prominence it has justly attained in the business world, as manufacturers and marketers of water treating preparations of unusual merit.

Alternating Current Grinding and Buffing Equipments.

The General Electric Company's new and improved types of alternating current buffing and grinding equipments are designed for use in wood working, machine and repair shops, foundries, etc., where alternating current is available. These devices find a ready application for dressing small castings, accomplishing the work much more quickly and giving a finer finish than can be obtained with a machine tool, chipping hammer or chisel. The grinding equipment consists of an alternating-current motor with substantial supports and fitted

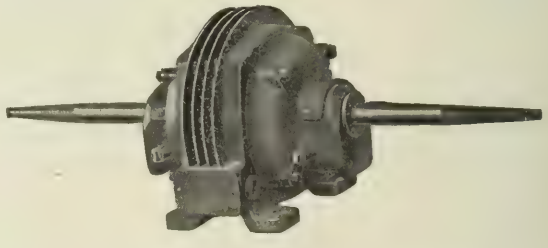


Alternating Current Grinding Equipment.

with a tool rest and a water attachment; these accessories are rigidly clamped to the bearing brackets in such a manner as to permit ready removal when desired. Each end of the extended shaft is fitted with two steel flanges, two leather washers and one nut for clamping the emery wheel securely in position. The motors are rendered splash and dust-proof by totally enclosing them; the shafts, bearings, attachments and all working parts are made extra strong and durable to withstand hard and constant usage.

The installation of a General Electric grinding equipment where it is readily accessible to the shop force enables the men to keep their tools sharp, thereby saving time, greatly increasing the output and improving the quality of the finished product. As sharp tools require much less power to operate than dull ones, the cost of power may be sensibly diminished. Workmen using dull tools are apt to become careless and eventually turn out inferior work.

The buffing equipment is self-contained, compact and rugged and provides a very effective polishing device. These devices



Alternating Current Buffing Equipment.

are similar in construction to the grinding outfits, with the exception that the tool and water attachments are omitted. The shaft is also longer, each end being tapered and threaded for buffs. The bearing brackets are circular and so designed that they may be turned through 90 degs. to admit of side-wall installation, thus allowing relocation of the device at will. The following equipments may be supplied for operation on single, two or three-phase, 110-220 volt circuits: Single-phase, ⅜, 1, 2 and 3 h.p.; polyphase, ⅜, 1, 2, 3, 5 and 7½ h.p.

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The subjects presented for discussion before the meeting of the western section of the Railway Signal Association at Chicago this year are in contrast to those of a year ago. At that time the uniform plan of signaling as devised by Committee No. 1 was put on trial, as it were, at the bar of the association. That the result was disastrous to the scheme as presented, is a matter of history, but the benefits of such an open discussion of subjects of vital importance to the signaling profession and to the association seem to have been overlooked; for this, the first experiment of the kind, has not since been repeated. Instead, details of various specifications (subjects of endless wrangling) and papers on various signaling and related subjects have since formed the topics for debate. Perhaps the meat of the reason for this state of affairs can be found in the remark of one prominent signal engineer, who said, in substance, that the result of the debate at Chicago in 1909 was the worst thing that could have happened to the association and the profession in general. His reason for this opinion was that the discussion had opened the eyes of the general managers to the fact that the signal engineers of the country were not unanimously in favor of the scheme of signaling proposed, or even nearly so. But this critic overlooked the fact that the object of the association is to seek for, and, if possible, find and publish abroad the best system of signaling, using the word in the broadest sense, that it is possible to devise. A committee is merely an instrument of convenience to further this object and it may very easily happen, as was demonstrated last year in Chicago and this year by the rejection of the report of Committee No. 1 by letter ballot, that the committee membership can be so constituted as not to represent in the ideas and ideals of its members, the ideas and ideals of the whole profession. It seems eminently desirable that the operating department should be more strongly represented on this committee.

A decided sign of health in the Signal Association was shown when the scheme of "neighborhood" meetings for committees was brought out during the morning in connection with the reports of the sub-committees of Committee No. 3. In brief, the plan is to have present at committee meetings as many persons interested as possible from the country adjacent to the place of meeting. The object is to bring out for the use and guidance of the committee the ideas of as many persons as possible. So far this plan has not been generally applied, it being in an experimental stage; but the enthusiastic approval by the people concerned and by the officers of the association, indicates that it will be extended. Mr. Stevens was particularly enthusiastic; he has ordered any of his staff who may be committee members to attend any meeting of his committee when he will not be absent on account of it for more than 36 hours. He has also encouraged all his men to attend as non-members all the meetings possible. The rapid extension of this "neighborhood" scheme will do much to mitigate the feeling which has of late been spreading, that the less discussion there was of committee reports, the better. No such plan, however, can replace in its salutary results the discussion of important committee reports in open meeting of the association.

The morning session of the Signal Association was taken up mainly with reports of committees. The association broke away somewhat from the schedule by discussing at some length the report of sub-committee No. 1 of Committee No. 1 on Standards. This discussion came near to involving the uniform scheme of signaling, but was headed off before any damage could be done. As at the meeting a year ago, there was a marked difference of opinion between the East and the West. Mr. Stevens (Santa Fe), as champion of the opposition, objected strongly to shelving the upper left-hand quadrant, and later to the use of a third arm on interlocking signals. One of the most significant points brought out by the discussion was the fact that a particularly strong committeeman had voted for the adoption of the standards submitted to Committee No. 1 because the majority of the members had done so. It is only too true that the same reason actuates many other members, both in committee and before the association. To many people the fact that a certain thing is endorsed by the majority, or by several prominent members, is an all sufficient reason for their support. In this way a bare majority of one in a sub-committee may influence the action of the whole association. Yet the difficulty with which a busy signal engineer is confronted, in finding time to give association affairs serious thought, is obvious.

The Manual of Recommended Practice of the American Railway Engineering and Maintenance of Way Association bids fair to become the standard guide of American railway engineers. If it is so to be such a guide, great care should be taken in its preparation, and it should be determined at once just what it is to be. For the most part, it is a manual of practice, but it is also in some small degree a sort of text book. For the most part, committees discuss questions of practice in the bodies of their reports and confine their recommendations as to material for the Manual to statements of practice, basing the recommended practice on the facts brought out in the discussion. But some of the committees include statements of facts either proven or to be proven in those paragraphs that are presented for inclusion in the Manual. Sometimes these statements of facts are

paragraphs by themselves, and sometimes they are included with paragraphs stating recommended practice. It is not altogether clear whether this method of presenting matter for the Manual is intentional or is the result of the high pressure under which engineers work. If it is intentional and the association approves of it, then the Manual will become more than a manual of recommended practice; it will become a text book of railway engineering. In this case the practice should be uniform among the committees and the reason for the practice recommended should be included with the statement of the practice. If it is the result of oversight on the part of the committee preparing the report and the association receiving and adopting it, then the result of calling attention to the matter should be elimination of statements of fact—or arguments— and a very careful editing of the material that goes into the Manual. Which is it to be, a text book or a manual of recommended practice?

THE WORK OF THE ASSOCIATION.

It was at the third convention of the American Railway Engineering and Maintenance of Way Association that one of the members present recollects his sitting beside a well-known editor, and noting and remarking the slowness, the unpreparedness, which characterized the opening of the business of the first day. There was clearly a lack of experience in that particular line of work, convention business. The same member during the tenth convention in 1909 was then very strongly impressed with the effectiveness of the members on the floor, in speaking clearly, concisely, directly to the point. Few bodies of a similar sort, engineering, educational or otherwise, are equally successful. The key to the situation lies, doubtless, in the fact that the railway engineer, or other officer, is perforce trained to present his case to the busy general manager in few words and directly to the point. The habit thus acquired is in evidence in the convention; clearness and brevity prevail. Other points of interest appear if one compares, or contrasts, some of the earlier and later tendencies as manifested in the meetings. At first much time was spent in discussions of phraseology and definitions; much of this is now delegated to the editor, with better results and with economy of the valuable time of the convention. In the earlier meetings there was a far more critical spirit and somewhat of distrust of the opinions and the reports of committees. At the last convention a conspicuous feature was the support given by the convention to the reports of its committees. This was due in part, no doubt, to a higher plane, generally, in the work of committees, but it also involved a change of attitude among the members, an acquired respect for the reports, and a strong trend toward constructive rather than destructive action. In fact, it seemed at times that one could distinguish between speakers who had been regular attendants, and others who were at this meeting for the first time, by the absence or the presence of the destructive attitude of criticism. Several years ago, when a new committee was appointed, one of its prospective members was warned by a colleague on the old committee that "we are lying in wait for your first report to make it lively for you." The early days were marked by a touch of this spirit. Now the convention is disposed to line up against the man with the brick in his hand and ready to throw it.

In his first address President Wallace said, among other things: "Membership is intended to include two elements—the technical and the practical—and it is intended that the technical engineer and the practical railroad man will be of mutual benefit, that the technical man will become more practical, and the practical man more technical, through the interchange of ideas and information which this association is designed to foster." The spirit thus defined is characteristic of the association, although, in fact, few of the members could be relegated to either class. Most of them are well qualified in practical experience and in theory also. This spirit has had the effect of really enlisting in the society's interest the activities both of men in editorial work on railroad publications, and of professors in engineering colleges; and both classes have rendered excellent service in committee work and otherwise. A liberal policy in this direction seems to have been wise. While most of these men may be regarded as representing the theoretical side, most of them are considerably experienced and practical, and they have not proved a burden through quibbling and hair-splitting. Their main value lies in the facts; first, of course, that they are interested, are in earnest; but also that they have a somewhat different point of view and perspective from the active railway operating officer, so that more sides of a subject are brought into view.

It is well understood, of course, that the work of the association is carried on through committee reports, and these reports are becoming more valuable as the years flit by. Nevertheless, there have been, first and last, many instructive papers presented, either independently or as appendices to reports upon subjects which specially appealed to the writers, or to which for some reason they had given special study. A continuance of this practice certainly seems desirable. In another direction, a useful phase of association effort has been in the conduct of experiments. The impact experiments and tests on rails are special examples. Valuable experiments have been made by members of committees on train resistance, although, in general, not directly as committee work. After a time there are likely to develop many lines in which committees of the society could conduct experiments to the advantage of the railways, but which could be carried on only by securing the financial support of the railways themselves. A system of co-operation with the railroads seems altogether appropriate, and the association might well find it good policy to solicit and to foster combined effort in such a direction.

IMPROVEMENTS IN SECTION WORK.

We publish in another column an interesting and important article by C. W. Kouns, about a plan which has been adopted on the Atchison, Topeka & Santa Fe for the reorganization of section work and the application to it of the bonus system. The Santa Fe plan aims to, and should, increase the efficiency of the foreman, and through him the efficiency of the track laborer. A good foreman is hard to find; the increased pay will attract better men and the present foreman will have the incentive to make him learn to be a better man. It may not affect the laborer directly to any great extent. The ordinary Mexican peon is not ambitious. He can live in Kansas, even in winter, on half his present pay. Also, he does not usually stay on the work long enough for the bonus to show fully the results of his individual harder work. If he works 30 per cent. harder than usual for one month, this affects the bonus only to the extent of 2½ per cent., it being divided by 12. It requires some foresight, which only a higher grade of man has, to appreciate the value of working hard for at least a year on the same section and then staying on it to reap the benefit. Most Mexicans do stay six months at least before going back to Mexico, but most of them go home frequently and many do not return to the same jobs. In the mind of the peon, therefore, the bonus system will probably reduce itself in the end to the sim-

plified proposition that on the Western division they pay high wages but you have to work hard.

The Northern Pacific will this spring lengthen sections and use gasolene section cars on the Linton branch of the Dakota division. This branch is 45 miles long and is now divided into four sections, each crew consisting of a foreman and two men. It will be handled in two sections, with a foreman and five men to the section. Another branch of this division, 28 miles long, may later be taken care of with a gasolene car and one section gang.

Another road on which an important reorganization of sections is being made is the Chicago, Milwaukee & St. Paul. An interesting comparison may be made between the Santa Fe's and the St. Paul's methods. The sections of the St. Paul are being materially lengthened. Sections on double-track lines which have been 4 miles long are lengthened to 6 miles. On some branches two sections have been united into one, which may attain a maximum length of 10 miles. In some cases the sections are made longer in winter, when the main work to be done is patrolling to see that the track remains in good condition, than in summer, when there is more actual maintenance work to be done. Instead of the common handcar, the section foreman is furnished with a gasolene power car weighing about 700 lbs., or from 50 to 70 lbs. more than the handcar that it replaces. The foremen's wages are increased $5 to $7.50 per month. Men who three years ago were getting $45 to $50 a month are now getting $50 to $65. The reduction in the number of sections, of course, reduces the number of foremen to be paid. The car costs $200, as compared with an average cost of $38 for the handcars used before. This, of course, increases the investment in and the cost of maintenance of equipment, but the increase in expense due to this and to the higher pay of the foremen is much more than offset by the reduction in the number of foremen to be paid. The amount that has to be paid in wages to a foreman for caring for a given stretch of track is about $30 a month less than had to be paid for the care of the same amount of track when the sections were more numerous and shorter, and the number of foremen to be paid larger. On this theory, enough will be saved in seven months on the wages of the foreman to pay for the car, so that if it only lasts a year there will be a substantial gain by its use. The reduction in the number of foremen makes it possible to eliminate from the service the less competent and thereby raise the average of efficiency. The higher wages paid are also expected to attract a better grade of men than it was possible to get for the lower scale.

The St. Paul management required that the power cars should be so light and simple in construction and operation that they could be as readily handled as a handcar. This requirement has been met. The car used was, on one occasion, when running 25 miles an hour, stopped within 40 ft. and cleared from the track by two men in 20 seconds. The speed at which it can be run saves the section gang about an hour daily in going to and from work. The gang on a long section consists of 12 to 18 men, who are paid $1.50 to $1.75 a day. Assuming a gang composed of 12 men, paid $1.50 each a day, a saving of an hour a day in time means a saving of $1.80 a day in wages. Assuming a gang of 18 men receiving $1.75 each a day, a saving of an hour in getting to and from work means a saving of $3.15 a day in wages. The power car also makes it unnecessary for the men to use their own muscle to get to work, leaving them that much more strength and energy for use after they reach destination. The consumption of gasolene is about 1 gal. for every 27 miles run.

One incident that happened on the St. Paul showed how the speed at which the power cars can be run may be used to good advantage in cases of emergency. On one of the divisions between Chicago and the Mississippi river there was a sudden and violent thunderstorm, accompanied by an excessive rainfall. The train dispatcher called out all the section foremen to patrol the line. Under the rules all foremen work in the same direction, each going to the next telegraph office to report conditions. On this occasion 140 miles of track were thoroughly patrolled by the foremen on their power cars in 20 minutes.

The new method of handling section work is now used on about 200 sections of the St. Paul, having a mileage of between 1,500 and 2,000 miles. It has thus far accomplished all the results that the management anticipated, and probably will be rapidly extended over the entire system.

An important point about motor cars is the value they would have on mountain divisions where the grades are such that the gang cannot pump a handcar up the hills, but has to use pushcars entirely. This means walking, at the maximum, the whole length of the section twice a day in getting to and from work.

THE EFFICIENCY PLAN IN MAINTENANCE WORK ON THE SANTA FE.

BY C. W. KOUNS,

General Manager, Atchison, Topeka & Santa Fe Western Lines.

Some five years ago there was introduced in the shops and roundhouses of the Santa Fe a new method of rewarding labor known as the bonus or efficiency plan. This method has since been extended until about 90 per cent of the time worked in the mechanical department is covered by schedules. From time to time articles have appeared in the "Railway Age Gazette," dealing with the practice and the results of the efficiency plan on the Santa Fe.

The system of paying men a special bonus for extra and unusual effort, in addition to regular daily or monthly wages, has produced such satisfactory results in the mechanical department of this railway that it has been decided that it is desirable to extend it to other departments where it may appear, on investigation, that it can be successfully applied.

The latest extension of the efficiency plan has been to the work of track maintenance, which is carried on by section gangs under the supervision of roadmasters. It is doubtful whether there are many exceptions, in this country or Europe, to the common method of paying section labor on the flat day rate plan. It is obvious that this system of remunerating labor holds out little inducement for special effort or the exercise of special intelligence. A special inducement in the form of dollars and cents is the necessary requisite to getting better work from an organization made up of men such as compose most section gangs.

With the aim of obtaining better co-operation and greater efficiency and economy in track work, the efficiency plan has been introduced on the western lines of the Santa Fe and is now effective on sections 41 to 70, inclusive, of the Western division. Bonus schedules have been prepared under which roadmasters, section foremen and section men will receive, in addition to their regular wages, a special bonus in proportion to the savings effected by their efforts. The Western division comprises 416 miles of track, 151 miles of main line and 265 miles of branch lines. Gangs of from four to eight men care for sections from five to seven miles in length on the main line, but on the

branch lines a much larger territory is taken care of by a single gang. The following schedule is in effect on each of the 30 sections, with individual standards set for each section:

"Section Number ..... Division.

"For the purpose of encouraging efficiency and economy in the maintenance of way, it is proposed to share with section foremen and their crews a portion of the savings effected by their efforts.

"The efficiency of section maintenance is measured by the labor and material charges, separately, which are incurred by the crew that is charged with the care of the section. Labor is measured by the charges to Account 6, per section time book, and material measured by the material charges to accounts 3, 5 and 18 for the section, as kept by the roadmaster, thus:

"(1) Account 3—Ties, 12 months' total.
"(2) Account 5—Other track material, 12 months' total.
"(3) Account 6—Roadway and track labor, 12 months' total.
"(4) Account 18—Roadway tools and supplies, 12 months' total.

"The 12 months' total is the total charge to the account on this section for the 12 months' period ending with the current month.

"Actual labor cost for the current month is item 3 above, divided by 12. Actual material cost for the current month is sum of items 1, 2 and 4 above, divided by 12.

"Standard cost divided by actual cost gives the per cent of efficiency. Reference to the standard efficiency tables gives the percentage bonus earnings.

"The sum of bonus per cents for labor and material is the total bonus per cent allowed to each member of the crew on his regular wages for the month.

"(a) The Standard Labor Cost, Account 6, for maintaining this section, using an ordinary hand car, is $..... per month.

"(b) The Standard Labor Cost, Account 6, for maintaining this section, using a motor section car, is $..... per month.

"(c) The Standard Material Cost, accounts 3, 5 and 18, for maintaining this section with ordinary track spikes, is $..... per month.

"(d) The Standard Material Cost, accounts 3, 5 and 18, for maintaining this section with screw spikes and using a motor section car, is $..... per month.

"Efficiency of section maintenance is computed monthly and bonus earnings are included in pay checks for the month following that month for which the efficiency is computed. No bonus will be allowed in discharge checks for employes leaving the service.

"All extra labor of employes not in regular section gang and material applied by them on the section on account of extraordinary work or repairs are not to be charged against the maintenance of the section, and the charges for such work are deducted from the total expense before computing the efficiency on this schedule.

"Section must be maintained in a condition satisfactory to the inspector, and his approval of the condition of the section must be obtained before bonus is allowed on this schedule.

"The standard herein provided for is based on the average tonnage per day for the year ending with the date of this schedule. When the 12 months' average of the freight ton-miles hauled has increased 20 per cent or more the standard cost will be increased 10 per cent or more proportionally. When the 12 months' average of freight ton-miles hauled has decreased 20 per cent or more the standard cost will be decreased 10 per cent or more proportionally."

The standard costs provided for in items (a), (b), (c) and (d) of this schedule are not shown, for the reason that these allotments are determined for each section separately on the basis of past costs and present conditions.

Attention is directed to the fact that the standard costs fixed for each section refer to present conditions only. The right is reserved to revise the standards whenever conditions are changed. For example, the existing standard costs of a certain section may be based on the expenditure necessary to maintain that section without ballast. Should this section be ballasted with crushed rock, the right is reserved to revise the standard costs to conform to the change of conditions.

If one section was put into first-class condition in every way in the month of September, 1908, the cost of maintaining it during the twelve months immediately following would be at the minimum. At the expiration of a year, or perhaps two years, say in October, 1910, the cost necessary to maintain that section in as good condition as it was from 1908 to 1909 would be materially higher. The standard, however, is based upon the cost of maintaining the section during the year previous to the date of the inauguration of this system. From 1909 to 1910 the cost of maintaining this section increases by reason of conditions prevailing during the previous year. From the beginnng of the year 1910 the cost necessary to maintain the section in the condition it was in during 1908 and 1909 will have so increased, and comparison with the preceding year will show figures so much higher than the standard fixed by the use of first year's figures, that it will be impossible to keep within the standard costs. In such a case as this, the conditions having changed, the standard costs would be subject to revision, if necessary, to make them conform to the change in conditions.

In order to have closer supervision of the quality of the work done on the sections, inspectors are provided, whose duty it is to acquaint themselves thoroughly and frequently with the condition of the individual sections covered by schedules, and the good condition of the sections must be certified to by the inspectors before bonus is allowed.

Item (a) provides a standard labor cost for maintaining a section, using an ordinary handcar. Item (b) provides a standard labor cost for maintaining a section, using a section motor car. For some years the use of gasoline motor cars on the sections, instead of the ordinary handcars, has been contemplated, and various cars were tried. Finally, a special car was designed for the purpose by H. W. Jacobs, assistant superintendent of motive power of the Santa Fe, and two of them were built on the Santa Fe for test purposes. They were thoroughly tried out in actual service on the Western division for several months, and proved altogether satisfactory. A number of these cars have since been built, and as rapidly as they can be secured will be put into service on the sections.*

This car will pull a load of 8,000 lbs., exclusive of its own weight, at a speed of 12 miles an hour. These cars have been used for section track work since July, 1909, without incurring any cost for repairs.

The use of these cars has demonstrated that there are the following adequate reasons for their general adoption:

(1) The car is inexpensive in construction, light in weight and simple in mechanism. Weighing between 800 and 900 lbs., two or three men can quickly remove it from the track or replace it. Little difficulty has been experienced in acquainting the foremen with the proper way to handle it and what to do in an emergency when three or four miles from a station. The car is also strong, having sufficient power to pull itself and a pushcar, both heavily loaded, at a speed of 15 miles an hour.

(2) By the introduction of these cars, the length of the sections, under the care of the same sized gangs as at present, may be increased by at least one-fifth. Thus, about six sections, out of the present 30, on which the efficiency system is installed, will probably be eliminated. Even if the size of the gangs have to be increased in direct proportion to the reduction in number of sections, the saving effected by the elimination of six section foremen will more than pay for all of the cars within two years.

(3) It is found that by the use of these cars the section men work at much greater efficiency. After having helped to pump a handcar for three or four miles, the laborer is by no means fresh for his work. The time required to go to and from work is considerably shorter; and for all of this time the company pays. The use of motor section cars in place of handcars means the substitution of machine power for human power in one more activity connected with railway operation; and wherever this has been done the result has been increased economy and efficiency.

Item (c) provides a material standard for maintaining the section with ordinary track spikes. Item (d) provides a standard cost for maintaining the section with screw spikes and a motor car.

On two divisions the Santa Fe has put in a large number of screw spikes. The cost of maintenance with screw spikes is expected to be considerably less than with the ordinary driven spike. It is not necessary here to go into the details of the economic value of the screw spike, but the necessity of having more liberal cost maintenance

*It is expected to describe this car in a later issue of The Railway Age Gazette.

standards with the driven spike than with the screw spike is self-evident.

The efficiency of section maintenance is based on the cost of labor and material separately compared with the standard cost. The labor cost comprises all the work performed by the crew chargeable to Account 6, as prescribed by the Interstate Commerce Commission. This account includes practically all of the labor used in track maintenance. The material charge includes the cost of all the materials used by the gang; and whether there shall be waste or economy in their use depends on how they are used by the gang. Under this head of materials such items as the following are included: Ties, all track tools (including hand, push and motor cars), fences, crossing planks, bolts, spikes and splices, switch lamps and supplies.

The regular section gangs are not charged with material drawn by floating or extra gangs when such gangs are in their territory. Substantially all new rail is applied by extra gangs, and for that reason is not included in the schedule on which regular gangs work.

A separate schedule is prepared and handed to each section foreman for his information, with the standard cost of labor and the standard cost of material shown thereon. These standard costs are determined for each section on the basis of past costs and existing conditions. One section may be ballasted with crushed rock, while another section may be ballasted with gravel. Such conditions as these make necessary the use of individual standards.

If the standard labor cost be such as will be fair in June, the inclemency of the weather in January may make section work well nigh impossible. The result of this will be that the decreased labor cost for January will cause a very high efficiency, with the resulting bonus earnings. To overcome this difficulty, actual costs are based on twelve-month averages; that is, the actual cost for any one month is the actual cost for the 12 months ending with that month divided by 12. In this way an average is obtained which will at all times take care of variances in monthly costs due to changes in the weather.

Suppose the standard labor cost to be $133. If on the average a certain section is maintained for this expenditure of labor, each member of the gang will receive 20 per cent of his wages as a bonus. Failure to properly maintain the section may work a forfeit of the bonus, but inability to keep the cost down to standard will not necessarily deprive the gang of bonus. Bonus is paid in decreasing amounts as the cost is increased above standard up to a cost 50 per cent above standard, in this case $200, where the efficiency (standard cost divided by actual cost) has fallen to 66.7 per cent., at which efficiency no bonus is paid. The following extract from the standard efficiency table shows this:

Efficiency Per Cent.	Percentage of Wages as Bonus.
66.7	None
70.0	.22
80.0	3.27
90.0	9.91
100.0	20.00
105.0	25.00
110.0	30.00

Efficiency for material is computed in the same manner.

The section men on the Western Lines of the Santa Fe are largely Mexican peons, and the question may be raised whether they have sufficient intelligence to appreciate such special rewards as are outlined above. The section foremen are, of course, in most cases white men, and it is to them that the inducement first appeals. We have a number of Mexican foremen in New Mexico, who are exceptions to the general rule. Through interpreters the plan has been explained to the Mexican employes; and they understand that less loafing, a few extra spikes tightened, a few additional strokes of the spade per hour, the saving of a spike, bolt or plate here and there, means a substantial increase in their regular wages, and they appreciate that. Of many inducements, this is, perhaps, the strongest that can be offered laboring men for increased efficiency.

The question, of course, arises as to whether or not the right-of-way will deteriorate because of the efforts of the foreman to economize. This is a question that always has arisen when innovations have been proposed with particular regard to the economical distribution of expenses. Proper workmanship must be secured by proper supervision. One workman may supervise his own work properly, but the majority of men require supervision. It is for the purpose of making certain that the work on sections will be performed in a thorough manner that inspectors have been appointed, who are to keep themselves thoroughly acquainted with the condition of each individual section. At regular and frequent intervals, each section is thoroughly inspected and, as already stated, if the track has been neglected in any particular, if the section is not in the proper condition, the matter is at once reported to the superintendent, with the result that the gang having that section in charge loses a part or all of its bonus, depending on conditions. In order to bring about an improved condition of affairs it may be necessary to increase the payroll on individual sections. This will reduce the extra earnings provided by the schedule; but regardless of bonus earnings the section must be maintained at all times in proper condition.

The extra earnings of the roadmasters are determined by the average of all their sections. A part of the territory of each of two roadmasters is included in the 30 sections referred to above. The schedule for roadmasters is as follows:

"Roadmasters.....Division.

"For the purpose of encouraging efficiency and economy in the maintenance-of-way, it is proposed to share with roadmasters a proportion of the savings effected by their supervision of the work handled by their section gangs.

"Bonus earnings of each roadmaster are a percentage of his regular monthly wages, and this percentage is an average of the section percentages used for determining bonus earnings of section gangs on his territory.

"For example, suppose that roadmaster 'A' has 10 sections, and that for the month of October the section percentages were as follows: 7, 24, 15, 12, 18, 9, 26, 10, 17 and 24, total 162 per cent. The average per cent. would be 16.2 per cent., and roadmaster 'A' would receive as bonus for the month of October 16.2 per cent of his salary.

"Bonus earnings are computed monthly and included in pay check for the month following that during which they are earned."

The plan for providing extra remuneration for section labor is practically one of profit sharing. The men have an opportunity to increase their total earnings by special effort, and the net cost to the company of maintaining sections is reduced. Some sections which have heretofore been operated by one foreman and six men can now be taken care of by a foreman and four men.

Co-operation is the idea, and this is accomplished by the arrangement of schedules so that the interests of the company and its employees are both served through efficiency and economy in track maintenance.

The Atlantic Coast Line has just completed a 16-lever, Saxby & Farmer mechanical interlocking plant at Dillon, S. C., at the crossing of the North & South Carolina Railway. There will be approach locking mechanical distant signals. All signals will give indications in the upper right-hand quadrant.

The most popular as well as ubiquitous individual at the Coliseum yesterday was Mister. In the course of a stroll around the exhibits he was met at many as twenty times and "Good morning, Mr. ————," was the most frequent salutation.

ROAD AND TRACK SUPPLY ASSOCIATION.

The Road and Track Supply Association is some six years older than the American Railway Engineering and Maintenance of Way Association. The first formal business meeting was held at the Broadway Central Hotel, New York city, September 10, 1894, at which less than 40 concerns were represented.

The original object of the association was to exhibit at, and supply entertainment for, the annual conventions of the Roadmasters' Association of America (now the Roadmasters' and Maintenance of Way Association). Since the first annual meeting of the American Railway Engineering and Maintenance of Way Association in 1900, the Road and Track Supply Association has given most of its time and attention to the latter organization of railway men.

The first president of the supply men's organization was W. W. Salmon, now president of the General Railway Signal Company. W. H. Stearns served as secretary. At the September 14, 1894, meeting the following were elected: President, W. W. Salmon; vice-president, F. A. Johann; secretary and treasurer, W. H. Stearns; executive committee, R. L. Thomas, D. B. Ruffner, Jr., R. J. Davidson, Harry W. Frost and Joseph Hanson.

On October 19, 1895, at a meeting of the association "in the Gents' Parlor of Southern Hotel, St. Louis," W. H. Stearns was elected president, William Goldie, vice-president, and H. W. Frost, secretary and treasurer. In the executive committee, E. G. Fisher and W. H. Elliot succeeded Harry W. Frost and Joseph Hanson.

The officers and executive committee elected in 1895 held over until the Old Point Comfort meeting, September 16. 1897, when the following were chosen: President, E. G. Fisher; vice-president, William Goldie, and secretary and treasurer, Harry W. Frost. The executive committee was changed to include F. A. Ingalls, W. H. Burnham, J. Alexander Brown and H. Elliott, Jr., instead of W. W. Salmon, E. G. Fisher, D. B. Ruffner, Jr., and W. H. Elliot.

At Denver, September 15, 1898, William Goldie was elected president; F. A. Ingalls, vice-president, and J. Alexander Brown, secretary and treasurer; and for the executive committee, E. G. Fisher and L. F. Braine succeeded F. A. Ingalls and J. Alexander Brown.

The 1899 meeting was held at Detroit, September 14. R. L. Thomas succeeded Mr. Goldie as president and H. T. Wallace was elected vice-president. The executive committee was changed by electing W. W. Worthington, William Goldie and F. A. Ingalls in place of Messrs. Braine, Thomas and Burnham.

The next change in the personnel of the Road and Track Supply Association occurred at the Washington meeting of the Roadmasters' and Maintenance of Way Association, October 9, 1901. More than one here at this week's gathering remember some of the enlivening experiences of the Washington convention. That those who were not there may view a likeness of some of the "doings," we reproduce an editorial from The Railway Age of October 18, 1901:

If anyone of the members of the Roadmasters' Association who attended the convention and lived in the National Hotel should be asked what was the most notable feature of the occasion and should answer "Rats!" he need not be convicted of levity offhand. In fact, the matter was serious. The staid and sober members, both of the association and the supply fraternity, seemed to have been selected for the ravages of the rodent. W. E. Clark, of the Continuous Rail Joint Company, displayed to anyone who wanted to see a shoe with a big hole gnawed neatly across the upper. W. L. Douglas, the shoe man, is $3 in, and L. F. Braine $6 out, on account thereof. C. E. Jones, who is almost the father of the association, and as such maintains its dignity so far as such a thing is possible, would have had to attend the first session of the association with but one sock except for his forethought in providing himself with two pairs. The one that was missing when he arose finally turned up overhanging the edge of a rat hole. It is supposed that the animal's strength failed at that point. Another member who had heard of the experiences of Messrs. Jones and Clark, had some difficulty in explaining to his wife in the morning why he had set his shoes on the mantel and hung his socks over the mirror on coming in the night before. The worst of the whole is that, if these were jokes, they would be tolerably tame; but neither are the stories jokes nor were the rats tame. Some of them that were seen appeared to have fraternized with Hooker's division in the 60's.

At the meeting in question R. J. Davidson and F. A. Ingalls were elected president and vice-president, respectively; and the following executive committee was chosen: H. Elliott, Jr., William Goldie, W. W. Worthington, R. L. Thomas, W. E. Clark and J. H. Martin.

At Milwaukee, September 10, 1902, F. A. Ingalls was elected president and William Godlie was for the third time made vice-president. At this meeting J. Alexander Brown, who had served as secretary and treasurer since 1898, was succeeded by the present holder of those two offices, John N. Reynolds. R. J. Davidson and J. Alexander Brown succeeded William Goldie and W. W. Worthington on the executive committee.

The next annual business meeting was held at Kansas City October 15, 1903. Joseph H. Martin succeeded Mr. Goldie and J. Alexander Brown was elected vice-president. The executive committee was changed by substituting the two retiring officers and F. A. Poor in place of J. Alexander Brown, R. J. Davidson and J. H. Martin.

At the September 13, 1904, meeting at St. Louis, the officers and executive committee were reelected; but on September 13, 1905 (at Niagara Falls) the following officers and committee were chosen: President, W. E. Clark; vice-president, John McKinnon; secretary and treasurer, John N. Reynolds; executive committee, J. H. Martin, William Goldie, Sr., William Goldie, Jr., Charles W. Reinoehl, W. F. Schleiter, F. A. Poor and George Stanton.

The time for holding the annual meetings of the association was changed in the fall of 1906 so as to correspond with the dates of the conventions of the American Railway Engineering and Maintenance of Way Association. The next election, therefore, did not take place until March 20, 1907. At that meeting, John McKinnon succeeded Mr. Clark as president and F. A. Poor was made vice-president. The executive committee underwent these changes: W. E. Clark and Orlando Metcalf, Jr., succeeded Charles W. Reinoehl and F. A. Poor.

While there had been much discussion between supply men and members of the American Railway Engineering and Maintenance of Way Association as individuals on the subject of holding the convention and exhibits at some place other than the Auditorium Hotel, the first official action of the Road and Track Supply Association as a body was taken at a meeting on March 19, 1907, when J. H. Martin and F. A. Poor were appointed a committee to confer with the railway association. While the report of that committee was discouraging, the idea was carried forward by the incoming officers and committee until finally, at a special meeting on September 10, 1908, it was decided to rent the Coliseum for the week in March, 1909, during which the American Railway Engineering and Maintenance of Way Association would meet. While the executive committee had not been successful in obtaining official recognition from the railway association, it did get encouragement. The result of that encouragement, combined with a whole lot of well-directed energy, spoke for itself in last year's display at the Coliseum. That the 1910 exhibition would surpass that of 1909 was foreseen a year ago.

The officers and committee, on whom fell the responsibil-



George Stanton.



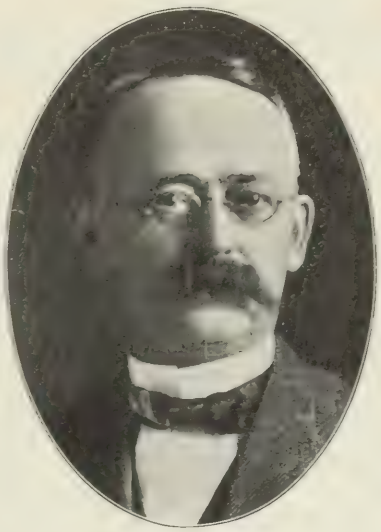
Robert E. Belknap.



John McKinnon.



W. F. Schleiter, President.



T. W. Snow, Vice-President.



Azel Ames.



John N. Reynolds, Secretary-Treasurer.



A. P. Van Schaick.

OFFICERS AND EXECUTIVE COMMITTEE OF THE ROAD & TRACK SUPPLY ASSOCIATION.

ity for last year's exhibition, were: George Stanton, president; W. F. Schleiter, vice-president; John N. Reynolds, secretary and treasurer; executive committee, John McKinnon, J. H. Martin, William Goldie, Sr., R. E. Belknap, T. W. Snow and Theodore Huss.

We show, on another page, the pictures of nine of the ten men who have borne the burden of this year's trials—and they were more than a few. Those who visited the Coliseum yesterday will readily admit that the incoming administration has been set a pace that is "going some."

William Schleiter, president, is secretary of Dilworth, Porter & Co., Ltd., Pittsburgh, Pa. Vice-President T. W. Snow is manager of the Otto Gas Engine Works, Chicago. John N. Reynolds, secretary and treasurer, is western manager of the Railway Age Gazette.

The members of the executive committee are: George Stanton, sales agent, Cleveland Frog and Crossing Company, Cleveland, Ohio; Robert E. Belknap, Chicago sales agent for the Pennsylvania Steel Company and Maryland Steel Company; John McKinnon, secretary and general manager, Kalamazoo Railway Supply Company, Kalamazoo, Mich.; Azel Ames, in charge of railway department, Kerite Insulated Wire & Cable Company, New York; A. P. Van Schaick, president, W. K. Kenly Company, Chicago; and John W. Duntley, president Duntley Manufacturing Company, Chicago.

RECONSTRUCTION OF CHICAGO RIVER TUNNELS.

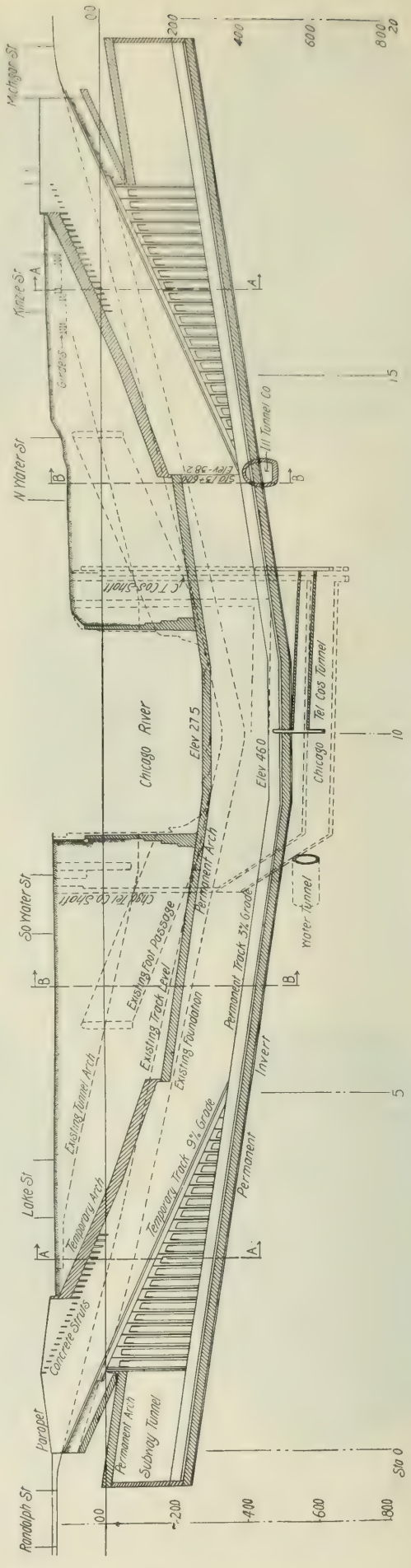
La Salle Street Tunnel.

The first tunnel under the main branch of the Chicago river at La Salle street was built by the city of Chicago in 1869. It has three bores, two for vehicular traffic and one for pedestrians. The work was done under contract by Moss, Chambers & McBean. In 1889 the two bores used by vehicles were slightly remodeled to accommodate the North Side cable cars, which continued to use the tunnel until 1906, when it became necessary to remove the upper portion of the river section on account of the order of Congress to provide a minimum depth of 22 ft. in the river channel.

The tunnel, as reconstructed for the surface cars, had maximum inside dimensions of 20 ft. x 20 ft., the brick arch roof being sprung to an 8-ft. radius. The clearance in the river over the tunnel was about 12 ft. In the accompanying profile, the outline of the old tunnel is shown in dotted lines.

The present rebuilding of the tunnel has been undertaken for two reasons: (1) To allow the North Side surface cars to leave the loop district without crossing the movable bridges, and (2) to provide a connection under the river for the city's future subway system. The removal of surface cars from the four bridges now used by the North Side lines will result in a saving of time for the surface cars, the river boats and vehicles. Cars are frequently delayed for long intervals by an open bridge, and the time consumed in crossing the bridge is always long, on account of the congestion of all classes of traffic. It is estimated that 12 minutes can be saved in the average running time of North Side cars. To avoid long delays to surface cars during the morning and evening rush hours, the city forbids the opening of the bridges for two hours each day, thus blocking all large boats and causing congestion in the river traffic. The existing congestion of vehicles on the bridges would be greatly relieved by the removal of cars, since the vehicular traffic could then use the entire width of roadway.

The new tunnel is to be approximately the same length as the old one, 1,900 ft. The standard twin tunnel section is 38 ft. x 25 ft. over all and each bore is 14 ft. x 20 ft., inside. The tunnel walls are of concrete, thoroughly reinforced with square bars. The clearance allowed in the



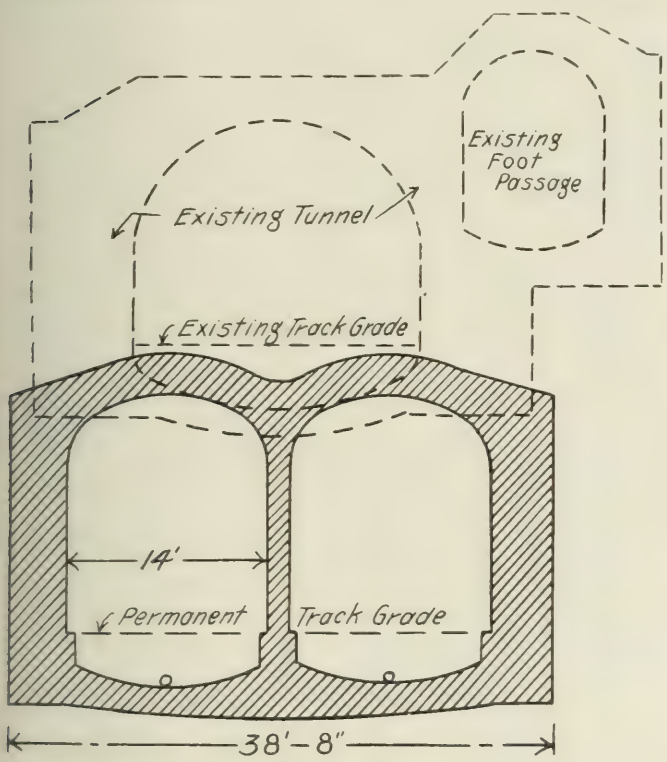
Profile of La Salle Street Tunnel.

river is 27 ft., which makes the foundation about 13 ft. lower than in the old tunnel. The approaches to be used by the future subway are to be made permanent, and a section of the arch roof omitted to allow a temporary wooden trestle to be built for the use of the present surface cars. The grades for the permanent tunnel are, from south to north, 957 ft. of 3 per cent. descending, 193 ft. of level, and 870 ft. of 3 per cent. ascending. The temporary structure for surface cars will be 510 ft. long in each approach and will be on a 9 per cent. grade.

The tunnel is drained by a concrete duct running from an opening in the middle of the river section to a small sump under the pump house on the north bank of the river. Details of the pump installation have not yet been decided on, but it is estimated that there will be very little water in the tunnels except after heavy rains.

The track is to be ballasted, except that the trestle approaches will be open-floor.

The contract for the construction of the tunnel was taken by the M. H. McGovern Company, Chicago, and, with the consulting engineering services of E. C. and R. M. Shankland, Chicago, plans for carrying out the work have been prepared. The work is to be divided into three sections: (1) the river section, which will be built complete and sunk into place, (2) about 370 ft. which will be built in open cut, and (3) the remaining portion, which will be tunneled without a shield by soft earth tunneling methods.

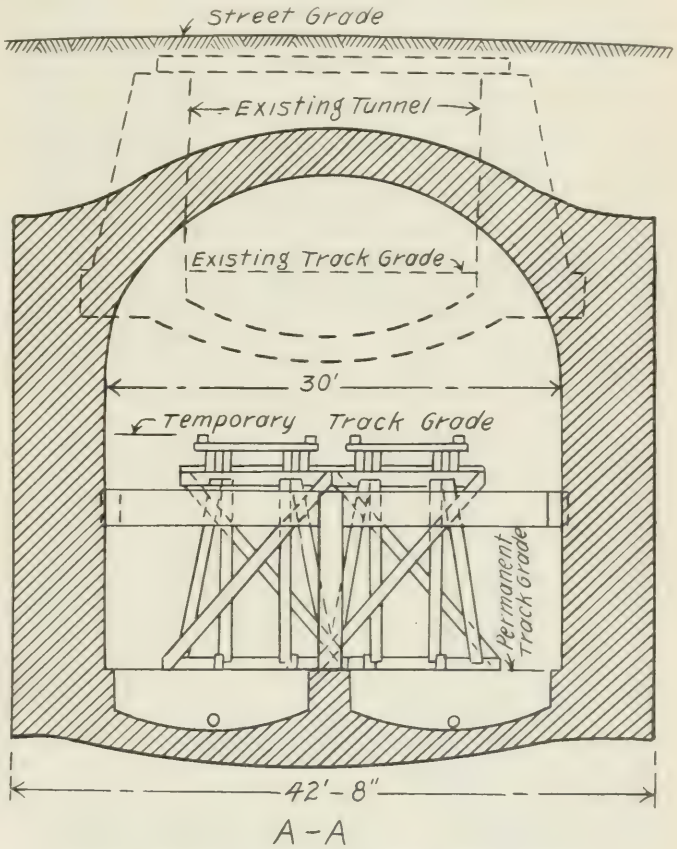


Cross Section on B-B; La Salle Street Tunnel.

The river section is 278 ft. long and has the standard cross section described above. The contract for building this section has been sublet to the Henry Platt Boiler & Machine Company, Chicago, and the work will be done at that company's plant on the river near Twenty-second and Halsted streets, about three miles by river from the site of the bridge. The forms will all be assembled at this place and enough concrete placed to partly submerge the bulkheaded section. The old tunnel foundation in the river will be blasted out, a trench dredged to grade and finished with an orange peel bucket. Two concrete foundations will be prepared, one about 90 ft. from each dock line. The tunnel section will be floated up the river to the tunnel site, anchored near one shore and enough concrete added to just submerge it. It will then be moved to a point over the trench and sunk to final position by admitting water through a water cock. Steel piling will be driven so as to guide the section to its proper bearing on the foundations. The finishing concrete will be placed through vertical pipes extending from above the water surface down to the top of the tunnel section near each end.

The open cut work will be about 45 ft. deep. Lackawanna section sheet steel piling will be used throughout the work, some having already been driven. The ends of the river section will be enclosed in a steel piling coffer dam in which to build the connection with the approach section.

The method to be used in the tunneling work has not been definitely decided, but the following is being considered: A small working heading is to be driven near the bottom of the tunnel section, extending from the open cut to the connection with the river section. This will be braced and lagged and a track laid for removing material and bringing in concrete. The enlarging of this small heading to the cross section of the completed tunnel will be done in lengths of 8 to 10 ft., adjacent workings being at least 25 ft. apart. Each of these short sections will be enlarged to full section and the concrete lining placed and allowed to set before the adjoining section is touched. All excavated material can be removed at the river end of the heading or used to backfill the old tunnel bore, while concrete is being brought in from the open cut end of the heading, the two operations in no way interfering with each other.



Cross Section on A-A; La Salle Street Tunnel.

Washington Street Tunnel.

The old tunnel under the south branch of the river at Washington street is also being rebuilt, considerable work having already been done. The conditions met in this work are similar to those described above, but a very different method is being used. The contract was let to Geo. W.

Jackson, Inc., Chicago, who made the plans for carrying out the work.

A much longer section of the Washington street tunnel could be built in open cut. The west approach, from Clinton street to Canal street, passes under the train sheds of the new Chicago & North Western station and, as work is now in progress on that building, open cut construction was allowable for the entire block. At the east approach a portion of the work between Franklin street and Market street was also done in open cut. The approaches are similar to the ones at La Salle street; provision is made for a future subway system, and the surface line is carried down on temporary wooden trestles.

The remaining work, including the section beneath the river, is being done by soft earth tunneling without a shield. The material is stiff clay, which is easy to handle in this way, and no difficulty is experienced. Two working shafts 9 ft. in diameter were sunk, one on each side of the river, and short sections of tunnel 6½ ft. wide by 7 ft. high were driven in both directions from the foot of each shaft to contain the air locks. The section under the river is to be a single tube, the roof of which was placed when the old tunnel was abandoned. Two headings were driven from the short tunnel containing the air lock, each following the line of what will be the lower portion of a side wall of the finished tunnel. These headings were lagged with 1-in. material, braces being spaced on about 4 ft. centers, and work was carried on from both shafts until the two headings met under the river. Steel forms for concrete were then placed and the lower sections of the side wall placed, almost completely filling the headings. This section of wall was built with two key spaces, one for the wall above and one for the invert.

To place the upper sections of the side walls, headings were driven inside the cross section of the tunnel bore and at the same level as the portion of wall to be placed. Side drifts were then driven and the concrete placed in short sections. The existing roof will be supported directly by the upper section of the wall which is now being placed. When this section is completed, the work will be finished by removing the earth from the bore of the tunnel and laying the invert. The material is excavated with a miner's knife, removed in small dump cars to the shaft, elevated to the surface and dumped into scows in the river. Materials for concrete are handled from cars on a siding to the mixer in wheelbarrows. The mixing is done in a cube mixer and the concrete is dumped into small cars, lowered down the shaft, run back in the tunnel and dumped in place. An air pressure of about 10 lbs. is used in the headings, the pressure at compressors being 12 lbs. Three compressors are used in each shaft house, the ones in the west side being operated by steam and those in the east by electricity.

The work in both tunnels is under the general supervision of Bion J. Arnold, chairman and chief engineer of the Board of Supervising Engineers. George Weston, assistant chief engineer to the board, represents the city. William Artingstall, division engineer for the board, has direct charge of the work in both tunnels.

The Pennsylvania Lines East of Pittsburgh has adopted as standard for the signal installation the scheme outlined by Committee No. 1 of the Railway Signal Association. This includes staggered lights and pointed blades on automatic block signals, and three arms on all interlocking signals.

W. A. Pedalle has been appointed superintendent of construction of the Hall Signal Company.

REGISTRATION—SIGNAL ASSOCIATION.

Adams, Edward L., Chief Signal Inspector, L. S. & M. S. Ry.
Allen, E. A., Signal Supervisor, Northern Pacific Ry.
Ambach, E. T., S. E., Cincinnati, Hamilton & Dayton Ry.
Anthony, C. C., Asst. Signal Engineer, Penna. R. R.
Arkenburgh, W. H., Chief Draftsman, Chicago, Rock Island & Pacific Ry.
Backes, W. J., Ch. Engr., Central New England R. R.
Baker, R. N., Salesman, Bryant Zinc Co.
Banks, W. C., Pres., Banks Electric Manufacturing Co.
Beck, H. M., Engr. Operating Department, Electric Storage Battery Co.
Beck, G. E., Supt. Signals, Lake Shore & Michigan South-
Bender, Fred W., Asst. Supervisor Signals Central Railroad of New Jersey.
Black, E. A., Supervisor Signals, Lake Shore & Michigan Southern Ry.
Boyce, Geo., Supt. Telegraph and Signals, C., St. P., M. & O. Ry.
Boynton, R. D., Lamp Insp., Chicago & North Western Ry.
Brach, Leon S., General Mgr., L. S. Brach Supply Co.
Brown, A., Signal Engineer, C., M. & St. P. Ry.
Brown, E. W., Sales Representative, Edison Manufacturing Co.
Brown, L., General Foreman, Atchison, Topeka & Santa Fe Ry.
Buchanan, F. H., Signal Supervisor, Vandalia R. R.
Buck, H. M., Eastern Representative, Railroad Supply Co.
Cade, J. T., Vice-Pres., Federal Signal Co.
Carr, R. F., Pres., Dearborn Chemical Wks.
Case, D. M., Supt. Signals, Cincinnati, New Orleans & Texas Pacific R. R.
Camp, W. M., Editor, Railway and Engineering Review.
Chenery, E. A., Supt. Telegraph, Mo. Pac. Ry.
Christofferson, C. A., Sig. Eng., Nor. Pac. R. R.
Church, H. M., Div. Engr., Baltimore & Ohio R. R.
Churchill, Wm., Corning Glass Works.
Chambers, Frank R., Jr., Vice-Pres., Duplex Metals Co.
Clausen, L. R., Sup. Chicago Division, C., M. & St. P. Ry.
Clement, S. B., Ch. Engr., Temiskaming & Northern Ontario Ry.
Cogswell, C. P., Jr., Representative, Railroad Supply Co.
Corey, Fred B., Engineer Railway Signals, General Electric Co.
Cotton, C. A., Asst. Signal Supervisor, Atchison, Topeka & Santa Fe Ry.
Combs, Harry, Signal Insp., Lake Shore & Michigan Southern Ry.
Condit, E. A., Jr., Representative, The Rail Joint Co.
Dane, G. W., Supt. Interlocking, South Side Elevated R. R. of Chicago.
Daves, Wm., Special S. E., Chicago Great Western Ry.
Dawley, W. M., Engr., Erie R. R.
Dayton, Clarence A., Assistant Engr., D., L. & W. R. R. Co.
Dean, A., Gen. Mgr., Federal Sig. Co.
Decker, J. R., Signal Supervisor, Michigan Central R. R.
Delavie, F. J., Mgr., Battery Zinc Dept., Grasseli Chemical Co.
Denney, C. E., S. E., Lake Shore & Michigan Southern Ry.
Dodd, E. B., Sig. Supvr., M., St. P. & S. S. Marie Ry.
Dodgson, F. L., Cons. Engr., Gen. Ry. Sig. Co.
Doxsee, C. F., Signal Foreman, Chicago, Rock Island & Pacific Ry.
Drake, Caleb, Supvr. Sigs., C. & N.-W. Ry.
Drake, W. E., Inspector of Signals, Wabash R. R.
Eck, W. J., E. E., Southern Railway.
Ellis, E. F., Supervisor Signals, Cleveland, Cincinnati, Chicago & St. Louis Ry.
Elliott, W. H., S. E., New York Central & Hudson River R. R.
Everett, E. A., Sig. Engr., Mich. Central.
Foale, H. J., S. E., Wabash R. R.
Folley, E., Asst. Signal Supervisor, Chicago & Eastern Illinois Ry.
Foster, W. E., Western Manager, U. S. & S. Co.
Front, R. E., Signal Engr., St. L. & S. F. R. R.
Fugina, A. R., Asst. S. E., Chicago & North Western Ry.
Gillingham, W. J., Jr., Resident Mgr., Hall Signal Co.
Grant, E. C., Signal Supervisor Union Pacific R. R.
Green, R. E., Supvr. Electric Signals, M. C. R. R.
Hall, G. L., Vice-Pres., Q. & C. Co.
Harkness, W. E., Sales Engineer, Western Electric Co.
Hartley, L. C., S. E., Chicago & Eastern Illinois Ry.
Hauser, J. A., Supvr. B. and B., C., C., C. & St. L.
Hickson, C. W., Signal Insp., Pennsylvania Lines West.

Hiles, Wm., Signal Insp., Cleveland, Cincinnati, Chicago & St. Louis Ry.
Hovey, M. H., Wisconsin Ry. Comm., Great Northern.
Hovey, W. G., Sales Dept., Hall Signal Co.
Howe, W. K., Chief Eng., Genl. Ry. Signal Co.
Hudson, E. E., Mgr. Sales, Edison Manufacturing Co.
Jacob, Frank E., Signal Engineer, C. & W. I. R. R. Co. and Belt Ry. Co. of Chicago.
Johns, C. W., Asst. Engr. M. of W., Chesapeake & Ohio R. R.
Johnson, Robt. C., Asst. Signal Engineer, N. Y. C. & H. R. R. R.
Johnson, T. L., Supt. Signals, Delaware, Lackawanna & Western R. R.
Johnson, W. M., Jr., Trainmaster, Bessemer & Lake Erie Ry.
Kelloway, C. J., Signal Engr., A. C. L. R. R.
Kelly, A. J., Supvr. Sigs., Big Four R. R.
Kimbell, E. E., Representative, General Electric Co.
Kinch, W. M., Signal Engr., Lutz-Lockwood Mfg. Co.
Kinder, James F., Secy. Duplex Metals Co.
Klemm, W. J., Signal Maintainer, Pere Marquette R. R.
Kolb, E. W., Sig. Engr., B., R. & P. Ry.
Krum, Paul, Light Insp., Lake Shore & Michigan Southern Ry.
Kyle, W. T., Representative, Duplex Metals Co.
Lane, W. H., Chief Engineer, Hall Signal Co.
Launbranch, M. E., Sales Engr., U. S. Electric Co.
Lee, Frank, Div. Engr., Canadian Pacific Ry.
Lepreau, F. J., Salesman, Edison Manufacturing Co.
Lomas, H. F., Asst. S. E., Illinois Central R. R.
Lorenz, J. N., Signal Engineer, Central Electric Co.
Lowry, H. K., Asst. S. E., Chicago, Milwaukee & St. Paul Ry.
Lutz, T. E., Supervisor of Signals, Cleveland, Cincinnati, Chicago & St. Louis Ry.
Mack, E. E., Asst. Supervisor, Chicago & Eastern Illinois Ry.
Mann, B. H., Signal Engineer, Mo. Pac. Ry.
Mann, L. R., Supervisor Signals, Missouri Pacific Ry.
Manuel, W. N., Supt. of Sigs., G. R. & I. Ry.
Marshall, E. L., Chemical Engineer, National Carbon Co.
McKeen, A. H., Signal Engr., O. R. & N. Co.
McWain, W. J., S. E., Pere Marquette R. R.
Moffett, M. H., Asst. Sales Mgr., National Carbon Co.
Miskelly, Sam, General Signal Inspector, C., R. I. & P. Ry.
Moore, A. G., Chief Draftsman, I. C. R. R.
Moore, P. W., Gen. Mgr., Railway Specialty & Supply Co.
Morris, D. R., Signal Inspector, I. C. R. R.
Nutting, A. G., Lamp Insp., Chicago, Rock Island & Pacific Ry.
Oglesby, E. R., Div. Repairman, Chicago & Eastern Illinois Ry.
Oppelt, J. H., Supervisor Interlocking, New York, Chicago & St. Louis Ry.
Osgood, J. O., Ch. Engr., Central R. R. of New Jersey.
Parrish, F. J., Engr. M. of W., Kentucky & Indiana Bridge & R. R. Co.
Patenall, F. P., S. E., Baltimore & Ohio R. R.
Patterson, H. D., Representative, Lauder & Patterson.
Patton, George J., Supervisor Signals, Delaware, Lackawanna & Western R. R.
Peabody, J. A., S. E., Chicago & North Western Ry.
Peck, J. W., Gen. Sig. Insp., Union Pacific R. R.
Phinney, R. M., Asst. Engr., Signal Dept., C. & N. W. Ry.
Poor, C. O., Genl. Supt., General Ry. Signal Co.
Poor, F. A., Western Sales Agent, The Rail Joint Co.
Pry, E. B., Signal Insp., Pennsylvania Lines West.
Ragland, R. R., Supervisor Signals, Mo. Pac. Ry.
Raymer, I. S., Asst. S. E., Pittsburgh & Lake Erie R. R.
Relph, E. J., Supt., Massey Batt. Co.
Rhea, Frank, Genl. Electric Co.
Rose, L. S., S. E., Cleveland, Cincinnati, Chicago & St. Louis Ry.
Rosenberg, C. C., Consulting S. E.
Rudd, A. H., S. E., Pennsylvania R. R.
Salmon, W. W., Pres., General Railway Signal Co.
Sconce, E. M., Signal Foreman, Chicago & Eastern Illinois Ry.
Seaman, J. C., Signal Inspector, L. S. & M. S. Ry.
Shaver, A. G., Signal Engineer, C., R. I. & P. Ry. Co.
Smith, F. G., Signal Supervisor, Chicago & Eastern Illinois Ry.
Smith, E. B., Spl. Sig. Inspr., N. Y. C. & H. R. R. R.
Smith, F. C., Salesman, American Conduit Co.
Smith, M. E., S. E., Delaware, Lackawanna & Western R. R.
Spafford, James H., retired.
Spencer, C. H., Engr., Washington Terminal Co.
Sperry, H. M., Sales Manager, General Ry. Signal Co.
Spicer, V. K., Canadian Manager, Union Switch & Signal Co.
Squire, Willis C., Consulting Engr.
Stephens, Charles, S. E., Chesapeake & Ohio R. R.
Stevens, Thos. G., Sig. Eng., A., T. & S. F. R. R.
Stradling, E. G., Signal Insp., Chicago, Indianapolis & Louisville R. R.
Talbert, W. W., General Foreman, Union Switch & Signal Co.
Thomas, L., Res. Mgr., General Railway Signal Co.
Trout, G. W., Signal Supvr., C., R. I. & P. Ry.
Unger, O. R., Signal Supervisor, Mo. Pacific Ry.
Warren, S. D., Signal Inspector, C., M. & St. P. Ry.
Weld, H. K., Asst. Sales Rep., McRoy Clay Works.
ern Ry.
Wentworth, C. C., Prin. Asst. Engr., Norfolk & Western R. R.
Whitcomb, F. E., Eng. of Maint. of Signals, Boston & Albany.
Wiegand, F. B., Asst. S. E., Lake Shore & Michigan Southern Ry.
Wight, S. N., Signal Inspector, L. S. & M. S. Ry.
Wilby, R. L., Asst. Engr., Toledo, Peoria & Western Ry.
Wiley, J. R., Western Mgr., Standard Underground Cable Co.
Willis, W. H., S. E., Erie R. R.
Wilson, A. G., Mgr., Hanlon & Wilson.
Winans, E., Chief Draftsman, Atchison, Topeka & Santa Fe Ry.
Whitcomb, L. L., Supervisor Signals, Lake Shore & Michigan Southern Ry.
Workman, W. S., Signal Foreman, Pennsylvania Railroad Lines East.
Wrecks, H. T., Secretary, Wire Inspection Bureau.
Wuerpel, M., Asst. Gen. Mgr., General Railway Signal Co.
Wyman, C. L., Sales Engineer, Millard Storage Battery Co.
Young, H. W., Sig. Maintainer, Chicago & North-Western Ry.
Young, John V., Supt. Signals, Boston & Maine and Maine Central Railroads.

EIGHT-TRACK SCHERZER BRIDGE.

The bridge now being built over the Sanitary and Ship canal, at Campbell avenue and Thirty-first street, Chicago, is composed of four double track single leaf Scherzer rolling lift bridges, placed alternately side by side.

It will carry four tracks of the Pittsburg, Cincinnati, Chicago & St. Louis, two of the Chicago Terminal Transfer and two of the Chicago Junction Railway. The bridge is being built and paid for by The Sanitary District of Chicago, under



Fig. 1. Progress Work on Bridge.

an agreement with the railway companies to provide a moveable bridge of an efficient design subject to their approval. The Sanitary District also pays the railways such a sum of money as will draw interest sufficient to pay the expenses of maintenance and operation of the bridge.

Competitive designs for the bridge were first invited in 1898, and from the plans submitted at that time, those by the Scherzer Rolling Lift Bridge Co., Chicago, were selected. Contracts for the substructure were let to McArthur Bros., and for the superstructure to Pencoyd Iron Works, Philadel-

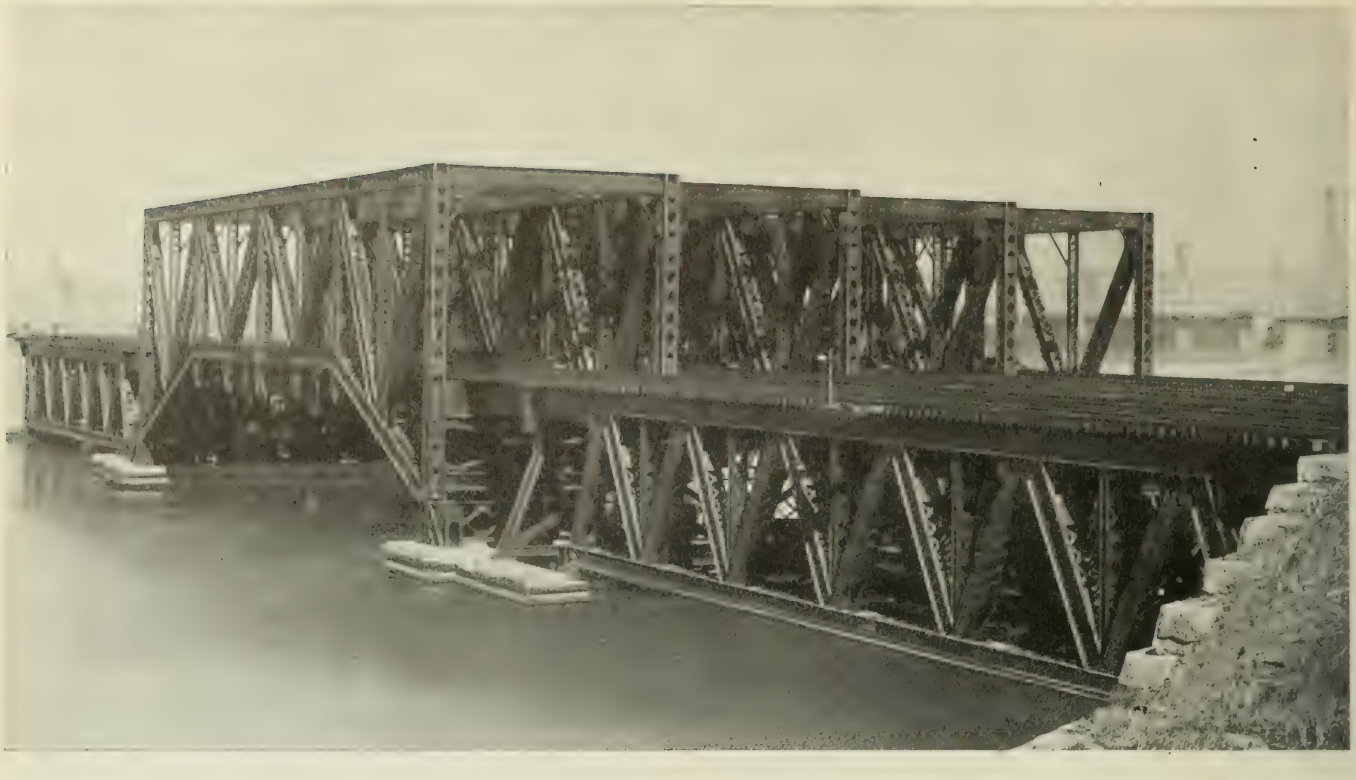


Fig. 2. Fixed Span Over Sanitary and Ship Canal Being Replaced by Eight-Track Scherzer Bridge.

phia, Pa. The bridge was built and placed in service in 1901. However, only those portions of the superstructure necessary to carry the moving loads when acting as a fixed span were erected at this time, and the structural parts and machinery required to make the bridge movable were to be furnished later when it was necessary to open the canal to navigation. Fig. 2 shows the bridge as first placed in service. The part constructed formed four three-hinged arch spans; when completed for operation as a movable bridge, each span was to be a double leaf rolling lift bridge.

When plans were made in 1908 to open the canal to navigation, it seemed advisable to abandon the original plan for the Campbell avenue bridge and substitute a single-leaf rolling lift bridge. The Scherzer company was contracted with by the Sanitary District for a new design, providing for four single-leaf, double-track Scherzer rolling lift bridges, placed side by side, the alternate bridges being supported at opposite ends to allow the minimum spacing between tracks.

Fig. 3 shows the plan of the bridge and Fig. 1 its location with reference to the canal and adjacent railway tracks.

The bridge crosses the canal on a skew, the intersection angle being about 68 deg. The span is 154 ft. center to center of bearings; width of each bridge, 29 ft. 1 in. center to center of trusses; clearance above Chicago datum, 16 ft.; and clear width of channel for navigation, 120 ft. The waterway is increased by an 89 foot channel under each approach span. These approach spans are the deck trusses which were placed when the first bridge was built.

The foundations as placed for the old bridge are used for the new with the exception that it was necessary to place concrete cylinders behind the piers to support the end of one of the track girders for each bridge. The length of roll of the new bridge is about 10 ft. greater than that of the old design, and in addition to this, the bearings were set back about 4 ft. on the pier, thus making the rear support of the girder about 14 ft. back of that for which the piers

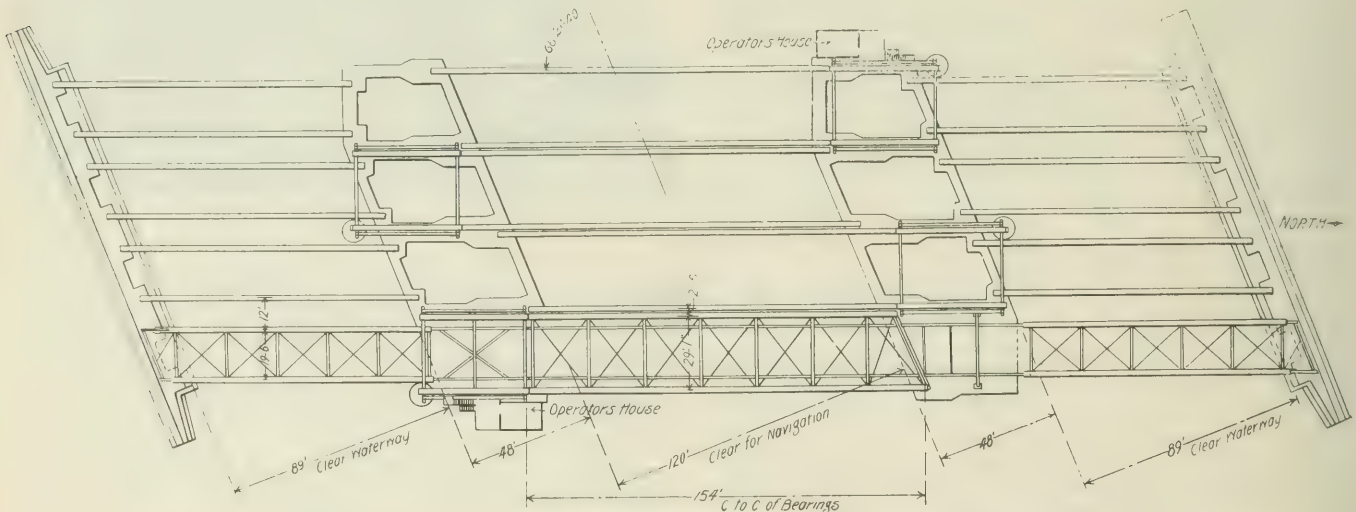
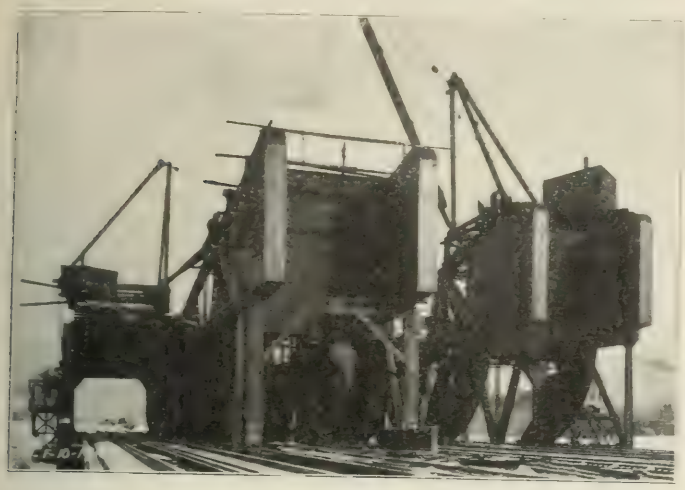


Fig. 3. Plan of Rolling Lift Bridge Over Sanitary and Ship Canal.

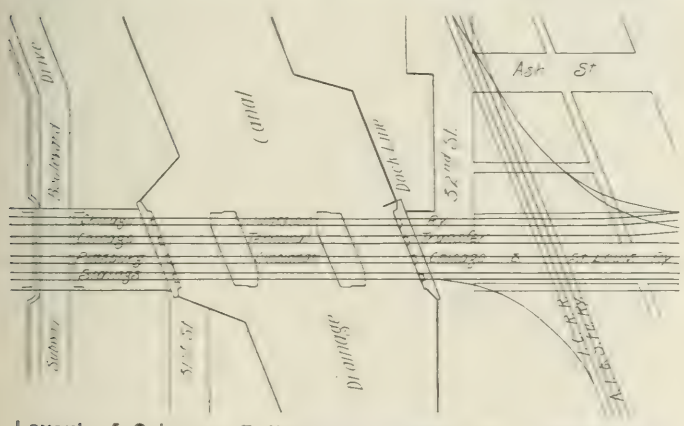
were designed. These cylinders are 9 ft. in diameter and were sunk to rock. They are made of a ½-in. steel shell filled with concrete, reinforced around its circumference by 1 ¼-in. square bars set vertically.

For in each truss the total rolling load is 852 tons, the track girder weighs 65 tons, the segmental girder 52 tons, and the structural steel 363 tons. The counter weight amounts to approximately 500 tons, which is made up of concrete, weighing 140 lbs. a cu. ft. in which pockets are provided for adding pig iron for the final adjustment of balance.



The Scherzer Rolling Lift Bridge.

The movements of the four bridges are to be controlled from two operator's houses, the two bridges supported on the south pier being operated from the south house, and the two on the north pier from the north house. Each leaf is operated by two, 50-h.-p. direct current motors from a series-parallel controller in the operator's house. The latch at the front of each leaf is operated by a 3 h.-p. motor. The control of each leaf is independently interlocked with the signals protecting the two tracks passing over it, so that it is impossible for the operator to unlock the bridge until the signals have all been set. The operations of unlocking the bridge and of raising the leaf are also interlocked to prevent any attempt of the operator to raise the leaf before the bridge is unlocked. This interlocking is by contact switches operating in the closing circuits of the mill type contactors on the switchboard. Electric light indicators in both operator's houses show the positions of the bridge leaves and locks. Each motor is provided with a solenoid brake. Those on the end latches are automatically applied when the latch reaches the end of its stroke, and the current is automatically cut out from the motor at the same time. The operating machinery for each leaf is provided with an emergency brake in addition to the solenoid motor brake. The emergency brake is controlled by a motor-operated mechanism, which allows it to be applied instantly at the will of the operator, or automatically when the current is cut off.



Layout of Scherzer Rolling Lift Bridge Over Sanitary and Ship Canal.

In replacing the old spans with the new movable spans, traffic was diverted from two tracks at a time, the other six being always open for operation. It was 62 days after diversion of traffic from an old span before traffic could be turned back on to the new bridge.

Figs. 4 and 1 show the progress that had been made up to February, 1910, in the erection. Three of the spans are in place and the erection of the fourth is under way.

The contract for the fabrication and erection of the structural steel was taken by the Chicago Bridge & Iron Works, Chicago, the complete electrical equipment was sublet to George P. Nichols & Bro., Chicago, and the erection to the Ketler-Elliott Erection Co., Chicago. The design was made by the Scherzer Rolling Lift Bridge Co., Chicago, Albert H. Scherzer, president and chief engineer, with the co-operation of the engineers of the Sanitary District of Chicago, C. R. Dart, bridge engineer, S. T. Smetters, assistant bridge engineer, and F. R. Williamson, assistant engineer in charge of construction. Ralph Modjeski represented the railway companies as consulting engineer and the chief engineer of each company also approved all plans.

LIST OF EXHIBITS.

The following is a complete list of all exhibits in place or being installed in the Coliseum yesterday (Monday) afternoon. The completeness was a compliment to the committee in charge.

Adams & Westlake Company, Chicago.—Signal lamps, lanterns; railway specialties. Represented by W. H. Baldwin, G. L. Walters, H. G. Turney, A. S. Anderson, C. B. Carson, W. J. Pierson. Spaces 83 and 84.

Adreon Manufacturing Company, St. Louis.—Clark tension set tie plate, Security rail brace and tie plate. Represented by E. L. Adreon, Jr. and Wm. Miller. Space 109.

Advance Power Company, Chicago. Inspection car. Represented by Mr. Warner. Space 215.

Alamo Manufacturing Company, Hillsdale, Mich.—Gasolene, gas, kerosene and distillate engines for railway service, pumping outfits, charging storage battery plants. Represented by L. A. Hopkins, J. L. Benedict, B. L. Winchell, Jr., R. A. Paterson, H. F. Worden, L. C. Thompson Space 99.

Alexander Crossing Company, Clinton, Ill.—Continuous-rail, non-pounding crossings. Represented by M. J. Hinchcliff, C. R. Wescott, I. N. Brown. Spaces 204-5-8-9.

Allith Manufacturing Company, Chicago.—Approved fire-door; warehouse door; continuous parallel door; merchandise carrier. Represented by W. D. Jameson, W. C Lang. Space 116.

American Concrete Company, Chicago.—Reinforced concrete pipe, piling and girders. Represented by O. J. West, G. H. Scribner, Jr., O. P. Scribner, D. S. Edwards. Space 15.

American Guard Rail Fastener Company, Philadelphia.—Anchor guard rail clamps, tie plate guard rail fasteners, Vaughan automatic rail anchors. Represented by D. F Vaughan. Chas. Z. Vaughan. Space 118.

American Hoist & Derrick Company, St. Paul, Minn.—Moving pictures, "American" railway ditcher, hoisting engines, etc. Represented by Frank J. Johnson, W. L. Manson, W. O. Washburn. Spaces 189, 190 and 191.

American Locomotive Company and Atlantic Equipment Company, New York and Chicago.—Photographs, catalogues and pamphlets of steam shovels, locomotives, dredges, rotary snow plows and automobiles. Represented by John H. Wynne, Ottis Parsons, Edwin M. Hall, A. M Sheffer. Space 30.

American Rail Joint Company, Toronto, Canada.—Reinforced angle bars. Represented by Tho. D. Beddoe. Space 194.

American Railway Device Company, Chicago.—Track specialties, tool grinder attachment for handcars, anti-rail

creepers, Economy separable switch points. Represented by O. Metcalf, Jr. Space 177.

American Railway Signal Company, Cleveland, Ohio.—Electric Automatic signals; electric switch locks; electric dwarf signals; lower and switch indicators; relays and electric interlocking apparatus. Represented by G. L. Weiss, H. M. Abernethy, H. D. Abernethy, J. L. Burrows. Spaces 22 and 23.

American Railway Steel Tie Company, Harrisburg, Pa.—Combination steel and asphalt ties. Represented by John G. Snyder.

American Steel & Wire Company, Chicago.—Right-of-way fencing, rail bonds, triangle mesh concrete reinforcement, nails and wire, electrical wires, W. & M. telephone wire. Represented by B. H. Rider, H. S. Durant, R. C. Moeller, C. S. Knight, J. M. Holloway, L. P. Shanahan, H. A. Parks. Spaces 69-70 and 50-51.

American Valve & Meter Company, Cincinnati, Ohio.—Water service supplies, embracing Poage improved automatic water columns; tank valves and fixtures; float valves; Fenner drop spout; track devices showing the Economy switch stands; Anderson's safety switch lock. Represented by J. T. McGarry, F. C. Anderson, Burton W. Mudge. Spaces 130 and 131.

American Vulcanized Fibre Company, Wilmington, Del.—Vulcanized fibre for rail joint insulation. Represented by John Barron.

American Well Works, Chicago.—Deep well and centrifugal pumping machinery, with any style of power, air compressors, well drilling and prospecting machinery. Represented by Geo. W. Igo, C. O. McLean, A. W. McLean. Spaces 12 and 13.

Cortlandt F. Ames, Chicago.—Hercules bumping posts, manufactured by J. M. Scott & Sons, Racine, Wis.; Automatic lock nuts, manufactured by Automatic Lock Nut Company, Rockford, Ill. Represented by J. M. Scott, E. E. Scott, Chas. Rystrom, Cortlandt F. Ames. Space 115.

Armspear Manufacturing Company, New York.—Pressed steel switch lamps, one-day and long-time burners; semaphore and train order lamps; automatic classification and train markers; steel and wire guard lanterns. Represented by F. D. Spear, C. K. Freeman, F. A. Buckley. Space 184.

Asphalt Ready Roofing Company, New York.—Roofing materials, asphalt saturated felts. Represented by Birney Blackwell, C. A. Sparrowhawk, J. A. Sturges, H. D. Keeler. Space 168.

Atlas Portland Cement Company, New York.—Samples of Portland cement. Represented by P. Austen Tomes, D. H. MacFarland, E. D. Boyer, John Evans. Space 146.

Badger Brass Manufacturing Company, Kenosha, Wis.—Locomotive and interlocking headlights. Represented by W. A. Belle, R. H. Welles, W. L. Yule. Space 220.

Barker Mail Crane Co., Clinton, Ia.—Mail crane. Represented by L. W. Barker. Space 181.

Barrett Manufacturing Company, New York.—Roofing; bridge waterproofing with bituminous binder protection; floor construction particularly adapted for repair shops and freight houses. Represented by W. S. Babcock, L. P. Sibley, H. B. Nichols, C. T. Bilyea, W. J. Walker. Space 106.

Bausch & Lomb Optical Company, Rochester, N. Y.—Engineering and surveying instruments, transits, levels, etc. Represented by W. Louis Johnson, F. M. Storr, H. D. Skelton. Space 17.

Beaver Dam Malleable Iron Company, Beaver Dam, Wis.—Tie plates and rail braces. Represented by Lawrence Fitch, J. V. Cowling, F. S. McNamara, E. A. Hawks, W. L. Douglas, D. P. Lamoreux, A. E. Martin, E. M. Cowling. Space 166.

Bird, F. W., & Son, East Walpole, Mass.—Pariod roofing, building papers and waterproofing, roof paints, etc. Represented by A. R. McAlpine, W. E. O'Neill, M. L. Caton, C. H. Martin. Space 2.

Bird, J. A. & W., & Co., Chicago.—Rex Plinkote roofing, signal railroad roofing, Concrex roofing, Zolium tile roofing, Paradux canvas top roofing, Tunaloid waterproofing felt, insulating papers, roof and damp proof paints, Ripolin enamel paint. Represented by F. E. Cooper, H. W. Benedict, F. A. Dale, M. B. Hood, Howard Schofield, Paul L. Griffiths, C. E. Rahr. Space 140.

Blocki-Brennan Refining Co., Chicago.—Carboxide, elastic metal preserver. Represented by W. F. Brennan, J. A. Early. Space 169.

Bossert, W. E., Manufacturing Company, Utica, N. Y.—Triple-lock switch stand, Bossert insulated rail joint, Bossert improved switch point adjuster, tie plate and guard rail clamp, semaphore blade clasps, Reliance spike braces. Represented by F. L. Guillaume, H. C. Williams, Willis C. Squire, F. G. Squire. Space 137.

Bowser, S. F., & Co., Inc., Fort Wayne, Ind.—Oil storage systems, Bowser self-measuring pumps. Represented by C. A. Dunkleberg, W. T. Simpson. Space 16.

Bryant Zinc Company, Chicago.—Signal supplies, battery supplies, fiber conduit, storage batteries, crossing bells, battery vaults and chutes, electrical instruments, track and linemen's tools. Represented by E. M. Deems, R. N. Baker, Stanley Bryant, H. J. Hovey, A. F. Klink, R. N. Chamberlain, R. Parmelee, P. W. Herbst, J. W. Cremerius. Spaces 153-4-5-6.

Buda Company, Chicago.—Railway motor cars and velocipedes, track drills, drill grinders, switch stands, ratchet jacks, ball bearing jacks, adjustable switch rods, solid manganese crossing, replacers, electric crossing gates. Represented by H. K. Gilbert, L. M. Viles, Wm. P. Hunt, Jr., C. H. DeLano, W. B. Paulson, J. T. Harahan, Jr., Geo. B. Shaw, L. Hamill, A. R. Dyer, J. J. Gard, H. S. Evans, W. T. Smettem, W. E. Marvel. Spaces 87-88-89-90.

Buff & Buff Manufacturing Company, Chicago.—Surveying instruments. Represented by The Engineering Agency, A. G. Frost, D. E. Rossetter. Half of space 94.

Buyers' Index Company, Chicago.—Book "Purchasing Agents, Buying List and Railway Supply Index." Represented by Lloyd Simonson, D. J. Beaton, F. B. Cozzens. Space 112.

Card & McArdle, Waukegan, Ill.—Timber-treating engineers. Represented by J. B. Card. Space 221.

Philip Carey Company, Cincinnati, Ohio.—Roofing, asbestos and magnesia products, insulating materials. Represented by R. B. Murdock, E. S. Main, C. L. Cockrell. Space 170.

Carnegie Steel Company, Pittsburg.—Section of railroad track, constructed with steel crossties, Duequesne joints and 100-lb. American Society rail, with various types of fastenings, including wedge fastenings illustrated in Bulletin No. 108. General assortment of Duquesne rail joints for principal sections of standard rails; Schoen steel wheels, including a wheel having been worn in service representing 301,374 miles; nickel-plated samples, showing various types of U. S. and Friestedt sheet piling. Represented by N. M. Hench, Edwin S. Mills, C. B. Friday, D. B. Coey, W. A. Bostwick, P. W. O'Brien, H. C. Griswold, Robt. Coe, A. R. Archer. Spaces 71-72-52-53.

Central Electric Company, Chicago.—General western agents for the Okonite Company, New York.—Okonite wires, aerial, lead covered and submarine cables, pot heads, joints, Manson and Okonite tapes, and samples of crude rubber. Represented by J. N. Lorenz, M. Cox, W. D. Dunsmore, D. M. Ayers, Lewis D. Martin, F. J. White. Spaces 203 and 210.

Channon, H., Company, Chicago.—Shovels, pumps, blocks, wheelbarrows and other railway supplies. Represented by O. W. Youngquist, Harry Keegan, B. Berntsen. Space 160.

Chicago Steel Tape Company, Chicago.—Steel tapes, leveling rods, lining poles, etc., for field use. Represented by L. A. Nichols, J. Levinson. Half of space 94.

Chicago Tie & Rail Fastening Company, Chicago.—Rail fastenings, tie plates and concrete ties. Represented by Andrew Stark, Henry Bryant, Burt F. Fuller. Space 174.

Cleveland Frog and Crossing Company, Cleveland.—"Hard Service" manganese frogs and crossings, improved spring rail frogs, switches, switch stands, guard rail clamps, Prentice anti-rail creepers, etc. Represented by G. C. Lucas, George Stanton, George A. Peabody, L. G. Parker, George Arnold, Jr. Spaces 102-3-4.

Iszard-Warren Company, Inc., Philadelphia.—"Sterling" transits and levels, engineering and drawing materials. Represented by J. Henry Warren.

Clow, James B., & Sons, Chicago.—Plumbing, steam, water and foundry products. Represented by W. E. Clow, Jr., Yates A. Adams, W. T. Brace, J. L. Ponic, W. R. Plum, L. J. Elliott. Space 33.

Conley Frog & Switch Company, Memphis, Tenn.—Conley patent frog, manganese frogs, rail braces, railway track appliances. Represented by John E. Conley, Fred C. Taylor. Space 34.

Cook Standard Tool Company, Kalmazoo, Mich.—Jacks, track drills, drill grinders, bits. Represented by E. Cook, E. H. Edelmann. Space 183.

Coulter-Paxton Company, Hammond, Ind.—Track wrench, rail drill and bonding rail drill. Represented by W. G. Paxton, J. W. Paxton, C. J. Coulter. Space 172.

Crear, Adams & Co., Chicago.—Hercules steel warehouse trucks for handling portable articles, such as freight packages, barrels, boxes, etc. Represented by C. A. Roberts,

F. R. Sheperd, P. J. Ford, Russell Wallace, J. A. Martin, C. W. Gregory, T. W. Bartlett, G. D. Bassett, G. B. Howard, R. M. Bullard. Space 95-96.

Detroit Graphite Company, Detroit, Mich.—Paint for bridges, buildings, structural steel, etc. Represented by T. R. Wyles, L. D. Mitchell, Edwin Booth, A. H. Kuerst. Space 167.

Detroit Hoist & Machine Company, Detroit.—Pneumatic and electric locomotive turn-table tractors. Represented by J. C. Fleming, F. B. Fleming. Space 191.

Paul Dickinson, Inc., Chicago.—Smoke jacks, cast iron chimneys and ventilators. Represented by J. A. Meaden, A. J. Filkins, E. W. Hodgkins, W. H. Dayton, Geo. M. Kenyon, F. C. Webb, F. W. Brydges. Space 186.

Eugene Dietzgen Company, Chicago.—A complete line of surveying instruments, leveling rods, ranging poles, tapes, rail profile machines, and other supplies which are used by engineers and surveyors both in the office and in the field. Represented by W. E. Cook, W. O. Phillips, O. S. Rhea. Space 97.

Dilworth, Porter & Co., Limited, Pittsburg.—Railroad spikes, tie plates. Represented by W. F. Schleiter. Space 26.

Joseph Dixon Crucible Company, Jersey City, N. J.—Graphite paint, lubricating graphite, crucibles and plumbago. Represented by E. R. Smith, B. B. Worley, H. W. Chase. Space 117.

Dressel Railway Lamp Works, New York.—Switch lamps, semaphore lamps, tower lamps, station lamps, engine lamps, tail marker lamps, caboose lamps, crossing gate lamps. Represented by Robert Black, E. W. Hodgkins, F. W. Edmunds, A. P. Grenier, W. H. Dayton. Space 5.

G. Drouve Company, Bridgeport, Conn.—Anti-Pluvius puttyless skylights and sash operators, "Lovell" and "Straight Push." Represented by William V. Dee, George J. Adams, R. S. Adam, A. H. Bates. Space 158.

Duntley Manufacturing Company, Chicago.—Rockford gasoline section and inspection cars, Rockford track weeder, Duntley pneumatic cleaners. Represented by L. C. Thompson, H. F. Worden, J. G. Minert, E. J. Cornish, R. A. Patterson, B. L. Winchell, Jr., Geo. M. Kenyon. Spaces 81 and 100.

Duplex Metals Company, New York.—Copper clad steel wire, model of coating process and material in various stages of manufacture; samples of all kinds. Represented by Frank R. Chambers, Jr., James F. Kinder, Wirt Tassin, George Wolf, W. T. Kyle, Geo. B. Muldaur, Jas. A. Waugh. Spaces 38 and 39.

Eastern Granite Roofing Company, New York.—Granite roofing, Evertite crushed stone roofing, Tisbest smooth surface roofing. Represented by H. Henning, P. G. Kennett, A. W. Turner, C. F. Barstow. Space 129.

Economy Separable Switch Point Company, Inc., Louisville, Ky.—"Mitchell" and "Palmer" types separable switch points; Economy separable claw bars. Represented by W. M. Mitchell, W. M. Mitchell, Jr., B. B. Betts. Space 187.

Edison Manufacturing Company, Orange, N. J., and Chicago.—B. S. C. O. and Edison primary batteries for signal work, automatic block signals, crossing bells. Represented by E. E. Hudson, F. J. Lepreau, E. W. Brown. Space 151.

O. M. Edwards Company, Syracuse, N. Y.—Railroad padlocks and railway devices. Represented by C. H. Rockwell, Russell Hotchkiss. Space 150.

Electric Storage Battery Company, Philadelphia.—"Chloride Accumulator" batteries for drawbridge operation and "Chloride," "Tudor" and "Exide" types for car lighting, signal, interlocking and automatic block signal work. ET. couple types for small lighting plants and telegraph service. Represented by G. H. Atkin, T. Milton, R. I. Baird, T. A. Cressey. Space 149.

Fairbanks, Morse & Co., Chicago.—Motor cars, standpipes, pumping machinery, dynamos, drills, scales, etc. Represented by A. A. Taylor, C. W. Kelley, R. E. Derby, L. H. Matthews, F. M. Condit, F. H. Clark, C. D. Walworth, R. D. Head, F. F. French, F. E. Church, H. C. McClary, S. F. Forbes, J. G. Jones, J. A. Steele, E. M. Fisher, L. Norvell, F. B. Roy, A. F. Young, H. D. Smith, A. C. Dodge, F. H. Douglas. Spaces 35-6-7 and 54-5-6.

Federal Signal Company, Albany, N. Y.—Electrical and mechanical signaling and interlocking apparatus. Represented by J. T. Cade, A. Dean, Jr., H. H. Cade, W. H. Reichard. Space 93.

Ford & Johnson Company, Chicago.—Line of Perfection railroad seats and chairs for parlor and buffet cars. Also rattan seating. Represented by Benjamin H. Forsyth, Walter J. Bennet, Clarance A. Van Derveer. Space 159.

Frank M. Foster, Columbus, Ohio.—Foster interlocking switch stands with independent facing point lock and distant signal operated with one movement of one lever. Represented by Frank M. Foster, George E. Kalb. Space 138.

Franklin Manufacturing Company of Pennsylvania, Franklin, Pa.—Asbestos reinforced corrugated roofing or siding, asbestos "Century" shingles, asbestos building lumber and asbestos lumber smoke jacks, asbestos pipe coverings, Chapman circular glass cutter. Represented by R. J. Evans, E. R. Rayburn, L. B. Melville, F. S. McNamara, John G. Sanborn. Space 6.

Thomas A. Galt, Sterling, Ill.—Steel-cushioned railroad tie. Represented by J. W. Hatch, E. W. Aument, E. L. Galt, Thomas A. Galt. Space 224.

General Railway Signal Company, Rochester. N. Y.—All electric interlocking machines, electric switch movements, various types of power signals, automatic signals, manual control signals, relays and other such devices. Represented by W. W. Salmon, L. Thomas, W. K. Howe, Geo. D. Morgan, F. L. Dodgeson, M. R. Briney, J. L. Langdon, H. M. Sperry, M. Wuerple, C. O. Poor, J. B. Evans, G. H. Macdonough, W. R. Young, F. H. Jones. Spaces 57-8-9-60.

Goheen Manufacturing Company, Canton, Ohio.—Preservative coatings for iron and steel. Represented by A. W. Price, G. L. Clapper. Space 109.

Peter Gray & Sons, Inc., Boston.—Railroad lamps and lanterns. Represented by Geo. M. Gray, J. M. Brown. Space 175.

Greenlee Bros. & Co., Chicago.—Railway tie boring, plugging and facing machines (Kendrick patents), screw spike driving machines. Represented by J. A. Lounsbury, O. V. Haegg. Space 7 and 8.

Grip Nut Company, Chicago.—Grip nuts, special grip holding nuts. Represented by E. R. Hibbard, Herbert Green, B. L. McClellan, W. G. Wilcoxson, B. C. Wilt, R. A. Flum, B. J. Bernhard, J. W. Hibbard. Space 40 and 41.

Hall Signal Company, New York.—Railway signals and accessories. Represented by W. J. Gillingham, Jr., W. H. Lane, W. G. Hovey, H. L. Hollister. Space 80.

Handlan-Buck Manufacturing Company, St. Louis.—Lamps, lanterns, long-time burners, Cairncross train indicators, track tools, McPartland rail clutches, metallic slow flags, and metallic train flags. Represented by A. H. Handlan, Jr., R. L. Cairncross, E. W. Handlan. Space 125.

Hart Steel Company, Elyria, Ohio.—Railroad tie plates and standard spikes. Represented by W. S. Miller, W. T. Bentz, Willis McKee, G. S. Wood, A. W. DeRocher, H. W. Davis, J. M. Van Harlingen. Space 101.

Hayes Track Appliance Company, Geneva, N. Y.—Hayes derails and attachments. Represented by S. W. Hayes, W. Harding Davis, Wellington B. Lee, Arthur Gemunder, K. M. Thompson, S. W. Wallace. Space 139.

Heath & Milligan Manufacturing Company, Chicago.—Siding finished with Way & Station paint and panels decorated with Durotone, a new and unique paint which dries absolutely flat, with a velvet-like, soft finish, which is sanitary and waterproof, and at the same time possesses unusual wearing qualities. Also a brineproof paint and rust inhibitive; paints and finishes for all seam and electric railway painting purposes. Represented by A. M. Heath, B. H. Pinkerton, J. H. Vance, C. R. Arnold, J. B. Campbell. Space 179.

Hobart-Allfree Company, The, Chicago.—Smyth and Freeland derailers; Newton car replacers. Represented by E. H. Allfree, W. H. England, Frank P. Smith. Space 148.

Hoskins Rail Chair Company, Chicago.—The Hoskins Combined Rail Joint and Chair. Represented by Zachary T. Hoskins, N. L. Towle. Space, half of 198.

James O. Heyworth, Chicago.—Three-yard bucket of the Heyworth-Newman excavator. Represented by H. N. Elmer, R. A. Meredith.

Interlocking Nut & Bolt Company, Pittsburg.—The Clark nut lock, as applied to track bolts; frog and crossing bolts; steel tie bolts, bolts for interlocking work, track bolts for cars. Represented by R. A. Clark. Space 185.

H. W. Johns-Manville Company, New York.—Asbestos and magnesia materials, electrical supplies, roofings, smoke jacks. Represented by J. E. Meek, J. C. Younglove, F. M. Gilmore, C. E. Murphy, H. A. Waldron, J. M. Trent, P. C. Jacobs, G. W. Risteen, Jr., R. A. Hamaker, H. G. Newman, H. T. Morris. Space 144.

O. F. Jordan Company, Chicago.—The Jordan earth and ballast spreader and snow plow combined. Represented by M. J. Woodhull. Space 181.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Manufacturers of hand, push and velocipede cars, improved track drills, jacks, pressed steel wheels, crossing

gates and other track appliances. Represented by John McKinnon, Chas. B. Hays, Frank B. Lay, C. A. Wallace, Donald A. Stewart, Geo. W. Mingus, W. I. Clock, H. C. Wilson. Spaces 24 and 25.

Joyce-Cridland Company, Dayton, Ohio.—Hydraulic and all other types of jacks. Represented by F. I. Joyce, George W. Llewellyn, N. Kohl, C. F. Palmer, Edwin Romeiser. Space 77.

W. K. Kenly Company, Chicago.—Security anchor tie plate, Gump car replacer, Latimer switch point lock, Universal carrier base, Arctic water box, Manhatton compromise joint, Moore trick drills, Kalamazoo velocipedes. Represented by A. P. Van Schaick, W. J. Fauth, Gerard Van Schaick. Spaces 78-79.

Kennicott Water Softener Company, Chicago Heights, Ill.—Water softening machinery. Represented by Cass L. Kennicott, Edwin J. Flemming, Frank S. Dunham, T. J. Windes. Space 74.

Kerlin Automatic Post Machine Company, Delphi, Ind.—Cement post machine; reinforcement for concrete post and concrete railroad tie. Represented by Wm. F. Kerlin, E. W. Bowen, E. R. Smock, Rega Porter, Wm. Donlin, R. C. O'Connor, W. A. Eldridge, Roy Kennedy, S. Benefield. Spaces 211-212-213.

Kerite Insulated Wire & Cable Company, New York.—Kerite insulated wires and cables. Represented by Azel Ames, P. W. Miller, J. V. Watson, B. L. Winchell, Jr., R. A. Paterson, E. B. Price, J. A. Renton. Spaces 61 and 62.

Keystone Driller Company, Chicago.—One large size double-stroke geared pump head for deep wells; plungers, working barrel, one model double-stroke geared pump in operation; also catalogue of deep well drilling machinery. Represented by E. O. Eyer, R. M. Downie. Space 188.

Kueffel & Esser Company of New York and Chicago.—Drawing materials, surveying instruments, drawing instruments, measuring tapes, etc. Represented by Rudolph Link, G. C. Moore. Space 98.

Lackawanna Steel Company, New York.—Rails, rail joints, structural and bridge material, reinforced concrete bars, steel sheet piling and track supplies. Represented by C. R. Robinson, G. A. Hagar, C. H. Hobbs, Blythe Harper. Spaces 31 and 32.

Lehon Company, Chicago.—Roofings, waterproofings and paints; manufacturers Roofite roofing with over-seal lap; Roofite car and cab roofing; Roofite waterproofed canvas for passenger cars; Roofite sill covering; mule-hide rubber roofing; Dry-Art insulating paper; Polar-Bear insulating paper; Lehon's duplex refrigerator felt; Niagara waterproof paper; Roofine paint; Damptite waterproofing compound. Represented by Tom Lehon, John T. Sullivan, C. E. Rice. Space 220.

Lidgerwood Mfg. Co., Chicago.—Incline car hoist. Represented by Frank D. Knight, W. G. Wilmot. Space 196.

Link-Belt Co., Chicago.—Elevating and conveying specialties as applied to the handling of coal, freight, etc., by railways; photographs, printed matter, etc. Represented by J. C. Nelligar, W. W. Sayers, R. C. Turner. Space 128.

Lufkin Rule Company, Saginaw, Mich.—Measuring tapes of all descriptions; steel rules, etc. Represented by Theo. Huss, S. B. McGee, B. F. Gould, F. G. Brown. Space 121.

Lutz-Lockwood Manufacturing Co., Aldene, Union Co., N. J.—Lutz primary cells (disc type), Gordon primary cells and "SX" ignition dry cells. Represented by W. M. Kinch, Geo. Marloff. Space 133.

David Lupton's Sons Company, Philadelphia.—Lupton steel sash; Lupton rolled steel skylight; Pond operating device; Pond continuous sash. Represented by Clarke P. Pond, George P. Heinz. Space 92.

Mackenzie-Klink Publishing Co., Chicago.—The Signal Engineer; The Signal Directory; Railway Electrical Engineer; Modern Machinery. Represented by L. B. Mackenzie, A. F. Klink, A. D. Cloud, Edward Wray, Edward Hammond, J. P. Sharpe, C. E. Gould, Fred W. Bender. Space 136.

Indianapolis Switch & Frog Company, Springfield, Ohio.—Manganese frogs, crossings, switches, etc. A special showing of I. Sw. & F. Co. Model R-N-R manganese frogs and tests. Represented by E. C. Price, W. H. Thomas, W. L. Walker, T. D. Hanley, G. S. Shaw, J. A. Foulks. Space 182.

Manganese Steel Rail Company, New York.—Manganese steel products consisting rails, sheets, plates and forgings. Represented by F. W. Snow, Sumner T. McCall, Oakley W. Cooke, E. Payson Cooke, W. S. Potter, F. C. Stowell, J. R. Aigeltinger.

Mann McCann Co., Chicago.—Graders, spreaders, snow plows, smoke jacks, track movers, flue rattlers, ventilators, etc.; The Mann No. 3 Universal machine. Represented by O. C. Mann, L. C. Mann. Space 176.

C. F. Massey Company, Chicago.—Railway signal materials. Massey battery wells. Represented by C. F. Massey, Wm. H. Powell, R. J. Collins, E. J. Relph Space 134.

W. N. Matthews & Brother, St. Louis.—Matthews guy anchors, telephone jack boxes and plugs for dispatching systems, cable clamps, cable splicing joints, lamp guards, and other money saving specialties. Represented by Clause L. Matthews, W. N. Matthews, Victor L. Crawford, Walter E. Bichoff. Space 142.

Alexander Milburn Co., Baltimore, Md.—Portable lights. Represented by A. F. Jenkins, Benj. Surjcek. Space 216 Annex.

Miracle Pressed Stone Company, Minneapolis, Minn.—Collapsible steel forms for concrete culvert and sewer construction. Represented by O. U. Miracle. Space 14.

Morden Frog & Crossing Works, Chicago.—Unity switch stand operating distant signal and facing point switch with positive point lock. Parallel ground throw, G. L. M. switch stand, rigid manganese steel frogs; guard rail clamps; switch adjustments; rail braces; slide plates; track jacks; compromise joints, etc. Represented by Arthur C. Smith, H. M. Macke, D. H. Cusic, W. J. Morden. Space 86.

Morgan Frog & Crossing Co., St. Louis.—Continuous rail boltless frog. Represented by B. J. Morgan, G. H. Kelley. Space 192. Annex.

Burton W. Mudge & Company, Chicago.—Adams motor car, safety mail crane. Represented by Burton W. Mudge, C. M. Mudge, Geo. E. Simmons, Otto P. Hennig, W. E. Adams. Spaces 113-114.

Municipal Engineering & Contracting Co., Chicago.—Chicago improved cube concrete mixer. Represented by C. E. Bathrick. Space 19.

National Electric Specialty Company, Toledo, O.—Space 223. Annex.

National Lock Washer Company, Newark, N. J.—Nut locks. Represented by F. [illegible]. Archibald, G. E. Bake, F. B. Buss, John B. Seymour. Space 124.

National Malleable Castings Company, Cleveland.—Malleable track specialties. Represented by F. R. Angell, H. I. Hiatt, J. J. Byers. Space 145.

National Roofing Co., Tonawanda, N. Y.—Mineral asphalt roofing; gravel and feldspar surfaced; asphalt roof coating; asphalt paints; graphite paints; stack paint and metal protecting paints. Represented by O. H. Dean, A. E. Arbuckle, D. A. Bonitz, H. R. Sinnett. Space 195.

Geo. P. Nichols & Bro., Chicago.—Electric turntable tractor and drawbridge specialties; also photographs of transfer tables, turntable tractors and drawbridge installations. Represented by Geo. P. Nichols, S. F. Nichols. Space 173.

O. K. Nut Lock Co., Providence, R. I.—Bolts of all kinds equipped with O. K. Nut Lock. Represented by John R. Armstrong. Space 222, Annex.

Ohio Post Mold Company, Toledo, Ohio.—One six-post machine, two six-post machines designed for steam curing kilns. Several posts. Represented by E. S. Smith, A. M. Smith. Space 201.

Okonite Company, New York.—Central Electric Co., Chicago, general western agents: Okonite wires, aerial, lead covered and submarine cables, pot heads, joints, Manson and Okonite tapes and samples of crude rubber. Represented by Lewis G. Martin, F. J. White, J. M. Lorenz, M. Cox, W. D. Dunsmore, D. M. Ayers. Spaces, 203-210.

Spencer Otis Company, Chicago.—Economy railway tie plates. Represented by W. L. DeRemer, H. H. Hart, Carter Blatchford. Spaces, 122 and 141.

Otto Gas Engine Works, Chicago.—Coal chute machinery and spouts, guard rail clamp, gasoline engines. Represented by T. W. Snow, R. E. Gurley, H. C. Harnish, C. C. Lazenby, R. A. Ogle. Spaces 49 and 68.

Pacific Timber Preservative Company, Spokane, Wash.—Treated cross-ties, telephone and telegraph poles and fence posts. Comparison of results in actual track service. Represented by Robert E. Allen. Space 11.

W. W. Patterson Company, Pittsburg.—Double extra heavy wood tackle blocks for manila rope; double extra heavy steel tackle blocks for wire cable. Represented by W. W. Patterson, Jr. Space 147.

C. F. Pease Co., Chicago.—Automatic blue and white print machinery and engineering and drafting room supplies, consisting of automatic equipments for printing, washing and drying both blue prints and direct white prints by one continuous operation; also trimming tables and other blue print apparatus, as well as a full line of Sterling engineering transits, levels, etc. Represented by C. F. Pease, P. M. Morgan. Spaces 161 to 164, inclusive.

Pennsylvania Steel Company, Steelton, Pa., and Maryland Steel Company, Sparrows Point., Md.—Solid Manard crossing, No. 40; Manard anvil face frog, design 160, section No. 235; No. 10 solid Manard frog, section No. 235; No. 10 spring rail frog, design 278, section No. 235; sample Never-

Turn split bolt; Never-Slip slide plate; New Process switch with rolled Manard (improved manganese) stock rail; intermediate main line safety switch stand, Model 56-B; low New Century switch stand, Model 51-A; low Steelton positive switch stand, Model 52-A; intermediate New Century switch stand, Model 50-E, with semaphore attachment; rolled Manard (improved manganese) rails; solid cast Manard frogs. Represented by C. W. Reinoehl, B. L. Weaver, G. S. Vickery, Wm. M. Henderson, N. E. Salsich, Robert E. Kelknap, H. F. Martin, J. C. Jay, Jr., C. S. Clark, R. M. Lechthaler, Drew Allen, W. H. Allen, M. L. Long, H. G. Barbee, J. W. Hennessey, C. F. Rolland. Spaces 45-6-7-8 and 64-5-6-7.

Pittsburg Steel Company, Pittsburg.—"Pittsburg Perfect" fencing for railroad right-of-way. Represented by W. R. Marsh, E. D. Finlay, E. Steytler. Space 197.

Pocket List of Railroad Officials, New York.—Pocket List of Railroad Officials. Represented by J. Alexander Brown, Chas. L. Dinsmore. Space 26.

D. & A. Post Mold Co., Three Rivers, Mich.—"D. & A." concrete post machinery and molds; specimens of reinforced cement posts; also sections of same showing construction, materials used; also different methods of reinforcement, as applied to the farm, vineyard and railway use. Represented by G. H. Dougherty, L. R. Dougherty, O. Dougherty. Space 132.

Potter-Winslow Company, Chicago.—Reinforced concrete battery vaults, concrete battery chutes, storage battery containers, concrete foundations, concrete posts and signs. Represented by Frank H. T. Potter, A. C. Heidelberg, W. R. Potter. Space 185.

Q. & C. Company, New York.—Bonanzo joints; step joints, insulated joints, anti-rail creepers, rail saws, rail benders, guard rail clamps, guard rail braces, rail braces, castings, bolts and nuts, cement and metal ties. Represented by C. F. Quincy, G. C. Isbester, Geo. L. Hall, T. B. Bowman, J. V. Wescott, J. A. Bodkin. Spaces 119-120.

Rail Joint Company, New York.—Continuous Wever and Wolhaupter types, base supporting rail joints. Represented by V. C. Armstrong, L. F. Braine, W. E. Clark, J. A. Greer, Percy Holbrook, H. C. Holloway, J. G. Miller, F. A. Poor, E. L. Vandresar, B. Wolhaupter, F. C. Webb, E. A. Condit, Jr., S. J. Collins. Space 82.

Railroad Fence Works, Chicago.—Railroad fencing. Represented by E. G. Fisher. Space 165.

Railroad Supply Company, Chicago.—Tie plates, derailers, signals. Represented by E. H. Bell, C. P. Cogswell, Jr., M. J. Comerford, E. W. Vogel, A. H. Smith, G. W. Daves, H. M. Bulk, W. H. Dayton, Frank C. Webb. Space 85.

Railway and Engineering Review, Chicago.—Represented by Willard A. Smith, Walter M. Camp, Clyde F. Burns, J. M. Lammedee, Paul R. Brooks, A. E. Hooven, G. E. Ryder, P. G. Stevens, Harold A. Smith. Space 20.

Railway Age Gazette, Chicago.—Railway Age Gazette, Daily Railway Age Gazette and standard railway publictions. Represented by Edward A. Simmons, Ray Morris, Samuel O. Dunn, Lucius B. Sherman, John N. Reynolds, Frank S. Dinsmore, Cecil R. Mills, Bradford Boardman, William Forsyth, George L. Fowler, Francis E. Lister, H. H. Simmons, Henry Lee, William E. Hooper, Francis W. Lane, S. H. Ankeney, W. H. Arkenburgh, T. E. Crossman. Spaces 44 and 63.

Railway List Co., Chicago.—The Monthly Official Railway List, Railway Master Mechanic, Railway Engineering and Maintenance of Way. Represented by Wm. E. Magraw, C. S. Myers, C. C. Zimmerman, G. Miller, L. F. Wilson, N. F. Rehm, O. N. Middleton. Space 112.

Railway Specialty & Supply Co., Chicago.—P. & M. rail anchors, arc damp lightning arresters; photographs showing effect of rail creeping, signal accessories. Represented by Philip W. Moore, L. W. Kent, A. G. Rockwell, F. A. Preston. Space 105.

Rampo Iron Works, Hillburn, N. Y.—Automatic safety switch stands; manganese pointed switches; manganese center frogs, rolled manganese steel rail, etc. Represented by F. W. Snow, Arthur Gemunder, W. B. Lee, W. C. Kidd, F. C. Stowell, Jas. B. Strong. Spaces 91 and 110.

Roberts & Schaefer Co., Chicago.—Working model of Holmen-Barrett coaling station, working model of Sauerman Siamese coal breaker, and enlargements of photographs of various types of coaling stations. Represented by Edward E. Barrett, Clyde P. Ross, Hiram F. Post, James S. Shannon. Space 73.

St. Louis Steel Foundry, St. Louis.—Solid manganese steel frogs, crossing and inserts for steam and electric railways. Represented by J. H. Steedman, J. N. Maher. Space 3 and 4.

Scherzer Rolling Lift Bridge Company, Chicago.—Models, photographs, designs, plans, drawings, and literature. Represented by A. H. Scherzer, C. L. Keller, J. I. Vincent, J. T. Dickerson, W. F. Martin, H. D. Harting, R. W. Flowers. Space 178

Sellers Manufacturing Company, Chicago.—Tie plates, angle bars, "Sellers Anchor Bottom Tie Plate." Represented by J .M. Sellers J. T. Markman, L. S. Gordon. Space 123.

Standard Asphalt & Rubber Co., Chicago.—Sarco products and Sarco methods for water proofing concrete surfaces. Represented by W. H. Lawrence, R. E. Kartack. Space 1.

Strauss Bascule & Concrete Bridge Company, Chicago.—Drawings and models of Strauss trunnion bascule bridges. Space 157.

Strauss Self-Balancing Window Company, Chicago.—Drawings and models of Strauss self-balancing windows for buildings, cars, vessels, etc. Space 157.

Strobel Steel Construction Company, Chicago.—Models of basculé bridges, photographs of bridges, center of locomotive turntables. Represented by Theodore Rall, J. C. Holland, E. Haupt. Space 180.

Streeter-Amet Weighing & Recording Company, Chicago.—Automatic weight recording machine for railroad track scales for weighing carload shipmentts, and automatic quick weighing dial attachment for freight warehouse and baggage scales for weighing L. C. L. freight. Represented by Fred Cruikshank, Fred H. Nemitz, Geo. Goetz, Chas. Gordon. Spaces 199 and 200, Annex.

Templeton, Kenly & Co., Ltd., Chicago.—Simplex track and car jacks. Represented by A. E. Barron, J. H. Hummel. W, B. Templeton. Space 126.

Union Fibre Company, Winona, Minn.—Linofelt insulating quilt for covering ice house, Linofelt sound deadening quilt for office buildings and other structures, waterproof lith board for insulating ice houses and cold storages! refrigator Linofelt for insulating refrigator cars. Represented by F. J. Bingham, S. E. McPartlin, H. W. Leeds, J. H. Bracken. Space 171.

Union Switch & Signal Co., Swissvale, Pa.—Interlocking and signaling apparatus for steam and electric railways, including electro-pneumatic and electric interlockings in operation; signals, relays and other apparatus for A. C. or D. C. automatic block signaling; staff system and other controlled manual apparatus; electric crossing gates and bells; Keystone insulated rail joints; mechanical interlocking details, etc. Represented by H. G. Prout, J. G. Schreuder, J. S. Hobson, S. G. Johnson, J. P. Coleman, M. D. Hanlon, L. F. Howard, T. H. Patenall, W. H. Cadewallader, J. D. Taylor. H. McCready, W. E. Foster, George Blackmore, W. M. Vandersluis, C. C. White, H. S. Beakes, E. T. Barnes. Space 42-43.

U. S. Metal & Manufacturing Co., New York.—"Diamond" tapered steel poles; Wolfe automatic rail joint lock; Columbia lock nuts. Represented by B. A. Hegeman, Jr. F. C. Dunham, H. A. Hegeman, Arthur Masters. Space 18.

U. S. Wind Engine & Pump Co., Batavia, Ill.—Water columns, tanks, tank fixtures, steel substructures (all in model); switch stands. Represented by L. E. Wolcott, A. J. Anderson, C. E. Ward. Space 111.

Wm. Wharton Jr., & Company, Inc., Philadelphia, Pa.—Manganese steel switches, frogs, crossings, and movable points; switch stands, guard rail clamps, anti-creepers, models, photographs, etc. Represented by V. Angerer, L. R. Ashhurst, Jr. R. C. McCloy, W. B. Cooke, W. McLain. Arthur S. Partridge. Spaces 9-10-27-28 and 29.

Weir & Craig Manufacturing Co., Chicago.—Electric turntable tractors; compressed air turntable tractors; electric portable hoists; compressed air portable hoists; locomotive drop pit jacks (pneumatic and hydraulic). Represented by Fred G. Whipple, R. W. Young, J. D. Granville, H. B. Shreve. Space 143.

Weisell Nut Lock Company, Chicago.—A nut lock in the form of a lock nut, which depends upon a wedge principle. It follows the thread of the bolt into the head of the nut, operating as a wedge-fulcrum. Represented by C. J. Grady, S. Glenn Andrus, T. Turner. One-half of space 201.

C. H. Whall & Company, Boston.—"Whall's Special Railroad Fibre" for insulating rail joints, etc., and fuses for train protection. Represented by F. R. Whall, John B. Given. Space 127.

Winans Improved Patent Rail-Joint Co., Portland, Ore.—A base supported rail joint. Represented by Audubon Winans. Space 185½.

Winters-Coleman Scale Company, Springfield, Ohio.—Automatic weighing machinery; Osgood and Sonander systems. Represented by Randolph Coleman, H. B. Osgood, C. F. Byerly. Spaces 107 and 108.

Worth Wire Works, Kokomo, Ind.—Demonstrating the appli-

cation of the "Cinch" fence stay, as used on railroad right-of-way fencing, to keep the line wires from spreading or sagging, at a minimum number of posts. Represented by O. H. Buck, W. N. Hall, F. Craig. Space 219.

Lewis Wylder, Cathay, N. D.—Models in reinforced concrete and metal railway ties. Represented by Lewis Wylder. Space 221.

Yale & Towne Manufacturing Co., New York.—Triplex blocks, padlocks, door checks. Represented by R. E. Gedney, C. H. VanWinkle, D. A. Wright, R. Kleinsmid, H. R. Butler. Space 152.

THE SHANTUNG RAILWAY.

The lease of Kiaochow by Germany in 1898 for 99 years was the outcome of the murder of two German missionaries in the province of Shantung in 1897. The commander of the German squadron took possession and a demand was made on the Peking government for the punishment of the governor of Shantung, an indemnity to the families of the victims and an amount to reimburse Germany for the cost of occupation, besides securing a preference for German railway enterprise in that province. These demands were acceded to, and with the signing of the lease a railway convention was concluded providing for the construction by Germany of two lines of railway in Shantung. One from Kiaochow and Tsinan-fu to the boundary of Shantung province, via Wei-hsien, Tsinchow, Pashan, Tsechuen and Suiping; the second to connect Kiaochow with Chinchow.

In order to carry out the railway work a Chino-German company was formed, and in this company both German and Chinese subjects were at liberty to invest money and appoint directors for the management of the undertaking.

It was also provided that if at any time the Chinese should form schemes for the development of Shantung, for the execution of which it is necessary to obtain foreign capital, the Chinese government, or whatever Chinese may be interested in such schemes, shall, in the first instance, apply to German capitalists. Application shall also be made to German manufacturers for the necessary machinery and materials before the manufacturers of any other nation are approached. Should German capitalists or manufacturers decline to take up the business, the Chinese shall then be at liberty to obtain money and materials from sources of other nationality than German.

A company to be known as the Shantung Eisenbahn Gesellschaft was organized at Berlin with a capital of 54,000,000 marks ($13,000,000). By its concession the syndicate was to build a line from Tsingtau to Kiaochow, and from the latter point by way of Weihsien to Chinanfu, together with a branch to Poshan, within a period of five years. The main line was completed in 1904, a distance in all of 240 miles. The branch to Poshun is 34 miles in length, making, in all, 274 miles approximately. The proposed line between Ichowfu and Chinanfu was abandoned in favor of the Anglo-German syndicate in connection with the construction of the Tientsin-Pukow line. The Kiaochow-Ichowfu line was surveyed, but further work was abandoned. The cost of the line was approximately $47,500 a mile. The editor of the London and China Express, who visited Shantung in 1907, made the following report:

"The Shantung railway is standard gage and the rails are laid on iron ties. Moderate weight rails are employed, and at present no fast speeds are attempted. The journey takes 13 hours, of which nearly three hours were stops. The stations are good, useful buildings, without ostentation. The bridge work over the many shallow rivers and streams, which in the rainy season often become raging torrents for a short time, is fairly solid, and the roadbed in good order. According to the last available figures, those for 1906, the stock comprised 30 locomotives, 107 passenger and baggage cars, and 720 freight cars.

Proceedings

The March meeting of the Railway Signal Association began at 10:20 A. M., Monday, March 14, at the Congress Hotel, Chicago, being called to order by Vice President C. E. Denney (L. S. & M. S.).

The first standing committee report was that of Committee No. 1, on Signaling Practice. The chairman, A. H. Rudd (Penna. R. R.), read the following progress report on upper left hand quadrant signals, making certain comments, as indicated.

In response to a circular letter, twenty-six replies were received, and only two or three signal engineers took interest enough in the subject to answer. The committee, decided to report against recommending the use of upper left hand quadrant signals for the following reasons:

While the upper right hand quadrant meets the requisites of the American Railway Association, the upper left hand is not in accord with them, and we believe that unless very decided advantages are shown for the use of the upper left hand over those of the upper right hand, the effort (involving as it must, a large amount of discussion and labor to induce the American Railway Association to change its requisites) would not be warranted. The Railway Signal Association has already by a large vote recommended the upper right hand quadrant, as also has the American Railway Engineering and Maintenance of Way Association, and these recommendations should not be changed unless, as cited before, very decided advantages are shown. From the data at hand, the committee did not feel that these advantages were developed. It is doubtless the case that if left hand quadrant signals had been used from the inception of signaling in the United States a great many situations would have developed and, in fact, some have been brought to the attention of the committee where upper right hand quadrant signals would have been more advantageous On the other hand, the situations where the upper left hand would be of advantage are so few in comparison with the number of signals already installed, that a change is not, in our opinion, warranted. Several cases have been cited where right hand signals are now located on through bridges, the arm being very difficult to discern, as it sticks through and outside of the bridge structure. Attention is drawn to the fact that if left hand signals were used the arm could be seen. In several of these cases if the arm projected to the left it would have been struck by passing trains, specially if signals carrying more than one arm were used.

(Mr. Rudd: As far as I have been able to reach the committee, all the members are against the upper left hand quadrant, as well as the chairmen of Committees 2, 3 and 4. I have not heard yet from Messrs. Patenall, Ingalls, or Temple. They voted against it.)

The change to upper right hand is entirely possible at isolated interlockings or for block signals on short stretches of road, and its installation has been proved not to be confusing where upper right hand and lower right hand are used indiscriminately. With upper left hand, in the opinion of our committee, the danger which might develop through enginemen reading the back of one signal in the lower quadrant for the front of another signal in the upper quadrant, especially if arms were not kept very brightly painted, would be so considerable that signals would have to be changed on only one engine division at a time, at least. The cost of this change would be prohibitive, while if upper right hand signals are installed no such change is required, and they may be put in for new work and renewals without extra expense. The men are educated to the arm projecting to the right of the mast, and if a change were made they would have to be re-educated. Even then, their old habits of thought might prevail and cause trouble. In the country districts especially, bad locations can generally be avoided by care in placing the signals and in the few cases where the nature of the surroundings makes necessary locations so that signals cannot properly be seen, adequate approach information in the shape of distant signals will, in the opinion of the committee, minimize this difficulty.

(Mr. Rudd: I might say that the members who signed the minority report of Committee No. 1 of last year, have not seen this, and it is possible that some of these reasons they might not endorse, but they endorse the position of the committee against the upper left hand quadrant.)

While the point has been made that telegraph lines, power lines, overhead trolley construction, etc., are increasing to such a degree as to require upper left hand signals, it develops that the only road using such construction at present

has decided on the so-called upper left hand quadrant signal which is pivoted on center and is half upper left hand and half lower right hand in its indication, although, in the clear position, it stands well out to the left of the post. In the stop position only half the arm projects to the left. It is possible that left hand signals may be used on trolley roads but, in the opinion of the committee, as above cited, obstructions of telegraph lines, power lines, etc., in the open country are not serious and in congested districts, the tendency is to put such wires underground and remove them from places where they will conflict with the sight of signals and further, while it is possible that the steam roads in electrifying will use overhead construction and will employ trolley wires for transmitting their power to the motors, we believe that with the exception of the one road in question, the recent installations have been largely of the protected third rail type which does not obstruct the view of signals. All things considered, therefore, unless stronger points are brought out in favor of this radical change than those already presented, we are of the opinion that the action of the association should be adhered to and upper right hand rather than upper left hand quadrant signals should be used for all new work and renewals.

Mr. Rudd: After this report was made we had a letter from a signal engineer, in which he called attention to the train order signals, two arms on one post, one to the right and one to the left, on single track, with trains moving in both directions, the use of the upper left hand on those two arms might cause very serious confusion. The following progress report of Sub-Committee No. 1 is an outline of the work done since the annual meeting in November, 1909.

The sub-committee submits six plans, described as follows:

No. 1026. Ladders for ground masts for mechanical signals.

No. 1029. Ladder clamps and stays. This drawing combines Nos. 1028 and 1029 of the 1908 issue, and includes the dimension table for clamps and stays for all sizes of masts, including the bracket post. The design is unchanged, and, therefore, no confliction can arise in ordering from either the 1908 or 1910 issues.

No. 1035. Ground signal masts, including base and pinnacle; also No. 1037, bracket post and bridge signal mast. These two drawings fix the distance between signal arms, the height of pole, height of mast, sizes of pipe, and give an outline of the base and pinnacle. The posts are made of two sections, and, in the case of the ground signal mast, they are made of two pieces of pipe instead of three, as shown in the issue of 1908. It is obvious that the use of 5-in. pipe throughout for the fastening of all connections will reduce to a minium the number of parts in signal fittings. As most all ground masts for mechanical signals are now made of three sections of pipe, in practically all cases it requires two sizes of fittings to equip a three-arm mast. This change will not require greater quantities of material than heretofore, and should eventually simplify the subject of signal fittings.

No. 1036. Base for bracket and bridge signal mast. Sketches in sufficient detail have been worked out to show that the offset base, which is submitted for approval, has advantages in the lead of mechanical connections to bracket posts and bridges. The sub-committee has not had time to prepare drawings of all the fittings to submit for approval, but details can be worked out with this design in a most satisfactory manner.

No. 1040. Pinnacle casting. Investigations with the manufacturers developed the fact that the General Electric Company and the Hall Signal Company would require a shorter pinnacle to conform to the dimensions shown on plan No. 1035 and plan No. 1037. The sub-committee has prepared a drawing, which it is ready to submit to the whole committee, along the same design as this pinnacle, but 5 in. shorter, so that any signal engineer who requires the actual dimensions and finds it necessary to put two or more different designs of signals on a bridge can have the top of masts exactly the same height.

In addition to these drawings, which have been approved by Committee No. 1, the sub-committee has prepared drawing and specifications for standard semaphore lamp, and for font; design of bracket post and ladders; design for platforms for bracket post; and base for bracket post.

We have under consideration the subject of specifications for zinc, copper clad bond wires, 1-in. wrought iron pipe, design for bolt locks, facing point locks, pipe carriers, and switch lamp, and will present for approval, if the association so desires, recommendation for standard binding post. The bracket post has received a good deal of attention, and the designs have been submitted, or are in the hands of the bridge engineers of the different roads represented by your committee members. As soon as the reports from all bridge engineers are received, a drawing will be presented for the approval of the whole committee, and we hope to have it in shape for presentation at the next stated meeting of the association. (The full committee, at Buffalo, gave the sub-committee instructions to make this drawing and that has been done.)

T. S. Stevens (A., T. & S. F.): Mr. Rudd has, with my consent, used my name in connection with the report about the upper left-hand quadrant. I believe the report in a sense is all right, but I do not think it would be worded exactly as it is, because I do not think that association can afford to condemn unqualifiedly the upper left hand quadrant. They can say it is not advisable to recommend it. I know that on the Santa Fe to-day I would be very glad if we had the upper left hand quadrant; we would have better signals unquestionably, but I know I can't get it; there is too much of the other. Appreciate what the committee says is true, that you cannot mix the two together without dangerous confusion. I do not suppose this meeting here can take any action. I would earnestly recommend that when the report is made at the annual meeting it does not condemn the upper left hand quadrant, but simply refer to the fact that this association does not think it proper to recommend it at the present time.

The Vice-President: I believe that that is the intention of the progress report, although, as you say, it may be advisable to change the wording. I assume that the committee will reconsider that feature before submitting the report to the annual meeting.

Mr. Rudd: Mr. Stevens' position is very tenable. This was drawn up without submitting it to the full committee by the chairman, on the basis of the arguments that were made at the meeting in Buffalo. I reported as nearly as I could the facts that were brought out at Buffalo and it is simply a progress report for the information of this association as to what the committee is doing. When the full report is made and approved by the entire committee I have no doubt they will change this paragraph. I don't imagine it will be necessary to publish this report in detail in the proceedings. That is the reason it wasn't printed. It was submitted for information, to give us time to talk the matter over and settle on the final report. I hope there will be some discussion on the particular castings recommended for use, and on the spacing arm. I ask this perhaps in a personal way. We are about to adopt a right-hand quadrant for our new work. We have a casting of our own, a type of our own that we have used on a small amount of upper quadrant work that has been done, and it looks as if we were going to have considerable work this year. I want to start right, and if there is any probable change of this association adopting the castings which have been submitted by the sub-committee, I want to alter my new work. If there is not a chance, I wish to stick to the old castings until something is settled, and that may be a couple of years or so.

Mr. Stevens: The Santa Fe has adopted the castings recommended by the committee, so far as the top arm is concerned. So far as the spacing of the arms is concerned, I shall always oppose the introduction of a third arm on a single mast so close to the two main arms. It is confusing and dangerous. The two arms are quite enough; we certainly ought not to go to three. While I have approved these drawings, as a member of the sub-committee, it has been with a view to accepting Nos. 1 and 2, feeling that I would never accept No. 3.

J. C. Mock (Detroit River Tunnel Co.): It seems to me that this is the place where we ought to discuss the designs that are proposed here as standards, but I should suggest that we take this up in the regular way. Regarding the first drawing, we want all signal engineers to feel that this is the best it is possible to get. The sub-committee cannot correspond with all the signal engineers in the United States, so I would like very much if this meeting could be considered in the nature of a committee meeting, and the members here instruct the sub-committee as to what they wish. I propose that this plan No. 1026 be approved and presented to the annual meeting as a standard.

A. G. Shaver (C., R. I. & P.): Will Mr. Mock kindly explain the difference between this plan and the one adopted? I understood from Mr. Rudd that there is very little difference, if any.

Mr. Mock: The difference is due to the fact that we have a post composed of two pieces of pipe. The spacing of these stays is a little greater; the distance between rungs is the same; the material from which the ladder is made is the same. In No. 1, the section is used for No. 2 and No. 3, with an additional section at the base to make up the necessary length. The slope is the same, but in working out the details of this new post there is a slight variation. It may not be

possible to put this ladder on the old pole and have the stays all fit, because of that change in the pipe section.

Mr. Shaver: I move that plan No. 1026 be accepted and approved by the meeting, with recommendation to the annual meeting that it be adopted.

L. S. Rose (C., C., C. & St. L.): I would like to know if anyone has made a post after this plan.

E. T. Patenall (B. & O.): This type of post, as far as my memory serves me, has been in use on several roads for the last ten years, so there will be no difficulty in its adoption so far as its construction is concerned.

Mr. Rose: About a year ago a post was adopted, which had a 4-in. top, and now we have proposed a post which has a 5-in. top. We have a great many signals fitted in the 4-in. post and do not want to change unless it is right.

Mr. Mock: I believe the report neglected to explain the reason for that change. I think it is possible that the two sections of pipe will reduce the number of pieces you will have to carry in fitting up a signal post. This base will take a certain casting and then all the other fittings will be on the 5-inch section. As pointed out in that letter, the present three-arm mast will require both the 5-in. and 4-in. fitting, whereas now we can use some of the 5-in. fittings for everything except the base stand. It makes a little better post, I believe, but the principal object is to get as few parts as practicable, when we come to work out the details of post fittings. It does not necessarily interfere, seriously, with what is now in service, namely the three sections: 4-in., 5-in. and 6-in.

Mr. Rudd: I think the question of spacing the arms is very important and should be discussed. We have found it necessary to use three signals on the P. R. R. for the last seven years. We use two arms, 6 ft., or, in some cases, 6 ft. 6 in. apart at the top and the lower arm 10 or 11 feet below that, so the third arm is quite a distance from the others. We found the spacing very satisfactory. The committee recommends that the spacings shall be 7 ft. and 6 ft.; that is, that the third arm shall be closer to the second arm than the second arm is to the first arm, so that in the upper quadrant the distance between the end of the second arm, when clear, and the top arm, and the distance between the end of the third arm, when clear, and the second arm shall be the same. I do not know whether I would be able to get our people to change our standard or not, but if the association votes to have that standard changed, I shall do the best I can to have it carried out. I do not think the matter should be rushed, and I think we should have some discussion as to whether it is safe to bring the third arm up so close to the second arm. Mr. Stevens says he does not think it is. He does not want to use the third arm in any event, but if he should use it he thinks the distance should be greater in the transition stage from the lower quadrant to the upper. If three arms are used, it would probably be necessary to have the three lights red, as it would be unwise to make the third light purple during the transition. I am not opposing this change, but I think that the matter should be very fully and freely discussed.

Mr. Mock: When the lower arm is 22 ft. 6 in. from the base of the pole, it is 22 ft. from the center of the arm to the top of the rail, figuring a 6-in. rail. The lowering of the third arm to a height which is not clear will require more spread of track in some places, and it will also be very difficult to establish standards for every rail. Take the bracket and the bridge mast: with a third arm at the bridge strut, it must be at least 21 ft. high and I believe in any design that is now felt to be good practice it would be at least 21 ft. Now, the practice, I believe, on the Pennsylvania is to put the third arm in the bridge truss, and that raises it to approximately 24 ft., so that the scheme of extra spacing between the second and third arm will require very high signals in order to bring the third arm to a reasonable height to show it above the cars, when on a curve, and with signal space between the main track and the side track. On bridge and bracket masts you will reduce it.

Mr. Stevens: I do not like to see this matter passed over in this way. There is a question involved which should be discussed. Some years ago we practically determined that a post with only two high arms on a signal mast was the best practice, and now we are practically recommending the adoption of a post with three arms. We recommend the two high arms for the purpose of reducing the possibilities of confusion, the possibilities of a man receiving a normal route signal, or normal speed signal, or some other high speed indication from a clear light on the second arm, when the top arm is out. All the theories we have advanced in the last two or three years have been with the idea of eliminating the possibilities of confusion with the lights out, yet the association has under consideration the recommendation that a further possibility of this kind shall be introduced in our signal practice. I should like to hear some discussion, even if we cannot take any definite action, on the advisability of the use of the three-arm signal.

Mr. Rudd: I hardly think this is the time to discuss the report of Committee No. 1, which has been rejected. There are railways that are using three-arm signals to-day, there are roads that are using two-arm signals, and there are roads that are using only one-arm signals, and the plan under discussion provides for ladders for the different signals in use.

It seems to me that the vote on the question confines itself to whether this is a proper construction of ladders to be used on various signals. If we can decide that the construction of the ladders is correct, the length of the ladder will be governed by the height of the signal.

Plan 2026 was adopted and recommended for adoption at the annual convention.

The Vice-President: Plan 1029 is almost a part of 1026, as it shows the clamps and stays for the ladders which we have now approved.

Mr. Mock: I move that plan No. 1029 be approved. This design has not been changed, the table of dimensions have been extended to cover stays and clamps for 9-in. and 10-in. type, and also the swedged joint of the 6-in. pipe. It is also true of the dimension table for the stays.

Motion carried.

The Vice-President: I think the meeting can fairly look at plan No. 1035 as a method of design for one, two and three-arm signals. We can hardly decide whether the Association shall recommend the use of the three-arm signal, just as shown, until the report is approved, but we can say that the meeting approves the general design of the pole if a three-arm pole is to be used.

The three-arm plan, No. 1035, was approved.

Mr. Mock: I move that plan No. 1036 be approved.

Mr. Rudd: I second the motion.

J. V. Young (B. & M.): I would like to hear the advantages of the off-set casting explained.

Mr. Mock: Your sub-committee has been working very closely with the manufacturers and it hears the complaints and sees the advantages of certain little changes in the method of running connections to a bracket post or to a bridge mast. In working up the leads for bracket posts with three-arm masts or two-arm masts, the castings clamped to the base work out with less off-set to the pipe by using this design. The bolt holes are spaced the same as in the old base, but there is a chance for a slight shifting of the base in case bolt holes are not accurately spaced. You can get your alinement by shifting the posts or slotting the posts.

The Vice-President: You have heard the motion for the adoption of plan 1036. Plan 1037 is in accordance with plan 1035, which has been adopted, except the dimension from base to center of bottom arm, and shows the proposed design for a bracket post and bridge signal mast. Is there a motion for the adoption of 1037?

Mr. Mock: I so move.

Motion carried.

Mr. Mock: I move the adoption of the pinnacle shown on plan 1040, and I have blue prints here showing a design along the same lines as that shown on 1040, except that it is 5 in. shorter to permit the general and the top post mechanism of the signals to be placed alongside of any other signal and to bring the tops exactly the same height. If any road should want to reduce the height of the pinnacle, even in any other design, they can do so by using this one. The shorter pinnacle is 18 in. over all, whereas the one shown in No. 1040 is 23 in. I move the approval of the shorter pinnacle as well.

Motion seconded.

The Vice President: I don't see that we can vote for the adoption of the plan if it has not been submitted to the meeting, although in voting on this it should be understood there will be another pinnacle submitted by the committee at a later meeting, probably the annual meeting, which will be 5 in. shorter than the one shown.

Mr. Rudd: Mr. Chairman, I think we can very well vote on both plans. Of course the second plan is secret. We have not all seen it, but it is very plain. If this pinnacle suits the majority of the members, undoubtedly the other will also, though 5 in. shorter, for the reasons explained. We cannot take any definite action any way. If the sentiment of the meeting is in favor of two pinnacles along this line, I think we ought to express it.

Mr. Mock: I withdraw the motion about the adoption of the shorter one. Perhaps it is best to separate it. If we adopt No. 1040 I think the other will follow. The committee

would like to have instructions as to whether it should change the second design.

Plan No. 1040 was adopted.

Mr. Rudd: I move that Committee No. 1 be instructed to submit drawings for a second pinnacle, 5 in. shorter than this, on substantially these lines.

Motion carried.

Mr. Rudd: I would ask, if not entirely out of order, for a vote on the design submitted at the last association meeting, which was not acted on, for the extra casting. All the members have seen that and I would be very glad if we could get an expression of opinion from them as to the advisability of that design as against any other. I move that the design for the upper casting, the three-arm mast, 9-a, drawing No. 1040 in the annual proceedings, on page 417 of the journal of the annual meeting, be approved.

Mr. Shaver: Has the committee tried this spectacle in actual service? It looks to me as though the design may be just a little bit light, particularly as to standing considerable wind pressures, to which these are subjected in some territories.

Mr. Patenall: I do not think there is any trouble in reference to the strength of castings. In fact, the majority of these spectacles are being built now with the spectacle of pressed steel, mounted on malleable iron or cast steel. We had quite a number of both types in service for two or three years, and have experienced no trouble such as mentioned by Mr. Shaver.

Mr. Shaver: I don't know that Mr. Patenall gets the point I make. I am aware there is a cast hub used for this spectacle, but it seems to me the pressed steel part is a little light. Such a spectacle as the association adopts should be one that can be used with either mechanical or automatic signals, and I am of the opinion that this spectacle may be found a little too light in service for mechanical connections.

The Vice-President: The plan referred to does not specify the thickness of a cast spectacle, nor does it specify the thickness of metal, if used; simply shows an outline of a punching, if one is desired.

Mr. Rudd: I would like to get advice on the general design of castings. We are using today practically the design shown on the cover of our Journal. If there is any chance of this association adopting Mr. Patenall's design we want to use it. If a majority of the members are opposed to the design submitted last October I want to know it, and we will keep on with what we have got.

Mr. Shaver. I wish it to be understood that it is the general design of the spectacle that I find unsatisfactory. I believe, from tests which we have made, that the Railway Signal Association design gives much the better curve

Mr. Patenall: The design shown on plan No. 1040, referred to in Mr. Rudd's motion, carries with it certain location of stops. But, as I understand the situation, Mr. Rudd simply desires a vote as to the general design of the casting, or rather the spectacle, and not as to its location of stops, as shown on that plan.

Mr. Rudd: This, as I said, is a personal matter, but I would like to get a general expression as to whether that general design is preferable.

The Vice-President: Do you wish to change your motion?

Mr. Rudd: If necessary to bring that out. I want to find out whether the general design of 1040, 9-a, is preferable to any other design submitted.

Motion as amended seconded.

W. H. Lane (Hall Signal Co.): There has been no design submitted before Sub-committee No. 1 about which there is so much discussion, and there has been no part discussed at any meeting of that sub-committee that was gone into so thoroughly, as the design of the castings for quadrant signal. The design shown, on which we are now voting, was adopted by Sub-committee No. 1, after most thorough discussion, largely for the reason that the short curve was shown to be better than any other design submitted. The fact that we have almost a maximum weight with the signals clear, and about the same weight with the signal at 45 deg., makes it the best design, in the opinion of the sub-committee, and I think those points should be taken into consideration.

Mr. Rudd's motion was adopted.

Mr. Mock: As a matter of guidance for this sub-committee in its future work in presenting plans before the next stated meeting for discussion, we are ready to submit plans for a standard lamp. We have under consideration a lamp with two hoods, which may take a lens of either size, so that it can be reversed, accordingly as it is placed on the left side or the right side of the pole, as is required in the scheme of signals. I have prints with me showing a lamp which has a door opening at the rear, or opposite the lens. The ordinary arrangement is to have the door at the side, on a 90-deg. angle. If this committee has any time to discuss the relative merits of these two arrangements, I should like to have an expression of opinion.

The Vice-President: We have just given about an hour to the discussion of the plans. I don't believe we can spare any more time, although I see your position.

The next committee report was that of Committee No. 2, on Mechanical Interlocking, C. J. Kelloway (A. C. L.), Chairman. This committee made a progress report.

The next report was that of Committee No. 3, Power Interlocking, B. H. Mann (Mo. Pac.), Chairman.

Mr. Mann: We assume that the association will be particularly interested in the experiment as to neighborhood meetings that the executive committee and, through the committee, the president, has authorized. The purpose is to expedite the work at the annual meeting, and insure that the report as adopted at the annual meeting is a clear expression of the wish, not only of one neighborhood but of each neighborhood as represented in the association. To carry out this idea this committee has been divided into five sub-committees. The neighborhoods covered so far have been: New York, W. F. Follett (N. Y., N. H. & H.); Northern New York, W. H. Harland (N. Y., O. & W.); Pittsburgh and adjacent territory, A. R. Rayner (P. & L. E.); Ohio, Michigan and Northern Indiana, F. B. Wiegand (L. S. & M. S.); west of the Mississippi river, W. H. Arkenburg (C., R. I. & P.). Personally, I am enthusiastic over the neighborhood idea, and assume that the sub-committee chairmen who have handled the work in their own neighborhoods can best give their individual opinions. Mr. Johnson, of the New York Central, is here, and can give the New York idea.

R. C. Johnson: The New York sub-committee has in charge the drawing of specifications for electric pneumatic interlocking. We are following the same plan or idea as to electric interlocking specifications, adopting the same specification where it applies, and adding to or subtracting from it where it conflicts. We expect to have the whole subject covered and have the complete specifications ready for the annual meeting.

Mr. Arkenburg: We have had two meetings. The neighborhood idea has worked out very well in our case. At the first meeting we had, I think, five outsiders present; at the second, two. We were discussing mainly the subject of indication in connection with power interlocking in general, and also the advisability of some means of locking the switch electrically, thereby performing the same function that the mechanical bolt lock now does in the mechanical interlocking plant. The first meeting was taken up more or less with organization, although there was some discussion, and at the second one the electric bolt lock in connection with mechanical interlocking plant was discussed.

Mr. Wiegand: Sub-committee No. 3 has held one meeting. The work of handling subjects (f), (j), (k), (l) and (m) was divided, a portion being assigned to each member. Several plans of circuits for replacing defective bars were received from various roads, but not much time has been devoted to them. We have also received several circulars from which several plans of typical wood-locking circuits have been drawn, typical circuits for a single switch of three types of power interlocking have also been drawn up.

Mr. Mann: Every signal engineer, or other man on the road in charge of this line of work, who is not a member of this committee, can, by consulting with the representative of his road before the meetings, know just the line of work. Five or six copies of the minutes are made and each sub-committee chairman can then take the typewritten copy and blue print it, attach his remarks as he would like to have them handled by his sub-committee and forward it in advance of his meeting to each of his sub-committee members; so that at the sub-committee meetings he feels that each of his members comes prepared for the discussion from his individual point of view, and also from the point of view of the road he represents.

I. S. Raymer (P. & L. E.): The idea of the neighborhood meeting worked out well in our case. We have on our sub-committee three or four members, all in Pittsburgh. We meet every Friday afternoon for an hour or so and discuss the subject that comes up at the time. We have taken up that troublesome question of trying to get some favorable way of carrying the electricity from the power out to the function. We are working on underground transmission, with wooden conduits, wires covered with an asphaltum or a pitch. We believe we have something that will be very good. In booths Nos. 42 and 43 at the Coliseum there is on

exhibition a piece of trunking taken out of the ground in March, 1910, put in in 1891, nineteen years ago. In the trunking is a four-wire cable, entirely covered with pitch. The cable is in an excellent condition of preservation. We believe we will be able to draw up specifications that will give us a good means of transmitting electric power to the functions on the ground.

The next report was that of Committee No. 4, Automatic Block, A. G. Shaver (C. R. I. & P.), Chairman. This committee made a progress report.

Committee No. 5, Manual Block, L. R. Mann (Mo. Pac.), vice-chairman; Committee No. 6, Automatic Stop and Cab Signals (N. Y. C. & H. R.), Chairman; Committee No. 7, Subjects and Definitions, C. C. Anthony (Penna. R. R.), chairman; Committee No. 9, Wires and Cables, W. H. Elliott (N. Y. C. & H. R.), chairman; Committee No. 10, Electric Signaling for Electric Railways, C. C. Rosenberg, chairman; Special Committee on Promotion of Signaling Education, W. J. Eck (Southern), chairman; Special Committee on Methods of Recording Signal Failures, J. C. Young (Un. Pac.), chairman; Special Committee on Lightning Arresters, Charles Stevens (C. & O.), chairman; and the Special Committee on Storage Battery, A. H. Yocum (P. & R.), chairman, all made progress reports.

T. S. Stephens (A. T. & S. F.): I would like to draw the attention of the members to the desirability of this neighborhood meeting idea. We have a member on nearly all the committees, specification committee especially, and I have instructed those men they shall attend any sub-committee meeting which they can reach in one night's travel. They are interested individually, and we are interested as a railway in being represented on these committees, and have our men attend meetings, if meetings can be held at such a place that these men will not be taken away from their work for a long time. That is a thing which I think will perfect our committee work and bring us all to our annual meetings without such an awful lot of stuff to discuss.

The Vice-President: I think we are all in sympathy with the neighborhood meeting idea. It may be that some of the chairmen of committees who have not already arranged for this year's work will find it advisable. I know that Committee No. 1 did some very good work because the men could get together without traveling very far. A one night's trip does not amount to much. The Committee on Electrical Interlocking has carried it out in fine shape and I believe the idea will grow on us and bring about a lot of good and cut down discussions at the annual meeting which has hampered our work, although at every annual meeting we have been improving along that line.

Mr. Rudd: I believe that not only the neighborhood meetings but the principle of them should be extended. When the chairman of the committee sends to the members the matters to be thought over and discussed the members ought to get into communication with the other members. The views of every member ought to be represented in the committee work, and if each member will make up his mind that he is somebody on that committee and work as hard as any other member, we will get better representative reports than we have ever gotten before.

The secretary then read a paper by Otto Holstein, chief train despatcher, Central of Peru, on Lightning Protection. Mr. Holstein first described the severe electrical storms in Peru, particularly in the territory served by the Cerro de Pasco and the Central of Peru.

A lightning arrester, known as the "Argus," is used on the Cerro de Pasco, for the protection of telegraph and telephone apparatus, and also for the protection of the train staff machines, which are in use there. In the case of the telegraph, these arresters have done excellent work. During one storm at Carhuamayo, a station on the Cerro de Pasco, the lightning arrester was completely destroyed by a heavy discharge while the telegraph relay was not damaged. During another storm at La Fundicion, on the same road, the helix of the arrester was fused, but no damage was suffered by the telegraph apparatus.

The results obtained in the case of the telegraphones were not so gratifying as in the case of the telegraph apparatus, for, although the current that got through the arrester before it reached an intensity sufficient to break down the resistance of the air gap between the helix and the ground plate, and was not sufficient to cause any damage to the telegraph relays, it was sufficient to puncture the comparatively delicate oiled paper tinfoil condensers used to bridge telegraph instruments in intermediate offices and in telegraphone circuits where these instruments were installed. We finally put two-pole single-throw cut-out switches in all telegraphone circuits as well as in condenser circuits at intermediate offices, with instructions to open switches on first appearance of a storm.

On the Central of Peru I found a type of lightning arrester that was entirely new to me. The arrester in question embodies many good features, and its performance has been quite satisfactory on this road, where very trying conditions are to be met.

The principal parts of this arrester are of cast iron; the arrester shown in the accompanying diagram is of the two-line type.

The ground plate measures 7¾ in. x 6 5-16 in. and stands on four legs cast with the plate. The whole upper surface of this plate is furrowed and sharply ridged, as shown in the profile of the ground plate. The line plates are likewise furrowed. The arrester, when assembled, has these sharp ridges at right angles, making every point of intersection (of which there are thousands) a spark-gap with an air space of but 1-32 in. to break down. As can be seen, thousands of small spark-gaps in multiple, with but 1-32 in. of air resistance to break down, impose but a negligible resistance to a static discharge of any intensity.

The line plates and ground plate are separated by hard rubber or ebonite washers 1-32 in. thick and the line plates are held in position by sentinels of the same material which are secured to the ground plate and which clamp the washers in position. On the line plates brass lugs are secured which also serve to hold the line plates in position; these lugs are insulated from the ground plate by a strip of ebonite that extends along the sides of this plate. The plates to which the line is connected can be lifted from the ground plate for inspection or for cleaning without interfering with the working of the wires.

The only fault that can be found with these arresters is that it is rather heavy, the weight of the two-line type being about 15 lbs. The records of this road show excellent performance for this type. There are records of some violent storms where office and ground leads have been fused by static electricity but no instruments have been lost.

The original manner of connecting the arresters was to connect them in series with the line and instruments and, inasmuch as they appear to have done their work so connected, it might seem best to let well enough alone, but I have put choke coils in series with the line plates of the arresters and the instruments with a view of still further retarding the passage of the high-frequency discharge, causing the charge to bank up and break down the resistance of the arrester sooner than it would otherwise, thereby offering greater protection to the instruments. Good ground leads have also been sought and both binding posts of the ground plate have been connected with separate grounds. A flat copper ribbon being used for the ground conductor, this form of conductor appears to embody qualities not possessed by round conductors. As may be supposed, I am awaiting the result of these changes.

The Secretary: Committee No. 6 will meet tomorrow at 2 o'clock in room 1308 in this hotel. Committee No. 10 will meet at 2:30 tomorrow afternoon, and it is suggested that the members present meet in the lobby of the hotel, a room not having as yet been secured. Committee No. 2 will meet in the lobby at 2 p. m. tomorrow, a room not having been assigned. Sub-Committee A of Committee No. 3 will meet at the La Salle Street station, room 1125, at 10 o'clock tomorrow morning. The Special Committee on Lightning Arresters will meet at room 452 Auditorium Hotel, at 10 o'clock tomorrow morning. The Special Committee on Promotion of Signaling Education will meet this evening at 7:30 o'clock at the office of the signal engineer in the Monadnock block. Committee No. 4 will meet tomorrow at 9 o'clock in the La Salle Street station, room 1125.

Mr. Rudd: Committee No. 10, of the Maintenance of Way association, will meet at a place yet to be designated at 4 o'clock tomorrow afternoon in connection with Committee No. 1 of the Railway Signaling association. The discussion of the report of Committee No. 10, which is practically the report Committee No. 1 presented last fall and which was rejected, will be held before the Maintenance of Way association tomorrow morning.

A paper on Soda-Copper Oxide Primary Cell on Track Circuits, by E. L. Marshall (National Carbon Co.) was then presented.

The object of this paper is the discussion of primary batteries for track circuit work, attention being devoted principally to a comparison of the soda-copper oxide cell with the gravity cell. Since track conditions determine, in a large meas-

ure, the length of service life. Mr. Marshall considers first some questions relative to track circuits.

The drain upon a battery depends upon three factors: (a) Continuous drain through rails and relays: (b) Shunt drain when train is in the block. (c) Leakage. He gives formulas and tables for the values of factors (a) and (b). As to (c) leakage of current is the cause of high drain when the block is clear, and this leakage is increased by bad conditions, such as ballast in contact with the rails, grounded rails, ties saturated with brine, and switches. He discusses these with regard to their aggregate effect on the life of batteries. There have been three types of soda-copper oxide cells. The first type had low internal resistance. Since this cell was designed for gas engine ignition and for operating automatic block signals, it had a high current discharge, and consequently an external resistance had to be inserted to prevent excessive drain when the cells were employed on track circuits. To improve upon this type and remove the necessity for the addition of external resistance in the circuit a type was developed with a high internal resistance, due to the shape and position of its elements and to the insertion of a porcelain grid between them. This cell has given good service on track circuits, but because of its greater cost it could not compete with the gravity cell. Like all other soda cells then in use, it had the disadvantage of not giving any evidence as to when it was nearly exhausted, there being no visible end-point or any means of testing for it.

To incorporate the good points of the second type and give a visible means of determining its degree of exhaustion, a third type has been developed. He describes this cell in detail, the four particular advantages of it being the following:

(1) It has a visible indicator to show when the cell needs renewing. (2) This cell is non-freezing and non-congealing, thus decreasing the expense for battery chutes or wells to house track batteries below frost line. (3) The cell has long life, lessening the danger of failure and labor cost of inspecting and renewing. (4) Because of the long life and small number of renewals per year, the saving in materials alone per cell per year will be about $1.

Mr. Kelloway: Mr. Marshall says: "A very severe test of a soda battery was a case when a train stood in the block house three-quarters of an hour, but when the train left the block the relay picked up immediately, a performance that will equal that of any gravity cell." In the case of a train standing on a track a definite time the relay will pick up. I want to know whether the relay will pick up if the train stands two hours on the track.

Mr. Marshall: That has happened. A man told me that he had for six continuous days, at least, a train standing in the block for two hours, and he said that he had no trouble as the result of this delay. That happened since this paper was written. The cases in which they stay there for three-quarters of an hour are not unusual, but the other cases are exceptional, when there is an accident, or something unusual happens to delay the train, but this case, in particular, to which I refer, was brought to my attention and was authentic. The man was in charge of the batteries on the road on which that occurred.

Mr. Kelloway: Quite often you will have an engine out upon the track probably 80 per cent. of the time. Will not the soda cells exhaust very quickly under these conditions? You are likely to have a breakdown, holding the track there for one hour, two hours, or three or four hours. Under such circumstances, will not the cell have to be renewed?

Mr. Marshall: If the train stays on the block, the cell gives service as long as there is life in the cell. The train may stay there until the elements are almost used up, but if they are not actually exhausted it will pick up after the train leaves.

Mr. Stevens: I do not think there is any question about the relay picking up as long as there is any battery left. That is the theory of the soda cell. I want to commend in a few words the analytical nature of this paper. I think it is fine and should be a guide to some of our committeemen in making their reports to the association. We do not analyze things sufficiently. There is one thing, however, which I would like Mr. Marshall to explain, without going into too many details, and that is why the cell which he recommends will stand a lower temperature than the ordinary type of potash cell, if he can do that without divulging secrets.

Mr. Marshall: There is no secret about it. The idea is that the elements are separated much further than they are in all ordinary internal resistance cells. In the ordinary type of signal battery the elements are close together, and in that space between them there seems to be what they call congealing of the soda solution. The difference can only be explained, in my opinion, on the ground of the distance between them. The soda cell will not freeze in any case; it will congeal with extremely low temperature, but it congeals more readily in the signal type of cell, where the plates are close together, than where the plates are far apart. The elements are 3 in. apart in the track battery type, and they do not congeal.

Mr. Stevens: In California, where we have tried track circuits, we have made exhaustive tests on the use of potash cells. We are now using Edison B. S. C. O. cells, with an external resistance and get good results. We also have some of the Columbia cells in service there. It is a money saver, provided you can save labor and get about three months' life out of the battery. It is well worth looking into.

Mr. Elliott: The data given in this paper is very valuable and complete. At the same time, a little checking would seem to show that the apparent saving by the use of the primary cell would not be so great as shown. It is assumed that the cell will last for 91 days on an average consumption of 0.3 of an ampere of current. That is approximately what I find is the discharge of a battery on a track circuit of approximately 2,000 ft. or more in length. Certain track circuits have a resistance between rails of 2.5 ohms, and of course the leakage is excessive. I am speaking of the average. I doubt if the consumption of current or discharge in the track circuit is less than 0.3 of an ampere. On this basis, according to the figures of the paper, two cells of 700 ampere hours' combined capacity would last 91 days. It is later stated that the saving per year by the use of the cells by actual results is 69 cents; but figuring on the assumption or comparison made in the next paragraph the saving is shown at 97 cents. In the case of the soda cell, it is assumed that with 2.8 renewals, at 81 cents per renewal, the total cost of the soda cell would be $2.27 per year. This, evidently, is taken at a rate of consumption less than that given in the table where the batteries are shown to last 91 days. On a 91-day life of cells, practically four cells would be required for the year, and there would be no saving, and the expense would be $3.24, exactly the same as figured for the gravity battery. It would seem that the results shown are sufficient to warrant our looking into the matter and determine for ourselves what this cell will do. Undoubtedly, it would appear that if the cell will not depolarize when a train is on the track circuit for three or four hours, and the reduction in current from the cold weather will not be too great, the saving in labor will be such as to warrant the use of this primary cell.

Mr. Marshall: In regard to the price on this test, which you have spoken of in particular, that was assumed not from the drain but from what one road got on 65 different tests. I do not know what the drain of the track circuit was, or how many train movements there were. They got an average of 143 days' service, on 65 different tests, and that figure was computed from that data. If the drain was more severe, and they had more train movements, then the cost of gravity cells would also increase, the same as the cost on soda cells. We assume the cost of $3.24 on the gravity cells because they had that figure previous to the use of the soda cell; but if they had heavier traffic and poor track conditions they would undoubtedly get a higher cost on the gravity. The assumption of 0.3 of an ampere drain is based on a good many tests. We made tests of different conditions on a number of diferent railways, and we got that as being as close an average figure as we could possibly reach in our computation. The 91 days is really low, compared with what some roads are getting by the use of these batteries, but we figured on the safe side when we put it at 91 days. It has been rather above 90 days than under. We have some exceptions, but the average is far above.

Mr. Stevens: Even if we do not decrease the labor cost, we are gaining a whole lot if we do produce such conditions that a great part of the time of the men can be spent in testing the apparatus and seeing that it is working right.

The Vice-President: Under "Leakage," Mr. Marshall refers to grounded rails, saying: "By grounded rails we mean the use of any kind of 'anti-creeper' that extends from the rail down into the ballast, thus making good contact with the earth. The leakage which this practice causes is very serious, especially in wet weather." Nearly all the anti-

creepers on the market extend below the base of the rail. They are probably more successful in this than in keeping the rail from creeping. If this is true, about all we may get from a good many types of anti-creepers is leakage. If that fact had been definitely established, and this association should recommend that anti-creepers and apparatus of that sort should not extend below the base of the rail, a good many manufacturers and designers will have a hard proposition on their hands. I ask Mr. Marshall if he has made any test to definitely establish this fact, and if so, about how far below the base of the rail the anti-creepers extend, and how much the leakage was increased by the anti-creepers.

Mr. Marshall: The information came directly from your road, Mr. Chairman. I had occasion to investigate a very severe track drain, and in one case, at least, I think it was due to the anti-creepers. I brought this matter to the attention of the road and they were removed. The drain on that particular circuit was reduced from an average of about 0.7 of an ampere down to 0.5 of an ampere, and it is a very clear demonstration of the effect of the anti-creepers, because that is all that was done to the section.

Mr. Stevens: It would be interesting to know whether the anti-creepers were on a regularly ballasted section or not.

The Vice-President: I admit that what Mr. Marshall says is true. When this battery was first called to our attention we naturally put it on bad sections, and not good ones, because we could work good ones with almost anything. There was a complaint made about the anti-creepers, but I have not heard the result of the second test where the anti-creepers were removed. That would only be one case. Referring to Mr. Stevens' question, I did not see the section. They are on our eastbound track, which is affected a good deal by the brine from refrigerator cars, and on curves. I think the particular section was the first or second curve out of a heavy yard where all the trains were made up. The standard cross-section calls for about 1-in. clearance. The anti-creepers extend below the base of the rail, probably an inch and a half. It was gravel ballasted, but whether the gravel was below, or nearly below, the bottom of the anti-creepers, I do not know.

Mr. Marshall: I do not know of any other case in which the drain was reduced because of the anti-creepers, not having authentic figures, but I have heard indirectly that it happens where anti-creepers have been used.

The Vice-President: The question has been brought up by the Committee on Track of the Maintenance of Way Association at least once, and I believe they have made some recommendations on the subject.

L. S. Rose (C. C. & St. L.): The Track Committee brought in a recommendation that where there is a leakage of the track circuit the track fastenings shall be kept above the base of the rail. There are a good many designs of rail joints that hang below the base of the rail.

W. N. Manuel (G. R. & I.): How much time is required on short circuit to exhaust the cell?

Mr. Marshall: Do you mean direct short circuit from one contact to another?

Mr. Manuel: Yes.

Mr. Marshall: Off-hand, I could not tell you, but I think it is about three days. Of course, you never have that condition and cannot have it, because of the length of wire to the rails.

The Secretary: Prior to our general executive committee meeting, held in January, one of our members suggested that he thought it was desirable for the association to adopt a certificate of membership, to be issued to our members. The matter was given some consideraton by the executive committee, and was then turned over to Mr. Eck, of the Southern Railway, who has looked into the matter, and is now ready to make a report to the association.

Mr. Eck: Most of the larger associations, the American Society of Civil Engineers, the American Institute of Electrical Engineers and other similar bodies have a certificate of membership which is issued to each member. As this association has grown in its 15 years of existence, and now occupies a place in the railway world, when it is an honor to belong to it, it has been thought by some of our members that it would be well for the association to issue certificates of membership to its members. [Mr. Eck here displayed two drawings of certificates of membership, one being probably 15 in. x 20 in., and the other about 8 in. x 10 in.] The certificates would be issued to the members at cost. The plates for the certificates would cost in the neighborhood of $100, and copies of the certificate would be furnished at about $15 a hundred. I move that the executive committee be instructed to look into the matter and to procure such a plate, and provide for the issuing of such certificates to the members who desire them.

[There was considerable discussion relating to the details of the proposed certificate.]

Mr. Mock: I move that in the next journal issued the secretary of the association make a proper announcement of this matter, and that if more than 100 members reply that they desire to receive such a certificate of membership, he be authorized to issue to such members a certificate of membership for the sum of $1.

Motion carried.

A paper by H. M. Beck (Electric Storage Battery Co.) on the Portable Storage Battery in Automatic Block Signal Service was then presented:

Portable Storage Battery in Automatic Block Signal Service.

Portable storage batteries have now been used in automatic block signal service for a sufficiently long period and on a sufficiently large scale, so that data based on actual results is available, and it is the purpose of this paper to bring together such data in convenient form for reference.

The regular use of storage batteries in this service dates from 1899. The first cells contained plates of the stationary type, assembled in portable form. They were not altogether satisfactory on account of their weight, two cells mounted in a case weighing about 60 lbs., and on this account, a few years later, a limited number of cells containing pasted plates of the vehicle type, were put in service. A pasted cell of equal capacity is much cheaper, smaller, lighter and consequently more portable. These cells known as the "PV 5" were not the proper shape, their base being too small for their height, so that they were easily upset, and on this account a smaller plate approximately five inches square and known as the "SS" was adopted about 1904, and this plate is now the standard. The jars usually contain from seven to nine plates, according to the capacity required, and from four to six cells are commonly connected in series, depending upon the voltage of the signals. They are boxed in wooden carrying cases so that they are convenient for transportation.

The standard method of assembly is to have four cells, type "SS-9," contained in a single carrying case. Where it is desired to reduce the weight, two cells only are placed in a case. The early practice was to join the cells by some form of a clamp or bolt connector, so they could be easily taken apart, but experience has shown that with proper attention it is seldom necessary to take them apart, so that the solid burned connection is coming into use. This practice eliminates a number of connections which not only require considerable attention to keep them in good condition, but are also a possible source of failure. The end connection is brought down to a wing nut terminal by means of a flexible rubber covered cable. Thus the number of connections is reduced from eight to two.

The jars are set in compound. They are thus more uniformly supported, which means less breakage, and even should they break, the compound will tend to make the leak a slow one and to protect the wood from the action of the acid. The compound is carried up over the tops of the cells, covering everything but the vent plugs, and thus forms an effective sealing and prevents leakage. Drainage holes are provided which carry off any electrolyte which may collect on top of the compound. The cylinder vents are unscrewed when it is desired to replace the evaporation or take specific gravity readings of the electrolyte.

For spacing the plates, wooden separators have been found to be very satisfactory and are standard in practically all cases. The wooden case is supplied with a cover for keeping out the dirt and the bottom contains an expansion joint, the purpose of which is to prevent the sides from being forced out, should the wood become acid soaked.

The number of cells in a set will depend upon the voltage of the signals and the speed at which it is desired to have them operate. It is usual to figure on two volts per cell, so that on this basis four cells would be required for an eight-volt signal. One large road is using four cells in connection with 10-volt signals, and reports that the duration of an operation is about 10 seconds as against seven seconds, when 16 primary cells are used. This refers to intermittent work, as where a number of operations follow each other in rapid succession, the storage battery gives the greater speed, due to its low internal resistance and high capacity. For equal speed on intermittent work, five cells of storage battery give about the same speed as 16 primary cells.

The size of the cells or their ampere-hour capacity will

depend upon the number of signal operations and the length of time during which it is desired to have the battery operate without charging. At least one-third reserve capacity should be allowed for irregularities, or in case the battery is not changed promptly. It is usual to have a battery operate a signal for one month and then replace it, this period having been selected as the maximum during which it is safe to allow a battery to continue without charge. There are indications, however, that where it is of advantage and the capacity required is not too great, cells may be left out for periods of two months, and if properly charged, can be kept in good condition. Some experiments in this direction are now being made. On the other hand, it will probably be found that, where the number of operations is so great that the cells have to be regularly changed more frequently than once in three weeks, the case is not a portable battery situation. The number of operations which a given type of cell will give, has not been accurately determined, but in one case an "SS-9" was left out for three months without trouble, this corresponding to some 3,000 operations.

The number of sets of batteries required will depend upon a number of conditions and will have to be figured out for each particular case, as nothing more than the most general figures can be given. Due to the fact that a certain number of batteries will be required for charging while the rest are in use at the signals, there will always be a greater number of batteries than the number of battery locations. Some reserve sets will also be needed for overhauling and emergencies. Data obtained from several railways indicates that the total number of extra sets required will be from 20 to 35 per cent. of the actual number of battery locations.

Due to its high capacity and low internal resistance, it is practical to operate more than one signal from the same storage battery. One large railway has decided that it is economy to operate signals within 500 ft. of each other from one battery. The number of battery locations as compared with the number of signal locations will vary in different cases as the number of signals which can be operated from a single battery, will depend on their relative locations. Actual data obtained in one case shows the total number of batteries to be 86 per cent. of the number of signal locations and 78 per cent. of the total number of signal blades. In another the figures are 87 per cent. and 83 per cent., respectively.

Where portable storage batteries are used, facilities must be provided for charging. A separate building is not always necessary, as it is often possible to use part of a building required for other purposes, the space actually needed for charging the cells not being very great. For example, in one case where 225 sets of batteries are handled, the actual charging space is only about eight by 12 ft. Where storage batteries are not used it is still necessary to have some sort of a building for a store room, work shop, etc., and it has frequently been practical to use part of this or make a small addition to it. It is preferable to locate the charging plant at some place where reliable power can be purchased, rather than to attempt to install a generating outfit, as power can usually be purchased for less than it can be made. Small charging plants are apt to be unreliable and require a large percentage of the battery man's time to keep them running. It is also of considerable advantage to be able to charge over night, which is hardly practical in connection with small generating plants, as these need some one present to look after them. Lighting companies will generally give a very favorable rate on current for charging storage batteries on account of the character of the load. Figures obtained in widely different sections of the country show that such power can be purchased at from three to eight cents per kilowatt-hour. If the power is alternating, a rectifier will be required, otherwise suitable resistances. In either case the switchboard should include one voltmeter, an ammeter which can be connected in each circuit, if there is more than one, and for each circuit, a rheostat, an underload circuit-breaker and the necessary switches and fuses. The rheostat should be capable of cutting down the voltage if necessary, so that it is practical to charge as few as three or four sets in series. The usual practice is to charge from six to 10 sets in series, depending upon the number of cells per set. Forty individual cells can be charged from a 110-volt circuit. The number of circuits required will depend on the number of sets to be charged at any one time. The cost of a rectifier or direct-current switchboard, while considerable in itself, does not amount to very much when divided among the two or three hundred sets of cells which it is capable of handling.

Where it is necessary to install a charging plant, from two to three kilowatt capacity will usually be required.

With the storage battery system a special battery man is required to look after the charging of the storage batteries, etc., for each section of from 100 to 150 miles, but on the other hand, no other battery men are required and the maintainers not having to be battery men, are thus relieved of both responsibility and work, so that they can either cover more miles of track or else work in other directions. For example, it is the regular practice where the storage battery is in use, for the maintainers to look after the lamps and no special lamp men are required. Thus, while with the storage battery system, an extra man is required to look after the batteries, this is compensated for by the fact that less men are needed on the road. Actual figures as to the total amount of labor under the supervisor have been obtained in several instances where the storage battery is used, and these are quite uniform where the conditions are comparable, showing an average of one man per 10 miles of single track equipped with 20 signals. In considering these figures it should be borne in mind that they cover all labor, including foremen, repair men, lamp men, etc., and do not simply refer to the maintainers.

There are now a number of roads which have had portable storage batteries in use for five years or more and the results obtained under normal conditions, indicate that a depreciation of 20 per cent per year is, if anything, conservative. There have been some special conditions in the extreme South under abnormally high temperatures, where plates have had to be renewed after only two years, but this condition is a special one and steps are being taken to meet it. Elsewhere the positives are giving from four to six years, while the negatives give indications of lasting much longer. This life is, if anything, less than might be expected, as it corresponds to only some 60 discharges on the basis of 12 per year, whereas the same type of plates will give some 200 discharges in a vehicle or 300 to 400 discharges on a bench. The shorter life in signal service is probably due to the cells not having as careful handling, or else to the long time over which the discharge work is distributed. The wooden carrying cases require renewal every two or three years, but this is a comparatively small item, while the rubber jars, except where broken, should last indefinitely. Thus a maintenance charge of 20 per cent per year on the first cost of the battery would seem to be conservative.

Where power can be purchased the cost of current for charging is surprisingly low. For example, consider a set of five cells, type "SS-9." Eight such sets can be charged in series from a 110-volt circuit. The charging rate is eight amperes and an average length of charge is probably about 20 hours. This corresponds to a very low ampere-hour efficiency, only 40 per cent, but the efficiency in this service is low due to the infrequency of charging. At a price of six cents per kilowatt-hour, the cost of charging the set would be $0.132. Assuming 12 charges per year, this would amount to only $1.59 per set per year.

A number of different schemes are being employed in transporting the cells to and from the signals and it is, of course, evident that the best solution in any case will depend somewhat on the local conditions. On one point, however, all seem to agree, namely, that the batteries should always be accompanied by an attendant in order to avoid damage in transit.

The most common method is to slip the cells to and from the maintainer's location on local freight or passenger trains, and the maintainers then distribute them to the signals on gasoline cars or velocipedes. Either the battery man or an attendant accompanies each shipment. A modification of this system is to have the maintainers bring the batteries to the charging station. This scheme is being used by a road where the distances are not great and the train service frequent. Still another modification is to send the batteries out on local freights with sufficient men so that they can be exchanged at the signals as they are passed, without stopping the train. Four men are needed. One jumps off the front of the train and disconnects the old battery from the signal. A few cars back two men get off with a charged battery which they put in place and return the discharged set to the train. The new battery is then connected up to the signal and the battery well closed before the rear of the train has come up.

A radically different scheme is being tried out by one of the western roads, and the signal engineer is said to be very enthusiastic over it. A box car has been fitted up with a portable charging plant and is moved from point to point, stopping at the various maintainer's locations and charging

the batteries. The crew consists of one man and as this car is able to cover 200 miles of track per month, it not only takes care of the transportation problem, but since two stationary plants would be required to handle the same territory, it cuts the number of charging plants and battery men in two.

The Missouri Pacific has had a system in operation for a number of years which has given excellent results. The territory covered roughly forms a "Y" with St. Louis at the base. The battery house is located in the yards at St. Louis, current being supplied directly from the company shops. There is one battery man who takes entire care of the cells, charging, overhauling and delivering them to the maintainers at the local stations. Twice a week on Tuesdays and Fridays, he goes out with charged batteries and delivers them at the local stations as previously requested by the maintainers. The batteries are then distributed to the signals by the maintainers on velocipedes, the discharged batteries being left at the most convenient station to be picked up by the battery man on his return. These trips require one day each. On the two intervening days the batteries are charged and overhauled. The train on which the batteries are shipped is in the yards over night and the batteries are loaded into the baggage car late in the afternoon or evening and go out the next morning. On the longest trip 30 sets of cells are taken out and the cells are delivered as far as Bismarck, a distance of 79 miles. Batteries are required some twenty miles beyond this, but are carried on by relay, it not being practical for the battery man to go further and return to St. Louis the same night. With this system one man takes care of 225 sets of batteries, 36 of which constitute a reserve for repairs and charging.

As will be seen, the Missouri Pacific system combines a number of very excellent features. Power is furnished day and night so that the battery man is not only relieved of all responsibility in operating the generating plant, and thus has more time for the batteries, but the charge can go on through the night when he is absent, which results in a very considerable saving of time. Since the batteries are always under his supervision until delivered at the way stations, the likelihood of their being damaged is lessened.

The radius covered, 79 miles, also indicates that this system ought to be quite generally applicable, as with charging stations only needed every 150 miles, it would seem like an exceptional case where reliable power could not be obtained within these limits, either from a public lighting or traction company or from a plant run in connection with some railway pumping station or shops.

The effect of the use of portable storage batteries on the reliability of a signal system is a very difficult thing to determine. One of the largest users states that while their experience has been that there is also an economy, still their policy is entirely determined by the question of reliability and that the net result of the use of the storage battery is a lessened number of signal failures.

From a theoretical standpoint it seems as if there should be a tendency towards greater reliability. The more units there are in a battery, the more chance of trouble both in the cells themselves and in the connections, as anything wrong with any one of them will interfere with all. The storage battery certainly reduces the number of units to a minimum. The maintainers do not have to be battery men, all that is required of them being to change the batteries at regular intervals. Battery knowledge is concentrated in one man who can be a specialist, and the batteries should thus receive better average attention.

While at the higher rates of discharge their capacity is reduced at low temperatures, the temperature coefficient falls quite rapidly as the rates of discharge decrease, or what amounts to practically the same thing, the length of time during which the discharge takes place, increases. Thus while at an eight-hour discharge rate the capacity decreases approximately one-half per cent per degree Fahrenheit, at one-tenth of the eight-hour rate the coefficient is only 0.15 per degree Fahrenheit, or, in other words, the reduction in capacity is almost negligible.

The electrolyte is practically immune from freezing, so that no special precautions have to be taken in this direction.

The internal resistance of a storage battery is so low that where special conditions occur signal operations may follow each other with great rapidity, or even simultaneously, without danger of failure. The internal resistance of the "SS-7" cell runs from approximately .006 ohm at a temperature of 80 degrees to .012 ohm at a temperature of 20 degrees Fahrenheit, and thus is almost a negligible quantity.

From the standpoint of economy also the storage battery would seem to be an excellent proposition. The initial cost of the cells can easily be obtained from the makers and with the data here given, both the approximate total first cost and maintenance expense for a given case can be quite easily worked out and it is believed that many cases will be found where a marked saving could be made.

In closing there are only one or two points which should not be overlooked. First, portable storage batteries have now been used in signal service on a considerable scale for some ten years, so they can no longer be considered as an experiment. Second, in the last ten years, conditions have changed very materially in regard to the possibility of purchasing reliable power for charging. Small towns all over the country now have their own lighting plants, electric railways are springing up everywhere, and thus the problem of charging has been greatly simplified, so that while the portable storage battery has its limitations, it certainly seems well worthy of serious investigation in many cases where it is not now being considered.

Mr. Eck: Why should the charging rate in amperes in portable storage batteries be given as a ten-hour rate, instead of an eight-hour, as usually given for storage batteries?

Mr. Beck: There are two general reasons. In the first place, the paste cell is weaker than the standard type, and in order to save it we like to have the charging rates as low as we can get them. The other reason is that the paste cell is apt to be rated at a capacity which will not give its full capacity at the service rate.

Mr. Eck: Would it be practicable in this style of plate to charge the cells at a high rate, and then taper off the charge toward the end of the charge? For instance, double the eight-hour rate at the beginning and taper off the rate at the end?

Mr. Beck: That would be all right, but it would not be practicable if the rate is reduced by the time the gassing begins. The injury is done almost entirely during the latter part of the charge, when the cells are gassing. If you can find the high rate at the early part of the charge that would be all right.

Frank Rhea (General Electric Co.): If you charge even a slower rate than ten hours, would it be still better at the end of the charge?

Mr. Beck: Yes, if you have time. If the rates get too low, however, it is difficult to determine when the battery is charging, and you do not want to get them so low that you do not get the charging indications, but that is the only limitation.

Mr. Stevens: As to the use of a primary battery, or a storage battery, I have analyzed the situation somewhat in this way. We put up a primary battery and it runs for a year. There is no labor done on the battery for a year. If we installed storage batteries we have to do some labor on them every month, collect them, take them into the shops, charge them and redistribute them. It has occurred to me that something that we can put down and leave for a year is better than something we have to expend labor on every month or every three months.

Mr. Beck: As Mr. Stevens says, there is a certain amount of labor connected with the distribution of storage batteries every month which we do not have with the other type. We have collected figures on roads using storage batteries and also figures on roads using primary batteries, but as far as we can find out the labor question does not seem to be affected either way. This would indicate that the labor of distributing storage batteries is made up in other ways on the roads using primary batteries. That is not a question of theory but one of fact.

If you assume the labor is not increased and that the reliability is the same, then the next point of importance is the cost. Of course, that has to be figured out for each individual case, but in many cases the figures show that a distinct saving can be made by the use of the storage battery. This might not be true in other cases, as it depends on special conditions.

Mr. Rhea: Do you consider it advisable to charge a large number of sets in series, or a comparatively low number and increase the number of circuits? You state that there should be a rheostat and underload circuit breaker and the necessary switches and fuses. In addition to that is it necessary between the different circuits, when you have more than two, to have a reverse current relay, in case anything happens with the source of power to cause an unbalancing between the two sets or four sets?

Mr. Beck: It is necessary to have some such protection, but the underload circuit breaker, which I have specified, takes care of it. If the current drops to zero, the circuit is cut out. I should say, in general, the fewer circuits you have,

the better, from the standpoint of attention in the way of requiring adjusting current, etc., so that the more you can charge in series, the better from that standpoint.

Mr. Elliott: Being an advocate of the charging of storage batteries by line, I should like to point out the advantages we have by such a system. Transferring portable storage batteries to the nearest station for recharging, and returning the batteries to the signal location on a velocipede car is prohibited on many roads, either on account of the frequent train service, unfavorable grades or weather conditions. In figuring the cost of portable storage batteries the paper does not seem to take into consideration the time of the men required to distribute the batteries, time which is not required with the present system, nor is the expense of transportation of the batteries by train figured. I understand that on the roads where the portable storage batteries are used the flooring and floor beams of the cars transporting these cells are very much injured and have to be renewed with considerable frequency. The consumption of current in the places where this type of cell is used must be very small. We are using on the Niagara Falls branch 120 ampere-hour batteries, and the charging requires an average of twenty hours a week. This discharge with the train on the track circuit is an ampere, and, figuring on the basis of .3 of an ampere consumption of current, or 8.2 ampere hours per day, that 120-ampere-hour cell would have a life of 15 days. It is stated in the paper that where the cells have to be renewed oftener than once in three weeks, it is not a portable storage battery situation, and as we charge all of our batteries approximately 18 to 20 hours a week, it would seem that few of our installations would be properly supplied or could use portable storage batteries properly. There is another matter—the life of the cells. The paper states that the maintenance charge is 20 per cent per year on the first cost of the battery, that is, that the life of the cell would be approximately five years. On the installation I have mentioned we have batteries that have been in use five years and seem to be in as good condition today as when they were put in service. There has been very little material that has disintegrated and dropped to the bottom of the cell. There is an undoubted advantage in the life of cells in generating current at local power stations along the line, or else purchasing it and distributing by a power line, and charging the batteries in place.

Mr. Beck: I certainly do not wish to advocate the portable storage battery for cases where the traffic was so heavy, and that I brought out in my paper, although I did not mention the line charging method as the solution of the problem in that case. Where the traffic gets so heavy, I think you will find the limit I give restricts you to the point where you must have the line-charging method, where we would recommend the line-charging method as the proper solution. I think you will find the portable storage battery, on the other side of the line, is cheaper on account of saving the line charging. Where the portable cell has sufficient capacity, it is the cheaper proposition. The point that has been brought up as to the possibility of using velocipedes was one criticism that Mr. Mann made of this paper, in stating that he thought that was the limit of possibility of using the portable cell, rather than the capacity. Where the traffic is so frequent that you cannot use the velocipede, you cannot use the portable system, that should be the test, but I think it works out at about the same point, if you compare it with the number of train operations given, it figures out for "SS 9" something like 3,000 operations; that will be equivalent in three weeks to about an average of about 120 movements a day, as the limit of the portable battery situation in that case. As to the weight of the cells, I think the statement of 123 lbs. is a little high. The "4-SS 9" weighs 58¾ lbs., and the "4-SS 7," which is the most largely used battery, weighs 45.5 lbs. a set. The cost of transportation I have not figured in, because in the case of every road that is using them there is no charge for transportation, the batteries being carried free just as other freight is. But as a matter of interest I have figured out about what it would cost to transport the battery for a year on the rates given by one of the eastern roads. The freight rate is 14 cents per 100 lbs. per 100 miles, or less, which I understand is a fairly high rate, if anything, and on that basis the "4-SS 7" set, with 12 trips a year, would cost $1.60 a year. On the basis of the rate that has been given by one of the western roads, ½ cent. per ton mile, it figures out at 9 cents per year, so in either case there is considerable leeway. Where it is a portable battery situation, you can charge transportation, if you wish to, and still show a material saving. The question of the injury to the baggage car was new to me and I have not heard of a complaint of that kind.

Mr. Young: Some time ago we experimented on our road with portable batteries in place of the primary batteries. We found that the 5-cell box was too heavy to handle. We have gone to the 2-cell and 3-cell box; a man has no trouble in carrying them out and taking one in each hand. They last month with one charge. It costs 20 cents a signal, against 60 cents and 75 cents with a primary battery. I figure that in about eight or ten months a battery pays for itself.

H. B. Mann: I asked Mr. Young how many trains he has a day in his territory, as that seems to be an important feature. Mr. Young says: "Parts of the day our trains are three minutes apart."

Mr. Stevens: That is a line-charging proposition.

Mr. Eck: I want to emphasize Mr. Beck's point in regard to purchasing current instead of developing it in your own plant. That point should be considered seriously in any proposition. If we could find out what it is costing us now in the ordinary gasoline generating plants, I think you will find it runs from 12 to 20 cents a K.W. hour, whereas you can buy the current from ½ cent to 8 or 10 cents a K.W. hour, besides having an unlimited supply and get rid of a lot of trouble. Within the last year we have displaced a number of isolated plants for lighting depots. In one case we showed a saving of over $4,500 on a small plant.

H. B. Mann: It seems to me the association, so far as the use of storage batteries on signals is concerned, owes a great deal to the California companies. In 1890 experts went to California and one of their particular duties was to show to the people that electro-pneumatic valves, as built in the east for storage batteries, were better than gravity cells. After they got to California, they found the people had been using storage batteries for two or three years. The paper shows that in 1899 they began to use storage battery cells on pneumatic circuits. The association should bear in mind the pioneers in storage batteries, both fixed and portable, are in the California territory. Mr. Slater should be given credit for a good deal of this work. It is unfortunate that some of our members from California are not here to speak on this subject.

Mr. Peck: We are using the storage battery on the Union Pacific, but I cannot tell you much about the details. They have been in use for about four years, and we are having very good success with them. As Mr. Elliott says, it is cheaper to have a charging line, but he is talking of a railway with four tracks. We have only one track, and that makes a difference. We have tried out some primary batteries on eight or ten different locations, but I cannot give you the details of the experiment. Mr. McKeen should be able to tell you a few things about this.

A. H. McKeen (O. R. R. &): We started about 15 years ago on the Southern Pacific to use a portable cell. We used at that time the "River and Rail" and they were quite successful. We never did much with the primary battery, but always used the storage battery. As you know, most of our lines are single track. We use the "SS 7" cell, which is mentioned in the paper. We have various means of charging these. At some locations we charge them with a rectifier where we can obtain the current, and in other cases we charge them with a gas engine-generator outfit. We also have several ways of distributing the cells. Where we have good local train service we distribute them on the passenger trains, leaving the cells at various stations along the line with the maintainer to pack up and change, leaving the changed cells at the station for the man who distributes them to pick them up on the local train going back, this being similar to Mr. Mann's method on the Missouri Pacific. In other locations we have a charging line as mentioned in the paper, with a gas engine generator in the car, and we run this car on the way freight, stopping at alternate stations, where the batteries are changed by the man in charge of the car and the maintainer, and the discharged batteries are brought back to the car and charged up before the car leaves for the next station. In that way we cover a territory of about 160 miles a month, with one car, figuring about two charges a month. Our batteries are arranged for a 50-ampere hour. At the home signals at the switches we change the cells in the distant signals, after the cells have been in service 15 days, operating two signals, and we interchange them with the cells at the distant signal. Consequently, these cells work only one signal. In that way the cell will last 30 days with a good margin of safety. On our mountain district we change our cells by loading on the pilot of a helper engine. The engine starts at the top of the mountain and goes down with a load of batteries on the pilot of the engine,

and the engine is started down 30 minutes ahead of the time it would start for ordinary purposes, and it stops at each signal where the maintainer changes the batteries. The engine returns to the top of the mountain, where the charging station is located.

Mr. Elliott: What batteries are you using for the track?

Mr. McKeen: Gravity.

Mr. Elliott: So that you require the battery man to look after the gravity batteries, and the only saving in the portable storage batteries is in the signal battery?

Mr. McKeen: Our maintainer attends to everything in his district, and looks after all the work in connection with the signals on his district.

The Vice-President: The question of the weight of the batteries has been referred to by several of the speakers. The paper does not definitely bring out what is considered to be the maximum weight per unit of value that can practically be handled on a speeder. Mr. Young called attention to the fact that they had used a complete set in one case, and it was necessary to change it. I think it would be well to have Mr. Mann, Mr. McKeen and Mr. Young say what they feel the maximum weight should be. That will determine the time and the system which is advisable for a given location.

Mr. McKeen: I would say that we arrange ours in weights of approximately 56 lbs., and one maintainer does not seem to have much trouble in carrying two of the cases in each hand.

Mr. Mann: I would like to ask one question, on the matter of the reliability, what 15 years of experience has developed as to his instructions to amend on sections. He calls them maintainers or repair men. What are your instructions to the men on your storage batteries if they have been in thirty days' service, understanding that you expect as reliable service as anyone else?

Mr. McKeen: Our signal maintainers take a voltage reading of their storage batteries. Other than that they have nothing to do with the battery problem whatever. The station men have charge of the overhauling of the batteries, and in case they need attention they are the men that look after that part of it. He takes the voltage reading in order to be sure that he will not have a signal failure on account of the discharge of the battery, and I will say the number of signal failures in our batteries are less than one per cent. of the total failures.

B. H. Mann: The point I wanted to bring out was nearly answered as to whether that feature of the pumping signal blade is the reason you take that reading. Exhausting the battery at a higher rate of speed than normal, could you cover that case with a counter on the signal, or is it some storage battery defect?

Mr. McKeen: I don't recollect any such failure. I have never seen it on our lines. Our batteries are sufficient to last ordinarily 30 days. Of course, we have once in a while a fall down in batteries on account of the overdischarge, not giving the proper amount of charge. Such cases, however, are very rare.

B. H. Mann: What is the length of your territory?

Mr. McKeen: Twelve to fifteen miles, and as high as twenty miles where the track is straight and where it is possible to run a gasoline motor.

Mr. Elliott: How long would it take, as a rule, to get another set of batteries to work the signal?

Mr. McKeen: In such a case, take the center battery out of the distance, which, of course, would not cause a very bad interruption of the batteries. I might say that these cases are also very rare and the maintainer in such a case wires headquarters for a man to locate it.

The Vice-President: Mr. Young, can you say the weight of the cell which you believed to be too heavy?

Mr. Young: Five cells are too heavy for a man to handle.

The Vice-President: What was the total weight of those cells? Do you know?

Mr. Young: I don't know; the weight now would run 25 to 26 lbs.

The Secretary: I think you use the "SS-7."

Mr. Young: Yes.

The Secretary: The five cells in one case weigh 56½ lbs., depending somewhat on the assembling.

The Vice-President: I do not know whether we have anything on the weight or not. Mr. McKeen says three cells weigh about 56 lbs. He said a man could pick up two in one hand. Is that it? Down in Maine a man can't carry one in two hands. It may be a question of locality.

A paper on the "Generation, Control and Transmission of Alternating Current for Railway Signals," by Frank R. Rhea and E. E. Kimball, both of the General Electric Company, was read by Mr. Rhea.

The advantages of alternating current for track circuits have been more or less recognized for some time and papers have been read and publications issued outlining various systems of track circuits and details of A. C. signal apparatus, but the signal engineer is concerned with another problem, for, after he has his signal problem worked out satisfactorily, he has yet to obtain a reliable and constant supply of alternating current. As soon as he begins investigating alternating current generation and transmission, he finds that his direct current practice stands for little and that the laws governing alternating current are different from those govening direct current For this reason it has been thought advisable to present an analogy between direct and alternating current generation and describe briefly some of the ways that alternating current can be produced, controlled and transmitted for the operation of railway signals.

The authors gave the principles of the construction and operation of A. C. generators and other apparatus.

L. F. Howard (Union Switch & Signal Co.): Mr. Rhea spoke of the parallel operation of the A. C. generators at different stations. The A. C. generation and transmission of power for signal systems is going to be somewhat different from the generation and transmission of power for other systems. The typical power transmission system generates a large amount of power, steps up to high voltage, transmits to a considerable distance, steps down again, and then we have the distribution at the end of the line. The A. C. signaling system is fundamentally and from necessity a distributing system, and it is a transmission system in so far as it is made so. I agree with Mr. Rhea that it is possible to operate alternaters in parallel, especially with turbines and steam engines, but think that considerable difficulty would be experienced in running the alternaters in parallel with gas engines. Mr. Rhea has stated that the division of the load between the alternaters in parallel depends on the adjustment of the prime movers, and anyone who has had experience in adjusting gas engines can imagine what trouble would be experienced by two operators twenty to forty miles apart in adjusting their gas engine governors so as to obtain the proper distribution of load between their respective generators. If parallel operation is attempted it will probably mean that the generators and prime movers will all have to be designed and furnished by one concern for any given system, for in so much as the proper synchronizing of the apparatus depends not only on the speed and load characteristics of the generators, but on the transmission line stands and the nature of the load, the designer will have to know all of these and very unsatisfactory results would probably be obtained if one generator was bought from one manufacturer, another from another, and so on with the prime movers. The question of operation of the signal system as a whole may have even greater weight in determining this question of parallel operation than the design of the apparatus and transmission line. Mr. Rhea spoke of the wattless synchronizing current passing between the generators. It is true that this current, which circulates between the machines in a generating station over the connecting bus bars is in a sense wattless, but, nevertheless, energy is being expended in heating up the conductors and in pulling the machines into step. When the generators are located twenty to forty miles apart this synchronizing current has to be carried over the connecting transmission lines, and in order to get good synchronizing the impedence lines must be low. If you get a short circuit on the transmission lines, with the four stations mentioned by Mr. Rhea, out go 120 miles of signals. The first operator who tries to get in on the line will probably blow a circuit breaker when he tries to handle 120 miles of signals. The second, third and fourth operators will probably do the same thing in succession. Then they will all call up the central office, notifying them that there is trouble somewhere on the 120 miles of line. The question then arises if it would not be better to do away with the parallel operation, cutting the lines between stations, and then by dividing the feeders going east and west at the generating station, when trouble occurs on any section, the circuit breaker for that feeder alone goes out, and if it does not stay in when closed, the operator knows that the trouble is confined to that particular ten or twenty miles of line and can notify the central office at once to that effect. As to the voltage, the power to be transmitted is small, and I think the distances will also be small. It is merely a question of balancing up the cost of high voltage generator and switchboard apparatus, high voltage transformers, cut-outs and lightning arresters, which have no more scrap value than the low voltage apparatus, against the extra copper which would be put in the transmission lines and which may increase in value as time goes on.

From what Mr. Rhea says in connection with three-phase vs. single-phase, I judge that he is in favor of the former. Putting aside the matter of complexity which would come with the three-phase, he has neglected the fact that three transformers, or a three-phase transformer, with three corresponding cut outs and lightning arresters, would be necessary at each signal location. He speaks of the advantage, when using the three-phase, of being able to lose one phase and still operate the motor. I cannot conceive that the difference in operation between a single-phase and a three-phase single motor can be the reason of Mr. Rhea's favor to the three-phase system, and must conclude that the three phases are necessary to the operation of the track circuit system. If the three phases are necessary to the track circuit system, the loss of one phase would disable the track circuit system. Where, then, would be the advantage of the three-phase motor over the single-phase motor, when there is no track circuit to close the relay contacts controlling the motor?

Mr. Rhea: The intention of the paper was not to touch on the signal system proper, and the point that Mr. Howard brings up as to the signal circuits is largely dominated by the interconnection of the circuits. It is not necessary to use three-phase, or three transformers, or three-phase transformers. It is possible to break connections well balanced by two-phase or three-phase quarter connections, as it is termed. That will give two phases. However, if the method of signal system is involved in using the single-phase track circuits, it will involve an arrangement of common wires, which will lead to a practice which ought to be really adopted in all signals, a separation by common wires, in almost an ideal manner. It means additional common wire, to use line wire control, but it doesn't mean doubling the common wire. If wireless control is adopted, or, what is analagous in D. C. practice, the track circuit polarized, another phase of the signaling problem is brought up. The signal engineer is confronted in A. C. signalling with two problems; one is signaling and the other is transmission. The study which I have made of the subject has been rather on the signal circuits themselves, and although it is not easy to figure out the circuits that will be necessary to use three-phase transmission and single-phase arrangement of signals, it is entirely practicable to do so, in my opinion, and in doing it is necessary to put in a system of common wires, which ought to be done and which a good many of the railways are now doing for their D. C. work. It will force you to that improvement, which is a good thing in itself.

Mr. Stevens: What do you mean by putting in common wire?

Mr. Rhea: Mr. Shaver sent out a circular letter a short time ago, which is particularly pertinent, as to the practice of the different railways and signal companies in regard to their common return wire. Mr. Elliott has a specification that this common wire must be good for five miles. The wire, in this connection, could be arranged common between certain sectionalizing points and particularly in the neighborhood of interlockings, which would almost necessitate putting the interlocking on one common wire, automatic signals on one side on another common wire and automatic signals on the other side on another common wire, overlapping the three of them. There are a number of details of that kind that are strictly signalling questions which will reduce to a question of the survival of the fittest.

Mr. Howard: Do I understand that with your three-phase system you could lose one phase and still operate the circuits without interruption?

Mr. Rhea: Yes, you would lose a portion of the track circuits.

Mr. Howard: What is the advantage, then, of the three-phase induction motor?

Mr. Rhea: With the three-phase motor, one particular advantage is the clearing of the signaling system when an interruption has occurred. With the commutator motor you have a large excess of current to start the system when there has been an interruption, about 300 to 350 per cent. overload being possible. That limits the extent of the transmission system, that can be handled with that generating plant; whereas, with a quarter phase motor, you can start your signal system with about 20 per cene. overload for the entire system.

Mr. Howard: As I understand it, your remarks concerning the advantage of the three-phase induction motor, in being able to start with one phase disabled, would apply to induction motors in general and has no force in connection with the signaling system.

Mr. Rhea: It will keep some of the apparatus working, and keep the system balanced. The track circuits connected on the other phases, of course, will be out of operation. You can keep your A. C. track circuits working through interlockings, which is another advantage that can be taken of it.

Mr. Howard: Is your reference to 300 to 350 per cent. applied to the increase in current of the induction motor, and not to the increase of the normal current of the signaling system?

Mr. Rhea: Yes, the dominating feature of the transmission system will be to design it so the signal system will start when there is an interruption of current.

Mr. Howard: But of course, the increase in the total load of the transmission system, will not be increased from 200 to 300 per cent.? The motor itself is a comparatively small per cent. of the total load of the system.

Mr. Rhea: No, I don't agree with you.

Mr. Howard: In throwing in the switch, after the power has gone off, the increase of the current over the normal current, we find to be well within 100 per cent.

Mr. Rhea: I haven't found it so. I have found on the starting load that with any system I have been able to get information on, the starting load has been at least 200 per cent. more than the normal load. Even with single phase wireless controlled circuits, your starting phase is dominating.

S. P. Hull, (N. Y. C. & H. R): I am in harmony with most of the things he has said. On page 49, he says: "As seen above, the current required to operate single phase motors is excessive, and it is obvious that a greater difficulty will be experienced in obtaining a generator of sufficient capacity," etc. As a matter of fact, single phase motors are now available in which the starting current and starting retorts are no greater than the running current and retort. They take less in starting than the three-phase motors. So I take it he means that remark to apply to induction motors. Three-phase motors are larger in efficiency and have no contraction, such as centrifugal contact to start them, or teaser windings; so that with the single phase motors now available a system can be started or reached after the circuit breaker has been opened without as much current as would be required with the equal weight that wauld be required with three-phase motors. He speaks of the single phase generators requiring more material, and so forth. That is true, but the generators are so small that it is an insignificant matter, and without very much excess, because you can provide single phase generators which will start the whole system without excessive drop. With regard to sectionalization, I believe it is desirable where possible to sectionalize at sub-stations, that is, to feed normally from one sub-station to another, so if a break occurs the part of the line isolated can be taken up by the adjacent substation rather than sectionalized between sub-stations, although it becomes expensive sometimes to do that, and it is a question if the additional expense is warraned.

Mr. Stevens: We are going into this matter, and I think it will be a success. We have ideal station conditions from the fact that we get our power from our own stations and don't have to employ labor to develope the power, but aside from that, the fact that we are going to get modern methods which will reduce our daily tasks seems to me to be a move in the right direction.

Mr. Elliott: I would like to get some information in regard to a point mentioned in the conclusion: "We venture the prediction that the use of A. C. current will be extended in future signal installations on account of its being the only absolutely effective means of eliminating foreign current troubles, and it is practical to so design and construct A. C. signal apparatus," etc. I have been up against the proposition of installing track circuits in a large terminal where there are a great number of double slip switches. These switches are so close together that it is almost impracticable to install installation joints to allow the use of what might be called two-rail track circuits. It is expected in the near future that electric traction will be installed for the movements of trains, and whether it will be D. C. or A. C. traction, we don't know. If D. C. propulsion is to be used, A. C. track circuits might readily be put in with a single rail type; but my understanding is that no satisfactory single track A. C. relay has been designed to work; that A. C. current has been used for propulsion, that is, irrespective of the cycles used for the track circuit, and we may be up against this proposition at any time almost any place, because double slip switches are very often used where it is difficult to install two rail track circuits. If the signal companies can help us out and explain how such circuits might be used we would be glad to have the information.

Mr. Rhea: I believe there is a number of representatives of the conduit manufacturers here. We have ventured an outline of what has seemed a new type of conduit construc-

tion, and I believe there is quite a problem in that connection to be worked out.

Harold K. Weld, (McRoy Clay Works): It seems as if the basis of the whole A. C. transmission system depends upon the integrity of the transmission line, and, therefore, it would seem that it is a very important matter that all steps be taken to make it absolutely reliable. If a street railway line is planned, it would seem that a first class power transmission line should be installed, or if it is desirable to put in a cable then, if possible, to eliminate the effects of inductive disturbances upon the telephone and telegraph lines, that will aid considerably to a great extent. If an underground system is planned, it would appear to me that it would not pay for a company to bury in the ground a cable which probably would have a value of $1 per foot, perhaps, with no possibility of taking it up. I believe Mr. Rhea agrees that the Pullian type of conduit would be the most desirable, and I believe type if the facts were known the Pullian type would be the only type employed. I know of conduits where the cost per duct foot was as low as 11.6 cents. This was laid under a 2-foot strip, and included the manhole. I think you could lay conduits in this manner for 10 to 14 cents per duct foot. I believe the figures are reliable. I give them to you for what they are worth.

Mr. Peabody: I would like to ask if it is possible to lay a single duct at any such cost?

Mr. Weld: In laying pipe clay conduits in South Halsted street, Chicago, about 103rd street. I don't mean to say that 11.6 cents is always reached in city work, but I have in my pocket a great deal of data, obtained from one of the largest pipe service corporations in this city, where the duct foot cost total, including manholes, averaged about 14 cents per duct foot, using pipe clay conduits, multiple pipe.

Mr. Elliott: Would you have to use practically lead covered cable?

Mr. Weld: Yes, certainly it would seem to me desirable to use lead and wood cable, although I am not certain what alkalis, or salts, get through. I am speaking more from the standpoint of a paper cable. There may be other people who know the effect of the salts that get through the road bed better than I do.

Mr. Peabody: The cost of laying ducts as given seems to me to be very low. We laid four ducts, and with the manholes each averaged perhaps 250 feet apart, or a little less; the cost was a little less than 80 cents a foot for the four ducts, the manholes and all complete. It was rather surprising when we made our estimates up and we found that wooden trunking, filled up trunking would cost us considerably more than the conduits laid in concrete permanent construction.

Mr. Elliott: The ducts that were installed in New York for the electric zone cost about $65,000. I think for three and one-half miles of ducts. Vitrified ducts were used, laid in layers of four splicing chambers. We found it impossible to pull the cable for more than 400 feet. When the apparatus was first installed two transformers were placed in the splicing chamber, and owing to water leaking in we had to go to the expense of putting boxes above the splicing chamber; so the expense of underground construction with A. C. work was very heavy.

The meeting then adjourned.

The executive committee announced in the Journal published previous to the convention that all the propositions submitted to letter ballot, at the annual meeting held in Louisville, Ky., have been adopted as recommended standards by this association, with the exeception of the report of Committee No. 1 on signaling practice, all, with the exception of the report of Committee No. 1, having received more than the required two-thirds affirmative vote.

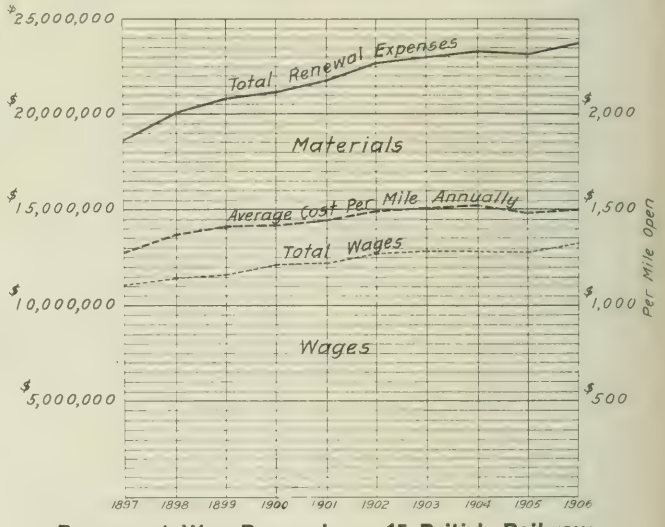
In the letter ballot on Wires and Cables, the item Specifications for Galvanized Iron Bond Wires was included in error. Also the definition of the word Mast, reading, "the upright to which the blade may be attached." should read, "the upright to which the signals are directly attached." By action of the executive committee, the first-mentioned was withdrawn after an examination of the minutes, which proved that it had been referred back to the committee instead of being submitted to letter ballot, and the latter was corrected as originally submitted.

Passenger charges on the Peking-Hankow railway in China are as follows: First class, 2.88 cents per mile; second class, 2.08 cents per mile, and third class, 0.76 cents per mile. Freight charges are as follows: First class, 13.28 cents per ton per mile; second class, 4.16 cents per ton per mile, and third class, 2.72 cents per ton per mile.

THE SERVICEABLE LIFE AND COST OF RENEWALS OF PERMANENT WAY OF BRITISH RAILWAYS.*

According to the Board of Trade railway returns (1907) there are, roundly speaking, a little over 23,000 miles of railway open for traffic in the United Kingdom, of which about 13,500 miles consist of double and more tracks, and about 10,250 miles of single tracks, besides which there are 14,000 miles of sidings. The total annual cost of the maintenance and renewal of way and structures amounted to roundly $55,000, nearly 15 per cent. of the entire working expenses, which have now and for some years past reached the exceptionally high figure of nearly two-thirds (63 per cent.) of the entire railway gross receipts.

In this paper the cost of the maintenance and renewals of the permanent way of fifteen of the principal British railways, having an aggregate of 15,184 miles of line (equivalent to about 80 per cent. of the total mileage of the railways in Great Britain), will alone be dealt with. The average cost of renewals per mile varies from an average maximum of £418.18 ($2,090) per mile during 10 years, in the case of the London, Brighton & South Coast to a



Permanent Way Renewals on 15 British Railways.

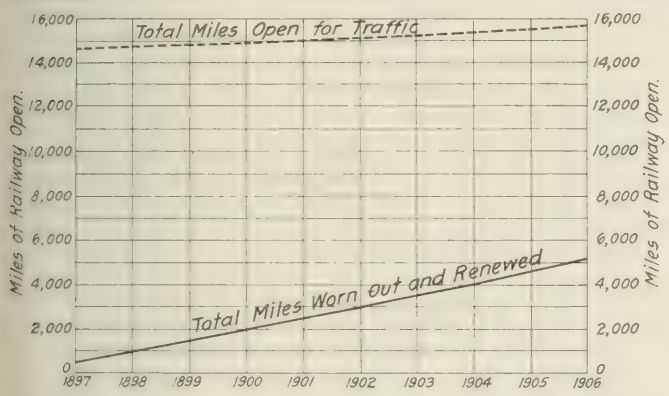
minimum of £190.80 ($955) per mile, in the case of the North British, while the tonnage of goods and minerals per mile in the latter case is just double that of the London, Brighton & South Coast. In another case, that of the Lancashire & Yorkshire, with a maximum tonnage of 41,678 tons per mile of goods and mineral traffic, the average annual cost of renewals is only £291.07 ($1,455) per mile, very little above the average. Again, in the case of the London & North-Western, with the large tonnage of goods and minerals of 26,493 tons per mile, the average cost of renewals is as much as £335.95 ($1,680) per mile, as compared with the North-Eastern company's average of only £236.26 ($1,180) per mile, with its heavy tonnage of 36,004 tons per mile of goods and minerals. It is clear, therefore, that we must look for something more than the mere weight of tonnage to account for the exceptionally large cost of renewals of the permanent way of some of the principal British railways, and there is everything to indicate that it is mainly due to the greatly increased weight and speed of the passenger traffic which has occurred since the introduction of the better and much more durable material of steel rails, and party to the increased weight and speed of the goods and mineral traffic. In this connection it will be as well to advert to the cost of the maintenance and renewal

*Abstract of a paper by R. Price Williams before the Iron and Steel Institute.

of the permanent way at the period almost immediately preceding the first introduction of Bessemer steel rails in the early sixties.

The total cost of the renewal of nine principal railways with iron rails during the 18½ years prior to 1865, with an average aggregate of 3,401 miles of line, during that period only amounted to £5,796,135 ($18,980,675)), and to an average of £170.40 ($850) per mile. It rapidly increased during the first 10 years, after the first partial introduction of steel rails, to £285.53 ($1,430) per mile, partly owing, no doubt, to the high price then of steel rails. Notwithstanding the great subsequent reduction in the price of steel rails to a lower figure than even the best iron rails, the expenditure on the renewal of way on these nine principal railways has, however, now reached an amount of £28,101,881 ($140,509,405) and £314.66 ($1,575) per mile during the short space of the last 10 years—a fivefold increase in amount and now double the cost per mile in renewals—the mileage of these railways increasing from 3,401 to 8,930.

While the mileage during the last 47 years has only a little more than doubled, the operating expenses have increased nearly sixfold, the number of passengers carried has increased nearly sevenfold, the tonnage of goods and minerals carried has increased nearly fivefold, while the number of passenger and freight cars has only increased threefold; no doubt a considerable portion of the increase



Mileage Operated on 15 British Railways.

of the permanent way expenses is mainly due, as already stated, to the very large increase in the weight and speed of the passenger traffic, and partly to the very large increase in the tonnage of goods and mineral traffic, and also in some degree to its somewhat increased speed.

An intimate knowledge of the constituents of the material has been obtained by chemical analysis; but what are conspicuous by their absence in all these analyses are particulars of the physical qualities of the steel, and the amount of the tonnage and of the speed of the trains to which the rails have been subject, together with an exact measure of the wear of the rail-head during a given period.

Considered as way and structures and not merely as track, the average annual expenditure in maintenance and renewals of the permanent way, in terms per mile of railway, whether it consists of double or single lines, during a sufficiently long period of years, is in reality the real equivalent of the annual death-rate of all classes of the perishable materials which constitute the permanent way of any railway. By way of illustration a period of thirty years may be fixed as a sufficient interval of time to obtain average and reliable results of the destructive effects of the wear and tear of traffic, and of the natural decay and exceptional causes necessitating complete renewal of the materials of all kinds. As will be seen from reference to the accompanying charts, of the results obtained in the case of the 15 principal British railways during the last 10 years, means are afforded of determining very approximately the equivalent number of miles of way and structure of all descriptions which have become worn out and have been required to be renewed so as to have enabled the permanent way of the particular railway to have been maintained in a thorough condition of efficiency. All, in fact, that is required, with the data of the actual annual expenditure per mile of railway of these 15 railways during the past long period of years in question, taking 30 years as a definite and reasonable maximum limit of serviceable life of all classes of materials, subject to the destructive effects of wear and tear and of decay, is to multiply each year's annual cost of renewals per mile of railway by the past 30 years' fixed period, and to divide the total amount of renewals expenditure during the last 10 years by it, and we get the equivalent number of miles of railway—whether double lines or more, or partly double and single, or exclusively single lines, of each of the 15 railways. The results are shown in Fig. 2. In the aggregate this amounts in the 10 years to 5,039 miles of railway, or, roundly, 504 miles annually, which have become worn out and have been replaced in most, if not all, cases with stronger and better materials, and as the traffic on these railways is still rapidly increasing, it may be satisfactory to the steel-rail manufacturers to know that at least that quantity of worn-out steel rails will have to be simultaneously renewed during a similar period in the future.

SCHEME FOR CHICAGO UNION PASSENGER STATION.

In the booth of the C. F. Pease Company a blue print is being shown, a plan for a union passenger station in Chicago, which has been designed by Leroy L. Hunter of Chicago. Mr. Hunter's scheme is based on the theory that all existing passenger stations, except the La Salle street station, are to be abandoned; that Illinois Central suburban trains will continue to run to Randolph street; that the suburban trains of the North Western and the St. Paul will use the new North Western station; that all other suburban trains will use the La Salle street station; and that all through trains will use the proposed union station. Through trains of the Burlington, Great Western, North Western, St. Paul, Wisconsin Central and Southern Indiana would, according to this scheme, enter the new station via Sixteenth street; those of the Santa Fe, Alton and Illinois Central (C., M. & N.), from the west via Twenty-fifth street those of the Pennsylvania Lines, Rock Island, Pere Marquette, Chicago & Eastern Illinois, Monon, Grand Trunk and Wabash, from the south via Twenty-fifth street; and those of the Illinois Central, Big Four, Baltimore & Ohio, Michigan Central, C. C. & L., Lake Shore, Nickel Plate and the Chicago, Indiana & Southern, from the east via Twenty-first street tunnel. Mr. Hunter would have two depots, one for "inbound" and one for "outbound." Both would be situated east of Halsted and near Sixteenth streets, the "inbound" station between Clark street and Fifth avenue, and the "outbound" between Clark and State streets. Each depot would be 1,200 ft. x 666 ft. x 270 ft. high, and contain a grand waiting room with a 35-ft. ceiling, and an "upper" and "lower" waiting room above and below this main waiting room. Above the depots would rise buildings 15 stories high, containing space for the general offices of the railways. Each depot would have 28 tracks in the "upper" and 32 in the "lower" train room, maing 120 tracks in all and in both a total capacity of 360 trains per hour, or one train in and one out every ten seconds. The estimated total cost of the station and terminals would be $120,000,000. Mr. Hunter has worked his interesting scheme out in much detail, and has received several complimentary letters from railway officers to whom he has shown it.

Conventionalities

Alas, for fame! The sign painters insist upon calling the genial manager of the Pocket List of Railroad Officials, "J. Alexander Bron."

The Chicago, Rock Island & Pacific last week issued a revised code of rules to conform with the requirements of modern signal practice.

William V. Dee, the G. Drouve Company, was inquiring, "Seen John Reynolds or anybody like that around here?" Unfortunately, there is only one "like that."

E. G. Fisher, Railroad Fence Works and the American Steel & Wire Company have each set up a row of hurdles across their spaces at the Coliseum. It has not yet been announced when the race takes place.

"The man who whispers down a well
About the goods he has to sell
Won't reap the gleaming golden dollars,
Like one who climbs a tree and hollers."

A. R. Fugina, assistant engineer, signal department Chicago & Northwestern Railway, has been appointed office engineer. R. M. Phinney, chief draftsman, succeeds Mr. Fugina and H. O. Morgan succeeds Mr. Phinney.

The Signal Association ran special yesterday with a clear track and all arms at the proper angle in the upper quadrant. To-day one car runs as second section of No. 1, and may expect to find the boards against it occasionally.

The Atlantic Coast Line is installing a 40-lever, Saxby & Farmer mechanical interlocking plant at Fort Norfolk, Va., at the crossing of the N. & P. Belt. All signals on both roads give indications in the upper right-hand quadrant. No distant signals are used.

Who said "graft" or "undue influence" in connection with this convention? The committee of arrangements in the official program publishes a list of attractions at local playhouses, but calmly adds: "It is suggested that members communicate with the theater company direct for tickets." Chilly weather for March, isn't it?

The temperature of the interior of the Coliseum yesterday suggested the propriety of approaching the representatives of the American Valve & Meter Company to ask permission to build soft-coal fires in their row of cost-iron stoves, but hopes of warmth were rudely dashed when it was found that they were only the casings of the working parts of water columns.

Even so youthful a road and track supply man as John McKinnon remembers when the exhibit was not so large as now. He was one of the "Peripatets" who formed the principal part of the show a few years ago when the outfit was taken the rounds from Chicago to Detroit, Toronto and Portland, and he still insists that the exhibit of 1901 consisted of a soapbox full of Lufkin rules.

The usual labor difficulty cropped up yesterday morning at the Coliseum. A number of employes of supply concerns were helping install the exhibits and get the booths in shape. Union workmen, who were similarly employed, objected to anyone but members of their organizations doing such work. In order to prevent serious trouble the supply concerns consented to use only union labor and to pay the union men for the work that already had been done by the employes of the supply concern. These concessions and the good offices of the management of the Coliseum, smoothed matters over, and before evening everything—or almost everything—was lovely.

There seem to be about three things that Henry M. Sperry never misses. The first is, to know all about the new jobs of signal illustration—large jobs—that are to be done; the second, to know all the conditions surrounding the work and what the best signal engineers—the rest of them—think ought to be done under such conditions; the third, to get the jobs of supervising the actual work. Makes a pretty good job, too, when it's done. Nothing definite is known as to what he may have up his sleeve now, but he's here.

The regular meeting of the Western Railway Club will be held this (Tuesday) evening at 8 o'clock at the Auditorium. The subjects for discussion are: A report of a committee on Revision of the M. C. B. Rules of Interchange, and an address by Prof. H. Wade Hibbard of the department of mechanical engineering, University of Missouri, on "The Graphical Study of Information." As Professor Hibbard was, in the characteristic way, a pretty good Missourian even before he went to that state, it is supposed that the address will show much that he has been shown.

Walter F. Schleiter of Pittsburg, secretary of the Dilworth-Porter Company and president of the Railroad Supply Company, who, as president of the Road and Track Supply Association, deserves a goodly share of the credit for the success of the Railway Appliances Exhibit, is being congratulated by his friends on having had conferred on him the high honor of appointment by Secretary of State Knox as one of the delegates to represent the United States government at the International Railway Congress, which meets at Berne, Switzerland, in July. He was endorsed by many railway and railway supply men and also by numerous other prominent business men in his home city, Pittsburg, for this appointment.

A representative of one of the tie-preserving companies was observed wandering through the Coliseum yesterday humming half to himself what sounded like the air of a once-familiar hymn. The words were not caught distinctly, but seemed to be about as follows:

"Blest be-e soft ti-ies that rot,
The po-oles that soo-oon decay;
Just co-ome and se-ee the do-ope we've go-ot,
To ke-eep decay awa-ay.

"If woo-od would no-ot decay.
'Twould gi-ive us inwa-ard pain,
And we-e would ha-ave no chance to sa-ay:
'Our tre-eat; please to co-ome a-gain.'"

Local facilities do not permit us to reproduce the musical score, which is, however, well known. We have therefore endeavored to indicate the proper accentuation in type, omitting the third and fourth stanzas.

In making additions of new concrete to old structures an engineer suggests that it would be well to bear in mind the account of the Chinaman, Wu, who was set upon by robbers and had his head severed from his body with the exception of a narrow strip of skin. Being almost immediately discovered by his friends his head was carefully set in place and fixed with bandages. As the patient was strong and healthy the wound apparently healed and he went about his business with no apparent disadvantage save the presence of a thin, red line around his neck. But some months later Wu was sitting at a banquet when a really good story was told. Everybody laughed; Wu roared, threw back his head, when, lo, the seam opened and his head fell to the floor. It was impossible to repeat the previous first-aid operations. Wu was gathered

to his fathers and, on account of the Chinese veneration for ancestors it is stated that his heirs are still in litigation for damages from the heirs of the man who told the story. It is not clear whether the moral should be confined wholly to pointing out the danger of laughing uproariously in the vicinity of concrete structures, or whether it may not be extended so as to suggest an equivalent danger from laughing too heartily at funny stories told at a banquet.

MARGULIES' BAND.

Oscar Margulies and his band are giving concerts each afternoon and evening at the Coliseum. The programs for today are as follows:

AFTERNOON.

March—The Flag of Victory.....Von Blou
Overture—Semiramis .....Rossini
Waltz—Skaters .....Waldteufel
Put on Your Old Gray Bonnet.....Wenrick
Selection—Mignon .....Thomas
March of the Eagles.....Bratton
Ballet—Egyptiene .....Luigini
Intermezzo—"Curly" .....Powell
Cornet Solo.....Mr. Albert Wasshausen
My Pony Boy .....O'Donnell

EVENING.

March—La Reine de Saba.....Gounod
Overture—Stradella .....Flotow
Waltz—"Sweethearts" .....Sullivan
Hearts and Flowers.....Tobani
Selection—Little Nemo .....Herbert
By the Light of the Silvery Moon.....Edwards
A Hunting Scene (descriptive).....Buccalossi
Largo .....Haendel
Grand American Fantasia.....Tobani
March—Semper Fidalis .....Sousa

THE RAILWAY APPLIANCES EXHIBIT.

The Railway Appliances Exhibit at the Coliseum this year is substantially larger than was that of last year. The number of exhibits last year was 160. The number this year is 164. But a number of firms took more space this year. The total number of spaces taken this year is 224, as compared with 170 last year. The total space on the main floor of the Coliseum is 45,312 sq. ft. Of this 12,817 sq. ft. is used for aisles, and 32,517 sq. ft. for the exhibits. The space in the Annex is 6,138 sq. ft., so that about 38,000 sq. ft. is occupied by the exhibits.

Not only are the exhibits this year larger and more numerous than last year, but they are better. Last year's was the first exhibition ever given by the Road and Track Supply Association. The supply men have profited by their first experience in the Coliseum, and this year are splendidly utilizing its possibilities.

The hall is very tastefully decorated. Flags of all nations wave overhead, the American flag, of course, predominating. The balconies are decorated with red, white and blue bunting, and the booths in green and gold. The centerpiece of the hall is a resting place banked high with ferns and flowers, around the lower part of which comfortable benches are arranged. The walls are decorated with artificial flowers on wooden net.

The attendance at the exhibition on the first day greatly surpassed the attendance on the first day last year.

One of the attractions at the Coliseum is Oscar Margulies' band, which gives concerts every afternoon and evening.

The Coliseum opens every morning at 8 o'clock and closes every night at 10 during the convention and appliances exhibition.

ROAD AND TRACK SUPPLY MEETING.

The annual meeting of the Road and Track Supply Association for the election of officers and members of the executive committee will be held in the ballroom of the Coliseum Annex, Tuesday, March 15, at 3 o'clock p. m.

The secretary has issued a notice to the effect that while all supplymen attending the convention will be welcomed at to-day's meeting, only one duly accredited representative from each member of the association will be entitled to vote for candidates for office. The latter will be recognized by yellow badges; which badges may be had by applying to the secretary, John N. Reynolds, at the Coliseum, any time after nine o'clock this morning.

DINNER TO W. J. CALHOUN.

J. W. Duntley, president of the Duntley Manufacturing Company, makers of the Rockford car, and the board of directors and employes of this company, gave an informal dinner on the evening of March 8 at the Union League Club, Chicago, to William J. Calhoun, recently appointed United States minister to China. Sixty persons were present. Mr. Calhoun is one of the directors of the company. Mr. Duntley acted as toastmaster and in a short speech presented Mr. Calhoun with a watch fob set with Chinese jade. "May its mission ever be," said Mr. Duntley, "to recall to your mind this scene and the feeling that prompts us in presenting it, and serve to remind you that 'the distant far still to memory dear.'" In the course of his reply Mr. Calhoun said:

"When Mr. Duntley inaugurated this enterprise I do not think he had more than a half dozen men in his employ. The enterprise has since developed so rapidly that it commands the assistance of the large organization which is represented here to-night.

"Behind every manufacturing and commercial enterprise are several forces, particularly in the manufacture and sale of what may be called a specialty. In the first place, there is behind all the forces the inventor. His ingenious mind produces the article; he studies the need of the public, and he tries to invent and produce something to meet that demand, so that he is, after all, the beginner of every movement of this kind, and always the important element in its success. After he produces a thing that the public wants, then the next thing is to introduce it to the public. Now, this business, which has grown so rapidly that it has been a surprise to Mr. Duntley and everybody connected with it, is divided into two departments—first, the cleaner, with which perhaps most of you are identified. Sitting over there is Mr. Smith, whose brain conceived the machine in all its parts and prepared it for the use and application to the wants of men.

"Another important part of the business, and one which is destined in my judgment to grow greater and greater as the years go on, is Mr. Duntley's special form of handcar. And over there, on the other side of the table, is Mr. Westaway, who has worked for days and months and perhaps years, and finally realized all his dreams and aspirations, and who is at work producing something that bids fair to revolutionize certain elements in the transportation problem in this country.

"After the inventor is through with his work, the salesman is required to introduce it to the public. The inventor can do no good unless he is able to introduce it to the public, and the salesman is the man who goes out into the

field and carries the fruits of the inventor's mind. It takes no ordinary man to make a good salesman; he must first have confidence in the thing he is selling; secondly, he must understand its workings and its adaptation to the use for which it is intended, and he must be a good judge of human nature; for he must know how to approach people.

"You have in this enterprise inventors who, I think, are able to cope with anybody who comes into the field. You must have a general manager who has the ability to infuse life and vigor into the forces which he has at his control. I have known Mr. Duntley for some ten or twelve years, and if there is ever a man in this world who has faith in himself and faith in the business in which he is engaged, and the power to infuse energy and faith in those associated with him, it is 'Jack' Duntley, and one of the great elements of his success is his appreciation of good work.

"Jack says that he is going to send me reports every week, and if you get tired and break down I will come back, take off my coat, and help you all possible. In the language of the Duntley poet, whose lines I am now reading, when I come back I expect to find a Duntley cleaner in every home in the United States."

MR. HOOLEY ON ENGINEERS.

"I see be th' pa-apers," remarked Mr. Hooley yesterday morning, "that there's goin' to be a convintion av th' relrod engineers at th' Aujytoryum this week. Ye wud think, Dinnissey, that th' meetin' was that av th' min that run th' engines, wudn't ye, Dinnissey?"

"I wud," replied Mr. Dinnissey. "I wud so."

"Ye're arl wrong, Dinnissey. Th' min that run th' engines, they're enginemin. Iv ye heard about a convintion av enginemin ye cud go to ut, Dinnissey, but ye won't go. Ye'll niver hear av wan. There ain't anny such thing but the brotherhood, my frind. Th' min that run th' engines, Dinnissey, they might be engineers, but they a'n't. I niver saw wan that was. 'Tis a discombobylation av th' English language that putts th' min that runs th' engines in th' class wit' th' engineers. Th' engineers, thim's th' min that lay out th' thracks, an'——"

"I thought thim was Dagoes," said Mr. Dennissey. "Arl th' min that I've iver seen layin' down track 'nd shpikin' rails 'nd tamperin' wit' ties, they was arl Dagoes. Thim's engineers, d'ye say, Misther Hooley?"

"Av there was annything, Dinnissey, that ye cud undershtand as it is wudn't be so, ye're that wrong in ye'er comprihinsions," replied Mr. Hooley. "Whin I'm talkin' about th' engineers that's going' to have th' meetin' 'nd that's got th' whole av th' Collyseeum to show th' things they do their relrod business wit', I'm maning' th' aljaybry min—th' wans that figure out on pa-aper what th' min that handle th' dirt 've got to do. They make a pitcher av ut on pa-aper, Dinnissey, 'nd th' min that's got th' pick 'nd shovel 'nd that lays th' rails 've got to make th' job look like th' pitcher. Wanst me frind Jerry Sullivan was th' roadmaster on th' Union Passific whin Mr. Park, th' wan that they've just made vice-prisidint av th' Illinois Cinthral, was th' soop'rintindint av th' division where Jerry was workin'. 'Twas a grea-at job Jerry did in Whyoming. He cut down th' hills, 'nd tuk out th' crooks that th' engineers that built th' line putt in f'r that th' gov'mint was payin' f'r th' wurruk at so much a mile, 'nd the more miles the more pay 'nd the longer job th' more graft. They didn't know so will thin where th' hills was thut they cud dodge, ayther. Mr. Park he wanted to run more thrains and to have more yards at Larrimy, 'nd he says to Jerry, says he, 'Jerry,' says he, 'whin'll ye have thim tracks in at Larrimy?' 'T'ree weeks,' says Jerry. 'I want thim in in two,' says Mr. Park. 'I want thim in in two.' 'Will,' says Jerry, says he, 'iv ye'll take thim aljaybry min, Misthur Parks,' says Jerry, 'I'll have thim in in wan. I'll have thim in in wan,' says he. Jerry didn't till me whither they tuk off th' aljaybray min, but he did a good job, Jerry did, avin iv th' aljaybry min did bother 'im.

"Thim's th' min, too, Dinnissey, that makes th' tunnels fit th' mountains. They misure th' fut av th' mountain like th' shoemaker in th' owld counthry used to misure ye'er fut, whin ye was goin' to a dance 'nd had to put on boots 'cause they wudn't lit ye dance barefutted, 'nd thin they drill fr'm th' wan side to th' other undher th' middle av th' mountain, 'nd iv th' drill man kapes his drill sthraight th' drill fr'm th' wan side hits th' drill fr'm th' other side undher th' middle. Gin'rally, though they bores a hole down fr'm th' fr'm the top av th' mountain so't they can see th' drills whin they hit. They's wan tunnel that I saw in Colorady where they made a misthake in th' misurement. They made th' tunnel too long, Dinniessey, 'nd it shtuck out at both inds, 'nd it's a-shtickin' out iver since."

"What is ut that shticks out, Misther Hooley?" inquired Mr. Dennissey with some show of interest.

"Th' hole, Dinnissey," replied Mr. Hooley, "Ye c'n see ut at both Busk 'nd Ivanhoe. But th' hole looked so bad shtickin' out av th' mountain on both sides that they covered it up wit' snowshids. A hole a quarther av a mile long shtickin' out on th' livil ground wud look bad f'r th' engineers—th' aljaybry min—wudn't ut, Dinnissey? But they's wan pla-ace on th' Southern Passific where there's a hole thrutty miles long that don't go through th' mountain at all, at all. They didn't aim th' drills right at th' shtart, 'nd the hole runs along th' side av th' hills. They've covered that wit' snowshids, too, but in th' hot, dhry wither th' shids get on fire, 'and they're goin' to aim again 'nd run it through th' mountain f'r fear th' hole'll burn up, too."

"Th' aljaybry min make misthakes, thin?" inquired Mr. Dennissey.

"Sometimes, iv th' min that's doin' th' wurruk a'n't shmart enough to corrict thim or get th' min out th' way, as Jerry Sullivan thried to do on th' Union Passific. That's why they have these meetin's, Dinnissey. Wan man finds out what th' others have done in time not to do th' same thing himself. Iv it's a tunnel that's too long they c'n cover it up wit' snowshids, but iv it's a bridge that's too short they can't sthretch it more than up to th' 'lasthic limmut, 's they call ut, whin it breaks."

"I didn't know before what th' 'lasthic limmut av a bridge was," said Mr. Dennissey.

"Nayther did I," replied Mr. Hooley.

MANGANESE FROGS.

The Indianapolis Switch & Frog Company, Springfield, Ohio, is distributing passes, one of which is reproduced herewith, with the following announcement: "Enclosed we hand you pass over our line, which runs from Hicost-on-Maintenance to Economyville, via the Manganese Route, which is equipped throughout with I. S. & F. Co. Model R-N-R frogs, noiseless and easy riding. We will be glad to have you join us on an inspection trip March 14th to 19th, inclusive. The Convention Special will stop daily at Point Interest (Exhibit Space 182, Coliseum), where these frogs are installed. The reverse of the pass shows a floor plan of the Coliseum.

This is a solid manganese frog, requiring no renewals during the life of the manganese, and the track rails connect direct to the frog proper, with no alteration. Only one pair of splices are required, instead of four, and all rails are protected by manganese easers, so that it is claimed that all joint and point pounding is eliminated and that the frog is smooth riding, noiseless and lasting.

The company also makes a specialty of solid and insert manganese crossings and switch points, and all types of regular built-up construction.

At the Coliseum

The triple lock switch stand, made by W. F. Bossert Manufacturing Company, Utica, N. Y., which is on exhibition in space 137, is attracting unusual attention from prominent maintenance of way and signal officers. It is evidently the long-desired device that locks switches and racks in every operation. As a prominent officer remarked, "At last we have something that is proof against the carelessness of the operator. Now I can sleep at nights."

MALLEABLE IRON TRACK BRACES.

The National Malleable Castings Co., Chicago, has on exhibit in booth 145 at the Coliseum a number of malleable iron track braces, which are light, strong, well designed, and will withstand climatic conditions to a large extent. The exhibit is in charge of H. I. Hiatt and J. J. Byers.

ADAMS MOTOR CAR.

The Adams motor car is one of the exhibits in booths 113-114, by Burton W. Mudge & Co., Chicago. The car is very light, the four-wheel model shown in the cut weighing only 270 lbs., and is so well balanced that a signalman, lineman or lampman can easily handle it alone.



It is equipped with a two-cycle, three-port, air-cooled engine, controlled by a throttle lever, spark lever and compression relief lever for starting and coasting. The makers claim for the car, simplicity, durability, cleanliness, convenience, safety and economy.

ELECTRIC AUTOMATIC RAILROAD SAFETY SIGNAL COMPANY.

The Electric Automatic Railroad Safety Signal Company, 5 Broad street, New York city, is putting on the market the La Croix cab signal, automatic stop and train telephone, a system designed to work on both single and double track, and to provide means for communicating by telephone between a train on the road and the offices in the stations. This apparatus was exhibited to a large number of railway men on the Erie Railroad, near New York city, a few months since. The source of electric power for the necessary currents is a steam turbine carried on the engine, and the circuits are arranged to be normally closed. Contact is made with wires along the road by means of steel brushes fixed to the trucks of the tender of the locomotive. These brushes come in contact with an electrical conductor a few hundred feet long fixed beside the track at suitable intervals. This conductor is connected to a wire line on the telegraph poles along the right-of-way. The block signaling arrangements are such that when two trains, moving toward each other, come within the same block section, say within two miles, the resistance of the circuits on the engines is changed in such a way as to open a local circuit, and by suitable apparatus, to apply the brakes and also extinguish the green electric lamp which is arranged to glow at all times when the block ahead is clear. Simultaneously with the application of the air brakes, an air whistle is blown by the escaping air. A suitable recording device is provided, so that the exact time at which all operations took place can be known. The same wires that are used to connect the engine with the line for signaling are used also for communication by telephone. Thus the engineman can communicate with headquarters from any signaling point. As in all track circuit signaling, the apparatus gives notice when the electric current in the track fails by reason of a broken rail, and protection is provided against danger from cars on side tracks, fouling the main line.

SCHERZER ROLLING LIFT BRIDGE FOR THE GALVESTON CAUSEWAY.

The causeway now under construction across Galveston Bay, connecting the city of Galveston with the mainland, is to have a total length of 10,642 ft. The bridge proper is to consist of 28 concrete steel arches, each 70 ft. clear span, and a single leaf Scherzer rolling lift bridge, 124 ft. center to center of bearings, giving a clear channel for navigation 110 ft. wide. The piers to support the movable bridge are nearly completed and the entire work is expected to be completed early next year.

The Scherzer rolling lift bridge will be 45 ft. wide center to center of trusses, and will accommodate two railway tracks, one interurban railway track and highway traffic. Owing to the large amount of traffic to be accommodated, every precaution has been taken for the safe and rapid operation of the bridge. The movable span is to be operated by electric power, and under usual conditions will be operated within 30 seconds.

The movable span is a rigid structure, the counterweight being composed of plain concrete covered by steel plates directly fixed to the trusses. The new bridge is to be used by the Harriman Lines, Santa Fe, Missouri Pacific, Rock Island, Missouri, Kansas & Texas, Galveston-Houston Interurban Electric, and will also accommodate highway traffic to and from the Island.

The building of the bridge is under the charge of Linton W. Stubbs, supervising engineer. The design of the Scherzer rolling lift bridge was made by the Scherzer Rolling Lift Bridge Company, Monadnock building, Chicago, and the contract for the superstructure was taken by the Penn Bridge Company, Beaver Falls, Pa.

TEST OF DIAMOND TAPERED STEEL POLE.

The U. S. Metal & Manufacturing Company, New York, conducted a test on the Diamond tapered steel pole in the yards of the Chicago City Railway, Chicago, on March 12, the results of which should be of interest to many. The pole used was one of the standard Diamond poles for trolley, electric light, telegraph or telephone wires and the conditions of the test were intended to be as near as possible those met in actual service. The Diamond poles are made from two tapered plates, the longitudinal edges being flanged and each plate troughed, so that when they are forced together the pole has a square cross section, a uniform taper and diagonally opposite longitudinal joints. The pole used in this test was 30 ft. long, made of ¼ in. steel, was 8 in. square at the bottom and 4½ in. square at the top. It was set in 6 ft. of concrete and a force exerted horizontally at a point 18 in. from the top of the pole in such a manner that the line of strain was along the diagonal through the joints. Four loads were applied ranging from 500 lbs. to 2,000 lbs., and the following deflections were measured for each load: 500 lbs., 1¾ in., 1,000 lbs., 4 in., 1,500 lbs., 6 1-16

in., 2,000 lbs., 8⅞ in. After each load was removed the pole returned to its upright position and showed no signs of permanent deformation.

A pole on which a similar test was made by the Illinois Traction System at Decatur, Ill., is on exhibition in booth 18 at the Coliseum. This test is to be repeated one day during the convention week, as a number have expressed a desire to watch the performance of the pole. At that test, loads greater than 2,000 lbs. are to be applied to see what effect excessive stresses will have.

SWITCH AND SEMAPHORE LAMPS.

The Armspear Manufacturing Company, New York, is showing its heavy steel switch and semaphore lamps for one-day and long-time burners of standard design with the new side door, which is also this company's design. The feature of this new door is its being built with a real water shed, so arranged that water runs off of instead of into the lamp. It is air tight and the door stop is made integral with the door proper.

The new "Armspear" flat-frame long-time burner is also being exhibited. This burner has a removable cone, so that the parts are accessible for cleaning. It may be a combination or a non-chimney burner, as desired. The burner shaft is fitted with a drag to prevent the wick from jarring down. It is the purpose of the company to place this new burner on the market to meet the demand for a long-time burner of maximum candle power at a minimum consumption of oil.

The new "Armspear" bayonet catch outside adjustment steel lantern is also displayed. The oil pot is removed from the bottom instead of through the top, and it does not require the removal of the globe for lighting. In addition to the above new products a full line of "Armspear" switch and semaphore lamps, bridge and pier lamps, markers for classification and caboose cupolas, and straight body-type companion lamps are shown.

All top draft lamps are equipped with "Armspear," easy access top ventilation, the parts of which are in plain sight and easily removed for cleaning. Samples of all will gladly be sent to those interested. The exhibit is in space 184, to the left of the main entrance.

KING LAWSON DUMP CARS.

The King Lawson dump cars may now be purchased outright, which is a decided advantage over the old policy of merely leasing them. This arrangement has been made, it is said, on account of the increasing demand for these cars, which demand could not be met under the leasing plan.

This car is adapted to a very wide field of usefulness and its economy in operation is an important feature. The cars are standard gage, made of steel and equipped to meet M. C. B. requirements.

The King Lawson dump cars deposit their loads clear of the rails, which enables their use on main lines without interfering with the regular traffic. Rock can be handled with speed and facility, as can very large boulders and hot material in steel works. The simplicity and strength of this car's construction insures great length of service, the car being considered as good, from a practical standpoint, after five years of hard service, as when new. An important feature of the King Lawson dump cars is that they dump on either side and at a rate of 80,000 lbs. of material in one-half minute.

The King Lawson Car Company, 17 State street, New York, has illustrated literature regarding these cars, which it will be pleased to send to interested parties. This company also publishes some valuable information under the heading of "Construction and Improvement Information."

NEW TIE-TREATING PROCESS.

The Pacific Timber Preserving Company, Spokane, Wash., has just gone into the market with its tie-treating process, after four years of experiment and tests.

The process consists of dipping the ties in a hot solution of coal tar and other ingredients. This puts a coating on them that excludes moisture and protects the wood from the chemical action of the soil. The dipping process and the subsequent draining of the ties take but a few minutes, after which the ties are left for several days for the coating to harden. Ties which have been in actual service 4½ years in the tracks of the Walla Walla Traction Company are in a perfect state of preservation, while untreated ties of the same character, in the same track, laid at the same time, have completely rotted and been replaced.

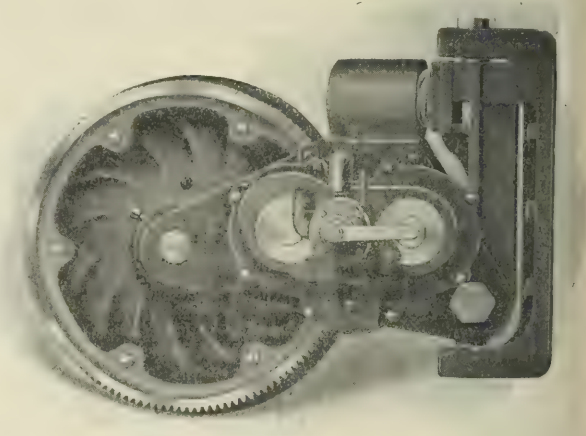
These ties have also been in service on the Oregon Railroad & Navigation for four years, without deterioration, and the Northern Pacific laid some last spring. Contracts have just been closed for supplying a minimum of 100,000 ties to the Northern Pacific, 25,000 to the Seattle Electric Company and 25,000 to the Washington Water Power Company, Spokane.

The process originated in a district where the life of untreated fir ties is very short, being from three to five years. The cost of the treatment is much less than that of creosoting, and the records of performance to date would indicate a large saving. A feature of the process is the fact that the treating plants are portable and can be set up at the points where ties are delivered to the railway, thereby saving cost of transportation to and from the plant, which means a great deal.

The treated ties are being exhibited in Space 11 at the Coliseum.

COMPRESSED AIR TURNTABLE TRACTOR.

Although the Weir & Craig Manufacturing Co., Chicago, (booth 143) has been well known for the past twenty-five years as a manufacturer of machinery, its entrance into the railway field dates only from 1907, when it took over the business and patents of J. L. Pilling Co., Chicago. Since this time, it has improved and added to its line of machinery, until now it has a complete line of compressed air and electric portable hoists, pneumatic and hydraulic locomotive drop pit jacks, combined electric tractors and winches for moving dead locomotives on to or off of the table, and machinery for operating transfer tables.



Compressed Air Turntable Tractor.

The illustration shown herewith is of the latest type of

compressed air turntable tractor which, as indicated by the number in use, is the most popular type. This is probably due to the fact that the machine can be operated either from a central source of air supply or from the locomotive which makes its application possible at any point.

A feature of this machine which is common to all the Weir & Craig tractors is the patented universal bracket. Being pivoted both horizontally and vertically it permits the tractor wheel to follow all variations in the pit rail, thereby considerably reducing the cost of maintenance of the pit rail, as well as greatly facilitating operation.

STRAUSS TRUNION BRIDGES IN EUROPE.

The Strauss Bascule & Concrete Bridge Co., Chicago, is making a number of very interesting designs at the present time. Among these is the bascule span which will form a part of the so-called Palace bridge at St. Petersburg, Russia. This structure forms the approach to the winter palace of the Czar and will be one of the most magnificent of continental bridges. In point of size and importance, it will surpass the famous Tower bridge of London, which still holds the record as the largest and most heavily trafficked highway bascule bridge in the world and which is also of the trunion type. The Strauss design was also selected for the recently completed Knippels bridge at Copenhagen, an equally noteworthy structure. The Strauss company has on exhibition in booth 157 a number of drawings and models of these bridges.

KENNICOTT WATER WEIGHER.

The Kennicott Water Softener Co., Chicago Hights, Ill., build an accurate water weigher which is well adapted for weighing water to locomotive tenders or for continuously weighing boiler feed water to stationary boilers.

This weigher, shown in the accompanying cut, is adapted to receive water from standpipe or tank and deliver it in unit charges of definite uniform weight to the tender. A counter registers each unit charge delivered and in this way an accurate check is kept upon the amount of water used, which gives at once the steam consumption of the



Kennicott Water Weigher.

locomotive. When the coal is also weighed the Kennicott water weigher furnishes a reliable means for checking the evaporative value of the fuel. The Kennicott water weigher is also adapted to weighing the water delivered to standpipes and storage tanks, and will weigh hot or cold water. It is simple, dependable, positive in operation, accurate at all rates of flow and entirely automatic. It has no valves, no revolving disks or vanes, and no pistons. Its accuracy is unaffected by changes of temperature or dirt, scale, sediment, rags, or sudden changes in rate of supply.

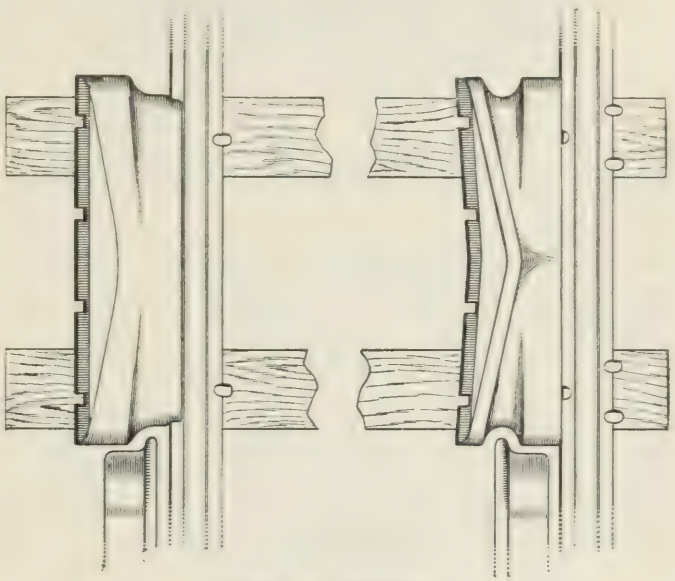
Each Kennicott weigher is assembled at the factory and tested and calibrated. The unit charge is accurately determined by actual weighing on platform scales; and a certificate of accuracy and capacity accompanies each shipment. The weigher is guaranteed to record the correct weight of water to within one-half of one per cent. of absolute accuracy.

The Kennicott Co. has an exhibit in booth 74 at the Coliseum.

BUDA CAR REPLACERS.

The accompanying illustration shows the Buda Company's No. 4 car replacer, which is being shown in booths 87-90 at the Coliseum. This replacer is for an 80 to 100 lb. rail, the weight per pair being 180 lbs.

Buda replacers are so designed that the tread of the wheel rather than the flange first comes in contact with the replacer which eliminates spinning of the wheel. In replacing a car the tread first engages the replacer, then the tread and flange, and finally the flange. The rise is gradual, which



Buda Car Replacer.

prevents any damage to the flange or replacer, and there is no jarring or jolting which avoids damage to the car.

These replacers are furnished in five different sizes for rails weighing from 60 lbs. up to 100 lbs. the replacers varying in weight from 197 to 240 lbs. per pair.

This company also make a single end type replacer for rails weighing 80 to 100 lbs. the replacer weighing 150 lbs. per pair.

GASOLINE MOTOR CARS.

For several years gasoline motor cars have been used for inspection purposes by men in signal, road and other departments; but it is only recently that they have been adopted as a practical car for regular section work, in place of the old style hand car. Motor cars as used in section work save the energy of the men for work on the track; they save the time consumed in getting to work and they increase the length of sections, with a corresponding decrease in the number of foremen. The possible increase in section length is variable, but if it is taken as one mile, a division with 40 four-mile sections, reduced to 32 five-mile sections, will show a yearly saving of about $4,800 in wages of foreman.

Fairbanks, Morse & Co. have recently added a new type of motor car to their line, which is known as style 27 and is specially designed for use as a section car. The engine is

two-cylinder, two-cycle air cooled, direct connected to rear axle, with enclosed dust proof crank case. The engine has no valves, cams, pawls, sprockets, or chains. There is no lubricating system, this being taken care of by mixing oil with the gasoline. Although very substantially constructed, and having a capacity for ten or twelve men, the car is but little heavier than a hand car; and it can easily and quickly be removed from the track. The speed is variable, from



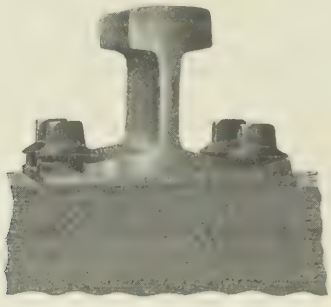
Fairbanks-Morse Gasoline Motor Section Car.

6 or 8 miles per hour up to 30 miles an hour, which is perfectly safe, as the car is equipped with 17-in. wheels, and sets low on the rails.

To provide for occasional engine failures, the car is furnished with a walking beam of the same type as on the standard hand car, which can be used by throwing a slip pinion on the front axle into a driving gear.

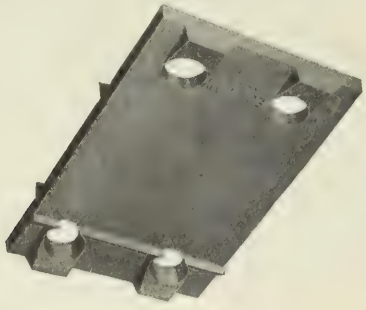
SCREW TIE PLATES.

The Spencer Otis Co., Chicago, has on exhibition in booth 122-141 many advanced types of economy tie plates, prominent among which is the Economy No. 9-R, designed especially for use with screw spikes.



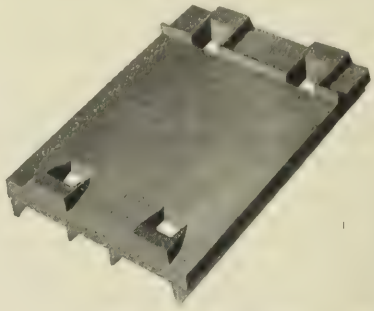
Rail Mounted on Tie Plate.

The introduction of screw spikes by steam, elevated and electric railways prompted the design of a tie plate, which



Economy Tie Plate No. 9 R.

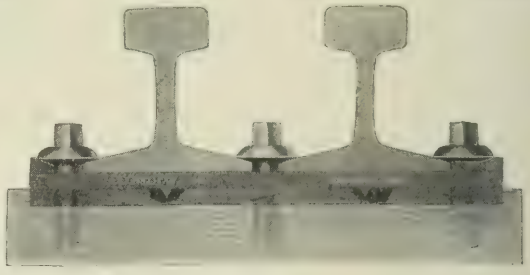
would furnish a perfect bearing for the flange of the spike on both rail and plate; furnish reinforcement back of the spike to prevent bending caused by lateral movement of the rail, and to minimize spike cutting caused by running rail, and insure the vertical driving of the spikes. For over two years this company has been successfully rolling at its mills at Portsmouth, Ohio, the Economy Tie Plate No. 9-R, which has in design and construction all the features required for a plate for the purpose. The illustrations show a plate with a strong main body, with a rail retaining shoulder, with elevated bosses rolled on the same angle as the flange of the rail, also bosses on the field end of the plate. These bosses provide bearing for the flange of the screw spike and



Economy Tie Plate.

give reinforcement to same preventing bending and cutting as before described. The spike holes in the bosses serve as guides or jigs when boring the ties after plates are in position under the rail, and prevent absolutely applying the spike improperly.

The plates are rolled from open hearth steel with four longitudinal or two transverse flanges on the bottom sur-



A. S. C. E. and A. R. A. Rails on Economy Tie Plates No. 9 R.

face, or with a flat bottom if desired. They can also be supplied for two, three or four hole punching. The Spencer Otis Co. has made a plate which gives the screw spike all the support required and has made probable the successful application and use of these spikes with the No. 9-R Economy Tie Plate, which is designed to accept A. S. C. E. and A. R. A. sections of rail of the same weight per yard.

ROCKFORD MOTOR CARS

Gasoline motor cars are effecting a material saving in the maintenance of way service, and one of these cars, the "Rockford," is being exhibited by the Duntley Manufacturing Co., Chicago, in booths 99 and 100. These cars eliminate chain, friction, or gear transmission of power, the connecting rods being direct connected to crank shaft. The engine is of the four cycle type with automatic intakes, having by way of valve gear a short transverse cam shaft which is driven by a light sprocket chain from the crank shaft, this cam shaft regulating the main exhaust valves, and also carrying the timer or commutator for the jump spark ignition system. Contrary to usual gas engine practice they use two exhausts, the main exhaust valve being in the head end of the cylinder, with an auxiliary exhaust on the under side at the far end of piston stroke. By this means the

cylinders are throughly cleared of all dead gas and obtain the full efficiency of their next charge, at the same time reducing the chances of heating to a minimum. An extremely low compression is used, and as a result the cylinder temperature never rises to a point where a cooling device is required.

An important device is the lever which opens the main exhaust valves, thus destroying all compression and stopping the engine, and at the same time automatically checking the flow of oil to the cylinders, as there is no suction, in this way avoiding any waste of fuel or flooding of cylinders. By opening the exhaust valves and applying brake, the operator can slow down for all switches, interlockers, crossings and danger points, and it is only necessary to release the lever, closing exhaust valves, for the engine to again operate.

The carburator used on these cars is specially designed, is patented and is not on the market. It is so constructed that the gasoline and air are automatically proportioned, and then thoroughly mixed and vaporized, so the gas which is formed will produce a clean explosion, and eliminate the forming of carbon deposits. It is due to the quality of gas formed that these cars will run in the most severe cold of winter as well as in the summer, which is an important factor.

LITH BOARD.

The accompanying cut illustrates the ice making and storage plant of the Pacific Fruit Express Co., at Las Vegas, Nev., during construction. This is one of three concrete buildings for this company which are among the largest and most important ice storage houses in the United States. The insulation used in these buildings is three inches of waterproof lith, faced with two inches of cork board. The heat transmission of this type of construction is said to be less than 0.9 B. T. U. per sq. ft. per day per degree difference in temperature.



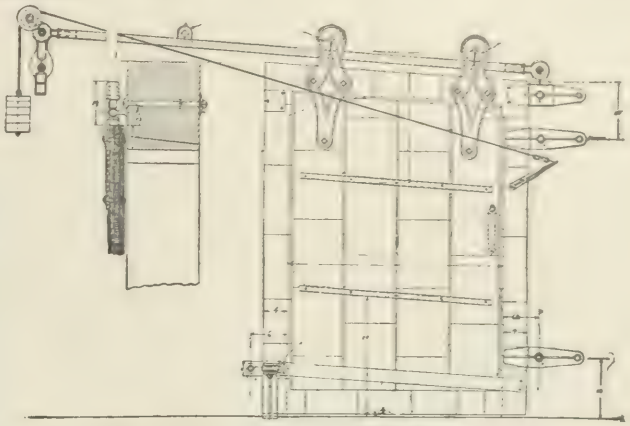
Precooling and Ice-Making Plant of Pacific Fruit Express Company at Las Vegas, Nev.

The lith board is applicable to ice houses of all types of construction, and in most climates the heavy coating used in the Las Vegas plant would be unnecessary. The heat transmission of the lith board alone is 1.6 B. T. U. per sq. ft. per day per degree.

This insulating material is one of the products of the Union Fibre Co., Winona, Minn., and is exhibited in booth 171 at the Coliseum.

ALLITH SLIDING FIRE AND WAREHOUSE DOOR HARDWARE.

The line of fire door hardware shown in Booth 116 by the Allith Manufacturing Company is applicable to sliding fire doors, to shutters for fire walls and to other similar openings.



Allith Sliding Fire and Warehouse Door.

These products are regularly inspected and labeled under the supervision of the Underwriters' Laboratories, Inc., which are under the direction of the National Board of Underwriters.

COPPER-CLAD STEEL WIRE.

A material which is new, one which has passed through the experimental stage, and the durability, economy and adaptability of which has been established in the minds of those who have given it a thorough practical trial, is worthy of the attention of railway officers in charge of construction and maintenance.

For a number of years various companies have attempted to cover steel wire with copper. Electroplating, wrapping a copper strip on a steel wire, and slipping a copper sleeve over a steel billet and rolling and drawing it into wire, are some of the methods which have been tried. It is said that in every case the results were unsatisfactory. The cause seemed to be identical in all cases, namely: The copper and steel were not welded together. The electroplating would shell off; the copper sleeve would break under the influence of temperature changes, or the stripped wire would open up. In the latter two cases, electrolysis would set in and destroy the wire.

In order to weld the copper shell to the steel core, it is necessary first to form a copper-iron alloy on the surface of the steel billet, after which a copper coating can readily be welded to this alloy and the billet drawn into wire.



Section of "Copper Clad" Steel Wire.

This is the process used by the Duplex Metals Company, New York. The accompanying half-tone shows sectional views of a piece of this wire. On account of the very satisfactory weld between the steel core and the copper shell, the company has trade marked this product "Weld Clad." Since copper had a low tensile strength, to obtain a strong line with copper wire, it is necessary to string a larger size than would be necessary to meet the demand of the conductivity alone. Even in the best copper construction, the line is constantly sagging and stretching out, requiring

heavy maintenance expense for pulling up and repairing breaks. Copper-clad steel wire combines the strength of steel with the conductivity and noncorrosive properties of copper; hence its use effects a considerable saving in first cost, maintenance and renewal.

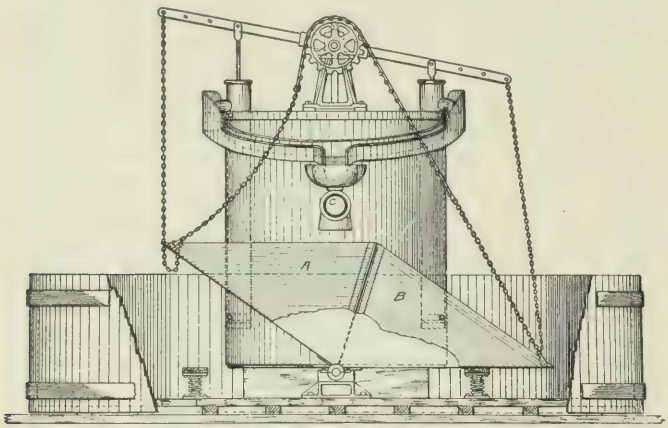
Copper-clad steel wire is especially adapted to signal service, where the size of the wire is usually based upon its tensile strength. Thus No. 10 wire is almost always used overhead, while No. 16 answers most cable purposes. The strength of No. 12 copper-clad is said to be much greater than that of No. 10 hard-drawn copper wire, while its conductivity is slightly better than No. 10 copper and its cost per mile about two-thirds that of copper. Copper-clad, though but 60 per cent. steel, is said to actually be stronger than galvanized wire of the same diameter. This is due to the working to which steel is subjected during the process of manufacture of the copper-steel wire rods, while galvanizing tends to reduce the tensile strength of a wire.

Copper-clad bond wires are now standard on many railway signal systems, as their conductivity is greater than that of galvanized, and they will not rust.

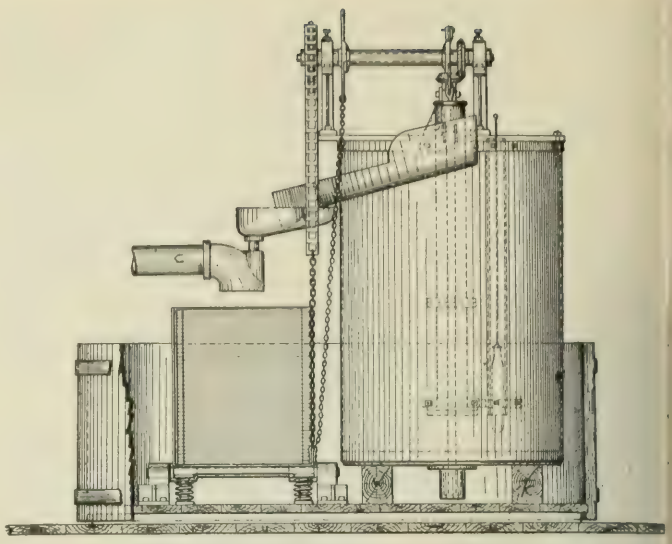
DAVIDSON PROPORTIONING MACHINE.

The Otto Gas Engine Works, 357 Dearborn street, Chicago, make a machine for use in water purification systems which automatically mixes a definite proportion of chemicals with the water without the use of power in excess of that required to pump the water.

To secure satisfactory water purification, it is necessary that the proper proportion of chemicals be thoroughly mixed with the water, and to accomplish this automatically a machine must accurately measure the water and the chemical, thoroughly mix the two, and in case the treatment is a mixture of two or more chemicals, keep this solution uniform. For the measurement of the water, the Davidson machine uses a tipping vessel divided in the center, and shown at AB in the accompanying cut. The raw water enters this vessel through the pipe C. When A is filled, the vessel tips, discharging the contents of A and presenting B for filling. When B is filled the vessel tips back and the operation continues. A pair of ball check pumps are used for measuring the chemical and a mechanical stirring device for its agitation. The two chains connected to the tipping vessel, as shown in the cut, operate these devices. When the vessel tips, a definite amount of the chemical is pumped and allowed to mix with the incoming water. At the same time, the solution is stirred by the action of the chain on the sprocket wheel shown, which is connected to the stirring device mentioned above.



Davidson Proportioning Machine.



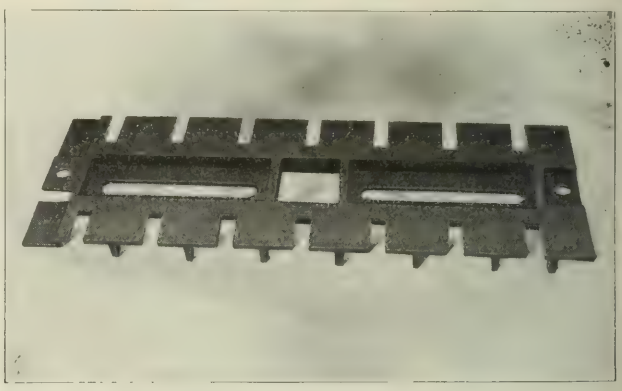
Davidson Proportioning Machine.

The mixture of the water and chemical is secured by the motion imparted to the incoming water by the shape of the vessel.

The machine is said to be positive and accurate in its operation, requires little inspection and is durable in construction.

UNIVERSAL PIPE LINE CARRIER BASE.

The Universal pipe line carrier base, illustrated herewith, is an improvement on the wooden bases so generally used that is in keeping with the adoption of concrete foundation blocks in signal practice. It is made of malleable iron, which practically eliminates the necessity for renewal. The ends are made as lap joints, so any number of bases can be joined together, and the slots for the anchor bolts are made long to allow the base to be fastened in any desired position on the foundation. This base is made by the W. K. Kenly Company, Chicago, and comes in five styles: One way, two way, three way, four way and six way.



Universal Pipe Line Carrier Base.

ADLAKE-SMALL TRAIN INDICATING LAMP.

The Adams & Westlake Co., Chicago, is showing in its exhibit booths, Nos. 83 and 84 the Adlake-Small train indicating lamp, which is designed for carrying train numbers, both regular and special, for day and night indications, rendering them easily read and thereby avoiding confusion or error.

The locomotive lamp is placed on the side of the boiler

back of the headlight, and in a position where the numbers are not dimmed by the light from the headlight. The lamp is placed at an angle so that the numbers are easily read by approaching as well as passing trains. Furthermore, this lamp is adaptable to caboose as well as other cars, so



Train Indicating Lamp.

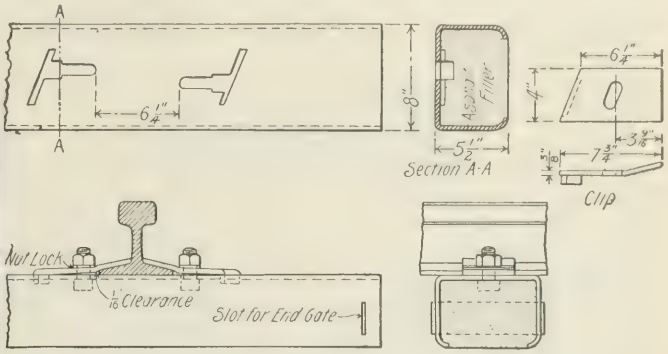
that similar signals may be carried at the rear as well as the front end of the train. The illumination of all of the figures is of uniform intensity, and as they are of ample size they are easily read both by day as well as by night.

These lamps have been adopted as standard by some of the most prominent railways and the comments concerning the results are extremely satisfactory as there is no occasion for an improper identification of trains.

SNYDER STEEL TIE.

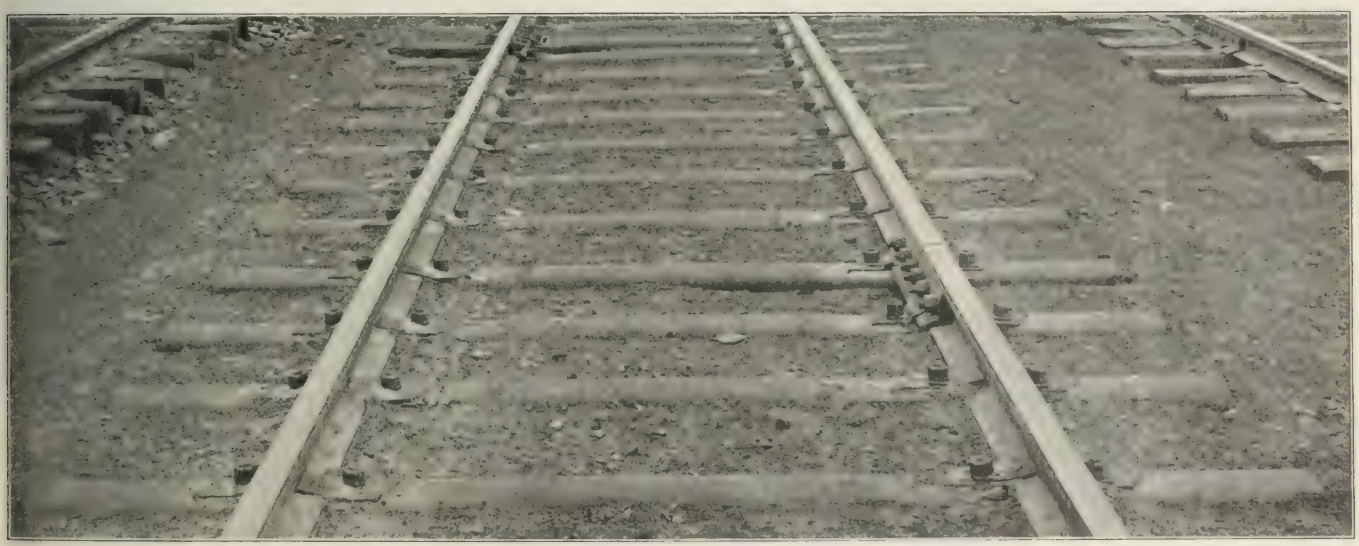
There are on exhibition at the Coliseum a number of Snyder steel ties taken from the Pennsylvania Railroad tracks at Conemaugh, Pa. This design has been in service for more than three years on the Pennsylvania Railroad, the Cornwall & Lebanon and other lines.

The standard type of Snyder tie has a steel casing 5-16-in. thick, 7 in. wide and 6 in. deep, with an open bottom. The casing is filled by hydraulic pressure with a mixture of asphalt and crushed stone. The sides are flanged inward on the asphalt filling and thus hold it in place, leaving a width of 5½ in. of the bottom of the tie exposed. This secures the same advantage as the wooden cross tie when embedded in ballast, the asphalt concrete taking hold of the ballast, the ballast imbedding itself into the filling, and preventing the tie from shifting any more than a wooden tie. The Snyder ties are especially adapted to perfect tamping for surfacing the track on account of the rounded corners. This



Snyder Steel Tie.

filling also takes up the vibrations and makes the track less rigid and more noiseless than with ties where only steel gets in contact with the ballast. The adjustable fastening of the rail to the tie is illustrated in the drawing. It can be adjusted to the gage of the track and fastens the rail to the tie with bolts more firmly and strongly than a rail can be secured to a wooden tie with spikes. It is expected that the life of ties made of 3-16 in. steel will not be less than 25 years and that the thicker ties will have correspondingly greater life. The Snyder tie, with complete fastenings, costs from $3 to $4, depending on the thickness. The weight of the standard tie is 600 lbs. The Pennsylvania Railroad reports that these ties continue to give satisfactory service in its Conemaugh and Derry yards. They are sold by the American Railway Steel Tie Company, Harrisburg, Pa., and made by the Central Iron & Steel Company, Harrisburg.



Snyder Steel Ties in Pennsylvania Railroad Tracks.

Fairbanks, Morse & Co., are inviting railway officers to make headquarters at their exhibit space, Nos. 35, 36, 37 54, 55, and 56, Coliseum, during the convention. The Fairbanks, Morse Co., are offering many conveniences to their railway friends, such as stenographer for private dictation, telegraph and telephone service and stationery.

BLUE AND WHITE PRINT PLANT.

The exhibit of automatic machinery by C. F. Pease Co., Chicago, in booths 161-164 includes the apparatus for making white prints which is in operation every afternoon and evening.

Engineers have long appreciated the value of these white prints over the ordinary blue prints for many purposes, but the labor and time involved by the negative process and the lack of uniform results has heretofore prevented their use to any large extent. The C. F. Pease Co. have perfected a process for making white prints direct from the tracing as quickly as blue prints, in one-fourth the time required to make a blue print from a negative.

While direct processes have been in use in a limited way for years the expense involved in handling the paper by hand and the irregularity of the results obtained have heretofore made the process impractical. The C. F. Pease Co., have invented and patented a special apparatus which makes this direct white print paper with as much uniformity as blue print, while unlike the blue print paper, which must be used very soon after coating, this white print paper will keep indefinitely. They have also patented a special apparatus which with their continuous printer and automatic washing and drying machine, enables them to make these white prints by one continuous operation as quickly as blue prints —printing, washing and drying, and delivering the finished prints at the end of the machine thoroughly dried and automatically wound up, ready for use. They are thus enabled to supply these prints any length in one piece, free from stick marks or distortion, and the smallest print can also be made with equal ease.

They claim for their white prints that they are absolutely fast color; that the strongest sunlight has no effect on them; that the high grade of paper which they use practically prevents shrinkage and does not distort in washing and drying; and that with their eradicating solution and special blue ink changes and additions can be made very readily. These white prints are specially good for profiles and field work, on account of the toughness of the paper, the non-fading quality of the print and the ease with which notations and changes can be made upon them. A print can be made from a print provided the original tracing has clear and reasonably strong lines. Reports, specifications and statistics printed from typewritten copy show up well while pencil sketches can be easily incorporated.

This company is prepared to do white printing quickly and in large volume, and are also putting their automatic machines on the market. They are also making a combination machine so that both blue prints and white prints can be made on the same equipment, changing from one to the other while the machine is in operation. They have placed their machines in the hands of quite a number of prominent railways and large corporations in the past year.

RAMAPO MANGANESE HARD CENTER FROG.

That an easy riding hard center frog, having long lapped joints with the connecting rail and a long uniform center casting, will give the best life, is the claim for the frog illustrated herewith and manufactured by the Ramapo Iron Works, Hillburn, N. Y.

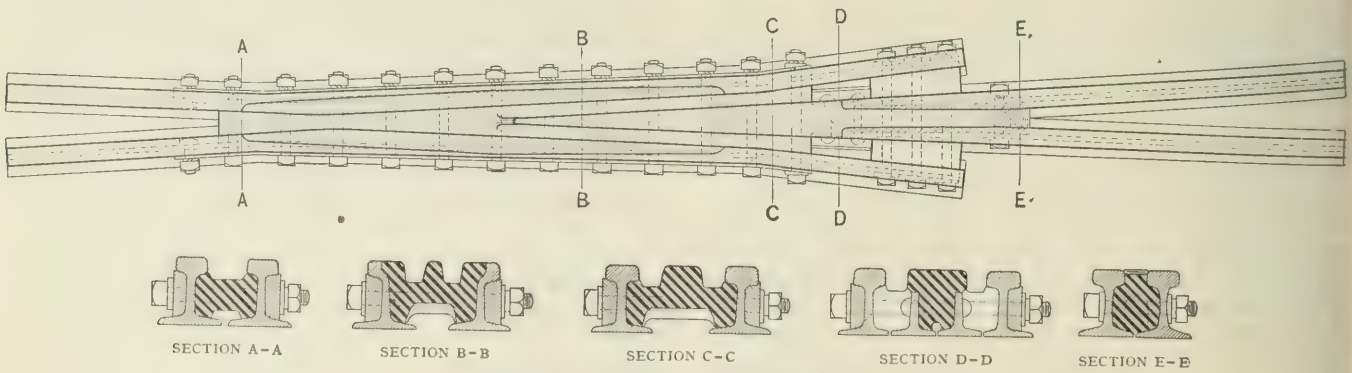
The illustrations show the construction of the frog, but attention is called to the fact that all points of hard service are well protected. The opening in the throat, which receives the wear from the wheel flange; the opening in the flare of the wing rail, which also receives the wear from the flange, and the filling in the heel end, which is subjected to wear from worn treads or double flange wheels, are all protected with manganese steel.

A large number of bolts are used, and it is not necessary to have a base plate. The point being supported on the wing rails cannot go down, and the large number of bolts, each of which is a driving fit, along with the continuous fit of the manganese against the side rails, insure the frog's remaining rigid.

There are many yards now being equipped with these frogs, and the manufacturers report large orders from several large railways where these frogs have been tested in service.



Ramapo Manganese Hard Center Frog.



Plan and Sections of Ramapo Frog.

FREELAND IMPROVED CLAMP DERAILER.

The Hobart-Allfree Co., Old Colony building, Chicago, has put on the market within the past year its improved Freeland derailer, which is on exhibition at the Coliseum, space 148.

Fig. 1 shows the derailer in closed position with only one connection used, and Fig. 2 shows the open position, the derailing block being protected from any dragging brake

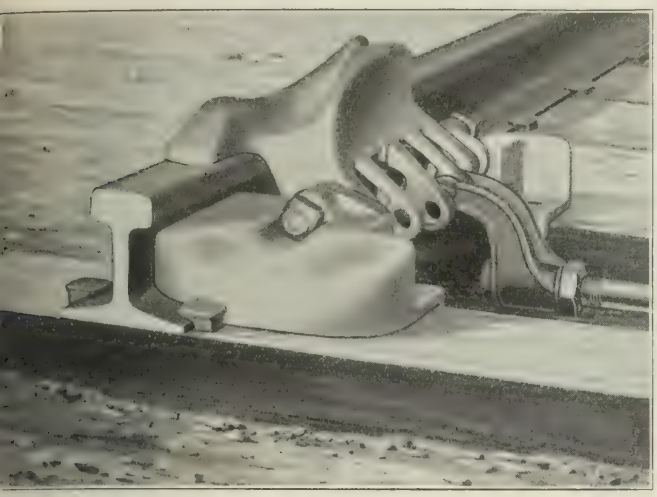


Fig. 1. Derailer in Closed Position.

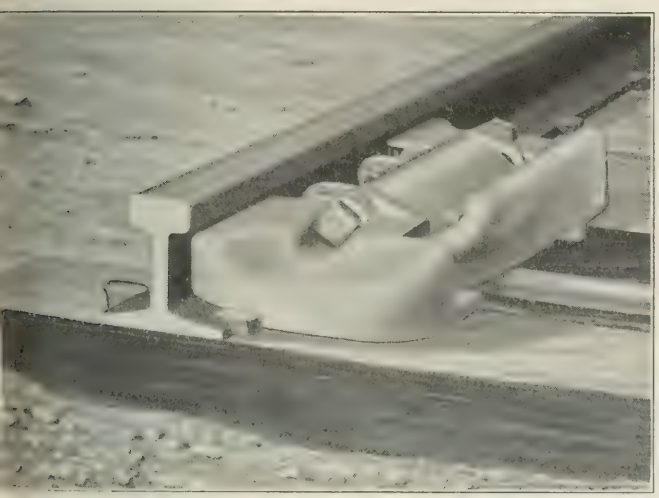


Fig. 2. Derailer in Open Position.

beams, by a part of the bracket which acts as a "derail protection."

The Freeland derailer is so constructed that it can be operated by any mechanism or used as a hand-throw. It is in two parts and is easily operated. The lip or flange which extends down over the head of the rail is retained on this derailer, and takes the bulk of the strain in derailment, preventing any possibility of the derailer being forced off the rail.

ANTI-RAIL CREEPERS.

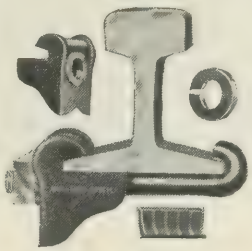
One of the phases of track maintenance which is perhaps at present receiving more attention than any other is the creepage of rails, which is one of the many evils to which railway track is subject.

Many devices have been tried to prevent this creepage. It has become very generally conceded that to properly perform its function, an anti-rail creeper should be fixed to the rail base only, having a lug or shoe casting which comes in contact with the tie and thus afford the resistance necessary to prevent creeping. Devices which are rigidly attached to both tie and rail move the tie back and forth with the creepage and contraction of the rail, which eventually loosens the ballast to such an extent that both tie and rail move. A device which has no provision other than pressure of creepage for retaining its grip on the rail is said to become loose and inoperative, or drop off of the rail entirely.

The Q. & C. Co. has spent much time and money in the development of anti-rail creepers, and the illustrations here-



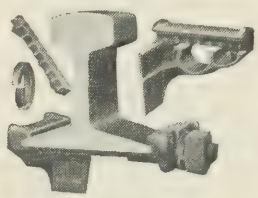
Vaughan.



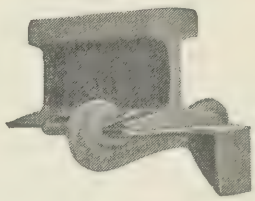
Q. & C.



L. & S.



Racine.



Murray.

Q. & C. Anti-Creepers.

with show those types designed to meet the varying conditions, and which may be applied to the rail or panel in any quantity.

A full line of these various types is on exhibition at spaces 119-120 at the Coliseum, where the Q. & C. Co., New York, representatives will take pleasure in explaining their details.

TERMINAL LAYOUTS.

The frog and switch department of the Pennsylvania Steel Co., Steelton, Pa., has furnished track work for all the principal terminals in the East, including Pittsburgh, Philadelphia, Baltimore, Washington and New York. The accompanying illustrations show the magnitude of the work undertaken, and are sufficient assurance that the types of construction used have been approved by the railway engineers. The material in these layouts is Manard steel; the hard center frogs, crossings and knuckle rails are all exclusively of Pennsylvania Steel Co. design, embodying the latest improvements in work of this character.

Pennsylvania enjoys a world-wide reputation as the nursery of the steel industry. Her mines and mills have contributed more to the material advancement of the nation than those of any other state in the Union. The great transportation lines of the country were possible achievements only by reason of the great steel mills of Pennsylvania.

The mills of the Pennsylvania Steel Co. form a crescent on the banks of the Susquehanna three miles in length. This plant owns its own coal and ore mines and every process of production is directed and controlled under the supervision of its engineers and skilled workers. Its rail



Track Layout (Manard Construction) East of Union Station, Baltimore, Md.

mill is one of the few mills turning out girder and high T rails. It has a blooming mill, a billet mill and a slab mill. With a thorough and full equipment for making open-hearth steel, it was early in the market with open-hearth rails and merchant steel of superior quality. The bridge and construction department of this company is far advanced in the magnitude of its undertakings, and its solution of the conspicuous difficulties of its engineering problems. The Williamsburg bridge and the Blackwell's Island bridge in New York are examples of current interest. India possesses an example of high-class engineering in structural work in the Goteik viaduct. A well-equipped steel foundry, recently enlarged to meet increased demands, supplies the company with its steel castings. These castings enter largely into the track work made by the frog and switch department, the largest manufacturing plant of its character in the world. Track material of all kinds is shipped to all points of the compass. Its product is in demand on every railway of importance in the United States, and very few cities of any importance in the country are without its special work construction for street railways. Its leading items in demand are the hard center frogs, switches, mates and crossings. These hard centers are made of a superior grade of manganese steel, brought to a high state of durability by the processes to which it is subjected. Many thousands of tons of this Manard steel have been distributed throughout the United States in track work alone, reducing track maintenance and insuring greater safety to the traveling public by reason of its durability and uniformity of service under widely varying conditions.



Track Layout (Manard Construction) Approaching Station, Washington, D. C.



Slips in Terminal, Showing Manard End Frogs, Design No. 153, Washington, D. C.

The Manard anvil face frog, design 160, is the high development of the steam railway frog adapted to high speeds and heavy traffic. A solid Manard center embracing the point and also the wings of the frog where they are subjected to the irregular shocks of false flanges is extended back to form a heel block that acts as a pick-up and reduces the shock on the carbon rails abutting on the Manard center. The frog is equipped with Never-Turn split bolts, a recent improvement in bolt construction that has already proved a potent factor in the prolongation of the life of the frog, and is a welcome relief to every track foreman from the monotonous and ever-recurring necessity of tightening up frog bolts. This bolt has an elongated head, which fits head and flange of rail, thus preventing the bolt from turning. The end of the bolt is split and the split is closed before the bolt is threaded. When the nut is placed the split is opened, thus firmly engaging the threads of the nut and the bolt. If it is found necessary to remove the nut, it can be replaced and the split reopened a number of times. The customary susceptibility of bolts to the vibration of traffic is not apparent in this bolt. Every railway man knows that tight nuts mean the maximum of service and the assurance of safety. In connection with the Never-Turn bolt a special long nut is furnished, as the absence of nutlocks makes it desirable that the nut shall project sufficiently to secure a good holding surface with a wrench. A totally new departure in a nut fastening is now under consideration by the officials, and it is expected to market this development in the very near future.

The Never-Slip interlock switch plate is also solely the



Track Layout (Manard Construction) East of Union Station, Pittsburgh, Pa.



Track Layout (Manard Construction) East of Union Station, Pittsburgh, Pa.

product of this company. This plate is rolled from a special steel and has replaced the old type of struck-up riser plate. It is a solid plate ⅝ in. thick, with riser of required height, and is practically a rail lock.

The Rapid Renewable hard center frog is fulfilling all expectations in its wide use on street railways during the last four years. The Manard center is set on a cast-iron bed of sufficient strength to resist the heaviest loads. Projecting lugs or feet on the bottom of the center are engaged with Tobin bronze bolts that will not rust. All strains are carried to the center of the frog, and the center can be removed from the frog in a few minutes without disturbing the pavement.

One of the most interesting shops in the frog and switch department is the switch stand shop, where mechanical signaling devices are constructed. The New Century switch stand of adjustable and non-adjustable types, both positive and automatic in action, are made here. The adjustable New Century switch stand has met with universal favor. It is adapted to any service. The facing point lock with distant signaling attachment is a high development of mechanical signaling. The processes in this shop insure mechanical accuracy of construction and first-class workmanship. Forgings, castings, machined parts and all accessories to track maintenance are turned out in large quantities in the frog and switch department.



Manard Knuckle Rails and Movable Points, as Applied to Slip Crossings, in Terminal Union Station, Pittsburgh, Pa.

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The total annual capacity for the production of open-hearth rails in the United States is now about 1,500,000 tons, the principal mill being that at Gary, which is turning out 500,000 tons; then Ensley, with 400,000 tons; Bethlehem, 200,000 tons; Colorado, 200,000 tons; Lackawanna and others of smaller capacity, 200,000 tons. The total capacity of all mills making open-hearth rails up to 1907 was less than 200,000 tons, and in that year production reached 252,700 tons. In 1908 it reached 567,000 tons, and in 1909, 1,256,000 tons. In the same year 1,806,600 tons of Bessemer rails were made. The Iron Trade Review says: "A new feature of the production statistics is the detailed statement of the alloyed rails made in 1909. This was probably an inconsequential feature in previous years. Of the 1909 production 50,505 tons are stated to have been alloyed rails, as follows:

Titanium	35,945
Manganese	1,028
Nickel-chrome	12,287
Nickel and electric	1,245
Total	50,505

Of this total, 36,809 tons were Bessemer steel and 12,696 tons open-hearth steel. It appears that greater effort has been made to improve the Bessemer rail by the use of alloys than the open-hearth rail."

Not long ago the general manager of a prominent western railway remarked that his company not only provides a school of instruction for its shop apprentices and requires them to take advantage of the opportunities for study, but arranges for them to do so during the daytime, and allows them regular wages for the time so spent. This remark followed a discussion of a source of instruction which is offered by another road to such of its employees as desire to devote a part of their spare time evenings to make up for a lack of school training, and was made with the same enthusiasm and satisfaction that the manager would have displayed in speaking of the excellence of the roadbed or train service of his system. He also made the statement that he expected to live to see the privilege extended to employees in other departments. The skeptical may say that such efforts are made for the selfish purpose of obtaining a sufficient supply of competent mechanics to keep the motive power and equipment of the company in good condition. However, in helping itself the company is also helping its men, for as a result of this instruction they are not only enabled to earn higher wages, but are also qualifying themselves better to discharge the responsibilities of citizenship and to advance in the social scale. Work of this kind is necessarily undertaken first by the more prosperous corporations. That there is no school of instruction, or pension system, connected with most railways is not because the officers and directors are less solicitous for the welfare of their employees, but rather because the railways in the latter group have not the means at their disposal. A railway corporation is organized primarily for the purpose of making returns to its stockholders on the money which has been invested in the property, and it cannot indulge in semi-philanthropic work until its obligations to its owners have been discharged. We do not predict that transportation companies will ever attempt to monopolize the philanthropic work of this country, but we believe that to the extent of their ability most of them endeavor to promote the general welfare of their employees. The particular merit of schools of instruction is that the benefits are reaped by the employees who especially need them.

The committee on flat spots still believes that the M. C. B. limit, 2½ in. under a 50-ton car, causes an abuse of the track structure which is hard to excuse. The experiment with a freight truck with flat wheels and gage for measuring the spring deflection will hardly be sufficient to convince the M. C. B. Association that the limit should be reduced, for the results of that experiment are very indefinite and do not go beyond a demonstration that flat spots do cause some excess pressure on the rail, which is already admitted. The measurement of this pressure by the deflection of bolster springs is liable to considerable error on account of the indirect action of the forces producing deflection and the irregular flexibility of the arch bars, bolts and bolster through which they are transmitted. A more satisfactory experiment could be made by using a similar gage in a pedestal truck of the Fox type, where the spring is directly over the journal and whatever deflection is caused by the flat spot is communicated through a rigid structure directly to the gage. Regardless of the size of the flat spots in chilled wheels, it is a fact that wholesale breakage of sound rails has been traced to shelled out spots on steel-tired wheels. On one road in the middle west there was a serious epidemic of this kind on the tender wheels of passenger trains, and it was necessary to work day and night in the wholesale replacement of wheels wherever shelled out spots occurred. The serious nature of this defect lies in the fact that the size of the flat spot continues to grow and will reach large proportions if the wheel is kept in service. On one of the transcontinental lines, in January of this year, a small shelled out spot was observed on a steel-tired wheel on a passenger car when it left the eastern terminal. As it proceeded west the size of the spot enlarged until ordinary inspection, or even casual observation of the rough riding of the car, should have

directed its removal, but it was allowed to proceed. On a single division in the western part of the run more than 200 sound rails were broken by the impact of this flat wheel, all of them within a distance of 14 miles. The rails which broke were 85 lb. section, in service two years; the fractures were straight and clean. When the wheel was finally removed the flat spot was found to measure 6 in. long and ⅜ in. deep. There were really two flat spots merging into one having a total length of 6 in., with a hump between them, and the maximum depth was ⅜ in. Such experiences as the two we have mentioned would indicate that more actual breakage of rails is caused by shelled out spots on steel-tired wheels under high speed passenger trains than by the small flat spots on cast wheels which are so carefully watched and gaged by the inspectors of freight cars in interchange traffic. The bad riding of passenger cars should be sufficient to detect defective wheels, and the inspection of these wheels at division points should be more rigid. On some roads it has been found necessary to place the inspection of tender wheels under the charge of the same men who inspect passenger car wheels, and this has resulted in the detection of many wheels which escaped the notice of the locomotive inspectors, who, in some way, had come to regard the condition of tender wheels as of slight importance. The relation of flat spots and shelled out spots to broken rails is intimate and direct, but the present importance of the subject lies in the fact that wheels with spots much larger than 2½ in. are allowed to run in high-speed passenger service, rather than that any positive demonstration has been made that a 2½ in. spot is dangerous.

STANDARD CROSS SECTIONS.

Every well-organized railway has its standard cross section for track. The uniformity and finish called for by the drawings are not always secured in execution on account of the great and apparently unnecessary expense of strict compliance with every detail. The most expensive of such details, both in labor cost and in the results obtained, is the requirement of an absolutely uniform distance from base of rail to top of roadbed. Except where embankments have not completed settling and in wet cuts, the constant tendency of all track is upward. This is apparent wherever opportunity offers for comparing present elevations of track with such monuments as depot floors and station platforms, which have retained their original elevations for a number of years. This upward tendency is, of course, due to the constant raising where track is resurfaced. As the track goes upward, that part of the subgrade beyond the ballast lines must also be raised if the slope, the width at subgrade and apparent depth of the ballast are maintained constant. Does this pay? In return for the constant labor of lining up the ballast at the foot of the slope and keeping the slope uniform, neat appearance is secured, which is, of course, a good advertisement among those passengers who ride on the observation car, but would not a much smaller amount of the money so expended be more effective if judiciously invested in printers' ink? The neat lines and slopes, which are prepared at such great expense, are destroyed in a few months by pedestrians and removal of grass and weeds from the ballast and their continual restoration is necessary. If it is admitted that such care is justified on first-class roads, which must present a neat appearance, the method of maintaining these constant dimensions is still open to question. As the track is raised, the subgrade outside of the ballast must also be raised. This is usually done with earth, which dams the water up under the bottom of the ballast, keeping the roadbed soft and increasing the frequency of resurfacing. Would it not be more economical to maintain the subgrade outside of the ballast at a constant elevation and let the apparent depth of ballast be the real depth, maintaining a constant top width and slope, with a variable bottom width? The width of the subgrade must be increased from time to time as the bank is raised, no matter which plan is pursued. Perfect drainage of track, although greatly to be desired, can seldom be obtained, but all methods should tend as far as possible in that direction. If the outer edges of the subgrade are to be raised with the track, then it should be done with porous material or drains should be provided at frequent intervals. Drains are difficult to keep open and constant porosity of filling material cannot be maintained unless it is frequently disturbed and cleaned. The method of least work is the most economical.

THE RAIL QUESTION IN GOOD HANDS.

Some time over two years ago the wheel and rail committee of the American Railway Association called a meeting, to which were invited presidents, general managers and other officers of the various rail manufacturers, for the purpose of a joint discussion of the rail question. It was announced at the opening of the meeting that a free and full discussion was desired. Every one taking part was expected to speak his mind without reserve, and that privilege was quite freely exercised. The result was something of an awakening as to the true situation regarding this subject, both on part of the makers and users of rails. The mutual understandings between the two parties that grew out of these meetings were the beginning of the greatest advance step toward better and more satisfactory rails of recent years. It was the initial move of what has since developed into a tacitly understood co-operation between makers and users of rails.

Instead of standing aloof from each other, as was formerly the case, and each accusing the other of being most to blame for rail failures, the dangers and damages resulting therefrom, they are working together for one common end, namely, rails of size, shape and grade of steel best suited to present needs for safety and economy. As investigation of the technical side of the rail question, relating to their manufacture and use, naturally falls to the engineering department of the railways, this whole subject has by general consent eventually fallen into the hands of the rail committee of the Engineering and Maintenance of Way Association. This committee consists of twenty or more of the leading civil engineers at present in active service throughout the country, and they are doing most excellent work. Part of their plans are to confer and co-operate with rail manufacturers in arrangements for tests and trials of rails in service, thus opening the way for each party to fully understand details on which the final welfare of rails depend, and for which the other may be responsible. By such mutual understanding and co-operation the best results are bound to be reached. Nearly every man, woman and child in active life, constituting the great traveling public, has a direct interest in any effort put forth to improve conditions and safety in travel. The traveling public may be regarded as a third party concerned in the rail question. On its behalf, it is gratifying to note that the best available engineering talent among railway men, as well as the most skilled workers in the art of rail manufacture, are jointly engaged in this most important undertaking.

All may rest assured that this matter is in competent hands, that investigations are being carried on in a thoroughly fair and reasonable manner, and that the outcome from such efforts will bring about betterments in rails and track construction, giving improvements and safety in

travel which will redound to the common welfare of all concerned.

THE OPEN-HEARTH RAIL AND THE NEW SECTIONS.

The report of the committee on rail indicates that specifications and rail sections are still in a far from satisfactory or settled condition. The more extensive use of open-hearth steel and of the new heavy base sections has served to complicate the subject and has not resulted in the production of the high-grade rails which were hoped for by both manufacturers and railways. The committee makes the surprising statement that as far as they know "No railway has purchased rails under the specifications approved by the American Railway Association, nor has any railway succeeded in buying rails during the past two years according to a specification entirely satisfactory to its engineers." All of the specifications under which rails have been rolled in that period have been compromises on the part of both parties with the general result that neither the manufacturer nor the railway has been entirely satisfied.

While the chemical composition of the open-hearth rail is in the main satisfactory, the principal defect is in its mechanical structure and the failure of these rails due to this defect has been a disappointment. The largest number of failures of such rails indicate physical defects, such as pipes, gas bubbles and unsound steel generally in the ingots. The Watertown tests were hardly necessary to demonstrate that sound rails cannot be made from unsound ingots, but with the conclusive evidence derived from those tests the committee is well sustained in its statement that the prime requisite in securing sound rails is first to secure the sound ingot. It would now seem to be more important to improve steel manufacture so as to prevent these physical defects in the ingots than to give so much attention to the demonstration that these imperfections exist, as that must be admitted.

The manufacturer is making little or no progress in this direction. It appears to be one of the regular accompaniments of the open-hearth process, as conducted in modern steel works, that it results in piped and unsound ingots. One explanation of this which has been offered takes accounts of the large mass of molten metal which fills the reservoir from which the ingots are poured. In the Bessemer converter the weight of metal in a blow is only 5, 10 or 15 tons, while in the open health process as much as 90 to 100 tons of molten steel is drawn into the ladle for filling the ingot molds, and it takes 25 to 30 minutes to empty it. During this time 25 or 30 rail ingots are poured, so that the rate is about one ingot per minute. The first ingots poured are from the steel in the bottom of the ladle, and the last from that at the top. The temperature of this large mass of metal varies as the level of the liquid steel goes down, with the result that the structure of the different ingots is different, and the principal difference is in the first few and the last few poured. Sufficient time is not always allowed for the chemical reactions to be completed and for the slag to collect on the surface. A portion of the gas and impurities, which are allowed to remain throughout the mass of steel in the ladle, are caught in the chilled portion of the ingot one or two inches from the surface, and in the rapid and heavy reduction of the rolling mill, this honey-combed structure in the ingot appears as seams of unsound steel in the rail.

These are matters for the manufacturer to consider in his effort to produce sound ingots of open-hearth steel. The committee believe that these details, such as temperature, time of holding in the ladle and amount of discard, should be left to the steel maker and not form a part of the specification. It also believes that the mills can furnish sound rails if proper care and sufficient time are taken in making the ingot. The defects due to piped ingots show themselves in piped rails, and these should be detected under the drop tests. It is not clear as to why so many piped rails should go into track if test pieces were completely broken so as to exhibit the fracture.

It is probable and unfortunate that the majority of open-hearth rails rolled in the past two years were not inspected by constant reference to a broken specimen from the drop test. The new specification recommended by the Maintenance of Way Association provides that the drop tests shall be made on pieces of rail rolled from the top of the ingot and that these test pieces shall be cut from the rail bar next to either end of the top rail. It also provides that test pieces which do not break under the first drop shall be nicked and tested to destruction. If any such test piece shows interior defects, the top rails from each ingot of that heat shall be rejected.

An inspection of this kind should determine approximately the percentage of rails which have pipe defects, and it should reject those which are liable to be broken in track by reason of such defects. The difficulty is that the principal mills have not agreed to manufacture rails under such inspection, and it is possible they may decline to do so after a specification with these requirements is formally adopted by the American Railway Association.

New rails are also a disappointment as to wear, and the committee states that a generally poor wearing rail is furnished. This is due to the low percentage of hardeners, carbon and manganese, which the manufacturers prefer to use in order more easily to meet the drop tests. The percentage of carbon is regulated by the amount of phosphorus it is possible to eliminate, and the committee admits that knowledge of the subject is too limited to fix a sliding scale for increasing carbon as the phosphorus decreases, but the new specification suggests that when lower phosphorus can be secured in Bessemer or open-hearth steel the carbon shall increase at the rate of 0.035 for each 0.01 reduction in phosphorus. It also makes the requirement that the percentage of carbon, manganese and silicon in an entire order of rails shall average as high as the mean percentage between the upper and lower limits.

Another means of preventing the practice of the mills from keeping both carbon and manganese as nearly as possible to the lower limits, is the regulation which is proposed for the deflection under the drop. Both the height of the drop and the amount of deflection are determined to some extent by the shape of the section as well as its weight per yard, and after this is standardized the relation of deflection to chemical composition must be determined so as to prescribe maximum and minimum limits. Some roads have already prescribed such limits of deflection and the committee on rail recommends that specifications should fix a minimum deflection to eliminate brittle rails and to secure greater uniformity of product and a maximum deflection to eliminate soft rails.

It appears to be too early to decide on new standard rail sections, as very few of the new patterns were laid in 1908. Practically none of the A. R. A. sections were laid in places where necessary information relating to them can be obtained. The rails laid in 1909 and 1910 have not been in long enough to show any decided superiority of any section. We understand that the majority of the rails laid during this time, especially by the lines west of Chicago, have been the A. R. A. section "A."

An unfortunate condition affecting these tests is the fact that the difference in section can be entirely destroyed by differences in chemical composition and by heat treatment and mill methods. The statistics obtained from the

tests of the heavy base section are not encouraging, as many of them have broken the same as the older sections. There is, however, no lack of faith in the correctness of the conclusion that the heavy base is better suited to the heat conditions in rolling, that straighter rails are obtained on the cooling bed, and that these are subject to less local stress by the gagging press.

On account of the difficulties in getting accurate information from the track tests, the committee has decided to adopt the laboratory method, just as the motive power officers have resorted to shop or test-room methods of testing locomotives, because they were unable to get accurate measurements under service conditions. The rail committee has arranged for a series of tests on rail of different sections and weights, both Bessemer and open hearth, made by different mills, with a uniform chemical composition for each kind of rail. The tests will include drop tests and wearing tests on the revolving machine at Steelton and on the reciprocating machine at Sparrow's Points, besides a service test on track. Max H. Wickhorst, engineer of tests of the Burlington, has been appointed chief chemist in charge of these tests, and has been given a year's absence from the Aurora laboratory in order to take up this special work. As the result of this investigation, which will doubtless extend over a period of years, important facts relating to rail composition, rail manufacture and rail wear will be brought out, and it will be possible to fix in the specification the limits which are now uncertain. The rail manufacturer will have a better knowledge of why rails fail and he may change his methods in order to prevent failure or rapid wear, but these changes or improvements will only be made to the extent to which they are profitable. The principal defects in rail manufacture may nearly all be traced to the same cause—too rapid work. This is also the principal cause for large profits in manufacture. This presents a condition difficult to change. That such rapid work is not now made necessary by the relation of demand to practicable supply can be shown by a few round figures. The maximum capacity of the rail mills of the United States is now at least 4,000,000 tons per annum. The amount required for new track will not average more than 1,000,000 tons, and for wear during years of maximum tonnage 1,000,000 tons, while trolley lines, export business and rails for miscellaneous purposes will not require more than 1,000,000 tons, making the total average consumption per annum only three-fourths of the total capacity of the mills. The increase in furnace and mill capacity, which is constantly being made, is greater proportionately than the increase in consumption. Under these conditions it should be possible to secure the more deliberate methods in manufacture which are essential to an improvement in the quality of rails.

DISTURBING FACTORS IN LOCOMOTIVE CAPACITY AND TRAIN RESISTANCE.

The committee of the Maintenance of Way Association on "Economics of Railway Location" devotes nearly 50 pages of its report to a consideration of "Power and Resistance," having reference to the net hauling power of the locomotive and the resistance of trains. The report contains the latest and best information on the subject, in the form of curves, tables and formulæ, making it a valuable compendium for those who find it necessary to resort to calculation in order to determine the useful hauling power of a locomotive, or the resistance of trains.

The first conclusion of the committee is that the actual drawbar pull of the locomotive at various speeds should be used in making estimates with reference to economic value of various locations of line and grade, and that when not known it should be calculated. Considering the various disturbing factors which the report points out and others which it does not mention, it is a question as to whether it would not be best to obtain the actual power of a similar or equivalent locomotive in actual practice rather than depend upon the uncertainties of calculations employing even the best and most recent formulæ. We have termed these uncertainties disturbing factors, and the text of the report furnishes a good opportunity to point out some of the principal ones connected with the calculation of the tractive power of locomotives and the resistance of trains.

The quality and quantity of fuel which can be properly fired are first considered, and it is pointed out that in various parts of the United States the thermal value of coal varies from 10,000 to 15,000 B. T. U., or as 2 to 3, one having an evaporative value 50 per cent. greater than the other, or, one having a heat value one-third less than the other. As the fireman cannot handle any more of the lower grade coal in a given time than of the higher, the boiler will deliver a larger amount of steam with the high-grade coal under equal firing.

The report suggests that such differences be equated by rating the steam capacity of the engine in proportion to the heat units in the fuel, but in the same paragraph it explains that the quantity of ash and tendency to clinker would affect the heat value to an uncertain degree beyond the relative value in B. T. U. For this reason, it would not only be advisable to get the drawbar pull from actual test, but to use in the test a grade of coal which would represent the average quality of the coal supply on the line whose economical location is under survey.

The report makes the surprising statement that one of the most important points affecting the steam-generating capacity of a locomotive is the ratio of heating surface to grate area, and diagrams and tables are given to show how the evaporation per square foot changes with different values for this ratio. The table gives maximum evaporation per square foot for a ratio of 1:50, which would give a locomotive 2,500 sq. ft. heating surface for a grate 50 sq. ft. area, but modern locomotives with 50 sq. ft. grate have 3,500 to 4,000 sq. ft. heating surface, or a ratio of 1 to 70 and 1 to 80, and the figures in the table for such ratio indicate an evaporation of only two-thirds that of the smaller ratio. While it is important to point out that heating surface in locomotives has a value which varies in some way with its relation to the grate area, the attempt to give exact values for such ratios is misleading and would be differently reported by every different experimenter. The attempt to take account of the difference in ratios of grate to heating surface in estimating the power of a locomotive, while correct in principle, should be accompanied by far more exact knowledge of the laws governing it than we now possess and would only introduce another disturbing factor, which, unfortunately, prevents exact or satisfactory calculations of this kind.

The variation in the strength and skill of different firemen and the gradual decline of that strength in individuals, is another disturbing factor which has such an effect on locomotive performance as to either make the tonnage rating lower than it could be if the fireman's work was well sustained throughout the run, or to prevent the schedule time from being maintained, by reason of low boiler pressure, due to poor firing. The report says it is a common experience for firemen to become exhausted in the heat of summer in an attempt to handle the average rating. It gives 4,000 lbs. per hour as a fairly high amount of coal to be properly fired. For short periods, after a rest at a station, the fireman will occasionally do better, but a study of the dynamometer record often reveals the point where the fireman gradually tires and finally comes down

to his normal capacity for a long run. This is one of the variables which even a practical test in service will not eliminate, and the suggestion that the firing of 4,000 lbs. of coal per day be taken as a standard for grading the strength of firemen and as a rate for coal combustion for normal boiler performance is one which can be followed with advantage in the effort to eliminate uncertainties.

The condition of the smoke box draft appliances and of the valve motion easily affect the steaming of the locomotive and the performance generally, and these are matters which no calculation can take account of and must be measured by their effect on the actual performance of the locomotive. Results of the tests of locomotives in the laboratory testing plants are useful in getting comparative efficiencies for different engines or for various changes in proportions or details, but the relation of such efficiencies to those obtained on the road are also uncertain. In a paper on fuel economy in testing plants and railways, by H. H. Vaughan, read at the November, 1909, meeting of the Western Canada Railroad Club, the conclusion was reached that with freight trains on the Canadian Pacific in July, the locomotive efficiency as a whole was within 25 per cent. of that obtained in a testing plant. The report suggests that the various losses in road operation due to radiation, leakages, steam auxiliaries, etc., would reduce the actual useful steam produced at least 5 per cent. less than that shown by testing plant, but no factor for a reduction of the whole locomotive efficiency, due to losses in service, is offered.

Much of the data in articles by F. J. Cole, consulting engineer, American Locomotive Company, and published in the Railroad Age Gazette,* is included in the report now under review, but the committee prefers to recommend factors somewhat different from those in Mr. Cole's articles. Thus, for the frictional resistance of the machinery of the locomotive, the factor 22.65 is used, instead of 22.2, as given by Mr. Cole, who multiplied this by weight on drivers regardless of the number of driving axles. The report suggests that greater accuracy would be obtained if not only the weight on drivers but the number of axles be considered, and a table based on this view is included in the report. The resistance of driving machinery is obtained by the formula: $R = 18.7\ T + 80\ N$, where R = resistance in pounds; T = tons weight on drivers and N = number of driving axles. For the engine and tender trucks, $R = 2.6\ T + 20\ N$, where T = tons weight on engine and tender trucks and N = number of truck axles. The factor of head-end resistance is the same as given by Cole, $.002V^2$ per square foot area, but this area is taken as 125 sq. ft., instead of 120, used by other authorities.

The uncertainties connected with the predetermination of the resistance of cars is shown by the variety of factors and formulæ used in tonnage rating on different roads, but there is now a much closer agreement than formerly, and the recent dynamometer work has been much more accurate. The record obtained by dynamometer car for loaded freight cars of a given design on one road can be be depended on for close reproduction on another road, and wider variations will be found from mixed and empty trains, where air resistance has more influence per ton weight of cars.

For passenger trains the uncertainties and disturbing factors are greater, due to the effect of speed on head-end and flange resistance caused by air pressure. The changes in atmospheric conditions, the velocity and direction of the wind, have more effect at higher speeds and render passenger train resistance quite variable and accurate determination impossible. This, however, is not so important, as the tonnage of passenger trains is easily regulated by actual performance and overloading is soon detected by a failure to make schedule time.

While the Maintenance of Way report on locomotive power and train resistance is the best treatment of the subject we have seen, and the tables and curves are so convenient as to make calculations easy, we have endeavored to point out that they must not be regarded as a close approach to accuracy, and it is always more desirable to obtain locomotive drawbar pull at different speeds directly from actual practice rather than by calculation from the best data and formulæ.

*See Railroad Age Gazette, August 27 to October 1, 1909.

EFFICIENCY DEVICES IN TRACK WORK.

In line with the broad general policy of this paper to promote efficiency in all departments of railway service, we announced a prize competition, last winter, for efficiency-producing devices or ideas in track work. A large number of manuscripts were submitted to us, and we were fortunate in securing the services of Messrs. J. W. Kendrick, vice-president of the Atchison, Topeka & Santa Fe, J. D. Isaacs, consulting engineer of the Union Pacific-Southern Pacific System, and J. B. Berry, chief engineer of the Rock Island, as a committee of award. We publish herewith the committee's decision, in the form of a letter from Mr. Kendrick.

Chicago, March 5, 1910.

To the Editor of the Railway Age Gazette—Messrs. Isaacs, Berry and the writer devoted some time to-day to the consideration of the paper submitted in the competition suggested by the Railway Age Gazette pertaining to descriptions and illustrations of tried expedients and methods in connection with track maintenance, and we report, with a great deal of regret, that we did not find any of the papers submitted sufficiently meritorious to warrant either the award proposed by your paper or publication therein. We feel that, notwithstanding the wide distribution of the Railway Age Gazette, there are many railway officers and sub-officers who do not read it, or who, because of claims upon their time, and perhaps some natural diffidence, have not submitted papers in relation to many topics which would be interesting, and, at the same time, very important to your thousands of readers. We beg to suggest that the announcement be put in form of a leaflet and sent to the proper executive officer of each one of, say, twenty railways, and that you ask the cooperation of these railway officers in bringing the matter to the attention of the members of their organization in the belief that such course will result in enabling you to publish a number of articles upon devices and practices which will be valuable to the railway profession, and which may not be, and probably are not, generally used at this time.

The articles that you have published under the general caption of "Shop Kinks" elicited much of value to shop superintendents, foremen and mechanical men in general. If this course is adopted, we believe that roads should be chosen so as to represent the entire territory within the boundaries of the United States. Perhaps twenty roads are too many to enlist in the beginning, because a considerable number of meritorious papers should be forthcoming. If this policy is pursued, and, as the number of prizes is necessarily limited, it will, if there is a general response, necessitate considerable labor in order to determine relative merit, and will, at the same time, result in disappointing some of the contestants. Perhaps it would be better to confine this experiment to eight or ten roads. In each case a sufficient number of the leaflets should be sent to each officer addressed to enable him to give them wide distribution among superintendents engineers, mainte-

nance of way, roadmasters, section foremen, and so forth. The composition of the replies should not be too closely criticized, and the expressions of our feelings that have evidently reached you would not be justified if it were not for the fact that the contestants in the cases submitted to us were all young engineers, and some of them, especially the one who states that he graduated from the best engineering institution in the country a few years ago, should certainly have made a very much better showing in the composition of their articles.

We are sorry that we could reach no other conclusion with respect to these offerings than outlined herein, but it seems to use that it would be a mistake to start an undertaking of such merit on such a low standard. The documents will be returned to you on Monday by messenger.

Trusting that the suggestions contained herein may be of some value, at least to the extent of suggesting a method of procedure which will result in the accomplishment of your purpose, I am, on behalf of my associates and myself, J. W. KENDRICK.

We concur heartily in the recommendations of the committee, and shall put them into effect as soon as possible.—Editor.

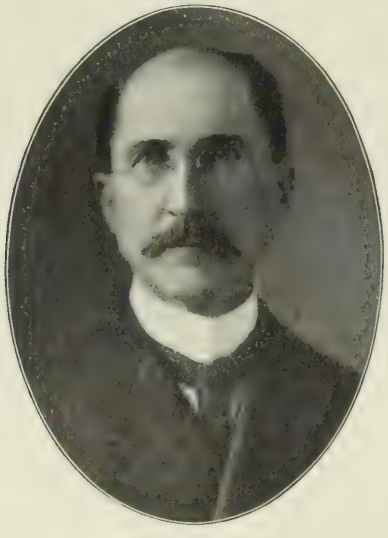
WOODEN BRIDGES AND TRESTLES.*

The work assigned by the board of direction was:

(1) Consider revision of Manual; if no changes are recommended, make statement accordingly.

(2) Continue the revision of the specification for structural timbers, co-operating with Committee Q of the American Society for Testing Materials and committees of other associations on the subject, with a view, if possible, of preparing a uniform standard specification.

(3) Continue the study of principles and methods of pile-driving, the subdivision to include pile-driving records, recommended types of sheet piles, concrete piles, pile-



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driving formulas, recommended types of equipment, shoes, splices, etc.

(4) Prepare a set of definitions relating to specifications for timber, supplementing definitions of defects, but more comprehensive than heretofore.

Sub-Committees.

The following sub-committees were appointed:

A. To consider item 4, in the outline of work, and that part of item 2 which relates to Southern yellow pine. F. H. Bainbridge, chairman; F. B. Scheetz, C. C. Wentworth.

B. To consider item 2, with reference to the preparation of standard specifications for Douglas fir and Western hemlock: G. A. Casseday, chairman; F. H. Bainbridge, L. J. Hotchkiss, Hans Ibsen, James Keys.

C. To consider item 3: R. D. Coombs, chairman; F. E. Bissell, J. A. Lahmer, F. B. Scheetz, W. F. Steffens, C. C. Wentworth, P. H. Wilson.

D. To consider item 1: James Keys, chairman; W. S. Bouton, G. R. Talcott.

The vacancy in the chairmanship of Sub-Committee B, due to the death of G. A. Casseday on July 20, 1909, was filled by the appointment of L. J. Hotchkiss.

Revision of the Manual.

Some amendments of recommended standard definitions are offiered, as well as amendments of two paragraphs in the specifications for metal details used in wooden bridges and trestles (see Appendix A).

The specifications for bridge and trestle timber and piling in the Manual, 1907, pp. 80-83, are superseded by others adopted later. The safe unit-stresses, on page 85, are also superseded by those adopted in 1909. Some other amendments relating to specifications to be inserted in the Manual are given under subsequent topics.

Standard Specifications for Bridge and Trestle Timbers.

The designations adopted for the two grades of Southern yellow pine at the last convention (see Proceedings, Vol. 10, p. 614) proved unacceptable to the Yellow Pine Manufacturers' Association, and at a joint conference of committees the designations "Standard Heart Grade" and "Standard Grade" were agreed on. It was also agreed to substitute "corner" for "edge," since the latter is employed as a technical term in the lumber trade, having a different meaning from that in ordinary usage; and to insert the requirement of having the timber sawed to full length. With these modifications the specifications were adopted August 4, 1909, by the Yellow Pine Manufacturers' Association, printed in pamphlet form, and issued to the trade with the request to put them into effect. It is to be remembered that the American Society for Testing Materials, through its Committee Q, on standard specifications for the grading of structural timbers, has actively co-operated to secure this result.

The committee emphasizes the importance of careful inspection. It is unfair to any honest manufacturer, who submits a bid on the basis of the face value of the specifications, if the purchaser finally accepts material which is inferior in quality to that demanded by a reasonable interpretation of the specifications.

At the last convention the committee withdrew all references to Douglas fir and Western hemlock, believing it to be impracticable to frame satisfactory specifications to apply in common to these species and to Southern yellow pine. Separate specifications, relating to Douglas fir and Western hemlock, are now presented for approval (see Appendix C).

Some of the existing specifications are too strict, and timber conforming to their requirements cannot be purchased except at excessive prices. It has been the purpose to frame a specification which will secure a good grade of timber and which is thoroughly practicable from a manufacturer's standpoint.

The chairman of the sub-committee is endeavoring to arrange for a meeting with representatives of the Oregon and Washington Lumber Manufacturers' Association and the Pacific Coast Lumber Manufacturers' Association, and of the American Society for Testing Materials, to secure, if possible, a uniform standard specification.

It was decided that the specifications shall cover only two grades of timber. The standard heart grade is intended for general use in bridges and trestles, while the standard grade is intended for false-work trestles for filling and for other temporary construction. White Douglas fir is excluded in the standard heart grade and accepted in the standard grade since it is not regarded as sufficiently durable for use in other than temporary structures. The limiting sizes given for pitch pockets and knots are believed to be readily met by the manufacturer, and that the quality specified will be satisfactory to the user. The general form of the specifications is similar to that adopted last year by the association.

As to whether the percentage of heart for different members of a structure should be specified, the committee concluded that, while this may not be necessary at present, the specifications to be adopted by the association will probably stand for a number of years, and, since the time may come soon when heart wood cannot be so easily secured, the percentage of heart should be designated.

Definitions Relating to Structural Timber.

Definitions heretofore adopted relate chiefly to standard defects (see Manual, 1907, pp. 72-79). Most of the defini-

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

tions now submitted were prepared last year, a few having been revised this year and several others added (see Appendix D).

Piles and Pile Driving.

The report submitted in Appendix E is a continuation of that of last year. The paper on The Supporting Power of Piles, given in Appendix F, was prepared by E. P. Goodrich, at the request of the committee.

Strength of Redwood Timber.

In Appendix G is given an abstract of an unpublished progress report by the United States Forest Service, dated March 31, 1909. This abstract is published for the information of members of the association as a valuable addition to the relatively meager results heretofore available upon the subject. However, since the number of tests is somewhat limited and the timber is taken from only one district, it is not deemed advisable to recommend any revision at present of the working unit-stresses for redwood.

Conclusions.

The committee recommends the adoption of the following conclusions:

(1) That the proposed amendments relating to specifications, etc., in the Manual of Recommended Practice, be adopted.

(2) That the standard specifications for Douglas fir and western hemlock bridge and trestle timbers be adopted and published in the Manual of Recommended Practice.

(3) That the definitions for structural timber be referred to the board of direction, with the recommendation to publish them in the Manual of Recommended Practice.

(4) That the report on piles and pile driving be received as information.

The report is signed by: Henry S. Jacoby (Cornell University), chairman; James Keys (Un. Pac.), vice-chairman; F. H. Bainbridge (C. & N. W.), F. E. Bissell (consulting engineer), W. S. Bouton (B. & O.), R. D. Coombs (Penna. Tun. & Term.), L. J. Hotchkiss (C., B. & Q.), Hans Ibsen (Mich. Cent.), J. A. Lahmer (K. C. Sou.), F. B. Scheetz (Mo. Pac.), W. F. Steffens (B. & A.), G. R. Talcott (B & O.), C. C. Wentworth (N. & W.) and P. H. Wilson (civil engineer).

Appendix A.

Proposed Definitions.

Wooden Bridges and Trestles.

Post.—One of the vertical or battered members of the bent of a framed trestle.

Pile.—(See definition under subject of Piles and Pile Driving.)

Sub-Sill.—A timber bedded in the ground to support a framed bent.

Jack Stringer.—A stringer placed outside of the line of main stringers.

Guard Rail.—A longitudinal member, usually a metal rail, secured on top of the ties inside of the track rail, to guide derailed car wheels.

Guard Timber.—A longitudinal timber framed over the ties outside of the track rail, to maintain the spacing of the ties.

Fish-Plate.—A short piece lapping a joint, secured to the side of two members, to connect them end to end.

Bulkhead.—A wall of timber placed against the side of an end bent to retain the embankment.

Piles and Pile Driving.

Batter Pile.—One driven at an inclination, etc.

Leads.—The upright, etc.

Cap.—A block used to protect the head of a pile and to hold it in the leads during driving.

Follower.—A member interposed between the hammer and a pile to transmit blows to the latter when below the foot of the leads.

Standard Defects of Structural Timber.

Wane.—See definition under the subject of Structural Timber.

Note.—See additional definitions of defects under Structural Timber.

Specifications for Metal Details Used in Wooden Bridges and Trestles.

In the Manual of 1907, pp. 83 and 84, amend paragraphs 2 and 3 on steel and cast-iron, respectively, to conform to the specifications for iron and steel structures in paragraphs 83-85, and 106, on pp. 267 and 270 of the Manual.

Appendix C.

Standard Specifications for Douglas Fir and Western Hemlock Bridge and Trestle Timbers.

(To be applied to single sticks and not to composite members.)

1. Standard heart grade shall include yellow and red Douglas fir and western hemlock. White Douglas fir will not be accepted.

2. General Requirements.—All timber shall be live, sound, straight and close grained, cut square cornered, full length, not more than ¼ in. scant in any dimension for rough timber or ½ in. for dressed timber; free from large, loose or unsound knots, knots in groups, or other defects that will materially impair its strength for the purpose for which it is intended. Subject to inspection before loading.

3. Stringers shall show not less than 90 per cent. heart on each side and edge, measured across the surface anywhere in the length of the piece. Shall be out of wind and free from shakes, splits, or pitch pockets over ⅜ in. wide or 5 in. long. Knots greater than 2 in. in diameter will not be permitted within one-fourth of the depth of the stringer from any corner nor upon the edge of any piece; knots shall in no case exceed 3 in. in diameter.

4. Caps, sills and posts shall show not less than 85 per cent. heart on each of the four sides, measured across the surface anywhere in the length of the piece. Shall be out of wind and free from shakes, splits or pitch pockets over ½ in. wide or 5 in. long. Knots shall not exceed one-fourth of the width of the surface of the piece in which they occur and shall in no case exceed 3 in. in diameter.

5. Longitudinal struts or girts, X braces, sash and sway braces shall show one side all heart, the other side and two edges shall show not less than 85 per cent. heart, measured across the surface anywhere in the length of the piece.

6. Ties and guard timber shall show one side and one edge all heart, the other side and edge shall show not less than 85 per cent. heart, measures across the surface anywhere in the length of the piece.

7. Timbers for Howe truss chords shall show not less than 90 per cent. heart on each side and edge, measured anywhere in the length of the piece. Shall be out of wind and free from shakes, splits or pitch pockets over ⅛ in. wide or 3 in. long. Knots shall not be over 1½ in. in diameter nor be closer together on each surface than one in any four linear feet, but if knots are 1 in. or less in diameter, one in any three linear feet will be allowed.

8. Standard grade shall include yellow, red and white Douglas fir and Western hemlock.

9. General Requirements.—All timbers shall be sound and cut square cornered, except that timbers 10x10 in. in size may have a 2-in. wane on one corner or its equivalent on two or more corners. Other sizes may have proportionate defects. Must be free from defects which will impair its utility for temporary work. Knots shall not exceed one-fourth the width of the surface of the piece in which they occur. Subject to inspection before loading.

10. Stringers, caps, sills and posts shall be out of wind, free from shakes or splits extending over more than one-eighth of the length of the piece, or knots more than 4 in. in diameter. Knots greater than 3 in. in diameter will not be permitted on the edge of any stringer.

Appendix D.

Structural Timber—Definitions.

Timber.—A single stick of wood of regular cross-section.

Cross-Section.—A section of a stick at right angles to the axis.

True.—Of uniform cross-section. Defects are caused by wavy or jagged sawing or consist of trapezoidal instead of rectangular cross-sections.

Axis.—The line connecting the centers of successive cross-sections of a stick.

Straight.—Having a straight line for an axis.

Out of Wind.—Having the longitudinal surfaces plane.

Corner.—The line of intersection of the planes of two adjacent longitudinal surfaces.

Girth.—The perimeter of a cross-section.

Side.—Either of the two wider longitudinal surfaces of a stick.

Edge.—Either of the two narrower longitudinal surfaces of a stick.

Face.—The surface of a stick which is exposed to view in the finished structure.

Sapwood.—A cylinder of wood next to the bark and of lighter color than the wood within. It may be of uneven thickness.

Heartwood.—The older and central part of a log, usually darker in color than sapwood. It appears in strong contrast to the sapwood in some species, while in others it is but slightly different in color.

Springwood.—The inner part of the annual ring formed in the earlier part of the season, not necessarily in the

spring, and often containing vessels or pores.

Summerwood.—The outer part of the annual ring formed later in the season, not necessarily in the summer, being usually dense in structure and without conspicuous pores.

Decay.—Complete or partial disintegration of the cell walls, due to the growth of fungi.

Sound.—Free from decay.

Solid.—Without cavities; free from loose heart, wind shakes, bad checks, splits or breaks, loose slivers and worm or insect holes.

Wane.—A deficient corner due to curvature or to taper of the log.

Square Cornered.—Free from wane.

Knot.—The hard mass of wood formed in a trunk at a branch, with the grain distinct and separate from the grain of the trunk.

Cross-Grain.—The gnarly mass of wood surrounding a knot, or grain injuriously out of parallel with the axis.

Wind Shake.—A crack or fissure, or a series of them, caused during growth.

Appendix E.

Piles and Pile Driving.

This appendix shows several forms of blanks for keeping pile driving records, illustrates various pile splices and shoes and discusses over-driving. After illustrating types of mechanical protection against marine borers, it takes up concrete piles, describing several designs.

The chief objection to cast-and-driven concrete piles has been based upon the possibility of injury to the reinforced concrete during driving. Most of the systems in vogue care for this by jetting the piles, or by the use of a special driving cap designed to protect the head of the piles. The patents covering these various systems refer principally to the driving caps, the arrangement of the reinforcement, provision for jetting, method of molding, and the shape of the pile itself. All of the items entering into the manufacture and placing of cast and driven piles may be varied to suit the local conditions.

It is estimated that about 2,500,000 linear feet of cast-in-place piles are now in use in this country. No definite data in regard to the use of cast-and-driven piles could be obtained, but the quantity is believed to be less than 250,000 linear feet.

Wooden piles are loaded to about 15 tons, and while many engineers think they are capable of carrying greater loads, this load represents conservative practice. The loads allowed on concrete piles vary from 25 to 50 tons each, depending on the nature of the ground and the system used; in European practice they are loaded to 40 or 50 tons each, and there are records of piles loaded to 80 tons; the best American practice, however, limits the load to 35 tons.

To prevent decay wooden piles are cut off at low water and the foundations must be carried down to this level. The tops of concrete piles may be at any elevation desired and the depth of the footing course will be governed by the spacing of the piles, and the weight of the superstructure. In this way the expensive excavation for deep footings, as well as the cost of the additional depth of footings, is saved.

Concrete piles cannot be driven as rapidly as wooden piles, but since the load per pile is greater, their use may result in a saving of both time and cost. If concrete piles are used, no delay is occasioned by waiting for the arrival of the piles; wooden piles are difficult to obtain in certain parts of the country, but sand, stone and cement are generally available. There is no reason why concrete should vary in quality, while it is becoming more and more difficult to obtain wooden piles of a standard grade.

A wooden pile rots if alternately wet and dry and is subject to attack by the teredo and other wood borers, when placed in salt water. The elevation of ground water fixes the point of cut-off, but the building of deeper sewers in the neighborhood may lower the ground-water level, and when this occurs wooden piles are subject to decay.

The argument most frequently urged against concrete piles is their cost. The cost per linear foot is certainly greater for a concrete pile than for one of wood, but when the saving in excavation, size of footings, number of piles and time of completion are taken into consideration, this additional cost per foot is discounted.

The length of cast-in-place piles is limited, but piles cast and driven may be of any length. When driven with a core or pipe, the maximum length thus far attained is 45 ft.; no cores have been made longer than this, while the difficulty experienced in pulling the pipe, renders a greater length impracticable.

Cast-and-driven piles require careful handling if made in long lengths, as cracks cannot be readily detected, and the piles should preferably be allowed to set several weeks before using. If made on the job this delays the work, while if made in distant yards, the exact lengths are hard to gage, and the piles may be either too short or too long. As the operations of lengthening or shortening cause delay and expense, it is very desirable that the penetration be determined before the piles are brought to the site.

If shells are used, they should be made of steel heavy enough to withstand the side pressures of soft ground or the shearing effect of boulders or gravel. Some objection has been made to dropping concrete through the longer lengths of a cast-in-place pile. As a wet mixture is used, and the concrete is deposited by shovels, it should be properly graded when the pile form is full.

The driving of an adjacent pile tends to settle the concrete in the pile just filled, thus forcing out the air bubbles, and while distortion may occur, particularly in the case of piles driven without a shell, this danger has not been manifest in actual practice.

In cast-in-place piles, unprotected by a shell, it is impossible to inspect the integrity of the pile. After the concrete leaves the end of the pile, it is subjected to the action of the surrounding ground without protection. Soils bearing running water may carry off a part of the cement, leaving the coarser aggregates; very dry, porous soils may absorb the water needed in setting; in either case the bearing power of the pile would be affected.

As in the case of peeled wooden piles, a smooth exterior offers less resistance to movement than a rough one. However, when the attempt is made to increase the skin friction by cementing the pile to the earth in which it is cast, a question arises as to how much the pile itself is weakened by an admixture of earth. The necessity of reinforcing concrete pile in certain soils is apparent, and the greater the dependence placed upon point bearing, the greater the necessity for reinforcing.

A pile depending on point bearing acts as a column, supported more or less at the sides, and any pile acting as a column should be reinforced. When subjected to bending stresses or placed in semi-liquid or shifting soil, piles should be reinforced. Piles whose method of manufacture precludes the insertion of reinforcement are not adapted to use in service which requires action as a column.

Appendix G.

Strength of Redwood Timber.

The following abstract is made from a progress report by the United States Forest Service, dated March 31, 1909, the tests having been made in co-operation with the Redwood Association. The material was selected by a member of the Forest Service, assisted by experienced mill men, an attempt being made to represent the various qualities occurring in commercial material and in amounts proportional to the general output.

The trees were felled in February, 1908, in Central Mendocino county, Albion district, California, and shipment to the laboratory included 4,867 ft. of sawed lumber in 70 pieces, with sizes ranging from 2x8 in. to 8x16 in., and 16 ft. long.

The beams tested were loaded at the third points, the average percentage of moisture being 68.1, the average results for 21 beams ranging in section from 7x9 to 8x16 in. and a span of 15 ft., expressed in lbs. per sq. in., are 4,210 for the extreme fiber stress at the elastic limit, 5,190 for the ultimate stress in the outer fiber, 260 for the longitudinal shear and 1,249,000 for the modulus of elasticity. The corresponding values for 24 beams from 2x8 to 3x14 in. and a span of 15 ft., are 3,160, 4,240, 190 and 1,030,000. By comparing the larger sizes the strength of redwood in flexure expressed as a percentage of that of Douglas fir is 96 at the elastic limit, 81 for the ultimate stress in the outer fiber, and 74 for the modulus of elasticity.

The average results for the elastic limit in compression on the side of the fibers are as follows: 19 tests on sticks, 7x9 to 8x16 in. in cross-section, give 470; 43 tests on sticks 2x8 to 8x16 in., give 450; and 113 tests on sticks 2x2 to 8x16 in., give 550 lbs. per sq. in. All the sticks were 24 in. long and contained an average of 65.7 per cent. of moisture.

For compression parallel to the grain the following average results are obtained: For 17 tests on blocks 6x6 in. and 20 in. long, the elastic limit is 3,270, and the ultimate stress is 4,160 lbs. per sq. in.; and for 70 tests on 2x2-in. blocks, 6 in. long, the corresponding values are 3,560 and 4,150 lbs. per sq. in. The average percentage of moisture is 76. For a comparison of the larger sizes the strength of redwood is 111 per cent. of that of Douglas fir.

IRON AND STEEL STRUCTURES.

The committee recommends that certain revisions be made in the Manual of Recommended Practice (1907) and that the General Specifications for Steel Railroad Bridges (1906), printed in pamphlet form, be revised so as to correspond therewith.

It presents the proposed modifications in two groups. The first includes minor changes in punctuation, words and construction of sentences, which do not affect the



J. E. GREINER.

substance. The second consists of important changes, additions to or revisions which affect the substance.

The second group, the important changes are as follows:

For paragraph 2, p. 257 of the Manual, substitute:

2. When alinement is on tangent, clearances shall not be less than shown on the diagram. The width shall be increased so as to provide the same minimum clearances on curves for a car 80 ft. long, 14 ft. high, and 60 ft. center to center of trucks, allowance being made for curvature and superelevation of rails.

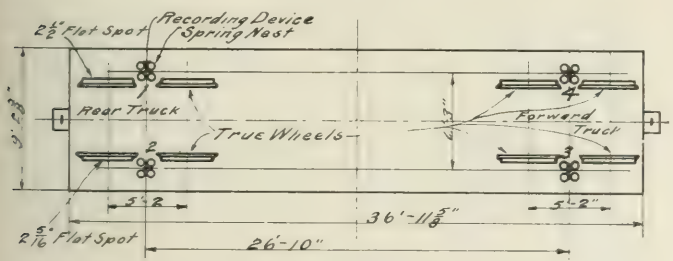


Fig. 1. Positions of Recording Devices.

6. Make addition so that the paragraph will include "reinforced concrete [assumed to weigh] 150 lbs. per cu. ft."

13. Omit marginal reference and substitute: Structures located on curves shall be designed for the centrifugal force of the live load applied at the top of the high rail. The centrifugal force shall be considered as live load and be derived from the speed in miles per hour given by the expression $60 - 2\frac{1}{2} D$, where D = degree of curve.

Substitute:

16. Axial compression on gross section of columns—

$$16{,}000 - 70 \frac{l}{r}$$

with a maximum of.....14,000

where "l" is the length of the member in inches, and "r" is the least radius of gyration in inches.

Direct compression on steel castings.....16,000

17. Add "and steel castings" after "girders."

19. Substitute in place of the figures now given for, "granite masonry and Portland cement concrete" and "sandstone and limestone" the following:

On masonry 600

Insert the following new paragraphs after paragraph 19:

19-a. The lengths of main compression members shall not exceed 100 times their least radius of gyration, and those for wind and sway bracing 120 times their least radius of gyration.

19-b. The lengths of riveted tension members in horizontal or inclined positions shall not exceed 200 times their radius of gyration about the horizontal axis. The horizontal projection of the unsupported portion of the member is to be considered as the effective length.

21. Omit marginal heading. Change "70 per cent." in the second line to two-thirds.

27. Add to this paragraph: "The thickness of web plates shall be not less than 1-160 of the unsupported distance between flange angles (see 36).

28. Make additions shown so that the paragraph will read: "The gross section of the compression flanges of plate girders shall be not less than the cross section of the tension flanges; nor shall the stress per sq. in. in the compression flange of any beam or girder exceed $16{,}000 - 200 \frac{l}{b}$, when flange consists of angles only or if cover consists of flat plates, or $16{,}000 - 150 \frac{l}{b}$, if over consists of a channel section where l = unsupported distance and b = width of flange."

45. Begin with the following sentence, so that the paragraph will read: "The latticing of compression members shall be proportioned to resist the shearing stresses corresponding to the allowance for flexure provided in the column formula in paragraph 16 by the term $70 \frac{l}{r}$. The minimum width of lattice bars shall be," etc.

46. Omit marginal heading. Revise so as to read: "Three-fourths-inch rivets shall be used for latticing flanges from 2½ to 3½ in. wide; ⅞-in. rivets shall be used in flanges 3½ in. and over, and lattice bars with at least two rivets shall be used for flanges over 5 in. wide."

51. Change last sentence so as to read: "At least one of these plates shall extend to the far edge of the farthest tie-plate, and the balance to the far edge of the nearest tie-plate, but not less than 6 in. beyond the near edge of the farthest plate."

60. Add "Segmental rollers shall be geared to the upper and lower plates."

61. Omit brackets and the footnote referring thereto.

66. Change "connection angles not less than 7-16 in." to connection angles not less than ½-in. in thickness.

75. Omit brackets and footnote referring thereto.

Substitute the following:

77. "There shall be web stiffeners, generally in pairs, over bearings at points of concentrated loading, and at other points where the thickness of the web is less than 1-60 of the unsupported distance between flange angles. The distance between stiffeners shall not exceed that given by the following formula, with a maximum limit of six feet (and not greater than the clear depth of the web)." [Follow with formula and remainder of paragraph as it now appears in the Manual.]

Substitute the following:

79. "Truss spans shall be given a camber by so proportioning the length of the members that the stringers will be level when the bridge is fully loaded."

80. Omit the footnote, also omit the expression "up to 300 ft. spans" and reconstruct so as to read: "Hip verticals and similar members, and the two end panels of the bottom chords of single-track pin-connected trusses shall be rigid."

84. Marginal heading "Properties."

Phosphorus limit for acid structural steel should be 0.06 instead of 0.08.

Insert the following paragraph after paragraph 84:

84-a. In order that the ultimate strength of full-sized annealed eye-bars may meet the requirements of paragraph 160, the ultimate strength in test specimens may be determined by the manufacturers; all other tests than those for ultimate strength shall conform to the above requirements.

Substitute the following:

91. "Rolled steel shall be tested in the condition in which it comes from the rolls.

Substitute the following:

93. "A deduction of 1 per cent. will be allowed from

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

the specified percentage for elongation, for each ⅛-in. in thickness above ¾ in."

111. Add: Material arriving from the mills shall be protected from the weather and shall have clean surfaces before being worked in the shops.

117. Marginal heading Reaming.

Omit last sentence and make additions so that the paragraph will read: "Where sub-punching and reaming are required," etc.

118. Omit the marginal heading, change footnote to correspond with revised addendum and alter so as to read: "When general reaming is required it shall be done after the pieces forming one built member are assembled, and so firmly bolted together that the surfaces shall be in close contact. If necessary to take the pieces apart for shipping and handling, the respective pieces reamed together shall be so marked that they can be reassembled in the same position in the final setting up. No interchange of reamed parts will be permitted."

119. Omit this paragraph, marginal heading and footnote, and substitute: "Reaming shall be done with twist drills and without using any lubricant."

120. Omit marginal heading. Make addition so that the paragraph will read: "The outside burrs on reamed holes shall be removed to the extent of making a 1-16-in. fillet."

126. Substitute the following and change marginal reference to correspond: "The main sections of floor beams and stringers shall be milled to exact length after riveting and the connection angles accurately set flush and true to the milled ends *[or if required by the purchaser the milling shall be done after the connection angles are riveted in place, and milling to extend over the entire face of the member]. The removal of more than 3-32-in. from the thickness of the connection angles will be cause for rejection."

127. Change marginal heading to Riveting and make additions so that the paragraph will read as follows: "Rivets shall be uniformly heated to a light cherry red heat in a gas or oil furnace so constructed that it can be adjusted to the proper temperature. They shall be driven by pressure tools wherever possible. Pneumatic hammers shall be used in preference to hand driving."

129. Change "turn to" in the second line to shall make and make additions so that the paragraph will read: "Wherever bolts are used in place of rivets which transmit shear, the holes shall be reamed parallel and the bolts shall make a driving fit, with the threads entirely outside of the holes. A washer not less than ¼-in. thick shall be used under nut."

132. Interpolate not less than after "templet" in the second line.

Change marginal reference to correspond with revision in addendum.

140. Make additions so that the paragraph will read: "Steel castings shall be free from large or injurious blow holes and shall be annealed."

142. Make additions so that the paragraph will read: ". . . . The finishing cut of the planing tool shall be fine and correspond with the direction of expansion."

146. Interpolate the word "scale" before "weight."

158. Make addition so that the paragraph will read: "Complete copies of shipping invoices shall be furnished to the purchaser with each shipment. These shall show the scale weights of individual pieces."

Substitute the following:

160. "In eye-bar tests, the minimum ultimate strength shall be 55,000 lbs. per sq. in. The elongation in 10 ft., including fracture, shall be not less than 15 per cent. Bars shall break in the body and the fracture shall be silky or fine granular, and the elastic limit as indicated by the drop of the mercury shall be recorded. Should a bar break in the head and develop the specified elongation, ultimate strength and character of fracture, it shall not be cause for rejection, provided not more than one-third of the total number of bars break in the head (see 133)."

In order to conform to the recommended revisions in the body of the specifications the "Addendum" on page 276 should be changed to the following, and all footnote references given in the specifications should correspond therewith:

Points to Be Specifically Determined by Buyers When Soliciting Proposals for Steel Railroad Bridges.

When general detail drawings are not furnished for the use of bidders specific answers should be given to questions a, b and c, below.

Specific answers should also be given to questions d, e and f if the class of work described in any of the paragraphs there referred to is desired. If these features are not specifically demanded, the unbracketed paragraphs will be construed to define the kind of work desired.

(a) What class of live load shall be used? (Par. 7 and 8.)

(b) Shall linseed oil or paint be used. If paint, what kind? (Par. 148.)

(c) Shall contractor furnish floor bolts?

(d) Shall general reaming be done? (Par. 118.)

(e) Shall field connections be assembled at the shop? (Par. 132.)

(f) Shall floor connection angles be milled after riveting? (Par. 126.)

Page 256. Omit Table of Standard Upsets and substitute the following:

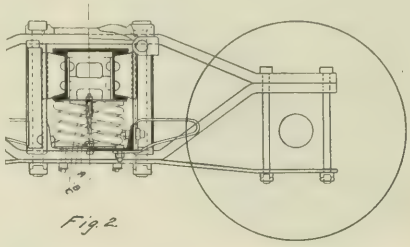
Recommended Conventional Signs.

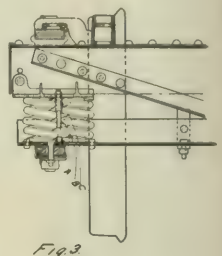
A—Bridge Rivets.

[The committee presents conventional signs for various kinds of rivets.]

B—Stresses.

+ Tension.
— Compression.


Fig. 2.


Fig. 3.

Figs. 2 and 3. Details of Recording Devices.

Conclusions.

The committeee recommends:

(1) That the recommendations under the heading "Revision of Manual" be adopted.

(2) That the report on "Care of Existing Bridges" be adopted and incorporated in the Manual.

(3) That the subject of "Specifications for Erection of Railroad Bridges" be referred back to the committee for further consideration.

(4) That the Review of the Development of Bridge Building in America be accepted.

(5) That report on Reinforced Concrete vs. Steel be accepted.

The report is signed by: J. E. Greiner (consulting engineer), chairman; C. F. Loweth (C., M. & St. P.), vice-chairman; C. H. Cartlidge (C., B. & Q.), C. L. Crandall (Cornell University), B. W. Guppy (B. & M.), A. J. Himes (N. Y., C. & St. L.), Charles M. Mills (Phila. El. R. R. & Sub.), A. D. Page (civil engineer), C. D. Purdon (consulting engineer), C. C. Schneider (consulting engineer), F. E. Turneaure (Univ. of Wis.), and J. R. Worcester (consulting engineer).

Appendix A.

Care of Existing Bridges—Methods of Field Work, Inspection and Records of Inspection.

This compound subject has been under consideration for several years and progress reports for information and discussion have been submitted. It was not the intention that they be included in the Manual.

The committee is of the opinion that the matter which pertains to inspection and records of inspection can be arranged so as to embody instructions of sufficient general application to justify publication in the Manual.

It therefore submits the following final report, with the recommendation that paragraphs (1), (2) and (3) be printed in the Manual.

Inspection of Bridges and Records of Inspection.

Inspections of bridges should be made with the object of discovering weakness or defects, of ascertaining the amount and rate of deterioration, the general physical condition, safety under traffic and the necessity for repairs, reinforcements and renewals.

The frequence of inspections should depend on the character of the bridges, their location, strength and physical condition. A thorough annual inspection by a competent inspector may suffice for many cases where the bridges have been properly constructed and are not overloaded. On the other hand, a daily inspection may be necessary in

order to observe with sufficient promptness damage which may be caused by an accidental blow.

Between these two extremes there are many reasons for making inspections of more or less thoroughness and frequency, but the committee does not feel that a set of hard and fast rules, prescribing in detail the manner and frequency of making inspections, could be drawn up which would be alike efficient for the various conditions of traffic, the many types of structures to be inspected, and the widely differing forms of organization of the forces entrusted with the safety and maintenance of railway bridges.

A proper system of bridge inspection should therefore generally include the following:

(1) Inspection by the regular section forces, daily, or as often as they inspect the track under their supervision. The object of this inspection is to discover any damage to the structure from fire, flood, derailments or other accidents from traffic, or any displacement in the structure in whole or in part. This inspection, due to the lack of skill on the part of the section forces, must necessarily be superficial, and will rarely, if ever, do more than call attention to unsafe conditions arising from causes other than those of natural depreciation. No reports of such inspections need be made unless adverse conditions are discovered.

(2) At periodic intervals of from one to six months there should be inspections by bridge foremen or others experienced in bridge repairs. These inspections should be more thorough than those of the section forces, and are intended to discover all the defects, arising from traffic, to which the bridge is subjected, and those due to natural depreciation or other causes. Reports of such inspections should be made to the one next in authority; preferably to the one most directly or primarily responsible for the safety of the structures.

(3) Annual or semi-annual inspections are to be made by men experienced in the design and maintenance of bridges; preferably by those who are primarily responsible for their safe maintenance. The reports of these inspections should be filed, and in connection with an examination of office data will determine the safety of the structures, and be the basis for decisions as to repairs, reinforcements or renewals.

The inspections outlined in (1), (2) and (3) above must be considered as quite general. Railway bridges are of timber, masonry or metal, and occasionally of unusual design; men competent to inspect one kind are often incompetent to inspect other kinds, and it therefore may be necessary to limit an inspector to structures of a certain kind.

Appendix B.

Reinforced Concrete vs. Steel for Short Span Bridges.

The committee was instructed to report on: "To what extent is steel construction, carrying heavy loads at high speed, preferable to reinforced concrete for main girders of bridges?"

This inquiry is understood to mean a consideration of "The relative desirability of reinforced concrete vs. steel construction for short span bridges," and the committee submits the following as a progress report for information and discussion, with the recommendation that it be referred back for further consideration.

In any bridge the qualities to be desired are: Adequate strength, freedom from vibration and excessive deflection, economy in first cost, economy in maintenance, and permanence.

The theory of flexure of reinforced concrete is sufficiently well understood to enable safe and economical designs to be made of this material, and experience with reinforced concrete structures carrying dead loads only has been abundant. Experience with such structures carrying heavy live loads and subjected to the shock and vibration of these loads, moving at high speed, has not been so extensive, but reinforced concrete girders can be designed and built in short spans of any strength required, or likely to be required, by railway loads. In the event of overloading or defective construction, reinforced concrete will give quite as much warning of probable failure as other materials.

While the art of bridge construction in steel has so far progressed that the safeguards surroundings the manufacture of steel and its fabrication into bridges have come to be matters of course, the equally careful supervision of the manufacture of reinforced concrete seems burdensome to the engineer, although it is just as necessary, but not more so. This necessity for careful inspection of methods and materials of manufacture needs to be emphasized, for, like steel, concrete may most easily be ruined by careless workmen, but when the same pains are taken to produce good concrete as are now taken to produce good steel, with the same rigid inspection and insistence on proper specifications, there will result a product which we believe will prove to be equally reliable.

One of the chief advantages of reinforced concrete over steel for short spans is that the form lends itself more readily to ballast floor construction, the superiority of which to open decks is evident to every operating officer, not only on the account of the absence of wood, which may rot or burn, or exposed steel, which requires protection from brine drippings or other corrosive influences, but also on account of the freedom from vibration and excessive deflection and the reduction of the cost of maintenance to a minimum.

The comparative economy of the two styles of construction is a matter which is not easily determined in general terms, depending as it does upon the market price of steel, concrete materials and labor. The character of the design is also a factor of first importance. Generally speaking, if it is not considered advisable to use ballasted floors in a particular case, for that case the short span of I-beams with ordinary floor of wooden ties is the cheaper construction in first cost. If, however, a large number of similar spans are to be built, so that concrete slabs can be constructed in a central and conveniently arranged plant, and if the erected price of steel work approximates 3 cents a lb., the difference between concrete slab construction built with ballast floor and steel construction with open wooden floor will be small, and in many cases will be favorable to the concrete.

If the designs contemplate the use of I-beams embedded in concrete, compared with reinforced concrete girders, economy will be all on the side of the latter. Short spans

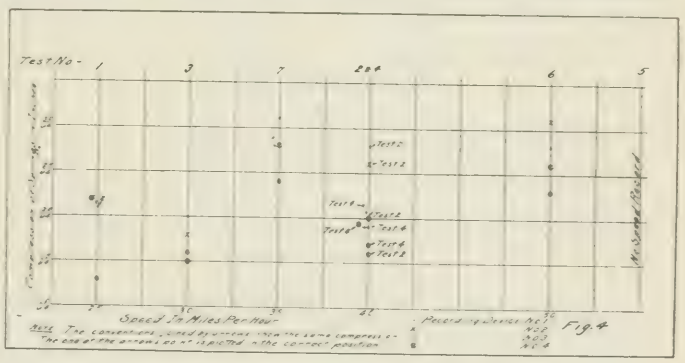


Fig. 4. Results of Tests.

of reinforced concrete also permit a substantial economy in the design of abutments carrying them. It is the opinion of the committee that reinforced concrete flat slabs or girders are not generally advisable for railway loads in spans exceeding 40 ft. But the importance of these small structures is very great, and it believes the use of reinforced concrete for these small spans is desirable.

Length of Flat Spots on Car Wheels.

In submitting its report to the last convention, the sub-committee felt that without an appropriation of funds sufficient to carry on some experimental investigation nothing further of interest or value concerning the effect of flat wheels on the roadway structures could be learned. It was expected, however, that the work of the sub-committee on Impact would develop some information of value, and it is now able to present a statement by that sub-committee concerning the impact of flat wheels on bridges. The sub-committee on Impact gave particular attention to this matter while carrying on some of its impact measurements and has now had sufficient time to review its data. The result of its study is embodied in the "Observations of the Effect of Flat Spots on Car Wheels on Bridge Stresses, made by Sub-Committee on Impact Tests," submitted herewith. These observations indicate a jarring or vibratory effect rather than a material increase in the unit stresses of the several bridge members. Such a result was to be expected, but the possession of tangible evidence of this effect is a material addition to our knowledge of the behavior of bridges.

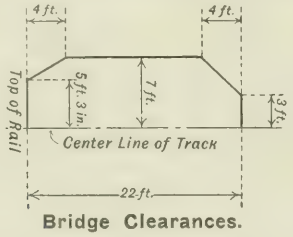
In the general discussion concerning the effect of flat wheels, which has been carried on during the past year or two in the technical journals and various meetings, it

has been asserted that under a rapidly moving train the fall of a car wheel due to a flat spot is so trifling that no serious blow could be delivered. For this reason the sub-committee has sought to procure some evidence of the magnitude of the blow from a flat wheel, and through the courtesy of A. W. Johnston, past-president of the association, and general manager of the New York, Chicago & St. Louis, an attempt has been made to measure the force of the blow under working conditions.

For this purpose an 80,000-lb. capacity car was equipped with registering devices to measure the compression of the car springs and a pair of wheels with flat spots was placed in one of the trucks. A diagram showing the position of the flat wheels, the springs and the recording devices is shown in Fig. 1. The trucks were of the arch bar type and in the center of each nest of springs there was placed a small tube in which was inserted a steel pin fitted sufficiently tight to hold it in place, but capable of being forced upward when, through the deflection of the springs, it came in contact with a projection arranged at the bottom of the nest. This device is shown in Figs. 2 and 3.

Messrs. Blaser and Pallister, of the instructing force of the Case School of Applied Science, calibrated the springs both before and after the test. The observations of the test were made by G. H. Tinker, bridge engineer of the New York, Chicago & St. Louis, assisted by Messrs. Blaser and Pallister.

The car was loaded with splice bars to its full capacity, the load being uniformly distributed. The trucks were fitted with registering devices and the flat wheels placed in position, at the Conneaut shops. The car was then run to Cleveland and the test made on a piece of straight track in excellent condition between Cleveland and Lorain. Test No. 5, however, was a run of several miles over track with



Bridge Clearances.

curves and switches, and is, therefore, not considered here. At the beginning of the test the steel pins were driven down in the tubes until they came in contact with the projection A, Figs. 2 and 3. The train was then run for a short distance, brought to a stop, and, the displacement of the steel pin carefully measured with calipers. After this measurement, the pin was again driven down and the process repeated. In this manner seven different tests were made.

In the following discussion it is assumed that inasmuch as the springs and recording devices are located midway between the two pairs of wheels belonging to a single truck, if the wheels of one pair have flat spots, only half of the influence of those spots is recorded. This may not be precisely correct, but it seems the most reasonable assumption that can be made.

The deflection of the car springs is occasioned by many causes. First in importance is the load of the car. In addition to this every inequality of the track produce a swaying or lurching movement of the car body, which causes the springs to oscillate back and forth. Bad rails, particles of earth and stone on the rails, the starting and stopping of the locomotive, the change of speed of the locomotive, and the application of brakes all cause variations in the deflection of the springs. To avoid these effects as far as possible, the recording device was arranged so that it could be set at any given time and indications secured at any time thereafter, and a very smooth and straight piece of track was selected on which to make the tests. The speed record was secured by counting the joints as the train passed over them. The wheels having flat spots were placed in a lathe and found to be elsewhere perfectly circular and truly centered on the axles.

The readings taken in the calibration of the springs were plotted and connected by continuous lines, which proved to be parallel within the limits of the test. This means that a given change of deflection indicates a certain number of pounds regardless of which nest of springs is considered and regardless of whether the calibration was made before or after the test. This is important, since we have to consider the differences of deflection rather than the total load. From these curves it was found that a load of 32,500 lbs. applied to a nest of four springs produced a compression of one inch.

The values of all of the observed deflections in pounds, platted in Fig. 4, with speeds as abscissas and deflections in inches as ordinates. It should be remembered that these are not total deflections, but deflections caused by the motion of the car between the points of starting and stopping. The deflections shown for the truck with true wheels are therefore due entirely to the ordinary causes producing an oscillation of the springs. In the truck where the flat wheels were located the flat spots were an additional cause of oscillation. It is assumed that any difference between the deflections in the truck with true wheels and in the truck in which the flat wheels were placed was due to the flat spots.

It is believed that recording devices Nos. 1 and 4 did not show accurately the true deflections, but that those on the other side of the car, Nos. 2 and 3, did. The pressure recorded by device No. 2 compared with that recorded by device No. 3 and arranged as in the following table, shows the increase of pressure on the rail due to the flat spot as given in the sixth column:

Test.	Speed, Miles per Hour.	Compression Shown by Device No. 2, Pounds.	Compression Shown by Device No. 3, Pounds.	Difference.	Increase of Pressure on Rail Due to Flat Spot.
1	25	10,800	6,700	4,100	8,200
2	40	13,300	8,000	5,300	10,600
3	30	9,000	8,000	1,000	2,000
4	40	10,000	8,700	1,300	2,600
5	..	14,300	15,800	1,500	3,000
6	50	15,800	11,600	4,200	8,400
7	35	14,300	12,100	2,100	4,200

It is apparent that the increase of pressure on the rail due to a flat spot under the conditions of the test may amount to as much as 10,600 lbs.

The pressure shown in the table is of course the number of pounds pressure required to compress the spring the amounts mentioned in the tests. But it should be remembered that the impacts producing these deflections were made almost instantaneously and the effect is that of a blow and not a gradually applied load. This difference is very important since the steel of which rails are made is injuriously affected by blows.

The tests appear to be a sufficient demonstration that a flat wheel does actually deliver a very serious blow on the rail, and in conclusion we would say that while these tests may not be sufficient to change the opinions of those who hold that the present M. C. B. limit for flat spots of 2½ in. is sufficient for 100,000-lb. capacity cars, they certainly indicate an abuse of the track structure which is hard to excuse and which is of such serious moment as to demand the attention of this association.

Observations on Effect of Flat Car Wheels on Bridge Stresses Made by Sub-Committee on Impact Tests.

During the progress of the special impact tests the Sub-Committee on Impact made such observations as it could relative to the effect of flat spots on car wheels on the stresses in bridges. In one series of tests a car having a wheel with a very decided flat spot was purposely used, and in other tests wheels with flat spots were occasionally noted in the test trains. In one case the tires of the locomotive were badly worn and quite rough.

From these observations the committee is unable to report any quantitative results. A distinct effect was noticeable on such members as stringers and floor beams. Where the track was smooth, and the wheels also, the record from the instruments attached to such members was generally clear and readable, even though the stresses under high speed might be largely in excess of those at low speed. In the case, however, of a rough track, caused by an open rail joint, or a flat or rough wheel, the passing train would produce such a "jarring" action on the stringer or beam that the measuring apparatus would be so shaken as to cause the parts to vibrate excessively, producing large and rapid vibrations in the record, thus rendering the diagram unreliable and, in many cases, quite worthless. Such diagrams would also commonly result where, for any reason, there was little or no elasticity between the rail and the beam. In one case where the rails were placed in steel troughs riveted directly to small cross-beams, the hip verticals were affected in this way. This effect would, however, seldom reach beyond the floor beams, and in the case of widely spaced stringers, would not always show up in the stringers. It would seem, therefore, that the "jar-

ring" effect might not imply a very great increase in stress, but that there is some increase is undoubtedly true.

The effect of flat spots on main truss members of a bridge was not definitely noticed in any case, but there were several cases where a train of three or four heavily loaded freight cars in a test train caused vibrations of the whole structure quite as large, relatively to the static deflection, as those caused by the locomotive. This effect was not noted in connection with any decided flat spots in the wheels, but in some cases at least, it seemed to be caused by a vibratory motion of a car body, due to some cause. This vibratory motion appeared to be due rather to some eccentricity of the bearing or of the wheel than to any flat spots, although our observations were not extensive enough to enable us to make a definite statement on this point. The speed at which such truss vibrations occurred under the loaded freight cars was generally high, such as 50 to 60 miles per hour. No such vibrations were ever noticed under the cars of a passenger train. The difference in equipment was very evident in the character of the diagrams produced.

CONSERVATION.*

The committee has been in correspondence with Gifford Pinchot, chairman of the Joint Committee on Conservation, and with his former and present assistants, Mr. Shipp and Mr. Gipe.

On May 13, 1909, the secretary of the Joint Committee on Conservation submitted a report containing suggestions as to the method by which the railway companies could assist in the conservation of natural resources. These suggestions, with some slight modifications, are submitted herewith, without comment.

The committee will continue to keep in touch with the Joint Committee on Conservation, and will hold itself in readiness to co-operate with that committee when called upon to do so, and will keep the association posted as to any steps that are taken by the Joint Committee on Conservation relating to railways.

The report is signed by: A. S. Baldwin (Ill. Cent.), chairman; Moses Burpee (Bang. & Aroos.), W. A. Bostwick (Carnegie Steel Co.), E. B. Cushing (Sunset Central Lines), E. O. Faulkner (A., T. & S. F.), A. L. Kuehn (Amer. Creosoting Works), D. W. Lum (Southern), and C. L. Ransom (C. & N. W.).

Appendix.

Suggestions for Railway Work in Forest Conservation.

Control of Forest Fires.

No accurate data has ever been compiled upon the total forest fire losses in the United States. More than 1,200,000 acres of forest were burned over last year in Wisconsin, and standing timber valued at nearly $3,000,000 was destroyed. In West Virginia, 1,700,000 acres were burned over, with about the same loss as in Wisconsin, while in Michigan it is estimated that 7,000,000 acres were burned over, and that $10,000,000 worth of timber was destroyed. These estimates do not include damage to young growth nor to the forest soil, which is often more serious than the damage to mature timber.

Railways may assist in the work of forest preservation on the following general lines:

(a) Keeping the right-of-way cleared of all inflammable material.

(b) The exercise of great care to prevent the escape of fire while this clearing is being done.

(c) Having it thoroughly understood by all section foremen that they and their crews must immediately go to and put out fires, set by the railway, about which information reaches them. Most roads have standing orders of this sort, but they are sometimes disregarded.

(d) By holding each train crew responsible for reporting to the section foreman, both by whistle signals and by personal report, any fires passed.

It is recommended that this association do all in its power:

(1) To obtain systematic co-operation of railways with federal and state authorities in the abatement of forest fires, whether originating from locomotives or from other causes.

(2) To devise efficient spark arresters.

(3) To enforce proper stoking.

(4) To place on the operatives, especially section foremen, responsibility for keeping rights-of-way clear and combating fires which do start.

Growing Timber for Railway Purposes.

A number of railways have adopted the policy of owning and managing their own forests. Some have withdrawn from the market the remainder of their forested land-grant areas; others have purchased forest land outright. The management of existing forests is more economical, and in the long run will probably be more satisfactory than the establishment of plantations. Such lands should be in charge of trained foresters.

Some roads operate in regions where lands already forested cannot be purchased. Almost every railway, however, can utilize waste lands, such as often become its property through the purchase of rights-of-way, for forest plantations. These plantations, again, should be installed and managed by trained men. The following general rules for plantations may be of assistance:

Rapid-growing species should be planted, as a rule, and the ties and timbers therefrom given preservative treatment. The harder and more durable woods are, as a rule, very slow growing, and plantations of these species would be less profitable. Loblolly pine in the south Atlantic and Gulf states; red oak, Scotch pine and European larch for the central and northeastern states; red or Norway pine for the northern lake states; Douglas fir for the northern Pacific coast; eucalyptus for southern California and other regions where there is no frost, are recommended. Black locust, which reaches fence post and tie size quickly, is also desirable wherever the locust borer is not dangerous. The planting of chestnut is not recommended anywhere until means of combating the chestnut bark diseases have been found. The species to be planted must always be suitable for the immediate locality.

Use of Sawed Instead of Hewed Ties.

About 70 per cent of the tree is wasted in making hewed ties. The waste is due to excess of material contained in most ties as hewed, loss of wood due to hewing large logs, the failure of tie cutters to use the butts of trees, on account of extra work involved, and to their failure to cut as far into the tops as could be done, through fear of making cull ties.

The saving in lumber by sawing, instead of hewing, ties varies from 20 to 190 per cent of the volume of wood actually going into the hewed ties, depending mainly on the size of the log. From a 16-foot log of loblolly pine, with a diameter at the small end inside the bark of 15 inches, two hewed ties can be obtained which need not contain more than 64 board feet under the usual specifications. By sawing the same log, four ties can be obtained, and also 57 board feet of lumber, or a total of 185 board feet. The gain in the form of ties and boards in this instance is nearly 190 per cent. This case is extreme, but it is safe to put the average gain from sawing at 80 per cent.

In 1907, 118,384,000 hewed ties were made—77 per cent of the total number used. Assuming that they contained, on the average, three cubic feet, and that the waste due to hewing was 80 per cent, the loss was 284,100,000 cubic feet, which is equivalent to the annual growth of merchantable wood on 9,470,000 acres of well-stocked timber land. In hewing ties, trees 12 to 15 inches in diameter are preferred. This is the size when the most rapid growth is being made, and when the trees should be left in the forest to accumulate wood. When ties are sawed, the larger the tree the better the quality of the tie and the less the cost of manufacture.

The chief objections to the sawed tie are that it is weaker and less durable than the hewed tie. On these points it may be said that few ties break that do not first partially decay, and preservative treatment will largely prevent decay.

The Forest Service found that the sale of lodgepole pine brought greater returns for trees under 15 inches when sold for hewed ties (scaling each tie 6 in. x 8 in. x 8 ft. at 33⅓ board feet) than when sold in the log by the Scribner decimal scale.

This does not show that hewing gives a greater product than sawing, but that the method of scaling saw logs in wide use robs the owner of small timber to such an extent that he gets larger returns by selling hewed ties, even though waste is greater.

For 9, 10 and 11-inch trees, hewing ties is about as eco-

*From the report of the special committee, co-operating with the National Conservation Commission, presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

nomical as sawing, and when it is desirable to cut such trees, as in thinning dense stands, or for species like lodgepole and Jack pines, whose rate of growth falls off beyond that point, tie hewing can well be employed.

In small timber tracts or woodlots, where it will not pay to erect a mill, tie hewing may be desirable.

To summarize, then, tie hewing cannot be condemned without exception.

(1) Hewing is economical for very small trees when these are desirable to cut from the point of growth.

(2) Hewing ties from trees under 15 to 18 inches and getting full scale is more desirable for the stumpage owner than being robbed by the scale of most existing log rules, if the price per thousand feet is the same.

(3) Hewing ties is desirable in small woodlots where a mill would be impracticable.

(4) Sawing ties is more economical by 20 to 200 per cent, and preferable for trees over 11 inches, when the mill man owns the stumpage, or for the independent stumpage owner when he is paid for the full saw output of his logs.

Supply of Creosote.

The greatest obstacle confronting the rapid advancement of preservative treatment is the lack of an adequate supply of a suitable preservative material to be obtained at a reasonable cost. Considerable difficulty has been experienced in securing a sufficient quantity of good grades of creosote. The consumption of domestic creosote in 1908 was over 17,000,000 gallons, and that of foreign creosote nearly 39,000,000 gallons.

The production and composition of domestic creosote are regulated to a large extent by the demand for pitch, which is the primary product for which coal tar is distilled. Creosote is a by-product of insufficient value in itself to pay the cost of manufacture. The pitch takes out a large proportion of the heavier constituents of the tar and leaves a proportionately increased amount of light oils.

In Europe, the conditions are quite the reverse. There is little demand for pitch, but a large demand for the lighter constituents of the tar, which are used in the manufacture of the aniline dyes. Hence, the lighter constituents are removed and the heavier left in the creosote. In the United States these heavier constituents are considered the most valuable components of the preservative, and consequently at the same price the foreign oils are preferred.

Coal tar is obtained chiefly from the distillation of coal in by-product ovens. Among the advantages of the by-product over the more common bee-hive oven are the possibility of using coals of greater range of volatility, larger capacity of oven, shorter time of operation, larger product of coke, and, what is especially important here, the using of the by-products.

The by-product oven, however, costs over four times as much as the bee-hive oven, and requires skilled labor to operate. Moreover, in the past the market for the by-products has been uncertain.

Coal tar is also obtained as a by-product in the manufacture of illuminating gas. According to the report of the United States Geological Survey, in 1902, there were 1,663 by-product retort ovens; in 1907 there were 3,892. Much gas is now made from petroleum instead of coal. In 1907 the production of oil and water gas was practically twice that of coal gas.

It is common practice in this country to mix the tars derived from oil and coal. Inasmuch as the efficiency of oil tar creosote has never been thoroughly tested as a wood preservative, this practice has caused a strong prejudice against the domestic article. It cannot be stated with certainty at this time whether this prejudice is wholly warranted, but indications are that it is.

It is recommended:

(1) That efforts be made to secure such improvements and economies in the construction and operation of by-product coke ovens as will lead to their general substitution for the bee-hive type.

(2) That tests be made to determine the relative efficiency of oil tar creosote and coal tar creosote as preservatives of wood.

(3) That tests be made to determine the minimum quantity of oil of a specified grade necessary to preserve wood under given conditions.

(4) That tests be made to find satisfactory substitutes for creosote in the treatment of timber.

RAIL.*

The board of direction instructed the committee as follows:

(1) Consider revision of Manual; if no changes are recommended, make statement accordingly.

(2) Continue the investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.

(3) Report on the results obtained from the use of open-hearth and special alloy rails, and chemical composition of such rails.

(4) Present report showing diagrams or photographs of typical characteristic rail failures corresponding to the adopted classification of rail failures.

(5) Report on any recommended changes in specifications for steel rails heretofore adopted, and prepare specifications for open-hearth rails.

(6) Present recommendations on standard rail sections.

(7) Consider the rail joint question and recommend design and specifications.

(8) Reconsider and report any recommended change in standard drilling for rails as given in the Manual.

The committee also considers as a part of its instructions a resolution submitted by the committee on Rail and Wheel Sections to the American Railway Association, and adopted by that association at the meeting held in New York April 22, 1908, to the effect that sections A and B, and the specifications for open-hearth and Bessemer rails be referred to the American Railway Engineering and Maintenance of Way Association, with the request that they follow up the question of determining the details as to drop test, etc., by observing the actual results of rails rolled under the new sections, tabulate all information as to comparative wear of rails rolled from the different parts of the ingot, and all other information necessary, keep careful record of the comparative results in service of rails of types A and B, and prepare and submit to the American Railway Association a single type of section which will embody their ideas as to the best type.

The work was sub-divided as follows:

Sub-Committee A—Experiments and Tests.

(a) Confer with the Manufacturers' Committee, through its chairman, F. W. Wood, from time to time, in order to keep each committee posted. It is of the greatest importance that we should not lose the harmonious feeling which has been established by the American Railway Association between the railway men and the manufacturers.

(b) Report on the results of drop tests.

(c) Recommend additional methods of testing rail.

(d) Exchange statistical information with the committee of the Manufacturers' Association, and under instructions from the general committee, confer with kindred associations.

(e) Make such tests as may be deemed advisable by the general committee; investigate and report upon tests made by outside parties, such as the Watertown Arsenal, when available, and examine into and report upon methods of manufacture and handling of rails at the mills.

Members: J. A. Atwood, chairman; R. Montfort, F. A. Delano, P. H. Dudley, J. D. Isaacs, Thomas H. Johnson, J. P. Snow, A. W. Thompson.

Sub-Committee B—Sections and Specifications.

(a) Consider revision of Manual; if no changes are recommended, make statement accordingly.

(b) Report on any recommended changes in specifications for steel rails heretofore adopted, and prepare specifications for open-hearth rails.

(c) Present recommendation on standard rail sections.

(d) Consider the rail joint question and recommend design and specifications.

(e) Reconsider and report any recommended changes in standard drilling for rails as given in the Manual.

Members: J. B. Berry, chairman; M. L. Byers, J. W. Kendrick, George W. Kittredge, Joseph T. Richards, Robert Trimble.

Sub-Committee C—Rail Service.

(a) Continue the investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.

(b) Report on the results obtained from the use of open-hearth and special alloy rails, and chemical composition of such rails.

(c) Present report showing diagrams or photographs of

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

typical characteristic rail failures corresponding to the adopted classifications of rail failures.

(d) Make comparative statement of the results of the use of series A and B, and other sections of rail.

Members: W. C. Cushing, chairman; E. B. Ashby, A. S. Baldwin, C. H. Ewing, H. G. Kelley, D. W. Lum.

Statistics of Rail Failures.

The first rail failure statistics for the six-months period from April 30 to October 31, 1908, have been printed in Bulletin No. 111; the statistics for the six months from October 31, 1908, to April 30, 1909, have been printed in Bulletin No. 116.

Open-Hearth and Special Alloy Steel Rails.

The information obtained for the six-months period from April 30 to October 31, 1908, has been printed in Bulletin No. 111. In the same bulletin A. W. Thompson, chief engineer of maintenance of way of the Baltimore & Ohio, has given the results of the use of titanium rail by that company. In Bulletin No. 116 the information of the comparative wear of special rail has been given for the period of six months from October 31, 1908, to April 30, 1909.

Characteristic Rail Failures.

The information obtained relative to this subject has been printed in Bulletin No. 116.

Specifications.

A new specification should not be proposed at this time without careful consideration. So far as we know, no company has purchased rails under the specifications approved by the American Railway Association and referred to us; nor do we know of any company that has succeeded in buying rails during the past two years according to a specification entirely satisfactory to the company. We believe that all of the specifications under which rails have been rolled have been compromises on the part of both parties, with the general result that neither party is entirely satisfied. Our experience during the year has brought to our attention some defects in all of the specifications now before us, and acting under the impression that there is a distinct feeling that we should revise our specifications, we offer the attached specifications for your consideration. Our association has no specification for open-hearth rails, and a specification for open-hearth rails is included.

We believe it necessary to submit a sliding scale for the percentages of carbon and phosphorus, which provides for increasing the carbon as the phosphorus decreases. The fixing of this scale properly is a matter requiring care and we admit that our knowledge on the subject is limited. The American Railway Association specification says: "When lower phosphorus can be secured a proper proportionate increase in carbon should be made." The amount of increase is not provided for in the specifications and this appears to us to be necessary in order to secure uniformity of practice. Bessemer rails are being furnished regularly with phosphorus under the maximum allowed, and where this is done, the carbon should be raised above the higher limit now fixed in our specifications, or a soft and poor wearing rail will result; yet this condition has not been fully guarded against in rails furnished under existing specifications. The lower and upper limits for carbon have heretofore been fixed with the intention that the mills furnish rails with a composition as near between the two limits as possible. The mills, however, in order to meet the prescribed drop tests with the least difficulty, keep both the carbon and manganese as nearly as possible to the lower limits, with the corresponding result that a generally poor-wearing rail is furnished.

Some roads have prescribed the limits of deflection to be allowed under the drop tests. With our present knowledge, we believe that we should fix a minimum deflection to eliminate brittle rails and to secure greater uniformity of product; also maximum deflection to eliminate soft rails. We are not able at the present time to fix these limits, but our ultimate object will be to determine and fix such limits for the specifications.

With reference to the amount of discard, time of holding in ladle, size of nozzles and such other details of manufacture or machinery, we are of the opinion that the physical and chemical tests required should be prescribed and that we should see that the material submitted for acceptance meets the prescribed tests. We should not dictate to the manufacturers the amount of crop which shall be removed from the top of the ingot, as this should vary with the care and time consumed at the various mills. The railways should not be asked to take anything but sound material in their rails. The mills can furnish such sound material if the proper care and sufficient time are taken in the making of the ingots. Information derived from the tests being made at the Watertown Arsenal shows definitely that sound rails cannot be made from unsound ingots, and that, therefore, the prime requisite in securing a sound rail is to first secure the sound ingot.

We recommend that the present specifications for steel rails be withdrawn from the Manual as no longer representing the current state of the art.

We submit herewith as an appendix a form for specifications. It will have to be amended from time to time as we receive further information on the subject.

Standard Rail Section.

Owing to the conditions existing in 1908 very little rail was laid, and practically none of the A. R. A. sections in such manner as to give the needed information. This year several roads have laid A. R. A. sections of rail. These rails have been in the track so short a time that we are not justified in drawing any conclusions as to which of the A. R. A. types is the better, or if either is better than the A.S.C.E. sections.

The statistics for rail failures given in Bulletin No. 116 show that the difference in section can be entirely annihilated by difference in chemical composition and by the treatment in furnace and mill.

The results so far obtained from the heavy base A. R. A. sections are disappointing, as we have received from the mills some rail of the new section which was as bad as we received with the old A.S.C.E. section.

The tests to be inaugurated by the committee, combined with the results of the tests at Watertown and the performance of the rail in the track, will give us valuable data to aid us in coming to a final conclusion.

The small demand, as indicated by mill sales data, and the slight possible variation in section of rail below 75 lbs. weight per yard makes inadvisable the consideration of new sections for this light-weight rail.

No recommendation as to sections of 75 lbs. and over is made at this time because of the lack of undisputed data upon which to base such design, the service value of the rail unquestionably being dependent upon chemical composition, furnace practice and mill practice, as well as upon the detail differences of dimensions, and the exact effect of each of these various factors is largely in doubt.

Rail Joints.

The tests at Watertown have not progressed as far as we would wish. It is deemed advisable to await these results before submitting recommendations on this subject. The committee will compile the information received from the Watertown tests and publish a special bulletin with the information at hand.

Standard Drilling.

(See Manual, Page 65.)

We are not ready to recommend any changes, although we are of the opinion that it is desirable to make a change. The tests now being made on joints at the Watertown Arsenal should give some information to aid us in fixing a proper drilling. The drilling now adopted as standard and incorporated in the Manual causes interference in the six-hole angle bars between bolts and spikes where slotted holes for spikes are used. We would recommend that railway companies which have not adopted the standard drilling postpone action for another year.

Tests.

The committee is arranging for a series of tests on rails of different sections and weights of both Bessemer and open-hearth steel, manufactured by different mills, with a uniform chemical composition for each kind of rail. The tests are to embrace drop tests, tests on revolving machine at Steelton, tests on reciprocating machine at Sparrows Point and a service test in track, the work to be done under the supervision of a man working under the committee.

Drop Testing Machine Specifications.

Changes in the specifications as now printed in the Proceedings are recommended in the conclusions presented below:

Conclusions.

The committee presents the following conclusions:

(1) That the specifications and plan for drop testing machine, approved by the association, be revised as follows:

Paragraph 2: Eliminate the last sentence and substitute the following: "Anvil to be guided in its vertical movement by removable finished wearing strips, these wearing

strips to be suitably attached to the finished edges of the column base."

Paragraph 5: Insert the following after the word "castings" in the first sentence: "And the surface of the anvil between these pedestals shall be formed to receive a wooden block to absorb shock under broken test pieces."

Paragraph 6: In the first sentence substitute the words "column base" for "base plate."

(2) That the specifications and plan for drop testing machine, as revised above, be printed in the Manual of Recommended Practice.

(3) That the present specifications for steel rails be withdrawn from the Manual of Recommended Practice of the association as no longer representing the current state of the art.

(4) That the specifications for Bessemer and open-hearth rails, as recommended above, be printed in the Proceedings, and that a note be added to the effect that these specifications are intended for a guide in the preparations of future specifications, and it is recommended that all railways embody in their specifications such matter from the specifications herewith presented as in their judgment is necessary to secure better results from the mills.

(5) That rail failure statistics be collected for tabulation and analysis from railway companies for the period of one year ending October 31, instead of for a period of six months, and that the title of form M. W. 2004-A be changed to read "Summary of Steel Rail Failures for One Year, Compared with the Same Period of Previous Year."

The report is signed by: Charles S. Churchill (N. & W.), Chairman; R. Montfort (L. & N.), Vice-Chairman; Robert Trimble (Penna. Lines), E. B. Ashby (Lehigh Valley), J. A. Atwood (P. & L. E.), A. S. Baldwin (Ill. Cent.), J. B. Berry (C., R. I. & P.), M. L. Byers (Mo. Pac.), W. C. Cushing (Penna. Lines), F. A. Delano (Wabash), Dr. P. H. Dudley (N. Y. Cent.), C. H. Ewing (P. & R.), John D. Isaacs (Harriman Lines), Thomas H. Johnson (Penna. Lines), Howard G. Kelley (Grand Trunk), J. W. Kendrick (A., T. & S. F.), George W. Kittredge (N. Y. Cent.), D. W. Lum (Southern), Joseph T. Richards (Penna. R. R.), J. P. Snow (B. & M.) and A. W. Thompson (B. & O.).

Appendix.

The American Railway Association.

The American Railway Engineering and Maintenance of Way Association.

Specifications for Steel Rails.

1. The entire process of manufacture shall be in accordance with the best current state of the art.

(a) Ingots shall be kept in a vertical position until ready to be rolled, or until the metal in the interior has had time to solidify.

(b) Bled ingots shall not be used.

2. The chemical composition of the steel from which the rails are rolled shall be within the following limits:

	Bessemer.		Open-Hearth.	
	80 Lbs. and Under.	85 to 100 Lbs. Inclusive.	80 Lbs. and Under.	85 to 100 Lbs. Inclusive.
Carbon	0.40 to 0.50	0.45 to 0.55	0.53 to 0.66	0.63 to 0.76
Manganese	0.80 to 1.10	0.85 to 1.15	0.75 to 1.00	0.75 to 1.00
Silicon	0.10 to 0.20	0.10 to 0.20	0.10 to 0.20	0.10 to 0.20
Phosphorus not to exceed	0.10	0.10	0.04	0.04
Sulphur not to exceed	0.075	0.075	0.06	0.06

3. When lower phosphorus can be secured in Bessemer or open-hearth steel, the carbon shall be increased at the rate of 0.035 for each 0.01 reduction in phosphorus.

The percentages of carbon, manganese and silicon in an entire order of rails shall average as high as the mean percentages between the upper and lower limits.

4. There shall be sheared from the end of the bloom formed from the top of the ingot sufficient discard to insure sound rails. All metal from the top of the ingot, whether cut from the bloom or the rail, is the top discard.

5. The number of passes and speed of train shall be so regulated that, on leaving the rolls at the final pass, the temperature of the rails will not exceed that which requires a shrinkage allowance at the hot saws, for a 33-ft. rail of 100 lbs. section, of 6½ in., and ⅛ in. less for each ten pounds decrease of section, these allowances to be decreased at the rate of 1-100 in. for each second of time elapsed between the rail leaving the finishing rolls and being sawed. The bars shall not be held for the purpose of reducing their temperature, nor shall any artificial means of cooling them be used between the leading and finishing passes, nor after they leave the finishing pass.

6. The section of rail shall conform as accurately as possible to the templet furnished by the railroad company. A variation in height of 1-64 in. less or 1-32 in. greater than the specified height, and 1-16 in. in width of flange, will be permitted; but no variations shall be allowed in the dimensions affecting the fit of splice bars.

7. The weight of the rail shall be maintained as nearly as possible, after complying with the preceding paragraph, to that specified in the contract.

A variation of one-half of one per cent. from the calculated weight of section, as applied to an entire order, will be allowed.

Rails will be accepted and paid for according to actual weight.

8. The standard length of rail shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths varying as follows: 30 ft., 28 ft. and 26 ft. A variation of ¼ in. from the specified length will be allowed.

All No. 1 rails less than 33 ft. shall be painted green on both ends.

9. Care should be taken in hot-straightening rails, and it shall result in their being left in such condition that they will not vary throughout their entire length more than four (4) in. from a straight line in any direction when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails, and be so marked. The distance between supports of rails in the straightening press shall not be less than forty-two (42) in.; supports to have flat surfaces and out of wind. Rails shall be straight in line and surface and smooth on head when finished, final straightening being done while cold. They shall be sawed square at ends, variations to be not more than 1-32 in., and prior to shipment shall have the burr caused by the saw cutting removed and the ends made clean.

10. Circular holes for joint bolts shall be drilled in accordance with specifications of the purchaser. They shall in every respect conform accurately to drawing and dimensions furnished and shall be free from burrs.

11. The name of the maker, the weight of the rail and the month and year of manufacture shall be rolled in raised letters and figures on the side of the web. The number of the heat and a letter indicating the portion of the ingot from which the rail was made shall be plainly stamped on the web of each rail, where it will not be covered by the splice bars. Rails to be lettered consecutively A, B, C, etc., the rail from the top of the ingot being A. In case of a top discard of twenty or more per cent. the letter A will be omitted. Open-hearth rails to be branded "O. H."

12. Drop tests shall be made on pieces of rail rolled from the top of the ingot, not less than four (4) ft. and not more than six (6) ft. long, from each heat of steel. These test pieces shall be cut from the rail bar next to either end of the top rail, as selected by the inspector.

The temperature of the test piece shall be between forty (40) and one hundred (100) degrees Fahrenheit.

The test pieces shall be placed head upward on solid supports, five (5) in. top radius, three (3) ft. between centers, and subjected to impact tests, the tup falling free from the following heights:

60 and 70 lb. rail.....16 ft.
80, 85 and 90 lb. rail.....18 ft.
100 lb. rail.....20 ft.

The test pieces which do not break under the first drop shall be nicked and tested to destruction.

13. It is proposed to prescribe, under this head, the requirements in regard to deflection, fixing maximum and minimum limits, as soon as proper deflection limits have been decided on.

(a) Two pieces shall be tested from each heat of steel. If either of these test pieces breaks, a third piece shall be tested. If two of the test pieces break without showing physical defects, all rails of the heat will be rejected absolutely. If two of the test pieces do not break, all rails of the heat will be accepted as No. 1 or No. 2 classification, according as the deflection is less or more, respectively, than the prescribed limit.*

(b) If, however, any test piece broken under test "A" shows physical defect, the top rail from each ingot of that heat shall be rejected.

(c) Additional tests shall then be made of test pieces selected by the inspector from the top end of any second rails of the same heat. If two out of three of these second test pieces break, the remainder of the rails of the heat will also be rejected. If two out of three of these second test pieces do not break, the remainder of the rails of the

heat will be accepted, provided they conform to the other requirements of these specifications, as No. 1 or No. 2 classification, according as the deflection is less or more, respectively, than the prescribed limit.*

(d) If any test piece, test "A," does not break, but when nicked and tested to destruction shows interior defect, the top rails from each ingot of that heat shall be rejected.

14. The drop-testing machine shall be the standard of the American Railway Engineering and Maintenance of Way Association, and have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of five (5) in.

The anvil block shall be adequately supported and shall weigh 20,000 lbs.

The supports shall be free from injurious defects and flaws of all kinds.

The supports shall be a part of or firmly secured to the anvil.

15. No. 1 rails shall be free from injurious defects and flaws of all kinds.

16. Rails which, by reason of surface imperfections, are not accepted as No. 1 rails, will be classed as No. 2 rails, but rails which, in the judgment of the inspector, contain physical defects which impair their strength, shall be rejected.

No. 2 rails to the extent of five (5) per cent of the whole order will be received. All rails accepted as No. 2 rails must have the ends painted white, and shall have two prick punch marks on the side of the web near the heat number near the end of the rail, so placed as not to be covered by the splice bars.

Rails improperly drilled or straightened, or from which the burs have not been properly removed, shall be rejected, but may be accepted after being properly finished.

All classes of rails must be kept separate from each other and shipped in separate cars.

All rails must be loaded in the presence of the inspector.

17. (a) Inspectors representing the purchaser shall have free entry to the works of the manufacturer at all times while the contract is being executed, and shall have all reasonable facilities afforded them by the manufacturer to satisfy them that the rails have been made in accordance with the terms of the specifications.

(b) For Bessemer steel the manufacturer shall, before the rails are shipped, furnish the inspector daily with carbon determinations for each heat, and two complete chemical analyses every twenty-four hours representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from small test ingots. The drillings for analyses shall be taken from the ladle test ingot at a distance of ¼ in. beneath the surface.

For open-hearth steel the makers shall furnish the inspectors with the complete chemical analysis for each melt.

(c) On request of the inspector, the manufacturer shall furnish a portion of the test ingot for check analysis.

(d) All tests and inspections shall be made at the place of manufacture, prior to shipment, and shall be so conducted as not to unnecessarily interfere with the operation of the mill.

(e) Rails to be accepted must meet all of the requirements of the specifications.

It is reported that one of the delicacies to be served at the banquet to-night will be frogs' legs. A large supply of manganese frogs has been impounded by the Indianapolis Switch & Frog Company; the Ramapo Iron Works will furnish manganese hard center frogs; and the Pennsylvania Steel Company has a large assortment of anvil face frogs, assuring a variety sufficient to please every taste.

One of the members of The Daily staff, as he kissed his wife goodby Sunday evening, remarked that he would come back somewhere about the last of the week. A careful canvass indicates a similar experience and foresight on the part of the rest of the staff, except that in some instances there appears to have been no one sufficiently interested in any possible return at any possible time to prompt the remark nor a similar inducement to get back soon.

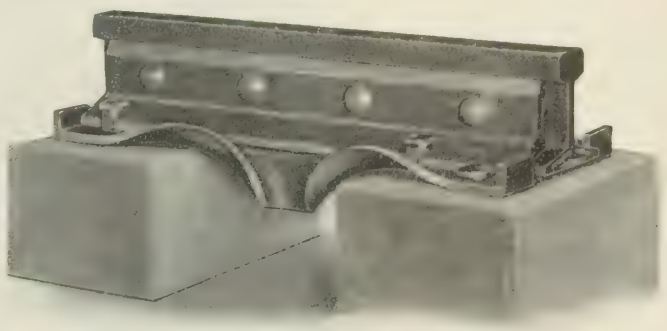
*Note: This clause to be added when the deflection limits are specified.

ABBOTT RAIL JOINT PLATE.

This joint plate is designed to strengthen and improve the efficiency of the ordinary angle bar joint. It is made in one piece, from a flat plate ⅜ in. x 7-16 in. thick, the width and length being made to suit the rail and angle bar with which it is used.

The downturned flanges at the center have a depth of 3 in. and a horizontal lower edge 2 in. wide. The upturned flanges extend from each end of the lower horizontal edge back toward the end of the plate 9½ in. each way from the center, making a total length of flanging of 19 in. The greatest depth of vertical metal is at the center, the point which is subject to the greatest strain. The depth of vertical metal in the upturned flanges is zero at the maximum depth of downturned flanges and is maximum at the zero line of the downturned flanges, finally reaching the other zero limit near the center of the tie, 9½ in. from the cross center line of the plate.

The combination of reversed flanging provides for the stresses in the plate, carrying the strain in a manner similar to that in the component parts of a bridge, and in reality forming a short deck bridge between the two joint ties.



Angle Bars.

There is also a slight camber at the center of the plate to insure the rails first taking bearing at the ends, thus bringing the plate into action before any deflection takes place in the splice bars. The end, or corner, lugs serve as anti-creepers and as guides to the rails holding them in line in case of loosening of the splice bars.

The illustration shows the application of the joint plates. Spike holes are punched to match the slotting in the angle bars and thereby made to fit joints on either side of the track, saving the trouble of distributing in pairs. Auxiliary spike holes are made in diagonally opposite corners for the purpose of spiking the plate without having these spikes come in contact with the rail or angle bar. They cannot be disturbed by vertical wave motion of the rail. The hook part of the spike head is turned away from the angle bar in driving these spikes. Where these plates are used with new or relaid track, the most convenient and economical plan for installation is to place the plates under the joints when the joint ties are respaced in the back work after track laying is completed.

The Abbott rail joint plate, being separated from the rest of the joint, is made of harder steel, with higher elasticity than the bars. The resistance it affords against deflection when all the joint members work together prevents the angle bars from bending or taking permanent set.

The device is made and sold by the Lackawanna Steel Company, Buffalo, N. Y.

The Otto Gas Engine Works have a new mixer this year. There is no reference to Teddy Snow nor Lazenby, as it is intended primarily for mixing water only.

Proceedings

The first session of the eleventh annual convention of the American Railway Engineering and Maintenance of Way Association was called to order at 9 o'clock a. m. on Tuesday, March 15, in the convention hall of the Congress hotel, by the president, William McNab, principal assistant engineer of the Grand Trunk.

The minutes of the last meeting were adopted without reading and the president then delivered his annual address.

President's Address.

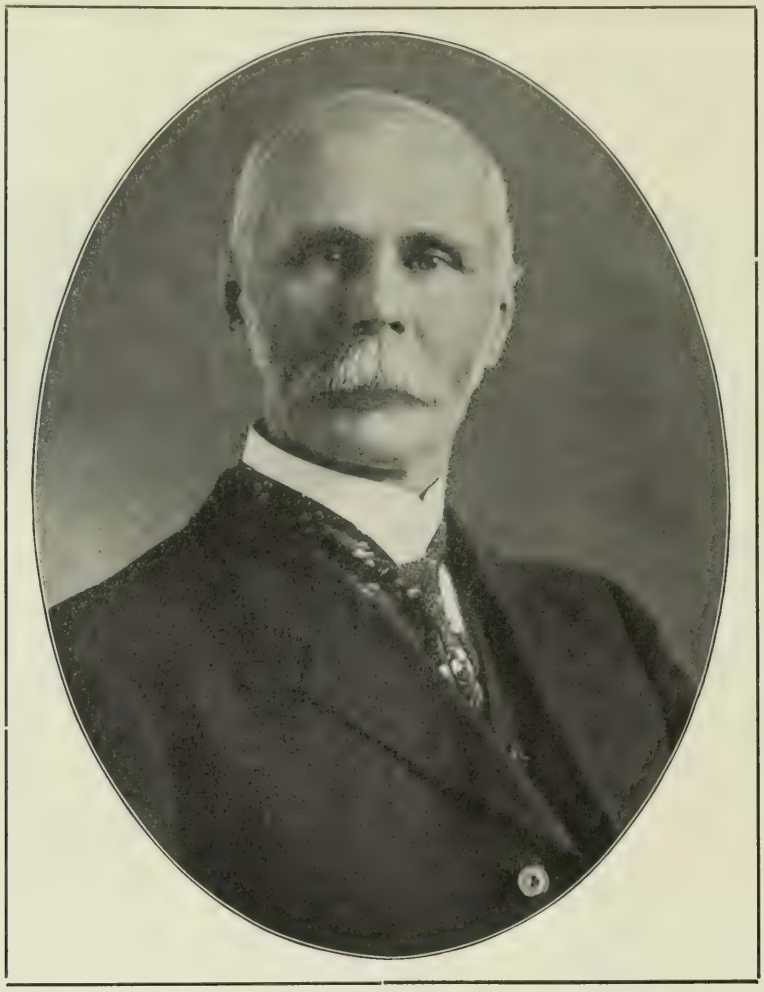
To the Members of the American Railway Engineering and Maintenance of Way Association:

At the close of the eleventh year of the existence of your association, it is gratifying to note that general progress and steady increase in activity have been manifested in every department of its work.

This progress is due not merely to additions in the association's membership and to the zeal of its officers, the committees and individual members in promoting the objects for which it was formed, but it lies also in the possession of a greater degree of that direct influence in the practical railway world which it has always been the aspiration of the association to attain. Seldom before have greater or more important problems in transportation matters, where such influence can be an aid, come before railway managements in general, than at the present time, and these conditions must be apparent to everyone who has kept pace with the improvements, as well as the methods of practice everywhere in evidence. More especially must they appeal to those who realize the value of technical and specialized knowledge as applicable to railways. Railways need specialists, and, to produce the best results, specialization is desirable; in fact, is a necessity.

The various committees of this association may be looked upon as specialists, as they are, in a complete sense, representative of every department of railway construction. In the assignment of work under the care or investigation of these committees, it is the aim of the board of direction to establish a line of policy which, if adhered to, will attain certain results; a policy the effects of which will demonstrate in a practical manner that in order to produce economic efficiency in train operation and the consequent permanent beneficial results in railway administration, economics as a science must be more carefully studied, and more generally applied in every feature of railway location, construction, operation and maintenance.

Although these committees are composed of specialists—and there is much efficacy in such a status—the association itself, acting as another great force, is predominant in blending into one harmonious whole the various interests involved. The influence, therefore, acquired by the association through the means of its conventions and supplemented by its Manual of Recommended Practice, serves as a great balance wheel in preserving that equilibrium of forces necessary for the success of any undertaking.



WILLIAM McNAB,
President.

During the year 1909, 4,886 miles of railway—exclusive of second, third and fourth tracks—were constructed and placed in operation in the United States and Canada, 1,138 of which were in Canada. Compared with the construction records of some former years, the amount added in 1909 did not increase the aggregate mileage to an appreciable degree, and, notwithstanding the recovery from the general stagnation in transportation matters which had existed, it might be a question whether or not during the year new railway enterprises and extensions of existing lines have kept pace with the increase in the industrial features of the country and its immediate

needs, due to the rapid advance in agricultural development now going on.

It is not, however, the purpose of this address to consider the reasons why the percentage of mileage added during the year was not greater, for it may be said that beyond having an interest of a general nature, such as may be accepted as universally shared in, it seldom comes within the special purview of the railway engineer to study in detail economic laws which govern eras of commercial prosperity. Neither does it directly belong to his province to question the attitude of the federal or state legislatures towards railway interests, or to analyze the complex factors which frequently produce the conditions leading to business stagnation or financial crises.

To the engineer, in such matters, the prime feature of import for the time being is trade and economic conditions as they exist, and it is in the degree in which such conditions are active that becomes the potential in his everyday life and avocations.



L. C. FRITCH,
First Vice-President.

From an engineer's standpoint, it is more desirable to anticipate the future and to consider and plan what has yet to be done, rather than to view the present situation in the light of what has not been accomplished. This statement, however, by no means implies that retrospect of work that has actually been done is unprofitable, for the members of an association such as this can well afford to review the records of construction of some portions of lines built during the past year. In the official descriptions of such construction it is clearly indicated that many novel and interesting engineering problems presented themselves for solution, and the progressive methods used in every branch of the work show that system, as applied to railway operation, has made a substantial advance and become more highly developed than in any other of the industrial arts.

In regard to lines and portions of lines built and placed in operation during the year, a review of the situation in general is convincing of the fact that certain extensions with a view to "transcontinentalism", and the construction of new roads with a similar object, was not only a feature of the year, but it contributed largely to the gross mileage built.

It is not possible, and even if it were so it would not be desirable in this address, to enumerate or analyze the general work of railway construction during the past twelve months. Suffice it in the meantime to quote one or two instances. The year 1909 has witnessed the advent at the Pacific coast of two of the large railway systems which had not until then physical access to that important section of the country. The Chicago, Milwaukee & St. Paul Railway System has been extended from the Missouri river to Seattle, Wash., a distance of 1,400 miles, 687 of which were built and placed in operation last year; and the Western Pacific, as representing the Gould system, has been opened for traffic from Salt Lake City, Utah, to Oakland, Cal., a distance of 924 miles, 440 miles of which were built in 1909. Two other roads, at present under way, viz., the Spokane, Portland & Seattle, and the Kansas City, Mexico & Orient Railway also will, when completed, form parts of transcontinental systems respectively.

Another undertaking, transcontinental in a complete sense, and greater in magnitude than any other single railway proposition that has been built at one time on this continent, viz., the Grand Trunk Pacific, and National Transcontinental is at present being rapidly constructed on the most approved modern lines from the Atlantic to the Pacific and entirely within the Dominion of Canada. The length of the main track of this railway will be 3,561 miles. Of a total of 1,500 miles now constructed, 500 miles were built and placed in operation in 1909, and 1,200 miles more of main track are at present under construction. It is interesting to note that the whole of the main line of this railway has been permanently located. It crosses the Rockies at an elevation of only 3,712 ft., and is being constructed on an entirely low-grade basis. It has only one summit between the prairies and its western terminal, Prince Rupert, on the Pacific coast, and with the expection of

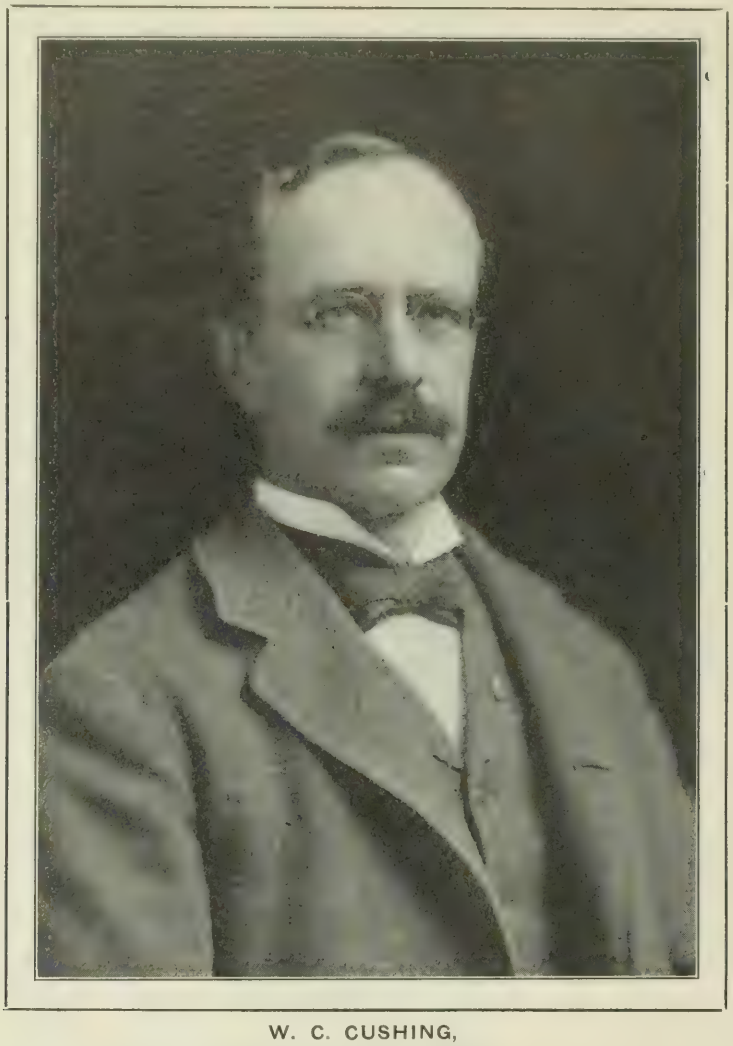
a stretch of 20 miles, where the grade is 1 per cent., its ruling grade through the mountains is 0.4 of one per cent. It will not be difficult to realize, therefore, that the line will be admirably conditioned for heavy traffic, and, further, that exceptional features concerning location have been the means of obtaining at the very outset this unique condition.

Such revision work, double-tracking and other permanent betterments (as distinct from ordinary maintenance) as have been undertaken throughout the country have been characterized by mature judgment in carrying them to completion. The longest individual stretch of double-tracking an existing line which had been in course of construction (but actually completed during the year), was on the Canadian Pacific, from Fort William, Ont., to Winnipeg, Man. The distance between these two points is 417 miles. In conjunction with this work the limiting grades against east-bound traffic were reduced from 1 per cent. (not compensated) to 0.4 of one per cent. (compensated). In order to obtain such a reduction reasonably, it was found desirable and more practicable to take advantage of the physical conditions of that section of the country, and locate the new east-bound track in some places beyond the right-of-way of the existing line, in lengths varying from 0.6 of a mile to 5 miles, and in distance from the original track of 500 ft. to 7 miles. The ruling grade of the west-bound track was at the same time also reduced from 1 per cent. to 0.4 of one per cent. except for a distance of 54 miles, which is still 1 per cent. and operated as a pusher proposition.

Among the most notable of the railway engineering structures which were completed during the year may be mentioned the Susquehanna bridge of the Baltimore & Ohio Railroad at Havre de Grace, Md., a double-track structure, the total weight of the steel being 16,000 tons. Three of the piers of this bridge were sunk in the bed of the river by the caisson process to solid rock foundations at depths varying from 60 to 75 ft. below tide.

Also, the Lethbridge viaduct over the Belly river on the Crow's Nest branch of the Canadian Pacific Railway. This bridge has 66 spans of deck plate girders and one deck lattice truss, which are carried on rigidly-braced steel towers. The magnitude of this work may be realized when it is stated that the steel structure is 5,327 ft. long, 314 ft. from the bed of the river to rail and contains 12,200 tons of steel.

The new bridge of the Pittsburg & Lake Erie Railroad over the Ohio river at Beaver, Pa., is so nearly completed as to be consistently mentioned at the present time. This structure is a double-track one, 1,787 ft. long, and replaces a single-track bridge. The new channel span is 769 ft., as against 443 ft. in the old. The old bridge was erected in 1878, at a time when the use of falsework was permitted, but the present one, being of the cantilever type, has been erected without interruption to navigation. The trusses were designed for Class E-55 locomotives and the floors for Class E-60 locomotives, with full allowance for impact. The superstructure contains 16,500 tons of steel.



W. C. CUSHING,
Second Vice-President.

The new spiral tunnels of the Canadian Pacific Railway in the Rocky mountains are particularly worthy of mention as being the first introduction of this particular system of tunnels on this continent. The original line of this railway between Field station and Hector station (known as the Kicking Horse Pass) was constructed for a distance of 4.10 miles with a 4.5 per cent. grade. In order to improve such conditions, only one proposition was feasible, namely, a development one, involving certain tunneling, with a consequent doubling back for some distance as well as crossing the Kicking Horse river twice. There are two tunnels, one of them 3,255 ft. long, on a reverse curve, and the other 2,921 ft. long, partly on a 10-deg. curve and partly on a tangent. The curves have 300 ft. of spiral at each end. The new grade in general on this deviation has been reduced from 4.5 per cent. to 2.2 per cent., compensated, except in the tunnels, where 0.6 per cent is used. Work on the tunnels was started from both ends, and despite

the complicated work caused by the spiral shape, the two headings met with the levels checking in one case to 1-100 of a foot, and in the other to 2-100 of a foot. The reduction in gradient from a 4.5 per cent. to 2.2 per cent. on this particular section necessitated an increase in length of track of 4.50 miles.

It is interesting also to note that in the month of November last, although not as yet completed for ordinary operation, a Pennsylvania Railroad train passed through the Hudson river tunnels for the first time.

In the carrying to completion of the railway engineering structures mentioned and many others built during the past year, as well as in most of the great number in course of construction throughout this great country, an influence traceable primarily and directly to the organization and working of the American Railway Engineering and Maintenance of Way Association, and which has already been referred to, is apparent, and such influence has been manifested, as well, in the development of every important detail connected with this particular section of industrial activity.

As far as the direct interests of the association and the work of your committees for the past year are concerned, it will be observed that for satisfactory reasons the reports of two of these committees are merely those of progress, but they are indicative of excellent material which will be worked upon, and from which practical information will eventually be obtained. A reference to the other reports will be self-convincing of the businesslike and scientific manner in which the details under investigation have been dealt with and focused to conclusions by these respective committees, and which you will be asked to pass upon in open convention.

The American Railway Association has placed at our disposal the means for employing an expert to superintend the tests of rails at the several mills on a uniform and scientific basis. Such tests will be carried on under the direct auspices of your Committee on Rail. Valuable results are confidently expected from the work thus to be undertaken. Good rail being of fundamental importance to a railway, this committee has been most zealous in its determination to leave nothing undone that will bring about conditions in design and manufacture that will be satisfactory to the railways in general.

The board of direction has for some time past been considering the advisability of revising the existing constitution of the association. Some of the changes proposed are minor in character, while others are more far reaching in their scope. The present form and the proposed form have been printed and issued to the members for their consideration, and it is suggested that each one of the proposed changes be carefully studied in order that the final vote may be looked upon as given after earnest consideration of future effects.

Last July our esteemed treasurer, Mr. W. S. Dawley, who had occupied that honorable office acceptably since the formation of the association in 1899, tendered his resignation as such to undertake railway construction work in China. The board of direction realizes that the association had in Mr. Dawley an efficient officer, and desires to place on record its regret at losing one who had rendered valuable services, not only as a member of the board, but also as custodian of the finances of the association during the past ten years.



C. F. LOWETH,
Treasurer.

We have lost a number of valuable members by death during the year, among them being H. F. Baldwin, at one time a director of the association; James Keys, vice-chairman of the committee on Wooden Bridges and Trestles (Mr. Keys has contributed very materially to the success of his committee and we are indebted to him for a large amount of valuable data); G. A. Casseday, another member of the same committee; J. W. Schaub, a valued member of the Masonry committee for a number of years; E. J. Randall, H. M. Steele, and James C. Gray.

At the close of your President's term of office as such, he desires to acknowledge his appreciation of the hearty co-operation of the Board of Direction, as well as of the member-

ship in general, in his efforts to satisfactorily administrate the affairs of the Association. It affords him much pleasure to feel that the Association stands on a high plane, and having been intimately connected with its work from the beginning, he would be devoid of proper spirit did he not feel that his practical interest in that work would never lessen.

The secretary then presented the report of the secretary and treasurer, which showed the following financial statement:

Receipts during the year		$19,758.08
Expenditures during the year		21,203.40
Excess of expenditures over receipts		1,445.32
Balance on hand March 10, 1910		16,403.01
The statistics regarding membership were as follows:		
Total members 1909 convention		784
Members admitted during the year		101
		885
Deceased	7	
Withdrawals	4	
Dropped	5	16
Membership March 12, 1910		869

Discussion of Report on Uniform Rules.

L. S. Rose (C. C. C. & St. L.): I would move the adoption of the rules as presented.

L. C. Fritch (C. G. W.): I second the motion.

Mr. Rose: There is some objection to the third rule of the rules governing track foremen, as regards the words, "at least once a day," in the second line of that paragraph. It is thought by some members, and I think so myself, that it is unnecesary to prescribe that there should be a track foreman or a track walked every day on all sections, and there ought to be some rule or modification. A railway man would modify this rule if he were applying it to his own road, especially if he had only one train a day or one train a week on the road. He would probably allow the engineer or the inspector to be the track walker, and I think there ought to be some slight change in that rule.

The President: What change do you suggest?

Mr. Rose: I would make it apply to Class A track or Class B track.

Joseph O. Osgood (C. of N. J.): Some of these rules, and notably the one to which Mr. Rose has referred, should properly take the place of the rules prepared by the Committee on Track. I wrote to Mr. Rose advising him of what we had done, calling his attention to the revision of the rules, and especially to the rules which had been prepared, which would naturally take the place of those prepared by the Committee on Track, and asked him if the rules as we had prepared them were satisfactory to the Committee on Track, stating that some discussion might be avoided if they were. He replied he saw no objection to them, and later he advised me that one member of his committee took the position which he now states in regard to this particular rule being too severe on roads of very small business. As I understand Mr. Rose in what he has just stated and what he wrote to me, it seemed a hardship that a road having a small amount of business should be obliged to send a man over the track every day, and I can conceive of a case in which that might be a hardship, but our idea in preparing these rules has been that they could not be made to fit every body's condition; that all we could do would be to prepare rules which would be satisfactory in ordinary cases, and which could be adopted where ordinary conditions prevailed and where traffic was very severe they would doubtless have to be added to materially, and there might be some exceptions made. I am afraid it would be difficult, indeed, to frame any set of rules so comprehensive as to meet the conditions Mr. Rose mentions, and all other conditions and not make a volume of it, a volume containing exceptions, interlineations, and many things which would be hard to take care of.

G. A. Mountain (Can. Ry. Com.): I agree with the committee, that it is a proper rule. The fact that you have one train or twenty trains a day over a piece of track that is not inspected, is of little consequence. One train may go into a washout and probably the twenty trains would go through all right. Probably the track should be walked every day of the year. I feel very strongly on that point, and I back the committee very strongly on that. I think it is a good rule and a rule I am satisfied the Canadian Railway Commission will enforce in Canada.

Mr. Rose: The last speaker has merely hit my position. If you have passenger trains, I think you have Class A track. You may have a road where you have mixed trains, and I think there is going to be considerable mileage of that sort of road in this country, where the trains run slowly and the track is poor, and if there is a washout the engineer will have time to see it and stop. If this association adopts such a rule some of the roads will get us on the carpet and cite this rule and the action of this association. If it is really put up to a railway manager, he will understand it is unnecessary to do that. The track committee, after receiving Mr. Osgood's letter about the overlapping of the rules in the Manual, page 66, subdivision of track, voted to withdraw all the rules under "Inspection of Track." They have no objection to withdrawing those rules, and I have been authorized by the committee to make such a statement, although we do not incorporate that in our report. We feel that the rules as outlined in the report of the committee are all right.

C. E. Lindsay (N. Y. & H. R. R. R.): I don't want to divert attention from the particular rule, but I would like to call attention to one or two minor points in the rules governing the general organization, and the rules governing track supervisors. The first rule on organization says that the man in charge of the maintenance of way department receives instructions from and reports to ————. Rule 1, governing the track supervisors, transposes this expression. He first reports to and receives instructions from ————. It seems to me that these two might be made to read the same. In Rule 2 of the rules governing track supervisors, I think tunnels are of quite sufficient importance to be placed definitely under the responsibility of the track supervisors, as well as the station grounds, and they are of sufficient importance to warrant mention in Rules 2 and 3. I think, also, that the committee has not incorporated a very essential rule for track supervisors, which is that it is the duty of the supervisor not only to select men but to train men for the position of foreman. I think the railways of the country to-day are suffering more, perhaps from the lack of properly trained and competent foremen than any other thing in the labor world. In Rule 5, I suggest that the supervisor must not only know that the foremen are familiar with the operating rules, but that he is supplied with the proper signaling and flagging appliances. Another duty that devolves on the track supervsor is the removel of snow and ice, which seems not to have been mentioned specifically by the committee.

Mr. Osgood: The first point raised as to the words "The Maintenance of Way Department on each division is in charge of the ————," which appears under "Organization," and the words "Track Supervisors shall report to, and receive instructions from the ————," which appear under the rules governing track supervisors, and the fact that these read somewhat differently, I think is simply because attention was not called to the matter. I do not think we should make any difference one way or the other—I think it would be better to have them both the same way. As to the question of including tunnels, etc., I do not think that that was discussed. If we begin to mention tunnels and go too much into details of the roadway, we are simply adding to the length without increasing the efficiency of the rules. It may be open to question whether it would be wise to put "tunnels" in, but I am very much opposed to the general proposition that we should add to the rules, because I believe when we add one detail the omission of another is evident, and so it goes on until the thing becomes so large and extensive it is of no use.

L. A. Downs: (I. C.) The last sentence of the fifth rule governing track foremen reads: "Foremen must provide themselves with reliable watches, and when possible, compare time daily with a standard clock, or with conductors' watches." It specifies only two ways of getting the correct time. I think that should be changed to read: "Foremen must provide themselves with reliable watches, and when possible compare time daily with a standard clock or with the watches of other employes whom they know have the standard time."

Mr. Osgood: That was discussed at considerable length, although I do not think the particular expression mentioned was thought of, but our conclusion after discussion pro and con, was that it was better to leave it as it is, not adding anything more to it. If the convention thinks otherwise, we are open to correction.

Mr. Downs: Am I to understand that the foreman could not get the time from an engineer?

Mr. Osgood: Not at all; it does not prevent his getting the time from the engineer. We do not undertake to tell him all he should do. We undertake to have him clearly understand that he must be supplied with the correct time.

Mr. Downs: My idea was to make the rule broader.

Mr. Osgood: I do not see any serious objection to it except that it adds length to the rule.

J. E. Taussig (Wabash): I suggest that it be changed to "Trainmen's watches," for the reason that all trainmen are subject under the rule to standard watch inspection—permit the foreman to confer either with the engineer, conductor or brakeman.

W. G. Brimson (Q. O. & K. C.): I agree heartily with the committee. Under the standard rules the last duty of a conductor is to get the time from a standard clock, and he is coming directly from the source of time and the section foreman if he gets his time from the conductor will be getting just as near to a standard clock as possible. I doubt very much if other trainmen would have watches which would be comparable with that of the conductor. I think the conductor has the most reliable time next to the standard clock.

James Burke (Erie): I agree with Mr. Downs that if any trainman should have the time, the locomotive engineer especially should have it. Sometimes the section foreman may be standing close to an engineer, whereas he would have to go clear to the rear end of the train to get the conductor's time.

Mr. Lindsay: I am in hearty agreement with Mr. Downs; but in order to keep the discussion seriatim, I move to amend Rule 2 by the omission of the words "Station grounds and driveways." It seems to me those words are not of sufficient importance to warrant specific mention in the rules.

G. D. Brooke (B. & O.): Before that motion is put to the house, I would like to say the reason those words were included is that the station grounds and driveways, especially the station grounds, are apt to be neglected by the station men, unless they are brought particularly to their attention, and for that reason the committee thought it proper to include these words in the rule.

Mr. Lindsay's motion was put to vote and was not carried.

C. Dougherty (C., N. O. & T. P.): As a compromise, I move to strike out the word "driveways." These are generally on the station grounds, and to that extent the word might be considered as redundant.

The motion was put to vote and was not carried.

Mr. Downs: In order to put the matter before the house, I move that in the last sentence of the fifth rule on track foremen we substitute the words "standard watches of other employes," in place of the words "with conductors' watches."

Mr. Lindsay: The practice on the New York Central is to go further, and permit the section foreman to compare his watch with trainmen's watches. All trainmen have their watches inspected and certified, so that every trainman's watch is a certified watch. We also require supervisors of track to have certified watches, so that the foremen could compare their watches with the watches of the supervisors of track if there were no trains on the road. I will heartily endorse the motion made by Mr. Downs, except that the word "certified" be used instead of "standard," and hope it will prevail.

Mr. Rose: It seems to me the fact is overlooked that the section foreman might get his time from the telegraph office, if he were around while the time was being sent.

T. C. Newbegin (B. & A.): On many sections, the section foreman on duty in outlying places never sees a conductor except on trains going by. Unless the rules permit him to compare time with any employe who carries a standard watch, he has no means of securing this standard time.

C. C. Anthony (Penna. R. R.): I object to the words "certified watches" for the reason that some roads do not have the watches certified. I suggest that the exact wording of the change be left to the committee. The committee understands now what is wanted, to get a little broader provision for securing the correct time.



E. H. FRITCH,
Secretary.

The president put the motion made by Mr. Downs, which was not carried.

Mr. Rose: I move that Rule 3 of the rules governing track foremen be changed to read by prefixing the following to the rule: "Except in case of roads with very light traffic, they must go over their sections," etc.

The President: Do you not think, when you express it that way that you leave it up to individual discretion of what "light traffic" means? If you specify it in some description of the road, Class A or Class B, would you not think that would be better?

Mr. Rose: The present rule in the Manual reads as follows: "Except in cases of roads of very light traffic, all main tracks shall be inspected each day by section gang or track walker." My idea is to incorporate this in Rule 3 on track foremen.

Mr. Anthony: I think we are now getting rules and specifications mixed up. These are rules addressed to the track foremen, and it certainly would not be up to the track foreman to decide that the traffic was so light that he did not need to go over his section once a day? If this change is to be made, it seems to me it should be worded in this way: "Unless otherwise specified." Then it is up to his superior officer to tell him whether or not to go over the road.

Mr. Osgood: The committee will accept the modification suggested by Mr. Anthony if it is satisfactory to Mr. Rose.

The report as amended was adopted.

Discussion of Report on Signals and Interlocking.

A. H. Rudd (Penna. R. R.): I move the adoption of the revision of the Manual, Subject 1.

L. C. Fritch (C. G. W.): As to the specification for rubber insulated wire, I ask the committee if it would favor a change in the requirements for voltage, making it 660 volts instead of 600.

The President: The committee will accept that amendment.

Mr. Rudd then read an answer to the objections contained in the minority report to the committee's report on subject No. 2, uniform system of signaling. This reply of Mr. Rudd's is published in another column. Mr. Rudd then moved the adoption of the report of the committee on subject No. 2, including the conclusions.

Motion seconded.

The President: We see that this committee, as a whole, is not a unit. The minority has brought in a report which seems to me, in a sense, to be a criticism without a substitute, and this minority report, together with the chairman's criticism of it, must be accepted in the form of discussion. It seems to me that, if there is very much divergence of opinion, it might be well to have this report referred back to the committee to see if the committee cannot as a whole harmonize some of the points at issue, rather than take up the time of the convention in settling the points which the committee has not decided upon itself.

T. S. Stevens (A. T. & S. F.): The reason the minority, so-called, submitted no scheme of signals, was because it did not feel that this association was at liberty to decide between one or two schemes. We felt that that was committee work. I would like to answer one thing stated by the chairman. I will not answer the whole report. I want to say there are railways in this country that are adopting the views of the minority, taking the signal "proceed," and such things, out of their rules this year, for a purpose.

L. R. Clausen (C. M. & St. P.): The work of the committee as regards subject No. 2, method of uniform signaling, has been carried on for about four years in this association, and for about five years in the Railway Signal Association. The subject was suggested by the committee itself. Probably because of the diverse practice throughout the country in the art of signaling, the desirability of uniformity has not been so clearly shown, and has not been dwelt upon by the committee in this discussion very particularly. The work was started in the Signal association, and annually reports have been presented by its committee on signaling practice, resulting, in October, 1909, in a final report which was presented with the recommendation that it be adopted. Each year in the Signal association saw a change in the committee's report. They were all progress reports until 1909, when the report was recommended for adoption. In 1909, the Signal association voted to submit the report to letter ballot. The result of that vote was 236 votes for the adoption of the report and 311 against the adoption of the report. That 311 does not include 25 votes of the Chicago, Milwaukee & St. Paul against the adoption of the report, which were not received in time to be counted on account of the question of the number of votes we should be allowed. If those 25 were counted it would make 236 for and 336 against the adoption of the committee's report. The report is exactly the same as subject No. 2, now presented to this association with recommendation for its adoption. The work of this association begins with the 1907 reports, and you have the report before you in your proceedings for 1907, 1908 and 1909, each year showing a material change in the report. This year you have presented to you a report with recommendations of the chairman and a majority of the committee for the adoption of a report be adopted which is clearly a change from last year. There are 18 members of the committee who have voted for this report and five members have not concurred. I am referring to subject No. 2 of the report only, and the minority report bears only on subject No. 2, not to any other subject of the committee's report. These eighteen members represent seven roads or systems, five not concurring. There are four members representing four different roads or systems who have voted for the minority report. The men who compose the minority hesitated somewhat before they made the report in as much detail as they finally submitted it, because of the fact it would take up too much of the association's time to read and discuss it. It goes too much into technical detail. In a few words, the minority's criticism of the report as presented to you is that there is an attempt to provide too much information to the engineman. We feel that the practice of to-day does not require that that information be furnished, and that it is a decided mistake to attempt to furnish it. We feel that unless you can say something to the engineman that is absolutely reliable you would better not say anything at all. The report, as it is presented to you, provides that the distant signal shall be a repeater of the home signal. The distant signal cannot be a repeater of the home signal, regardless of how you connect it up. It often is in the clear position and the home signal is found against the runner. It is often in the "caution" position and the home signal is found clear, due to various causes. That signal should not say what the position of the next signal is, but it should say to the runner only "caution" or "proceed," either one or the other. Any attempt to make a distant signal a repeater of a home will encourage laxity on the part of the engineman because he will be in a measure relieved of the responsibility of looking for the home signal. There have been to my knowledge three or four disastrous wrecks on railways during the past few months which are very illuminating in that respect; they are very interesting because they show just that weakness. The chairman has ridiculed the position of the minority, that the clear block signal should not mean to the engineman a clear block section. A clear block signal is one thing and a clear block section is another. The art of signaling has not reached a point when we can say to an engineman, with reliability, that a clear block signal means a clear block section. We have not reached that point in railway operation at present, and unless you can say that to him and guarantee it you don't want to say it. You want to say to him that a clear block signal means "proceed" and only proceed. It does not mean "you are going to find the block clear;" it means "you can go." The chairman has ridiculed our stand in regard to this question and asks what block signals are for. I will answer and say the conception of the minority in regard to the block signals is that they are introduced to place trains; they mean "stop" in one position and "proceed" in another; or, if to be used in "caution" position, you have a third indication which says "caution." The main difference between the minority and the majority revolve around the question of the meaning of a distant signal to an engineer, and the meaning of a clear signal to an engineer. I wish to, if possible, remove an impression that you may have gained from the remarks of the chairman, with regard to the American Railway Association code and the report submitted by the majority. He probably left with you an impression that the majority report is in accordance with present practice and that it complies in every respect with the A. R. A. code. We wish to dispute that statement, and I wish to say that in the A. R. A. code you will find but four indications, "stop," "caution," "proceed," and under the head "automatic block" you will find the fourth one, "approach next signal prepared to stop." How the majority can expand those four indications into the fourteen at present in the report is beyond my understanding. In view of the arguments which we have presented in our reports and in view of the committee's action in annually changing

its report, in view of the substantial minority on the committee which is against the report, in view of the action of the Railway Signal Association in turning this report down by an overwhelming vote, I believe the report should be returned to the committee for further consideration.

Hunter McDonald (N. C. & St. L.): I move, in lieu of the pending motion, that subject No. 2 be referred back to the committee for further consideration.

Motion seconded.

Mr. Fritch: The committee has done very hard and intelligent work on this report, and as this matter goes to the A. R. A., anyway, for adoption or rejection, I can see no harm in having it passed upon at this meeting. If the minority of the committee has something better to offer or something in lieu of this to offer, they should have given us something so that we could choose between the two. Many of us are putting in new automatic block signals, and we want the most modern practice. We don't want to make an installation that is expensive now and in a year or two change it. I hope the committee's report will be adopted.

Mr. Rudd: The conclusions endorse the report of the committee as a good system, and refer it to the A. R. A. for its consideration. Now, you can leave this a year, or two or three years, before sending it to the association. Perhaps the association will do something without your sending it anyway. It is a subject on which this association ought to take some action, some day. But you can't settle it. The A. R. A. is the association that has to settle the indications and the aspects, but this association, on account of its knowledge of signaling, what can be performed by signalling, and what cannot be performed by signaling, is in a position to make recommendations to the A. R. A. for a uniform system. It simply devolves on the point whether you are ready to do that or whether you don't wish to do it.

B. H. Mann (Mo. Pac.): I hope that the report will be referred back to the committee for further action, for the reason that we have here a strong majority report and a strong minority report. The point is made, as well, that each year has seen a change in the form of the majority report. It may be a slight one. There are two questions. One is the question of engineering, in which there seems to be but very little divergence. The second question is the transportation matter, the handling of the engineman on the train. The entire variance in opinion seems to be a question as to how the railway shall handle the trainman after the train is in motion on the road, on the schedule. The committee seems to have entirely overlooked the fact that this signal, you might say, is a sudden instruction to depart from the schedule, just as a No. 31 order. Ever since the train order has been in practice, one sacred thing has been that there shall be no written or other instructions that will qualify the train order; the train order as delivered to the man on the engine and the conductor means only what it says. This means that the engineman, when taking a signal on a high speed train, must think back to this printed or written instructions to ascertain whether the yellow signal, for example, means proceed. He may three miles in advance find a signal against him, but must maintain his schedule in the interim, or else it means an earlier restriction. In referring questions on transportation to the A. R. A., this association ought to have a unanimous report. I think the president is right in his first suggestion that as we have these two reports, the committee should be given one more opportunity, at least, to harmonize the reports.

Mr. Stevens: The chairman's report to the association shows that I did one day's work more than any other member of the committee on this subject. That did not take into account the large amount of work I did in my office. I had monthly reports in Chicago for something like five months, which entailed an expenditure of nearly a week's time of part of my office force getting out reports and blue prints, so that the minority has been working on this matter earnestly and sincerely, and this report is made after that earnest consideration, feeling that this association cannot afford to send this report to the A. R. A. in its present condition.

The President: It has been moved and seconded that subject No. 2 be adopted. An amendment has been moved, duly seconded, that subject No. 2 be referred back to the committee for further consideration, presumably on account of the divergence of opinion it the committee itself.

Howard G. Kelley (Grand Trunk): Before the motion is put, I wish to ask for some information. The difference of opinion on this committee is basic. They agree on methods, mechanical and engineering. Their difference is, therefore, on the theoretical side or the train movement side. The members who have submitted a minority report are men of long experience, representing many thousands of miles of railway, and I believe that we agree with the majority that we owe an obligation to the minority to allow them an ample opportunity for discussion in a manner that will enable them to settle the controversy. Well, how can they settle it? I believe by referring the matter back to this committee, it will not approach a settlement; that it will not help a situation. The only way that occurs to my mind is whether a settlement can be reached by requesting the Committee on Signaling of the A. R. A. to discuss these basic principles with our committee and ask them for information. It seems to me that is the only way we can arrive at a unanimous opinion. The gentlemen on this committee are represented on the A. R. A. by their companies. I feel that the gentlemen composing the minority have their railway operating officials behind them in their report, the same as the majority have their operating officials behind them. It is one of our hardest working committees, I believe one of our most conscientious committees, and they have reached a point where they cannot, as expert signal men, come together. We as an association must not recommend to the A. R. A. anything that does not bear the unanimous stamp of the committee that reported it to this association. We must send it before the A. R. A. without a dissenting vote. I ask the members of this committee whether, by referring the matter to a committee of the A. R. A., and having a joint discussion between the two committees, they can come before us next year with an agreement and settlement of some of these divergences of opinion. Some men will have to give way, some men will gain their point. but even if that can't be done I believe that is the way we should proceed. I should certainly hesitate to support Mr. McDonald's motion to refer the matter back to the committee for another year. If we do that, when the matter comes before us next year we will most certainly have another dissenting report.

Mr. Rudd: Three years ago, I think such procedure would have been feasible. The Signal Association adopted a report very much on these lines as a progress report, and referred it to the joint committee of the American Railway Association for its opinion. That report was referred to the joint committee of the A. R. A., and that joint committee is now dead. I do not know whether that report killed it or not but it went out of office, and I presume that the report went out with the joint committee. Now, whether we will get any better action by having this committee try to take the matter up with the Signal Committee of the A. R. A., I do not know. It would seem to me that the way out might be for this association to refer these reports, both majority and minority, to the committee of the A. R. A. and ask them to give a ruling on the points at issue. It seems to me that is about the only one of three ways to settle it. There are two other ways: One is to remove the minority members from the committee, and the other is to remove the majority members from the committee. I do not think, with the views which we hold on the basic principles, that we will ever get together on a recommendation. I would like to ask Mr. Stevens and Mr. Clausen what they think of that, whether they believe there is any chance of our getting together on that question of distance. They made fun of us and we make fun of them, but it has ceased to be a matter of fun, and we have got to get down to business. I do not believe we can get together in that way.

Mr. Clausen: I think that if this committee had an opportunity to discuss this entire question of signaling with a proper committee from the A. R. A. we could get together. I do not think there is any question about it. It would all depend on the manner in which the matter was discussed and how much weight the committee gave to the opinions of the gentlemen of the A. R. A. But I do not think there is any question but we could get together on the matter and bring in a report which we could all sign.

Mr. Fritch: I want to make an amendment to the amendment, that this report be referred back to the committee with instructions that the committee confer with the committee on Signaling and Interlocking of the A. R. A., with a view to bringing in a harmonious report at the next meeting.

Mr. Rudd: Would you embody the suggestion that the A. R. A. committee confer with us?

Mr. Fritch: I have no objection to that.

Frank Rhea (Gen. Elec. Co.): As I understand it, there is no such committee of the A. R. A. at the present time, but Mr. Kelley's suggestion is certainly pertinent and in my

opinion is a proper way to settle this problem. The signaling question is divisible into two distinct parts: One is an operating part and the other is a signaling part. The indications are the operating questions. This committee has been working all these years without an authoritative outline of what the indications should be. If the A. R. A. will settle the requirements in the form of a proper set of indications, the matter then reduces itself to a question of aspects, and I think that will be the happiest way, and the only way, by which this subject will ever be settled.

Mr. McDonald: I accept the amendment to the amendment.

The President: The amendment as it now stands is that this subject No. 2 be referred back to the committee with instructions to that committee to confer with a similar committee of the A. R. A., with a view to harmonizing, if possible, the differences between the majority and the minority reports of this committee.

Mr. Mann: I hope that that amendment will not go to the A. R. A. in that way. It would seem as though the dignity of this association calls rather for an arbitration on questions that perhaps are not pertinent to the work of our association. This body in a dignified manner could ask for that arbitration, and the Committee on Transportation of the A. R. A. could refer back to this association the settlement of the engineering questions.

Mr. Rudd: I have asked the members of the committee concerning this, and they feel that that method of disposing of the matter will not cast any reflections on the committee. I move that the remaining subjects, No. 3, No. 4, etc., on which this committee has reported, be adopted as progress reports.

Motion carried.

Discussion of Report on Electricity.

J. B. Austin (Long Island): In explanation of the form in which the report is presented I will say that this is a new committee on a new subject, and in gathering information we find it takes rather more time, possibly, than in a case of a subject that has been under discussion for some years. We have had four meetings of the general committee and about ten or eleven meetings of the various subcommittees, but we feel that our foundation work has not progressed far enough yet to enable us to draw any definite conclusions, or present any recommendations to the association for adoption. I move the adoption of the report of the committee.

Motion carried.

There was no discussion on the report of the Special Committee Co-operating with National Conservation Commission.

Discussion on Iron and Steel Structures.

Group 1 of the specifications was adopted, without discussion.

The secretary then read the first paragraph under group 2.

J. E. Greiner (Consulting Engineer): The only practical difference is that we made the height one foot more than before. It was 21 feet before and we thought it advisable to make it 22 feet. We have illustrated the clearance by means of a diagram. The change is really of no great importance.

Mr. Mountain: According to the Railway Act, bridges built in Canada are required to be 22 ft. 6 in. from base of rail. The idea is to give 7 ft. over the running board of the highest car.

Mr. Greiner: I think 22 feet is based on some laws in this state. This merely means the minimum clearance. If there are no other restrictions you could make it as high as you want. I think the majority of the roads in this country have established 21 feet from the top of the rails.

This clause was accepted, and the secretary then read clauses 6 and 13.

Mr. Greiner: The original clause was a little indefinite, and we thought that it would be better to fix the degree of curve for which centrifugal force should be calculated. That formula simply means that for a 10-degree curve the speed is 35 miles an hour, and on a tangent it is 60 miles an hour, which, in our opinion, is ample provision for the centrifugal force in connection with the other force.

T. L. Condron (Consulting Engineer): Is it intended that the impact formula shall be applied to this as treated as live load?

Mr. Greiner: No.

Mr. Condron: It says: "Shall be considered as live load." Live loads are subject to impact formulas.

Mr. Greiner: I think you will find in the specifications we state that the impacts are not to be applied to centrifugal force. I think that is taken care of.

The secretary read clause 16.

Mr. Greiner: The change in that clause is limiting the original compression formula to 14,000 lbs. In the old specifications we use a simple, straight-line formula, without any maximum, and we thought it advisable to fix that maximum at 14,000 lbs., based on bending tests on full size members which are now being undertaken. Then there is another addition to the clause which is giving a unit stress of 16,000 lbs. for steel castings. These are not in the original specification.

Mr. Kelley: As to adopting a minimum of 14,000 lbs., is that based on any series of experiments? For a number of years, in using a similar formula, I had been limiting it so that it gave me 13,500 as the maximum.

Mr. Greiner: It was simply a compromise. There are not enough tests made on steel compression members at the present day to enable us to settle that with any degree of certainty. Our old formula would allow 16,000, or pretty near it, for short columns. We felt that to be conservative it would be better to reduce that 2,000 at any rate. Some members of the committee thought we should get down to 12,500, ut we compromised on 14,000, pending the results of the full-sized tests that are being undertaken.

As to clause 17, the old specifications for bending did not provide any bending on steel castings. We made the addition of 16,000 lbs. for bending steel coastings.

As to clause 19, the old specifications gave a bearing value of 600 lbs. per square inch on granite masonry and Portland cement concrete, and 400 lbs. per square inch for sandstone and limestone. We have simplified that by making a uniform bearing value of 600 lbs. on masonry.

The secretary read clauses 18-a, 19-b, 21 and 27, which were approved.

Mr. Greiner: As to section 28, in the old specifications, we gave a formula for the maximum length of the compression flange of the girder. That applies to girders when flanges are composed of angles and flat plates. We thought in this revision that we had better take care of other kinds of girders, such as those which have a channel, the flanges of which are rather long and without lateral support, and that is the object of this change of formula when the cover consists of a channel section.

The committee would like to make a further slight change in clause 45, as there has been some question as to whether the shearing stresses should be determind from a uniform load or from a concentrated load. We would add after the word "flexure" the words "uniform load."

Clause 66 was changed on account of the gradual increased weight of our moving loads, so as to take care of that in the future.

As to clause 79, the old rule, one that has been in quite general use, was to increase the length of the top chord ⅛ in. for every 10 ft., to provide for camber. It is all right for a very small span, but when you get up to 400 or 500 ft. spans you must take care of the camber in the manner provided here.

C. C. Schneider (Consulting Engineer): The change in clause 160 was made to make it clear. Heretofore we specified the ultimate strength of the test piece. Now we specify the ultimate strength of the full-sized eye-bar and let the manufacturer determine the ultimate strength of the test piece, which will give the final results of the test bar as specified, 55,000 lbs. per sq. in.

Mr. Greiner: In clause 133 the committee would like to make a change in order to make this paragraph consistent with 160; we want to change the last part to read, "the manufacturer shall guarantee the bars to meet the requirements of paragraph 160." In paragraph 160 we want to say "bars shall generally break in the body," because we make provision later on unless more than one-third of it breaks it will not be cause for rejection.

Mr. Kelley: I want to ask the committee if there should not be necessary to limit it to such a narrow head as this not be necessary to limit it to such a narrow head as this would give if we cut out our ⅜-in. web.

Mr. Schneider: The change in that paragraph was intended to do away with the thin web plates which are used in specifications. A great many roads now limit the thickness of web plates to ½ in., like the Pennsylvania R. R. That is somewhat of a compromise move in the right direction.

Mr. Greiner: You should also take into consideration the fact that while we have many plate girders now with ⅜ and 5-16 web, a number of them were built for much lighter roads. The ⅜ webs are undoubtedly giving good service, even now for the lighter loads, but as we have increased the rivets and increased everything else, it is consistent to let the webs go

up with it. Unless we have some such limit as that there is nothing to prevent the engineers trying to fill the girders with something else.

C. S. Churchill (N. & W.): I want to refer back to 119, increase of load on masonry. It occurs to me that may be a step backward, due to the fact that impact loads are increasing. It is not strictly correct to say that sandstone and limestone bases are equal to granite.

Mr. Schneider: In the old specifications we allowed higher pressure on concrete than on stone, and in most bridges the size of the bed plates is determined without knowing the size of the masonry.

Mr. Greiner: There was another reason: we wanted to be consistent with the Masonry Committee's recommendation.

The secretary read conclusion 1.

Mr. Fritch: Would the committee be willing to change the signs for tension and compression, minus for tension and plus for compression?

Mr. Greiner: Some of the committee have used minus for compression and plus for tension and others reverse them. But all the text books use plus for tension and minus for compression, and it has become the general practice.

Mr. Fritch: I think that every reason points to using the minus sign for tension.

Conclusion was adopted.

The secretary then read conclusion 2.

Mr. Greiner: This section has been under consideration for several years. The committee felt that rules for governing the inspection of bridges in the field should be carefully considered and expressed, and so far as possible in such manner as not to commit either this association or the individual roads which would use this rule to any great extent. Inspection of bridges must necessarily, of course, depend on the character of the bridges and the organization of the roads which control this inspection. This report is the report of the full committee, without dissension.

The secretary read that part of Appendix A to which this conclusion refers, and conclusion 2 was adopted.

J. P. Snow (B. & M.): Regarding conclusion 3, I think that a specification for this purpose should be pretty much in outline, concise and short, something similar to what the committee has given us in the way of directions for the care and inspection of existing bridges.

The subject of erection of bridges was referred back to the committee for further consideration.

Conclusion 4 was adopted.

Mr. Greiner: Regarding conclusion 5, I would like to ask some of the reinforced concrete men present what kind of a railway bridge they could construct of reinforced concrete in the shape of a slab for a span of 40 or 50 feet.

Mr. Condron: I have designed up to 30 feet.

Mr. Greiner: The committee feel that 40 feet is about the limit.

Conclusion 5 was adopted.

Prof. F. E. Turneaure (U. of Wis.): It would be impossible to read the whole report of the sub-committee on impact here, of course.

The following summary of results relates only to the series of tests which have been made by the sub-committee:

1. With track in good condition the chief cause of impact was found to be the unbalanced drivers of the locomotive. Such inequalities of track as existed on the structures tested were of little influence on impact on girder flanges and main truss members of spans exceeding 60 to 75 ft. in length.

2. When the rate of rotation of the locomotive drivers corresponds to the rate of vibration of the loaded structure, cumulative vibration is caused, which is the principal factor in producing impact in long spans. The speed of the train which produces this cumulative vibration is called the "critical speed." A speed in excess of the critical speed, as well as a speed below the critical speed, will cause vibrations of less amplitude than those caused at or near the critical speed.

3. The longer the span length, the slower is the critical speed and, therefore, the maximum impact on long spans will occur at slower speeds than on short spans.

4. For short spans, such that the critical speed is not reached by the moving train, the impact percentage tends to be constant so far as the effect of the counterbalance is concerned, but the effect of rough track and wheels becomes of greater importance for such spans.

5. The impact as determined by extensometer measurements on flanges and chord members of trusses is somewhat greater than the percentages determined from measurements of deflection, but both values follow the same general law.

6. The maximum impact on web members (excepting hip verticals) occurs under the same conditions which cause maximum impact on chord members, and the percentages of impact for the two classes of members are practically the same.

7. The impact on stringers is about the same as on plate girder spans of the same length and the impact on floor beams and hip verticals is about the same as on plate girders of a span length equal to two panels.

8. The maximum impact percentage as determined by these tests is closely given by the formula:

$$I = \frac{100}{1 + \frac{l}{20{,}000}}$$

in which I = impact percentage and l = span length in feet.

9. The effect of differences of design was most noticeable with respect to differences in the bridge floors. An elastic floor, such as furnished by long ties supported on widely spaced stringers or a ballasted floor, have smoother curves than were obtained with more rigid floors. The results clearly indicated a cushioning effect with respect to impact due to open joints, rough wheels and similar causes. This cushioning effect was noticed on stringers, floor beams, hip verticals and short-span girders.

10. The effect of design upon impact percentage for main truss members was not sufficiently marked to enable conclusions to be drawn. The impact percentage here considered refers to variations in the axial stresses in the members, and does not relate to vibrations of members themselves.

11. The impact due to the rapid application of a load, assuming smooth track and balanced loads, is found to be, from both theoretical and experimental grounds, of no practical importance.

12. The impact caused by balanced compound and electric locomotives was very small and the vibrations caused under the loads were not cumulative.

13. The effect of rough and flat wheels was distinctly noticeable on floor beams, but not on truss members. Large impact was, however, caused in several cases by heavily loaded freight cars moving at high speeds.

The report includes photographs of typical curves illustrating various points of the report, diagrams of the impact percentages on all of the trusses, diagrams of maximum impact with the curves plotted thereon, and sheets of data. The original diagrams are all filed now in the secretary's office, where they can be inspected by any one interested.

The future work of the committee, so far as it has been planned, includes some additional work on spans exceeding 300 ft., and, if practicable, on very short spans. It has been found very difficult to devise an instrument which will be entirely satisfactory for spans 20 or 30 ft. in length, but if that can be done it is very desirable to continue experiments on the very short spans.

The President. I am sure you will agree with me that we have some very valuable information before us in this particular form, and it will be in print as early as possible and you will all receive a copy of it.

Mr. Greiner: I move that this report on impacts be accepted as a progress report, although it is almost complete, and that the committee be continued with instructions to make further investigations on impacts on long spans and very short spans and also on the investigation of secondary stresses.

Mr. McDonald: I would add that concrete slabs be included.

Mr. Greiner: That was our intention.

The sub-committee report on the allowable length of flat spots on car wheels and the effect of flat spots on car wheels on bridge structures was accecpted as a progress report, with instructions to the committee to continue their investigation.

Discussion on Wooden Bridges and Trestles.

Mr. Condron: Referring to the revised specifications for metal details used in wooden bridges and trestles (Appendix A). I notice it reads "if made by the acid process it shall contain not more than 0.08 per cent. phosphorus." The other committee changed it to 0.06.

Prof Jacoby: The idea is to have it in perfect harmony. It is understood that change will be made here.

The proposed amendments relating to the specifications to be covered in the Manual were adopted.

Prof. Jacoby: Turning to Appendix B, these specifications were adopted almost exactly in the form in which they appear here at our meeting last year. At that time the titles for the two grades of yellow pine were given as Railroad Grade and Falsework Grade, but at the meeting of the Yellow Pine Manufacturers' association these titles, although agreed to by its committee, were not favorably considered. Hence in consultation with our sub-committee, which was present at that meeting, it was agreed to substitute the terms Standard

Heart Grade for the long leaf yellow pine, and Standard Grade for the long-leaf and short-leaf yellow pine, in the two grades included. One addition was made. In connection with the next specifications which we will take up on Douglas fir and Western hemlock, the term "full length" was necessary, and it was considered desirable to add this term also in these specifications. This has been agreed to by the committee of the Yellow Pine Manufacturers' association and the committee for the American Society for Testing Materials, and the word "corner" has been substituted for "edge" to conform with the trade terms. It does not, however, change what has already been adopted in any other particular.

Mr. Fritch: In the Standard Grade there is provision for ties and guard timbers.

Prof. Jacoby: It was not intended to include that.

Mr. Fritch: It seems to me ties and guard timbers should be covered, because we may want to use standard grade on inferior lines.

W. H. Courtenay (L. & N.): I would like to see the knot specification limited a little. I think the specification admits too large knots in stringers and also in taps and sills. It would seem to me preferable to merely say that no loose or unsound knots be accepted. That is a fair specification in the yellow pine district, but I fear with this specification as to knots we would get a good deal of bad stuff; you frequently find yellow pine with the grain running across the stringer, and such material is weak and should be rejected.

Prof. Jacoby: The specification in detail was gone over at the last meeting and adopted in the form in which it is here presented, with the exception of a few minor matters which are to be adjusted, and it is now brought forward simply for the purpose of receiving the approval of the association so far as these few modifications are concerned in order that it may be printed in proper form in the Manual.

Mr. Fritch: I move that a clause be inserted in the specification for standard grade long-leaf and short-leaf yellow pine, covering ties and guard timbers.

Mr. Courtenay: A railway company would not want yellow pine ties and guard rails according to the specification for standard grade for anything except temporary purposes. The sap rots very rapidly on yellow pine.

L. J. Hotchkiss (C. B. & Q.): It was the idea of the committee in considering these specifications that such timber as is included under the standard grade would only be used for temporary construction, falsework and construction of that sort; for that reason these timbers were omitted and included only in the standard heart grade.

M. A. Neville (P. & E.): In reply to Mr. Fritch's remark, the practice where I have been, under these circumstances, has been to use a first-class tie and figure on reusing it for some other purpose after it has served the temporary purpose, because the ties need not be handled so that they could not be again used. The inferior timber you would get under this secondary specification would not be of any account after you used it temporarily in falsework. We always used the better class of ties and guard rails, and figure on getting our money back in using them again in another place.

Mr. Snow: It does not seem to me consistent for this committee to specify the use of poor material you can always use poor material if you want to.

Mr. Fritch: There are a lot of places where you have trestles for industrial track, where you are not justified in using first-grade stuff and second-grade stuff would give all the service required.

Appendix B was adopted.

Mr. Fritch: I think the terms Standard Heart Grade and Standard Grade are unfortunate. In the first place, we here use the term "Standard Grade" for inferior material. It seems to me that there is great opportunity for making errors in the requisitions. If you leave out the word "heart" you get an inferior grade of material. I suggest instead the terms "Standard Heart Grade" and "Second Grade."

Prof. Jacoby: The matter of terms has been taken up for several years in the meetings of the three committees—the Yellow Pine Manufacturers' association, the American Society for Testing Material and the committee of this association, and it has been exceedingly difficult to get terms which will be satisfactory to the manufacturers. They will not consider for a moment the use of the term "Second Grade," because of its confusion with that term as employed in the trade in other ways. Last year we had a second meeting after our report was adopted and we came in the next morning after further consultation and substituted for "Railroad No. 1" and "Railroad No. 2" the terms "Railroad Heart Grade" and "Falsework Grade." When we came before the Yellow Pine Manufacturers' association they refused to adopt that, and the three committees agreed on these terms as the best that could be secured at present. Possibly in the future better names may be agreed on.

Mr. Snow: I am in considerable sympathy with Mr. Fritch's remarks. I do not think that term is a good one. Has the committee tried the term "Merchantable" with the manufacturers?

Prof. Jacoby: We are glad to receive the suggestion.

Sections 1 and 2 of Appendix C, were adopted.

Mr. Fritch: I desire to go back to Appendix B and call attention to the fact that the word "live" is left out of the general requirements. Is that intentional?

Prof. Jacoby: It was pointed out to members of the committe by those who had experience with the Douglas firm that it was very much more important that it be included in this specification than in the specification for yellow pine, and it was thought the wisest course to have it included definitely in this place; that dead Douglas fir was much more seriously to be considered than in the case of yellow pine.

Sections 3 to 8, inclusive, of Appendix C, were adopted.

W. K. Hatt (Purdue Univ.): As to the name of that inferior grade, my understanding is that the manufacturers will not object to the term No. 2, or Merchantable, but that the objection has come from the members of this association. I think the term "Merchantable" is better, as the members of Committee Q say that the members of the association do not care to acknowledge that they have any second class material in their tracks.

The President: I think the members of the Yellow Pine Manufacturers Association strenuously objected to the use of the term No. 2, and gave us a number of reasons for doing so.

Clauses 9 and 10 were adopted.

Mr. Fritch: I do not think we ought to pass over these names Standard Heart Grade and Standard Grade without fixing them definitely. We can all see how easy it is to make up a requisition and leave out the word "heart" and have a lot of material on the ground which would be expensive for us. It seems to me if we would use the word "merchantable" instead of "standard grade" it would lessen the possibility of error. I move that the words "standard grades" be changed to "merchantable grades."

Mr. Osgood: I will ask if there is any danger of a conflict. In some kinds of timber the manufacturers have a merchantable grade. I do not know whether that is the case in this Western country or not. But if they do have such a program it might be very confusing to have a merchantable grade for the association and also a merchantable grade of the manufacturer.

Mr. Fritch: I think the specifications will fix that.

O. E. Selby (C. C. C. & St. L.): I think the term "heart grade," should be retained. It is disinctive and shows the quality most desired in that kind of timber. The term "standard grade" is not distinctive, but it is not objectionable to anybody. The term "merchantable grade" is a trade term that I think should be left out of the proceedings of this body. It is a common trade term and if adopted here would be confused with other "merchantable" terms adopted by manufacturers associations. It seems to me that the object suggested by Mr. Fritch, the possibility of confusion in the specifications on the requisitions and orders, could be obtained by omitting the word "standard" from the first grade, calling that heart grade and retaining the word standard for the second grade, calling that standard grade. I move to amend by making that substitution.

Mr. Jacoby: There might not be a serious objection to the term, so far as it relates to Western hemlock, but I do not think it desirable to make any change in the previous specifications for yellow pine, because, in accordance with the instructions of the association the committee has been endeavoring for three years to bring about absolute uniformity between the three associations. The specifications in the form in which they are printed here have been published and extensively circulated throughout the country in pamphlet form, and it is desirable that these should be given a thorough test, and then if any modifications be found desirable they can be brought up in subsequent revision. We feel we have done the best possible to secure this result, and we do not believe it would be wise to change the terms at present. This specification in its present form has been adopted by the American Society for Testing Materials and the Yellow Pine Manufacturers Associations. Of course, any suggestions to be offered can be taken up and considered in the consultations with the conference committees, and we shall be very glad to do what we can.

Mr. Fritch: I withdraw the motion, with the understanding that it will be taken up with the Yellow Pine Manufacturers Association and see if they can harmonize on terms that are not confusing.

Mr. Selby: I move that the term " standard" be dropped from our grades; that the first grade be called "heart grade" and the second grade be called "standard grade."

The motion was lost. Conclusion 2 was adopted.

Mr. Jacoby: It was suggested that we add to the definitions of structural timber, as printed in Appendix B the definition of full lengths, long enough to square up to the lengths specified in the order.

Conclusion 3 was adopted, with the change suggested.

Conclusion 4 was adopted.

Discussion on Rail.

Mr. Churchill: The only item of work we regard as completed is No. 4, presenting the report showing diagrams and photographs of typical characteristic rail failures. The photographs of the rails which were published in bulletin 116, page 66, we would like to present and have them considered as a conclusion of that subject, excepting that the special cases that come up from time to time will be treated of as such where they will give information. But as for making another special report on that subject, we think it unnecessary.

In drawing up specifications we have had before us one main point: that we shall determine the quality of the rail not so much by prescribing details of manufacture as by establishing some tests that will determine whether the rail output is good or not.

As to conclusions, the results so far obtained from the heavy base A. R. A. sections are disappointing. We have received from the mills some rails of the new section which were as bad as those from the old A. S. C. E. section, showing that the quality of the rail does not depend upon the section.

The Vice-President: If there is no objection, we will adopt the committee's recommendation with regard to rail failures.

Mr. Churchill: As to the amendment of paragraph 5, that is the practice of the mills today, and has been ever since the drop-testing machine was put in use.

Conclusions 1, 2 and 3 were adopted.

Mr. Churchill: Conclusion refers to the specifications for Bessemer and open hearth rails. The original specifications were printed in Bulletin 118. Those specifications were printed in this bulletin early in December and were sent to the Manufacturers' Committtee. As the result of meetings with that committee we made slight modifications of this specification, which have just been published in this little pamphlet.

[The changes referred to may be summarized as follows: In article 2, the weight of lighter rails for which the composition is specified are limited to 70 lbs and over, but under 85 lbs. The allowable manganese content was changed to 0.80 to 1.10 for Bessemer 85 to 100-lb. rails; 0.70 to 1.00 for all open-hearth rails. The allowable silicon content was changed to 0.07 to 0.20 for all rails. In article 3, the limit below which the phosphorus content must be reduced to require an increase in carbon, is 0.08 for Bessemer and 0.03 for open-hearth rails. The requirement concerning the average percentages in an entire order of rails was limited to carbon. In article 4 the specification as to the amount of metal to be sheared from the end of the bloom formed from the top of the ingot is that the entire face shall show sound metal. In article 5 the shrinkage allowance permitted is made 6⅛ in. for A. S. C. E. sections and 6½ in. thick base sections. In article 8, shorter lengths to be accepted are allowed to vary by 1 ft. from 32 ft. to 25 ft. In article 9, the variation from a straight line, after hot, straightening is allowed to be 5 in. for A. S. C. E. section and 4 in. for thick base sections. In article 11 the following sentence is added: "All marking of rails shall be done so effectively that the marks may be read as long as the rails are in service." In article 12 (a), 60-lb. rails are omitted from the paragraph referring to the height of fall of the trip in drop tests. In article 16, the question of what rails contain physical defects which impair their strength is not specifically left to the judgment of the inspector; it is simply specified that any such rails shall be rejected.]

Article 1 of this revised specification was adopted.

The secretary read article 2.

Mr. Rhea: It is a well-known fact that the rail which we get is vastly different from the analysis of the test ingot. In taking this up with the manufacturers, I have found this difficulty. We have been endeavoring to get an open-hearth rail that would come within certain limits. If our specifications are so run that we are tied down to the chemical analysis of the test ingot, we cannot throw out the rails regardless of what the chemical composition of the rail is. Now, the manufacturer tells you that they cannot guarantee anything in the rail, and all they can do is to guarantee that the test ingot will be within certain chemical limits. I have found in actual practice that in one or two cases, under stringent conditions, we were able to get open-hearth rails within certain limits; that is, the analysis on the rail itself. Now, the point I make is that we should have something to definitely limit the chemical analysis of the rail itself. The specification plainly says it must be within the limit by analysis of the test ingot. I realize that you cannot test the rail before it is rolled. This test must be upon the ingot. You must test the ingot in order to tell how the rail is coming, but I think we ought to have something in the specification which will guarantee us within certain limits of the rail itself. In connection with this the last paragraph of article 3 comes in: "The percentage of carbon in an entire order of rails shall average as high as the mean percentage between the upper and lower limits." If you undertake to get a rail according to that specification, I presume that article would refer to the analysis of the ingot. If so, it should plainly state that, because you cannot tie yourself down to the analysis of the ingot in one place and state the analysis of the rail in another.

Mr. Osgood: We have found a great difference between the specification of the steel and what we actually got in the rail. I would also ask why it is the limit of carbon of the rail has been placed as low as 76. as a maximum for a hundred pound rail.

Mr.Churchill: As to the first point, we do not find as much variation as the gentleman has mentioned. The reports that we have been receiving show rails that do come within these limits. On the other hand, if there is segregation of material or other defects in the rail, then we will find the chemical analysis will run up out of reason, and it is those defects we wish to detect by tests. We cannot stop the rolling mills to take analysis of individual rails, and I think the gentleman will concede that. We have a right to take those tests if we choose, and the mill people have, before these specifications were talked of, even, taken rails back when complaints were made by the different railway companies, when defects were found and the material did not come within the specification.

As to the amount of carbon in open-hearth rails, we have attempted to provide for that to some extent in article 3. If the phosphorus runs down and is condensed, then the carbon can be increased. We think that 0.76 is about as high as we wanted to go with safety for an open-hearth rail with 0.04 phosphorus. I want to call attention right here to the fact that we have cut these specifications into only two classes of chemical content, which has never been done before. We think that entirely too much weight has been placed upon little variations in chemistry, and what we want more particularly is to find out what we are getting in the rails by testing the rails, just as we examine bridge materials; we don't prescribe minutely the chemical contents of all the steel that goes in our bridges. There are only a few limiting features. We think that we can get rails the same way, if we can make the tests on the finished product.

G. J. Ray (C. I. & L.): I think we should include in our specifications a clause to the effect that the chemical analysis of the rail itself shall be within certain limits. If the manufacturer cannot guarantee our rail within a limit of thirteen points, which is given in this specification for carbon, he ought to guarantee it within fifteen points. There is certainly some limit which should be set. The point I make is this: The rail itself, the carbon in it, may vary from fifteen to eighteen, or twenty. Careful analyses we have made on rails run from one heat to another show conclusively that the rail does not run within the limit which the test ingot was supposed to run. As a matter of fact, in these tests we have found that the test ingot and the rail itself run reasonably close, so that if care is taken in the matter of the manufacture of the rail, the rail can be rolled within certain limits. The rails purchased by the majority of the companies are in the track before the tests given them by the manufacturer are checked. We should have something specifically stating the limit in the rail itself.

The Vice-President: Don't you think the committee has endeavored to do that?

Mr. Ray: No, they do not. They say that the chemical composition of the steel from which the rails are rolled shall be within the following limits. There is nothing in this specification from one end to the other which shows the chemical analysis of the rolled rail. If you take the specification of any manufacturer in the country, he will not guarantee to roll

the rail and have it in accord with the specifications covering the chemical composition of the steel.

The Vice-President: You refer to the entire contents other than the carbon?

Mr. Ray: The carbon. But is is the case with all the composition.

T. H. Johnson (Penna. R. R.): I do not think the last speaker has ever studied any of the well-known analyses of different compositions in the ingot. Whatever the chemistry of the different elements of the ingot may be, no two rails rolled from the same ingot will show the same analysis, neither will test pieces taken from different forgings of a section of any one rail show the same analysis. To make a special provision covering the chemistry in the finished rail is simply an impossibility, and you could not carry it out.

Mr. Ray: I know very well that no two rails of any one ingot will show the same analysis. I have had several hundred of them analyzed the last season, all sections and all parts of the rail, and I know that is true. The point I make is that there should be some limit within which the rolled rail should come, and if it cannot be within thirteen points, it should be within something else. I cannot see how you are going to decide on the analysis of the ingot and let the rail go. You must analyze the rails, and if you do, you will find they are not anywhere near the chemical analysis of the ingot. You have no come-back whatever on the manufacturer. It is care in the manufacturing of rails that will make better rails. It is going to take more care to make the rails within certain limits, and that is what we ought to have.

W. C. Cushing (Penna. R. R.): The Pennsylvania Lines West this year are getting 75,000 tons of rail and we are having a regular checking analysis of the rail steel made after receiving the analysis of the metal from which the rails are rolled. In no instance have we found any where the check falls behind, and they check within reasonable limits of the analysis furnished by the mill of the metal from which the rail is rolled. And it would be an impossibility for any mill to guarantee how close it is going to come, but by continually watching, which is the duty of the customer, he can easily catch up defects which may occur. We have failed to find any case yet where it was necessary to take that up, and no one can guarantee what may happen in segregated steel. On the whole there seems to be little difficulty in having the rail steels come within reasonable limits of the mill from which it is rolled, just as Mr. Johnson said. We, therefore, find no reason or necessity of putting in any such specifications or any such clause in the specifications, because it is something that no one would know how to handle and nobody could guarantee.

W. R. Webster (Con. Eng.): I move that clause 2 be accepted and that the matter of any additional requirements upon the finished rail be referred to the committee to give us its opinion next year, if it deems it advisable. It is a matter we cannot decide tonight and it is useless to take up the time to go at it.

Motion carried.

Article 3 was adopted.

The secretary read article 4.

Mr. McDonald: I would ask the committee what the view of the manufacturers is with reference to that.

Mr. Churchill: The manufacturers have agreed to that clause in this form.

Articles 4, 5, 6, 7 and 8 were adopted.

The secretary read article 9.

J. G. Sullivan (Can. Pac.): I would ask the committee if it would not consider a rail that cools straight within 3 in. or 3½ in. a better rail, less apt to be damaged in the gagging; also if they had any difficulty with the manufacturers agreeing to give them such a rail. We are getting such rails in Canada.

Mr. Churchill: I believe that we will be able to get a rail that cools straight within 3½ in. from a great many mills. But many mills say they cannot do it at present. It is to the interest of the mill men themselves to get it as low as they can; and we have made the difference 4 inches for one type of rail and 5 for the other because the the thin base rail will cool less straight than the thick base rail and we are very certain that all mills will come well within that figure.

We hardly think it is to the advantage of the purchaser to put in the hands of the inspector a small detail such as a half inch or an inch variation from a straight line as a basis for condemning a rail, in view of all of these facts.

Articles 9, 10 and 11 were adopted.

The secretary read section 12 (a).

Mr. Sullivan: The committee has made a distinction in the chemistry of the rail between the Bessemer and the open hearth, but they make no distinction in the drop test. We are getting out some rails at present, and wherever we have a rather rigid drop test the mills are not complaining about the test on the open hearth, but they are complaining about the drop test on the Bessemer, even although we make a difference of 2 ft. in the drop. There is one other point I note the committee has not touched. I presume it is conceded that the drop test is to test the chemistry, as it were. If the chemistry is correct there would probably be no necessity for the drop test. The point that a gentleman brought out about the chemistry of the rail might, I think, be partially covered so far as the physical test could be made by putting limits in a deflection that you would get in the drop. We are doing that at present, that is, putting a minimum and maximum limit to which the rail would deflect. If you have such limits it seems to me you are getting a test on the hardness of your rail.

Mr. Churchill: The committee intends doing that. In section 12 (b) as you will see.

Mr. Sullivan: What we are depending upon for our hardness is this, if your rail don't break, but bends, in 3 ft. or 4 ft. whatever your requirements are, it would be deemed as being a rail too soft. If, on the other hand, it only showed a deflection of one inch which would be required, that would be an evidence of the rail being too hard.

Mr. Chuchill: That is just exactly the object of our committee. We do not have enough information before us to determine those figures. We have a very good idea of what those figures should be, but we prefer not to put them in the specifications now.

Mr. Sullivan: We would have changed recently to a three foot space instead of four feet, but we had data for the last ten years for four feet, so we retained four feet in order to be able to put that factor in our specifications.

Articles 12, 13 and 14 were adopted.

The secretary read article 15.

W. H .Courtenay (L. & N.): I would like to inquire why the word "injurious" is used there.

Mr. Churchill: We think defects such as small bends would not be injurious or make them defective for use on track. On the other hand, if the defects are of a larger character, a bad nick, a deep one or any defect whatever—we made this very sweeping—or any defect whatever discovered by the inspector, or a flaw of any kind that will render the rail unsafe, it is to be discarded.

Mr. Courtenay: It might be a flaw only an eighth of an inch deep, and the question might arise whether that is an injurious flaw or defect. On the other hand, that flaw might be a quarter or three-quarters of an inch deep.

Mr. Churchill: That we must leave, I think, to our inspectors. One class of specifications describe how deep a nick or flaw shall be to be rejected. This committee thought best not to go into detail. We think we have inspectors that are around mills constantly who are able to decide those questions at the mill. A flaw an eighth of an inch deep would be injurious in certain places, but a quarter of an inch flaw in other places might not be injurious.

Mr. Courtenay: The point is whether, when there is a slight defect in the rail due to pipe or air bubble, such rail is to be accepted or not.

The Vice-President: It is to be rejected.

Mr. Courtenay: It strikes me in this specification, that a slight flaw due to an air bubble in the ingot, and apparently running in one-eighth of an inch, might vary from nothing at all to a very grave defect, and it seems to me it would materially strengthen the specification if that word "injurious" would be eliminated.

Mr. Johnson: I think the gentleman wholly misapprehends the meaning of that particular sentence. That relates to superficial defects. Defects due to an air bubble or pipe are interior and never show on the surface. In the surface defects, they are defects which occur as the rail goes through the roll. They may be due to a flaw which makes a fault in the surface, similar to a nick. It does not matter whether it is one-eighth inch or one-half inch deep, it is equally dangerous. It may be due to a piece of cinder adhering to the roll, which merely makes a deficiency in the contour of the rail, which is harmless. It is that type of defect which that paragraph covers.

Mr. Courtenay: Twenty-six years ago I inspected many rails at the mills. That species of flaw which begins at the outer corner of the rail head and runs in will vary from nothing until it becomes a very great defect. At that time it was a question with me, as an inspector, when these flaws were extremely slight, whether I should reject the

rails, or whether they should only be rejected when the flaws became somewhat greater. There was a difference of opinion between myself and the mill authorities at that time, and we still get rails occasionally which are accepted by our inspectors as first quality rails that have these very slight flaws, and it is a question whether the inspector overlooked the slight flaws or knowingly passed them. I am of the opinion that a rail with a very slight flaw of that character is much more liable to break than a rail with no possibility of flaw whatever, and it would seem to me that a flaw of that type should be sufficient to reject the rail even though it may be very small. For that reason I make the inquiry about the word "injurious," whether it is the opinion of the committee that these extremely slight flaws, when of the same general character that sometimes run one-quarter inch, one-half inch and three-quarter inch from the gage edge of the rail, should be sufficient cause for throwing a rail into the second quality class.

The Vice-President: If you eliminate the word "injurious" then a rail must not have any defect or flaw of any kind on the surface.

Mr. Courtenay: I would not call a mechanical dent in the head of the rail a defect at all. Neither would I call a scrape along the head of the rail a defect, due to the fact that while the rail was hot, it got a little askew with the guide of the rails and got scraped.

The Vice-President: That is what the committee intends to cover. It does not refer to any interior imperfections, but imperfections on the surface only.

Mr. Courtenay: The point seems of some importance, because it strikes me that with this specification you might have a flaw, and although its outward appearance on the rail may seem to be very unimportant, it is of the same general character and induced by the same causes as interior flaws.

The Vice-President: Then, no matter if the defect were of no consequence, it would reject that rail as number 1.

Mr. Courtenay: I would not include mechanical indentations; that is not a flaw.

Mr. Snow: It seems to me the way in which this clause is written covers the gentleman's case exactly. If he discovers these very slight flaws he speaks of and considers them injurious, as he says he does, and he thinks the rail would be liable to break at that point, it certainly then becomes an injurious flaw in his judgment and he has a right to reject it. If we leave that out and make it free from all defects, then he has to throw out the rail if there is the slightest indentation, which he says does not hurt it any. I think it is better to leave it as it is.

Prof C. Frank Allen (Mass. Inst. Tech.): It says that rails shall be free from injurious defects and flaws of all kinds. Suppose the inspector thinks the defects are injurious and the representative of the rolling mill thinks they are not injurious, should there not be some statement in this clause as to whose decision shall govern it?

The Vice-President: The inspector should be the umpire in that case.

Prof. Allen: Should not the clause so state?

Mr. Webster: The inspectors as a general thing take care of that matter individually. I think that is a point that the committee might take under consideration and express their views upon the matter at the next meeting. I do not think it is right to ask the committee to change any part of their specification unless they do so willingly, and therefore I move that the clause as it now reads be accepted, and that they give us their views as to the different classes of flaws, if they have any remarks to make on them, next year.

Mr. Churchill: We will consider that next year.

Mr. Churchill read clause 16.

Mr. Downs: Nothing is said about loading, except that they shall be loaded in the presence of an inspector. I have known of mills damaging rails while loading them, loading the rails in coal cars, and the rails have been kinked after they have been loaded in the car. I think it would be well to have something in the specification on that point, and it should be specified who is responsible for the loading.

Mr. Churchill: It seems the fact that they are loading in the presence of an inspector makes them responsibe for their correct loading. That is the object of the reading.

Mr. Downs: I do not know whether that would cover it. It does not define what he shall do if they are loaded improperly.

Mr. Churchill: We think when we put an inspector on the ground and tell him he must see these rails properly loaded and shipped correctly, he is responsible.

Mr. Downs: I think it would be wiser to make it broader —to make it "carefully loaded" and not thrown on the cars. I have seen rails loaded at the mill which were injured and kinked after they have been loaded on the cars, because of their not being loaded properly.

Mr. Churchill: We have endeavored to make the wording precise and brief right through, and we believe that clause will do the work and get the results.

C. H. Stein (C. of N. J.): I notice that it specifies that No. 2 rails should have two prick punch marks on the side of the web, near the heat number near the end of the rail, so placed as not to be covered by the splice bars. It seems to me that the use of the words "near the end of the rail" are unnecessary, because the heat number is not always near the end of the rail. I have seen many places where it was right in the center of the rail.

T. H. Johnson (Pennsylvania Lines): I would like to ask the last speaker what mills those rails were from. In all the mills the committee visited, we haven't seen any mill that had the practice of making the heat number in the middle of the rail.

Prof. Allen: In relation to one of the objections made, that all rails shall be loaded in the presence of the inspector, would there be any objection to making that read: "All rails shall be loaded in the presence of the inspector and to his satisfaction."

Mr. Stein: The committee visited four different mills. Now, in examining quite a number of tons of rail from one of those mills I never saw the heat number missed in a single instance. There was not a single instance in which that heat number was not at the two ends of the rails. With two of the other mills specified here, I found the heat number in the center of the rail, and in the case I particularly referred to, I found it invariably at the center of the rail, and in a great many of the rails I examined I didn't find it in a single case anywhere but at the center of the rail.

Mr. Churchill: We expect to get better results in marking the rails than ever before. Committee A has that up with the manufacturers now, to get all the mills to be more systematic in branding, and we think that article 11, taken in connection with this one, will get that up and put the marks at the branding point or the heat number nearest to the end of the rail, and therefore easiest to find. We will take up the question as to the satisfaction of the inspector next year.

Prof. Allen: It would be desirable in the specifications, if you can, to say distinctly what is meant. No. 15 reads that it shall be free from injurious defects and flaws of all kinds, to the satisfaction of the inspector. That makes it absolutely definite, and there is no question as to who shall determine the injurious quality of the defect.

The Vice-President: The committee feels that adding a word of that kind is superfluous; that these specifications are supposed to be to the satisfaction of the inspector, or they would not be drawn.

Mr. Courtenay: The Louisville & Nashville has had a great deal of trouble getting its rails loaded properly. They dump them over the side of the car and let them fall any way they may. The mills have given a variety of excuses. Instead of having one rail laid head up and the next head down, we have frequently had them thrown in promiscuously. We have complained to the inspector and the mill both.

Mr. Cushing: I can offer some explanation of trouble of that kind. That occurred in our case, and in making investigation at the mill we found improper loading always occurred in the case of cars that were too short. They are cars that the rail absolutely filled up. There was scarcely any margin of length between the end of the rail and the car, and the mills pointed out and showed to us conclusively that they could not load the rail in cars of that kind in the way that the railway companies wanted. But when the cars were furnished of proper length, with a foot or two of margin between the ends, the men were able to get in and properly load them. I think you will find all mills are willing to do the same thing without saying anything about it in the specifications.

Robert Trimble (Penna. Lines): Our investigation showed that nearly all the mills now are putting in improved loading devices, so that with short cars they will be able to load them properly.

Mr. Webster: I would like to ask some of the speakers who have expressed themselves about extra care that should be taken in loading the rails, if they will say what care shall be taken in unloading the rails, so as to avoid injury? If you will add that I will move that those sections be adopted.

The Vice-President: I think Mr. Webster has touched the sore spot.

The secretary then read article 17 (a) and (b).

Conclusion 4 of the report was then adopted.

Conclusion 5 was adopted.

Mr. Cushing: Now, the plan of the committee is that hereafter the date will remain the same, October 31, but that some time will be taken for receiving and collecting and digesting the report, and that no attempt will be made to have those statistics printed in a bulletin before the convention; they will follow shortly after the convention, and be ready for the proceedings; and if the association desires to act formally on those statistics it will be done by letter ballot instead of on the floor of the house as at present, as there is usually little to discuss in these statistics; they are for the purpose of study rather than discussion; and it seems to us that that will be sufficient. We would like to have that plan hereafter approved by the association instead of attempting to rush them through and omitting a lot of valuable reports in order to get them out in time.

The first two sets of reports that were published did not contain very many remarks in regard to them, but as the statistics became a little more perfect, we have given some thought obtained from a study of the last collection on page 10. It is not the intention to act on this, but just to call your attention to them and give you an idea of what we think these statistics accomplish: First: the study of these general statistics does not furnish accurate and specific information so as to determine the value of different sections of rail because the conditions of traffic are different, the conditions of road-bed are different, and the conditions of ingot making and rolling practice are so different that the quality of the material varies widely, and this difference in quality of material eliminates difference in section. Second: The study of these general statistics, however, tends to disclose unusual results. Third: The general statistics are also important in showing the relation between broken rails and failure of heads, web and base.

Unless they hereafter bring out something else, that seems to be the most we can get out of them. They have been not only tabulated, but tables or diagrams have been made with the attempt to make those comparisons which I have mentioned. But in looking through those diagrams you won't be able to tell whether heavy base rails are better than light base rails or whether high section rails are better than low section rails. You can think out most any result from those and it comes too largely from the conditions I have mentioned, and from the fact that the periods of the rails in the track are different. It is well shown by these diagrams that most of the rail failures occur in the first four years of the life of the rail, but we continue to receive reports from those particular tonnages of the rail all through their life and I think there are fewer failures toward the latter part than toward the beginning. Therefore the same age of rail does not always compare; but we think we can get some very general ideas from the information.

The association is requested to approve of a change in a few of the forms which have been used for collecting rail failure statistics, because in making these up we have found changes desirable, and as this is a time for printing the manual, we would like to have them as complete as possible before they go in. This information is given on page 11, Bulletin 121. The main change is in Form 2002-A: "Report of Rail Failure in Main Tracks." And it is desired to change the unit for comparison from percentage as heretofore in the blanks to appear on failures from 10,000 tons. The same unit will then be used for the diagrams and for the tabulated statement. At the present time, two units are used, one for the diagram and one for the general statement. Our experience leads us to believe that the diagram unit is the preferable and that is the object in requesting the change in these forms. Form 2002-B naturally follows from 2002-A. The change in the laboratory report is simply a correction in the headings, introducing the words "per square inch," omitted in the former report. That is 2003-A. And the only remaining change is 2004-D, "Position in ingot of steel rail."

The changes in these forms, as recommended, were approved.

J. A. Atwood (P. & L. E.): Regarding the further plans of the committee arrangements have been made for manufacturing a certain number of rails by the Cambria Steel Co., the Lackawanna Steel Co., the Maryland Steel Co., the United States Steel Co., the Pennsylvania Steel Co. and the Bethlehem Steel Co. Some will be open hearth and some Bessemer. These rails are to be tested chemically, physically and possibly on the revolving machine of the Pennsylvania Steel Co. and on a machine which the Maryland Steel Co. has built for testing the ability of a rail to resist crushing. These rails will also be tested in the track test, and a certain number of them will also be tested in service. This series of tests will take a long time, but we may have some results to present at the meeting next year. We have engaged Mr. Wickhorst of the C., B. & Q., to assist us in this respect in looking after these tests. He will give his personal attention to the making of these tests and to the guiding and directing of the committee and assisting the committee in every way he can.

We have made, as you know, several tests of rail joints at the Watertown Arsenal. The result of those tests have been tabulated and will be presented in a Bulletin to be published shortly. Drop tests which have been made at the Maryland Steel Co. have already been printed in bulletins. This covers, I believe, in a general way the actual tests which Committee A has had under way.

Mr. Churchill: I don't want to have the association think that we have agreed in every little detail with the Manufacturers' Committee but we have gotten together as closely as we can, and we have obtained substantial agreements on the greater part of these specifications.

The paper by J. W. Kendrick (A. T. & S. F.) on Conservation of Cross Ties by Means of Protection from Mechanical Wear was then presented by the author and illustrated by lantern slides. This paper is published in another column.

UNIFORM SIGNALING.

A. H. Rudd (Penna. R. R.) chairman of the Committee on Signals and Interlocking, presented the following answer to the minority report of that committee during the discussion of the report:

The committee believes that its report on uniform signaling fully covers the subject and has no additions or further explanations to make. The minority report sets forth certain objections and it is our belief that time will be saved if an opportunity is given the committee to answer these objections of the minority (which has studied the subject probably more carefully than any member outside the committee) as, if we can dispose of them, the way will be cleared for action. The following page numbers refer to pages in Bulletin 119, in which the majority and minority reports were published:

Page 71. It is unfortunate that the minority included paragraphs (a) and (b) in a report to this broad gage association. The statements are really not arguments, for if the system is a good one, the official titles of its sponsors cannot injure it, and if it cannot be commended, no such titles should be used to bolster it up—it should stand or fall on its merits. However, the statements have been made and as they carried considerable weight in the Signal association, and as they possibly affected some votes of that letter ballot (which resulted in 235 votes for the report and 311 against it, while two-thirds vote was necessary for adoption), it devolves upon us to answer them despite our embarrassment, for it now becomes necessary to tell you what a wonderfully well equipped body of experts we are—a fact which should be self-evident to all men of discrimination, but upon which the minority casts a doubt. We apprehend that a chief engineer approving designs for a classification yard has glimmerings at least that it is to be used for the passing through it of cars, and from some of the discussion had here on the subject of momentum grades, for example, it is to be presumed that some engineers at least know something about the requirements of the transportation man; similarly it is fair to suppose that a well-equipped signal engineer must of necessity understand the requirements of the traffic he facilitates and safeguards, and as he makes a specialty of this work, that he is better fitted if he understand his business, to devise a uniform system of signals, than a superintendent, whose desire is to attain certain ends and whose study of the means to attain these ends must perforce in most case be perfunctory; although it cannot be denied that under the spur of the discussions in this and the Signal association some superintendents have given the subject more thought in the past four years than all the superintendents on all the roads ever gave it before. I do not wish to be understood as implying that our honored vice-chairman is disqualified as an expert because he has become a superintendent. We claim that this committee is made up of just such well equipped competent signal engineers as those referred to and we offer ourselves as living proofs of the statement. This committee is composed as follows: Of men who make, or have made until recently, a special study of signaling, majority 14, minority 2; operating men, on whom such stress is laid, majority 3, minority 3; one not signing either report, engineering in close touch with operation, majority 1. These men do not represent any roads or systems in this voluntary organization;

they represent their own individuality, untrammeled by instructions of their operating officers, superior officers or any one else. It is true that the Pennsylvania has two men on the committee, the Baltimore & Ohio, two, and the New York Central Lines five, but the fact that these five happen to be employed on the component parts of a great system, which parts have different practices, does not warrant the implication of prejudice and certainly a responsible position on the New York Central Lines is not prima facie evidence of mental disability or lack of knowledge, or judgment—in fact, these are the men who are best qualified to design a uniform system, because they have to deal with the complicated as well as the simple problems of track layouts and signaling. The Pennsylvania Railroad, for instance, has problems in no whit different from those of the western signal engineers. We have approximately, 456 miles of four-track, 110 miles of three-track, 1,230 miles of two-track line, a total of 1,786 miles, and 3,500 miles of single track—two-thirds of our mileage is single track. And, on 445 miles of this we had, a year ago, only from 2 to 10 movements daily and on 525 miles more, from 11 to 18 movements daily. It is true that there is less four-track west of Chicago than east of it, but the western roads are growing and they will soon be confronted with the problems which are now vexing many of the majority members and will appreciate more fully the need of the information we propose to give, and this problem covers the whole coun —no east and west issue should be brought into it; and, in fact, some of the busiest four-track road is right around Chicago—and they give in a different way just these very indications.

It will be noted that the minority offers no substitute scheme, but confines itself to criticising. Last year Mr. Stevens presented a scheme and it was illustrated in the Proceedings. Mr. Clausen presented a scheme to the committee, this scheme being discussed at the Signal association last March. Neither of these schemes met the approval of your committee. It is fair to suppose these schemes were in the minds of the minority when its report was made. It states that our schemes represents the opinions of signal experts rather than those of men actually engaged in railway operation. Is this a fact? No road, to my knowledge, has adopted the basic principles of the scheme advocated by Mr. Stevens. If I am wrong he will be able to correct me later. No road, as far as I know, has adopted the fundamentals of Mr. Clausen's scheme, and it is in two or three fundamentals only that our differences lie. There is no difference of opinion as to the advisability of upper quadrant arms approved by this association, little, if any, on green for clear, approved by this association none on the automatic signal. The chief differences are on the use of the mid-position of the home signal arm instead of a second arm to indicate a divergence from the main track, the addition of a permissive indication for those roads who believe they require it, and the question whether the distant signal should be considered as giving the engineer a right to proceed to the home, expecting to find it clear. Is the vice-chairman's own road, which he implies he represents, using his mid-position for diverging routes on new work and renewals? On the other hand, the B. & O. is using the primary aspects recommended by the committee, except the use of green for clear; The New York Central operating officials have endorsed the committee's scheme; at least, to such an extent that they have adopted it for all new work and renewals, with little change. All the new interlockings on the L. S. & M. S. are arranged in this way, and the basis of the system is being used on many others; at least, this is my understanding. Transportation officers of the Pennsylvania Railroad, from general manager down, have, with few exceptions, endorsed practically all the primary aspects (and we have adopted 3-pos. upper-quadrant for new work and renewals on our lines east of Pittsburgh within the past week). Further, we are going to use automatic signals with one pointed arm and two lights staggered; the interlocking signals three-arm, with top arm for high speed, second arm for medium speed, and third arm for low speed; distant signals approaching interlockings will have two arms with staggered lights to correspond with the high medium speed arms on the interlocking signals; distant switch signals are to be of the one-arm automatic type. It would appear, therefore, that some operating officials of good standing approve the scheme.

Page 71. We believe that this argument is sufficiently answered in the body of the report under the caption "Object of the Report," except as reference is made to the American Railway Association. As that association has endorsed the upper-quadrant and made optional the use of green for clear, and has never made any rulings on the other principles enunciated in the report which are at variance with the recommendations of your committee, it is fair to suppose that if this system meets the approval of this association, it will have as much chance for adoption, if the A. R.-A. sees fit to recommend for adoption any uniform system, as some other which it has not been considered advisable by the minority to submit for your consideration. Certainly if this association should decide not to present any scheme to the A. R. A. for fear it might not approve it, the decision should be made of having annual reports presented on it.

Now, as to the seven specific objections:

Page 72. (a). The minority states: "The 45 degree position of the arm is at present used indiscriminately for caution signals, whether for distant signals, permissive signals or for some other purpose." This statement is perhaps a little misleading to those who are not experts. It is used perhaps indiscriminately on one or two roads for the distant signal indication and the permissive, but on a number of roads 45 degrees is used for the distant only (at least, in the new U. Q. installations), and on most other roads the day aspect for the distant signal at caution, is a fish-tail arm horizontal and the permissive a square end arm inclined downward or upward from the horizontal. So they are not used indiscriminately generally to-day. As to the some other purpose, the minority should amplify. We do not know of any instances where the 45-degree position of an ordinary semaphore signal is used, for instance, as a slow sign for track under repair, which requires caution, nor for diverging from the main track, as advocated in committee by the minority members, and we would be glad to be enlightened as to other purposes for which it is used. The committee recommends its use not as the minority states, for the distant signal indication only, but for the permissive as well, but it recommends a distinguishing mark when it is used for the latter indication, in order that the engineer may know whether he is to stop at a definite point ahead, or look out for a train in a long block moving at perhaps varying rates of speed. While it is true that very little discussion was had on this particular point in the full committee, it certainly had plenty in the sub-committee, and, further, little discussion was needed in the full committee, for, as the minority well states, it was (after consideration) "held by the majority as axiomatic."

(b) On page 57, you will note the indications presented in 1908, where routes were specified; the next year the word route was eliminated by the vice-chairman, who was given the task of correcting the table and bringing it into accord with his watchword, "The action required of the engineman in the control of his train." This year it appears that the original table was right. The revised table is now considered wrong. Ever since the top arm has led to the straight or through route at interlockings, it has, in the clear position, given the indication that the route was set up on which, unless prevented by some other cause, full speed could be maintained, and ever since that time the second arm has meant reduce speed, because the train was going to diverge. Some roads displayed indicators to designate the track and then discarded them. Some roads used three arms, the second arm to govern with traffic and the third against traffic; not because of routes to be shown, according to our analysis, but because they realized it was not safe to give the same signal for different rates of speed; in rare cases four arms were used, if there was a junction with three running tracks. I have never heard of a road having six or seven diverging routes, however, as a four-track joining a four-track, which used eight arms, signaling each route separately; the routes, as the minority say, were grouped, and not only common practice, but the action of this association, gives approval to the arrangement of the top arm for the high-speed route, second arm for medium-speed route or routes, and the third arm for low-speed route or routes, and if it will clear the atmosphere and simplify matters in the minds of any to add the word route, it can easily be done; the point in our minds is not important enough to require much discussion and we have followed the wording of the A. R. A. The statement that the assignment of arms has not had full discussion in full committee depends for its accuracy on the definition of the word full. The location of arms was discussed in connection with Mr. Stevens' scheme, at the signal meeting last March, and at the meeting of the committee in Philadelphia, at which Mr. Stevens was present. To the best of the chairman's knowledge, both of these matters have been open for discussion at all times in the committee meetings. If they have not had full discussion, the reason is, it is believed, that most of the members were convinced of their correctness and were not disposed to join in prolonged discussion.

Page 72. 2d. "The majority scheme has too many aspects and indications which are difficult to remember and understand and will be confusing to trainmen and enginemen."

As the minority does not present its so-called simplified scheme, no comparison can be made, and we are naturally at a disadvantage in argument. It is fair to state, however, that the 96 pictures will probably never appear on any one engine division, and certainly will only need to be read one at a time. In view of the fact that some roads now have, as stated by the vice-chairman in one of the earlier discussions, as high as 125 aspects, at the worst this scheme is simpler; as a matter of fact, the primary aspects consist of one, two or three-arm interlocking signals and an automatic block signal, and a switch target, all in use on the great majority of roads that have any signal installations of any size, a special mark to show permissive block, now shown by a distinctive position of the arm on many roads, slow track and resume speed signs of some kind are almost universally used, and a signal for block office closed is new and needed. If you have no occasion for signals, you would not need any of these aspects.

The minority says, page 73: "The engineer of a high-speed train should never be in doubt as to the meaning of a signal if he is to run safely; the signal should mean something perfectly definite to him, which he cannot mistake." We endorse this sentiment, and yet the simplified scheme presented by the minority for approval of this committee used the 45-degree position of the upper arm when there was a train in the block, perhaps within 300 or 400 ft. of it, when the next signal was at stop; when the next signal was at proceed with a route set up which could be run safely at 40 miles per hour; or for diverge right at the signal, safe speed 40 miles per hour. What a wealth of definite information, all embodied in one aspect! It's like saying that all the letters of the English language are included in the alphabet, and if you say "alphabet" to a man you've taught him the language. If you say caution to a man when caution is not needed, you mislead that man and you set a trap for him. All of you who have had anything to do with signals know that in the days when discipline was lax, a distant signal would be left at caution by a lazy operator, sometimes for all except two or three trains daily, and that engineman so finding it used to disregard it, and when interviewed would say: "It's always that way, it doesn't mean anything." The proposed scheme does give just that information which is needed and required by practical men on roads which have reached a considerable development. The simplifying of a system by the process of omission is a poor policy.

Precision vs. Brevity is a fair summing up of the situation, but the minority advocates precision by employing brevity.

The reference to train orders is very apropos, the train orders should be very brief, they must be exact. The application to signaling is obvious and need not be enlarged upon.

Page 73. 3d. No additional indications are necessary. We take flat issue with the minority members. The wording is that of the American Railway Association, to quote:

"Distant Signals—Name as used in rules, Caution Signal; indication for enginemen and trainmen, proceed with caution to the home signal; occasion for use:—home signal at stop, route is not clear.

Name as used in rules, Clear Signal; indication for enginemen and trainmen—proceed. Occasion for use:—home signal at Proceed route is clear."

Certainly the A. R. A. is more likely to favor its own phraseology than a departure from it, made on such hair-splitting lines, and we eliminated the words quoted by the minority on page 74 for the reason that we desired to follow the A. R. A. wording as far as possible. An arm at 90 degrees giving the indication "Proceed" involves no restrictions by signal indication and is the converse of Stop. Is there any reason why the same unrestrictive indication "Proceed" should not remove other restrictions that might be indicated by other positions of the arm or arms; any reason why it should not be the converse of other restrictive indications than stop—of all restrictive indications that might be given by the particular signal?

Page 74. 4th. In the preceding paragraph we were criticised in following the Code; in this paragraph because it is said we vary from the Code.

We have discussed aspect No. 8, for the past two years, in committee, before the Signal association, and here, and further discussion is unnecessary except to present the remedy advocated by the minority in committee.

The committee feel that if tracks are so arranged with long crossovers that a train may safely pass the home signal at 40 or 50 miles per hour, but cannot pass it at 70 or 80 without a bad lurch, the engineer should be warned of the safe speed, but should be allowed to take advantage of his track layout and not be required to reduce speed at the distant, prepared to stop at the home. That is, provided signals are installed to expedite movement and not simply to restrict it as much as possible. The aspect No. 8 they claim is not logical and their suggestion for correcting it is a very simple one. Eliminate the indication entirely—don't tell him he can go when all is right, but tell him to reduce speed prepared to stop at the home signal, because, forsooth, the occasion for use is pass home signal at 40 or 50 miles per hour. This process amplified and logically applied to a home signal, would reduce that to a one-arm signal only 0 then stop all trains that have to diverge at low speed, and flag by them.

Page 74, 5th—The committee stands on the principle that in a completed, uniform scheme, there should be two lights on each signal governing train movement, first, as a marker to distinguish between automatic and interlocking or telegraph block, (the action of this association having already asserted that a distinction of some kind is necessary) and second, as a marker, to show the location of the signal if the other light is extinguished at night. If this marker should not be red and display a stop signal when the other light is out, following strictly the rule that a signal improperly displayed is to be regarded as a stop signal, what color should it be? Obviously not green—proceed; obviously not yellow—caution; from our point of view obviously red, and red only. From the minority standpoint of brevity and simplicity, logically eliminate it entirely; but to do this no signal should have more than one light, consequently no diverging low speed routes could be signaled by fixed signals logically.

The Standard Code is admittedly a skeleton and not complete—one of its framers told me less than a year ago that it ought to be amplified and completed. Obviously in a complete scheme we give more indications than in an incomplete one—for confirmation of this statement see any good dictionary. Aspect No. 8 is absolutely consistent, in that it indicates unmistakably the position of the high and medium speed arms at the home signal, and that is what the fast runner wants to know.

Page 74, 6th—The same aspects are used for different indications and different indications for the same aspects. This sounds as if there were two objections, but both clauses mean the same thing. These variations are incident to the necessity already shown for information in the other positions of the arm—"the same aspects for different indications," is not an objectionable feature. If, however, these aspects might be misread so as to convey to the engineman a more favorable indication than he should receive, then they would be objectionable. This, however, is not the case.

Page 74, 7th—I will read the first three paragraphs on page 51. If the members have done as the committee requested, they can determine (with this statement of the minority as a guide) whether their operating officials are practical or impractical railroad men and those of you who are operating in an impractical way and who have anything to do with signaling, will perhaps recollect requests from such superintendents for more information rather than less.

The minority claims that the distant signal cannot be relied upon and that it should not indicate next signal at proceed, but should, in the clear position, indicate proceed to the next signal. How? Obviously in the only safe way, if it cannot be relied on, that is prepared to stop. Why then display the caution aspect, which means the same thing? More elimination, more brevity, more uncertainty, more delay, and less safety.

On this basis truly the American Railway Association is composed of members carrying on impractical operation, for the Code says: Distant signal, indication proceed—occasion for use—home signal at proceed. If the minority is correct in its treatment of the distant signal, where does the A. R. A. stand? The majority believes it is on firm ground.

How many of you are ready to do away with distant signals where high speed is required, and how many are ready to say to their engineers: "A home signal at stop means stop." A distant signal at caution means "prepare to stop any point beyond this signal." And the distant signal at clear "you have a clear track to the home and our apparatus is arranged to comply with A. R. A. requisites, so that in case of failure it will indicate caution, but nevertheless you mustn't place any dependence upon it, because it is unreliable?" In the 3-position automatic system the distant and home are combined in one arm. Are you prepared to say: "When the automatic is clear, reduce speed at once, the block is clear, but we don't rely on the indication?" Interlocking has been known to fail. Must a man prepare to stop at each clear home signal and feel his way? We endorse present practice. Do you say it is all wrong, dan-

gerous, subversive of discipline, and that it, by its encouragement of lax discipline, will lead to the use of cab signals, automatic stops, etc.? You have the word of the minority, three of the four men being operating men of note, that discipline cannot be maintained if this use of the distant signal is allowed.

The issue is clean cut. It means that you cannot discipline a man for passing a home signal and that your men will become careless and disregard the home signals, unless you require them to reduce speed so that they may stop at any point within vision beyond the distant signal and this on a crooked road. And this is the deliberate, considered opinion of the three operating experts of the minority. The committee states that most roads today use the distant signal is precisely the way condemned by these experts and asks you if discipline is lax; whether your men under this practice disregard your home signals and whether you will, by your votes, endorse the position of the minority, or will back up your committee, in the light of your experience, bearing in mind the fact, gentlemen, that signals do not enforce discipline; that duty devolves upon the officials in charge of transportaion. Page 76—In conclusion—In recommending a portion of the report for adoption the committee considered that this portion, covering the primary indications and aspects, had been worked out to a conclusion through several years of study and discussion during which no radical changes had been made. In the case of the secondary indications and aspects, embodied in the progress report, various schemes have been under discussion and the one presented was developed and agreed to within the past year. It therefore seems advisable to allow more time for consideration and possible revision before final action is recommended.

The only question affecting the wisdom of adopting a portion of the report, as recommended, seems to be, whether revision of the secondary system might make changes in the primary system necessary. On this point the committee feels no fear whatever. The report shows that a practical secondary system, in harmony with the recommended primary system, can be devised and the primary system is so we estabished that, beyond question, any desirable changes in the secondary system can and will be so made as to require no revision of the primary system.

The two following paragraphs the committee accepts as axiomatic. Read them. The system recommended will certainly help to bring about the condition stated in the first and involves no added mechanical or electrical complications that could result in an increased number of failures and false indications as compared with good signaling of the present day.

The minority says "any system which says any signal indications that a clear block signal means that the "Block is clear" of necessity encourage laxity." The A. R. A. Code says: Clear Signal—Proceed. Occasion for use:—Block is clear. Which is right? What use are block signals under the interpretation of the minority?

Evolution, not revolution is the object of this committee and we believe this association. Where is the minority position short of revolution?

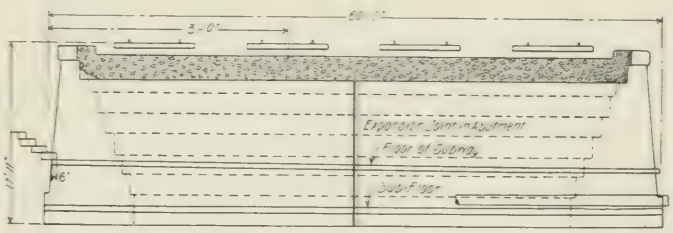
In the 2nd paragraphs on page 77, the minority defines what a consistent uniform system should cover. The committee agrees with this basis and submits its system as designed in conformity with it.

GRADE SEPARATION IN JOLIET, ILL.

The City of Joliet, Ill., with a population of about 35,000, is located 40 miles southwest of Chicago, and is connected with that city by three double track trunk lines, the Chicago, Rock Island & Pacific, the Atchinson, Topeka & Santa Fe, and the Chicago & Alton. A single-track line of the Michigan Central terminating at Joliet, connects with the main line of that road at East Gary, Ind., and the Elgin, Joliet & Eastern forms a double-track connection for frieght transfer with every road entering the Chicago territory. The Santa Fe and the Alton handle only through traffic; the Rock Island has both through and suburban service; the Michigan Central does a local passenger and freight business; and the Elgin, Joliet & Eastern handles only freight, of which a large amount originates in the Joliet manufacturing district.

All the roads entering the city except the Elgin, Joliet & Eastern, cut through the business district and cross the busiest streets. The Rock Island and Michigan Central are roughly parallel and approximately 700 ft. apart, running east and west. The Michigan Central's line ends in the eastern part of the city where its passenger station, freight depot and yards are located, but has two connecting tracks running west to a connection with the Santa Fe and the Alton. The Rock Island alinement has a I deg. 50 min. curve to the south near the center of the city, which ends in a 2,500 ft. tanget running southwest. This location is objectionable to the adjacent property owners on account of the odd shapes and sizes of lots that are formed, and to the public because the right-of-way cuts the corner of the square on which the court house is located, the tracks running between the court house building and a G. A. R. monument. The Santa Fe and the Alton are parallel and adjacent for the greater part of the distance through the city. They run north and south, crossing the Rock Island at grade near the business center of the city.

On account of the amount of street traffic in the section cut by the railways, it was desirable to separate the grades at all crossings in the business district. A general ordinance covering this work was passed by the City Council in January, 1906. The preparation of plans required some time and no work was done until the summer of 1907. Then the business depression made progress slow, and although the ordinance specifies December, 1908, as the date

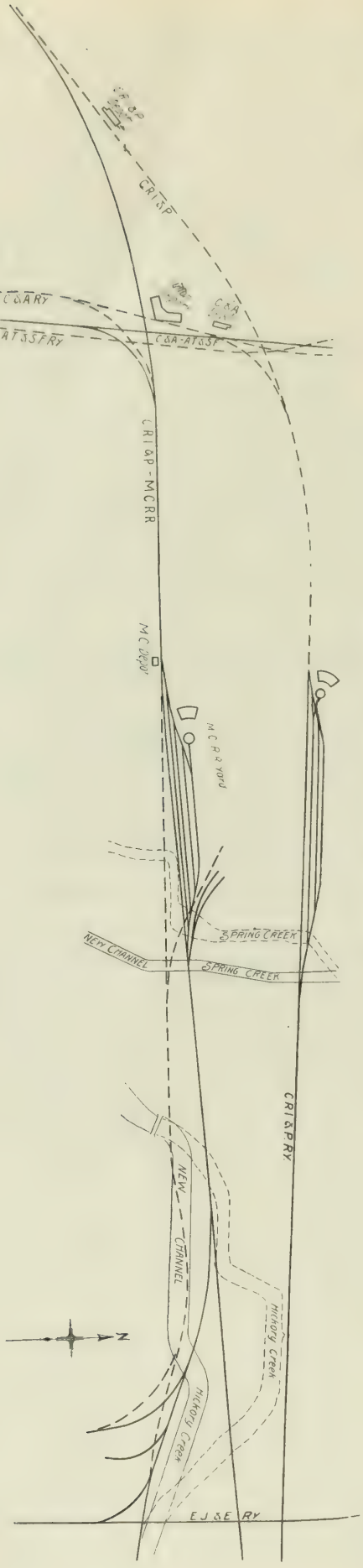


Longitudinal Section of Foot Passageway Under Rock Island and Michigan Central Tracks at Joliet, Ill.

for the completion of the work it will probably be late in 1910 before it is finished.

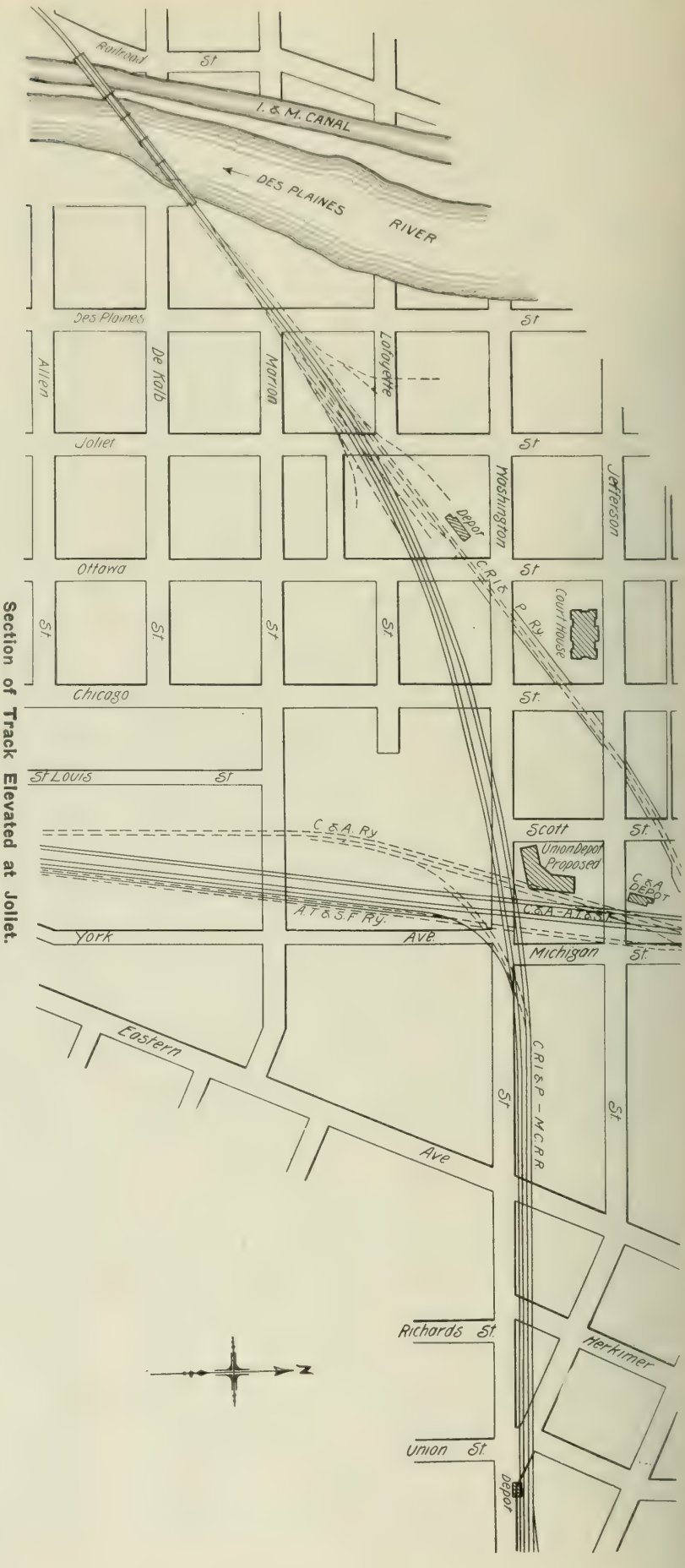
The Rock Island under the terms of the ordinance abandons its right-of-way through a part of the territory affected, and the Michigan Central agreed to change the location of its line slightly, so that after the work is finished, the two roads will use the same elevated line. This permits the elevation of tracks and building of subways to be done jointly by the two companies. An important argument in favor of this plan was the desire of the county authorities and the public to have the tracks removed from the Court House square. The new union passenger station which is now being planned is also a result of this re-location, since it furnishes a common intersection point of the four roads at which to locate the building. The plan as adopted necessitated the abandoning of considerable property and the buying of more by the Rock Island and Michigan Central, but this expense was offset by the economy of building one embankment instead of two and of conducting the entire work with one field organization.

The Rock Island re-location is approximately two miles long, the maximum distance between the old and new line being about 800 ft. The new line to be used by both Michigan Central and Rock Island, is about 150 ft. from the present line of the Michigan Central at the point where the two re-located lines meet and from this junction west, the joint line and the present Michigan Central line slowly converge, meeting near the present passenger station of the latter company. A special problem in this relocation work was the changing of the channel of a shallow winding stream, known as Hickory Creek, whose natural course crosses the new line of the Rock Island east of the junction



Relocation of Railways in Joliet, Ill.

New lines shown solid.



Section of Track Elevated at Joliet.

with the Michigan Central, runs west along the joint line about 1,500 ft. and crosses it again. To eliminate one crossing a 100 ft. channel was dug which will carry the stream under the Michigan Central tracks east of the junction of the two roads, and then west parallel with the tracks to the inter-section with the old channel. With the exception of the sharp bend necessary to cross the Michigan Central, the new channel will be straight, so that in flood seasons, the water will be removed more rapidly than at present. The two tracks of the Michigan Central are carried over the new channel on a girder bridge similar to the subway bridges mentioned below. Two piers are placed in the channel, the total width being increased to allow the same clear waterway as in the standard channel section.

Another small stream called Spring Creek, which crosses the joint line a little farther west, has recently been straightened and deepened by the two companies working in conjunction with the Spring Creek Drainage District, and this new channel was bridged by reinforced concrete floor slabs carried on longitudinal steel girders. of 60 ft. span. The structure carries six tracks, spaced 13 ft. center to center. The floor slab is built in sections 13 ft. wide separate by mortar joints, each section resting on two girders on 7 ft. centers placed symetrically about the center line of the slab. The slab reinforcing is of deformed bars, spaced on 4 in. centers, every third bar of the lower plane reinforcing being bent up to carry the shearing stress. Drainage is provided by crowning the slabs 2½ in. and embedding 2 in. gas pipes vertically in the concrete at 10 ft. intervals along the joints.

The section of track to be elevated is approximately one mile long, extending from Railroad street, just west of the Desplaines river, to Collins street, on the east side. There are eight subways and one foot passageway to be built in this distance.

With the exception of Chicago and Scott streets, all the subways are of the girder type with I beams carrying a water tight floor pan 10 ft. in width, which retains the ballast, the open spaces between the outer edges of floor pan and girders being filled with concrete to give a water tight construction over the entire bridge. Twelve feet of clear headroom for the street traffic is required except at Chicago street and Eastern avenue, where 13½ ft. headroom is required to accommodate street railways. The abutments are of mass concrete, the proportions being 1:3:5 except in the bridge seats and back walls, where a 1:2:4 mixture is used. Plans for the Chicago and Scott street subways are not yet decided on, but will probably be of the concrete encased I-beam type.

It will be necessary to raise the bridge over the Desplaines river one or two feet in order to get the grade high enough at Railroad street, to enable a subway to be built with the required clearance and with a free drainage into the river. The raising of the bridge will not be difficult, as the abutments and piers are of concrete and of limestone quarried in the locality, and while the bridge is jacked up under traffic, a course of stone or concrete of the desired thickness can be laid.

At Collins street the City permitted the closing of the street to vehicular traffic, but insisted on having a foot passageway under the tracks. This was made by spanning a 15 ft. opening with a reinforced concrete slab. The slab is 2 ft. 6 in. thick, 54 ft. 4 in. long, and carries 4 tracks. The lower plane reinforcing consists of ⅞-in. square bars set longitudinally on 3 in. centers and ½-in. square bars set transversely on 2 ft. centers. In the upper plane ½ in. square bars are spaced on 2ft. centers in both directions. The web stresses are provided for by bending up three of every four of the ⅞-in. bars and by the addition of ½ in. square bar stirrups. The slab is crowned 3 in. longitudinally and carries a minimum depth of ballast of 8 in. The drainage carried over the rear wall of the abutments enters a layer of coarse filling which conducts it to a 4 in. vitrified sewer pipe extending the full length of the abutment and draining into the gutter outside of the retaining walls. The slab top and rear walls of the abutments are waterproofed by a coating of asphalt paint.

The retaining walls are of mass concrete, of standard gravity section. The dimensions vary with the location, the width of base being kept at least one-half the height. The inner surface is battered 1 to 3 for a distance of about 5 ft. from the top and from there down it is stepped off with bearing surfaces 10 in. wide, and rises 2 ft high. The outer face has a batter of 1 to 12 with a 1 ft. 6 in. coping at the top. Good footings for all masonry work were obtained at a maximum depth of 5 to 7 ft. below the surface. Bed rock is very near the surface in some places and in others a footing on boulders and coarse gravel was used. The footings were made of concrete in rough forms with reinforcing bars extending about 18 in. above the surface to form a bond with the wall. Drainage is provided by embedding 4 in. drain tile in the wall just above the ground level at 20 ft. intervals. The concrete proportions in the retaining walls are the same as mentioned above for the subway abutments, 1:3:5 for the body of the wall and 1:2:4 for the coping. The mixing was done in a 22 cu. ft. capacity Smith and Koehring mixer and the materials before and after mixing were handled in Koppel cars.

The problem of filling to required grade was a comparatively simple one. The necessity for caring for traffic during the work was eliminated as the new line does not seriously interfere with the existing operating tracks. The material for filling was obtained from the cut made for the new channels of Hickory Creek mentioned above and consisted of fine gravel, coarse gravel and boulders in various proportions. It was very hard to handle on account of a natural cement filling which made portions of it as compact as solid rock. Parts of the deposit could be handled with a steam shovel, but most of it had to be blasted down from the vertical working face. The filling was done from cars by unloaders and spreaders.

The work on the Santa Fe and the Alton is divided into two sections, and by an agreement between the two companies, the Santa Fe prosecutes all work north of the crossing with the Rock Island Michigan Central line and the Alton all south of that point. Work by both these forces has progressed somewhat more slowly than the Rock Island Michigan Central work, and although most of the filling is done, none of the permanent subways are yet in place. The two companies adopted very different methods of accomplishing the filling work. The Santa Fe built a double-track pile trestle and filled from that while the Alton raised the tracks as the filling progressed by tamping in filling sand.

The joint work of the Rock Island and Michigan Central is being done under the general supervision of J. B. Berry, chief engineer of the Chicago, Rock Island & Pacific, and G. H. Webb, chief engineer of the Michigan Central. The field work is in charge of G. H. Harris, assistant engineer, Michigan Central Railroad. The Santa Fe work is being done under the general supervision of W. B. Storey, Jr., vice-president of the Atchison, Topeka & Santa Fe and the Alton work under the direction of W. D. Taylor, chief engineer of the Chicago & Alton.

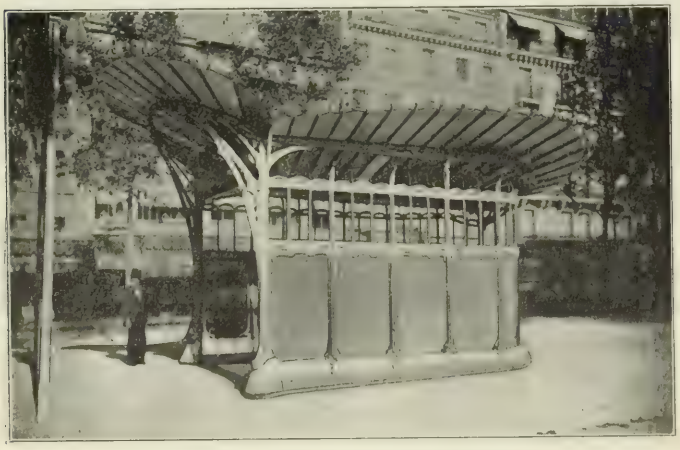
R. Emerson, formerly assistant to the general manager of the Lehigh valley, who has recently returned to the motive department of the Atchinson, Topeka & Santa Fe, with which he was connected before going to the Lehigh Valley, was a visitor at the convention and the exhibition at the Coliseum Tuesday.

SHELTERS FOR SUBWAY STAIRS.

The Boston Transit Commission, in passing on work in Boston, has discussed and illustrated various types of stairway shelters for subways.* The accompanying photographs show subway stairs in Boston and in other cities. Where the subway stairs in Boston were somewhat distant from other buildings, so that they did not obstruct the sight to and from them, the design of the shelter was such as to combine architectural beauty with adaptability to the particular needs of that subway station. This was the case with the stairway shelter at Scollay Square and at Boston Common. At Haymarket Square the shelter was designed solely for the purpose of forming a shelter over the stairway and adjoining sidewalk, and no attempt was made to give the structure architectural beauty.



Paris Subway; Open Stairway.



Paris Subway Station, Parte-Maillot.

The subway stairs at Old South Church and at Adams Square were near other buildings, and various plans were considered for making the shelters as serviceable as possible, and at the same time making them of such a shape as to give the minimum interference with sight from the buildings. The commission considered making open stairways, such as are shown in the pictures of the Metropolitan subways of Paris and the Berlin subway. It was decided, however, that this would not be satisfactory, and that something more even was needed than the half covering of the stairway, as shown in the picture of the New York subway entrance at Fulton street. The photograph of the stairway to the Washington street tunnel at Old South Church shows the design finally adopted by the commission.

This concrete stairway shelter was cast as a monolith, except for the window fixtures on the side, which were molded separately and bolted in the forms before the concrete for the rest of the shelter was poured. Wood forms were used, which were erected complete except for the lagging on top of the roof before any concrete was placed. The concrete or mortar was poured in a practically liquid condition and required very little ramming. The same set of forms were used with slight alterations for three shelters. Sheet glass was not used, because the commission thought that in most places where this type of structure had been used the glass had very quickly cracked. The photograph of the covering for the Paris subway at Porte Maillot shows, however, an exception to this rule. Pane glass was used for this shelter, but has not cracked.



Boston Common Subway Entrance.



Haymarket Square, Boston.

In answering criticisms of the design of shelter used at Old South Church, the Boston commission quotes from an article on "Expression in a New Material," in the *Architectural Record*, New York, April, 1908. The article in dis

*Report for the year ended June 30, 1908.



Budapest Subway Entrance.



New York Subway Stairs on Broadway.



Boston Subway at Old South Church.



Berlin Subway Stairs.



New York Subway; Fulton Street.

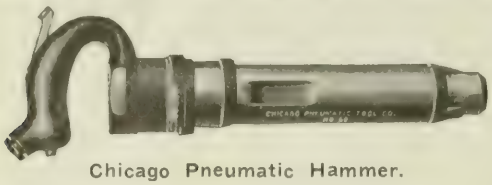


Boston Subway; Scollay Square Station.

cussing the design of concrete structures says: "The conventional form handed down to us in the motives of articulated stone and timber architecture should be abandoned, root and branch, because entirely without relation to monolithic construction; . . . ."

CHICAGO PNEUMATIC TOOLS.

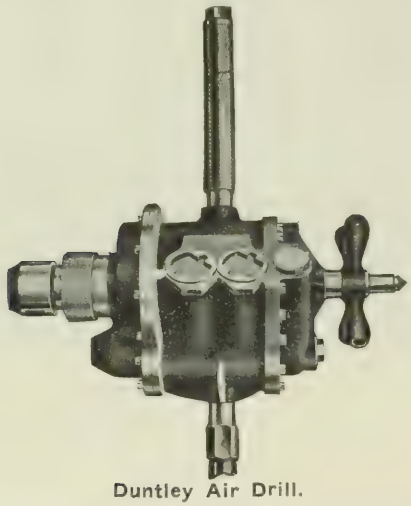
The range of adaptibility covered by the line of drills, made by the Chicago Pneumatic Tool Co., Chicago, seems not to have reached its limit and progress continues in the development of this tool for uses outside of the regular drilling operations. One of the recent applications is the combination of the Duntley 550-volt drill with the Boyer



Chicago Pneumatic Hammer.

angle gear in a track drill to accomplish quick and accurate work in track drilling.

Looking forward to the extended use of screw spikes, the universal adoption of which seems inevitable for the preservation of wooden ties, the Duntley electric spike driver



Duntley Air Drill.

provides the railways with the valuable tool for the application for screw spikes.

Several designs of pneumatic hammers placed on the market by this company for riveting, calking and chipping continue to hold their prestige and the company reports a gratifying increase in its output and in the number of users, both in this country and abroad.

SELLERS ANCHOR BOTTOM TIE PLATES.

The Sellers Manufacturing Company, Chicago, has on exhibit in Space 123 several different sizes of its Sellers anchor bottom tie plate. This plate has a corrugated bottom which takes a firm grip on the tie and holds the track to gage under very severe conditions and without tearing or injuring the tie. This plate is now said to be in use on more than 100 of the leading railways of the country.

The Road & Track Association has arranged to run limousine cars between the Congress hotel and the Coliseum on a five-minute schedule for the convenience of those who wish to visit the exhibition. To distinguish these cars from others, a banner bearing the name of the association, was attached to the car, but as all kinds of advertisements are prohibited on Michigan Boulevard, the banners were taken off and an American flag has been substituted, that the cars may be readily distinguished.

REGISTRATION.

These names belong on the Registration List in addition to those printed in another column:

Backes, W. J., Chief Eng., Cent. New Eng. Ry., Hartford, Conn.
Bagg, F. A., Eng. F. J. & G. R. R., Gloversville, N. Y.
Beagles, Fred, Asst. Eng., O. R. R. & N. Co., Portland, Ore.
Begien, R. N., Division Engineer, B. & O. R. R., Philadelphia.
Bergen, W. J., Asst. to C. E., N. Y. C. & St. L. Ry., Cleveland.
Beye, John C., Loc. Eng., C., R. I. & P. Ry., Chicago, Ill.
Chadbourn, W. H., Prin. Asst. Eng., C. G. W. Ry., Chicago, Ill.
Clausen, L. R., Supt., C., M. & St. P. Ry., Chicago, Ill.
Coburn, Maurice, Prin. Asst. Eng., Vandalia Line, St. Louis, Mo.
Cowper, J. W., Worden-Allen Company, Chicago, Ill.
Cutler, A. S., Asst. Prof. Ry. Eng., Univ. of Minn., Minneapolis.
Delo, C. G., Engineer M. W., Nat'l Rys. of Mexico, Mexico.
Denney, C. E., Signal Eng., L. S. & M. S. Ry., Cleveland, O.
Emerson, R., A. T. & S. F. Ry., Chicago.
Fulks, E. B., American Creosoting Co., Chicago, Ill.
Howard, R. H., E. M. W., C. & E. I. R. R., Chicago, Ill.
Jackson, E. D., Asst. Eng., B. & O. R. R., Baltimore, Md.
Khuen, Richard, Resident Engineer Am. Bridge Co., Pittsburg, Pa.
Kimball, G. H., Consulting Engineer, Detroit, Mich.
Kuehn, A. L., Genl. Supt., American Creosoting Co., Chicago.
Lee, E. H., Chief Engineer, C. & W. I. R. R., Chicago, Ill.
Long, M. A., Architect, B. & O. R. R., Baltimore, Md.
McNeill, J. E., A. T. & S. F. Ry., Los Angeles, Cal.
Merrell, G. W., Asst. to G. M., N. & W. Ry., Roanoke, Va.
Parker, Chas. J., Prin. Asst. Eng., N. Y. C. & H. R., New York.
Puder, F. R., Asst. Eng., Chicago Sou. Ry., Chicago, Ill.
Reichmann, A. F., Resident Engineer, Am. Bridge Co., Chicago, Ill.
Ritter, Louis E., Consulting Engineer, Chicago.
Safford, H. R., Chief Engineer M. W., I. C. R. R., Chicago.
Schneider, C. C., Consulting Engineer, Phildelphia, Pa.
Schwitzer, J. E., Asst. Ch. Eng., C. P. R., Winnipeg, Can.
Scott, Guy, Eng. M. of W. Pa. Lines, Toledo, O.
Shurtleff, A. K., Office Eng., C., R. I. & P. Ry., Chicago.
Simmons, I. L., Bridge Engineer, C. R. I. & P. Ry., Chicago, Ill.
Slifer, H. J., Gen. Man., C. G. W. R. R., Chicago, Ill.
Stewart, A. F., Asst. Chf. Eng., Mackenzie, Mann & Co., Toronto.
Walker, G. M., Jr., Asst. Eng., K. C. T. Ry., Kansas City, Mo.
Webb, Walter Loring, Con. Eng., Philadelphia, Pa.
Weston, C. V., President, South Side Elev. R. R., Chicago.
Wishart, J. A., Ch. Draftsman, C., R. I. & P. Ry., Chicago.
Woolley, B. C., Civil Eng., Sioux City, Iowa.

ROAD AND TRACK SUPPLY ASSOCIATION.

The annual meeting of the Road & Track Supply Association was held at the Coliseum, Tuesday afternoon, March 15th, for the purpose of electing officers for the ensuing year and also for the transaction of other business. The following were elected: T. W. Snow, president, Otto Gas Engine Works, Chicago; R. E. Belknap, vice-president, Pennsylvania Steel Co. and Maryland Steel Co., Chicago; John N. Reynolds, secretary and treasurer, western manager, Railway Age Gazette, Chicago. Executive committee: John McKinnon, Kalamazoo Railway Supply Co., Kalamazoo, Mich.; George Stanton, Cleveland Frog & Crossing Co., Cleveland, Ohio, A. P. Van Schaick, W. K. Kenly Co., Chicago; Azel Ames, Kerite Insulated Wire & Cable Co., New York; T. W. Wyles, Detroit Graphite Co., Detroit, Mich.; and George Isbester, Q. & C. Co., Chicago. A. F. Schleiter, Dilworth, Porter & Co., Ltd., Pittsburg, Pa., the retiring president, was elected ex-officio member of the executive committee for one year.

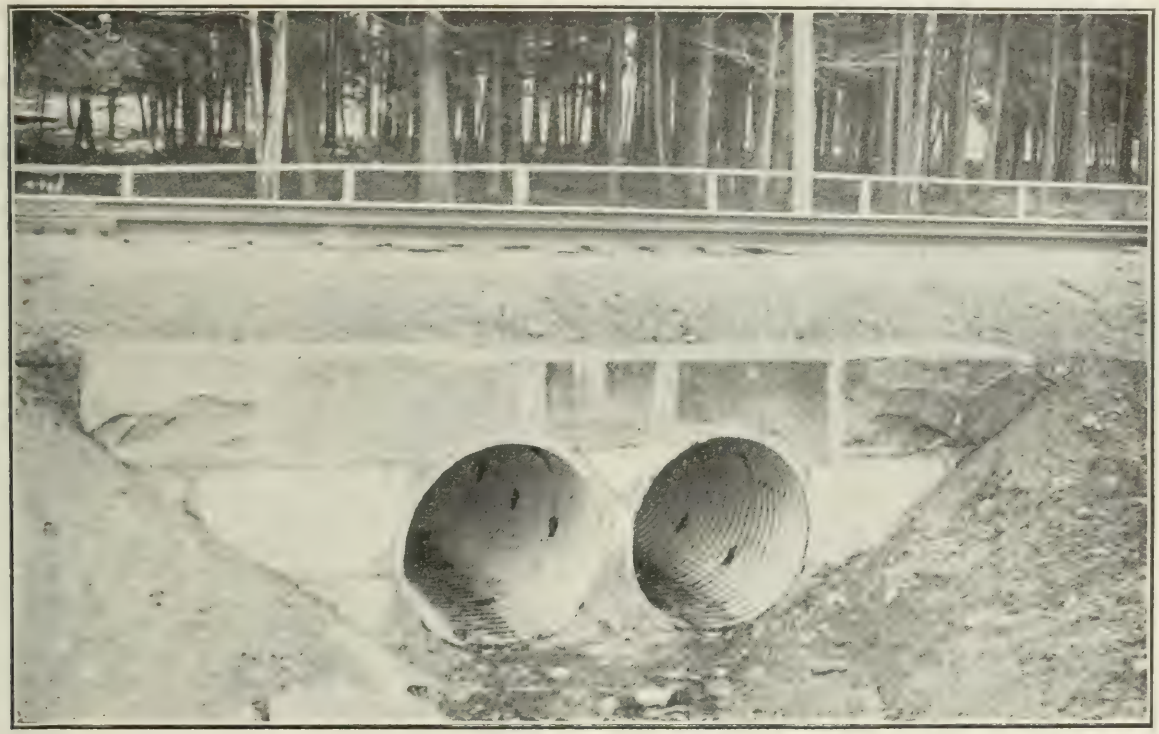
At the meeting it was decided to change the name of the

association to the Railway Appliances Association, it being considered that this name is better adapted to the purposes of the association.

CORRUGATED CULVERT PIPE.

Among the exhibits at the Coliseum there is one of an iron culvert pipe laid beneath a track whose ballast and bed is of a finely broken stone. The ends of the pipe are embedded in concrete walls and project slightly from the surface of the same.

It is safe to say that, a few years back, such an exhibit would have received but scant consideration from practical men, who would have seen in it all of the elements of an early and rapid deterioration from corrosion, together with the attendant inconveniences of a correspondingly early replacement. Sentiment, at that time, was divided between the desirability of using cast-iron and vitrified pipe. The latter possessed the advantage of an indefinite life, barring breakage, but did not have the strength to carry heavy concentrated loads and did its best work when well below the track. The cast-iron pipe was slow to rust and had the strength needed for use in any position, but would decay and did have a limited life. It was, however, heavy and could not be easily handled. The question was to provide a material that had the strength of the cast-iron, some approach to the life of the vitrified pipe and should posses an added advantage that neither of the others had—lightness.



Corrugated Culvert Pipe Used With Concrete Walls.

In all the navies and merchant marine of the world the corrugated furnace is in use. It is in the form of a corrugated cylinder, whose corrugations are uniform in depth and pitch and whose strength is varied by the thickness of the metal. It is possible, with the diameters in use, of four ft. and over, to sustain steam pressures of from 200 to 225 lbs. per square inch. such a pressure (200 lbs.) when applied to a furnace of 48 in. in diameter is equivalent to a uniform loading of 115,200 lbs. per lineal foot. This is merely cited to indicate the possibilities of the resistance of metal to external pressures when put into this shape.

It is this principle of which advantage has been taken in the designing of the corrigated culvert pipe in the exhibit to which allusion was made. In this work, of course, no such loads as that required for boiler purposes, will have to he carried, so the corrigations are made more shallow and the metal used is much thinner. In general, too, the imposed load will be of a different character, though there are indications that certain materials, especially some of the clays act exactly like liquids in the distribution and augumentation of their pressures. Hence it might occur that a load placed upon the top of a bank might be carried directly down to the culvert pipe beneath. If such a case were to be supposed, and a load of 30,000 lbs. were to be taken down vertically from a half tie length, it might happen that the culvert would be called upon to carry, say 9,000 lbs. per lineal foot. Tests have been made where the imposition was 22,300 lbs. per lineal foot with no injury to the metal, or more than two and a half times that of the heaviest locomotive, thus showing that the principle so successfully applied to steam boilers holds, as it ought, to the use of culvert pipes. It is evident, then, that strength has been cared for.

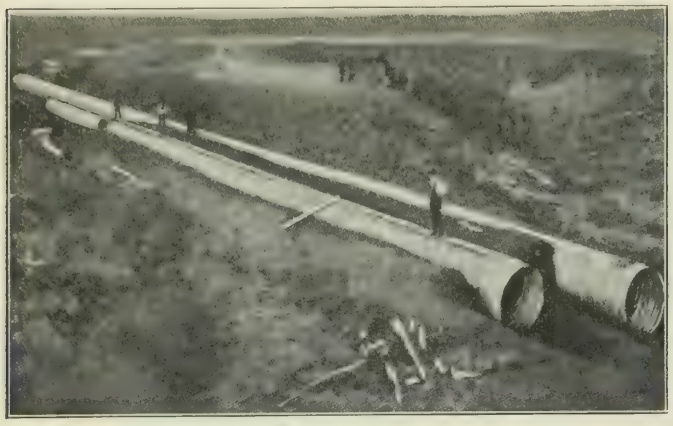
But of a far different character is the question of durability, and it does look risky to put a sheet of metal of from 12 to 16 gauge in thickness, in a bank subject to the direct action, not only of the water flowing through it, but to the leakings from above.

About eighteen years ago, it was suggested that the corrosion of iron and steel, was due to an electrolytic action caused by a current set up by the contained impurities, and it was urged that if a perfectly pure and homogeneous iron could be obtained, the rapidity of corrosion under ordinary conditions would be greatly decreased, and above all that what did occur would be distributed evenly over the surface and would not be marked by that pitting which is so characteristic of the corrosion of ordinary samples of iron

and steel. This theory is, now, very generally accepted as correct.

Quoting from a recent work on the subject: "all non-homogeneous metals and therefore all commercial iron and steels are doomed to decay unless adequately protected. In the case of the metallic impurities there which, like manganese, are themselves more liable to corrosion than iron, will act unfavorably." It was discovered, two years ago that "segregated manganese formed centers of corrosion." As for carbon, inasmuch as it allows hardening, it will act as a protection, "provided it is combined with the iron and uniformily distributed," but, "when present in the free state will, by contact action promote corrosion."

The problem, then, was to produce an iron that should be pure and being pure must be homogeneous. This found, the use of it for culvert pipes could be considered safe. The ingot iron that is rolled, corrigated and manufactured into culvert pipe, is claimed to be 99.94 per cent. pure.



Culvert Under Railroad Yards.

That is it is ferrite. The impurities are sulphur, phosphorus and carbon.

One sample tested showed.

Sulphur	.021	per cent.
Phosphorus	.005	,, ,,
Carbon	.02	,, ,,

Of these, phosphorus appears to retard corrosion.

It is not claimed, therefore, that the metal is absolutely non-corrodable, but that it is so pure and so homogeneous in its structure, that whatever corrosion does take place will be evenly distributed over its whole surface and will advance so slowly, that even the thin sheets used, are essentially indestructible.

The three points attained, then, are lightness, strength and durability, the three that go to make up the desirables of culvert construction.

As to its method of application, that depends upon local conditions solely, the character of the structure and the individuality of the engineer in charge. It may be embedded in a concrete wall at each end as shown at the exhibit, with the ground tamped about it dry or puddled. Or it may be used in an earth embankment, with no end protection, dependent solely upon the impermeability of the filling, to prevent leakage. Of course, it is not proof against leakage through the bank along its outer surface in the case of poor workmanship. But it has the strength to carry any depth of cover, or may be set so close to the rails as to sustain the direct thrust of the wheels.

In form it is a simple corrugated tube, made up of lengths of about 2 ft. rivetted together, and galvanized, though the galvanizing is done prior to the rivetting. One of the illustrations shows a culvert set less than its own diameter below the rails, and with a 50 ton engine above it. Another shows a twin culvert with concrete end walls, also close to the rails, while a third shows two long tubes set in place ready for the fill covering to be put on.

These are examples of the practical application of the idea, showing that it is one which appeals to engineers as a means of obtaining, at a low cost, a strong and light construction which gives promise of great length of life.

RAILWAYS AS CITIZENS.

By WILLIAM H. BOARDMAN. Editor of the Railway Age Gazette.

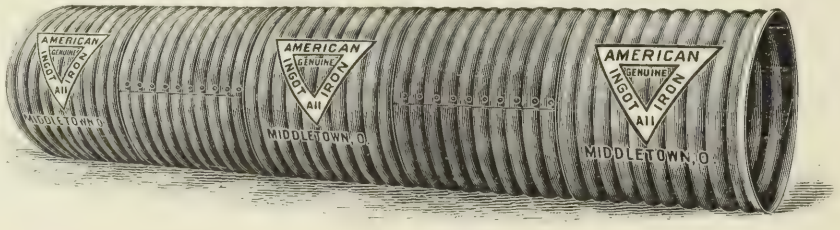
I know many railway officers who. at the time of the last election for President of the United States, felt somewhat like the log driver with three red-haired daughters. The oldest one had been long, overlong, in the matrimonial market, and she was detaining the others. He was anxious; his wife was anxious. When she telegraphed him that the oldest girl was engaged, he answered: "Thank God, the jam is broke." Looking backward, there are reasons for thinking that some of the logs in the jam are loosened, and that the railways have accomplished this by their own acts of citizenship.

In the Sherman Act the word "person' is used all the way through; but section 8 tells us that "the word person or persons, wherever used in this act, shall be deemed to include corporations and associations." This is a considerable enlargement of the dictionary definition. The Sherman Act amends Noah Webster and a good many other folks. A person may or may not be a voter. A corporation can't vote, and occasionally has difficulty in getting votes. Both are alike citizens. The railway company is domiciled in each community it serves, and has plain duties of citizenship enlarged in full proportion to the size of its interests in those communities.

In this attitude of corporate citizenship I hope we have passed through two phases, and that we are entering upon a third and last one. The last is to be somewhat like the first; but a great improvement on it; the middle one was outrageous.

The pioneer promoter of railway building was always a great man. He built roads in barren lands and coaxed people to come in and make them bloom. Bold and imaginative, his work lives after him, although he usually busted up.

Here is a sample of many cases: The promoter built a city on his line, largely of architect's plans and of material used for castles in the air. He established banks, water



Section of Corrugated Culvert Pipe.

and gas companies and Y. M. C. A. associations. At the inevitable meeting of his creditors, he made a tearful speech: "I surrender to you everything that I possess (the rest was in his wife's name). If it will better the situation, divide my body among you." An unfeeling creditor said: "Then put me down for his gall."

Note one fact seriously. The state did not make or regulate the early railways. The early railways made the state, and are now continuing to make the existence of the state possible.

* * *

There was a middle period or phase when the railways were hostile, domineering, mysterious. This has been changed by methods comparable to the American Revolution, or the Civil War—indiscriminate attacks, just and unjust, hostility to everything that bore the name of company or corporation. It has been brutal, but it has been effective. I sincerely believe that the railways, as a whole, are now more exactly law abiding and, as citizens, are more helpful than any other class of persons. They are more helpful when they do their full duty, simply because they are bigger citizens.

In the southerly corner of California there is a valley of nearly a million acres as fertile as any in the world. It is irrigated by a canal from the Colorado river, built by the California Development Company. The Colorado is a great flood river; it is powerful and mischievous. Four years ago it tore through the canal and, instead of quietly keeping on its way to the Gulf of Mexico, it began to make the Salton Sea, in the Imperial Valley of the state of California. The development company could not stop it without help, and the Southern Pacific Company loaned them about a million and a half dollars to do it. But the Colorado river seemed to be hell bent on abandoning its Mexican direction and fighting its way northerly. It broke through again and again in the light alluvial soil, each time at places nearer and nearer to the Mexican boundary. At these points the river is the Colorado-California state boundary, and the last break was close to the Mexican line. It was an interstate and was becoming an international incident when, at the end of 1906, a flood without precedent tore an opening one-fifth of a mile wide and 34 ft. deep, through which the Colorado went at 4½ miles an hour, to the doomed Imperial Valley.

The Southern Pacific has a branch, not a main, line in this valley. The company was simply one of its 10,000 citizens, with possibly less at stake than some of the others. The responsibility for stopping the break was probably on the United States Reclamation Service, but the company had the facilities for immediate action and did not hesitate a moment. It did not hesitate, although the demand of the President of the United States for action was irascible and unjust. All the cars and men for which there was room were put to work. The crevasse was closed in 15 days, and the closure was made permanent by half a mile of dam and 15 miles of levee. The cost of it all was $3,150,000, paid by the Southern Pacific Company and never refunded to it. It was greater than the whole cost of the company's branch line in the valley. The Southern Pacific proved its citizenship.

Mr. Harriman ("Is Saul among the prophets?") was in other ways a most enlightened believer in the citizenship responsibilities of his companies. They are carrying on in the great West a form of partnership with the business associations—state, county and city—by means of which enterprising men and educated young men the world over have correct information of the possibilities of the West, and these companies are peopling that great region with desirable citizens. The present day idea of a railway president is that he is a man of no principles and few prejudices, but we might say in Irish: "Half the lies told about him ain't true."

* * *

On August 3, 1898, just after the Spanish War, the Long Island Railroad was notified that a convalescent camp for the Fifth Army Corps would be established on the Dunes, near Montauk Light, on the east end of Long Island, and that the cavalry regiments would arrive with their horses in Long Island City within three days. It was indeed fortunate that this poor, light, single-track road had as president a great citizen, William F. Baldwin, who has since died in his prime.

He called his staff together and talked to them: We are facing a tragedy. 25,000 men and all that they need must be carried at once over 116 miles of single-track to a terminal where nobody lives and where there is now only a ticket office and a 1-car siding. We haven't the engines, the cars or the terminal yard at Montauk for handling them; it looks impossible, but we must do it. We must spend ourselves; and he quoted: "Whosoever would save his life shall lose it."

They borrowed engines and cars; they did not spare themselves, these citizens, and when, on the second day, the army came, they moved it promptly. In less than a week they had built at Montauk a four-mile distributing yard, unloading platforms for animals and wagons, cooking and sleeping houses for the railway employes, two large freight houses, a water supply and all the necessary equipment for a busy terminal.

The railway hauled in its own materials and all that was wanted for the new government storehouses, general hospital and detention camp. It moved 35,000 officers and men, 8,750 horses and mules, with their belongings, daily food and other needs. For a few weeks the little single-track road was the busiest line in the world; then the army folded its tents, like the Arab, and as silently stole away.

There are many less spectacular instances in the development of citizenship. Self-sacrifice and free gifts are not long remembered. Broad-minded selfishness is the most interesting phase of corporate management. When L. F. Loree became general manager of the Pennsylvania Lines West of Pittsburgh, he found the trains, the right-of-way and the yards infested by vagrants and tramps. They rode on the trucks and blind ends of postal and express cars. They got killed, had to be buried, and pretty often their lives or legs had to be paid for. They stole from the cars and stations and from the residents. They caused fires and had an insane bent for petty crimes. The vagrant laws varied widely through Indiana and Ohio, but this was unimportant while they were not enforced.

Loree employed Josiah Flynt, the literary hobo. He spent weeks on the line, disguised as a tramp, and made a fine report on the damage, the cause and the cure. It needed cooperation between the railway and the municipal authorities. Loree finally got splendid cooperation. Either personally or through members of his staff, he met and had it out with all the municipalities on his line. His general proposition was: We will arrest and bring in every tramp in the region, if you will enforce the law. They all accepted it. He formed an unusually sturdy police force, and for a few weeks they had the time of their lives. It was team work, and they made touch-downs less gently than the football teams, until suddenly in all that region the tramp became as extinct as the buffalo on the western plains.

There are now going on numberless railway undertakings to make their fellow citizens well to do. You may call this patriotism, or enlightened selfishness, but one of these terms may be a definition of the other one.

Mr. Delano, on his lines in Missouri, is showing the

man from Missouri; he is spending money and time in encouraging the study of agriculture along his lines.

Mr. Brown, of the New York Central, has citizenship in seven states and is buying quarter-section farms in each of them to be used by the state as experiment and demonstration farms. Being a farmer himself, he knows that the productiveness of land can be largely increased, and at a large profit.

Mr. Peters, of the Long Island road, has already nearly doubled the money value of Long Island garden truck by his two experiment gardens and his fortnightly bulletin of results.

By personal intercourse with his company's fellow citizens in the southern states, Mr. Finley has converted one of the worst possible situations to one of the best situations. He has been patient under the hostilities, long enduring with fanaticism, law abiding but firm and skilful in getting true interpretations of the law. "The law is good if a man use it lawfully." This is what St. Paul wrote to Timothy, but Finley has also read, out of the tail of his eye, another remark by St. Paul: "Law is not made for the righteous man, but for the lawless and unruly; for the ungodly and sinners." His ungodly neighbors now know he read that. He has been firm as well as kindly to his neighbors and is surely well on the way to making their region and his company highly prosperous.

Looking back over the period since the last general election, I think the railway officers were then right in believing that the jam is broken. We get a line on public opinion largely from the newspapers, partly from the action of the state commissions and negatively from the demagogues. The man who has observed but a few facts can make up his mind with great definiteness. A careless or ignorant paragraph in his newspaper may establish for life the commonplace man's opinion about railway corporations. Nevertheless, in the long run, public opinion is about right. From the storm of bitter hostilities the railways are coming to reasonably good weather. Under the leadership of great men they have substituted frankness with the public for mystery, a neighborly attitude instead of hostility and successful overtures for cooperation with the towns, cities, counties and states in which they are powerful citizens.

It is true that the railways are creatures of the state, but I will repeat once more, the railways have made the state. They will get justice for two reasons; because we are a just people, and because we cannot get the highest measure of prosperity unless they are so highly prosperous as to serve us well.

LIST OF EXHIBITS.

The following are printed to correct errors of omission or commission in yesterday's Daily:

American Rolling Mill Company, Middletown, Ohio.—American ingot iron corrugated culverts. Represented by G. H. Charls, Ray Frazer, Jos. DeFrees, F. M. Beach, A. B. Nilder, Howard O'Neal, C. C. Fouts, G. Ahlbrandt, J. A. Hupperle. Spaces 75-76.

Dorp-Mueller Company, New York.—Anti-creepers. Represented by A. Dinklage.

Fairbanks Company, New York City.—Dart union couplings, Dart flange couplings, Fairbanks valves, P. & C. blow-off cocks. Represented by L. B. Mann, G. W. Conine, F. M. Parks. Space 135.

Morden Frog & Crossing Works, Chicago.—Unity switch stand operating distant signal and facing point switch with positive point lock. Parallel ground throw, G. L. M. switch stand, rigid manganese steel frogs; guard rail clamps; switch adjustments; rail braces; slide plates; track jacks; compromise joints, etc. Represented by J. T. Hartz, Arthur C. Smith, H. M. Macke, D. H. Cusic, W. J. Morden. Space 86.

National Electric Specialty Company, Toledo, O.—Vac-M lightning arresters. Represented by F. S. Chapman, R. M. Stover. Space 223.

Railway Specialty Company, Atchison, Kan.—Power device for setting screw spikes; also the Au-Tra-Kar, a self-propelling section car. Represented by C. Hastings.

Railway & Traction Supply Company, Chicago.—Hercules bumping posts, made by J. M. Scott & Sons, Racine, Wis.; automatic lock nuts, manufactured by Automatic Lock Nut Company, Rockford, Ill. Represented by J. M. Scott, E. E. Scott, Charles Rystrom, Cortlandt F. Ames. Space 115.

St. Louis Surfacer & Paint Company, St. Louis, Mo.—Metal surfacer paints and paint specialties. Represented by W. S. Avis, A. D. McAdam. Space 214.

CONSERVATION OF CROSS TIES BY MEANS OF PROTECTION FROM MECHANICAL WEAR.

By J. W. Kendrick, Vice-President, Atchison, Topeka & Santa Fe Railway System.

The following is from a fully illustrated paper presented by Mr. Kendrick at the annual meeting of the American Railway Enginering and Maintenance of Way Association: After discussing in detail the past and present consumption of ties and amount of timber available, he estimates the greatly increased sums which, at the present rates of development, must be spent for ties in 1920. He continues:

The developments of the past five years have proven that the railway officials of the country are alive to the fact that this very important problem requires immediate and earnest consideration. In fact, it affords one of the few great opportunities for enormous reduction in the expense of maintaining our railways. The average life of ties in the United States is about seven years, referring now to those that are not treated with some preservative against decay. Europe has practically demonstrated beyond a doubt that so far as decay is concerned it can be prevented for a period of twenty-five years or more.

An inspection made by E. O. Faulkner, in 1907, of a portion of the track of the Paris, Lyons & Mediterranean, over which 70 trains are run daily, resulted in the discovery of a large number of ties that show conclusively what can be achieved by proper methods. Most of these ties were of Baltic pine, and had been in use for 26 years. (Photographs are shown of one which was selected as a fair sample, is not decayed, and is still fit for many years of service.)

Cross ties remain in the tracks of European railways until they are removed for causes other than decay (i. e., because of mechanical wear), and afterwards serve for years for fence posts and other inferior purposes. True, European wheel and axle loads are much less than ours, but this fact has little to do with resistance of the ties against decay.

We in America have considered this problem because the facts of the past few years have forced its consideration upon us. We are passing through the experience of European railway men, who encountered the same problem in years now long passed and who have solved it successfully according to the requirements by which they were confronted. Our problem is measurably more difficult. We have to deal with conditions as to climate, precipitation, and so forth, which are limited by greater extremes than those ordinarily existing in European countries.

Again, we have to deal with quite different conditions as regards character and weight of locomotives and cars, conditions not conducive to durability of ties. Naturally, the wide experience of the managers of European railways and the methods that have been adopted and successfully pursued by them seem to indicate the course that we should follow. We should adapt their practice to our needs as far as possible until such time as something better can be found. There is no reason to suppose that ties properly treated will not resist decay in this country for an average of 25 years.

Decay may begin within the tie or attack it from without. Wood is subject to deterioration because of the attack of enemies of both the animal and the vegetable kingdom. The chief cause of deterioration of ties, aside from mechanical wear, is due to the penetration of the wood by vegetable spores which feed upon and cause the destruction of the wood cells. Many inquiries have been made as to the cause of cross tie failure. The anwers have been: because of decay about 75 per cent., because of rail cutting 25 per

cent. The writer believes that these figures are misleading; that more than 25 per cent. of ties are removed on account of what we generally term mechanical wear, and, in fact, mechanical wear so generally precedes decay that the cause of tie failure cannot be accurately asertained.

Mechanical wear, in rail cutting, and in killing or the disruption of the fibres by spikes, opens up the interior of the wood to the action of the fungi causing decay, hastening the process. Decay of course breaks down the structure of the wood and weakens it beyond the power to withstand mechanical wear. The two processes of tie destruction facilitate each other. Mechanical wear thus undoubtedly hastens decay, and reduces the life by several years.

Some 18 or 20 years ago the subject of the protection of ties against rail cutting was actively introduced and as the weight of locomotives and cars was increased, and the necessity for tie protection became apparent, tie plates were gradually adopted. Then, as now, and as it will be in the future, the element of first cost in connection with a new and untried device of unknown merit was a matter of prime consideration. It is well known to everyone that the tie plates of 18 or 20 years ago were entirely inadequate. They shriveled under the weight imposed upon them as the green leaf does under the influence of frost. Like the leaf they disintegrated. The finely spun theories about the plate becoming part of the tie because its ribs or flanges, were forced into the grain of the wood, were dissipated by the inexorable demonstrations of practical experience. The wood composing the tie invariably developed a cross check coincident with the penetration of the ribs or flanges, and the rail rested upon a bent, buckled, or broken, sheet of pressed or cast metal, which in turn rested unstably upon a disintegrated mass of wood fiber, and into the cavity thus formed water entered, decay spores followed and the days of the cross tie so armored were practically numbered. The lesson of experience are only learned at great cost.

Even supposing the tie plate to be effective, the question of primary expense was still to be considered. The cost of timber was still relatively cheap, very cheap, in fact. The time for facing the problem in its entirety had not yet arrived; and so by various stages the railways of the United States year after year, or at intervals of a few years, changed the type of the metallic tie protection, or tie plate, and grudgingly increased its strength and area.

In view of the fact that this country had passed through many years of experience with timber bridges, that the properties of timber had been investigated by engineers and scientists, that its ability to resist compression, and so forth, had been demonstrated, had been accepted, had been taught in our engineering schools, it seems strange that anyone should have thought that a piece of metal of such inadequate area could transmit pressures, approximately determined, without crushing the wood fiber, or that, knowing as we did, and have known for more than 20 years, the properties of steel and iron, their capability for transmitting stresses or pressures without destruction, we should have provided for conditions more unfavorable than those which ever existed in any properly constructed bridge, such ridiculously inadequate metallic bearing and transmitting agencies as those that we adopted, and upon which the railways of this country have spent millions of dollars. Yet that is what we did.

The English engineer uses a heavy cast iron chair of ample size. The Continental engineer favors a rolled plate, but they are adequate for the purpose for which they are intended, and the tie removed from the track of the Paris, Lyons & Mediterranean after 26 years of service still sound, and apparently in as good condition so far as decay is concerned as it ever was, shows only the imprint of the tie plate upon the timber, and this tie was not selected because it was in exceptional condition, but was one of many that looked alike, and is only a fair sample of other ties that were inserted at the same time. The tie plate, as used in the United States, has in many cases been a destructive rather than a preservative agent.

But the tie plate that has been, and too often is even now, is not the worst feature of our track. There are many elements that are bad; some are worse than others. Let us consider some of these elements. The statistics of the Forestry Service and the Department of Commerce and Labor for the last year show that about 18 per cent. of the ties used were sawed; the remainder were hewed. Hewed ties, like everything else, may be well or badly made. If they are badly made, the upper and lower faces are not plane surfaces. The mark of the axe is frequently in evidence. They are often crooked, especially in this latter day, when everything of which a tie can possibly be made is used.

If one walks the tracks of many of the railways of the country cross ties will be found which not many years ago would not have been accepted even as culls. Woods that were formerly excluded by terms and designations in specifications have become preferential. Many of the cross ties now inserted on certain roads where timber is scarce are not large enough to make first-class fence posts. Other ties are made of timber naturally crooked and without proper surface.

In order to secure good track a tie should have a supporting medium composed of proper ballast, should afford an upper plane surface for the support of rails, and, on important lines, should be protected from rail cutting by the introduction of tie plates of proper dimensions. If the surface of the tie is imperfect, the utility of the tie plate is diminished little or much, according to the bearing that it has upon the tie.

Granted that tie and tie plates are all that can be asked for theoretically and practically, we then proceed to spike the rail to the ties with 5½x9-16 inch (or whatever the size may be) spikes. These are driven well or badly, according to the varying skill of the trackmen, or to the care that they take.

Tie plates with ribs are used. It is impracticable to bed them in the wood with any rapidity and the trackmen are content with securing a bearing on the tie, leaving a space dependent upon the length of the flanges of the tie plate between its lower surface and the top surface of the tie. Thus such penetration as has been secured, is the result of some preliminary pounding with a spike maul and driving the spike home. On curves two spikes are frequently driven on the outside, and on track that is intended for high rates of speed, for passenger trains, and also for freight traffic, it is frequently the case that the rails are double spiked on both sides. The passage of loads over the the rails and the transmission of pressure upon the tie plates is relied upon to bed them in the wood. Then, of course, the spikes are slack and it is necessary to complete the driving after the tie plates are in place.

The roadbed of a railway is more or less elastic. All ties do not have the same bearing, this being dependent upon the area of the bottom surface of the tie, character of ballast and the extent to which it is tamped under the tie, so that even in the most perfect track only approximately stable conditions exist. It is a well known fact that each pair of wheels on the engine and on the cars that it hauls causes what is known as a "wave," an actual depression of the rail occurring at the point of application of the load imposed by each pair of wheels and a corresponding elevation taking place before and behind that pair of wheels, due to the flexure of the rail.

When the wheels are immediately over any particular tie the tendency is, of course, to cause the rail and the tie plate to sink into the tie and compress its fibers, whereas, in adjacent ties the tendency is to rise and exert an upward pressure on the head of the spike. As a consequence anyone who may walk the track of any railway in the United States will find comparatively few spikes that are in contact with the rails. Some of them lack a quarter of an inch to an inch or more from coming to a bearing on the base of the rails. Of course, it is the duty of the trackmen to drive those spikes home again, but it is a well-known fact that anything in the nature of a nail or spike that is once loosened after being driven will never fit as snugly as it did in the first place.

If ties are made of oak, or some other hardwood in which the elasticity and resistance to compression is considerable, the holding power of the spike is, of course, considerably more than in soft grain woods, but in the end the result is the same. It eventually becomes necesary to draw the spike and drive it in a new place. The hole which it formerly occupied may not be plugged. If it is plugged, the spike may be redriven in the place originally occupied, but the hole has been enlarged, moisture creeps in and the spores of the infectious fungi follow. Ties fail quite as much, if not more, from spike cutting as from rail cutting, and this is especially true where curvature is excessive and it is necesary to reline and regage the track at frequent intervals.

All foreign engineers and managers express surprise that the railway officials of the United States have not long ago adopted the screw spike, which has been in general use in Europe for many years.

The economical use of ties (a practical application of

conservation") depends, first, upon their preservation; second, upon their proper manufacture or shaping for the service that they are to perform; third, upon the introduction in the case of heavy traffic lines of adequate metallic bearing agencies, or tie plates, to transmit the load from the comparatively narrow rail base to the wood; and fourth, upon a form of fastening, i. e., a screw spike, which will hold the rail closely to the bearing surface upon which it is to rest. If all of these conditions are not observed, the wave motion of the rail, together with the intermitten depression and lifting of the ties, and the sliding back and forth or sawing motion of the rails will speedily result in their destruction.

Again, when it becomes necessary at periods ranging from a few months up to seven or eight years to renew rails (we are speaking of main line service now) what happens? Usually the rail is of heavier section than that it replaces. The ties were already cut by rails of lighter section, having a narrower base, or, even if the rail is the same in section, the ties are nevertheless cut, and before the new rail can be placed (without going into detail, which is unnecessary for our purpose, in regard to the entire process of relaying), it is indispensible that the tie should be adzed. The labor is usually unskilled, and it is regrettable that it is becoming more so each year. The adzes speedily become dull. Some ties are practically uncut; others are cut by varying degrees up to perhaps an inch or two inches, and with dull tools an attempt is made to bring them to a proper surface to receive the new rails. The result is that they are mutilated, some of them are cut one-third through, depressions are formed which gather and hold moisture, the old spike holes, plugged or unplugged, are covered, or partially covered, by the base of the rail, spikes are driven in new places, and the ties are left in such a condition that they are peculiarly receptive to moisture and germs that cause decay.

You will find this condition of affairs on every railway in the United States. The question of the power of timber to resist compressive strain, which, as previously stated, was determined many years ago, having been entirely neglected, reliance is placed on increased width of rail base to prevent cutting. Various theories are entertained in regard to the non-necessity for using tie plates on tangents; if at all. Hundreds of thousands, yes, millions, of treated ties (soft wood) have been placed in track without protection from rail cutting, and only after they have been seriously damaged has the necessity for some protection against mechanical wear been acknowledged.

Why should we not consider the matter from a common sense standpoint? Why should we not first of all treat our ties so that we may reasonably expect them to last 25 years; then provide a sufficient metallic bearing surface under the rail to prevent mechanical wear, and size or surface the tie, if hewn, so as to make a perfect contact between it and the bearing surface of the tie plate which transmits the pressure incident to the load? Then if the tie plate is sufficiently strong to transmit the pressure, and if the rails are properly fastened to the ties by the best known means, a means the practicability of which has been proven for many years in European practice, why should we not get such service from our ties to make them last three times as long as under present conditions, and, if the problem is properly solved, even four times as long?

In considering this subject we have felt it desirable to traverse for ourselves ground that had already been covered, although that precaution might seem superfluous in view of the experience of foreign roads.

There have been many experiments tried for the purpose of demonstrating the effect of the use of certain varieties of spikes upon the fiber or grain of the woods into which they were driven, and experiments to determine their holding value, but as far as we know these experiments have been tried for the purpose of demonstrating the superiority of one cut spike as compared with another. Various people have advocated the adoption of a spike having a long taper point which would not so badly distort the wood fiber in passing through it. Others thought a triangular spike or bayonet section would be preferable to those now commonly used. Still others thought that a round spike with square shank and chiseled point would better meet the requirements, and this field has been very thoroughly exploited.

We do not know whether the same line of experiments that we tried had previously been conducted by anyone, but, at any rate, our experiments seem to justify the position that we take, that the use of the destructive cut spike, now universal on all American railways, should be discontinued. (Mr. Kendrick shows photographs illustrative of tests which he conducted with the utmost care in the laboratory of R. W. Hunt & Co. at Chicago.) The destructive effect of the spikes upon the timber is clearly shown, the wood fiber being crushed and distorted in varying degrees according to the kind of wood, kind of spike and whether or not the tie was bored before driving the spike. Other photographs show the results obtained in other tests made with ties in which screw spikes were inserted in wooden plugs, in accordance with European methods. Screw spikes may be inserted directly in the tie, or the tie may be bored and plugged for each spike that is to be applied. In these cases the fiber of the wood is practically undisturbed.

As before mentioned, it is a common practice in Europe to provide a wooden screw plug or dowel to receive the spike. The ties are bored with holes about 5½ inches long and 1½ inch in diameter. These holes are then threaded to about one inch pitch. The ties are then treated, usually with creosote, and the wood around the hole intended for the plugs is thoroughly impregnated. The plugs or dowels are also impregnated with creosote and are screwed home in the holes prepared for them, the tie is then sized and the tops of the plugs are smoothly cut off in the same operation. The number of spikes varies from two to four at each rail bearing.

The question may be asked, of what use are the plugs? In the first place, the boring of the tie previous to treatment makes it practicable to thoroughly impregnate it with a preservative against decay at the points where it is most vulnerable, namely, where the spikes are inserted, and where the wearing action of the tie plates and the rails occur.

But there is another very good reason which will be shown by the table which follows. Tests were made for the purpose of determining the resisting power of various kinds of spikes against withdrawal under various circumstances:

	Mean.	Maximum.
Square spike in unbored tie	4,558 lbs.	6.826 lbs.
Round spike in unbored tie	2,478 lbs.	6,066 lbs.
Square spike in bored tie	4,082 lbs.	5,810 lbs.
Round spike in bored tie	4,108 lbs.	6,940 lbs.
Screw spike in bored tie	6,916 lbs.	10,842 lbs.
Screw spike in oak plug	8,170 lbs.	9,724 lbs.

Of course the resistance of the driven spike as compared with the screw spike is very much greater, according to this table, than it would be after it had been used for a little while. After they are once loosened their power of resistance against an upward force would be much less. It will be observed that the resistance of the screw spike against withdrawal is much greater than of the others.

A series of tests were made to determine the comparative crushing strength of ties with, and without, a certain number of plugs. Test "A" represents tie plate on tie without plugs; test "B," one with two plugs; and test "C," one with four plugs. The compression in inches under pressure of 80,000 lbs. was as follows:

Test:	1st Series.	2d Series.
"A"	2.69 in.	3.25 in.
"B"	1.03 in.	1.34 in
"C"	.97 in.	.87 in.

The only conclusion that can be reached as a result of these experiments is that the plug acts as a column, transmitting by means of its threads the pressure to which it is subjected through each layer of wood fibers, so that the pressure is distributed from top to bottom instead of being concentrated upon the top layer.

Regarding the Baltic pine tie taken from French track, to which reference has been made, it should be noted that after the first 10 years of service before the wooden tie plugs, or dowels, were inserted, the tie became rail cut. During the remaining 16 years' service, during which time the tie plate was used, the compression of the wood under the tie plate was very slight. This tie had four dowels, or spike holes. Although the penetration of creosote into the heartwood on the lower section of the tie was very slight, it has been sufficient to cause it to withstand decay, although, of course, the road is well ballasted and drained.

If ties serve their purpose for upwards of 25 years on European roads and are afterwards useful, as is the case, for fence posts and other purposes, there is no good reason why approximately the same longevity should not be ob-

tained in American practice. In order to secure this result it is necessary to:

First, treat the ties with some preservative to prevent decay.

In doing this first cost is of comparatively minor importance. The best proven treatment should be used, and there is no doubt that creosoting satisfies this requirement better than any other method. Ties may be fully creosoted, i. e., impregnated with all the creosote that the wood will take; they may be impregnated by the Rueping process, in which a portion of the creosote is extracted by exudation resulting from the expansion of the air forced into the wood cells during the process of treatment, and by the after application of a vacuum. They may be treated by a mixture of zinc chloride and creosote, or by any other method that is proven. It is not the purpose of the writer to discuss the relative merits of various methods of tie preservation. It seems sufficient to emphasize the necessity for using only such processes as have been proven. Proof does not depend upon actual practical use of ties in track. The growth of the fungus that produces decay can be stimulated, and results can be obtained in a few months that would require years of actual service to develop. The Atchison, Topeka & Santa Fe has adopted the Rueping process for the treatment of ties at its plant in Somerville, Texas, which has a capacity of about 2,500,000 ties annually. It uses crude oil with an asphaltum base at its plant in Albuquerque, N. M., which has a capacity of about 750,000 ties annually. The oil treatment is considered experimental, and its adoption was based upon the results obtained in its experimental track on the Beaumont division in southeastern Texas, where ties treated in this way were perfectly sound after a period of 5 years, and are still in that condition after the expiration of 7 years from the time of their insertion. Untreated ties made of the same wood placed in this track decayed within 9 months.

The Rueping process is rapidly taking the place of the full creosote treatment, which has been followed for years in Europe. This is especially true in Germany, where the relative value of treatment with various preservatives has been determined by exhaustive tests at Standal, and possibly at other places where similar plants are employed.

Second, tie plates of adequate length, width and thickness should be used in order to properly distribute the maximum pressures transmitted through the base of the rails to the upper surface of the ties.

The properties of various kinds of wood, with respect to their ability to resist compressive strains, have been determined repeatedly. As the majority of the ties that will be used in future will, as at present, be made of the soft and inferior varieties of wood, it is desirable to reduce the pressure upon the wood fibers to about 700 lbs. per square inch. The maximum weight on a single engine driving wheel is about 30,000 lbs. It will probably be sufficient if we add 50 per cent. to this to represent the effect of a suddenly applied load; in other words, to provide for the effect of impact. The rails and tie plates being securely fastened to the ties by screw spikes, the transmission of the effect due to the load on any wheel will be much more uniform than when cut spikes are used, in accordance with prevailing practice.

A flat-bottom tie plate which has been adopted, among others, by the A. T. & S. F., is 8¾ in. x 7½ in. and ½ in. thick. The effective area is therefore about 63 in., and the pressure on the tie incident to a load of 45,000 lbs. is just 700 lbs. per square inch. The thickness (one-half inch) has been found sufficient as a result of service under the heaviest power during a period of more than two years. It may be said that the width of this tie plate, 7½ in., will require a change in tie specifications, but in the interests of economy this change should be made. Narrower ties cannot be protected from wear, and, consequently, it will be unwise to go to the expense of treating them with preservatives. This tie plate has raised seats for the screw spike heads, designed to support the head of each spike in its entirety, and this is very necessary for the purpose of securing satisfactory results. It is arranged for four spikes, but only two are used in ordinary track.

Third, screw spikes should be so designed as to facilitate driving without injuring the shank.

Where spikes are driven by hand this is not so important, but the only reason for tapering the head is the fancied advantage in forging the spikes. It is practicable to forge them with cubical heads, and these are preferable. It is impracticable to apply screw spikes by hand in this country, without unnecessary expense, on account of the high wages that must be paid for labor, and the application of a machine driven tool to a truncated pyramidal head has been found to be difficult on account of the tendency of the tool to engage, then slip, so rounding the head as to impair its value for the purpose for which it is intended.

Fourth, it is desirable to introduce wooden screw dowels or plugs bored in the center to receive the screw spikes.

The office of these wooden dowels is referred to in a preceding paragraph. The tie should be bored and threaded to receive these plugs at the treating plant, and before treatment, as impregnation by the preservative generally will be very much more thorough than if these holes are prepared after treatment. This method of procedure is considered very important because it is impossible to secure the impregnation of heartwood by any preservative, at least to any great extent, and if the tie is treated first and bored afterwards, the portion which is unimpregnated will be opened for the admission of moisture, and fungi spores, which cause decay.

The plugs, or dowels, should also be impregnated before they are inserted. The bearing surface of the ties should be sized, and the plugs cut off at the same operation, to receive the tie plates, and thus insure proper and uniform bearing.

(Drawings show sections of ties in which wooden dowels have been inserted. See Railroad Age Gazette, December 24, 1909, p. 1231, where the track construction referred to below is described.)

The question will naturally be asked as to the relative cost of adopting this form of construction as compared with that now in use. A proper machine at the treating plant will bore and plug 600 ties with 8 plugs each, per day of 10 hours, at a cost of 3½ cents per tie. The cost of making the plugs will be about 1½ cents each. The cost of screw spikes will be 2.7 cents each; of tie plates 21 cents each. The cost of cut spikes will be 1.06 cents each. Assuming 3,000 ties per mile of track, with 4 spikes per tie, assuming that the same types of tie plates are used both with screw and cut spikes, and that 8 wooden dowels are provided for the plates with screw spikes, and no dowels are provided for cut spikes, the relative cost per mile of track would be as follows:

One Mile of Track With Screw Spikes and Dowels.

12,000 spikes at 2.7 cents each	$ 324
6,000 tie plates at 21 cents each	1,260
Boring ties for, and driving, 24,000 dowels, at 1 cent each	240
24,000 wooden dowels at 1½ cents each	360
Driving screw spikes (per mile)	150
Total	$2,334

One Mile With Cut Spikes.

12,000 spikes	$ 127
6,000 tie plates at 21 cents each	1,260
Driving cut spikes (per mile)	150
Total	$1,537

The difference in cost is considerable. The calculation assumes that tie plates will be used in either case, and true economy requires that this be done. The estimated cost of driving screw spikes is based upon work actually done under unfavorable conditions on a section of track about 5 miles in length, on the Illinois division of this railway, last fall. Unfortunately, the holes in the tie plates were a little too small, so that the screws acted as reamers to enlarge the holes before they could be driven home. The record of cost for driving 4,200 track feet—the best progress made in one day—indicated that there would be little or no difference between the cost of applying screw spikes and of driving cut spikes.

The element of increased cost is one which enters into any construction of superior type, and the real question is: Is it worth while? If this process is followed, the average life of ties on American railways would, very conservatively speaking, be 21 years instead of about 7, that is, they would last three times as long as at present. Screw spikes should be applied as ties are renewed. Then at the end of a period of from 7 to 10 years any line of railway pursuing this course would have provided its track with treated ties, screw spikes, and so forth. Let us consider what this would mean if the railway mileage of the United States were reconstructed in these respects:

Present (1910) trackage United States steam railways	350,000 miles
At present in track, about	1,000 million ties
Present annual requirements	150 million ties
Average trackage added per year for past 7 years	10,000 miles
Requiring yearly for new track	30 million ties
Present average life of ties	7 years
Requirements, assuming annual increase in trackage of 10,000 miles, for next 21 years	4,000 million ties

Corresponding to over 200 billion board feet timber, or 1-12th of our present standing forest.

Cost for 21 Years With Cut Spikes.

Present cost per tie, including treatment, tie plates, spikes, etc.	$1.00 to $1.15
At present rate of increase in timber prices, cost as above, in 1931	$1.75 to $2.00
Average cost during next 21 years, approximately	$1.55
Total investment in ties, present practice, to 1931	$5,500,000,000

Cost for 21 Years, With Screw Spikes.

Present cost per tie, average only 20 cents more than for cut spikes.	
Average present cost	$1.35
Average cost during next 21 years, if all renewals and new construction are made with screw spikes, approximately	$1.65
Tie requirements to 1931, less than	1,600 million ties
Cost of same	$3,500,000,000
Saving from use of screw spikes	$2,000,000,000

These figures are sufficiently large to command respectful attention. They will be proportionately corrrect fo any mileage that may comprise any system, or any mileage that may be assumed. They may err in gross, because of the impossibility of determining the relative number of ties used in main lines, which should be so treated, and in yards, where such treatment would not be generally followed.

With the national timber supply only sufficient to last 30 years,* with the certainty that the cost of ties will increase more rapidly in the future than it has in the past, with the necessity for conserving the timber supply of the country in the interests of economy and in order that timber may be obtainable for purposes for which no other materials are suitable, there can be no question that the time has come when this very important problem should receive the serious attention of everyone having to do with maintenance of track. The saving that can be effected will represent an addition to the net earnings of the railways of the country. The total saving indicated by the above statements amounts to 4 per cent. upon the enormous sum of fifty billions of dollars.

That this method was not introduced and used long ago is due to the fact that the timber supply of the United States has, until late years, been constantly referred to as inexhaustible. Sinful waste has characterized its use. Various lands have been cut over and only the most desirable and soundest trees of chosen varieties have been taken. They have been cut over again and all the timber that was then merchantable has been removed. Again, for the third time, they have been cut over and practically everything that would make a lath has been removed and utilized. Sections of the country which are still blessed by the possession of extensive forests, are prodigal in the use of timber, but the time will come within the next decade, or certainly within the next 20 years, when there will be no such sections, and no one now living can foretell with any accuracy what the price of timber and ties will then be.

Other very important savings in connection with this method are those incident to the reduction in the enormous cost of transporting the greater number of ties that are now required as compared with the lesser number that will be required if the sensible and more economical practice of European countries is followed. The average haul of cross ties in 1905 being 500 miles, assuming the actual cost of transportation to the railroads to be 3 mills, the cost per tie transported was about 8 cents, and the cost of transporting the ties used annually, an average of 200 million for the next 21 years, would amount to $16,000,000 per year. If the life of the tie be increased threefold, the cost of the transportation will be decreased almost to one-third of this amount, or to $6,400,000 per year, and the difference between these two costs represents an annual saving to the railways of the United States of $9,600,000, or about $200,000,000 for the period.

Again, a common estimate of the cost of inserting a new tie is 15 cents. This includes all the operations necessary for removing the old tie, inserting a new one, and restoring the ballast. Applying the cost of 15 cents to the number of ties annually used results in showing a cost to the railways of the nation for removing old ones of $30,000,000 annually, whereas, if the foregoing arguments are correct, this amount could be reduced to $12,000,000; and, really, the saving of $18,000,000 per year, or $378,000,000 for the period of 21 years, constituting the difference between these two sums, does not represent the entire saving because the reballasting or resurfacing is not contemplated at the time of the tie insertion, but in the aggregate, vast indeterminate sums of money must be spent to restore the track to standard condition, subsequent to tie renewals.

These computations do not take into consideration the cost of providing the enormous number of cars and locomotives required for the transportation of ties, or a fair compensation to the railways for the use of such equipment. If they are not required for this purpose, it will either be possible to get along with less equipment or to use them for the transportation of revenue business.

The above computations, which show the apparent saving due to the adoption of a more rational and thorough system of track construction, do not take into account any interest charges which will properly accrue in connection with that portion of expenditures for ties used in construction, which are paid for with the proceeds from the sale of bonds.

The interest alone would amount to another vast indeterminate sum, according to the rate per cent., whether applied to the whole investment or only to that in new track, whether compounded, etc. In any case it would run into the hundreds of millions.

It may be said that some substitute will be found for wooden ties. If the figures representing the average cost of ties during a period of 21 years are correct—and that cost is $1.55—there is very little probability that steel ties can be economically used. In the first place, they are not successfully used anywhere. Perhaps this statement is a little too positive, yet the testimony of American engineers who have investigated the subject abroad is to the effect that the men actually having to do with maintenance of track, even those who have had the longest experience with various types of steel ties, have very little to say in their favor.

It must be remembered, too, that the cost of steel is destined to increase, not in the same ratio as the cost of timber, perhaps—still it must increase appreciably. It is believed at the present time that all of the large existing bodies of ore have been located and approximately defined. If this is true, the exhaustion of these measures will be similar to that which must take place in our forest supplies. The coal measures of the United States, and the tonnage that can be extracted therefrom, can be computed at the present time with comparative accuracy. Without doubt, the cost of coal must increase, and if it is also true, of which there can be no doubt, that the consumption of steel will increase enormously, its cost is bound to be higher. Of course, a satisfactory steel tie will be found, but the writer believes that it will be a combination tie made of steel and wood. If so, the problems of tie preservation and protection against mechanical wear will be similar to those which must be considered in connection with ties made entirely of wood.

No success has attended efforts to make ties of concrete, and if such a tie is finally constructed it must, in the opinion of the writer, be as a result of a combination of steel concrete and wood, or some fiber which will afford the elasticity necessary to prevent the destruction of the rails.

The purpose of this paper is to draw attention to the magnitude of the problem, to its vastness. Some better and cheaper method of accomplishing the ends herein referred to may be discovered, but none has been, and the writer presents the problem to the American Railway Engineering and Maintenance of Way Association for consideration, with the hope that its study will result in the invention of expedients and methods superior to those suggested.

*Gifford Pinchot's Estimate; see The Outlook, October 12, 1907.

THE STRAIGHT PUSH SASH OPERATOR.

The G. Drouve Company, Bridgeport Conn., in space 158, is showing a complete working model of the straight-push sash operator. This model was completed just previous of this convention, and is being shown for the first time. A full-size section of the operator is also shown, which, with the model, gives an excellent idea of the device.

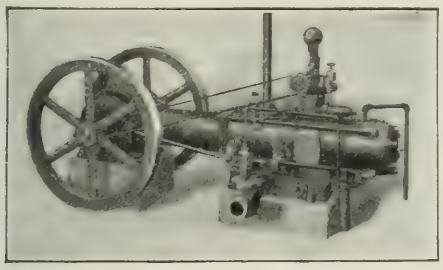
It can be applied to open or close, any number of sash from one control, being designed to meet practically any condition found in industrial buildings, steam or electric railway shops, power houses, foundries, etc.

The main features of this operator are two arms ½-in. steel rods, to each sash; guide and main lever of ¼-in.; pipe shafts, ¾-in. wrought steel, dowel connected; supporting brackets, cast iron spools, bearing shafts of phosphor bronze; operating wheel, with cast iron gears and steel shaft, controlling malleable iron rack and pinion.

All heavy substantial parts have phosphor bronze washers between rivet connections, as a protection against rust. Large rivets are used and all joints are flat. As there are no intricate parts, ease in placing and speed in operation is assured.

FRANKLIN GAS DRIVEN AIR COMPRESSOR.

The Chicago Pneumatic Tool Co., Chicago, has recently placed upon the market, a gasoline-driven air compressor, for which the company claims increased speed and greater efficiency. This is said to be made possible by the improved valve action and an oiling system which insures perfect lubrication. This new design affords minimum resistance, and overcomes gasket troubles. It is built in capacities of 75, 100 and 150 cu. ft. of air at one 100 lbs. pressure. It is simple in construction and operation, moderate in first costs and economical in maintenance. Being self-contained, it is especially adapted for yard work, tank building and general structural work.

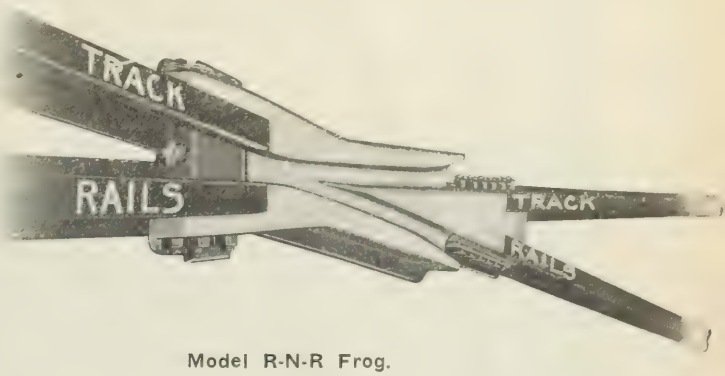


Gasoline-Driven Air Compressor.

Hitherto, when equipping cars, for maintenance bridges and buildings, the common practice has been to use a compressor belted to one of the standard gas engines, requiring large floor space. This new Franklin compressor can be accommodated in one-third of the usual floor space, and, being self-contained, can be readily removed from the car and placed where required.

MODEL R-N-R FROG.

The Indianapolis Switch & Frog Co., Springfield, Ohio, has specialized on solid manganese construction for frogs and crossings. By the elimination of the bolted construction, the company claims that the best effiiciency is obtained. One of the company's special designs, the Model R-N-R railway frog, is shown in in space 182. This is a solid manganese frog, requiring no renewals during the life of the manganese. The track rails connect directly to the frog proper, without alteration. Only one pair of splices are required, instead of four, and all rails are protected by manganese easers so that it is claimed, all joint and point pounding is eliminated, also that the frog is smooth riding, noiseless and lasting.



Model R-N-R Frog.

The company shows one of these frogs which has been subjected to 165 blows by a 1,250 and a 2,500-lb weight, aggregating 1,679,375 ft. This test piece illustrates the physical properties of this manganese, which is made by the American Brake Shoe & Foundry Co., Mahwah, N. J., and under the supervision of W. G. Nichols.

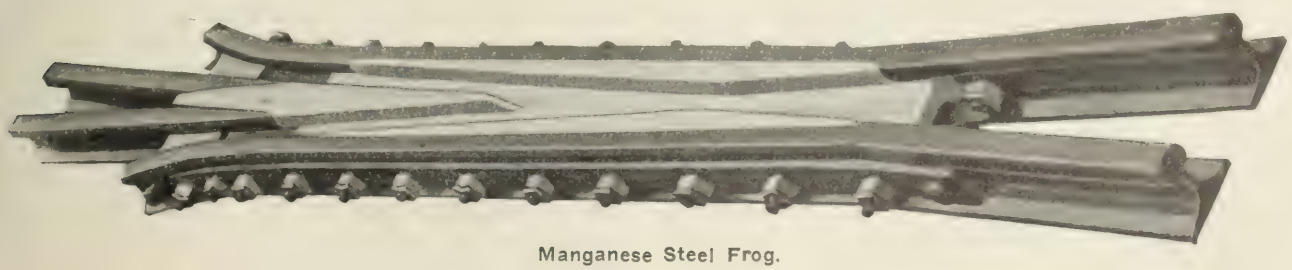
All these frogs and crossing parts are tested before being placed in track.

MANGANESE STEEL FROG.

The accompanying cut shows one of the 86 manganese steel frogs being built by the Morden Frog & Crossing Works, Chicago, for the new Chicago & Northwestern terminal. These frogs are reinforced with 1½-in. D-bar straps on each side and are made of 100-lb. A. R. A. type B, open-hearth rails.

These manganese frogs have met with success in many places. The Illinois Central placed nine of them in track over three years ago, replacing Bessemer frogs that were worn out in three months under the heavy switching service. The nine manganese frogs are still in use, and on last inspection apparently had many months of life still in them.

The Morden Frog & Crossing Company is exhibiting in booth 86 at the Coliseum.



Manganese Steel Frog.

MARGULIES BAND.

The following is the program that will be rendered by Margulies' Band at the Coliseum today:

AFTERNOON.

March—Fighting Hope.....Maurice
Overture—Fest.....Leutner
Waltz—Tales from the Vienna Woods.....Strauss
Selection—The Army Chaplain.....Millocker
The Glow Worm.....Linke
Patrol—American.....Tobani
Darkies' Jubilee.....Turner
Spring Song.....Mendelssohn
Invitation a la Valse.....Weber
March—Gates City.....Weldon

EVENING.

March—Great Divide.....Maurice
Overture—La Gaza Ladra.....Rossini
Put on Your Old Gray Bonnet.....Wenrick
Quartette from Rigoletto.....Verdi
March—That Dreamy Rag.....Adler
Selection—Martha.....Flotow
Waltz—Southern Roses.....Strauss
Sextette from "Lucia".....Donizetti
The Guardmount.....Eilenberg
March—Dublin Daisies.....Wenrich

RECENT INSTALLATIONS OF STRAUSS MOVABLE BRIDGES.

The Strauss Bascule & Concrete Bridge Company, Chicago, whose exhibit is in booth 157 at the Coliseum, is building a movable bridge for the Chicago & Western Indiana over the Calumet river at 125th street, Chicago. It is the first of two double-track, single-leaf bascule spans for this crossing. The leaf in this bridge is 186 ft. long, and the live-load capacity E-50, making it one of the largest and heaviest of bascule bridges on main-line railways. The operating equipment comprises a 30-h.p. oil engine, with a 22-kw. generator and the necessary storage battery, and also two 65-h.p. operating motors, a 25-h.p auxiliary motor and a 3-h.p. lock motor. The operator's house is of reinforced concrete, three stories in height, of fireproof construction throughout. The bridge will be used jointly by five trunk lines and is being built by the American Bridge Company.

There are four other bridges of the same type under construction at the present time, for the Peoria & Pekin Union Ry., the Northern Pacific Ry., the New York, New Haven & Hartford Railroad and the Transcontinental Ry. of Canada.

The company recently finished a bridge at Green Bay, Wis., over the Fox river, which presented unusual difficulties, as the piers rest on 70 ft. of mud and the river is very treacherous. The bridge consists of a bascule span and six approach spans.

A similar structure has recently been built over the Illinois river at Ottawa, Ill. It was designed as a bascule span, but only the parts necessary to carry the loads as a fixed span were erected, and the parts necessary to make it movable will be added when the river is made navigable by the opening of the Lakes-to-Gulf waterway.

The Florida East Coast Railway has recently completed a bascule bridge at Laudervale, Fla., which is of a new desgn. The span is designed on the lines of an ordinary deck plate girder span, and counterweight and mechanism for raising the bridge are attached at one end. The Florida East Coast bridge is a single-track structure of 63-ft. 6-in. span, and is opened by hand in one-half minute. A similar bridge with a span of 73 ft. has been built for the Ohio Electric Company at Toledo, O., another with a 96-ft. span at Winnipeg, Man. This new type has proven very successful where a deck construction is desired.

MAKING A DAILY TECHNICAL NEWSPAPER.

The work of getting out a daily technical morning newspaper is vastly different from that of getting out an ordinary daily morning newspaper. The ordinary daily newspaper has a large staff of editors, reporters, copy readers, printers, foremen, pressmen and binders, who are thoroughly trained to this kind of work. They are used to the idea that what can't be done today for tomorrow's paper can never be done. They work on the theory that it is far better to report a thing wrong today than to report it right tomorrow, because the average reader won't know whether a "story" is right or not, anyway. The technical daily newspaper, on the other hand, is edited and printed by men who are not used, every day of their lives, to rush work. Furthermore, it is read by technical men who are used to exact statements and exact work, and to whom a journal that does not get things right is so much wasted print paper. Between the necessity of rushing work as fast as the regular daily newspaper men, and of getting their copy as nearly as exact as a blue print as possible, the editors of a daily technical paper have an exceedingly hard job. In order to enable them to do it right, a well-nigh perfect organization, welded together by the most perfect spirit of co-operation, and impelled by great enthusiasm, is required. As to whether the results show that the Daily Railway Age Gazette has such an organization, composed of men united by such a spirit of co-operation and inspired by such enthusiasm, the reader is the best judge.

The object in printing this article is to give the layman a bird's-eye view of what it means to get out four consecutive daily issues of a morning newspaper made up largely of high-class engineering matter.

In the regular routine of the Railway Age Gazette, weekly edition, the staff is divided into two departments—editorial and business. The former has to do only with the matter that goes into the reading pages; while the business department concerns itself only with the advertising pages and the general executive work of the company. In the case of the Maintenance of Way Daily, the work of soliciting advertising is finished one week before the convention opens. The business department staff is then divided into three parts; one to assist the editors, another to circulate the papers, and a third to make up and supervise the work of printing the advertising pages.

The labor involved in getting out the Daily is not of a week or a month, but of several months. In fact, as this is the first time a publication of this kind has been attempted in connection with the conventions of the American Railway Engineering and Maintenance of Way Association, the plan and scope had to be worked out nearly one year ago.

With the planning, the work of the business department begins. This year much educational work, which will be unnecessary another year, had to be done. Then started, simultaneously, the business of soliciting advertising and gathering together the materials consumed in printing the paper.

Providing for the presswork, binding and mailing involves hundreds of details of no special interest to the reader; but they all require constant attention. For instance, all paper used in printing the Daily had to be made to order. Eleven tons were necessary; and it differs so in quality and size

from the usual run of printing paper that it cannot be bought in the regular market. The cover stock had to be made at one mill and the white paper at another mill. The order then had to be duplicated to insure prompt replacement by express in the event of a wreck en route or a fire after delivery at the press rooms. Fifty thousand envelopes had to be made and printed in a certain way to conform with the postal regulations. They were then shipped from the factory to our New York office, put through the addressing machines, sorted geographically for mailing, reboxed and shipped here by express. And so on, from selecting the proper plant in which to do the mechanical work, to providing offices in the hotel and Coliseum and living accommodations for such members of our staff as we must bring to Chicago from our other offices.

To procure the best possible current comment on the work of the convention, two members of the staff, Mr. Forsyth and Mr. Fowler, attend all sessions and prepare editorial notes. The paper has also been fortunate in obtaining direct co-operation in the form of editorial paragraphs from Messrs. Hunter McDonald, Charles S. Churchill, C. H. Cartlidge, M. L. Byers, L. C. Fritch, W. W. Colpitts, O. P. Chamberlain, Franklin E. Abbott, J. A. Lahmer, Azel Ames, W. H. Arkenburgh, Professor C. Frank Allen, Professor W. K. Hatt, Professor Walter L. Webb, Professor William G. Raymond and Professor W. D. Pence.

Apart from the leading editorial pages, the Daily is made up of convention proceedings and reports, "conventionalities," and descriptions of the exhibits at the Coliseum. Where the sessions of the convention last until 11 or 12 at



Workers on the Maintenance of Way Daily.

Aside from the preliminary educational work and planning, it took a considerable part of the time and energy of the business department for two and one-half months.

Two-thirty o'clock on the afternoon of Sunday, March 13, found just twenty regular staff members assembled at their desks in the Railway Age Gazette Daily office in the Congress Hotel, in executive session perfecting plans for four of the most strenuous days they will have had since last June, when we edited seven daily issues in Atlantic City, printed them in New York, and had them on the breakfast tables at Atlantic City every morning. At this Sunday meeting every man was assigned to specific work; and for the first time since the 1909 M. M. and M. C. B. conventions, the forces of both departments were interwoven to expedite the exact work.

night the work of making a full and accurate report and getting it edited, printed and distributed by 6 in the morning is a first-rate task. Expert convention stenographers, in charge of T. E. Crossman, work in relays, and two editors, Bradford Boardman and H. H. Simmons, handle their copy leaf by leaf, passing it through to the managing editor, Ray Morris, who is responsible for its appearance in the paper.

Two editors, F. W. Lane and Samuel O. Dunn, handle the "conventionalities"; two others, F. E. Lister and F. S. Dinsmore, the latter temporarily detached for this purpose from the business department, handle news of the exhibit, and they are assisted by the entire business staff, which has direct responsibility for the brief descriptions of the Coliseum exhibits. The Railway Age Gazette automobile runs all day long between the editorial office, at the Congress Hotel, the

Coliseum, and the printing shop of the Blakely Printing Company, where the Daily is printed, and serves to co-ordinate the work of the editorial office, the Coliseum office, and W. E. Hooper, the make-up editor, at the printer's.

In the editing of any daily it is the unexpected that usually happens. This Daily is no exception. No foresight can tell what is going to happen many minutes ahead. The managing editor cannot anticipate when any specified report is going to be reached. He cannot anticipate how long or important the discussion on the report will be. He cannot tell when one of the editors will bring in a long "must" story. He cannot know when one of the linotypes or presses at the printing office, or the automobiles, with the uncertain and refractory disposition characteristic of all linotypes, presses and automobiles, will balk. But up to this writing neither man nor machine has refused to pull its share of the load, and no signal of distress has yet been run up indicating that any such calamity is going to happen.

The moment the make-up editor O.K.'s the last page of reading matter for press, the entire responsibility for conforming to the rest of the schedule is assumed by the business department.

Henry Lee is in direct charge of the advertising make-up and presswork. The last advertising form is running through the press about the time the first form of text matter is sent "down stairs." It is his job to watch the run-off of the first one thousand sheets of every form, so that the convention distribution is assured before he goes to bed. Yesterday morning he said "goodnight" at 3 a. m. At present writing, with a meeting scheduled to adjourn at 11 o'clock Tuesday night, it means 5 a. m.; and he will have had just one and one-half hours' sleep since 7 a. m. Monday. But that's only an incident of our sertnuous life.

The printed sheets take their usual course through the folding, stitching and trimming machines and one thousand copies are tied in packages by 6 o'clock a. m. At that exact moment a Railway Age Gazette automobile containing L. B. Sherman and two messengers stops at Blakely's; the packages of Dailies are put aboard and the work of local distribution begins. With a carefully compiled registration list as a guide, copies of the Daily are in the boxes or at the doors of the rooms of every railway man registered at a hotel or club in Chicago, before 7 o'clock. A corps of messenger boys starts out at 7 a. m., and copies of the Daily are placed by them on the desks of every railway officer in the down-town district who is a regular subscriber to the Railway Age Gazette—and there are several hundred in that particular district. The rest of the run is then mailed to all regular subscribers in North America.

All the executive work and all the work of the members of the business department is directed by the vice-president, Edward A. Simmons. He is the general burden bearer and is subject to call at all times of the day and night. These burdens, however, are no greater than the specific burdens of each and every member of the entire staff. And the best of it all is, that every one of them enjoys his work.

REGISTRATION — MAINTENANCE OF WAY ASSOCIATION.

Allen, C. Frank, Prof. R. R. Eng., Mass. Inst. Tech., Boston, Mass.
Ambrose, J. R. W., Asst. Eng., Grand Trunk Ry., Montreal, Can.
Ames, Azel, Jr., Kerite Insulated Wire & Cable Co., New York.
Anthony, C. C., Asst. Sig. Eng., P. R. R., Philadelphia, Pa.
Anthony, F. D., Montreal, Can.
Armour, Robert, Asst. Eng., Grand Trunk Ry., Montreal, Can.
Armstrong, H. J., Asst. Prof. C. E., Armour Inst., Chicago.
Arthur, G. F., Assistant Engineer, I. C. R. R., Fulton, Ky.
Atwood, J. A., Chief Eng. P. & L. E. R. R., Pittsburg, Pa.
Atwood, Wm. G., Chief Engineer, L. E. & W. R. R., Indianapolis.
Backes, W. J., Chief Eng., Cent. New Eng. Ry., Hartford, Conn.
Bagg, F. A., Eng. F. J. & G. R. R., Gloversville, N. Y.
Beagles, Fred., Asst. Eng., O. R. R. & N. Co., Portland, Ore.
Begien, R. N., Div. Eng., B. & O. R. R., Philadelphia.
Bergen, W. J., Asst. to C. E., N. Y. C. & St. L. Ry., Cleveland.
Beye, John C., Loc. Eng., C., R. I. & P. Ry., Chicago, Ill.
Blaiklock, M. S., Eng. M. of W., Grand Trunk Ry., Montreal, Can.
Bostwick, W. A., Metallurgist, Carnegie Steel Co., Pittsburg.
Bowser, E. H., Chief Timber Insp., I. C. R. R., Memphis, Tenn.
Boyd, G. E., Roadmaster, I. C. R. R., Chicago, Ill.
Bremner, Geo. H., Eng. Ill. Dist., C., B. & Q. R. R., Chicago.
Brimson, C. T., Eng. M. W., Q. O. & K. C. Ry., Kansas City.
Brimson, W. G., V.-P. and G. M., Q. O. & K. C., Kansas City.
Brooke, G. D., Div. Eng., B. & O. R. R., Baltimore, Md.
Brown, J. M., Dist. Eng., C., R. I. & P. Ry., Davenport, Ia.
Burgess, G. H., Chief Eng., D. & H. Co., Albany, N. Y.
Burke, James, E. M. W., Erie R. R., Cleveland, O.
Burpee, Moses, Chief Eng., B. & A. R. R., Houlton, Me.
Burpee, T. C., Eng. M. W., Intercolonial Ry., Moncton, N. B.
Burton, W. J., Div. Eng., Mo. Pac., Ry., St. Louis, Mo.
Bush, Lincoln, Cons. Eng., Metropolitan Life Bldg., New York.
Byers, M. C., Chief Eng.-Operation, St. L. & S. F., St. Louis.
Camp, W. M., Editor Railway & Eng. Review, Chicago, Ill.
Cantine, E. I., Div. Eng., D. L. & W. R. R., Hoboken, N. J.
Cartlidge, C. H., Bridge Eng. C., B. & Q. R. R., Chicago, Ill.
Chandler, Charles, Bridge Engineer, C. G. W. R. R., Chicago.
Chanute, O., Consulting Engineer, Chicago, Ill.
Christofferson, C. A., Signal Eng., N. P. Ry., St. Paul, Minn.
Church, H. M., Div. Eng., B. & O. S. W. R. R., Cincinnati, O.
Churchill, Chas. S. (Director), Chief Engineer N. & W. Ry., Roanoke, Va.
Clausen, L. R., Supt., C., M. & St. P. Ry., Chicago, Ill.
Clement, S. B., Chief Eng. T. & N. O. Ry., North Bay, Ont.
Coates, F. R., V. P. Interocean Steel Company, Chicago, Ill.
Coburn, Maurice, Prin. Asst. Eng., Vandalia Line, St. Louis, Mo.
Colby, J. A., Insp. Eng., Philadelphia, Pa.
Condron, T. L., Consulting Eng., Monadnock Block, Chicago.
Conner, J. K., First Asst. Eng., L. E. & W. R. R., Indianapolis.
Cook, C. C., B. & O. R. R., Morgantown, W. Va.
Correll, E. J., Eng. M. W., Mo. Pac. Ry., Little Rock, Ark.
Courtenay, W. H., Chief Eng. L. & N. R. R., Louisville, Ky.
Cox, J. B., Consulting Engineer, Chicago, Ill.
Crandall, C. L., Prof. of Ry. Eng., Cornell Univ., Ithaca, N. Y.
Crumpton, Arthur, Asst. Eng., G. T. Ry., Montreal, Can.
Cunningham, A. O., Chief Eng., Wabash R. R., St. Louis, Mo.
Curd, W. C., Asst. Eng., Mo. Pac. Ry., St. Louis, Mo.
Curtis, L. G., Div. Eng., B. & O. R. R., Chicago, Ill
Curtis, W. W., Consulting Eng., Chicago, Ill.
Cushing, W. C., (Second Vice-President), Chief Eng. M. of W. S. W. Sys., Penna. Lines, Pittsburg, Pa.
Dakin, A. H., Jr., Cons. Eng., 370 St. Nicholas Ave., New York.
Davidson, Geo. M., Chemist & Eng. Tests, C. & N.-W. Ry., Chicago.
Davis, C. A., Eng. Dept., C. B. & Q. R. R., Lincoln, Neb.
Davis, C. S., Consulting Engineer, Toledo, Ohio
Davis, Garrett, Superintendent, C., R. I. & P. Ry., Elden, Mo.
Dawley, W. M., Asst. Eng., Erie R. R., New York.
Dorley, A. F., Div. Engineer, Mo. Pac. Ry., Kansas City, Mo.
Dougherty, C., Engineer M. W., C. N. O. & T. P. Ry., Cincinnati.
Douglas, H. T., Jr., Chief Eng., W. & L. E. R. R., Cleveland.
Downs, J. L., Roadmaster, Y. & M. V. Ry., Vicksburg, Miss.
Downs, L. A., Asst. to Chief Eng. M. of W., I. C. R. R., Chicago.
Dunham, Chas., Signal Eng., Gt. Northern Ry., St. Paul, Minn.
Eck, W. J., Electrical Eng., Sou. Ry., Washington, D. C.
Elliott, W. H., Signal Eng., N. Y. C. & H. R. R. R., Albany, N.Y.
Entwisle, E. B., Ch. Eng., J. & S. C. R. R., Johnstown, Pa.
Ewing, C. H., E. M. W., P. & R. Ry., Reading, Pa.
Fake, C. H., Chief Eng. M. R. & B. T. Ry., Bonne Terre, Mo.
Faulkner, E. O., Man. T. & T. Dept., Santa Fe., Topeka.
Ferriday, Robert, E. M. W., Big Four Ry., Indianapolis, Ind.
Finke, W. F. H., Tie and Timber Agt., Sou. Ry., Washington, D. C.
Fisk, C. H., Consulting Engineer, St. Louis, Mo.
Fithian, C. B., Div. Eng., M. P. Ry., Van Buren, Ark.
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Fritch, L. C. (First Vice-President), Chief Engineer, Chicago Great Western Railroad, Chicago, Ill.
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Griswold, H. C., Asst. Inspecting Eng., I. St. Co., Chicago, Ill.
Hale, H. E., Prin. Asst. Eng., Missouri Pacific Ry., St. Louis.
Hallsted, Jas. C., Consulting Engineer, Chicago.
Hanna, E. E., Div. Eng., Mo. Pac. Ry. Aurora, Mo.
Hatt, W. K., Prof. C. E., Purdue Univ., Lafayette, Ind .
Hendricks, V. K., Asst. E. M. W., St. L. & S. F. Ry., St. Louis.
Hill, C. C., Div. Eng., M. C. R. R., Niles, Mich.
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Johnston, A. W., (Past President), Gen. Man. N. Y. C., & St. L. R. R., Cleveland, O.
Jordan, S. A., Eng. M. of W., B. & O. R. R., Baltimore, Md.
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Knickerbocker, C. E., E. M. W., N. Y., O. & W. Ry., Middletown, N. Y.
Lahmer, J. A., Prin. Asst., K. C. S. Ry., Kansas City, Mo.
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Lee Frank, Div. Eng., Can. Pac. Ry., Winnipeg, Man.
Leighty, John R., Div. Eng., Mo. Pac. Ry., Kansas City, Mo.
Lemond, J. S., Engineer M. W., Southern Ry., Charlotte, N. C.
Lewis, E. R., Div. Eng., M. C. R. R., Bay City, Mich.
Liggett, Thomas, Jr., Chief Eng., W. Allegheny R. R., New Castle, Pa.
Loweth, C. F. (Treasurer), Eng. & Supt. B. & B., C. M. & St. P. Ry., Chicago.
Lum, D. W., Ch. E. M. W. and Str., Sou. Ry., Washington, D. C.
McDonald, Hunter (Past-President), Chief Eng. N., C. & St. L. Ry., Nashville, Tenn.
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Macomb, J. de N., Jr., Eng. Dept., A. T. & S. F. Ry., Chicago.
Mann, B. H., Signal Eng. Mo. Pac. Ry. System, St. Louis, Mo.
Martin, L. B., Engineer M. W., Illinois Traction Co., Decatur, Ill.
Mather, Richard, Asst. Eng. Erie R. R., Cuba, N. Y.
Miller, C. H., Engineer River Prot., Mo. Pac. Ry., St. Louis, Mo.
Mitchell, W. M., Chief Engineer, K. & I. B. R. R. Co., Louisville.
Mock, J. C., Electrical Eng. Detroit River Tunnel Co., Detroit.
Modjeski, R., Cons. Eng., Monadnock Block, Chicago, Ill.
Monsarrat, C. N., Eng. of Bridges, C. P. Ry., Montreal, Can.
Montfort, R., Cons. Eng. L. & N. R. R., Louisville, Ky.
Montzheimer, A., Ch. E., E., J. & E. and C., L. S. & E., Joliet.
Moore, W. H., Br. Eng., N. Y. N. H. & H. R. R., New Haven.
Mordecai, Augustus, Consulting Engineer, Cleveland, Ohio.
Mountain, G. A., Chief. Eng. Can. Ry. Commission, Ottawa, Can.
Mullen, Joseph, E. M. W., C. C. C. & St. L. Ry., Mt. Carmel, Ill.
Myers, J. B., Div. Eng., B. & O. R. R., Cumberland, Md.
Neff, F. H., Prof. C. E. Case School Appl. Sci., Cleveland, O.
Nelson, J. C., E. M. W., S. A. Line, Norfolk, Va.
Newbegin, P. C., Maint. Eng., B. & A. R. R., Houlton, Me.
Osgood, Jos. O, Chief Eng., C. R. R., of N. J., New York.
Parker, W. A., Chief Eng., St. J. & G. I. Ry., St. Joseph, Mo.
Parrish, F. J., E. M. W., K. & I. B. & R. R. Co., Louisville, Ky.
Patenall, F. P., Signal Eng., B. & O. R. R., Baltimore, Md.
Patterson, J. C., Asst. C. E., Gr. Nor. Ry., St. Paul, Minn.
Patterson, F. M., Asst. Eng., C., B. & Q. R. R., Chicago, Ill.
Peabody, J. A., Signal Eng., C. & N.-W. Ry., Chicago, Ill.
Pelley, John, Roadmaster, I. C. R. R., McComb Miss.
Pence, W. D. (Editor of Publications), Prof. R. R. Eng., Univ. of Wis., Madison, Wis.
Philbin, T. R., Consulting Engineer, Chicago.
Puder, F. R., Asst. Eng., Chicago Sou. Ry., Chicago, Ill.
Quigley, C. N., Asst. Eng., M. C. R. R., Bay City, Mich.
Ransom, C. L., Res. Eng., C. & N.-W. Ry., Omaha, Neb.
Ray, G. J., Chief Eng., D., L. & W. R. R., Hoboken, N. J.
Raymer, A. R., Asst. Chief Eng., P. & L. E. R. R. Pittsburg, Pa.
Raymond, W. G., Dean, State Univ., of Iowa, Iowa City, Ia.
Rhea, Frank, General Electric Co., Schenectady, N. Y.
Rice, S. B., Roadmaster R. F. & P. R. R., Richmond, Va.
Richey, C. W., Master Carpenter, P. R. R., Pittsburg Pa.
Roach, J. H., Div. Eng., L. S. & M. S. Ry., Cleveland, O.
Roberts, S. S., Asst. Prof. R. R. Eng., Univ. of Ill., Urbana, Ill.
Robinson, A. F., Bridge Eng., Santa Fe Ry. System, Chicago.
Rohbock, W. L., Asst. to Ch. Eng., W. & L. E. R. R., Cleveland.
Rose, L. S., Signal Eng., Big Four Ry., Cincinnati, O.
Rote, R. O., Jr., Prin. Asst. Eng., L. S. & M. S., Cleveland, O.
Rowe, S. M., Con. Eng., Monadnock Block, Chicago, Ill.
Rudd, A. H. (Director), Signal Eng., P. R. R., Philadelphia.
Schulz, W. F., Eng. Dept., L. & N. R. R., Louisville, Ky.
Scott, G. E., 502 Fitzsimmons Bldg., Pittsburg, Pa.
Scribner, G. H., Jr., Contr. Engineer, Chicago, Ill.
Seddon, W. L., Chief Eng., Seaboard Air Line, Norfolk, Va.
Selby, O. E., Bridge Eng., C., C. C. & St. L. Ry., Cincinnati.
Shurtleff, A. K., Office Eng., C., R. I. & P. Ry., Chicago, Ill.
Smith, C. E., Asst. Eng., Mo. Pac. Ry., St. Louis, Mo.
Smith, C. H., Div Eng., N. Y. C. & St. L. R. R., Cleveland, O.
Smith, F. A., Civil Eng., Chicago, Ill.
Snow, J. P. (Director), Ch. Eng., Boston & Maine R. R., Boston.
Spencer, C. H., Eng., Washington Term. Co., Washington, D. C.
Sperry, H. M., Res. Man., Gen. Ry. Signal Co., New York.
Splitstone, C. H., East Orange, N. J.
Starbuck, R. D., Asst. Eng., M. C. R. R., Detroit, Mich.
Stein, C. H., Eng. M. of W., C. R. R. of N. J., Jersey City.
Steinbeck, E. J., Asst. Eng., I. C. R. R., Chicago, Ill.
Stern, I. F., Eng. Bridges, C. & N.-W. Ry., Chicago, Ill.
Stevens, F. S., Supt. P. & R. Ry., Reading, Pa.
Stevens, Thos. S., Signal Eng., Santa Fe System, Topeka, Kan.
Stimson, Earl, Ch. E. M. W., B. & O. S. W. R. R., Cincinnati.
Strouse, W. F., Assistant Engineer, B. & O. R. R., Baltimore, Md.
Sullvican, J. G., Asst. Chief Eng., C. P. Ry., Montreal, Can.
Swartz, Albert, Div. Eng., Erie R. R., Huntington Ind
Swingly, G. D., Div. Eng., B. & O. R. R., Connellsville, Pa.
Taussig, J. E., Ter. Supt. Wabash R. R., St. Louis, Mo.
Thompson, W. S., Asst. Eng., P. R. R., Sunbury, Pa.
Tinker, G. H., Br. Eng., N. Y. C. & St. L. Ry., Cleveland, O.
Tratman, E. E. R., Resident Editor Engineering News, Chicago, Ill.
Trench, W. I., Div. Eng., B. & O. S. W. R. R., Chillicothe, O.
Trimble, Robert, Ch. Eng. M. of W. N. W. Sys., Penna Lines, Pittsburg, Pa.
Turneaure, F. E., Dean, Col. of Engr., Univ. of Wis., Madison, Wis.
Wallace, W. A., Div. Eng., C., I. & L. Ry., Chicago, Ill.
Webb, G. H., Chief Eng., M. C. R. R., Detroit, Mich.
Webster, Wm. R., Cons. and Insp. Engineer, Philadelphia, Pa.
Weiss, H. F., Section Research, U. S. Forest Service, Madison.
Wendt, Edwin F. (Director), Asst. Eng., P. & L. E. R. R., Pittsburg, Pa.
Wentworth, C. C., Prin. Asst. Eng., N. & W. Ry., Roanoke, Va.
West, O. J., Res. Eng., Phoenix Bridge Co., Chicago, Ill.
Wheaton, F. L., Eng. Const., D. L. & W. R. R., Hoboken, N. J.
Wickhorst, M. H., Eng. of Tests, Rail Committee, Aurora, Ill.
Wilgus, H. S., Eng. M. of W., P. S. & N. R. R., Angelica, N. Y.
Wilson, C. A., Consulting Engineer, Cincinnati, O.
Wiltsee, W. P., Asst. Eng., N. & W. Ry., Roanoke, Va.
Wood, B. A., Chief Eng., M. & O. R. R., Mobile, Ala.
Young, R. C., Chief Eng., L. S. & I. and Munising Rys., Marquette, Mich.

GUESTS.

W. A. Fisher, Atlantic Coast Line.
F. W. Carrington, Indian Refining Co.
G. T. Warren, Ast. Div. Eng., B. & O. R. R.
Prof. F. O. Dufour, Univ. of Ill.
Prof. C. W. Malcomb, Univ. of Ill.
W. G. Nusz, Asst. Eng., I. C. R. R.
P. Aagaard, Supr., B. & B., I. C. R. R.
O. E. Strehlow, Ch. Eng., J. O. Heyworth Co.
J. R. Reinholdt, Div. R. M., M. & St. L. R. R.
O. R. Price, Asst. Eng., L. S. & M. S. Ry.
J. C. Mock, Elec. Eng., Detroit River Tunnel.
J. E. McNeil, Atlantic Coast Line.
R. Emerson, Eng. of Track Economics, A., T. & S. Fe Ry.
B. Wolhaupter, Rail Joint Co.
E. B. Temple, Asst. Ch. Eng. Penna. R. R.
H. W. Chase, Jos. Dixon Crucible Co.
E. R. Smith, Jos. Dixon Crucible Co.

SIGNALS AND INTERLOCKING.*

The board of direction assigned eight subjects:

1. Consider revision of Manual.
2. Continue investigation of outline and description of a comprehensive and uniform signal system, suitable for general adoption.
3. Continue preparation of standard agreement form for signal work, conferring with Special Committee on Uniform General Contract Forms. This agreement form should be general and should not include division of expense.
4. Confer with Committee III, on Ties, and make report on the effect of treated and metal ties on track circuits.
5. Report relative to proper form of switchstand signals, conferring with Committee V, on Track.
6. Confer with Committee IX, on Records and Accounts, relative to conventional symbols.
7. Revise Mechanical Interlocking Specifications presented in Bulletin 108, and include wrought-iron pipe as well as steel.
8. Review and re-submit Electric Interlocking Specifications, with statement of the results from experience.



A. H. RUDD.

Sub-committees were appointed as follows to handle the above subjects:

1—Sub-committee D: Eck, Temple and Wendt, chairman.

2—The entire committee with Sub-committee A, on special work of aspects, consisting of Messrs. Anthony, Cable, Mock, Patenall, Scott and Stevens, chairman, until May 20, and subsequent to that date, Cable, Ingalls, Patenall, Peabody, Scott and Anthony, chairman.

3—Sub-committee B: Harahan, Peabody, Rhea and Balliett, chairman.

4—Sub-committee G: Christofferson, Clausen, Hovey and Denney, chairman.

5—Sub-committee C: Taussig and Ingalls, chairman.

6—Sub-committee E: Ames, Ellis and Elliott, chairman.

7 and 8—Sub-committee F: Anthony, Patenall, Peabody, Stevens and Mock, chairman.

The committee makes changes and additions, the most important of which is matter adopted by the association since the Manual was last published and definitions from the revised Standard Code.

Uniform Signal System.

This report, with its conclusions, is similar to the one presented at the annual meeting of the Railway Signal Association last fall (Railroad Age Gazette, October 15 and 22, 1909), at which time, also, a minority report similar to the one mentioned below was presented by Messrs. Clausen and Stevens.

Standard Agreement for the Construction, Renewal, Maintenance and Operation of Joint Interlocking Plants.

On September 11 the chairman submitted to the chairman of the committee on Uniform General Contract Forms copies of agreements "A," "B" and "C," and asked that he check against these proposed agreements as instructed by the Board of Direction and supply his comments. No advice other than acknowledgment of receipt of papers has been received. Through oversight the Railway Signal Association committees were not instructed to prepare a table of the relative values of the various functions; this will be remedied during the current year, the instructions to the various committees interested being to submit lists of the comparative values to be given to the operating units with which each has to do, based on an arbitrary value of 10 for a one-arm three-position power operated signal, and it is hoped to have this information presented to the Railway Signal Association next October, so that it will be available for the use of this committee in time for its next report. The elimination of the division of expenses from the report as ordered by the 1909 convention emasculates the subject to such an extent that it is almost impossible to treat it intelligently or in a comprehensive manner. Considering all the circumstances, therefore, the committee feels that it is not in a position to make any definite recommendations this year and presents this explanation as a progress report.

Effects of Treated and Metal Ties on Track Circuits.

Committee III, on Ties, was notified of the appointment of the sub-committee, and did not arrange for a conference. It, therefore can only report progress.

Switchstands.

Last year a progress report only was presented, no conference being held, largely on account of the report of Committee X being accepted as a progress report. Members of this sub-committee were unable to attend a conference on the date arranged this year. Any delay must, therefore, be charged to Committee X.

Symbols.

The sub-committee held no meetings, as probably none will be necessary unless and until report on a uniform signal system is adopted.

Electrical and Mechanical Interlocking Specifications.

At the last convention the subject was referred back to the committee, with instructions to include wrought-iron pipe, as well as steel, and at the request of the committee the mechanical specifications were eliminated from the Manual.

Electric interlocking specifications were referred back to be revised and resubmitted with statements of the results of experience. In view of this attitude of the association, and of the numerous other subjects assigned to the committee, it was considered best to postpone the presentation of any specifications for a year or two in order that, as they had been adopted by the Railway Signal Association, they might be given a thorough trial, amended where necessary, and presented for adoption here just previous to the publication of the next Manual. The sub-committee, therefore, in conjunction with manufacturers and the chairmen of Railway Signal Association committees having these matters in charge, has occupied its time largely in harmonizing; making the specifications as far as possible identical in arrangement and wording.

The sub-committee has, in addition, prepared specifications for wrought-iron signal pipe, in conformity with the instructions of the association, voted at the 1909 convention. These specifications, however, have not been submitted to the committee as a whole, and have not been acted upon by the Railway Signal Association. Under these circumstances it has been considered best not to embody them in this report, and the sub-committee reports progress, which the entire committee endorses..

The report is signed by: A. H. Rudd (Penna. R. R.), chairman; Azel Ames (Kerite Insulated Wire & Cable Co.), C. C. Anthony (Penna. R. R.), H. S. Balliett (N. Y. C. & H. R.), H. S. Cable (C., R. I. & P.), C. A. Christofferson (Nor. Pac.), C. E. Denney (L. S. & M. S.), W. J. Eck (Southern), W. H. Elliott (N. Y. C. & H. R.), G. E. Ellis (Federal Signal Co.), M. H. Hovey (Amer. Ry. Signal Co.), A. S. Ingalls (L. S. & M. S.), J. C. Mock (Detroit River Tunnel), F. P. Patenall (B. & O.), J. A. Peabody (C. & N. W.), Frank Rhea (General Electric Co.), H. H. Temple (B. & O.) and Edwin F. Wendt (P. & L. E.).

The minority report, asking that the above report be referred back for further consideration, is signed by: L. R. Clausen (C., M. & St. P.), vice-chairman; W. B. Scott (Harriman Lines), Thomas S. Stevens (A., T. & S. F.) and J. E. Taussig (Wabash).

W. J. Harahan (Erie) does not concur in the majority report and does not sign the minority report.

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

RULES AND ORGANIZATION.*

The committee was instructed to:

1. Consider revision of Manual, both generally and with a view to consistent general grouping of heads, uniformity of numbering and similarity in language covering similar rules.

2. Confer with allied committees which have heretofore presented rules which have been adopted by the association with a view of harmonizing all such rules as have been considered by this committee.

The work under the first instruction has mainly occupied the time of the committee, and this year's report does not attempt to deal with the second.

The General Rules for the government of employes of the maintenance of way department, heretofore adopted by the association, have been carefully reviewed by the committee, the revision being a more logical arrangement of the rules, and minor changes in wording without change in substance.

Some progress has been made, however, in compiling and arranging the rules originating with other committees, and it is proposed during the remaining months of the year to confer with such committees with a view to obtaining their



J. O. OSGOOD.

assent to the changes in arrangement which may be found desirable.

The report then presents the rules as revised.

Conclusion.

The committee recommends that the revised general rules for the government of employes of the maintenance of way department, submitted herewith, be approved and incorporated in the Manual of Recommended Practice.

The report is signed by: Joseph O. Osgood (Cent. of N. J.), chairman; F. L. Nicholson (Nor. & Sou.), vice-chairman; C. C. Anthony (Penna.), F. D. Anthony (Que., Mont. & Sou.), M. S. Blaiklock (Grand Trunk), G. D. Brooke, B. & O.), W. H. Elliott (N. Y. C. & H R.), A. S. More (C., C., C. & St. L.), J. B. Myers, (B. & O.), and J. A. Peabody (C. & N. W.).

ELECTRICITY.†

This is a progress report. The following sub-committees have been appointed:

A—Clearances: L. C. Fritch, chairman; W. W. Drinker, G. A. Harwood.

B—Transmission Lines and Crossings: R. D. Coombs, chairman; A. S. Baldwin, G. A. Harwood.

C—Insulation: H. R. Talcott, chairman; R. D. Coombs, L. C. Fritch.

D—Maintenance Organization: J. B. Austin, Jr., chairman; E. P. Dawley, C. E. Lindsay.

E—Electrolysis: A. S. Baldwin, chairman; W. W. Drinker, H. R. Talcott.

F—Relation to Track Structures: C. E. Lindsay, chairman; J. B. Austin, Jr., E. P. Dawley.

These sub-committees were directed to prepare histories and bibliographies of the subjects considered, but in other respects each sub-committee will be permitted to conduct its investigations in the manner that the subject and conditions seem to make most desirable. At this meeting it was decided that the committee would meet bi-monthly.

Progress reports from the sub-committees have been made, as follows:

Sub-Committee A:

Reports of the Committee on Standard Location of Third Rail Working Conductors of the American Railway Association were discussed, and while no conclusion as to the amount of clearance which it would be advisable to recommend was agreed on, it was the sense of the sub-committee that the clearances between the limiting lines of equipment and the limiting lines of third rail structures, which are shown as 1½ inches in the report referred to, are insufficient, and that a greater clearance should be established. In order to determine the limiting clearance that could be established, it was decided to secure data



G. W. KITTRIDGE.

showing limiting lines of clearances of third rail conductor structures, the limiting lines of rolling equipment and the limiting lines of third rail structures with respect to maintenance of way structures from various railways. The sub-committee is also collecting data from various railways electrified or partly electrified, and also interurban lines with heavy traffic, which may possible interchange with steam lines electrified or not electrified. This sub-committee is communicating direct with the representatives of the various railways, and a circular has also been issued by the secretary of the association, requesting data pertinent to the subjects outlined.

Sub-Committee B:

No meetings. Communications have been sent to various associations, suggesting the advisability of the various associations co-operating and requesting copies of their previous reports; copies of crossing specifications have also been requested from various companies. It is the intention to make report of comparison of the various specifications referred to. The secretary of the association has issued a circular requesting data pertinent to the subject.

Sub-Committee D and Sub-Committee F:

A circular letter of inquiry has been sent out to representatives of various railways that have substituted electricity for steam, wholly or in part, as a means of motive power.

The report is signed by: George W. Kittredge (N. Y. C. & H. R.), chairman; J. B. Austin, Jr. (Long Island), vice-chairman; A. S. Baldwin (Ill. Cent.), R. D. Coombs (Penna. Tun. & Term.), E. P. Dawley (consulting engineer), W. W. Drinker (Erie), L. C. Fritch (C. G. W.), G. A. Harwood (N. Y. C. & H. R.), C. E. Lindsay (N. Y. C. & H. R.), and H. R. Talcott (B. & O.).

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

†From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

Conventionalities

Did the man lisp who named those sliding fire-doors? He calls them "Allith."

L. R. Clausen, when he was signal engineer of the Chicago Milwaukee & St. Paul, was recognized as one of the wheel horses of the Railway Signal association. As superintendent of the Chicago division of the same road, he does not find it necessary to run away from his former pole-fellows, but, on the contrary, makes an admirable leader.

Constant Reader.—No, that is not a potato-digger, nor a vacuum cleaner that is exhibited by the Duntley Manufacturing Company—that is, it does not dig potatoes unless they are planted on the right-of-way, but it does create very much of a vacuum so far as weed-life along the track is concerned. It is admitted by manufacturers and users that it is better to use the machine before the weeds have gone to seed, though this is likely to injure the chances of the second crop.

Among the notable figures at the opening meeting was Octave Chanute, who divides his time between timber preservation and flying machines. If engineering is correctly defined as the utilization of the forces of nature for the benefit of man, Mr. Chanute has gone a little further than most of the members who are, indeed, sometimes "up in the air" temporarily, but are quite likely to be "in a hole" at the same time. The aeronauts appear to have solved the paradoxical situation by scooting off in the air and dragging the hole after them.

If there's a hole in a' ye'r coats
I rede ye tent it;
A chiel's amang ye takin' notes,
An', faith, he'll prent it.
—Burns.

An' ither holes ye may ha' had,
An' ye ha' tented—
He'll speir about them, too—ye're glad
To see them prented?

The spasmodic estheticism which occasionally catches Chicago, cropped out Monday in the issuance of an edict by some of Chief Steward's blue-coated and flat-footed minions requiring the removal of the streamers from the big red limousine which serves The Daily Railway Age Gazette as copy boy. This car makes trips from the Congress Hotel and Coliseum to the printing office on an hourly schedule from 6 a. m. to 2 a. m. and the aforesaid streamers afforded great joy to the A. D. T. boys who accompany the car.

But alas! for the joys
Of those A. D. T. boys
In the ribbons behind them so gallantly streaming,
The police have said: "No,
Those streamers don't go;"
And their joy-rides descend to the level of teaming.

Dr. W. Kendrick Hatt, chairman of the committee on "Wood Preservation," professor of civil engineering, Purdue University, was among early arrivals on Monday. This association has always been particularly fortunate in the quantity and quality of active educational talent included in its membership, and it is believed to be no reflection upon the association to express the belief that however great the benefit derived from its proceedings by those members who are engaged in active educational work, its equivalent is fully returned in the amount of research and record work for which most of the latter have more ample facilities than the active railway engineer. Dr. Hatt is alleged to have a considerable amount of material in his traveling bag in addition to that which he carries in intimate relations with himself.

If any one of the twelve or fifteen men who met in a little club room half way up the stairs in the Auditorium ten years ago to take the initial steps for the formation of the American Railway Engineering and Maintenance of Way Association—if any one of them had ventured to predict a membership of 1,100 at the date of this meeting, he would have been looked upon as an exponent of wild-eyed optimism. It only means that the strong men who took hold of the job at the start were good pushers and possessed the enviable faculty of imparting some of their enthusiasm to those who came after them. It is pleasant to note, also, that so few of the smaller numbers have been vacated and that most of the same men are still in the lead in the work of pushing.

Daily newspapers have lately had a lot to say about a knocker who is trying to sell track appliances. Knowing the natural aversion of railway supplymen to "knockers," and learning that the knocker referred to in the published reports intends to be in Chicago this week, it becomes the duty of the Railway Age Gazette to do a little exposing. His name is Harry E. McCormick. He is with the queer and crazy—beg pardon; we mean the Q. & C. Co. The picture which we herewith produce as evidence of his professional calling, was taken both on the "fly" and just before the "fly." McCormick is a believer in "every knock is a boost," because he has proved the truth of the saying. Last year he knocked so hard that he nearly reached the top notch in professional baseball. Judging from what he has done so far this season in the way of selling rail joints, rail braces, rail saws and a lot of other track devices, he is destined to like success in the railway supply field.



PROGRAM FOR TODAY.

Morning session—9:00 a. m. to 12:30 p. m.
Afternoon session—2:00 p. m. to 5:30 p. m
Reports of Committees:
XVII. Wood Preservation.
III. Ties.
II. Ballast.
V. Track.
Special Committee on Standard Specification for Cement.
VIII. Masonry.
VI. Buildings.
Annual Dinner at 7:00 p. m. in Gold Room of Congress Hotel and Annex.

PROGRAM FOR THURSDAY.

Reports of Committees:
I. Roadway.
XI. Records and Accounts.
IX. Signs, Fences and Crossings.
XIV. Yards and Terminals.
New Business.
Election of Officers.
Adjournment.

At the Coliseum

The Kennicott Water Softener Co., Chicago Heights, Ill., has opened offices in New York in addition to its offices in Chicago, London and Paris. W. T. Runcie, formerly of the Tatnall Engineering Co., Philadelphia, Pa., will be in charge of this eastern office, located at suite 2072, Hudson Terminal building, 50 Church street, New York.

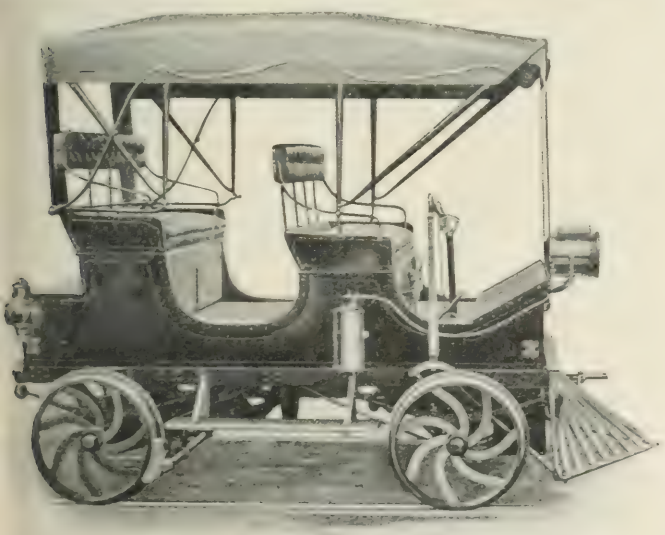
A simple and practical device that interests track men is the Bossert one-piece insulated rail joint in space 137. It seems strange, with the many devices of this kind on the market, that no one heretofore thought of this simple practical method. This joint, when closed, clamps the rail, making a solid, even surface of the rail ends. It compels the rail ends to bend uniformly, thus preventing friction or movement of the rails in a manner to cause unnecessary wear and tear of the fibre insulation. This joint is made by W. F. Bossert Manufacturing Company, Utica, N. Y.

CARNEGIE STEEL SHEET PILING IN LA SALLE STREET TUNNEL.

The statement on page 563 of yesterday's daily edition concerning the use of Lackawanna steel sheet piling in the open-cut work for the La Salle street tunnel was incorrect. The Carnegie Steel Company received the contract for 45-ft. U. S. steel piling for the approach sections and 65-ft. Friestadt piling for the cofferdam work at the ends of the river section. About 1,700 tons of this piling will be required.

BUDA INSPECTION CAR NO. 100.

One of the exhibits in the Buda company's booths at the Coliseum is its No. 100 motor inspection car. This car is intended for officials who must spend much time on inspection runs or in keeping in active touch with points along the line. No. 100 is a well finished car accommodating six passengers comfortably. Its power equipment consists of a double cylinder, horizontal opposed, water cooled motor de-



Motor Inspection Car.

veloping 18-20 h.-p. Transmission is of the friction type with double side chain drive to the rear axles, permitting the same speed in either direction. The frame of the car is channel steel; the axles are 2 in. in diameter and run in Hyatt roller bearings; the wheels are of one-piece manganese steel; the springs are 30 in. semi-elliptical standard; the body is entirely independent of the frame and may be easily removed.

THE Q. & C. BONZANO JOINT.

The perfect rail joint should connect the rails as a continuous girder and combine simplicity of design with sufficient strength to resist deformation or becoming permanently set, as well as to prevent deflection or vertical movement of the rail ends and at the same time provide for proper expansion.

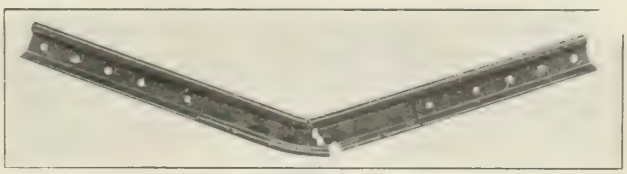
The common angle bar, while possessing the essential qualifications of simplicity and ease of application, has not the requisite strength to meet the other essential points. The various types of reinforced joints are, for the most part, evolutions of the common angle bar. Many of them are cumbersome, having many parts and difficult of applica-



Common Angle Bar.

tion. The Q. & C. Bonanzo joint, on the other hand, is intended to combine the simplicity and ease of application of the common angle bar with the necessary strength. Much of the deficiency attributed to rail fastenings can more properly be ascribed to either bad timber or poorly maintained joint ties, and this very fact proves that the perfect rail joint should develop sufficient strength in itself to prevent the movement of the rail ends without dependence upon the timber. This, therefore, would require to be a suspended joint of such construction and design as will develop the strength and resilience equal to the unbroken rail.

The Q. & C. Bonzano rail joint, or reinforced angle bar, is said to meet these requirements. The reinforcement in this joint converts it into a truss, with sufficient girder depth to sustain and transmit the moving loads, and gives the rail joint the strength and resilience required both



Joint Before Given "Q. & C. Bonzano" Design.

vertically and latterly. The web feature, found only in the Bonanzo joint, presenting no abrupt change from light to heavy construction, allows the strain to be equally transmitted throughout the entire joint structure.

The accompanying illustrations are of peculiar interest, as they show the relative strength of the common angle bar, a bar containing the same amount of metal as the Q. & C. Bonzano—the joint having been given the reinforcing design—and the finished Q. & C. Bonzano joint. The comparison would seem to prove the superiority of the last named. All pieces were taken from the same section of rail and tested under a 2,000-pound hammer at an equal drop. The angle bar was destroyed at the third blow; the reinforced joint, containing the same amount of metal as the Bonzano, shows a great deflection and was fractured

at the third blow, while the finished joint shows less deflection and developed no fracture at the third blow. The adoption of the Bonzano joint, manufactured by the Q. & C. Co., New York, by many of the leading railways after having been in service for several years, seems to be evidence that this joint has demonstrated its work.

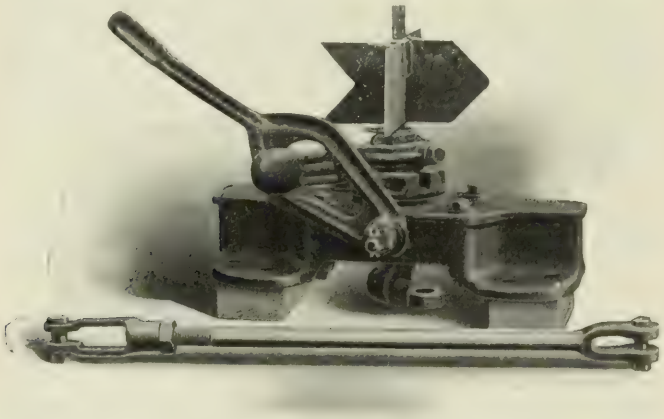


Finished "Q. & C. Bonzano" Joint.

RAMAPO PARALLEL THROW AUTOMATIC SWITCH STAND.

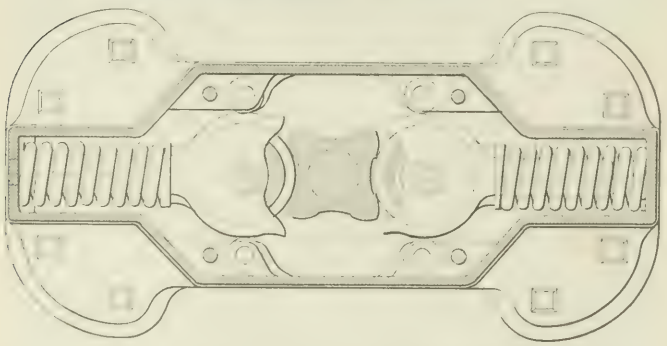
The Ramapo Iron Works, Hillburn, N. Y., are said to have, during the last 20 years, furnished several hundred thousand automatic safety switch stands. The design most popular is the company's new parallel throw yard stand, style No. 20, as shown in the halftone illustration and line sectional plan view herewith.

This stand is rigid for hand operation, yet is entirely automatic under the high pressure exerted by the pull on the switch points when they are trailed through, set in wrong position. The target, as in the other types of Ramapo stands, always follows the switch points and indicates absolutely their position.



Ramapo Safety Switch Stand, Style No. 20.

This individual design, being low, compact in form, and having a parallel throw, makes a very ideal yard stand. The automatic mechanism is held in position by two strong springs, either one of which is sufficient to operate the switch. The springs are only used as a reserve power, as they do not come into operation except in automatic movements.



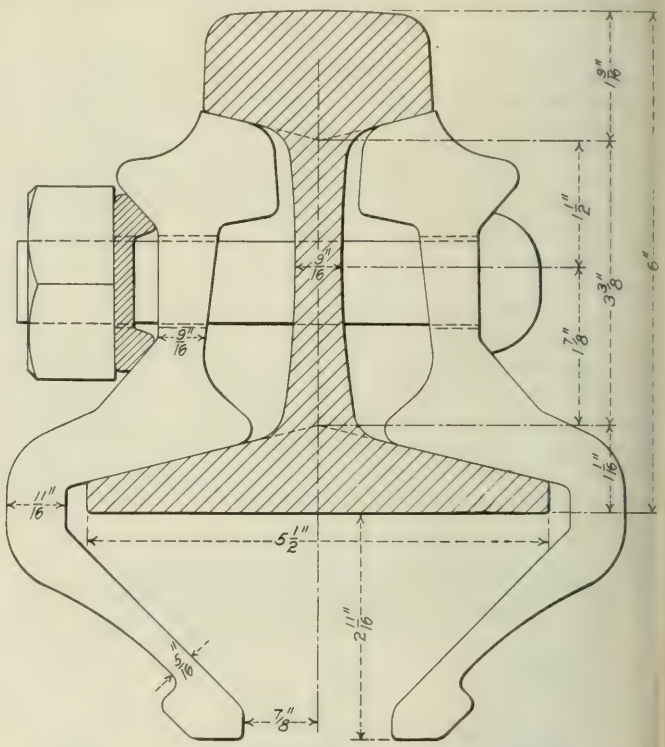
Horizontal Section; Ramapo Safety Switch Stand.

For hand operation, one movement unlatches the stand, throws the switch and rigidly relatches it. The adjustable throw eyebolt crank and the adjustable moving rod provide the necessary adjustments, so that the stand can be used with switches of any throw. All lost motion resulting from wear on the switch points or other causes can be readily taken up.

HIGH CARBON OIL TREATED RAIL JOINTS.

The Cambria Steel Co., Philadelphia, Pa., claims to be the first steel manufacturer in the United States to successfully make rail joints of high carbon steel and high carbon steel, oil treated.

The demand for joints made of high carbon steel has led to several attempts to meet it, but little, if any, success, it is said, has resulted, mainly because the joint made of such steel could not be finished cold, due to excessive breakage and crystallization. The Cambria Steel Co., having great faith in high carbon steel for joints, decided to finish them hot. This led to many mechanical difficulties, which were overcome only by patient and intelligent experimentation. The principal trouble arose from the fact that a hot bar would not retain its original section as does a cold one, and when finished by the same process the bar would not only be distorted on its bearing surfaces, but bent vertically and latterly. A new design of the rail section overcame some of these difficulties, and new finishing methods were adopted to overcome the other defects. It is now claimed that a more perfectly finished joint is being made by the hot than was formerly made by the cold process.



The 100-Per-Cent. Rail Joint.

The economic advantage of high carbon steel, hot finished, is that with the expenditure of about 10 per cent more than the cost of soft steel, a joint is given a carrying capacity that can be equalled only by the addition of double the quantity of metal of soft steel and at the additional cost of 100 per cent. This latter joint will cost 100

per cent more for freight, while there is no additional cost for freight in the former.

The oil treatment of steel is a natural sequence of the use of high carbon, and its advantages are about equal to those of high carbon over soft steel. This, however, varies with the section of the bar and hardness of the steel. In economy, oil treated steel is as much in advance of high carbon steel as is the latter over soft steel.

There are in successful use many 100 per cent. joints of high carbon and high carbon oil treated steel, and the opinion of those familiar with the service of these joints is adverse to again returning to the use of the old soft steel joint. Ordinary angle bars cannot be made of high carbon steel and be oil treated, since the ordinary angle bar is so limited in girder depth and sectional area that it would break rather than bend if made of high carbon steel.

REX FLINTKOTE ROOFING.

J. A. & W. Bird & Co., Boston, Mass., whose exhibit is in booth 140 at the Coliseum, are showing the well-known Rex Flintkote roofing. This roofing has been on the market about ten years, and is now classified by fire underwriters with the old style tar, gravel and metal roofs. It has been sold all over the world, being now in use on the steamboats operated by "Cook's" on the river Nile. It was used on the St. Louis Exposition buildings, safely protecting the valuable exhibits.

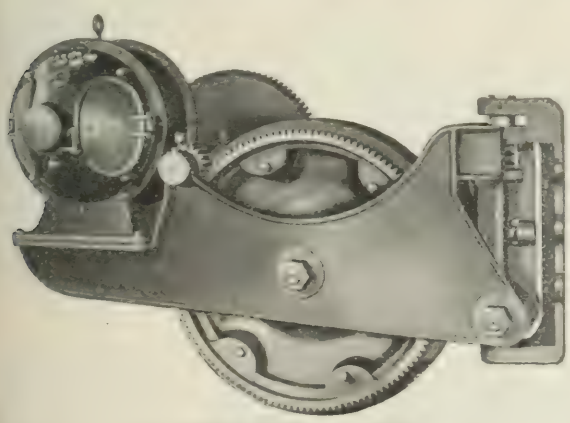
This roof covering is especially adapted to railway buildings, stations, train sheds, freight houses and car shops. The Southern Railway used Rex Flintkote on the train sheds of its stations at Mobile, Ala.; Birmingham, Ala., and Atlanta, Ga., after testing practically every roof manufactured in this country.

The method of fastening is a new feature, patented a few years ago, which has met with general satisfaction.

The company has issued a new book, describing this product in detail, and giving examples and results of tests to show comparison of Rex Flintkote with other roofing materials.

CAST STEEL ELECTRIC TURNABLE TRACTORS.

Among the new applications of cast steel on exhibition at the Coliseum this week is a cast steel electric tractor, by the Weir & Craig Manufacturing Co., Chicago. As shown in the accompanying illustration the frame is made of a one-piece steel casting instead of being built up of plates or



Cast Steel Electric Tractor.

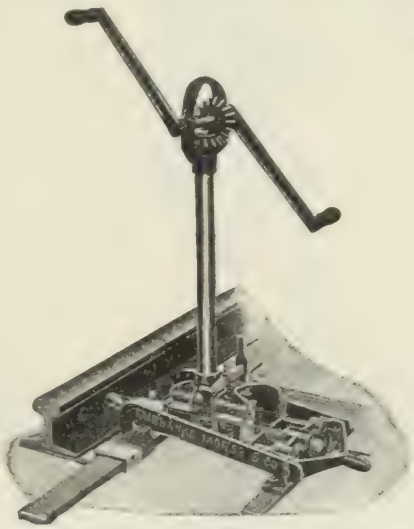
rolled shapes as has been the custom. In this way the number of parts is greatly reduced and the machine made simple and compact, as well as rigid. The motor, which can be of any size or type which conditions demand, is mounted at a height which minimizes the possibility of its being damaged by water due to the pit filling up. Another important feature of its location is that it will give, due to the leverage, an increased weight on the wheel for tractive purposes.

A vertical spring, shown in the illustration, is placed in the universal bracket to absorb the shock when the locomotive comes on to the table, so the motor receives practically no jar. A leaf spring is provided between the guides at the top of the frame extending down into the inner part of the universal bracket, which can be adjusted so as to increase or decrease the traction as occasion demands.

Brackets can be attached to the sides of the frame for supporting a shelter house immediately over the tractor, or it can be located elsewhere if more convenient.

RAIL DRILLS.

The vertical, crank-operated rail drill is largely used at the present time and officials in the road department are interested in studying the merits of the various types offered. The essentials for a first class drill are ease of op-



Fairbanks-Morse Under-Rail Clamp Drill.

eration, rapidity with which track can be cleared, strength, durability and simplicity. Fairbanks, Morse & Co. have several drills in booths 35-36-37-54-55-56, which have the following points of merit. The gears which are the parts of the



Fairbanks-Morse Over-Rail Clamp Drill.

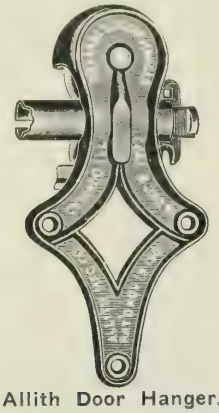
drill that are given the hardest service are of steel. A convenient means is provided by which the bit can be run up quickly to the rail after the drill is in position. This is done by placing the foot on a small lever and operating the

cranks the same as for drilling, until the tip of the bit strikes the rail. The pressure of the foot on the lever is then released and the regular drilling feed commences automatically without stopping the operation.

There are two methods of clearing the track, one by lifting an eccentric lever at the back of the drill which releases the over-rail clamp and allows the whole machine to be drawn out of the way; the other by releasing the clamp holding the top of the drill to the base, removing the top, then releasing the overrail clamp and drawing them back out of the way. The over-rail clamp is usually preferred, but the manufacturers have also designed under-rail clamps for those who desire them.

ALLITH DOOR HANGERS AND ROUND TRACKS.

The door hanger and track, illustrated herewith, is made of malleable iron and high carbon steel, carefully finished. It is designed to withstand rough treatment under all condi-



Allith Door Hanger.

tions of inside and outside use of sliding doors. It is made by the Allith Manufacturing Company, Chicago, and is on exhibition in booth 116 at the Coliseum.

THE GUMP CAR REPLACER.

The Gump car replacer, exhibited by the W. K. Kenly Company, Chicago, in booths 78 and 79, has some new features. The principal improvements are the clamp,



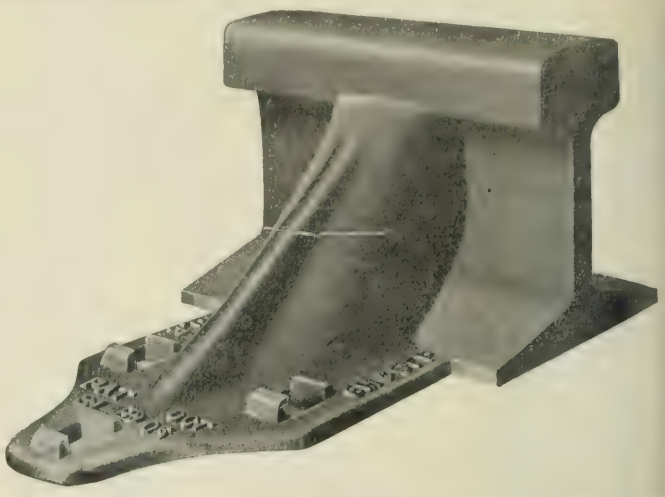
Gump Car Replacer.

which holds it securely to the rail and prevents it from slipping; the shoulder, which rests against the rail and prevents overturning, and the lug on either end, which does away with the use of spikes. The Gump replacer is so made that there is practically no jar in replacing a derailed car on the track, which eliminates rail breakage.

The device has been favorably passed on by the testing departments of several railways.

RAIL BRACE.

The Beaver Dam Malleable Iron Co., Beaver Dam, Wis., makes a rail brace of malleable iron which has the strength of a steel brace and the advantage of better withstanding the deterioration due to the atmosphere and brine drippings from refrigerator cars. This advantage makes it especially adapted to use in yards where large numbers of refrigerator cars are handled.



The cut shows the brace as applied to the rail, and illustrates two features of merit in its design. The rib shown on the front of the brace adds strength at the point where it is most needed, and the risers at the spike holes permit the spikes to be withdrawn easily and quickly and without injury to the brace. Beaver Dam Malleable Iron Co., Rail Brace.

REFRIGERATING LINOFELT.

The Pacific Fruit Express Co. refrigerator car, shown in the illustration, is one of the 10,000 cars of that type owned by, or now on order for, that company. The insulating material in all these cars is refrigerating linofelt, a product of the Union Fibre Co., Winona, Minn.

This material is furnished in strips ½ in. thick, and in width up to 9 ft., and of any desired length. For the walls of the car the strips are applied horizontally, the length of each strip being equal to the distance from door post around to door post. Three layers were used in the P. F.



Refrigerator Car for Pacific Fruit Express.

E. cars, two being applied inside the frame and one outside. The roof is protected by the same thickness of insulating material, the strips being attached longitudinally. The points of merit claimed for linofelt are its efficiency, strength, durability and the ease with which it is applied. It is at present in use on over 30,000 refrigerator cars in this country. The exhibit of the Union Fibre Co. is in booth 171.

LANTERNS.

That the advance in the improvement of railway lanterns has kept pace with the increasing and exacting demands of railway service is shown by the Adams & Westlake Co., Chicago, who are exhibiting in booths 83 and 84 lanterns with Adlake perfected ventilation, outside wick raisers and Adlake encased oil pots.

Adlake perfected ventilation was adopted after tests in which the test lanterns were carried at high speeds in blizzards, in yard service in sultry heat and in all the degrees of temperature between. Under all these conditions the lanterns stayed lighted and gave a clear, strong signal. Lanterns were carried several nights without cleaning the globes, and gave a clear signal all the time. Adlake perfected ventilation is said to eliminate smoked globes and poor light, thus saving time in cleaning and breakage of globes due to imperfect ventilation.



Adlake Lantern.

The outside wick raiser is a convenient and time-saving device. The oil pot need not be removed, as a slight turn is all that is required to adjust the flame. The burner screws tightly into the collar of the oil pot, so the oil cannot leak out.



Train-Indicating Lamp.

The Adlake encased oil pot eliminates leakage and the consequent soiling of clothes. Surrounded entirely by the guard hoop which forms the casing, the oil pot is placed in position from the top, and as the bottom is closed it cannot drop out. It dispenses with locking rivets and springs, which sometimes allow the pot to drop out, thus losing a signal.

SAFETY MAIL CRANE.

The Safety mail crane is a device for delivering mail pouches to moving trains and has the following points of merit: It insures safety to employes, and it is reliable, simple, durable and economical. The crane holds the pouch up and back from the track until released by the action of a U-shaped trip on the front tender truck which engages a trigger encased in a self-closing box in the track. A swivel finger and spring hold the pouch to the crane arms but allow its removal in the direction of the train movement without resistance. All parts are of steel, insuring a light, durable structure. The four cuts show the steps in the operation of the device. Burton W. Mudge & Co., Chicago are the selling agents.



Fig. 1.

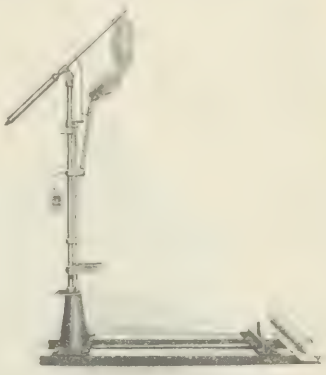


Fig. 2.

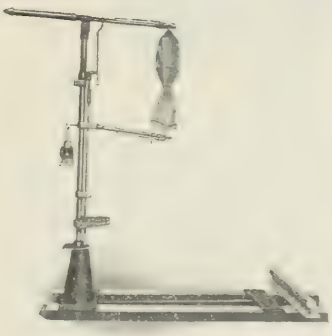


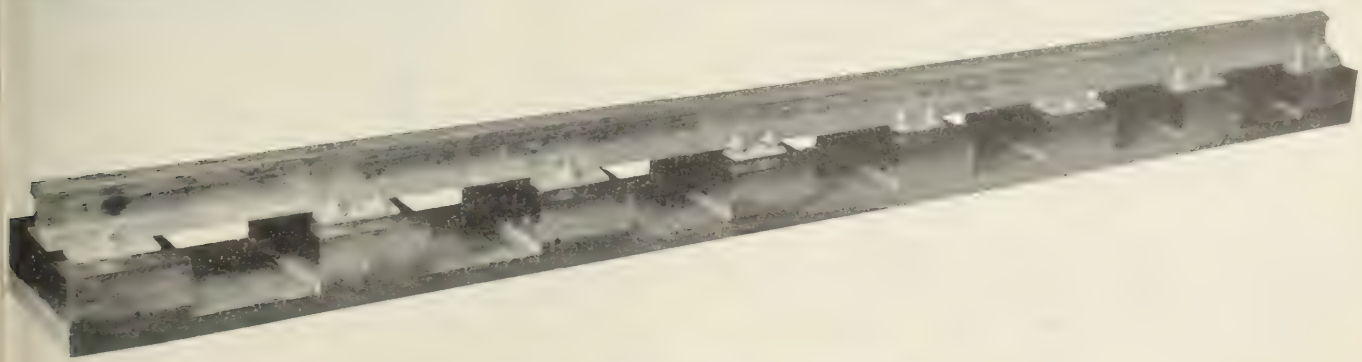
Fig. 3.



Fig. 4.

SCREW SPIKE TIE PLATES.

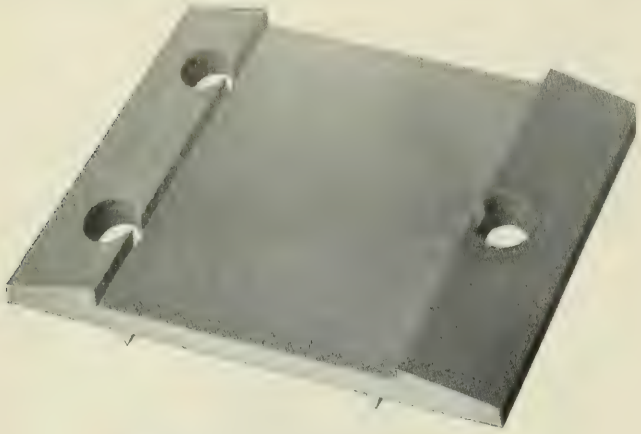
An interesting exhibit of different styles or types of rolled steel tie plates adaptable to use with screw spikes is to be seen in the tie plate display of the Hart Steel Company, Elyria, Ohio, in booth No. 101 at the Coliseum.



Model Showing Different Designs of Tie Plate.

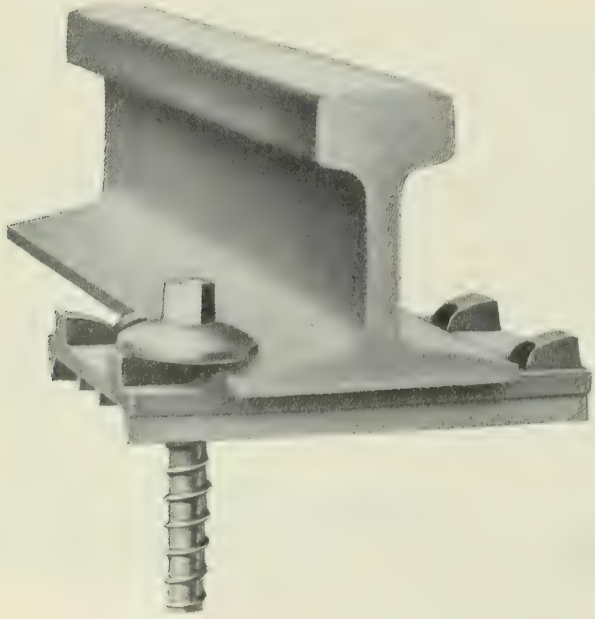
This company, which is the railway products selling organization of the Elyria Iron & Steel Company, Elyria, Ohio, exhibits a model rail and ties showing not only the five different types of this style of tie plate which they are manufacturing, but also models of the principal types in use on European roads. This model shows clearly wherein these American designs are considered superior to European types as applicable to American requirements.

The Hart Steel Company's type S-1 tie plate is designed with the idea of obtaining wide surface contact between the head of the spike and rail, this wide surface contact being obtained by inclining the screw spike, for which



Style S-3 Screw Spike Tie Plate.

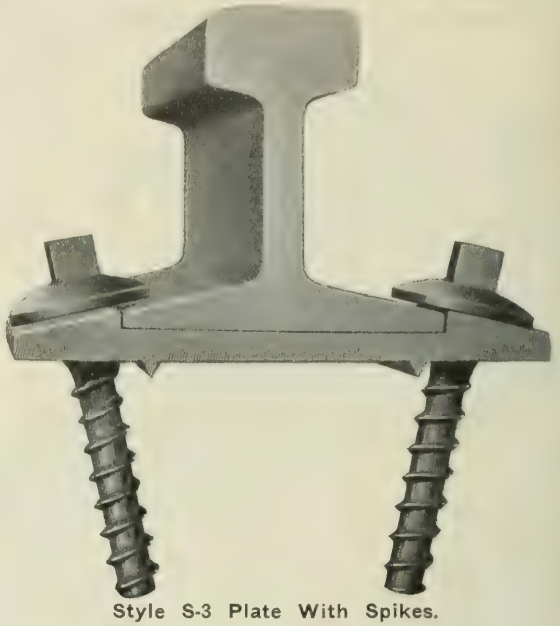
practice many points of superiority are claimed. The shoulder of this plate is depressed slightly below the plane of the top of the rail flange, thereby insuring surface contact not only between the head of the spike and rail, but also between the spike and the tie plate, regardless of any excessive rolling mill variation in the flange of the rail. This plate is furnished with or without short flanges on the bottom.



Style S-4 Plate With Spike.

Style S-2 is similar to style S-1, except that it has only one shoulder, this construction permitting the easy removal of the rail. It has wide bearing surfaces to back up all of the screw spikes used, as in style S-1, and is also furnished with or without short flanges.

Style S-3, shown in halftones, is also similar to style S-1, having two shoulders, but the bearing surface for the spike head in this style is above the plane of the top of the rail flange. This permits the tie plate to be firmly held, at the same time leaving the rail loose. This plate was designed to meet the views of some engineers who contend that a loose rail will eliminate the pumping of

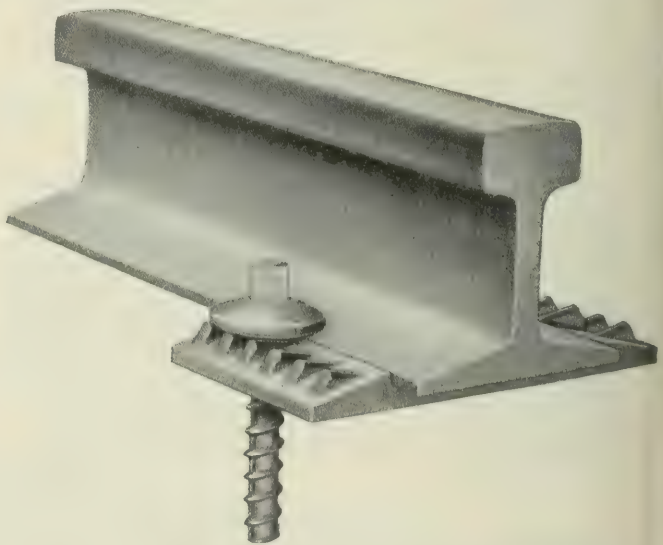


Style S-3 Plate With Spikes.

ballast, while at the same time the rigid fastening of the plate eliminates the chafing of ties and the rattling incidental to a loose plate.

Style S-4 is designed to meet the demand for a longitudinal flange screw spike plate and can be used expediently only with hardwood ties. Style S-5 is designed to meet the requirements of those who desire a flat bottom plate with perpendicular spike. The bosses are arranged to back up the head of the spike in any position and at the same time afford means for drainage.

Although the Hart Steel Company, in its exhibit, has



Style S-5 Plate With Spike.

given considerable prominence to the subject of the screw spike plate, it also exhibits many styles of standard types of plates for use with ordinary spikes.

Their new catalogue, No. 4, now ready for distribution, furnishes in detail much valuable information on the subject of both standard and screw spike plates.

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There usually is a good deal of work going on in Chicago which is of interest to railway engineers, and a number of pieces of important work are being done at the time of this year's convention of the Maintenance of Way Association, some of which will be described in the Daily Railway Age Gazette. The most important is the construction of the new passenger station and terminals of the Chicago & Northwestern, which it is estimated will cost $20,000,000. At Grand Crossing is being done the greatest piece of track elevation in the country. The driving of the tunnels of the Chicago Railways Company under the Chicago River at Washington and La Salle streets has many interesting features. The Northwestern has been doing, and the St. Paul now has under way, at Evanston, track elevation having some unusual aspects. In the different parts and suburbs of Chicago, grade separation work may be seen which is being carried on under various conditions and according to diverse methods devised by a large number of railway engineers. At Thirty-first street and Campbell avenue an 8-track Scherzer rolling lift bridge is being built for the use of the Pennsylvania Lines, the Chicago Junction Railway and the Chicago Terminal Transfer Railroad. No doubt, many of the visiting engineers will take advantage of the opportunity to see some or all of this work.

The long discussion on the economics of location yesterday morning brought out some consideration of details that would probably not have seen the light of day had the time limit been more closely drawn. One of these was that it might be well to consider the condition of the locomotive at the end of a long pull. An engine that may enter a grade with fire in first-class condition might have it in very bad shape at the end, so that, as was suggested, it would be a good idea to ease off on the requirements at the end by increasing curve compensation or even cutting down the rate of tangent grade. That the doctors should diagnose in this matter of curve compensation, is small wonder, for it is evidently one of those items of location that must be governed by local conditions. So, while the 3.05 per cent. recommended for general use may be all right, there was probably not a man in the room who voted for it without making mental reservations as to his own practice. In discussing curve work there was brought out, in a very marked manner, the difference that may exist between theoretical construction and practical maintenance. The committee recommended that the superelevation on curves should be obtained by elevating the outer and depressing the inner rail an equal amount, which would thus be one-half the desired superelevation. It was conceded that this would be easy enough on new work where the grade stakes were available for reference, but after these had disappeared, how was a section man to do his work? A question to which no satisfactory answer was forthcoming.

Registration records, admitedly incomplete, because of the tendency to procrastinate about comparatively insignificant matters, showed 411 members registered up to noon on Wednesday. It is probably safe to estimate a total attendance of 500 members. This doubtless is the largest attendance in the history of the Maintenance of Way Association. This, like last year's proceedings, show the increasing strength and importance of the organization.

COMMITTEE ON RAIL.

The problem before the Committee on Rail is probably one of the most important which has come to the attention of the Maintenance of Way Association, involving, as it does, a number of opposing factors.

From the standpoint of the public, the destruction of life and limb through derailments caused by the breaking of defective rails, is almost the sole point of interest in connection with rail manufacture. To the railway company, also, this feature is of the utmost importance, while the cost of rail wear, which is one of the large items in the cost of roadway maintenance, is assuming greater and greater importance with the rapid increase in the density of traffic.

An improvement in the method of manufacture of rail, which would result in doubling the wearing capacity of rail under traffic, as compared with present conditions, would probably mean an average gross saving to the railways of the United States of not far from $20,000,000 per year. From this, of course, must be subtracted the increased cost of producing this better quality of material. As the cost of manufacture of any article is, in the end, borne by the consumer, this, of course, means that the net saving in this item would, in the end, be felt in reduced cost of transportation to the shipper.

The securing of rail free from defects would seem to be largely a question of furnace practice—of the production of a sound ingot. The securing of increased life of sound rail under traffic is, however, affected by many factors, including the furnace practice, the mill practice, the chemical composition, and the design of the rail.

In the report of October, 1907, of the American Railway Association Committee on Standard Rail and Wheel Sections, working with the Manufacturers' Committee, the following paragraph occurs:

> The joint committee endeavored to unite upon a single design or type of section for the roads, but, due to the varying conditions throughout the country, or due to the fact that there are many adherents among railway engineers to each of two distinct types, it seems out of the question at the present time to reduce the number of types to less than two.

The varying conditions throughout the country referred to as affecting rail design probably consist solely in the variation, on different railways, of the relative per cents. of straight and curved track and in the sharpness of the curves.

It has been suggested that, while it is true that different railways vary greatly in the per cent. of straight line and curvature, yet the conditions of wear on straight line are practically the same on all railroads, and also the conditions of wear on curved track are the same on all railroads. Therefore, a rail designed for use solely on straight line would be equally satisfactory for straight line in all parts of the country. By simply adding to the depth of the rail head, a design especially suited to curve wear would be produced, and these two designs would have the same splicing section. By adopting one of these sections as standard for frogs and switches and by laying it through all turnouts, it would appear that but few practical difficulties would result from the common use of these sections of rail on all roads having any considerable proportion of straight line.

As rail wear and lack of stiffness are the final cause of over 90 per cent. of rail renewals, defects accounting for not much over three per cent., it is hoped that the Association will investigate this possibility as well as merely report on the best compromise type of section that can be designed.

WASTEFUL TIE SPECIFICATIONS.

Fully 90 per cent. of the hewn ties now used are cut by a large number of small cutters from scattering timber. In spite of this fact there has recently developed a tendency among the maintenance of way engineers to allow too small a margin in variations from dimensions of hewn cross-ties. For instance, specifications have been drawn for ties to be furnished 95 per cent. number one ties (full and exact dimensions). The source of supply in eastern territory is largely oak and pine, ties being cut from trees that will make only one tie to each 8 ft. or 8½ ft. length. In the oak district trees will cut about three ties to the tree and will average two number one ties and one number two. In the pine district the timber will cut about four ties to the tree and will average three number one ties and one number two. Fortunately for the tie supply and the stockholders of the railways all engineers do not insist on the same amount of number one ties. Should they all agree on demanding 90 or 95 per cent. of number one ties the increase in price due to waste and loss of timber would come very quickly. If difference of opinion as to policy continues the engineers who insist on an unnatural percentage of number one ties will have to pay more for their cross-ties, and in times of scarcity or active demand will have difficulty in securing their supplies.

There also appears to be a tendency to construe specifications more rigidly and to endeavor to secure hewn ties with as little variation in size as if the material was sawn. This is impossible, and if hewn ties of good timber, one-half inch under in size at any point, are rejected, it is as wasteful as it is to adhere to a larger percentage of first-class ties than the timber will naturally make. It is the same if an engineer insists that if a tie overruns in length two inches and makes his track look a little ragged it is to be treated as a reject, and he is thereby advancing the price of ties both for to-day and the future and wasting the stockholders' money purely for sake of appearance.

The engineer who buys all sizes of ties as they come and finds a use for them, who does not reject ties for minor defects which do not affect their strength and durability, will get his ties cheaper, will aid in conserving the supply, and keep down prices in the future.

WORK OF THE COMMITTEE ON BUILDINGS.

The work of the Committee on Buildings should be most carefully considered before positive recommendations are adopted as to any particular type of construction. While this statement applies to all committee work, it is particularly important in the actions of the Committee on Buildings, because most chief engineers on railways having no bridge and building department have been too busy in other lines of construction and maintenance to study thoroughly the building problem.

On the two most important topics assigned to this committee for report at this convention, progress reports only are presented, which contain much valuable information. The first of these topics, which, by the way, has been under consideration by the committee for two years, is the "investigation of reinforced concrete coaling stations." In the report as presented are several photographic reproductions of some of the best designs already built, which will no doubt be of interest to those contemplating the erection of new coaling plants. We feel that the committee might have safely gone a little farther than it did in this report, and might have recommended the adoption by the larger roads of this type of coaling station for experimental purposes with the specific advice that each railway whose size and finances warrant the expenditure build at least one experimental plant.

One difficulty evidently encountered by the committee is the inability of proving to the satisfaction of the engineering department alone the economy of reinforced concrete coaling stations. Leaving the fire loss, with the incidental extra expense to the operating department, out of the problem, the reinforced concrete type of coaling station is undoubtedly not economical compared with the customary timber construction. The incidental losses in operating due to a loss by fire of the coaling station of an important terminal are not charged to the engineering department and can be only with some difficulty separated from other operating costs, yet every operating man who has experienced such a fire loss knows that the cost is high and that such an accident is most aggravating and demoralizing to the department. Such a one would, had he the authority, do as a chief engineer of one of our largest systems has recently done, put in a reinforced concrete coaling station. This engineer, when asked if he believed it to be economical, said, "I could not prove it by figures, but I recommended it; the management authorized it; I built it and have had no reason to regret it."

The chief engineer of another large railway recently stated that he had secured the authority and was about to build some coaling stations of this type. Thus there is a strong tendency toward building reinforced concrete coaling stations at important terminals, on the broad grounds that, regardless of cost, a railway cannot afford to risk the temporary paralysis of its operating department through a fire loss.

The second topic on which the committee presents a progress report is that of "roof coverings." The committee discusses at some length various "ready roofings," but gives most of its attention to the built-up roofs of felt made waterproof by coal tar pitch, asphalt or similar preparations, the final protective coating being gravel, chat or screenings.

One of the difficulties in learning how to put on a good roof covering is the inability to obtain from the roofing felt manufacturers reliable information as to what their felt is made of and what really constitutes a good felt. It has been conclusively shown that 80 per cent. of some so-called wool felts is wood pulp and that the remaining 20 per cent. is largely cotton rags. As neither the wood

pulp nor the cotton are good absorbents of the waterproofing materials, it would seem that the average roofing felt is about as reliable a product as the shoddy of the Hester street merchant, which he proclaims is "all wool and a yard wide."

It seems to us that the committee has acted wisely in making no hasty recommendations in this matter of roof coverings. Further investigation and study of the question, it is to be hoped, will enable the committee to give the association and the engineering profession generally, information by which an engineer may be surely guided in testing the materials recommended for roof coverings to determine whether they are really good and durable. At the present time most engineers and architects are taking their roofings on faith and the guarantee of the manufacturer.

ECONOMICS OF RAILWAY LOCATION.

The report of this committee for this year was devoted to a discussion of power and resistence, since these are two fundamental elements on which all questions of economics depend. The locomotive tests made at the St. Louis Exposition have furnished much authoritative information. A portion of the report is a discussion and digestion of the figures obtained during these tests. Several tables have been compiled from which to determine the tractive power of locomotives. Table No. 1 gives the average evaporation in locomotive boilers burning bituminous and similar coals of various qualities and for various quantities consumed per square foot of heating surface per hour. Tables 2 to 5 give in regular order the various figures which must be used to obtain finally in Table 6 the tractive power of a locomotive of almost any given type, burning any given quality of fuel, and running at any given velocity.

The discussion of freight train resistance is startling in that it departs so radically from the formulas which have become classic. Until within a few years train resistance was assumed to vary with the square of the velocity. More recently formulas have been proposed involving at least one term varying with the first power of the velocity. The most recent and most reliable tests of heavy freight train resistances on modern track show that the resistance may be represented by a formula which is independent of velocity within the velocities of seven and thirty-five miles per hour. The formula recommended is

$$R = 2.22\,T + 121.6\,C,$$

in which R is the resistence on a level tangent, T is the tonnage of the cars and C is their number. As a very condensed explanation of the validity of a formula which is independent of velocity, it may be said that some elements of train resistance, notably journal friction, actually decrease with a moderate increase in velocity and this decrease neutralizes the increase due to atmospheric resistance. At the very high speeds of passenger express trains the atmospheric resistance is so great that the total resistance increases very materially with the velocity. It is conceded that the constants in the above formula will not be applicable to all cases, but it may be safely applied in comparing freight train ratings on different lines and grades.

The effect of temperature on hauling capacity is also tabulated, showing that the effect is proportionately insignificant when the grade is high (over one per cent,) but is of great importance on very low ruling grades.

An investigation of curve resistance has brought out the fact that the unbalanced centrifugal force, developed on a curve when the train is run at a speed either lower or higher than that for which the track is super-elevated, varies as the square of the degree of curvature. The conclusion is drawn that the elimination of one degree of central angle has a greater value on sharp curves than on easy curves and also a greater value for high-speed than for low-speed traffic. As a general figure, the use of 0.035 per cent. per degree of curve is recommended as the proper rate of curve compensation on grades, the large majority of replies received from members indicating that 0.03 per cent. is too low and that 0.04 per cent. is too high.

LIMIT GAGES FOR RAIL AND FROG WEAR.

The railway mechanical associations have for a long time maintained standard gages and limits for the wear of wheels and axles. The rules define not only the limits of wear of wheel flanges of locomotives and cars as affecting the track gage, but also the shape of the worn flange when it is condemned. These gages and limits have been repeatedly revised, and are kept up to the requirements of changing service conditions. When derailments or wrecks occur there is usually careful inspection by standard gages to ascertain if the limits of wear have been exceeded, and the usual attitude of the inspector is that if there is anything wrong with the gage it must be found at the wheel flange.

The track also is subject to constant inspection, especially as to the wear of rails on curves and at switches, frogs and cross-overs. While the track is kept to gage, no standard limits have been established for the wear of rail or of frogs; that is, the gage inspection does not take account of the shape of the worn rail, and there are no limits which define when a frog is worn out. The books of rules for the maintenance of way of some of the largest railways contain careful instructions in regard to the inspection of frogs and switches, but there is no mention whatever of any limits or limit gages upon which any accurate or intelligent inspection is to be based. One of these rules in a recently revised official book reads as follows: "Section foremen must personally inspect all main track switches once each day, or have some reliable and competent man do so. Track men in making their inspection of switches should pay particular attention to line and gage, worn points, guard rails secure and in true gage, position springs of frogs at proper tension, and that the points of all switches fit squarely against the main rail." The Maintenance of Way rules governing track foremen are as follows: "Track foremen shall be responsible for the proper inspection and safe condition of the track and roadway under their charge, and shall do no work thereon that will interfere with the safe passage of trains, except under proper protection. They must go over their sections, or send a reliable man, with suitable tools, at least once a day to make a thorough inspection, to see that the track, highway crossings, signals, culverts, bridges, fences, telegraph lines, etc., are in safe condition."

These rules indicate very clearly the importance of constant inspection, but they do not define in any way when the rails and points have become worn so they are dangerous and require renewal. They reach that condition some time, and while the judgment of the track men in general must be very good to have served this purpose without resort to exact measurement or definite description or the use of limit gages, yet it is easy to conceive that there are in the main lines of many roads frogs and switches and rails worn on curves which some section foreman would condemn as dangerous, while others might regard them as fit for further service. These decisions would naturally depend to some extent upon the amount of money appropriated for the maintenance of track, and the degree to which a high standard was enforced. Wheels and axles can be inspected and renewed in detail without

interfering with traffic, but the renewal of frogs and switches and main line rail interrupts business and is only resorted to when absolutely necessary, and there is thus a tendency to keep worn track in service longer than it should be. Even in yards the frogs become so badly worn that heavy engines are frequently derailed, but the frogs remain until conditions become so bad that renewal is enforced for the general good of the service. Rail on curves becomes worn at an angle of about 60 degrees, with the horizontal, which materially reduces the width of the top of the head, while the bottom is nearly the original width. The track gage takes no account of this diagonal wear, but standard gage is maintained by measurement across the widest part of the head, while the shape of the head may be such as would induce derailment. What should be the limits of such wear?

The points of frogs become battered down and made blunt to an uncertain degree, and they finally reach a condition where some track man says they should be renewed. Some other track man might have condemned a frog point weeks before it caused a derailment and another man might say it could remain a few weeks longer. What should be the limits of wear of frog points in main track which determine when it is safe and when it is dangerous? The fact that no such limits for rail or frog wear have been established by any of the railways, as far as we know, or by the Maintenance of Way Association, may be taken as evidence that they are not necessary, but when there is so general a complaint that railway accidents are due to carelessness and the faithful old Irish section foreman is disappearing, it would seem that it will soon be necessary to resort to more exact methods of track inspection and that limits of wear will be fixed and limit gages for measuring that wear will be found advisable for conditions about as we have here outlined.

MODERN RAIL MANUFACTURE.

It was generally expected that the discussion on the new rail specification would be one of unusual interest, but it was soon apparent that it was the desire of the committee that little or no change be made in it and that it be allowed to stand as it is, on trial, during the coming year, and that necessary or desirable changes be included in the report next year. The points which were discussed at length were the comparatively unimportant ones relating to surface defects and loading, but the really critical items in the specification, relating to the shearing of the bloom and testing nicked specimens under the drop to destruction, were not taken up.

It is probable that these matters were discussed at the joint meetings of the railway engineers and the steel manufacturers, and it remains to be seen how far the new specification can be enforced in the manufacture of rails during the coming year.

The paragraph relating to the shearing of ingots until the entire face shows sound metal leaves the question of discord about as indefinite as before. It implies that ingots of irregular quality are still expected and that the method of securing sound metal by shearing is still indefinite and uncertain. The new specification requires that test pieces which do not break under the first drop shall be nicked and tested to destruction, and this we regard as probably the most important change, as its strict enforcement would require radical changes in methods of steel manufacture which are scarcely realized. It is this clause which manufacturers have most strenuously objected to, as it is sure to reduce the rate of tonnage output, either by requiring slower methods in both steel works and the rail mill, or by causing a heavy rejection of rails on account of pipes and other internal defects due to unsound steel.

The enforcement by one railway of a clause requiring all drop test pieces to be broken so the fracture could be examined, resulted in the rejection of over 30 per cent. of the rails, and the mills cannot continue in operation under present conditions if all roads attempt to enforce such a method of inspection.

If the steel works and rail mills have made such improvements in their methods as would enable them to operate at a satisfactory profit and make rails which will pass the new specification when rigidly enforced, we are glad of it, but such changes have not been loudly chronicled. Our impression is that the changes in modern rail manufacture are in the other direction, tending to faster rolling and greater tonnage rate per hour.

WOOD PRESERVATION.

An increasing number of roads have resorted to wood preservation as a means of increasing the life of ties and decreasing maintenance of way expenses. The amount of saving can only be calculated approximately and many of the important problems in the art of wood preservation and in the use of preserved wood have yet to be settled. However, the uncertainty of a future tie supply and the certainty of a considerable economy has governed the decision to use preserved wood.

With the critical attention of engineers now fixed on wood preservation, we may expect the art to be advanced and put on a more rational and scientific basis. We believe that hitherto the process of wood preservation has not been attended with the scientific scrutiny of methods and results that will obtain in the future, when increasing demands of specifications and more rigid regulations for inspection will force the wood preservers to study the results which are attained and to correct defects.

Some of the uncovered problems in wood preservation may be suggested. As between zinc chloride and creosote, the advocates of the use of creosote in the past have had the better of the argument. But it is becoming evident that the leaching out of the zinc chloride, which substance is admitted to be an effective and cheap preservative, has been unduly magnified. The volatilization of the lighter fractions of the creosote is becoming evident. Recently insistence has been upon the heavy fractions of the oil that are permanent rather than the lighter fractions.

Another fundamental problem is as to the amount of creosote that needs to be injected in ties. Practice varies anywhere from 6 to 12 lbs. of creosote per cubic foot. This problem is related to the mechanical life of the tie and to the first cost of the tie. It is one of economics. The amount of creosote should be sufficient to preserve the tie for a period equaling its mechanical life, and the use of light creosote treatments, such as the Rueping or Lowry processes, base their belief on the principle that it is not an economy to protect the tie chemically for 25 years, when its mechanical life is limited to 12 years under our present track fastenings.

The future supply of creosote oil is another matter of interest. This creosote oil, which is the by-product of the coal tar industry, is controlled by the use to which the other by-products may be put. In Germany, the hard pitch is used for making briquettes and the heavier portions of the oil appear in the creosote, while in this country comparatively soft pitch is needed for roofing purposes and the creosote oils are not so heavy. Recently the advent of the automobile has torn up the service of our old macadam roads and demanded a new type of construction in which the surface of the road is bound together by a

pitch. The indications are that this is forcing larger supplies of creosote on the market. Again the increased use of the by-product coke oven adds to the supply of creosote.

Coming to the treating process itself, we may note the progress toward the use of seasoned timber, as reflected in the specifications proposed by the Committee on Wood Preservation. It is apparently cheaper and better to season the wood in the air than to attempt to open the passages by slow steaming of green ties in the cylinder. Of course, exigencies of the market may force the treatment of green wood.

With the increased demands of inspection, it is apparent also that more uniform results must be obtained. Wood has great inherent variability. We must expect that individual absorption by individual ties must vary considerably from the average absorption that is specified. The aim must be, however, to reduce this variation. In other words, the ties that go in the cylinder must be uniform. It appears that little is known of the proper grouping of ties, especially in the case of hard woods. Practice and opinions differ largely.

Coming to the method of injection, we find a wide number of different sequences of the application of the various elements, namely, vacuum, hot air, pressure, and temperature of preservative. The object, of course, is to obtain the greatest degree of penetration with the smallest amount of creosote that is safe to use. We are dealing, in the case of creosote, with two fields of knowledge, about which the average man knows but little, and concerning which the experts themselves are apparently very much at sea, namely, the physical laws that control the passage of air and fluids through the wood structure, and the properties and manufacture of coal tar. Indeed it may be said that the whole theory of wood preservation is apparently unsettled. We are led to believe that the antiseptic elements of the coal tar are the least important, but that the waterproofing elements are most effective. It is said that the crude petroleum oils with an asphalt base, in which there is no antiseptic, are effective in preserving woods.

With reference to the preservatives again, the value of the oil from water gas tars, which are produced in such large quantities and which are supposed to form a source of supply of creosote oil, is yet to be determined.

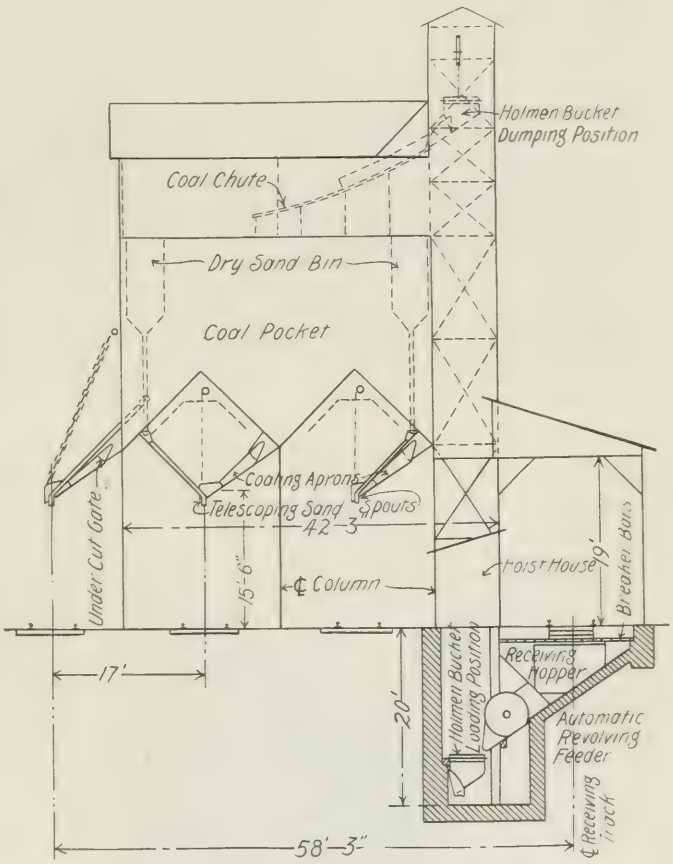
Summing up, it may be said that continued and more extended use of wood preservation may be expected and that thereby the tie renewals in this country should be cut down from the present of 130 million to less than 80 million in the progress of the next 10 years; that we have yet to learn the best method of making use of preserved ties by mechanical protection in the track; that the relative merits of creosote and zinc chloride are yet to be determined; that the relative value of coal tar and petroleum tar as a basis for creosote is yet to be determined; that creosoting of woods and the sequence of operations in the cylinder must be elucidated by a large amount of scientific study. After all, arguments which are based on traditions and on theoretical relations which are not ascertained, must receive final answer in statistics of service. These are beginning to be available, and will be of greatest value if the committees of association will gather together the accurate records of tie renewals in an impartial manner.

The Committee on Wood Preservation makes its second report this year. The chief work of the committee has been the revision of the former specifications for tie treatment. The report of the inspection of the Texas track exhibits the difference in life between ties adequately and inadequately treated. The growth on the industry may be judged by the list of treating plants. The report on the strength of treated timber is a most important contribution to this subject in that all experiments of record have been analyzed and conclusions drawn from the results. The committee has contributed a body of scientific data and experiments that will aid in the interpretation of known facts and aid in the building of a scientific substructure upon which a future improved practice may be built.

A CONCRETE LOCOMOTIVE COALING STATION.

The coaling station now under construction at Corning, N. Y., on the line of the New York Central, is a good illustration of the use of reinforced concrete for this type of structure. The foundations and the entire superstructure, including the storage pockets, elevator housing, engine house, etc., are entirely of concrete, properly reinforced with steel. The structure is therefore entirely fireproof and permanent in construction.

The storage pockets span two railway tracks and are



Elevation of Holmen Coaling Station.

arranged to coal locomotives on both these tracks beneath the pockets and on one track outside the pockets; the receiving track and receiving hopper being on the opposite side of the station from the latter track. The storage capacity of the pockets is 300 tons of coal, besides containing two dry sand bins of 190 cu. ft. each.

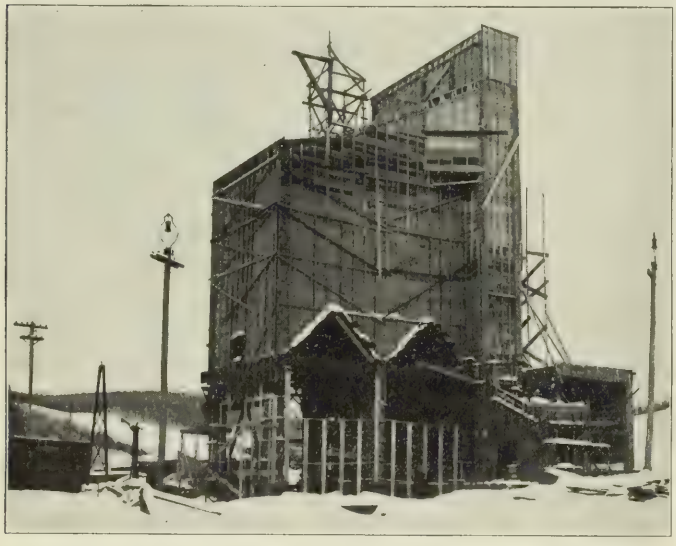
The receiving hopper is 40 ft. long and is arranged to supply coal to two independent hoisting outfits, each consisting of a pair of Holmen balanced bucket elevators, together with a pair of automatic revolving feeders. The hoisting capacity of each outfit is 120 tons per hour. The balanced buckets are connected directly by cable to the reversible hoist in the engine room, and in connection with the automatic revolving feeders constitute practically an automatic hoisting apparatus. The driving power for each set of hoisting equipment consists of a 20 h.-p. motor.

The coal is elevated by the Holmen balanced bucket to a point about 55 ft. above the base of rail, where it is dumped on curved chutes and is lowered into the coal pockets.

The receiving hopper is covered with ¾ in. x 4 in. steel breaker bars, spaced 15 in. centers in both directions, thus enabling the operator to convert mine run coal into locomotive coal of this size. The bottom and all sloping surfaces of the receiving hopper, as well as the bottoms of all the overhead coal pockets, are finished with 1 in. coat of neat cement.

The coaling fixtures consists of three sets of standard balanced hooded aprons complete with heavy steel undercut gates. On each coaling track there is also one set of sand fixtures complete with undercut valves, and telescoping spouts. The dry sand supply is piped to the storage bins in the coal pockets from the adjacent sand drying house, being driven up into the sand bins by compressed air in the usual manner.

The plant is provided with complete steam heating and electric lighting. The outlet gates in the bottom of the storage pockets are steam jacketed to prevent the coal freezing at these points during cold weather. Special heating coils are also provided in the motor house and in the receiving hopper where the coal is delivered into the revolving feeders to prevent the coal freezing at those points. The dry sand bins are also each provided with steam coils.



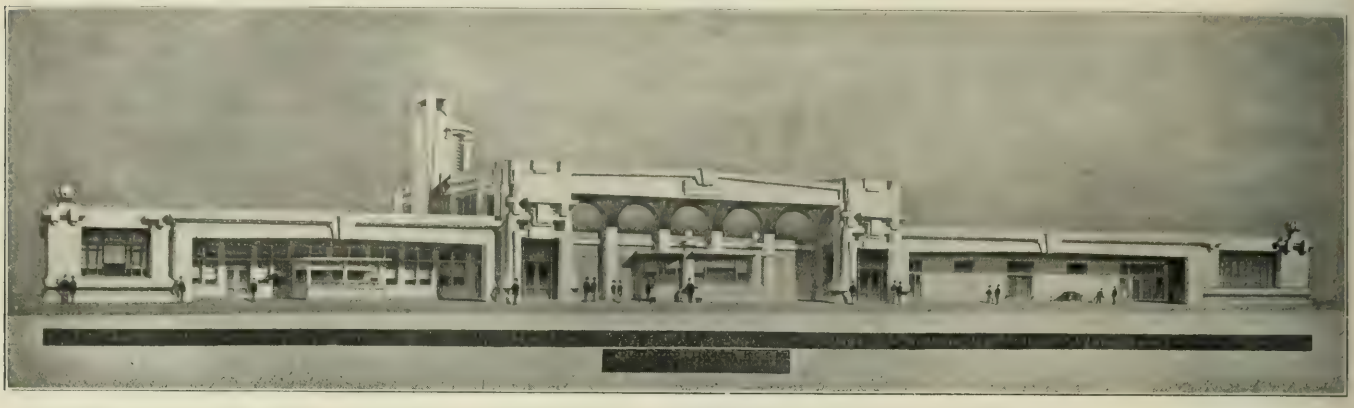
Holmen Concrete Coaling Station.

The plant is also provided with complete electric signal equipment, including safety limit switches to prevent overwinding in the operation of the elevator buckets. The electric current both for lighting and power is taken from the railway company's three phase, 60 cycle, 440 volt current.

This station was designed and built by the Roberts and Schaefer Company, consulting engineers and contractors of Chicago, under the supervision of G. W. Kittredge, chief engineer of the New York Central and Hudson River Railroad.

JOPLIN UNION STATION.

The accompanying illustration shows the track side of the proposed Union station to be built at Joplin, Mo., for the Kansas City Southern, the Atchison, Topeka & Santa Fe, the Missouri & North Arkansas and the Missouri, Kansas & Texas. The Santa Fe at present comes into Joplin over the Kansas City Southern tracks. It is not yet decided exactly how the other two roads will make their connections.



Joplin Union Station.

The general waiting room is in the center of the building. The ticket office projects out toward the track from the wall of the waiting room, as shown, but is under the projecting roof. The wing at the left, in the view herewith, contains the restaurant, and the other wing contains the baggage, mail and express rooms. The present plans are subject to a number of modifications, and the floor plan of the station has not yet been fully worked out. For instance, the news stand shown in front of the left wing will, instead, be put inside the station in the general waiting room.

The building will be either of reinforced concrete or partially of steel frame construction encased with concrete. The exterior will be finished in either limestone or white tile.

BUSH TRAIN SHED AT CHICAGO.

The Bush train shed being built for the Chicago & Northwestern's new passenger station in Chicago was fully described in the Railway Age Gazette of July 16, 1909. The erection of the steel for the shed has progressed very satisfactorily and the accompanying photographs taken March 11 show about one-third of the structure in place.

As was explained in the previous article on this shed, the design differs from the two similar sheds which have been built, in that it is on an elevated structure. The shed columns are carried through the platform and riveted to the girders which support the entire structure.

In designing this station, the engineering and operating departments of the Northwestern considered carefully the relative advantages of locating the columns on the center line between the tracks and on the center line of the platforms. With the columns located on the platforms, the smoke ducts come at the high point of the shed roof, which prevents the possibility of any gases following along the steel work. The



BUSH TRAIN SHED
In Course of Erection—Interior View.



BUSH TRAIN SHED
In Course of Erection—View from Above.

smoke ducts, which are 5 ft. and 3¾ in. high, project about 18 in. above the roof so as to have their tops as high as the roof ridge; and extend downward directly over the engine smoke stacks, thus preventing down drafts of gas and smoke into the train shed. If the columns were located on the center line between tracks, the smoke ducts would be at the low point of the shed and would have to be of greater height to bring their tops flush with the roof ridge and the entire shed would necessarily be of greater height, and cost more. It was also considered essential to provide skylights over the center line between tracks, in order to furnish light to the sides of the cars farthest from the platforms. This would have been impossible with the columns between the tracks, as the gutters are necessarily at the low part of the shed roof and any accumulation of snow or water would naturally lodge at this point.

When located on the platforms the columns do not occupy more than 12 in. of width per pair of tracks, which is about 2½ ft. less than they would require if located between the tracks, and which, in turn, would have to be spread for proper clearance. With tracks spaced 12½ ft. center to center, the clear distance between passenger cars is practically 2½ ft. a recognized safe clearance, and permits sufficient room for car cleaners to clean coaches and car windows within the shed. With the columns between the tracks, in order to provide the same relative clearance and room, the track centers would have to be 16 ft. apart, allowing one foot for the column and 2½ ft. clearance either side of it. This is an important item where the real estate for a new terminal site is very valuable.

It was also found from observations made in the rush hours at the Hoboken terminal where the train shed columns are located on the center lines of platforms, that when one train is discharging passengers on one side of a platform, and another train receiving passengers on the opposite side of the same platform, that the column facilitated the movements, the lines of travel in opposite directions dividing themselves naturally on each half of the platform.

The Bush shed is patented by Lincoln Bush, E. D. 1 Madison avenue, New York City. Mr. Bush was chief engineer of the Lackawanna at the time of building his type of shed at Hoboken and Scranton.

ECONOMICS OF RAILWAY LOCATION.*

There are two fundamental points: Power and resistance. In many different practical tests variations in results have occurred, owing to differences in standards of maintenance of track and equipment, and differences in details of construction of equipment. Exact rules for determining the power and resistances, which will apply in all cases, cannot be deduced; but approximations can be made of sufficient practical value when applied for the purposes intended.

Power.

Where actual tests have been made under the prevailing local conditions, the problem is simple, as the actual available power for various speeds should be used. Where such tests have not been made the problem is more complex.

The report goes fully into the theoretical rating of locomotives and develops the accompanying tables.

Appendix A shows a number of diagrams of calculated drawbar pull on the basis outlined herein and actual recorded drawbar pull reduced to level grade at maintained velocities. [They show, with various kinds of locomotives, excesses of from 1,400 to 2,700 pounds of cylinder tractive power over actual drawbar pull.] It may be claimed that the calculated pull varies too much from actual results obtained, but it will be impossible to devise a formula that will come much nearer the actual results than the proposed method, with the meager information at hand with reference to the exact effect of each detail of locomotive on tractive power, and were information available, the method of calculation would be very complex.

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

The committee recommends that the following conclusions and tables mentioned therein be adopted for publication in the Manual, with a view to furnishing a reasonable and logical method of determining the available power of any given locomotive, it being distinctly understood that as further research and data are secured the tables and rules can be changed when considered advisable.

Conclusions and Recommendations.

(1) Actual drawbar pull of the locomotive at various speeds should be used in making estimates with reference to economic value of various locations of line and grade, where such drawbar pull is known. Where not known, the drawbar pull should be calculated. In comparing a new line with an existing line, the same percentage of efficiency of drawbar pull should be used in both cases.

(2) The tractive power of a locomotive depends on its steam-producing capacity, the boiler pressure, the adhesion and the size of the cylinders and drivers.

(3) The steam-producing capacity of a locomotive depends mainly upon the quantity and quality of the fuel burned, the amount of heating surface and the ratio of heating surface to grate area.

TABLE No. 1.

AVERAGE HOURLY EVAPORATION PER 1000 FT. OF HEATING SURFACE FOR VARIOUS RATIOS OF HEATING SURFACE TO GRATE AREA AND FOR VARIOUS RATES OF FUEL CONSUMPTION BASED ON USE OF BITUMINOUS COAL TESTING 15000 B.T.U. PER POUND.

RATIO	LBS COAL PER SQ FT GRATE AREA PER HOUR										
	60	70	80	90	100	110	120	130	140	150	160
R-50	8136	8965	9690	10324	10879	11365	11790	12162	12487	12771	13020
R-55	7697	8480	9165	9764	10288	10747	11149	11501	11809	12079	12314
R-60	7295	8037	8686	9254	9751	10186	10567	10900	11191	11446	11669
R-65	6913	7617	8233	8772	9244	9657	10018	10334	10610	10852	11064
R-70	6566	7234	7818	8329	8776	9167	9509	9808	10070	10299	10500
R-75	6238	6874	7430	7917	8343	8716	9042	9327	9576	9794	9985
R-80	5939	6542	7070	7532	7936	8289	8598	8868	9104	9311	9492
R-85	5677	6255	6761	7204	7591	7930	8227	8487	8714	8912	9085
R-90	5440	5993	6477	6900	7270	7594	7878	8126	8343	8535	8699
R-95	5211	5741	6205	6611	6966	7277	7549	7787	7995	8177	8336

ABOVE TABLE ASSUMES FEED WATER AT AVERAGE OF 60° F. AND BOILER PRESSURE 200 LBS. FOR 160 POUNDS BOILER PRESSURE APPROXIMATELY ONE HALF PER CENT GREATER QUANTITY WOULD BE EVAPORATED

FOR COAL OF DIFFERENT THERMAL VALUE THAN 15000 B.T.U. MULTIPLY TABULAR AMOUNTS BY FOLLOWING DECIMALS:

14500 B.T.U.	- 0.967	12000 B.T.U.	- 0.80
14000 "	- 0.933	11500 "	- 0.767
13500 "	- 0.900	11000 "	- 0.735
13000 "	- 0.867	10500 "	- 0.70
12500 "	- 0.833	10000 "	- 0.667

(4) Knowing the areas of grate and heating surface, the average steam production of locomotives burning bituminous and similar coals can be estimated by the use of Table No. 1, assuming 4,000 pounds of coal as the maximum quantity that can be properly "fired" per hour.

(5) The maximum velocity at which full cut-off can be maintained can be found by dividing the pounds steam produced per minute by the quantity of steam used per revolution of the drivers, as shown in Table No. 2. Dividing this quotient by the coefficient given in Table No. 3 for the diameter of the drivers will give the speed in miles per hour at which full cut-off can be maintained. This velocity is referred to as "M" in the tables. [Table No. 3 is not reproduced herewith. It is derived from the formula: $C = \frac{336.13}{\text{Diam. of drivers in inches.}}$]

(6) Tractive power of a locomotive is greatest at starting, gradually reducing to the maximum velocity ("M") at which full cut-off can be maintained. At speeds above this

velocity the tractive power decreases more rapidly. The tractive power at any multiple of "M" is practically a fixed percentage of the tractive power at "M." The fixed percentages are different for compound types than for simple locomotives.

(7) Knowing the steam production of a locomotive and the maximum velocity at which full cut-off can be maintained ("M"), the indicated horsepower of the locomotive can be obtained for velocity "M" or higher velocities by dividing the total steam produced per hour by the quantity of steam used per I.HP. hour, as given in Table No. 4, after applying the corrections for proper boiler pressure.

(8) Horsepower can be converted into tractive power by the formula, tractive power equals 375 times the horsepower, divided by the velocity in miles per hour. To simplify the operation, the tractive power can be obtained by multiplying the horsepower by the figures shown in Table No. 6. [The table is not reproduced herewith.]

(9) Where I.HP. at "M" velocity has been converted into cylinder tractive power, the cylinder tractive power at other multiples of "M" can be determined by using the percentages given in Table No. 5 without first calculating the I.HP. for the respective multiples of M.

(10) Available drawbar pull on level tangent is the cylinder tractive power, less the sum of the resistances from the cylinder to the rim of drivers, the resistance through the trucks of engine and tender, and the "head end" or velocity resistance. The formulas and data given in Table No. 7 are recommended for use in determining these resistances. Available drawbar pull at starting, with use of sand, should not usually be considered as greater than 30 per cent. of the weight on locomotive drivers, and at running speeds not greater than 25 per cent.

DATE	April, 1904 Constant Speed	April, 1904 Constant Speed	May, 1906 Constant Speed	April, 1904 Constant Speed	April, 1904 Constant Speed
Speed	10 M.P.H.	10 M.P.H.	6.5 M.P.H.	15 M.P.H.	15 M P.H.
Engine	2343	2343	2646	2343-1821-1403	2343
Location	North Mntn. Cut-off	North Mntn. Cut-off	Mt. Airy Hill	Mt. Airy Hill	Adamstown Cut-off
Grade	3%	3%	85%	85%	30%
Curvature	Max. 4°	Max. 4°	2° 30′	Tangent	Tangent
Track	Good—Rock Ballast	Good—Rock Ballast	Fair—Cinder Ballast	Fair—Cinder Ballast	Fair—Cinder Ballast
Rail	85 lb.	85 lb.	85 lb.	85 lb.	85 lb.
Compensated	.03	.03	03	.....	.....
Number of cars	38	38	26	32	32
Kind of Cars	36 loaded Coal Hoppers	36 empty Coal Hoppers	24 Coal Hoppers	30 loaded Coal Hoppers	30 loaded Coal Hoppers
Weight of Cars	687.5 tons	687.5 tons	468.0 tons	582 tons	582 tons
Caboose	9.5 tons	9.5 tons	9.5 tons	9.5 tons	9.5 tons
Dynamometer Car	17 tons	17 tons	17 tons	17 tons	17 tons
Total Number of Cars	38	38	26	32	32
Total Tonnage	2533	714	1513	2113	2113
Resistance by Dynamometer	27195	11504	34630	45600	23100
Resistance on level	12000	7220	8531	9679	10422
Formula deduced	.....	.....	R = 2.68t+143.8n*	.....	.....
Resistance in lbs. per ton	4.73	10.11	5.64	4.58	4.92

RECORDS OF DYNAMOMETER TESTS.

Train Resistance and Curve Resistance.

While it is impossible to deduce rules for absolute freight tonnage rating between speeds of 7 to 35 miles per hour, owing to variables which must be allowed for at the beginning of each trip, it is feasible to make a formula which will be sufficiently accurate for purposes of comparing locations, and one which may be used as a base to which corrections may be applied.

As is well understood, corrections must be applied for:

(1) Temperature (always allowed for).

(2) Condition of equipment.

(3) Amount and character of curvature. (Allowed for by adding to ruling grade if uncompensated.)

(4) Condition of roadbed, i. e., class of maintenance. (An important consideration not taken into account as it should be.)

(5) Local conditions, such as short passing sidings or limited facilities, which would curtail the length of a train.

(6) Length of grade. (Grades over five miles in length will cause reduction of trainload with coal-burning engines.)

(7) Kind of fuel. (For instance, with oil fuel, engines will accelerate on long ruling grades, where, with coal, they might not haul their rating.)

(8) Efficiency of operatives.

(1) Formula of A. C. Dennis:

Under date of August, 1909 (Bulletin No. 114), Mr. Dennis produced a formula

$$R = 2.6\,t - 85\,n$$

where t = tonnage of cars in train, and n = number of cars.

A ittle closer working of his data gives $R = 2.41\,t + 89.6\,n$.

The cases cited show a remarkable uniformity, which would indicate that the conditions under which the results were attained were about the same. The cars were all box cars.

(2) Baltimore & Ohio Tests:

In April, 1904, certain tests were made on the Baltimore & Ohio with coal hoppers, which were conducted under such satisfactory conditions as to make some conclusions of value. J. R. Onderdonk, engineer of tests, conducted these tests. The accompanying record shows the data of some of the tests.

From the foregoing tests it would appear that, on the class of line that is covered by the tests, coal hoppers need a higher factor than box cars. In the eastern part of the United States, especially among the mountains, alignment is crooked, and even if curvature is compensated, long trains often get on two or more curves at once, with the result that compensation is not sufficient to offset the fact that the trucks do not straighten themselves out in accordance with the theory that they should do so. The result is a greater resistance than would be shown on a uniformly straight line. This fact may account for the high unit resistance shown on these tests.

Based on a large number of tests made on the Baltimore & Ohio in 1904, a formula was evolved which has since been used by that road. When reduced to a form equivalent to Mr. Dennis', it is:

$$R = 2.78\,t + 113.9\,n$$

This formula has been found to meet working conditions fairly well when corrected to meet local peculiarities—temperature, etc. It would, however, call for a lower adjustment per car than the formula $R = 2.68\,t + 143.8\,n$, and accordingly would call for a higher rate of correction to meet local conditions.

Following is an exposition of the formula with corrections for temperature and adjustments in tons per car:

System to Determine Rating for Locomotives.

Let P = Pulling power of locomotive (lbs.).
E = Weight of engine and tender (lbs.).
W = Weight of train (lbs.).
R = Rate of grade (tangent of angle).
K = Function of W (resistance).
N = Number of cars.
C = Function of N (resistance).
and A = Rating.

Then as the general formula for train resistance

$$P = (E + W)\,(R + K) + N\,C \qquad (1)$$

$$\frac{P}{R + K} - E = W + N\left[\frac{C}{R + K}\right]$$

$$\text{but } W + N\left[\frac{C}{R + K}\right] = A \qquad (2)$$

$$\text{Therefore } \frac{P}{R + K} - E = A \qquad (3)$$

To Determine Value of K.

$$\text{Let } \frac{P}{R' + K} - E = A' \text{ and } \frac{P}{R'' + K} - E = A''$$

Then $P = (A' + E)\,(R' + K)$ and $P = (A'' + E)\,(R'' + K)$.

Therefore

$$A'R' + A'k + ER' + EK = A''R'' + A''K + ER''EK,$$

from which we get

$$K = \frac{R''(A'' + E) - R'(A' + E)}{A' - A''} \qquad (4)$$

Now by test, using E-24 engine,

When $R' = .003$, $A' = 6{,}970{,}000 - .3\%$ grade,

and when $R'' = .01$, $A'' = 2{,}480{,}000 - 1\%$ grade.

Also $E = 336{,}500$ weight of engine and loaded tender.

Substituting values for A', A", R', R", and E, we get,

$$K = \frac{.01\,(2{,}480{,}000 + 336{,}500) - .003\,(6{,}970{,}000 + 336{,}500)}{6{,}970{,}000 - 2{,}480{,}000}$$

or $K = .00139$ pounds per pound,

$= 2.78$ pounds per ton.

To Determine Value of C.

Let $B = \frac{C}{R + K}$ = adjustment.

By test it is found that five tons is the proper adjustment for 1 per cent. grade, substituting values for B, R, and K,

$$10{,}000 = \frac{C}{.01 + .00139}$$

$$C = 113.9.$$

Example.—To determine adjustment for .3 per cent. grade knowing C and K,

$$B = \frac{C}{R + K}$$

Substituting values for C, R, and K, we get,

$$B = \frac{113 - 9}{.003 + .00139} = 25{,}945, \text{ or } 13 \text{ tons.}$$

To Determine Value of P for E-24 Engine.

We have $A = \frac{P}{R + K} - E$,

Therefore $P = (A + E)(R + K)$

As above when $R = .003$, $A = 6{,}970{,}000$.

E and K are known.

Substituting we get,

$$P = (6{,}970{,}000 + 336{,}500)(.003 + .00139)$$

$$P = 32{,}075.$$

To Determine the Rating of E-24 Engine on Various Grades.

We have

$$A = \frac{P}{R + K} - E$$

in which P, K, and E are known, substituting we get,

$$A = \frac{32075}{R + .00139} - 336{,}500$$

For example, to determine rating for a E-24 engine on .3 per cent. grade,

$$A = \frac{32075}{R + .00139} - 336.500$$

Substituting value R, we get,

$$A = \frac{32075}{.003 + .00139} - 336.500$$

$$A = 6.970.000$$

$$= 3.485 \text{ tons.}$$

Adjustment for Various Grades.

Per cent. of grade.	Adjustment in tons.	Per cent. of grade.	Adjustment in tons.
.3	13	1.0	5
.35	12	1.1	5
.4	11	1.2	4
.45	10	1.3	4
.5	9	1.4	4
.55	8	1.5	3
.6	8	1.6	3
.65	7	1.7	3
.7	7	1.8	3
.75	7	1.9	3
.8	6	2.0	3
.65	6	2.2	2
.9	6	2.4	2
.95	5	2.6	2

The Pennsylvania Railroad formula, as shown in Mr. Cole's article on Train Resistance, Railroad Age Gazette (page 547, Vol. XLVI, No. 13), is as follows:

$$R = 1.0769\,t + 138.46\,n$$

This formula gives a higher rate of adjustment than any of the formulas shown so far. It is based on tests made in 1907, which gave the following results:

Weight of car.	Resistance on level tangents.	Number of tests.
20 tons	8 lbs. per ton	3
72 tons	3 lbs. per ton	15

It should be noted from the article in the Railroad Age Gazette that while resistance per ton increases slowly as weight increases after car passes weight of 60 tons, resistance per ton increases very rapidly as car is lighter than 20 tons. Between these two car weights resistance in pounds per ton is nearly proportional to the weight of car.

As it is out of the question and perhaps a refinement to have special formulas for different classes of cars, the following is recommended as being a combination of the result of Mr. Dennis' and Mr. Shurtleff's investigations, those of the Baltimore & Ohio and the Pennsylvania Railroad, according to the Railroad Age Gazette.

	Resistance of 20-ton car on level tangent.	Resistance of 70-ton car on level tangent.
Dennis and Shurtleff	138	258
Selected tests Balt. & Ohio.	197	331
Baltimore & Ohio	169	308
Pennsylvania Railroad	159	213
Average of all	166	277

Thus, $166 = K\,20 + C$

$277 = K\,70 + C$

$111 = K\,50$

$2.22 = K$

$121.6 = C$

Formula recommended: $R = 2.22\,t + 121.6\,c$.

Adjustments in tons per car from the formula:

Tons per Grade.	car.	Tons per Grade.	car.	Tons per Grade.	car.	Tons per Grade.	car.	Tons per Grade.	car.
Level	54	0.4	12	0.8	6.7	1.2	4.6	1.6	3.5
0.1	29	0.5	10	0.9	6.0	1.3	4.3	1.7	3.3
0.2	20	0.6	8.5	1.0	5.4	1.4	4.0	1.8	3.1
0.3	14	0.7	7.5	1.1	5.0	1.5	3.7	1.9	2.9
								2.0	2.8

Per Cent. of Rating to Be Used for Various Temperatures Based on Tests on .3 Per Cent., 1 Per Cent. and 2.6 Per Cent. Grades.

Per cent. of grade.	A Above 45 deg.	B 45 to 35 deg.	C 35 to 20 deg.	D Below 20 deg.
.3	100	88	76	65
.35	100	90	80	69
.4	100	91	82	72
.45	100	91	83	74
.5	100	92	84	76
.55	100	93	86	78
.6	100	93	87	80
.65	100	94	88	82
.7	100	94	88	83
.75	100	95	89	84
.8	100	95	90	85
.85	100	95	90	85
.9	100	95	90	86
.95	100	96	92	87
1.0	100	96	92	88
1.1	100	96	92	89
1.2	100	97	93	90
1.3	100	97	94	91
1.4	100	97	94	91
1.5	100	97	94	92
1.6	100	97	94	92
1.7	100	98	95	93
1.8	100	98	95	93
1.9	100	98	96	94
2.0	100	98	96	94
2.2	100	98	96	95
2.4	100	99	97	96
2.6	100	99	97	96

Starting Resistances.

Starting resistances vary with temperature, loading, condition of equipment and character of roadway maintenance. In pounds per ton, it will vary from 40 to 10. Trains are

started by increments, so that starting resistances rarely become limiting.

Mr. Dennis is probably the first to call attention to the fact that speeds between 7 and 35 m. p. h. show a constant total train resistance, for the same train. Mr. Shurtleff further corroborates with personal experience.

On page 546, Railroad Age Gazette, Vol. 47, No. 13, it is stated that the Pennsylvania Railroad used resistance between 5 and 35 m. p. h. as a constant. Further corroborative evidence is had from dynamometer experiments of the Baltimore & Ohio in 1904. The runs at the higher speeds, over exactly the same track, showed slightly less resistance than those at ten miles per hour. These tests were reliably made, and, like the others, were conducted by Engineer of Tests Onderdonk.

Curve Resistance.

We are interested in curve resistance chiefly from the standpoint of its compensation. In the location of a railway curvature evils may be eliminated partially by reducing gradient on the curve by such an amount as to make the engine effort the same on curve as on tangent.

How much of a reduction shall be made? Under curve resistance it is proper to consider a few subheads:

(a) Resistance of long curves.
(b) Resistance of short curves.
(c) Curve resistance at high speed.
(d) Curve resistance at low speed.
(e) Easements to curves.
(f) Superelevation of curves—which rail, if either, should remain at grade.
(g) Dynamometer tests.

(a) Resistance of long curves.

The resistance to traction of long curves is probably greater than short curves. If the curve is long enough to take the whole train at once, the engine is changing direction at the same time that it is pulling the train. All the trucks in the train are slewed around at the same time.

(b) Resistance of short curves.

In the case of short curves, however, only a part of the trucks are slewed at the same time, and for a proportion of the time the engine is working on straight track while it is pulling the train.

(c) Curve resistance at high speed.

On account of the trucks straightening up better at high speed, it is probable that the effect of curvature is dispelled sooner at high speed than at slow speed.

(d) Resistance at slow speed.

As an example of the way that trucks fail to straighten at slow speed, attention is called to the old single-track bridge on the Baltimore & Ohio over the Susquehanna river.

The traffic is practically 100 per cent. loaded eastbound and about 40 per cent. westbound. At the eastbound approach to the bridge there was a 7 deg. 30 min. curve, running out on the bridge about 400 ft. The speed of eastbound trains at this point was ten miles per hour and the length of the bridge about one and one-eighth miles, leaving over a mile of tangent on the bridge.

The north rail on the bridge (which was the continuation of the high rail of the curve) was badly flange-worn throughout the mile length of the bridge—the first half-mile being as much worn as the high rail of the curve. The north rail also crept much faster than the other, showing the pressure of the flanges.

The above would indicate that curve resistance at slow speed does not stop at the end of the curve.

(e) Superelevation of curves.

The easement to a curve serves the double purpose of an easy approach to the curve and a run-out to the superelevation. It should be noted that, with the inner rail held at grade, the center of gravity of the train must be raised through approximately one-half the superelevation. It would appear as if the logical superelevation would be a call for raising the outer rail by one-half the calculated superelevation. This would mean depressing the inner rail by the same amount. It would seem from a standpoint of resistance that the question should be given consideration. It is already the practice on many of the roads in the United States and Canada.

(f) How much does curve resistance amount to in equivalent grade?

In April of 1904 tests were made on the Baltimore & Ohio Railroad, North Mountain Cut-Off and Mount Airy Grade, to determine the effect of curve compensation. Certain parts of these lines were compensated at the rate of

TABLE No 2.

WEIGHT OF STEAM USED IN ONE FOOT OF STROKE IN LOCOMOTIVE CYLINDERS

CYLINDER DIAMETER IS FOR HIGH PRESSURE CYLINDERS IN COMPOUND LOCOMOTIVES

DIAMETER OF CYLINDER IN INCHES	WEIGHT OF STEAM PER FOOT STROKE FOR VARIOUS GAGE PRESSURES						
	220 #	210 #	200 #	190 #	180 #	170 #	160 #
12	0.405 Lbs	0.389 Lbs	0.370 Lbs	0.354 Lbs	0.337 Lbs	0.321 Lbs	0.304 Lbs
13	0.475 "	0.456 "	0.435 "	0.415 "	0.396 "	0.376 "	0.357 "
14	0.551 "	0.529 "	0.504 "	0.482 "	0.459 "	0.436 "	0.414 "
15	0.633 "	0.607 "	0.579 "	0.553 "	0.527 "	0.501 "	0.476 "
15½	0.675 "	0.649 "	0.618 "	0.590 "	0.562 "	0.535 "	0.508 "
16	0.720 "	0.691 "	0.658 "	0.629 "	0.599 "	0.570 "	0.541 "
17	0.812 "	0.780 "	0.744 "	0.710 "	0.676 "	0.643 "	0.611 "
18	0.911 "	0.875 "	0.834 "	0.796 "	0.759 "	0.722 "	0.685 "
18½	0.962 "	0.924 "	0.881 "	0.841 "	0.801 "	0.762 "	0.724 "
19	1.015 "	0.975 "	0.928 "	0.887 "	0.845 "	0.804 "	0.763 "
19½	1.069 "	1.027 "	0.978 "	0.934 "	0.890 "	0.847 "	0.804 "
20	1.125 "	1.080 "	1.029 "	0.983 "	0.936 "	0.891 "	0.846 "
20½	1.181 "	1.134 "	1.081 "	1.032 "	0.984 "	0.936 "	0.888 "
21	1.240 "	1.191 "	1.134 "	1.083 "	1.032 "	0.982 "	0.932 "
22	1.361 "	1.307 "	1.245 "	1.189 "	1.133 "	1.078 "	1.023 "
23	1.487 "	1.428 "	1.361 "	1.300 "	1.238 "	1.178 "	1.118 "
28	2.204 "	2.117 "	2.017 "	1.926 "	1.835 "	1.745 "	1.657 "

FOR WEIGHT OF STEAM USED PER REVOLUTION OF DRIVERS AT FULL CUT-OFF:-
MULTIPLY THE TABULAR QUANTITY BY FOUR TIMES THE LENGTH OF STROKE IN FEET FOR SIMPLE AND FOUR CYLINDER COMPOUNDS. FOR TWO CYLINDER COMPOUNDS MULTIPLY BY TWO TIMES THE LENGTH OF STROKE

TABLE No 4.

MAXIMUM CUT-OFF AND POUNDS OF STEAM PER I.H.P HOUR FOR VARIOUS MULTIPLES OF "M".

"M" = MAXIMUM VELOCITY IN MILES PER HOUR AT FULL CUT-OFF BOILER PRESSURE, 200 LBS.

VELOCITY	PER CENT CUT-OFF	LBS STEAM PER I.H.P HOUR		VELOCITY	PER CENT CUT OFF	LBS. STEAM PER I.H.P. HOUR:	
		SIMPLE LOC	COMPOUND LOC			SIMPLE LOC	COMPOUND LOC
1.0"M"	FULL	38.30	25.80	2.9"M"	38.5	24.37	21.04
1.1 "	94.4	36.46	24.36	3.0 "	37.0	24.22	21.21
1.2 "	89.1	34.89	23.24	3.2 "	34.2	24.00	21.57
1.3 "	84.3	33.56	22.35	3.4 "	31.8	23.85	21.93
1.4 "	79.7	32.41	21.65	3.6 "	29.8	23.8	22.27
1.5 "	75.4	31.40	21.14	3.8 "	28.0	23.8	22.57
1.6 "	71.4	30.49	20.77	4.0 "	26.4	23.87	22.85
1.7 "	67.7	29.67	20.52	4.25 "	24.7	24.05	23.22
1.8 "	64.3	28.93	20.40	4.50 "	23.3	24.24	23.56
1.9 "	61.0	28.25	20.40	4.75 "	22.1	24.44	23.85
2.0 "	58.0	27.62	20.40	5.00 "	21.1	24.64	24.15
2.1 "	55.2	27.05	20.40	5.5 "	19.5	24.98	24.70
2.2 "	52.6	26.52	20.40	6.0 "	18.4	25.20	
2.3 "	50.1	26.06	20.40	6.5 "	17.6	25.45	
2.4 "	47.8	25.67	20.40	7.0 "	17.1	25.60	
2.5 "	45.7	25.32	20.47	7.5 "	16.7	25.70	
2.6 "	43.7	25.02	20.60	8.0 "	16.4	25.80	
2.7 "	41.8	24.76	20.73	9.0 "	16.1	25.90	
2.8 "	40.1	24.54	20.88				

FOR STEAM PER I.H.P. HOUR FOR OTHER BOILER PRESSURES TAKE THE FOLLOWING PERCENTAGES OF VALUES GIVEN IN TABLE;

160 Lbs. - 103%
170 Lbs - 102.1%
180 Lbs - 101.3%
190 Lbs. - 100.6%
210 Lbs. - 99.5%
220 Lbs. - 99.2%

.03 and other parts at .04. The detailed results showed that on the portion compensated .03 per cent., resistance on curve was greater than on tangent, and on the portion compensated .04 per cent., resistance on curve was less than on tangent. These tests were conducted under the direction of J. R. Onderdonk, engineer of tests, and the results were computed by him.

The consensus of opinion of the replies to a circular put out in 1907 for information on the same subject was that .035 per cent. per degree gave the best results.

Conclusions.

It is recommended that the following conclusions be adopted:

(1) Dynamometer tests to be of the greatest value should show the following:

(a) Dynamometer record (graphical) showing drawbar pull to nearest ten pounds, with horizontal scale not less than 400 ft. to one inch and in special cases a larger scale.

(b) Speed record to nearest tenth of mile per hour (graphical).

TABLE No 5.

PER CENT CYLINDER TRACTIVE POWER FOR VARIOUS MULTIPLES OF "M"

"M" = MAXIMUM VELOCITY IN MILES PER HOUR AT WHICH BOILER PRESSURE CAN BE MAINTAINED WITH FULL CUT-OFF.

Velocity	Compound %	Simple %	Velocity	Compound %	Simple %	Velocity	Compound %	Simple %
Start	(135/60) 135.00	106.00	3.6 M	32.40	44.75	6.4 M		23.59
0.5 M.	103.00	103.00	3.7 "	31.25	43.56	6.5 "		23.18
1.0 "	100.00	100.00	3.8 "	30.10	42.39	6.6 "		22.79
1.1 "	96.28	95.57	3.9 "	29.14	41.24	6.7 "		22.42
1.2 "	92.55	91.53	4.0 "	28.24	40.10	6.8 "		22.06
1.3 "	88.83	87.83	4.1 "	27.38	39.00	6.9 "		21.71
1.4 "	85.12	84.46	4.2 "	26.56	37.96	7.0 "		21.38
1.5 "	81.40	81.37	4.3 "	25.77	36.97	7.1 "		21.06
1.6 "	77.68	78.55	4.4 "	25.03	36.03	7.2 "		20.75
1.7 "	73.96	75.97	4.5 "	24.34	35.13	7.3 "		20.45
1.8 "	70.25	73.60	4.6 "	23.69	34.26	7.4 "		20.16
1.9 "	66.54	71.41	4.7 "	23.07	33.41	7.5 "		19.88
2.0 "	63.21	69.37	4.8 "	22.48	32.59	7.6 "		19.61
2.1 "	60.20	67.47	4.9 "	21.92	31.82	7.7 "		19.34
2.2 "	57.48	65.67	5.0 "	21.38	31.11	7.8 "		19.08
2.3 "	54.97	63.94	5.1 "	20.87	30.42	7.9 "		18.82
2.4 "	52.68	62.22	5.2 "	20.37	29.75	8.0 "		18.57
2.5 "	50.42	60.55	5.3 "	19.89	29.10	8.1 "		18.33
2.6 "	48.16	58.92	5.4 "	19.43	28.48	8.2 "		18.09
2.7 "	46.08	57.33	5.5 "	18.99	27.87	8.3 "		17.86
2.8 "	44.10	55.78	5.6 "		27.33	8.4 "		17.64
2.9 "	42.29	54.26	5.7 "		26.81	8.5 "		17.43
3.0 "	40.57	52.78	5.8 "		26.30	8.6 "		17.22
3.1 "	38.95	51.33	5.9 "		25.81	8.7 "		17.01
3.2 "	37.42	49.91	6.0 "		25.34	8.8 "		16.82
3.3 "	35.98	48.55	6.1 "		24.88	8.9 "		16.63
3.4 "	34.66	47.24	6.2 "		24.44	9.0 "		16.45
3.5 "	33.53	45.97	6.3 "		24.01			

(c) Key to record mile posts.

(d) Condition of track surface (graphical).

(e) Steam pressure of boiler (graphical).

(f) Train line air pressure (graphical).

(g) Time record (graphical).

(Speed record may be independent record, and in this case time record is desirable.)

(h) Coal consumption (record of shovels of coal as used) (worked by hand in engine).

Requisite data to be taken:

Track.

(i) Office profile and alinement connecting with mile posts (so as to connect with 3).

(j) Section of rail.

(k) Condition of rail.

(l) Number of ties to rail (and rail length).

(m) Kind of ballast.

Locomotive.

(n) Type (wheel arrangement, whether simple or compound, and dimensions of locomotive).

(o) Total weight and weight on drivers.

Cars.

(p) Record of length, initial, number, class of each car of train, also weight empty and weight loaded.

(q) Kind of truck.

(r) Condition of car.

Weather.

(s) Temperature.

(t) Direction and force of wind and direction of train.

(u) State of weather (rain or clear).

(2) Resistance of freight trains shows practically no change of resistance between 7 and 35 m. p. h.

(3) It is recommended that for freight train resistances between 7 and 35 m. p. h. the formula,

$$R = 2.2\,T + 121.6\,C,$$

be used for comparing freight train ratings on different lines and grades.

R = total resistance on level tangent.

T = total weight cars and contents in tons.

C = total number of cars.

(4) In order to equalize resistance on curve and tangent, curves shall be compensated .035 per cent. per degree of curvature. Effect of curve resistance is dispelled more slowly at slow speed than at high speed.

TABLE No 7.

LOCOMOTIVE RESISTANCES

(A) CYLINDER TO RIM OF DRIVERS:
TOTAL POUNDS $R = 18.7\,T + 80\,N$
T = TONS WEIGHT ON DRIVERS
N = NUMBER DRIVING AXLES

(B) ENGINE AND TENDER TRUCKS:
TOTAL POUNDS $R = 2.6\,T + 20\,N$
T = TONS WEIGHT ON ENGINE AND TENDER TRUCKS.
N = NUMBER OF TRUCK AXLES

(C) HEAD END OR "AIR" RESISTANCE
$R = .002\,V^2A$;---- V = VELOCITY IN MILES PER HOUR
A = AREA (AVERAGE FOR LOCOMOTIVES, 125.50 FT)

TOTAL $R = 0.25\,V^2$

AIR RESISTANCE (C) FOR VARIOUS VELOCITIES.

Velocity	R	Velocity	R	Velocity	R	Velocity	R
1	0.25	11	30	21	110	31	240
2	1.00	12	36	22	121	32	256
3	2.25	13	42	23	132	33	272
4	4.00	14	49	24	144	34	289
5	6.25	15	56	25	156	35	306
6	9.00	16	64	26	169	36	324
7	12.25	17	72	27	182	37	342
8	16.00	18	81	28	196	38	361
9	20.25	19	90	29	210	39	380
10	25.00	20	100	30	225	40	400

DRAW BAR PULL ON LEVEL TANG'T EQUALS THE CYLINDER TRACTIVE POWER LESS THE SUM OF ENGINE RESISTANCES.

AT LOW SPEEDS THE ADHESION OF DRIVERS SHOULD BE CONSIDERED AND AVAILABLE DRAW BAR PULL SHOULD NEVER BE ESTIMATED GREATER THAN
30% OF WEIGHT ON DRIVERS AT STARTING WITH USE OF SAND
25% " " " " " RUNNING SPEEDS

(5) Superelevation and depression should be equally divided between high and low rail of curve, in order to avoid shock in entering curve and exceeding maximum gradient on runoffs of curves.

(6) Condition of roadway maintenance has a great effect on train resistance.

(7) Condition of equipment has a great effect on train resistance.

(8) Train resistance is greater in cold weather than in warm. Per cent. of rating on account of variation in temperature, as shown in body of report, is recommended for use.

(9) Resistance of individual cars of same weight but of different type shows considerable variation. Sufficient data are not yet available to determine just how much the difference is.

(10) Starting resistance varies from 10 to 40 lbs. per ton, depending on loading, temperature and character of maintenance of roadway and equipment.

Curvature.

As far as known to the committee, the rail wear and other expenses of maintenance on curves are approximately proportional to the number of degrees of central angle, but there are a number of reasons why light curves are better than sharp curves. Sharp curves require greater elevation, which is objectionable and takes considerable care and close inspection to maintain correct and uniform. The track can only be elevated for one velocity, while speed of trains will necessarily vary. Straight lines and light curves permit higher safe speeds. As a general rule, it is desirable on any railway to have alinement such that trains can run as fast as possible with the greatest possible factor of safety against derailment. Curves should be made as light as practicable down to a curve where any advantage gained by making it lighter would be offset by the difficulty of maintaining the alinement.

If on any curve a train runs at a speed greater (or less) than that for which track is elevated according to formula $E = .00066DV^2$ (page 61 of Manual), the amount of unbalanced centrifugal force and the difference in weights on the two rails will be represented by the approximate formulas:

Unbalanced centrifugal force, $f^1 - f = .0177\ (a^2 - 1)$ WE,

Difference in weight on rails $w^1 - w = .00753\ (a^2 - 1)$ WEH,

Where W = total weight on both rails, H = height of its center of gravity above the rails, E = the elevation of outer rail in inches, and a = the quotient obtained by dividing the actual speed by that for which track is elevated.

These unbalanced forces vary directly as the elevation; and therefore as the degree of curve where track is elevated for a given speed.

For example, if track is elevated for 50 m. p. h. and trains run at different speeds, we would have for an engine of 100 tons with center of gravity 6 ft. above the rails.

Actual speed 60 m. p. h.,

$f^1 - f =$ 1.3 tons for a 1-deg. curve.
5.2 tons for a 4-deg. curve.
$w^1 - w =$ 3.3 tons for a 1-deg. curve.
13.1 tons for a 4-deg. curve.

Actual speed 15 m. p. h.,

$f^1 - f =$ — 2.7 tons for a 1-deg. curve.
— 10.6 tons for a 4-deg. curve.
$w^1 - w =$ — 6.8 tons for a 1-deg. curve.
— 27.1 tons for a 4-deg. curve.

Both the unbalanced centrifugal force and the difference in weights on rails are four times as much on the 4-deg. as on the 1-deg. curve. At 15 m. p. h. on the 4-deg. curve the weight on the inside rail is 63½ tons against 36½ on the outside, nearly as great a disproportion as for train standing still—which would be 65 and 35.

Where track is elevated for 50 m. p. h., as in the above examples, a speed of 83 m. p. h. on a 1-deg. curve will give the same unbalanced centrifugal force and difference in weight on rails as 60 m. p. h. on the 4-deg., and as far as these forces are concerned it is equally safe.

As a 10-deg. curve for 30 m. p. h. and a 2 deg. 30 min. for 60 m. p. h. require the same elevation, the unbalanced centrifugal force and difference in weight on rails will be the same in each case for any given percentage of increase (or decrease) in speed over that for which track is elevated.

The committee believes that the unbalanced centrifugal force is an important objection to curves and diminishes the factor of safety against derailment; and that for slow trains the excess of weight on the inside rail tends to increase the elevation of track while the pressure is lightened on the outside rails.

Curvature is more objectionable at high speeds than low. As the energy of any jolt or rebound caused by imperfect surface increases with the square of speed, the factor of safety against derailment at high speeds is diminished to that extent. Therefore any additional reduction in the factor of safety caused by the introduction of curvature is more objectionable than it would be at lower speeds where the margin of safety is greater.

It is fully realized that the subject has only been partially covered in the present report, and further data and study are needed in order to reduce to a minimum the portion of the work that must eventually rest on the judgment of the engineer.

Conclusions.

(1) A straight line is the best alinement, and with the possible exception of very light curves, it is the safest.

(2) The justifiable expenditure to eliminate one degree of central angle in the alinement of roadway depends largely on the number of daily trains and the cost per train mile.

(3) As a general rule, it is good practice to spend more money to take out one degree of central angle where the radius is small, requiring the maximum elevation of outer rail, than where the radius is large, requiring less elevation.

(4) As a general rule, it is justifiable to spend more money to take out one degree of central angle where trains run at a high rate of speed than where the speed is low.

The report is signed by: A. K. Shurtleff (C., R. I. & P.), chairman; C. Frank Allen (Mass. Inst. Tech.), vice-chairman; W. Beahan (L. S. & M. S.), R. N. Begien (B. & O.), J. F. Burns (L. & N.), A. C. Dennis (Can. Pac.), C. P. Howard (L. S. & M. S.), P. M. LaBach (Mo. Pac.), Fred Lavis (Consulting Engineer), L. B. Merriam (Consulting Engineer), C. J. Parker (N. Y. C. & H. R.), J. E. Schwitzer (Can. Pac.), F. L. Stuart (Erie), H. R. Talcott (B. & O.) and W. L. Webb (Consulting Engineer).

TRACK.*

Revision of Manual.

The committee recommends substituting the following for that portion of page 64 in the Manual, under Maintenance of Gage.

Maintenance of Gage.

(1) Tie plates should be applied in all cases where greater economy in maintenance is secured by their use than in depending on the life of the tie, limited by rail wear.

(2) Shoulder tie plates are recommended in preference



L. S. ROSE,
Chairman of Committee on Track.

to rail braces, except for guard rails and stock rails at switches, where the latter should be used.

(3) For heavy traffic, shoulder tie plates should be used on all ties on curves.

(4) For medium traffic, shoulder tie plates should be used on all ties on curves over three degrees.

(5) For light traffic, the outside of rails on curves should be double spiked.

(6) The gage (tool) used should be the standard gage recommended.

(7) When track is intended to be spiked to standard gage, the rail should be held against the gage with a bar while the spike is being driven.

(8) Within proper limits, a slight variation of gage from the standard is not seriously objectionable, provided the variation is uniform and constant over long distances. Under ordinary conditions it is not necessary to regage track if the increase in gage has not amounted to more than one-half inch, providing such increase is uniform.

(9) Spikes should be started vertically and square, and

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

so driven that the face of the spike shall come in contact with the base of rail; the spike should never have to be straightened while being driven.

(10) The outside spikes of both rails should be on one side of the tie, and the inside spikes on the other. The inside and outside spikes should be spaced as far apart as the face and character of the tie will permit. The ordinary practice should be to drive the spike two and one-half (2½) in. from the outer edge of the tie. The old spike holes should be plugged.

On page 61, it is recommended that the third line from the bottom be changed to read:

"and E=elevation of outer rail in inches at the gage line."

With regard to metal portions of the track coming in contact with track circuits, the committee makes the following recommendation:

"Where there is material leakage from track circuits, track fastenings should be so designed as to prevent contact between the metal and the ballast."

The committee was unable to discuss fully the question of switchstand signals with Committee X this year, and is unable at this time to make a recommendation for a standard switchstand signal. It has, however, carefully considered the specifications for spring and rigid frogs, which were presented to the last convention as a progress report, and these specifications were submitted to the various frog and switch manufacturers in this country for their criticisms. The committee now presents for adoption the following specifications:

Specifications for Spring and Rigid Frogs.

General.

The company will furnish the manufacturer one copy of the specifications and drawings.

The drawings will show the rail sections, splice drilling, angle, alinement and general dimensions.

The drawings are intended to co-operate with and form a part of the specifications. Dimensions should not be scaled. Anything which is not shown on the drawings, but which is mentioned in the specifications, or vice versa, or anything not expressly set forth in either, but which is reasonably implied, shall be furnished the same as if specifically shown and mentioned in both. Should anything be omitted from the drawings or specifications which is necessary for a clear understanding of the work, or should any error appear either in the drawings or specifications affecting the work, it shall be the duty of the manufacturer to notify the company, and he shall not proceed with the work until instructed to do so by the company.

Materials.

Rail shall be first quality, of the section ordered, as called for by the.....company's rail specifications.

Filling between the main and wing rails, and between the main and easer rails, shall be rolled steel.

Raising blocks must be of cast steel.

Solid foot guards and beveled filler blocks not presenting a running surface may be of cast-iron.

Foot guards when made of steel shall be not less than ⅜ in. thick, of width shown on plans, shall fill the space between head and base of rail, and shall be bolted to the web of rail by bolts not less than ¾ in. in diameter. These foot guards shall be supplied at all places where protection is needed, and where conditions will not allow the above specified cast-iron foot guards.

Bolts shall be of double refined iron. Bolt iron shall have a tensile strength of not less than 48,000 pounds per square inch, and an elongation of not less than 15 per cent. in eight inches. When nicked on either side and then broken, the fracture shall be entirely fibrous and free from flaws and unwelded seams. Bolts must be round and true to size, with U. S. standard square heads and nuts. Threads must be accurately cut and nuts must have a wrench-tight fit. Each bolt must be provided with an approved head lock made of material not less than ¼ in. thick, preventing the bolt from turning, and a nut lock of approved pattern large enough to give full bearing for the nut. A ¼-in. cotter pin must be placed outside of and close up to the nut after it is tightened. Beveled washers must be used wherever necessary to give head and nut a full square bearing; they must be wide enough to act as head locks. Bolts must be long enough to allow the nuts to be brought out from under the head of the rail, with a suitable washer not less than ½ in. thick, so that the nuts may be readily tightened with an ordinary wrench.

Rivets shall be of good quality mild steel, with an ultimate tensile strength of 50,000 to 54,000 pounds.

Reinforcing bars shall be of wrought-iron or soft steel.

Plates shall be of rolled steel.

Springs shall be of best quality spring steel, and of dimensions and capacity shown on the plans. They shall meet the following tests:

(a) Each spring shall be placed on the testing machine and forced down solid four times.

(b) After the foregoing, each spring shall be placed on one end on a flat plate, and the distance between the plate and the other end of the spring measured by means of the standard depth gage; this measurement being the free length of the spring. The free length must conform to the plans within ⅛ in.

(c) Double springs shall be assembled and a load at least 25 per cent. greater than the rated capacity of the spring shall be applied for thirty seconds. Upon release neither spring must vary from its original free length. If either one does so vary, it shall be rejected.

(d) The inner and outer coils of springs shall be coiled in opposite directions.

Spring covers shall be made of malleable iron.

Braces shall be made of malleable iron.

Stops and hold-downs shall be made of soft steel.

Anti-creeping device shall be made of soft steel.

Workmanship.

The workmanship must be first class. Bends shall be made accurately and with care, so as not to injure the material. They shall be in arcs of circles and not angles.

It is desired that rails be bent cold. If heating is resorted to, it shall be done in such a manner as not to injure the rail. Welding in any part of the frog will not be permitted. Planing shall be true, and all abutting surfaces fit closely. Ends of rails shall be cut at right angles to the axis of the rail, except where otherwise shown on the plan. All burrs shall be removed.

Fillers shall fit the fishing angles and the web of the rail tight for a distance of ½ in. above and below the base and the head, respectively, and still maintain the required flangeway. Where the brand of the rail interferes with the fit of the filler, the brand shall be chipped off flush. Fillers shall be grooved or cut out to fit over rivet heads.

Heel raising blocks shall fit the head, base and web of rail equally as well as the fillers are fitted.

Beveled fillers and solid foot guards shall fit the rail sufficiently well to maintain the required spacing.

The diameters of the rivets shall be of full size shown on plan, and the diameters of the rivet holes shall not be more than 1-16 in. greater than the diameters of the corresponding rivets. The rivets shall be of sufficient length to provide full, neatly made heads when driven. They shall be driven tight, bringing all adjacent parts in contact.

Rivet heads, when not countersunk or flattened, shall be hemispherical and of uniform size for the same size rivets. They shall be full and neatly made, and concentric with the holes. When the rivet heads are countersunk they shall be flush with the plate, and fill the holes.

Reinforcing bars shall fit the fishing angles and web of rail throughout their length.

Plates shall be flat and true to surface.

Springs shall have the ends cut square with the axis, so that when the spring is placed on end on a flat surface it will stand perpendicular.

Spring covers shall be of such dimension as to permit a proper working of the springs, and shall be provided with a spring bearing for each end of the spring.

Braces shall fit the head and web of rail accurately.

Stops shall be so placed on plates as to hold the wing rail at 1⅞ in. opening at the ½-in. point. Hold-downs shall fit stops so as to allow at least 2 in. horizontal play and not more than ⅛ in. vertical play.

The anti-creeping device shall fit accurately to the parts of the frog or angle bars.

Holes shall be drilled from the solid. No punching will be permitted except in case of bottom plates and washers. Drilling shall be accurately done, on bevel where necessary, and holes shall be made 1-16 in. less in diameter than the bolt to be used. Then the parts shall be assembled and the holes reamed so they are straight and true, with no offsets between the adjacent parts, and of such size as to give the bolts a driving fit for their entire length.

In lieu of the above specification for drilling and reaming, the manufacturer may assemble and accurately fit all the parts, including the rail and fillers, before any drilling whatever is done; after the parts are securely clamped in

their correct positions, the holes may be drilled through the entire mass to the exact diameter of the bolt.

The number of the frog, maker's name, weight of rail and the date shall be plainly stamped with ¾-in. figures and letters on the flare of one wing rail for rigid frogs and the flare of both wing rails for spring frogs.

No paint, tar or other covering shall be used before inspection.

The alinement and surface of all finished work shall be even and true, and shall conform to the angles specified.

Inspection.

Material and workmanship shall be at all times subject to inspection by a duly authorized representative of the company, who shall examine the material before it is worked in the shop. He will inspect the work during progress and will also inspect the finished product, with power to reject materials and workmanship found to be unsatisfactory. He shall have free access to the shops and mills at any and all times during the progress of the work. The acceptance of any material by an inspector shall not prevent subsequent rejection if found defective after delivery or during the progress of the work, and such defective material if furnished by the manufacturer shall be replaced by him at his own expense.

All facilities, labor and tools necessary for the shop inspection shall be furnished at the expense of the manufacturer.

When the manufacturer furnishes the rails, he shall supply the company with a certificate of inspection made by some competent person acceptable to the company.

The following ten requisites for switchstands are recommended:

Requisites for Switchstands.

(1) There should be no lost motion in parts.

(2) Stands should have an adjustable throw on the foot.

(3) The operating lever of ground stands should work parallel with the track.

(4) Throwing apparatus should be so arranged that when the switch is set for movement of a train, it will be thrown to an extreme position and the throwing rod be locked independent of the latch on the stand lever.

(5) Ground stands should be provided with latches which work with the foot.

(6) The stand should be snowproof.

(7) The connection between the throwing rod and the stand should be so arranged that it will be impossible to separate the throwing rod from the stand when the stand is set up in working position.

(8) The stand should be so arranged that it can be easily inspected.

(9) The target should not show clear signal for main track movements unless the points are up snug against the stock rail.

(10) The targets shall conform to drawing No. —.

In considering the subject of lengths of switch points, it is noted that the association has adopted 33 ft. as the standard length of rail. For general use the committee recommends switch points 11 ft., 16½ ft., 22 ft. and 33 ft., with the further recommendation that the last three named lengths will most nearly meet ordinary requirements. It further recommends that the following combinations of switches and frogs be used:

11-ft. switch points with No. 6 frogs and under.

16½-ft. switch points with frogs over No. 6, up to and including No. 10.

22-ft. switch points with frogs over No. 10, up to and including No. 14.

33-ft. switch points with frogs over No. 14.

Three frogs are recommended to meet all general requirements. These are No. 8, No. 11 and No. 16. The lengths from point to toe and from point to heel, total lengths, and recommended practical leads for these frogs, with the corresponding recommended switch, are given in the accompanying tables.

The committee has further investigated the widening of gage on curves, and has received and tabulated answers to its circular from 45 different railways. It recommends for adoption the following rule:

Curves eight degrees and under should be standard gage. Gage should be widened one-eighth inch for each two degrees or fraction thereof over eight degrees, to a maximum of 4 ft. 9¼ in. for tracks of standard gage. Gage, including widening due to wear, should never exceed 4 ft. 9½ in.

The installation of frogs upon the inside of curves is to be avoided wherever practicable, but where same is unavoidable, the above rule should be modified in order to make the gage of the track at the frog standard.

The committee's attention has been called to the method of measuring frogs, and, under special instructions from the Board of Direction to recommend a definition for frog number, recommends the following:

Considering that the frog angle is the angle between the gage lines of the point rails, that the axis of a frog is the line which bisects that angle, and that the spread of a frog is measured at right angles to the axis, the number of the frog is the number of units measured on the axis in which the frog spreads one unit, from which the frog number is one-half the co-tangent of one-half the frog angle.

	PROPERTIES OF FROGS. Thickness of All Frog Points 0½"								Properties of Switches. For All Switches Thickness of Point=0½" and Heel Distance =H=6½"					THEORETICAL LEADS					
N=Frog Number.	F=Frog Angle.			W=Length Point to Toe.		K=Length Point to Heel.		Total Length.		Spread at Toe.	Spread at Heel.	S=Length of Switch Rail.		a=Switch Angle.			R=Radius of Center Line.	D=Degree of Lead Curve.			Distance Point of Switch Rail to Theoretical Point of Frog.	Closure Straight Rail.	Closure Curved Rail.
I	II			III		IV		V		VI	VII	VIII		IX			X	XI			XII	XIII	XIV
	Deg.	Min.	Sec.	Ft.	In.	Ft.	In.	Ft.	In.	Feet	Feet	Ft.	In.	Deg.	Min.	Sec.	Feet	Deg.	Min.	Sec.	Feet	Feet	Feet
4	14	15	00	3	2	5	4	8	6	0.79	1.32	11	0	2	36	19	112.26	52	53	56	37.05	22.88	23.29
5	11	25	16	3	7	6	5	10	0	0.71	1.28	11	0	2	36	19	183.22	31	40	24	42.77	28.19	28.55
6	9	31	38	4	0	7	0	11	0	0.66	1.16	11	0	2	36	19	273.95	21	01	58	48.11	33.11	33.38
7	8	10	16	4	5	8	1	12	6	0.63	1.15	16	6	1	44	11	364.88	15	47	19	61.94	41.02	41.24
8	7	09	10	4	9	8	9	13	6	0.59	1.09	16	6	1	44	11	488.71	11	44	40	67.47	46.22	46.42
9	6	21	35	6	0	10	0	16	0	0.67	1.11	16	6	1	44	11	616.27	9	18	27	72.24	49.74	49.92
9½	6	01	32	6	0	10	0	16	0	0.63	1.05	16	6	1	44	11	699.97	8	11	33	74.90	52.40	52.58
10	5	43	29	6	0	10	6	16	6	0.60	1.05	16	6	1	44	11	790.25	7	15	18	77.51	55.01	55.17
11	5	12	18	6	0	11	6	17	6	0.54	1.05	22	0	1	18	8	940.21	6	05	48	92.06	64.06	64.20
12	4	46	19	6	5	12	1	18	6	0.53	1.01	22	0	1	18	8	1136.34	5	02	38	97.25	68.83	68.96
15	3	49	06	7	8	14	10	22	6	0.51	0.99	33	0	0	52	5	1744.38	3	17	01	133.02	92.36	92.46
16	3	34	47	8	0	16	0	24	0	0.50	1.00	33	0	0	52	5	2005.98	2	51	24	135.95	94.95	95.05
18	3	10	56	8	10	17	8	26	6	0.49	0.98	33	0	0	52	5	2587.66	2	12	52	146.38	104.54	104.61
20	2	51	51	9	8	19	4	29	0	0.48	0.97	33	0	0	52	5	3262.98	1	45	22	156.35	113.68	113.76
24	2	23	13	11	4	23	2	34	6	0.47	0.97	33	0	0	52	5	4922.77	1	09	42	175.09	130.66	130.77

Conclusions.

The committee recommends:

(1) That the recommendations contained in the report for substitution in the Manual be approved.

(2) That the resolution regarding design of track fastenings with reference to track circuits be approved as good practice.

(3) That the specifications for spring and rigid frogs and the requisites for switchstands be approved.

(4) That four lengths of switch points be approved, and the four kinds of frogs and the combinations of frogs and switches, together with the practical leads submitted, be approved as good practice.

(5) That the rule for widening of gage on curves be approved.

(6) That the definition of the number of a frog, viz., that the number of the frog is one-half the co-tangent of one-half the frog angle, be approved.

The report is signed by L. S. Rose (C., C., C. & St. L.), chairman; C. E. Knickerbocker (N. Y., O. & W.), vice-chairman; E. C. Blundell (C., St. P., M. & O.), Garrett Davis (C., R. I. & P.), R. C. Falconer (Erie), T. H. Hickey (Mich. Cent.), R. H. Howard (C. & E. I.), C. B. Hoyt (N. Y., C. & St. L.), J. B. Jenkins (B. & O.), John R. Leighty (Mo. Pac.), J. C. Nelson (S. A. L.), P. C. Newbegin (Bang. & Aroos.), R. M. Pearce (P. & L. E.), H. T. Porter (B. & L. E.), G. J. Ray (D., L. & W.), William G. Raymond (Univ. of Iowa), F. A. Smith (civil engineer), R. A. Van Houten (Lehigh Valley), W. D. Wheeler (consulting engineer), and A. A. Wirth (Penna. Lines).

PRACTICAL LEADS

N=Frog Number.	R_1=Radius of Center Line.	D_1=Degree of Lead Curve.			Rectangular Co-ordinates to the Quarter and Center Points on Gage Side of Curved Rail, Referred to Point of Switch Rail as Origin.						T=Tangent Adjacent to Switch Rail.	T_1=Tangent Adjacent to Toe of Frog.	L=Distance Actual Point of Switch Rail to Theoretical Point of Frog.	Lead=Distance Actual Point of Switch Rail to Actual Point of Frog.	Closure for Straight Rail.		Closure for Curved Rail.	
					X	X_1	X_2	Y	Y_1	Y_2								
1	XV	XVI			XVII	XVIII	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII		XXVIII	
	Feet	Deg.	Min.	Sec.	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet				
4	110.69	53	42	24	17.74	23.44	29.75	0.97	1.67	2.79	1.03	0.00	37.77	37.94	1-23.60		1-24	
5	174.34	33	19	57	17.78	24.54	31.27	0.95	1.61	2.62	0.00	0.82	42.26	42.47	1-27.68		1-28	
6	265.39	21	43	04	19.07	27.13	35.15	1.01	1.74	2.72	0.00	0.66	47 73	47.98	1-32.73		1-33	
7	362.08	15	52	29	26.72	36.93	47.11	0.97	1.71	2.74	0.00	0.19	61.81	62.10	1-13.89	1-27	1-14.11	1-27
8	487.48	11	46	27	28.37	39.91	51.45	1.02	1.78	2.91	0.30	0.00	67.65	67.98	1-16.40	1-30	1-16.60	1-30
9	605.18	9	28	42	28.75	40.98	53.19	1.02	1.76	2.75	0.00	0.57	71.91	72.28	1-16.41	1-33	1-16.59	1-33
9½	695.45	8	14	45	30.31	43.35	56.37	1.06	1.82	2.83	0.76	0.00	75.32	75.71	1-25.82	1-27	1-26	1-27
10	790.25	7	15	18	30.28	44.05	57.81	1.06	1.84	2.85	0.00	0.00	77.51	77.93	1-27	1-28	1-27.17	1-28
11	922.65	6	12	47	40.74	56.47	72.19	1.08	1.84	2.87	2.99	0.00	93.85	94.31	1-32.85	1-33	2-33	
13	1098.73	5	12	59	43.99	60.65	77.28	1.15	1.90	2.91	5.33	0.00	100.30	100.80	1-23.88	2-24	3-24	
15	1744.38	3	17	01	55.49	77.95	100.41	1.01	1.78	2.85	0.00	0.00	132.66	133.28	2-33	1-25.9	2-33	1-26
16	1993.24	2	52	59	58.16	81.76	105.35	1.04	1.82	2.87	1.56	0.00	136.90	137.57	1-29.90	2-33	1-30	2-33
18	2546.31	2	14	31	58.73	84.46	110.10	1.04	1.82	2.86	0.00	1.08	145.76	146.51	1-25.93	3-26	4-26	
20	3257.26	1	45	32	61.84	90.21	118.59	1.08	1.88	2.93	0.44	0.00	156.59	157.42	1-26.92	2-27 1-33	3-27	1-33
24	4886.16	1	10	21	67.82	100.21	132.59	1.27	1.97	3.00	2.43	0.00	176.22	177.22	1-32.89	3-33	4-33	

TIES.*

The board of direction assigned the following subjects:

1. Consider revision of Manual; if no changes are recommended, make statement accordingly.

2. Continue compilation of statistics on life of treated and untreated ties. Digest the statistics and present conclusions derived therefrom.

3. Continue investigation of the general question of the present and future status of the tie supply; the various methods heretofore adopted for reducing the yearly demands on the timber supply, and what general lines of investigation and change in existing methods may seem most desirable to be followed so as to secure the best results in the future.

4. Continue investigation as to the extent of use, life and design of metal, composite and concrete ties, with illustrations and descriptions of the most successful designs, and draw such conclusions as the information may warrant.

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

The following sub-committees were appointed:

Sub-Committee A—Revision of Manual: E. D. Jackson (chairman), A. F. Stewart, E. B. Cushing.

Sub-Committee B—Statistics: L. A. Downs (chairman), F. G. Jonah, Hermann Von Schrenk, A. F. Dorley.

Sub-Committee C—Timber Supply and Conservation: W. F. H. Finke (chairman), G. H. Webb, Hermann Von Schrenk, A. W. Thompson.

Sub-Committee D—Metal and Concrete Ties: E. E. Hart (chairman), H. S. Wilgus, H. C. Landon.

Sub-Committee on Cypress Ties: W. F. H. Finke (chairman), L. A. Downs, A. F. Dorley, Hermann Von Schrenk.

The results of investigations are given in Appendices A, B, C, D and E, the last of these being a report on some test ties in Texas.

Conclusions.

(1) The committee recommends the approval of the changes proposed in the Manual.

(2) The committee has recommended, and the association has adopted, a series of rules and blank forms for establishing a record of ties, and the committee regrets that the blank forms have not been generally adopted by railways. After further careful study of the subject, the committee cannot recommend any change in the rules or blank forms, but again recommends their general adoption and use by railways.

It having been found impossible to obtain replies to the numerous questions embraced in the forms adopted, the practice of issuing them will be discontinued, and an endeavor will be made to obtain in other ways information which will be of value to the association.

(3) The committee concludes that the cultivation of trees as a basis of future tie supply should be undertaken where practicable.

The report is signed by: E. B. Cushing (Sunset Central Lines), chairman; E. E. Hart (N. Y., C. & St. L.), vice-chairman; A. F. Dorley (Mo. Pac.), L. A. Downs (Ill. Cent.), W. F. H. Finke (Southern), E. D. Jackson (B. & O.), F. G. Jonah (St. L. & S. F.), H. C. Landon (Erie), A. F. Stewart (MacKenzie-Mann Co.), Dr. Hermann Von Schrenk (R. I.-Frisco), A. W. Thompson (B. & O.), G. H. Webb (Mich. Cent.) and H. S. Wilgus (P., S. & N.).

Appendix A.

Revision of Manual.

The committee submits the following changes it recommends:

Definitions.

Tie.—The tranverse member of a railway track supporting the rails, by means of which they are retained in position.

Pole Tie.—A tie made from a tree of such size that not

more than one tie can be made from a section; a pole tie generally shows sapwood on two sides.

Sap Tie.—A tie which shows more than the prescribed amount of sapwood in cross-section.

Score Mark.—A mark made by the ax as a guide in hewing.

Specifications for Ties.

Under this heading the committee has made a few minor changes, consisting mostly in substitution of words, without change in substance.

Specifications for Dating Nail.

Make the first and second paragraphs read as follows:

1. The nail shall be made of iron or steel, galvanized with a coating of zinc, evenly and uniformly applied, so that it will adhere firmly to the surface of the steel; it shall be ¼ in. in diameter, 2½ in. in length, with head ⅝ in. in diameter, having stamped therein two figures, designating the year, the figures to be ⅜ in. in length and depressed into the head 1-16 in.

2. Any specimen shall be capable of withstanding the following test: The sample shall be immersed in a standard solution of copper sulphate for one minute and then removed immediately and thoroughly washed in water and wiped dry; this process shall be repeated four times, if necessary, and if after any immersion there is a copper-colored deposit on the sample, or the zinc has been removed, the lot from which the sample was taken shall be rejected.

Forms and Rules for Tie Records.

Withdraw the first paragraph and make the third paragraph read as follows:

A dating nail should be driven in the upper side of every treated tie 10 in. inside of the rail, and on the line side of the track. The tie should be laid with the end having the year stamped on it on the line side of the

TREE PLANTING.

Railroad.	Locations.	Date.	Number.	Kind.	First Cost per M.	Cost Planting per M.	Per M. Annual Maintenance	Synopsis of Replies from Railroads.
Chicago, Burlington & Quincy.....	Ottumwa, Iowa.	1906	100,000	Catalpa.	$10 00	$20 00	No Figures Available	No definite knowledge obtained from results to date but conditions are favorable for obtaining, within about 20 years, ties and posts amounting to double the expenditure and interest on property up to present time. Expect to plant 10,000 trees in 1910.
Pennsylvania.....	40 plantations between New Brunswick, N. J., and Altoona, Pa	Some each year 1902 to 1909.	2,000,000 1,200,000 230,000	Black Locust. Red Oak. Mix'd Species.	$5.00 to $10 from Commercial Nursery. $3 to $5 now from Company Nursery.	About $5.00 at present	Practically no charges for maintenance	Too early to now estimate returns, but are certain forest planting is best way to utilize outlying idle lands belonging to the company.
		Total...	3,430,000					
L. & N. R. R.....	Eleven locations		868,930 570,000 630,800 14,650	Catalpa. Walnuts Locust. Poplar	$5 64	$23.44, includes maintenance chgs to date		Unable to estimate ultimate value of the plantations for future cross-tie supply.
		Total...	2,084,380					
D. L. & W.....	Towaco, N. J., and Alden, New York.	1906 1907	44,000 50,000	Yel. Locust. Yel. Locust.	$23 02	$12 22	$1 20	Lost about 3,000 trees which were planted on low ground and did not stand the winter weather. Balance are thrifty and look well. Can't now estimate ultimate value.
		Total...	94,000					
Galveston, Harrisburg & San Antonio R. R.....	At section houses between New Orleans and El Paso, Texas.	1903	15,000	Catalpa.	$16 70	$12 00	$50.00	From results thus far obtained no reliable estimate of ultimate value can be made. Present results do not warrant additional planting. Catalpa is decided failure in arid and semi-arid districts of Texas. In the humid districts of Louisiana and Texas conditions do not seem favorable to its growth.
Southern Railway....	Wolf Trap, Va.	1906	40,000	Catalpa.	$19.40	$ 7.77	$ 2 84	Too early for any estimate as to ultimate value. Trees have secured fair root growth and it is expected to cut all crooked and branched trees to ground line this winter. About 5,000 seedlings failed to take root at time of planting.
Michigan Central...	Small plantations at Section Houses.	1900 1903	80,000	Catalpa.	No.	Figures.	Given.	Total of 123 acres planted. Latitude of extreme coldness was unsuitable for catalpa, and practically none of the trees grew.
Norfolk & Western.	Ivor, Va.	1905	2,000	Catalpa.	No.	Figures.	Given.	Soil and climate found unsuitable and experiment discontinued. Company has large holdings of mountain timber, also tracts in Eastern Virginia, containing both soft and hard woods, original and second growths, which are being held, only mature timbers being cut.
Penna. (N. W. Sys.)	Kosciusko, Ind.	1906	35,000	Catalpa.	$12.65	$10.46	$10.85	Can give no estimate of ultimate value.
S. A. & A. P. Ry.	Skidmore, Tex.	1909	22,000	Catalpa.	$11.60	$27.10	$32.72	No remarks.
St. L. & S. F. ..	Farlington, Kan.	1880	No Figures Given.		.....	.....	.....	640 acres planted, but only about 250 acres bore trees; balance were on poor, thin soil. Trees would never make ties because of poor soil, so were used for posts and poles.

Southern Pacific: Expects to soon start planting Sugar and Red Gum.
Union Pacific: Contemplates planting Catalpa on low lands owned by Company.
Delaware & Hudson Co.: Owns large tracts in Adirondacks and are now making experiments to determine what trees are best suited to soils and climate.
Northern Pacific: Have reserved from sale several million acres of their timber lands; products from these tracts to be used for future tie supply.
C. C. C. & St. L.: Near Indianapolis; started small plantation some years ago; land used was not favorable and trees were not of proper species. Never obtained any results.

track. Dating nails should be driven the same day the tie is put in.

Section foremen should be especially careful to see that the marks or nails intended to identify the ties are not injured or destroyed.

It is recommended that, in addition to the use of the dating nail, each tie be stamped with the year at the treating plant, before treatment, and, preferably, be stamped on both ends.

Specifications for Tie Treatment; Specifications for the Analysis of Coal-Tar Creosote; Determination of Zinc in Treated Timbers.

Withdraw the matter under the above headings now incorporated in the Manual. The committee understands that this subject is being considered by the Committee on Wood Preservation.

NUMBERS AND SIZES OF TIES.

Railroad.	Mileage.	Size of Tie Main Line.	Number Ties per Mile.	Trees Planted.
Southern	6588	7x7 and 9x8½	2880	Yes
Penna. R. R.	5311	7x7 and 9x8½	2880	Yes
L. & N.	4161	7x7 and 9x8½	2880	Yes
B. & O.	3402	7x7 and 9x8½	2880	No
N. & W.	1920	7x7 and 9x8½	2880	Yes
P. & R.	1491	7x7 and 9x8½	2880	No
Penna. (S. W. Sys.)	1420	7x7 and 9x8½	2880	No
Lehigh Valley	1394	7x7 and 9x8½	2880	No
N. C. & St. L.	1230	7x7 and 9x8½	2880	No
D. & H. Co.	782	7x7 and 9x8½	2880	No*
A. B. & A.	621	7x7 and 9x8½	2880	No
Cent. of N. J.	591	7x7 and 9x8½	2880	No
B. R. & P.	441	7x7 and 9x8½	2880	No
C. C. & O.	211	7x7 and 9x8½	2880	No
A. C. L.	4129	7x7 and 9x8½	2816	No
Penna. (N. W. Sys.)	1345	7x7 and 9x8½	2816	Yes
D. L. & W.	957	7x7 and 9x8½	2816	Yes
Fla. East Coast	579	7x7 and 9x8½	2816	No
C. C. C. & St. L.	2186	7x7 and 9x8½	3300	Yes
Hocking Valley	338	7x7 and 9x8½	3050	No
L. S. & M. S.	1508	7x7 and 9x8½	3040	No
Erie	2383	7x7 and 9x8½	2720	No
Long Island	392	7x7 and 9x8½	2720	No
Southern Pacific	10664	7x9x8′	2880	No*
Union Pacific	3280	7x9x8′	2880	No*
S. A. L.	2964	7x9x8′	2880	No
N. Y. N. H. & H.	2004	7x9x8′	2880	No
C. of Ga.	1913	7x9x8′	2880	No
G. H. & S. A.	1335	7x9x8′	2880	Yes
Georgia	303	7x9x8′	2880	.....
M. & O.	926	7x9x8′	3164	No
Norfolk & Southern	579	7x9x8′	2816	No
N. Y. C. & H. R.	3117	7x9x8′	3200	No
Great Northern	6904	7x8x8′	2880	No
S. P. L. A. & S. L.	879	7x8x8′	2880	No
Northern Pacific	5596	7x8x8′	2900	No*
D. & R. G.	2709	7x8x8′	3200	No
C. B. & Q.	8735	6x8x8′	3200	Yes
C. R. I. & P.	6781	6x8x8′	3200	No
St. L. & S. F.	4727	6x8x8′	3200	Yes
Grand Trunk	4599	6x8x8′	3200	No
M. K. & T.	2837	6x8x8′	3200	No
Col. & Sou.	1084	6x8x8′	3200	No
Maine Central	931	6x8x8′	3200	No
C. & E. I.	817	6x8x8′	3200	No
C. I. & L.	578	6x8x8′	3200	No
El P. & S.-W.	808	6x8x8′	3200	No reply
St. L. B. & M.	399	6x8x8′	3200	No
Ft. W. & D. C.	454	6x8x8′	3080	No
C. & N.-W.	7910	6x8x8′	3000	No
C. M. & P. S.	1276	6x8x8′	3000	No
C. M. & St. P.	7266	6x8x8′	3000	No
C. I. & S.	325	6x8x8′	3000	No
St. L. S. W.	1327	6x8x8′	2992	No
M. & St. L.	998	6x8x8′	2992	No
S. A. & A. P.	723	6x8x8′	2992	Yes
Rutland	415	6x8x8′	2992	No
Mo. & N. Ark.	313	6x8x8′	2992	No
S. Fe P. & P.	364	6x8x8′	2900	No
L. E. & W.	872	6x8x8′	2880	No
G. R. & I.	583	6x8x8′	2880	No
W. & L. E.	442	6x8x8′	2880	No
N. W. Pac.	404	6x8x8′	2880	No
Mo. Pac.	6298	6x8x8′	2816	No
B. & M.	2303	6x8x8′	2816	No
K. C. M. & O.	637	6x8x8′	2816	No
Tenn. Cent.	291	6x8x8′	2816	No
C. G. W.	1380	6x8x8′	2880	No
C. H. & D.	974	6x8x8′	3168	No
M. C.	1732	6x8x8′	3564	Yes
Bangor & Aroostook	515	6x6x8′	2880	No
N. Y. O. & W.	493	6x9x8′	3120	No
M. J. & K. C.	401	7x9x9′	3168	No
C. St. P. M. & O.	1673	7x7x8′	2816	No
D. S. S. & A.	588	7x7x8′	2730	No

*Indicates that while no trees have been planted, the question is now under consideration.

Appendix B.
Statistics.

The committee issued a circular to about 700 railways, asking the following questions:

(1) Have you now in use on your road forms similar to M. W. 300, 301, 302, 303 and 304?

(2) Do you expect to put them into use?

(3) In your judgment, would the results justify each railroad to make an actual count of the number of each kind of ties in the track as a basis for future report?

In answer, 45 replies were received, but from this number the committee received little encouragement.

To the first question, as to whether the blank forms recommended had been put into use, but four answers were in the affirmative. In a few instances railways use a form similar to the section foreman's blank.

To the second question, as to whether the respective railways would put the forms into use, five roads replied in the affirmative; the remainder in the negative.

To the third question, relative to making an actual count of the number of each kind of ties in track, 18 roads replied in the affirmative, and 19 in the negative.

In addition to answering the questions propounded by the committee, some of the replies contain comments which are published in the report. These comments include the following:

The committee would meet with greater success if it asked for less, and included only such questions as could be answered without too much labor; there are a total of 174 questions on the four forms for each division.

Better results would be secured if statistics were kept on a few representative sections only.

Dating nails disappear after a few years.

Section foremen's reports contain many errors; too much guess work is required, and the foreman does not keep the same position long enough.

It is suggested that instead of dating nails, a certain number of test ties be put in, those of each kind and date being put at a certain mile post.

It is the opinion of the committee that if the blank forms (M. W. 300, 301, 302, 303 and 304) were put in use by railways and the information accurately given, valuable statistics of ties would be obtained, and this information would be of much benefit to the management of roads in determining their course in the matter of cross-ties for future use.

The committee believes that its future work should be confined to such roads or officers as may be interested in the matter.

Appendix C.
Timber and Conservation.

The sub-committee was directed to:

(1) Compile information as to results to this time of tree planting by various railways.

(2) To ascertain the number of ties used per mile and percentage of rail length having bearing on ties.

(3) Advise the Special Committee on Conservation of work undertaken that might bear on the work of that committee, and furnish it any data or assistance it should desire; also prepare a map showing the present forests of the United States.

Compilations of the data received are attached as Exhibit 1, covering subject (1); Exhibit 2, covering subject (2); Exhibit 3, being map showing forest regions of the United States, with estimate of the area and stand; this map is a copy of map accompanying Forest Service Circular 166 of July 10, 1909, on Timber Supply of the United States. [Railroad Age Gazette, Sept. 10, 1909, p. 447.]

The following conclusions may be drawn:

(1) No cross-ties have yet been produced from trees planted by any railway.

(2) Of the total number of trees planted, the locusts predominate, with catalpa second; results to date favoring the former, though it is perhaps too early to fairly estimate the ultimate value of any of the plantations now under cultivation.

(3) With the exception of the years 1907 and 1908, there has been, since 1900, a steady increase in the number of trees planted, indicating that more attention is being given the question of providing a future cross-tie supply.

(4) The railway which has planted the greatest number of trees has decided that tree planting is the best way to utilize its idle outlying lands.

(5) While such a large percentage of roads reporting plantations also report failures, or at least unsatisfactory present results, the information received indicates that the failures, to a large extent, are due to unfair experiments, and where plantations are contemplated it is recommended—

First—That the species of trees to be grown be selected only after careful and expert study of the available soils and climate; and

Second—That where plantations are made, they be of such extent as to warrant a maintenance appropriation sufficient to insure proper attention.

(6) Tree culture should be encouraged where practicable; that the number and variety of experiments be increased each year to the end that the trees most suitable

for the various climates, soils, etc., may soon be known and their production specialized; this is important, because, with the timber supply rapidly diminishing, it is unwise to plant any one species and then defer other planting for five or ten years awaiting results of the first planting, which may be a failure.

(7) Where railways have outlying lands on which second growth timber is appearing, or where a natural original forest is growing, those tracts should be carefully preserved and the native timbers added to, if practicable; especially if those tracts contain trees of the semi-hard varieties, which can be effectively treated, and are of comparatively rapid growth.

Appendix D.
Metal and Composite Ties.

This report is a continuation of last year's, and consists of reports on experience with various ties, as follows:

Carnegie I-Beam—B., R. & P.; B. & L. E.; N. Y. C. & H. R.; P. & L. E.; Union R. R.; Penna. Lines; P., S. & N.; C., C., C. & St. L.; B. & M.; Dul. & Iron Range; Nor. Pac.; Lake Terminal; Lehigh Valley; D. & H.; Lake Champlain & Moriah; also a number of interurban lines.

Through Type Ties.—Mexican Ry.; B. & L. E.

Metal Tie Co.—B. & O.

Snyder—Penna. R. R.

Combined Wood and Steel.—L. S. & M. S.

Concrete—L. S. & M. S.; Penna. Lines; Chic. & Alton; G. H. & S. A. These ties are: Buhrer, Riegler, Kimball, Atwood and Percival.

Proceedings

The Wednesday morning session of the Railway & Engineering & Maintenance of Way Association was called to order by President McNab, 9:30 o'clock.

Discussion on Economics of Railway Location.

A. K. Shurtleff (C. R. I. & P.): D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West, in a paper before the Western Railway Club, in December, 1901, gave a diagram of drawbar pull which coincides closely with some of the diagrams in Appendix A. The drawbar pull dropped rapidly from a velocity of about five miles per hour. The Master Mechanics' curve show a very uniform drawbar pull up to about ten miles per hour. As a matter of fact, we are not able to get it in practice. The cut-off is such, in burning our Western coal, particularly, as to start in at from five to seven miles per hour with the freight locomotives, otherwise we could not maintain steam in our boilers. Another thing Mr. Crawford called attention to was that, after a number of dynometer tests, no material increase in resistance within the ordinary range of freight train speeds was noticable. This is in contradiction to Mr. Wellington's and other formulas. In other tests, since made, that has been shown to be true.

We believe our methods of determining the drawbar pull is logical; we know that it takes certain heat units to make steam, and, therefore, the quality and quantity of fuel required determines the steam producing capacity of the locomotive, with its heating surface being known. George R. Henderson's work goes into this quite thoroughly, and it does seem consistent to do away with any arbitrary mean effective pressure curve in trying to determine the power of a locomotive for the purpose of this association. It would also be true as far as determining the power of a locomotive for tonnage rating.

L. C. Fritch (C. G. W.); There are a great many formulas to establish the hauling capacity of locomotives, yet I think out of all of them we can select some rational formula that will pretty nearly cover the conditions under which we are operating to-day. Recently the American Locomotive Co. issued a pamphlet on train resistances, which shows the remarkable difference in the resistances in lightly loaded and heavily loaded cars. For example, as I recall it now, a 50-ton capacity car empty, or lightly loaded, has a resistance per ton of about 8.5 lbs. If that car is loaded to its capacity it has a resistance of about 2.6 lbs. per ton. In tonnage rating these conditions are not always taken into account. I do not believe we have taken into consideration the internal resistance of the engine, i. e., the loss between the cylinder horsepower at the brim of the wheel. The committee uses, in Table 7, 18.7 lbs. per ton of weight on drivers. From the tests published by the American Locomotive Co. that is a little bit low. They give 22.2 lbs. I would like to ask the committee if it has taken into consideration these tests of the American Locomotive Co.

Mr. Shurtleff: No. However, we have considered the St. Louis tests, and there certainly is a difference in resistance with reference to the weight on drivers, depending on the number of drivers which are carrying the load, the same as it is in the case of freight cars as to the number of wheels that carry the load.

Mr. Fritch: I believe many roads in the past have spent a lot of money unnecessarily in the reduction of grades. I think that in many cases it is possible to use heavy engines, where traffic is comparatively light, instead of spending a lot of money on grade reduction.

The usual method now in establishing the economy of a grade reduction and line improvement, has been to determine how many train miles could be saved, and applying some value to this saving, capitalizing that amount to determine the amount you are justified in speending on grade reduction. This is only a very rough approximation. There is another system that has been used, and that is to fix the capacity of the line in ton miles per hour, taking as an ideal condition a straight and level road taking a certain class of power and determining the quantity of traffic that that particular locomotive can handle over that line in ton miles per hour and calling that percentage 100. Then assume new grades, etc., and determine the capacity of the line on that basis. In that way you get a direct measure of the efficiency of the line. I believe that is the more accurate method than to estimate the saving in train miles. By this ton miles per hour method you give a value to each particular part of the line, and take account of every element that enters into the problem. I suggest that the committee take up that line of investigation.

The secretary read conclusion 1.

Mr. Fritch: What is meant by "percentage of efficiency of drawbar pull?"

Mr. Shurtleff: In existing lines it is very rare that 100 per cent. total efficiency is realized throughout the year. Therefore, in comparing a new line with an existing line, on the new line we should use per cent. efficiency, and the same rate should be used for the two routes. If you felt that possibly rules could be put into effect to increase the efficiency of the old line to 90 per cent. you would use 90 per cent. in both cases.

Conclusion 1 was adopted.

The secretary read conclusion 2.

Mr. Fritch: I would suggest that you add there the weight on the drivers also.

Mr. Shurtleff: Does not the word "adhesion" cover the point?"

Mr. Fritch: The weight on the drivers is an element of its tractive power.

Mr. Shurtleff: Adhesion is the weight on the drivers multiplied by the co-efficiency of adhesion, so that the total adhesion is a factor of the weight on the drivers.

Mr. Fritch: Adhesion may vary in different cases, but the weight on the drivers is constant.

F. S. Stevens (P. & R.): Without the weight on drivers we would have no adhesion and there would be no power. I think the conclusion as drawn is correct.

Mr. Shurtleff: The weight on the drivers is always constant, while adhesion is not constant. The tractive power would vary as the adhesion varies, and, therefore, I cannot see why we should mention speecifically the weight on the drivers. The only place adhesion enters in it is where a locomotive is over-cylindered, as you might say, and can develop at low speed power at the rim of the drivers which would slip the drivers at such a time; you must consider adhesion in estimating tractive power.

G. W. Kittredge (N. Y. C. & H. R.): I move that conclusion 2 be adopted, although Mr. Lum has suggested that a very important factor has been left out of the conclusion; that is the man at the throttle.

Conclusion 2 was adopted.

The secretary then read conclusion 3.

Mr. Shurtleff: I wish to modify conclusion 3. Since this report was complied we have found a shorter way of reaching the results obtained in Table 1. We have found that the steam produced per square foot of heating surface is more directly in proportion to the coal burned per square foot of heating surface. Therefore we have changed Table 1 to show the number of pounds of steam per pound of coal, varying with the ratio of coal burned per square foot of heating surface. It simplifies the table very much. Therefore, I desire to change conclusion 3 to read: "The steam-producing capacity of a locomotive depends mainly upon the quantity and quality of the fuel burned, and the area of heating surface." I think that covers Mr. Lum's point about the man at the throttle.

Conclusion 3, as amended, was adopted.

The secretary then read conclusion 4.

Mr. Shurtleff: We want to change this to "Knowing the area of heating surface, etc.," eliminating the reference to grate area.

Conclusion 4, as amended, was adopted.

Conclusions 5, 6, 7, 8 and 9 were adopted.

The secretary then read conclusion 10.

Prof. W. D. Pence (Univ. of Wis.): Regarding these two figures, 30 per cent. and 25 per cent, respectively, taking the place of the older figure of 20 per cent., I should like to know the basis on which they are calculated.

Mr. Shurtleff: With sand, 33 per cent. has been realized, to my certain knowledge. But we place 30 per cent. as a maximum with sand, and 25 per cent. as a maximum for good rail without sand.

Mr. Fritch: I think the committee is safe in establishing those percentages, because the head of the rail is wider than formerly and the adhesion is greater.

C. S. Churchhill (N. & W.): In taking up the question of changing grades and such matters as that, we don't want to use maximum figures, such as 25 per cent. We want to use a figure that has proven to be a safe figure. We are using 22½ per cent. ourselves.

Mr. Shurtleff: I would say 22½ per cent. is the safe figure, but the doctors have disagreed very much upon this question.

Prof. Pence: The 22½ per cent. figure has been pretty extensively used as a conservative figure. This is a conservative committee, and I am sure no one would expect them to recommend a thing that would be dangerous to depend upon in spending money on economic improvements. Would the committee be disposed to add something that would call attention to the point of danger by the use of extreme maximum?

Mr. Shurtleff: There was considerable discussion at the November meeting of the committee on this question of adhesion, and we decided that no greater adhesion than these figures should be considered. The question as to what might be used will vary with locality. In the arid West, where dew and frost on the rail is unknown, adhesion can be taken as being higher than in the South and in this section of the country. Therefore I would consider that 25 per cent. is the maximum that should be considered in any section. I would put it at a lower figure in a country similar to this, where we have heavy dews, frosts, and a great deal of humidity in the air.

W. G. Raymond (Univ. of Iowa): Doesn't the committee, in view of what the chairman has said, want to change the words "not usually" to "never"?

The President: The committee desires to eliminate the word "usually." The particular sentence then reads: "Available drawbar pull at starting, with use of sand, should not be considered as greater than," etc. With that amendment, conclusion 10 will stand.

The secretary then read the conclusions under Train and Curve Resistance up to and including 1 (h).

C. E. Lindsay (N. Y. C. & H. R.): Does the committee include superelevation under "Condition of track surface," or should that be included under "track"?

R. N. Begien (L. & O.): I think it should be added to that paragraph.

The President: Do I understand that that sub-section (d) will then read, "Condition of track surface and rail elevation"?

Mr. Fritch: Would it not be more consistent to put (d) under the "Track"?

Mr. Shurtleff: As I understand it, "Condition of track surface" will show the relative elevation of rails, mechanically or graphically shown by the apparatus, and I hardly think we would have to specifically state: "and curve elevation."

The secretary then read down to and including 1 (m).

Mr. Fritch: Would the committee object to changing (m) to "Kind and quantity of ballast"?

The President: That is acceptable to the committee.

The secretary then read down to and including conclusion 2.

W. H. Courtenay (L. & M.): Has been conclusively established by experiment?

Mr. Shurtleff: I have personally been connected with dynamometer tests where we took particular pains to find out the resistance of the train at various maintained speeds, and there was only about three or four-hundredths pounds per ton of train variation between the speeds of 10 miles per hour, 28 miles per hour and 35 miles per hour, and that variation could easily have been caused by track conditions. Mr. Crawford, in the paper I referred to before, called attention to this point. He had a hard time trying to make his dynamometer tests fit the estabished theories with reference to train resistance, and others have found the same thing to be true. I believe Mr. Wyckhorst, in his paper before the Western Railway Club, brought out the point that within the ordinary limits of freight train speeds, I think be mentioned up to 35 miles an hour, the resistance is practically the same. The velocity resistance will increase as speed increases, but journal friction will reduce as the temperature of the journals increase, until the temperature reaches about 100 degrees. This modification in journal resistance will practically offset the head-end resistance. I think that Prof. Goss has established pretty well the fact that the velocity resistance should not be applied to each ton of train; in fact the velocity resistance at the front end of the train is considerably greater than the velocity resistance at the intermediate portions or cars of the train, and the end resistance is higher than the intermediate portion.

Prof. C. F. Allen (Mass. Inst. Tech.): This same result has been shown by a committee report on train resistance, three years ago, by Mr. Shurtleff's experiments, by Mr. Dennis' experiments, by records of the B. & O. on freight trains, and by the American Locomotive Co. pamphlet that has been spoken of, based on experiments on the Pennnsylvania R. R. In the compilation made three years ago there was only one set of experiments quoted on what you might call heavy freight trains. There was one freight train of a little over 100 tons, the Daniel experiment, and the formula given by Mr. Daniel did show an increase due to velocity. I platted those experiments, and, with the exception of one record at a very low velocity, which would mean high resistance, the straight and level line on the diagram fits quite as well as the line that Mr. Daniel suggested, so that at the present time the situation is substantially this: We have five or more authorities to the effect that the resistance does not increase with velocity, and as far as heavy freight trains are concerned I know of nothing pointing in the other direction; so that I find myself quite unable to resist the conclusion, at present, that the resistance is independent of velocity. It seems to me that we must accept that, however difficult it seems.

Mr. Fritch: If so, why can't we haul maximum freight trains as well at 35 miles per hour as we can at 10? But I think it is perfectly clear. It is not due to increase in resistance. It is due to the decrease in the capacity of the locomotive. So I think that makes it quite clear, that if a locomotive could maintain its capacity up to the speed of 35 miles per hour, if the steam could be made and supplied at that rate, the freight trains could be hauled at 35 miles per hour as readily as at 10 miles per hour. That is one advantage of the electrical locomotive. The electrical locomotive does not lose its hauling capacity in proportion to its speed, and with the use of electrical locomotives you will be able to handle maximum freight trains at 30 miles per hour as well as you will at 10 miles per hour.

Prof. Pence: Taking Dean Goss' conclusions with respect to the substantial constancy of horse power of the locomotive, this matter Mr. Fritch has just mentioned must depend on the tractive effort. If the speed is equal to 375 times the horse power, divided by the tractive effort, that must be the direct result of the hauling tractive effort.

Conclusion 2 was adopted.

The secretary then read conclusion 3.

Mr. Fritch: The grade element is not taken into consideration in that formula. If you would say, "Ratings on different lines, with the same grades," it would be all right.

Prof. Allen: It says "R is the total resistance on level tangent."

Mr. Fritch: That is clear, but the formula, as it stands, should not be used for comparing ratings on different lines and grades. You would have to add the grade resistance.

Mr. Shurtleff: We would naturally suppose any man who is authorized to calculate those things would know he should make the corrections for grades and curves.

Conclusion 3 was adopted.

The secretary then read conclusion 4.

Mr. Fritch: I am reminded of the remarks Mr. Churchill made a few moments ago, that we don't want to take the maximum conditions, or the minimum conditions, rather in this case. I don't believe 0.035 is sufficient to allow for curve compensation. The tests shown in this report indicate that 0.03 is probably too low, and that at 0.04 trains gain speed around the curves. That may be true in cases of selected trains or selected conditions, but I believe that the average condition will be such that 0.04 is a more reasonable amount to use. There are many who have used 0.05, but if you take a crooked line, where a train would lap over two or three curves, the resistance would be more than even 0.04. Then again, there is no distinction made

between curves of different radii. The distance is greater on curves of short radii than on curves of long radius. So I believe that ought to be changed to 0.04.

Mr. Shurtleff: Besides the results as obtained on the Baltimore & Ohio in making tests with reference to curves and distances, I will call attention to the tabulated extracts from answers to the committee circular of October 19, 1907. There are some pretty good authorities there on that point. E. H. McHenry, of the N. Y., N. H. & H., found 0.03 per cent. compensation too low and 0.04 too heavy. H. R. Talcott, B. & O., A. V. Kellogg, Sou. Pac. (Atlantic system), found the same. In some tests, analyzed by myself, for Mr. Berry, we found with new rail that trains at less than 10 miles per hour retarded on 0.03 compensation and accelerated on the same curves at higher velocities. Mr. Merrian, of the Grand Trunk Pacific, found 0.04 too high for new rail. Mr. Kittredge, N. Y. C. & H. R., found 0.03 made limiting grades on curves, but that 0.04 was all right.

G. W. Kittredge: I wish to vote unhesitatingly for 0.04 to-day.

Mr. Shurtleff: Mr. Wendt found 0.035 all right. Mr. Stuart found the same; trains accelerated when loaded for 1 per cent. grade on curves compensated at 0.035. Mr. Courtenay, L. & N., found 0.03 too low. H. T. Douglas, Jr., W. & L. E., used 0.03, but believes 0.04 better. Mr. Churchill, N. & W., found 0.035 all right; he finds that trains accelerate on 0.04. Mr. Schwitzer, Can. Pac., found that trains accelerate on 0.04 compensation. A. C. Dennis, Can. Pac., found 0.04 all right up to five degrees, and too high for sharper curves. V. C. Bogue, West. Pac., found 0.04 used, but probably is higher than necessary. H. F. Baldwin, Wash. & Oregon, found that heavy trains stalled or retarded on 0.04 and found 0.05 all right. W. S. Dawley, Allegheny Imp. Company, found with 0.05 compensation trains loaded for 10 miles per hour on ruling grade tangents retarded on curves, while 15 miles per hour trains accelerated. So there is a considerable variation there.

Mr. Jenkins: If a line is built exclusively for freight traffic and superelevated for low speed, you will find that 0.003 is even too much. I have observed a train going over such a line, and in every instance the speed would be accelerated on curves and retarded on tangent with only 0.003 compensation, but when a line is mixed traffic, both passenger and freight, and is superelevated for the passenger traffic, the increase of pressure on the low rail increases the friction so greatly that 0.035, I think, is about right. On a purely freight line I am of the opinion that 0.025 would be sufficient.

Mr. Shurtleff: There is another point. On a worn rail the resistance would be different. It is difficult to reach the same results unless the trial is made over the same points in track, and it is pretty difficult to reach the exact amount.

Mr. Fritch: I think that is the best argument for making this a limit that could be reasonably attained under all conditions. I would rather be on the safe side than be just at the limit point.

Mr. Lindsay: On the New York Central, where we had a 5-degree curve, the rail was elevated, as I recall it, 2½ or 3 in. That was the first stalling point that our test trains encountered. Trains uniformly stalled on that curve. We reduced the elevation to one-half inch and eliminated that as the stalling point. The grade was compensated for 0.3 per cent. After that elimination we found 0.03 was insufficient and that the trains stalled at other points on the hill.

Mr. Fritch: I move that, in conclusion 4, 0.35 be changed to 0.04.

Mr. Begien: I would call attention to the fact that it is necessary, especially on long supported grades, that with very heavy curvature, to hold down the rate of compensation to the lowest possible minimum. On very long grades the loss of elevation, due to compensation of curvature, is very expensive. It may lower the summit elevation, such as to lengthen the tunnel quite a number of hundred feet, or if the tunnel is retained at its constant elevation it may heighten the fall in the sag, where the expense is considerable. I think it is a well-known fact that curve resistance on light curves is greater per degree than it is on very heavy ones. Of course, at the top of a grade, if we have a heavy curve, it is necessary to compensate it more than you would one at the bottom, where there is a chance of getting a run.

Mr. Fritch: The difference between 0.035 per cent. and 0.04 or 0.05 per cent. would make a difference of 0.26 of a foot in the grades between the two points. It seems to me so slight a difference that it would not cut much figure in the cost of construction.

A. W. Sullivan (Mo. Pac.): In seconding Mr. Fritch's motion, I would like to point out the fact that we are dealing with a vital matter, and something you are building which cannot be changed. An error in the elevation of the curve can be readily remedied, but a mistake in grades cannot be changed without a very heavy expense, and I am in favor of the limit of 0.04 rather than 0.035.

Mr. Kittridge: I would offer as an amendment to that motion that the clause be changed to read that the maximum shall be .04 per cent.

J. O. Osgood (C. of N. J.): This is a subject on which we ought to have considerable experience by this time. When the Atchison was built to the Rocky mountains, the line was compensated for hundreds of miles to the extent of 0.04 per cent. per degree, part of it 0.05, and part of it 0.06. Years later, the West Shore was constructed with compensation, as I remember, of 0.03. If anyone here is familiar with the operation of the curves on these lines, he should be able to give us some information from practical experience.

The President: The amended motion is that conclusion 4 shall read: "In order to equalize resistance on curve and tangent the maximum compensation shall be 0.04 per cent. per degree of curvature."

W. L. Webb (Con. Eng.): I think there is one point that is not considered there. I think the rate of compensation should never be made absolutely constant, because the effect of that compensation on the construction and on the ruling grade should be taken into account. There are places where an excessive compensation can be harmlessly introduced, and in those cases it is perhaps wise to put the rate of compensation up as high as 0.05, but then, as has been pointed out, there are cases where the rate of compensation has a very important influence on the cost of construction, and so we must take the best that we can for average conditions, rather than for the unfavorable conditions that might sometimes happen. Wherever there is a limitation, as there is in many cases when compensation is put in on a ruling grade, I think we must use average conditions. I think the tests that have been made all over the country show that for average conditions 0.035 is more nearly correct, although 0.04, or even 0.05, occasionally may be proper and desirable.

F. M. Patterson (C., B. & Q.): Some roads have conducted compensation tests with dynamometer cars. I have in mind a case of a 7 deg. 30 min. curve, turning through 90 degrees, at the foot of a 0.5 per cent. grade. The maximum compensation on that line was at the rate of 0.03 per cent. per degree, and it was found in actual practice to be much too low. There was a long tangent before entering the curve, so the freight trains could get a good run for it, but they would either be stalled or the speed would be reduced to such an extent that they could hardly get around. On the 0.5 per cent. grade they would pick up speed and go over the hill without any trouble. Mr. Wickhorst made some experiments on that track with the dynamometer car.

M. H. Wickhorst (Eng. of Tests): As I recall it, the results of these tests showed that the resistance of the curve would amount to about 1.5 lbs. per ton, and the proper compensation in that particular case would be 0.07 per cent., or so. I found a similar result in one other test.

The experiences we have been listening to here seem to indicate that the criterion must be this: If you are running along with a train on a grade and find, when you come to a curve, with the throttle left about the same, that the speed drops down, it is apparent that the compensation is not enough. If the speed increases, you have too much compensation. I judge from the figures Mr. Shurtleff has given that perhaps the general experience of other engineers ought to overrule the results I got in that particular case.

Mr. Fritch: The committee seems to lay a good deal of stress on the increased cost between the two compensations. I think the point Mr. Sullivan raised is very important. Suppose you have a mile of 3-degree curve, and at the summit you have a tunnel, if you give that an increased compensation of .04 instead of .035, you only get .79 of a foot increase in elevation. I would rather spend my money in doing that.

Mr. Begien: A grade a mile long is a short grade. In almost any line revision we reduce grades at present by cutting down a number of summits, and in this way grades 15 or 20 miles long result. I have personally projected 20-mile grades in the last few years, and the difference in compensation of a line that carries 69 or 70 per cent. curvature, as they do through the eastern part of the United States and the Alleghany mountains, amounts to considerable. An average of seven or eight ft., distributed over 20 miles of line, will result in a very material difference in the cost.

I do not think we ought to set a maximum compensation for curvature, for the reason if you had a curve at a station where every train stops, or at a water station, it is necessary to compensate that curve considerably more than you would a curve where the running of the train was constant. I would further call attention to the fact that this .035 compensation was based on actual data, and I suppose, in the absence of any other information, that the .04 is based more on guesswork than anything else.

Hunter McDonald (N. C. & St. L.): I think this discussion is developing the fact that if you undertake to fix a standard for this amount you will fix it so that it cannot be used in a great many instances. I think, therefore, that this matter should be given further consideration by the committee and that it should enlarge its conclusion with some description as to the conditions under which this per cent. should be varied from. I do not think that this house should undertake to alter the conclusion of the committee; if its conclusion is not satisfactory it should be asked to give it further consideration.

Mr. Shurtleff: We have, in our report, recommended these conclusions for present adoption, with a view to future study on all of these points. We do not expect to cover this field in one year, two years or five years. We thought we had pretty good authority for recommending .035 compensation. I know where .03 has been used in mountain lines, and the curves have become the controlling points. I know where .04 has been used, and the curves have become the accelerating points. I believe that this is a local question, depending on conditions and the maintenance of the grade and elevation. I do not think that we are too high in this figure, but I see no serious objection to changing this as Mr. Kittredge has suggested.

Mr. Fritch: I would like to see Mr. McDonald's suggestion carried out. If we adopt .035 now and change to a higher compensation later, we would be put to an additional expense for changing what we have done.

Mr. McDonald: I suggest that the committee in its next report bring in a conclusion as to the conditions under which this percentage should be varied from.

Mr. Osgood: It seems to me the principal objection to the .035 per cent. is that it is too fixed. The report says "curves shall be compensated .035 per cent. per degree of curvature." So far as I can see, there is general agreement that the compensation should be somewhere between .03 and .04. Would it not be better for the present to say, "Shall be ordinarily compensated," etc.

The amendment offered by Mr. Kittredge was put to vote and lost.

Mr. Shurtleff: Mr. Osgood's suggestion as to the insertion of the word "ordinarily" will be acceptable to the committee.

Conclusion 4 was adopted with the word "ordinarily" inserted before "compensated."

The secretary read conclusion 5.

G. D. Brooke (B. & O.): In the discussion of conclusion 4, no mention has been made of the exact gage on curves, and that is evidently a feature which will affect the resistance. I would suggest that in connection with dynamometer tests, in section (d), "Condition of track surface," we provide that the exact gage on all curves be accurately given.

Mr. Shurtleff: How would it do to make section (d) read: "Condition of track surface and gage"?

Mr. Brooke: That will be acceptable.

Mr. Lindsay: How far is the superelevation and depression provided in paragraph 5 observed by railways? From our point of view, it is undesirable to depress the low rail below the grade line.

Mr. Shurtleff: To my knowledge that practice exists on the Union Pacific and on the C., R. I. & P. It was put into effect on the Union Pacific for the purpose of reducing the entrance resistance to curves, the curve run-offs. By the way, as an explanation, curves two degrees and under are not spiraled; the run-off is carried off in the tangent. Unless the grade be compensated on the run-off, the entrance resistance to these curves was increased. We know that the entrance resistance to curves is pretty heavy anyway, because of the skewing of the trucks in succession, and we desire to bring that entrance resistance down to the minimum. The method of depressing the inner and raising the outer rail equally compensated the grade of the run-off.

Mr. Lindsay: I appreciate the theory, but desire to know the extent to which it is put into practice. If there are any representatives of the two roads mentioned here, I would like to hear from them as to how they maintained the curves.

Mr. Fritch: There is another point that hasn't been brought out, as indicating an advantage in the use of the method prescribed by the committee, and that is on curves on limiting grades with the elevation all on the outer rail. If you are using momentum grades and come to a curve that is elevated 7 inches you must raise the entire weight of the train 3.5 inches, which will have a great effect in retarding the momentum of that train.

E. F. Wendt (P. & L. E.): The Committee on Track has heretofore considered the superelevation of curves, and on page 62 of the Manual you will find that it is recommended that the inner rail be retained at grade.

Mr. Begien: This subject is given consideration with a view to train resistances and especially with reference to track maintenance. Personally, I do not see why it would be any harder to maintain the track with the inner rail slightly depressed than it would be to hold it at grade.

Mr. Kittredge: I move as an amendment to this conclusion that the superelevation of curves be obtained by the elevation of the outer rail. However, the convention being on record, as cited by Mr. Wendt, might make it unnecessary to mention that fact here.

Mr. Shurtleff: I think Mr. Begien has just covered the point as to why it is brought in here. It must be considered in train resistances. If you are going to make the superelevation by maintaining the inner rail at grade, you have increased your grade resistance on entering curves, particularly on supporting grades. Mr. Fritch brought up the same thing. We have increased the grade resistances, and if there is anything to be changed the chairman of this committee desires that the Track Committee change its conclusion which has been adopted in the past.

J. B. Jenkins (B. & O.): I think the best way to arrive at the proper result, as to train resistances, would be to drop the grade line so as to keep the center of gravity of the train at proper elevation. If you establish your grade line with just the compensation on curves, and then drop your low rail, you will not have sufficient ballast under the low rail. It is better to fix the grade line and keep the low rail as grade line for the top of rail. There is another thing. The superelevation of track is frequently changed with the change in schedule speed. If the grade line is a mean between the two rails, then when you change the superelevation there will be a different relation between the sub-grade line and the top of the low rail because of such change, and it will have considerable effect on your structures, bridges, etc. You will either have to raise the grade line on tangents when you increase the superelevation, or else you will have to drop the bridge floor.

W. M. Camp (Ry. & Eng. Review): This question was pretty thoroughly threshed out when it came before the Track Committee. There is a difficulty in maintaining elevation when you depress the lower rail. It works all right when you have the engineer's stakes to go by when the track is first put up, but in subsequent maintenance it does not. If you get a low place in the vicinity of your depression, the foreman has nothing to go by in sighting his rail, whereas if the low rail is carried to grade all around, he has the tangent on either side to guide him in keeping the rail in surface, and of course he uses his level board in keeping up the upper rail. I have seen that question come up a good many times in practical work, and considering that section men do not have grade stakes to go by at all times I think it is better to keep the lower rail at grade and elevate the outer rail.

Mr. Lindsay: I would like to know if there are any gentlemen who maintain the track by depressing the lower rail half of the elevation and raising the outer rail the other half.

D. W. Lum (Sou.): I would like to ask these gentlemen how they get the lower rail down? I do not believe it is possible. I believe if you run over the road after a few months you will find your section masters, in spite of your orders, surfacing the low rail by the superelevation after they surface the high one. If the reverse, however, is true, I cannot imagine how they accomplish it. I have never heard of their cutting it down. We would, therefore, have to assume that the adjustment of the inside rail always required raising. It does generally require raising, especially where you have very slow speed in one direction and high speed in the other.

Mr. Shurtleff: One of the members who is using this method on the Union Pacific is the chairman of the committee. On the reconstruction of the U. P. through Wyoming we did not find any difficulty in doing this. We did not find any difficulty in making our embankments or our excavations in line with this, but I cannot say as to the difficulty since then in maintenance. I know personally from having to handle track in my experience that a track foreman who can carry a gradient for several hundred feet around a curve is a dandy. If you do not find three inches difference in your

gradient on your inner rail, where you have no stakes, I am very much mistaken. The matter of carrying it into effect is no trouble whatever. We are speaking of building new lines. In such cases this can be done, and in many cases it can be carried into effect on constructed lines.

Mr. Courtenay: A number of years ago there was a wreck on the Old Colony road due to jacks being placed between the rails. On the L. & N. we have a rule prohibiting jacks from being used between the rails. Since it has been enforced it was found our section foreman could not reasonably put the lower rail to surface, but the jacks outside of the rail, toward the center of the curve, interfers with their line sight. Our foremen have universally adopted the rule of surfacing the outer rail by lifting it to proper surface with jacks, and then bringing the lower rail to surface with the level board. We some time ago adopted the rule requiring that the outer rail follow the profile, and the lower rail be depressed. In practice, for a number of years, with such methods as have prevailed on the L. & N. we do not find any serious difficulty about it. Our experience is that the lower rail goes down a great deal more than the upper rail. Our curves are elevated for passenger train speed, and, therefore, the lower rail gets excessive weights and requires more lifting and attention than the upper rail.

Mr. Lum: Mr. Shurtleff states that he has given such orders, but does not know how it is accomplished. How do you get the inner rail down when it is too high, as has been known to be the case? The one question is: How do you do it? I do not think it can be done as a practical proposition. Of course, you can do anything on a special occasion.

Mr. Camp: The practice which Mr. Courtenay described is not what the committee recommends. Mr. Courtenay states in his practice they keep the outer rail at grade. That is easily enough done, because he has the rail on a tangent on either side to go by, but where you put the outer rail half the elevation above the grade of the tangent on one side, and depress the inner rail half the elevation on the other side, that is where the difficulty comes in. It is easily enough done when you have the grade stakes, when the track is built. But I do not think you will find the track men will keep it there.

L. S. Rose (C., C., C. & St. L.): It has been my experience that we have to change the elevation a good many times, as the speed of trains increases. I do not see how that could be accomplished in this case unless you take the track down or raise the whole thing up.

Mr. Begien: I do not think it is a function of the committee to describe methods of maintaining the track. If we recommend what should be done, that is all that is in our province. On the other hand, I do not believe that it will be a very hard matter to maintain the track under these circumstances. It is not an unsual thing to take the track down in case of change of the superelevation. It is merely a matter of taking down the lower side and raising the higher side. If it is necessary to do that, however, and no doubt it is something to be accomplished in view of train resistances, I do not see why we should not keep stakes for the section men to surface by.

H. T. Porter (B. & L. E.): I have endeavored to place the vertical curves so they will come on the tangents. I am aware this cannot be done all the time, but as a rule it can be done. Then all the foreman has to take care of is the horizontal curve. You give him stakes set to straight grade for his inner rail, and he gets his track up in good solid condition. As a rule, he can keep the lower rail very close to the grade. The engineer can set the stakes exactly, but as a rule the foreman by experience can follow the grade closer than the engineer could if he undertakes to do it. I mean with the section gang, not with the instruments. Now, you could either follow the straight grade with your inner rail or your outer rail. I have always followed the straight grade with the inner rail. That simply leaves it to the foreman to put in the elevation called for, which he determines with his level board, so that it makes his proposition a simple one. If you have to lower the inner rail and raise the outer rail, you have three vertical curves in the inner rail and three vertical curves in the outer rail, and the foreman has nothing to guide him unless you furnish exact stakes. You must furnish stakes by which to surface the track the first time, but we are well aware that it is not desirable to maintain stakes along side the track at all times, on account of danger to the trainmen. Besides, a permanent set of monuments from 25 to 50 feet apart would be very expensive, and this would be necessary in order to have the foreman do good work with three vertical curves in both rails, as he can now with stakes for the inner rail set at the time he gets his track in good, solid condition.

I believe that the elevation of the outer rail does increase the resistance, but it only affects it on the short length of the train and the momentum readily takes care of this. It may produce a slight reduction of speed on entering the curve, but it is compensated for as you leave the curve, so that in the end there is practically no loss of speed.

Mr. Churchill: In view of the fact that conclusion 6 refers to general track maintenance, and in view of the fact that the committee has already presented us a rule for elevating rails on curves, and that this conclusion 5 affects the other, I move that it be stricken out.

Motion carried.

Conclusions 6 and 7 were adopted, with the addition of the words "and design" in conclusion 6, making it read, "condition and design," etc.

The secretary read conclusion 8.

C. H. Ewing (P. & R.): This is quite an important table. I have had to refer to it within the last few weeks is making a comparison of actual practice in adjusting for winter tonnage, and I was very much surprised to find so great a variance with actual practice the results obtained, as compared with the table prepared by the committee. It appears to me that the table is entirely too conservative. I have talked to some motive power men, who have made a number of experiments on this line, and they said that the reduction should not start above 35 degrees. I have found by starting at 45, and then going down to winter weather, say, 20 degrees, the reduction is very much greater than is usual in actual practice. If we start the reduction at 35 degrees with percentages given for temperatures 45 degrees to 35 degrees, it would approach more nearly the actual condition.

Mr. Fritch: I agree with what Mr. Ewing has said. The changes are too slight.

W. S. Thompson (Penn. R. R.): My experience is different from the last two speakers. The reduction is not enough. If it is calculated for double track, and trains moving constantly after starting, that is one proposition, but if the train gets in on the side track and waits ten, fifteen or twenty minutes, or an hour, you cannot start at zero degrees with the reduction you have in this table. I would like to ask what experiments are made on which this table is based?

Mr. Begein: This table represents the practice of the B. & O. This practice varies on the different divisions. I have known of cases where the temperature was about freezing, where, according to the division, it would call for 90 per cent, of rating where we were pulling 30. This is not a basis of tonnage rating, and is not intended to be such. It is a basis for comparing one line with another. If you can get the average temperature in any given locality on your line, we merely offer this table to show what per cent. of the calculated rating you can have the year around.

Mr. Fritch: I would suggest to the committee changing the last three or four words in the conclusion and make it read, "is submitted as information."

Mr. Ewing: In view of what the member of the committee has just said, if it would add to this conclusion that it is only intended for theoretical comparison between lines and not intended to apply to a tonnage rating of locomotives, I think that would cover the whole matter. It is confusing the way it is placed now.

Mr. Shurtleff: I believe the committee would consent to adding the words: "Is recommended for use in making comparisons of the economical value of locations or lines."

Mr. Ewing: I think the committee should make it a little more definite and say, "it is not intended to be made use of for tonnage ratings."

Mr. Fritch: I do not see how it would be useful in comparing various lines, because you cannot estimate what your temperature conditions will be in making comparisons. It is a very valuable matter, as far as information goes, but it will not fit the country generally.

The President: I understand that the committee will accept the suggestions which have been made.

Conclusion 8, as amended, was adopted.

Mr. McDonald: I move to reconsider the last vote. My reason for a reconsideration is that if we receive this part of the report as information we cannot put it in our Manual, and I think if we amended it at all, we should amend it as we want it, and then adopt it. I favor the idea of Mr. Ewing that we add to conclusion 7 that it be used as a method of working on a new line and not for tonnage rating.

Motion carried.

Mr. Begien: Perhaps some substitute can be offered. It is

very difficult, in a recommendation of this character, to get something to suit everyone. I think you will all agree that it is absolutely necessary to have some figures of this sort in comparing revisions, especially those extending over whole divisions. If we can have something to substitute, I do not think that the committee is at all anxious to use these particular figures. They certainly have worked out well in some cases.

Mr. McDonald: I move that conclusion 8 be amended as follows, by adding the words "incomparing new lines and not for tonnage rating."

Mr. Fritch: I cannot understand how you are going to assume your temperature under conditions where you are going to compare one line with another. You must assume some conditions. I do not see how it will be useful to you in making a comparison between the lines. It is, as Mr. Begien stated, almost impossible to make up a table of this kind that will be acceptable to everyone.

The motion of Mr. McDonald was put to vote and carried.

Conclusions 9 and 10 were adopted.

The secretary then read conclusion 1 as to curvature.

Several members objected to the word "safest."

G. A. Mountain (Can. Ry. Com.): I agree with the speakers who suggest an amendment. I do not think the word "safe" or the word "dangerous" should be used in any clause in the Manual whatever. It might be construed in a lawsuit, where an accident occurred on a curve, to mean that the curve was dangerous.

Mr. Shurtleff: The committee realizes the reasons for eliminating the word "safest." It brings up a point that I got a little excited about a while ago. In establishing values for curvature we have got to consider the question of safety, and railways are very diffident about giving out even to committees of this kind information with reference to the matter. After these conclusions have been considered, this committee would like to have suggestions from such operating or executive officers as are in the convention room, as to how we can get information that is necessary to establish these values.

After some further discussion, conclusion 1 was amended to read: "A straight line is the best alinement."

Conclusions 2, 3 and 4 were adopted.

Discussion on Wood Preservation.

Prof. W. K. Hatt (Purdue Univ.): Since printing the report some amendments have been prepared by the committee which will be offered to the specifications as printed. Some few amendments are also made to recommended practice.

The secretary read the General Requirements, from the specifications as printed.

Prof. Hatt: The committee wishes to add one clause to avoid an ambiguity, as follows: "The thoroughly air-seasoned ties shall be placed in the cylinder and a preliminary vacuum of not less than 24 inches of mercury shall be produced and maintained not less than ten minutes, at the expiration of which time the preservative shall be admitted without breaking the vacuum." That calls for a preliminary vacuum on air-seasoned ties to add the penetration and avoid subsequent drip. The specifications for the zinc-chloride treatment are substantially as printed in the Manual. The committee desires to add one clause, after the first sentence, as follows: "The cylinder shall be entirely filled with preservative and so maintained while the pressure is on, an air vent being provided by which the air in the cylinder and that coming from the charge while under pressure may be released.

The Zinc-Tannin treatment is substantially as written in the Manual, and there is no special comment to make upon it. The committee wishes it to be understood that the amendment calling for an air vent in the cylinder will apply to each of these treatments should be inserted after the first sentence under "Zinc-Tannin treatments" and all other treatments that are here recorded.

Under Creosoting the committee has called the ordinary processes "plain creosoting," to distinguish it from the modified processes which have been introduced in the last few years. The changes are as follows: Instead of specifiing a pressure of so many lbs. per square inch, the phrase "adequate pressure" is used. Instead of specifiing 10 lbs. per cubic foot, it should read, "the amount of dead oil to be injected shall be that provided for in the contract." The committee makes the following change in the first paragraph on page 317, by inserting the words, "on the same tank," after the word "taken," making the sentence read as follows: "The amount of oil absorbed shall be determined by calculation, based upon gage readings taken on the same tank before the introduction of the oil into the cylinder and after forcing the oil back after treatment." The committee has made a change in the specifications calling for the weighing of ties in and out of the cylinder occasionally. The sentence is as follows: "These should be checked occasionally by weighing the ties loaded under cylinder tram cars before and after treatment, the scale being inserted in the tram tracks." The committee also recommends a change in the last paragraph, which is that the amount of water accumulating in the creosote oil is limited to six per cent. instead of ten per cent.

The recommended specifications were approved.

The secretary read recommendations for the determination of zinc in treated timbers.

Prof. Hatt: The committee has another clause, No. 13, to add to these recommendations, as follows: "In order to judge of the penetration of the oil, borings should be made with a three-quarter to one inch augur, in not less than six ties in each cylinder load. The holes should be plugged with creosote turned plugs, with one-sixteenth inch larger diameter than the holes."

These recommendations were approved.

The secretary then read the conclusions, which were accepted.

Mr. McDonald: I think it is the function of this committee to prepare specifications for timber intended for treatment. We already have specifications for timber to be used without treatment, that is, in trestle work and matters of that kind, but we do need some directions or specifications as to the kind of timber that should be used for treatment, and the condition it is in. For instance, the amount of sap, and as to whether it is better to use long leaf yellow pine for piles or loblolly pine for piles. What I have in mind is that the more sap weight the greater the absorbing power of the timber. Is it better to rely on the treatment for durability than the natural condition of the wood, such as the heart yellow pine?

The President: The committee will take note of your suggestions.

The president then announced the result of the ballot for officers of the association for the ensuing year. The officers elected are as follows:

President, L. C. Fritch; Vice-President, C. S. Churchill; Secretary, E. H. Fritch; Treasurer, C. F. Loweth. Directors, three years each: Robert Trimble and F. S. Stevens.

Discussion on Ties.

The secretary read conclusions 1 and 2.

E. E. Hart (N. Y., C. & St. L.): The roads do not respond in furnishing this information.

Mr. Downs: There were about 750 inquiries sent out asking three simple questions. One was as to whether or not they had used the blanks that had been gotten up by the committee. Another was, if they wanted to use them, and another if they favored a count of the ties. A postal card was enclosed, so that all they had to do was to answer Yes or No. A surprising thing was that there were only 45 replies received out of that number, which shows the very little interest taken in giving the information we are trying to get. So the committee intends to take it up individually with those whom we know to be interested in tie statistics, outline certain questions that they can answer very easily, and by next year, I think, we can get some information that will be of interest to the association. We still believe, however, that the blanks are a good thing and the whole committee think that if they are kept by roads indefinitely they will in time have information on those blanks that will assist them materially.

E. O. Faulkner (A. T. & S. F.): We have given a good deal of attention to that subject on the Santa Fe for the last five years and the trouble is that owing to the frequent changes in section foremen and the fact that that class of labor is not of the highest class, in the West especially, we find it very difficult indeed to get any records which at all approximate the correct condition of the treated ties in the track, or untreated ties, either. Our practice is to put a round nail in treated ties and a square nail in untreated ties; but in spite of instructions, in spite of supervision, we find we cannot get correct statistics. I have recommended to our people that, instead of attempting to keep watch over 1400 sections, we take on each superintendent's division one, two or three representative sections, and keep good men in charge. We can watch that a great deal easier than we can the larger number and in that way approximate generally and much more accurately than we do at the present time the life of the treated and untreated ties which are in our track. I was interested in noticing in the bulletins that other companies have found the same difficulties as we have, and practically suggest a similar plan, and I hope yet that this will be carried out. While we are all doing this wood preservation, it

really is an essential fact to know what result we are getting from it; but when we get reports which we know do not at all reflect the actual conditions in the track, those are really worse than having none at all. If we had no reports, the roadmasters and others would take observations there themselves, instead of relying on our statistics. It has always seemed to me that the Tie Committee asks too much, and therefore does not get anything. I believe if the committee would send to the roads and ask them a few leading questions, such as the different ties they used, the approximate average life they get, both treated and untreated, and any other information that is generally kept, we would get something to base comparisons on. I think nearly 180 questions are asked now from each individual system, and it is worse than keeping statistics for the Interstate Commerce Commission. I shall cooperate by giving whatever statistics I have in my department. There are a number of experimental pieces of track changes of line, for instance,—that I am sure the roads would be glad to give the committee if their attention were called to it.

Mr. Downs: Mr. Faulkner probably misunderstood me in saying that we were asking too much on the blanks. We did not send out the blanks this year to be filled in, but we sent out a letter with a postal card reply, asking three questions, all of which could be answered by Yes or No.

O. Chanute (Con. Eng.): I agree with Mr. Faulkner, that if you ask too much you get nothing. It is, however, quite possible for the committee to boil down the list of the inquiries so as to obtain valuable results. That was done 25 years ago by a committee of the American Society of Civil Engineers, which occupied five years in gathering data as to the preservation of wood. They began much in the same way which this committee did this year, by asking a very few questions as to what information had been obtained, what had been the results up to that time, and who else might possess information. The answers received disclosed that a number of people throughout the country had had experience, and those gentlemen's lives were made miserable by correspondence until we managed to get out of them what they knew, and what they recollected. The result was the report of 1885 to the American Society, which I believe inaugurated the treatment of wood in this country.

Conclusion 2 was adopted.

The secretary read conclusion 3.

Dr. Herman Von Schrenk (R. I.- Frisco.): The tree planting proposition for tie supplies must be considered very much in the light of a banking proposition. It represents a certain invested capital, from which we must obtain, sooner or later, a certain definite interest return. The practicability of making a large investment to start with in planting trees will be determined by the cost of land, the cost of planting trees, maintenance charges, and the probability of a certain definite return after a comparative brief period of years. Up to the present time, with very few exceptions, private indivuals or an aggregation of individuals, have found that the investments of large sums of money in lands in the purchase of trees and their proper maintenance has not been a paying proposition. My personal view is that it a very much better plan for a railway which desires to assure a future supply to buy standing stumps. One can still find in many parts of the United States forest lands in regions, which so far as we can foretell, will not be distinctively agricultural in the future. A company can buy the standing forest trees and protect them against fire, and the natural reproduction which takes place in the forest will obviate the more or less expensive replanting of new trees. I know of one road that has recently gone to a scheme of that sort, and purchased a large tract of pine land in the south, which will be operated very economically by cutting out the mature timber, and thereby giving the young timber a chance to grow. If any plan is determined, an important part is the employment of capable men to continue such a plan and, above all, a suitable fund to make possible a maintenance which will bring the matter to a successful conclusion.

Conclusion 3 was adopted.

Discussion on Ballast.

The secretary read conclusion 1:

Mr. Cushing: The official term is stone ballast, as approved by our Manual, and not rock ballast.

The President: That change will be made.

Mr. Lindsay: The committee in another portion of the report has touched very properly on the quality of toughness in the stone suitable for stone ballast. Is that quality of sufficient importance to insert a reference to it in the specifications? I also ask if the words "when crushed" are necessary?

Mr. Hanna: In regard to toughness, the committee has not covered that in a recommendation in connection with tests of stone to be used for ballast. The view that the committee has taken of that is that it is hardly the proper place in the specifications to cover that characteristic of stone. The question of the preparation of ballast, the conditions that the roads have to meet, the selection of a suitable ballast, involves tests or some method of ascertaining the suitability of the stone. It has seemed to the committee that that phase of the subject was sufficiently covered when the committee recommended tests for stone, and published one of those tests. We think that no good object is accomplished by enlarging the specifications to cover this feature of toughness. In selecting stone for ballast, the quality of toughness would be a relative one, that would be determined by the tests when a road was in a position to choose between different stones. As to whether the words "when crushed" are superfluous, it seems to me proper to include these words in the specification simply for the reason that it is possible that a stone would break in angular pieces under the hammer. What we are concerned with as a commercial proposition is the way the stone will act in a crusher.

Mr. Hanna: In the second clause under Revised Specifications for Rock Ballast, the members will notice a change. We now say: "2½-in. test ring." In the specification in the Manual, we state "shall not exceed pieces which will pass through a screen having 2-in. holes." The use of the test screen in this connection is intended to make the size of the stone more definite. It is brought out in some of the replies to the committee's circular that the use of a screen with holes of a certain size does not make it follow, as a matter of necessity, that the average of the stones are of that size.

Robert Trimble (Penna. Lines): On page 96 of the bulletin is a quotation from the specifications of the Pennsylvania Lines West. The quotation was correct at the time it was given to the committee, but since that time we have changed our specification and we changed the minimum hole of the screen from ¾ of an inch to 1 inch. The trouble with a minimum hole of ¾ of an inch is that you get ballast that is quite small, and under ¾ in. in dimensions, and we found we were getting a large amount of small stone. We therefore changed the hole in the screen for the minimum size.

The secretary read conclusion 2.

H. R. Stafford (I. C.): What is the basis of the classification referred to? Is it the same basis that was adopted some years ago in the Manual in reference to the work of the Committee on Ties and the Committee on Track?

Mr. Hanna: Yes.

Conclusion 2 was adopted.

The secretary read conclusion 3.

Mr. Hanna: By an oversight, the tests recommended were not printed in bold-faced type in the bulletin. You will find on page 87 the tests recommended.

The secretary read the matter referred to.

Mr. Cushing: Does the committee consider that the crushing tests are of no particular value in testing stone for ballast, and that these tests were designedly left out?

Mr. Hanna: Yes. A letter received since our report from the director of public roads, Mr. Page, says: "This office has not made a practice of making crushing tests on road materials, for the reason that we have never been able to discover any relation between the crushing strength of a rock and its behavior on a road surface." As is stated in the report, these tests were undertaken by the Department of Agriculture as one means of encouraging good roads. They have not been heretofore undertaken with a view to determining the value of stone for ballast. I think perhaps it is a debatable question whether the crushing strength might not be a desirable thing to determine.

Conclusion 3 was adopted.

The secretary read conclusion 4.

Mr. Lindsay: I would call attention to the fact that Congress has passed a law requiring that all locomotives shall be equipped with ash pans, which can be dumped without the necessity of a man crawling under the engine. The old style ash pan did reasonably well in keeping the ashes in the pan. With the pan equipped with the automatic dumping feature, the normal position of the pan is open, and the ashes go directly on to the track. Track men will soon find a marked increase in the necessity of cleaning stone ballast, and it is going to show in the expense accounts.

Mr. Begien: The statement is made: "Clean between ties to bottom of ties." I do not think that is deep enough. It is our practice to clean the ballast five inches below the bottom of the ties for the purpose of cleaning the base on which the tie rests. I think this clause should be amended so as to state some distance below the bottom of ties, say five inches below the bottom of the ties.

C. H. Fisk (Con. Eng.): As to the statement, "Per cent. of new stone ballast to be applied—15 to 25 per cent.," when is that to be applied?

Mr. Hanna: Whenever it is cleaned.

H. R. Stafford (I. C.): We have had occasion to clean in the neighborhood of nearly 100 miles, I should say, of ballasted track. The cause for that cleaning is largely due to the fact that a portion of one quarry from which we had obtained ballast contained a rather soft stone. The necessity for cleaning was due to the disintegration of the material, and our practice was to clean the ballast to the bottom of the ties. We considered going below the bottom of the tie, but that could not be done, of course, between the ties and would leave a bed of clean ballast on a trench, as it were, of dirty material and would tend to hold the water. It would be cheaper in the long run for us at the time we cleaned to leave that bed undisturbed at the base of the tie, and put in sufficient new ballast, in addition to the ballast cleaned and thrown back, to raise the track some four or five inches. It was our opinion, based on tests, that some element of damage resulted in cleaning out the ties to a depth lower than the bottom, and results that we procured subsequently were very much better.

Conclusion 4 was adopted.

Discussion on Track.

Mr. Rose: In addition to the report as printed, the committee recommends the withdrawal of six paragraphs under the heading "Inspection of Track," on page 66 of the Manual. As explained yesterday, when the Committee on Uniform Rules presented its report, these six paragraphs are now covered by the Uniform Rules Committee.

The secretary read conclusion 1.

Mr. Mountain: I notice under Maintenance of Gage that the committee only alludes to spikes at the outside of the rails on curves. There has been a good deal of use of the other fastenings of rails to ties, and I would ask the committee if it has any recommendations to make, such as the screw spike. I judge it refers to the ordinary cut spike in all its recommendations.

Mr. Rose: The committee has made no recommendations concerning any special kind of spike, and it has not given the matter any consideration. This is merely a revision of the Manual, worded slightly different from what it appears in the printed portion of the Manual, covering shoulder tie plates. The old recommendation did not specify shoulder tie plates, and that was the principal reason for rewriting these recommendations. This is for very light traffic.

Mr. Downs: I wish to refer to clause 8, under Maintenance of Gage, the last sentence, in which it says: "Under ordinary conditions it is not necessary to regage track if the increase in gage has not amounted to more than one-half inch, providing such increase is uniform." I think the Rail Committee will take exception to that, especially on curves, where the wheels tend to go to the outside curve, causing worn flanges to be up on the rail on the inside, causing the rail to flow. The rail will be materially damaged when the gage is a half inch wide on curves, and I do not think that should be in the Manual.

To make clear what conclusion 1 covered, the secretary read the clauses under Maintenance of Gage, to and including clause 7.

Mr. Brooke: I ask the committee why it would use two spikes on the outside of rail on curves under light traffic and make no mention of that feature under heavy traffic?

The secretary read clause 8.

Mr. Cushing: I am opposed to that change where it says it is not necessary to regage the track if the increase in gage has not amounted to more than ½ in., providing such increase is uniform. It is now ⅜ in. in the Manual.

Mr. Rose: That was adopted last year and changed to ½ in.

Mr. Cushing: I am still opposed to it. I move that it be made ⅜ in. instead of ½ in.

H. G. Griswold (Ill. Steel Co.): I have had some experience with wide gages. I find with a ⅜ in. increase it causes flow of the inner rail. The wide gage also allows the lead wheels of trucks to get in greater angularity with the outer rail and increases flange wear.

Mr. Camp: If the track is ⅜ in. out at a switch, it would be too wide even though it is uniform.

Mr. Rose: I would like to refer to some letters we got on that question. One gentleman asked how we would get an engine through a switch with eight-foot wheel base, and all flanged drivers. We would have to widen the switch.

Mr. Camp: Would you widen the main track?

Mr. Rose: Yes.

Mr. McDonald: I think the tendency is toward the use of a spike in treated ties that will as far as possible preserve the ties. Mr. Kendrick last night pointed out to us very clearly the destructive effect of driving spikes in a tie. Every time you regage the track with the ordinary driven spike you destroy that much more life of the ties. Where you use screw spikes it seems almost impossible to shift the rail back to its standard gage without very serious injury to the tie. My experience has been, where I have used screw spikes that rather than shift the rail on the ties I have found it better to change the rail, and I think we are entirely within safe limits in allowing that rail to wear at least ¾ in. before we change. I think we should go slowly on this proposition.

Mr. Roberts: I do not think it is the intention of the committee to recommend to the various roads that they let their track go ½ inch wide gage, but simply to place a limit beyond which they should not go. I think it is the general opinion of the committee that a good trackman will keep his track at all times as near as possible to the correct gage.

W. S. Thompson (Penn. R. R.): Would not a foreman, when he knows he is allowed a ½ inch wide gage, allow his track to stay there, instead of regaging, and would not a wide gage tend to make your track spread wider, due to the oscillation of a train passing over a wide gage?

Mr. Rose: It is not the intention to have these rules for the track foreman, but as a recommendation for the engineers.

The President: Gentlemen, you have heard the motion to change the increase in gage, as given in clause 8, from ½ inch to ⅜ inch.

The motion was lost.

The secretary read clauses 9 and 10, which were passed without change.

Conclusion 2 was adopted.

The secretary read conclusion 3 and the accompanying matter under the heading Specifications for Springs and Rigid Frogs.

F. S. Stevens (P. & R.): This specification calls for general dimensions. I move that we should substitute "full detais" for "general dimensions."

Mr. Rose: There would be a lot of roads that would not have any one to make these details, and the manufacturer is better able to do that than the railway companies.

Mr. Stevens: How is a frog to be built on general dimensions?

Mr. Fritch: I think that the committee is wise in specifying General Dimensions. If you go into the details of this matter you will have as many plans as there are individual roads in the country. I think we should agree upon "general dimensions," and I believe it will simplify the manufacturer of frogs and switches very much.

Mr. Stevens: I do not mean the details of any general plan, but the details furnished by the company which is buying the material. I move that the words "full details" be substituted for the words "general dimensions," with the explanation I have made it refers only to the plans of the company ordering the material.

Mr. Fritch: Referring to the clause at the bottom of page 176, reading as follows: "Where there is material leakage from track circuits, track fastenings should be so designed as to prevent contact between the metal and the ballast," how that is to be accomplished in the case, say, of a 100 per cent. joint, where the reinforcement extends below the top of the tie?

Mr. Rose: You will have to use some other joint or cut the ballast down. My understanding is that in some classes of ballast there is no leakage on the track surface, but with cinders and with slag there is considerable leakage. You cannot maintain the track circuits when you have contact between the ballast and the rail.

Mr. Fritch: I think there would be very serious objection to having pockets in your ballast, to cut the material away from the joint. Furthermore, on tracks provided with track circuits, the ballast is usually of another class than cinder ballast. I move that that clause, which was included in the adoption of conclusion 1, be reconsidered.

Mr. Begien: On lines that have track circuits, a great many of them also have sinks, and these sinks are almost invariably ballasted with cinders. The trouble which we experience from currents and short circuits in cinder bal-

lasted track are very noticeable and we make a practice of putting angle bars on all tracks across sinks where cinders are used.

The secretary continued to read the Specifications for Spring and Rigid Frogs.

Mr. Cushing: I would like the committee to remove the word, "coöperate" in the first line of the third paragraph.

The President. The committee will accept that.

Mr. Ewing: I wish to speak to the section which reads: "Raising blocks must be of cast steel." I understand that many frog companies are using raising blocks made of sections of rail, rolled steel.

The President: This is a recommendation of the commitee for the best practice.

Mr. Ewing: In the section on "bolts," I suggest the elimination of the words "United States Standard," for the reason that there are today special bolts used in the construction of the track, which have special heads, which are very much better than a standard head.

Mr. Rose: The committee wanted to recommend a square head rather than an hexagonal head. You get a better arrangement.

Mr. Ewing: I do not refer to the hexagonal. I refer to a special square headed bolt that fits the rail and prevents turning. A United States standard square head is one which requires you to use special washers. In place of the standard head bolt, there is a special head bolt made, which is better than the standard head.

The President: The committee will accept that.

Mr. Brooke: I would like to go back to paragraphs 3, 4 and 5 under Maintenance of Gage. These paragraphs contain recommendations as to the use of tie plates on lines of heavy traffic, medium traffic and light traffic. In the Manual on page 277 we have a classification of track, Class A, Class B, and Class C, which were formulated by a special committee and accepted by the association. Could not these classifications be used in paragraphs 3, 4 and 5? It seems to me that would make the practice of the association more consistent.

The President: This has already been passed, do you wish to reopen the subject or do you wish to ask the committee to classify these roads?

Mr. Brooke: I move to reopen the subject so that these changes can be made.

Mr. Roberts: As a member of the committee, I object to the change suggested, for the reason that you might have Class A track for light traffic. The classification of the track does not entirely govern the traffic you have over it.

Mr. Brooke: This classification of the track in the Manual definitely states a minimum of traffic on Class A track. I move that for the words "heavy traffic," in paragraph 3, the words "Class A track" be substituted; for the words "medium traffic," in paragraph 4, the words "Class B track" be substituted, and for the words "light traffic," in paragraph 5, that the words "Class C track" be substituted.

The chair ruled that the motion was out of order.

The secretary read the balance of the clauses, under the headings "Workmanship," "Inspection" and "Requisites for Switch Stands."

Mr. Churchill: I object to clause 5, under "Requisites for Switch Stands," where it is provided, "Ground stands should be provided with latches which work with the foot." That is liable to compel the use of a particular form of stand. I think there are plenty of ground stands that work as well, and we should not tie this association up to a particular shape of stand, such as is used in ordinary yards.

The President: Do you offer that as a substitute?

Mr. Churchill: I move that it be omitted entirely.

Mr. Rose: I know of two or three concerns which make latches which are worked by the foot. The committee was not aware that we were running into any patented device. We were trying to look out for the one-armed switchman.

The motion of Mr. Churchill was adopted.

The secretary read conclusion 4 and the accompanying matter relating to frogs and switches.

Mr. Rose: The committee desires to change the recommendation slightly in regard to frogs and switch points. It is now as follows: "22-ft. switch points with frogs over No. 10, up to and including No. 14," and "33-ft. switch points with frogs over No. 14." We desire to change the first one to read, with frogs over No. 10, up to and including No. 15; and we desire to change the second one to read, with frogs over No. 15, and the table will be changed accordingly.

Prof. Allen: As far as conclusion No. 4 is concerned, I have no desire to make any suggestions as to the substance of the table. But in one matter of form, I think it is perhaps of sufficient importance to take the matter up. I notice that the frogs and the degree of lead curve, and the switch angle, are all given in seconds. It seems to me that is unnecessarily fine, and I would like to suggest to the committee that the nearest minute be used instead of seconds, if that meets with the approval of the committee.

Mr. Roberts: We were asked to give, first, theoretical leads for the given switch rails, frogs and gage, so in giving those theoretical leads we worked to the second, but I do not believe the committee means to recommend that all roads require the frog builders to build their frogs or their switch rails to seconds. We agree with Mr. Allen that if they build them to the nearest minute they will do very well, but for the sake of the table, we believe the table is correct, and that the distances as given in this table will be as nearly right, owing to the inaccuracies of the frog, as if you worked to the minute. The frog may be a little less or a little more, and that is probably a happy medium, as if we had taken it to the minute.

Prof. Allen: I do not object to their getting three figures through the use of seconds, but it seems to me that in the incorporation of the table in the Manual a false idea is given. It seems to me that it conveys an impression of precision that is altogether inappropriate for the things we are dealing with. A frog, I presume, cannot be, or generally is not, made closer than perhaps five minutes, and it seems to me that the position of the association would be more fortunate if these figures were presented simply to the nearest minute, although in the intermediate process the use of seconds may have been somewhat valuable.

Mr. Ewing: I would like to ask the committee if there are any roads using 33-foot switches?

Mr. Rose: Yes; we are using them on the Big Four.

Mr. Ewing: Does the committee consider it good practice to put a joint in the stop rail, in the body of the switch?

Mr. Rose: That is a question the whole committee has not discussed, but personally I will say yes.

Mr. Ewing: I would like to ask the committee if it can be done with the use of ordinary joints. Will not special joints have to be used?

Mr. Rose: Yes; you would have to trim the bar.

Mr. Ewing: For that reason they are very objectionable. and I would say a 33-foot switch should be eliminated and a 30-foot switch substituted to get rid of troubles of that kind. which are of quite a serious nature.

Mr. Begien: I think a 60-foot rail is in common use at such points.

Mr. Rose: I would like to tell Mr. Ewing how to get rid of his trouble. Space the joints so the angle bar will come near the heel of the switch, where the spread is sufficient to take care of it.

Mr. Ewing: As I understand the committee, with 6½-in. spread at the switch, which is the least distance that it is possible to get a standard angle bar, if you move the joint back you have got to move it back at least 2 ft. 6 in. to properly clear the angle bar at the point of the switch.

Mr. Rose: The heel distance of these switches has been so arranged that an angle bar 36 in. long can be used and some patented joints that have wide bases can be applied also by putting in an angle bar of shorter length. I think you can get it in there all right.

H. P. Porter (B. & L. E.): The 33-foot switch was suggested by the committee on account of it being the standard length of rail. We have several 33-foot switch points. We haven't got them all in, and at the joint you can shear off the angle bar even with the base of the rail. That can be done in the ordinary shop and at a very small expense. I believe the spacing at the heel of the switch point is such that you could get a 5-inch spike between the bases of the two rails. A 30-foot rail is not the standard rail now, and you would either have to sort out or else waste 3 ft. on each rail, when you have your switch point made, for which you would have to pay and for which you would have no return.

Mr. Ewing: I think Mr. Porter is a little mistaken in that. The Rail Committee says the standard length of rail is 33 ft., but at the same time the Rail Committee permits the acceptance of rails 30 ft. in length, and it is possible to get all the 30-foot rails you need to cover all your switch requirements.

Mr. Porter: Switches are supposed to be made only of first quality No. 1 rails, and I think you can get them without having them sorted. I wrote to practically all the large rail manufacturers in the United States and their reply was that anywhere from 92 to 99 per cent. of the rails they rolled were 33 feet; that a 30-foot rail was not called for.

Mr. Ewing: I should like to go back to the subject under discussion, the length of switches. In view of the admission

on the part of the committee that this type of construction requires a weak point in the main track rails, by cutting off the angle plates at the joint, I move that the standard length of the longest switch be 30 feet, instead of 33 feet, and that this report be referred back to the committee for revision.

The President: You mean that part?

Mr. Ewing: That part which would carry with it the tables.

Mr. Porter: I would like to know how much spread would be necessary to allow your full angle bar.

Mr. Ewing: The main factor of using a long switch is to decrease the angle in the switch so that trains can run over it at the highest rate of speed possible. In view of that, you ought to get the minimum distance at the heel of the switch that it is possible to obtain and get on your standard track construction.

Mr. Roberts: The committee would be very glad to revise this table, the latter part of it especially, and cut out the 33-foot switch rails. We agree with you that you ought to reduce the distance. We also agree that whether you use 30 or 33 foot switch rails you have to clip the angle bar. If the convention will approve cutting down the heel distance and using shorter switch rails, I believe you will get better switches, have less long, unsupported length of switch rails; but last year and prior to that time the convention did not approve of using the smaller heel distances.

The President: Mr. Ewing's motion is that conclusion 4, with the accompanying tables, be referred back to the committee for further consideration. That will take care of Prof. Allen's matter too.

Prof. Allen: I understand the committee accepts that change.

Mr. Rose: For practical leads.

Mr. Ewing's motion was lost.

Mr. Rose: The committee has no objection to leaving off the seconds in that portion of the table under practical leads for the switch angles, frog angles and the degree of curve.

Mr. Osgood: I notice the length of the switch points favored here include 11 feet, 16½ feet and 22 feet. I take it that they are so fixed because the rails are ordinarily 33 feet in length. I would like to inquire if it is not a fact that at the present the vast majority of switch points are 15 and 20 feet, or some such lengths, and that at present there is a comparatively small number of lengths of 16½ feet and 11 feet. I know that in my part of the country we use 15 feet and 20 feet and have none of the lengths mentioned here.

Prof. Allen: I move that in these tables the frog angle, the switch angle and the degree of allowed curve shall be amended so that they will be shown to the nearest minute.

Mr. Ross: The committee does not feel that it should cut out more than the seconds on the track lead.

The motion was lost.

Conclusion 4 was adopted.

The secretary read conclusion 5.

Mr. Lum: I suggest that the words "four degrees" be substituted, and that the increase be made as suggested further on in the paragraph. If I understand the second clause, it is proposed to widen the gage where the curve exceeds eight degrees, but if there shall be a frog in that curve it is to be brought down to the 4 ft. 8½. This does not seem to be consistent, as it would be easier for the train to pass through the curve where there is no frog than it would be for it to pass at the throat of the frog. I move a change from the words 8 degrees to 4 degrees in the first clause and a change in the second clause permitting the widening of the gage at the frog, providing at that place a difference in the guard rail clearance.

Mr. Rose: It is not necessary to widen the gage on four-degree curves with the present engines. The rule is based on calculations made by the committee submitted last year and also on replies from over 40 roads. It was found that the committee's calculations and the replies came very closely together. That is the reason we begin with 8 degrees. The second part of Mr. Lum's motion refers to widening the gage of frogs. We admit that it will introduce some resistance, but we say that the installation of frogs on the inside of curves is to be avoided wherever practicable. This applies to frogs on the inside only; with frogs on the outside of the curves we would widen the gage just the same. The reason for that is that we will have to widen the flange way of the frog in order to take care of it, and we will get our wheels on the flangeway passing through the fillers.

Mr. Lum: It was not suggested that you widen the flangeway through the frog, but widen the flangeway through the guard rail. That gives you the proper clearance for a widened gage at the point of the frog, and in that way you maintain your consistency in spreading the gage for the sharp curve, instead of spreading it through its general length and then reducing it at the point of the frog.

Mr. Lindsay: Assuming an 8-degree curve on a high speed track, with the frog in the low rail, it is true that we can provide for the passage of the pair of wheels there by maintaining the proper distance between the frog point and the guard rail on the opposite side of the track; but assuming a train passing through there at the speed for which the curve is elevated, or a higher speed, the flange striking the wing rail frog, is forcibly pulled down hill by the amount that the gage is widened, and it throws a tremendous strain not only upon the frog bolts, but upon the flanges and the wheels, and increases very materially the danger from fracture of the flanges or breaking the axle.

Mr. Camp: I think the committee is perfectly right in regard to the second part of this resolution. Where you have the frog on the inside of the curve, you have the guard rail on the inside of the curve; that is to say, the wing frog constitutes the guard rail, and it is a short guard rail at that. If you widen the gage, every wheel passing through the curve is going to hit that guard rail hard. I have seen that.

Mr. Osgood: Isn't the logical way to take care of that to widen the flangeway of the frog? I have done that in some instances.

The amendment proposed by Mr. Lum was lost.

Conclusions 5 and 6 were adopted.

Discussion on Masonry and on Standard Specifications for Cement.

The report of the Special Committee on Standard Specifications for Cement was accepted.

Mr. Wendt: I would like to ask, whether Appendix A, in the report on Masonry including all these specifications, has received the unanimous approval of the committee.

Mr. Cunningham: It is unanimous.

The matter in Appendix A regarding concrete materials was adopted.

Mr. McDonald: I would ask the committee if they anticipate any trouble in securing re-enforcing steel with 60 per cent. ultimate. I recently had to place an order under that specification and I finally had to compromise on 55 per cent. and the work was delayed for five weeks and the factory said they couldn't furnish it without making a special arrangment for it.

Mr. Cunningham: This is the same specification that has been adopted by the convention for structural steel. It is in the Manual.

Mr. McDonald: Having taken it out of the Manual and having this trouble about it, I doubt the expediency of putting it in here now.

The matter on Steel Reinforcement was adopted.

Mr. Cunningham: I want to call attention to something the committee wishes to insert on page 11, next to paragraph 46. It was left out for some unknown reason: "The reinforcement shall be carefully placed in accordance with the plans, and adequate means shall be provided to hold it in its proper position until the concrete has been deposited and compacted."

The matter on Workmanship was adopted with this addition. The other conclusions of the report were also adopted.

Mr. Cunningham: The committee made a recommendation, conclusion 5, which has been inadvertently omitted. It reads: "That the report of the Joint Committee on Concrete and Reinforced Concrete be received as information and be printed in the proceedings."

This conclusion was adopted.

KERITE INSULATED CABLES.

The Kerite Insulated Wire & Cable Co., New York, in space 61-62, has a very interesting display of Kerite insulated wires and cables. Several samples of insulating tape, made by the company some 15 years ago, demonstrate the fact that this tape does not deteriorate with age, the samples shown being as good as new.

Mounted on a board is shown a sample taken from a section of nine miles of cable manufactured for the Western Union Telegraph Company. This nine-mile length was shipped, on March 5, to be used in replacing a section of English cable across Puget Sound, Washington. There is a section of the present cable which will remain in place and to which the

new section will be spliced, when the entire cable will be Kerite.

A section of the Colon-Panama cable is also shown. This cable was made in one length of 50 miles in November, 1908, shipped to the isthmus intact on 16 flat cars chained together. When it was laid, however, it was necessary to cut it into sections and resplice the joints. During the construction of the canal the cable will lay along the canal route, in some places above and in others below the surface. During this time the cable is being subjected to very severe temperature conditions. When the canal is completed, it will be laid along the canal bed. This cable was put into service in December, 1908, and it is considered one of the most important cables extant, connecting, as it does, the Atlantic and Pacific oceans.

The contract for this cable was given to the Kerite company, said to have been the highest bidder, after a careful investigation of then existing installations in the United States and Europe. The cable has four copper conductors of 7 strands each. The conductors are insulated with Kerite, making each 8/32-in. diameter outside of insulation. Each core is marked for tracing and covered with lead 4/100-in. thick to prevent induction when submerged. In making this cable is laid up in spiral formation, then jute laterals are placed, after which it is taped. It is then again juted, after which the armor, of No. 8 B. W. G. galvanized wire, is placed. Additional jute, in two reverse layers treated with a preservative compound, is then placed.

ANNUAL DINNER.

The eleventh annual dinner of the American Railway Engineering and Maintenance of Way Association was held Wednesday evening at the Congress hotel. The attendance was about 300. President McNab was a highly efficient toastmaster and the proceedings were enlivened by excellent music, singing, and a few well-selected vaudeville specialties.

The speeches, which were received with much enthusiasm, were as follows:

President McNab.

The office of President would not be worth very much unless the encumbent enjoyed some privileges or prerogatives. One of these prerogatives is that he sometimes can do as he pleases, or rather that he can do what pleases him, and on that account I am going to begin my address tonight in a little different manner from what is customary at an assembly of this sort of our members, and I am going to address the ladies first.

Ladies, members of the American Railway Engineering and Maintenance of Way Association and guests: —(Applause.) I am very pleased to welcome you on this social occasion. I am sure it is the consensus of opinion of the members of this association that our banquets in the past have been ideal. I do not mean altogether on account of the procedure or the material comforts enjoyed, but by reason of the flow of wit, the rhetoric, philosophy and after-dinner shop talk that we have had such an abundance of, and I am very pleased to see tonight that there is no indication that the lustre which has surrounded these festive occasions is going to be dimmed.

I suppose that if we were all Scotchmen it would be perfectly legitimate for us to rub each other on the back and praise one another for all the great and glorious things that we have done in the past, not only ourselves but our fathers before us, but as we have not all that honor—(Laughter and applause.)—I am just going to say seriously —(renewed laughter.)—oh, some of you have the honor—that if you search this continent from the Atlantic to the Pacific, and from the Gulf of Mexico to the Pole, either discovered or undiscovered (Laughter) you will not find a body of men, who, in business session, apply themselves with greater zeal, assiduity, and earnestness of purpose than do the members of this association. (Applause.) I will say here that, phlegmatic as engineers are supposed to be, I know of no body who can enjoy a social function of this kind on a higher plane than do our members.

Now, gentlemen, I hope that the pleasures of anticipation that you have had in regard to this banquet will only be exceeded by the joys and happiness of realization. (Applause.)

The company then sang "God Save the King."

President McNab continued: Ladies and Gentlemen: Adjoining this country on its northern boundary, and extending from ocean to ocean is a land which today for good reasons, perhaps enviable reasons, is in the limelight of universal public interest. Evidence that nationhood, with all the mighty import that that term implies, is assuming considerable proportions in that country is not difficult to find. Clearing of the virgin forests (there are none in this country, gentlemen, but there are still some over there), settlement of the prairies, the development of water power with which that country is liberally blessed, the establishment of industries and commercial relations with other countries, the opening up of mines, and, last to be mentioned but by no means least in importance, the question of transportation, is being forced upon that country, naturally forced upon that country, and is being dealt with by master minds of that art, and with all the vigor and foresight with which they are so liberally endowed.

There is a great department of the government in Canada known as the Department of Railways and Canals. It is presided over by a minister of the Crown, who for the time being is Master of Transportation, if I may use that word in its broadest sense, Master of Transportation of Canada.

We are fortunate in having with us tonight the Hon. George P. Graham, the Minister of Railways and Canals (applause), and I wish to express, as the president of this association, my personal appreciation of the kindness of Mr. Graham in leaving his parliamentary duties and coming all the way from Ottawa to Chicago. But, notwithstanding that, I want Mr. Graham to know that there is such a thing as reciprocity, and I want him to feel that despite his coming that distance and leaving his parliamentary duties, he has come to a place where he can feel that he is going to get much good from his visit, and I am sure Mr. Graham will take my statement in its kindest way.

I have very much pleasure in introducing to you Mr. Graham. (Applause.)

Hon. George P. Graham.

Mr. President, Ladies and Gentlemen: It is a considerable relief to me that the ladies are present, because I am told that the president is a veritable story teller; he will not tell them tonight. (Laughter.) I am not sure, now, ladies, addressing you particularly, that I can say anything that will be of interest to you. It was not always thus. (Laughter.) I do not pretend that I was ever any kind of a success where there were a number of ladies, but I have made progress where the audience was confined to one (laughter). However, I am sure, sir, that we are all delighted to have the ladies with us, and if I could take advantage of my transportation facilities, as the president says, I would do so for the purpose of trans-

porting myself to the gallery. (Laughter.) Not by the long-haul route, but by an air line. (Laughter.)

Now, sir, it is a great pleasure for me to come from what you call my parliamentary duties to meet those who are engaged, as I am, in working out the transportation problems of this country,—I in my sphere and you in yours. But, like railway engineering, there is always a compensation, and it is a great relief for me to come here and get away from parliamentary duties.

I am a little inclined, sir, to be somewhat timid, in coming from a small town and being dropped in the center of a great city like Chicago; but, surrounded by a body of men who are fellow-workers with myself, I am not so much alarmed as I might be; and, further, I am told there are 50,000 Canadians in Chicago, and I feel I can have somebody to depend on in case of stress. I have sympathy, of course, with the men who belong to this association. Our universities in Canada, possibly, have been a little slow in taking up the practical work which pertains to your calling; but they are falling in line now and our universities are being equipped for giving the technical education that is required for the practical lives we have to live to-day and the practical work we have to do. It is a great pleasure for me, although it has its compensations, however, in the fear I have in having a president of a university so close at hand. I feel, sir, there will be no wit and empty rhetoric, but common shop talk in what I have to say. The Engineering Department, as I heard them discussing to-day the question of elevation and grades and compensations, reminded me that some people are moral enough to say that politicians have curves. Others go so far as to say that there is no compensation to the public for those curves. (Laughter.) I am not sure whether that section 4 you were discussing to-day so learnedly would apply to that remark or not. Then, too, sir, we have our up grades of public life, just as you have in the transportation problem. But to my mind the most moral of all the departments of railway construction is the Maintenance of Way Department, because you are always mending your ways. (Laughter.) Perhaps if some of the rest of us did it we would get some applause at times from the great public, but we are so busy watching your ways that sometimes we haven't time to mend our own.

Now, a writer that we all admire has said that he is the truest cosmopolite who loves his native land the best, and you will pardon me if I devote most of my time to-night to the land from which I come. I believe you expect that of me, and I might say, sir, that the only remark I have to make with surety is that I am not at all able to do justice to the subject. If we were to compare the size of the two countries, the United States and Canada, there is little to choose between them. You are older than we are and you have a larger family. Your entire homestead is now pretty nearly occupied by your family. You have 80,000,000 people; we have 8,000,000 scattered over about an equal territory. You have approximately, or nearly so, reached the limit of your arable land; we are just on the verge of tickling the edges of our great productive soil; and we have what I might call the last great West.

Last year was, I might say, almost a record year in its productiveness. We have in the West about 212,000,000 acres of arable land in the three provinces, Alberta, Saskatchewan and Manitoba; and out of that 212,000,000 only 12,000,000 yet are under cultivation, or less than 6 per cent. Last year they produced 364,000,000 bushels of wheat, barley and oats, or, if we take Canada all together, without going into details, per acre of the land tilled we produced 24 bushels of winter wheat and 21 bushels per acre of spring wheat—a record per acre equaled by a few older countries, but by no country on this continent.

The productiveness of Canada, of course, means something to you as well as to us. We cannot live side by side, the United States and Canada, without each reflecting on the other. If we are sane in our commercial relations, your success must mean our success; and if we are successful it must in a measure reflect that success upon your business. Now, sir, that great increase in productiveness of course means an increase in railway traffic and in transportation by our great waterways. It might be interesting, Mr. President, to railway men to know that in Canada our freight has the longest haul, averaging 197 miles—which may be a joy or a sorrow to railway men, just as you look at it and according to the grades you climb.

In addition to our productiveness, of course, in the great West, we have the remainder of Canada. We have our industries, our fisheries, our lumber, our pulp wood and our minerals. It would not be out of place, I think, Mr. President, if I would say, not egotistically, that I think we have in Canada one of the greatest sources of wealth of any country in the world in our fisheries. We have great resources in our timber, in our pulp wood, which I am inclined to think you will want to utilize in the years to come, as you have utilized it in the years gone by.

In the province of Ontario, I think we have the greatest nickel mine in the world. As you all know, Canada and a certain French colony control the production of the world's nickel, and in this age, when so much nickel is being used, and more is to be used in structural work, in ship building and kindred industries, you will agree with me that to have the source of supply for this great commodity is no small thing for a young country like Canada.

Now, sir, we are growing, as I stated before. Our trade this year will be something like $650,000,000, and 47 per cent. of that trade is with the United States, rather proving, as I have pointed out, that it is to the interest of both countries that we should be sane, so far as we can be sane, in the matter of our trade relations one with the other. But there is this point that strikes me—you will bear with me for pointing it out to you—that while you have eighty millions of people, you only bought half as much goods from us as our eight millions bought from you. Now, perhaps we were better able to buy than you were. The fact remains that while you sold us $180,000,000 worth of goods, we sold you some $90,000,000 worth of goods. Again, it brings me back to the point that we are each interested in the other. Now, I must not get on dangerous ground, or, as I might call it, thin ice. I am not here to make any political suggestion from a party sense at all. But naturally in discussing these trade relations the question of what keeps us from trading or what would induce us to trade forces itself on one's mind. You have some things evidently that we want to buy or we wouldn't have bought them—twice as many things as you bought from us—and if we make it impossible for you to sell to us, it will hurt somebody, and whichever way you look at it, you can form the decision from that point of view, whether it hurts the one that is selling or the one that is buying. That is a question of political economy that I dare not discuss.

You have passed a statute, which has received the approval of your president, which enables you on a certain day, a few days hence, to bring into force what is called the maximum-minimum tariff. The maximum tariff will apply to everybody who is not excused and placed on the minimum tariff. We have on our statute books a provision enabling us to put into force what is called a sur-tax, which is really a maximum tariff, or an addition to our regular tariff. That sur-tax was placed upon German goods for several years and only removed a few weeks ago.

Now, speaking for myself, but quite plainly, I think there is no reason under the sun why these two countries, living side by side, should enter upon a tariff war. (Great applause.) We both have clubs to use in our statutes, but I see no reason, I see no tangible excuse, why either of us should

produce the club. Now, sir, I feel that I should not say a word more on that point.

Returning to the Canadian point of view, I want to point out that we have great potentialities for growth. During the last ten years there have come into the Dominion of Canada something like 1,500,000 souls. During that time, I am happy to say, there have come from the United States into Canada something like 500,000 souls. They did not come without bringing something with them. They are not only able to hew out homes for themselves, but they have brought some capital with them, and it is estimated that these people from your country coming into ours brought fully $400,000,000 with them in cash and household effects. Now, $400,000,000 coming from the United States to Canada is more than all our national debt, so you see that during the last ten years you have given us enough to wipe out all the debt we have in Canada and have enabled us to put quite a surplus in the treasury. (Applause.) For this, sir, I will ask you to join me in thanking the United States.

We are glad to have your people come and take up their abode with us, and you need not at all, sir, have any fear that any stock is taken in certain scare-head despatches you occasionally see that there is any fear in our country that these settlers will not make first-class citizens of the Dominion and first-class Canucks. You say, that was during the last ten years, but what about the present time? I might say that during the last ten months we have had 81,000 of your fellow countrymen come over to be fellow countrymen of mine. They look good to us. (Laughter and applause.) And, sir, I want to say again, that we are delighted to have them with us, and particularly are we delighted because 43 per cent. of these men take up homesteads in our great Northwest and are today assisting in producing goods that somebody will have to build railways to carry out of the country.

Now, sir, we have great potentialities for growth in other directions, but the ones I have mentioned are perhaps the most interesting to you. In Canada we have taken upon ourselves great burdens in the matter of transportation and in other matters as well. There is a different system prevailing in Canada in respect to the initiation of a railway project from what exists in this country. You in your country, I think, in the main, do not have to go to Congress for an act or statute to enable you to be incorporated to construct a railway. In our country a charter has to be procured, and we have to place on the statute book that charter with its various provisions, before those wishing to undertake that work can do so.

I often come in contact with the great body of intelligent engineers in relation to these matters, because it devolves upon me, Mr. President, when the capitalists intend to build a railway, to help them locate the railway, to help them make up their minds where they will put it, not where they would like to put it, but where they will put it. (Laughter and applause.) In a new country everybody is anxious for the railway line to come as nearly as possible his way, and it is not an easy task to approximately please the population who are trying to get this railway communication, and are crying out for it, without having the railway companies harbor feelings of discontent. Sometimes they are more enthusiastic than that. (Laughter.) My position in that regard is not a bed of roses, but notwithstanding my Scotch name, I am Irish, and a bit of a scrap does not hurt me in the least. (Applause.)

When a charter is applied for and granted, and the location is about to be made, the railway company applies to the Department of Railways and files its location plans. These have to be approved by the head of the Department of Railways and Canals, and our Board of Railway Commissioners can not vary that location one mile either way, after it is approved by the minister. It is an advantage that the people are invariably consulted as to where the line will go, and although they are not always pleased, it gives pretty general satisfaction to them to know that a responsible minister has it in his hands to locate the line of railway or to approximately do so, because in our country they can get at a member of the Government very quickly. He sits in the House of Commons. The members of your cabinet do not have a place in Congress, and are not subject to the heart-to-heart talks and the face-to-face exhortations that we are. (Laughter and applause.)

We feel it our duty, so far as the finances will permit, to give the people we bring into our country the fullest opportunity to get value for the labor they put upon the soil introducing their crops, and in order to get that value the price of transportation must be reduced to a minimum, because the nearer you can get the consumer and producer together the greater will be the revenue that comes to the man that produces the goods.

Now, sir, in the Dominion of Canada we have been more than liberal in our aid of the railways. Out of the federal treasury alone we have given $135,549,000. The provinces, corresponding to your states, have given $35,500,000. The municipalities have given about $18,000,000. The government of Canada owns railways itself and operates them, which have cost $111,000,000. They are now building another line which will cost approximately $125,000,000. All told, there has come directly out of the people for railway transportation in Canada $425,500,000. But that is not all, sir. In addition to that, in years gone by, when land was not as valuable as it is now, large grants of land were given to the railways, to the C. P. R., among others, and the balance of these railways were guaranteed by the government of the Dominion and the governments of the provinces.

All told, I think the people of Canada, who now number possibly 8 millions or 7½ millions, have given directly for transportation, $750,000,000, or about $100 for every man, woman and child in the Dominion of Canada. In addition to that, of course, is the private capital invested, about one billion and a half, in railways. In our maintenance of way last year in the Dominion of Canada, the railways spent 20.2 per cent. of their operating expenses—I thought I would say that to you so you would let me know quietly, some of you, if that was the proper proportion or not. (Laughter.)

Some four or five years ago the government conceived the idea that we ought to have another transcontinental line, and immediately they proceeded to arrange for its construction. The Grand Trunk Pacific line will be approximately 3,600 miles; 1,804 miles of this line, from New Brunswick to Manitoba, are being constructed by the govvernment. The Western branch, to the Pacific coast, is being constructed by the Grand Trunk Pacific Railway itself. When these two divisions are completed the Government will lease to the Grand Trunk Pacific for fifty years the Eastern division for its operation, so that we will have in that line a government-owned and company-operated line; on the other half, a company-owned and government-operated line. But as you have in the United States, so we have in Canada a body that thoroughly regulates all the railway companies to see that they do not charge exorbitant rates. I am sure you are enthusiastic over that. (Laughter.) Now, sir, we are told, and you are told, that that line is going to cost a lot of money, particularly the Eastern division. I would not dare say a word about the cost of the Western division. It will be large, I suppose as it ought to be, but the

Eastern division being a government-constructed line, comes under peculiar and particular criticism. As against east-bound traffic, which will be the greater amount of traffic, we will have a grade of 0.4 of 1 per cent., except in one or two places where pusher grades will be used, while against west-bound traffic the grade has been obtained of 0.6 of 1 per cent.—almost a level line.

Then we have another line in the Dominion of Canada—and who has not heard of McKenzie and Mann?—they have been constructing lines in different parts of the Dominion, east and west.

Now, as to the great waterways of the Dominion of Canada and the United States in common—this perhaps has not impressed itself upon you, who are along the Great Lakes in this section—but Canada owns the gateway of the St. Lawrence.

Then, sir, we have our great canals. You have your canals; we have nineteen. We are going to have more in a few years. I will not at all discuss with you the advisability of enlarging the Welland canal; that is one of the things that will be done in a few years, so that the five hundred and more great lake vessels that now have to stop at Port Colburne and unload will be able to go through the Welland canal down at least through the lakes to the head of what is known as the St. Lawrence canal. When the Welland canal is deepened, wheat can be carried from Duluth to Montreal, forwarders tell me, at a fair profit at three and a half or three and five-eighths cents per bushel. What is known as the Georgian Bay canal project is now before the people not only of Canada, but of all the world. That canal, of course, would connect the Georgian Bay at Lake Huron with Montreal, where there is a deep ship channel going out to sea. It would save a good many miles even over the Welland canal and the Great Lakes route.

The government is beginning this year to start the construction of the Hudson Bay Railway; that is, a railway from the center of the wheat belt of our great West to Hudson Bay. It will not only afford a splendid means of transportation for the grain products, but it will give an advantageous route for the stock of the great western lands to be carried to the markets of the old country with a very short railway haul and a cool route as long as navigation is open, which is a great advantage in the transportation of stock.

Now, as to the Quebec Bridge project. The Anglo-Saxon race never knows defeat; what they undertake they generally accomplish; and the government of Canada has taken over that project from the Quebec Bridge Company and has placed it in the Department of Railways and Canals. When the government took over this project, I suggested—and they adopted it—the formation of a board of engineers, prominent bridge engineers, to whom would be given full authority to make the plans, and to see that the bridge was constructed under the plans, so that if there as failure we would know where the failure ought to be placed. Mr. Fitz Maurice, the chief engineer of the County Council of London, England; Mr. Votely, of Montreal, and last, but by no means the least efficient and able member of that board, is Mr. Modjeska, of the city of Chicago. (Applause.) The span of this bridge will be nearly 800 feet; the width, 88 feet; and it is designed to carry two double steam railway tracks, two electric lines, two roadways, as well as accommodations for foot passengers, You are engaged in a great work; so are we. Our relations are most cordial; they ought to always be. If you will allow me in the words of a very crude couplet, which some of you may recognize, though slightly modified, I will express the feelings we have in Canada towards you:

Dear Samuel, we like you; yes, we do;
We are proud of your gentile touch;
But we cannot leave Mother, not even for you;
She is so kind and we love her too much."

(Applause.)

Ralph M. Shaw.

Mr. Toastmaster and Gentlemen: The ordinary railway man at present is in very much the same mental condition as was Swanson after the accident to Oleson. Upon being placed on the witness stand he was asked:

"Gus, did you see the accident to Oleson?"

A. "Yah."

Q. "Well, tell us about it."

A. "Well, me and Ole we was walking along the track and Aye heard the engine coming, and when it passed by Aye stepped on again, but Aye don't see nothing of Ole, and by and by Aye tank Aye see Ole's hand, and by and by Aye tank Aye see Ole's leg, and then Aye tank Aye see Ole's hat, and then Aye tank Aye see Ole's head, and Aye say to myself, 'By goll, Aye tank something must have happened to Ole.'"

The very name—the American Railway Engineering and Maintenance of Way Association—implies a picked body of men. You it is who have conquered the morasses, bridged the rivers, tunnelled or scaled the mountains, and by economies in construction and operation have, regardless of advancing wages and increased operating expenses, made it possible for the companies in recent years to maintain a balance upon the right side of the ledger.

The Constitution says that Congress shall have the power "to regulate commerce among the several states." In my judgment the framers of the Constitution had no purpose in view in conferring upon the Federal government the power to regulate commerce among the several states, other than that they could thereby prevent the various states from imposing restrictions upon the free interchange between themselves of their agricultural, mining and manufacturing products. If at that time Congress had attempted to determine, by law, the details of the construction of a stage-coach plying between New York and Philadelphia; or to fix the rules of liability as between master and servant in cases of accident; or the number of hours which the coachman might drive, it would not have been tolerated for a moment, but would have been denounced and repudiated as an unwarrantable interference by the legislature with the rights and privileges of a free people. (Great applause.)

Forty years later, the state of New York attempted to confer upon Robert Livingston and Robert Fulton the exclusive right to navigate upon all of the waters within the borders of that state. That grant of power was attacked by owners of vessels coming from points outside of the state and destined to points on the island waters of the state, and the interpretation of the phrase "to regulate commerce among the several states" came before the United States Supreme Court. In interpreting the phrase, Judge Marshall said:

"Commerce, in its simplest signification, means an exchange of goods; but in the advancement of society, labor, transportation, intelligence, care and various mediums of exchange, become commodities and enter into commerce; the subject, the vehicle, the agent, and their various operations become the base of commercial regulation." No definition has since been given which is so compact, so complete and so far-reaching. This power was never attempted to be exercised by the government until 1887, when the federal government, for the purpose of eliminating abuses arising the great development of the country, passed the original Interstate Commerce Act, ordinarily known as the Cullom Act.

Congress or one of its administrative bodies now regulates many of the most important incidents of ownership which formerly belonged to the companies. They have left to them only the shell, the right to operate, and the right for which they are in a great measure indebted to the Supreme Court of the United States, to make a modest return on the millions invested.

It is claimed by eminent men, such as President Hadley of

Yale University and ex-President Roosevelt, that if a correct valuation of the railroads was now to be made, that the outstanding capitalization of all the railroads of the United States, at par, would not exceed their present physical value. Upon this valuation they are not now earning to exceed four per cent.; the owners of capital invested are dominated by a power which exercises these incidents of ownership and has none of its responsibilities.

We search the statute books and laws of Congress in vain for a single federal enactment which has been devised and passed for the benefit of the railway companies. For the farmers who may buy land, work it and sell it as they please and charge such prices as they can get; for the manufacturers who may earn unlimited sums upon the capital invested, the Congress of the United States has passed a protective tariff. For the railways it has enacted laws which tend to diminish profits.

The railways themselves are heavy buyers of manufactured commodities. As was stated by Samuel O. Dunn in an article published in August, 1909, if there was no tariff in this country, foreign rails could easily be shipped here and sold for $22 to $25 a ton, and the United States Steel Corporation could easily meet this price; for the cost of making rails in this country is lower, as Andrew Carnegie has said, than anywhere else in the world. But there is a tariff per ton, which enables the domestic manufacturers to charge American railroads $28 per ton. Suppose now that the railways, in order to recoup themselves for the high price that they pay for rails, should advance their rates on iron and steel; there is not much doubt, in view of the Interstate Commerce Commission's decisions in many similar cases, that this raise in freight rates would be held unreasonable and illegal. (Applause.)

These considerations, however, though of moment, are of but small importance in comparison with one great defect in the present relations between the government and the railways. I refer to the safety-appliance and hours-of-labor legislation.

While for the purpose of complying with the laws, millions have been spent and are being spent by the companies for improvements in equipment, etc., not one law has ever been passed by the federal government aimed at fixing individual responsibility for accidents. In Mexico, at whose laws and civilization we sometimes sneer, when an employe of a railway company, through his negligence, is responsible for an accident resulting in damage either to person or property, he is punished promptly by the state. There are similar laws in England and Canada.

During the past few years one of the great systems in this country has spent more than five million dollars in installing along the entire line of its road the most modern safety and signal appliances which human science has yet been able to devise. Within a year four bad wrecks have occurred on the line of this road, resulting in enormous loss of life and property, caused by the neglect of the train crews to recognize and follow rules and regulations established for their safety, and which, if observed, would have prevented the accidents. There is no law under which they may be punished. The railway is responsible for the accident and must pocket the loss and pay the damages.

Under the Federal Safety Appliance Act it is not made a crime for an employee to couple up a defective car into a train, but it is made a crime for the company, who has no knowledge of the defect, to haul the car so coupled up, and use it for transportation purposes. The employees of the company are urged to report violations of the law to the employees of the government. In other words, the men who make the company violate the law, by refusing to report defective cars, or by coupling them into trains with knowledge of their defects, are encouraged by the government to report violations so made against the companies, who are substantially helpless in the matter.

No greater injury could be done to the confidence and good-fellowship which ought to obtain between the companies and their employees than to create and promote such a system of espionage, by which those who violate the law and are by the law held blameless, become the witnesses in criminal cases against the companies, who are not responsible, morally, for the violation. It destroys discipline and creates hostility. It is an evil which, in justice to those who have the responsibility, but not the power, should be rectified by the government, which has the power and not the responsibility. (Applause.)

Dr. Harry Pratt Judson.

We are fortunate in this country not to have much of a leisure class. Men who are brought up with an ample income and with no particular necessity for work, may or may not be useful members of a community. In some countries, no doubt, some of them have been valuable in public service and also in their devotion to literature and science, but the tendency invariably in such cases is to create a body of men whose chief occupation in life is amusement, and they are of no particular value to the community at large, and, I fancy, of not much value to themselves. In this country, thus far, the necessity of work is pressed hard in everybody, and therefore we have a generation of active workers, with a knowledge of multifarious affairs of business and professional endeavor. Our colleges, therefore, are not places of elegant leisure, but places designed to train young men for active life in some shape, and the first duty of the college is obedience to the fundamental life of our most modern society, and that is to the life of service.

No one is really entitled to a place in our social organism unless the sum total of his efforts is a benefit to the community. In short, in whatever line of life he engages he should render a distinct and valuable service to his fellows in order to be entitled to rewards which normally should follow from industry. This is true of manufacture, and of commerce most distinctly. It is true of various learned professions. It is undeniably true of those engaged in the great activities of transportation. Modern society in all parts of the world and in all its developments rests fundamentally upon the means of transmitting intelligence and transporting persons and commodities from place to place. If the modern means of accomplishing these needs should be materially crippled, our most industrial cities would be paralyzed. On the other hand, with the advance of industry, improved methods are applied also to transportation. Thus these lines of transportation are arteries of social life. They carry the blood into all parts of the social organism.

As young men grow up they should be afforded by the community facilities for preparation. These facilities should run to the particular lines of life which it is likely they will follow. Roughly speaking, you may divide education then into two groups, which we will call for convenience the lower and the higher. Lower education affords the general basis of intelligence which should prepare for good citizenship and which should enable one in some lines of labor to earn an honest living. The higher education affords that basis of intelligence and aptitude which trains one for activities resting on a large basis of expert knowledge. This is true of the life of engineering and medicine. All these can be prosecuted successfully only by one who is master of a considerable body of scientific knowledge. This body of knowledge it is the function of institutions of higher learning to provide.

At the same time these professions require not merely a basis of knowledge in these sciences, but also expertness in the application of this knowledge. These applications are continually changing. New methods are being devised all

the time. One who is thoroughly versed in the methods of today may be entirely at sea in a year or two, unless he keeps pace in advance of knowledge. Therefore, for the proper training of young engineers, there is needed not merely fundamental schooling, to which reference has been made, but also constant practice of the applications of schooling to practical conditions. Engineering schools, of course, attempt to do this, but in all schools of this kind, which have come to my knowledge, there is the grave difficulty that this training tends constantly to lag behind the progress of the profession. I have been told by the head of an engineering school that when expensive machinery is installed, very soon it is found that this machinery is already far behind the times. Young men who are trained in its use are of little value.

It seems to me that a solution may be found for this difficulty if a combination can be effected between the school on the one hand and the profession on the other, so that the student in constant touch with the actual application of what he is learning. In some branches of mechanical work, for instance, the matter has been solved in this way: Students are arranged in groups of two, one being always in the school and the other always in active work. In one school, for instance, the student has two weeks in school and then two weeks in the shop. Of course, in other branches of activity the time may be readily changed, the student remaining two, three, or four months in school, then taking a similar time in active employment. If this can be carried out in engineering as effectively as it has been in some branches of mechanical art, it would seem that the student might benefit from the practical experience which he should acquire, accompanying his theoretical thaining, and the profession he might gain from supplies of intelligence and assistance. In the long run I believe that the product of such combined training would reinforce the profession by a body of better trained and more practical men.

Certainly all of the colleges have the means to advance this profession, a service for which they exist under the general law of service, and it is the duty of every college to render an immediate benefit to the welfare of the community in which it is placed.

The purpose of the university in its largest sense is somewhat different. The essential university idea is that of investigation and discovery of new knowledge. It is the belief of many thoughtful engineers that there is a field for research in engineering, which would be of great value to the profession. If the university should undertake this line of activity, it would involve investment of considerable funds and of constant employment of a number of experienced and successful engineers in pursuing these specific investigations. This to the university is an interesting subject for inquiry, and it seems likely that the time is not far distant when the university should be able to render this important service to professional engineering.

Hon. Milton J. Foreman, Member City Council of Chicago.

Mr. President, ladies and gentlemen of the association with an unspeakable name: I feel that I have a peculiar right to talk here tonight, because for eleven years I have been advising the managers of the railways in this city how to run their roads, and for eleven years they have studiously and steadfastly violated my advice and ignored it. (Laughter and applause.) I do not retract a word, even though my advice has been found wanting. It is natural that there should be on the part of railway men some impatience at the legislative operation of railways. Men in the legislative bodies cannot understand that. Railway men can.

If I were to talk about the relation of legislative bodies to railways, I would say that the relation is that of a mother-in-law, a kind and gentle mother-in-law, but one who is not sparing in her admonitions.

Now, we, in Chicago, had some experience with railway engineers. We have discovered that they are a hardy race; their patience and faith outruns their work, so far as the city of Chicago is concerned. We have a faint, glimmering idea that some time we would like to have locomotives quit smoking—just a diaphanous day dream, gentlemen, born in the solitude of our legislative chamber. We consult the railway officials, and they say, "Certainly; perfectly feasible, and we will refer it to our engineers, to show you how absolutely impossible it is." (Laughter and applause.) If the engineering department of a railway is good for nothing else, it is good to show the utter futility of cities attempting to do anything they think they would like to do. They do not shock us, by telling us, brutally, that we cannot do it; they accommodatingly show us a series of blue prints, with wavy lines, and after we have seen these blue prints, series and tomes, and volumes and editions, they tell us it is absolutely certain now, that it can be done, but "we have got to get out another set of blue prints to show you how impossible it is." (Laughter and applause.) I applaud their patience and ingenuity. Of course, I do not think that everything is true that is said about them.

I was at a funeral once and the pastor delivered a very glowing tribute to the dead man, and while he was talking a distinguished lawyer of Chicago, who is now dead—I say that to differentiate him from Shaw—walked over and looked into the coffin very intently, and tiptoed back to a corner of the room, and after the funeral services were over the minister said, "My friend, why did you look at the corpse?" The lawyer replied: "In listening to what you had to say, I came to the conclusion that I was at the wrong funeral." (Laughter and applause.) So I am willing to justify the lack of works on the part of the railway engineer, so far as Chicago is concerned, in view of the tremendous faith and energy they show in giving us illustrations of what ought to be; not that Chicago is without engineers of its own. Now, the railway problem, so far as Chicago is concerned, and I speak of Chicago particularly, is an engineering problem. We leave to nations the matter of the regulation of rates, and to states the regulation of the safety of passengers, and to nations, too, and to states, also, the proper regulation of railroad lawyers, but ours is an engineering question. It is a question of track, stations, elevation, switches, frogs and that sort of thing, and it is upon you that we depend for the proper solution of these things, not that we have not got engineers in Chicago, not that we have not got engineers in the City Hall—we have tried engineers there. (Laughter and applause.)

We have even got some against whom charges have not yet been filed. But it is a particularly special piece of work and the city of Chicago is very much indebted to the railway engineers for what has been done. No city presents as many physical difficulties as Chicago. It is idle for the people to say the railroads owe us a duty. Chicago and the railways are tied together. They are as necessary to one another as much as it is possible for two things to be dependent upon one another. They cannot get along without one another. Chicago's life has been a life brought to it by railways. The railways are getting their life from Chicago. Chicago is a trading post. They may call use an overgrown village, but it is a great trading and manufacturing place, but requires railways. But that does not excuse the railways from doing their duty. I know they have hard luck. I have listened to Brother Shaw. They have almost as hard luck as a chap who owed a friend of mine money and he used to pay him


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interest every year by check. He finally got so hard up he couldn't pay interest any more, and he finally sent the interest money by money order. He said, "I went on to the Stock Exchange, and it broke me. I have had such hard luck that if the good Lord said, 'Come forth, Lazarus,' I would come fifth." (Laughter). So you see, I am not without sympathy for the railways. Much has been said about repressive and regulating legislation. Much legislation is unnecessary. Perhaps some is necessary. But no public service corporation that reflects and responds to the just requirements of the public need have fear of oppression or interference. The people are quick to recognize when they are justly treated. I recognize the fact, and I agree that in the first years of railroading and up to the present time there has been much uncertainty, much guess work, and occasionally there has been some sandbagging. There is no doubt about that; but let the municipalities and the railways work hand in hand; let the railways grant and give these things to the people that the people are justly entitled to, no legislative body dare, no legislative body will impose restrictions, regulations or oppressions on railways or on any other public service corporation. We have had experience in Chicago for years. It was the open season on quasi-public corporations. It was a mighty poor alderman that couldn't take a shot at a street railway company every morning. We have well defined ordinances and well defined laws. Five years more will find the entire public service question in Chicago settled. There will be well defined principles, and well defined ordinances for street railway companies, electric light and telegraph companies, and they will be out of politics and out of the legislative hall. (Applause). I don't blame the corporations, particularly railway corporations, for not wanting to be governed by city councils and legislatures. I have been at Springfield myself as an on-looker, and I recognize some of the irrational laws represented by miners, but that is often due to the unwillingness of the public service corporations to recognize the trend of public demands, public needs and public rights, and instead of respecting public needs, the public rights and public demands, they wait until they are forced upon them. Instead of controlling the public service question, they permit it to be controlled by men for personal needs or personal gains. There is as much political wisdom in the railway business as there is in any legislative hall. There is no reason why the public service policy of this country should not run hand in hand with the operation of public corporations serving the public. If the public service corporations, moved by an enlightened selfishness, will recognize the public tendency of things and grasp the opportunity to work out these problems with proper public officials and the proper public organizations, we will have no trouble with sandbagging of the public corporations. The public will supoprt the move, no matter from whom it comes, and if not, it will be because the public service corporations have left the field to either the reformer so-called, or to the man who uses public service corporations for his own purposes or aims. I do not mean that the public service corporations should go into politics, but I do mean the result of their service can make harmless any oppression or sandbagging tactics. The transportation problem in Chicago, the smoke problem, and the station problem will be solved by the city of Chicago and it has been taken out of the city council for all time. There is a close bondship between a city and its railways. Where one profits the other profits, where one loses the other loses. Public service corporations operating without profit operate at the expense of service. A profitless public service corporation is a drag and a detriment to the city, to the state and to the country, and railway corporations and every corporation must recognize the fact that they stand in a different relation to the people than any other form of industry; that they bear a practical duty, and when they fulfill their duty they need have no fear that there mother-in-law will give them the bed-slat. (Laughter and applause).

A. H. Rudd.

Mr. Toastmaster and Gentlemen, and You to whom we look up as a benediction that makes our lives worth living, it seems almost a crime to introduce such a disturbing element as a signal man, and I notice that even the thought of it has begun to thin out the audience. The evening probably has passed very quickly with you, but I feel like the gentleman Mr. Foreman told about, Lazarus. I have come fifth. And I have been reminded of the story of the poor fellow at the hospital who was lying in a sick bed for a long time, and finally one day he decided he would like to see what he looked like, so he reached over on the table at the head of the bed and picked up, instead of the mirror, a hair brush. He gazed into it a few minutes and said, "Gee, I need a shave." (Laughter.) I feel if I had waited here about five minutes, I would need a shave.

In figuring out why I was asked to speak to you I was reminded of the story of the farmer who set a poor, puny, little bantam chicken on an ostrich egg, and somebody said to him, "What in the world did you do that for?" "Well," he said, "I wanted to see the durned little thing spread itself." Now, I suppose that is what the gentleman had in mind when he requested me to address you.

When I listened to the eloquence of the Hon. John W. Lawson last year, and when I listened to the speeches tonight and thought of my own lack of eloquence, my own lack of information, I felt like the old minister who used to draw a comparison between his insufficiency and others' sufficiency, and he used to say, "When God made a whale He made a minnow; when He made an elephant he made a flea; when He made me He made a daisy." After hearing Mr. Ross and Mr. Graham, after coming in pleasant contact with such notable men last year, and with other honored members from Canada, especially those we have particularly honored—where is Kelley? and Mr. McNab?—I have always understood why it was that Canada was the greatest country on the western continent—north of the United States. But I don't think that we ought really to forget some other members of Canada who have contributed tremendously to make that country what it is. A friend of mine who was in Canada last year met a most enthusiastic French Canadian and got discussing Laurier with him, and the French Canadian said, "Laurier, he ees ze greatest man ever live." "Well, now," my friend said, "how is he the greatest? there is Washington." "Yes, of course, dere ees Washington; he vas president; but he ees not so great man as Laurier." "Well, there is Napoleon?" "Oh, of course, Napoleon, he great general, but he not so great a man like Laurier." "Well, there is the Czar?" "Yes, he great emperor, but not so great a man ees Laurier." In desperation my friend said, "Well there is God?" "Oh, yes, of course, there is God; but Laurier he a young man yet."

I came, gentlemen, from Philadelphia, the land of gastronomy, the home of catfish and waffles, the resting place of scrapple. I felt like it to-night. We have been taught—were taught there—that the foot that rocks the cradle rules the world. We found out lately that the man that rocks the trolley car rules the city. In Philadelphia, they say in New York. they don't eat snails; not because they are very cannabalistic, but because they can't catch them. We have been going some there lately. We have developed a new declaration of Independence. The Independence of the Sons of Martha is my toast, from the contractual obligations to their employers, as evidenced by the general sympathetic strike. Now, there is a chance for a whole lot of talk, a whole lot of eloquence, but I am not going to attempt it, because I am in the same fix as the old lady from Ireland was when her neighbor accused her dog of having bit her boy Patsy and she denied it.

Her neighbor was also from Ireland, and the dispute ran in this fashion: "Your dog bit my boy Patsy last night." "He did not." "He did." "He did not." "He did." "He did not, for three reasons: In the first place, my dog is too old to bite your boy Patsy; in the second place, he has no teeth to bite your boy Patsy with; and in the third place, I haven't any dog in the first place." And that is the truth of my eloquence.

The Sons of Martha is a generic term, I understand, for those who labor with their hands as well as their brains.

Aside from the laborers, there is another class of the Sons of Martha, the young engineer, and he was asked how he would obtain the height of a house by means of a barometer, and he said he would tie it to a string and lower it to the street and draw it up again.

In closing, before we adjourn to the palm room, I suppose, I want to read a rather old poem. I am sorry I must read it, but when I was seven years old, under the tutelage of my honored grandparents, I committed to memory that grand old hymn "Barbara Fritchie." While this poem is, I believe, intended to cover the Sons of Martha that labor with their hands, a poem by Rudyard Kipling, I think it refers particularly to the engineers as we know them, and is especially applicable to our work in all its branches. There is an uplift and inspiration for those who love our profession, that it is well worth keeping before you.

The Sons of Mary seldom bother, for they have inherited that good part,
But the Sons of Martha favor their mother of the careful soul and the troubled heart;
And because she lost her temper once, and because she was rude to the Lord, her guest,
Her Sons must wait upon Mary's Sons—world without end, reprieve or rest.

It is their care in all the ages to take the buffet and cushion the shock;
It is their care that the gear engages; it is their care that the switches lock;
It is their care that the wheels run truly; it is their care to embark and entrain,
Tally, transport, and deliver duly the Sons of Mary by land and main.

They say to the mountains, "Be ye removed!" They say to the lesser floods, "Run dry!"
Under their rods are the rocks reproved—they are not afraid of that which is high.
Then do the hilltops shake to the summit; then is the bed of the deep laid bare,
That the Sons of Mary may overcome it, pleasantly sleeping and unaware.

They finger Death at their glove's end when they piece and repiece the living wires.
He rears against the gates they tend; they feed him hungry behind their fires.
Early at dawn ere men see clear they stumble into his terrible stall,
And hale him forth like a haltered steer, and goad and turn him till evenfall.

To these from birth is relief forbidden; from these till death is relief afar—
They are concerned with matters hidden—under the earth line their altars are.
The secret fountains to follow up, waters withdrawn to restore to the mouth—
Yea, and gather the floods as in a cup and pour them again at a city's drouth.

They do not preach that their God will rouse them a little before the nuts work loose;
They do not teach that His pity allows them to leave their work whenever they choose.
As in the thronged and the lightened ways, so in the dark and the desert they stand,
Weary and watchful all their days, that their brethren's days may be long in the land.

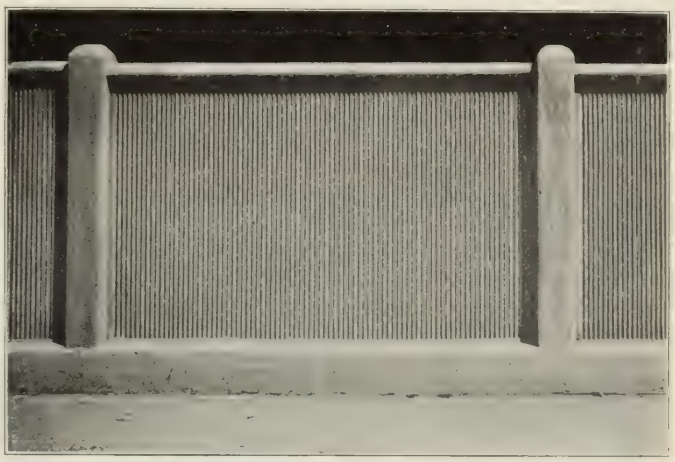
Lift ye the stone, or cleave the wood, to make a path more fair or flat—
Lo! it is black already with blood some Sons of Martha spilled for that.
Not as a ladder from Earth to Heaven, not as an altar to any creed,
But simple service, simply given to his own kind, in their common need.

And the Sons of Mary smile and are blessed—they know the angels are on their side.
They know in them is the Grace confessed, and for them are the Mercies multiplied.
They sit at the Feet, and they hear The Word—they know how truly the Promise runs.
They have cast their burden upon the Lord, and—the Lord he lays it on Martha's Sons.

REINFORCED CONCRETE FENCE FOR THE LONG ISLAND.

BY J. P. H. PERRY.

Although concrete has become very popular during the last few years and has been adopted in many forms of construction, its use for building fence is comparatively new. The Long Island Railroad, in connection with a very large improvement at Flatbush and Atlantic avenues, Brooklyn, N. Y., consisting of a terminal station, subway and depressed freight yards, built nearly two miles of reinforced concrete fence, which is exceptionally pleasing in appearance and decidedly satisfactory from an engineer's point of view. A section of the completed fence is shown in one of the illustrations herewith.

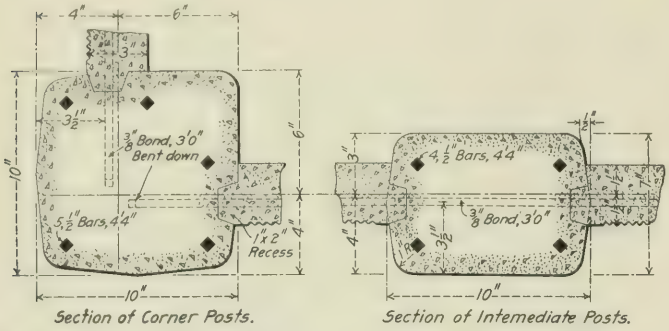


Section of Finished Fence.

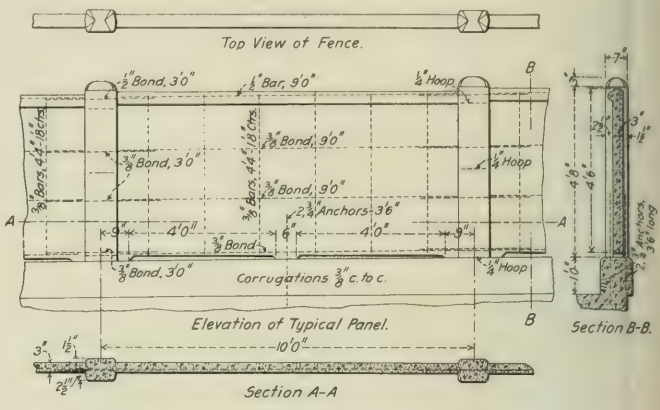
The considerations leading to the choice of concrete for fence construction by the engineers of the railway are as interesting as the structure itself. The Atlantic avenue terminal yards, which this fence encloses, is almost exclusively of concrete. Not only are the retaining walls of this material, but the stairs, platforms, bridges, floors and roofs are of concrete. It was therefore logical to make the enclosure of the same character of construction. More important in the discussion of the different types of fence

possible of selection was the necessity of having one through which the general public could not see. Wood was eliminated as being not alone only temporary in character, but unsightly and not in keeping with the monumental nature of other structures. The usual designs of pipe railings, pickets or parapet received little consideration. The style chosen avoided all the disadvantages of the more common forms of fences. The only serious objection to concrete was the use to which small boys frequently put it. Smooth concrete surfaces are often defaced by being marked upon. This condition was overcome by corrugating the street side surface of the fence. Some parts of the Atlantic avenue fence have now been standing for nearly two years and are so far unscarred.

The details of the design of these fences are shown in the line cut. The panels are generally 3 in. thick and 9 ft. long. They vary in height from 4 ft. 8 in. to 6 ft. The



Cross Sections of Posts.



Elevation and Sections of Concrete Fence.

reinforcement consists of ⅜-in. cold twisted steel bars, spaced 20 in. on centers, horizontally and vertically. The posts between the panels are reinforced with four ½-in. bars and are provided with horizontal bond bars as indicated.

In building these fences, two methods were employed. At first the panels were cast in a horizontal position, and after the concrete had set sufficiently to permit safe handling, were placed on the coping of the retaining wall. By this method, the sections butted against each other and were held in place by knee braces, and the posts did not come between the panels. The more successful scheme consisted of casting the posts in position, after which the forms for the panels were set up and filled, alternate panels being concreted. This latter method is shown in the half-tone illustration herewith.

The corrugated surface on the street side of the fence was obtained by fastening a sheet of corrugated iron to the inner face of the form. In good weather, the forms for the panels could be removed in about 12 hours and used again in the next section. After a considerable portion of the fence had been concreted, white sand and La Farge cement, in a 1—2 mixture, was applied with a brush. This produced a uniform color and gave a whiter surface than would the plain concrete.

The cost of this fence was about $3 per lineal foot. The rate of production was about 450 lin. ft. of finished fence per week in good weather. The plans were prepared in the office of J. B. French and F. Auryansen, bridge engineers, successively, under the direction of J. R. Savage, chief engineer. The Turner Construction Company, New York, were the contractors.



Method of Casting Alternate Panels in Position.

Conventionalities

The Chicago Engineers' Club extends its hospitality and the privileges of the club to the members of the association during the convention.

One of the chief enjoyments of William R. Webster always comes in March. He meets more men in a bunch who understand rails approximately as well as he does himself than he is able to get together on any other occasion.

It is said that a house divided against itself shall not stand, but the committee on "Signaling and Interlocking" seems to stand fairly well. Each side is well buttressed, the majority by A. H. Rudd, chairman, and the minority by L. R. Clausen, vice-chairman.

The rites in connection with the work on "Masonry" were very brief—possibly because the only approach to regalia available consisted in the white sheet drapery of the official table which, by a stretch of imagination and a cloth, might be considered a continuous apron.

One of the most noticeable features of the present convention is the full attendance. Many times during the sessions practically every chair in the large hall was filled and there were, besides, several more or less complete rows of innocent by-standers along the rear of the room.

The committee on "Track" mustered 13 members to sit behind the table when its report was up. It may have been an unlucky number. It was noticed that when one vote was taken there were a few scattering votes "ay," from the floor, and a solid phalanx of "no" from the platform, with no support from the house.

Frank R. Coates, he makes rings now, though not exactly in the jewelry business. They are largely in the form of tires. However, the arduous duties of the presidency of the Interocean Steel Company have apparently not kept him from absorbing frequent and generous draughts from the fountain of perpetual youth.

The fine Boston hand of Prof. C. F. Allan appears to have operated to good advantage on the report of the committee on "Economics of Railway Location," judging from the incisive statement of technicalities involved as covered in the synopsis forming part of the official program. The professor was early on the ground and brought his genial smile with him.

It is a prevailing belief that a training in newspaper work is of advantage in almost any subsequently chosen calling. In support of this belief it may be stated that the chauffeur who has so recklessly and well driven The Daily Railway Age Gazette's limousine copy basket during the present week has been selected as the driver of President Taft's car during his stay in Chicago.

It is unfortunate that the acoustic properties of the convention hall are so bad, and yet the hall gives an interesting example of the manner in which sound will follow curved surfaces. Facing the president and the committee platform every word can be heard, as the sound apparently follows the arch of the ceiling. But along the axis of the room the sound simply refuses to travel.

T. J. Foley, heretofore assistant superintendent of the Union Pacific, with headquarters at Omaha, Neb., has been appointed assistant to Vice-President W. L. Park of the Illinois Central, with office at Chicago. For the past four years, while located at Omaha, Mr. Foley has had charge of the terminals at Omaha, Council Bluffs and South Omaha. He has also done important special work for the transportation department. He was connected with the Pennsylvania for 15 years at Fort Wayne, Ind., and later for five years in the general offices at Pittsburg. In 1902 he was appointed assistant general manager of the Baltimore & Ohio and was later superintendent and general superintendent.

When J. M. Meade, engineer of the Eastern lines of the Santa Fe, and T. Hickey, roadmaster of the Michigan Central, appeared in the session during the discussion of the report on "Track," their presence indicated the gradual drawing together of the technical and practical men interested in the proper construction and care of track. Mr. Meade remarked, "Hickey and I were in it before the flood."

A. E. Killam, inspector of bridges and buildings of the Intercolonial Railway of Canada, was noticed among the attendants of the convention. Mr. Killam is not listed as a member, but ought to be. He has been one of the most active and valuable members of the Association of Railway Superintendents of Bridges and Buildings, and his character as a genial gentleman is evidenced by the fact that he answers unhesitatingly to the name "Johnny Bull."

An unusual feature of Tuesday's session was the presence of delegations of students from nearby universities. There were four men from the engineering department of the University of Wisconsin and several from Purdue. In this early enlisting of interest in the work of the association on the part of those who are students now, but may eventually become members, we fancy we notice the influence of Herren Profassoren Turneaure, Pence and Hatt.

An innovation that is worth following in the meetings of any association in which all the members are not interested in all of the subjects or at which there is frequent going and coming, appeared in the convention hall yesterday. This consists in the provision of a series of neat signs painted in large letters and framed giving the subjects of committee reports and discussion. As one subject is disposed of the sign is removed and the proper one substituted according to the programme. The sign is hung in a conspicuous place on the wall behind the president's chair.

H. N. Turner, manager of sales, railroad department, St. Louis Surfacer & Paint Company, St. Louis, Mo., dropped from a fast train into Chicago the other day to attend the convention. He is en route to the Pacific coast to become manager of the towel supply department at the training camp of Jim Jeffries. Mr. Turner is very proud of his 120 lbs. and even more so of the fact that he has gained two ounces during the past year. Probably he is using his surfacer and paints on himself, both externally and internally. He was incorrectly reported yesterday morning among the list of exhibitors at space 214.

Aside from the usual interferences that tend to make the first session of a convention go somewhat more slowly than later sessions, there is this year a hindrance that is peculiar to the place in which the meetings are held. This is found in the high-art decorations of the Florentine ceiling. When President McNab opened the meeting and throughout the morning he was not only confronted with a sea of up-turned faces, but the faces were up-turned at such an angle as to suggest at first thought the possibility of a general prevalence of saw-toothed collars. Following the direction of some bold and some furtive glances it was discovered that eyes were quite generally riveted upon the pastoral and other scenes depicted upon the arched ceiling. These also created in some quarters a profound abstraction which militated against extended discussion. Even the contending elements in the "Signals and Interlocking" committee were partially harmonized by the soothing in-

fluence of the overheard forms of interlocking, or, better, interlocked forms; the report of the committee on "electricity" was short circuited; and it appeared to be the tacit opinion of the members that if the illustrations under inspection were in the nature of an exhibit of the committee on "Conservation of Natural Resources," resources of such nature should by all means be conserved.

The Maintenance of Way Convention adjourned at 4 o'clock Tuesday afternoon so that the members of the Association could go to the Coliseum to see the exhibits. The members had been preceded by one of the largest crowds that ever attended such an exhibition, and the addition to the crowds of the Association members comfortably filled the aisles of the Coliseum. The early adjournment of the session and the large attendance of engineers has been particularly gratifying to the exhibitors as a mark of appreciation of the great efforts made to make the exhibition not only attractive but interesting and instructive as well.

"What's the engineer a-groanin' for?" asked the Stranger on Parade.
"'Is turn 'as come, 'is turn 'as come," the news man sadly said.
"What makes you look so sad, so sad," said the Stranger on Parade.
"I'm dreadin' what I've got to see," the news man sadly said.
"For they'll do the engineer up brown—my, but they're feelin' gay;
They'll give 'im all the dope they've got, 'e can never get away.
For they've got 'im where they want 'im, and there 'e'll 'ave to stay,
And they'll do 'im good and plenty till the mornin."

"What makes that fellow look so glad?" said the Stranger on Parade.
"'E's specified, 'e's specified," the news man softly said.
"What makes that next man glare at 'im" said the Stranger on Parade.
"E's lost 'is chance, 'e's lost 'is chance," the news man sadly said.
"They'll do the engineer all 'round, now they've got 'im in their 'ands;
They've got 'im at a table now, and the man that's waitin' stands
And 'e's askin' what they're goin' to 'ave, namin' sev'ral diff'rent brands,
And there's like to be some 'eadaches in the morin'."

"'Is sleepin' room is next to mine," said the Stranger on Parade.
"'E'll never use 'is room to-night," the news man sadly said.
"I've 'eard 'im come in sev'ral nights," said the Stranger on Parade.
"'E'll not come in at all to-night," the news man sadly said;
"For the engineer's bamboozled, 'e's 'ad sev'ral kinds of booze,
'E's just lit up a half-burned stub—'e didn't notice whose—
And a couple hours longer'll be enough to cook 'is goose,
And 'e'll come 'ome in a carriage in the mornin'."

"What is the cause of all the noise?" said the Stranger on Parade.
"They're tryin' to take 'im to a cab," the news man sadly said.
"What's that they're puttin' in 'is 'and?" said the Stranger on Parade.
"A list of orders that 'e's placed," the news man sadly said.
"For they've done just all they can to 'im; I 'eard one of them say,
They'd time to do another one and they're feelin mighty gay,
For this is just the season when they make their crop of hay,
But they'll feel like six bad nickels in the mornin'."

The American Railway Signal Company has just installed an electric interlocking plant at Lindale, Ohio, at the crossing of the Cleveland Short Line and the Big Four. There is a 48-lever frame with 26 working levers, controlling three switches, nine derails, four two-arm signals, two three-arm signals, four distant signals and three dwarf signals. The plant is equipped with electric dectector and route locking in addition to detector bars. The signals on the Short Line are upper quadrant, three-position, semi-automatic. The other signals are lower quadrant. Secondary circuits are controlled by 12 volts from storage battery. The battery is the chloride accumulator type, 120 ampere-hours, and is charged from a Northwestern generator driven by an Alamo gasoline engine. The distant signals on the Short Line have no separate levers. The American Railway Signal Company is also installing at Parma, Ohio, a 62-lever electric interlocking machine with 41 working levers, at the crossing of the Baltimore & Ohio and the Cleveland Short Line. All signals on the Short Line are three-position, upper quadrant, slotted. The plant is equipped with detector bars and electric detector and approach locking. Gasoline engine and generator and storage battery are the same as in the previous plant. The American Railway Signal Company is also installing at St. Cloud, Minn., at the crossing of the Northern Pacific and the Great Northern, a 54-lever electric interlocking machine with 35 working levers. All signals are three-position, upper quadrant. The plant is equipped with detector bars and complete electric locking. The gasoline engine, generator and storage battery are the same as in the other plants. All these plants are provided with annunciators and block indicators.

MR. HOOLEY ON THE RAILWAY EXHIBIT.

"What's this show that's goin' on 't th' Collyseeum now?" inquired Mr. Dinnissey as he strolled into Mr. Hooley's thirst parlor for his "mornin's mornin'."

"'Tis th' exybit av th' engineers' tools that I was tellin' ye about th' other day."

"I t'ort ye sid th' engineers didn't do nothin' but make th' pitchers, 'nd misure th' mountains 'nd till th' min that do th' wurruk what to do 'nd how to do ut, 'nd th' aljaybry wurruk that I don't know what 'tis, 'nd th' like o' that," said Mr. Dennissey.

"I towld ye, Dinnissey, that uv ye thought annything was so 'twouldn't be so," said Mr. Hooley as he glanced sternly at the glass which Mr. Dinnissey had tried to cover with his hand. "Th' aljaybry wurruk 's th' figgerin' before th' min do th' rale wurruk 'nd they use litthers 'nstid av figgers so't iv they get th' figgers wrong th' foorst time they c'n change 'em 'nd ye can't till what th' change is cause ye don't know what th' litthers is worth. T' illusthrate," continued Mr. Hooley, making a personal application of his remarks for the sake of the more permanent impression. "T' illusthrate: Iv I putt down what ye owe me f'r goods as ay, bay, say, wan time 'nd thin agin with some Yiddish litthers that ye don't know th' mainin' av——"

"Ye don't know thim ayther," retorted Mr. Dinnissey.

"'Tis merely f'r purposes av illusthration I'm shpakin' av

thim things that makes a pa-aper luk like a laundhry chick. Iv I putt down ay, bay, say, wan day, 'nd thin some Yiddish marks th' nixt 'nd thin add thim up 'nd putt down ix, why, zed, ye don't know how much ye owe me, do ye, Dinnissey? Ye don't annyway, but ye say, th' litthers riprisint annything I want thim to mane, 'nd iv ye're flush wan month, th' litthers mane more to me cash drar thin they do whin ye have no money, though I'm thinkin' ye'er tab's gettin' that long that ix, why, zed, don't mane much more'n ye'er laundhry does whin ye've lost the Chink's chick. But 's ye say, th' litthers is flixible 'nd admit av changes whin a mishtake is made, f'rinstance, like in the lingth av th' tunnel I towld ye about that shticks out av th' mountain on th' both sides.

"But ye were wantin' to know about th' exybit at the Collyseum. Thim's th' movible fixures av the relrod thrack that th' engineers have to ricommind whin th' prisidint 'nd gn'ral manager's directhors in th' comp'ny that makes 'em. They're brought here 'nd sprid out so't th' relrod min c'n ricognize thim 'nd not ordher th' things that's made be th' comp'ny that's got its directhors fr'm a compatin' road. Ye say, Dinnissey, that th' relrod business 's got to that point fr'm th' rigilation av Congriss 'nd th' ligislachoors 'nd th' Int'rsthate Commerce C'mission, that there a'n't anny more money in runnin' a relroad 'nless there's a chanst f'r graft on th' side. Sometimes it's wan way, 'nd sometimes it's another. Iv th' gin'ral orfisers c'n form a comp'ny t' make th' things th' relrod comp'ny has to buy, ye say 't's th' sthockholders that have t' pay f'r thim 'nd th' orfisers gets th' profut f'r th' goods. That's th' only way that relrodin' pays in these days, Dinnissey. Wanst in a while it pays to divide th' profuts fr'm th' manufacturin' wit' th' sthockholders 'nd bull th' sthock in Wall street so't some wan man av th' orfisers c'n unload whin th' market's good 'nd make up f'r th' money 't they lost in payin' a dividind. They take turns at ut, Dinnissey, 'nd whin a man gits old he c'n retire on a compethence 'nd lave a chanst to move up th' other orfisers 'nd make room f'r th' old man's son 't th' bottom or 't th' top, 'cordin' to th' old man's inflooence wit' th' rist.

"Where does th' engineer come in?" inquired Mr. Dennissey.

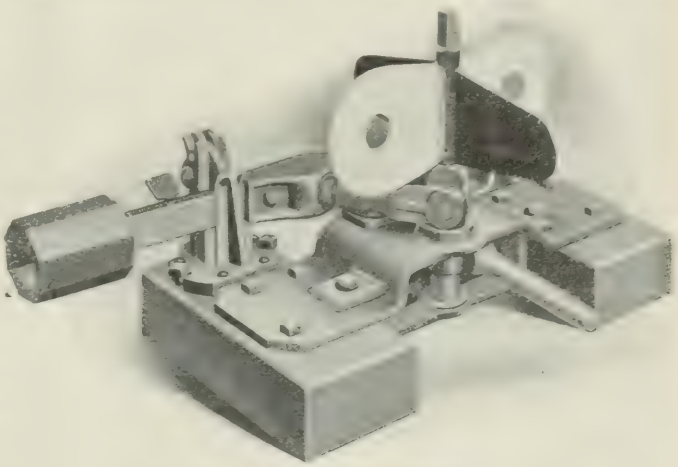
"He don't come in at arl, 'nless he invints a signal, 'r a rail joint, 'r a simmyfor, 'r a wather spout, 'r a hand car that he c'n spisify in his rekisitions 's th' bist 'nd only thing av th' kind that he c'n use owin' to th' pecooliar c'nditions av the road he wurruks f'r. Av coorse, he guts paid f'r his aljaybry wurruk 'nd 's th' other orfisers don't know nothin' av th' valoo av th' litthers he uses in th' place av th' figgers he c'n make his istimates 's he plases 'nd make ut worth while f'r th' couthractor 'r th' manufacthurer t' whack up with 'im. 'nd they get r'yalties fr'm th' wans that make th' invintions. 'Tis a good thrade, is th' engineerin', 'nd I'm thinkin' I'll sind me bye to wan av thim take-a-nickel schools. That's what they call thim schools where they take th' byes that's betther at th' figgerin' than they be at th' readin' 'nd ritin' 'nd th' hist'ry 'nd th' langwidges. A good manny av th' engineers don't find it nicissary t' bother wit' th' inthricacies av English, 'nd grammar 'nd capital litthers 'nd poonctuashun, 'nd they don't have time at the schools nayther. 'Twould pay ye, Dinnissey, t' sneak ye'er way int' th' Collyseeum 'nd look over th' exybit. Maybe ye cud find out th' differens bechune a simmyfor 'nd a wather spout, 'nd ye might not expayrience much difficulty in th' case av a hand car 'nd a whalebarrow. Thin they's switches 'nd frogs, 'nd rale j'ints 'nd imitation j'ints, 'nd culverts—thim's holes made out av conchrate f'r th' wather to run through undher th' thrack—'nd iverything th' relrod uses on th' right-av-way ixcipt wades. Th' wades they don't like, 'nd they's a masheen like a sassige grinder what pulls thim up be th' ruts 'nd cuts thim to paces to make ballast av. 'Tis a grea-at show, Dinnissey, 'nd av ye like I'll say me frind Jawn Reynolds 't's th' main guy there 'nd get ye a pass. Wud ye like to go, Dinnissey?"

"I wud that. I wud go," replied Mr. Dinnissey. "But ye were sayin' about th' graft, Misther Hooley. I've rid about th' min that got caught f'r buyin' coal fr'm comp'nies 't they owned, 'nd at th' clarks that got rich at sixty dollars a month fr'm knowin' where to place orders f'r coal 'nd grain dures. But I don't raymimber that I iver heard av an engineer that was caught gettin' rich faster thin th' law allowed. C'n y'explain that, Misther Hooley?"

"'Tis aisy, Dinnissey. 'S I was a-tellin' ye, they're ijukated in th' take-a-nickel schools. They're arl will-ijukated min," replied Mr. Hooley, pleased to be able to explain and remarking something about a tin roof, as it would be on the house.

G. L. M. SWITCH STAND.

The Morden Frog & Crossing Co., Chicago, has on exhibition in booth 86 at the Coliseum two new types of parallel ground throw G. L. M. switch stands. These stands



G. L. M. Switch Stand.

are built either rigid or automatic, as desired; they are made of plate steel or malleable iron and there are no bevel gears. The makers claim that these stands will maintain their initial throw until practically worn out.

LOVELL WINDOW OPERATOR.

In the accompanying illustration is shown an installation of the Lovell window operator recently completed by the G. Drouve Company, Bridgeport, Conn., in the erecting and machine shop building of the Delaware, Lackawanna & Western shops at Scranton, Pa. The total length of this installation is 7,840 lineal feet. Among other railway companies which have recently installed this window operator are the Pennsylvania, Lake Shore & Michigan Southern, New York Central & Hudson River, and Atchison, Topeka & Santa Fe.

This operator will open and close any number of windows in runs of 100, 200 or more lineal feet. The push and pull principle is used instead of a twisting movement. It is claimed that a window at the far end of the building will open equally as well as any other. The small number of fittings required are well made and of standard shapes, giving the maximum strength. The Lovell bracket, which holds the operating rod, is of steel and can be extended to meet varying conditions. Small wheels are used as guides for operating the rod, giving easy action. The operating rod is of standard size steel pipe and for each run is connected into one continuous piece. The arms that fasten to the

window and operating rod are made of pressed steel and wrought iron piping. The operating arms are fastened to the main rods with open adjustable couplings, and to the window framing by universal joints designed to prevent binding. A rack and and opinion is used with a large wheel from which is extended a chain or wire cable for operating the device. A rolling motion occurs in operation, carrying practically no strain to the operating wheel.

The Lovell window operator is easy to install, and will operate the following kinds of construction: Monitor, lantern, side sash, side frames, saw-tooth windows and pivoted or hinged sash. Either horizontal or vertical arrangements are provided for and operate with equal facility. The application of this operating device permits ventilation regulation. Windows that may bind can be readily cut out of the line by detaching the open couplings of the arms from the rods. In case of fire, with this arrangement for operating sash in long runs, an immediate closing of windows from few stations will check the draught.



Lovell Window Operator at Scranton Locomotive and Erecting Shop; Delaware, Lackawanna & Western.

LIDGERWOOD INCLINE COAL CAR HAUL HOISTS FOR COALING STATIONS.

A coaling station embodying an elevated pocket from which the coal is drawn by gravity through chutes is probably the best design for obtaining rapid delivery into the tender.

About thirteen or fourteen years ago, the Great Northern conceived the idea of shortening the length of the old style incline and hoisting the coal up by a powerful geared machine. It was also decided to operate the hoist by a gas engine, as such is available for use at any time, requires no firemen and does not have the inconveniences of maintaining steam for infrequent use, especially in temperatures which are extreme during the winter season. Since this early experience, a great majority of western railways have adopted this form of coaling station as a standard. Various improvements have been made in the hoisting machines with the intention of increasing their length of service. These stations are being built to handle 150,000-lb. cars up a 20 per cent. grade, inolving a pull at the drum of 36,000 lbs. at a speed of 20 feet per minute. The most recent large installations use a hoisting speed of 30 feet to 40 feet per minute.

In the majority of cases in isolated locations, the hoisting machine is operated by a gas engine, but in numerous terminal locations electricity has been used, the motor being direct connected with suitable spur gearing to the hoisting drum. A steam engine is also frequently employed, in which case double cylinders, 8¼-in. by 10 in. are used, direct geared to the hoist. One of the present up to date type hoists of this class is on exhibition in space 206, and represents a type, a large number of which have been furnished by the Lidgerwood Manufacturing Co. of New York.

These hoists are designed for hauling loaded coal cars weighing from 100,000 to 150,000 lbs. up inclines to the pockets for coaling locomotives. They may be driven by steam engines, electric motors, or gas engines, either directly connected, or by sprocket or rope drives. These hoists are geared at a ratio of 32.2 to 1 and have a rated capacity of 36,000 lbs. rope pull at the drum at a speed of 20 ft. per minute, which provides for hauling loaded cars up an incline with a 20 per cent. grade.

The hoists are provided with powerful differential band brakes on the drums, spiral square jawed clutches on the intermediate shafts, frictions on the driven shafts, and automatic band brakes on the driven shaft pinion which comes into instant action to hold a car in any position in case of accident or failure of power. The hoist is mounted on the timber structure of the pocket. The bed consists of two side pieces, each carrying bearings for the three shafts. The intermediate shaft and driven shaft have three bearings each, the center ones being in pillow blocks, mounted on the central timber of the foundation.

The drum is 40 in. in diameter, with a 44-in. base, grooved for the 1¼-in. wire rope. On the gear side it has a 48-in. flange, through which it is bolted to the main gear wheel. At the opposite end, the flange is 60 in. in diameter and the outside rim, supported by heavy ribs, carries the band brake for lowering empty cars. The drum and gear wheel are keyed to the 6-in. forged steel shaft. The main gear wheel is 77 in. pitch diameter, with a 6½-in face, and has 80 teeth of three-inch pitch. The shrouded pinion is 12½ in.-diameter with a 7½-in. face and has 13 teeth. The intermediate shaft is of machinery steel 4⅜ in. in diameter. The intermediate gear wheel is 38 in. diameter with a 5-in. face and has 68 teeth of 1¾-in. pitch. This bronze bushed intermediate gear runs loose on the shaft and carries on its hub one part of a spiral cut jaw clutch. The other part of the clutch moves on a feather on the shaft. The clutch lever quadrant is mounted on the cap of the outer shaft bearing. The shrouded pinion on the driven shaft has 13 teeth. A flange is cast upon this pinion for a 24-in. friction and upon this flange is also the face for the automatic band brake. The bronze bushed pinion runs loose upon its shaft. A friction plate, carrying the friction woods, slides on a feather on the shaft. The friction has patent cork inserts and is operated by the regular Lidgerwood friction screw, friction pin, crosskey, and hand lever. A positive releasing device insures the withdrawal of the friction plate when the lever is thrown to the "off" position.

The main brake is operated by a lever provided with hand lever brasses and a saw-notched quadrant, suitably mounted on the hoist. The automatic brake on the driven shaft pinion, of the differential band type, is set up by an adjustable spring. It has a lifting lever by which the operator may release it, and it may also be used instead of the main brake for allowing empty cars to run down the incline. The short end of the lever has a stop which prevents the brake from being opened more than is necessary to release its hold.

Space is provided between the center and side bearings for the sprocket wheel, rope pulley or gear connections, and the driven shaft may be extended outside the bed for motor connections.

REGISTRATION — MAINTENANCE OF WAY ASSOCIATION.

Alfred, F. H., Asst. to Prest. C. H. & D. Ry., Cincinnati, O.
Andrews, Geo. W., Insp. of Maint., B. & O. R. R., Baltimore.
Arn, W. G., Asst. Eng., I. C. R. R., Louisville, Ky.
Austin, J. B., Jr., Eng. M. W., Long Island R. R., Jamaica, N. Y.
Bachelder, F. J., Div. Eng., B. & O. R. R., Wheeling, W. Va.
Baldwin, A. S., Chief Eng., I. C. R. R., Chicago, Ill.
Barrett, W. C. Div. Eng., B. & O. R. R., Grafton, W. Va.
Bell, Gilbert J., Div. Eng., A. T. & S. F. Ry., Marceline, Mo.
Black, G. F., Eng., M. W. Maine Central R. R., Portland, Me.
Bouton, W. S., Asst. Eng., B. & B., B. & O. R. R., Baltimore.
Boynton, C. W., Insp. Eng., Universal Port. Cement Co., Chicago, Ill.
Brown, T. H., Asst. Eng., M. of W., B. & O. R. R., Baltimore.
Brunner, John Asst. Gen. Supt., Nor. Wks., Ill. Steel Co., Chicago, Ill.
Butterworth, A. C., Asst. Eng., Mo. Pac. Ry., St. Louis, Mo.
Chamberlain, O. P., Chief Eng., C. & I. W. R. R., Chicago, Ill.
Charles, R. S., Div. Eng., C. & E. I. R. R., Salem, Ill.
Clark, C. E., Asst. Eng., A. T. & S. F., Bosworth, Mo.
Clark, W. A., Chief Eng., D. & I. R. R. R., Duluth, Minn.
Cochran, C. W., Asst. Eng., Big Four Ry., Galion, O.
Collin, D. R., Architect, N. Y. C. & H. R. R. R., New York.
Deimling, J. F., Chief Eng., P. M. R. R., Detroit, Mich.
Dick, H. B., Div. Eng., B. & O. R. R., Newark, O.
Dorrance, W. T., Dist. Eng., N. Y. C. & H. R. R. R., Albany, N. Y.
Douglas, B., Tunnel Eng., D. R. T., Detroit, Mich.
Edwards, J. H., Asst. Ch. Eng., American Bridge Co., Passaic, N. J.
Falconer, R. C., Asst. Eng., Erie R. R., Cuba, N. Y.
Fisher, S. B., Chief Eng., M., K. & T. Ry., St. Louis, Mo.
Goltra, W. F., Tie Agent, New York Central Lines, Cleveland.
Grandy, A. L., Div. Eng., Pere Marquette R. R., Saginaw, Mich.
Graves, G. J., Div. Eng., A. T. & S. F. Ry., Dodge City, Kan.
Gray, Edward, E. M. W., Sou. Ry., St. Louis, Mo.
Greensfelder, A. P., Laclede Bldg., St. Louis.
Hamilton, Paul, E. M. W., C. C., C. & St. L. Railway, Springfield, O.
Hanna, E. E., Div. Eng., Mo. Pac. Ry., Aurora, Mo.
Hart, E. E., Chief Eng., N. Y. C. & St. L. Ry., Cleveland, O.
Holland, Hans, Supt. M. W., S. A. & A. P., Yoakum, Tex.
Hickey, T. H., Roadmaster M. C. R. R., St. Thomas, Ont.
Humphrey, Richard L., Consulting Eng., and Chemist, Philadelphia, Pa.
Hynes, M. V., Div. Eng., C. H. & D. Ry., Indianapolis, Ind.
Janney, A. D. P., Res. Eng., Erie R. R., Portageville, N. Y.
Johnson, J. E., Div. Eng., H. V. Ry., Logan, O.
Johnson, J. M., Prest., L. B. & I. Co., Louisville, Ky.
Jonah, F. G., Chief Eng. Const., St. L. & S. F. R.R., St. Louis.
Kent, A. S., Div. Eng., C., I. & L. Ry., Chicago, Ill.
Kittredge, George W. (Past-President), Ch. Eng., N. Y. C. & H. R. R., New York.
Lane, H. A., Asst. Eng., B. & O. R. R., Baltimore, Md.
Layfield, E. N., Chief Eng., C. T. T. R. R., Chicago.
McMaster, R. T., Insp. Eng., P. & L. E. R. R., Corapolis, Pa.
Markley, A. S., Master Carpenter, C. & E. I. R. R., Danville, Ill.
Meade, J. M., Engineer E. L., Santa Fe Ry., Topeka, Kan.
Metcalf, John S., President John S. Metcalf Co., Chicago, Ill.
Michel, Wm., Eng. M. of W. Hocking Val. R. R., Columbus, O.
Miesse, C. H., Asst. Eng., Erie R. R., Cuba, N. Y.
Millard, C. S., Eng. M. of W., Big Four Ry., Indianapolis, Ind.
More, A. S., E. M., W., C., C., C. & St. L. Ry., Wabash, Ind.
Neville, M. A., Supt. P. & E. Ry., Indianapolis, Ind.
Newton, A. W., Gen. Insp., C., B. & Q. R. R., Chicago.
Ogden, William, Asst. Div. Eng., P. M. R. R., Saginaw, Mich.
Oren, F. B., Asst. Roadmaster, I. C. R. R., Fulton, Ky.
Petersen, W. H., Prin. Asst. Eng., C., R. I. & P. Ry., Chicago.
Pfafflin, E. H., Ch. Eng., S. I. & Ch. Sou. Rys., Chicago.
Pfeifer, H. J., E. M. W., Ter. R. R. Assn., St. Louis, Mo.
Pifer, C. W., Roadmaster, I. C. R. R., Clinton, Ill.
Porter, H. T., Ch. Eng., B. & L. E. R. R., Greenville, Pa.
Rockwell, Samuel, Ch. Eng., L. S. & M. S. Ry., Cleveland, O.
Rossiter, L. P., Div. Eng., B. & O. R. R., Pittsburg, Pa.
Simar, Frank E., Ch. Eng., K. C. Ry., Hancock, Mich.
Simar, V. D., Act. C. E., D., S. S. & A., Marquette, Mich.
Simmons, F. G., Eng. and Supt., Elec. L. & Ry. Co., Milwaukee, Wis.
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Smith, Sherman, Asst. Eng., Grand Trunk Pac. Ry., Earl, Sask.
Stevens, E. S., Asst. Eng., B. & O. R. R., Pittsburg, Pa.
Stimson, F. J., E. M. of W., G. R. & I. R. R., Grand Rapids.
Talbot, A. N., Prof. Mun. & San. Eng., U. of Ill., Urbana, Ill.
Temple, H. H., Supt. B. & O. R. R., New Castle, Pa.
Thompson, A. W. (Director), Ch. E. M. W., B. & O. R. R., Baltimore, Md.
Thompson, F. L., Asst. Eng. Bridges, I. C. R. R., Chicago, Ill.
Von Schrenk, Herman, Dr., Supr. Timber Pres., Rock Island-Frisco Rys., St. Louis, Mo.

Westcott, C. R., Superintendent, I. C. R. R., Clinton, Ill.
Williams, S. N., Prof. C. E. Cornell College, Mt. Vernon, Iowa.
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Woods, A. A., Res. E., A. & V. and V. S. & P. Rys., Vicksburg.
Woods, H. A., Asst. Ch. Eng., Gr. Tr. Pac. Ry., Montreal.
Zinck, K. J. C., Asst. Eng., G. T. Pac., Winnipeg, Man.

ASSOCIATE MEMBERS.

Buchler, Walter, Consulting Eng., Kettle River Quar. Co., St. Louis, Mo.
Wolfel, P. L., Ch. Eng., McClintic-Marshall Co., Rankin, Pa.

GUESTS.

Ackenheil, A. C., C. E., Pittsburg.
Albright, C. C., Asst. Prof. Civil Eng., Purdue Univ., Lafeyette, Ind.
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Brannon, C., Asst. Div. Eng., E. & T. H. R. R., Evansville, Ind.
Christian, W. A., Asst. Eng., C. G. W. R. R., Chicago, Ill.
Dewees, A. R., Asst. Eng., P. M. Ry., Saginaw, Mich.
Gennet, C. W., Jr., R. W. Hunt Co., Chicago.
Goetz, Frederick, Gen. Roadmaster, Mil. Elec. Ry. & Light Co., Milwaukee.
Gordon, H. L., Asst. Eng., B. & O. R. R., Baltimore.
Harvey, W. C., Asst. Eng., Chicago G. W. Ry., Chicago.
Harvey, W. F., Board of Local Improvements, Chicago.
Herrold, G. H., Eng. M. W., C. G. W. R. R., Chicago, Ill.
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Hunter, J. W., Div. Eng., E. & T. H. R. R., Evansville, Ind.
Johnston, D. B., Div. Eng., Pa. Lines, Louisville, Ky.
Lawton, L. C., Div. Eng., A., T. & S. F. Ry., Newton, Kan.
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Masters, Arthur, U. S. Metal & Mfg. Co., New York.
McCalman, Ralph, Ch. Eng., Standard Const. Co., Cleveland, O.
McCalman, D., Asst. Eng., Chicago G. W. Ry., Chicago.
Nichols, George P., G. P. Nichols & Bro., Chicago.
Parsons, G. J., Con. Eng., Penna. Steel Co., Steelton, Pa.
Rettinghouse, Herman, Div. Eng., C. & N. W. Ry., Boone, Ia.
Spielmann, J. A., E. M. W., B. & O. R. R., Wheeling, W. Va.
Wiggins, W. D., Eng. M. of W., Pennsylvania Lines, Pittsburg.
Wirth, A. A., Eng. M. of W., Penna. Lines, Pittsburg, Pa.

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John C. Beye, Locating Engineer, Chicago, Rock Island & Pacific.
D. J. Brumley, Principal Assistant Engineer, Illinois Central.
Moses Burpee, Chief Engineer, Bangor & Aroostook.
W. C. Curd, Assistant Engineer, Missouri Pacific.
W. M. Dawley, Assistant Engineer, Erie.
Walt Dennis, Office Engineer, Kansas City Southern.
Paul Didier, District Engineer, Baltimore & Ohio.
C. Dougherty, Engineer Maintenance of Way, Cincinnati, New Orleans & Texas Pacific.
D. McPherson, Assistant Chief Engineer, National Transcontinental.
W. D. Pence, Professor of Railroad Engineering, University of Wisconsin.
H. J. Slifer, General Manager, Chicago Great Western.
J. A. Spielmann, Engineer Maintenance of Way, Baltimore & Ohio.
John G. Sullivan, Assistant Chief Engineer, Canadian Pacific.
J. E. Willoughby, Engineer of Construction, Louisville & Nashville.
W. P. Wiltsee, Assistant Engineer, Norfolk & Western.
R. C. Young, Chief Engineer, Lake Superior & Isheming and Munising.

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W. J. Bergen, Assistant to Chief Engineer, New York, Chicago & St. Louis.
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J. M. Egan, Roadmaster, Illinois Central.
H. E. Hale, Principal Assistant Engineer, Missouri Pacific.
G. D. Hicks, Superintendent, Nashville, Chattanooga & St. Louis.
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C. C. Hill, Division Engineer, Michigan Central.
J. M. Meade, Engineer Eastern Lines, Atchison, Topeka & Santa Fe.
C. S. Millard, Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis.
F. J. Stimson, Engineer Maintenance of Way, Grand Rapids & Indiana.
S. N. Williams, Professor of Civil Engineering, Cornell College.

III—Committee on Ties.

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W. F. H. Finke (Vice-Chairman), Tie and Timber Agent, Southern.
A. F. Dorley, Division Engineer, Missouri Pacific.
L. A. Downs, Assistant to Chief Engineer Maintenance of Way, Illinois Central.



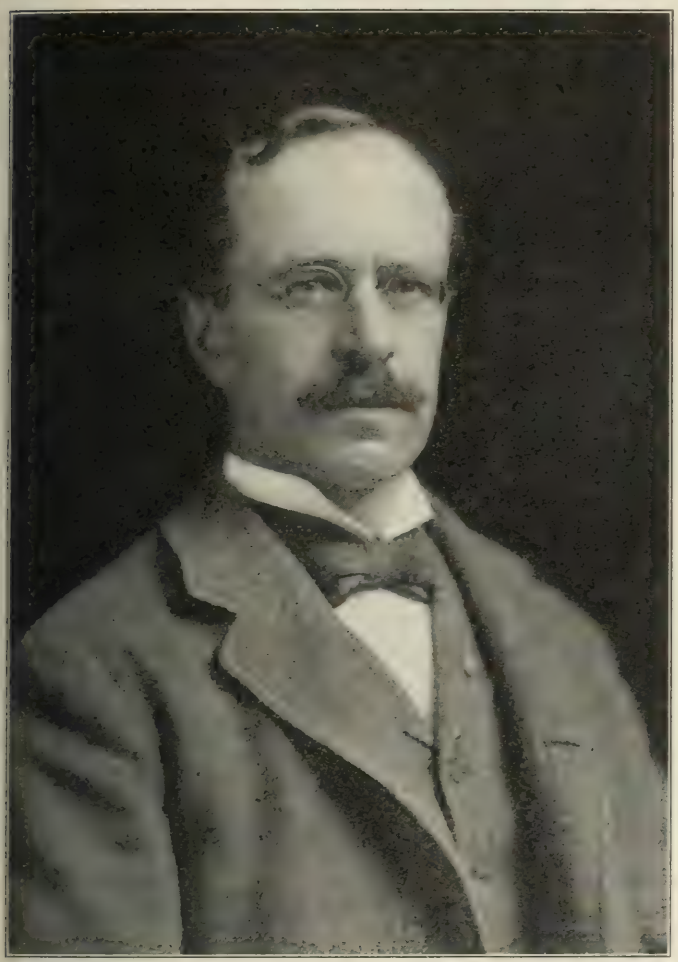
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E. D. Jackson, Assistant Engineer, Baltimore & Ohio.
F. G. Jonah, Chief Engineer Construction, St. Louis & San Francisco.
H. C. Landon, Division Engineer, Erie.
Edward Laas, Engineer Maintenance of Way, Chicago, Milwaukee & St. Paul.
F. R. Layng, Engineer of Track, Bessemer & Lake Erie.
G. W. Merrell, Assistant to General Manager, Norfolk & Western.
L. M. Perkins, Division Engineer, Northern Pacific.
H. S. Wilgus, Engineer Maintenance of Way, Pittsburg, Shawmut & Northern.

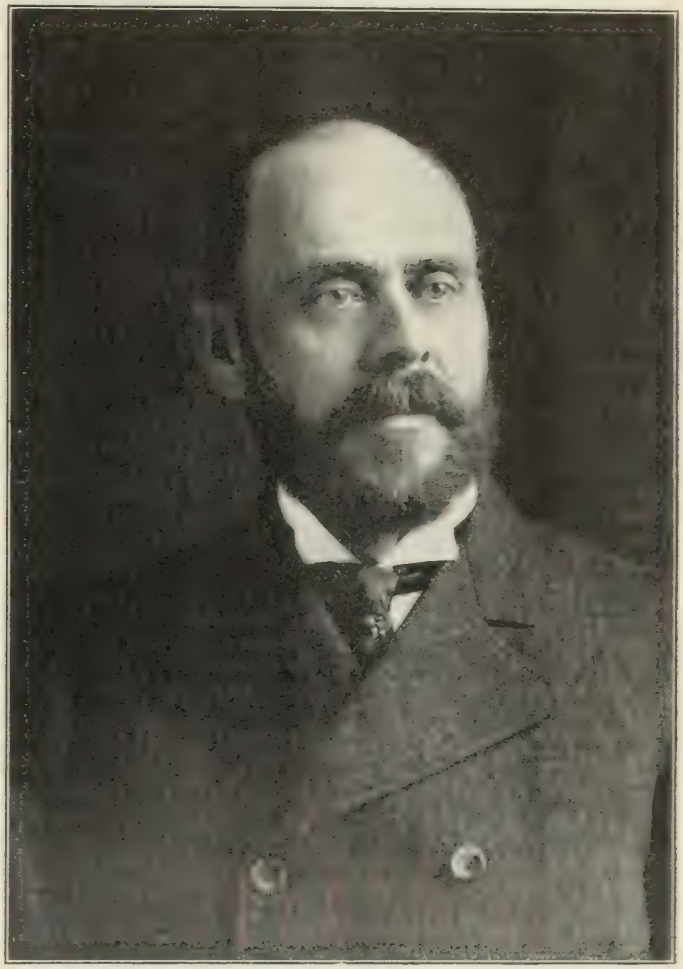
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R. Montfort (Vice-President), Consulting Engineer, Louisville & Nashville.
Robert Trimble (Secretary), Chief Engineer Maintenance of Way, Northwest System, Pennsylvania Lines.
E. B. Ashby, Chief Engineer, Lehigh Valley.
J. A. Atwood, Chief Engineer, Pittsburg & Lake Erie.
A. S. Baldwin, Chief Engineer, Illinois Central.

J. B. Berry, Chief Engineer, Chicago, Rock Island & Pacific
M. L. Byers, Chief Engineer Maintenance of Way, Missouri Pacific.
W. C. Cushing, Chief Engineer Maintenance of Way, Southwest System, Pennsylvania Lines.
F. A. Delano, President, Wabash.
Dr. P. H. Dudley, Rail Expert, New York Central & Hudson River.
C. H. Ewing, Engineer Maintenance of Way, Philadelphia & Reading.
John D. Isaacs, Consulting Engineer, Harriman Lines.
Thos. H. Johnson, Consulting Engineer, Pennsylvania Lines.
Howard G. Kelley, Chief Engineer, Grand Trunk.
J. W. Kendrick, Vice-President, Atchison, Topeka & Santa Fe.
George W. Kittredge, Chief Engineer, New York Central & Hudson River.
C. B. Hoyt, Superintendent Track, New York, Chicago & St. Louis.
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P. C. Newbegin, Maintenance Engineer, Bangor & Aroostook.
R. M. Pearce, Resident Engineer, Pittsburg & Lake Erie.
H. T. Porter, Chief Engineer, Bessemer & Lake Erie.
G. J. Ray, Chief Engineer, Delaware, Lackawanna & Western.
William G. Raymond, Dean, State University of Iowa.
S. S. Roberts, Assistant Professor of Railroad Engineering, University of Illinois.
L. S. Rose, Signal Engineer, Cleveland, Cincinnati, Chicago & St. Louis.
F. A. Smith, Civil Engineer.



W. C. CUSHING,
Incoming First Vice-President.



CHAS. S. CHURCHILL.
Incoming Second Vice-President.

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Joseph T. Richards, Chief Engineer Maintenance of Way, Pennsylvania.
J. P. Snow, Chief Engineer, Boston & Maine.
A. W. Thompson, Chief Engineer Maintenance of Way, Baltimore & Ohio.
M. H. Wickhorst, Chicago, Burlington & Quincy. (Appointed Engineer of Tests for Rail Committee.)

V—Committee on Track.

C. E. Knickerbocker (Chairman), Engineer Maintenance of Way, New York, Ontario & Western.
J. B. Jenkins (Vice-Chairman), Assistant Engineer, Baltimore & Ohio.
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Garrett Davis, Superintendent Chicago, Rock Island & Pacific.
J. L. Downs, Roadmaster, Yazoo & Mississippi Valley.
R. C. Falconer, Assistant Engineer, Erie.
T. H. Hickey, Roadmaster, Michigan Central.
R. H. Howard, Engineer Maintenance of Way, Chicago & Eastern Illinois.
R. A. Van Houten, Division Engneer, Lehigh Valley.
W. D. Wiggins, Division Engineer, Pennsylvania Lines.

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George W. Andrews, Inspector of Maintenance, Baltimore & Ohio.
J. P. Canty, Supervisor Bridges and Buildings, Boston & Maine.
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H. M. Cryder, St. Louis.
William T. Dorrance, District Engineer, New York Central & Hudson River.
C. H. Fake, Chief Engineer, Mississippi River & Bonne Terre.
P. F. Gentine, Division Engineer, Missouri Pacific.
E. N. Layfield, Chief Engineer, Chicago Terminal Transfer.
M. A. Long, Architect, Baltimore & Ohio.
John S. Metcalf, Civil Engineer.
H. Rettinghouse, Division Engineer, Chicago & Northwestern.
C. W. Richey, Master Carpenter, Pennsylvania.

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F. H. Bainbridge (Vice-Chairman), Resident Engineer, Chicago & Northwestern.
F. E. Bissell, Civil Engineer.
W. S. Bouton, Engineer of Bridges, Baltimore & Ohio.
R. D. Coombs, Structural Engineer, Pennsylvania Tunnel & Terminal.
L. J. Hotchkiss, Assistant Bridge Engineer, Chicago, Burlington & Quincy.
Hans Ibsen, Bridge Engineer, Michigan Central.
J. A. Lahmer, Principal Assistant Engineer, Kansas City Southern.
F. B. Scheetz, Assistant Engineer, Missouri Pacific.
G. R. Talcott, Assistant Engineer, Baltimore & Ohio.
C. C. Wentworth, Principal Assistant Engineer, Norfolk & Western.
P. H. Wilson, Civil Engineer.
I. L. Simmons, Bridge Engineer, Chicago, Rock Island & Pacific.

VIII—Committee on Masonry.

W. H. Peterson (Chairman), Bridge Engineer, Chicago, Rock Island & Pacific.
G. H. Tinker (Vice-Chairman), Bridge Engineer, New York, Chicago & St. Louis.
W. J. Backes, Chief Engineer, Central New England.
G. J. Bell, Division Engineer, Atchison, Topeka & Santa Fe.
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W. H. Chadbourn, Principal Assistant Engineer, Chicago Great Western.
W. W. Colpitts, Chief Engineer, Kansas City, Mexico & Orient.
T. L. Condron, Consulting Engineer.
B. Douglas, Tunnel Engineer, Detroit River Tunnel Company.
L. N. Edwards, Assistant Engineer, Grand Trunk.
A. H. Griffith, Assistant Engineer, Baltimore & Ohio.
Richard L. Humphrey, Consulting Engineer.
R. T. McMaster, Inspecting Engineer, Pittsburg & Lake Erie.
C. H. Moore, Engineer of Grade Crossings, Erie.
F. E. Schall, Bridge Engineer, Lehigh Valley.
A. N. Talbot, Professor Municipal and Sanitary Engineering, University of Illinois.
F. L. Thompson, Assistant Engineer of Bridges, Illinois Central.
Job Tuthill, Engineering Maintenance of Way, Cincinnati, Hamilton & Dayton.

IX—Commitee on Signs, Fences and Crossings.

W. D. Williams (Chairman), Chief Engineer, Cincinnati Northern.
K. J. C. Zinck (Vice-Chairman), Assistant Engineer, Grand Trunk Pacific.
A. M. Funk, Division Engineer, Baltimore & Ohio.
E. R. Lewis, Division Engineer, Michigan Central.
W. H. Hoyt, Assistant Chief Engineer, Duluth, Missabe & Northern.
Joseph Mullen, Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis.
W. J. Burton, Division Engineer, Missouri Pacific.
C. H. Stein, Engineer Maintenance of Way, Central of New Jersey.
E. J. Steinbeck, Assistant Engineer, Illinois Central.

X—Committee on Signals and Interlocking.

A. H. Rudd (Chairman-Director), Signal Engineer, Pennsylvania.
L. R. Clausen (Vice-Chairman), Superintendent, Chicago, Milwaukee & St. Paul.
Azel Ames, Train Control Board.
C. C. Anthony, Assistant Signal Engineer, Pennsylvania.
H. Baker, General Manager, Queen and Crescent Route.
H. S. Balliet, Signal Engineer, Electric Zone, New York Central & Hudson River.
W. G. Besler, Vice-President and General Manager, Central of New Jersey.
H. S. Cable, General Superintendent, Chicago, Rock Island & Pacific.
W. B. Causey, Superintendent, Chicago Great Western.
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C. E. Denney, Signal Engineer, Lake Shore & Michigan Southern.
W. J. Eck, Electrical Engineer, Southern.
W. H. Elliott, Signal Engineer, New York Central & Hudson River.
W. J. Harahan, Assistant to President, Erie.
M. H. Hovey, Wisconsin Railroad Commission.
A. S. Ingalls, Assistant General Superintendent, Lake Shore & Michigan Southern.
J. C. Mock, Electrical Engineer, Detroit River Tunnel Company.
F. P. Patenall, Signal Engineer, Baltimore & Ohio.
J. A. Peabody, Signal Engineer, Chicago & Northwestern.
Frank Rhea, Engineer for Signal Department, General Electric Company.
W. B. Scott, Assistant Director Maintenance and Operation, Harriman Lines.
Thomas S. Stevens, Signal Engineer, Santa Fe.
J. E. Taussig, Terminal Superintendent, Wabash.
H. H. Temple, Superintendent, Baltimore & Ohio.
J. C. Young, Signal Engineer, Union Pacific.
Edwin F. Wendt, Assistant Engineer, Pittsburg & Lake Erie.

XI—Committee on Records and Accounts.

H. R. Safford (Chairman), Chief Engineer Maintenance of Way, Illinois Central.
H. J. Pfeifer (Vice-Chairman), Engineer Maintenance of Way, Terminal Railroad Association.
J. M. Brown, District Engineer, Chicago, Rock Island & Pacific.
M. C. Byers, Chief Engineer, St. Louis & San Francisco.
A. L. Davis, Assistant Engineer, Illinois Central.
T. H. Gatlin, Engineer Maintenance of Way, Southern.
C. H. Gerber, Consulting Engineer.
Edward Gray, Engineer Maintenance of Way, Southern.
Henry Lehn, Maintenance of Way Accountant, New York Central & Hudson River.
Thomas Maney, General Roadmaster, Louisville & Nashville.
J. H. Milburn, Chief Draftsman, Baltimore & Ohio.
C. W. Pifer, Roadmaster, Illinois Central.
W. H. Sellew, Principal Assistant Engineer, Michigan Central.
J. E. Turk, Superintendent, Philadelphia & Reading.
R. W. Willis, Engineer, Missouri District, Chicago, Burlington & Quincy.

XII—Committee on Rules and Organization.

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F. L. Nicholson (Vice-Chairman), Engineer Maintenance of Way, Norfolk & Southern.
F. D. Anthony, Chief Engineer, Quebec, Montreal & Southern.
G. D. Brooke, Division Engineer, Baltimore & Ohio.
S. E. Coombs, Assistant Engineer, New York Central & Hudson River, New York.
B. T. Elmore, Assistant Chief Engineer, Virginian.
A. S. More, Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis.
G. L. Moore, Engineer Maintenance of Way, Lehigh Valley.
J. F. Deimling, Chief Engineer, Pere Marquette.
D. B. Johnston, Division Engineer, Pennsylvania.
A. J. Neafie, Principal Assistant Engineer, Delaware, Lackawanna & Western.

XIII—Committee on Water Service.

C. L. Ransom (Chairman), Resident Engineer, Chicago & Northwestern.
Robert Ferriday (Vice Chairman), Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis.
James Burke, Engineer Maintenance of Way, Erie.
J. L. Campbell, Engineer Maintenance of Way, El Paso & Southwestern.
H. M. Church, Division Engineer, Baltimore & Ohio Southwestern.
G. H. Herrold, Engineer Maintenance of Way, Chicago Great Western.
E. G. Lane, Engineer Maintenance of Way, Baltimore & Ohio.
A. Mordecai, Consulting Engineer.
C. A. Morse, Chief Engineer, Atchison, Topeka & Santa Fe.
W. A. Parker, Chief Engineer, St. Joseph & Grand Island.
L. P. Rossiter, Division Engineer, Baltimore & Ohio.
A. D. Schermerhorn, Division Engineer, Union Pacific.

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E. E. R. Tratman (Vice-Chairman), Resident Editor, Engineering News.
Hadley Baldwin, Superintendent, Cleveland, Cincinnati, Chicago & St. Louis.
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G. H. Burgess, Chief Engineer, Delaware & Hudson Co.

L. G. Curtis, Division Engineer, Baltimore & Ohio.
A. H. Dakin, Jr., Consulting Engineer.
H. T. Douglas, Jr., Chief Engineer, Wheeling & Lake Erie.
A. C. Everham, Assistant Tunnel Engineer, Detroit River & Tunnel Co.
M. J. Henoch, Resident Engineer, Louisville & Nashville.
H. A. Lane, Assistant Engineer, Baltimore & Ohio.
E. J. McIntyre, Assistant Engineer, Northern Pacific.
B. H. Mann, Signal Engineer, Missouri Pacific.
A. Montzheimer, Chief Engineer, Elgin, Joliet & Eastern.
G. F. Morse, Assistant Engineer, Central of New Jersey.
C. C. Post, Jr., Assistant Engineer, Union Pacific.
C. H. Spencer, Engineer, Washington Terminal Company.
C. H. Stein, Engineer Maintenance of Way, Central of New Jersey.
A. Swartz, Division Engineer, Erie.
E. B. Temple, Assistant Chief Engineer, Pennsylvania.

XV—Committee on Iron and Steel Structures.

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A. J. Himes (Vice-Chairman), Engineer Grade Elimination, New York, Chicago & St. Louis.
J. C. Bohland, Bridge Engineer, Great Northern.
Charles Chandler, Bridge Engineer, Chicago Great Western.
C. L. Crandall, Professor Railway Engineering, Cornell University.
J. E. Greiner, Consulting Engineer.
B. W. Guppy, Bridge Engineer, Boston & Maine.
Charles M. Mills, Consulting Engineer.
C. Monsarratt, Chief Engineer of Bridges, Canadian Pacific.
C. D. Purdon, Missouri Pacific.
A. R. Raymer, Assistant Chief Engineer, Pittsburg & Lake Erie.
A. F. Robinson, Bridge Engineer, Santa Fe.
C. C. Schneider, Consulting Engineer.
I. F. Stern, Engineer of Bridges, Chicago & Northwestern.
F. E. Turneaure, Dean, College of Engineering, University of Wisconsin.
J. R. Worcester, Consulting Engineer.

XVI—Committee on Economics of Railway Location.

A. K. Shurtleff (Chairman), Office Engineer, Chicago, Rock Island & Pacific.
A. C. Dennis (Vice-Chairman), Assistant Engineer, Canadian Pacific.
C. Frank Allen, Professor Railroad Engineering, Massachusetts Institute Technology.
R. N. Begien, Division Engineer, Baltimore & Ohio.
Willard Beahan, Assistant Engineer, Lake Shore & Michigan Southern.
C. P. Howard, Lake Shore & Michigan Southern.
P. M. LaBach, Assistant Engineer, Missouri Pacific.
L. B. Merriam, Consulting Engineer.
C. J. Parker, Principal Assistant Engineer, New York Central & Hudson River.
J. E. Schwitzer, Assistant Chief Engineer, Canadian Pacific.
Francis Lee Stuart, Chief Engineer, Erie.
Walter Loring Webb, Consulting Engineer.

XVII—Committee on Wood Preservation.

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W. H. Courtenay (Vice-Chairman), Chief Engineer, Louisville & Nashville.
E. H. Bowser, Chief Timber Inspector, Illinois Central.
Walter Buehler, Consulting Engineer, Kettle River Quarries Company.
Lincoln Bush, Consulting Engineer.
O. Chanute, Consulting Engineer.
C. K. Conrad, Assistant Engineer, Erie.
E. B. Cushing, Engineer of Construction, Sunset Central Lines.
G. M. Davidson, Chemist, Chicago & Northwestern.
E. O. Faulkner, Manager Tie and Timber Department, Santa Fe.
V. K. Hendricks, Assistant Engineer Maintenance of Way, St. Louis & San Francisco.
A. L. Kuehan, General Superintendent, American Creosoting Company.
S. M. Rowe, Consulting Engineer.
E. A. Sterling, Forester, Pennsylvania.
Earl Stimson, Chief Engineer Maintenance of Way, Baltimore & Ohio Southwestern.
Herrmann Von Schrenk, Supervisor of Timber Preservation, Rock Island, Frisco and Chicago & Eastern Illinois.
Howard F. Wiss, Forest Service, United States Department of Agriculture.

XVIII—Committee on Electricity.

George W. Kittredge (Chairman), Chief Engineer, New York Central & Hudson River.
J. B. Austin, Jr. (Vice-Chairman), Engineer Maintenance of Way, Long Island.
R. D. Coombs, Consulting Engineer.
A. O. Cunningham, Chief Engineer, Wabash.
E. P. Dawley, Consulting Engineer.
G. A. Harwood, Chief Engineer, Electric Zone Improvements, New York Central & Hudson River.
W. W. Drinker, Assistant Engineer, Erie.
W. S. Kinnear, Assistant General Manager, Michigan Central.
C. E. Lindsay, Division Engineer, New York Central & Hudson River.
E. H. McHenry, Vice-President, New York, New Haven & Hartford.
J. A. Peabody, Signal Engineer, Chicago & Northwestern.

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W. G. Brimson (Vice-Chairman), Vice-President and General Manager, Quincy, Omaha & Kansas City.
E. F. Ackerman, Assistant Engineer, Lehigh Valley.
F. H. Alfred, Assistant to President, Cincinnati, Hamilton & Dayton.
William Archer, Assistant Engineer Maintenance of Way, Baltimore & Ohio Southwestern.
William Ashton, Chief Engineer, Oregon Short Line
W. L. Breckinridge, Engineer Maintenance of Way, Chicago, Burlington & Quincy.
E. H. Lee, Chief Engineer, Chicago & Western Indiana.
F. W. Smith, Engineer of Construction, Cleveland, Cincinnati, Chicago & St. Louis.
W. F. Tye, Civil Engineer.
C. A. Wilson, Consulting Engineer.

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C. H. Cartlidge, Bridge Engineer, Chicago, Burlington & Quincy. (Representing Committee on Iron and Steel Structures.)
C. B. Hoyt, Superintendent Track Maintenance and Construction, New York, Chicago & St. Louis. (Representing Committee on Track.)

Special Committee Co-Operating with National Conservation Commission.

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D. W. Lum (Vice-Chairman), Chief Engineer Maintenance of Way and Structures, Southern.
Moses Burpee, Chief Engineer, Bangor & Aroostook.
W. A. Bostwick, Metallurgical Engineer, Carnegie Steel Company.
E. B. Cushing, Engineer of Construction, Sunset Central Lines.
E. O. Faulkner, Manager Tie and Timber Department, Atchison, Topeka & Santa Fe.
A. L. Kuehn, General Superintendent, American Creosoting Company.
C. L. Ransom, Resident Engineer, Chicago & Northwestern.

Special Committee Co-Operating with National Advisory Board on Fuels and Structural Materials.

Hunter McDonald, Chief Engineer, Nashville, Chattanooga & St. Louis.
Howard G. Kelley, Chief Engineer, Grand Trunk.
Julius Kruttschnitt, Director of Maintenance and Operation, Harriman Lines.

STANDARD SPECIFICATIONS FOR CEMENT.*

By an oversight this special committee made its last report through the masonry committee, which, prior to 1904, had handled the matter of standard specifications for cement. Since the report of 1905, when the present standard specifications for cement were adopted, the special committee has not reported, as there was nothing particular to report. However, during the last two years the committee of the American Society for Testing Materials and representatives of other societies and associations co-operating with it have been active in considering a revision of the standard specifications for cement.

At a meeting on June 30, 1909, at Atlantic City, certain amendments to the standard specifications for cement were

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

recommended by the committee. These amendments were favorably received by the American Society for Testing Materials and were later approved by letter-ballot.

To bring M. of W. specifications up to date and put them in line with the new standard of the American Society for Testing Materials it will be necessary to amend paragraph 15, under Natural Cement, page 102 of the 1907 edition of the Manual, to read as follows:

"The minimum requirements for tensile strength for briquettes one inch square in cross-section shall be as follows, and shall show no retrogression in strength within the periods specified:

Age Neat Cement.	Strength.
24 hours in moist air	75 lbs.
7 days (1 day in moist air, 6 days in water)	150 lbs.
28 days (1 day in moist air, 27 days in water)	250 lbs.
One part cement, three parts standard Ottawa sand:	
7 days (1 day in moist air, 6 days in water)	50 lbs.
28 days (1 day in moist air, 27 days in water)	125 lbs.

Paragraph 19, under Portland Cement, page 103, should be made to read:

"The specific gravity of cement shall not be less than 3.10. Should the tests of cement as received fall below this requirement, a second test may be made upon a sample ignited at a low red heat. The loss in weight of the ignited cement shall not exceed 4 per cent."



HOWARD G. KELLEY,
Chairman of Committee on Standard Specifications for Cement.

Paragraph 22, under Portland Cement, same page, should be revised to read:

"The minimum requirements for tensile strength for briquettes one inch square in section shall be as follows, and the cement shall show no retrogression in strength within the periods specified:

Age Neat Cement.	Strength.
24 hours in moist air	175 lbs.
7 days (1 day in moist air, 6 days in water)	500 lbs.
28 days (1 day in moist air, 27 days in water)	600 lbs.
One part cement, three parts standard Ottawa sand:	
7 days (1 day in moist air, 6 days in water)	200 lbs.
28 days (1 day in moist air, 27 days in water)	275 lbs.

Conclusions.

It is recommended that the standard specifications for cement be revised to conform with the amendments reported.

As standard specifications for cement have always been reported by the masonry committee, the special committee recommends that this practice be continued and that the masonry committee be instructed to incorporate the revisions to the standard specifications for cement in its report and that the revised specifications appear in the Manual as a part of the masonry committee report; and as the masonry committee formerly handled the question of standard specifications for cement, which work is naturally a part of the work of the masonry committee, the special committee further recommends that this work be reassigned to the masonry committee and that the special committee be dismissed.

The report is signed by: Howard G. Kelley (Grand Trunk), chairman; C. W. Boynton (Univ. Port. Cem. Co.) and C. H. Moore (Erie).

WOOD PRESERVATION.*

The instructions to the committee were:

(1) Consider revision of Manual; if no changes are recommended, make statement accordingly.

(2) Continue compilation of statistics, conferring with Committees III, on Ties, and VII, on Wooden Bridges and Trestles.

(3) Continue investigation of proper grouping of different timber for antiseptic treatment.

(4) Report on the proper preparation of timber for treatment, giving consideration to the deterioration of wood while undergoing air seasoning, and its handling prior to the injection of antiseptics.

(5) Report on the proper quantity and quality of antiseptics to be used for preservation, and determine the conditions under which they should be used. The most successful antiseptics should be first considered and attention drawn to those which have failed and give no promise of success. (Crude petroleum can be discussed under this head.)

(6) Investigate and report on tests of strength of treated timber showing effect of antiseptics on its strength.

The following sub-committees were appointed:

A—Revision of Manual and Specifications for New Processes: W. H. Courtenay, chairman; R. N. Begien, Carl G. Crawford, W. W. Curtis, E. O. Faulkner, E. B. Cushing.



W. K. HATT,
Chairman of Committee on Wood Preservation.

B—Statistics and Inspection: O. Chanute, chairman; C. K. Conrad, V. K. Hendricks, S. M. Rowe, Hermann von Schrenk, Howard F. Weiss.

C—Grouping of Different Timbers, Fungi, Seasoning: Howard F. Weiss, chairman; Hermann von Schrenk, A. L. Kuehn.

D—Crude Petroleum, Wood Creosote and Petroleum Tar Oil: G. M. Davidson, chairman; Carl G. Crawford, W. W. Curtis, E. O. Faulkner.

E—Strength of Treated Timber: V. K. Hendricks, chairman; Earl Stimson, Lincoln Bush.

F—Instructions for Inspection of Treatment of Timber: A. L. Kuehn, chairman; R. N. Begien, E. H. Bowser, G. M. Davidson.

Revision of Manual.

The matter in the Manual at present consists of specifications for:

(a) Analysis of Coal-Tar Creosote.

(b) Determination of Zinc in Treated Timbers—Bulletin 103, September, 1908—Addenda to Manual of 1907. The committee recommends no change except textual improvements that in no wise alter the substance.

(c) Recommended Standard Specifications for Tie Treatment—Manual of 1907, pp. 48-53. The committee recommends changes in these specifications that reflect the trend of practice toward air-seasoning and more careful grouping of ties for treatment and better inspection.

(d) The committee recommends no change in the specifications for coal-tar creosote, adopted in 1909, for insertion in the Manual.

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

(e) Recommended Practice (adopted Vol. 10, 1909, Part 1, p. 630) — The committee recommends the following change:

(3) Preserved wood may be destroyed by mechanical wear before it is decayed, and therefore should be protected by economical devices when the mechanical life limits the life of the tie.

The following paragraphs embody the more important changes and additions to the specifications for tie treatment:

Ties shall not be treated until air-seasoned. If they arrive at the treating plant in a seasoned condition, ready to treat, they may be loaded direct from the cars to the tram buggies; otherwise they shall be piled on the ground in their respective groups or classes, green ties separated from partially seasoned or from seasoned ties, and all resting on treated stringers, with not less than 6 inches air space between bottom of lowest tier and ground; the spaces under, between and around the piles shall be thoroughly drained, and at all times kept clear of weeds, high grass and decaying matter. The top tier shall be laid sloping to form a watershed. Especial attention should be given to keeping all rotten wood off of the yard and away from the ties. Ties shall be piled either 8x1 or 8x2 or any other manner adapted to secure rapid and uniform seasoning with mimimum checking. Alleys must be left between piles, with 4 feet clear space in one direction and 1 foot in the other direction. These alleys will, in general, provide for uniform and fairly rapid seasoning.

Since the seasoning varies with the latitude, time of year, the exposure and peculiarities of the season, it is best to establish by experiment the weight per cubic foot at which each class of timber will best receive the treatment, and then to weigh from time to time to determine when the timber is ready for treatment. Ties piled for seasoning shall be closely watched, and not allowed to over-season or to deteriorate.

When ties that are not seasoned must be treated, and are to be treated with creosote, either long steaming or seasoning in hot creosote oil within safe limits of heat, as determined by experience, may be resorted to.

Under plain creosoting, the proposed specifications provide that the dead oil be heated to a temperature of not less than 160 deg. before admission to the cylinder. The old specification places the minimum at 140 deg.

The following three paragraphs are added to the specifications for plain creosoting:

This [calculated amount of oil absorbed] should be checked occasionally by weighing the ties loaded on the cylinder tram cars before and after treatment, a scale being inserted in the tram racks.

Daily reports of the injections shall be made. At least once a week an account of stock shall be taken and balance established to check the reported amounts used.

In making all measurements the oil should be at a constant temperature, or they should be reduced to a constant temperature by a proper reduction factor.

The specifications for Wellhouse treatment are omitted.

The specifications for zinc-creosote emulsion treatment are entirely new, as follows:

An emulsion of zinc-chloride and suitable coal-tar (creosote), the latter being at least 10 per cent of the whole, shall be admitted. Adequate pressure shall be applied and maintained until the desired absorption is obtained. The amount of solution injected shall be such as to leave in the wood an equivalent of 4-10 pound of dry soluble zinc-chloride and from 1¼ to 1½ pounds of creosote per cubic foot on the average.

The zinc-chloride used shall be as weak as can be used and still obtain the desired absorption of zinc-chloride, and shall not be stronger than 3½ per cent. It shall be as free from impurities as is practicable, free from free acid and containing not more than 25/1000 of 1 per cent of iron. The coal-tar oil used shall be as nearly as possible of the same specific gravity as the zinc-chloride solution. It should generally conform to the standard specifications for coal-tar creosote of this association, except that it should preferably contain a large percentage of tar acids and a small percentage of naphthalene. To insure as perfect a mixture of the emulsion of the zinc-chloride solution with the coal-tar oil as possible, an effective stirring apparatus must be used in the storage tank, and preferably also in the cylinder. The emulsion shall be heated to a temperature of not less than 140 deg. F. before admission to the cylinder, and if the latter is provided with steam coils, pressure shall be maintained in these coils during treatments. Hydraulic pressure of 100 pounds per square inch shall be applied upon the emulsion in the cylinder and shall be maintained until the required amounts are injected as above specified. The amount absorbed shall be determined by calculations based upon gage readings, both before the introduction of the emulsion into the cylinder and after forcing it back after treatment. This should be checked occasionally by weighing the ties loaded on the cylinder tram cars, before and after treatment, a scale being inserted in tram tracks. Daily reports of the injections shall be made, and at least once a week an account of stock shall be taken and balance established to check the reported amounts used. In making all measurements the oil should be at a constant temperature, or the measurements should be reduced to a constant temperature by a proper reduction factor.

The committee recommends for insertion in the Manual the specification for analysis of coal-tar creosote, adopted in 1908 (Vol. 9, 1908, pp. 708-711, 768).

The following additions to the rules for the determination of zinc in treated timbers (adopted in 1908, Vol. 9, pp. 712-714, 768) are recommended for printing in the Manual:

All chemicals used should be tested for purity from time to time. Either the chemists for the company will do this themselves or indicate some simple tests which may be applied by operatives at the works.

In operating with zinc-chloride, the strength of the solution should be varied from time to time to conform to the kind and condition of the ties, so as to inject the required quantities. But in no case shall the strength of the solution exceed 5.0 per cent.

It is better to inject quantities of the chemicals in excess of the requirements than to skimp the treatment in any way.

Daily reports should be kept at the works, and duplicates sent to the general office, if desired, in order to check the operations.

Ties treated with zinc-chloride should dry for some little time (to harden the outer surface) before they are put in the tracks. This is preferably done in piles, arranged to induce drying without checking as evaporation takes place.

Dating nails should be inserted in the ties and an account kept of the average lives obtained, in order to be able hereafter to improve on the treatment.

Statistics and Inspection.

The sub-committee on statistics has been able to add very little to the data published last year in Table 1. It has not yet obtained reliable information as to some ancient experiments, and most of those made since 1903-4-5-6 are too recent to furnish absolute conclusions. The sub-committee has, however, been made aware that great differences are found in the life of zinc-treated ties in the track. On some roads they promise to average 14 to 17 years, while on others they are giving out in five to six years. This is fully confirmed by the results of the recent examination (Appendix C) of the experimental track on the Gulf, Colorado & Santa Fe of treated ties laid from February to May, 1902. It cannot be too strongly pointed out that no adequate results will be obtained with any process unless the work is skillfully and honestly done.

The sub-committee was instructed to begin the following new work:

(a) Importation, production and consumption of creosote and zinc chloride.

(b) Amount and kind of timber treated.

On the above matters the sub-committee submits statistics from government and other reports.

(c) Methods of treatment.

Only two preservatives are being used in practice, i. e., creosote and chloride of zinc. Creosoted ties which have heretofore given good results were treated by the "full cell" process, with 10 to 20 pounds per cubic foot.

(d) Consider the question of economics of timber preservative. The sub-committee is not yet prepared to report on this question. It wants more data.

(e) Confer with other committees. This has been done.

(f) Inspect and report on the Texas, the Northern Pacific, the Chicago & North Western and other service tests.

The sub-committee has a copy of the inspection report of the experimental track laid by the Chicago & North Western in July, 1907. The conclusion of the examiners was that: "At the end of one year and eight months' service all of the ties were in a perfect state of preservation. There was no noticeable difference in the soundness of the treated and untreated ties."

The Northern Pacific laid test tracks near Maywood, Wash., in the late fall of 1906, and in western Montana, near Plains, in 1907. This track has not been in service long enough to furnish conclusions.

The report on the Texas experimental track is the most interesting and valuable thus far received. It is given in full in Appendix C.

Grouping, Fungi, Seasoning.

H. D. Tiemann, of the Forest Service, stationed at the Yale Forest School, has made a careful and original examination of wood structure and how fluids enter wood. His report, printed in full in Appendix E, shows that air seasoning, or, to a less effective degree, steaming, is necessary to open slits in the walls of the cells of wood which otherwise are impenetrable to fluids under pressure. He observes that the slits or openings that permit entrance of fluids to the cells begin when the moisture in the cell walls begins to dry out. These openings, therefore, occur before the wood is completely air seasoned; for the initial drying out of the cell wall is an intermediate stage in the seasoning of wood from the green state until it ceases to lose weight. In loblolly pine, for instance, the green state may be characterized by 60 per cent. moisture, and the fiber saturation point (at which the walls begin to dry) by 25 per cent. and the complete air seasoning by 12 per cent. to 18 per cent., depending upon size and climate. The fiber saturation point varies from about 25 to 30 per cent. moisture in various species. This suggestive and interesting study should give direction to experimentation under the conditions of practical workings of preserving plants.

The proper grouping of timbers is discussed in Appendix F, by H. F. Weiss, of the Forest Service, who suggests a tentative grouping which may be used in experimental determination of the most practical working grouping to fit the local condition existing at any plant. He concludes that to obtain uniform penetration and absorption, air-seasoned ties should preferably be used, but if the ties are not fully air-seasoned, they should have equal moisture per cent. when placed in the treating cylinder.

The recorded data of air-dry weights of wood have been summarized in Appendix F. Certain hitherto unpublished results of seasoning tests of ties and English woods are presented in Appendix G.

The term "air-seasoned" does not specify a fixed degree of moisture. A board one inch thick, when air-seasoned, may not have more than 15 per cent. moisture, while a tie, air-seasoned, may have 30 per cent. Again, a board air-seasoned in California in summer may have a less moisture content than one air-seasoned in Louisiana; and a plank of pine less than a plank of oak. The moisture content of air-seasoned wood varies with size, species and atmosphere fluctuations of temperature and humidity. Furthermore, the variation of moisture in large sticks must be reckoned with.

To aid in inspection of timber, a description of the fungi that attack wood is submitted in Appendix H by C. J. Humphrey, pathologist in the Bureau of Plant Industry.

Preservatives.

Crude Petroleum—In 1902 a test track was laid on the Beaumont division of the Gulf, Colorado & Santa Fe, between Pelican, Tex., and Cleveland. Ties treated with Beaumont crude oil and Bakersfield oil containing a heavy asphaltum base were used. Those treated with the Beaumont oil were short lived and gave but little, if any, service beyond those which had not been treated. These treated ties are stated by E. O. Faulkner to have been half-seasoned, and to have absorbed only about one pound of oil per cubic foot. The ties treated with Bakersfield oil are still in the track, in a good state of preservation, which, in view of the fact of the very severe climatic conditions existing in this locality, may be considered as giving good service. The amount of oil forced into these ties varied considerably, depending on the amount of sapwood, ranging all the way from 23 to 82 pounds per tie. It is generally conceded that the oil does not possess any antiseptic value, but clogs up the cells of the wood to such an extent that moisture is unable to enter. This means that in order to preserve the tie, large quantities must be injected.

The Santa Fe has since constructed a plant to treat its ties, using crude petroleum with a heavy asphaltum base. This plant has only been in operation two years, and the ties have not been in use long enough to give results.

Wood Creosote—This oil has had a limited use as a wood preservative in the United States for more than 20 years. The only methods of application, however, have been either to paint it on with a brush or to immerse the timber in the wood creosote for a brief period of time. Very few records have been kept of its use. It is hard to foretell what the results would have been had the oil been forced in under pressure according to the most approved methods.

In Europe some attempts have been made to use wood creosote oil instead of tar creosote oil. On the Swedish State Railways, experiments were begun in 1903. It was, however, difficult to get the oil to penetrate deep enough into the wood, and although a pressure of 182 pounds was employed, not more than 12 pounds to the tie could be absorbed. So far, the ties seem perfectly sound. The price of the oil used for these experiments is about 2 cents a pound.

Petroleum Tar Creosote—This product, which is distilled from the tar that results from the manufacture of water gas, has not been used in its pure state to any extent in the United States, or, if it has, it has been used under some other name. Many reports have been circulated that it has been freely used as an adulterant and mixed with coal-tar creosote; however, there is no data as to its value.

In 1906 the Forest Service conducted experiments in the treatment of mine timbers placed in the Silver Creek mine of the Philadelphia & Reading Coal and Iron Co., near Pottsville, Pa. The conditions for decay were unusually severe, the ordinary loblolly pine timber 10 inches in diameter being completely decomposed in from eight months to three years, depending on its location. Several barrels of petroleum tar creosote were obtained to use in the treatment of the experimental timber to be placed in this mine, and unusual care was taken in selecting the fractions distilled from the petroleum tar. The timbers treated with this product are in an excellent state of preservation at the present time, although located in close proximity to other timbers placed at the same time which have completely rotted away. The conditions in the mine are altogether different from those found in the open. Humidity and temperature remain practically the same; therefore the timbers do not check as they would in the open.

Strength of Treated Timber.

A synopsis of all available previously unpublished data is shown. The various tests have been made on different sized sticks, and the data is not sufficiently extensive, so that only a tentative conclusion regarding the effect of treatment can be reached at this time.

The average of the results with Douglas fir tested at the Sacramento shops of the Southern Pacific and at the University of California indicates a decrease of the modulus of elasticity of some 10 or 15 per cent. for the creosoted timber, as compared with untreated timber, and a decrease of some 30 per cent. in the outer stress at elastic limit and at failure.

This creosoted timber, however, was treated by the boiling process, and the records of treatment were destroyed in the San Francisco fire of April, 1906, so that the details of treatment are not available. It is probable that the heating by the boiling process may have been responsible for the weakening of the timber, or it may be that the characteristics of the Douglas fir timber are such that it will be weakened by treatment. Sticks 4 in. x 6 in. in cross-section were cut from the interior of the large sticks where the creosote had not penetrated, and these showed about one-half the strength of untreated sticks of similar size. It is possible that the temperatures formerly used were in excess of those of present practice. Further tests are necessary, and such tests are under way at Seattle, Wash., under direction of the Forest Service.

The tests of longleaf yellow pine show little, if any, reduction in outer fiber stress at failure for creosoted bridge stringers as compared with the natural wood. These tests cover 10 beams of treated and 10 untreated in each case, representing carefully selected material, well matched, and with the full history of treatment, etc., known.

These tests showed that the difference between the strength of the top end and the bottom end of the 32-foot stringer may be anywhere from 8 to 0 per cent. and this difference between the butt and top should, therefore, be considered in drawing conclusions from the tests.

The tests of loblolly pine at Purdue University, in connection with the tests of longleaf yellow pine mentioned above, showed a loss in strength of the loblolly pine in flexure of about 16 per cent., and in compression perpendicular to the grain about 29 per cent.

Tests by Professor Talbot on loblolly pine beams show, in Series C, a reduction of 44 per cent. in elastic limit and 30 per cent. at maximum load, but in Series D a greater strength when treated is shown, the latter result being corroborated by the results of tests of small test beams taken from the uninjured portion of the beams of Series D. In Series N, in which the alternative sticks were creosoted, the treated timber gave 17 per cent. less strength at elas-

tic limit, and 22 per cent. less strength at maximum load than the untreated timber. The strength of the treated shear blocks in Series N was 11 per cent. less than that of the untreated blocks.

In unpublished tests which were made some time ago at the University of Illinois, on oak and gum ties, the half length of each tie being treated and the other half being untreated, the modulus of rupture, elastic limit and shearing strength are stated by Professor Talbot to have been from 5 to 10 per cent. less than the values of the untreated ties.

The indications from certain minor tests are that creosoting has little effect on the strength of Douglas fir or Wisconsin white pine in tension or end compression; but does weaken it some 20 to 25 per cent. in shear. Burnettizing appears to weaken the timber, but the Burnettized specimens were not so dry as the untreated. It may be noted that the cellulose is soluble in a 40 per cent. solution of zinc chloride.

The conclusions to be reached from Forest Service Circular 309, Experiments on the Strength of Treated Timber, are fairly well based, and are as follows:

That wood treated with zinc chloride at a temperature of about 250 deg. F. renders the timber brittle. It is possible this may be on account of free acid in the solution, but this question will require further investigation before it can be determined; that the creosote itself is largely inert, and has its chief influence in modifying the transmission of moisture in or out of the wood; that excessive steam pressures are detrimental to the timber—anything over four hours at 30 pounds, or six hours at 20 pounds, exceeding the safe limits.

In Dr. Hatt's Fourth Progress Report of Tests of Treated Ties the tests showed very little diminution in strength in rail bearing for either creosoted or Burnettized red oak or creosoted loblolly pine ties as compared with the untreated timber. The lateral and pulling resistance of the spikes did not appear to be affected much, if any, by treatment of the timber, except in the case of crude oil. The crude oil was unusually viscous and a temperature of 210 deg. F. was used. The extremes of atmospheric temperature are found to have an appreciable effect on the strength of wood, especially when green. The warm timber is from 9 to 17 per cent. weaker than the very cold timber.

The committee calls attention to the data that should accompany any report on the strength of treated wood. In so many cases the results are entirely accidental, and the variation in strength introduced by the elements other than the treatment will entirely mask the latter. The reports should be examined with reference to the following elements at least: description of wood with reference to heart, sap and openness of grain; condition of seasoning; details of treatment, including analysis of preservative, with steam pressure, if any, temperature of oil or preservative; length of time between treatment and test, and exposure during this time; origin of test pieces to eliminate difference of strength between butt and top of long sticks. Again, in quoting the conclusions, the particular exhibition of strength should be considered. For instance, very wet wood, and probably wood heavily dosed with creosote, will show greater weakness under side compression than under flexure or end compression. Then, too, it must be clearly distinguished whether small pieces of timber are treated or large pieces, because the artificial seasoning under the high temperatures of the cylinder will introduce internal strains that result in serious checks, when large timbers are treated. This weakness is more likely to appear in tests of the material under shear or in ruptures of large beams under longitudinal shear. It is probable that this accounts for some of the deficiencies in strength reported.

The data so far obtained appears to support the following conclusions:

(1) With reference to small material, such as ties:
  (a) High steaming will diminish the strength rapidly.
  (b) Treating with strong solution of zinc chloride will render the timber brittle, perhaps because of free acid in the solution.
  (c) Creosote is inert.
  (d) Seasoned timber treated with light doses of creosote is as strong as the original timber.

(2) With reference to large bridge material:
  (a) The use of high steam pressures of 40 to 50 pounds is attended with considerable loss of strength.
  (b) The thermal condition of the treatment introduces internal strains that result in internal checks, which, in turn, weakens the timber to shearing stresses.
  (c) Heavily creosoted material is weak in compression at right angles to the grain.

(3) Treatment with crude petroleum may render wood soft and weak, at least temporarily; it is to be determined whether this is the effect of the process or of the preservative.

Recommendations for Future Work.

The extension of the table of statistics and the gathering of information concerning the life and use of treated timber should be continued. Further investigation and report should be made on the use and value of other preservatives, particularly crude petroleum and petroleum tar oil.

The committee should, in the next report, extend the revision of specifications for timber treatment, to include the Rueping, Lowry and other widely used processes, both for ties and timber. The specifications should be in the form of general requirements for handling of the wood previous to treatment, and detailed specifications covering all the processes in general use. There should also be submitted, in connection with these, the standard forms of inspection report blanks for various treatments.

Experiments to show proper grouping and seasoning of wood should be inaugurated at treating plants. The facilities soon to be available at the Forest Products Laboratory of the Forest Service, Madison, Wis., involving an experimental cylinder and all accessories, should result in valuable and useful data.

The question of track fastenings to be used with treated ties is one of economics, depending in part upon the life of a treated tie against decay and its life against mechanical wear. The determination for suitable fastenings should be made a subject of joint consideration of the proper committees for future work.

Conclusions.

1. That the changes in the specifications for tie treatment embodied in this report be adopted and placed in the Manual.

2. That the new version of Conclusion No. 3 of Recommended Practice be adopted and placed in the Manual.

3. That additions to Recommended Practice given in the report be adopted and placed in the Manual.

The report is signed by: W. K. Hatt (Purdue Univ.), Chairman; W. H. Courtenay (L. & N.), Vice-Chairman; R. N. Begien (B. & O.), Lincoln Bush (Consulting Engineer), O. Chanute (Consulting Engineer), C. K. Conard (Erie), C. G. Crawford (Amer. Creosoting Co.), E. B. Cushing (Sunset Central Lines), G. M. Davidson (C. & N. W.), V. K. Hendricks (St. L. & S. F.), R. L. Huntley (U. P.), A. L. Kuehn (Amer. Creosoting Co.), S. M. Rowe (Consulting Engineer), Earl Stimson (B. & O. S. W.) and Howard F. Weiss (Forest Service).

BALLAST.*

The following sub-committees were appointed:

Revision of Stone Ballast Specifications in the Manual: S. N. Williams, Chairman; J. B. Dickson, R. D. Starbuck.

Method of Making Physical Tests of Stone Ballast: S. A. Jordan, Chairman; H. E. Hale, H. B. Dick, J. G. Bloom.

Proper Thickness of Ballast, Distribution of Load on Roadbed and Question of Sub-Ballast: C. A. Paquette, chairman; H. E. Hale, G. D. Hicks, J. M. Meade, C. C. Hill.

Review of Report on Gravel Ballast and Methods of Grading Qualities: F. J. Stimson, Chairman; C. A. Paquette, W. J. Bergen, O. P. Allee.

Treatment of Foul Ballast: F. J. Bachelder, Chairman; C. S. Millard, G. M. Walker, Jr.

Mr. Jordan being unable to serve on his sub-committee, H. E. Hale was, a little later, appointed chairman in his stead.

The committee recommends that the definitions of sand and gravel as amended last year be printed in the Manual in the place of those first inserted.

The sub-committee on revision of stone ballast specifications has reported as follows:

Ballast should be of such character as to transmit the

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

pressure to and distribute it on the roadbed with minimum displacement of either, besides affording proper drainage. Sizes used should depend on the nature of the soil, kind of coal used and on the character of the traffic. One road reports that 2 in. rock will fill to the top of the tie in twelve years, then when cleaned to the depth of the tie will fill again in about six years. Another line advises using a less shoulder than usual to avoid poor drainage and finds 4 in. on straight track and 6 in. on curves satisfactory, since the sharp edges offer much friction and little rock keeps the track in line. The small broken rock keeps a finer surface, can readily be handled and allows a slight adjustment of grade, while a large size requires a corresponding raise. Too fine rock may foul easily and prevent quick drainage, does not hold line and surface as well as coarse rock, but this does not make as compact a mass and may work down into a bad soil. There is apt to be much dust with smaller sizes, while large sizes are not apt to have as sharp angles and not hold the ties as well. Light traffic has less tendency to pulverize the rock and requires less tamping, while heavy traffic requires larger dimensions. One road reports it costs about 25 per cent. more to apply 3-in. rock than 1½-in., and another that it costs more to maintain. The quality, however, decides the size used. In preparing specifications a rock of desired quality should be selected and the specifications prepared for this particular rock or that of a corresponding quality. Granite, slag and some gravel can be used to any degree of fineness, since they do not silt up and allow free drainage:



JOHN V. HANNA,
Chairman of Committee on Ballast.

In Appendix A abstracts of replies to the committee's circular of inquiry are given.

The sub-committee recommends that the ballast specifications be revised to read:

Revised Specifications for Rock Ballast.

1. Rock ballast shall be sufficiently durable not to disintegrate in the climate where used; hard enough to prevent pulverizing unduly under the action of tools or traffic, and shall break with an angular fracture when crushed.

2. The maximum size shall not exceed pieces which will pass through a 2½-in. test ring in any direction.

The minimum size shall not pass through a ¾-in. test ring, and the rock shall be free from dust, dirt or rubbish.

The sub-committee refers to the physical tests adopted by the United States Government as given by the sub-committee on method of making physical tests, and to the following Pennsylvania Railroad specifications for crushing strength of standard rocks:

"Trap rock, and other rocks in that class, must withstand a crushing stress of not less than 12,000 lbs. per sq. in.; and limestone and other stone in that class must withstand a crushing stress of not less than 10,000 lbs. per sq. in.; and all other stone must pass such other tests as the railway company may from time to time think necessary to apply."

The previous report of the committee on ballast devoted considerable space to methods of preparation and delivery of ballast, particularly crushed rock, washed and pit gravel, cementing gravel, burnt clay and chats. There was also a review of the advantages and disadvantages of various types of ballast, which led to some investigation by the committee of the proportions of sand and gravel giving best results in track. The committee made some recommendations as to best proportions of these two materials for ballast under various classes of traffic. The recommendation was not adopted by the convention, but, instead, was referred back to the committee for further investigation and report. The sub-committee appointed to consider this subject finds that there is quite a wide variance of opinion in regard to the percentages of gravel and sand which make good ballast. There are two reasons for this. First: the difference in meaning with which the term "percentage" is used. Second: the difference in the proportions of different sizes of stone of which the gravel consists.

Some engineers use the term "percentage" to indicate that portion of the original bulk which is gravel or sand. Others use it to indicate that portion of the algebraical sum of the constituent parts which is gravel or sand, Still others use it to indicate the relation of the bulk of sand to the bulk of gravel, which is considered 100 per cent.

The first and last use of the term may result in the same percentage; for instance, when the sand is not in sufficient quantity to fill the voids in the gravel. In such a case when the sand is separated from the gravel it will be found that the bulk of gravel is as great as the original bulk, making the gravel 100 per cent. and the sand the same percentage of the original bulk as of the screened gravel.

In the second use of the term the result always differs from the other two, as when 10 parts of gravel and 3 parts of sand are combined and the gravel is found to be 77 per cent. and the sand 23 per cent. of the sum of the constituent parts. In this case the actual percentage of each—of the bulk—resulting from combining the two ingredients physically, will be approximately: Gravel, 95 per cent. Sand, 28½ per cent.

In the specifications given below, "percentage" is used with the first meaning mentioned, sand if 30 per cent. of sand is designated, it means that of the original bulk, or of the bulk after combining physically the gravel and sand, 30 per cent is sand. The percentage of gravel will be 100 per cent. or less, but never as low as 70 per cent., owing to the fact that the voids in the gravel must first be filled by the sand before the bulk can be increased.

As suggested in the last paragraph, the second cause for a divergence of opinion as to the proper percentage results from the difference in the voids found in different samples of gravel. For this reason and the fact that theoretically perfect proportions call for just sufficient sand to fill the voids, there can be no fixed maximum or minimum percentage. Proportions that will result in a good ballast in one case will result in comparatively poor ballast in another. From the replies which have been received to our inquiries it is shown that 10 parts gravel and 3 parts sand represent the average practice. Especial attention is called to the fact that in the specifications two conditions are covered: (1) Bank gravel; (2) washed or screened gravel.

The committee submits the following specifications:

"For Class A Roads: When bank gravel contains more than 2 per cent. of dust or 40 per cent. of sand, it should be washed or screened. Washed or screened gravel should contain not less than 25 per cent. nor more than 35 per cent. sand.

"For Class B Roads: When bank gravel contains more than 3 per cent. of dust or 60 per cent. of sand, it should be screened or washed. Screened or washed gravel should not contain less than 25 per cent. nor more than 50 per cent. of sand.

"For Class C Roads: Any material which makes better track than the natural roadbed may be economically used."

The sub-committee on proper thickness of ballast, etc., has been unable to get its matter in shape to present. If this cannot be done in time for the convention, the work will be carried over to the coming year.

The sub-committee on physical tests of stone ballast has reported as follows:

The only physical tests of crushed stone reported which are considered reliable and have been in use for a sufficient length of time to provide a good comparison with various kinds of stone are the tests made by the Office of Public Roads, United States Department of Agriculture, at

Washington, D. C. These tests are made by the government free of charge, and were originally intended to test crushed stone for public wagon roads. These government tests for crushed stone for wagon roads, however, appeal to the sub-committee as being satisfactory physical tests for crushed stone ballast.

The tests and data given by the government are shown on form 28 of the Department of Agriculture, a copy of which is shown in Appendix A, and are as follows: (a) Weight in lbs. per cubic foot. (b) Specific gravity. (c) Water absorption in lbs. per cubic foot. (d) Per cent. of wear. (e) French coefficient of wear. (f) Hardness. (g) Toughness. (h) Cementing value.

The machine used to make the abrasion tests, or tests for wear, consists of a cast-iron cylinder closed at one end and furnished with a tightly fitting iron cover at the other end. This cylinder is 7⅞ in. in diameter and is mounted on a shaft diagonally at an angle of 30 degrees with the axis of rotation. Eleven lbs. of broken stone 1¼ in. and ½ in. in size, 50 pieces, if possible, are placed in the iron cylinder and this cylinder is revolved at 30 to 33 revolutions per minute for 10,000 revolutions for each test. The stone is then thoroughly washed and dried and the percentage of dust or detritus by weight that will pass through a screen with 1-16-in. mesh is considered the percentage of wear.

By hardness is meant the resistance of a rock to the grinding action of an abrasive agent like sand.

By toughness is meant the resistance a rock offers to fracture under impact.

By cementing value is meant the binding power of a road material or dust from rocks. Some rock dust possesses the quality of packing to a smooth surface of considerable tenacity and which is impervious to water, while others entirely lack this quality. The test consists of pulverizing the rock and, with water, making a paste, which is pressed into briquettes. These are dried and then tested for resiliency. Rock with the lowest cementing value (other properties being equal) is considered the best for crushed stone ballast.

Tests Recommended.

It is recommended that the tests made by the Department of Agriculture be used for physical tests of stone ballast, with the exception of those for specific gravity and the French coefficient of wear, as practically the same information is given in the other tests.

Detailed information as to how to select and ship specimens of rock to the Department of Agriculture for tests can be obtained from A. S. Cushman, Acting Director, Office of Public Roads, United States Department of Agriculture, Washington, D. C.

The sub-committee on treatment of foul ballast submits the following conclusions and recommendations:

That under usual conditions no ballast, except stone or hard slag, be cleaned.

Cleaning Foul Ballast, Recommended Practice.

Clean with ballast forks.
Clean shoulder down to subgrade.
Clean between ties to bottom of ties.
Clean center ditch of double track to subgrade.
Return clean ballast.

Stone Ballast Should Be Cleaned.

In terminals, at intervals of 1 to 3 years.
Heavy traffic, coal and coke lines, at intervals of 3 to 5 years.
Light traffic lines, at intervals of 5 to 8 years.

Per Cent. of New Stone Ballast to Be Applied.

Fifteen to 25 per cent.

Conclusions.

(1) The committee recommends the adoption of the revised specifications for crushed rock, submitted by the sub-committee on that subject.

(2) The approval, by the convention, as good practice, of the proportions of sand and gravel for various classes of roads, as submitted by the sub-committee having that subject in charge.

(3) The adoption, by the convention, of the recommendations as to physical tests of stone, made by the sub-committee having that subject in charge.

(4) The approval, by the convention, as good practice, of the methods for cleaning foul ballast, recommended by the sub-committee having that subject in charge.

The report is signed by: John V. Hanna (Kan. City Term.), Chairman; C. A. Paquette (C., C., C. & St. L.), Vice-Chairman; O. P. Allee (K. C. S.), F. J. Bachelder (B. & O.), W. J. Bergen (N. Y. C. & St. L.), J. G. Bloom (C., R. I. & P.), H. B. Dick (B. & O.), J. B. Dickson (Erie), W. H. Grant (Can. Nor., Ont.), H. E. Hale (Mo. P.), G. D. Hicks (N. C. & St. L.), C. C. Hill (Mich. Cent.), S. A. Jordan (B. & O.), J. M. Meade (A., T. & S. F.), C. S. Millard (C., C., C. & St. L.), R. D. Starbuck (Mich. Cent.), F. J. Stimson, (G. R. & I.), G. M. Walker, Jr. (Kan. City Term.), S. N. Williams (Cornell).

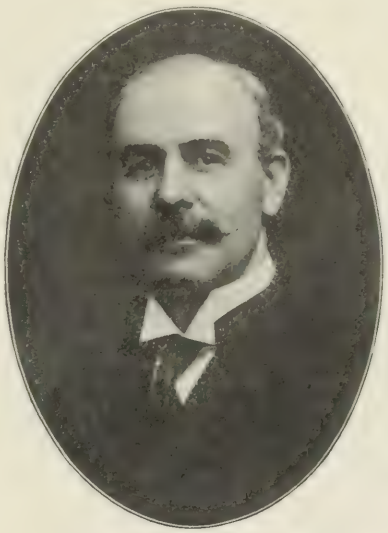
MASONRY.*

The following sub-committees were appointed:

Sub-Committee A—Specifications for Portland Cement Concrete and Reinforced Concrete: T. L. Condron, chairman; W. C. Boynton, C. H. Bartlidge, Richard L. Humphrey, A. N. Talbot, F. L. Thompson.

Sub-Committee B—Waterproofing of Masonry: G. H. Tinker, chairman; C. H. Moore, F. E. Schall, B. Douglas, L. N. Edwards.

Sub-Committee C—Monolithic Construction: W. H. Petersen, chairman; R. T. McMaster, Job Tuthill.



A. O. CUNNINGHAM,
Chairman of Committee on Masonry.

Sub-Committee D—Retaining Walls and Abutments: W. W. Colpitts, chairman; W. J. Backes, G. J. Bell.

Sub-Committee E—Reinforced Concrete Trestles, Typical Designs and Costs: G. H. Scribner, Jr., chairman; W. H. Chadbourn.

Sub-Committee F—Joint Committee on Concrete and Reinforced Concrete: A. O. Cunningham, chairman; C. W. Boynton, C. H. Moore, G. H. Scribner.

The committee reports progress on the subjects of retaining walls and abutments, monolithic construction, and reinforced concrete trestles, and requests that these subjects be reassigned.

Conclusions.

The committee recommends:

(1) That the specifications for natural and Portland cement, now appearing in the Manual, be amended to conform to the version given in the report of the special committee on standard specifications for cements (see Bulletin 118).

(2) That the specifications for Portland cement concrete now appearing in the Manual be withdrawn, and that the specifications for plain and reinforced concrete given in Appendix A of this report be adopted and incorporated in the Manual.

(3) That the recommended practice for designing reinforced concrete structures in Appendix B be adopted and incorporated in the Manual.

(4) That the report on waterproofing of masonry, in Appendix C, be received as information and the investigation continued.

The report is signed by: A. O. Cunningham (Wabash), chairman; W. H. Petersen (C., R. I. & P.), vice-chairman; W. J. Backes (Cent. New Eng.), G. J. Bell (A., T. & S. F.), C. W. Boynton (Univ. Port. Cem. Co.), C. H. Cartlidge (C., B. & Q.), T. L. Condron (consulting engineer), W. H. Chadbourn (C. G. W.), W. W. Colpitts (K. C., M. & O.), B.

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association

Douglas (Detroit Riv. Tun. Co.), L. N. Edwards (Grand Trunk), Richard L. Humphrey (consulting engineer), R. T. McMaster (P. & L. E.), C. H. Moore (Erie), F. E. Schall (Lehigh Valley), G. H. Scribner, Jr. (contracting engineer), A. N. Talbot (Univ. of Ill.), F. L. Thompson (Ill. Cent.), G. H. Tinker (N. Y., C. & St. L.) and Job Tuthill (C., H. & D.).

Appendix A.

Specifications for Plain and Reinforced Concrete and Steel Reinforcement.

Concrete Materials.

1. The cement shall be Portland and shall meet the requirements of the standard specifications. (See Manual of Recommended Practice.)

2. Fine aggregate shall consist of sand, crushed stone, or gravel screenings graded from fine to coarse, and passing when dry a screen having ¼-in. diameter holes; it shall preferably be of siliceous materials, clean, coarse, free from vegetable loam or other deleterious matter, and not more than 6 per cent shall pass a sieve having 100 meshes per linear inch.

3. Mortars composed of one part Portland cement and three parts fine aggregate by weight when made into briquettes shall show a tensile strength at least equal to the strength of 1:3 mortar of the same consistency made with the same cement and standard Ottawa sand.

4. Coarse aggregate shall consist of crushed stone of gravel, graded in size, and which is retained on a screen having ¼-in. diameter holes; it shall be clean, hard, durable and free from all deleterious material. Aggregates containing soft, flat or elongated particles shall not be used.

5. The water used in mixing concrete shall be free from oil, acid, and injurious amounts of alkalies or vegetable matter.

Steel Reinforcement.

6. Steel shall be made by the open-hearth process. Rerolled material will not be accepted.

7. Plates and shapes used for reinforcement shall be of structural steel only. Bars and wire may be of structural steel or high carbon steel.

8. The chemical and physical properties shall conform to the following limits:

Elements Considered.	Structural Steel.	High Carbon Steel.
Phosphorus, max. { Basic	0.04 per cent.	0.04 per cent.
Phosphorus, max. { Acid	0.06 per cent.	0.06 per cent.
Sulphur, maximum	0.05 per cent.	0.05 per cent.
Ultimate Tensile Strength.	Desired	Desired
Pounds per square inch	60,000	88,000
Elong., min. % in 8", Fig. 1	1,500,000*	1,000,000
Character of Fracture	Ult. tensile str'gth Silky	Ult. tensile str'gth Silky or finely granular
Cold Bends without Fracture	180° flat†	180° $d=4t$‡

*See paragraph 15. †See paragraphs 16 and 17. ‡"$d=4t$" signifies "around a pin whose diameter is four times the thickness of the specimen."

9. The yield point for bars and wire, as indicated by the drop of the beam, shall be not less than 60 per cent of the ultimate tensile strength.

10. If the ultimate strength varies more than 4,000 lbs. for structural steel or 6,000 lbs. for high carbon steel, a retest shall be made on the same gage, which to be acceptable, shall be within 5,000 lbs. for structural steel, or 8,000 lbs. for high carbon steel, of the desired ultimate.

11. Chemical determinations of the percentages of carbon, phosphorus, sulphur and manganese shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector. Check analysis shall be made from finished material, if called for by the railway company, in which case an excess of 25 per cent above the required limits will be allowed.

12. Plates, Shapes and Bars: Specimens for tensile and bending tests for plates and shapes shall be made by cutting coupons from the finished product, which shall have both faces rolled and both edges milled to the form shown by Fig. 1. [This drawing is the same as the one in the present Manual, p. 268, illustrating test pieces for plates, shapes and bars in iron and steel structures]; or with both edges parallel; or they may be turned to a diameter of ¾-in. with enlarged ends.

13. Bars shall be tested in their finished form.

14. At least one tensile and one bending test shall be made from each melt of steel as rolled. In case steel differing ⅜ in. and more in thickness is rolled from one melt, a test shall be made from the thickest and thinnest material rolled.

15. For material less than 5-16 in. and more than ¾ in. in thickness the following modifications will be allowed in the requirements for elongation:

(a) For each 1-16 in. in thickness below 5-16 in. a deduction of 2½ will be allowed from the specified percentage.

(b) For each ⅛-in. in thickness above ¾-in., a deduction of 1 will be allowed from the specified percentage.

16. Bending tests may be made by pressure or by blows. Shapes and bars less than one inch thick shall bend as called for in paragraph 8.

17. Test specimens one inch thick and over shall bend cold 180 degrees around a pin, the diameter of which, for structural steel, is twice the thickness of the specimen, and for high carbon steel, is six times the thickness of the specimen, without fracture on the outside of the bend.

18. Finished material shall be free from injurious seams, flaws, cracks, defective edges or other defects, and have a smooth, uniform and workmanlike finish.

19. Every finished piece of steel shall have the melt number and the name of the manufacturer stamped or rolled upon it, except that bar steel and other small parts may be bundled with the above marks on an attached metal tag.

20. Material which, subsequent to the above tests at the mills, and its acceptance there, develops weak spots, brittleness, cracks or other inperfections, or is found to have injurious defects, will be rejected and shall be replaced by the manufacturer at his own cost.

21. All reinforcing steel shall be free from excessive rust, loose scale, or other coatings of any character, which would reduce or destroy the bond.

Workmanship.

22. The unit of measure shall be the cubic foot. A bag containing not less than 94 lbs. of cement shall be assumed as one cubic foot of cement. Fine and coarse aggregates shall be measured separately as loosely thrown into the measuring receptacle.

23. The fine and coarse aggregates shall be used in such relative proportions as will insure maximum density.

24. The proportions of materials for the different classes of concrete shall be as follows:

[The committee shows a blank form to be filled for each contract, the form being ruled in columns to show class, use, and proportions of cement and fine and coarse aggregates.]

25. For plain concrete, a proportion of 1:9 (unless otherwise specified) shall be used, i. e., one part of cement to a total of nine parts of fine and coarse aggregates measured separately; for example, 1 cement, 3 fine aggregate, 6 coarse aggregate.

26. For reinforced concrete a proportion of 1:6 (unless otherwise specified) shall be used, i. e., one part of cement to a total of six parts of fine and coarse aggregates measured separately.

27. The ingredients of concrete shall be thoroughly mixed to the desired consistency, and the mixing shall continue until the cement is uniformly distributed and the mass is uniform in color and homogeneous.

28. The various ingredients, including the water, shall be measured separately, and the methods of measurement shall be such as to secure the proper proportions at all times.

29. A machine mixer, preferably of the batch type, shall be used, whenever the volume of the work will justify the expense of installing the plant. The requirements demanded are that the product delivered shall be of the specified proportions and consistency and thoroughly mixed.

30. When it is necessary to mix by hand, the mixing shall be on a watertight platform of sufficient size to accommodate men and materials for the progressive and rapid mixing of at least two batches of concrete at the same time. Batches shall not exceed one-half cubic yard each. The mixing shall be done as follows: The fine aggregate shall be spread evenly upon the platform, then the cement upon the fine aggregates, and these mixed thoroughly until of an even color. The water necessary to mix a thin mortar shall then be added and the mortar spread again. The coarse aggregates, which, if dry, shall first be thoroughly wetted down, shall then be added to the mortar. The mass shall then be turned with shovels or hoes until thoroughly mixed and all of the aggregate covered with mortar. Or, at the option of the engineer, the coarse aggregate may be added before, instead of after, adding the water.

31. The materials shall be mixed wet enough to produce a concrete of such consistency that it will flow into the forms and about the metal reinforcement, and which, on the other hand, can be conveyed from the place of mixing to the forms without separation of the coarse aggregate from the mortar.

32. Retempering mortar or concrete, i. e., remixing with water after it has partially set, will not be permitted.

33. Concrete after the addition of water to the mix shall be handled rapidly from the place of mixing to the place of final deposit, and under no circumstances shall concrete be used that has partially set before final placing.

34. The concrete shall be deposited in such a manner as will prevent the separation of the ingredients and permit the most thorough compacting. It shall be compacted by working with a straight shovel or slicing tool kept moving up and down until all the ingredients have settled in their proper place and the surplus water is forced to the surface. In general, except in arch work, all concrete must be deposited in horizontal layers of uniform thickness throughout.

35. In depositing concrete under water, special care shall be exercised to prevent the cement from floating away, and to prevent the formation of laitance.

36. Before depositing concrete in forms, the forms shall be thoroughly wetted except in freezing weather, and the space to be occupied by the concrete cleared of debris.

37. Before placing new concrete on or against concrete which has set, the surface of the latter shall be roughened, thoroughly cleansed of foreign material and laitance drenched and slushed with a mortar consisting of one part Portland cement and not more than two parts fine aggregate.

38. The faces of concrete exposed to premature drying shall be kept wet for a period of at least three days.

39. The concrete shall not be mixed or deposited at a freezing temperature, unless special precautions, approved by the engineer, are taken to avoid the use of materials containing frost or covered with ice crystals, and to provide means to prevent the concrete from freezing.

40. Where the concrete is to be deposited in massive work, clean, large stones, evenly distributed, thoroughly bedded and entirely surrounded by concrete, may be used, at the option of the engineer.

41. Forms shall be substantial and unyielding and built so that the concrete shall conform to the designed dimensions and contours, and so constructed as to prevent the leakage of mortar.

42. The forms shall not be removed until authorized by the engineer.

43. For all important work, the lumber used for face work shall be dressed to a uniform thickness and width; shall be sound and free from loose knots and secured to the studding or uprights in horizontal lines.

44. For backings and other rough work undressed lumber may be used.

45. Where corners of the masonry and other projections liable to injury occur, suitable moldings shall be placed in the angles of the forms to round or bevel them off.

46. Lumber once used in forms shall be cleaned before being used again.

Details of Construction.

47. Wherever it is necessary to splice the reinforcement otherwise than as shown on the plans, the character of the splice shall be decided by the engineer on the basis of the safe bond stress and the stress in the reinforcement at the point of splice. Splices shall not be made at points of maximum stress.

48. Concrete structures, wherever possible, shall be cast at one operation, but when this is not possible, the resulting joint shall be formed where it will least impair the strength and appearance of the structure.

49. Girders and slabs shall not be constructed over freshly formed walls or columns without permitting a period of at least four hours to elapse to provide for settlement or shrinkage in the supports. Before resuming work, the tops of such walls or columns shall be cleaned of foreign matter and laitance.

50. A triangular-shaped groove shall be formed at the surface of the concrete at vertical joints in walls and abutments.

51. Except where a special surface finish is required, a spade or special tool shall always be worked between the concrete and the form to force back the coarse aggregates and produce a mortar face.

52. Top surfaces shall generally be "struck" with a straight edge or "floated" after the coarse aggregates have been forced below the surface.

53. Where a "sidewalk finish" is called for on the plans, it shall be made by spreading a layer of 1:2 mortar at least ¾-in. thick, troweling the same to a smooth surface. This finishing coat shall be put on before the concrete has taken its initial set.

Appendix B.

Recommended Practice for Designing Reinforced Concrete Structures.

(1) The materials and workmanship for reinforced concrete should meet the requirements of the specifications for plain and reinforced concrete, presented in this report of the committee on massonry.

The concrete recommended for general use is a mixture of one part of cement to six parts of fine and coarse aggregates. A richer mixture will be found advantageous for special conditions.

(2) The dead load is to include the estimated weight of the structure and all other fixed loads and forces acting upon the structure.

(3) The live load is to include all variable and moving loads or forces acting upon the structure in any direction.

(4) As the working stresses herein recommended are for static loads, the dynamic effect of moving loads is to be added to the live load stresses.

(5) The span length for beams and slabs is to be taken as the distance from center to center of the supports, but not to exceed the clear span plus the depth of beam or slab.

(6) The internal stresses are to be calculated upon the basis of the following assumptions:

(a) A plane section before bending remains plane after bending.

(b) The distribution of compressive stresses in members subject to bending is retilinear.

(c) The ratio of the moduli of elasticity of steel and concrete is 15.

(d) The tensile stresses in the concrete are neglected in calculating the moment of resistance of beams.

(e) The initial stress in the reinforcement due to contraction or expansion in the concrete is neglected.

(f) The depth of a beam is the distance from the compressive face to the centroid of the tension reinforcement.

(g) The effective depth of a beam at any section is the distance from the centroid of the compressive stresses to the centroid of the tension reinforcement.

(h) The maximum shearing unit stress in beams is the total shear at the section divided by the product of the width of the section and the effective depth at the section considered. This maximum shearing unit stress is to be used in place of the diagonal tension stress in calculations for web stresses.

(i) The bond unit stress is equal to the vertical shear divided by the product of the total perimeter of the reinforcement in the tension side of the beam and the effective depth at the section considered.

(k) In concrete columns the concrete to a depth of 1½-in. is to be considered as a protective covering and is not to be included in the effective section.

(7)* "When the maximum shearing stresses exceed the value allowed for the concrete alone, web reinforcement must be provided to aid in carrying the diagonal tension stresses. This web reinforcement may consist of bent bars, or inclined or vertical members, attached to or looped about the horizontal reinforcement. Where inclined members are used, the connection to the horizontal reinforcement shall be such as to insure against slip.

"In the calculation of web reinforcement when the concrete alone is insufficient to take the diagonal tension the concrete may be counted upon as carrying one-third of the shear. The remainder is to be provided for by means of metal reinforcement consisting of bent bars or stirrups, but preferably both. The requisite amount of such reinforcement may be estimated on the assumption that the entire shear on a section, less the amount assumed to be carried by the concrete, is carried by the reinforcement in a length of beam equal to its depth."

(8) The following recommended working stresses, in pounds per square inch of section, are for use in concrete of such quality as to be capable of developing an average compressive strength of at least 2,000 lbs. per square inch when tested in cylinders 8 in. in diameter and 16 in. long

*The recommendations regarding web stresses are quoted from a report of the Joint Committee on Concrete and Reinforced Concrete.

and 28 days old, under laboratory conditions of manufacture and storage, the mixture being of the same consistency as is used in the field:

Structural steel in tension	14,000
High carbon steel in tension	17,000
Steel in compression, 15 times the compressive stress in the surrounding concrete.	
Concrete in bearing where the surface is at least twice the loaded area	700
Concrete in direct compression, without reinforcement on lengths not exceeding six times the least width	450
Concrete in direct compression with not less than 1 per cent nor over 4 per cent longitudinal reinforcement on lengths not exceeding twelve times the least width	450
Concrete in compression, on extreme fibre in cross bending	750
Concrete in shear, uncombined with tension or compression in the concrete	120
Concrete in shear, where the shearing stress is used as the measure of web stress	40
Note.—The limit of shearing stresses in the concrete, even when thoroughly reinforced for shear and diagonal tension, should not exceed	120
Bond for plain bars	80
Bond for drawn wire	40
Bond for deformed bars, depending upon form	100-150

At the Coliseum

The Roberts & Schaefer Company, Chicago, has just closed a contract with the Pennsylvania Railroad for a large Holmen cooling station for installation in Pennsylvania.

The W. F. Bossert Manufacturing Company, Utica, N. Y., space 137, is showing its latest improved switch point adjuster, of which a large number have been installed on many of the leading railways during the past two years. It is very simple, strong and compact. It has the advantage of being completely housed from the elements, which also prevents all foreign substance from clogging the working parts.

A particularly interesting feature of the exhibit of the Okonite Company, New York, is the display of the portion of a fine Para rubber biscuit, weighing 93¼ lbs., which, at the market price of $2.46 per lb., is worth $229.40. After being washed, dried and made ready for use in manufacture, owing to shrinkage and other losses, it would be worth $3 per lb. To the users of rubber insulated wire this is of interest, as it explains the present high price of this high-grade product.

The life of a rubber compound is dependent on the quality and percentage of rubber used, also the care in treating, compounding and vulcanizing. The Okonite Company's specialty is 30 per cent. fine Para rubber, the only grade which this company has ever made.

KEUFFEL & ESSER COMPANY EXHIBIT.

A very attractive exhibit in the line of surveying and drawing instruments is shown by the Keuffel & Esser Company, New York, represented by its Chicago branch in space 98. It shows the most modern instruments, as this company has made, during the last few years, many improvements in its surveying instruments, which are very neat in appearance and evidence the best of workmanship.

This company also shows a large assortment of slide rules and an 80-in. model of the Duplex slide rule which has been quite an attraction to the engineers. There is also shown a very complete line of steel measuring tapes, with the Keco finish, which protects the tape from rust. On account of the dark finish of these tapes, the figures show up very plainly and are very easily read.

LOCK JOINT CAST IRON CULVERT PIPE.

Three years ago the National lock joint cast iron culvert pipe was placed upon the market by the American Castings Company, Birmingham, Ala., and since that time it has been in use by railway companies in all parts of the country.

The National lock joint pipe is said to be lighter per foot than pressure pipe, and cheaper. As it is made in 3-ft. to 5-ft. lengths, it is easily transported and placed in the trench. Being equipped with a metal lock joint, unbelling and disjointing is impossible and no cement is required on the joints. In case of breakage, a 3-ft. unit is lost rather than a 12-ft. one, and the short units make cutting unnecessary. There are four bells in a 12-ft. length, which act as reinforcing bands to prevent crushing, and they also reduce washouts to a minimum, as each acts as an additional anchorage.

National pipe is designed especially for railway culverts, using only No. 2 and No. 3 pig iron and no scrap. The



Section of Lock Joint Cast Iron Culvert Pipe.

pipe is cast in a green sand mold, which is a decided novelty and necessity in making pipe of this character. The shrinkage strain is prevented, since the inside core member is stripped out, while the pipe is bright red hot.

Where box culverts have failed, National pipe has been used to good advantage by threading the short units through and locking the same inside of the old culvert, and filling in around the pipe as the culvert is laid. On new work, where transporting across the country is difficult, due to the fact that National pipe can be handled by one or two men and nested, haulage charges are much less.

CORRUGATED METAL CULVERTS.

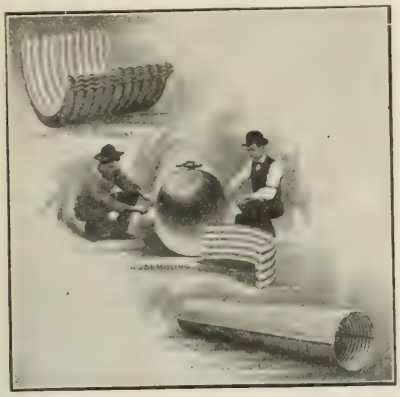
If the demand which is being made upon the Canton Culvert Company, Canton, Ohio, for its Acme corrugated metal culverts, Doro railway drains, etc., can be used as a criterion, it seems that corrugated metal culverts are recognized as among the best of underground water conductors. This culvert, while it is cheaper, in the long run, than cast iron, tile or terra cotta, though perhaps not so in first cost, is nevertheless more desirable in many particulars.

Acme culverts are so constructed as to enable shipping, hauling and handling with economy and convenience, due to the knock-down feature, and being easily set up and installed by the use of a few bolts.

They are made of heavier gauge material than has characterized corrugated culverts manufactured in the past, which, coupled with the fact that the lateral flanges along both sides and the circumferential reinforcements supplied by the lapping break joints at 12-in. intervals, makes them amply strong. These culverts are said to have proved their stability, through satisfactory use, under highways, traction railways and for other purposes.

A strong feature in favor of Acme culverts is in the fact that they are made of a special analysis iron known com-

mercially as "No-Co-Ro" metal. Ordinary galvanized sheets are more or less susceptible to the corrosive action of dirt, ashes, salt water, with which they come in contact when imbedded in the earth. Tests on "No-Co-Ro" metal, according to the specifications of the United States government



Details and Assembled Canton Culverts.

and various technical institutes, and in accordance with the recommendation of the American Society for Testing Materials, are said to prove that it is far superior, for culvert purposes, to ordinary steel, charcoal or muck bar iron, and is remarkably free from the impurities in iron which tend toward corrosion.

HAND, PUSH AND VELOCIPEDE CARS.

The Kalamazoo Railway Supply Co., Kalamazoo, Mich., whose exhibit is in booths 24 and 25, carries a complete line of hand, push and velocipede cars. The hand cars are substantially built and have the following desirable features: Pressed steel, taper wheels and pinion-fit axles, flexible steady-box, double acting brake and well trussed gallows-frame. These cars are made in 16 types. Push cars are made in ten styles, including small, light cars and large, extra heavy track-laying or rail cars. Velocipedes are made in both three and four wheel types. They are made of steel and malleable iron and the frame is trussed to give maximum strength with minimum weight. The axles revolve under anti-friction rollers and the cars are geared 3½ to 1. For inspection purposes, four-wheel cars with or without canopies are supplied.

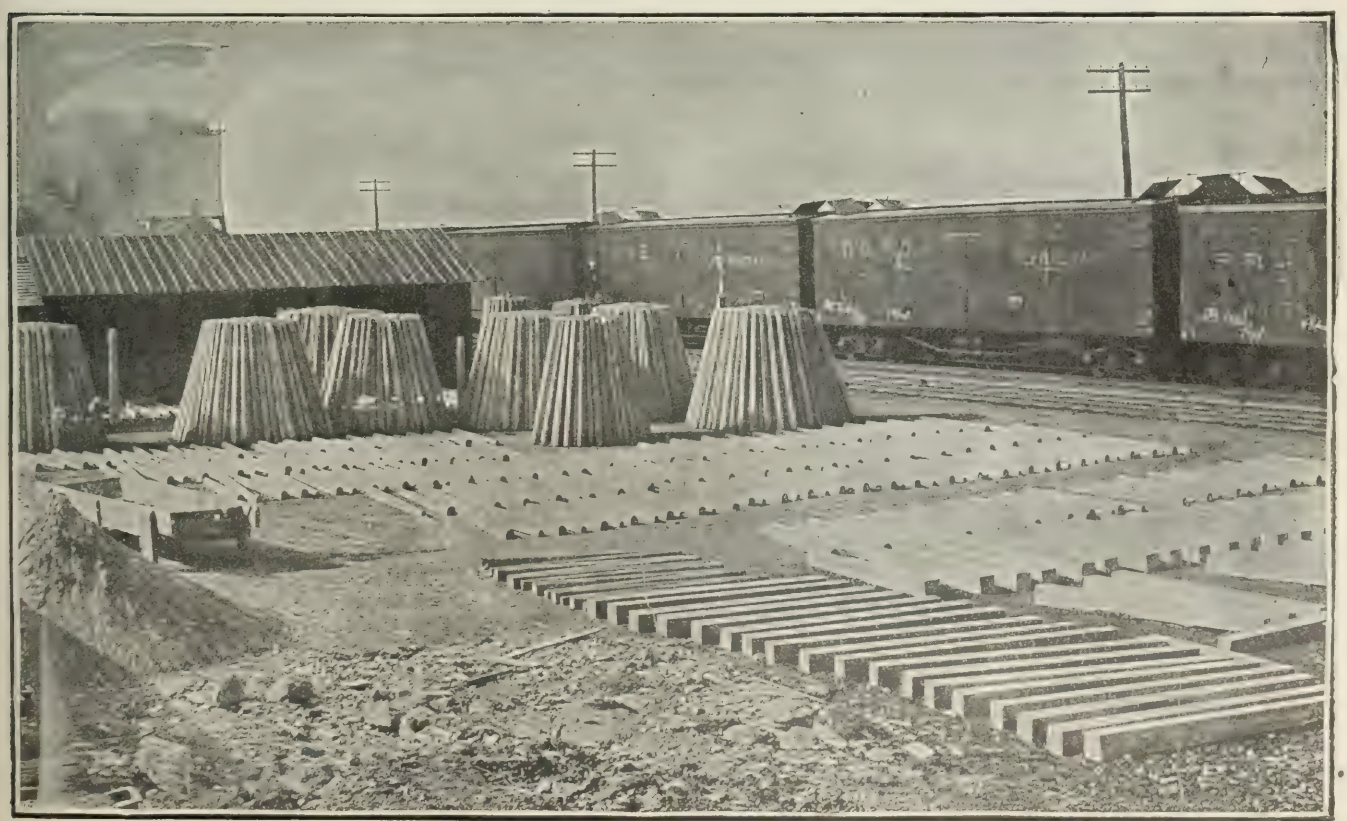
In addition to the cars mentioned, the company carries a full line of motor cars, track drills, jacks, crossing gates and other track appliances.

MODEL "R N R" MANGANESE FROGS.

The Indianapolis Switch & Frog Co., Springfield, Ohio, has on exhibition in booth 182 its model "R N R" manganese frogs. These frogs are proving their economy in service on account of lower maintenance charges and higher efficiency. By the use of all manganese frogs, three pairs of splices are saved as well as the maintenance of joints. These frogs are made to receive the track rails without any alteration and the rails are protected by manganese easers. The company also makes solid and insert manganese crossings and switch points.

REINFORCED CONCRETE FENCE POSTS.

The accompanying cut is a view of the plant of the D. & A. Post Mold Co., Three Rivers, Mich., whose exhibit is in booth 132 at the Coliseum. The posts made by this company are of concrete reinforced by four vertical steel bars; they are U-shaped in cross section and are tapered. The machine for making the posts consists of a set of ten individual molds placed on a frame for filling. Adjacent molds have their taper in opposite directions so all the molds fit tightly together to form a solid table on which the concrete is scooped or dropped from a mixer. After leveling off, the reinforcing is pressed into place by a special device



D. & A. Cement Post Plant.

furnished with the outfit. Then the concrete is compacted by vibrating the supporting frame. This method allows the ten posts to be compacted more quickly than a single one could be tamped. After removing the posts from the forms they are laid out to season, as shown in the view of the company's plant. The average cost of the posts is given as about 17 cents.

AUSTIN CUBE MIXER.

The Austin non-tilting cube mixer is now in use on 22 railways in this country, and on the Panama Canal 20 such mixers are being used which have a capacity of 64 cu. ft. each, the largest batch mixers ever built. The cube principle of mixing is used entirely, the only internal vanes being the large discharge vanes which are necessary to deposit the concrete on the discharge chute, since the mixer is non-tilting. The point of discharge is always stationary, which eliminates the spilling of concrete over the edges of

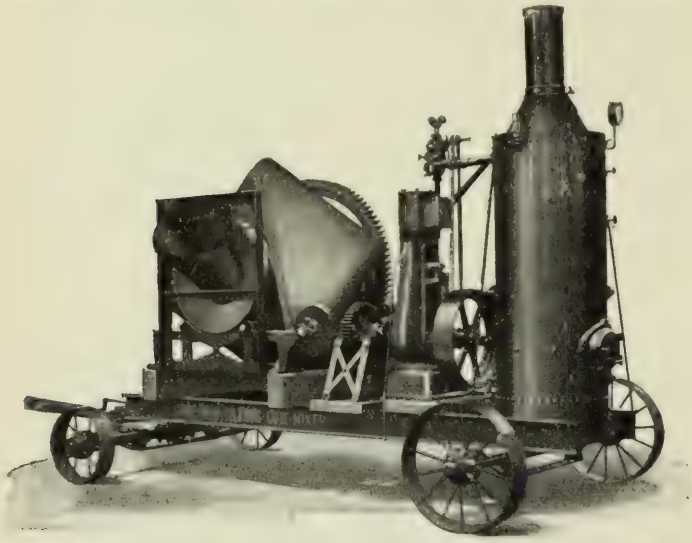


Fig. 1. Austin Mixer, Charging Side.

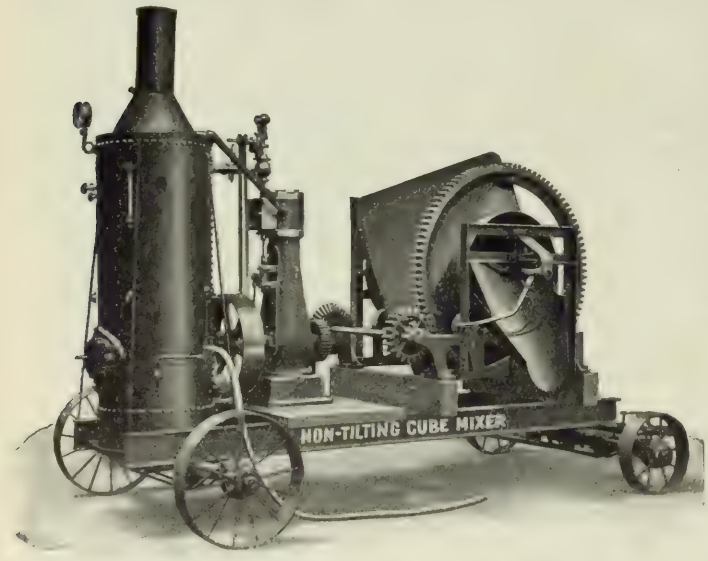


Fig. 2. Austin Mixer, Discharging Side.

wheelbarrows. These mixers are mounted on skids or trucks and are driven by steam, gasoline or electric power. There are five standard sizes.

The Austin mixer is one of the products of the Municipal Engineering & Contracting Co., Chicago, whose exhibit is in booth 19.

RAILWAY ENGINEER'S INSTRUMENTS.

An attractive exhibit at the Coliseum is made by the Iszard-Warren Company, Inc., Philadelphia, Pa., through its Chicago representative, the C. F. Pease Company, Chicago. The exhibit contains a complete line of surveying instruments for every branch of the engineering profession, also barometers, anemometers, field glasses, drafting instruments, parallel rulers, etc.

The precision transit No. 1 is well proportioned and of beautifully executed workmanship. This instrument is also made with an improved one-piece U-shaped standard, making a very rigid combined transit and leveling instrument for railway work. The mountain size, weighing 10 lbs., a counterpart of the precision transit No. 1, makes a very light, accurate and portable instrument. The explorer's size is a very unique instrument, weighing only five lbs. This is thought to be the smallest transit made and is designed especially for location surveys. The engineer's transit for general field work requires accurate workmanship and at the same time an ability to withstand the roughest handling without injuring the adjustments. The engineer's and contractor's Y-levels, having 15-in., 18-in. and 20-in. telescopes, have many admirers on account of the graduated levels, as well as the fine definition and the high power of the telescopes.

The most interesting feature of this exhibit is a dissected precision transit, showing the inside construction of the long tapered centers, the reinforced ribbed-cast horizontal limb and the original method of dovetailing a strip of solid silver, on which the graduations are cut. The opportunity of examining the hard perfect metal employed and the precise workmanship of the Sterling transits and levels will undoubtedly make many friends for the manufacturers.

SNYDER STEEL TIE.

The American Railway Steel Tie Company, Harrisburg, Pa., in space 217-218, has a very convincing exhibit relative to the installation and life of the Snyder steel tie. A section of rock-ballasted track with ten ties is shown. The exhibit also contains several Snyder steel ties, which, with others, were placed in track on the Pennsylvania railroad, Pittsburgh division, three years ago, where they have remained ever since. The ties shown were taken up and brought to the convention with the permission of the railway company. A number of these Snyder ties have been removed from yard to main line track, which would seem to show that they are considered applicable for the most severe service.

The standard type of this tie consists of a steel case, 5-16 in. thick, 8 ft. long. It is 7 in. wide on face by 6 in. deep. The interior of the case is filled with a mixture of asphalt and crushed stone. The sides are flanged on the asphalt filling, which holds it in place, leaving 5½ in. of the bottom of the filling exposed the entire length of the tie, which is embedded in the ballast to prevent shifting. The filling is flexible, and being exposed on the bottom of the tie, has the same resiliency as that of a wooden cross tie.

The adjustable fastening to the ties admits of adjusting the gage and aligning the track without shifting the ties, and also secures the rail to the ties by clips and bolts. It is well adapted to perfect tamping or surfacing the track, having the round corner. It conforms in size to the standard wooden cross tie. Being uniform in size, it gives a uniform support to the rails. The weight of this tie is 600 lbs., and when laid and properly aligned and surfaced, it is claimed that it can be made maintained on 40 per cent of the cost of keeping up track with wooden ties. The uniform bearing of this tie prevents low joints .

LONG-SPAN SCHERZER ROLLING LIFT BRIDGE.

The Baltimore & Ohio is replacing its single-track, center-swing bridge across the Cuyahoga river at Cleveland, Ohio, with a double-track, single-leaf Scherzer rolling life bridge, having a movable span of 200 ft., center to center of bearings. In length of span for a single-leaf bridge this structure is exceeded only by the single-leaf, single-track Scherzer bridge which was built several years ago for the B. & O. across the Cuyahoga river.

During the construction of the new bridge, the regular traffic will be maintained over the existing structure by erecting the new bridge in the open position.

This is the eighth Scherzer bridge built at Cleveland and replacing center-pier swing bridges during the internal harbor improvements to accommodate large lake vessels. The designs, plans and specifications of the superstructure and operating machinery of the new bridge and also the consulting engineering services were furnished by the Scherzer Rolling Lift Bridge Company, Chicago. The Pennsylvania Steel Company, Steelton, Pa., is the contractor for the superstructure. The entire work is being supervised by A. M. Kinsman, chief engineer, and W. S. Bouton, bridge engineer of the Baltimore & Ohio.

99.94 PER CENT. PURE IRON.

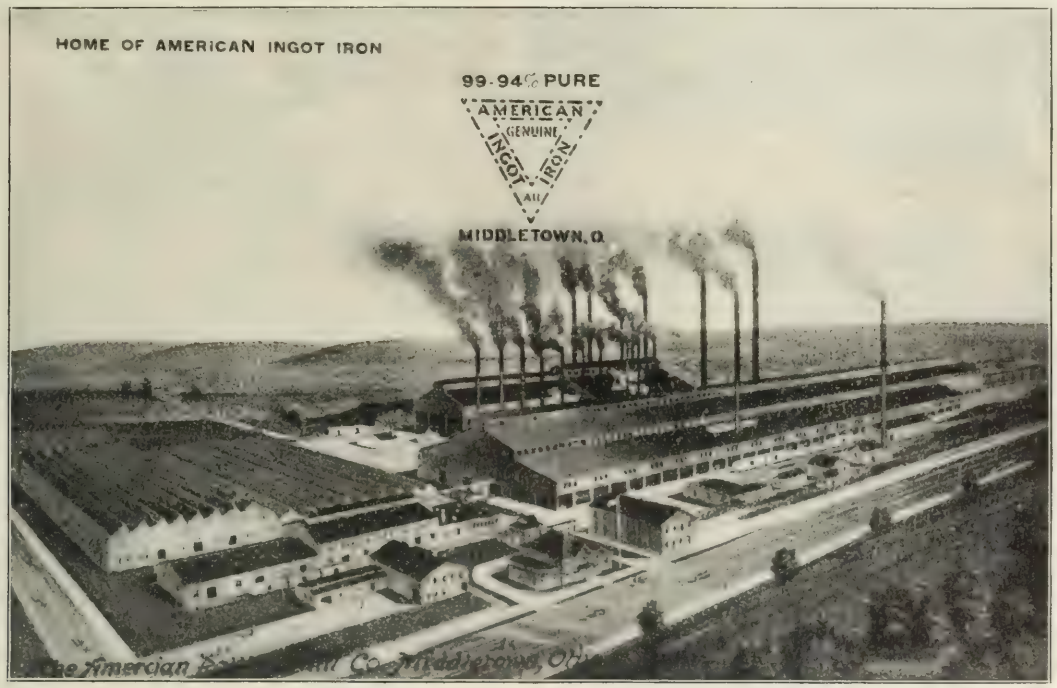
The remarkable achievement of the production of an almost chemically pure iron, developed and placed on the market by the American Rolling Mill Company of Middletown, Ohio, and known as American ingot iron, has created a considerable amount of interest and a review of the properties of this metal will indicate some of the advantages to be expected from its use.

After experimenting for a number of years, in endeavoring to eliminate the impurities and harmful elements always existing in steel, a product was finally obtained that contained at least 99.94 per cent. of iron; thus the total impurities would amount to but .06 per cent. or less.

This degree of purity was never obtained by the puddling process, and even at the present time iron wire of 99.90 per cent. of iron is used for standardizing solutions in the chemical laboratories and is sold for $1 a pound.

American ingot iron is made by a process in which the metal, while in a molten condition, is poured into molds, forming ingots, which are subsequently rolled into material demanded by the trade. While the iron is in a molten condition it is purified by the addition of suitable purifying agents, which carry the impurities into the slag and, being of less gravity than the iron, the slag floats on the surface and does not become mixed or contaminated with the iron.

Wrought iron always contains slag, the poorer grades large quantities—often amounting to two per cent., while the better grades may contain .2 per cent. It is in this respect that American ingot iron differs from wrought iron when examined under the microscope. The longitudinal sections of wrought iron always show slag lines in a network of ferrite or nearly pure iron, while American ingot iron shows the network or grains of ferrite but the absence of slag.



American Rolling Mill Co., Middletown, Ohio.

The absence of slag gives American ingot iron superior physical properties, and it has a higher tensile strength—greater elastic limit and more elongation and reduction of area than any wrought iron manufactured.

The property that has created the greatest interest is its remarkable resistance to corrosion. A sheet of American ingot iron, when immersed in a 25 per cent. solution of sulphuric acid at 70 degrees centigrade, will lose about .3 per cent of its weight in a half hour; while a sheet of Bessemer steel of the same size and gauge will dissolve completely (lose 100 per cent.) under the same conditions.

The sulphuric acid test has been recommended by the American Society for Testing Materials and shows in a quick way the comparative rust-resisting properties of iron and steel, and has been selected because of the presence of sulphur compounds in most water as well as sulphur compounds in the air formed by the combustion of sulphur in coal.

Open-hearth steel will not show as much loss in an acid

solution as Bessemer steel. This is probably due to the Bessemer steel containing more gases.

It is possible to degasify American ingot iron so completely that a cross-section of the ingot obtained by cutting the ingot in two will not show a blowhole. Some grades of steel will contain so much gas or so many blowholes that a cross-section will look like a piece of Swiss cheese.

The reason for degasifying and eliminating all of the impurities usually found in steel is because modern research has shown that corrosion is caused by electrolysis, whereby the impurities, being electro-negative to iron, in the presence of moisture, electric currents are generated with the destruction of the more electro-positive metals.

The metal manganese, which is always found in steel, is more electro-positive to the impurities than iron, and the electric currents generated will destroy the manganese first and cause pitting or tubercular corrosion, especially where the manganese has segregated.

As American ingot iron contains but traces of manganese, and the impurities being at a minimum, there will be no segregation, hence no tubercular corrosion and fewer electric currents.

The high permeability of American ingot iron makes it suitable for magnets and other electrical purposes where the best Swedish iron has been used.

In welding properties it is superior to either wrought iron or steel. It also enamels far better, and has higher electrical conductivity, thus making it suitable for telephone wire.

In stamping and deep-drawing, it is far superior to steel on account of its remarkable ductility.

At the present time, American ingot iron is only made in the form of sheets and plates. However, it is hoped that in the near future it will be used for making wire and nails, as well as many other articles.

Five basic patents have been granted on this product by the U. S. government to the International Metal Products Company.

UNION SWITCH & SIGNAL EXHIBIT.

The exhibit of the Union Switch & Signal Company, Swissvale, Pa., is remarkable, chiefly, for the number of signal mechanisms displayed. There are four top post signals and two bottom post signals.

The exhibits may be briefly described as follows:

Top post, three position, electro-pneumatic signal. This is designed for either automatic block or interlocking work.

Top post, three position, style T, low voltage signal. This signal has no dashpot, the shock of the blade returning to stop being absorbed by a snubbing circuit on the motor. This necessitates driving all the gears and the motor backwards; therefore, as an extra precaution, the circuits are so arranged as to cause the motor to pull the signal to stop should it tend to stick clear. This signal can be furnished either to sit on top of a pipe post or to bolt to the side of a post.

Top post, three position, style T, high voltage signal. In all respects the same as the former, except designed to operate on 110-volt circuit.

Top post, three position, style D signal. This signal is designed to meet the views of such persons as object to driving the gears and motor backwards when the signal goes to the stop position. A smaller motor is here used than in style T, and there is greater gear reduction. A slot is used to engage and disengage the motor and the semaphore shaft. One novel feature of this signal is the double-acting air buffer, with mechanically actuated valves, so arranged as to cause retardation both of compression and vacuum.

The post signals are the well-known style B and style S, both three position, low voltage.

Electro-pneumatic interlocking machine connected to a subway motion plate type switch and lock movement and the top post three position signal. The machine is equipped with electric lights below the levers to show whether or not a track section is occupied.

Multiple unit electric interlocking machine connected with motion plate, screw-driven switch and lock movement and solenoid dwarf signal.

Set of staff machines modified so that they can be manipulated by trainmen, thus doing away with the necessity for operators, provided all trains stop at all stations.

Controlled manual block instrument connected to upper quadrant, three position train order signal with universal spectacle.

Cable post with relay box and switch indicator, as used by the Rock Island. Also double disk and semaphore indicator, so arranged in one instrument that one repeats the position of the home signal and the other announces the approach of a train.

Circuit controlled for eight independent circuits. Contacts adjustable.

"Electro-pneumatic relay," an electro-pneumatically controlled circuit controller, used as a repeating relay where a great many circuits must be controlled by one relay.

Type 9-C neutral and polarized relays.

Alternating current, ordinary induction and frequency vane type relays. Galvanometer and induction motor type polyphase relays.

Clockwork-driven slow hand release for electric locking circuits.

Storage battery charging switch.

Adjustable resistances to be used with storage battery on track circuits.

Testing sets for relay inspectors.

Deflecting bars, both vertical and horizontal.

Pipe carriers and foundation tapes of iron "Sheradized" or impregnated 3-16 in. with zinc dust, so as to prevent rust and make painting unnecessary.

Highway crossing bell, with relay box and sign on iron post.

Electrically driven crossing gate, with positive drive up and down, equipped with buffer to absorb shock.

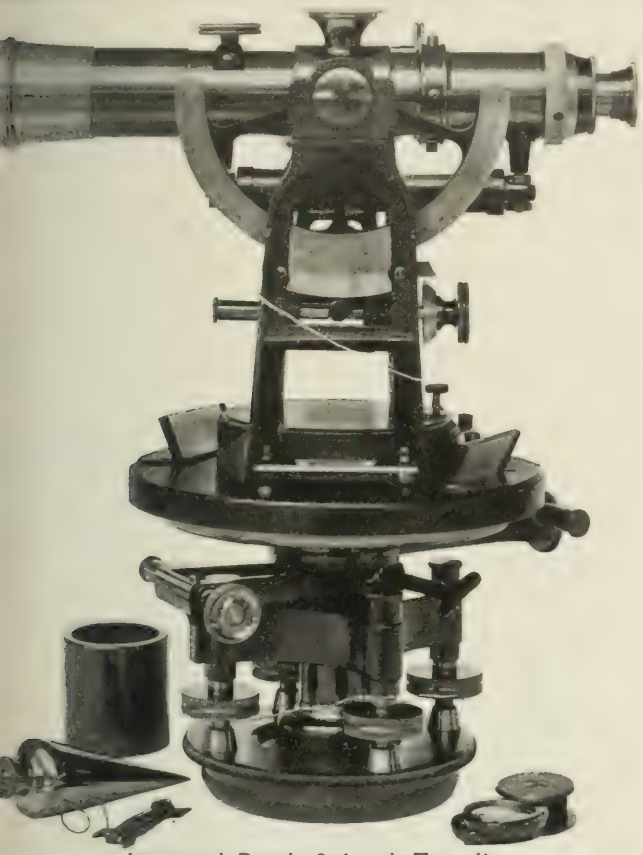
NEW LORAIN STEEL COMPANY SHOPS.

The use of manganese steel in the track equipment of steam railways has, during the last few years, become so general that it has ceased to be a curiosity and railway engineers generally have realized the important part this metal plays in the maintenance of track under the constantly increasing demands of steam railway traffic. The Lorain Steel Company, Johnstown, Pa., has added to its large plant a new shop devoted especially to the manufacture of steam railway frogs, crossings and switches, in which the use of manganese steel is employed to the best advantage. Frogs of every angle or rail section are made in the shops, which are equipped with the latest and most advanced types of machinery for this particular product. The designs embody the best features of track equipment, whether of solid manganese or partial manganese and rolled rail combined.

Steam railway crossings, heretofore made of rails or in combination with manganese intersections, are now made of manganese steel of one piece, or in halves, proportioned to the angle of the intersecting tracks. This type of crossing eliminates the small brackets, bolts and fillers, and is rapidly replacing the construction known among railway men as the "three-rail type."

BAUSCH & LOMB SUPERIOR TRANSITS AND LEVELS.

In the manufacture of transits and levels there is great need for the highest class of workmanship, perfection of materials and accuracy of adjustment. The superior transits and levels shown in booth 17, are made by the Bausch & Lomb Optical Co., Rochester, N. Y., under the personal supervision of George N. Saegmuller and have many important improvements. The graduations are on silver so alloyed that it will not tarnish and the accuracy of the divisions is insured by the use of the latest design of automatic dividing engine. The lenses used have large apertures, fully utilized, insuring large field, perfect detail and definition. The centers are long and ground free from eccentricity and are fitted with the greatest possible care. The special features claimed for these transits are variable power eyepiece, new construction of magnetic needle, plate levels inside of com-



Improved Baush & Lomb Transit.

ass box, continuous variation plate, consolidation type "U" tandards, hermetically sealed telescopes, patent interior fousing system, brilliant axial illumination, interchangeable enta-prism with adjustments for parallelism and alignment. In addition to the exhibit at the Coliseum, these instruents can be seen at the company's branch office at room 09, 103 State street.

WATERPROOF LITH.

The Union Pacific is at present reconstructing its ice ouse at Grand Island, Neb., to increase its efficiency. The ouse was built of several layers of boards and building aper, with air spaces between the layers. A false gabled oof was built over the roof proper, which was flat, and entilators were left open at each end of the building to llow for circulation of air under the gabled roof. With his construction, the total loss of ice was about 35 per cent. o 40 per cent.

In the reconstruction an insulating layer is being applied o the inner walls, consisting of one layer of insulating paper, two inches of waterproof Lith, another layer of insulating paper and an interior lining of matched lumber. The old roof was removed, and a floor of ⅞-in. T. & G. flooring laid at the top of plates. On this floor was laid one thickness of insulating paper, three inches of waterproof Lith and a heavy coating of asphalt. The false roof was re-



Union Pacific Ice House at Grand Island, Nebr.

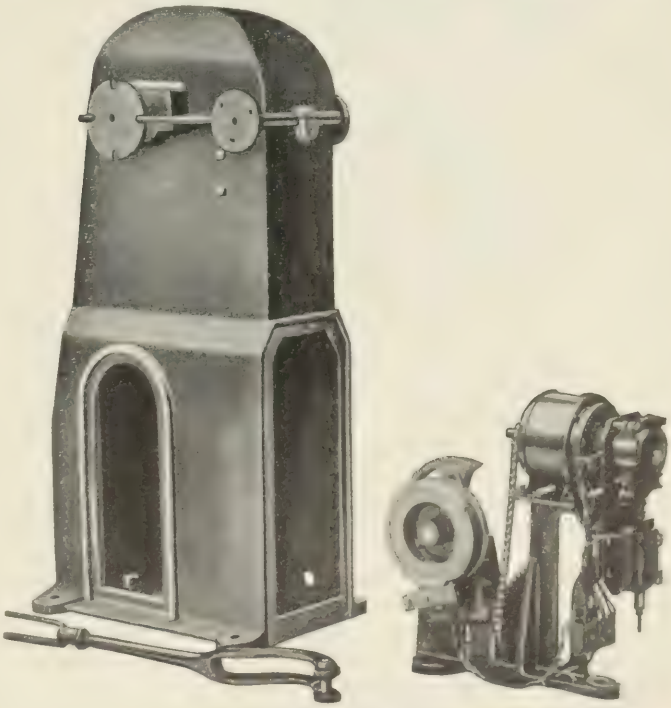
placed and the free ventilation provided for as before. This type of construction reduces the total ice loss to less than 7 per cent.

The waterproof Lith is one of the products of the Union Fibre Co., Winona, Minn., whose exhibit is in booth 171 at the Coliseum.

CROSSING GATES.

One of the exhibits of the Buda Co. in booths 87-90 at the Coliseum is its new type of electrically operated crossing gate. The accompanying illustration shows the gate post and operating mechanism.

Two and three crossings may be handled by one man and in many cases, where the view from the station is ob-



Electric Crossing Gates.

structed, the agent or operator is able to handle the gates, in addition to his other duties. No physical exertion is necessary as the gates are controlled entirely by an electric current, through a switch, which may be installed at the point most convenient for the operator. The apparatus is furnished with either direct or alternating current motors, at the option of the purchaser. A storage battery may be used if the voltage of the battery is the same as that for which the motor equipment was designed.

The following special features are claimed for this gate by the makers: It is easy to operate, being controlled by a switch; the arms may be stopped instantly at any angle; the direction of movement of the arms can be reversed at any point; the constant attention of an operator is not required; an automatic cut-off is provided which stops the arms when they have reached a set limit in either direction; there is no lost motion, the arms responding at once to a movement of the switch. The gates are arranged for two or more posts.

KENNICOTT GROUND-OPERATED WATER SOFTENER.

The type "K" Kennicott ground-operated water softener, illustrated herewith, is similar to those now being erected at several points on various railways in the United States.

Besides the merits of the regular type "K" Kennicott, this machine has the additional advantage of ground operation. It is not necessary for the attendant to climb to the top



Kennicott Ground-Operated Water Softener.

of the apparatus, for all machinery is located in a small house at the foot of the single large tank in which the entire mechanism is contained. In the type "K" machine all parts move in a positive rotary direction, which makes the operation simple.

This water softener is one of the products of the Kennicott Water Softener Company, Chicago Heights, Ill., whose exhibit is in booth 74 at the Coliseum.

Q. & C. SAMSON RAIL BENDER.

Maintenance men have generally experienced difficulty in transporting a heavy rail bender, with the result that it is seldom where most needed, necessitating a shift in the repairs or delay of work until the bender can be moved.

To meet this condition the Q. & C. Samson rail bender was designed, and the large sale of them would seem to prove their popularity and effectiveness. This bender is designed especially for T-rails up to 100 pounds per yard weight, either in or out of track. Its rapidity of action and portability has made it a favorite, and many railways are equipping every section with a bender instead of the usual practice of having one of the heavier design serve a division, or at least a district.

The Q. & C. Samson rail bender weighs 100 pounds and can easily be transported on a hand car. It is particularly adapted to bending stock rails, guard rails, etc., aside from the usual functions of the bender, and is a most valuable addition to any wrecking outfit. This bender is shown at



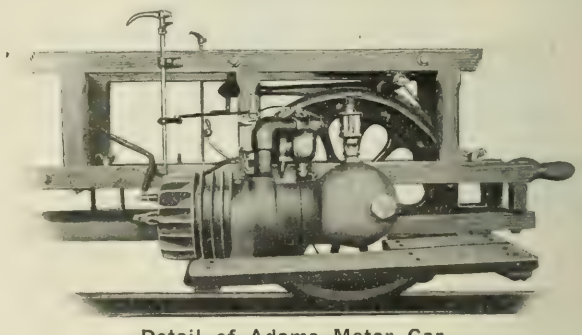
Samson Rail Bender.

the exhibit of the Q. & C. Co., New York, in spaces 119-120 at the Coliseum, and representatives of the company will gladly explain it to interested parties.

ADAMS MOTOR CAR.

The accompanying cut shows a near view of the two-cycle reversible, air-cooled, direct-connected motor of the Adams motor car. The main engine bearing is 1⅜ in. in diameter by 4½ in. long. All of the working parts are enclosed so as ot exclude dirt and grit and retain the oil. The cylinder and crank-case are ground, metal to metal, their being no packing to blow out and therefore no loss of compression or oil to spatter the clothes of the operator.

Jump-spark ignition, a Schebler carburetor and sight-feed oil cups are used. For convenience a simple compression relief is provided to facilitate starting and enable coasting. The compression can also be used as a brake by leaving the compression relief closed. The batteries, spark coil, switch and tools are inclosed in a box, by locking which the operator can



Detail of Adams Motor Car.

prevent the car being started or the batteries run down in his absence.

Safety is assured by limiting the speed so that the maximum will be under 30 miles an hour and without decreasing the power available. This requirement must be specified in advance. The fuel consumption is one gallon of gasoline for a 70 to 90-mile run, depending on weather conditions.

The Adams motor car, made by Burton W. Mudge & Co., Chicago, is on exhibition in spaces 113-114, Coliseum.

CONCRETE FENCE POSTS.

The D. & A. Post Mold Company, Three Rivers, Mich., exhibits in Space 132 molds for reinforced concrete fence posts which are now in use by five of the leading railways, also by concrete products companies in various parts of the country.

The D. & A. shaking system makes 10 wet-mix concrete posts at one time. The machine consists of ten 10-in. or 6-in.

U-shaped steel troughs, placed upon a frame about two feet high. When the molds are in position for filling, the flanges overlap, forming a table upon which the concrete is shoveled or dropped from a mixer and leveled off. With the placing device, the reinforcements are pressed into the wet concrete, after which it is thoroughly compacted, by vibrating the molds lengthwise, which is said to be much quicker than one single post could be tamped. The filled molds are then placed upon soft, level ground, and when the concrete is sufficiently set, the molds are inverted and the ends removed, which releases the post.

Three slightly different mixtures are employed in the manufacture of concrete fence posts. The dry mixture is tamped or pressed for compacting; the wet mixture is usually settled by pressing or agitation, and the slush mixture is made thin for pouring into the molds or forms. A dry mixture is one which will allow immediate removal of the forms, while the wet requires that the posts be left in the molds for from 6 to 24 hours, or until the initial set has taken place. Posts made with slush concrete require to be left in the molds for about 48 hours.

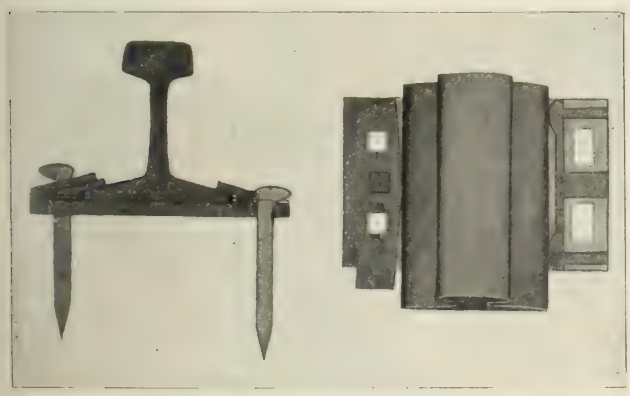
The labor cost in the manufacture of concrete fence posts is said to be reduced by the use of wet mixture concrete, since it does away with tamping. The use of a multiple mold, such as the D. & A., is also a time saver.

SECURITY ANCHOR TIE PLATE.

The Security anchor tie plate performs two functions in addition to that of an ordinary tie plate, viz., that of a rail anchor, to prevent the creeping of rails, and that of a rail brace, to prevent their tilting on curves.

For use as a rail anchor, the device is applied to the unbroken rail on each joint tie, that is, at the other end of the tie from the rail joint.

Its construction is such that the edge of the rail base bears against the plate in three places, as shown in the accompanying cut, and if the plate is rotated about one of these points, its grip on the rail will be strengthened. The angle bars at the rail joint are spiked to the tie and bolted to the rail ends, so, if the rail creeps, the tie will



Security Anchor Tie Plate.

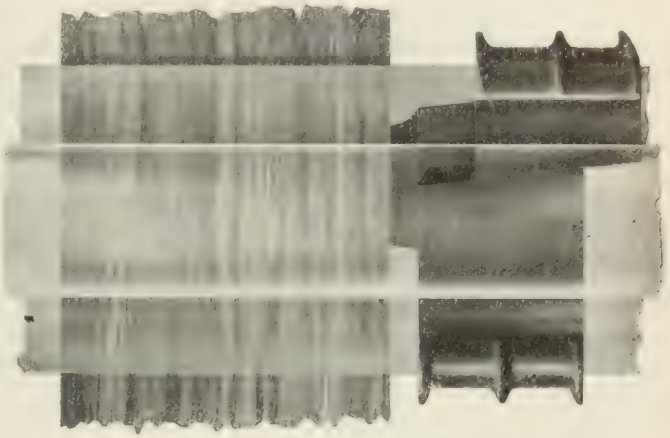
be slued in the track. This motion will tend to rotate the plate which is spiked to the other end of the tie, and that rotation will cause it to grip the rail as described above. This is a new application of the old idea of staggering the spikes in the joint tie. That method prevented creeping only so long as the spikes held firm, but the holding power of the anchor tie plate is not affected by the loosening of the spikes.

When used as a brace on curves, the overlapping of the rail base is the important feature of construction. The plate firmly grasps the base of the rail and, in addition to this, greatly increases the width of the rails bearing on the tie.

The Security anchor tie plate is being exhibited by the W. K. Kenly Company, Chicago, in booths 78 and 79.

P. & M. RAIL ANCHOR.

The P. & M. rail anchor is one of the products of the Railway Specialty & Supply Co., Chicago, on exhibition in booth 105 at the Coliseum. The accompanying cut shows very clearly the application of the device to the rail. It



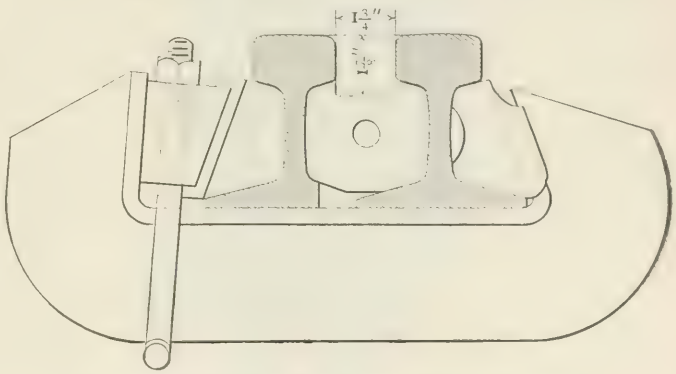
Rail Anchor Applied.

consists of two simple parts which automatically tighten as the rail creeps, and which maintain their grip on the rail base whether there is pressure against it or not. The creeper is adapted to single as well as double track.

RAMAPO GUARD RAIL CLAMPS.

In the accompanying line cuts are shown elevation and plan views of a guard rail clamp of unique construction, manufactured by the Ramapo Iron Works, Hillburn, N. Y.

The adjustments are made, through the wedge blocks, by tightening the nuts on the U-bolt. The U-bolt passes under a very rigid Tee steel yoke, made of a special quality of steel not affected by low temperature. This yoke, while offering exceptional rigidity, cannot, it is said, be broken at zero temperature under a blow even by a heavy steam



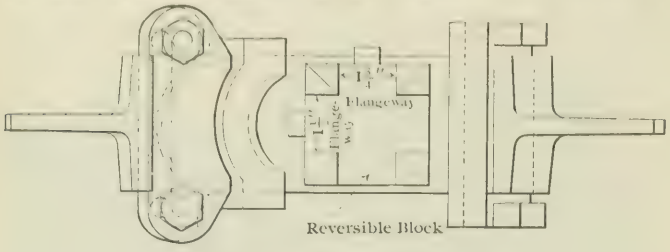
Elevation of Ramapo Guard Rail Clamps.

hammer, which, however, might cause considerable distortion.

The illustration shows a reversible block. The same clamp may be furnished with adjustable blocks held in position by a stud projecting through a drilled hole in the guard rail or by lugs engaging the clamp. In the latter case it is not necessary to drill the guard rail. The manufacturers, however, recommend the rigid reversible

block, offering the one adjustment for wear or for different flangeways at different locations, and when the guard rails are drilled, the stud on the block insures the clamp being placed in the correct location.

This clamp is very economical and compact in form. It is claimed that under the hardest service it will not work loose or rattle if tightened up when the blocks are well seated after a few weeks' service. The nuts may be held by any special nutlock, but the manufacturers furnish a



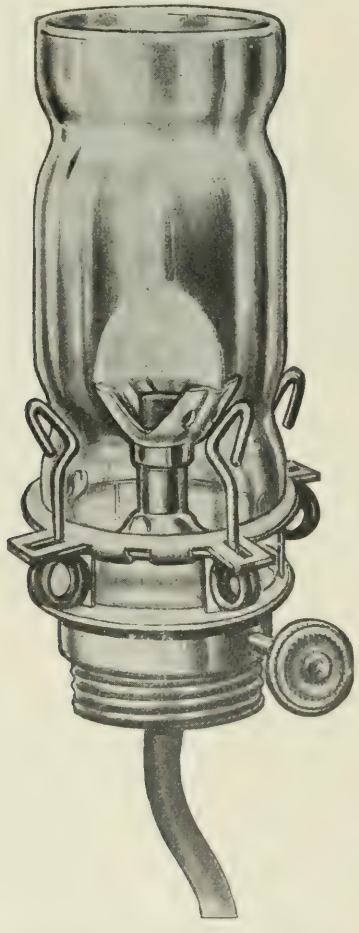
Plan of Ramapo Guard Rail Clamp.

tight-fitting thread, which, in addition to one of the improved types of nutlocks, insures the best service.

Although these clamps have been but recently placed upon the market, there are said to be several thousand giving very satisfactory service on several of the larger railways.

ADLAKE LONG-TIME BURNERS.

The Adams & Westlake Co. Chicago, are exhibiting at their booth, Adlake long-time burners, for which they



Flat-Flame, Long-Time Burner.

will burn from five to six times as long, upon a given quantity of oil, as the ordinary signal lamp burners, and they are remarkable time savers, in that they require attention but once a week. It is claimed that the saving effected in maintenance is sufficient to buy a new Adlake



Flat-Flame, No-Chimney, Long-Time Burner.

lamp in 15 months. It is said that one of the leading railways in England is saving £200 annually ($1,000) in lamp tenders' wages only, on a section where 200 Adlake lamps are in use, because one man is now doing what it took five men to do before they adopted the Adlake signal lamp with long-time burners.

RIPOLIN ENAMEL PAINT.

Possibly the best known enamel paint in Europe is that special old Dutch brand, called "Ripolin." It is the product of an old Dutch hand process, originated by a paint master, and has become famous in the old world. For the last few years Messrs. J. A. & W. Bird & Co., Boston, Mass., have been importers and American agents for this paint, and with very little advertising it has worked its way all over this country. It has been largely used for painting railway stations and for signals, and the standard signal colors in which it is manufactured are permanent. One of the features of this paint is its smooth flowing under the brush, and it is claimed that it has 30 per cent. greater covering capacity than domestic paints.

J. A. & W. Bird & Co., who are exhibiting in booth 140, report a large business in "Ripolin," and say that it is rapidly being adopted by railway systems as the standard for their railway station and signal paints.

The Edison Manufacturing Company, of Orange, N. J., is showing a full line of Edison B. S. Co. primary cells at the Coliseum. An interesting feature of the exhibit is the combination of soda, copper, oxide cells with the new heat resisting glass jars. Among other improvements in their line the Edison Manufacturing Company has added a cell having a rectangular heat resisting glass jar, which, in addition to making a very attractive appearing cell, makes it possible to save considerable space in the housing of signal batteries. This should result in a saving to roads having locations where the temperature does not reach a point low enough to affect gravity cell track batteries, as by the use of cells with the new rectangular jars the track battery may be housed in signal post battery cases, thus saving the cost of track battery chutes and the installation of the same.

Several improvements have been made in the construction of Edison B. S. Co. Elements which not only effect a decrease in internal resistance of these cells, but also affords greater reliability.

HOISTS AND JACKS

Although the exhibition by the Road and Track Supply Association is held to show the apparatus and material which is of interest to the maintenance of way and engineering departments of railways, interest is taken in it by all railway departments. Among the exhibitors to whom this is of special importance is the Weir & Craig Manufacturing Co., who have in addition to their air and electric turntable tractors, a complete line of compressed air portable geared hoists and pneumatic and hydraulic locomotive pit jacks.

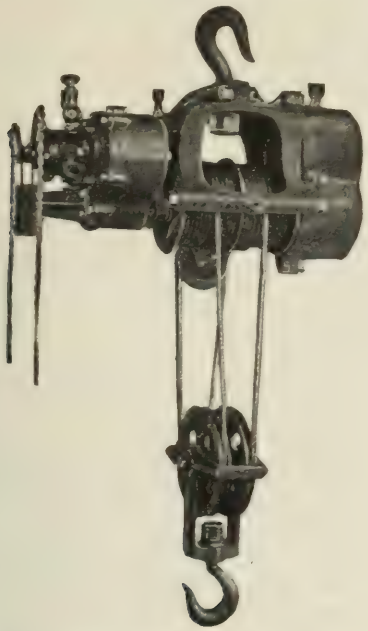


Fig. 1. Compound Air Geared Hoist.

The accompanying illustrations show two of these machines which are on exhibition at the Coliseum, Fig. 1 being the compressed air geared hoist and Fig. 2 the pneumatic locomotive drop pit jack. Among the various features

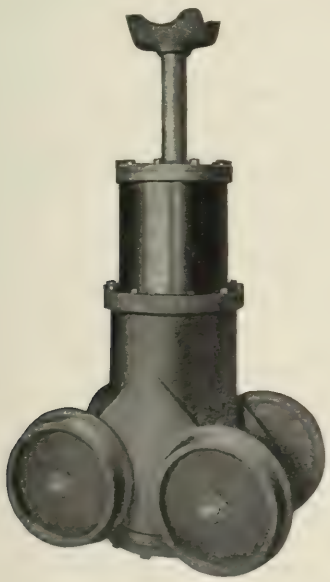


Fig. 2. Pneumatic Locomotive Drop Pit Jack.

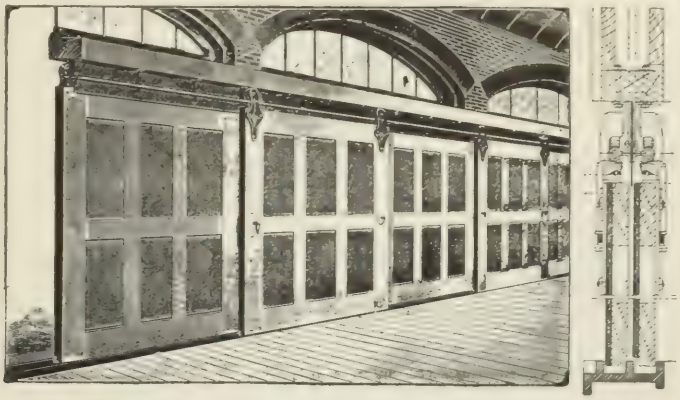
claimed for the hoists are the following: They require small amount of head room; they are compact, and they are entirely closed. The pneumatic jack is so designed as to give a lift of five and one-half feet with a capacity of 18,000 lb. net at 80 lb. air pressure.

The hydraulic jacks are of about the same general design, a feature of importance in each being the small amount of clearance necessary below the top of the drop pit rail.

ALLITH PARALLEL DOOR EQUIPMENT.

The Allith Manufacturing Company, Chicago, makes a parallel door equipment, shown in the accompanying cut, which is especially applicable to the doors of freight stations and warehouses.

This equipment is designed to meet the exacting requirements of maintenance. These continuous sliding parallel doors, as a result of service test, show many points of superiority, and have been adopted as a standard by a large number of railways.



Allith Parallel Door Equipments.

The Allith Manufacturing Company is exhibiting this equipment in booth 116.

SHEFFIELD STANDPIPE.

The standpipe illustrated herewith has three distinctive features in its design; (1) the spout is not of the ordinary flexible type, (2) the pipe has a vertical telescoping movement, and (3) the main valve is adjustable for variations in pressure.



Sheffield Standpipe.

The flexible spout is often hard for the fireman to control, especially when the pressure is high. The Sheffield spout has a goose neck, shown in the illustration, which directs the force of the water downward as it leaves the

discharge end, so that the pressure of the spout is vertical, instead of horizontal. The telescoping movement of the pipe permits a variation of about 5 ft. in the elevation of the spout, which is an important advantage when high and low tenders are in service on the same line. This telescopic pipe has been in use for four or five years, and the repeated orders from satisfied users are evidence of its satisfactory performance.

In connection with the adjustable main valve, this water column is furnished with a hydraulic relief valve. This prevents the breaking of water mains by "water hammer," due to closing the standpipe valves too quickly and effects a large saving in repairs necessary after such a failure. Fairbanks, Morse & Co., Chicago, the makers of the Sheffield standpipe, have also a number of other designs which are illustrated in a special pamphlet which they mail to interested parties.

STEEL RAILWAY TANKS.

The accompanying cut shows one of the standard hemispherical-bottom tanks built by the Chicago Bridge & Iron Works, Chicago, for the Chicago, Milwaukee & St. Paul at Elgin, Ill. It has a capacity of 10,000 gal., and is 45 ft. 2 in. high.

Steel tanks are superior to wooden ones on account of their longer life, smaller expense for maintenance and ability to remain water-tight under all conditions. In this design the supply pipe is made so large that it cannot freeze solid in winter, thus eliminating the danger of ice forming in the valves, without the use of wooden lagging, which is often resorted to for this purpose. This large supply pipe has the valves located at its center, so that ice forming on the sides of the pipe will not interfere with the operation of the tank. The large cylinder also serves as a settling basin for sediment which can be drawn off through a valve in the bottom without emptying the tank. The hemispherical bottom effects a material saving in cost, since it is self-supporting and eliminates the heavy beams necessary in a flat-bottom tank. The cost of the hemispherical-bottom tank is about the same as that of a wooden tank with steel substructure.



Hemispherical Bottom Railway Tank.

Economy in pumping requires that a tank have a large diameter and low height, which has been hard to attain in self-supporting bottom tanks, for the bottoms are only self-supporting for small diameters. This is not the case with the hemispherical bottom, and the tanks can be built to allow economical pumping.

In addition to these tanks, the Chicago Bridge & Iron Co. builds steel smoke stacks, portable tie-preserving retorts, bridges, trestles, etc.

ROCKFORD ECONOMY.

The following facts and figures were collected by the Duntley Manufacturing Co., Chicago, makers of the Rockford motor car, which was described in the Daily Railway Age Gazette of Monday.

A large American railway which is now a large user of motor cars investigated the subject carefully before adopting them and prepared estimates of the amount of money that could be saved by their use. For this purpose they used the records of one of their divisions, which they later equipped with motor cars. This division is 129 miles long, double track, or 258 miles altogether. According to their estimates they could save $11,000 per year, while actual service has shown a saving of $25,060 per year. They have figured interest on their investment at 6 per cent; depreciation, 20 per cent., and repairs at 10 per cent., and this amount deducted from the total saving for the year still shows a saving of $89.59 per mile per year.

The Duntley company is prepared to vouch for the accuracy and correctness of the above statements, and have asked information from other roads which have adopted or are experimenting with Rockford cars, the following being extracts from their replies:

"We have never had any trouble with the Rockford car, and no trouble in taking care of the work in better shape than it was taken care of before with three crews, saving the company about $110 per month."

"It is hard to estimate the exact saving, but we judge it to be from 10 per cent. to 20 per cent. over the ordinary hand car method."

"I have reduced our track expenses about one-third on my division without effecting the service by the reduction; in fact, we have gained in service in many ways."

"The two Rockford cars which we have showed a saving of over $1,000 last season."

"The car has made the saving that I thought it would. We have been able to dispense with one foreman, and have made a net saving in wages alone of $47 per month. As to the amount of time saved by the whole gang, it is difficult to arrive at exact figures, but I have estimated this to be not less than $25 per month, making a total saving of $72."

"With nine cars we have cut out four sections entirely, making a saving of the wages of four foremen and six laborers, making a total saving on the division at the present rate of wages of $464.60 per month. This saving is based on winter conditions, where gang consists of one foreman and one or two laborers."

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A merchant of Toledo said recently that a troublesome congestion of freight in that city, inconveniencing receivers of all kinds of car-load goods, was due to bad management, and that in St. Louis a similar overcrowding of railway facilities did not cause delays. What degree of truth there may be in this accusation as regards Toledo we do not know; but from St. Louis we are informed that such virtues as there may be in the plans and methods of handling freight in that city are due to the simple fact that the men who manage the business are constantly "on the job." The situation is described in an article in another column—which, however, is written in general terms, making no reference to St. Louis. The men who switch and deliver cars make that their main business; the highest officers give this business their chief attention, and the company is alert to know and, we suppose, to meet, all reasonable demands for additions or improvements to the plant. In short, it is an illustration of the old principle that to make sure of the accomplishment of a severe and complicated task, some strong man must make that task his chief concern. Another old principle comes to notice: The principle that valuable things must be paid for. Every wideawake business man who pays for any service more than his competitor pays will sooner or later be found trying to beat down the price; and to-day we see in St. Louis a committee of shippers and wholesalers declaring in strenuous language that their constituents ought to deal with the railways individually and not with the Terminal Railway Association—which, though it is a separate corporation and really a railway in itself, represents the large lines, being owned by them. These merchants say that the charges of the Terminal are too high. Whether this is actually so, or is true only in the sense that all railway charges are too high, when viewed from the shipper's standpoint, remains to be seen. Unfortunately, the value of promptness and efficiency in freight service is not easily measured, and the railways' customers are therefore usually unwilling to pay for these qualities, whereas delays and losses may be expressed in dollars and cents with lightning-like rapidity.

Many of the endorsements given to President Taft's plan for a court of commerce when it was first suggested, including that of the *Railway Age Gazette*, were based on the assumption that the tenure of the members would be for life. The administration's bill, which is pending in both houses of Congress, provides otherwise. Under it the Chief Justice of the United States would designate five circuit judges to serve on the court for not more than five years. After 1914 no circuit judge could be re-designated to serve until at least one year after the expiration of the period of his last previous designation. This arrangement nullifies the main arguments advanced in favor of the creation of a court of commerce. One of these was that its members, by long experience, would get special knowledge of railway law and railway affairs, and thereby special fitness to deal with the technical, but vitally important, questions involved in litigation over the rights of carriers, shippers and public. But a court constituted as the administration's bill proposes would have little more technical fitness to try such cases than any circuit court. It would take four or five years for a judge to get the knowledge and experience necessary to peculiarly fit him for his duties, and just as he got them he would be sent back to his circuit. A court whose members were appointed for life might in time exceed in knowledge of railway affairs even the Interstate Commerce Commission. A court constituted according to the administration's plan never would have as much knowledge of railway affairs as the commission, because members of the commission are appointed for ten years and often are reappointed. The railways doubt the impartiality of the commission. They would rely on the impartiality of a court of commerce, but they have confidence now in the impartiality of the circuit courts. It has been said that the decisions of a court of commerce would be more consistent than those of the various circuit courts. But a court whose personnel was constantly changing, and would be entirely changed every five years, would not necessarily be more consistent in its decisions than the existing courts. We believe the view that the judges of the court of commerce should be appointed for life is held by almost everyone having any technical knowledge of railway affairs. It is the view of the Interstate Commerce Commission as expressed by Chairman Knapp on behalf of that body at the hearing before the Senate committee on interstate commerce on February 17. It is the view also expressed by E. B. Peirce, general solicitor of the Rock Island, in his statement before the House committee on interstate and foreign commerce on February 10. As an expression from the railway standpoint, Mr. Peirce's statement has peculiar weight, because, as commerce counsel of the Rock Island-Frisco lines, he probably has appeared in more proceedings under the Hepburn act than any other lawyer. If the administration and Congress are not disposed to create a court of commerce which will be fit to serve some useful purpose it would seem they had better spare the country the expense of maintaining one.

THE GRAND TRUNK'S INVASION OF NEW ENGLAND

It may be set down as well-nigh an axiom of railway development that any extensive absorption of productive territory by a railway system is sure to be followed by an incursion of a rival. Stated more briefly, profitable monopoly challenges competition. The time and nature of the competition and the direction from which it may come varies infinitely. But it is pretty sure to come from somewhere, or at least, be threatened. The New England situation is the latest illustration of the principle. Not long ago the New York, New Haven & Hartford, by securing control of the Boston & Maine, joined southern and northern New England and six states with high productive power in first-class freight business, and with high passenger density, in a single monopoly. But hardly is it consummated when the Grand Trunk applies to the Rhode Island legislature for a kind of "omnibus" charter for a line to Providence. The Grand Trunk proposes to build from its Central Vermont line at Palmer, Mass. The proposed charter, as often in such cases, asks for more than the applicant expects to get. It seeks not only powers of local extension in Rhode Island but special privileges in the use of the New Haven's great plant in that state.

The story of the immediate facts leading up to the situation is, in some respects, more interesting than the situation itself. In the late months of the year 1908 the New Haven made what was, in effect, a traffic alliance with the Canadian Pacific by which all-rail business from New York city to the west was secured at rates competitive with the Grand Trunk, which takes freight by boat and rail via New London and at a much lower rate than that of the standard trunk lines. The alliance was, in practice, only effective during the "closed" months of the lower lake and rail rate. But it got New York business on a considerable scale and shook up seriously the whole westbound rate status. The usual "conferences" of presidents followed. But the stress of a threatened trunk line rate war did not relax until recently, when, under the threat of reductions by the Erie and the Lackawanna, the New Haven receded to avoid the prospective war, and not only yielded its Canadian Pacific alliance but raised its rates over the Ontario & Western to the basis of 75 cents, that of the standard lines. The Grand Trunk, however, yielded nothing to the demands of the Erie and Lackawanna, though it was included in them. It saw the menace to its New England business by the friendly relations of the New Haven with the Canadian Pacific, and a menace not diminished by the New Haven's control of the Boston & Maine. Accordingly, the Grand Trunk seems to have elected an aggressive policy. Its first step was the substitution last July of its own boats for those of the New Haven between New York and New London. Its second step is the application for the Rhode Island charter of the Palmer-Providence extension. According to a statement by Vice-President Buckland the New Haven will, in deference to Rhode Island business sentiment, not oppose an ordinary charter, but confine itself to resisting one granting special privilege. Mr. Buckland says: "If the proposed charter to be granted to the Southern New England Railway Company is the bona fide desire on the part of a reputable, solvent corporation to enter Rhode Island it would be useless and foolish for me to attempt to stop it, for it would be obviously for the interests of the state of Rhode Island."

Such is the contest as it appears behind the scenes. In the background there are unseen forces and factors of greater moment. The prime ambition of the Grand Trunk for years has been to obtain by traffic agreement a New York terminal for through all-rail business, and the New York, Ontario & Western has been of late its chief objective. A year or more ago during the trunk line conferences then in progress there was a credible report that the Grand Trunk offered the New Haven the surrender of its southern New England rail connection in return for a similar concession involving the Ontario & Western. The Rhode Island charter, with its potentialities, thus appears in a fresh light. It can be used actually to build a new competing route or as a "big stick" to secure concessions, or for both. And if coupled with a Providence-New York boat line it becomes a new, not to say disturbing, element in the trunk line business. There are modifying facts. A year or two at least must elapse before the new line can be built. It must be a line of the "long bridge" type, not of ramified branches and extensive local business. But even as a project it complicates a situation not limited to New England. It will be interesting to observe whether hereafter, with a charter granted, that charter is used concretely for a new line or as a club to extort concessions.

There is another and more general aspect: Canada has now two large and rival railway systems—the Canadian Pacific and the Grand Trunk. The first is stalwart financially, the second, relatively speaking weak, but with that paradoxical strength acquired by relief from the obligation to pay good dividends. New England is to be one of their immediate battlegrounds, with ultimates at New York city. The New Haven system, intrenched for the time being in its territorial monopoly of the six New England states, is now suddenly called upon not merely to readjust itself between the two rivals, but to serve as a kind of "buffer" between them and the main trunk lines. The outcome hereafter, as the Canadian rivals push downward either for new business of their own or for strippings of existing business, will be worth watching.

ENGINE AND TRAIN RESISTANCE.

Calculations relating to engine and train resistance have always been uncertain and unsatisfactory because the conditions affecting the various resistances which go to make up the total load to be overcome are never exactly alike in any two trains and are apt to vary considerably even when the size and weight of the trains are the same. Owing to this reason, and to many other disturbing causes, every investigator of the subject has found something different from those who preceded him, and has proposed new formulas and factors which he believes to be more nearly correct. Dr. Sinclair has been honored with a curve of train resistance which bears his name in the text books and locomotive pamphlets. On both sides of it, and crossing and recrossing it, will be found other lines representing the law of train resistance as affected by speed as calculated by A. M. Wellington, D. L. Barnes, A. F. Aspinall, the Baldwin Locomotive Works and the American Locomotive Company. Making a necessary choice among these curves for a factor in tonnage rating would seem to be less like a matter of science than of religion or politics. One is selected, not on its intrinsic merits, but, perhaps, because of a more or less intimate acquaintance by the one making the selection with the author.

With the improvements in dynamometer cars more accurate measurements have been made, and in getting figures for tonnage rating a large amount of data on the resistance of modern 50-ton steel cars has been accumulated. Dynamometer records from heavy passenger equipment at high speeds have also been collected, a number of new papers have been written which include theoretical treatment of the subject, and there is now opportunity for a study of the problem which will narrow the uncertainties and make possible a more accurate predetermination of train resistance. Such a study was made by F. J. Cole, consulting engineer of the American Locomotive Company, and the principal part of it published in the *Railway Age Gazette*, commencing Aug. 27, 1909, page 361, and continuing through six issues.

The same material, with the addition of conveniently arranged tables, has been used in the preparation of a Bulletin recently issued by the American Locomotive Company. In this pamphlet on "train resistance" the curves and tables are clear cut and plainly printed, and the whole subject is placed

in convenient form for ready application. It is without doubt the most satisfactory treatment of train resistance yet published, and the mechanical departments of railways will feel indebted to the American Locomotive Company for its enterprise in putting this material in such satisfactory shape.

One of the main improvements in the method of treating the subject is the more rational and intelligent consideration of engine and tender resistance. The internal locomotive resistance is assumed to be independent of speed, and a figure derived from the Pennsylvania Railroad St. Louis tests is used for calculating it. The weight on drivers in tons is multiplied by 22.2 for resistance in pounds due to the friction of driving wheels, piston rods, cross heads, etc. The resistance of engine trucks, trailing wheels and the tender is assumed to be the same as that of the cars in the train. The head air resistance of the engine is taken to be 120 sq. ft. x .002 V^2. This factor is the one used by the General Electric Company, though it is not explained why it is preferred to the larger one, .0027 V^2, derived from the Berlin Zossen Electric Railway tests, where the observed pressures at very high speeds were measured on a car having a wedge or parabolic-shaped end, which should show less resistance than the rough and broken up surface of the front of a locomotive. It must be said, however, that the table giving data obtained from tests of high-speed passenger trains agrees closely with the results calculated by the use of this factor for one of the principal elements of resistance. The main departure from ordinary methods in calculating freight car resistance is the assumption that with slow-moving trains at the speeds ordinarily used in heavy freight service, the resistance may be regarded as constant between the limits of 5 and 30 miles per hour, that is, on level tangents at 30 miles per hour it does not exceed the resistance at 5 or 10 miles per hour.

The authority for this radical assumption is the fact that it is sustained by the regular tonnage ratings of several large railways, and no good and sufficient data has been found to contest it. The explanation is interesting and assumes that one or more of the elements which make up the total of train resistance have a maximum value at starting and reach a maximum at 20 or 30 miles per hour, with a slightly increasing value at higher speeds. Journal friction has this characteristic, as it is highest at starting and does not reach a minimum value until a considerable speed is attained.

The tables and diagrams in the pamphlet for freight car resistance do not take account of speed, more importance being placed on the weight of the cars and their lading in obtaining resistance in pounds per ton. While the change in journal friction may offset the increased air resistance due to speed in one class of cars, that change may be said to be normal for all journals of the same size, while the air resistance must be different for cars of different shapes, especially when empty, and it is still doubtful if a formula for empty freight car resistance can have general application to all speeds up to 30 miles per hour. Empty 50-ton hopper cars, box and stock cars must have a considerably greater end and side pressure at speeds of 20 to 30 miles per hour than at 5 or 10 miles per hour, and further investigation would show that the speed element must be considered for such conditions.

The effort to equate the tractive power of passenger locomotives and the resistance of passenger trains at speeds beyond 50 miles per hour is less satisfactory because locomotives of the same class seem to vary in their performance at high speeds, and there is a wide difference in the resistance of passenger cars of the same weight. Cars with 4-wheel trucks and cars with 6-wheel trucks must differ considerably in their resistance per ton. The curve and formula proposed for passenger car resistance is more complicated than that for freight cars, and it includes two variables which take account of velocity, one of them having V^2 and the other V^3. This curve differs from that derived from the Pennsylvania Railroad dynamometer data by 1½ lbs. per ton resistance at 50 miles per hour, while at 75 miles per hour the lines are in close agreement.

A difference in the design and condition of the trucks and of the brake lever equipment will show different resistances for passenger cars on nearly every railway, and until some of these differences are eliminated no satisfactory data for passenger car resistance can be obtained. For this reason we are inclined to believe that the resistance curve proposed for passenger cars, especially at the higher speeds, will be subject to modification in the future.

The effort to keep the air brake connections in close adjustment so as to limit piston travel has had a good effect in improving the efficiency of the brakes and has reduced the time and length of stop, but sufficient care has not been given to the proportions of the lever arms in relation to the slack adjustment. The result is that in many cases the brake shoes are in contact with the wheels when the train is accelerating speed, and this additional resistance makes a heavy drag on the locomotive and has not been taken account of in measuring passenger train resistance. In a recent test it was shown by dynamometer car that with the short piston travel, which was considered normal and desirable, the resistance at speeds of 50 or 60 miles per hour was nearly double that found when the adjustment was such as to keep the brake shoes free from the wheels. This probably accounts in some measure for the high resistance of passenger trains and for the difficulty which is found in accelerating to high speeds when there is an opportunity for a fast run. It will also account in part for the discrepancies which are found in dynamometer data from tests in passenger service.

NEW YORK CENTRAL & HUDSON RIVER.

There are several reasons why the operations of the New York Central & Hudson River Railroad are of peculiar interest. The company has been among the first in this country to feel the extreme pressure for high class service and perfect appliances which has been so marked a feature of railway operation in Great Britain, and must some day spread over most of this country. The New York Central has also had an extremely difficult situation to deal with in its New York terminal, and, during years when the increase in its passenger travel has been enormous, it has been engaged in a very elaborate scheme of electrification. These difficulties in themselves make the annual report interesting; an additional feature of much interest and importance is the strongly departmental operating organization, which is unique among great American railway companies.

The theory of the New York Central organization is that the best technical skill and the best mechanical appliances available in the whole country shall be at the disposition of that part of the system which needs them most at any time. The division is subordinated to the system, and the division superintendent is almost without nominal authority, except his direct supervision over train movement. It has been expected that all departments would coordinate for the common good and, during the last two years, this expectation has to a large degree been realized, although for many years before that the departmental system and a rather apparent shortage of officers had produced disorganization rather than organization.

During the year ended December 31, 1909, the New York Central & Hudson River Railroad Company, operating 3,782 miles (of which 805 miles were owned, three miles were proprietary, 2,618 miles were leased and 356 miles were otherwise operated) earned $93,171,861 gross from its rail operations, and operated for 69.33 cents of gross, leaving net revenue from rail operations of $28,578,034. These results are in striking contrast to those of the 1907 year, when gross earnings were approximately the same, but the operating ratio was over 77 per cent.*

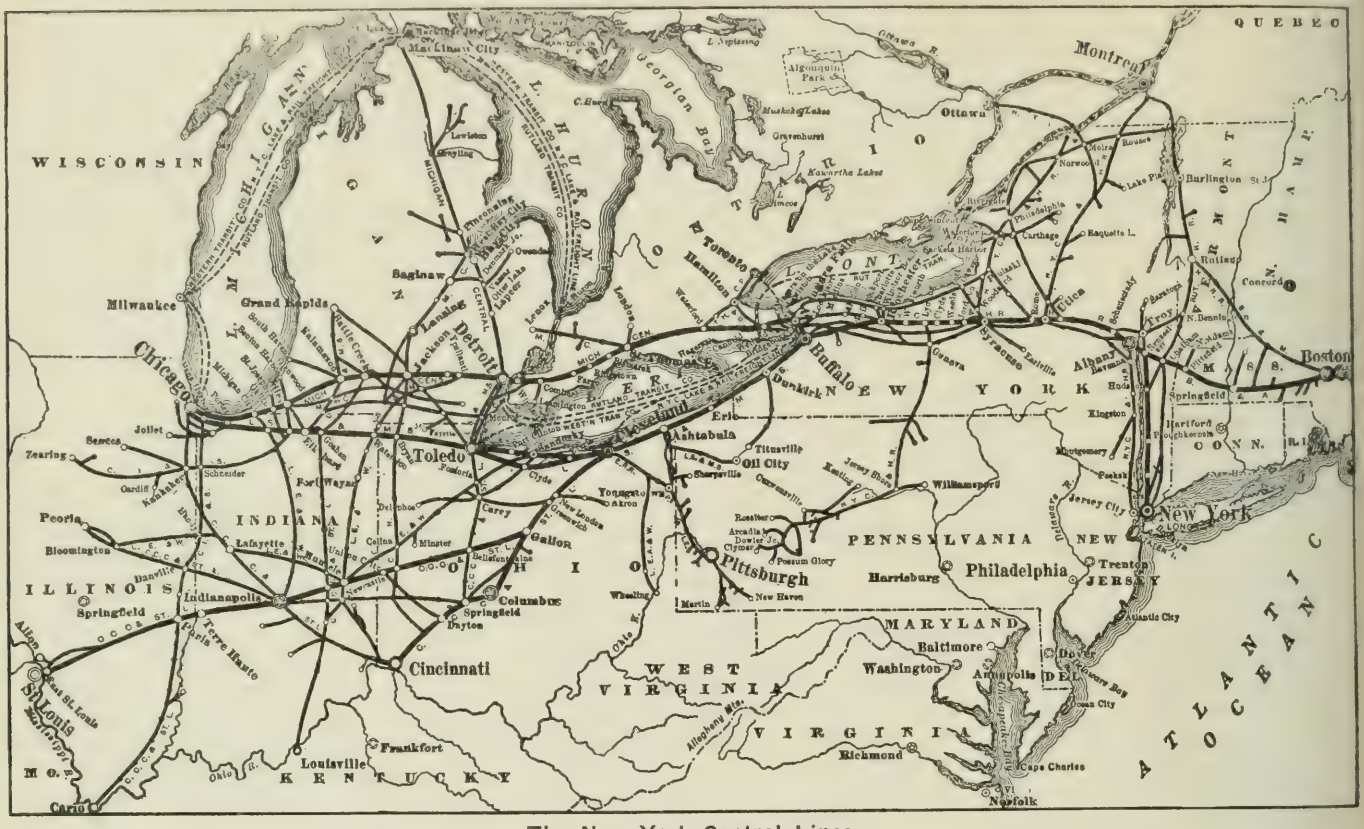
*Exact comparison with 1907 can scarcely be made, owing to the differences in the forms of accounting used.

The reduced operating costs this last year, as compared with those of 1907, were not obtained at the expense of the property. On identical mileage maintenance of way, structures and equipment cost $26,915,671 in 1909 as against $27,285,677 in 1907, while the cost of conducting transportation was reduced over twelve and a half millions in 1909 as compared with 1907.

This great gain in operating efficiency seems to be attributable to three main things: better yard and terminal facilities; better equipment, and better team play. Great congestion had been caused in 1906 and 1907 by the lack of proper facilities on some of the leased and allied lines, such as the Boston & Albany and the Rutland. Moreover, until 1908 the equipment had long been inadequate, and the roundhouse facilities had been insufficient to take care even of the existing motive power.

During the dull year of 1908 the company used great energy and farsightedness in remedying these defects. In that year it bought not far from 18 per cent. of all the locomotives actually built in the United States, and it got them at a price which averaged close to $3,000 per locomotive below the prevailing figures for the same type of power at the present time; consequently, when the traffic became brisk again in 1909, the company found itself well equipped.

Since 1906 the New York Central has spent approximately $42,500,000 on the work within the electric zone at New York, and the unexpended balance of authorizations and contracts stands now between 30 and 35 million dollars. The New York improvements are scheduled to be completed by the fall of 1912. These improvements include certain work of a character never before undertaken in this country. To provide for the work now being done at the New York terminal, the company acquired rather more area than that contained in three city blocks, in addition to its large holdings before this work was begun. This real estate, lying between Madison avenue on the West, and Lexington avenue on the East, and between Forty-second and Forty-ninth streets, in New York City, is enormously valuable, and the company does not need its air rights in the conduct of the railway business. Consequently, it is making a beginning, jointly with the New York, New Haven & Hartford in erecting a large commercial structure occupying the entire block between Park avenue, Lexington avenue, Forty-sixth street and Forty-seventh street, and it is planned, if the experiment is successful, to build more of these office buildings. Ground rent is the determining factor in the success or failure of New York office buildings, if centrally located. The New York Central needs to pay no additional ground rent on account of these buildings, and it may well be supposed that they can add materially to the income derived from this very costly tract of realty. The Hudson terminal buildings, erected in the interests of the Hudson & Manhattan Railroad, illustrate a situation somewhat similar, but the New York Central realty is much greater in extent.



The New York Central Lines.

The map shows, in addition to the roads whose reports are reviewed in this issue, the smaller New York Central Lines, like the Lake Erie & Western and the Rutland.

The difficulties with the New York, New Haven & Hartford at one time threatened to become serious, but have now been adjusted, and the New Haven road is a long-term tenant of the New York terminal improvements, on a basis satisfactory to all concerned.

The cost of maintenance of way and structures per mile of single track is shown in the following table:*

	1909.	1908.
Maintenance way and structures per single-track mile.	$1,615	$1,559
Repairs and renewals: Per steam locomotive	2,188	2,101
" " " " passenger car.....	639	620
" " " " freight car	117	83

The company earned $24,637 of operating revenue per mile of road; operating revenue per train mile was exactly $2, and operating expenses per train-mile $1.39. The average revenue trainload was 404 tons, as against 384 tons in 1908.

*According to the *Railway Age Gazette* formula, single track is derived by adding the entire mileage of first, second, third and fourth tracks, and one-half the mileage of sidings and yard tracks.

The amount received for each ton of freight was $1.23, and the average ton-mile revenue was 6.31 mills. The average passenger-mile rate was 1.748 cents. The greatest changes in the details of freight movement were the large increases in bituminous coal, in cement, brick and lime and in manufactured articles. There were fairly large decreases in the tonnage of grain and of fruits and vegetables. Out of a total of 44,171,954 tons of freight moved in 1909, manufactures aggregated 12,441,114 tons, thus exceeding the bituminous coal movement of 11,404,560 tons. The effect of the depression in 1908 is well shown by the fact that the total tonnage of manufactured articles in that year was only 8,901,984 tons. How much more important this tonnage of manufactured articles is than the grain traffic, which used to be of such determining influence on the company's prosperity, is shown by the fact that grain tonnage in 1909 amounted to only about 4 per cent. of the total tonnage; whereas, even as recently as 1896, grain supplied over 12 per cent. of the total. The company's grain traffic has actually fallen off materially in the last 10 or 15 years, while its general traffic has gone ahead by leaps and bounds.

Viewing the whole group of eastern Vanderbilt lines together, it is noteworthy that the deplorable conditions which existed a few years ago on the Boston & Albany have now been remedied. That road is no longer in disfavor in the city of Boston; a comprehensive scheme of improvement work has been taken up, and proper roundhouse and terminal facilities have been provided for the large amounts of new equipment which have been purchased. The affairs of the Lake Shore, the Michigan Central and the Big Four lines are discussed elsewhere; it may be fairly said that the only real problem which confronts the management is that of the Rutland. The Rutland is a curious instance of a road handicapped in its development by the fact of having cumulative dividends on its stock. The unpaid accumulation is now so great that it is substantially impossible to provide any new scheme of financing improvement work on this road, and changes have to be made slowly, out of earnings. The Rutland divides the Montreal traffic with the Delaware & Hudson, and has a heavy package freight business between Boston and Ogdensburg, by way of Bellows Falls. Something like half of its entire westbound freight traffic between Rouse's Point, on Lake Champlain, and Ogdensburg, consists of sugar. The road still costs a good deal to operate and there is much to be done to its physical condition. Betterment work on a comprehensive plan out of surplus earnings is slow business, however.

In the New York Central report proper, President Brown, who signs the report for the first time, calls attention to the fact that the relations of the road with its patrons and the communities served by it, have been pleasant, and says that this satisfactory condition has been encouraged by the efforts of the New York and Massachusetts commissions which, handled with less wisdom, might have resulted in friction and controversy. Mr. Brown says that the influence and the cooperation of these commissions have been uniformly beneficial to the road, and have done much to improve the service for the public, and he asks if this very desirable result does not emphasize the advantage of appointing to positions so vitally affecting every business interest of the country, men qualified by experience, temperament and ability to discharge the important duties of their office. "Governmental regulation of railways within proper limitations is of benefit to the public, to the railroads and to those who hold their securities; but in order to secure the maximum benefit for all interests, it is important that men selected for these positions should possess the necessary natural breadth and ability and, in addition thereto, a willingness to undertake the conscientious, painstaking study of conditions necessary to enable them to deal intelligently with the complex and delicate questions affecting transportation that are constantly arising."

The following table shows the results of operation for the last two years:

	1909.	1908.
Average mileage operated	3,782	3,781
Freight revenue.....	$54,449,281	$48,561,181
Passenger revenue	29,001,911	26,608,766
Total operating revenue	92,238,523	83,063,820
Maint. way and structures.	11,494,023	10,807,335
Maint. of equipment	15,421,648	12,991,416
Cond. transportation.....	33,309,315	33,456,743
Total operating expenses....	64,593,826	61,289,304
Taxes	4,434,504	4,253,087
Net earnings	24,349,497	18,521,084
Gross income	35,742,357	31,133,080
Net income	13,695,420	9,075,877
Dividends	8,931,600	8,931,600
Surplus for the year	4,763,820	144,277

LAKE SHORE & MICHIGAN SOUTHERN.

Perhaps the most significant facts of the 1909 year on the Lake Shore, as on the New York Central, have been the improvement in rolling stock and in facilities for handling it, and the strong efforts which the management is now making to enable all the properties to operate in harmony. Like the New York Central also, the Lake Shore began a highly successful campaign to get operating costs down after the 1907 year; in 1908 it operated for 64.52 per cent., and in 1909 for 62.12 per cent. In the case of the Lake Shore, moreover, the outside income received in the form of dividnds and interest on securities owned or controlled is very important. In 1909, with gross operating income from operation of $45,110,997 and net operating revenue of $17,087,336, the company reported total "other income" of $6,486,887 derived from asset stocks and bonds owned, having a total par value of $145,288,800, and carried on the company's books at $101,607,273.

The Lake Shore & Michigan Southern controls and operates under lease the Jamestown, Franklin & Clearfield Railroad. During 1908 and 1909 this road was extended approximately 68 miles towards the Pennsylvania coal fields, reached on the east by the Beech Creek line and, through trackage rights over the Buffalo, Rochester & Pittsburgh, arranged for a term of years, the Vanderbilt lines now have a through route into this central Pennsylvania coal territory, from the north at Geneva, N. Y., and from the west at Ashtabula. It does not seem probable that very much of this coal will be shipped west over the Lake Shore under present conditions, but it is not improbable that a package freight business of some importance can be built up from the Philadelphia and Baltimore district working west, over the Philadelphia & Reading, Beech Creek, Jamestown, Franklin & Clearfield, and Lake Shore into the Cleveland territory.

A significant transaction during the year having a somewhat similar bearing on the Lake Shore is the traffic agreement which has been concluded between the Pittsburgh & Lake Erie and the Western Maryland, by which certain divisions of rates are provided, and these two roads become allies in developing traffic from Baltimore territory to the Pittsburgh territory and west. Before this contract can begin working the Western Maryland must build not far from 100 miles of new line through the extremely heavy country between the West Virginia line and the nearest point on the west where connection can be made with the Pittsburgh & Lake Erie; and the contract does not provide that the Pittsburgh & Lake Erie shall lend its credit for this purpose. The management evidently believes that the connection will be built before very long, however.

Operating 1,663 miles in 1909, an increase of 152 miles over 1908, the Lake Shore showed a net corporate income after operating expenses and all charges, including hire of equipment, etc., of $11,654,362. From this dividends were paid aggregating 12 per cent. and costing the company $5,935,980, and a balance of $5,718,382 was carried forward from the year's operation. That is to say, the Lake Shore earned very close to 24 per cent. on its stock after the usual generous

expenditures for maintaining the property. Operating revenues per mile of road were $29,122; operating revenues per train mile were $2.54, and operating expenses per train mile were $1.58. The revenue trainload reached the impressive figure of 624 tons, and the average haul of revenue freight was 173 miles, bituminous coal, manufactured articles and ores supplying about two-thirds of the total tonnage. The following table shows the unit costs of mainenance, single-track mileage being calculated in accordance with the *Railway Age Gazette* formula:

	1909.	1908.
Maintenance way and structures per single-track mile*	$1,703	$1,686
Repairs and renewals: Per locomotive	2,286	1,800
" " " " passenger car	922	783
" " " " freight car	90	98

*Total mileage of first, second, third and fourth tracks, plus one-half mileage of sidings.

The following table summarizes general operating results for the year:

	1909.	1908.
Average mileage operated	1,663	1,511
Freight revenue	$29,735,277	$25,038,104
Passenger revenue	10,154,220	9,073,669
Total operating revenue	44,757,812	38,758,459
Maint. way and structures.	5,468,363	4,796,284
Maint. of equipment	6,811,551	5,452,822
Cond. transportation	13,914,957	13,280,087
Total operating expenses	28,023,661	25,206,504
Taxes	1,458,905	1,433,647
Net earnings	15,549,524	12,418,980
Gross income	22,036,411	17,516,061
Net income	11,654,362	7,676,200
Additions and betterments	1,263,186	1,433,568
Dividends	5,935,980	5,935,980
Surplus for the year	5,718,381	1,740,220

MICHIGAN CENTRAL.

The same general kinds of improvement were shown last year in the operation of the Michigan Central that appeared in the other principal Vanderbilt lines. Operating 1,746 miles, this figure remaining unchanged from last year, gross operating income from rail operations was $27,415,467, which is at the rate of $15,698 a mile. The road operated for 67.48 per cent. of gross as compared with 69.29 per cent. last year, and the net revenue from rail operations was $8,915,939. After all offsets and charges the company had a net corporate income of $2,872,497 and paid dividends aggregating 6 per cent., costing the company $1,124,280, the surplus from the current operations after dividends being $1,748,217. During the year there were issued out of an authorized total of $25,000,000 20-year 4 per cent. debentures, provided for in an indenture made with the Guarantee Trust Company of New York; $7,634,000; and the total funded debt now stands at $42,159,000. Under the New York Central Lines equipment trust of 1907, the New York Central, Lake Shore, Chicago, Indiana & Southern, Michigan Central and Big Four have acquired, between them, 691 locomotives, 153 passenger cars, 16,425 freight cars and 650 company service cars, the arrangement being that the certificates are issued by the Guarantee Trust Company for 90 per cent. of the value of the equipment, and that the certificates are retired by the companies by means of an annual redemption of one-fifteenth of the par value of the certificates issued at the beginning. This financing has been of particularly great help to the eastern lines of the Vanderbilt system, and the Michigan Central in particular has been enabled without straining its credit at all to provide itself with 3,500 freight cars which it greatly needed.

A rather important feature of the year's operations, which affects all the Vanderbilt lines alike, may also well be brought out in this review. On November 10, 1909, the directors approved a plan, taking effect January 1, 1910, for the retirement and pensioning of the employees of the various companies who, through age or disability, became unable to continue in its service. A comparative statement showing this and some other American railway pension systems was published in the *Railway Age Gazette* March 11, page 517; it is sufficient to say here that the plan provides for a pension board consisting of eight persons, to be appointed annually by the president of each company, and each company authorized a maximum appropriation based on the number of employees, to be made annually for the payment of pensions. The plan provides that all employees who reach the age of 70 years shall be retired, and that such of them as have been in the service for at least ten years immediately preceding their retirement shall be pensioned. Those employees who, having been in the service continuously for 20 years, have become unfit for duty in the opinion of the board of pensions, may be retired and pensioned.

The president points out in the case of the Michigan Central, as of other lines, that general conditions were never more favorable than at the present time, and that every indication points to renewed and increasing prosperity.

The following table shows what was expended during 1909 and 1908 on maintaining way, structures and equipment:

	1909.	1908.
Maintenance way & structures per mile single track*	$809	$661
Repairs and renewals: Per locomotive	2,253	2,053
" " " " passenger car	534	382
" " " " freight car	84	68

*All mileage of first, second, third and fourth tracks, plus one-half mileage of sidings.

The concluding table shows the general results of operation in 1909 as compared with those for 1908:

	1909.	1908.
Average mileage operated	1,746	1,746
Freight revenue	$18,267,530	$16,026,759
Passenger revenue	6,655,699	6,030,419
Total operating revenue	27,222,677	24,051,346
Maint. way and structures.	3,458,165	2,781,814
Maint. of equipment	3,756,582	3,009,143
Conducting transportation.	10,050,690	9,844,524
Total operating expenses	18,499,528	16,783,768
Taxes	1,121,532	1,105,694
Net earnings	7,743,255	6,313,644
Gross income	8,684,736	7,157,163
Net income	2,872,497	1,627,120
Dividends	1,124,280	1,124,280
Surplus	1,748,217	502,840

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.

The Central Western group of what the New York Central management describes as the allied lines includes the Lake Shore, the Lake Erie & Western, the Chicago, Indiana & Southern, the Indiana Harbor Belt, the Michigan Central, the Big Four, the Nickel Plate, the Pittsburgh & Lake Erie, the Rutland and the Toronto, Hamilton & Buffalo. Having covered operations in the East in our study of the New York Central, in the North in our study of the Michigan Central and our references to the Rutland, and having covered separately the operations of the Lake Shore & Michigan Southern, the rest of the territory in the Central West can be well typified by a study of the report of the Cleveland, Cincinnati, Chicago & St. Louis. This road operates 1,982 miles, of which by far the greater portion is main line. It is located in Ohio, Indiana and Illinois in approximately equal parts, with 35 miles of line in Michigan and fractional track rights in Kentucky.

The characteristics of the operation of the Big Four are that the territory is very highly competitive, and that the company moves a larger proportion of low-grade freight than any other of the main sub-divisions of the Vanderbilt system. Bituminous coal on the C. C. C. & St. L. furnished over 40 per cent. of the total tonnage, while manufactures do not contribute much more than 20 per cent. of the total. The result is reflected in the ton-mile revenue, which is only 5.4 mills this year, while passenger-train revenue per train-mile is $1.20, as compared with $1.44 on the New York Central in spite of its enormous commutation traffic out of New York, and with $1.67 on the Lake Shore & Michigan Southern.

The Big Four earned in 1909 $27,657,741 from rail operations, which is at the rate of $13,953 per mile of road, and it operated for 71.27 per cent. After all deductions from gross corporate income, the net corporate income for the year

mounted to $2,776,372, out of which dividends aggregating 1,441,126 were paid; 5 per cent. on the preferred stock and per cent. on the common stock; and a surplus from current perations of $1,335,246 was carried forward.

Within the last ten years the portion of the Central West n which the Big Four operates has had a great growth in opulation and resources and railway operation there is ecoming analogous to that in the eastern states, since the ew road built is not very considerable, while large sums are eing spent in putting the lines in really first-class condition. his is a matter which does not depend very much on the hoice of the executive; the competitive situation is so severe hat small advantages have great weight, and must be pro- ided for even at considerable capital cost. During 1909 the leveland, Cincinnati, Chicago & St. Louis spent $944,906 for pecific improvement work charged to capital cost, in addi- ion to which charges for maintenance of way and structures nd equipment were on a generous scale, as may be seen from he following table:

	1909.	1908.
Maintenance way and structures per single-track mile*	$1,158	$1,037
Repairs and renewals: Per locomotive	2,620	2,059
" " " " passenger car	797	682
" " " " freight car	88	68

*Mileage of first, second and third tracks, plus one-half mileage of idings.

The company also spent $832,030 of which $669,072 was harged to replacement fund and $162,958 to capital account. he Big Four has not been as badly off for equipment as ome of the other lines in the system, and it took propor- ionately smaller amounts of new rolling stock under the ew York Central Lines equipment trust of 1907. Like the ther lines in the system, it inaugurated its pension system ast November in the manner described in the report of the ichigan Central.

The following table shows the principal statistical results of peration during the year:

	1909.	1908.
Average mileage operated	1,982	1,982
Freight revenue	$17,975,353	$15,250,361
Passenger revenue	7,169,670	6,643,072
Total operating revenue	27,402,194	24,029,604
Maint. way and structures.	3,159,609	2,817,641
Maint. of equipment	4,652,610	3,848,424
Cond. transportation	10,434,269	10,307,469
Total operating expenses	19,711,495	18,333,451
Taxes	878,328	829,008
Net earnings	7,011,350	5,062,684
Gross income	7,634,613	5,616,710
Net income	2,776,372	708,779
Dividends	1,441,126	500,000
Current surplus	1,335,246	208,779

NEW BOOKS.

apid Transit Routes in New York City. Published by the Public Service Commission of New York State, First District, 154 Nassau street, New York City.

his is a reprint, in pamphlet form, of appendix A of the ast annual report of the Public Service Commission. It con- ains maps, with full historical and descriptive notes, of the levated and underground railways, built or to be built, or hich have been officially proposed under the rapid transit ws.

reight Transportation on Trolley Lines. By Charles S. Pease. New York: The McGraw-Hill Book Co. Cloth; 5 in. x 7½ in.; 62 pages. Price, $1.

his is a collection of brief notes on those subjects which ould naturally engage the attention of anyone intending begin or to promote the transportation of freight on elec- ic railways, especially lines in suburban districts. The ope of the work is indicated by the titles of the chapters: he Canvass; Maps and Statistics; Routes and Time Sched- es; Stations and Depots; Cars; Side Tracks; Employees; assification and Rates; Interstate Commerce and Public rvice Commissions; Accounts and Stationery; Instructions Employees; Connecting Lines; The Platform Package Sys- m; The Public.

Letters to the Editor.

MACHINERY VS. INGENUITY IN A CROWDED YARD.

St. Louis, March 12, 1910.

To the Editor of the Railway Age Gazette:

In these days of super-protection and multiplication of safety devices to the point of frills and trimmings, it is worth while, as a sedative, to observe how, in many cases, a minimum of apparatus when added to a maximum of common sense and training can accomplish in a perfectly satisfactory manner what our modern methods often fail to do. If we may believe recent reports the Chicago & North Western is about to install in its new Chicago passenger terminal the most elaborate system of interlocking and signaling that it is possible for the signal and operating departments to devise. The whole object of the installation, as of any other, is to expedite traffic in as safe a manner as possible. Now for the sedative. In 1890 there was installed in Kansas City by the Union Switch & Signal Company a hydro-pneumatic interlocking plant to work the switches and signals at the entrance to the Union depot. When first put in service the plant was complete; it was equipped with detector bars, mechanical locking and all other devices considered necessary in those days. As time went on and traffic grew, one thing after another in the way of safety devices had to be sacrificed in order to move without unnecessary delay the increasing number of trains. To-day there is not a detector bar left. All the mechanical locking except that preventing the clearing of conflicting signals has been removed, and switchboard jacks have been provided so that conflicting signals may actually be given by making electrical connections. In fact, a combination board has been set up at one end of the machine to facilitate this practice. Yet there is almost never a failure or derailment. Delays innumerable occur because there is not sufficient yard room to accommodate all of the trains, but not from any fault in the machine. In fact, a complete modern machine would increase the congestion many fold. The secret of the whole matter is this: Speed is strictly limited to five miles an hour, and all the trainmen and enginemen understand the situation thoroughly and co-operate with the signalmen. During the periods of maximum congestion a man is stationed on the ground to help direct enginemen by hand signals, which he gives on the signalman's orders. Mr. Latimer and our British cousins have well said that money invested in discipline yields better returns than that invested in machinery. Of course when the new passenger terminal in Kansas City is built the old hydro-pneumatic machine, the last of its kind, will go to the scrap heap, and we shall probably see a new terminal plant surpassing even that of the North Western; and it will be better so. Then if a collision occurs it can be charged up properly to the negligence of the men concerned. Probably in this country we never shall be able to attain to the perfection in discipline enjoyed by the railways of Europe except in isolated cases and under extraordinary conditions. This being so, we must make our apparatus as near fool-proof as possible and trust to the Lord to remove the fool.

R. H.

Freight rates were advanced on the Austrian State Railroads Jan. 1. The freight earnings in the month of January increased something like 7 per cent., which is attributed chiefly to this advance in rates. It is observable, however, that in the adjacent country of Germany, where rates were not advanced, there was also a large increase in freight earnings, due without doubt to the fact that business is picking up. In Hungary, however, where rates were also advanced, earnings fell off.

Contributed Papers.

THE WHITEHALL SCHOOL FOR STATION AGENTS.

The Delaware & Hudson Company has in operation at Whitehall, N. Y., which is the junction of its Saratoga and Champlain divisions, 77 miles north of Albany, a school of telegraphy which has been running two years and has graduated 37 young men who are now at work for the company as operators or station agents or both. The school as yet has only one teacher, Lewis M. May, who is the principal, but it has had altogether 59 pupils, of whom 16 are now studying. Thus 53 are accounted for. The balance, six, represents the loss—those who for any reason dropped out.

Besides teaching telegraphy, Mr. May instructs his pupils in the principal features of freight office work, and therefore turns out pupils in some degree qualified to take charge of a small station or to assist in a larger one. Pupils usually take seven or eight months to complete the course, and about one-fourth of this time is devoted to the study of freight office work.

The Delaware & Hudson operates 828 miles of road and has over 150 stations. The school was begun at a time when telegraphers were scarce, in consequence of the additional forces required because of the advent of the hours of labor law, and at that time the company, in order to attract applicants, made a contribution toward the board of pupils; and even with this expense the actual outlay by the company was less than $100 a pupil. At present no allowance is made for board, but those who live near Whitehall are carried free on the trains of the company from and to their homes. All of the pupils now in the school come from villages within 50 miles of Whitehall, and most of them from places within 25 miles, but circulars telling of the advantages of the school have been distributed throughout the company's lines and it is probable that applicants will appear at many other places. This circular reads, in substance:

The Delaware & Hudson Company has established a School of Telegraphy in order that young men may be fitted by proper training to assume positions of responsibility in the railway service.

Equipment and Instruction are provided that makes graduation possible in a few months to those having aptitude for the business. Positions will be found for students that have completed the required course of study.

Thorough instruction in freight office business methods and station management is a specialty of this school. The student will become qualified to fill a position in this line of railway service, in addition to becoming a skilled telegrapher.

To enter this school a young man must be from 17 to 21 years of age, and of sound health; and should be advanced in the study of the English language, mathematics and geography. A certain standard of efficiency will be exepected by the school, and a determined effort to master the details of the telegraphic business will alone lead to success. Anyone disqualified for advancement will be so informed when this is noted by the instructor

Since the school has been established thirty young men have completed the course and have secured salaried positions with this company.

To encourage study in this branch of business the D. & H. Company allow free transportation to and from Whitehall to students of this school residing out of town.

With the facilities provided for practical work, if the student has the ability and desire to advance, the course may be completed in from six to eight months.

No tuition charge is made.

Good board can be secured for $4.50 per week and up.

Applicants are required to pass the usual physical examinations such as are imposed on applicants for employment, and thus no time is wasted in teaching young men who might prove to be physically unsuitable for the service; and the mental examinations are graduated according to the age of the prospective pupil. Boys of 17 are received if they have a good grammar school education and are otherwise satisfactory; but one of 20 would be called upon to show high school qualifications or to give suitable evidence of profitable expenditure of his time during the years when he naturally would have been in high school.

In telegraphy the pupils are drilled and redrilled in sending and receiving train orders and messages until they are thoroughly familiar with the work and competent to receive at fair speed. The school is adjacent to and overlooks the main line where all of the trains pass each day, so that the pupils have actual object lessons in connection with the flags and lights on the front and rear ends of the trains. Most of the graduates have done so well that, with suitable caution on the part of the train despatcher, it has been practicable to send them directly from the school to take charge of a small station for an eight-hour day, working the second or third trick.

The principal features of freight office work taught are the making of waybills and expense bills; the writing of the freight-received record and the preparation of the daily reports which have to be sent to headquarters, such as summaries of foreign waybills, etc. The pupils are given practice in balancing daily accounts, but have not as yet been put through actual cash transactions such as are common in business schools.

The school being thus far something of an experiment, it has been kept in a small room where only limited facilities could be provided, but larger quarters are now being prepared and a complete freight-office outfit will be provided.

The pupils are encouraged to inform themselves as fully as possible about railway work by reading, and for this purpose they are supplied with the books listed below, as well as others.

"General Accounts"; "Passenger Traffic Accounts"; "Freight Traffic Accounts," by M. M. Kirkman; and other books on railway station work and accounting, by the same author.

"Railroad Freight Rates," by Logan G. McPherson; "The Working of Railroads," by the same author.

"Diagrams for Telegraph Engineers and Students," by Willis H. Jones.

"Electrical Dictionary," by Edwin J. Houston.

"Catechism of the Locomotive," by M. M. Forney.

"Science of Railways," series, by Kirkman, including books on locomotive operation, locomotive appliances, handling the air brake, etc.

The books dealing directly with the station agent's work are included in a list of required reading, but the reading of those on what may be called collateral subjects, such as the locomotive, is not compulsory.

Half-hour lectures are delivered to the students by superintendents, chief despatchers and division agents, thus furnishing for beginners an atmosphere of reality that might be lacking if they did not have this incentive to extend their thoughts beyond the four walls of the school building.

General Superintendent J. B. McKim informs us that the results of the school have been looked upon by the officers of the road with marked satisfaction, and its scope is being enlarged. Judging by the appearance of the students as a body it would appear that a very satisfactory class of young men has been attracted to the school.

Graduates of the school are now in the service at Addison Junction, Ballston Lake, Cadyville, Center Rutland, Central Bridge, Chazy, Corinth, Dresden, Essex, Fort Edward, Lake Placid, Lion Mountain, Mechanicville, Plattsburg, Port Henry, Port Kent, Saratoga, Standish, Smiths Basin, Westport, Willsboro, Whitehall and a number of other places.

FOREIGN RAILWAY NOTE.

Belgium, a great coal-producing country—for its size—now imports more coal than it exports, due to the fact that it is also a great iron-producing country. Last year its coal imports were 6,452,677 short tons, and its exports 5,580,388. About 40 per cent. of its imports came from Germany; by far the larger part of its exports go to France.

THE PRE-COOLING PLANT OF THE SOUTHERN PACIFIC AT ROSEVILLE, CAL.*

The successful transportation of fresh perishable fruit in refrigerator cars depends primarily on the sound condition of the fruit; on cooling it as soon as possible after it has been picked; on shipping it in packages which cool quickly and thoroughly; on dry cold air uniformly distributed in the car, and on the cooling process being such as will completely cool the center of the fruit. After numerous experiments, means have been provided for meeting the above conditions, and the precooling of fresh California fruits in carloads for shipment east has been so successful in preserving the fruit and reducing the expense of icing that the railways have gone into the business on an extensive scale and have made large expenditures for plants for this purpose.

Two of the largest plants have been built for the Pacific Fruit Express Company, a subsidiary corporation of the Harriman Lines, at Roseville, and at Colton, Cal. Each of these plants is built in connection with large ice manufacturing plants and the cars are iced while standing in the precooling shed. The refrigerating part of the plants at Roseville and Colton are quite similar, but the relation of the precooling to the ice plant and the location of the air ducts are different, as will be seen by the plans. At Roseville the car shed is at one side of the ice plant and the precooling houses and ducts are on that side, while at Colton the precooling plants are on the center line and at the ends of the ice plant with the car sheds and lines of ducts at each side.



Pre-cooling and Car Icing Shed. Exhaust Ducts Connected to Cars.

The Roseville plant was placed in operation October 9, 1909, and has been since in successful operation. The plans and photographic illustrations, with one exception, relate to that

*A preliminary description of the pre-cooling plants of the Southern Pacific in California will be found in the *Railway Age Gazette*, June 2, 1911, page 1388. Since the completion of the plants we are able to present photographic views of the Roseville plant with more complete drawings.



Pre-cooling House with Main Air Duct at the Center. Ice Plant at the Right.

plant. The buildings are of brick and reinforced concrete and the construction is shown in the cross sections. The main building, or ice plant, is 357 ft. 8 in. long and 111 ft. 4 in. wide, with a corner recessed for one precooling building. The second building is at the east end of the ice plant. These precooling plants are each 121 ft. long and 43 ft. 4 in. wide, the main portion being two stories, while the central portion has a ventilating deck or third story. The car shed is 900 ft. long and is built of timber with an upper deck for the main exhaust duct, and a platform for icing the cars; and below is a main pressure duct for cold air. The relation of these piping and the insulation of the floor of these boxes consists of two layers of 2-in. "Lith" and a 2-in. plank with asphaltum covering. The insulation is laid on 5 in. of concrete and is covered with 2 in. of cement concrete. The ice storage rooms are also insulated with waterproof "Lith" 3 in. thick bedded in a heavy coat of cement. The "Lith" is covered with a facing of union cork board bedded in waterproof cement.

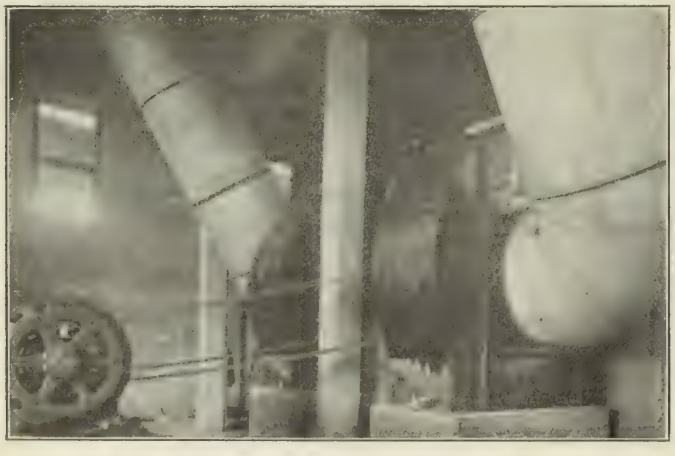
The precooling method used at Roseville and Colton is the intermittent vacuum process invented by A. R. Sprague, the object being to withdraw the heated air and gases which emanate from warm fruit and cool the fruit clear through by



Ice Plant at Roseville, Cal. Southern Pacific Company.

to the refrigerator car is plainly indicated in the sectional view which illustrates the fans. The Roseville plant has a capacity for precooling 24 cars of fruit at once, and the temperature of the car and contents is reduced from normal, 70 or 80 deg. F., to 40 deg. F. in two hours. The ice plant has a capacity of 250 tons daily and a storage capacity for 20,000 tons. In the construction of these buildings a large amount of insulating material was used, which was supplied and installed by the Union Fibre Company, Winona, Minn., the Roseville plant requiring 152,200 feet of "Lith" board and 128,370 ft. of union cork. The bunker room or air cooler is 80 ft. x 26 ft. with upper and lower sections. The walls of the rooms are made of terra-cotta tiling, the section having two 4-in. tile walls with two layers of 2-in. "Lith" insulation between. The coil boxes are filled with direct expansion subsequent cold blast. The walls of the car are also cooled down so that the first icing does not melt rapidly and the car will travel much farther before re-icing is required. There are two series of main ducts. One is for exhaust overhead in the car shed, with branches leading to the roof openings of the ice boxes. The other is a cold blast duct running along the first floor with branches having large rectangular openings which fit with proper packing into the side door opening of the refrigerator car.

The intermittent system stops the cold blast for a brief



Exhausters in Pre-cooling Plant.



Train Shed of Pre-Cooling Plant. Exhaust Ducts Above Track

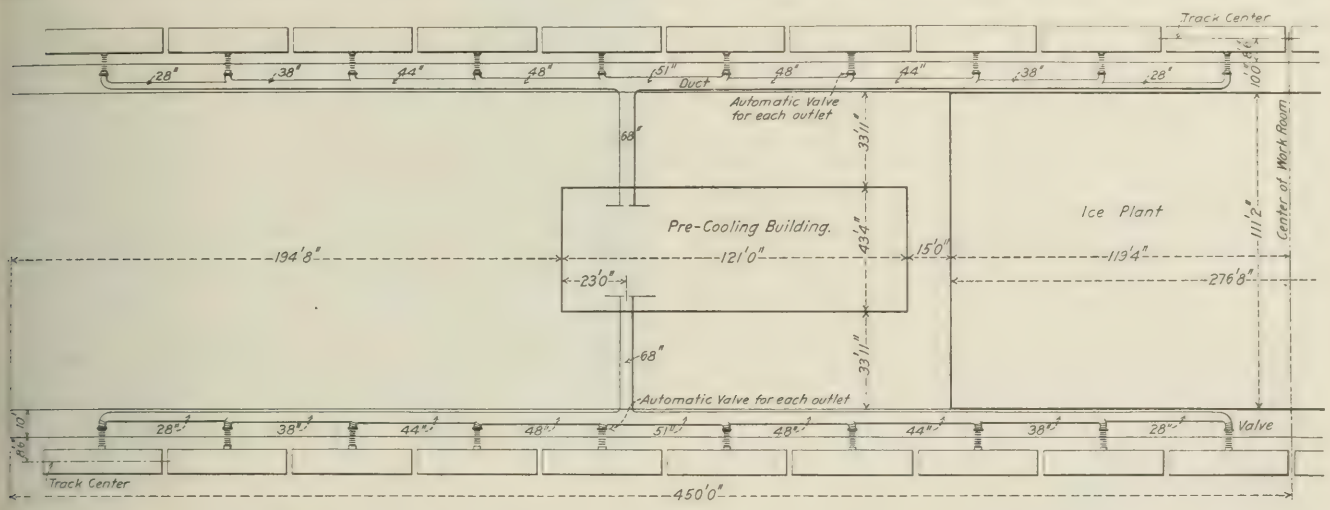
period while the exhaust continues until a partial vacuum is produced within the car, causing the fruit to part with its warm vapors. During this period the exhaust is discharged into the open air. The vacuum is produced at intervals of 5 to 15 minutes, depending on temperature conditions. The valves are regulated automatically so that when the discharge to the open air is closed the cold blast valve is opened and the cooling process continues, but with the discharge entering the cold air chambers, where it passes over the coils, and is cooled and deposits its moisture. The cold blast to the car is then dry. During the exhaust period the gages should show a vacuum of 2 to 2½ in. at the center of the packages, and the precooling is continued by this intermittent process until the walls of the car have a temperature of about 25 deg. F. While the temperature of the cold blast is as low as 5 deg. F., that of the fruit equalizes at about 40 deg. F.

The main exhaust pipe is made of No. 18 galvanized iron 78 in. in diameter from the fan to the main connection where it branches into two longitudinal pipes parallel with the track, and these are reduced from 60 in. in diameter to 24 in. at the ends, as shown in the drawing. The down pipes to the car roof openings are 20 in. in diameter, and 8 ft. from the end are made of flexible canvas so as to adjust themselves to the varying position of the car. These flexible down pipes are plainly shown in the illustration. The cold blast pipe is 68 in. in diameter where it leaves the coil boxes, and is reduced to 28 in. at the end of the main. The plan view of this pipe is shown in the drawing of the Colton plant.

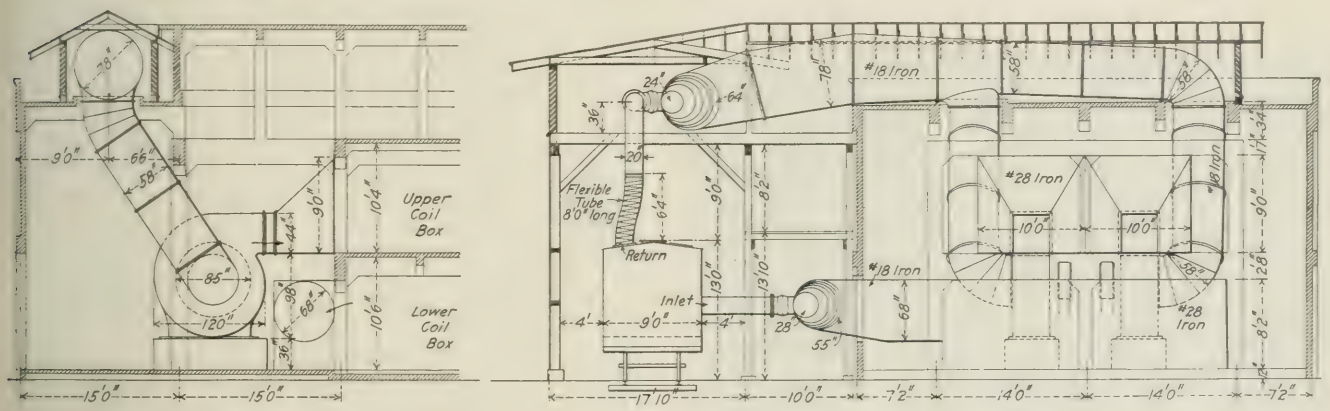
There are two exhaust fans in each precooler house. These exhausters were supplied by the Buffalo Forge Company, and have wheels 85 in. in diameter by 27 in. wide. The capacity of each fan is 44,500 cu. ft. air per minute under pressure of 3 oz. and at a speed of 380 revolutions per minute. The two exhaust fans are driven by Westinghouse electric motors.

The refrigerator plan consists of two 250-ton machines each consisting of double acting "York" ammonia compressors with cylinders 24 in. x 40 in. driven by a tandem compound Corliss engine with cylinders 24 in. and 46 in. in diameter by 36 in. stroke. The ammonia condensers contain 48 coils of 2-in. galvanized pipe each 20 ft. long and 24 pipes high. The freezing tanks and ice cans are similar to those in large modern ice plants. There is ice storage room under the tanks for 6,000 tons of ice and in other parts of the building for 14,000 tons.

The complete plant was designed by A. Faget, consulting engineer, San Francisco. The Sprague patents on the Intermittent Vacuum Precooling process, which was used in the plant, are controlled by L. H. Roy, Chicago. We are indebted in the Pacific Fruit Express Company for the drawings and photographs here reproduced.



Arrangement of the Pre-cooling Plant at Colton, Cal. Southern Pacific Company.



Sections Showing Fans and Air Ducts. Pre-cooling Plant at Roseville, Cal.

The budget for the Swiss Federal Railways for 1910 is as follows: The estimates for the operating receipts are $33,580,000, and the operating expenses $23,490,000, leaving the net earnings $10,090,000. The profit and loss account is estimated as follows: Receipts, including the $10,090,000 net earnings, $12,102,000; expenditures, $13,090,000, leaving a deficit of $988,000, against a deficit, according to the budget, in 1909, of $1,115,000. The principal receipts outside the net earnings were from withdrawals from the renewal fund, $1,388,000, and interest from the renewal fund, $518,000. The expenditures are given as follows: Interest on consolidated debt, $8,946,000; amortization, $1,453,000; deposit in renewal fund, $1,740,500; interest, commissions, etc., on temporary loans $726,000; part payment deficit of the pension and loan fund, etc., $192,000; all other, $32,500.

SUBAQUEOUS TUNNELS.*

BY R. B. WOODWORTH,
Engineer with the Carnegie Steel Company, Pittsburgh, Pa.

II.

The method of removable steel forms has also been used in building the Southwest water tunnel in Chicago, built by the George W. Jackson Co., Inc., while the Blue Island tunnel was 8 ft. inside diameter, the Southwest water tunnel is horseshoe shape in cross-section of variable dimensions equivalent at different points to 12-ft., 14-ft. and 16-ft. cinches. In this instance, the lagging ribs were 6-ft. channels. This form of interlocking steel ribs, or some similar method of construction, will doubtless reduce very materially the cost of concrete lining; so also will doubtless the use of the telescopic collapsible steel form and traveler, manufactured by the Ransome Concrete Machinery Company, and described in the October 2, 1909, issue of the *Engineering Record.*

Reinforced concrete commends itself for rock tunnel lining. Whether or not it will eventually replace brick for such purposes will depend on its performance in recent installations. What form the reinforcement will take will depend largely on circumstances, but the reinforcement should always be designed to increase materially the strength of the concrete and be in such form as to perform the most service for the least weight. In the construction of the Aspen tunnel, of the Union Pacific, in Wyoming, unexpected difficulties were encountered. A double track tunnel was driven by the ordinary American method of taking out and timbering the top third of the excavation and the benches were removed by the use of the steam shovel. The material through which the tunnel penetrated was exceedingly unstable, being a disintegrated soft shale rock. Here slips were frequent and heavy timbering was used to overcome the tendency of the whole mountain to slide into the excavation. When heavy timbers proved too



Fig. 3—Steel Tunnel Supports Twisted Under Pressure of Disintegrated Soft Shale Rock.

light 12-in. 31.5-lb. beams bent to the curve of the tunnel and erected in three sections spliced together were tried. These also proved too light for the work and many of them were seriously bent and twisted under the tremendous earth pressure, as shown in Fig. 3. The settlement was finally stopped and the tunnel completed by the use of 12-in. 55-lb. I-beam rings spaced two feet center to center and filled in solid by concrete, as shown in Fig. 4. Inasmuch as steel mine timbers, in more or less similar form, have been found highly satisfactory in coal mining operations in this country and abroad, there seems to be no reason whatever to prevent their similar use in standard railway tunnel construction where heavy loads are to be sustained and where the ordinary methods of timbering appear likely to prove inadequate.

*From a paper read before the Railway Club of Pittsburgh.

SOFT GROUND TUNNELS.

The essential differences between a rock tunnel and a soft ground tunnel is that the former is drilled and blasted while the latter is bored and dug; machine drills give place to



Fig. 4—Supporting Structure Finally Adopted in Place of That Shown in Fig. 3.

augers, and timbering common in stable ground is replaced by the foregoing method of construction. If the ground contains no water and danger of subsidence is small, the timbering necessary is reducible practically to the amount required properly to support the excavation during the process of lining. If, however, the material contains water and the excavation is carried on at shallow depth in close proximity to buildings, the use of a shield may be found desirable, and so also may the use of compressed air at a low pressure, ordinarily ranging up to 8 or 9 lbs. above normal.

The largest system of soft ground tunnels in the world is the network built by the Illinois Telephone & Telegraph Company below the streets of Chicago which now extend 66 miles. These were first built for telephone and telegraph cable conduits and have been later extended to carry a narrow gage transportation system for freight traffic. The tunnels, of a horseshoe form 6 ft. wide and 7ft. 6 in. high inside dimensions, are constructed of concrete 10 in. thick on the crown and sides and 13 in. at the bottom. The method of construction was as follows:

The bore was dug in the clay for a distance of 20 ft. and about a foot larger all around than the completed tunnel. The 13-in. concrete bottom was then put in place and upon this were placed forms made of 5-in. channel bars in two pieces, curved to the exact size of the inside of the completed tunnel. Outside of these forms boards 20 ft. long were placed, one at a time, on each side and the concrete rammed into the space between the boards and the clay. When the crown forming the key was reached boards 3 ft. long were used. It was afterwards found better to build 15-ft. sections instead of 20-ft. The concrete was composed of one part Portland coment, three parts sand and five parts gravel.

The tunnels were commenced in September, 1901, and were driven in stiff blue clay containing very little water, but occasional pockets of gas and quicksand were encountered. As a precaution the work was all done on the pneumatic system, the air pressure being about nine pounds per square inch.

The material was excavated with spades and drawknives and hauled away in small cars 20-in. x 48-in. inside measurement. The main tunnels are built at a depth about 20 ft. from the street surface to the crown of the tunnel. As they are located under the center line of the street, they are clear of the lines of pressure from the buildings and are subject only to the pressure due to the overlying material. The work, therefore, is delicate in its nature, but with the low air pressure there has been practically no trouble from settlement of the ground; where driven without air small subsidence has sometimes occurred.

The intake tunnel of the Municipal Water Works of Gary, Ind., built 1908-09, is likewise an example of the soft ground tunnel driven without shields. This tunnel has a horseshoe shaped cross-section equivalent to a 6-ft. circle and a total length of approximately 15,000 ft. It is being driven through the thick stratum of clay underlying Lake Michigan and at a depth of about 20 to 30 ft. above bed rock. A section of tunnel about 225 ft. long was first driven from the bottom of the pump shaft and lined without the use of compressed air in the heading. An air lock was then installed at this point and since then all the operations in the heading have been handled under air pressure. The work in the heading is prosecuted by three 8-hour shifts of laborers. The mining is done by two shifts which advance the heading 24 to 27 ft. under normal conditions, and the concrete lining for the bore of the tunnel is placed by the third shift, so that 24 to 27 ft. of lined tunnel are completed every 24 hours. Most of the clay removed is of such a nature that it can be cut with a drawknife, although sharp spades and adzes are occasionally used. The excavation is not timbered as it progresses since an air pressure of 12 to 16 lbs. is sufficient to mintain the shape of the bore until the concrete lining can be placed. The forms for the concrete lining consist of pieces of 3 in. wooden lagging 3 ft. long, which are held in place by tee iron ribs bent to the horseshoe shape of the tunnel cross-section. These ribs are spaced 3 ft. apart on centers and are made in three pieces to permit of ready removal.

The Baltimore Belt Tunnel, Baltimore, Md., 1.4 miles long, is a double track tunnel through sand and clay, built by the crown bar method of timbering in 1890-1893, and is notable on account of an attempt to carry forward the excavation by means of a roof shield running on side walls built previously.

The construction of tunnels by this half shield method proved successful in 1896 on a portion of the Boston subway under Tremont street and the system has had rather wide application. The shield weighed about 22 tons and was calculated to sustain an approximate load of 640,000 lbs.; was 29 ft. 4 in. wide over all, with a rise of 4 ft. $4\frac{5}{16}$ in. and was composed of two plate girders 3ft. 8 in. deep and 4 ft. apart with cover plates extending 4 ft. beyond the girder, while an additional top plate extended 2 ft. in the rear. Under each foot of each girder was an iron casting which fitted into a recess in the cast steel shoe. These shoes rested upon two lines of 10-in. steel I-beams imbedded in the concrete side walls forming the track upon which the roof shield slid as it was pushed along. The shield was propelled by 10 6-in. hydraulic jacks located around its upper portion. The outer ends of the plungers were fitted with collars which abutted upon 2¼-in. cast iron round bars built into the brickwork of the arch and forming continuous lines of metal to resist the thrust of the jacks. This device was apparently first used by Walter I. Aims in the East river gas tunnel at New York City. As soon as the shield had been pushed forward about 3 ft. the timber centering was erected behind it and the brick arch lining of the tunnel built. During this time a heading 6 ft. high and the whole width of the tunnel was excavated ahead of the shield and supported by posts and poling boards; which were removed as the shield reached them. The material was mainly gravel and stiff clay. The depth of earth above the tunnel varied from 6 ft. 9 in. to 13 ft., and a progress of about 50 ft. per week was made. The two side walls were built in advance headings. The arch was built by means of the shield and the center core of material was removed later.

The half-shield method has also been employed in 1908 in the construction of the intake tunnel of the Lawrence avenue pumping station, Chicago, Ill., 1,446 ft. long. This tunnel is used in connection with the intercepting sewerage system of Chicago for furnishing water from Lake Michigan for dilution of the sewage and is believed to have the largest cross-section of any that has been built for similar purposes. It has a full center arch with a span of 20½ ft. with a rise of 8 ft. 11 in. The bottom is an inverted flat arch so that the total height of the structure at the center line is 14 ft. The cross-sectional area is slightly more than equivalent to a 16-ft. circle.

The cover between the crown of the arch and the bottom of the lake varies from 18 ft. at the outer end of the tunnel, where it is made up of 4 ft. of sand at the top and the remainder clay, to 34 ft. at the shore shaft. The upper part of the bed of clay is of a soft blue character which increases in stiffness with the depth, so that the invert and the bench walls of the arch of the tunnel are founded on hardpan. Owing to the large area of cross-section it was considered impracticable to make the whole bore at one operation. The plan was, therefore, adopted of driving two headings, each 7 ft. high, 6 ft. wide at the top and 9 ft. wide at the base, for the bench walls of the arch and of building these walls in advance of the removal of the core of the excavation and the completion of the balance of the tunnel. The drifts were excavated by hand with draw-knives, adzes and similar tools without air pressure, though they had to be lined closely with bents of 8-in. x 10-in. timbers.

The shield used in driving the main tunnel excavation was built up of steel plates and structural shapes and conformed in outline to the arch of the tunnel. It traveled on rails laid on the bench walls of the arch built of concrete in the advance headings. The shield was five feet long with a projecting cutting edge around its rim at the front end and was braced apart at the bottom by a horizontal steel platform carried by five 10-in. 40-lb. I-beams. A heavy plate on the bottom of each side of the shell of the shield rested directly on a pair of rails on timbers carried by the corresponding bench wall. The shield was advanced by means of 12 6-in. hydraulic jacks equally distributed around the periphery of its shell. The work was carried on under an air pressure of 8 lbs. as an assurance against difficulty and the regular sequence of operation was as follows:

First the concrete bench walls were built ahead 150 to 200 ft. in the side headings. When the concrete had set the shield was pushed ahead with its own jacks which reacted against the timber lining of the excavation. This lining consisted of segments in 3 and 4-ft. lengths cut from 7-in. x 10-in. oak timbers and was placed immediately following the shield to retain the soft bulging clay through which the greater part of the tunnel is built. The brick arch was constructed in sections 22 ft. long from a timber traveler of that length which operated on rollers on timber laid on the hardpan. After the arch work was built the excavating and concreting of the invert were completed.

The latest practice by French engineers in shield construction is shown in Fig. 5, which is a cross-section of a tunnel with the shield in place used in the construction of the Metropolitan Railway, Paris. The roof of the Metropolitan Railway tunnel is but little below the surface of the street and the tunnel is a double track structure with a clear span of 23.29 ft. and with a rise of 6.79 ft. in the arch. The arch abutments and floor are all of masonry. The first portion of this tunnel was built in 1898 with a half section shield on which the arch was built and the abutments built last, but the results were not satisfactory and the failure of the shield was largely due to the fact that the soil penetrated was not homogeneous. Then, too, in moving forward the shield carried with it around

its outer surface a certain thickness of earth which caused undulations on the surface ground and by its broken condition threw too much weight on the tail end of the shield. There was thus a tendency in the shield to rise at the forward end, while the fresh arch masonry was damaged under the friction of the shield when it was moved forward.

The characteristics of the new roof shield designed by the engineers Radenac and Raguet to avoid these troubles were its length and the more stable support provided for the shield rollers when the shield moved forward. In actual use the shield has been advanced as much as 20 ft. in 24 hours. The shield was made of an outer steel shell-shaped with the extrados of the arch and its total length was 24 ft. 6 in. This shell was supported by four cross-beams connected by 38 longitudinal girders, of which 20 extended forward to support the front end and 18 were on the rear end. The webs of the

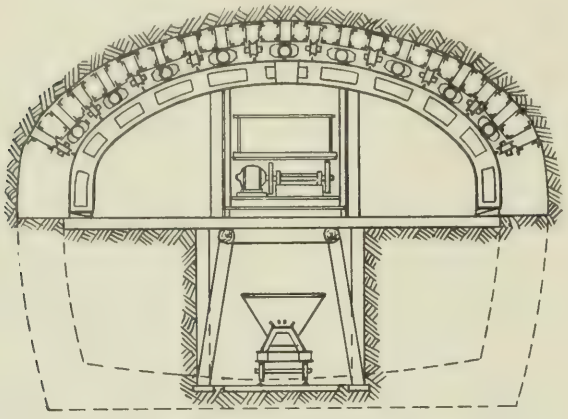


Fig. 5—Shield Construction Used in the Metropolitan Railway Tunnel, Paris, France.

girders were stiffened with angle iron, making a beam box of each pair of girders. Ten of these box beams supported the rollers on which the shield was moved and nine of them carried the hydraulic jacks. The total weight of the shield and its framework was 34 tons. The steel cutters on the front of the hood were eight in number. The rollers were not operated on top of freshly laid masonry, but traveled on steel centers which were built of beams shaped to the arch and divided into two equal parts connected by bolts. The foot of this center extended about 18 in. below the spring of the arch and rested upon a cross-tie made of two steel plates and angles. This tie obviated the tendency in the center to spread and the whole center was carried on longitudinal sills supported by posts driven in the undisturbed ground of the lower advance gallery. The movement of the shield over these centers was very steady and the surface undulations did not exceed 3 in. The hydraulic jacks were 8 ft. 8 in. long and had a stroke of 3 ft. 7 in. They were fastened to the shell of the framework and their pistons acted upon thrust blocks set between the center ribs. As these ribs were theoretically immovable, the shield shell and its framework advanced. As the shield moved forward, sheets of thin steel replaced it to prevent the earth from falling in. These plates were held in place by temporary timbering until the masonry was completed, the plates remaining in the ground. The masonry was built on wooden lagging laid on the steel centers.

The most recent example of the half shield method of construction in soft soil is to be found in the construction of the Detroit River tunnel, of the Michigan Central, now building. The total length of this tunnel is 12,800 ft. made up of 1,540 ft. open cut, Detroit end, 2,135 ft. approach tunnel, Detroit end, 2,625 ft. subaqueous, 3,100 ft. approach tunnel, Canadian end, and 3,400 ft. open cut, Canadian end. The cross-section of the approach tunnels on both sides of the river is practically the same, each consisting of two single track structures with a vertical wall 4 ft. thick between. The roof of each half of these structures is a full center arch 2 ft. thick on the American side and 2 ft. 6 in. thick on the Canadian side with an inside radius of 8 ft. 3 in. and a clear height of 18 ft. above head of rail. Owing to the great extent of the excavation required it was realized that if it became necessary to handle the excavation by the shield method operating either in the open or under pneumatic pressure, a shield large enough to permit the twin tunnels to be built simultaneously would be impracticable. The decision was, therefore, made to run a drift of sufficient cross-section to permit the construction within its limits of the common center wall, and after this wall had been placed, to start the heading of the twin tunnels, thus utilizing the massive core of concrete both as a guide and as a basis for the excavating and concrete work to follow.

The 10-ft. 5-in. x 14-ft. center headings were carried through on the Detroit side without the use of air pressure, but all the work was heavily timbered as rapidly as the headings advanced. On the Canadian side difficulties were encountered in the blue clay through which the headings advanced, and on account of this condition a shield was used in driving the center heading on a portion of the approach tunnels. The design of this shield, which was rectangular in shape, having a total height of 16 ft. 5⅝ in. and a total width of 12 ft. 4⅛ in., does not concern us here. Suffice to say that work on the drift with this shield was advanced sufficiently far to permit the excavation of the center wall. The character of the clay, however, required the center sides and roof of the bore to be heavily timbered. After the center wall had thus been constructed a sufficient distance in advance, the side shield shown in Fig. 6 was used for the remaining excavation.

Four of these shields, built according to the same general design, were in operation, one in each of the two headings

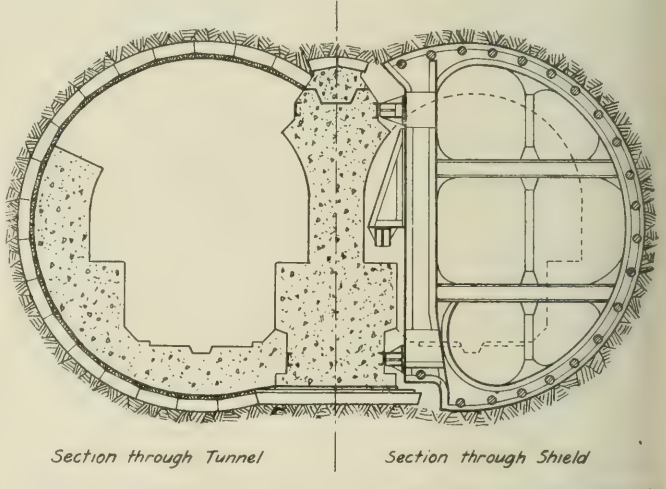


Fig. 6—Side Shield Used in the Land Portion of the Detroit River Tunnel.

being advanced on both sides of the river. These shields are slightly more than half cylinders 27 ft. 1½ in. in diameter. The cutting edge is confined to the circular portion and the shield is advanced by 21 8-in. hydraulic jacks placed around the cutting edge. Although the course of the shield can be determined to a certain extent by these jacks, it is necessary to guide chiefly from the finished center wall. Under normal conditions the weight of the shield and its load are carried by the lower portion of the curved section of the casing, which has a total width of 13 ft. from the cutting edge to the rear of the shield. Two heavy shoes, having their faces vertical, are mounted on the outside of the verticle section of the shield, one near the top and the other close to the bottom, and bear against the rear face of the web of a 12-in. steel channel set horizontally in the concrete of the center wall. To provide for emergencies a third shoe with its face hori-

zontal is mounted on a heavy knee brace on the vertical section of the shield in a position directly over the bench on the center wall.

The excavation made in connection with the shield is lined immediately in the rear of the latter with continuous rings consisting of 4-ft. segments cut from 12-in. x 12-in. maple and beech timbers wedged in place to insure a lining fully capable of carrying the load until the concrete has been placed and has received its set. This lining of timber rings is finished with a ring of 2-in. x 2-in. beech lagging to give a smooth surface for the waterproofing, which consists of three-ply roofing felt laid in hot straight run coal tar pitch. The arch of the tunnel is built in 12-ft. sections after the invert and side walls have been built. The inverts and side walls are built by the use of removable steel forms made in sections 2 ft. wide of $\frac{3}{16}$-in. plates with a 2-in. x 2-in. x $\frac{1}{4}$-in. angle riveted along both sides of each 3-ft. section, and horizontally every two feet, to stiffen them. The arch forms also consist of steel ribs built up of two angles and a plate with these ribs spaced 3 ft. 9 in. apart on centers, and lagged with 3-in. planks attached to them by wood screws. The arch forms are advanced in 12-ft. sections by means of a traveler car.

(*To be continued.*)

MOVEMENT OF PASSENGERS ON PLATFORMS AND STAIRWAYS.*

In this proposition the small area of land required for underground terminal facilities was very costly, involving an average price of between $40 and $45 per square foot for purchase, exclusive of the payment under franchise provisions for lease and use in perpetuity of the underground space of the adjacent streets. The elevation of the tracks in the station was determined as 11.7 ft. below mean sea level, or at a depth of 36.86 ft. below the street surface at Church and Dey streets, and this depth was altogether too great for the movement of passengers up and down without an intermediate landing. For railway operation the shorter the movement vertically or horizontally between the concourse, or distributing floor, and the cars, the better, and as the clearance needed for the cars was only 12 ft. 6 in. above top of rail, and the floor depth required was only 24 in., a grand concourse was laid out at an elevation of 4.33 ft. above mean sea level. In this case there was an added advantage, as at this level the concourse could be constructed continuous under Dey street and practically over the entire area of the station site. The only necessary function, therefore, of the street level in connection with the railway station was to provide adequate access and egress for passengers, well distributed, to the concourse floor, and with that exception the entire surface area was available as part of the office building now developed.

The provision of platforms, stairways and openings had next to be considered. To do this intelligently it was necessary to work back from the ultimate carrying capacity of the tunnels. The capacity of each pair of tunnels is one trainload of 800 persons on a headway of 90 seconds, or say 530 persons per minute, and this number either arriving or leaving at times of maximum movement in one direction, as the reverse movement is always comparatively light. Two terminal station tracks will easily take care of this service, allowing three minutes for the train to enter and stand in the station. As there are two pairs of tunnels provided for the future (one pair of which is now in operation), the station was laid out with four operating tracks, and an additional track, allowing only for unloading passengers, for car inspection and for storing disabled trains. The unloading platform widths and areas need to be sufficient to hold only such part of the trainload as would not have passed onto the stairs when the last portion of the trainload has discharged, and obviously a floor area equal to the train itself is more than adequate providing there is no undue congestion on the stairs. In order to load a train promptly the loading platforms should have sufficient area for a trainload of passengers to stand without undue crowding, largely grouped along the edges at the points where the car doors come when the train stops, with sufficient space in addition to permit a free passage through the crowd being maintained. The width should be greater than that of the unloading platforms and should not be less than twice the width of the trains. Alternating the platforms as before mentioned and thereby maintaining one way movement permits this. The platforms as finally arranged are as follows:

Along the Church street side, an unloading platform 11½ ft. wide serving one track; area, 5,200 sq. ft.

Between tracks Nos. 1 and 2, a double loading platform 22 ft. wide; area, 9,000 sq. ft.

Between tracks Nos. 2 and 3, a double unloading platform 11 ft. wide serving two tracks; area, 9,300 sq. ft.

Between tracks Nos. 3 and 4, a double loading platform 22 ft. wide serving two tracks; area 9,300 sq. ft.

Between tracks Nos. 4 and 5, a single unloading platform, 13 ft. wide, serving No. 5 track only in emergency and being regular only for No. 4 track; area 5,400 sq. ft.

To ascertain the necessities in respect of stairs and passages, count of actual movement of traffic at congested points in New York was made, notably at the Brooklyn bridge. In a straight passage of ample width the "rush hour" New York crowd moves at the rate of 300 ft. per minute, walking with a step averaging 30 in. There is only a small reduction in this speed on ramps of, say, not over 10 per cent. grade. At this rate each person averages about 10 sq. ft. space occupied and the movement discharges about 30 persons per foot of width of passage. If the passageway becomes too congested, the space occupied per person reduces and the speed of movement also reduces, but the number discharged remains about the same, 30 per minute. Any contrary movement in a broad passage reduces the movement rather more than the relative space occupied in multiples of say 30 in. per person, but in narrow passages the relative reduction is much greater, notwithstanding that persons crowd into smaller space, not over 24 in. width.

A crowd moving freely upwards on stairs takes about the same number of steps per minute, say 120, but advances only about 12 in. horizontally instead of 30 in. Upstairs movement is much more dense than downstairs, but correspondingly slower. We have counted discharge on stairs of 24 persons per foot of width per minute moving upwards, but never more than 18 per foot of width moving downwards. There does not appear much difference in discharging rate on stairs above 4 ft. wide if the movement is all in one direction, but stairs of all widths (particularly below 8 ft. wide) are seriously impeded by any contrary movement even when only four or five persons per minute are moving in the direction reverse to the heavy traffic. Generally, for stairs above 4 ft. width, all movement in one direction, actual count indicates:

Upwards—Maximum 20 persons per foot of width of stairs per minute. Average for ordinarily free moving crowds, 15 per minute.

Downwards—Maximum 18 persons per foot of width of stairs per minute. Average for ordinarly free moving crowds, 13 per minute.

In case of any contrary movement it is most important to force the people to a right-hand direction of movement, and speaking generally no stairs serving traffic in contrary directions for railway service should be permitted to be installed of less than 5 ft. clear width.

In unloading railway trains in rapid transit service, it is very important to distribute passengers as quickly as possible, particularly in discharge, and in such a problem as ours to get them off the track platforms as rapidly as possible and with the least amount of walking along the platforms, allow-

*From a paper by J. Vipond Davies and J. Hollis Wells, read before the American Institute of Architects at Washington, D.C., December 16. This paper deals with problems connected with the design of the "Hudson Terminal" of the Hudson & Manhattan at Cortlandt street, New York City. A description of this terminal and of the tunnel under the Hudson river, written by Mr. Davies, was published in the *Railway Age Gazette* of September 17 and 24, October 1, 8, 15, and 22, 1909.

ing them the more easily to freely distribute themselves on the great concourse floor. In a full train there are, say, 20 door openings in the train, all simultaneously discharging practically a single line of persons. Therefore, we located stairways on all the unloading platforms in tandem, six stairs to each, distributed as nearly uniformly along the platform lengths as possible. No. 1 platform has an aggregate of 26-ft. stairs to discharge at the rate of 880 persons in a three-minute interval, or 266 persons per minute, or, say, 10 persons per foot of width of stairs. No. 3 platform has six stairs (one not fitted until needed) aggregating 48½ ft. width for discharge of 800 persons in 90 seconds, or say nine persons per foot of width per minute.

For the loading platforms, it was important for the economical operation of the railway to group the landings on the concourse floor, and consequently it was necessary to provide for this service only four stairs per platform in pairs. These have an aggregate width of 32½ ft., and maximum passenger movement of 16 persons per foot of width per minute, on the assumption that the train is fully loaded at the terminal station and no consideration given to local movement at other stations. The arrangement of stairway heads on the concourse floor tends as far as it is possible to thoroughly distribute the movement, and also to separate the incoming from the outgoing traffic. The distribution of the streams of traffic cannot be too thoroughly separated to obtain the best results.

The first essential purpose of this railway and station is for the operation of a purely local rapid transit passenger service, but, as before stated, the railway was to operate a terminal service for the various steam railways in Jersey City and Hoboken.

The concourse floor has ticket offices for the trunk line railways, enabling them to sell all classes of tickets for all points on their lines for trains departing and to advertise schedules of trains departing from Church Street Terminal. A train leaving at an advertised time becomes the train connection for the specified steam railway train from New Jersey. The ticket examiners at the ticket barriers on the concourse floor announce the train connection and at the leaving time of the train deliver a clearance ticket for the train to the conductor, who in turn surrenders the clearance ticket to the platform man at the respective stations on the New Jersey side, on receipt of which ticket the main line train is despatched.

MAINTENANCE CARDS.

Railway employees in all departments are often puzzled to know just how certain pieces of work should be done, and what degree of finish should be given in order that the best results may be obtained. Circular and other letters of instruction are not altogether satisfactory except as a correction for specific bad practice or some local defect. They are apt to be forgotten and contradicted, and a change of foreman or even of a workman may result in a change of method. The maintenance regulation cards that were described in a recent paper read before the Canadian Railway Club by R. W. Burnett, general master car builder of the Canadian Pacific Ry., furnish a pretty good solution of this problem, and are worthy of the careful consideration of foremen and officers who have to do with the maintenance of any kind of equipment.

These cards are so drawn up that they contain clear and concise information and instruction as to the methods to be followed in the performance of the specific piece of work to which they are devoted; and they now cover a wide range of subjects, though by no means complete. We quote Mr. Burnett as follows:

"The use of these cards has been developed by evolution. In the earlier stages they were used only to give direct instructions relative to standards, materials to be used (such as paint for the various classes of freight equipment), giving drawing numbers, or such instructions as pressures to be used in mounting various sizes of wheels, etc. But, as the cards were issued, the possibilities of the scope for which they could be used became more and more apparent. In a short time cards were prepared giving in detail instructions covering certain subjects, containing drawing pattern, and form numbers, stating under what conditions betterments could be made, naming stations that would do the work, and the amount of work expected at various stations, in many cases saying what not to do and advising how report of work should be made.

"The method of preparing these cards varies. The usual procedure is to originate them in the general office, by making a preliminary draft of the proposed card, covering the subject as completely as possible, and giving copies to one or more members of the staff, or to foremen particularly interested, for criticisms and suggestions, after which all papers are turned over to one of the staff to compare with previous instructions and rewrite. The card is then given to the chief draftsman to be checked for accuracy as to drawing, pattern, and form numbers and dimensions. Copies are then sent to the heads of the departments interested, who in turn refer them to their staff for suggestions and criticisms. The card is then finally approved and proof-printed, proof is checked up, and necessary number printed. If necessary, extracts of the proposed card are sent out for the guidance of the foremen, pending the final approval and issuing of the card.

"The chief draftsman is asked to prepare cards which consist principally of data that would be furnished by the drawing-room. Various other members of the staff are called upon to make drafts of proposed cards on subjects with which they are in close touch. In some cases a local foreman may be asked to prepare a card on some practice that he has developed, or which has necessarily been carried on more largely at his station than at other points.

"Considering the manner in which these cards are prepared, which gives so many of the staff an opportunity to make suggestions and criticisms, it may be said that, to a large extent, foremen are carrying out their own instructions. We invite suggestions as to the subjects that should be covered by cards, and at divisional car foremen's meetings the drafts of the proposed cards are criticised and suggestions considered, also propositions are made as to the issuing of cards on subjects requiring definite instructions, sometimes accompanied by draft of proposed card. This combines the practical side of the subject, as seen by the men actually handling the work, with such necessary data and further instructions as may be furnished by the office.

"The cards are given the same index number used for correspondence. The index number of wheels, tires and trucks is 5, and the first card on any of these subjects would be 5-C. R. 1, aand the second 5-C. R. 2. One card has been issued showing the index numbers and the subjects they cover. A card is issued quarterly showing the active cards, giving the index number of each, subject covered, issue number and date, by which all on the mailing list are enabled to check their file, and, should they be short of any, they are supplied upon request.

"An example of the cards is shown in that on methods of fumigation, the text of which is as follows:

14 C. R. 2.
CANADIAN PACIFIC RAILWAY
OFFICE OF THE MASTER CAR BUILDER | METHODS OF FUMIGATION.
CAR REGULATION 14 C. R. 2. | "Thorough" & "Ordinary."
ISSUE NO. 2. APRIL 1, 1909.. |

THOROUGH FUMIGATION.

1. Fumigation should be done before the carpet or anything in car is removed, or cleaning is begun.
2. Close all outside doors, windows, deck sash and ventilators tight and pack all lamp jacks and similar jacks tightly with waste from the outside.
3. Open all interior doors and RAISE CLOSET SEATS. If car has dry hoppers stop up chutes at bottom.
4. Pull seats forward and loosen pillows in pillow boxes.
5. Open upper berth and lay headboards across the seats so that one corner rests upon a seat arm.
6. Lay lower mattress on the headboard with middle arched upwards, by placing the ends together.
7. Raise curtain poles and hang curtains near the ends by a single hook.

8. Throw blankets over curtain poles, making as few folds and thicknesses of cloth as possible.
9. Arch the upper mattresses in the berths.
10. Soiled linen in the lockers must be pulled out and scattered in passage.

NOTE.—It is necessary to make the greatest possible surface exposure of the contents of the car, so as to insure the best results.

11. After car has been prepared for fumigation as above, place 3 galvanized iron pails per Dwg. No. 48961-6 in the aisle of the car, one in each end, and one in the middle. In each pail place 1-lb. of Permanganate of Potash and 1 pint of Formaldehyde.
12. After placing pails in position, cars must be closed and locked, and left for at least 3 hours, after which time thorough ventilation will be necessary. Pails should be removed soon after opening car to hasten ventilation.

NOTE.—In ventilating the car, open all windows, and deck sash when weather will permit.

13. The ventilation usually requires about 3 hours before car is in condition to receive passengers.

ORDINARY FUMIGATION.

1. Make the car as nearly air-tight as possible by closing all deck sash, windows, ventilators and other openings.
2. Open all inside doors, berths and lockers and raise closet seats. If car has dry hoppers stop up chutes at the bottom.
3. Prepare Formaldehyde as in "thorough" fumigation, except that only 1 pail containing 1 lb. of Permanganate of Potash and 1 pint of Formaldehyde will be used, placing the pail in the aisle, in the center of the car.
4. Close and lock car, and leave closed for 1½ hours, or longer if time will permit, after which car should be ventilated as thoroughly and quickly as possible, the same as in "thorough" fumigation.

"Such assistant foremen, leading hands, and inspectors as do not have a place in which to keep a file of cards, not only have access to the regular office file, but it is insisted that they read the cards and familiarize themselves with up-to-date instructions.

"It is, of course necessary to occasionally revise the cards to take care of new developments, such as a change in shop practice or the alternation of drawings that would affect the subject covered. When this is done the card retains its index number, but is given a new issue number corresponding with the number of times it has been issued, and is also given the last date of issue. When a revised card is issued, the card which it supersedes is returned to the office.

"It is the intention to institute a system of examination of foremen and inspectors with regard to their familiarity with the cards covering their work. When a card is once issued it furnishes a foundation upon which any changes or alterations can be made with comparatively little work, and avoids the reconsideration of any subject as a whole.

"To a large extent, where explanatory correspondence was formerly used, where work had been neglected or information asked, it is only necessary to call attention to the card and insist on instructions being carried out.

"One thing that has been learned in the development of this system is that, before the preparation of a card is commenced, it is best to sub-divide a subject, covering sub-divisions by separate cards. As an instance of this, the card covering gas equipment, 28-C. R. 1, gives full catalogue reference as to lamps, class of cars in which used, and where used in car, also catalogue reference of parts liable to failure. 28-C. R. 2 gives instructions regarding cleaning and testing of gas equipment both at terminals and shop. 28-C. R. 3 gives instructions regarding gas mantles, showing catalogue reference, stating where large and small mantles are used, how and in which cars extra mantles will be carried, and method of applying new mantles.

"For electric train lighting equipment the cards are subdivided into instructions for shops, originating terminals, and intermediate terminals, as we wish the men at intermediate terminals to have a clear understanding as to the extent to which they should attempt to make repairs to a car in transit, with brief instructions as to how to locate cause of trouble and make repairs quickly.

"I will cite a few of the advantages we have found in using cards in place of circular letters. In the first place, they are prepared with more care and cover in detail all points of the subject referred to, while circular letters are more apt to be hastily prepared, and subsequent circular and other letters often give further instructions and modify or cancel portions of former issues. This is often confusing to the persons receiving such letters, causes extra work checking with previous letters, and also necessitates great care to avoid issuing contradictory instructions. With the card system all obsolete instructions are canceled, but, when letters are depended upon, any prudent foreman can refer to some long-forgotten letter as authority for almost any practice that may be found at his station.

"Another advantage is that, when a card is to be prepared, it is found that there are many points in connection with the subject that have not received the necessary amount of attention. Frequently parts have not been maintained as they should be and could have been without extra expense, and inexpensive alterations can be made and betterments applied. For example, in considering the maintenance of doors and door fixtures, we find that a 3-in. stop secured in a certain manner is necessary in place of a 2-in. stop, that the brackets should be riveted on (a plain, inexpensive bracket can be used for all wooden cars), that the hasp should be secured with a wrought staple instead of malleable, and malleable wedge applied to doors of old cars in place of wooden. All these changes were found advisable on going into the subject thoroughly, in order to avoid as far as possible any afterthoughts that would make it necessary to change instructions, and that when repairs or alterations were made they would all be considered at once and be cheaply done.

"It might be said that this could have been done independently of the regulation card, which is, of course, true, but the fact remains that, had the work been ordered in the usual way, by circular letters, it is probable that first one item and then another would have been changed, and, in place of one clear, concise set of instructions on a single card, a series of letters would have been issued, which would have been far more difficult to follow up.

"Another advantage that has been found is that some devices, having a number of parts with in many cases no established name for each part, have to some extent been ordered complete to get one part, the heavier and more expensive pieces being held indefinitely in stock, where they have little better than scrap value, owing to their freedom from failure. To overcome this we have issued cards on the various devices or specialties, with full information as to what parts have proven liable to failure, instructions as to what should be ordered, pattern numbers, stating which parts are interchangeable, and other necessary information, and coining a name where necessary. On the back of the card is printed a photograph of the device, showing number and name of each piece, which has promptly enabled the foreman to obtain the parts which he had difficulty in procuring before, and prevented the purchase of parts not required.

"Another point of advantage in the card system, which also illustrates the disadvantages of depending on circular letters and blue prints, is found when an officer visits a station with limited time to check various subjects. He is often confronted by some subject on some points of which, on account of possible confusion, neither he nor the local man are entirely clear. They go to the office, and his time is consumed in looking over circular letters and correspondence pertaining to the subject, and drawing and pattern numbers, possibly having to follow the file through several years to determine what should be done on one subject, only to learn perhaps that a part of the instructions are missing, and at best having no assurance that the file is complete. His time should be used in looking at the actual work, assuring himself that proper shop practice is being followed, and that maintenance of equipment is promptly and economically conducted. Where maintenance cards are depended upon, the foreman would most likely be informed on the subject, and, if in doubt, a very few moments would locate the card and settle the matter.

In preparing these cards the difficulties often experienced by one of the staff most familiar with the subject—in sorting

out various instructions, eliminating obsolete and canceled instructions, filling in proper pattern, drawing, and form numbers, and dimensions and conditions under which certain instructions should be followed—have brought to us a realization of what we have been expecting of our foremen in the way of memory and office work, which expectations have not always been realized, or have been partially realized at the expense of proper supervision.

"By the use of this system it has been possible to have work done in a uniform manner at points separated by thousands of miles, which could not always be done when other means of issuing instructions were used."

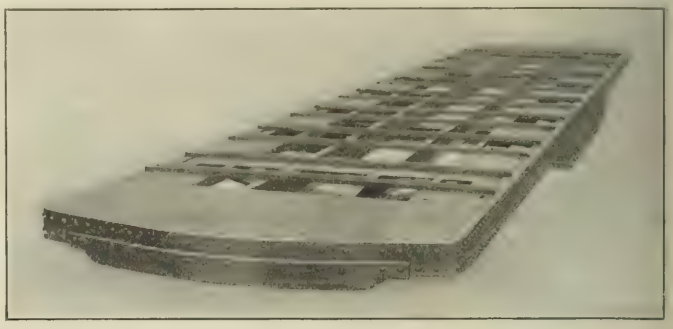
ALL-STEEL BAGGAGE CARS FOR SUBWAY SERVICE.

The Hudson & Manhattan Railroad Company, New York, recently received from The J. G. Brill Company two all-steel cars specially designed for the transportation of baggage between the several steam railway terminals which are served by the Hudson tunnel lines. Each car is arranged to receive at one time eight loaded baggage trucks, the plan being that the baggage should be transported on the trucks in order to eliminate all extra handling and trucking and to make it possible to unload a car with minimum delay. Each of the eight spaces between the side posts is provided with a folding apron on which are runways or guides, formed from steel plate, for the truck wheels. The runways on the apron are in line with depressions in the sheet steel floor of the car and thus a continuous guide or track for the truck wheels is provided by which a truck loaded with baggage may be quickly and easily pushed into position on the car from the loading platform. The aprons which take the place of the loose steel plates, frequently used by freight and baggage handlers to bridge the gap between the loading platform and car, are cleverly designed with levers and locking devices. The aprons themselves are part of a locking device for holding the baggage trucks on the car and are so designed that the air-brakes are kept set until the aprons are raised.

The locking device for holding the baggage trucks on the car consists of the apron, two guide levers and two swinging hooks at each end of each truck compartment. The guide levers act upon the swinging hooks in such a manner that when the apron is raised, the swing hooks are forced together and clamp the baggage trucks and secure them against any motion of the moving car.

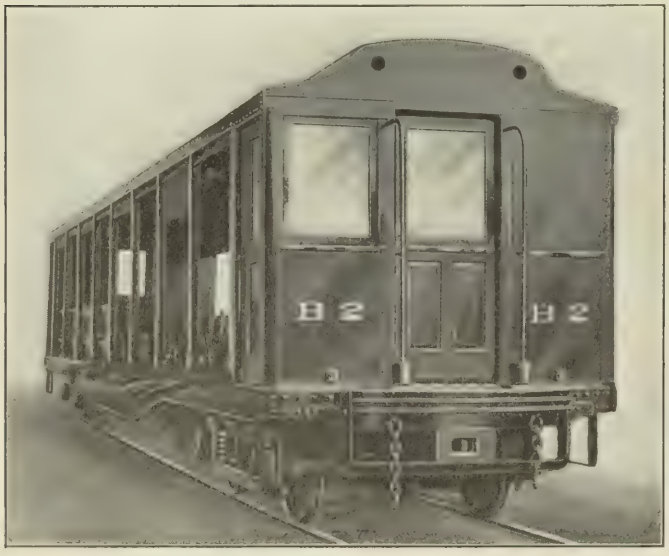
The locking device for the platform aprons consists of a central handle with a bar extended to the flooring and having a foot and a hook formed at the end to brace the apron in the vertical position when the handle is turned. The handle hooks over the top of the apron plate in the upright position. The bottom end of this bar with the bracing foot and hook is also attached and hinged to a stem extending through the floor and braced by side sill clips. This stem is fitted through sockets to a valve stem which turns the valve in the train line open or closed and thus holds the brakes set whenever the aprons are lowered. The sides of the cars are enclosed by waterproof curtains which fit between each pair of side posts. There is a motorman's compartment at both ends of the car.

The underframing comprises side sills of the fish-belly type, 22 in. deep at the center and 9 in. deep over trucks.

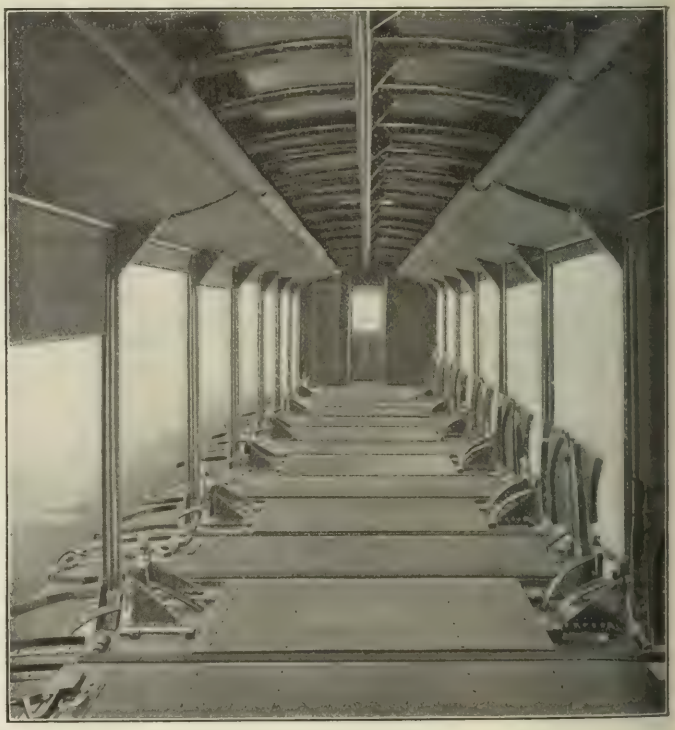


Underframe of All-Steel Baggage Car.

Each side sill is built up a $\frac{5}{16}$-in. plate with 3½ by 3 by $\frac{7}{16}$-in. steel angles riveted at the top and the bottom. The center sills are 8-in. rolled steel channels (11.25 lb.). They are reinforced at the bolsters where the top flange is cut away by a 7-in. steel channel. The end sills are built up of 3½ by 3½ by $\frac{7}{16}$-in. rolled steel angles with ¼-in. front plates and are secured to the ¼-in. telescoping floor plate. The bottom part of the end sill is also reinforced by a ½-in. pressed plate which forms a guide and support for the drawbar. There are two cross beams between the bolsters, built up of 6-in. steel channels. They are fastened to the side sills by strong knees



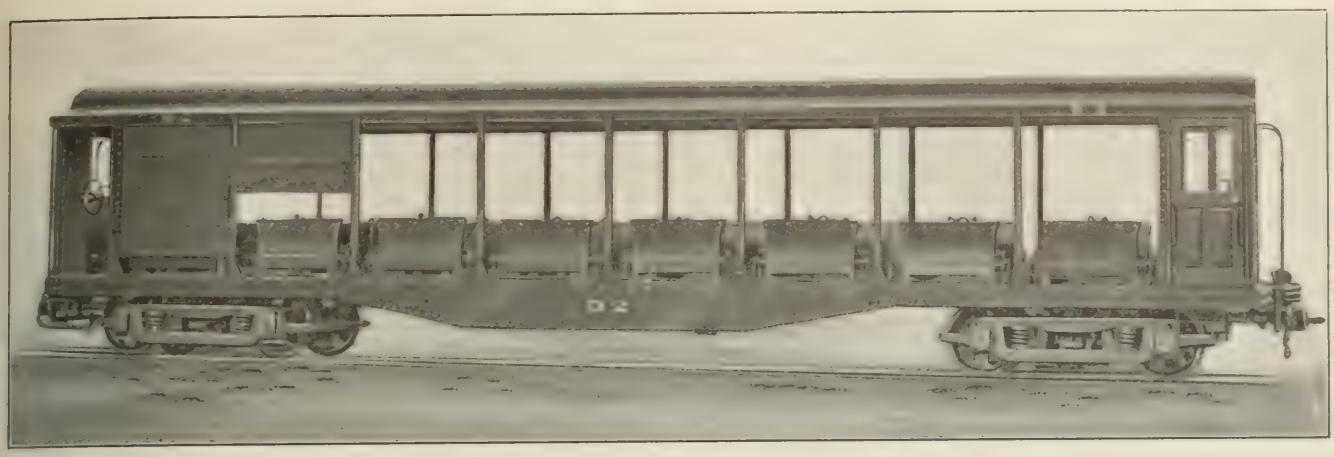
Baggage Car with Several of the Aprons Down.



Baggage Car with Aprons Down for Loading on the Left Side.

and are supported and braced to the center sills with ¼-in. gusset plates. The body bolsters consist of 9 by ¾-in. wrought iron top members and 9 by 1-in. bottom members connected to the side sills by malleable iron filters.

The body framing consists of 3½ by 3-in., 8 lb. per ft. T-section side posts. They are fastened to the side sills by ¼-in. outside gusset plates and to the ⅛-in. floor plates by pressed pockets. The carlines, bent to conform to the contour of the roof, are 3½ by 3-in. rolled T-sections, in line with each pair of side posts, and two 1½ by 1½ by $\frac{3}{16}$-in. rolled angle carlines between each T-section. The T-sections are strongly braced to the T-posts by double gussets. The roof is constructed of ⅛-in. leaded steel plates riveted to the roof framing and made water-tight by soldering.



All-Steel Baggage Car for Subway Service. Hudson & Manhattan Railroad.

Following are a few of the principal dimensions of the cars:

Length over platform end sills	49 ft. 7	in.
Length over anti-chambers (bumpers)	50 " 7	"
Distance between truck centers	34 " 6	"
Width over side sills	8 " 6¾	"
Height from top of rail to top of flooring	3 " 9⅞	"
Height from top of rail to top of roof	11 " 8 $\frac{7}{16}$	"

The specifications and design of the cars were prepared under the direction of L. B. Stilwell, consulting engineer of the Hudson & Manhattan Railroad Company.

RAILWAYS IN MESSINA EARTHQUAKE.

The annual report of the Italian State Railways has a detailed account of the effect of the great earthquake at Messina and Reggio on the railways, and the measures that were taken to restore train service and provide, so far as possible, for the sufferers. From this it appears that if these places had not been accessible by sea, the suffering must have been much greater even than it actually was. The chief operating officer in Messina, Inspector Barbera (whose name deserves to be remembered), immediately after the shock sent out men to walk over the the line westward towards Palermo and southward towards Catania and beyond, to ascertain whether trains could run over them. The line to Palermo was found impassable for some 14 miles; but the line to Catania, which passes immediately under Etna, was clear beyond the city, and it could be cleared sufficiently to despatch trains the very day of the shock, which was in the early morning. Trains were soon running, and by this route most of the inhabitants took flight. The dock walls of the train ferry slips had sunk and were distorted, and it was long before the boats could run. On the Reggio side of the straits both lines were impassable for long distances. Within the zone affected by the shock there were some 2,600 railway employees. Of these 476 were killed and many others were wounded, lost members of their families and their household goods. The minor orphans of railway men numbered 173, and of these 89 had lost both parents by the earthquake. These the railway management placed in asylums. Six months pay was advanced to the families of the employees who had lost their lives. The whole railway system to the remotest corners of Italy suffered. Men and rolling stock were hurried down, 4,000 freight cars assigned for shelters of those who had lost their dwellings, and such a diversion of forces made to carry supplies and materials to the suffering district that much ordinary traffic had to be declined and the business of the peninsula largely interrupted.

MACHINES AND TOOLS IN AUSTRO-HUNGARY.

The following extracts from the *Daily Consular and Trade Reports* are interesting indications of the extent to which American machine tools are used in foreign countries.

The Bohemia-Moravia Machine Works in Prague, Austro-Hungary, is one of the best in the Prague district. In all there are about 520 machine tools in service in the various shops, and of this number about 102 are of American make. The merits of American machine tools appear to be well understood at this plant, and the engineers are not only conversant regarding the American tools in use, but are well posted regarding the general run of American types.

During the past year a number of fine tools were purchased from the Niles-Bement-Pond Co., New York, at figures said to be considerably lower than continental quotations. The purchases include two heavy boring mills and one heavy lathe. The same firm has supplied additional lathes and also a steam hammer, which latter tools are seldom seen on the continent. The tool furnished by the Niles-Bement-Pond Co. is probably the best steam hammer in the Prague plant. As long as European prices can be met, there is no reason why hammers from the United States should not enter the European market to full advantage. Broadly speaking, the European prices can be met by American machine tool builders, and it is not necessary to go below prices prevailing in the United States. Directors of works, who are the buyers of machine tools in Europe, are known to be in a disposition to buy American machine tools at American prices.

The following is a list of the American tools in use in this plant:

Acme Machinery Co., Cleveland, Ohio	Screw cutters.
American Tool Works Co., Cincinnati, Ohio	Planers, radial drill.
Baker-Brainard Milling Machine Co., Hyde Park, Mass.	Vertical miller.
W. F. & J. Barnes Co., Rockford, Ill.	Vertical drill.
Bickford Drill & Tool Co., Cincinnati, O.	Radial boring mill.
Bradford Machine Tool Co., Cincinnati, O.	Lathes.
Bullard Machine Tool Co., Bridgeport, Conn.	Vertical boring mill.
Cincinnati Milling Machine Co., Cincinnati, Ohio.	Universal milling machines
Cincinnati Shaper Co., Cincinnati, Ohio.	Double shaper.
Cleveland Automatic Machinery Co., Cleveland, Ohio.	Automatic machine.
Flather & Co., Nassau, N. H.	Lathes.
Mark Flather Planer Co., Nassau, N. H.	Planers.
Gould & Eberhardt, Newark, N. J.	Gear cutters.

G. A. Gray Co., Cincinnati, Ohio	Planers.
Jones & Lamson Machine Co., Springfield, Vt.	Turret lathe.
Landis Tool Co., Waynesboro, Pa.	Grinders.
Lodge & Shipley Mach. Tool Co., Cincinnati.	Lathes.
Niles Bement Pond Co., New York	Vertical boring mills, lathes, horizontal miller and slotter and steam hammer.
Wm. Powell Planer Co., Worcester, Mass.	Planers.
Pratt & Whitney Co., Hartford, Conn.	Turret lathes
Prentice Bros., Worcester, Mass.	Vertical drill.
F. E. Reed Co., Worcester, Mass.	Lathes.
Wm. Sellers & Co., Philadelphia	Planer.
J. E. Snyder & Co., Worcester, Mass.	Vertical drill
Universal Machine Co., Providence, R. I.	Grinders.
Warner & Swasey Co., Cleveland, Ohio	Nut facing machine, turret lathes.
Whitcomb Mach. Tool Co., Worcester, Mass.	Planer.

The present demand at the Bohemia-Moravia works is for good milling machines, and there is also a demand for good lathes. A strong machine planing bearing boxes with cross-head guides for locomotive work is at present needed.

The shops are driven by electric power, generated by steam turbines. One 900-k.w. turbine is at present installed and a new 3,000-k.w. turbine is being placed.

These works employ about 1,500 men. A day's work comprises nine hours, and a good mechanic at a machine will earn about 14⅓ cents per hour, or $1.28 a day, but he must be a good man to make these wages.

The works of the Maschinenbau-Actiengesellschaft, Breitfeld, Danek & Co., Prague-Karolinenthal, Austria, are among the first engineering establishments in Bohemia at the present time. Two thousand men are employed in the Karolinenthal shops in Prague, although when business conditions are the best this number is greatly increased. The total number of men carried on the rolls of the company at the present time is 4,500, the 2,500 above the number engaged in Prague being scattered among the branch works in Aussig and Schlan, Bohemia, and Blansko, Moravia.

The business of this firm includes the manufacture of a varied line of engineering products, including mining plant equipment, installations for iron and steel works, blowing engines, steam engines of all types, gas engines and plants, steam and water turbines, ice-making and water works machinery, bridge building and general structural work, cranes, lifts, conveyors, steam, hydraulic, and pneumatic presses, pumping engines, boilers, sawmill machinery, cement-making machinery, flour-mill equipment, and railway signal and safety apparatus.

The following American machines are in service in this plant:

Acme Machinery Co., Cleveland, Ohio	Bolt heading machines.
Am. Tool Works Co., Cincinnati, Ohio	Lathes.
Baker Bros., Toledo, Ohio	Vertical cutter.
Baker-Brainard Milling Machine Co., Hyde Park, Mass.	Vertical millers.
Bickford Drill & Tool Co., Cincinnati, O.	Radial drills.
Bullard Mach. Tool Co., Bridgeport, Conn.	Vertical turret lathes and double boring mill.
Cincinnati Milling Machine Co., Cincinnati, Ohio.	Milling & grinding machine
Cleveland Automatic Machine Co., Cincinnati, Ohio.	Threading machines and automatic drills.
Colburn Machine Tool Co., Franklin, Pa.	Boring mill.
Gisholt Machine Co., Madison, Wis.	Turret lathes and boring machines.
Gleason Works, Rochester, N. Y.	Heavy bevel gear planer.
Gould & Eberhardt, New York	Gear cutter and grinder.
Hendley Machine Co., Torrington, Conn.	Engine lathes.
Jones & Lamson Machine Tool Co., Springfield, Vt.	Turret lathes.
Kampsmith Mfg. Co., Milwaukee, Wis.	Milling machines.
Landis Tool Co., Waynesboro, Pa.	Grinding machines.
Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.	Lathes.
Morton Mfg. Co., Muskegon Hgths., Mich.	Shaper and vertical slotter.
National Acme Mfg. Co., Cleveland, Ohio	Automatic machines.
Stamp "C.-F.," New York	Hor. metal saw cut.
Warner & Swasey Co., Cleveland, Ohio	Hor. turret lathes.

The Ringhoffer works in Prague, Bohemia, are engaged in the manufacture of a varied line of equipment, but by far the most important branch has to do with railway carriage building. All kinds of European type cars are built. In addition, the output embraces motor cars, tenders and snow plows. There are about 3,000 men employed in the car shop, while 5,200 men are necessary to operate all of the departments running full time.

A working day at the Ringhoffer works is nine hours, less two pauses of one-half hour each. The best workman receives from $1.22 to $1.42 per day, and laborers from 61 to 81 cents per day. In the hammer shop foremen receive $1.62 to $2.03 per day, as do the foremen in other departments.

The machine tools in this plant are largely of American and German make. About 25 years ago nearly all the tools were obtained from English sources, and there are many of these old English tools now in service, although there are comparatively few English tools being purchased to-day. The Ringhoffer plant affords an object lesson of the situation in the machine tool trade at the present time. The main competition is between American and German tools, and the former are overwhelmingly favored. In comparing American and German machine tools in Europe, it is often said that the former are too light. This statement is not borne out in connection with this plant, where the foreman of the screw-making shop considers that his best tools are of American make and that they are not too light. His proof of these facts is that the American tool handles the heaviest work. A specific comparison of two tools, a planer, made by the G. A. Gray Co., Cincinnati, Ohio, and one of German make, is as follows: The former had been in constant service on heavy work for five years, maintaining the same accuracy as when first purchased; the German planer, notwithstanding its greater weight, possessed neither the strength nor the accuracy of the American machine.

The only fault to be found with American machine tools is in the matter of prices. Practically all purchases of American tools, it seems, at this plant were made through German sources; that is, the Bohemia works are largely compelled to apply to Germans to fill their requirements for American machine tools. American selling houses, it seems, have not yet attempted to enter this territory and offer machine tools as they would do in California or other distant states, and yet the Austrian territory has direct sea freight connection with the port of New York.

The following American machine tools are in use in the Ringhoffer shops:

Baker Bros., Toledo, Ohio	Drilling machine.
Baker-Brainard Milling Machine Co., Hyde Park, Mass.	Vertical miller.
Garvin Machine Co., New York	Shapers.
G. A. Gray Co., Cincinnati, Ohio	Planers.
Gould & Eberhardt, Newark, N. J.	Shaper.
Landis Tool Co., Waynesboro, Pa.	Grinder.
Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.	Lathes.
Niles-Bement-Pond Co., New York	Slotters, vertical boring machine.

The Austro-Hungarian State Railway Works, Vienna, is one of the oldest locomotive plants in Austria. It is said that there is only one other establishment in Austria which is equipped with greater percentage of up-to-date machine tools than the Vienna locomotive shop. This one exception is an automobile plant, and due to the peculiar character of the work, it can hardly be compared in all fairness with the locomotive works. Exclusive locomotive shops permit of the use of many varieties of tools of the rougher sort, and many of these tools are heavy. It is understood that a visitor to this plant is impressed with the great number of high-grade modern machine tools in use, which shows clearly that the directors of these works are alert to the advantage of getting the best lines of machines.

There are six No. 6 Brown & Sharpe grinders in this plant. Milling machines of this same make are also very much in evidence, as are a number of Gray planers and Pratt & Whitney tools. Probably a larger number of Sellers' planers are in service here than in any other shop in the Austrian territory. Other American machine tools in use here include a Bickford radial drill, Gisholt turret lathes, Gould & Eberhardt shapers, Pratt & Whitney millers, a Hilles & Jones punch and Brown & Sharpe planer grinders. It is understood that the purchase of Sellers' tools is made direct from America, and this fact seems significant, showing that a close

connection has been established in the relationship between the Vienna and Philadelphia firm. Portable electric drills are used to a considerable extent, but there are no pneumatic tools in service.

VALUE OF A UNION FREIGHT TERMINAL ORGANIZATION.

A union passenger station is a detriment to a city, but a union freight terminal railway is a benefit. Where there is a union passenger station many passengers travel straight through without spending any time or money, which is a loss to the city. Union freight terminals, on the other hand, afford cheaper switching to the merchants of the city, and their goods can be delivered more promptly. A railway covering all switching zones can do the switching more quickly and more cheaply than where these zones are the yards of different railways.

A trunk line naturally gives more consideration to road business than to strictly switch business. They are interested in getting their outbound long haul stuff lined up and away on time, and long haul inbound freight delivered to connections or placed at unloading points; much more interested than in handling of a loaded car for an industry on their rails given them by a connecting line; one to be handled a short distance for a small switching charge.

A switching railway has every incentive to handle all cars in turn and quickly. It is a specialist, and its specialty is local switching service. The entire organization from the president down is right on the ground and in close touch with the people and the situation at all times. Immediate supervision is constant, and supervision pays the highest rate of interest, especially in crowded terminals where there are many complexities and a great amount of business to be done in limited space. Trunk lines having terminals in cities of the first class should have terminal superintendents. By watchfulness capable officers can save their salaries many times over every day.

A union terminal railway need not own cars. Since nearly every car it handles is under per diem, all cars must be hurried, only from two to six days being allowed to get them placed, unloaded and returned empty to the delivering line. If a switching line does not handle cars promptly, all the profit of the switching service is lost in payment of per diem to the owners of the cars. The majority of cars on a trunk line are its own, and the men are not forced to hustle to escape the 25 cents a day.

Many industries complain that their shipments are bunched A union terminal railway avoids this to a large extent by systematic switching; handling cars in rotation. The records of any union terminal railway compared with trunk line terminals, in the same section of the country, will show that there is less bunching and more prompt movement by the switching line.

A union terminal railway, being able to handle carloads to destination quickly and cheaply, pleases shippers and receivers and promotes the growth of the city. Good service is the surest guarantee that a railway will increase its usefulness and its revenue. It is fast getting to a point where good service is the best advertisement of a railway.

Where movements are made quickly there are few stray cars, fewer mistakes and less liability of theft, and men work better. Activity is contagious. Where a set of men are ahead of their work or right up with it all the time, whether in an office or shifting freight cars in the yard, they work more quickly and with a better spirit than when snowed under.

A union terminal company may be looked upon as the fountain head of the different railways branching out from a city. Such a corporation can better deal with the people. It is more likely to expand and keep its facilities ahead of the needs; has more power with the community and can get necessary concessions from municipal officers more readily than they can be got by individual railways working independently. City officers will recognize the benefits of a union terminal as compared with independent terminals.

Demurrage is an important question. As the ground in cities becomes more valuable the dollar a day paid as demurrage will not compensate owners for conversion of cars into warehouses, and this eventually will bring about graduated demurrage, as it already has done in several large cities. This graduated demurrage can more easily be assessed by a union terminal company. Trunk lines are timid about applying it for fear of driving business to competing lines. Railways using the sliding scale are now charging $1 for the first, $2 for the second, $3 for the third and $4 for the fourth, 24 hours after free time. The probabilities are that, in the near future, at congested city yards, $4 or $5 will be made the maximum demurrage charge in order that owners may get the proper use of their cars. When business is heavy a car is worth $8 a day, and the practice of consignors and consignees using freight cars as warehouses must stop.

A railway doing switching exclusively must expand its facilities and organization, and must keep ahead of the switching necessities in the city. It must figure to what extent it has to increase facilities to take care of the business next year. It keeps engines and tracks in first class condition, promoting prompt handling of business. The officials know that unless they do handle business properly the newspapers and business men will raise an uproar, and one that they cannot pacify except by improved service.

While a union freight terminal is the best for the prosperity of the city there must be no standing in the way of terminal developments of all kinds. Development of railway terminals must be encouraged and fostered; terminals must be enlarged, and for the benefit or all concerned; enlarged in time to take care of the business; extended before retardation affects the situation.

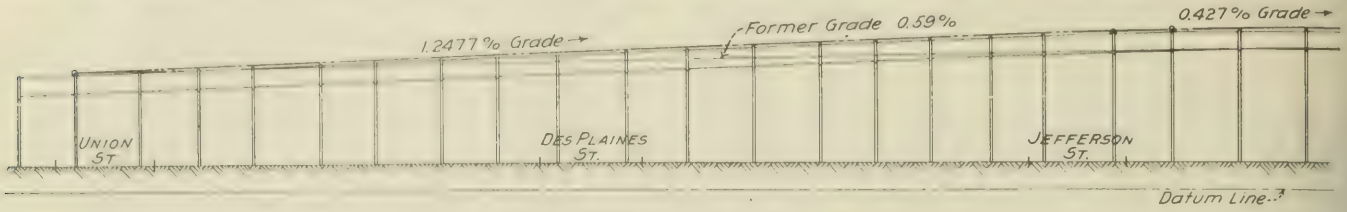
REVISION OF OAK PARK ELEVATED AT ENTRANCE TO NEW NORTH WESTERN TERMINAL, CHICAGO.

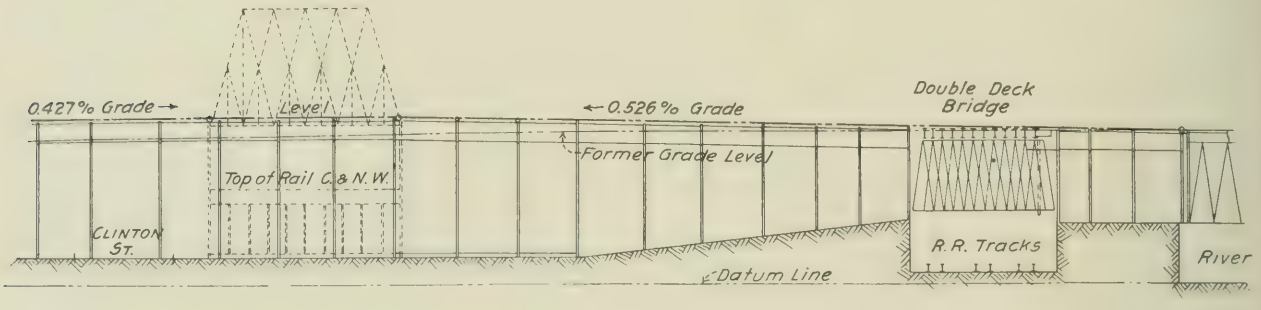
The approach to the new passenger terminal which the Chicago & North Western is building in Chicago passes under the Chicago & Oak Park Elevated structure (formerly the Lake Street Elevated) between Canal and Clinton streets. As this approach is elevated, it necessitated raising the elevated railway structure to give the necessary clearance for the railway trains. A plan and profile of this change of grade is shown herewith in Fig. 1. It extends from the west side of the Chicago river to Union street, 2,100 ft., and the maximum raise was 6 ft. Where the elevated structure crosses the railway tracks the regular column and girder construction of the former was replaced by a 155-ft. truss span.

In raising the structure work was begun at the west end of the stretch to be lifted. The elevated structure is of the type having columns at the curb line supporting transverse plate girders. Between cross girders are four lines of track stringers. The former are 45-ft. span and the latter vary from 30 to 50 ft. Before raising, longer knee braces were put in between columns and cross girders to give the necessary rigidity. The lifting was done by A-frames under the cross girders, bolted to the columns and having their bases resting on blocking at each end. The greatest lift given any bent at one time was 2 in. When the desired height was reached and the jacks taken out, the column shoes were removed and base pieces or extensions riveted to the old columns after putting in new concrete column foundations. The columns were then lowered the slight amount necessary to land them on the pedestals.

Preparatory to putting in the truss span over the railway tracks, the elevated tracks were detoured on falsework to the

north and south of their respective normal locations, as shown in the photograph, Fig. 2. The 155-ft. span, consisting of three trusses, is carried at each end by a box girder 10 ft. deep, back to back of angles, which is supported by a column on each curb. Each column rests on a foundation pier 10 ft. in diameter, which was carried to hard-pan and there belled out to 16 ft. in diameter. Suitable bracing between the curb line columns and the adjacent columns of the elevated structure was provided by latticed struts 18 ft. 7¾ in. deep. The old stringers were remodeled for use in these panels, and their ends





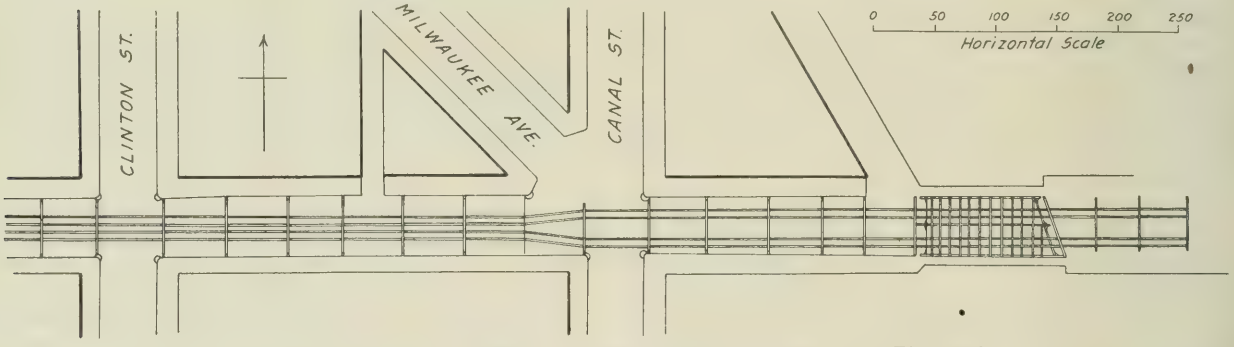


Fig. 1—Plan and Profile of Grade Change of Oak Park Elevated.



Fig. 2—Elevated Railway Detoured on Falsework.

adjacent to the abutment girders given suitable horizontal bracing.

The 155-ft. through riveted lattice truss span is designed for four tracks, to provide for the two additional future tracks the elevated road expects to put in. The extremely stiff bottom chords of the span were made straight and the necessary camber put in during erection. This camber conforms to a vertical curve uniting the 0.5 per cent. grades of the track at each end, which are thus rounded off in the span. No trouble was experienced in imparting this considerable camber to the chords in the way mentioned.

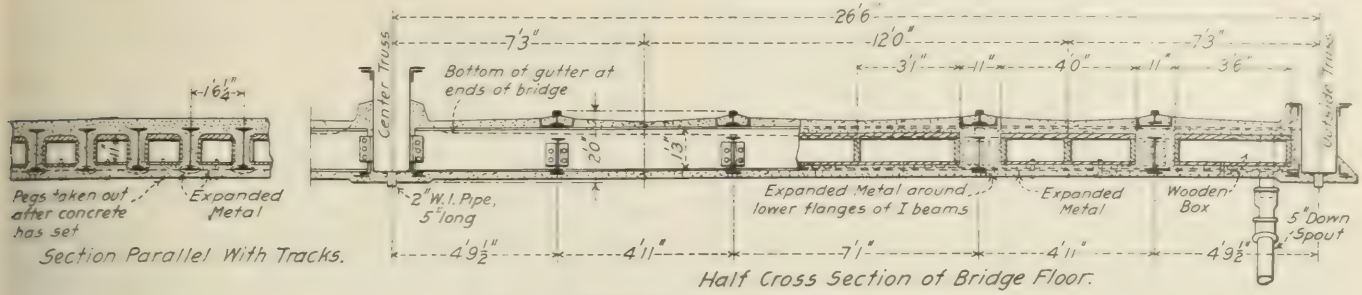


Fig. 3—Sections of Bridge Floor.

The floor construction is the novel feature of this span. The floor beams are 15-in., 60-lb. I-beams spaced 18¼ in. on centers. Under each rail, between floor beams, except the two at each end, are diaphragms cut from 12-in., 31.5-lb. I-beams, having their bottoms flush with those of the floor beams. A bottom plate under each row of diaphragms, extending the length of the row, gives them continuity and brings more floor beams into action at one time.

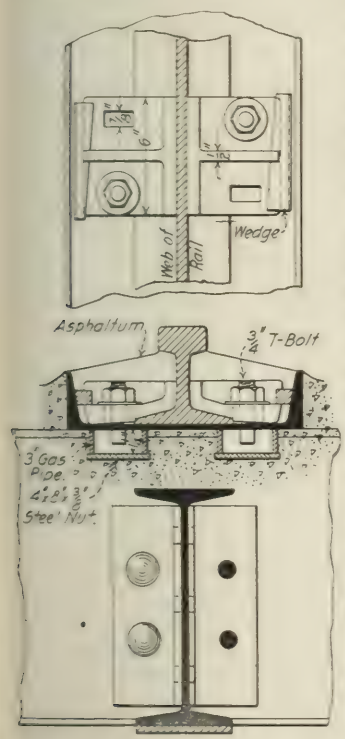


Fig. 4—Details of Rail Fastening.

The floor members of the span are incased in concrete to protect them from the locomotive gases, as shown in the half cross-section of the bridge floor, Fig. 3. To minimize weight wooden boxes were put in the spaces bounded by diaphragms and floor beams. Openings from these boxes through the bottom course of concrete for draining off water which might collect in the boxes while concreting were provided by attaching square pegs to the bottom forms, which pulled out when the forms were removed. The boxes were put in place without their tops, and these were nailed on after concrete had been put around the boxes to hold them in place. A torpedo sand concrete was used, being made thin enough to pour.

The transverse grading of the top surface for drainage is shown in the cross-section. The camber gives the necessary drop each way from the center for longitudinal drainage, and across each end, between the first and second floor beams, is a gutter leading to a downspout at each column.

The rails are laid in 12-in., 25-lb. channels riveted to the floor beams. The method for fastening the rails is ingenious. As shown by the detailed view, Fig. 4, they are held by cast-iron clips secured by T-bolts passing through the web of the channel. The holes in the channel webs for the passage of the bolt heads have the greater dimension londitudinal, and the bolts were given a quarter turn after incertion. The shank of the bolt is square, and when the clip was set down over it it was effectually locked in position. The method for providing cavities for the bolt heads in the concrete under the channel is shown in the details. A piece of 3-in. gas pipe, 1¼ in. long, was fastened under the opening by a 4-in. x 8-in. x ⅜-in. steel plate on the under side, into which a short ¾-in. bolt was screwed from above. When the concrete had set the bolt was removed. The clip has a transverse central rib, and at the outer end of the latter is an opening for driving a wedge between clip and channel flange. When all fastenings were made secure, asphaltum was poured around the rail in the channel.

The half cross-section of the bridge floor shows the drains from the bottom chords through the concrete under-surface. These are 5-in. lengths of 2-in. pipe, having a flange screwed on to the upper end to hold them in the concrete. These drains are put in midway between the diaphragms of the chords. The abutment box girders are designed to allow a man to get inside at either end to inspect and paint them. The bottom cover plates stop 6 ft. from the column, giving ample space for entrance, and the intermediate diaphragms extend down only 17 in. from the top. The distance between girder webs is 20⅛ in.

The elevated structure for the North Western's tracks follows the standard for the track elevation bridges of the road, which have already been described in these columns.

All of the work was done at the expense of the Chicago & North Western, including the removal of the station of the elevated railway at Canal street and building a new station at Clinton street. The steel work follows the North Western's standards, while the new elevated station conforms to the standard design of the elevated railway. The work was done under the direction of E. C. Carter, chief engineer of the North Western, and W. C. Armstrong, terminal engineer, by George W. Jackson, Inc., Chicago, who also built the extensions for the columns of the elevated structure, and the steel work for the new station at Clinton street. The remainder of the steel work was fabricated by the Pennsylvania Steel Co., Steelton Pa.



Fig. 5—Completed Span; Bridge for Steam Railway Tracks Below.

THE PRIVATE FREIGHT CAR AND DEMURRAGE.

BY ARTHUR HALE.

II.

The article in the *Railway Age Gazette* Aug. 27, 1909, should be revised in line with the national demurrage rules, and the decisions of the Supreme Court handed down on January 10, especially the Illinois Central and Pitcairn cases.

These decisions give the Interstate Commerce Commission the sole right to say whether or not certain practices are forbidden by the Hepburn Act as involving "undue or unreasonable prejudice or advantage." It is, therefore, clear that the commission may legally forbid railways to exempt private cars from demurrage, if, in the opinion of the commission, such exemption would give car owners an undue and unreasonable preference or advantage over others.

The commission had already issued an order on the subject, as noted in the article referred to, but this order it has practically annulled by approving the national demurrage rules, which provide an entirely new solution for the matter, and it is understood that in the next tariff bulletin the commission will amend its administrative rulings based on the old order.

A minor point, which may be noted in the first place, is that the commission has withdrawn its definition of "privately owned car." This definition was not in line with the American Railway Association's definition of a "private car" as being "a car of other than railway ownership," a definition which therefore stands, one element of confusion being eliminated.

The *Railway Age Gazette* article above referred to was an argument in favor of the charging of demurrage on private cars exactly as it is charged on railway cars, with one exception, which seemed so obvious that no detailed argument was made in its favor. The cars to be excepted from demurrage were private cars on the tracks of their owners.

The national demurrage rules go farther than this. They provide that private cars should be subject to demurrage "while in railroad service" to the same extent as railways' cars. An explanation of the circumstances under which private care are in railway service follows.* And under this explanation are developed many cases where owners of private cars are expected to pay demurrage, even when their own cars are on their own tracks.

Although, at the hearing on the subject of these demurrage rules, there was no objection to this exemption of private cars on tracks of their owners, the railways are accepting the national rules without change, including, as they do, this provision for the charging of private car owners demurrage on their own cars on their own tracks. The rules have been adopted by the American Railway Association. They have been approved by a large majority of the demurrage bureaus in the country and will go into general effect in interstate commerce in some states on March 1, and in others on April 1. Some of the railway commissioners have also promulgated them for immediate adoption in intrastate car business.

To a layman it seems that this private car rule comes perilously near confiscation of private property. Certain shippers have built private cars solely because they desired to store their freight in cars, or to take their time in loading or unloading their own cars on their own tracks unhampered by demurrage rules, and some of the private car owners are resisting this rule on constitutional grounds. Other private car owners of equal importance are accepting the rules and arranging to work under them.

The resistance of the private car owners has so far been confined to representations to the various state commissions, which are considering the adoption of these rules in intrastate traffic. It is quite possible that when rules go actually into effect the car owners may institute proceedings before the Interstate Commerce Commission and the courts.

The defence of the new rule, as given in the report of the committee of the national railroad association and in other correspondence, is simply that to relieve a private car owner of the payment of demurrage on his own car, on his own tracks, is an undue and unreasonable preference or advantage over the shipper, who under similar circumstances is obliged to pay demurrage on cars which he does not own or which are located on tracks which he does not own. This discrimination the commission feels is sufficient to justify an order that demurrage rules apply in all cases.

Under the decisions of the Supreme Court alluded to above, there is no doubt that the individual car owners will have to make their appeal first to the Interstate Commerce Commission, and in view of the commission's approval of these rules there seems to be no doubt that their decision will be against them. This decision can, however, be appealed to the federal courts.

A careful reading of the Supreme Court's decision would seem to confirm the view that the courts will only take constitutional questions into consideration and if it is urged that the charging of demurrage on private car on track of the owner amounts to a confiscation, it is quite evident that the Interstate Commerce Commission will reply that the mileage paid for the car is in lieu of all the rights and privileges of the car owner and no exemption from any of the rules of the carriers applying to him as shipper or consignee will be allowed. Whether or not this view will be sustained by the court is, of course, a question, but the position of the carriers in this matter is very similar to their position in the Pitcairn and Illinois Central cases when they urged that the handling of their own fuel was not commerce and that, therefore, they could use their own cars for their own fuel coal without interference by the Interstate Commerce Commission. As already noted in your columns, the Supreme Court brushed this contention aside with the simple statement that coal cars of the carriers were instrumentalities of commerce and were, therefore, under the law. It seems quite probable that the courts will decide that private cars when in railway service are instrumentalities of commerce just as the railway coal cars are, and are equally subject to the law.

Arguments against the wisdom of the decision will not avail, for the Supreme Court makes it very clear that the courts can only pass on the legality of the commission's orders and not on their wisdom. Indeed, the Supreme Court makes it very plain that in questions of great complexity, like this, an order of the commission is likely to create some "inequality," and for all that may be legal. Under the circumstances, it seems probable that the rule will stand.

There is something almost comic in the idea that an order intended "to prevent undue advantage," or as it is very commonly called, discrimination, can legally create anything like "inequality," but due reflection convinces one that the point is well taken and that this is only another case where the least of evils must be chosen.

To quote the Supreme Court again, it will probably be found that the private car owners in objecting to the rule in question "but assail the wisdom of Congress in conferring upon the commission the power which has been lodged in that body to consider complaints as to violations of the statute and to correct them if found to exist, or attack as crude or inexpedient the action of the commission in performance of the administrative functions vested in it."

*Private cars while in railway service, whether on carrier's or private tracks, are subject to these demurrage rules to the same extent as cars of railway ownership.

(Empty private cars are in railway service from the time they are placed by the carrier for loading or tendered for loading on the orders of a shipper. Private cars under lading are in railway service until the lading is removed and cars are regularly released. Cars which belong to an industry performing its own switching service are in railway service from the time they are placed by the industry upon designated interchange tracks and thereby tendered to the carrier for movement. If such cars are subsequently returned empty they are out of service when withdrawn by the industry from the interchange; if returned under load, railway service is not at an end until the lading is duly removed.)

General News Section.

Newspapers in the West say that the Western Pacific is to be opened for passenger traffic on June 1.

A press despatch from Indianapolis says that the Southern Indiana is to abandon its shops at Bedford and establish shops at Jasonville.

During the strike of street railway men in Philadelphia the Pennsylvania Railroad had in and near that city 200 members of its police force.

At the Greenwich piers of the Pennsylvania Railroad at Philadelphia, last week, a steamship was loaded with 5,268 tons of coal in six hours.

Thomas King, representative of the Boilermakers' Brotherhood, says that the New York Central has agreed to increase the pay of boilermakers and their helpers.

It is announced in Minneapolis that the Minneapolis, St. Paul & Sault Ste. Marie, which is controlled by the Canadian Pacific, will this year adopt a pension plan for its employees similar to that of the C. P.

Prince Rupert, the new town at the Pacific coast terminus of the Grand Trunk Pacific, now boasts a population of 4,000. The railway company will this season develop a fertile fruit district about 100 miles east of Prince Rupert.

The mechanics in the shops of the Chicago, Indiana & Louisville, at Lafayette, Ind., have had their pay increased about two cents an hour, and the whole number of men benefited, including laborers, receiving a smaller advance, is 600.

During the strike of street railway employees in Philadelphia last week the Philadelphia & Reading carried about 90,000 additional passengers each day, nearly all on short journeys within the city limits. The average increase in receipts is given as $7,200 a day.

A press despatch from Winnipeg says that railway employees throughout western Canada are demanding an increase of 25 per cent. in their wages. It is said that unless the increases are granted just as they stand, the employees will appeal to the government for arbitration under the Lemieux act.

A bill has been introduced in the New York legislature to provide for the appointment of a barge canal traffic commission of five members to fix, for the barge canal, a tariff of rates to govern traffic when the canal shall be opened, and to see that canal carriage is not unduly monopolized.

Electric traction on the Harlem division of the New York Central was this week extended from Wakefield northward about 10 miles to North White Plains, and the electric locomotives will now run through between North White Plains and the Grand Central station, New York City, 24 miles.

The local transportation committee of the Chicago council has sent a circular letter to officers of 26 Chicago railways asking 150 questions about electrification of terminals. These questions relate to the extent of the use of coal, coke, oil, gasolene and electricity as motive power and the results got from them. The issuance of this circular letter is taken to be a renewal of the city's agitation for the suppression of the locomotive smoke nuisance.

From the statistics gathered by the Interstate Commerce Commission for the year ended June 30, 1908, it has been found that in that year 62 per cent. of the total operating expenses of the railways of the country was paid out for labor, as compared with 61.3 per cent. in 1907 and 60.5 per cent. in 1902. This increased proportion went to the employees in 1908 notwithstanding a decrease of 7.5 per cent. in gross operating revenue as compared with 1907.

The through train service between Odgen, Utah and Oakland, Cal., over the Southern Pacific was restored March 11 after an interruption of 10 days or more by reason of floods in Nevada. Serious damage was done to the roadbed over a distance or more than 60 miles. The worst damage was in the Humboldt valley. The Western Pacific, which has been open for freight business for several months, also suffered severely, the roadbed being completely destroyed for many miles.

The Santa Fe System is now using telephones for train despatching between Denver and Pueblo, Colorado, 120 miles, making approximately 1,950 miles of the Santa Fe lines now thus equipped. There are forty telephone stations on this 120 miles, Western Electric telephones and Gill selectors being used. There are about 30 trains a day and 75 regular meeting points. This division is used jointly by the Santa Fe and the Colorado & Southern, the despatching being all done from Pueblo by the Santa Fe.

The benefits paid out by the relief fund of the Lehigh Valley Railroad during the year 1909 amounted to $85,689, and there was left a balance in the treasury of $28,100. A recent newspaper item says that the fund was established in 1878, and that in its 32 years of existence the contributions have amounted to $1,485,793, of which sum one-half was paid by the railway company; and it is said that this is the only instance in the United States where the railway company pays half of the relief benefits. Of the 21,505 persons employed by the company last year, 7,346 were subscribers to the relief fund. Subscriptions are called for whenever the condition of the fund may demand.

Robert J. Bailey, secretary of the Individual Car Owners' Association, in a letter approved by the executive committee of the association, has asked the Interstate Commerce Commission to decide what would be a just and equitable rate to be paid by the railways to the owners of private cars of different kinds; what should be paid for such cars when they are diverted from "the use of their owners" for the public use without the knowledge, consent or desire of the owner; and to what extent the owner of a private car should be liable for bills for repairs of such cars when they left his hands in perfect condition. Mr. Bailey says that for two years he has been trying unsuccessfully to get answers from these questions from the railway associations. Lately he has been before the Pennsylvania State Railroad Commission, but that body sends him to the Interstate Commerce Commission.

St. Louis newspapers say that the appointive members of the Municipal Bridge & Terminals Commission of St. Louis probably will resign in a body. Mayor Kreismann is quoted as having stated that they offered to resign a short time ago, and only retained their offices at his urgent request. This commission was appointed in 1905 to solve the terminal problem at St. Louis. It employed Albert T. Perkins and Robert Moore as expert advisers in regard to railway traffic, operating and engineering matters and took up with the railways various questions relating to readjustments of rates between the city and the East and physical improvements of the terminals in the city. It secured various reductions in rates to the East, reached an understanding with the railways regarding improvements that were to be made in the terminals and sought to get the city to pass ordinances which would enable the roads to carry out their plans. The council having rejected the ordinances which the commission drew and submitted, its members feel that they no longer have any standing as the representatives of the city, and, therefore, will no longer have any influence with the railways and that, in consequence, the commission has outlived its usefulness. The mayor and board of public improvements are ex-officio members and the appointive members are seven of the leading business men of St. Louis. The St. Louis house of delegates has passed a resolution asking the mayor to seek conferences with the presidents of the various St. Louis railways with a view to securing the abolition of the bridge arbitraries within the 100-mile district.

The committee on railway mail pay, Julius Kruttschnitt, chairman, whose argument was printed in the *Railway Age Gazette* February 25, page 396, calls attention to the erroneous deduction made by many persons from language used in the special message of the president, December 7, 1909: "The

annual cost of the *transportation of this matter* is more than 9 cents a pound." * * * The report of the Postmaster-General shows that the rate named is erroneous. He says (page 8): "The cost to the government for its *handling* and *transportation* averages 9.23 cents a pound," and on page 32 he states that this figure includes "transportation, handling, administration and all items in connection with the operation of the postal establishment." It appears that in the weighing of 1907 the packages constituted 43.09 per cent. of the total weight carried, the mail itself constituting 56.91 per cent.; in other words, for every pound of actual mail carried, the department for its own use and convenience requires the roads to carry three-fourths of a pound of additional weight. The report of the Postmaster-General (page 29) gives the following figures of cost:

	Per pound mail matter.	Per pound of mail and equipment.
Payments to railways for transportation..	2.88 cts.	1.65 cts.
Do., for railway post office car service.*...	.31 "	.18 "
Total payments to railways.....	3.19 cts.	1.83 cts.
Transportation other than payments to r'ys	.84 cts.	.48 cts.
Railway mail service (salaries clerks, etc.)	.57 "	.32 "
Rural delivery service	1.74 "	1.00 "
Salaries postmasters, clerks, carriers, etc...	2.71 "	1.55 "
Other expenses directly assignable.....	.03 "	.02 "
Other expenses not directly assignable.....	.15 "	.08 "
Total expenditures	9.23 cts.	5.28 cts.

*Namely, compensation for hauling a fully equipped post office in a moving passenger train.

Therefore, the railways receive for the transportation of second-class mail and equipment used by the department to contain it, *not* over 9 cents a pound, but only 1.65 cents a pound.

Negotiations Concerning Wages.

The leaders of the Firemen's Brotherhood, in session at Chicago, voted last Monday to order a strike on 47 of the principal railways west of Chicago, employing about 25,000 firemen; the reason given for striking being that the committee of managers, representing the railways, had refused to submit to arbitration any of the questions at issue between the companies and the employees, except that of wages; but on Tuesday it was decided to wait until Messrs. Knapp and Neill could be brought from Washington to attempt a settlement of differences. The Brotherhood committee consisted of President W. S. Carter and 47 representatives, one from each of the 47 roads. The date specified in their strike resolution was not given out, but the reporters say it was Monday, March 21. The appeal to Washington was made by the railway managers. Messrs. Neill and Knapp at once telegraphed to Mr. Carter and received from him the following reply:

Matters in controversy involve conditions of employment and increase in wages. Committee preparing to leave city, but if assurance is given that mediation will begin immediately and in the city of Chicago, authority for the men to leave the service of the companies will be temporarily withheld. The fact that we have proposed arbitration on all matters in controversy and the fact that the managers' committee have rejected our proposition does not lead our men to expect a settlement from mediation but as evidence of our fairness will accept your friendly offices under the conditions named herein.

At the same time Mr. Carter wrote to the managers insisting that the only parties concerned in the dispute are the railways, the public and the employees represented by his committee. This evidently is meant as a denial of the managers' claim that the present dispute is affected seriously by what the roads would have to do with other employees if increases or concessions are granted to firemen. Mr. Carter told the reporters that Messrs. Knapp and Neill were coming, not to arbitrate but to determine what should be arbitrated. The railways had all along expressed willingness to arbitrate wages, but refused to arbitrate the question of the right of the firemen's brotherhood to represent a fireman who has been promoted to engineman, or questions of seniority. The proposed schedules of wages, made up by the brotherhoods, are said by them to call for increases of 12½ per cent., but representatives of the railways say that 22 per cent. would be more nearly correct.

Mr. Carter tells the reporters that, in asking the railways to negotiate with his brotherhood concerning wages or conditions of employment of enginemen, he is asking no more than the railways have granted in the case of conductors and brakemen. In these services, as well as in engine service, men promoted from a lower to a higher place still retain their membership in the brotherhood of the lower position.

Press despatches from New Haven, Conn., March 15, say that the brotherhood leaders of the conductors and trainmen of the New York, New Haven & Hartford have got out of patience waiting for a satisfactory offer from General Manager Higgins, and have asked the employees of both brotherhoods throughout the lines of the company to vote this week on the question of authorizing a strike.

Officers of the Baltimore & Ohio and of the conductors' and trainmen's unions announced in Baltimore last Saturday that the principal questions at issue between the road and its employees concerning wages and conditions of employment had been compromised, and that a serious strike had been averted. The government mediators, Messrs. Knapp and Neill, had held protracted conferences with both sides, and there was a long, final conference of the three parties together. The terms of the agreement were not given out, and some of the questions, particularly that concerning the demand of the employees that the road should not run two engines on a train, are left for further discussion and probably arbitration. It is said that both sides will consult interests connected with other roads before a decision shall be reached on this point. The leaders of the employees said that there would be a substantial increase in pay to the conductors and trainmen in the passenger, freight and yard service.

Electric Locomotives on the Baltimore & Ohio.

Two electric locomotives have recently been added to the equipment of the Baltimore & Ohio for operation through the tunnel at Baltimore. These are designed for either freight or passenger trains and are of a somewhat different design from the older types. In general the new type has a flexible wheel base consisting of two trucks coupled together and surmounted by a platform carrying a steel cab and extending the entire length of the locomotive. The two trucks are permanently linked together with heavy connections and carry the draft gear and bumper on the outer end frames. With this construction all hauling and pushing stresses are transmitted through the truck framing on approximately the same horizontal line and are not carried through the center pin into the platform framing. The principle embodied in this type of locomotive construction is not new but is one whose success has been demonstrated by its practical application to steam locomotives for a number of years. The Baltimore & Ohio Mallet compound locomotive resembles the new electric type in this respect.

Apparatus for controlling the locomotive is mounted on the platform and enclosed in the cab. This cab is divided into two parts, a main operating cab occupying the center part of platform and low auxiliary cabs extending from the main operating cab to the outer ends of the locomotive. The end cab contains such parts of the control apparatus as do not require continuous inspection and care. The new electric locomotive weighs 90 tons on drivers. The weight on the drivers of a Pacific type steam locomotive for heavy passenger service very rarely exceeds 75 tons. A weight of 90 to 100 tons on drivers is only obtainable on freight locomotives of the consolidation and Mikado types.

In the steam locomotive, on account of boiler limitations, it is impossible to exert the maximum tractive effort, which, in the case of the Pacific type of passenger locomotive amounts to but 32,000 lbs. at speeds higher than eight to ten miles an hour; the electric locomotive will develop its maximum tractive effort at a speed of 14 to 15 miles an hour. This tractive effort of 45,000 lbs. corresponds to an output of 1,750 horsepower. The electric locomotive, however, is more flexible and has a greater power than indicated by these figures. By means of the multiple unit control, which is a feature of these locomotives, two of these 90-ton units can be coupled together and operated by one engineer in the forward cab. All the motors are controlled simultaneously by one operating handle, and one engineer thus has under his control a maximum capacity of 3,500 h.p., or a maximum tractive effort of 90,000 lbs., developed from one 180-ton locomotive, which could move off

on a level track with a 6,000-ton load behind it or take a 1,000-ton load up a grade 80 ft. to the mile.

Electric Railway History.

From the report this week of the electrification committee of the New York Railroad Club the following brief history is summarized:

The first successful trolley installation was made in Richmond in 1888 by Mr. Sprague. For heavier traction, the third rail was first used in 1893 at the Chicago World's Fair, and in 1895 this was the distinctive feature of the equipment of the Metropolitan elevated in Chicago. The multiple unit system was first put in use in 1898 by the South Side Elevated of Chicago, and later by the elevated railways of New York City. The first important installation of heavy electric locomotives was by the Baltimore & Ohio in its Baltimore tunnel in 1895; smaller electric locomotives had been previously used for mining and industrial purposes. The Long Island Railroad's suburban zone third rail electric equipment was put in service in 1905. The West Jersey & Sea Shore, between Atlantic City and Philadelphia, was electrified in 1906, and in the same year the New York Central began operating electrically, both by locomotives and by the multiple unit system, a portion of its electric zone. In 1907 the Erie installed a multiple unit, high voltage, single-phase system on its Rochester division; also in 1907, the Spokane & Inland Empire Railroad was put in operation. This is the first railway built for heavy electric service, both freight and passenger, and the current is generated by water power. In 1908 the Grand Trunk Railway electrified the Sarnia tunnel. In 1909 the Cascade tunnel of the Great Northern was electrified. In this the three-phase system is used. The Pennsylvania expects to operate electrically its new terminal in New York City during the current year.

Railway Matters at Washington.

Washington, March 16, 1910.

The administration railway bill still finds rough sailing, and members of the house committee find new features that are objectionable every time the bill is taken up for discussion. One of the latest changes proposed is to give to the Interstate Commerce Commission the power to fix the price at which shares shall be exchanged when two roads are merged with one another, the idea being to compel the owners in such cases to reduce the amount of stock to the supposed actual value of the physical property. Another proposition would give the Interstate Commerce Commission power to regulate the price of all shares of stock sold by existing railways.

In the Senate Mr. Nelson proposes that traffic agreements between carriers (which are authorized by the pending bill) shall be filed with the Interstate Commerce Commission, and shall not take effect until 20 days after approval by the commission. Senator Nelson has also proposed further changes in section 12, which has already been discussed at great length in the committees in both houses, but without any definite conclusion.

The house committee has adopted an amendment to punish the shipper, as well as the railway, if he accepts payment of a damage bill which conceals a rebate, and another intended to provide further safeguards against the combination of railways and steamship properties.

Yesterday and to-day Senator Cummins, the chief critic of the administration bill in the Senate committee, has presented his objections at length on the floor of the Senate. He declares that the bill has not received really serious consideration in the committee, the majority accepting without question the draft prepared by the Attorney-General. While not imputing improper motives to the President or the Attorney-General, the senator deplored the practice of railway presidents going to the White House instead of to the committees in Congress. But the presidents had been there, and the bill bore no resemblance to that which was drafted last summer in New York by the special committee appointed by the President. Senator Cummins asserted that the proposed court of commerce would not be called upon to hear more than seven or eight cases a year, yet the court would cost $100,000 yearly. The most seriously objectionable clause in the bill is that which transfers from the Interstate Commerce Commission to the Attorney-General the duty of defending suits contesting orders of the commission. Senator Bailey joined in the criticism of this feature, declaring that with such a law the railways would be more interested in the selection of an attorney-general than of a president.

The house bill to amend the law concerning the reporting of railway accidents and to authorize the investigation of accidents, after slight changes, has been again reported to the Senate by the Senate committee.

Criticism of New York Public Service Commission.

(Representative of a "very large traction interest," quoted in the *Journal of Commerce.*)

"I do not believe a more honest set of men was ever brought together than the Public Service Board of the First district (New York City). They have kept out of all positions that would even bear the appearance of seeking personal advantages. But they are not big men. They are $15,000-a-year men and should be $25,000 or $50,000-a-year men. When Chairman Willcox answers that if we cannot run our roads at a profit we should give up our franchises it is rather discouraging for investors.

"The traction system of New York needs many millions of dollars from investors. It will not be able to get these millions unless there is either a change in the personnel of the Public Service Commission or in the attitude of the present dominant members. The commission ever since its inception has lacked courage. It should have said to the railways: There are certain things that the traction future requires of you; you must buy new cars; you must rehabilitate your system; must put side doors in the subway cars and many other things; you must pay your men living wages and keep them contented and avoid strikes; we may want you to enter into joint routes; we know all this will cost money and we are prepared to stand back of you and aid you in getting from investors the money to secure a modern traction system. Of course, if the commissioners had taken such a stand the newspapers would probably have charged connivance with the railways; but they would have proved themselves big men. The people are not interested whether it costs 3.49 cents or 4.10 cents per passenger, but they are interested in securing proper scientific management of the roads.

"The Metropolitan is not earning 2½ per cent. on its real capital, the actual investment. The commission say that if the Metropolitan was not earning anything at all, it must go ahead, obey instructions and incur increased expenditures. The commission's demand for a joint rate at Fifty-ninth street meant that the company must conduct its business at a price that would not pay. Such orders drive capital away.

"The railways should be made to give the best service they can; they should not be permitted to make a large profit, or to pay dividends on watered stock. The commission, I think, should determine on what amount of stock the roads can earn fair returns on, but the roads should not be compelled to do impossibilities.

"Of course the Public Service Commission has had a tremendous job on its hands. Traction conditions that they have had to consider could not have been worse, and probably will never again be as bad; and they have been compelled to make decisions over night that parliamentary committees in England, for instance, would have spent years in investigating. * * * The commission claims credit for everything the roads voluntarily do. They learn of some improvement contemplated, for instance, and then send a letter demanding its immediate introduction. This is very small business."

American Railway Tool Foremen's Association.

This association has decided to hold its next meeting at Chicago July 12, 1910. O. T. Harroun, C. & A. Ry., Bloomington, Ill., is the secretary-treasurer.

American Society of Civil Engineers.

A meeting was held in New York City on March 16 at which a paper on "A Concrete Water Tower" was presented by A. Kempkey, and one on "Some Mooted Questions in Reinforced Concrete Design" by Edward Godfrey.

Canadian Society of Civil Engineers.

At the meeting on March 17 H. R. Lordly gave an illustrated address on "Subaqueous Concrete Work." W. H. Breithaupt read a paper on "Grade Separation."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; Havana, Cuba; March 28.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31—June 3; Atlantic City.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F. Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 14; Chicago.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASS'N.—H. M. Buck, Secy.-Treas., 30 Church street, New York.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Santa Fe lines on March 10 put into effect 3-cent passenger fares throughout Oklahoma.

Manufacturers and jobbers of Indianapolis, Ind., are forming a trade association with the purpose of establishing a bureau to deal with the railways.

The Toledo Chamber of Commerce is preparing a shippers' guide similar to that issued by the Chicago Board of Commerce. With this book the best route and the best time to any railway freight station in Ohio, Indiana or Michigan can be quickly found.

The New York Central & Hudson River has reduced to a uniform basis of two cents a mile all round-trip fares on the Hudson division. From Albany to New York and return the rate will be reduced from $6 to $5.75. Similar reductions are to be made on the line along the west side of the Hudson river.

The steamer Texan, of the American Hawaiian Steamship Company, arrived in New York last week with shipments of canned goods and other freight from San Francisco in 22 days. The route was by way of the Tehuantepec Railway, and the time was: San Francisco to Salina Cruz eight days, Salina Cruz to Puerto Mexico by railway (vessel to vessel) seven days, Puerto Mexico to New York seven days.

The Western Pacific has been opened for freight business for some weeks, but the reporters who try to find out how much freight is being moved have no success. They observe, however, that in January and February the gross revenues of the Denver & Rio Grande increased about 25 per cent. over the same period of 1909. It is conjectured that these large increases can have been possible only by reason of a large amount of traffic going over the Rio Grande for the Western Pacific.

Representatives of the commercial organizations of Omaha, Neb.; St. Joseph, Mo.; Sioux City, Iowa; South Omaha and St. Paul and Minneapolis conferred with executive officers of the western lines in Chicago on March 8 in regard to the advances which recently were made in rates on packing house products from these points to Chicago. They protested that the advances which had been made should not be kept in effect unless a proportionate advance is made from Kansas City.

The Pennsylvania Railroad Company is enlarging its work in the dissemination of farming literature, and has just sent out a series of pamphlets on orchard development, some 18,000 copies. The subjects are "Planting," "Cultivation," "Pruning" and "Spraying." The text matter was written specially for the Pennsylvania Railroad Company by Professor H. A. Surface, Economic Zoologist of the State of Pennsylvania. It was also approved by Hon. N. B. Critchfield, State Secretary of Agriculture.

The Oregon Railroad & Navigation Co. announces reductions, to go into effect March 20, averaging 14 per cent. on freight rates between Portland and points in Oregon east of The Dalles, in accordance with the order of the State Railroad Commission which was issued April 22, 1908. This order was contested in the courts, but has lately been sustained by the United States Circuit Court. Under the bond given by the railway company, shippers or consignees who have paid bills at the old rates during the past two years may now secure a rebate. It is not unlikely, however, that the road may carry the case to the Supreme Court.

David O. Ives, president of the Boston Merchants' Association Board of Transportation and formerly an officer of the Wabash Railroad; William C. Maxwell, general traffic manager of the Wabash, and S. C. Freisner, foreign freight agent of the same road, were arraigned in the United States Circuit Court at New York March 14 and pleaded not guilty to indictments found against them in September last for violations of the Interstate Commerce law. They were held in $5,000 bail each for trial. William F. Schmidt, western representative of the Missouri Pacific, and Robert Burnap, formerly general traffic agent of the Central Vermont, were unable to appear. The district attorney did not ask for their arrest, as he had been informed that they would appear as soon as they were able to get to the city. It was announced that the

Government was still continuing the investigation of the agreements between the railway lines and the transatlantic steamship company, which led to these indictments. The indictments charge the giving and receiving of rebates.

The St. Louis lines are still considering the advisability of establishing a joint down town ticket office. A committee, composed of John M. Beall, B. H. Payne and W. S. St. George, general passenger agents, respectively, of the Mobile & Ohio, the Missouri Pacific-Iron Mountain system and the Missouri, Kansas & Texas, reported that the plan was favorable as a measure of economy and that a large and commodious corner location could be secured at a rental of one-fourth of what is paid for the various present offices of the roads interested. The committee will make further inquiries and report at a later meeting on desirable locations for down town union offices at a rental not to exceed $30,000 a year.

Reporting Unclaimed or Refused Freight.

There has been a great deal of discussion for some time between shippers and railway traffic men of the matter of the railways sending reports to consignors of unclaimed or refused freight. The National Industrial Traffic League has been trying to get the railways to adopt some consistent method of reporting, but the roads have been loath to do so because they have feared that they might thereby increase their liability for loss and damage. At present they are ordinarily not liable for failing to make such reports, but if they should put a provision in their tariffs that they would do so they would at once become liable for any failure to carry out the tariff provision.

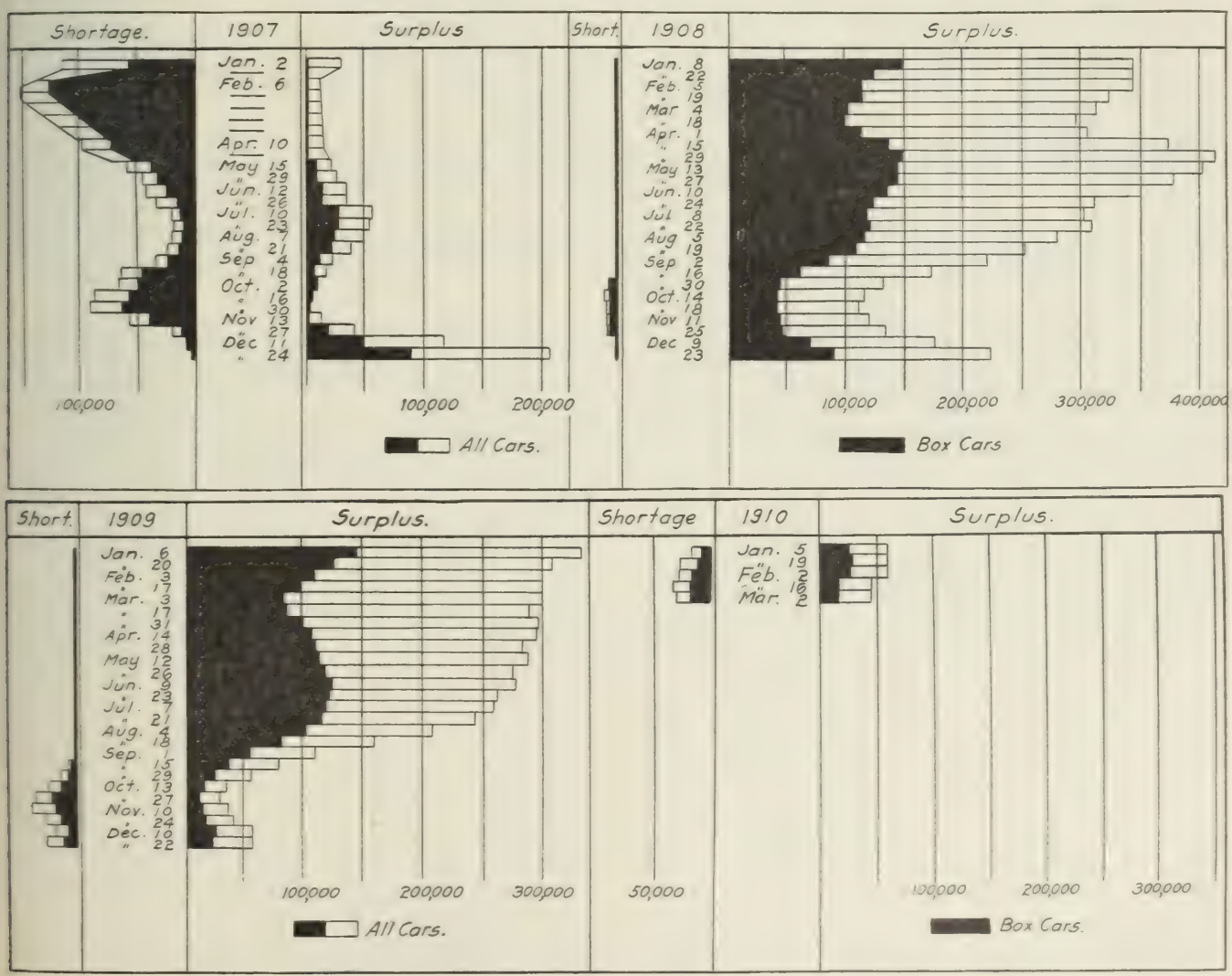
The Virginia Claim Conference at a meeting in Washington, D. C., on January 28, adopted a method of reporting unclaimed or refused freight which the shippers believe solves the problem in a way that will be satisfactory to both interests. The carrier under this plan does not print in its tariffs a provision that reports will be made and does not even agree to make them. It does, however, adopt a form of which the following is the substance:

> The shipment is refused, unclaimed and if you have legal interest in same you are respectfully requested to furnish disposal orders at once through THE AGENT OF THE CARRIER ISSUING THE BILL OF LADING or arrange with consignee to remove shipment at once to prevent further accumulation of storage charges. We are authorized by law to sell the shipment for freight and storage charges if same is not removed within the statutory period. This notice is voluntary, is issued as information to consignor, and no liability shall attach to carriers for failure of the notice to perform its mission, or for failure to issue similar notices on other shipments.
>
> * * * * * * * * *
>
> INSTRUCTIONS TO AGENTS.—Reconsignment orders from shipper must be accepted only when received from the initial carrier, or through the Freight Claim Agent.
>
> Order-Notify shipments must not be reconsigned without surrender of Original B/L., unless authorized by Freight Claim Agent.

Under this plan report is made to the consignor, to the agent at the forwarding station and to the claim agent. The National Industrial Traffic League will try to have the northern and western lines adopt a similar plan. With this object a conference will be sought between the freight claims committee of the league and a similar committee of the Freight Claim Agents' Association.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in pre-



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

senting statistical bulletin No. 67 giving a summary of car shortages and surpluses by groups from October 28, 1908, to March 2, 1910, says:

"There is practically no change in the situation since the date of our last bulletin, the surplus having decreased only 198 cars and the shortage 1,297 cars. While the shortage is still chiefly in coal cars in groups 2 (Eastern), 3 (Middle) and 4 (South Atlantic), there is a slight increase in the surplus and an unimportant decrease in the shortage of this class. There is little change in the box car situation, either by groups or in the grand total."

Car Surpluses and Shortages.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group 1 March 2, 1910	8	6	1,011	341	55	1,413	258	.....	.....	255	513
" 2 " 2, 1910	21	208	227	1,352	550	2,337	445	15	2,717	13	3,190
" 3 " 2, 1910	23	300	284	768	1,711	3,063	3,586	20	2,771	1,652	8,029
" 4 " 2, 1910	10	1,438	93	452	801	2,784	2,301	38	3,491	700	6,530
" 5 " 2, 1910	20	1,307	459	359	684	2,809	2,321	578	845	152	3,896
" 6 " 2, 1910	18	3,232	639	2,172	2,737	8,780	5,081	22	57	758	5,918
" 7 " 2, 1910	4	136	116	483	643	1,378	.....	.....	.....	.....	.....
" 8 " 2, 1910	14	813	347	929	1,460	3,549	143	.....	21	83	247
" 9 " 2, 1910	9	1,210	388	164	698	2,460	.....	.....	40	22	62
" 10 " 2, 1910	19	3,101	1,270	2,235	4,733	11,339	47	26	.....	13	86
" 11 " 2, 1910	6	2,718	1,779	32	874	5,403	1,167	.....	.....	269	1,436
Grand total	152	14,469	6,613	9,287	14,946	45,315	15,349	699	9,942	3,917	29,907

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.

INTERSTATE COMMERCE COMMISSION.

Reasonable Joint Rate in Existence.

Sunnyside Coal Mining Co. v. Denver & Rio Grande et al. Opinion by Commissioner Prouty.

Complainant shipped two carloads of coal from Strong, Colo., to Quinn and Cottonwood, S. Dak., over a route taking combination rates. There were open to the complainant joint through rates over another route under which this coal might have moved which compare favorably with other rates in that section and which are reasonable. Instead of availing itself of those rates the complainant saw fit to ship this coal to Rapid City and thence to destination. The fact that it might have availed itself of a reasonable joint rate is no reason why it might not adopt the route selected; nor why it should not be accorded from Rapid City to destination a reasonable local rate; but the commission is not satisfied on this record that the rates charged were in this case unreasonable, although they are abnormally high and would be excessive under ordinary conditions. Complaint dismissed. (17 I. C. C., 540.)

Two Single-Deck Cars Equal One Double-Deck Car.

Corn Belt Meat Producers' Association v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Prouty.

Certain tariffs of defendants in other states provide that when double-deck cars cannot be furnished and single-deck cars are used instead for the convenience of the carrier, two single-deck cars shall be treated in computing the rates and the minimum as one double-deck car; held, that the tariffs of defendants establishing these rates from Iowa points ought to contain the same provision, with the limitation that it shall apply only when seasonable notice has been given by the shipper of his desire to use the double-deck car.

Certain territorial regroupings and reductions in cattle rates are prescribed. The advances in hog rates made by the defendants since the publication of the original opinion are condemned and the rates then in effect are restored.

No order will be made in this case for 60 days. Unless defendants within that time have filed schedules putting into effect the rates suggested in this opinion, the commission shall take up the case again and proceed to the making of a definite order. (17 I. C. C., 533.)

STATE COMMISSIONS.

The Indiana Commission is preparing to prosecute the Southern Railway for violation of the safety appliance law, and the Pennsylvania for violation of the hours of service law.

The United States circuit court has again decided against the railway in a suit, pending since May 11, 1908, attacking the constitutionality of the law establishing the State Railroad Commission of Oregon.

The Michigan State Railway Commission has issued a general order requiring all railways to have their cabooses equipped with end platforms and platform steps. Many are now using side stirrup steps.

The Railroad Commission of Louisiana has ordered that there shall be no change in the rates authorized or established for seats or berths in sleeping cars, chair cars or parlor cars between points in the state without the consent of the commission.

The Indiana Commission has brought suit in court against the Cincinnati, Indianapolis & Louisville to enforce an order issued last August regulating freight rates on coal, sand and gravel. The railway company some time ago brought suit in the federal court against the commission, but in that court the commission's demurrer was sustained.

COURT NEWS.

The supreme court of the United States, by a divided bench of four to four, has affirmed the decision of the lower federal court holding that the proper unit for assessing penalties under the 28-hour law, forbidding the keeping of animals in cars longer than that time, is the shipment and not the train. That is to say, a train of 30 cars consigned to or by 30 different parties would, if illegally delayed, incur a penalty of 30 times as great as a train of the same size all sent by one shipper to one consignee.

Judge Hazel in the United States circuit court at Buffalo, March 12, continued the injunction, referred to in our last issue, page 538, forbidding an advance in rates on coal and coke from the Connellsville (Pa.) region to Buffalo, which had been announced by the principal roads. The complainants, the Lackawanna Steel Co. and other Buffalo concerns, were required to give an indemnity bond, to save the roads harmless until the Interstate Commerce Commission can pass on the reasonableness of the proposed advance.

The supreme court of the United States has sustained the state of North Dakota in the coal rate suit. The law of 1907 is held to be constitutional despite the claim of the railway that it requires the transportation of coal below the cost of service. The decision of the supreme court of North Dakota is affirmed. Justice Holmes said that there were so many uncertainties about the rate being confiscatory that the supreme court felt it was not justified in overruling the state court, which held the law would not prove confiscatory if put into effect. The affirmance was made, however, with the statement that it should not prejudice the case of the railways if after the law went into effect it should prove confiscatory.

MONTH OF JANUARY, 1910.
(See also issue of March 11.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, Inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating Income (or loss).	Increase (or dec.) comp. with last year.
Atlanta, Birmingham & Atlantic	670	$159,742	$39,459	$210,359	$27,779	$35,203	$12,449	$88,346	$8,244	$172,021	$38,338	.....	$10,000	$28,338	$24,195
Bangor & Aroostook	546	185,319	39,341	236,376	36,432	26,747	2,930	68,557	12,506	147,172	89,204	.....	1,500	87,704	9,743
Buffalo, Rochester & Pittsburgh	567	574,929	64,761	655,925	47,263	148,535	9,687	210,041	14,431	429,957	225,968	$138	13,000	213,105	92,534
Central of Georgia	1,916	656,536	239,536	979,835	145,735	165,896	31,173	325,948	37,330	706,082	273,753	4,615	45,000	233,368	9,188
Chicago Great Western R.R.	1,486*	612,633	185,803	879,372	96,161	133,390	46,450	480,567	35,849	792,417	86,955	—1,855	26,543	58,557	.....
Chicago, Indianapolis & Louisville	616	285,831	97,588	421,967	69,138	68,461	15,998	165,095	15,889	334,581	87,386	.....	22,200	65,186	18,968
Chicago, Milwaukee & Puget Sound	1,555†	759,135	56,564	831,830	64,792	73,962	21,598	307,589	13,770	481,711	350,119	134	22,560	327,692	.....
Chicago, Milwaukee & St. Paul	7,511	2,939,990	897,857	4,253,667	580,672	593,659	99,372	2,251,504	107,271	3,632,478	621,190	—208	216,041	404,941	—661,187
Chic., St. Paul, Minneapolis & Omaha	1,739	684,063	306,366	1,125,586	77,559	130,833	25,429	505,632	29,078	768,531	357,055	1,338	55,358	300,359	—42,150
Cincinnati, Hamilton & Dayton	1,036	505,139	113,200	687,580	88,912	135,740	23,530	326,076	29,584	603,842	83,738	.....	26,889	56,849	33,468
El Paso & Southwestern Co.	867	485,258	85,197	600,141	97,174	76,356	9,867	180,285	22,653	386,335	213,806	—850	18,993	193,963	—48
Florida East Coast	583	130,111	143,040	321,715	44,489	41,864	7,104	108,355	7,413	209,225	112,490	.....	12,500	99,990	11,264
Galveston, Harrisburg & San Antonio	1,338	572,049	228,954	847,592	137,033	142,320	26,014	320,002	28,146	653,515	194,077	722	28,800	164,556	7,134
International & Great Northern	1,160	498,205	154,446	699,467	92,196	126,615	24,661	326,388	21,859	591,719	107,748	.....	22,000	85,748	46,073
Kansas City Southern	827	608,659	108,630	787,160	83,224	91,850	28,252	290,258	30,000	523,584	263,576	.....	28,965	234,611	27,534
Lake Erie & Western	886	349,223	53,428	424,610	33,585	85,813	13,905	178,751	10,599	322,653	101,957	.....	17,950	84,007	75,317
Long Island	390	195,673	314,484	542,874	89,186	101,347	9,900	322,989	24,005	547,427	—4,553	25,463	33,232	—12,322	3,796
Maine Central	932	430,534	160,233	630,690	72,551	106,764	7,318	254,241	21,850	462,724	167,966	569	35,993	132,543	28,572
Mobile & Ohio	1,114	659,878	99,882	894,732	101,556	179,842	34,997	291,837	32,884	641,116	253,616	2,092	21,929	229,595	—12,330
Nashville, Chattanooga & St. Louis	1,230	703,993	211,701	983,429	119,711	150,202	39,469	362,322	23,676	695,380	288,049	432	20,500	267,117	44,796
New York, Chicago & St. Louis	558	817,815	93,957	939,409	39,052	98,416	46,428	390,634	13,481	588,011	351,398	—1,941	27,000	322,457	176,902
New York, Ontario & Western	546	498,636	66,452	587,994	75,265	107,704	10,664	264,232	17,849	475,714	112,280	—6,165	16,667	89,448	—19,225
Norfolk & Southern	593	136,858	49,110	202,115	24,390	25,004	3,488	62,345	14,533	129,760	72,355	.....	6,200	66,155	—14,455
Northern Central	466	796,965	151,191	1,014,571	128,910	224,155	12,436	492,370	22,459	880,330	134,241	298	24,708	109,831	86,930
Northern Pacific	5,852‡	3,153,760	1,130,285	4,593,595	635,490	775,720	78,178	2,114,316	96,213	3,699,917	893,678	5,576	208,049	691,205	337,807
Oregon Short Line	1,508§	1,033,220	335,177	1,472,606	109,542	195,131	38,105	422,515	31,168	796,461	676,145	—4,044	55,491	616,610	—17,495
Philadelphia & Reading	1,024	3,033,908	532,382	3,732,113	241,111	719,793	42,586	1,238,927	75,094	2,317,511	1,414,602	18,095	73,457	1,359,204	384,470
St. Louis Southwestern	773	482,254	107,807	617,449	95,072	91,816	28,493	134,511	22,911	372,803	244,646	—763	18,490	225,393	76,795
St. Louis Southwestern of Texas	703	209,571	68,170	297,084	101,556	66,794	10,033	149,115	15,520	343,018	—45,934	—184	11,846	—57,964	15,664
San Pedro, Los Angeles & Salt Lake	979#	203,819	92,948	332,079	126,837	86,949	20,450	139,957	17,494	391,687	—59,608	—3,669	20,739	—84,016	—223,745
Seaboard Air Line	2,995	1,129,725	376,049	1,683,541	219,198	247,037	64,705	557,687	51,605	1,140,232	543,309	—1,579	59,418	482,312	67,024
Southern Pacific Co.—Pacific System	6,060△	4,149,933	2,444,233	7,080,277	926,398	945,600	144,161	2,082,196	207,458	4,305,813	2,774,464	—33,228	280,054	2,461,182	684,482
Texas & New Orleans	458	208,347	80,628	311,189	48,228	61,385	7,847	118,028	8,861	244,349	66,840	1,673	11,835	56,678	80,195
Vandalia	827	594,898	180,967	870,579	95,070	159,429	21,229	329,434	19,208	624,370	246,209	.....	24,000	222,209	116,247
Wabash	2,514	1,606,364	486,175	2,282,219	220,329	296,958	79,671	978,807	67,800	1,643,565	638,654	—4,054	75,538	559,062	223,927
Wheeling & Lake Erie	458	436,990	37,647	505,742	47,593	92,484	5,527	208,145	12,958	366,707	139,035	6,570	20,057	125,548	98,705
SEVEN MONTHS OF FISCAL YEAR, 1910.															
Atlanta, Birmingham & Atlantic	670	$1,107,511	$322,509	$1,510,876	$182,947	$234,501	$83,932	$580,915	$61,055	$1,143,350	$367,526	.....	$73,265	$294,261	$67,278
Bangor & Aroostook	546	1,161,132	404,678	1,652,046	258,051	196,579	19,784	463,469	73,313	1,011,196	640,850	.....	10,500	630,350	91,482
Buffalo, Rochester & Pittsburgh	567	4,495,855	606,473	5,360,634	582,336	1,098,755	63,547	1,441,842	92,094	3,278,574	3,082,060	$638	91,000	1,991,698	834,177
Central of Georgia	1,916	4,775,560	1,866,560	7,270,786	1,012,888	1,100,267	209,818	2,116,309	281,744	4,721,027	2,549,759	43,027	338,257	2,254,528	340,411
Chicago Great Western R.R.	1,486*	3,469,703	1,093,751	4,926,438	529,122	580,347	203,422	2,098,912	165,179	3,576,982	1,349,456	—6,501	135,819	1,207,136	.....
Chicago, Indianapolis & Louisville	616	2,328,895	871,113	3,487,860	475,259	464,267	96,230	1,096,450	103,066	2,235,212	1,252,648	.....	143,700	1,108,948	314,271
Chicago, Milwaukee & Puget Sound	1,555†	4,611,635	475,105	5,181,564	204,188	324,181	128,447	1,581,433	71,961	2,310,210	2,871,354	18,294	122,560	2,767,088	.....
Chicago, Milwaukee & St. Paul	7,511	26,436,516	8,768,242	38,166,256	5,447,959	4,656,341	786,819	14,920,392	683,601	26,495,112	11,671,144	170,470	1,449,169	10,392,445	—2,118,884
Chic., St. Paul, Minneapolis & Omaha	1,739	5,592,759	2,695,340	8,916,427	1,164,798	1,022,053	168,466	3,243,589	194,756	5,793,662	3,122,765	—173	373,405	2,749,187	6,091
Cincinnati, Hamilton & Dayton	1,036	4,008,938	1,057,435	5,665,523	744,594	951,400	151,734	2,205,847	190,093	4,243,668	1,421,855	.....	181,889	1,239,966	397,626
El Paso & Southwestern Co.	867	3,379,257	604,024	4,174,018	582,326	543,489	73,045	1,133,584	158,604	2,491,048	1,682,970	— 6,414	143,539	1,533,017	—95
Florida East Coast	583	744,245	532,091	1,478,108	239,303	258,395	31,618	569,226	58,967	1,157,509	320,599	.....	81,767	238,832	215,258
Galveston, Harrisburg & San Antonio	1,338	4,474,879	1,502,392	6,287,576	813,295	899,840	171,739	2,265,872	190,564	4,341,310	1,946,266	18,815	206,508	1,720,943	16,958
International & Great Northern	1,160	3,743,431	1,176,408	5,229,872	847,033	815,496	135,131	2,102,539	148,501	4,048,699	1,181,173	.....	150,000	1,031,173	—62,960
Kansas City Southern	827	4,001,800	840,744	5,385,919	608,404	710,158	180,676	1,806,748	209,027	3,515,013	1,870,906	.....	181,745	1,689,161	—86,896
Lake Erie & Western	886	2,606,926	529,685	3,301,258	436,950	572,070	88,772	1,133,821	71,404	2,303,017	998,241	.....	128,295	869,946	410,420
Long Island	390	1,788,157	3,576,100	5,623,260	551,415	706,777	106,702	2,320,119	132,886	3,817,899	1,805,361	557,313	232,627	2,130,047	586,961
Maine Central	932	3,105,961	1,875,523	5,300,904	788,318	729,374	54,588	1,742,089	156,948	3,471,317	1,829,587	21,747	249,396	1,601,938	298,204
Mobile & Ohio	1,114	4,495,251	779,989	6,115,995	721,593	1,091,760	209,012	1,968,418	217,334	4,208,117	1,907,878	—17,167	155,102	1,735,609	—17,452
Nashville, Chattanooga & St. Louis	1,230	4,693,925	1,575,048	6,681,977	1,014,933	1,126,075	255,283	2,296,107	158,722	4,851,120	1,830,857	—5,829	143,500	1,681,528	176,361
New York, Chicago & St. Louis	558	5,228,499	905,751	6,344,142	494,970	638,702	333,823	2,337,073	94,634	3,899,202	2,444,940	—8,440	225,109	2,211,391	625,186
New York, Ontario & Western	546	3,746,594	1,075,142	5,037,254	657,031	767,331	79,376	1,841,119	118,678	3,463,535	1,573,719	—24,336	116,667	1,432,716	—17,325
Norfolk & Southern	593	969,715	423,213	1,510,096	175,845	187,467	27,805	461,283	99,916	952,316	557,780	2,659	41,900	518,540	135,057
Northern Central	466	5,903,647	1,286,571	7,608,982	828,287	1,441,080	94,782	3,242,773	149,350	5,756,272	1,852,710	5,689	172,959	1,685,440	298,392
Northern Pacific	5,852‡	28,002,284	14,054,098	44,665,306	5,979,277	5,425,964	576,740	13,875,229	648,084	26,505,294	18,160,012	566,914	1,730,774	16,996,152	—1,106,608
Oregon Short Line	1,508§	8,324,045	3,248,586	12,255,936	1,186,528	1,082,710	188,142	2,565,889	220,006	5,243,275	7,012,661	5,927	421,443	6,597,145	655,256
Philadelphia & Reading	1,024	20,527,009	4,067,550	25,685,295	1,885,824	5,409,404	268,913	7,555,593	432,207	15,551,941	10,133,354	83,801	514,072	9,703,083	1,092,472
St. Louis Southwestern	773	3,410,679	835,658	4,429,017	559,064	632,628	175,876	958,570	151,353	2,477,491	1,951,527	—6,007	149,646	1,795,873	338,873
St. Louis Southwestern of Texas	703	1,577,517	549,577	2,278,747	546,632	470,171	66,890	929,594	109,572	2,122,859	155,888	1,379	63,602	90,907	15,206
San Pedro, Los Angeles & Salt Lake	979#	2,459,765	1,683,291	4,432,921	768,762	712,691	191,456	1,450,676	116,626	3,240,211	1,192,710	18,081	173,506	1,001,123	39,744
Seaboard Air Line	2,995	7,687,983	2,455,837	11,190,843	1,556,422	1,541,355	400,408	3,536,524	357,486	7,392,195	3,798,648	—17,600	415,926	3,365,122	933,313
Southern Pacific Co.—Pacific System	6,060△	33,976,977	18,697,179	56,234,939	6,356,987	7,075,040	868,041	14,184,655	1,425,588	29,910,311	26,324,628	—24,547	1,720,430	24,579,651	5,109,603
Texas & New Orleans	458	1,536,271	583,348	2,252,849	322,015	361,333	48,672	830,980	61,961	1,624,961	627,888	11,039	88,130	550,797	177,863
Vandalia	827	3,871,927	1,357,586	5,826,131	827,844	994,970	168,189	2,053,653	131,087	4,175,743	1,650,388	.....	167,676	1,482,712	297,007
Wabash	2,514	11,560,169	4,355,283	17,212,969	2,028,414	2,278,054	540,901	6,316,583	467,654	11,631,606	5,581,363	12,654	473,631	5,095,075	989,642
Wheeling & Lake Erie	458	3,502,254	359,299	4,152,626	405,349	923,027	49,575	1,391,390	97,546	2,866,887	1,285,739	11,423	158,526	1,171,636	425,516

* Began operations September 1, 1909. † Began operations August 1, 1909. ‡ Mileage operated January 31, 1909, 5,673. § Mileage operated January 31, 1909, 1,456. # Total mileage, 1,105, but 126 miles not operated on account of washout. △ Mileage operated January 31, 1909, 5,589. — Indicates Deficits, Losses and Decreases.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. S. Kies, general attorney of the Chicago & North Western at Chicago, has been appointed general solicitor of the Chicago & Western Indiana and the Belt Railway of Chicago, with office at Chicago.

Frederick H. Meeder has been appointed assistant to Vice-President John Carstensen, of the New York Central Lines, with office at New York City. Mr. Meeder was born on January 7, 1869, at Brooklyn, N. Y., and was educated in the public schools at South Orange and East Orange, N. J. He began railway work on May 12, 1886, in the treasurer's office of the Michigan Central at New York. He went to the New York Central & Hudson River as clerk in the comptroller's office in June, 1890, and about a year later was appointed general bookkeeper, remaining in that position until February 1, 1903, when he was made chief clerk to the auditor. On October 1, 1905, he was appointed chief clerk to Vice-President Carstensen, which position he held at the time of his recent appointment.

E. O. McCormick, assistant traffic director of the Southern Pacific, the Union Pacific, the Oregon Railroad & Navigation Company, the Oregon Short Line and the Oregon & Washington at Chicago, has been elected a vice-president of the Southern Pacific, with office at San Francisco, Cal.; he will be in charge of traffic on the Pacific system. William F. Herrin, chief counsel of the Southern Pacific and vice-president of the California Northeastern and the Pacific Electric Railway at San Francisco, has been elected vice-president of the Southern Pacific, with office at San Francisco; he will be in charge of the legal and land departments. E. E. Calvin, vice-president and general manager at San Francisco, has been elected vice-president in charge of transportation, construction, purchasing and hospital departments, with office at San Francisco.

Operating Officers.

J. R. McKee has been appointed a trainmaster of the Missouri, Kansas & Texas, with office at Parsons, Kan.

L. M. Mills has been appointed superintendent of dining cars on the Missouri Pacific-Iron Mountain system, with office at St. Louis, Mo., succeeding G. L. Bonney, resigned.

G. H. Emerson, superintendent of motive power of the Great Northern, at St. Paul, Minn., has been appointed assistant general manager, with office at St. Paul, succeeding H. A. Kennedy, resigned.

G. W. Melbourne has been appointed assistant trainmaster of the Elgin, Joliet & Eastern, with office at Joliet, Ill. He will have jurisdiction over the Joliet division except Joliet terminals and the Rossville district.

W. C. Morse, superintendent of the Missouri Pacific-Iron Mountain system at Ferriday, La., has been transferred to Wynne, Ark., succeeding H. J. Scheuing. C. M. Andrews, trainmaster at Little Rock, Ark., succeeds Mr. Morse, and W. S. Coffin succeeds Mr. Andrews.

J. H. Stanfiel, superintendent of the Mobile division of the Southern, with office at Selma, Ala., has been appointed superintendent of the Birmingham division, with office at Birmingham, succeeding W. R. Hudson, promoted. J. Lasseter, trainmaster at Wilton, succeeds Mr. Stanfiel, with office at Selma.

The Electric division of the New York Central & Hudson River has been extended northward from Block station 7 to Croton, N. Y., inclusive, and Croton is now the southern terminus of the Hudson division. A. R. Whaley is the general superintendent of the Electric division, with office at New York.

Charles Ware, superintendent of the Nebraska division of the Union Pacific at Omaha, Neb., has been appointed general superintendent, with office at Omaha, succeeding W. L. Park, resigned to become vice-president of the Illinois Central. W. R. Cahill, assistant superintendent at Omaha, succeeds Mr. Ware. W. D. Lincoln, car service agent at Omaha, has been appointed superintendent of transportation, with office at Omaha, and the title of car service agent has been abolished. Mr. Lincoln will continue to perform the duties of that office.

John W. Eber, who has been appointed superintendent of the Adirondack division of the New York Central & Hudson River, with office at Utica, N. Y., was born July 14, 1871, at Jersey Shore, Pa. He began railway work on February 27, 1890, as a rodman on the West Shore, now a part of the New York Central, and for the six years following was in the engineering department of that road. On November 27, 1896, he was appointed assistant roadmaster at Canajoharie, N. Y., and in May, 1899, became supervisor of track on the West Shore division. Three years later he was made supervisor of track on the New York Central at West Albany, where he remained for two years, and was then appointed division engineer at Watertown. On March 6, 1905, he was made engineer of track, with office at New York City. In April, 1909, he was appointed assistant superintendent of the New York Central stock yards at Buffalo, remaining in that position until his recent appointment as superintendent of the Adirondack division. The Mohawk & Malone and the St. Lawrence & Adirondack railways, heretofore included in the Mohawk division of the New York Central & Hudson River, will in future be operated as the Adirondack division.



John W. Eber.

Traffic Officers.

J. B. Modisette, whose appointment as general passenger agent of the Vandalia Railroad, with office at St. Louis, Mo., was announced in the *Railway Age Gazette* in its issue of February 25, page 433, was born April 19, 1859, at Uniontown, Pa. He attended Cheltenham academy, Philadelphia, and studied also at Pottstown, Pa.; and he began railway work about 20 years ago with the Pennsylvania system. He was first assistant ticket agent at Cincinnati, and was then consecutively chief clerk in the office of the assistant general passenger agent at Chicago; chief clerk in the passenger department of the Vandalia at St. Louis; city passenger agent at Chicago; district passenger agent and later assistant general passenger agent at Cleveland. About three years ago he was appointed first assistant general passenger agent at Pittsburgh, Pa., from which position he has recently been promoted.



J. B. Modisette.

J. R. Clack has been appointed a commercial agent of the Southern, with office at Sumter, S. C.

Leroy Blue has been appointed a traveling freight agent of the New York Central Lines, with office at Spokane, Wash.

H. G. Benedict has been appointed commercial agent of the Atlanta, Birmingham & Atlantic, in charge of the new agency at Kansas City, Mo.

C. C. Landers, division freight and passenger agent of the Wabash at Danville, Ill., has had his jurisdiction extended to include stations on the Altamont branch, not including Bement, Ill.

R. G. Parks has been appointed traveling freight and passenger agent of the Georgia & Florida, with office at Augusta, Ga. B. F. Holzendorff, traveling freight and passenger agent, with office at Douglas, Ga., having resigned, that office is abolished.

Ralph T. Bretz has been appointed assistant general western freight agent of the Northern Pacific, with office at Tacoma, Wash. O. R. Lonergan has been appointed general agent in the freight department, with office at Tacoma.

Engineering and Rolling Stock Officers.

A. B. Pollock, assistant supervisor of signals of the Pennsylvania Railroad at West Philadelphia, Pa., has been appointed a supervisor of signals.

S. J. Hungerford, shop superintendent of the Canadian Pacific at Winnipeg, Man., has been appointed superintendent of rolling stock of the Canadian Northern, with office at Winnipeg.

W. E. Woodhouse, master mechanic of the Canadian Pacific at Calgary, Alb., has been appointed shop superintendent at Winnipeg, Man., succeeding S. J. Hungerford, resigned to go to another company.

J. H. Farmer, master mechanic on the Fourth division of the Denver & Rio Grande at Alamosa, Colo., has been appointed master mechanic of the Rio Grande Southern, with office at Ridgway, Colo.

W. S. Johns, Jr., has been appointed a supervisor on the Allegheny division of the Pennsylvania Railroad, with office at East Brady, Pa., pending the return to duty of H. R. Catlin, who has been granted leave of absence.

The Choctaw district of the Rock Island Lines having been abolished, the jurisdiction of A. B. Warner, district engineer of the Southern district, at Fort Worth, Tex., has been extended over the Arkansas, the Louisiana and the Indian Territory divisions.

Special Officers.

W. L. Glessner has been appointed land and industrial agent of the Georgia & Florida, with office at Augusta, Ga.

Controversy Over Station at Geneva.

A French company, the Paris, Lyons & Mediterranean, owns its station in Geneva, with the very short section of line which is on Swiss territory. For a long time, and especially since the state system has been established, the Swiss have desired to acquire this station, and in the course of the negotiations last year for better connection with the Simplon Tunnel route, it was agreed that either the confederacy or the canton of Geneva (which is little more than the city) might do so on certain terms. The question of purchasing it is now up in Geneva, and, strange to say, it is made largely a religious one. Those who think of Calvin and Geneva as almost synonymous terms, may be surprised to learn that the population is almost equally divided between Catholics and Protestants. Now it seems that the whole force of station employees of the French Company is Catholic, and the purchase by the canton is denounced as a measure for "protestantising" the railway station, it being certain that if in government hands no discrimination would be made on account of religion.

Railway Construction.

New Incorporations, Surveys, Etc.

Abilene Central.—J. M. Wagstaff, chairman, Abilene, Tex., is said to be asking for bids up to noon March 21 for building 56 miles of main line and six miles of sidings and switches between Abilene and Rising Star. The work will include clearing and grubbing 500 acres; earth excavation and embankment work, 972,000 cu. yds.; loose rock excavation, 24,000 cu. yds.; solid rock excavation, 36,000 cu. yds. H. J. Bradshaw, engineer, Abilene. (March 4, p. 460.)

Alexandria & Western.—An officer is quoted as saying that work will be started at once on this line. The projected route is from Alexandria, La., west via Leesville to the Sabine river at the Texas border. It is the intention of the company to eventually extend the line to a point in Texas. G. F. Cotter, president; I. W. Sylvester, chief engineer, Fort Worth. (Oct. 22, p. 776.)

Altus, Wichita Falls & Hollis.—See Wichita Falls & Northwestern.

Arizona & Colorado.—See Southern Pacific.

Arizona Eastern.—See Southern Pacific.

Arkansas Valley Interurban.—According to press reports from Wichita, Kan., work will be started at once by the Jennings Construction Co., on this line, from Wichita, north to Valley Center, 10 miles. The line is ultimately to be extended northwest to Hutchison, 40 miles additional. The company has also secured a right-of-way for a line down the west side of the Arkansas valley south via Oxford to Arkansas City, but work on this end will not be started until the northern end of the line is completed. It is expected to have the first section of 10 miles open for traffic by July. The construction company has established a camp midway between Wichita and Valley Center, and work will be pushed both north and south from that place.

Cherryvale, Oklahoma & Texas.—An officer writes that work was started March 10 locating this line from Caney, Kan., southeast via Wann, Okla., to Nowata, thence east to Vinita, 62 miles, and contracts will be let as soon as possible. Maximum grades will be 1 per cent. and maximum curvature 6 degs. The work includes one steel bridge. S. M. Porter, Caney, president; B. J. Dalton, chief engineer, Lawrence. (March 11, p. 546.)

Chicago, Aurora & De Kalb (Electric).—An officer writes that this company is now at work with its own men electrifying the line from Aurora, Ill., west to De Kalb, 30 miles. The equipment for special stations, rolling stock, transmission and distributing line has been bought.

Chicago Great Western.—This company is establisbing construction camps near Oelwein, Iowa, it is said, and will continue the work of double-tracking the line to Chicago. The present double-track from Dubuque, Iowa, east to Stockton, Ill., is to be extended further east to Pearl City, also from Stanley east to Aurora.

See Great Northern.

Chicago, Milwaukee & St. Paul.—See Great Northern.

Chicago, Rock Island & Pacific.—See Great Northern.

Cleveland, Cincinnati, Chicago & St. Louis.—See report of this company elsewhere in this issue.

Denver & Gulf.—An officer writes that at the present time no definite information concerning the plans of this company can be given out, as a number of changes are to be made in the proposed plans. The promoters expect to build a new line, to be about 125 miles shorter than any existing line from Denver, Colo., southeast to Dallas, Tex., the work to be carried out within two years. Contracts are said to have been entered into with residents of Lamar, Colo., whereby the railway company agrees to construct and put in operation 150 miles between Lamar and Texhoma, Okla., before July 1, 1911, and this work in addition to contracts already made in Texas will insure the completion of 350 miles by that date. The line is eventually to be extended south to the Gulf of Mexico. A 24-mile branch from the main line north of Tex-

homa is to be built west into undeveloped coal fields, and another branch is now under construction from Texhoma south to Amarillo, Texas, 90 miles. Franklin A. Umsted, president, Texhoma; W. R. Evans, vice-president, Lamar, Colo. (Feb. 11, p. 328.)

Detroit River Tunnel.—See Michigan Central.

Eastern Illinois.—Incorporated in Illinois, with $1,000,000 capital and office at Chicago. The plans call for a line from a point in Cook county, near West Hammond, via Harvey to a point near Riverdale, about 16 miles. W. E. Snyder, 2808 West Warren avenue, Chicago; W. H. Robinson, E. H. Pank and S. Blumenthal, all of Chicago, are directors.

Fairmont & Pittsburgh.—Organized in West Virginia, with $1,000,000 capital and office at Fairmont, W. Va. The plans call for a line from Fairmont north via Blacksville and Waynesburg, Pa., to Pittsburgh, about 75 miles. The company is also authorized to build a loop line from Fairmont northwest to Mannington, Blacksville and Morgantown, thence along the Monongahela river, returning to Fairmont. W. M. Laws, Jersey City, N. J.; J. F. Beatty, Mannington, W. Va., and S. E. Miller, Fairmont, are said to be interested.

Gallatin Valley.—An officer writes that this company is now operating 20 miles of railway in Montana, and will let contracts at once for building 27½ miles between Bozeman, Mont., and Three Forks. The work will include several large trestles and at least one 200-ft. steel span. N. C. Van Natta, chief engineer, Bozeman. (Nov. 19, p. 990.)

Galveston-Houston (Electric).—According to press reports a contract has been given to the North American Dredging Co. to build 2.6 miles of roadbed on Galveston island from the causeway to the city limits of Galveston. It is expected that additional contracts will be let at once for building 16 miles on the main land from near Texas City junction to Clear Creek, and about April 1 for 19 miles between Clear Creek and Brays bayou. These two short sections will be built during the coming summer, and the entire line from Houston southeast to Galveston, 50 miles, is expected to be finished about January, 1911. The estimated cost of the line is $2,000,000, including equipment. The Stone & Webster Engineering Corporation, Boston, Mass., are building the line. There will be 30 small bridges. The company will have temporary headquarters in Galveston. J. B. Townsend is chief engineer and general superintendent of construction. Mark Lowd is Southwest manager for the Stone & Webster Engineering Corporation. (Jan. 28, p. 209.)

Georgia & Florida.—Track-laying has been started recently on the connecting link from Normantown, Ga., north to Swainsboro, 20 miles. From that place the line is completed north to St. Clair, and it is expected that by the middle of June the extension from St. Clair north to Augusta, 28 miles, will be finished and the company will be operating trains over its own tracks to Augusta. This new line will be shorter than the present route via Millen, from which place the tracks of the Central of Georgia are now used to Augusta. (Dec. 10, p. 1167.)

Grand Trunk Pacific.—A statement has been issued by this company, which shows that of the 7,900 miles already authorized, 4,800 miles have been completed or are under contract. On the main line of 3,500 miles a total of 3,000 miles is under construction, of which 1,795 miles has track laid. From Winnipeg track is laid west to Wolf Creek, 915 miles, and east to Fort William, Ont., 445 miles, making a continuous stretch of 1,360 miles. The Winnipeg-Fort William section will not be ready for trains for some months. Contracts have been let for the section from Wolf Creek west to Tete Jaune Cache, in the Rocky mountains, where a large force of men and 1,000 teams are now at work. On a section of 240 miles east from Prince Rupert, B. C., work is also under way, and construction is being carried out on over 686 miles of branch lines in Saskatchewan and Alberta. (Feb. 11, p. 333.)

Great Northern.—Work is to be started this year by the railways in Minneapolis, Minn., it is said, that will cost more than $10,000,000, enlarging the Minneapolis terminals and increasing the freight handling capacity. The most important work will be the Northtown cut-off by which the Great Northern will shorten the distance from its northern entrance to the union station from five to three miles, and the Northern Pacific will also avoid entering through the congested Omaha and Soo line yards. The cut-off will be an elevated line and cost about $2,000,000. The Rock Island has bought 200 ft. frontage on Fifth street adjoining its present terminals for eventual enlargement. Improvements are also to be made by the Great Northern in the Bryn Mawr district, as well as by the Minneapolis & St. Louis in the same section. It is probable that the Chicago, Milwaukee & St. Paul will build shops near Hopkins. A proposition is now under consideration for the elimination of grade crossings along the Hastings & Dakota division of this road, which crosses south Minneapolis. The Minneapolis, St. Paul & Sault Ste. Marie will put up an office building, also a roundhouse at the Shoreham shops. The Chicago Great Western will make some improvements to its terminals, as well as the Minneapolis & Western, which is a switching road. The Minnesota Railway Transfer, operating a large yard, has bought 250 acres of land near New Brighton and is making plans for track-laying and improvement work that will greatly increase its facilities.

Illinois Oil & Coal Belt.—An officer writes that this company will begin work this year on a line from Terre Haute, Ind., southwest to Cairo, Ill., about 200 miles. Contract let to the Western Indiana Construction Co., 6 Sherman street, Chicago. Maximum grade will be 1 per cent., and maximum curvature 4 degs. There will be two steel bridges. James R. Campbell, president; Allan G. Russell, chief engineer, McLeansboro, Ill. (March 11, p. 547.)

Lake Shore & Michigan Southern.—See report of this company elsewhere in this issue.

Lansing & Northeastern (Electric).—Plans for the construction of this road have been finished and it is expected to have the line in operation by October of this year. The first section to be built will be from Lansing, Mich., northeast to Owosso, 30 miles. An extension is projected from Morrice east through Duran, thence northeast to Flint, also an extension from Owosso northeast to Saginaw. The Michigan Railway Commission has recently authorized the company to issue $800,000 in bonds to provide funds for building the line. G. G. Moore, Detroit, and T. W. Atwood, Caro, are interested. (Feb. 18, p. 379.)

Lynchburg, Amherst & Northern.—Surveys are to be started at once, it is said, from a point near Lynchburg, Va., north via Amherst to Sandidges and Lowesville, about 30 miles. There will be three steel bridges, each about 100 ft. long. H. L. Page, president; J. Campbell, Amherst; W. A. Taylor, Lynchburg, and W. E. Walker, Sweetbrier, Va., are said to be interested.

Mexican Southern.—See National Railways of Mexico.

Michigan Central.—The report of this company for the year ended December 31, 1909, shows that the construction of the double-tube tunnel under the Detroit river by the Detroit River Tunnel Co. is nearing completion. The open cuts and approaches on both sides of the river are finished and the tunnel under the river is finished so far as to be open for use for the purposes of construction. There remains only a portion of the interior lining of the sub-aqueous tunnel and the tracks and electrification work yet to be added. It is expected to have the tunnel in operation early in 1910. An arrangement has been made by which the company can secure property in the city of Detroit for a new passenger station, and can also close a number of streets and construct subways. See report elsewhere in this issue. (Sept. 24, p. 563.)

Minneapolis & St. Louis.—See Great Northern.

Minneapolis, St. Paul & Sault Ste. Marie.—Foley, Welch & Stewart, St. Paul, Minn., are said to have contracts for building the cut-off from New Richmond, Wis., west to Withrow, Minn., 17 miles, also for the cut-off from Spencer, Wis., west to Owen, 19 miles. The work includes putting up a steel bridge over the St. Croix river. (Feb. 11, p. 329.)

Missouri, Kansas & Texas.—An officer writes that Patton & Gibson, contractors, have finished the work between Atoka, Okla., and Red river, on a section of 46 miles, reducing the existing grade and providing roadbed for double-track. The

same contractors are reducing the grade to 0.40 per cent. and grading for double-track from Atoka north to Stringtown, eight miles; and also have a contract for reducing the grade and the curvature at Limestone Gap on a section of two miles, at a point 11 miles north of Stringtown. It is expected to have all this work finished this fall. (March 4, p. 461.)

Montana Rapid Transit.—An officer writes that only preliminary work is now under way on this line. According to press reports right-of-way has been secured and some grading finished between Helena, Mont., and Butte, about 55 miles. J. K. Toole, president; A. W. Verharen, chief engineer, Helena.

National Railways of Mexico.—According to press reports the Mexican Southern is to be extended east via Magdalene, Oax., to Tlacolula, and will probably eventually be extended east to a connection with the National Tehuantepec. Surveys for the proposed extension are now being made and contracts will be let soon for the section as far as San Dionisio, about 20 miles southeast of Tlacolula.

Nevada-California-Oregon.—Bids are to be asked for about April 1 to build an extension from Alturas, Cal., north to Lake View, Ore.

New York Central & Hudson River.—See report of this company elsewhere in this issue.

North Coast.—According to press reports this company has amended its charter and announced that it will build lines as follows: Seattle, Wash., east to Spokane, 350 miles, through the counties of King, Pierce, Lewis, Yakima, Benton, Franklin, Adams, Whitman and Spokane, with a branch from the main line in either Benton or Franklin county to Walla Walla; also branches from the main line in Adams county to Eureka junction; another to Davenport, and a third to Wilson creek. The plans include a line from Spokane southeasterly via Tekoa to Lewiston, Idaho. Press reports say that work is being rushed from both ends of the section on the main line between Spokane and Benton county. (Nov. 12, p. 943.)

Northern Pacific.—See Great Northern.

Omaha, Western & Lincoln (Electric).—Surveys are said to be finished and contracts let to the Osceola Construction Co., Lincoln, Neb., to build this line. The plans call for a line from Omaha southwest to Hastings, about 200 miles, with a branch south to Lincoln. F. E. Schaff, president, Lincoln; W. H. Fuller, chief engineer, Hastings. (Jan. 14, p. 114.)

Pennsylvania Midland.—See Pennsylvania Railroad.

Pennsylvania Railroad.—Grading work and laying rails on the Pennsylvania Midland between Bedford, Pa., and Altoona has been finished and only some bridge work remains to be done. The construction work from Bedford to Cumberland, Md., is now under way. Trains will be put in operation from Altoona to Bedford in June and to Cumberland this coming fall.

Pennsylvania Roads.—A company has been incorporated in Pennsylvania to build from New Park, Pa., east to a connection with the Maryland & Pennsylvania, at Delta, about 10 miles. As part of the line will pass through Maryland the company will ask for a new charter. Residents of New Park are interested in the project. J. H. Anderson, president; J. H. Gehey, secretary; A. H. Strawbridge, treasurer, and J. C. Wiley, general manager.

Pittsburgh & Susquehanna.—Incorporated in Pennsylvania, with $100,000 capital, to build from Utahville, Clearfield county, Pa., south to Dean, Cambria county, 10 miles. The incorporators include: T. F. Barrett, president; R. K. Klack, J. H. Smeltzer, C. D. Bruce and H. G. Vancourt, all of Philadelphia.

Red River Valley & Texas.—Organized to build from a point near Chillicothe, Tex., through undeveloped territory probably to a point near Ardmore, Okla. Grading work has been started. There will be 10 steel bridges. F. L. Mercer, president and general manager; G. Kenfaver, chief engineer, Davidson, Okla.

Sioux Falls & Western.—Incorporated in South Dakota, with $1,000,000 capital and office at Sioux Falls, S. Dak. The plans call for a line from Sioux Falls west to Wheeler, about 125 miles. The incorporators include: R. F. Brown, S. Fantle, G. B. Tuthill, F. H. Hollister and G. T. Blackman, all of Sioux Falls.

Southern Pacific.—An officer writes that no construction is contemplated as a consequence of the consolidation of the several short lines in Arizona recently under the name of the Arizona Eastern. Prior to this consolidation, the Gila Valley, Globe & Northern was building two short extensions from Globe, Ariz.; one, northeasterly 10 miles to recently developed copper property, and the other southeasterly about five miles to other copper developments. The Arizona Eastern at the same time was building 29 miles through the Gila canyon from the terminus of the Phoenix & Eastern at Winkelman northeast to San Carlos, on the Gila Valley, Globe & Northern. All of the smaller companies were making surveys, but nothing has been decided upon definitely as to when these lines will be constructed. (March 4, p. 460.)

An officer writes that the Arizona & Colorado has located a line from Gallup, N. Mex., north via Farmington to Durango, Colo., and contributions to be used for buying the right-of-way are being subscribed by residents of various places along the route. The company has not yet definitely determined when actual construction work will be started. (March 4, p. 460.)

Temple-Northwestern.—An officer writes that contracts have been let to D. J. Grigsby, Temple, Tex., and work was started March 17 on the first section of 60 miles. The plans call for a line from Temple, Tex., northwest via Gatesville, Hamilton, Comanche, Gorman, Eastland, Breckenridge, Crystal Falls, Throckmorton and Munday to Benjamin, in Knox county, about 210 miles, air line. There will be five steel bridges. (See Temple & Northwestern, March 4, p. 461.)

Trinity Valley & Northern.—A contract is said to be let for building the extension of this road from Fouts, Tex., north to a connection with the Gulf, Colorado & Santa Fe. It is expected to have the work finished in two years. (Feb. 4, p. 281.)

Whitefish & Polson.—An officer writes that surveys have been made on a section of 32 miles from Whitefish, Mont., south via Kalispell to Summers, and the surveys are being continued south to Polson, in all about 100 miles. It is expected to begin construction work this summer. Considerable rock work will be carried out on the section along the west shore of Flathead lake, also some tunneling as well as a large amount of trestle work. The organization of the company will be finished in about one month. An extension is projected from a point on the main line about 20 miles north of Polson southwest to Hot Springs, in the Flathead Indian reservation. Joseph Edge, president, and F. E. Marsh, chief engineer, both of Kalispell, Mont.

Wichita Falls & Northwestern.—An officer writes that this company is planning to build a branch from Altus, Okla., west to Wellington, Tex., about 60 miles. The company has secured about 45 miles of the grade built by the Altus, Roswell & El Paso. Two companies have been organized, one covering the Oklahoma line, to be known as the Altus, Wichita Falls & Hollis Railway, and the other, covering the 15 miles from the Oklahoma state line west to Wellington, to be known as the Wichita Falls & Wellington. Both these companies are being financed by the Wichita Falls & Northwestern, and were incorporated to obtain charters in the states of Oklahoma and Texas. The line will be known as the Panhandle division, and will be owned by the same interests as now own the other lines comprising the Wichita Falls Route. Contract has been let for completing the line, which it is expected will be put in operation within six months.

A contract is said to have been signed by this company and residents of Lawton, Okla., for the construction of a branch from Devol, Okla., north to Lawton, 38 miles. The railway company agrees to have the extension finished by September, 1910.

Wichita Falls & Wellington.—See Wichita Falls & Northwestern.

Railway Financial News.

Camas Prairie.—The Camas Prairie Railroad Company has been formed to operate the line from Lewiston Junction, formerly Texas City, Wash., to Grangeville, Idaho, 150 miles, which is owned jointly by the Oregon Railroad & Navigation Company and the Northern Pacific.

Chicago & Alton.—Kissel, Kinnicut & Co., New York, have bought and resold an issue of $2,650,000 three year 5 per cent. collateral trust notes of the Chicago & Alton, a portion of which are now being offered in the general market at 99⅜. The notes are to be secured by the deposit of $3,500,000 new equipment and improvement mortgage 5 per cent. bonds, due 1930, authorized last week to the amount of $18,000,000.

Chicago, Milwaukee & Puget Sound.—This company has taken over and will hereafter operate as part of its own line the property of the Montana Railroad, whose line runs from Lombard, Mont., to Lewistown, 157 miles. The Puget Sound road owns all of the Montana Railroad's $2,000,000 general mortgage bonds and $3,500,000 stock.

Cincinnati, Bluffton & Chicago.—W. A. Guthrie, a broker of Indianapolis, has petitioned the circuit court at Huntington, Ind., to have the property of this company sold because of the non-payment of receiver's certificates, amounting to $100,000.

Cincinnati, Hamilton & Dayton.—The first and refunding mortgage 4 per cent. gold bonds recently announced are offered for sale by Kuhn, Loeb & Co. and Speyer & Co., of New York, and the amount offered is $12,500,000. The price is 91½ and interest, and subscriptions close March 22 or earlier. Principal and interest are guaranteed by the Baltimore & Ohio. The 75 millions of bonds authorized are to be issued as follows:

a	For the payment or adjustment of indebtedness, both due and accrued	$7,500,000	
b	For improvements now needed	5,000,000	
c	For necessary working capital	2,000,000	
d	For deposit as collateral under $11,557,000. 4 per cent. notes due July 1, 1913	13,000,000	
			$27,500,000

Reserved for future use:

e	For additions, improvements and betterments	$23,721,000	
f	For refunding underlying bonds	23,779,000	
			47,500,000
			$75,000,000

The $12,500,000 now offered constitute $5,500,000 of the bonds specified under *a* and all of those under *b* and *c*. The remaining $2,000,000 under *a* (not guaranteed by the B. & O.) were given in lieu of cash for adjustment of indebtedness.

Hocking Valley.—Reports persist and apparently are informally authorized, to the effect that the Hocking Valley system is to be divided between the Chesapeake & Ohio and the Lake Shore & Michigan Southern. It is said that a definite plan has been adopted by which the Chesapeake & Ohio is to take the Hocking Valley proper, the Lake Shore is to take the Toledo & Ohio Central and both companies are to take and operate jointly the Kanawha & Michigan. It will be recalled that some months ago an Ohio court directed the relinquishment of the Toledo & Ohio Central on the ground that its control by the Hocking Valley was contrary to law, in that the Toledo & Ohio Central was parallel to and competing with other lines of the Hocking Valley. The execution of this order was stayed pending an appeal which will be argued next June.

Lake Shore & Michigan Southern.—Four per cent. gold bonds of this company to the amount of $15,000,000 are offered for sale by J. P. Morgan & Co. at 93¼ and accrued interest. These bonds are a part of the issue of $50,000,000 of 25-year bonds authorized in 1906, and they are due May 1, 1931. Interest is payable May 1 and November 1. Application will be made to list the 15 millions on the New York Stock Exchange. The proceeds of the present sale are to be used to repay funds that were borrowed to pay the 15 millions of three-year 5 per cent. gold notes of 1907, which were payable on the first of last February.

J. P. Morgan & Co. have sold, at 95, the remainder of the first mortgage 4 per cent. 50-year gold bonds of the Jamestown, Franklin & Clearfield. This road is owned by the L. S. & M. S., which guarantees the bonds, principal and interest.

New Jersey & Pennsylvania.—This road, formerly the Rockaway Valley, has been taken out of the hands of the receiver, by order of Vice-Chancellor Emery, of New Jersey, and Receiver Pitney has turned over the affairs of the company to George E. Fisher, treasurer. It is said that the sum of $15,000 has been secured, and that the road is to be extended from its present northern terminus at Watnong northward about two miles, to a point near the business center of Morristown, N. J.

Norfolk & Southern.—The sale of this company's property on December 7 to the bondholders' reorganization committee, for $8,500,000, has been affirmed by the United States circuit court of appeals. The court decides on all points in favor of the reorganization committee, and against the parties who appealed from the decision of the lower court. It is expected that 5 per cent. first mortgage bonds to the amount of $5,780,000 will be sold at once to N. W. Harris & Co. and Redmond & Co., and the new organization will be perfected at once, though some of the reports say that the parties opposing the bondholders' committee will take the case to the supreme court if they can find a way to do so.

According to the plan of reorganization a new company will be incorporated with $16,000,000 capital stock, and $12,000,000 first mortgage 5 per cent. bonds, secured upon all the property of the company. Stock will be given to the owners of the $14,000,000 outstanding 5 per cent. bonds, who have deposited them with the reorganization committee, at the rate of $1,142.80 of stock for each bond. All but 24 of these bonds have been deposited. This exchange will take all of the $16,000,000 stock authorized. The $5,780,000 in new bonds will be used to retire $2,043,893 collateral trust notes, $1,442,865 receivers' certificates, and $47,000 Raleigh & Pamlico Sound bonds, and to furnish working capital for the new company. Their sale in the market will not take place until it is known that the syndicate opposing the sale does not intend to apply for a writ of certiorari. The road is said to be now earning 4 per cent. on $16,000,000 stock.

Norfolk & Western.—The directors have voted to offer to preferred and common stockholders the privilege of subscribing at par to new 4 per cent. convertible bonds to the extent of 12 per cent. of their holdings of stock. There is now $66,000,000 common stock outstanding and $22,991,700 adjustment preferred, so that the new bonds will total between ten and eleven million dollars.

Seaboard Air Line.—There have been sold abroad about $11,000,000 adjustment 5 per cent. bonds. These bonds are part of the new issue of $25,000,000 authorized to help the road out of its receivership. Of the amount authorized $6,345,000 were reserved to be exchanged for the general mortgage 5 per cent. bonds then outstanding, while the remainder, $18,000,000, were offered to stockholders at 70. They were underwritten by a syndicate of bankers, headed by Blair & Co. and Ladenburg, Thalmann & Co., New York, and Middendorf, Williams & Co., of Baltimore. The bankers' profit is $1,260,000 less about four months' interest. About $7,000,000 of the bonds were reserved by the underwriters. By this transaction the way is paved for bringing out a portion of the $125,000,000 of refunding 4 per cent. bonds, also authorized in the reorganization plan. This issue would be used to retire $10,000,000 ten-year 5 per cent. collateral trust bonds and $4,651,000 of three-year collateral trust 5 per cent. bonds, both of which mature on May 1 next.

Wichita Falls & Northwestern.—The unsold portion of the Pan Handle division 5 per cent. gold bonds are being offered for sale at 97 and interest by the National City Bank of Chicago. These bonds are a first lien and the total amount issued was $900,000. They are due January 1, 1925, but may be called on any interest date at 105.

Supply Trade Section.

The Denver plant of the Griffin Wheel Co., Chicago, was partially destroyed by fire March 8.

The Isthmian Canal Commission will receive bids until March 28 for lumber and steel castings (Circular No. 566), and until April 4 on electrical materials of various kinds (Circular No. 565).

At the annual meeting of the Hobart-Allfree Co., Chicago, March 7, the following officers were elected: President, B. F. Hobart; vice-president and general manager, J. B. Allfree; second vice-president, Frank P. Smith; treasurer, E. H. Allfree, and secretary, W. H. England.

The Commonwealth Edison Co., Chicago, has bought 109 acres of land on which to build new generating stations. One or two stations are to be put up at once; it is planned to build a group of stations to have a combined capacity of about 350,000 horse-power.

The Cutler Hammer Co., Milwaukee, Wis., makes a magnet with which steel cargoes are being rescued from the bed of the Mississippi river. A barge load of kegged nails is now being raised near New Orleans; a load of cotton ties near Natchez and a load of woven wire near Pittsburg will be raised later.

The Electric Storage Battery Company, of Philadelphia, has acquired all the patents and rights of the Westinghouse Storage Battery Company, who owned all the rights of the General Storage Battery Company and the storage battery interests and patents of the Westinghouse Machine Company. The Electric Storage Battery Company will have the sole right to manufacture Westinghouse batteries.

The Western Electric Company reports for the quarter ending February 28 an increase in its sales of 50 per cent. over the corresponding quarter last year. For the month of February the gross sales increased 60 per cent. over the corresponding month last year. Based on these returns and known facts, the company estimates that its total sales for the current year will exceed $61,000,000. No recent contracts have been of unusual size, but there seems to be a broad and increasing demand for telephones, especially among railways and farmers.

TRADE PUBLICATIONS.

Great Northern.—The Great Northern has issued a folder advertising the first Minnesota Conservation and Agricultural Development Congress to be held at St. Paul, Minn., March 16-19, 1910.

Georgia & Florida Railway.—This road announces the completion of its Vidalia-Hazlehurst extension and the opening of its line from Millen, Ga., to Madison, Fla. A copy of the first folder issued by it has just been received from C. H. Gattis, general passenger agent, Augusta, Ga.

Hardening Furnace.—A cylindrical hardening furnace for heating high-speed steel reamers, tabs, drills, etc., for hardening and suitable for either oil or gas fuel is described in a sheet which is being distributed by the Rockwell Furnace Company, New York. It is part of bulletin G and should be attached to it.

Hydraulic Valves and Fittings.—This is the title of a 120-page catalogue (No. 78) from the Watson-Stillman Company, New York. It is said to be the most complete catalogue of this kind ever issued and contains numerous suggestions as to the best piping arrangements, what types or combinations of valves are best suited for different classes of work, and how a valve arrangement may operate a number of cylinders or machines automatically, etc.

Chicago, Union Pacific & Northwestern.—"London to San Francisco in Ten days" is the title of a four-page folder issued by the Chicago, Union Pacific and Northwestern line. The heading refers to a recent trip from London to San Francisco which was made on a wager in the time mentioned, the "San Francisco Overland Limited" on the Chicago, Union Pacific & Northwestern line being used for the portion of the trip from Chicago to San Francisco.

Coaling Stations and Briquetting Plants.—The Roberts & Schaefer Company, Chicago, have prepared a number of loose leaves for insertion in their bulletin No. 15, covering the work performed by their railway department during the past year. A number of coaling stations are illustrated, including the following types: Holmen bucket and chain, car haul and single counter-balanced bucket. A coal briquetting plant built for the Standard Briquette Fuel Company, Kansas City, Mo., is illustrated; also the Siamese coal breaker and the Barrett patent revolving measuring feeder for automatically filling a Holmen bucket from the receiving hopper.

RAILWAY STRUCTURES.

ALTAIR, TEX.—A contract is said to have been given to the Weber-Duller Co., Houston, Tex., for the foundation of a bridge for the San Antonio & Aransas Pass, to be built over the Colorado river. The structure will be a pin-connected through span bridge, the span being 276 ft. long. The steel work will be put in place by the Virginia Bridge & Iron Co. and the concrete piling will be put in by the Gulf Concrete Construction Co.

ATLANTA, GA.—The Southern is about to begin work on a freight transfer station at the Inman freight yards in Atlanta similar to the one now in use at Spencer, N. C. At Spencer the company will put up a large boiler shop, to be equipped with modern machinery and tools, and will also put up a large storehouse.

COLFAX, CAL.—According to press reports the Southern Pacific will begin work soon on a roundhouse and machine shops in Colfax.

DES CHUTES, ORE.—According to press reports the Oregon Trunk Line, now building from a point on the Columbia river, near the mouth of the Des Chutes river, south into central Oregon, is asking for bids for a number of bridges, the most important of which will be over the Columbia river, the Celilo canal, the Oregon Railroad & Navigation main line as well as the Portage Railroad. It is said this work will cost between $1,000,000 and $1,500,000. The plans provide for a swing bridge over the canal on seven fixed spans. The bill authorizing the construction of the bridge over the canal has been passed by both houses of Congress and signed by the president, and the plans are already in the hands of the war department for approval. There will be three other bridges over the Des Chutes river, one of which is to be at Horseshoe Bend and another at Oxbow. (Nov. 5, p. 897.)

FAIRVIEW, OKLA.—The car and repair shops of the Kansas City, Mexico & Orient were burned March 9. The total loss is estimated at $100,000.

FORT WAYNE, IND.—An agreement has been reached between the city officials of Fort Wayne, Ind., and the Pennsylvania Company, operating the Pittsburgh, Fort Wayne & Chicago, for the separation of grades at two of the most heavy traffic streets in Fort Wayne and on an intermediate street. This is to be accomplished by raising the railway tracks and depressing the streets. The city of Fort Wayne is to pay a proportion of the cost of the work. In connection with these improvements the Pennsylvania company intends to put up a new passenger station west of Calhoun street, a short distance west of the present station.

HOPKINS, MINN.—See Great Northern under Railway Construction.

KLAMATH FALLS, ORE.—The Southern Pacific has finished its new passenger station of granite and cut stone at a cost of about $30,000.

MCKEES ROCKS, PA.—According to press reports the Pittsburgh, Chartiers & Youghiogheny has reached an agreement

with the officials of McKees Rocks regarding the elimination of grade crossings. The plans provide that two crossings are to be eliminated and improvements made for an undergrade crossing. At Chartiers avenue the street will be depressed about 3 ft. and the railway tracks are to be elevated.

Minnedosa, Man.—Bids are wanted by Frank Lee, division engineer on the Central division of the Canadian Pacific, at Winnipeg, Man., March 28, for building a station at Minnedosa. Plans at the office of the resident engineer, Brandon, and at the division engineer's office at Winnipeg.

Mobile, Ala.—The Mobile & Ohio will start work at once improving about 1,000 ft. of dock property between St. Anthony and Adams streets, in Mobile.

New Orleans, La.—According to press reports work will be resumed by the New Orleans Terminal Co. on the Chalmette terminals. The damage caused by sinking of some of the concrete piers can be easily repaired.

Philadelphia, Pa.—A contract has been given to J. J. Walsh & Son, Baltimore, Md., for putting up a fireproof freight house at Fifty-eighth street and Woodland avenue, in Philadelphia. The building is to be 60 ft. x 20 ft., equipped with rolling steel doors, scales and fire protection. Work on the new building is to be started at once.

Richmond, Que.—According to local reports the Grand Trunk is planning to build a roundhouse in Richmond and make other improvements.

St. Louis, Mo.—An officer of the Rock Island writes regarding the improvements to be made at North St. Louis that the work has not yet been authorized. (March 4, p. 464.)

St. Paul, Minn.—It is said that the railways which propose to use the new union passenger station to be built in St. Paul have agreed that there should be 30 tracks in the station. Negotiations will be entered into soon with the harbor commission of St. Paul relative to changing the channel of the Mississippi river to provide enough land to extend the station and provide a site on which to lay the necessary tracks.

Shoreham, Minn.—See Great Northern under Railway Construction.

Tacoma, Wash.—Plans are being prepared by the Northern Pacific and bids are to be asked for by W. L. Darling, chief engineer, St. Paul, Minn., to build passenger stations in the state of Washington at the following places: Toppenish, Ritzville, Centralia, Chehalis, Olympia and Kelso. (March 4, p. 464.)

Temple, Tex.—See Temple-Northwestern under Railway Construction.

FOREIGN RAILWAY NOTES.

The Technical High School of Berlin has conferred the degree of Doctor of Engineering on Richard Pintsch in recognition of his services in connection with car lighting and the illumination of buoys.

The Minister's estimates for the Prussian State Railways for the year 1909-1910 indicate a deficit amounting to $22,000,000, against a deficit of $46,000,000 the previous year. The Minister insists that tolls must be levied on boats using the canals and the improved rivers.

The International Freight Traffic Agreement, which provides for freight transportation between different European countries, at the end of March last had been accepted by railways of 14 different countries having an aggregate length of 150,230 miles, having begun in 1893 with 94,785 miles.

Henschel & Son, of Cassel, obtained the contract for locomotives for the Argentine Northern Railway, their bid being $9,925 each (kind not specified), which was $60 less than the bid of the American Locomotive Co. A French firm, an English firm and Baldwin were also bidders. The highest bid was $678 more than the lowest.

Late News.

The items in this column were received after the classified departments were closed.

Paul Morton, president of the Equitable Life Assurance Society, New York city, formerly vice-president of the Atchison, Topeka & Santa Fe, and later secretary of the Navy, has been elected vice-president of the Pan-American Railway.

In the Federal Court at Philadelphia, March 16, the grand jury returned indictments against the Lehigh Valley and the Philadelphia & Reading for violation of the Interstate Commerce law in canceling demurrage charges that should have been collected from the Bethlehem Steel Company.

F. B. Harriman, general manager of the Illinois Central, the Yazoo & Mississippi, and the Indianapolis Southern, has resigned, and his duties have been taken over by Vice-President W. L. Park, of these companies. T. J. Foley has been appointed assistant to vice-president of the Illinois Central and the Yazoo & Mississippi Valley, with office at Chicago.

In the United States Circuit Court of Appeals at Richmond, Va., March 16, Judges Goff, Pritchard and Boyd held, in substance, that United States courts have no jurisdiction in matters pertaining to railway rates; the Interstate Commerce Commission has exclusive jurisdiction in such matters. Such is the newspaper report. The decision was reached in the case of the Tennessee Central against the Southern.

At Daytona, Fla., on Wednesday of this week, Barney Oldfield, driving a 200 h.p. Benz automobile, traversed a mile in 27.33 seconds, or at the rate of 131.72 miles an hour. Oldfield took a flying start. From a standing start he traversed the mile in 40.53 seconds. In his first run he beat the best previous record, which was made by Marriott four years ago, by .87 second, and in the second he beat the best previous record by .6 of a second.

In the Federal Court at Louisville, Ky., March 16, the Louisville & Nashville pleaded guilty on ten counts in eight indictments charging the payment of illegal rebates, and Judge Evans imposed a fine of $1,000 for each count, a total of $10,000. The eight indictments contained forty-seven counts, but it was admitted that conviction on many of the counts was impossible. Col. Henry L. Stone, counsel for the road, made a statement to the effect that the violations were technical in nature and not willful, and that no moral guilt attached to the company's officials. The remaining thirty-two counts were then dismissed by the court.

The United States Steel Corporation for the year ended December 31, reports an increase in gross receipts of $164,074,411, as compared with 1908. The volume of business done by the corporation and subsidiary companies as represented by their combined gross sales and earnings equalled the sum of $646,382,251. The income account for the year shows earnings of all properties after the deduction of operating expenses, including approximately $35,000,000 for ordinary repairs and maintenance, employes' bonus funds, provisional allowance for corporation excise tax, interest on bonds and fixed charges of subsidiary companies, of $131,773,100, an increase of $39,643,703 over 1908, and compares with $160,964,673 in 1907, $156,624,273 in 1906 and $119,787,658 in 1905.

Final contracts were signed this week for the construction of the two large office buildings which are to be put up between Forty-sixth and Forty-eighth streets at the Grand Central station, New York City, on the Lexington avenue side. These buildings are to be owned jointly by the New York Central and the New York, New Haven & Hartford, and it is planned to have them ready for occupancy within a year. When these are finished the "Grand Central Palace," two blocks south, will be vacated and in its place will be built another large building similar to the office building which is now nearly finished. The lower floors of the Grand Central Palace are now in use as the temporary passenger station, the "Lexington avenue terminal." The two buildings now to be built will be 13 stories high, and will be leased to the Merchants' & Manufacturers' Exchange, which will manage the New York Furniture Exchange and other enterprises.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Louisville & Nashville has ordered 25 consolidation locomotives from the Baldwin Locomotive Works.

The Hocking Valley locomotives, specifications for which were given in the *Railway Age Gazette* of March 11, will have Baker-Pilliod valve gear and not Walschaert, as reported.

The Southern Railway is in the market for 75 new locomotives, including passenger, freight and switching engines. The freight engines include two of the Mallet articulated compound type, which will weigh, in working order and including tenders, 520,550 lbs. each. They will be used for heavy freight service.

CAR BUILDING.

The Missouri Pacific is reported in the market for 25 ca boose cars.

The Chicago, Milwaukee & St. Paul is said to be in the market for 60 coke cars.

The Chilian States Railway is said to be in the market for 50 thirty-ton and 30 twenty-ton cars.

The Swift Refrigerator Transportation Co. has ordered 50 tank cars from the Pressed Steel Car Co.

The United States Express Co. is reported in the market for 25 refrigerator cars. This is unconfirmed.

The Missouri, Oklahoma & Gulf is said to have ordered 25 tank and 300 coal cars. This item is not confirmed.

The Louisville & Nashville are taking prices on steel underframes for 1,400 freight cars to be built at company shops.

The Crescent Tank Line is said to be in the market for from 100 to 125 tank cars. This item is not confirmed.

The Louisville & Eastern is reported to have ordered three express and five passenger cars. This item is not confirmed.

The Idaho & Washington Northern has ordered one 70-t McKeen motor car from the McKeen Motor Car Co., Omaha, Neb.

The Southern Pacific is said to be in the market for 75 passenger, 50 chair, 30 baggage and 35 postal cars; all to be of steel.

The New Orleans, Mobile & Chicago has ordered from the American Car & Foundry Co. 100 box and 200 flat cars. Garrett draft gear is to be used in these cars.

The Chicago, Aurora & De Kalb is in the market for eight dump cars of 12 yds. capacity and an electrically-driven gravel unloader, having a capacity of 100 yds. per hour.

The Western Maryland fifty-ton steel hopper cars and forty-ton gondola cars, described in the *Railway Age Gazette* of March 11, have the following special equipment:

	Hopper.	Gondola.
Type	Hopper.	Gondola.
Angle cock holder	Western.	Western.
Bolsters, truck	Scullin-Gallagher.	Simplex.
Brakes	Westinghouse.	Westinghouse.
Brake-beams	Waycott, Damascus Brake-Beam Co.	Waycott, Damascus Brake-Beam Co.
Brake-shoes	Am. Brake-Shoe & Foundry Co.	Am. Brake-Shoe & Foundry Co.
Brasses	Nat'l Supply Co.	Nat'l Supply Co.
Couplers	Sharon, Nat'l Mall. Castings Co.	Sharon, Nat'l Mall. Castings Co.
Doors.*	Dunham, U. S. Metal & Mfg. Co.	
Draft gear	Farlow.	Farlow.
Journal boxes	McCord.	McCord.
Paint	John Lucas & Co.	John Lucas & Co.
Release rigging	Carmer.	Carmer.
Springs	R'y Steel Spring.	R'y Steel Spring.
Wheels	National Car & Wheel Co.	Standard Steel Car Co.

*Side, drop and grain.

The Southern Railway is in the market for 3,000 all-steel coal cars of 100,000 lbs. capacity, 500 all-steel coke cars of 100,000 lbs. capacity, 150 steel underframe stock cars of 60,000 lbs. capacity, and 10 steel underframe combination passenger and baggage cars. The company is now building for itself, at its Lenoir car works, 1,000 steel underframe ventilated box cars and 200 steel underframe stock cars. It is also building at these works 205 steel underframe ventilated box cars for the Georgia Southern & Florida Railway. Upon the completion of this work, about the first of August, it will commence the construction, for the Southern Railway, of 1,000 additional steel underframe ventilated box cars of 80,000 lbs. capacity. The Lenoir car works are also making car wheels at the rate of 120 per day, and this production is to be steadily increased to 300 per day, the full capacity of the plant.

The Idaho & Washington Northern, as reported in the *Railway Age Gazette* of February 11, has ordered from the Haskell & Barker Car Co. 100 box cars and 100 flats. The company has also ordered six refrigerator cars from the same builders. The box cars have the following dimensions: Inside, length, 40 ft.; width, 8 ft. 6 in.; height, 8 ft. Overall, length, 41 ft.; width, 9 ft. The flats are 41 ft. long and 8 ft. 10 in. wide, overall. The bodies and underframes on all these cars are of wood. Delivery is specified for March, 1910, on the flat cars, and September, 1910, on the box cars.

Special Equipment.

Axles	5 x 9 M. C. B. steel
Bolsters	Simplex
Brakes	Westinghouse
Brake-beams	Simplex and Haskell & Barker
Brake-shoes	Streeter
Brasses	Filled
Couplers	Tower
Draft gear	Williamson-Priest
Dust guards	Wood
Journal boxes	M. C. B. steel
Roof	Williamson-Priest
Side bearings	Simplex
Springs	Coil
Trucks	M. C. B. standard
Wheels	Haskell & Barker 665-lb. cast steel

MACHINERY AND TOOLS.

The Baltimore & Ohio Southwestern will make improvements in its shops at Washington, Ind., to cost about $61,000. The larger proportion of this will be expended for the machine shop.

The Columbus Railway & Light Co., Columbus, Ohio, has ordered a steam turbo-generator set from the Allis-Chalmers Co., Milwaukee, Wis., for increasing the capacity of its generating plant. It is a 400-k.w., 4,150-volt, three-phase, 60-cycle, 1,800-r.p.m. unit and will receive steam at 160 lbs. and 100 degs. F. superheat.

The Citizens Railway & Light Company, Muscatine, Iowa, has recently added a 750-kilowatt Westinghouse turbo-generator set for its local light, power and railway service. A rotary converter set makes available direct current for the latter purposes. The condensing system is of the Leblanc jet type, manufactured by the Westinghouse Machine Company, East Pittsburgh, Pa.

The American Steel Foundries Company is making some changes in the electrical equipment of its shops at Thurlow, Pa., and is about to install a 200-k.w. induction motor generator set. The alternating current side will receive 2,200-volt, 60-cycle, two-phase current while the output will be 250-volt direct-current. A two-panel switchboard will carry the control instruments. This apparatus will be furnished by Allis-Chalmers Company.

The Pennsylvania Lines West of Pittsburgh have ordered from the Allis-Chalmers Co., Milwaukee, Wis., electric generating units to increase the capacity of the power plant at Conway, Pa., from which current for operating the shops there, and also for railway signal work, is supplied. The new machinery consists of two 750-k.v.a., 3,600-r.p.m., 60-cycle, three-phase, 2,300-volt steam turbo units. The turbines will receive steam at 145 lbs. pressure and 100 deg. superheat. During warm weather they will exhaust into a condenser in which a 28-in. vacuum is maintained. During cold weather steam from the turbines will be used in heating the plant, and a maximum back pressure of about 2 lbs. will be effective on the exhaust end. For exciting the alternators two units are to be supplied. One is a 25-k.w., 120-volt, 260-r.p.m. di-

rect-current generator coupled to an engine. The other is a 25-k.w., 125-volt generator direct-connected to a three-phase, 60-cycle, 2,300-volt, 200-r.p.m. synchronous motor. This motor is rated at 150 k.v.a. and, beside driving the exciter unit, will serve as an electrical condenser and thus improve the power factor of the station. Two 12-k.w. fly-wheel type motor generator sets will be installed in the station for supplying current for the railway signal system. These will each consist of a 12-k.w., 600-volt, shunt-wound generator direct-coupled to a 220-volt, 1,720-r.p.m. induction motor.

IRON AND STEEL.

The Erie is reported in the market for 20,000 kegs of spikes.

The Baltimore & Ohio is in the market for 200 tons of bridge material.

The Soo Line has ordered a bascule bridge of 87 tons from the Chicago Bridge & Iron Co.

The Baltimore & Ohio has ordered 300 tons of bridge material from the American Bridge Co.

The Great Northern has ordered 2,100 tons of bridge steel from the Wisconsin Bridge & Iron Co.

The Western Maryland has ordered 200 tons of bridge material from the American Bridge Co.

The Philadelphia & Reading is taking bids on 1,500 tons for a bridge across the Schuylkill river.

The San Antonio & Aransas Pass has ordered 500 tons of bridge steel from the Virginia Bridge Co.

The Duluth, Missabe & Northern has ordered 600 tons of bridge material from the American Bridge Co.

The New York, New Haven & Hartford is in the market for 800 tons of material for a bridge at New Haven.

The Atlantic Coast Line has ordered 2,600 tons of structural steel from the Virginia Bridge & Iron Co.

The Elgin, Joliet & Eastern has ordered 100 tons for plate girder bridges from the American Bridge Company.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 600 tons of bridge material from the King Bridge Co.

The New York, New Haven & Hartford has an inquiry for 10,000 tons of 100-lb. and about 5,000 tons of 80-lb. rails.

The Chicago, Burlington & Quincy has ordered 500 tons of bridge material from the McClintic-Marshall Construction Co.

The Chicago, Milwaukee & St. Paul has ordered 200 tons from the Chicago Bridge & Iron Co., and 460 tons from the Worder Alen Co.

The Boston & Maine has ordered 250 tons of bridge material from the American Bridge Co. and 400 tons from the Pennsylvania Steel Co.

The Cincinnati, Hamilton & Dayton has ordered 1,300 tons of bridge material from the American Bridge Co. and 1,200 tons from the McClintic-Marshall Construction Co.

The Southern Railway will order 46,000 tons of steel rails, of which 36,000 tons will be for the Southern Railway proper, and the remainder for the Georgia Southern & Florida, the Virginia & Southwestern, the Mobile & Ohio, the Alabama Great Southern and the Cincinnati, New Orleans & Texas Pacific Railways. The larger part will be ordered from the Tennessee Coal, Iron & Railroad Company.

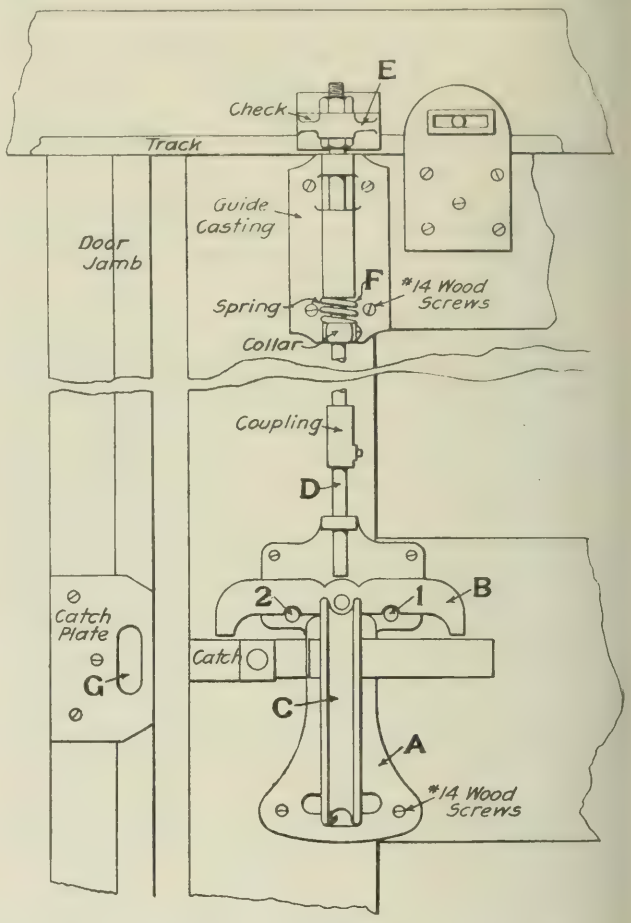
General Conditions.—An encouraging feature is the better demand of the railways for new equipment. Since the first of the month orders have been coming in at a rate close to the capacity of the mills. The strike at the works of the Bethlehem Steel Corporation is practically at an end and the number of employees is increasing daily.

The Swiss State Railways increased their gross earnings 1.7 per cent. and decreased their expenses 2 per cent. in 1909, which resulted in an increase of nearly 9 per cent. in net earnings, amounting to about $950,000.

Laconia Sliding Door Fastener.

This door fastener is intended for application to the sliding doors of mail, baggage or express cars. Its purpose is to hold such doors in a closed or partially open position and to prevent their moving under the jarring action of the car, or because of sudden stopping or starting.

It consists of a friction slide that is pressed down against the running rail by a stiff spring whenever the door is at rest, but which is lifted out of the way when it is to be moved. It may also be used to lock the door in the closed position. To accomplish this there is a latch support, A, fastened by screws to the door near its edge. This support has two fulcrum studs, 1 and 2, projecting from its face, and carries a latch, B, which rests upon them. This latch is made



Laconia Sliding Door Fastener for Mail Cars.

solid with a handle, C. Now, if this handle is moved to the right or left, the latch, B, will come to a bearing upon one fulcrum or the other and, turning about it, will lift the central portion beneath the rod, D. The upper end of this rod is rigidly attached to and carries the check shoe, E, which rests upon the rail. Ordinarily the rod, D, with the shoe is pushed down against the rail by the spring, F, which seats against a guide casting fastened to the upper part of the door and a collar fastened to the rod.

If the door is to be moved, the latch handle, C, is pulled in the direction of that movement. This relieves the pressure of the shoe on the top of the rail and releases the door, which then moves on the regular sheave rollers. The pressure of the shoe on the rail is dependent upon the stiffness of the spring, so that it may be made to carry any amount up to half the weight of the door.

When closed the latch drops over a catch plate, G, which is fastened to the door-jamb. By holding the latch down with a lock or bolt the door may be locked. It is evident that any type of door rail may be used, and that the fastener may be adapted to any weight of door. The device is in the hands of Irving S. Elliot, Lakeport, New Hampshire.

ANNUAL REPORT.

NEW YORK CENTRAL & HUDSON RIVER RAILROAD CO. FORTY-FIRST ANNUAL REPORT: FOR THE YEAR ENDED DECEMBER 31, 1909.

The Board of Directors herewith submits its report for the year ended December 31, 1909, with statements showing the results for the year and the financial condition of the company. The income account for the year and the various tables of statistics are shown in the form promulgated by the Interstate Commerce Commission and the details of the previous year have been revised for purposes of comparison.

The mileage embraced in the operation of the road is as follows:

Main line and branches owned	805.47 miles
Proprietary lines	3.06 "
*Lines leased	2,617.93 "
Lines operated under contract	81.70 "
Trackage rights	273.67 "
Total road operated	3,781.83 miles

The slight increase in road mileage operated is due to change of alinement and measurement at various points on the system. A statement showing in detail miles of road and track operated will be found upon another page.

The capital stock authorized and outstanding is as follows:

Authorized to December 31, 1909	$250,000,000.00
There was no change during the year in the amount issued and outstanding, the total on December 31, 1909, being	178,632,000.00
Balance authorized but not issued December 31, 1909	$71,368,000.00

The funded debt outstanding on December 31, 1908, was $243,414,845.00

There have been issued and sold during the year Gold mortgage bonds	4,000,000.00
and Gold bonds secured by a mortgage on the Spuyten Duyvil & Port Morris Railroad	2,500,000.00

making the total funded debt outstanding on December 31, 1909 $249,914,845.00

* The Dunkirk, Allegheny Valley & Pittsburg Railroad, 90.51 miles, is also leased by this company, but its mileage and operations are not included in this report. Separate accounts are kept and independent reports prepared in its behalf.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

OPERATING INCOME.	1909. 3,781.83	1908. 3,780.79	Increase or *decrease.* *1.04 miles.*
RAIL OPERATIONS	*miles operated.*	*miles operated.*	
Revenues	$93,171,860.69	$83,927,354.29	$9,244,506.40
Expenses	64,593,826.35	61,289,304.00	3,304,522.35
NET REVENUE FROM RAIL OPERATIONS	$28,578,034.34	$22,638,050.29	$5,939,984.05
Percentage of expenses to revenue	(69.33%)	(73.03%)	*(3.70%)*
OUTSIDE OPERATIONS.			
Revenues	$4,517,996.90	$3,678,616.47	$839,380.43
Expenses	4,312,028.96	3,542,495.95	769,533.01
NET REVENUE FROM OUTSIDE OPERATIONS	$205,967.94	$136,120.52	$69,847.42
NET REVENUE FROM ALL OPERATIONS	$28,784,002.28	$22,774,170.81	$6,009,831.47
TAXES ACCRUED	4,434,504.32	4,253,086.64	181,417.68
OPERATING INCOME	$24,349,497.96	$18,521,084.17	$5,828,413.79
OTHER INCOME.			
Joint facilities rents	$1,274,627.35	$1,160,380.38	$114,246.97
Miscellaneous rents	506,611.57	880,223.30	*373,611.73*
Dividends on stocks owned or controlled	7,692,497.79	7,968,785.74	*276,287.95*
Interest on funded debt owned	577,901.13	499,492.66	78,408.47
Interest on other securities, loans and accounts	1,080,595.14	1,352,400.64	*271,805.50*
Miscellaneous income	260,625.88	750,712.97	*490,087.09*
TOTAL OTHER INCOME	$11,392,858.86	$12,611,995.69	*$1,219,136.83*
GROSS CORPORATE INCOME	$35,742,356.82	$31,133,079.86	$4,609,176.96
DEDUCTIONS FROM GROSS CORPORATE INCOME.			
Rentals of leased lines	$9,943,576.81	$9,708,044.63	$235,532.18
Hire of equipment:			
Car mileage and per diem balances	959,684.09	1,473,594.49	*513,910.40*
Interest on equipment trust certificates	548,948.26	586,545.01	*37,596.75*
Joint facilities rents	449,441.42	404,479.42	44,962.00
Miscellaneous rents	83,057.29	6,159.41	76,897.88
Interest on funded debt	8,913,651.53	8,501,964.02	411,687.51
Other interest	940,970.39	1,179,576.33	*238,605.94*
St. L. & A. Railway: interest, rental, etc.	74,000.00	138,600.00	*64,600.00*
N. Y. & Ottawa Railway: interest on bonds	58,240.00	58,240.00	
Other deductions	75,366.67		75,366.67
TOTAL DEDUCTIONS FROM GROSS CORPORATE INCOME	$22,046,936.46	$22,057,203.31	*$10,266.85*
NET CORPORATE INCOME	$13,695,420.36	$9,075,876.55	$4,619,543.81

NOTE.—Decreases in *italics*.

DIVIDENDS, four, aggregating 5%	1909. $8,931,600.00	1908. $8,931,600.00	Increase or *decrease.*
SURPLUS FOR THE YEAR	$4,763,820.36	$144,276.55	$4,619,543.81
Balance to credit of profit and loss December 31, 1908			$10,946,870.96
Surplus for the year ended December 31, 1909			4,763,820.36
Add: Profit on sale of capital stock of Chesapeake & Ohio Railway Co.			1,354,410.21
			$17,065,101.53
Deduct:			
Adjustment of items assumed under various leases			$781,192.15
Injury claims prior to 1909			809,632.45
Improvement on Boston & Albany Railroad assumed by lessee			48,000.00
Cancellation of uncollectible charges and sundry adjustments			17,089.26
			$1,655,913.86
BALANCE, DECEMBER 31, 1909			$15,409,187.67

The revenues from operation of the properties of the company are now divided into three classes: revenue from transportation, revenue from operations other than transportation and revenue from outside operations.

For the year covered by this report the revenue from transportation was $92,238,523.28, an increase of $9,174,703.16; revenue from operations other than transportation was $933,337.41, an increase of $69,803.24; revenue from outside operations (connected with, but in addition to transportation by rail) were $4,517,996.90, an increase of $839,380.43.

The total gross revenue from all operations was $97,689,857.59, an increase of $10,083,886.83.

All sources of revenue from transportation have shown an increase with the exception of the mail service. The United States Government has established a new basis of computing the weight of mail matter, resulting in a diminution of the compensation of this company of approximately 14 per cent. from July 1, 1909.

Freight revenue was $54,449,281.47, an increase of $5,888,099.98. The revenue freight carried amounted to 44,171,954 tons, an increase of 5,093,792 tons over last year, and with the exception of the year 1907 reached a higher total than in any other year of the company's history. The average tonnage for the four years, 1905 to 1908, was 43,240,164, so that the traffic for the year 1909 was 931,000 tons above the average of the four best previous years. Large increases show in all mineral and manufacturing products, the decreases in the classified list of commodities being in food stuffs, such as grain, fruits and vegetables, live stock, dressed meats and other packing house products, and dairy products. The largest increases occurred in bituminous coal, lumber and miscellaneous manufactures, while ores, iron and machinery were carried in largely increased quantities.

The revenue from passengers amounted to $29,001,911.18, an increase of $2,393,145.37. An increase in the number of local passengers carried of 1,412,711 and an increase of 1,661,266 in commutation passengers carried, with a slight increase in the average distance of travel and in the average receipts per mile, show that the passenger traffic over this company's lines is in a more satisfactory condition than in 1908, during which it suffered from the stagnation caused by the financial panic of the end of the year 1907. The figures of the year compare favorably with those of 1906 and 1907.

The revenue from express traffic was $4,081,575.49, an increase of $495,821.82, due to an enlarged volume of business.

The expenses of rail operations amounted to $64,593,826.35, an increase of $3,304,522.35 Included in this increase is an augmented charge for renewals of equipment amounting to $1,366,496.76.

The operating expenses by groups were:

Maintenance of way and structures	$11,494,023.08
Maintenance of equipment	15,421,648.21
Traffic expenses	2,273,827.68
Transportation expenses	33,309,314.82
General expenses	2,095,012.56
Outside operations	4,312,028.96

In maintenance of way and structures most of the items show small increases, due not to excessive expenditures this year, but to the comparatively small amount of work done in the months following the financial disturbance at the end of 1907. The only large increases are for ballast, labor on roadway and track, bridge structures and buildings and fixtures.

In maintenance of equipment an increase of $2,430,231.91 is shown, due mainly to a largely increased cost for repairs of freight cars and the inclusion in this year's expenses of an increase of $1,366,496.76 for renewals of equipment, consequent on a change of method in handling this account, which was instituted July 1, 1908, since which time this company has charged to renewals of equipment account the full value, less salvage, of all equipment demolished or taken out of service, so that the year 1909 has borne its full proportion of such charges while 1908 had corresponding charges for the last six months only.

Traffic expenses, being those charges incurred in soliciting and procuring traffic outside of its actual movement by rail, amounted to $2,273,827.68, an increase of $205,136.27, mainly due to larger payments on account of expenses of fast freight lines and to wider advertising.

The cost of transportation shows decreases in a large majority of the accounts, the most noticeable one being $436,387.33 in payments for loss and damage to freight. Fuel for locomotives shows a decreased cost of $310,531.20, partly offset by an increase of $127,288.50 in the cost of electric power.

General expenses show a small net increase due almost entirely to larger disbursements for law expenses.

In outside operations the net revenue shows an increase of $69,847.42, the result of an increase of $839,380.43 in the revenue derived against an increase of $769,533.01 in the expenses incurred.

The net revenue from all operations amounted to $28,784,002.28, an increase of $6,009,831.47.

In deductions from gross corporate income an increase of $235,532.18 occurred for rentals of leased lines. The rental of the Boston & Albany Railroad increased $238,777.79, due to the payment of interest for the whole year on $7,000,000 Improvement bonds and for six month on an additional $4,500,000 of Improvement bonds.

Interest on bonds of this company shows an increase of $411,687.51, due to the charge on $4,000,000 Gold mortgage bonds for a full year, on $13,000,000 Gold debentures of 1904 for twelve months, as against four months of 1908, and the charge for interest on the Spuyten Duyvil & Port Morris Railroad mortgage bonds from July 21, 1909.

The surplus for the year, after paying a dividend of $8,931,600, representing 5 per cent upon the capital stock, was $4,763,820.36.

Extraordinary expenditures during the year were as follows:

For additions to property, charged to cost of road and equipment		$6,216,747.03
For construction work on leased lines and for Grand Central terminal improvement, charged in part against funds provided by lessor companies	$9,389,381.67	
Less amount refunded from proceeds of securities of lessor companies	7,000,000.00	2,389,381.67
Total		$8,606,129.60

Details of the above-mentioned expenditures are shown on subsequent pages.

The operation of trains by electricity has been extended to Yonkers on the Hudson River division for trains equipped with the multiple unit system and the necessary work for the extension of electric operation on the Harlem division from Wakefield to North White Plains is rapidly nearing completion.

In pursuance of the plan outlined in last year's report for the consolidation and merger of several electric railway companies into a corporation to be known as the New York State Railways, various exchanges of capital stock have been made with the result that this company's holdings in electric railway corporations now stand as follows:

New York State Railways	133,650 shares
Ontario Light & Traction Company	600 shares
Rochester Electric Railway Company	1,043 shares
Rochester & Suburban Railway Company	2,404 shares

On October 27, 1909, the board of directors authorized the issue of 446,580 of the 713,680 shares remaining unissued under previous authorizations, to the stockholders of record at 3 o'clock p. m. on Friday, December 10, 1909, to the extent of 25 per cent. of their holdings, the shares so issued to participate in dividends declared after the beginning of the year 1910. On November 3 the Public Service Commission of the Second District of the State of New York approved of the issue, defining the use of the proceeds of the sale of the stock as follows: $21,966,615.48 for the discharge of a portion of the three-year gold notes of the company maturing February 1, 1910, and the remaining $22,691,384.52 for the acquisition of property and for the extension and improvement of facilities, of which sum $9,000,000 may be used for the purchase of new equipment and rolling stock.

On November 10, the board of directors approved a plan, to take effect January 1, 1910, for the retirement and pensioning of employees of the company who, through age or disability, become unable to continue longer in its service. A board of pensions, consisting of eight persons to be appointed annually by the president of the company, was established, and the sum of $225,000, or such portion thereof as may be necessary, was authorized to be appropriated annually for the payment of pensions. The plan provides that all employees who reach the age of 70 years shall be retired and such of them as have been in the service for at least ten years immediately preceding their retirement shall be pensioned. Those employees who, having been in the service continuously for 20 years, become, in the opinion of the board of pensions, unfitted for duty, may be retired and pensioned.

The following apointments have been made during the year: February 1, Frank V. Whiting, claims attorney; April 28, Edward F. Stephenson, assistant secretary; October 11, F. Breakey Freeman, chief engineer of Boston & Albany Railroad; October 20, Julius W. Pfau, engineer of construction.

William H. Newman, who had been president of this company from June 3, 1901, resigned February 1, 1909, and William C. Brown, who had been vice-president from January 4, 1902, bearing the title of senior vice-president from May 18, 1906, was elected president on January 27. Samuel F. Barger, who had been a director of this company from November 1, 1869, and Charles C. Clarke, who had been a director since May 4, 1883, and first vice-president from the same date until November 9, 1900, resigned from the board, and their places were filled by William C. Brown and Edward H. Harriman. Mr. Harriman died on September 9, and Marvin Hughitt was elected a director on October 13, 1909, to complete the board.

The relations of the road with its patrons and the communities served by it have been harmonious and pleasant.

This mutually satisfactory condition has been fostered and encouraged by the efforts of the Public Service Commission in New York State and the Massachusetts Board of Railroad Commissioners, in composing and adjusting differences which, handled with less wisdom and moderation, might have resulted in serious friction and controversy. The influence and the co-operation of these Commissions have been uniformly beneficial to the road, and have done much to improve the service for the public.

Does not this very desirable result emphasize the advantage of appointing to positions so vitally affecting every business interest of the country, men qualified by experience, temperament and ability to discharge the important duties of their office? Governmental regulation of railroads, within proper limitations, is of benefit to the public, to the railroads and to those who hold their securities; but, in order to secure the maximum benefit for all interests, it is important that men selected for these positions should possess the necessary natural breadth and ability, and in addition thereto a willingness to undertake the conscientious, painstaking study of conditions necessary to enable them to deal intelligently with the complex and delicate questions affecting transportation that are constantly arising.

General conditions were never more favorable, and every visible indication points to renewed and increasing prosperity for the country at large, in which the railroads may hope to participate.

The business of the road shows steady increase; and expenditures which have been made for improvements, adding to efficiency and economy of operation, should be reflected in increased net revenue.

Appreciative acknowledgment is made of the faithful, efficient performance of duty by employees in every department of the service during the year.

WILLIAM C. BROWN,
President.

EQUIPMENT.

Including Equipment of Leased Lines.

	1909	1908
Locomotives	1,858	1,924
Cars in passenger service	2,365	2,326
Cars in freight service	61,858	62,843
Cars in company's service	3,670	3,505
Marine department vessels:		
Total floating equipment	257	256
Total ledger value of fleet	$2,853,964.84	$2,282,327.15
Leased Under Equipment Trust.		
Locomotives	447	437
Cars in passenger service	88	88
Cars in freight service	3,980	3,989
Summary of Equipment in Service.		
Locomotives	2,305	2,361
Cars in passenger service	2,453	2,414
Cars in freight service	65,838	66,832
Cars in company's service	3,670	3,505
Vessels in marine department service	257	256

TRAFFIC STATISTICS.

Freight	1909.	1908.	Increase or *decrease.*
Tons of revenue freight carried	44,171,954	39,078,162	5,093,792
Tons of company freight carried	6,924,084	6,240,311	683,773
Total tons of freight carried	51,096,038	45,318,473	5,777,565
Tons of revenue freight carried one mile	8,622,952,658	7,784,641,505	845,311,153
Tons of company freight carried one mile	1,244,696,813	1,151,277,700	93,419,113
Total tons of freight carried one mile	9,874,649,471	8,935,919,205	938,730,266
Miles of road operated in freight service	3,766.65	3,765.61	1.04
Tons of revenue freight carried one mile per mile of road	2,291,148	2,067,299	223,849
Tons of freight carried one mile per mile of road	2,621,600	2,373,034	248,566
Average distance haul of one ton of revenue freight	195.37	199.21	*3.84*
Average distance haul of one ton, all freight	193.26	197.18	*3.92*
Average number of tons of revenue freight per train mile	404.42	384.49	19.93
Average number of tons all freight per train mile	462.75	441.36	21.39
Average number of tons of revenue freight per loaded car mile	16.30	16.58	*.28*
Average number of tons all freight per loaded car mile	18.66	19.03	*.37*
Average number of freight cars per train mile	37.52	36.26	1.26
Average number of loaded cars per train mile	24.81	23.19	.62
Average number of empty cars per train mile	11.71	12.06	*.35*
Total freight revenue	$54,449,281.47	$48,561,181.49	$5,888,099.98
Average amount received for each ton of freight	$1.23	$1.24	*$0.01*
Average revenue per ton per mile	mills 6.54	mills 6.24	mills 0.30
Average revenue per mile of road	$14,455.63	$12,895.97	$1,559.66
Average revenue per train mile	$2.55	$2.40	$.15
Passenger			
Number of interline passengers carried	3,016,069	2,794,731	221,338
Number of passengers carried	29,125,834	27,713,123	1,412,711
Number of commutation passengers carried	13,703,165	12,041,899	1,661,266
Total number of revenue passengers carried	45,845,068	42,549,753	3,295,315
Total number of revenue passengers carried one mile	1,658,878,092	1,526,259,276	132,618,816
Miles of road operated in passenger service	3,494.04	3,506.06	*12.02*
Number of revenue passengers carried one mile per mile of road	474,774	435,320	39,454
Average distance each revenue passenger carried	36.18	35.87	.31
Average number of passengers per train mile	66	63	3
Average number of passengers per car mile	16	16	
Average number of passenger cars per train mile	6	6	
Total passenger revenue	$29,001,911.18	$26,608,765.81	$2,393,145.37
Average amount received from each passenger	cents 63.26	cents 62.54	cents .72
Average revenue per passenger per mile	cents 1.748	cents 1.743	cents .005
Total passenger service train revenue	$36,552,882.35	$33,678,714.18	$2,874,168.17
Average passenger service train revenue per mile of road	$10,461.50	$9,605.86	$855.64
Average passenger service train revenue per train mile	$1.44	$1.39	$0.05
Total Traffic.			
Operating revenue	$93,171,860.69	$83,927,345.29	$9,244,506.40
Operating expenses	64,593,826.35	61,289,304.00	3,304,522.35
Net operating revenue	28,578,034.34	22,638,050.29	5,939,984.05

NOTE.—Decreases in *italics.*

	1909.	1908.	Increase or *decrease.*
Operating revenue per mile of road	$24,636.71	$22,198.36	$2,438.35
Operating expenses per mile of road	17,080.04	16,210.71	869.33
Net operating revenue per mile of road	7,556.67	5,987.65	1,569.02
Operating revenue per train mile	2.00	1.89	11
Operating expenses per train mile	1.39	1.38	01
Net operating revenue per train mile	61	51	10

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1909.

Assets.

Cost of Road and equipment	$229,056,160.52
Securities owned	126,567,336.23
Other permanent investments	$10,918,680.99
Cash and current assets	80,069,412.80
Deferred assets	48,467,359.52
Total assets	$495,108,850.06

Liabilities.

Capital stock	178,632,000.00
Mortgage, bonded and secured debt	275,064,845.00
Working liabilities	17,350,370.13
Deferred credit items	1,187,271.08
Reserves for replacement of property	20,811.70
Additions to property through income since June 30, 1907	1,144,364.48
Profit and loss; surplus	15,409,187.67
Total liabilities	$495,108,850.06

FORTIETH ANNUAL REPORT, LAKE SHORE & MICHIGAN SOUTHERN RAILWAY COMPANY: FOR THE YEAR ENDED DECEMBER 31, 1909.

To the Stockholders of
THE LAKE SHORE & MICHIGAN SOUTHERN RAILWAY COMPANY:

The Board of Directors herewith submits its report for the year ended December 31st, 1909, with statements showing the results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

	Miles
Main line and branches	870.89
Proprietary lines	215.57
Leased lines	488.50
Trackage rights	87.83
Total	1,622.79

The miles of road operated has increased during the years as follows:

Leased lines increased	72.46	
Trackage rights increased	84.50	156.96
Proprietary lines decreased		5.27
Net increase		151.69

A statement showing in detail the miles of road and track operated will be found upon another page.

There was no change in capital stock during the year, the amount authorized and outstanding December 31st, 1909, being $50,000,000.00

There has been no change in the funded debt of the company, the amount outstanding December 31st, 1909, being $135,400,000.00

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

	1909.	1908.	Increase or *decrease.*
OPERATING INCOME.	1,662.79	1,511.10	151.69
RAIL OPERATIONS	*miles operated.*	*miles operated.*	*miles operated.*
Revenues	$45,110,997.15	$39,066,941.55	$6,044,055.60
Expenses	28,023,661.04	25,206,504.44	2,817,156.60
NET REVENUE FROM RAIL OPERATIONS	$17,087,336.11	$13,860,437.11	$3,226,899.00
Percentage of expenses to revenues	(62.12%)	(64.52%)	*(2.40%)*
OUTSIDE OPERATIONS.			
Revenues	$422,399.56	$326,581.91	$95,817.65
Expenses	501,306.73	334,392.10	166,914.63
NET DEFICIT FROM OUTSIDE OPERATIONS	$78,907.17	$7,810.19	$71,096.98
NET REVENUE FROM ALL OPERATIONS	$17,008,428.94	$13,852,626.92	$3,155,802.02
TAXES ACCRUED	1,458,905.00	1,433,646.68	25,258.32
OPERATING INCOME	$15,549,523.94	$12,418,980.24	$3,130,543.70
OTHER INCOME.			
Joint facilities rents	$381,596.15	$289,975.67	$91,620.48
Miscellaneous rents	43,070.37	114,438.56	*71,368.19*
Dividends on stocks owned or controlled	4,550,205.62	3,126,758.17	1,423,447.45
Interest on funded debt owned	231,310.00	241,091.32	*9,781.32*
Interest on other securities, loans and accounts	1,268,721.45	1,321,966.13	*53,244.68*
Miscellaneous income	11,983.69	2,850.86	9,132.83
TOTAL OTHER INCOME	$6,486,887.28	$5,097,080.71	$1,389,806.57
GROSS CORP'ATE INCOME	$22,036,411.22	$17,516,060.95	$4,520,350.27
DEDUCTIONS FROM GROSS CORPORATE INCOME.			
Rentals of leased lines	$1,858,691.23	$1,100,381.87	$758,309.36
Hire or equipment:			
Car mileage and per diem balances	272,621.06	601,200.38	*328,579.32*
Interest on equipment trust certificates	309,331.46	289,225.42	20,106.04
Joint facilities rents	277,237.45	245,347.55	31,889.90
Miscellaneous rents	5,051.46	6,701.92	*1,650.46*
Interest on funded debt	5,920,000.00	5,920,000.00	
Other interest	75,181.93	179,415.86	*104,233.93*
Dividend on guaranteed stock	64,020.00	64,020.00	
Additions and betterments		1,433,567.61	*1,433,567.61*
Additional equipment	1,263,186.28		1,263,186.28
Other deductions	336,728.52		336,728.52

NOTE.—Decreases in *italics.*

	1909.	1908.	Increase or *decrease.*
TOTAL DEDUCTIONS FROM GROSS CORP'TE INCOME.	$10,382,049.39	$9,839,860.61	$542,188.78
NET CORPORATE INCOME	$11,654,361.83	$7,676,200.34	$3,978,161.49
DIVIDENDS, TWO, AGGREGATING 12%	5,935,980.00	5,935,980.00	
SURPLUS FOR THE YEAR	$5,718,381.83	$1,740,220.34	$3,987,161.49

From the surplus for the year there was *deducted*: $5,718,381.83

Net loss in adjustment of sundry accounts 68,211.92

$5,650,169.91

Amount to the credit of profit and loss, December 31, 1908 21,515,868.19

Balance December 31, 1909 $27,166,038.10

The operating revenues for the year were $45,110,997.15, an increase of $6,044,055.60 as compared with last year.

Revenue derived from transportation of freight amounted to $29,735,276.62, an increase of $4,697,172.90, due to improved business conditions during the year, and a resulting increase in tonnage handled.

Passenger revenue was $10,154,220.17, an increase of $1,080,551.41, due to a substantial improvement in passenger traffic, and a greater number of passengers carried.

The revenue from transportation of mails was $2,124,186.70, a decrease of $64,028.39.

The revenue from express traffic was $1,502,022.08, an increase of $41,618.34.

Other passenger train revenue including excess baggage and milk, amounted to $637,924.21, an increase of $152,898.83.

Switching and other transportation revenue amounted to $604,181.99, an increase of $91,139.54, due principally to larger receipts from switching service.

Revenues other than from transportation were $353,185.38, an increase of $44,702.97, due principally to larger revenue derived from rents of buildings and other property.

The operating expenses for the year amounted to $28,023,661.04, an increase of $2,817,156.60.

Maintenance of way and structures increased $672,079.12. The resumption during the year of important improvement work, consisting of four tracking the main line, strengthening and rebuilding bridges, additional ballasting, etc., made necessary heavy charges to maintenance to provide for changes to existing roadway and structures.

Maintenance of equipment increased $1,358,728.50, due to the large amount and extensive use of equipment in service during the year.

Traffic expenses increased $123,056.37, due principally to a larger cost to this company in maintaining fast freight lines and outside agencies.

Transportation expenses increased $634,869.80, due to heavier volume of traffic handled, affecting largely station and train service.

General expenses increased $28,422.81.

Outside operations show a loss for the year of $78,907.17, due to a deficit in the operation of dining cars and commercial ice supply plants.

Taxes accrued increased $25,258.32.

Other income for the year amounted to $6,486,887.28, an increase of $1,389,806.57, due to additional revenue received from dividends on stocks owned and rental of joint facilities.

Deductions from gross corporate income amounted to $10,382,049.39, an increase of $542,188.78.

Rentals of leased lines increased $758,309.36, due to a larger rental paid Mahoning Coal Railroad Company on account of increase in traffic handled over that road, and rental paid to Jamestown, Franklin & Clearfield Railroad Company.

Other deductions increased $336,728.52, due to amount paid to the Indiana Harbor Belt Railroad Company as this company's proportion of its deficit from operation.

From the net corporate income of the company for the year, amounting to $11,654,361.83, two dividends, aggregating 12 per cent., amounting to $5,935,980.00, were paid, leaving a surplus for the year of $5,718,381.83.

Additions and betterments to the property during the current year were $3,564,414.00, the full amount of which was charged direct to capital account. By the elimination of this expense from charges to "Income" in 1909, that account shows a decrease in additions and betterments to the extent of $1,433,567.61, the amount charged to such account in the previous year.

Expenditures for new equipment purchased during the year, including this company's equity in the New York Central Lines equipment trust of 1907, were as follows:

20 Freight locomotives	$336,617.96
25 Passenger coaches	278,302.04
2 Dining cars	32,808.21
2 Café cars	28,553.78
4 Postal cars	40,108.03
1,000 Self-clearing steel gondola cars	932,574.58
8 Coal cars, 208 Company's service cars, etc.	113,304.62

Second instalment of 1907 Equipment Trust	$447,226.18
	$2,209,495.40
Of the total expenditures as above there was charged to Replacement Fund the sum of.	$946,309.12
and against income the sum of	1,263,186.28
Total	$2,209,495.40

The company acquired through lease, dated April 1, 1909, the entire railroad and property of the Jamestown, Franklin & Clearfield Railroad Company, extending from the Ohio-Pennsylvania State Line to Oil City, Pennsylvania, and from Polk Junction to Brookville, Pennsylvania—the latter part of the road being under construction at date of lease, and opened for operation on September 26, 1909.

In connection with the opening of the above line, trackage rights were acquired over the tracks of the Pennsylvania Railroad between Brookville and Falls Creek, Pennsylvania, and over the tracks of the Buffalo, Rochester & Pittsburgh Railroad between Falls Creek and Clearfield, Pennsylvania, forming a connection with the New York Central & Hudson River Railroad at the latter point—thereby giving the company a direct line from the coal fields of Central Pennsylvania to the port of Ashtabula on Lake Erie. The above largely accounts for the increase in mileage of leased lines and trackage rights.

The company exchanged during the year all of its holdings of the capital stock of the Central Trunk Railway Company, the Franklin & Clearfield Railroad Company, the Jackson Coal Railroad Company and the Jamestown & Franklin Railroad Company for a like amount of the capital stock of the Jamestown, Franklin & Clearfield Railroad Company, the latter company being a consolidation of the four former-named companies, and in addition thereto the company acquired through purchase 2,535 shares of the capital stock of the Jamestown, Franklin & Clearfield Railroad Company, and received in reimbursement for advances made to that company for construction purposes $11,000,000.00 of its first mortgage 4 per cent. bonds.

There were also purchased during the year 35,000 shares of stock of the Cleveland Short Line Railway Company, 50,001 shares of stock of the Pittsburgh & Lake Erie Railroad Company and $884,000.00 of the Lake Shore & Michigan Southern Railway Company's three year, 5 per cent. gold notes of 1907.

There were acquired through exchange $507,000.00 of bonds of the Chicago, Kalamazoo & Saginaw Railway Company, for which this company relinquished 1,800 shares of the preferred stock and a promissory note of that company.

On November 10 the Board of Directors approved a plan, to take effect January 1, 1910, for the retirement and pensioning of employees of the company who, through age or disability, become unable to continue in its service. A Board of Pensions, consisting of eight persons to be appointed annually by the President of the company, was established and the sum of $85,000,00, or such smaller amount as may be necessary, was authorized to be appropriated annually for the payment of pensions. The plan provides that all employees who reach the age of seventy years shall be retired, and that such of them as have been in the service for at least ten years immediately preceding their retirement shall be pensioned. Those employees who, having been in the service continuously for twenty years, become, in the opinion of the Board of Pensions, unfitted for duty may be retired and pensioned.

The summary of financial operations affecting income and detailed exhibits of operating revenues, expenses, etc., are compiled in accordance with the recent classifications promulgated by the Interstate Commerce Commission.

On January 1 Mr. Herbert D. Howe was appointed General Land and Tax Agent and Mr. Ora E. Butterfield was appointed Assistant General Solicitor of the company.

On February 1 Mr. William C. Brown was elected President of the company.

On May 1 Mr. Edward F. Stephenson was appointed Assistant Secretary of the company.

On August 1 Mr. George M. Glazier was appointed Assistant Auditor and Mr. George F. Tomlinson was appointed Auditor of Disbursements of the company.

On November 1 Mr. Newton D. Doughman was appointed Assistant General Attorney of the company.

General conditions were never more favorable, and every visible indication points to renewed and increasing prosperity for the country at large, in which the railroads may hope to participate.

The business of the road shows steady increase, and expenditures which have been made for improvements, adding to efficiency and economy of operation, should be reflected in increased net revenue.

Appreciative acknowledgment is made of the faithful, efficient performance of duty by employes in every department of the service during the year.

WILLIAM C. BROWN,
President.

CAPITALIZATION.

Capital Stock.

Number of shares issued—Common	494,665
Number of shares issued—Guaranteed 10 per cent.	5,335
Total number of shares outstanding	500,000
Number of shares authorized	500,000
Total par value issued and outstanding	$50,000,000.00
Total par value authorized	$50,000,000.00
Par value per share	$100.00

Amount of capital stock per mile of road owned (870.89 miles), $57,412.53.

Funded Debt.

Class of bond.	Date of issue.	Date of maturity.
Gold mortgage	1897	June 1, 1997
Gold bonds	1903	Sept. 1, 1928
Gold bonds	1906	May 1, 1931

Amount of authorized issue.	Amount issued and now outstanding.	Rate of interest.	Payable on the first days of
$50,000,000.00	$50,000,000.00	3½%	December and June
50,000,000.00	50,000,000.00	4 %	March and September
50,000,000.00	35,000,000.00	4 %	November and May

Bonds of Other Roads Assumed by This Company.

Kalamazoo & White Pigeon		1890	Jan. 1, 1940
400,000.00	400,000.00	5 %	January and July

Amount of funded debt per mile of road owned (870.89 miles), excluding Kalamazoo & White Pigeon bonds, $155,013.83.

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1909.

Assets.

Property owned as investment		$108,401,192.95
Working assets:		
Cash	$13,998,004.31	
Marketable securities	95,525,939.25	
Loans and bills receivable	3,952,915.88	
Net traffic, car mileage and per diem balance	793,191.73	
Net balance due from agents and conductors	592,343.61	
Miscellaneous accounts receivable	8,450,106.01	
Materials and supplies	3,684,439.41	
Other working assets	375,206.76	
		127,372,146.96
Deferred debit items		10,857,528.20
Total assets		$246,720,868.11

Liabilities.

Stock	$50,000,000.00
Mortgage, bonded and secured debt	150,400,000.00
Working liabilities	8,328,285.23
Dividends declared and interest and rents accrued, not due	4,583,149.01
Deferred credit items	245,327.19
Additions to property through income since June 30, 1907	5,998,068.58
Profit and loss—surplus	27,166,038.10
Total liabilities	$246,720,868.11

STOCKS AND BONDS OWNED.

Stocks.

	Number of shares	Total par value
Battle Creek & Sturgis Railway Co	825	$ 82,500.00
Chicago, Indiana & Southern Railroad Co. pf.	50,000	5,000,000.00
Chicago, Indiana & Southern Railroad Co	120,000	12,000,000.00
Chicago, Kalamazoo & Saginaw Railway Co.	1,800	180,000.00
Cleveland, Cincinnati, Chicago & St. Louis Railway Co.	302,077	30,207,700.00
Cleveland Short Line Railway Co	37,500	3,750,000.00
Detroit & Chicago Railroad Co	10,000	1,000,000.00
Detroit, Monroe & Toledo Railroad Co	4,141	414,100.00
Detroit, Toledo & Milwaukee Railroad Co.	7,500	750,000.00
Detroit Terminal Railroad Co	933	93,300.00
Elkhart & Western Railroad Co	4,598	229,900.00
Fairport & Phalanx Railroad Co	10	1,000.00
Hocking Valley Railway Co	11,540	1,154,000.00
Indiana Harbor Belt Railway Co	12,250	1,225,000.00
Jamestown, Franklin & Clearfield Railroad Co.	29,945½	2,994,550.00
Jefferson Coal Co	5,100	510,000.00
Kalamazoo & White Pigeon Railroad Co	2,309	230,900.00
Lake Erie, Alliance & Wheeling Railroad Co.	30,000	3,000,000.00
Lake Erie & Pittsburg Railway Co	50	5,000.00
Lake Erie & Western Railroad Co. pf	59,300	5,930,000.00
Lake Erie & Western Railroad Co	59,400	5,940,000.00
Lake Shore & Michigan Southern Railway Co.	39	3,900.00
Lansing Transit Railway Co	10	1,000.00
Mahoning Coal Railroad Co. pf	7,990	399,500.00
Mahoning Coal Railroad Co	17,318	865,900.00
Mahoning State Line Railroad Co	12	600.00
Merchants Despatch Transportation Co	23,335	2,333,500.00
New York, Chicago, & St. Louis Railroad Co. 1st pf.	25,030	2,503,000.00
New York, Chicago & St. Louis Railroad Co. 2d pf.	62,750	6,275,000.00
New York, Chicago & St. Louis Railroad Co.	62,400	6,240,000.00
Northern Central Michigan Railroad Co	5,985	598,500.00
Pittsburgh & Lake Erie Railroad Co	150,003	7,500,150.00
Reading Company 1st pf	121,300	6,065,000.00
Reading Company 2d pf	285,300	14,265,000.00
Reading Company	200,050	10,002,500.00
Sturgis, Goshen & St. Louis Railway Co	3,000	300,000.00
Swan Creek Railway Co	400	40,000.00
Taylor Street Warehouse Co	100	10,000.00
Terminal Railway of Buffalo	5,000	500,000.00
Toledo Terminal Railroad Co	4,800	480,000.00
Westinghouse Electric Manufacturing Co	6	300.00
Total par value stock		$133,081,800.00

Bonds.

	Total amount held
Chicago, Kalamazoo & Saginaw Railway Co. First mortgage	$ 507,000.00
Elkhart & Western Railroad Co. First mortgage	200,000.00
Jamestown, Franklin & Clearfield Railroad Co. First mortgage	11,000,000.00
Terminal Railway of Buffalo First mortgage	500,000.00
Total par value bonds	$ 12,207,000.00
Grand total par value stock and bonds	$145,288,800.00

The above securities are carried on the books of the company at a total value of $101,607,272.58.

FREIGHT.

	1909.	1908.	Increase or *decrease.*
Tons of revenue freight carried	33,080,566	26,212,378	6,868,188
Tons of company freight carried	3,821,702	3,053,484	768,218
Total tons of freight carried	36,902,268	29,265,862	7,636,406
Tons of revenue freight carried one mile	5,736,452,739	4,851,849,036	884,603,703
Tons of company freight carried one mile	279,385,464	227,072,584	52,312,880

NOTE.—Decreases in *italics*.

	1909.	1908.	Increase or *decrease.*
Total tons of freight carried one mile	6,015,838,203	5,078,921,620	936,916,583
les of road operated in freight service	1,543.73	1,511.10	32.63
ns of revenue freight carried one mile per mile of road	3,715,969	3,210,806	505,163
ns all freight carried one mile per mile of road	3,896,950	3,361,076	535,874
erage distance haul of one ton of revenue freight	173.4	185.1	*11.7*
erage distance haul of one ton all freight	163.0	173.5	*10.5*
erage number of tons of revenue freight per train mile	624.2	586.7	37.5
erage number of tons all freight per train mile	654.6	614.2	40.4
erage number of tons of revenue freight per loaded car mile	20.2	19.7	.5
erage number of tons all freight per loaded car mile	21.1	20.6	.5
erage number of freight cars per train mile	46.6	46.0	.6
erage number of loaded cars per train mile	31.0	29.8	1.2
erage number of empty cars per train mile	14.6	15.2	*.6*
tal freight revenue	$29,735,276.62	$25,038,103.72	$4,697,172.90
erage amount received for each ton of freight	cts. 89.9	cts. 95.5	*cts. 5.6*
erage revenue per ton per mile	cts. 0.518	cts. 0.516	cts. 0.002
erage revenue per mile of road	$19,261.97	$16,569.46	$2,692.51
erage revenue per train mile	$3.24	$3.03	$0.21
PASSENGER.			
mber of interline passengers carried	1,244,806	1,072,719	172,087
mber of local passengers carried	7,739,975	7,485,626	254.349
es of road operated in passenger service	1,516.21	1,529.80	*13.59*
Total number of revenue passengers carried one mile	$558,647,351	$491,518,018	$67,129,333
Total number of revenue passengers carried	8,984,781	8,558,345	426,436
Number of revenue passengers carried one mile per mile of road	368,450	321,296	47,154
Average distance each revenue passenger carried	62.18	57.43	4.75
Average number of passenger per train mile	64.59	60.89	3.70
Average number of passengers per car mile	16.18	16.86	*.68*
Average number of passenger cars per train mile	6.99	6.55	.44
Total passenger revenue	$10,154,220.17	$9,073,668.76	$1,080,551.41
Average amount received from each passenger	$1.13	$1.06	$0.07
Average revenue per passenger per mile	cts. 1.818	cts. 1.846	*cts. 0.028*
Total passenger service train revenue	$14,418,353.16	$13,207,312.97	$1,211,040.19
Average passenger service train revenue per mile of road	$9,509.47	$8,633.36	$876.11
Average passenger service train revenue per train mile	$1.67	$1.64	$0.03
TOTAL TRAFFIC.			
Operating revenues	$45,110,997.15	$39,066,941.55	$6,044,055.60
Operating expenses	28,023,661.04	25,206,504.44	2,817,156.60
Net operating revenue	$17,087,336.11	$13,860,437.11	$3,226,899.00
Operating revenues per mile of road	$29,121.53	$25,853.31	$3,268.22
Operating expenses per mile of road	18,090.75	16,680.90	1,409.85
Net operating revenue per mile of road	$11,030.78	$9,172.41	$1,858.37
Operating revenues per train mile	$2.54	$2.40	$0.14
Operating expenses per train mile	1.58	1.55	0.03
Net operating revenue per train mile	$0.96	$0.85	$0.11

NOTE.—Decreases in *italics*.

IXTY-FOURTH ANNUAL REPORT, MICHIGAN CENTRAL RAILROAD COMPANY: FOR THE YEAR ENDED DECEMBER 31, 1909.

the stockholders of the Michigan Central Railroad Company:

The Board of Directors herewith submits its report for the year ed December 31, 1909, with statements showing the results for year and the financial condition of the company.

ll revenues, operating expenses, other income, and train and engine eage, for the year ended December 31, 1909, are stated in accordance h the classifications required by the Interstate Commerce Comsion, effective July 1, 1908, and the general balance sheet in ordance with classification and order effective July 1, 1909.

The report covers the operation of the following mileage:

	Miles.
Main line	270.07
Proprietary lines	345.05
Leased lines	1,117.34
Lines operated under trackage rights	14.00
Total road operated	1,746.46

statement showing in detail the miles of road and track operated be found upon another page.

re was no change in capital stock uring the year, the amount authorized nd outstanding being — $18,738,000.00

funded debt outstanding December 1, 1908—including Three-year 5% Gold otes, issued February 1, 1907—was — 36,030,000.00

t has been increased during the year ed December 31, 1909, as follows:

higan Central—Jackson, Lansing & aginaw three and one-half per cent. old bonds of 1951 purchased and canceled by the Trustees of the Land rant Fund of the Jackson, Lansing & aginaw Railroad Company — 5,000.00

higan Central-Grand River Valley six er cent. bonds maturing September 1, 909, surrendered and paid — 1,500,000.00 — 1,505,000.00

The $1,500,000.00 of this company's ix per cent. bonds secured by mortgage xecuted by this company and the Grand iver Valley Railroad Company maured September 1, 1909, and will be efunded by the issue of $1,500,000.00 f new fifty year four per cent. bonds ut of a total authorized issue of 4,500,000.00 of bonds similarly secured.) — $34,525,000.00

ring the year there were issued out of n authorized total of $25,000,000.00, wenty year four per cent. gold debenures, provided for in an indenture ade between this company and Guarnty Trust Company of New York ated April 1, 1909 — 7,634,000.00

al funded debt December 31, 1909 (detail on another page) — $42,159,000.00

The charges in cost of road and equipment account were as follows:

Amount charged account Main line to December 31, 1908		$35,213,257.09
There was charged for additions and betterments in 1909:		
Against capital account	$1,069,702.64	
Against income account (equipment)	548,924.72	1,618,627.36
Additions and betterments charged to income June 30, 1907, to December 31, 1908 (set up as required by Interstate Commerce Commission)		1,129,103.84 — $37,960,988.29
Amount charged account Leased Lines to December 31, 1908		$14,245,038.87
There was charged for additions and betterments against capital account during 1909		872,734.29
Additions and betterments charged to income June 30, 1907, to December 31, 1908		503,518.30 — 15,621,291.46
Total to December 31, 1909		$53,582,279.75

The charges for new equipment during the year amounted in total to $1,443,041.06, disposed of as follows:

Charged to capital account as set forth elsewhere in detail		$894,116.34
Charged to income:		
Payments account trust equipment	$988,699.55	
Less—replacement and reserve funds—	439,774.83	
Balance—additions and betterments		548,924.72
Total		$1,443,041.06

Full particulars regarding the equipment acquired and rental paid under the terms of the New York Central Lines Equipment Trust Agreement and Lease of 1907 will be found on another page.

The Detroit Belt Line Railroad, which owns a valuable terminal and connecting railroad in the City of Detroit, Michigan, was organized May 18, 1909. This company owns the entire capital stock thereof, amounting to $100,000, and under agreement dated July 20, 1909, operates the road.

The construction of the double tube tunnel under and across the Detroit River by the Detroit River Tunnel Company, the entire capital stock of which latter company is owned by this company, has progressed almost to completion. The open cuts and approaches on both sides of the river are finished, and the tunnel under the river is finished so far as to be open for use for the purposes of construction. There remains only to be completed a portion of the interior lining of the sub-aqueous tunnel and the tracks and electrification work. It is expected that the tunnel can be put into use during the early part of 1910.

An arrangement has been made under the terms of which this company can acquire at any time, upon demand, the title to and possession of the property in the City of Detroit desired for the location of a proposed new passenger station, and a satisfactory ordi-

mance passed by the City providing for the necessary closing of streets and construction of subways, etc., has been accepted by this company.

On November 10, the Board of Directors approved a plan, to take effect January 1, 1910, for the retirement and pensioning of employees of the company who, through age or disability, become unable to continue longer in its service. A Board of Pensions, consisting of eight persons to be appointed annually by the President of the company, was established, and the sum of $50,000.00, or such smaller amount as may be necessary, was authorized to be appropriated annually for the payment of pensions. The plan provides that all employees who reach the age of seventy years shall be retired, and that such of them as have been in the service for at least ten years immediately preceding their retirement shall be pensioned. Those employees who, having been in the service continually for twenty years, become, in the opinion of the Board of Pensions, unfitted for duty, may be retired and pensioned.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

Operating Income.	1909. 1,746.46	1908. 1,746.46	Increase or *decrease.*
Rail operations	*miles operated.*	*miles operated.*	.....
Revenues	$27,415,467.20	$24,222,139.20	$3,193,328.00
Expenses	18,499,528.24	16,783,767.94	1,715,760.30
Net revenue from rail operations	$8,915,938.96	$7,438,371.26	$1,477,567.70
Percentage of expenses to revenue	(67.48%)	(69.29%)	(*1.81%*)
Outside operations.			
Revenues	$489,927.04	$473,281.68	$16,645.36
Expenses	541,079.10	492,314.52	48,764.58
Net deficit from outside operations	$51,152.06	$19,032.84	$32,119.22
Net revenue from all operations	$8,864,786.90	$7,419,338.42	$1,445,448.48
Taxes accrued	1,121,531.99	1,105,694.21	15,837.78
Operating income	$7,743,254.91	$6,313,644.21	$1,429,610.70
Other income.			
Joint facilities rents	$185,157.79	$185,019.56	$138.23
Miscellaneous rents	3,011.19	3,138.59	*127.40*
Dividends on stocks owned or controlled	248,153.85	239,066.50	9,087.35
Interest on funded debt owned	33,760.00	23,498.89	10,261.11
Interest on other securities, loans and accounts	471,397.82	392,795.38	78,602.44
Miscellaneous income	.....	.....	.....
Total other income	$941,480.65	$843,518.92	$97,961.73
Gross corporate income	$8,684,735.56	$7,157,163.13	$1,527,572.43
Deductions from gross corporate income.			
Rentals of leased lines	$510,310.00	$510,310.00	.....
Hire of equipment:			
Car mileage and per diem balances	714,640.99	803,909.87	*$89,268.88*
Interest on equipment trust certificates	180,127.61	214,402.05	*$4,274.44*
Joint facilities rents	516,400.76	488,738.99	27,661.77
Miscellaneous rents	5,959.84	6,712.07	*752.23*
Interest on funded debt	2,451,584.32	2,268,938.33	182,645.99
Other interest	747,290.52	841,896.40	*94,605.88*
Additions and betterments	.....	395,135.27	*$95,135.27*
Additional equipment	548,924.72	.....	548.924.72
Other deductions	137,000.00	.....	137,000.00
Total deductions from gross corporate income	$5,812,238.76	$5,530,042.98	$282,195.78
Net corporate income	$2,872,496.80	$1,627,120.15	$1,245,376.65
Dividends, two, aggregating 6%	1,124,280.00	1,124,280.00	.....
Surplus	$1,748,216.80	$502,840.15	$1,245,376.65

Surplus for the year		$1,748,216.80
Amount to credit of Profit and Loss December 31, 1908		8,741,014.06
		$10,489,230.86
Deduct:		
Discount and Commission on Gold Debentures	$553,445.00	
Less—adjustment of sundry accounts	30,192.42	
		523,252.58
Balance to credit of Profit and Loss December 31, 1909		$9,965,978.28

The total operating revenues were $27,415,467.20, an increase of $3,193,328, as compared with the previous year.

Note.—Decreases in *italics.*

The freight revenue was $18,267,530.44, an increase of $2,240,771.25. This was due to an increased movement in nearly all commodities.

The passenger revenue was $6,655,698.85, an increase of $625,279.59, due to a general improvement in both local and interline business.

The express revenue was $1,244,745.14, an increase of $204,082.11.

Revenue from transportation of mails was $409,212.23, a decrease of $4,328.60.

The operating revenue from all other sources increased $127,523.65, over the previous year.

The total expenses of operation were $18,499,528.24, an increase of $1,715,760.30.

Maintenance of way and structures increased $676,351.40, due to additional expenditures for repairs to roadway, track and buildings.

Maintenance of equipment increased $747,438.75, on account of extensive repairs to locomotives and cars of all classes.

Traffic expenses increased $83,667.05.

Transportation expenses increased $206,165.49, due to the heavier volume of traffic handled.

General expenses increased $2,137.61.

There was an increase in the deficit from outside operations of $32,119.22 over the previous year, due principally to additional expenditures in the operation of dining car service and stock yards.

The operating income was $7,743,254.91, an increase of $1,429,610.70.

Other income was $941,480.65, an increase of $97,961.73, on account of additional amount received from interest on loans.

Total deductions from income amounted to $5,812,238.76, an increase of $282,195.78, due principally to interest on gold debentures issued, charges for additional equipment and proportionate share of deficit from operation of Indiana Harbor Belt Railroad, partially offset by decreased charges for hire of equipment, general interest and additions and betterments.

The profit from operation for the year, after payment of 6% in dividends upon the capital stock, was $1,748,216.80, which has been carried to the credit of Profit and Loss.

The following appointments of officials were made during the year:

January 1, Herbert D. Howe, General Land & Tax Agent.
January 1, Ora E. Butterfield, Assistant General Solicitor.
April 1, Nathaniel E. Slaymaker, Land Tax Agent.
April 1, William Hutchinson, Assistant Land & Tax Agent.
August 2, James J. Ross, Superintendent of Telegraph.
October 1, Henry Shearer, Division Superintendent, St. Thomas.
November 1, N. Bates Ackley, Assistant Auditor.
November 1, Eugene A. Wigren, Auditor of Disbursements.
November 1, John M. Eedson, Freight Claim Agent.
November 1, William C. Lewis, Assistant General Freight Agent, Chicago.
November 1, Joseph H. Brown, Assistant General Freight Agent, Bay City.
December 1, Frank E. Robson, General Attorney.
December 1, John P. Puhl, Paymaster.

General conditions were never more favorable, and every visible indication points to renewed and increasing prosperity for the country at large, in which the railroads may hope to participate.

The business of the road shows steady increase; and expenditures which have been made for improvements, adding to efficiency and economy of operation, should be reflected in increased net revenue.

Appreciative acknowledgement is made of the faithful, efficient performance of duty by employees in every department of the service during the year.

WILLIAM C. BROWN,
President.

CAPITALIZATION.

Capital Stock.

Number of shares issued and outstanding	187,38(
Number of shares authorized	187,38(
Par value per share	$100.0(
Total par value issued and outstanding	$18,738,000.0(
Total par value authorized	$18,738,000.0(
Amount of capital stock per mile of road owned (270.07 miles)	$69,382.0(

Amount of funded debt per mile of road.

Road	Funded debt.	Miles.	Amount per mil of road
Michigan Central Railroad	$31,634,000	270.07	$117,13
Detroit & Bay City Railroad	4,000,000	171.34	23,34
Kalamazoo & South Haven Railroad	700,000	39.50	17,72
Michigan Air Line Railroad	2,600,000	115.16	22,57
Jackson, Lansing & Saginaw Railroad	1,725,000	379.23	4,56
Joliet and Northern Indiana Railroad	1,500,000	45.00	6,66
	$42,159,000	1,020.30	$41,32

DIVIDENDS.

Payable July 29, 1909, 3% on 187,380 shares of capital stock		$562,140.0
Payable January 29, 1910, 3% on 187,380 shares of capital stock		562,140.0
Total	6%	$1,124,280.0

SUMMARY OF FIRST CHARGES.

Interest on funded debt	$2,451,584.3
Rentals of leased lines	510,300.0
Other deductions	2,850,344.4
Total first charge	$5,812,228.7

Funded Debt.

Class of bond.	Date of issue.	Date of Maturity	Amount of authorized issue.	Amount issued and now outstanding.	Rate of interest.	Payable on the first days of
Michigan Central first mortgage	1902	May 1, 1952	$18,000,000	$14,000,000	3½%	May and November
Gold Debentures	1909	April 1, 1929	25,000,000	7,634,000	4 %	April and October.
Gold Notes	1907	February 1, 1910.	10,000,000	10,000,000	5 %	February and Augus
Detroit & Bay City first mortgage	1881	March 1, 1931	4,000,000	4,000,000	5 %	March, June, September and Decembe
Kalamazoo & South Haven first mortgage	1889	November 1, 1939.	700,000	700,000	5 %	May and November
Michigan Air Line first mortgage	1890	January 1, 1940	2,600,000	2,600,000	4 %	January and July.
Jackson, Lansing & Saginaw first mortgage	1901	September 1, 1951.	*2,000,000	1,725,000	3½%	March and Septembe
Joliet and Northern Indiana first mortgage	1907	July 10, 1957	3,000,000	1,500,000	4 %	January and July 10
Total amount of funded debt				$42,159,000		

*$275,000 purchased and retired by the Land Grant Trustees.

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1909.

Assets.

Property owned as investment: Total cost of road and equipment	$53,582,279.75
Securities owned	7,759,191.50
Investments	3,180,820.77
Total property owned as investment	64,522,292.02
Working assets	10,964,851.77
Deferred debit items	7,900,099.19
Total	$83,387,242.98

Liabilities.

Capital stock, common		$18,738,000.00
Funded debt:		
Mortgage Bonds:		
Michigan Central first mortgage	$14,000,000.00	
Detroit & Bay City first mortgage	4,000,000.00	
Kalamazoo & South Haven first mortgage	$700,000.00	
Michigan Air Line first mortgage	2,600,000.00	
Jackson, Lansing & Saginaw first mortgage	1,725,000.00	
Joliet & Northern Indiana first mortgage	1,500,000.00	
Plain bonds, debentures and notes:		
Gold debentures	7,634,000.00	
Three-year 5% gold notes	10,000,000.00	42,159,000.00
Total capitalization		$60,897,000.00
Working liabilities		$9,363,507.45
Accrued liabilities not due		642,202.05
Deferred credit items		337,008.34
Surplus: Additions to property through income since June 30, 1907		2,181,546.86
Profit and loss: Surplus		9,965,978.28
Total		$83,387,242.98

TWENTY-FIRST ANNUAL REPORT, CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS RAILWAY CO.: FOR THE YEAR ENDED DECEMBER 31, 1909.

To the stockholders of

THE CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS RAILWAY COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1909.

The statements showing operations, revenues and expenses in detail, etc., are prepared in accordance with the recent classifications of the Interstate Commerce Commission.

The mileage embraced in the operation of the road is as follows:

Main line	1,680.95
Branches	166.64
Trackage rights	134.62
Total length of road operated	1,982.21
Second track	338.63
Side tracks	1,084.27
Total mileage of track	3,405.11

The total mileage of track operated has been increased during the year as follows:

Side tracks—increased	23.23
Main line—decreased	.02
Total additional tracks	23.21

The following is a statement of the capital stock authorized and outstanding on December 31, 1909:

Preferred stock authorized		$10,000,000.00
Common stock authorized		50,000,000.00
Total preferred and common stock authorized		$60,000,000.00
Preferred stock issued and outstanding	$10,000,000.00	
Common stock issued and outstanding	47,056,300.00	57,056,300.00
Balance common stock authorized, but not issued December 31, 1909		$2,943,700.00

The funded debt outstanding December 31, 1908, was $65,183,730.00

During the year there were issued

C., C., C. & St. L. Ry. general mortgage bonds for retirement of prior lien bonds	79,000.00
	$65,104,730.00

The prior lien bonds retired during the year were as follows:

C., I., St. L. & C. Ry. Co. first mortgage 6 per cent. bonds	$6,000.00	
C., I., St. L. & C. Ry. Co. general first mortgage 4 per cent. bonds	73,000.00	79,000.00
Total funded debt outstanding December 31, 1909		$65,183,730.00

There was expended during the year for additions to the property, improvements, double tracking, equipment, etc., and charged to cost of road and equipment, the sum of $944,906.32, as follows:

Cleveland Division	$141,176.16
Cincinnati Division	142,888.32
St. Louis Division	151,226.64
Chicago Division	171,520.49
Cairo Division	135,525.95
Michigan Division	13,355.69
Interest during construction, Cincinnati and Chicago divisions	26,254.78
For new equipment	162,958.29
Total	$944,906.32

A detailed statement of the above will be found upon another page.

There has been advanced on account of the St. Louis Short Line Division during the year, for construction, $30,276.20.

The accumulated charges for advances to the Central Indiana Railway Company for deficit on account of operation to December 31, 1908, amounting to $635,081.72, have been regarded as uncollectible and have been written off against Profit and Loss. This company's proportion of the deficit in operation of that road for the year 1909, amounting to $52,640.92, has been charged off as a "Deduction from Income."

The Evansville, Mt. Carmel & Northern Railway Company was organized under the laws of the State of Indiana, August 1, 1906, and under the laws of the State of Illinois, November 7, 1906, to construct a railroad from Mt. Carmel, on the Cairo Division, to Evansville, Indiana. There has been advanced on account of this property, during the year, $12,746.09.

The Saline Valley Railway Company was organized under the laws of the State of Illinois, April 6, 1907, for the purpose of constructing a railroad from Harrisburg, Saline County, Illinois, to Marion, Williamson County, Illinois. There has been advanced on account of this property, during the year, $1,546.31.

There have been purchased during the year by the Central Trust Company, Trustee for the C., C., C. & St. L. Ry. Company's St. Louis Division first collateral trust mortgage bonds, 22 bonds, par value $22,000.00, making a total of 542 bonds at par value of $542,000.00, now held by the Central Trust Company, Trustee.

During the year there was expended for new equipment, including instalments on account of the New York Central Lines Trust of 1907, the sum of $832,029.90, of which $669,071.61 was charged to replacement fund and $162,958.29 to capital account.

Full particulars regarding the equipment acquired and rental paid under the terms of the New York Central Lines Equipment Trust Agreement and Lease of 1907 will be found on another page.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

OPERATING INCOME. RAIL OPERATIONS.	1909. *1,982.21 miles operated.*	1908. *1,982.23 miles operated.*	Increase or *Decrease. .02 miles.*
Revenues	$27,657,740.99	$24,242,616.75	$3,415,124.24
Expenses	19,711,494.56	18,333,450.53	1,378,044.03
NET REVENUE FROM RAIL OPERATIONS	$7,946,246.43	$5,909,166.22	$2,037,080.21
Per ct., expenses to revenue	(71.27%)	(75.62%)	(4.35%)
OUTSIDE OPERATIONS.			
Revenues	$305,324.92	$286,661.79	$18,663.13
Expenses	361,863.38	304,135.84	57,727.54
NET DEFICIT FROM OUTSIDE OPERATIONS	$56,538.46	$17,474.05	*$39,064.41*
NET REVENUE FROM ALL OPERATIONS	$7,889,707.97	$5,891,692.17	$1,998,015.80
TAXES ACCRUED	878,328.26	829,008.13	49,320.13
OPERATING INCOME	$7,011,379.71	$5,062,684.04	$1,948,695.67
OTHER INCOME.			
Joint facilities rents	$309,155.40	$290,920.24	$18,235.16
Miscellaneous rents	132,489.89	125,699.65	6,790.24
Dividends on stocks owned or controlled	98,274.90	57,332.90	40,942.00
Interest on funded debt owned	44,260.00	43,420.00	840.00
Interest on other securities, loans and accounts	36,177.43	36,652.73	*475.30*
Miscellaneous income	2,875.25	.....	2,875.25
TOTAL OTHER INCOME	$623,232.87	$554,025.52	$69,207.35
GROSS CORPORATE INCOME	$7,634,612.58	$5,616,709.56	$2,017,903.02
DEDUCTIONS FROM GROSS CORPORATE INCOME.			
Rentals of leased lines	$120,000.00	$120,000.00	.....
Hire of equipment, car mileage and per diem balances	482,156.54	717,437.05	*$235,280.51*
Interest on equipment trust certificates	170,627.10	176,617.97	*5,990.87*
Joint facilities rents	499,006.81	428,470.62	70,536.19
Miscellaneous rents	142,109.70	143,481.90	*1,372.20*
Interest on funded debt	2,925,848.00	2,910,935.67	14,912.33
Other interest	465,851.70	410,987.65	54,864.05
Proportion loss operation Central Indiana Ry.	52,640.92	.....	52,640.92
TOTAL DEDUCTION FROM GROSS CORPORATE INCOME	$4,858,240.77	$4,907,930.86	*$49,690.09*
NET CORPORATE INCOME	$2,776,371.81	$708,778.70	$2,067,593.11
Dividends preferred four, aggregating 5 per cent.	$500,000.00	$500,000.00	.....
Dividends common, one, 2 per cent.	941,126.00	.....	$941,126.00
	$1,441,126.00	$500,000.00	$941,126.00
SURPLUS FOR THE YEAR	$1,335,245.81	$208,778.70	$1,126,467.11

Amount to credit of profit and loss December 31, 1908 ... $2,078,460.85
Surplus for the year 1909 ... 1,335,245.81

NOTE.—Decreases in *italics*.

	1909.	1908.	Increase or *decrease.*
Add:			
Profit on sale of 30,000 shares of stock in the Chesapeake & Ohio Ry. Co.	$814,291.08		
Adjustment of sundry accounts	21,026.39		
			835,317.47
			$4,249,024.13
Deduct:			
Advances to the Central Indiana Ry. for loss in operating to December 31, 1908	$635,081.72		
For defalcation of Local Treasurer, Cincinnati, Ohio	591,989.19		
			1,227,070.91
Balance December 31, 1909			$3,021,953.22

The operating revenues were $27,657,710.99, an increase of $3,415,124.24.

The freight revenue was $17,975,352.63, an increase of $2,721,991.90. The local earnings show an increase of 11% and the interline an increase of 22%.

The passenger revenue was $7,169,670.05, an increase of $527,597.75. The local earnings show an increase of 5% and the interline an increase of 10%.

The mail revenue was $729,272.38, an increase of $13,009.29.

The express revenue was $784,675.90, an increase of $26,822.10.

Other transportation revenue was $743,222.52, an increase of $80,168.11, due chiefly to increased revenue from switching.

Revenue from operations other than transportation was $255,547.45, an increase of $42,535.09, due chiefly to increased car service and revenue from joint facilities.

The expenses of operation were $19,711,494.56, an increase of $1,378,044.03.

Maintenance of way and structures showed an increase of $341,967.98.

Maintenance of equipment showed an increase of $804,185.79, of which $248,900.64 was in renewals and $555,285.15 in repairs to all classes of equipment.

Traffic expenses increased $89,246.74.

Conducting transportation showed an increase of $126,800.45. The principal fluctuations were as follows:

Fuel for locomotives increased $68,158.59.

Engine and roundhouse men, train service and supplies increased $216,236.23.

Station yard, telegraph service and supplies increased $101,733.33.

Loss and damage decreased $203,404.91.

Injuries to persons decreased $60,844.89.

General expenses increased $15,843.07.

The net operating revenue was $7,946,246.43, an increase of $2,037,080.21.

The net deficit from outside operations was $56,538.46, an increased net loss of $39,064.41.

Taxes increased $49,320.13.

Other income was $623,232.87, an increase of $69,207.35, due principally to increased rental received from joint operations and other property and increased interest and dividends from securities.

Deductions from income were $4,858,240.77, a net decrease of $49,690.09.

The principal fluctuations consisted of increased interest on funded debt $14,912.33; increased interest on loans $54,864.05; increased rentals paid account joint facilities $70,536.19; proportion operating loss of Central Indiana Railway Company $52,640.92; and decrease in hire of equipment $235,280.51; due to larger earnings from per diem mileage.

The net income for the year, after paying all charges, was $2,776,371.81, out of which was paid a dividend of 5% on preferred stock, and 2% on the common stock, leaving a surplus for the year of $1,335,245.81.

On the pages following will be found the general balance sheets and tabulated statements showing results of operation for the year.

Separate reports have been issued showing the financial condition and results from operation of the Peoria & Eastern Railway and the Cincinnati Northern Railroad for the year.

The operation of the Kankakee and Seneca Railroad (for which separate acounts are kept) shows earnings for the year $76,001.86, operating expenses and taxes $92,591.47, deficit $16,589.61.

The Mt. Gilead Short Line (for which separate accounts are kept) shows earnings for the year $5,918.39 operating expenses and taxes $8,546.38, deficit $2,627.99.

On November 24th the Board of Directors approved a plan, to take effect January 1, 1910, for the retirement and pensioning of employees of the company who, through age or disability, become unable to continue longer in its service. A Board of Pensions, consisting of eight persons to be appointed annually by the President of the company, was established and the sum of $70,000.00, or such smaller amount as may be necessary, was authorized to be appropriated annually for the payment of pensions. The plan provides that all employees who reach the age of seventy years shall be retired, and that such of them as have been in the service for at least ten years immediately preceding their retirement shall be pensioned. Those employees who, having been in the service continuously for twenty years, become, in the opinion of the Board of Pensions, unfitted for duty, may be retired and pensioned.

The following changes in organization occurred during the year:

On January 27, 1909, Mr. W. C. Brown was elected president.

On January 1, 1909, Mr. George P. Smith was appointed Chief Engineer.

On January 1, 1909, Mr. Herbert D. Howe was appointed general land and tax agent.

On June 15, 1909, Mr. Joseph Moses was appointed assistant general land and tax agent.

On November 1, 1909, Mr. Edward P. Higgins was appointed assistant auditor.

On November 8, 1909, Mr. Rush N. Harry was appointed local treasurer.

General conditions were never more favorable, and every visible indication points to renewed and increasing prosperity for the country at large, in which the railroads may hope to participate.

The business of the road shows steady increase; and expenditures which have been made for improvements, adding to efficiency and economy of operation, should be reflected in increased net revenue.

Appreciative acknowledgment is made of the faithful, efficient performance of duty by employees in every department of the service during the year.

William C. Brown,
President.

First Charges.

Interest on bonds	$2,925,848.00
Rentals of leased lines—C., I. & St. L. Short Line Railway	120,000.00
Hire of equipment—car mileage and per diem balances	482,156.54
Interest on equipment trust certificates	170,627.10
Joint facilities rents	499,006.81
Miscellaneous rents	142,109.70
Interest on loans, notes and bills payable	465,851.70
Proportion operating loss—Central Indiana Railway	52,640.92
Taxes on real estate	791,594.03
Taxes on gross earnings—State of Ohio	85,690.03
Railroad commissioners' assessments—State of Ohio	1,043.30
Total first charges and taxes	$5,736,569.03

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1909.

Assets.

Road and equipment to June 30, 1907		$114,393,891.04
Road and equipment since June 30, 1907		12,283,500.51
Total		$126,677,391.55
Securities owned		$1,966,078.00
Other permanent investments		1,061,711.84
Total capital assets		$129,705,181.39
Working assets:		
Cash		$2,630,692.88
Marketable securities		241,555.00
Loans and bills receivable		80,541.60
Net traffic, car mileage and per diem balance		725,471.20
Net balance due from agents and conductors		771,045.43
Miscellaneous accounts receivable		1,654,642.69
Materials and supplies		1,149,171.23
Total working assets		$7,253,120.03
Deferred debit items		2,807,316.04
Total assets		$139,765,617.46

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1909.

Liabilities.

Stock:		
Capital Stock:		
Common stock	$47,056,300.00	
Preferred stock	10,000,000.00	
Cincinnati, Sandusky & Cleveland preferred stock and scrip	428,997.45	
Stock liability for conversion of outstanding securities of constituent companies	10,821.01	$57,496,118.46
Mortgage, bonded and secured debt:		
Funded debt:		
Mortgage bonds	$55,183,730.00	
Collateral trust bonds	10,000,000.00	
Plain bonds, debentures and notes	5,003,425.00	70,187,155.00
Working liabilities:		
Loans and bills payable	$3,000,000.00	
Audited vouchers and wages unpaid	3,707,353.08	
Miscellaneous accounts payable	6,690.31	
Matured dividends, interest and rents unpaid	473,627.37	
Working advances due to other companies	74,260.48	
Other working liabilities	10,997.04	7,272,928.28
Accrued liabilities not due		1,785,202.06
Deferred credit items		2,260.44
Profit and loss—Surplus		3,021,953.22
Total liabilities		$139,765,617.46

NEW YORK CENTRAL LINES EQUIPMENT TRUST OF 1907.

The following statement shows the character of the equipment acquired under the terms of the New York Central Lines Equipment Trust Agreement and Lease of 1907, together with the total amount of certificates issued by the Guaranty Trust Company, and the amount now outstanding:

Road.	Locomotives.	Passenger cars.	Freight cars.	Co. service cars.	Certificates issued by Guaranty Trust Co. for 90 per cent. of value.	Rental paid and applied to redemption of certificates.	Balance certificate issued by Guaranty Trust Co. outstanding Dec. 31, 1909.
N. Y. C. & H. R. R. R. Co.	447	88	4,000	...	$11,904,901.78	$1,587,320.24	$10,317,581.54
L. S. & M. S. Ry. Co.	125	25	4,000	200	6,708,392.73	894,452.36	5,813,940.37
C., I. & S. R. R. Co.	2	8	3,400	150	3,779,976.60	503,996.88	3,275,979.72
M. C. R. R. Co.	5	15	3,500	200	3,906,381.73	520,850.90	3,385,530.83
C., C., C. & St. L. Ry. Co.	112	17	1,525	100	3,700,347.16	493,379.62	3,206,967.54
Totals	691	153	16,425	650	$30,000,000.00	$4,000,000.00	$26,000,000.00

In addition to the annual rental payment of one-fifteenth of the par value of the certificates originally issued, the further sum of $1,400,000, representing interest at the rate of 5 per cent. per annum on $28,000,000 of certificates, was paid in 1909 by the companies, parties to the agreement, as follows:

New York Central & Hudson River Railroad Company	$555,562.08
Lake Shore & Michigan Southern Railway Company	313,058.34
Chicago, Indiana & Southern Railroad Company	176,398.90
Michigan Central Railroad Company	182,297.82
Cleveland, Cincinnati, Chicago & St. Louis Railway Co.	172,682.86
Total	$1,400,000.00

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Including the Railroad Gazette and The Railway Age

DAILY EDITION

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In one feature the committee reports of this convention deserve special praise. They have reached definite conclusions, and have made recommendations. In this they accomplished what they started out to do, and though their conclusions may not always be accepted, they have formed a nucleus for discussion, and have showed that the committees have not been meandering through a mass of data without getting enough out of it to produce results.

The beneficent results of railway legislation are often different from those intended or remotely anticipated. In the discussion on Ballast, a member called attention to the fact that the old-time ash pans with closed bottoms were fairly tight and retained the ashes in the pan. The new self-dumping ash pans required by federal law open directly on to the track, and when slightly warped will leak constantly and are often open when the engine is running. This indicates that the general introduction of self-dumping ash pans is resulting in the wholesale filling up of the ballast with ashes, thus seriously affecting its draining quality—a damage to track for which the motive power department will be held responsible.

A point was brought up yesterday morning in connection with the discussion of the Buildings report questioning the advisability of going too far into details. For example, in standardizing or recommending peculiar constructions for the erection of section houses, the details of these will always be varied to suit local conditions and to meet the views of the engineers in charge, so that it is useless to specify or even recommend how the walls should be covered, or the kind of windows to be used. An engineer who is competent to occupy the position in charge of the maintenance of way on a railway, would certainly be competent to design a section house, and would do it to suit himself regardless of what the association might recommend. A paper or report on the subject would be of value only as giving information as to what had been done; beyond this its usefulness ceases. On the other hand, too many detailed recommendations may be actually injurious, as giving unscrupulous lawyers a basis for an argument in case of suits, where there may be a variation from strict compliance with the recommendations, even though the practice followed may be as good or better than that which has met with the approval of the association.

The statement made on Wednesday that a half-inch widening of the gage was a matter of no moment, provided only there was enough of it, struck some outsiders as being radical. One speaker did call attention to its effect on the nosing of engines, and thought that gage widening would make it worse. There is another point that was not mentioned, namely, that if the gage is widened to such an extent it is essential that the surfacing should be in prime condition. A low joint or a high spot tends to throw the locomotive or car to one side or the other, and so start a nosing action that is apt to increase, according to the speed, and may result in some decidedly heavy blows being dealt to the rails. The committee hedged when it came to curves; the understanding of the recommendations is that the track be kept to the proper gage on curves. This is, of course, essential in order to avoid heavy blows to the guard rails. If there were to be such a condition it is possible that the power required to slip the wheels laterally on the rails would rise to as much as 65,000 lbs. or more. The practice in holding the track to gage on curves, too, is taking a step contrary to what was nearly universal a few years ago. Many engineers are laying their rails to standard gage around curves, even of short radius. There is no doubt that a car or locomotive can be piloted to go and will go around a curve so laid. But some work that was done on rail a short time ago seems to indicate that there is a binding of the wheels on this tight gage that does not occur, where it is a little loose, and that a good deal of extra stress is being put upon the spikes, that might be relieved by following the old practice.

It seems almost certain that the coal miners in the middle West will strike April 1st, and the regular supply of coal for locomotives and industrial purposes will be shut off. In anticipation of this the railroads have been storing coal, and some of them have a supply sufficient for two or three months. For the past month the price of coal in Illinois, Iowa and Indiana has been considerably advanced, and to check this a large amount of bituminous coal has been bought in Ohio and Pennsylvania for storage. The price there has not advanced, the quality of the coal is much better, coming from older measures, and being harder than the western coals, it is better suited for storage purposes. Its higher heat value will largely make up for the cost of the extra haul, and if it is required to be held in storage for some time, it will not deteriorate to any large extent, and when used will be at least equal to the fresh coal from local western mines. As an indication of the amount of coal used by railroads and the enormous quantity required to be stored for a few months' supply, we may cite the report of the fuel agent of the Rock Island, showing the consumption of coal for January, 1910, on the Rock Island and affiliated lines: For passenger engines the fuel consumed was 90,000 tons, averaging 22.63 lbs. per passenger car mile; in freight service the consumption was 168,000 tons, averaging 318.4 lbs. per 1000 ton miles. The

total consumption per month was 258,000 tons, or 8,600 tons per day. The daily requirements for coal on the Burlington system is 14,000 tons in winter and 10,000 to 12,000 tons in summer, or say an average of 360,000 tons per month, which would mean 9,000 cars containing 40 tons each. To provide for a strike lasting two months there would be required for this one system a storage of about 700,000 tons of coal. In the East anthracite coal is stored in vast quantities and machinery is installed for piling the coal in larger cones and for loading it in cars when wanted. While most western bituminous coals are not well adapted to such storage in large bulk, it is possible that if the miners' strike is of long duration better provisions for storage will be demanded for the future, and structures for its protection and perhaps machinery for reloading it will be devised.

ORGANIZING THE CONVENTION.

It is doubtful if, ten years ago, the founders of the American Railway Engineering and Maintenance of Way Association realized to how great an extent it would grow or to what a place it would attain among the various engineering and railway associations. Naturally enough, the subjects first considered have been those most vital to the association, and with the adoption of the reports of this year's committees, standards will have been adopted for the most of these. It is not unnatural that there should be a sense of work accomplished, of labor well done, and a feeling that the work which is to follow will be of less importance and of consequent less interest.

Now that the membership has grown to such an extent and the attendance at the conventions to a greater extent, the machinery for still better and more beneficial work is at hand. Everyone who has had occasion to reflect on the subject of railway organization has realized the complexity of that on a single road, due to the various ideas and personalities of its members. The most successful executive is the man who forces or leads all these to a common purpose, and who, while leaving each man free to give of his best, eliminates as far as possible the defects inherent in human nature. The likeness of a successful organization of men to a machine is trite, but true, and if it be so on one railway, how much more vast is the machine comprising all the roads in the country, and how much greater the difficulty in amalgamating the ideas and energies of all the individuals on them. This, however, so far as its department of engineering and maintenance of way is concerned, is the task of the association. The elimination of the personal equation through the annual contact of individuals, the comparison of ideas and practice, the standardization, not necessarily for all time, but for the moment, of all that is best in each, may be the highest function of the association. That the work which has already been done in establishing standards has found ready recognition is evidenced by their wide adoption, but it must not be considered that all the hard or valuable work has been done or that what is now left to be settled is of minor importance or of mere detail. It is evident that this feeling exists, in some degree, at least, but it is to be hoped that it will not become general, because it is not warranted, and because it does exist there is all the more reason to urge its dismissal.

Now that the membership is so great, so interested, and so enthusiastic, it would be a pity to allow any feeling that the big things have been settled to interfere with the further development of the association.

Not the least interesting is the development of the social side of the association. While this feature may, at first thought, seem of minor importance, it is by no means a negligible quantity in estimating the assets of the convention, if its various attractions may be so termed. The prospect of interchange of good fellowship is not less pleasant, if perhaps less profitable, than the interchange of technicalities of no matter how great interest.

To those most interested in the welfare of the association the outlook should hold nothing but encouragement.

WATER SERVICE.

The usual method of treating boiler waters containing sulphates of lime and magnesia is by the use of soda ash, which, though fairly efficient and satisfactory, is open to two objections. The first is the expense of the soda ash and the second is, that while the chemical reaction removes the hard scale-making sulphates of lime and magnesia, it leaves soluble sulphate of soda, which increases the tendency to foam. This latter has been one of the principal difficulties connected with water treatment for locomotives by soda salts, as the foaming tendency is very objectionable. A new method of treating such waters is now being used in England for both locomotive and stationary boilers, and although the process is successful in preventing hard scale from waters containing 20 to 30 grains incrusting matter to the gallon, no chemicals are used, and it is, therefore, inexpensive as compared with soda ash treatment. The apparatus, which is called a "luminator," consists of a thin sheet of aluminum which is corrugated, 1-5 in. wide and about 1 in. deep, the dimensions varying with the amount of water to be treated. A strip of the corrugated metal 3 or 4 ft. long is set in an almost vertical position and the water flows down over it, being fed from a header through small tubes, each of which leads into one of the corrugations. There is no chemical change produced on the water by the apparatus and the hardness remains the same. The effect seems to be due to the action of light, which in some way changes calcium sulphate so that it does not crystallize, but is precipitated as a finely divided amorphus powder and magnesium sulphate also is completely ionized and is precipitated as a fine powder. These precipitates are easily washed or blown out instead of depositing a very hard scale on the tubes and firebox. A strange thing connected with the process is that it is found necessary to give the apparatus 12 hours' continuous rest during daylight every seventh day, and it then can be used day and night. This mysterious action of the apparatus and the uncertainty of the explanation may cause one to think it is a fake and our report a fairy story, but the apparatus has been in successful use over six months in a number of establishments about London, and it is being investigated by one of the German Imperial laboratories, and our report is from a most reliable contemporary, London Engineering.

THE STEEL INDUSTRY.

Conditions in the steel industry have undergone a great change since 1907, when the question of discard from the ingot in rail manufacture first became very important. In 1906, and in 1907 up to October, the panic month, the capacity of the Bessemer steel works was strained to get out maximum output. The position of the mills was that to increase the discard was to reduce the output of the works, as they wished to charge for increased discard largely on the basis of the loss of profits through reduced output, rather than on the basis of the mere increase in shop cost involved.

Whatever may be the attitude of mill owners at present, the physical position of the mills has entirely changed since then. During the past four or six months the open-health steel capacity of the country has been practically fully engaged, while the Bessemer capacity has been but

indifferently engaged. The Edgar Thomson plant, the chief rail plant of the Carnegie Steel Company, has not averaged more than one-third capacity in the past twelvemonth, while the Cambria, Pennsylvania and Maryland rail mills have been but indifferently engaged. The Cambria Steel Company is erecting a plant to engage in the manufacture of wire, to find an additional outlet for its Bessemer steel, while the Maryland mill has been rolling billets part of the time. The Bessemer department at the Homestead steel works of the Carnegie Steel Company constituted practically the last important steel-making capacity to be put in operation in the revival last year, and there had been doubts, after its being closed late in 1907, whether it would ever operate again.

Thus there is clearly an excess of Bessemer steel-making capacity in the country, as compared with the demand for the different finished products. Bessemer steel is practically tobooed for plates for any purpose, and finds but limited acceptance in structural shapes, with the prospect that it will be shut out entirely.

The question arises what shall be done with the existing equipment for the manufacture of Bessemer steel rails? It would be costly to remodel plants so as to roll the Bessemer steel into other finished products, while it is questionable whether demand could be found for the additional products in Bessemer steel.

The basic open-hearth steel industry, which has continued to make rapid strides in tonnage output, has found it increasingly difficult to obtain the scrap necessary for carrying on the process along the usual line. The Monell and Talbot processes, essentially non-scrap processes, have not justified all the hopes entertained for them, and there is a strong tendency to turn to duplexing. The Jones & Laughlin Steel Company has been experimenting for some months with the duplex process in its present Pittsburg plant, with the idea of using a portion of its Bessemer capacity for preparing metal for its open-hearth furnaces, thus decreasing its output of Bessemer steel and correspondingly increasing the open-hearth output. The Maryland Steel Company is completing five open-hearth furnaces with the intention of using a portion of its present Bessemer capacity to duplex with the new open-hearth furnaces.

These moves in the direction of duplexing represent a distinct desire to find a new use for Bessemer capacity because there is not sufficient employment for it in its old function.

The major portion of the scrap used in the ordinary open-hearth steel process has been new scrap, produced in the casting and rolling of both Bessemer and open-hearth steel, old material constituting only a minor portion of the total scrap used. The production of basic open-hearth steel first passed the million-ton mark in 1897, and while production increased rapidly thereafter, the production of Bessemer steel also increased, increasing the supply of scrap, although not in proportion to the increase in the requirements. The production of Bessemer steel reached its maximum in 1906, with 12,275,830 tons, production of basic open-hearth steel in the same year being 9,658,760 tons. Since 1906 the production of Bessemer steel has been decreasing, while production of basic open-hearth steel has continued to increase. Estimates based on Bessemer pig iron production in 1909 place the output of Bessemer steel in that year at between 9,300,000 and 9,400,000 tons, while it is conjectured that the output of basic open-hearth steel lay between 13,000,000 and 15,000,000 tons.

There is thus vastly more pressure for new steel scrap for the basic open-hearth furnace than there was in 1906 or even 1907. Prices in the market illustrate this. Statistics compiled by authorities indicate that in 1906 and 1907, for delivery to Pittsburg and valley steel works, heavy melting steel scraps averaged from $2 to $4 a ton less than basic pig iron f. o. b. valley furnaces, while the average in 1909 was nearly a dollar a ton in the opposite direction, showing a total change in the alignment of $4 a ton; scrap, relative to pig iron, advancing by approximately that amount.

Thus, on account of the increase in basic open-hearth steel manufacture and the decrease in Bessemer steel manufacture there is a great deal more pressure to obtain scrap than there was three or four years ago. It is reasonable to infer that Bessemer steel rail manufacturers having open-hearth adjuncts should be much more ready than formerly to run their Bessemer departments with a view to furnishing scrap for the open-hearth, and to be willing to crop more liberally in manufacturing rails. It is no longer a question of reduced outputs for Bessemer rail mills if more liberal cropping is resorted to, for there is not enough work to keep the Bessemer rail mills busy. More liberal cropping would rather increase outputs by finding more orders and permitting the mills to run nearer to capacity.

The case of the Bessemer steel rail is by no means hopeless for the 1909 statistics, just out, show that of the 50,505 tons of alloyed steel rails made, 36,809 tons were Bessemer, and only 13,696 tons open-hearth.

COMPETITIVE RAILWAY BUILDING IN THE DES CHUTES RIVER CANYON.

The Des Chutes Railroad (Harriman Lines) and the Oregon Trunk Railway (Hill Lines) are building parallel lines up the Des Chutes river canyon into central Oregon. The history of these projects and their traffic possibilities were fully discussed in the Railroad Age Gazette of November 12, 1909, p. 905. The plateau between the Cascade range and the Blue mountains has been without railway or waterway



Looking North from Mile 32; Des Chutes Railroad.

transportation, except for the branch of the Oregon Railroad & Navigation Company which runs down to Shaniko, 70 miles from the Columbia river, and some shorter branches to the east of this one. The Des Chutes river is not navigable. Wheat growing has been extended so far as is possible without adequate transportation facilities, the crops being hauled by wagon for long distances. In 1907 an attempt was made to haul for 50 miles, with a traction engine and a train of road cars, 1,000,000 bushels of wheat raised near Madras. This proved to be a failure. The country is, therefore, undeveloped, no town which the new railway lines will reach having more than 1,500 population, and the land has been largely used for stock raising. With outlets to market it will become a big wheat country, taking the

place of the land in the coast counties of Oregon, formerly devoted to wheat, but now given over to the more profitable dairying, fruit growing and truck farming. Later, as land gets more valuable in central Oregon, this higher grade farming will follow the wheat on the land best suited to it, namely, the slopes and the irrigated country. Several irrigation projects are now under way. The timber on the eastern slopes of the Cascades is the best in the state, being part of the forest already tapped in the Klamath country. The Des Chutes is an excellent power stream, and considerable hydro-electric development is expected.

The Des Chutes Railroad will run from Des Chutes, on the Oregon Railroad & Navigation, south to Redmond, 130 miles. For the first 83 miles it follows the east bank of the Des Chutes river, keeping at the bottom of the canyon close to the high water level of the river. The maximum grade on this part of the line is 0.8 per cent., and the maximum curvature is 17 deg., 30 min. Fifty-two miles of the first 80 is curved track, the greater part being less than 4 deg.; of the total 9,859 deg. of curvature, 822 deg. are over 10 deg. The line leaves the Des Chutes river at Mile 83 and turns up the Trout creek valley for a few miles, and thence,



Island in Des Chutes River.

In making its third crossing of the Des Chutes River, the Oregon Trunk goes over this island, coming across from the far side (west bank) shown in the photograph.

with considerable development work, continues south. There is a nearly continuous 1.5 per cent. grade as far as Madras, 15 miles, and the maximum grade is 1 per cent. from there to Redmond. The maximum grade opposing northbound traffic is 1 per cent. as now located, and, as shown on the profile, this is to be reduced to 0.6 per cent. Between Mile 80 and Mile 100 there are 11 miles of curved track, most of which is between 4 and 10 deg., there being only 89 deg. of curvature over 10 deg. In the 30 miles from Madras to Redmond there are 6 miles of curved track, all of which is less than 4 deg. except 46 deg. of curvature between 4 and 10 deg.

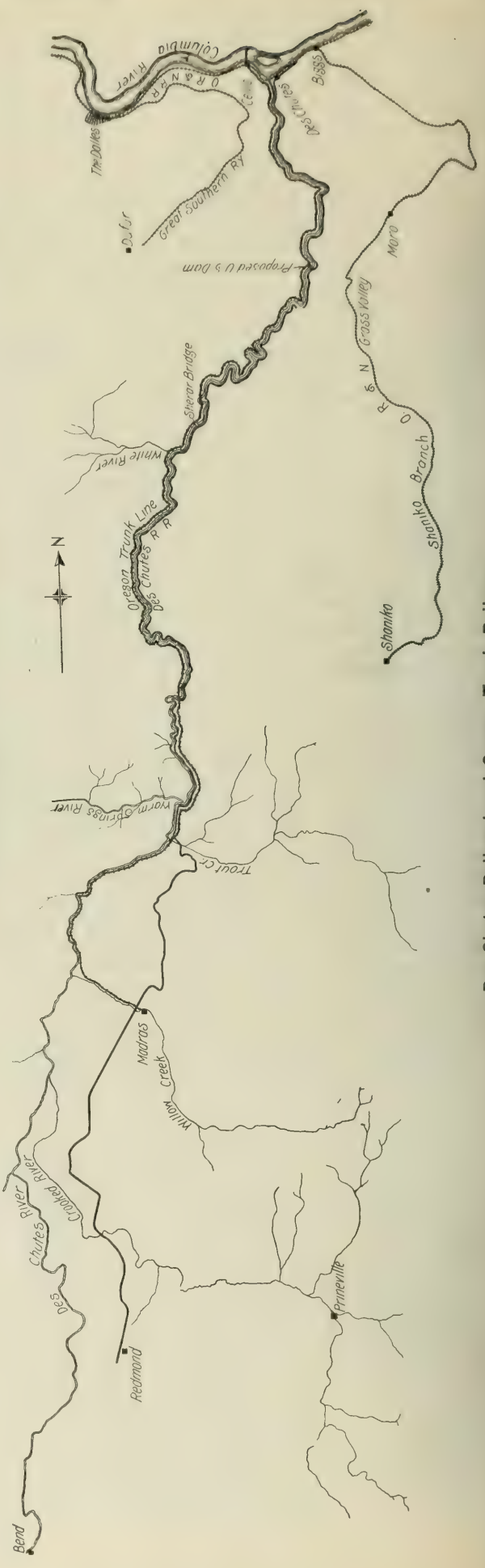
Most of the cut work is through hard, volcanic rock, the character of which is shown in the photographs. The yardage of cut and borrow work is as follows:

Cut.	Cu. Yds.	Borrow.	Cu. Yds.
Solid rock	1,400,000	Solid rock	20,000
Loose rock	600,000	Loose rock	380,000
Shell rock	200,000	Common excavation*	400,000
Common excavation*	300,000		

The free haul allowed is 400 ft., and the total over-haul is estimated as 1,900,000 yds.

The bridge over Trout creek will be 800 ft. long, 100 ft. maximum height, and the one over Willow creek will be 1,200 ft. long and 230 ft. maximum height. Both of these

*Earth, etc., handled without blasting.



Des Chutes Railroad and Oregon Trunk Railway.



Site of Crooked River Bridge; Des Chutes Railroad.



Approach to Tunnel at Mile 33; Des Chutes Railroad.



Characteristic Rock; Des Chutes Railroad.



Characteristic Section of Lower Des Chutes Canyon.



Site of Willow Creek Bridge; Des Chutes Railroad.

will be steel viaducts. The character of the structure over Crooked river, which will be 360 ft. long and 302 ft. high, has not been decided; it may be a steel arch. There will be five 150-ft. through riveted truss bridges. There will be about 5,300 ft. of frame trestles from 10 ft. to 120 ft. high. At present temporary wooden structures are being used for the larger culverts, but eventually concrete arches will be put in for all openings up to 20 ft. Corrugated steel pipe in 2-ft. and 2-ft. 8-in. sizes is being used for small openings where the fill is less than 20 ft. high.

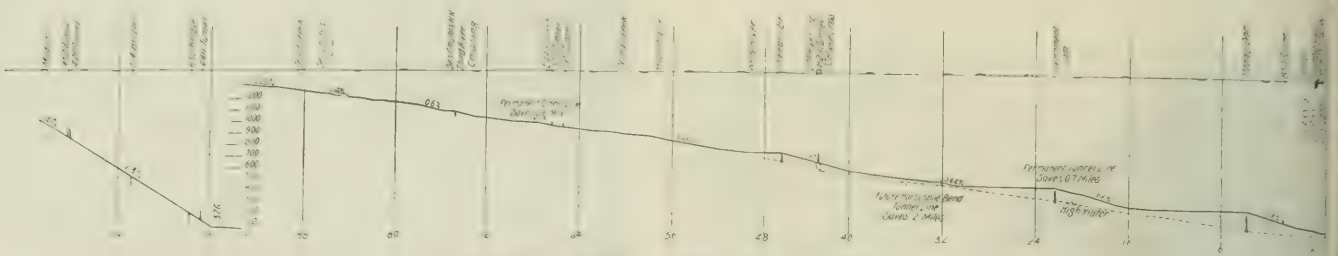
There are five tunnels ranging from 500 ft. to 1,200 ft. long. Two of them have been holed through, and work is under way on the others. Hand drills are used almost entirely, it being too expensive to get in the necessary power plant for steam or air drills. All equipment for the southern part of the line, where it is at the bottom of the canyon, had to be brought by wagon to the top of the cliffs and then lowered down on skidways. The steam shovels were knocked down and brought in in this way. This equipment and all materials are coming in via Shaniko and Grass Valley. For the northern part, now about completed, they came via Moro.

The roadway is being built 14 ft. wide on fills and 16 ft. wide in cuts, with the expectation of widening it later. The tunnels are 17 ft. wide and 24 ft. high from top of subgrade. New 75-lb. rail is being laid. Ties are 7 in. x 9 in. and tie plates are used.

John Twohy, Spokane, Wash., is the general contractor. He has at work 3,600 men and five steam shovels. The bridge work and the track-laying are being done by 350 men of the railway company's forces. Construction began last September. There are now 6 miles of track laid, and 20 miles graded from the mouth of the river south and 25 miles more graded in isolated stretches. It is expected that trains will be in operation by the end of July on the first 90 miles. The cost for the 130 miles is estimated at $45,000 a mile.

The Oregon Trunk Railway starts from a connection with the Spokane, Portland & Seattle on the north bank of the Columbia river. It will cross that river near Celilo, about 2 miles west of the Des Chutes, and for 75 miles it stays on the west bank of the Des Chutes, except at a point four miles north of Sherar Bridge, where it goes across and back again. At Mile 74½ it crosses to the east bank, crossing also the Des Chutes Railroad, and thence it keeps to the east of the Des Chutes Railroad as far as Trout creek, where the latter leaves the Des Chutes canyon. The Oregon Trunk keeps on up the east bank to a point near Willow creek, when it climbs out of the valley and gets into the Willow creek canyon, which it follows to Madras, 108 miles from Celilo. This is as far as the road is under contract, but it is located to Bend, 40 miles further.

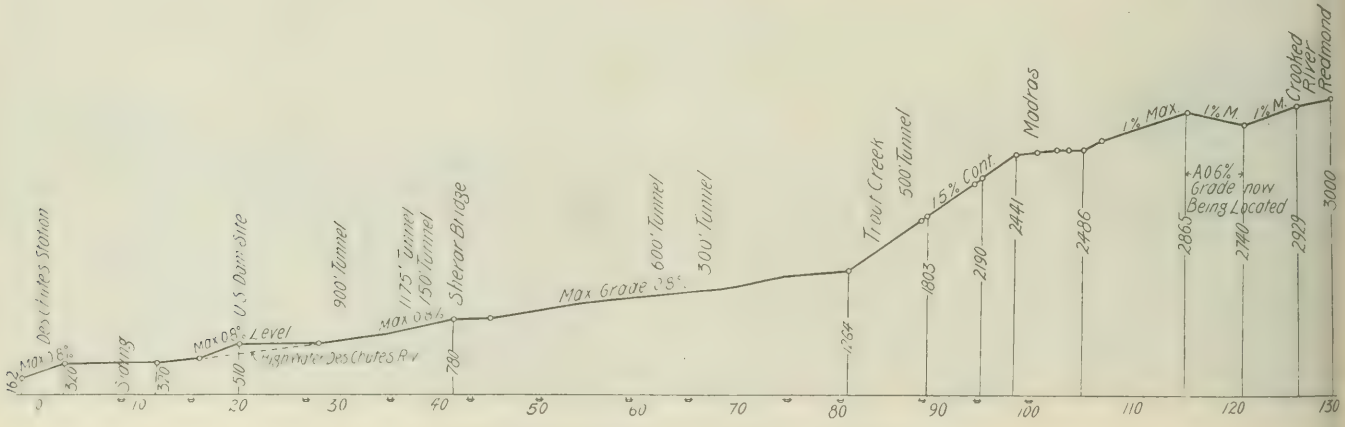
The maximum grade for the first 95 miles is 0.6 per cent., and for the remaining 14 miles the maximum is 1.3 per cent., compensated. There will be no grades opposing northbound traffic. The maximum curvature is 6 deg. There will be eight tunnels, from 200 to 850 ft. long. Ultimately, as shown on the profile, there will be three more tunnels, which will make the line several miles shorter. The bridge across the Columbia river will be 3,400 ft. long. Of the three crossings of the Des Chutes river, two will consist of two 150-ft. spans each, while the other will be a 3-span bridge. There will be about 5,000 ft. of trestles, to be eventually filled in. The larger culverts are being made of timber for the present and will later be concrete arches. Corrugated steel pipe is used in sizes from 18 in. to 60 in. in diameter. The roadway will be 18 ft. wide on earth fills, 16 ft. wide on rock fills, 24 ft. wide in earth cuts and 20 ft. wide in rock cuts. The tunnels are 16 ft. wide and 23 ft. high from the top of rail. The road is to be laid with 85-lb. and 90-lb. rail, tie plates being used on curves. The cut and fill work will be distinctly heavier than on the Des Chutes Railroad, and the total cost is correspondingly high.



Condensed Profile; Oregon Trunk Railway.

Porter Brothers, Spokane, Wash., have the general contract. They have 3,800 men at work. Work began on September 1, and there is now 25 miles graded, but no rail laid. Supplies and equipment are brought in at Des Chutes and by wagon via Dufur, on the Great Southern, and Shaniko. Only hand drills have been used so far.

Distances between sidings on each road are shown on the profiles. Little traffic is expected to originate on the first 80 miles, but the valley of the Des Chutes broadens out



Condensed Profile; Des Chutes Railroad.

omewhat near Warm Springs river, and there are already number of productive farms in these bottoms. Both lines et up on top of the plateau at Madras.

We are indebted for the above material to G. W. Boschke, hief engineer of the Des Chutes Railroad; J. F. Stevens, resident of the Oregon Trunk, and G. A. Kyle, vice-presi-ent.

THE ELEVENTH BIRTHDAY.

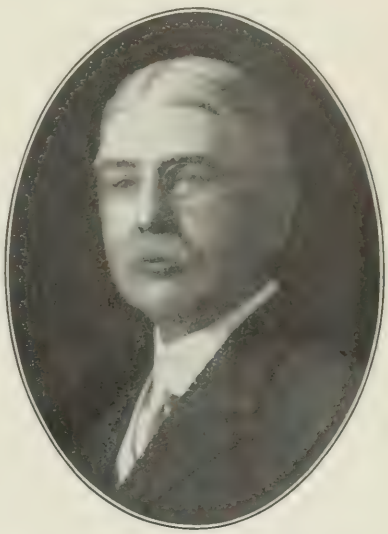
As a part of the celebration of the eleventh birthday of he American Railway Engineering and Maintenance of Vay Association, and as a part also of the record which eems likely to be continued by The Daily Railway Age azette, it seems fitting to set out briefly for the benefit of he more recent recruits to the membership some of the ncidents attendant upon the organization of the association nd to mention some of the men who are entitled to credit or the solid foundations upon which the present sturdy tructure has been erected. So far as the paper is con-erned, its interest in the association is not a matter of nushroom growth. The Daily represents merely an appre-iation of the development of the association itself. The



HUNTER M'DONALD,
Past President.



HOWARD G. KELLEY,
Past President.



A. W. JOHNSTON,
Past President.

all for the original meeting, at which the preliminary steps oward the organization of this now great and powerful as-ociation were taken was issued from the office of The ailway Age, one of the predecessors of the present com-ination, and over the signature of the editor of that paper. eginning with the second annual convention, which, as a natter of fact, was the first meeting except for purposes f organization, the proceedings of the association have ach year been published in full in the regular issue of the aper of the week of the convention. The Daily is merely n amplification of that work to correspond with the growth n importance and influence of the association itself. Its eception by engineers and those representing kindred in-erests upon the commercial side has been such as to war-ant a forecast of a permanence like to that which has haracterized another daily edition of the same journal hich has for 23 consecutive years been published in honor f the annual conventions of the Master Car Builders' and he American Railway Master Mechanics' Associations. So uch for The Daily.

The preliminary meeting, pursuant to the call to which eference has been made, was held in the Auditorium Ho-tel in Chicago on October 21, 1898, and was attended by some fifteen or twenty railway engineers and the writer of the present account. At that meeting the present name was selected. Augustus Torrey, then chief engineer of the Michi-gan Central, since deceased, was elected temporary chair-man, Louis C. Fritch, now president, was elected temporary secretary, and a committee on permanent organization was appointed, with instructions to report at a meeting to be held in Buffalo on March 30, 1899. This committee, to whose members much of the substantial character of the organization is due, consisted of J. F. Wallace, then chief engineer Illinois Central; W. G. Curtis, since deceased, then engineer maintenance of way Southern Pacific; Thomas Rodd, chief engineer Pennsylvania Lines West; C. H. Hud-son, chief engineer Southern, and P. A. Peterson, then chief engineer Canadian Pacific. The early recognition of a unity of interest between the United States and Canada possibly has had much to do with the lively interest in the associa-tion which has always characterized its Canadian members, and which has again been recognized in the presidential honor conferred upon William McNab, who has just finished his term of office.

At the Buffalo meeting J. F. Wallace was elected presi-dent, L. C. Fritch was confirmed in his election as secre-tary, and a form of constitution and by-laws adopted in sub-stantially the same form as they exist to-day. To the un-usual capability of Mr. Wallace as a presiding officer dur-ing the three terms he served, and to the loyal support given by his colleagues named and some others, are largely due the rapid acceleration which marked the early progress of the association. At its first professional session its pro-ceedings were characterized by all the vim and vigor dis-played by any similar organization regardless of age, and its course since has been uniformly progressive. The asso-ciation easily ranks first among railway organizations in the ability of its membership and the authoritative nature of its proceedings.

The men who have so ably filled the presidential office are, in order: John F. Wallace, George W. Kittredge, Hunter McDonald, A. W. Johnston, Howard G. Kelley and William McNab. Walter G. Berg, who was from the first one of the most hard-working and efficient members, was elected to the presidency, but died before the meeting at which he would have presided, and he was succeeded by Mr. McNab, who was subsequently elected to a second term on his own

account. In Mr. Berg the organization lost one of its strongest supports, and the workings of his keenly analytical mind appear in almost every matter that has emanated from the board of direction, and in many of the more important reports.

At the Buffalo meeting P. Alex. Peterson and W. G. Curtis were elected vice-presidents. Curtis died in the early years of the association's history and increasing age compelled Mr. Peterson to retire from the active chief engineership of the Canadian Pacific and from continuing his former activity in the affairs of the association. He still retains his "No. 7" and is consulting engineer of the same road. W. S. Dawley was elected treasurer at the same meeting and was regularly reelected until the present, prior to which time his resignation was presented owing to his having connected himself with a railway in China. He is succeeded by C. F. Loweth.

The Buffalo meeting established a board of direction consisting of W. H. McFarlin, then of the Chicago, Rock Island & Pacific; Hunter McDonald, then as now chief engineer of the Nashville, Chattanooga & St. Louis; D. J. Whittemore, chief engineer Chicago, Milwaukee & St. Paul; F. H. McGuigan, now retired from railway service, then chief engineer Grand Trunk; A. Torrey, then chief engineer Michigan Central, since deceased, and Thomas Rodd, then as now chief engineer of the Pennsylvania Lines West—"No. 4."

Among the past presidents who are named above, some have changed their connection or title—promotions all. Wallace became general manager of the road he knew so well, then chief engineer for the Isthmian Canal Commission, which nobody knew well before, then president of the Electrical Properties Company, which pays better and is more certain; McDonald, he sticks, because engineering is the most important part of a road that runs in the vicinity of the "Great Smoky Mountains," and, to apply the language of one of Mr. McDonald's stories when he was elected president, he is the "hell-roarer" of that same country—in engineering, not preaching, because he hasn't the "woice;" Johnston, he's general manager now; Kelley has switched from the Minneapolis & St. Louis to the Grand Trunk and is chief engineer of that system; and McNab is his principal assistant—another bond between the two countries that Nature made to be one; and Kittredge is chief engineer of a great system when once he was of only a part.

In the course of this account it has not become necessary to mention anyone who has taken steps backward. Chief engineers have become general managers, engineers of small lines have been placed in charge of large systems because they had many talents, and the few columns of a weekly journal became first a paper half an inch thick and then three-quarters and then a daily. The only answer is the old Latin quotation, "Tempora mutantur, et nos mutamur in illis." It answers the question, "Why is a Daily?"

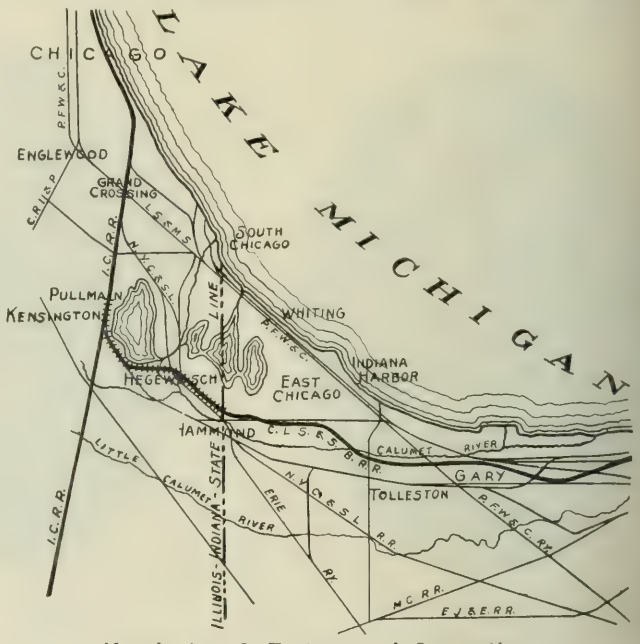
THURSDAY REGISTRATIONS.

Barnes, O. F., Div. Eng., Erie R. R., Susquehanna, Pa.
Beahan, Willard, Asst. Eng., L. S. & M. S. Ry., Cleveland, O.
Cleveland, G. C., Asst. Ch. Eng., L. S. & M. S. Ry., Cleveland, O.
Davis, C. S., Consulting Eng., Toledo, O.
Everham, A. C., Asst. Tun. Eng., D. R. T. Co., Detroit, Mich.
Paquette, C. A., Asst. Ch. Eng., C., C., C. & St. L. Ry., Cincinnati.
Pfafflin, E. H., Ch. Eng., S. I. and Ch. Sou. Rys., Chicago.
Ramsay, J. P., Receiver C., P. & St. L. Ry., Springfield, Ill.

DESCRIPTION OF THE CONSTRUCTION WORK ON THE KENSINGTON & EASTERN.

The sections of northeastern Illinois and northwestern Indiana near the shores of Lake Michigan, embracing Chicago and the towns eastward to Michigan City, although already traversed by numerous important steam railway trunk lines, furnish a most promising field for interurban development. The growth of the industrial city of Gary under the influence of the Indiana Steel Co. created a necessity for a frequent train service to Chicago, which could be most economically secured by the operation of an electric line.

About five years ago a syndicate of Cleveland capitalists obtained the franchise for an electric line from South Bend, Ind., to the Illinois-Indiana state line near Hammond. An arrangement was made with the Illinois Central for the construction of a connection from the state line to Pullman, Ill. At Pullman the business is transferred to the Illinois Central suburban trains for delivery to stations reached by that service. The section of the line in Indiana, approximating 71 miles, was built under



Kensington & Eastern and Connections.

the name Chicago, Lake Shore & South Bend; that in Illinois, approximating seven miles, by the Illinois Central, under the name Kensington & Eastern. Construction work was begun in the early part of 1907, and the electric railway was put in operation on April 4, 1909, and is known as the "South Shore Route." This description is limited to the features of the Kensington & Eastern.

Two tracks were built on this section on 14-foot centers. One is leased to and operated by the Chicago, Lake Shore & South Bend for its suburban service between Pullman, Ill., and South Bend, Ind., and the other is reserved for steam service. Provision was made in the purchase of property and the design of structures to construct second tracks for both the electric and steam service whenever business demands additional facilities.

At present there is no steam service. The Chicago, Lake Shore & South Bend, on the track leased to it, operates 26 trains each way between the hours of 4:40 a. m. and 12:05 a. m. The time interval between trains varies from 30 minutes to one hour, with an average schedule of one train each way every 47 minutes. The motor equipment used is designed to develop a speed of 65 to 70 miles an

hour, but the average speed of the limited cars probably does not exceed 40 miles an hour.

The northern terminus of the Kensington & Eastern is at Pullman, Ill. From this point to Kensington the line occupies the right of way of the Illinois Central; from Kensington the line diverges to the southeast, parallels the southern shore of Lake Calumet, crosses the Grand Calumet river, the lines of the New York, Chicago & St. Louis, the Chicago & Western Indiana, and Pennsylvania near Hegewisch, and the Indiana Harbor Belt near Hammond. The entire line lies within the corporate limits of Chicago and the village of Burnham.

The country traversed is level and not more than 10 ft. above the level of Lake Michigan. The location of a line at this time in a city like Chicago, if reasonable construction cost is considered, will, in a great measure, be determined by the prices demanded for real estate, density of



Calumet River Drawbridge, Looking East.



Overhead Construction, Parsons Siding.

population, occupation by industrial concerns, street improvements, probable conversion of unimportant navigable streams into deep waterways of first importance, and the probable future street grade separation. On account of the complex conditions it was found necessary to make accurate surveys of the entire section traversed and careful studies of detailed estimates of cost on many alternate routes, due respect being given to the limitations fixed by public authorities having jurisdiction over the crossings of other railways, the crossings of navigable streams, and the crossings of streets, alleys and public places. These matters were given careful consideration, as well as the resultant effect of the construction and operation of a high voltage single phase alternating system upon abutting property and public utilities before permits and ordinances were requested. This part of the work extended over a two-year period.

On account of the high value of real estate it was found economical to haul sand for fills, approximately 650,000 cu. yds., from Dune Park for all the work. Between Kensington and the Grand Calumet river a temporary track was laid on the ice across the swamp from which the embankment was brought to the grade line. From the Grand Calumet river to Hegewisch the embankment was made from a temporary trestle built on the center line between the two tracke and to the formation grade line. The sand was hauled in Haskell & Barker gondola cars, unloaded by Lidgerwood machines and widened to the standard cross section by Jordan spreaders.

The most important bridges on the line are the structures over the Grand Calumet river and the overhead crossing of the New York, Chicago & St. Louis and the Chicago & Western Indiana. The former is a double track swing draw 228 ft. in length, supported by a hollow concrete, reinforced circular center pier and two concrete abutments. The foundations for the pier and abutments are placed sufficiently low to provide for the future 24-ft. waterway. The steel superstructure is of through type; the riveted trusses are spaced 30-ft. centers and rest on a steel drum 30 ft. in diameter. The bridge is equipped with modern electrical turning machinery and provision has been made for taking current from the electric railway's trolley circuit.

The overhead railway crossing consists of a double track viaduct approximately 715 ft. long. The tracks of the Kensington & Eastern, which are on a 4 deg. curve, cross two tracks of the New York, Chicago & St. Louis on tangent and two tracks of the Chicago & Western Indiana on a 5 deg. curve. The portions of the structure over the existing tracks and over the spaces for future tracks consist of through girders with I-beam floors and concrete water-proofed decks supported on towers made up of columns and cross girders. The portions of the structures from the abutments to the through plate girder sections

consist of deck girders, water-proofed concrete decks supported on columns and cross girder towers. The entire superstructure rests on reinforced concrete. Provision is made in both masonry and steel superstructure for the construction of an additional track on both sides of the existing structure.

The tracks are constructed for two types of service. The one for the steam service is laid with 85 lb. rails, with 6 in. x 8 in. x 8 ft. 6 in. ties on 20-in. centers. The one for electric service is laid with 70 lb. rails, with the same tie spacing. Both tracks are surfaced on 10 in. of furnace slag, uniform in size, the largest pieces passing through a circular iron ring three inches in diameter.

The single phase installation in connection with the section in Indiana is one of the important ones operating in the United States. In designing the installation the best practice was adopted, the materials used were tested and the construction is most substantial.

The pole line is of creosoted long leaf yellow pine. The poles are 45 ft. long and are designed to carry the transmission line near the top, the trolley line at a height of 22 ft. above the top of the rail, and the signal and telephone circuits about midway in the pole space between the transmission line and the trolley line supports. The bottoms of the poles are placed uniformly 6 ft. below the formation grade line. To secure stability a two-ft. section at the bottom of the pole, and another two-ft. section at the surface of the ground are incased in concrete of 1:3:6 mixture. On account of the high speed traffic to be maintained, as great care was exercised in giving alinement and grade to the pole line as to fully ballasted completed track. The poles are spaced on 166-ft. centers on tangents and at closer intervals on curves.

The return circuit is made by the use of the rails and rail bonds. The bonds are of the so-called "foot bond type," consisting of copper ribbons, with welded terminals one inch in diameter, and have the same carrying capacity as No. 0000 copper wire. The bond terminals are on five-inch centers and are under the base of rail in the space between the ties of suspended joints.

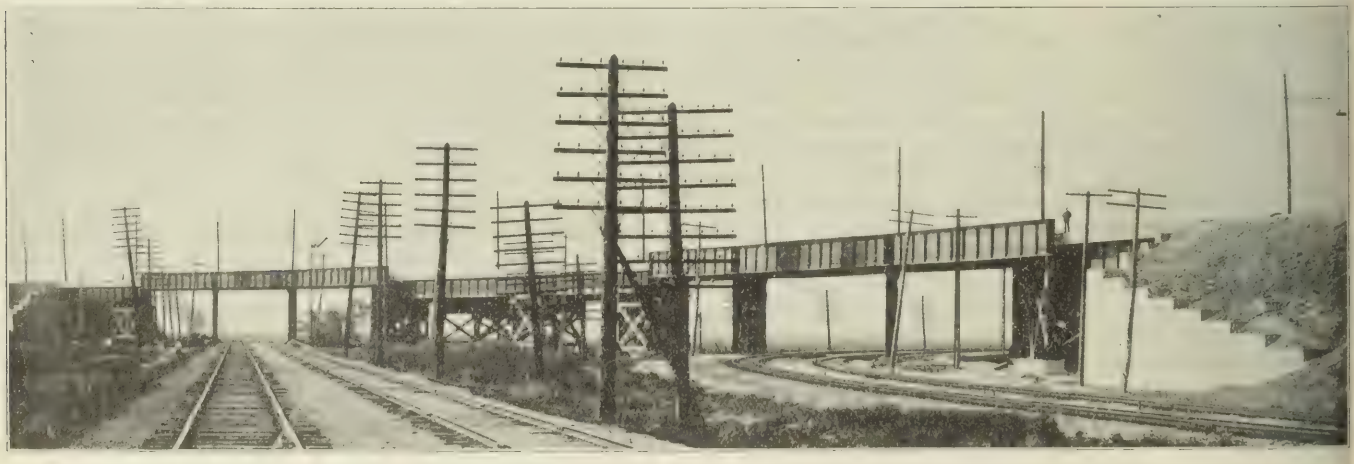
The trolley wire throughout is No. 0000 C. E. grooved section, supported by a half-inch, stranded steel, extra strength, double galvanized, messenger cable, which assumes a catenary curve and has a maximum sag of 18 in. for a pole spacing of 166 ft. The immediate connection of trolley wire to steel cable is by a half-inch galvanized iron rod provided with sister hooks over the cable, and a mechanical screw wedge clamp engaging the upper section of the trolley wire.

The catenary cable is supported from the poles by T-iron brackets, the outer end being fastened by half-inch overtruss rods. The insulator pins are of iron, the sockets of which engage the T-iron bracket; they are held in position by set screws, and are easily adjusted to take care of any irregularities which may develop in the alinement of the catenary system. The catenary system is supported on the pole brackets by high-tension porcelain insulators, tested to 20,000 volts. To secure stability and at the same time some elasticity, the iron bracket pins were wrapped with rubber tape before applying the catenary insulators. In case of impact to the catenary system the shock is absorbed by the rubber cushion and the loss of insulators by breakage is minimized. In addition to the vertical support for the trolley wire, lateral stability is obtained by means of an insulated wood steady strain placed at every pole. The trolley wire and messenger cable are anchored at the ends of curves and at half-mile intervals on tangents. The anchorage is V-shape in plan. The trolley poles serve as supports for one side and additional poles are placed on the opposite side of the track to complete the system. This method of anchorage is so designed to take care of longitudinal movement in either direction.

Of necessity the trolley wire must be maintained as nearly as possible at a uniform distance from the top of the rail, and must be free from abrupt undulations on the surface in contact with the pantagraph collectors. The trolley splices are of cold drawn copper tubing 36 in. long and soldered the entire length. The trolley wire is passed through the ends of the splices, soldered through the whole length of the splices, and as a further measure of safety the ends are either upset or held by clamps. Great care was exercised in putting both messenger cable and trolley in place to secure the same tension throughout its entire length.

Where, as at drawbridges or terminals, a break in the continuity was required as necessity of operation or maintenance, the messenger cable and trolley wire are sectionalized. The trolley section break is composed of wood impregnated with oil, being provided with a grounded brass band center. The messenger break is made up of porcelain spools which are placed immediately over the trolley section break. The circuit past the break is made by No. 0000 wire, extending from both sides and passing through a knife-blade disconnecting switch placed on the nearest trolley pole. Under ordinary operating conditions the switches are kept closed, but in case of trouble the line can be sectionalized by the men in the field and thus protect men engaged in making repairs from the 6600-volt trolley circuit.

The feed wire, return wire, telegraph, telephone and signal wire for the electrical installation at the Grand Calumet river crossing are supported on steel towers suf-



Overhead Crossing of New York, Chicago & St. Louis and Chicago & Western Indiana.

ficiently high to carry all wires 125 ft. above the mean level of the water. It was deemed advisable to adopt this plan of crossing rather than that of placing insulated armored cable below the bed of the stream. The stream now is a narrow channel and navigable by boats of light draft. If a cable crossing had been installed, future widening and deepening of the channel would cause serious interruption to traffic.

The circuit on the drawbridge is of special design and so made as to offer no interference with the opening or closing of the swing draw. The shore end of the messenger cable and trolley are supported by steel columns with knee brace stiffeners resting on masonry. The drawbridge ends are supported by structural steel columns and lattice girders founded on the end posts of the swing bridge. In this way both shore and drawbridge ends of the operating trolley circuit are maintained in a fixed position, subject only to such variations as arise from the expansion and contraction of steel in the supports. A space of 2½ in. is provided between the shore and drawbridge supports. With the drawbridge closed the continuity of circuit is made by spring copper bus-bars having a wiping contact surface of 4 in.

Power is generated at the Chicago, Lake Shore & South Bend plant at Michigan City, Ind. There are no substations on the Kensington & Eastern section.

Commodious station buildings, designed for suburban service, have been constructed at Pullman, Kensington, Hegewisch and Burnham. The stations are provided with steam heat and lighted by current from the trolley system. The station platforms are the same elevation as the car floors, and have easy approaches to the streets.

The design of the electrification details was under the direct supervision of W. E. Davis of Cleveland, Ohio, and the general supervision of all work was by A. S. Baldwin, chief engineer of the Illinois Central, and D. J. Brumley, principal assistant engineer, who was in charge of the work.

THE HUDSON BAY RAILWAY PROJECT.

The deputy minister and chief engineer of railways and canals of Canada finds "considerable difficulty in deciding on what basis to provide accommodation for a railway that in the nature of things cannot be operated to its capacity for more than two months in a year, to a lessened extent for a possible three months and for the remainder of the year still less."

Two routes for the Hudson Bay Railway have been surveyed, one from Pas Mission to Port Churchill on Hudson bay, 477 miles; the other from Pas Mission to Port Nelson, southeast of Port Churchill, on Hudson bay. The Nelson route follows the route laid out for the Churchill road for 150 miles and then branches off to the east. It is 440 miles long. The cost of surveying these routes has been $130,716, up to September 30, 1909.

The reasons for building a Hudson bay railway have often been discussed. They are partly military and partly sentimental. The report of the deputy minister and chief engineer of Canada attempts to in part justify such a road by showing what traffic may be developed. He points out that a line drawn from Dauphin, Man., in a southwesterly direction, passing through Weyburn, Sask., will separate the territory tributary to Pas from that tributary to Port Arthur on Lake Superior. He estimates that nearly the whole of the province of Manitoba and about 11,000 square miles of the southeast corner of Saskatchewan is tributary to Winnipeg. The whole of the remaining area of Saskatchewan and of Alberta belong to Pas Mission. He thinks that the country tributary to Pas is as fertile and as capable of production of agricultural products as is North and South Dakota.

The first 150 miles of the railway would run through well timbered country and the greater part of both the Churchill route and the Nelson route would be in a country where there is thought to be considerable mineral wealth. Limestone is found in large quantities and is favorable for quarrying, and marble is found in fair quality at Port Churchill and in good quality on Marble island in Hudson bay. It is pointed out in the report that there are a number of varieties of fish of good quality in Hudson bay, and if the new line were built fresh fish could be brought to the inland towns of Manitoba and Saskatchewan in 24 hours. It is hoped to develop some export and import traffic by means of a steamship connection with Liverpool. The steamship route would pass north of Ireland and the distance from Liverpool to Port Nelson is 3,200 miles, as against 3,007 miles from Montreal to Liverpool.

The report of the chief engineer favors the Nelson route. The road could be built from Pas Mission to Nelson with a maximum grade of 0.4 per cent. and with an average curvature per mile of about five deg. 30 min. Gravel and sand have been found in sufficient quantities along the surveyed route to justify the belief that ballast may be had without long hauls. There are no large bridges necessary on the Churchill route. On the Nelson route there would need to be three important bridges, one crossing the Saskatchewan river and two crossing the Nelson river.

The total estimated cost of building the Churchill line, if laid with 80-lb. rails, is $11,351,520. In addition, it would cost about $7,757,152 for stations, terminals, yards, etc. The cost of the Nelson line, laid with 80-lb. rails, is estimated at $8,981,800, stations, yards, etc., being estimated at $7,444,540 additional.

The line on which these estimates are made is designed to handle 32 trains a day, hauled by Mallet articulated compound locomotives, each train being made up of 40-ton capacity cars. This would permit moving 64,000 tons a day, allowing 50 per cent of the total mileage for empty car mileage.

Such a line as the one from Pas Mission to either Nelson or Churchill could not be operated profitably as an independent line and probably would have to be operated by one of the other large systems, the Grand Trunk Pacific, or possibly the Canadian Northern, might, for some reasons not directly connected with profit, find it advisable to operate such a line to Hudson bay.

IMPORTANCE OF THE COLISEUM EXHIBIT.

The following circular is of considerable interest:

New York Central Lines.

Circular No. 843.

Cleveland, March 9, 1910.

All Roadmasters and Master Carpenters, L. S. & M. S. Ry., D. A. V. & P. R. R., L. E. A. & W. R. R.

The Road and Track Supply Association will give exhibition of railway appliances used in the construction, maintenance and operation of railways at the Coliseum, Chicago, Ill., March 14 to 19, 1910.

This exhibition is very interesting to the engineering department, and I would suggest that each of you spend one day there, advising me in the regular way what day you wish to be off your division.

While some of the manufacturers have sent out formal invitations, I am advised that such invitation is unnecessary and that you will be admitted on presenting your railroad pass.

G. C. Cleveland,
Assistant Chief Engineer.

If every road in Chicago territory should issue similar instructions next year, the best current ideas in maintenance work would have a chance to spread very rapidly.

Proceedings

The Thursday morning session of the American Railway Engineering and Maintenance of Way Association was called to order at 9:40 o'clock by President McNab.

BUILDINGS.*

The committee was divided into three sub-committees, as follows:

Sub-Committee A: Maurice Coburn, chairman; H. M. Cryder, C. H. Fake, P. F. Gentine.

Sub-Committee B: William T. Dorrance, chairman; George W. Andrews, M. A. Long, C. H. Stengel.



O. P. CHAMBERLAIN,
Chairman Committee on Buildings.

Sub-Committee C: E. N. Layfield, chairman; John S. Metcalf, L. D. Smith, O. P. Chamberlain.

The topics submitted to the committee by the board of direction were as follows:

(1) Consider revision of Manual; if no changes are recommended, make statement accordingly. (Considered in full committee, afterward referred to Sub-Committee A.)

(2) Report on the use of reinforced concrete for coaling stations and storage bins. (Proceedings, Vol. 10, Part 2, page 1109. Sub-Committee C.)

(3) Continue the investigations on the design and detail arrangements of oil houses at terminals. (Proceedings, Vol. 10, Part 2, pp. 1124-1128. Sub-Committee C.)

(4) Recommended conditions under which various types of roof coverings are desirable. (Sub-Committee A.)

(5) Submit recommended designs for section tool houses applicable to roads of classes A, B and C. (Sub-Committee B.)

Revision of Manual.

The committee submits the Recommended Practice proposed and present on opposite pages for convenience of comparison. The proposed changes are to eliminate discrepancies and repetitions and present the recommendations in a more orderly fashion. It has not deemed it within its province under topic (1) to make radical changes in the Manual.

The changes submitted may be summarized as follows:

Waiting Rooms in Local Passenger Stations.

Omit paragraph (8).

The floor plans shown in the 1905 Manual, which are to be inserted in the new Manual, are altered so as to have a bay window in the telegraph office, giving the operator a view up and down the track.

Enginehouse Design,

Turntable.

Insert: "If electric power is used, the wires should be carried in a conduit up through the center of the pivot masonry and the turntable center."

Turntable Pit.

Change to read: "The side walls of the turntable pit should be of concrete or brick," etc., brick being sometimes cheaper than concrete and entirely satisfactory.

Omit: "Pivot masonry may be of concrete with stone cap." The stone cap for pivot masonry is not necessary, reinforced concrete being satisfactory.

Omit: "The distance from center of turntable to the inner side of roundhouse should be determined by the number of stalls required in the full circle."

Door Openings.

Change to: "The clear opening of entrance doors should be not less than 13 ft. in width and 16 ft. in height." The present 12-ft. width is not sufficient to avoid chance of injury to employees; and the present 17-ft. overhead clearance may be desirable, but it is not necessary.

Materials.

Insert the following (from Bulletin 103, p. 19):

"Reinforced concrete should be used below the floor when it is cheaper than plain concrete.

"The additional security against interruption to traffic from fire warrants the serious consideration of the use of a reinforced concrete roof.

"When the roof is of reinforced concrete the columns and roof beams should be of the same material.

"Reinforced concrete should be used for the walls only where special conditions reduce its cost considerably below that of brick or plain concrete."

Smoke Jacks.

Committee has cut out all reference to damper, and expressed size of flue in square feet of sectional area.

Drop Pits.

Last clause in present recommendation ("These can be most economically constructed in pairs") is not always true. Three pits are more economical than two, in some cases.

Heating.

Insert conclusions adopted at convention last year.

Window Lights.

Insert the following (from Bulletin 103, p. 19):

"The disadvantages of roof lights are so much greater than their advantages as to make them undesirable.

"Windows in the outer walls should be made as large as practicable and contain the largest glass or light area consistent with the requisite strength. In general, the lower sill should be not more than four feet from the floor and only sufficient space left between pilasters and sides of window frames and girders and window heads to properly secure the window frames. Windows or transoms as large as practicable should be provided over all doors where locomotives enter, but where possible to avoid it window lights should not be placed in doors on account of difficulty of maintenance."

Electric Lighting

Change to: "For general illumination there should be an arc lamp or something equally efficient in each space between stalls. There should also be plug outlets for incandescent lamps in each alternate space between stalls." The Manual specifies arc lights only; also plugs for incandescents in each space. The arc lamp has competitors, such as the Cooper-Hewitt lamp, which gives evidence of being efficient for this purpose. Plug outlets in alternate stalls, if sufficient in number, are satisfactory. The difficulties in maintaining electric wires in an enginehouse make it desirable to cut down their total length as much as possible.

Piping.

Change to: "The contents of boilers should not be blown off into the house and engine pits, but by means of a blow-off pipe should be carried to a suitable receptacle and used for heating refilling and washout water. The refilling water and the washout water should be maintained at the same temperature in different parts of the house and under suitable pressure by means of pumps and return circulating lines. As necessary, the blow-off steam and water can be supplemented by steam from the power plant and additional water. The use of warm water for washing out and refilling considerably reduces the cost of boiler maintenance and the time necessary for a washout or change of water." Present Manual specifies handling of cold water only, and merely mentions the desirability of hot water.

"Compressed air with from 80 to 100 pounds pressure which can be used for operating air tools and also for hoists and blowing and steam with 100 pounds pressure for use in raising boiler pressure should also be provided. The steam outlet is needed near the front end of the boiler and

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

the incandescent light plugs; the blow-off pipe, the air, the washout and refilling water, and the cold water connections, should be near the front end of the firebox. Connections need only be provided in alternate spaces between stalls." This simplifies the present recommendations. The overhead compressed outlet is not considered necessary, and connections in alternate stalls are considered satisfactory.

Hoists.

The committee calls attention to the fact that, besides air, hoists or cranes with differential blocks there are other cranes not operated by air in successful use, such as jib cranes on the front post or a trolley around the house near the outer wall.

Power Plant.

Insert: Where circumstances permit, the efficiency of the power plant can be increased by using the locomotive water supply for condensing purposes.

Locomotive Coaling Stations.

Insert (from Bulletin 103, p. 18): "In figuring the cost of handling coal, there should be included charges for interest and depreciation, charges for maintenance and operation (the cost of switching cars on to trestles should be included) and a charge for the use of the cars for storage purposes."

Oil Houses.

Insert the conclusions adopted last year.

Reinforced Concrete Coaling Stations.

Plans and photographs of four reinforced concrete plants recently built are shown in the committee report.

While it has been difficult to obtain data as to comparative costs of reinforced concrete stations and timber structures, the committee sees no reason to change the opinion previously expressed that the cost of the reinforced concrete structures averages about 50 per cent. greater than that of timber structures of like capacity.

It would seem that the use of the reinforced concrete type of coaling stations and storage bins is increasing. In many cases, no doubt, the freedom of this type from the danger of the loss of the structure and contents by fire due to spontaneous combustion of soft coal will cause many engineers to install one or more of those structures so that they may have a practical test of their efficiency.

The committee does not present any recommendations for the general adoption of this type of coaling stations and storage bins.

Oil Houses.

The committee has revised the typical oil house cross-section shown in last year's report to correspond with the following additional conclusions:

(5) Openings for ventilation should be provided above the level of the top of the tanks.

(6) Lighting, when practicable, should be by electricity and heating by steam.

Roof Coverings.

The committee does not present definite recommendations. The following is given as a progress report:

Tile.

A roof of well-burned tile properly laid is probably unexcelled for a pitch of six inches or more to the foot. It is so heavy in appearance that it ordinarily does not look well on a frame building.

Slate Roof.

A slate roof is cheaper in cost and lighter in weight than tile. It will give results almost as good and can be used satisfactorily on wooden buildings. The pitch should not be less than for a tile roof.

Wood Shingles.

A wood shingle roof properly laid and of good material will last for many years. First-class shingles can still be obtained from the Pacific coast for a reasonable price. If the shingles are dipped in linseed oil or creosote their life will be considerably increased. Painting after laying induces decay and should be avoided. When the roof is old and a little out of shape it is somewhat dangerous, providing a chance for the lodgment of sparks. The pitch should be at least six inches to the foot.

Built-Up Roofs.

Roofing built up of felt saturated with coal tar, cemented together with coal-tar pitch and covered with a protective coating of gravel or slag has shown by long experience its great serviceability for flat surfaces.

The following specifications give what is considered good practice in the laying of such roof coverings over boards and over concrete, the first specification being designed for roofs having an incline not exceeding three inches to the foot:

Specifications for Five-Ply Tar and Gravel or Slag Roof.
(Over Boards).

(To follow description of roof sheathing.)

Over the foregoing shall be laid a coal-tar pitch, felt and gravel or slag roof.

There shall be used one thickness of sheathing paper or unsaturated felt, five thicknesses of saturated felt weighing not less than 14 pounds per 100 sq. ft., single thickness, and not less than 120 pounds of pitch, and not less than 400 pounds of gravel or 300 pounds of slag from ¼ to ⅝-in. in size free from dirt, or 100 sq. ft. of completed roof.

The material shall be applied as follows: First, lay the sheathing or unsaturated felt, lapping each sheet one inch over the preceding one. Second, lay two full thicknesses of tarred felt, lapping each sheet 17 in. over the preceding one, and nailing as often as may be necessary to hold the sheets in place until remaining felt is applied. Third, coat the entire surface of this two-ply with hot pitch mopped on uniformly. Fourth, lay three full thicknesses of felt, lapping each sheet 22 in. over the preceding one, mopping with hot pitch the full width of the 22-in. lap between the plies, so that in no case in the last three plies shall felt touch felt. Such nailing as is necessary shall be done so that all nails will be covered by not less than two plies of felt. Fifth, spread over the entire surface of the roof a uniform coating of pitch, into which, while hot, imbed the gravel or slag. The gravel or slag in all cases must be dry.

The following specification is designed for roofs having an incline not exceeding one inch to the foot, and by adding the words "such nailing as is necessary shall be done so that all nails will be covered by at least two plies of felt," the specification is suited for inclines not exceeding three inches to the foot:

Specifications for Five-Ply Tar and Gravel or Slag Roof.
(Over Concrete).

(To follow description of concrete, which should be smooth and perfectly graded to carry water to outlet or gutter.)

Over the foregoing shall be laid a coal-tar pitch, felt and gravel or slag roof.

The specification is similar to the previous one, except that the sheathing paper is omitted, and 200 pounds of pitch is specified instead of 120 pounds.

The material shall be applied as follows: First, coat the concrete with hot pitch mopped on uniformly. Second, lay two full thicknesses of tarred felt, lapping each sheet 17 in. over the preceding one, and mop with hot pitch the full width of the 17-in. lap, so that in no case shall felt touch felt. Third, coat the entire surface with hot pitch, mopped on uniformly. Fourth, lay three full thicknesses of felt, lapping each sheet 22 in. over the preceding one, mopping with hot pitch the full width of the 22-in. lap between the plies, so that in no case shall felt touch felt. Fifth, spread over the entire surface of the roof a uniform coat of pitch, into which, while hot, imbed the gravel or slag. The gravel or slag in all cases must be dry.

The felt is saturated with tar from which the water and more volatile oils have been removed. The pitch is coal tar from which the creosote oils have been distilled. The pitch should be so soft that it can be used at all times without the addition of coal-tar or oil on the work, and yet so hard that it can be easily handled in warm weather. The best pitch for use in Winnipeg would not be satisfactory in New Orleans. If the pitch is too soft, it will run and the coating cannot be made thick enough. If too hard, or if used in too small quantity, the gravel will not stick. The gravel acts as a protection to the surface from walking on the roof, and from the action of the sun, and also keeps the pitch from running. The gravel of the sizes specified is supposed to give the greatest amount of protection to the pitch, without being in danger of washing off. The sheathing paper or unsaturated felt placed on the bottom next the roof boards is mainly to keep any pitch which might penetrate the two-ply felt above it from cementing the roofing to the roof boards. It also is of value in preventing the drying out of the roof through open joints from below. The saturated felts should be nailed when there is any chance of disturbance of the roof from underneath by wind and also enough to hold it in place while laying. The practice in regard to nailing varies in different parts of the country. Better results can be assured if matched sheathing is used. The two layers of saturated felt first laid are necessary in order to carry the amount of pitch which must be handled in one mopping.

After the original two layers of saturated felt are used, the additional layers are merely to give additional thickness of wearing material, and with a roof properly laid, the greater the amount of felt and pitch used the greater

the life of the roof. Ten-ply roofs have been laid. If too much pitch on top is used, it will run. The flatter the roof, the greater the life.

There are several grades of tar sold—the old-style strictly coal-gas tar, the tar from by-product coke ovens and the tar from the oil used in enriching water gas. Their value for roofing purposes is assumed to be in the order named. The oil tar is supposed to contain volatile oils which evaporate gradually, leaving the residue brittle. The increasing value of and the demand for creosote and other available residues of coal tar, with the attendant increase in the number of by-product plants, is increasing the output of coal tar.

It should be understood that there is a considerable variation in the quality of the tar produced, both in the by-product plants and from the gas houses. Good coal-gas tar can be bought under the guarantee of reputable manufacturers.

The inspection of a built-up roof is a difficult matter. The National Association of Master Gravel and Slag Roofers of America is endeavoring to insure the construction of good roofs. It recommends specifications about as follows:

"Labels.—All pitch and felt used on this work shall bear the manufacturer's label, and the felt shall also bear the manufacturer's label, stating the minimum weight per 100 sq. ft., single thickness.

"Inspection.—The architect reserves the right to inspect the roof by cutting a slit not less than three feet long at right angles with the way the felt is land before the gravel is applied."

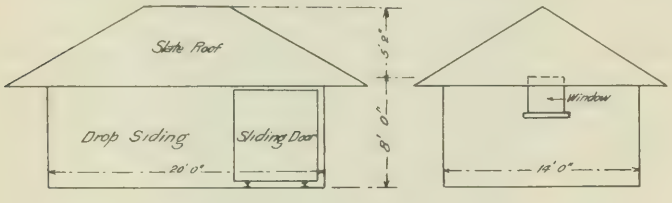
One arrangement suggested to insure the specified quantity of materials is to weigh all materials which come to the work and insist on the proper amount being used. No specifications for coal-tar pitch and saturated felt are available, and the only assurance of good quality is the guarantee of the manufacturer.

With a proper foundation, a coal-tar roof perfectly flat, covered with water, would theoretically have an indefinite life. Crushed material, such as quartz with rough edges, is better than routed gravel for covering steep slopes.

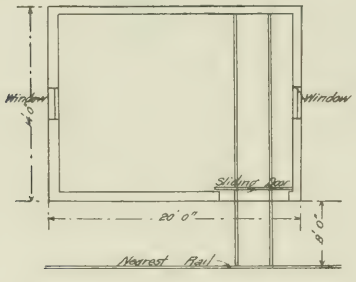
Asphalt is used for this purpose. It is variable in quality. It is claimed that its volatile constituents are so great that it deteriorates gradually. It seems to be relatively of more value for steep slopes than for flat surfaces.

Ready Roofing.

The roofings which come ready to lay are made on the principle of the built-up roof, but in a preparation which comes rolled it is impossible to get the amount of waterproof material deemed necessary for a good built-up roof. Asphalt is generally considered better for this purpose than coal tar.



TRACK ELEVATION END ELEVATION



PLAN

Section Tool House for Class A Roads.

The committee report also shows plans for classes B and C. They are similar to class A, with the variations indicated in the specifications.

The weakness of this type of roof covering lies also in the exposed lap and nailing and in the narrow lap. These coverings are valuable because of their economy for small, isolated and temporary buildings. They do not require the expert help required for a built-up roof.

Tin.

A tin roof can be used for almost all slopes, and if properly and frequently painted, gives good results, where it is not exposed to locomotive gases. Its maintenance is, however, expensive. It can be easily damaged and it is not suitable for railway purposes except under special conditions.

Patent Shingles.

There are also on the market various types of metal and composition shingles. Reinforced concrete slabs from 5 to 6 ft. long have been used for this purpose. Corrugated iron, asbestos boards, asbestos protected metal and tin or galvanized iron shingles are among those offered for sale.

Section Tool House.

Your committee begs leave to submit the following conclusions as its recommendation for the three classes of roads, A, B and C:

Class A.

House, 14x20 ft., with long dimension parallel to track; house to have sliding door 8 ft. in clear at extreme end on track side to permit the storing of handcar.

Building to be on wooden posts, unless the location can be permanent, in which case brick or concrete piers may be substituted for posts.

Building to be covered with drop siding.

Roof to be slate or asbestos shingles. (It is considered especially dangerous to have the ordinary shingle construction on buildings of this type.)

Building to have window openings on two sides and sliding shutters. (No glass to be used in windows or doors.)

Class B.

House, 12x16 ft., with long dimension parallel to the track; house to have sliding door 8 ft. in clear at extreme end on track side to permit the storing of handcar.

[Remainder of specification is same as for Class A.]

Class C.

House, 10x14 ft., with the short dimension parallel to the track, with double swinging door, swinging out on the end nearest the track.

[Remainder of specification is same as for Class A.]

Conclusions.

(1) The committee recommends that the changes in the Manual, as set forth in the report, be approved.

(2) That the recommendations under the heading of oil houses be approved.

(3) That the report on roof coverings be received as information.

(4) That the designs for section tool houses be approved as good practice, and incorporated in the Manual.

The report is signed by: O. P. Chamberlain (Chi. & Ill. West.), chairman; Maurice Coburn (Vandalia), vice-chairman; George W. Andrews (B. & O.), H. M. Cryder (W. P. Carmichael Co.), William T. Dorrance (N. Y. C. & H. R.), C. H. Fake (Miss. River & Bonne Terre), P. F. Gentine (Mo. Pac.), E. N. Layfield (Chi. Term. Trans.), M. A. Long (B. & O.), John S. Metcalf (John S. Metcalf Co.), L. D. Smith (Sou Pac.) and C. H. Stengel (Virginian).

Discussion on Buildings.

O. P. Chamberlain (C. & I. W.): Your committee and the subcommittee, of which Mr. Coburn is chairman, has spent a great deal of time in the investigation of roof coverings, and we discovered how little we know about roof coverings. Mr. Coburn, particularly, has devoted a great deal of attention to this matter. He was called back to St. Louis last night and he told me that he was not entirely satisfied with the result of the work of his subcommittee and hoped that the matter would be referred back to the committee. We have conferred with the American Society for Testing Material, and we hope at some future time to be able to give the convention something definite as to what constitutes a good roof covering, and perhaps some recommendations as to what means shall be adopted by the engineer to ascertain whether he is receiving a good material or not. The more important revisions of the Manual are as follows: Beginning with page 142, the principal difference on that page is the omission, under waiting rooms and local passenger stations, of what was formerly No. 8. I don't think the station we recommend admits of architectural treatment, and the committee left that out. On pages 144 and 145 the designs for the stations are identical with those formerly adopted by the

committee, with the exception of a bay window. On page 147, under the present form, the turntable pit was to be of concrete only. We inserted "concrete or brick" because there are places where it is much more convenient to get brick and we believe it makes as satisfactory a pit wall. As to door openings, the former reading was that the clear opening of entrance doors should be not less than 12 ft. in width and 17 ft. in height. We substituted, "The clear opening of entrance doors should be not less than 13 ft. in width and 16 ft. in height." We did not regard a 12-ft. clearance as sufficient and we did not regard the 17-ft. clearance as necessary.

W. C. Cushing (Penna. Lines): I do not think the committee has gone quite far enough. I should like to see them made 14 ft. in width and 16½ ft. in height at least. State legislatures are passing laws on those subjects now, and we are going to be put to a great deal of expense to widen out and increase the clearances. It will be a mistake on our part to decrease the clearances. I move that we substitute 14 ft. for 13 ft. and 16 ft. 6 in. for 16 ft.

J. P. Snow (B. & M.): I am not much in sympathy with making that 14 ft. It would simply be an encouragement to the state legislatures, and other parties in power that Mr. Cushing referred to, to fix that as a minimum; and they may go one better. They may say this association has adopted that as good practice and everybody must come to it. I do not think we ought to encourage extreme clearances of any kind, because the various commissions, state and national, are apt to pick up these figures and go one better.

C. H. Fake (M. R. & B. T.): The committee had that in mind, and it inserted the words "shall not be less." If anyone wishes to have a wider door there is nothing here to prevent it. Some roads do not have as large engines as others, and they might want to build a house with doors less than 14 ft. wide. We thought 13 was ample for small engines, and it was put in that shape.

C. F. Loweth (C. M. & St. P.): It seems to me the requirements presented by the committee are ample and we will be on the safe side if we adhere to that.

G. H. Bremner (C., B. & Q.): I hope this motion will pass. It seems to me there is another side of this that we ought to look at, that is, the building of buildings by private parties. We frequently have to meet the question as to how wide and how high shall doorways and entrances be made. If we have 13 ft., we will have no argument whatever for making those entrances any wider, and we should not allow them to be made that narrow in private buildings.

Mr. Snow: Part of this applies to a roundhouse. Private parties seldom build a roundhouse.

C. E. Lindsay (N. Y. C. & H. R.): I agree that when we establish 13 ft. as the width of our engine house doors, we knock from under ourselves the support that we have for arguments with private parties. Our standard for such openings now is 14 ft., and I think we ought to have our engine house doors 14 ft. It means 10 ft. greater distance between the turntable and the face of the engine house.

Mr. Loweth: The standard on the road I am connected with is also 14 ft. for all our new houses, but we have a great many houses that we will continue in service a great many years where the opening is 13 ft., and in many cases less than 13 ft. It is admitted that it is desirable to have a wider opening, but we cannot bring about a wider opening in many of the old houses that many roads have in service. I think we should not put into our Manual a requirement that is going to give a black eye to perhaps nine-tenths of all the old houses in existence to-day and that will remain in existence a good many years. Mr. Bremner's argument, I think, is good, but it is unnecessary that we should put into our Manual many things that are otherwise not necessary simply to bolster up an argument when we have to deal with other buildings into which our locomotives are supposed to run. I think we should meet the situation by saying that our newer houses are built with such a width of opening and that we will decline to run our engines and cars into their houses unless they will conform to the present width of openings.

W. S. Thompson (Penna. R. R.): I think one thing we should remember is our past experience with equipment. We constantly enlarge the equipment, and we cannot foresee now the width we are coming to. The Baltimore & Ohio now has up this question of taking care of the new Mallet engines, and roundhouse doors will have to be provided to receive those engines.

Mr. Chamberlain: We are not advocating the adoption of 13 ft. width and 16 ft. height of entrance. That is the absolute minimum. That is the point, it seems to me, that some of the speakers have overlooked. I want to lay particular stress on that before the matter is brought to a vote.

The motion was lost.

Mr. Chamberlain: On page 148, under "roundhouse doors," we have omitted the first part of the first paragraph: "Roundhouse doors should be made of non-corrosive material." This same statement occurs about three times in the Manual. We decided to eliminate it entirely. If there is no discussion on that we will proceed to the smokejacks. The only material change is leaving out the recommendation that a damper be provided in the flue. There is a very decided opinion on that on the part of the engineers and we dodged it by eliminating it entirely. We also omitted "non-corrosive." I think that was brought up by Mr. Loweth last year. The next change is under "drop pits." The original reading will be found at the bottom of page 148. We left off the last sentence, because, as stated in the footnote, it is not true. As to electric lighting, the change was introduced to indicate that we did not consider the electric light absolutely necessary. There are some places where it would be impracticable to have electric lights, and there are others as satisfactory as electric lights. If there is no further discussion, I move that the revision of the Manual as presented by your committee be adopted for the new Manual.

Mr. Loweth: It seems to me that the specifications that have been presented by the committee are drawn primarily for a large and well-equipped house at an important terminal. I believe that a great many new houses are built for terminals where the engines will be simply turned around and little or no work done on them. Such houses will be of perhaps 10 stalls or so. These specifications are entirely too elaborate and call for too much equipment of such houses, and I think that some discrimination ought to be made in their favor. I move that we change the heading of these specifications to read, "Recommended Practice for a New House for Large Terminals." It seems that that is really what the committee had in mind.

Mr. Fritch: I wish to know if Mr. Loweth would change the word "large" to "important terminal"? It may not be a large terminal, but it may be an important one.

Mr. Chamberlain: The committee has no objection to that change being made. I think Mr. Loweth's point is well taken. Of course we did have in mind large engine houses.

Motion carried.

Mr. McDonald: As to the resolution just passed, it seems to me the committee has made a change in the Manual which they do not show. The title in the Manual under this heading is "Requirements of a Modern Roundhouse." The committee seems to have omitted that altogether. If that had been included it would have carried the meaning Mr. Loweth recommended.

Mr. Loweth: That would hardly fill the bill. A 10-stall house without air and drop pits and without heating and lighting, might be a modern house in every sense of the word, and one able to accomplish all the work required of it, but it would not comply with these specifications.

The report of the committee with regard to the revision of the Manual, as amended by Mr. Loweth's motion, was adopted.

Mr. Chamberlain: As to the use of reinforced concrete for coaling stations and storage bins, we have no recommendation to make for the Manual. I suggest that the board of direction refer the matter back to the committee for further consideration. There is, I think, a growing tendency to put in coaling stations of reinforced concrete, at least on trial, and so far as we have been able to learn those which have been installed are quite satisfactory. They are more expensive, but when the question of the possible loss due to fire is considered we figure out that they are more economical. We believe an engineer is justified in important terminals in installing this type of house on the ground that he cannot afford to have a fire which will upset his whole operating department.

As to the design and detail arrangements of oil houses at terminals, there are two recommendations presented by the committee which I think the secretary had better read.

The President: Before the secretary proceeds to read these sections, it is understood that the report on "Reinforced Concrete Coaling Stations" is received as information and referred back to the committee for further consideration.

The secretary read the conclusions referred to.

Mr. Loweth: I suggest that the second clause read: "Lighting, when required, should be by electricity, and heating by steam."

L. C. Fritch (C. G. W.): There is one point the committee has not covered in these specifications, and that is the ques-

tion of fire protection. It is customary in oil houses to put in a coil of steam pipe with a valve operated from the outside, so that in the case of fire the valve is opened. This is a great protection in the event of fire.

Mr. Chamberlain: The committee is willing to substitute "when required" instead of "when practicable."

The president put the motion on this substitution, which was carried.

Mr. Chamberlain: I do not know that that motion carries exactly what we wanted, and I would like to get the sense of the convention on the matter. I move that these two recommendations, 5 and 6, as adopted by this convention, together with the cross-section, Fig. 10, be incorporated in the Manual, and also that the further consideration of the matter of oil houses be referred back to the committee, especially in regard to the suggestion made by Mr. Fritch.

Motion carried.

E. N. Layfield (C. Ter. Trans.): The report on "Roof Coverings" is not regarded as entirely satisfactory, and as the chairman of the committee has stated, the committee desires to have it referred back for further consideration.

The President: I do not believe any discussion is necessary on that point. The committee is not prepared to discuss it to-day and we refer it back for further consideration. We now take up the question of section tool house.

Mr. Chamberlain: We present three sketches of section tool houses, together with recommendations, which I will ask the secretary to read.

Mr. Lindsay: Does the drawing of the Class B house agree with the dimensions in the first paragraph? The paragraph refers to a house 12 ft. by 16 ft. and the dimension on the diagram appears to be 18 ft.

Mr. Chamberlain: That is an error and we will correct it. The dimension on the diagram is incorrect.

The secretary read the paragraphs under Class A.

Mr. Loweth: I would like to inquire why these buildings are to be covered with drop siding instead of some other kind of finish which may harmonize with the other buildings about the station?

Mr. Fritch: I think Mr. Loweth's point is well taken. A lot of roads adopt standards that do not conform to this. A lot of roads use shingles. I suggest that sentence be omitted.

The President: The committee will omit that sentence.

Mr. Loweth: I move that the words, "Roof to be slate or asbestos shingles," be omitted. I see no reason why, if we desire, we should not put ordinary shingles on a building of this character. I object to putting in the Manual the statement that a shingle roof on a small building of this kind in any part of the country is dangerous.

Mr. Chamberlain: We have no objection to striking out this provision.

A motion to that effect was carried.

Mr. Fritch: As to the "Building to have window openings on two sides and sliding shutters. (No glass to be used in windows or doors.)" It is customery sometimes to have windows of glass arranged to slide out of the way. I do not see any necessity for putting in the matter in parentheses.

A. W. Thompson (B. & O.): That motion being carried, there is no mention made of the roof in the following specifications. I think it would be preferable to make some mention of some kind of roof. For instance, a roof of fireproof construction.

C. H. Stein (C. of N. J.): It seems to me that you have taken the sides out of this building and removed the roof and now you are about to eliminate that feature in regard to the windows. Where is the building going to come in? It has always seemed to me that it was the province of this organization to originate and not, necessarily, to imitate. The point was made a few moments ago that a great many roads adopt standards that would not be in conformity with what was composed here, therefore, it was not thought wise that we should place ourselves on record in regard to this matter.

During the discussion of the report of the Track Committee we made one of the most radical departures this organization has ever made, and that was with regard to the length of switches and numbers of frogs preferable to use, etc., asking us, in a great many cases, perhaps in the larger percentage of cases, to deviate entirely from the established plans that have been built up after years of time and consideration spent upon them. I do not see any more reason why in this case also you may not establish a standard for recommended practice, just as this convention, by its silence, permitted the Track Committee to establish new standards at variance with what railways have considered, generally, recommended practice for their government. I believe we should incorporate in our Manual certain features that would apply to a well-constructed building for the use of track foremen and section gangs, and I do not see any reason why this convention should not say what would make the best form of construction. That imposes upon no individual nor any railway the obligation to conform strictly to the recommended practice of this association. It is within the province of every railway to do as it sees fit, but this convention says by its vote and voice that this is the recommended practice. If a railway, in its wisdom, thinks well to depart from what this association declares as the best practice, no one can offer any objection to it. It seems to me entirely unreasonable and illogical that we should strike out this entire building, which we will do in effect, and in fact have done, if we strike out the various clauses that have been discussed.

G. W. Andrews (B. & O.): In striking out these clauses, you have eliminated the recommendations of this committee. The sub-committee having this particular subject in charge, of which I am a member, received a great number of answers to their request for information from various roads, and if your committee had endeavored to draw up a specification covering all the methods and so-called standards of the different railways, we would have filled a bulletin much larger than this one with specifications alone. The committee gathered from these specifications what it thought was the best practice, and inserted in the report a recommendation of what we consider good practice. Now, if you do not want to follow that practice, cut it all out; if any road does not desire to use the lap siding it can use shingles, or vertical siding, or any class of siding it desires; it can use lap siding on one-half and shingles on the other half, or it can use lap siding entirely, or vertical siding entirely. We simply make this as a recommendation of what we consider a building of good design, one on which slate or asbestos shingles are to be used. We eliminated the ordinary wooden shingle, because we did not consider it a safe roof from the fire standpoint. If you do not want these things, send the report back to the committee; but in sending the report back to the committee I think the convention should tell the committee what it wants, and not let the committee come in year after year with recommendations and have them stricken out. (Applause.) I wish to state that this is my maiden effort. (Applause.)

W. L. Webb (Con. Eng.): There is one principle involved in this question, which applies to the whole subject matter that is to go into the Manual. I do not think we should permit anything to go into the Manual except the essentials of practice, and when some little detail is brought up which can be done in half a dozen different ways, all equally good, or at least some applying in one place and some in another, I do not think that some one method of doing that thing should be put into the Manual. This has already been brought to my attention in many cases. A great many things have been put into the Manual which engineers of roads will not agree to, they will not recommend them to their roads, and even if they do recommend these things, those higher in authority will not agree to them. Whenever we allow anything to go into the Manual which will not have general acceptance, it weakens the Manual to that extent.

Mr. Loweth: Mr. Webb has expressed my sentiments much better than I have been able to do for two or three years, and I am glad he spoke as he did. I asked last year, I think, why, when there are several ways of accomplishing a result, all equally good, should we select one of these several methods and put it into our Manual? Now, the inference is very clear that whatever is not recommended is passed over because it is not as good as something else. One of the speakers has said that if the railway companies in their wisdom decide not to follow the recommended practice they are at liberty to do so. I think it would have been better for the speaker to have said if some of the railway companies in their presumption decline to follow the recommended practice they are free to do so. I feel that when a body of men such as those composing the membership of this association deliberately pass on these details and put them into the Manual for Recommended Practice, I should have to have very many and excellent reasons for not putting them into practice in my own work, and I stand ready, so far as I can, to put into my own practice everything that is approved by this convention, but I do not want to be hindered with the non-essentials.

Mr. Chamberlain: I want to say, in regard to what Mr. Webb and Mr. Loweth have stated, that I do not consider by any means that the action taken by this convention in striking out the two paragraphs has destroyed these recommendations. The essentials of these little houses are the general size, the size of the doors and the shape of the houses. If the convention sees fit to adopt the recommendations, omitting these two, we can build a house from these little diagrams, if we want to build it that way, and if you do not want to cover it with drop siding you can cover it with shingles or asbestos or corrugated iron, or something else. The same applies to the roof; we can put on shingles, slate roof, some ready-made roofing material, or tin. So I personally do not feel that the striking out of these two clauses really damages the recommendations we have made; it simply puts it up to the engineer who builds a house, if he follows this design, to build it of any material he sees fit. I move that the entire recommendation in regard to section tool houses be adopted and incorporated in the Manual as amended; that is, striking out these two paragraphs under Class A, and, of course, under Classes B and C, as the only difference between the buildings as recommended is the matter of size. I make this motion simply to get the matter before the convention.

Moses Burpee (Bang. & Aroos.): I ask if it is the intention to place in the recommended practice that tool house which is shown, with no glass in the windows or doors.

Mr. Chamberlain: It was the intention of the committee that there should be no glass, only shutters. My experience is that the glass in section houses is in very poor condition, and that simply openings for sliding shutters are preferable. There is another objection to the closed house in addition to this, and that is that the section men instead of being out on the section will stay in the section house in the winter and play cards.

Mr. Burpee: My opinion is that glass in the tool house is very well taken care of if we consider it necessary. My road is in a colder climate than most roads.

E. F. Wendt (P. & L. E.): This is a new subject, which has been considered during the past year. I think it was not considered previous to that time. The general purpose of the instruction was to get a conclusion respecting the general layout of tool houses. These small houses are necessary on every road, and it was thought wise to get some conclusion respecting size and general layout. It does seem to me, in view of the discussion this morning, that the convention would make greater progress if the conclusions this year were limited to the first portion of the recommendation, that relating to the layout, which involves the size. The detail specifications may be considered later. Furthermore, tool houses are built for special purposes and the design will need to be amended to show some interior equipment, so that the houses may be of the maximum use. I, therefor, would ask if the committee would agree to a conclusion, which will be limited to the diagrams and the first paragraph under Classes A, B and C, respectively, giving layout and dimensions of each, but leaving the subject of detail specifications to a future meeting.

Mr. Chamberlain: That is what I wanted to get at. If Mr. Wendt wishes to put that in the shape of a motion I will withdraw my motion.

Mr. Wendt put his suggestions in the form of a motion.

The President: It would be understood that conclusion 4, on page 173, would remain as it is, as it refers simply to design.

Mr. Fritch: We have attacked everything about the poor, little section tool house except its location. I think the location is an important point, and it should be beyond the switches. There is a lot of time lost by section forces being hemmed in by trains lying within side tracks and within switches. I suggest a clause be added: "The location of tool houses should preferably be beyond the switches."

The President: Does the motion include the diagrams?

Mr. Wendt: The motion includes the diagrams when they are corrected by the committee.

Mr. Loweth: I amend that by omitting the diagrams. My reasons are: First, that the text contains all the information that is necessary; and, second, that these diagrams show roofs projecting a considerable distance. We want to design the section house or the tool house so that, in some respects at least, it will harmonize with the appearance of the station, and it may be that that projection of the roof will be quite out of harmony.

Mr. Chamberlain: This is simply a diagram, not an architectural design for a building, and there are some things shown in the diagram which it is pretty hard to explain in the text. I do not think there is a particle of objection to incorporating the diagrams, as such, in the Manual. We understand that anyone who wishes to build a tool house to conform with some station nearby is at perfect liberty to do it. The diagrams show as little as they can—they are outline sketches. They show the distance of building from track, which is important, and size of doors, and location of track leading into the houses, which is important. I would prefer to see the resolution adopted as Mr. Wendt presented it.

Mr. Stein: I think we will all agree that with a little more discussion we will have absolutely nothing left here. I am not so certain that the dimensions given in these diagrams and in the text are just what we want. I would amend the original motion, therefore, and refer this entire matter back to the committee for another year's consideration.

Mr. Chamberlain: The subcommittee spent a good deal of time on this. It looks like a little thing, but it is discouraging to bring these things before the convention and have members get up and object and offer nothing in place of what they object to. It is perfectly feasible and perfectly rational to alter these recommendations later on, even though they should be adopted. I am speaking particularly for the subcommittee, which has labored assiduously and faithfully to try to give you something. Unless you have some specific objections to these diagrams going in the Manual, I think Mr. Wendt's original motion is perfectly proper.

Mr. Snow: Class B is given as 16 ft. over all, with a sliding door on the inside, 8 ft. in the clear. That is a practical impossibility.

C. Dougherty (C. N. O. & T. P.): In regard to the diagram, I would object to the location of the house 8 ft. from the nearest track. I do not think that is enough.

Hunter McDonald (N. C. & St. L.): Possibly the board of direction made a mistake in referring this subject to a committee at all. Certainly we ought to tell the committee just what we want them to report on. We seem to have left it to their discretion to a large extent. I do not think it wise to reverse and amend the reports of committees, I think we have had enough discussion here to enable them to revise the report, and I think it should be referred back to the committee for further consideration.

A vote was taken on Mr. Loweth's amendment, which was lost.

Mr. Wendt's motion was carried.

ROADWAY*

The subjects assigned were as follows:

(1) Consider revision of Manual; if no changes are recommended, make statement accordingly.

(2) Collect all known formulas for determination of size of waterways, and tabulate them in such manner that they may be intelligently compared. Also consider whether, by the introduction of factors suiting local conditions, a general formula for waterway areas could not be used in all cases.

(3) Confer with Committee II, on Ballast, and report relative to unit pressures allowable on the roadbed of different materials.

(4) Report on the following: (a) Tunnel Cross-Sections; (b) Tunnel Lining; (c) Tunnel Drainage and Ventilation.

(5) Investigate and report on the question of agricultural drainage in levee and marsh district as they affect railways: (a) Laws and assessments; (b) Methods of construction of drainage channels through railways.

Sub-committees were appointed as follows:

Sub-Committee A—Consider Revision of Manual: S. B. Fisher, Chairman; H. J. Slifer, J. G. Sullivan, A. M. Kinsman.

Sub-Committee B—Tabulate Formulas for Waterways: W. D. Pence, Chairman; John C. Beye, J. A. Spielmann.

Sub-Committee C—Mean Pressures Allowable on Roadbed: W. M. Dawley, Chairman; Duncan MacPherson, John C. Sesser, Paul Didier.

Sub-Committee D—Tunnels: J. E. Willoughby, Chairman; D. J. Brumley, Walt Dennis, Curtis Dougherty.

Sub-Committee E—Agricultural Drainage Districts: W. C. Curd, Chairman; Moses Burpee, R. C. Young.

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

The committee reports progress on subjects (2), (3) and (5), and suggests that these subjects be reassigned.

Conclusions.

(1) Your committee recommends that the changes given under the heading of Revision of Manual be approved.

(2) It is recommended that the conclusions given under the heading of Tunnels be approved and incorporated in the Manual of Recommended Practice.

The report is signed by: George H. Bremner (C., B. & Q.), chairman; S. B. Fisher (M., K. & T.), vice-chairman; John C. Beye (C., R. I. & P.), D. J. Brumley (Ill. Cent.), Moses Burpee (Bang. & Aroost.), W. C. Curd (Mo. Pac.), W. M. Dawley (Erie), Walt Dennis (K. C. S.), Paul Didier (B. & O.), C. Dougherty (C., N. O. & T. P.), A. M. Kinsman (B. & O.), Duncan MacPherson (National Transcontinental), W. D. Pence (Univ. of Wis.), John C. Sesser (G. Nor.), H. J. Slifer (C. G. W.), J. A. Spielmann (B. & O.), J. G. Sullivan (Can. Pac.), J. E. Willoughby (L. & N.) and R. C. Young (Lake Superior & Ishpeming).

Appendix A.

Revision of Manual.

The sub-committee recommended the following changes in the definitions:

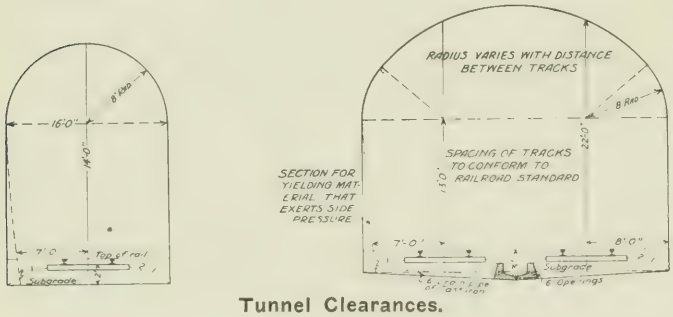
Slide.—The movement of a part of the earth under the force of gravity.

Washout.—The carrying off of the permanent way by the impact and erosion of flood waters.

Bog.—Soft spongy ground, usually wet and composed of more or less vegetable matter.

Berme.—(a) The space left between the top or toe of slope and excavation made for ditches or borrow pits.

Berme.—(b) An approximately horizontal space introduced in a slope.



Tunnel Clearances.

The committee submits for approval the following definition:

Earthwork.—The moving of masses of earth by artificial means.

The committee recommends that the recommendations under Specifications for the Construction of the Roadway be revised as follows:

That paragraph 4 be amended to read: "Profiles should be made complete in regard to distribution of material."

That paragraph 1, under the heading Design and Construction of Roadway, be amended to read: "There should be recognized three widths of roadbed for standard-gage railways, and these should be selected to suit the density of traffic. These widths should be 14, 16 and 20 ft."

That the Specifications for the Formation of the Roadway be amended as follows:

That paragraph 11 be amended to read: "In localities where isolated trees and buildings exist, payment shall be made for their removal at a price to be agreed upon."

That paragraph 37 be amended to read: "In crossing bogs or swamps of unsound bottom, for light fills a special substructure of logs and brushwood may be required, the logs forming this foundation to be not less than six (6) in. in diameter at the small end. If necessary there shall be two or more layers crossing each other at right angles, the logs of each layer being placed close together, with broken joints, and covered closely with brush; the bottom layer shall be placed transversely to the roadway and project at least five (5) ft. beyond the slope stakes of the embankment."

That paragraph 72 be omitted.

That the following clause be added to the recommendations under slides, adopted in 1909:

(7) The weighting of the toe of the slopes to restore equilibrium may sometimes be found efficient.

That former (7) be renumbered (8); former (8) be renumbered (9).

Appendix B.

TUNNELS.

The committee has undertaken to consider the tunnel only in so far as to make recommendations covering the following matters:

(a) Form and dimensions of the clear opening to be provided for trains, both on straight and curved track;

(b) What change is advisable, if any, in the rate of grade through the tunnel where the tunnel occurs on a ruling grade;

(c) The character of masonry advisable to adopt for the permanent lining where the tunnel is excavated through material requiring support;

(d) The system of drainage best adapted to the tunnels.

The committee issued on August 6 a request for blueprints typical of present practice and for replies to the following questions:

1. What modifications do you make in the dimension of the clear opening to accommodate curved track?

2. Do you prefer stone, brick or concrete (or combinations of any two) for lined tunnels through:

(a) Thin strata of hard stone?

(b) Slate or like material good for one to three months without support?

(c) Shales, clays, etc., swelling on exposure?

(d) Mixed boulders and clay when dry? When wet?

(e) Unsound material of any kind requiring support of roof and sides only?

(f) Unsound material of any kind requiring support for roof, sides and bottom?

3. Do you use any formulas for determining the thickness of masonry in linings?

4. Do you reduce rate of maximum grade through tunnels? At what rate?

5. Do you have any tunnels where drainage is carried through conduits or pipe lines? Where are the conduits and pipes located? What precautions are taken to prevent them from filling? Is such drainage efficient?

6. Do open side ditches give efficient drainage? Have you taken precautions to make the ditches smooth with concrete to facilitate shoveling out the accumulation in the ditch?

7. Would you prefer the drainage of a single-track tunnel be concentrated in one ditch, conduit or pipe, or distributed in two?

As a result of its deliberations and the examination of a multitude of plans sent to it, the committee submits the following partial report:

It recommends the adoption, for single track tunnels on tangent, of a tunnel section 22 ft. high from top of rail to soffit of arch over the center of track, and 16 ft. wide between sidewalls. Where pressure against the sidewalls must be provided for, it will be advisable to reduce the width at rail top level to 14 ft. and to join the springing line width of 16 ft. and rail top width of 14 ft. with a curve of long radius.

When a tunnel is on curved track, the section should be widened and the track displaced from the center of tunnel to such an extent as to give substantially the same clearance at the car floor level and at the car-eave level as is given on tangent by the dimensions recommended above.

For double-track tunnels it is recommended that the width to be that suggested for single-track tunnel plus standard width between track, and that the clear height above top of rail over the center of each track be 22 ft.

The arch for a single-track tunnel should usually be a semi-circle. The arch for a double-track tunnel should have the central portion constructed on a long radius and with short radii to connect the central portion to the sidewalls.

The dimensions given are considered the minimum for Class A track. The size of the tunnel should not be varied for the different classes of track on account of the high cost of enlarging a tunnel constructed to a less dimension than that required for Class A track, and in view of the probability of all principal lines of railway soon needing roadways to support Class A track.

The committee is not satisfied with the prevailing drainage in single-track tunnels through side ditches and favor some form of pipe drainage, but cannot make recommendation at this time as to what construction is best. The advice of the full committee is requested.

For double-track tunnels the committee favors carrying the drainage down the space between the two tracks through a concrete channel, which may be covered with old boiler plate if so desired.

It is recommended that the rate of grade in long tunnels be lessened by 25 per cent. from that of the ruling

grade so as to compensate for the greater resistance due to bad track, the less adhesion due to wet rail and to avoid the possibility of the train stalling in the tunnel, with the resulting asphyxiation of the train crew.

Concrete is recommended for the permanent lining of tunnels requiring support. It is recognized, however, that in certain conditions, e. g., when the movement of the material through which the tunnel is excavated is so rapid that concrete will not have time to reach a permanent set, a brick lining must be constructed. When brick are used for tunnel lining that portion of the arch for a horizontal distance of five feet each side of the center line of track should be of vitrified brick laid in Portland cement mortar.

Conclusions.

The following is submitted for insertion in the Manual of Recommended Practice:

1. That the form and dimensions of the clear space to be provided for single and for double-track tunnels on tangent conform to the accompanying diagrams.
2. For tunnels on curved track, the dimensions of the section should be increased and the track displaced from center of tunnel so as to give substantially the same clearance as is given on tangent by the sections above.
3. For double-track tunnels the drainage should be provided for by the construction of a concrete channel midway between the tracks.
4. The rate of grade in long tunnels should be reduced so as to be 25 per cent. less than that of the ruling grade.
5. Concrete should be used for the permanent tunnel lining except where local conditions will injure the concrete before there is time for it to harden.

In the event that a brick lining be used, that portion of the arch for a horizontal distance of five feet on each side of the center line of each track should be laid with vitrified brick in rich Portland cement mortar.

Discussion on Roadway.

G. H. Bremner (C. B. & Q.): The committee would like to eliminate the definition for earthwork. In regard to profiles, we make it read: "Profiles should be made complete in regard to distribution of material," and cut out the reasons for making it complete in that conclusion. Under "Design and Construction of Roadway" we strike out the words "probable density" and "to be handled in the future." In the provision for carrying small articles off of the right-of-way, the word "grading" is substituted for "clearing." In regard to crossing bogs or swamps the words "for light fills" were put in. Paragraph 72 was cut out from the specifications. Those are all the changes in the Manual except the change which we were instructed to make last year in regard to washouts.

Conclusions 1 and 2 were approved.

Mr. Bremner: This report on tunnels does not cover the full instructions of the board of direction in the consideration of this matter. We hope to go into the matter further and report other conclusions and recommendations during the coming year.

Mr. Bremner then read conclusions 1, 2, 3, 4 and 5, with regard to tunnels, and moved their adoption.

G. A. Mountain (Can. Ry. Com.): I notice the diagram for double-track calls for 22 ft. clearance head room from sub-grade. Day before yesterday, on bridges, this house approved 22 ft. from top of rail.

Mr. Bremner: The diagram was intended to show 22 ft. from top of rail.

The President: That amendment will be made.

R. N. Begien (B. & O.): I move to amend conclusion 4, to read: "The rate of grade in long tunnels should, if necessary, be reduced tby an amount equal to 25 per cent. of the ruling grade." We can readily conceive of cases where the tunnel is on other grades than the ruling grade. I believe ruling grade has never been defined by this convention.

G. D. Brooke (B. & O.): In connection with some location work on the Baltimore & Ohio, with which I was connected some years ago, we considered this matter of reducing grades in tunnels. At first we reduced the grades through the tunnels themselves. Later, we considered it would be better to reduce the grade below the tunnel. Th purpose of the reduction of th grade in the tunnel is to relieve the engine of the extra work due to the slipping of the wheels in the tunnel, and also on account of the gaseous conditions of the tunnel. If the grade is held to the maximum, practically all of the train will be on the heavy grade when the locomotive enters the tunnel, and the speed of the train will be reduced; but if the grade is reduced below the tunnel the train will be accelerated and on entering the tunnel will have higher speed than on maximum grade. This will be reduced as it goes through the tunnel and it should emerge from the tunnel at about the maintained speed.

Mr. Mountain: I want to enter an objection to the method of measuring this head room from the top of rail. I think that is wrong. The top of rail is not a fixed point. In my practice on the Canadian Railway Commission we order it from the base of rail.

J. E. Willoughby (L. & N.): The committee considered that there should be a greater reduction of grade on those grades that require helper service than on the lighter grades, and that was one reason the committee adopted the ruling grade. The usual measurement on American railways for clearances has been from the top of rail, since that is the clearance that the train will need. Now it is assumed that the road will be maintained in the tunnel, so that the clearance above top of rail will not be diminished. As to the reduction of the rate of grade before you get into the tunnel, the engine is supposed to carry its rating up the grade outside. I think the only place where the reduction of grade is necessary is in the tunnel.

C. S. Churchill (N. & W.): I think that the committee is working on the right lines in reducing the grades of tunnels, but it does not seem to me that they have given all the reasons for it. The important reason, in my opinion, is that the grade be reduced in the tunnel, and at the end of it, in order to reduce the work of the engine while passing through the tunnel, when that tunnel is on a ruling grade. Unless that is done, it is only a question of time when artificial ventilation must be resorted to in case the tunnel is of considerable length, say, over 2,500 ft. That has been thoroughly tested out. It is a matter of record. I believe the committee is right in its recommendation to reduce at least 25 per cent. for those reasons, and that that reduction should extend below the entrance of the tunnel a short distance. I think that should be borne in mind in view of other questions this committee has before it. The question of ventilation will come up later; they say they have not acted on at present. It is very important that the ease of trains passing through tunnels be greater than on the line below the tunnel, where the tunnel is on ruling grade.

Mr. Bremner: The intention of the committee was to fix the grades so the trains could get through the tunnels easier and quicker. In fixing 25 per cent. reduction of grade the engineer should certainly take into account the approach grade. If the approach grade is light, the reduction of the grade in the tunnel should not be so great. If the approach grade is steep, it should be reduced to meet the grade in the tunnel and the amount of reduction in the tunnel would depend to a great extent on the approach grade, and it is the ruling grade over the division that governs the length of the train. So it seems to me we have covered that matter in saying that the grade in the tunnel should be reduced 25 per cent.

Mr. Churchill: I think it should be at least 25 per cent., and I think it would better be expressed that way. The French engineers recently passed on this question and made it a specification that the grades in tunnels should be reduced, and that it is necessary for ventilation purposes. We have one on our read 3000 feet long, and it is reduced 60 per cent; yet ventilation has been necessary for years.

Mr. Courtenay: It is our experience that it is very desirable to reduce grades in long tunnels for a variety of reasons. Long tunnels in a mountainous country are very apt to be near the summit on long grades; frequently the track is wet in those tunnels. The adhesion of the locomotive drivers on the rails is less. It frequently happens that quite serious consequences have been due to stalling in these tunnels, where the precaution was not taken in the original construction to materially reduce grades, and I presume those who have long tunnels have sometimes had to carry their enginemen and firemen out of the tunnel unconscious. This, so far as my experience goes, has been partly due to having summits in tunnels. I do not find that the committee has covered that point, and I would suggest that if, under the instructions, it be proper, it should express a recommendation prohibiting summits in tunnels. There is only one valid reason that I know of for putting a summit in a tunnel, and that reason I do not consider good. Sometimes great quantities of water are met in long tunnels and apparently the reason for some summits in tunnels is on account of the engineer

providing against water, so at ⅞ or ¾ of the length of the tunnel down hill he puts in the summit. The effect of the summit is largely to interfere with the draught through the tunnel and to collect smoke and hold it. My experience is that much shorter tunnels, with summits in them, are far worse for the trainmen than longer tunnels with approximately the same height of cross section without the summits, if practicable, without too great cost. I agree with the opinion expressed here that the grade should be reduced before reaching the tunnel. In most long tunnels it is a very serious question to cut down the length of the tunnel.

Mr. Wendt: This discussion is most interesting and profitable, but I doubt if we will come to any final conclusion on a question of this character without having the Committee on Roadway and the Committee on Economics of Railway Location come together in conference and agree on a conclusion. There are four main questions before us this morning. The first, tunnel cross-section; second, tunnel lining; third, tunnel drainage; fourth, tunnel ventilation. I suggest that these questions be taken up one by one, and that the question involved in conclusion 4 be referred back to the committee for further consideration during next year.

J. A. Lahmer (K. C. S.): There is another reason for considering the grade before entering into the tunnel, instead of considering the reduction of the grade in the tunnel, which I don't believe I have heard expressed. In some cases the biggest part of the train may be still outside of the tunnel when the engine is working in the tunnel. This, of course, would be applicable in the case of long freight trains. The engine would be obliged to work throughout the tunnel on account of the train being largely on the grade approaching the tunnel.

Mr. Bremner: The committee is willing to make conclusion 4 apply also to approaches. In regard to the summit of grade in a tunnel, the committee expects to consider the subject of ventilation next year.

H. G. Kelley (Grand Trunk): Returning to conclusion 1, Mr. Mountain brought up the question as to the point from which clearance should be measured. The original Railway Act in Canada was intended to give a 22-ft. clearance for an ordinary box-car and a man on top, but the commission said, "Rails are changing in height, maybe an inch or maybe two inches, and we will give 22 ft. 6 in. from the base of rail." Suppose we are running with a 4¼-inch rail and we build our tunnels and bridges and we give 22 feet above the top of that rail. Next year we put down a 6-in. rail. All of our structures violate the Act. It is only an inch or two, to be sure, but an inch or two will win or lose a damage suit. I agree heartily with Mr. Mountain in this matter, that we should give the clearance from a fixed point, and that is the base of the rail. You put up a structure with your horizontal and vertical clearance fixed from a definite point, the horizontal from the center of the track, and the vertical from the base of the rail. You can change your rail, but you cannot change the vertical clearance on a bridge or on a tunnel without taking it down. The same thing will occur in this country. The time will come in the United States when the fixed clearances will be enforced just as safety appliances are enforced, and I think this association should leave nothing indefinite in these conclusions and recommendations.

Mr. Lahmer: If you fix the clearance from the base of the rail, when, say, you have 4¼-in. rail, and later use 6-in. rail, then you have to reduce the actual clearance, which is from the top of the rail.

Mr. Kelley: The gentlemen misses the point I am trying to make. I know the clearance will be reduced a little, but the effect is not the same. We are working under a law and when the clearance is given from the base of the rail we cannot raise our rail, but we can raise the top of the rail to meet the requirements and still comply with the law. You gentlemen who do not work under a precise act do not appreciate that, but in Canada we are working under a precise act, precise laws and precise figures, and any violation renders their companies liable for negligence.

Mr. Lahmer: I appreciate the point you are trying to make. I simply wanted to point out that we would not be saving our clearance.

Mr. Courtenay: In at least one state the statute requires a clearance to be from the top of the rail. I think it would be futile to try to conform to the statutes of the states and to the laws of Canada.

Mr. Mountain: If you meet with an accident and they find out your tunnel has been reduced you will be out of court.

A. S. Baldwin (I. C.): As a matter of fact, this dimension is really more fixed than if it were a dimension from base of rail. It behooves a road to make the depth below the base of rail under this diagram such that it will not go outside of the law. It is absolutely more fixed here than it would be by dimensioning it from the base of the rail and allowing six inches, as is the custom in Canada. Suppose later a 10-in. rail should be adopted, there is nothing in the Act of Canada that would prohibit that. You can have it 22 ft. 6 in. to the base of the rail and take in a 10-in. rail and you will not have the clearance and you will be conforming with the statute. But if you have absolute dimensions to the top of the rail, it is impossible for railways to use a rail higher than the one originally designed without going outside of the statute. I think this diagram is proper, and that it is incumbent on the railway in designing the tunnel to make sufficient provision to insure that it does not go outside of the diagram and infringe the law.

J. G. Sullivan (C. P.): I don't like to make an international question of this, but I do wish, however, to support Mr. Mountain in this contention. This liberal interpretation of the Canadian Railway Act was made at the solicitation of the railway engineers of Canada. If, as has been said by Mr. Kelley, we put in a 6-in. rail where we had a 4-in. and the clearance was 22 ft. 6 in. above the top of the rail, at that time we would be out of court in a case at law. Supposing we do put in a 10-in. rail, the laws are strict enough to tie the railways down tight enough, and with all the laws that we have adverse to railway construction and railway operation, I don't think that this body should try to advocate the principle of tying them down tighter and make it impossible to do practical things. It is only natural to expect that we will probably increase the height of our rail, probably another inch, within the lifetime of some of the members here, but it is not probable that we will go to 10-in.

Mr. McDonald: I believe the committee would consent to have the words "unless otherwise required by law" added to conclusion 1.

Mr. Bremner: I think that is understood with all our conclusions as a matter of course.

Mr. Kelley: Mr. Baldwin says taht we should provide for lowering our base of rail, if required by use of heavier rail. We are discussing the clearance of tunnel; that means taking out some ballast. That we can do, but the clearance that we fix for tunnels will be the clearance that we fix for bridges or any other overhead structure. We cannot lower the floor of our bridges without undue expense. In many cases we cannot lower it at all. It does seem to me the base of the rail is a fixed point. We can always control the base of rail feature, but we cannot always control the top.

C. H. Ewing (P. & R.): There is another matter that has not yet been touched upon, and I doubt very much the wisdom of this association providing clearance such as is proposed in admitting the necessity for providing clearances such as proposed in admitting the necessity for providing clearances for a brakeman on the top of a car. The question of clearances has been disposed of by the Safety Appliance Act. The introduction of air brakes makes it unnecessary to provide such clearances as are here proposed. It is absolutely impossible in cities to provide such clearances for overhead bridges, and I doubt very much the wisdom of the association in admitting the necessity for providing clearance as great as this.

Mr. Willoughby: The object of the committee in suggesting 22 ft. covered the necessity of providing space enough to prevent unpleasant results to passengers from smoke while passing through tunnels, and, in long tunnels, avoiding the asphyxiation of the engine men. It included a little more than the clearance of bridges, where such conditions would not obtain. The first fixed point in railway construction is the sub-grade. Railways having a legal stipulation relative to the clearance height above base of rail would take that into consideration in fixing their sub-grades. I think, therefore, the stipulation of a certain definite distance above the top of rail, covering, as it does, the comfort of the passengers and enginemen, is of more importance than making an exception for a specific law in one part of the country.

Mr. Baldwin: Mr. Kelly misunderstood my reference to lowering the grade. I meant to convey the idea that should be considered in the design of a structure. It would behoove a railway company, I think, in designing its structures to provide a sufficient clearance to take care of any rail that is likely to be used.

Mr. Fritch: The matter of clearances not only affects our tunnels, it affects our bridges, and later on it is going to affect electrification. In electrification you need all the clearance you can get. It is strange that we did not discuss this more thoroughly when we had up the question of the clear-

ances on iron and steel structures. That diagram refers to clearances from top of rail. Personally I think the base of rail is the point that we ought to adopt in all our clearances, because if railroads are going into electrification—and they are in the future—we must have a point that will not vary, and the base of the rail and the top of the tie will not vary.

Mr. Burpee: As to ballast, I think the recommendation does not mean to tie anybody down to this as a maximum, but rather as a minimum, and I don't believe there is an engineer in the room who would not make some allowance for the difference in the height of rail to be used in the future. I think he would make a difference of an inch to provide for a larger rail to be used in the future, and I think it would be wise that an allowance should be made for possibly a few inches of raise in ballast under the tie, and that any engineer in adopting a design for a tunnel would be sure to make these allowances.

Mr. Sullivan: I am sorry I am against the government, again, but I want to know how many engineers in this room use the top of the rail at the datum for their bridge foundations, and so forth.

Mr. Bremner: If they follow the conclusions and the directions of this association, they all use the top of the rail. On page 257 of the Manual, general specifications for steel railway bridge designs, it says: "On a straight line, the clear height of bridges shall not be less than 21 ft. above top of rails for a width of 6 ft. over a single track," etc.

Mr. Sullivan: I was referring to the foundations.

Mr. Bremner: You will have to tie the two together. I don't see how they can be separated. The association is already committed to the top of the rail as a basis for clearance vertically. If we change it, as to tunnels, to the base of the rail, we should do the same for bridges and our other work.

Mr. Baldwin: I move that the clearance height as indicated on this diagram be changed so as to be the dimension from the base of the rail, and that this height be given as 22 ft. 6 in. instead of 22 ft.

Mr. Mountain: The base of rail has no fixed relation to the top of the tunnel. One of the most difficult orders to enforce is to keep the track men working in tunnels where they have bad air most of the time.

Mr. Baldwin's amendment was adopted.

Mr. Lindsay: I move to amend Mr. Begien's motion as to conclusion 4 by referring that conclusion back to the committee with instructions to confer with the Committee on Economics of Railway Location and the Committee on Roadway. It should also be considered in connection with ventilation.

Mr. Lahmer: I second the amendment.

Mr. Willoughby: The committee took up the question of the reduction of the grade in long tunnels, because it had to solve the question of ventilation in tunnels. The committee has in mind that the association has already expressed its belief that 0.2 per cent. grade is the minimum for drainage in pipes. The committee feels that it has not gone beyond the direction of the board, but has simply taken up another subject so as to enable it to properly carry out the direction of the board.

Mr. Lindsay's amendment was carried.

Mr. Bremner: As to the other work which the board of direction gave us to do, "Collect all known formulas for determination of size of waterways, and tabulate them in such manner that they may be intelligently compared," there has been a lot of work done on that by the subcommittee under Prof. Pence, and it expects to give you a report later on it. We hope to get a conference with the committee as to unit pressure allowable on roadbeds. With reference to agricultural drainage, Mr. Burbee has obtained the laws of nearly all of the states, and we will make a synopsis of that, which he will present to the convention this summer, probably.

Mr. Fritch: I would like, if it would not be inconsistent, to refer to the Iron and Steel Structures Committee report, and change the recommendation with reference to the clearance diagram to conform to the action taken by the Roadway Committee on the matter of clearance in tunnels.

The President: We will do that.

RECORDS AND ACCOUNTS.*

The committee was assigned the following:

1. Revision of Manual.
2. Recommend a system for numbering all forms adopted.
3. Continue recommendations of changes in adopted conventional symbols, with especial reference to Forms M. W. 1020 and 1022.
4. Recommend forms for preparing preliminary detailed estimates of contemplated construction, this form to be used preliminary to and form the basis for the summary estimate data embodied on Form M. W. 1017.

The organization for sub-committee work was as follows:

A—Revision of Manual: M. C. Byers, chairman; C. W. Pifer, Thomas Maney.

B—Conventional Signs: A. L. Davis, chairman; W. H. Sellew, J. H. Milburn, V. D. Simar.

C—Bridge Estimates Forms: Edward Gray, chairman; R. W. Willis, E. E. Hanna.

D—Building Estimate Forms: T. H. Gatlin, chairman; W. P. Wiltsee, S. D. Brady, Paul Jones.

E—Water Service Estimate Forms: C. H. Gerber, chairman; O. L. Holman, J. M. Brown.

F—Accounts: Henry Lehn, chairman; J. E. Turk, G. L. Moore.

Revision of Manual.

In answer to a circular there were 38 replies, of which 22 said that none of the forms that have been recommended by the association were in use on the railways represented, and 16 replied that some of the forms were in use. However, 5 of the 22 reported using a few that were very similar in character.

The great difficulty that confronts the study and consideration of forms is the variety of organization on existing railways. It is this difficulty that has made it impossible for the committee to conclude fully its study with reference to the revision of the Manual.



H. R. SAFFORD,
Chairman Committee on Records and Accounts.

The definitions on page 173 of the Manual, as well as the recommendations in regard to filing of duplicate records, are approved.

The sub-committee reported that it was not practicable to either approve or disapprove certain blanks intended for use by the bridge and building departments until a definite form of organization is adopted. A discussion of this matter brings up the question of the advisability of considering in the work of this committee the subject of organization, and the committee would like instructions from the board of direction, as well as an expression from the membership of the association of the advisability of attempting to create forms that will apply to the various types of organization.

Form M. W. 1000 seems to be unnecessary, as it only tells the whereabouts of the bridge gang, and this could just as well be accomplished by the use of a small card or a brief note from the foreman to his superior. The work of a bridge foreman is carefully planned, and the superior officer always knows where his forces are located.

It is the opinion of the sub-committee that Forms M. W. 1003, 1005, 1006, 1007 and 1009, which are reports of the use of tools, material and inspection of structures, are not required in the ordinary organization.

Form M. W. 1011, Register of Title Deeds, is approved.

As to Form M. W. 1012, Contract and Lease Records, the

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

committee considers it advisable, under certain conditions, to use a card index, and therefore suggests that under the specification on page 213 the word "book" be eliminated, which will make the specification elastic enough to embody the use of a card index where desired.

Conclusions.

(1) To recommend to the board of direction that the committee be authorized to submit different forms, if necessary, calling for the same information to suit varying organizations.

(2) To abolish Form M. W. 1000.

(3) To further consider Forms M. W. 1003, 1005, 1006, 1007 and 1009.

(4) To indicate on Form M. W. 1010—

(a) Data showing width of streets and alleys.

(b) Distance along street lines which intersect the right-of-way line.

(c) A line representing the original center line of the main track.

This should also be embodied in the definition of right-of-way map as it appears on page 667, Vol. 9, of the proceedings, definition No. 1.

Conventional Signs.

There are three groups of conventional signs, Forms M. W. 1020, M. W. 1021 and M. W. 1022. Form M. W. 1021 has been revised and accepted by the association, and the symbols apply more particularly to track maps. Forms M. W. 1020 and M. W. 1022 are applicable, the former more particularly, to right-of-way maps and maps showing preliminary and location surveys, the latter to structural and roadway designs.

The committee has combined Forms 1020 and 1021, making a number of changes and additions and a better grouping. It has similarly revised Form 1022.

In starting its work, the committee sent out a circular, asking, among other questions, to what extent the present forms were in use. To this circular 50 replies were received, showing:

Number using symbols on forms 1020 and 1022.....10..20 per cent.
Number using symbols to a large extent....17..30 per cent.
Number proposing to adopt forms 1020 and 1022..... 4..8 per cent.
Number not using these forms.....19..38 per cent.

Conclusions.

The conclusions of the committee as a whole, with reference to the work of the sub-committee, are as follows:

(1) The use of red ink with black arrows for dimension lines on all drawings.

(2) Combination of Forms M. W. 1020 and 1021, as illustrated on the attached chart.

(3) Revision of Form M. W. 1022, as represented on revised Form 1022.

(4) Use of the following titles for forms covering drafting practice:

(a) For conventional signs on pp. 132 to 138, inclusive, 1907 Manual: "Conventional Signs for Use on Signal and Interlocking Plans."

(b) For Forms M. W. 1020 and 1021: "Conventional Signs for Use on Topographical and Right-of-Way Maps."

(c) For Form M. W. 1022: "Conventional Signs for Structural Drawings."

(d) For Form M. W. 1016: "Conventional Signs for Track Charts."

(e) For Form M. W. 1015: "Conventional Signs for Working Profiles."

(5) It is recommended that the signs composing the groups above indicated be published in pamphlet form and distributed to the membership of the association at a nominal price. Attention is called to the grouping of the conventional signs to enable the desired sign to be more easily found.

Bridge Estimate Forms.

The sub-committee received 45 replies to a circular, 39 of which indicated that the senders were in favor of the use of forms detailing the various items used in bridge construction. Only six replies were received which were not in favor of the use of such a form. Of the entire number only three or four roads had a form in use for the preparation of estimates of this character. Among these were the Chicago, Burlington & Quincy and the Chicago Great Western. A tentative form was submitted, fashioned, more or less, after the forms used by both of these roads.

After considerable discussion, it was the sense of the committee that further investigation ought to be made, as no decision was reached as to the extent to which such a form should show the detail items composing this estimate. One of the principal things to consider is for whose use these estimate forms are to be provided, and whether a form could be devised that would serve not only the man making ordinary wooden bridge estimates, but the bridge engineer who is called upon to make estimates of more extensive and complicated bridges. The committee has referred the subject back to the sub-committee for further investigation in next year's work.

Building Estimate Forms.

Much of the same difficulty was met in considering building estimate form as was met in the preparation of bridge estimate forms, and for the same reasons the committee has felt the necessity for further study of the subject. No report was submitted by the sub-committee.

Water Service Estimate Forms.

The sub-committee submitted a tentative form. As the same difficulties were met in considering estimate forms for water service work as were met in considering estimate forms for bridges and buildings, it was concluded by the committee that this subject be given further study by the sub-committee in next year's work, with the hope that the collection of additional data will enable a form to be developed.

Accounts.

The sub-committee made a short progress report.

Numbering of Forms.

It was necessary to agree on a definition for the term "Form," and the definition submitted by the committee is as follows:

Form.—A form is an outline or illustration of a prescribed method of indicating and recording information.

The committee submits a plan for numbering forms, which plan is considered to be sufficiently elastic to take care of the work of the various committees for many years to come. It groups the forms under 21 heads, to each of which are allotted 100 serial numbers, thus: Roadway, 100-199; Ballast, 200-299; etc.

In the indiscriminate use of the word "Estimate" it has a dual application, being used to indicate an approximate quantity, as well as to indicate the exact quantity of completed work, as the ordinary practice is to call a final statement of completed work a "Final Estimate." The committee recommends that the use of this term be applied only to such statements as are prepared for contemplated construction work, for statements prepared to show the progress of such work, and statements forming the basis for partial payments; and that the word "Statement" should be used for statements showing the actual work done.

The report is signed by: H. R. Safford (Ill. Cent.), chairman; H. J. Pfeifer (Term. R. R. Assoc. of St. Louis), vice-chairman; S. D. Brady (Little Kanawha), J. M. Brown (C., R. I. & P.), M. C. Byers (St. L. & S. F.), A. L. Davis (Ill. Cent.), T. H. Gatlin (Southern), C. H. Gerber (Un. Pac.), Edward Gray (Southern), E. E. Hanna (Mo. Pac.), O. L. Holman (G. Nor.), Paul Jones (Cin. & Mus. Val.), Henry Lehn (N. Y. C. & H. R.), Thomas Maney (L. & N.), J. H. Milburn (B. & O.), G. L. Moore (Lehigh Valley), A. G. Norton (Erie), C. W. Pifer (Ill. Cent.), W. H. Sellew (Mich. Cent.), V. D. Simar (Dul. S. S. & A.), J. E. Turk (P. & R.), R. W. Willis (C., B. & Q.) and W. P. Wiltsee (N. & W.).

Discussion on Records and Accounts.

H. R. Safford (I. C.): The committee has had its attention called to the sign for reinforced concrete and the use of the words "expanded metal" and "rods or bars." It had been suggested to us that the term "expanded metal" perhaps committed us to the use of one of several brands of material, and that it would better be expressed by the use of the word "metallic mesh," or something of that nature. I think the words "wire mesh" or "metallic mesh" would be better, and the committee suggests that change. I move that form 1022 or 1905 as revised in the new numbered system be adopted. The committee has worked with the other committee interested in the preparation of these signs, and we have attempted to meet their views.

Mr. Mann: I would like to ask the committee whether they consulted with the Committee on Signals and Interlocking. I notice in some cases the conventions used by this committee do not coincide with those used by con-

tractors and railways in purchasing signaling devices. For quite a long time the contractors and purchasers have been getting together on these functions.

Mr. Safford: The committee did confer with Committee 10 and the signs we present are in accordance with its views.

Mr. Fritch: The conventional signs under "rivetting" are not quite the same as the conventional signs recommended by the Iron and Steel Structures Committee. There is a distinction made in flattening the various rivets, as to size. For instance, flattening to ¼-in. refers to ½ and ⅝-in. rivets, and flattening to ⅝-in. has reference to ¾, ⅞ and 1-in. rivets. I want to ask if it will not be possible to increase the size there.

Mr. Safford: The intent of the committee was to show exactly the same conventional signs that were adopted by the Committee on Iron and Steel Structures. They may have made some modification of their signs after we had our conference with them. We will amend our form so as to agree fully with their signs.

Form 1022, or 1905 under the new system of numbering, was adopted.

A new work in reference to conventional signs was the consolidation of the two forms, 1020 and 1021. We added eight signs on page 106, one for streams, one for springs and sinks, one for lakes and ponds, one for falls and rapids, one for water line, one for marsh, one for canals, and one for ditches. The sign for the marsh, however, was brought over from 1022, as well as the one for ditches, in order to make a different indication from canals. We also add one for sand and one for cliffs. We have classified all the signs into various headings. They were not well classified before. On page 107 there are no material changes, except that we reduced the thickness of some of the lines merely to save time in drawing. On page 108 the committee this morning, acting upon a suggestion from one of the members, concluded to recommend the change for the signs for "new tracks" and "future tracks," near the bottom of the page. What the committee intended to do was to have one indication for tracks that were intended to be immediately constructed, to be used on construction maps, and another sign to show ultimate development. So it is suggested in place of the words "new tracks" and "future tracks," the words "proposed for immediate construction" will apply to the first and "proposed for ultimate development" will apply to the second. On page 109 we have added an indication for "battery box." We also propose to insert the words "Indicated length" between the symbol for turntable, and the word "turntable." On page 111 there has been a change with reference to the through pole wire lines. We had a similar indication for telegraph, but we thought it better to have a consolidated form to indicate all types of pole wire lines. That was discussed last year, and so it is not any change. A new indication appears for wire conduit separated from switch or signal lines. A change also appears on that page in the character of the form for dimension line. The committee concluded that red ink should be used for dimension purposes. We made a slight change in the character of distinction for the two meridian lines. I move that conclusion 2 be adopted.

Mr. Fritch: I do not think the committee missed many signs, but there is one omitted, which is quite important, and that is a telephone line, or a high tension transmission line, or any wire carrying electric current crossing the track. That is one, I think, which should be specified definitely. I do not know whether the committee intended that the designation under miscellaneous pole wire lines would cover that or not. It seems to me that would refer to telegraph lines.

Mr. Safford. The committee did have under consideration different indications for these different types of pole wire lines. We wanted to minimize the number as much as possible, and adopted an indication headed "pole wire lines," which can be supplemented by such explanatory wording as may be desired.

J. O. Osgood (C. of N. J.): We found it impracticable to use a number of the suggestions of the committee, not because they were not good, but because where there are such slight distinctions between lines they cannot be used on maps which are much complicated, so that for such matters as pole wire lines, and similar lines, we write on the map what they are. On page 108 there are three symbols used a great deal by all roads which do much construction work. I refer to those for new tracks and future tracks, in which you have changed the phraseology to advantage. The symbols are excellent, but we have found in practice that the expense of coloring a large number of blue prints is so great that of late we have been making the plans in the same way, but drawing heavy black ink lines on the tracing, so as to print broad lines. That is not as good, but it is necessary on account of the great expense involved in coloring so many prints.

Robert Ferriday (C., C., C. & St. L.): Does the term "railway tracks" mean existing tracks or old tracks?

Mr. Safford: It means existing tracks.

Mr. Ferriday: I suggest you use "existing tracks" for "old track to remain" and retain the symbol for "old track to be moved."

Mr. Safford: The committee will accept that.

Mr. Safford: In connection with the revision of the Manual, we have not attempted to make a general revision of some of the forms now existing, because we found that the character of the organizations of different roads cuts a great deal of figure in the character of form to be used, particularly bridge inspection reports. Therefore the committee has suggested that this study be continued, and as a basis for it, before attempting to make some classification of railway organization which we have in view, we have suggested that the matter be continued over until next year.

The conclusions under "Revision of Manual" were adopted.

WATER SERVICE.*

The following sub-committees were appointed:

Sub-Committee A—M. H. Wickhorst, J. L. Campbell. Revision of Manual.

Sub-Committee B—C. L. Ransom, W. A. Parker, A. D. Schermerhorn. Specifications for water tanks and trestle supports from 50,000 to 100,000 gallons capacity.

Sub-Committee C—Robert Ferriday, James Burke, G. H. Herrold. Friction factors for delivery pipe lines, such as



C. L. RANSOM.
Chairman Committee on Water Service.

used for water columns; also friction factors for water columns.

Sub-Committee D—L. P. Rossiter, E. G. Lane, C. A. Morse. Types of track pans, with designs of typical installations and critical review.

Revision of the Manual.

The committee makes certain minor changes, mostly in wording.

All matter relating to "Function of a Water Station and Storage Tanks" is cut out, as the whole subject is being reconsidered.

Form M. W. 1302, Statement of Cost of Pumping Water. Add a column headed "Labor Cost," and change column now headed "Total Labor and Material" to "Material Cost."

Specifications for Water Tanks.

The specifications submitted at the last convention were referred back to the committee.

The committee endeavored to compile a specification for tanks as requested, without reference to any particular

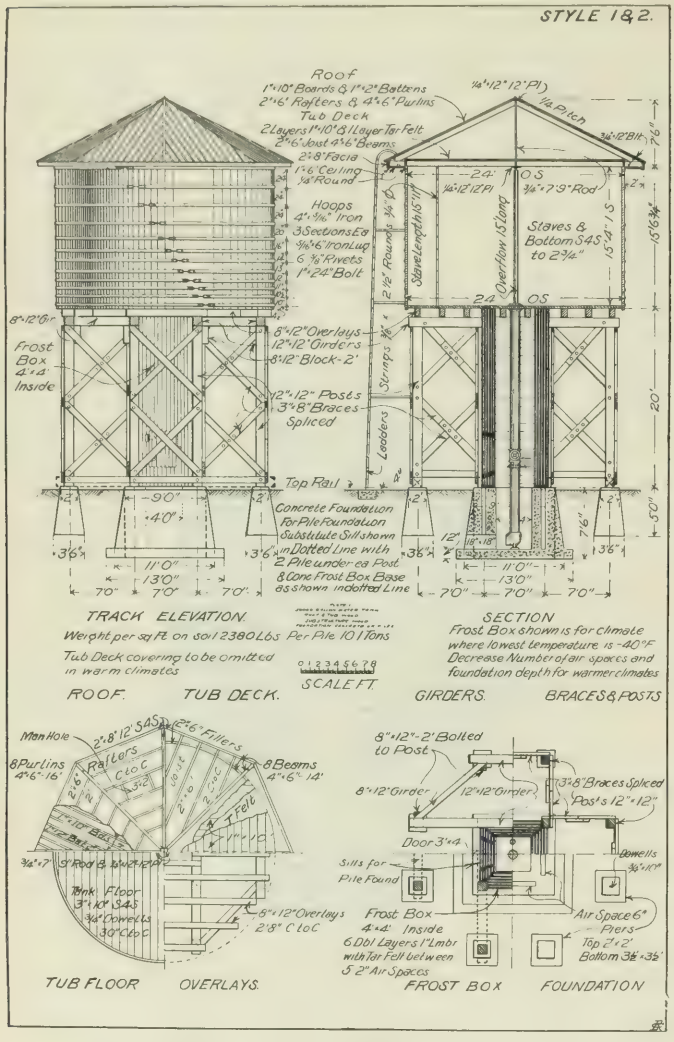
*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

design, but working on these lines it has so far been unable to produce an intelligent specification which it is thought would be of any value to the association.

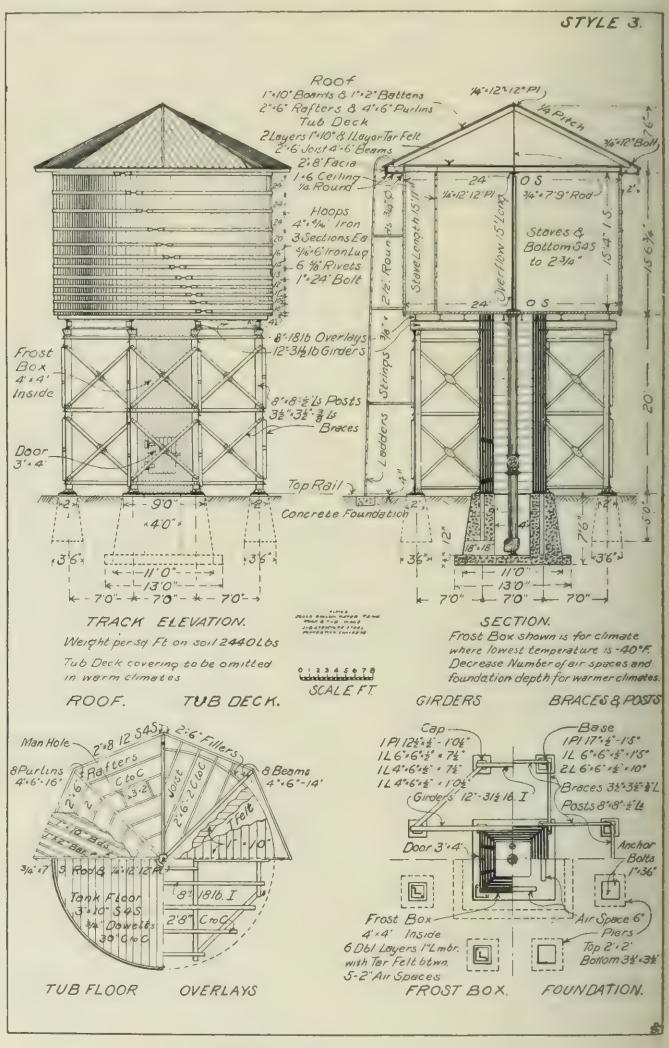
Failing in this, it was considered preferable to prepare designs of a general nature for different classes of tanks and make a comparative study of same as regards first cost, repair cost, interest cost, life of tank, cost of wrecking, scrap value and, finally, net cost of storage per year for 1,000 gallons.

In making this statement, Chicago prices were used, and each class of material was figured at the same price throughout all estimates.

It was found impossible to prepare plans for each style of tank for the 100,000-gallon tanks, so that the plans and estimates submitted cover the 50,000-gallon tank only. If the association approves of the plans submitted, and so desires, the 100,000-gallon plans can be prepared for submission at a later date.



Water Tanks, Styles 1 and 2.



Water Tank, Style 3.

The general plan for the tank shall be as per Plate (1), Style (2), Capacity (3).

Foundation to be (4).

Substructure to be (5).

Tub to be (6).

Roof to be (7).

The foundation shall consist of (8).....

When concrete is used an additional pile foundation may be required, which will be added at an agreed price and of agreed design, when so directed by the engineer in charge.

Piles shall be round (9)..... in full accordance with the specifications of the association for No. 1 R. R. Grade, pages 541, 542, Vol. 10, Part 1, paragraphs 1 to 5. They shall be of length to be specified by the engineer, and driven as shown by Plate 1 to depth as directed by the engineer.

Excavation shall be made of sufficient size to permit forms to be built for sloping sides of concrete. Earth banks may be used for forms where faces are vertical and they stand firm.

Concrete shall be as per specifications of the association, pp. 1338 to 1342, Proceedings, Vol. 10, Part 2, paragraphs 1 to 6, inclusive, and 22 to 47, inclusive.

The substructure shall be (10) ..... Timber shall be No. 1 R. R. Grade (11), all as per specifications of the association, pp. 539 and 540, Vol. 10, Part 1, paragraphs 1 to 8, inclusive; all to be surfaced four sides for painting. All to be erected as shown on plans, in a good workmanlike manner, with well-fitted joints and proper fastenings.

Steel shall be open-hearth, as per specifications of the association, published in Manual of Recommended Practice,

Specifications for 50,000 and 100,000-Gallon Water Tanks.

[1] I, II, III, IV, V.
[2] Style 1-2-3-4-5-6.
[3] 50,000 or 100,000.
[4] Style 1, piles. Style 2-3-4-6, concrete. Style 5, crushed rock.
[5] Style 1-2, timber. Style 3-4, open-hearth steel. Styles 5 and 6, omit.
[6] Etyle 1-2-3, wood. Style 4-5-6, steel.
[7] Style 1-2-3, wood. Style 4-5-6, steel.
[8] Piles for 1. Concrete for 2-3-4-6. Crushed stone, 5.
[9] Specify kind of timber.
[10] Timber, 1-2. Open-hearth steel, 3-4. Cancel whole paragraph for styles 5 and 6.
[11] Give kind of timber available.

paragraphs 83 to 88, 92 to 105, 108 to 110, 111 to 116, 127 and 128, 144 to 158, inclusive, both as to material and workmanship.

All field connections shall be made with bolts.

The tub shall be built of (1).....

Dimensions and design shall conform to Plate.....

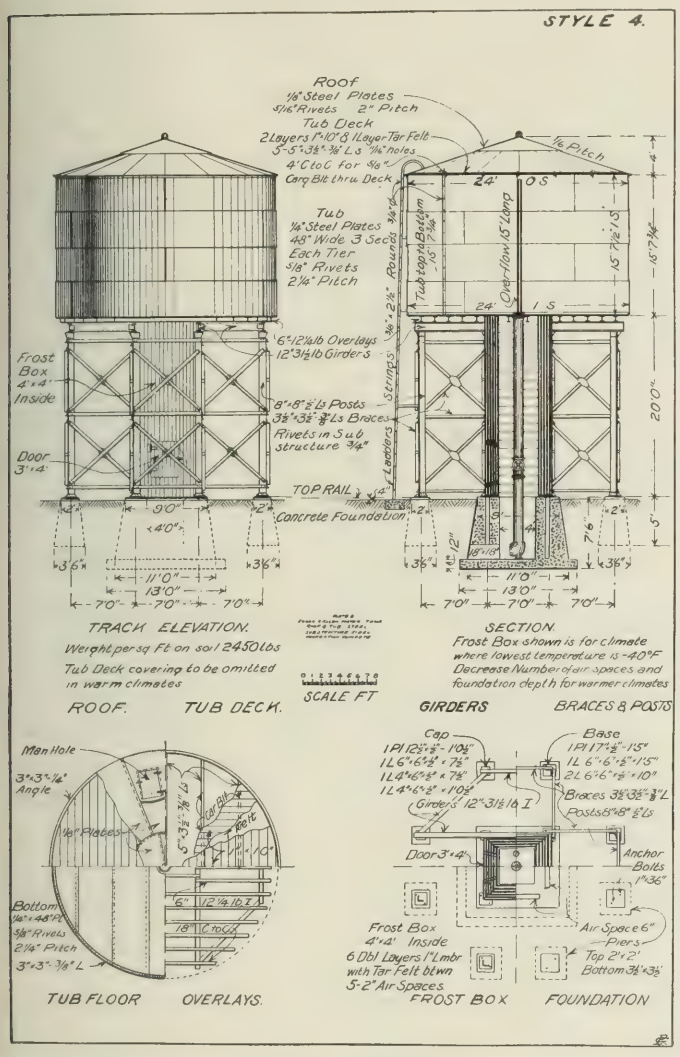
Timbers shall be carefully selected, free from sap, shakes, unsound knots or other imperfections which will impair the durability of the tub. All small black knots extending entirely through the plank shall be carefully bored and thoroughly plugged (2).

Staves shall be full length, without splicing. Joints shall be surfaced true and perfect and cut on radial lines. Outside of stave to be surfaced convex to the diameter of the tub. Crozing at bottom of stave to be cut circular, so that bottom will completely fill it when tub is drawn up. Staves six 5/8-inch iron rivets, countersunk on back side, and 1 in. by 24 in. bolt, 12-inch thread and hex nut and head. Hoops to be built in three equal sections and put on tub spaced as shown on plan.

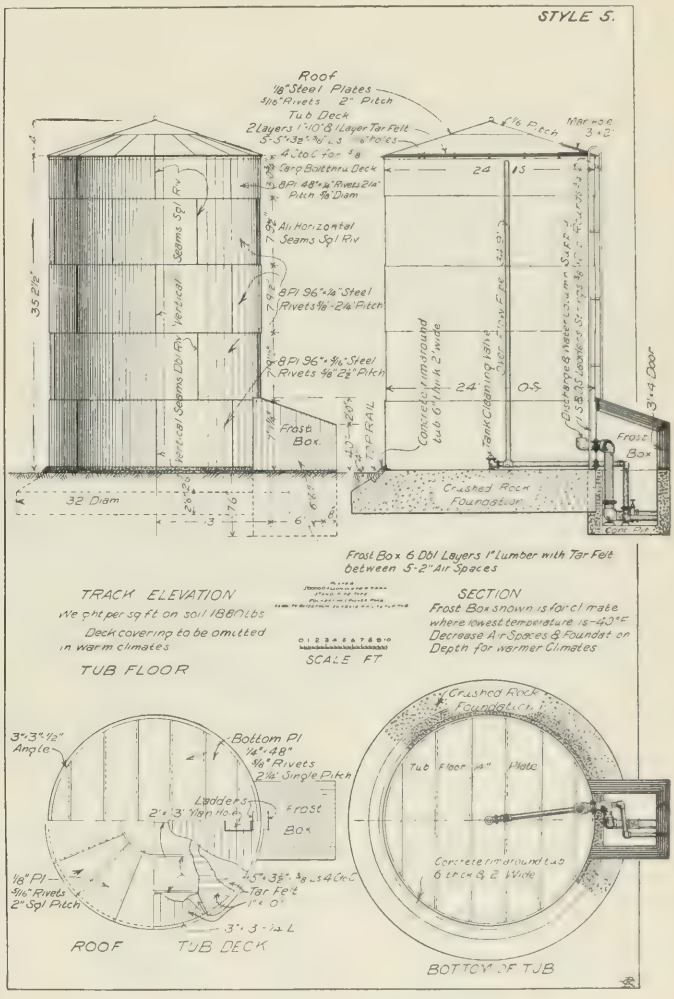
Bottom of tub to be laid on overlays close together, with dowels in place and drawn tight and cleat tacked across to hold in place while staves are being placed. The setting-up staves to commence at the longest piece of bottom and driven only two-thirds depth of croze. When staves are all in place they are to be stayed with rope and then hoops to be put on, beginning at bottom. Hoops to be uniformly tightened. No lug to be placed on the same stave as any other lug. Steel shall be manufactured by the open-hearth process, and shall be in accordance with the specifications of the association as given under head of "Steel Substructure."

All tank plates must be bent cold.

Erection shall be in accordance with the specifications of



Water Tank, Style 4.



Water Tank, Style 5.

shall be marked in their order before shipping. One extra stave for each tub shall be furnished.

Bottom plank shall be full length, without splicing, up to 24 feet long. Over 24 feet they may be joined with 1 in. by 1 in. mortise and tenon at ends of plank. No two joints on adjacent plank to be nearer than 30 inches, center to center. Joints shall be surfaced true and perfect. Outside edge of bottom of tub to be cut to true circle. Bottom plank to have ¾ in. by 3 in. wood dowels, 30 inches, center to center, for joining.

Hoops for wood tubs to be made of muck bar iron 4 inches wide by 5-16 inch thick, furnished with muck bar iron lug 6 inches long for 1-inch bolt fastened to hoop with

[1] Style 1-2-3, specify kind of lumber. The following kinds are suitable for the life given: White pine, 20 years; cypress, 25 years; redwood, 35 years; Douglas fir, 18 years. Plate IV, V, VI, open-hearth steel.

[2] Where cypress and redwood are used, omit sentence about black knots.

the association, as given under head of "Steel Substructure," and also as follows:

Joints must be made water-tight by caulking in such a manner as not to injure the abutting plate. No foreign substance of any kind will be permitted between plates.

Leaks which may develop after tank is filled with water must be recaulked until the tank is tight.

Indicator to be furnished and placed. Board to be white, with 6-inch black letters indicating feet, and furnished with chain, pulleys and galvanized iron float. Board to be set at least one inch clear of stave. Design to be approved by the engineer.

The roof shall be of (1)..... Dimensions and design shall be according to Plate.....

Dimension timbers and lumber not painted to be rough (2), free from large loose or unsound knots and other defects which will injure its strength and durability.

[1] Style 1-2-3, wood. Plate 4-5-6, open-hearth steel.

[2] Give kind timber available.

Finish lumber boards and battens to be (³).....,
free from defects, such as large or unsound knots, sap or checks, which will injure its durability.

Steel shall be same as specified for tub and erected in same manner, except that the caulking may be omitted.

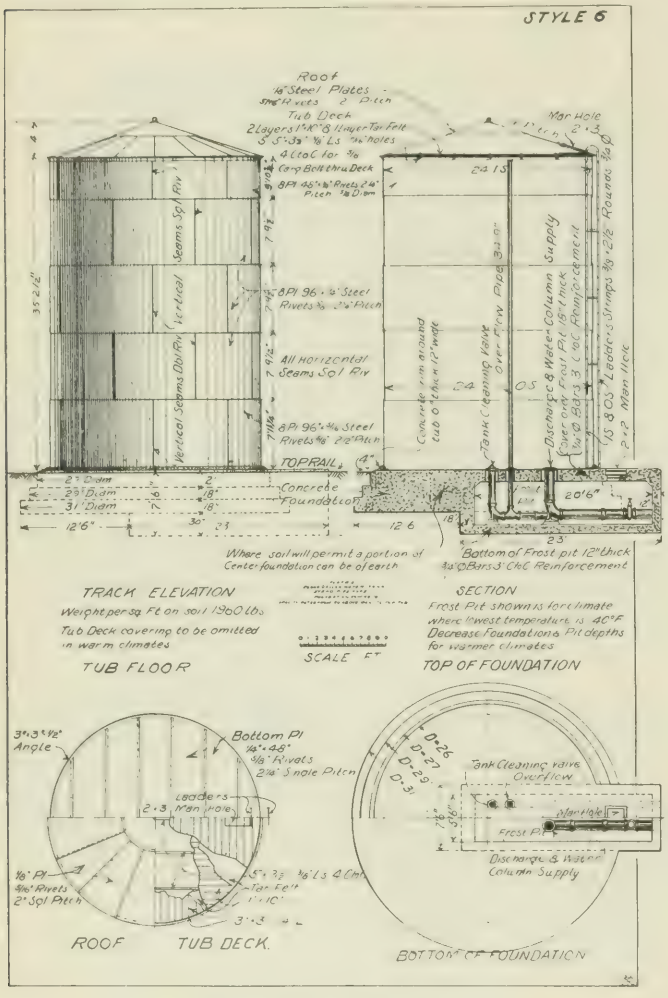
Provide trap doors of wood for wood roofs and of steel for steel roofs, not less than 2 ft. by 3 ft. clear opening in upper roof and tub decking. Doors to be hung with 8-in. heavy tee hinges and provided with 8-in. hinge hasp for fastening. All openings for doors to be framed so as to make structure of same strength as balance of roof.

(⁴) Frost box to be built for tanks as per plate.....
as shown on said plate.

Lumber shall be (³).....

Number of air spaces to be (⁵).....

Each inside layer to consist of two layers common 1-in. sheathing lumber S1S, with one layer of tar felt weighing



Water Tank, Style 6.

about 15 lbs. per 100 sq. ft. Air space to be made by 2 in. by 4 in. S1S and 1E, not over 2 ft. 6 in. center to center, erected vertically. Outside layers to be of one layer common 1-in. sheathing lumber S1S, one layer 15-lb. tar felt, and one layer 1-in. by 6-in. dressed, matched and beaded ceiling; all to be well nailed and erected in good, workmanlike manner.

Ladders inside and outside of tub to be of open-hearth steel, of design indicate on Plate....., all to be erected as shown on said plate.

³ Specify kind lumber available.
⁴ No frost box required for Plate VI. Cut out whole paragraph.
⁵ Use 5 air spaces where lowest temperature is —40° Fahrenheit.
Use 4 air spaces where lowest temperature is —20 Fahrenheit.
Use 3 air spaces where lowest temperature is 0 Fahrenheit.
Use 2 air spaces where lowest temperature is +20 Fahrenheit.
Use 1 air space where lowest temperature is +30 Fahrenheit.
Omit frost box entirely where temperature never gets below freezing.

Pipe connections to consist of (¹) ..... inch wrought-iron overflow pipe and ..... inch wrought-iron discharge or water column supply pipe, and for standpipe tanks a clean-out pipe.

Overflow pipe to extend to within 6 in. of top of stave or steel tub and there to be stayed to roof of tank. Discharge or water column pipe shall extend from floor of tank to bottom of frost box and be provided with flange union and two-ply rubber gasket, gate valve and base ell. Where both pipes pass through bottom of tank, there shall be two standard faced and drilled screwed flanges and two two-ply rubber gaskets for each pipe, both to be full bolted with standard number and size of bolts. Fittings for standpipe tank connections to be furnished and placed as indicated on Plates IV and V.

(²) Where called for in specifications (⁸) ..... inch outlet valve, outlet pipe supported on suitable brackets, and movable spout, with counterweights, etc., are to be provided and placed. For standpipe type of tank, outlet valve only is to be furnished and placed.

Outlet valve shall be cast-iron of the removable type, arranged with a cut-out device, so that valve can be removed for renewal of valve face rubber without emptying water in tank, and also so that it can be operated from the locomotive tender. Design to be approved by the engineer.

Outlet pipe to be cast-iron and to be conected to outlet valve with standard size faced and drilled flange, fastened with standard number and size of bolts, and to drop down and extend out to the distance, as required by the engineer. Lower end of outlet pipe to be supported by suitable brackets fastened to tank substructure and provided with face plate for spout to rest against. Design to be approved by the engineer.

Spout to be provided of suitable dimensions to reach from outlet pipe to locomotive tender. Dimensions of tenders to be furnished by the engineer. Spout to be provided with counterweights, pulleys, pull-down rope, etc., so that it can be reached from locomotive tender and will be securely held up above the clearance line when not in use. Clearance dimensions to be furnished by the engineer. Design to be approved by the engineer.

Exterior wood and iron work (lower part of bottom of steel tub included) to be painted three coats, inclusive of mill coat, of paint approved by the engineer. Separate paints for iron, steel and wood to be used, if required. Paint to be applied to surfaces when dry and free from rust or grease, and to be put on in the best manner and well brushed into the surface painted.

Steel and iron to receive one coat at the mill.

Exterior of wood tubs to be painted one coat before applying hoops.

Interior steel tubs, inside ladders and overflow pipe to be painted one coat at mill and one coat after erection, of paint or other compound approved by the engineer.

Interior of steel roofs to be painted one coat only, at mill.

The different styles shown on plates I, II, III, IV, V are recommended for use where their only object is supply of water to locomotives and not where there is a question of fire protection to be considered.

The different styles, 1, 2, 3, 4, 5, 6, are recommended for use where most of the following conditions obtain:

Style 1.—For water stations not at terminals.
- Soft moist ground at tank site.
- Location not permanent.
- Character of water such that steel tub would be apt to be corroded.
- Water carrying no sediment.
- Where fire risk is not great.

Style 2.—For water stations not at terminals.
- Good ground for foundation.
- Location not permanent.
- Character of water such that steel tub would be apt to be corroded.
- Water carrying no sediment.
- Where fire risk is not great.

Style 3.—For water stations not at terminals.
- Good ground for foundation.
- Location permanent.
- Character of water such that steel tub would be apt to be corroded.
- Water carrying no sediment.
- Where fire risk is not great.

¹ Fill in size to suit local conditions.
⁸ Cut out this paragraph, where location is such that locomotives are not required to take water direct from tank.
⁸ Fill in size.

Style 4.—Water stations not at terminals.
Good ground for foundation.
Location permanent.
Character of water such that steel would not be corroded.
Water carrying no sediment.
Where the fire risk is to be considered.

Style 5.—Terminal water stations.
Good ground for foundation.
Slight settlement of tank not objectionable.
Character of water such that steel will not corrode.
Water carrying sediment.
Where the fire risk is to be considered.

At plants where water treatment is necessary, this style can be utilized as a settling tank, and also as a mixing tank, by building bottom inside of tank shown on inset at page 768, Vol. 10, Part I.

At terminal stations where increased storage under low head is valuable for washout water and filling locomotives by means of auxiliary pumps.

Style 6.—Recommended for the same conditions as Style 5, except it is to be used where slight settlement of tank is objectionable.

Conclusions.

That the association approve as good practice, publishing same in Manual, the designs for tanks, Plates I, II, III, IV, V, together with the specifications for 50,000 and 100,000 gallon tanks.

In Appendix A is given the report on friction factors for pipe lines and water columns, with the following conclusions:

Friction in Pipe Lines and Columns.

Definitions:—The Head at any point in the pipe of a gravity water supply system is the vertical distance, in feet, of the center of the pipe at that point below the plane of the free water surface.

The Pressure Head, at any point in the pipe of a gravity water supply system, is the head in feet which corresponds to the pressure in pounds per square inch at that point, and is obtained by multiplying the pressure by 2.304.

The Velocity Head is the term used to designate the expression $\frac{v^2}{2g}$ obtained from the formula giving the theoretic velocity of flow, $v = \sqrt{2gh}$, in which v = the velocity of flow in feet per second, g = the acceleration of gravity in feet per second (mean value 32.16).

The Velocity Head at any point in the pipe of a gravity water supply system is the head which could produce a theoretic velocity equal to the velocity at that point.

The Flow Head in a gravity water supply system is the difference in elevation which causes flow. It is the vertical distance, in feet, of the center of the end of a pipe, which discharges freely into the air, below the plane of the free water surface at the other end. If the discharge is submerged it is the vertical distance between the planes of the free water surfaces.

Formula.—The flow head equals the sum of the lost heads plus the velocity and pressure heads of the issuing stream.

$$H = m\frac{v^2}{2g} + \frac{V^2}{2g} + h_e + h_t + h_l + h_p + h$$

in which H = Flow head in feet.
h = Pressure head of issuing stream = O.
$m\frac{v^2}{2g}$ = Head (in feet) lost at entrance to pipe line, in which m is a constant which varies from 1.00 for a pipe extending into the tank, to 0.00 for a perfect mouth piece. $\frac{v^2}{2g}$ may be obtained from diagram for "velocity head in feet;" see Fig. 28.
$\frac{V^2}{2g}$ = Velocity head (in feet) of issuing stream; see Fig. 28.
h_e = Head lost (in feet) in overcoming friction in all elbows; see Fig. 28.
h_t = Head lost (in feet) in overcoming friction in all tees; see Fig. 28.
h_p = Head lost (in feet) in overcoming friction in all pipe lines; see Figs. 26 and 27.
h_n = Head lost (in feet) for the type of column used; see Figs. 3, 5, 7, 9, 11, 13, 15, 17, 19, 21.

Problem 1. Given the composition of delivery line from storage tank and the required discharge. To find the flow head.

From Fig. 28 find the velocity head at entrance, which multiplied by the usual value of m, viz., 1.0, gives the loss at entrance. From the same figure find the velocity head of the issuing stream; also the head lost in one elbow or tee of each size used, and multiply by the total number of each. From Figs. 26 and 27 find the head lost in 100 ft. of pipe for the various sizes in the line, and with this find the loss in each length of same size and add these totals to get the total friction in straight pipe. From one of the figures 3 to 21 find the head lost in type of water column to be used. The sum of these lost heads and the velocity head equals the flow head.

Problem 2. Given the composition of delivery line from

COMPARATIVE STATEMENT OF WATER TANK COSTS—PLATE VII.

Style Number.	1	2	3	4	5	6	7
Foundation Material	Piles	Concrete	Concrete	Concrete	Crushed Stone	Concrete	Concrete
Substructure Material	Timber	Timber	Steel	Steel	Steel Stand Pipe	Steel Stand Pipe	Steel, 4
Tub Material	Wood	Wood	Wood	Steel	Steel Stand Pipe	Steel Stand Pipe	Wood
Roof Material	Wood	Wood	Wood	Steel	Steel	Steel	Wood
Costs as follows:							
Foundation	$ 300.00	$ 244.50	$ 244.50	$ 244.50	$ 402.50	$ 796.50	$ 252.25
Substructure	190.17	158.77	1,069.00	1,069.00	1,673.00	1,673.00	1,365.80
Tub	503.37	503.37	503.37	748.00	1,673.00	1,673.00	503.37
Roof	106.54	106.54	106.54	54.62	54.62	54.62	106.54
Frost Proof Deck at Roof	56.38	56.38	56.38	56.62	56.62	56.62	56.38
Frost Box Below Tub	187.90	187.90	187.90	187.90	96.25	None	187.90
Piping in Frost Box	158.40	158.40	158.40	158.40	200.30	176.30	158.40
Ladders	30.20	30.20	30.20	0.20	35.00	41.00	30.20
Total First Cost	$ 1,532.96	$ 1,446.06	$ 2,356.29	$ 2,549.24	$ 2,518.29	$ 2,798.04	$ 2,660.84
Estimated Life in Years	20	20	20	40	40	40	20
Weight per sq. ft. on Soil, lbs.	per pile 20,203	2,380	2,440	2,450	1,720	1,890	2,500
Scrap Value less cost of Wrecking	$ 12.50	$ 12.50	$ 170.00	$ 300.00	$ 135.00	$ 135.00	$ 85.00
Net Cost	1,520.46	1,433.56	2,186.29	2,249.24	2,383.29	2,563.04	2,375.84
Repairs During Life	520.00	520.00	182.50	689.50	682.50	682.50	184.00
Interest on first Cost at 5 per cent. for Life of Tank	1,532.96	1,446.06	2,356.29	5,098.48	5,036.58	5,596.08	2,660.84
Total Final Cost	$3,573.42	$ 3,399.62	$ 4,725.08	$ 8,037.22	$ 8,102.37	$ 8,841.62	$ 5,220.68
First cost per 1,000 Gallons	$ 3.06	$ 2.89	$ 4.71	$ 5.10	$ 5.04	$ 5.59	$ 5.32
Final cost per 1,000 Gallons, per annum	3.57	3.39	4.72	4.02	4.05	4.42	5.22
	Renewal Substructure Once. Repair Frost Box Once Paint every 3 Years, 2 Coats=5 Paintings.	Renewal Substructure Once. Repair Frost Box Once Paint every 3 Years, 2 Coats=5 Paintings.	Paint every 3 Years, 2 Coats =5 Paintings.	Paint every 3 Years, 2 Coats, O. S.=12 Paintings and 2 Coats, ½ I. S.=12 Paintings.	Paint every 3 Years, 2 Coats O. S. = 12 Paintings and 2 Coats, ½ I. S.=12 Paintings.	Paint every 3 Years, 2 Coats O. S. = 12 Paintings and 2 coats ½ I. S.=12 Paintings.	Paint every 3 Years, 2 Coats O. S. = 5 Paintings.

storage tank and the height of water in same above the rail. To find the discharge.

(a) Find available flow head by deducting the height of free discharging end from height of water in the tank. (b) Assume a discharge and compute flow head as in Problem 1. (c) Divide the loss in the column for assumed discharge by this computed flow head. This will give the trial ratio. (d) Multiply available flow head by this trial ratio. This will give the column loss which may be expected with the available head. (e) With column loss find corresponding discharge, from column loss diagram. (f) As a check, use computed discharge, solve as in Problem 1 and obtain flow head. This should come out approximately equal to given flow head (a). If the result is not close enough, take the value found (e) as the assumed discharge and again run through steps indicated. This will rarely be necessary.

A critical inspection of the head lost in each portion of the delivery line will develop where to economically decrease the loss in head by increasing the sectional area.

The diagrams of pipe friction refer to new cast-iron pipe. Allowance must be made for pipes becoming tuberculated and for incrustations of treated water. (The former alone may decrease the discharge 20 per cent. in 20 years.) These facts and the possibility of future demand for discharge larger than required when designed, suggest the advisability of selecting pipes larger than developed by the calculations.

Ultimate economy in water station design is secured by comparing the interest on investment with the cost of pumping for several combinations of delivery line and flow head.

Appendix A also contains a report on water columns, friction in straight line and friction in elbows and tees.

Appendix B is a report of experiments on water columns at the hydraulic laboratory of the University of Illinois, by Prof. Arthur N. Talbot. Appendix C consists of diagrams of friction of water in new, straight, cast-iron pipe, and Appendix D is a bibliography.

Conclusions.

(1) The conclusions under "Friction in Pipe Lines and Columns," Appendix A, are essential to a full understanding of the subject and should accompany the diagrams when published in the Manual.

(2) The views of water columns and the diagrams of head lost therein (Figs. 2 to 22, incl., Appendix B) are recommended for publication in the Manual.

(3) The diagrams of head lost in straight pipe (Figs. 26 and 27, Appendix C) are recommended for publication in the Manual.

(4) The diagrams for head lost in tees and elbows and for values of the velocity heads (Fig. 28, Appendix C) are recommended for publication in the Manual.

The report is signed by: C. L. Ransom (C. & N. W.), chairman; M. H. Wickhorst (C., B. & Q.), vice-chairman; James Burke (Erie), J. L. Campbell (E. P. & S. W.), Robert Ferriday(C., C., C. & St. L.), G. H. Herrold (C. G. W.), E. G. Lane (B. & O.), C. A. Morse (A., T. & S. F.), W. A. Parker (St. Joseph & Grand Island), L. P. Rossiter (B. & O.) and A. D. Schermerhorn (Un. Pac.),

Discussion on Water Service.

The minor changes recommended for the revision of the Manual were adopted.

C. L. Ransom (C. & N. W.): The approval of the specifications for 50,000 and 100,000-gallon tanks is desired. In explanation of the five designs of tanks submitted, the attention of the convention is called to the table on page 204. Since these tables have been compiled, one or two minor errors in the calculations have been found; but these errors will not materially change the figures at the bottom of the page, that is, the first cost per thousand gallons and the final cost per thousand gallons handled.

The secrtary read the specifications.

G. W. Kittredge (N. Y. C. & H. R.): These specifications would seem to bar the use of half-round or round hoops.

Mr. Ransom: The committee had more discussion on this hoop matter than on any other feature of tub design. The round hoops were suggested, but we were unable to find anyone who had used them over two or three years, so that we felt it was rather a radical departure from the old practice and hardly to be considered at the present time. So far as half-round hoops are concerned, it looked as though they would be very satisfactory, but the same objection was open to them, that they had been very little used. We have on the table a portion of a flat tank hoop which has been in service for 23 years, of wrought iron, which shows very little deterioration, and the committee thought it was safe in recommending that style of hoop.

Mr. Kittredge: I think the field ought to be left open for the use of either the round or the half-round hoop. I believe we are going to get better service from these hoops than the flat hoops. It is simply a detail as to manufacture. With the flat hoop, unless you take the hoops off entirely and paint them on the underside as well as the outside, after a few years you are liable to have a dangerous condition which will not appear from external observation.

Mr. Ransom: The committee is willing to accept that suggestion. The reason it was worded in this way was to bring out some discussion. We were not able to get any discussion last year on this same subject that amounted to anything, or get any information from the members as to the hoops, and we worded it in this way more to bring out discussion than anything else.

J. C. Nelson (S. A. L.): During 1909 we lost three tanks because of flat hoops rusting on the inside. They were not observed to be rusted to any appreciable extent, and the tanks bust without any warning whatever. I have been trying to find something that would be satisfactory any have recently used round hoops.

Mr. Ransom: Were those hoops made of steel or wrought iron?

Mr. Nelson: I do not know. They were in service only about six years. We have a very hard condition down in Florida in the salt air. It seems to get in behind the hoops, next to the staves, and rot the hoops, whether they are made of steel or iron.

Mr. Stein: We have known of a number of cases where the flat iron hoops have given out and the tank has failed. In each case they were steel and not iron. A substitution of a round iron bar was made. I do not know of a single case where a flat wrought iron hoop failed, but I do know that the steel hoops deteriorated very materially. Between the hoop and the tank corrosion would go on very rapidly; the effect of the rusting would run down the tank inside of a year and make the tank appear as if it had not been painted for eight or ten years. I know where substitutions were made of round iron bars, in place of these flat hoops. The hoops have been in service as much as six years, and at present there is not a particle of evidence of deterioration.

Mr. Courtenay: Our supervisors, who are in immediate charge of water stations, maintain steadily that cypress tubs with steel hoops will rust the hoops quicker than any other type of tub. They maintain there is some kind of peculiar acid in the cypress which attacks the steel. At any rate, the trouble with steel hoops has been so great on the L. & N. that we have changed to a standard round hoop. As Mr. Kittredge observed, it is impossible to paint the underside of these steel hoops without taking them off the tubs. It frequently occurs that the hoop is apparently good, from the outside indications, but, as a matter of fact, may be pitted almost entirely through and extremely weak. The L. & N. used round hoops at least 25 years ago. For many years we specified iron hoops, but did not get them; we got steel hoops. Our experience is that the loss with flat hoops has been sufficient to justify the change to round hoops.

Mr. Loweth: About six years ago the St. Paul used four or five tanks with round hoops, and as a result of our experience that year and observation of these tanks the next year the round hoop will become the standard on the St. Paul. We have been using round steel hoops for the past three or four years. We use the steel hoop because we think with a round hoop we can protect the steel as well as we can the iron. It is difficult nowadays to find good wrought iron, and by using the steel hoop we save ourselves a good deal of trouble and annoyance in trying to get iron in place of steel. I feel we will not have to paint the hoops on our tubs any oftener than we will have to paint the tank for general purposes.

Mr. Lindsay: We used the flat hoop largely and had to take them off to repaint them. We have begun to experiment with the round hoop, and find a decided advantage in their use, except that the round hoop indents the wood in the tub. We have decided to use ¾-in. round iron, which will obviate that difficulty, so that in changing the adjustment of the hoop it will not leave the furrow.

Prof. W. D. Pence (Univ. of Wis.): The investigation I made of the failure of water tanks a few years ago led me to the conclusion that the form of the hoop should be given special attention. As a result of these studies, and conference with the representatives of the insurance companies, it seems to me that the suggestions made by Mr. Loweth and

others will be the means of procuring decided improvement in the hoops.

Mr. McDonald: My impression is that the National Board of Fire Underwriters require the use of round hoops.

J. M. Meade (A., T. & S. F.): Will some of these gentlemen who are speaking of the round hoops give the diameter of them?

Mr. McDonald: That depends on their position.

Mr. Courtenay: Our practice is ¾ in.

Mr. Kittredge: Do I understand that the chairman will make some reference to the round hoop so that it will not be barred?

Mr. Ransom: The committee will accept that.

The secretary continued to read the specifications.

Prof. Pence: Cross reference is made to the steel substructure adopted in the specification of the association. Does that mean the specification for iron and steel bridges?

Mr. Ransom: It is the same as referred to in the paragraph on substructure.

Prof. Pence: I think more attention is needed to certain details of that question than is covered in that paragraph.

Mr. Ransom: The committee went over that pretty thoroughly, and in taking out these paragraphs we have suggested here they felt that they had practically covered the erection of tanks with the addition of these paragraphs which are added.

Prof Pence: It seems to me that these specifications would not give the results that the committee is seeking to recommend. I am unable offhand to make any suggestions. I think the committee should withhold making this as their recommendation. It is not in line with the specification.

The secretary continued to read the specifications.

Mr. Stein: Is the supply pipe to be connected to the tank by these screwed flanges also?

Mr. Ransom: Yes.

Mr. Stein: I presume also there is an automatic valve in the tank to close it off at the proper point?

Mr. Ransom: No, there is a gate valve in the frost box.

Mr. Stein: There is a gage in the frost box, but don't you have an automatic valve in the tank?

Mr. Ransom: No, not unless required.

Mr. Stein: Is not that customary?

Mr. Ransom: Not always. You mean a floating valve.

Mr. Stein: A floating valve to automatically cut off the water supply.

Mr. Ransom: That would be a detail of the system and would not go into the specifications for a tank.

Mr. Stein: I know of a case where the water pressure was extremely high, and just at the moment the automatic valve cut off that water supply, throwing the entire pressure into this supply line and to the bottom of the tub, the water would invariably leak between these flanges and the bottom of the tub and run down into the frost box, taking with it the waterproofing material. It was necessary to run the pipe through a stuffing box in the bottom of the tank. That is necessary where your pressure is not more than 30 to 60 lbs. Where you run to a pressure of 80 to 100 lbs., you can hardly prevent leakage by the system of screwed flanges. I think this point should be taken care of in the specifications.

J. L. Campbell (E. P. S. W.): In cases where we have the water supply from a city line, or pipe line, under high pressure, I think that a form of floating valve should be adopted that would eliminate the water hammer. The ordinary hydraulic valve that will close within a few seconds will cause a water hammer on the line.

Mr. Stein: I am not referring to a water hammer, but direct pressure, and until you turn off the valve in your frost box you have the pressure from the point where the automatic valve begins to work down through the supply line.

Mr. Campbell: I understand you had trouble from leakage.

Mr. Stein: Yes.

Mr. Campbell: That is not my experience. With a good gasket joint there is no trouble in making a joint tight at 100 lbs.

E. J. Correll (Mo. Pac.): What is the objection to using cast iron pipe for the supply pipe?

Mr. Ransom: I do not know that there is any objection, except that it requires flanged joints or leaded joints. Leaded joints would seem somewhat objectionable in frost boxes.

Mr. Correll: If that is the only objection to cast iron, why not change it? I move to strike out the word "wrought" and leave the character of iron blank.

The secretary continued to read the specifications.

Mr. Ransom: I would like to make a slight correction. The matter of clean-out valve was omitted, and the committee would change this paragraph to read: "Outlet, or clean-out valve shall be of cast iron of the removable type, arranged with cut-out device, so that valve can be removed for the renewal of valve face rubber without emptying water in tank, and also that it can be operated from the locomotive tender, for outlet valve, and from the roof of the tank for clean-out valve. Design to be approved by the engineer.

The President: If there is no objection that will be considered approved.

The secretary continued to read.

Mr. Lindsay: I do not find any reference to the painting of the hoop.

Mr. Ransom: It says that steel and iron work shall receive one coat at the mills, that includes hoops. They would be painted two coats afterwards as directed.

Mr. Ewing: Has the committee given any consideration to the matter of the use of a permanent sub-structure other than steel, the use of a brick or masonry circular wall, which has the advantage of the elimination of frost boxes?

Mr. Ransom: The committee did not go into that this year. It was intended, if this tank matter were continued, to investigate something of that sort and also, in later years, the reinforced concrete tank.

A. F. Robinson (A. T. & S. F.): I suggest that the specifications do not cover at all clearly the matter of the metal to be used on the tanks, the matter of beveling the plates, bending, assembling, riveting, caulking, and similar matters. On our road we use a good many steel tanks and I am sorry to say that I do not think there are a half dozen that do not leak. We might make our specification in the present case so clear and so carefully worded that it will be easily understood. It would make the specifications complete and serviceable. I suggest that the committee hold this item and work on it for the coming year.

Mr. Ransom: The committee is willing to accept that suggestion and will be glad to co-operate with any of the members who have specifications that will help us in our work.

Mr. McDonald: In view of the fact that there has been a discussion here of value on quite a number of points upon which the committee has been unable to get any discussion before, and in view of the fact that it will probably be the action of the board of direction to ask the committee to study the question with reference to water tank supports of concrete, and water tanks of concrete, I suggest that the committee take the entire report and give it further study, with a view of boiling it down a little more and report definitely on some of the points that have been discussed. I do not believe that the report in its present shape can be published in the Manual.

Mr. Ransom: The instructions of the board of direction were quite explicit and did not include concrete tanks.

Mr. McDonald: I am simply forecasting the action of the board, as I happen to know what the program is for next year.

Mr. Loweth: If this report is to be referred back to the committee, I suggest the advisability of dividing the specifications so as to get a complete specification for timber tanks and another complete and separate specification for steel tanks. I believe that would be clearer. I suggest that the plans include the cone roof. We have the octagonal roof, and the cone roof has the advantage of being cheaper and, to many, looks as good. I thing an alternative sketch should show the cone roof. I also suggest an alternative plan omitting decking on top of the tubs. We inaugurated that practice several years ago and we have seen no reason for going back to the decking. I think it would be desirable to consider the question of reducing the width of the timber overlays.

Mr. McDonald: We could not dispense with the covering on tubs in the South. The growth of algae makes it necessary to cover them.

Mr. Loweth: My idea is that the plans should show a tub covering and also an alternative sketch showing the tub without the covering.

Mr. Cushing: The result of our investigation in the matter of steel supports for tanks is that there should be only four supports instead of twelve, for the reason that the additional number of supports brings the thickness of the steel used down to too small gages, and it is better to compact the steel into a few supports which are more durable.

Mr. Ransom: The committee had both styles of tanks, four and twelve posts, analyzed, and taking into consideration the foundations and all other features, we found the four-post design was more expensive.

Mr. Cushing: It is not a question of cost, but a question

of durability of material. In bridge work our company will not allow the use of anything less than ⅜-in. thick, and I don't suppose anyone else does.

Mr. Ransom: The columns on the steel substructure are of 8-in. x 3-in. x ½-in. angles.

Mr. Lindsay: I would like to have the question of making the pitch on the wood tank roof the same as the pitch on the steel tank roof considered. We use the low pitch now on our wooden tanks and they look very well.

The President: I understand the committee will be glad to act on Mr. Loweth's suggestion, and it is so ordered.

Mr. Ferriday: With reference to Appendix A, I would like to call attention to what I feel is the most interesting part of our report, apart from the tests themselves. That is the analysis, all of which is interesting, but particularly the part on page 222. It is the usual practice to lay a 14-in. line to a 12-in. column, or 12-in. line to a 12-in. column. If you will refer to page 224, a table which gives the interpretation of table of flue heads, I would like to call your attention to these interesting conditions. Combinations 7 and 8 show the maximum and minimum discharge with 10-in. supply by 10-in. pipe instead of 12-in. pipe, since the length is only 200 ft. In minimum discharge we have assumed that about 5 ft. would be the allowable minimum for the water to get into the tank. The other condition is where the tank is full. In other words, if a 10-in. pipe supplies a 12-in. column, a large portion of the 12-in. outlet would not be filled with water, and the water would spray, but that could be coned down to the necessary amount. Another interesting paragraph is that showing a maximum practice, combination 21, which is a 16-ft. tub on a 32-ft. substructure, taken as the average height of the tank. With this 100-ft. of 14-in. pipe, supplying a 12-in. column, will deliver 6000 gallons a minute.

SIGNS, FENCES AND CROSSINGS.*

The following subjects were assigned:

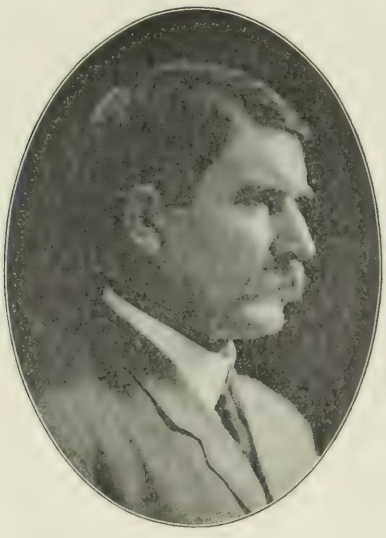
(1) Consider revision of Manual.

(2) Report on ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.

(3) Rewrite detailed matter accompanying conclusions adopted at the tenth annual convention, with a view to brevity, and furnish plans to explain them.

(4) Continue investigation of the use of concrete fence posts, and submit recommendations.

(5) Investigate the best form of flangeways at crossings.



W. D. WILLIAMS,
Chairman Committee on Signs, Fences and Crossings.

Revision of Manual.

The committee has made a revision of the matter in the Manual. The following changes are those which are more than simply changes in wording:

Under "Fences, Recommended Practice" omit: "The use of heavier smooth wire than has generally been adopted is recommended."

Under "Surface Cattle Guards," omit: "It should be so constructed as to overcome the objectionable features of the pit guard, particularly so far as endangering trains is concerned."

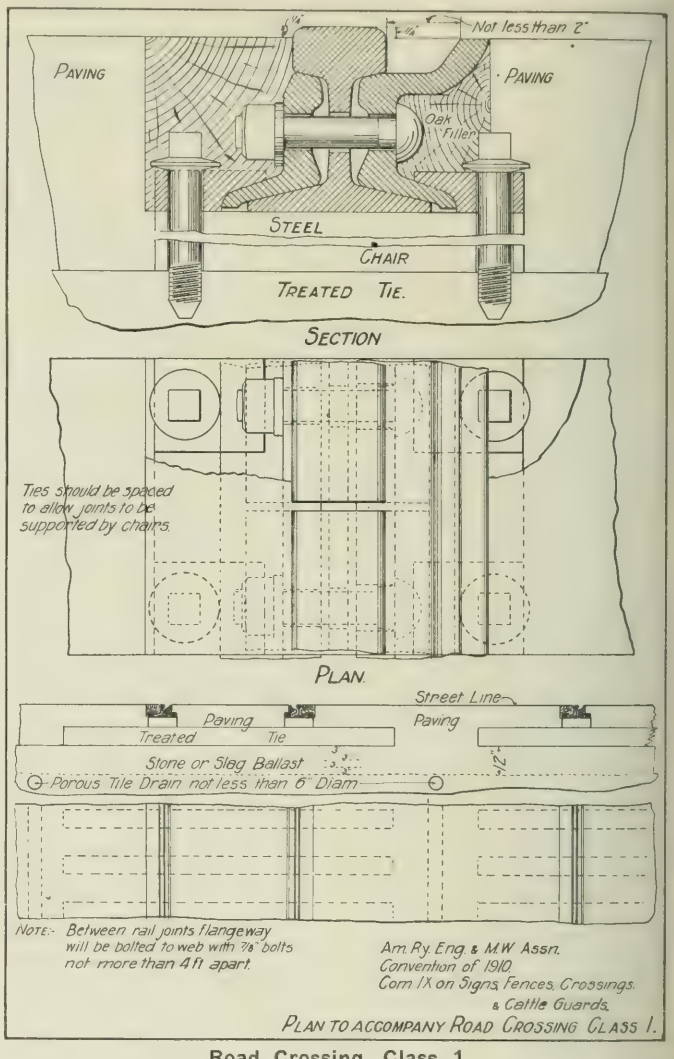
Under the specifications for third class fences, omit: "When desirable, 1 in. x 2 in. wooden stays * * * interlaced between the longitudinal wires, may be used," etc.

Insert the following in place of the present specifications for braces:

"Braces for end posts, gate posts and intermediate brace panels shall be common fence posts or 4x4 in. common lumber, free from large knots, splits or rot."

Change the specifications for the erection of bracing accordingly.

Omit the matter under "Tensile Strength of Fence Wire." Substitute the following paragraphs for the first two under "Gates:"



Road Crossing, Class 1.

"A hinged metal gate is recommended.

"The width of farm gates should be not less than 12 ft., depending upon the size of agricultural machinery in use in the vicinity, or as required by the laws of the state through which the railway operates. The minimum height of farm gates should be 4 ft. 6 in. from the surface of the roadway."

Proper Quality of Fence Wire.

The committee has not yet been able to gather sufficient data to warrant any recommendations.

Tests are being made by the American Society for Testing Materials on wires protected by different methods, such as galvanizing, copper-plating, sherardizing, electro-plating and paint. The Paint Manufacturers' Association is making a practical field test of the value of various pigments.

One manufacturer reports an improved process by which he can put a heavier coating of zinc on the wire without having it crack or peel off during fabrication into fencing.

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

Several roads and several members of the committee are now experimenting with and testing out a new form of wire fence—"galvanized after weaving." The tests were started in April, 1909. The committee recommends the continuation of the consideration of this subject for another year.

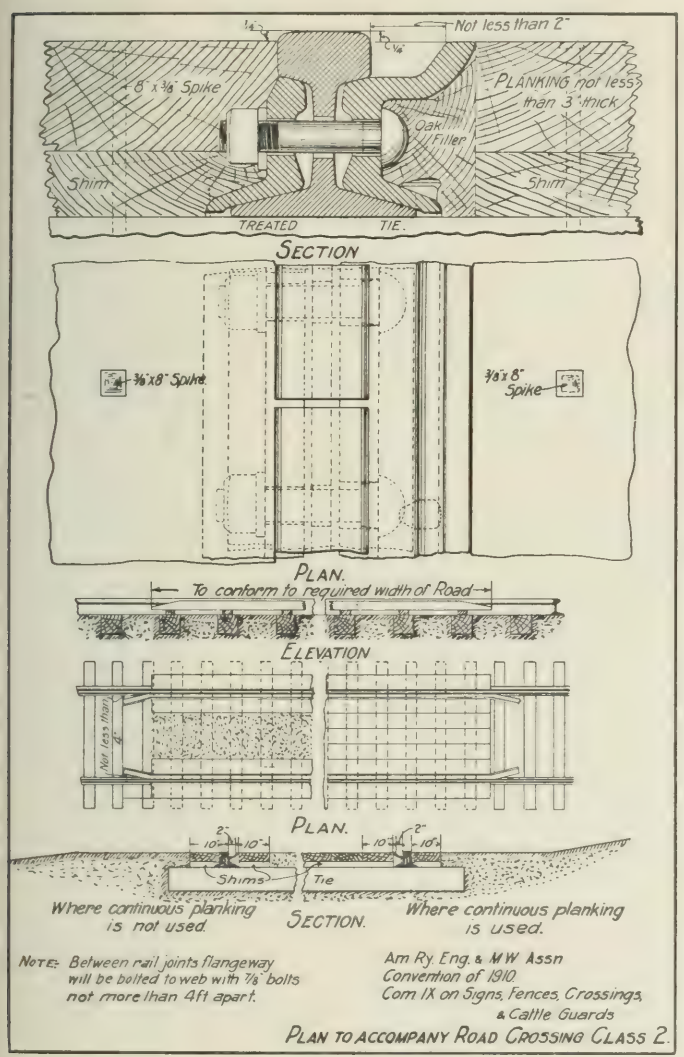
Grade Crossings.

A sub-committee has rewritten the detailed matter making recommendations as to proper construction of grade crossings adopted last year. It also submits drawings showing: (1) Crossings where paving is required to conform to street specifications. (2) Crossings of streets where no paving is required. (3) Crossings of public roads or highways outside of towns or cities. (4) Crossings of private or farm roads.

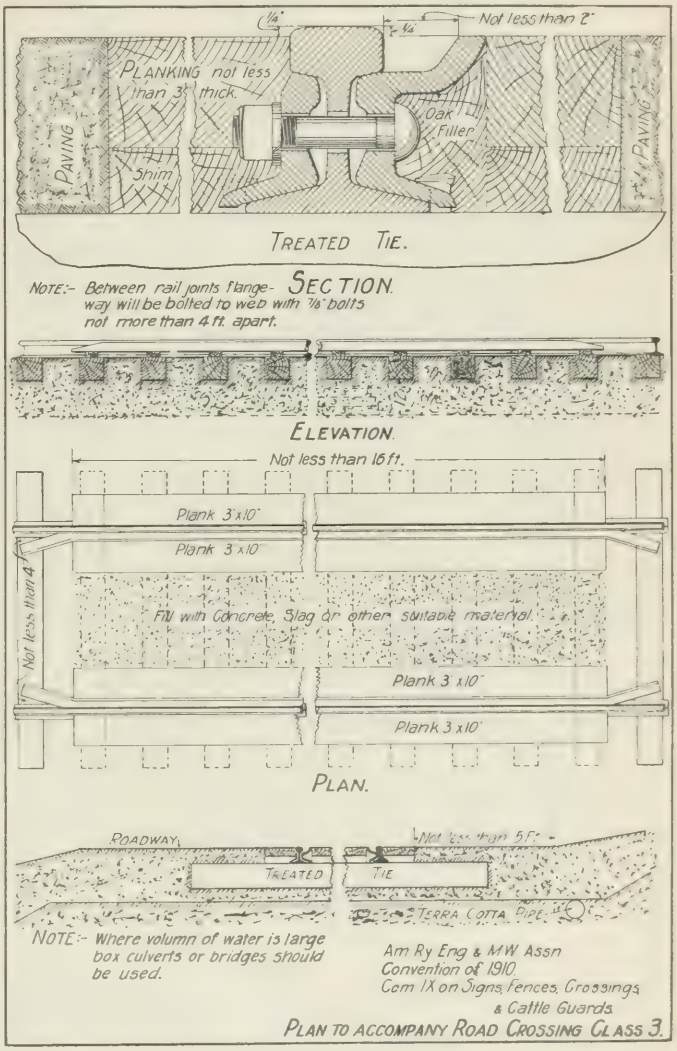
Snow Fences, Snow Sheds and Methods for Snow Removal.

The recommended practice adopted, as shown in Vol. 10, 1909, pp. 877, 881-897, 915-917, is presented for insertion in the Manual, with slight modifications in phraseology.

For illustrations of various types of portable and permanent snow fences and snow sheds, reference is made to Vol. 10, pp. 887, 888, 893-897.



Road Crossing, Class 2.



Road Crossing, Class 3.

For illustrations of various types of portable and permanent snow fences and snow sheds, reference is made to Vol. 10, pp. 887, 888, 893-897.

Concrete Fence Posts.

The committee continued the investigation of this matter, begun last year. It finds that reinforced concrete fence posts are not in use to any large extent in foreign countries.

One of the members of the committee has been experimenting during the past several years, and proposes this year to erect wood posts in concrete every 20 to 30 rods as straining posts for American woven wire fence, the experimental reinforced concrete posts to form the line posts set a rod apart. After the line posts have seasoned for 90 days this fence will be built across a marsh, the long, coarse, heavy grass of which is burnt over every summer or fall. This marsh is a frozen lake in winter and a sea of floating ice in spring. A fence of wood posts will not endure for two years in this swamp. He will also place concrete posts across a marl pan, where wood posts heave out of the ground every spring.

The committee considers that the following facts have been established:

1. Concrete fence posts will heave very little, and in most cases not at all; posts set from two to five years ago are still in almost perfect alinement.

2. They appear sufficiently strong for all practical purposes after having been properly cured and set.

A cedar post of dimensions identical with the average concrete post would weigh about one-fourth as much and is about four times as strong when new, but this only brings out the fact that the cedar post is stronger than necessary, and that the concrete post, with its lesser strength, is yet strong enough to serve its purpose, and has a longer life.

3. The claim that a concrete post, reinforced with steel, forms a lightning protector appears reasonable.

4. They resist the action of fire and decay, and will not float and cannot be displaced as easily as wood.

5. They must be handled carefully in loading and unloading, and be well cured before being set.

6. They are much heavier than wood posts, and the cost of distributing and setting is about 25 per cent. greater.

Flangeways at Road Crossings.

This subject was considered in connection with the third clause of the committee assignment, but it is not prepared to offer anything further this year than what it has presented in its recommendations under that clause.

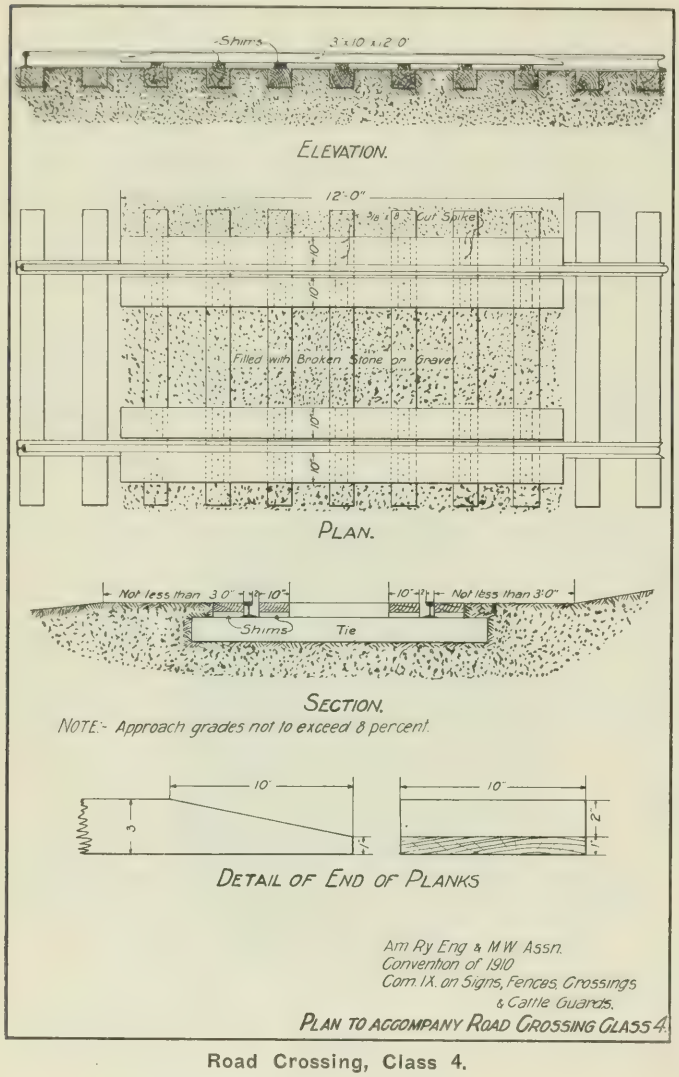
Conclusions.

The committee recommends the adoption of the following conclusions for publication in the Manual:

1. That the revision of the Manual as recommended be approved as good practice, and that tables and illustrations referred to be included in the Manual.

2. That the recommendations made in the rewriting and revision of the detailed matter accompanying conclusions adopted at tenth annual convention, and plans accompanying same affecting the proper construction of grade crossings and snow fences, snow sheds and recommended methods for snow removal, be approved as good practice.

The report is signed by: W. D. Williams (Cin. Nor.), chairman; K. J. C. Zink (Gr. Tr. Pac.), vice-chairman; A. G. Boughner (B. & O.), A. E. Doucet (Transcontinental Ry.), A. M. Funk (B. & O.), Paul Hamilton (C., C., C. & St. L.), C. W. Johns (C. & O.), H. L. Laughlin (M., St. P. &



Road Crossing, Class 4.

S. S. M.), E. R. Lewis (Mich. Cent.), J. W. Orrock (Can. Pac.), P. Petri (B. & O.), C. H. Stein (Cent. of N. J.) and E. J. Steinbeck (Ill. Cent.).

Discussion on Signs.

The conclusions under Appendix A were adopted.

Discussion on Signs, Fences and Crossings.

W. D. Williams (Cin. Nor.): The committee is not ready to recommend the plans submitted in the Bulletin but merely submits them for discussion.

The conclusions of the report were adopted.

The President: Does the chairman of the committee wish anything brought up in regard to concrete fence posts?

Mr. Williams: We haven't anything to offer further than what is printed in the Bulletin, other than for information.

The President: The matter on page 83 has been submitted for information only.

Mr. Kittredge: I desire to offer the following resolution:

Resolved, That the members of the American Railway Engineering and Maintenance of Way Association, in annual convention assembled, desire to express their hearty appreciation of the efforts made and the admirable results obtained by the Railway Age Gazette in its daily issue during this convention:

Resolved, That the cordial thanks of the association be extended to its managing officers and editorial staff;

Resolved, That a copy of these resolutions be spread upon the minutes of this convention and a copy transmitted to the Railway Age Gazette.

The President: It is unnecessary to ask you if you are ready for the question, but I do ask you to signify your approval in a good, hearty way.

The resolution was unanimously adopted.

Mr. McDonald: I desire to offer the following resolution:

Resolved, That the members of the American Railway Engineering and Maintenance of Way Association, in annual convention assembled, desire to express their hearty appreciation of the efforts made and the admirable results obtained by the Railway and Engineering Review in its daily issue during this convention;

Resolved, That the cordial thanks of the Association be extended to its managing officers and editorial staff;

Resolved, That a copy of these resolutions be spread upon the minutes of this convention and a copy transmitted to the Railway and Engineering Review.

The resolution was unanimously adopted.

Mr. Wendt: I am sure that all who attended the Coliseum this week were impressed with the splendid exhibition of railway appliances. I, therefore, move that as an association we recognize the merits of the exhibition referred to and commend the Road and Track Supply Association for the high standard on which the exhibition has been conducted, and that a copy of this resolution be forwarded by our secretary to the officers of the Road and Track Supply Association.

The motion was unanimously carried.

The Secretary: No reports have been presented by the Committee on Uniform General Contract Forms, the Committee on Brine Drippings from Refrigerator Cars, nor the special committee co-operating with the National Advisory Board on Fuels and Structural Materials. Those matters are still under consideration and the committees only report progress.

The President: We are fortunate enough to have with us today four of our past presidents, and I will request them to assist me on the platform by taking chairs here.

President McNab: Gentlemen, I take this opportunity, as I may not get it again at this convention, of expressing to you my appreciation of your kindness to me while I have occupied this honored chair. I do not think that there is any position in this country where railway engineers are concerned that is more honorable than being president of this association, and I only wish that it could be that it would come to you all in turn, but that is impossible. Let me, however, put it up to you as an ambition to look forward to, and I am sure that you will find that what I have said is correct, that there is no position in the railway engineering world more to be desired than the presidency of this association. I, perhaps, can speak with a little feeling on that point, as I have been connected with the association since its inception. I have seen it grow. I have been in close touch with the majority of our members. I have been associated with my honored friends here on the platform since the association was started, and I have observed it wield a great influence in the railway world. I am perfectly satisfied that the physical status of the great railways, the great trunk lines and most of the railways of this country could not be in the condition in which they are were it not for the exercise of the principles and practice recommended by this association.

After the past presidents had made brief remarks, the President continued:

I think no one knows better than I do E. H. Fritch's ability in taking care of the work of this association. I belong to a number of technical societies and I know of none in which the amount of work is accomplished with such a small force as is found in our office in Chicago, but it is a force, and that force is E. H. Fritch. There is just one fault that he has. He is too modest. During a convention of this kind the tax upon the mental faculties of the incumbent of an office like that is very severe. We have had our experience with Mr. Fritch and he has never failed yet, but I think at the present time he has just about gone through all he can and I am going to

suggest to our Board of Direction, at its first meeting, that we give Mr. Fritch a little leave of absence to get up good, robust health. He is painstaking in the highest degree, and in regard to his work you have only got to point to the volume of Proceedings and the excellent manner in which it is gotten up. Mr. Fritch's early training, of course, helps him to a large extent. I have much pleasure in asking the association to testify their appreciation of their secretary's work by a good, rousing cheer.

At 4:30 p. m. President Taft arrived at the meeting.

President McNab spoke as follows:

In the name and in behalf of the officers and members of the American Railway Engineering and Maintenance of Way Association, it is my pleasing duty, as well as privilege, to extend to you a hearty welcome to our eleventh annual convention, and may I be permitted to say that your visit is none the less appreciated by reason of its informality.

I am quite aware that the objects of this body are as familiar to you as they are to those who have the immediate direction of the location, construction, operation and maintenance of railways. Let me trust that it will not be looked upon as being beyond the limits of modesty, if it be said by me, that the excellence of the physical status of our great trunk lines, as well as that of most of our roads, has not been produced merely by the amount of money expended upon it. It is due also to the manner in which the work involving such expenditure was made, and this has been brought about largely through the influence of and exercise of the principles and practice recommended by this association.

Mr. President, this association is American in name and domiciled in the city of Chicago, yet as far as the science of railroading (in its broad sense) is concerned, it is not circumscribed by mere national lines. Today its chief executive officer is one who is not a citizen of the United States, and on that account he would be deficient of ordinary human nature did he not feel and appreciate in the highest degree the unique honor and privilege he possesses at the present time of presenting the President of the United States of America to this convention, with a request for a few words from your Excellency.

President Taft then addressed the audience as follows:

Mr. Chairman, and gentlemen of the Maintenance of Way convention, I am very glad to meet and cultivate the good graces of a Canadian just at this time. (Applause.) I suppose that I shall surprise you if I tell you that I have done a good deal in the way of railway repair and railway construction. There was a time, between 1893 and 1900, when I occupied the position of United States Circuit Judge in that part of the country where most of the railways went into the hands of receivers—(laughter)—and if you know anything about receiverships, as I doubt not most of you do, as you are railway men—the first thing that a good receiver does is to consult his maintenance of way man and his engineer to see how much in the way of receiver's certificates he ought to issue to make the road safe for the carriage of passengers. I was an undertaker in the burial of I don't know how many railway companies in the Sixth Circuit and in the reconstruction, under the system of receiver's certificates, of thousands of miles of railway, and at that time I was able to follow with a good deal of interest the price of steel rails and how far a million dollars would go in helping along a railway that needed new steel. I came then to know what I ought to know anyway, that the maintenance of way man is the man, after all, into whose keeping is given the safety of ninety millions of people. The engineers who make the roadbed and direct the laying of the track and the building of the bridges are the persons who affect not only our comfort as we go over the road but our safety, and make the question whether we will return to our wives a certain one or otherwise. I traveled 14,000 miles this year and I am bound to say that the travel was in every respect delightful. The ways were well maintained and when we had a jolt we attributed it, not to the engineer of the road, but, knowing something about those things, to the carelessness of the locomotive engineer. (Applause.) But I did not come, gentlemen, to make a speech on the subject of railways. I know that I am looking into the faces of the men who have the brains used in railway construction of this country, and I am glad to be here and to extend you a congratulatory word on the improvement that has gone on in railway construction and railway repair and railway roadbeds within the memory of the youngest of us. So that today you who can look back a generation can see an improvement that you certainly did not expect when you began your profession. We have not, in this country, followed you in the perfection of laws that shall protect the public against accident. I mean not the traveling public, because I think there the statistics are not so unfavorable and compare well with foreign railways, but the law I refer to is the law which keeps the roadbed free from trespassers (applause) and which requires gateways and such protection against the negligence of the public itself as to reduce to a minimum the killing and wounding of people, who, when they are wounded, have only themselves to blame. (Applause.)

Gentlemen, I do not know whether this is the fifth or sixth speech that I have attempted to make today, but I know you will excuse me from saying anything further than to express my great pleasure at your welcome and especially at the hands of one who comes from our Northern neighbor. (Applause.)

The President: We will now take up again the report of the Committee on Signs, Fences and Crossings.

Mr. Williams: We would like some discussion on the subject of flangeway.

Mr. Lindsay: The New York Central has in Utica, N. Y., a double-track line two miles long running on a street paved with granite, on which we used the construction shown on Plate 1 of the report. We have replaced it with 9-in. girder rail, with a rolled flange, setting on ties located on the orginal gravel ballast. The ties are held apart by concrete at the top of the tie. We have maintained a perfect alinement so far.

Mr. Churchill: I have used the chair construction in paved street in Norfolk, Va. The first form we used were short chairs, made wider than the rail flange. Later we lengthened the chairs out and have ties the size of the base of the rail, and since that time we have had no trouble.

Mr. Kittredge: The New York Central has experienced no trouble with the flangeway breaking down. The trouble was simply in the construction of the chairs.

R. N. Begien (B. & O.): In the plans for the small drain there is 12 in. of ballast under the tie, and the track is drained by a 6-in. porous tile drain. I think it is worth while to put in cast iron pipe between the tracks, and have no pipe as small as 6 inches. I put them in as large as 18 inches.

K. J. C. Zink (G. T. P.): How do you expect to get water into the cast iron pipe?

Mr. Begien: We run the pipes inside manholes, practically head walls, and lift them up on the sides; run the tie in through the concrete and pack in between these small head walls with crushed stone.

Mr. Stein: These specifications do not confine you to 6-in. pipe. The report says that pipe not less than 6 in. in diameter shall be used.

C. W. Boynton (Univ Port. Cement Co.): I think it is a mistake to specify porous tile.

Mr. Williams: These plans were gotten up hurriedly, and after the specifications were written they were not checked over, perhaps, as closly as they should be. That is why we said in the beginning that we did not want these plans to go in as any part of the proceedings, but merely to develop some discussion.

YARDS AND TERMINALS.*

The subjects assigned were as follows:

(1) Consider revision of Manual; if no changes are recommended, make statement accordingly.

(2) Study further the subjects reported on at the tenth annual convention, with a view of arriving at conclusions that may be of value concerning each.

(3) Prepare and recommend typical designs for hump yards, with special reference to yards where the preponderance of traffic is empty cars, and where the preponderance is loaded cars, both under varying climatic conditions.

(4) Development of mechanical handling as means of promoting rapidity and economy in the handling of freight.

(5) Submit typical track layout for passenger terminal of medium size, both dead end and loop, and analyze graphically the train capacity of the layout.

The committee presents the changes of the Manual in Appendix A.

The committee finds that as the subjects considered last year and reported on at the tenth annual convention were supplementary to those forming the basis of the preceding report, no additional conclusions of value can be presented.

The committee finds that the plans and profiles submitted with its eighth annual report, together with the conclusions bearing thereon, adopted at the ninth annual convention

*From a report presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

and published in the manual, cover the subject quite fully, particularly as to humps on which scales are located. The committee has not yet secured sufficient data as to relative movement of light and loaded cars over certain grades to be able to present any additional information of value at this time. It is to be noted, however, that the committee's ninth annual report (1909) discussed the operation of hump yards, and gave details of the operation of 28 such yards.

The fourth subject has received a great deal of attention from the committee, and several reports have been made, giving all information obtainable at the time. In Appendix B is given a description of suggested developments in this direction.

The fifth subject has been considered by the committee and much information has been collected as to installation and operation of many stations and terminals of the character named in our instructions. This is given in Appendices C, D and E, but the committee has not yet sufficient data to enable it to make a proper analysis or draw definite conclusions.

The report then discusses briefly double-deck and loop terminals.

The committee's eighth report (1908) suggested a special design of track scale for heavy service in which the dead rail is supported on a continuous concrete wall instead of on iron standards. This construction has been carried into effect for a scale 39 ft. 2 in. long, and of 120 tons



F. S. STEVENS.
Chairman Committee on Yards and Terminals.

capacity, at Coatesville, Pa., on the Philadelphia & Reading. The Pittsburg & Lake Erie has installed a track scale of 200 tons capacity, designed to weigh cars passing over the scale at a speed of five miles an hour. It is fitted with an automatic weighing device. A feature of the scale is that the end is so arranged that, instead of the entire load being taken by the end section, it is distributed, the wheel on one side loading the first section, while the wheel on the other side loads the second section. This reduces the stresses due to the sudden application of the load. The platform is 67 ft. long, with an effective length of 53 ft.

The following recommendations were adopted at a committee meeting, but were reconsidered later. It was decided that further discussion and a consideration of the plans accompanying the report might make it advisable to make changes. They are given herewith as a matter of record and as information, but not as a part of the report.

(1) In planning the track arrangement for a passenger terminal, each platform track should be connected (as near the end of the platform as is practicable) with at least two lead or approach tracks. These latter, in turn, should be connected with as many platform tracks as practicable, up to the limit required in each instance. The purpose of this is to permit departing and arriving trains to meet or pass immediately outside the platform, and also to provide the maximum number of independent drilling or switching routes.

(2) Where platforms between tracks are to be used for passengers and trucking, the distance between centers of tracks should be not less than 28 ft. if posts are located on the platform, and not less than 24 ft. if there are no posts.

(3) Platforms should be covered. When a train shed is used it should be formed by a series of short transverse spans, each to cover not more than two tracks and a platform. This type of train shed is recommended as permitting good ventilation and light, and involving a low cost of maintenance.

The report is signed by: F. S. Stevens (P. & R.), chairman; E. E. R. Tratman (Engineering News), vice-chairman; Hadley Baldwin (C., C., C. & St. L.), W. C. Barrett (B. & O.), G. H. Burgess (D. & H.), L. G. Curtis (B. & O.), A. H. Dakin, Jr. (Consulting Engineer), H. T. Douglas, Jr. (W. & L. E.), A. C. Everham (Detroit River Tunnel), M. J. Henoch (L. & N.), H. A. Lane (B. & O.), B. H. Mann (Mo. Pac.), L. J. McIntyre (Nor. Pac.), A. Montzheimer (Elgin, Joliet & Eastern), G. F. Morse (Cent. of N. J.), W. L. Seddon (S. A. L.), C. S. Sims (D. & H.), C. H. Spencer (Washington Terminal), C. H. Stein (Cent. of N. J.) and A. Swartz (Erie).

Appendix A.

Definitions for Yards and Terminals.

The proposed changes are as follows:

Terminal.—An assemblage of facilities provided by a railway at a terminus or at intermediate points on its line for the purpose of assembling, breaking up and relaying trains.

Yard.—A system of tracks within defined limits provided for making up trains, storing cars and other purposes, over which movements not authorized by time table or by train order may be made, subject to prescribed signals and regulations.

Receiving Yard.—A yard for receiving trains.

Separating Yard.—(Eliminate.)

Classification Yard.—A yard in which cars are classified or grouped in accordance with requirements.

Cluster or General Yard.—(Eliminate.)

Gravity Yard.—A yard in which the classification of cars is accomplished by gravity.

Poling Yard.—A yard in which the movement of cars is accomplished by the use of a pole operated by an engine on an adjacent parallel track.

Summit or Hump Yard.—A yard in which the movement of cars is accomplished by pushing them over a summit, beyond which they run by gravity.

Tracks:

Body Track.—Each of the parallel tracks of a yard, upon which cars are switched or stored.

Ladder Track.—A track connecting successively the body tracks of a yard.

Lead Track.—An extended track connecting either end of a yard with the main track.

Open Track.—(Eliminate.)

Running Track.—A track reserved for movements through a yard.

Relief Track.—An extended siding long enough to allow an inferior train to continue running.

Stub Track.—A track connected with another at one end only.

Spur Track.—A stub track of indefinite length diverging from main line.

House Track.—A track alongside of (or entering) a freight house, and used for cars receiving or delivering freight at the house.

Industrial Track.—A track serving one or more industries.

Team Track.—A track where freight is transferred direct between cars and wagons.

Note.—In a typical yard there will be several tracks devoted to special purposes, varying with local conditions. These will include caboose tracks, scale tracks, coaling tracks, ashpit tracks, bad order tracks, repair tracks, icing tracks, feed tracks, stock tracks, transfer tracks, sand tracks, depressed tracks, etc.

Switching District.—(Eliminate.)

Rail and Water Terminal.—A terminal where freight is transferred between railway cars and boats.

Wye.—A triangular arrangement of tracks used for turning engines, cars or trains.

Transfer Slip.—A protected landing place for car floats with adjustable apron or bridge for connecting the tracks on the land with those on car float.

Incline.—An inclined track (or tracks) on a river bank at a protected landing place, with adjustable apron and

cradle for connecting to the track on a car float for transfer of cars.

Siding.—A track auxiliary to main track for meeting or passing trains, limited to the distance between two adjacent stations.

Passing Siding.—(Eliminate, and use definition of siding.)

Lighterage Pier.—An open or covered pier at which freight is transferred directly between cars and boats.

Station Pier.—A pier having no rail connections, where freight is received and delivered by car floats.

Recommended Practice.

Body Tracks.—Under ordinary conditions body tracks should be spaced 12 ft. to 13 ft., c. to c., and where they are parallel to main track or other important running track, the first body track should be spaced not less than 15 ft., c. to c., from such main or other important track.

Ladder Tracks.—These should be spaced not less than 15 ft., c. to c., from any parallel track. Frogs of greater angle than No. 8 should not be generally used, and the angle between the ladder track and body tracks will be governed by the distance on ladder track required for a turnout.

Lead Tracks.—For safety of operation the connections of these tracks with the main track should be interlocked, and to facilitate train movements, communication by telegraph or telephone should be established.

Drill Tracks.—Drill tracks should be so located as to cause least possible interference with other movements.

Open Tracks.—(Eliminate.)

Running Tracks.—Running tracks should be provided for movements in either direction, to enable yard engines to pass freely from one portion of the yard to the other; also to enable road and yard engines to pass to and from the engine house and other points where facilities are provided.

Caboose Tracks.—Where conditions permit, caboose tracks should be so located that cabooses can be placed on them in the order of their arrival, and should be so constructed that cabooses can be dropped by gravity onto the rear of departing trains.

Scale Tracks.—Scale tracks should be so located that weighing can be done with least delay; and where many cars are to be weighed they should pass over the scale by gravity and be weighed while in motion.

Bad Order Tracks.—Where cars are classified, one or more classification tracks, easy of access, should be provided for setting off cars in bad order, from which they may be readily removed to the repair tracks.

Icing Tracks.—Icing tracks should be so located that the work of shifting out, icing and classifying cars for movement can be performed in least time.

Yard.—If possible to so arrange, the main tracks of both single and double-track roads should be located on the outside of yard, and engine house, coaling station, etc., should be centrally located.

Coach-Cleaning Yard.—The coach-cleaning yard should be conveniently located near terminal station. The tracks should be of sufficient length to hold full trains, and should be stub ended, with a car cleaner's repair and supply building at right angles thereto at their ends.

Inbound Freight House.—Inbound freight house should be of such width as will furnish a reasonable amount of floor space for holding freight (5 ft. is a good average width). Usually not more than two tracks are needed, and the side toward the tracks should be provided with a platform and should be fitted with doors moving vertically between the posts to avoid the necessity for spotting cars.

Outbound Freight House.—To avoid excessive trucking, the outbound freight house should be narrow (25 ft. is a good average width), and not more than four tracks should be provided. The side toward the tracks should have a platform and should be fitted with doors moving vertically between the posts.

Where a great number of cars are required, the average trucking distance will usually diminish and trucking through cars will be avoided if the freight house is built at right angles to and at the back ends of a series of stub tracks built in pairs, with covered platforms between.

Transfer Station.—A transfer station should be located at a point where traffic is concentrated, and where a necessity exists for consolidating freight into a less number of cars for movement to a certain destination, or for separating and reloading freight into a greater number of cars for further movement to final delivery.

Yard at Rail and Water Terminals.—The tracks should be so arranged that as trains arrive the cars can be promptly classified and grouped for delivery without interference with other movements.

Piers.—At rail and water terminals the piers should be designed with a view to the most efficient, rapid and economical handling of the business, and with a view to its future development. Care must be, etc.

Grain Elevators.—If conditions permit, grain elevators should be so located that cars may be put in at one end and taken out at the other, and without interference with other yard movements. Where this cannot be done the tracks should be so arranged that the work of placing and removing cars may be done without serious interference with the operation of the elevator or delay to other shifting.

Car Capacity of Freight Tracks.—It is recommended that 42 ft. per car be allowed in rating the car capacity of freight tracks.

(1) Freight car repair yards should be composed of short tracks of about 15 cars capacity, arranged in pairs; each pair should be spaced 15 ft., c. to c. of tracks, and the pairs should be spaced 40 ft., c. to c. of pairs.

(3) In computing working capacity of repair tracks, 50 ft. should be allowed for each car.

(4) The yard should be equipped with air and water pipes, and outlets furnished with air hose should be provided at intervals of 50 ft. for testing the brakes on cars.

(5) Tracks on which heavy repairs to freight cars are made should be under cover, and overhead traveling cranes should be provided for heavy lifting.

Team Delivery Yard.—(2) The tracks should be stub tracks, arranged in pairs, spaced 12 ft., c. to c., and if conditions permit the pairs should be spaced not less than 52 ft., c. to c. of pairs, or 30 ft. in clear. For convenience in handling, the tracks should not exceed 20 cars capacity each.

(3) If possible, the yard should be provided with a power-driven crane for handling heavy freight.

(5) Wagon scales should be installed at most convenient place near the entrance to the driveway, and a track scale should be placed at the most convenient location for weighing cars when entering or leaving the yard.

Hump Yards.—(10) Where cars to be classified are largely empty or light, and the scale is on the hump, grades are recommended for average conditions, as follows.

The summit of the hump should be reached from the ascending grade by vertical curves, etc.

Discussion on Yards and Terminals.

F. S. Stevens (P. & R.): The first item of our instructions was to consider the revision of the Manual, and this constitutes the principal part of the report presented at this time, and we will ask you to adopt the present form for substitution in the Manual. The second item is to study further the subjects reported on at the tenth annual convention, which was a supplement to the preceding report, covering practically nothing else. Being a supplemental report, it did not, in the opinion of the committee, require any additional conclusions. Therefore, we considered that portion of the instructions covered also. The third instruction is to prepare and recommend typical designs for hump yards. This subject, we consider, we have covered quite thoroughly from time to time, and since the original report was made we have brought the matter up to date. Since the last report treating on that subject there has been no new developments and nothing has been discovered by this committee to add to the report previously made. The fourth item of our instructions was the development of mechanical handling as a means of promoting rapidity and economy in the handling of freight. This is a subject that we have considered every year for some time. We are still keeping up with the advance made on this subject, and present what we have been able to obtain this year, with the request that these instructions be continued. The fifth instruction was on the subject of typical track layout for passenger terminals of medium size. We have collected a large amount of data on which to work. We submit, therefore, the matter connected with the fourth and fifth paragraphs of our instructions, as a progress report only. We will ask you to adopt our recommendations, in their amended form, for the Manual.

L. G. Curtis (B. & O.): As a member of the committee I want to make a suggestion under the heading of "Transfer Station." While I think the matter is covered very nicely for ordinary stations, for terminal points like Chicago we ought to incorporate after the word "cars" in the third line of the matter at the top of page 147 the words "or into home cars." The definition as given there is not just as plain as it should be, and does not cover

every transfer station, for the reason that cars are often transferred in order to get the lading into home cars, and I simply make that suggestion. I will put that in the form of a motion.

Mr. Meade: Why not make those words "system cars?"

Mr. Curtis: That will be satisfactory.

Mr. Stevens: The committee will accept that.

Mr. Cushing: On page 143, under "Ladder Tracks," the committee recommends a change from No. 7 frogs to No. 8 frogs for yards. I do not like that. I move that it be left No. 7, as at present.

Mr. Nelson: I hope the motion will not prevail. Those who experience the trouble that we have with long coupled engines on short turnout curves will be glad to see No. 8 frog adopted.

Mr. Cushing: We have as long coupled engines as anybody.

Mr. Nelson: Some roads also have a long push.

Mr. Courtenay: The L. & N. also had trouble with No. 7 frogs in the turnouts. On account of that trouble we have gone to No. 8.

Mr. Wendt: I would like the committee to explain why that change was made.

Mr. Stevens: The clause reads: "Frogs of greater angle than No. 8 should not be generally used, and the angle between the ladder track and body tracks will be governed by the distance on ladder track required for turnout." The object of that is to secure the greatest possible radius of turnout with the greatest possible angle between the turnout and the body track. To illustrate that point, I will say that I have under construction now some turnouts with No. 8 frogs, in which the angle between the ladder track and body track is 9 deg. 10 min. That places the switch close to the heel of the frog in each case, and makes use of the entire distance on the ladder tracks for turnouts with no waste room. The object is to secure a larger radius than you can secure with a No. 7 frog, but the same object is secured in so far as the angle is secured. The same economy is secured as would be secured with the No. 7 frog. We thought this was a better arrangement than to use the No. 7 frog on that account, and that the radius of curvature is easier.

The conclusions of the committee were adopted.

Concluding Business of the Convention.

W. L. Seddon (S. A. L.): Under the head of new business I have a matter to bring before the association. I do not know that any of my railway friends are having the experiences we are having down in the southeastern section of this country regarding the requirements for structures over navigable streams. The definitions of navigable streams have been very much extended in the last few years, and under the present situation, while the matter is left somewhat in the discretion of the United States engineering officer of the district, it is very often in such shape as to put him in a rather awkward position, and I believe the time is ripe for something to be done on that line. I have talked to several army officers about the matter and I believe if this association would appoint a committee to confer with the Chief of Engineers, considerable help could be had for the railways in that respect and one that we need very much in my part of the country where the small motor boat is causing us to put in very expensive structures on streams with no other navigation.

The President: The board of direction will take that matter under consideration.

Gentlemen, I have very much pleasure in presenting to you L. C. Fritch, whom you have elected as your president for the ensuing year. I will ask Mr. Wendt and Mr. Cushing to escort Mr. Fritch to the chair. (Great applause.)

Mr. Fritch: I appreciate very deeply, gentlemen of the association, the honor you have conferred upon me. I am following a long line of illustrious predecessors who have brought this association up from its humble beginning until I think it is now the strongest railway association in the United States, in fact in this country today. I sometimes think that the membership at large and the railway managers and executives do not appreciate what this association is doing for the railways. I believe that the recommended practices of this association are saving the railroads of this country thousands, perhaps millions of dollars annually.

My only hope, gentlemen, is that I may fill the duties of this office to the satisfaction of the association. I know that with the coöperation of the board of directors, the officers, the committees and the membership at large and with my own effort, I will render to the association the very best that is in me. I thank you. (Applause.)

President Fritch: Gentlemen of the convention, I beg leave to offer a resolution of thanks of this association to our retiring president, William McNab. He has given the association almost two years of untiring effort as the guiding hand of this organization. You might say that most of the success of this association is due to the efforts of the president. It is the executive officer who is in charge of the destinies of the association, and its success is proportioned to the amount of zeal and energy that he puts into the work. I think that this convention marks the very zenith of the success of this association, and I think it is largely due to the efforts of our retiring president. I want to ask you all to rise in a vote of thanks for our retiring president.

The members rose and cheered the ex-president.

Mr. McNab: Mr. President and Gentlemen: Just let me say this: I appreciate the vote of thanks you have passed, and all I want to say now, which I could not say during my term of office, is that the office of president of this association is not a sinecure.

Mr. Coates: I desire to offer a resolution of thanks to the Irish Fellowship Club of Chicago for the assistance they gave us in securing the attendance of the President of the United States at this meeting.

President Fritch: I think the resolution is happily put, for the reason that credit is largely due to the local committee of the Irish Fellowship Society for having the President with us today.

The motion of Mr. Fritch was put and carried.

Mr. Ewing: I desire to add to the resolution I put a little while ago and to thank the committee of arrangements in the part they took in getting the President to come here.

The President: If there is no objection, the entire Committee of Arrangements will be included in that arrangement.

Mr. McDonald: I move that we adjourn.

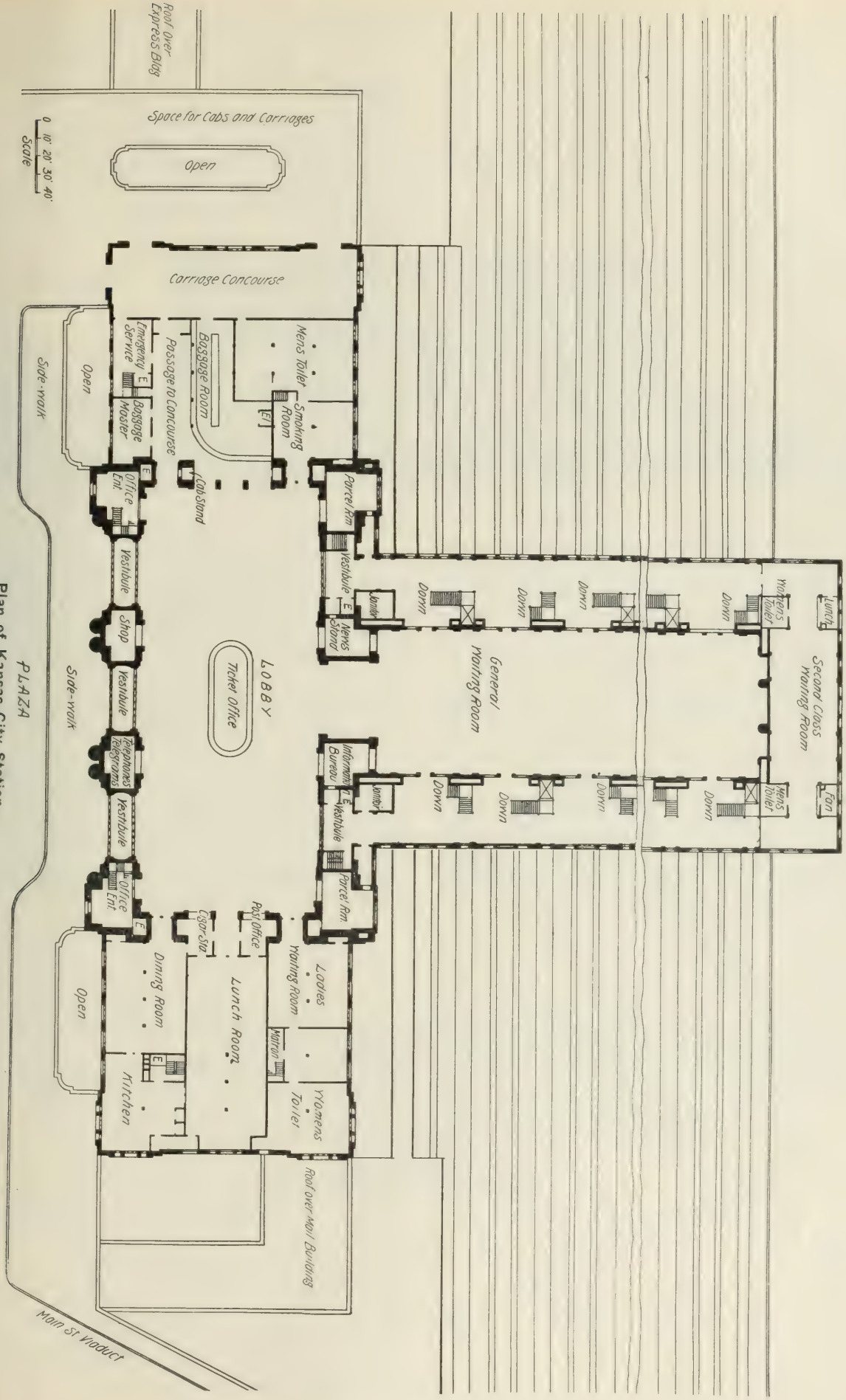
The President: I now declare the eleventh annual convention of the American Railway Engineering and Maintenance of Way Association formally adjourned.

KANSAS CITY UNION PASSENGER STATION.

The accompanying plans show the proposed union passenger station at Kansas City, to be built by the Kansas City Terminal Railway Company. This station is a part of the scheme of terminal improvements approved by the city council and ratified by referendum vote last September (see Railroad Age Gazette, November 19, 1909, page 963). The plans shown herewith have been approved by the board of directors of the terminal railway. Certain minor modifications are now being worked out by Jarvis Hunt, Chicago, the architect who designed the station.

The present union station at Ninth street serves the ten roads, who own the stock of the Terminal Company, as follows: The Chicago, Rock Island & Pacific, the Atchison, Topeka & Santa Fe, the Wabash, the Missouri Pacific, the Union Pacific, the Chicago, Milwaukee & St. Paul, the St. Louis & San Francisco, the Chicago, Burlington & Quincy, the Chicago & Alton and the Missouri, Kansas & Texas. The new union station will be at Twenty-second street, between Main street and Broadway. It will take care of the above roads and four more which now use the Grand Central depot, namely, the Kansas City Southern and its three tenants, the Chicago Great Western, the St. Joseph & Grand Island and the Quincy, Omaha & Kansas City.

As shown on the small scale plan, the new station is a through station. Most of the roads in it run trains through Kansas City, but for several it will be a terminal, either eastern or western, and on the others there will be many local trains originating or terminating here. It was first designed for 12 station tracks and two running tracks, based on the service required in the present union depot. A study of the present traffic of the additional four roads, however, together with an estimate of the increased traffic which must be taken care of by the time the station is completed, made it evident that 16 station tracks would be required, and these, with the two running tracks, are to be



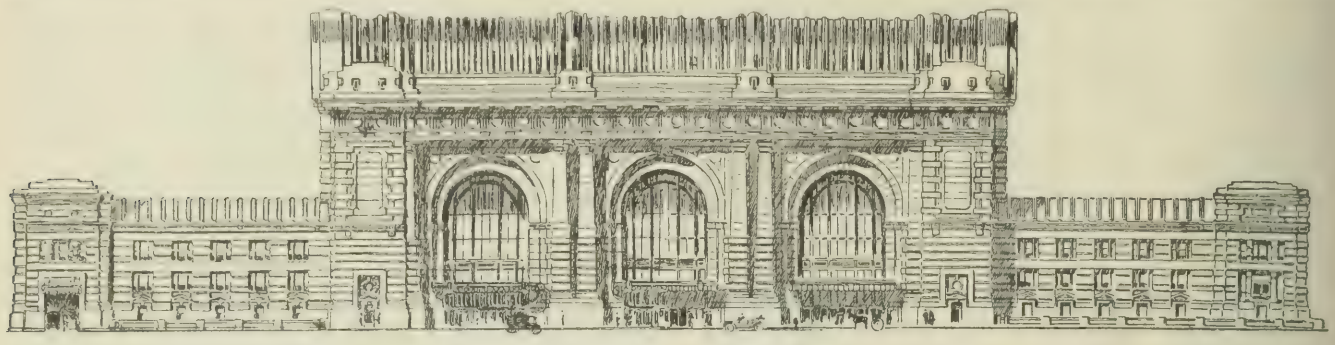
Plan of Kansas City Station.

built now. The company owns enough land to add six more tracks when they are needed.

The present union station handles, per day, 212 trains, made up of 1,100 cars, making a daily average of 20,000 passengers using the station. The present Grand Central station, serving the Kansas City Southern and its tenants, handles 22 trains per day. It is estimated that in 1915 the new station will take care of 317 trains and 48,000 passengers daily. It is on this estimate that the present lay-out of tracks is based.

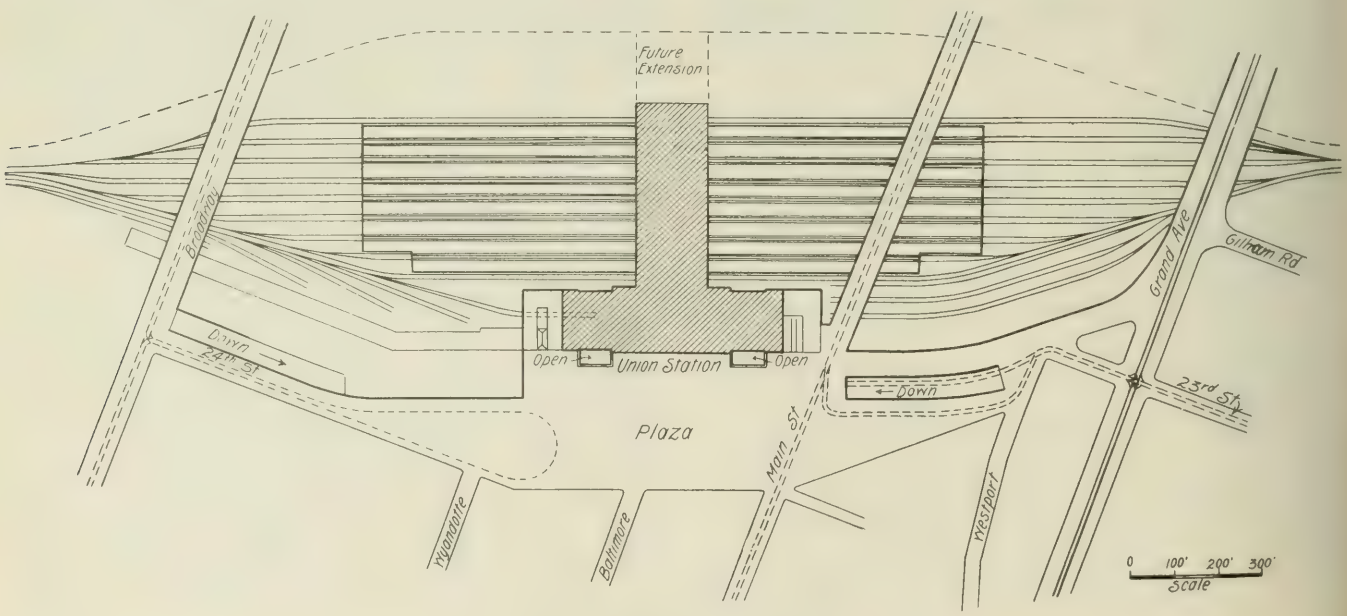
The provisions of the city ordinance required the company to buy land and make a plaza in front of the station. As shown, the station fronts to the south, facing toward the residential portion of the city, the business district being to the north of the tracks. This frontage is desirable as making a better appearance when the property around the plaza is developed. The land to the north of the tracks would have been much more expensive and the outlook would have been on the unattractive wholesale district. The plans show proposed street car lines coming across on the Main street and the Broadway viaducts, and also a loop from Broadway down to the plaza. No such lines have been built nor has anything definite been decided on regarding them. The new viaduct carrying Main street across the tracks is nearly completed, and street cars are now in operation on the Grand avenue viaduct. The plaza is on the same level as the Main street viaduct and the proposed Broadway viaduct and about 10 ft. below the level of Grand avenue. The present yards are already depressed, but considerable excavation will be necessary for the station building. As indicated on the plan, inclines will lead down from Broadway and Grand avenue to the lower or track level of the station, so that teams can go direct to the baggage, express and mail rooms without getting on the plaza.

The purpose of the plaza is not only to make the station approach more dignified and attractive, but also to facilitate the handling of passengers. In mild weather the plaza area supplements the waiting room area, thus increasing the capacity of the station at a cost much lower than the cost of a roofed over structure. Also it will reduce the congestion at the entrance of the station. Where the station fronts on a street, passengers leaving the station have to turn directly to the right or to the left and interfere with incoming passengers restricted to the same lines of movement. When the entrance is on a broad plaza, passengers diverge in all directions as they leave the entrance and, similarly, the entrances are approached from all directions, and the movement is more free.



Kansas City Union Passenger Station.

The large scale plan of the concourse level shows the lay-out of facilities. These, as indicated above, will be modified to some extent. The general waiting room is directly over the tracks. Each pair of tracks is served by ramps and an elevator, and perhaps escalators will also be used. The plan herewith shows stairways, but these plans, as indicated, will be modified when it is decided exactly what connections there will be between the waiting room and the track levels. Incoming and outgoing passengers are kept entirely separate; passengers leaving the trains will use the side galleries or midways, and travelers bound to trains will



Location of Kansas City Station.

use only the central waiting room. Tickets will be examined at the entrances to elevators, ramps, etc., so that the passenger cannot help but go direct to the proper platform.

The platform sheds will be of steel, concrete and glass construction, but the exact design has not yet been decided. On the track level floor of the station building are the mail, express and baggage rooms, commission and Pullman service and the despatcher's office. From this floor there are elevators and a baggage chute to the sub-basement from which baggage, etc., is delivered to the station platforms through subways. Electric baggage trucks will be used throughout. They are similar to those in service at certain points on the Pennsylvania Railroad, but an improvement has been made on this design, namely, the floor of the truck can be tilted so that baggage slides off into the baggage chute, thus doing away with a certain amount of handling.

The upper stories of the wings of the building will be used for offices. The station will be built of steel, stone and concrete, and the interior finishing will be marble. Over the lobby, as indicated in the front elevation, is an arch roof, with axis parallel to the tracks.

Under the original ordinance, the company proposed to spend $3,000,000 for the passenger station, but the present plans require an expenditure of $5,750,000, exclusive of real estate. The company asked for vacations of streets on February 4. Under the city ordinances the City Council will be able to act March 30 and, judging from the sentiment of the council and the attitude of the citizens, as indicated by the overwhelming vote in favor of the terminal ordinance last fall, there is little doubt but that the street vacations will be granted at that time. The Terminal Company has bought all the property required and is ready to let contracts as soon as the council acts. It is expected to have the station open in 1913.

We are indebted to H. L. Harmon, president of the Kansas City Terminal Railway, for material for the above description.

The railway branching off the Peking-Hankow line at the small station of Chentow, several miles to the south of Chentingfu, traverses the hilly country to the west, and terminates at Taiyuanfu, the provincial capital of Shansi. Its official Chinese name is the Chen-Tai Railway, but it is also as well known by the name of the Shansi Railway or by its French translation "Ligne du Chanse." This line of 150 miles in length was probably the most difficult to construct of any of the roads in the Chinese Empire. Traversing a very mountainous country, the line has steep gradients, many curves and long tunnels. The highest point reached in the line is 3,500 feet above sea level, and at its western terminus at Taivuanfu the elevation is 2,600 feet. The air line distance between Chentow and Taiyuanfu is 120 miles; by the railway it is 150. There are 25 stations on the line, a somewhat larger average than found on the main Peking-Hankow road.

A CORRECTION.

By courtesy of Henry M. Sperry we are enabled to straighten out herewith a portion of Monday's discussion that got a little tangled (Railway Age Gazette, March 15, page 575):

W. K. Howe (General Railway Signal Company): I am in harmony with a great deal that Mr. Rae has said. There are, however, some things in his paper to which I must take exception. On page 49 of the proceedings he makes the following statement: "As seen above the current required to operate single-phase motors is excessive," etc. As a matter of fact, motors are now available which will operate on single phase in which both the starting current and torque are no greater than when running. They take even less current to start then do three-phase motors. I therefore take it that Mr. Rae's remarks apply to single-phase induction motors.

The single-phase motors I refer to as taking so little current are very high in efficiency and have no teaser windings, centrifugal starting contacts, etc. With this motor the entire system can be started without as much current as would be required with three-phase motors.

Mr. Rae states that single-phase generators require more material, etc., for the same output. This is true, but is an insignificant point, because the added expense required for a single-phase generator which will start the entire system without excessive drop is so small that it is hardly worth considering.

Regarding the matter of sectionalization, I believe it to be good practice to sectionalize at substations where the cost would not be prohibitive. That is, one substation would feed all the way to the adjacent substation normally, so that if a break should occur the adjacent station could take over the portion of the line thus isolated.

Conventionalities

W. H. Taft, president of the United States, was in town yesterday.

The committeemen who were provided with yellow badges felt that the world was all against them on Thursday—St. Patrick's day.

Good as the attendance at the convention has been all along, it was remarkable to notice the interest that was shown at the closing session when attendance is apt to be a little slack. Mr. Taft—he was to speak.

It is an interesting fact that the word gazette, used so much to-day as the name of publications, is the result of an act of a public-spirited citizen in Venice in the fourteenth century. In booths on the street, this gentleman posted news bulletins, and admission to the booth was gotten upon the payment of one gazette, a small coin used at that time.

As an indication of the value of exhibits at a convention of the character of the present, it may be worth while to note that twelve inspectors employed by R. W. Hunt & Co. were assembled in a body on Thursday afternoon, under the leadership of C. W. Gennet, Jr., from the local office, for the purpose of inspecting the track and maintenance of way appliances at the Coliseum.

Merely to help out the professional talent and to assist in making a record for an association in which he has only an altruistic and educational interest, Dr. W. F. M. Goss spent one day with the convention. It is unfortunate for this association that it does not deal to any great extent in the subjects with which Dr. Goss is directly concerned in his educational work, of which the railway mechanical associations are so largely the beneficiaries in June of each year. As colleagues at Purdue Professors Goss and Pence worked side by side with no perceptible interference, and with the innate modesty so characteristic of the man, Dr. Goss is quite content to assume an inconspicuous part in an association upon whose published literature Pro. Pence's work makes so deep an impression.

Inadvertently, Frank R. Coates was mentioned as the president of the Interocean Steel Company. Of course, the curse of our error was removed by the fact that we gave him a higher office than he actually holds. He is vice-president. The baneful effects of the error were possibly thrown further into perspective by our very complimentary and courteous reference to the fountain of perpetual youth from which Frank absorbs. It is only fair to extend all the courtesies there are to him and the rest of the committee on arrangements—W. A. Wallace, chairman, J. B. Cox, who, if memory serves, has done the

same stunt at every meeting of the association, L. C. Fritch, who had time because the nominating committee had treated him right, and John C. Lesser and O. J. West. It is not known exactly what each individual of the committee did, but their team work resulted admirably. There has not been a flaw of any kind in the work of the committee of arrangements.

Since there were several more or less painful accidents in the handling and demonstration of the many appliances on exhibition at the Coliseum, the Railway Appliances Association arranged with the local Illinois American Red Cross for the services of six of its members. Several cases have so far been given the first aid to the injured treatment. Space has been reserved at the right of the main entrance, where the Red Cross members are equipped to answer any and all calls.

THURSDAY'S NIGHT THOUGHTS.

Same old subjects—
Speakers, too;
Same conclusions,
Nothing new.
Heaps of papers—
Dry as dust—
By committees
'Cause they must.

Same exhibits
Here once more;
Windy salesmen—
Talk galore;
Bragging speeches—
Stories, too—
Same old stories,
Nothing new.

Tired of list'ning,
Going to go;
Leave the smoky
Chicago.
Hope they'll like it—
Wouldn't be 'em—
Clearing out the
Coliseum.

MR. HOOLEY ON SIGNALING.

"The' was a convintion av th' signal min at th' Congriss Hot'l doorin' th' week, 's I rade in the pa-apers," remarked Mr. Hooley, casually, the other morning, to his friend, Mr. Dennissey. "T' me mind, Dinnissey, th' signal man's th' 'riginal saf'ty 'pliance av American relrods. Iv ye have wan man to luk out f'r saf'ty arl 'long th' line, ye'er road's safe. But ye say, Dinnissey, f'r th' signal man to be av anny good, he's got to have th' apparratus t' extind his influoence 's far's th' road goes, 'nd 'tis not within th' powers av wan man, 'nless he's a gayraff, Dinnissey, that he c'n ixtind 'imsilf over siv'ral t'ousand miles av rails 'nd ties—slapers, they call thim in Ingland, 'nd 'tis a good rayson f'r carlin' thim something else in this land av th' free discindant av Brine Boroo—ties. I says—iv he can't ixtind himsilf over th' whole line, 't is fate that th' accident occurs just 't th' pla-ace where th' signal man is not at that p'ticular time. 'For thim r'asons,' says me friend Bayylet, 'r wuds t' that iffect—Ballyet 's th' prisidint' av th' Signal 'Sociation—'f'r thim r'asons,' says Ballyet, 'ye can't run a safe road wit'out plinty av signals. Iv ye have to putt signals t' ivery switch,' says Ballyet, says he 'tis bether to do so, 'nd to give th' ingineman warnin' av how much comp'ny he's goin' t' have whin he runs by 'nd th' thrain goes in th' ditch wit' th' poshibility th't th' ingin' goes wit' 'em 'nd gives an exybition av high degrays av timp'rachoor before 'tis due be th' schedule that's detarmined be their past lives. D'ye know th' diffrens bechune a simmyfor 'nd a gin'ral maniger, Dinnessey?" inquired Mr. Hooley, interrupting himself.

"I don't know gin'ral manigers, Misther Hooley, 'nd what is a simmyfor?" said Mr. Dennissey.

"I t'ought ye didn't know th' diffrens, Dinnissey. I know a relrod newspa-aper man who sid, when he started his pa-aper, he was in th' same c'ndition av knowin'ness. He learned something fr'm expayrience. Dinnissey, 'nd that's more'n ye'll do av ye don't begin soon. He hilped out his so'rces av inf'mation be publishin' a daily noospaper wanst or twicet a year, whin the' was a relrod convintion like th' wan that serves as me tixt, only th' wasn't anny convintion av that kind in thim days. But t' t'row th' simmyfor in th' upper quadrant, so't avin ye c'n say ut, Dinnissey. D'y knaw, me frind, that whin ut foorst became nicissary f'r relrod trains to be signaled, 'twas th' habit t' do ut wit' th' arrums—wit' a flag 'n th' daytime 'nd a rid lantern be night? Sometimes 't was done wit'out ayther 'nd thin 't was saf'ty f'r th' thrain, but not much f'r th' man that did th' wavin', for by th' goil wit' a rid pittycoat who always escaped 'nd saved th' thrain besides. Whin, wit' th' 'dvancemint av human knowledge 'nd th' increase 'n mechanical skill, 's me frinds Ellyot 'r Rood 'r A-ames might 'av sid, but didn't, 's far's I know, doorin' th' convintion—whin, I say, 't was nicissary f'r somet'ing to be wurruked in a mechanical way to take the pla-ace av th' human arms which cudn't be waved over siv'ral miles av thrack 'nless th' signalman 'd arrums like th' nick av th' gayraff—whin, I say ut agin, they had t' make signals that'd shtay putt avin iv th' wind was a-blowin' 'nd th' shnow a-shnowin', they made th' signal like ye'er arrum, Dinnissey, 'nd putt a wire to ut, be th' same token, so 't wud wiggle th' way 't they wanted ut to wiggle. Th' thing they putt up there f'r a signal, Dinnissey, was a simmyfor."

"What's th' simmy for?" asked Mr. Dennissey, who had nodded once or twice before Mr. Hooley finished speaking.

"O, Dinnissey, Dinnissey, whin will ye iver learn t' pay attintion t' me illuminatin' remarks," moaned Mr. Hooley. "Th' simmyfor 's th' wooden arrum that's putt up on a post 'nd wit' a wire connected to ut, so 't whin ye pull th' wire th' arrum goes up or down. 'Nd it manes something iv'ry time ut goes up or down. Th' wurrukin' av th' simmyfor, Dinnissey, 's like th' movemint av ye'er arrum whin I say, Wud ye have th' same? They's t'ree p'sitions, Dinnissey. Whin ye reach f'r th' bottle, ye'er arrum's out sthraight. That's danger, Dinnissey. Whin ye raise ye'er arrum half way up, Dinnissey, that manes caution, because ye've prob'ly filled th' glass so full ye may shpill ut. Iv ye was runnin' a thrain ye might mate with an accident av ye didn't pay attintion t' th' indications av th' simmyfor, as ye wud wit' me av ye didn't look at me. Iv th' thrack's clear th' simmyfor 'll go t' th' lasht position, 's ye'er arrum 'll be in whin I give ye th' wink that means 'Prosade.' Th' Dootchmin call ut 'Prosit,' but ye needn't mind that. Whin ye'er arrum's in the 'Prosade' p'sition, ye know what ye c'n can do, Dinnissey."

"D'ye iver give objic lissons, Misther Hooley, t' illusthrate ye'er manin' more complately?" inquired Mr. Dennissey, with some display of interest.

"Me signal app'ratus 's av th' old-fashioned kind, 'nd 'tis not fitted f'r illusthrations av wurruk 'n th' upper quadrant," replied Mr. Hooley, as he doused and wiped the empty glasses.

At the Coliseum

The Vanadium Sales Company of America, Pittsburgh, Pa., has just issued two new publications treating of vanadium steels, their classification, heat treatment and also instructions for application. These booklets are printed, one in German and the other in French, to meet the demand for this information published in foreign languages. Copies of these booklets will gladly be sent to interested parties.

A combination tie plate and guard rail clamp is shown in space 137 by the W. F. Bossert Manufacturing Company, Utica, N. Y., that overcomes the objections heretofore made with regard to a device of this kind. There are no screws to jar loose. It is adjustable to wear. The tie plate and guard rail clamp bind the rails into a firm and solid structure. The semaphore blade clasps, shown by this company, simplify the work of installation and insure a large saving in the cost of maintenance. One, and never more than two bolts are required, instead of six, as at present used.

LITH BOARD.

The cut run with the Union Fibre announcement March 15, should have had the caption "Pacific Fruit Express Ice House, Grand Island, Neb." We located it, erroneously, at Las Vegas, Nev.

UNITY SWITCH STAND.

Among the devices on exhibition by the Morden Frog & Crossing Works, Chicago, in booth 86 at the Coliseum, is the Unity switch stand. This stand operates and interlocks a split switch and distant signal. It is a parallel ground throw stand with a single lever moving through 180 deg., and is provided with an independent facing point lock rod to the switch point. With the switch set and point locked for main line and the distant signal indicating "safety," the first 90 deg. throw of the lever sets the distant signal to "danger" and then releases the point lock, the final 90 deg. of the lever movement throwing the switch. Switch may be thrown back and forth for drilling or switching without disturbing the distant signal, which remains at danger, protecting train movements, but the stand can only be padlocked when switch is in final main line position and distant signals are cleared. The Unity stand is simple in construction and is designed to operate either a wire-connected or electrically controlled distant signal. The facing point becomes operative with point ⅛ in. open, as shown by many tests, and in this position distant signal cannot be cleared.

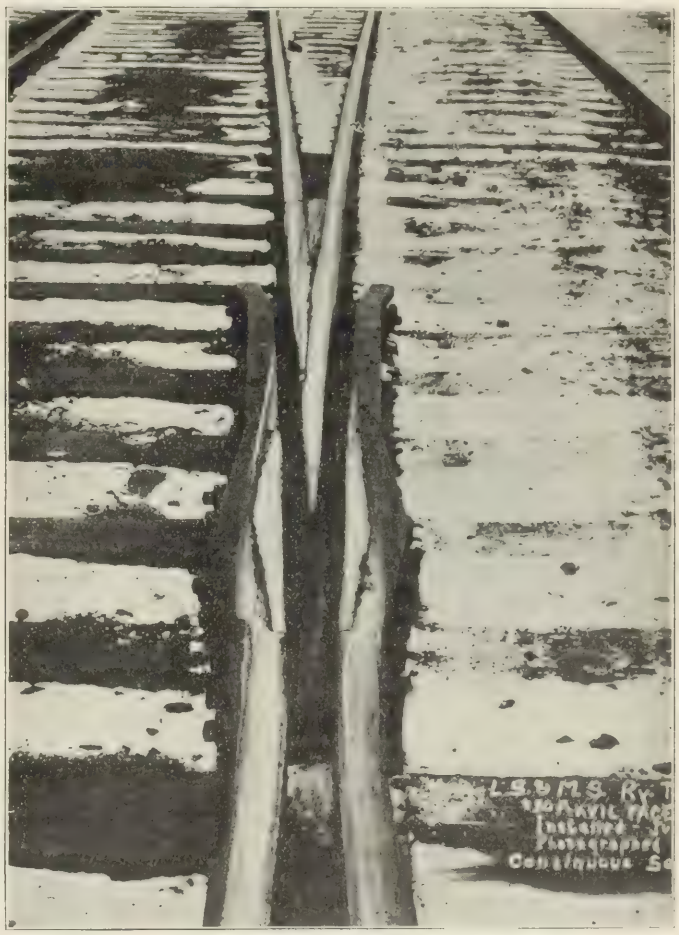
The following tests made by the Morden company with railway officers indicate the necessity for some form of facing point lock and further protection at facing point switches, than is given by ordinary switch stands.

Twelve switches were selected, all on main line, on well ballasted track, with heavy rail. Switch stands were of various makes; most of them the common form of high open main line stand, three being stands made by the Morden company. Small cut pieces of steel varying in width by eighths of an inch were used. These were inserted between the switch point and head of the stock rail over the lead rod. A small man, weighing not more than 125 lbs., handled the switch stands and threw the switch. In ten of the switches ½-in. pieces of steel were inserted; in one ¾-in. piece, and in one a 1-in. piece, and in all cases the switch stand was thrown with ease and padlocked, with target indicating "clear" with the obstruction as noted, and switch point dangerously foul, the actual point being open a slightly greater distance than the width of the test pieces of steel, as these were placed about 12 in. back of the point.

From watching and measuring the actual movement of stock rail and switch point, it was decided that the lost motion was about equally divided, the stock rail crowding over just about as much as the switch point bent back, and the full movement being evidently easily distributed through the various connections to the stand and in the stand itself.

NO. 20 ANVIL FACE FROG.

The frog shown in the accompanying illustration is a No. 20 anvil face frog, made by the Pennsylvania Steel Co., Steelton, Pa. It has been in service for 10 years and six months, having been placed in track on the Lake Shore & Michigan Southern at Air Line Junction, Toledo, Ohio, in July, 1899. It is estimated that this frog has outworn about seven ordinary ones. The one shown is of



the earlier design hard center frog, which has, of recent years, been improved by making the point, as well as the side blocks, of Manard, improved manganese steel. This improved type of frog has now come into universal use on most main lines and yards at points of heavy traffic.

HAVEMEYER BAR FOR REINFORCING CONCRETE.

The Havemeyer bar for reinforcing concrete is one which should appeal to all railway engineers and contractors who are desirous of securing high efficiency. The bar has a uniform cross section, the four projections and the lugs on the sides of the bar offsetting the amount of metal taken from the two corners of the bar. It is rolled to the same weight as a plain square bar, and can be readily substituted therefor, as the bar is a square bar

deformed, the full square section being shown between the projections.

The change of section from the plain square to the deformed section is gradual, and by this means the bar is not weakened at any point, and the full strength of the metal is developed. The section of the bar can be readily gauged or measured in actual practice by simply measuring the square section between the projections. This is a very important point, as it avoids confusion and possible error, which might be disastrous.

Laboratory tests have shown that this bar has the strongest possible grip when imbedded in concrete. Five samples were tested at the Stevens Institute, using a ¾-in. bar imbedded in a block of concrete 10 x 10 x 20 in. In each case the bar broke outside of the block of concrete and showed no slip, the average ultimate strength of the steel being 88,460 lbs. per square inch. Similar tests made with other types of deformed bars showed that the bars pulled through the concrete at considerable lower stresses. Five samples of ¾-in. twisted bars subjected to the same test pulled through the blocks of concrete on an average of 71,730 lbs. per square inch.

These bars are very easy for the contractor to fabricate or wire together, the square section forming a seat for the attachment of members, such as stirrups, etc., and the lugs prevent slipping in either direction. They can be readily bent cold in any desired angle, and tests have shown that they bend true and accurate, a quality not possessed by others, particularly with the twisted bar. Tests made with high carbon steel have shown that these bars will bend 180 deg. around their own diameter, which is more than a bar is ordinarily called upon to do in actual practice.

All Havemeyer bars are rolled from new billet steel, either open hearth or Bessemer, as may be desired. No re-rolled rails are used. A stock of all sizes of Havemeyer bars is carried in New York City and in Pittsburgh, Pa., for immediate shipment, mill shipments coming from the mills in Pittsburgh. These bars are rolled in sizes from ¼ in. to 1¼ in.

In addition to selling Havemeyer bars, the Concrete-Steel Co. maintains an experienced engineering department, and is glad to take up any difficult problems called for in concrete engineering.

A catalogue and full information can be obtained by addressing The Concrete-Steel Co., 29 Broadway, New York.

RAMAPO ROLLED MANGANESE STEEL SWITCH POINTS.

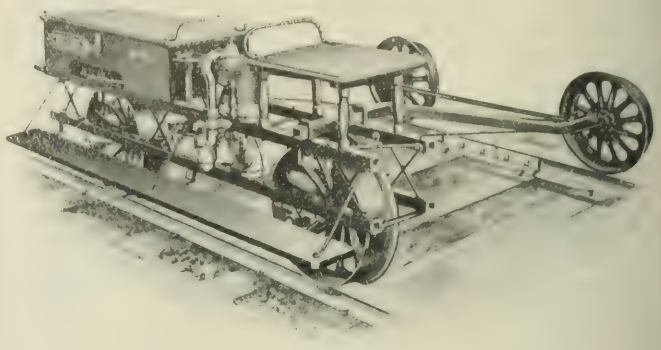
The Ramapo Iron Works, Hillburn, N. Y., is now offering switch points made of rolled manganese steel rail. These are of especial advantage for short radius turnouts, where curved switch points are used, particularly where the stock rail can be given a slight offset to allow a substantial point on the switch rail.

For straight featheredge switch points, where the point end is subjected to the severe wear, the Ramapo people advocate their style No. 12, where the switch rail, although continuous throughout its entire length, is equipped with a manganese point securely held in position. The manganese points of either construction, however, are said to be showing very remarkable service as compared with that of other steels. There are many busy railway yards now equipped with manganese points, especially on the high or turnout side of switches. For sharp radius turnouts, the switch points are frequently made double, providing a manganese guard which may be extended continuously from the switch point for the inside curved rail. The latter construction, however, is more applicable to city subways or elevated lines having a great many sharp curves.

Manganese pointed switches, or switches made entirely of manganese, from the present outlook will soon be in use at all busy points, not only due to their economy resulting from their long life, but also on account of the increased safety afforded.

BUDA NO. 12A MOTOR CAR.

One of the new motor cars being shown by the Buda Co. is its No. 12A. It is a four-wheel car accommodating three passengers. It has a 4 h.-p. air cooled engine of the four-cycle type driving through a compensating sprocket to the front wheel. The sills and guide arms of the car are of square steel tubing and the wheels are pressed steel.



Motor Velocipede.

This car is intended for heavy service on construction and repair work. It is capable of a speed of thirty miles an hour under full load and will negotiate any grade.

The tool box forms the back seat and contains the spark-coil, duplicate batteries, and a compartment for tools. The operator sits in the center of the car and both rear and operator's seats are well forward of the rear axle.

McDONALD REINFORCED CONCRETE CROSS TIE.

In June, 1907, the Atchison, Topeka & Santa Fe placed twenty McDonald reinforced concrete ties in the main track between Los Angeles, Cal., and Redonda Junction. In March, 1908, the inspector of track and roadway reported that the ties showed "no indication of deterioration or failure in any way," and in January, 1910, they were reported to be "in first-class condition in every respect." The track on this line is ballasted with gravel and the traffic is heavy.

The McDonald tie is reinforced with horizontal steel rods bent up under the rail seats and tied together at intervals with vertical rods, which serve also as web reinforcement. The rail is secured to the tie by spiking into sections of wrought iron pipe set in the concrete. The inside diameter of the pipe used for this purpose is a little less than the greatest dimension of the spike, in order that the spike may cut the metal enough to insure a firm connection. The length of the section of pipe is made the same as the depth of the tie, and both ends are passed through tie plates and expanded, so as to hold the plates solidly in the surface of the concrete. This construction allows the tie to be used with either face up. It is necessary to use a spike with a head so formed that its under face will conform to the top of the rail base when the spike is partially rotated, for at each re-driving the spike should be turned so that its edges will cut an unused portion of the pipe and furnish a new bond. When the surface of the concrete crumbles under the tie plate or the end of the tube becomes too badly worn to hold the spike, the tie may be turned over in the

track, thus providing a new surface and an unused portion of pipe to spike into.

The cost of the tie when made in small numbers is given by the inventor as about $1.30, and it is stated on the same authority that a railway by using company forces in the making of the ties could reduce this price by at least 25 cents.

In addition to the installation on the Santa Fe, a slightly modified form of this tie has been installed on all the lines of the Los Angeles Railway company, but no reports of its performance in this service are as yet available.

The McDonald reinforced concrete tie is placed on the market by the McDonald Company, 617 Lissner building, Los Angeles, Cal.

INGOT IRON.

There are two items in the exhibit of the American Rolling Mill Company that show very markedly the differences between the ordinary steel product and the ingot iron, for which such decided non-corrosive qualities are claimed. The first does not particularly demonstrate this quality, but is intended to show the difference in the appearance of a section of ingot iron of steel and one of ingot iron. In the case of the iron the surface is smooth, homogeneous and free from blowholes, while that of the steel and from



Section from an Ingot of "Ingot Iron."



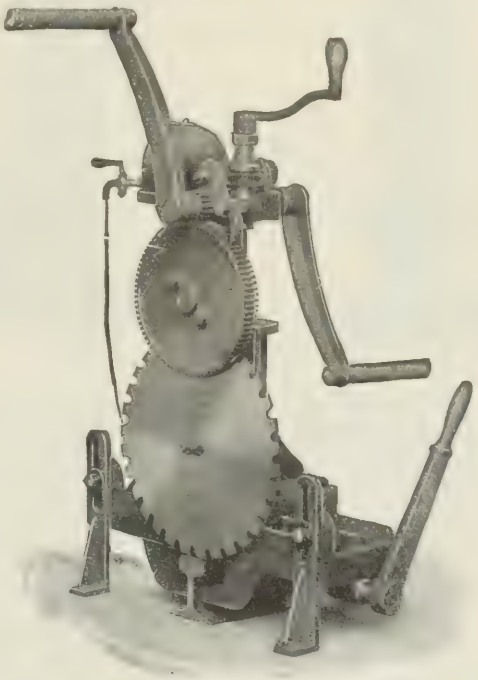
Section from an Ingot of Steel.

the same location in the ingot, is mostly holes and is far from being all that could be desired.

The other exhibit is certainly a most remarkable demonstration of the soundness of the electrolytic theory of corrosion. It consists of a series of articles, shown in pairs, that were originally identical in shape and size. One of each pair is of steel and the other of ingot iron, and each was subjected to the same corrosive action of an acid. The difference in the appearance of the two pieces is very marked, and that the steel was of a very uniform grade is shown by the maintainance of the shape in a reduced form. Take, for example, the spike. That made of ingot iron is up to nearly its original size, while that made of steel is reduced to lilliputian dimensions, and yet the head and shank remain clearly and unmistakably defined. The same holds, though perhaps not so strikingly, in each of the other pairs. It certainly does look from this as though a pure iron possessed the qualities of resistance to a corrosion to a high degree.

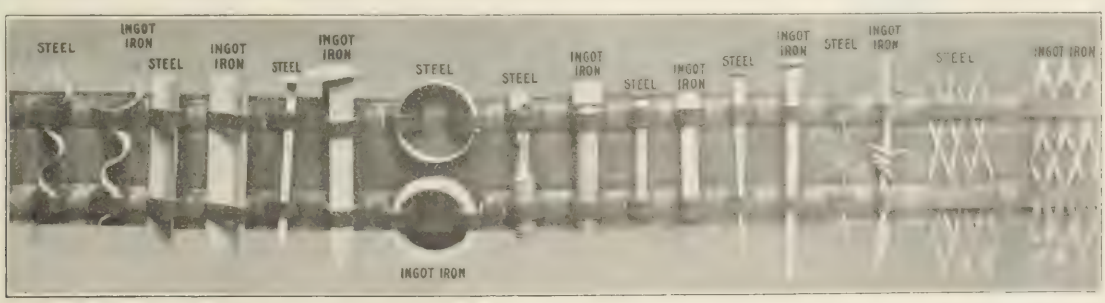
Q. & C. PORTABLE RAIL SAW.

A very effective track tool is found in the Q. & C. portable rail saw, shown in the accompanying illustration. The saw is made in two designs of two sizes each. One is designed for making right angle cuts, while the other is for cutting at an angle, in multiples of 5 degrees each, up to 45 degrees. The small size will cut all T-rails up to and including 100-pound sections, while the larger will cut a 9-in. girder rail of any regular section. The saw is anchored to the rail by an adjustable clamp jaw at the base, which is tightened by a screw and lever.



Q. & C. Portable Rail Saw.

The reducing gear is arranged on the side which supports the saw blade, and a simple form of automatic feed lowers the saw at proper speed for cutting the head or base of the rail. The feed screw is driven by a friction nut, which can quickly be released to feed the saw by hand through the web of the rail or return the slide. These saws make clean, perfect cuts, beginning in the center of the head and making a true vertical cut, leaving the ends of the rail smooth and straight. This portable saw, made by the Q. & C. Co., New York, is on exhibition in spaces 119-120 at the Coliseum.



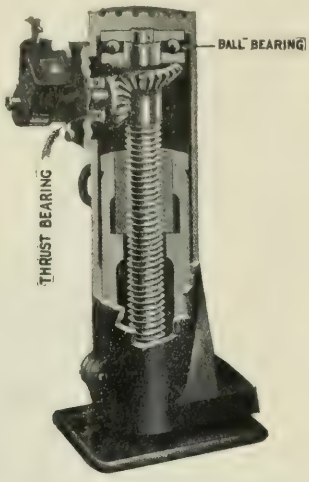
Example of the Difference in the Resistance to Corrosion of Ingot Iron and Steel.

JACKS.

The Duff-Bethlehem hydraulic jack, recently placed on the market by Fairbanks, Morse & Co., Chicago, is said to be so made that the objectionable features of the standard type of hydraulic jack are eliminated. One of the most frequent causes of trouble in the old type was leakage, which generally occurred at the joint between the base and outer cylinder. In the Duff-Bethlehem jacks the base



Ball Bearing Geared Screw Jack.



Section of Ball Bearing Geared Screw Jacks.

and cylinder are a one-piece steel forging, which not only prevents leakage, but also eliminates the leather packing necessary in the old jacks. The ram is also a one-piece steel forging. The use of steel forgings makes a material reduction in weight of a jack of given capacity. For instance, a 40-ton Duff-Bethlehem broad base jack with a



Duff-Bethlehem Hydraulic Jack.

12-in. raise weighs 141 lbs., while the same size in other makes weighs from 245 lbs. to 320 lbs.

The same company also makes a ball-bearing jack in capacities up to 70 tons. The principal feature of advantage in the ball-bearing jack is that the bearing plates carrying the load are grooved so that the load instead of being carried at only two points on the balls' surface is distributed over a larger surface, reducing the liability of the balls breaking. Ball-thrust bearings are also provided for the operating lever.

The company still makes all types of the Barrett jacks for track and bridge work, car departments, etc. A new catalogue showing a large and complete line of jacks has just been issued by Fairbanks, Morse & Co., and they will send it on request.

SIGNAL LAMPS.

Perfect ventilation is claimed for the signal lamps which are exhibited by the Adams & Westlake Co., Chicago, in booths 83 and 84. The baffle-plates in the top of the lanterns are arranged to deflect the currents of air so as to produce the best possible results. The lamps have non-sweating top ventilation—which means no fogging of lenses, consequently the maximum of signaling efficiency. There is no flickering of flame, no overheating of lamp. Non-sweating insures long life of the body of the lamp, on account of the absence of corrosion from moisture. The lamps, which are made entirely of riveted Bessemer sheet steel, are of high quality, both in construction and finish.

ROCKFORD TRACK WEEDER.

The Rockford track weeder, which is on exhibition at the Coliseum in spaces No. 99 and 100, has attracted considerable attention from the visitors. This is the invention of "Jack" Duntley, as he is known to all railway men, who one year ago presented the Rockford gasoline motor car for section use. This weeder is on exhibition for the first time, although service tests were made last summer.

In order to arrive at the average cost of weeding track from the end of ties to grass line, reports were obtained by the Duntley Manufacturing Co., from 10 road masters. These reports show that it requires 6 6/10 laborers to clean one mile of track in one day, and with wages at $1.50 per day this work would cost $9.90. When this work is performed by hand it is necessary to weed the track about three times per year, which would make the weeding process cost $29.70 per mile each year.

The Rockford track weeder, according to the makers, will clean 20 miles of track in one day, at a cost of 60 cts. per mile, as follows:

1 man at $3.00	$ 3.00
4 men at $1.50	6.00
Gasoline	2.50
Lubricating oil	.50
	$12.00

Or 60 cts. per mile.

The machine removes weeds by the roots, and only two cleanings per year are necessary, making the cost of cleaning each year $1.20 per mile, as opposed to $29.70 by the old method. This shows a saving of 95 per cent., on which basis the machine will pay for itself in one week.

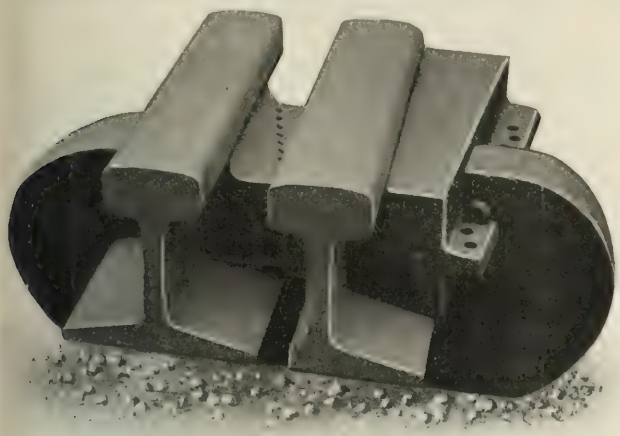
The machine is very similar to a harrow or cultivator, and is rigged to a Rockford gasoline locomotive No. 6. There are two upright posts with crank and chain attachment for lowering and raising arms to which are attached the teeth of the harrow, and at the outer end of these arms are idler wheels which ride the grass line and keep the harrows at the proper elevation to perform the most efficient service. It is simple and is well constructed, having practically no breaking parts. For railways which do not desire the weeder attached to a gasoline locomotive, it

can be furnished for use with a team of horses or a light steam locomotive.

The company advises that several orders for May and June delivery have already been received.

ADJUSTABLE GUARD RAIL CLAMPS.

Among the exhibits of the Morden Frog & Crossing Company, Chicago, in booth 86 at the Coliseum, are two styles of adjustable guard rail clamps. These clamps are forged



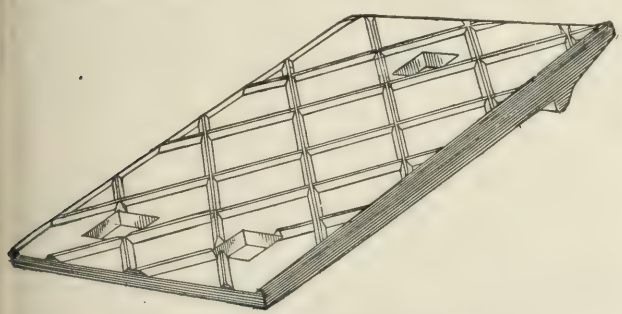
Adjustable Guard Rail Clamps.

from a single piece of heavy wrought iron, the central or saw-tooth block which gives the adjustment being of grey iron and the wedge of malleable iron. These clamps will permit a wear of ¾ in. on the guard rail and still maintain the normal throat of 1¾ in. by means of the adjustment.

SELLERS ANCHOR BOTTOM TIE PLATE.

The Sellers anchor bottom tie plate, made by the Sellers Manufacturing Company, Chicago, is designed to furnish perfect protection to the tie against cutting and consequent cutting; to provide the greatest resistance against track widening; to resist the effect of corrosion and brine drippings from refrigerator cars; to furnish protection to the spike and prevent spike necking, and to be easy of application or readjustment for track alinement on either hard or soft wood ties.

The corrugations on the bottom of the Sellers tie plate impress and engage the top fibers of the tie without cut-



Sellers Anchor Bottom Tie Plate.

ting. As these corrugations run across the fibers of the tie, they present as great as possible a surface to resist track spreading.

All of the Sellers plates are made with shoulders. Without shoulders, the provision against track spreading is only as great as the shearing strength of the outside spike.

These plates are rolled from wrought iron, it being claimed that an iron plate will wear better, under a steel rail, than will a steel plate.

BAUSCH & LOMB OPTICS.

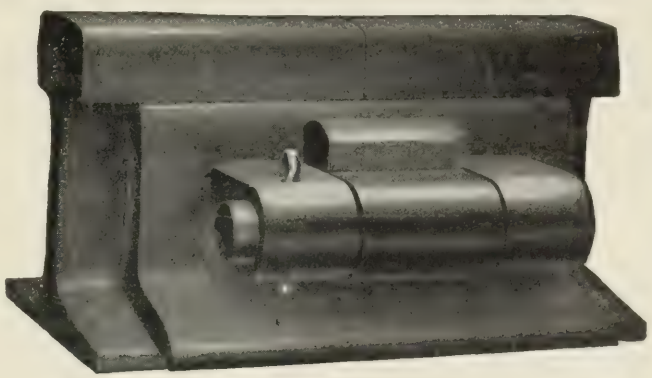
The Bausch & Lomb Optical Company, Rochester, N. Y., announces that during the present year it will present an entirely new system of optics, combined with an improved mechanical equipment.

There are three principal sources of error in using a precision instrument; natural, personal and instrumental. To be able to secure a transit, whose circles are divided upon automatic engines, and to know that such an instrument was equipped with lenses of the finest optical glass, ground to approved formulæ, is a consideration of prime importance. The engineer is fully aware of the fact that, while he may improve his methods of handling a precision instrument, a cheaply built one is always a defective piece of mechanism.

WOLFE AUTOMATIC LOCK.

The U. S. Metal & Manufacturing Co., New York, has on exhibition, in space 18, the Wolfe automatic rail joint lock, which has attracted wide attention within the past seven months, and is said to have been applied by the principal steam and electric railways in the country and adopted by many of them as the standard fitting for joints and crossings.

This lock is designed to keep angle bars at a joint or crossing absolutely tight and to insure a perfectly level rail. As previously described in the Railway Age Gazette,



Wolfe Automatic Lock.

the purpose of the Wolfe automatic joint lock is to take up the slack due to elongation of the track bolts and wear of angle bars at the joint.

So-called patented rail joints and nut locks have been used in an effort to overcome the difficulty of loose rail joints. The device here shown consists of an elongated nut screwed on the ordinary track bolt. A bolt passes through the holes in adjoining nuts and is held in place by a cotter pin. Between the nuts is a malleable cam-shaped piece, through which the bolt passes. This, when turned in a horizontal position, allows a small space between it and the fish plate, and into this an iron wedge is inserted. The cam-shaped piece turns on the bolt and cannot rise, but must fall, taking the wedge with it, thus taking up any slack.

The device is applied to the joint bolt in pairs. When applied to the center bolts, the nuts on the others are kept tight, so that it is not necessary, save under severe conditions, to apply it to more than one pair of bolts.

It is said that this lock will prevent loose bolts and joints, wearing of the angle bar and battering and corrosion of the threads and bolts. Also, that it will eliminate the work of the track walker in tightening nuts and materially help in keeping the track properly bonded.

SHEATHING LINOFELT.

The Mineral Range passenger station at Calumet, Mich., shown in the accompanying cut, is lined with sheathing linofelt, a product which, on account of its insulating qualities, is well adapted to buildings in a cold climate. The linofelt used in building construction differs from the refrigerating linofelt, being only ¼-in. thick and covered with a lighter grade of paper which is not waterproof, as it is in the heavier material. This makes the cost of the



Mineral Range Station at Calumet, Mich.

sheathing material less without reducing the effectiveness of the insulation. One or two thicknesses are applied, depending on local conditions.

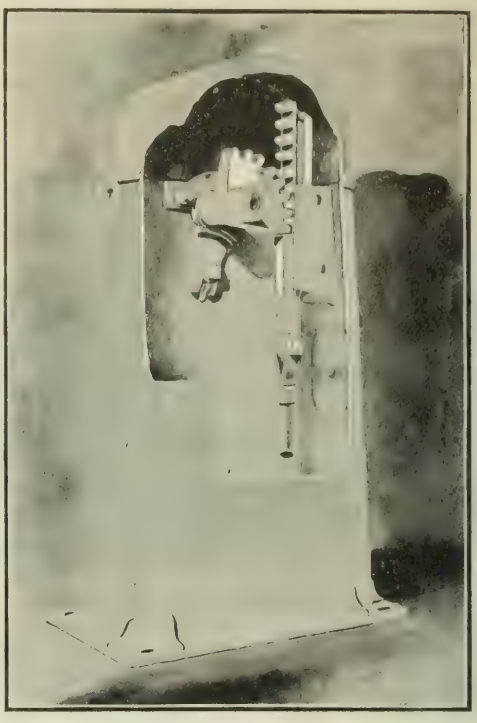
For shops or any buildings with a concrete roof, in which condensation of water is troublesome, the heavier grade of linofelt is used, and its waterproofing qualities eliminate the trouble.

This material is made by the Union Fibre Co., Winona, Minn., and can be seen in booth 171 at the Coliseum.

WILSON RAILWAY GATE.

The protection afforded by crossing gates should be well considered by maintenance of way officers. The flagman can protect but one side of the crossing at a time, while the gates protect both sides.

In a perfect working crossing gate, four main points are essential: strength, reliability, direct positive action and economy of maintenance. The Wilson gate is simple in design, there being no complicated mechanisms to get out of order, and to require frequent adjustment. All parts of the Wilson gate are designed to withstand a greater strain than any to which they will be subjected in service. No wood is used in the installation, excepting for the street arms, all material being iron, steel and cement. Provision is also made to prevent freezing. The post is made of

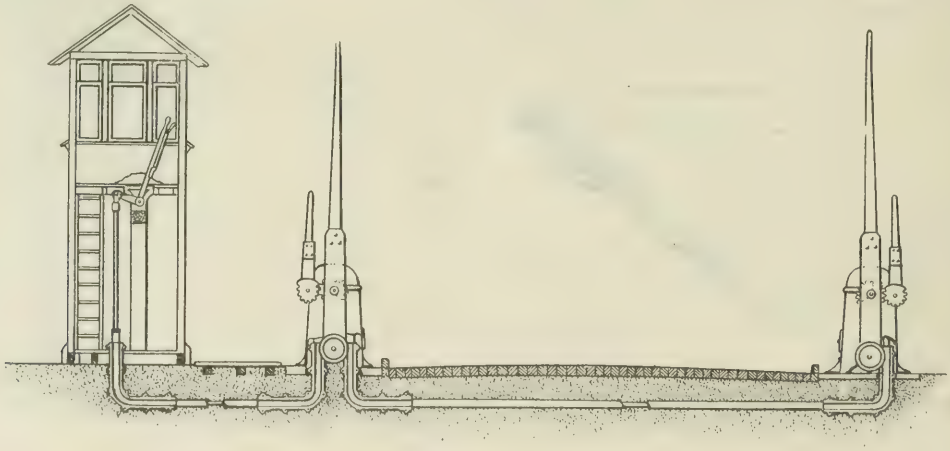


Cast Iron Post for Wilson Railway Gate.

cast iron and all working parts are protected from the elements.

The operating levers provide for locking the gates in either direction. It is frequently necessary to check the arms quickly after they have been put in motion, and the Wilson gate is under complete control of the operator at all times. The direct rigid connections provide for this absolute control.

All turns are made in watertight deflecting boxes, by the use of anti-friction rollers. These deflecting boxes are made in acute, obtuse or right angles. After the connections have been made, the two-inch pipe line from the lever stand to the gate post is filled with cold test oil.



Sectional View of Wilson Railway Gate Installation.

The Wilson railway crossing gate has been added to the specialties of the Kalamazoo Railway Supply Co., Kalamazoo, Mich., and is exhibited in space 25 at the Coliseum.

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Including the Railroad Gazette and The Railway Age

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At a general staff dinner of the *Railway Age Gazette* held at the Engineers' Club, New York, March 21, the members of the staff gave William H. Boardman, president and editor, a bronze lamp in recognition of his forty years of service on the paper.

On March 21, Ernest McCullough became a member of the staff of the *Railway Age Gazette*, with direct supervision over the civil engineering department. Mr. McCullough comes to us from the editorial staff of *Engineering-Contracting;* he has had wide experience in railway location and construction, especially in the West, and is the author of several works in civil engineering. He will make his headquarters at our Chicago office.

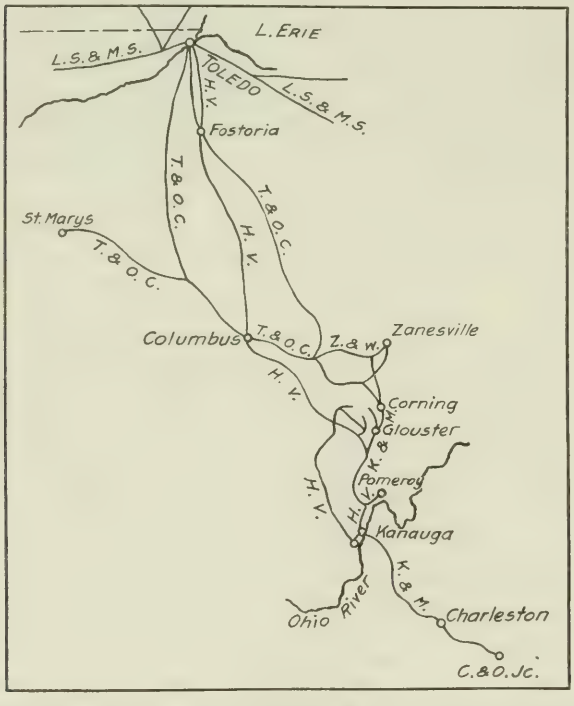
Congress is talking about President Taft's railway bills every day; but the talk produces nothing but confusion. Those members who speak on the subject either on the floor of the Senate or in the Senate or House committees, seem to be actuated by considerations of party expediency almost entirely. These bills proposing amendments to the Interstate Commerce law have now been before Congress over a month in their latest form—not to mention the two months' consideration that was given to them in committee and through the newspapers before they were rewritten—and they have made no progress at all unless it be backward. Senator Cummins prolonged his speech last week so that it occupied four days; but apparently his only purpose was to show that he was a true insurgent. His criticisms were perfunctory and so evidently designed merely to sand the track that no one weighed them with care. On Monday of this week Senator Elkins made a "set speech" in defense of the bills, but his reply was as dull as Senator Cummins' "attack." On Tuesday Senator Clapp, the second chief insurgent, spoke. Mr. Cummins exhausted the senators' patience, Mr. Elkins made them laugh and under Mr. Clapp's remarks they nearly—or quite—went to sleep. At the other end of the capitol the bill is still in committee and each day brings out some new proposed amendment. The reporters, meantime, ordered by their editors to treat this news as important, have had a difficult job in making copy and they even have to talk about amendments which are under consideration but "not yet drafted." When the bill finally gets before the house it may be that the reasons for and against the commerce court, the prohibitions of mergers, the legalizing of traffic agreements and the limitation of railway capital issues, will be set forth in cogent statements and receive intelligent consideration; but at present about all that can be said is that the President wants action and the majority of the congressmen want action only so far as may be necessary to redeem their party pledges. The study of the real merits of the President's proposals is something which, apparently, they would like to avoid.

The report of Chief Inspector B. W. Dunn of the Bureau of Explosives—this short title is proper, for it is used by Colonel Dunn himself—is an interesting document. We give, in another column, the abstract of the work done; but the report itself is too solid for reproduction except in full and an abridgment would not do it justice. A reduction in the annual losses from accidents in transporting explosives by rail of 99½ per cent. in less than three years cannot be due to good luck or chance; the usefulness of the inspections, which are made by the bureau, must be real and widespread. The condemnation of 11,497 packages of explosives in one year as not properly put up tells the same story in another way. The number of persons killed was, in 1907, fifty-two; in 1908, twenty-six, and last year, six. The chief inspector gives a list of roads which do not belong to the bureau, and it contains a few prominent ones. He says that all these are disobeying the law, for the government regulations assume the employment of the bureau as one of the precautions for safe transportation. But though some of the railways are neglectful the steamship companies appreciate the value of inspection, and nine prominent Atlantic coastwise lines have joined Col. Dunn delivered last year nine lectures, James L. Taylor 155, and local inspections 51. By the revised regulations of the bureau placards are required on a much smaller number of cars than at first, this making more prominent those cars which are placarded. This important change was accomplished by abolishing the placard requirement as regards certain classes of goods which are not very dangerous. Several reckless shippers have been punished in the courts. Encouraged by railway officers, the chief inspector offers the very practical suggestion that inspection of *all* of the work of freight house and freight train men, and not alone that which is dangerous, should be done by a single authority. There is room, of course, for very much closer inspection of this department of railroading provided that, as Col. Dunn intimates, the inspection is such as to educate the workmen and not fill their minds with fears of punishment for what may seem to them trifling faults.

THE HOCKING VALLEY AND THE CHESAPEAKE & OHIO.

The acquisition of control of the Hocking Valley by the Chesapeake & Ohio gives the C. & O. an outlet to the lakes, and gives it a north and south line comparable in some ways with the north and south line recently acquired by the Baltimore & Ohio through its gain of control of the Cincinnati, Hamilton & Dayton, but it does not give the Hawley system a direct connection between its lines west and southwest of Chicago and the Chesapeake & Ohio. This is very plain from the map. If Hawley traffic officers should solicit freight from the eastern seaboard and route it over their own lines, it would now have to go over the C. & O. to Gauley Bridge, over the H. V. to Toledo, and from there southwest almost to St. Louis over the Clover Leaf before it could get on to the Alton. If, however, the C. & O. later buys the Chicago, Cincinnati & Louisville, as is persistently rumored, it will be able to route freight in a direct and natural way from the seaboard to Cincinnati, and from there to Chicago, where it can deliver it to the Alton or Clover Leaf, as the case may be.

Control of the Hocking Valley has previously been held by



The Hocking Valley, the Toledo & Ohio Central and the Kanawha & Michigan.

five trunk lines, the Pittsburgh, Cincinnati, Chicago & St. Louis holding one-third of the $5,770,000 common stock; the Lake Shore & Michigan Southern holding one-sixth; the Baltimore & Ohio holding one-sixth; the Erie holding one-sixth, and the Chesapeake & Ohio holding one-sixth. This stock, which was acquired in 1903 by the trunk lines, has been sold to the C. & O. for a price said to be between $8,000,000 and $9,000,000. The stock was bought by the trunk lines at a time when plans were being made for the merger of the Hocking Valley, the Toledo & Ohio Central, the Kanawha & Michigan and the Zanesville & Western. The Ohio courts have held that the merger plans were illegal, and have ordered the Hocking Valley to divest itself of control of the Toledo & Ohio Central and of the Kanawha & Michigan. This order the Hocking Valley has now complied with by selling its Toledo & Ohio Central and the Zanesville & Western stock to the Lake Shore & Michigan Southern, and its Kanawha & Michigan stock to the Chesapeake & Ohio and the Lake Shore jointly. It will be seen, therefore, from the map that the Lake Shore and C. & O. have each got a north and south road extending from Toledo to Gauley Bridge, a junction with the Chesapeake & Ohio main line. Just west of Gauley Bridge and across the river from it is Deepwater, the northern terminus of the Virginian Railway.

When the Baltimore & Ohio was looking out for a north and south line it probably considered the Hocking Valley, but it is equally probable that the New York Central would have been unwilling to let the Lake Shore sell its interest in the Hocking Valley to a road which competes in so many fields with the New York Central Lines. Apparently the same objection did not apply to a sale to the Chesapeake & Ohio. The decision to let the C. & O. have the Hocking Valley may have been influenced somewhat also by the fact that the New York Central Lines will get an entrance into Baltimore and incidentally into the soft coal regions when the new line between New Haven, Pa., and Cumberland, which is being built by the Western Maryland, is finished.

The C. & O. is to finance the purchase of the Hocking Valley by the issue of $31,390,000 convertible 4½ per cent. bonds. There were $37,000,000 of these bonds recently authorized by the directors, and stockholders are to meet on April 28 to ratify this action of the directors and the authorization of an equal amount of stock to provide for the conversion of the bonds at par at the option of the holder after one year.

The preferred stock of the Hocking Valley, of which there is $15,000,000 outstanding, has equal voting rights with the common, so that to have absolute control it will be necessary for the C. & O. either to acquire a part of this preferred stock or to retire it. The stock is subject to call at par. In addition to the sum involved in the Hocking purchase, the C. & O. has authorized in the past two years a total of $10,000,000 improvements, so that only a part of the total authorized issue of convertible bonds will be needed to carry out present plans, and if the Chicago, Cincinnati & Louisville is to be bought later, new financing may not be required.

As the sale of the Toledo & Ohio Central and Kanawha & Michigan has added $13,433,300 cash to the Hocking Valley treasury only $1,566,700 more would be required to retire the $15,000,000 preferred stock of the company at par, and with an accumulated surplus of $4,513,259 on June 30, 1909, which will probably come to $5,000,000 by the close of the present fiscal year, it can be seen that the company could make this retirement with little inconvenience.

If the preferred stock were retired in this manner the company would show earnings on the common on the present basis of earnings at the rate of 23.9 per cent.

The minority stockholders of the Kanawha & Michigan have been offered $72 a share for their stock. This is the same price that was paid for the majority stock by the Hocking Valley.

LIGHT CENTER SILLS FOR STEEL CARS.

The importance of ample section of center sills and cover plates for resisting buffing in steel passenger cars has been demonstrated by the results of collisions and wrecks, but, notwithstanding this, there is a large amount of steel equipment building which is manifestly deficient in this particular. It is unusual in freight cars, which are much shorter and should therefore have greater stiffness for a given area than the longer passenger car, for such defects to be shown up in regular service, however severe, but in the last report of the arbitration committee of the Master Car Builders' Association there is a case in which this question is discussed.

A 40-ft., 80,000-lb., steel underframe car was offered to the owner in interchange and refused on account of two steel center sills and one side sill being badly bent. The offering road claimed that the defects were the result of ordinary service, the parts yielding to the extent of having taken permanent set at four distinct places in the longitudinal framing, the offsets amounting to as much as 2½ to 3 in. These center sills consisted of two 15-in., 33-lb. channels without cover plates, and a comparison is made to show their slight resist-

ance as compared with cars of similar capacity, but of good design. Car A, with the light sills, has a buffing area of 19.8 sq. in., while car B, of good design, has a section of 29.24 sq. in., a difference of 47.5 per cent. in favor of car B. The moment of inertia, which in columns of the same length is a measure of the stiffness, in car A is 625.2, while in car B it is 2,368.9, a difference of 279 per cent. in favor of car B. The section modulus, which measures the comparative strength of sections, is for car A, 83.4, and for car B, 236.9, a difference of 184 per cent. The safe load for the center sills on car A is 43,000 lbs., while on car B it is 123,000 lbs., a difference of 286 per cent.

It is thus shown that by the addition of less than 50 per cent. more weight in the center sills and cover plates, which is a small percentage of the total weight of the car, their stiffness in resisting buffing stresses and the strength in carrying their portion of the load are increased nearly 300 per cent.

The arbitration committee ruled that the damage was of such an extent that repairs were necessary and the offering road was responsible for them, thus establishing the principle that the design and proportion of steel cars were not proper subjects for discussion in disputes arising under the interchange rules. While this is a fair decision under the present rules it suggests the desirability of adopting some limits of cross section and moments of inertia for the center sills of steel cars, both freight and passenger, as there is a tendency for some railways to buy cars which are of poor design and have light center sills because they are cheaper than others where these members are properly designed. In freight interchange some railways, which are careful to secure substantial designs for their own cars, become liable for the distortion of weaker cars owned by other roads, and it would seem that a majority of the M. C. B. votes ought to favor a simple rule which would prevent the continuation of orders for cars of weak design and establish standards which would place some minimum limits on the area of buffing members of the underframe.

At the M. C. B. convention in 1908 a committee report on steel passenger cars discussed the question, as it was under instruction to recommend a standard sectional area for center sills and cover plates. It reported that it had found a great difference in the design and area of center sills, one type having an area of 10.66 sq. in., another 18.52 sq. in., and another 50 sq. in., and in any standard area it would be necessary to take account of the length of the car, the application of the load and the shape of the longitudinal sills; for these reasons it did not make definite recommendations for standard areas.

On account of the liability of the collision of freight and passenger cars, the latter should be at least as strong in center sill construction as the strongest freight cars and a higher factor of safety should be used. The committee recommended that steel passenger cars in through service should be capable of withstanding a shock of 150,000 lbs. on the draft gear and 250,000 lbs. on the buffers, making a total of 400,000 lbs. compression, in which the combined stress on the sills should be 12,500 lbs. per sq. in., and in no case exceed 15,000 lbs. For cars in suburban service the fiber stress might be increased to 20,000 lbs. For freight cars a compression load of 500,000 lbs. should be assumed and this should not cause stresses exceeding the elastic limit of the metal sills. The weak cars, as well as the strongest representing current practice for both freight and passenger service, are those in which the center sills are continuous beams, having a channel or eye-beam section, some in freight cars, as in the example given above, without cover plates, some with partial cover plates and others in passenger cars with complete top and bottom cover plates. It is in this class of construction that it is possible to establish standards for center sills which are safe. By commencing in this way, steel car construction could in time be brought under such control as to be safe and satisfactory.

LIGHT FROM EUROPE ON PROPOSED WATERWAY DEVELOPMENT IN THE UNITED STATES.

A document recently issued by the British Royal Commission on canals and waterways throws an instructive sidelight on the campaign for the development of inland waterways in the United States. The document referred to is an exhaustive report on the waterways of Belgium, France, Germany and Holland, by W. H. Lindley, assistant commissioner. It deals with all their various phases—engineering, operating, financial, traffic, etc. It ought to be read and compared with the report of the board of United States army engineers on the proposed lakes-to-the-gulf deep waterway by all who wish to form an intelligent opinion about the desirability of additional extensive development of inland waterways in the United States. The data given by Mr. Lindley strongly sustains the contention of the army engineers in their report that the Mississippi and its tributaries, with 14,000 miles of navigable waters, are now, as they have been developed and are maintained by the federal government, as good an inland waterway system as any in Europe.

In France the waterways, which are considerably used, include about 4,500 miles of rivers and 3,000 miles of canals, a total of 7,500 miles. In 1879 a program was adopted of developing them all to a minimum standard depth of 6.6 ft., and in 1905 this has been carried out on 1,306 miles of rivers and 1,671 miles of canals. The maximum depth attained is 8.5 ft., and the great bulk of the traffic is carried on water varying from 5 ft. in depth down to 1.5 ft. The largest estimate of the length of German waterways is 8,500 miles; the mileage on which the traffic is considerable is 6,200. The depth of the free rivers varies from 3 or 4 ft. on those, such as the Oder, Elbe and Vistula, having unstable beds, to 5 or 6 ft. on those, like the Rhine and the Upper Main, having stable beds, and on the lower sections of the larger rivers the depths become as much as 8 to 10 ft. The depths of the canalized rivers are from 2.6 ft. to 7.5 ft., and of the canals from 4 ft. to 10 ft., the latter depth being very rare, and depths of 4 to 6 ft. being the most common.

Compare these figures with those given by the board of army engineers regarding the Mississippi and its tributaries. Even during low water seasons boats of a draft of 25 to 30 ft. may easily be sent from the Gulf of Mexico 270 miles to New Orleans, Baton Rouge and Bayou Sara. Boats of 9 ft. draft may be sent 840 miles thence to Cairo, Ill.; boats of 8-ft. draft may be sent from Cairo to St. Louis, 182 miles, and boats of 4½-ft. draft may be sent from St. Louis up the Mississippi and Illinois rivers and the Illinois state canals to Chicago, 365 miles. The Mississippi's minimum depth to St. Paul is 4½ ft., the Missouri river's minimum depth is 4 ft. as high as Kansas City and 2½ ft. to Fort Benton, 2,285 miles from St. Louis. The Ohio has a depth of 9 ft. from Cairo to Pittsburgh, 1,000 miles; the Monongahela, 5 ft. from Pittsburgh, 128 miles to the Pennsylvania coal fields; the Kanawha, 6 ft. for 90 miles to the West Virginia coal fields, and numerous other tributaries of the Mississippi, including the Allegheny, Little Kanawha, Muskingum, Columbia, Tennessee, St. Croix, Minnesota, Osage, St. Francis, Yazoo, Arkansas and Red, have navigable depths of 2 ft. and upward.

Since the Mississippi and its tributaries, as the figures show, actually constitute a better waterway system than any in Europe, why is it that the river and canal traffic of Europe is growing faster than the railway traffic, while in this country the railway traffic is rapidly increasing and the river and canal traffic steadily decreasing? One reason is that municipalities and private concerns in Europe have provided the waterways with good terminals, and that boats and barges have been developed which are specially adapted to modern river and canal traffic, whereas in this country almost nothing has been done either by municipalities or private concerns to provide river boats with suitable and adequate terminals, and there has been almost no improvement for thirty years in the

boats used on rivers. But the main reason for the growth of river and canal traffic in Europe and its decline in this country is to be found in the differences between the railways and the railway rates of Europe and America.

Mr. Lindley gives a great many figures regarding the freight rates of European railways and waterways. The average railway rate per ton-mile in France is 14 mills and in Germany 13 mills. It is impossible to ascertain the averages for the waterways, as complete statistics have never been compiled. But numerous figures are given for different waterways. On the Rhone in France they are from 7.8 to 15.6 mills per ton per mile, and rise as high as 18.6; on the Seine, 26 to 56; on the Canals du Centre and du Midi, 6.2 to 7.8, and on the canals of the northeast and east of France, from 3.8 to 4.6. The average rate on a wide variety of commodities moving from Havre, Rouen and Lens to Paris is 5.78 mills. A very conservative estimate of the average for all traffic on all the waterways of France is 6 mills. It must be borne in mind that this is figured on the basis of the waterway mileage, which is on the average fully 50 per cent. greater than the rail mileage. If the average *absolute* waterway rate were divided by the shorter mileage of competing railways, the average waterway rate would rise to fully 8 mills per ton per mile. Mr. Lindley's figures for the rates of German waterways are much less full, but those which he gives for traffic of various kinds and between a number of important centers average 5 mills, and on the basis of the shorter railway mileage would average at least 6.5 mills. The waterway rates of Europe are therefore not 50 per cent. of those of the railways of Europe.

The average rate per ton per mile on the railways of the United States in 1907 was 7.59 mills, and this, of course, includes high grade as well as low-grade traffic; traffic hauled over mountain ranges and in sparsely settled territory as well as that hauled on easy grades and in thickly settled sections. On many American roads which handle mainly low-grade traffic or have especially favorable operating conditions the average rate is as low as or lower than on the waterways of either France or Germany. The average rate of the New York Central, in 1907, was 6.4 mills, of the Pennsylvania Railroad, 6.3 mills; of the Cincinnati, Hamilton & Dayton, 6 mills; of the Illinois Central, 5.77 mills; of the Lake Shore & Michigan Southern, 5.27 mills; of the Big Four, 5 mills; of the Detroit, Toledo & Ironton, 4.36 mills; of the Norfolk & Western, 4.95 mills, and of the Chesapeake & Ohio, 4.33 mills. And while these railway rates cover the entire cost of transportation the rates on the waterways of Germany and France do not cover the entire cost. The annual interest and maintenance charges on waterways paid by the government of France amount to 4.2 mills for every ton-mile of freight carried. The similar expenditures in Germany amount to 8½ tenths of a mill, including the Rhine and the Elbe, on which the traffic is very large and the expenditures have been small. Excluding these rivers the expenditures for maintenance and interest in Germany amount to 2 mills per ton per mile. Adding these figures to the average rates makes the *total* average cost of water transportation in France not less than 10 mills and in Germany not less than 7 mills. If the calculation be made on the basis of the shorter railway mileage the cost in France rises to 12 mills and in Germany to 7½ mills. The former exceeds the average railway rate in the United States, and the latter almost equals it. If allowance be made for the superiority of rail over water service, the conclusion is unavoidable that rail transportation in the United States is very much less costly than water transportation in Europe. The rivers and canals of Europe could not compete with the railways of the United States any more successfully than can the existing rivers and canals of the United States.

Some of the advocates of large expenditures for additional waterway development in this country recognize this fact, and therefore advocate the development of deeper waterways than any in Europe. Some of these favor the construction of a 14-ft. channel from the Great Lakes to the Gulf, on the theory that it would be used by lake and ocean-going vessels. But fully 95 per cent. of the steamships on the lakes draw over 14 ft. of water, and more than 80 per cent. of them draw in excess of 19 ft.; and, of course, ocean vessels could not use any waterway that lake vessels could not. Finally, it is argued that a great ship canal should be built from the lakes to the gulf. But engineers who have carefully investigated the subject contend that a towboat with barges can transport commodities on a river or canal cheaper than a lake or ocean steamship, and a towboat and barges can navigate in 5 ft. of water as well as in 50. Thomas W. Symons, colonel corps of engineers, U. S Army (retired), after investigating this subject for the state of New York, concluded that the cost of transporting grain by a typical lake freighter on a deep-water canal would be 38 per cent. greater than by a towboat and barges on a barge canal, and it was this conclusion that led the State of New York to decide to make the Erie canal only 9 ft. deep instead of over 20 ft. In making his estimate Colonel Symons took no account of the greater cost of constructing and maintaining a deep waterway. His investigation related merely to the cost of operating the various kinds of boat.

In view of the foregoing facts the conclusion seems inevitable that it would be the very height of folly for the government of the United States under present transportation and commercial conditions to spend hundreds of millions, as is proposed, for the additional development of inland waterways. All the evidence tends to show that the only way by which any considerable commerce could be diverted to the present or proposed waterways would be to compel the competing railways to raise their existing rates on low-grade commodities and refrain from making reductions. In France the government consistently follows the policy of compelling the railways to keep their rates at least 20 per cent. higher than the rates on the competing waterways, this practice, as Mr. Lindley says, "being based on the opinion that the waterways are considered not to be able to compete at equal freights with the railways, owing to the longer duration of transport." Unless the governments of the states and of the United States are prepared to adopt a similar policy rivers and canals will continue to be unable to compete with the railways and the proposed expenditures for their development will, if made, turn out a sheer waste of money.

UNITED STATES STEEL CORPORATION.

The total production of finished products for sale in 1909 by the United States Steel Corporation equaled about 75 per cent. of the normal maximum productive capacity of the property. There were 9,859,660 tons of finished products produced for sale to customers outside of the organization in 1909. This is an increase over 1908 of 58.8 per cent. There were 11,618,350 tons of pig iron, spiegel and ferro, produced in 1909, an increase over the previous year of 67.5 per cent.; and there were 13,355,189 tons of Bessemer and open hearth steel ingots produced, an increase over 1908 of 70.3 per cent. The volume of business done by all companies during the year, as represented by their combined gross sales and earnings, including sales made between subsidiary companies and gross receipts of transportation companies for service rendered both to subsidiary companies and to the public, amounted to $646,382,251. This compares with gross receipts of $482,307,840 in 1908. From the gross business the corporation was able to earn, after paying expenses, $131,491,414, in 1909 as against $91,847,711 in 1908. It will be seen, therefore, that with a tonnage output of basic semi-finished and finished articles greater by about 66 per cent., the company had gross sales greater by 34 per cent. in 1909 than in 1908 and earnings 43 per cent. greater in 1909 than in the year before.

There was charged off for depreciation and extinguishment

funds $5,884,367 in 1909, as compared with $3,844,214 in 1908; and there was charged for extraordinary replacement $16,109,687 last year, comparing with $11,532,897 the year before. After paying interest on bonds and sinking funds there was net corporate income of $79,073,695, comparing with $45,728,714 the year before. In 1908 7 per cent. was paid on the preferred stock and 2 per cent. on the common stock; in 1909 7 per cent. was paid on the preferred and 4 per cent. on the common. This left a surplus after payment of dividends of $33,521,918 in 1909 and $10,342,987 in 1908. Last year there was charged off for additional property and for the discharge of capital obligations $10,000,000, and for reserve fund to cover advance mining royalties $3,200,000, and in addition there was set aside for expenditures at Gary, Ind., $5,000,000. None of these charges were made against income in 1908.

Total annual wages amounted to $151,663,394 in 1909 and $120,510,829 in 1908. This is an average wage of $776 last year and $729 the year before. The prices, however, received for products were considerably less in 1909 than in 1908. On domestic business, on all rolled and other standard products prices averaged 14.3 per cent. less; on export shipments the average price was 7.8 per cent. less than in 1908.

The United States Steel Corporation is in a financially strong position to handle a very large volume of business, and since the close of the calendar year the new orders have just about borne out expectations, notwithstanding the unusually heavy placing of new business for future delivery which took place during the closing quarter of 1909. At the close of the year the unfilled export orders on the books of the United States Steel Products Export Co. amounted to 462,603 tons. At the beginning of 1910 the combined books of the other subsidiary companies showed unfilled orders for rolled and other finished products of 5,927,031 tons. The production of the various subsidiaries in 1909 compare with figures for 1908 as follows:

	Tons	
	1909.	1908.
Iron ore mined	23,431,047	16,662,715
Coke manufactured	13,590,112	8,169,931
*Coal mined	3,889,021	3,008,810
Limestone quarried	3,496,071	2,186,007
Blast furnace production	11,618,350	6,934,408
Bessemer ingots	5,846,300	4,055,275
Open hearth ingots	7,508,889	3,783,438
Rails	1,719,486	1,050,389
Total finished products†	9,859,660	6,206,932

*Not including that used in making coke.
† Including rails.

It is interesting to note that among the finished products the production of steel car wheels increased from 7,223 tons in 1908 to 67,985 tons in 1909. This is the greatest proportionate increase in the output of any class of finished products and is accounted for by the fact that 1909 was the first complete year of operation of the Schoen steel wheel plant by the Carnegie Steel Company.

The total current assets, including inventories, amounted to $291,018,167 on Dec. 31, 1909, comparing with current assets of $239,222,176 on Dec. 31, 1908. Cash on hand amounted to $58,521,113 last year and to $49,548,053 the year before. Current liabilities last year totaled $61,144,726, and $43,031,854 the year before. Of these current liabilities $29,734,951 was accounts payable and payrolls in 1909, and $20,858,014 in 1908. The only other considerable increase in liabilities is in common stock dividend, which in 1909 included ¾ per cent. extra dividend, payable March 30.

The total inventory valuation included in current assets was $163,811,280 in 1909, and $143,179,629 in 1908. The greater amount of inventories on hand is due largely to the increased volume of business being conducted at the close of the year as compared with the volume of business conducted at the close of 1908. The item of iron ores in stock piles at mines, valued at $67,692,137 in 1909, and $65,783,299 in 1908, shows an increase in total valuation of 2.9 per cent. The tonnage on hand, however, was 10 per cent. greater, the average price at which ores were inventoried being somewhat lower in 1909 than in 1908. The inventory valuations include profits on materials which have been purchased by one subsidiary from another. These profits are not included in the reported earnings of the entire organization until such profits have been converted into cash.

Undivided surplus of the Steel Corporation and subsidiary companies amounted to $151,354,528, which includes the $25,000,000 paid in as working capital in 1901. Since 1901 the company has issued net $59,482,593 bonds, of which $20,000,000 are Steel Corporation bonds and the remainder purchase money obligations and bonds of subsidiaries. The total payments made since 1901 on capital account amounted to $403,817,202. Of this amount $241,553,432 was charged to surplus net income, $10,000,000 was charged to surplus appropriated since January 1, 1910, to cover payment of capital expenditures, and $92,781,176 was charged to capital surplus and to undivided surplus.

For the Gary plant, which began operation last year, the Steel Corporation has appropriated $55,000,000 from net income. Of this amount $10,547,011 has been spent for real estate and development work in the city of Gary, and $38,073,181 for construction of the manufacturing plant. In addition, there has been spent $5,258,405 for terminal railway work, but this outlay has been financed by the Chicago, Lake Shore & Eastern by the recent sale of $9,000,000 bonds, guaranteed jointly by the Elgin, Joliet & Eastern and the United States Steel Corporation.

During the year there were put in operation at Gary four blast furnaces, making a total of six in operation at the close of the year; 28 open hearth steel furnaces, the heavy rail mill, the blooming and large billet mill and the 18-in. merchant bar mill. Among other work that is being undertaken at Gary there has been authorized to be built by the American Bridge Co. a bridge and structural plant, consisting of two units, with a total annual capacity of 120,000 tons of fabricated structural material. During 1909, 519,197 tons of pig iron, 511,601 tons of open hearth steel ingots, 324,856 tons of open hearth steel rails and 73,480 tons of billets and merchant mill products, and 6,862 tons of foundry products were produced at Gary.

NEW BOOKS.

Subsidy for American Ships Only. Pamphlet V. Merchants' Association, New York City.

This is a pamphlet of 40 pages containing the argument presented by a committee of the Merchants' Association before the Merchant Marine committee of the lower house of Congress, February 3. The Merchants' Association favors subsidies for American-built ships, but presented this argument in opposition to the Humphrey bill, because it is believed that that bill will permit the diversion of the public money to foreign-built ships.

FOREIGN RAILWAY NOTES.

The Baden State Railways after investigation decided that the hearing of locomotive engineers is affected by vibrations of the engine communicated from the floor on which the men stand. To prevent this, cocoanut mats are to be provided, both for engineman and fireman.

The Swiss are preparing to show the whole of Switzerland to the delegates to the eighth International Railway Congress, which is to be held in Berne July 4 to 16, which will make it well worth while to go. It is reported that 1,300 are expected, 200 speaking German, 500 French and 600 English (or the Yankee-dialect thereof). The French-speaking delegates are largely Russians and others from the outlying parts of the world.

Letters to the Editor.

TRAIN RESISTANCE ON THE VIRGINIAN RAILWAY.

Norfolk, Va., March 19, 1910.

To the Editor of the Railway Age Gazette:

Referring to the letter in your issue of February 25, by William G. Raymond, the explanation asked for by Prof. Raymond is that the second train referred to of 120 cars—which astonished him so much—was hauled by a Mallet compound engine of about 65,000 to 66,000 lbs. tractive power. The first train was hauled by the Mikado engine—correct information concerning which Mr. Raymond seems to have.

R. P. C. SANDERSON.

FASTEST WORK IN TUNNEL DRIVING.

New York, March 14, 1910.

To the Editor of the Railway Age Gazette:

In the article in your issue of March 11, p. 519, by R. B. Woodworth, entitled "Subaqueous Tunnels," certain data is given in regard to speed, etc., of various rock tunnels which seems to differ from data published elsewhere, and while these differences do not affect the argument that there has been some improvement in this country since the Hoosac tunnel was built, in the interest of accuracy it would seem to be worth while to note these so that corrections may be made where necessary.

I can find no record of any work having been done on the Newhouse Drainage tunnel in 1906. Does this refer to the Central tunnel of the Big Five Company which was 6 ft. x 9 ft. and driven at that time at Idaho Springs, Col.? It is stated that the Newhouse Drainage tunnel was 12 ft. x 12 ft., and the Hot Time Lateral 5 ft. x 7½ ft.

The length of the Roosevelt Drainage tunnel is given as 16,700 ft. instead of 15,550 ft. and the best month's work 436 ft. in March, 1909, while the average advance for a "long time" was 362 ft.

The record for the Gunnison tunnel for one month is given as 824 ft. instead of 842 ft.

The cost of the Elizabeth tunnel of the Los Angeles aqueduct is given as $35.81 per lineal foot instead of $31.81, and the best month's work 476 ft. in March, 1909, in the south heading.

While all the above records are for one heading, the record for the Bitter Root tunnel of 580 ft. in May, 1908, is for both headings. The best month in a single heading in this tunnel is stated to be 385 ft. at the west end in January, 1909, and for the whole tunnel 753 ft. in that same month.

The stated record of 550 ft. per month for the new Croton aqueduct is apt to be misleading, as this amount was never actually driven in a single month, but represents the rate per month based on a single week's run of 127 ft.

The record for the Loetschberg is given in your article as 574 ft. in September, 1907. I find it stated elsewhere, however, that in:

April, 1908,	the	north	heading	was	driven	.....	656 ft.
June, 1909,	"	"	"	"	"	.....	1,990 "
July, 1909,	"	"	"	"	"	.....	1,913 "
Aug., 1909,	"	"	"	"	"	.....	1,915 "

These last three months the heading was in limestone.

The best record for the Simplon tunnel that I have been able to find is 685.5 ft. in July, 1904, instead of 755 ft., as stated in your article.

In the discussion of a paper by Messrs. Francis and Dennis, read before the American Society of Civil Engineers in 1906, the writer advanced the idea that the better progress possible in Europe was due to different labor conditions, a trained body of tunnel workers and better organization, rather than to differences in methods. Recent developments, both in this country and Europe, seem to confirm this impression.

The idea that the Brandt drills were responsible for the progress on the Simplon tunnel has been dissipated by the remarkable progress on the Loetschberg tunnel by percussion drills of a type similar to those generally used in this country.

F. LAVIS.

Contributed Papers.

TRAIN ACCIDENTS IN FEBRUARY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of February, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
5.	Florida E. C.	S. Jacksonville.	rc.	P. & P.	1	3
7.	Chic., B. & Q.	De Soto, Wis.	bc.	P. & P.	0	4
8.	Southern	Waddy, Ky.	rc.	P. & Ft.	1	2
13.	Penn.	Munster.	rc.	Ft. & Ft.	1	3
†14.	Ga., S. & Fla.	Bonaire	bc.	P. & P.	8	8
16.	Illinois Cent.	Idlewild, Tenn.	bc.	Ft. & Ft.	1	3
17.	Penna.	Whitemarsh Jn.	xc.	Ft. & Ft.	1	2
19.	Wheeling & L.E.	Conners.	rc.	Ft. & Ft.	1	3
23.	Balt. & Ohio.	Greenspring.	xc.	Ft. & Ft.	1	2
23.	Bess. & Lake E'.	Shermansville.	xc.	P. & P.	0	1

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	No. persons reported Inj'd.
1.	Chic., Ind. & L.	Bennettsville.	unx.	Pass.	0	4
4.	Ill. Central	Sardis, Miss.	unx.	Pass.	0	5
9.	Chic., R. I. & P.	Union, Mo.	unx.	Pass.	1	3
12.	Denver & R. G.	Woodside.	b. rail.	Pass.	0	7
*12.	M., & Int. Falls.	Walker.	unx.	Pass.	0	6
19.	Chic. & N. W.	Little Suamico	b. rail.	Pass.	0	14
20.	P., C. C. & St. L.	Scio.	unx.	Pass.	0	0
27.	Chic., M. & St. P.	Hastings.	b. rail.	Pass.	1	6
28.	L. S. & M. S.	Olmsted Falls.	b. truck.	Pass.	0	0

The collision at South Jacksonville, Fla., early in the afternoon of the 5th resulted in the complete wrecking of a Pullman car, but the car carried no passengers. Northbound passenger train No. 40, standing at the station, was run into at the rear by northbound passenger train No. 36, the "Oversea Limited" from Knights Key. The reports indicate that No. 36 came on at high speed, disregarding yard signals. The person killed was a trespasser. Two passenger cars were wrecked and the engine of No. 36 was slightly damaged. There were no passengers killed and only one injured. Two employees were slightly injured.

The butting collision of passenger trains near Bonaire, Ga., on the 14th, is reported as due to a mistake on the part of the men in charge of the northbound train. They had a despatcher's order to meet the southbound at Bonaire, but they ran past Bonaire without stopping. Both engines and the two leading cars of both trains were wrecked, and two passenger cars in the southbound train were badly damaged. The southbound was No. 5, the northbound No. 2, and both trains were well filled. They were running at full speed when they met. Three passengers and five trainmen were killed and 24 passengers and trainmen were injured.

The derailment at Union, Mo., on the 9th occurred just as the train was entering on a trestle bridge. The reports indicate that the cause was not discovered, but the tender was the first vehicle to jump the track. The reports say that the bridge is 75 ft. high and that the baggage car, mail car and two passenger cars fell to the bottom of the ravine. The conductor of the train was killed and three passengers were injured.

The train derailed at Scio, Ohio, on the 20th, by a broken rail, was No. 30, the eastbound 24-hour train from St. Louis to New York. Only the last four cars went off the track. The train was running at high speed, but the cars did not

[1] Abbreviations and marks used in Accident List: rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

sustain severe damage, and of the 29 passengers on the train none was injured seriously enough to require surgical attention.

The derailment at Hastings, Minn., on the 27th, in which the baggageman was killed, occurred about a mile south of the station while the train was running about 35 miles an hour. The engine was not wholly derailed, but the tender, baggage car, express car and first four passenger cars fell down a 14-ft. bank. The breaking of the rail is ascribed to the intense cold.

The train derailed at Olmstead Falls, Ohio, on the 28th, about 3 a.m., was the westbound Twentieth Century Limited express, and, according to the reports, it was running at 60 miles an hour when the wheels left the track; yet only two or three persons were injured, and these but slightly. The train consisted of two engines and seven cars. The engines were not derailed, but all of the seven cars went off. The number of passengers on the train was about 80.

Of the 15 electric car accidents reported in the newspapers of the United States in February six are reported as resulting in fatal injuries, the total number of persons killed being eight. There were runaway cars at Dalton, Mass., and St. Louis, Mo., and street cars were struck by locomotives at Columbus, Ohio; Scranton, Pa., and Chicago. At El Paso, Tex., on the 20th, a car full of passengers was thrown into a panic by the controller box of the car taking fire, though there was no serious damage done to the car and no derailment; yet two of the passengers were killed in jumping off, and a third was injured.

THE WESTERN FREIGHT-RATE SITUATION.*

The commission reopened the Spokane case in the fall of 1909, and gave hearings at Salt Lake City, Spokane, Seattle, Portland, San Francisco and several other places. Never were the rates of any section sifted by a public body with such thoroughness, or attacked and defended with such skill, energy and resources. * * * The initial fallacy of the shippers is in the assumption that the railway will not voluntarily make any rates which will not cover all operating expenses and overhead charges. They make rates every day that do not cover all these things. The production of transportation, like the manufacture of several articles in the same factory, is an example of joint cost. The meat packer pays, perhaps, $7 per 100 lbs. for a steer. He makes a number of things from the carcass—steaks, roasts, etc.—and finally, from the residue, fertilizer. He does not sell 100 lbs. of each for the average cost per 100 lbs. of the steer, plus proportionate parts of the expense of operating his factory and of his overhead charges. He sells porterhouse steaks for a great deal more than this. He sells fertilizer for very much less. The manufacture of fertilizer adds something to the expenses of running his plant. If he gets for it something more than this *added* expense, he can say truly that he has derived a profit from it, although he may not receive for it one-tenth as much per 100 lbs. as he paid for the steer.

Now, the railway is in a situation precisely analogous to the packer. It does not make much difference in their total operating expenses whether they pull their cars to the coast empty or loaded. If they can load their cars to the coast with traffic that pays only a little more than the additional expense incurred by taking it, their net gains will be increased by that much. Now, the rates that they can get to the coast are strictly limited by the rates by water. If they are made much higher than the rates by water the coast shipper will bring his goods in by boat, because the rail charge will exceed the *value* to him of the rail service as compared with the water service. Theoretically, the rail rates might be made the same either by raising those to the coast or by reducing those to the interior. But, as a matter of fact, the charges to the coast cannot be raised without the sacrifice of a great deal of traffic. Water competition is no myth. The American-Hawaiian Steamship Company takes goods from New York across the Isthmus of Tehuantepec and lands them in San Francisco in 25 days. Last year all boats (not including tramp vessels) landed 266,000 tons of freight in California, while the Southern Pacific carried there of transcontinental traffic only 205,000 tons.

The logical application of the distance principle would be ruinous to the very communities that are contending for it. If, on principle, rates *into* this territory should be based on distance, then, on the same principle, rates *out* of it on its products ought to be based on distance. But both the Pacific coast and the interior West are very remote from the great markets of the East where they sell their fruit, vegetables, lumber, etc. To enable them to sell their products in these markets the railways have made much lower rates on them in proportion to distance than on similar commodities when produced farther east. To these low rates is largely due the present extraordinary prosperity of the West.

The roads concede that some changes should be made. It is to the interest of the entire nation, including the western railways, that the development of the rich natural resources of the interior West should be fostered in every practicable manner. The only way the railways could put and keep it on an actual parity of rates with the Pacific coast would be to get control of the water lines. Public opinion would not stand that.

Whether public authorities constitutionally may reduce the rates of a railway on the ground that its earnings are excessive is an open question. The decision of the Supreme Court of the United States which has the most direct bearing on the matter was in a case involving the constitutionality of an act of the legislature of Kansas reducing the rates of the Kansas City Stockyards Company. On the rates fixed by the company it was earning 11 per cent. On the rates fixed by the legislature it could have earned 5.3 per cent. It was contended that the legislature was justified in reducing the charges of the company because its profits were excessive. But the supreme court unanimously held otherwise. Justice Brewer, who wrote the opinion, said:

"The court has not held that the legislature may enforce rates that stop only this side of confiscation. * * * It has declared that the present value of the property is the basis by which the test of reasonableness is to be determined, although the actual cost is to be considered, and that the value of the services rendered to each individual is also to be considered. The question is always not, What does he (the person performing a public service) make as the aggregate of his profits? but, What is the value of the services which he renders to the one seeking and receiving such services? Of course, it may sometimes be * * * that the amount of aggregate profits may be a factor in considering the question of reasonableness of the charges, but it is only one factor, and is not that which finally determines the question of reasonableness."

It is contended by the railways that even if the public, through commissions or legislatures, has the *power* to so reduce the rates of railways as to limit their net earnings to the current rate of interest, it will not be economically expedient to exercise it.

The main cause of the large increase in net earnings since 1893 has been the reductions in operating expenses that have been effected by improvements in the railways' plants and in the methods of operating them. The main incentive to improve and reduce the expenses of existing railways and to build new lines will be removed if it shall become the policy

*From an article in *Scribner's Magazine*, by Samuel O. Dunn, Western Editorial Manager of the *Railway Age Gazette*.

of the government to appropriate for the benefit of those who furnish neither the money nor the brains for railway improvements and extensions all the net earnings above a certain low maximum. It is argued that so long as the rates of the railway do not discriminate or impose an undue burden on traffic it is entitled to earn at least the ordinary rate of commercial profit in the territory where it does business. It is contended that the prosperity which the West is enjoying shows that the rates of the railways as a whole lay no undue burden on its commerce. It is shown that the average annual profits of the very jobbers who most complain are, according to their own testimony, from 15 to 20 per cent. per annum. It is argued that in view of these facts, there is no justification for sweeping reductions in freight rates.

WORK OF THE BUREAU OF EXPLOSIVES.

Following is a summary of the routine work done during the year 1909 by the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, taken from the annual report of Chief Inspector B. W. Dunn, 24 Park place, New York.

	1909.	1908.
Total No. railway lines members of Bureau Dec. 31st	172	158
Total mileage of Bureau lines December 31st	209,984	202,186
Total No. of inspections of stations for explosives	6,953	5,603
No. stations receiving two or more inspections for explosives	1,839	1,309
Total No. inspections of stations for inflammables	6,950	*1,098
No. stations receiving two or more inspections for inflammables	1,886	.....
Total No. of inspections of factories	278	270
No. of factories receiving two or more inspections	75	69
Total No. of inspections of magazines	1,293	1,540
No. magazines receiving two or more inspections	349	361
Total No. boxes of high explosives condemned as unsafe for transportation	*10,029*	*4,852*
Total No. kegs of black powder condemned as unsafe for transportation	*1,468*	*531*
Total No. cars in transit containing explosives inspected	475	448
Total No. cars in transit showing serious violations of the regulations	168	197
Total No. inspections of steamship companies' piers (inflammable, 75; explosive, 63)	138	.....
Total No. of inspections made by Bureau	16,087	8,959
Total No. of lectures to railway officials and employees and meetings addressed on the subject of safe transportation of explosives and other dangerous articles	215	171

	1909.†	1908.	1907.
Total No. accidents resulting in explosions or fires in transportation of explosives by rail	12	22	79
Total known property loss account explosions or accidents in transporting *explosives* by rail	$2,673	$114,629	$496,820
Total No. persons injured by explosions in transit	7	53	80
Total No. persons killed by explosions in transit	6	26	52

During the same period reports have been rendered to the chief inspector by the Chemical Laboratory of the Bureau on 734 samples, as follows:

Explosives	211
Fireworks	186
Inflammables	304
Paper for lining high explosive boxes	31
Ammunition	2
Total	734

* October 15, 1908, to January 1, 1909.
† On Bureau lines, 3 persons injured and 2 persons killed; property loss, $1,173. On mine railway, not a member of the Bureau, 2 persons injured, 4 persons killed; property loss, $1,500.

REID-RAMSEY STEAM TURBINE ELECTRIC LOCOMOTIVE.

The Reid-Ramsey steam turbine electric locomotive, being built at the works of the North British Locomotive Company, was recently described by Hugh Reid before the Glasgow University Engineering Society. This locomotive is a development of the old Heilmann steam electric locomotive which received so much attention in English and Continental electrical circles in 1894, though it is on a different and more practical basis. The steam is generated in an ordinary locomotive type boiler fitted with a superheater. Coal and water supplies are carried in the side bunkers and there are water tanks at both sides of the boiler. The steam is led to a turbine of the impulse type, operating at a speed of 3,000 revolutions per minute, to which is direct coupled a continuous-current variable voltage dynamo or generator. The dynamo supplies electrical current at from 200 to 600 volts to four series-wound traction motors, the armatures of which are built on the four main or driving axles of the locomotive.

The exhaust steam from the turbine passes into an ejector condenser, and is, together with the circulating condensing water, delivered eventually to the hot well. The water of condensation being free from oil is returned direct to the boiler by a feed pump; the water carried in the tanks is used for condensation purposes. It is circulated by means of small centrifugal pumps driven by auxiliary steam turbines placed alongside the main turbine and dynamo. The cooler is situated in front of the locomotive, where the full benefit of the blast of air caused by the movement of the locomotive, aided by a fan, is utilized. The condensation of the exhaust steam deprives the locomotive boiler of the usual exhaust blast and forced draft is provided by means of a small turbine-driven fan, placed within the cooler, so that it will deliver hot air to the fire and at the same time assist the current of air through the cooler.

On the driver's platform, within easy reach, are the small switchboard and instruments, the controller for grouping the four motors in series, series parallel and parallel, according to the drawbar pull to be exerted, and the regulator for controlling the voltage in the electrical circuit and consequently the speed of the train. These are all mounted on a strong underframe, which is carried upon two eight-wheel trucks so constructed that they will easily negotiate curves. Each truck carries two of the four motors. Mr. Reid stated that the experiment was being carried out at heavy expense and on a large scale. The engine is intended for express passenger main line work, and it is hoped to obtain comparisons with the performances of the reciprocating steam locomotives, especially as regards relative consumption of fuel and water, and as to the efficiency of transforming the energy of steam into drawbar or train pull and also the relative rapidity of acceleration.

FOREIGN RAILWAY NOTES.

The minister of public works of Panama is soon to ask bids for building a railway from Panama to David, 200 miles; also from Panama to Los Santos, and from David to Bocas del Toro.

The French railways as a whole earned gross $10,564 per mile in 1893, $11,513 in 1898, $11,925 in 1903, $12,865 in 1906, and $13,516 in 1909. The working expenses have varied between 53 and 57½ per cent., the latter in 1908—the last year reported.

At a meeting of promoters held at Nagoya, Japan, it was decided to organize a company with $1,000,000 gold capital for building a 21-mile electric tramway from Temma Cho, Atsuta, the terminus of the Nagoya line, to Tokoname Cho, Chita district. This scheme, if carried out, will undoubtedly present an opportunity for the sale of a considerable quantity of American electrical and railway supplies.

An agreement has been made by Le Roy Ferry, of New York, on behalf of the Honduras National Railroad, with a London syndicate to provide money for the completion of this road from Truxillo, on the Atlantic Coast, to Tegucigalpa, the capital of Honduras, 350 miles. The mountains on the west are thought to prohibit an extension to the Pacific Coast. The company is an Arizona corporation with $10,000,000 authorized stock, and $5,000,000 first mortgage 30-year 6 per cent. bonds authorized. The track is to be standard gage, laid with 70-lb. rails.

THE NEED OF UNIFORM RAILWAY TAXATION.

BY CHARLES HANSEL.

The railway companies cannot hope for satisfactory and reasonably uniform tax laws until they themselves are prepared to offer a plan; and it does not seem practicable for them to do so before they have worked out independent plans on the lines of the several theories of value and tested them thoroughly so as to be sure that they have obtained a workable, understandable and fair solution of the question.

A study of the railway tax laws of the various states demonstrates the wide difference in principles and results and illustrates the great difficulty of writing a statute which is comprehensive in all its details, and, perhaps, the vagaries of the tax laws are not occasioned so much by the ignorance or unfairness of the legislators as by the difficulty of arriving at the proper method of determining value, having in mind the various "true values" of the railway and the apportionment of value into states and minor civil divisions. It is, however, very difficult to formulate the remedy, and, although railway officers generally have reason to complain of the various theories of taxation adopted in the several states, it does not appear that they are prepared to offer a complete plan which would be fairly just to all concerned and which they would willingly see incorporated in the statutes of all the states.

The primitive systems employed in earlier years have given way to special enactments. Taxation based on gross earnings or gross receipts has been, generally, superseded by ad valorem of some form of specific taxation; and, in 32 states and the District of Columbia we find a general property tax based on the value (?) of real and personal property; and, with some qualifications, several other states might be included; and, indeed, all the states have some form of ad valorem or specific taxation. It appears, therefore, that the trend of change is toward ad valorem or property value and this, of course, involves the valuation of the physical property; and, perhaps, in addition thereto, the non-physical, adventitious, intangible, franchise or unearned increment elements.

The state boundaries and minor civil divisions or taxing districts of the state present obstacles which seem difficult to overcome, and this is fully appreciated by interstate railways, which face a different system of taxation in each of the various states traversed and are compelled to spend a considerable sum of money each year to finally determine and adjust the payment of taxes in each of the states and the several minor divisions in which they operate.

Since the term "Value" is not generical or definite, it is necessary to dfine the term for the purposes to which the valuation applies. From the point of view of the traveler or shipper, who is personally interested in arriving at his destination or in feeling assured that his shipment will arrive with considerable certainty, the value of a railway lies in its continuity, and not in the aggregate cost or value of its many parts. From this point of view there is no difference in value between any two parts of a railway for the reason that it requires all of the various departments and a continuous track to perform the service for which he has paid. The state or taxing district cannot accept this broad equalization of value for the purposes of taxation.

The general balance sheet of a railway may properly record the money expended to acquire the property, although, as in the case of right of way, terminal grounds and the like, the cost of acquiring land is generally far more than the going price of contiguous or adjacent land. Improvements in alinement or grade, causing abandonment of old roadbed and right of way, may be, from one point of view, properly chargeable to asset account in the book values. It might be advisable, however, to segregate these abandoned properties into the amortization fund to justify the original bond issue. Such improvements may, and generally do, require the sale of fresh shares, especially when the cost is large, thereby adding to the capital account although the mileage may be shortened. While the capital account is then increased, it is expected that the saving in operation will yield an increased net revenue which will warrant the expenditure. Under such conditions the current appraisal of physical elements would eliminate such abandoned portions of the roadbed; consequently, the current appraisal of physical property might fall below the sum indicated on the balance sheet as the true cost of the property. In the opinion of a number of influential railway men, "Cost of Construction," as shown by the general balance sheet is the best available measure of the value of railways. It is doubtful, however, if they would be willing to be taxed on value established in such manner.

Any system of inventorying and appraising the physical property, as well as the purposes of the valuation, must be clearly defined, and, in order to avoid confusion and misinterpretation, it is necessary to prepare a glossary of terms and arbitrary definitions of words as applied to the particular scheme of valuation, as well as a standard of measurement or template to be applied to each of the various important classes of property involved in a railway.

The method of fixing depreciation in all the various departments of railway service is to-day undetermined, and any tax law based on physical value must consider depreciation in order to establish present value. Consequently, it is necessary to formulate some rule of depreciation in each of the several departments.

It is, perhaps, impossible for the finite mind to determine the value of any element apart from the purposes of its use and many items of great cost to the railway are only valuable to the specific purposes they fulfil. It is practicable, however, to establish a physical value if arbitrary definitions are given and detailed rules of measurement laid down.

It cannot be expected that there will ever be a uniform system of railway taxation in all the states, but it may be practicable to secure uniformity in the majority of the states if the American Railway Association can suggest a reasonable and workable method of railway taxation. The best results would probably be accomplished by the organization of a special bureau on railway taxation, the members of which should devote their entire time to the study of all the problems attendant upon this profound question. After having compiled their studies, they would be in a position to prepare several definite, detailed bills based upon each of the several theories of taxation, such as commercial value, gross earnings, cost of constructing, intangible assets, market value of securities, etc.; and, when tney have prepared these bills and a complete glossary of terms to accompany same, they could test out the several plans on some one railway property and report the results obtained under each of the several plans. In the application of the plans, errors and omissions would develop which, of course, could be corrected and adjusted before the final results were determined. After these final results had been determined by the bureau the whole matter could be laid before the Railway Association in an intelligent and comprehensive manner. The association would then be in a position to offer a plan for railway taxation which it believed was fair and workable.

The public, generally, has a high regard for the ability and integrity of purpose of the railway officers of the country, and the governors of the several states would, no doubt, respond to an invitation from the American Railway Association to send representatives from each of the states to meet in convention for the purpose of considering a comprehensive, workable tax law, and, even though many changes might be suggested, the result would be a majority opinion favoring some definite form of taxation. The railway officials are not, perhaps, so greatly interested in any particular theory of taxation, providing it is reasonably fair, as they are in securing

uniform taxation throughout the land, practicably eliminating state boundaries and minor civil divisions.

The writer has served as a member of two commissions in the appraisal of railway property, the purpose of appraisal in one state being to establish principles of determining value, which are to be the basis of a new statute entirely different from the existing law; the purpose of the appraisal in the other state was to fix the "True Value" of all the railway property separately from the value of franchise, and in form available for the assessment of taxes under existing laws which required the interpretation of the laws and disclosed the defects. In the first instance we were called upon to evolve detailed methods of appraisal to conform to a predetermined theory of taxation; in the other case, we had to apply the law—which was not broad enough nor narrow enough to insure comprehensive certainty.

There must be some method of railway taxation which is reasonably correct and understandable. It is not likely, however, that satisfactory progress will be made toward uniformity or practicability unless the matter is made the particular business of the railways.

CULLYBACKEY INTERLOCKING AND TYER'S TABLET.

The drawings and photographs reproduced herewith illustrate the signaling at a typical station on a single-track railway in Ireland—Cullybackey, on the Midland Railway, leading from Belfast to Portrush and Derry. This is a double-track line for 33 miles from Belfast and single-track for the remainder of its length. On this portion of the line there are in winter 16 scheduled trains between the hours of 8 a.m. and 8 p.m., but in summer this number is almost doubled by pleasure parties and other specials. The average scheduled speed is 40 miles an hour for express trains and 30 for



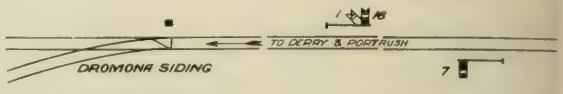
Station Building and Platform; Signals 5 and 10.

stopping trains. The blocks are from three to five miles long. For about an hour morning and evening the line is used almost to its full capacity. The double-track at the station is of sufficient length to accommodate the average freight train, and there are separate interlockings at each end of the station.

The interlocking machines are lever-locked, having a horizontal locking frame under the floor. Lazy-jack compensators are used in the pipe lines and there are adjustable crank connections to the functions. The facing point or switch lock is fastened to the tie plate between the rails and has a flat-shaped plunger. A wooden covering protects the lock and its connections against injury. As elsewhere in Great Britain left-hand running is the rule of the road, and all signals are placed left-handed to the tracks. Signals 2-14 and 5 are the starting or block signals, signal 10 is for shunting purposes and 7 is the advance starting signal for trains running toward Derry.

To provide joint control of the up and down main line switch signals between the two signalmen mechanical slots are used, the slot being fixed on the signal post except in the case of the distant signals, where they are fixed on a ground stand near the home signal. All signals are worked by single wires—stranded cables. The slotted signals are indicated on the track diagram by the double blades. The numbers on the blades shown in the stop position refer to the lever in the cabin adjacent to the switch.

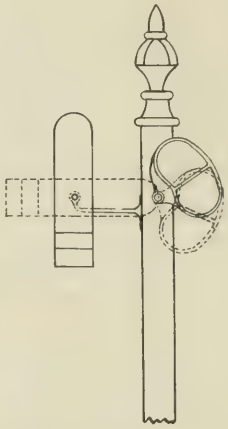
All signals are bolt locked on the facing points which they protect. Bracket signals are used at diverging routes, the higher post being for the main route. Siding signals are distinguished by a ring placed on the blade. The highway



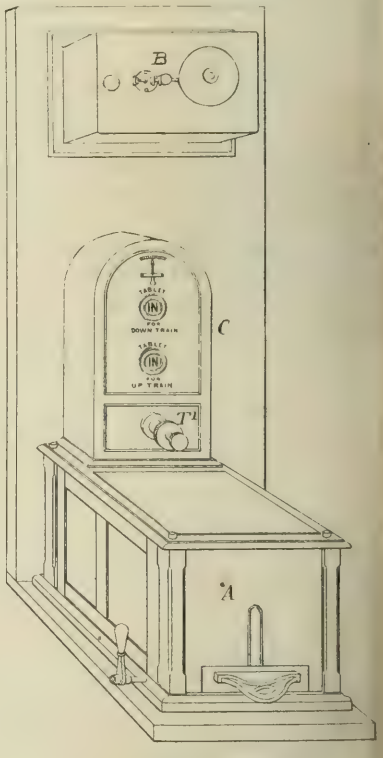
Cullybackey Station; Midland Railway of Ireland.

(Continued on following page.)

gates at the grade crossing are locked from the down signal cabin in such a manner as to prevent the clearing of a signal for a movement over the crossing until the gates are opened to the track and closed to the highway. A track diagram and manipulation chart is provided in each cabin and in addition the number plates on the levers are provided with a lower extension, giving the order in which the levers of any particular route must be moved. In the later type of sig-



Late Design of Semaphore.



Tablet Case.

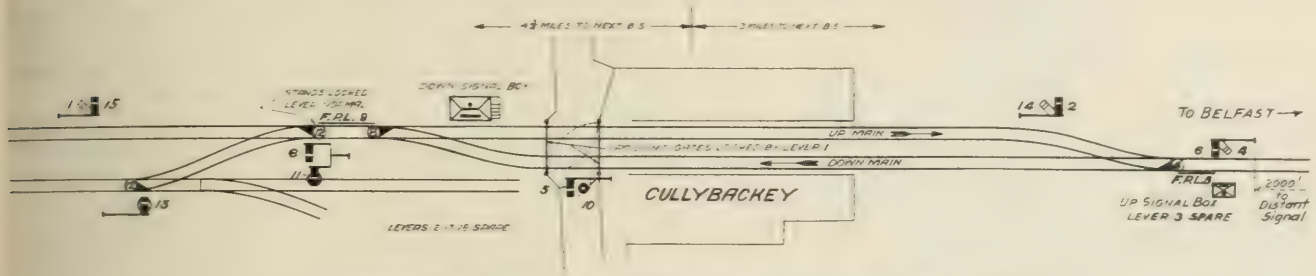
nals the blade and the spectacle casting are independent of each other and are mounted each on a separate axis. The blade, when cleared, assumes the vertical position, about 18 in. away from the signal post as shown. Distant signals are located about 2,000 ft. in rear of the first home signal. Detector bars are made of angle iron and have a link connection to the rail.

TYER'S TABLET APPARATUS.

Trains on this line are controlled by the controlled manual absolute block system, Tyer's train tablet apparatus being used. This apparatus works on the same principle as the electric train staff. Briefly described, the block instrument

consists essentially of a slide by means of which tablets are inserted in or withdrawn from a magazine cylinder, D, placed vertically. The slide can be withdrawn empty at any time by means of handle D5, but is mechanically locked by the commutator whether normal or reversed (in or out) against issuing a tablet.

The handle, D-5, lifts lever D-4, and raises the tablets out of the recess and releases the lock on the slide; but it is mechanically locked when in or out (which may be considered the normal or reversed position), against issuing a tablet by the dogs E-2 and e. Either one of these dogs is released by the downward movement of the rods d-4 and e-I which are attached to the disk, T-2, mounted on the same axis as the commutator, T-I, in front of the instrument. One of the rods, d-4 and e-I, stands normally locked by the armatures, e-2 and d-5, of the lock magnets. The commutator, T-I, operates the pole changer. When both instruments are normal and the plunger, T-4, is pressed, a current is sent to the instrument receiving the unlock, operating the polarized relay in the proper direction to release the normal lock. This enables the commutator, T-I, to be turned, when it becomes locked by the reverse lock. The turning of the commutator lowers rod d-4, which raises dog E-2 from engagement with the slide, enabling the slide to be withdrawn with a tablet. The slide cannot now be fully restored owing to dog e being free to engage in a groove in it.



Arrangements of Signals at Cullybackey, Ireland; Midland Railway.

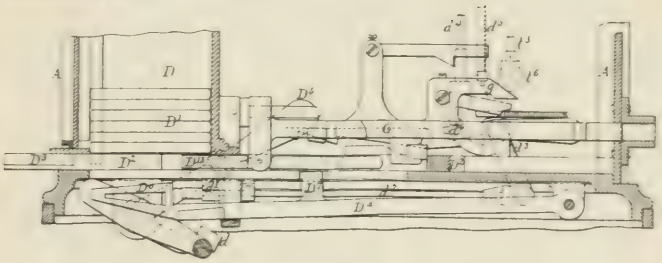
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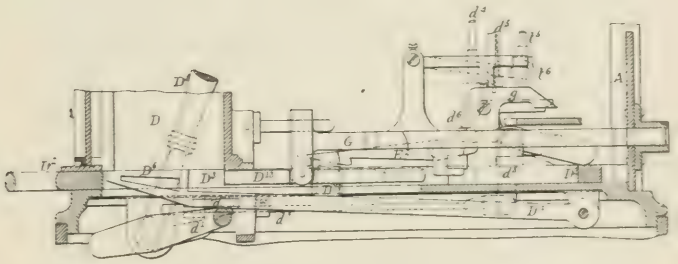
Signals 6 and 11: Switch 8.



Tablet Exchanging Apparatus.



Tyer's Tablet Apparatus; Slide Out.



Tablet Apparatus; Slide in.



Outlying Switch at Dromona Siding Controlled by Tablet.

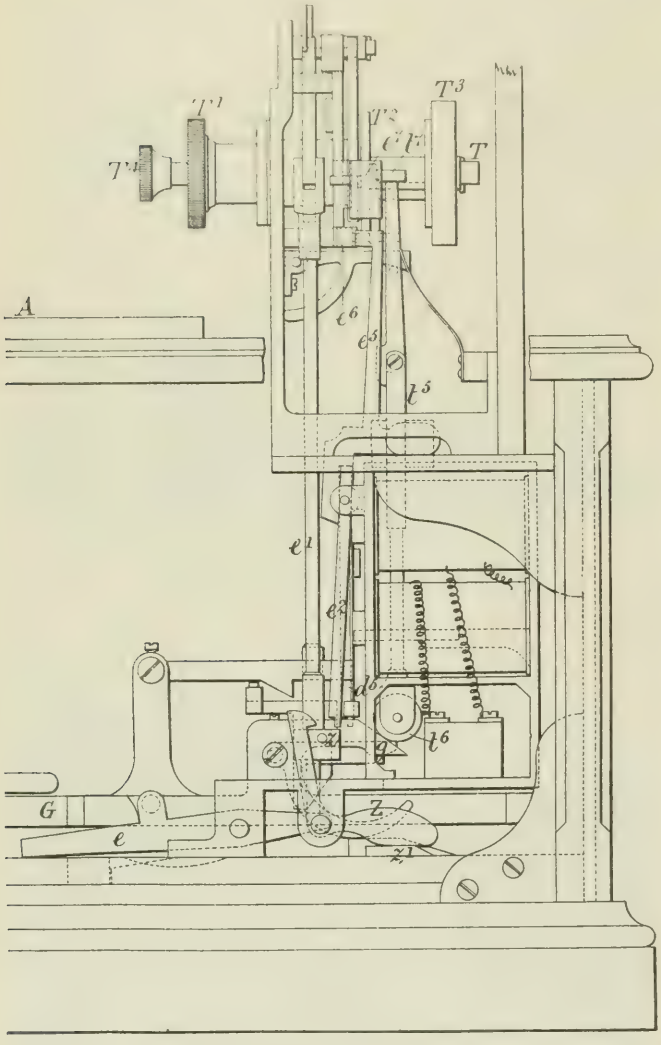
When a tablet has been carried by a train to the unlocking station the slide is withdrawn empty and the tablet inserted. This enables the slide to be pushed all the way in, when it temporarily reverses the commutator by means of rod t-5 so that if plunger T-4 is now pressed a current will be sent to the issuing instrument releasing the reverse lock on the commutator there; and when this is restored it mechanically releases the reverse lock on the slide by means of rod e-I acting downwards on dog e, enabling the slide to be pushed home; and then the apparatus becomes normal again for further operation.

The block instruments also include bell signaling and indicators to show the state of the block, and there are a number of special devices to make it proof against improper use. The entire apparatus, including bells and telephone, is operated with one line wire—a galvanized iron wire with ground return.

A tablet exchanging apparatus shown is used for non-

stopping trains. The tablet, protected by a leather pouch, is placed in the catcher. The catcher on the engine is similar to the one on the ground stand, and these are brought into alinement when the exchange is to be made.

The block instruments are situated in the station master's office, who takes charge of them. No control is used between the semaphore signal and the block instrument; the rules of the operating department being depended on to insure safety in this connection. When the station master has delivered a tablet to a train he notifies the signal man in the



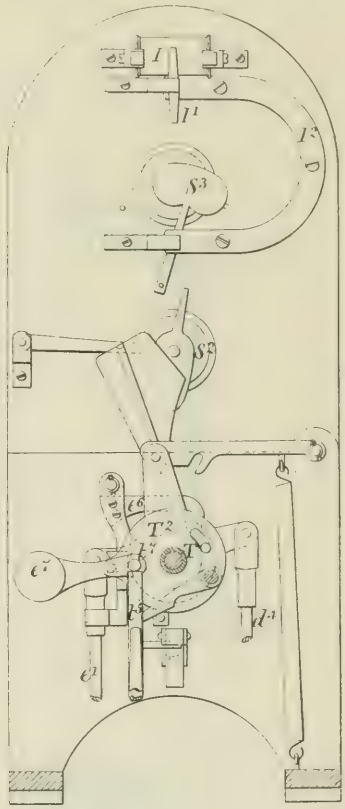
Tablet Apparatus; Side View.

cabin to clear the starting signal. The engineman must not pass the block or starting signal at stop, and he must not proceed into the next block without having in his possession the tablet for that section.

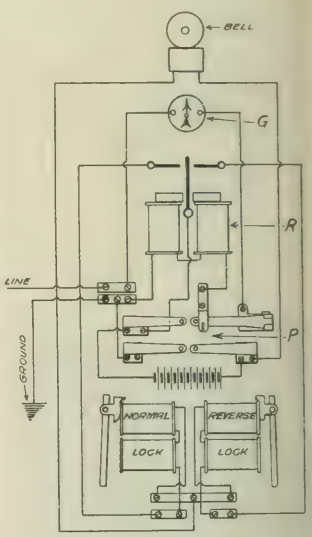
Rule 409 provides for cases where two trains approach from opposite directions at the same time and reads as follows: "(a) When trains which have to cross [meet] each other are approaching a tablet station, in opposite directions, the signals in both directions must be kept at danger, and when the train which has to be first admitted into the station has been brought nearly to a stand, the home signal applicable to such train may be lowered to allow it to draw forward to the station or to the starting signal, and after it has again come to a stand and the signalman has seen that the line on which the other train will arrive is quite clear, the necessary signals for that train may also be lowered." Other special rules deal with the safe handling of trains when the section head is not clear beyond the first home signal at the next block station.

The outlying switch at Dromona Siding shown, is controlled by the tablet for the section in which it is located. A two-lever dwarf machine is housed in a cast-iron box at the switch; one lever operates the switch and derail, and the other operates the switch lock. When the levers are reversed they come into a plane outside the door of the box, hence the door cannot be shut unless the levers are normal. To open the door the tablet is placed in a slide at the top and the tablet cannot be withdrawn from the slide until the door is closed again. This arrangement effectively interlocks the switch with the block instrument, and the switch is also locked by a splice bar bolt which screws the switch point and stock rail together. The switch is not used more than twice a day, and as there is an attendant on hand, this latter feature does not seem to cause any inconvenience.

In cases where an engine assists a train in the rear partially through a block section, where the Tyer apparatus is



Commutator Details.



Circuits for Tyer Tablet Apparatus.

G—*Galvanometer.*
R—*Polarized Relay.*
P—*Polechanger.*

in use, a banking staff is handed to the assisting engine. This has the form of a large key and controls the electric locks on the tablet instrument in such a way that the instrument cannot be restored normal until the banking staff is replaced.

DOUBLE TRACK IN MAINE.

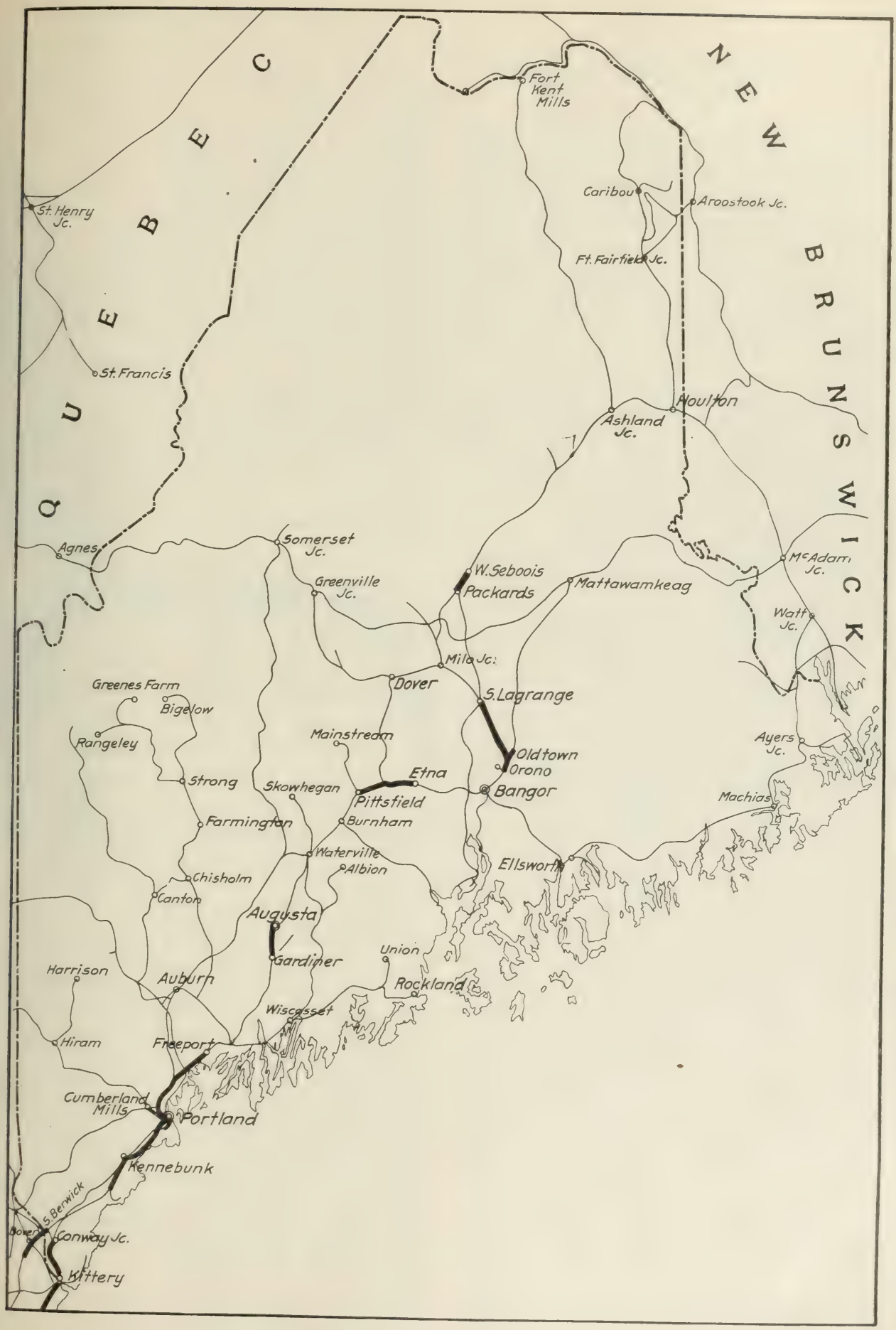
The map of the state of Maine, published herewith, has been made for the purpose of showing the location of all those pieces of railway in the state which have more than one main track. All railways in the state not here shown in heavy lines are single-track. The termini of the double-track sections are as follows:

Bangor & Aroostook.
Northern Maine Junction-S. Lagrange.
West Sebois-Packards.

Boston & Maine.
Kittery-Conway Junction.
Portland (1.77 miles).
Kennebunk-Portland, Western division.

Maine Central.
Portland-Freeport.
Gardiner-Augusta.
Pittsfield-Etna.
Orono-Oldtown.
Portland-Cumberland Mills.

Maps of other states are to follow.



Double-Track Railways in Maine.

SUBAQUEOUS TUNNELS.

BY R. B. WOODWORTH.
Engineer with the Carnegie Steel Company, Pittsburgh, Pa.

III.

The soft ground tunnel constructed with a side shield shades insensibly into the subaqueous tunnel, and indeed, so far as modern practice indicates, the chief difference between a soft ground tunnel through heavy water bearing strata and a subaqueous tunnel in soft material is the feature of hydrostatic head and the necessity for the employment of compressed air at high pressure, not as a matter of expediency and to avoid possible difficulties, but as a matter of necessity in view of conditions always present. The hydrostatic pressure increases with the diameter of the tunnel and is always greater at the bottom than it is at the top and its action needs very careful attention in tunnel design and in tunnel driving.

In the construction of subaqueous tunnels the thing chiefly to be desired is to get the roof of the tunnel as high as possible and its depth below mean low water is usually fixed by the harbor regulations which apply in the particular locality where the tunnel is built; as for example, in New York City the harbor regulations require a minimum depth of 40 ft. from mean low water to the top of the structure. The higher the roof of the tunnel can be made, the slighter are the grades necessary in approaches and the smaller, as a rule, the expenses of construction, it being sometimes possible to remove a large portion of the material by dredging methods rather than by mining. A smaller depth of water over the tunnel also means a lesser hydrostatic head and consequently a thinner tunnel lining. The danger in having the roof of the tunnel too close to the stream bottom arises from the usual treacherous character of the material, as blowouts may occur during its construction and the tunnel be drowned out entirely. These blowouts may take place through rock fissures or in soft material bodily throughout the entire mass.

The character of the material in the bottom of the stream has, therefore, a large bearing upon methods of subaqueous construction, and subaqueous tunnels may be classified in accordance with the methods which have been taken to overcome unstable conditions into three classes, which are:

1. The Closed Caisson and Excavating Method.
2. The Closed Caisson and Dredging Method.
3. The Shield Method.

With the first two of these it is not necessary at all that the material in the river bottom should be firm or that the tunnel bed should be below the bottom of the stream more than a sufficient distance to insure a firm foundation. Under the shield method the tunnel must either penetrate firm strata below the river bottom or else an air proof blanket be deposited over its entire extent.

CLOSED CAISSON AND EXCAVATING METHOD.

The Harlem River tunnel of the New York subway system, built in 1903, passes under the Harlem river through mud, silt and sand, the latter flowing with remarkable ease when wet. Between bulkhead lines the river, 26 ft. deep, is 400 ft. wide, but for 610 ft. the tunnel is made of two cast iron cylinders imbedded in concrete. D. D. McBean, of the subcontracting firm of McMullen & McBean, devised the following plan for its construction:

He proposed to inclose the space to be occupied by the tunnel by two lines of specially constructed 12-in. tight sheet piling. Upon these lines of piling cut to the proper level he would lay a timber roof of three layers of 12-in. x 12-in. timbers separated by courses of 2-in. plank running at right angles, making the roof 40 in. thick. Under the protection of the box so made he proposed to excavate the material either with or without the use of compressed air.

In the execution of this plan the river was first dredged so as to leave an average depth of 7 or 8 ft. of material to be removed. Four rows of piles were driven 6 ft. 4 in. apart, center to center transversely, and 8 ft. 4 in. apart longitudinally. They were cut off and capped to support the heavy timber roof and the interior bracing system and eventually were to be cut off at sub-grade to further support the finished tunnel. A line of 12-in. x 12-in. sheet piling was then driven along each side of the tunnel in careful alinement guided by a floating wale frame, steel pilot piles being further used to secure accuracy in driving. With the sheeting in place, the 40-in. thick timber roof, supported on six lines of 12-in. x 14-in. range timbers bolted to their bottoms, was floated into position, and when it was sunk these timbers rested exactly upon the two rows of sheet piling and the four inner rows of round piles. The sunken roof was next overlaid with about 5 ft. of earth dredged from the immediate vicinity to bring it to a firm bearing and to provide weight against the uplifting tendency of the air pressure. Each end of the box so formed was closed by suitable bulkheads, making the length of the timber 216 ft., or about half the width of the river, the other half being left open for navigation. When the water was driven from the working chamber formed within the box by compressed air, the leakage was found to be small and the sheeting in excellent alinement. The material inside was excavated with little trouble and the tunnel lined and concreted.

For the building of the second half of the tunnel Mr. McBean was convinced that a more economical form of construction could be devised by the substitution of the upper half of the tunnel itself for the heavy timber roof, especially as the timber roof had no function to perform after the completion of the tunnel. Fig. 7 shows the method by which the second half of the tunnel was constructed. The system of tunnel excavation after this method has been covered by letters patent. As before the site was dredged to nearly subgrade and a double line of 12-in. x 12-in. sheeting driven to form the sides and ends of the submerged box, but the sheeting was now cut off at the springing line of the tunnel to form a footing for the roof, which was built in three sections, two 90 ft. long and one 84 ft. long, in a floating box 106 ft. long, 35 ft. wide and 12 ft. deep. The bottom of this box was made of 12-in. x 12-in. transverse timbers laid 4 ft. apart and floored with 3-in. x 12-in. plank. On three 4-in. x 12-in. longitudinal timbers fastened to the floor of this box was then built a false floor for the upper half of the tunnel made of 16-in. x 16-in. transverse timbers 8 ft. apart carrying a center longitudinal sill of 10-in. x 16-in. timber and two side sills of 16-in. x 16-in. timber 6 ft. 3 in. from the center line. The space between these longitudinals was floored with 2-in. plank. Upon this false floor the cast iron tunnel was erected in 6-ft. rings. Rods and braces were introduced as a precaution against any possible deformation, and suspension bars were built through special cast iron and plate brackets. The roof was then covered with concrete tied together by imbedded reinforcing rods as a further precaution. Each 6-ft. ring of the iron shell weighed about 41,000 lbs. and carried 618 cu. ft. of concrete. It was estimated that the total weight

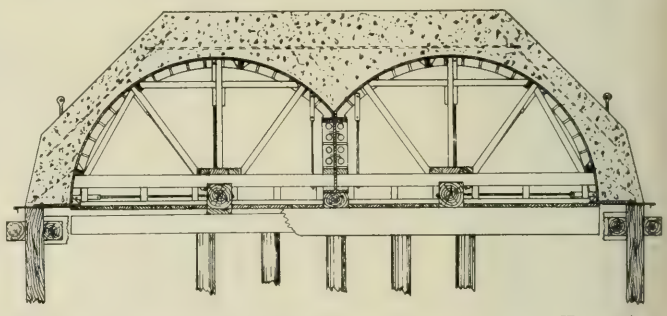


Fig. 7—McBean Construction; Harlem River Tunnel.

of the iron, concrete floor, etc., was about 50 lbs. per lineal foot less than the estimated buoyancy of the empty roof chamber. When everything was ready derrick boats were run along the side of the roof, the needle beams, floor, etc., lifted, the submerged box floated out from underneath and the roof lowered into its final position. At convenient intervals in the roof openings had been left for the descent of the workmen and for the removal of material. The excavation went on underneath the roof, which, with the lines of piling, formed a waterproof working space for the workmen. After the excavation had been completed under compressed air the interior of the tunnel was lined with concrete, the end bulkheads, surplus wood, etc., removed, leaving a reinforced concrete tunnel tube. The entire work was completed under the very low air pressure of 10 lbs. per square inch.

In this system of tunnel construction any shape desired may be given to the cross-section, also any combination of metal tubes and concrete, either plain or reinforced, can be employed. A twin double-track tunnel may be built as readily as a single tube, and such a double-track tunnel built as a single tube would possess materially increased rigidity and resistance to vibration under passing trains. This system also permits a much more rapid rate of working than is possible with other methods and provides ample opportunity for any kind of foundation desired underneath the structure.

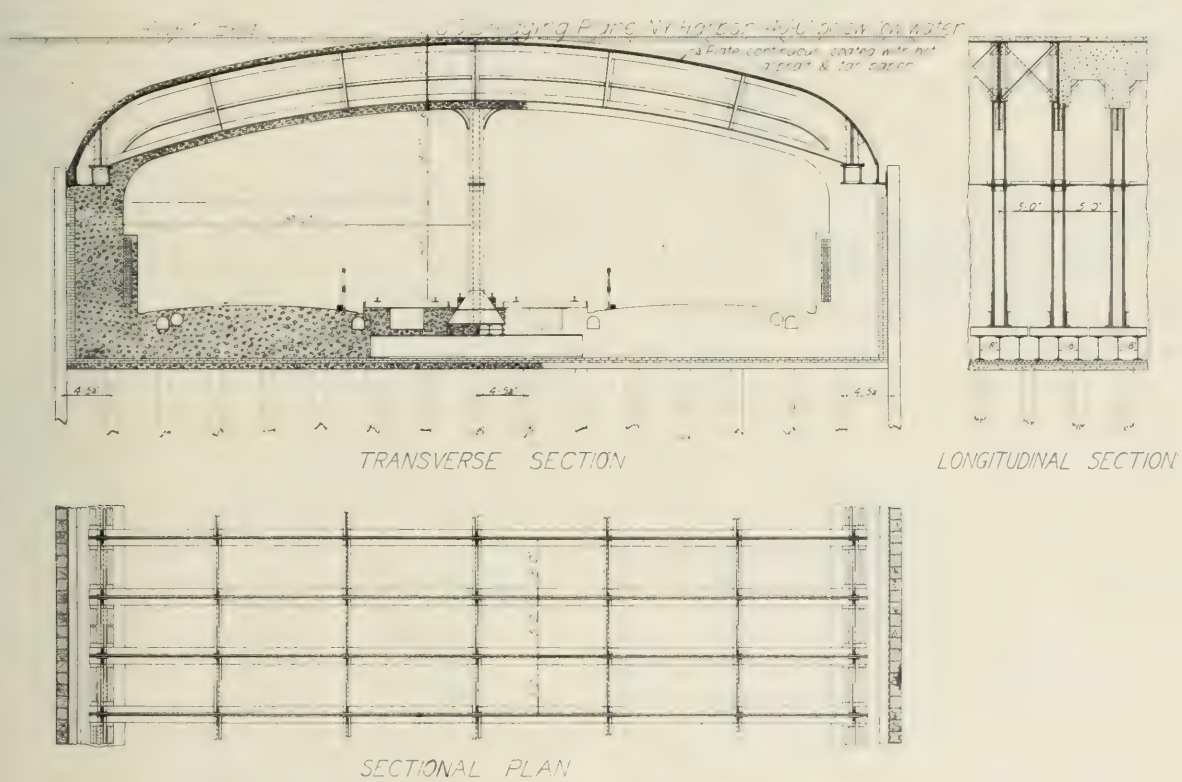


Fig. 8—Tunnel for Roadways; McBean System.

One of the advantages of this method of construction is the excessive weight of the cast iron tunnel segments which have to sustain, in this method of construction, tensile stresses for which they are not perfectly adapted and which require, therefore, an excess weight of material. To obviate these tensile stresses to some degree it is necessary that the false floor be made exceedingly heavy. In addition the design of the section for a double-track tunnel is such as to entail a considerable excess of concrete. To obviate these disadvantages and to utilize as well the known advantages of steel in all classes of building construction the design shown in Fig. 8 has been proposed by the Carnegie Steel Company. This design is for the construction of a subway boulevard 60 ft. wide, having a central column adjacent to which run two street car tracks separated from the roadways by ornamental railing. This tunnel can be constructed after the McBean system of driving wooden side sheeting, or steel sheet piling, building the steel and concrete roof on pontoons and floating into position. Excavation can then be made in perfect safety and convenience under the roof, which is connected by a water-proof metallic seal to the sheet piling. The foundation for the tunnel will be constructed on round timber piles driven with floating equipment at convenient intervals across the tunnel site. The center piles should be longer than the others in order to allow the crown of the tunnel roof to rest upon them during construction. The steel work is figured for vertical stresses only; horizontal stresses will pass through the concrete and be resisted thereby. Girders would be shipped in two pieces and in erection would be riveted together over the columns and to the 18-in. distributing beams at their ends. They will then be assembled in sections and fastened together by chains from one end of one girder to the opposite end of the next so as to prevent separating when lowered into position. These chains are figured for about 88,000 lbs. thrust in the girder and are to be connected by clevises to 1-in. plates between the girders and the distributing beams. This will cause the girders to act as arches during erection. After the sections are lowered into their position and the working chamber opened it will be desirable to excavate the center portion to put in grillage and columns before the side portions are removed. In order to cut down the amount of concrete required it is placed after the manner of floor arches in buildings. The estimated weight of the steel required, including the columns, the girders, the grillage, etc., is 7,900 lbs. per running foot.

CLOSED CAISSON AND DREDGING METHOD.

A somewhat similar method of construction has been followed in the tunnel crossing under the Seine river by Line No. 4 of the Metropolitan Railway, of Paris. The total length of the tunnel is 3,584 ft., of which 2,038 ft. were driven by the shield method, 1,320 ft. by the submerged caisson and 226 ft. by the freezing process. The tunnel is lined with cast iron segments and the same method of lining pertains through the

shield driven tunnels, the length built by the freezing process and that built by the caisson method. Three caissons, as shown in Fig. 9, were sunk end to end to form the crossing of the main stream, two others to form the crossing of a smaller branch, while three were sunk to form each of the two stations.

The three river caissons were 118, 126 and 142 ft. long, respectively, and the two caissons for the smaller crossing were each 66 ft. long. The caissons were made of structural steel ribs braced together by longitudinal framework consisting of heavy I-beams and short members made of steel angles. The frames were continued below the elevation of the floor to form the working chamber beneath the caisson. The entire frame-

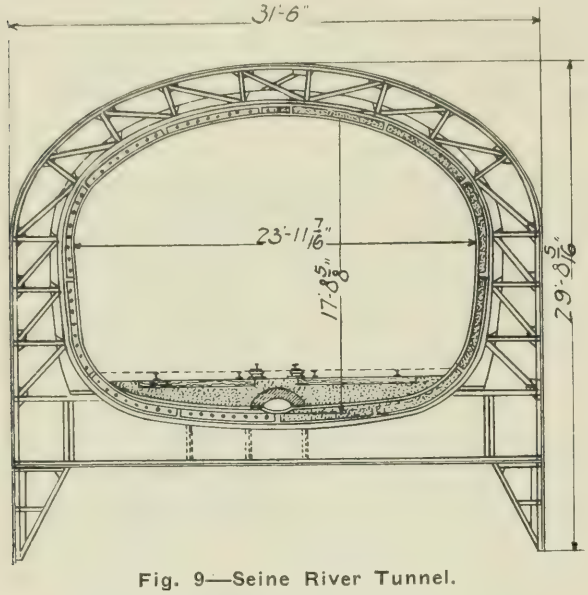


Fig. 9—Seine River Tunnel.

work, including the ends, was covered with steel plates so that when finished the caissons had flat sides and ends and an elliptical top. After erection the caissons were launched and towed into position between pile stagings, which served the double purpose of guiding their descent and forming a working platform. Previous to this sinking the portion of the river bed to be occupied by the caisson had been leveled by dredging. Once in position the cast iron segments were erected within the framework and the annular space between the lining and the shell filled with concrete, gradually sinking the caisson to the river bottom. As the sinking progressed the working shafts were placed in position, air pressure applied and the excavation proceeded with underneath the cutting edge of the caisson. No special difficulty was experienced in sinking the caisson aside from the hardness of the material which had to be broken up by blasting. A space was left between the successive caissons of about 5 ft. and it was proposed to close this space by building in a section of lining and steel envelope.

A similar method was followed in the construction of the subaqueous portion of the Detroit river tunnel, of the Michigan Central, 2,622½ ft. in length. The construction adopted was to build the entire length in ten sections of riveted twin tubes 23 ft. 4 in. in diameter built on shore, floated into position and sunk with the aid of air cylinders to position on a steel grillage with alinement beams laid in a dredged trench with a maximum bottom width of 48 ft. and a depth of 32 ft., one such grillage coming at each joint. The arrangement of the completed tube and the steel frame is shown in Fig. 10. The steel tubes were made of ⅜-in. plates with caulked lapped joints having double rows of ¾-in. rivets. The exterior of each tube was reinforced with transverse vertical diaphragms 12 ft. apart, made with ⅜-in. plates reinforced by pairs of 3½-in. x 3½-in. angles on the outer edges. The shape of the plate conformed to the cross-section of the concrete jacket, the lower edge being horizontal to serve as a cradle supporting the tubes on the steel grillage in the trench. Intermediate between the diaphragms were inside 3-in. x 3-in. flange angles with connections for twelve 1-in. adjustable radial rods connected to a center ring to provide interior bracing and to prevent deformation in handling. Before launching each end of each tube was temporarily closed with a timber bulkhead taking bearing against 3½-in. x 3½-in. inner flange angles of the tube. A pair of tubes 262½ ft. long altogether, weighing about 550 tons, were launched transversely and floated into position between rows of guide piles about 30 ft. each side of the center line of the tunnel. Each tube was equipped with two horizontal steel air cylinders about 10 ft. in diameter and 60 ft. long temporarily secured with adjustable chains to cradles in the diaphragms, as indicated in the general elevation.

The upper end of the trench in which the steel tubes lie was excavated by a dipper dredge and the lower part by a clam shell dredge provided with a specially designed clam shell bucket. The bottom was approximately leveled and the steel grillages sunk into approximately accurate position to receive the steel tubes. After the tubes had been centered over the grillages they were sunk into position by opening inlet valves in the lower part of the bulkheads and outlet valves in the upper part; water enters through the former causing the tubes to sink slowly. Enough water was admitted to sink the tubes below the surface until the air cylinders on top commenced to be submerged, maintaining the tubes in a horizontal position and preventing them from sinking further until their buoyancy was overcome. They were thus maintained in an even balance and gradually lowered to the bottom under perfect control without danger of severe stresses or distortion. After the sections were sunk and adjusted to exact position concrete was filled beneath and around the tubes, forming a monolith concrete structure in which are two steel-lined tubes 23 ft. 4 in. inside diameter This concrete is deposited under water through steel tremies in an outside form with vertical walls, between which and the sides of the dredged trench the space was backfilled. After

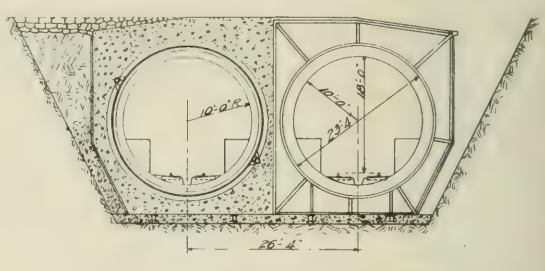


Fig. 10—Detroit River Tunnel.

the outside concreting was in place the tubes were lined with concrete 20 in. in thickness.

The underlying principles of the construction are as follows:

The steel shell serves first as a form for confining the outside concrete deposited through the water and later forms a perfect waterproofing for the completed tunnel. The outside concrete is of sufficient dimensions and strength to resist hydrostatic pressure when the water inside the steel tubes is pumped out in order to enable workmen to go inside and construct the tunnel proper without the employment of compressed air. The outside concrete fills up all depressions and irregularities in the bottom of the tunnel trench and makes, so to speak, its own bed. This will eliminate any tendency to settlement after the tunnel is completed and in use, and if the bottom has a tendency to yield or settle, it will do so while the outer concrete is being deposited rather than after the tunnel is completed. The tunnel proper, which is built inside of the steel shell and the outer concrete casing, is of

sufficient strength to resist all loads, whether hydrostatic, static or live, which may come upon it. It can be built in long sections at a time and under a strict and reliable system of inspection.

(*To be continued.*)

VALUE OF CARE IN FREIGHT YARD WORK.*

The preventional rules tending toward the minimization of railway terminal yard accidents and damages are many. The remedies I suggest have been tried and found fruitful of good results.

The personnel of the organization is of the foremost importance. It is the kind of men you have and the way they do the business that counts. Find out the class of men in the service and rid the ranks of objectionables—those continually laying themselves liable to dismissal. After closing the back door, as it were, then stand vigilantly at the front in this matter and know the class entering the ranks. Call applicants in and talk with them if a doubt exists as to the action to be taken. This plan often confirms an opinion after an examination of an application and the references therein. Use the veto power without hesitation if you would raise the standard of your organization. The best can be had by close discrimination. He who hunts flowers finds flowers; he who expects weeds gets weeds. Men with others depending upon them as a general rule are the cleanest, soberest and most reliable. The young chap with too much money often injures himself and the service by his conduct while off duty. Men careful about their personal appearance are careful with railway property, simply through the habit of carefulness. While being careful about the employment of men, be still more so about discharging one, especially a man that you have educated to your work. It is unquestionably true that most of the bad accidents in a yard are caused by new men—men who make serious mistakes before they get acquainted with the yard and your methods of doing the work.

By discharging a man with a previous good record for the sake of discipline (an uncertain quantity so many times) you may be hurting the service of your road, for the untried fellow you get in his place oftentimes costs dearly. You can afford to overlook a good deal with a man having a record above the average, rather than take chances with a new man inexperienced in your yard. With an intelligent man a good straight talk has the same effect as it would have with you if you were in his place and the offending one. Have your men realize that so long as they attend to business and do good work, you are "strong" for them, and that their positions are secure. The right kind of an employee likes to feel the security of his position. Have respect for his position as you would have respect for his character. Exercise your power for good by giving all of the men under you a square deal. Do not insult the intelligence of employees by ill-timed or excessive discipline. Where there are wholesale discharges the discipline is not as good as where the discharges are few, and it follows that the damages are largest where the discharges are largest.

A drinking man in a railway yard is a dangerous and an expensive individual. A man who gets to drinking on duty will cause more damage every day or night that he works, even though he only keeps his blood partially fired up, than his wages amount to. An employee found with intoxicating liquor of any kind in his locker, on his person, drinking it with his lunch or drinking it at any other time while he is on duty should be dismissed from the service.

Work grows interesting to that man doing his best to make it better. Seek and hold the conscientious workman in your yard (there are lots of them); encourage him all you can. He takes pride in his work. His conscience will not let him do poor work. He is a happy man, a money-maker for the company and a saver in many ways of the company's good money. No man overburdened with debt, who keeps saturated with liquor or who is deceiving those who trust him can do good work or be really happy. The employee in the yard who plays the game fairly leads a useful life. The thoughtless, careless and incompetent should be sidetracked as soon as possible.

Check closely the reports of accidents and damages. Some men would about as soon be suspended as to have to sit down and write out a report. Since the making out of reports is therefore so important a matter, it behooves superintendents, especially superintendents of terminals where large numbers of cars are handled, to provide the best possible check to insure the getting in of reports after damages occur. A report should be made out on regular form of all accidents or damages and left by the foreman of the crew in the general yardmaster's office, and by engineers in general foreman's or road foreman's office, before leaving duty the day of the occurrence. A serious accident should be immediately telephoned to the superintendent's office. A memorandum should be made of telephone reports, even those where the superintendent is not required to notify higher authorities, and held in the suspense file for a full report. It is not practicable to handle every accident by telephone, but a check can be had on the smaller accidents by getting a daily report from the foreman of the repair track of cars showing up with evidence of rough handling. When a bad order car is found in a yard which has come from some other yard the yardmaster should immediately telephone the particulars to the general yardmaster's office and also to the assistant yardmaster in charge of the yard from whence the car came, that an investigation may be started to ascertain how the damage was done and what crew caused the damage. Yard crews in some places even go so far as to break cars in two and make out no reports. This lowers the bars and opens the way for rough handling evils. Interest begets interest. If officials interest themselves in all cases of rough handling and car damage, if they get every possible check on reports covering the small as well as the large accidents, this solicitous concern is reflected by the concern of the men. It does not require a very close observer to see the effect. There will be one-half again more damage in the yard where there is no system. If a superintendent or a general yardmaster will get and keep a line on all damages, if he will insist on reports being made out by all concerned covering the damages, he can save the amount of his salary many times over every month by this one supervisory plan.

Engineers should stop and start trains skilfully. When trains are being shoved the men should not give violent stop signals except in emergency. Engineers stop according to signals given them. Extreme signals by yardmen to engineers are the cause of a great deal of damage. Here is where the importance of a foreman comes in. If he is careful about his signals and insists upon his men being the same way the engineer knows what to depend upon and how to handle engine. It is important for general yardmasters and assistants to see that each engine crew, and yard crew with the engine, cooperate to the fullest extent in the way of giving and taking signals. Not every switchman will make a foreman. Carefully look over the available men in making promotions. The good foreman considers the temperature and the weather; considers whether a car is loaded or empty; considers the direction and velocity of the wind; remembers what he has sent in on a track so as to make subsequent cuts into the track; boosts cars just far enough to couple on to stationary cars in on the track without causing damage; wastes no time shoving tracks at frequent intervals to close up gaps he has left by poor figuring; uses his head more and his feet less, and makes no false moves on the yard checkerboard.

In many yards where derailment occurs, the car gotten off track is put back on and started along, only to be derailed

*Extracts from a paper read before the St. Louis Railway Club by Charles Burlingame, Superintendent of the Wiggins Ferry Company. This company operates 13 miles of railway.

again. This can be avoided, if, when a car is first derailed, the yardmaster calls an inspector to inspect it. The first available inspector should be required to look over the car. It should not be moved out of the district where the derailment occurred until inspection is made. In case a foreign line crew has a car off the track, arrangements should be mode by assistant yardmaster, through the office of the general yardmaster or the superintendent, for a joint inspection of the car by the foreign line and home line inspectors, while the case is fresh, to determine responsibility, thereby saving an endless amount of correspondence in trying to get at the responsibility after the facts get cold.

A common cause of damage is the cornering of cars by shoving through a track where a car on a converging track does not clear. Some foremen have a habit of shoving cars into such tracks blindly and pushing them down without regard to what the conditions may be at the far end. This dangerous procedure is the cause, I might say, of the most serious mishaps in railway yards. Always send a man ahead. Another inexcusable carelessness in railway yards is the coupling of a car with the load protruding over the end in to a box car, instead of cutting in a trailer. Cars in a weakened condition or slightly damaged we placard with a special card; also require car inspectors, when they find it necessary to card a car on connection track, to make a notation on a blank card showing car number, initial and location in the track and tack this card on head car on connection track to notify foreman of switching crew that there is a special bad order in on the track. Yardmen know that a car with this card tacked on it requires special handling. A general order has been issued on the subject to yardmen that they handle such cars separately and alone. Before these instructions were issued cars slightly damaged were often put in heavy trains and the damage very much augmented before they reached the repair track or unloading point. Where coupler attachments or other parts of a car are weakened sufficient to justify their being sent to the repair track, much money will be saved by giving such cars special attention. Weakened cars will run hundreds of miles in a road haul without giving trouble, and only give way when put to the heavy strain of switching in terminals.

A new air hose and a large wrench should be provided on each yard engine, the wrench for removing and applying air hose. When a hose is used, take care to charge it to the right car. Cars loaded with bulk bottles or other easily breakable material, either loading or unloading on a track where the work will not be finished before the track is to be switched, should be put at the farthest end of the track, and the foreman switching in on that track should see that his cars are left a sufficient distance away. These cars should be loaded and unloaded in some out-of-the-way place and not be disturbed by switching. Large claims are being paid by railways right along because such cars are disturbed while loading or unloading. The car does not necessarily have to be roughly handled to cause damage. Ordinary handling will cause it.

In all terminals there are here and there bridges, buildings, platforms, switch stands, signal stands and other obstructions which do not clear extra large, extra long or leaning cars. Issue a general notice calling attention of yardmen to the kind of cars that will not clear. This emphasizes the importance of keeping regular men in the service, foremen who are acquainted with the physical conditions, since in these modern days cars are being built larger and larger. Most damages happen where a new foreman is in charge of a crew. These are very aggravating accidents to proprietors of industries on your rails. The remedy is proper notice to employees, watchfulness to see that the notices are complied with and steady working foremen in that part of the yard territory.

There are also places which do not clear a man standing on top of a covered car, or hanging on the side of any kind of a car. We all realize how dangerous they are to life and limb. These should be clearly designated on the back of your application blank, and new places that spring up from time to time covered by general notices until new supply of the application blank is printed. Yardmen must be kept acquainted with these points; they must be cautioned to be very watchful while working about them and not take any chances on getting injured.

In some cases yardmasters expect too much work out of an engine. One day of worry is more wearing on a man than ten days of sweet-tempered work. * * * Let me think aloud about the matter of kicking cars too hard in switching. It is a business that is entirely in the hands of yardmen. Yardmen should give stop signals before the cars attain too much momentum, remembering that if they do not run in to clear it is cheaper to go down and shove them in.

Did you know that where a car loaded with grain is damaged and some of the grain leaks out that often the spilt grain will be shoveled back into the same car? We take the grain and use it for our company teams or sack and sell it. When it is shoveled up and thrown into the original load it invariably results in refusal of car by consignee, whether any dirt gets in with the grain or not.

Probably the most prevalent accidents in a yard are those where couplers and draft timbers are pulled out. The draft rigging seems to be the weakest point in car construction; therefore, when a car has one sleeve bolt broken or gone, two draft bolts broken or gone from one timber, or two or more lug bolts gone from one lug, I say the car should be riptracked. Where this is done the pulling out of couplers and draft timbers will be reduced to a minimum and growth of damage avoided, which spells money saved through timely attention. * * * Car doors which fall off should be loaded into the car they belong to, if possible; if not, place the door clear of rails and give the general yardmaster or foreman of repair track a memorandum. In this way special attention can be given to the matter of picking it up, whereas if no attention is given to it the door will be stolen for shanty or fence construction, or will be run over and destroyed. Do not allow doors to be thrown indiscriminately into empty cars to clear the yards. Load them either into car bearing same number and initial as the door, or into a foreign empty after it is carded to the repair track, to deliver the door there; on the principle that it is cheaper to pay 25 cents per diem on the foreign car and do the switching rather than allow a $5 door to go astray. A car door in medium good condition is worth about $5.

If properly instructed, careful switch foremen in charge of trains, those handling transfer trains in either direction between different zones in a chain of yards, or handling deliveries to another road for a considerable distance, will look them over, or have a responsible helper do so, to see that all hand brakes are released, air-brake retaining valves properly adjusted and car doors fastened, in this way preventing the sliding and flattening of wheels, tearing off of car doors, battering of switch lamps or signal posts, saving much by their carefulness. At some places inspectors do not look over trains before they are started out; here is where it devolves upon the foremen to look them over. A car with brake set does not have to be hauled far to slide the wheels. If they are flattened it costs about $10 a pair. Little precautions can save the railway company many dollars. Where a freight train or a switch cut has to take run for a hill in terminals, the conductor or foreman should, in all cases, before attempting to make the run, send one of his men to the top of the hill to see that all intervening switches are properly set; that wagons on intersecting or paralleling streets are out of the way, and cars on side tracks are in to clear.

Yardmen should not attempt to use a new track anywhere until it has been regularly turned over to the transportation department by the maintenance-of-way department.

A frequent cause of damage is the shifting of dressed lumber. If a car is struck hard, lumber starts sliding and the

end of the car is broken out. I have thought it might be worth while, particularly on roads that handle a great deal of this material, to get specially built cars, having the ends reinforced with steel plates anchored into steel sills.

Refrigerators having side doors that swing out, when carded empty, should have doors securely latched by yard clerk doing the carding; and car inspectors should give such cars special attention on receipt from connections to see that the doors are securely latched.

When push poles, chains or rerailing frogs are broken the pieces should be placed on engine and report sent to general yardmaster by foreman of crew on proper form explaining the accident, and the engineer on the engine should, after turning in, morning, noon or night, be sure to get new ones before leaving engine house. The lack of these instruments where they ought to be, on the engine, convenient, when they are needed and are not there, costs railways astonishingly. It is false economy for locomotives to be without push poles, chains and rerailing frogs.

Many dangers occur in stopping trains on curves, thereby causing couplers to pass each other and break guard arms off. Engineers can save this damage by taking slack properly and applying brakes scientifically. An engineer who does not take slack properly or who uses poor judgment in applying brakes will cause hundreds of dollars of damage that a more careful man on engine will avoid.

Switch lights should be on all main line yard tracks and on main lead tracks. Switch lights enable men to do more work and avoid many accidents. Men cannot work quickly nor safely where they have to grope around the yards in the dark without any markers to indicate how switches are set.

There should be a general order and general notice board in each cabin or office frequented by assistant yardmasters, engineers, firemen, hostlers, trainmen and yardmen. These boards should be incased in a box with a glass front to protect the sheets from the dirt and keep them from being torn or destroyed. Men can read them through the glass front, and they are much better preserved than if hung out in the open. General notices play an important part in the avoidance of damages. The files should not be encumbered with dead timber to the confusion of those reading, particularly new men.

Yard enginemen, foremen and switchmen should not be worked any part of the noon or midnight meal hour, nor should they be worked overtime, except in the most extreme emergency cases. They need a full hour in which to partake of lunch at noon and midnight and need, to give good service after lunching, a suitable switch house, where they can be comfortable while the important part of digestion is taking place. An ill-digested meal or working over a reasonable number of hours causes a man to become sulky and makes him reckless. If this meal does not settle well or a man has worked too long hours it shows both in his physical and mental work. Any man when ill-tempered is more likely to be reckless. The starting time of crews can be graduated and the spacing of crews around noon and midnight can be regulated by some figuring, so that the forces can be given an hour in which to eat and not work more than ten hours continuously. When this is done the men will grow to like the conditions better. Where overtime is tolerated there is a continual temptation on the part of most men to overdo. They lose sight of their physical selves. Some drag out their work to get in overtime in their anxiety for the money they make working it. This is a matter which can be looked after by superintendents to the everlasting profit of the railways. Let the superintendent view the physical aspect of the matter, not only for the good of the men, but in the interest of the service. He can do it to the physical good of the men and to the financial benefit of the company. Men need rest and recuperation, and show the result of it in their work after dinner or after midnight lunch hour. If they enjoy their hour, which they will under right conditions, they come out eager to drive their work before them. The condition of the minds of men has a great deal to do with the proposition. The general yardmaster and his assistants should strive diplomatically to keep foremen and engineers in the proper frame of mind while they are on duty, and the foremen and engineers in turn use the same influence on those under them. It helps so much to get along pleasantly and harmoniously. When a crew does get along pleasantly the men are anxious to come out to work and to prosecute it vigorously. Where men get at loggerheads with each other they have been known to give violent signals and otherwise "try" themselves, thinking they are taking their spite out on the object of their hatred; but they are only tearing company property to pieces. When they come to make their explanation tempers have subsided and a frame-up of reports relative to the damage may occur if the yardmaster gets on to the case and they actually have to make out reports at all. * * * Do not force men to work together where you know an antagonism has grown up, if by changing around it can be avoided. The feeling is liable to grow worse. It can easily be cured if the men are half sensible. I have seen cases where a man changed off in this manner would do the best kind of work.

Replying to a question Mr. Burlingame said: In regard to following men off duty as to drinking. We do not do this unless the man's appearance while at work indicates that he is drinking heavily. If I know him to be a drinking fellow that stays up half the night in and around saloons, drinking and influencing other men to drink with him, I have followed them up. I have called men into the office and proved to them just how much they took in each saloon, who they drank with, and have warned them if they did not stop it they would be dismissed. If a man drinks immoderately off duty it is our business. What he does off duty, if he takes care of himself, is not especially our business. I have found that when we tell these men where they drank and what they drank, they know that we have such good tab on them that they stop it. I have not had any trouble. If a man is dismissed for drinking, or any other charge where liquor is concerned, I simply give them a certificate discharging them "for violation of rules," or simply say "dismissed," without giving a cause at all.

ELECTRIC TRACTION.*

BY GEORGE GIBBS.

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ELECTRIC LOCOMOTIVES.

Electric locomotives for heavy service are still in the development stage; much has been done towards perfecting their design, but much remains to be done before the questions of their design and practical performance reach the stage of accumulated knowledge which we possess of these elements in steam locomotives. In the earlier stages of the art, attention was mostly directed to the perfection of electric apparatus; the importance of the mechanical features of the machine in its adaptation to track conditions, were not fully appreciated. In fact, it was assumed that the characteristics of rotary motion and uniform torque, possessed by an electric motor, made its application to a locomotive a simple matter, and removed one of the chief defects of a steam locomotive, the unbalanced reciprocating weights and unsymmetrical turning effort, which were held to be destructive to track. Experience has taught, however, that there are other elements in a locomotive which may be even more destructive; namely, unduly low center of gravity and improper weight and wheel base distribution. Defective design in these respects becomes especially noticeable in a machine where power is applied with extraordinary compactness, and where the machinery for its development is naturally centered around the driving axles, and

*From a report to be presented before the International Railway Congress.

the weight concentrated below the wheel tops. It appears to be a fact that in present designs of electric locomotives, a given total weight and individual wheel weight is more destructive to track than the same weight distributed as in steam locomotives. It is noticeable in motor cars even, that the quite moderate axle weights of a motor truck have an unfavorable effect upon economy in track maintenance.

Th importance, therefore, of a study of the electric locomotive problem from standpoints other than that of power development, is being recognized and the co-operation of practical railway men in the design is being sought.

The first electric locomotives were practically powerful motor cars; that is, single-reduction motors were mounted on bogie trucks and carried a body and cab for housing the control apparatus. Then steam locomotive design began to be copied in the use of rigid frames carrying at times four axles and motors, and gearless motors of large capacity and great weight were employed. In the greater number of the earlier designs all weight was adhesive for driving—a feature which was supposed to constitute one great advantage of an electric over a steam locomotive.

These heavy and powerful locomotives at high speed began to manifest their bad riding qualities, and they were suspected of being "hard on track." In order to bring out the facts experimentally, the Pennsylvania Railroad Company, who were about to design locomotives for their tunnel entrance into New York City, constructed a special test track with apparatus for measuring side pressures upon the rail; they built sample locomotives of different designs and instituted a series of tests of electric and steam locomotives to determine their relative riding qualities at speed. It is not the purpose of this report to go into the results of these tests in detail, but some of the more important conclusions may be stated in general as having a bearing upon the radical departure determined upon in design of their high speed electric locomotives.

It was found that all types of locomotives were practically steady at speeds under 40 miles per hour, but that above this speed marked differences appeared; that the steadiest riding machines were those with high center of gravity and with long and unsymmetrical wheel base. In other words, that the nearer steam locomotive design is approached in wheel arrangement, distribution of weight, height of center of gravity and ratio of spring-borne to under-spring weight, the less the side pressures registered on the rail head.

In addition to the excessive side pressures on the rail head, due to the oscillation and "nosing" of a low center of gravity machine, abnormal track effects may be caused by the vertical pounding due to a large non-spring-borne motor weight, or to weights with imperfect spring cushion. A remedy for all of these defects appears to mean a radical departure in the design of a high speed locomotive, both as to its running gear and as to the form of motor drive. It means a combination of driving and carrying wheels, an unsymmetrically disposed wheel base and the setting of the motors on the main frames above the axles. The extent of the departures in practice thought desirable for heavy high speed locomotives is shown in the diagrams and photographs of the Pennsylvania locomotive. It will be noted that it is a "double locomotive," the halves being permanently connected, with the wheel arrangement of two "American" type steam locomotives (4-4-0) set back to back. Each half locomotive has a single very large gearless motor, set on top of the frames and driving through connecting rods to a jack shaft and thence by main and parallel rods to the wheels. The main features of this design may also be worked out by combining motor gearing with rods and with economy in motor cost on a slow-speed locomotive, but it was thought that the purely rod-drive was more suitable for high speed service. It will be interesting to observe from the diagram its similarity to a steam locomotive in the height of center of gravity and the ratio of spring-borne to non-spring-borne weight.

FIRST COST.

It is difficult, in fact, practically impossible to give any general statement of the first cost of electrification which can be safely applied to individual cases. In the case of an entirely new line, built for traction by electricity, unit costs may be made to apply, but in the case of conversion of an existing steam line there are many collateral costs to be considered aside from those of electric equipment. In few cases will an electrified steam railway be conducted precisely in the same manner as that previously done by steam; that is to say, multiple unit train service at frequent intervals will displace part or all of the infrequent locomotive train service; existing tracks, yards and terminals, stations, signaling and telegraph lines must be changed to a greater or less extent to adapt the road to the new class of service; special rolling stock must in part be purchased and in places new real estate acquired.

It therefore results that each electrification must be dealt with as a separate and individual problem and cost figures for one situation will generally not apply to another, even if the other road is of similar character. Generally speaking, the cost of converting a steam railway is very high under American conditions, taking into account the changes in the physical property and equipment it will at times mean a doubling of the existing capitalization.

The high cost of conversion will act as a deterring factor upon additional electric construction until a sufficient number of installations are made to furnish evidence of the advantages and economy of electric traction; in fact, railway managers although watching closely, and with interest, the pioneer installations of electric operation on steam roads have not been anxious to duplicate experiments in advance of a demonstration of the results, and are awaiting this demonstration.

As elsewhere stated, the systems available for heavy traction are the A. C.-D. C. and the straight A. C., either single phase of polyphase. Comparative first cost figures for these two systems would be interesting, but are available only from estimates for the reasons before given and because of the fact that the systems are not in the same stage of development; thus, figures of cost for A. C.-D. C. would be more exact than in the case of the single phase because figures for the latter system must be made on assumptions of present methods of application, and these methods are, it is thought, susceptible to important modifications.

Considering the electrical items of installation, the chief elements of cost may be grouped under three headings; the power house, the transmission system from power house to the cars, and the train equipment.

Of these three divisions, in general the power house is the least expensive and the train equipment the most. For illustration, and comparing figures for the two systems, an estimate may be given of the case of a trunk line road with dense suburban traffic conducted by multiple unit trains and with an important through business conducted by electric locomotives. The percentage of the total electrical cost carried by the three equipment divisions were as follows:

	System—	
	A. C.-D. C.	A. C. (single phase).
Power house	23 per cent.	25 per cent.
Transmission, power house to cars	35 "	22 "
Train equipments	42 "	53 "
Total	100 per cent.	100 per cent.

These percentage figures are given to show the relative importance, as regards cost, of the three divisions for the two systems, and shows the larger proportion carried by the train equipments of the single phase system.

The actual money value of the various costs would not be useful without a detailed presentation of the case, but the important fact developed was that there was little difference figured for the total first cost of either system. In other words, as at present developed, it appears that for a dense suburban

service conducted by multiple unit trains, or, in the case of locomotive haulage in terminals or over short lengths of a main line, there would be little difference in first cost between third rail A. C.-D. C. system and the single phase alternating current system; in fact, the figured differences are so small as to be within the limits of error in calculation. As, however, the length of line increases and as the frequency of trains becomes less and the weight of the trains increases, the single phase system becomes cheaper in comparison with the A. C.-D. C. and a substantial saving in first cost can be effected by the use of single phase on such lines. In fact, for long trunk line work and with the average density of traffic found on American railways, the first cost of the A. C.-D. C. system would certainly be prohibitive, whereas there will be found instances where this will not be the case with the alternating current system. It is, of course, a matter of importance to determine the prospect of reducing first cost. This might be accomplished by lowering in price of apparatus, or by a radical change in system, or by both. There appears to be a reasonable prospect of some substantial reduction in the first cost of electric apparatus, as the market for same broadens, but the manufacturers do not promise very radical reductions. As to the prospect of a change to a system inherently simpler and cheaper than existing ones, it would be unprofitable to predict what the future may bring forth; a system which would eliminate the element of transmission, power house to cars, would seem to open up a prospect of important simplification and cheapening, but such a system does not appear to be in process of development.

COST OF OPERATION.

This is a matter of the highest importance to railway officials, since the question of net yield is the foundation for an investment. High first cost may act as a deterrent in the rapid introduction of an improvement, but in the end a new system will prevail if the operating results, as measured by the net earnings, show a betterment. Under another heading will be given a summation of the advantages of electric traction and a statement of its probable field, but it is here proposed to give such concrete examples of operating costs as are available to the writer. It is to be regretted that the list it not longer, but it includes, perhaps, the only cases in which important installations have been in complete operation for a long enough period to furnish comprehensive figures.

The installations referred to are those on the Long Island Railroad and the West Jersey & Seashore Railroad, and figures are presented for two complete years, operation in each case.

Below are condensed tabular statements, taken from the complete monthly and yearly tables, of the figures which can be usefully given without lengthy explanation. They may be referred to as follows:

Table 1 gives a concise statement of the camparative physical characteristics of the electric installations on the two roads, from which a general idea of the magnitude of the operation may be gathered.

Table 2 gives average number of cars in trains and the average weight per car. It will be noted that the average weight per car changes slightly in the two years, due to a change in the ratio of the motor to trailer cars.

Table 3 gives comparative figures for electrical quantities and efficiencies and is of interest in showing the distribution of the various losses in electrical energy from the power house to the cars. The figures for power consumption per ton-mile and per car-mile represent fair averages for electric installations of the character in question and in a climate which requires a considerable consumption of energy in winter for heating the cars. Electric heating adds very largely to power consumption, as will be illustrated when it is stated that, in summer months, the watt-hours per ton-mile at substations on the West Jersey & Seashore Railroad were about 63, while in mid-winter months this figure rose to 100; the larger part of this difference is due to the additional energy required to light and heat the cars in winter. It is interesting to note also that the efficiency of the electric system from the power station to the point where the current leaves the substation for feeding into the third rail is from 70 to 80 per cent., depending upon the loading during the various months; in the busy months, the efficiency will at times run as high as 85 per cent. The losses from the substation to the cars in the direct current feeder system cannot be accurately measured, but in the cases cited it is estimated to be between 5 and 10 per cent. The figures given for "current used for other purposes" illustrate the considerable and useful consumption of power for running shop motors, lighting stations and operating the signal system.

Table 4 gives the cost of generating current at the power house and cost of the current when delivered at the cars. The former figures include all power house operating and maintenance expenses, but no fixed charges, taxes or depreciation charges. The "delivered cost" includes the operating and maintenance cost for transmission lines, third rail, track bonding and substations and allowances for losses in transmission of the current and its conversion to direct current delivered at the car contact shoes. It should be noted, however, that the above figures do not include any maintenance expenses other than for electrical apparatus, and no portion of the general expenses of the railway.

Table 5 gives the monthly car mileage and cost per car-mile; the total yearly mileage and the average car-mile cost; and average yearly cost per 1,000 ton-miles moved. The cost per car-mile includes the following: The cost of power, maintenance of third rail and track bonding, maintenance of car bodies and trucks, maintenance of way and equipment expenses, conducting transportation and traffic expenses, general expenses, wages of motormen and train crews; in fact, all operating expenses of the railway. In comparing the costs per car-mile, the difference in weight of cars, given in table 2, should be noted; it should furthermore be explained that in the case of the Long Island Railroad, all trains may be termed "local" as the average length of the run on the so-called express service is only about 2½ miles, whereas on the West Jersey & Seashore Railroad about one-third of the total train-miles are made in cross-country express service with an average length of run of about 25 miles between stops, and the remaining service termed "local" averages 2½ miles between stops, or about the same as express service on the Long Island Railroad. In other words, the Long Island installation may be considered purely local service in a densely populated district, whereas the West Jersey service approximates main line railway conditions with long runs.

GENERAL REMARKS UPON TABLES.

As before stated, the two roads have been in operation for a sufficiently long time to rather definitely establish the behavior of all apparatus in practical service; there is no indication that in subsequent years of operation there will develop cause for extraordinary maintenance in any particular items due to the accumulative effect of service. It should be noted, however, that no account is taken of possible advances in the electric art, which might make the equipment obsolete; in other words, no "depreciation" account has been kept. In a rapidly advancing art, replacements on account of "change of type" are quite possible contingencies, but much difference of opinion exists upon this whole subject in America and its pros and cons cannot be entered into in this general report.

Of the total cost per car-mile, one-third is due to cost of supplying power to the car, including maintenance of all parts of the electric system on the car, and of this figure about one-half is the cost of the power alone. In both roads the load conditions at the power houses are not favorable, nor is the quantity of power turned out as large as it is expected to be in the near future, so that the item for cost of power at the car should come down considerably as the magnitude of the operation increases. Other items also in the total cost per

car-mile, namely, general expenses of various kinds and wages of motormen and train crews, are largely affected by density of traffic and have a downward tendency.

The list of detentions looks quite formidable, but when analyzed the general result is found to be good. Motors, as before stated, have been brought to a high state of perfection and detentions caused by their failure on the road are rare and largely due to overloading. The temptation in electric service is constantly to overload, either quickening the schedule, increasing the number of stops or adding trailer cars; this is due to the fact that the apparent limit of capacity of railway motors is their ability to make schedule and it is often not remembered by the railway superintendent that this is far beyond the heating capacity of the motors.

Where all cars in a train are motor cars, overloading cannot be as readily accomplished as where trailers are hauled, especially if the motors have been designed to take care of a continuous running condition with the minimum number of stops, as is generally the case.

The multiple unit control system is a very complicated assemblage of delicate apparatus, but works surprisingly well and when properly maintained it will be noted gives very little trouble.

Table 1.

	Long Island Railroad. 1907.	Long Island Railroad. 1908.	West Jersey & Seashore R.R. 1907-1908
Route miles of track	37.6	43.9	74.6
Miles of single track	90.0	98.69	152.5
" " high-tension pole line	41.0	42.0	69.59
" " " circuit (3-phase)	70.24	80.03	417.54
" " " circuit (1-phase)	14.1	9.7	None.
" " conduit	9.09	9.09	None
High-tension transmission voltage	11.000	11,000	33,000
Number of substations	6	6	8
Number of portable substations	2	2	None.
Capacity of substations	19,500	19,500	17,000
" portable substations	2,000	2,000	None.
" of power house	16,500	16,500	8,000
Number of motor cars	130	132	80
" " trailer cars	84	82	None.
" " baggage and mail cars	5	5	8

Table 2.—*Weight of Cars and Make-up of Trains.*

	Long Island Railroad. 1907.	Long Island Railroad. 1908.	West Jersey & Seashore R.R. 1907.	West Jersey & Seashore R.R. 1908.
Average car per train	3.70	3.94	2.95	3.45
Av. tons per car (ton of 2,000 lbs)	37.8	36.5	47.9	47.4

The relatively unfavorable showing on the West Jersey for electric saving is in part accounted for by the difference in character of the service on the two roads, as before explained, and by the fact on the Long Island road the average length of train in steam service was about the same as in the electric and the stops frequent; it was, therefore, costly service. On the West Jersey the average cars per steam train was twice that of the electric and much of the service was long distance express with few stops and of an exceptionally economical character.

Cost compared with steam.

Considering the figures for the year 1908 it is seen that the Long Island road operated their electric mileage at a cost of 17.80 cents per car-mile; the steam train mileage cost 27.95 cents, a difference in favor of electric traction of 10.15 cents per car-mile. On the West Jersey & Seashore Railroad the electric mileage cost 20.46 cents per car-mile as against 22.30 cents for the steam mileage, or a saving for the electric service of 1.94 cents per car-mile.

Operating costs of A. C.-D. C. vs. A. C.

A comparison of this kind must, at present writing, be based on estimates and opinion, as no operating figures for the A. C. systems are obtainable. It is the opinion of the writer that the maintenance costs of the single phase system, as at present developed, will be somewhat higher than for the A.C.-D.C., but not by an important amount; eventually the maintenance costs should be about the same for either system. The total operating cost figure, however, will probably be in favor of the single phase system, because of the higher average efficiency of this system and the lower operating cost of substations. The importance of the savings possible for the single phase will depend upon the character and extent of the traction scheme, becoming greater as the length of line increases and the density of traffic decreases. It is impossible, however, to generalize safely and each case should be considered upon its own merits.

An estimate may be given for the particular case referred to under the "first cost" heading, in which it was figured that about 13 per cent. less energy at the power house would be required for the single phase than for the A.C.-D.C. system. This, together with the saving in substation operation, would

Table 5.—*Car-mile Costs.*

Month.	Car-miles. West Jersey & Seashore R.R. 1907.	Car-miles. West Jersey & Seashore R.R. 1908.	Car-miles. Long Island Railroad 1907.	Car-miles. Long Island Railroad 1908.	Cost per car-mile. West Jersey & Seashore R.R. 1907. cts.	Cost per car-mile. West Jersey & Seashore R.R. 1908. cts.	Cost per car-mile. Long Isl'd R.R. 1907. cts.	Cost per car-mile. Long Isl'd R.R. 1908. cts.
Jan.	294,672	281,723	235,828	201,128	27.50	29.29	28.16	26.97
Feb.	255,344	271,542	214,242	186,256	30.90	28.53	30.04	27.87
Mar.	270,286	291,959	241,024	224,919	23.90	26.57	28.05	24.77
Apr.	244,431	331,224	281,509	271,224	24.30	21.34	24.05	23.94
May	267,317	323,584	347,211	382,195	21.50	19.97	21.39	20.90
June	292,767	344,523	349,133	478,793	22.50	18.92	22.32	18.00
July	435,860	451,149	392,514	628,511	15.30	16.17	15.73	13.53
Aug.	478,041	485,565	400,880	632,388	14.90	13.71	15.59	13.26
Sept.	411,359	369,204	299,798	509,213	15.85	17.17	19.87	14.79
Oct.	317,141	312,833	306,138	441,638	23.50	19.55	22.37	17.21
Nov.	292,349	282,322	245,748	345,640	21.40	20.42	25.93	22.29
Dec.	295,097	292,397	212,144	360,325	22.60	22.68	27.48	22.45
Total	3,854,664	4,044,025	3,526,227	4,662,230	21.30	20.46	22.45	17.80
Cost*					$4.406	$4.307	$5.94	$4.86

*Per 1000 ton-miles.

Table 3.—*Energy Consumption.*

	1907. Long Island Railroad.	1907. West Jersey & Seashore R.R.	1908. Long Island Railroad	1908. West Jersey & Seashore R.R.
1. A. C. kilowatt-hours received at substations	20,341,826	.....	21,899,739	.....
2. Efficiency of H. T. transmission	96.2	.....	97.7	.....
3. D. C. kilowatt-hours delivered from substations	16,138,965	14,585,900	18,138,515	16,088,300
4. D. C. kilowatt-hours used for electric traction	13,466,995	13,530,659	16,201,962	14,780,145
5. D. C. kilowatt-hours used for other purposes	896,075	389,672	901,934	731,771
6. Kilowatt-hours lost in conversion from A. C. to D. C.	4,202,861	5,882,510	3,761,224	5,997,020
7. Efficiency from power house to substation bus-bars	78.52 per ct.	72.15 per ct.	81.3 per ct.	73.8 per ct.
8. Total ton-miles-passenger	141,541,106	184,615,535	180,129,860	192,472,541
9. Car-miles-passenger	3,808,479	3,855,580	4,945,719	4,044,025
10. Train-miles-passenger	1,021,102	1,305,663	1,251,877	1,172,894
11. Watt-hours per ton-mile at substations	95.2	73.29	90.0	76.8
12. Watt-hours per ton-mile at power house	121.2	101.58	110.6	104.0
13. Kilowatt-hours per car-mile at power house	4.51	4.86	4.028	4.95
14. Kilowatt-hours per car-mile at substation	3.54	3.51	3.276	3.66

Table 4.—*Current and Maintenance Costs.*

	Long Island Railroad. 1907.	Long Island Railroad. 1908.	West Jersey & Seashore R.R. 1907.	West Jersey & Seashore R.R. 1908.
Cost per kilowatt-hour at power house	0.804 cents	0.697 cents.	0.680 cents.	0.592 cents.
Cost per kilowatt-hour at cars	1.705 "	1.461 "	1.302 "	1.151 "
Cost per car-mile for maintenance of electrical equipment on cars	0.71 "	0.76 "	.....	.....
Net output in kilowatt-hours at power house	.....	31,517,200	.....	22,887,800
Pounds of coal per kilowatt hour	.....	3.29	.....	3.36
Cost of coal per ton (of 2,000 lbs.)	.....	$2.512	.....	$2.1814
Number and capacity of units	.....	Three : 5,500-kw.	.....	Four : 2,000-kw.
Total kilowatts capacity of power house	.....	16,500	.....	8,000

TABLE 10. GENERAL CHARACTERISTICS OF ELECTRIC LOCOMOTIVES.

Key No. for reference to diagrams and curves	Baltimore & Ohio Railroad — Passenger. 1	Baltimore & Ohio Railroad — Freight. 2	New York Central & Hudson River R. R. — Original. 3	New York Central & Hudson River R. R. — Revised. 4	Pennsylvania Railroad — Experimtl. 5	Pennsylvania Railroad — Experimtl. 6	Pennsylvania Railroad — Passenger. 7	New York, New Haven & Hartford R.R. — Original. 8	New York, New Haven & Hartford R.R. — Revised. 9	Spokane & Inland Railroad — Freight. 10	Spokane & Inland Railroad — Freight. 11	Gr. Trunk Sarnia Tun'l. Pass. & Ft. 12	Great Northern Ry. Freight. 13	Mich. Cent. Detroit R. Tunne'. Freight. 14
General:														
Builder: Mechanical	Am. Locomotive Co.	Am. Locomotive Co.	Am. Locomotive Co.	Am. Locomotive Co.	Pennsylvania R.R.	Baldwin Loco. Wks.	Pennsylvania R.R.	Baldwin Locomotive Wks.	Baldwin Loco. Wks.	Baldwin Loco. Wks.	Baldwin Loco. Wks.	Baldwin Loco. Wks.	American Loco. Co.	American Loco. Co.
Builder: Electrical	General Elec. Co.	General Elec. Co.	General Elec. Co.	General Elec. Co.	Westinghouse Co.	Westinghouse Co.	Westinghouse Co.	Westinghouse Company.	Westinghouse Co.	Westinghouse Co.	Westinghouse Co.	Westinghouse Co.	General Elec. Co.	General Elec. Co.
Date built	1895.	1903.	1906.	1908.	1905.	1907.	1909.	1906.	1908.	1906.	1907.	1907.	1908.	1909
Type	0 4-4-0	0-8-0	2-8-2	4-8-4	0-4-4-0	4-4-4-4	4-4-4-4	0-4-4-0	2-4-4 2	0-4-4-0	0-4-4-0	0-6-0	0-4-4-0	0-4-4-0
Number of driving wheels	8	8	8	8	8	8	8	8	8	8	8	6	8	8
" " truck wheels	.....	.....	4	8	..	..	..	..	4	.....	.....	.....	8	8
" " motors	4-DC.	4-DC.	4-DC.	4-DC.	4-DC.	4-DC. single phase.	2-DC.	4-AC. single phase.	4-AC. single phase	4-AC. single phase	4-AC. single phase	3-AC. single. phase	4-AC.3-phse	4-DC.
Dimensions:*														
Length over couplers	35 ft. 0 in.	29 ft. 0 in.	37 ft. 0 in.	43 ft. 0 in.	36 ft. 5 in.	65 ft. 8 in.	64 ft. 11 in.	37 ft. 7 in.	37 ft. 7 in.	32 ft. 1 in.	38 ft. 3 in.	29 ft. 4 in.	44 ft. 2 in.	39 ft. 6 in.
Width of cab	9 " 5 "	9 " 5 "	10 " 0 "	10 " 0 "	10 " 2 "	10 " 0 "	10 " 0 "	9 " 7 "	9 " 7 "	9 " 6 "	9 " 6 "	10 " 2 "	10 " 0 "	10 " 0 "
Height, rail to top of roof	14 " 3 "	13 " 8 "	14 " 4 "	13 " 9 "	13 " 1 "	13 " 1 "	13 " 1 "	12 " 2 "	12 " 2 "	11 " 9 "	12 " 2 "	13 " 0 "	14 " 2 "	12 " 4 "
Driving wheel base	23 " 2 "	14 " 7 "	13 " 0 "	13 " 0 "	26 " 1 "	30 " 0 "	24 " 1 "	22 " 6 "	22 " 6 "	21 " 1 "	24 " 10 "	16 " 0 "	31 " 9 "	27 " 6 "
Truck wheel base	6 " 10 "	.....	.....	6 " 0 "	8 " 6 "	6 " 2 "	6 " 7 "	8 " 0 "	8 " 0 "	7 " 4 "	9 " 6 "	.....	11 " 0 "	9 " 6 "
Rigid wheel base	6 " 10 "	14 ft. 7 in.	13 " 0 "	13 " 0 "	8 " 6 "	7 " 6 "	7 " 2 "	8 " 0 "	8 " 0 "	7 " 4 "	9 " 6 "	16 " 0 "	11 " 0 "	9 " 6 "
Total wheel base	23 " 2 "	14 " 7 "	27 " 0 "	36 " 0 "	26 " 1 "	56 " 2 "	55 " 11 "	22 " 6 "	30 " 10 "	21 " 1 "	24 " 10 "	16 " 0 "	31 " 9 "	27 " 6 "
Diameter of driving wheels	62 in.	42 in.	44 in.	44 in.	56 in.	72 in.	68 in.	62 in.	62 in.	38 in.	50 in.	62 in.	60 in.	48 in.
Diameter of truck wheels	.....	.....	36 in.	36 in.	.....	36 in.	36 in.	.....	33 in.	.....	.....	.....	.....	.....
Weights:														
Per driving axle, in lbs.	48,125	40,000	33,500	35,500	48,785	54,900	55,800	48,000	40,500	25,070	36,250	42,200-47,000	57,500	50,000
Per truck axle, in lbs	.....	.....	28,000	22,000	.....	21,150	26,400	.....	20,000	.....	.....	.....	.....	.....
Total, in lbs.	192,600	160,000	190,000	230,000	195,140	304,000	328,800	192,000	202,000	100,280	145,000	131,400	230,000	200,000
Per ft. of wheel base, in lbs.	8,340	11,000	7,040	6,400	7,500	5,430	5,870	8,540	6,530	4,750	5,830	8,200	7,220	7,280
Center of gravity of locomotives	43.2 in.	40.5 in.	44.4 in.	40.0 in.	42.5 in.	55.0 in.	63.75 in.	53.0 in.	.....	.....	.....	51 in.	60 in.	42.5 in.
Speed: Approximate with full load on level, miles pr hr.	20	10	60	60	45	60	60	60	60	25	15	35	15	35
Power:														
Tractive effort, starting†, lbs	48,000	40,000	33,500	35,500	37,400	26,800	55,000	AC. 20,000	DC. 24,000	AC. 20,000	DC. 24,000	AC. 25,000	DC. 25,000	AC. 36,000	DC. 36,000	43,800	57,500	50,000
Do., at 1 hr. rating, lbs.	.....	38,000	23,000	23,000	17,540	14,400	26,400	8,400	10,200	8,400	10,200	10,500	13,000	22,000	27,500	19,000	46,000	35,000
Do., at cont. rating, lbs.	.....	.....	5,700	5,700	.....	7,600	12,000	5,700	7,750	5,700	7,750	5,020	6,000	14,600	15,500	11,800	36,000	.....
Motors:														
Type	DC No. AXB 70	DC No. GE-65	DC. No. GE.-84-A	DC. No. GE.-84-A	2 DC. Nos. 103 & 129	AC. No. 144	DC. No. 315	AC. DC. No. 130		AC. DC. No. 130		AC. DC. No. 133		AC. DC. No. 151		AC. No. 137	AC. No. GEI-506	DC. No. GE-209-A
Rating h. p.: 1 hour	180	200	550	550	300 & 320	460	1,250	235	360	235	360	125	94	170	150	225	475	275
Rating, h. p.: continuous	.....	.....	230	230	.....	310	800	195	295	195	295	86	60	140	108	178	375	.....
Current per motor: starting	1,725	318	1,100	1,100	800	2,500	2,850	2,025	2,000	2,025	2,000	960	830	1,125	1,100	1,525	700	530
" " " 1 hour	.....	300	750	750	415 & 438	1,590	1,725	1,909	1,000	1,090	1,000	545	543	820	910	910	500	400
" " " continuous	.....	.....	325	325	.....	1,045	1,070	845	810	845	810	365	365	645	635	685	.....	.....
Voltage at collector	625	625	625	625	600	11,000	650	11,000	600	11,000	600	6,600	600	6,600	600	3,300	6,000	625
Voltage at motor	300 app.	625	625	625	600	275	650	220	300	220	300	235	150	220	150	235	500	625
Weight of each motor	.....	12,975	11,500	11,500	11,500	19,500	45,000	16,710		16,710		6,025		10,420		15,660	.....	.....
Weight of each armature	9,500	2,800	7,640	7,640	5,300	9,350	10,950	5,850		5,850		2,705		3,570		5,095	.....	.....
Gear ration	Gearless.	81 : 19	Gearless.	Gearless.	Gearless.	Gearless.	Side r'd dry	Gearless.		Gearless.		72 : 17		79 : 17		85 : 16	4.28 : 1	4.37 : 1

* All figures under heading "Dimensions" have been given to nearest complete inch, neglecting fractions.
† Unless limited by characteristics of motors the starting tractive effort is calculated as one-quarter of the weight upon the driving wheels.

TABLE 11. *Electric and Steam Locomotives. Comparison of weights and centers of gravity.*

Type	Electric. 0-4-4-0	4-4-4-4	4-4-4-4	2-4-4-2	Steam. 4-4 2	4 4 0
Railroad	Pennsylvania.	Pennsylvania.	Pennsylvania.	N. Y., N. H. & H.	Pennsylvania.	Pennsylvania.
Reference to Table 9	5	6	7	9	..	..
Service	Experimental.	Experimental.	N. Y. tunnel.	Main line.	Main line.	Main line.
Total weight of locomotive, running order in lbs.	195,140	304,000	332,000	202,000	176,600	138,000
Height, center gravity, complete loco, from rail, in.	42.5	55	63.75	53	73	63
Per cent. of weight of running gear below springs to total weight.†	50	46.3	16.7*	37.4	22.7	22.7
Heights of center of gravity of running gear from rail, in.	28	33.5	30.2*	30	33	29

*Does not include motors as they are mounted in cab. †Including motors in the case of electric locomotives Nos. 5, 6 and 9.

show an operating saving of about one cent per car mile, or, say, between 4 and 5 per cent. of the total operating cost.

ENGINE REPORTS USED ON THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD.

Owing to the demands on the space a few forms of engine reports were crowded out of the description of the organization of the mechanical department of the New York, New Haven & Hartford Railroad, published March 4. This omission did not detract from the completeness of the description of the organization, but the forms are of value for showing the final methods of keeping close track of the condition of the power. They are in the form of weekly reports to the mechanical superintendent from the several shops, the chief clerk of mechanical accounts and the master mechanics and are illustrated herewith. They consist of reports of the engines in the shop for repairs, engines condemned, engines rented, engines in service and reserve and the engines transferred from one division to another.

When an engine is taken into the shop, the superintendent reports the date on which he expects to be able to deliver it.

ENGINES IN SERVICE OR RESERVE.

	Engine No.	Location Division or Place in Service.	Class of Service-Days: Pass.	Freight.	Mixed.	Work.	Switch.	Helper.	Reserve.	Class Repairs Needed.		Engine No.	Location Division or Place in Service.	Class of Service-Days: Pass.	Freight.	Mixed.	Work.	Switch.	Helper.	Reserve.	Class Repairs Needed.
1											41										
2											42										
3											43										
4											44										
5											45										
*											*										
*											*										
37											77										
38											78										
39											79										
40											80										

Master Mechanic.

ENGINES TRANSFERRED.

Eng. No.	Division Transferred to	Delivered. Hour.	Delivered. Date.	Eng. No.	Division Received from	Received. Hour.	Received. Date.

M 127.

WEEKLY REPORT OF ENGINES, Week ending _____ 19

_____ Shops. _____ Division.

ENGINES IN SHOPS FOR REPAIRS.

	Engine No.	Division Received From.	Service.	Class Repairs.	Date Received at Shop	Date to be Ready for Service.	Date Turned Out.		Engine No.	Division Received From.	Service.	Class Repairs.	Date Received at Shop.	Date to be Ready for Service.	Date Turned Out.
1								16							
2								17							
3								18							
*								*							
*								*							
14								29							
15								30							

If this date is overrun he is asked to explain the reason for the delay. This naturally has a tendency to influence him to allow as much time as he can for the work so that he will be sure to make the delivery on or before the time set. If he shows an inclination to take more time than seems reasonable, he is asked to explain why so much is needed, which tends to make him shorten the time. The result is that, between these two influences, the estimate of the time required to effect repairs is usually very close and the locomotives are delivered on the schedule time. This report is made every

ENGINES CONDEMNED.

Eng. No.	Date Condemned.	Eng. No.	Date Condemned.	Eng. No.	Date Condemned.	Eng. No.	Date Condemned.	Eng. No.	Date Condemned.

ENGINES RENTED.

Eng. No.	To Whom Rented.	Location.	Delivered.		Returned.	
			Hour.	Date.	Hour.	Date.

ENGINES IN SHOPS, DATE TO BE OUT HAVING BEEN CHANGED TO LATER ONE.

Eng. No.	Explanation as to Cause of Later Date Being Given.

week. At the bottom there is a list of engines whose date of delivery has been changed for reason, for of course delays do occur.

The other forms are self-explanatory, and are used to check off the locomotive record board in the office of the mechanical superintendent.

The Orient express between Paris and Constantinople, 1,933 miles—perhaps the oldest "limited" train in Europe—is to have its time shortened up. Something was done last year, when the time from Paris to Vienna, 861 miles, was reduced to 25 hours. The changes announced for this year reduce the time in the other direction to 20¾ hours. From Constantinople after April the train will leave at 7:15 p.m., Budapest (889 miles) at 6:50 a.m. (the second day), Vienna at noon, Munich at 7:44 p.m., Strasburg at 2:30 a.m., and reach Paris at 8:45 a.m. This requires but one night between Budapest and Paris (1,044 miles) instead of two as formerly. It is interesting to note that this much-talked-of long-distance train is so well patronized that it is regularly made up with two sleeping cars and a dining car! Of late a limited express between Ostend and Vienna, 822 miles, has connected with it, going by way of Cologne, Frankfort and Nuremberg. The average speed from Constantinople to Budapest will be 25 miles an hour; thence to Paris, 40 miles.

THE TRAINMASTER'S FUNCTIONS.

This composite chapter consists of paragraphs selected from the writings of Messrs.—

John T. Finerty,	Assistant Trainmaster,	Del., Lack. & West.
S. A. Covington,		Col. & So. Ry.
W. E. Burk,	Trainmaster,	Vandalia Line.
J. F. Russ,	Trainmaster,	Missouri Pacific.
W. C. Morse,	Superintendent,	Missouri Pacific.
F. C. Syze,	S. I. Rapid Transit and	Balt. & O. R.R.
W. H. Simms,	Vice-President,	Phila. & Western.
W. B. Gormley,	Trainmaster,	Pennsylvania.
W. F. Thiehoff,	Superintendent,	Chic., Bur. & Qy.
F. B. Turner,	Master of Trains,	Louisville & Nash.
F. E. Bolte,	Passenger Trainmaster,	St. L. Ter. R. R. Assoc.
C. K. Miller,	Trainmaster,	Cin., N. Or. & Tex. Pac.
V. R. C. King,	Trainmaster,	Atlantic Coast Line.
V. V. Boatner,	Trainmaster,	Yazoo & Miss. Val. R.R.
W. M. Wardrop,	Trainmaster,	Penna. Lines West.

PERSONAL QUALIFICATIONS.

An eminent railway officer once said that two positions most difficult to fill are those of track foreman and trainmaster. To become a good trainmaster one requires lusty health, a fair education, perseverance, patience, keen intuitions and an abundance of moral courage. He must be temperate, love work, possess a high sense of justice and a penetrating knowledge of human nature. He must have robust common sense, be imbued with high ideals and actuated by sound convictions. To every man is given an opportunity to do something worth while, but the life of a trainmaster abounds in such opportunities.

Health is the first requisite, for he must exercise intense effort and prolonged, persevering application, must bear frequent interruptions, changes and disarrangements of his plans;

must be prompt and fertile in resources and expedients to meet sudden demands; must calmly bear with irritating subordinates and superiors; must be able to lose sleep and have ability to keep a-going for long periods. He must possess in a high degree the genius of adaptability in order to meet every possible emergency. Furthermore, he must have the courage to exercise all his authority, and he must not only know, but he must know that he knows. Doubt and vacillation can have no part in the personality of a successful trainmaster. He is the man of trained intelligence who plans the work, but he must also find the men and qualify the men to do the work. Ill-health breeds bias and prejudices and it prevents one from judging men, their motives and actions dispassionately and fairly; consequently, one in ill-health is not qualified to form proper conclusions as to the worth and qualities of men in employing them, nor can he have the balanced temperament that is essential to fair and impartial decisions in investigating cases and imposing discipline upon employees.

The writer was assistant to a trainmaster who suffered from attacks of gout, when he would be absent from one to four weeks at a time. On his return, while the demons were chasing each other through his system, he would pass upon the accumulated cases of discipline and at times would impose thirty suspensions in thirty minutes. It was impossible for him to acquaint himself with the conditions and relations of each case, therefore he was unconsciously unjust to the men involved, for without knowledge justice is impossible.

An ideal trainmaster is a man who has served several years as train despatcher and chief despatcher, as those duties carry certain qualifications and experience in the operating department not easily gained in any other manner. His being a telegrapher will be of great assistance to him when out on the road, as he can get much quicker action than any man who has to do his talking through an operator.

He should be old enough to have mature judgment, not easily influenced by stories the men on the road will tell him about the despatchers' office, and at the same time be able to pick out any good suggestions that may be made to him by the men.

He must be able to discern the probability of truth made by persons on trial, or interested in investigations, as at times the parties greatly interested will not always state the facts.

If a man [of the right character] has had eight or ten years' experience in the transportation department, and this before reaching the age of thirty, and if he assumes the responsibilities of the office by the time he is thirty-five, we have the basic material for the making of a first-class trainmaster.

He should get an early start, for the reason that there is much to learn which can be gained only by practical experience. He must also have earnestly aspired to the position, which is an indication of the necessary ambition. You cannot make a first-class trainmaster; he must make himself.

His knowledge of the rules and regulations should be beyond question. The more thorough his knowlege of the fundamental principles of train operation the greater will be the respect in which he will be held by his subordinates, for men in the ranks quickly detect their superiors' weak points, and not a few hasten to take advantage of them at every opportunity.

If the chief train despatcher be chosen for the position of trainmaster, he should spend his days and nights on the line in the thickest of the train work, rub shoulder to shoulder with the tried men in the ranks and keep an open mind for the hints such men give by their actions and methods of working, until he has mastered the details of field work.

Since a large percentage of trainmasters become superintendents, and thence are frequently promoted to still higher positions, the educational qualification, whether self-obtained or otherwise, is an essential which must be taken into consideration. The ever-increasing tendency of railway work to a more scientific standard demands this. I know several men whose experience I envy, but who have never risen above a certain grade because of their lack of a good general education. The young men who are occupying positions from which trainmasters are chosen should strive to their utmost to educate themselves on as broad lines as possible.

A man promoted from the despatching department should have some experience in train service, as it will save him from learning this after being made trainmaster. A man not experienced in train service is not in a position to at all times render fair discipline, for no matter how fair-minded he may be his lack of knowledge in this direction may cause him to give a decision which would not be considered fair to an experienced trainman.

While it may not be regarded as actually essential it is certainly of considerable practical advantage if he is able to determine, from personal knowledge, when a locomotive is being efficiently fired or handled.

He should be familiar with at least the simpler rules and practices pertaining to maintenance of way and structures, and should have some knowledge of accounting to enable him to assemble and move traffic economically. He need not necessarily have special training in either of the three branches or departments last named, but can pick up a fair working knowledge of them, if he has interest enough, and if he maintains friendly intercourse with men in charge of those departments.

The individual who is ambitious to succeed should not tie down to one branch of the service, but should be alert and watchful of all things in whatever department in order to fit himself for emergencies and overcome obstacles.

He should never lose sight of the need of thoroughly equipping himself for any emergency, and should be ready at a moment's notice to represent his company at any meeting wherein the transportation department is interested. The proceedings of the various associations of railway officers, their rulings and disposition of cases brought before them should be well known to him. The conditions of interchange at the various junction points, per diem, and, in fact, every item pertaining to the increased revenue accruing from the prompt movement of cars should be thoroughly understood.

A trainmaster with the bulletin habit is always productive of dissatisfaction in the train service, and particularly if he feels it necessary to reissue instructions periodically. An order once issued remains in effect until its purposes have been accomplished or it has been recalled; and to repeat it advertises the failure on the part of those whom it affects to observe its provisions and a lack of proper supervision on the part of the official charged with enforcing it.

OFFICE WORK.

Usually when a practical man is first promoted to the position of trainmaster he finds it rather difficult to write his views and ideas. He is able to tell you all about it, but to express it in writing is hard on him, and truthfully so, for his former occupation was not devoted much to writing. This is the obstacle he should try to overcome before embarrassing circumstances arise.

I remember the first report I dictated, or rather tried to dictate. I signed my name under the title "trainmaster," instead of between it, and "yours truly." I really thought it was all right. Describing the details of my work on paper was my most difficult duty, but I grasped every correction in my sentences until it became easier for me. A man so situated should observe closely the language of his superiors, read during his spare time and study the reports of others who have had better opportunities. Some day he is liable to be delegated to represent the superintendent at a meeting or conference, and he should be able to represent him well. This is one of the most important elements that make him first class.

A first-class trainmaster should keep his office in his hat if he is anxious to produce the results expected of him. In other words, he should be continually out nosing around, figuring on changes that will effect improvement and getting them in substantial form for consideration at the next change of time-

table. The management is always looking for increased service with less expense. A trainmaster who thinks he can familiarize himself with the many complex details of an up-to-date railway by transacting his business from the office makes a serious mistake.

He should have access to all reports sent to the superintendent pertaining to the movement of trains, so that he will be in touch with what is going on and in position to apply the proper remedy without having the superintendent bring the matter to his attention, which, at times, to say the least, is embarrassing.

See that your clerk is a capable man, and under no circumstances allow your correspondence to be neglected. Requests for replies to telegrams and letters are embarrassing to you and may be to your superior, as he may be waiting upon information from you before he can advise his superior.

Take a good railway paper and study it. Inform yourself thoroughly, bearing in mind that promotions come to those who are qualified. Be loyal to your superior. His success is your success.

EMPLOYING NEW MEN.

Few realize the splendid opportunity open to them in the employment of men. The pressing need of the moment often serves as the excuse for admitting undesirable men to the division. Then follows not only an increase in car damage and property loss, but also a general disaffection. With the general recognition by the railway companies of the employees' organizations and the right of their committees to have a hearing, it becomes hard to get rid of unworthy and incompetent employees. In admitting men to the service temporary inconveniences in order to make a discriminating choice is therefore better than immediate relief at a heavy later expense.

It is imperative on the trainmaster to select clean, wholesome, well-disposed men, who are fit to associate with decent men. While a passenger conductor the writer was stirred with a sense of shame and indignation because of a few common, drunken, vulgar counterfeits of men who held equal rank in the service. The appointment of such men as passenger conductors was an insult to every self-respecting man in the service and a disgrace to the company who employed them. The writer was once given a man as passenger flagman who had been discharged from the U. S. Army, afflicted with chronic asthma, but as he was a brother of a train despatcher, the trainmaster employed him as a passenger brakeman and afterward made him flagman. The poor fellow was about as fit to run as he was to fly, and he was absolutely unfit to be trusted with the protection of a train in a snowstorm. The sympathies of the trainmaster were commendable, but they should not have overruled his judgment and inflicted upon the service a man who was incompetent.

All employees who are hired and examined by your department should be examined by you personally, and this should never be left to your clerk.

The employment of trainmen should be done by the trainmaster personally and not left to a clerk, except when there is a regular employment bureau.

He will do well to work on the principle that he is employing conductors and engineers, as each brakeman or fireman employed should be eligible for promotion. The best results will be got from men who live on the line of road, and it is best, as a general rule, to employ inexperienced men and train them. The following order in employment of brakemen will hold good:

1. Men who have had some experience as a car repairer or inspector. Such men will have a knowledge of equipment and will be more careful than a man with no knowledge of the dangers from this source.

2. The brakeman or conductor from small roads in the same locality. Such a man moving from a small to a larger road will feel that he has something to learn and will go at it with enthusiasm.

3. Section men of sufficient education who have been found to be honest.

4. Station helpers, freight checkers or handlers. Such men will be especially adapted for local freight service.

5. Men of character off adjoining farms who have sufficient education.

6. Any other, in preference to the experienced "rounder," who will start some kind of trouble before he gets settled.

All men employed should have a fair education and be able to write a legible hand, as a great deal depends on being able to make legible records. Men of families are, of course, preferable.

RELATIONS TO SUPERIORS.

Be loyal to superior officers. Confer with them on all matters of importance and profit by their suggestions and experience. I once knew a trainmaster who made a dismal failure and disorganized a division by suggesting to employees in his department who had been disciplined that the old man had decided to do so-and-so, but in his opinion it was too severe. He not only lost the respect of the trainmen, but created endless dissatisfaction among them and was finally reduced.

Never pass papers to the superintendent with the words "please note" or "herewith report of so-and-so," or "I attach result of investigation of accident to so-and-so," without explaining in detail just what was brought out by the investigation and summing up the evidence as a lawyer would present his case to a jury.

Never fail to ask the superintendent for what is needed to properly handle the division in the way of additional help or facilities, and be just as ready to reduce the forces when it can be done.

It is the practice on many roads to require trainmasters to ride all special passenger trains, trains carrying officers' cars and trains hauling important freight, etc., and the writer has known of instances where a trainmaster had instructions to ride more than one train at the same time. The efficient trainmaster does not need, and should not be given, positive instructions as to his movements, but should be kept posted regarding important movements and allowed to control his own plans. He will have sufficient judgment to do the proper thing.

A good chief despatcher is the most important official a superintendent can have, and he can make and save more money than any other subordinate official in the service.

He should work in closest harmony with the trainmaster, as the success of one depends greatly on the other. He should be equal in authority with the trainmaster, although he is the most important necessity of the two. Chief despatchers should go over the road frequently and inspect and supervise station and telegraph service, and should have sufficient force to allow this without crippling the service.

The trainmaster must be a defender of his superior officers and their policies; he must, for instance, know how to assuage the injured feelings of the station agent, as well as patrons, who can see no good reason for the further postponement of the proposed new station building to take the place of the present "buzzard roost." He must get in behind the roundhouse force at the point, for instance, where only the canopy of heaven serves for a roof, and, instead of joining the chorus of knockers, endeavor to convince them that there are good reasons, and give them the reason, if possible, why such conditions are not remedied. He must always be alert to allay, if possible, the friction between employees or departments, keep after the knockers, point out to them the futility of knocking, how it impairs the service and how infinitely more it impairs the knocker.

He should be so thoroughly familiar with every portion of his division that he can say off-hand whether or not a new idea is worth trying out. It is the man who studies conditions and tries to adopt or change practices that will effect economy for the company and reflect credit on his superiors that is valued.

He should keep in pretty close touch with the maintenance of way department, and heartily co-operate with it in all changes that affect the handling of traffic.

While you are essentially a transportation officer, yet you should familiarize yourself with the workings of your allied departments—the mechanical and maintenance of way—keeping your eyes and ears open for pointers that will be of great benefit to you in the future—perhaps in a few days. Whenever you see conditions in other departments that should be corrected, do not hesitate to call the attention of the division heads to them, and, if of importance, the attention of your superior also. Disasters have been known to be averted in this manner. Work closely and in harmony with other departments, as friction between heads of departments never resulted in good for any company.

RELATIONS TO SUBORDINATES.

Invite suggestions and weigh each one carefully. Do not have "Private" stenciled on your door in "box car letters."

I remember quite well, when I had only been trainmaster a short time, a conductor came to the office with a letter that I had written censuring him for an error in judgment, and said: "You can certainly write the most sarcastic letters of any official I ever worked under." I asked him to sit down and we would read the letter and discuss it. We did so, I explaining my views and intentions when writing the letter, and he his interpretation of the meaning. It so happened that he received the letter after making a hard trip on short rest and when he had been without a square meal for twelve hours. He felt that he had a grievance anyway, and the criticism was the finishing blow. I asked him to take the letter home with him and get a good rest and have his wife cook him a good meal and then sit down and read the letter while he smoked. The result was he came back next day and said: "Well, that letter wasn't so bad to take on a full stomach." However, the incident put me on my guard and taught me to thereafter use such language in a letter as would explain to the offender his violation and suggest a remedy without offending the most sensitive.

Another thing I found a necessity. Never criticize an employee in the presence of another. If anything goes wrong suggest some remedy to the individual at the time and then ask him to come to the office and go over the matter thoroughly. Listen to his explanations and weigh them carefully, deciding the case after considering conditions and circumstances and administer discipline necessary without humiliating the employee before any other employee. Especially does this refer to passenger employees, for two reasons: One, the traveling public should never be allowed to overhear discussions of failures to properly perform, and the other, passenger employees should give their entire attention to the handling of their train and administering to the needs and comforts of passengers on the train. Many a man has sacrificed his position to retain his self-respect as he saw it from looking at one side only.

He must have the knack of teaching the things best suited to the service on the particular railway or division of the railway on which he is employed and have his instructions carried out by employees in his department, teaching them loyalty and interest in their work that they may bring success to the operation and credit to themselves and the officers of their division and system. To do this he must first have the confidence of employees in his ability to teach, and be firm in requiring each individual to give particular attention to the details of the work. If the little things that seem unimportant to the individual are watched closely and the attention of each employee is called to the violation of rules and instructions promptly and courteously, failures explained at length, suggestions made as to how to avoid a recurrence and the responsibility of each clearly defined, he can in a short time find out the competent, careful and conscientious employee as well as the careless and unscrupulous.

You should know each of your men by name; study them individually so as to know their weak points. Always greet them pleasantly, calling each man by name every time you meet, and whenever an opportunity presents itself (in a friendly conversation, if possible), relate experiences or anecdotes that show up the weakness of others, that will show the person spoken to his own weak points and will set him to thinking, and thus do more good than to attack him direct. Show them the importance of being always vigilant for the welfare of the company; teach them that whatever is to the company's interest is to their interest; to make friends of all of the patrons by impressing upon them how glad we are to get their business. Make them understand that it will not do to violate rules in order to accommodate anyone asking a special favor. In refusing, it should be done in a quiet, gentlemanly manner, explaining why their request cannot be granted. When on the road with trainmen make yourself one of them by helping to do their work whenever an opportunity presents itself. This will show them that you know how and can do the work yourself; will prevent shirking or offering flimsy excuses when their work does not come up to your requirements. When they make a wrong move, let them finish it their own way (if not too far wrong, and then show them how it should have been done. Discuss it freely so as to show that your only object is to get it done in the best and quickest manner.

Keep a watch over enginemen. See that they do their part of the work properly. In a friendly manner call their attention to improper whistle signals, especially as to the abuse of blowing too often and too long. Call attention to the misuse of air-brakes.

Care should be taken to see that all train and enginemen get sufficient rest and plenty to eat. I have fed quite a number of train and enginemen when on long runs, often doing the cooking myself in the caboose while they were doing their station work, and when the next station was reached they worked like new men; and thus (the most important point) you get close to men.

At Christmas time try and show your trainmen some special attention, such as annulling local freights, arranging call of slow freights so as to let as many as possible be at home for dinner. If practicable, make them some inexpensive, useful present, such as memorandum books or time-table holders.

Labor organizations have come to stay where they are led by intelligent, conservative men, and will abide carefully by all agreements entered into. They are a benefit and not a hindrance and greatly simplify the matter of handling large bodies of men. It is true that all labor organizations do not meet these tests, but the railways are fortunate in having to deal with some of those which do come up to the highest standard of reliability; whose representatives not only speak fully for their constituents, but can also be of inestimable benefit in preventing misunderstandings by disseminating clear, accurate information on their part to the men.

Wnere the discipline is so thorough that the official dignity of the officers is not lessened by very close and friendly contact with the men, and where the men have well-developed *esprit de corps* and faith in the integrity of their superiors, it is possible to deal with the men through their representatives on subjects tending toward progress and efficiency.

A sore place in a man's heart heals but slowly.

Be very slow about discharging anyone unless for drinking or insubordination (which must never be tolerated), realizing that discharging an employee, especially a man of family, makes him move, breaks up his home temporarily and works a hardship. But when absolutely necessary to discharge a man, help him to get a position on another road.

When a man is careless and not giving desired results, call the man to the office and have a heart-to-heart talk with him, showing that his position depends wholly upon the service rendered, and put it up to him to improve or be dismissed.

Such handling will, if the man be the right kind, bring him out. If he is not the right kind of a man, he should be dropped from the service, as no trainmaster can afford to carry any dead material in the machine.

Endeavor to employ young men with good education and good habits, and turn down every young man for a position with the cigarette signs on his fingers.

New men who have had no experience as brakemen should be placed with the best conductor to learn the road and duties of a brakeman, and should be required to remain with him for a sufficient time to get the foundation for the rules of carefulness and safety. They should not be crammed full of long-winded lectures, but allowed to learn from observation and experience. After they have got a start in this way they will then be benefited by short talks from the trainmaster, on a few subjects at a time, and the trainmaster will usually be able at this time to determine whether or not he has the right man.

Make it a rule to observe seniority in promotion where merit and ability are nearly equal. Make it as far as you can worth while for the men to stay, remembering that continual changes in the personnel are costly, and the valuable men are the stayers. When it does become necessary, on account of greater ability or merit, to put a junior man in a preferred position, take the pains to explain to the senior man why. Come out in the open and be frank and honest with your men. There is no virtue which will win the respect and admiration of men like that.

Always bear in mind that in the ranks are specialists, so to speak, in their different callings, and that a man who is proficient cannot be fooled by one who is not. The trainmaster makes a mistake when he starts off with the idea that because he ought to know more than he does he must make others think so. This is not an uncommon mistake. It is fatal, for he fools no one but himself, and loses the respect of his men. He also loses the chance for acquiring knowledge in which he is deficient.

Loyalty is a reciprocal proposition; you must pay the price for it, not only in wages, but in just treatment. A sort of dogged obedience may be enforced for a time, but that is not loyalty, and without loyalty good service is impossible. You may be able to make a man submit to an injustice, but you can never convince him that it is right to do so. It is just as necessary to sow the right kind of seed for loyalty as it is to plant corn for corn, or cotton for cotton. Men cannot be loyal and discontented at the same time, and they will be discontented while injustices are practised.

See to it that under ordinary conditions the forces are sufficiently recruited to allow a reasonable percentage of extra men, so that requests to be absent from duty may be readily granted when made in the proper manner. Consideration should always be given to all reasonable requests, for experience has proved that where the extra list is not large enough to permit the days off as requested, not a few men will take the chances of reporting "sick" or of resorting to some other subterfuge which has a demoralizing effect. On the other hand, I have known cases where these bad effects have been entirely eradicated when the men learned that there was a sincere effort made to grant all reasonable requests.

Particularly meritorious service by a subordinate should have proper recognition, and where the entire organization acquits itself with more than ordinary credit under adverse conditions, cause the fact to be made known in order that assistants of all ranks may have a share in the general satisfaction.

A trainmaster must be honest throughout, for a man is known by the promises he keeps. Therefore, he must be guarded about making promises or anything that can be construed as a promise. It requires courage sometimes to say "No," but it is better than to delude one with false promises. Associated with real honesty is courtesy, and real courtesy springs from the heart. The greatest lie and the one most believed is the superficial adage that "Courtesy costs nothing." It costs a great deal. Cheerfulness is essential, helpful, and thrives by diligent cultivation. It is the element most conducive to the best individual and team work, for it lubricates all the relations and activities of life. A grouchy, grumpy, disgruntled trainmaster will have a seething streak of hell running through all the ramifications of a division, for bad dispositions are as infectious and as pestilential as smallpox, and on a railway they are as demoralizing as whisky—ruinous to business and individuals.

Be as ready to defend men against injustice or harsh discipline as he is to enforce observance of rules, because railway men, particularly those who have to deal with the public, are frequently subjected to insult when they cannot defend themselves, and are not infrequently unjustly charged by inconsiderate people with offenses of which they are not guilty.

The trainmaster can do more than probably anyone else to preserve the team play of the organization. Besides being a member of the superintendent's team, he is, of course, captain of his own team—a kind of 'varsity scrub, as it were. His team is made up of assistant trainmasters (if any), yardmasters, trainmen, yardmen and clerks. He must see that they play the game and they will be ever watchful to see how he plays his part on the big team.

RELATIONS TO THE PUBLIC.

In dealing with the public the trainmaster has unlimited possibilities for good or evil. A large portion of the public have a tendency to resist railway instructions. A privilege once extended to the public is almost impossible to withdraw. It is claimed as a right. People are so imbued with the idea that the railways discriminate; that the slightest inadvertent privilege to meet some local condition may cause embarrassment at points far removed. It is therefore, best for any trainmaster to understand the legal aspect of all questions affecting the public before he renders any decision, to the end that his orders may be in accordance with the law. If he follows this course he will save himself many unpleasant situations and the company much hostile criticism. The greater his knowledge of all laws, both federal and state, which concern a common carrier, the greater his efficiency.

The trainmaster has occasion to handle diplomatic matters with the smaller stations and firms, and should therefore enlarge his acquaintance as much as possible along the road. In this way he can frequently render good service to his company. He should be in close touch with the agents and see to it that they place the company in the proper light before the public.

Have very little to say to newspaper reporters, but endeavor to keep in such close touch with shippers and patrons of the road, so that they will come to the trainmaster with their complaints instead of taking them up with the president.

When out on the road agents and customers with whom you will come in contact, will raise questions which are entirely out of your department—questions with which you are not familiar and cannot satisfactorily answer. See to it that you make a note of these; either find out about them, so that when next in the vicinity you can explain; or else see that someone connected with your road in the proper department makes a personal call and gives the desired information. You can make or lose a friend for your company by attending to or neglecting it.

(To be continued.)

On taking possession of the Gotthard Railway it was necessary for the Swiss government to negotiate with Germany and Italy, which made large contributions towards its construction, as it forms the chief channel of communication between those two countries. They have agreed to limit the through fares to 1.614, 2.26 and 3.23 cents per mile for the three classes, respectively, and to make a reduction in the through freight rates. These have been higher than on adjacent and connecting railways, by a percentage allowed on account of the great cost of the work. They will still be higher, but the percentage is reduced.

General News Section.

The New York Central is preparing to introduce telephones for train despatching on the Ontario and the St. Lawrence divisions.

The Chicago & North Western has increased the pay of its telegraph operators. A press despatch says that those in towers will be advanced $5 a month; station agents $10 to $12.50, and all other operators from $2.50 to $5.

The New York State Public Service Commission, Second district, has ordered the Delaware, Lackawanna & Western to send in corrected reports of passenger train movements for the Buffalo, Syracuse and Utica divisions for the five months, September to January, the reports which have been sent being found unsatisfactory.

A bill has been introduced in the legislature of New York at Albany amending the law so as to give to persons who have suffered loss or damage at the hands of a railway a lien for reparation in all cases where his injury was due to the negligence of the railway; this lien to take precedence over the claims of all other persons or interests.

The Cunard steamship Mauretania, on her last westward trip, arriving in New York Thursday evening, March 17, surpassed all previous westbound records over the long course, making the run from Daunt's Rock, Queenstown, to the Ambrose Channel Lightship, New York, in 4 days, 15 hours, 29 minutes, the average speed being 25.91 knots an hour. The best previous record, 26 minutes longer, was made by the Mauretania last July.

The question whether Benjamin Thomas, John C. Fetzer and Charles R. Kappes committed the real estate frauds alleged against them by the board of directors of the Chicago & Western Indiana may be submitted to arbitration. A full statement of the allegations made by the directors of the Western Indiana in the civil proceedings brought by them against Messrs. Thomas, Fetzer and Kappes was given in the *Railway Age Gazette* of January 28, page 197. The state's attorney for Cook county, Illinois, refused to take the case before the grand jury and, therefore, there will be no criminal action. The proposed arbitration would be to determine the civil liability of Thomas, Fetzer and Kappes to the Western Indiana.

On recommendation of the Interstate Commerce Commission the President has awarded medals for heroism to George Karsten, of Milwaukee, and Robert Brendle, of McKeesport, Pa. Mr. Karsten is a switchman of the Chicago & North Western. On the afternoon of September 29, at Allis (Milwaukee), he risked his own life in endeavoring to save a woman who started to cross the railway where there are 20 parallel tracks. A string of freight cars cut off her view, and when she reached a point directly in the way of an approaching engine, becoming confused, she stopped. Seeing her danger, Karsten ran to her assistance, but the woman did not comprehend his intentions and struggled with him until the engine struck them and she was fatally injured. Karsten, however, fell wholly between the rails and the tender passed over him, but he was not seriously injured. Application for a medal was made on behalf of Mr. Karsten by officers of the Chicago & North Western. Mr. Brendle is an officer on the police force of McKeesport. On October 26, at the crossing of the Baltimore & Ohio, where 9 parallel tracks cross the street at grade, he saved a woman who started across the tracks just as a freight train was rapidly approaching. Her head was covered and she did not see the oncoming train. Officer Brendle shouted to her, but she was a foreigner, not speaking English, and did not heed the warning. Brendle, seeing that the woman continued, ran to her, grabbed her about the waist and carried her off the track. The train was so close that the pilot beam of the locomotive brushed against the officer's body. The application in this case was made by the mayor and the chief of police of McKeesport. The President has written personal letters of commendation to accompany the medals.

Brown's Discipline on the M., K. & T.

Trainmen and enginemen on the Missouri, Kansas & Texas are now disciplined without suspension. The rules went into effect March 1. In general they are like those on most other roads where Brown's discipline is in force. Each employee will be entitled to 60 demerit marks before dismissal. For each six months of perfect record employees will receive a credit canceling 10 demerit marks; for one year's perfect record employees will receive a credit canceling 25 demerit marks; for two years of continuous clear record employees will receive a credit canceling all demerit marks. Employees will also be given credit on their records for deeds of heroism and loyalty, for good judgment in emergencies and for valuable suggestions. Record bulletins will be issued monthly by superintendents and master mechanics covering employees in train, yard and engine service. Such cases as appear advisable to publish, especially those in which there was a doubt in the minds of employees at fault as to what course they should have pursued, will be included. Credits for extraordinary service will be included in record bulletins.

Illinois Commission on Employers' Liability and Workmen's Compensation.

Governor Deneen, of Illinois, has appointed a commission to study the subject of employers' liability and workmen's compensation. It consists of six employers and six representatives of labor, and is to present a draft of an employers' liability law to the governor by September 1, 1910. The members of the commission representing the employers are as follows: Ira G. Rawn, president Chicago, Indianapolis & Louisville, Chicago; E. T. Bent, secretary Illinois Coal Operators' Association, Chicago; P. A. Peterson, furniture manufacturer, Rockford; Charles Piez, president Link Belt Machinery Company, Chicago; Mason B. Starring, president Northwestern Elevated Railroad, Chicago; Robert E. Conway, manufacturer, East St. Louis. Those representing labor are: Edwin R. Wright, president Illinois State Federation of Labor; George F. Golden, business agent Packinghouse Teamsters' Union, Chicago; M. J. Boyle, Switchmen's Union of North America; John Flora, Carpenters' Union, Chicago; Daniel J. Gorman, Street Car Men's Union, Peoria; Patrick Carr, United Mine Workers, Ladd.

New Railway Law in New Jersey.

The legislature of New Jersey has passed and sent to the governor a public utilities bill. The present railway commissioners, with salaries advanced to $6,000, will become the Public Utilities Commission, and will have power:

To require every public utility to comply with the laws of this State relating thereto and to perform the public duties imposed upon it thereby.

To require every public utility to furnish safe and adequate service.

To require every public utility to keep its records so as to afford an intelligent understanding of the conduct of its business, and to that end to require every such public utility of the same class to adopt a uniform system of accounting.

To direct any public utility found to be granting rebates or other unjust, unfair and unreasonable discriminations to immediately cease therefrom.

The issue of corporation stock is regulated as follows:

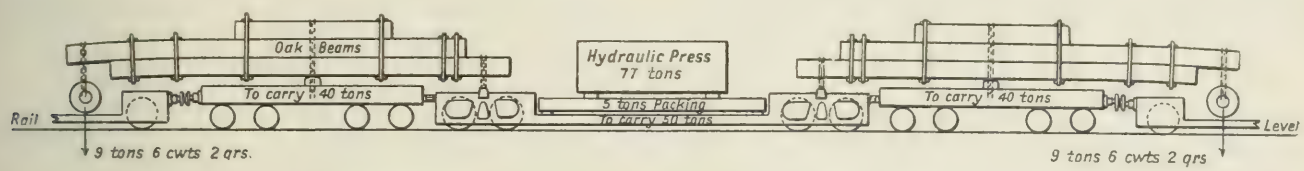
No issuance, sale and delivery of its stock or of securities authorized by it and maturing more than twelve months from the date thereof, by any public utility, shall be valid until approved by the board. It shall be the duty of the board to approve of any such proposed issuance, sale and delivery of stock or securities, maturing more than twelve months from the date thereof, upon being satisfied that said proposed issuance, sale and delivery is to be made in accordance with the provisions of law relating thereto. No lease of its prop-

erty, rights and franchises by any such public utility, and no merger or consolidation of its property, rights and franchises by any such public utility with the property, rights and franchises of any other such public utility shall be valid until approved by the board.

Certificates of public necessity and convenience are required; and no privilege or franchise granted to any public utility by any local, municipal or county governing body shall be valid until approved by the board.

Transporting a Heavy Casting.

A unique method of transporting a large casting, much heavier than the capacity of the car on which it was loaded, is shown in the illustration. On two occasions recently such castings have been successfully transported from the Openshaw Works, Manchester, England, of Sir W. G. Armstrong, Whitworth & Company, Ltd., to the Middlesbrough Docks, for shipment to Japan. Although each of these castings had the unusual weight of 77 tons, they were each loaded on one of the Great Central Railway's 50-ton cars, and the excess weight was distributed over two other vehicles by means of the cantilever arrangements shown. The leverage was worked by means of a number of oak beams attached at one end of the vehicle carrying the load, and at the other end heavy weights were suspended and swung over small well cars without being in any way attached thereto. The counterbalance weight at each end was about nine tons, and the oak beams were each 2 ft. square cross section; each of the sets had an approximate weight of about 11 tons. The levers were not equally placed on the cars carrying them, and the leverage was assisted by the greater length being extended over the small cars at each end. In addition to the load there were five tons of packing, making a total load of 82 tons, so that a weight of 16 tons was required to be taken off each truck. Besides the 50-ton car there were used two armor plate cars, each of 40 tons capacity, and two small well cars for underrunning the balance weights. Some years ago a casting of 90 tons weight was safely transported in this manner from the Openshaw Works to Liverpool.



Transporting a Heavy Casting on an English Railway.

Railways Not Opposed to Canal.

That statement by Admiral Evans is not true. Not a railway in this country has done anything to interfere with the progress of the work on the Panama canal. Mr. E. H. Harriman, shortly before his death, told me that the railways in which he was interested would welcome the completion of the canal. He said that if freight could be carried from the Pacific coast to European ports at a lower rate by way of the canal the transcontinental roads would benefit by it.

Is an adequate return to be brought to this country for the vast expenditure on the building of the canal? is a question often asked. I would say that the return will come in time. But the immediate good of the canal will be felt first by other countries. The United States has no commerce to-day except her coastwise commerce. Protection has done this. When the Panama canal is completed there will be two routes to what has long been known as the East.—*J. F. Wallace.*

Disastrous Derailment at Green Mountain, Iowa.

In a derailment of a passenger train on the Chicago Great Western at Green Mountain, Iowa, early on the morning of Monday last, 42 passengers and five trainmen were killed and 40 passengers were injured. A day car and a smoking car, which were the third and fourth from the front of the train, were completely wrecked, and nearly all of the victims were in these two cars. The train, consisting of two engines and 13 cars, was one of the Chicago, Rock Island & Pacific running over the Chicago Great Western because of a blockade on the line of the Rock Island. The two engines hauling the train were both running backward, and the press despatches say that the speed was about 25 miles an hour. The tender of the leading engine jumped the track in a cut and was quickly ditched, falling into a bed of soft clay at the side of the road. The engine thus became an almost immovable obstruction, and the second engine and the first three or four cars were piled up in a very bad wreck. The first car in the train was a heavy sleeping car, and, the next two cars being lighter, the sleeping car suffered comparatively little damage. The smoking car, the second back from the sleeping car, was so completely crushed by the sleeper that none of the upright members of the car body remained standing.

Award in Brotherhood of Railway Trainmen Arbitration.

The Illinois Board of Arbitration rendered an award on March 18 giving the switchmen in the Chicago district who belong to the Brotherhood of Railroad Trainmen an increase in wages of 2 cents an hour. The men asked for an advance of 5 cents an hour.

The scale recommended by the board is as follows: Yard conductors, days, 37 cents an hour; nights, 39 cents an hour; yard brakemen, days, 34 cents an hour; nights, 36 cents an hour. One argument offered by the representatives of the employees for an increase in their pay was the hazardous nature of their work. On this phase of the matter the board said:

"The board recognizes the impossibility of adequately measuring risk in cents of compensation per hour, and, in its opinion, the solution lies rather in developing a means which will result in a reduction of risk than in determining adequate compensation in wages. Such means can best be developed through the operation of an employers' liability act, under which both employer and employee will share the burden of the risk and under which both will co-operate to reduce the sacrifice of life and limb which present conditions involve. The board therefore looks forward to the law which the recently appointed employers' liability commission is to present as a more just and humane solution of the question of hazard."

The employers' liability commission referred to has been appointed by the Governor of Illinois.

A good deal of testimony was introduced regarding the cost of living. Much of this related to the general price of products prevailing in January, 1910. The board said that the prices prevailing in that month were seriously affected by the severe climatic conditions and should, therefore, be considered of but temporary influence on the cost index.

The demand of the men for time and a half for overtime was not granted. The board said in part:

"Conditions in the transportation service differ from those in a shop, or in the building trades, in that overtime cannot be readily and completely controlled. Weather conditions, density of traffic, unexpected breakdowns at points lacking facilities for prompt repairs may, either singly or together, cause delays to such an extent that a run, which under reasonably favorable conditions takes 10 hours, may be protracted to 14 hours. In such cases the crew is not called upon to perform 40 per cent. more labor, as would be the case in a shop, but is required to spend 40 per cent. more time in performing the same amount of labor. To that extent, therefore, the railway company is already penalized for the delay, and it does not seem proper to the board that in the transportation service further pecuniary penalty shall be assessed."

It recommended, however, that 10 hours be made the maxi-

mum day's work. Heretofore, the only general limit placed has been that imposed by the 16-hour law. The rule recommended is as follows:

"Ten hours, or less, shall constitute a day's work, and the duties assigned to each crew shall be such as not to require a longer day's work under average conditions. No new work shall be assigned after the expiration of 10 hours, nor, excepting in cases of emergency, shall any new work be assigned shortly before the expiration of 10 hours, if such assignment shall cause the men to work overtime.

"Yardmen will be paid pro rata for overtime. Anything less than 30 minutes of any hour will be paid for as one-half hour; anything more will be paid for as one hour."

The third point involved in the arbitration was the demand of the employees that all men taken out of service for cause should be given a hearing within three days. The board grants a hearing within five days, and if hearing is delayed longer the employee will be paid his regular pay during the period of delay. Employees will have the right at such hearings to be represented by fellow employees to be chosen by them and, should the decision rendered be unsatisfactory, the right of appeal to the higher officers of the railway.

Both the representatives of the railways and officers of the Brotherhood of Railway Trainmen expressed themselves as dissatisfied with the award, but both announced that they would accept it.

Increased Pay for the Switchmen's Union at Chicago.

An increase of about two cents an hour in the pay of those yard switchmen in Chicago who belong to the Brotherhood of Railway Trainmen, was announced on March 18, as noted under another head in this paper. On Tuesday of this week it was announced that switchmen belonging to the Switchmen's Union of North America had been awarded a larger increase; three cents an hour in most cases. The B. R. T. controversy was arbitrated by the Illinois State Board of Arbitration, and one of the principal reasons for not making the increase larger was that the increase in the cost of living was not so great as had been claimed by the switchmen. The Switchmen's Union controversy was arbitrated by a board consisting of C. R. Gray, vice-president of the St. Louis & San Francisco, representing the railways; S. E. Heberling, vice-president of the Switchmen's Union, and S. C. Gregory, selected by the federal arbitrators. Switch tenders and signalmen in towers are awarded $5 a month increase, but the demand for an increase in the pay of assistant yardmasters was rejected. It is said that the officers of the Brotherhood of Railway Trainmen will now appeal to the roads to pay the higher rate; and if this request is not granted, will give the 60 days' notice required by the Illinois statute that they wish to repudiate the agreement which has just been made. The increase now decided on is to take effect as of February 10. The roads affected are: Chicago & Eastern Illinois, Chicago switching district; Chicago Great Western, entire system except St. Paul and Minneapolis; Chicago, Rock Island & Pacific, Chicago Terminal Transfer, Lake Shore & Michigan Southern, yards only; Michigan Central, west of Detroit; Pere Marquette, entire system; Wisconsin Central, Chicago switching district. The arbitrators, while unable to reach a precise conclusion, believe that the cost of living has increased in Chicago since 1906 about 25 per cent. They believe that switchmen in Chicago, when working full time, now earn about $85 to $100 a month. It is understood that the hazards of the work was one element which led to the award of a rate higher than that awarded in the B. R. T. case.

The roads on which the Brotherhood of Railway Trainmen control the switchmen and where the lower rate applies, are the Santa Fe, the Belt Railway, the Baltimore & Ohio, the Chicago & Alton, the Chicago, Milwaukee & St. Paul, the Chicago & North Western, the Chicago, Burlington & Quincy, the Chicago Junction, the Erie, the Chicago, Indianapols & Louisville, the Illinois Central, the Wabash and the Indiana Harbor.

The roads in these two different groups not only have yards situated near yards of the companies in the roads of the other group, but in many cases are sending their men every day with switching trains long distances over the lines of other companies.

Mr. Gray filed a dissenting opinion. The award will affect eight thousand men, and will cost the roads $1,250,000. Mr. Gray held that the roads were unable to bear the expense, and that the Pere Marquette, the Chicago Great Western, and the Chicago Terminal would be irreparably injured. He also held that the increased efficiency of the service is due more to the management than to the men themselves.

Railway Matters in Washington.

Washington, March 23, 1910.

The House committee, after numerous long discussions and the proposal of many amendments, is now understood to have agreed on a re-draft of the President's railway bill, and it is expected to be presented to the House within a day or two. It is understood that a number of the provisions of Mr. Mann's bill have been inserted in the administration bill. Among the proposals said to be favored by this committee is one to give the Interstate Commerce Commission almost absolute power to enforce the long and short haul clause of the law, without being restricted by the provision regarding similarity of circumstances and conditions.

Senator Cummins talked four days in the Senate on the administration bill; Senator Elkins took another day to reply to him, and Senator Clapp has also spoken in opposition to the bill. The discussion which these speeches have aroused has, however, been of a perfunctory character. Neither the defenders of the President's proposal nor those who are supposed to be unfriendly have organized their forces; and as yet it is difficult to see what forces they have. In other words, there is little evidence of crystallized opinion in either the Senate or the House on any of the provisions of the bills.

The Senate Committee on Interoceanic Canals is understood to be unfavorable to the Flint bill, to provide for a line of government steamers between the northern Pacific coast and Panama, to break the monopoly of the Pacific Mail Steamship Co. The bill provides for heavy expenditures in the purchase of steamers. It is possible, however, that the committee may favor the hiring of steamers, which would permit the government to make the experiment of competing with the Pacific Mail.

The federal corporation tax law was argued before the Supreme Court last Thursday by Ex-Senator Foraker. He made a strong presentation of the objections to the constitutionality of the act. There are 15 cases before the court involving the validity of this tax. The Coney Island & Brooklyn Railroad Co. has presented arguments *in favor of* the law. An amendment has been incorporated in the legislative appropriation bill providing that only the President shall have the power to disclose information of corporations making returns under this law.

The records of the post office department show that in the last fiscal year the aggregate amount of fines assessed against the railways for failures to run mail trains on time amounted to $34,000, as compared with $675,000 in the year preceding. The appropriation bill for 1909 was silent on the subject of fines, leaving the matter to be managed by the department at its own discretion. Fines are to be imposed only where the delay could have been avoided "by ordinary diligence," but for several years past, and until 1909, Congress inserted a provision in the appropriation bill requiring a rigid enforcement of this provision of the law, and exorbitant fines were imposed.

Canadian Society of Civil Engineers.

At the meeting of the electrical section, held at Montreal, Canada, on March 24, a paper, Resonance in Alternating Current Circuits, was given by J. Dalemont.

American Institute of Electrical Engineers.

The regular April meeting will be held in the auditorium of the Engineers' building, New York, on April 15, 1910. The meeting is to be held under the auspices of the educational committee of the institute. Dr. Samuel Sheldon, professor of physics and electrical engineering of the Brooklyn Polytech-

nic Institute, Brooklyn, N. Y., will present a paper, Education for Leadership in Electrical Engineering.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; Havana, Cuba; March 28.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30 April 1; Charlotte, N. C.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
National Machine Tool Builders' Association.—March 24-25; Rochester, N. Y.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
Railway Telegraph and Telephone Appliance Ass'n.—H. M. Buck, Secy.-Treas., 30 Church street, New York.
Roadmasters' and Maintenance of Way Association.—Walter E Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Norquist, Chicago.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

According to Ohio papers the New York Central has within the past week found itself short several hundred cars; and on one day the requests of shippers amounted, it is said, to 5,000 more than the company could furnish.

It is reported in Boston that the Boston & Albany has agreed to make a reduction this year in the rate on export grain from Lake Erie to Boston, with a view to meeting the sharp competition of the lines which carry grain for export to Montreal.

The Buffalo, Rochester & Pittsburgh is going to run a farmers' special train carrying experts from the Pennsylvania School of Agriculture. According to the *Pittsburgh Times*, which reports this statement, all up-to-date railways will soon be running farmers' specials.

The Canadian Northern Railway is to run steamships this summer between Montreal, Canada, and Bristol, England. The "Royal Edward" will leave Bristol for Montreal May 12, and returning will leave Montreal May 26. The "Royal George" will leave Bristol May 26 and return June 9, and thereafter steamships will sail once a fortnight. H. C. Bourlier, of Toronto, formerly with the Allan Line, has been appointed general agent of the new "Royal Line."

According to a press despatch from Omaha, the Chicago, Rock Island & Pacific is now getting all of the packing house products that are shipped east from that city because it can make lower rates than any other road. Notice was given in February, by all of the lines, that rates on packing house products to eastern cities would be increased March 21, and the tariffs went into effect on that day; but from Albright, a station on the Rock Island just outside of the South Omaha yard limits, the old and lower rates still prevail, the company having filed no new tariff for that station.

Total rail shipments of freight from New York to the West—Buffalo, Pittsburgh, etc., and beyond—in January were 143,821 tons; in January of last year 115,566 tons; increase 24.45 per cent. In December the total quantity was about the same, and the increase over December, 1908, was 15.5 per cent. The percentages carried by each of the nine initial lines in January were as follows:

January.	1910, tons.	Per cent.	1909, tons.	Per cent.
New York Central	28,300	19.7	19,241	16.6
Pennsylvania	30,912	21.5	23,200	20.1
Erie	16,614	11.6	13,326	11.5
Baltimore & Ohio	11,618	8.1	9,786	8.5
West Shore	7,513	5.2	6,676	5.8
Del., Lack. & Western	17,818	12.4	14,983	13.0
Lehigh Valley	16,890	11.7	14,378	12.4
New York, Ont. & Western	10,232	7.1	10,867	9.4
Central R. R. of New Jersey	3,924	2.7	3,109	2.7
Total	143,821	100.0	115,566	100.0

For the last calendar year the Pennsylvania carried 18.9 per cent. and the New York Central 17.9.

In the year 1909 south Jersey farmers shipped more than $7,500,000 worth of produce, an increase of 34 per cent. over 1908. The freight filled 18,891 cars, and a good part of it went out of the state. The market has been greatly widened by the campaign of the Pennsylvania Railroad in behalf of the agricultural interests of that region. The south Jersey farmer is now in as close touch with his markets as any business man, and is careful to see that his products are forwarded to destinations where he will receive the maximum price. The construction by the Pennsylvania Railroad of the bridge across the Delaware river has resulted in improved through train service. Over 7,200 cars went to Camden and Philadelphia and 4,985 to Jersey City and New York; Newark, N. J., 1,186 cars; other New Jersey points, 399; Buffalo, 331; Rochester, 145; Pittsburgh, 792; Boston, 829; Chicago, 342, and so on; and some went to Michigan, 76; Nebraska, 4; North Dakota, 3; South Dakota, 1; Indiana, 10; Iowa, 6; Richmond, Va., 1; Louisville, Ky., 3; Kansas, Vermont, Maine, Michigan, Colorado, Oklahoma and other states, and to Canada. The principal commodities were: Berries (660 cars), cranberries; fish (573 cars), melons; mixed carloads (3,163 cars), oysters and clams (3,401 cars), peppers (418 cars), poultry (496 cars), potatoes (8,002 cars), and tomatoes (1,478 cars).

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1910.
(See also issues of March 11 and 18.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Ann Arbor	301	$124,024	$29,795	$163,490	$12,209	$21,405	$3,862	$64,450	$4,668	$106,594	$56,896	—$17,432	$12,331	$27,133	$13,792
Buffalo & Susquehanna	361	135,275	13,930	156,350	28,155	66,110	2,564	78,036	7,857	182,722	-26,372	—10	4,000	30,382	41,464
Central R.R. of New Jersey	668	1,438,802	308,724	1,857,684	139,896	305,075	26,189	568,755	37,139	1,077,054	780,630	—6,252	95,573	678,805	89,998
Central Vermont	411	182,788	60,980	265,948	21,526	44,852	12,211	132,908	8,228	219,725	46,223	428	10,116	36,534	19,245
Charleston & Western Carolina	340	93,481	24,335	124,068	30,390	17,631	3,032	40,446	3,334	94,833	29,235	.....	4,475	24,760	13,333
Chicago & Alton	998	593,805	305,460	987,906	99,618	162,458	43,656	447,863	35,079	788,674	199,232	—2,064	32,000	165,168	-121,928
Chicago & Erie	269	338,915	49,383	427,619	33,485	102,852	15,742	205,008	8,774	365,861	61,758	.....	10,938	50,820	37,574
Chicago, Cincinnati & Louivsville	284	89,357	17,021	113,793	16,623	25,450	8,636	67,758	6,189	124,656	—10,863	.....	3,410	-14,273	—7,405
Chicago, Peoria & St. Louis	255	141,966	18,041	166,274	22,619	31,814	6,655	72,039	5,258	138,385	27,889	.....	4,500	23,389	20,033
Cincinnati, New Orleans & Texas Pac	337	564,999	138,955	742,453	82,472	141,327	19,728	201,200	19,550	464,277	278,176	-722	20,000	257,454	48,022
Colorado Midland	337	118,991	25,866	157,460	16,737	34,067	10,314	84,950	6,271	152,339	5,121	—641	10,734	-6,255	51,400
Detroit, Toledo & Ironton	441	87,939	10,561	108,423	34,765	32,093	2,651	65,951	4,552	140,012	-31,589	443	6,510	-37,656	-21,259
Duluth, South Shore & Atlantic	599	135,463	60,445	211,326	29,816	27,492	9,231	93,094	6,145	165,778	45,548	-929	18,000	26,619	8,728
Elgin, Joliet & Eastern	781*	622,906	6	691,029	95,466	152,227	4,291	276,566	13,042	541,592	149,437	.....	13,500	135,937	20,822
Fort Worth & Denver City	454	275,823	127,160	423,023	42,485	59,226	6,289	144,143	15,214	267,357	155,666	—5,803	9,928	139,925	42,181
Georgia	307	171,228	67,898	255,348	25,320	36,698	10,985	101,781	7,194	181,978	73,370	.....	1,833	71,537	10,774
Grand Trunk Western	336	324,037	147,632	496,325	32,473	73,983	18,814	211,964	14,791	352,025	144,300	-1,930	29,190	113,180	22,968
Gulf & Ship Island	307	132,213	31,196	174,273	32,711	31,294	1,504	53,907	7,644	127,060	47,213	.....	4,863	42,350	4,934
Hocking Valley	350	485,173	60,411	567,654	60,299	100,428	7,719	192,233	14,168	374,847	192,807	-997	20,676	171,134	109,730
Houston & Texas Central	789	278,400	103,988	417,715	67,347	72,942	18,431	195,585	20,698	375,004	42,711	.....	16,485	26,226	—28,868
Iowa Central	558	202,571	38,616	253,347	25,321	48,251	7,282	130,218	9,986	221,058	32,289	.....	7,497	24,792	278
Midland Valley	324	81,793	27,057	113,791	19,048	22,846	1,806	38,485	5,906	88,091	25,700	310	8,000	18,010	14,854
Minneapolis & St. Louis	1,027	226,929	69,365	322,652	32,248	53,593	10,650	170,407	13,942	280,840	41,812	108	16,924	24,996	—25,069
Morgan's La. & Tex. R.R. & S. S. Co.	358	310,071	100,108	439,375	57,867	50,037	10,975	142,190	12,413	273,482	165,893	4,619	17,000	153,512	82,342
New Orleans, Mobile & Chicago	403	115,147	28,227	154,188	22,478	15,087	2,171	46,412	9,450	95,598	58,590	.....	3,544	55,046	2,360
Northwestern Pacific	376	67,052	92,264	179,183	41,990	32,358	2,599	83,316	9,640	169,903	9,280	.....	10,988	—1,708	12,148
Oregon R.R. & Navigation Co.	1,476†	639,906	263,603	983,104	127,081	127,219	29,885	424,061	31,583	739,829	243,275	—5,952	42,190	195,133	9,384
St. Joseph & Grand Island	319	87,617	28,214	124,624	23,163	18,214	6,138	61,799	6,045	115,359	9,265	-111	5,389	3,765	—21,078
St. Louis, Brownsville & Mexico	455	86,767	46,267	141,860	38,916	8,997	2,444	48,909	6,422	105,688	36,172	.....	3,500	32,672	11,883
Santa Fe, Prescott & Phoenix	257	82,848	27,118	115,713	16,334	8,939	2,334	30,099	5,121	62,827	52,886	.....	76	52,810	9,267
Spokane, Portland & Seattle	420§	141,064	55,722	208,278	57,199	46,877	2,508	101,471	7,322	215,377	—7,099	10,422	19,200	—15,877	—4,136
Toledo & Ohio Central	440	298,162	42,043	357,047	36,156	55,451	4,957	120,800	7,912	225,276	131,771	2,522	14,654	119,639	67,774
Toledo, Peoria & Western	248	73,405	29,495	107,615	12,987	17,376	2,556	42,454	3,181	78,554	29,061	.....	6,000	23,061	18,378
Toledo, St. Louis & Western	450	242,588	32,312	293,668	35,004	51,233	9,184	112,863	9,329	217,613	76,055	.....	12,000	64,055	13,587
Trinity & Brazos Valley	455‡	159,814	20,545	185,713	47,643	39,632	6,145	93,138	14,038	190,596	-4,883	.....	3,500	—8,383	—3,897
Virginian	444‡	143,634	15,864	166,047	22,302	29,203	5,823	55,784	7,392	120,504	45,543	231	13,000	32,774	.....
SEVEN MONTHS OF FISCAL YEAR, 1910.															
Ann Arbor	301	$703,509	$300,563	$1,092,906	$154,763	$131,200	$29,222	$373,907	$30,057	$719,149	$373,757	—87,205	$86,314	$280,237	$45,678
Buffalo & Susquehanna	361	1,223,142	142,312	1,414,773	244,005	388,843	15,194	539,682	55,144	1,242,868	171,905	—171	28,000	143,734	81,486
Central R.R. of New Jersey	668	10,272,521	2,709,813	13,723,247	1,200,297	2,195,728	205,630	3,703,508	284,297	7,589,460	6,133,787	189,828	686,520	5,637,095	722,094
Central Vermont	411	1,422,735	668,216	2,244,513	259,085	418,440	62,175	895,199	51,522	1,686,421	558,092	6,111	70,816	493,387	187,515
Charleston & Western Carolina	340	667,517	198,609	914,884	209,262	115,875	21,317	300,400	24,595	671,449	243,435	.....	31,325	212,110	49,994
Chicago & Alton	998	4,999,186	2,560,480	8,187,860	1,014,389	920,473	280,027	2,706,454	210,349	5,131,692	3,056,168	—10,021	224,000	2,822,147	-189,158
Chicago & Erie	269	2,238,723	489,041	2,975,582	353,493	629,823	108,531	1,241,716	63,290	2,396,853	578,729	.....	76,570	502,159	228,433
Chicago, Cincinnati & Louivsville	284	688,232	191,585	931,012	166,357	155,281	60,726	416,992	41,873	841,229	89,783	.....	23,840	65,943	100,408
Chicago, Peoria & St. Louis	255	849,115	194,662	1,089,747	155,221	214,562	45,578	408,530	36,109	860,000	229,747	.....	29,400	200,347	89,933
Cincinnati, New Orleans & Texas Pac	337	4,003,756	926,012	5,185,045	586,063	993,526	135,317	1,411,831	124,926	3,251,663	1,933,382	—638	140,000	1,792,744	422,049
Colorado Midland	337	1,041,534	249,785	1,465,038	181,935	231,492	72,292	621,355	39,441	1,146,513	318,525	-2,231	66,835	249,459	—75,674
Detroit, Toledo & Ironton	441	770,500	100,041	940,302	204,322	174,579	20,737	438,258	28,801	866,697	73,605	316	45,572	28,349	-54,324
Duluth, South Shore & Atlantic	599	1,222,615	604,910	1,931,069	294,953	206,622	65,012	700,417	47,957	1,314,961	616,108	7,090	134,146	489,052	166,823
Elgin, Joliet & Eastern	781*	4,955,162	143	5,371,541	517,743	1,023,714	29,080	1,585,385	113,406	3,269,328	2,102,213	.....	94,500	2,007,713	779,520
Fort Worth & Denver City	454	2,009,011	1,087,047	3,232,528	335,383	402,612	47,004	942,044	101,075	1,828,118	1,404,410	1,794	56,458	1,346,158	310,729
Georgia	307	1,226,734	505,671	1,836,146	229,101	274,423	68,448	688,387	49,659	1,310,018	526,128	.....	14,561	511,567	190,504
Grand Trunk Western	336	2,226,976	1,148,182	3,597,199	401,111	509,921	149,655	1,307,756	90,791	2,459,234	1,137,965	—5,792	204,330	927,843	51,332
Gulf & Ship Island	307	922,530	258,857	1,260,987	236,658	209,504	9,159	368,353	51,487	875,161	385,826	.....	34,050	351,776	106,350
Hocking Valley	350	3,778,234	548,013	4,471,879	589,631	796,425	52,633	1,222,218	84,189	2,745,096	1,726,782	85,606	149,719	1,662,670	459,410
Houston & Texas Central	789	2,524,096	893,197	3,651,228	446,662	402,077	123,050	1,328,635	137,262	2,437,686	1,213,542	.....	100,183	1,113,359	10,015
Iowa Central	558	1,573,751	336,618	1,996,824	264,017	302,948	60,238	814,739	62,041	1,503,983	492,841	.....	51,934	440,907	101,680
Midland Valley	324	564,721	197,523	800,770	129,922	156,052	13,400	222,191	33,357	554,922	245,848	165	56,000	190,013	158,547
Minneapolis & St. Louis	1,027	2,027,312	767,941	2,988,605	310,996	339,100	88,541	1,126,846	93,642	1,959,125	1,029,480	—336	135,508	893,636	48,665
Morgan's La. & Tex. R.R. & S. S. Co.	358	2,189,985	674,449	3,025,146	375,530	339,136	71,939	1,006,709	88,854	1,882,169	1,142,977	—64	123,520	1,019,393	246,441
New Orleans, Mobile & Chicago	403	718,460	200,718	985,993	151,458	94,486	15,124	300,411	59,372	620,851	365,142	.....	25,593	339,549	44,986
Northwestern Pacific	376	793,958	980,676	1,923,642	334,289	227,841	18,523	655,417	67,480	1,303,550	620,092	.....	74,881	545,211	120,411
Oregon R.R. & Navigation Co.	1,476†	5,753,175	2,694,748	8,966,032	929,785	760,024	213,489	2,751,875	230,463	4,885,636	4,080,396	4,678	396,134	3,688,940	—76,169
St. Joseph & Grand Island	319	663,526	250,969	989,217	223,102	111,243	44,455	383,296	33,616	795,712	193,505	—184	39,197	154,124	—172,960
St. Louis, Brownsville & Mexico	455	530,817	266,166	848,482	226,938	72,377	17,777	289,963	45,388	652,443	196,039	.....	22,500	173,539	45,974
Santa Fe, Prescott & Phoenix	257	582,207	200,344	832,373	130,073	63,259	19,011	211,542	36,198	460,084	372,289	.....	260	372,029	28,092
Spokane, Portland & Seattle	420§	1,365,282	464,026	1,902,926	334,504	194,475	21,353	652,253	44,859	1,247,444	655,482	1,239	193,710	463,011	381,212
Toledo & Ohio Central	440	2,088,717	388,262	2,584,622	344,394	408,684	39,687	791,779	46,271	1,630,815	953,807	60,019	99,332	914,494	—23,584
Toledo, Peoria & Western	248	420,458	248,234	704,675	119,016	116,274	15,820	248,636	22,232	521,978	182,697	.....	31,000	151,697	32,322
Toledo, St. Louis & Western	450	1,850,105	283,354	2,269,538	262,516	330,260	48,136	715,083	60,884	1,416,879	852,659	.....	84,000	768,659	94,509
Trinity & Brazos Valley	455‡	1,170,380	136,018	1,333,134	245,260	227,157	37,724	596,880	78,729	1,185,749	147,385	.....	25,353	122,032	-30,019
Virginian	444‡	902,494	126,213	1,079,238	178,929	194,690	41,332	319,942	51,378	786,271	292,967	8,154	79,667	216,454	.....

* Mileage operated January 31, 1909, 742. † Mileage operated January 31, 1909, 1,327. ‡ Mileage operated January 31, 1909, 434. § Mileage operated January 31 1909, 272. ‡ Began regular operations on July 1, 1909. — Indicates Deficits, Losses and Decreases.

President Taft at Chicago Traffic Club.

President Taft was the guest of the Traffic Club of Chicago at noon on March 17, and while there was elected an honorary member of the club and made a speech. His talk was devoted mainly to a statement of his attitude toward railway men. The president said:

"It seems to be in the mind of some men in positions of responsibility that those who are affected directly never should be consulted. If, in the recommendation of legislation affecting railways, you consult the railway men, who are affected, these people will consider that sufficient to condemn you and all the legislation you recommend.

"But I consider that I would be a coward if I did not consult every interest affected by the legislation I have to pass upon. I am against the railways only when they violate the law, and I consider that every man is entitled to his day in court. I may be criticized, but I am not afraid of the people of the United States. They are fair. The great difficulty, however, is to get to them with the facts.

"Now, I did not intend to say this exactly, but I have said it and I mean it.

"The time was in this country when it was most difficult for any railway man to conduct his business within the law. I would bring it about so that he may conduct his business within the law and so that the law shall be fair, and so that he shall be made to feel the penalty of the law when he steps outside of it.

"I believe there is a course, and legislation, that can bring this about, and I hope that I always may be able, no matter what the result may be, to do justice between the great interests of this country—the people, the shippers and the railways; and I hope that every man shall see that it is to his ultimate advantage to uphold the law and preserve it and make it inviolate."

Brief as the speech was it probably has caused as much comment among railway men and shippers in Chicago as anything Mr. Taft ever said. Many of them have given interviews to the press heartily endorsing the attitude taken.

Agronomy and Other Things.

The latest farmers' special takes in everything, almost. It is that of the Oregon Railroad & Navigation Company, and is to be run in eastern Oregon from March 31 to April 10. The lecturers are from the Oregon Agricultural College, 12 members of its faculty. It is planned to make up the train as follows: One car for a live stock exhibit; one flat car for farming machinery; one flat car for a poultry yard exhibit; one baggage car for poultry supplies and demonstrations; one baggage car for a horticultural exhibit; one baggage car for agronomy; one baggage car for dairying machinery and supplies; one Pullman sleeper and one business car.

INTERSTATE COMMERCE COMMISSION.

Interpretation of Utah Demurrage Provisions.

United States v. Denver & Rio Grande. Opinion by Chairman Knapp.

The reclamation service of the government, in connection with an irrigation project at Strawberry Valley, aided the defendant in building a 700-ft. side track at mile post 679, about two and a half miles west of Thistle Junction. The track, although principally for use by the government, was also used for other purposes, and was therefore a public and not a private siding. The government ordered 52 cars of cement to be shipped from Independence, Kan., billed "to mile post 679, near Thistle Junction." The government then ordered a certain number of cars—the exact number being in dispute—placed on its track each day. The railway company followed these instructions, holding cars at Thistle Junction until the government was ready to have them placed on the side track. The Utah Car Service Association rules in regard to demurrage provide that as prevent prompt delivery, then such cars will be considered as having been placed when the road offering the cars would have delivered them had the condition of such tracks permitted.

Section 1.—Cars containing freight to be delivered on carload delivery tracks or private sidings shall be placed on the tracks designated immediately upon arrival, or as soon thereafter as the ordinary routine of yard work *will permit.* Delivery will not be made on specially designated yard or tracks except when it is *practicable* to do so. When such delivery cannot be made, on account of such tracks being fully occupied, *or for any other reasons beyond the control of the carrier,* delivery shall be made at the nearest available point.

Sec. 2.—Delivery of cars shall be considered to have been effected at the time when such cars have been placed on the proper private or public delivery tracks, or if such track or tracks already contain such number of cars belonging to the same consignee. The commission holds that since the track in question could have accommodated nine cars, and was never at any time filled to its capacity, the railway company cannot charge demurrage on the cars held at Thistle Junction.

Commissioner Prouty dissenting:

It is conceded that if the non-delivery of the balance of the cars at Thistle Junction was due to a reason beyond the control of the carrier, the demurrage charge properly could be made. The railway company simply followed orders in delivering only two cars a day to the side track, and therefore it was induced to this course by a reason beyond its control. It is a novel proposition that the United States can defeat the right of the defendant to the demurrage which properly accrued for the detention of these cars at Thistle Junction by showing that the defendant obeyed its instructions. (18 I. C. C., 7.)

Demurrage Charges on Coal Cars Held Reasonable.

Peale, Peacock & Kerr et al. v. Central of New Jersey. Georges Creek Coal & Iron Co. v. same. Opinion by Commissioner Clark.

Complainants allege that the defendant's demurrage regulations on coal and coke held for trans-shipment at tidewater ports are unjust, unreasonable and discriminatory; first, in favor of shippers of large tonnage; second, in favor of lake ports, southern ports and New York harbor points, where no demurrage is charged or where more liberal rules apply; third, in favor of competitors in bituminous coal markets operated under embargo, under demurrage regulations which are not enforced, or where no demurrage regulations obtain. The commission is asked to enter an order enjoining defendant from collecting demurrage charges that have accrued under existing rules, and to enter an order that demurrage should be computed on the average over a year instead of on the average monthly.

It is held that no power rests in this commission to enjoin a carrier from collecting its lawful tariff charges for services rendered; that it would be unreasonable to extend to one year the period on which average demurrage will be computed; that free time should be computed from 7 a.m. of the day succeeding the date on which car arrives at the yards to and including the date on which car is unloaded or upon which vessel registers at the pier as ready to receive that consignee's shipments, provided that consignee has sufficient coal in the yard to load his vessel and has ordered same dumped. Defendant's rules do not unjustly discriminate against complainants or unduly prefer other shippers or places. (18 I. C. C., 25.)

Uniformity in Minimum Carload Weights Prescribed.

Acme Cement Plaster Co. v. Chicago Great Western et al. Opinion by Commissioner Prouty.

A common carrier cannot impose an unreasonable rate because of the origin of the traffic. The minimum carload weight upon cement plaster as applied to the rates above established ought not to exceed 30,000 lbs. To whatever points a minimum carload weight of 60,000 lbs. on cement plaster is accorded from Gypsum, Iowa, the same minimum weight, with a corresponding reduction in the rate, should be given from Council Bluffs, Iowa.

It seems that in the making of rates from Rapid City, S. Dak., to Missouri river points on cement plaster, where competition from both Gypsum and Laramie, Wyo., must be met,

certain intermediate points in this territory are given a lower rate than would otherwise be accorded and a rate somewhat lower in proportion to distance than is made from Gypsum or Council Bluffs; held, that the apparent discrimination is, under all the circumstances, not undue. (18 I. C. C., 19.)

Discrimination Against Henderson, Ky.

Henderson Elevator Co. v. Illinois Central. Opinion by Chairman Knapp.

During a part of 1906 defendant, by provisions in its tariffs, applied to the transportation from Omaha, Neb., and Council Bluffs, Iowa, to Cairo and other Ohio river crossings of grain placed in elevators at the latter points and reshipped thence to southeastern destinations proportional rates less than the local rates paid from said points of origin to said destinations, but no such transit privilege was allowed at Henderson, Ky.; held, that failure to allow the proportional rate and transit privilege at Henderson unlawfully discriminated against complainants' business at that point. Reparation awarded. (17 I. C. C., 573.)

Competition of Express Companies with U. S. M.

Nathan B. Williams v. Wells Fargo & Co. Opinion by Commissioner Prouty.

The defendant express company does not, in handling small packages in competition with the United States government in the transportation of mail matter, or in filing its tariffs applicable thereto, transgress any provision of the act to regulate commerce. (18 I. C. C., 17.)

COURT NEWS.

Judge Kohlsaat of the federal court at Chicago on March 15 refused to grant a permanent injunction restraining the railways entering Chicago from putting into effect the National Car Demurrage rules. A short time ago Judge Kohlsaat issued an order temporarily restraining the roads from putting the rules into effect. He rescinds this order but keeps jurisdiction of the case in order to enforce any order that may be issued by the Interstate Commerce Commission with regard to the matter. The Chicago grain interests will appeal to the commission.

STATE COMMISSIONS.

The Illinois Railway Commission has issued an order requiring the general superintendents or general managers of railways within the state to make reports to it of accidents immediately after their occurrence. The commission complains that heretofore reports have often been made by claim agents and other persons without knowledge of the facts instead of by the responsible operating officers.

The Oklahoma Corporation Commission a few weeks ago summoned the executive officers of 16 railways to appear before it on March 15 and supply it with information which would enable it to ascertain the cost of operating these roads in Oklahoma. When the commission met on March 15 only one of the roads was represented, this being the St. Louis, Iron Mountain & Southern. The commission then extended its order to April 18.

New York: Increase in Milk Rates Disapproved.

Holding that milk is a necessity of life, the New York Public Service Commission, Second district, has decided that the advance of ½ cent per gallon in the rates on milk to Buffalo for distances up to 75 miles, and of 1 cent per gallon in rates on cream for the same distances, made by the roads entering that city, is unreasonable and unjust and that the rate should not exceed 1½ cents per gallon in 8 and 10-gal. cans on milk and 2½ cents per gallon on cream in 5 and 10-gal. cans.

The commission wholly sustains the complaints made by the Western New York Milk Producers' Association and the Association of Milk Dealers of Buffalo against the six roads entering the city from the south and east. The opinion was by Commissioner Decker and lays down the following principles:

1. The commission has jurisdiction to entertain a complaint filed against published advances in rates before such rates become effective.

2. When rates long in effect are challenged the burden of proof is upon the complainant, and when advances in rates are complained of the burden of proof is upon the respondent.

3. Milk is a food article of daily consumption, properly regarded as a necessity of life in all households, and as such must be deemed to come within that class of commodities which the whole public interest requires shall be transported by public carriers to consuming localities at low rates.

4. This commission has absolutely no function to perform respecting the regulation of prices for milk made by dealers and charged to consumers. Its duties are confined to the fixing of transportation charges on milk when shown unreasonable or unjust upon complaint presented, and the same provisions of law which require carrier's charges shall be limited to the point of reasonableness justify the carrier in insisting upon the right to charge as much as is actually reasonable.

5. In a case involving the reasonableness of rates the cost of production of a given article, the cost of handling that article for sale, and the prices charged in wholesale and retail markets or for delivery to consumers are all elements entitled to full weight, but with them are to be considered the history of the traffic in question and the conditions pertaining to performance of transportation by the carrier, including the changes in such conditions.

6. Evidence showing the general custom of carriers as to rates on a given article to a large number of cities and throughout wide territories is not conclusive—similarity of traffic and transportation conditions must also be established, and this must then be considered in connection with the other elements of the case.

7. The increased cost of labor, materials and equipment for railways may be fully met by increased volume of traffic on the railway, and the question whether an increased railway rate is justified is by no means settled when it is shown that as compared with former years the railway company is subjected to greater present cost of operation.

8. There is no evidence upon which the commission can ascertain the cost of the milk service on the respondent lines. While there has been a general increased cost of railway operation and some increase in the average distance haul of milk by respondents to Buffalo, the practically constant use of the same car equipment in milk traffic, the economical employment of passenger trains and passenger train crews in that service, the large and constantly increasing volume of the milk traffic and its reliable character as a daily movement, and all of the other stated conditions in these cases indicate that the old rate on milk was profitable to the respondents and would be so under present conditions.

The order of the commission as to the Buffalo & Susquehanna Railway is, on account of the present financial condition of that company, suspended pending further investigation.

Wisconsin: Telephone Installation Ordered.

Burlington, Brighton & Wheatland Telephone Co. v. Chicago & North Western.

Petition praying for an order compelling the respondent to install one of petitioner's telephones in its stations at Fox River. One subscriber of petitioner resides in said station and all of its subscribers, 258 in number, reside on farms and in villages adjacent to such station and transact business at same to a considerable extent. Within the meaning of ch. 614, Laws of 1907, every railway station is an "office" and in relation to the question of reasonably adequate telephone service it is immaterial whether such station is a station within the meaning of Sec. 1801, R. S.; that said chapter requires reasonably adequate telephone service at its stations where it can be had; that in the instant case such service can be had and respondent is ordered to install a telephone in its station at Fox River.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Joseph Ramsey, Jr., vice-president of the Ann Arbor, with office at New York, has been elected president, succeeding E. Zimmerman.

Kingdon Gould has been elected vice-president of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with office at New York.

William S. Kenyon, general attorney of the Illinois Central, with office at Chicago, has resigned to accept the appointment as assistant to the Attorney-General of the United States, succeeding Wade H. Ellis.

W. C. Brown, president of the New York Central Lines, has been elected also president of the Toledo & Ohio Central, succeeding C. T. Lewis, and the other executive officers of the New York Central Lines have also been elected to take positions on the Toledo & Ohio Central.

Charles S. Clarke, vice-president of the Missouri Pacific, has been elected first vice-president, with office at St. Louis, Mo. C. H. Middleton and M. C. Markham, assistants to the vice-president at St. Louis, have both been elected assistants to the first vice-president, with office at St. Louis.

W. M. White, vice-president and general manager of the Liberty White Railroad at McComb City, Miss., has been elected president and general manager, with office at McComb City, succeeding J. J. White, resigned. J. W. Johnson has been elected vice-president, with office at McComb City.

C. E. Walker, secretary, treasurer and purchasing agent of the Southern Pacific's subsidiary lines, having resigned to engage in other business, the following appointments have been made: Gibson Taylor has been appointed assistant secretary of the Southern Pacific Railroad of Mexico, also secretary of the Arizona Eastern, the Phoenix & Eastern, the Gila River Railroad and the Aravaipa Canyon Railroad. P. J. Archer has been appointed treasurer and purchasing agent of the Arizona Eastern, assistant treasurer and purchasing agent of the Southern Pacific Railroad of Mexico, treasurer of the Phoenix & Eastern, the Gila River Railroad and the Aravaipa Canyon Railroad, also purchasing agent and cashier of the Sonora Railway, both with offices at Tucson, Ariz.

E. O. McCormick, whose election as vice-president of the Southern Pacific Company, with office at San Francisco, Cal., has been announced in these columns, was born April 3, 1858, at Lafayette, Ind. He received a high school education and began railway work in 1879 in the construction department of the Lake Erie & Western. He was then consecutively in the freight department of the Louisville, New Albany & Chicago, now a part of the Chicago, Indianapolis & Louisville, at Lafayette; general agent for the Great Eastern Freight Line at Louisville, Ky.; city passenger and ticket agent at Louisville and later at Chicago, then general northwestern passenger agent and later general passenger and ticket agent at Chicago for the Chicago, Indianapolis & Louisville; general passenger and ticket agent of the Cincinnati, Hamilton & Dayton, and traffic manager of the Cleveland, Cincinnati, Chicago & St. Louis. In May, 1899, he was made passenger traffic manager of the Southern Pacific at San Francisco, Cal., and five years later he was appointed assistant traffic director of the Southern Pacific and the Union Pacific, with office at Chicago, from which position he has recently been promoted.



E. O. McCormick.

William S. Kies, whose appointment as general solicitor of the Chicago & Western Indiana and the Belt Railway Company of Chicago, with office at Chicago, has been announced in these columns, was born December 2, 1877, at Mapleton, Minn. He received the degree of B.L. from the University of Wisconsin in 1899 and a second degree from the same institution in 1900. After graduation he became an investigator for the Chicago City Railway and was later chief trial attorney for the city of Chicago. Five years ago he was appointed general attorney for the Chicago & North Western, which position he held at the time of his recent appointment as general solicitor.



Photograph by Matzene.

William S. Kies.

The following have been elected officers of the Temple Northwestern, a line under construction in Texas: W. J. McDaniel, president; H. W. Peck, first vice-president and general attorney; J. B. Grigsby, second vice-president, all of Dallas, Tex., and P. L. Downs, of Temple, Tex., treasurer. T. C. Taylor, soliciting freight agent of the Atchison, Topeka & Santa Fe at Dallas, Tex., has been appointed secretary and auditor of the Temple Northwestern, with office at Temple. See item under Traffic Officers.

Operating Officers.

The office of J. B. Sucese, superintendent of the Chicago, Indianapolis & Louisville, will be changed from Chicago to Indianapolis, Ind.

J. V. Kennedy, trainmaster of the Cleveland, Cincinnati, Chicago & St. Louis at Riverside, Ohio, has been appointed superintendent of terminals at Cincinnati, Ohio.

J. M. Scott, superintendent of the Cincinnati, Hamilton & Dayton at Indianapolis, Ind., has been appointed superintendent at Dayton, Ohio, succeeding T. A. Sweeney, resigned to accept service elsewhere. R. B. White succeeds Mr. Scott.

T. A. Sweeney, superintendent of the Cincinnati, Hamilton & Dayton at Dayton, Ohio, has been appointed trainmaster on the Southern division of the Chicago Great Western, with office at Des Moines, Iowa, succeeding W. G. Hunter, resigned.

Edwin C. Keenan has been appointed superintendent of telegraph of the Lake Shore & Michigan Southern, the Lake Erie, Alliance & Wheeling and the Dunkirk, Allegheny Valley & Pittsburgh, with office at Toledo, Ohio, succeeding William Kline, retired. Mr. Keenan will also represent the Western Union Telegraph Co.

W. L. Connelly, trainmaster of the Chicago, Indiana & Southern at Danville, Ill., has been appointed superintendent of telegraph of the Chicago, Indiana & Southern and the Indiana Harbor Belt, with office at Gibson, Ind., succeeding Thomas Brennan, transferred. Mr. Connelly will also represent the Western Union Telegraph Co.

Charles Ware, whose appointment as general superintendent of the Union Pacific, with office at Omaha, Neb., has been announced in these columns, was born in January, 1863, at Jonesboro, Ill. He was educated at the Southern Illinois University and served eight years on the Iowa division of the Chicago & North Western as train despatcher and later as chief train despatcher. In 1890 he went to the Union Pacific, where he was consecutively to 1905 train despatcher, chief train despatcher and assistant superintendent of the Nebraska division. For the past five years he has been superintendent

of the Nebraska division, from which position he was promoted to general superintendent.

J. Lasseter, who has been appointed superintendent of the Mobile division of the Southern Railway, with office at Selma, Ala., as announced in these columns, was born near Tuskogee, Ala., April 7, 1863. He began railway work in the agent's office of the Louisville & Nashville as messenger boy and a year later, while in the service of this company, he studied telegraphy. From 1877 to 1881 he was employed as operator and agent at various places on the same road. In 1881 he was appointed despatcher on the Memphis & Charleston, now the Memphis division of the Southern Railway. He was promoted to chief despatcher in 1890, since which time he has been consecutively, trainmaster in 1901, assistant superintendent in 1906, superintendent of the Selma division in 1907, and again trainmaster in 1908. This change was brought about by the Southern's policy of rigid economy and consolidation of divisions following the panic. He remained as trainmaster until his recent appointment as superintendent.



J. Lasseter.

Traffic Officers.

E. J. Dowie has been appointed an industrial agent of the Cleveland Short Line, with office at Cleveland, Ohio.

M. B. Irwin has been appointed live stock agent of the Chicago, Rock Island & Pacific, with office at St. Joseph, Mo.

C. E. Carleton has been appointed a soliciting freight agent of the Trinity & Brazos Valley, with office at Houston, Tex.

C. R. Krause has been appointed a soliciting agent of the Atlanta, Birmingham & Atlantic, with office at Kansas City, Mo.

E. H. Dallas has been appointed a district passenger agent of the Gulf, Colorado & Santa Fe, with office at San Antonio, Tex.

Frank N. Newman has been appointed a district passenger agent of the St. Louis & San Francisco, with office at Denver, Colo.

F. N. Hicks has been appointed a traveling emigration agent of the Chicago, Milwaukee & St. Paul, with office at Chicago.

A. B. Moseley, traveling passenger agent of the Oregon Short Line, with office at Ogden, Utah, has resigned to engage in other business.

George E. Reynolds has been appointed a commercial agent of the Louisiana Railway & Navigation Company, with office at Alexandria, La.

Wm. F. Morris, Jr., traveling freight agent of the Great Northern, with office at Buffalo, N. Y., has resigned to engage in other business.

W. T. Spicer has been appointed a traveling passenger agent of the Colorado & Southern, with office at Fort Collins, Colo., succeeding N. P. Bilter, transferred.

P. L. Sheppard has been appointed a traveling freight agent of the Indiana Harbor Belt, with office at Chicago, succeeding C. R. Coughlin, resigned to accept service elsewhere.

H. A. Cherrier, city passenger agent of the Chicago, Burlington & Quincy at Chicago, has been appointed general agent in the passenger department, with office at Chicago.

Harvey Kidwell has been appointed a traveling freight agent of the Southern Railway, with office at Atlanta, Ga., succeeding R. G. Parks, resigned to accept service elsewhere.

Frank I. Smith has been appointed a commercial agent of the Seaboard Air Line, with office at Denver, Colo., succeeding A. H. Stevens, resigned to accept service with another company.

S. R. Drury has been appointed a general agent in the passenger departments of the Chicago, Burlington & Quincy and the Colorado & Southern, with office at Denver, Colo., succeeding E. A. Cooper.

A. A. Martin, freight claim agent of the Galveston, Harrisburg & San Antonio at Houston, Tex., has resigned to take charge of the claim department of the Texas & Pacific, with office at Dallas, Tex.

W. D. Cornell, traveling passenger agent of the Toledo, St. Louis & Western and the Chicago & Alton at Buffalo, N. Y., has been appointed a district passenger agent of those lines, with office at Cincinnati, Ohio.

O. M. Burkholder, city passenger and ticket agent of the St. Louis Southwestern at Shreveport, La., has been appointed a traveling passenger agent, with office at St. Louis, Mo., succeeding L. E. Saupe, transferred.

J. N. Griswold, division freight agent of the Atchison, Topeka & Santa Fe at Dallas, Tex., has been appointed traffic manager of the Temple Northwestern, with office at Temple, Tex. See item under Executive, Financial and Legal Officers.

M. E. McKirahan, freight claim agent of the San Pedro, Los Angeles & Salt Lake at Los Angeles, Cal., having resigned, that office is abolished, and the duties heretofore performed by the freight claim agent will be assumed by the general claim agent.

J. A. Fitzpatrick, southwestern freight agent of the Toledo, St. Louis & Western and the Chicago & Alton at Dallas, Tex., has been appointed general agent in the traffic department of these roads, the Iowa Central and the Minneapolis & St. Louis, with office at Buffalo, N. Y., succeeding W. J. Leahy, deceased. L. B. Gerner succeeds Mr. Fitzpatrick.

R. E. McGrath, contracting freight agent of the St. Louis & San Francisco at Kansas City, Mo., has been appointed a traveling freight agent, with office at Kansas City, succeeding H. G. Benedict, resigned to go to the Atlanta, Birmingham & Atlantic. W. F. Hutchinson succeeds Mr. McGrath. A. H. Stevens has been appointed a general agent, with office at Denver, Colo.

J. A. McWilliams has been appointed a traveling freight agent of the Southern Railway, with office at Knoxville, Tenn., succeeding C. E. Rising, resigned. The office of commercial agent at Houston, Tex., has been abolished and the following appointments have been made: Walter Shipley, commercial agent at Dallas, succeeding W. T. Rembert, who becomes a traveling freight agent, with office at Dallas, and L. W. Sanderson traveling freight agent, with office at Dallas.

W. W. Richardson, assistant general passenger agent of the Pennsylvania Lines West at Indianapolis, Ind., has been appointed assistant general passenger agent, with office at Pittsburgh, Pa., succeeding J. B. Modisette, promoted. F. A. Bauchens, district passenger agent at Toledo, Ohio, succeeds Mr. Richardson. G. L. A. Thomson, traveling passenger and freight agent at Winnipeg, Man., succeeds Mr. Bauchens, and W. E. Blachley succeeds Mr. Thomson.

Engineering and Rolling Stock Officers.

H. E. Hale has been appointed principal assistant engineer of the Missouri Pacific-Iron Mountain system, with office at St. Louis, Mo., succeeding R. H. Ford, transferred.

W. H. Wilson, superintendent of motive power of the Buffalo, Rochester & Pittsburgh at DuBois, Pa., has resigned, effective April 1, to go to one of the large roads, with headquarters at St. Paul, Minn.

W. B. McLoughlin, engineer maintenance of way on the St. Louis division of the Cleveland, Cincinnati, Chicago & St. Louis, at Mattoon, Ill., has been transferred to the Chicago division, with office at Indianapolis, Ind.

M. A. Zook, engineer maintenance of way of the Chicago

Great Western at St. Paul, Minn., has been appointed resident engineer in charge of grade revision and improvements on the Eastern division, with office at Chicago.

C. M. Tritsch, master mechanic of the Maryland division of the Western Maryland at Hagerstown, Md., has been appointed superintendent of motive power and car departments, succeeding R. C. Evans, resigned. W. J. Bingley succeeds Mr. Tritsch, both with offices at Hagerstown.

The mechanical department of the Great Northern, formerly in charge of G. H. Emerson, who is now assistant general manager at St. Paul, Minn., has been divided, and two superintendents of motive power have been appointed. R. D. Hawkins, assistant superintendent of motive power at St. Paul, has been appointed superintendent of motive power, with jurisdiction over the mechanical and electrical forces, other than locomotives and car shops, and A. C. Deverell, assistant superintendent of motive power at St. Paul, has been appointed superintendent of motive power, with jurisdiction over locomotives and car shops. John C. Sesser has been appointed an assistant engineer maintenance-of-way, all with offices at St. Paul.

Samuel J. Hungerford, whose appointment as superintendent of rolling stock of the Canadian Northern, with office at Winnipeg, Man., has been announced in these columns, was born July 16, 1872, at Bedford, Que. He received a common school education and began railway work as a machinist apprentice in May, 1886, with the Southeastern Railway, now a part of the Canadian Pacific, at Farnham, Que. He was then consecutively machinist apprentice for the Canadian Pacific; a machinist at various places; roundhouse chargeman with the Canadian Pacific at Windsor street, Montreal, and later at Farnham, Que.; locomotive foreman at Lake Megantic, Que.; general foreman at McAdam Junction, N. B.; locomotive foreman at Cranbrook, B. C.; master mechanic on the Western division at Calgary, Alta., and superintendent of locomotive works at Winnipeg. Since January, 1908, he has been superintendent of shops at Winnipeg, which position he resigned to become superintendent of rolling stock of the Canadian Northern and the Duluth, Rainy Lake & Winnipeg, with office at Winnipeg.



S. J. Hungerford.

OBITUARY.

Richard S. Simmons, traveling freight agent of the Chicago, Rock Island & Pacific, with office at Kansas City, Mo., died at Kansas City March 16.

W. Frank Wilson, assistant manager of the New York Central Fast Freight Lines at Buffalo, N. Y., died March 17 while traveling on a train. Mr. Wilson was born January 11, 1846, at Chicago, and began railway work in 1863 as a clerk in the office of the Chicago, Burlington & Quincy at Chicago.

A. F. Sortwell, president of the Montpelier & Wells River and vice-president of the Barre Railroad, died March 21 of heart disease at his home in Cambridge, Mass. Mr. Sortwell was born July 21, 1854, at Boston, and was educated at Phillips Academy at Andover, Mass. He was elected vice-president of the Montpelier & Wells River in 1889 and was made president in November, 1894. He also held a number of offices in the Cambridge city government and was mayor of that city in 1897 and 1898.

Railway Construction.

New Incorporations, Surveys, Etc.

American Central.—Preliminary survey is now being made by J. B. Taylor & Co., 37 Liberty street, New York, from Miami, Tex., southeast via Mobeetie and Wheeler to Texola, Okla., and through Mangum and Olustee to Vernon, Tex., 160 miles. Financial arrangements are made to build the line. The project is financed by New York and London capitalists. W. E. McClintock, chief engineer, Mobeetie. (Jan. 14, p. 113.)

Baltimore & Ohio.—A contract has been given to the Robert Grace Co., Cleveland, Ohio, and work will be started at once building an extensive freight terminal at Chicago Junction, Ohio, on the main line of the Chicago division. The new terminal will be the largest west of Brunswick, Md., and second in size on the system. The improvements are to include a gravity or hump classification yard, having a capacity of 3,900 cars with the necessary yard buildings, scales, etc., and a water reservoir, to have a capacity of 200,000,000 gals. The new freight terminal will contain receiving yards, to have a capacity for 2,000 cars, and classification yards, to have a capacity for 1,900 cars. Chicago Junction is the terminus of the Chicago and New Castle divisions, and at the intersection of the Newark division lake line to Sandusky. It is the most important locomotive terminal on the Baltimore & Ohio. It is estimated that the work will include the excavation of 950,000 cu. yds. and the construction of 4,500 cu. yds. of concrete for the terminal. The cost of the improvements will be $1,500,000.

Brownwood North & South.—A contract has been given to the Texas Building Co., Fort Worth, Tex., it is said, for building 20 miles of this line from Brownwood north to May. It is expected that grading work will be begun at once. The line is eventually to be extended further north to a point on the Texas & Pacific. John Mead, chief engineer, Brownwood. (Feb. 25, p. 428.)

Carlton & Coast.—An officer writes that contracts are to be let in April to build from Carlton, Ore., northwest to Fairdale, Yamhill county, 14 miles, and work is to be started in April. There will be two bridges and several trestles on the line. Chas. E. Ladd, president; W. B. Dennis, vice-president and general manager, 505 Concord building, Portland. (March 11, p. 546.)

Charles City & Western.—Organized in Iowa, with $300,000 capital, to build 20 miles of line from Charles City, Iowa, southwesterly. C. W. Hart, president, and A. W. Dennis, Charles City, is interested.

Cherryvale, Oklahoma & Texas.—An officer writes that engineers are now in the field making the final and definite location for this line. The plans call for a line from Cherryvale, Kan., southwest towards El Paso, Tex., with a branch south towards Aransas Pass, and another branch south to South McAlester, Okla.; also one from Caney, Kan., southeast towards Fayetteville, Ark. The company expects to let grading contracts this month. Preliminary surveys are under way from Cherryvale, Kan., southwest towards Mangum, Okla., 235 miles, as well as for a branch from Caney southeast via Vinita, Okla., 78 miles. The first work to be carried out will be on the branch via Vinita. S. M. Porter, president, Caney, and B. J. Dalton, chief engineer, Lawrence. (March 18, p. 749.)

Chicago, Burlington & Quincy.—An officer writes regarding the reports that surveys are being made for a line from Mexico, Mo., west to Kansas City, that some surveys are being made near Carrollton for a line between St. Joseph and Mexico, but there is no immediate prospect of the company building the line. Surveys are not being made for a line to Kansas City.

Chicago, Milwaukee & Puget Sound.—This company has definitely decided upon the route to be followed by its projected branch to Everett, Wash. From the main line at Moncton, Wash., a small station 39 miles east of Seattle, the line will pass through North Bend and then will follow the Snoqualmie river valley to the junction of that river and the Skykomish at a point about seven miles scuth of the town

of Snohomish, thence through the Snohomish river valley to Snohomish and Everett, 52 miles. The upper end of the Snoqualmie valley is narrow and winding, with mountain grades. After the junction of the Snoqualmie and Skykomish rivers, however, it widens into a valley floor of from one-half mile to one mile in width. The entire route is heavily timbered. The contract has been let to H. C. Henry, Seattle, Wash. The ground for extensive terminals upon the Snohomish flats in Everett has already been procured and construction will be commenced at once. (Feb. 18, p. 379.)

Durham & Charlotte.—See Sanford & Troy.

Franklin & Abbeville.—An officer writes that a contract has been given to J. M. Sullivan, New Iberia, La., for the grading, and to M. Baugh, Cades, for track and bridge work for an extension from David junction, in Iberia parish, northwest via Kingsville to Milton, about 20 miles. Track laid on 9½ miles. The company also has plans made for putting up two stations as well as carrying out some bridge or tunnel work on the line. (Sept. 17, p. 520.)

Georgia Roads.—According to press reports financial arrangements have been made, surveys completed and contracts are to be let at once for a line from Toccoa, Ga., south to Carnesville, 20 miles. W. S. Erwin, Clarkesville, Ga., may be addressed.

Grand Trunk Pacific.—An officer writes that a contract has been let to J. D. McArthur, Winnipeg, Man., for completing the remaining 135 miles on the Tofield-Calgary branch, in Alberta. A contract has also been given to the same contractor for completing the Melville-Regina branch from Bacarres, Sask., southwest to Regina, about 60 miles. A contract has been given to Rigby-Hyland & Plummer for the extension of the Yorktown, Sask., branch north to Canora, about 30 miles. It is intended to complete this work during 1910.

Idaho & Washington Northern.—An officer writes that a contract has been given to Grant, Smith & Co., Spokane, Wash., for an extension from Ione, Wash., north to Metaline, 10 miles, and work is now under way. Maximum grades will be 0.3 per cent. and maximum curvature 6 degs. The work involves handling about 50,000 cu. yds. per mile. There will be one 600-ft. tunnel, a large trestle and a bridge over the Pend Oreille river. (Jan. 7, p. 68.)

Iowa & Omaha Short Line.—According to press reports grading work, which was suspended early in the winter, has been resumed on this line. It is expected to have the line in operation from Council Bluffs, Iowa, to Treynor, 15 miles, by July 1. George W. Adams & Co., Walnut, Iowa, are the contractors. The office of the company is at 410 Fifth avenue, Council Bluffs. (Nov. 12, p. 943.)

Johnstown & Altoona.—Surveys made and, it is said, financial arrangements completed to build from Johnstown, Pa., northeast to Altoona, about 40 miles. Contracts for the work are to be let in June. G. Holman, chief engineer, Johnstown.

Kansas Roads.—The Electric Traction Construction Co., Scarritt building, Kansas City, Mo., want to sub-let 25 miles of railway work in Kansas. The grading and other work involves the handling of about 402,300 cu. yds.

Memphis, Pensacola & Northwestern.—Organized in Mississippi to build from Memphis, Tenn., southeast to Pensacola, Fla., about 400 miles. The projected route is via Plumpoint, De Soto county, Miss., on the Tennessee border, southeasterly through Mississippi via Meridian and Clarke county, thence through the southwest corner of Alabama to Pensacola. J. M. Dockery, H. T. Bruce, S. W. Jones, B. G. Hening and D. S. Rice, Memphis, are interested.

Nebraska, Kansas & Southern.—A contract is said to have been given to Smith & Scott, Garden City, Kan., for building a section of this line. The company was organized to build from Garden City northeast eventually to Stockton, about 162 miles. Track laid from Garden City east about 15 miles. Baxter L. Brown, chief engineer, 610 Laclede building, St. Louis, Mo. (Nov. 26, p. 1037.)

New Park & Fawn Grove.—An extension is to be built from Fawn Grove, Pa., east to Delta, 8½ miles, with spurs to slate quarries in that section.

Nueces River Valley.—An officer writes that contracts will be let within the next 90 days to build from Beeville, Tex., west via Oakville, Tilden, Cotulla and Carrizo springs to Eagle Pass, about 17 miles. There will be two steel bridges and 16 station buildings. William A. Frisby, president; John Andrewartha, chief engineer, Beeville. (March 4, p. 461.)

Payette Valley.—Contracts are to be let in April to build a 19-mile extension of this road. The company operates a 13-mile line from Payette, Idaho, southeast to New Plymouth, and has preliminary surveys made for an extension from New Plymouth to Emmet. (Nov. 26, p. 1038.)

Quanah, Acme & Pacific.—According to press reports financial arrangements have been made to build an extension from Paducah, Texas, southwest to El Paso, about 375 miles. Surveys finished from Paducah to the New Mexico state line. The original plans called for a line from Paducah west via Roswell, N. Mex., thence southwest to El Paso, but it is now intended to build the line through New Mexico at a point about 50 miles south of Roswell. (March 4, p. 461.)

Rome & Northern.—Surveys are being made for an extension from Gore, Ga., northeast to Tunnel Hill, 33 miles, and contracts are to be let in April. The company now has a 20-mile line from Rome north to Gore, and was organized to eventually extend the line north to the Tennessee state line at a point about 80 miles north of Rome. H. M. Smith, chief engineer, Rome. (Nov. 26, p. 1038.)

St. Louis & Pacific.—According to press reports this company is to build a line from St. Louis, Mo., southwest to Fort Smith, Ark., 310 miles. A. Busch, St. Louis, and Joseph Ramsey, Jr., president of the Ann Arbor, with office at New York, are said to be back of the project. It is estimated that it will cost $70,000 a mile to build the line.

San Antonio, Rio Grande & Tampico.—A grading contract is said to have been given to W. O. Robertson, San Antonio, Texas, and work is now under way from San Antonio southwest. The company was organized to build from San Antonio southwesterly to a point in La Salle county, about 90 miles. The Harrison Engineering Co., New York City, are the general engineers and contractors. G. W. Nock, chief engineer, San Antonio. (Feb. 25, p. 429.)

Sanford & Troy.—An officer writes that this company has finished work on nine miles of line from Gulf, N. C., southeast towards Colon. Work is to be carried out this spring and summer to complete the line from Colon southwest to Sanford. Grading remains to be finished on 3.8 miles. The work will be easy and will probably be carried out by the company's men. J. B. Lenning, president, Bridesburg, Pa.; E. G. Segroves, chief engineer, Star, N. C., are also officers of the Durham & Charlotte.

Savannah, Augusta & Northern.—See an item in regard to this company under Railway Financial News.

Union Pacific.—According to press reports this company during 1910 plans to make improvements and build extensions in the section immediately north of Denver, Colo. The work of double-tracking from Pullman to Sand Creek has been started. This line is to connect with the new line being built from Denver to Greeley. The improvements include a bridge over Sand creek. The line is already double-tracked from the union station to Pullman. (Oct. 29, p. 829.)

The new freight line, via Fort Morgan, Colo., will not use the Kansas Pacific for a short distance east of Denver, as was at first intended, but is to build an entirely new line from the present Denver-Cheyenne line at Sand Creek. It will parallel the Burlington for six miles north of Sand Creek. Grading work is to be started at once. (Feb. 11, p. 329.)

Western Maryland.—Bids are wanted on or before April 1 for building the branch from Cumberland, Md., northwest to a connection with the Pittsburgh & Lake Erie at New Haven, Pa., about 83 miles. The new line will be apparently about 10 miles shorter than the main line of the Baltimore & Ohio between these two places. From Cumberland the projected route is directly west, running south of Savage mountains to Salisbury junction, from which point to Connellsville the line will parallel the Baltimore & Ohio. Between Salisbury junction and Confluence the new line will cross the Casselman river five times, and from that point to Confluence it will cross the Youghiogheny three times. It is said the improvements include one tunnel, about a mile long, and several shorter tunnels. (March 11, p. 548.)

Railway Financial News.

Ann Arbor.—As noted in another column, Eugene Zimmerman has resigned as president, and Joseph Ramsey, Jr., who is an associate of Newman Erb, has been elected president. The new directors representing Erb interests are W. J. Woolman, W. M. Wadden and LeRoy Baldwin. Newman Erb, Joseph Ramsey, Jr., and H. H. Harrison were already members of the board of directors, so that now there are six directors representing Erb interests.

Boston & Maine.—See Boston Railroad Holding Co.

Boston Railroad Holding Co.—The Massachusetts Railroad Commission has approved the issue of $1,357,300 stock, the proceeds to be used to pay for Boston & Maine stock recently purchased. (Feb. 15, page 430.)

Canadian Northern.—The company sold in London from March 7-9 £1,000,000 ($5,000,000) 4 per cent. perpetual consolidated debenture stock at 95 per cent. When all stock subscribed to has been fully paid for there will be outstanding £6,792,750 ($33,963,750.) The company is now operating 3,180 miles of line, which includes 665 miles of leased line.

Chesapeake & Ohio.—See an article in regard to this company and the Hocking Valley in another column.

Chicago, Milwaukee & St. Paul.—Arrangements have been made to extend the $2,155,000 Milwaukee & Northern first mortgage 6 per cent. bonds, which mature June 1, 1910, to June 1, 1913, the extended bonds to bear interest at the rate of 4½ per cent.

Hocking Valley.—See an article in regard to this company and the Chesapeake & Ohio in another column.

Illinois Tunnel Co. (Chicago Subway).—Sutro Bros. & Co., New York, are offering a block of 6 per cent. receiver's certificates of 1910-April 1, 1912, at 99¼, yielding 6.40 per cent. on the investment. The total issue of receiver's certificates is $3,500,000, and they are prior in lien to $36,000,000 first mortgage bonds. The Illinois Tunnel Co. owns and operates 58 miles of tunnels for the transportation of merchandise, and has connections with the freight stations of all railways in Chicago, except the Grand Trunk.

London & Northwestern.—The gross earnings for the year ended December 31, 1909, amounted to £15,125,111 ($75,625,555); expenses of operation, including taxes, amounted to £9,859,592 ($49,297,960); after paying dividends of £5,344,226 ($26,721,130) and charging off £50,000 ($250,000) to general reserve account, the company had a gross corporate surplus of £17,160 ($85,800). The total number of passengers carried amounted to 81,103,351, and the total tons of freight carried amounted to 52,139,454 tons.

New Jersey & Pennsylvania.—A new issue of $200,000 first mortgage 5 per cent. bonds has been authorized. (March 18, p. 752.)

Pennsylvania Railroad.—A committee of the whole has reported to the Hudson County Board of Taxation of New Jersey that it recommends an assessment of $8,460,000 on the property of the Pennsylvania Tunnel & Terminal Co. for the years 1905-1909 inclusive. The Pennsylvania T. & T. is the company which built and owns the Pennsylvania tunnel under the Hudson river. The portion of this tunnel included in this taxation runs from the state boundary line under the Hudson river, under Weehawken, West Hoboken and North Bergen to the western portal of the tunnel, and the taxation also includes the railway property on the surface west to a connection with the Pennsylvania's main line.

St. Louis & San Francisco.—The $7,500,000 5 per cent. notes due January 1, 1911, are to be called for redemption July 1, 1910. New St. Louis & San Francisco, New Orleans, Texas & Mexico division first mortgage 5 per cent. bonds, due March 1, 1940, which will be either a direct first mortgage on the St. Louis, Brownsville & Mexico, the Colorado Southern, New Orleans & Pacific, the Beaumont, Sour Lake & Western and the Orange & Northwestern, or a first lien on all the first mortgage bonds and stocks of these companies which are to be issued. Of these bonds, of which the total authorized issue is $50,000,000, $26,000,000 are to be sold in the near future. Stockholders are soon to be asked to approve the retirement of the first and second preferred 4 per cent. non-cumulative stock of the company, of which there is now outstanding $5,000,000 first and $16,000,000 second, and the issue in place thereof of new 7 per cent. preferred stock.

The directors have approved the plan for the practical merging of the roads named above and have elected Hans Winterfeldt, of Speyer & Co., a director to fill the vacancy caused by the resignation of R. A. Jackson. Speyer & Co. and William Salomon & Co., of New York, and G. H. Walker & Co., of St. Louis, will handle the securities to be issued. Speyer & Co. have bought from the company and have sold to investors here and abroad $8,000,000 three-year 5 per cent. gold notes, due March 1, 1913.

Savannah, Augusta & Northern.—This road, of which 25 miles have been completed and 20 miles are under construction, has been sold for $250,000 to W. J. Oliver, Knoxville, Tenn., the contractor, who held a claim for $286,516.

Stamford & Northwestern.—The Railroad Commission of Kansas has approved the issue of $1,872,880 first mortgage 30-year 6 per cent. bonds, to be secured by a mortgage on 82½ miles of track running from Stamford to Spur, Tex. This road is controlled by the Colorado & Southern.

Tellico Railroad.—According to the *Knoxville Sentinel*, this road, which crosses the Louisville & Nashville at Englewood, Tenn., has been sold to the L. & N., and local interests are expecting that it will be extended from its western terminus northward to Harriman, Tenn. The present line is 24 miles long; 16 miles east from Englewood to Tellico Plain and eight miles west from Englewood to Athens. At Athens it connects with the Southern Railway. The road was built in 1887 as the Athens & Tellico. In 1888 the name was changed to the Nashville & Tellico and, after a receivership, came forth as the Nashville, Tellico & Charleston. In 1897 it was again put into a receiver's hands, and the next company was the Tellico Railway Co. According to *Poor's Manual*, the company owns three locomotives and 32 cars, and the cost of the road to the last owners was $10,000. The *Knoxville Sentinel* says that the road "is free from debt and a money maker."

Twin City Rapid Transit.—The Minneapolis, St. Paul & Suburban Railway has been incorporated with a capital of $1,000,000. The Minnetonka & White Bear Navigation Co. and the Rapid Transit Realty Co. have been incorporated, each with $250,000. The supreme court decided recently that the suburban lines of the Twin City Rapid Transit are railways, and amenable to the Minnesota 4 per cent. gross earnings tax. This being the case, it was decided to rearrange the incorporation in such manner that the suburban lines, the steamer lines operated on Lake Minnetonka and White Bear lake, and the hotels, restaurants and amusement enterprises of the company might be handled separately for taxation and accounting purposes, and the new companies have no greater significance, it is said.

Vandalia.—Speyer & Co., New York, have bought $5,000,000 Vandalia consolidated mortgage 4 per cent. bonds, due 1957. The bonds are a first mortgage on about 550 miles of road including equipment, of the Vandalia lines, which are part of the Pennsylvania system, the Pennsylvania Co. owning a majority of the stock of the Vandalia Railroad Co.

Western Maryland.—Stockholders are asked to approve the issue and sale of $25,469,670 authorized common stock, and this amount is offered to stockholders at 50, both common and preferred, to the extent of 75 per cent. of their holdings. The sale of the stock has been underwritten by Blair & Co., New York. The company estimates that it will be necessary to provide $12,700,000 for the extension of the line from Cumberland, Md., to a connection with the Pittsburgh & Lake Erie at Connellsville, and the present sale of stock is for the purpose of raising this amount. See this company under Railway Construction.

Supply Trade Section.

The Leonard Allfree Company, Chicago, has opened an office in New York City at 50 Church street, room 1824.

The Bass Foundry & Machine Co., Lenoir City, Tenn., has sold its plant to the Lenoir Car Works, of the same place.

The Railway Brake Shoe Co., Washington, Pa., has been organized to engage in the manufacture of a patent brake-shoe for railways. The incorporators are J. L. Cohnagan, G. O. De Vaughan and Eli Gray, all of Washington.

The St. Louis offices of the contract agent of the Electric Storage Battery Co., Philadelphia, Pa., which are at present located in the Wainwright building, will, on March 28, be moved to 1205-6-7 Fullerton building, St. Louis, Mo.

The Patton Paint Company announces the opening of a New York office in the Hudson Terminal building, 50 Church street, room 1366. This office will be headquarters for salesmen representing the eastern factory at Newark, N. J.

The Browning Engineering Co., Cleveland, Ohio, is frequently called upon to furnish good operators for its locomotive cranes. At the present time the concern has more openings than men and wants the names of such operators as are available.

The Ward Equipment Company, New York, has found it necessary because of the volume of business to increase the floor space used for offices and warerooms. It has rented all the stores and offices at 139-143 Cedar street, which will be arranged for general offices and stock-rooms.

The Griffin Wheel Co., Chicago, will on May 1 move its general offices from the Western Union building to the twelfth floor of the new McCormick building, Michigan avenue and Van Buren street. The company has occupied its present offices in the Western Union building since November, 1888.

The Isthmian Canal Commission will receive bids until April 5 for boiler feed pumps, steel, boiler tubes, chain, bolts, rivets, screws, copper, muntz metal, sheet zinc and lead, twist drills, taps, dies, pipe cutters, tube expanders, boilermakers' clamps, fusible plugs, cellar bolt keys, saws, files, jacks, pulleys, valves, coach varnish, etc. (Circular No. 567.)

Ned Boughter, department manager of the U. S. Metal & Manufacturing Co., New York, died at Lebanon, Pa., of pneumonia on March 21, after an illness of about 10 days. Mr. Boughter was well and favorably known throughout the iron and steel trade in eastern Pennsylvania and New York state, and was at one time in partnership with former Mayor Hess, of Lebanon. The death of Mr. Boughter causes the loss of a very efficient and conscientious representative.

At the annual meeting of the Cambria Steel Company, in Philadelphia, March 15, Charles S. Price, vice-president, was elected president in place of Powell Stackhouse, who retires after 53 years' service with the company. Mr. Stackhouse has been president since 1891, and the stockholders, in accepting his resignation, adopted complimentary resolutions. A. P. Robinson was chosen first vice-president, in place of Mr. Price, and J. Leon Replogle, heretofore assistant to the general manager, will now fill the new position of assistant to president.

The Titan Steel Castings Co., Newark, N. J., will be represented in Chicago by R. B. Clark, Jr., with office at 757 Monadnock building. Mr. Clark was formerly assistant general manager of the Merchants Despatch Transportation Co., which position he resigned to become sales agent of the Scullin & Gallagher Iron & Steel Co., St. Louis, Mo., in the Chicago district, from which he was later transferred to New York. On February 1 last he left this company to enter business for himself and his present connection with the Titan Steel Castings Co. is but one of several interests which he now has.

J. B. Crawford has been appointed sales manager of the Whipple Supply Co., New York. Mr. Crawford has had a wide experience and is well known in the electric railway world. His early training was obtained in New England with the Hartford Street Railway and the Groton & Stonington Street Railway. During the last few years he has been located in the central states at different times with the Fort Wayne & Wabash Valley Traction Co., Ft. Wayne, Ind., and the Lexington & Interurban Railways, Lexington, Ky. Just previous to entering the employ of the Whipple Supply Co. he was superintendent and purchasing agent of the Winona Interurban Railway, Winona Lake, Ind.

At the annual meeting of the board of directors of the Keller Manufacturing Company, Philadelphia, the following officers were elected: Julius Keller, president; W. P. Pressinger, Wm. H. Keller, S. W. Prince, vice-presidents; Francis J. Rue, treasurer; C. S. Bell, secretary. The Keller Manufacturing Company has purchased the business of the W. P. Pressinger Company, of New York, its general eastern distributor and distributor for Michigan, and this territory will hereafter be handled direct by the Keller Manufacturing Company. J. J. Swan, secretary of the W. P. Pressinger Company, will be associated with the Keller Manufacturing Company. Chas. Strader has been placed in charge of western agencies, with offices at Chicago and Lincoln, Neb.

McCord & Co., Chicago, have purchased the window fixture and accessory business of the Grip Nut Co., Chicago, and will conduct the business in the future. All correspondence referring to these specialties should be addressed to the McCord Co., Old Colony building, Chicago. This purchase in no way affects the manufacture and sale of grip nuts. The capacity of the Grip Nut Company plant was found to be overtaxed in the making of grip nuts alone, and it was thought best to dispose of the Universal window fixture business and employ every available means to meet the demand for grip nuts. The company has filled orders during the first 20 days of the present month for 10 times as many grip nuts as it did during the entire month of March two years ago. The plant has been running night and day for some time and it is expected that all back orders will be filled by April 1, and that after that time all new business can be handled quickly. It has been necessary to cancel orders for 300,000 grip nuts on account of the lack of capacity in the plant. At the present rate 225 tons of steel is being made into grip nuts every month, and even this rate will have to be increased to supply the demand.

L. H. Conklin, formerly general manager of the Scranton Electric Co., Scranton, Pa., has been engaged by J. G. White & Co., New York, as engineer in its operating department. After graduating from Pratt Institute, Brooklyn, N. Y., in 1891, Mr. Conklin spent three years in obtaining general shop and construction work experience in New York and Massachusetts. During the next two years he was employed as draftsman, erecting engineer and later assistant superintendent of the Excelsior Electric Co. of Brooklyn. From 1896 to 1900 he was superintendent of the electric department of the Flatbush Gas Co. of Brooklyn, and for the succeeding four years was a partner in the contracting firm of Weiderman & Conklin, New York and Brooklyn. During the years 1904 and 1905 he was in charge of the construction and operation of a hosiery mill in North Carolina, and during the next two years was engaged as engineer, in New England, for A. M. Young, with headquarters at Waterbury, Conn., during which time he remodeled and built several electric properties in New London, Rockville and Stafford Springs, Conn., and also the Woodbury & Waterbury Street Railway Co. From 1907 to 1909 he was superintendent of lighting and general superintendent of the West Penn Railways, Pittsburgh, Pa. During the years 1909 and 1910 he has been general manager of the Scranton Electric Co., Scranton, Pa., which position he has held until his present appointment as engineer in the operating department of J. G. White & Co.

TRADE PUBLICATIONS.

Missouri Pacific-Iron Mountain.—The passenger traffic department of the Missouri Pacific-Iron Mountain route is distributing a reprint of an article from the *Saturday Evening*

Post of January 22, 1910, on "The Story of an Arkansas Farm."

Forge Shop Furnaces.—Catalogue No. 8 from the W. S. Rockwell Company, New York, describes the Rockwell forge shop furnaces, including those for forging, flanging, plate heating, tire heating, angle and beam heating, spring fitting, case hardening, tempering, annealing, etc. These may be adapted for either oil or gas fuel.

Chicago, Burlington & Quincy.—The Land Seekers' Information Bureau of the Chicago, Burlington & Quincy has issued a folder on the Big Horn Basin, Wyoming. In addition to the photographs and description of the country and its products a short, terse argument in favor of that particular locality is printed in red at the bottom of each page.

Marine Engines.—The Fairbanks, Morse & Co., Chicago, has issued catalogue 112B on four-cycle, heavy-duty marine engines, and 113 on two-cycle marine engines for light motor boats. The four-cycle engines are built in sizes from 20 to 100 h.p. with two, three and four cylinders, and two types of two-cycle engines are built, one in sizes from 6 to 45 h.p. and the other in sizes 3½ and 7 h.p.

The Graphose Age.—The Chicago Bearing Metal Co., Chicago, is distributing a small booklet which the title page affirms is a "mixture taken hot from the crucible, poured into the mold of publicity and cast once in a while." This is the first time it has been "cast" but it is evidently the purpose of the company to use this means at intervals to remind railway men that graphose bronze bearings, premium babbitt metals and the other products of the company are still on the market. The description of the products in this booklet is brief and forcefully arranged and enough humor and sane advice is added to make the little book easy reading.

Steam Turbines.—The Kerr Turbine Company, Wellsville, N. Y., has issued two new bulletins, No. 9, "Turbo-Blower Units," and No. 10, "Steam Turbine Generators, Steam Turbine Centrifugal Pumps." The first one illustrates practical outfits for forced and induced draft, gas works service and for furnishing blast for cupolas. The other includes generating sets for electric power and lighting, and pumping units for boiler feeding, fire service, water supply, circulating condenser water, draining pumps and for other service where water must be delivered at moderate or high pressure or against considerable head. Both of these bulletins contain interesting descriptive matter about the construction and operation of Kerr steam turbines. The comparisons between turbine and reciprocating engines are of interest to all who are in charge of or operate steam power plants.

"Concrete in Railroad Construction."—The Atlas Portland Cement Co., New York, furnished free copies of its book on "Concrete in Railroad Construction" to all railway officers and contractors who visited the company's booth during the exhibit of the Road and Track Supply Association in Chicago March 14-19. This book, while intended to advertise Atlas cement, contains much information of interest to the designing engineer and the maintenance of way man. It is largely a compilation of descriptions of specific pieces of concrete construction, arranged by Sanford E. Thompson. Two introductory chapters take up the general advantages of concrete for railway work and the general principles used in designing. Each of the 15 descriptive chapters is introduced by a short general discussion of the requirements for the particular structures taken up in that division, and all are fully illustrated with original photographs and detailed drawings. A number of photographs of miscellaneous structures of general interest are added after the last chapter. The book contains 228 pages, 6½ in. x 9 in., bound in cloth, price $1.

RAILWAY STRUCTURES.

Altair, Tex.—An officer of the San Antonio & Aransas Pass writes confirming the report that a contract has been let to the Weber-Duller Co. for the foundations, and to the Virginia Bridge & Iron Works for the fabricated steel and erecting the bridge to be built over the Colorado river. It is to be a riveted steel structure on concrete piers and abutments, and is to have a height of 45 ft. There will be one 40-ft. span, another of 60 ft. and a third of 275 ft. (March 11, p. 753.)

Carlton, Ore.—See Carlton & Coast under Railway Construction.

Chicago Junction, Ohio.—See Baltimore & Ohio under Railway Construction.

Cleveland, Ohio.—According to press reports the Erie will put up a double-track lift-bridge at Cleveland.

Colorado Springs, Colo.—The railways entering Colorado Springs, it is said, have under consideration the question of building a union passenger station to be used by the Atchison, Topeka & Santa Fe, the Colorado & Southern, the Denver & Rio Grande and the Rock Island.

Conneaut, Ohio.—The Bessemer & Lake Erie is said to have given a contract to the American Bridge Co. for steel for a bridge to be built at Conneaut.

Hagerstown, Md.—It is said that the Western Maryland will put up a new station at Hagerstown.

Houston, Tex.—Contract is said to have been given to the Fred A. Jones Construction Co., Houston, by the Southern Pacific, for the hospital building, to cost about $150,000. (March 11, p. 518.)

Lumberport, W. Va.—According to press reports the Baltimore & Ohio is planning to build a bridge over the Monongahela river at Lumberport, to cost $500,000.

Madison, Wis.—A contract has been given by the Chicago & North Western to G. A. Johnson & Son, Chicago, for the new passenger station at Madison. The work of demolishing the old structure is now under way. It is understood that the railway has under consideration the question of straightening the tracks in the yards, removing the present roundhouse and putting up two new roundhouses, one to be built in South Madison. (Feb. 18, p. 383.)

Milton, La.—See Franklin & Abbeville under Railway Construction.

Northumberland, Pa.—According to press reports the Pennsylvania Railroad is putting up a new freight house at Northumberland. Contracts have already been let.

Richmond, Que.—An officer of the Grand Trunk writes regarding the reports that this company will build a roundhouse and make other improvements that there is no foundation to the rumor. The company is only making some repairs to the roundhouse at that place. (March 18, p. 754.)

Wheeling, W. Va.—According to press reports the Baltimore & Ohio will spend about $300,000 in building a new freight station and in providing for additional freight terminals at Wheeling.

Experimenting with Heavier Rails in Belgium.

From recent information regarding the testing of heavier rails on a portion of the international railway line from Liege to Welkenraedt, Belgium, Consul H. Albert Johnson says that it appears that the work, commenced in 1907, is now half completed.

It is said that the results so far are highly satisfactory, the trains running on these new rails without jar or shock and much smoother than heretofore. A difficult problem has been strengthening the joints. Fish plates are used, 46 inches in length, resting on three wooden ties, one immediately under the joint of the rails and one at either extremity of the fish joint. This arrangement has given excellent results, eliminating the shock caused by the wheels of cars passing over joints. The new rails weigh 1,026 kilos (2,257 lbs); they are 18 meters (58½ ft.) long, and are screwed to 26 ties. The old rails of 40 kilos (88 lbs.) per meter (39.37 inches) were spiked to 20 ties. Placing the new rails is slow, as traffic is excessively congested.

Late News.

The items in this column were received after the classified departments were closed.

The Maine Central has sold to Lee, Higginson & Co., Boston, Mass., $5,000,000 two-year 4½ per cent. notes, dated April 1, and maturing in 1912.

Owners of 17,000 shares of a total of 44,000 shares of minority stock of Kanawha & Michigan have consented to sell their holdings at $72 per share in accordance with plans outlined in another column.

The following directors have been elected for the Toledo & Ohio Central and the Zanesville & Western: W. C. Brown, W. H. Newman, C. E. Schaff, Horace E. Andrews, L. D. Kelley and F. J. Jerome.

The Chicago Great Western, reported in the *Railway Age Gazette* of February 25 as being in the market for 200 steel-underframe 40-ton box cars, has ordered this equipment from the American Car & Foundry Co.

The Pennsylvania Railroad has not yet fixed the date for the opening of its tunnel and station in New York. The severe winter has delayed the work, especially on the New Jersey meadows and at Sunnyside Yard, Long Island.

The Chicago, Rock Island & Pacific, for which inquiries for 250 refrigerator, 500 automobile and 25 caboose cars have been previously noted in the *Railway Age Gazette*, has ordered 500 furniture cars from the American Car & Foundry Co.

The fifth annual convention of the National Supply & Machinery Dealers' Association and the eighth convention of the American Supply & Machinery Manufacturers' Association will be held jointly in Atlantic City, N. J., May 11-13, 1910.

Negotiations between the Hocking Valley and the Virginian Railway, for the joint construction of a bridge across the Kanawha river at Deepwater, W. Va., have been terminated, owing to the recent sale of the former road to the Chesapeake & Ohio.

The Colorado & Southern, reported in the *Railway Age Gazette* of March 11, as asking prices on a large amount of equipment, including 500 steel gondolo cars, has ordered this equipment from the Pressed Steel Car Co. It is reported that this company has ordered some wooden freight cars from the Mt. Vernon Car Co., but this later item is not confirmed.

The Atchison, Topeka & Santa Fe, it is said, will shortly offer convertible bonds to its stockholders. In the absence of President Ripley, an official statement is lacking, but it is believed that the company will not issue more than about $25,000,000 at this time. There are $43,000,000 of the convertible bonds authorized but still unissued. It is pointed out that the company's last two or three bond issues have been from $26,000,000 to $28,000,000 in amount.

The conference between the trainmen and conductors of the New York Central & Hudson River, through their grievances committees, with Assistant General Manager P. J. Crowley, resulted Wednesday in a declaration on behalf of the men that the terms on which the settlement was recently effected with the Baltimore & Ohio were the lowest that would be accepted. That is, the lowest standard to be accepted would be the same standard of payment for the same kind of work on the different divisions.

The Baltimore & Ohio is holding a series of conferences with representatives of all the coal shipping interests throughout its territory, with reference to the question of revising its system of coal car distribution. A committee consisting of officials of the Consolidation Coal Co., the Virginia & Pittsburgh Coal & Coke Co., the Hutchinson Coal Co., and the Maderia-Hill-Clark Coal Co., representing the leading shippers of the Fairmont region, has already conferred with Transportation Superintendent Galloway of the B. & O. on this question.

Frank Trumbull, chairman of the board of the Chesapeake & Ohio, has been elected also chairman of the board of the Hocking Valley, and G. W. Stevens, president of the Chesapeake & Ohio, has been elected also president of the Hocking Valley. James Steuart MacKie, secretary and treasurer of the Chesapeake & Ohio, has been elected also assistant secretry and assistant treasurer of the Hocking Valley, all with offices at New York. Edwin Hawley, Frank Trumbull, G. W. Stevens, A. C. Rearick and James Steuart MacKie have been elected directors of the Hocking Valley.

The city council of St. Louis has passed a resolution creating a committee of its members to confer with the officers of the individual railways which control the Terminal Railroad Association of St. Louis, with a view to securing the abolition of the bridge arbitraries on traffic within a radius of 100 miles of St. Louis. In its resolution the council authorized co-operation with a committee representing the shippers of the city and declared that if the arbitraries were abolished the assembly would proceed to pass the ordinances necessary for an increase of railway facilities in St. Louis.

The offer of the federal mediators, Messrs. Knapp and Neill, made at the request of the railway companies in the firemen's controversy was accepted by the leaders of the brotherhood at Chicago, and on Monday of this week it was announced that the matters at issue had been compromised, at least to such an extent that there would be no strike. Thus far, however, the details have not been given out, and it does not appear certain that the two parties have come to a complete agreement, except on the one point that the question of wages shall be arbitrated. Questions of seniority and of the way in which employees shall be represented in negotiations with the companies are to be disposed of outside of the arbitration proceedings, which seems to mean that the negotiators do not yet know what to do with these matters.

Vice-President Gray, of the St. Louis & San Francisco, filed a dissenting vote in the federal wage award to the switchmen. Umpire Gregory, differing from the State arbitrators, held that the hazard of the occupation should be recompensed by higher wages. Vice-President Heberling, of the Switchmen's Union, and third member of the arbitration board, signed the decision but did not think the wage increase sufficient. The award will affect eight thousand men and cost the roads $1,250,000. Vice-President Gray, in dissenting, held that the roads were unable to bear the expense, and that the Pere Marquette, Great Western, and Chicago Terminal would be irreparably injured, and that the increased efficiency of the service is due more to the roads than to the men themselves.

FOREIGN RAILWAY NOTES.

The annual report for 1908-1909 of the South Australian Railways' Commissioner says that the permanent survey for the proposed line from Gawler to Angaston, 24 miles, has been completed and the work of construction is shortly to be begun.

The report covering all the railways in the German Empire for the year 1908, recently published, shows that the mileage increased from 30,006 in 1898 to 35,745 in 1908, of which 92.6 per cent. were state railways. There were about 6 square miles of area and 1,766 inhabitants per mile of railway in the latter year.

The Swiss Railways are to invade the rights of smokers. When one takes his place in a compartment labeled for non-smokers, he may not smoke even if all the other occupants consent, and not even if he is the sole occupant of the compartment. Up to this time only one-third of the compartments have been reserved for non-smokers. On cars built hereafter they are to have one-half of them.

In Russia much less new railway was opened for traffic in 1909 than for several years previous, only about 330 miles. There is considerable building under way, however. Russia needs many more railways, but it needs much more to increase the efficiency of the existing lines. And it seems to have done something in this direction. Its last grain harvest was an exceptionally large one, but there has been very little complaint of the blockading of the lines in the fall months, such as has demoralized traffic nearly every other year of late

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Canadian Pacific has ordered two locomotives from the American Locomotive Co.

The Grafton & Upton has ordered one consolidation locomotive from the Baldwin Locomotive Works for June delivery.

The Virginian has ordered 12 Mikado and one eight-coupled switching locomotive from the Baldwin Locomotive Works.

The Union Railroad, Pittsburgh, Pa., has ordered five consolidation locomotives from the Baldwin Locomotive Works.

The New York Central & Hudson River is said to have ordered six locomotives from the American Locomotive Co. This item is not confirmed.

The Temple-Northwestern, a new line building from Temple, Tex., to Benjamin, about 210 miles, will buy motive power within 60 or 90 days. W. J. McDaniel, president, Temple.

The Southern, reported in the *Railway Age Gazette* of March 18 as being in the market for 75 locomotives, has ordered this equipment from the Baldwin Locomotive Works.

The Boston & Maine is said to have ordered 10 locomotives from the American Locomotive Co. This item is not confirmed. This company is in the market for four Mallet locomotives.

The Missouri Pacific, reported in the *Railway Age Gazette* of January 22 as being in the market for 60 locomotives, is said to have ordered 10 switch and 30 consolidation locomotives from the Baldwin Locomotive Works and 20 Pacific locomotives from the American Locomotive Co. This item is not confirmed.

CAR BUILDING.

The San Antonio & Aransas Pass is in the market for 12 caboose cars.

The Cold Blast Transportation Co. is in the market for 75 refrigerator cars.

The Washington, Idaho & Montana has ordered one coach from the American Car & Foundry Co.

The Toledo & Ohio Central is said to be asking prices on 1,200 gondola cars. This item is not confirmed.

The Pacific Fruit Express is said to be considering the purchase of 2,000 refrigerator cars. This item is not confirmed.

The Texas City Refining Co., Texas City, Tex., has ordered twenty 10,000-gal. tank cars from the American Car & Foundry Co.

The Georgia, Southern & Florida has ordered, through the Southern Railway, 100 flat cars from the Standard Steel Car Co.

The Vera Cruz Railway is said to have ordered 25 freight cars from the Barney & Smith Car Co. This item is not confirmed.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 1,000 30-ton box cars, 300 30-ton stock and 300 50-ton ore cars from the American Car & Foundry Co.

The St. Louis, Brownsville & Mexico is now in the market for 12 caboose cars in addition to the 100 steel underframe box cars reported in the *Railway Age Gazette* of March 11.

The Temple-Northwestern, a new line building from Temple, Tex., to Benjamin, about 210 miles, will buy car equipment within 60 or 90 days. W. J. McDaniel, president, Temple.

The Idaho Northern has ordered one 70-ft. motor car from the McKeen Motor Car Co. This order was unintentionally credited to the Washington & Great Northern in last week's issue.

The Wabash has leased 250 automobile cars from the Mather Horse & Stock Car Co. These cars are being built by the Haskell & Barker Car Co. as mentioned in the *Railway Age Gazette* of March 11.

The United States Express Co., reported in the *Railway Age Gazette* of March 18 as being in the market for 25 refrigerator cars, has ordered 35 cars from the American Car & Foundry Co.

The Chesapeake & Ohio, previously reported in the *Railway Age Gazette* as being in the market for freight equipment, has ordered 3,000 cars, divided equally among the American Car & Foundry Co., the Pressed Steel Car Co. and the Standard Steel Car Co.

The Southern, reported in the *Railway Age Gazette* of March 4 as asking prices on 3,000 coal, 500 coke and 100 flat cars, has ordered 2,000 fifty-ton hopper cars from the Pressed Steel Car Co.; 500 fifty-ton hopper cars from the Standard Steel Car Co.; 500 fifty-ton hopper cars and 500 coke cars from the Cambria Steel Co., and 100 flat cars for the Georgia, Southern & Florida, from the Standard Steel Car Co.

MACHINERY AND TOOLS.

The Isthmian Canal Commission. See item in Supply Trade News.

The Transcontinental Railway Commissioners, P. E. Ryan, secretary, Ottawa, Ont., will receive bids until April 12 for machines and tools; leather belting; shafting hangers, steel frame work, etc.; miscellaneous equipment, industrial track and lockers; motors; furnaces and forges; cranes; air compressers; Grey iron foundry equipment and brass foundry equipment.

IRON AND STEEL.

The Lehigh Valley has ordered 2,200 tons of structural shapes and 800 tons of plates.

The New York, New Haven & Hartford is in the market for 15,000 tons of open hearth rails.

The Elgin, Joliet & Eastern has ordered from the American Bridge Co. 100 tons of structural steel for two plate girder bridges.

The Cleveland, Cincinnati, Chicago & St. Louis is in the market for 5,000 tons of structural steel for the Indianapolis, Ind., shops.

The Kansas City Terminal will soon be in the market for about 18,000 tons of structural steel for the new passenger station and approach work.

The Electric Traction Construction Co., Kansas City, Mo., is in the market for 2,550 tons of 60-lb. relaying rails, also spikes, bolts, nuts, boilers, engines and general equipment for work on 25 miles of railway work in Kansas.

The Southern, reported last week as having ordered 42,000 tons of rails from the Tennessee Coal, Iron & Railroad Co., has divided this order, 30,000 tons being placed with the company mentioned and 15,000 tons with the Maryland Steel Co.

General Conditions in Steel.—The opening of spring weather seems to have had its effect in the rather marked improvement in the steel business during the past week. Although few new contracts came to light, there is a feeling that extensive buying is about to begin. Several standing orders for equipment have just been placed and several new inquiries have just come into the market, which will result in greater activity in shapes and plates. Outstanding inquiries for structural steel throughout the western states are said to exceed 60,000 tons, or nearly double the amount at times seen at this period. These inquiries do not include railway structural steel.

SIGNALING.

Extensive Upper-Quadrant Signaling on Pennsylvania Lines West.

The Pennsylvania Lines West of Pittsburgh intend this year to complete the automatic block signaling of the Pittsburgh,

Fort Wayne & Chicago main line (Pittsburgh to Chicago) by installing signals all the way from Crestline, Ohio, to Chicago, 280 miles; and the signals will be three-position upper quadrant. It is said that the appropriations which have been made for this work amount to $800,000. Most of the material will be furnished by the Union Switch & Signal Company, and some of the work will be done by that company. The signals are to be worked by storage batteries, charged by means of line wires from generating stations.

Motor Cars in Zero Weather.

A party of officers of the Chicago Great Western made an inspection trip last February with a No. 16 Fairbanks-Morse



Motor Car Used in Zero Weather.

motor car which was a notable example of the satisfactory performance of these cars. The run made was as follows: Feb. 17, Oelwein to Clarion, 106 miles; Feb. 18, Clarion to Hayfield and double back to Austin, 125 miles; Feb. 19, Austin to Ft. Dodge, 114 miles; Feb. 20, Fort Dodge to Council Bluffs, 135 miles. The concluding part of this trip was made in the most severe blizzard of the year, with the thermometer 12 deg. below zero and the snow drifting and piling up on the track.

This motor car was made by Fairbanks, Morse & Co., Chicago.

The Main Mills of F. W. Bird & Son.

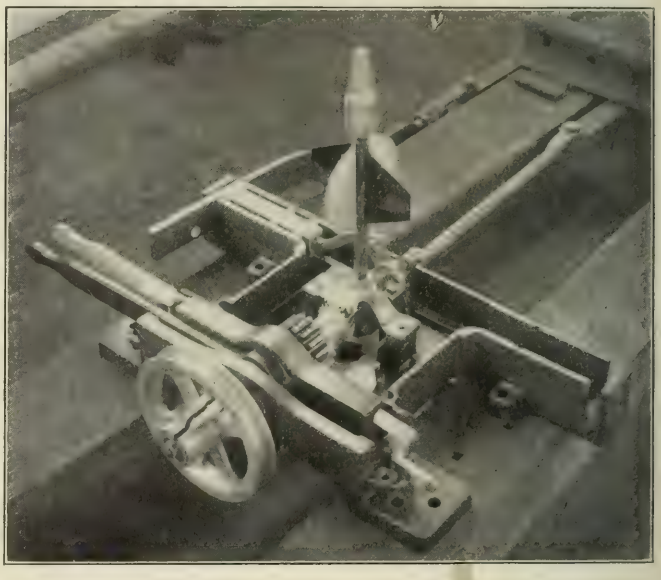
The accompanying cut shows a general view of the main mills of F. W. Bird & Son at East Walpole, Mass. Nearly a century ago the first mill of this company was built near the site of the present mills on the Neponset river. Four generations of the Bird family in direct succession have carried on the same industry and built up what is said to be one of the largest roofing and waterproof building paper plants in the country. The operation of the main plant requires over 5,000 h.p. Branch mills are located at Phillipsdale, R. I.; Norwood, Mass.; Hamilton, Ont., and Pont Rouge, Que. This company makes a ready roofing from felt to fixtures. The roofing is laid with a square rust proof cap, which is said to have more binding surface than the ordinary round cap and is made from new metal.

Paroid roofing is in use on many railway systems, and the United States government, it is said, last year used more than 1,000,000 sq. ft. of it. Proslate roofing is practically the same material as Paroid, except that it has an extra weather surface of brown color, which the makers claim is an advantage over coloring the original coating. This product makes an attractive roof and is being largely used for small railway stations and train sheds. Other products of the company are Paroid sill covers, Paroid car roofing, Neponset insulating paper, Neponset waterproof building paper and Neponset Hydrolyke waterproofing felt.

The Triplelock Switch Stand.

The importance of the safe operating and locking of railway switches at junction points and cross-overs has long been realized. Apparatus have been devised to effectively care for the proposition where switches are grouped, but single switches in the main track, where the trains run at a high rate of speed, have not, it is said, received any great amount of attention. The apparatus that has been devised for groups of switches is an expensive installation for a single switch.

The Triplelock switch stand which has been placed on the



Triplelock Switch Stand with Covers Removed.

market by the W. F. Bossert Manufacturing Co., Utica, N. Y., is intended to have all the features of an interlocking plant. While it is very simple in construction, it is strong and reliable, rigidly locking the switch-points mechanically both in the stand and with duplex bolt blocks. It also controls the mechanical or electrical signal, and can be controlled either from any distant point or by the approach of trains through the action of the track circuit.



Main Mills of F. W. Bird & Son, East Walpole, Mass.

Railway Age Gazette

Including the Railroad Gazette and The Railway Age

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We referred last week to the perfunctory character of the hearings on and discussions of the various measures affecting railways which are pending in Congress. The entire scene presented at Washington is in striking contrast to that presented four years ago when the Hepburn bill was under consideration. The comparatively small amount of keen and intelligent interest being shown is due to a number of causes. There is little public demand for railway legislation at this time. The railways have found that their opposition is more apt to cause than to prevent radical law-making, because politicians usually assume that whatever is bad for the railways is good for the public and that, therefore, when the railways oppose doing a thing it is a sure sign it ought to be done. Consequently, the railways are offering very little concerted opposition to pending measures. More active and vigorous opposition has been offered by the Railway Business Association. This has rather graveled the politicians, who with characteristic simplicity have heretofore been wont to assume that there were only two sides to railway regulation, that of the public and that of the railways. The discovery in their own districts of members of the Railway Business Association, having large numbers of employees, has caused not a few members of Congress to devote more judicious, although perhaps not more disinterested, reflection to the fairness of continually pounding railways than they otherwise would have given to the subject. The ultimate result, no doubt, will be the passage of laws which will be less conservative than what the railways and interests affiliated with them may wish, but less radical than what they have feared.

The press despatches have stated in veiled fashion, but at periods immediately preceding and immediately after the New Haven's settlement with its men, that the latter, as part of the settlement, endeavored to commit the New Haven company to a position favorable to "labor" in case of trouble of the New York Central with its men. The New Haven men had voted to strike—barring a satisfactory adjustment—and the New York Central men were about to vote. Apparently, therefore, the New Haven conductors, trainmen and yardmen tried unsuccessfully to inject into their own negotiations the conditions of an independent corporation, not as bearing on wages, hours or other concrete matters, but as a sentimental force. Stated differently, but not too strongly, the sympathetic strike idea was to be grafted on the corporation itself as against a sister corporation to bring the latter to terms, and the corporation was to be used officially as labor's weapon. If this interpretation is true it introduces us to a new aspect of the arrogance of organized labor. It is not enough to threaten a strike. It is not enough to actually strike with all the injury to corporate and public and private interests that a strike on a public service system implies. But the further step must be taken of a compulsory alliance of the corporation with the union against other corporate interests with which the union happens to disagree. The corporation must not only surrender but must serve in the ranks of the victors. That such a proposition, far outstripping the ordinary sympathetic strike, falls by its own audacity does not disguise it as a symptom of the present temper of organized labor and its waxing spirit of aggression. It is to be noted, however, that a saner counsel prevails among the central officers of the national labor organizations; it is understood that they refused to countenance the stand taken by the New Haven employees.

In the spring the graduate's fancy turns toward thoughts of a job. To the engineering graduate comes the report that all branches of the engineering profession are overcrowded, and one of them writes to ask us if this is true. Our answer is, yes. But the same thing can be said of every business and profession. No escape is possible from severe competition in the lower strata, where the inexperienced start. But while

there is nowhere much room at the bottom, there is plenty of it at the top. This trite saying was never more true than now, nor more true of any profession than the engineering. The young man with an engineering education doubtless has the best preparation for winning success under modern conditions. In the first years of his professional life he is put to work on short notice, laid off without any warning and has frequent and long periods of non-employment. In this respect he is on a plane with the common laborer, and he has little advantage over the laborer in the wages he receives. But industry and ability, combined with his technical education, usually will soon lift him high above the rank of the laborer, financially and otherwise. American railways annually absorb a good proportion of engineering graduates. That a man who enters railway service has had engineering education does not necessarily mean that he will stay in exclusively engineering work. Education means opportunity; and technical training spells opportunity in many different branches of the railway business. Whether a man will stay in exclusively engineering work, or drift into some other branch of railway service, will depend on the man and on conditions; but in either event he will find no lack of opportunity.

THE RAILWAY AS PRESS AGENT.

A few months ago a collision of some seriousness occurred on one of our eastern railway lines. The first telegraphed report of it stated that the engineer at fault had been on duty 59 hours without rest. The facts were otherwise. The engineer had been given his time for sleep and when the collision came was very much awake, or should have been. Within a few hours the operating officers of the company had the exact facts in hand. But no official denial followed hot-foot on the telegraphed misstatement. The truth dribbled out by bits a few days later with no emphasis of big headlines. There was no official statement at all. Some millions of newspaper readers got an impression more or less deep that the railway corporation was overworking its men and endangering its passenger service. And that impression, emphasized in its character by a "human interest" story told on the wires, went to take its place as a unit in the thousand and one impressions, favorable or the reverse, by which the great mass of public opinion for or against the railway corporation was made up. The truth, to be sure, could never have quite caught up with the original error; but it could have heeled the error close and much qualified its evil. The Virgilian Latinism concerning the growth of scandal as it flies rests for much of its force upon whether or not truth is a pursuer.

The special incident expresses, in its limited way, the general truism of the overgrowth of reticence as a railway policy. Silence, in undue extremes, has become the line of action—or, rather, inaction—in the railway office. Nor is it to be denied that, perhaps primarily, the newspaper itself is one cause. There are newspapers and newspapers. Some give railway matters intelligent treatment. They see railway affairs in clear perspective, detect and expunge the absurdity in reportorial "copy," discriminate fact from fiction. But there are other newspapers, unblessed alike with the accurate reporter and with the copy reader "up" in railway circumstance, that run riot in the railway world of visions. Their presses turn off daily their paper product of unrealism which the railway officer cons on the clipping sheet with a sardonic smile. But the smile is unfortunate. It means the transmission to the sensorium of the railway office of the idea that the column of the newspaper is too faulty to be worth attention; that the reading public either does not believe what it reads or forgets quickly what it does believe; and that the better plan is to let the newspapers severely alone. Such a theory easily crystallizes into the chronic reticence with which the railway officer treats the news seeker. Coupled with it often go the too sharp discrimination between things of public interest and railway interest and the theory that what concerns the one does not concern the other. The "mind your own business" is undoubtedly too strong and fast a phrase to describe this attitude. Yet that idea, which a great railway king once accented with profanity, has its savor of fact.

Subject to certain reservations the wiser railway policy lies at the other extreme. Some of the elements of a public interest in the railway, rational, legitimate and intense, are obvious. They are based upon the intrinsic nature of the railway as a public service institution with which the people are in constant contact—or collision. But beyond there is a public interest sentimental, imaginative, poetic. The railway bulks big in public fancy. Its physical vastness, the size of its locomotives, the speed of its fast express, the new bridge or station of magnitude and beauty catch the popular eye outwardly just as the inner eye is caught by the tale of a big railway "deal." From this environment of acute public interest the railway cannot escape if it would. As such does it not become the valid object of "news," to be diverted so far as may be by prudential railway policy from the airy limbo of reportorial fiction to the precisions of official fact?

But, as stated, there are reservations easily found. If there are things to be disclosed there are other things to be covered, for a time at least, with their mantle of secrecy. A railway corporation is planning the purchase of a new line or a merger. The publicity that would thwart or imperil it must, of course, be postponed. An extension is on the blue-prints involving purchase of rights of way. The "news" of it, which would send the rights kiting upward, must wait and can justly wait. So, also, for example, with schemes for operation which, known, would advantage rival interests. In all such cases the railway corporation in compelling secrecy merely follows the analogy of human nature and of the individual. But sometimes, even in those cases and often in others, the railway as a press agency makes the mistake of holding back "news" too long. A good and, indeed, a fundamental rule of action is, when a piece of news is of a nature that must sooner or later disclose itself, to give it out as soon as possible in clear, definite, substantial and official shape. In such case the "news" starts right; it avoids the greater risk of leakage, of half-truth and of sensational treatment flaunted under big type; and though the reportorial pen may add some frills, the body of truth is there. As a bit of practical advice may be added the wisdom of study of the newspaper and of the press association as mechanisms of publication. The railway news that goes out in the rush hours of the editorial room and of the wires habitually suffers as compared with the official statement sent in early.

There has of late years been much comment on corporate publicity by the compulsion of law. Under the shadow of that expansive topic has not the railway manager lost sight of the values of the voluntary publicity that, properly used, may be a genuine railway asset? Has he not too often overlooked the powers of voluntary publicity as a defensive and protective policy and overmuch let corporate reticence harden into an inflexible rule? And is not the best remedy for distorted railway fiction in the press a larger outgiving than now in the form of the official utterance that nails the fact?

NEW BOOKS.

Air Brake Catechism and Instruction Book, including the Westinghouse and New York Air Brakes. By C. B. Conger. Published by the author at 224 South Prospect street, Grand Rapids, Mich. Cloth; 4 in. x 6½ in.; 270 pages. Price, $1.00.

This handbook of instruction on air-brakes is so well-known and has been so favorably received that it is now published in the twenty-fourth edition. All new designs of locomotive and high-duty car brakes of both the Westinghouse and the New York air-brake companies in current use are here explained. The book went to press about the first of February, and it covers all air-brake apparatus in general use at that time. It contains complete explanations, with illustrations, of the dif-

ferent valves as well as the foundation brake for both systems; a new series of questions and answers are given covering the general operation of the brakes. As railways are now requiring most of their trainmen to be informed in regard to the construction and operation of the air-brake, convenient books of this kind will be found necessary, and we know of none which meets the requirements better than does this one.

Letters to the Editor.

THE JAMAICA FLOODS.

Jamaica Government Railway,
Kingston, Jamaica, B.W.I., March 4, 1910.

To the Editor of the Railway Age Gazette:

It may be of interest to your readers to learn that during the floods which prevailed in this island in November last, 135 in. of rain fell in five days. In the 24 hours ending 7 a. m., November 9, 30 in. fell at one station on our line.

FRANK RICHMOND.

A CORRECTION.

Olympia, Wash., March 20, 1910.

To the Editor of the Railway Age Gazette:

We have read with interest your notes on the article by myself in your issue of February 18, and your editorial on the question of the valuation of railways in your issue of March 4. In the editorial you made an error in the mileage of the Northern Pacific in this state which is very material and produces a rate of valuation per mile much in excess of the correct amount. There were also slight errors in the mileages of the other roads. This was probably occasioned by your taking into consideration the branch lines and subsidiary lines included in the valuation of the Northern Pacific, such as the Washington & Columbia River and the Central Washington, which, with other branch lines, brings the total mileage of the Northern Pacific in this state to 1,629.42 miles.* The following table gives the market value, mileage, rate per mile as found by the commission and the amount which you have found:

Road.	Market value.	Mileage.	Per mile.	*Railway Age Gazette*
Great Northern	$59,577,212	770.01	$77,200	$73,900
Northern Pacific	110,308,450	1,629.42	67,800	106,500
Oregon R.R. & Nav.	19,500,000	501.09	39,000	38,900

Without taking issue with you in your editorial, and along the lines of our conversation in your office, we believe that substantial results can be secured by valuation which will harmonize the relationship of the railways and the public and bring about a better understanding on the part of each as to the attitude of the other. I feel that the public good will be subserved by that fair and intelligent work in rate regulation which will save us from the catastrophe of government ownership.

J. C. LAWRENCE,
Member, Railroad Commission of Washington.

FOREIGN RAILWAY NOTES.

The Governor-General of Indo-Chine has announced that through traffic between Yunnanfu and Tonkin was to commence on February 1.

The latest report from Chinese native sources regarding ways and means to raise money for the construction of railways throughout the Chinese empire says the board of posts and communications has proposed the establishment of a lottery with a view to creating a construction fund. So far as has been learned Imperial sanction has not been secured.

*[The erroneous figures were derived from the commission's interesting, but very detailed and often puzzling, "findings of facts."—Editor.]

Contributed Papers.

SUBAQUEOUS TUNNELS.*

By R. B. Woodworth,
Engineer with the Carnegie Steel Company, Pittsburgh, Pa.

IV.

THE SHIELD METHOD.

The construction of subaqueous tunnels of large extent through soft materials under the beds of streams without removal of the cover has been made possible by the shield method in connection with the use of compressed air and metallic tunnel lining. It has succeeded where attempts to tunnel by ordinary mining methods with or without compressed air and with the use of brick lining have failed. Consequently it may be looked upon as the most perfect method of subaqueous tunnel construction.

History.—The shield method of driving subaqueous tunnels was invented by Mark Isambard Brunel. This remarkable engineer, born in Brittany, educated for the ministry, trained alike in seamanship, surveying, architecture, timber production and manufacture, inventor of shoemaking machinery, improved copying pens, methods of polishing tin foil, etc., etc., applied to the construction of the Thames river tunnel the best of his skill and experience, and did what the best engineers of his day could not do. The tunnel was first proposed in 1798 by Ralph Dodd, but abandoned. In 1804, under act of Parliament, a tunnel from Rotherhithe to Limehouse was begun when a shaft 11 ft. in diameter was sunk 42 ft. with a view to the commencement of the horizontal excavation. Work was soon suspended, to be resumed with a diameter of 8 ft. in 1807 by the Cornish engineer, Trevithick, and a small heading carried 923 ft., or to within 150 ft. of the opposite shore. Trevithick then made an opening in the top of the heading to test the alinement with the result that he and his party were almost drowned, the heading was filled up and the work abandoned. After various plans had been proposed for the construction of the tunnel it was taken up in 1824 by Brunel, who sunk a new shaft of brick work 50 ft. in diameter, 42 ft. high and 3 ft. thick, built on a metal cutting edge and sinking bodily into the ground by what are now called caisson methods. From this shaft he proceeded with the tunnel, which, when completed, was a brick structure 38 ft. by 22 ft. 6 in., enclosing two horseshoe-shaped tubes 16 ft. 4 in. high by 13 ft. 9 in. wide separated by a 3-ft. 6-in. brick wall, pierced occasionally with openings. The shield was placed in position by January 1, 1826. It consisted of 12 great frames 22 ft. high and 3 ft. wide, made of cast iron with a cutting edge top and bottom and divided into three stories, thus presenting 36 cells or working platforms both front and back for the workmen, namely the miners, by whom the ground was cut down in front and the bricklayers, who simultaneously, with the advance of the shield, placed the brickwork of the finished structure. The leaves of the shield were advanced by powerful screw jacks, and the vertical face was protected by horizontal poling boards which could be handled separately and pushed forward as the ground was excavated. The water broke in several times, impeding the work, to be stopped by bags of clay dumped into the chasm; financial conditions also interfered to delay the completion until 1843, but the shield was a success from the start. It embodied all the fundamentals of the modern type except the tail tube, which came in use with tunnels of circular form.

The annular shield and cast iron lining were first used by James Henry Greathead. Greathead was born in Grahamstown, Cape Colony, on August 6, 1844, came to England in 1859, and in 1864 became a pupil of P. W. Barlow, through

*From a paper read before the Railway Club of Pittsburgh.

whom he became acquainted with the shield method of tunneling. Barlow had a strong belief in the shield and was the author of a scheme to facilitate London traffic by the construction of underground railways running in cast iron tubes built with its aid. To show what the method could do it was resolved to make a subway under the Thames near the Tower, but the trouble encountered by Brunel in the Thames tunnel made engineers hesitate to undertake the subway, though it was of much smaller dimensions—6 ft. 7 in. in diameter (some say 8 ft. 0 in). At this juncture Greathead offered to take the contract and he successfully carried it through without resort to the use of compressed air, which Barlow in 1867 suggested might be employed in water bearing strata. In 1884 Parliament authorized the construction of the City & South London Railway to be worked by the Hallidie system of cable traction. This was begun in 1888 and the tunnel was driven by means of the Greathead shield, compressed air being used in water bearing strata when necessary. During the progress of the work electric traction became so far developed as to be superior to cables and when the line was opened it was an electric one. The railway is 3⅛ miles long entirely underground and consists of two 10-ft. 6-in. cast iron lined tunnels substantially parallel to each other, which converge into a single tunnel at the terminal.

Where Barlow got the idea of lining tunnels with cast iron does not appear. It is significant that coal mine shafts have been lined with cast iron tubbing rings for more than 50 years, and it is more than likely that their use in tunnels is the application to horizontal passages of a method of construction long approved by English and European practice in sinking deep shafts through soft and water bearing strata under difficult conditions, and is but another proof of our preposition that tunneling is essentially a mining operation.

Compressed air was first used in the United States in 1880 by D. C. Haskin in the Hudson river tunnel, where an attempt was made to drive a double track tunnel through the mud and silt with a pilot tube 6 ft. 6 in. in diameter advanced 30 to 40 ft. ahead of the main tunnel, to form a firm support for the iron plates of the latter by means of radial screws. Compressed air at a pressure of 20 lbs. per sq. in. prevented the weight of silt and water from crushing the plating and flowing into the tunnel.

Where open gravel or running sand heavily charged with water are met a diaphragm must be fitted to the shield. Mallet proposed in 1858 to carry in this way a tunnel under the English Channel. The pneumatic shield designed by Sir Benjamin Baker is the outcome of this idea. His shield is supported against external pressure by girders 6 ft. apart. Horizontal shelves of steel plates with cutting edges are spaced about 4 ft. apart, and the face of the shield is closed by vertical plates, slides and doors, so as to admit the materials being excavated, while the compressed air prevents the influx of water. Where firm clay is met the shield plates may be unbolted. When sufficient material has been excavated the shield is advanced by hydraulic pressure and the lining built under the tail of the shield. The Blackwall tunnel, 3,116 ft. long and 24 ft. 3 in. inside diameter, built in 1892 to 1897, was built with a shield 28 ft. 8 in. outside diameter, 19 ft. 6 in. long, with bulkheads, movable shutters and other important features embodied in Sir Benjamin's design. The shield was pushed ahead by twenty-eight 100-ton hydraulic jacks abutting against the cast iron lining, which was placed in position by two hydraulic erectors. This type of shield is that used on the Pennsylvania Railroad tunnels into New York City.

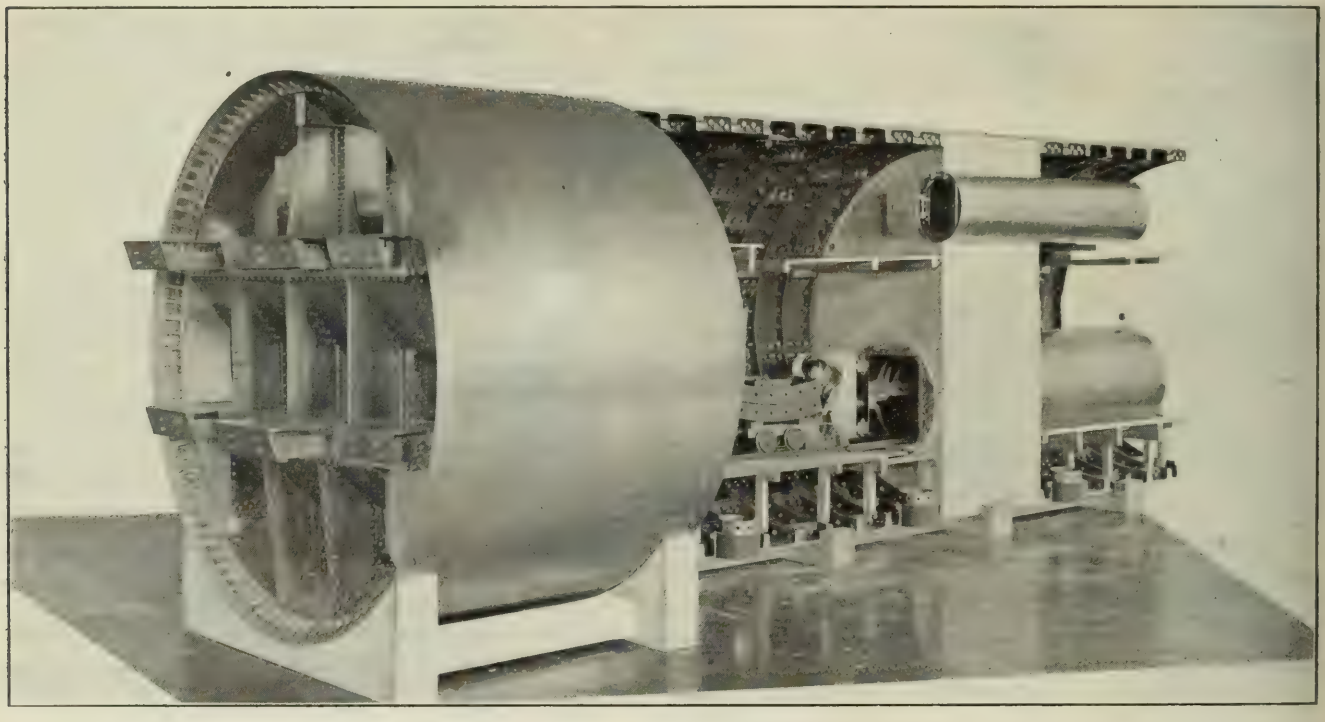


Fig. 11—Front View of Pennsylvania Railroad Tunnel Shield.

Various plans have been suggested for the removal of the material in front of the shield. Mr. Greathead would effect it by a closed current of water carrying the stuff through the shield from front to back. In part of the Hudson tunnel work the shields were driven through mud and silt, plowing it aside.

The first American subaqueous tunnel constructed and completed by the shield method was the St. Clair under the St. Clair river at Sarnia, built inside a cast iron lining, under Joseph Hobson, chief engineer of the Grand Trunk. The shields were 21 ft. 6 in. in diameter and 15 ft. 6 in. long, made of 1-in. steel plates stiffened by five diaphragms dividing it into 12 cells. There were 24 hydraulic jacks, each capable of 125 tons pressure, but the total power used did not exceed 1,800 tons. Each lining ring is 18 in. long, made up of 13 segments and a key. Each segment weighs 1,050 lbs. and the total weight of the cast iron lining is 27,000 tons.

Parts of the Shield.—It will be noted from the discussion that the construction of the shield varies somewhat in accord-

ance with the character of the work under construction. The Brunel shield was rectangular in form to conform to the outline of his tunnel section. Modern subaqueous tunnels are usually circular in order to get the benefit of the full strength of the circular form of section. This explains to some degree why the circular form is better adapted also to the shield.

The system of tunnels under the North and East rivers, by which the Pennsylvania Railroad gains access to New York City and Long Island, is the greatest piece of subaqueous tunnel construction ever attempted. The length of the work and different conditions naturally to be expected required careful consideration in the design of the tunnel shields, air chambers, etc. The contractors for the North river tunnels were the O'Rourke Engineering Constructing Co., and for the East river tunnels, S. Pearson & Sons, Inc. The latter contractors had built the Blackwall tunnel in London by the use of a shield patterned after the design of Sir Benjamin Baker's. The chief engineer on the North river tunnels was Charles M. Jacobs, who had been chief engineer of the old Hudson river tunnel and also of the other tunnels projected and built under the Hudson river. The forms of the shields used in the North river tunnels, therefore, varied somewhat from those used by Pearson in the East river tunnels. The essential features, however, were, of course, the same. Figs. 11 and 12 show the front and back of the shield used on the North river tunnels. The exterior diameter of the shield was 23 ft. 6¼ in.; its length, 15 ft. 2⅜ in. The skin of the shield was made up of three steel plates ¾-in., ⅝-in. and ¾-in., respectively, making a total thickness of 2⅛ in., thus leaving an inch space all around between the tail of the shield and the tunnel lining. The tail of the shield overlapped the lining a maximum of 6 ft. 4½ in. during ordinary working and a minimum of 2 ft. during the operation of taking out any rams for repairs. This overlap also permitted the removal of any segment which might be fractured during the process of shoving the shield against it without exposing the dangerous ground.

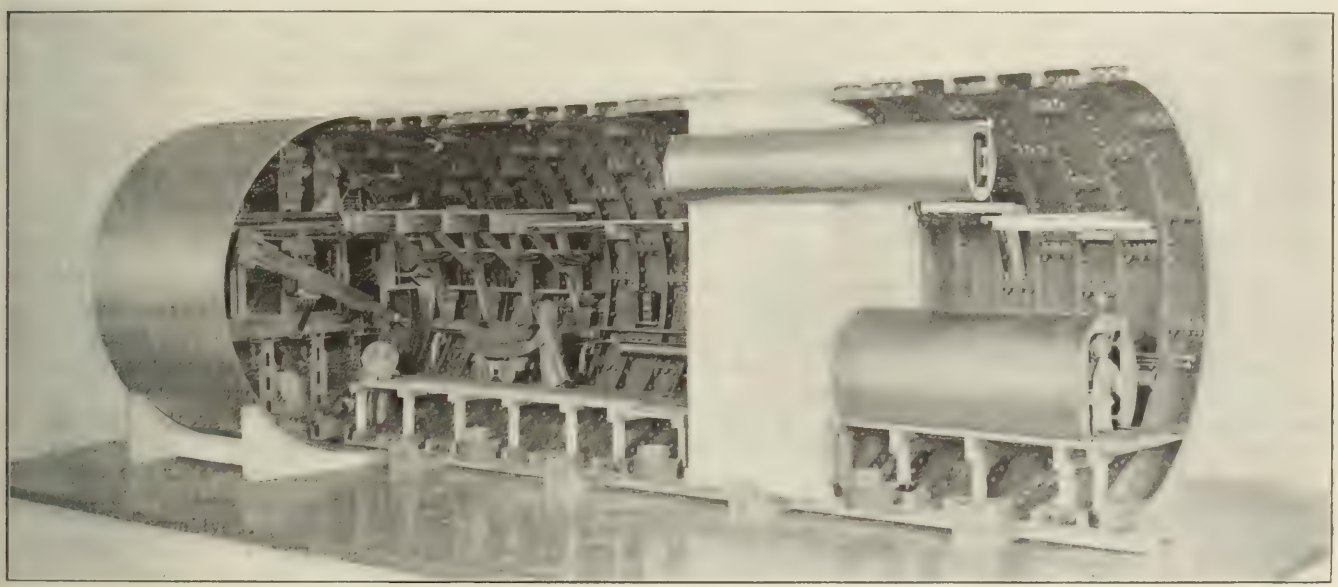


Fig. 12—Rear View of Pennsylvania Railroad Tunnel Shield.

The essential parts common to all large shields operating under compressed air are as follows:

1. *The Cutting Edge.*—Usually made of cast steel riveted to the shield skin and braced against the first diaphragm by structural steel brackets.

2. *The Working Platforms.*—Extending out under the cutting edge for use of workmen in excavating, forepoling, etc. These platforms are usually fixed. In the North river tunnel shield there were eight of these platforms which could be extended 2 ft. 9 in. in front of the shield by means of hydraulic rams, independent of the shoving rams, and when extended were strong enough to carry a load of 7,900 lbs. per sq. ft., this being equivalent to the maximum combined head of muck and water. These sliding platforms were conceived by James Forgie in 1894 and first adopted in 1895 under the direction of Mr. Greathead on the shield of the 23-ft. internal diameter tunnel of the Waterloo & City Railway, London. They were used in America in 1903 in the shield of the south tunnel of the Hudson & Manhattan.

3. *The Hydraulic Rams.*—The rams of the North river tunnel shield were 24 in number with a net diameter of 8½ in. and a stroke of 38 in., and were designed for a minimum pressure of 2,000 lbs. per sq. in., a maximum pressure of 5,000 lbs. and a test pressure of 6,000 lbs. The average working pressure was 3,500 lbs. per sq. in. The forward pressure of one ram under a maximum pressure of 5,000 lbs. per sq. in. was 275,000 lbs.; total pressure 3,300 tons. The rams were made subject to individual control so that differential pressure might be applied around the shield under the varied conditions encountered, the worst situation probably being the case of a tunnel half in rock and half in soft material. In the East river tunnel shields there were 27 rams, 9 in. diameter, 3 ft. stroke, tested to 9,000 lbs. per sq. in.

4. *The Diaphragms and Bulkheads.*—The North river shield had only one transverse bulkhead; no air locks or other provisions for maintaining higher face pressure and no material chutes or any discharges other than the nine openings fitted with doors. The East river shields were divided into nine pockets by two vertical diaphragms and two horizontal floors, and in addition to the two vertical diaphragms there were two transverse bulkheads completely closing the shield except for openings made for doors and muck shoots. The object of these two bulkheads was to maintain differential air pressure. By closing the doors of the forward bulkhead air could be pumped into the shield at a higher pressure than the pressure in the tunnel. The two transverse bulkheads also gave the shield an added stiffness. Great difficulty with this feature would have occurred in material composed part of rock and part of quicksand and the small reservoir of air contained in the shield would have caused great variation of pressure in the event of blows and flooding would have been frequent. As the maximum pressure in the East river tunnels was only 37 lbs. per sq. in., this refinement of diaphragms and bulkheads proved unnecessary and some of the material was cut out in order to permit more speedy operations.

5 *The Tail.* The Brunel shield had floors in front for the use of the miners and at the back for the use of the bricklayers, and the brick lining was placed as the shield advanced. It is apparent that there is always a possibility of the flowing of material and the dripping of water into the tunnel through the space between the end of the shield and the lining. The tail in the modern shield avoids this difficulty by at all times extending over two or three lining rings, which are erected within the tail itself. The space between the lining and the shield being only 1 in., very little chance of material entering therein is afforded, and this is to be looked upon as one of the elements of large importance in subaqueous tunnel construction and an evidence of the farsightedness of Sir Benjamin Baker.

6 *The Erector.*—The weight of one ring of tunnel lining in the North river tunnel was 23,737 lbs., or an average of more than a ton per segment. They were, therefore, erected, as is common in modern tunnel practice, by means of an erector mounted on the shield itself and consisting of a box shaped frame mounted on a central shaft, which revolved in bearings attached to the shield. Inside of this frame was a differential hydraulic plunger 4-in. and 3-in. diameter and 48-in. stroke. To the plunger head were attached two channels which slide inside the box frame and to the projecting ends of which was attached the grip. At the opposite end was a counterweight which balanced part of the weight of the tunnel segment. The erector in the North river tunnel was revolved by two single acting rams fixed horizontally to the back of the shield, and with the single erector six rings of tunnel lining have been put in in eight hours. The East river tunnel differed from the North river tunnel in having two erectors moving about an angle of 236 deg. each. The erector in the North river tunnel was operated under 1,000 lbs. per sq. in. pressure.

The total weight of the North river tunnel shield was fully 200 tons; of the East river tunnel shield 185 tons.

Rate of Progress—The rates of progress in subaqueous tunnel practice vary, of course, with conditions. The record for the United States seems to have been made in the construction of the south tunnel of the Hudson & Manhattan, where large use was made of the method of advancing by closing the shield doors and shoving ahead in the soft silt and mud without excavation, as much as 62 ft. being done in 24 hours and 348 ft. in a single week. The entire length of the south tunnel was 5,100 ft. It was excavated in 334 actual working days at an average rate of 15.3 lineal ft. per day. The four Long Island shields in the East river tunnels, Pennsylvania Railroad Company, excavated 4,195 lineal ft. in 120 days, at an average rate of 8.74 ft. per day for a shield.

The most serious difficulty encountered in the shield method of construction comes from falls of sand from the face and from blowing out of the cover. The most effectual method to prevent these blowouts is that discovered years ago by Brunel of dumping clay into the chasms caused by the inrush of material and water, though something can be done by heating soft material in advance of the shield to dry it out and make it more stable.

There are three methods of excavation usually employed in advance of the tunnel: the ordinary method in comparatively firm ground of forepoling ahead and of excavating from the platforms; the pushing aside of the material bodily by closing the doors in the tunnel shield and forcing ahead with hydraulic jacks; also that of sluicing the material through the shield mixed with the proper proportion of water. A fourth method was followed in the Rotherhithe tunnel under the Thames, which was opened to traffic on June 12, 1908. It was built in a little over four years, though the contract allowed 5½ years for its construction. The tunnel, 30 ft. in diameter, was driven by the use of two shields advanced from opposite ends of the tunnel. One of these was 5 ft. shorter than the other, as it had to work around a long curve of 800 ft. radius. The longer shield was built of cast steel segments 60 in number in three rings, the segment in each ring breaking joints with those in the next, and weighed 380 tons. The front portion of the shield was provided with 16 working compartments by three vertical and three horizontal partitions, and the tail of the shield, 7 ft. 3 in. long, was built up of three thicknesses of ¾-in. plates riveted together. The shield was advanced by 40 rams 9 in. in diameter with 3-ft. 6-in. stroke, fitted with small internal drawback rams. These rams exerted a pressure of 3 tons per sq. in., or about 6,000 tons in all, and the lining was erected by two hydraulic erectors consisting of the usual arrangement of rack, pinion and sliding arm.

From borings on both banks it was thought probable that a bed of clay extended across the river, and in order to obtain definite information a small pilot tunnel was driven across the river in advance of the main heading. This pilot tunnel was 12 ft. 6 in. in diameter, lined with cast iron, the top being 2 ft. below the top of the main tunnel. It was driven with a shield fitted with a rotary excavator of the pattern introduced by the contractors in the construction of several of the London tube railways and in general resemblance to a rotary snow plow. The cutters were of steel and when the cutter head revolved scored concentric curves in the material forming the face. The speaker has called attention several times to the resemblance between shaft sinking by approved modern European methods and subaqueous tunnel driving, and would respectfully suggest that this method of a rotary cutter might be further extended and that a large size subaqueous tunnel might be constructed with the boring machines used in sinking deep shafts through water bearing strata.

(To be continued.)

WHICH LINE MAKES THE RATE?

BY WILLIAM Z. RIPLEY,
Professor of Economics, Harvard University.

In the case of competition between a direct and a longer, more roundabout line, which one "controls" or fixes the rate? It is an important matter, involving as it does the economic, if not the legal, right of a carrier to participate in any given traffic. Concerning this question the greatest diversity of opinion prevails. On the one hand, both writers[1] and practical railway men[2] aver that the short line makes the rate, while the long line merely meets the rate thus made. This is probably the more prevalent opinion. Yet expert evidence of an opposite sort is to be had for the seeking. The Interstate Commerce Commission has repeatedly held that the short line is at the mercy of the longer line under certain circumstances;[3] and traffic managers not infrequently plead their inability to control rate situations in the face of irrepressible, roundabout competition.[4] There is evidently a confusion of thinking, or else a loose use of terms where statements are so conflicting. As a matter of voluntary agreement among roads, or of prescribed rates under government regulation, the issue often assumes the form of controversy as to whether a road operating under a physical disability shall be permitted to participate in a given business by a concession in rates or not. Thus in the notable Milk Rate cases it was a question whether roads with heavy grades should be allowed to make concessions in rates. This issue really also underlies the question of enforcement of the Long and Short Haul clause. In the recent Spokane case the Harriman lines to St. Paul asked that they, being long lines, should not be compelled to reduce their rates to the figure prescribed for the direct Hill roads.

[1] Acworth, "Elements of Railway Economics," p. 125.
[2] Testimony of J. J. Hill, Elkins Committee, 1905, p. 1507; certainly in the Missouri-Mississippi river territory, the Hannibal-St. Joe distance rules.
[3] Especially in the Danville and St. Cloud cases; Int. Com. Repts., VIII, 357 and 429. Cf. the Vermont Central case, *Ibid.*, I, 182; and also I, 82 and VII, 481.
[4] An especially notable instance was the Canadian Pacific differential arbitration in 1898. Proceedings, etc., p. 73, argument of J. C. Stubbs.

It is clear in the first place that "short line" and "long line" are merely used as convenient terms to designate differences in the cost of operation. This was well put by James J. Hill before the Elkins Committee of 1905.*

The problem should really be stated thus in terms of cost, not of distance. Suppose the roundabout line to be in part or wholly by water, as in competition between the transcontinental roads and the Isthmian or Cape Horn routes, or as between the direct all-rail line from Boston to Nashville, Tenn., and the steamer line from Boston to Savannah, and thence up to Nashville by rail. In such cases the rail lines allow the water routes a differential or constructive mileage in recognition of their relatively cheaper per mile expenses of operation. The differential may sometimes exist, where, judging by the bulk of traffic, the advantage, irrespective of the differential, lies with the line giving the lower rate. In other words, as measured by volume of business, the stronger line and not the weaker one enjoys the benefit of the differential. This is the case in the coastwise traffic between Atlantic and Gulf ports; where the bulk of the tonnage goes by steamer and at lower rates than by all-rail lines. The difficult point to settle in all such cases is whether the allowance is made as a voluntary *concession* to the roundabout line because it *costs* more to operate; or whether it is a toll or tribute, because, irrespective of the cost, the long line rate is made on the basis of value of service. The problem, then, resolves itself into this: how far in practice does cost of operation really "control" the rate in cases of competition between two lines differently circumstanced in this regard? If cost is of fundamental importance, the "short line," using the term as above said in a figurative sense, "controls" the rate. If cost is an entirely secondary matter, rates being made in accordance with considerations of value of service, the "long line" holds the upper hand, and the short one is at its mercy.

It is important, moreover, in the comparison of costs of operation, to keep in view the inter-relation between fixed charges and operating expenses. This point is often neglected. Any well-considered outlay upon permanent improvements, of course, increases fixed charges according to the extent of the new capital investment; but at the same time it presumably lessens the direct cost of operation. The interest upon funds spent for heavier rails, reduction of grades, straightening of curves, better terminals or heavier rolling stock, must be set over against the direct economies resulting from heavier train loads, lessened expenditure for wear and tear, for accidents and claims or for wages. This relation between current expense and capital cost was clearly emphasized in an arbitration decision by the late S. R. Blanchard. Two roads were in competition for business at New Orleans. One had costly but convenient terminal facilities. The other was so far from the heart of the city that the drayage expenses were an important item. This second railway began by offering free cartage to shippers in order to even up with its more favored competitor; but this soon gave way to the practice of private teaming by shippers with an allowance on the freight bill for "drayage equalization." The other road objected to this on the ground that it constituted a virtual rebate; that in other words the weaker line was taking business at an abnormally low rate. The arbitrator, however, upheld the practice, on the ground that the heavier operating expense for cartage was merely an alternative for increased interest charges, had the road elected to construct costly and more convenient terminals. One road virtually paid money for team hire, the other paid it in interest on bonds.

Analyzing the main question two propositions are certain. Firstly, the long line can never charge *more* than the short line; whence it follows that as the short line reduces its rate, the long one must accept that rate as made; and, secondly, the long line, costing more to operate, is, in the process of reduction of rates, bound to be the first to strike the bedrock of cost incident to that particular service. To go below this point of particular cost would obviously be indefensible from every point of view. *The general rule, then, is that the "short line rules the rate."* This is accepted widely in practice, as for example throughout trunk line territory and between the so-called Missouri-Mississippi river points, where the short line from Hannibal to St. Joseph determines all rates by longer routes.† But the problem yet remains unsolved. The long line may never be able to charge *more* than the short line—may it, however, charge *less* under certain conditions? The moment it is enabled to do so, the long line and not the short line, for the moment, "controls the rate." If, now, we use the technically proper terms, the question becomes this: Under what circumstances is average cost of service in railway competition set aside in favor of other considerations; or, otherwise stated, when may a line, operated under a disability as to cost, properly give a lower rate than its competitors notwithstanding? Does disability justify a handicap or the reverse? This was the form which the question assumed in the notable Milk Rate case; as to whether the weaker lines in respect of distance or grades should be allowed compensation therefor by permission to charge higher rates.

One of the common instances of rate control by a line operating under a disability as to distance or normal cost is the competition of a bankrupt with a solvent property. The "roundabout" line, like the Erie or the old New York and New England, having repudiated its fixed charges, undoubtedly "makes" the rate which the other roads must meet or lose the traffic. Usually they prefer to absorb or control it otherwise financially, thus substituting monopoly for a ruinous condition of competition. Yet such instances resolve themselves, evidently, into questions of relative cost of operation after all. The bankrupt road holds the whip hand, because, having repudiated its fixed charges, its average costs of operation are correspondingly reduced. The validity of operating cost as a basis of charges is surely not shaken by this exceptional case.

The relative proportions and the distribution of local and through traffic upon two lines of differing length in competition with one another are primary factors in determining the ability of either one to "make the rate." This is, of course, especially true under the operation of any "long and short haul law," under which any reduction of the competitive rates would necessitate a lowering of the charges at intermediate points. No road is going to sacrifice lucrative rates upon a large volume of local traffic unless it can gain either a large volume of business or a very long haul from a competitive point. Many of the notorious rate disturbers in our industrial history have been "short cut" roads—the shortest lines between given important points, regardless of the nature of the intervening territory—like the old New York and New England, the Erie or the Canada Southern. Other roads, like the Chicago Great Western or the Central Vermont were more roundabout, and yet enjoyed but little local business, depending almost exclusively for their livelihood upon long hauls between termini. On the Central Vermont at one time, through business constituted 79 per cent. of the total; and only 5 per cent. was strictly local in origin. On the other hand, the Louisville & Nashville, in its original petition for exemption from the long and short haul clause, stated that 80 per cent. of its income was derived from local business. This consideration, as applied to competition between the two primary trunk lines, may not be without significance. As compared with the Pennsylvania Railroad, rich in local business, the New York Central, running along the narrow Mohawk

*"We will say that the distance from Cincinnati to New York is 800 miles, and that they haul 800 tons behind one locomotive on 1 per cent. ruling grades. Now somebody else builds a road with a 0.3 grade, and he can haul 2,000 tons—twice and a half the amount; but that line is 200 miles longer. You can see readily that to move a given number of tons the second road runs less than half the train miles, so that the farthest way round is the nearest way home in that case."

†It is also the rule in France. Elkins Committee, V. p. 273.

and Hudson valleys, has not inaptly been described as operating "between good points, but not through a good country." Under a strict enforcement of the long and short haul clause, the dilemma on the former road would be more serious than on the latter. To choose between its rich local traffic in iron and steel or coal and the long haul business from the West would be a more difficult matter for the Pennsylvania than for the New York Central management to weigh its through grain business against the local traffic from interior New York points.

In one way the persistence of locally high rates in the South and West, irrespective of the low charges at competitive points, is defensible on this ground:* Local business is scanty. The roads cannot live upon it. Their mainstay is the long-distance traffic from important points. On the other hand, where there is no obligation to maintain a distance tariff, of course the road with rich local business enjoys a great advantage in making rates at competitive points. It can practically subsist upon its revenue from its own particular constituency, meeting all its fixed charges thereby; and can afford to cut rates on the competitive tonnage down to the bone. Such a road, quite irrespective of the length of its line, would obviously "control" the rate at competitive points, as against any rival without such a subsidiary and independent source of income.

Volume of traffic is another fundamental element in the determination of cost of operation. No matter how short the line or how easy its curves and grades, unless it can handle its tonnage in large bulk it will operate at a disadvantage. Hence a most important factor to be reckoned with in deciding which of two competing lines is in a commanding position as to rates is the volume of traffic, both in gross and as susceptible of concentration on either line. In the notable Chattanooga case, for example, although the line from New York to Nashville, passing around to the South by way of Chattanooga, is 212 miles shorter than the lines via Cincinnati or Louisville, the latter, by reason of the density of traffic in trunk line territory, seem to stand at least on an even footing. On the other hand, the enjoyment of the bulk of the tonnage sometimes places its possessor at the mercy of a petty rival. The Fall River water line to New York, carrying an overwhelming preponderance of the business, obviously could not afford to cut rates to prevent the Joy Line from stealing a small portion of the traffic. The same principal holds good in other lines of business. The Standard Oil Co. can better afford permanently to concede a small fraction of business to a small independent dealer, so long as he knows his place and refrains from ambition to enlarge, rather than to attempt to drive him out entirely by cutting prices on a huge volume of business. Occasionally independents are shrewd enough to take advantage of this; and to so distribute their business that they shall in no single place menace a powerful rival, and yet comfortably subsist on the gleanings over a wide area.† In no single locality are they important enough to exterminate at the cost of cut rates applied to a large volume of business; and yet in the aggregate they may make quite a fair livelihood. The only difference between the status of a railway and other lines of business in this regard is that the railway may not be quite so free to deploy its forces. Its territory and tonnage are more definitely circumscribed by physical conditions of location.

A point to be noted in this same connection is the relative stability of the traffic. Is it concentrated in a few hands or does it arise from many scattered sources? In the former case either road by making a bold stroke may so entirely capture the business that, by reason of the enhanced volume, a handicap in operation may be overcome. Thus, in the notable instance of trunk line competition for the beef traffic, some twenty years ago, the Grand Trunk, although much more roundabout, besides being handicapped in other ways, by securing *all* the business could afford to make rates impossible under other circumstances.

Whether the business in question is natural or normal to a road, or is an extra, diverted from other more direct lines, is still another factor of importance affecting ability to compete successfully for any given traffic. The best statement of this is found in the argument of J. C. Stubbs before the Arbitration Board on Canadian Pacific Differentials in 1898.§ "These are differentials in favor of weaker lines—lines which upon the merits of their service cannot successfully compete for the business, but claim a share of it as the reward of virtue, the price of maintaining reasonable rates. . . . . For example, the Canadian Pacific road was not projected or built for the purpose of developing, fostering or sharing the carrying trade between San Francisco and the eastern part of the United States. . . . . After they were built and the various connections made, then, and not until then, it was seen that there was a business opened. The route having been opened, the newer and longer lines entered the field of competition against the older, shorter and more direct lines by cutting the latter's rates. . . . . In a fight of this kind, paradoxical as it may seem, the stronger line always got the worst of it. . . . . The weaker or longer line, not having any business at the outset, had nothing to lose. Everything was gain to it, which appeared to show an earning above the actual cost of handling the particular lot of freight. Quite a distinction between that and the average cost of handling all business. Such an inequal warfare could not long continue, and the common result was that the stronger line sought for terms, and ultimately bought the weaker line off, ... this class of differentials is and always has been obnoxious.

Our final conclusion must therefore be that the outcome in cases of inequal competition in respect of cost of operation can seldom be predicted with certainty. Everything depends upon local circumstances and conditions. Sometimes the long line and sometimes the short line will dominate. Careful analysis of every feature of the business must be made before positive affirmation is possible. This result is at all events worth noting. A due appreciation of the complexity of the business of rate making may safeguard us against the cocksure statements of the novice, who has never closely examined into the subject. President Taft has recently emphasized the need of expert service in the field of customs and tariff legislation. It is greatly to be hoped that a similar appreciation of the care with which railway legislation should proceed may prevail at Washington during the present session of Congress.

DOUBLE TRACK IN NEW HAMPSHIRE.

The map of the state of New Hampshire, published on the opposite page, has been made to show the location of all those pieces of railway in the state which have more than one main track. All railways in the state not here shown in heavy lines are single-track. The terminal of the double-track sections are as follows:

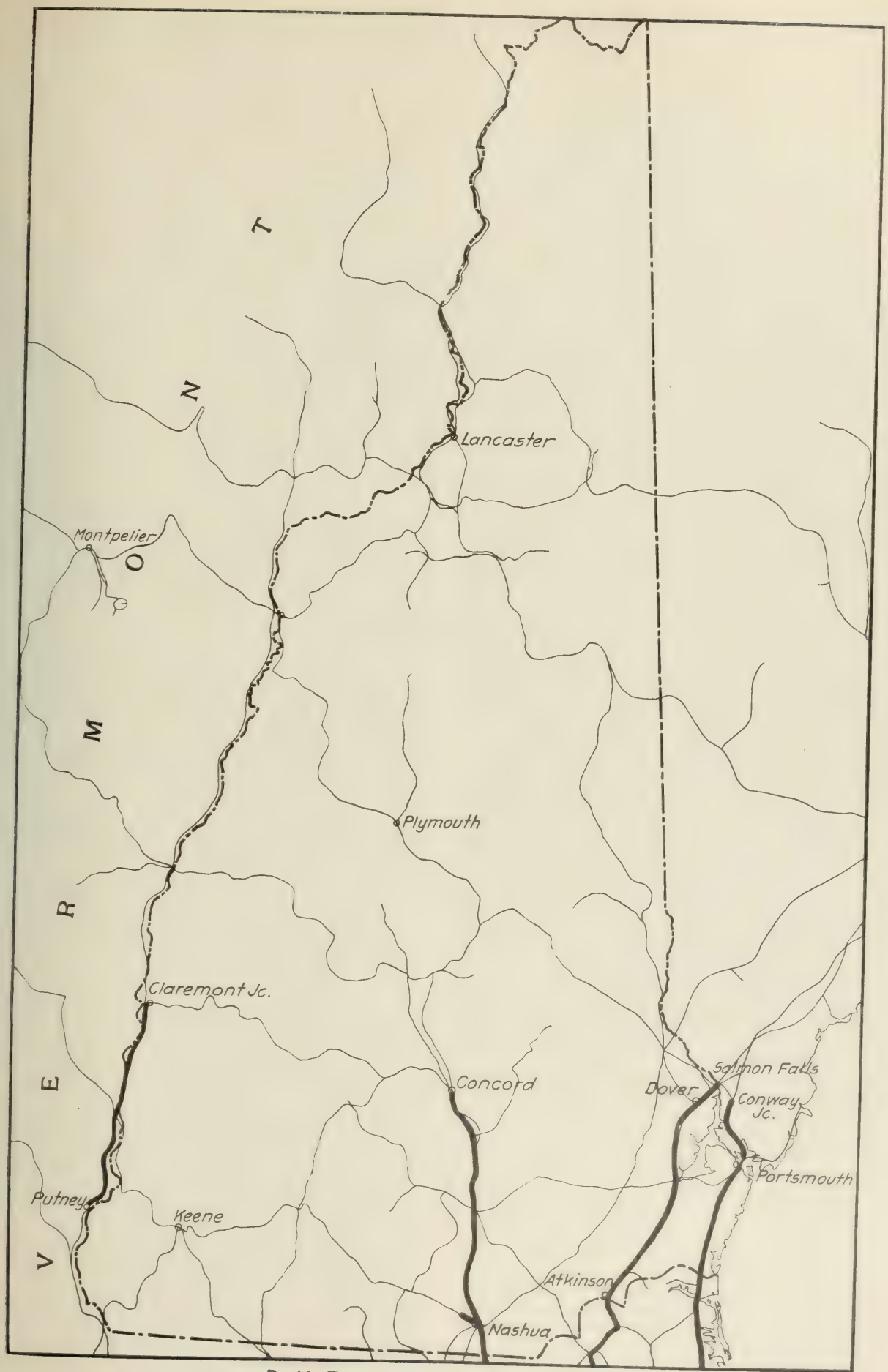
Boston & Maine.	
State line, N.H.-Portsmouth, N.H.	Tyngsboro, Mass.-Concord, N. H.
Atkinson, N.H.-Salmon Falls, N.H	Through Nashua Yard, Keene Br.
	Claremont Jct., N.H.-Putney, Vt.

It will be seen that one of these lines is partly in the state of Vermont. No map of Vermont is to be published, the only other piece of double-track that we can find in the state being one a few miles long in the extreme southwestern part of the state, which will be shown in connection with the map of Massachusetts.

*Cf. Mr. Fink's testimony in Hearings Senate Committee on Interstate Commerce, 51st Cong., 1st session, Sen. Rept. 847, p. 29.

†For an instance in the tobacco business: Cf. The *Atlantic Monthly*, 1908, p. 487.

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Double Track Railways in New Hampshire.

DOUBLE TRACK IN MAINE; CORRECTION.

In the map of the state of Maine, published March 25, page 823, the double track on the Bangor & Aroostook should be shown as extending from South La Grange directly southward to Northern Maine Junction, as stated in the text accompanying the map, and not southeastward, as shown in the map. Northern Maine Junction is six miles west of Bangor, on the Maine Central. South of Portland the name "Kennebunk" should be at the end of the double track, not midway.

THE TRAINMASTER'S FUNCTIONS.

II.

INSTRUCTION AND DISCIPLINE.

The attainment of a high degree of discipline, although difficult, is practicable if the trainmaster receives proper support from his superiors. To obey, men must understand clearly what is required of them. It therefore follows that close supervision to compel unfailing obedience, and intelligent instruction to enable the men to give this obedience, are alike indispensable. The necessity for supervision is generally recognized and employed, but the use of instruction varies with the intelligence and education of the instructor.

Every irregularity, however small, should be handled, as the mere handling constitutes discipline and is an unconscious, but effective, warning of ever-present supervision. It does not follow, however, that punishment should follow every irregularity, even if the responsibility is clearly proved as the greatest distinction should be drawn between wilful offenses and all other offenses. Wilful offenses should be met with merciless punishment, whereas the handling of others should be governed by the individuality of the man and his previous record. Two recent cases investigated at the same time fairly well illustrate the distinction just drawn. One man, acting as flagman, with nothing against his previous record, who was found asleep by the conductor when the train pulled into a siding, was instantly dismissed, in spite of earnest pleading of overwhelming drowsiness caused by fever which he claimed to have had before leaving the terminal. He had had, however, full rest before being called and could easily have obtained relief if he had asked for it. When he felt drowsy he should have notified the conductor, who could have taken steps to guard against that nightmare of responsible railway men, an open main line switch. For the sake of a very small sum he had placed thousands of dollars of property and human life in jeopardy. The other man, a baggagemaster, with nothing against his previous record, frankly admitted that in some inexplicable manner he had put a piece of baggage off at the wrong station, which only the quickest kind of tracing had been able to locate in order to avoid a heavy claim, and he had no excuses to offer. Firm in the belief that the error was due to one of the freakish twists, to which the best minds are subject, and that punishment would only hurt the pride of an ambitious man, the incident was at once closed, with an admonition to use all possible care to guard against a recurrence.

Collective instruction is almost invariably satisfactory in its results, especially when there is time for general discussion, as it brings out the views of many different minds, and, by enabling the instructor to perceive where the subject is least understood, permits him to apply the remedy at once. In the same way oral examination, although there must be a limit to the number being examined, in proportion to the thoroughness desired in the examination, allows the examiner sufficient knowledge of the proficiency of the men, but still permits him to remedy any deficiency on the spot.

Men who are good teachers, with the knack of making their pupils quickly grasp their meaning, and what is even more important, hold it, are few; but an efficient trainmaster must instruction the opportunities that the men have had for ac- have it. Before making any attempt at individual or collective quiring information on the subject to be discussed should be taken into consideration, for the trainmaster frequently has taken part in the arguments leading up to the adoption of a particular method of execution, whereas the men have only had the short, terse instructions in their unrelieved directness. The next step should be to realize how little the instructor himself could retain, if he were hearing the subject discussed for the first time, and then estimate the relative ability of the men in retentiveness as compared with his own ability. Although there is considerable difference of opinion as to the relative merits of individual and collective instruction, and, although I have found that, sometimes one, sometimes the other, best serves the purpose, the recent instructions issued on a certain subject by nearly all railways, constituting a formidable mass of information to be quickly digested, made it plain that, on such occasions, large class meetings alone would enable the trainmasters to reach all the men. After careful perusal of the instructions it was very clear that, in the limited time at my disposal, it would be impossible to make the men remember all the details, so I decided to summarize the entire subject in such a way that, if possible, it would be understood sufficiently to enable the men to know where to turn in the printed instructions for all doubtful points, and, by emphasizing the salient features, I tried to ensure their being memorized. If I had not mapped out this plan beforehand, and had attempted, paragraph by paragraph, to explain everything in detail, I should never have finished within the allotted time, and the men would have forgotten everything I had told them. As it is now, I have a series of well-understood sections to work upon for a more elaborate whole.

The trainmaster who listens to the soothing call of personal popularity, and who weighs any action by the effect it may have on such personal popularity, is building his citadel, discipline, on shaky foundations. In conducting investigations and arriving at a conclusion it is as much to the interest of a railway company to have a trainmaster protect the interests of the men as it is to have its own interests protected. Thereupon follows that indefinable and subtle something called *esprit de corps.*

Lack of system militates more than anything else against a high standard of discipline, for if small details are not taken up, classified and definitely arranged for with a view to a specified method of handling, there can be no thorough instruction of the men who cannot therefore be expected to obey.

In administering discipline, never take hasty action or snap judgment; never place the superintendent in the embarrassing position of being unable to support you. Do not allow technical or catch questions to be brought up, but the practical, every-day duties of a man in the transportation department.

To the end that team work may be developed to the highest degree, work up a good-natured rivalry by means of comparisons; hold frequent staff or class meetings, where you will bring out by discussion the object of the different rules, as well as a clear and uniform interpretation and understanding of them; call on the men to point out any rule or rules in the code which, in their judgment, should be modified or eliminated. Failing in this they necessarily acknowledge the importance of the strict observance of same. This puts the matter right home to them. Review any accident that may have occurred since the last meeting, and point out where the observance of certain rules would have avoided it.

The trainmaster must sometimes arouse his men to have them achieve better results. Some men only need a suggestion; others an appeal to their honor and sense of justice, while with others a good scare is better than good advice. It is possible to be quite right, and at the same time quite disagreeable, and in the main we awaken in others the same attitude of mind that we hold toward them.

INSPECTION.

He should, if possible, cover his division each week on local freight, as this is his best inspection train, stopping at all stations; it gives him the opportunity to properly inspect them.

Make notes of the errors made and put them before all of your men in a circular form, omitting names and places. Show what the results would have been had each man concerned done his full duty.

Look out for delayed cars, especially at non-agency stations.

Make periodical check of terminal yards and go through the shop yards (if in your charge) to see that light repair cars get their turn.

Make an inspection of cabooses and lockers at least once every three months to check up monthly reports required from conductors.

The trainmaster's movements should be so uncertain that the men will not be surprised to find him at any station, day or night. This fact alone will keep them on the lookout to properly carry out the rules and obey instructions.

Like a good district attorney he should know the law and have some ability as a cross-examiner, because some men lie; some evade the truth to shield others, but will not lie outright. Some will neither deliberately lie nor evade the truth, but will not tell all they know because they do not realize the essential points or have poor descriptive powers.

Thoroughly familiarize yourself with your assigned territory, covering all of it, including main line, branches and terminals, at least once a week. When on the road, keep your office and the chief despatcher minutely advised as to your whereabouts, present and future, and if any change in plans, notify headquarters immediately. This is absolutely necessary, as oftentimes it is required that you be located for important business without delay.

It is necessary that bulletins and special instructions be issued, but they should be curtailed as much as possible and gotten up in the most simple and plain language, so that your employees may understand readily and without difference of opinion. Carefully examine your bulletin boards or books when passing over the line, to see that all bulletins are contained therein and that dead ones are removed. Whenever possible approve all bulletins and special instructions before allowing them to be sent out. Some highly important matters, such as placing derailing switches on main line or passing tracks, should not be depended upon for safety by simply posting up a mail bulletin on bulletin boards. A regular "31" train order should be put out and receipts taken from your train and enginemen until such a time as it is fully covered, when the "31" order can be taken down and signatures in your bulletin books depended upon.

ACCIDENTS.

Train and enginemen should be taught thoroughness in making reports. Too many are prone to make a short report of accidents or failures without giving the details. They have a mental photograph of the occurrence, and it seems to them that the trainmaster should understand just how a collision or derailment happened.

My first experience as a trainmaster was on a division with which I was not familiar. I was called out with the wrecker to where a train had parted and run together, piling up some empty cars. When we arrived I instructed the wrecking foreman to turn the cars over and clear the main track, and he replied: "We don't do that here." I insisted that it be done and reported to the superintendent that the track would be clear at a given time; and then after investigation made a detailed report of the accident and told the despatcher to handle trains to the nearest point on either side of the derailment, which he did. The first train was let over within fifteen minutes of the time that I had named in my report, and I was complimented by the superintendent on the "concise and accurate report" rendered and the method used in clearing a busy main line, and the result gave me confidence that has been of assistance to me ever since.

The trainmaster should be able from his own knowledge and experience, to form a reasonable opinion and conclusion as to how the accident happened. In serious accidents that seem to call for investigation, get the entire crew or crews interested together, and hold an investigation, having clerk write it up, giving each employee copy of his own statement. Insist that each member of crew interested make a statement; if he knows nothing about the matter, let him say so. He cannot then come back later, when a grievance committee may be handling the case, with any other story.

The manning of the wrecking crew, its proper equipment with portable telephones, telegraph, first aid, etc., and the ability to get it out with absolutely no loss of time, detouring traffic and caring for such as cannot be detoured, indicate the character of a trainmaster's organization. Halting uncertainty at a critical moment costs the confidence of management and employees alike. It is imperative that prompt and vigorous action be taken in emergencies, and upon the trainmaster usually falls the duty of taking the initiative.

(To be continued.)

RAILWAY EXTENSIONS IN TRINIDAD.

With the advent of a new and energetic governor in the person of Sir George Le Hunte, the railways of Trinidad are likely to receive a great impetus in construction. The proposed extensions, although only modest, and amounting in length to little over 39 miles, are nevertheless of great importance to the commercial and agricultural interests of the island.

The territory to be opened up is a rich cocoa and rubber-growing district. There are no engineering difficulties to be overcome, nor will the expenses be at all considerable.

At the present time there are 82.8 miles of Trinidad government railway open for traffic, which is the same as in 1907, the railway having been first opened in 1876.

The extensions are two in number, from Tabaquite to Poole, and from San Fernando to Siparia.

The original survey in 1898 for the first line passed along the watershed ridge dividing the Nariva and its tributaries, running east, from the Ortoire and its tributaries, running first south, then east. This ridge has since been occupied by a cart road, and is perhaps impossible, at any rate difficult, for a railway at one or two points. The watershed ridge throws off from it a network of spurs and ravines, making it necessary either to keep to the ridge, or to descend by means of the best valley; no middle line is feasible. With a view of connecting up the settlements, the line would turn southward from the present Tabaquite station, and pass by the Palmiste into the Poole Valley, which it was intended to follow on to the Poole Bridge, on the Mayaro Trace, 12 miles east of Princess Town. This terminus was considered too far to the west, and too distant from Mayaro, a diversion, therefore, 9 miles from Tabaquite, has been made turning the line to the eastward into the Guayanapo Valley, and so to the Princess Town-Mayaro Trace, near the lands of the Poole syndicate, 15 miles from Tabaquite. This line intersects the St. John's and Brothers Settlement roads, a mile west of the Mayaro-Tabaquite road, and so opens up the Brothers, Sisters, North and Torib Trace settlements. The length of this line will be approximately 15 miles.

The estimated cost of construction is as follows:

Land and compensation	$30,000
Clearing	1,687
Fencing	17,187
Earthworks and River Diversions	93,750
Bridges and culverts	234,375
Permanent way	200,000
Stations, yards, etc.	26,041
Level Crossings and accommodation works	7,812
Telegraphs	4,687
	$618,539

The line will be of a somewhat tortuous nature, very similar to the already-existing Caparo line, otherwise there are no serious engineering difficulties in its construction.

The existing line to San Fernando, opened for traffic in 1882, terminates on the San Fernando wharf. In connection with it, but with approaches impracticable for heavy traffic, the San Fernando Tramway, the property of the government, runs through the wharf and streets for 1 mile into the country, at which point it joins with the Cipero Tramway, under the management of a nominated board of control known as the Cipero Commissioners. With the Cipero line there are connections by means of several sidings or branches.

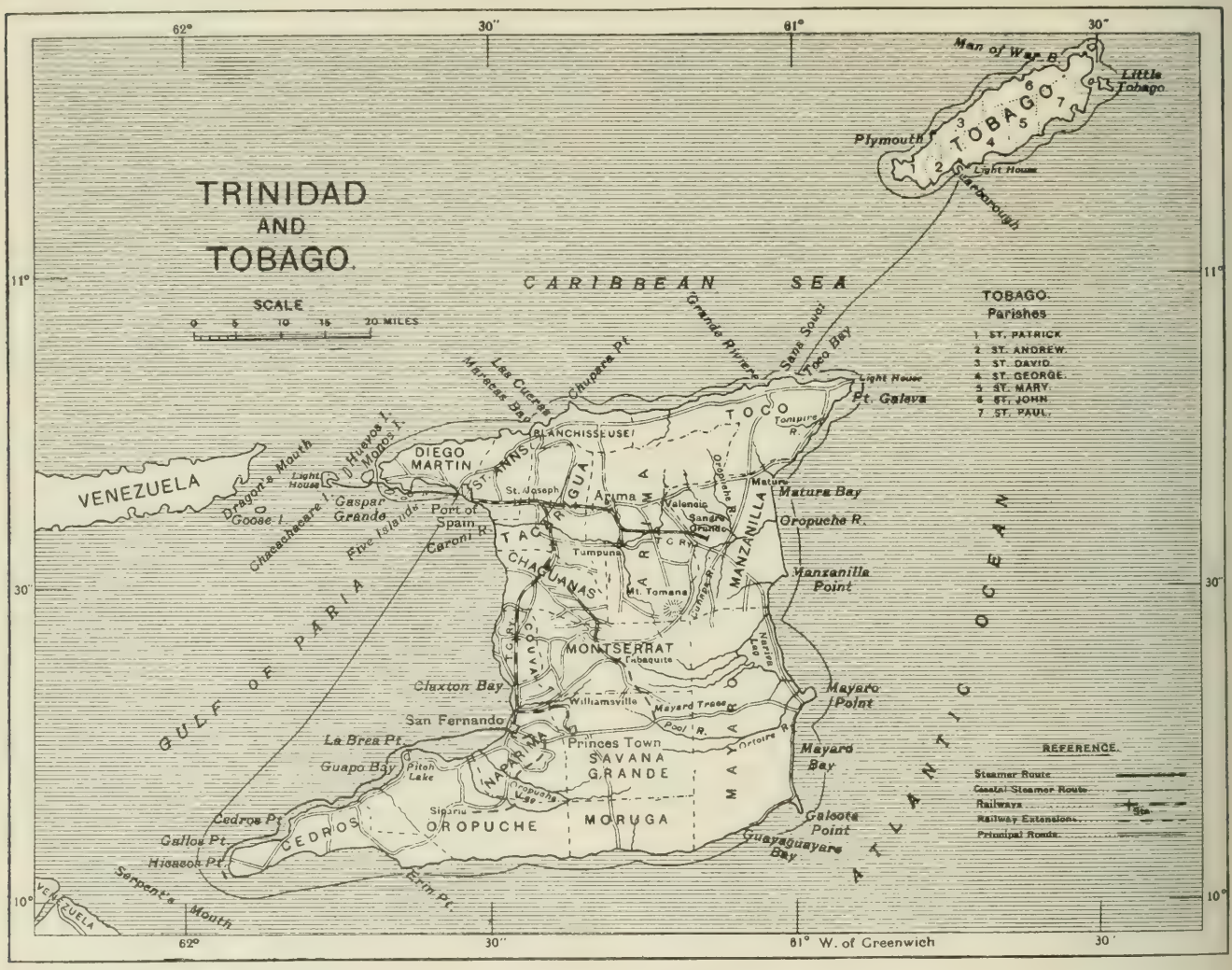
An offer of a free gift of lands required for this extension has been received, but the easier, although longer, line considered passes to the eastward of these properties, through lands of the Colonial Company, to a common point on the north side of the Oropuche Lagoon, at Dumfries, whence there is a line of high ground extending almost across the lagoon, forming a natural crossing, of which it is desired to take advantage.

The line selected passes across the wharf at San Fernando, and, by a diversion west of the hospital, rejoins the San Fernando Tramway near the southern end of "Broadway," following it and the Cipero Tramway to a point near the Corinth Line Junction, whence it turns south to join the Colonial Company's Fullerton branch, which is proposed to acquire and relay, thence to Dumfries, crossing the lagoon about half a mile west of Debé Settlement, gaining the Cura and Tururepano Valleys to the south of Siparia Village, about a quarter of a mile. The length of this line is a little more than 16 miles.

An alternative line would leave the Cipero Tramway near Victoria Village, pass through the Union Hall Estate, entailing a short tunnel through the Diamond Bridge, and thence to Dumfries. While this line would be a little shorter, it would entail more new, and heavier, work than the former.

There will be stations at St. Madeleine, Dumfries (for Debé, Picton and Wellington), Cura (for Rock-Penal, St. Francique) and Siparia. And the estimated cost of the line is $709,455.

The addition of 32 miles of new lines will entail the provision of additional rolling stock for them, which is estimated as follows: 4 locomotives with tenders; 1 composite coach, first and third-class; 1 second-class coach; 6 third-class coaches; 80 gondola cars; 40 box cars; 4 cattle cars; 2 horse cars; 2 cabouses; 2 engine turn-tables, at a total sum



Railways of Trinidad.

At $192,100. Railways were inaugurated there in 1874-76, with a line of 16 miles in length to Arima. Several extensions since carried out, have brought that length up to 82 miles at the present time. With the contemplated extensions, the total of the colony's system will be then brought up to 121 miles and still further extensions will be necessary in a few years' time.

On the Antung-Mukden railway the work of piercing the Fuhklinglin tunnel commenced in September is progressing satisfactorily. Latest reports are to the effect that up to December 15 a distance of 135 ft. had been pierced from one end and 80 ft. from the other. The contractors expect to have the tunnel completed by November, 1910.

Shop Section

Remember the competition which closes on April 15. A first prize of $50 and a second prize of $25 will be given for the best articles on "How the Foreman Can Promote Shop Efficiency." The manuscript must be from one thousand to three thousand words long and must be in our hands by April 15. Manuscripts worthy of publication, but not awarded a prize will be paid for at space rates.

Every successful foreman or shop manager has developed methods or made changes in the organization which have been productive of important results in increasing the efficiency of the shop or department. Don't let the fact that you may not have developed an elaborate or seemingly important scheme deter you from entering the competition. Sometimes very simple improvements or changes produce more far reaching and important results than others that are more elaborate and apparently more important.

A notable feature of the article descriptive of the foundry methods pursued by the Chicago, Milwaukee & St. Paul is the schedule of the hardness tests that were made on a section of a wheel. In this the expected is shown, though we have no record of such a showing having been made before. This is the indication of the variation in the hardness of the various portions of the wheel and the very marked lessening of the hardness as the distance from the throat is increased. It has long been suspected that there may be great variations in the hardness and quality of the treads of different wheels made from the same heat, owing to the variations in the temperature of pouring and other things that enter into the making of the wheel. It has also been urged that much of the running to sharp flanges that has been experienced may be explained by the difference in the wearing qualities of the wheels that are placed on the same axle. This test shows how well this may be the case. It also shows how very rapidly the hardness decreases from the surface of the tread down into the metal, and suggests the advisability of looking into many things along this line if the cast iron wheel is to hold, not its old monopolistic position, but any position in the future.

ENGINE SERVICE IN WINTER.

One of the best methods of measuring the efficiency of the locomotive repair shop, the thoroughness of the work done in the roundhouse and the skill and care with which the engineer handles his engine, is a record showing the miles run per engine failure. This record is found so useful for the purpose that it is now being kept by quite a number of roads. On some roads 5,000 miles per engine failure is regarded as a fair record, but good practice requires as high as 16,000 miles in freight service and 20,000 miles in passenger service. The difficulty in making any comparison of such records is that there are no uniform methods of reporting failures. Many roads report failures only for more than 5 minutes delay to passenger trains, or 20 minutes to a freight train, but others are able to keep their engines in such good working condition that they are able to apply a much more severe standard in defining the delay and consider two minutes delay to a passenger train and five minutes to a freight train as good cause for reporting a defect in the locomotive, if that is the cause of the delay. In order to make such reports useful for comparison it would seem worth while to take some measure to insure greater uniformity; it might be possible for the Master Mechanics' Association to secure such uniformity by appointing a committee to draw up rules for reporting engine failures, but as it is to some extent an operating question, it might be difficult to have such rules put in effect on all roads.

The past winter has been unusually severe for the operation of railways in the northern part of the country, where snows have been very frequent and deep and the temperature low. This has contributed to an unusual number of engine failures, and the records for summer and winter months should show the comparative efficiency of different roads in preventing the delays due to engine failures. The following table gives the average percentage of locomotives held out of service for repairs in February for six of the principal railways in the Middle West. It also gives the miles run per engine failure in December and January on these roads:

Locomotives out of service February, 1910.

Road.	A Per cent.	B Per cent.	C Per cent.	D Per cent.	E Per cent.	F Per cent.
Undergoing shop repairs	5.8	3.5	7.4	9.5	7.4	10.6
Awaiting shop repairs.	1.4	2.9	6.0	4.2	...	7.2
Under roundhouse repairs over 24 hours.	1.0	5.1	Not reported	1.1	9.7	7.2
Out of service, per cent of number owned	8.2	11.5	13.4	14.8	17.1	25.0
Out of service, total locomotives	126	172	241	216	235	275
Miles run per engine failure, *December*	10,970	4,428	4,337	12,156	10,274	16,716
Miles run per engine failure, *January*	10,232	4,456	Not out.	11,664	11,387	15,844

We are permitted to publish below the very creditable report of the Lake Shore & Michigan Southern, giving similar figures for their engine service during the past winter.

	Dec.	Jan.	Feb.
Average daily number of engines out of service	120	106	101
Miles run per engine failure, all services	16,299	20,212	21,138
Weekly average number of engines undergoing shop repairs	33	34	34
Weekly average number of engines undergoing engine-house repairs, over 24 hours	45	44	52
Number of engines waiting shop repairs on last day of month	18	14	..
Per cent. of engines out of service to number owned	13.4	11.8	11.4

WHAT WOULD YOU HAVE DONE?

The 1 o'clock shop whistle had sounded and the men were on their way back to work. An ambitious boiler shop apprentive, in a hurry to get started on his afternoon's task, had started to climb a ladder that was leaning against the boiler on which he was working. Another apprentice happened along and slyly kicked the bottom of the ladder, bringing it down with a crash. The result may be imagined. The two apprentices were good, live, healthy boys, not much worse nor not much better than their fellows.

A few blows were exchanged, when unfortunately the shop superintendent came in sight. A couple of the workmen tried to warn the boys, but were too late. The superintendent, a strict disciplinarian who had practically forgotten that he had ever been a boy himself, discharged the two young men on the spot. One of them, who assisted in the support of his family, was forced to take the best job he could find at the moment, and engaged in a class of work that he did not like and for which he was not particularly well fitted. The other boy could not find a job and loafed around for several months until the shop superintendent relented and took him back into service. During his idleness he formed habits and selected companions who have had anything but a good effect on him.

* * * * *

A shop superintendent had been engaged with a supplyman and was late in getting away to lunch. In order to save time he took a short cut through the car shop. Most of the men had finished lunch and were scattered about in groups, chatting or playing cards. Two of the apprentices were engaged

in watching one of the card games, one of them juggling two or three nuts in his hands. The game which they were watching was not particularly interesting, and like most apprentices who have nothing particular on their minds they were on the lookout for an opportunity for a little excitement.

An electric light bulb was hanging along the shop wall about 20 ft. distant. One of the boys suggested that the other one could not come within a mile of hitting it with one of the nuts. The second apprentice thoughtlessly took the dare, let the nut fly and the lamp broke into a thousand pieces with a loud report. The shop superintendent came along just in time to take in the situation. He called the boys over and in a few well directed words called attention to the seriousness of destroying company property, doing it in such a way that they felt very much ashamed of themselves. Then he commended the apprentice for throwing so accurately, and in spite of the fact that he was in a hurry for his lunch, gave the boys a little talk on the importance of selecting a proper goal toward which to work, and of using every energy to reach it. If their energies were thus rightly directed it would mean much for them in the future.

As he passed on the boys felt heartily ashamed for what they had done, and because of his good advice they started in on work of the afternoon with renewed energy. Keeping his words in mind both of them have successfully completed their apprenticeship and are doing splendidly.

THE SPEED LIMITS OF MALLET LOCOMOTIVES.

The speed limits of passenger locomotives were discussed in editorials in our issues of December 24, 1909, and January 28, 1910, which have been commented on in an interesting way by several correspondents, whose letters we have published. The speed limit of Mallet compounds is also an important matter which is now receiving considerable attention, as it has been found that it has a direct relation to their useful power when operated in service requiring higher speeds than those usual on mountain grades.

The area of the steam passages for both live and exhaust steam in the locomotive of ordinary construction has always been regarded as an important point in locomotive proportion, and it has been found especially important for passenger engines where the steam has high velocity. When the critical point is a local restriction of short length it is easily remedied, but if the restricted cross-sectional area of steam passages extends through long distances there is a drop in pressure due to friction of the live steam and an accumulation of back pressure in the exhaust which is difficult to overcome. An objection to the compound locomotive for passenger service is that not only is it not any more economical at running speeds than the simple engine, but the steam diagram is so attenuated that the same amount of power cannot be obtained from it as from an equivalent simple engine. This must be due in part to the friction and loss in pressure of steam following indirect passages. When a superheater is added and a longer travel is required, there must be a still further loss in pressure due to friction through the small superheater pipes. The use of a compound engine with a superheater of the small tube type would, therefore, not appear to be a good combination for a locomotive intended for express service.

In the Mallet compound the long shell is not all required for the regular smoke and gas tubes, as 20 feet appears to be the maximum practical length for these, and there is a long section of the shell available for a superheater, a feed water heater and a reheater for the steam passing from the high pressure to the low pressure cylinders. These have all been used in recent designs, and while they may be found advantageous in slow moving mountain helpers, or for road service handling maximum tonnage at slow speeds, it is not so certain that such a combination will be well suited for passenger locomotives unless the friction of the steam, both live and exhaust, is well taken account of and ample area is provided so as not to interfere with the desired pressure as usually found in simple engines.

In a recent design the live steam first passes through a superheater with baffle plates and tubes and around several elbows before reaching the high pressure cylinder. From this cylinder the high pressure exhaust makes four right angle turns before reaching the saddle connection to the boiler. From this point it passes through a 6-in. pipe with a generous right angle elbow to the reheater, where, after circulating over more baffle plates and tubes, it escapes to the receiver pipe, and after making four more turns it enters the low pressure cylinder. The exhaust from the low pressure cylinder is first carried forward in pipes outside the cylinders to a point over the forward engine truck wheels, then returns to a point back of the cylinders, and after passing four more right angle turns, it finally reaches the exhaust nozzle. While this exhaust pipe is of generous size, the tortuous route of the exhaust steam must produce extra back pressure on the low pressure pistons, and one would think its sluggish flow would not be effective in producing a good steaming boiler. The hot gases, after traversing the long boiler tubes, encounter additional frictional resistance in the superheater, the reheater and the feed water heater before they finally reach the smokebox, and a very efficient draft appliance will be required to overcome this resistance without producing undue back pressure.

While the Mallet locomotive admits of the use of the various appliances above named for producing economy of fuel in freight service, it has not yet been proved that the steam and hot gases can be successfully passed around numerous obstructions and elbows, at the high velocity required for passenger service, without producing objectionable results, and it would appear that considerable experimentation and some modification of the accepted designs will be necessary before such a type of locomotive can be operated successfully in passenger service.

We understand that Mallet freight locomotives in road service reach their maximum power below 20 miles per hour and at about 17 miles per hour the power is so restricted by friction of steam through numerous passages, as above described, that the useful tonnage hardly exceeds that of a good sized simple consolidation engine.

THE APPRENTICE.

The successful apprentice instructor, or the foreman who has the faculty of developing the apprentices under him and bringing out the best in them, is the one who can look back over his own experience and realize the state of mind and the feelings which he had when he was in a similar position. The first six months or the first year of apprenticeship is a critical period. During this time especially the apprentice must be watched closely; his character and disposition must be studied, and he must be treated as an individual. Too often a boy's whole future is spoiled by indifference or carelessness on the part of those who have charge of him during this period. Mr. Creary, in speaking before the meeting of the apprentice shop instructors of the Santa Fe on "The Boy's Side of Apprenticeship," seems to have the rare faculty of appreciating the apprentices' feelings, as will be noted by his discussion, which will be found in this number. For those who are interested in apprentices, this article has a peculiar value.

It is not always an easy matter for the shop foreman to look at the problem from Mr. Creary's standpoint, but it is absolutely necessary to do so if he is to be successful in handling the young men under him. Even if he does have the rare faculty of understanding the boys, he will find it greatly to his advantage to study those principles of ped-

agogy and psychology that are being used to such splendid advantage in our modern systems of education. This sounds rather formidable, but it does not mean that it is necessary to know or understand all about, or even very much about, these subjects. Several writers have emphasized the more important principles which are involved in a most simple and readable manner. A good example is Margaret Slattery's "Talks to a Teacher's Training Class." While, as its title indicates, it is not primarily intended for railway shop apprentice instructors, yet the principles are just as true for the apprentice as for young people in general; the book has been a great inspiration and help to some of the instructors who have made use of it. In most interesting way Miss Slattery tells of the characteristics of young people of different ages, and as to how they may be developed and influenced to the best advantage.

An important feature of improved apprenticeship methods, such as are in use on the Santa Fe and the New York Central Lines, is that the boys who are not suited for the trade to which they are apprenticed are quickly discovered, and may be transferred to a department or a work for which they are better fitted.

Letters to the Editor.

SHOP KINKS.

March 12, 1910.

To the Editor of the Railway Age Gazette:

The shop kinks that you are publishing are of great value to railway shop foremen and mechanics; they give them, without any effort on their part, the results of the labor and efforts of others (in some cases of years) in experimenting and perfecting these tools and appliances.

There is no question but that the man who selects these kinks and prepares the article should be given proper credit for his labor and be reimbursed for it, as you are doing; but I believe that the inventor, the man who through his ingenuity, thought, labor and experiments, which in some cases were kept up for years before the device was simplified and made practical, should be given some of this credit. His name should be given in the article, also the position he occupied and where he was located when he developed the tool. Of course, in a good many cases this cannot be done, but where it is I think you will agree with me it should be done. There is a great difference in the labor entailed in measuring up a tool already made and making a drawing of it, from the thinking out of the original design, making the device, trying it out and changing and strengthening it until you have the completed and practical tool.

Then again, some of these machines are patented, but mention is not always made of the fact; this is neither fair to the patentee nor to the readers. The former may lose a lot of revenue he is entitled to, and may never see or hear of the invention having been used without his sanction. The reader may make one of the machines and later find that he has put his foot into it for using a patented tool.

I have seen write-ups in the daily papers in the neighborhood where some of these appliances were gotten up, calling attention to the mechanical and inventive ability of the men who have sent in the material to you, and calling the public's attention to these tools as having been devised by these parties, when, as a matter of fact, they had no more to do with them than Adam did.

Wherever it can be done, the inventor's name should accompany the sketch; this will encourage him to continue his efforts and make him feel that he is not using his brain and lying awake nights for someone else's aggrandizement.

Trusting that you can do this, even to publishing the names of the inventors of tools that you have already described, but which have not been properly recognized.

Yours in fair play,

A Mechanic.

[The writer's points are well taken. The editors are anxious to give credit where it is due, and ask the co-operation of contributors and readers in seeing that this is done. Contributors who send in descriptions of patented devices are asked to make note of the fact.—Editor.]

Contributed Papers.

THE BOY'S SIDE OF APPRENTICESHIP.*

By Thomas Creary,
Apprentice-Shop Instructor, Blacksmith Shop, Topeka, Kan.

The boy who, from force of circumstances or a dislike for study, abandons his school work must do one of two things. He must seek some kind of employment or become a loafer. Fortunately most boys prefer going to work and it is at this period of his life that the boy begins to look about for some employment that will not only be congenial, but will also bring him a fair remuneration for the service rendered. The thoughtful boy also has the future in mind and takes into consideration the possibilities of advancement in the work he is about to take up. Large industrial plants, such as the Santa Fe maintains at various places along its lines, naturally attract the boys and many make application for employment, a majority with the intention of learning a trade, and a few who are undecided. It is the boy who files an application for apprenticeship that I have in mind. In many instances he has a decided fancy for some particular trade, and again there are quite a few who do not know just what they would like to follow.

Were it in my power to direct the preliminary movements of the prospective apprentice I would have him report at the shops some morning. I would meet him and take him through the various departments. We would make the trip leisurely giving him ample time for observation and a chance to see what actual shop conditions are. A trip to the school would also be made and then he could see the progressive lessons in drawing, arithmetic, etc., giving him an idea of what systematic effort will do for a boy. I would have him tell me if any particular operation or process he had witnessed interested him, and what interested him most. In this way a boy would be enabled to better decide just what trade he prefers.

I firmly believe in a boy being allowed to follow his natural inclination in regard to mechanics. Boys are too often the victims of circumstances in being assigned to trades for which they have no adaptability. This is often the result of parental persuasion, the boy's fitness not being at all considered; and again boys are pushed into trades just because there happens to be an opening. This is wrong, wrong to the boy because he can never hope to attain the high degree of skill or proficiency he would if allowed to follow the trade of his own choosing, wrong to the company because of the low efficiency and perhaps utter failure which is bound to follow such an assignment.

After the trip through the shop and school and after the boy has decided what trade he prefers, then the real test of his judgment begins. He is ushered into the shop and begins his four years' term. He sees strange faces all about him, strange machinery, hears strange noises and for a time is bewildered. He gazes in wonder at what is going on about him and just at this particular time is apt to become so interested in what someone else is doing that he forgets for a moment what he is doing himself.

*Read before a meeting of the Apprentice-Shop Instructors of the Santa Fe System, Albuquerque, New Mexico.

After a time all this wears off and he becomes accustomed to his surroundings and settles down to business. By easy and progressive stages he is being led along the line of his chosen work and if his judgment has been good it will soon crop out in many ways. When he is told how to do a piece of work he readily grasps the idea. He develops the knack of taking advantage of his work in many ways, some perhaps a trifle crude, but it shows that he has his mind on his work and is using his brain as well as his hands. He is eager to advance; takes pride in the quality of his work; he makes slight mistakes and has his faults; both are trivial and, aside from a kindly suggestion in the right direction, should pass unnoticed. A boy continually nagged becomes discouraged and disgusted but he feels no resentment at being called down for a breach of discipline or an error caused by carelessness on his part. He takes pride in keeping up the quality of his work and feels that in estimating time on jobs that come to him, care should be taken so that a fair schedule may be made, as he takes pride in keeping up his efficiency as well as the quality of his work. He is not insensible to a compliment passed by his foreman or instructor regarding the general excellence of his work.

Some boys have not the faculty of seeing into things mechanical as readily as others. This should be noted and a special effort made to get the boy straightenend out. If after a fair trial the boy shows no adaptability he should be released and allowed to take up something better suited to his talents.

The boy who makes good during the probationary period should not be anchored to one job so long that it will become tiresome. He is eager to forge ahead and his progress should be limited only by his ability and development. A bright boy pushed ahead will serve as an example for the laggards and will stimulate an increased effort on their part to get close to the leader. As he progresses along his four-year course of shop practice, his hands becoming more skilled each day, it dawns upon him that by the skill of his hands alone his future advancement will be uncertain. With this thought uppermost in his mind he sets to work to develop his mental powers. Aside from an increased interest in his regular school work he provides himself with good books concerning his particular craft; he also subscribes for a magazine published in the interest of this branch of mechanics and in this way keeps in touch with all that is new and progressive in his line.

In the daily papers he frequently reads of some man being appointed to a higher position in the railway world. He notes with interest the story of the man's rise from the bottom of the ladder, all brought about by his own ability, hard work and close attention to business. He becomes more convinced each day that it is the man who does things who rises above the free and easy fellow whose greatest care is watching the clock or waiting for the whistle to blow. He realizes that it is not within the reach of all to rise, but he is determined to leave no stone unturned in the way of preparing himself for advancement along his line of effort. To the boy who has this ideal in mind, every opportunity and encouragement should be given so that his advancement will not be retarded to such an extent as to cause him to lose interest.

Occasionally bad luck will cast its discouraging shadow over his path; nothing goes right; everything goes wrong; on an occasion of this kind it is sympathy and not censure the boy requires. His youth will perhaps at times assert itself and find expression in various pranks; never with evil intent but always with a view of getting something humorous out of the situation. When in this mood, he is no respector of persons; his foreman or instructor may be his victim. We were all boys once and, judging from the little improvement some of us have made, we were worse than the boys we now have to contend with.

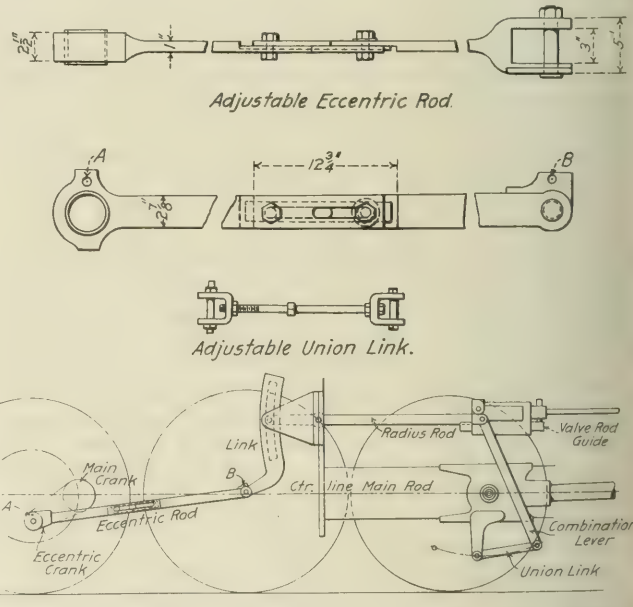
The capable boy who has finished his apprenticeship and shown his loyalty to the company by remaining with it, should, when opportunity offers, be given a promotion of some kind and a chance to make good. Before this young man there lies a field of golden opportunities and to a very great extent he is the architect of his own fortune. By attending strictly to business and taking full advantage of the benefits and privileges his apprenticeship has afforded, the boy's future cannot be other than bright. Let him do his share to bring about a realization of the management's dream in establishing this system, namely, the training of a sufficient number of bright, loyal young men to fill every position in the mechanical department, and he will rise according to his merits.

DISCUSSION BY B. D. MILEHAM,
Apprentice Shop Instructor, Paint Shop, Topeka.

If I want the confidence of the boys under me I endeavor to teach them that they must first of all rely upon me as a business confident, that if they come to me for information upon any subject pertaining to the painting business they can get it in full detail, given with great pleasure and in its entirety. Don't let us make the mistake of trying to govern all boys by the same tactics. Be a student of human nature. Study their different dispositions. When you meet them talk and act to suit their particular and different dispositions. You must handle some with a curbed-bit; with others of a gentler nature, moral suasion is the better way. Don't be austere and hard to approach, but let them feel that their inquiries are solicited.

SETTING VALVES WITH WALSCHAERT GEAR.

The usual practice of setting valves on locomotives equipped with Walschaert gear, is to change the length of the eccentric rod three-quarters of the amount the valve is shown to be out of square. The rod is then removed and a cut and try method used, which takes considerable time and labor. This may be eliminated by using the device shown in the illustration. It consists of an adjustable ec-



Details of Device for Setting Walschaert Valve Gear.

centric rod and an adjustable union link. The original eccentric rod and union link are removed and the adjustable devices are put in their places. These are adjusted to the proper lengths for the correct position of the valve. The centers A and B on the ends of the adjustable rod eliminate the necessity of having to find the centers each time. The proper lengths being obtained, the original rods are made to correspond. This device is used by H. F. Grewe, general foreman, Wabash-Pittsburg Terminal Railway, Rook, Pa.

Shop Kinks.

FROM THE ELIZABETHPORT SHOPS OF THE CENTRAL RAILROAD OF NEW JERSEY.

BY F. E. LISTER,
Associate Editor of the *Railway Age Gazette*.

The shop kinks given herewith were gathered at the shops of the Central Railroad of New Jersey at Elizabethport, N. J. In this connection we wish to acknowledge our indebtedness to C. E. Chambers, superintendent motive power, who made the necessary arrangements looking to this end.

The mechanical department organization of this road places the locomotive and the car departments under separate heads, each of which reports direct to the superintendent motive power. G. L. Van Doren, superintendent shops, is in charge of the locomotive work, while William Alter, general foreman car snops, is in charge of the car work.

The thought has been expressed that the supply of shop kinks would soon be exhausted, judging from the numbers which have appeared in these collections. There seems every reason to believe that the supply, rather than being exhausted, will increase, for a time at least. It is a noticeable fact that in gathering shop kinks, the main difficulty lies in locating them about the shop. Being in most cases made up from rough sketches, no record of them is made, and after being in use for some time, they are forgotten as shop kinks. Although used continually, they do not stand out and are found only after persistent search.

Car Shop.

The shop kink competitions and the several other collections which have appeared in tne *Railway Age Gazette* since the first competitive collection on October 1 last, have failed in one respect, that of bringing out a share of car shop kinks equal in number to those of the other shops. It is a generally accepted fact that the field for kinks is much more limited in wood-working than in iron-working and this fact has been borne out in the results of the past months.

The present collection shows, however, an advancement in car shop kinks, not so much in the number as in the real merit of the devices shown. The pneumatic jack, the diaphragm face-plate straightener and the spring testing machine show very well developed and useful devices and they should receive the deserved approval of all car shop men. C. O. Fuss, car shop foreman at Elizabethport, is the originator of these kinks and he is authority for the statement that they have resulted in a considerable saving of time and money in his department.



Fig. 1—Pneumatic Jack.

PNEUMATIC JACK.

In the accompanying half-tone, Fig. 1, and the line drawing, Fig. 2, are shown a general view and details of a pneumatic jack, which is an exceedingly efficient and necessary car shop

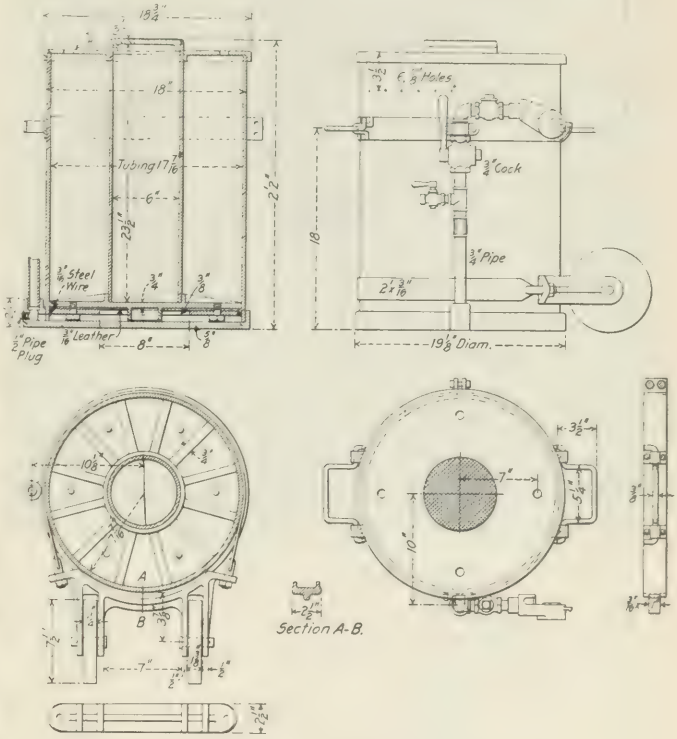


Fig. 2—Details of Pneumatic Jack.

kink. The half-tone shows this jack in place under the end of a coach. In jacking up a coach, it is of course, necessary to use two jacks under each end. Air hose connections are made to operate the jacks simultaneously, which provides for their moving equally, both as to speed and travel. One man operates the jacks through one valve, while the second man arranges the blocking and different height horses on which cars are placed after the trucks are removed.

The cylinder is made of a piece of tubing, 17 7/16 in. in diameter by 24 in. long. The top and bottom heads are made of cast iron, as are the piston head and cap, the follower plate and the wheels. The bracket which carries the wheels is made of cast steel. The plunger is made from a piece of 6-in. pipe, which screws into the piston. Air enters through a port cast in the bottom head. The drawing shows the original design of using a cap on the plunger, but this has been changed, as shown in the half-tone, to a longer ram, with the

use of which it is not necessary to block up to the sill, but run the ram against it direct.

DIAPHRAGM FACE PLATE STRAIGHTENER.

The accompanying half-tone, Fig. 3, shows as used, a very effective device for straightening diaphragm face plates. The line drawing, Fig. 4, gives two elevations, which show the device to be simple, though requiring some skill in forging. The I-section shape of the feet provides for using the device for straightening any bend in a diaphragm face plate, the

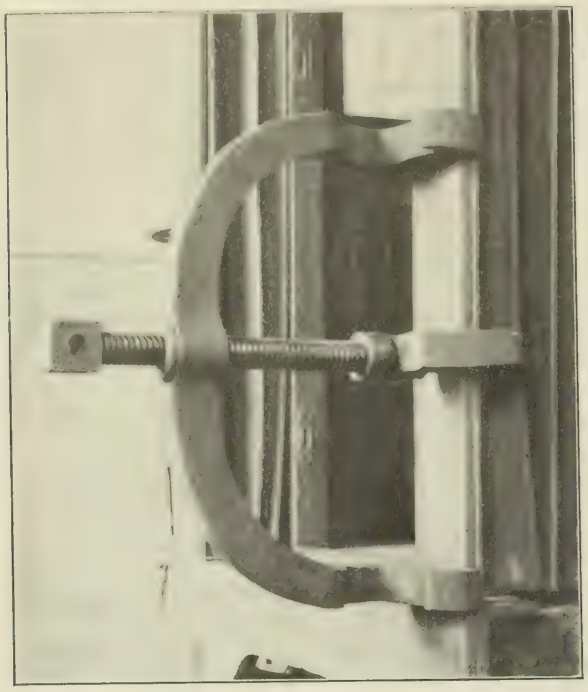


Fig. 3—Diaphragm Face Plate Straightener.

screw being run in or out as required. The screw is double square threaded, 1¾ in. in diameter.

In the majority of cases, the diaphragm is bent inward and the device is used as shown in the half-tone. It can be placed

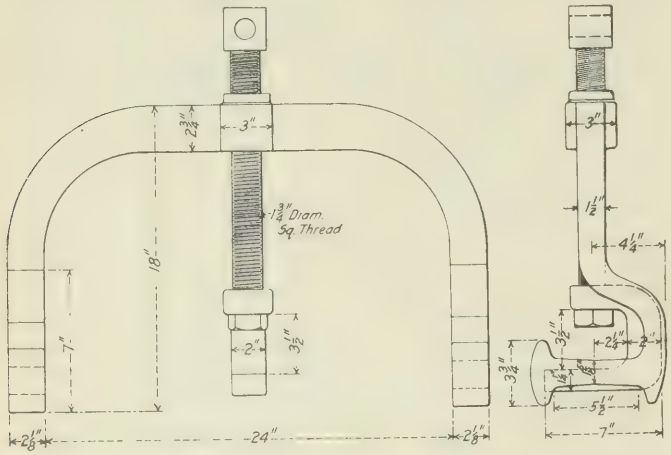


Fig. 4—Details of Diaphragm Face Plate Straightener.

in about four or five minutes and the face plate straightened in about the same time. Without this device it would be necessary to remove the face plate, which would mean taking off the diaphragm and in a good many instances, the tearing of it and the necessity of placing a new one. Although the center clamp bears against a portion of the diaphragm, it is not injured.

This device is also applicable to a variety of other uses, such as straightening truss rods in place, or the light channel section shapes used in coach construction.

LIGHT COACH STEP HOIST.

In the half-tone, Fig. 5, is shown a light hoist used for holding steps in position while bolting them in place. The cylinder is made from a piece of brass pipe, 2¼ in. in diameter by 28 in. long. This pipe is tapped into a cast iron base,



Fig. 5—Light Coach Step Hoist in Position.

through a port in which the air enters. A 12-in. diameter base is bolted to the cast iron one, and maintains the hoist in position.

Unless some device is used for this purpose, two men are required in putting up a pair of steps, one holding in position while the other places the bolts. With this hoist, one man can do all the work, as the hoist holds the steps in their position.

CLAMP FOR GENERAL WORK.

A clamp for general use about the coach shop, especially for drawing together coach framing, siding, etc., is shown in the line drawing, Fig. 6. It has a maximum range of 13 ft., which is ample for all uses to which it can be put. The U-shaped pieces, as well as the running rod, are made of ⅞-in.

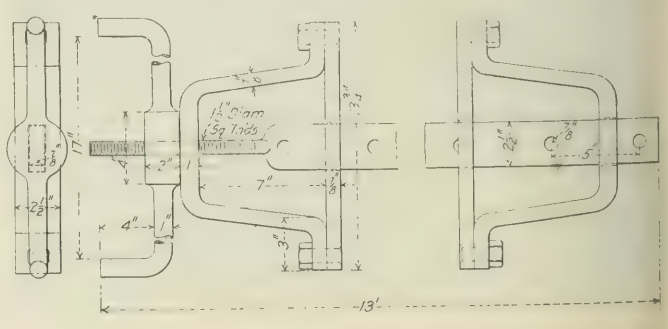


Fig. 6—Clamp for General Work.

x 2½-in. iron, making the clamp rigid. The running rod is drilled with ⅞-in. holes on 5-in. centers for its entire length, and as the square threaded screw has 9-in. length, ample provision is made for any condition. The tightening nut has two 8½-in. arms, giving sufficient leverage.

COACH SPRING TESTING MACHINE.

The coach spring testing machine used at Elizabethport and shown in the accompanying illustration, Fig. 7, is used on every coach spring placed in trucks. Freight car brake cylinders, arranged in tandem, connect to a common crosshead and exert an even pressure on the spring. The springs are handled to the machine by a pneumatic hoist, running on an overhead track, and by the hooks shown in the illustration. A table is posted on the side of the building near the machine, which shows the pressure to which the springs should be tested. After the spring is in position and the wooden block placed, as shown, the air is admitted to the cylinders. The spring is then given the pressure which it should withstand according to the table, when its height is measured. If the spring then shows the correct loaded height it is O. K., otherwise it is rejected.

The chain, weight and lever arrangement shown provides



Fig. 7—Coach Spring Testing Machine.

for lifting the crosshead, pistons, etc., when the air is exhausted at the conclusion of a test. This machine is located just outside the coach shop and adjoining one of the tracks and the spring storage floor.

COACH SHOP SCAFFOLDING.

The scaffolding, a portion of which is shown in the half-tone illustration, Fig. 8, does not differ materially from that used in most shops, but it does show a design which is extremely simple and at the same time very effective for working on the sides of coaches. The brackets are made of ½-in. x 2-in. material, the horizontal and oblique members being made of one piece and bolted or riveted to the vertical member which carries the hook. The iron rounds are spaced 10 in. apart. The uprights are loosely bolted to the horizontal timbers and fastened to the floor by bolt latches. This latter provision allows for swinging the uprights in to the center post so as to be out of the way when not in use. The top cross member is rigidly bolted to the shop building posts, at about 10 ft. 6 in. from the floor. The runways are made heavy and trussed with ⅜-in. rods, the queen posts being made of 1-in.



Fig. 8—Coach Shop Scaffolding.

pipe, flattened on the lower end. This illustration, besides showing the general construction of this scaffolding, also shows a plug and reel of hose for fire protection.

Air Brake Shop.

The Elizabethport air brake shop occupies a portion of the general storeroom building, being separated from the store section by a low board partition, which is extended further upward by wire screening. A new Westinghouse triple valve testing rack is placed on one side of the space, while a circular multiple angle-cock grinding machine is located in one corner. All triple valves are thoroughly tested before leaving the shop.

Quite a little ingenuity is displayed in the utilization of the space available for the work, the manner in which hose, valves, etc., are handled and stored and in the use of home-made efficiency devices. In Figs. 9 and 10 is shown the method of stripping and fitting up hose. J. V. Brannan, foreman air brake shop, is at the present time having made a new machine for stripping, one which will strip both the coupling and the nipple end simultaneously.

BRAKE HOSE STRIPPING MACHINE.

The half-tone illustration, Fig. 9, shows a machine in the air brake shop fitted for stripping the nipples and couplings

from brake hose. This same machine is used for fitting up new hose, in which case air is admitted at the rear rather than the front of the piston, giving a pushing instead of a pulling movement. The nipple or coupling is gripped by the double-jawed, hook-shaped clamp, so designed that its hold becomes more firm as the pressure acts. The hose is held between two eccentric and fluted dogs, and as the pulling action tends to draw these flutes into the hose, it is firmly gripped. Another view of this same machine is shown in Fig. 10, the top view showing this eccentric action very well.

When used as a fitting-up machine one of the detached castings seen in the illustration is substituted for the double-

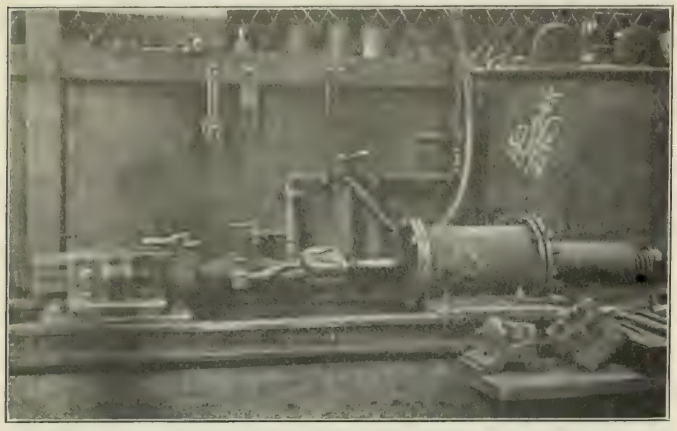


Fig. 9—Brake Hose Stripping Machine.

jawed hook shown screwed on the end of the piston rod. These castings are made to fit the irregular surface of the hose coupling, and such that it is held, during fitting, without being clamped, it being only necessary to place it in the casting. The air control valve is placed in a convenient position for the operator standing in front of the machine.

BRAKE HOSE REPAIR BENCH.

The brake hose repair bench, with the stripping and fitting machine shown in Fig. 9, is seen in the half-tone illustration, Fig. 10. The various devices used in this work and their arrangement show the possibility for kinks in this department. The small casting just beyond the couplings in the foreground is used for inserting the rubber gaskets in couplings. The casting is held in the vise and the impression provides for holding the coupling in a manner much more easy and quickly than it could be clamped in the vise. Just beyond this casting is seen an air-operated clamp used for closing up the metal clamp which is held together by a bolt. It is difficult to draw these metal clamps together for bolting without some special device, and this design, given in detail in Fig. 11, is probably as effective a device as can be designed for this purpose. Near the vise in the background is shown a clamp formerly used for this purpose, but it was necessary to place it in the vise, by which method much time was lost. The old clamp is still used on occasional odd-size hose, such as used by boiler washers and others about the shops. The locomotive reducing valve, seen on the partition above the bench, provides for cutting down the pressure of the air which comes from the shop main, and at a greater pressure than required for the brake hose work.

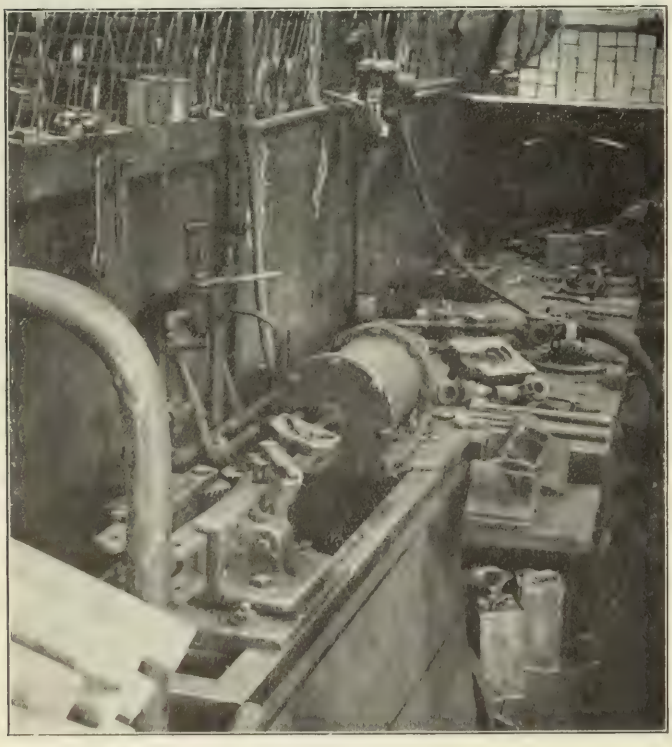


Fig. 10—Brake Hose Repair Bench.

AIR OPERATED CLAMP.

The clamp seen on the edge of the bench in Fig. 10 is shown in plan and elevation in the line drawing, Fig. 11. Its use is self-explained in the half-tone illustration, which shows a piece of hose held between the jaws. The 8-in. brake cylinder

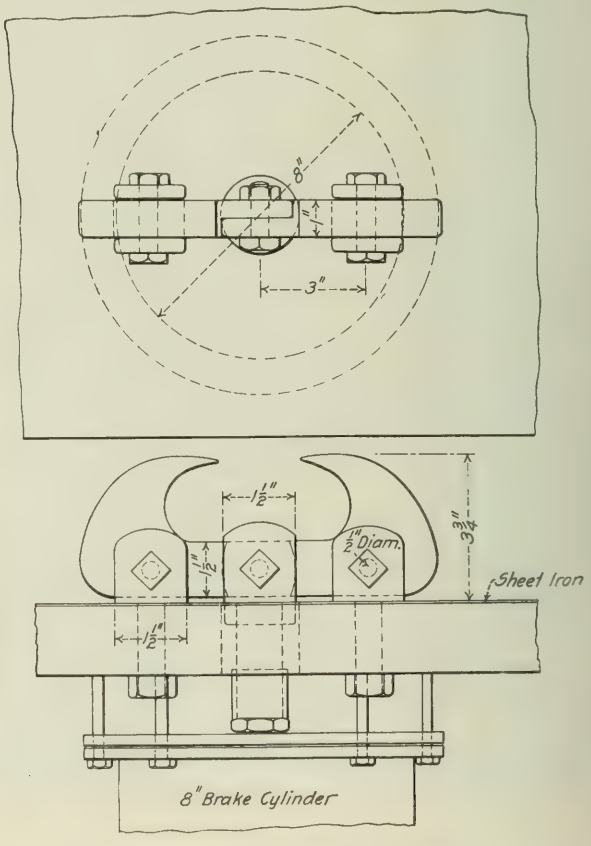


Fig. 11—Air Operated Clamp.

is swung below the bench and the air is controlled by a valve placed to the right just behind the clamp. As only about 2 in. of movement is necessary in the cylinder, a loose piece of pipe is slipped over the piston rod which arrests the downward movement of the cross-head. This provision is important, since the hose often slips, in which case the sharp jaws of the clamp might cut the hose.

TRIPLE VALVE PISTON COMPRESSOR.

The line cut, Fig. 12, shows a clamp used for closing up packing ring grooves in triple valve main pistons. This clamp is bolted to the bench in the position shown in the left hand

elevation. The 3½-in. diameter ram is loosely fastened to the 1¼-in. diameter threaded bolt. It is made loose to permit its seating itself evenly against the piston, which rests in the bored impression in the upper side of the U-shaped base. An improvement in this respect could be made by using a ball shaped connection, rather than the flat one which the device now has.

Before placing the triple piston in the impression which receives it, its packing ring is snapped into position to prevent the groove from being closed too much. The 36-in.

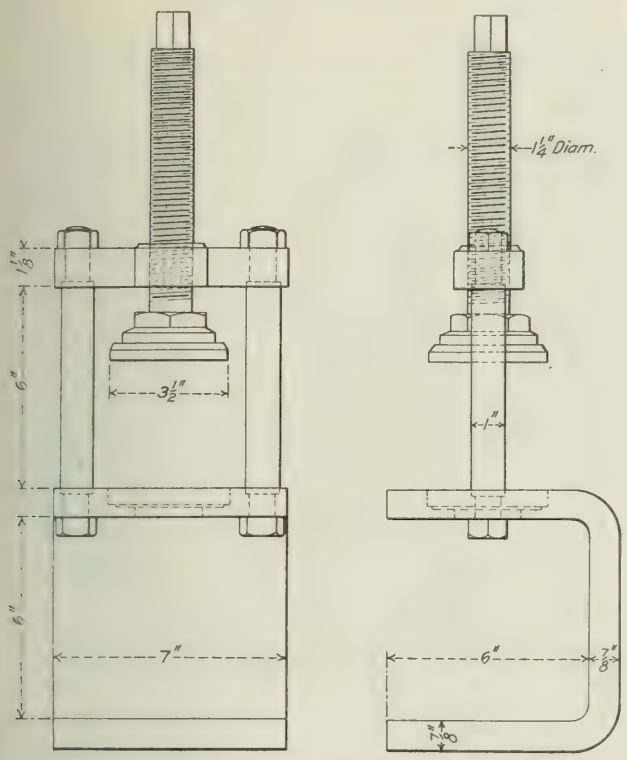


Fig. 12—Triple Valve Piston Compressor.

double end wrench provides a large amount of leverage, so that grooves are easily closed and marks or burrs can also be pressed out. Another advantage could be had by slotting one side of the upper cross bar which carries the screw. This would allow of putting the triple piston in position easily and would save the time which at present is required to run the ram down against the piston.

Blacksmith Shop.

The blacksmith shop kinks of this collection are probably the most interesting and valuable yet presented. The importance of this class of shop tools becomes more and more marked with each shop that is visited and as it is realized that shop foremen devote a large amount of time and study to this part of their departments. Geo. W. Kelly, foreman blacksmith at Elizabethport and president of the International Railroad Master Blacksmiths' Association, has increased the efficiency of his shop to a very decided degree through the designing and installation of a large number of these home made labor saving devices, a number of which are shown.

Thermit welding of locomotive frames and driving wheels has been reduced to a simple but effective process by him, and his statement that over 300 successful welds, of both frames and wheels, have been made at the Elizabethport shops, speaks well, not alone of the process, but of his apparent skill in handling the work. All of this welding is in the foreman blacksmith's personal charge, as it should be in all shops, as these men are certainly best acquainted with the properties of metals, the expansion and contraction of which is a most important factor in obtaining the best results. Preheating is done by the use of a hydro-carbon water gas, a by-product in the manufacture of Pintsch gas for car lighting. Having the Pintsch gas plant on the grounds, the by-product is easily obtained. These Thermit welds cost from $12 to $18 apiece for material and labor, using about 60 lbs. of Thermit for a top rail weld and about 40 lbs. for bottom frame weld.

The bulldozer work shown below gives evidence of the possibility for a high state of perfection in this work, the aim being to reduce the machine work to a minimum and to so equip the machine that every stroke will be utilized to its maximum, thus forming or punching at least two pieces at the same time. To fully explain the action of a particular die and the flow of metal during the forging process, the different stages of the forging are shown, as the blacksmith, to get the full benefit of the description, must know these successive stages.

The frog shop at Elizabethport occupies one corner of the blacksmith shop, and the large new planer, the drill press and several other machines, at first thought, would seem to have been crowded out of the machine shop, which is, however, not the case, as they were intentionally so located that the work could be easily supervised by the blacksmith foreman.

Mr. Kelly was particularly interested in our obtaining shop kinks and extended every possible courtesy, both in fully explaining the devices and arranging them for photographing.

Pneumatic Swedging and Welding Machine.

The half-tone illustration, Fig. 14, and the line drawing, Fig. 13, shows a pneumatic swedging and welding machine, which was designed and perfected by G. L. Van Doren, superintendent of shops at Elizabethport.

The frame is made of cast steel, and of very stocky and rigid design. The inside face is 9⅞ in. from the center line of the dies and only 4 in. wide, allowing a wide range of movement on the die blocks. These are made of hammered steel and keyed in position. An old locomotive truck center

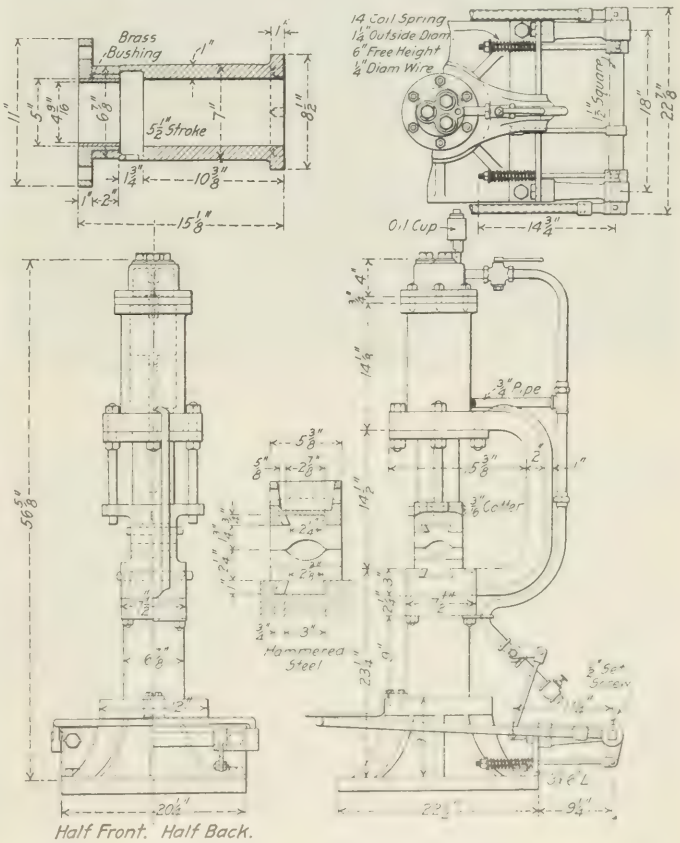


Fig. 13—Pneumatic Swedging and Welding Machine.

casting is used for the base. The air cylinder, as shown in the detail drawing, screws on to a hammered steel collar which is inserted from the lower side of the frame. A $\frac{1}{16}$-in. shoulder on the outside of the cylinder wall and the collar clamp the frame, while the four 1-in. through bolts fasten the cylinder securely. Two of these bolts have $\frac{7}{8}$-in. extensions, which act as guides for the movable die block.

It will be noticed that there are two air supply pipes. The lower one carries the air which finds its way to the top side of the piston through a $\frac{7}{8}$-in. passageway drilled along the center line of the piston, which is made in one piece with the piston rod. Two $\frac{1}{2}$-in. drilled ports lead the air into

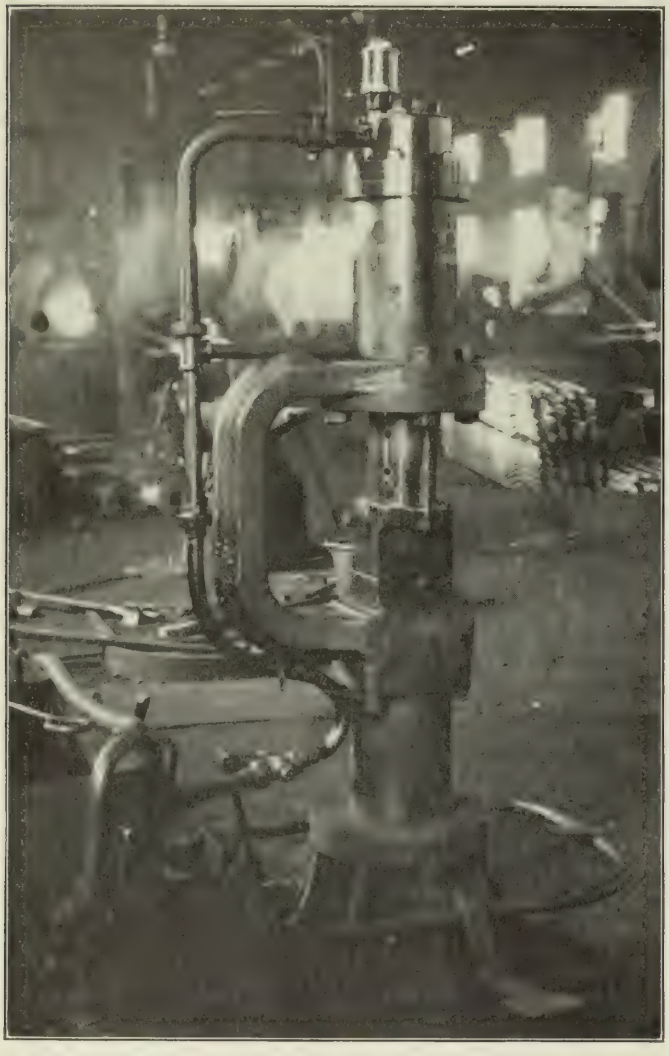


Fig. 14—Pneumatic Swedging and Welding Machine.

this passageway and also exhaust it when the hammer is at the bottom of its stroke, as shown in the illustration. This arrangement was, in the first design, the only provision made for the air supply, and it was later changed to that which is shown. A cast iron valve chamber, having three $1\frac{3}{8}$-in. openings and mild steel valves, was placed on top of the cylinder. The lower stems of these valves are $2\frac{1}{8}$ in. long and extend down into the cylinder, while $\frac{1}{2}$-in. diameter guide rods extend upward into the brass caps which are shown in the plan. When the piston approaches the top of its stroke it strikes the downward extending portions of these valves, opening them and admitting an additional supply of air for the downward stroke. A $\frac{3}{4}$-in. cut-out cock provides for using the lower air supply only if so desired, in which case, however, only about 50 per cent. of the actual value of the hammer is obtained.

There are three of these hammers now in use in the Elizabethport blacksmith shop, as well as in shops along the line. Each is placed near a forge and is used on all kinds of small work in welding from $\frac{3}{4}$-in. to 3-in. round iron and general shaping. The original design was intended for welding truss rods, chain links, etc. The $5\frac{1}{2}$-in. stroke is ample for all this class of work.

Signal or other thin lubricating oil is fed into the cylinder from the oil cup, which is tapped into the valve casing at top of the cylinder.

FORGING MACHINE DIE RACK.

A shop kink is a tool for doing a piece of work with ease and acceleration, but it may also be an arrangement by which tools are stored and handled, which condition is just as important as the tool itself. Under this head comes the



Fig. 15—Section of Forging Machine Die Rack.

forging machine die rack at Elizabethport, a section of which is illustrated, Fig. 15.

The uprights are made of 3-in. x $3\frac{1}{2}$-in. T-section iron, material left over after completing a job for which it was especially made. The shelf rests are made of iron and bolted in place. The shelves are made of $\frac{5}{8}$-in. plates, 7 in. deep, there being two such plates in each compartment, which accommodates two sets of dies for the 3-in. forging machine. The entire rack has 16 vertical sections, lettered from A to P inclusive, and each section has four compartments, in all providing for housing the 128 sets of dies which are at present on hand.

The chain block shown in the illustration is used in handling the dies to the machine, using an overhead track. Each die is tapped for the loop shown, so that very little other handling is necessary.

ECCENTRIC JAW DIES.

The accompanying half-tone, Fig. 16, shows the dies used and the three successive stages of making the jaw ends of eccentric blades. These dies are used in a 3-in. machine and

take the relative position shown. The dies are made of cast iron and the plunger of soft steel. Ranged along the top of the dies are three pieces, showing the stages of manufacture.

The first shape is roughed out under a hammer. It will be noticed that a boss is made on one side to provide metal for the branch arm. The second stage is that of punching the jaw. This is done on any forging machine, after which



Fig. 16—Eccentric Jaw Dies.

the jaws are spread sufficiently to allow the entrance of the plunger when put in the dies for the final operation. The chalk mark on the upper half of this jaw indicates that portion which is cut off just previous to the final heating. The dies, plunger and final shape explain the third operation, which is the result of a single blow. It is interesting to note that very little machine work is required, this being confined to the wearing and bolt and nut bearing surfaces.

EYE BOLT DIES.

A very interesting pair of dies, with plungers, is shown in Fig. 17, along with the ⅞-in. eye bolt formed. These dies, as well as the plungers, are made of soft steel.

The top impressions, with the plunger shown at the left, are used for the first stage, during which the collar is formed, while sufficient metal enters the plunger to form the eye. The lower impressions, with the plunger shown at the right, finally shape the collar and the boss which entered the first plunger. The central impressions are used without a plunger, their work being that of lateral action only in punching the eye hole. A film of metal, $\frac{1}{16}$ in. thick, remains after this process, and it is removed cold with a single blow of a hand hammer.

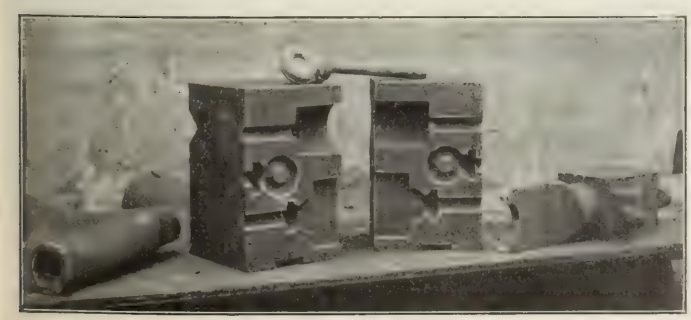


Fig. 17—Eye Bolt Dies.

PATCH BOLT DIES.

The patch bolt dies shown in the line cut, Fig. 18, are interesting as illustrating a method of making a small forging in one combined movement. The assembled view at the right of the drawing, showing position of the dies, the knife and the plunger when the bolt is finished, is almost self explanatory to blacksmiths. The metal is passed through the die plate and the cast steel knife, which shears of sufficient metal for the finished bolt and continues the movement which places the stock in line with the cast steel plunger. The finished bolt is thrown from the dies by a kicker pin which passes through the ⅜-in. drill hole in the knife. This knife is made of cast steel and is circular in shape, being successively revolved into a new position as the cutting edge becomes worn. The set screw shown in the die plate holds the knife in position.

The drawing shows the original design, which has been changed somewhat by bolting high speed steel strips on the top of the dies, providing a counterbore which the plunger enters rather than merely meeting the flat surface as shown in the drawing.

These dies are used on a 1½-in. Acme heading and forging machine. It is important that the correct diameter metal be used with such dies, following being the ruling in this case: Use 15-16-in. round iron for making a bolt to be sized for a 1 3-16-in. diameter tap and having a 13-16-in. square end, and use 1 1-16-in. round iron for bolts to be sized for 1 3-16-in. to 1⅜-in. diameter taps and having 15-16-in. square ends.

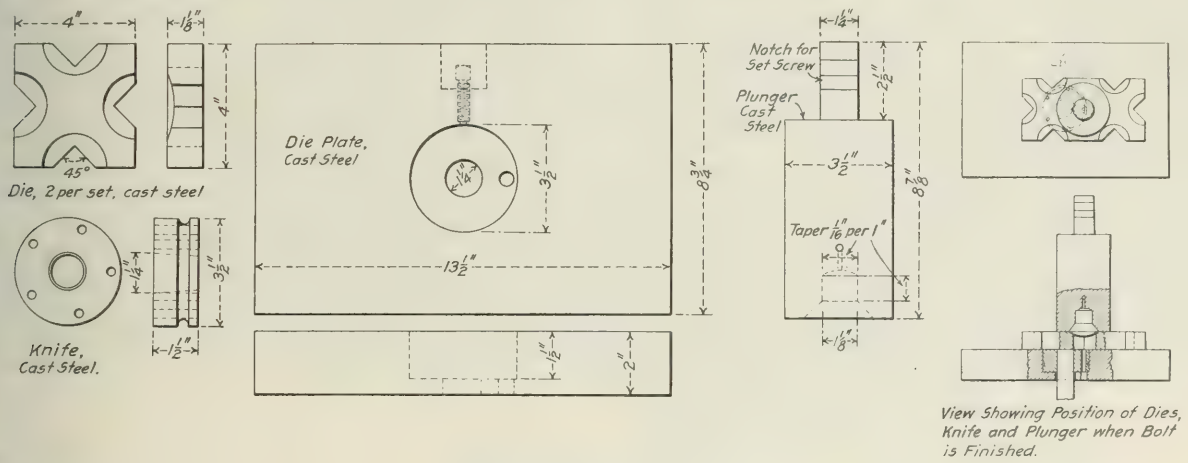


Fig. 18—Patch Bolt Dies.

FOOT FORMING DIES.

An object lesson in the flow of metal during a die forging

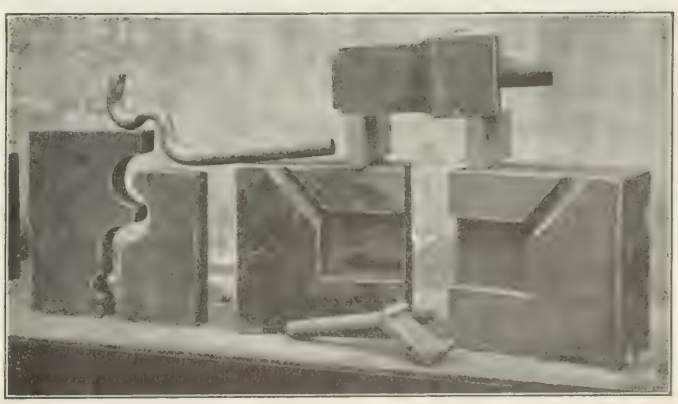


Fig. 19—Foot Forming Dies.

process is well illustrated in the half-tone, Fig. 19. This forging, made from 1¼-in. round iron, is used for the lower foot of a passenger car pedestal strap brace, but this same general shape is used in a variety of instances, both in car and locomotive work.

The bending dies, shown at the left, are used in forming the round iron into the triple-bend shape. These dies are clamped on the top of the main dies, the half circular section of the lower portion of the extreme left-hand dies being made only to clear the oblique circular impression in the main die. This three-bend shape was gotten by a series of trial shapes, it being probably easier to get it in this way than by calculation of the metal flow. After this preliminary shape is gotten, the metal is returned to the furnace for a welding heat, at which time it is made into the final shape shown, using the plunger.



Fig. 20—Pneumatic Bending Machine.

PNEUMATIC BENDING MACHINE.

The accompanying half-tones, Figs. 20 and 21, show two views of a pneumatic bending machine, which was originally designed by F. F. Hoeffle, master blacksmith, Louisville & Nashville shops at South Louisville, Ky. Mr. Hoeffle's design provided for a single cylinder, larger than the 12-in. x 14-in. ones shown. This tandem cylinder arrangement has been made up for another purpose, but was used in building this machine, and gives much more power than would the single cylinder.

This machine has just recently been completed and the dies for it are now being made. The front view shows an arrangement for forming the eyes of the long link shown. It is intended to use this machine for forming the freight car hooks shown, the hook end of which will be made on the now vacant side of the movable head and bed. The machine will then form the opposite ends of the two hooks at the same movement.

It will be noticed that the machine is made of scrap material. The discarded locomotive frame makes an excellent framing for the machine. The equalizing arm arrangement serves to evenly distribute the cylinder thrust and to guide the cross-head. The extension gives an operator easy control of the air from his position in the front of the machine.

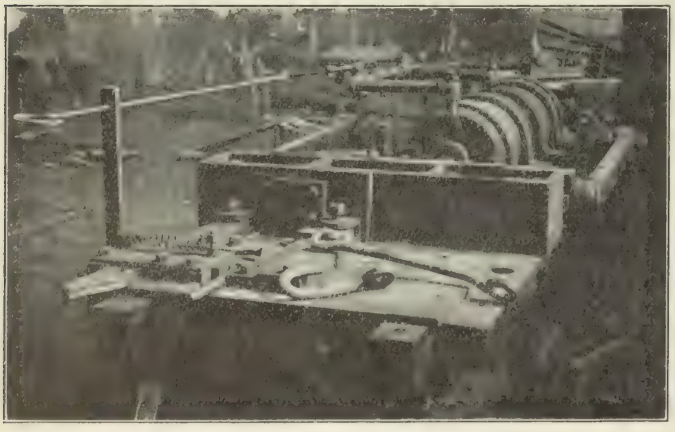


Fig. 21—Pneumatic Bending Machine.

BENDING AND PUNCHING MINER DRAFT RIGGING YOKES.

In the accompanying half-tone, Fig. 22, is shown an ar-

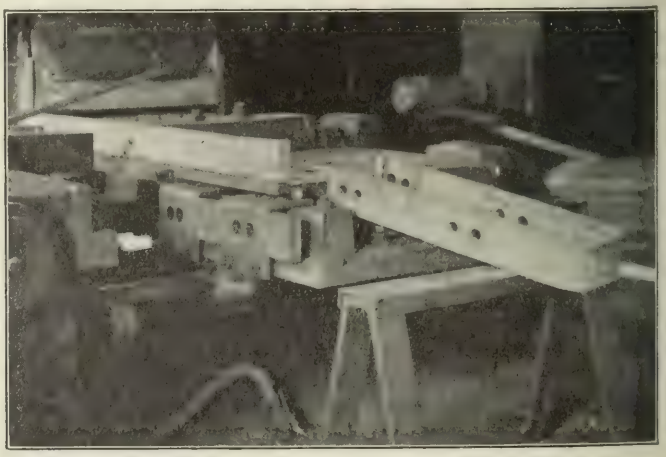


Fig. 22—Machine for Bending and Punching Miner Draft Rigging Yokes.

rangement on an Ajax bulldozing and bending machine for bending and punching Miner draft rigging yokes made from 1-in. x 5-in. iron.

The shoulders, on the open end of the yoke, for gripping the coupler shank are upset on a forging machine, after which the center end plate hole is drilled or punched. After heating, the plate is placed on the bed of the machine, the end plate hole taking a pin in the end of the bending block, which is bolted in place. After bending, the yoke is inserted between the stripping plate and block shown for punching the four large holes. The yoke is then reversed for punching the four holes on the opposite side. The stripping plate is made loose, so that it acts as a straightener also, taking out the flare which is left after the bending operation, as the bending die is only about half the length of the yoke.

The plan of utilizing each movement of the machine to full capacity is used in this process, since while one yoke is being bent by the bending dies another yoke can be punched at the same stroke. In order to avoid having the combined shock of the bending and punching come upon the machine at the same time, the punching takes place near the end of the machine's stroke and after the bending shock has passed. The punches, also, vary ¼-in. in length, which serves to distribute these shocks.

The capacity of this machine depends upon the heating facilities. The 4-ft. 4-in. x 9-ft. oil furnace, with full width door, is seen in the background and near the machine. Under ordinary conditions this machine will handle 100 yokes per day.

BENDING SPRING SEAT STIRRUPS.

Spring seat stirrups for freight car trucks are formed on the Ajax bulldozing and bending machine with the dies shown in position in the half-tone illustration, Fig. 23, and in the line drawing, Fig. 24. The male die is bolted to the face plate and rests against the end stop of the machine, while the female

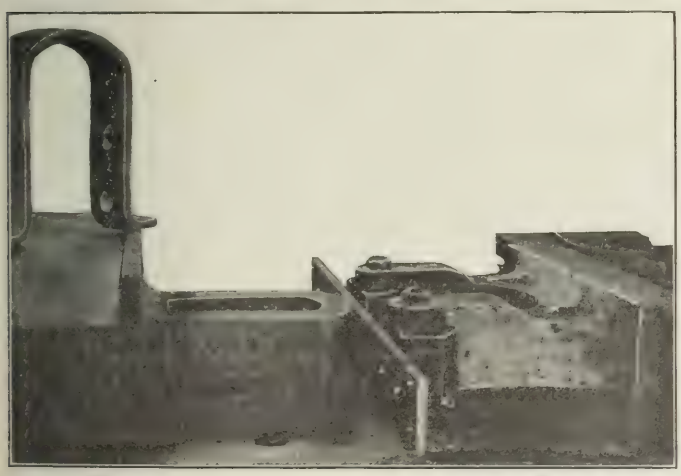


Fig. 23—Machine for Bending Spring Seat Stirrups.

die is bolted to the movable head. The holes in the stirrups are first drilled and countersunk, after which the plate, 1-in. x 6-in., is placed in the furnace. The half-tone illustration shows one of these plates in position just before bending. The small drilled hole in the center of the plate takes a pin on the male die.

Making these stirrups on this machine presented a problem which was met in a decidedly novel way, and at the same time adding a feature to the dies which very materially assists the metal in taking the new form. This problem lay in the fact that the travel of the machine was about 3 in. less than the length of the finished stirrup. Reference to the line drawing shows the two extreme positions of the movable blocks which were placed on the ends of the female die. The dotted lines in the drawing and the half-tone illustration show the positions which these blocks assume at the beginning of the operation, while the solid lines show their final position. As the dies close together, these revolve on the 1¼-in. bearings, and the flat surfaces of the blocks present two 10½-in. movable sur-

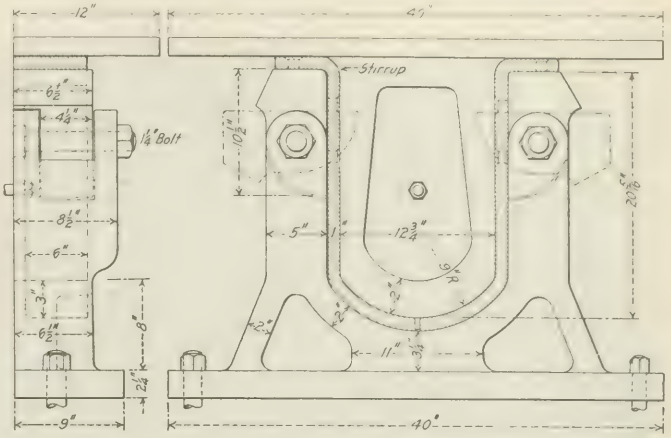


Fig. 24—Details of Spring Seat Stirrup Dies.

faces to bend the iron, which is an advantage over the metal's bending against the corners of the die.

FORMING EQUALIZERS UNDER STEAM HAMMER.

The half-tone illustration, Fig. 25, shows a portion of a 4,000-lb. Chambersburg steam hammer in the blacksmith shop at Elizabethport and the way in which it is used for forming passenger truck equalizers using cast steel dies.

The bars are first cut to length and their ends shaped as shown by that end which is under the hammer in the illustration. Two heats are necessary for this work, one for each end. One end of the bar is then returned to the furnace and when sufficiently heated, it is placed in the lower die and clamped in position as indicated. The movable die, seen above, is then brought down, forcing the end into the die

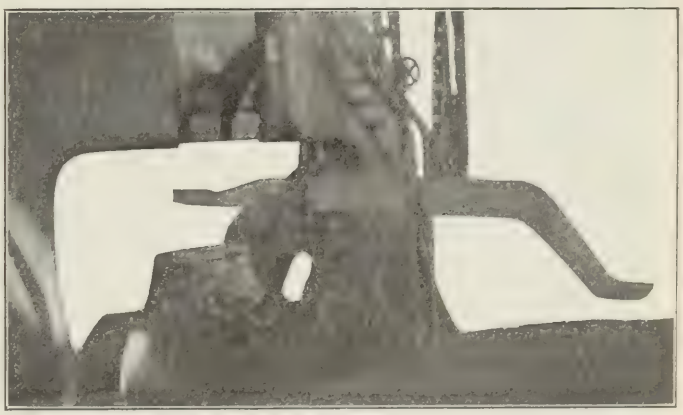


Fig. 25—Forming Equalizers Under Steam Hammer.

below. This lower die has upward extending flanges, between which the metal is held and prevented from slipping. The opposite end of the equalizer is then treated in a manner similar to the first, four heats in all being required for completing the bar.

These bars are made from 2-in. x 7-in. metal at a saving of much more than 50 per cent. in labor and fully 100 per cent. in time. In most cases, when equalizers are forged into shape, it is necessary to machine the $\frac{3}{32}$-in. taper of the ends which takes a horizontal position along the top of the journal box when the bar is loaded. This is provided for by these dies, and the only machine work necessary is that required for the cast circular ridge on the top of the box.

BENDING UNCOUPLING RODS.

The half-tone illustration, Fig. 26, shows an arrangement by

which uncoupling rods or pin lifters are shaped on the Ajax machine. This attachment operates on two lifters at the same time, the four center bends being made as indicated by the partially completed rod seen on the face plate and extending around the die block, while the two end bends are made as

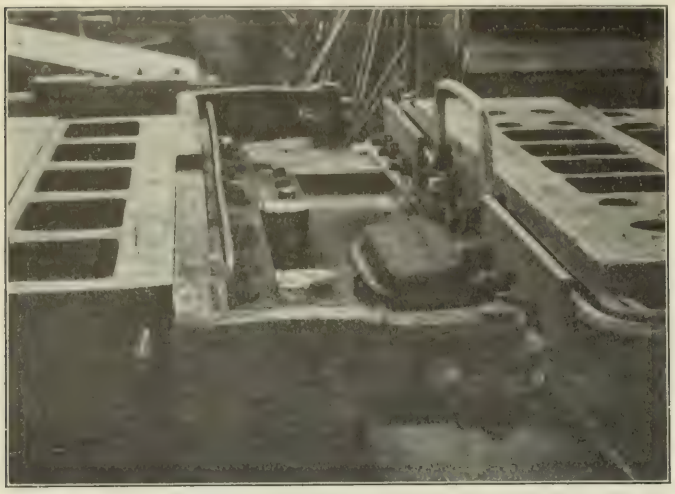


Fig. 26—Machine for Bending Uncoupling Rods.

indicated by the completed rod shown near the top of the stationary block of the machine.

These rods are made of 1-in. round iron and bent cold. All bends are made against grooved rolls, and the cold metal takes the new form much more easily than it would were these grooves rigid, in which case a good amount of friction would result. The rod which is taken from the lower position and moved to the upper for the final bends is not rigidly clamped in position, but merely placed along the space blocks. When the rolls meet the round iron, they hold it firmly in position.



Fig. 27—Drinking Fountain.

DRINKING FOUNTAIN.

In the accompanying half-tone, Fig. 27, is shown a drinking fountain, two of which are in the blacksmith shop and a number of which are distributed through the other shops. The one shown is placed near the center aisle of the blacksmith shop, where it is easily accessible and at the same time affords no excuse for time being lost when men congregate about such a place. The water used in these fountains is obtained by air pressure from a 300-ft. well on the shop grounds.

The bowl is made of cast iron. The spigot, seen on the feed pipe, provides for filling buckets for general use.

THERMIT FRAME WELDING.

The use of Thermit for frame welding has, during the past few years, demonstrated the fact a frame can be permanently welded in place on a locomotive, and that the section thus welded is easily as strong as, and in most cases stronger than, the original section. The making and repairing of locomotive frames has been the subject of no little discussion and study by railway mechanical departments.

The illustration here given, Fig. 28, shows a steel frame section Thermit-welded to the frame in position under the locomotive when it was in the back shop for light repairs on March 7, 1907. This locomotive is at present in service with the same frame in perfect condition, which shows the value of the weld. These steel sections are now being applied to all of this class engine when they are shopped, and up to the present time 31 engines have these Thermit-welded sections, 15 of

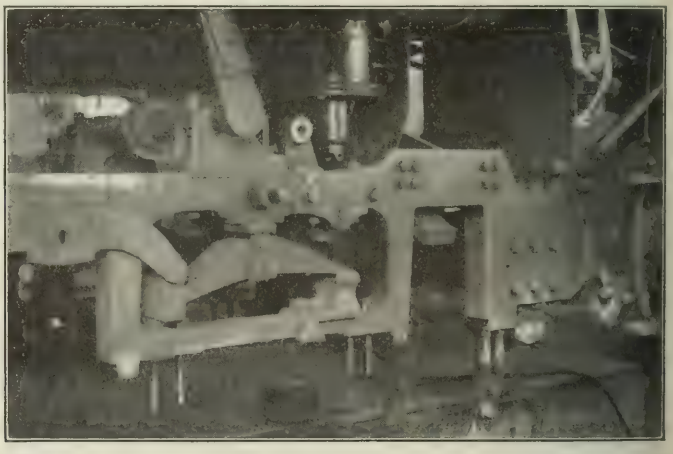


Fig. 28—Steel Section Welded to Frame in Position with Thermit.

which are thus equipped on both sides. Their application is made in the following manner: After the old section is cut away the steel section is bolted in position, with from ¾-in. to 1-in. open space between the abutting ends to allow for a free flow of the Thermit. The frame is trammed for its final position and then jacked long of the tram marks from $\frac{7}{32}$-in. to ¼-in., which is later taken up again when the Thermit contracts on cooling. Short steel wedges are then driven between the adjoining ends of both rails to hold them in position, after which the jacks are removed. A wax collar, from ¾-in. to 1-in. thick, and overlapping from 1½-in. to 2-in. on each side of the opening, is then applied to the top rail. The bottom half of the mold box is then adjusted and a spreading bar, extending between the backs of the adjacent frame legs, is put in place and held by a wedge during the preheating of the section to be welded. This preheating takes from an hour to an hour and a half, according to the size of the frame, which must be brought to a white or fusing heat. A 75-lb. crucible, with a ½-in. tapping hole, is swung above the frame

and directly over the pouring gate of the mold. When the frame is sufficiently heated, the fire is turned off, the jet pipe removed and the ignition powder lighted. After the Thermit has become set, the spreading bar is removed and the lower rail welded in the same manner as the upper one.

The entire process of Thermit welding requires that it be properly handled, but it is also very important that due allowance be made for shrinkage and releasing of the strains which are set up in the frame. To relieve these strains, the forward leg of the second jaw is heated after the weld has cooled.

Thermit frame welding was begun at Elizabethport in January, 1905, and up to the present time about 300 welds of all kinds have been made, with no failures of welds, although failures have occurred in both old frames and new steel sections adjacent to the Thermit welds. Previous to August, 1906, all welds were made without preheating, as the 5,400-deg. Fahr. heat of the reaction was considered sufficient to perfectly amalgamate the metals. Since this date, however, preheating has always been resorted to and the result has always been much more satisfactory. There are at present several locomotive frames in service having as many as five and six welds.

Boiler Shop.

The boiler shop at Elizabethport occupies one end of the same building in which the erecting and machine work is done. The longitudinal pit tracks of the erecting shop extend the building's entire length and the portion of the boiler shop having these tracks is used for doing the tank work.

Fig. 30 shows, in the background, the office of Frank Craig, foreman boilermaker. The office space extends just past the third window, where there is a partition dividing the office and tool room. All the boiler-making tools are kept in this tool room, which is much better than having them kept in the general tool room. All air hammers for chipping and calking, when not in use are partly submerged in a tank of oil which keeps them in condition and prevents the valves from sticking on account of rust from the moisture in the air.

Safe-end flue welding in this shop in a small building adjoining the main building. Geared to the shaft carrying the flue cutter is another parallel shaft which carries a tapered reamer. After the end of the flue is cut off, the new weld end is reamed. As the safe-end pieces are tapered off, the weld is made with two tapered surfaces rather than one, which seems to give better service and makes a longer weld. It is the policy in this connection to reduce the number of welds on the flue as much as possible, and one safe-end, 24-in. long is used in place of two shorter pieces.

In the boiler shop kinks, as well as in those of other shops, the use of old freight car brake cylinders is noticeably evident.

BLUEPRINT FILING CASE.

The accompanying half-tone, Fig. 29, shows a blueprint filing case in the boiler shop, in which are filed all the working blueprints required in this shop. The case is substantially made of wood, with four wooden partitions, which act also to strengthen it, while the vertical partitions are made of light sheet iron. It will be noticed that the partitions are numbered serially from 1 to 46. When made it was the intention to keep a card index of the prints, but this was later found unnecessary, as the men very soon got to know the sizes of the various drawings and could locate a print direct, knowing its size, about as soon as by the use of a card index. Each print is mounted upon heavy cardboard and varnished over, both of which preserve the prints as well as make them most available for use in the shop.

FLUE SWEDGING MACHINE.

The flue swedging machine shown in Fig. 30 is easily and cheaply made from old material. The bed is made of a 13-in. channel section, about 10 ft. long. To one end of this channel is bolted the upright which holds the air cylinder used for clamping the flue. The second cylinder is mounted horizontally at the opposite end of the bed plate. On the end of the piston rod of this second cylinder are screwed the formers, either the one shown, for swedging down the firebox end of the tube, or the pin former for expanding the ends of flues for large holes rather than to use a ferrule.

An oil furnace is placed near the machine for heating the tube ends. When placed on the V-block the air is turned on. The piston in the vertical cylinder responds first, thus clamp-



Fig. 29—Blueprint Filing Case.

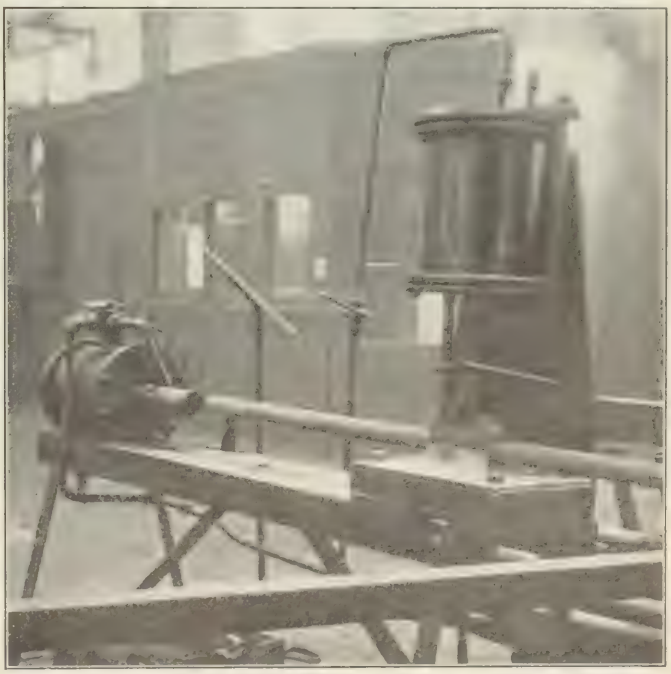


Fig. 30—Flue Swedging Machine.

ing the tube in position, after which the piston of the second cylinder acts to move the forming die against the end of the flue.

FLUE TESTING MACHINE.

In Fig. 31 is shown an arrangement for cold water testing flues which have had new safe ends welded on them. The set of flues seen on the buggy show that 24-in. safe-ends have just been welded. At the extreme left of the illustration is seen the plunger against which one end of the flue is held, while the near view of the right end of the machine, Fig. 32,



Fig. 31—Flue Testing Machine.

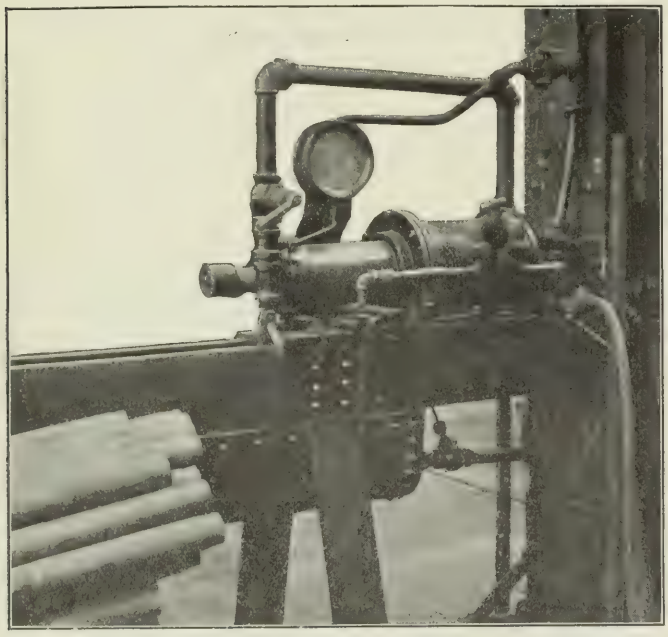


Fig. 32—Near View of Operating End of Flue Testing Machine.

gives a very good idea of the plunger cylinder arrangement and the water supply.

The bed of the machine is made with two metal plates, riveted to the feet. The semi-circular bottom binds the vertical plates together, making a tank into which the waste water falls.

The flues are handled from buggy to buggy, one being placed on each side of the machine. This saves the time of loading.

DEVICE FOR REMOVING MUD RINGS.

The device shown in the perspective line drawing, Fig. 33, illustrates a method of using two heavy bars of iron, a round iron link and a jack for removing a mud ring. Although the rivets are all removed the ring is far from being released, as it is held by the clamping action of the side sheets as well as by the rust and scale which has accumulated. Unless some continuous strain device, such as the one here shown, is used it is necessary to drive the ring down with hammer blows, but this usually results in damaging the corners of the ring and partially closing the bolt holes.

After the rivets are removed and sections of the box cut out at the corners, as shown, the lower 3-in. x 4-in. x 36-in. bar of iron is put in position, one end being rested on the mudring and the other on a block of wood. A hydraulic or screw jack is then placed near the mudring end, when the top bar of iron, with the downward extending arm is put in position, the hooked end gripping the sheet and the other

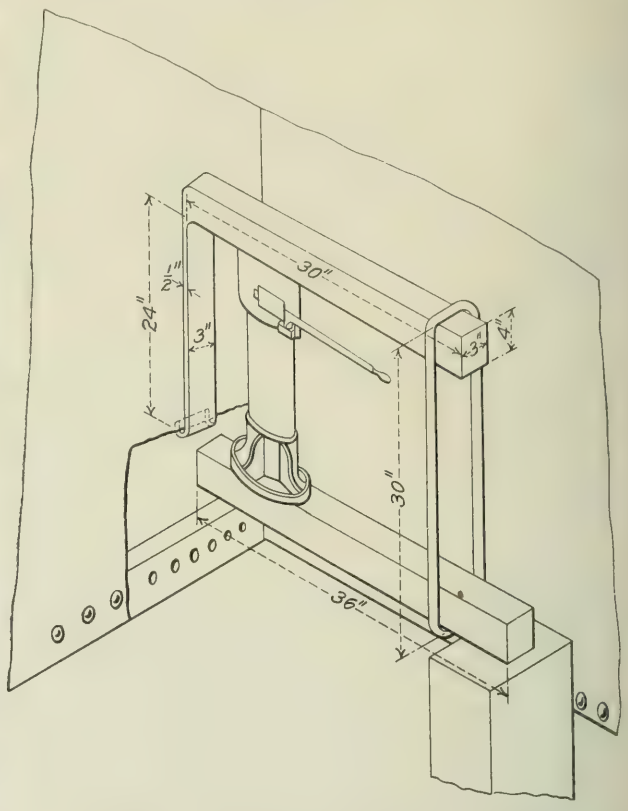


Fig. 33—Device for Removing Mud Rings.

end being run in the loop. The mudring is then easily jacked down about ⅜-in., and as each corner is handled in a similar manner, the ring is then easily removed.

HOLDER-ON FOR TATE BOLTS.

The accompanying line drawing, Fig. 34, shows an attachment to a Boyer pneumatic holder-on for use in connection with riveting Tate flexible staybolts. The regular Boyer holder-on, as designed for these bolts, is used, with the addition of a stirrup which passes around the holder-on, the one

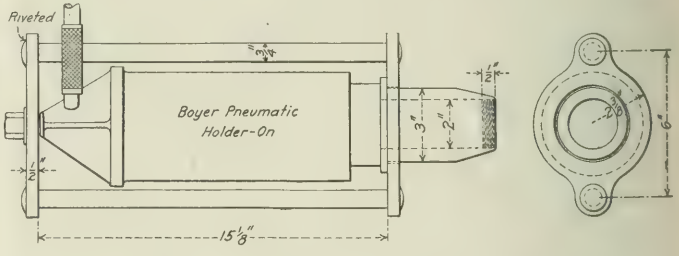


Fig. 34—Holder-On for Tate Bolts.

end of which is rigid with it while the other end makes a loose fit over the collared bushing. This bushing is threaded for screwing on the cap threading. When the air is admitted to the holder-on, the ball end of the plunger moves to a solid bearing on the round head of the bolt and forces the holder-on away from the bolt, which action is transferred to the bushing and threads of the bolt cap, resulting in a self-supporting hold-on, against which the staybolt may be riveted

over on the inside of the firebox in the usual manner.

This work is handled by two men, the one inside the boiler doing the riveting, while the man on the outside shifts the holder-on as the bolts are riveted. While riveting is going on, during which time he is not engaged in handling the holding device, he places the caps on the bolts. As this work is paid for on a piece-work basis, much time is saved in this way.

STAYBOLT BREAKER.

The staybolt breaker shown in the line drawing, Fig. 35, may not differ greatly from other breakers of this general design, but it is given here with the belief that some feature of it may be of advantage to those using this style of breaker.

The barrel is made of steel tubing, 4-in. inside diameter. The ram or plunger is 12 in. long and made loose running in the cylinder bore. Two ¼-in. thick packing leathers are used with flanges turned in opposite directions. These leathers are held between two 3-in. diameter, 5-16-in. thick washers, the whole being held in position on the back head of the plunger by a ¾-in. tap bolt. The hammer end is 9 in. long over all, and is screwed to the barrel on standard threads, 10 per in., by using a spanner.

For using, the breaker is swung in position, a block and fall being used to hold it against the chisel. After a blow, the handle of the 3-way cock is drawn back into the position shown. When this valve is first moved, air enters the forward end of the cylinder to return the plunger preparatory for another blow. The backward movement of the valve handle also causes a collar to move backward and expose 8 ½-in. drilled holes which release the air in the front end of the cylinder, while that at the rear end exhausts through the 3-way valve.

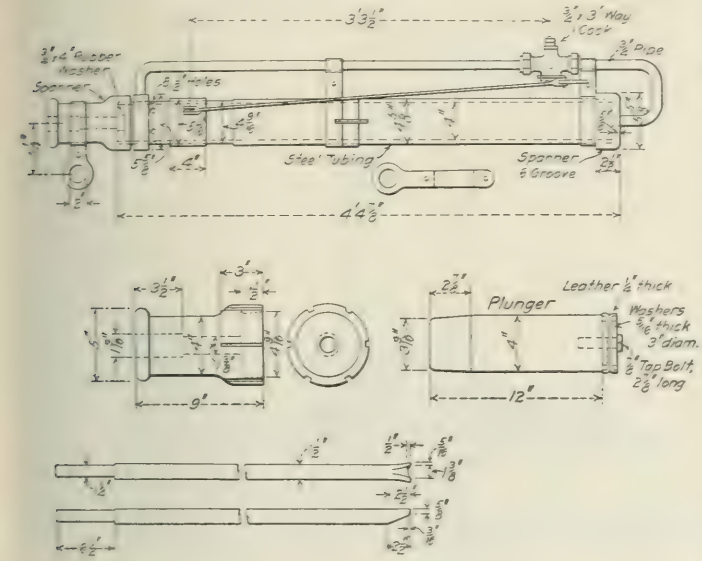


Fig. 35—Staybolt Breaker.

Machine Shop.

The machine shop kinks given in this collection show devices which should easily find their way into every such shop. The method of repairing cylinders which have cracked in the live steam passage is the greatest single money-saver and its real merit is certainly demonstrated by the fact that 61 pairs of cylinders have been saved from the scrap-heap by it. The eccentric drilling jig is a kink of much merit, as is the small bolt centering machine which prevents the loss of a large number of centering drills ordinarily broken by apprentice boys to whom this work generally falls. N. H. Hawkins is machine shop foreman and is particularly interested in shop kinks, and especially in the method of repairing cracked cylinders which has been used with such very good success in this shop.

ECCENTRIC DRILLING JIG.

The line illustration, Fig. 36, shows the details and the half-tone, Fig. 37, the general appearance of a jig for drilling the bolt holes in the halves of split eccentrics. The jig is placed on the drill press bed in the position shown. The half-eccentric is placed on the cams, planed face upward.

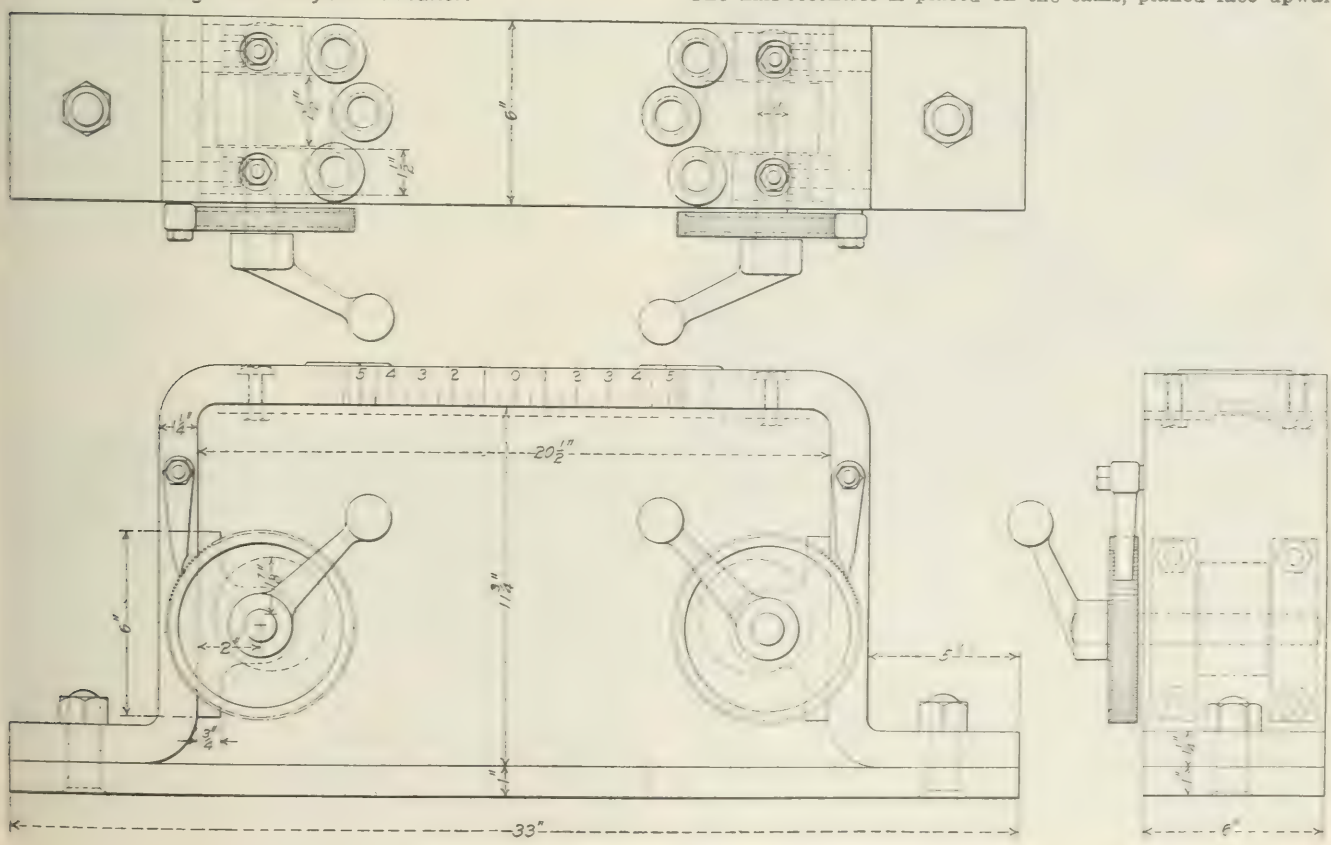


Fig. 36—Details of Eccentric Drilling Jig.

The levers are then raised until the planed surface is in contact all along the under side of the top bar of the jig. The latch dogs provide for holding the cams in position. The half-eccentric is centered up by the graduations shown in the line drawing, when the drill is fed down through one of the bushings in the top bar of the jig, no laying off of holes being necessary. It will be noticed that a plate is seen—in the

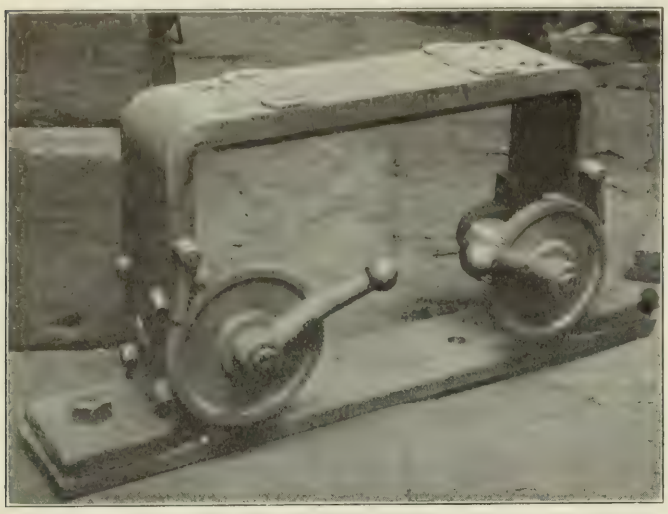


Fig. 37—Eccentric Drilling Jig.

half-tone illustration and dotted in the line drawing—bolted to the under side of the top bar. Reference to the end elevation in Fig. 36 shows this plate to have a wider groove than does the under side of the bar itself, which provision is necessary to provide for different style eccentrics.

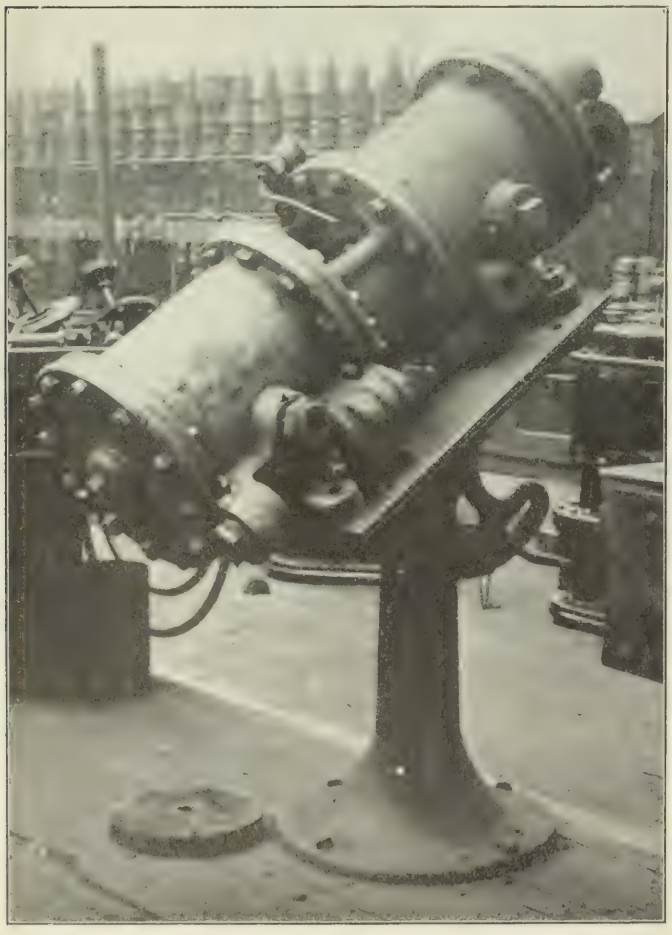


Fig. 38—Air Pump Repair Table.

AIR PUMP REPAIR TABLE.

The illustration, Fig. 38, shows an air pump mounted upon an adjustable table in the repair shop. The feature of this arrangement lies in the table's being designed to be shifted and clamped at any angle. The base and upright are made integral of cast iron. The quadrant is also of cast iron, while the table top is formed with two wrought iron plates.

The illustration is fully explanatory, and the advantages of this table at once appeal to the man who has had to work on an air pump without any arrangement for convenience in working.

BOLT-CENTERING MACHINE.

Fig. 39 shows a bolt-centering machine used at Elizabethport. The necessity for this machine arose through the fact that the bolt-centering work is usually done by green apprentice boys, who would continually break centering drills. The machine had a long lever feed, which allowed excessive leverage, resulting in broken drills.

In the present design the drill is fed into the bolt by air pressure. The three-way valve fastened to the upright plate

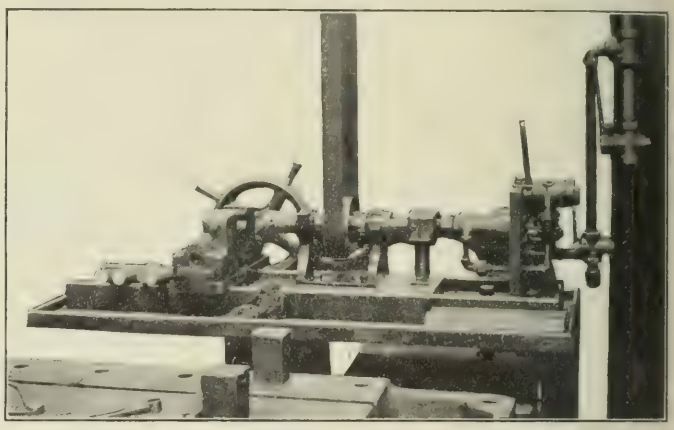


Fig. 39—Bolt-Centering Machine.

at the right-hand end of the machine is the same as used in a locomotive cab for controlling the air which operates the water scoop. When the air is admitted it exerts a steady and sufficient pressure against the drill to feed it into the metal. When the drilling is completed the handle is thrown over, releasing the air behind the piston and at the same time admitting air in front of it to withdraw the drill.

The machine is seen to be made from scrap pieces which may be found about any shop.

BABBITTING CORNER.

The corner of the machine shop which is devoted to the babbitting work is shown in the half-tone illustration, Fig. 40. In the center of the illustration is seen a turntable, around the edge of which a large number of boxes or crossheads are

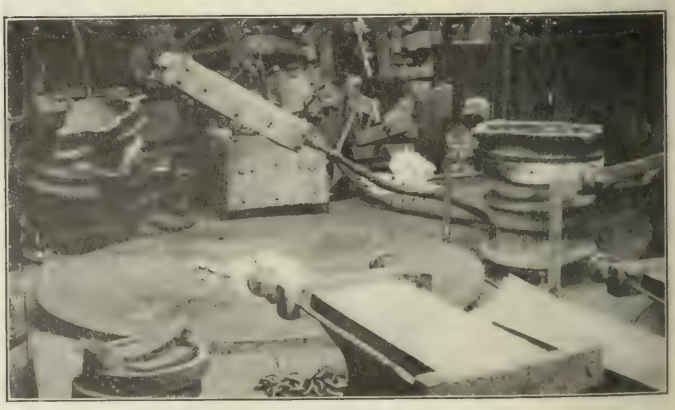


Fig. 40—Babbitting Corner.

placed. These are, of course, previously made ready to receive the molten metal. In the background is seen the square metal box used for heating driving box hub surfaces previous to pouring the metal. Just above this box is the smaller one which is used for heating crossheads before pouring the metal. The pouring is done on a number of pieces at a time by revolving the table and stopping it as each piece comes into position in front of the heating ladle, shown at the left of the illustration.

After driving box journal bearings have been spotted to the journal they are returned to the man who does the babbitt work, who puts a thin coat of tin over the entire crown of the bearing. This plan was adopted first on the heavy engines, the journal bearings of which very often run hot just after leaving the shop. The tin prevents heating by presenting a very soft wearing surface to the new journal and allowing its more gradual accommodation to the bearing.

SHOE AND WEDGE PLANER TOOL.

A heavy planer tool for shoe and wedge work is shown in Fig. 41. New shoes and wedges at Elizabethport are planed first on the inner faces, after which they are clamped to long planing bars from which they are not removed until com-

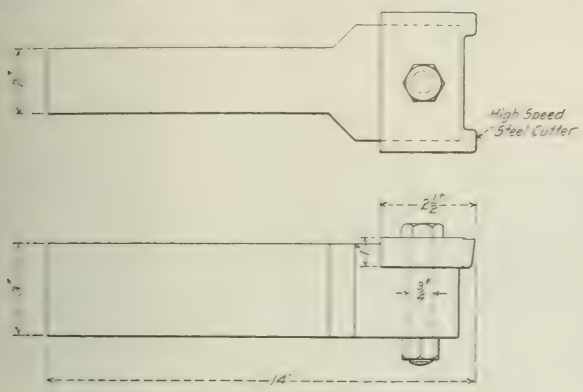


Fig. 41—Shoe and Wedge Planer Tool.

pleted. The tool here shown is used for truing up the inside flange faces, doing the work complete with a single tool.

The cutter is made of high speed steel and held in place against a shoulder and with a ¾-in. bolt. One of these cutters may be used continuously for a week without redressing, and the grinding which would be required in that time is done on the bottom surface only, which does not affect the width of the cutter, which is the important point.

REPAIRING CRACKED CYLINDERS.

When a cylinder casting cracks in the live steam passage between the steam pipe joint and the valve chamber and the steam is allowed to escape from the live steam passage before it reaches the valve, the half cylinder saddle is useless unless it can be repaired. The accompanying cross-sections, Fig. 42, illustrate a method of reclaiming such cracked cylinder castings. The first application was made by G. L. Van Doren, superintendent Elizabethport shops, in February, 1907, and this was probably the first application of its kind. Since that time, some 61 pairs of cylinders have been repaired in this way at Elizabethport, none of which have given any trouble.

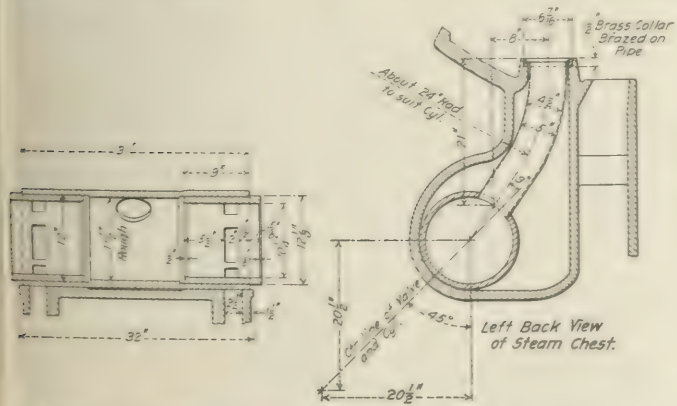


Fig. 42—Sections of Cylinder Saddle and Bushings.

The saddle casting shown is that of an inside admission valve, with two short valve bushings. When the crack occurs in the live steam passage between these bushings, the steam must be carried direct from the steam pipe to the valve chamber, thus relieving the cracked cylinder of all steam pressure. The short bushings are removed, the valve chamber rebored to receive a ⅞-in. thick bushing which extends over the outside edges of both steam ports. Steam ports are cut in this long bushing and the short bushings replaced. A 5-in. diameter hole is bored in the long bushing, in which the 5-in. seamless steel tube is rolled with a specially made roll expander. The upper end of the tube has a ring brazed to it, which ring joints with the casting.

OLD MAN FOR BOILER WORK.

The old man shown, Fig. 43, illustrates a design made by C. H. Weeks, a gang foreman at Elizabethport. It is intended particularly for work on boilers, but is applicable in other cases. The base is made of boiler plate, 1½ in. x 10 in. x 10 in. A side elevation of this base plate would show that by cutting

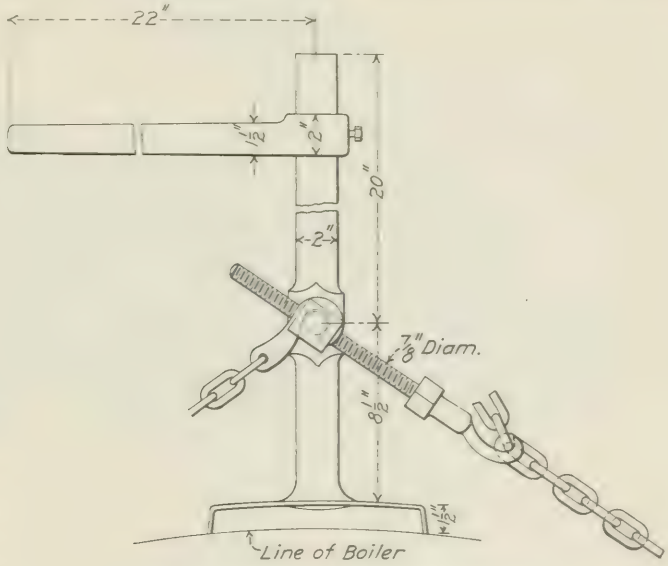


Fig. 43—Old Man for Boiler Work.

out the center portion of the vertical metal four feet are formed. This provides for clearing rivets, etc.

This old man is easily and quickly placed and by passing the chain around the boiler and catching a link in the hook the device is fastened tightly by the use of the threaded bolt which has a swivel connection with the hook.

SLOTTER TOOL.

The slotter tool shown in Fig. 44 was designed to save resetting, on the plate, of the tool when change of cut direction is made. It is also advantageous in that it allows the use of small pieces of high speed tool steel. The slot will take ½-in. steel, which is held in place by tightening the top nut.

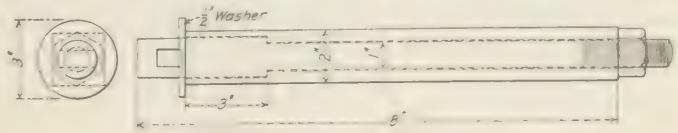
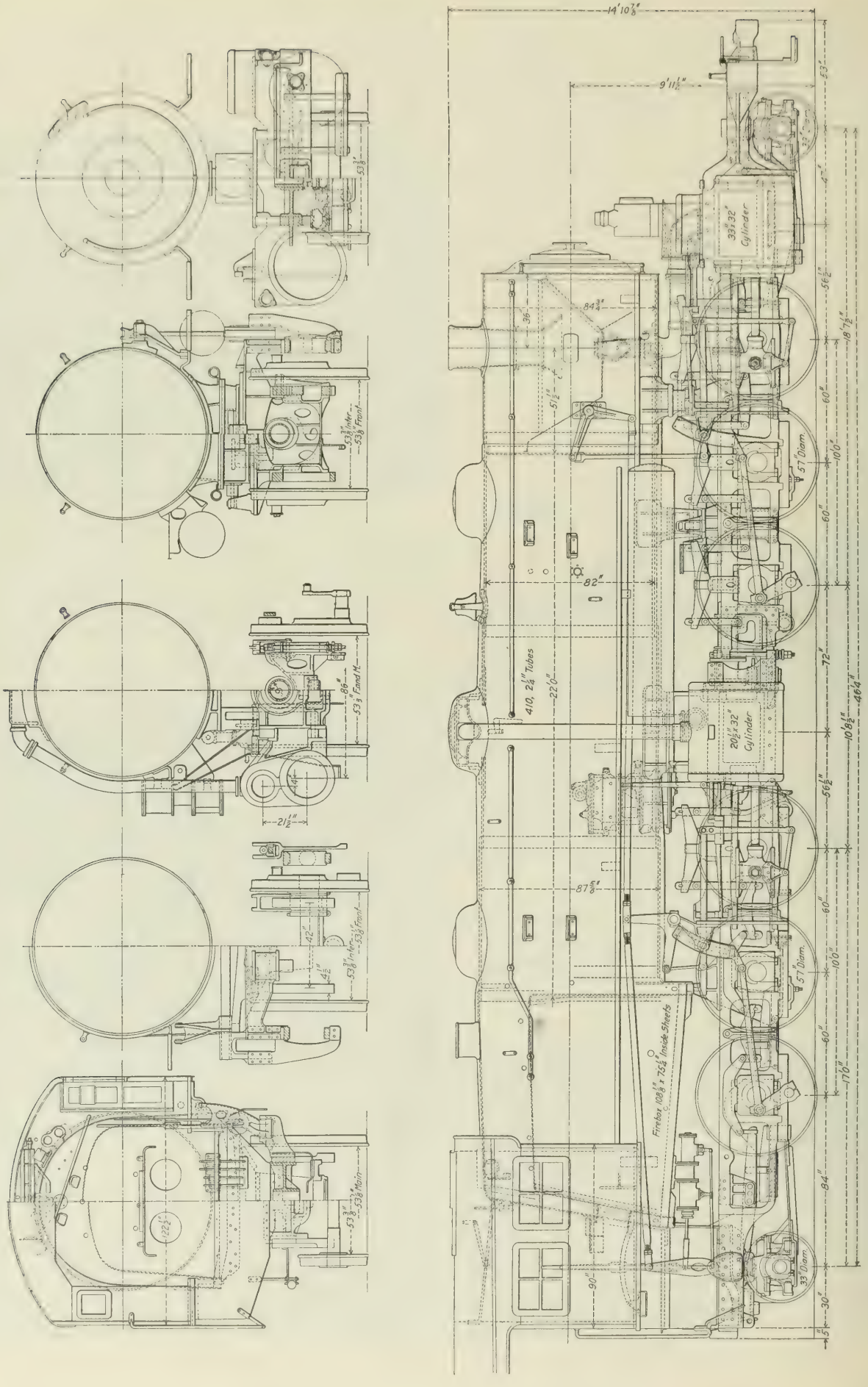


Fig. 44—Slotter Tool.

When it is necessary to change a slotter tool at the plate, in order to change direction, the exact stroke is very often lost. With this tool, the stroke is not altered at all and the cutter is easily and quickly adjusted to any position by loosening the nut at the top of the tool.

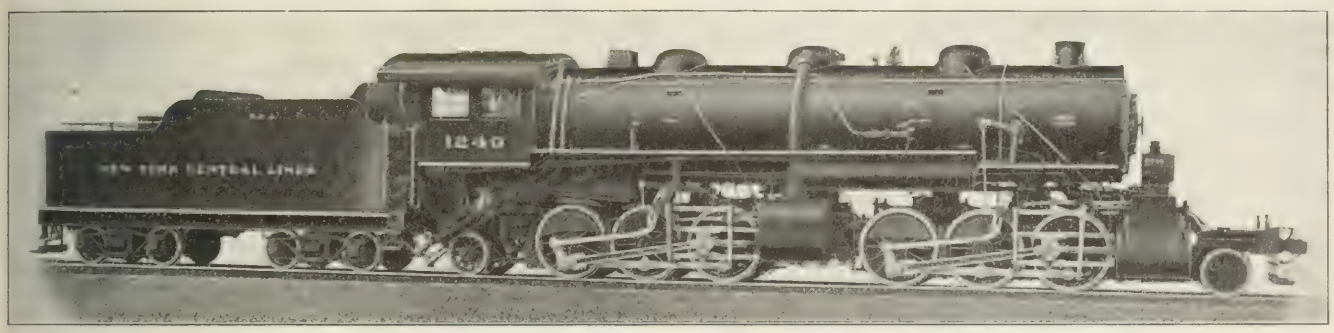


Mallet Compound Locomotive; Boston & Albany, New York Central Lines.

MALLET ARTICULATED COMPOUND LOCOMOTIVE. NEW YORK CENTRAL LINES.

The Boston & Albany Railroad of the New York Central Lines has recently received a Mallet articulated compound locomotive from the American Locomotive Company. It is the first engine of the articulated type to be put into service on the New York Central Lines, and will be used in hauling freight on the Albany and Springfield division. This part of the road passes through the Berkshire Hills and the grades are long and steep in both directions. Going east it is a practically continuous ascent from Rensselaer for a distance of about 43 miles, the maximum gradient in this distance being .87 per cent. For the next 9 miles there is a down grade into Pittsfield Junction. Then comes a grade 6 miles long of 1.42 per cent. to Hinsdale, the summit of the division. Westbound from Springfield the grades are equally heavy, the last 11.5 miles of the ascent between Chester and Washington having an average grade of 1.5 per cent.

At present the freight traffic is handled by consolidation locomotives having a total weight in working order of 234,000 lbs., cylinders 23 in. by 32 in., and a theoretical maximum tractive power of 45,700 lbs. Pusher engines are used on the two ruling grades both east and west. In order to handle the present maximum trainload over the division without helpers and to increase the weight of the trains, with a view to reducing the operating cost and increasing the efficiency of the division the officials of the New York Central Lines are considering the adoption of the Mallet type of locomotive; the engine illustrated was purchased for the purpose of deteremining the efficiency of this class of power for such service. Although it is thus in a sense an experimental locomotive the success of the Mallet type on other roads where the conditions are analogous to those existing on the Boston & Albany leaves little doubt but that it will mark the adoption of this type on that road.



First Mallet Compound Locomotive for the New York Central Lines.

The following table gives a comparison of the principal dimensions of the new locomotive, and the present class of heavy freight engine on the Boston & Albany:

Type of locomotive	2-8-0	2-6-6-2
Weight in working order.	234,000 lbs.	342,000 lbs.
" on drivers	208,700 "	296,500 "
" on leading truck..	25,300 "	23,500 "
" on trailing truck.	..... "	22,000 "
Diameter driving wheels..	63 in.	57 in.
Cylinders, diam & stroke.	23 in. x 32 in.	20½ & 33 x 32
Boiler pressure	200 lbs.	210 lbs.
Max. tractive power, comp	.....	66,600 lbs.
Do., simple	45,700 lbs.	80,800 lbs.
Driving wheel base(rigid)	17 ft. 6 in.	10 ft. 0 in.
Engine wheel base	26 " 5 "	46 " 4 "
Heating surface, tubes...	3,474.8 sq. ft.	5,291 sq. ft.
" " firebox .	185.6 "	185 "
" " w. tubes	28.7 "	..... "
" " total ..	3,689.1 "	5,476 "
Grate area	56.5 "	56.5 "
Average load per axle ...	52,175 lbs.	49,400 lbs.

It will be seen that the Mallet locomotive has about 45 per cent. more tractive power than the consolidation, while the average weight per axle is about 2,775 lbs. less, and the rigid wheel-base is 7 ft. 6 in. shorter. Another interesting fact is that the grate area of the two classes of engines is the same, which gives a much larger proportion of heating surface to grate area in the Mallet locomotive than has been the previous practice in locomotives of this type. Service tests of Mallet engines designed to burn bituminous coal have, however, proven that larger grate areas have hitherto been provided than were required for slow speed service. The grate area was, therefore, reduced, facilitating firing and securing a better rate of combustion.

Exhaustive dynamometer and efficiency tests are being made of this engine on the Pennsylvania division of the New York Central; we hope in a future issue to publish the results of these tests. With the exception of a larger boiler and larger truck wheels the locomotive is practically a duplicate in design of eight of the same type recently delivered by the builders to the Denver & Rio Grande Railway. As far as the features characteristic of the Mallet type of locomotive are concerned the design follows the builders usual practice. The wheel arrangement is of the 2-6-6-2 type, having a two-wheel truck front and rear. The theoretical maximum tractive power working compound is 66,000 lbs., which, with the Mellin system of compounding employed, can be increased to 80,800 lbs. by working the engine simple.

That a large boiler capacity has been provided is apparent from a study of the ratios. The figure of 693 for the B. D. factor is below the average for even simple engines designed for a similar class of service and would indicate that this engine would deliver its theoretical tractive power at the ordinary speeds of freight service. The boiler is of the straight top radial stayed type, and the barrel measures 82 in. in diameter inside at the front end. It contains 410 tubes 2¼ in,. in diameter and 22 ft. long. The total heating surface is 5,476 sq. ft., of which the tubes contribute 5,291 sq. ft. The ratio of the heating surface to the grate area of 97 is considerably higher than the usual practice for engines of this type, designed for burning bituminous coal. The crown and sides of the fire box are in one sheet, as are also the roof and sides of the outside shell. Ample water spaces are provided around the fire box, the mud-ring being 4½ in. wide on the side and back and 5 in. at the front. The fire box is supported at the rear end by a ⅝-in. buckle plate and at the front end by sliding shoes on a cast steel crosstie.

Cast steel frames are used and there is a single articulated connection between the frames of the front and rear systems. A strong and substantial system of frame bracing has been employed. In the front system the frame bracing consists of a heavy cast steel crosstie at the back end which is bolted to both the top and bottom rails of the frame, and to which the radius arm of the articulated connection between the front and rear frames is secured. A massive vertical steel casting located between the second and rear driving wheels extends down to the bottom rails of the frames, the upper part extending outside of the frames and furnishing a support for the self-adjusting sliding boiler bearing; another steel casting of similar design, located between the first and second pair of driving wheels, constitutes the guide yoke and also the support for a second boiler bearing; a cast steel front deck cast-

ing ahead of the cylinders also serves for the engine truck center pin guide.

In the rear system, in addition to the cast steel foot plate at the back end, the cylinder casting and the steel casting at the front end, which includes the bearing for the center pin of the articulated connection, is a heavy cast steel guide yoke across the upper rails of the frame between the first and second pair of driving wheels and the cast steel crosstie over the middle pedestal which furnishes the support for the front end of the fire box. The front and rear systems are equalized together in the usual manner by vertical bolts connecting the upper rail of the front frame with the lower rail of the rear frame. As in the engines of this type built for the Virginian Railway, the load on the bolts is supported by a coil spring through which the lower end of the bolt passes and which presses up against the bottom of the rear frame rail, thus giving the flexible support at this point which is necessary in order that the three boiler supports, viz.: the two sliding bearings and the equalizing bolt, may each bear its proportion of the load in any variation of the alignment of the three. Both the front and rear trucks are of the center bearing radial type with swinging bolster and similar in design to that of the Virginian Mallet engines. The bolster is suspended by three-point or stable equilibrium hangers. The truck frame is of cast steel and the portions of the sides over the journal boxes are shaped to form caps for the coil springs, which transmit the load to the journal boxes upon which they are directly seated.

The principal dimensions and ratios of the design are given in the following table:

Ratios.

$\frac{\text{Weight on drivers}}{\text{Tractive effort}}$	= 4.45
$\frac{\text{Total weight}}{\text{Tractive effort}}$	= 5.13
$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}}$	= 693
$\frac{\text{Total heating surface}}{\text{Grate area}}$	= 97
$\frac{\text{Firebox heating surface}}{\text{Total heating surface}}$	= 3.37*
$\frac{\text{Weight on drivers}}{\text{Total heating surface}}$	= 54
$\frac{\text{Total weight}}{\text{Total heating surface}}$	= 62
Volume of equiv. simple cyldrs, cu.ft.	= 19.32
$\frac{\text{Total heating surface}}{\text{Volume equiv. simple cylinders}}$	= 283
$\frac{\text{Grate area}}{\text{Volume equiv. simple cylinders}}$	= 2.92

* Per cent.

General Data.

Service	Freight
Fuel	Bituminous Coal.
Tractive power, compound	66,600 lbs.
Tractive power, simple	80,800 lbs.
Weight on drivers in working order	296,500 "
Weight, total in working order	342,000 "
Weight of engine and tender in working order	494,700 "
Wheel base, driving, front engine	10 ft.
" " " rear engine	10 "
" " " total	30 ft. 8½ in.
" " front engine	18 " 7½ "
" " rear engine	17 ft.
" " total	46 ft. 4 in.
" " of engine and tender	74 " 8 "

Cylinders.

Type	Compound.
Diameter	20½ and 33 in.
Stroke	32 in.

Valves.

Type, high pressure	Piston
Type, low pressure	Double ported slide
Travel, high pressure	6 in.
Travel, low pressure	6⅛ "
Steam lap, high pressure	1⅛ "
Steam lap, low pressure	1 "
Exhaust lap, high pressure	¼ in.
Exhaust lap, low pressure	¼ in.

Wheels.

Driving, diameter	57 in.
Thickness of driving tires	3½ "
Driving axles—size of journals	9 x 13 "
Engine truck and trailing wheels, diameter	33 "
Engine truck and trailing axles, journals	6 x 12 "

Boiler.

Style	Straight top
Working pressure	210 lbs.
Firebox, length and width	108⅛ x 75¼ in.
Firebox, water spaces	F., 5 in.; S., 4½ in.; B., 4½ in.
Firebox sheets, thickness	Crown ⅜-in., tube ½-in., sides ⅜-in., back ⅜-in.
Crown staying	Radial
Tubes, number	410
Tubes, diameter and length	2¼ in. x 22 ft.
Heating surface, tubes	5,291 sq. ft.
Heating surface, firebox	185 "
Heating surface, total	5,476 "
Grate area	56.5 "
Smokestack, diameter	19⅛ in.
Smokestack, top above rail	14 ft. 10⅞ in.

Tender.

Tank, style	Water bottom
Tank, capacity, water	8,000 gals.
Tank, capacity, coal	12 tons
Frame	13 in. channels
Wheels, diameter	33-in.
Axles, size of journals	5½ x 10 in.

QUALIFICATIONS OF THE TRAVELING ENGINEER.

The peculiar variety of duties performed by the road foreman or traveling engineer requires the selection of a man in good physical condition, having considerable ability and good judgment along mechanical lines; furthermore, to obtain results and keep the several members of the railway family working in harmony, he must be somewhat of a diplomat, without being an all-around good fellow. For this reason the men advanced to the position of assistant road foreman of engines, or traveling engineer, should be first-class enginemen, having not less than two years' road experience, and before being promoted should have had a certain amount of experience on special work in the master mechanic's department, relative to shop conditions, also grates, draft appliances and the use of steam indicators, or at least how to intelligently read indicator diagrams as to cause and remedy for certain conditions of valves and cylinders, thereby broadening their views and better fitting them to analyze mechanical problems from both a shop and road standpoint. The superintendent and master mechanic should keep in training a limited number of available men who would be in line for advancement to such positions of responsibility.

This suggestion might also include the instructor of firemen, where this position is required. The instructor of firemen is necessarily a much younger man and should not be considered in direct line for further promotion without having experience as an engineman in road service; however, to have desirable men always available for this position, firemen, under certain regulations, should be permitted to make application and be given shop experience as machinist helper, or inspector, under the direction of the foreman in charge. This suggestion is made advisably, knowing well the probable adverse criticism that such an arrangement would badly affect shop organization, on account of the frequent change in men and the probable increased rates paid enginemen or firemen while so employed. Such comments are to some extent warranted, especially in case of a reduction of force in both enginehouse and road forces, where the regular shop employees might have to give way to the road men. On the other hand, shop hands could be considered eligible for promotion to the position of firemen, but this is also open to the objection before mentioned. However, if at all practicable, such an arrangement would be of great benefit along educational lines and tend toward a higher efficiency of the entire force.—*J. R. Alexander*, general road foreman of engines, Pennsylvania Railroad, before the Railway Club of Pittsburgh.

THE USE OF STEEL IN LOCOMOTIVE AND CAR CONSTRUCTION.

D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West of Pittsburgh, has prepared a most valuable and exhaustive report on the "Use of Steel in the Construction of Locomotives and Rolling Stock in America"* for discussion at the eighth session of the International Railway Congress. His endeavor has been to give the results obtained by the use of steel or partial steel construction from a general operating and maintenance standpoint, rather than from the purely technical or designer's point of view. We regret that space does not admit of reproducing the entire report; the following extracts cover some of the more important points:

LOCOMOTIVES.

Fireboxes.—Steel fireboxes last from three to twelve years, depending somewhat on the nature of the service in which the locomotive is used and the quality of the water available in the district, as well as the design of the boiler and firebox. In general, the life obtained from the wide fireboxes used on many locomotives at the present time, is not as long as that obtained from the narrow fireboxes previously in general use. The average life of fireboxes obtained in two groups of locomotives coming under the writer's observation is as follows:

Firebox 40 in. wide, average life.....	85 months.
Firebox 66 in. wide, average life.....	57 months.

The causes assigned for this difference have been as follows: With the wider fireboxes, the fire is thin immediately adjacent to the side sheets, causing rapid variation in the temperature at the side sheets. The straight sides of the wider fireboxes do not present the same opportunity for expansion and contraction as the curved sheets used in the narrow construction. The circulation of water is more favorable with the curved sheets.

Tubes.—Steel tubes have not been in use a sufficient length of time to determine whether they will eventually entirely supplant the wrought iron tube, but the large increase in their use by many roads would indicate favorable results. The lower cost of the steel tube, as compared with the wrought iron tube, led to their trial and the results obtained seemed to warrant their further consideration. The success obtained with the steel tube will undoubtedly depend somewhat on the quality of the water used, as, up to the present time, it would appear that with water containing corrosive materials the steel tube is affected by corrosion more rapidly than the iron tubes.

An interesting use of the seamless steel tube is for safe ending wrought iron tubes with steel. On one road operating about eighteen hundred locomotives, it has been the practice to use seamless steel tubing for safe ends for several years, for the following reasons:

1. Steel ends stand up better under the repeated calking and beading required, thus the time between resetting of tubes is prolonged.
2. Reduction in cost of material as compared with charcoal iron and reduced maintenance cost on account of prolonged life of the tubes.
3. The life of the wrought iron tubes already in service was prolonged, as safe ending is less frequent.
4. Less length of the steel tube subject to corrosion as compared with the entire steel tube.

Axles.—From both a strength and service standpoint, the carbon steel axle may be considered satisfactory, but with the larger sizes precaution is necessary to obtain solid billets, and in some cases it is the practice to bore a hole about two inches in diameter from end to end in the center of the axles of the larger sizes to permit of interior inspection.

Springs.—With the heavier loads now carried by the springs, some difficulty has been experienced in obtaining satisfactory service, and the chemistry of spring steel, as well as the heat treatment and method of manufacture, is receiving the attention of the railway mechanical engineers and the spring manufacturers. Springs made of steel containing vanadium are being used experimentally, and laboratory tests of the material are at least promising, although the service tests have not been of sufficient duration to permit conclusions being drawn.

Steel Castings.—With the advent of heavier locomotives, the desirability of obtaining material of greater strength than cast iron led to the adoption and almost general use of steel castings in place of cast iron for the following locomotive parts: Driving wheel centers, driving boxes and truck boxes, eccentrics, eccentric straps, frame braces, pistons (centers), as well as many of the other castings used. The development of the manufacture of steel castings for the above mentioned purposes permitted their manufacture at a cost which made their use attractive as a substitute for many of the parts which had been made of wrought iron, and many locomotives have been built having the parts named below made of steel castings instead of wrought iron: Frames, spring rigging, stirrups, saddles, hangers and equalizers, valve motion parts, guides and guide yokes, cross heads and many of the smaller forgings.

Conclusions.—In locomotive construction steel has been substituted for other materials for the following reasons:

1. Greater strength, permitting use of relatively smaller and lighter parts.
2. Stronger material necessary to meet the demand made by the more powerful and consequently heavier locomotives constructed at the present time.
3. Lower first cost and reduced maintenance cost as compared with the other materials if used on the present heavy locomotives.

For three reasons the use of steel, without doubt, will be extended to include practically all parts of the locomotives, other than certain of the wearing surfaces which will be of bronze or of other bearing metal or of cast iron.

FREIGHT CARS.

Number of Steel and Steel Underframe Cars.—In twelve years there have been built by the larger car manufacturing companies approximately 311,000 all steel and 242,000 steel underframe cars, divided in kinds as follows:

All Steel.

Box	18
Gondolas, hoppers, dump, ore and coke	299,425
Tank	7,250
Flat, log and miscellaneous	4,375
Total	311,068

Steel Underframe.

Box	125,403
Refrigerator	1,821
Stock and coke	16,797
Gondolas, hoppers, ballast, ore and dump	75,463
Flat	21,139
Miscellaneous	1,214
Total	241,837

To these numbers must be added the cars built by the smaller companies, as well as those built by the various railway companies at their own shops. It is estimated, from the data available, that there are in use on American railways, a little over a half-million steel and steel underframe cars, or about 20 to 22 per cent. of the freight carrying cars in use.

Cost of Cars.—It is impossible to give any accurate comparison of the first cost of cars of steel and cars of wooden construction as any steel cars which have been built are of much stronger design and construction than the wooden ones. That is, the cost of exactly equivalent strength is not available. Therefore, part of the higher cost of the steel car is due to increased strength rather than to the change of material. The fluctuation in the price of material also makes variations. It is safe to assume that cars of all steel construction will cost from 25 to 50 per cent. in excess of cars of

*Bulletin of the International Railway Congress Association, Vol. XXIV., No. 2, page 527, February, 1910

wooden construction, depending on the difference in the strength of construction permitted. As the available supply of lumber decreases, the cost is increased and even at this date the grade or quality of lumber formerly used in car construction is sold at a price which makes it necessary to lower the grade of lumber used, the cost of the grade which is considered best prohibiting its use. The difference in price of the steel as compared with the wooden cars will undoubtedly become more favorable to the former, both on account of the increased cost of lumber and the possible decrease in the price of steel, made possible by the rapid developments of the various manufacturing processes involved.

Cost of Maintenance.—On the Bessemer and Lake Erie Railroad, where steel cars have been in use since 1897, records have been maintained to ascertain the average cost of maintenance for wooden and steel cars separately. From the annual report of this company your reporter quotes the following:

Average maintenance cost per car per year.

Year.	Wooden cars.	Steel cars.
1905	$71.14	$27.83
1906	94.11	30.74
1907	118.50	39.21
1908	53.06	32.11

The steel cars covered by the above are of the all steel construction. This data is the best available on the comparative cost of maintenance of cars of wooden and of steel construction at the present time, as on many roads separate records of costs of the steel and wooden cars have not been maintained, and on other roads the cars of steel construction have not been in service a sufficient length of time to permit the consideration, as comparative, of such data as has been obtained. The writer's observations and estimates tend to confirm the figures given above, namely. That the all steel cars can be maintained for about $30 per car per year as compared with $60 per car per year for cars of wooden construction.

Life of Steel Cars.—Twelve years is, of course, not a sufficient length of time to obtain any data regarding the probable life of the steel cars or steel parts of the composite cars. Careful inspection of a hopper car used for carrying coal and ore for eleven years fails to give any evidence as to what life may be expected, the deterioration being hardly appreciable. The cars of wooden construction were frequently damaged in service to such an extent that the expense of restoring them to condition for service was not warranted. With the cars of steel construction very few cars have been damaged to the extent which would make it inadvisable to repair them. Of the cars of steel and steel underframe construction in the freight carrying equipment of the Pennsylvania Railroad but 18 of all steel cars and 126 of the steel underframe cars have been destroyed in eleven years, the majority of these being destroyed on other roads where facilities for repairing had not been provided; during the same period about 20,000 wooden cars were destroyed as a result of being damaged in service.

Weight and Capacity.—Comparisons of the weight carrying capacity and the cubic capacity of cars of steel construction or having steel underframes, and the same points of cars of wooden construction, with the weight of the vehicle, show considerable advantage in the use of the steel structures. By the use of cars of larger capacity, the proportion of the paying load to the total weight of lading and car is generally increased, and the effect of the use of the heavier cars in service during a term of years on a portion of the Pennsylvania Railroad system shows an increase of 67.5 per cent. in the average paying load per car in the year 1907, when the maximum service was being rendered by the railways in America, over the average paying load per car in 1890. While the average paying load per car increased 67.5 per cent. the average weight of the vehicles used in 1907 increased by but 47.5 per cent. as compared with those used in 1890.

Service Comparisons.—It has been found that with the larger capacity cars in use in 1907, a given locomotive could haul about 60 per cent. more paying load than it could have hauled in the cars of lower capacity in use in 1890. This statement refers to the average weight and the average lading of cars and, of course, covers all kinds of commodities carried, many of which tax the cubic capacity rather than the weight carrying capacity.

An example is given showing that a certain locomotive would haul in the cars of steel construction 16 per cent. more paying load than it would in the cars of wooden construction, and to move the traffic there would be required twenty-one less cars, of which the first cost, interest and maintenance charges must be considered. In addition to withstanding the wear and tear incident to the operation on unloading machines better than the wooden cars, the cars of steel construction, on account of their greater carrying capacity, permit the unloading of 1,500 tons of coal per hour, instead of 900 tons per hour as would be the case with cars of wooden construction.

Wheels.—Solid forged steel wheels are produced for about one-half the cost of a steel tired wheel of the same diameter and general dimensions and the net cost is about three times the net cost of the chilled cast iron wheels. Net cost is the difference between the cost of the wheel when new and the amount obtained for the worn out wheel when removed from service. At the present relative prices of the solid steel wheels and the cast iron wheels, with proper allowance for salvage in each case, the indication from service tests is that the cost per mile of the steel wheel will compare favorably with the cost of the cast iron wheel per mile, allowance being made for interest on the increased investment involved in the use of the steel wheel. From the evidence so far obtained, it will be possible to obtain solid steel wheels of much greater strength than the wheels made of cast iron for about the same service cost, and improvements may be expected to make the comparison still more favorable to the steel wheel. From tests made by Geo. L. Fowler it was found that the flange of a cast iron wheel could be broken off by an applied pressure of from 60,000 to 110,000 lbs., while to break off the flange of a steel wheel required the application of 526,612 lbs. pressure. In service some trouble has been experienced with the solid wheels on account of lamination of the metal in the treads similar to the lamination which sometimes occurs in steel tires. Improvement in shop methods and larger experience in manufacturing, however, have reduced the percentage of wheels showing evidence of lamination and further experience will, no doubt, practically eliminate the defect.

It is desirable to increase the nominal capacity of cars having the steel wheels from 100,000 lbs. to 110,000 lbs. for two reasons:

1. The increase in the paying load at least makes up for the higher charge for interest necessary on account of the larger investment.

2. It tends to prevent the use of cast iron wheels under such cars, as the steel wheels are a necessary part of the higher capacity cars.

Conclusions.—From examination of the designs and construction of the freight carrying cars recently built and building for the railways in America, your reporter draws the following conclusions:

1. Cars of steel construction or with steel underframes will be substituted for cars of wooden construction.

2. Steel will be used more extensively for that portion of the car now made of wood; that is, the side framing, end framing and roof carlines and similar parts will be of steel.

3. Steel castings and pressed steel and structural steel shapes will be substituted for parts now made of cast or wrought iron.

4. The manufacture of steel wheels has made sufficient progress to permit of their consideration for the high capacity cars.

5. The use of steel in freight car construction has permitted the development of cars of maximum capacity and minimum weight consistent with strength.

6. Cars of the greater capacity permissible with the steel construction facilitate the movement of traffic in many ways and assist in obtaining economical maintenance and operation.

PASSENGER CARS.

Number of All-Steel and Steel Underframe Cars.—Several of the railways in America have in service passenger train cars, and others are building or have under consideration at the present time the design of passenger train cars of all-steel or steel underframe construction. Information obtained from the various car builders shows they have built to date for steam railway service the following number of passenger train cars in which metal is extensively used:

Steel underframe cars	400
All-steel cars	900

The Pennsylvania Railroad System have had built, or have under construction, passenger train cars of all steel construction as follows:

Passenger cars	392
Combined passenger and baggage cars	75
Dining cars	44
Postal or mail cars	82
Baggage and mail storage cars	93
Total	686

The Pullman Company, which operates the majority of the sleeping cars in service on the railways in America, has under construction, a large number of sleeping cars of all steel construction.

Design.—The designs prepared to the present time may be divided into three classes, viz.:

1. That in which the load due to the weight of the car body and lading is carried by the center girder which at the same time takes care of the pulling and buffing strains.

2. That in which the load due to weight of the car body and lading is carried by the side girders; an additional girder being provided at the center of the car for the pulling and buffing strains.

3. That in which the center and side sills with truss rods used in the wooden car construction is reproduced in metal.

While the majority of the cars built have been of the first class described, several of the later designs are of the second class. Very few cars of the design covered by the third class have been built, and it does not seem likely that this type will be extensively used, as it does not permit of the best utilization of the possibilites in metal construction. From a study of these designs it is found:

A.—For stresses other than pulling and buffing, cars of equal strength will be practically the same weight and cost for structure.

B.—Where pulling and buffing strains do not exceed 100,000 lbs. the weight and cost of the structure will still be practically the same.

C.—To resist pulling and buffing strains exceeding 100,000 lbs. the weight of the car in which the sides carry the load will be increased, while the weight of the car of the first type would not be increased for strains within a limit of 400,000 lbs.

D.—Cars of the third type mentioned to have equal strength of the other types will weigh more.

It having been the practice to assume for freight cars that the car must be capable of withstanding shocks of 300,000 lbs. compression, whenever the car is shifted, and that such shocks very often are equivalent to 500,000 lbs., such cars were given a center sill construction capable of resisting such shocks without exceeding the elastic limit of the metal. Experience with freight cars in the past five years indicates that this basis is none too high. From tests made by allowing a dynamometer car weighing 51,000 lbs. to run down a grade at seven miles per hour and collide with a train of loaded cars having the brakes set, a shock of 607,000 lbs. (the capacity of the dynamometer) was recorded. A loaded steel freight car and the dynamometer car, weight 181,400 lbs., striking the train referred to above, at three and nine-tenths miles per hour, caused a shock of 400,000 lbs. As cars in steam railway service come together and are coupled at speeds equal to or in excess of those mentioned, it could not be considered safe to assume snocks less than 300,000 or 400,000 lbs. In collisions between passenger and freight cars the passenger cars should not be seriously damaged, which would require the passenger car center sill construction to be at least as strong as the same parts of the freight car.

For passenger cars a higher factor of safety is desirable, therefore, the design of the center sill construction is based on end shocks equivalent to 400,000 lbs. compression, under which the combined stresses should be about 12,500 lbs. per square inch and in no case exceed 15,000 lbs. per square inch for cars used in heavy trains in through service, and not more than 20,000 lbs. per square inch for cars used exclusively in suburban service. The stresses in the framing throughout under static load do not exceed the usual practice of 12,500 lbs. per square inch and none of the superstructure above the belt rail has been included in determining these stresses.

Cost of Cars.—Comparison of the cost of cars of wooden construction 70 ft. long between end sills and cars of steel construction of the same length, the cars to be alike in seating capacity, and all details such as couplers, air brakes, vestibules, toilet facilities and electric lighting system, would indicate that at the present time the car of all-steel construction will cost from 16 to 25 per cent. in excess of the car of wooden construction. As the price of lumber suitable for the construction of passenger cars continues to increase and as the number of parts made of metal and the weight of the metal parts is increased in the desire to obtain greater strength there is no doubt but that the cost of cars of wooden construction will be higher than at present, while with the cars of steel construction it is to be expected that the cost will decrease due to the simplification and standardization of the designs, improved manufacturing methods developed by experience and the development of special machinery for producing various parts which are now made with ordinary machinery or by hand.

Cost of Maintenance.—As a considerable proportion of the cost of maintaining passenger equipment cars is due to the frequent painting and renovation of the interior fittings, the maintenance cost, while less with the cars of metal construction than that of cars of wooden construction, will not be as great as that between the cost of maintaining freight cars of metal and wooden construction. The cost of running repairs, other than wheels, will be reduced on account of the large reduction in the number of bolts, the nuts of which must be kept tight, and there will be no shrinkage of parts which loosens the structure sufficiently to cause racking and requiring fastenings to be drawn up frequently.

Weight and Capacity.—From the designs made for passenger carrying cars it has been ascertained that cars of all-steel construction having from three to four times the strength of cars of wooden construction of the same general type, may be built without undue increase in weight of the car as compared with that of the car of wooden construction.

It is estimated that the weight of the Pullman sleeping car of all-steel construction will be from 145,000 to 150,000 lbs., while a similar car of wooden construction weighs from 125,000 to 130,000 lbs. Although cars of steel construction are somewhat heavier than similar cars of wooden construction it must be remembered that in designing the all-steel car advantage was taken of the opportunity to provide a stronger car.

From special records made on a large number of trains of

the number of passengers carried it was determined that the actual average weight per passenger of these two classes of cars in service during periods of normal traffic:

Wood	1,783 pounds per passenger.
Steel	1,835 pounds per passenger.

and during periods of abnormal, such as holiday traffic:

Wood	1,675 pounds per passenger.
Steel	1,637 pounds per passenger.

Conclusions. From examination of the designs and construction of the passenger carrying and passenger train cars recently built, and building for the railways in America, your reporter draws the following conclusions:

1. Cars of steel construction will be substituted for cars of wooden construction on account of the former having greater strength, being non-inflammable and less expensive to maintain.

2. The difference in weight of the cars of metal and the cars of wood is not such as would make their use prohibitive from an operating standpoint.

3. As the cost of the cars of steel construction will probably decrease, due to more experience in their design and construction, the cost of cars of wooden construction will undoubtedly increase, due to the scarcity of suitable materials and the use of the metal cars will be extended.

4. For railways using electricity as a motive power the danger of serious accidents will be reduced by the use of the metal cars.

5. The metal structure will better retain its initial strength than any composite structure made up of wood and metal, such as the cars of the so-called wooden construction in use to-day.

GENERAL CONCLUSIONS.

1. The present practice in America in the construction and designing of locomotives, freight cars and passenger cars is to use steel either of rolled or pressed shapes, or steel castings for many parts, extending to practically the complete car.

2. The progress made in design and manufacture in steel of the various details of locomotives and cars, such as tubes, wheels, bolsters, truck frames and similar parts, indicates that further substitution of this material for wood, wrought and cast iron may be expected.

3. While steels of special alloy or composition have been utilized in the building of railway rolling equipment, neither the quantity used nor the length of time in service is sufficient to warrant any expression as to the possible economy to be obtained by their use.

4. The use of steel construction of railway rolling equipment has generally given advantageous results, both from a service and economic standpoint, as compared with the results obtained with the material for which it was substituted.

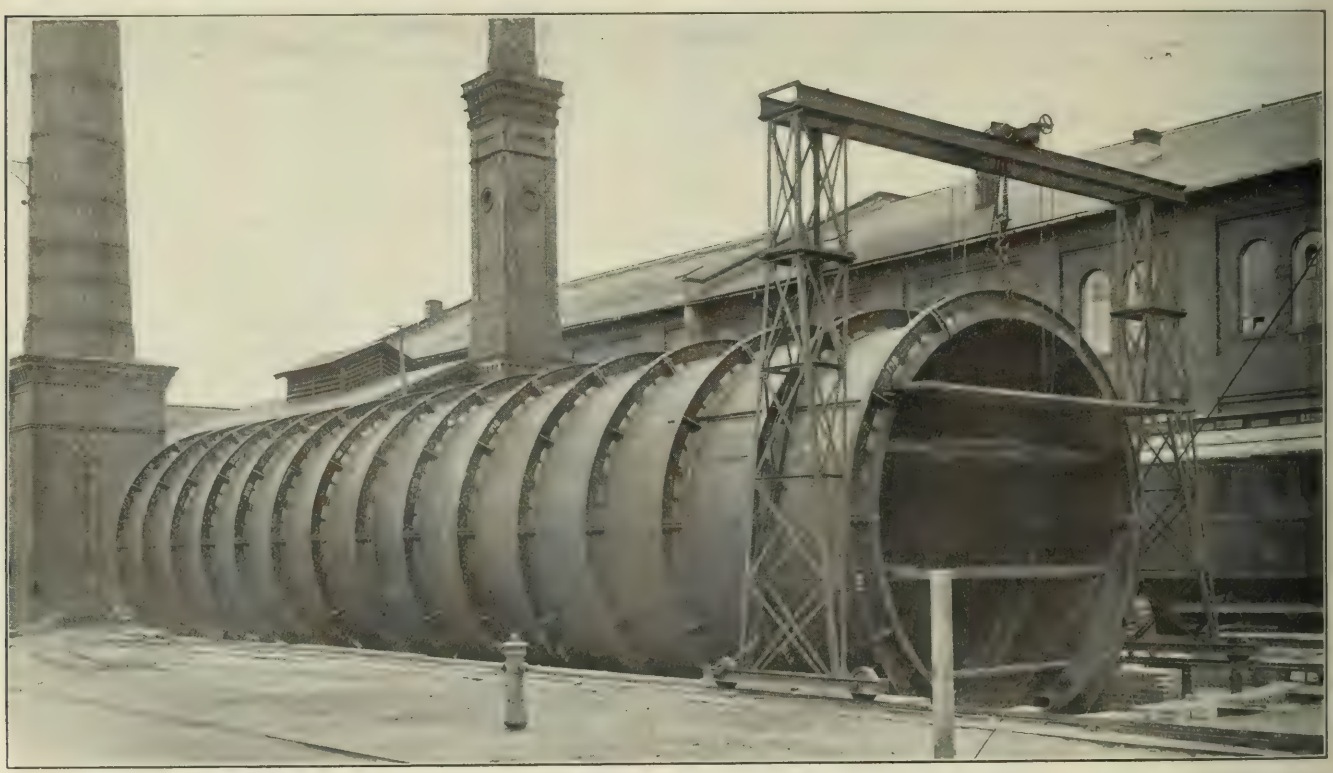
THE DISINFECTING OF PASSENGER COACHES.*

BY P. SCHUMACHER.

The regulations to prevent danger from infection and contagious diseases in railway traffic in Germany cover the following points:

1. General provisions.
2. Measures to be taken in railway traffic whenever diseases dangerous to the public make their appearance.
3. Treatment of railway cars when diseases of the above description break out.
4. Directions for disinfection.

International traffic, and more particularly the traffic with Russia, made it an urgent necessity to construct a device in which any vermin infecting the cars could be absolutely destroyed. Furthermore, an enclosed space which can be quickly heated to high temperatures, and in which such temperatures can be maintained for a considerable length of time, is an exceedingly desirable addition to the equipment of passenger-car shops. The floors of dining and kitchen cars are frequently found to be wet through. Slight damage to car roofs is often the cause of wet ceilings, and, furthermore, the hot-water heating devices in parlor and sleeping cars are not always tight and sometimes drench the double floors. In very cold weather damage to the hot-water heat-



Apparatus for Disinfecting Passenger Coaches, with Front Head Removed.

*From *Annalen fur Gemerbe und Bauwesen*, Berlin, Jan. 15, 1910.
†Works Manager, Royal Prussian State Railways, Potsdam.

ing plants in sleeping and parlor cars, due to freezing, is unfortunately of frequent occurrence, and the consequences resulting from such damage could heretofore only be removed very slowly because it was necessary to let a car stand for days in the hottest part of the paint shop to heat it. In addition, it is very desirable for a railway shop to have an available drying room designed to quickly dry all kinds of articles, such as upholstered chairs that have been washed, as well as for thoroughly drying lumber and other purposes.

The Central shops in Potsdam have been used principally for several years past for the maintenance of parlor, sleeping and vestibule cars. Among these, those cars used for the Russian traffic are most frequently infested with vermin, and such cars could only be thoroughly cleaned by removing all the upholstered parts, and also the wainscoting. This method of cleaning is not only very expensive, but it involves considerable loss of time, inasmuch as the cars must remain in the shops for weeks. Furthermore, there is always danger of vermin escaping into the shops and subsequently infesting other cars.

The preliminary examination into the problem of constructing a device which would meet all the conditions demanded by the regulations and be serviceable in the above-mentioned cases of damage, etc., was commenced several years ago. From the beginning it was considered a primary requirement that the device should be designed for treating an entire car at one operation, and not merely parts of a car.

Devices supplied by the Julius Pintsch Company are known to have proved efficient in disinfecting ocean vessels at Hamburg, and that concern is likewise engaged in constructing large vacuum devices for various purposes. Extensive experiments have proven, for instance, that bed bugs can only be radically destroyed by heating all the parts (in the case now under consideration the entire car body is heated to a temperature of from 104° to 122° F.) and subsequently reducing the air pressure within the device for quite a length of time. This process can readily be used at the same time for thoroughly disinfecting the car in every respect.



Interior View of Apparatus for Disinfecting Passenger Coaches; Sleeping Car About to Enter.

The introduction of formalin has made disinfection considerably more perfect, but there were no available devices by which the formalin vapors could be made to penetrate to any great depth into recesses. The Julius Pintsch Co. thereupon worked out a plan for the construction of a device which has recently been completed and is now in practical operation.

OPERATION.

The car requiring treatment is pushed into the apparatus, which is heated by a system of pipes, until an even temperature of from 114° to 122° F. is obtained throughout the

interior. As soon as the cushions and other upholstered parts of the car have attained this temperature the air is pumped out by a special air pump plant, until the air pressure is reduced to from 27 to 29 inches of mercury below normal and without interrupting the heating process. It is known that water will boil under this air pressure at a temperature of 104° F. All such insects or other living organisms as may be present in the car are deprived of every particle of moisture and consequently must certainly perish. The above-mentioned preliminary experiments proved that bed bugs could not be absolutely destroyed by either heat alone or by the production of a vacuum, but that their absolute destruction can be insured by using these two factors in combination.

By this process, which has been patented by the Julius Pintsch Company, vermin and nits can be destroyed without taking apart or removing the car cushions, leather fittings, wooden frames, wainscotings, etc., and without any danger of damaging the various parts of the car, including the outside varnish and interior polish. If the car is also to be subjected to disinfection according to the reguations, formalin is introduced when the vacuum is at its lowest point, and is quickly evaporated. The formalin vapor will thus fill the entire space, and its action is not impaired by the air which remains in the device. If at the end of the operation the outer air is admitted, it becomes saturated with formalin vapor and conveys it into the most minute orifices.

CONSTRUCTION.

The cylindrical cross section of the device is exceedingly well adapted to the outlines of railway cars, inasmuch as it leaves sufficient space at the sides and bottom for installing heating devices, etc. The cylinder, both ends of which can be closed by means of heads, is made of cast-iron. It measures about 16 ft. 5 in. in diameter inside, while the available length for a car, measured from buffer to buffer, is about 75 ft. 6 in.

The device, which thus has the shape of a horizontal boiler, is composed of 15 cast-iron annular supports, which carry 14 cast-iron barrel sections, made up of separate plates. The barrel sections, as well as the annular supports, are so strongly constructed that there is no danger of the device being bent out of shape, either from its own weight, by the weight of a 60-ton car, or by the air pressure, even when there is a complete vacuum in the cylinder.

In designing the apparatus, a pressure of 3,129 lbs. per sq. in. and a tensile strain of 1,565 lbs. per sq. in were used as a basis. The total weight of the device, including the crane, is 297,000 lbs. The load supported by either of the 15 annular supports is 18,900 lbs. when the device is empty. When in this condition the surface pressure between the bed supports and the masonry work is 19.9 lbs. per sq. in., while the pressure amounts to 35.5 lbs. per sq. in. at the points of maximum strain, when the cylinder contains a car weighing 132,000 lbs.

The supports are equipped with rollers capable of moving in the longitudinal axis to provide for the longitudinal expansion of the device when it is heated. Actual measurements have shown this expansion to be about .78 in. at a temperature of 167° F. The track inside the cylinder has its bearings on the annular supports, vertically above the bed supports, and is fastened to the former. The base supports are thus made to bear the load of a car without exerting a strain on the other parts of the barrel. The fact that the supports are comparatively far apart made it necessary to use rails measuring 8.64 in. in height, so as not to exceed a bending strain of 2,640 lbs. on the rails.

The space between the rails is filled in with a runway of iron grating. Stop blocks have been provided for shutting off the rear end of the track, but as an additional safeguard against damage to the rear head a buffer has also been installed. There is a pit at the front end of the barrel to make room for the front head which closes the entrance opening and can be swung to one side. When the head is moved aside the pit is bridged over by sections of rail resting on swinging brackets, so as to make them easier to handle. This front head, or cover, is provided with steps and a foot-board, weighs about 8,800 lbs., and is forced against the rim of the barrel by tap bolts. The closure is made tight by an Indian rubber ring mounted in a groove and protruding slightly. Both the front and rear heads are composed of cast-steel frame collars of specially designed cross section and of a mild steel plate, convex on the inside, partly welded and partly riveted, and shaped like a segment of a sphere.

A movable crane of special design was required for the front head. This peculiarly constructed swinging crane is remarkable for the ease and convenience of its operation. The head or cover can be quickly and safely withdrawn and replaced by one man.

The device is heated by live steam, which is admitted through a main pipe running longitudinally through the upper part of the barrel. Two hundred and fifty-two semi-annular pipes form the connections between this main pipe and a joint condensing pipe which runs along the bottom of the cylinder. The condensed water is automatically drawn off by a steam trap placed outside of the cylinder. The so-called "Schneidendichtung" (edge packing) was selected for making the pipe joints tight. It was tested at a pressure of 213 lbs. per sq. in. above the atmospheric pressure and found to be absolutely tight. The pipe system is 6,429 ft. in length and provides a total heating surface of 2,260 sq. ft. Two fans, which operate in opposite direction, have been mounted in the center of the barrel, one on each side, to reduce the time required for uniformly heating all the air in the cylinder.

An evaporator for disinfecting formalin has been placed on the bottom of the cylinder, midway between the ends Briefly described, it is an open vessel with a double bottom. Steam is admitted to the space provided by this double bottom and used for evaporating the formalin. While the apparatus is in operation the evaporator is filled from the outside; the formalin evaporates in an exceedingly short space of time in the rarified air of the cylinder. All the fittings required for operating the formalin evaporator are accessible from the outside.

A special inspection hole has been provided for reading the thermometers inside the cylinder. The thermometer scales are lighted up by electricity; one of the thermometers is freely suspended in space, while the other is immerged in a vessel filled with water. This arrangement provides not only a means for determining the maximum temperature of the atmosphere in the apparatus, inasmuch as it influences the varnish of the cars, but the thermometer submerged in water makes it possible to estimate the temperatures inside the cushions and other upholstered parts. In order to provide a convenient means for moving around in the apparatus while it contains a car, foot-boards have been mounted on both sides of the barrel, which are adequately lighted by 12 incandescent lamps. The cubic capacity of the apparatus is about 1,700 cu. ft.

THE VACUUM DEVICE.

A Siemens-Schuckert air pump, direct coupled to a 20 h. p. three-phase motor is installed in a small wooden extension of the railway shops. It is capable of producing a vacuum in the cylinder within two hours. The air in the cylinder is expelled through a pipe leading to the boiler room, where it may be discharged either under the grate of a steam boiler or direct into the chimney. When cars under suspicion of containing germs of any epidemic disease are being disinfected, such germs as may be carried along by the air are burned.

RESULTS OBTAINED.

On startng the operation of the plant it was found that the interior space could be heated to 212° F., when the outside temperature was 60° F. A normal temperature, up to 122° F. can be obtained within an hour, but the car placed in the apparatus will only be thoroughly heated at the end of about 5 hours. As above stated, the air can be sufficiently rarified within 2 hours. No damage to the varnished and polished parts of cars has been observed. Disinfection with formalin proved to be a very quick process, as the fluid evaporates instantly. The time during which the cars must be left exposed to the formalin vapor can only be determined by a series of experiments.

The first test was made with a car infested with bed bugs and was wholly successful. The bed bugs, as well as the nits, having their nests behind the mouldings and in crevices were thoroughly destroyed. Live bed bugs and the nits purchased from a vermin destroyer of Berlin and placed in the apparatus in a glass vessel, were likewise killed. This glass vessel was covered with cotton and closed with a linen cloth tied around the neck.

Several vestibule cars and dining cars have been treated for quickly drying the ceilings, walls and floors, which had become wet through. After heating the cars and leaving them in the vacuum, surprisingly satisfactory results were obtained at the end of 24 hours. The disagreeable kitchen smell in the dining cars had entirely disappeared. In such cases the cars are not treated with formalin.

By way of experiment, unseasoned lumber of various kinds, recently supplied, was also dried. The time allowed for this process should not be made too short, as the lumber is liable to crack. The time required for the process depends on the amount of moisture in the timber.

The plant was completed and its operation started in the fall of 1909. The approximate cost of construction was $18,800.

The operating expenses for disinfecting a large sleeping or vestibule train car are approximately as follows:

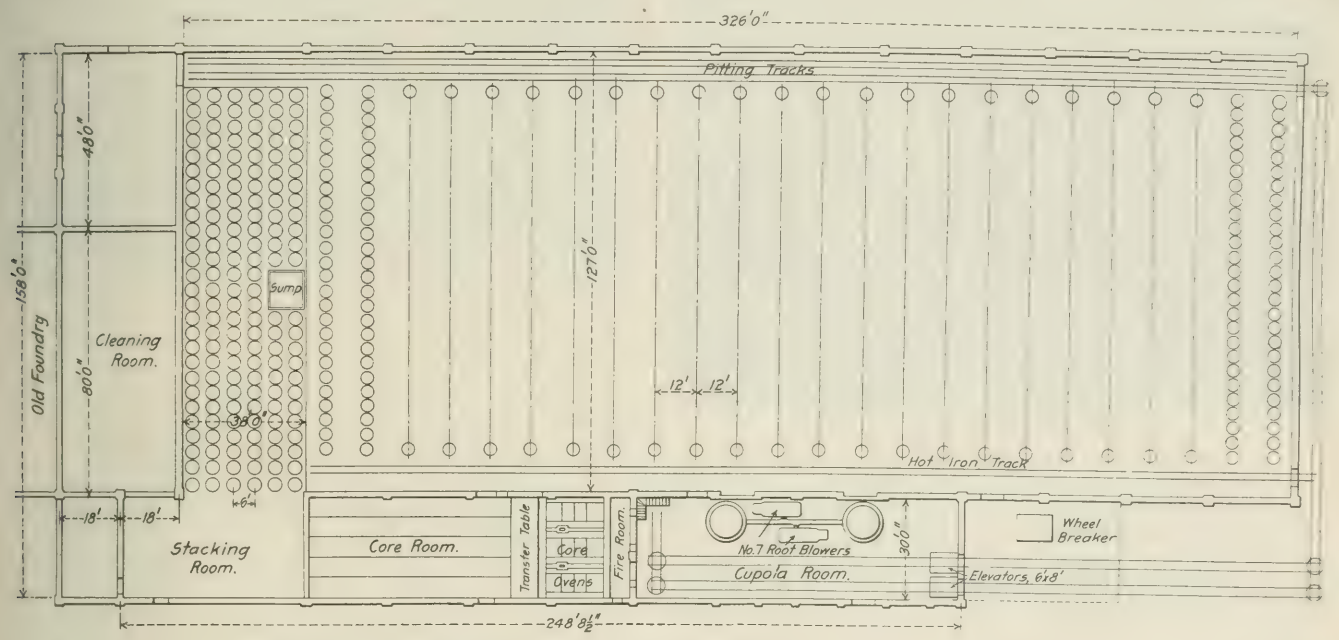
If heated during 10 hours, 1,100 lbs. of coal and water	$1.90
40 kilowatt-hours electric current for power and lighting	.95
11 lbs. formalin	1.07
Pushing car in and out of the apparatus, including expense of attendance	.84
Total	$4.76

If 5 per cent. of the invested amount be added for interest and for decrease in value resulting from wear and tear, and presuming that one car per day is treated in the apparatus, the total expense per car amounts to $8.33. With the old method of cleaning cars infested with vermin, the expense for labor was not only ten times as high, but it was also impossible to be sure that such cars were perfectly and thoroughly cleaned

CAR WHEEL FOUNDRY AND PRACTICE. CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

BY GEO. L. FOWLER.
Associate Editor of the *Railway Age Gazette.*

The Chicago, Milwaukee & St. Paul is one of the few railways that manufactures its own cast-iron car wheels in quantities; it has a large foundry at the shops in West Milwaukee, Wis., which was built in 1906. The straight floor is used for the molding of the wheels. The building is a brick structure, 158 x 363 ft., with an extension at one end 80 ft. wide. This addition was the old foundry and is used for soft iron work, with which this article will have nothing to do.



Plan of Car Wheel Foundry. Chicago, Milwaukee & St. Paul Railway.

Molding Floors.—The arrangement of the building is clearly shown on the plan. There are 24 floors, each capable of holding 25 wheels. These floors are set 12 ft. between centers and each is served by an overhead trolley and hoist that traverses the building and takes the ladles of hot metal from one side and delivers the hot wheels to the other. Each floor is furnished with its own water boxes, one near each end, and, to avoid wetting or injury from accident, the water is brought in from overhead. There is also a sheltered rack for storing the pattern when it is not in use and a stand for holding the cores until they are needed.

Cupolas.—There are two cupolas, each 98 in. in diameter inside the lining, and set 36 ft. apart between centers. They stand outside the main wall of the building and discharge into a tilting reservoir in the usual manner. This reservoir has a capacity of ten tons when freshly lined, but this drops to about eight tons before relining is considered necessary. The cupola room has a length of 84 ft. and a width of 30 ft.; the details of its arrangement will be considered later. Adjoining the cupola room, on one side, is a wheel breaker housed in an enclosure measuring 8 x 10 ft.; on the other side are the core rooms and ovens.

Annealing Pits.—At one end of the main room are the annealing pits, of which there are 180, arranged in six cross rows. The top platform of the pits is elevated somewhat

above the foundry floor in the usual manner, and the bottom is well below it. The pits are served by three low traveling cranes, each with two hoists, and each serving two lines of pits. Beyond this the end of the building is occupied by the cleaning floor and the toilet and bath rooms.

Industrial Railway.—Extending along the side of the building, next to the cupolas, there is a line of 21-in. gauge track, which is used as a hot metal route. On the other side there is a double track of 24-in. gauge, used for carrying the hot wheels to the annealing pits.

Storage of Material.—Turning now to the details of the arrangements and the methods employed for the work. Just back of the cupola side of the building and set 40 ft. from it there



Pig Metal Storage.

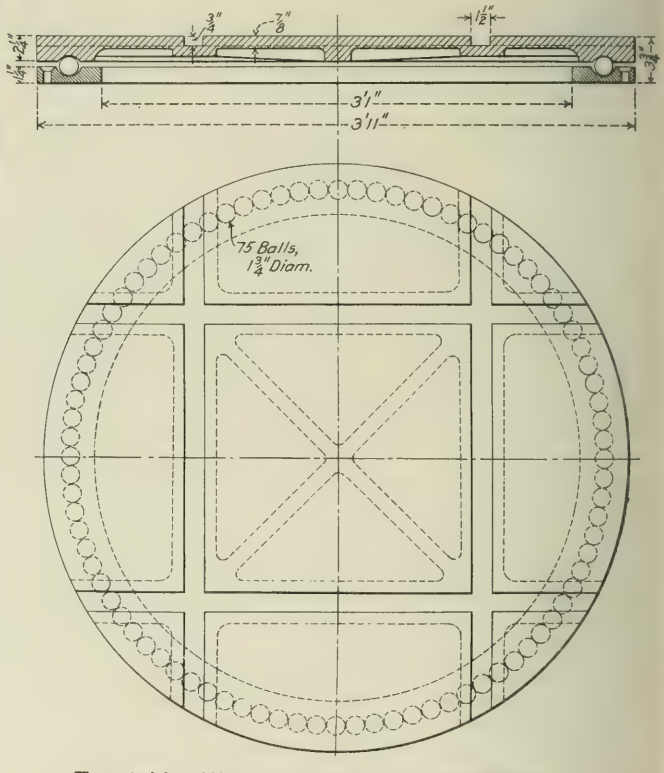
is a track used for the delivery of the material. The space between it and the building immediately adjacent to the cupola room is used for the storage of pig iron. On the other side are the sand sheds, while further along toward the end of the building are the platforms for the storage of old wheels. There are no mechanical facilities for the handling of this material, and the pig metal is taken from the cars and stacked by hand. Owing to the limited space available this has to be neatly done. Each pile is marked with the grade and brand to which it belongs, so that it is readily available for the melter. In the same manner the sand and other bulk supplies are shoveled from the cars into the bins.

The wheels are rolled to the breaker and from there loaded directly upon the charging cars. Though the proximity of the two—the breaker and the cars—is quite intimate, and in the usual course of events the metal is taken direct from the breaker to the charging floor, provision is made for the failure of the supply by the storage of a pile of broken wheels of several hundred tons, so that in case of the disablement of the breaker there will be a supply available to keep the cupolas in operation to the end of the heat. In addition to this precaution there is also another breaker at the other end of the building, which, though ordinarily used for the soft iron foundry, can be used for the wheel work in case of emergency.

Charging Floor.—The broken wheels are loaded with the proper proportion of pigs upon small iron lorreys, which are run in upon an elevator and by it raised to the charging floor. On the charging floor there are two lines of track, running along the outer side of the building and leading from the two elevators, respectively. These are connected at each end with cross tracks and turn-tables so that material can be delivered from either elevator to either track. In ordinary operation, the track next the wall is occupied by a string of cars, loaded with metal, ready for charging. This is a reserve provision, so as to provide iron for the immediate requirements of the cupolas in case of an accident and consequent disablement of the elevators, so that the regular deliveries could not be made. This is supplemented by the storage of a pile of coke on the floor between the cupolas, with which, in case of any delay arising in the delivery of materials between the ground and the cupola, work could be continued. Here, as upon the ground, all material is handled by hand, the charging doors being set well down close to the floor so that the minimum of lifting is required.

After the charging floor had been originally designed, it was found that a better and more frequent communication between the two tracks and the cupolas was desired. As the floor had not been built to stand the concentrated load of a turn-table at any point, a shallow type of table was designed that carried the load at the rim and distributed it over the whole of the circumference. This table, shown in one of the illustrations, consists of a ring for a base, with grooves cut for the balls upon which the table itself is carried. The latter is merely a circular plate, ⅞ in. thick, and ribbed at the rim and at the flangeways to sustain the load, and supported by a continuous line of balls.

Reservoir.—The metal, as tapped from the cupola flows out in a discharge trough, the end of which is well out over the receiving reservoir, so that there is no interference with this flow as the reservoir is tilted for the filling of the pouring ladles. The tilting of the reservoir is accomplished by means



Turntable, Wheel Foundry Charging Room.

of a reversible electric motor driving a worm that meshes with a gear attached to the trunnion. It is operated by an attendant standing upon a shielded platform just above and to one side of the ladle, where he has a clear view of the discharge trough, the reservoir, the ladles and the cars, and the tracks upon which they run to the ends of the building. He also controls the movement of these cars.

Hot Metal Cars.—The hot metal cars are run in trains of four, and are hauled by a wire rope driven by an electric motor. Each car can carry two ladles which have a capacity of about 900 lbs. each, so that they carry enough for the casting of a 700-lb. wheel with its risers. They pour from the top and have a skimming shield at the spout so that they discharge clean metal only into the mold. The cars are con-

nected by long links and stand 12 ft. apart, from center to center, corresponding to the distance between molding floors.

The method of operation is to put one filled ladle on each car and send the train down to the floors to be served. The molder puts an empty ladle on the car and removes the filled one. While he is pouring the train returns to the cupola, the ladles are filled and the process repeated. In this, of course, the cars are run up and stopped successively in front of the reservoir.

Molding Floor Hoists.—The means of handling the ladles to the molds and the wheels to the pitting tracks consist of the overhead lorrey and hoist already referred to. This consists of a carriage running on rails well above the floor and hauled by a wire rope driven by a drum attached to a line shaft running the whole length of the building along the center line. A clutch serves as the immediate means of attachment and this is so arranged as to be reversible, so that the carriage may be moved in either direction. A single lever serves for either the reversal of the motion or the stopping, according as it is moved to the right or the left, or is brought to the central position. A line leads from this lever to each side of the building and then comes down and across, forming a loop and running about 7 ft. from the floor. This is within easy grasp of the molder, so that he can control the movement of the carriage from any point.

The hoist is effected by means of the rope, A, made fast at one end, and passing over the pulleys, C C, on the carriage and the single fall, D, and thence on to the other side, where it is attached to the piston rod of a pneumatic cylinder. The movement of the piston in this cylinder is controlled by a single three-way valve, which is operated by a line running across the building, parallel and close to the traversing line. With this arrangement the molder can control the hoist and traverse from any point on the floor, and so, though he may follow the ladle to the mold and the hot wheel to the pitting track, he is not obliged to be close to it, thus avoiding much of the heat exhaustion that would otherwise occur.

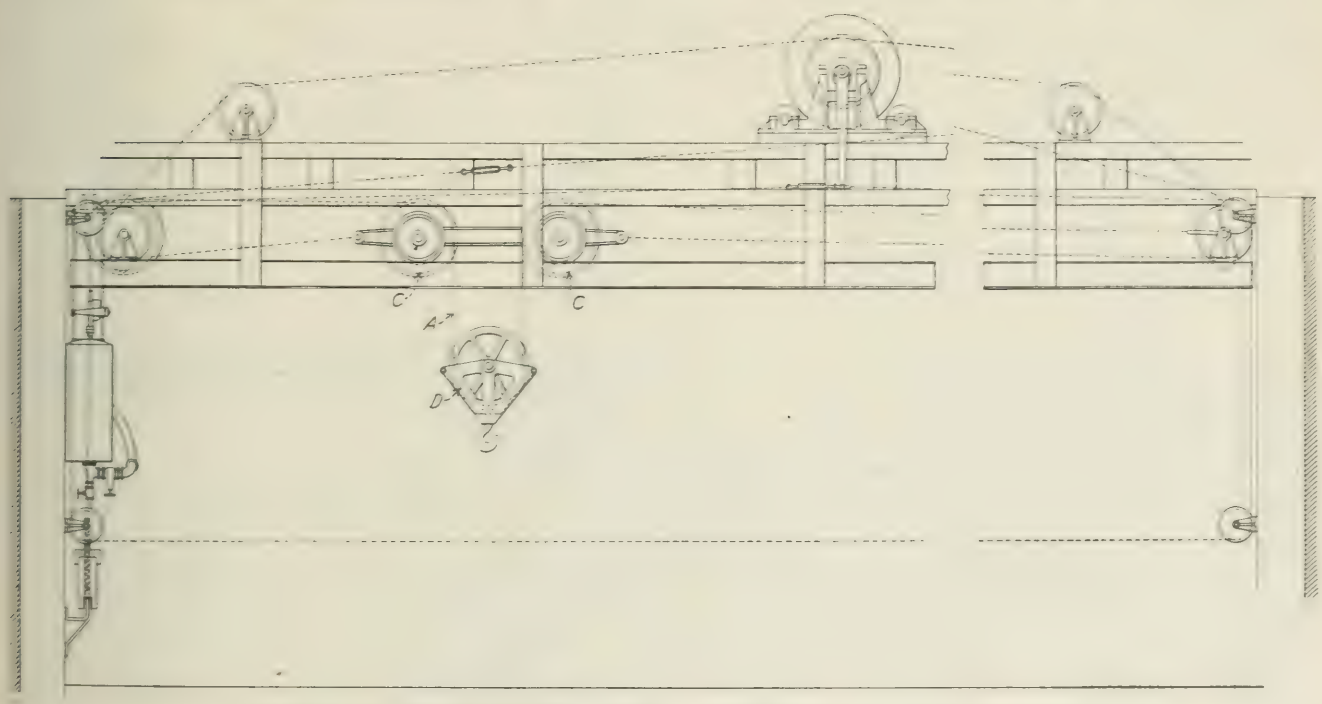
Wheel Tongs.—When the wheel is lifted from the mold it is taken by one point of the rim, instead of at three points, in the usual manner. For this a special form of tongs is used that were designed in the shops. They are arranged to grip the rim of the wheel. After the cope has been lifted off, the end is slipped beneath the rim and the handle, A, is pressed down so as to cause the tongs to nip the wheel. Then, as the hoist lifts on the eye, B, the wheel tilts and the spreader, C, strikes on the handle end of the straight end of the tongs.



Ladle Train, Wheel Foundry.



Hot Wheel Train.



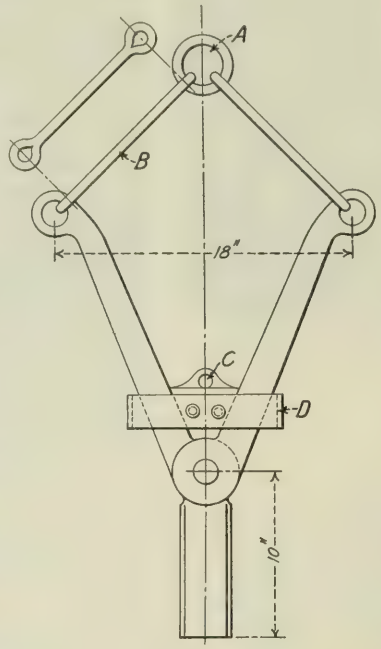
Ladle Crane, Wheel Foundry, Chicago, Milwaukee & St. Paul Railway.

The whole load of the wheel thus tends to hold the tongs tight, and the wheel will be lifted and held securely. When it is lowered to place on the pitting car the tongs automatically let go as soon as the pressure of the spreader is relieved. When the wheel is picked up by the tongs in this manner it stands on edge and the adherent sand is readily knocked off. In striking the wheel to remove the sand, it is always done on the rim on the outside and never on the brackets or the flange.

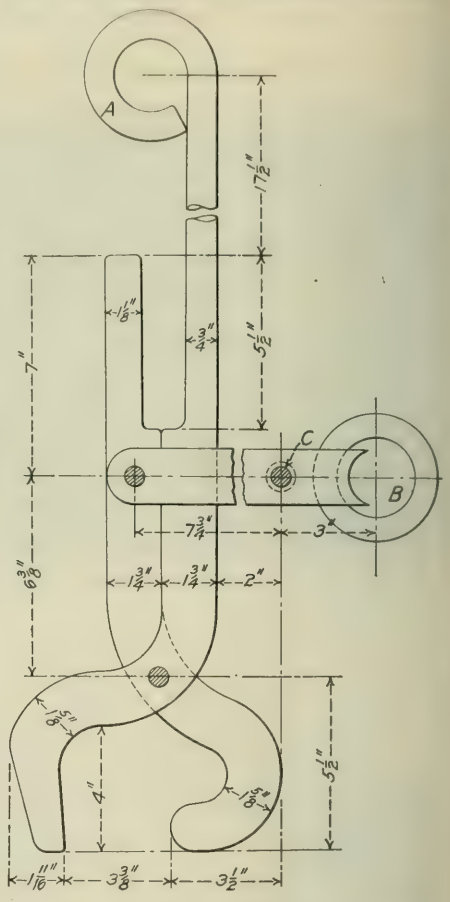
Just before reaching the ends of the annealing pits, the risers are knocked off as the cars pass by a balanced battering ram, swung by a rope and operated by a laborer. He strikes each riser as the wheel passes.

Annealing Pit Cranes.—As already stated, the wheels are picked off the cars by traveling cranes, each carrying two hoists, spaced 6 ft. apart to match the centers of the pits. These cranes are shown in outline in an illustration. They run on an I-beam overhead track, with the carriage hung from the center and coming down close to the top of the pits. On each side the operator is protected from the heat of the wheels by sheet iron shields. An ordinary electric motor, adapted for the work, is used for traversing and hoisting.

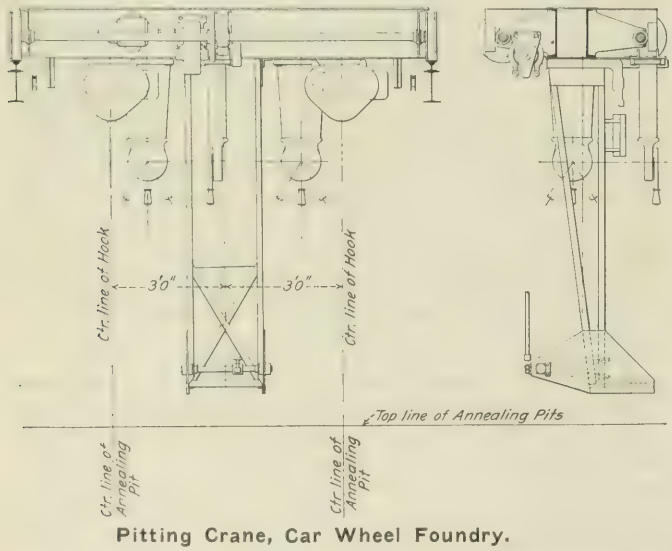
Pitting Tongs.—The pitting tongs were also designed in the shops. They hang by the eye, A, from the hoisting hook, and it will be seen that an upward pull through the links, B, draws the upper arms together and spreads the lower. This would hold for any stress whatever, even to that of the bare weight of the tongs. To prevent this, the wedge block, C, is used. This is made to fit into the angle formed by the upper arms and is held in place by the guide strips, D, that span the arms. This wedge is dropped into the position shown in the engraving when the tongs are to be entered in a wheel hub. When it is down the wedge is lifted by the crane operator by means of a chain and the lower arms of the tongs are immediately spread. Any further lift at A only tends to spread them more and so tighten them that they lift and hold the wheel. When the wheel has been pitted the wedge is allowed to drop back, spreading the upper arms, and so drawing the lower ones together that the tongs can be withdrawn.



Pitting Tongs. Car Wheel Foundry.



Wheel Tongs.



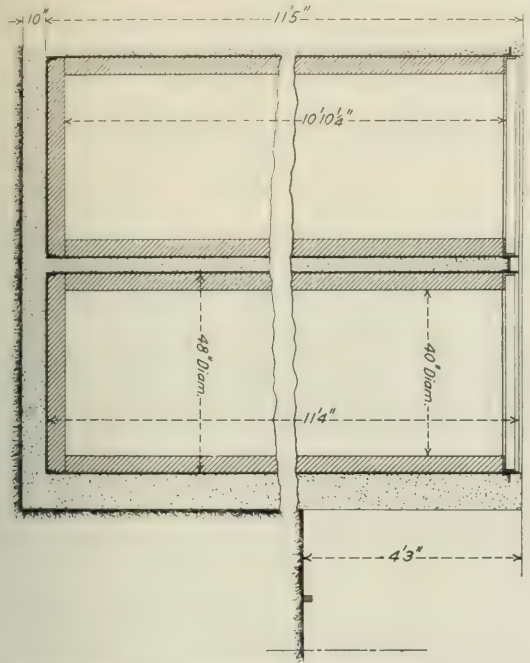
Pitting Crane, Car Wheel Foundry.

Annealing Pits.—The pits are 174 in number, 40 in. in diameter, and each has a depth of 10 ft. 10¼ in. beneath the cover, and a capacity for 16 wheels. This gives a total capacity of 2,784 wheels, or enough for 4½ days' output. Ordinarily, however, the foundry is not working to capacity and the wheels are left in the pits six days. The pits are of the usual type, made of a steel shell lined with firebrick, and packed with dry sand on the outside. As these pits extend down below the natural level of the ground water, special precautions were taken to protect them from moisture. They are enclosed in a concrete box. The sand used was carefully selected and dried, and the whole was kept hot for several days before using. Then on one side, as indicated on the plan, there is a sump to catch the drainage and so relieve the concrete box from the outside pressure and the seepage to which it would otherwise be subjected.

Grinding the Wheels True.—The wheels are removed from the pits by the same cranes with which they were placed, and are carried out to the stacking floor; they are put on two-wheeled trucks and taken to the grinding room, where they are trued by an emery wheel grinder. The management consider this worth the trouble and expense, for while the wheels vary only by an insignificant amount from true rotundity in the rough, they do have the fins due to the contracting chill; the better rolling surface obtained by the grinding is, of course, an advantage for both wheel and rail. The total cost of grinding, including emery wheels, upkeep of machinery and labor is about 2½ cents per wheel.

Pig Iron Used.—So much for the physical means and methods of making wheels at West Milwaukee. The foundry methods are of equal or greater importance. The first point to be considered in this is the choice of the metal. It would not be true to say that in this choice no attention whatever is paid to the chemical analyses of the irons, as they are watched to see that the sulphur does not get beyond bounds, but the basis upon which the wheel mixtures are formed, and upon which, as a sole apparent dependence, the excellence of the wheel relies, is that of the strength of the pig irons used. This is the thing that is looked to first, last and all the time. A sample is taken from every carload of iron received; it is melted in a crucible,

and a test piece cast measuring 2 x 2 x 14 in. This is put upon supports 12 in. apart and broken in transverse stress. This bar must carry at least 18,000 lbs. to be acceptable, though not necessarily to be accepted, as will be noted later. Sometimes, bars 1 in. square are also tested, and these generally show about one-eighth the strength of the larger bar, as they should, though the rule is not invariable. In general,



Construction of Annealing Pits, Wheel Foundry.

the No. 2 irons break at from 16,000 lbs. to 18,000 lbs.; the No. 3, at from 18,000 lbs. to 22,000 lbs., and the No. 4, at from 20,000 lbs. to 24,000 lbs. This, for the usual run of irons, but the Salisbury often goes to 27,000 or 28,000 lbs.

The physical inspection of the iron is also carried to the pigs themselves. Out of a carload lot, a few, 16 or 18, are broken, and the fracture examined. If these run with some uniformity of appearance the carload is accepted as being all of the same character. But, if variations appear, the breaking is continued, and may even extend to every pig on the car. And the iron so inspected is thus re-sorted, according to the number or grade to which each individual piece is shown to belong.

It is on this basis of strength, then, that the irons used in the mixtures are selected, and any new iron to be approved must first show its value in the matter of strength. To test it the usual bars are first broken, then a few wheels are made in an experimental cupola. If these come up to the requirements of the drop and the thermal tests, then other wheels are made and put into service. From this it might appear that any accepted brand would be all right for use in wheels, and that the whole mixture could be made up of that one and scrap. Practical experience, however, has shown that a mixture of several brands will produce a stronger and better wheel than any one alone with the scrap, and the mixtures that are used are those obtained by close observation and testing of results and not from a chemical analysis of the irons used. The mixtures are, therefore, purely empirical.

At the present time only four brands of iron are used, and a typical mixture may be taken, as:

Salisbury	Nos. 3 or 4	10 per cent.
Spring Lake	" 3 " 4	11 "
Shelby	" 2 " 4	9 "
Rock Run	" 3 " 4	10 "
New scrap		12 "
Old wheels		47 "
		100 per cent.

These irons are all charcoal. The Salisbury is from Lime Rock, Conn., but no analyses of this brand could be obtained, either from the railway company or the makers, as none has been made.

The Spring Lake is a Lake Superior iron that would give an average analysis of about:

	No. 3.	No. 4.
Phosphorus	0.191 per cent.	0.192 per cent.
Manganese	.26 "	.26 "
Silicon	.82 "	.68 "
Sulphur	.028 "	.025 "

The Shelby and Rock Run are both Southern irons that are said to be nearly identical, but analyses could not be obtained.

In addition to this inspection for strength, a record is kept of other characteristics of the iron, which are dependent upon



Annealing Pits, Car Wheel Foundry. Chicago, Milwaukee & St. Paul Railway.

the personal equation and judgment of the observer. This record takes: first, the size of the pig, its width, depth and length, also the grade or number of the iron. From the melting in the crucible a block is poured that measures 6 x 3 x 1½ in. This is broken in the middle. The shrinkage of the ends is noted and it is marked 1, 2 or 3, according as it is more or less, the higher figure indicating the greater shrinkage. Then the color of the fracture is taken. If it has a nice dark blue color it is marked 1. This number is increased as the color falls off and approaches a dull gray. The cleanliness is numbered in the same manner. No. 1 is the cleanest, and as dirt appears the number is increased.

As for grain, a smooth even grain is marked 1, and if it is spotted with dullness the number is increased according to the size and area of such spots. The touch of the grain is indicated in the same manner. If it bites into and holds on to the finger, as it is drawn across the surface, like a burr, it is marked 1, and the number is increased as the points of the grain become dull and do not hold.

The fall is a record of the height from which a pig must be dropped to break it, when striking on the center of its length on an anvil block. A typical record of such an inspection would be:

Width, 3 in.	Grade, 3.	Clean, 1.
Depth, 3¾ in.	Shrinkage, 1.	Grain, 2.
Length, 24 in.	Color, 1.	Touch, 1.
Fall, 6 ft.	Breakage, 19,620 lbs.	

One surface of the block is chilled and the fracture of this is noted to determine whether it has a "crystal" chill, which is brilliant and denotes hardness, or whether it is dull and gray, indicating inferiority.

It is not expected that all brands will at all times come up to the standard of strength set by the foundry practice of the road to break at 18,000 lbs., minimum. But, when a carload is received that falls below the requirements, the maker is notified of the fact, and the iron is accepted and worked into the mixtures in smaller percentages, even as low as 1 or 2, than would otherwise be used. In this way the strength of the resulting wheel is not injured.

Scrap Wheels.—In like manner a careful watch is kept over the character of the old wheels that are used as scrap. If these wheels show a close fine-grained fracture and one that indicates that it would be apt to make a deep chill, then Nos. 2 and 3 pig are used for the balance of the mixture; but, if the iron of the wheels runs to an open fracture with an indicated tendency toward a low chill, then Nos. 3 and 4 pig are used. This involves a daily change in the mixture sent to the cupola in order to meet the requirements.

Fuel.—With the iron selected, the next step is the melting. The fuel used is a coke made by the Milwaukee Solvay Coke Co. It is a hard, exceedingly dense, very dark, by-process coke, with a high carbon content. In color it is as dark as the ordinary gas coke, but resembles it in no other particular. It is very strong and bears the burden of the furnace with ease. Its average analysis is about as follows:

Volatile matter	1.82 per cent.
Carbon	88.80 "
Ash	9.38 "
	100.00 per cent

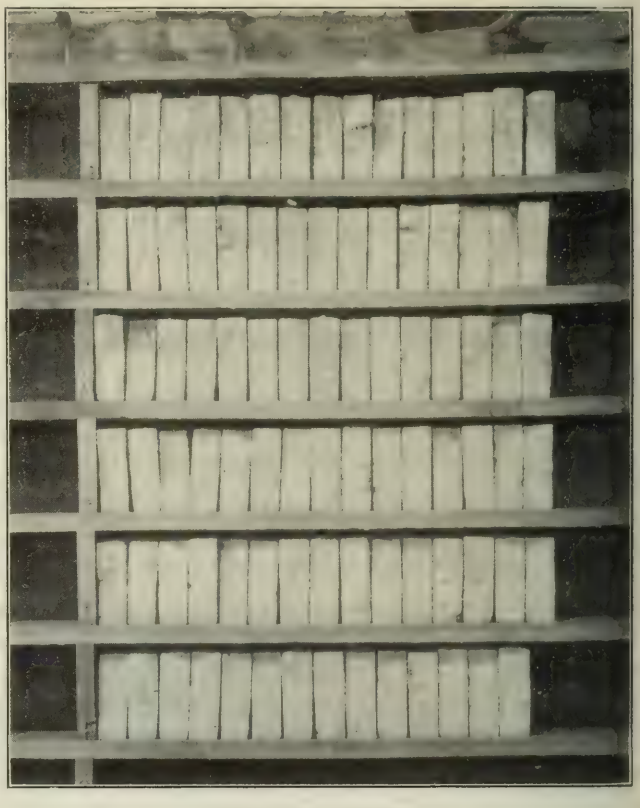
This is typical, though the volatile matter frequently drops as low as 1.32, and it is claimed that the average is 1.40. The carbon often runs as high as 92 per cent., but averages about 90. Such a coke must have good progenitors and is made from a mixture of Pocahontas and Boomer, West Virginia coals, the latter coming from the Eagle and Gas mines. These coals would analyze about as follows:

	Pocahontas.	Boomer.
Moisture	0.27 per cent.	0.79 per cent.
Volatile matter	15.73 "	32.90 "
Fixed carbon	79.80 "	61.05 "
Ash	4.20 "	5.26 "
Sulphur	0.61 "	0.76 "
Phosphorus	0.0045 "	0.009 "
Accounted for	100.6145 "	100.769 "
British thermal units	15,413	14,933

Cupola Charges.—In making up the bed in the cupola the sand bed is 6 in. deep and the first charge of fuel is 6,000 lbs., with a burden of 15,500 lbs. of metal. The following charges are 9,000 lbs. of iron to 900 lbs. of coke. For the average working of the cupola this gives a rate of melting of about 8½ to 1, varying, of course, with the amount. For, as the quantity melted increases, so does the per pound of fuel, frequently rising to above 9 and sometimes falling to below 8 pounds of iron per pound of coke.

Blast.—The blast is furnished by a positive action Root blower, driven direct by an electric motor at a speed of 4,500 revolutions per minute and producing an air pressure for the blast of 10 in. of water. With this the iron comes down in from 5 to 10 minutes after putting on the blast, and the rate of melting will be about 18 tons per hour, with a total output for each cupola of from 105 to 110 tons, with the first tap in about 30 minutes after the putting on of the blast.

Tapping the Cupola.—The metal is tapped from the cupola direct into the reservoir and from there is run into the pouring



Chill Test Pieces.

ladles. As this is about to be done a handful of ferro-manganese is thrown into the bottom of the ladle as it is considered that a better diffusion can be obtained in this way than if it is thrown on the top of the hot metal. The amount varies according to the character of the mixture as determined by the tests that have been cited.

Test Pieces.—Close watch is kept of the metal as it comes from the cupola and a test piece measuring 4 x 6 x 1¼ in. is cast from each tap broken, and the depth of chill noted, so that the results are kept remarkably even.

Pouring.—Then, in the pouring of the wheels, great care is exercised to keep the men as far apart as possible, so that one molder will not be injured by the carelessness of his neighbor. The method pursued is this: On the first pouring, for example, the molders of floors 1, 2, 3 and 4 each pour seven wheels in succession from the first metal drawn and as rapidly as they can. Nos. 1 and 3 will pour into molds on the east side of the building, and Nos. 2 and 4 on the west side. This puts a full floor between each two. Then, when the seven wheels

have been poured, Nos. 5, 6, 7 and 8 pour while 1, 2, 3 and 4 are shaking out, and so on down the line. It is the practice to pour the metal very hot and to fill the mold in about 9 seconds.

Apprentices.—In the molding and pouring of the metal, all pains are taken to secure the best of results. In the first place there is a regular school of apprentices, so as to insure a supply of skilled workmen. The apprentice first starts in the yard sorting iron, so as to become familiar with the appearances of the different grades. He then goes to the cupola and learns of the methods of mixing and charging. From the cupola he goes to the core room and learns the work of core making, tempering, baking, etc. He then becomes successively a second helper on the floor, first helper, extra molder and finally, when a vacancy occurs, is given a floor. In this way the men are kept interested in the work and are taught carefulness.

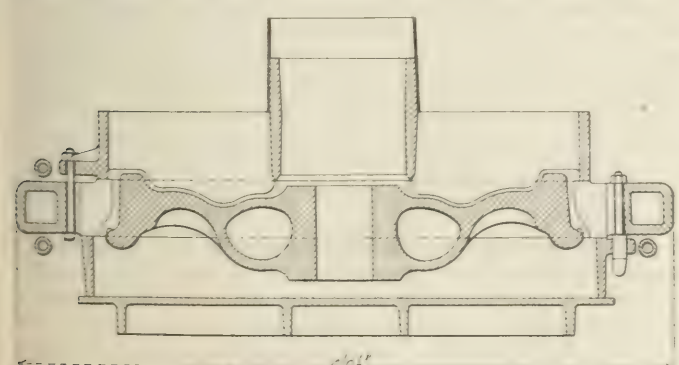
Wheels Lost.—Each molder pours his own wheels, handles the hot metal ladles and so can never shirk the responsibility for a lost wheel. This loss is, therefore, very low, running from .5 to .10 per cent., with an average of about .75 per cent.

Chills.—It is well known that the water-cooled contracting chill originated with the late J. N. Barr, who inaugurated the wheel work on the road. When he was alive the foundry was equipped with circular floors and very little trouble was experienced from the water leakages wetting the sand. But, with the introduction of the straight floor, so much trouble was experienced in this way that the use of steam to heat the chill and of water to cool it was abandoned, though the form of chill fitted for such a circulation is still used. It is thought that the circulation of air through this hollow ring has a very decided cooling effect, and so materially assists in holding the chill to size that it is worth retaining. The actual chill is of the usual segmental character with the fingers separated by a saw kerf.

Cores.—The cores used in the wheels are two kinds, differing slightly for the pan and the hub. The pan core is made of 20 parts by volume of sand, and 1 part of rye flour, mixed to the proper consistency with water, and blacked with XX mineral blacking. The hub core is made up of the same proportions, except that while fresh, new river or bank sand is used exclusively in the pan cores, in the hub cores the sand proportions are made up of 8 parts of old burnt core sand and 12 parts of new sand. Both cores are baked in the usual manner on rack carriages, in an open fire oven for from 3 to 4 hours.



Interior of Car Wheel Foundry. Chicago, Milwaukee & St. Paul Railway.



Chill for Car Wheel.

Tests.—The wheels so made stand the M. C. B. thermal test, running from 2¼ to 5 minutes before cracking and withstanding a drop test of from 150 to 175 blows of a 100-lb. drop falling 7 ft., without breaking.

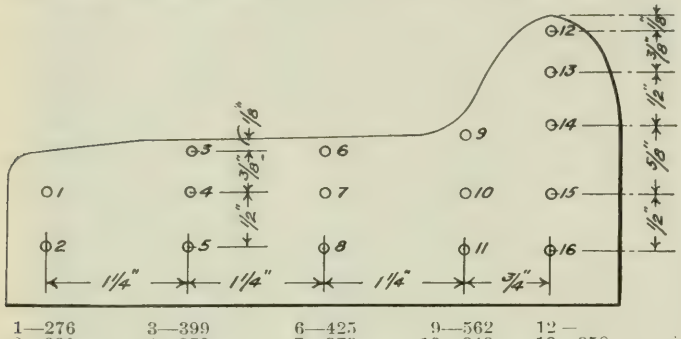
Treatment of the Men.—A part of the good results obtained are attributed to the treatment accorded to the men. They are provided with ample toilet, bath and washroom facilities, of which they take full advantage. The day's work begins at about quarter past six and is over at five. The facilities of the foundry are such that very few men are employed. There is a molder and one helper on each floor, and besides the cupola tenders, the cleaners and pitting men, there are but two or three other laborers about the premises. A record is kept of each man's work, and he is listed according to the percentage of his wheel losses; this list is posted monthly, creating a strong rivalry among them to be at the head.

Physical and Chemical Properties of Wheels.—As for the physical properties of the wheels made here; that they are sat-

isfactory is evidenced by the fact that the company considers it better to make than to buy its wheels. As for the records of service they may be taken as giving an average life of about 80,000 miles. As to the physical and chemical properties of the finished wheels there are no records, but it is assumed that the combined carbon rises about .10 per cent. above, and the silicon drops about .10 per cent. below the average of the mixture, in passing through the cupola.

From this resumé of the conditions obtaining at Milwaukee, it will be seen that the personal factor of the foundryman in charge enters largely into the character of the product and that it would be quite impossible for an outsider to go in and, taking such records as exist, obtain results that would be equal to those that are now produced. That these results are satisfactory to the railway company is evidenced by the fact that the wheels from the Milwaukee foundry are given the preference under the home cars and no wheels are bought from outside parties so long as the capacity of the foundry is up to the demands.

Hardness.—There is also very little data at hand regarding the relative degrees of hardness of the various portions of the tread of a cast-iron wheel. A section of a tread of one of the Milwaukee wheels, that may be considered typical, has been



1—276 2—220 | 3—399 4—373 5—182 | 6—425 7—372 8—200 | 9—562 10—243 11—224 | 12— 13—358 14—330 15—215 16—121

Results of Hardness Tests Made at Various Points on Cast Iron Car Wheel.

taken and subjected to a Brinnell test, the load being applied for 10 seconds in each instance. The results are shown in the accompanying engraving, from which it will be seen that the hardest portion of the section of the wheel is in the chill of the throat and that the hardness tapers down as the edge of the rim is approached. There are indications, however, that possibly the hardest part of the section may have been at the point of the flange, but no record was obtained at this point as the metal chipped off because it did not have strength enough to sustain the pressure of the Brinnell ball. It will be seen, too, that the surface hardness of the metal drops away very rapidly as we go down into the rim. For example, take the three indications at 1¼ in. outside the throat; they drop from 425 at ⅛ in. below the surface to 200 in the gray iron. Tests that were made on the surface of the tread in line with the two rows 1¼ in. and 2½ in. from the throat gave hardness of 591 and 451, respectively, thus checking the indications of a softening of the wheel as we approach the edge of the rim. The probability is that the hardest part of the wheel is in the throat, which is where it would be expected to be because of the intensity of the chilling action at that point. The chill on the wheel tested was very uniform and had a depth of ⅝ in.

LEATHER BELTING.

The difference in the cost of a good and a poor grade of belting is small compared to the expense of maintaining an inferior grade, or of the loss due to belt failures when an inferior grade is used. Two things are necessary in order to keep the cost of maintenance and the number of failures at a minimum. The best quality of belting should be used and its care should be placed in the hands of a specialist, with instructions to prevent failures rather than to remedy them after they have occurred.

The Delaware, Lackawanna & Western, realizing the importance of using the best quality of belting, has recently put into force the following specification, which is more thorough and complete than that ordinarily used.

"All butts used in the construction of this belting shall be of No. 1 selection, free from all defects and blemishes and of the native packer steer hides class, tanned by the slow oak bark process. The shoulder portion of every butt shall be severed at 4 ft. from the tail end, leaving not more than 4 ft. of length to be used in the butt before stretching, and not more than 4 ft. 6 in. after stretching. In the preliminary process of currying the butt shall receive every detail of treatment necessary for the proper setting out and condensation of fiber, in order to insure the greatest possible amount of cohesive strength in the leather. The leather shall be lubricated by processes that will insure the penetration, diffusion and retention of the greases. Nothing shall be used in such lubrications but the pure meat tallow. The leather shall be stretched in straight edged clamps and there shall be no attempt to incorporate any portion of the rear cheek pieces in the lap sections of the belt. Centers and sides must be stretched separately; that is, all the side leather from which widths under 8 in. are to be cut shall be stretched, removed from the influence of the backbone center section and the centers stretched in exactly the size for which they are to be used.

"Every ply of which this belting is constructed shall include the back-bone piece intact, in all sizes 8 in. and above; and in sizes below 8 in. when particularly specified; but, if not so specified, all sizes below 8 in. shall not be cut from any other section but the quality area, which extends not more than 15 in. each side of the back-bone, and all sizes in both single and double must show an even thickness from edge to edge. The same character of leather stock must be used in all doubles on both sides. The strips in every roll of single and double belting shall be matched and graded in order to obtain uniformity by selecting from like location in the belting butt the different cuts for the complete roll of belting, so that each length between laps will be of like texture, caliber and quality; in the construction of all double belting the plies shall be specially matched and graded to insure a level, even and symmetrical construction throughout, and no shims shall be used to fill in or build up to a fictitious thickness. The scarfing, joining and cementing shall be done by expert and experienced workmen; the cement shall be of the best character obtainable, and the press work and accuracy of the laps as perfect as it is possible to obtain in any belt construction.

"All belts shall be subjected to stretch test and tests for straightness of laps under strain of not less than 2,000 lbs. per sq. in. before delivery. Belts must have a tensile strength of not less than 3,800 lbs. per sq. in. in either the leather or the splice, and an elongation of not more than 20 per cent. in 2 in. All belting must bear the manufacturer's brand and name on every 10 ft. The weights for this grade of belting shall be for singles, 16 ozs. to the sq. ft., and in all doubles from 4 in. up, 32 ozs. to the sq. ft., unless otherwise instructed; the weight for doubles below 4 in., 30 ozs. per sq. ft., unless otherwise instructed for lighter weight. All three-ply, 48 ozs. to the sq. ft.

"The manufacturer shall give a guarantee to remedy any defects that may be due to inferiority of material or workmanship at his own expense at any time. All belting must be shipped to Scranton, Pa., for test and inspection. Material which fails to meet all the above requirements will be condemned and returned at the expense of the shipper, he paying freight charges in both directions."

General News Section.

The Pennsylvania Railroad has been experimenting at Altoona with a wireless telegraph; and, with receiving apparatus attached to kites, flown a considerable distance above the surface of the earth, messages were received from a vessel in the gulf of Mexico and from one 600 miles out in the Atlantic ocean.

For the month of January, when weather conditions were severe the percentage of passenger trains in New York State arriving on time, as reported to the Public Service Commission, Second district, was 73. The average delay of each late train was 39.9 minutes, and the average delay for each train run was 10.8 minutes.

The Southern Pacific has let to the A. B. Corey Construction Co., a Utah contracting firm, the contract to build a 28-mile pipe line from Strongknob, Utah, to Lemay. This is an addition to the line built about two years ago from Terrace to Lemay. The line supplies water for locomotive watering stations in the arid region west of the lake, and it is said that when the addition is finished it will be the longest pipe line for water in the United States. The construction company expects to put 500 men to work at once.

At St. Paul on Friday last between 80 and 90 men stood in line, many of them for 24 hours, at the general office of the Northern Pacific, in order to be ready for a good chance in buying some of the 250,000 acres of land in North Dakota and Montana, which was offered for sale by the railway company on that day. Most of these applicants were from towns near the lands offered and many of them were bankers or representatives of bankers. It is said with this sale the last of the big cattle ranges of Montana will be turned into wheat fields.

Near Wilmington, Del., on the afternoon of March 23, the conductor of a Baltimore & Ohio passenger train and the porter of a parlor car on the train were instantly killed with a pistol by a crazy man. After the shooting the murderer barricaded himself in a toilet room, where he held the police of Wilmington at bay, having in his possession a revolver and 100 rounds of ammunition. After detaining the train for over an hour, many shots being fired on both sides, the murderer was dislodged by a stream of water from a fire engine; but he came out still belligerent and had to be shot dead. Two of the policemen were injured by his shots.

Henry Miller, vice-president and general manager of the Wabash, has issued a statement that this road may use the free bridge which the city of St. Louis proposes to construct across the Mississippi river. Mr. Miller's statement is as follows: "If convenient rail connections are available the Wabash will be glad to use the free bridge for the handling of such of its traffic as will be expedited thereby, and, properly worked out, it looks like an excellent way to avoid the tunnel with passenger trains. It was the Wabash which first put St. Louis on the railway map, by instituting the through bill of lading. Immediately after the Wabash took the lead the other eastern roads followed."

Compilations have been made from reports tabulated by the Census Bureau showing in a long list of maladies, that the only one to which the railway employee is more liable than workers in manufacturing or agricultural trades is typhoid fever, and to this he is far less liable than are the workers classed as "laborers." The figures shows that the railway man is far less liable to consumption than workers in the manufacturing and mechanical industries. He is less apt to commit suicide than any other wage earner, and suffers less from rheumatism and malarial fever. His nevrous system, according to the statistics, is in excellent shape. Heart disease and pneumonia are rarer among railway employees than among any other working men.

Daniel Willard, president of the Baltimore & Ohio, and other officers of the road made a thorough inspection last week of the property of the Chicago Terminal Transfer, which has now passed entirely into the control of the Baltimore & Ohio. While in Chicago Mr. Willard said that it had been decided to make extensive improvements in the Terminal Transfer property. It has not yet been decided whether the road will be operated as a division of the Baltimore & Ohio or under a separate organization; he thought the latter plan would be adopted. The road in future will be known as the Baltimore & Ohio Chicago Terminal Railroad. It is still being operated by John N. Faithorn, its receiver, but it is expected that the receivership will be terminated about April 1.

A Specialist in Prevention of Accidents.

R. C. Richards, general claim agent of the Chicago & North Western, will in future devote most of his time to the study of the causes of accidents on this road and to the devising and application of methods for preventing them. As stated in another column, H. C. Howe has been appointed freight claim agent, relieving Mr. Richards of the duties incident to the handling of claims for loss and damage to freight and giving him more time to devote to personal injury claims and claims for damage to property other than freight claims. Mr. Richards will spend more of his time in future on the road, where he will get employees together, call their attention to means by which accidents which have happened could have been avoided and conduct a general campaign of education for the elimination of accidents. In particular, he will try to devise ways for reducing the number of accidents to employees.

Two Miles in Less Than a Minute.

At Ormond, Fla., March 23, Barney Oldfield, in his Benz automobile, traversed two miles in 55.38 seconds, or at the rate of 130.01 miles an hour, breaking all records for two miles. He also broke another record by covering one kilometer in 17.04 seconds, or at the rate of 131.29 miles an hour. The record for one mile, made by Oldfield March 16, and reported in a previous issue (131.72 miles an hour) was something more than one mile an hour better than the best previous speed with any kind of a vehicle ever run by man on the surface of the earth, the best time reported by the electric railway car between Berlin and Zossen, Germany, in 1903, being at the rate of 130½ miles an hour.

The Ormond despatch, of March 23, says that George Robertson traversed one mile in 30.39 seconds in Walter Christie's car, making the best time for one mile ever recorded for an American built car.

Railway Matters in Washington.

Washington, March 30, 1910.

The house committee finally reported the Interstate Commerce bill March 24, with many of the sections rewritten. The changes which have been made by the committee deal with matters of detail. It will be hardly worth while to rehearse these details at this time, for it is said that the objections which have been presented in the Senate will result in the drafting of numerous amendments in the Senate bill, designed to meet these objections; and the proposed new amendments are to be drafted, it is said, by Attorney-General Wickersham, the primary author of both the House and the Senate bills. The Senate still remains in the listless attitude which has characterized it all along, but an attempt to limit debate and set a date for taking a vote was defeated. It is said that Senator Root, of New York, will address the Senate on the bill this week. Senator Bailey, of Texas, a leader of the Democrats, is expected also to speak. President Taft is becoming a trifle impatient, aand it is reported that he is now urging members to get the bill passed in some shape in both houses, and then, if necessary, send the whole subject to a conference committee.

Chairman Mann, of the house committee, has decided to ask.

next Monday, for unanimous consent to the consideration of the bill.

The proposition to restrict the publicity of corporation returns made under the corporation tax law, has now taken another shape; Senator La Follette, of Wisconsin, has procured the insertion in the appropriation bill of a clause making the tax returns public "when called for by resolution of the Senate or House"; and presumably not otherwise.

Increases of Railway Employees' Pay.

The Pennsylvania Railroad has made a voluntary increase of 6 per cent. in the pay of all employees who now get less than $300 a month, the increase to take effect April 1. This applies to all employees regardless of how their pay is computed. It is understood that a similar advance will be made on the lines west of Pittsburg, thus affecting about 175,000 men. On the lines east of Pittsburg the company employs about 123,000 men, and on the western lines there are 58,000 more.

In 1907 the Pennsylvania Railroad made a horizontal increase of 10 per cent. in the pay of employees. During the last few months the Pennsylvania has made some wage adjustments with its locomotive engineers.

Following the negotiations of the past few weeks, it was announced in New Haven this week that the conductors, trainmen and yardmen of the New York, New Haven & Hartford would be granted increases of pay amounting to $500,000 a year, said to be 15 per cent. of the total amount now being paid out for wages—meaning, presumably, the wages paid to these classes. The pay of passenger conductors is increased from $3.60 a day to $4.20 per 100 miles; ticket collectors from $2.40 to $3.35; baggage masters from $2.40 to $2.75; passenger brakemen from $2.20 to $2.55; freight conductors from 3.55 cents a mile to 3.63 cents a mile; freight flagmen from $2.45 to $2.52½; brakemen from $2.35 to $2.42. Men engaged on work trains and in similar work are to have their working day reduced from 11 hours to 10.

Members of the Order of Railway Conductors and of the Brotherhood of Railway Trainmen on the New York Central are this week voting on the question whether to accept a compromise proposed by the officers of the road. It is said that these employees have demanded twice as large an increase in pay as the company is willing to grant. The leaders of the trainmen say that their minimum demand is for the same increase that has been or will be agreed to on the Baltimore & Ohio.

The Board of Arbitration, reporting on the controversy between the Cleveland, Cincinnati, Chicago & St. Louis and its telegraph operators, made a report on Monday of this week. The telegraphers will get a considerable increase. On the same day that this decision was announced another press despatch represented the same road as demanding increases in pay.

A press despatch from Winnipeg says that all of the unions of mechanics on both the Canadian Pacific and the Canadian Northern have formed an alliance to demand increases of pay. About 15,000 men are involved, and they say that they are now well organized and do not expect to repeat the failure of two years ago.

The Canadian Pacific, the Grand Trunk and the Toronto, Hamilton & Buffalo will next week begin arbitration with certain of their employees concerning wages. These arbitrations are carried out under the Lemieux act. The representative of the three railways is Wallace Nesbitt, a lawyer.

A press despatch from Denver says that the Brotherhood of Railroad Trainmen has asked for an increase of pay on the Colorado & Southern, and that similar requests will be made of the Chicago, Burlington & Quincy, the Union Pacific and the Denver & Rio Grande.

The conductors and trainmen of the Cleveland, Cincinnati, Chicago & St. Louis are this week voting on the question of approving the action of their leaders in demanding from the company higher rates of pay than the company has yet agreed to.

Committees of the conductors' and brakemen's brotherhoods have presented an application for higher pay to the general manager of the Lake Shore & Michigan Southern.

The Joint Adjustment Committee of the employees of the Boston & Maine is urging on the officers of the company a request for 10 per cent. increase in pay.

Telegraphers on the Southern Railway are voting on the question of accepting a 5 per cent. increase in wages offered by the company.

Committees of the Brotherhood of Locomotive Engineers have asked the Erie road for an increase of pay.

The Western Maryland has made an increase of 8 per cent. in the pay of its 200 locomotive engineers.

The Firemen's Brotherhood has secured concessions in regard to wages from the Lehigh Valley.

The railways entering Chicago which were concerned in the arbitration by the Illinois Board of Arbitration of the wages to be paid their switchmen, have consented to pay these employees the same rates as have been awarded by the federal board of arbitration to switchmen employed by other roads in the Chicago district. As noted last week, pages 841 and 842, the Illinois board awarded switchmen belonging to the Brotherhood of Railroad Trainmen an increase of two cents an hour, while a board organized under the Federal law awarded switchmen on other roads in the Chicago district an advance of three cents an hour. This greater advance, under the new arrangement, will be given to all.

In return for this concession in wages by the railways, the members of the Brotherhood of Railroad Trainmen have consented to a modification of certain rules in the agreement signed by their representatives and those of the railways on March 19. The agreement then signed provided that yardmen should be paid pro rata for over-time and that any time less than 30 minutes should be paid for as a half hour. It also provided that more than a half hour over-time should be paid for as an hour. The rule as changed provides that yardmen shall be paid pro rata for over-time, actual minutes to be counted. One of the rules in the agreement signed on March 19 read as follows:

"Ten hours or less shall constitute a day's work, and the duties assigned to each crew shall be such as not to require a longer day's work under average conditions. No new work shall be assigned after the expiration of ten hours, nor, excepting in cases of emergency, shall any new work be assigned shortly before the expiration of ten hours if such assignment shall cause the men to work overtime."

This rule has been revised under the new agreement so as to read as follows:

"Ten hours or less shall constitute a day's work. No new work shall be assigned after the expiration of ten hours."

Switchmen of the Indiana Harbor Belt were left out of the new agreement, as officers of this road were not able to attend the conference.

On March 24 an agreement was signed by the representatives of 49 western railways and the representatives of the firemen employed by these roads binding them to terms of settlement of the controversy over wages and conditions of employment between them. The negotiations had been going on since March 17. Under the terms of the agreement the question of an increase in wages will go to arbitration under the Erdman act. The rule of seniority to be applied was settled, but has not been made public. The question of the representation of members of the Brotherhood of Firemen who have become enginemen is understood to remain unsettled.

A. J. Earling on Conditions on the Chicago, Milwaukee & Puget Sound.

President A. J. Earling, of the Chicago, Milwaukee & St. Paul, in an interview at Seattle during his recent western trip, said that the Chicago, Milwaukee & Puget Sound will confine its building operations in 1910 largely to the completion of the branch lines now under construction or authorized.

"For some time," Mr. Earling said, "there has existed a sensitive situation, together with a lack of confidence in eastern financial circles, and it is hard to find a market for railway securities. No such situation exists in the west. Conditions here could not well be better. Operating conditions on the Milwaukee's coast extension are much better than I had been led to believe. The last of the interruptions to

traffic has been cleared away. Although conditions on the west end of the line were bad during the latter part of February and the early part of March, as on the other northern roads, they quickly improved. The winter in the northwest east of the Missouri river was the worst I have seen in forty-five years."

Mr. Earling denied rumors that the Chicago, Milwaukee & Puget Sound had purchased the Idaho, Washington & Northern and the Washington, Idaho & Montana.

"The Milwaukee has been promised the last of its equipment for the Seattle-Chicago through passenger service by June 15," he said, "and we ought to be ready to inaugurate through passenger service by July 1, or shortly thereafter. Meantime we shall put the roadbed west of Mobridge in the very best of condition for the fast operation of passenger and mail trains. The service will include two through trains between Seattle and Chicago each way per day, in addition to the present local trains.

"We have planned a campaign of advertising and exploitation of Washington and the whole Pacific northwest for this year."

Labor Legislation of 1908 and 1909.

Bulletin No. 85 of the United States Bureau of Labor reviews the labor legislation of the country during the past two years. An increasing uniformity in the provisions of such legislation is clearly in evidence.

Commissions to investigate the liability of employers for injuries to their employees and better methods of compensating employees for the results of accidents were appointed in Minnesota and New York, while Wisconsin had a similar body at work under an earlier appointment. The co-operation of these commissions, though not at all provided for in the laws creating them, has been a practical economy in the matter of conducting investigations. Arizona, Illinois and Ohio assigned the conditions and regulation of mine labor to commissions for investigation and report.

Five states (Michigan, Texas, Idaho, Maine and New Jersey) and the Philippine Islands passed laws affecting employers liability directly; while in Georgia, Iowa, Massachusetts, Mississippi, Ohio and South Dakota the customary defenses of employers in suits for damages by injured employees, i. e., fellow-service, assumed risks and contributory negligence, were more or less restricted or modified. The doctrine of comparative negligence, with a corresponding award of damages, has been incorporated in the laws of Texas, Iowa and Ohio, and in a modified form in Georgia.

A statute of Montana provides for a state co-operative insurance fund to be maintained by coal-mine operators and their employees and administered by state officials.

More than fifty separate laws were passed by the legislatures of various states within the past two years regulating the conditions of employment in factories and mercantile establishments. Laws providing for a higher standard of ventilation, and requiring artificial ventilation where necessary, were passed in Illinois and Minnesota. A law was enacted in Oklahoma, prohibiting the sending of workmen into steam boilers, fireboxes, etc., before the steam is exhausted or the fire drawn.

Massachusetts enacted a new law requiring the water used for humidifying the air in workrooms to be so pure as not to give rise to impure or foul odors.

The safety of employees in mines is the subject of a number of laws. The increasing employment of electricity for lighting and other uses in mines received attention in Idaho, Ohio and Oklahoma, where proper insulation and other precautions are prescribed. Safety lamps, explosives and blasting, ventilation, inspection and the exclusion of intoxicants and intoxicated persons are features of several laws relating to mines. A number of states require mine employees to secure certificates of competency before being employed. The New York legislature enacted a law, the first of its class in the United States, governing the employment of workmen in mines and tunnels where compressed air is used; the hours of labor per day are regulated according to the degree of air pressure, and provision is made against too sudden changes from the place of work to open air; medical examinations prior to employment or re-employment after an absence of three or more days, as well as after each three months' continuous employment, are prescribed.

Laws regulating railway employment were passed by several states, three principal features being a determination of the number of persons necessary to constitute crews on trains, the provision of adequate headlights on locomotives, and regulation of the size, construction and equipment of cabooses. Safety appliances, as brakes, couplers and ash pans on locomotives are other provisions of laws of this class.

Four states (Connecticut, Mississippi, North Carolina and Texas) passed laws prohibiting blacklisting, while conspiracy, intimidation and interference with employment are subjects of other laws. In the class last named is a law enacted by Congress making it an offense to entice employees in arsenals or armories to leave service during the term of their employment, or to avoid or break their contracts. Hiring, retaining or employing or harboring in any wise such workmen during their term of service is also forbidden.

The giving of a commission or bonus to domestic servants or others making purchases for their employers is made an offense in New Jersey and Washington, the receiving of tips by waiters in hotels and restaurants and the giving of such tips being also prohibited in the latter state.

On the employment of women and children thirty-two states have enacted fifty-four laws or amendments thereon in the past two years. Extended and detailed lists of employments prohibited for children appear in the legislation of New York, North Dakota, Ohio, Oklahoma and Pennsylvania, and in a number of states new laws are added prohibiting night work. Other laws relate to the negligence of employees, the reporting of accidents, the control of private employment agencies, the protection against discharge by employers or exclusion by labor unions of workmen who are or may become members of the national guard, and the protection of employees on building construction.

Average Pay of Enginemen in New York.

The pay-roll of one of the large railways terminating in New York City has been analyzed, and averages computed on the basis of actual time worked. This road guarantees its engineers a minimum of $4 a day. The following table shows average selections of enginemen running freight trains in the month of December.

Freight Runs.

Enginemen.	No. of days worked.	Time, in hours.	Amt. earned in month.	Average pay per hour in service.
Allen	26	188	$128.66	$0.68
Bond	27	335	196.56	.59
Camp	25	257	137.32	.53
Dent	29	241	121.44	.50
Earl	25	285	135.89	.48
Fisk	31	263	128.96	.49
Gill	25	274	110.76	.40

Passenger Runs.

Enginemen.	No. of days worked.	Actual time in hours.	Amt. earned in month.	Average pay per actual hour worked.
Hope	16	96	$170.35	$1.77
Ives	15	105	126.95	1.21
Jenks	18	160	170.59	1.07
Kent	28	121	196.56	1.62
Lent	24	96	172.85	1.80
Moon	28	166	161.58	.97
Nelson	29	89	119.42	1.34
Oakes	30	115	117.86	1.02

It is seen from this table that the pay varies from $0.97 to $1.80 per hour. On a daily basis of 10 hours, this would be $9.70 and $18 a day respectively.

Delegates to the International Railway Congress.

The Secretary of State, supplementing his former announcement of the appointment of Messrs. Lane, Clark, Harrison, Garrett, Brown and Haines, announces the appointment of three additional delegates to the congress, to be held at Berne next July; namely, W. F. Schleiter, secretary of Dilworth, Porter & Co., Ltd., Pittsburgh, Pa.; C. A. Severance, lawyer, St. Paul, Minn., and William C. Kuntz, Steelton, Pa. Mr. Kuntz is now sales agent of the Pennsylvania Steel Co., but

expects soon to discontinue his service with that company and to take a position with the Goldschmidt Thermit Co., New York City.

Approval of the Burr Mail Delivery Apparatus.

The Burr device for delivering mail bags from moving cars, which was described in the *Railway Age Gazette* October 15 last, page 715, has been approved by the Postmaster-General, and can now be introduced by any railway company which sees fit to adopt it. This apparatus has been in use regularly on the Chicago, Rock Island & Pacific between Davenport, Iowa, and Union Pacific Transfer, for nearly a year and intermittently for about four years.

This device operates by compressed air. The mail bags to be left at a station are piled on an iron grating or apron which, when at rest, hangs down along the side of the mail car and forms the door step to the side door. When pulled up in position to be loaded it lies on the floor of the car, projecting out of the door about ten inches. A chain and lever connects this platform with the compressed air cylinder, which, when power is applied, pulls the apron outward and downward, delivering the mail in a box or trough prepared for it, or upon the ground. The air pressure is furnished by the air brake system. If a box is used at a station, the side of the box nearest the track serves to prevent bags from falling under the wheels of the train. If no box is used then a guard railing is put up at the point where the mail is dumped. The air power is applied by a trigger, which, when at rest, lies along side of the car about on a level with the bottom of the car sills. This trigger when set for operation, just before reaching a station, projects about twenty inches from the side of the car, and when it reaches the place where the mail is to be dropped engages with a sloping rod fixed on a post and arranged parallel with the track. The trigger slides up this sloping rod until the motion is sufficient to open the valve of the compressed air reservoir.

The catching device does not differ materially from others now in use.

A Correction.

In the daily edition of the *Railway Age Gazette* of March 17, page 686, the Hon. George P. Graham, minister of railways and canals of Canada, was quoted as saying that the new Quebec bridge would have a span of nearly 800 ft. The figure should have been 1,800 ft.

American Railway Tool Foremen's Association.

This association was organized in Chicago on December 7, 1909, with 39 charter members. The next meeting will be held in Chicago, July 12, 1910, when papers on the following subjects will be presented and discussed: The Tool Check System; Special Tools for Railway Work; Treatment of Steel; The Tool Room—Past, Present and Future; Pneumatic Tool Repairs; High Speed Steel; Railway Legislation and the Railway Employee. Tool foremen who are not identified with this association are urged to communicate with the secretary-treasurer, O. T. Harroun, tool foreman, C. & A. Ry., Bloomington, Ill. The other officers are: President, F. J. Powell, of the El Paso & Southwestern, at El Paso, Tex.; first vice-president, M. H. Bray, New Haven, Conn.; second vice-president, A. W. Meitz, Grand Rapids, Mich.; third vice-president, John T. Fuhrman, St. Paul, Minn.; chairman of executive committee, J. W. Pike, Silvis, Ill.

American Association of General Passenger and Ticket Agents.

At the annual convention, held in Havana, Cuba, on March 28, the following officers were elected: President, Samuel Moody, Pennsylvania Railroad; vice-president, C. A. Cairns, Chicago North Western; secretary, C. M. Burt, Boston & Maine (re-elected). It was decided to hold the next annual convention at St. Paul.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
Railway Telegraph and Telephone Appliance Ass'n.—H. M. Buck, Secy.-Treas., 30 Church street, New York.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Norquist, Chicago.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

The joint committee representing the municipal assembly and the shippers of St. Louis, which has been appointed to confer with the railways with a view to securing the abolition of all bridge arbitraries across the Mississippi river, has voted to entertain no proposition from the railways which does not include the entire abolition of these arbitraries.

Massachusetts, sometimes spoken of as a state of abandoned farms, is the scene of the latest Farmers' Special. The Boston & Albany, with a train "laden with wisdom, wise men and instructive exhibits," carrying Professor Hurd and other experts from the State Agricultural College, is this week making a four days' trip over its main line and principal branches. At North Adams and Worcester evening meetings were held.

The Traffic Club of Chicago at its meeting this week elected the following officers for the ensuing year: President, John T. Stockton; First Vice-President, Frank P. Eyman; Second Vice-President, W. M. Hopkins; Third Vice-President, G. K. Sage; Treasurer, John H. Grace; Secretary, Guy S. McCabe; Directors, O. F. Bell, J. Charles Maddison, W. H. Johnson and Geo. E. White.

Representatives of the railways estimate that more than 130,000 head of cattle will be shipped from the ranches south and west of San Antonio, Tex., to Oklahoma during the four weeks ending about April 15. Shippers have already ordered over 4,500 cars and the roads are receiving additional orders daily. This heavy movement of stock is due to a scarcity of grass upon the ranges, caused by a shortage of rain fall during the past winter.

The Lehigh Valley, not content with such temporary measures as running special trains for the instruction of farmers, has established a permanent agricultural department and has appointed as the head of it F. R. Stevens, heretofore a traveling agent of the New York State Department of Agriculture. Mr. Stevens will devote his time principally to giving lectures to farmers an following up the lectures with such individual conferences or instruction as may be found desirable or necessary.

J. M. Glenn, secretary of the Illinois Manufacturers' Association, has issued a circular saying that an advance in the freight rates of the differential lines between Chicago and New York was prevented by the Grand Trunk, and suggesting that members who are interested "give the Grand Trunk System all the moral as well as material encouragement they can to aid it in maintaining the stand it has taken." Mr. Glenn has also issued a circular protesting against the advance in rates on coal from Illinois and Indiana points.

The Niagara Frontier Shippers' Traffic Association has complained to the New York State Public Service Commission against the adoption of the National Car Demurrage rules by the railways in and around Buffalo. Complainants declare that the rule allowing the railways to notify the consignee on the arrival of a car instead of after it is placed for unloading is unlawful, as also the rule allowing the road to set a car on some other track when the usual track is occupied. It is also claimed that the note estopping a consignee from complaining of the insufficiency of a notice does not adequately cover the subject.

Business men of Kansas City have subscribed $1,000,000 to a fund to maintain a line of freight boats on the Missouri river between that city and St. Louis. The use of this stream as a highway for transporting freight at rates lower than those charged by the railways has been agitated by Kansas City merchants for two years. When the full amount was assured a big demonstration was held at the boat line headquarters, and United States Senator Burton was telegraphed to, reminding him of his "promise to Kansas City, made in December, 1906, of a government appropriation for the Missouri river if Kansas City would use the river."

Adrian Gips, general agent of the Holland-America Steamship Line at New York, has been fined $4,000 for receiving rebates on shipments of freight over the Central Vermont and the Wabash. Counsel for the defendant claimed that it was doubtful whether the steamship company should be regarded as a shipper, but did not press the point, and advised Gips to plead guilty, which he did. This is the same case in which certain officers of the railway companies have been indicted. On Tuesday David O. Ives, now with the Merchants' Association, of Boston, and formerly traffic manager of the Wabash, pleaded guilty before Judge Holt in the federal court at New York to paying a rebate to the steamship company, and was fined $1,000.

The railways belonging to the Southwestern Tariff Committee have adopted a rule to require shippers to pay postage on the tariffs sent to them. At a meeting on March 25 the tariff committee of the Missouri Manufacturers' Association of St. Louis decided unanimously to oppose this requirement. E. J. Troy, secretary of the association, in a letter to F. A. Leland, chairman of the Southwestern Tariff Committee, says that the tariff committee of the association feels that the business of the railways should be handled in the same way as any other business and that as the tariffs properly correspond to the catalogues of a commercial concern, they, like catalogues, should be placed in the hands of patrons without cost to them. He says that if the shippers should elect to refuse to pay the charges and should demand quotations of all rates in writing, the expense to the railways of furnishing rates would be much increased.

The curious situation at Albright, Neb., was noticed last week, page 843, when the new tariffs on dressed beef to Chicago were published, Albright, three miles southwest of South Omaha, was by mistake left out. The packers at Omaha have been switching their dressed beef to Albright and consigning it from there in the belief that the old rate of 18½ cents still legally applies from there to Chicago. The road (the Rock Island) contends, however, that the true origin of these shipments is South Omaha and that as the new rate of 23½ cents is published from South Omaha this is the rate that must be collected by the road and be paid by the packers. The higher rate is, therefore, being collected on the shipments from Albright, and in order to get back the difference, if they can legally get it back at all, the packers no doubt will have to sue the railway. Such a suit seems improbable.

Hearing Regarding Rates from New York to the Southwest.

Commissioner Prouty, of the Interstate Commerce Commission, took testimony at Kansas City last week in the proceeding brought by the Southwestern Shippers' Traffic Association for reductions in through freight rates from the Atlantic seaboard via Galveston to points in Kansas, Oklahoma, Texas and Colorado. The competition of the steamship lines from New York to the Gulf ports has caused heavy reductions in the rates to these ports. The complainants allege that by refusing to establish reasonable through rates from the seaboard via the Gulf ports into the interior, the rail carriers from the Gulf have prevented receivers of freight in the interior from obtaining the benefit to which they are entitled from the reductions in the steamship rates to the Gulf ports.

The all-rail rates to points in the section referred to, and also the water-and-rail rates, are based on the rates to the Missouri river. In other words, the rate to Wichita, Kan., is the rate from New York to Kansas City plus the local rate from Kansas City to Wichita. The complainants contend that the rates to points such as Wichita should be based on the rates to the Gulf instead of on the rates to the Missouri river. On the present method of making rates the rate to Wichita is higher than to Kansas City. The adoption of the proposed method would make the rate to Wichita lower than to Kansas City. The complainants argue that the rates to these interior points should be based on Galveston instead of on the Missouri river, because the cost of the service of transporting goods from New York via Galveston to the interior is less than the cost of the service of transporting them from New York to the Missouri river and thence to the interior point. The theory upon which the complainants are proceeding is shown by the following illustration: Oklahoma City is 1,550 miles by all-rail from New York City. The rate at present is based on the all-rail haul. The distance by water from New York to Galveston is 1,800 miles and the distance from Galveston to Oklahoma City is about 600 miles. The complainants

contend that it costs about one-sixth as much to haul goods by water as by rail, which makes the distance by water from New York to Galveston "constructively" 300 rail miles. The addition to this of the rail distance from Galveston to Oklahoma City makes a "constructive" mileage of 900 miles, and the complainants contend that the rates should be based on this constructive mileage. The principal witness for the complainants was J. H. Johnston, manager of the Oklahoma Traffic Association. The hearing will be resumed on April 17, when the railways will introduce their testimony.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 67-A, giving a summary of car shortages and surpluses by groups from November 25, 1908, to March 16, 1910, says:

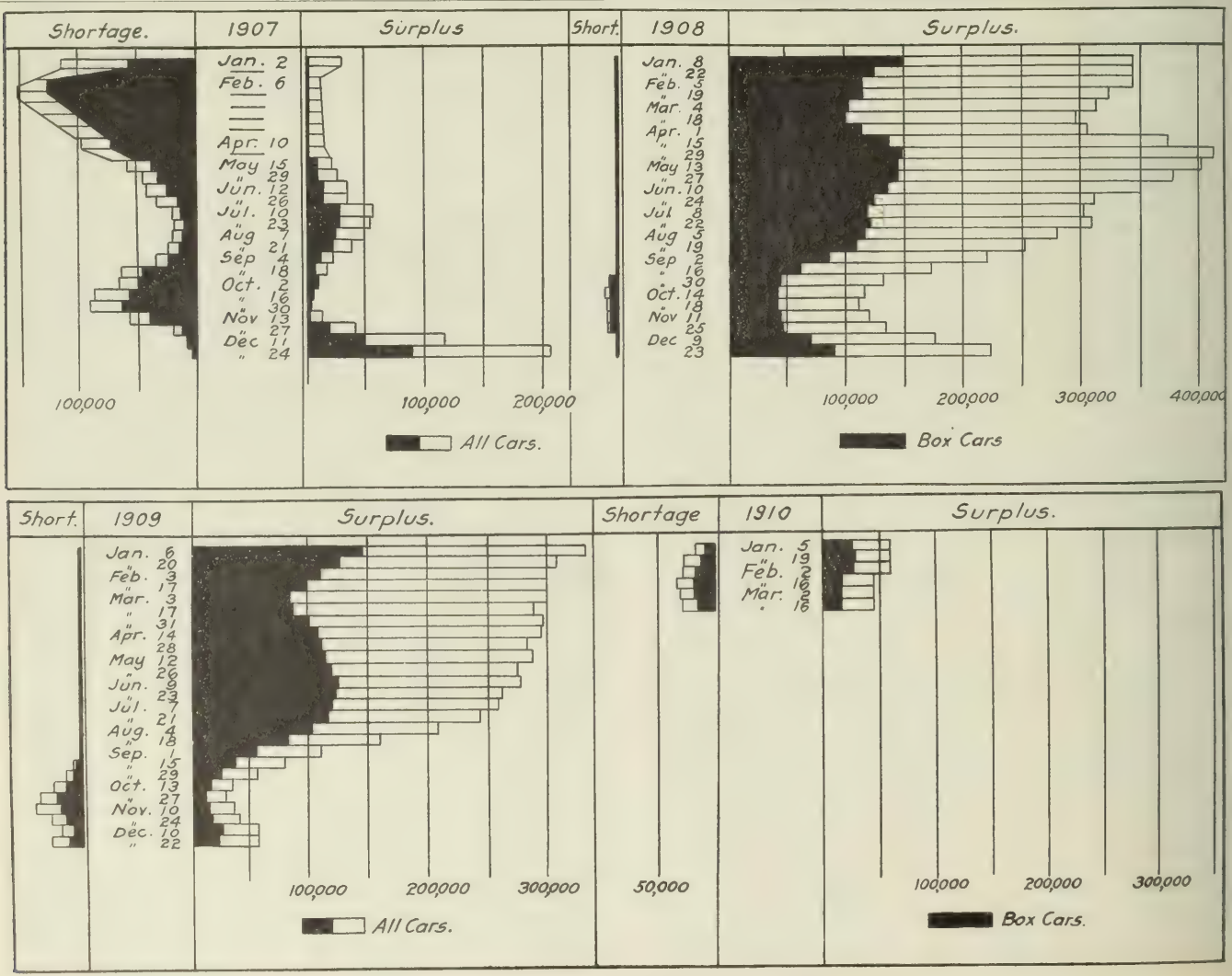
"While the total of surplus cars shows but little change, the class figures indicate some falling off in the use of box cars and an increase in the demand for coal and gondola cars. The increase in box surplus is especially noticeable in group 6 (Northwestern), while groups 4 (South Atlantic) and 5 (Southern), show an increased demand for this class. On the shortage side there is a decrease of 2,720 cars. The box car shortage decreased 3,839 cars, the principal change being in group 6 (Northwestern).

The accompanying table gives surpluses and shortages by groups on March 16, 1910, and the charts show total surpluses and shortages in 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1 March 16, 1910	8	97	669	566	46	1,378	45	5	31	401	482
" 2— " 16, 1910	22	333	53	1,351	609	2,346	539	517	2,468	23	3,547
" 3— " 16, 1910	22	663	210	160	1,514	2,547	2,060	155	3,266	1,747	7,228
" 4— " 16, 1910	10	973	43	382	621	2,019	3,430	180	2,452	725	6,787
" 5— " 16, 1910	21	682	475	683	656	2,676	2,204	771	893	150	4,018
" 6— " 16, 1910	17	5,851	437	2,199	2,739	11,226	1,822	255	26	617	2,720
" 7— " 16, 1910	4	236	129	328	308	1,001	.....	.....	.....	.....	.....
" 8— " 16, 1910	14	1,150	78	283	1,487	2,998	28	2	4	108	142
" 9— " 16, 1910	10	1,144	320	273	630	2,367	150	.....	.....	624	774
" 10— " 16, 1910	19	3,080	1,058	2,038	4,504	10,680	63	45	1	13	122
" 11— " 16, 1910	7	1,098	2,654	167	1,372	5,291	1,169	.....	.....	198	1,367
Grand total	154	15,487	6,126	8,430	14,486	44,529	11,510	1,930	9,141	4,606	27,187

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

MONTH OF JANUARY, 1910.
(See also issues of March 11, 18, and 25.)

Name of road.	Mileage operated at end of period.	Operating revenues— Freight.	Passenger.	Total, inc. misc.	Operating expenses— Maintenance— Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$93,643	$39,352	$143,259	$21,078	$25,065	$4,589	$46,453	$5,151	$102,336	$40,923	....	$4,350	$36,573	$5,955
Alabama Great Southern	309	249,857	89,144	371,038	46,806	73,335	8,685	109,673	8,379	246,878	124,160	—556	11,236	112,368	31,056
Atlantic & St. Lawrence	167	121,483	16,243	148,058	11,493	17,354	5,433	41,434	4,054	79,768	68,290	....	6,436	61,854	20,816
Bessemer & Lake Erie	201	211,112	19,069	239,593	42,155	107,077	8,474	111,496	7,946	277,148	—37,555	....	6,000	—43,555	—41,279
Canadian Pacific in Maine	233	100,976	20,072	128,128	23,962	20,851	4,234	55,546	5,717	110,310	17,818	....	5,000	12,818	17,578
Carolina, Clinchfield & Ohio	225*	96,728	9,364	108,538	11,532	17,123	5,926	23,715	8,540	66,836	41,702	....	4,000	37,702	38,168
Central New England	278	178,042	21,814	214,608	39,051	23,753	2,059	79,755	4,375	148,993	65,615	....	6,500	59,115	15,889
Chicago, Indiana & Southern	341	301,802	17,288	324,911	25,199	55,697	9,514	125,079	8,521	224,010	100,901	11	13,500	87,412	28,682
Chicago, Rock Island & Gulf	529	196,451	62,463	271,247	44,485	25,650	7,751	103,669	8,273	189,828	81,419	—250	8,593	72,576	5,839
Cleveland, Akron & Columbus	212	137,473	34,630	186,024	30,199	40,734	2,329	64,818	4,729	142,809	43,215	....	5,000	38,215	5,502
Cumberland Valley	162	173,877	41,363	225,928	25,192	29,758	7,031	78,015	5,829	145,825	80,103	691	4,084	76,710	—5,111
Detroit, Grand Haven & Milwaukee	190	98,316	33,488	149,127	19,321	24,520	6,697	76,975	4,412	131,925	17,202	—28	2,727	14,447	—5,522
Evansville & Terre Haute	310	119,546	49,623	187,973	22,092	36,701	5,615	64,735	6,335	135,478	52,495	—849	9,035	42,611	3,673
Georgia Southern & Florida	395	109,540	63,405	205,305	18,802	49,308	5,749	84,194	10,199	168,252	37,053	.....	8,119	28,934	—4,840
Grand Rapids & Indiana	587	244,644	101,803	373,043	51,676	68,760	10,598	185,408	13,698	330,140	42,902	948	24,071	19,779	—16,792
Kanawha & Michigan	175	200,102	21,810	227,138	41,682	63,907	1,903	60,760	4,722	172,974	54,164	—80	6,890	47,194	36,786
Louisiana Ry & Nav. Co.	350	98,064	14,245	124,768	20,065	17,033	4,902	55,589	6,185	103,774	20,994	....	4,250	16,744	16,604
Louisiana Western	198	107,118	54,412	169,961	21,199	26,673	6,116	50,073	6,438	110,499	59,462	1,066	5,500	55,028	—16,632
Minneapolis, St. Paul & S. S. Marie	2,495†	863,355	267,769	1,193,184	83,601	127,528	28,438	347,912	25,459	612,938	580,246	—339	60,666	519,241	353,076
Missouri Pacific	3,881‡	1,443,433	339,471	1,989,482	347,939	295,505	60,781	917,600	68,395	1,690,220	299,262	—5,735	79,385	214,142	.....
New Orleans & North Eastern	196	211,134	50,257	283,722	27,847	39,914	10,572	99,535	10,973	188,841	94,881	....	8,700	86,181	—8,262
New Orleans Great Northern	275§	94,907	26,508	128,358	17,248	15,299	2,285	31,229	5,164	71,225	57,133	—78	1,250	55,805	59,601
New York, Philadelphia & Norfolk	112	185,561	27,910	230,968	27,539	39,402	3,389	91,005	8,901	170,236	59,832	....	6,850	52,982	9,045
New York, Susquehanna & Western	151	130,231	45,456	201,250	18,211	20,702	2,176	95,465	3,472	140,027	61,224	—3,373	11,317	46,534	—20,488
Pecos & Northern Texas	198‡	98,198	18,811	122,259	19,639	19,788	2,264	38,319	4,043	84,053	38,206	....	2,097	36,109	6,309
Peoria & Eastern	351	198,101	48,872	263,800	20,079	49,893	6,140	101,898	5,289	183,299	80,501	....	9,200	71,301	43,588
Pittsburgh & Lake Erie	191	1,187,943	110,815	1,335,772	108,035	105,796	13,518	357,502	20,830	605,681	730,091	—426	28,000	701,665	313,196
Rutland	468	117,253	63,524	206,508	20,238	36,081	6,857	93,858	4,493	161,527	44,981	....	9,083	35,898	6,129
St. Louis, Iron Mountain & Southern	2,610	1,544,218	463,655	2,190,873	302,064	287,145	59,989	798,955	70,049	1,518,202	672,671	—9,066	70,413	593,192	56,070
San Antonio & Aransas Pass	727	224,876	81,884	325,807	56,014	37,510	4,107	125,844	8,989	232,464	93,343	....	9,000	84,343	51,908
Southern Indiana	236	91,610	12,262	104,646	12,793	21,216	2,004	37,176	5,023	78,212	26,434	....	6,928	19,506	2,571
Southern Kansas Ry. of Texas	125	83,506	17,112	104,022	13,024	23,601	2,358	42,550	3,697	85,230	18,792	....	2,325	16,467	—483
Texas Central	268	67,411	28,096	103,335	13,744	11,919	1,526	29,757	3,710	60,656	42,679	....	2,138	40,541	8,901
Vicksburg, Shreveport & Pacific	171	74,333	36,336	120,523	24,117	22,100	3,494	38,312	4,375	92,398	28,125	....	6,378	21,747	1,423
West Jersey & Seashore	356	110,449	151,276	286,327	82,943	48,319	9,303	168,527	8,359	317,451	—31,124	—2,561	20,037	—53,722	—8,760
Wisconsin Central	1,030¶	588,296	96,391	718,242	90,272	95,557	23,821	269,405	17,695	496,750	221,492	357	32,071	189,779	96,467
SEVEN MONTHS OF FISCAL YEAR.															
Alabama & Vicksburg	143	$641,219	$291,067	$1,000,115	$154,530	$156,011	$26,307	$304,220	$36,129	$677,197	$322,918	....	$30,501	$292,417	$87,274
Alabama Great Southern	309	1,550,510	636,793	2,394,993	292,168	560,052	62,162	687,844	61,866	1,664,092	730,901	—$3,549	78,652	648,700	120,074
Atlantic & St. Lawrence	167	576,797	198,016	842,004	228,750	90,466	23,844	252,043	21,643	616,746	225,258	....	45,049	180,209	58,232
Bessemer & Lake Erie	201	4,650,694	211,328	4,919,824	439,151	750,026	51,582	1,158,289	74,633	2,473,681	2,446,143	....	75,210	2,370,933	724,101
Canadian Pacific in Maine	233	566,831	147,322	767,738	147,704	92,697	31,933	251,672	22,645	546,651	21,087	....	35,000	—13,913	—1,944
Carolina, Clinchfield & Ohio	225*	494,746	83,981	596,635	75,904	98,215	34,498	137,223	45,782	391,622	205,013	....	23,500	181,513	179,558
Central New England	278	1,450,881	210,338	1,750,119	309,797	156,211	11,717	523,292	22,840	1,023,857	726,262	....	45,500	680,762	202,813
Chicago, Indiana & Southern	341	1,910,924	163,642	2,121,542	317,643	369,332	59,637	707,610	57,158	1,511,380	610,162	400	88,003	522,559	200,165
Chicago, Rock Island & Gulf	529	1,351,098	451,864	1,892,171	315,288	137,343	44,057	666,620	60,468	1,223,776	668,395	—1,760	39,816	626,819	217,064
Cleveland, Akron & Columbus	212	1,052,458	313,058	1,461,237	209,921	365,789	20,198	464,138	26,977	1,087,023	374,214	....	36,041	338,173	—22,510
Cumberland Valley	162	1,256,411	373,305	1,702,344	226,079	163,054	31,108	496,409	42,199	958,849	743,495	4,068	28,585	718,978	61,777
Detroit, Grand Haven & Milwaukee	190	707,007	358,564	1,219,689	166,762	165,933	41,475	479,868	37,691	891,729	327,960	110	19,091	308,979	62,977
Evansville & Terre Haute	310	964,816	379,761	1,475,595	166,926	212,191	35,491	425,701	46,433	886,742	588,853	—6,347	62,267	520,239	117,396
Georgia Southern & Florida	395	769,781	432,605	1,390,851	142,756	284,630	39,292	497,474	60,909	1,025,061	365,790	6,442	60,828	311,404	41,448
Grand Rapids & Indiana	587	1,775,171	1,066,719	3,041,107	359,238	470,508	77,037	1,182,681	94,006	2,183,470	857,637	—2,120	150,456	705,061	6,500
Kanawha & Michigan	175	1,388,225	193,788	1,613,779	312,219	355,761	15,957	394,531	29,082	1,107,550	506,229	—187	48,333	457,709	199,135
Louisiana Ry & Nav. Co.	350	602,203	112,394	795,349	158,986	93,188	34,015	323,791	38,807	648,787	146,562	....	27,150	119,412	107,606
Louisiana Western	198	805,736	360,550	1,225,725	123,940	191,670	40,464	333,011	46,882	735,967	489,758	—760	40,638	448,360	—18,660
Minneapolis, St. Paul & S. S. Marie	2,495†	6,836,147	2,260,575	9,568,403	795,565	889,209	170,948	2,565,872	158,304	4,579,898	4,988,505	107,621	545,595	4,550,531	1,482,330
Missouri Pacific	3,881‡	9,346,673	2,390,322	12,940,679	1,965,003	1,911,464	331,708	5,061,922	350,687	9,620,784	3,319,895	—20,998	461,290	2,837,607	.....
New Orleans & North Eastern	196	1,454,038	365,934	1,971,501	200,222	311,480	61,619	665,698	72,999	1,312,018	659,483	....	57,524	601,959	$4,885
New Orleans Great Northern	275§	547,765	208,710	799,825	147,066	110,949	14,938	205,594	33,506	512,053	287,772	—565	6,950	280,257	249,544
New York, Philadelphia & Norfolk	112	1,533,253	242,622	1,905,137	183,735	321,167	24,485	669,250	62,175	1,260,812	644,325	....	44,350	599,975	135,756
New York, Susquehanna & Western	151	1,010,876	381,594	1,562,540	192,913	150,945	11,033	588,725	26,493	970,109	592,431	—36,996	79,216	476,219	—6,658
Pecos & Northern Texas	198‡	746,936	159,432	942,401	153,736	128,393	12,505	265,374	27,755	587,763	354,638	....	12,579	342,058	95,877
Peoria & Eastern	351	1,389,360	431,216	1,954,303	211,435	338,097	38,223	672,956	35,595	1,296,307	657,996	....	60,994	597,002	169,188
Pittsburgh & Lake Erie	191	9,236,260	892,973	10,392,077	954,357	782,561	96,221	2,163,978	143,052	4,140,169	6,251,908	—2,412	126,636	6,122,860	2,510,350
Rutland	468	1,044,380	694,579	1,938,885	273,754	268,991	46,270	686,648	39,291	1,314,954	623,931	....	70,133	553,798	106,578
St. Louis, Iron Mountain & Southern	2,610	11,164,713	3,179,047	15,564,552	2,228,070	2,125,339	384,532	4,766,953	471,215	9,976,109	5,588,443	—35,035	494,119	5,059,289	713,443
San Antonio & Aransas Pass	727	1,711,183	625,810	2,464,546	360,978	291,783	31,467	886,332	62,100	1,632,660	831,886	....	63,000	768,886	4,130
Southern Indiana	236	708,595	104,759	824,337	105,231	122,093	15,145	224,297	34,192	500,958	323,379	—836	48,500	274,043	106,959
Southern Kansas Ry. of Texas	125	737,268	140,479	922,146	110,789	150,671	13,077	291,882	25,437	591,856	330,290	....	13,152	317,138	183,259
Texas Central	268	382,325	226,598	658,379	117,014	88,547	11,341	200,257	26,941	444,100	214,279	....	20,251	194,028	—66,161
Vicksburg, Shreveport & Pacific	171	499,769	292,913	858,319	150,982	155,360	23,682	245,142	30,348	605,514	252,805	....	46,118	206,687	31,091
West Jersey & Seashore	356	974,776	2,246,827	3,454,621	562,301	396,362	101,510	1,357,240	59,831	2,477,244	977,377	13,767	140,260	850,884	103,490
Wisconsin Central	1,030¶	3,737,398	935,496	4,962,576	652,902	677,744	160,925	1,681,667	115,737	3,288,975	1,673,601	5,146	205,553	1,473,195	168,921

* Mileage operated on January 31, 1909, 145. † Mileage operated on January 31, 1909, 2,395. ‡ Consolidated company; began operations on August 9, 1909. § Mileage operated on January 31, 1909, 91. ‡ Mileage operated on January 31, 1909, 152. ¶ Mileage operated on January 31, 1909, 1,131. — Indicates Deficits, Losses and Decreases.

Union Pacific Merger Hearing.

On Monday of this week Edwin Hawley testified at New York in the suit of the government to annul the practical merger of the Union and the Southern Pacific. He testified that he was associated with C. P. Huntington of the Southern Pacific for twenty years; that he was in close touch with Mr. Huntington for several pears prior to the latter's death, seeing him every day; that he accompanied Messrs. Huntington and Harriman on a trip into the Adirondacks when Mr. Harriman was negotiating for the control of the Southern Pacific, and that he never knew of Mr. Harriman's making an effort to secure the Central Pacific as a separate property. Shortly before Mr. Huntington's death Mr. Hawley joined with him in the purchase of 100,000 shares of Southern Pacific stock from the Crocker estate; and after Mr. Huntington's death Mr. Hawley negotiated the sale of the Southern Pacific stock of the Huntington estate to Mr. Harriman, this stock consisting of 475,000 shares, including Mr. Hawley's own holdings, which amounted to about one-fourth.

Mr. Hawley fixed the price at which this stock was sold. This was in February, 1901. He had never been approached by Mr. Gould regarding the sale of this stock. He received authority to sell the Huntington estate stock from Mrs. Huntington.

INTERSTATE COMMERCE COMMISSION.

Shipper's Mistake in Misrouting.

P. P. Donahue v. Chicago, Milwaukee & St. Paul et al. Opinion by Chairman Knapp.

Reparation denied. (18 I. C. C., 92.)

Increase in Minimum Carload Rate Reasonable.

E. T. Barnum Iron Works v. Cleveland, Cincinnati, Chicago & St. Louis et al. Opinion by Commissioner Clements.

Complaint dismissed. (18 I. C. C., 94.)

Carload Rate on Salt from West Virginia South Unreasonable

Liverpool Salt & Coal Co. et al. v. Baltimore & Ohio et al. Dixie Salt Works v. same. Opinion by Commissioner Clements.

Maximum rate prescribed. (18 I. C. C., 51.)

Unreasonable Rate Charged.

George Tritch Hardware Co. v. Chicago, Rock Island & Pacific. Opinion by Commissioner Harlan.

Reparation awarded on one shipment of agricultural implements from Omaha, Neb., to Denver, Colo. (18 I. C. C., 71.)

Refund of Demurrage Charges Denied.

Germain Co. v. Philadelphia, Baltimore & Washington et al. Opinion by Commissioner Clements.

Complaint dismissed. (18 I. C. C., 96.)

Failure to Furnish Large Car Condemned.

Maldonado & Co. v. Ferrocarril de Sonora et al. Opinion by Commissioner Harlan.

Reparation for overcharge awarded. (18 I. C. C., 65.)

Wood-Pulp Board Shipments.

Wabash Coating Mills v. Wabash Railroad et al. Opinion by Chairman Knapp.

Reparation on shipments from Wabash, Ind., to St. Louis, Mo., denied. (18 I. C. C., 91.)

Rate on Egg Case Material Unreasonable.

Anderson-Tully Co. v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Cockrell.

Rate from Tennessee to Oklahoma for future established. Reparation awarded. (18 I. C. C., 48.)

Class Rates from Albuquerque to El Paso.

Crombie & Co. et al. v. Atchison, Topeka & Santa Fe.

Complaint dismissed and case referred to informal docket for the adjustment of reparation. (18 I. C. C., 57.)

Rate on Coal Unreasonable.

Rainey & Rogers v. St. Louis & San Francisco. Opinion by Chairman Knapp.

Rate on coal from Carbon Hill district, Ala., to New Albany, Miss., reduced from $1.10 per ton to 95 cents per ton. (18 I. C. C., 88.)

Rates on Canned Goods Unreasonable.

Stone-Ordean-Wells Co. v. Southern Pacific et al.—Opinion by Commissioner Prouty.

Reparation awarded on shipments from California to Montana. (18 I. C. C., 13.)

Shipments from California Points to Alturas, Cal.

E. Lauer & Son v. Southern Pacific et al. Opinion by Chairman Knapp.

Reparation on interstate shipments of hardware and other commodities denied. (18 I. C. C., 109.)

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF NOVEMBER, 1909.

Name of company. Mileage of all lines covered: Rail lines	Adams Express. 30,958	American Express. 46,267	Canadian Express. 7,078	Can. Nor. Express. 3,164	Globe Express. 1,900	Great Nor. Express. 7,232	National Express. 1,094	Northern Express. 6,497	Pacific Express. 22,171	Southern Express. 30,691	United States Express. 23,921	Wells, Fargo & Co. 56,518	Western Express. 3,4
Other lines	3,488	1,321	2,792	22	.....	211	292	261	608	2,995	611	5,189	
Operating revenues:													
Express	$2,825,476	$3,029,214	$207,941	$35,103	$48,269	$217,164	$92,122	$284,870	$744,069	1,214,753	$1,402,725	$2,473,868	$65,4
Misc. transportation	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	141	
Nontransportation	17,472	100,479	4,890	2,226	478	1,278	492	5,242	11,790	15,379	23,432	46,191	
T'l receipts operation	2,842,948	3,129,693	212,831	37,329	48,747	218,442	92,614	290,112	755,861	1,230,132	1,426,157	2,520,200	66.(
Exprs. privileges—Dr.	1,478,291	1,428,255	100,428	13,673	24,127	87,940	33,694	140,308	361,851	580,901	649,512	1,204,949	25.1
Total	$1,364,656	$1,701,438	$112,403	$23,656	$24,620	$130,502	$58,920	$149,804	$394,009	$649,231	$776,645	$1,315,251	$41,4
Operating expenses:													
Maintenance	$73,849	$81,589	$1,635	$195	$314	$1,582	$444	$1,401	$12,341	$19,612	$32,252	$51,615	$
Traffic	6,315	17,805	953	114	1,673	809	.....	3,467	6,061	6,378	13,526	16,600	
Transportation	931,995	1,170,253	84,729	10,039	15,133	49,952	45,357	73,175	223,413	371,193	595,289	841,642	21.(
General	84,384	101,163	7,080	1,366	2,598	3,177	2,828	3,569	13,248	44,470	44,736	74,128	1,7
Total	$1,096,543	$1,370,810	$94,398	$11,714	$19,719	$55,520	$48,629	$81,612	$255,062	$441,653	$685,804	$983,985	$24,7
Net operat'g rev. or def.	$268,114	$330,628	$18,005	$11,942	$4,901	$74,982	$10,291	$68,192	$138,947	$207,578	$90,841	$331,266	$16,7
Taxes	14,097	16,744	1,150	130	550	2,792	215	3,500	4,948	10,036	6,194	15,659	
Operating inc. or loss.	$254,017	$313,884	$16,855	$11,811	$4,351	$72,190	$10,076	$64,692	$134,000	$197,542	$84,648	$315,607	$16,2

Hardwood Lumber Shipments from Memphis to New Orleans.

J. W. Thompson Lumber Co. et al. v. Illinois Central et al. Opinion by Commissioner Lane.

Reparation awarded on basis of original report of the commission in case 13 I. C. C., 657. (18 I. C. C., 83.)

Rates on Fertilizer from Memphis, Tenn., Unreasonable.

Virginia-Carolina Chemical Co. v. St. Louis, Iron Mountain & Southern et al. Opinion by Commissioner Prouty.

Case retained for further proceedings. (18 I. C. C., 1.)

Virginia-Carolina Chemical Co. v. Chicago, Rock Island & Pacific. Opinion by Commissioner Prouty.

Case retained for further proceedings. (18 I. C. C., 3.)

Virginia-Carolina Chemical Co. v. St. Louis & San Francisco. Opinion by Commissioner Prouty.

Case retained for further proceedings. (18 I. C. C., 5.)

Increased Rate Reduced.

Commercial Club of Omaha v. Southern Pacific et al. Opinion by Commissioner Harlan.

Without renewing the discussion of the question, fully considered in other cases, as to which side has the burden of proof in a proceeding attacking the reasonableness of an increased rate, it is clear that an order granting affirmative relief, and particularly in a case in which reparation is awarded, must be predicated on a definite conviction drawn from the record or from the commission's own investigation, or from both, that the rate exacted on the shipments complained of was an unreasonable rate.

Defendants' prior rate of 85 cents per 100 lbs. for the transportation of lima beans in carloads from certain points in California to Omaha, Neb., found unreasonable, and their subsequently established 75-cent rate prescribed for the future. Reparation awarded. (18 I. C. C., 53.)

Use of Mileage Books Discussed.

Bernard Eschner v. Pennsylvania Railroad et al. Opinion by Commissioner Harlan.

Defendants' published tariffs prohibit the use of an exchange order in connection with an ordinary mileage book as a warrant for checking the holder's baggage or securing through sleeping accommodations from any point on the Pennsylvania Lines West of Pittsburgh to a point on said lines east thereof, or *vice versa*. On complaint that such a provision in the tariffs is unreasonable and discriminatory, held that the right to use exchange orders and mileage books is in the nature of a privilege voluntarily accorded by carriers under their tariffs, and must be accepted by those who use such special fares with all lawful and non-discriminatory limitations that may be attached to them.

The language of the act relating to the issuance of mileage, excursion and commutation tickets is altogether permissive, and the commission has no affirmative power to require carriers to establish, for the use of passengers on particular occasions or for special purposes, special fares based on less than a normal passenger-mile revenue. (18 I. C. C., 60.)

Informal Complaint Is Cause of Action.

Memphis Freight Bureau v. St. Louis Southwestern. Opinion by Commissioner Harlan.

The rules of the commission, while not overlooking the definite requirements of the law, were intended to relieve complainants from the observance of the technical rules of pleading in order that shippers unskilled in such matters might bring their troubles to us in their own proper persons.

An informal complaint showing the date of the shipment, its actual weight, the rate charged and collected, and all other facts necessary to identify it, coupled with the claim that there was an overcharge on the shipment in that the carrier applied a 10-cent rate instead of a 6-cent rate is a sufficient presentation or filing of the claim to stop the running of the limitation of actions provided in section 16 of the act. Such an informal complaint sufficiently alleges a violation of the act and therefore sets up a cause of action as in that section provided. A rate of 10 cents per 100 lbs. on cotton-seed meal and hulls formerly published by the defendant from Little Rock, Ark., and Pine Bluff, and Memphis, Tenn., declared unreasonable and reparation awarded. (18 I. C. C., 67.)

Rates on Cement Plaster Reduced.

Acme Cement Plaster Co. v. Chicago & North Western et al. Opinion by Commissioner Prouty.

Rates on cement plaster in C. L. lots from Norfolk, Neb., to various points on the Niobrara branch of the C. & N. W. found unreasonable and reasonable rates prescribed for the future. Reparation denied.

Commissioner Harlan dissenting:

The complaint, as well as the report of the commission, proceed on the theory that when the through charges on a commodity moving between interstate points are attacked as unreasonable, it is sufficient to prove that part of the through charge is unreasonable. The defendant claimed that the total cost of through transportation was reasonable and the complainant insists that the question involved is really whether the amount charged by that defendant (Chicago & North Western) for its part of the through haul is unreasonable or not. When closely analyzed the report of the majority seems to proceed on that theory. In my judgment the rates referred to in the report, most of which are rates between points in the same state, are not properly the subject of an order except by showing that the through charges are themselves unreasonable, and no such showing was pretended to be made. (18 I. C. C., 105.)

Flour Rate from Minneapolis to New York Reduced.

W. J. Jennison Co. et al. v. Great Northern et al. Opinion by Commissioner Clark.

This case was originally submitted to the commission for decision on June 3, 1909, but the case was reopened and further testimony was taken at Buffalo, N. Y., in January, 1910. Complainants operate mills with a daily capacity of about 125,000 barrels of flour. The defendants include all the rail and water carriers engaged in transportation of flour from Minneapolis and Duluth to the Atlantic seaboard. Flour moves from Minneapolis to the Atlantic seaboard under joint through rates. Wheat moving lake and rail to the seaboard does not move under joint through rates.

The rate on flour rail-lake-and-rail from Minneapolis to New York via Duluth is 23 cents per 100 lbs.; from Duluth to New York, lake-and-rail, it is 18 cents per 100 lbs.; all-rail from Minneapolis, it is 25 cents per 100 lbs., and all-rail from Duluth, it is 25 cents per 100 lbs. The all-rail rate on wheat from Minneapolis to New York is 26 cents per 100 lbs., and from Duluth 26 cents per 100 lbs. The rail rate on flour from Buffalo to New York is 10 cents per 100 lbs. The local rate on wheat from Buffalo to New York is 10 cents per 100 lbs. and the ex-lake rate, which also includes elevation, is 10.83 cents per 100 lbs.

The complaint is that defendants discriminate against Minneapolis in favor of millers at Buffalo, in that the transportation charges on the mill products from the mill points in the Northwest to the Atlantic seaboard are unduly high as compared with the charges for the transportation of the wheat from the same territory to Buffalo, plus the transportation of the milled product from Buffalo to the Atlantic seaboard. Complaint is also made that the rail-lake-and-rail rate of 23 cents per 100 lbs. is unreasonable *per se*.

Mills located at Buffalo grind large quantities of the Minnesota and Dakota wheat, which is brought to Buffalo by water carriers on the Great Lakes. The mill products manufactured at Buffalo are marketed principally in the state of New York, in northern Pennsylvania and in the states east thereof. The Buffalo millers export but little flour. It appears that the Minneapolis millers market more or less of their product in the Northwest, large quantities in the Middle West, and that they send large quantities to the Atlantic seaboard and New England. It is shown that since 1902 the total output of

Minneapolis mills has decreased and the receipts of wheat at Buffalo have increased.

In comparing the transportation charges on wheat and on flour, both must be computed from Minneapolis, as the Minneapolis flour rate is the one attacked. The commercial profits of the Minneapolis and Buffalo millers would be computed on another basis, and are neither controlling nor important here. The charges paid by them, respectively, for transportation services are about as follows: The Minneapolis miller pays 23 cents per 100 lbs., or 46 cents per barrel of flour from Minneapolis to New York. The Buffalo miller ships from Duluth to Buffalo 270 lbs. of wheat from which to make a barrel of flour, and on that he pays 9.45 cents for transportation and 4.32 cents for elevation. He pays 20 cents for transporting his barrel of flour from Buffalo to New York, and has therefore paid total charges 33.77 cents, which includes the freight to Buffalo on 70 lbs. of by-product, amounting to 2.45 cents. Insurance, storage, switching, cleaning, etc., might change these figures slightly, but apparently such charges are common to both and about equal.

As has been seen, the lowest rate on flour from Minneapolis to New York is via Duluth and is 5 cents per 100 lbs. higher than the rate from Duluth. It is therefore seen that in spite of a differential of 5 cents per 100 lbs. against the Minneapolis miller as compared with the Duluth miller, Minneapolis has been and still is the greatest flour-milling center in the country. It also appears that the milling industry at Duluth has been declining.

We therefore have this situation: For a number of years prior to 1898 the regular or package lines of boats on the lakes were independent of the railways and a well-recognized and established differential of 5 cents under the all-rail rate existed via rail-lake-and-rail. The railways gradually absorbed the lake lines and in 1898 they increased the rail-lake-and-rail rate on flour 2 cents per 100 lbs. and in 1902 increased this rate another cent. It is conceded that the defendant railways own or control all of the boat lines that transport flour from Duluth to Buffalo. These boats also engage in the transportation of wheat. At some seasons of the year the rate on wheat is made by the tramp boats and at other seasons by the regular line boats. The records of the Duluth Board of Trade and of the United States Government and the testimony in the case establish the fact that the average rate for transporting wheat by water from Duluth to Buffalo is not in excess of 3.5 cents per 100 lbs. It is admitted that this is a profitable rate. It costs less to carry wheat than to carry flour on the lakes. Independent boats that were originally built and fitted to engage in package freight business are unable to secure and engage in that business because defendants control the terminals and wharves and refuse to permit independent boats to load or unload [flour] thereat and refuse to receive packages from independent boats.

This record shows that subsequent to the increase in rail-lake-and-rail flour rates in 1898 and in 1902, and prior to August 28, 1906, the effective date of the amended act, the actual rate paid on flour from Minneapolis to New York rail-lake-and-rail did not exceed 20 cents per 100 lbs.

The rate on flour rail-lake-and-rail from Minneapolis to New York is 23 cents per 100 lbs. This rate is divided, as we understand, 5.8 cents Minneapolis to Duluth, 7.6 cents Duluth to Buffalo, and 9.6 cents Buffalo to New York. The transportation charges on wheat from Minneapolis to Buffalo are in the average, including elevation, just about 10 cents per 100 lbs., divided 5 cents Minneapolis to Duluth, 3.5 cents Duluth to Buffalo, and the remainder for elevation, and the rate on flour from Buffalo to New York is 10 cents per 100 lbs. There is therefore a difference of 3 cents per 100 lbs. in these transportation charges to the disadvantage of the Minneapolis miller.

The charge for transportation of wheat rail-lake-and-rail from Minneapolis to New York, using the existing ex-lake rate from Buffalo of 10.83 cents per 100 lbs., and including cost of elevation is a little less than 21 cents per 100 lbs. The additional costs to the Buffalo miller for handling wheat at Buffalo seem to be common to the milling business and to be substantially the same as and offset by similar costs borne by the Minneapolis millers and not figured in as transportation cost. The difference in profits and ability to sell in common markets as between the Buffalo miller and the Minneapolis miller must be purely commercial questions, in so far as they go beyond the above-outlined difference in transportation costs.

From Minneapolis to Duluth the rates on wheat, 5 cents, and on flour, 5.8 cents, are substantially on a parity. The same is substantially true as to the rates from Buffalo to New York, where we find the local rate on flour 10 cents, the division of the all-rail rate from Minneapolis 9.6 cents, the local rate on wheat 10 cents, and the ex-lake rate on wheat 10.83 cents. This ex-lake rate includes, as has been seen, some costs of elevation, etc. It has somewhat recently been raised above the level at which it stood for a long time, and at its present level is particularly objected to by the Chicago interests. It is, however, on substantial parity with the rate on flour which, in the *Banner Miller Co.* case, we found to be reasonable, and nothing now presented persuades us that that finding should be changed. From Duluth to Buffalo, however, the rates and charges are not nearly or substantially on a parity. The charge on wheat is 3.5 cents and on flour 7.6 cents. It appears that 2 cents per 100 lbs. fully compensates for the additional cost of transporting flour as compared with wheat, but here we find an additional charge of 4 cents.

These proportional rates and divisions of rates are not taken by us as conclusive in determining the reasonableness of either local or joint through rates. They are, however, highly illustrative and emphasize the conclusion that is reached by other tests.

The rate complained of, 23 cents per 100 lbs. on flour via rail-lake-and-rail from Minneapolis to New York and other Atlantic seaboard points taking the same rate, is unreasonable in so far as it exceeds 21½ cents per 100 lbs. We find that for the future that rate should not exceed 21½ cents per 100 lbs., and such an order will be entered.

Discrimination Against Des Moines.

Greater Des Moines Committee v. Chicago, Milwaukee & St. Paul. Opinion by Commissioner Cockrell.

Complaint asks that rates from Des Moines, Iowa, to western Minnesota and North and South Dakota be readjusted and made on a mileage and percentage basis of the rates from Chicago to those points. Complaint attempts to show that Des Moines is discriminated against, because rates from there are relatively higher to Minnesota and to North and South Dakota points than from Chicago and points based on Chicago. The commission finds that Des Moines, although the largest city in Iowa, is not materially differently situated, as regards trade, from a number of other interior Iowa points. The interests of these localities were not represented at the hearings, and in passing on so important a matter the commission is bound to consider the whole field. It is held that the facts shown are not sufficient to justify a change in present rate adjustment.

Commissioner Lane dissenting:

I hold that we should not dismiss a complaint because a complainant has not made out a case. The burden of proving the case is not on the complainant. When a proceeding is brought before this commission, after complaint is made the burden is on the commission to make such investigation as may be necessary in the public interest. Examinations into various complaints brought before this commission by the Greater Des Moines Committee satisfy me that the rate adjustment between the cities in the territory between the Mississippi and Missouri rivers, and the cities of Chicago, St. Louis, Kansas City, Omaha and similarly situated points, is not fair. There will be no harmony between carriers and shippers in Iowa and west thereof until some system similar to that prevailing in official classification territory is adopted. Discrimination between individuals has been largely destroyed. The problem now before the commission is to investigate and destroy discriminations between places. Burnham-Hanna-Munger case 14 I. C. C., 299, cited. I favor the retention of this complaint as a basis for exhaustive investigation that will lead to an effective order. (18 I. C. C., 73.)

Greater Des Moines Committee v. Chicago Great Western et al. Opinion by Commissioner Cockrell.

Complaint claiming discrimination against Des Moines in favor of St. Joseph and other cities dismissed because not sustained by the facts presented. (18 I. C. C., 98.)

STATE COMMISSIONS.

The Louisiana Railway Commission has fixed a maximum intrastate charge of 35 cents for the transportation of samples of sugar, rice, molasses and coffee.

The Georgia State Railroad Commission has modified its order requiring railways to report all accidents, and will not compel the roads to give the names of persons injured.

The Railroad Commission of Louisiana holds that the rule proposed by telegraph companies, limiting the number of letters in unpronounceable combinations of letters to five, and counting as one word each five letters or fraction thereof, is not unreasonable.

The Louisiana Railway Commission has fixed a rate of one-half the regular tariff rate for all shipments of second-hand machinery which has been repaired and returned to the original owner or which is to be purchased from the original owner for the purpose of being reconstructed by the purchaser for manufacturing purposes in Louisiana. A minimum carload weight of 40,000 lbs. is fixed.

The State Railway Commission of South Carolina has ordered the Charleston & Western Carolina to run an additional daily passenger train between Yemassee and Robbins, 59 miles. This order was issued on petitions from citizens of a number of towns along the line, and it will result in double daily service from Yemassee to Augusta, Ga., as from Robbins to Augusta there are already two daily trains.

The Indiana Railroad Commission has prepared a circular letter to be sent to all the railways in the state, accompanied by a blue-print, calling attention to the order that all unprotected highway crossings, outside of incorporated towns and cities, shall be equipped with sign posts bearing the words "Railroad Crossing" and "Danger," the latter word to be painted in red. Where there is a double crossing the commission is particular in directing that the words "Two Crossings" shall appear. The blue-print sent with the letter shows types of signs approved by the commission. The signs have the customary crossed arms with the word railroad on one arm and crossing on the other. In addition there is a horizontal arm below the cross having the word danger painted on it in red.

Wisconsin: Spur Track Ordered.

Hickerson Roller Mill Co. v. Northern Pacific.

Petition alleges that the respondent railway company refuses to repair a certain spur track leading from respondent's main line to petitioner's mill, and prays that an order issue ordering respondent to make such repairs. Where there is no private contractual limitation upon the use of a spur track by the railway constructing it, the same becomes a part of its railway system and must be maintained and operated accordingly for the benefit of any and all persons who may require the services thereof. That the respondent in the instant case acquired the right of way without restriction as to its use and constructed, maintained and operated the spur track for public purposes.

Louisiana Express Rates from Shreveport.

Shreveport Traffic Association v. The Pacific Express Co., Wells, Fargo & Co. Express, The Southern Express Co.

The commission holds that the rates from Shreveport to points in Louisiana for express matter should not exceed rates for similar distances for the same service as apply from Monroe, and that the present rates from Shrevepert are discriminative. The following rates from Shreveport are ordered:

Distances.				Rate per 100 lbs.
20 miles and less				$0.40
30 miles and over			20	.45
50 " " "			30	.50
70 " " "			50	.60
100 " " "			70	.75
120 " " "			100	.80
150 " " "			120	.90
175 " " "			150	1.00
Over 175 miles				1.25

COURT NEWS.

The United States circuit court of appeals at St. Louis has rendered a decision holding that the federal 28-hour law cannot be applied to a terminal railway unless the terminal railway causes on its own tracks the entire delay to a shipment of live stock which results in infraction of the law. The decision was rendered in a case brought against the Stock Yards Terminal Company of St. Paul, Minn. The delivering railway had pleaded guilty to a charge of keeping live stock in transit without food and water more than 28 hours and was fined. The government sought to collect an additional penalty from the terminal company.

The supreme court of Texas has rendered an opinion holding that under the laws of that state railways must obey routing instructions of shippers when given to them in writing. The decision was rendered in the case of James A. Thompson versus the Missouri, Kansas & Texas. Thompson bought some lumber from the Thompson-Tucker Lumber Company at Willard, a point on the line of the Katy where there is no agent, and gave the conductor bills of lading containing directions that the goods be so transported to Taylor, Tex., as to give the International & Great Northern the long haul. The conductor accepted the bills of lading but erased the shipper's instructions and so routed the shipment as to give the M., K. & T. the long haul. The court said that one mind cannot make a contract, and, therefore, there was no contract between Thompson and the railway, but a high-handed disregard of his legal rights and a forcible taking and carrying of his property according to the railway's wishes without consent on his part, but to serve its unlawful purpose. Thompson had no choice, the court said, but to receive the cars when they reached Taylor, and, therefore, his doing so did not in any way ratify the unlawful act of the defendant. He was awarded damages.

An injunction forbidding the Boston & Maine to charge or collect the present scheduled freight rates was issued in the superior court of New Hampshire March 26 by Judge William A. Plummer. The injunction is based on the claims that the greater part of the Boston & Maine mileage in New Hampshire consists of leased lines; that these leased lines were chartered by New Hampshire legislatures with the conditions specified that they should be subject to New Hampshire laws and state authorities; that they were leased in accordance with special permissions from New Hampshire legislatures, and that these permissions were granted with special provisos that the freight rates should not be raised without permission from the legislature, and that they have been raised without such permission. The matter has been before the State Railroad Commission, but that body has come to no conclusion. The railway attorneys put up a blanket defense, claiming compliance with the spirit of the law, and that if it should be technically found that the railway has not complied with the precise letter of the law that any action is barred by the statute of limitations. The present equity suit is brought as an expeditious means of bringing the case to a final decision from the state supreme court. The case is brought in the name of the state by Attorney-General Eastman in his home county of Rockingham. The superior court hearing on the question of making the injunction permanent is ordered for the term to be held at Exeter beginning Tuesday, April 19.

FOREIGN RAILWAY NOTES.

The promoters of the Dairen-Laohutan light railway have asked for a franchise and propose to spend $25,000 in installing a line. They agree to make 10 trips a day each way and to provide cars with a capacity of seating 30 passengers. From 4.5 to 10-ton locomotives will be used.

In 1906 a section of track in Prussia was laid on 1,000 beech ties preserved with a mixture of tar oil and chloride of zinc. Down to a recent date 74.7 per cent. of these had been removed because of decay, while on an adjacent section where at the same time track was laid on 3,000 similar ties, preserved with tar oil alone, not one had required renewal. The Prussian railway authorities call for other observations of the effect of different methods of treating ties.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

E. W. Beatty has been appointed general solicitor of the Canadian Pacific, with office at Montreal, Quebec.

J. F. Collins has been elected President of the Toledo & Western, with office at Sylvania, Ohio, succeeding C. F. Franklin.

Maurice H. Thatcher, of Kentucky, has been appointed, subject to confirmation by Congress, a member of the Isthmian Canal Commission.

Ray Morris, comptroller of the Gulf Line Railway, has resigned to enter other business. E. K. Gullen, traveling auditor of the Norfolk & Southern, becomes auditor of the Gulf Line Railway April 1.

F. L. Maytag, first vice-president of the South Dakota Central, at Newton, Iowa, has been elected president, succeeding P. F. Sherman, resigned. Joe Kirby has been elected First Vice-President, succeeding Mr. Maytag, and G. W. McArthur has been elected Second Vice-President and General Manager, all with office at Sioux Falls, S. D.

Operating Officers.

L. M. Olliges has been appointed assistant trainmaster of the Missouri, Oklahoma & Gulf, with office at Muskogee, Okla.

J. S. Douglas has been appointed an Assistant Trainmaster on the Missouri Pacific-Iron Mountain system, with office at Scott City, Kan.

F. I. Cummins, traffic manager of the South Dakota Central at Sioux Falls, S. Dak., has been appointed also general superintendent, with office at Sioux Falls.

B. J. Fallon, engineer maintenance of way of the Metropolitan West Side Elevated Railway at Chicago, has been appointed assistant general manager, with office at Chicago.

E. D. Winslow has been appointed superintendent of telegraph of the Chicago, Rock Island & Gulf, with office at Ft. Worth, Tex., succeeding A. B. Crowley, assigned to other duties.

L. E. Beilstein has been appointed General Manager of the Toledo & Western, with offices at Sylvania, Ohio, succeeding C. F. Franklin. W. E. Pierce has been appointed Superintendent, with office at Sylvania.

F. O. Whiteman, Trainmaster of sub-divisions 46 and 47 on the Louisiana division of the Rock Island Lines, has had his jurisdiction extended over sub-divisions 45 and 45a, with office at Eldorado, Ark., succeeding J. P. Quigley, resigned.

J. J. Mahoney, assistant superintendent of the Chicago & Alton at Bloomington, Ill., has been appointed superintendent of transportation of the Atchison, Topeka & Santa Fe, with office at Newton, Kan. The office of assistant superintendent of the Alton at Bloomington has been abolished.

G. H. Groce, Assistant to the General Manager of the Illinois Central and the Indianapolis Southern, with office at Chicago, having resigned to go with the General Railway Signal Company at Rochester, N. Y., the position of Assistant to the General Manager has been abolished. The Superintendents of telegraph will report to the Assistant to the Vice-President and the Signal Engineer will report to the Chief Engineer.

Joseph Fortin, whose appointment as superintendent of the Quebec Central, with office at Sherbrooke, Que., has been announced in these columns, was born December 29, 1859, at St. Aubert, L'Islet county, Quebec. He attended Levis college in 1878, and began railway work on February 14, 1882, on the Quebec Central. In 1886 he was appointed agent and representative of that company, and later was made acting superintendent, which position he held at the time of his recent appointment.

Traffic Officers.

A. M. Dudley has been appointed Agent of the Kanawha Despatch, with office at St. Joseph, Mo.

H. R. Carl has been appointed a traveling freight agent of the Great Northern, with office at St. Paul, Minn.

J. J. Carey has been appointed a traveling passenger agent of the Erie, with office at San Francisco, Cal., succeeding A. H. Moffitt, resigned.

W. H. Askew has been appointed a traveling freight and passenger agent of the New Orleans, Mobile & Chicago, with office at Laurel, Miss.

C. B. Fiske, division freight agent of the Chicago Great Western, with office at Fort Dodge, Iowa, has resigned to engage in other business.

W. T. Robson, advertising agent of the Canadian Pacific at Montreal, Que., has been appointed general advertising agent, with office at Montreal.

George H. Martin, District Passenger Agent of the Iowa Central and the Minneapolis & St. Louis, with office at Oskaloosa, Iowa, has resigned to engage in other business.

C. A. Lahey has been appointed chief of the tariff bureau of the Chicago, Milwaukee & St. Paul, with office at Chicago, succeeding B. F. Bayha, resigned to accept service elsewhere.

Geo. B. Ogden has been appointed a traveling freight agent of the Great Northern, with office at Buffalo, N. Y., succeeding Wm. F. Morris, Jr., resigned to engage in other business.

E. W. Rice, General Agent of the American Refrigerator Transit Company at Tyler, Tex., has been appointed General Freight Agent, with office at St. Louis, Mo., succeeding H. H. Purcell, deceased.

D. M. Newton, City Passenger Agent of the Oregon Short Line at Salt Lake City, Utah, has been appointed a Traveling passenger agent, with office at Ogden, Utah, succeeding A. B. Moseley, resigned to engage in other business.

A. J. Lee, city passenger and ticket agent of the Southern Railway at Mobile, Ala., has been appointed district passenger agent, with office at New Orleans, La., succeeding J. C. Andrews, southwestern passenger agent, retired.

T. J. Smith has been appointed general freight agent of the Canadian Pacific, with office at London, England, succeeding H. D. Annable. F. W. Forster, agent at Bristol, has been appointed agent at Liverpool, succeeding J. J. Gilbertson. A. S. Ray succeeds Mr. Forster.

R. A. Taylor has been appointed freight claim agent of the Galveston, Harrisburg & San Antonio, the Houston & Texas Central, the Houston East & West Texas and the Houston & Shreveport, with office at Houston, Tex., succeeding A. A. Martin, resigned to accept service elsewhere.

Harry C. Howe, agent at the terminal interchange station of the Chicago & North Western at Chicago, has been appointed freight claim agent, with office at Chicago, succeeding to part of the duties of R. C. Richards, general claim agent, to whom he will report. Mr. Richards continues as general claim agent and will hereafter give special attention to matters pertaining to personal injuries and damage to property other than freight.

Engineering and Rolling Stock Officers.

James Walker, consulting engineer of the Metropolitan West Side Elevated Railway at Chicago, has been appointed chief engineer, with office at Chicago.

The office of Roadmaster of the Rock Island Line at Lecompte, La., has been abolished. M. J. Farrell has been appointed Roadmaster between Eldorado, Ark., and Eunice, La.

R. P. C. Sanderson, superintendent of motive power of the Virginian Railway at Norfolk, Va., has resigned to become general superintendent of the new works of the Baldwin Locomotive Works at Eddystone, Pa.

T. H. Hamill, roadmaster of the National Railways of Mexico at Torreon, Coahuila, Mex., has been appointed resident engineer in charge of betterments and additions on the Northern division, with office at Monterey, Mex.

J. F. Deems, general superintendent of motive power, rolling stock and machinery, of the New York Central Lines, with office at New York, has had his authority extended over the Toledo & Ohio Central and the Zanesville & Western.

C. M. Tritsch, recently appointed superintendent of motive power and car departments of the Western Maryland, with office at Hagerstown, Md., has been appointed also to the same position on the Georges Creek & Cumberland Railroad.

E. W. Pratt, assistant superintendent of motive power and

machinery of the Chicago & North Western, at Chicago, has been transferred to Clinton, Iowa. F. S. Fosdick, master mechanic at Mason City, Iowa, has been transferred to Chicago, succeeding E. H. Wade. J. Charlton, master mechanic at Chicago Terminals, Chicago, succeeds Mr. Fosdick, and W. R. Smith succeeds Mr. Charlton. E. B. Hall has been appointed a master mechanic, with office at Eagle Grove, Iowa, succeeding C. Coleman.

C. S. Millard, engineer maintenance of way of the Cleveland, Cincinnati, Chicago & St. Louis at Indianapolis, Ind., has been appointed engineer of track and roadway, with office at Cincinnati, Ohio. As has already been announced, W. B. McLoughlin, engineer maintenance of way at Mattoon, Ill., succeeds Mr. Millard. Joseph Mullen, engineer maintenance of way at Mt. Carmel, Ill., succeeds Mr. McLoughlin. A. S. More, engineer maintenance of way at Wabash, Ind., succeeds Mr. Mullen, and W. C. Kegler succeeds Mr. More. A. Maischaider, assistant engineer on the St. Louis division (of the Cleveland, Cincinnati, Chicago & St. Louis) has been transferred to the Chicago division, and Thomas Steiner, assistant engineer on the Cairo division, succeeds Mr. Maischaider.

Purchasing Officers.

A. B. Lacy has been appointed purchasing agent of the Virginian Railway, with office at Norfolk, Va.

F. H. Greene, general purchasing agent of the New York Central Lines, with office at New York, has had his authority extended over the Toledo & Ohio Central and the Zanesville & Western.

OBITUARY.

John C. Ilse, assistant general freight agent of the Chicago Great Western, at Chicago, died March 29, at the age of 60 years.

Ralph W. Hickox, formerly first vice-president of the Hocking Valley, died recently of apoplexy at Lyons, France, while on an automobile tour from Paris to Monte Carlo. Mr. Hickox was born in Cleveland, Ohio, and graduated from Harvard university in 1872.

Dudley Evans, president of the Wells, Fargo & Co. Express, died March 27 in New York. Mr. Evans was born in Morgantown, W. Va., January 27, 1838, and graduated from Washington college in 1859. He entered the service of the Wells, Fargo & Co. Express in 1886, becoming manager in 1892, and was later made vice-president, remaining in that position until his election as president in 1901.

Levi C. Weir, chairman of the board of managers and of the board of trustees of the Adams Express Co., died at his home in New York City on Monday last at the age of 68. Mr. Weir was president of the Adams Express Co. until May, 1909, when he resigned that office to take the chairmanship of the two governing boards. He was also a director of the United States Express Co. and of many railways and industrial and insurance corporations, including the Colorado & Southern, Des Moines & Fort Dodge, Iowa Central, Minneapolis & St. Louis and Norfolk & Western Railways.

George F. Gardner, general superintendent of the Gulf & Ship Island, with office at Gulfport, Miss., died at Gulfport on March 24. Mr. Gardner was born April 6, 1852, at Bremen, Ohio, and began railway work in April, 1865, as a telegraph operator on the Cincinnati, Wilmington & Zanesville, now the Cincinnati & Muskingum Valley, at Bremen. He was later operator and clerk at New Lexington, Ohio; train despatcher at Lancaster, Ohio, and trainmaster of the same road. In November, 1887, he was made superintendent of the Zanesville & Ohio River, now part of the Baltimore & Ohio, at Zanesville, Ohio, and in May, 1892, he was made general superintendent of the Cincinnati, Lebanon & Northern at Cincinnati, Ohio, where he remained for six months. He was then appointed master of transportation of the Pittsburgh, Akron & Western, now the Northern Ohio, and the next year he was appointed superintendent. For nine years from April, 1895, he was superintendent of the Middle and Clearfield & Mahoning divisions of the Buffalo, Rochester & Pittsburgh, which position he resigned to become general superintendent of the Gulf & Ship Island.

Railway Construction.

New Incorporations, Surveys, Etc.

Alexandria & Western.—An officer writes that this company has located a line from Alexandria, La., west via Weil, Lamothe, Crane and Quadrate to Wilda; surveys made for 23 miles. Preliminary surveys have been extended further west, but the location beyond Wilda has not yet been made. Maximum grade 0.5 per cent. and maximum curvature 3 degs. There will be one steel bridge, a short plate girder span, over the state canal. I. W. Sylvester, chief engineer, Alexandria. (March 18, p. 749.)

Algoma Central & Hudson Bay.—Bids are wanted by C. N. Coburn, chief engineer, Sault Ste. Marie, Ont., it is said, to build from Hawk Lake junction, Ont., to the Canadian Pacific. (Jan. 28, p. 209.)

Arbuckle & Western.—Incorporated in Oklahoma, with $400,000 capital and headquarters at Ardmore, Okla. The plans call for a line from Ardmore northwest to Chickasha, 110 miles, with a branch from Milo, near Ardmore, northwest to Lawton, 65 miles. It is estimated that it will cost $16,000 a mile to build the line. The directors include: O. O. Ayers, J. R. Pennington and R. A. Hefner, Ardmore, and E. S. Ayers, Eddington, Kan.

Canadian Northern.—Surveys have been made and bids will be asked for at once, it is said, to build from Hope, B. C., west to New Westminster, about 56 miles. Surveys are said to be made and bids will be asked for this spring to build from Edmonton, Alb., west to the Rocky mountains, about 200 miles. (March 4, p. 460.)

Central Railroad of Oregon.—According to press reports plans are being made for an extension from Union, Ore., northwest through the Grande Ronde valley and over the Blue mountains to Walla Walla, Wash., about 80 miles. (June 18, p. 1328.)

Cieneguita & Sonora Central.—According to press reports from Hermosillo, Mex., this project is being financed by an American syndicate, headed by Charles Deering, of the International Harvester Co., Chicago. The plans call for a line through a mineral and coal section, and is to provide an outlet for the Cieneguita Copper Co. It is to connect with the Yaqui River branch of the Southern Pacific Railroad of Mexico at Tonichi. The line will be about 125 miles in length.

Cleveland, Cincinnati, Chicago & St. Louis.—An officer writes that a contract has been given to the Walsh Construction Co., Davenport, Iowa, to build the Evansville, Mt. Carmel & Northern, from Mt. Carmel, Ill., south to Evansville, Ind., about 43 miles. Maximum grades will be $^3/_{10}$ per cent. northbound and $^5/_{10}$ per cent. southbound with light curves. There will be a bridge over the Wabash river. The Cairo division will be double-tracked from El Dorado south to Ledford, 11 miles, also on a section from Chrisman north to Lyons, 23 miles. (March 11, p. 546.)

Erie.—In five or six weeks the Erie expects that the Genesee River Railroad, building a low-grade line from Hunts, N. Y., south to Cuba, 33 miles, will be finished and perhaps put in operation about that time. The Erie & Jersey, a low-grade line between Guymard, N. Y., and Highland Mills, with the revision of that portion of the road between Highland Mills and Newburgh junction, is finished and is now in operation. Efforts are being made to complete the Bergen Hill, N. J., improvements so as to have the roadbed ready for the operation of trains in a short time. The Bergen Hill improvements include a four-track open cut, 70 ft. deep and 4,500 ft. long, through Bergen Hill, for passenger trains. The company has spent between $12,000,000 and $15,000,000 improving its freight service from the west, and for a better approach to the Jersey City terminal. (Dec. 3, p. 1107.)

Evansville, Mt. Carmel & Northern.—See Cleveland, Cincinnati, Chicago & St. Louis.

Gainesville, Oklahoma & Western.—Incorporated in Texas, with $100,000 capital, to build from Gainesville, Tex., southwest through Cooke and Wise counties to a connection with

the Rock Island near Bridgeport; also to build from Gainesville, northeast to Red river, at or near Orlena, in all about 80 miles. The incorporators include: J. C. Whaley, G. C. N. Ball, H. W. Stark, T. M. King, O. F. Scott and J. T. Edwards, Gainesville.

Garden City, Gulf & Northern.—An officer writes that contracts have been let for building this line, the work to be started at the option of the railway company. The projected route is from Scott, Kan., south via Garden City, and Santa Fe to Liberal, 100 miles. Track laid on the first 40 miles from Scott, where connection is to be made with the Atchison, Topeka & Santa Fe and the Missouri Pacific south to Garden City. The work to be carried out is not difficult, being through a prairie section. There will be a bridge over the Arkansas river and another over the Cimarron river. The project has only been financed for the first 40 miles. The company was organized to build from Plains, Kan., on the Chicago, Rock Island & Pacific, north via Garden City and Scott to St. Francis, in Cheyenne county, about 225 miles. B. M. McCue, president, and William H. Cost, chief engineer, Garden City. (Nov. 5, p. 894.)

Grand Trunk Pacific.—A contract is said to be let to the J. D. McArthur Co., Winnipeg, Man., for a branch line from Regina, Sask., north to Portal.

Gulf Coast & Provident City.—Plans are nearing completion, it is said, and work is to be started in April on the first section from Pierce, Tex., on the Galveston, Harrisburg & San Antonio, in Wharton county, west to Provident City, now known as Goldenrod, about 25 miles. As soon as that section is finished work will be started from Pierce to Houston. E. W. Townes, Houston, is attorney for the company. (Dec. 24, p. 1260.)

Iron Mountain, St. George & Grand Canyon.—Incorporated in Arizona to build from Thermo, Beaver county, Utah, on the San Pedro, Los Angeles & Salt Lake, south to Cedar City and Kanarraville, thence southwest via St. George to the Santa Fe, in the Hualapai valley, at or near Kingman, Ariz., about 240 miles, with a long branch below Kanarraville southeast through an oil and timber region to the grand canyon of the Colorado river. Shorter but important branches are also to be built from near Cedar City to the coal fields and iron mines in Iron county, Utah. The incorporators and directors include: J. R. Walker, C. Read, E. S. Kimball, E. Rykert and M. T. Burges, Salt Lake City.

Jacksonville & Atlanta Short Line.—Organized to build from Jacksonville, Fla., northwest via Homerville, Ga., Ocilla, Fitzgerald and Perry to Fort Valley, about 225 miles. B. B. Gray, president, Pinebloom, Ga., and C. A. Holtzendorff, treasurer, Fitzgerald.

Kanawha & Michigan.—According to press reports the Lake Shore & Michigan Southern and the Chesapeake & Ohio, now in control of the Kanawha & Michigan, will make improvements on the road, including new tracks, some tunnel work and eliminating steep curves, at a total cost of $1,400,000.

Kansas City, Lawrence & Topeka (Electric).—A contract is said to have been given to the Guilford Company, Kansas City, Mo., for building six miles of line from the present terminal at Shawnee, Kan., southwest to Zarah. (July 2, p. 35.)

Manufacturers' Railway (St. Louis).—See an item under Railway Financial News in regard to this company.

Mexican Pacific.—According to press reports the building of this line is now assured. The state of Guerrero, Mex., has granted the company a subsidy for the section from Acapulca, Mex., to Zihuatanejo, about 110 miles. Surveys for the line have already been made and it is said that the construction work will be pushed. The promoters own a large tract of land in the coast section of the state of Guerrero, which it is proposed to colonize and develop. The line will parallel the Pacific coast for the entire distance. Joseph Castlelot, vice-president, Mexico City. (March 11, p. 547.)

Mexican Roads.—A Consular report says that a concession has been given to William P. Wood to build a line from Santa Lucretia, at the junction of the Vera Cruz & Isthmus and the Tehuantepec National Railways, northeast to a point in Yucatan, where connection is to be made with the United Railways of Yucatan, 620 miles.

Alberta Lagorreta, of the state of Queretaro, Mex., recently obtained a concession from the federal government to build a 50-mile line between Mexico City and Queretaro City.

Minneapolis, St. Paul & Sault Ste. Marie.—According to press reports, a decision of the courts permits this company to cross the Northern Pacific's tracks at grade for a period of two years, pending the erection of an overhead approach to the new station at Sixth avenue, west, in Duluth, Minn.

According to press reports, this company will build a line from Duluth, Minn., northwest to Thief River falls, 225 miles, and will also carry out a large amount of curve elimination work during 1910.

National Railways of Mexico.—According to press reports a branch is to be built from La Capilla, Mex., on the main line of the Guadalajara division, south to Chapala, on the north shore of Lake Chapala, about 14 miles.

Nevada-California-Oregon.—An officer writes that contracts are to be let about April 10 to extend this road from Alturas, Cal., north to Lakeview, Ore., 50 miles. (March 18, p. 751.)

New York, New Haven & Hartford.—An officer writes that plans are under way for double-tracking the Berkshire division from Hawleyville, Conn., southeast to Bottsford, eight miles.

Omaha, Western & Lincoln (Electric).—An officer writes that financial arrangements have not yet been completed for building this line, projected from Omaha, Neb., with a spur to South Omaha, west via Junction, Wahoo, Weston, David City, Osceola and Aurora to Hastings, 156 miles. A branch is also projected from Junction, which is 20 miles west of Omaha, south to Lincoln, 34 miles. The work will not be difficult. Maximum grades will be 1 per cent. and maximum curvature 4 degs. Preliminary survey has been made. The company owns about three miles of graded line, which was carried out by the old Omaha & Nebraska Central. There will be a bridge over the Platte river 2,000 ft. long. F. E. Schaff, president, Lincoln; W. H. Fuller, chief engineer, 233 University avenue, Hastings. (March 18, p. 751.)

Osage Western.—An officer is quoted as saying that contracts are to be let in April for grading work on this road. It is expected to have the entire line from Vinita, Okla., west to Enid finished by August, 1910. E. J. Noonan, locating engineer, Muskogee. (Jan. 28, p. 209.)

Pascagoula Northern.—Financial arrangements are said to have been made to build an extension of this road, now in operation for 45 miles in Jackson county, Miss., from Scranton, port of Pascagoula, north to a connection with the Mobile, Jackson & Kansas City. The projected extension will run northwest through Greene, Wayne, Jones, Smith, Scott, Leake, Attala, Montgomery, Webster, Calhoun, Lafayette, Tate and De Sota counties. (July 30, p. 215.)

Pecos-Fort Stockton.—According to press reports this company will build a line from Pecos, Tex., southeast to Fort Stockton, 51 miles. This new line will connect at Pecos with the Texas & Pacific, the Atchison, Topeka & Santa Fe and the Pecos Valley Southern, now building from Pecos south, and with the Kansas City, Mexico & Orient at Fort Stockton. W. G. Trotman, Minneapolis, Minn., may be addressed.

Prairie Farm & Southwestern.—Organized to build from Prairie Farm, Wis., southwest to Glenwood, or Emerald, about 20 miles. Surveys are now under way and financial arrangements partly completed. It is expected to begin construction work about the middle of April. G. E. Scott, president, Prairie Farm. (Feb. 4, p. 281.)

St. Louis, Brownsville & Mexico.—An officer writes that the company expects to begin work early in April on an extension of the Tres Palacios branch to Collegeport, in Matagorda county, Tex., 7.6 miles. The branch is already completed from the main line at Buckeye, southeast for nine miles. Sixty-five-pound rails will be laid on the extension. The grading contract will be let in a few days. The company will do the track laying with its own men.

St. Louis East Side Belt Terminal.—Incorporated in Illi-

nois to build a belt line around East St. Louis, Ill. The proposed route is from a point near the Mississippi river, in St. Clair county, south of East St. Louis around the city to a point near Venice, in Madison county. The office of the company will be at East St. Louis. C. T. Smiley, O'Fallon; A. E. Meints, F. Kraft, W. H. Hause and J. L. Flannigan, East St. Louis, are said to be interested.

Salt Lake-Idaho.—Incorporated in Idaho by the Harriman interests, with a capital of $160,000, to build from Saline, Utah, on the Southern Pacific's Lucin cut-off north via Kelton through Raft River valley to Minidoka, Idaho, on the Oregon Short Line, 150 miles. W. H. Bancroft, J. M. Davis, D. E. Burley, P. L. Williams and F. H. Knickerbocker are interested.

Sonora Railroad.—See Southern Pacific of Mexico.

Southern Pacific.—According to press reports the Lucin cut-off across the Great Salt lake in Utah is to be double-tracked. As soon as the necessary material is received between 500 and 1,000 men are to be put to work.

Southern Pacific of Mexico.—This company has finished the main line down the Pacific coast of Mexico from Empalme, Mex., near Guayamas, southeast to Santiago river, 622 miles. The completed track has been accepted by the Mexican government, and subsidies, aggregating $6,275,000, have been paid on this section. Grading and track-laying is now in progress between Tepic and Orendain, which is on the National Railways of Mexico, 25 miles west of Guadalajara. Construction work through the Sierra Madres, north of Tepic, involves a number of problems, and it is understood that it will take about two years to complete the work. (Jan. 21, p. 164.)

The branch of the Sonora Railroad from Corral, Sonora, Mex., was opened on March 26 for general traffic north to Tonichi, 96 miles.

Statesville Air Line.—Organized to build from Statesville, N. C., north to Mountairy, in Surry county, about 65 miles, thence to Radford, Va., 60 miles additional. It is said that financial arrangements are being made and that actual work will be begun this spring. The first section to be built will be from Statesville via Harmony and Yadkinville to Boonville, in Yadkin county, 42 miles. W. D. Turner, president; D. Mausley, treasurer and general manager. (Sept. 3, p. 427.)

Stuttgart & Rice Belt.—Organized in Arkansas, with $78,000 capital, to build from Mesa, Prairie county, Ark., south to Stuttgart, thence to Coopers, Arkansas county, 40 miles. The directors include: J. R. Porter, W. M. Price, R. H. Toll, E. Pettit and P. Reinsch.

Terrell-Dallas Interurban.—Organized in Texas to build from Dallas, Texas, east to Terrell, about 30 miles. Surveys made and right-of-way secured for 23 miles. C. L. Wakefield, E. W. Morton, Jr., E. Gray and T. Layden, Dallas, are interested. William Cook, chief engineer. (See Dallas Interurban, Sept. 10, p. 477.)

Tucumcari, Portales & Gulf.—Bids have been received, it is said, and work will be started early in April from Pyote, Tex., north to Duval, 25 miles. The plans call for a line from Tucumcari, N. Mex., southeast to Pyote, thence to Del Rio. M. J. Healy, president and general manager, Pyote. (March 11, p. 548.)

Union Pacific.—According to press reports a branch from Wamsutter, Wyo., to a point near Craig, Colo., will be built during the coming summer. Kilpatrick Brothers, Beatrice, Neb., is said to have the general contract, and it is understood that a sub-contract is let to Reinhardt Brothers.

West Penn Railway Co.—See West Penn Traction.

West Penn Traction.—According to press reports from Greensburg, Pa., this is to be the new name of the West Penn Railways Co., which will be reorganized. It is planned to carry out the improvements under consideration for about six months, including the construction of a trunk line connecting West Newton, Pa., with McKeesport. Surveys have been completed for a line from Greensburg east to Latrobe, and it is understood that the line will eventually be extended further east to Ligonier. As soon as consent is obtained from the Greensburg council, and the right-of-way secured through streets in that place, work on the Latrobe-Crabtree branch will be started.

Railway Financial News.

Atchison, Topeka & Santa Fe.—The directors have voted to issue new convertible 4 per cent. bonds to the extent of 14 per cent. of holdings to holders of common and preferred stock of record April 19 at 102½. For this purpose $43,686,000 new 50-year bonds have been authorized. The bonds are the balance of $98,000,000 authorized three years ago, of which $26,056,000 were issued as 5s in 1907 and $28,258,000 more as 4s, last July. As of a recent date, Atchison had outstanding $41,259,500 convertible bonds, about $20,000,000 of which are the so-called old fours, sold in 1905 and 1906. With the above new lot the company will have issued a total of $146,727,000 convertibles, all exchangeable at par. With $41,259,500 convertibles yet outstanding and $163,725,000 common stock out, the new bonds will bring the total amount of common eventually to be issued up to $248,670,000. The new bonds will not be offered to convertible bondholders unless they change their bonds into common stock before April 19.

Walker D. Hines, acting chairman of the Atchison executive committee, made the following statement:

"The issue, just authorized, of $43,686,000 of 50-year 4 per cent. convertible bonds, is to aid in providing the necessary capital expenditures, aggregating over $46,000,000, designed to enlarge the capacity of the lines now in operation. The territory served by the Atchison system is developing with extraordinary rapidity, and the largely increased business already in sight urgently requires these improvements, and insures a very large increase in the earnings of the system.

"It may be stated in addition to the foregoing that the company is expending over $18,000,000 for new equipment and is constructing nearly 600 miles of additional railway in the state of Texas to serve a very extensive territory which is now almost entirely without railway facilities.

"Important portions of this additional mileage are expected to be in operation within a year, and it is believed will still further increase to a large extent the earnings of the system."

The new bonds have been underwritten.

Bangor & Aroostook.—Brown Brothers & Co., New York, are offering the unsold portion of the total authorized issue of $1,650,000 Wabash extension first mortgage 5 per cent. bonds of August 1, 1909-1939, at par. These bonds are secured by a first mortgage at the rate of $30,000 a mile on a cut-off connecting two of the principal lines of the company in northern Maine.

Birmingham Terminal.—Walter L. Ross & Co., Philadelphia, are offering $1,500,000 first mortgage 4 per cent. bonds of 1907-1957 of the Alabama Terminal Co. at 92, yielding about 4.40 per cent. on the investment. These bonds are guaranteed jointly by the Southern Railway, the Illinois Central, the Seaboard Air Line, the Central of Georgia, the St. Louis & San Francisco and the Alabama Great Southern.

Buffalo & Susquehanna.—Among the securities owned by Fisk & Robinson, bankers, whose affairs were recently placed in the hands of a receiver, are $968,450 Buffalo & Susquehanna bonds, $411,100 preferred stock and $24,310 common stock.

Chattanooga Southern.—Newman Erb and associates have bought a majority of the $2,250,000 common and $750,000 preferred stock. The property has been in the hands of a receiver since April 1, 1907. The road runs from Chattanooga, Tenn., to Gadsden, Ala., 92 miles.

Chesapeake & Ohio.—In the call for a stockholders' meeting for April 28 to authorize the issue of $31,390,000 4½ per cent. convertible bonds of February 1, 1910-1930, the official circular says that the bond sale is made to provide funds among other things for the acquisition of the majority of the common stock of the Hocking Valley and of substantial interests in the stock of the Kanawha & Michigan, and for the acquisition from interests in control of pending foreclosure proceedings, who have agreed to acquire the same

at foreclosure sale, of the property of the Chicago, Cincinnati & Louisville, or of the securities representative thereof; for additions and betterments to the property and for the purchase of additional motive power and equipment. The sale of bonds has been underwritten, and they are offered to stockholders at 93½ to the extent of 50 per cent. of their respective holding of common stock.

Chicago, Cincinnati & Louisville.—See Chesapeake & Ohio.

Colorado Southern, New Orleans & Pacific.—This company, which operates the line of the St. Louis & San Francisco system running from Houston, Tex., to Baton Rouge, La., has changed its name to the New Orleans, Texas & Mexico, and the line of the St. Louis & San Francisco running from Houston, Tex., to Brownsville, will also hereafter be part of the New Orleans, Texas & Mexico.

Denver & Rio Grande.—The New York Stock Exchange has listed $4,000,000 additional preferred stock and $3,006,000 additional first and refunding mortgage 5 per cent. bonds, with authority to add $427,000 additional bonds on notice of sale. The preferred stock has been sold at par for cash, and of the proceeds $3,160,000 has been used to reimburse the treasury for recent betterments and for equipment acquired, and the balance, $840,000, is on deposit to be used for like purposes. Of the $3,433,000 bonds issued, $433,000 are for corporate purposes, $1,435,000 were issued to acquire second mortgage 5 per cent. bonds of the Western Pacific (the entire $25,000,000 second mortgage bonds have now been acquired), and $1,565,000 for additions and betterments.

Georgia, Southern & Florida.—This company has filed an equipment mortgage securing an issue of $500,000 4½ per cent. bonds, due in instalments of $50,000 yearly.

Kanawha & Michigan.—All of the majority directors except N. Monsarrat have resigned, and Edwin Hawley, Frank Trumbull, W. C. Brown, C. E. Schaff and A. H. Gillard have been elected directors in their place. The minority directors, W. H. Goadby, O. F. Roberts and George D. Mackay, were re-elected.

The new stockholders' committee, consisting of J. S. Stanton, D. H. Gould and Samuel Untemeyer, have issued a circular opposing the acceptance of the offer of $72 per share for the minority stock made by the Chesapeake & Ohio and the Lake Shore & Michigan Southern. The circular says:

"We understand that the promises made by the past management to pay dividends during the present year equal to 40 per cent. of the net earnings and to pay a stock dividend amounting to about 11 per cent. in order to recoup the stockholders for the loss of past dividends are repudiated by the purchasing company. It was upon these promises and not on the recommendation of the Mackay committee that the minority stock was allowed to be retained."

Lake Erie & Western.—This company, slightly more than half of whose common and preferred stock is owned by the Lake Shore & Michigan Southern, had total operating revenues in the year ended December 31, 1909, amounting to $5,043,990. This compares with $4,361,158 in 1908. The miles operated in 1909 were the same as in 1908, namely, 886 miles, the main line running from Peoria, Ill., to Sandusky, Ohio, with branches to Minneapolis, Fort Wayne, etc. The total operating expenses last year were $3,860,443, comparing with $3,660,393 in the year before. This left an operating income of $966,123 in 1909 and $487,114 in 1908. The company paid no dividends in either 1908 or 1909. There was charged for additions and betterments $56,965 in 1909 and nothing in 1908. After the payment of fixed charges and other deductions from income the company had a surplus in 1909 of $91,105 as against a deficit in 1908 of $240,440. Freight revenue last year was $3,972,410, an increase of $624,829, mostly during the last half year and due to the general restoration of business activity and to improved train schedule. President Brown says that general conditions were never more favorable. Under operating expenses $769,087 were spent for maintenance of way in 1909 and $778,337 in 1908. Maintenance of equipment cost $981,127 last year and $797,790 the year before. Transportation expenses cost $1,843,506 last year and $1,818,657 the year before.

The total tonnage of all products carried amounted to 4,487,722 tons in 1909 and to 3,696,681 tons in 1908. The total freight-car miles run in 1909 amounted to 45,772,565 and to 40,241,050 miles in 1908. The loaded car mileage last year totaled 32,324,705, comparing with loaded car mileage of 26,718,260 in 1908, and empty car mileage totaled 11,802,907 in 1909, comparing with 12,002,811 in 1908. Nearly all classes of commodities furnished a greater tonnage in 1909 than in 1908. The most noticeable increases in tonnage furnished are in the cases of machinery and other castings, the tonnage of which amounted to 285,127 tons in 1909 and to 171,363 tons in 1908, and flour, the tonnage of which amounted to 1,024,621 tons in 1909 and 72,524 tons in 1908. The tonnage of bituminous coal also increased considerably. The noticeable exceptions to increases in tonnage of commodities is in the case of live stock, which furnished 84,524 tons in 1909 and 98,330 tons in 1908, and anthracite coal, which furnished 96,713 tons in 1909 and 106,001 tons in 1908. The average haul of revenue freight was 129 miles in 1909 and 127 miles in 1908, and the average revenue per ton per mile was 6.86 mills in 1909 and 7.15 mills in 1908. The average revenue train load was 328 tons in 1909 and 295 tons in 1908.

The balance sheet, as of December 31, 1909, shows total current assets of $1,333,998, of which $622,149 is cash and $373,446 materials and supplies. Current liabilities amounted to $2,478,563, of which $1,180,016 was loans and bills payable.

Manufacturers' Railway (St. Louis).—Stockholders have authorized an increase in the stock from $250,000 to $5,000,000, and have authorized a bond issue of $5,000,000, the proceeds of which are to be used to build east and west terminals for St. Louis. The company was incorporated in 1887 and owns and operates about 21 miles of track at St. Louis, Mo. It has been controlled by Adolphus Busch and associates. President Moore says:

"The Manufacturers' Railway, when completed, will afford trans-Mississippi river service by way of barge lines or car floats. It will also be in a position to connect with the free bridge, both on the Illinois and Missouri sides of the river. In addition it is the purpose of the company to construct a line through the southwestern section of the city of St. Louis to furnish an independent entrance for any road now constructed or to be constructed. Considerable work has been done to make possible a line between Fort Smith and St. Louis, which will be from 100 to 125 miles shorter than any other of the existing lines. The Manufacturers' Railway is only interested in such matters so far as to secure tenants."

New Orleans, Texas & Mexico.—See Colorado Southern, New Orleans & Pacific.

New York Central & Hudson River.—Stockholders are to vote April 20 on modifying the lease of the Dunkirk, Allegheny Valley & Pittsburgh so as to provide that in addition to the annual dividend payment of 1½ per cent. on the $1,300,000 stock there shall be paid as rental interest on such bonds as may be issued to refund bonds now outstanding and such bonds as may be issued for extensions and improvements.

St. Louis & San Francisco.—See Colorado Southern, New Orleans & Pacific.

St. Louis, Iron Mountain & Southern.—The New York Stock Exchange has listed $1,785,000 additional River & Gulf division 4 per cent. bonds of 1903-1933. Of these bonds $1,026,966 were issued to pay for second-track and terminals at St. Louis, Thebes and East St. Louis, and $758,208 were issued to build 1.43 miles of road between Batesville, Ark., and Newark, and for improvements.

Wabash.—The company has sold $5,000,000 new 5 per cent. notes of May 1, 1910-1913, to Blair & Co. and Kuhn, Loeb & Co., both of New York. The company is to pay off $6,000,000 4½ per cent. notes, maturing May 1. The new notes are secured by the collateral securing the old issue of notes, and in addition by the deposit of a block of Wabash 4 per cent. bonds.

Western Pacific.—See Denver & Rio Grande.

Supply Trade Section.

T. P. O'Brian has entered the sales department of the O. M. Edwards Company, Syracuse, N. Y. Mr. O'Brian's headquarters will be at 3099 Broadway, New York.

R. P. C. Sanderson has resigned as superintendent of motive power of the Virginian Railway to become general superintendent of the new works of the Baldwin Locomotive Works at Eddystone, Pa.

G. H. Groce, assistant general manager of the Illinois Central and the Indianapolis Southern, with office at Chicago, has resigned to enter the employ of the General Railway Signal Co., Rochester, N. Y.

William C. Kuntz, sales agent of the Pennsylvania Steel Co., Steelton, Pa., will on May 1 sever his connection with that company, and is to take a position with the Goldschmidt Thermit Co., New York.

The Mt. Vernon Bridge Co., Mt. Vernon, Ohio, will soon begin the building of a new plant to replace the one destroyed by fire. The main building will be 500 ft. x 135 ft. and the template shop 40 ft. x 128 ft.

The Safety Car Heating and Lighting Co., New York, will on May 1 move its Chicago office from the Monadnock building to the 19th floor of the new People's Gas building, Michigan avenue and Adams street.

F. X. Cleary has been appointed advertising manager of the Western Electric Co., New York. Mr. Cleary has been with the Western Electric Co. for about 20 years, during which time he has held important positions in the sales department.

H. Sanborn Smith has resigned, effective April 1, as general sales agent of the Lackawanna Steel Co., New York, intending to devote all of his time to personal interests. Charles R. Robinson has been appointed general sales agent to succeed Mr. Smith.

The Isthmian Canal Commission will receive bids until April 19 for piles, staybolt iron, brass screws, sulphate of copper, yellow ocher, chrome green and chrome yellow (Circular No. 569); and until April 25 for lumber, steel, iron and manila rope (Circular No. 570).

A. J. Davidson, who resigned from the presidency of the St. Louis & San Francisco in November, 1909, has accepted the office of vice-president of the American Creosoting Co., Chicago. He will have charge of the development of the company's business in the southwest.

The O. M. Edwards Co., Syracuse, N. Y., is adding to its present business the manufacture of gates, globes, angles, hoes, checks and radiator valves. These articles will be made in brass, but it is the intention later to go extensively into the manufacture of iron and steel valves.

The Northwestern Metal Manufacturing Co., 1328 North Second street, Minneapolis, Minn., want representatives to handle their line of metallic packing and railway specialties in Chicago, St. Louis, New Orleans, New York, Pittsburg, Cincinnati, Seattle, Texas and the Pacific coast.

The Anderson Forge & Machine Co., Detroit, Mich., is beginning work on a new plant at Jefferson and Kercheval avenues, which it is estimated will cost $750,000. There will be eight concrete buildings and a brick office building. The company makes drop forgings for all purposes, crankshafts, special forgings, cold chisels and special tools.

Burton W. Mudge & Co., Chicago, announce that, effective February 1, 1910, they assumed the exclusive right to handle the Garland ventilator for both passenger and freight equipment, and the Garland heating and refrigerating appliances for freight cars. The company will be glad to furnish any information on the ventilating and refrigerating of all kinds of equipment.

The Burton Tracklaying Machine Co. has been incorporated in Utah with a capital of $300,000 to manufacture a tracklaying machine patented by Charles W. Burton. The company will have offices in Salt Lake City, Utah. The officers are: Charles W. Burton, president; H. Borman, vice-president and treasurer, and S. H. Lynch, secretary. It is the intention to build a machine at once for demonstration.

Walter M. McFarland, who has been associated with the Westinghouse Electric & Mfg. Company, Pittsburgh, Pa., since January 1, 1899, has resigned to accept an official position with the Babcock & Wilcox Company, New York. Mr. McFarland has occupied the office of acting vice-president of the Westinghouse company for a period extending over 10 years. In this capacity he has had official supervision of the large contracts of the company, as well as being the advisory head in all the co-operative movements of the company with the associated Westinghouse companies involving literature, advertising and exhibition work.



W. M. McFarland.

As a frequent representative of the Westinghouse companies at important meetings of engineering societies and at conventions, he is well known, and he has long been considered by his company as its official host. In the latter capacity he has come into contact with many distinguished engineers and other guests from all parts of the world. His broad experience in the activities of the company and in engineering matters in general, attained through his previous work in the United States Navy, and his personal acquaintance with men of public affairs, particularly fitted him for duties of this character.

Mr. McFarland was born in Washington, D. C., in 1859. He obtained his education in the public schools of Washington, the preparatory department of Columbia University and the United States Naval Academy. He entered the latter institution as a cadet engineer in 1875, and in 1879 was graduated second in his class. In 1881 he was commissioned as assistant engineer; in 1891 as past assistant engineer, and in 1898 as chief engineer. For more than 20 years he was the youngest officer to have reached the latter grade. When the Personnel Board was assembled by the Secretary of the Navy in 1897, Mr. McFarland acted as the sole sponsor for the younger men of his corps. He was one of the most active and effective supporters of the amalgamation scheme, the recommendation of which was the main result of the deliberation of the board. In 1899 he was commissioned lieutenant and in the same year resigned to enter the employ of the Westinghouse Electric & Manufacturing Company. In 1882 he was detailed for service in the Bureau of Steam Engineering. From 1883 to 1885 he was detailed from the navy as assistant professor of Mechanical Engineering at Cornell University, and during the years 1885 and 1886 he was occupied with the inspection of machinery then building, and with work on preliminary design for proposed vessels. From 1889 to 1894 he was again attached to the Bureau of Steam Engineering. Mr. McFarland was vice-president of the American Society of Mechanical Engineers in the year 1907, and at the present time is vice-president of the Society of Naval Architects and Marine Engineers. He is also a member of the Engineers Club of New York, Duquesne Club of Pittsburgh, the Army and Navy Club of Washington, and the Army and Navy Club of New York.

TRADE PUBLICATIONS.

Great Northern.—"Washington, Idaho, British Columbia & Oregon" is the title of a Great Northern bulletin just issued.

Thirty-eight pages are filled with information and photographs of interest to home-seekers.

Joseph T. Ryerson & Son.—Two additions have recently been made to the Ryerson technical library, No. 10 on tool steel and No. 13 on "Glyco." The books are of the standard size of that company's publications, 4½ in. by 7½ in. No. 10 contains 64 pages and No. 13, 80 pages. Both are full of useful information and tables for users of tool steel and babbitt metal.

RAILWAY STRUCTURES.

Calgary, Alta.—N. E. Brooks, division engineer, Canadian Pacific at Calgary, is receiving bids for several concrete subways, arch culverts and concrete abutments for steel spans.

The Canadian Pacific is having plans made for the construction of a high level bridge near Calgary, and to make important improvements to its station at Brandon, Man.

Chicago, Ill.—See an item under General News regarding the Chicago Terminal Transfer.

Cleveland, Ohio.—According to press reports an agreement has been reached between the Pennsylvania Railroad and the city of Cleveland, whereby the railway company secures the right to make certain fills to the north of Whisky island in the Cuyahoga river, which will enable the company to make about 100 acres of new land and add extensively to its present dock facilities. With the Whisky island improvements and the new union station that is assured, the railways entering Cleveland will spend upward of $30,000,000 in Cleveland within the next two or three years.

Denison, Tex.—The Missouri, Kansas & Texas has let a contract to James Stewart & Co., St. Louis, Mo., for building its new car shops to replace those burned last June. Five buildings of fireproof construction are included in the plans and the total cost is estimated at $100,000.

Lansing, Mich.—An officer of the Lake Shore & Michigan Southern writes regarding the reports that extensive improvements are to be made at Lansing that this is not true, as no extensive improvements are contemplated.

Logansport, Ind.—The Ft. Wayne & Wabash Valley Traction Co. expects to build an interurban station for freight and passenger service, estimated to cost $40,000. A site has not yet been selected.

Mariscal, Mex.—A concession has been granted by the Guatemalan government to David E. Thompson, president of the Pan-American Railroad, to build the international bridge to be used for railway and highway traffic over the Suchiate river between Mexico and Guatemala. The Mexican government has already granted permission to build the bridge, which will be used primarily for an entrance of the Pan-American into Guatemala. (Jan. 7, p. 71.)

Minnedosa, Man.—An officer of the Canadian Pacific writes that the new station to be built in Minnedosa will be of brick, with shingle roof, and is to cost $10,000. Contracts were let March 28, and work is to be started about April 10. (March 18, p. 754.)

New York.—Bridge Commissioner Martin has submitted to the Board of Estimate and Apportionment estimates for strengthening the Williamsburg bridge over the East river connecting the boroughs of Manhattan and Brooklyn, for the purpose of running heavier cars over it. The commissioner is quoted as saying that the bridge should be reinforced by two supporting towers under each land span, and supporting towers under each end of the central span.

Vancouver, Wash.—The Northern Pacific has given contracts to the Hurley-Mason Co. for 27 new bridges between Vancouver and Tenino. The total cost of the work will be about $500,000.

Wheeling, W. Va.—An officer of the Baltimore & Ohio writes regarding the new freight station to be built at Wheeling, to cost about $300,000, that the new terminal is included in the plans of President Willard for increasing the Baltimore & Ohio's facilities in West Virginia. It has not yet been definitely decided just what kind of building will be put up, and the plans have not been made. (March 25, p. 853.)

Late News.

The items in this column were received after the classified departments were closed.

The Erie Railroad is asking local contractors for bids to reconstruct its station in Buffalo, N. Y., which was damaged by fire. It is expected that the improvements will cost between $25,000 and $30,000.

The New York, New Haven & Hartford has filed with the Interstate Commerce Commission new tariffs governing passenger rates, which make a horizontal increase of 5 cents per ticket on all tickets sold by the company of $1.70 and over. In some instances the increase applies on tickets costing less than $1.50. The new tariffs become effective May 1.

A free bridge to cost $500,000 is to be built over the Arkansas river between Fort Smith, Ark., and Van Buren. The Fort Smith Light & Traction Co., which operates electric lines in Fort Smith, has extended its line to the proposed approach of the bridge, and is asking permission to operate over the structure. Plans are also under consideration for an extension of the line. The Fort Smith-Van Buren & Western Arkansas Electric is also seeking permission to cross the bridge.

The new officers of the Baltimore & Ohio, Chicago Terminal Railroad, are as follows: Daniel Willard, president; Frederick C. Batchelder, first vice-president; H. L. Bond, Jr., second vice-president; J. P. Leary, controller; F. B. Worthington, auditor; J. V. McNeal, treasurer, and C. W. Woolford, secretary. F. E. Blaser, superintendent of the Cumberland division of the Baltimore & Ohio, has been appointed general superintendent of the main line system of the B. & O., succeeding Mr. Batchelder.

The action of the Pennsylvania in making a general increase in the pay of employees, noted in another column, was followed on Wednesday by a similar notice from the Philadelphia & Reading. The Reading order is limited to employees receiving less than $300 a month, but it does not include certain classes whose wages have been revised within the last 90 days. Including those who have recently had an increase and those affected by the present order, there are about 37,000 persons. The Norfolk & Western had advanced the pay of telegraphers 5 per cent.

Professor George Leonard Vose, professor of civil engineering at Bowdoin college from 1872 to 1882 and at Massachusetts Institute of Technology for the following four years, died March 30 at Brunswick, Me. Professor Vose was a well known writer on civil engineering subjects and had been a valued contributor to the *Railroad Gazette*. He began his professional career in the office of Samuel Nott in Boston in 1848. He studied at Lawrence Scientific school, Cambridge, and following that was in the railway service for a number of years. He was one of the editors of the *American Railway Times*, published in Boston from 1860 to 1864.

It is understood that arrangements have been made between the Moore-Reid interests and the Morgan interests in Lehigh Valley, under which a plan of financing will be brought out on the following lines:

1. To repay a part of the improvement to the Lehigh Valley property made of late years from earnings, it is proposed to declare a 50 per cent. cash dividend, or $25 per share, upon the $40,000,000 Lehigh Valley shares which have a par value of $50.
2. It is proposed to give stockholders the opportunity to take another share of stock at its par value of $50, which will furnish the money for the cash dividend and for still further improvements and the redemption of $6,000,000 second mortgage 7 per cent. bonds maturing September 1 next.
3. It is proposed that President Thomas become chairman of the board and that Mr. Miller, of the Chicago & Eastern Illinois, succeed Mr. Thomas as president of the Lehigh Valley.
4. It is proposed that the stock be listed in New York as soon as practicable.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The St. Louis & San Francisco has ordered five Mallet locomotives from the American Locomotive Co.

The Winston-Deere Co. has ordered five switching locomotives from the Baldwin Locomotive Works.

The Browndell Improvement Co. has ordered one 17-in. x 24-in. tank locomotive from the American Locomotive Co.

The Missouri, Oklahoma & Gulf has ordered four consolidation locomotives from the Baldwin Locomotive Co. for September delivery.

The Pennsylvania Railroad will build 105 locomotives at its Juniata shops, including the following classes: H 8 b, K 2, E 3 d, E 5, B 6 and B 8.

The Carter Construction Co., Chicago, has ordered four switching locomotives from the Baldwin Locomotive Works, and one tank locomotive from the American Locomotive Co.

The Mineral Range Railroad has ordered six 23-in. x 30-in. consolidation freight locomotives and two 19-in. x 26-in. six-wheel switching locomotives from the American Locomotive Co.

The New Orleans, Texas & Mexico has ordered 12 consolidation locomotives from the American Locomotive Company and 13 consolidation, five Pacific and five switchers from the Baldwin Locomotive Works.

The Colorado & Southern has ordered seven switching locomotives from the Baldwin Locomotive Works. Orders for the remaining locomotives, inquiries for which were reported in the *Railway Age Gazette* of March 11, will not be placed at this time.

The Denver, Northwestern & Pacific, as reported in the *Railway Age Gazette* of February 11, has ordered 12 consolidation, seven Mallet and one 10-wheel passenger locomotive from the American Locomotive Co. Delivery is specified for June and September, 1910.

General Dimensions.

	Consolidation.	Mallet.	10-wheel.
Weight on drivers	195,000 lbs.	327,000 lbs.	149,000 lbs.
Total weight	219,000 "	327,000 "	200,000 "
Diameter of cylinders	22 in	21 & 33½ in.	20½ in.
Stroke of pistons	28 in.	32 in.	28 in.
Diameter of drivers	55 in.	55 in.	63 in.
Type of boiler	Ext. wgn top.	Straight top.	Ext. wgn top.
Working steam press.	210 lbs.	225 lbs.	200 lbs.
Heating surface, tubes.	3,325 sq. ft.	5,035 sq. ft.	3,054 sq. ft.
" " firebox	213 "	236 "	199 "
" " total.	3,538 "	5,271 "	3,253 "
Tubes, number	426	409	400
" outside diameter	2 in.	2¼ in.	2 in.
" length	15 ft.	21 ft.	14 ft. 8 in.
Firebox, length	108 in.	108 in.	108 in.
" width	72¼ "	96¾ "	70¼ "
Grate area	54.2 sq. ft.	72.2 sq. ft.	52.6 sq. ft.
Water capacity	8,000 gals.	9,000 gals.	7,000 gals.
Coal capacity	12 tons.	12 tons.	10 tons.

The following special equipment will be used on all the locomotives:

Special Equipment.

Axles	Otis Steel
Bell ringer	Trojan
Boiler lagging	Sectional magnesia
Brakes	Westinghouse
Brake-beams	"Creco"
Brick arch	Am. Locomotive Equipment Co.
Couplers	Sharon
Fire doors	Franklin
Headlight	Pyle-National
Injector	Nathan Mfg. Co.
Journal bearings	More Jones Co.
Piston and valve rod packing	Paxton-Mitchell
Safety valve	Ashton
Sanding devices	Leach
Sight-feed lubricators	Nathan Mfg. Co.
Springs	Railway Steel-Spring Co.
Steam gages	Ashton
Steam heat equipment	Safety Car Heating & Ltg. Co.
Tires	Latrobe
Tubes	Worth Bros.
Valve gear	Walschaert

The Missouri, Kansas & Texas, reported in an unconfirmed item in the *Railway Age Gazette* of March 11, to have ordered locomotive equipment, has ordered five ten-wheel passenger, 10 Pacific passenger, 20 consolidation freight, 20 Mogul freight and 10 switching locomotives from the American Locomotive Co.

CAR BUILDING.

The Northwestern Elevated, Chicago, is taking prices on 20 cars.

The Elgin, Joliet & Eastern is in the market for 500 steel hopper cars.

The St. Joseph & Grand Island has ordered two 70-ft. McKeen motor cars from the McKeen Motor Car Co.

The Coal & Coke Railway is said to be considering the purchase of 500 coal cars. This item is not confirmed.

The Chicago, Rock Island & Pacific has ordered two 70-ft. McKeen motor cars from the McKeen Motor Car Co.

The Atchison, Topeka & Santa Fe has ordered three 70-ft. McKeen motor cars from the McKeen Motor Car Co.

The Los Angeles Railway, Los Angeles, Cal., is reported in the market for 90 electric cars. This item is not confirmed.

The American Smelting & Refining Co. is reported as being in the market for 100 steel ore cars. This item is not confirmed.

The New Orleans & Northeastern has recently had 10 thirty-ton box cars built at the Hattiesburg, Miss., shops of the Mississippi Central.

The Vandalia has ordered 800 fifty-ton steel hopper cars from the Cambria Steel Co. and 50 steel underframe stock cars from the Standard Steel Car Co.

The Portland Ry., Light & Power Co., Portland, Ore., is reported to have ordered 40 passenger cars from the American Car Co., the trucks to be furnished by the J. G. Brill Co.

The Chicago, Burlington & Quincy, reported in the *Railway Age Gazette* of March 4 as asking prices on 1,000 fifty-ton gondola cars, has ordered this equipment from the Pressed Steel Car Co.

The Pennsylvania is said to be in the market for 100 coaches, 10 combination, 50 suburban, 10 suburban-combination and five express horse cars for the Lines West, and 65 cars of different types for the Lines East. This item is not confirmed.

The Chicago, Rock Island & Pacific has ordered 25 caboose cars from the Mt. Vernon Car Mfg. Co. The inquiry for 250 refrigerator cars reported some time ago is still pending and in addition a new inquiry has been issued for 800 forty-ft., 40-ton box cars of the same type as those recently ordered from the Western Steel Car & Foundry Co., 500 thirty-six-ft., 40-ton stock cars, 200 fifty-ton ballast cars, 250 forty-ft. automobile cars and 250 fifty-ft. furniture cars. All of the cars in the recent inquiry will have steel underframes.

The Missouri, Kansas & Texas, reported in the *Railway Age Gazette* of February 4 as being in the market for freight and passenger equipment, has ordered the following cars: From the American Car & Foundry Co., 1,000 thirty-ton box, 200 thirty-ton automobile, 325 fifty-ton steel underframe gondola, 100 fifty-ton steel underframe flat cars and 15 coaches, 15 chair cars, 6 combination mail and coaches and 10 baggage cars; from the Mt. Vernon Car Manufacturing Co., 300 thirty-ton furniture, 175 forty-ton side dump coal and 50 standard caboose cars, and 5 postal cars from the Barney & Smith Car Co.

MACHINERY AND TOOLS.

The Baltimore & Ohio is in the market for machinery and tools for its shops at Huntington, W. Va. The order will be placed by Westinghouse, Church, Kerr & Co., New York.

The Baltimore & Ohio Southwestern has received bids on machinery for its Washington, Ind., shops, which will cost about $61,000.

IRON AND STEEL.

The Delaware, Lackawanna & Western is in the market for 500,000 tie plates.

The Cincinnati, Hamilton & Dayton is in the market for 1,600 tons of bridge steel.

The Boston Elevated has ordered 1,500 tons of rails from the Pennsylvania Steel Co.

The Great Northern has ordered 2,000 tons of structural steel from the Wisconsin Bridge & Iron Co.

The Omaha & Council Bluffs Railway has ordered 1,700 tons of structural steel from the Wisconsin Bridge & Iron Co.

The New York, New Haven & Hartford is to receive bids April 12 on steel for a bridge at Middletown, Conn. The requirements call for 1,200 to 1,500 tons. The company has ordered 9,000 tons of O. H. rails from the Maryland Steel Co. and 4,500 tons from the Bethlehem Steel Co.

General Conditions in Steel.—Present indications are thought to indicate a good showing in new steel orders during April. It is estimated that present inquiries amount to about 300,000 tons of structural steel, rails and shapes, a large proportion of which will very probably become orders before May 1. The earnings of the United States Steel Corporation for the first quarter of this year are expected to run in the neighborhood of $41,500,000. March earnings were heavy, to which is due the expected good showing for the quarter.

SIGNALING.

The General Railway Signal Co. will install nine type 2-A top post, automatic block signals between M. P. 27 and M. P. 51 on the Duluth & Iron Range, double-track. These signals will give three indications in the upper right hand quadrant and will be operated by portable storage battery, housed in concrete wells.

The Federal Signal Co. has been awarded the contract to build an interlocking plant for the Waterloo, Cedar Falls & Northern, an electric railway at Waterloo, Ia., at the crossing of the Rock Island. There will be a mechanical machine controlling upper quadrant power operated signals on the Rock Island and mechanical dwarf signals and derails on the Waterloo, Cedar Falls & Northern. The apparatus will be so arranged that the route will be normally lined up for Rock Island trains, and it will be operated by the crews of the electric cars.

Corrugated Steel for Cans and Pails.

The Steel Basket Co., Cedar Rapids, Iowa, makes a full line of cans, pails and baskets from the best grade of galvanized sheet steel designed to outlast bamboo, rattan, ash or oak several times. One of the company's specialties is a safety oily waste can, which is fully endorsed by underwriters. It has self-closing covers which open from both sides, four legs and a center support, a double bottom with all seams riveted and soldered. All these products are made to nest for shipment, thereby securing the third class freight rate.

Lacroix Battery Chute.

F. Lacroix, engineer of the Electrical Automatic Railroad Safety Signal Co., 25 Broad street, New York, has put in use, in connection with his experimental installation of cab signals on the Erie Railroad, near Newark, N. J., some battery chutes embodying two decided improvements over the ordinary style. These chutes are made of cast iron, and their general shape is shown in Fig. 1. The elevator supporting the jars is suspended by chains, running over pulleys, as shown, and is counterweighted so that when pulled up the jars can be stopped in any position; as, for example, that shown in Fig. 2, where the upper of the two jars stands in a position convenient for examination or cleaning. By further turns of the crank the lower jar may be brought into the position shown. The second improvement is the lock by which the cover is fastened. These locks are simple gravity catches, and their appearance is shown in Fig. 2, where the cover, bottom side out, stands on the ground outside of the chute. This chute, it will be understood, has not been set in place. When a chute is in position, mostly buried in the ground, the lug on its side, which covers the opening through which the wires are run to the battery, comes just above the surface of the ground. When a cover is put on a chute, it is automatically locked; and it can be unlocked only by the lifting of the rack (elevator) which holds the jars. The crank by which this lifting is effected is removable, and thus constitutes the key for unlocking the chute. To signal officers who have had padlocks broken, and zincs and copper wires stolen from battery chutes, this feature will need no recommendation.

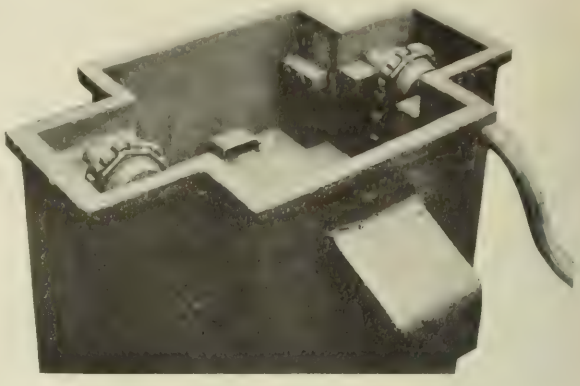


Fig. 1—Lacroix Battery Chute.

It has been found that the counterbalacing of a battery can be readily adjusted so that the jars can be stopped at any position in their upward course, and that they will remain in position without fastening; and that therefore the batteryman will never need an assistant to hold the elevator in place while he does his work or while removing a jar. The danger of breaking jars by careless dropping of the elevator is also obviated.

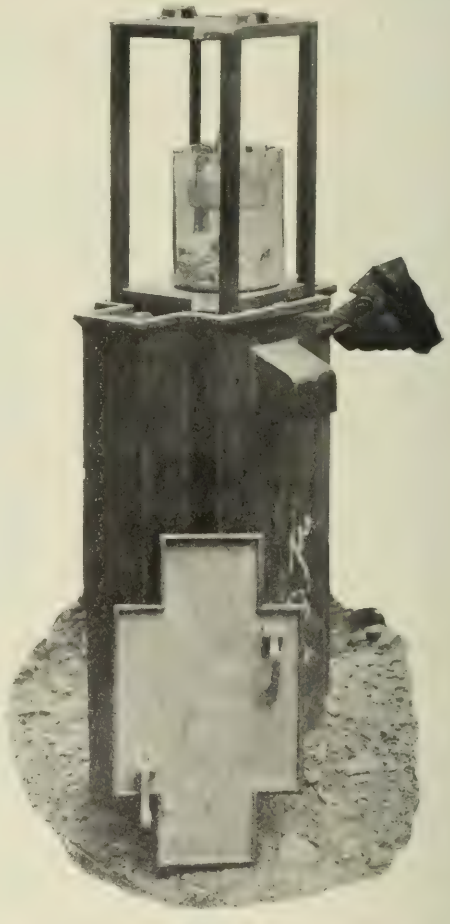


Fig. 2.

Shop Equipment.

Shop Window Sash Operator.

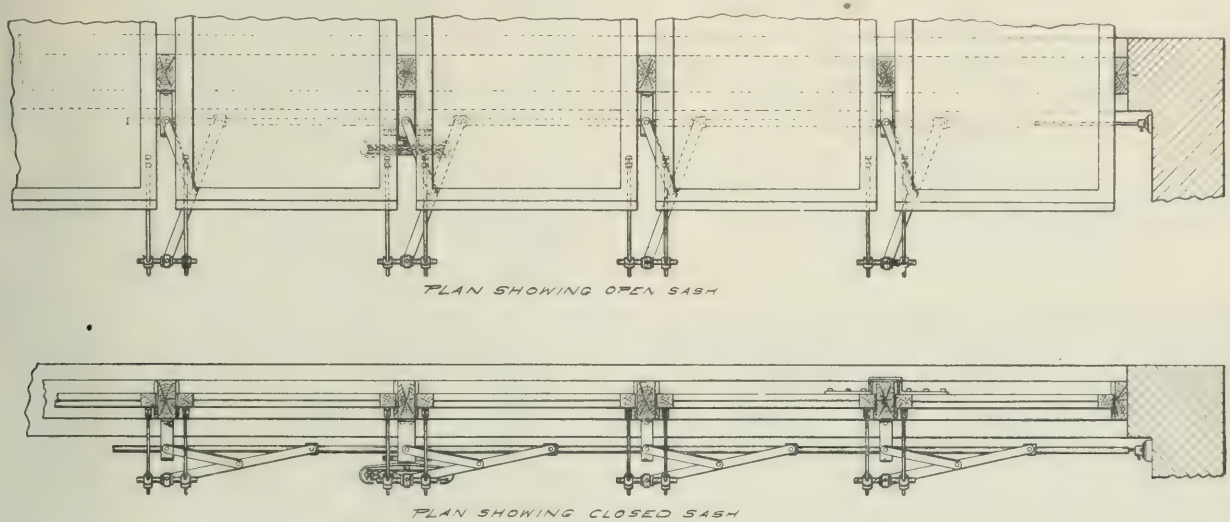
Pivoted windows in shops are not always made to fit their frames without binding and changes of weather and swelling of the wood often make the use of a chisel and hammer necessary to open them. The G. Drouvé Company, Bridgeport, Conn., which has been manufacturing and installing sash operating devices for a number of years, has designed a new sash operating device known as the "Straight Push" operator. It is simple, substantial and as nearly "fool proof" as it is possible to make it.

The direct pushing outward of the sash with two half-inch steel rods, one arm being fastened to each side of the sash at the lower part of side rail, opens the window. These two arms are adjustable to give a 30-deg. or 45-deg. opening. A line of ¾-in. pipe shaft, to which is fastened the main lever at each sash with an open coupling, is moved backwards and forwards between spool roller brackets secured at each column between the windows. A rack and pinion with a geared wheel, controlled by chain from the floor, gives the forward and return movement.

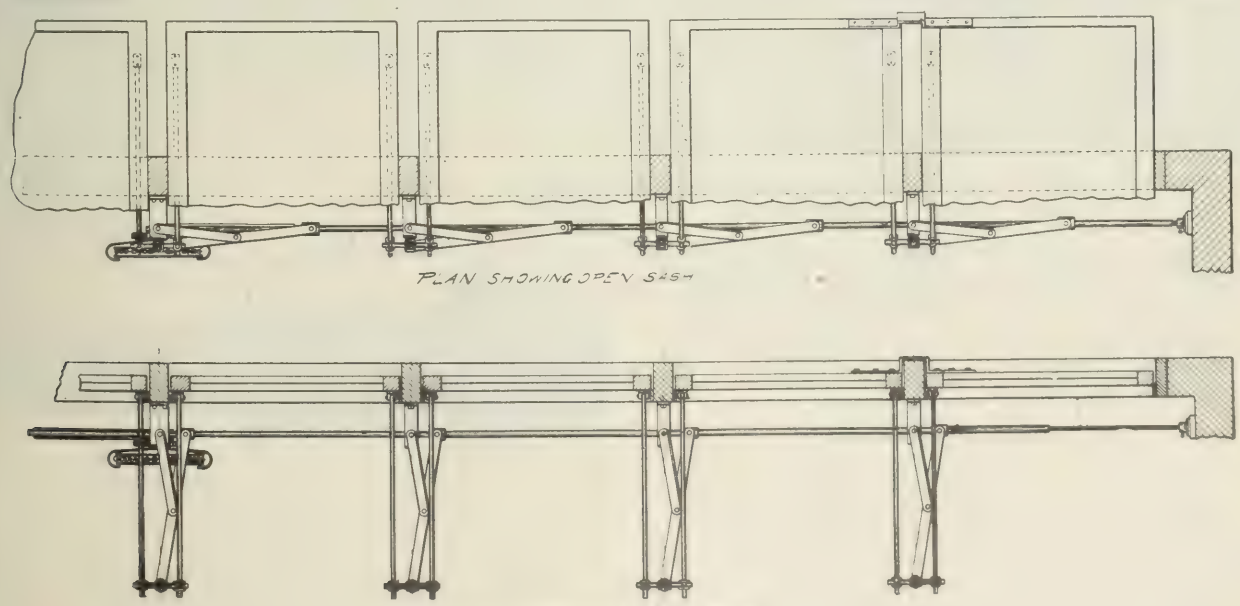
A guide lever is secured to the top of each bracket and in turn is fastened to the main lever. One end of the main lever has a U-chair riveted to it which supports the shaft connecting the two steel arms. While the arms bind to the connecting shaft it works freely in the U-chair support, allowing the arms to follow the inclination of the sash. The movement back or forth of the main shaft operates the levers at each window and as all arms work simultaneously the windows open or close quickly and surely, and each window has the same power applied. As no lost motion occurs the farthest window on the line operates in unison with the first. Several different sizes of wheels are made which give the increased power required as the number of sash to be operated is increased. Any number from 10 to 100 or more sash are easily placed under one control with this operator.

The construction is substantial and the few connecting couplings are simple and of sufficient strength to withstand strain as well as to resist the corrosive effects of gas and acid fumes. The apparatus is adapted to operate pivoted side or pivoted top-and-bottom sash, hinged-at-the-top or hinged-at-bottom sash. The operating parts which are very few cannot rust together as the connections are phosphor bronze-to-iron.

The device is also adapted for unusual conditions that are sometimes met with, as, for instance, where the crane, while not interfering with the hinged or pivoted sash when opened, interferes with the placing of any brackets or parts of an operating device at the normal position of such. Instead of pushing the sash outward from the bottom the sash are pulled inward from the top and are pushed closed. In



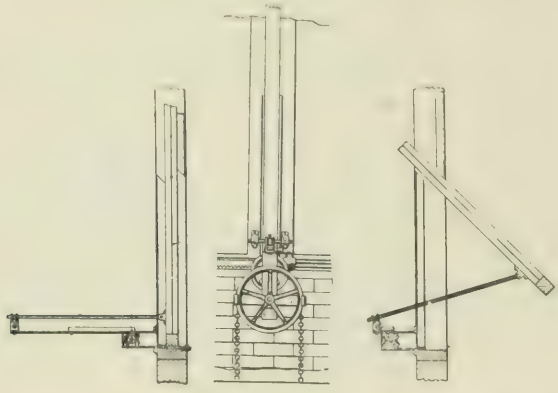
Device Arranged for Pulling in the Sash at the Top to Clear Traveling Crane.



Device as Arranged for Pushing Out the Sash from the Bottom.

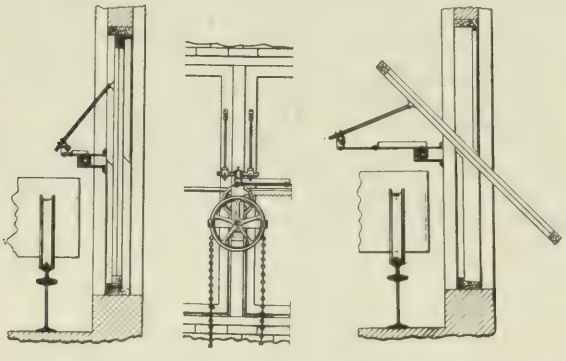
a monitor or lantern construction, where ordinarily it would be necessary to bring the operating chain down the underside slope of the roof and then to the floor, by reason of the numbers of sash that can be controlled from one point, the operating wheel may be placed at the end of the building, the chain coming down the end wall, thus giving a direct control from the floor.

Idlers or pulleys can be used to make corners and with the power being applied only after the wheel sets the rack and pinion in motion, is more direct, easier and quicker to operate than with a torsion shaft. The sash can be opened as much



Closed and Open Position of the Sash Arranged to be Pushed Out from the Bottom.

as may be required for proper ventilation and held at any position. The straight arms act as a brace against wind pressure. Fire drafts may be checked at once by the quick closing of sash made possible with this type of operator. The same holds good in case of a sudden rain or dust storm. The weakest point of this operator is the chain, which controls the operating wheel. This is heavy enough to operate any number of sash that may be put on the line and to stand a reasonable strain, yet will part under an abnormal weight. It is an easy matter to connect a pulled apart link connection



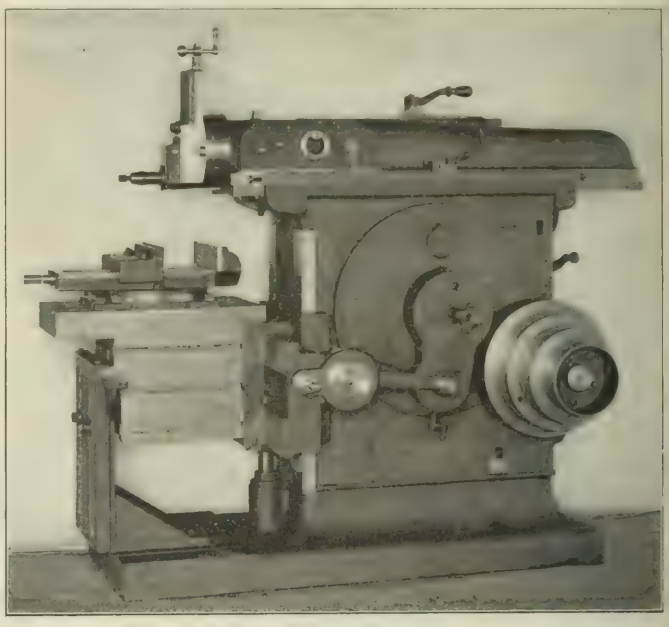
Closed and Open Position of the Sash Arranged to be Pulled in from the Top to Clear Traveling Crane.

and replace the chain over the wheel. This will direct attention to the trouble and it can be remedied, the offending binding window or windows being dropped off the line until such time as they can be planed by the carpenter. The working parts of the apparatus will therefore not be broken and the windows will not all be put out of commission.

Stockbridge 24-Inch Shaper.

A number of changes have been made in the construction of the new 24-in. Stockbridge shaper with the idea of simplifying it and making it stronger. The taper packing, formerly used for taking up the wear of the side thrust of the ram, has been replaced by a solid gib which is bolted to the column and is adjusted by screws. This provides practically a solid face on both sides of the ram. The feed rod of the cross-feed mechanism adjusts itself to any position of the bar, and, without changing its position, feeds the table in either direction and automatically stops at either end of its feed.

The driving cone is carried on a sleeve that is supported by a large self-oiling bearing which takes all strain of the driving cone off the driving shaft and permits the using of a very large bearing. This, in connection with the self-oiling feature prevents the box becoming hot. The direct drive gear ratio is 6 to 1; the back gear ratio is 30 to 1. The ram has eight changes in speed, the number of strokes varying from 8 to 90 per minute. The change gears are all made of steel. The driving shafts are carried through on both sides of machine, giving a bearing at either end. The shafts run in self-oiling



Stockbridge 24-Inch Crank Shaper.

boxes. The shaper may be equipped with a gear box and a single pulley drive, the parts being interchangeable.

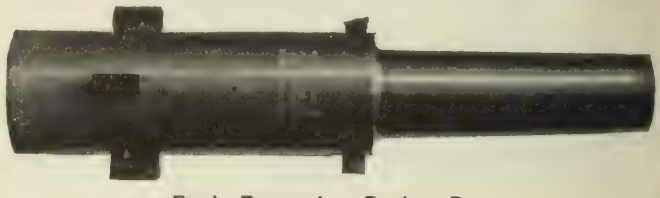
The principal dimensions are:

Actual length of stroke	24¾ in.
Vertical traverse of table	15 "
Horizontal traverse of table	30 "
Top of table	16 x 24 "
Length of ram bearing in column	36 "
Width of ram bearing in column	12 "
Net weight of machine	4,400 lbs.
Floor space required	102 x 52 in.

The shaper is equipped with the Stockbridge patented two-piece-crank motion, which gives an even cutting speed the entire length of cut, together with a quick return. It is manufactured by the Stockbridge Machine Company, Worcester, Mass.

Expansion Boring Bar for Wheels.

Boring mills equipped with the Buck expansion boring bar are finishing from 70 to 80 steel wheels in 10 hours. It is claimed that a steel wheel can be bored complete in five minutes and a cast iron one in still less time. One set of steel

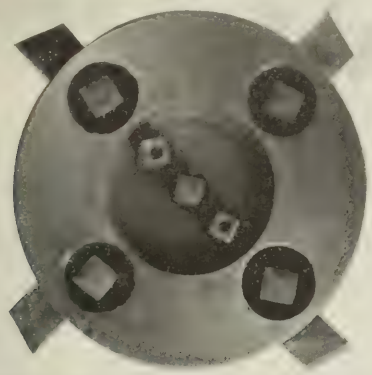


Buck Expansion Boring Bar.

cutters have been known to bore 2,000 wheels. The bar has four cutters which are expanded separately and may be adjusted to divide the metal to be removed into four parts, thus requiring a comparatively light cut of each cutter and adding to the life of the cutting edge, insuring a standard size hole.

The bar was designed to take the roughing and finishing cuts separately—the finishing cutters being slipped out while

the roughing cut was being taken and slipped back into place at its completion. This change may be made so quickly that the time for the complete job is greatly reduced as compared to that ordinarily required. The roughing and finishing cuts may, however, be taken at the same time. The cutters are readily fitted to the bar, requiring no machine work. As they



End View of Expansion Boring Bar.

are expanded separately it is not necessary for them to be of exactly the same length; this feature also permits the tools to be used down to a short length, effecting a considerable saving in the cost of tool steel. The clearance of the cutters is such that they bore a smooth hole and there is no tendency toward springing the bar and boring out of center. A chamfering tool is included at the upper part of the bar, as shown.

A water attachment applies a small stream direct to the point of the cutting tool, keeping the cutters cool and allowing the machine to be run at a high speed. This water is applied through the bar; there is no piping around the machine to be in the way of the operator. To adjust the cutters to bore the size of hole required, a gage the full width of cutters is used; it is placed over the cutters and they are expanded to the gage. This is found to be more correct than to graduate the expansion adjustment, for in graduating the adjustment the cutters must be kept ground square and of exactly the same length; every time they are reground they become shorter, requiring readjustment. The cutters have a 2-in. range of expansion and one bar will thus answer for wheels with two Master Car Builders standard sizes of bore. The bar is made short and can be used in connection with any make of boring mill. In railway shops, where the work is largely fitting, the bar will be found a great time saver because of its ready adjustment. It is manufactured by the Buck Boring Bar Company, Huntington, W. Va.

Crane Service in the Foundry.

Good crane service is of the greatest importance in improving the efficiency and increasing the output of a railway foundry. An excellent example of a well-equipped plant in this respect is that of the Norfolk & Western at Roanoke, Va., which was described by George L. Fowler in the *Railway Age Gazette* of July 16, July 23 and November 12, 1909. A general view of the wheel foundry is shown in one of the accompanying illustrations. It is equipped with three Niles traveling cranes, each of 15 tons capacity and having a span of 86 ft. 8½ in. They are of the three-motor type, but high speed auxiliary hoists may be attached at any time, if desired. Ample head room has permitted the use of girders, of latticed construction, thus obtaining maximum strength and rigidity, with minimum weight.

The molding floors are in circular form, served by specially designed gib cranes, each one of which serves 17 molds. These gib cranes are of the simple post design, and were illustrated and described in detail in the November 12, 1909, issue, page 929. The boom is 11 ft. in length, and the hoist is operated by a two-cylinder reciprocating air engine.

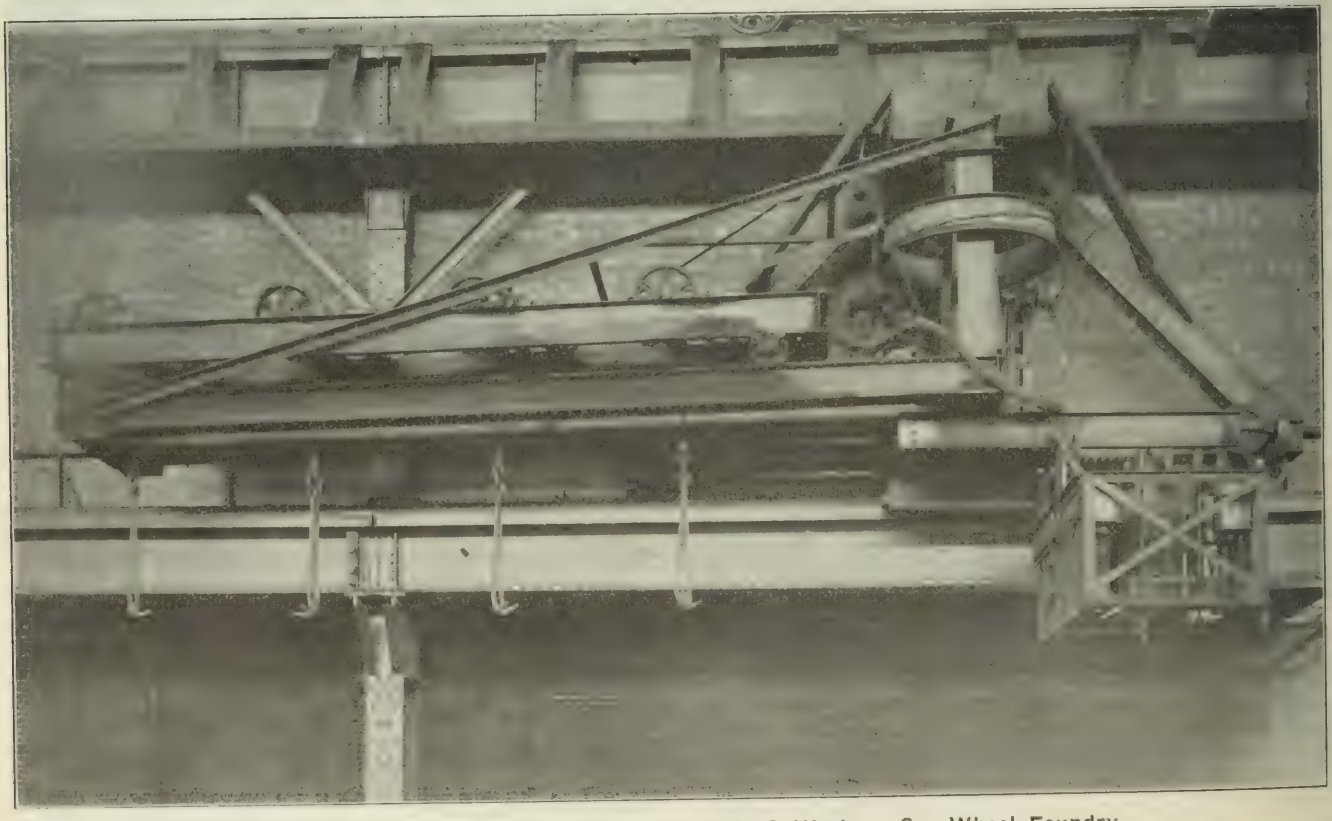
In addition to the overhead traveling cranes and the gib cranes there are two Niles traveling wall cranes on each side of the foundry; these are two-ton capacity each, with a 25-ft. reach, and operate on tracks extending the entire length of the building on both sides. Two of them, one on each side, are of the rigid or stationary arm type, and are equipped with a single hoist and operated by three independent motors. On the other two wall cranes, one of which is shown in detail, the arm or gib is of the revolving type and is geared to operate by power through an arc of 90 degrees. The revolving arm cranes are each equipped with four hoists, as shown, having hooks for picking up the wheels. Each hoist is operated by an independent hoisting mechanism, equipped with a Niles double disc lead brake and independent motors. A special master controller is located in the cage attached to the crane, and is so arranged that any one of the four hoists may be operated independently, or they may all be operated in unison. These cranes each carry four wheels at a time from the mold-



Niles Traveling Crane over the Annealing Pits, Revolving Arm Wall Crane in the Rear; Norfolk & Western Wheel Foundry.



Wheel Foundry of the Norfolk & Western at Roanoke, Va.

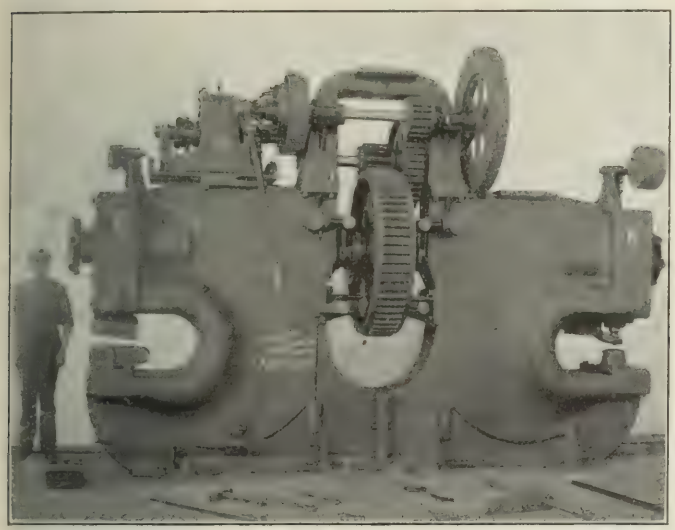


Niles Wall Crane with Revolving Arm; Norfolk & Western Car Wheel Foundry.

ing floor to the annealing pits; the pits are located at the end of the foundry in an addition at right angles to the main building. The wheels are deposited on the floor and are picked up and placed in the pits by an overhead Niles traveling crane equipped with four hoists, also illustrated. This same crane is used for removing the wheels from the pits, four at a time, and transferring them to the cleaning department. The Niles cranes were furnished by the Niles-Bement-Pond Company, New York.

Boiler Shop Tools.

The Hilles & Jones Company, Wilmington, Del., has recently supplied to the Salt Lake shops of the Denver & Rio Grande a number of unusually heavy tools for boiler shop work. The double punch and shear, here illustrated, has an 18-in. throat on each side and is driven by a 25-h.p. motor. One end of the machine is fitted with a punching attachment, the capacity being equal to punching a 3-in. hole in a 1½ in. thickness of steel. The shearing end has a capacity for shearing 2 x 10-in. flat bars. The machine is double geared, both driving shafts being carried in split babbitted bearings, with



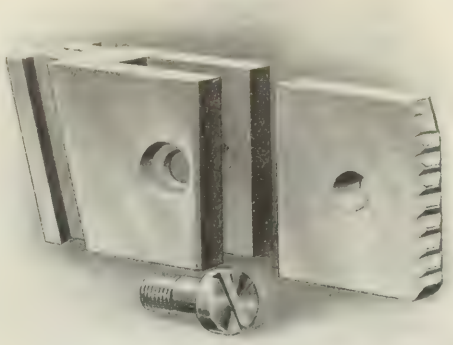
Double Punch and Shear, Hilles & Jones Company.

caps set at an angle so that the shafts can be rolled out of position if necessary without disturbing the bearing keys.

Another machine for the same company is the large bending roll, also illustrated. This tool has rolls 12 ft. 2 in. between housings; the diameter of the upper roll is 19 in., and of each of the lower rolls 14 in. The lower rolls are driven by a 40-h.p. motor, supplied with a reversing controller. The upper roll is raised and lowered independently by a 10-h.p. motor. These motors are placed on the gearing bed, which is separate from the roll housing, as will be seen in the illustration. The rolls are made of forged steel; the top one has a solid extension for counterbalancing, and the housing is hinged for removing plates rolled to full circle.

National Interchangeable Case Die.

The resharpening or regrinding of the cutting edge of dies used in bolt cutters soon reduces the size of the steel and unfits it for further service. The renewal of these cutters has always been the main item in the cost of keeping up bolt threading machinery. Tool holders have been provided for lathes in order to reduce the cost of the steel in the cutting



National Interchangeable Case Die.

tool; with the same purpose of economy in mind and a view to eliminating the express charges to and from the factory, which have heretofore been required by the National plain case die and other types, the new National interchangeable case die has been devised for use where standard sizes are used.

The new case die is made of a special grade of steel and is hardened, as is also the holding screw, making these parts indestructible. They are ground to gages, insuring accurate contact with the head slots and forming a perfect seat for the chaser, thus eliminating lost motion in the dies. The chaser extends the full width of the case, permitting of 20 per cent. more resharpening than is usually secured. The wider chaser also gives more bearing on the work, which further insures the maintenance of correct pitch. The chaser also requires approximately 30 per cent. less cutting steel than other dies. The sum of all these advantages is that most troubles from dies are overcome and 30 to 50 per cent. in bolt cutter up-keep is saved. These improved case dies and chasers are made by the National Machinery Co., Tiffin, Ohio.

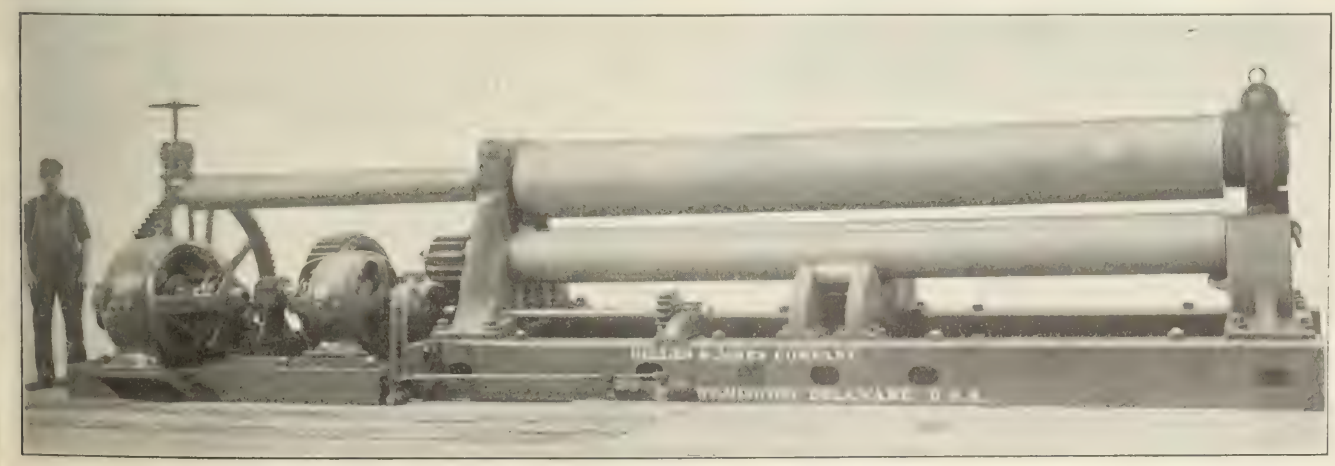
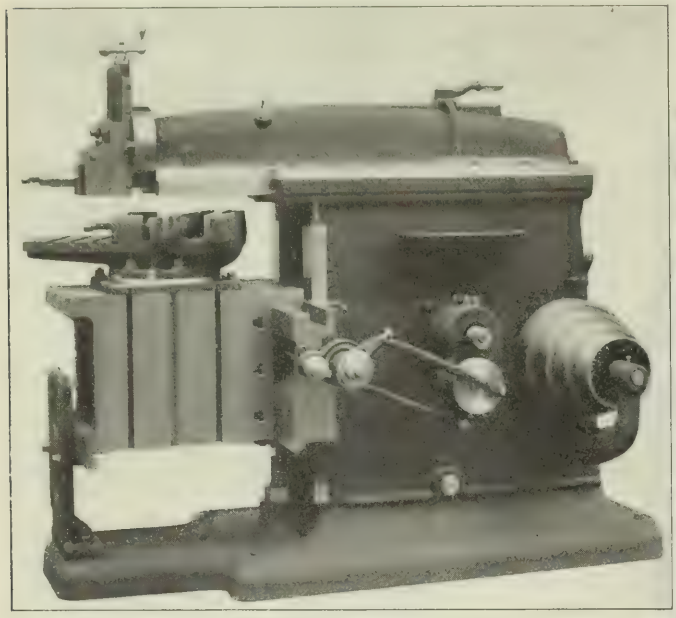


Plate Bending Rolls, Hilles & Jones Company.

24-Inch Queen City Shaper.

Several improvements have recently been made in the 24-in. shaper of the Queen City Machine Tool Company, Cincinnati, Ohio. These will shortly be added to the other sizes. The automatic feed has sixteen changes, from 1-128 to ⅛ in. on the 16 and 20-in., and from 1-64 to ¼ in. on the 24 in. The changes from zero to full feed or reverse, or to and from any number of notches in either direction, may be made instantly while the machine is in operation by means of the cam at the end of the cross traverse screw. To keep the feed on the return stroke, lift the plunger out with the lever on the feed rod and it will travel automatically to the opposite side of the plate and drop into a hole. The changes may be made very rapidly and without danger to the fingers. The feed and distance rods act automatically as the height of the rail is changed. The friction device provides for the transmitting of sufficient power for the feed but not enough to break any of



Queen City 24-Inch Crank Shaper.

the parts if the operator allows the saddle nut to strike against the rail at either end.

The bull wheel bearing is a large bushing that is a press fit in the column, and is also held by four large cap screws. The column is strongly braced at this point. The stem of the bull wheel is of large diameter, with a fillet at the flange, and extends well out from the column, making a balanced bearing with a minimum overhang; a double bearing here is bad practice, as the two diameters will not wear evenly; a double bull wheel merely increases the overhang, without adequate advantage. The length of stroke may be set while the machine is in motion or at rest.

The bearing of the rail on the column is long, wide and deep, with very heavy holding clamps the full width of rail. When making changes it is only necessary to loosen the nut on the stud at the top; as the cap screws hold it to a sliding fit, the rail cannot fall away from the column; the elevating shaft being on the reverse side one trip around the table is saved each time, and it cannot be confused with the cross traverse screw. The elevating screw works in a sleeve, and a hole in the floor is not required; a ball bearing minimizes the friction; the bevel gears are of proper ratio and are protected from chips and dirt.

The saddle bearing on the rail is long and very wide both on top and the front; the wedge gib at the top provides for easy adjustment; the clamp at the bottom prevents tipping. The V connection of the table to the saddle makes a rigid construction, and provides for instant return to former alinement if removed; it is also held to the saddle by T-bolts. All of the T-slots in the table are equidistant from the centers. The table support has full adjustments and it is made self-adjusting.

Stanton Coach and Window Washer.

A number of railways have recently installed a new window washer which is said to show a marked economy over the old methods. The device consists of a bristle brush through which water is sprayed by a patent sprayer, the brush and sprayer being attached to a cold-drawn steel tube handle which is connected at its lower end to a hose from the hot or cold water supply. The amount of water used can be accurately controlled by a ground valve at the lower end of the handle, so that the operator can flush the surface being washed or merely dampen it.

The brushes are bristle, copper tied. In regular service at the Wabash roundhouse in Decatur, Ill., a single brush washed about 1,000,000 sq. ft. of glass. The handles, being made of steel, should have a long life. A patent goose neck is used to prevent water from running down the handle to the hands of the operator.

Since the water comes through the brush continuously and there is no stopping to dip the brush, it is claimed that one man, with the Stanton cleaner, can easily do the work of two men with the old method. As the cost of the device is not



Roundhouse Window Washing with Stanton Washer.

great, the saving in labor should soon pay the difference in cost.

Geo. R. Stanton, 1302 West Main street, Decatur, Ill., is the inventor and owner of the device.

To show the tendency of things in Russia an official journal publishes the following statement of the new railway mileage built by the State and by private corporations from 1903 to 1907, both inclusive:

	State.	Private.		State.	Private.
1903.....	3,343	723	1906.....	1,247	462
1904.....	3,163	685	1907.....	1,229	53
1905.....	2,608	611			

But at the beginning of 1909 authority had been issued for the state to build 1,407 miles and for companies to build 1,643 miles. Moreover, all but 146 miles of the State railway consisted of the Amur Railroad, in the extreme east of Siberia, so that the building of railways in Russia seems again to be left to private enterprise.

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Including the Railroad Gazette and The Railway Age

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The Railroad Commission of Wisconsin has a large number of traveling inspectors to make reports on the various public utility corporations in the towns and cities of the state. These inspectors naturally go over a great part of the railway mileage of Wisconsin in the performance of their duties. For instance, during a period of eight months one inspector traveled approximately 5,500 miles. Each inspector is furnished with blank forms on which to make a report on the general conditions of service of the railway on which he travels. This report is simply incidental to his regular work of making an inspection of an electric lighting plant, for instance, in some town, which he has to travel 250 miles to get to. His report on the service of the railway is intended to cover the points that a "wide-awake" traveler would note were he taking the journey. It relates to courtesy of employees, cleanliness of stations and the percentage of cases when trains are on time. These reports are taken up by the railway commissioners and by them submitted to the roads. When reports like these are made by intelligent, fair-minded men, without necessarily any other knowledge of the management of a railway than is gained by the every-day traveling man, they should be of great value both to the public of Wisconsin in furnishing them with the data to be used in demanding improvement of service, and to the management of the railways in enabling the higher officers to learn of violations of their orders and of the petty annoyances to which travelers are often subjected without the knowledge of the railway management. The idea of such reports is much the same idea as that embodied in articles that have appeared in the *Railway Age Gazette* on the causes of the unpopularity of railways.

The comparison of 1908 and 1905 earnings made by the Interstate Commerce Commission in the introduction to the bulletin of revenues and expenses of railways in 1908 and 1909, of which an abstract is published in another column, is fairly close as far as gross revenues and operating expenses are concerned. As the commission points out, however, net operating revenue is really the account with which a railway's income statement begins. The commission says that the average net revenue per mile of line for the fiscal year 1908 is below that of both 1907 and 1906, but it does not fall below the corresponding figure for the year 1905. "Should taxes be included in the deductions [before arriving at net] . . . the result for 1908 is only $9 per mile of line below 1905." The use of the word "only" here is rather misleading. Were the railways really earning the profits on their invested capital and on the enterprise and ability put into their management, then operating income, after the deduction of taxes, would not be "only" $9 per mile in 1908 below that for 1905, but it would be *greater* by some hundreds of dollars per mile of line. In 1905 the interest requirements on the bonded debt of railways reporting to Poor's Manual was $1,129 per mile of line, and the total of required payments, including taxes, from net income amounted to $2,942 per mile. In 1908 the interest requirements per mile of line amounted to $1,259, and the total payments from net revenue amounted to $3,801 per mile. Since 1905 such improvements as the Pennsylvania Railroad's New York extension, Chicago track elevation work and the electrification of the New York, New Haven & Hartford, have been carried out without adding any new mileage. In making a comparison, therefore, of the earnings per mile of line it must be borne in mind that with the improvement of each mile of line the railway company must earn a correspondingly larger net income to remain abreast of its own prosperity. Certain it is that the tax commissioners of the various states recognize the increased value of each mile of line. In 1905 railway taxes amounted to $303 per mile; in 1906 to $349; in 1907 to $367; in 1908 to $367, and in 1909 to $382.

A certain railway is doing a piece of track elevation work in which unexpected difficulties were met. Necessary excavation endangered the foundations of adjacent buildings and space was restricted. If the work had been let to a contractor he would have made a careful preliminary examination and provided for the unforeseen. Not so with the railway. The trouble that might have been anticipated came as a surprise. Worry, hurried efforts and overtime were the result. It was costing about $2 per cu. yd. to handle the material, and the bills had risen to an alarming total. Then an experienced contractor's foreman was employed. The cost dropped to 70

cents per cu. yd. The work is well worth description by the *Railway Age Gazette;* but when we tried to get hold of enlightening data about it the meagerness of what was found available was disheartening. Company forces are doing the work, and the collection of efficiency and cost data has not been divorced by the road in question from ordinary accounting. It would seem that the men in charge of the construction departments of railways need to get the contractor's point of view. Accounting is a matter of balancing of income and expenditures. Cost keeping is a measure of and a means to efficiency. Low costs are obtained by study and improvement of methods, of which cost keeping is one; the business of the bookkeeper is merely to show the final result. This is true not only of the construction but of the surveys and location of railways. To the average railway officer all civil engineers look alike. No particular attention is paid to the records of individual men until by fortuitous circumstances they rise above the $1,800 a year grade. The first thing settled is the doing of the work; the second thing the securing of the men to do it. This latter is really of vital importance. Yet men are employed mainly on their claim that they are fit, and "the last hired, the first fired" is the almost invariable rule, the effect being that many good men are let out and poor men retained when slack times come. The bookkeeper shows the ultimate results, but the effect of railway bookkeeping on costs is indirect and usually negligible. The contractor, whose failure on one job may result in complete financial ruin, has a record of every man and keeps in touch with former employees. To him the weekly or monthly wage of an individual employee means much less than the net results he obtains. Whether a young engineer on railway work is competent is apt not to be known except in a very general way. This could all be changed by having each man in charge of work make weekly, or at least frequent, reports on the efficiency of each of his assistants. Then when the time came for the reduction of forces a wise selection could be made of the engineers to be retained. The results would ultimately be manifest in the records of the accounting department. The rule of seniority is good only when it is coupled with some system of selection for retention in service and for promotion. The reduction in the cost of handling excavated material from $2 per cu. yd. to 70 cents per cu. yd., above referred to, was not accidental. It was the result of improved methods; and the cost might have been further reduced, and the effect felt all along the line, if the men accomplishing the reduction had known that their records were being kept at headquarters and that they could and would be rewarded according to their deserts.

THE SELECTION OF LUBRICANTS.

It is an interesting and significant coincidence that at the meetings of two technical associations this winter, the American Society of Mechanical Engineers and the Railway Club of Pittsburgh, there were papers on lubrication and the use of oils, and that, in both cases, the use of the laboratory testing machine was discredited and especial emphasis put upon the value of service tests as the best and most reliable means of ascertaining the value of lubricants for special purposes. No criticism was made of the comparative results of the testing machine, provided it is distinctly understood that they are for testing machine conditions and that what they really show is the "relative lubricative value of oils for the machine itself" under the conditions in which it is operated. For example, it is very evident that the results obtained on a testing machine could not be regarded as determinative of the value of a valve oil that was to be used with high steam pressures in a cylinder, for it might lead to the use of a cheap car oil as best adapted to the purpose. In like manner the testing machine is hardly adapted as yet to the reproduction of the conditions obtaining on car journals. In the machine there may be established a journal pressure corresponding exactly to the static load of the car at rest, and dimensions of axle and brass can, of course, be reproduced; and, when it is in motion, we may even have the travel of the bearing to and fro, but there the resemblance ends. We cannot reproduce the pounding, the variation in pressure and the lurching back and forth that is characteristic of actual work. We cannot reproduce them because we do not know what they are, nor have we more than a glimmering of an idea as to the amount or intensity of these variations; and these variations must have an important bearing on the facility with which the lubricant is carried in between the surfaces, as well as on the character of the lubricant that can be so carried. As the author of one of the papers expressed it: "In valve oils, especially where the action of steam in emulsifying the oil may have great influence on the value of the oil, it is manifestly impossible to make any sensible deduction from such a type of instrument as to the action of the oils in cylinders under working conditions." It was, therefore, suggested that the testing department of a road work out a series of testing machines to duplicate road and working conditions; a suggestion that, in a way, resembles that of belling the cat, for how can road conditions be reproduced until you know what these conditions really are? It comes back then to service tests as a means of determining the value of an oil.

In his paper before the Railway Club of Pittsburgh, A. D. Smith, of the Canfield Oil Co., discussed the value of specifications and showed that the usual tests of gravity, flash, fire and viscosity bore no true relation to lubricating value; but that, when conditions under which an oil is to be used are known, certain conclusions as to its general suitability for the purpose in hand may be derived empirically from a consideration of the tests as a whole. Thus experience has shown that cylinder oils must possess certain qualities of flash and fire tests, about 525°F. and 600°F., respectively, and that there must be a certain minimum of tarry matter. In like manner, engine and car oils should flash and burn at 300°F. and 400°F., respectively, points that may well be embodied in the specifications. Possibly, too, it may be wise to include a minimum viscosity in the specification, but this should be worked out ultimately from service results.

There was, then, a slight inconsistency in first disclaiming the value of a viscosity test and later saying that, possibly, it might be wise to incorporate it in the specifications. This disclaimer and yet admission of the possible value of a viscosity test checks very closely with the paper read before the mechanical engineers, which said that "the value of viscosity as a distinguishing property of lubricating oil is recognized by all who have given attention to the subject, but all are not agreed as to the extent of its practical reliability." And one author suggests that the quality of oiliness or greasiness is of nearly as much importance as viscosity. And, here, we are met by the fact that there are no precise methods by which the quality of oiliness can be determined.

This leaves us somewhat in the air as to why a test should be made and embodied in a specification if we cannot tell what the results may signify nor have any idea as to what use to make of them when they have been obtained. So, it seems, from these two discussions, at least, that the final court for the determination of the value of a lubricant is service. It it, undoubtedly, for that reason that so few roads are willing to experiment with lubricants, and certainly none would be willing to abandon one that had been tried even though the price of another might be made attractive and the laboratory certificate be all that could be desired. It is service that settles it. It is not probable, however, that in oil, any more than anything else, the last word has been said and that the best that can be made for cars or cylinders has been produced. It is trite to say that cost and lubricating qualities are both to be considered. It is comparatively easy to learn the cost of lubrication, but in getting at the real efficiency of a lubricant as a means of reducing the co-efficient of friction under a car,

nothing has yet been done beyond ascertaining that co-efficient on a testing machine and watching the oil boxes to determine the temperatures, methods that cannot be regarded as of scientific exactness for the purpose indicated.

As to viscosity, it is sometimes specified and sometimes not. According to Mr. Canfield, one specification is about as likely to produce good results as the other. Not because viscosity may not be an important quality, but because it does not, necessarily, bear any relation to lubricating power, and that is what is bought. He considers that when it is known that a certain oil is doing the work required in a satisfactory way, it is well to insert a viscosity specification as a check on future deliveries; in other words, use it empirically.

As to the specifications for valve oils, he called attention to the undesirability of any excessive amount of foreign matter, since it points directly to an inferior base or carelessness in refining, or both, and that 1 per cent. in cylinder oils is the upper limit of what should be accepted, since more than this indicates that the oil has been subjected to an excessive temperature.

And finally, while recommending that laboratory investigations should be made of the relations existing between the constants of flash and fire, flash and viscosity, fire and viscosity, sulphur content, action of sulphuric acid at high temperatures, distillation, etc., it is the actual service results that should be most closely watched, and that when all has been said and done, "the whole scheme of selecting a lubricating oil should be service first, then standards, followed by tests and then service."

RAILWAY WAGES AND RAILWAY RATES.

In each of the recent cases in which the western railways and their employees have submitted their differences regarding wages to arbitration, awards of higher wages have been made. Probably the railways will feel constrained to accept these awards as guides for future action. They are apt to lead to many general advances in wages, such as were made last week by the Pennsylvania and the Philadelphia & Reading. All friends of social progress are glad to see the earnings of workingmen increased where this can be done without causing more harm to other interests than benefit to the workers. Railway officers, many of whom have risen from the ranks, are as glad to see their subordinates get good pay as anyone else is or could be. But they always have to remember that they have the interests of others as well as of employees to consider. These others are investors in railway securities and the public.

Their main reason for at first resisting demands for advances in wages were that they felt that railway employees already were being paid as much in proportion as workers in other industries and that the railways under existing conditions could not afford to pay them more. Nevertheless, the raises in wages are being made. In order to enable the railways to stand the increase in expenses and prosper they must be allowed, many of their officers are saying, to increase their revenues by raising their rates.

Railway net earnings are the resultant of numerous forces besides wages and rates. They may increase while wages are going up and rates are going down. They may decrease while wages are going down and rates are going up. The effect which changes in wages and rates have on railway profits depends on the effects these changes have on the efficiency of labor and on the movement of traffic.

There are several forces at work that are tending to increase railway profits and several others that are tending to reduce them. The growth of traffic and the improvements that are being made in plant and methods of operation are tending, the former to increase gross earnings, the latter to reduce operating expenses, and both to increase net earnings. The steady advances in the prices of materials are tending to increase operating expenses and thereby to reduce net earnings. If advances in wages caused proportionate or greater increases in the efficiency of labor, they would not affect, or would reduce, the expenses of operation, and would increase railway profits. But, as a matter of fact, the efficiency of labor has not kept up with the wages paid. It has declined rather than increased, absolutely as well as relatively. In the recent arbitration of the demands of the Brotherhood of Railroad Trainmen, representatives of the employees showed that the tonnage efficiency—that is, the tonnage moved—per trainman had increased 2 per cent. in eight years. But this increase in tonnage efficiency can be more than accounted for by reference to the increases which have been made in the power of capacity of railway equipment. It is the increased efficiency of the machinery they use, and not the improved and increased work of the employees themselves, which has increased their tonnage efficiency.

With various forces working in opposite directions, some of them to increase and some to reduce net earnings, the wisest student of railway affairs living cannot tell what the resultant will be. Most railway managers not only say but sincerely believe that, since the things which are working to reduce net earnings are being reinforced by increases in wages, serious impairment of railway profits can be prevented only by reinforcing with increases in rates the things that tend to maintain net earnings.

The change in rates which is needed to increase railway earnings is not a general horizontal advance but a pretty general readjustment. The notion that a horizontal advance could be made with benefit to the railways and without harm to industries betrays as much ignorance of the fundamental principles of railway economics as does the more widespread popular notion that a horizontal reduction in rates could be made with benefit to industries and without harm to the railways. There are but few rates in the United States that are excessive *per se*. No doubt, however, there are some rates the reduction of which would create traffic that would add less to railway expenses than it would add to railway earnings. This would be of benefit both to the public and to the carriers. On the other hand, there are many rates whose increase would not reduce the volume of the traffic, and, therefore, would benefit the railways without imposing an undue burden on commerce. Some of these rates have been made unduly low to favor large industrial combinations which have had a "pull," and they should be increased both because they yield the railways too little revenue for the services rendered for them and because they are unfairly discriminatory as compared with the rates charged on other commodities handled by small shippers. The western lines have made a good beginning by raising the low rates on dressed meat from the Missouri river to Chicago. It is to be hoped that they and the railways in other sections will have the courage to go ahead and raise other rates which are open to similar criticism. The roads cannot successfully defend advances in rates on commodities handled mainly by small shippers as long as they leave in their tariffs rates made in the interest of large industrial combinations which are proportionately much lower.

Some railway officers think that if the roads are to be required by law and public sentiment to submit their differences with their employees regarding wages to arbitration and to abide by the awards made, the Interstate Commerce Commission, or at least the chairman of the Interstate Commerce Commission and the United States Commissioner of Labor, who are now the official mediators under the Erdman act, should also be made the exclusive arbiters. They would have the responsibility for awarding increases in the wages they must pay for the services their employees render to them put on the same body that controls the charges that they may make for the services they render to others, the shipping and traveling public. Whether this should be done or not, cer-

tainly the commission in regulating the rates of the railways in the interest of the public should take into consideration the fact that the public, in the interest of railway employees, is regulating the wages that the railways must pay, and should co-operate with the roads in the effort to so readjust their charges that they will be able to pay the higher wages fixed and at the same time properly maintain their properties and pay satisfactory dividends to stockholders. The power that regulates should also protect, and this is not in the interest of the railways but in the interest of the public. It is to the interest of the public that railway employees should be well paid. It is to the interest of the public that railway rates should be low. But it is not to the interest of the public that railway wages shall be made so high and railway rates kept so low as to impair the earning capacity of the roads. For whatever impairs their earning capacity will impair their ability to get capital. And whatever impairs their ability to get capital will impair their ability to give the public safe and adequate transportation. We know that this last statement is very hackneyed, but the fact that it has grown hackneyed is, perhaps, the best evidence that it has needed to be said frequently and that it will have to be reiterated many times yet before the public and the railway regulating authorities grasp its true significance.

DELAWARE, LACKAWANNA & WESTERN.

The payment of an aggregate of $22,831,586 dividends by the Delaware, Lackawanna & Western in 1909 and the showing after this payment of a surplus credit account of $27,800,000 on December 31 marks this company as unique among American railways. The underlying reasons for the extraordinary prosperity of the Lackawanna are broadly the conservatism of its capitalization and the location of its coal fields. The company has no bonds or funded debt and has $30,277,000 capital stock, which is at the rate of $37,195 per mile owned and leased. This is an extremely low capitalization when the fact that the company owns extensive and valuable coal fields is taken into consideration. These coal fields lie in the region around Scranton, Pa., and from their situation give the Lackawanna a shorter haul on anthracite coal to tidewater than has any other of the anthracite roads; coonsequently the rate per ton per mile that the company receives on coal is high when compared with the rate received by other companies.

In 1909 the average rate per ton per mile on coal traffic was 8.61 mills; on merchandise traffic the rate was 7 mills. On coal traffic the rate was the same last year as the year before; on merchandise traffic it was less last year by .08 of a mill. As about half of the total tonnage carried by the Lackawanna is furnished by anthracite coal, and more than half of the ton-mileage comes from anthracite coal, this high average rate per ton per mile gives the company about the most profitable traffic that any road could ask for.

The situation of the road, running as it does from New York through Scranton about 146 miles west to Buffalo, 448 miles, is in highly competitive territory. The Lackawanna has facilities for handling a large volume of traffic, and it has a traffic department that is thoroughly aggressive. In 1909 traffic expenses amounted to $650,000, an increase over the 1908 expenses of more than 14 per cent.; but the results as shown by the total operating revenue and by the ton mileage and passenger mileage in 1909 apparently fully justifiy the outlay as a good business investment. The company has succeeded in building up a reputation, both for the prompt handling of freight and for efficient passenger service, that is highly creditable. The passenger traffic department has in the past few years done a great deal of very clever advertising, and the operating department has succeeded in pretty well living up to the claims made for it by the traffic department, which is indeed remarkable. The traffic department has advertised the fast freight service from New York to all points west, and apparently shippers have found this service satisfactory. The traffic department has also persistently advertised the excellence of the passenger service between New York and Buffalo, from which place the Lackawanna has through arrangements to Chicago with the Nickle Plate. The road's reputation is possibly due in part to the success with which the general passenger agent has vaunted the road's superiority and as well to the real excellence of its service.

In 1909 the Lackawanna had total revenue amounting to $34,800,000; this compares with total revenue in 1908 of $32,900,000. Operating expenses amounted to $18,700,000 last year as against $18,600,000 the year before, leaving operating income after the payment of taxes of $15,000,000 in 1909 and $13,200,000 in 1908. After adding other income; after the payment of rentals, and after charging off $2,100,000 for renewals and betterments, the company had a surplus available for dividends of $15,980,000 in 1909. In 1908 the charge for renewals and betterments was $2,800,000 and the surplus available for dividends after paying rentals, etc., was $10,700,000. The company paid 10 per cent. regular and 10 per cent. "extra" dividends, and, in addition, paid an extra dividend of 50 per cent. in July and an extra dividend in stock of 15 per cent. in August.

To comply with the requirements of the commodities clause, as finally interpreted by the Supreme Court of the United States, the Delaware, Lackawanna & Western Coal Co. was formed during the year, and the railway company made an arrangement by which it sells all of its coal at the pit's mouth to the coal company for 65 per cent. of the tidewater price. The stock of the coal company was offered to railway company stockholders at the time of the declaration of the 50 per cent. extra dividend, and it is generally understood that a large proportion of the railway company stockholders availed themselves of the privilege of subscribing for coal company stock at par. As yet there has been no dividend declarations made by the coal company. The railway company still mines the coal and, of course, owns the mines. The agreement as to wages between the coal miners and the operators, which expired in 1909, was renewed for three years more, and President Truesdale says that it may be stated in showing the friendly relations between the company and the men that although there has been no relaxation in the discipline, it has not been necessary to refer a single case in the last seven years to the conciliation board for arbitration.

Of the total revenue last year amounting to $34,800,000, $14,500,000 was derived from transportation of coal. This was less than in 1909 by only about $94,000. The total number of tons of coal carried one mile amounted to 1,679,000,000 tons, the average haul being 186 miles. The ton mileage was only slightly less than in 1908, but the average distance each ton was carried decreased by four miles. The number of tons of merchandise traffic carried one mile totaled 1,627,000,000 tons last year, an increase over the year before of 236,000,000 tons, or about 17 per cent., and the average distance each ton of merchandise freight was carried was 158 miles last year and 169 miles the year before.

The total number of passengers carried one mile amounted to 493,000,000, an increase over the previous year of 5 per cent., and the average receipts per passenger per mile amounted to 1.385 cents in 1909 and 1.374 cents in 1908. This very low average passenger rate is due to the great volume of the Lackawanna's commutation traffic out of New York.

As has been stated, total operating expenses amounted to $18,700,000. Maintenance of way cost $3,300,000, about 1 per cent. less than in 1908; maintenance of equipment cost $4,800,000, or about 1 per cent. more than in 1908. Transportation expenses cost $9,300,000, or just about the same as in 1908 This is a particularly good showing for transportation ex

penses in a year when merchandise freight traffic ton-mileage increased 16 per cent. and passenger mileage 5 per cent. The large increase under transportation expenses in the cost of locomotive fuel is the result of the company's using more bituminous coal on its freight and switching engines than heretofore. Formerly the smaller sizes of anthracite coal was used for locomotive and freight service, but this coal is now so much in demand that President Truesdale says that the company can better afford to sell these small sizes and use the bituminous coal on its own engines in freight service. The following table shows the unit costs of maintenance:

	1909.	1908.
*Maintenance of way per mile.....	$1,673	$1,710
†Repairs per locomotive	1,732	1,703
" " passenger car	601	603
" " freight car	52	54

*Per mile of first, second, third, etc., track, the cost of two miles of siding and switch tracks being taken as equal to the cost of maintenance of one mile of main track.

†This is for repairs only and does not include renewals, depreciation or superintendence charges.

The expenditure for repairs to passenger and freight cars is about what might be expected on a road like the Lackawanna, but the expenditure for repairs of locomotives appears very small. This is somewhat hard to explain, because unquestionably the motive power of the Lackawanna is kept in first class repair.

The success of the traffic department in securing business is well shown in the comparative statement showing the tonnage of various commodities carried in 1909 and 1908. For instance, the tonnage of grain in 1909 totaled 636,562 tons, an increase of 127,621 tons over 1908; and this notwithstanding the bid that was made for this traffic by the Grand Trunk and other Canadian roads. With the exception of products of animals, the tonnage of nearly all classes of commodities was greater last year than the year before. Naturally the most noticeable increases in tonnage were in the case of building materials and machinery and castings. This was due, of course, to the greatly improved business conditions throughout the country.

The following table shows the results of operation in 1909 compared with 1908:

	1909.	1908.
*Mileage operated	957	957
From coal transportation..	$14,464,221	$14,558,703
Merchandise freight revenue	11,393,860	9,850,008
Passenger revenue	6,825,430	6,449,032
Total revenue	34,815,011	32,898,495
Maintenance of way.....	3,298,389	3,343,396
Maintenance of equipment..	4,797,073	4,747,700
Traffic	651,888	569,398
Transportation	9,340,845	9,312,645
Total operating expenses.....	18,745,509	18,623,655
Taxes	1,394,500	1,180,800
Operating income	15,039,687	13,249,939
Gross corporate income.....	23,513,595	18,930,191
Rentals and interest	5,434,946	5,451,463
Renewals and betterments....	2,099,454	2,781,603
†Dividends	5,831,586	5,240,000
Surplus	10,147,600	5,457,125

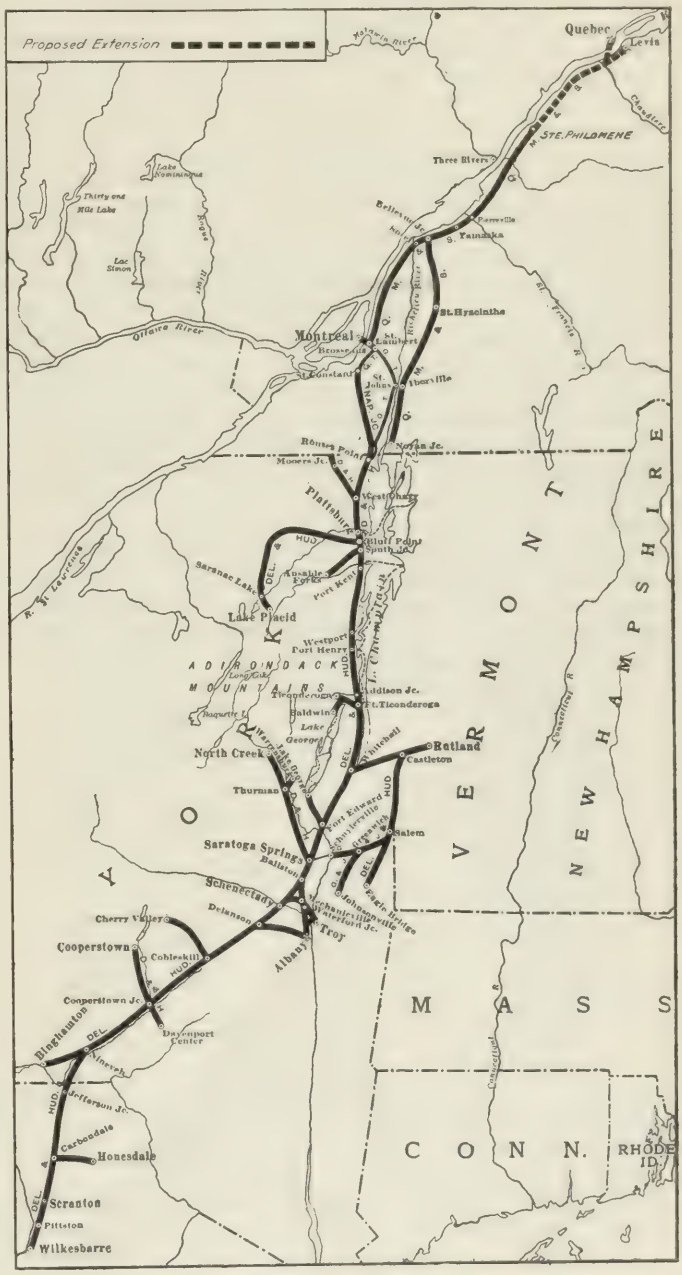
*This is the total mileage of the D., L. & W. system, and includes mileage of controlled and operated roads.

†This is the regular dividend of 10 per cent., and the regular "extra" dividend of 10 per cent. only. The 50 per cent. cash dividend and the 15 per cent. stock dividend were charged to profit and loss.

DELAWARE & HUDSON.

Both the policy of the former management of the Delaware & Hudson in expanding the road by the purchase of the Quebec, Montreal & Southern and the purchase of a number of interurban electric railways, and the policy of the present management in financing these extensions have been apparently justified. The Supreme Court, in overruling a decision of the New York Up-State Public Service Commission which refused to sanction the issue of Delaware & Hudson first and refunding mortgage bonds to reimburse the company for expenditures in the acquisition of coal lands and of electric railways, justified the present management in its contention that regardless of the details and good judgment of the original purchasers, it was proper for the company to make the best use it could of its new properties and to issue bonds to cover their original cost.

The policy of buying these properties at all was justified by the showing of earnings made in the calendar year 1909. The year was one of depression in the anthracite coal trade, and the railway company had to depend on its earnings from merchandise traffic and from passengers to make up for the loss it suffered in the falling off in anthracite coal traffic. Total revenue in 1909 amounted to $19,500,000, an increase over 1908 of a little over $1,000,000. This result was obtained



Delaware & Hudson.

notwithstanding that the earnings from coal freight traffic amounted in 1909 to $8,300,000, or about $800,000 less than in 1908. Previous to 1906 the D. & H. had extended north no further than the international boundary. At that time the company bought the entire capital stock of the Quebec, Montreal & Southern and acquired a number of electric railway properties; and also bought considerable tracts of coal land. The purchase of the Quebec, Montreal & Southern, which has now been extended as far as Fortierville and was put in operation June 14, 1909, and the purchase of the street railways were largely protective measures. The company's

heavy coal haul is, of course, north, and it has needed traffic bound south to balance the loaded car mileage northbound. By the purchase of the Q., M. & S. the management was able to protect the woodpulp industries located on its line and secure accordingly a considerable tonnage of lumber southbound. The purchase of the street railway properties was probably to protect passenger earnings as well as to acquire properties that should become profitable in themselves. These objects, it is evident from the annual report for the year ended December 31, 1909, are being successfully carried out. Passenger earnings amounted to $2,800,000 last year, an increase of $140,000 over the year before. The earnings from electric lines showed substantial improvement. The total increase in net earnings of the United Traction Co., the Hudson Valley Railway Co., the Troy & New England, the Schenectady Railway and the Plattsburg Traction Co. was $298,877. Four per cent. dividends were declared on the stock of each of these electric railways with the exception of the Hudson Valley Railway. The Delaware & Hudson received $1,088,014 dividends and interest on securities owned in 1909, as compared with $803,599 in 1908. The valuation of stocks and bonds owned, as carried on the balance sheet, was $23,588,806 in 1909. This figure is greater by only about $200,000 than the valuation as carried on the 1908 balance sheet. There is no information given as to the cost of these stocks and bonds, or as to the cost of the coal lands purchased, so that it is impossible to judge of the business wisdom shown by the former management in making the purchases; but it is evident that if the stocks and bonds pay over 4½ per cent. in dividends and interest, they are now carried on the balance sheet at a fair valuation.

The annual report of the Delaware & Hudson is a model in respect to completeness and frankness with which traffic statistics and operating results are shown. The following table shows the tonnage of the various classes of commodities and the ratio of this tonnage to the total:

	1910.	1908.	1909.
Products of agriculture:			
Tonnage	1,176,354	792,319	1,027,131
Per cent.	9.63	4.50	5.76
Products of animals:			
Tonage	137,359	210,096	214,722
Per cent.	1.09	1.19	1.21
Products of mines:			
Tonnage	8,030,343	12,206,034	11,171,637
Per cent.	65.79	69.31	62.70
Products of forests:			
Tonnage	513,252	789,402	976,244
Per cent.	4.20	4.48	5.48
Manufactures:			
Tonnage	1,549,778	2,207,754	2,533,282
Per cent.	12.69	12.54	14.22
Merchandise:			
Tonnage	196,313	351,741	438,848
Per cent.	1.68	2.00	2.46
Miscellaneous:			
Tonnage	600,908	1,052,364	1,455,600
Per cent.	4.92	5.98	8.17

The showing made by the tonnage of products of agriculture is particularly good, because there has been during the past year keen competition for the movement of grain, especially by the Grand Trunk and by the New York, New Haven & Hartford; and the securing of a grain tonnage amounting to 450,369 tons in 1909 as compared with 316,012 tons in 1908 is an indication that the D. & H. is able to justify its extension into the territory of the Canadian roads. Both the movement of grain tonnage and lumber tonnage, which latter, it will be noted, showed a substantial increase in 1909 over 1908, is in the right direction, that is, south.

The resulting improvement in loaded car mileage as compared with empty car mileage is marked. In 1908 the total freight car mileage amounted to 136,334,072 miles, of which mileage 49,180,713 miles were made by empty cars; in 1909 the total freight car mileage was 146,899,067, of which only 48,419,358 miles were made by empty cars. There was an increase in the northward loaded mileage of about 5,000,000 miles, with an increase of only about 800,000 miles in the empty northward mileage; while in the southward movement there was an increase of about 6,000,000 miles in the loaded movement, with a decrease of nearly 2,000,000 miles in the empty movement.

The number of tons of all commodities, including anthracite coal, carried one mile totaled 2,491,000,000 in 1909; this is an increase over 1908 of 256,000,000. The average number of miles each ton was carried was 134 in 1909 and 121 in 1908. The average earnings per ton per mile were 6.7 mills in 1909 and 7.1 mills in 1908. It is rather interesting to note that the average length of haul has steadily increased since 1900, the average being 94 miles that year, and every succeeding year showing an increase with the exception of 1908, in which year the average remained almost the same as the year before. The average earnings per ton per mile, however, was 7.9 mills in 1900, decreasing steadily down to 1906, then beginning to increase again. Although the revenue from freight traffic was 82 per cent. of the total revenue, passenger traffic on the D. & H. is important, because of the future possibilities of developing a considerable through traffic between New York and Quebec.

The Quebec, Montreal & Southern is to be extended to a point opposite Quebec as soon as the Canadian government decides definitely on building the Quebec bridge. The D. & H. will then offer, in connection with the New York Central from Albany, the shortest route between New York and Quebec.

The number of passengers carried one mile in 1909 totaled 134,946,143, an increase over 1908 of 7,922,645; and the average number of miles each passenger was carried was 20, an increase over 1908 of a little less than a mile. The average receipts per passenger per mile were 2.1 in 1909 and 2.12 cents in 1908.

Total operating expenses were greater by $650,000 in 1909 than in 1908 and totaled $11,460,000 last year. The cost of conducting transportation accounted for $300,000 of the increase in expenses and totaled $6,800,000 in 1909. There were some economies made, as shown by the detailed list of expenditures under cost of transportation; but in general, since neither wages nor materials were cheaper last year than the year before, it cost proportionately more to move a greater volume of traffic. There is one item that is especially noticeable. Fuel for road locomotives cost $1,594,047 in 1909; this is $140,427 more than was spent in 1908. This is notwithstanding that the miles run by all locomotives were sligtly less in 1909 than in 1908, the passenger locomotive mileage showing a decrease and the freight locomotive mileage showing an increase. The annual report of the Delaware, Lackawanna & Western, reviewed elsewhere in this issue, says that the D., L. & W. found it more profitable to sell the small sizes of anthracite coal that it had been in the habit of using for fuel in its freight locomotives and to use instead bituminous coal, and it would be interesting to know whether the same thing was done in the case of the Delaware & Hudson. As a whole, maintenance of way cost $1,334,546 in 1909 and $1,417,319 in 1908; and maintenance of equipment cost $2,598,566 last year and $2,219,543 the year before. The following table shows the unit costs of maintenance:

	1909.	1908.
*Maintenance of way, per mile	$972	$1,050
†Repairs per locomotive	2,821	1,909
" " passenger car	275	274
" " freight car	44	46

*Per mile of first, second, third, etc., track, the cost of two miles of sidings and switch tracks being taken as equal to the cost of maintenance of one mile of main track.

†This is for repairs only and does not include renewals, depreciation and superintendence charges.

In studying the expenditures for maintenance and for additions and betterments, as well as for new equipment, it must be borne in mind that in the past few years the company has been spending large sums for double-tracking and for other improvements. For instance, its entire road, both single and double track, is equipped with automatic signals. Last year was one in which coal traffic fell off, and apparently it was not found necessary to buy any new equipment nor to increase the expenditures for maintenance of way and

structures. A contract was made, however, during the year with the American Locomotive Co. for the purchase of six Mallet articulated compound locomotives, and these locomotives will be available for service during part of 1910.

There is no mention made about additions and betterments made during the year and charged to income account. There was, however, $720,459 spent on new construction in 1909, and apparently this sum was charged to capital account.

The annual report of the D. & H., while very frank and complete as to traffic and operating figures, does not give details of its profit and loss account. In the annual report for 1908 the balance sheet of December 31 shows "general profit and loss being excess of assets over liabilities" of $11,827,598. The balance sheet of December 31, 1909, shows general profit and loss of $11,079,486 for that date and gives a comparison with 1908 showing $11,525,205 for December 31, 1908. Probably through the new requirement of the Interstate Commerce Commission there was made necessary some change in the method by which the balance sheet was made up, which accounts for this apparent discrepancy. During the year the company sold $7,395,000 first and refunding bonds at a discount of $286,009, which discount was charged to general profit and loss account. Loans payable, which amounted in 1908 to $8,500,000, were reduced during the year to $4,325,000. The cash on hand in 1909 amounted to $1,850,765, as against $830,919 in 1908. This is a rather small working capital, since in 1909 the balance sheet shows interest, dividends, etc., accrued amounting to $1,076,952, comparing with interest accrued of $613,785 in 1908. Bills and accounts receivable totaled $5,803,758 in 1909, an increase over 1908 of $1,430,480.

The following table shows the earnings and expenses in 1909 and 1908:

	1909.	1908.
Mileage operated	843	845
Coal freight revenue	$8,311,479	$9,106,820
Merchandise freight revenue	7,691,617	6,162,181
Passenger revenue	2,834,628	2,693,672
Total operating revenue	19,525,859	18,500,731
Maintenance of way	1,334,546	1,417,319
Maintenance of equipment	2,598,566	2,219,543
Traffic	227,347	204,849
Transportation	6,821,392	6,528,112
Total operating expenses	11,458,480	10,811,721
Railway taxes	411,468	413,029
Operating income	7,655,912	7,275,982
Net earnings coal department	507,875	1,145,418
Gross corporate income	9,980,531	9,926,075
Net corporate income	5,194,840	5,254,458
Dividends	3,825,090	3,816,000
Surplus	1,369,750	1,338,458

Letters to the Editor.

TRAIN RESISTANCE ON THE VIRGINIAN RAILWAY.

Iowa City, Iowa, March 30, 1910.

To the Editor of the Railway Age Gazette:

Mr. Sanderson's reply (*Railway Age Gazette*, March 25) to my note published in your issue of February 25 only partially explains the difficulty mentioned. I trust it is not out of place to call attention to what on its face is an example of remarkably low train resistance. The new formula of the committee on economics of railway location of the American Railway Engineering & Maintenance of Way Association would give a resistance between 40 and 50 per cent. greater than that apparently obtaining with the 100-car train on the Virginian Railway. The Pennsylvania Railroad formula, which seems to give a less resistance than any of the others that have been suggested, indicates a resistance considerably in excess of that apparently obtaining on the Virginian Railway. And the Baltimore & Ohio tests and the resulting formula also indicate a very much higher resistance than that apparently obtaining on the Virginian Railway. If the observations have all been correct and if it is a fact, as supposed, that the grades are too long to be operated in any degree by stored energy, then this performance is particularly worthy of note as indicating a lower train resistance than any heretofore published experiments or formulas indicate to be usual.

WILLIAM G. RAYMOND.
Dean of the College of Applied Science, State University of Iowa.

WASHING WINDOWS.

Altoona, Pa., April 1, 1910.

To the Editor of the Railway Age Gazette:

Being a regular reader of your journal, I noticed in your issue of April 1 a cut illustrating a device for washing windows, claimed by Geo. R. Stanton, of Decatur, Ill., as inventor and owner. This device was used in the boiler department of the Altoona machine shops about 12 years ago. We certainly agree with him that it is all right, but the idea was conceived by me, who was assistant foreman of the Altoona boiler shop at that time.

J. B. TATE,
Foreman Boiler Department, Altoona Machine Shops.

[Mr. Tate's letter approves of the device and brings up a question which we cannot answer and are not interested in.—Editor.]

LOCAL PASSENGER TRAFFIC.

Chicago, April 4, 1910.

To the Editor of the Railway Age Gazette:

The question of how to meet the competition of electric lines for local passenger business is receiving more earnest consideration by managers of steam railways than ever before. For a time the tendency was to submit to the loss of all the local business—in other words, to let the electric lines have all the local traffic and be content with the operation of through trains between the larger cities of the country, except, perhaps, a couple of local trains daily in accordance with the franchise requirements. But the managers of steam lines have recently awaked to the fact that the suburban lines are not content with local business alone, but are reaching out for through business. For that reason motor cars as a means of keeping and regaining local traffic are, I believe, going to be rapidly placed in service by many steam lines.

It is indeed well that some means has been devised whereby the steam roads may compete on a high plane with the modern interurbans that are forming such a network of lines throughout the country, especially in the central states. I have given considerable thought to the seemingly poor policy of the steam lines in sitting idly by and permitting their business to be taken from them without the least resistance, except perhaps a fight over a country crossing or a city switch. I am not severe in my condemnation of what may have occurred in this respect four or five years or longer ago, but since the remedy has been at hand for the past three years, there is really no excuse, and I am at a loss to understand why the steam lines have failed to grasp the true situation.

In nearly every case they have the short line, and yet interurban competition has sprung up. By maintaining equally frequent service the steam roads would get 75 per cent. of the local business. Why? There are several reasons. First, Americans want fast time, and a much better schedule can be made on steam tracks. The use of city streets, street stops and city street railway crossings are avoided, thus permitting top speed up to the station both in and out of the cities and through villages. The cars in steam trains have more seat space, or rather, elbow room, better toilet facilities; and steam lines look well to the care of baggage, which the interurbans fail to do. For these reasons and others 90 per cent. of the traveling public prefer to ride on a steam road. As I have said, "time" is the all-important factor with us Americans, but I must add "convenience." The old-time policy of the steam lines in providing only a morning and an evening train, unless additional ones earned exactly as much, was not enough. Along came the interurban with its hourly service or better, and what was the result? Capacity of the interurbans taxed to their limits and the practical discontinuance of purely local service by steam lines.

It is only within the past few years that interurban promoters started the idea of building new or extending short city lines across country to a neighboring city or village, and little did they care how they got there, how the road was

built or managed, or what broad franchises were forced upon them. They were primarily 5-cent fare fellows, but wise enough to see into the future. Accordingly, a piece here, an extension there, and almost before we were aware of it, we were patronizing and booming a new industry in direct competition with the old steam lines. The managements of the steam lines sat and dreamed and wondered, watched a big reduction in fares, noted the frequent service given, which was the method used in wresting from them all their local business, and did nothing.

The steam lines couldn't exist—so they said—on anything less than the 3-cent rate, and when called upon by municipalities, boards of trade, etc., for better service they couldn't afford to give it. The capitalists began to put their money into electric lines, to abandon the old highways, to build on private rights-of-way, eliminate curves, lay heavy steel, build steel bridges, grade, erect commodious stations in cities and convenient shelter shops in the country, to buy a piece of line here and a piece there, until now an interurban road of 100 miles length is not of sufficient importance to gloat over.

Then came their limited cars, through interline ticketing arrangements, the formation of a Central Electric Traffic Association with a permanent chairman, and the publication of a through joint selling and basing fare sheet, covering a membership representing some 2,500 miles of line.

They have shown that it is possible to carry passengers for two cents and less, and this all helped to bring about legislation for 2-cent fares, which the steam lines had to adopt, but which a few years ago they "couldn't afford" to grant.

I have mentioned casually only a few of the more important things that have happened in recent years, showing how the local business of the steam lines received its death blow. The interurbans are now adopting the policy wherever possible of raising all their fares to the 2-cent basis, knowing that with even the same rates as the steam roads they will get the local business, and in addition, by giving a superior service, a goodly portion of what might be termed "through."

Now, the point I am getting to is the fact that the steam road is here to stay. There is still some virgin territory left open not yet invaded by interurbans, but which will see such lines very shortly, as evidenced by surveys that have been and are being made. The steam lines must surely have knowledge of this condition of affairs.

By adopting the motor car such steam lines as still have territory open will not only retain for themselves all the local passenger business, but effectually prevent competition in freight traffic, which is an all-important factor.

I heartily favor these single unit motor cars for use on steam tracks for several reasons:

They can be run in between through trains to handle local traffic.

They can pull one or two trailers, if necessary, thus handling a large crowd at a given time.

They can do switching service.

They can be put on lines where the conditions of travel vary. Many steam roads operate lines the summer traffic on which taxes their capacity. The handling of local business to lakes or resorts is a serious problem if they would handle the people satisfactorily. In the winter a meager service on these lines answers all requirements. The expense of any steam service that might be given is out of proportion to the profits. This is not true of motor car service. Interurban lines, when not advised in advance of any large crowd for a particular movement, must seriously inconvenience passengers unless superintendent or despatcher can find an idle crew and an extra car handy to run in and help out.

Each motor car being its own power house, it is not necessary to operate a huge plant at a large expense, as the interurban must do, to provide for a certain party in one car a short distance after the usual closing hour. The motor car is built to carry one-third more passengers than the ordinary interurban can, and, as it will also handle on schedule time two or three trailers, the company is always in a position to take care of large parties that desire to travel together, mingling en route and all arriving at destination at the same time, all that is necessary being to have on the siding at each terminal two or three regular standard passenger coaches, which can be backed up, coupled and started out as a three or four car train if necessary, without loss of time, the coaches being returned when convenient.

About the most important feature is that should one motor car fail, the service of that one car only is lost. When the power-house of an interurban line is crippled or a trolley wire fails, the entire line is tied up until repairs are made.

Capital would be hard to find for investment in a trolley line parallel to a steam line that had motor cars in use. When the promoter informed his man of money that the steam line he proposed to parallel either had, or was about to institute hourly, or bi-hourly, service, I am afraid it would be exceedingly hard to convince the capitalist that a competing line would pay.

I know of one case where an interurban line was built between two important cities on which an hourly service is now maintained in addition to limiteds. It does an average business each day of about $700. Does that mean anything? Well, if $225,000 annually means anything, why, that is the answer. The competing steam line was importuned to adopt motor car service and keep all this business, but it thought it impracticable. I am safe in saying that capital could not have been secured for the interurban line had the steam road announced an interurban service, which could have made the run between the two cities mentioned 45 minutes faster than it is made by the present interurban line. The steam line could have purchased five or six gasolene motor cars and installed them while the trolley people were thinking about it, and even then had the trolley line succeeded in building, the business would have gone to the line whose cars made the run in three-quarters of an hour less time.

In 1907 I put a motor car proposition up to a steam line to head off the building of an interurban competitor. The manager laughed and said I was impractical. To-day he is considering the adoption of such a service, and I am sure that if the motor service is inaugurated it will spell doom for the trolley line.

It is needless for any steam line operating officer to say that owing to through freight and passenger train service over his line the operation of such a service is unpractical. More cars (limited locals and freights) are daily being operated over certain single track interurban lines than some steam lines handle in a week, and it is accomplished, too, by persons of less operating experience than the steam lines usually have. Sufficient passing tracks and intelligent despatchers seem to be the requirements.

My sixteen years of close application to the passenger business from a general office standpoint, ten of which have been with steam lines and six with interurbans, has enabled me to give this subject considerable study, and it is with a certain degree of pride that I still retain that steam line feeling, which we all know lingers in the mind of a one-time steam railway man. It was because of this that I undertook the study of what may be accomplished by the steam roads with the adoption of the motor car.

If I have, by my remarks, been able to awaken to any extent the minds of any steam railway officers who would broaden their field of activity and regain for their property its rightful and just share of the ever increasing local passenger traffic, I will feel amply repaid. Data as to the cost of equipment and operation of electric lines and as to new lines which it is proposed to construct, I would be glad to furnish on request.

G. M. H.

Contributed Papers.

SUBAQUEOUS TUNNELS.*

BY R. B. WOODWORTH,
Engineer with the Carnegie Steel Company, Pittsburgh, Pa.

V.

THE SHIELD METHOD.

Lining. Since the days when Greathead built the Tower tunnel, practically all subaqueous railway and passenger tunnels have been lined with cast iron. The Thames tunnel, built by Brunel, was lined with brick in cement by bricklayers who placed them directly from the platforms of the tunnel shield. The bricks were thus laid as the shield advanced, nevertheless there was always an unprotected space between the brick lining and the shield through which water and silt might pass into the tunnel. The Severn tunnel and the Mersey tunnels, built in 1873 to 1886, were also lined with brick laid in cement, but these two were rock tunnels—subfluvial but not subaqueous.

Apart from its longitudinal weakness, one great disadvantage in brick lining is the necessity for centers on which to construct the arches. These can be made moveable, but only serve to crowd space already well filled and in so far interfere with the progress of the work. In some cases, however, brick lining is most desirable and water works and drainage tunnels are properly lined that way, whether driven with shield or without. The Flushing tunnel for the Gowanus canal in Brooklyn, for example, is so lined. This tunnel, 6,270 ft. long, is circular with an inside diameter of 12 ft. and is lined with four rings of brick laid in cement, making a wall 16 in. thick at all points. The tunnel was driven from two headings by the shield method under compressed air at 7 lbs. pressure. Each shield was 15 ft. long and 14 ft. 8½ in. in diameter and weighed, with its jacks, etc., about 55 tons. The length of the shield was somewhat more than is common in tunnels of approximately the same diameter and the rear end projected 5 ft. 10¾ in. behind the back diaphragm to form a tail piece, inside which the brickwork was built. The shield was equipped with fourteen 140-ton Watson-Stillman jacks with automatic drawbacks. These jacks had 8½-in. pistons, 36-in. stroke and reacted against a heavy cast iron ring which covered the entire face of the brickwork and distributed the pressure over it. This ring was attached to the rams of four of the jacks and when the rams were drawn back after making a shove they carried the ring with them. The centering ribs consisted of four segments of two 4-in. x 3-in. angles riveted together so that each angle projected a foot beyond the other on opposite ends to allow for joining the segments together. The ribs were circular and both ribs and lagging went all the way around. The bricklayers laid the lagging up to the spring line as fast as they laid the brick, and this protects the green brickwork from damage due to walking upon it. The usual time for two bricklayers to complete a 34-in. ring of brickwork was 4½ hours, so the progress of the tunnel was limited to the rate of setting the brickwork. Average progress of each shield was 11 ft. in 24 hours.

Fig. 13 shows the cross-section of tunnel and detail of cast iron lining of the Pennsylvania Railroad's New York tunnels. This lining is of the usual tube type as developed in the light of experience and may be considered as the embodiment of modern tunnel practice. In addition to the standard cast iron lining, cast steel rings of the same dimensions were provided for use in a short stretch of the tunnel when passing from rock to a soft ground foundation, where it was anticipated that unequal settlement and consequent distortion and increase in stress might occur. The rings were 30 in. wide and composed of 11 segments and a key. Each segment weighed approximately 2,020 lbs. and the key 520, the total weight being 9,102 lbs. per lineal foot of tunnel. Each segment is stiffened to resist the back pressure of the jacks by two ribs to the rams, but the ram pressure is applied through the heads on each side. These ribs do not come into any fixed relation over at least one rib at any possible position.

Just as in coal mining operations the size of mine timbers is fixed by judgment and experience, so the thickness and form of the cast iron segments seem likewise in the ultimate analysis to be based on experience rather than on mathematical calculation. The length of the rings in the Tower subway was 18 in., in the St. Clair Tunnel 18¼ in., in the

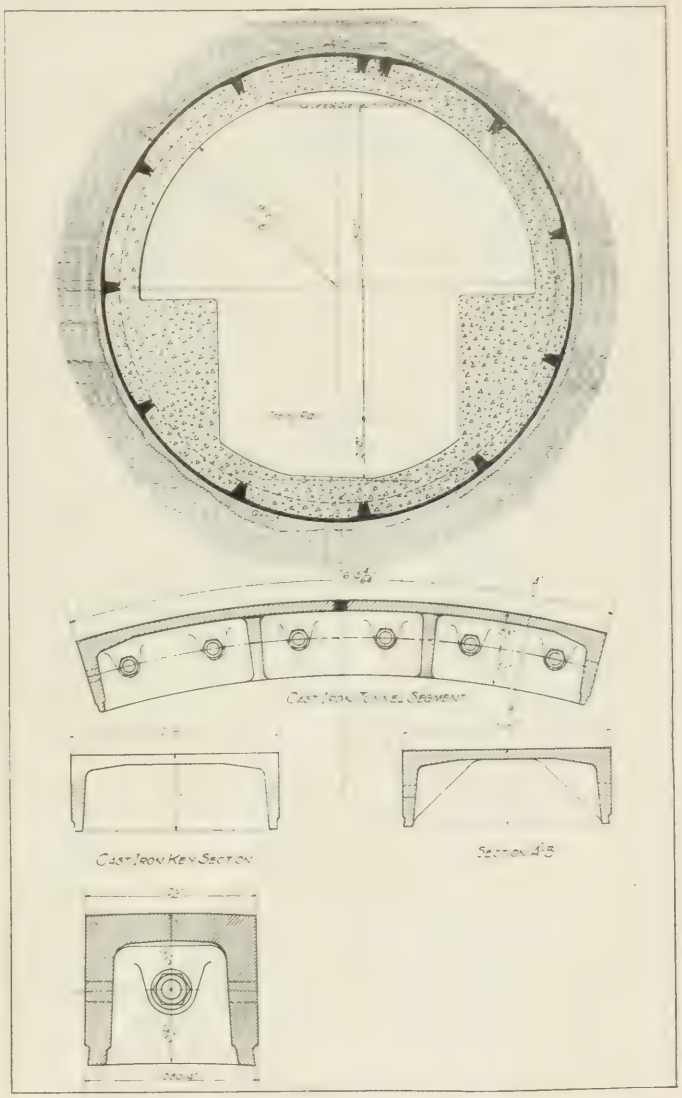


Fig. 13—Lining of Pennsylvania Railroad Tunnels.

City & South London Railway tunnel 18 in., 19 in. and 20 in.; in the Hudson tunnels of the Hudson & Manhattan, 20 in. and 24 in.; in the Blackwall tunnel the length was increased to 30 in. and the same dimension has been followed by the Pennsylvania Railroad. The length is a matter of convenience. The longer length means a greater shove of the shield, less time spent in moving equipment and consequently greater economy in construction. The longer length, however, means increased weight of segments, greater thickness for the same strength and heavier erecting equipment. It has been said the thickness is a matter of experience. This is borne out by the history of the Hudson river tunnels of the Hudson & Manhattan. The cast iron lining at the start had an inside

*From a paper read before the Railway Club of Pittsburgh.

diameter of 18 ft. 2 in. and an outside diameter of 19 ft. 6 in.; each ring was 20 in. wide, composed of 9 segments and a key. These segments were 1¼ in. thick in the web, with flanges 8 in. deep and 1½ in. thick, and the points were not planed. On account of the appearance of serious weakness a new and heavier lining was substituted after 286 rings were in place. In the new type all joints had planed faces, the ring was composed of 11 segments and a key and the thickness was increased to 1½ in. with 9-in. depth of flange. After 380 rings of this type were placed, the design was again changed; the depth of flanges was reduced to 8 in., the web remained 1½ in. thick, but the flange thickness was increased to 2¼ in.

One of the recommendations of the cast iron segment has been the cheapness of the material of which it is made. This

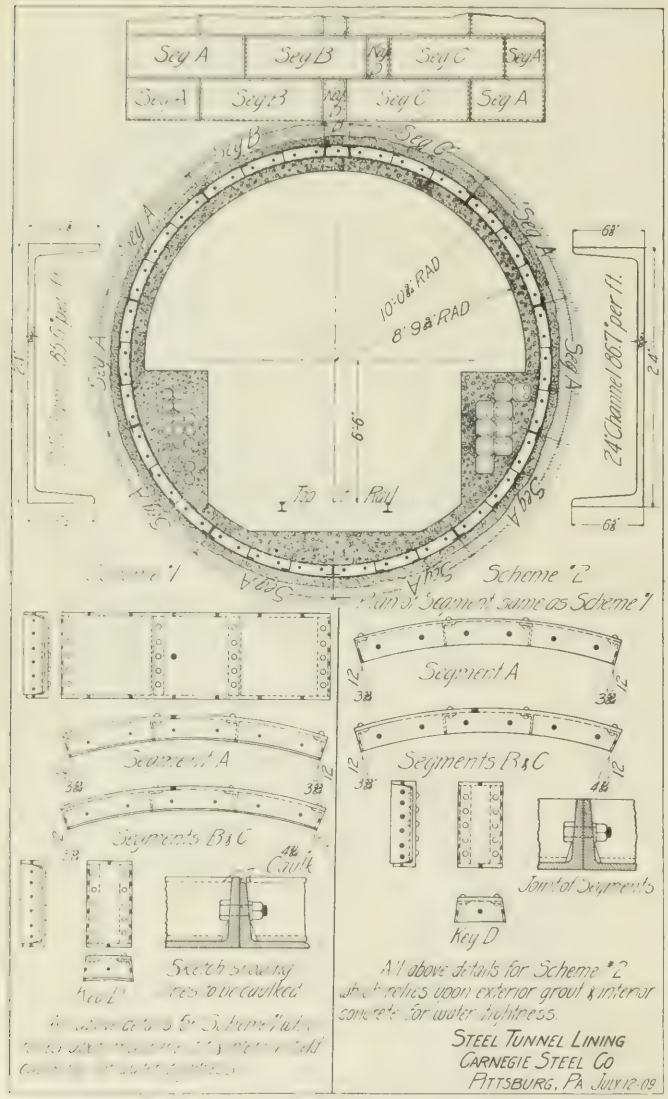


Fig. 14—Structural Steel Lining.

cheapness is offset in modern practice by the machine work on all four sides necessary to provide the fineness of workmanship demanded by considerations of watertightness, and endeavors have been made to devise some means to avoid it. As noted, in the first Hudson tunnel work the joints were not faced and this probably constituted one element of structural weakness. Henry Japp, managing engineer of S. Pearson & Son, Inc., has covered by letters patent a pressed steel tunnel segment of much merit. Pressed steel equipment has not yet, however, reached the development necessary for the production of so accurate workmanship, and the equipment suitable for this work would of necessity be heavy and expensive. Moreover, the segments would either need to be short, which would mean more time in erection, or if of the same length as the cast iron would need to be stiffened by angle iron stiffeners to resist the ram pressure.

Structural shapes and plates, however, are the logical successors of cast iron in building construction and it is confidently believed that a steel segment can be designed economically to replace the cast iron. This confidence is based on the fact that steel is a material of universal application in building construction, that it possesses strength and stiffness and has been employed in lining mine shafts in place of cast iron tubing and, therefore, has been used in vertical tunnel construction, if not in horizontal. Such a design is shown in Fig. 14 and its basis is worth some attention. The tunnel lining is subject to stresses in three general directions —transversely as a tube to resist the weight of superincumbent material under hydrostatic head, longitudinally as a beam under bending moments due to inequalities in the excavation, etc., and longitudinally also as a column to resist compressive stresses due to the back pressure of the rams.

Considered as a thin walled tube subject to a uniformly distributed internal pressure which would tend to split it longitudinally, such as would be produced by a weight of superincumbent material under hydrostatic pressure, the thickness of lining required for a tunnel 20 ft. in diameter under 100 ft. hydrostatic head would be, on the usual assumptions as to ultimate tensile strength with a factor of safety of 4, 1.056 in. for cast iron, .44 in. for wrought iron and .33 in. for medium steel; with a factor of safety of 8, 2.112 in. for cast iron, .88 in. for wrought iron and .66 in. for medium steel.

The longitudinal stresses due to inequalities in settlement are in the nature of the case indeterminate, but are beyond question small in comparison with those due to the hydrostatic pressure applied transversely. They are resisted by the bolts connecting the tunnel rings, and it appears reasonable that if the number of bolts fixed by experience in the cast iron lining is ample, it will not be necessary to use more in the steel. Moreover in the steel the stiffeners extend clear across the segment and lend to the ring their tensile strength and stiffness, while in the cast iron lining the ribs are not continuous and there is no strengthening or stiffening of the central portion of the segment.

The buckling of the sections under ram pressure may be prevented either by thickness of metal in the webs of the sections or by the use of stiffeners, it being understood that the packing plates which are placed under the rams will be of sufficient area to produce a uniform distribution of pressure over the web or stiffener. With the web secured against buckling the resistance up to the elastic limit would be equal to the fibre stress multiplied by the web area. The ultimate shear value of medium steel may be taken at 48,000 lbs. per sq. in., elastic limit 50 per cent. to 60 per cent. of the ultimate. On the basis of 50 per cent. the resistance of a 24-in. channel would be 288,000 lbs. if ½-in. thick, 360,000 if ⅝-in., 432,000 if ¾-in. If stiffeners be omitted the safe resistance of the web at 24,000 lbs. against buckling will be 160,400 lbs. if ½ in. thick, 241,400 if ⅝ in., 322,200 if ¾ in. Inasmuch as the maximum forward pressure of one ram in the Pennsylvania Railroad tunnels was 275,000 lbs., it will be seen that if stiffeners are so arranged that one stiffener at least comes under each ram, ½ in. web thickness will be sufficient, and if no stiffeners are used, the steel need be but $\frac{11}{16}$ in. thick; and that, therefore, a 24-in. channel with a ⅝-in. web stiffened by heavy angles will be ample construction under ordinary conditions. The same conclusion is reached from the fact that the cast iron lining 1½ in. thick has proven satisfactory in a number of tunnels and it, on the same basis of calculation, is only good for 296,600 lbs. The elastic limit loads are used in this calculation as against the maximum ram pressure; the working pressures and the unit stresses, therefore, are much less. The use of stiffeners also strengthens the steel segment in the center, where the cast iron is weak.

Watertightness.—Outside the mechanical fit of the cast iron segments watertightness is effected by methods of grout-

ing and calking. A certain proportion of the segments are tapped with 1½-in. holes closed with screw plugs. Through these grout is forced under pressure to fill the space between the lining and the excavation. Care has to be taken in grouting to prevent contact with the tunnel shield, as the filling of the space between the lining and the shield will cause the latter to freeze fast or else impede its movements; grout behind the tail of the shield may also impede progress by increasing the friction. In the East river tunnel, Pennsylvania Railroad, a modified quick setting natural cement manufactured expressly for this work gave the best satisfaction. Grouting behind the lining is necessary only in firm material or rock; in silt or fine sand the small cracks are soon filled with the silt or sand and further passage of water prevented. The clay blanket has the same effect when in contact with the lining.

Most cast iron tunnel linings are made with a calking space usually machined on their outer faces. Where two rings or segments bolt together these spaces form a continuous groove, which are filled with calking material driven home with a tool. The rust joint mixture of iron filling and sal-ammoniac, in the proportions of 400 to 1 by weight, is in common use for this purpose. The plan approved for the first Hudson river tunnel called for the placing of strips of creosoted wood between the longitudinal flanges of the segments. In the East river tunnels of the Interborough Rapid Transit, 16 ft. 8½ in. in diameter with 22-in. cast iron lining rings, the joints were calked by driving a lead strip tightly into the bottom of the groove and filling up the rest with rust joint mixture. Lead wire calked cold was also used in the East river tunnels of the Pennsylvania Railroad.

Tunnels are built with and without concrete lining. In the case of the Pennsylvania tunnels the cast iron segments were lined with concrete to insure permanency, to strengthen them further against outside pressure and to guard against accidents. This concrete was placed with side benches to keep the strains in the center of the tunnel in case of accidents, and to furnish sidewalks for the workmen employed in track and tunnel maintenance.

Watertightness may be effected by two methods; first by a machine shop fit of the segments calked with approved joint mixtures assisted by exterior grouting, as is the common practice, or second, the segments may be fabricated in accordance with bridge shop practice, so as to reduce their cost, and lined with concrete waterproofed by customary methods, assistance being given also by external grouting. Both of these methods are allowed for in the design of the steel tunnel lining. Whatever method of watertightness is followed, the tunnel segments should be rotated in erection so as to break joints and to prevent the intersection of four joint lines at one point and the bolts connecting the joints should be all drawn up tightly, as the tightness of the joints affects the watertightness of the whole structure.

The advantages of steel for tunnel lining as compared with cast iron are obvious. Sections of the same size and strength are much lighter and, therefore, more economical in transportation, handling and erection. Sections of the same weight would be longer and rings can be assembled with fewer pieces. Rolling processes being much more perfect than casting, machine work may be dispensed with and the segments made by ordinary fabricating methods. The toughness of the steel obviates breaking of segments due to uneven movements of the shield and the expense of their removal and replacement. The use of steel permits also the use of field rivets and in consequence the making of more nearly waterproof joints without calking. Thirty feet of steel lining has been experimentally installed in an 8-ft. 8½-in. tunnel of the Hudson & Manhattan. It is confidently expected that the advantage seen in erection will be further amplified by service.

Pile Foundations.—The Pennsylvania Railroad plans contemplated the use of screw piles placed through special bore segments to sustain the tubes at points of low stability and to prevent the tendency of the tube to rise by reason of its buoyancy. Only one, however, seems to have been driven as an experiment, as experience showed they were not necessary. Foundation bents were, however, placed through the lining in the reconstruction of the East river tunnel of the Interborough Rapid Transit through the fine sand region some 1,200 ft. long. These foundation bents spaced about 50 ft. apart longitudinally consist each of two concrete filled tubular steel piles 20 in. in diameter, ½-in. thick and spaced 7 ft. 0 in. centers transversely. These piles were sunk to hardpan or rock by jetting through a 4-in. pipe embedded in the center of the pile, were filled with concrete while being sunk and afterwards were capped with a concrete cradle formed around the bottom of the tunnel shell. The bents have been sunk to depths varying from 10 to 50 ft., the jet being assisted where necessary by hydraulic jacks butting against the roof by means of distributing timbers. The whole construction is one of the most permanent character and another proof of the wide extent of subaqueous tunnel construction.

Tunnel construction is not child's play. In its modern extent it demands engineering and executive ability of no mean order. Accurate knowledge of geological conditions and civil engineering skill must be combined with large mechanical experience and mastery of transportation methods to produce the most economical and permanent results; above all is there a place for rational use of the modern materials of construction.

The material for this paper has been drawn largely from the issues of the technical press for the last five years, chiefly the *Engineering News*, the *Engineering Record* and the *Engineering and Mining Journal*. Reference has also been had to D. McN. Stauffer's Modern Tunnel Practice and to the description of the Pennsylvania Railroad's New York tunnels in the September, October and November, 1909, issues of the *Proceedings* of the American Society of Civil Engineers. The author claims no originality for the material; it has been his purpose to sort, classify and digest for the use and guidance of any master tunnel builder who may come after him. Perhaps it may assist some such builder in the construction of subaqueous tunnels under the Allegheny and Monongahela rivers as a part of the rapid transit system of future greater Pittsburgh.

THE TRAINMASTER'S FUNCTIONS.

III.

STATIONS.

A most important thing to watch is the condition of offices, waiting rooms and warehouses. When these are kept in a neat, cleanly manner everything else is likely to be done properly. See that all placards are removed when soiled. Nevertheless, observation should be made frequently as to the quality of the work. It is often found that an agent gets behind in his work for lack of system, letting his work pile up instead of doing it correctly as it comes along. Show him how time can be saved.

Careful watch should be kept over operators to see that they make proper use of all signals and safety devices. See that they comply with all rules relative to handling of train orders. Night men should be watched to see that they properly and safely care for baggage and mail and not leave them out. Unless absolutely necessary, never make use of a Pullman berth on your own division, nor make a practice of riding altogether in them, but spend a part of your time on different parts of the train.

Note anything that is wrong around the station, window-glass out, door fastenings gone, holes in platform, condition of freight room, office and waiting rooms, and insist upon

cleanliness and things being kept in proper order. See that agent or operator is supplied with proper signals, wears his uniform when time to sell tickets or meet passenger train; that trash is not allowed to accumulate back of the depot or out buildings. Keep sharp lookout for foreign cars. If loaded, get after agent to have them released, and at any time when cars are scarce, see that any loaded cars are released promptly. Look after baggage trucks and keep them repaired. Note whether or not switch lights and train order signals are kept clean and burning brightly.

Study very carefully the movement of loads and empties, consulting frequently with your chief despatcher and superior, figuring your train handling accordingly, so that your cost of operation will be upon your mind, as well as the rapid handling of your loads and the prompt placing of your empties for prospective business. The loading on your territory should be studied thoroughly season after season, especially at your larger freight stations, for in doing so and consulting with your various agents you may be able to effect great improvement, diminishing the number of cars loaded, time for handling and, in general, better this important branch of service.

YARDS.

Give special attention to delays caused by hot boxes; drop around in the terminal yards to see what attention they are getting from the "car knockers." I have caught them going down one side of a train and back up the other, not even opening a journal box unless there were some outward indication of heating. When taken to task and the waste was pushed up to journals very few hot boxes would develop for the next 150 miles.

Yardmasters should be schooled to figure out the yard operation, as far as possible, a day in advance, keeping in touch with the chief despatchers and connecting lines as to the outlook for business the following twenty-four hours, which can in most cases be closely estimated. Yard engines and crews are then ordered for the following day in accordance with this estimate. In this manner great saving can, in some cases, be effected in yard engines and like expense, and at the same time it has a tendency to enlarge the views of the yardmaster and make him capable of rendering more efficient service. Particular attention should be devoted to trains departing promptly at the time set for departure. Each case of failure should be investigated thoroughly and promptly, defects remedied and both train and yard men kept thoroughly alive to this important feature. This matter, as a rule, has considerable bearing on the success of the trip. The despatcher having taken the train at a time when it can best be handled, and its failure to depart at the time set, usually results in further delays at meeting points.

Employ good yardmasters. A train started on time is an inspiration, while one started late is a discouragement. Don't let the call boy be train and yardmaster; he will have all he can do if he gets crews out on time. Make up trains in station order at starting point instead of expecting the next yard to do it. The yard was built for the proper making up of trains, and a train can often be made up properly, if a little care is used, with as little work as otherwise.

Do not make local freights out of the majority of your trains simply to convenience a yard and save them a little work. Such trains will cause an unnecessary delay and you will lose in maximum train haul.

Perfect a strong organization at terminals under your jurisdiction so as to have a good check on the motive power and employees. Where there are several industries requiring more than one engine, the work should be properly distributed to each engine and then watched to see that each engine performs a good day's work, with no overtime.

PASSENGER TRAINS.

Sitting quietly in a modest compartment you will frequently hear travelers telling of the various ways they have of beating a conductor. Put your men on to their methods.

Know that both conductor and flagman are posted on all connections at each end of their run and at junctions; show them the importance of always being polite and attentive to the wants of passengers, and especially women with children. Impress upon the train porter the importance of keeping the coaches clean and of giving special attention to ventilation.

See that road crews furnish in detail reports of all detentions of ten minutes, or more, from time called until engine arrives on pit at end of run.

The writer always felt that a passenger trainman should not chew tobacco, so in employing young men who graded into the passenger train service he decided not to employ any young men who chewed tobacco. He smoked moderately, but not in the office or on the road, and to be consistent with his decision he gave up smoking altogether. After following this method for nine years he left that arm of the service, but during that time he had employed several hundred young men, who gave him their word that they did not chew tobacco and would not chew it. That was not sentimentality nor fanaticism; it was simply an element of common decency applied to a public service.

Passenger and special train service of any character should receive personal attention, as generally such service is watched by your management, and you will be called upon to explain all irregularities. Arrange to ride special trains and regular trains, both freight and passenger, that do not maintain schedule time, to see that the best possible service is rendered.

FREIGHT TRAINS.

Early in my career I was called out of bed one night by the jingle of the 'phone and told by the despatcher "223 is crowding 271," and asked: "Shall I let them pass?" Two-seventy-one was the through merchandise run and 223 a local passenger train. The division was new to me, but in this and similar cases I always decided one way or the other and said "yes" or "no." Sometimes my judgment brought a protest from my superior officers. But that was easy as compared with the nights that the despatcher would say: "Water over the track and washed out between A and B. Shall we detour the mail?" or "it's snowing hard and 790 is doubling into X; engine about out of water (or coal) and stock on the cars about the limit required by law." Then arose the question: "Haven't you a 'dead freighter' that you can put in at V. or W. and use its engine to double head?" Regardless of what went wrong, unless in case of accident, causing loss of life or serious injury, I make it a point to handle the case without disturbing the superintendent during the night. Sometimes when I had decided injudiciously he was kind enough to point out wherein I had failed. At other times the results were satisfactory, and he would say: "Jack, you did good work last night in handling so-and-so." If I discussed any problem with him I made my arguments according to my judgment, but after he had decided on a plan I worked to that end, regardless of my own judgment or opinion.

In keeping an organization in harmony for moving a business on a division nothing has better effect than first-class local freight service. If local business moves properly the through business will in turn move with more ease. For that reason particular attention should be given to way freight trains. The best conductors, flagmen and brakemen should be on these trains. They will not only keep down expense in overtime, but will reduce claims from improper handling. They will also place the road in better light to patrons along the line who have to deal with this class of employees. The men best adapted to handling this business should, in all cases, be placed on way freight trains, regardless of the rank in service. Nothing takes more petty worry off the trainmaster than first-class local freight service.

One of the greatest helps that a trainmaster can have is good and comfortable caboose cars. These cars should be so constructed that men can board themselves and sleep in their

cars, when away from home, and a safe storage track should be provided.

Each crew should have a regular car, and its good condition will do much to keep men in good spirits, and at work regularly, as they will not want to turn their car over to extra men. The best man in any position is the one who has respect for his comforts and health, and a comfortable employee is one who will care for his position and take a personal interest in his work. Such employee will be less susceptible to bad influences, which, in a trainman's life, are numerous.

Run local freights on time and clean up the road each day. A car left over to-day may be buried to-morrow and take twice as much time to handle; besides, it has been delayed.

Do not overload trains; the last 50 tons of any overloaded train will cost you as much as the handling of the balance of train.

Well and congenially organized crews will always give best results, and a crew once well organized should not be disturbed more than is absolutely necessary.

Men should not be allowed to lay off periodically, and those who have this inclination are not the best men, as they show that they are not interested in their work. The best men are always those who are interested.

When necessary, for filling a vacancy in a crew temporarily, an extra man should be used instead of allowing regular men to be chain-ganged. The successful operation of a train depends as much upon the proper and permanent organization of its crew, as the operation of a railway depends upon its official organization.

The following, printed on a mimeograph and distributed among yardmasters and trainmen, is a useful and convenient way of making and maintaining an assignment:

"The following shows assignment of conductors, flagmen and brakemen, caboose cars, as well as seniority of men, for ..... division.

"When necessary to fill vacancies the oldest man, in age of service, should be used, if such vacancy is permanent; if only emporary, the extra man standing first out should be used.

"Caboose cars must be kept with the crew to which assigned, nd when cars are disabled, making a change necessary, an xtra car must be used.

"Conductors and brakemen should not lay off except in cases f absolute necessity, but when it is necessary to do so they nust make proper arrangements in sufficient time to allow the roper filling of their places."

ASSIGNMENT OF MEN.

Passenger Service.

Conductor.	Age.	Flagman.	Age.	Baggagemaster.	Age.
dams, J. W.....	1	Arnold, C. W.....	2	Smith, A. H.....	3
ones, E. H.....	2	Jacobs, M. H....	4	Sellman, C. H....	2
ampson, G. W...	3	Jackson, C. N....	1	Johnson, E. M...	4
essup, H. N....	4	Simpson, T. H..	3	Joseph, F. G.....	1

Extra Passenger.

oorehead, G. H.	5	Dixon, G. C.....	5	Jacobs, C. H.....	5
'illiams, F. T...	6	Wilson, R. T....	6	Wintergreen, J.W	6

Freight Service.

Ca-pose.	Con-ductor.	Age.	Flagmen.	Age.	Brakemen.	Age.	Assigned to
002	Messer, C. L..	1	Jones, G..	3	Wolf, R. M...	2	No. 51 & 52.
001	Marsh, C. B.	2	Jack, T.G..	1	Wenn, T. J....	1	No. 51 & 52.
004	Max. G. H...	3	Coe. T. L..	2	Carr. J. C....	3	No. 53 & 54.
003	Moss, G. T..	4	Bull, Y. G.	6	John. C. D. .	7	Chain gang.
006	Moore, R. E..	5	Nort, R.W.	4	Maxey, J. R ..	6	Chain gang.
007	Mann, R. W..	6	Wash, Y.U.	5	Moonney, D.H.	4	Chain gang.

Extra Freight.

Ca-pose.	Con-ductor.	Age.	Brakemen.	Age.	Brakemen.	Age.	Brakemen.	Age.
005	Dow, T. H.	7	Dix, D. R..	7	Dan, T. H..	8	Mart, T. H.	9
008	Ward, G. H.	8	Masy, G...	10	Worth, W.R.	11	Jones, T...	12
009	John. G. ...	9						

Issued July 10, 1909.

.....Trainmaster.

Overtime and the regulating of constructive mileage has ver been an important factor in railway economy. A practical trainmaster should be able to indicate the cause of overime more intelligently than anyone else connected with the mpany, for he is out on the road most of the time and nows just what a crew is capable of doing, the cause of unecessary delays and is in the best position to apply a remedy.

A trainmaster is bound to attract attention if he watches closely constructive mileage. There are many roads that pay out large amounts of money every month in wages, for which they receive absolutely no returns. If the trainmaster is on to his job he can reduce the cost of handling trains considerably.

MISCELLANEOUS SUGGESTIONS.

The hardest, best, most valuable training was on small roads, because the small roads are lacking in resources and they develop individual initiative. They are also more closely supervised; the worthless man is quickly eliminated and the good man is soon recognized and appreciated. An experience on local freight on a small road gives a man an excellent training. If we got off the track we got on again; if flues leaked we hunted mills for sawdust or bran or confiscated rice from a local car and pumped it into the boiler; we tackled anything and everything; made double flying switches, coupled without stopping and passed thirty and forty car trains on ten-car sidings. If a confirmed loafer was assigned to a crew he was left at some way station. No laggard or loafer could live with those intrepid, daring, energetic fellows; the atmosphere was too highly surcharged for his comfort. But every man had a fair deal, and if one was really ill or crippled he was treated with consideration.

But what a difference from this on the great systems. It was as if a sailing master had been transferred from a sailing ship to a liner, for on the big divisions the traffic, in the main, is from one terminal to another, and the crews simply ride along. To make up a train in a yard was a task; to run a local freight over a road was a feat to most of the men. Energy and initiative were lacking; laggards and incompetents cursed the life of the yardmasters and stifled the energies of capable men. There was little to quicken endeavor, less to stimulate individual initiative, and the prevailing spirit was carping, hypocritical and arrogant. These conditions were due, first, to a lack of deliberate, painstaking care in the selection of men, and second, because there was no method of eliminating incapable employees; consequently, the dull, apathetic, ordinary creature, devoid of concern for the company's welfare, suffered nothing for these deficiencies. As long as he did not wreck a train or commit a heinous crime he could keep step with his fellow-employee, who possessed and exercised all the qualities the former lacked.

Mr. A. is trainmaster of the first division and Mr. M. is trainmaster of the second division on the same system. Mr. M. does not allow his trainmen to unfavorably criticize the despatching. His men make reports of their delays, but do not assume to say that the despatcher could have done better had he known more. It has been kindly but firmly explained to them that they are not competent judges of this particular matter.

Not long ago a trackage arrangement was made by virtue of which thirty or forty first division crews run over the second division track for about fifty miles. This arrangement was not more than well started, when Mr. M's office began to be flooded with reports (many of them under "personal" cover) from conductors and enginemen of the first division—all on the same subject and all to the same effect, viz.: that the despatching could not be worse done if it were undone.

After causing it to be thoroughly understood that second division etiquette would be standard in second division territory, Mr. M., by means of a little quiet investigation, discovered that most unfriendly relations existed between Mr. A. and Mr. J., who is chief despatcher of the first division. All the trainmen and enginemen were well aware of this feeling and sought to gain favor with Mr. A. by furnishing him ammunition with which to fight Mr. J. At first glance this might seem like loyalty of his men to Mr. A., but having been allowed to treat one kind of authority with disrespect they have acquired a very general contempt for any and all authority, and Mr. A. has a division full of insubordination as his reward for not "playing the game."

RAILWAY DEPRECIATION ACCOUNTS.*

BY C. I. STURGIS,
General Auditor, Chicago, Burlington & Quincy.

I shall not confine myself to the consideration of depreciation accounts in the abstract, but shall consider them in relation to the very live question of railway regulation. By so doing my efforts will, I trust, prove more interesting.

What is depreciation? It is not very well understood and but little has been previously written on the subject, so I shall take the liberty of attempting a definition.

Broadly speaking, depreciation is a lessening in value. To illustrate: A manufacturer buys a lathe and puts it into use; later he sells it. The difference between the value new and the value worn out represents the depreciation. This depreciation is measured by what the manufacturer has to pay for a new lathe, which he must buy to take the place of the old one, but, from the price paid for the new lathe there must be deducted the amount realized from the sale of the old one, and what is left measures the depreciation. When we talk about setting aside a depreciation fund, we mean setting aside, out of income, periodically during the life of the lathe, various sums which, in the aggregate, should equal the amount of depreciation by the time a new lathe must be purchased.

This depreciation, or lessening in value, may be due to two causes, which we may classify:

(1) Depreciation due to wear.

(2) Depreciation due to premature abandonment, necessitated by changed conditions; this is generally known as obsolescence.

The first of these, that is, depreciation from wear, is the simpler, and in its determination by month or by year, in advance, we can apply certain general principles for all properties of any given class, but beyond these generalizations are thousands of questions of detail, so complex as to require separate study for each independent plant or railway, and when all is said and done the result is but an estimate. On a railway, the life of ties varies with soil and climate, the life of bridges depends on the weight of locomotives running over them, the life of locomotives depends on the quality of water and coal with which they are fed, and there is hardly a railway tool or machine, the life of which does not depend on local conditions, and, even if, in determining depreciation, we could approximately estimate such variable factors as those, we would still have to consider what in the end will be the cost of the new articles to replace the old, and with markets ever fluctuating that is impossible definitely to determine. Furthermore, prosperous roads, in maintaining high standards, consider equipment is worn out when, on poorer roads, it would be considered still good for many years of service.

Beale and Wyman, in their work on "Railroad Rate Regulation" (Section 430), say:

> "In general, an annual charge for depreciation in value of the plant by use, seems proper. This is again a matter which cannot be decided by general rules as to a standard percentage, but is a matter of careful investigation into the character of the particular plant."

The second class, that is, depreciation due to this obsolescence, is far more difficult to anticipate and to measure and commissioners may well shrink from assuming a railway director's responsibility along this side of the financial policy of his road.

No doubt some of you are manufacturers, or are interested in manufacturing plants, and know how often newer makes of machines, in the hands of your competitors, force you to dispose of yours, when only partly worn out, that you may meet the competition. To take care of this depreciation, the successful manufacturer must put aside sums equal to 10 or even 20 per cent. of the value of his plant, in those years when he can afford to, that is, when satisfactory prices and large business warrant his doing so. Good business policy dictates that the railway director should do likewise, for a similar condition holds in the manufacturing side of railroading, that is, the building of locomotives and cars. With up-to-date machinery, the railway can afford to do its own building, because the maintenance of the plant, salaries of officers and general expenses, as well as the cost of running boilers and dynamos, are shared with the repairing and other branches of railway work. This advantage to the railway lasts only so long as its planers, lathes and other machines are as up-to-date as those of the outside builder.

As further illustration of depreciation due to premature abandonment, necessitated by changed conditions, let me cite one or two further cases: A railway has 40 miles of road in a city, and the city authorities require that the tracks be elevated. The old roadbed must be abandoned, a new and more expensive one built, and this without bringing one cent more earnings. This is clearly a case of depreciation due to premature abandonment of the old roadbed. Some will claim that while track elevation brings no more gross earnings, it does result in larger net earnings, because it saves payments for gates and gatemen and for personal injuries. Without disputing the propriety of track elevation, under certain conditions I contend that the expense of those gates and gatemen and the personal injury payments became necessary after the road was originally built, and their growth represented loss of efficiency and hence increased expense, and therefore were in the nature of depreciation charges.

On another road the director sees that a city, to free itself from smoke, is likely to insist on electrification of the railways or perhaps he sees the approaching necessity of steel freight and passenger cars. Either of these requirements means premature abandonment of a still good conditioned plant and equipment and the rapid accrual of depreciation due to prospective and sudden ending of efficiency. These changes will bring no increase of earnings and the expenditure may come in a year when his earnings are not large, therefore the director should begin at once to set aside each year, out of income, as much as he can spare, in order to meet these expenses.

Permit me to give one more illustration in the way of a definition of this depreciation due to obsolescence: C. C. McCain, in his pamphlet on "The Diminished Purchasing Power of Railway Earnings," recites that the price of coal per ton of 2,000 lbs. at the mines, as given by the United States Geological Survey, was, in my state, Illinois, 72 cents in 1897 and $1.07 in 1907, an increase of 48.61 per cent. It is interesting to study the effect of this increase, in the price of fuel, on the necessity of premature renewals and, consequently, on depreciation. This increase necessitated greater earnings per train, which meant heavier engines to pull more cars, larger cars to reduce dead weight as compared with paying loads. Then the heavier engines required heavier rails and roadbed and stronger bridges, and all without any increase in net earning efficiency.

In England there has been consideration of this question of depreciation in its relation to railways. It was there a question involved in the determination of the income tax, and the railways and the taxing authorities agreed upon the amount of depreciation which should be included in the statements made up for the purpose of determining the taxable income. I understand that this agreement applies only to the tax returns, is mutual and amicable, and is to avoid a wrangle each year with each company over the amount to be deducted, from gross income, for depreciation, in determining the net income on which the tax is to be assessed. This agreeing is parallel to the practice in this country of lawyers agreeing on certain elements in a case and so avoiding the necessity of arguing them out before the court.

At this point I want to impress upon your attention the fact

*An address before the National Association of Railway Commissioners, Washington, D. C.

that the English agreement covered only depreciation deducted in the determination of the taxable income, and that while a similar agreement (or an arbitrary or a court ruling) may be necessary in this country, in determination of the net income to which the recently passed Corporation Tax Law shall apply, such depreciation figure will not properly be the one which the directors of any railway will wish shown on the books of their company. In other words, the necessity under the law of determining the net income seems to force upon the Department of Internal Revenue the necessity of deciding how much it is willing to allow the railways to deduct for depreciation; even as the Interstate Commerce Commission must decide, in any hearing on rates (where net earnings are to be considered), how much the railway at bar may deduct for depreciation.

In our country the diversity of practice on different roads resulted in an attempt by the authorities charged with the formation of a uniform system of accounts to arrive at a basis for determining amounts which, charged monthly on the books of different roads, would distribute, by months, the depreciation claimed by some to be uniformly going on on railway property. There has been much controversy in an attempt to determine whether there is any depreciation which should be recognized in the accounts and, if any, how much. The present rules of the Interstate Commerce Commission permit of a depreciation charge and in any amount desired by each carrier, but it is understood that the commission contemplates determining upon an arbitrarily determined basis for the charge, to be as nearly correct as may be, and requiring all the roads to use that basis.

This intention to require the roads to make upon their books a monthly charge for depreciation is, it is claimed, justified by the 20th Section of the amended Interstate Commerce Law. I quote the following from that section of the law:

"Sec. 20. (Amended June 29, 1906.) * * * ; and the Commission may, in its discretion, for the purpose of enabling it the better to carry out the purposes of this Act, prescribe a period of time within which all common carriers subject to the provisions of this Act shall have, as near as may be a uniform system of accounts, and the manner in which such accounts shall be kept.

"Said detailed reports shall contain all the required statistics for the period of twelve months ending on the thirtieth day of June in each year, and shall be made out under oath and filed with the Commission, at its office in Washington, on or before the thirtieth day of September then next following, unless additional time be granted in any case by the Commission. * * *

"The Commission may, in its discretion, prescribe the forms of any and all accounts, records and memoranda to be kept by carriers subject to the provisions of this Act, including the accounts, records and memoranda of the movement of traffic as well as the receipts and expenditures of moneys. The Commission shall at all times have access to all accounts, records and memoranda kept by carriers subject to this Act, and it shall be unlawful for such carriers to keep any other accounts, records or memoranda than those prescribed or approved by the Commission, and it may employ special agents or examiners, who shall have authority under the order of the Commission to inspect and examine any and all accounts, records and memoranda kept by such carriers. This provision shall apply to receivers of carriers and operating trustees. * * * Any person who shall wilfully make any false entry in the accounts of any book of accounts, or in any record or memoranda kept by a carrier * * * or who shall wilfully neglect or fail to make full, true and correct entries in such accounts, records or memoranda, of all facts and transactions appertaining to the carrier's business, * * * shall be deemed guilty of a misdemeanor * * *"

We should now consider what constitutes a "System of Accounts." The "Century" dictionary defines the word account as "a reckoning of money or business; a statement or record of financial or pecuniary transactions." That and other authorities show that accounts are records of transactions—of actual transactions of things actually done. What then is a System of Accounts? It is a plan—a comprehensive plan—of recording actual transactions. Now, therefore, when the law authorized the Interstate Commerce Commission to formulate a System of Accounts did it not authorize it to go ahead and draw up a plan of recording actual facts and transactions? That seems to be what the law authorized and in no manner can the 20th section of the law be stretched to, or interpreted as, regulating the actual transactions which the accounts record. Everything in this section 20 seems to imply that the reports required shall deal with facts. It says, "a complete exhibit of the financial operations of the carrier each year," and, again, "shall be made out under oath." All through the section there is reference to the recording of facts and transactions and there is not one word about prescribing what those facts and transactions shall be.

This section of the law does not appear to authorize the commisson to arbitrarily determine what amounts, if any, any railway shall set aside to cover depreciation. The act of setting aside an amount is a transaction wholly within the right and power of the directors of the railway company and the commission can properly order the recording of such act upon the books and state how and in what manner it shall be recorded, how it shall be shown in the accounts and statements, but it cannot arbitrarily determine the transaction itself.

I understand that neither in this section 20 nor elsewhere in the law is the commission given the power to regulate this class of transaction. This fact seems to have been determined by the oft-quoted opinion of Mr. Justice Brewer, in the case of the Interstate Commerce Commission versus Chicago Great Western Ry., on Appeal to the U. S. Supreme Court 209 U. S. 108. The learned Justice said:

"It must be remembered that railways are the private property of their owners; that while, from the public character of the work in which they are engaged, the public has the power to prescribe rules for securing faithful and efficient service and equality between shippers and communities, yet in no proper sense is the public a general manager. As said in Int. Com. Com. vs. Ala. Mid. R.R. Co., 168 U. S. 144, 172, quoting from the opinion of Circuit Judge Jackson, afterwards Mr. Justice Jackson of this court, in Int. Com. Com. vs. B. & O. R.R. Co., 43 Fed. Rep., 37, 50:

"'Subject to the two leading prohibitions that their charges shall not be unjust or unreasonable, and that they shall not unjustly discriminate so as to give undue preference or disadvantage to persons or traffic similarly circumstanced, the act to regulate commerce leaves common carriers, as they were at the common law, free to make special rates looking to the increase of their business to classify their traffic, to adjust and apportion their rates so as to meet the necessities of commerce and of their own situation and relation to it, and generally to manage their important interest upon the same principles which are regarded as sound and adopted in other trades and pursuits.'"

The proper interpretation of section 20, taken in connection with Mr. Justice Brewer's opinion, has special bearing on the commission's intention, several times announced by Mr. Henry C. Adams, of exercising supervisory control over railway operations through the agency of accounts.

The intention of Congress, in giving to the commission the right of control over the accounts, must be interpreted as a desire to enable the commission to carry out the other provisions of the law, about which Mr. Justice Brewer has said, "in no proper sense is the public a general manager" and common carriers are "free * * * to manage their important interests upon the same principles which are regarded as sound and adopted in other trades and pursuits." It is a fact that, incidentally, section 20 does control management, but only in the indirect way in which all publicity of accounts tends to prevent questionable and dishonest acts of management.

To sum up, there does not appear to be anything in this 20th section which authorizes the requirement that the accounts be made to contain anything but a record of transactions, nor does this section 20 authorize excluding from the accounts the record of any transaction which has been had. If this is so, then it would seem that an arbitrary depreciation charge cannot be ordered by the commission to be placed upon the books of a railway company until such time as the commission has right to order the transaction itself, that is, the right to order the directors of a railway to set aside such amount from the annual income as the commission may deem proper. I propose to show later why the commission should

not desire this right, which now belongs strictly to the board of directors of a railway, who alone are held responsible for the successful conduct of the property, including its financial policy, upon which, perhaps more than on anything else, depends the success or failure of every legitimate business enterprise. In the opinion above quoted it is implied that the directors of a common carrier are free to manage its financial policy "upon the same principles which are regarded as sound and adopted in other trades and pursuits."

In the *Railway Age Gazette* of October 2, 1908, page 1050, a writer well expressed this phase of the question. He wrote:

"It is suggested with a good deal of force that it is the duty of the board of directors of each railway company to determine from time to time, according to the fact as they exist, when and to what extent charges should be made against income on account of depreciation which has actually occurred, and also to determine the proper means of providing for meeting these charges, either out of the company's surplus or otherwise. Has the Act to Regulate Commerce taken from those boards of directors any of their authority in these respects, or relieved them of any of their responsibilities? In other words, has the commission a legal right to compel railways to make charges in order to create reserve accounts against liabilities which it is estimated will occur?"

There is another reason for questioning the commission's power, under authority to prescribe a uniform system of accounts, to order an arbitrary charge for depreciation or any charge at all. This depends on the necessary nature of such a charge. It is an estimate. No definite or satisfactory rule can or ever has been found for determining the exact amount of depreciation in any manufacturing institution and still less on a railway. There are so many factors which enter into such a determination, and each factor varies so greatly with each branch of industry, and with each department of each branch of industry, and with each variety of condition surrounding each such department, and with every busy day as against every dull day, and with each rainy, dry, hot and cold day; each separate condition having an unequal bearing on the amount of depreciation accruing.

At the last annual meeting of the American Association of Public Accountants, a paper on depreciation was read by Herbert G. Stockwell, C. P. A. I do not know Mr. Stockwell personally, but his paper shows careful study by an analytical and practical mind and one cannot read it without realizing that this question of depreciation is far-reaching and is not to be easily disposed of with an arbitrarily fixed per cent. for general application. Mr. Stockwell said:

"I think it can be confidently asserted that there are no two manufacturing plants in this country in which the management is sufficiently identical in character ability and temperament that a depreciation charge in the same amount, or on the same percentage basis, could be correctly used in both. This being true, how useless it is to attempt to form averages for the life of machines in all plants, even in the same lines of business.

"It seems to me that the only way that the annual amount of depreciation can be determined is by a study of each individual plant, and the application of the figures representing the depreciation to that individual plant and no other. To say that it is absolutely impossible to figure depreciation in advance is true. This is a statement that comes under a general proposition that the actual value of no asset can be determined until it is converted into cash."

All of these difficulties make the problem one of great complexity—so much so that the theoretical advocate of a correct basis for depreciation seeks refuge in the claim that the law of averages must govern. This is really begging the question, for the bases for the averages exist only in men's minds and are not determinable facts. This shows that any annual depreciation charge can only be estimated—must be an estimate—and, according to the opinion of Judge Calhoun, in the so-called Texas Bookkeeping case, an estimate upon any theoretical or arbitrary basis cannot be required by a commission under a law which gives to such commission a right to prescribe a system of bookkeeping. The opinion referred to contained the following:

"Now, as I understand, under Article 4571 of the Revised Statutes of 1895, the Railway Commission of Texas has power to prescribe a system of bookkeeping to be observed by all the railways subject thereto, under penalties prescribed in the article. Now, there is no definition in that statute of what is meant by a 'system of bookkeeping.' Therefore, the common acceptation, as I understand it, or what is generally understood, of what is meant by a 'system of bookkeeping,' must be interpreted as the system meant by the law. Now, bookkeeping is the act of recording pecuniary transactions in a regular and systematic manner, or, in other words, the art of keeping accounts in such manner as to give a permanent record of business transactions, from which the true state of history of one's pecuniary affairs or dealings may at any time be ascertained.

"I further conclude that under the law it was never intended by said statutes to require the railways to arbitrarily divide their expenses upon any theoretical or arbitrary basis, and to enter the same as a part of their system of bookkeeping, and in my opinion, there is no power vested in the Railway Commission of Texas to require the same of them, The power which in my opinion is vested in the Railway Commission under said act is to require the railways of Texas that they keep their accounts by a uniform system of bookkeeping and to record all facts as facts in such manner that the true state or history of their pecuniary affairs or dealings may at any time be ascertained by the Railway Commission in any manner authorized or prescribed by law."

The idea of exercising supervisory control over railway operations, through the agency of accounts, did, I have been informed, originate in the Statistical Department of the commission, and it is not unnatural. Many of us railway auditors have had the same dream. It is natural for one who feels that his ambition in the railway world is limited to the formulating and the keeping of accounts. This auditor's dream of the control of operation through the accounts has invariably had a rude awakening when it bumped up against the practical question. With whom does operating responsibility lie? The railway director, looking far into the future and realizing his responsibility to the investing public which he represents, is continually confronted with new problems, to meet which ordinary prudence requires the setting aside of depreciation funds. Where these future problems take the shape of exceptionally large renewal charges, he should set aside out of the current year's income as much as can be spared to meet the future expenditures. If at this stage he finds that the government has limited the amount which he may set aside, as result of which the misinformed stockholder clamors for and gets further dividends, who is responsible for this failure to provide for the future expenditure? In that case, does the responsibility rest with the director or with the government? Gentlemen, I do not believe that any one of you is willing to relieve the director of that responsibility.

When the directors have decided that an amount shall be set aside to meet depreciation incident to future renewals, the commission may properly, under the twentieth section of the Interstate Commerce Law, insist on it being shown in the accounts and reports—that is publicity and is reasonable—and if there is a hearing before a commission or before a court the railway should be called on to explain its justification of the amount it has set aside, that the commission or the court may decide, on the evidence, whether the amount is too high or not high enough as affecting the question before it.

After all, what would be gained by requiring roads to make monthly charges to depreciation on a fixed standard percentage basis?

The railway manager would not be benefited because, in studying the monthly returns, he would have to discard this arbitrary figure before he could determine the actual results accomplished by his efforts to obtain business and by the exercise of his judgment in making renewals and in operating the property.

The investor would not be benefited, because including a charge for depreciation in the monthly accounts and published statements of a railway is but a "penny wise, pound foolish" attempt to show the investor, by a present 30-day measure, how valuable or otherwise his investment is. As a matter of fact, the true investor bases his idea of value on past history and future prospects, and the immediate present snap-shot

view given by a monthly statement misleads more than it helps him.

The public would not be benefited, for if railways are to be regulated it must be on the basis of facts and not of estimates. The use of an arbitrarily based depreciation figure for all roads or for a group of roads is similar to a doctor giving the same pills for all ailments.

It is sacrificing broad policy in railway financing to an attempt to get theoretical accounting.

The attempt to apportion depreciation, by months, may have been based on the common practice of including in the monthly accounts, on an estimate, certain regular monthly bills which are not received before the closing of the month's accounts, but this latter practice, like the monthly apportionment of bond interest, is the including of a part payment of an actual expense, and hence there is no parallel between that practice and the including of a monthly depreciation estimate. It has been contended that if an estimated depreciation rate is used, and at the end is found to be too high or too low, an adjustment can then be made. This is an admission that the arbitrary monthly figure may be and probably will be wrong and, furthermore, there is no cutting off place, there is no time in the future when we may say—now we may take the measure of the correctness of all these past monthly depreciation charges.

To gain the imaginary advantage of having arbitrarily fixed depreciation, the railway director would be deprived of the right to do that for which he is responsible to his stockholders and to the public, that is, to intelligently carry out that financial policy which will maintain the property for its owners and which will build up a successful and prosperous railway, able to give high standard service to the communities through which it runs and to give employment to thousands located along its line.



Model of Baltimore Union Station.

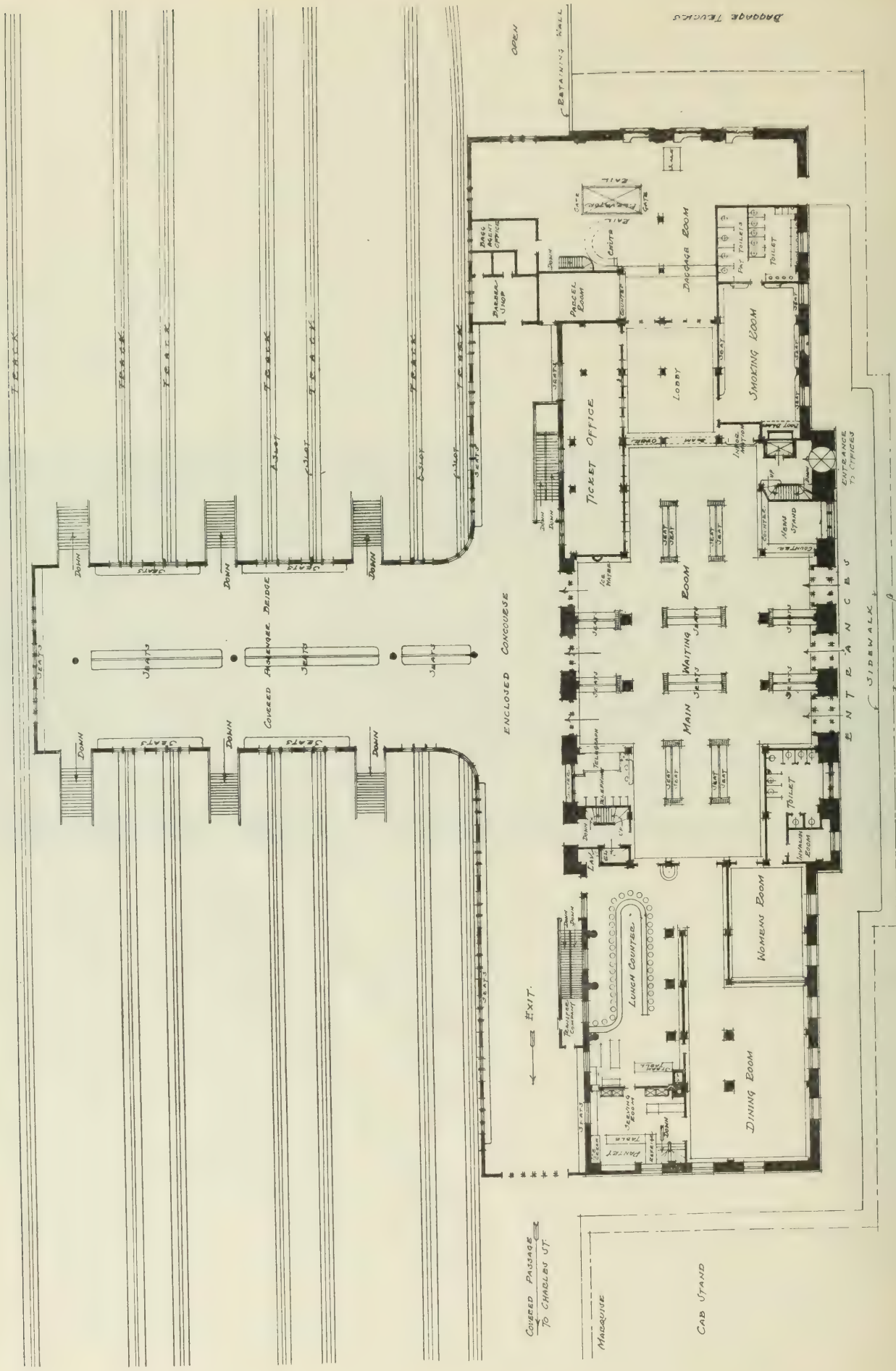
PENNSYLVANIA STATION AT BALTIMORE.

Contracts are about to be let for the new union station to be built at Baltimore, Md., by the Northern Central, a subsidiary of the Pennsylvania Railroad. A general description of the proposed station appeared in the *Railway Age Gazette* of November 12, 1909.

The new building will be on the site of the present union passenger station between St. Paul street and Charles street and just north of Jones falls. The present station covers about half the area which will be taken up by the new building. The station fronts south, toward the center of the city. The front of the building is on an angle with Charles street and an approach 110 ft. wide will be built from the center of the station to an intersection with Charles street. This approach will be on a bridge over several spur tracks and over Jones falls. It meets Charles street about 200 ft. from the station. The small triangle left between the station, Charles street and this approach will be parked, and it is proposed also to extend the parking south along the east side of Charles street so that there will be a large open space for several hundred feet in front of the station. This, however, is as yet undecided. There is a street car line on Charles street, but none on St. Paul street.

As the accompanying plan shows, the concourse is at street level. There is an enclosed concourse parallel to the tracks with a covered passage leading past the cab stand to Charles street. The rest of the concourse is on a bridge over the tracks. Incoming and outgoing passengers are not mechanically separated, but their movements should be unrestricted, since incoming passengers will diverge through the enclosed concourse toward Charles street, while outbound passengers will go from the main waiting room direct to the head of the stairs leading to the platform on which their train stands. At the top of each stairway there will be an illuminated train indicator, and tickets must be shown at these points. There will be six station tracks for passenger trains; the two outer tracks shown on the plans are for freight service. The platforms will be 20 ft. wide. The tracks will be protected with Bush train sheds, several installations of which have been described in these columns. The sheds will extend from the St. Paul street viaduct to Charles street. This type of shed was decided on after a committee of five Pennsylvania Railroad officials had inspected all available types of train shed.

The baggage room at the street level is to be used only for luggage which the passenger brings to the station with him. The main baggage room is below on the track level. This level is reached by an inclined driveway opening on St. Paul street just south of the new street parallel to the tracks in front of the station. A baggage chute and an elevator also connect the baggage room on the street level with the large room at track level. In all, there will be five elevators in the building. There will be no subways under the tracks for handling baggage to the platforms; baggage will be trucked across the tracks. A feature of the baggage room will be the doors, which will be the Cross folding type. These are composite doors, made up of units hinged horizontally; the smaller doors can be opened independently or the whole compound door can be opened by folding up and lifting all the units. The other rooms on the track level of the building include express room, immigrants' waiting room, commissary



Plan of New Union Station of the Northern Central at Baltimore.

department rooms, trainmasters' office, station master's office.

The two upper floors of the building will be used for offices. The main waiting room is three stories high, being covered by a skylight. The building is fire-proof, steel and concrete construction. The exterior will be finished in pink Milford granite, and, as the accompanying model of the building shows, there will also be considerable ornamental iron work. The interior of the waiting room is of Doric architecture and will be finished in Pentellic marble, the same stone of which the Parthenon at Athens is made. The concourse on the bridge over the tracks is lined with Faience tiling, and all rooms in the basement are also tiled.

The station will cost $700,000 and it is expected to have it finished by July 1, 1911. It was designed by Kenneth M. Murchison, New York, his plans being selected from eight competitive plans submitted by architects in Chicago, New York, Philadelphia and Baltimore.

RAILWAY EARNINGS IN 1909.

The Interstate Commerce Commission has issued a statement showing the revenues and expenses of all railways in the United States for the fiscal years ended June 30, 1908 and 1909. This annual bulletin, compiled from the monthly reports, is in effect a substitute for the preliminary report on the income account of railways, heretofore compiled from the annual reports of carriers.

The returns submitted have been compiled, as in previous monthly bulletins, in such a manner as to show the operations of the important systems in which most of the railway mileage of the United States is included. There is also shown the grouping of the roads by classes, for which the new forms for annual report make provision. An additional table is provided, showing detailed figures for each road filing monthly reports. In commenting on the report Henry C. Adams says:

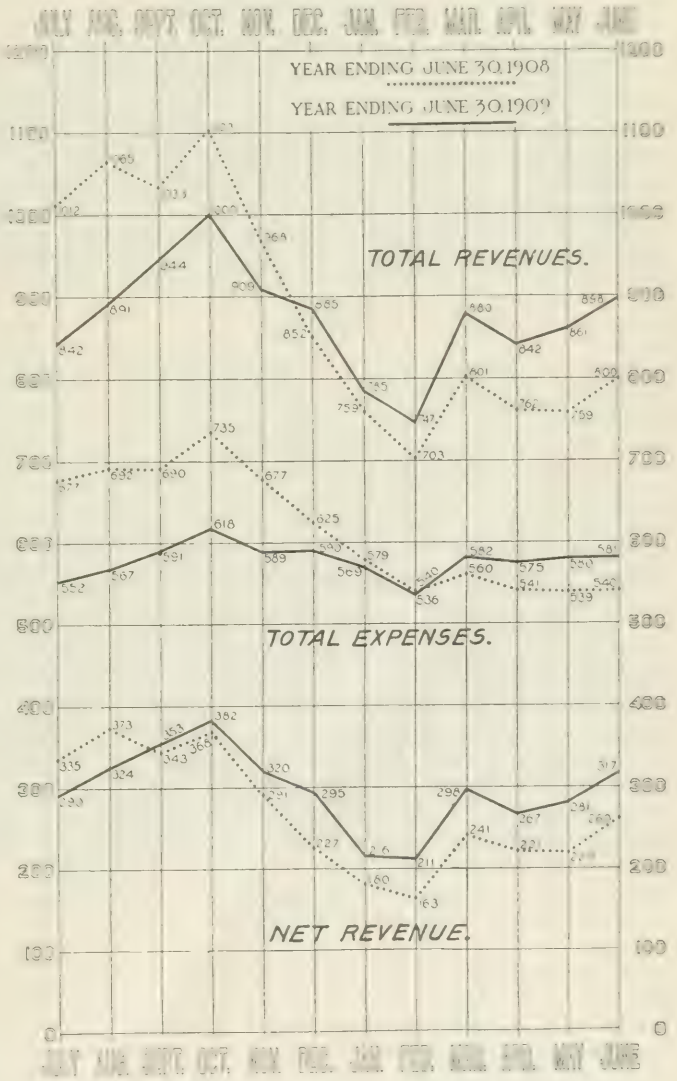
"If rail operations and outside operations be combined to produce a proper basis for comparison with the results of years prior to 1908, the general summary shows a constant increase in revenues, which, for the year ended June 30, 1909, exceeded those for the year ended June 30, 1908, by $32,594,244. At the same time, the rather general tendency to greater economy effected a decrease of $59,224,982 in the corresponding expenses, resulting in an increase of $91,819,226 in total net revenue.

"Reduced to per mile of line averages which, of course, take into account the increase in average mileage operated during the twelve months, approximating 5,000 miles, the figures show that the increases in gross earnings during the last half of the year ended June 30, 1909, were not quite sufficient to offset the decreases during the first half of the year, the respective amounts being $10,704 for 1909, as against $10,788 for 1908, $11,383 for 1907 and $10,460 for 1906. On the other hand, operating expenses per mile, which showed a constant upward tendency until the year ended June 30, 1907, with $7,687 per mile, were only $7,544 per mile for 1908 and $7,133 for 1909.

"The increase in net revenue per mile of line, the amounts being $3,189 for 1905, $3,548 for 1906, $3,696 for 1907, $3,244 for 1908 and $3,571 for 1909, shows that the year ended June 30, 1909, corresponds in its net results as closely to 1906 as 1908 did to 1905, and if the present upward movement continues, 1910 will compare with 1907, which latter year now represents the high-water mark in railway earnings.

"Notwithstanding the marked decline in the volume of railway traffic beginning with November, 1907, the average revenues and expenses per mile of line for the fiscal year 1908, although below the corresponding averages for the year 1907, are higher than for the year 1906. The average net revenue per mile of line for the fiscal year 1908 is below that of both the year 1907 and 1906, but it does not fall below the corresponding figure for the year 1905. Should taxes be included among the deductions, thus changing the comparison from total net revenue to operating income the result for 1908 is only $9 per mile of line below that for 1905.

"The first of the general conclusions to be drawn from the data submitted is that the assignments per mile of line and the ratio of operating expenses to operating revenues, as well as the ratios existing among the various sources of revenue, and among the several classes of expenses, which have been reported by this office in previous years for railways of all classes, are in the main correct as representing the operating results of the large roads. This means that while the operating results of small roads and of switching and terminal companies differ greatly from the corresponding results of large roads, the amount of mileage, revenues and expenses contributed to the total by these two classes is relatively so slight



*6000 6499 6682 6864 6802 7340 7632 7684 6986 7099 7191 6749
†6559 6363 6264 6180 6478 6665 7243 7179 6616 6633 6730 6473

Revenues and Expenses by Months in 1908 and 1909.

* *Operating ratio in* 1908. † *Operating ratio in* 1909.

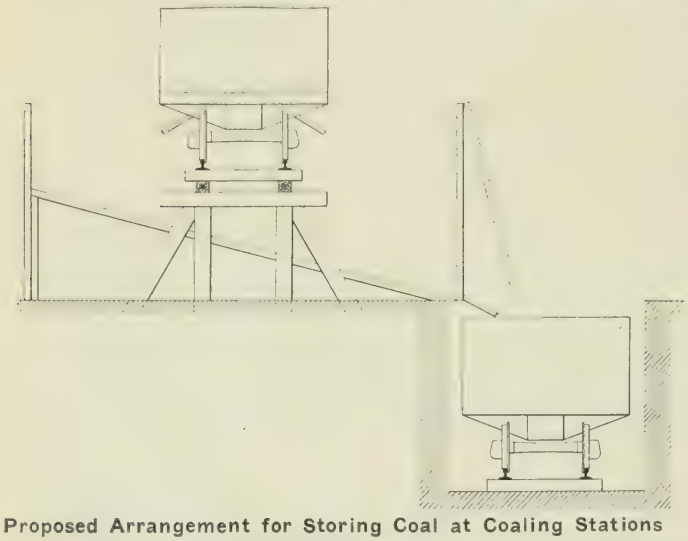
as compared with the total that the general results are not appreciably disturbed. Thus for 1909, the ratio of operating expenses to operating revenues for all carriers, according to the summaries, was 66.12 per cent.; for class A, that is to say, the large roads, the corresponding ratio was 65.98 per cent.; while for class B, the small roads, it was 72.31 per cent., and for class C, the switching and terminal companies, 66.49 per cent. It is a significant fact, and one that warrants the classification, that while the revenue from rail operations per mile of line of large roads is $11,010.78, that of small roads is $3,115.38, and of switching and terminal companies, $19,129.32."

The accompanying diagram shows graphically the revenues and expenses of all railways in the United States for the fiscal years 1908 and 1909.

COAL STORAGE BIN.

The Atchison, Topeka & Santa Fe has a number of coaling stations in which the coal is carried by a belt conveyor from a small bin at the ground level to a bin above the chutes. The combined capacity of both of these bins is small and it is necessary to dump most of the coal on the ground. When it is required it is loaded on a car by hand, the car is then run up a slightly elevated track and is dumped into the bin at the foot of the conveyor. This is a slow and expensive process, but it would be too expensive to install a system of conveyors such as is used in a large storage plant.

To cut out the manual handling of the coal and reduce the



Proposed Arrangement for Storing Coal at Coaling Stations of Small Capacity.

expense, James Kiely, master mechanic at Clovis, N. Mex., has proposed an arrangement, which is shown in the illustration. The coal is dumped from the car on a low trestle into a bin at the ground level. The capacity of the bin may be increased by making the trestle higher, or by making it longer. As the coal is needed it is fed from this bin to a car on a depressed track alongside. The car is then hauled up the elevated track and dumped into the bin at the foot of the conveyor.

TRACK ELEVATION ON THE CHICAGO, MILWAUKEE & ST. PAUL AT EVANSTON, ILL.

An ordinance was passed in 1908 by the city council of Evanston, a suburb of Chicago, directing the Chicago, Milwaukee & St. Paul to elevate its tracks between Howard avenue and Church street, a distance of about two miles. This work, which is now being done, is especially worthy of attention for two reasons: first, the new and artistic design of the subways, and, second, the methods used to handle traffic during the raising of the tracks.

The subways are of concrete throughout, reinforced slabs resting on reinforced piers and mass abutments. Two views of the finished subways are shown in the accompanying illustrations, one of the illustrations also including a section of the retaining wall, and the other including a distant view of the standard steel girder subway of the Chicago & North Western, whose tracks parallel those of the Chicago, Milwaukee & St. Paul through Evanston. The comparative merits of these widely different types of subways are still in dispute. It is contended by those who favor the concrete type that its first cost is less, that the maintenance charges for it are substantially smaller, and that its appearance is the more pleasing.

As compared with other concrete subways, this design conveys an impression of lightness and beauty of line rather than massive strength and avoids the tunnel-like appearance which concrete subways are apt to have. This is largely due to the greatly reduced section of the columns, which is made possible by spacing them closer together. It has been customary to allow one column per track, or in some designs one and one-half, but in this case two columns per track have been used. In the details of design the same general impression is conveyed by the paneling of the slabs, the small arches between the pillars and the rounding of all exposed corners.

The abutment plans shown in Fig. 3 illustrate an interesting feature of the design. The line is two-track at present, but the addition of a third track is anticipated and all structures are designed to provide for that addition. In the case of the abutments, the footings are carried out to a width sufficient to support the three-track structure, and the rear wall on the side of the future track is stepped down to facilitate the addition of concrete as outlined by the dotted line in the elevation. To avoid unsymmetrical appearance and increased first cost the remainder of the concrete is not to be placed until the third track is built. To prevent the ballast from rolling over the face of the abutment as at present constructed, the wall at the side of the present slab and back of the seat for the future slab is raised to the level of the base of rail. The seat for the third slab is carried out to the proper width to insure that slab a support similar to those provided for the other two.

Fig. 4 shows the details of the piers. The width of the columns is only 18 in., which greatly reduces the obstruction to the street as compared with the 30-in. columns used on some other designs. The small arches between columns are used for the sake of appearance and the arching effect was neglected in the design. The footings at the different streets vary greatly owing to the variable composition of the soil, loam, soft blue clay, quicksand and coarse gravel being found in various combinations. At seven of the thirteen streets intersected a good natural footing of packed gravel was obtained at a depth of 4 to 5 ft. below the surface, and at the other six streets pile foundations had to be driven, the concrete being carried down 7 to 9 ft. below the surface.

The construction of one of the large floor slabs is shown in detail in Fig. 5. The size of these slabs varies greatly, as every street is intersected at a different angle and several subways are located on curves. The Davis street subway is on a 12-deg. curve, and the Chicago avenue subway, shown in the figure, is on a 9-deg. curve and has the maximum intersection angle, 18 deg.-34 min. The slabs are all of one track width with the exception of one subway, where the span is so long that the weight of a full width slab would have been too great to handle, in which case the slabs are of one-half track width. For the purpose of handling, a 1¼-in. round stirrup was placed at each end of the slab with its diverging ends under the reinforcing bars, as shown in the detail drawing. The method of placing the slabs will be described later.

The tracks of the Chicago, Milwaukee & St. Paul, from where its Evanston line originates in Evanston into the northern part of Chicago, are used chiefly by the Northwestern Elevated Railroad, an electric line. The elevated trains stop at four stations on the section being elevated and facilities for handling large numbers of people had to be provided at these points. Small brick stations are to be used with four stairways and a passageway under the tracks to allow passengers to reach the platforms rapidly. The stations are located entirely below the grade of the tracks and are covered with flat concrete roofs, as in some cases the designs for the future third track provide for its passing directly over the station building. The stations of the Chicago & North Western in Evanston are raised to the grade of tracks at much greater expense for footings. The stairways from the station level to the St. Paul's track level and the subway under the tracks are of concrete, the details being shown in Fig. 6. The most peculiar feature of the design is the cantilever construction

used for one stairway. This plan was adopted to shorten the length of the footing and thereby protect the stairways from damage by unequal settling. The same object was sought in making an open joint between the subway and the stairway so that the former may settle appreciably without damaging the latter.

A standard gravity section was used for the retaining wall, but in two cases where special conditions were met, the design was altered. One of these is illustrated in Fig. 7. A team track was to be provided between the tracks of the Chicago & North Western and the Chicago, Milwaukee & St. Paul, to lead from street level to the new track level. As the fill on one side of the wall is at a constant elevation and on the other side varies from zero to full height, the section of wall required at any point is that necessary to withstand the pressure due to a head of fill equal to the difference in elevation on the two sides. As constructed, the mass wall is used at the lower end of the team track for a distance of 175 ft., and for the



Fig. 1—Subway and Retaining Wall; Evanston Track Elevation of the Chicago, Milwaukee & St. Paul.

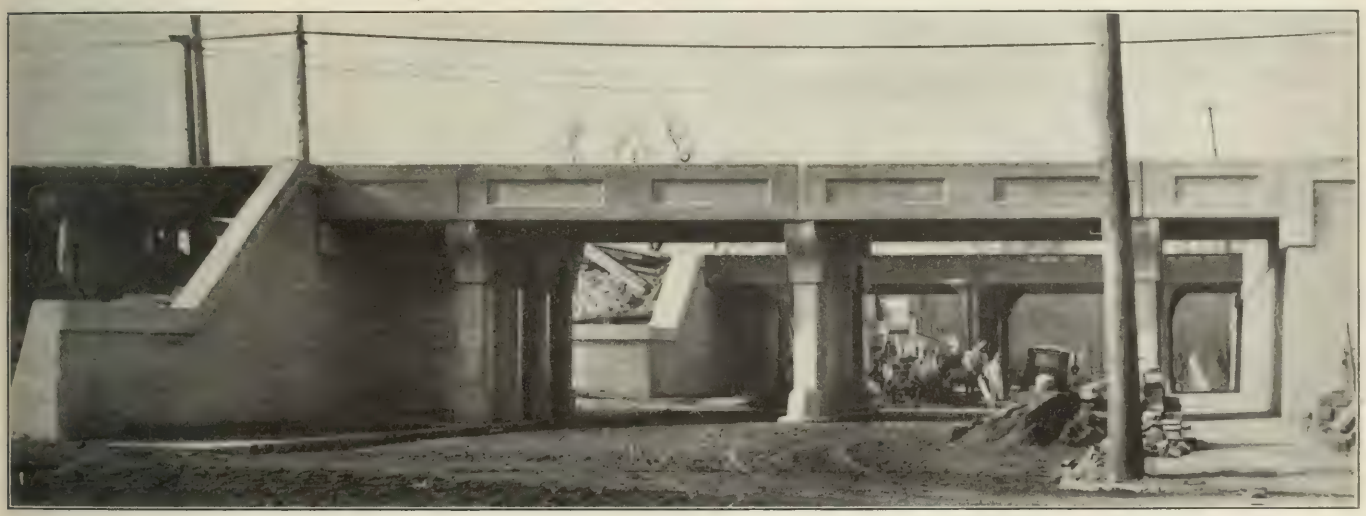


Fig. 2—Subway.

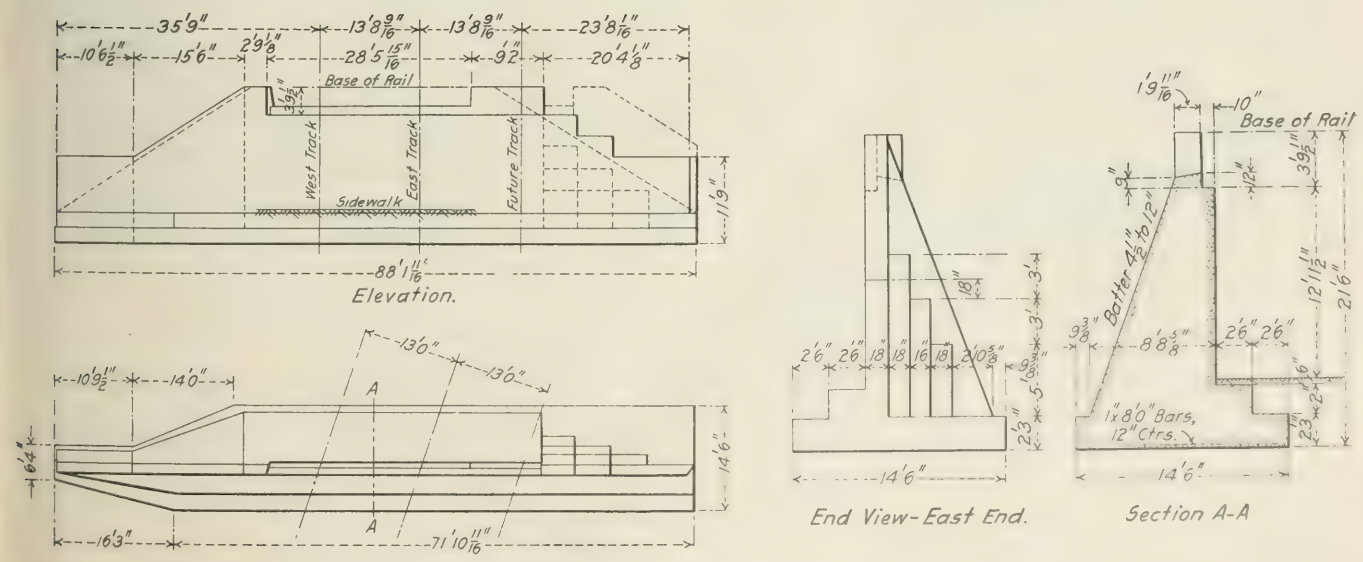


Fig. 3—North Abutment for Chicago Avenue Subway.

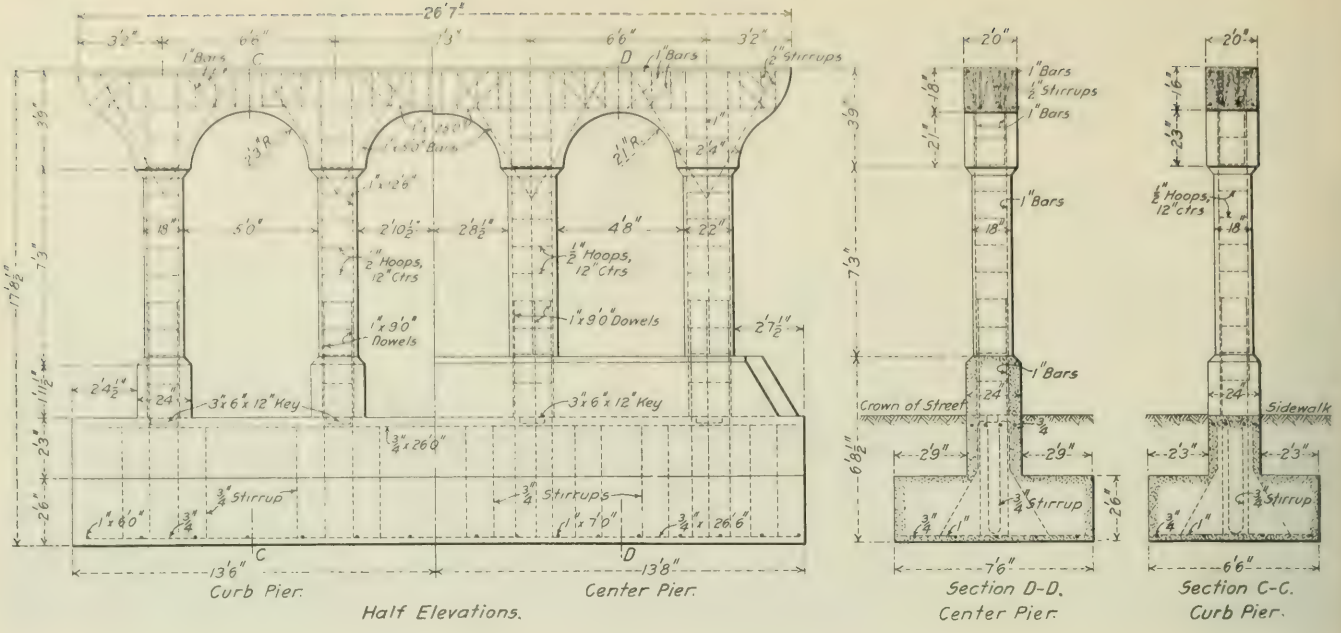


Fig. 4—Details of Piers for Chicago Avenue Subway.

remaining 90 ft. the standard section is abandoned and a reinforced section supported on pillars is substituted, thus effecting a great saving in concrete.

At another point where the right of way is very narrow and no permit could be obtained to extend footings into an alley which parallels the tracks for a short distance, a 1 ft. 9 in., reinforced wall, buttressed on the outside, was adopted in order to economize space. The addition of a third track at this point will require the outer rail to be laid very close to the right of way line and to provide for this a cantilever construction has been worked out to rest on the reinforced retaining wall and support the track directly. As the full height of the wall is not required at present it is only made 8 ft. high, but provision is made for placing the additional height directly on the existing wall when the third track is added. This construction is used for a total distance of about 75 ft. The buttresses are 1 ft. 6 in. wide and are placed about 16 ft. center to center.

The problem of handling the traffic during the work of elevating the tracks was a difficult one. The line was only two-track and the very narrow right of way prevented the laying of a third track for construction purposes. The Northwestern Elevated operates two to five car trains on a ten-minute schedule between 5:30 a. m. and 2:30 a. m., and it was imperative that the regularity of these train movements should not be interrupted. Another factor that added to the difficulty of the problem was the necessity of elevating the trolley wires with the tracks, as the cars are operated on an overhead trolley system.

It is impossible to describe the numerous special problems

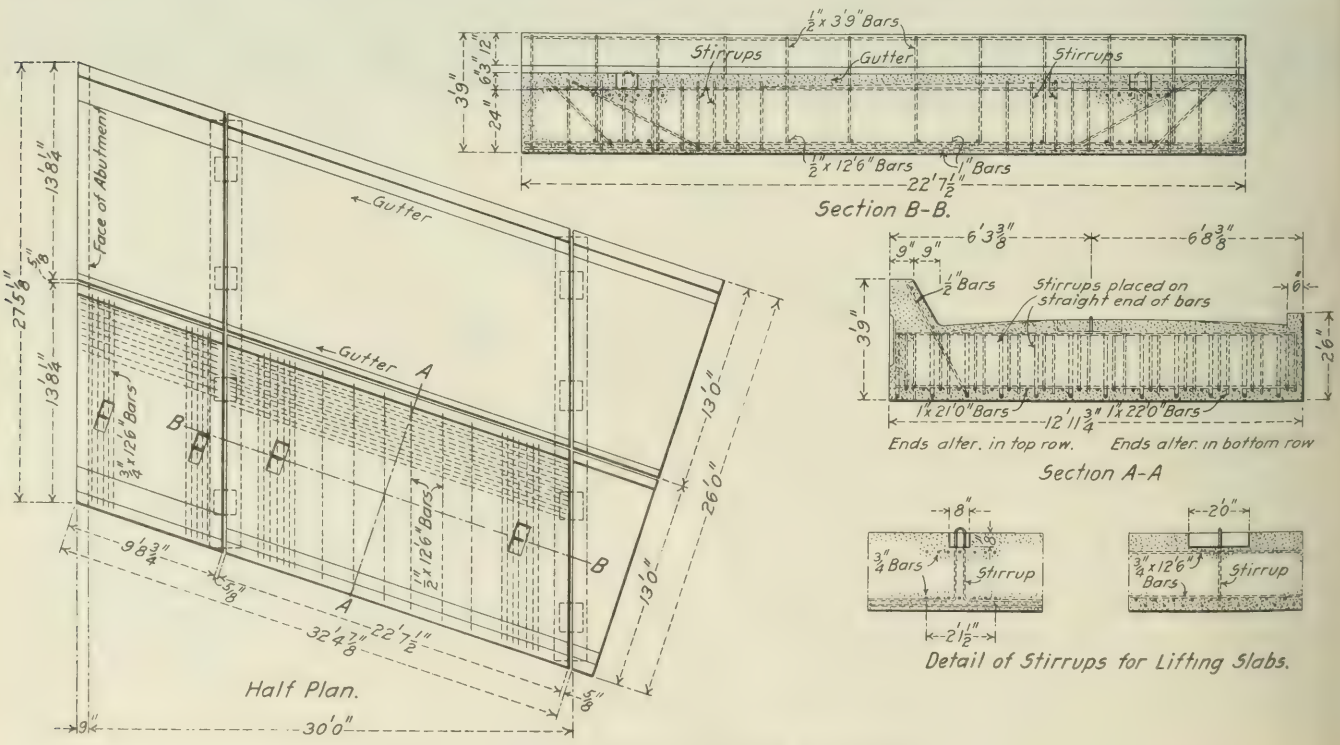


Fig. 5—Details of Reinforced Slab for Subway.

that arose and the original methods used to solve them, but the general plan of the work can be briefly outlined. A point near the center of the work was selected at which to begin work. The tracks were separated as widely as the width of the right of way would permit, a pile trestle giving the full amount of clearance for street traffic was built between the tracks, and enough fill placed at the ends of the trestle to allow one track to be shifted to the false work. Crossovers were placed on both sides of this work and the trains were operated single track over that section until the other trestle could be built and the second track shifted to it. From this beginning the work proceeded in both directions. Sections three or four blocks in length were operated single track, while trestle bridges were built across the streets and the intermediate tracks raised by filling. In most cases the trestles were made full height and the filling was carried up as high as possible without flooding the operating track. Usually the traffic had to be shifted from track to track two or three times before the full height of fill was attained under both tracks. At some streets where it was impossible to raise the track to full height at a single operation, a fill in the street was used in preference to a half height trestle. The street was closed while the fill was being placed and then rock screenings were spread on top, easy approaches formed, and the street traffic carried over the fill. Extra crossing men were required at such places, but the interruption to traffic was slight. After the grade in the adjacent blocks had been raised enough to allow it, the fill in the streets was removed and full height trestles substituted. This method was probably cheaper than the driving of two sets of pile trestles and it also served to keep the street open more of the time. Whenever the trains were forced to operate on a single track a pilot was employed, who rode from crossover to crossover, going on one train and returning on the next. This made the

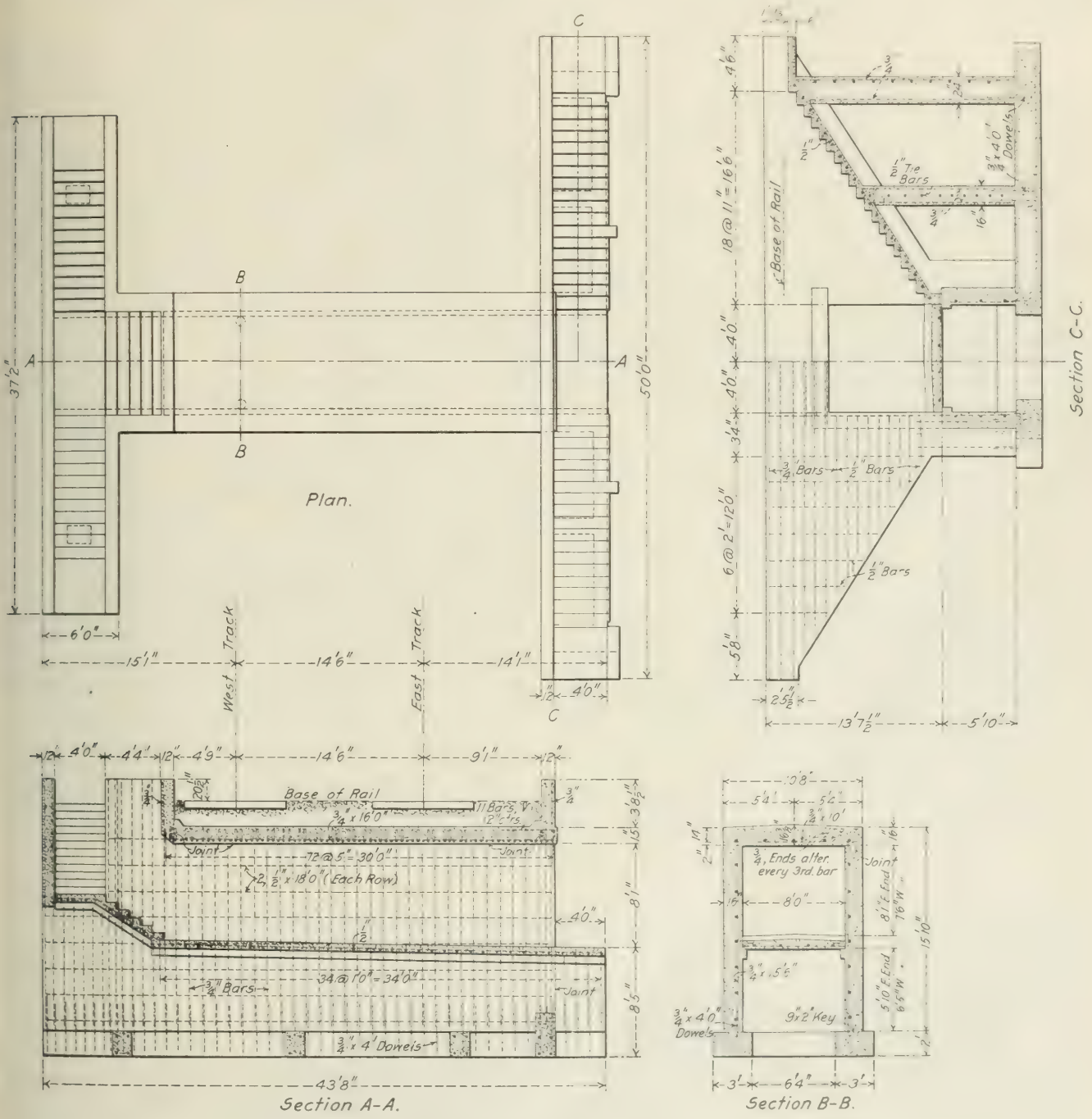


Fig. 6—Stair and Station Subway Details; Evanston Track Elevation.

single track operation perfectly safe and the delay in trains was never great.

The material and construction yard was established on a piece of ground about five acres in size at the extreme southern end of the work. The slabs were made here, being arranged in rows along switch tracks to facilitate their being handled. On account of the varying angles on which the subways were built, the forms for the slabs were laid out accurately with a transit. The solid floor to form the bottom of the slab was built first and then the angles accurately turned to establish the four corners of the slab on this floor. The method proved very satisfactory and the exactness with which the slabs fitted in place was an ample reward for the care taken in laying them out.

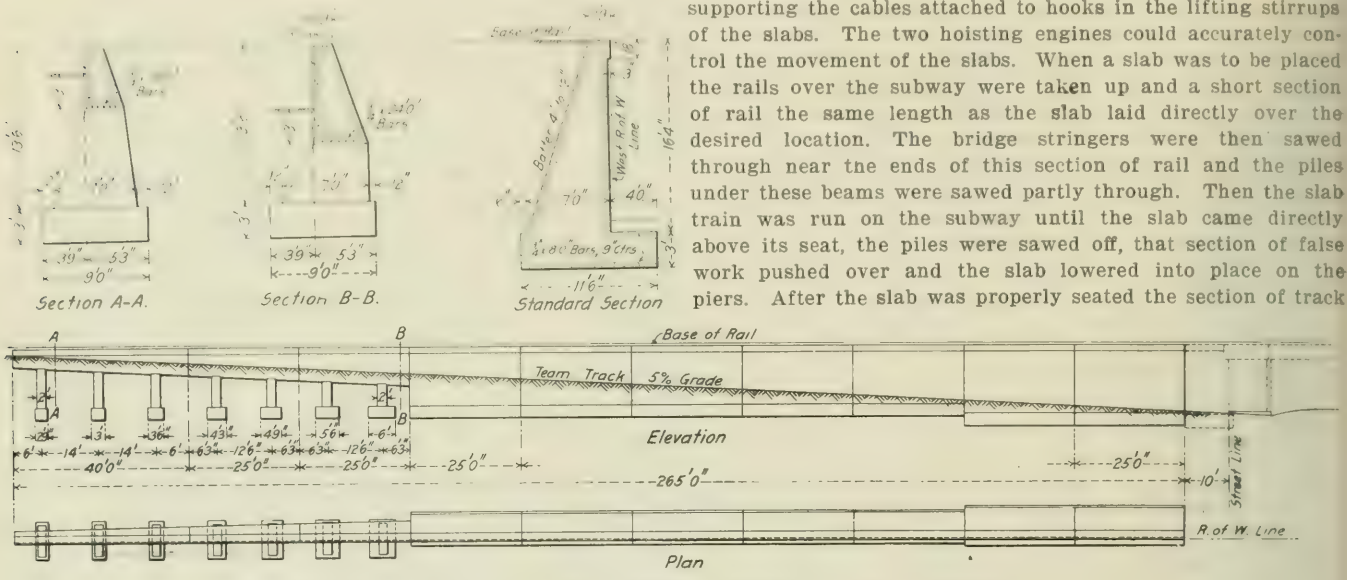


Fig. 7—Retaining Wall Design; Evanston Track Elevation.

The method of placing the slabs was adopted from necessity and proved a very satisfactory one. The weight of the heaviest slab was about 65 tons and the capacity of the largest derrick car available for the long reach required was 50 tons. It was also feared the false work bridges might not be able to support the concentrated load of a derrick car carrying a 65-ton slab. The use of two derrick cars was not possible since, on account of traffic, only the track on which the slab was being laid could be blocked during the operation. The method finally adopted is illustrated in Fig. 8, which shows one of the heavy street slabs being lowered into place. A pair of 75-ft. girders were supported on two 50-ton, steel, underframe, flat cars, the points of support being arranged to allow enough space between the cars for the largest slab to hang free. The tractive effort was transmitted by a king pin in an ordinary truck bolster which was blocked up on the car. A bridge erection derrick car was coupled in front of the two girder cars and a flat car carrying a hoisting engine was coupled behind them. The train was assigned one of the switching engines employed on the work and was always very carefully handled. The girders were placed close together with blocks across the upper flanges supporting the cables attached to hooks in the lifting stirrups of the slabs. The two hoisting engines could accurately control the movement of the slabs. When a slab was to be placed the rails over the subway were taken up and a short section of rail the same length as the slab laid directly over the desired location. The bridge stringers were then sawed through near the ends of this section of rail and the piles under these beams were sawed partly through. Then the slab train was run on the subway until the slab came directly above its seat, the piles were sawed off, that section of false work pushed over and the slab lowered into place on the piers. After the slab was properly seated the section of track was blocked up temporarily on the slab and the train removed. Some of the light sidewalk slabs were placed with a bridge erection derrick car, but for placing the heavy slabs this car was only needed for the hoisting engine it carried. By the use of this train the weight was distributed almost uniformly on the four sets of trucks of the flat cars and allowed the train to be run in safety over all false work.

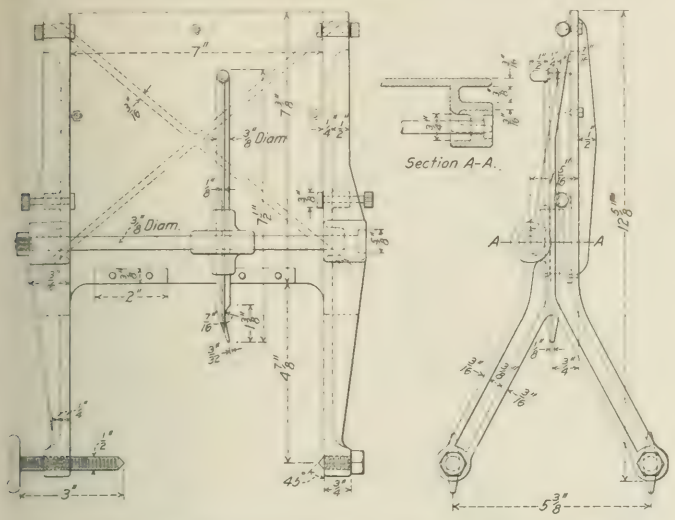
We are indebted for the descriptive matter and illustrations in this article to C. F. Loweth, engineer and superintendent bridges and buildings of the Chicago, Milwaukee & St. Paul; J. H. Prior, assistant engineer in charge of the design of this work; R. J. Middleton, assistant engineer in charge of construction, and E. O. Greifenhagen, who assisted in the design of the work.



Fig. 8—Slab Train Placing One of the Floor Slabs: Evanston Track Elevation.

TIRE CONTOUR INDICATOR.

A device for getting the profile of worn driving wheel tires, designed by W. C. Arp, superintendent of motive power, and F. F. Hildrith, mechanical engineer of the Vandalia at Terre Haute, Ind., is shown on the accompanying drawing. The tires have center punch marks at a standard distance from the inside diameter. Set screws fit into these punch marks and hold the device in place. The crosshead carrying the stylus



Device for Securing Contour of Worn Wheel Flange and Tread.

has a lateral motion on the ⅜-in. rod and the stylus slides vertically in the crosshead. A pencil point at the upper end of the stylus traces the profile of the flange and tread on a piece of paper placed on the flat plate, which is ribbed on the rear side to insure strength and rigidity. The paper is held in place by the four cams on the ends of the small, short shafts which are turned by the knurled heads.

TELEPHONE TRAIN DESPATCHING ON THE UNION PACIFIC.*

The Union Pacific now has nearly 600 miles of telephone lines nearly ready for use as train despatchers' wires, the line between North Platte and Sidney, 123 miles, which was put up in 1908, having proved highly successful. In addition to these despatching wires, telephones are extensively used "composite" with telegraph instruments on the long-distance copper telegraph wires.

The cost of two copper wires, weighing each 210 lbs. per mile is about $110 a mile; of a despatcher's telephone equipment, $40; station telephone equipment, $20; booths used at sidings and places where there is no operator cost $60; apparatus in booth, $50; selector apparatus at the despatcher's office, $60; selector apparatus at way stations, $30 per station.

Telephone wires are transposed on the poles every quarter mile. In the circuits now being put up there are from 12 to 23 station sets in each, and from 6 to 12 booth sets. At the despatcher's office each despatcher has a separate set. On the North Platte-Sidney circuit a high impedance receiver of about 700 ohms is used, making it possible to use a uniform style of receiver throughout the length of the circuit. By thus placing the most of the impedance in the receiver instead of outside, the working of the line has been improved. At stations not more than 100 miles from the despatcher's office the current for the station apparatus is from three cells of dry battery; at greater distances four cells are used.

With the selector used, the bell at the station need not ring until the operator stops it; the despatcher can stop it at will. The time required to start the bell at a distant station is about eight seconds. By a special winding on the selector magnet, a faint "answer-back" is given. The selector works on the step-up principle.

Mr. Sheldon concludes that despatching by telephones is at least one-third faster than by Morse telegraph, and in some cases one despatcher can manage a district alone where, if the telegraph were used, he would have to have assistants or perhaps have the district divided. A telephone despatching circuit is rather costly, but usually the expense can be saved within the first year of its use.

The telegraph circuits before referred to are four in number, extending from Omaha to Ogden, 1,000 miles. The telegraph instruments on these wires are worked duplex. The wires are transposed on the poles so that two splendid telephone circuits are available all the way. With these telephones conversations are held frequently between Omaha and Cheyenne, 516 miles. Regular telephone operators send messages over these wires every day between the headquarters of the different divisions of the road. For these operators roomy, ventilated booths are provided. Messages received are written directly on the typewriter, and the speed of the service is approximately three times that of the telegraph. This service is maintained both day and night. One of the eight telegraph circuits worked on these wires extends through to San Francisco, with repeaters every 500 miles. For telephone transmission the 1,000 miles of line are separated into five circuits on each pair of wires. The ten telephone circuits thus provided, added to the eight telegraph circuits, handle about 200,000 messages a month.

*From a paper read before the Omaha Railway Club March 9, by J. B. Sheldon, superintendent of telegraph of the Union Pacific.

TWO, THREE AND FOUR TRACK RAILWAYS IN MASSACHUSETTS; TWO TRACK AND FOUR TRACK IN RHODE ISLAND.

Following the maps of double-track railways in the states of Maine, New Hampshire and Vermont, printed in previous issues we show on the next page a similar map of Massachusetts. In this state there are a number of stretches of four-track line; and sections of two-track, three-track and four-track road are distinguished from each other in the map by the thickness of the lines in the drawing. The railways in and around Boston are shown in the lower left-hand corner on a larger scale. That part of the Fitchburg division of the Boston & Maine which lies in Vermont is double-track, and is indicated on this map, no map of Vermont being published. The termini of the sections in Massachusetts having more than one track are as follows:

MASSACHUSETTS.

	No. tracks.
Boston & Albany.	
Boston-South Framingham	4
South Framingham-Charlton (Including 3-track line as shown.)	2
Charlton-East Brookfield	3
East Brookfield-Washington	2
Washington-Pittsfield	3
Pittsfield-West Pittsfield	3
West Pittsfield-State line	3
Cary Cut-Curtis St. Junction, East Boston	2
Riverside-Boston	4
Cottage Farm-Charlestown	2
Boston & Maine	
Boston-State line, N. H.	2
Everett Junction-West Lynn	2
Salem-Peabody	2
Beverly-Gloucester	2
Boston-Somerville	2
Boston-Somerville	2
Boston-Atkinson, N. H. (Inc. 1.53 miles of 3-trk.)	2
Medford Junction-Medford	2
Lowell Junction-Bleachery	2
South Lawrence-Lawrence	2
Somerville-Nashua, N. H.	2
Somerville Junctn-Lexington	2
Winchester-N. Woburn Jctn.	2
Boston Union Square	4
Union Sq.-W. Cambridge	2
W. Cambridge-Waltham	3
Waltham-Roberts	2
Roberts-North Pownal, Vt.	2
W. Cambridge-Waltham	2
Worcester-Groton	2
Springfield-Greenfield	2
New York, New Haven & Hartford	
Boston-E. Thompson, Conn.	2
Springfield - Thompsonville, Conn.	2
West Roxbury-Needham	2
Worcester-Woonsocket, R.I.	2
Forest Hills-Dedham	2
Readville-Dedham	4
Boston-Readville	4
Readville-Central Falls, R.I.	4
Canton Jctn-Stoughton Jctn	2
Boston Harrison Square	4
Harrison Square-Fall River	2
Harrison Square-Milton Jctn	2
Raynham-Whittenton Jctn.	2
S. Braintree-Pemberton	2
Nantasket Junction-Cohasset	2
S. Braintree-Whitman	2
Kingston-Plymouth	2
Mayflower Park-Brockton	2
Brockton-Campello	4
Campello-Buzzard's Bay	2
Fitchburg-Prairs Junction	2
Marlboro Jct.-S. Framingham	2
Walpole-New Bedford	2
RHODE ISLAND.	
Woonsocket-Central Falls	2
Central Falls-Providence	4
Providence-Westerly	2
Providence-Warren	2
India Point-Valley Falls	2



Two-Track, Three-Track and Four-Track Railways in Massachusetts and Rhode Island.

General News Section.

The Tacoma (Wash.) *Ledger* says that the Northern Pacific intends to substitute oil for coal as fuel in the switching engines used in Tacoma. Six engines are being changed from coal to oil burners.

The street railways in Cleveland, Ohio, which carry passengers for three cents each, report that for the first month the profit per car-mile is 66 cents, after paying the expenses, and 6 per cent. to the stockholders.

Mexican laborers moving north to work on new railway construction are now passing through El Paso, Tex., at the rate of several hundred a day. Some of these men go as far east as Illinois and as far north as Nebraska.

A fire in the elevator district at Omaha, Neb., on April 4, destroyed about 100 cars standing in the adjacent yards and imperiled the Independent elevator belonging to the Chicago Great Western. This building was saved, however, as its steel sides made it partially fireproof.

A strike of all men employed in the operating department of the Tonopah & Goldfield was reported April 4. All conductors, brakemen, enginemen and firemen walked out. A recent order reducing wages and a refusal of the company to arbitrate brought about the strike.

Studying in the course on railway operation at the Wharton School of Finance and Commerce, University of Pennsylvania, there are now 16 students; five Americans, ten Chinese and one Hindu. This is a mixed graduate and senior course. It is under the charge of Professor Howard G. Brownson.

When the new Chicago & North Western station in Chicago is opened, a postal station will be opened in it which will replace the present Station U in the Union station, as well as the postal station in the present North Western station on Kinzie street. This will be much the largest postal station in Chicago.

The Ohio members of the Railway Business Association have requested the general executive committee of that organization to consider whether or not the association in Ohio should protest against the enactment of a measure for the regulation of public utilities, which was passed by the Ohio House on March 30, and is now pending in the Senate. The measure provides for very detailed regulations of public utilities, including railways.

The Southern Railway is putting into service an equipment for despatching its trains by telephone on the division from Greensboro, N. C., through Lynchburg, Va., about 124 miles of the road having 36 way stations. The equipment is of the latest type furnished by the Western Electric Co., New York, and employing Gill selectors. The regular message work, as well as the trains on this busy division, will be handled by telephone. The company is also equipping its block signal wires with telephones.

Governor Hughes of New York has signed a bill providing for the issuance of 50-year 4 per cent. canal bonds not to exceed $78,000,000, in lieu of 3 per cent. bonds previously authorized but not issued. The New York State Superintendent of Public Works has awarded two additional barge canal contracts as follows: Contract No. 21, from the Genesee river to the East End of contract No. 6, at Rochester, to Lane Bros. Company, Altavista, Va., $1,383,150; contract No. 39, for dredging a channel in the Oswego river from Three Rivers to Fulton, 11 miles, to James Stewart & Co., New York, $1,046,674.

The Railroad Commission of Wisconsin, in making an investigation of the conditions on street railways of Milwaukee, arrives at the conclusion that out of a car full of from 40 to 42 persons, eight prefer to stand rather than sit, regardless of the number of seats provided. The commission says: "A number of reasons might be suggested as explaining this preference. The passengers may wish to stand on the rear platform and smoke; they may prefer to stand on the front platform for observation; or they may have been sitting down all day and prefer to stand for that reason; or having only a slight distance to ride they may not care to go to even the slight trouble of searching for one of a number of available seats." The commission, therefore, arrives at the conclusion that a car having a seating capacity of 42 is only comfortably loaded when it carries 50 passengers. New York Public Service Commission, First district, please note.

Colonel B. W. Dunn, chief inspector of the Bureau of Explosives, has issued a circular to members of the Bureau calling attention to the carelessness of some freight agents in selling at auction, at a loss, freight which is plainly marked with the name of the manufacturer. Money could be saved usually by looking carefully for the name stamped on the package and then getting from the shipper the necessary information as to the ownership of the goods. In the same circular Colonel Dunn warns yard men against allowing cars containing explosives to stand near to fires built by the men on the ground in the yards to warm themselves in cold weather. Instruction is also given as to the best method of destroying explosives by burning. In the annual report of the chief inspector, recently issued, there is an illustration of a vessel suitable for thawing small quantities of dynamite. Having received many complaints of delays to shipments of explosives, the inspector calls attention to paragraph 1685, of the government regulations, requiring that every effort be used to expedite the movement of cars containing explosives. Neglect is a violation of law. Copies of the inspector's annual report may be had at $1 each from W. F. Allen, secretary, 24 Park place, New York city.

Railway Matters in Washington.

Washington, April 6, 1910.

The amendments to the employers' liability law have finally been agreed to by both houses of Congress and President Taft says that he is going to sign the bill. By these amendments state courts are given concurrent jurisdiction with federal courts in dealing with suits for damages growing out of accidents.

The House on Saturday adopted a provision amending the corporation tax so as to provide for publicity of returns in the discretion of the president, rejecting the proposal that returns might be made public on the request of the Senate or the House.

The bill to increase the powers of the Interstate Commerce Commission over safety appliances on freight cars and requiring uniform steps, ladders and running boards, efficient hand-brakes, etc., after much discussion in the committees of both houses, has finally been agreed to by a conference committee and the conference report has been accepted in both houses, so that it will probably become a law at an early day. This bill (H R 5702) was originally presented in the House March 29, 1909, by Mr. Esch. According to the latest draft, it goes into effect July 1, 1911. Besides the provisions referred to, there is a clause empowering the Interstate Commerce Commission to establish a new standard for the height of drawbars.

In the Senate on Monday Chairman Elkins offered three amendments to the "administration bill," designed to meet the criticisms of Senator Cummins and others. One of these makes traffic agreements legal only when approved by the Interstate Commerce Commission, another strikes out the concluding sentence of Section 12 and the third inserts the word "lawful" in that section, so that a road seeking to acquire the stock of another road must already "lawfully" own not less than 50 per cent. of the stock of the road to be acquired. The House Committee finally reported the bill on April 1 with many changes and on Monday of this week voted to take it up immediately after the passage of the naval appropriation bill, which means probably the first part of next week.

Senator Root in his argument for the administration bill addressed the Senate for about two hours on March 30, three hours the next day (Thursday) and again an hour on Friday. He spoke without notes. He said that, personally, he was not much in favor of making new courts; but, in view of the knowledge of those charged with the duty of administering

the Interstate commerce law, he accepted their judgment. The essential principle of the Interstate Commerce law was to facilitate the presentation by the ordinary citizen of his claims against the railways, and the proposed court was an advance step in this direction. It will be wise to have the court in Washington, because the great question now before the government and the public is not that of reasonable rates but of proper *relative* rates. A court sitting in Washington will not be influenced by local considerations. It will be as free and untrammeled as the Supreme Court of the United States. As to the jurisdiction of the proposed court he had no objection to the amplification of the language in this section, if senators desired it, but really it is satisfactory already. It is proper to delegate to the Attorney-General the authority to conduct proceedings in the court on behalf of the government. There is nobody we can trust better than the Attorney-General. It is not businesslike for every board, bureau and separate agency of the government to have its own lawyers.

Speaking of Section 7, Senator Root had no objection to a provision that traffic agreements shall be subject to the approval of the Interstate Commerce Commission; neither did he oppose the elimination from Section 12 of the clause permitting a railway owning half the stock of another to acquire the remainder of such stock. There is nothing in the bill which relieves railways from the full penalties of the Anti-Trust Act, but if any senator is afraid of this permissive clause it can be cut out.

Senator Root defended Section 9, empowering the commission to suspend changes in rates until their propriety can be investigated, and opposed the proposition to allow more than 60 days for such investigation. To allow a long time would be about the same as giving the commission definite authority over rates, which the senator did not believe in.

Railway Regulation in Maryland.

A bill creating a public utilities commission to have supervision over all public service corporations in Maryland has been passed by the legislature of that State, and it is expected that the Governor will sign it. It is patterned after the New York and Wisconsin commissions with the court review provision of the latter State.

Increases in Pay.

Following the announcement of general increases of pay last week on the Pennsylvania and the Philadelphia & Reading, the New York Central, on April 1, announced an increase of 7 per cent. to all employees receiving not more than $200 a month. Yard conductors and yard brakemen will receive three cents an hour additional. Employees of the engineering and maintenance of way departments are excepted, their wages having been recently adjusted, and the exception applies also to the conductors, trainmen and telegraphers, whose committees have recently been in conference with the general manager. The general increase applies also on the Boston & Albany.

The Erie Railroad, following extended conferences, has increased the pay of locomotive enginemen. It is said that in view of the financial condition of the Erie, the enginemen did not stand out for rates as high as those which have been granted on other roads. The difference between the Erie wages and those of other companies will be about the same as before.

The Erie has reduced the working time of the men in all of its shops from 55 hours a week to 45 hours a week; this in consequence of the falling off in freight traffic since the first of April.

The Atlantic Coast Line, following protracted negotiations, has made a new agreement with the Brotherhood of Locomotive Engineers, to hold for two years; and it is said unofficially that the men secure an increase of about 5 per cent. in their pay.

The Boston, Revere Beach & Lynn has increased the pay of all employees 5 per cent.

The Delaware, Lackawanna & Western is negotiating with committees of conductors and brakemen. It is said that the company refuses to pay as high rates as those which have been granted by the Baltimore & Ohio.

The Delaware & Hudson, on April 4, offered its conductors and trainmen an increase of 6 per cent. in pay, but it does not appear that the employees have as yet accepted the offer.

The Norfolk & Western, following extended conferences, has increased the pay of firemen about 5 per cent.

Some of the track laborers on the Delaware & Hudson struck April 1 for an increase of pay from $1.40 a day to $1.70, but it is said that the men returned to work pending negotiations.

Track laborers of the Cincinnati, Hamilton & Dayton struck April 1 for an increase of pay.

Increases of from one cent to one and one-half cents an hour were made April 1 in the pay of conductors and motormen of the Rhode Island Company, which operates most of the street cars in Rhode Island. This company is controlled by the New York, New Haven & Hartford.

On the night of March 31 there was a strike in New York harbor of the pilots and masters on the tug boats of the Baltimore & Ohio, the Central of New Jersey, the Delaware, Lackawanna & Western and the Lehigh Valley railroads. It appears that the other roads doing business in the harbor had made increases in wages, but that the four named stood out. Within one or two days the companies announced that they were moving nearly or all their freight, and the strike seems to have failed.

The new rates of wages agreed to between the New York, New Haven & Hartford and its conductors are based on runs of 157 miles, not 100 miles. The conductors receive $4.20 per 157 miles; ticket collectors, $3.35 for the same distance; baggage masters, $2.75 per 177 miles; brakemen, $2.55 per 170 miles.

A. B. Garretson, president of the Conductors' Brotherhood, says that conductors on the New York Central receive less pay than those on any other prominent road. A conductor running the Twentieth Century Limited express train from New York to Buffalo, 440 miles, receives less than $2 per 100 miles, while the conductor of the Lake Shore & Michigan Southern (controlled by the N. Y. C.) running the same train from Buffalo to Chicago, 525 miles, receives $2.50 per 100 miles. The Baltimore & Ohio has for years paid $2.60 per 100 miles on through express trains and on some other trains, and henceforth will pay $2.68. Freight conductors on the New York Central receive $2.90 and $3 per 100 miles, while on other lines controlled by the New York Central they receive $3.20. On the Baltimore & Ohio freight conductors have received $3.46½ and will now receive $3.63. West of Chicago freight conductors receive $3.80 per 100 miles.

THE NEW BALTIMORE & OHIO RATES.

The increases of pay which have been granted on the Baltimore & Ohio, under the mediation of Messrs. Knapp and Neill, and which have furnished the basis for the settlement of differences concerning wages on a number of other roads, appear, from an official statement, to amount to the following percentages: Passenger conductors 4.76; baggagemen 11.66; brakemen 12.38. Freight conductors, through, 4.77; local, 2.77; freight flagmen, through, 4.39; local, 1.20; brakemen, through, 4.77; local, 1.33. Work train conductors 10.00; flagmen 9.78; brakemen 9.78. These figures represent the average percentage under each heading, and the average increase granted to all classes of trainmen is calculated at 5.44 per cent.

The variety of rates under each head is due to differences in length of runs and other conditions. The principal changes in the rates per mile are: Passenger conductors, old, 2.6 cents; new, 2.68 cents; increase 3.08 per cent.; new minimum rate per month, $125. Baggagemen handing express, old, 1.53 cents; new, 1.65 cents; increase 7.84 per cent.; not handling express, old, 1.38 cents; new, 1.55 cents; increase 12.32 per cent.; new minimum, handling express, $79; not handling express, $75. Brakemen, old, 1.33 cents; new, 1.50 cents; increase 12.78 per cent.; minimum monthly rate, new, $70. Through freight conductors, old, 3.465 cents; new, 3.630 cents; increase 4.76 per cent. Flagmen, through freight, old, 2.42 cents; new, 2.525 cents; increase 4.34 per cent. Brakemen, through freight, old, 2.31 cents; new, 2.42 cents; increase 4.76 per cent.

The yards are classified into three groups: (1) Chicago, Cleveland, Pittsburgh, Wheeling and eight others; (2) Bel-

laire, Columbus, Akron, Johnstown, Chicago Junction and seven others; (3) Grafton and all east thereof; Parkersburg, Mansfield, Fostoria, Huntington and eight others west of Grafton. The new rates in these yards, which are a 6.04 per cent., average net increase over former rates as follows:

	Conductor.		Brakeman	
	Day.	Night.	Day.	Night.
Group 1	$3.50	$3.70	$3.20	$3.40
" 2	3.40	3.60	3.10	3.30
" 3	3.30	3.50	3.00	3.20

A press despatch from Baltimore says that the basis of increase which governed in the foregoing adjustment has been followed in negotiations between the company and the locomotive enginemen, and that the increases will be as follows: Passenger engineers, 2½ per cent.; through freight and helper, 4.76 per cent.; local freight, 4.76 per cent.; work train, 10 per cent. Yard engineers are to be increased practically 5 per cent. No change was made in the provisions of the existing agreement for a 12-hour day in helper service.

WAGES ON THE PENNSYLVANIA.

The advance of 6 per cent. in the wages of all permanent employees of the Pennsylvania Railroad and its controlled companies (including the Cumberland Valley) who now receive less than $300 a month, which was announced last week, is the third general voluntary increase in wages granted by the Pennsylvania in the last eight years. The lines represented employ about 200,000 men, and of these about 195,000 will participate in the increase. This will involve an addition of some $10,000,000 to the pay rolls. In December, 1902, the Pennsylvania made an increase of 10 per cent. to all employees receiving less than $200 a month, and in December, 1906, another voluntary horizontal increase of 10 per cent. was made, so that the present readjustment means a total addition of 28.26 per cent. to the rates paid in December, 1902. There have also been many increases in wages due to promotions, as well as increases for various classes of employees, so that the cost of labor to the system for the year 1910 will be more than 33 per cent. greater than in 1902.

The Pennsylvania has not made a general reduction of wages since May, 1877, when, because of riots and other troubles, reduced earnings made a 10 per cent. decrease necessary. This was restored in March, 1880. In the panic of 1908 the company made no reduction in wages, but reduced forces and furloughed the younger men.

The total payroll in 1909 for the lines participating in the present increase was $131,823,937, and the number of men receiving this money was 189,721. This was divided as follows:

	Employees.	Wages.
Pennsylvania	123,455	$87,068,100
Cumberland Valley	1,830	1,120,944
Pennsylvania Lines West	55,032	36,425,599
Vandalia	5,346	4,375,878
Grand Rapids & Indiana	2,658	2,133,416
New York, Phila. & Norfolk	1,400	700,000
	189,721	$131,823,937

The forces have been largely increased since the first of the year; so that the increase on the lines east of Pittsburgh will make the wage cost for the year 1910 about $100,000,000.

The New Jersey Public Utilities Law.

The full text of the new public utilities law of the state of New Jersey is found in chapter 41 of the session of 1910. The complete act fills only three small pages, and substantially the whole of its requirements were given in our report of March 25, page 840. The law applies to every railway, express, street railway, traction, canal, subway, pipe line, gas, electric light, heat and power, water, sewer, telephone, telegraph or other corporation, association or joint stock company, operating within the state of New Jersey for public use, under privileges granted by the state or by any municipality thereof.

Governor Fort in signing this bill issued a statement defining his attitude toward the measure. The governor is satisfied as to the constitutionality of the bill. Continuing, he says: "It is a long step in advance. If it did nothing else than give the commission power to inquire into and expose unjust exaction and to inhibit unjust discriminations as to rates and charges—which it clearly does—it would be unfortunate if it should fail of enactment. But it does go further, in that it confers upon the Utilities Board in the strongest language possible power to compel safe and adequate service by all utilities companies. Under this power proper and safe car service can be required.

"The commission has no power to fix rates under this act, even upon complaint, but it can investigate rates (on its own motion) and examine witnesses and let the public know the truth as to the cost of furnishing gas, electric light, telephone service and the like.

"The eighth section prevents the granting of privileges or franchises by municipal bodies until approved by the board, and it can only approve after hearing, which assures the public an opportunity to oppose. This power I regard of the utmost importance. Most of the scandals of the past and all the perpetual privileges granted have been due to the influence, not to say corrupt manipulation, of local municipal or county boards.

"Of course, there are serious omissions in the bill. It should contain a rate making clause, giving the commission power to fix rates upon complaint by a municipal board or a given number of citizens. * * * I approve the act in order that the principle may be established and the act made a basis to build future legislation upon which shall be more effective."

Agreement for Arbitration with Firemen.

As was stated by the *Railway Age Gazette* in its issue of April 1, page 906, an agreement has been signed by the representatives of the Brotherhood of Locomotive Firemen and Enginemen and the conference committee of general managers representing the railways west of Chicago for arbitration under the Erdman act of the wages and of the matter of representation of this union on these roads. The demands of the firemen which are to be submitted to arbitration and the agreements reached regarding them are as follows:

"Article I.—(a) Firemen in main line and branch passenger service shall be granted an increase of 25 cents per 100 miles or less.

"(b) Firemen in through and irregular freight, mixed, work, wreck, gravel, helper, pusher, snow-plow and branch service (except Mallet type engines) shall be granted an increase of 40 cents per 100 miles or less; provided, that on simple engines having cylinders 24 in. or over in diameter and on compound engines weighing 215,000 lbs. or more on drivers, firemen shall receive not less than $3.85 per 100 miles or less.

"(c) Firemen in local or way-freight service shall be granted an increase of 10 per cent. over through freight rates, as established at this conference.

"(d) Firemen on Mallet type engines shall receive $4.20 per 100 miles or less in all classes of service. This rate shall also apply on lines where the schedules provide for trip basis in helper or pusher service, in accordance with rules in effect.

"(e) Firemen in yard service shall be granted an increase of 35 cents per day.

"(f) Where rate of pay is provided for transfer service, firemen shall be granted an increase of 35 cents per day.

"(g) On lines where rates of pay are negotiated through the B. of L. F. & E., committees for hostlers, switch engineers and engine despatchers, such employees shall be granted an increase of 50 cents per day.

"(h) The above increase shall be based on rates of pay in effect January 1, 1910, except that the differential as between through and local freight shall be based on the through freight rate established at this conference. Overtime shall be paid pro rata.

"*Agreement.*—Request in this article to be submitted to arbitration under the provisions of the Erdman Act, waiving the right of appeal, the award of the arbitrators to be final and conclusive. Agreement as to such arbitration to be signed as scon as practicable.

"Article II.—Any engineer, fireman or hostler feeling himself aggrieved, may be represented before the proper officials of the company by a committee of enginemen of his own selection. The right of appeal to the highest authority is conceded, and on such appeal he may be represented by the committee or by an officer of the organization of enginemen of which is a member. Note.—The word "engineer" shall

be construed to include electric or motor engineers, and the word firemen shall include helpers on electric or motor engines.

"*Agreement.*—The managers' committee recommends that no change be made in the rules or the actual practice of any company which shall deprive any individual employee of any right or privilege of being represented which he now possesses."

Final agreements were reached and signed governing the question of seniority and some other matters. The agreements regarding these matters are as follows:

"*Article III.*—(a) Firemen shall be examined for promotion according to seniority on the firemen's roster; and those passing the required examination shall be given certificates of qualification, and when promoted shall hold their same relative standing in the service to which assigned.

"(b) If for any reason the senior eligible firemen are not available and a junior qualified fireman is promoted and used in actual service out of his turn, whatever standing the junior fireman so used establishes shall go to the credit of the senior eligible fireman. As soon as the senior fireman is available he shall displace the junior fireman, who shall drop back into whatever place he would have held had the senior fireman been available and the junior fireman not used.

"(c) As soon as a fireman is promoted he will be notified in writing by the proper official of the company of the date of his promotion and unless he file a written protest within 60 days against such date he cannot thereafter have it changed. When a date of promotion has been established in accordance with regulations, such date shall be posted and if not challenged in writing within 60 days after such posting no protest against such date shall afterwards be heard.

"(d) No fireman shall be deprived of his right to examination nor to promotion in accordance with his relative standing on the firemen's roster, because of any failure to take his examination by reason of the requirements of the company's service, by sickness or by other proper leave of absence. Provided that upon his return he shall be immediately called and required to take examination and accept proper assignment.

"*Article IV.*—(a) It is understood that upon lines where higher rates of pay or better conditions are now in effect the propositions herein agreed to shall not in any way interfere with such existing rates of pay or conditions.

"(b) General chairmen and their boards shall not be debarred from taking up with their respective managements matters not acted upon at this conference.

"This agreement signed in triplicate day and date above written [March 23]. The rules granted to be effective as of this date, and the arbitration award to be effective in accordance with its own provisions."

W. C. Nixon, vice-president and general manager of the St. Louis & San Francisco, was chairman of the committee of general managers which negotiated with the firemen.

A member of this committee writes as follows to the *Railway Age Gazette:*

"You will see that the Erdman Act has been used as an instrument to prevent a strike of firemen from occurring. Canada has an act which makes it unlawful for a strike to occur without having first resorted to mediation through the government sources. While the Erdman Act does not go quite this far, its moral effect accomplishes almost the same result.

"The labor organizations are the fathers of the Erdman Act, and they do not appreciate this one phase of it. Perhaps they may object to other parts of it, but this, I believe, is the most objectionable to them. It goes without saying, however, that it is a very good thing for the public, and the railways appreciate it, for they do not want strikes to occur; but if the railways must submit to arbitration and abide by its consequences and increase wages when they cannot afford to do it and when employees are not entitled to it, the increase, if any, should be given to the employees and forced upon the railways by the same tribunal that has the same authority to increase their revenue, i.e., the Interstate Commerce Commission, under whose jurisdiction, in my opinion, the practical operation of this law should be left. I do not think that a special tribunal, independent of the body responsible for regulating rates, should be given the power to increase wages. It should be done by the Interstate Commerce Commission as a part of its duties, with the assistance, of course, of the United States commissioner of labor. The law will never be acceptable to both sides unless the government officials have charge of its operation. In other words, the plan of having it operated by the chairman of the Interstate Commerce Commission and United States commissioner of labor is the proper way to have it handled."

Details of Award in Arbitration of Wages of Chicago Switchmen.

As was stated by the *Railway Age Gazette* in its issue of March 25, page 842, the board appointed under the Erdman Act to arbitrate the differences between certain Chicago railways and their switchmen belonging to the Switchmen's Union of America resulted in an award by the majority of the board, giving the employees an increase of wages of three cents an hour. This board was composed of S. E. Heberling, C. R. Gray and S. S. Gregory. The following are some of the findings of the majority:

"We find that since 1906 the cost of living in Chicago and the territory immediately adjacent thereto is considerably increased. It is impossible for us to measure this increase accurately, but we find that it has been, approximately, 25 per cent.

"We also find that with larger engines and cars, as compared with 1906, the relative efficiency of switchmen has increased, and each man handles larger tonnage. We are also inclined to the opinion that the individual efficiency or expertness of switchmen is somewhat greater than in 1906.

"We find that there have been wage increases in many, if not most, other crafts and callings since 1906 in Chicago; that these increases have been considerable in some lines.

"We find that, on the whole, hazards of employment to the yardmen have not increased since 1906; that the tendency of improved equipment and methods now in use is to reduce the risks of such employment, although it still remains that switching is a highly hazardous occupation.

"While this subject is involved in some difficulty and obscurity, we find, as our best impression from the evidence, that the actual average monthly earnings of switchmen in the Chicago district, for those who work what is called full time, runs from about $85 to $100 per month. This would be, approximately, on the basis of 27 days' work in each month, at 10 hours a day. For short periods many switchmen can earn much more than this, working Sundays and very long hours per day.

"The evidence relating to the ability of the railways to meet an increase in their expenses has been supplemented somewhat by excerpts from the Manual of Statistics—1909. It is shown that late in 1902, and again in 1906, increases were granted the switchmen, and that immediately following increases were granted to the engineers, firemen, conductors and brakemen.

"Mr. Jackson (C. & E. I.), Mr. Moon (L. S. & M. S.) and Mr. Schoyer (Penn.) testified that from their experience an increase to the switchmen would reflect itself throughout the other transportation department employees.

"We find from the evidence and the Manual of Statistics that the Lake Shore & Michigan Southern, the Michigan Central, the Chicago, Rock Island & Pacific, the Chicago & Eastern Illinois and the Wisconsin Central are dividend-paying properties (the latter having paid one dividend in its existence). The Chicago Terminal Transfer, the Chicago Great Western and the Pere Marquette have not earned the interest upon their bonded indebtedness for the past three years.

"The board is clearly of the opinion that it is unfair to consider wholly the effect an increase in wages might have upon that road which is least able to bear it, and by the same token could not consider the situation from the standpoint solely of the most prosperous roads. All of this showing is persuasive, and the board in its finding has endeavored to adapt itself to the average of the lines, rather than upon either extreme.

"We are of the opinion, however, that the interests of those holding the stocks and securities of all of these companies require the continued operation of these lines.

"This being so, we are also of opinion that these companies

must be regarded as able to pay operating cost, including, of course, just and reasonable wages to the class of employees parties to this arbitration.

"We find also that the cost of equipment and railway supplies to the railways concerned in this arbitration has considerably increased since 1906.

"We overrule the suggestion made for the roads that this must be considered as separate arbitration between each of the roads concerned and its switchmen, or that the pecuniary ability or financial situation of each road must be considered separately and this treated as an arbitration severally with each road. We do not find that it is improper to consider the pecuniary circumstances of each railway, but we do find that under the agreement this is a joint arbitration to which there are virtually two parties and that it must be treated accordingly.

"We also overrule the suggestion made for the railways that for this board to make an award against a road not earning its operating expenses would be to deprive such road of property without due process of law. We rule, on this proposition that upon the principle *volenti fit non injuria*, our authority being derived from the agreement of the parties, this must be deemed a voluntary concession on the part of the railway."

DISSENTING OPINION.

Mr. Gray in his dissenting opinion says:

"It is apparent from the award of the majority that the increased cost of living has been regarded as fundamental, regardless of the fact that not one of the witnesses introduced by the proponent would admit this to be true.

"The increased efficiency per man is also regarded as fundamental, although the evidence was not specific in this respect and it is necessary to disregard the exhibit introduced by the proponent, consisting of a graphic chart taken from the reports of the Interstate Commerce Commission and which shows that the tonnage efficiency per trainman (including switchmen) has increased in an eight-year period something like 2 per cent., while the wages of switchmen have been increased during the same period 23.9 per cent.

"I regret exceedingly that I feel compelled conscientiously to dissent, and I base my opinion solely upon the fundamental principle that until a greater income can be insured to at least three of the parties involved in this controversy an increase in wages cannot be granted without inflicting irreparable injury.

"It was shown in the evidence that the income of the railways per passenger mile and per ton-mile are constantly decreasing; that the individual states have, by statute, reduced the passenger rate 33⅓ per cent.; that state commissions and the Interstate Commerce Commission are and have been constantly engaged in making reductions in rates which are far-reaching in their immediate application, and even more so in their ultimate results.

"I feel also that the tonnage efficiency is an imperfect fundamental, because it varies day by day according to the flow of business and the change in the unit (car or engine) employed. It is also unstable as a theory because the employees themselves do not recognize it as between yards or as between crews. They would not admit it to be a fundamental upon which a reduction in wages should be allowed, if from any cause the average tonnage per man should be reduced. It is further unstable because its application serves to directly withdraw from the railway any opportunity through the payment of vast sums of money in the purchase of heavier engines and heavier cars to recoup themselves for wage increases already granted.

"I appreciate that the laborer is worthy of his hire, but I cannot admit that to do justice to the one we must disregard those fundamental principles which we know, and have been shown through evidence to arbitrarily control an employer's income."

Brotherhoods' Meeting at Worcester.

At Worcester, Mass., on Sunday last there was a national joint meeting of the Order of Railway Conductors, the Brotherhood of Locomotive Engineers, the Brotherhood of Locomotive Firemen and Enginemen and Brotherhood of Railroad Trainmen. Speeches were made by President William H. Taft, Governor Eben S. Draper, President William C. Brown, of the New York Central; President Charles S. Mellen, of the New Haven; President Lucius Tuttle, of the Boston & Maine, and Edgar E. Clark, Interstate Commerce Commissioner; also by the brotherhood leaders: A. B. Garretson, of the Order of Railway Conductors; P. H. Morrissey, of the American Railway Employees' and Investors' Association; W. S. Carter, of the Brotherhood of Locomotive Firemen and Enginemen; W. G. Lee, of the Brotherhood of Railroad Trainmen, and Warren S. Stone, of the Brotherhood of Locomotive Engineers.

Among other things, President Taft said: "I believe in labor organizations, and if I were skilled enough to become a member I should apply for membership. But in spite of my sympathy with organized labor, I put above them, above everything, the right of every man to labor as he will, to earn the wages that he will and, if he chooses, to stay out of labor organizations. Labor must organize to be on equality with its employers and the capital that the employers have. It is by such organization and by proper methods it can secure the wages to which it is entitled. I am trying to get through a bill amending the interstate commerce law; and one of the objections to my bill is that I consulted six railway presidents before I made my recommendation. * * * I consulted shippers; I consulted the Interstate Commerce Commission; I consulted everybody that had an interest. * * * I am not afraid to consult railway authorities in determining whether a law ought to be put on the statute books. I am not bound to follow what they recommend, but am bound to give them a hearing.

"* * * The employers' liability act for interstate commerce employees has now been amended in such a way as to leave to the jury the question as to how far the man's fault entered into the accident, and leave to it the amount that ought to be deducted by reason of the negligence. That is hard on railways. It is harder on railways than the old rule of law was, but it means that the loss is to go in the expense of the railway and ultimately if the rates are properly fixed it has to come from the public; in other words, that in the case of those whose lives are exposed in perilous employment like this for the benefit of the public, the people may well divide that loss among them."

American Society of Civil Engineers.

At the meeting held on April 6 the following papers were presented for discussion, and illustrated with lantern slides: The New York Tunnel Extension of the Pennsylvania Railroad, The Terminal Station West, by B. F. Cresson, Jr., M. Am. Soc. C. E., and The New York Tunnel Extension of the Pennsylvania Railroad, The Bergen Hill Tunnels, by F. Lavis, M. Am. Soc. C. E.

International Railway General Foremen's Association.

The annual convention will be held at the Grand Hotel, Cincinnati, Ohio, May 3-7. Papers on the following subjects will be read and discussed: "The Best Method of Cleaning Ash Pans to Conform to the Interstate Commerce Law"; "The Use of Commercial Gas as Fuel"; "The Advisability of Installing Hot Water Washout and Filling Systems"; "The Use of Oxy-Acetylene Process of Welding Fireboxes, Boiler Sheets, Frames and other Locomotive Work"; "Wide Firebox"; "Superheaters"; "Location of the Point of Water Delivery."

New York Railroad Club.

At the regular meeting to be held on April 15, a paper entitled Stresses Developed by Collisions of Freight Cars will be presented by Colonel B. W. Dunn, chief inspector of the Bureau for Safe Transportation of Explosives.

Canadian Society of Civil Engineers.

At the meeting of the general section, held on April 7, a paper, entitled, "The Fort William Water Supply," by H. S. Hancock, Jr., A. M. Can. Soc. C. E., was given by R. S. Lea.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 7, 1910; Niagara Falls, Ont.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal
Car Foreman's Association of Chicago.—Second Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
General Superintendents' Assoc. of Chicago.—Third Wednesday in month; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Association of Special Agents and Police of U. S. and Canada. May 10-13; Los Angeles, Cal.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
Railway Telegraph and Telephone Appliance Ass'n.—H. M. Buck, Secy.-Treas., 30 Church street, New York.
Richmond Railroad Club.—Second Monday in month; Richmond, Va.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
Short Line R. R. Association.—First Monday in month; New York.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Nyquist, 1134 La Salle St. Station, Chicago
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

A press despatch from Montreal says that the Grand Trunk will make reductions in the rates on export grain to meet those recently made by the New York Central from Buffalo to Boston.

The Western Trunk Line Committee has decided to withdraw its notice that shippers will in future be required to pay for copies of tariffs mailed to them. It is probable that the Southwestern Freight Tariff Committee will take similar action.

Atlanta is the last city at which the merchants have protested against the adoption of the National Car Demurrage rules. It is quite plain that merchants do not like to pay for the use of freight cars as storehouses, if they can get such use without paying for it.

On Sunday, the third of April, 17 special trains, carrying 6,000 immigrants, passed through Montreal from Halifax and St. John bound for western Canada. Very large numbers of immigrants are coming into western Canada from the central part of the United States.

At Philadelphia, March 29, the Bethlehem Steel Company was indicted by the grand jury, in the Federal court, for receiving from the Lehigh Valley and the Philadelphia & Reading unlawful concessions on demurrage charges. The grand jury had already indicted the railway companies for these offenses.

The Duluth Traffic Committee has a stack of postal cards, said to be large enough to fill a library, showing the date of arrival at destination of innumerable shipments of freight made by the wholesalers of that city, who claim that the railways are not giving Duluth fair treatment, as compared with their treatment of other cities. The information on these cards is to be tabulated.

On April 1 the American Express Company succeeded the Pacific Express Company in handling express matter on the lines of the Union Pacific Railroad and the Oregon Railroad & Navigation Company. On May 1 it will take over the express business of some others of the subsidiary lines of the Union Pacific, and on September 1 it will take over the express business of the San Pedro, Los Angeles & Salt Lake and the Las Vegas & Tonopah.

The Southwestern Tariff Committee has directed its chairman to ask the traffic officers of the Mexican lines for a conference at the time of the regular meeting of the committee in New York in May. The Mexican railways are making an effort to divert the bulk of the traffic between their country and the United States to routes by way of their southern ports, Tampico and Vera Cruz, in order that they may get longer hauls and more favorable divisions of the through rates.

Steps are being taken by the railways of the country toward the adoption of uniform practice in the making of special rates for conventions, etc. A conference on this subject will be held in New York early in May. The following committee has been appointed to represent the Western Passenger Association lines: (W. B. Kniskern (C. & N. W.); L. M. Allen (C., R. I. & P.); A. L. Craig (C. G. W.); W. J. Black (A., T. & S. F.), and E. E. McLeod, chairman of the Western Passenger Association.

Grain dealers in Philadelphia say that the railways have agreed to give them 24 hours' free time for reconsigning carloads of grain from the West. It appears that on much of the grain bought by these merchants the destination is changed at Buffalo, Altoona or some other point on the road, and that they have to pay $2 a car on every car stopped for that purpose, even if the stop be for only an hour. But they have been importuning the railways for over a year and now have got the concession noted, which some of the grain men say will save them $200,000 a year. To the man in the street this statement naturally suggests the query why the telegraphic orders for change in destination could not be sent a little earlier and thus avoid this costly delay. The sum named

represents presumably 100,000 cars standing idle 100,000 days.

The presidents of the Wabash, the Chicago & Alton, the Illinois Central, the Burlington, the Big Four, the Missouri Pacific, the St. Louis, Iron Mountain & Southern, the Vandalia, the Southern and the Missouri, Kansas & Texas have signified to Mayor Kreismann, of St. Louis, their willingness to confer with the joint committee of the municipal assembly regarding the assembly's demand that all bridge arbitraries across the Mississippi River to and from St. Louis shall be abolished. Four railways which belong to the Terminal Railroad Association have yet to be heard from. These are the Baltimore & Ohio, the St. Louis & San Francisco, the Rock Island and the Louisville & Nashville. April 20 has been fixed tentatively as the date for the conference.

The rates on export grain from Buffalo to Boston for the coming season of late navigation (beginning May 1), as announced by the New York Central, are as shown in the table below, the rates in the first column being those which were in effect last year. This very considerable reduction has been made to meet the demands of the shippers that the railway co-operate with them in meeting the severe competition of the lines through Montreal.

	Per bushel.	
	Old rates.	Effective May 1, 1910.
Wheat	5½	4
Corn	4¾	3¾
Rye	5½	3¾
Barley	4¾	3½
Oats	3.7	3

Pacific Coast Lumber Trade.

San Pedro, a name almost unknown east of the Mississippi, is to-day one of the biggest lumber-receiving ports of the country. The gazetteers of eight years ago described San Pedro in four lines "a bay and inlet of the Pacific ocean, in California, 105 miles southeast of Santa Barbara." That was all. To-day it is the ocean port for the great commercial activity that centers about Los Angeles. It received last year over 500 million board feet of lumber; redwood, fir and yellow pine, brought in by coast vessels from the forests of the Northwest. The arrivals of redwood, pine and fir at all the ports of San Francisco bay totaled 900 million feet. The fruit-growing section of southern California consumes much lumber, most of which is cut a full thousand miles to the north, and Washington, Idaho and Oregon lumber is also distributed by rail from southern California to many inland points.

Proposed Advances in Freight Rates in the West.

The rate clerks of western railways are checking over the tariffs with a view to finding on what commodities advances in rates may most satisfactorily be made. The roads already have advanced most of their rates on dressed beef. They have announced advances in the rates on coal from the Illinois and other fields. The new coal tariffs, however, have not been filed, as the railways have acceded to the request of shippers for conferences before putting them in effect. One conference was held in Chicago on March 31. Another was held on April 6. It was originally intended to put the higher rates into effect on April 1. The plan now is to file the tariffs about April 12, making them go into effect on May 15.

It is proposed to advance the rates on the better grades of brick. The same rates are not made in western territory on ordinary brick as on kinds of greater value. Other commodities on which advances in rates are being considered are cement, drain pipe and tile, sewer pipe, iron and steel articles and agricultural implements.

The rate on cattle from the Missouri river to St. Louis will be advanced from 14¾ cents to 17 cents per 100 pounds, and on hogs from 17½ cents to 18½ cents. The present rate on both cattle and hogs from the Missouri river to Chicago is 23½ cents. As the rates from Chicago to New York are 5 cents less on both cattle and hogs than from St. Louis, the advance from the Missouri river to St. Louis equalizes the rates on hogs from the Missouri river via Chicago and via St. Louis to the east, and comes within 1½ cents of equalizing the rates on cattle. These advances in the rates on cattle and hogs from the Missouri river to St. Louis were made largely as a result of protests from Chicago live stock men that they were being discriminated against as compared with live stock dealers at St. Louis.

It is not probable that the class rates in western territory will be materially changed, as many of them are fixed by orders of the Interstate Commerce Commission or by maximum rates fixed by the Illinois, the Missouri, the Iowa and other state commissions.

INTERSTATE COMMERCE COMMISSION.

Informal Rulings Made in Conference.

The commission will not recognize, as a basis for reparation, any rate that is not on file with it.

A carrier cannot lawfully transport free of charge and deliver to a connection the household goods of an employee who has left its service to accept a position with another carrier.

Tariffs authorizing allowances for grain doors do not conform with Rule 78 of Bulletin No. 4 unless they state both the maximum allowance per car and the maximum allowance per grain door.

The destruction of canceled tariffs that have been posted at the stations of a carrier is not regarded by the commission as an offense under section 20 of the act so long as a copy of the same tariff is preserved by the carrier in its general files.

The purpose of the rule requiring the domestic carriers to publish their divisions of rates to and from Mexico is to give to this commission definite information as to their lawful earnings and was not intended as a means of exercising any jurisdiction over carriers in Mexico.

With respect to shipments that move on and after March 1, 1910, it will be the policy of the commission not to authorize the waiver of any uncollected undercharge that is not brought to the attention of the commission within 30 days after the date of the delivery of the shipment.

When a shipment leaves a point of origin in a single car and for the convenience of the carriers is transferred in transit into two cars and is subsequently detained by consignee at destination beyond the free time, demurrage should be assessed as for one car only, so long as either car is detained.

Interstate carriers would not be in violation either of section 1 or section 22, in according free transportation to a car occupied by the American National Red Cross Society and its attendants when traveling for the purpose of giving courses of instruction looking to the prevention of accidents in mines and factories and on railways, the car being used also for displaying approved safety appliances.

On a movement from a domestic point to a destination in Canada charges were assessed at a combination of rates both factors of which were on file with this commission but which made higher than another combination over the same route one factor of which was on file with the Canadian commission but not with this commission. Held, that the commission cannot award reparation on the latter combination.

A shipment having been accepted by the consignee at destination and removed to his place of business was subsequently returned to the delivering carrier, the outbound charges were refunded and included in the return waybill as advance charges. On delivery of the returned shipment to the original consignor the return charges as well as such advance charges were demanded and collected. Held, that the published rate for the return movement was the only charge that carrier could exact from the original consignor.

If when a concurrence is revoked the carrier that publishes the tariff neglects to make changes therein, shippers are entitled to have shipments moved as provided in the tariff, and the carrier that so neglects to correct its tariff

will be held responsible to other carriers for the difference in charges under the tariff as it is and as it would be if it had been corrected. If the tariff is published by a joint agent, the provisions herein will apply to each of his principals, as traffic is tendered to them as initial carriers.

A carrier for 25 years has operated a commissary car making two trips monthly with a staple line of meats, groceries and a restricted stock of shoes, overalls and other wearing apparel. The sales are limited to employees of the company and their immediate families and are not made for cash but on tickets signed by the company foreman showing the amount of wages due the holder. The purchases are limited to two-thirds of this amount. Held, that the practice is illegal and the operation of such a car is in violation of the commodity clause.

Where two or more carriers publish a joint through rate they must publish in connection therewith one carload minimum weight for the through movement under that rate. This ruling is not to be understood, however, as condemning the publication in joint tariffs and the use of through rates made up in combination on a specific base point and providing one minimum weight in connection with the specified portion of the rate up to the base point and a different minimum weight in connection with the specified portion of the rate beyond the base point.

A shipment had moved 150 miles from the point of origin before the consignor discovered that an error had been made in filling the consignee's order. On inquiry by telephone he was informed by the carrier's clerk that the car could be returned without extra charge, and thereupon the consignor requested its return for a correction of the loading. A part of the carload was exchanged, the shipment was again billed out and moved to destination. Held, that the commission cannot relieve the carrier from the obligation of collecting the published rates for all the movements actually made.

A carrier may issue a tariff publication under I. C. C. number containing an official list of its stations and showing distances, prepay stations, billing instructions to points not on the line of road, etc. If such publication contains no rates and no rules or regulations that of themselves or in connection with a tariff which refers to this publication affect the charges on any shipment, supplements to and reissues of it may be made effective on one day's notice to the public and to the commission. Each such supplement or reissue must bear on its title page notation: "Issued under authority of rule 10, tariff circular 17-A."

A shipment originating on one line and not routed by the shipper reached a junction point with another line where a joint agent was maintained. Instead of delivering the shipment to the other line at that point the joint agent permitted it to go forward on the originating line to another junction point with the second line, over which route the charges were substantially higher than if the second line had taken the shipment at its first junction with the originating carrier. Held, that although the agent was a joint agent, he was, with respect to this shipment acting as agent for the originating carrier and the cost of his error should be borne by that line alone.

While it has been the practice of the commission when examining the accounts of carriers to give notice in advance, this is done for the convenience of the commission and of the carriers and is not a requirement imposed upon the commission by the law. The credentials of an examiner are all that is necessary to entitle him to full access to the carrier's records, whether at its general offices or at a station, and the refusal to give access on the presentation of such credentials is in violation of the law. The commission, except in special cases, will continue to give previous notice of any such examination in writing, unless the refusal of the carriers to honor the credentials of examiners when presented without such notice shall make it necessary to withdraw the practice.

STATE COMMISSIONS.

The State Railroad Commission of Ohio has renewed its order permitting railways to suspend the demurrage tariff on carloads of fine coal. This concession in favor of this grade of coal has been in force nearly two years.

Ohio: Rate on Coal Reduced.

The Pittsburgh Vein Operators' Association of Ohio v. Wheeling & Lake Erie et al. Opinion by Commissioner Gothlin.

The complaint challenges the rate of 90 cents per ton f.o.b. vessel on coal, carloads, from mines in the No. 8 district of Ohio, to the village of Huron and the city of Cleveland, Ohio. The commission finds that the rate of 90 cents is excessive and that for the future 70 cents shall be substituted therefor.

Ohio: Loading Milk Cars.

The West Jefferson Creamery Co. v. Baltimore & Ohio Railroad. Opinion by Chairman Hughes.

Complaint is made that rates of the defendant are unreasonable and service inadequate in that defendant's tariff of rates on milk contains a rule that the shipper must load the milk into the car if required. Complaint is also made that defendant fails and refuses to publish and file rates on milk to Columbus, Ohio, from stations more than 75 miles distant, although receiving milk at such stations for other points within 75 miles.

The commission holds that loading and unloading less than carload freight must be considered as an incident of transportation, and that defendant's rule is unreasonable.

Where there is a regular station for receipt of freight, such freight must be received and transported to any other station on such line and connecting lines, regardless of distance.

COURT NEWS.

In the United States district court at Cincinnati, March 30, Judge Hollister, in cases against the Baltimore & Ohio Southwestern for violating the law forbidding shipment of unhealthy sheep, sustained the road in its contention that the words "received for shipment" meant the initial reception and not the receiving at the hands of another railway, as in the present case.

The Supreme Court of the United States will give a rehearing on the Baltimore & Ohio Southwestern suit involving the question as to whether the penalty for violation of the 28-hour law for the shipment of livestock shall be asssessed on the separate shipment, as urged by the government, or on the trainload as a unit, as contended by the road. By a vote of 4 to 4 the court affirmed the judgment of the lower court, which decided in favor of the government.

Holding that the action of the state of Arkansas in requiring railways to furnish cars for intrastate shipments within five days from the time they were ordered is a burden on interstate commerce, the Supreme Court has reversed the Supreme Court of Arkansas. The Supreme Court of Arkansas discussed the fact that the St. Louis Southwestern, in the case before the court, was unable to furnish more cars for local traffic because of the requirements of the American Railway Association applicable to cars going out of Arkansas. The Arkansas court said "it might be better for the appellant to suffer these ills than to sail under a black flag and refuse to send its cars beyond its line."

The Supreme Court of the United States has declared unconstitutional the law of Nebraska requiring railways to build tracks to all grain elevators along their lines on request. In announcing the opinion of the court in the Nebraska case, Justice Holmes said that, although the state possessed certain police powers, and that railways must fulfil the purposes for which their charters were granted, yet, he added, "railways, like other owners of property, have rights that are protected by the Constitution." He held that their property could not be taken without compensation, as this law proposed to do. The decision does not prejudice cases arising under the law as amended recently.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,458	$4,519,189	$1,646,983	$6,643,192	$1,026,214	$1,057,318	$151,167	$2,162,087	$154,962	$4,551,748	$2,091,444	.....	$273,816	$1,817,628	—$324,488
Atlantic Coast Line	4,482	1,872,160	664,261	2,709,603	324,680	323,269	45,880	783,970	102,393	1,580,192	1,129,411	.....	95,500	1,033,911	143,963
Bangor & Aroostook	546	217,641	35,130	264,895	37,822	26,168	3,050	73,786	10,074	150,900	113,995	.....	1,500	112,495	22,241
Boston & Maine	2,242	1,849,119	871,279	2,943,840	276,306	450,090	35,637	1,520,842	79,765	2,362,640	581,200	$1,014	181,766	400,448	—129,587
Buffalo, Rochester & Pittsburgh	567	581,664	58,902	655,633	43,974	137,664	9,781	203,863	12,703	407,985	247,648	63	15,000	232,711	121,280
Central of Georgia	1,916	721,547	206,597	1,018,174	152,094	167,433	30,135	316,403	35,560	701,625	316,549	4,397	48,300	272,646	19,235
Chesapeake & Ohio	1,939	1,974,322	320,949	2,387,680	202,395	489,031	43,174	764,434	52,334	1,551,368	836,312	- 2,661	80,500	753,151	208,698
Chicago & Eastern Illinois	966	825,698	137,148	1,009,119	99,252	200,483	24,898	403,227	31,867	759,727	249,392	—1,349	29,900	218,143	—7,462
Chicago & North Western	7,638	3,655,803	1,165,887	5,315,727	382,279	765,557	102,967	2,493,645	108,620	3,853,068	1,462,659	—8,058	228,000	1,226,601	171,387
Chicago, Burlington & Quincy	9,021	4,821,038	1,423,672	6,890,600	659,706	1,237,823	126,671	2,454,492	185,633	4,664,326	2,226,274	—17,146	215,571	1,993,557	289,547
Chicago Great Western R.R.	1,486*	720,016	165,520	945,080	135,014	103,899	42,981	479,940	37,916	799,750	154,330	—3,853	26,543	123,934	.....
Chicago, Rock Island & Pacific	7,393	3,082,889	1,198,359	4,585,746	731,056	642,045	147,876	2,047,326	143,559	3,711,862	873,884	—7,194	236,550	630,140	—237,935
Chic., St. Paul, Minn. & Omaha	1,739	776,585	281,886	1,133,085	71,365	145,362	22,562	504,101	27,710	771,100	361,985	—153	55,358	306,474	110,577
Cincinnati, Hamilton & Dayton	1,036	465,218	103,211	634,343	67,380	128,665	22,413	290,549	19,406	528,413	105,930	....	26,899	79,031	69,471
Colorado & Southern	1,248	655,456	90,862	784,583	81,525	125,820	12,924	265,305	24,657	510,231	274,352	—1,709	21,925	250,718	84,296
Delaware, Lackawanna & Western	930†	1,958,908	434,212	2,556,961	169,689	412,738	57,084	783,234	54,292	1,477,037	1,079,924	18,847	118,650	980,121	212,125
El Paso & Southwestern Co.	867	439,493	92,413	562,973	93,109	90,660	9,573	156,559	22,147	372,048	190,925	—656	18,993	171,276	—78,253
Erie	1,961‡	2,543,887	533,671	3,362,431	323,366	616,959	95,398	1,292,862	72,391	2,400,076	962,355	—53,778	108,930	799,647	—103,198
Great Northern	7,129₴	2,800,759	808,807	3,873,315	612,463	603,739	76,613	1,431,978	77,866	2,802,659	1,070,656	—2,382	286,902	781,372	10,395
Gulf, Colorado & Santa Fe	1,518	573,771	194,740	844,384	223,410	152,585	25,713	390,435	32,648	824,791	19,593	.....	35,758	—16,165	—260,437
Kansas City Southern	827	599,141	97,890	780,470	77,153	89,412	25,180	295,745	31,230	518,720	261,750	.....	29,164	232,586	—9,842
Lehigh Valley	1,441	2,113,736	244,804	2,443,285	266,289	402,905	64,116	864,527	57,304	1,655,141	788,144	-22,479	94,600	671,065	211,845
Louisville & Nashville	4,599§	3,058,513	805,510	4,115,839	734,054	686,682	93,453	1,347,964	100,346	2,962,499	1,153,340	33,237	125,580	1,060,997	71,256
Maine Central	932	443,515	147,527	627,894	77,254	106,386	5,824	246,618	19,349	455,431	172,463	1,289	35,993	137,759	6,476
Missouri, Kansas & Texas	3,072	1,207,034	569,751	1,921,341	328,339	234,947	55,632	868,486	79,059	1,566,463	354,878	—4,810	98,575	251,493	—74,362
Mobile & Ohio	1,114	593,727	91,440	810,560	100,813	145,812	30,039	287,980	34,852	599,496	211,064	—2,164	22,564	186,336	—51,655
New York, New Haven & Hartford	2,045	2,175,306	1,653,798	4,238,942	432,327	486,860	21,674	1,825,165	135,833	2,901,860	1,337,082	61,178	350,000	1,048,260	41,755
Norfolk & Western	1,941	2,303,864	249,945	2,657,233	258,583	476,916	47,081	825,168	57,391	1,665,139	992,094	-1,810	92,800	897,484	180,132
Pennsylvania R. R.	3,947	9,236,557	2,167,388	12,149,287	1,554,650	2,582,485	154,186	4,575,382	314,067	9,180,770	2,968,517	163,172	197,526	2,607,819	829,708
Pennsylvania Co.	1,416	2,953,562	487,090	3,767,355	629,493	712,000	80,426	1,387,700	74,426	2,884,045	883,310	—5,106	145,226	732,978	356,464
Pere Marquette	2,331	867,544	211,955	1,161,369	132,517	157,626	38,026	552,265	30,477	910,911	250,458	3,415	69,060	184,813	60,323
Philadelphia, Baltimore & Washington	717	605,397	541,362	1,280,644	234,161	253,294	30,056	564,796	31,774	1,114,081	166,563	.....	35,772	130,791	—7,900
Pitts., Cincinnati, Chicago & St. Louis	1,468	2,263,369	487,433	3,093,952	455,736	588,965	77,256	1,148,864	57,105	2,327,926	766,026	—876	112,939	652,211	147,950
Southern Ry.	7,050	3,042,690	998,727	4,417,369	508,180	772,336	120,596	1,558,297	145,618	3,105,027	1,312,342	—2,917	170,100	1,139,325	228
Union Pacific	3,411¶	2,633,327	712,102	3,690,131	272,555	518,152	88,224	1,107,457	85,400	2,071,789	1,618,342	19,083	123,250	1,476,009	343,304
Vandalia	827	502,747	144,088	736,499	93,616	155,428	24,127	304,720	18,465	596,355	140,144	.....	25,199	114,944	—10,153
EIGHT MONTHS OF FISCAL YEAR 1910.															
Atchison, Topeka & Santa Fe	7,458	38,375,570	13,771,533	56,566,845	9,325,603	8,605,090	1,134,708	16,239,950	1,219,865	36,525,216	20,041,629	.....	2,132,874	17,908,755	—411,055
Atlantic Coast Line	4,482	13,415,595	4,453,838	19,249,961	2,623,819	2,751,452	327,592	5,863,220	542,609	12,108,692	7,141,269	.....	758,500	6,382,769	1,293,815
Bangor & Aroostook	546	1,378,774	439,808	1,916,941	295,873	222,746	22,834	537,256	83,387	1,162,096	754,845	.....	12,000	742,845	113,723
Boston & Maine	2,242	16,848,998	9,971,269	28,919,509	3,525,022	3,502,125	332,056	12,408,388	645,121	20,412,712	8,506,797	54,053	1,398,644	7,162,206	772,437
Buffalo, Rochester & Pittsburgh	567	5,077,520	665,375	6,016,268	626,310	1,236,418	73,329	1,645,706	104,797	3,686,560	2,329,708	702	106,000	2,224,410	955,457
Central of Georgia	1,916	5,497,107	2,073,157	8,288,960	1,164,982	1,267,700	239,953	2,432,712	317,304	5,422,651	2,866,309	47,423	386,557	2,527,175	359,646
Chesapeake & Ohio	1,939	16,445,241	3,327,986	20,584,247	2,109,789	3,886,605	352,096	5,553,395	388,698	12,290,583	8,293,664	8,462	553,000	7,732,202	1,654,022
Chicago & Eastern Illinois	966	6,422,185	1,246,956	8,069,508	753,013	1,500,039	178,078	2,740,791	259,523	5,431,444	2,638,064	—11,045	242,524	2,384,495	493,071
Chicago & North Western	7,638	32,983,322	12,524,581	49,453,944	7,461,229	6,298,702	937,149	19,478,356	823,918	34,999,354	14,454,590	—35,732	1,824,000	12,594,858	—1,804,979
Chicago, Burlington & Quincy	9,021	39,134,208	15,256,890	59,237,020	9,920,185	10,359,066	1,125,992	18,524,495	1,447,479	41,387,217	17,849,803	—119,712	1,724,688	16,005,402	—423,204
Chicago Great Western R.R.	1,486*	4,189,719	1,259,271	5,880,519	664,137	684,246	246,403	2,578,852	203,095	4,376,733	1,503,786	10,354	162,362	1,331,070	.....
Chicago, Rock Island & Pacific	7,393	26,832,234	12,689,527	41,996,898	6,798,093	5,419,038	1,039,014	15,544,503	1,141,465	29,942,113	12,054,785	104,045	1,696,727	10,254,013	336,685
Chic., St. Paul, Minn. & Omaha	1,739	6,369,344	2,977,227	10,049,513	1,236,163	1,167,414	191,029	3,747,690	222,466	6,564,762	3,484,751	-327	428,763	3,055,661	116,668
Cincinnati, Hamilton & Dayton	1,036	4,474,156	1,160,647	6,299,866	811,974	1,080,065	174,147	2,496,396	209,499	4,772,081	1,527,785	.....	208,788	1,318,997	467,098
Colorado & Southern	1,248	5,081,693	1,131,983	6,541,672	832,075	1,031,162	111,502	2,066,235	169,743	4,210,717	2,330,955	—4,075	173,300	2,153,580	296,235
Delaware, Lackawanna & Western	930†	17,740,454	4,683,181	23,874,126	2,009,230	3,190,548	424,960	6,449,902	453,607	12,528,248	11,345,878	207,567	1,041,400	10,512,045	1,090,280
El Paso & Southwestern Co.	867	3,818,750	696,438	4,736,992	675,435	634,149	82,619	1,290,143	180,751	2,863,097	1,873,895	7,070	162,531	1,704,293	78,348
Erie	1,961‡	22,946,144	5,799,452	31,051,523	3,484,343	5,531,124	721,801	10,176,220	636,249	20,549,737	10,501,786	168,299	848,926	9,484,561	1,361,047
Great Northern	7,129₴	31,013,323	9,547,662	42,834,666	6,423,703	4,881,798	593,061	11,828,283	656,942	24,383,787	18,450,879	240,073	2,401,404	16,289,548	2,990,229
Gulf, Colorado & Santa Fe	1,518	5,751,427	2,036,994	8,311,193	1,668,607	1,253,169	192,661	3,105,605	243,550	6,463,592	1,847,601	.....	276,475	1,571,126	—1,004,096
Kansas City Southern	827	4,600,941	938,634	6,166,389	685,557	799,570	205,856	2,102,493	240,258	4,033,734	2,132,655	.....	210,908	1,921,747	—96,738
Lehigh Valley	1,441	19,663,235	2,879,520	23,381,148	2,449,437	3,873,260	590,100	6,964,839	472,474	14,350,110	9,031,038	-7,420	756,800	8,266,818	1,344,393
Louisville & Nashville	4,599§	25,177,665	7,207,781	34,486,458	4,340,248	5,404,581	725,816	10,346,747	690,559	21,507,951	12,978,507	—14,097	1,005,890	11,958,520	2,200,350
Maine Central	932	3,549,476	2,023,050	5,928,798	865,572	835,760	60,412	1,988,707	176,297	3,926,748	2,002,050	23,036	285,389	1,739,697	304,680
Missouri, Kansas & Texas	3,072	11,903,198	5,207,404	18,193,765	2,579,658	2,238,049	431,686	6,555,823	589,324	12,394,540	5,799,225	18,465	725,862	5,054,898	549,666
Mobile & Ohio	1,114	5,088,978	871,429	6,926,555	822,405	1,237,572	239,051	2,256,398	252,187	4,807,613	2,118,942	—19,330	177,666	1,921,946	—69,108
New York, New Haven & Hartford	2,045	19,591,251	16,657,342	39,823,940	4,337,955	4,370,712	202,643	15,095,430	1,003,557	25,010,297	14,813,643	884,759	2,665,000	13,093,402	3,441,104
Norfolk & Western	1,941	19,366,586	2,660,690	22,769,641	2,279,705	3,865,062	353,281	6,527,765	465,694	13,491,506	9,278,135	—10,419	689,600	8,578,116	1,678,176
Pennsylvania R. R.	3,947	78,879,169	20,756,907	106,469,379	12,890,591	19,612,715	1,343,509	35,274,886	2,455,354	71,577,055	34,892,324	812,239	1,580,209	32,499,876	6,894,801
Pennsylvania Co.	1,416	27,719,031	5,085,960	35,510,067	4,470,727	5,582,517	558,888	11,149,186	595,929	22,357,247	13,152,820	24,908	1,185,764	11,942,148	3,361,746
Pere Marquette	2,331	7,238,866	2,572,655	10,574,807	1,331,744	1,375,374	269,411	4,192,443	237,930	7,406,902	3,167,905	11,242	417,335	2,761,812	505,130
Philadelphia, Baltimore & Washington	717	5,855,923	4,715,238	11,755,304	1,696,122	2,019,739	192,303	4,601,184	250,079	8,759,427	2,995,877	.....	286,173	2,709,704	351,242
Pitts., Cincinnati, Chicago & St. Louis	1,468	18,430,769	5,065,213	26,315,478	3,545,727	4,435,452	544,263	8,616,310	474,203	17,615,955	8,699,523	—6,911	887,139	7,805,473	1,812,853
Southern Ry.	7,050	25,256,087	9,969,815	38,181,880	4,499,673	6,393,877	917,380	12,524,492	1,147,907	25,483,329	12,698,551	11,822	1,318,002	11,392,371	1,231,058
Union Pacific	3,411¶	25,360,165	7,462,447	35,784,513	3,303,659	3,747,862	901,077	8,618,950	768,902	17,340,450	18,444,063	23,221	1,051,526	17,369,315	1,679,583
Vandalia	827	4,374,675	1,501,674	6,562,630	921,460	1,150,398	192,316	2,358,372	149,552	4,772,098	1,790,532	.....	192,875	1,597,657	286,854

* Began operations on September 1, 1909. † Mileage operated on February 28, 1909, 893 miles. ‡ Mileage operated on February 28, 1909, 1,901 miles. § Mileage operated on February 28, 1909, 4,388 miles. ₴ Mileage operated on February 28, 1909, 6,937 miles. ¶ Mileage operated on February 28, 1909, 3,309 miles. — Indicates Deficits, Losses and Decreases.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. H. Wilson, superintendent of motive power of the Buffalo, Rochester & Pittsburgh at Du Bois, Pa., has been appointed assistant to the third vice-president of the Northern Pacific, with office at St. Paul, Minn.

F. C. Batchelder, the new vice-president and general manager of the Baltimore & Ohio Chicago Terminal Co., at Chicago, was born at Fall River, Wis., on May 27, 1857. He began railway work in 1874 as a telegraph operator and station agent on the Chicago, Milwaukee & St. Paul, filling various positions with that company and the Minneapolis, St. Paul & Sault Ste. Marie, until February, 1899, when he was made superintendent of the Soo. In July, 1899, he went to the Baltimore & Ohio as superintendent of the Chicago division, with office at Garrett, Ind., and was transferred on December 1, 1901, to Newark, Ohio, as superintendent of the Newark division. He returned to the Chicago division on April 1, 1905, as superintendent, with office at Chicago. In December, 1906, he succeeded C. C. F. Bent, now general manager of the Baltimore & Ohio Southwestern, as general superintendent of the main line of the B. & O. at Baltimore, Md., and on April 1, 1910, when the Baltimore & Ohio took over the operation of the Chicago Terminal Transfer Railway, under the name of the Baltimore & Ohio Chicago Terminal Co., Mr. Batchelder was elected vice-president and general manager of the new company. A re-arrangement of the operating organization of the Baltimore & Ohio lines west of Chicago Junction, Ohio, was made, with the creation of the Northwest system, which is also under the jurisdiction of Mr. Batchelder, as general superintendent.



F. C. Batchelder.

M. L. Bell, assistant general attorney of the Rock Island Lines at Chicago, has been appointed general attorney, with office at Chicago, succeeding E. C. Lindley, resigned to become general solicitor of the Great Northern, with office at St. Paul, Minn.

Newman Erb has been elected to the new position of chairman of the board of the Ann Arbor Railroad. H. H. Harrison has been elected vice-president and treasurer, succeeding B. J. Burke as vice-president, and G. Casper Niles as treasurer, and H. B. Blanchard succeeds Mr. Niles as secretary, all with offices at New York.

Operating Officers.

P. L. McManus has been appointed trainmaster on the Chicago & Alton, with office at Springfield, Ill., succeeding F. M. Corbett, transferred.

A. E. Kane has been appointed an assistant superintendent on the Salt Lake division of the Southern Pacific lines east of Sparks, with office at Sparks, Nev.

Thomas Brennan, assistant superintendent of the Chicago, Indiana & Southern at Gibson, Ind., has been transferred to Danville, Ill., as trainmaster, succeeding W. L. Connelly, promoted.

The following officers of the St. Louis Southwestern have been appointed assistant superintendents: F. S. Stimson, trainmaster at Illmo, Mo.; E. Richards, trainmaster at Pine Bluff, Ark.; C. S. Hutchins, trainmaster at Mt. Pleasant, Tex., and H. D. Earl, trainmaster at Tyler, Tex.

H. T. Coates, Jr., foreman of the Enola, Pa., shops of the Pennsylvania Railroad, has been promoted to a position on the staff of W. H. Myers, general manager, with office at Philadelphia.

W. E. Baily, trainmaster of the Lehigh & New England at Pen Argyl, Pa., will in future have jurisdiction over the entire road. The office of J. J. Kitchin, trainmaster at Sussex, N. J., has been abolished.

J. A. Logan has been appointed acting superintendent of transportation of the Missouri, Kansas & Texas, with office at Denison, Tex., succeeding T. S. McDowell, granted a leave of absence on account of ill health.

W. W. Brogan, trainmaster of the Gulf & Ship Island at Hattiesburg, Miss., has been appointed acting superintendent, succeeding George F. Gardner, general superintendent, deceased. Mr. Brogan will report to the second vice-president.

D. H. Lovell has resumed his duties as superintendent of the West Jersey & Sea Shore and general superintendent of the Philadelphia & Camden Ferry Co., with office at Camden, N. J., succeeding J. T. Wallis, temporarily filling these positions, who returns to the motive power department.

John J. Driscoll, superintendent of the Connellsville division of the Baltimore & Ohio, at Connellsville, Pa., has been transferred to the Cumberland division, succeeding F. E. Blaser, promoted. C. L. French, trainmaster of the Cumberland division at Cumberland, Md., succeeds Mr. Driscoll, with office at Connellsville.

O. J. Langston has been appointed an assistant superintendent of the Oregon Short Line at Kemmerer, Wyo., succeeding L. E. Halbert, assigned to other duties. Frank E. Eisenhard has been appointed an assistant superintendent, with office at Pocatello, Idaho, succeeding T. C. Collopy, granted leave of absence.

J. H. Stephens, chief despatcher of the Union Pacific at Omaha, Neb., has been appointed assistant superintendent, with office at Omaha, succeeding W. R. Cahill, promoted. C. C. Cornell, assistant superintendent at Grand Island, Neb., has been appointed assistant superintendent at Omaha, in charge of terminals. Frank D. Schermerhorn, supervisor of bridges and buildings at Omaha, Neb., succeeds Mr. Cornell, is under the charge of Professor Howard G. Brounson.

Frederick E. Blaser, who has been promoted from superintendent of the Cumberland division of the Baltimore & Ohio to general superintendent of the main line, with office at Baltimore, Md., was born at Tomah, Wis., and educated in the public schools at that place. Mr. Blaser began the study of telegraphy when he was nine years of age, and began railway work in April, 1871, as a waterboy in the construction department of the West Wisconsin Railroad, now a part of the Chicago, St. Paul, Minneapolis & Omaha. After completing the study of telegraphy he was consecutively operator and agent, freight brakeman and conductor, train despatcher, passenger conductor and trainmaster, until June, 1900, when he went to the Ohio River Railroad. The following month he was appointed superintendent of that road and remained in the same position when it was taken over by the Baltimore & Ohio system on August 1, 1901. He was transferred



F. E. Blaser.

to the Wheeling division as superintendent April 16, 1903, and the following February was transferred to the Cumberland division, which position he held at the time of his recent appointment.

A. H. Westfall, whose appointment as general superintendent of the Chicago & Alton and the Toledo, St. Louis & Western, with office at Bloomington, Ill., has been announced in these columns, was born June 14, 1862, at Milwaukee, Wis. He was educated in the public schools and at the German and English Academy at Milwaukee, and began railway work in 1880 as an agent and operator on the Chicago, Milwaukee & St. Paul. In 1884 he was made train despatcher, and three years later went with the Elgin, Joliet & Eastern as chief train despatcher. For four years from 1897 he was assistant superintendent of the Chicago, Lake Shore & Eastern, and he was then made general superintendent of that road and the E. J. & E. In 1906 he was appointed superintendent on the Atlanta division of the Southern Railway, and the next year was promoted to general superintendent on the Northern division, which position he resigned to accept his present appointment.



A. H. Westfall.

Traffic Officers.

R. F. Malone, assistant general passenger agent of the Chicago Great Western, with office at Chicago, has resigned.

G. A. Dobbin, industrial and colonization agent of the Gulf, Colorado & Santa Fe at Houston, Tex., has had his office transferred to Galveston, Tex.

G. W. Quackenbush, assistant general freight agent of the Chicago & Alton, with office at Springfield, Ill., has resigned to accept a position with the Illinois Traction Company.

A. J. Hirshman has been appointed a traveling freight agent of the Missouri, Kansas & Texas of Texas, with office at Fort Worth, Tex., succeeding D. Allen, resigned to accept service with the Morgan Steamship line.

G. M. Ellis, chief clerk in the office of the assistant general passenger agent of the Southern Railway at Chattanooga, Tenn., has been appointed division passenger agent at Knoxville, succeeding J. E. Shipley, resigned, effective April 15.

L. M. Foss, division freight agent of the Chicago Great Western at Red Wing, Minn., has been appointed division freight agent, with office at Fort Dodge, Iowa, succeeding C. B. Fiske, resigned to engage in other business. B. J. De Groodt, commercial agent at Des Moines, Iowa, succeeds Mr. Foss.

C. V. Manker, soliciting agent of the Southern Railway at St. Louis, Mo., has been transferred to East St. Louis, Ill. J. T. Powers succeeds Mr. Manker, with office at St. Louis, Mo. E. J. Burke has been appointed traveling tariff inspector of the St. Louis-Louisville lines, with office at Louisville, Ky., succeeding J. S. Rhamstine, deceased.

F. R. Dalzell has been appointed division freight agent of the Gulf, Colorado & Santa Fe, with office at Dallas, Tex., succeeding J. N. Griswold, resigned to accept service elsewhere. T. V. Murray, Jr., soliciting freight agent of the Missouri Pacific-Iron Mountain system at Dallas, has been appointed soliciting freight agent on the Santa Fe, succeeding T. C. Taylor, resigned to accept service elsewhere. Mr. Murray will report to the division freight agent.

T. O. Jennings, general agent in the freight department of the Chicago & Eastern Illinois at Chicago, has been appointed assistant general freight agent, with office at Chicago, succeeding E. J. Knickerbocker, resigned to engage in other business. B. H. Stanage, chief clerk in the freight department, has been appointed an assistant general freight agent in charge of claims, with office at Chicago. E. S. Stephens, freight claim agent at Chicago, succeeds Mr. Jennings.

James Young, contracting freight agent of the Great Northern at Chicago, has resigned to engage in other business. F. T. Lonergan, traveling freight agent at Chicago for the Indiana district, has been transferred to the Illinois district, with office at Chicago, succeeding George B. Ogden, transferred to Buffalo, N. Y. Robert C. Huston succeeds Mr. Lonergan in the Indiana district. R. W. Richards and Francis Frawley have been appointed contracting agents, with office at Chicago.

Thomas E. Watt, district passenger agent of the Pittsburgh district of the Pennsylvania Railroad at Pittsburgh, Pa., having reached the age limit, has been retired, after 49 years of continuous service in the employ of the Pennsylvania Railroad. Mr. Watt entered the service of the Pennsylvania on May 1, 1860, as a brakeman on passenger trains, and in 1864 was promoted to passenger conductor. He was made city ticket agent in 1872 at Pittsburgh, Pa., and five years later was appointed district passenger agent.

Walter Shelton Saunders, who has been appointed assistant general freight agent of the Virginian Railway, with office at Norfolk, Va., as announced in these columns, was born August 3, 1870, at Richmond, Va. He was educated in the public schools at Richmond and began railway work in 1888 with the Chesapeake & Ohio at Richmond. He was with that company as billing clerk in the freight office until March, 1900, when he went to Roanoke, in the general freight office of the Norfolk & Western. In May, 1896, he was made chief clerk of all rail despatch lines, operating over the Norfolk & Western under O. Howard Royer, manager, and in June, 1905, he became chief clerk to the assistant general freight agent of the Norfolk & Western. He went to the Virginian Railway in June, 1909, as chief clerk to the general freight agent at Norfolk, remaining in that position until his recent appointment as assistant general freight agent.

Engineering and Rolling Stock Officers.

Bernard Herman has been appointed principal assistant engineer of the Southern Railway, with office at Washington, D. C.

Robert Rice has been appointed roadmaster of the Kansas Southwestern, with office at Portland, Kan., succeeding Thomas Fleming, deceased.

James Duffy, a foreman on the Chicago Junction Railway, has been appointed roadmaster of the Chicago & Illinois Western, with office at Chicago.

W. L. Harrison, superintendent of motive power of the Northern district, Rock Island Lines, at Cedar Rapids, Iowa, has resigned to go into other business.

R. A. Pyne, district master mechanic of the Canadian Pacific at Nelson, B. C., has been appointed master mechanic, with office at Calgary, Alta., succeeding W. E. Woodhouse, promoted.

W. G. Himes, assistant engineer of the Lehigh & New England, at Bethlehem, Pa., has been appointed engineer maintenance-of-way, with office at Bethlehem, and his former position has been abolished.

F. J. Harrison, division master mechanic of the Buffalo, Rochester & Pittsburgh, has been appointed superintendent of motive power, with office at Du Bois, Pa., succeeding W. H. Wilson, resigned to go to another company.

W. J. Rusling, assistant master mechanic of the Pennsylvania Railroad, at Harrisburg, Pa., has been appointed foreman of the Enola, Pa., shops, succeeding H. T. Coates, Jr., promoted. H. G. Huber, assistant master mechanic at Phillipston, succeeds Mr. Rusling.

J. M. Borrowdale, assistant superintendent of the car department of the Illinois Central, has been appointed superintendent of the car department of that road, the Indianapolis

Southern and the Yazoo & Mississippi Valley. Robert W. Bell, superintendent of machinery; Mr. Borrowdale and Edward J. Jansen, who has been appointed electrical engineer, will report to the general superintendent of motive power.

J. T. Wallis, acting superintendent of the West Jersey & Sea Shore, and acting general superintendent of the Philadelphia & Camden Ferry Co., has resumed his duties as superintendent of motive power of the Erie division of the Pennsylvania Railroad and the Northern Central, with office at Williamsport, Pa.

F. W. Williams, superintendent of motive power of the Southern district of the Rock Island Lines at Fort Worth, Tex., has been transferred to the Northern district, with office at Cedar Rapids, Iowa, succeeding W. L. Harrison, resigned to engage in other business. C. M. Taylor, superintendent of motive power at Shawnee, Okla., has had his jurisdiction extended over the entire Southern district. T. W. McCarthy, master mechanic of the Arkansas division at Little Rock, Ark., has been appointed master mechanic of the Indiana Territory and the Pan Handle divisions, with office at Shawnee, Okla. C. A. McCarthy, master mechanic of the Louisiana division at Eldorado, Ark., succeeds T. W. McCarthy, with office at Argenta, Ark., and W. J. O'Neill, master mechanic at Fort Worth, Tex., succeeds C. A. McCarthy.

Morgan K. Barnum, general inspector of machinery and equipment of the Chicago, Burlington & Quincy, has been appointed general superintendent of motive power of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago. Mr. Barnum was born April 6, 1861. He graduated from Syracuse University in 1884 with the degree of A.B. and later received the degree of A.M. He began railway work the year he graduated as a special apprentice in the shops of the New York, Lake Erie & Western, now the Erie, at Susquehanna, Pa. He was then consecutively machinist and mechanical inspector and later general foreman of the same road at Salamanca, N. Y.; general foreman of the Louisville & Nashville shops at New Decatur, Ala.; assistant master mechanic of the Atchison, Topeka & Santa Fe at Argentine, Kan.; superintendent of shops at Cheyenne, Wyo.; district foreman at North Platte, Neb., and then division master mechanic at Omaha, Neb., on the Union Pacific; assistant mechanical superintendent on the Southern Railway. In February, 1903, he was made superintendent of motive power of the Chicago, Rock Island & Pacific, and in April of the next year was made mechanical expert of the Chicago, Burlington & Quincy; since 1907 has been general inspector of machinery and equipment of the Burlington.



M. K. Barnum.

Purchasing Officers.

J. J. Conn has been appointed assistant general purchasing agent of the Atchison, Topeka & Santa Fe, with office in Chicago.

William Wibel, acting assistant purchasing agent of the National Railways of Mexico, the Mexican International and the Interoceanic, at New York City, has been appointed assistant purchasing agent of these companies, with office at New York.

Addison B. Lacy, who has been appointed purchasing agent of the Virginian Railway, with office at Norfolk, Va., was born on March 25, 1875, at Gloucester City, N. J. He was educated in the common schools of Philadelphia, Pa., and began railway work on January 1, 1892, with the Norfolk & Western, remaining with that company till December, 1898, as messenger and clerk in the purchasing agent's office at Philadelphia and at Roanoke, Va. In December, 1898, he left railway work to become assistant buyer and later buyer for a railway supply house in New York City. He returned to railway work in December, 1901, as chief clerk to the purchasing agent of the Seaboard Air Line at Portsmouth, Va., and from November, 1905, was chief clerk in the purchasing department under the assistant general manager of the Virginian Railway, which position he held at the time of his recent appointment as purchasing agent.

OBITUARY.

D. B. Eldredge, traveling freight and passenger agent of the Rock Island Lines at Salt Lake City, Utah, died at Salt Lake City on April 2.

Caleb Wheeler Durham, civil engineer, died March 28, 1910, at Peekskill, N. Y., at the age of 63 years. He was born February 6, 1848, at Tunkhannock, Pa., and served in the Civil war as a private in 1863 and 1864. He subsequently studied at the University of Michigan, in the class of '69, and commenced railway work as an assistant engineer on the New York Central Railroad, now the New York Central & Hudson River. In 1871 he was engineer in charge of construction of a section of the Chicago & North Western and the following year was appointed principal assistant engineer on the location of the Texas & Pacific in Arizona and New Mexico. Subsequently he was in general practice in Chicago as engineer and surveyor. He invented an improved hot air furnace embodying the principles now recognized as essential in the best types of furnace, and a system of hot air heating and ventilation, and in 1880 invented and afterward carried on business of installation of the Durham system of house drainage, consisting of wrought iron or steel pipe with special threaded fittings, now almost universally employed in large buildings. On the recommendation of Col. Waring he installed the entire drainage system in the Capitol at Washington, D. C. He married, May 28, 1873, Clarissa Safford Welles, of Ann Arbor, Mich., who died in 1907, and is survived by four sons. Mr. Durham was a member of the Chi Psi fraternity, one of the early members of the Civil Engineers' Club of the Northwest, and a charter member of the Engineers' Club of New York. For 19 years he was a member of the American Society of Civil Engineers.

Henry H. Porter, railway manager and builder and recently president of the Chicago Transfer & Clearing Company, died in Chicago on March 31. Mr. Porter was born December 7, 1835, at Machias, Me. He attended the public schools and East Machias Academy, and in 1853 began railway work as a station agent on the Galena & Chicago Union, now a part of the Chicago & North Western. He was later paymaster and general ticket agent on that road, and then general freight agent and general superintendent of the Michigan & Northern Indiana. He was at one time general manager of the Chicago & North Western and from 1874 to 1877 organized and consolidated the various roads now comprised in the Chicago, St. Paul, Minneapolis & Omaha, of which road he was president for several years. He was also at one time president of the Chicago & Indiana Coal Railroad and of its successor, the Chicago & Eastern Illinois, and was for a time chairman of the board of the latter road. He was also chairman of the board of the Duluth & Iron Range. He was a director of the Chicago, Rock Island & Pacific for a number of years from 1869, of the Chicago & North Western from 1870 to 1878, and of the Union Pacific from 1873 to 1877. Mr. Porter was also interested in the formation of the Illinois Steel Company and later in the Federal Steel Company and in the development of iron ore properties and in lumbering in Michigan and Wisconsin. He was one of the organizers of the Chicago Shipbuilding Company and of its successor, the American Shipbuilding Company. He was interested in the laying out of the present Chicago stock yards, and the Chicago Transfer & Clearing Company, of which he was president at the time of his death, was organized by him.

Railway Construction.

New Incorporations, Surveys, Etc.

Alberta & Great Waterways.—This company will start work soon, it is said, from Edmonton, Alb., south to Calgary, about 200 miles. It is intended to ultimately extend the line further south. Darling & Lumsden, engineers, are working on the plans. E. A. James, manager, Edmonton. W. R. Clark, Kansas City, Mo., is also interested. (Oct. 1, p. 612; Nov. 26, p. 1036.)

Arbuckle & Western.—An officer writes that the company was recently incorporated with $400,000 capital, which will be increased to about $5,000,000. The plans call for a line from Ardmore, Okla., northwest to Chickasha, 110 miles, with a branch from Milo west to Lawton, 80 miles. The company is about ready to let contracts and expects to begin the work soon. There will be about 17 steel or concrete bridges, none of which will be over 100 ft. long, and probably one important trestle. Oscar O. Ayres, president and acting chief engineer, Ardmore. (April 1, p. 917.)

Arizona Southern.—The Arizona-Mexican Construction Co. has been incorporated in Arizona, with a capital of $100,000, by M. Goodloc, O. Longacre, Jr., D. J. Holdrige, L. M. Mulhern and A. W. Davis. It is understood that the company was formed to build an extension of the Arizona Southern, now in operation from Silverbell, Ariz., northeast to Red Rock, 20 miles, from the present southern terminus at Silverbell southwest towards Port Lobos, Mexico, on the Gulf of California. It is probable that an extension will also be built from Red Rock north to the Christmas-Winkelman section.

Astoria, Seaside & Tillamook.—F. L. Smart, vice-president of the National Public Utilities Corporation, promoters of this project, and W. L. Crisman, Portland, Ore., are quoted as saying that the necessary right-of-way has been secured and actual construction work is to be started before April 1. The company's plans provide for a direct rail connection from Portland to Tillamook. The line will be 70 miles long and, it is estimated, will cost $2,000,000 to build.

Butte & Boise.—An officer writes that as soon as preliminaries have been arranged for work will be started on this line. The company was organized in Idaho and has preliminary survey and location made. Capital has been secured to carry out the work. The projected route is from Butte, Mont., southwest to the Big Hole basin, thence following the Big Hole river and via the summit of the mountains to Salmon, Idaho, and along the Salmon river to the Sawtooth range, thence to Boise down the Boise valley via Caldwell to the Snake river and through Jordan valley to Winnemucca, Nev. At Butte connections will be made with the Northern Pacific, the Chicago, Milwaukee & Puget Sound and the Great Northern, and at Winnemucca with the Western Pacific and the Southern Pacific. S. H. Bracey, president; G. T. Wiswell, chief engineer, 1606 Tribune building, Chicago.

California Roads.—According to press reports from Red Bluff, Cal., a line is projected from Red Bluff northwest via Camp Wrigley, on Tom Head mountain, in the western part of Tehama county, to Eureka, about 110 miles. The line is to be built to provide an outlet for the copper mines at Camp Wrigley. The project is backed by Chicago and New England capitalists and has no connection with the proposed electric line from Eureka via Hayfork and Harrison Gulch. William Wrigley, Jr., Chicago, is said to be interested. N. E. Guyot, Chamber of Commerce, Tehama county, can give information.

Canadian Northern.—Contracts are to be let at once for the following work: Extension of the Oak Point line from Oak Point, Man., north; extension from Battleford, Sask.; extension of the Edmonton & Slave Lave from Morinville, Alb., north.

The company now has under consideration the question of building the main line west of Edmonton, Alb., but nothing definite has yet been decided. (April 1, p. 917.)

Canadian Pacific.—Plans are said to have been filed for extensions to complete a line between Regina, Sask., and Prince Albert, 129 miles. Bids are to be asked for the work at once.

The following contracts are said to be let: In Alberta, for an extension of the Kipp line, to Foley, Welch & Stewart, from the present terminus at Little Bow river northwest. The plans include an extension from Carmangay to a point southeast of Calgary, and next year it is intended to continue the extension to a connection with the Calgary-McLeod branch. (March 4, p. 460.)

Branch from Langdon line at Irricanna, Alb., southeast, let to Foley, Welch & Stewart.

Contract for 25-mile section of the Weyburn extension let to the J. D. McArthur Co., Winnipeg, Man., and 90 miles of the Outlook extension will also be built by the J. D. McArthur Co. John Bradley, Brandon, Man., is said to have a contract for work from Craven, Sask., north to Colonsay, 110 miles. (March 4, p. 460.)

Right-of-way secured and work to be started soon on an extension of the Esquimault & Nanaimo from Union Bay, B. C., to Oyster river, about 25 miles, into the Comax district.

According to press reports plans are under consideration by the Canadian Pacific for large improvements to be made in Montreal, Que. These include a large addition to the yards in the east end; additional trackage from Dalhousie square to Hochelaga; the construction of a continuous series of subways under Notre Dame street, which is to become a continuous viaduct from Berri street to Sohmer park; the rearrangement and partial reconstruction of the station buildings, and the construction of new freight sheds and warehouses near Dalhousie square. From the point where the warehouses are to be built the company owns land to the harbor front.

Cherryvale, Oklahoma & Texas.—According to press reports from Caney, Kan., construction work has been started by this company. The company plans to build a line from Cherryvale, Kan., southwest towards El Paso, Tex., with a branch south towards Aransas Pass, and another branch south to South McAlester, Okla., also one from Caney southeast towards Fayetteville, Ark. B. J. Dalton, chief engineer, Lawrence, Kan. (March 25, p. 849.)

Chicago & Illinois Western.—The yards and second track between McCook, Ill., and Hodgkins are to be extended. An automatic track scale will be installed at McCook, where a hump yard is under construction.

Chicago & North Western.—An officer is quoted as saying that work on an extension from Milwaukee, Wis., northwest to Elroy, 130 miles, will probably be started about May 1. The new line will run over a more level country than the present route via Madison. Other extensions include a line from Belle Fourche, S. Dak., northeast to the Moreau river, about 40 miles; Pierre, S. Dak., north to Gettysburg, about 40 miles, and a line from Iroquois, west to this proposed extension, about 112 miles. (Nov. 26, p. 1036.)

Cincinnati, Hamilton & Dayton.—A contract is said to have been given to the Carter Construction Co., Chicago, for revision work between Piqua junction, Ohio, and Swanders, on about 10.5 miles.

Delaware, Lackawanna & Western.—The report of this company for the year ended December 31, 1909, shows that there was laid during the year 19,370 tons of new open hearth rails, with fastenings, which was 5,998 tons more than during 1908. A large amount of stone ballasting work has been carried out during the year, about 202,537 cu. yds. of stone having been used, which ballasted 40.75 miles of double-track. This work will be prosecuted more vigorously during the coming year. Contracts have been made for an increased quantity of pressed stone for this purpose, the intention being to complete the work of stone ballasting the main track between Hoboken, N. J., and Buffalo, N. Y., as soon as possible. Important work of a permanent character was done on the docks and wharves at Hoboken during the year and similar work will be carried out during the coming year. The Lackawanna Railroad Co. of New Jersey, which was organized in New Jersey in 1908 to build a cut-off between Slateford, Pa., and Port Morris, N. J., 28 miles, has been pushed vigorously dur-

ing the year. It is expected that it will be completed and ready for operation by the latter part of 1911. The work is heavy and expensive, the line being located in a semi-mountainous section. The total cost will be between $8,000,000 and $9,000,000. The new line will be about 11.5 miles shorter than the existing line, and will have lower grades and less curvature. During 1909 the company advanced for construction of this line $3,594,286. (See report elsewhere in this issue.)

This company, in accordance with its general plan, is making improvements to lower the grades on the road from Analomink, Monroe county, Pa., to High Bridge. On this section the present line will be moved between 500 and 700 ft. from its present location, and three tracks are to be laid. An additional track is to be laid from High Bridge to Henryville, in the Pocono mountains.

Denver, Laramie & Northwestern.—According to press reports this company, now operating a line from Denver, Colo., north to Milliken, 43.4 miles, has been reorganized and plans are made to build about 200 miles of line north via Greeley. Regular train service, it is expected, will be started about April 20 from Denver, Colo., to Greeley, and about a year later it is expected to have an extension finished to Laramie, Wyo. (Feb. 18, p. 379.)

El Paso & Southwestern.—According to press reports surveys are being made for an extension from Benson, Ariz., northwest via Tucson to Phoenix. (Sept. 10, p. 477.)

Grand Trunk Pacific.—An officer writes that a contract has been given to J. D. McArthur, Winnipeg, Man., for grading and bridge work on a branch from Regina, Sask., southeasterly for 90 miles. (April 1, p. 918.)

Great Northern.—An officer writes that a contract has been given to A. Guthrie & Co., St. Paul, Minn., to build from Surrey, N. Dak., near Minot, southeast to Fargo, 225 miles, and that work will be started at once.

An officer writes that a contract has been given to Morris & Shepard for a branch from Stanley, N. Dak., northwest for 50 miles.

Gulf & Northwestern.—Contracts will probably be let within the next 60 days for work on this line. The projected route is from Oklahoma City, Okla., northwest through Kansas to Sterling, Colo., where connection is to be made with the Union Pacific and the Chicago, Burlington & Quincy. There will be a number of wooden bridges, including one over the Arkansas river at Syracuse, Kan. At the annual meeting to be held in Goodland, Kan., April 12, it will probably be determined to start work on the first 30 miles. The line is eventually to be extended from Oklahoma City south to Denison, Tex. J. B. Dyatt, president, Goodland, and R. B. Ketchum, consulting engineer, Salt Lake City, Utah. (Dec. 3, p. 1107.)

Gulf & Provident City.—An officer writes that contracts have been let, but grading will not be started for about 60 days. The projected route is from Pierce, Tex., on the Southern Pacific, north to a connection with an east and west line to be built from Glen Flora, on the Gulf, Colorado & Santa Fe, west to Provident City. The work includes large trestles. Emil Reinbold, chairman and president, Kansas City, Mo.

Intercolonial.—A contract has been given to A. Kirkpatrick, Antigonish, Nova Scotia, to build a branch between Georges river, Cape Breton, N. S., and Sydney Mines, 9.09 miles. (Feb. 25, p. 429.)

Kanawha & Michigan.—An officer writes regarding the reports that extensive improvements, including new track, tunneling work and eliminating steep grades, are to be carried out at a cost of $1,400,000, that nothing has been determined as yet, with the exception of the Ohio approach to the Ohio river bridge, on which work is already under way. (April 1, p. 918.)

Kinder & Northwestern.—Surveys are said to be made and work is now under way building from Kinder, La., to timberlands, 15 miles. Work on the first three miles is said to be finished. A. J. Peavey, president, Shreveport.

Lackawanna Railroad Co. of New Jersey.—See Delaware, Lackawanna & Western.

Memphis, Dallas & Gulf.—See Memphis, Paris & Gulf.

Memphis, Paris & Gulf.—An officer writes regarding the reports that contracts will shortly be let for extending this line, that it is undecided when bids will be asked for additional work. The line is in operation from Murfreesboro, Ark., southwest to Ashdown, 41 miles, and is projected from Memphis, Tenn., southwest to Dallas, Tex. Track has been laid on 70 miles. The part of the line to be built in Texas will be known as the Memphis, Dallas & Gulf. The extensions are to have a grade of 1 per cent., with curvature of 3 degs. There will be two steel bridges and five important trestles. (Feb. 4, p. 280.)

Missouri & North Arkansas.—Betterment work to cost $750,000, it is said, will be carried out by this company on the line between Leslie, Ark., and Helena.

Nevada Roads.—Right-of-way is being secured by H. G. Comstock, Reno, Nev., for a line from Reno, south to Lake Tahoe, about 20 miles.

New York Connecting.—A bill has been introduced in the New York state legislature extending the time for commencing work on the bridges for the New York Connecting to January 1, 1911, and providing that the work shall be finished five years from that date. Another bill has also been introduced, which extends the time from January 1, 1911, for five years for the completion of the railway which is to operate over the bridges. The projected route is from the Morris Park yards of the New York, New Haven & Hartford in the borough of the Bronx. The plans call for a large viaduct over Ward's and Randall's islands and bridges over the Harlem and East rivers. The line is to be built jointly by the Pennsylvania and the New York, New Haven & Hartford. (Dec. 10, p. 1168.)

Northern Pacific.—A contract is said to have been given to Albert Walker, Bearmouth, Mont., for double-tracking work between Missoula, Mont., and De Smet.

Oregon Railroad & Navigation Co.—Plans are said to be made for rebuilding three miles of the main line on the Washington division in Hay canyon, Wash. The improvements are to cost $100,000.

Panama Railroad.—An agreement has been made whereby the Panama Railroad will start surveys at once for the proposed line from the city of Panama, west to David, in the province of Chiriqui, about 300 miles. When finished the line will be owned by the Panama government. By an arrangement with the United States government the line is to be built by the Panama Railroad Co. (See Panama Roads, Jan. 7, p. 69.)

It is expected to begin the operation of trains over the relocated line between Gatun, Canal Zone, Panama and Gamboa, 24 miles, about May 1. (Dec. 10, p. 1168.)

Pennsylvania System.—The record of the mileage of the road on December 31, 1909, shows that the total length of main line on the lines east of Pittsburgh and Erie is 5,305 miles, with 1,825 miles of second-track, 543 miles of third-track, 469 miles of fourth-track and 4,299 miles of company's sidings, a total of 12,441 miles. There was an increase of three miles of second-track, two miles of fourth-track and 48 miles of company's sidings, and a decrease of nine miles of first-track and 27 miles of third-track, a total increase of 17 miles. On the Pennsylvania Lines West of Pittsburgh and Erie the mileage is 2,911 miles of first-track, 1,193 miles of second-track, 184 miles of third-track, 91 miles of fourth-track and 2,339 miles of company's sidings, a total mileage of 6,718 miles. During the year there was an increase of six miles of second, third and fourth-track and 32 miles of company's sidings, and a decrease of three miles of first-track, making a total increase of 35 miles. The mileage of the Vandalia Railroad is: First-track, 924 miles; second-track, 84 miles; third-track, eight miles, and sidings, 643 miles, a total of 1,659 miles. During the year there was an increase of two miles of second-track and company's sidings and a decrease of one mile of first-track, making a total increase of one mile. The grand total of all lines, including those operated by and associated in interest with the Pennsylvania Railroad, is 11,234 miles of

first-track, 3,348 miles of second-track, 760 miles of third-track, 570 miles of fourth-track and 8,185 miles of sidings, a total of 24,097 miles. Of this 6,294 miles of first-track are east and 4,940 miles are west of Pittsburgh and Erie.

Pensacola, Mobile & New Orleans.—An officer writes that contracts have been let to J. M. Kinney and C. W. Merritt, Pensacola, Fla., for grading four miles of line in Alabama. The work involves the handling of about 30,000 cu. yds. of earth excavation and 30,000 yds. of embankment. The projected route is from Pensacola, Fla., northwest to Mobile, Ala., about 60 miles. Contracts are let for building the entire line. There will be 10 steel bridges and about 2.5 miles of trestle work. L. G. Wilkinson, superintendent of construction, Pensacola.

Rock Island Southern.—This company, which operates an 18.5-mile line in Illinois, from Monmouth, east to Galesburg, expects to finish an extension this month from Monmouth north to Rock Island and Moline, about 50 miles. The company plans to build a branch from this extension at Aledo junction, west to Aledo, 10 miles, the work to be finished about July 1.

Rock River Traction.—Surveys are said to be under way for lines in Illinois as follows: Princeton, west via Geneseo, to Rock Island; Geneseo, northeast to Sterling, with a branch from this line at Prophetstown, north to Morrison; Geneseo, southeast to Kewanee, thence southwest to Galesburg, in all about 170 miles. H. W. Cole, president, Geneseo; F. W. Sears, chief engineer, Prophetstown.

Salt Lake & Ogden.—See Salt Lake City, Utah, under Railway Structures.

Southern Pacific of Mexico.—According to press reports from Mexico, a concession has been granted this company by the federal government to build a branch from Quila, Sinaloa, Mex., to Borado. Construction work is to be started as soon as survey can be made and approved.

Tennessee Central.—An officer writes regarding the reports that surveys have been made for an extension from Harriman, Tenn., south, thence east to Knoxville, about 45 miles, that the company is contemplating some extensions on this line, but nothing has yet been determined in regard to carrying out the work. (March 11, p. 547.)

Tennessee Traction.—An officer writes that surveys are being made from Memphis, Tenn., northeast via Brownsville and Jackson, to Nashville, 225 miles. W. K. Burton, president; G. E. Bushnell, general manager and chief engineer, Memphis.

Wasiota & Black Mountain.—A second contract is said to have been given to the Callahan Construction Co., Knoxville, Tenn., for building an additional 27 miles. This company now has contracts to build from Pineville, Ky., on the Louisville & Nashville, in Bell county, northeast via Harlan, to a point in Harlan county, in all about 51 miles. E. R. Keller, general superintendent of the construction company, Harlan.

Waycross & Florida.—Organized in Georgia to build 70 miles in Georgia and an extension into Florida. C. J. Haden, C. E. Johnson and C. R. McCormack, Atlanta, Ga.; G. W. Deen, Waycross, and D. Blalock, Jonesboro, are said to be interested.

Wichita Falls & Northwestern.—An officer writes that a contract has been given to the Texas & Oklahoma Construction Co., T. R. T. Orth, president, Wichita Falls, Tex., for building from Altus, Okla., west to Wellington, Tex., about 60 miles. The railway company is considering the question of building a line from Devol, Okla., north to Lawton, 38 miles, but no definite decision has yet been reached. (March 18, p. 751.)

Wyoming Railway.—An officer writes that contracts are to be let at once for building this proposed line from a point on the Union Pacific, in Wyoming, north via Casper, Buffalo and Clearmont, to a point on the Northern Pacific and the Chicago, Milwaukee & St. Paul in Montana, 358 miles. Maximum grades will be 1 per cent. and maximum curvature 3 degs. There will be about 12,000 cu. yds. of excavation per mile. The work includes putting up a 3,000-ft. trestle. Col. W. C. Dows, president, and W. J. Thom, treasurer, First National bank, Buffalo, Wyo. (Jan. 14, p. 114.)

Railway Financial News.

Atlanta & West Point.—The Georgia Railroad Commission has given the company permission to issue $1,232,200 additional stock, the proceeds of the sale of which will be used to retire at par the $1,232,200 6 per cent. certificates of indebtedness. The new stock is to be offered to stockholders at par.

Chicago, Rock Island & Pacific.—Speyer & Co., New York, have bought from the company and sold here and abroad about $6,750,000 4½ per cent. equipment trust notes, series D, of May 1, 1910, maturing in semi-annual installments of $225,000, secured by equipment costing about $7,500,000.

Galveston, Harrisburg & San Antonio.—Stockholders are to vote May 23 on the question of authorizing a new mortgage to secure $10,000,000 thirty-year 6 per cent. bonds. The mortgage will be secured on the properties of the former New York, Texas & Mexican; Gulf, Western Texas & Pacific; San Antonio & Gulf; Galveston, Houston & Northern; Gonzales Branch Railroad, which were taken over in 1905, and on the new line from Stockdale, Tex., to Cuero, 47 miles, a total of about 425 miles.

Hocking Valley.—The directors have voted to retire at par April 30 the outstanding $15,000,000 preferred stock. The company has in its treasury about $10,000,000 cash as the result of its sale of stock of the Toledo & Ohio Central and the Kanawha & Michigan. This is the final step in the abandonment of the plan for the consolidation of the Hocking Valley, the Toledo & Ohio Central and the Kanawha & Michigan. Of the $15,000,000 outstanding preferred stock and the $6,000,000 common only about $5,000,000 of the preferred and $2,000,000 of the common were ever deposited under the plan of consolidation.

Houston & Texas Central.—The company has applied to the Texas Railroad Commission for permission to issue $3,000,000 bonds, to be secured by a mortgage on the cut-off line from Mexia to Melieva, 94 miles.

Lake Shore & Michigan Southern.—See New York Central & Hudson River.

New York Central & Hudson River.—The New York Up-State Public Service Commission has authorized this company and the Lake Shore & Michigan Southern to execute a New York Central Lines equipment trust of 1910, providing for the issue of $30,000,000 4½ per cent. equipment trust certificates, to be sold at not less than 97 per cent.

The New York Up-State Public Service Commission has given permission to the New York Central & Hudson River and the Lake Shore & Michigan Southern to make an equipment trust agreement securing $30,000,000 4½ per cent. equipment trust certificates of 1910. The certificates are to be sold at not less than 97.

New York, Ontario & Western.—The New York Up-State Public Service Commission has authorized the company to issue $720,000 4½ per cent. notes dated April 1, 1910, due $36,000 semi-annually up to 1920. Proceeds of the sale of these notes is to be used to pay for seven passenger coaches, 500 forty-ton coal cars and 14 locomotives.

Pennsylvania Company.—See Pittsburgh, Youngstown & Ashtabula.

Philadelphia & Western.—Edward B. Smith & Co., Philadelphia, have made arrangements to buy the property of the Philadelphia & Western. This electric road runs from the Sixty-ninth and Market streets terminal station of the Philadelphia Rapid Transit elevated subway to Stafford, Pa., about 12 miles.

Pittsburgh & Lake Erie.—The annual report of this company shows that in 1909 there was no change in the mileage operated. The road runs from the bituminous coal fields in Fayette county, Pennsylvania, through Pittsburgh to Youngstown, 191 miles. Of its total $10,000,000 stock outstanding at the beginning of the year, $5,000,100 was owned by the Lake Shore & Michigan Southern. Total

operating revenues amounted to $14,838,918 in 1909 as compared with $10,382,620 in 1908; operating expenses totaled $6,419,205 in 1909 and $5,372,668 in 1908. After deducting taxes and deficit from outside operations, operating income amounted in 1909 to $8,214,288 and in 1908 to $4,804,638. Nothing was charged to income account in 1909 for additions and betterments or for additional equipment, while in 1908 $1,135,327 was charged for betterments and $1,608,579 was charged for equipment. In 1909 $1,387,896 was spent for additions to the property and charged to capital account, and $1,214,796 was spent for additions and charged to reserve funds. In November, 1908, stockholders were offered $5,000,000 stock at par to the extent of 50 per cent. of their holdings. The annual report shows all of this stock outstanding, and the annual report of the Lake Shore shows that that company subscribes for its proportional share of new stock. Dividends of 10 per cent. were paid in 1908 and also in 1909. Surplus for the 1909 year after the payment of these dividends amounted to $6,115,605, and to $339,893 in 1908. The total to the credit of profit and loss after the crediting of surplus for 1909 was $16,479,796, and from this accumulated surplus there was declared an extra dividend of $20 per share, calling for the payment of $6,000,000.

Under operating expenses maintenance of way cost $1,496,196 in 1909 and $1,374,007 in 1908; maintenance of equipment cost $1,351,357 in 1909 and $963,976 in 1908. Transportation expenses cost $3,188,159 in 1909 and $2,644,931 in 1908.

Of the total tonnage, 28,232,941 tons, carried in 1909, 9,612,412 tons was bituminous coal. These figures compare with a total tonnage in 1908 of 19,215,998 tons and a bituminous coal tonnage of 7,911,266 tons. Nearly every class of commodity furnished a greater tonnage in 1909 than in 1908. The tonnage of coke carried amounted to 5,731,264 tons in 1909, an increase over 1908 of 2,656,592 tons; and the tonnage of ores amounted to 4,655,487 tons in 1909, an increase of 2,158,271 tons over 1908. The average length of haul of revenue freight was 63.57 miles in 1909 and 65.20 miles in 1908. The average revenue train load was 1,192 tons in 1909 and 1,058 tons in 1908. Total freight revenue amounted to $13,087,637 last year and to $8,840,381 the year before; and the average revenue per ton per mile was 7.29 mills last year and 7.06 mills the year before. Total passenger revenue amounted to $1,337,825 in 1909 and to $1,165,684 in 1908. The December 31, 1909, balance sheet shows total current assets of $11,314,742, of which $8,176,112 was cash; total current liabilities amounted to $1,738,721, of which $646,534 was traffic balances payable and $957,853 audited vouchers and wages unpaid. Under accrued liabilities not due there are $6,750,000 dividends declared, which have since been paid, thus reducing the cash on hand by that amount.

Pittsburgh, Youngstown & Ashtabula.—Stockholders are to vote May 15 on the question of leasing the property to the Pennsylvania Company, which owns $5,775,000 out of a total of $9,100,000 of the preferred stock, and all of the $2,100,000 common stock. President Wood has issued a circular stating the conditions of the lease that the Pennsylvania has agreed to, in part as follows:

(1) The efficient operation and maintenance of your property. (2) The maintenance of the corporate organization. (3) The payment of a guaranteed rental sufficient to pay the interest on your funded debt and other obligations and a dividend of 7 per cent. on your preferred and common capital stock. (4) Betterments to meet, from time to time, the demands of the increasing business, the cost of which shall be represented by capital stock or bonds to be issued by your company, and to bear such rate of dividend or interest as may be satisfactory to the lessee; and (5) the failure to pay the rental provided in the lease, and perform all of the covenants therein contained, for 90 days, shall work a forfeiture of the lease.

Rutland Railroad.—The annual report of this company shows 468 miles of line operated in 1909, the same as in 1908. The road runs from Bellows Falls, N. H., and Chatham, N. Y., to Ogdensburg. A majority of the $9,257,000 capital stock of the company is owned by the New York Central & Hudson River. The total operating revenues in the calendar year ended December 31, 1909, amounted to $3,102,432; this compares with total operating revenues of $2,755,204 in 1908. Expenses amounted to $2,201,845 in 1909 and to $1,981,767 in 1908. Operating income, after the deduction of taxes, amounted to $786,281 in 1909 and to $674,461 in 1908. Nothing was charged from income for additions and betterments or additional equipment in 1909, these charges being made in profit and loss account according to Interstate Commerce Commission rules, while $2,320 was charged for betterments in 1908 and $18,667 for equipment in 1908. The surplus for the year amounted to $204,005, comparing with $71,499 in 1908. After crediting this surplus to profit and loss and making adjustments required by the Interstate Commerce Commission, there was a total to the credit of profit and loss of $1,503,876, of which $585,051 is treated as appropriated surplus, from which it is proposed to buy new equipment at an estimated cost of $227,000, and to spend for improvements $114,057. The preferred stock of the Rutland, amounting to $9,257,000, is a 7 per cent. cumulative stock, on which no dividends were paid in 1908 or 1909. Minority stockholders have complained for a number of years that the management was using funds for other purposes that should properly be paid in dividends to preferred stockholders, and they claim that up to January, 1909, dividends aggregating 179 per cent. were due.

Of the total expenses $468,164 was spent for maintenance of way in 1909 and $392,507 in 1908. There was spent for maintenance of equipment in 1909 $459,687 and $361,526 in 1908. Transportation expenses cost $1,124,892 in 1909 and $1,088,119 in 1908.

The total revenue tonnage in 1909 amounted to 1,993,725 tons and to 1,759,502 tons in 1908. Products of forests other than lumber furnished a greater tonnage than any other commodity, but in 1909 this tonnage amounted to 289,965 as compared with 326,854 tons in 1908. The tonnage of lumber also decreased in 1909 as compared with 1908. The tonnage of bituminous coal, grain and sugar increased in 1909. The average haul per ton of revenue freight was 122 miles as compared with 105 miles in 1908; the average revenue train load was 380 tons last year, an increase of 42 tons over the year before; the average revenue per ton per mile was 7 mills in 1909 and 7.9 mills in 1908. Total freight revenue amounted to $1,721,305 last year and to $1,476,478 the year before; total passenger revenue amounted to $1,043,562 in 1909 and to $972,118 in 1908. The December 31, 1909, balance sheet shows current assets of $1,032,609, of which $419,631 is cash and current liabilities amounting to $778,529, of which $323,000 was loans and bills payable.

St. Louis & San Francisco.—Stockholders are to vote May 16 on the question of making a mortgage on the new New Orleans, Texas & Mexico division to secure $50,000,000 5 per cent. bonds of March 1, 1910-1940.

Southern Railway.—Potter, Choate & Prentice, New York, have purchased $5,200,000 Southern Railway equipment trust 4½ per cent. bonds, dated April 1, and maturing in 20 semi-annual instalments of $260,000 each, October 1, 1910, to April 1, 1920. The security for this issue is equipment of a total cost of $6,322,500, of which amount 17½ per cent. has been paid in cash by the company.

Vandalia.—Speyer & Co., New York, are offering $5,000,000 consolidated mortgage 4 per cent. bonds of 1907-1957 at 97½. These bonds are part of the $10,000,000 series B, which series is part of the total authorized issue of $25,000,000 bonds, of which there is outstanding, including this $5,000,000, $18,000,000. The proceeds of the bond sale are to be used by the railway company to retire $500,000 Terre Haute & Logansport first mortgage 6 per cent. bonds, and to pay for the building of additional second-track and for additional equipment, estimated to cost $4,500,000.

Western Maryland.—An initial quarterly dividend of 1 per cent. has been declared on the $10,000,000 non-cumulative 4 per cent. preferred stock.

About 8 per cent. of the stockholders have voted to ratify the action of the directors in authorizing the sale of the $25,469,670 unissued stock at $50 a share. There were no dissenting votes.

Supply Trade Section.

The King Bridge Co., New York, on April 6 moved its office to room 1040, Hudson Terminal building, 30 Church street.

George W. Fleming, of the Pittsburgh Gage & Supply Co., Pittsburgh, Pa., has been appointed eastern sales manager, with office at 91 Liberty street, New York.

C. P. Williams has been appointed, effective April 1, to succeed E. G. Buchanan, who resigned as the New York representative of the Chicago Railway Equipment Co., Chicago.

George E. Howard has been appointed eastern representative of J. Rogers Flannery & Co., general sales agents of the Flannery Bolt Co., Pittsburgh, Pa., manufacturers of the Tate flexible staybolt.

Work of rebuilding the Denver plant of the Griffin Wheel Co., Chicago, which was burned March 8, is progressing rapidly and it is expected that a portion of the plant will resume operation May 15.

The Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., will, on April 23, move its Chicago office from the Fisher building to suite 1007-1009 of the new People's Gas building, Michigan avenue and Adams street.

A. Munch, formerly secretary of the Northwestern Metal Manufacturing Co., Minneapolis, Minn., has been elected vice-president, to succeed W. C. Schroeder. R. E. Cook, formerly treasurer, has been elected secretary and treasurer.

The McKeen Motor Car Co. has sold one 55-ft. motor car to the Charles City & Western, Charles City, Iowa; one 55-ft. car to the Woodstock-Sycamore Traction Co., Chicago, and one 70-ft. car to the Minnesota Central, Minneapolis, Minn.

During the past several months the Northern Engineering Works, Detroit, Mich., has been placing orders for new tools and machinery, consisting largely of lathes, gear cutters and milling machines, which machinery is now being installed.

The Blue Island Rolling Mill & Car Co., Chicago, has increased its capital stock from $500,000 to $750,000. The new plant which the company is building at Blue Island, Ill., is nearing completion and it is hoped that it will be ready for operation by June 1.

The Isthmian Canal Commission will receive bids until May 2 for lumber, piles and steel castings (Circular No. 571), and until May 3 for cast iron car wheels and car journal bearings, this being the annual estimate for the period ending June 30, 1911. (Circular No. 572.)

Frank McMurdie, superintendent, since 1894, of the Detroit plants of the American Blower Co., Detroit, Mich., has resigned to become general superintendent of the Clarage Foundry & Manufacturing Co., Kalamazoo, Mich. Mr. McMurdie was one of the oldest employees of the American Blower Co., having entered its employ in 1883.

C. T. Alden, an electrical engineer of New York, was, on April 1, made chief engineer and general manager of J. B. Taylor & Co., Inc., New York. Mr. Alden will reorganize and enlarge the business, with the idea of making an engineering and operating company to handle the building and reorganizing of electric and steam railways, gas, water power, irrigation, etc.

The Volkhardt Co., Stapleton, N. Y., desires to arrange with supply companies, having representatives who call upon master mechanics, to handle its line of hydrant cocks and valves in Chicago, St. Louis, Mo.; Detroit, Mich.; St. Paul, Minn.; New Orleans, La.; Denver, Colo.; Seattle, Wash., and San Francisco, Cal. The business which the company has, at the present time, in these cities will be turned over to representatives.

The Ohio Welding & Manufacturing Co., Cincinnati, Ohio, will represent the Davis-Bournonville Co., New York, and has installed a large demonstrating plant, including welding equipment, and an oxygen plant, so as to handle all classes of repair work to which the oxy-acetylene process can be applied. This includes broken or cracked parts in cast iron, steel, aluminum, brass, copper, German silver, platinum, malleable iron, etc. The Davis-Bournonville Co. will also shortly open a demonstrating and repair shop in Cleveland at 2121 East Second street, S. E.

A little over four years ago the Allis-Chalmers Co., Milwaukee, Wis., secured the right to manufacture the Parsons turbine in this country. Only one unit was placed in operation the first year, but since then there has been a steady and rapid growth in sales, until the present total capacity of Parsons turbines in use is over 300,000 h.p. Of this aggregate, 48.2 per cent. were sold during 1909 and 20.6 per cent. have been ordered since January 1, 1910. Forty per cent. of the units have been for use by power, lighting and railway companies, textile manufacturers being next with 14 per cent. of the machines. Practically every type of industry is represented in the buyers of these machines and they are distributed over nearly every state in the Union and also in Canada and Mexico.

The Automatic Cattle Guard Co., Sandpoint, Idaho, advises that its machine shop was completed and all machinery installed about February 15, and that plans are now completed for a concrete foundry building 40 ft. wide and 100 ft. long. The cattle guard made by this company has been sold to a number of roads west of the Mississippi river and in Canada, the orders being filled by contract with firms in Chicago and Spokane, Wash. The machine shop, which is now in operation, has a capacity of 60 guards a day, and when the foundry is completed the entire guard can be made at the Sandpoint plant. It is the intention to build factories in Kansas City and at some point in Canada within the next year, and the establishing of offices in Kansas City is being considered. The officers of the company are: Chas. W. Palmer, president; Geo. W. Cline, vice-president and treasurer; Fred J. Keller, secretary; D. W. Richards, general manager.

TRADE PUBLICATIONS.

Shop Improvements.—The S. A. Woods Machine Co., Boston, Mass., has reprinted, in a two-page leaflet, an editorial from the *Iron Age* entitled Modernizing Old Shops.

Foundry Machinery and Equipment.—The Northern Engineering Works, Detroit, Mich., has just issued booklet No. 93 regarding the foundry, machinery and equipment which it manufactures.

Industrial Railways.—The C. W. Hunt Co., New York, has issued pamphlet No. 101, which is fully descriptive of Hunt industrial railways. The pamphlet contains a large number of illustrations and valuable information on this subject.

Chloride Accumulator.—The Electric Storage Battery Co., Philadelphia, Pa., has just issued bulletin No. 121 containing a very complete description of the installation of the chloride accumulator in the mills of the Indiana Steel Co. at Gary, Ind.

Machinery and Railway Supplies.—The H. Channon Co., Chicago, has issued catalogue No. 50, listing the wide variety of railway machinery and supplies handled by the company. The book is 7 in. x 9½ in., bound in cloth, and contains 952 pages.

Heaters.—The American Blower Co., Detroit, Mich., in bulletin 273, illustrates and describes its ABC sectional base heater, for use in connection with fans and blowers for heating, ventilating and drying. The bulletin also contains a table giving capacities of these heaters.

Generators.—The Western Electric Co., New York, in bulletin No. 5,111 describes its new design of Hawthorne, type LL, multipolar, engine-driven, d.c. generators. A full description of all the details of design and construction is given, along with the merits of the component parts.

Planing Machinery.—The S. A. Woods Machine Co., Boston, Mass., has just issued three small leaflets, one describing its Woods No. 20 high-speed planer with one side drive; another its Woods convertible disk side heads, and the third the new Woods beading or profile attachment.

Waterproofing Materials.—The Barrett Manufacturing Co., New York, has issued a folder carrying a large illustration of the new Pennsylvania Railroad terminal in New York City, with some general information regarding it and the use of coal tar pitch and tarred felt waterproofing used both in the tunnels and the station proper.

Waterproofing.—J. A. & W. Bird & Co., Boston, Mass., has issued, in pamphlet form, an article entitled the Waterproofing of Structures, which has special reference to sub-level construction, the envelope method and the use of tunaloid. The pamphlet also contains an illustrated article regarding the application of tunaloid in the Pennsylvania Railroad tunnels from Long Island City, L. I., to Jersey City, N. J.

Tie Plates.—The Hart Steel Co., Elyria, Ohio, in a catalogue recently issued, describes its several designs of plain and shoulder tie plates, both with flat bottom and with longitudinal and transverse flanges, and also its latest and most efficient types of screw spike plates. The catalogue contains a number of half-tone and line illustrations, together with some data obtained from tests of these plates. These screw spike tie plates were illustrated and described in the *Daily Railway Age Gazette* of March 16.

RAILWAY STRUCTURES.

Baltimore, Md.—See elsewhere in this issue an illustrated article in regard to a union passenger station to be built by the Northern Central.

Birmingham, Ala.—Permission has been granted to the Atlanta, Birmingham & Atlantic, it is said, to put up a stone and concrete freight house, 38 ft. by 349 ft., in Birmingham.

Bridgeport, Tex.—According to local reports, the Rock Island is planning to put up a passenger station at Bridgeport, to cost between $12,000 and $15,000.

Cleveland, Ohio.—The Erie is planning to provide a new draw span to replace the present temporary swing draw over the Cuyahoga river at Cleveland. The channel of the river at this point is to be widened, which will require the installation of a 180-ft. lift span, center to center bearings, to provide a clear width of channel of 120 ft. There will also be one 106-ft. plate girder approach span. New masonry will be put in for the steel work and the bridge will be double-tracked. The consent of the war department and local authorities to make the improvements has been secured. (March 25, p. 853.)

Duluth, Minn.—The Minneapolis, St. Paul & Sault Ste. Marie has completed a new roundhouse in the yards in the west end of Duluth. The structure has six stalls and is built adjoining the small repair shop at Twenty-first avenue and Michigan street. A coal shed and turntable have also been provided.

Fruitvale, Cal.—The Western Pacific has granted the request of the local board of trade for a new station, and plans are being prepared for a combined passenger station and freight house.

Montreal, Que.—See Canadian Pacific under Railway Construction.

Ogden, Utah.—The Harriman Lines are to build three new structures in the local yards, a large shed for housing passenger cars, a depot ice house and a car repair shop. The plans call for the completion of these buildings by October 1 and work is to be begun at once.

Salt Lake City, Utah.—Announcement is made that the Salt Lake & Ogden will put up a large terminal in Salt Lake City, to cost about $50,000. The company expects to have the electrification of this line from Salt Lake City north to Ogden, 35.50 miles, finished and trains in operation to the terminal site in Salt Lake City about May 1. (Oct. 29, p. 832.)

San Antonio, Tex.—The International & Great Northern will build a new boiler shop in San Antonio, to cost about $50,000.

Wilkesbarre, Pa.—According to press reports plans are being made by the county commissioners for a new bridge to be built between Plymouth and Breslau, in Luzerne county, at a cost of about $175,000. It is to be a combined highway and street railway bridge.

Late News.

The items in this column were received after the classified departments were closed.

The Central of Georgia has increased the wages of enginemen 5 per cent.

The Norfolk & Western has made an increase of 6 per cent. in the wages of all employees who receive $155 or less monthly, and who have not received an advance since October 1 last.

The general offices of the Ann Arbor Railroad are to be moved on May 1 from Detroit to Toledo, and the operating offices of the Detroit, Toledo & Ironton from Toledo to Detroit.

Otto H. Kahn, has been elected a director of the Southern Pacific to fill the vacancy in the board occasioned by the resignation of William Mahl at the time of his election as a vice-president of the company.

Judge Robert S. Lovett, chairman of the executive committee of the Union Pacific and the Southern Pacific and president of the Union Pacific, at the regular anuual meeting of the Southern Pacific was formally elected also president of the Southern Pacific.

According to press reports from Wichita Falls, Tex., contracts have been let to build the first 10 miles of the Wichita Falls-Oklahoma City Railway, from Walter, Okla., southwest to the Red river, and contracts for 18 miles, from Wichita Falls, Tex., northeast to the Red river, will be let soon. The line is being built by residents of Walter.

Contracts are to be let at once by the Oregon Trunk Line, it is said, for an extension from Madras, Ore., south to Bend. The line is now under construction from the Dalles, Oregon, on the Columbia river, south through central Oregon to Madras. Contract for the first 109 miles let to Porter Brothers. J. F. Stevens, president, Portland. (Jan. 28, p. 209.)

Emory V. Donelson, of Baltimore, Md., died suddenly on the morning of April 5 on the way from his home to his office. Mr. Donelson was the district representative of the Asbestos Protected Metal Co., of Canton, Mass. He was well known in public life in Baltimore, having been electrical commissioner of that city for a number of years and under his direction the new electrical apparatus was installed after the fire in 1904. He is survived by his widow and two daughters.

A Washington rumor says that the Interstate Commerce Commission has reached a decision in the case brought by George S. Loftus, a commission merchant of St. Paul, against the Pullman Car Company, alleging unreasonable charges, and will probably hand it down within a week or ten days. The commission has not made known its decision, but there is a report that it is against the Pullman Company and that it will mean a reduction in Pullman rates throughout the United States, and that hereafter an upper berth will cost less than a lower one.

The New York Public Service Commission (New York City) has ordered the Long Island Railroad to equip all electric trains either with platform gates or vestibule doors, and to make all station platforms even with the car platforms. The order with regard to the car platforms must be complied with by April 30, and that with regard to the station platforms by June 30. It is understood that the company has already equipped most of its cars with platform gates or vestibule doors, but the order with regard to the station platforms necessitates changes at a number of stations.

A draft of the form of contract for sectional construction by the city, of the Broadway-Lexington avenue subway in the borough of Manhattan, the Broadway-Lafayette subway in Brooklyn and the branches of the Fourth avenue line in Brooklyn, has been agreed upon. These branches will cost about $100,000,000. An alternative form of contract will be drawn. This will permit bidders to build the line with their own money, also to bid for the equipment and the operation

of the proposed lines, and bids will be asked for on both these propositions. As soon as both forms of contract are approved by the board of estimate and the city officials, the Public Service Commission will hold a hearing, which must be advertised for two weeks. It is believed that bids will be asked for the work about May 1, and it is expected that work can be started about a month later.

The executive committee of the Western Union Telegraph "recommends to the board of directors that no increase in the present rate of dividends be made until the plant of the company wherever it may be found necessary is placed in the highest possible condition, the working conditions of the employees improved and their salaries rearranged, recognizing in this readjustment merit, proficiency and length of service modified by location." President Robert L. Clowry, in explanation of the committee's action, said: "All earnings of the company above the present dividend rate of 3 per cent. per annum will be put into the property in order to raise it to the highest standard of efficiency. Wherever renewals of trunk lines are necessary it is our intention to substitute copper for iron wires. This will tend to improve greatly the efficiency of transmission. The speed of transmission of all messages is to be increased by the introduction of additional equipment in offices and additional direct wires between traffic centers."

A press despatch from Philadelphia, received too late to be confirmed, says that when the New York station of the Pennsylvania is opened through long distance competitive passenger fares, as from Buffalo, Cleveland, Chicago, Cincinnati and St. Louis, in other words, from all such points as the Pennsylvania Railroad and the New York Central come into direct conflict for business, will not be changed. On this traffic the company expects to profit by getting a larger share than at present. Between Philadelphia, Baltimore, Washington, Harrisburg, Pittsburgh and other non-competitive points and New York an additional charge will be made to the Seventh avenue terminal. It is said that this will be conservative—that is, that the extra charge over the fare to Cortlandt street will probably be 25 cents, although it may possibly be twice that much. Commutation rates out of New York to New Jersey points will be considerably advanced on tickets good to and from the terminal station. Just how far back this advance will be extended is undecided, but probably it will extend as far back as New Brunswick. The Long Island Railroad will make a small extra charge to and from the New York terminal. This will be $2 a month above the Long Island City basis, or an advance of about 95 cents a month over the railway and ferry basis. All other passengers will pay five cents more for coming into the city station.

Mr. Henry D. Shute has been appointed acting vice-president of the Westinghouse Electric & Manufacturing Co. as of April 1, 1910. For seventeen years Mr. Shute has been associated with this company and his work has been of a character to give him a broad experience in the shop, sales and executive departments. Mr. Shute studied electrical engineering at the Massachusetts Institute of Technology. Following his graduation in 1892, he spent a year studying in Germany at the School of Mines, Clausthal, and also in Dresden. In 1893 he began work with the Westinghouse company at Pittsburgh as an apprentice, spending his first two years in the testing department, following which he spent considerable time on erection work, on laboratory work, under Mr. C. F. Scott, and later as assistant foreman of one of the departments of the works. He subsequently took up designing work on alternating current apparatus, which, in the engineering department, enlarged his experience still more. After five years' service with the company Mr. Shute took up work in connection with the sales department at the East Pittsburgh office, and in 1901 was made the head of the alternating current division, correspondence department. Two years later he was made assistant to Vice-President L. A. Osborne, which position he held at the time of his recent appointment. In this latter position he was active in the developments made in heavy electric traction and particularly in single phase railway work. Mr. Shute is a member of the American Institute of Electrical Engineers and a member of the Engineers' Club of New York.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Iowa Central is in the market for 10 consolidation locomotives.

The Queen & Crescent Route is in the market for 10 Mallet locomotives.

The St. Louis & San Francisco is in the market for 80 Pacific locomotives.

The Chicago & Alton is in the market for 10 Mogul switch, 10 Pacific and 30 Mikado locomotives.

The Chicago, Rock Island & Pacific is in the market for 25 Pacific and 34 consolidation locomotives.

The Minneapolis & St. Louis is in the market for 10 consolidation and two Mogul switch locomotives.

The Chicago Great Western is reported as being in the market for 41 locomotives. This item is not confirmed.

The Arbuckle & Western, Ardmore, Okla., a new line under construction in Oklahoma, expects to buy rolling stock in the near future.

The Wichita Falls Route has ordered three eight-wheel and three consolidation locomotives from the Baldwin Locomotive Works.

The Southern Railway has ordered two Mallet, 38 consolidation, 25 Pacific and 10 six-wheel switch engines from the Baldwin Locomotive Works.

The Wyoming Railway, a line under construction in Montana and Wyoming, is in the market for motive power. W. C. Dows, president, Buffalo, Wyo.

The Elgin, Joliet & Eastern has ordered 25 consolidations, 18 six-wheel switching and two eight-wheel transfer locomotives from the American Locomotive Co.

The New Orleans Great Northern is having two 4-6-0 locomotives built at the Paterson, N. J., plant of the American Locomotive Co. Delivery is specified for April.

CAR BUILDING.

The Northern Pacific is to build 600 box cars in its Tacoma shops.

The Crystal Tank Line is in the market for 100 8,000-gal. tank cars.

The Wichita Falls Route has ordered 75 box cars from Haskell & Barker.

The New Orleans Railway & Light Co., New Orleans, La., is to buy 35 to 50 electric cars.

The St. Louis & San Francisco is contemplating the ordering of 300 to 500 automobile cars.

The Arbuckle & Western, Ardmore, Okla., a new line under construction in Oklahoma, expects to buy rolling stock in the near future.

The National Railways of Mexico have ordered 300 box, 50 stock, 50 flat, 200 gondola and 10 tank cars from the American Car & Foundry Co.

The Wyoming Railway, a line under construction in Montana and Wyoming, is in the market for rolling stock. W. C. Dows, president, Buffalo, Wyo.

The Mexico North Western, reported in the *Railway Age Gazette* of February 25 as being in the market for 260 freight cars, will buy 200 forty-ton box and 60 thirty-ton stock cars.

The Hilo Railway, Honolulu, H. I., has ordered the 10 box cars for which it was reported in the market in the *Railway Age Gazette* of February 25, from the American Car & Foundry Co.

The St. Louis & San Francisco is in the market for two

café-observation and two smoker-observation cars, and has ordered six 70-ft. gasolene-electric motor cars from the General Electric Co.

The Southern Railway, reported in the *Railway Age Gazette* of March 11 as being in the market for 10 combination baggage and passenger cars, has ordered 10 wooden combination coaches from the Hicks Locomotive & Car Works.

The Colorado & Southern, as reported in the *Railway Age Gazette* of March 25, has ordered 500 all-steel dump gondola cars from the Pressed Steel Car Co., and 300 forty-ton box and 200 thirty-ton stock cars from the Mt. Vernon Car Mfg. Co. In addition to these orders one dining car was ordered from the Pullman Co. The orders for the other equipment mentioned in the inquiry reported March 11 will be placed in a short time.

MACHINERY AND TOOLS.

The Marshall & East Texas has ordered from Joseph T. Ryerson & Sons, Chicago, the complete equipment for its boiler shop at Marshall, Tex.

The Pittsburgh & Lake Erie has ordered from the Industrial Iron Works, Bay City, Mich., a 100-ton wrecking crane with a 10-ton lifting magnet. The crane is to be installed in the car repair shops at McKees Rocks, Pa.

The American Car & Foundry Co. has ordered an 18-in. x 24-in. single tandem gas engine and a 250-k.w., 240 to 250-volt d.c. generator for its Huntington, W. Va., plant. The equipment will be furnished by the Allis-Chalmers Co., Milwaukee, Wis.

The Boston & Maine has ordered the electrical equipment for the installation of a motor-driven fan in the Hoosic Tunnel from the Allis-Chalmers Co., Milwaukee, Wis. The order includes a 150-k.v.a., 2,300-volt, three-phase, 60-cycle, 900-r.p.m. synchronous motor to be direct-belted to the fan, three 50-k.v.a. oil-filled, self-cooling transformers to step the current down from 6,600 volts to 2,300 volts, and a 5-k.w. belted exciter.

IRON AND STEEL.

The Chicago City Railway is in the market for 5,000 tons of street railway rails.

The Cleveland Electric Railway has ordered 8,000 steel ties from the Carnegie Steel Co.

The St. Joseph & Grand Island has ordered 2,500 tons of rails from the Illinois Steel Co.

The Milwaukee Electric Railway & Light Co. is said to have ordered 4,500 tons of girder rails from the Pennsylvania Steel Co.

General Conditions in Steel.—Reports indicate that steel orders are being taken at close-to-production rate by practically all of the steel companies. The United States Steel Corporation is understood to be receiving between 35,000 and 40,000 tons per day in orders. During the next six months the equipment companies are expected to be the heavy buyers as orders and inquiries for cars and locomotives have been brisk during the past two weeks. The annual report of the Bethlehem Steel Co., for the year ended December 31 last, just issued, shows a net manufacturing profit of $2,645,457 against $2,020,208 for the previous year.

SIGNALING.

Automatic Signal Costs on the B. & O.

F. P. Patenall, signal engineer of the Baltimore & Ohio, reports the cost of maintenance and operation of his electrically-lighted automatic semaphore block signals for the year 1909 as $100 per blade; and he finds that the system compares favorably with signals lighted by oil lamps, not only in performance but in cost. Between Baltimore and Washington there are 69 lamps. These were lighted and extinguished 1,259,250 times, while on the Metropolitan branch 38 lamps were lighted and extinguished 208,050 times, and during the year there were but nine failures, four being caused by lightning and five by films burning out. This system of electric lighting for signal lamps, patented by Messrs. Patenall and Dryden, has been in use over two years. When burning the lamps consume approximately one-half an ampere of current, and on the Washington branch, where 50 trains are run in each direction daily, this results in each lamp burning 1 hour and 40 minutes each 24 hours. The lamps light upon approach of the trains both day and night.

The territory covered by these 107 signals is divided into five sections, and each section has one repairman and one batterman, no lampman being required.

The cost of repairs and maintenance for these signals for the year was as follows:

Blue vitriol	(41,637 lbs.)	$1,782.05
Zincs (2,804)	$786.54	
Coppers (83)	4.61	
	$791.15	
Less credit scrap, copper and zinc.	567.45	
		223.70
Battery jars (10)		1.10
Repair material		139.46
Batterymen labor (5 at $55 per month)		3,330.00
Repairmen labor (5 at $75 per month)		4,500.00
Supervision.		840.00
		$10,786.31
Pounds of blue vitriol used per signal per month		32.4
Maintenance and operation:		
Cost per signal blade, per annum		$100.00
Cost per signal indication, per annum		50.40
Cost per signal blade, per day		.28
Cost per signal indication, per day		.14

Current for lighting the lamps is obtained from the same source as for operating the motor, viz., six cells of storage battery, charged by 18 cells of gravity for each pair of signals. At interlocking plants, where frequently four signals are operated from the battery in one well, seven cells of storage are used, charged by 21 cells of gravity battery. With this system the wages of five lampmen, equivalent to $225 a month, has been saved.

FOREIGN RAILWAY NOTES.

The Port-Arthur-Dalny Railway has been ceded to Japan and, according to report, the Chinese retain the civil administration of the South Manchuria Railway district.

The selection of a route to connect South Siberia and Altai with the main line of the Siberian Railway is now in the hands of a commission. It is understood that Semipalatinsk will be the terminal point and the point of junction lies between Omsk and Tomsk.

Otto Hagend, who reached the highest rank in the Prussian State railway service and retired from it in 1895, and for the last ten years has been one of the editors of the journal of the German Railroad Union, was killed by an automobile in Nice March 1 last in his 68th year.

Capital has been subscribed by the merchants and gentry in the Chefoo district for the purpose of constructing the Chefoo-Weihsien Railway, for which there has been much agitation during the last two years. Application for registration has been made to the ministry of agriculture, industry and commerce. This line is believed to promise the salvation of Chefoo as a commercial port.

There was recently a meeting held in Leipzig, largely attended by state railway employees, which was addressed by a Social-Democratic delegate to the Saxon Diet, who had been a brakeman. At this meeting the railway men were invited to join a "Railroaders' Union," doubtless of the Social-Democratic stamp. Thereupon the Saxon authorities put up placards at the shops and elsewhere calling attention to the fact that membership in this union, any support of its measures and attending its meetings are prohibited under penalty of dismissal from the state railway service.

ANNUAL REPORT.

EIGHTIETH ANNUAL REPORT OF THE DELAWARE & HUDSON COMPANY: YEAR ENDED DECEMBER 31, 1909.

New York, N. Y., March 31, 1910.

To the Stockholders of The Delaware & Hudson Company:

The President and Managers submit the following statement of the affairs of the Company for the year ended December 31, 1909:

The results from operation of the Coal Department of the Company, were:

	Coal produced and purchased.	Receipts.	Expenses.‡	Net.
1909.....	6,238,653 tons.	$16,340,290.43	$16,133,836.38	$206,454.05
1908.....	6,814,200 tons.	†23,847,116.58	†22,993,999.99	853,116.59
Decrease..	575,547 tons.	$7,506,826.15	$6,860,163.61	$646,662.54

†Includes cost of coal added to stock during year.
‡Including taxes.

The results from operations of the Railroads of the Company were:

	Miles.	Earnings.	Expenses.*	Net earnings.	Percentage of expenses to earnings
1909..	843.46	$19,525,859.46	$11,458,479.58	$8,067,379.88	58.68
1908..	845.26	18,500,731.43	10,811,720.87	7,689,010.56	58.44
Inc....	†1.80	$1,025,128.03	$646,758.71	$378,369.32	0.24

* Excluding taxes.
† Decrease.

The general distribution of the earnings and of the operating expenses of the railroads of the Company was as follows:

	1909.	1908.	Increase or *decrease.*
EARNINGS			
From Coal Fr't Traffic.	$8,311,478.85	$9,106,819.84	*$795,340.99*
From Mdse. Freight Traffic, includes switching..	7,691,617.44	6,162,180.98	1,529,436.46
From Passenger Traffic.	2,834,628.48	2,693,672.13	140,956.35
From Express Traffic ..	205,909.51	189,656.38	16,253.13
From Transportation of Mails.	125,947.74	132,315.96	*6,368.22*
From Miscell. Sources...	356,277.44	216,086.14	140,191.30
Gross Earnings	$19,525,859.46	$18,500,731.43	$1,025,128.03
EXPENSES:			
For Maintenance of Way and Structures	$1,334,546.21	$1,417,318.58	*$82,772.37*
For Maintenance of Equipment	2,598,566.26	2,219,542.60	379,023.66
For Traffic Expenses ..	227,346.94	204,849.29	22,497.65
For Conducting Transportation	6,821,392.37	6,528,112.31	293,280.06
For General Expenses ..	476,627.80	441,898.09	34,729.71
Total Expenses	$11,458,479.58	$10,811,720.87	$646,758.71
Net Earnings from Operation	$8,067,379.88	$7,689,010.56	$378,369.32
Percentage of Expenses to Earnings.	58.68	58.44	0.24

NOTE.—Decreases in *italics*

GENERAL INCOME ACCOUNT OF THE DELAWARE & HUDSON COMPANY, YEAR ENDED DECEMBER 31, 1909, IN COMPARISON WITH YEAR ENDED DECEMBER 31, 1908.

	1909.	1908.	Increase or *decrease.*
COAL DEPARTMENT:			
Gross Receipts.....	$16,340,290.43	$23,847,116.58	*$7,506,826.15*
Gross Expenses (excluding taxes of $301,421.22)	15,832,415.16	22,701,698.26	*6,869,283.10*
Net Earnings	$507,875.27	$1,145,418.32	*637,543.05*
RAILROAD DEPARTMENT:			
Gross Earnings	$19,525,859.46	$18,500,731.43	$1,025,128.03
Operating Expenses (excluding taxes of $411,468.62)	11,458,479.58	10,811,720.87	646,758.71
Net Earnings from operation	$8,067,379.88	$7,689,010.56	$378,369.32
OTHER INCOME:			
Hire of Equipment	$100,611.50	$275,046.59	*$174,435.09*
Outside Operation	Dr. 2,684.51	Dr. 1,417.17	Loss 1,267.34
Dividends and Interest on Securities Owned..	1,088,013.71	803,599.38	284,414.33
General Interest and Discount.	504,519.36	375,163.23	129,356.13
Miscellaneous Items	126,283.67	52,283.39	74,000.28
Total Other Income...	$1,816,743.73	$1,504,675.42	$312,068.31
Gross income	$10,391,998.88	$10,339,104.30	$52,894.58
DEDUCTIONS FROM INCOME:			
Rentals	$2,076,265.96	$1,897,628.11	$178,637.85
Taxes	712,889.84	705,330.93	7,558.91
Interest on 1st and Refunding Mort. Bonds (1943)	542,253.89	243,998.34	298,255.55
Interest on 1st Mortge. Bonds (1917)	350,000.00	350,000.00	.....
Interest on The D. & H. Co. Debenture Bonds (1916)	559,061.67	559,080.00	*18.33*
Interest on 1st Lien Equipm't Bonds (1922)	450,000.00	450,000.00	.....
Interest on Car Trust Bonds (1909)	2,625.00	7,875.00	*5,250.00*
Interest on Equipment Debenture Bonds (1914)	$36,000.00	$44,000.00	*$8,000.00*
Interest on Divisional Bonds	75,000.00	75,000.00	.....
General Interest and Discount.	392,678.44	707,299.73	*$14,621.29*
Miscellaneous Items.....	384.14	44,433.83	*44,049.69*
Total Deductions	$5,197,158.94	$5,084,645.94	$112,513.00
Net Income Carried to General Profit and Loss..	$5,194,839.94	$5,254,458.36	*$59,618.42*
Percentage to Capital Stock	12.22% on $42,501,000.00	12.39% on $42,400,000.00	....

NOTE.—Decreases in *italics*.

FINANCIAL.

The Balance Sheet shows an increase in Liabilities of $2,338,628.78, the principal changes being as follows:

Capital Stock.

Additional Capital Stock of The Delaware and Hudson Company to the amount of $101,000 was issued during the year, in exchange for $1,000 The Delaware and Hudson Company Debenture Bonds of 1916 and $201,000 The Albany & Susquehanna Railroad Company First Mortgage Bonds.

Funded Debt.

The Public Service Commission having approved the issue by the Company of additional First and Refunding Gold Bonds to the amount of $7,395,000, the bonds were issued and sold during the year. The Company realized from the sale $7,108,991.25. The discount of $286,008.75 was charged to General Profit and Loss Account.

In accordance with the Equipment Trust Indenture, dated June 1, 1907, $650,000 was paid the Trustees on July 1, 1909.

By the payment of $150,000, due May 15, 1909, the Car Trust Certificates of 1909 were entirely paid off. The indenture has been canceled of record, and title in the equipment covered thereunder has been transferred to this Company.

The amount of Debentures of 1914 shows a reduction of $200,000, the bonds maturing January 1, 1909, having been retired during the year under the provisions of their issue.

The amount of Debentures of 1916 shows a reduction of $1,000, one bond having been exchanged for Capital Stock of The Delaware and Hudson Company.

Floating Debt.

The Floating Debt of the Company decreased $4,175,000 during the year.

Dividends.

On December 29, 1909, a dividend for the year 1910, upon the outstanding $42,501,000 of Capital Stock of the Company, was declared out of the earnings for the preceding years at the rate of nine (9) per cent. upon the par value thereof, and amounting in the aggregate to $3,825,090, payable as follows:

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon February 26, 1910, and payable upon March 21, 1910.

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon May 28, 1910, and payable upon June 20, 1910.

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon August 30, 1910, and payable upon September 20, 1910.

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon November 29, 1910, and payable upon December 20, 1910.

GENERAL REMARKS.

Coal Department Operations.

The collieries and washeries of the Company were idle a portion of the year on account of the general depression in the coal business; they produced 6,199,042 tons of anthracite coal out of a total of 61,969,885 tons produced in the region.

The Coal Department expenses include construction and betterments amounting to $720,713.46.

Taxes of the Coal Department for the year 1909 increased $9,119.49.

On June 1, 1909, a contract was made with The Hudson Coal Company by which that Company purchases outright, at the pit-mouth, all the coal produced from the mines belonging to this Company.

Coal Department Relief Fund.

The report of the Coal Department Relief Fund for the year ending December 31, 1909, is as follows:

RECEIPTS:		
Balance on hand, January 1, 1909.....		$2,782.37
Contributed by employees in 1909.....	$10,983.94	
Contributed by The Delaware and Hudson Company, 1909.....	6,987.80	
		17,971.74
TOTAL		$20,754.11
DISBURSEMENTS:		
Accident death benefits.....	$2,044.46	
Accident disablement benefits.....	11,349.00	
		13,393.46
BALANCE ON HAND, DECEMBER 31, 1909		$7,360.65

These funds were authorized by vote of the stockholders on May 10, 1887, since which time the benefits paid have amounted to $313,029.90, to which the Company contributed $157,940.16.

Railroad Department Operations.

The earnings from Coal Freight traffic decreased $795,340.99, largely due to the general depression in the coal business during the latter part of the year. The earnings from Merchandise traffic increased $1,529,436.46, and from Passenger traffic increased $140,956.35.

The ratio of expenses to earnings for the year 1909 shows an increase of 24-100ths of 1 per cent. over 1908.

The expenditures during the year on account of additions and betterments of the Company's railroad amounted to $720,458.99. This included $50,797.29 for continuing the work of strengthening bridges

on the Susquehanna and Pennsylvania Divisions, $222,071.91 for additional right of way, and $136,046.83 for additional main and side tracks.

A contract has been entered into with the American Locomotive Company for the purchase of six Mallet Articulated Compound Locomotives. These locomotives will be delivered early in the year 1910.

The extension of The Quebec, Montreal and Southern Railway from Pierreville to Fortierville (formerly Ste. Philomene) was completed and put into operation June 14, 1909. The work of extending the line from Fortierville to Levis (opposite Quebec) is held in abeyance because of the destruction of the Quebec Bridge while in course of erection. The Dominion Government has arranged to take over this work, and it is believed that contracts for a new bridge over the St. Lawrence River will be awarded during the year 1910.

Electric Railway Earnings.

The earnings of the electric lines show a substantial improvement, the several roads showing increases in the net earnings as follows: United Traction Company, $141,772.55; Hudson Valley Railway Company, $32,573.03; Troy and New England Railway Company, $12,477.97; Schenectady Railway Company (including Electric Express Company), $110,659.91, and Plattsburgh Traction Company, $1,394.47.

Dividends of 4 per cent. for the year 1909 were declared on the Capital Stock of the United Traction Company, the Schenectady Railway Company, the Troy and New England Railway Company and the Plattsburgh Traction Company.

Mechanicville Power Plant.

The earnings of the Mechanicville Power Plant for the year were $86,031.43, an increase of $59,908.87 over 1908. This power plant develops 3,000,000 K. W. hours per month with 4,000 K. W. installed; and the buildings, foundations, etc., are arranged for the installation of 6,000 K. W. additional.

The Fort William Henry Hotel Company.

During the year the Company purchased the entire outstanding capital stock of The Fort William Henry Hotel Company.

This property consisted of about twenty (20) acres of land, a summer hotel and outbuildings erected thereon, together with furniture and other personal property, all situated in the Village of Lake George, Warren County, New York, at the point of interchange of traffic between the Company's railroad and the steamers of The Lake George Steamboat Company.

On June 24, 1909, as it was about to open for the season, the hotel and contents were totally destroyed by fire. The loss was covered by insurance.

The tourist business to and through Lake George suffered some loss in 1909, which is believed to have been due largely to insufficient hotel accommodations.

Arrangements are now being made to rebuild the hotel.

Litigation.

The litigation referred to in the Company's last Annual Report in reference to the so-called Commodity Clause added to the Interstate Commerce Act in 1906, was terminated during the year by the decision of the United States Supreme Court to the effect that the said Commodity Clause did not prevent carrier corporations from transporting, in interstate commerce, coal which they had originally mined but which they had sold before such transportation, nor prevent a carrier corporation from transporting in interstate commerce coal belonging to a coal company some or all the shares of the capital stock of which were owned by such carrier. Since this company sells in the State of Pennsylvania all the anthracite coal produced from its mines it can therefore lawfully transport such coal on its railroads.

The judgment against this company in favor of The Albany and Susquehanna Railroad Company and its stockholders, referred to in the last Annual Report, was affirmed upon appeal, and this judgment was duly paid and satisfied by the Company. The result of this litigation is that this Company does not receive the benefit, to which its Managers had believed it to be entitled, from the saving of interest, amounting to $120,750 annually, effected by the refunding at 3½ per cent., in the year 1906, of $3,450,000 7 per cent. Bonds of The Albany and Susquehanna R. R. Co. Bonds then maturing, but the saving thereby effected goes to The Albany and Susquehanna R. R. Company. This Company, however, does receive the benefit of the saving of 3½ per cent. annually then effected by the refunding of the remaining $7,050,000 of the $10,000,000 issue of The Albany and Susquehanna R. R. Co. Bonds. Under the judgment the Company paid $1,350,512.36 back rentals, which amount was charged to General Profit and Loss Account. The Company owns about 13 per cent. of the stock of The Albany and Susquehanna R. R. Co., and to that extent will participate in the distribution of the saving effected through the refunding of the 7 per cent. bonds.

The litigation in respect to the contract under which this Company is operating the Ticonderoga Railroad, about 1.41 miles in length, is still pending upon appeal taken by this Company against an adverse decision of a Referee.

During the year the Supreme Court and the Court of Appeals each unanimously reversed the order of the Public Service Commission of the Second District, State of New York, refusing to approve the issue by the Company of its First and Refunding Mortgage Bonds, for the purpose of discharging its obligations incurred in the purchase, in 1906 and 1907, of certain coal lands and traction lines, and thus permitted the Company to carry out its original plans in this respect.

On October 27, 1909, Mr. R. S. Lovett was elected a member of the Board to fill the vacancy caused by the death of Mr. Edward H. Harriman

By order of the Board of Managers,

L. F. LOREE,
President.

Freight Traffic Statistics—Years 1909 and 1908.

ALL COMMODITIES.	Year 1909.	Compared with 1908. Increase.	Decrease.
Miles of road	843.46	.....	1.80
Freight earnings	$15,938,522.51	$709,764.73	.....
Per cent. of total earnings	81.628	.....	.686
Number of tons carried	17,817,464	207,754	.....
Number of tons, one mile	2,391,653,458	256,309,159	.....
Average miles each ton was carried	134.20	12.97	.....
Number of tons carried per mile of road	21,124	.291	.....
Number of tons carried one mile per mile of road	2,834,815	309,267	.....
Freight earnings per mile of road	$18,896.60	$879.95	.....
Average earnings per ton	.89454	.0298	.....
Average earnings per ton per mile	.0067	.....	.0004
Average number of tons loaded in car	24.28	.....	0.21
Average train loads (tons)	414.66	16.97	.....
Average number of loaded cars in train	17.08	0.84	.....
Average number of empty cars in train	8.40	.....	0.76
Revenue frt. train mileage	5,766,286	398,414	.....
Revenue freight train mileage per mile of road	6,836	.485	.....
Freight earnings per revenue freight train mile	$2.7641	.....	.0729

BALANCE SHEET.

Assets.

	1909.	1908.	Increase.	Decrease.
Unmined Coal, Owned and Controlled	$18,462,664.86	$18,594,577.83	.....	$131,912.97
Advances on Unmined Coal	542,425.78	501,547.87	$40,877.91	.....
Real Estate	5,150,124.36	4,987,228.35	162,896.01	.....
Road and Equipment—The D. & H. Co.	47,839,824.94	47,253,235.83	586,589.11	.....
Road and Equipment—Canadian Lines	6,271,702.56	5,662,851.22	608,851.34	.....
Marine Equipment	9,880.00	9,940.00	.....	60.00
Coal Department Equipment, Cars, Motors, Mules, Horses, etc.	1,074,724.82	1,022,411.24	52,313.58	.....
Coal Handling and Storage Plants	267,476.43	273,447.27	.....	5,970.84
Stocks and Bonds	23,588,805.57	23,364,060.57	224,745.00	.....
Cash	1,850,765.48	830,919.34	1,019,846.14	.....
Fire Insurance Fund	286,536.26	249,142.49	37,393.77	.....
Equipment Trust Fund	673,404.79	12,852.55	660,552.24	.....
Supplies on Hand	2,481,726.84	2,920,837.73	.....	439,110.89
Coal on Hand	*	1,283,206.09	.....	1,283,206.09
Bills and Accounts Receivable	5,803,757.70	4,373,277.51	1,430,480.19	.....
Advances for Construction and Acquisition of New Lines	1,306,218.85	2,377,593.64	.....	1,071,374.79
Total	$115,610,039.24	$113,717,129.53	$1,892,909.71	.....

* Included in Bills and Accounts Receivable for 1909.

Liabilities.

		1909.	1908.	Increase.	Decrease.
Capital Stock		$42,501,000.00	$42,400,000.00	$101,000.00	.....
Bonds as follows:					
1st and Refunding Mortgage Bonds, 1943, 4%	$20,704,000				
1st Mtge. Bonds, 1917, 7%	5,000,000				
The Adirondack R'y Co. 1st Mtge. Bonds, 1942, 4½%	1,000,000				
Schenectady & Duanesburgh R. R. 1st Mtge. Bonds, 1921, 6%	500,000				
The D. & H. Co. Debentures, 1916, 4%	13,976,000				
1st Lien Equipment Bonds, 1922, 4½%	10,000,000				
Equipment Debentures, 1914, 4%	900,000				
Total Bonds		52,080,000.00	45,036,000.00	7,044,000.00	$4,175,000.00
Loans Payable		4,325,000.00	8,500,000.00	.....	.....
Interest, Dividends, etc., Accrued		1,076,951.67	613,784.67	463,167.00	.....
Interest, Dividends and Bonds due and not yet collected		178,554.60	193,601.10	.....	15,046.50
Accrued Taxes		106,273.52	112,041.16	.....	5,767.64
Sinking Fund		1,201,538.87	805,454.55	396,084.32	.....
Audited Vouchers and Pay Rolls		2,840,346.86	3,611,577.61	.....	771,230.75
Other Accounts Payable		220,888.22	919,465.92	.....	698,577.70
Total Liabilities		$104,530,552.74	$102,191,925.01	$2,338,628.73	.....
General Profit and Loss, being excess of Assets over Liabilities		11,079,485.50	11,525,204.52	.....	$445,719.02
Total		$115,610,039.24	$113,717,129.53	$1,892,909.71	.....

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GENERAL NEWS SECTION 1003

SUPPLY TRADE SECTION 1019

We discuss elsewhere the decision of the Interstate Commerce Commission in the Pullman case, which decision is reprinted quite fully in this issue. The dissenting opinion of Chairman Knapp is given almost in full. It is an exceptionally good example of clear, common sense reasoning expressed in language that is entirely free from annoying legal phrases and repetition. It will be recalled that Chairman Knapp wrote a dissenting opinion in the Portland gateway case, and that the United States Supreme Court, in overruling the majority findings of the commission, commented on its agreement with the minority opinion.

In connection with the 113 miles of railway track which have been elevated in Chicago about 110 miles of retaining walls have been built. A conservative estimate of the average cost of these walls is $25 per lineal ft., making the total cost $14,520,000. In another column we print a paper and discussion dealing with theories of earth pressure, which have a very direct bearing on the question of the best design of retaining walls. Theories of earth pressure have been relegated by many practical engineers to the limbo of discarded thoughts of great minds. They have been regarded for years as the playthings of professors—mathematical recreations interesting because consistent results could be got on paper, but rather neglected by designers because practical men declared them to lack value. The accumulated experience of ages is, instead, relied on by conservative engineers, and practice in regard to them has become settled. The advent of the reinforced concrete wall, however, has made earth pressure a live question. The committee on masonry of the American Railway Engineering & Maintenance of Way Association gave instances in its 1909 report of reinforced concrete retaining walls costing 25 per cent. less than walls of gravity type of presumably equal stability. There are no precedents to guide in the building of this type of wall. Engineers must accumulate experience, and the hypothesis as to earth pressure will govern in design until safe precedents are established. Only experience and such discussion as that of Mr. Mohler's paper will bring out the true worth of the theory advanced by the author of that paper. Its main immediate value to interested parties will, perhaps, be in the discussion it evokes. The reinforced concrete walls costing 75 per cent. as much as plain concrete walls of the same computed stability were designed in accordance with a theory generally believed to err far on the safe side. This being the case, extensive experiments and good discussions may result in a further reduction of cost. Bridges have been built from time immemorial, but rule of thumb methods were followed until the advent of railways. Their coming caused the importance of a knowledge of stresses in bridges to be realized; and careful studies were made with the result that less than 70 years ago an American showed the world how to effect economy in bridge design. A realization that safe retaining walls of reinforced concrete cost much less than gravity walls, even when designed according to a hypothesis rather than by following a theory demonstrated to be true by experience, should lead in the near future to a settlement of moot questions involving earth pressure. The railway engineers can settle these questions if backed by proper authority and given the money to make proper experiments.

The restaurant at the Grand Central station, New York City, now puts up an attractive luncheon for travelers. It is packed in a box convenient for carrying, and consists of four sandwiches of different kinds, olives, cake, fruit and a paper napkin. The price is 35 cents. In England, where dining cars are not so nearly universal as here, the sale of filled lunch baskets is common on all railways. In this country the field is limited, but there certainly is a field in large cities, particularly on Sundays and holidays during the summer when a day's excursion into the country is popular. The convenience of being able to pick up an attractive lunch at the last minute instead of preparing it at home in advance is sure to be appreciated. No one who has gone up from New York to New Haven on the day of a big football game will forget the discomfort and difficulty of getting luncheon after arriving at New Haven. Again, the lunch basket ought, if possible, to be popularized, as a means of promoting the simple life. We cannot say that any railway officer has a duty to spend either money or thought in this direction, but from the passenger's standpoint the matter is not beneath notice. Occasions often arise when, under present arrangements, the choice lies between spending 50 minutes (or more)

in time and 100 cents (or more) in money for a full meal, and going without anything whatever to eat; when the more agreeable way would be to spend twenty minutes, and a reasonable sum, on a light luncheon. By "simple life" we mean not merely abstention from ten-ounce steaks when the appetite calls only for a sandwich, but also avoidance of the irksome waiting which is necessary when dining cars are crowded. Dining cars worked beyond their capacity are now common. Few roads are so reckless of their expenditures as to put on two dining cars when by making a part of the diners wait one car will answer; and the waiting is decidedly unpleasant. The dining car is a great convenience, but it is maintained under serious disadvantages. Inasmuch as most of these difficulties are unavoidable it is regrettable that a considerable percentage of the patrons of the cars must put up with the added inconvenience of waiting for the people at the first table to finish in a leisurely way a five-course dinner. The lunch box has great possibilities as an educator!

PERFORMANCE OF MALLET ENGINES ON THE GREAT NORTHERN.

The figures regarding the performance of the Mallet locomotives on the Cascade tunnel line of the Great Northern, as given in another column, check very closely with observations made on the same type of locomotive elsewhere. It shows that the internal resistances of these engines is very high. On the 1.7 per cent. grade the average resistance of three engines and their tenders was 20,347 lbs. for a weight of 250 tons. Subtracting that due to grade, or 8,500 lbs., we have a remainder of 11,847 lbs. for the total of internal resistances, showing that the engines would not drift down the grade, which is quite in accord with conditions that have been found to exist elsewhere, where steam must be used to take the locomotive down grades of from 1 to 1.25 per cent. The resistance of the consolidation locomotive, weighing 159 tons, was 10,080 lbs. Subtracting that due to grade, or 5,406 lbs., we have 4,674 lbs. for internal resistance, showing that the engine would drift down this grade, though not down one of 1 per cent., which is not quite in accord with practice elsewhere, where consolidations do drift readily down such grades. The Pacific locomotive tested at the same place showed the lowest percentage of internal resistances. It weighed 188 tons and required 10,270 lbs. to haul it. This left, deducting for grade, only 3,878 lbs. for internal resistances.

That the Mallet should hold back with more strenuousness than the ordinary single locomotive is easily understandable, but why its resistance should be so very much greater is not so readily explained. There is, to be sure, the side motion of the boiler on its front supports, and it is evident, from breakages that have occurred, that there should be a greater flexibility between the front and rear trucks than is usually allowed; but even taking these into consideration, it does not explain why the internal resistance of the Mallet should be 2.37 per cent. of its weight as against 1.37 per cent. for the consolidation. It looks as though there were probably some, as yet, undetected binding on the rails, and this suspicion is strengthened by the fact that considerable trouble has been experienced in some places by the breaking of the connections between the two trucks. Adding to this the fact that the consolidation locomotive, with eight wheels coupled, offers a greater resistance than the Pacific locomotive, with but six, it seems as if this binding of the wheel on the rail is a promising place in which to search for the trouble.

Of course the figures given for the engines on the Cascade grade are for resistances set up by an engine being towed; whereas, in service, the locomotive is working under its own steam. This would make some difference in the actual quantities, though the proportions between the several engines would hold, leaving the Mallet with the still unexplained excess.

THE DECISION IN THE PULLMAN RATE CASE.

It is not conceivable that the Pullman Company will submit without a contest to the order of the Interstate Commerce Commission for reductions of its rates. If the validity of the order is litigated, the courts will be called on to pass on several interesting and important questions.

In the first place, it is a question whether the commission has jurisdiction over sleeping car rates. Sleeping car companies are declared to be common carriers by the Hepburn act. But is a sleeping car company a common carrier in fact? And if it is not, can it be made one by legislation? Such a company does two distinct things. It furnishes the traveler with a seat to sit in and a berth to sleep in; for this it is paid by the traveler. It also provides him a car to ride in, and for the use of this car the railway which furnishes the motive power and the track usually pays on the basis of the mileage the car is hauled. In the latter capacity, the sleeping car company is plainly an agent of the railway. It has been contended that in its former capacity it is an innkeeper. If in this capacity it is an innkeeper, can congress or the commission regulate its charges, as such? It seems rather probable that the courts will hold that it is really the agent of the railway in both capacities, and that, therefore, it is a carrier whose charges are subject to regulation to the same extent as are those made by the railway for transportation.

If the courts do so hold, they will then have to pass directly, it would seem, on the legality of the commission's order regarding the Pullman Company's rates. The commission really made two rulings. One is that it is unfair to charge the same for an upper as for a lower berth. We have heard some persons say that they prefer an upper berth. They are decidedly exceptional. To a great majority the value of the service rendered in providing them with a lower berth is much greater than that rendered in providing them with an upper. On this basis it seems an unfair discrimination to charge the same for an upper as for a lower, and the commission appears justified in requiring that a difference be made in the rates.

The second ruling of the commission, from which Chairman Knapp and Commissioner Harlan dissent, is that the rates of the company as a whole are unreasonable, this being based, seemingly, entirely on the ground that it has been earning excessive profits. But the Pullman Company makes cars as well as operate them. As a manufacturer it is not subject to public regulation, no matter how large its profits, as such, may be. Moreover, as a manufacturer it cannot be contended that the company has a monopoly. Therefore, before it can be held that its rates are unreasonable because its profits as a carrier are excessive, its profits as a carrier must be carefully segregated from its profits as a manufacturer. Whether the commission has done this is a question of fact for judicial determination. And even if, after a correct segregation has been made, it shall be found that the company's profits as a carrier are large, it does not follow that its rates may be reduced. Whether a carrier's rates may be reduced merely because its profits are large and regardless of the value of the service it renders, is a question of law which has never been directly passed on by the Supreme Court of the United States. Several million persons testify each year by riding in the Pullman Company's cars that they regard the service it renders as worth what it charges for it. Assuming the Pullman Company will be held to be a common carrier, the case presents as nicely and directly as any that has come under our observation the question of whether a carrier's rates may be reduced merely to reduce and limit its profits.

NEW PHASES OF THE RAILWAY LABOR PROBLEM.

The most striking feature of the railway post-panic year 1908 was, perhaps, the abnormal position into which it forced the railways in their policy toward labor. The panic of 1907 came on and its after results ensued at a time when labor was highly organized and assertive. It threatened in advance strikes should any attempt be made to reduce wages. The only sentimental effect on the labor union of hard times and reduced railway earnings was to suppress its noble rage for an advance of wages and postpone it to better times. The logical sequel in the policy of the railway companies followed and, indeed, was compelled by necessity. Debarred from the natural remedy of reducing wages, with public sentiment set firmly against any increase of rates and with the federal "big stick" and the lesser state sticks in menacing poise, the railways' direction of least resistance was the reduction of forces; and that reduction followed on a very large scale. It ran down in many cases to the lowest point consistent with public safety in operation. The head of one of the large eastern railways could be quoted here as saying at the time that but for the reductions of train service the matter of conserving public safety with his reduced operating force would have been a problem grave if not insoluble.

The reduction had two other aspects, one of them strongly emphasized at the time. It enabled the railway to discharge its least efficient men and, relatively, it made the labor retained more efficient—not only because it was naturally so, but because it was spurred by the fear of losing its job. The other aspect relates to the attitude of organized labor itself. In effect, organized labor proclaimed as its policy the intensified penalty for the few as the better alternative for the slight advantage of the many. The union, rather than assent to a reduction of ten per cent. in the wage, would be willing to see twenty per cent. of its members discharged and go on a basis of semi-starvation. Had the hard times been longer, had they reached down deeper, had they been commensurate with the panic and "long drag" of 1873 and after years, this illogical, not to say inhumane, position of the unions would have come out in more vivid perspective.

With the revival of business on the railways, economic history now repeats itself and organized labor is asking increased wages accompanied with the usual threat of a strike. After an indefinite number of years there will again be a period of railway depression. But through both periods, whether of depression or prosperity, several new facts are beginning to be writ large. One is the tendency of labor to trench more and more upon the railways' gross earning power. Another is the increased unwillingness of the railway to face the consequence of a strike. A third has already been expressed in the experiences of 1908, when for the old and orthodox remedy of wage reduction there was substituted the reduction of the working force, raising sharply the question whether wage reduction hereafter is to be outworn and the more cruel expedient supersede it. But these subordinate questions are lost in a larger one. Insistent claims of labor, making larger and larger drafts upon the earning power of the railways have thus far been measurably met by fresh operating and mechanical efficiencies. But the claims of labor have no natural limit. They grow with labor's own organized strength, while to railway efficiency and economy there must be a limit somewhere. What will be the line of readjustment when this limit is reached? Will there be a reversion to old remedies, or a resort to new ones with some such principle as compulsory arbitration in the foreground, certain to be urged more strenuously as the railways' relation to public necessity and convenience intensifies?

Partly then as the result of economic changes, of which the rise in the cost of living is most prominent, one finds these elements in the railway labor situation, some of them new, some of them old forces but with higher potentials. They are conspicuous now in the numberless controversies of labor with the railway corporations which are everywhere in the land. Historically speaking, never heretofore have we had general conditions when organized labor has been more assertive, when the railway corporation has been held more unjustly under the restraints both of public sentiment and of civic authority and when the normal economic remedies have been denied them. Large earnings relieve the immediate stress and give a margin for compromise; and when in future years the inevitable backward swing of the pendulum to industrial depression comes, there will undoubtedly be a margin for increased operating efficiencies. But with the present drift of things, in the long look ahead one must forecast with some anxiety the time when the waxing demands of labor, urged at shorter and shorter intervals, overtakes the railway managements' economies.

Letters to the Editor.

WASHING WINDOWS.

Decatur, Ill., April 10, 1910.

To the Editor of the Railway Age Gazette:

I have read J. B. Tate's statement in your issue of April 8, page 937, claiming to have used a device for washing windows several years ago. It is quite possible that this is true. The first ideas of the telephone, automatic coupler, automatic brake, etc., on which thousands of patents have been issued, were claimed by several.

I have seen the cleaning of coaches daily for more than 15 years. I have seen one man with a bucket of water as dirty as the coach, and which had to be replenished every few minutes, and with a brush which he held on the ground with one foot while he jammed a pole into its head, take 40 minutes or more to distribute many buckets of dirty water over the car's surface and down his own arms. This forced upon me the question, Why not provide some way to use an abundance of clear water to flush off all this dirt without getting a drop of water on the man, and do a thorough, workmanlike job in 15 minutes instead of a very bad job in 40.

I have acted as this question suggested and have developed a window washing device from a crude model into a commercial success. This device has been in use by many roads for the past three years and is covered by clear patents. Because someone else may have used a similar device does not affect my claim as inventor and patentee of mine.

George R. Stanton.

[We publish Mr. Stanton's letter in order to give him the same opportunity to present his case as was given to Mr. Tate last week. This ends the discussion in these columns.—Editor.]

LIGHT CENTER SILLS FOR STEEL CARS.

Chicago, April 7, 1910.

To the Editor of the Railway Age Gazette:

I have read with interest and considerable surprise your editorial headed "Light Center Sills for Steel Cars" in your issue of March 25, Page 812, and would like to call the attention of your readers to some of the statements in it with which I take issue.

In the first place, you compare the center sills of cars "A" and "B," "B" being a "good design," but fail to state that the center sills of car "A" are designed to carry only the portion of the load coming on the center sills, the trussed sides carrying the majority of the load, while the center sills of car "B" are designed, quoting from Arbitration Case No. 792, "to carry the entire rated capacity of the car plus 10 per cent. overload plus the weight of the superstructure and 20 per cent. of the gross weight for oscillation." Is it giving car "A" quite a fair deal to compare it with a design almost diametrically opposite, and are comparisons so made of any

value whatever? It is now common practice in both steel passenger and steel freight design to carry the load anywhere from entirely on the center construction to entirely on the side construction, in the latter of which cases the center sills are only called on to resist the pulling and buffing strains and do not, therefore, demand the strength required in the other designs. It is for this very reason that no set rule can be made as to the proportion of center sills, and the 1908 M. C. B. committee on "Steel Pessenger Cars" fully appreciated this.

In the second place, the statement is made that the moment of inertia in columns of the same length is a measure of stiffness. It is my understanding that the strength of columns of equal length depends on the least radius of gyration which is the square root of the quotient of least moment of inertia by area, from which it is seen that the moment of inertia is not even simply proportional to the radius of gyration. To illustrate, a 15-in. 33-lb. channel with an area of 9.9 sq. in. has a least "I" of 8.23 and a radius of gyration of 0.91, while a 55-lb. channel with an area of 16.2 in. has a least "I" of 12.19, or 48 per cent. more, and a radius of gyration of 0.87, or 4 per cent. less.

Another point in connection with the subject is that wooden cars when struck will spring to a considerable extent, returning at once to their original shape, and in severe shocks the draft timbers and end sills will fail and perhaps one or more sills will be broken. Everyone agrees that this is a defect for which the delivering company is responsible.

With the steel car, on the contrary, we have not this inherent resiliency, as we might call it, and we have the draft gear secured absolutely solid to the center sills, a condition not possible with wooden draft timbers, so that if the shocks are severe enough the sills may be bent and will remain so as a register of the blow struck. Just because we have used a material in our sills which may be doubled on itself, and not break as does the wooden sill, is it fair to condemn the design because it registers blows which no doubt would completely destroy a wooden car? After an experience of several years with many thousand cars of design "B," cited above, it has invariably been found that when distorted the car had been involved in accidents or struck a terrible blow in switching.

No account has been taken of the fact that all of the bottom members are so combined in the structure as to share in resisting pulling and buffing stresses, and while the center sills are more directly in the line of these stresses, the outside sills take a considerable proportion of shocks received by the frame which are in excess of the draft gear absorption capacity.

In steel car designing the provision for taking care of pulling and buffing stresses and lateral strength may be said to be incidental, as the character of the sections used for securing the vertical strength required have also qualities of lateral strength and cross section which when combined in the structure provide suitable strength in all directions.

George S. Goodwin,

Chief Draughtsman, Mechanical Dept., Rock Island Lines.

[The comparison of the two cars made in our editorial was a quotation from the report of the arbitration committee of the M. C. B. Association and Mr. Goodwin's statement that in comparing the stiffness of columns the least radius of gyration should be used is, of course, correct. We are glad to publish the letter, as it will serve to make more prominent the principal point made in the editorial, that under present conditions numerous cases will be presented for arbitration where weak steel center sills have been distorted by severe switching service and the delivering road will not want to accept responsibility for the damage. Mr. Goodwin admits that other cars of design "A" without cover plates have had their center sills distorted by heavy blows in switching; and under present conditions of operating hump yards such severe treatment must be accepted as a necessary condition and not accidental. He says that no set rule can be made as to the proportions of steel center sills in freight cars, but we believe that if railways continue to build cars with channel center sills without cover plates the distortion by switching will become so frequent that the owners of strong cars which resist such blows will not be satisfied until some rule is adopted which will place a limit on the area of center sills and will require such form of construction as will resist swtching blows without distortion. The practice in steel car design described in the last paragraph of the letter, that of making buffing stresses incidental, cannot long continue for, as in the case of cars like "A" design, damage and distortion result from careless practice which is not likely to be improved or prevented in future. —Editor.]

Contributed Papers.

THE AMENDMENT TO THE SAFETY APPLIANCE LAW.

Following is the full text of the Esch bill (H. R. 5702) as it finally passed both houses of Congress and went to the President this week. This law goes into effect a year from next July, and gives the Interstate Commerce Commission power to prescribe standards for sill steps, ladders, grab-irons and running-boards; to require all cars to be equipped with efficient hand-brakes and to change the present standard height for draw-bars.

AN ACT to supplement "An Act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their cars with automatic couplers and continuous brakes and their locomotives with driving wheel brakes and for other purposes," and other safety appliance Acts, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of this Act shall apply to every common carrier and every vehicle subject to the Act of March 2, 1893, as amended April 1, 1896, and March 2, 1903, commonly known as the "Safety Appliance Acts."

Sec. 2. That on and after July 1, 1911, it shall be unlawful for any common carrier subject to the provisions of this Act to haul, or permit to be hauled or used on its line any car subject to the provisions of this Act not equipped with appliances provided for in this Act, to wit: All cars must be equipped with secure sill steps and efficient hand-brakes; all cars requiring secure ladders and secure running-boards shall be equipped with such ladders and running-boards, and all cars having ladders shall also be equipped with secure hand-holds or grab-irons on their roofs at the tops of such ladders: Provided, That in the loading and hauling of long commodities, requiring more than one car, the hand-brakes may be omitted on all save one of the cars while they are thus combined for such purpose.

Sec. 3. That within six months from the passage of this Act the Interstate Commerce Commission, after hearing, shall designate to the number, dimensions, location, and manner of application of the appliances provided for by section two of this Act and section four of the Acts of March 2, 1893*, and shall give notice of such designation to all common carriers subject to the provisions of this Act by such means as the Commission may deem proper, and thereafter said number, location, dimensions and manner of application as designated by said Commission shall remain as the standards of equipment to be used on all cars subject to the provisions of this Act, unless changed by an order of said Interstate Commerce Commission, to be made after full hearing and for good cause shown; and failure to comply with any such requirement of the Interstate Commerce Commission shall be subject to a like penalty as failure to comply with any requirement of this Act:

*Section 4 of the Act of March 2, 1893, requires grab-irons on the ends and sides of cars.

Provided, That the Interstate Commerce Commission may, upon full hearing and for good cause, extend the period within which any common carrier shall comply with the provisions of this section with respect to the equipment of cars actually in service upon the date of the passage of this Act. Said Commission is hereby given authority, after hearing, to modify or change, and to prescribe the standard height of draw-bars and to fix the time within which such modification or change shal become effective and obligatory, and prior to the time so fixed it shall be unlawful to use any car or vehicle in interstate or foreign traffic which does not comply with the standard now fixed or the standard so prescribed, and after the time so fixed it shall be unlawful to use any car or vehicle in interstate or foreign traffic which does not comply with the standard so prescribed by the Commission.

Sec. 4. That any common carrier subject to this Act using, hauling, or permitting to be used or hauled on its line, any car subject to the requirements of this Act not equipped as provided in this Act, shall be liable to a penalty of one hundred dollars for each and every such violation, to be recovered as provided in section six of the Act of March 2, 1893, as amended April 1, 1896: Provided, That where any car shall have been properly equipped, as provided in this Act and the other Acts mentioned herein, and such equipment shall have become defective or insecure while such car was being used by such carrier upon its line of railroad, such car may be hauled from the place where such equipment was first discovered to be defective or insecure to the nearest available point where such car can be repaired, without liability for the penalties imposed by section four of this Act or section six of the Act of March 2, 1893, as amended by the Act of April 1, 1896, if such movement is necessary to make such repairs and such repairs cannot be made except at such repair point; and such movement or hauling of such car shall be at the sole risk of the carrier, and nothing in this section shall be construed to relieve such carrier from liability in any remedial action for the death or injury of any railroad employee caused to such employee by reason of or in connection with the movement or hauling of such car with equipment which is defective or insecure or which is not maintained in accordance with the requirements of this Act and the other Acts herein referred to; and nothing in this proviso shall be construed to permit the hauling of defective cars by means of chains instead of drawbars, in revenue trains or in association with other cars that are commercially used, unless such defective cars contain live stock or "perishable" freight.

Sec. 5. That except that, within the limits specified in the preceding section of this Act, the movement of a car with defective or insecure equipment may be made without incurring the penalty provided by the statutes, but shall in all other respects be unlawful, nothing in this Act shall be held or construed to relieve any common carrier, the Interstate Commerce Commission, or any United States attorney from any of the provisions, powers, duties, liabilities or requirements of said Act of March 2, 1893, as amended by the Acts of April 1, 1896, and March 2, 1903 and except as aforesaid, all of the provisions, powers, duties, requirements and liabilities of said Act of March 2, 1893, as amended by the Acts of April 1, 1896, and March 2, 1893, shall apply to this Act.

Sec. 6. That it shall be the duty of the Interstate Commerce Commission to enforce the provisions of this Act, and all powers heretofore granted to said Commission are hereby extended to it for the purpose of the enforcement of this Act.

THE RAILWAYS' COST OF LIVING.

BY FREDERICK E. VOEGELIN.

Everybody is talking about how much more it costs him to live, how much smaller the purchasing power of his income is, than ten years ago. Here is the railways' household account for 1907, compared with that for 1897, as reported by the Interstate Commerce Commission:

	Per mile of line operated. 1907.	1897.	Increase, per cent.
Gross earnings from operation	$11,388	$6,122	86
Operating expenses	7,687	4,106	87
Income from operation	$3,696	$2,016	83
Passengers carried one mile	123,259	66,874	84
Tons carried one mile	1,052,119	519,079	103

Thus, the railways in 1907 carried more than double the number of traffic units they carried in 1897, but their compensation was only one and four-fifths (1 4-5) times what it was ten years before. During that period the average freight rate per ton-mile had been reduced from 7.98 mills to 7.59 mills and the average rate per passenger-mile from 2.022 cents to 2.014 cents. In the year 1907 these reductions amounted, as compared with 1897, to a saving of $2,217,485 to the traveling public and a saving in freight bills of $92,274,540 to somebody. For the period of ten years the total savings were $52,807,368 and $727,558,714, respectively. We say that somebody got the benefit of the reduced freight rates. The shipper says the consumer got it and the consumer says the shipper got it. But we know that somebody got the money, whoever he is. We also know that, in spite of the large contributions made by the railways toward reducing the transportation item in the cost of living, the latter has steadily increased. Nobody has yet included the railways as a factor in the increased cost of living. Neither has anyone given them credit for what they have done toward reducing it. Any investigation of the causes of the rise in prices will not be complete unless it discovers who is getting what the railways are saving to the public. If the shipper promptly takes advantage of a reduction in freight rates to plead increased manufacturing or selling expenses for the purpose of maintaining his price list, he ought to be exposed. We venture to say that a downward revision of a price-list by a manufacturer or merchant on account of reduced freight rates is unheard of except where competition or differentials force it. The public has every right to know who is pocketing $73,000,000 a year derived from reductions in freight rates.

Everyone knows that these heavy contributions to somebody have been made, in addition to steadily increasing outlays per unit for railway labor and materials. Let us go a little deeper into the "iron horse's" household account. We will take the wage question first—for it, too, is vexed by a "servant" problem. Here is its list of servants and what it pays them, according to the Interstate Commerce Commission, which supervises and tries to manage its household:

	1907. Per 100 miles of line.	Av'ge daily compensation.	Daily pay roll, per 100 miles.	1897. Per 100 miles of line.	Av'ge daily compensation.	Daily pay roll, per 100 miles.
General officers	3	$11.93	$35.79	3	$9.54	$28.62
Other officers	3	5.99	17.97	2	5.12	10.24
General office clerks	29	2.30	66.70	15	2.18	32.70
Station agents	16	2.05	32.80	16	1.73	27.68
Other station men	67	1.78	119.26	41	1.62	66.42
Engiremen	29	4.30	124.70	19	3.65	69.35
Firemen	31	2.54	78.74	20	2.05	41.00
Conductors	22	3.69	81.18	14	3.07	42.98
Other trainmen	59	2.54	149.86	35	1.90	66.50
Machinists	24	2.87	69.28	15	2.23	33.45
Carpenters	31	2.40	74.40	20	2.01	40.20
Other shopmen	97	2.06	199.82	50	1.71	85.50
Section foremen	18	1.90	34.20	17	1.70	28.90
Other trackmen	162	1.46	236.52	94	1.16	109.04
Switch and crossing tenders & watchmen	23	1.87	43.01	24	1.72	41.28
Telegraph operators and despatchers	17	2.26	38.42	12	1.90	22.80
Employees acc't floating equipment	4	2.27	9.08	3	1.86	5.58
All other employees and laborers	100	1.92	192.00	49	1.64	80.36
Total	735		$1,603.73	449		$832.60

By the simple process of subtraction and division we find that the expense of servants required to run the household has increased 93 per cent. in ten years, but that the income of the householder has increased only 86 per cent. during the same period. The increase in the daily wage per servant has been attended by an increase in the number of servants because of a decrease in the hours of labor per servant and an increase in traffic. So much for the servant question for the time being.

What about the cost of supplies required to keep the house-

hold running? In the case of railway labor we do not insist that wages have risen more rapidly than wages in other industries, but in respect to supplies and materals we maintain that the wholesale prices for articles which the railways use have stood at a higher general level than has obtained for any other class of commodities. We submit as evidence a table showing the per cent. of increase in prices for railway materials for 1907 over the average for the period 1890 to 1907 in comparison with other classes of commodities, the figures being based on reports of the Bureau of Labor:

Commodities.	Increase.
*Lumber and building material	36.0 per cent.
*Metals and implements	35.0 "
Farm products	28.6 "
Clothes and clothing	23.1 "
*Fuel and lighting	22.1 "
Food, etc.	14.8 "
House furnishing goods	14.2 "
Drugs and chemicals	5.6 "
All commodities	23.5 "

We have marked with an asterisk (*) the commodities making up the bulk of a railway's purchases. With respect to fuel supplies some will raise the objection that since the railways own a great number of coal mines they get the benefit of increased prices through dividends on their coal stocks, and that it simply amounts to taking money out of one pocket and putting it into the other. We do not think that this argument is sound for the reason that the cost of labor and supplies required to operate the mines is also increasing rapidly.

Below we give average wholesale prices from 1890 to 1899, and prices for 1897 and 1907 for some commodities used by railways:

Commodities.	Average, 1890-99.	1897.	1907.	Inc.,* per cent.
Fuel and lighting:				
Bituminous coal at mine, George's Creek, per ton.	$0.8887	$0.8333	$1.5375	85
Bituminous coal at Pittsburgh, Youghiogheny, per bushel	.0643	.0570	.0824	45
Petroleum, crude, per barrel	.9102	.7869	1.7342	120
Petroleum, refined, per gallon	.0890	.0900	.1346	50
Metals and Implements:				
Auger, extra, ¾-in., each	.1608	.1425	.3600	153
Axes, M. C. O., Yankee, each	.4693	.3938	.6800	73
Best refined bar iron from mill, Pittsburgh, per pound	.0145	.0110	.0175	59
Butts, loose joints, cast 3x3 in., pr	.0316	.0306	.0400	31
Chisels, extra, 1-in., each	.1894	.1710	.4438	160
Sheet copper, base sizes, per lb.	.1659	.2175	.2792	28
Bare copper wire, per pound	.1464	.1375	.2402	75
Files, 8-in. mill bastard, per dozen	.8527	.8050	.9975	24
Hammers, Maydole No. 1½, each.	.3613	.3800	.4660	23
Lead, pig, per pound	.0381	.0358	.0552	54
Lead pipe, per 100 lbs.	4.8183	4.3167	6.7050	55
Locks, common mortise, each	.0817	.0833	.2000	140
Nails, cut, 8d fnce & com.,100 lbs.	1.8275	1,3329	2.1625	62
Nails, wire,8d fnce & com.,100 lbs.	2.1618	1.4854	2.1167	43
Planes, Bailey, No. 5, each	1.3220	1.2300	1.5300	24
Hand saws, Disston, No. 7, doz.	12.78	12.60	12.95	3
Shovels, Ames, No. 2, per dozen	7.8658	7,9300	7,8400	1†
Steel rails, per ton	26.0654	18.75	28.0000	49
Steel sheets, black No. 27, per lb.	.0224	.0195	.0250	28
Spelter, per pound	.0452	.0421	.0617	47
Tin, pig, per pound	.1836	.1358	.3875	186
Trowels, M.C.O., buck, 10½ in. ea.	.3400	.3400	.3400	..
Vises, solid box, 50-lb., each	3.9009	3.5000	5.7500	64
Wood screws, 1-in., No. 10 flat heads, per gross.	.1510	.0850	.1219	43
Zinc, sheet, per 100 lbs.	5.3112	4.9400	7.4858	51
Lumber and Building Materials:				
Common brick, per M.	5.5625	4,9375	6,1563	25
Cement, Portland, per barrel.	1.9963	1,9667	1.6458	16†
Cement, Rosendale, per barrel.	.8871	.7521	.9500	26
Common lime, per barrel.	.8332	.7188	.9492	32
Raw linseed oil, per gallon	.4535	.3275	.4342	33
Hemlock, per M ft.	11.9625	11.0000	22.2500	102
Hard maple, per M ft.	26.5042	26,5000	32.2500	22
Plain white oak, per M ft.	37.4292	36.2500	55,2083	52
Yellow pine, per M ft.	18.4646	16.4375	30.5000	86
Poplar, per M ft.	31,6667	30,6667	58,0833	89
Spruce, per M ft.	14.3489	14.0000	24.0000	71
Shingles, Cypress, per M.	2.8213	2.3500	4.2250	80
Putty, per pound	.0158	.0145	.0120	17†
Resin, per barrel	1.4399	1.6125	4.3771	171
Turpentine, per gallon	.3343	.2924	.6344	117
Window glass, single, 50 sq. ft... Firsts, 6 x 8 to 10 x 15.	2.1514	2.1986	2.8133	28
Window glass, single, 50 sq. ft... Thirds, 6 x 8 to 10 x 15.	1.8190	1.9630	2.2419	14

*Increase, 1907 over 1897.
†Decrease.

One of the heaviest items of maintenance is renewals of rails. The length of life of rails has probably decreased 20 per cent. during the last ten years, owing to greater traffic density, heavier equipment and heavier trainloads. Adding this depreciation to the 49 per cent. increase in price, the cost of 80-pound rail renewals in 1907 was $163 per mile, compared with $95 in 1897, making an increase of 72 per cent. in the cost of the rails themselves, to say nothing of the increased cost of labor employed in relaying or of increased investment necessitated in replacing light rails with heavy. The increase in total cost of material and labor has been greater than the increase in gross earnings.

We have indicated above the movement of prices for about fifty articles entering into the cost of railway operation. They serve only as an indication of the movement of prices for hundreds of other articles that railways require for the replacement and up-keep of their property and that enter into the cost of new equipment purchased. Perhaps some will take exception to a comparison of wages and prices for 1907 with those for 1897, on the ground that it is a comparison of the highest level since 1890, with the level of the year next following that which recorded the lowest level since 1890. It has been said that there is no absolute standard of a reasonable freight rate. Who will say what is a standard price level? There are those who say that the virtue in a panic is that it pricks the inflated business world and reduces it to standard dimensions. If that is so—and there is plenty of room for doubt—then the standard level is constantly rising, for the price recessions in 1900 averaged less than 2 per cent. of the high level in 1899; the recessions in 1903 averaged less than one-half of 1 per cent. of the higher level in 1902, and in 1909 prices had almost regained the new high level reached in 1906 and 1907. Therefore our comparison is valid. We have compared the lowest with the highest point in an upward movement that progressed steadily from 1897 to 1907 with only two slight recessions during that decade.

Railway wages have almost doubled. Prices have advanced in greater or less degree. Rates have declined. But still the railways are not in the hands of receivers. Why? Here is the answer:

Estimated amount of earnings, reinvested in property during last decade, without increase in capitalization $500,000,000

	Inc., 1907 over 1897.
Ton-miles	149 per cent.
Ton-miles per freight locomotive	58 "
Number of tons in train	75 "
Passenger-miles	126 "
Pass.-miles per passenger locomotive.	77 "
No. of passengers in train	33 "

In the *Saturday Evening Post* of January 22, 1910, the following editorial appeared:

"The proposition that railways cannot raise their rates without the consent of the Interstate Commerce Commission probably means that they cannot raise them at all.

"The constant effect of governmental intervention in rate-making undoubtedly will be to lower rates, not to raise them. Therefore some railway men are saying that further intervention, such as President Taft has in mind, must result in governmental ownership, because rates will finally be forced to so low a point that private ownership cannot give an adequate service. This view, we think, is mistaken.

"From 1890 to 1907 the decline in freight rates was 18 per cent. The average ton-mile rate was 9 mills and a fraction in the former year, against 7 and a fraction in the latter. But in 1890 dividends were paid on but little over one-third of outstanding railway stocks, the average rate being a trifle less than 5½ per cent. In 1907 dividends were paid on over two-thirds of outstanding railway stocks and the average rate was 6¼ per cent. In short, railroading was far more profitable with a 7-mill freight rate than it had been seventeen years before with a 9-mill rate. The greater profit was due to a far greater volume of business and to more economical operation.

"Railway rates should not be advanced. They are high enough. Wages and even the cost of materials may advance, but the roads will find their profit in increased tonnage and heavier train load."

The proposition that railways "will find their profit in increased tonnage and heavier train load" is unjust and indefensible. The popular belief has been that the railway business is one of "increasing returns." Such writers as Thomas

J. Greene and Professor Emory R. Johnson have supported this theory. In his able work on "Corporation Finance" Mr. Greene says: "Usually the volume of units of traffic increases as the charge per unit falls, so that the road makes as much gross profit from the larger as from the smaller receipts per unit." We quote from Mr. Johnson's widely read book on "American Railway Transportation" the following: "After a railway has been constructed, equipped and put into operation most expenses are independent of the volume of traffic. Until the point is reached when the facilities of a railway are fully utilized, the greater the volume of business (per passenger-mile or ton-mile) the higher are the profits. The railway business is one of increasing returns. A company with a traffic of 1,000,000 tons annually will much more than double its profits by carrying 2,000,000 tons, provided the extra business can be secured without reducing the rates, and if a reduction in rates should be necessary to secure the additional traffic the company will probably add to its profits by taking the extra tonnage."

Mr. Greene's book was published in 1901 and Mr. Johnson's in 1903. We assume that both writers made their observations and drew their conclusions from results obtained during the decade 1890 to 1899, which was marked by three great movements: (1) A falling price and wage level. (2) A growing up of earnings to invested capital by a rapid expansion in volume of traffic. (3) An increase in the train load.

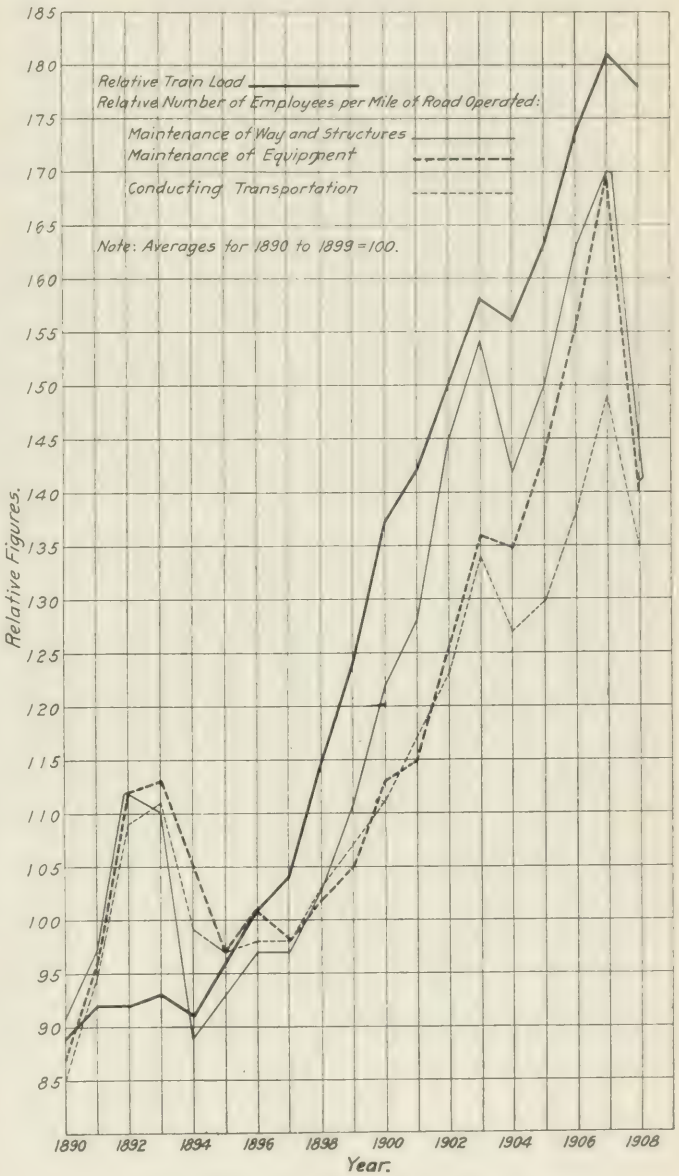
The first of these conditions was sharply reversed in the decade 1900 to 1909; the second and third were continued. The theory that operating expenses are independent of volume of traffic is a flagrant misstatement of facts, under conditions that have existed since 1900. The facts are easily found in the reports of the Interstate Commerce Commission, and they utterly disprove the theory that a railway can double its profits by doubling the volume of traffic. To establish this we submit the following figures, simply to prove that the single factor of quantity of labor required to move traffic is not independent of the volume of traffic moved:

Increase in	1900 over 1890.	1907 over 1900.
Employees per 100 miles of line.....	10 per cent.	39 per cent.
Tons moved	70 "	66 "
Passengers carried	17 "	52 "

In 1907 there was an increase of 64 per cent. over 1897 in the number of men required to move double the tonnage. Therefore had there been no increase in wage rates whatever the railways would have paid out 64 per cent. more in wages in 1907 than in 1897 to move double the tonnage. As a matter of fact, the increase both in the number of employees and in wage rates resulted in an increase of 93 per cent. in the payroll after moving a double volume of traffic, with increased gross earnings of only 86 per cent. How, then, can we say, in face of these established facts, that operating expenses are independent of volume of traffic?

The theory that the railways will find their profit in heavier train loads is as fallacious as the theory that additional tonnage produces clear profit. The established facts disproving the one also disprove the other. The increasing train load is the immediate reason why operating expenses are dependent on the volume of traffic. From 1897 to 1907 75 per cent. increase in the train load brought with it a 76 per cent. increase in the number of employees per mile of line operated engaged in maintenance of way and structures and a 76 per cent. increase in the number engaged in maintenance of equipment. Professor Johnson's theory does not hold true even with expenses for conducting transportation, for the number of employees in this department has increased 52 per cent. with the doubling of tonnage. Nor does it hold true even with expenses of general administration, which amount to less than 4 per cent. of total operating expenses. In this department the number of employees increased 65 per cent. We must also bear in mind that along with declining freight rates the carrier's liability for loss and damage has increased by reason of the rise in prices for commodities carried.

Thus we see visions of doubled profits produced by doubled volume of traffic vanish. We see increased train loads and increased mileage performed by equipment of increased capacity. We are convinced that the point has been reached where the existing facilities of our railways are fully utilized. It is true that the average train load for the United States is far below the average for many of our roads with a great traffic density. On the latter the consensus of opinion among experts is that maximum of efficiency has been reached. On the others the traffic doesn't exist. As evidence of this we point out that total ton-miles increased 149 per cent., while ton-miles per mile of road increased only 103 per cent. from 1897 to 1907. We may feel assured that during a decade of



Train Load and Numbers of Employees.

declining rates and increasing wages and prices every exertion has been made to secure economy and efficiency of operation.

In 1907 there was moved the greatest volume of traffic in the history of American railroading. Instead of finding "increased returns" we find an expansion in gross earnings in less degree than the expansion in volume of traffic, an increase in operating expenses in greater degree than the expansion in earnings, leaving an expansion in profits in even less degree than in gross earnings.

We summarize:

Instead of the railway business being one of increasing re-

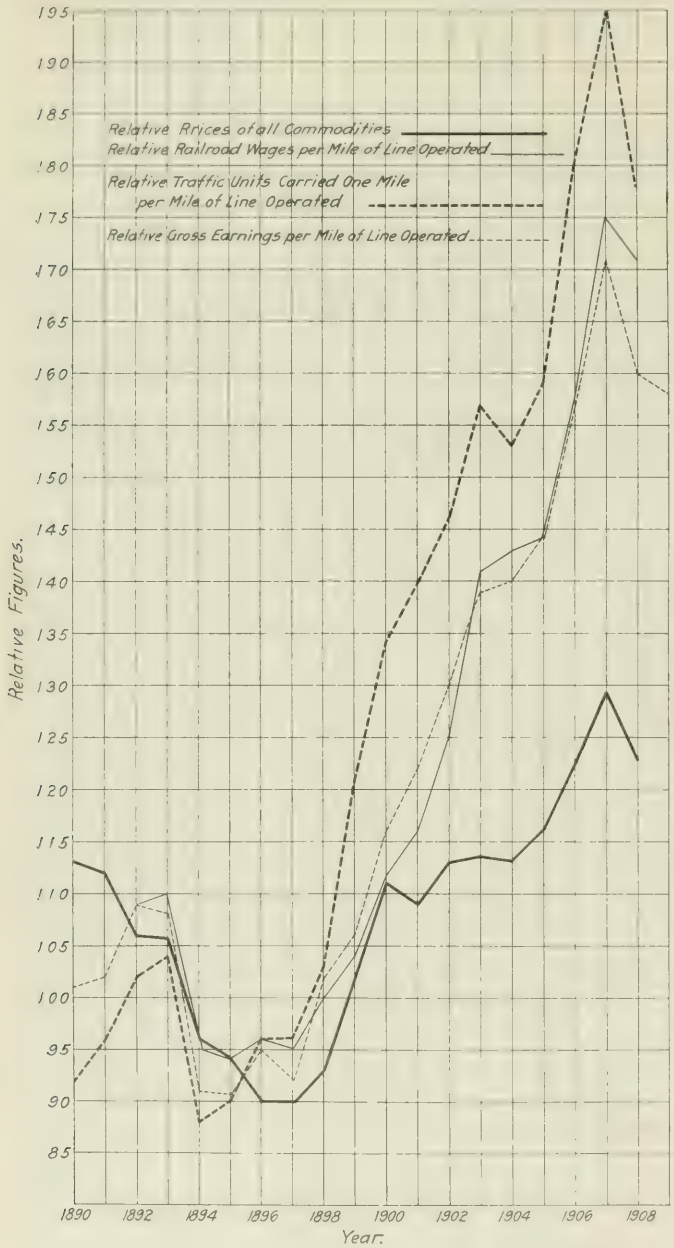
turns, or even constant returns, it is a business of diminishing returns under prevailing conditions. Increased volume of traffic and heavier train loads have been followed closely by public demands for improved service, increase in the number of employees per mile of line operated, increased wages per employee, increased prices of materials, reduced rates per ton-mile and per passenger-mile. The sum total is that during a period when railways carried the largest volume of traffic in their history expenses per train-mile increased more rapidly than revenue per train-mile.

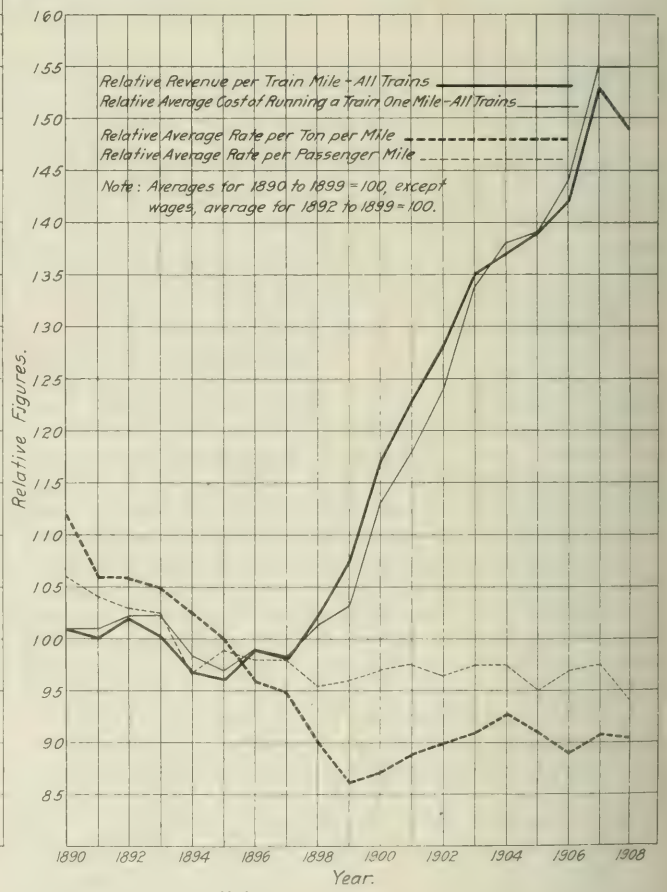
The railway business is like any other business, though the general public does not realize it. Every manufacturer, whether he is a producer of candy, shoes, power or gas, knows that, other things being equal, the price of his product has declined as the ratio of production (i. e., consumption) to plant capacity has increased, although the rate of profit on his investment remained constant. When, however, the correlation co-efficient equaled 1.00 and increased production could be obtained only by increased investment, he either had to advance the price of his commodity or take a smaller rate of profit, when profits were spread over the enlarged investment, until consumption again grew up to plant capacity.

Every consumer knows that he has to pay more for retail purchases than for wholesale. The consumer of electric current for one hour a day pays 13 cents per kilowatt-hour, but the consumer who uses it for the full twenty-four hours pays only 2½ cents per kilowatt-hour. The company furnishing the current is a public service corporation like a railway, and we say the discrimination it makes between the big and the little consumer is justified.

Then we turn to the railway and say, figuratively speaking, that the shipper using the railway twenty-four hours a day has no right to a better rate than the one using it only one hour a day. Then we go a step further and say that the railway can increase its carrying capacity "ad infinitum" without having to increase its investment in plant or its cost of production. And then, finally, we say that the railway should electrify and improve its terminals, elevate its tracks and make all kinds of improvements for our comfort and convenience, which do not increase its earning power one cent, and yet be able to maintain the same rate of profit on the increased investment.

Legal doctrines are full of anomalies and human nature is full of inconsistencies. But we are not pessimists. We look forward to the dawn of enlightenment when the general public will realize that the railway business is subject to the same laws that govern all other industries, be they public, quasi-public or private.





Operating Results and Prices of Commodities.

We are not concerned here with the causes of the increase in wages and prices. Whether the tariff, the trusts or the increasing supply of gold are individually and collectively to blame is too big a question to discuss here. We will merely pause and say, (1) that, whatever the cause, rising prices and rising wages increase the cost of materials and operation and tend to decrease the net profits of those companies which cannot advance the price of their products or services at all, or who are not free to advance them as rapidly as prices and wages advance; (2) that if the high price level brings about rising or high interest rates the securities of those companies must decline in their market value.

PULLMAN CAR CHARGES FOUND UNREASONABLE.

George S. Loftus v. Pullman Co. et al. Opinion by Commissioner Lane:

In view of the similarity between the issues involved in these cases, it seems proper to dispose of them in a single report.

The complainant challenges the lawfulness of the standard charge of $2 exacted by the Pullman Company for a berth in a first-class sleeping car from St. Paul, Minn., to Chicago. Request is made that the rate for the lower berth be fixed at $1.50 and the rate for the upper berth at 75 cents. [Other rates are complained of and reductions on about the same basis are asked.]

All the rates of which complaint is made are alleged to be unreasonable, and the exaction of the same charge for the use of an upper berth as is made for the use of a lower berth is alleged to be unduly discriminatory. The defendants answer generally, denying that the rates which are the subject of attack are unreasonable or discriminatory or otherwise in violation of the act. * * *

The Pullman Company has contracts for the operation of its cars over virtually every important railway system in the country with the exception of the Great Northern, the Chicago, Milwaukee & St. Paul, and the New York, New Haven & Hartford. The contracts originally entered into by the Pullman Company and the various railways were so-called "scaled mileage" contracts—that is, they provided that a certain mileage payment should be made to the Pullman Company, the rate varying with the amount of the earnings. The revenue from the sale of seats and berths accrued, of course, to the Pullman Company. In some of these earlier contracts the mileage payment was at the rate of 3 cents per mile. A representative modern contract provides that if the average earnings of the sleeping cars operated are less than $5,000 per car-year the railway shall pay mileage at the rate of 2 cents per mile. If the car earnings average more than $5,000 but less than $6,000 per car-year the mileage payment is at the rate of 1 cent per mile. If the earnings are in excess of $7,000 per car-year the railway is exempt from the payment of mileage. It is provided further that if the earnings per car-year fall short of the stipulated amount the railway company may at its election make up the difference in lieu of paying mileage. Other contracts exempt the railways altogether from the payment of mileage, and still others provide that the Pullman Company shall share with the railway company the earnings from the sale of seats and berths in excess of a certain figure.

For the purposes of this report an extended review of the results of our investigation into the lawfulness of the rates complained of is unnecessary. Suffice it to say that our inquiry has been thorough and has led us to the following conclusions:

The present rate of $2 for a lower berth from St. Paul to Chicago over the Chicago, St. Paul, Minneapolis & Omaha and the Chicago & North Western is not found unreasonable, but the rate for an upper berth is unreasonable to the extent that it exceeds $1.50.

The present rate of $1.50 for a lower berth from St. Paul to Superior is not found unreasonable, but the rate for an upper berth is unreasonable to the extent that it exceeds $1.10.

The present rate of $12 for a lower berth from St. Paul to Seattle is unreasonable to the extent that it exceeds $10. The rate for an upper berth is unreasonable to the extent that it exceeds $8.50.

The present rate of $2 for a lower berth from St. Paul to Fargo, N. Dak., is unreasonable to the extent that it exceeds $1.50. The rate for an upper berth is unreasonable to the extent that it exceeds $1.10. * * *

An order will be issued in accordance with these findings.

Chairman Knapp, dissenting:

I am unable to concur in the foregoing report and will briefly indicate my reasons for dissenting. Without discussing whether the profits of the Pullman Company have heretofore been excessive, but expressing my serious disbelief that its current earnings yield more than a reasonable return upon the present value of its property, especially in view of the risks and uncertainties of its business future, I base my objections to the majority report upon altogether different grounds.

The fact that sleeping-car accommodations are furnished by an independent company, which has had an extremely profitable career and may continue prosperous for an indefinite period, seems to me wholly immaterial, except as sleeping-car earnings may properly be taken into account in determining whether the entire revenue from passenger transportation is excessive. In other words, the question presented in these cases is precisely the same, in my judgment, and should be determined by the same considerations as would govern if sleeping cars were provided in all cases by the railways themselves and not, as is the general rule, by an outside company. Nor does it matter, save to the same extent, that the few roads which operate their own sleeping cars, as do the Great Northern and the Milwaukee, realize handsome profits from this branch of their business. It is of no appreciable concern to the passenger, either in sleeper or day coach, whether the car he rides in belongs to the road over which he is traveling or to some other company, and he is equally unconcerned as to which of them gets the money paid for his passage. The real question in all cases is whether unreasonable charges are exacted from the public for any service or facility which a railway is bound to provide or undertakes to provide; and this question, as applied to sleeping-car rates, must be determined wholly by comparison, because there is no other helpful or even available test. What sleeping cars cost, or how much they earn, or what profits are derived from their operation, seems to me of little bearing upon the reasonableness of the charges in question. The facts of controlling weight and the only fair basis of judgment, as I think, are found by comparing sleeping-car accommodations with day-coach accommodations, and what it costs to travel in sleeping cars with what it costs to travel in day coaches. When this comparison is made it becomes evident, to my mind at least, that the transportation charges now paid by passengers in sleeping cars are *relatively lower* than the charges paid by other passengers. The difference in the value of the service is greater than the difference in charge.

The railways in effect furnish two kinds of passenger cars, differing very materially in comfort, convenience, and safety, and passengers may take one kind or the other, as they choose, at the different rates provided. Now, what *ought* to be paid by passengers who elect to take the superior car *in comparison* with what *must* be paid by passengers who take the inferior car because, for the most part, they feel obliged to travel as cheaply as possible? Holding, as I do, that the *relation* between sleeping-car and day-coach rates is the vital matter of concern to the public, and believing that the present differences are of doubtful justice to the day-coach passenger, I can not vote to reduce sleeping-car charges, particularly lower-berth charges, and thereby increase the relative advantages enjoyed by sleeping-car passengers.

A concrete case from the record, which is typical of conditions generally, may serve to illustrate my point of view. The first-class fare from St. Paul to Seattle is $48.90. For this sum the passenger can make the journey in a standard day coach and have such conveniences as are ordinarily found in passenger cars of that class. By paying $12 more, or slightly less than 25 per cent., he may travel in a sleeping car so much superior to the day coach as hardly to permit comparison. This car may fairly be called a hotel on wheels, and a hotel of attractive and even luxurious appointments. It is much heavier than the day coach and easier to ride in; its greater strength makes it very much safer. It carries comparatively few passengers, less than half the number that may be crowded into an ordinary car, and its occupants are usually persons of good appearance and unobjectionable manners. In

addition to its sleeping accommodations, which are generally excellent in point of comfort and cleanliness, it has commodious toilet and smoking rooms, with other features of convenience and desirability, including the more or less attentive porter. In such a car the journey is made with little fatigue and often with positive enjoyment. Surely all this is cheap by comparison at the cost of only 25 per cent. above the day-coach rate. Is not the discrimination in fact *against the day-coach passenger?*

On many roads there are trains composed exclusively of sleeping cars and parlor cars, which fall in the same category. Such trains often include observation and buffet cars, supplied with books, magazines and papers, to say nothing of bodily refreshments, and not infrequently carry a stenographer, lady's maid and barber to wait upon the passengers. For all these conveniences and satisfactions the additional charge appears to me extremely moderate in comparison with the accommodations provided for and rates paid by day-coach passengers, and I fail to see upon what ground these additional charges can be found unreasonable.

If the undisputed facts of comparison and the argument, based thereon are given due weight, and they seem to me peculiarly applicable and convincing in these cases, they lead to the conclusion that the sleeping-car charges in question, certainly the lower-berth charges, are not shown to be unreasonable. To reject these facts and their legitimate inferences is, in my opinion, to ignore the element of *the value of the service* and to leave the conclusions of the majority with little support, except the fact that the Pullman Company has made a great deal of money, and that the defendant roads which operate their own sleeping cars have found the business profitable, or at least have so kept their books as to indicate that result. In my judgment, the deduction is wholly unwarranted.

It is a matter of common knowledge that the number of sleeping-car passengers compared with the number of day-coach passengers is relatively small. Leaving out all short-distance travel and taking into account only journeys of, say, 100 miles and upward, much the greater number of travelers ride in ordinary coaches. The remaining minority patronize sleeping and parlor cars, paying the additional charge therefor, as most of them are well able to do. It does not accord with my sense of justice or my understanding of the law which the commission is appointed to administer to reduce the charges voluntarily paid by the limited number of persons who travel in sleeping cars, and I regret a decision which, as I view the matter, will operate unjustly, not perhaps to the Pullman Company, but to the public at large.

On broad grounds of social welfare I have long believed in low passenger fares for everybody, and I shall welcome a material reduction from present rates as soon as it can be made without injustice to the railways. But I would bring this about, if I could, *before* reducing the extra cost of sleeping-car accommodations for the benefit of a comparatively few persons who, in my estimation, are now distinctly favored.

It is evident that the upper berth is less desirable to a substantial degree than the lower berth, and I would agree to some reduction of the upper-berth charges, not because there is any evidence that they are unreasonable *per se*, but because the same charge for both may be fairly regarded as an unjust discrimination against the upper-berth passenger.

I am of the opinion, however, that the difference fixed by the majority report is in some cases too great. For example, when the lower-berth rate is not more than $1.50, I think a charge of $1.25 for the upper berth should be allowed.

Commissioner Harlan, dissenting:

I am unable to assent to the conclusions announced in this proceeding in the report of the majority. While concurring in some of the views expressed by the Chairman of the Commission in his dissenting report I place my own dissent upon the general ground that the order directed to be entered is not justified by the record.

A NEW THEORY FOR EARTH PRESSURE.

At a meeting of the Western Society of Engineers in Chicago, Charles K. Mohler, engineer for the Loop Protective Association of Chicago, presented a paper discussing the subject of earth pressure in connection with the design of retaining walls.

Mr. Mohler referred to Fig. 1, illustrating a wall built in Chicago, as a typical case of excessive pressure and consequent settlement. On this point he said:

"While we are greatly in need of more reliable and exact data relating to earth pressure than we now possess, there is one erroneous dogma, which we should lose no time in getting away from absolutely. That is the old text-book statement that 'If the wall is designed so that the resultant of the forces acting on the base cuts the base inside the middle third the wall is safe against overturning.' Under some conditions nothing could be much farther from the truth. *It is a safe*



Fig. 1—Retaining Wall Tipped Because of Excessive Toe Pressure.

rule for only one condition, that is where there is a rigid and unyielding foundation such as solid rock. Unfortunately rock foundations are the exception rather than the rule for ordinary walls.

"With a compressible or yielding foundation you cannot expect anything but a cracked or failing wall when the foundation reaction at the toe of the wall is greatly in excess of that at the heel, which the middle-third theory allows and usually gives. Piling is often used to correct the evil and take care of the excessive toe pressure, but even that method, while adding greatly to the expense, often fails to prevent settlement and cracks. The only safe rule is to so design the wall that the resultant will pass through the center of the base, or perhaps a little better, just back of the center.

"The misconception of the middle-third theory and the application of it has alone been responsible for most of the failures

and partial failures of retaining walls and abutments.

"In the treatment of wall design we are at once confronted with the question: What is the amount and direction of the earth pressure against the wall, and how does it affect the direction of the resultant foundation reaction, and the determination of the point at which it cuts the base?

"It has long been recognized that the data and formulae relating to earth pressure are not as complete and reliable as we should have for correct designing, but for most conditions it is unquestionably better than guessing or working in the dark. Many of the formulae and resulting computations are very long and complicated, and it is almost a hopeless task to work out results for use and comparison."

In order to facilitate design the author computed tables of a

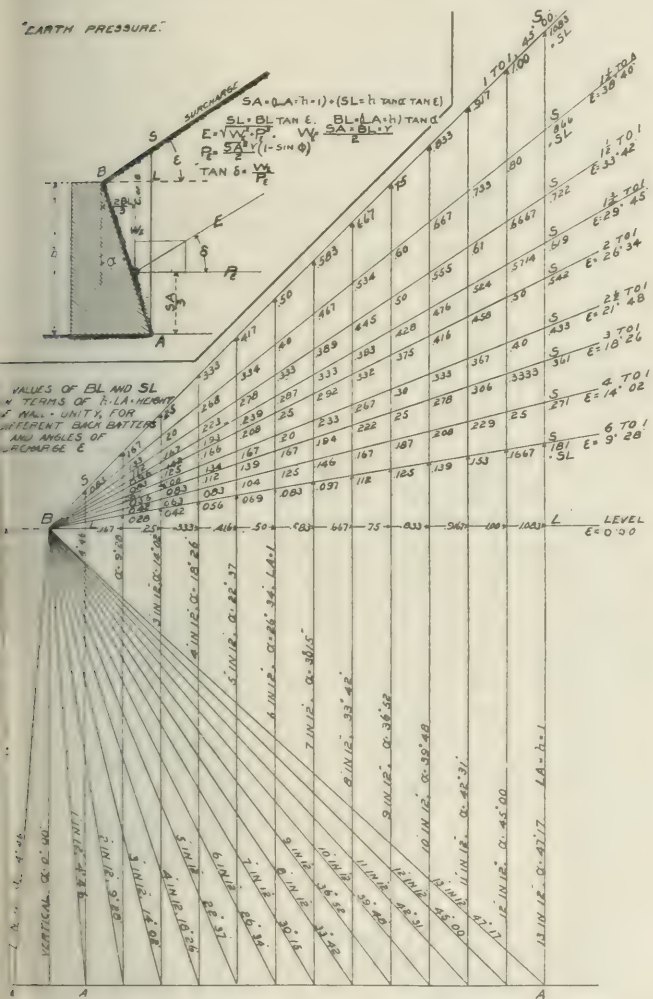


Fig. 2—Surcharge Heights, Back of Wall Batter and Surcharge Triangle Dimensions.

factor C for a large number of varying conditions governed by angles of repose or natural slope of retained material, batters on back of wall, angles of surcharge, etc., using the Rankine theory and the Rebhann graphical treatment of the Coulcomb theory of the maximum wedge. It was found that there was an agreement only with a wall having a vertical back and a level fill, i e., no surcharge. A number of diagrams were presented showing conditions within wide limits and illustrating the lack of flexibility in the two theories. The illustrative examples show them to be adapted to ordinary and not exceptional cases.

Continuing, the author said:

"The failures of Rankin and Rebhann under conditions of angle or surcharge e greater than the angle of repose ϕ are very important for the following reasons:

"1st. It is not uncommon to have a bed of sand, gravel or stiff clay overlying a stratum or bed of very soft material which is penetrated by the excavation. With good, firm material above and below such a stratum, the pressure developed by the flow of the soft material, caused by the superimposed load and high surcharge (over the vertical projection of the back of wall batter) should be considered as giving the amount to be taken care of.

"2d. With a material such as plastic clay the angle of repose for moderate heights may be as much as ninety degrees. At a great enough depth, however, the squeeze is developed and there results a flow in any direction where full resistance is not encountered. It will even heave vertically from the bottom of a pit. That is only a condition where the same material will hold a greater surcharge than the angle of repose or flow at considerable depth. It is probably owing to the cohesion of nearly all materials used in fills that more wall failures have not occurred, where theoretically they should have failed. On account of the cohesion, as well as the friction of the material, to be overcome before an active lateral pressure can be developed, the point of application of the resultant pressure is probably lower than one-third the height of fill h. That being the case the overturning moment would be less than usually computed.

"On account of the great variation and lack of agreement between the analytical theory of Rankin and the sliding prism theory as treated by Rebhann, and their break-downs, the author was led to consider *earth pressure* from an entirely different point of view.

"The values obtained from the formula for *hydrostatic pressure* are considered to be beyond question. That being the case, the author was led to try out results by working with the hydrostatic pressure as a base from which to obtain all other values, corresponding to the different assumed angles of repose. Under that conception he treated the angle of repose as the angle at which flow would take place, or the *angle of flow*. Possibly another conception to take would be to treat it as the *angle of resistance to flow*, when referred to the horizontal or the angle of flow of a fluid. In fluids the pressure developed by gravity is transmitted equally in all directions. If in any case the substance is considered as losing part of its fluidity, there would then be a certain resistance to flow. If the angle of the resistance is expressed by the slope ratio or the angle ϕ, then the sine of ϕ may be considered as the amount of the resistance. Then we would consider the hydrostatic pressure reduced by the sine of ϕ into the hydrostatic pressure. Hydrostatic pressure $E = \frac{h^2 w}{2}$, in which h equals the height, and w the weight of the fluid retained.

FORMULAE FOR DEVELOPED PRESSURE THEORY.

1st. *For Positive Values of a (back batter away from the fill).*

For a substance having an angle of resistance to flow ϕ, the formula would become

$$E = \frac{h^2 w}{2} - \frac{h^2 w}{2} \sin \phi = \frac{h^2 w}{2}(1 - \sin \phi), \text{ when } a = 0.$$

When E is the pressure against a vertical plane alone and has no vertical component it may be represented by P.

The values at E at the limiting values of ϕ are as follows:

$\phi = 0$, $E = \frac{h^2 w}{2}(1 - \sin 0) = \frac{h^2 w}{2}(1 - \sin 0^\circ) =$

$\frac{h^2 w}{2}(1 - 0) = \frac{h^2 w}{2} =$ hydrostatic pressure.

$\phi = 90^\circ$, $E = \frac{h^2 w}{2}(1 - \sin 90) = \frac{h^2 w}{2}(1 - \sin 90^\circ) =$

$$\frac{h^2\ w}{2}\ (1-1) = \frac{h^2\ w}{2}\ (0) = 0.$$

For the intermediate value of ϕ we have $\frac{0+90}{2} = 45°$, when

$$\phi = 45°.\ E = \frac{h^2\ w}{2}\ (1 - sin\ \phi) = \frac{h^2\ w}{2}\ (1 - sin\ 45°)$$

$$\frac{h^2\ w}{2}\ (1 - .707) = \frac{h^2\ w}{2}\ .293.$$ In other words the intermediate value of ϕ gives a value for E which is a little over one-quarter that given for $\phi = 0°$ making E the maximum. The increase in the value of E $(= C)$ is almost inversely proportioned to the square of decrease of ϕ from the value (90°), giving the lower limit, as by the above formulae.

In which,

E = total earth pressure acting against the back of the wall.

h = height in feet of fill or backing retained.

ϕ = the angle of repose or natural slope of the earth or fill, with the horizontal.

w = weight in lbs. per cu. ft. of the earth fill or backing.

e = angle of surcharge of fill back of the wall, with the horizontal.

a = the angle which the back of the wall makes with the vertical; *positive* when the batter is *from* the fill and *negative* when *toward* the fill, i. e., as a leaning wall.

d = the angle which the direction of the resultant earth pressure makes with the horizontal.

W_E = the weight of the earth wedge carried on the vertical projection of the back batter $= \frac{h^2 \tan a\ w}{2}$ and is the vertical component of the earth pressure.

WALL WITHOUT SURCHARGE.

For back of wall batter, a, positive and $e = 0$, the formula becomes:

$$E = \sqrt{\left[\frac{h^2\ w}{2}\ (1 - sin\ \phi)\right]^2 + W_E^2}$$

In Fig. 2 are given the dimensions by which the area of the earth wedge carried over the back of wall batter may be determined. The larger diagram was originally drawn to scale with the height h as unity, and the results checked with trigonometrical formula. Referring to the sketch at the top of the diagram the formula for obtaining the area of the earth wedges $A\ B\ L$ or $A\ B\ S$ are as follows:

1ST—WALL WITHOUT SURCHARGE.

$B\ L = A\ L\ tan\ a = h\ tan\ a.$

$$Area\ A\ B\ L = \frac{B\ L \times h}{2} = \frac{h\ tan\ a\ h}{2} = \frac{h^2 \tan a}{2}.$$

2ND—WALL WITH SURCHARGE.

$S\ L = B\ L\ tan\ e = h\ tan\ a\ tan\ e.$

$S\ A = h + S\ L = h + h\ tan\ a\ tan\ e = h\ (1 + tan\ a\ tan\ e).$

$$Area\ A\ B\ S = \frac{B\ L \times S\ A}{2} = \frac{h\ tan\ a\ h\ (1 + tan\ a\ tan\ e)}{2}$$

$$\frac{h^2\ (tan\ a + tan^2\ a\ tan\ e)}{2}$$

$$Weight\ of\ A\ S\ B = W_E = \frac{w\ h^2\ (tan\ a + tan^2\ a\ tan\ e)}{2}$$

The horizontal earth pressure P_e is taken for the full height $S\ A$, and equals $\frac{w}{2}\ (h\ [1 + tan\ a\ tan\ e])^2\ (1 - sin\ \ )$.

With surcharge and back of wall batter away from the fill

$$E = \sqrt{P_e^2 + W_E^2} =$$

$$\sqrt{\left[\frac{w\,(h[1+tan\,a\,tan\,e])^2(1-sin\,\phi)}{2}\right]^2 + \left[\frac{w\,h^2(tan\,a+tan^2 a\,tan\,e)}{2}\right]}$$

The assumed point of application of P_e is at ⅓ $S\ A$ from the bottom.

DIRECTION OF EARTH PRESSURES.

The direction of the resultant earth pressure E with the horizontal equals the angle d, and $tang\ d = \frac{W_E}{P_e}$.

The earth pressure P is considered as acting only in a horizontal direction whether the wall carries a surcharge or not. When a mass of earth is either confined in a bin or surrounded

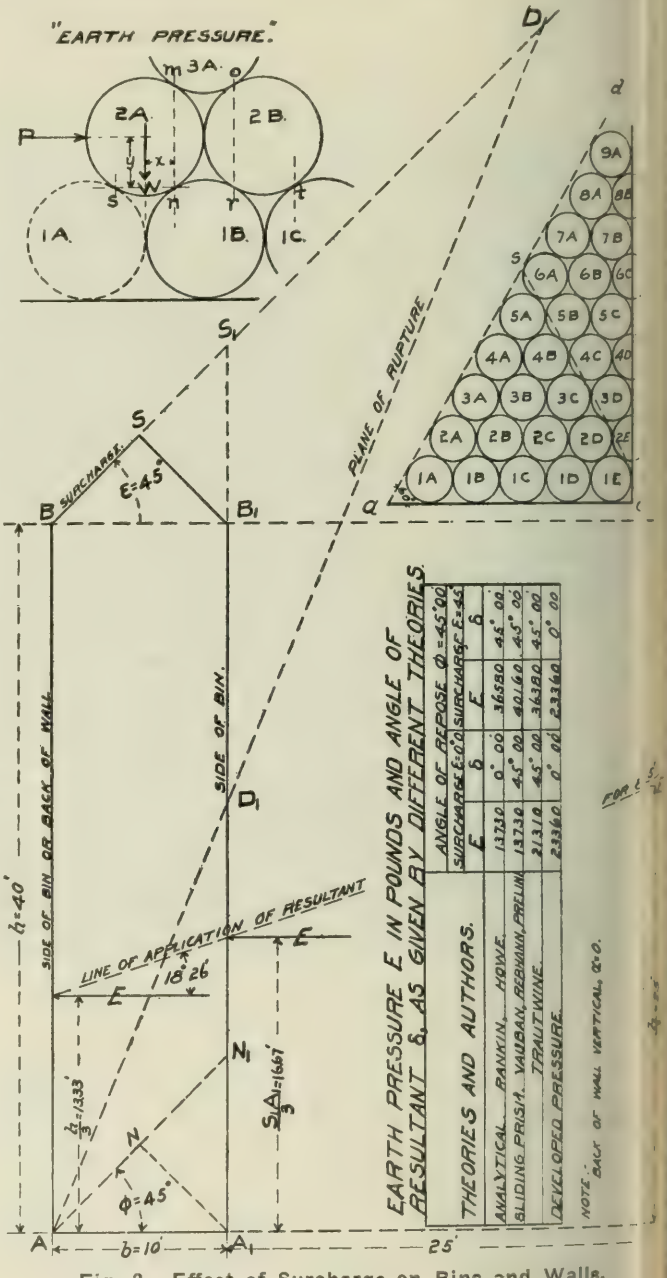


Fig. 3—Effect of Surcharge on Bins and Walls.

by a mass of the same material, and indefinite in extent, t developed pressure producing squeeze, to be in equilibriu must act and react on the particles within the mass. Con quently the net resultant of the squeeze will be at right ang to the force of gravity.

The case of material simply confined in a bin should

e confused, however, with the case in which material is withrawn from the bottom. In the latter case, as soon as ıaterial is withdrawn from the bottom, friction is developed gainst the sides of the bin and the whole case is thereby ıodified.

For a negative back of wall batter as well as for vertical lack, a surcharge fill is not considered as giving any more ressure than if it ran off level or even sloped down away rom the back of the wall. To illustrate, take Fig. 3, which epresents a bin 40 ft. deep and 10 ft. square. For hydroıtatic pressure the amount is the same, whether the fluid ressing against the side of the bin extends back from the ace one foot or is of indefinite extent. The same should hold rue within certain limits for granular and semiplastic subtances. With a bin of the size shown and filled wth a granlar mass possessing little or no cohesion and incompressible, ut having sufficient friction between the particles to stand t an angle of repose of 45 deg., there is little reason to elieve there would be any more pressure on the side *A B* ith a surcharged slope than with a level top. In the upper ight-hand corner of Fig. 3 is sketched what we will term a ile of cylinders, marked 1*A* — 1*E*, 1*A* — 9*A*, etc. A comıon example is the piling of barrels. When piled as shown hey will stand with a natural slope of 60 deg., and are held n this position by friction alone, as there is manifestly no ohesion. If the cylinders and the plane a c, on which they est, were to lose all friction they would sink to the level of *A*, 1 *B*, etc. As long as the angle of friction between cyliners in contact is greater than 30 deg. the cylinders will reıain in equilibrium. (The angle which the tangent passing hrough the points of contact of the cylinders makes with the orizontal is 30 deg.)

To show that the surcharge of a slope should not increase he horizontal pressure against a vertical surface, consider he cylinders 1 *A*, 2 *A*, 3 *A*, 1 *B* and 2 *B* of *a d c*. While 1 *A* vidently holds the whole tier 2 *A*, 3 *A*, 4 *A* — 9 *A* in posiion, it does not carry any more weight or thrust than if nly 1 *A*, 2 *A* and 2 *B* were considered. 1 *A* and 1 *B* carry *A* with points of contact or support at *s* and *n*. (See enarged sketch of cylinders at upper left-hand corner.) Reıove the cylinder 1 *A*, then to maintain 2 *A* in position and quilibrium, substitute a horizontal force *P* acting through the enter of 2 *A*. Then 2 *A* is maintained in position and quilibrium by *P* and the weight *W*, acting through their repective lever arms, with *n* the point of contact as the center f moments. Total moments about $n = 0 = P\,y - W\,x$, from hich $P = \frac{W\,x}{y}$. But 2 *A* carries one-half the weight of 3 *A* pplied at their point of contact *m*. By construction, *m* is ertically above *n*. Therefore the weight from 3 *A* applied at ı will pass through the point of support *n*. As *n* is the enter of movements for 2 *A*, the weight from 3 *A* and passing nrough *n* will not disturb the equilibrium of 2 *A* already stablished. The horizontal thrust *P* will not be increased by ne added weight at the point of contact, so long as the angle f friction between the surfaces is greater than 30 deg. The ther half of the weight of 3 *A* is carried by 2 *B* from the oint of contact *o* and passed on to *r* without disturbing the quilibrium of 2 *B*. Thus it is seen that the cylinders above o not disturb the equilibrium or produce an added horiontal thrust in those below, but only contribute their weight o increase the vertical load. This is as it should be, for ne particles on a natural slope, to contribute an added horiontal thrust to those below, would imply an arching effect hich does not exist. In other words, if arching of that kind ook place, we would have the anomaly of the toe of the atural slope of an embankment carrying a load greater than ne weight of the material in the vertical projection above.

2d.—*For Negative Values of a* (*back batter toward the fill*).

With back batter toward the fill or *a* negative, the formula employed for obtaining the earth pressure is:

$$E = \frac{h^2\,w}{2}\left(1 - \frac{\sin\phi}{\cos a}\right)$$

The values of E at the limits of ϕ and a are:

for $\phi = 0°$ *and* $a = 0°$, $E = \frac{h^2\,w}{2}\left(1 - \frac{\sin\phi}{\cos a}\right) = \frac{h^2\,w}{2}\left(1 - \frac{\sin 0°}{\cos 0°}\right)$

$= \frac{h^2\,w}{2}\left(1 - 0\right) = \frac{h^2\,w}{2}$ = hydrostatic pressure.

for $\phi = 90°$ *and* $a = 0°$, $E = \frac{h^2\,w}{2}\left(1 - \frac{\sin\phi}{\cos a}\right) = \frac{h^2w}{2}\left(1 - \frac{\sin 90°}{\cos\ 0°}\right)$

$= \frac{h^2\,w}{2}\left(1 - \frac{1}{1}\right) = 0$

For $a =$ the complement of ϕ (or when the back batter coincides with the natural slope, $a = 90° - \phi$), then $E = \frac{h^2\,w}{2}\left(1 - \frac{\sin\varphi}{\cos[90° - \phi]}\right) = \frac{h^2\,w}{2}\left(1 - \frac{\sin\varphi}{\cos\,complement\,\phi = \sin\phi}\right)$

$= \frac{h^2\,w}{2}(1 - 1) = 0$

Diagrams were presented giving plotted results of comparisons of the Rankine, Rebhann and developed pressure theories in which the following interesting results were noted: For $a = o$ and $e = o$ or ϕ, the values are greater than Rankine or Rebhann give but are less than those given for $a = o$, $e = \phi$. As previously stated, when $a = o$, or is negative, a surcharge fill is assumed to give no greater pressure than a fill level with the top of the wall.

The values given by the developed pressure theory are almost a mean of those given by Rankine and Rebhann under the extremes of $e = o$ and ϕ. For a = 33° 42′ and $e = \phi$, the developed pressure formulae give much lower values than the old theories, with one exception. When $\phi = 55°$ Rebhann gives lower values, which is evidently a breakdown for the Rebhann method. The increase in E caused by the added load of the earth wedge with its surcharge is almost offset by the decrease in the horizontal pressure P, as the angle of repose ϕ increases until high values of a and e are reached.

With $a = -4°\ 46'$ and $-22°\ 37'$, $e = o$ and ϕ, the values for the developed pressure theory are almost a mean of those given by Rankine and Rebhann. With $\phi = 45°$ and $e = 0°$ and 45° the developed pressure theory gives larger results, but for $e = 45°$, the results are less with a positive. When $a = o$, the two curves join while Rankine breaks down and Rebhann gives very low values for $e = o$.

Mr. Mohler concluded with the following summary:

"No attempt has been made to give a complete mathematical analysis or discussion of the formula used. The results appear to be consistent and without any break-downs.

"Until such time as a set of tests shall have been made on a large scale to verify or disprove any theory, we are only justified in using such theories as give the most rational and consistent results. Small model tests on a material possessing any degree of cohesion are perhaps worse than useless. That is equally true of materials possessing both cohesion and friction between the particles of its composition. Owing to the fact that nearly all retained earth possesses both cohesion and friction, it is quite probable that the full resultant earth pressure is developed at a point lower than one-third the height. As an instance to illustrate the point at issue, observe the caving of an ordinary bank. For several feet at the top the slope is almost invariably vertical.

"It is to be hoped that tests may soon be made on a large scale to give as near as may be, by exact experimental data, the true values for earth pressure.

"In the meantime the author respectfully presents the theory based on the assumption that 'the horizontal pressure is equal to hydrostatic pressure, diminished by the sine of the angle of resistance to flow (= ϕ = the angle of repose) into the hydrostatic pressure,' or what I have chosen to call the

developed pressure theory, for the consideration of the engineering profession."

DISCUSSION.

Ernest McCullough, Associate Editor, *Railway Age Gazette*:—Rankine himself pointed out the limitations of his theory, but believed it would serve until proper experiments could be made. The graphical solution by Rebhann of the prism of maximum pressure appeared in 1871, but the work of Weyrauch, published in 1878, was so superior that no prominent English or American author mentioned Rebhann until 1909, when his method appeared in Prelini's book.

Few gravity walls have been built in the construction of which any pretense was made of considering theory. The reason assigned for the failure of the wall illustrated is a case in point. In the picture is shown the cause. The ditch to drain the roadbed passes close to the wall, nd no doubt the foundation has become so soft that the toe pressure is excessive.

There are three reasons for requiring the resultant to pass through the middle third: (1) that the maximum pressure will not exceed twice the average, (2) that there shall be no tension on the heel and (3) it is very important that the pressure at the toe be kept well within the limits of the pressure the foundation soil will carry. This can be attained by making the base wide or by driving piles under the toe.

Experience has shown that a rectangular wall with a thickness equal to one-third the height will suffice for average conditions without surcharge if built of first class masonry or concrete. For extraordinary conditions experience and study of good examples will lead to the adoption of a base wide enough to make the wall safe. Sir Benjamin Baker stated that for an engineer to claim he had no retaining walls fail simply proved inexperience and not always superior ability.

Vauban saved material in walls he built by battering the front face and increasing the bottom width. For walls with a vertical back and battered face, sections of equivalent stability are obtained when the thickness at a point one-ninth the height above the base is the same.

Poncelet deduced the following formula for trapezoidal walls with battered face, vertical back and equal moment about the toe:

$$b' = b + \frac{1}{10} b''$$

in which

b' = base of trapezoidal wall
b = base of rectangular wall
b'' = assumed base of battered face $= \frac{h}{\tan B}$
h = height of wall
B = inclination of face to the horizontal

The accuracy increases with the inclination of the face.

I find myself unable to agree with Mr. Mohler on the question of surcharge. Additional height of fill implies additional weight, therefore additional pressure. The toe of a slope having an angle equal to the angle of internal friction of the material is assumed as starting from the foot of the wall. The wall is built to retain material above this slope in which material cohesion is uncertain. Friction alone can be considered, and the effect of frction is lessened if moisture is introduced into the mass, thus increasing the pressure. Assume a wall of sufficient weight and stability to retain a fill and be on the point of overturning; there will be a tendency toward readjustment of all particles above the slope of internal friction starting from the heel of the wall, if additional filling is provided as in case of a surcharge. The assumption of increased pressure against the wall because of surcharge is in agreement with common observation, the results of experiments and theoretical, or hypothetical, deductions. Returning again to the rectangular wall, the following rules of French engineers are useful for fixing the thickness when there is surcharge:

Let h' = height of surcharge above wall
h = height of wall
b = thickness

then $b = \frac{h}{3} + \frac{h'}{3}$ if $h' < \frac{h}{2}$

and $b = \frac{h}{3} + \frac{h'}{15}$ if $h' > \frac{h}{2}$

For values of h' in terms of h between 3 and 15, interpolations can be made. The base width or thickness fixed, the face may be battered by the rules already given and a saving in material effected.

For a typical rectangular wall having a thickness equal to one-third the height the three fundamental formulae are practically as follows:

Horizontal thrust $= 16\ h^2$
Overturning moment $= 5.4\ h^3$
Resisting moment $= 11\ h^3$

the assumptions being, a fill level with the top of the wall; the weight of the fill per cu. ft. being 82 per cent. of the weight of the masonry; the factor of safety against overturning being 2 +.

Walls built now seldom have much face batter, the slope being on the back throwing the center of gravity forward. All the earth resting on the rear projection of the wall adds weight, so the center of gravity of the composite section is found, a vertical being passed through it. The line of thrust is drawn through this vertical and from the point of intersection are plotted the thrust, and the weight of the composite section. Completing the diagram by drawing the resultant, the stability of the wall is determined.

The angle the resultant makes with the vertical depends upon the weight of the composite section, the amount of thrust and the angle of thrust. In the Coulomb theory no direction was originally indicated for the thrust. Later authorities variously made it horizontal, parallel with the slope of repose or normal to the back of the wall. For nearly fifty years the wedge of earth resting on the rear projection of the wall has been considered as adding weight and stability, the back surface being therefore considered as vertical. Professor Cain assumes the thrust as normal to a line representing the angle of friction between the wall and the earth fill, thus inclining the thrust downwards. Rankine assumed the thrust as parallel with the surface of the fill so that with high surcharge it inclines downward considerably. Experiments indicate that for low walls the thrust acts at about half the height and drops to about four-tenths as the height increases until for walls exceeding 10 ft. the point of application is practically at one-third the height. Many walls are built without making calculations to determine the amount of thrust or probable pressure on the toe. Poor sections often go in merely because they look right. It takes but a few minutes to test the matter by the best information at hand, so this should not be neglected.

It is at this point the theories come in. The formula of Rankine gives considerably higher results than any other, so it is more generally used to-day than the formulae based on the theory of the maximum wedge. The fluid pressure formulae presented to-night by Mr. Mohler seem to be consistent between extremes, so they may be safely used. The fluid pressure idea, however, is not new, for the fluid pressure formula has been used for over a century. Coulomb's theorem was expressed, by a formula in which

w = weight of a cubic foot of soil in lbs.
h = the weight of the wall in feet.
r = the angle of internal friction.
s = the angle at which the effect is lost.

P = horizontal thrust in lbs. against the wall.

hen

$$P = \frac{w h^2}{2} \times \cot s \times \tan (s - r)$$

A fluid having no limiting angle of resistance the formula becomes

$$P = \frac{w h^2}{2}$$

Coulomb's theorem showed that the wedge of maximum pressure has a face bisecting the angle made by the slope of repose with the vertical, so

$$P = \frac{w h^2}{2} \cot^2 s$$

$$\text{for } \cot s = \tan (s - r)$$

Assuming sand weighing 106 lbs. per cu. ft. with an angle f internal friction = 30 deg. the above expression reduces to

$$P = 16\ h^2$$

ne of the fundamental equations already given, representing he horizontal thrust of a fluid weighing 32 lbs. per cu. ft.

The thrust being applied at one-third the height, we have n overturning moment,

$$M\ O = 16\ h^2 \times \frac{h}{3} = 5.4\ h^3$$

nd for a factor of safety of 2 +, the resisting moment,

$$M_R = 11\ h^3$$

ractions neglected.

These equations may be proved in another way. It has een stated that walls with a rectangular section have proved table when the thickness is one-third the height. Assume uch a wall and then alter the form of the section so material an be saved without affecting the stability.

Let W = total weight of wall and earth wedge.

P = horizontal thrust.

b = width of base.

i = intercept on base between resultant and vertical hrough center of gravity of composite section.

h = height of wall.

hen

$$Wi = P \times \frac{h}{3}$$

n order that the maximum pressure be not more than twice he average, and that there be no tension at the heel or back nd of the footing, i cannot be greater than $\frac{b}{6}$.

If the moment of stability of the section is equivalent to

$$Wi = P \times \frac{h}{3} = 5.4\ h^3$$

he wall will be just on the point of overturning about the toe.

When there is surcharge the typical rectangular wall may e assumed and the base broadened in accordance with the mpirical rules already presented; calculations then made or stability and an equivalent fluid pressure found, the thrust, f course, being horizontal.

A knowledge of the forces acting to overturn retaining alls is important just now, for reinforced concrete walls are upplanting heavy gravity sections. There is no precedent to uide designers, so theories of earth pressure, long regarded s absorbing mathematical recreations, are coming again to ight and probably we are on the threshold of a valuable dis- ussion. Dr. Baker and Professors Turneaure and Maurer ave called attention to the thrust of equivalent fluid pressure, ound by ascertaining the stability of standard walls evolved y generations of wall builders.

The reinforced concrete wall is seldom more economical than a gravity wall for heights of less than 10 ft. At this height it is well to begin making comparisons, while for walls over 20 ft. in height the reinforced concrete wall is said to show an economy in cost of about 25 per cent. This is worth trying for, and so it seems probable that this type of wall is going to be the wall of the future. Experiments are needed on full size walls, for at present we have records only of experiments on small models with material without cohesion. Until proper experiments are made, however, the equivalent fluid pressure method apparently satisfies requirements.

O. P. Chamberlain, Chief Engineer, Chicago & Illinois Western: Probably in no city in the country within the last ten or twelve years has there been more work done in the construction of retaining walls than in and about Chicago. I presume many of the engineers who have handled this work have not gone very deeply into the theory of retaining walls, but have been guided by precedent. The paper to-night is especially interesting on account of its uniqueness and originality. There was one thing in the discussion by Mr. McCullough I rather expected him to go into a little further. That was the matter of surcharge of a wall. The author of the paper reaches the conclusion that the horizontal thrust will not be increased by added weight at the point of contact, so long as the angle of friction between the surfaces is greater than 30 deg. I take exception to the demonstration in which a number of cylinders of uniform diameter are shown in equilibrium while the angle with the horizontal is 60 deg. This does not prove that a heterogeneous mass of earth would follow the same rule. The condition existing in the example is due to the fact that these cylinders are of uniform diameter and in close contact. If the lower line of cylinders had not been put in close contact the whole mass would fall like a house of cards. It occurs to me that if we can prove by using these cylinders that there is no horizontal thrust we can also prove that the surcharge of earth would stand at an angle of 60 deg., which is, of course, not true. I would say that the fact that these hexagons formed by circles, placed in contact, or by cylinders in a plane which may not be hexagon, made by cylinders placed in contact, do not prove by any means that thrust would not occur in a homogeneous material which we know would not stand at an angle of 60 deg. In fact, we are very certain that a material surcharged over a retaining wall will undoubtedly produce thrust on the wall. I think our old method of treating that is undoubtedly correct. Whether we can measure it exactly or not is another question.

Mr. Wilson: I think it is the general belief that where walls have failed it is due in a great many cases to water making the angle repose much less than the angle which is used in the design of the wall, because the angle which is used in the design of the wall is usually an angle based on the assumption that the material is fairly dry. When this material gets soaked up with water the angle of repose is very small.

W. H. Finley, Assistant Chief Engineer, Chicago & North Western: We are indebted to Mr. Mohler for the work he has put on this paper. I believe there are so many factors we cannot control entering into the pressure on a retaining wall that it is very difficult to make any theoretical deduction. In the city here, where we have built a lot of retaining walls on track elevation, I have noticed many where there is probably a whole block, side walls, retaining walls at each end and abutment in the street—an absolute reservoir, with no provision for draining the walls. One of the points necessary is to have a good foundation and another to be dead sure that the fill is well drained. With those conditions taken care of, I believe that almost any of the accepted methods of designing a retaining wall will give satisfactory results. There is no doubt that the reinforced retaining wall is best. In the stone masonry retaining wall it was just a question of providing a mass to resist the action of the earth. With rein-

forced concrete we have a masonry that will resist tension. The preceding speakers in drawing sections of reinforced concrete walls assumed that you can put a toe in front. You can not always do it, for the wall is on a street line frequently or on a party line. There is no doubt that in extending the base behind and making use of the weight of the earth itself in helping to resist the overturning moment you are getting nearer a correct and an economical solution than by any other method. I have designed a few retaining walls and have noticed a great many built in various sections. I do not remember to have seen a retaining wall that actually failed by overturning. You will see any number where they can be pushed over at first and apparently reach a condition of equilibrium and never move afterwards. I remember, eighteen years ago, in Rockford, Ill., they started a retaining wall, and after it had been built it tilted a certain amount and continued to tilt until it reached a certain position, and it remained that way for years and never moved any more.

Personally I believe you will accomplish more by being sure of your foundation and the drainage of your wall than you will by any mathematical deduction of earth pressures. I believe it so hard to arrive at any satisfactory solution of the factors that you can never get a general formula to cover all cases. Take, for instance, in Chicago, where they are using sand mostly for track elevation. They have a material that is probably as nearly uniform as any material they will get. Yet it will vary in weight considerably, due to the amount of moisture in it, and undoubtedly is very much different from the earth that is usually piled up against a retaining wall. On railroad construction there is no choice but to use the material you have, and it may be a mixture of soil, clay and sand.

W. C. Armstrong, Terminal Engineer, Chicago & North Western: The subject of retaining walls has been attractive for mathematical experts and I think the old rules are near enough correct. I think there has been more worthless mathematics carried out on the subject than on any other one I know of, unless it is methods of calculating earth work. That used to be a favorite subject years ago. In looking over the diagrams in the paper that Mr. Mohler has published and considering the effects within the limits of practice, we do not find they differ much. For a wall with a vertical back, without surcharge, and an angle of repose at 1½ to 1, they practically agree. Those are usual conditions and the results deduced from these conditions give a formula that is near enough for any practical purpose. The only value of a formula in any case is to get uniformity in your construction. We do not know whether the pressures we get from formulae are correct or not. We can never know. I do not believe that any experiments on a large scale or small scale would be of any practical benefit. The pressure that might exist against a wall at one time with the same material would be different at another time. Dry sand is different from wet sand. Dry clay is different from wet clay. The clay may be so wet that you have a hydrostatic pressure. It may be so dry as to shrink away from the wall vertically without any pressure against it whatever. Under such conditions how is it possible to deduce a formula that will give accurate results? The only thing to do is to assume formulae that will give the worst results. The thrust formula I have used for many years is 15 h^2, always applied at a point one-third up from the base and regarded as horizontal pressure. Then it is simply a matter of mechanics to work out the stability of a wall. I think you all will agree the old formulae give a greater effect because of surcharge than will be found in practice; but to assume that there is no effect from surcharge is certainly an error. If Mr. Mohler had followed out his illustration to a logical conclusion I think he would have arrived at the same result. It is a little difficult to explain without a diagram, but I went into it far enough to satisfy myself that if he had considered the effect of these cylinders on the cylinders below he would have found that they would have produced an increased pressure against the wall. The design and construction of retaining walls, after all, is a practical question, and it depends more on the method of construction and the drainage of the wall, as Mr. Finley has said, than it does on the theory upon which the design is based. Water will get down back of a wall and freeze. Freezing will expand the material and crowd the wall up. The question of drainage is really the most important one in the construction of retaining walls.

Mr. Chamberlain: Mr. Armstrong has brought out very clearly a point in regard to all formulae which may be used for the pressure on the back of a wall. Of course, to use it practically, we would obtain the horizontal component of the pressure, whether we considered the pressure horizontal or not, originally, and whatever formula we use we are confronted with the fact that the same material, under different conditions, may have a slope which may vary anywhere from a few degrees to almost horizontal. We have all had experience with gumbo soil. If that becomes thoroughly water-soaked it produces almost a hydrostatic pressure undoubtedly, because the material will flow, while under extremely favorable conditions, when there has been a long dry season, it may be cut down almost vertically and will stand. We have to assume as a factor a certain angle of repose, and it seems to me that to split hairs on some other factors in our formula when we have that extreme variable is rather uncalled for. It is enough for a practical engineer to know that he is assuming a pressure on a wall which is sufficient for the worst case.

E. N. Layfield, Chief Engineer, Chicago Terminal Transfer: I have no desire to join in the onslaught against the mathematics of retaining walls, but I never had very much confidence in the value of any of these formulae for the purpose of designing such walls. I think that feeling probably is based on reading a good many years ago the book of Sir Benjamin Baker that Mr. McCullough referred to. Sir Benjamin, if I remember correctly, discussed a number of these formulae at some length and concluded by saying that for ordinary conditions and ordinary materials without surcharge if you were making the wall four-tenths the height you were doing about the right thing. I am frank to admit that when the question of designing the retaining walls of the Chicago Terminal track elevation came up I sent my assistants around town and found out what all the sections were that had been used on other walls and a record as to how they were standing. Between us we cooked up a composite wall that looked good to us and built several miles of it. It is still standing. I will say, however, that the ground under nearly all of these walls was of such a character that we considered it necessary to put piling underneath so that they had a solid foundation, which was practically equivalent to the rock foundation that has been spoken of. It became necessary in some cases where it was impracticable to get the pile driver close enough to buildings to put the piling near the toe of the wall and for us to do considerable figuring as to thickened walls in order to take care of that changed condition. That was merely a question of moment and had nothing to do with the calculation of earth pressure.

I. F. Sterns, Engineer of Bridges, Chicago & North Western: I think that Mr. Layfield touched upon the crux of the matter when he said: "We cooked up a wall that looked good to us." It is very fortunate that the making of the design and the passing on it are in the hands of men who have the preliminary experience to appreciate that even though the figures show something, if it does not look good it ordinarily is not. It is like making estimates, in which we have all had experience. We make an estimate and then we guess at it, and if our guess and our estimate do not agree, we make our estimate over again (laughter) and find where we made an error in our figures. I do not care to employ any mathematical theory. I have gone into that and in a measure tried to forget it and simply to retain the idea of what is right

and what ought to be right. Trautwine says in the biginning of his book that an apparently simple subject can be hidden by a whole lot of mathematical analysis. That is right. But I do not think many people understand what he meant. What he meant was, in my way of thinking, that we are afraid of a mathematical analysis as a general thing, but that if we look at it in a fearless way as we ought to look at the whole study of mathematics, we will find that after all that part of it is the simplest part of the entire problem. I have listened to the various speakers, and, after all, we have based everything that we have done upon the old analytical theory of Rankine. Rankine, in his figures, assumed the slope of earth; said that we had to do that; we had to get some basis for it. Now, once assuming a certain slope of earth, assuming that you have a granular mass that will remain in a quiescent condition under a certain slope, the mathematics of it is very simple, indeed. As Mr. Finley has pointed out, the trouble lies in the fact that we do not always assume the right thing. We have our clay, our sand and our water-soaked soil, and we do not know just at what slope that will stand up.

The formula of 15 h^2 or 16 h^2 is based absolutely on the weight of earth from 100 to 107 lbs. and slope of earth of 1½ to 1. If we approach those things without fear and trembling and say we have to make some assumption to guide us we draw up something that looks right and it is probably quite right. I discussed with Mr. Armstrong the diagrams of the solutions made by Mr. Mohler and it struck both of us that while we agreed with his demonstration that for the particular solution involved there was no increase due to surcharge, it simply meant that the surcharge did not affect the top of the wall. When you came down below the surface of the ground, below the top of the wall, then effect of surcharge is noteworthy. If Mr. Mohler will carry out his figures and go down below the surface I think he will agree with us.

E. P. Goodrich, Consulting Engineer (written discussion not received in time to be read at the meeting):—Almost no tests have been made or data secured as to the compressibility, viscosity and elasticity of soils, although an intimate knowledge of these three properties is absolutely essential to a full treatment of earth pressure problems. One illustration of the lack of knowledge on the part of engineers is given by the author in his citation of the celebrated "middle third" proposition and of its frequent erroneous application. It should be considered by every designer that every structure like a building foundation, bridge pier or arch abutment will shift and settle to some extent (often only very slightly) when loads are brought to act upon it, but account is invariably taken of this fact in every well considered design. Most soils exhibit a very appreciable amount of elasticity, which in connection with the compression produced at considerable depths or because of superposed loads, combined to some extent (depending upon the soil) with a sort of viscosity, is what produces the earth pressures concerning which so many theories have been devised from time to time.

Concerning the old theory of Vauban as interpreted by Colomb, Rebhann, Prelini, etc., little need be said beyond the criticisms of the author, except to note the simplicity of the application of the graphical method, which can be adopted even to the case which has been called by the author excessive surcharge, simply by changing the value of γ, every much in the way which is explained by W. S. Hoag, Jr., of the New York Dock Department, in his paper on The Dock Department and the New York Docks contained in the *Proceedings* of the Municipal Engineers of the City of New York for 1905.

Concerning Rankine's theory, it should be observed that he repeatedly states its applicability only to conditions of indefinite extent of top surface (Civil Engineering, 1894, ed. pp. 321, 324, etc.); and while the analytical method may be theoretically applicable to every angle of slope of back of wall, still Rankine makes use only of the pressures against a vertical plane, modifying the location of the center of gravity of the masonry or the weight on the base so as to care for the mass of earth or masonry between the vertical and the back of the well. With strict adherence to these points, the author's criticisms of the Rankine theory are not justified.

Another point in which the author's theory is as defective as the other theories he mentions is that he makes use in his formulae of the symbol ϕ as applied to the "angle of repose or natural slope" (as do all the others), although later the author discusses the "angle of resistance to flow," which is also mentioned by Rankine as the "angle of repose" "between the portions into which it (a mass of earth) is divided by any plane," each of which terms really correspond with what the writer has called the "angle of internal friction." (See Earth Pressures and Related Phenomena, Trans. Am. Soc. C. E., Vol. LIII, 1904, p. 292.) Just so long as inventors of earth pressure theories measure the induced internal stresses in terms of the angle of *surface slope* (however modified), will their theories fail to accord with facts, and the author is believed to be open to this important criticism along with the other authors he criticises.

He has done much valuable work in analyzing the two great earth pressure theories and in collating the results of his analysis, if for no other reason than to show how the several theories are not to be applied. But when it comes to the analysis through which he deduces the conclusion that no more pressure is produced against a wall with vertical back, whether there is a surcharge fill or whether the fill runs "off level or even *sloped down away from the back of the wall*" (the italics are mine), I believe the author to be seriously in error. This conclusion is reached through study of such experiments as those of Darwin (Minutes of Proceedings, Inst. C. E., vol. LXXI., p. 350), Steele (*Engineering News*, Oct. 19, 1899, vol. XLII., p. 261), etc., as well as by the following analysis of conditions assumed much like those in Fig. 3 of the paper. In this survey I shall ignore for the moment the author's statement (which I question) that "the net resultant of the squeeze will be at right angles to the force of gravity . . . . whether the wall carries a surcharge or not." (The above quotation is not seriatim from the text of the paper, but is believed, nevertheless, to state the conclusion of the author.)

Assume a pile of cylinders as shown in cross section diagram in Fig. 4. The action of gravity on each is represented by the vertical arrow through the center of each circle, while the small arrows show the points and directions of the pressures exerted on the cylinders beneath. Upon the assumption that the angle of slope of the pile is 60 deg. from the horizontal, it is evident that each little pressure will be transmitted directly through each lower circle without reduction, so that if the final resistance is for the moment considered as acting along 60-deg. lines, as shown in Fig. 5, it is seen that the left-hand arrow in the latter figure must equal three of the small downward arrows in Fig. 4, corresponding to the three left-hand cylinders in the pile, while the next upward arrow in the same direction must equal two and the next only one downward diagonal pressure. Similarly the pressures extended by the left cylinder in the pile shown in Fig. 6 are, as shown therein, to be such that the lateral equilibriating pressures would increase downward according to the series 1, 3, 5, etc., to infinity, provided the top surface is of that extent, but increase only to a constant value in the case of a mass of definite width, such as the contents of a bin. This latter is seen to check with remarkable exactitude with numerous experiments and with the best bin theories. According to Fig. 7, however, when the top slope is at an angle of 60 deg., it is seen that the lateral resisting force at the down-hill side of the slope is equal for all depths when the mass is of limited extent, and the uppermost arrow is much larger than in the case of a horizontal top. On the up-hill side the arrows are seen to increase in length with increase of depth to the same ultimate value as for the other side, but the important

point is found in the fact that the rate of increase is only half that of the condition with horizontal top, viz., 1, 2, 3, 4, 5, etc., against 1, 3, 5, etc. According to the diagram, if the mass is infinite in extent the necessary lateral resisting pressure would theoretically also have to be infinite and equal for all depths. This is perfectly consistent with the conditions of the problem as assumed, because practically all actual natural conditions have been set aside in making the assumptions. Furthermore, it is closely in accord with facts as encountered in cases of large slides where it is practically impossible to construct walls which will resist the earth mass, because in this case the lateral component of the whole weight of the gigantic sliding mass must be resisted. I have experienced several cases of such enormous pressures on the sides of slopes, one example being the crushing of heavy braces placed across a sewer trench only about 3 ft. wide and 6 ft. deep, the ditch having been cut along a side hill composed of damp clay. Intermediate conditions between those of Fig. 6 and the down-hill side of Fig. 7 will give a lateral pressure, increasing with depth and at a rate greater than in the case of a horizontal top. Such a condition may be illustrated as in Fig. 8, where there is seen to be a real increase with depth, but this is seen to be greater than in the case of a horizontal top.

Obviously, in order to secure actual horizontal or other pressures in the diagrams above it is only necessary to revolve the upwardly directed arrows horizontally and vertically; for example, the horizontal component being the one desired, while the vertical component is to be assumed as resisted by the friction against the back of the wall or other proper resisting factor.

Taking up the author's analysis of his Fig. 3, it would seem to the writer that the value of P when deduced in accordance with the author's method could be only of such size as just to equilibrate the single cylinder on which it is applied. This value then would be constant for all depths, however great or small, which is contrary to fact; and for cylinders of infinitesimal size, like grains of sand, the lateral pressure would itself be infinitesimal, which is again contrary to fact.

Moreover, the writer has found by experiment that under certain circumstances in nature almost the exact condition actually exists which the author derides as impossible when he says, "We would have the anomaly of the top of a natural slope of an embankment carrying a load greater than the weight of the material in the vertical projection above." The writer found that with certain kinds of compressible soils the *edges* (and even more pronouncedly the corners) of a column footing, for example, had to resist several times the earth pressure developed under the center—probably due to the very arch action which the author derides.

It would therefore seem that the author's primary assumptions are wrong except in so far as he has made an endeavor to get at the conditions of so-called "flow," which, however, should be approached from a different standpoint, in my opinion.

It seems to me that the author is entirely wrong in comparing the surcharge greater than the surface angle of repose with a deep-lying soft layer over-laid by strata of heavy materials. A much fairer comparison seems to the writer to be between the actual stratum in question and one in a fill entirely composed of the soft material but of a new depth and surface slope, such that the vertical pressure produced at the stratum in question will be that of a properly selected one in the new assumption. In Fig. 9, for example, suppose a stratum of soft material 10 ft. below the surface, over-laid by material 1.2 as heavy as the soft layer. Obviously, the same conditions, as far as the special layer, are secured by assuming a bank 1.2 as high and all composed of the soft material.

Again, the author's illustration of the bank of clay which will stand with a vertical face for several feet, but will flow



Fig. 4.



Fig. 5.

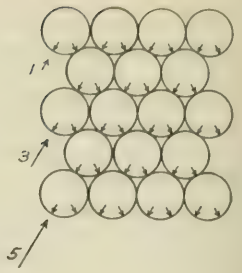


Fig. 6.

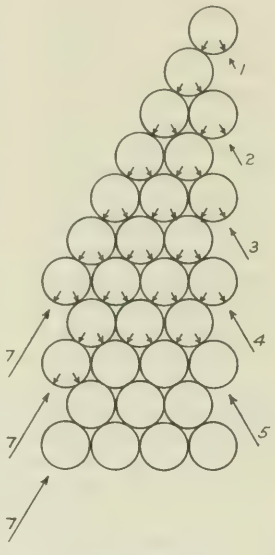


Fig. 7.

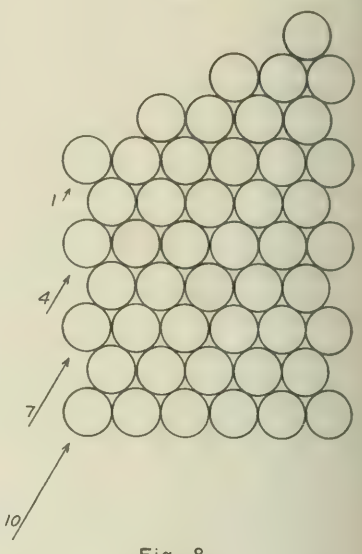


Fig. 8.

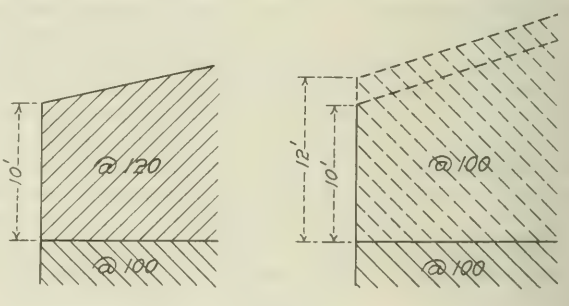


Fig. 9.

at great depths, does not seem at all comparable with a surcharge exceeding the angle of repose, unless it be considered as described in the last paragraph above. It seems to the writer that the true situation is found in the fact that the "angle of internal friction" changes with depth, and this is a condition of which none of the theories—even the author's—take account, unless it be by the device explained above. The writer's experiments on both full-size retaining walls, as well as on models, have led him to the opinion that the resultant of earth pressures is usually located *above* instead of below a point ⅔ down from the top, as the author states.

Nor do I understand how the accident described by the author at the end of his paper proves anything at all as to the location of the resultant of the pressures which existed. In that case there existed downward, lateral and upward pressures and it was the resistance offered to the last named immediately under the steam shovel which failed.

Finally, after a considerable study, I cannot work out any consistent reason for the formulae used by the author, un-

less the symbol Ø as used by the author refers to an angle entirely different from that usually understood. It seems quite possible to devise a formula starting from the idea of hydrostatic pressure, but my experiments with clay show that the angle of internal friction alters widely with the depth, so that the symbol Ø must also vary if the author's theory is to be of any value. Again, it seems as if there should be some means of making a formula which could be applied to walls with back slopes both positive and negative instead of the necessity of using two quite dissimilar formulae as the author has done. In the very fact that two dissimilar formulae are necessary is to be found a marked "break-down" of the author's theory, in my opinion. As stated above, the author has done much service in disclosing the weak points of the existing earth pressure theories, and for that he deserves the thanks of the profession.

OPERATION OF ELECTRIC AND MALLET LOCOMOTIVES ON THE GREAT NORTHERN.

The operating conditions of the Cascade tunnel line of the Great Northern were described in the *Railway Age Gazette* of December 3 and December 24, 1909. In a paper before the American Institute of Electrical Engineers, Cary T. Hutchinson, the electrical engineer of the line, gave some additional data regarding the performance of the electric and Mallet locomotives on this line.

Electric service was started on July 10, although one or two trains had been handled previously. From that time to August 11, practically the entire eastbound service of the company was handled by electric locomotives.

During this period of 33 days there have been 212 train movements, of which 82 were freight, 98 passenger and 32 special. In each case the steam locomotive was hauled through with the train. The tonnage handled was as follows:

	Tons.
Freight tonnage	171,000
Passenger tonnage	88,500
Special tonnage	15,500
Total	275,000

This is an average of 8,350 tons a day, all eastbound.

The average freight train weight has been as follows:

	Tons.
Cars	1,480
One Mallet locomotive	250
Three electric locomotives	345
Total train weight	2,075

The maximum weight of cars was 1,600 tons; the minimum 1,200 tons.

The representative passenger train handled is made up as follows:

	Tons.
Coaches	426
One steam locomotive	250
Two electric locomotives	230
Total train weight	906

The maximum was about 125 tons greater.

The power required to haul these trains seemed greater than it should be; investigation showed that the difference was accounted for by the unexpectedly high friction resistance of the steam locomotives, as a trailing load; tests were made on several engines with the following results:

1	2	3	4	5	6
Test No.	Engine classification.	Total weight with tender. Tons.	Weight on drivers. Tons.	resistance on 1.7 per cent. grade. Lbs.	Equivalent weight of freight cars. Tons.
1	Mallet No. 1904, 2-6-6-2..	250	158	19,340	482
2	" No. 1911, 2-6-6-2..	250	158	17,500	432
3	" No. 1905, 2-6-6-2..	250	158	24,200	602
4	Consolidation ...2-8-0 ..	159	90	10,080	255
5	Pacific .....4-6-0 ..	188	70	10,270	257

The tests were made by towing an engine through the tunnel behind an electric; the electric was fitted up with test instruments and the total tractive effort was thereby obtained. An allowance of 6 lbs. per ton was made for the resistance of the electric and the difference is the draw-bar pull in column 5. Column 6 is the equivalent load in cars, taking car resistance as 6 lbs. per ton. Each test given is the average from six to twelve separate readings. The average for the three Mallets is more than 20,000 lbs.

If the grade resistance be deducted from the total pull, and the difference lumped as "lbs. per ton" for the locomotive and tender, there results:

Table IV.

Engine classification.	Frictional resistance of locomotive. Lbs.	Lbs. per ton.
Mallet No. 1904	10,840	43.0
Mallet No. 1911	9,000	36.0
Mallet No. 1905	15,700	63.0
Consolidation	5,480	34.5
Pacific	3,870	20.7
Electric	1,500	13.0

The average for the three Mallets is 47.0 lbs. per ton for the frictional resistance on a straight level track.

The figure for the electric was obtained from tests made by towing it by a motor car on straight level track; this test was made at Schenectady. Included in it is the resistance of gears and bearings of motors.

Using 20,000 lbs. as the pull required for a Mallet on the 1.7 per cent. grade, the approximate average from the table, the total tractive effort for the average freight train is:

Cars	1480 tons × 40 = 59,200 lbs.
One Mallet	250 tons × 80 = 20,000 lbs.
Three Electrics	345 tons × 40 = 13,800 lbs.
Total tractive effort	93,000 lbs.

This is equal to 31,000 lbs. for each electric locomotive.

On account of the very high frictional resistance of the Mallet engine as a towing load, this representative train is equivalent to 1980 tons, excluding the three electric locomotives, or a total of 2,325 tons, on the 1.7 per cent. grade. This is on the assumption that the draw-bar pull required for the Mallet is replaced by freight cars at 6 lbs. to the ton; this represents the average freight train handled.

The tractive effort for the passenger train varies from 40,000 to 50,000 lbs., depending on the number of steam locomotives taken through; two electrics are ordinarily used, although one would answer in nearly all cases.

During this period there have been no delays due to failure of the electric locomotives, and but two trifling delays due to failures of the electric plant, both chargeable to the transmission line and both caused by accidents beyond the control of the operating force.

On August 11 the electric service was discontinued, owing to failure of both water wheels. Service was resumed on September 9 and has been continued regularly since. The plant was taken over by the operating department of the railway late in September.

The westbound service was not at first handled by the electrics regularly, as there is nothing in particular gained by braking the trains electrically on this short stretch, but now westbound passenger trains are so handled, for the benefit of the passengers.

A number of tests have been made to determine the power returned when regenerating; the following is typical:

Train: Mallet engine, 1,550 tons, car weight, two electrics on 1.7 per cent. grade.

Force due to grade.		Frictional Resistance.	Remainder for acceleration.
Mallet	8,500 lbs.	11,500 lbs.	— 3,000 lbs.
1,550 tons in cars	26,500 "	9,300 "	+ 17,200 "
Three electrics	11,770 "	2,070 "	+ 9,700 "
Total for acceleration			49,830 lbs.

This is equivalent to 1,495 K.W. delivered to the gears of the motors at 15 miles per hour.

The efficiency of the locomotive is approximately 80 per cent., hence the power returned to the line should be 1,200 K.W. The test of this train gave 950 K.W.; the difference is due to the standard practice, not yet abandoned, of keeping a certain number of car pressure retainers set on down grade. The Mallet, instead of adding to the delivered power, is an additional load that has to be carried by the train.

A similar test on a ten-car passenger train weighing 950 tons gave:

Delivered power, calculated	590 K.W.
Delivered power, measured	597 K.W.

In this case there was no added resistance of pressure retainers.

These tests merely confirm the calculations, as they should. On a 1.7 per cent. grade, then, the ton, descending at 15 miles per hour, will deliver 0.67 K.W. to the system; on a 2.2 per cent. grade it will deliver 0.91 K.W.

The losses in the system when delivering 4,000 K.W. to the locomotive, at the west end of the Wellington yard, are:

Place.	Power	
	Kilowatts.	Per cent.
Powerhouse low tension bus-bars	4,740	100
Sub-station low tension bus-bars	4,250	89.8
Trolley wheel of the locomotive	4,000	84.5
Driving axles of the locomotive	3,320	70

The average efficiency is somewhat higher than 70 per cent.

The maximum duty was imposed upon this equipment from the outset. On account of very poor regulation of water wheels, steam has been used in one of the Mallet engines in starting the freight trains in the Wellington yard; an attempt has been made to use just sufficient steam to enable the Mallet engine to turn itself over. Steam is shut off at the portal of the tunnel; in addition to this, in order to provide smoother starting, a slight air pressure has been maintained on the locomotive at starting, which is gradually reduced.

On several occasions trains have broken in two, due to the trolley wheel on the rear locomotive leaving the wire and thus cutting off part or all of the power supply to the rear locomotives. This throws a greatly increased draw-bar pull on the front locomotive, and the consequence is that the train is jerked apart. This happened in the early stages of the work, and was due to the fact that the turn-outs were not in the best order, and also that the enginemen had not sufficient experience in handling trains. Another means taken to avoid the broken draw-bars was to use the rear Mallet engine to assist the train over the trolley crossings in the Wellington yard; this was a temporary measure and has been discontinued.

It is interesting to compare the performance of a Mallet locomotive under the same operating conditions as this system. The data for this are given by Mr. Emerson, superintendent of locomotive power of the Great Northern, in a discussion before the American Society of Mechanical Engineers on locomotives of this type. As an excellent performance, he gives these figures:

"Recent performances show that on a round trip over this division the L-1 engines handled 1,600 tons with a total of 43 5/6 tons of coal, or equivalent to 25.13 lbs. of coal per 100 ton-mile."

The division referred to is from Leavenworth to Everett, 108.7 miles. The work done per ton for a round trip over this run is readily calculated; from the profile I find,

Total rise, westbound	2,212 ft.
" " eastbound	3,440 ft.
Total	5,652 ft.

and $5{,}652 \times 2{,}000/2.65 \times 10^6 = 4.26$ K.W.-hrs., at the rail; this is the work done per ton in lifting the train; the work done against train resistance, assuming resistance to be 6 lbs. to the ton, for 108.7 miles, is 1.3 K.W.-hrs.; the total work done in round trip per ton 5.56 K.W.-hrs. There should be a negligible addition to this for starting the train.

The average train weight is:

Cars	1,600 tons
One engine, 109 miles.	
Second engine, 58 miles.	
Equivalent engine weight	380 tons
Total	1,980 tons

The coal used was 43 5/6 tons, equal to 87,660 lbs.

Coal per ton	44.3 lbs.
Coal per kilowatt-hour	8.0 lbs.

A modern steam station can deliver one kilowatt-hour for 3 lbs. of coal, at the bus-bar, which, with an efficiency of 70 per cent. to the rail, gives a consumption of 4.28 lbs. per kilowatt-hour at the rail; in other words, the Mallet requires nearly twice as much coal per kilowatt-hour at the rail as would be used in a modern steam station in the place of the hydro-electric station at Leavenworth.

PENNSYLVANIA RAILROAD STATION AT NEW YORK.

The plans for the new Pennsylvania Railroad station in New York City were fully shown in the *Railroad Gazette* of February 9, 1906, and May 25, 1906. Later articles appeared in the *Railroad Age Gazette* of March 19, 1909, and August 20, 1909.

The main entrance is on Seventh avenue, between Thirty-first and Thirty-third streets. The tracks are 40 ft. below the street surface and the station is divided into three levels. The Seventh avenue entrance is for foot passengers only. It leads to the main waiting room through an arcade 225 ft. long and 45 ft. wide, flanked on both sides by shops and booths. At the farther end of the arcade are the restaurant, lunch rooms and cafe and beyond is the general waiting room and concourse.

On the first level below the street is the station proper. The general waiting room is 277 ft. x 103 ft. and is 150 ft. high. On the same level with the general waiting room is the main baggage room, with 450 ft. frontage. This is for the use of the transfer wagons and covers the full area occupied by the arcade and restaurants on the floor above. Baggage is delivered and taken away through a special subway. From the baggage room trunks are delivered to the tracks below by motor trucks and elevators. Motor cabs will also be stationed on this level.

Parallel to and connecting with the main waiting room by a wide thoroughfare is the concourse, over 200 ft. wide, extending the entire width of the station and under the adjoining streets. Stairs descend from it to each of the train platforms on the track level. The concourse and adjacent areas are open to the tracks, forming a courtyard 340 ft. x 210 ft., roofed by a lofty train shed of iron and glass. In addition to the entrances to the concourse from the waiting room there are also direct approaches from the streets.

Auxiliary to the main concourse and between it and the tracks is a sub-concourse 60 ft. wide, which will be used for exit only. This exit concourse is 18 ft. above the tracks, but is connected with the track level by two stairways and one elevator from each platform. From it ample staircases and inclines lead directly to the street.

The northern side of the station, extending along Thirty-third street, is assigned to the Long Island Railroad. Into this part of the station trains will run from all points on Long Island by way of the East river tunnels. Ample entrances and exits are provided, so that this traffic can be handled independently. The third level is the train platform, about 36 ft. below the surface of the street.

The building covers the entire area bounded by Seventh and Eighth avenues and Thirty-first and Thirty-third streets, being 788 ft. x 430 ft. The main part of the building reaches 76 ft. above the street level. With entrances through each of the two corners of the station on Seventh avenue there are carriage drives, each about 63 ft. wide. The frontages on Thirty-first and Thirty-third streets are similar.



Waiting Room.



Pennsylvania Station at New York.

Looking southwest over the corner of Seventh avenue and Thirty-third street.



Concourse of Pennsylvania Station.



Track Level and Concourse.

The following figures as to the track facilities, etc., are of interest:

Area, Tenth avenue to normal tunnel section east of Seventh avenue	28	acres
Length of trackage	16	miles
Number of standing tracks at station	21	
Length of platforms adjacent to passenger trains	21,500	ft.
Number of passenger platforms	11	
Highest point of tracks—below sea level (M. H. W.)	9	ft.
Number of baggage and express lifts	25	
Total excavation required	3,000,000	cu. yds.
Length of retaining walls	7,800	ft.
Number of lineal feet of streets and avenues carried on bridging	4,400, or an area of about 8	acres.
Loading per square foot on avenue bridging	1¾	tons
Maximum loading per square foot on bridging east of Seventh avenue	5	tons
Maximum capacity of all tunnels, in trains per hour	144	
Storage capacity of station yard tracks	386	cars
Proposed initial daily service of P. R. R. trains	400	
Proposed initial daily service of L. I. R. R. trains	600	1,000 trains

PROGRESS IN LOCOMOTIVE CONSTRUCTION.

The locomotives shown in the accompanying half-tone give an idea of the progress in locomotive building during a period of 45 years. Engine No. 1 was built by Breese, Kneeland & Co. in 1857, and the modern decapod, No. 27, was built by the Baldwin Locomotive Works in 1903.

Engine No. 1 is at the present time standing on a section of slag-ballasted track in a park which adjoins the general office building of the El Paso & Southwestern, at El Paso, Tex. Previous to its service on this road the locomotive belonged to the Milwaukee & Mississippi, and after this road became a part of the Chicago, Milwaukee & St. Paul, the engine's number was changed to 111. The original engine was designed for wood burning and had a large stack. The extended front end and straight stack were applied some time during the seventies, after the engine was acquired by the Chicago, Milwaukee & St. Paul and converted into a coal burner. These facts indicate that this engine is an early example of front end improvement. These changes are probably the only radical ones which were made from the original design.



Decapod Locomotive of 1903 and American Type of 1857.

The following are the general dimensions of the two locomotives:

Type	4-4-0	2-10-0
Weight on drivers	36,000 lbs.	200,000 lbs.
" on trucks	16,000 "	20,000 "
" total	52,000 "	220,000 "
Total w't, eng. and tender	104,166 "	390,000 "
Firebox, length	49 in.	114 in.
Firebox, width	35 in.	66 in.
Tubes, number	125	410
" length	11 ft. 0 in.	16 ft. 8 in.
" diameter	2 in.	2¼ in.
" heating surface	715 sq. ft.	4,003 sq. ft.
Firebox, heating surface	77.6 "	150 "
Total heating surface	792.6 "	4,153 "
Grate area	11.91"	52.2 "
Boiler pressure	110 lbs.	190 lbs.
" diameter, front	42.5 in	80 in
Water capacity	1,700 gals.	7,500 gals.
Coal capacity	6 tons.	14 tons.
Tractive effort	9,000 lbs.	46,904 lbs.

NEW PRIVATE CAR FOR THE QUEEN OF ENGLAND.

BY C. VAN LANGENDONCK.

Herewith is illustrated a new private car recently built for the use of the Queen of England and Princess Victoria.

The car is 67 ft. long, 9 ft. wide, and 12 ft. 9 in. high from the rail level to the top of the roof, and is carried on two six-wheel trucks.

The body is built of teak, finished with selected Java panels, also of teak, the center panel bearing the royal coat of arms. The roof is elliptical. Entrance to the platforms at either end is obtained from double doors opening inward, the outside panels of which are embellished with gilt brass moldings and mounted with Her Majesty's cypher. On each side of the doors ornamental grip handles finished in gilt extend from the floor to the cornice.

The arrangement of the saloon is as follows:

The Queen's day saloon.

The Queen's dining saloon, convertible to sleeping saloon for night traveling by insertion of portable partition.

The Queen's dressing room.

Two lavatories.

Princess Victoria's dressing room.

Princess Victoria's sleeping saloon.

Attendants' end and platform.

This arrangement provides two complete and separate suites of rooms.

The interior of the day saloon is paneled from floor to ceiling and enriched with special moldings and cornices, the whole being enameled white with half-gloss finish. The ceiling is enriched with moldings and finished flat ivory white. The furniture is of inlaid hardwood, upholstered in pale flowered silk. The metallic fittings are finished in mercury gilt. The artificial lighting of the saloon is obtained by the reflection from the ceiling of electric lino lights concealed behind the window cornice at either side of the saloon, and supplemented by two-light electric brackets of artistic design fixed at intervals below the cornice, and covered with silk hand-painted shades. The floor is covered with a thick red wilton pile carpet.

The walls and ceiling of the dining saloon are finished as in the day saloon. The furniture is of inlaid satinwood upholstered in striped silk. The floor is covered with a red wilton pile carpet, and the fittings are of mercury gilt. The artificial lighting is effected by means of three-light table standards in which electric candle lamps are used, supplemented by two-light electric brackets attached to the walls at suitable intervals.

When used as a sleeping saloon for night service the day service furniture is removed and replaced by a brass bedstead and other suitable furniture, and a portable section of paneling fitted to form a corridor between the day saloon and retiring rooms, the paneling being finished to match the other walls of the saloon.

The walls and ceiling of the Queen's dressing apartment are finished in white, as previously described. The furniture is of inlaid satinwood, and includes dressing table with large mirror and drawers below, the top being laid with figured silk covered by beveled plate glass, washstand with marble top, and porcelain basin, clothes stand and dressing chair.

Princess Victoria's dressing and sleeping rooms are paneled



Princess Victoria's Bedroom.

and finished in white to match those in the Queen's suite. The furniture is of inlaid satinwood upholstered in pale flowered silk, and the floors are covered with a gray wilton pile carpet.

The two lavatories are paneled and molded in plain pencil cedar and the ceilings finished white. The floors are covered with cork parquet.

The platform is paneled and molded in Java teak, and the ceiling finished white and enriched with moldings.

The platform at the attendants' end is treated in the same manner and is fitted with a chair upholstered in red leather. In this compartment the whole of the mechanism for the control of the lighting, heating and ventilation is contained. A telephone, communicating with all the vehicles forming the train, is installed here, as well as an electric bell indicator communicating from each of the royal apartments.

The corridor is paneled and molded throughout with Java teak from floor to ceiling, and the ceiling finished flat, ivory white, and enriched with moldings and carton pierre ornaments. The floor is covered with India rubber, inlaid tile pattern, to prevent noise when moving along the corridor, the same material being used on the floor of the attendant's compartment.

The windows throughout the carriage are easily opened or closed. They are fitted with spring blinds of green silk, draped with white taffeta curtains on rods, and overhung with silk curtains, those in the day saloon being finished with embroidered pelmets, which in combination with the light artistic fittings lend an elegant appearance to the interior, as well as the exterior of the vehicle.

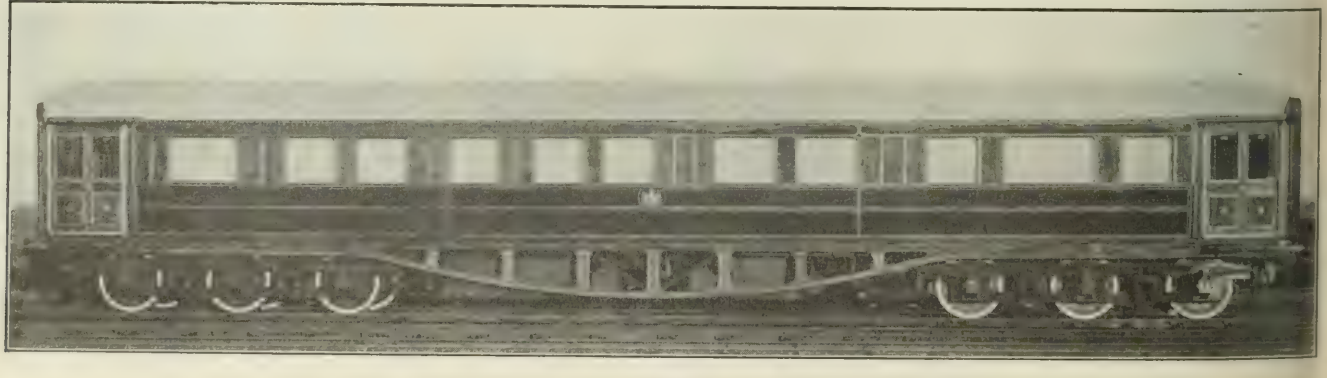
The car carries a complete electric installation to deal with the lighting and ventilation, consisting of two dynamos working in parallel coupled to two sets of accumulators, also in parallel. The aggregate candle-power of the lamps mounts to 1,120.

A complete system of ventilation, electrically operated, has been adopted throughout the carriage, and worked in conjunction with means for heating and cooling each or any of the apartments. The air ducts, secreted between the roof boards and the interior ceiling finish, are led the full length of the carriage. An air intake cowl projects through the carriage roof and is coupled to two electric motors and fans fixed in a false roof above the attendants' compartment. The air is drawn through a purifying tank consisting of fiber matting saturated with water, thoroughly purified, and delivered into the two ducts for distribution in the various compartments, each of which is provided with air inlets, which can be opened or closed at will. In its passage to the ducts arrangement is made for heating the air by a steam coil in winter time. A delicate perfume is also imparted to the air obtained by packing the top of the purifying tank with kuskus root.

For the purpose of keeping the temperature under perfect control and extracting any impure air, an exhaust electric motor and fan is placed under the carriage body coupled to an exhaust duct running the full length of the carriage and secreted in the same manner as the pure air ducts, and controlled by outlet grids, which can be opened and shut as required.

In addition to the complete electric installation described the car is arranged with a 50-volt circuit fed from a van at the end of the royal train. This is used to supply a number of portable electric radiators disposed in the various compartments and also for heating the provided kettles and urn.

The car is fitted with vacuum and Westinghouse brakes, Pullman vestibules, and Buckeye automatic couplers. The weight in running order is 44 tons.



The Queen's Car.

General News Section.

The New Jersey legislature has refused to renew the appropriation for the board of three experts which has been engaged in a valuation of the railways of the State, but has authorized the State Board of Assessors to continue the work by appointing one of the three experts, who will engage assistants as may be found necessary.

James J. Hill has assured the Governor and the Railway Commission of Washington that immediate steps will be taken to avoid future trouble with snowslides on the line of the Great Northern. The points at which the disastrous slides of the past winter occurred were thought to be safe, but these and other points not already adequately protected will be covered with sheds at once.

Near New Lisbon, Wis., on the morning of April 8, on the Pioneer Limited Express of the Chicago, Milwaukee & St. Paul, two masked men held up Conductor A. P. Shumway with pistols, intending evidently to rob the passengers; but the conductor, instead of holding up his hands, leaped upon the larger of the two bandits and, with the aid of a sleeping car porter, repulsed them; but they applied the air-brakes, stopped the train and escaped.

On the passenger trains of the Lehigh Valley the trainmen, porters and waiters have been instructed to tell any passenger who may be noticed looking out of a window the name of the place or building which has attracted his attention.

Seventy local passenger agents and ticket sellers of the Lehigh Valley have been taken to New York City to inspect the Hudson river tunnels; this for the purpose of enabling these men to give intelligent answers to questions asked by passengers.

On behalf of the Illinois Central, R. E. Gaut, engineer of bridges and buildings, has offered to the city of St. Louis land for crossings and approaches for the city's proposed free bridge across the Mississippi river. The land offered amounts to more than one-half an acre, and it is stated that to condemn it might have cost the city from $10,000 to $50,000. St. Louis newspapers say that the Southern Railway has offered the city seven acres, which it will need for the free bridge, for about $80,000.

The New York State Superintendent of Public Works has awarded Barge Canal Contract No. 90 to the D'Olier Engineering Company of Philadelphia, Pa., for $178,197. It is for furnishing and installing electrical equipment for lighting and operating locks on the Erie, Champlain and Oswego canals, at Baldwinsville, Smith's Basin, Comstocks, Whitehall, Phœnix and Oswego. The superintendent also has awarded a contract for the construction of a dyke along the Oswego River for 1¼ miles, near Fulton, to Cunningham & Woodard, of Hudson Falls, for $47,721.

The Mayor of New York City has announced informally that the tunnel under the East river from the Borough of Queens to Lexington avenue and Forty-second street, Manhattan, which was completed more than two years ago, is to be put in use. The intimation is that the Interborough Rapid Transit Company, which is in control of the tunnel, will extend it westward from Lexington avenue, through Forty-second street to Broadway, and then run trains direct to Broadway. An extension of this tunnel westward would have to go below the level of the present north and south subway, which runs through Forty-second street for most of the distance between the two points named.

On the eight or ten preference freight trains running over the Philadelphia division of the Pennsylvania, each engineman now has his own engine; that is to say, an engine is assigned to each crew, and it stands idle while the men of that crew are sleeping. This action has not been extended to the slow freight trains. On the middle division the officers have been experimenting with this matter for some time, and it is believed that the order will shortly be extended to the preference freight crews over the entire road. In the passenger service two crews are assigned to one engine, and the plan works very satisfactorily in the main. For some time the middle division slow freight crews have been having their own engines.

J. S. B. Thompson, assistant to the president of the Southern Railway, whose office is at Atlanta, has engaged Lauren Foreman, hitherto city editor of the *Atlanta Constitution*, as director of the publicity department of his work. Mr. Thompson, under the direction of President Finley, is enlarging the activities of the road in connection with the promotion of industrial and farming interests throughout the southern states, and not only will new settlers and new industries be attracted to the region by every means possible, but the dissemination of information in all districts served by the railway will be attended to with special care and with a constant endeavor to develop the territory in the best possible manner.

The Chicago & North Western and the Bessemer & Lake Erie have issued orders that the movement of freights on Sundays must be reduced as completely as possible. The Bessemer & Lake Erie is owned by the United States Steel Corporation, which has ordered the discontinuance of Sunday work so far as possible in all of its mills. It is said that in the Pittsburgh district 13,000 men in the steel mills have hitherto worked seven days (or nights) in each week. Besides the Bessemer & Lake Erie, the United States Steel Corporation controls a number of other railways, on all of which the Sabbath-keeping rule will be put in force. The principal roads in this list are the Duluth & Iron Range, the Duluth, Mesaba & Northern and the Elgin, Joliet & Eastern.

The pension department of the Pennsylvania Railroad, including the lines west of Pittsburgh, last year paid out the sum of $786,345 in pension allowances to 3,465 retired employees. The appropriations for pensions made by the different companies of the system amounted to $882,500. The total number of employees on December 31 was 181,987, of which 123,628 were on the lines east of Pittsburgh and Erie, and 58,359 on the lines west of Pittsburgh. A statement of the pension payments of twelve of the leading roads of the country in the fiscal year ending June 30, 1907, shows that, with some 303,000 employees, 1,765 of whom were retired, the total payments of these roads amounted to $358,519, or less than half of the total payments of the Pennsylvania the past year. The average pension paid by the Pennsylvania last year was $254.57, while the average paid on the twelve other principal railways in the year ending June 30, 1907, was $203.

The Pennsylvania Railroad is now using signal instruction cars on all divisions. The new cars in use on the main line are 60 feet long, divided into two compartments. One room will be used for examinations, while the other will contain a table upon which is to be placed under a glass cover a large track chart of the railway, which can be rolled back and forth by means of rollers placed at each end. This chart shows all main running tracks, switches and cross-overs; all signals, track troughs, stations and mile posts. The men will be given an opportunity to study this chart prior to passing an examination on it. Each car is provided with a set of model signals, which can be manipulated so as to show all signal indications. The cars are in charge of examiners, each of whom has an assistant. These men will have charge of all examinations, except those on machinery and air brakes. The cars will also be used for examination of employees on train rules and other subjects.

According to the *Deseret News* of Salt Lake City, the track of the Western Pacific across the southern end of the Great Salt Lake, which for eight miles is on a trestle or earth embankment in the water, has been so much damaged by high water recently that there has been some thought of running around the lake farther south, by using the track of the San Pedro, Los Angeles & Salt Lake; but to do this, about ten miles of new line would have to be built to make a suitable connection with the Western Pacific west of the lake. It seems to be assumed that the lake is rising at the rate of 2 ft. a year. The Lucin cut-off of the Southern Pacific, across the northern

part of the lake, was badly damaged in the last week in March, and for several days through trains had to run around by the old line through Kelton, which is about 44 miles longer than the cut-off line. This old line has not been kept in good condition, and trains had to be run very slowly. It is now proposed to relay the track with heavy rails and to put the roadbed in good condition.

Proposed Public Utility Legislation for Ohio.

The Ohio members of the Railway Business Association attended a hearing before a committee of the Ohio legislature at Columbus on the evening of April 12 to oppose the enactment of a number of provisions in the Wood bill, which proposes to create a public utilities commission by changing the name and enlarging the powers of the present state railway commission. The provisions of this measure are so drastic and sweeping that if it were passed it would practically place the administration of all the railways and other public utilities entirely in the hands of the proposed public utilties commission.

By section 501-2 "the commission is vested with the power and jurisdiction to supervise and regulate every public utility in this state and to do all things necessary and convenient in the exercise of such power and jurisdiction."

Section 508 provides that no change shall hereafter be made by any public utility in any of its classifications or charges except after 30 days' notice to the commission and with its approval. The commission may allow a reduction of rates within a less time.

In sections 524, 526, 527 and 528 the commission is given power, on complaint by any person or on its own motion, to investigate the reasonableness of any charge made by any public utility in the state, and, after investigation, to make whatever rate, regulation or classification it shall have determined to be just and reasonable, and the charge fixed by it must be imposed in the future. In other words, it is given the power to fix not merely maximum rates but absolute rates.

Section 541 provides that all orders, etc., of the commission shall be in force and prima facie lawful from the date they take effect, unless or until changed by the commission or the courts.

Section 583-6 makes it unlawful, unless the commission shall otherwise order, for any public utility to receive a greater compensation for any service than the lowest charge fixed for that service on January 1, 1910.

Section 602-5 gives the commission authority to examine and audit all accounts of all public utilities and to prescribe all the details of their accounting. All accounts must be closed annually on June 30, and on or before the August 1 following a copy of the balance sheet must be furnished to the commission.

Section 602-6 requires each public utility "to carry a proper and adequate depreciation account whenever the commission after investigation" shall so order, and empowers the commission to "ascertain and determine what are the proper and adequate rates of depreciation of the several classes of property of each public utility. The rates shall be such as will provide the amounts required over and above the expenses of maintenance to keep such property in a state of efficiency corresponding to the state of the industry."

Section 602-7 provides that "all moneys thus provided for shall be set aside out of the earnings and carried in a depreciation fund. The moneys in this fund may be expended in new construction, extensions or additions to the property of such public utility, or invested, and if invested, the income from the investments shall also be carried in the depreciation fund. This fund and the proceeds thereof shall be used for no other purpose than is provided in this section for depreciation and only as allowed by the commission."

Section 602-26 prohibits any public utility, domestic or foreign, to in future acquire, take or hold any part of the capital stock, bonds, notes, or other evidences of indebtedness of any public utility unless authorized so to do by the commission.

Section 602-27 provides that no corporation of any kind shall acquire or hold under any circumstances more than 25 per cent. of the total capital stock issued by any public utility, except where such stock is transferred or held for the purpose only of collateral security, "and in such case only with the consent of the commission." Nothing in the act shall be construed to prevent the holding of stock heretofore lawfully acquired. Every act in violation of this section shall be void.

Under section 602-28, in case of the consolidation of two or more public utilities the aggregate amount of the capital stock and the aggregate amount of the debt of the consolidated companies shall not by reason of such consolidation be increased.

Negotiations Concerning Wages.

The Boston & Maine, after a 10 days' conference, has agreed with its conductors and brakemen on an increase of wages. The rates as given in a published account are as below, the average increase being, it is said, 11 per cent. The settlement provides that the standard for a day's work shall be 10 hours. Passenger conductors are to receive 2.68 cents a mile, ticket collectors 2.15 cents a mile, baggagemen 1.55 cents a mile, and brakemen on passenger trains 1.5 cents a mile. The rate per mile for through freight crews is: Conductors 3.63 cents; flagmen, 2.525 cents; brakemen, 2.42 cents. Yard conductors, days, 34, 33 and 32 cents, according to their rating; yard conductors, nights, 36, 35 and 34 cents an hour. Day yard brakemen receive 31, 30 and 29 cents an hour, and night yard brakemen 33, 32 and 31 cents. The rates in road service are the same as those of the Baltimore & Ohio and the New York, New Haven & Hartford. Local freight trainmen are to have higher rates than through freight trainmen. The rates for yard men seem to be lower than those of the B. & O., the first or highest grade on the B. & M. being the same as the second grade on the B. & O.

Officers of the New York Central have agreed with committees of the conductors and the brakemen of the company to arbitration of the question of wages of these classes of employees, which question has been under discussion for several weeks. President Brown, of the company, submitted a number of propositions for arbitration, one of which was to call in Messrs. Knapp and Neill under the Erdman act, but the proposition finally accepted by the representatives of the employees was that the question be submitted to E. E. Clark, Interstate Commerce Commissioner, and P. H. Morrissey, president of the American Railway Employees' and Investors' Association; these two, if unable to agree, to select an umpire, whose decision shall be final and binding. Mr. Clark was formerly chief of the conductors' brotherhood, and Mr. Morrissey was formerly chief of the brakemen.

An officer of the New York Central, discussing the increase of wages which has been asked for by the conductors, says that on the Baltimore & Ohio, which has granted a higher rate than the New York Central is willing to grant, the conductors earn less per month than on the New York Central. Passenger conductors on the New York Central now earn $144 a month; the company is willing to increase the rate so as to make the average earnings $176 a month, while the rate demanded by the conductors would produce $205 a month. This officer says:

"The B. & O., under the new arrangement, pays but six of its conductors $169 per month, and these are the highest paid men in the company's employ. They make 22 trips each month to earn this amount. Under the schedule which the New York Central offers, 66 men, going out 18 times per month, would each earn $176 per month. While the mileage of the New York Central men is greater than that on the B. & O., the superior equipment allows them to make four trips less than on the B. & O. and still earn a greater amount of money." By superior equipment this officer refers to the complete signaling, the four-track lines and the high speeds and few stops, which simplify the work of the conductors. At $176 a month, conductors will earn $2,100 a year, or about $1 an hour. Nine years ago conductors received only $1,500 a year.

Committees of employees of the Lake Shore & Michigan Southern, the Michigan Central and other lines controlled by the New York Central have been presenting requests to the officers of the several roads, but a settlement of the matter on these roads seems to be likely to be postponed until after the announcement of the results of the arbitration on the New York Central proper.

The New York Central has increased the pay of its telegraphers about 7 per cent.

The Pittsburgh & Lake Erie has increased the wages of conductors and brakemen about 7 per cent.

Grievance committees representing conductors and brakemen of the Pennsylvania are asking for a greater increase than that (of 6 per cent.) which the company has just granted.

The Wabash has agreed with representatives of its conductors and trainmen to pay these classes the same rates of wages which may be established in eastern territory—meaning, presumably, the rates of the Baltimore & Ohio.

The Norfolk & Western has made an increase of about 6 per cent. in the pay of men in the maintenance of way department.

The Baltimore & Ohio Southwestern has increased the pay of mechanics in its shops one cent an hour, and of unskilled workmen in the shops five mills an hour.

On the Pennsylvania Railroad at Harrisburg, Pa., and presumably at other yards of the same class, the rates of pay for yard men are given as follows: Yard conductors working days, 35½ cents an hour; night, 1 cent an hour more. Day brakemen, 30 cents an hour, and night brakemen, 32 cents. Enginemen on H-6 engines, day or night, first class, 43.5 cents; second class, 40.7 cents. Other enginemen, day or night, first class, 40.6 cents an hour; second class, 37.8 cents. Firemen, day or night, on H-6 engines, 23.1 cents, and on others, 25.2 cents.

The New York, New Haven & Hartford has reduced the working time in its shops from 48 hours a week to 40.

The Seaboard Air Line has increased the pay of locomotive enginemen 6 per cent., following negotiations which have been carried on for the past three weeks.

Disastrous Collision in Germany.

In a rear collision at Mulheim, on the Rhine, March 30th, 2 passengers were killed and 200 injured, all of the victims being soldiers returning to their posts from Easter vacations. Two signalmen were arrested.

Improvement Work on the Rock Island Lines.

The improvement work which has been under way on the Rock Island Lines for some years will be continued during this year. Ballasting and widening of track will be done on a large scale, about $1,100,000 being spent for this purpose. Approximately 500 miles will be reballasted. Special attention will first be given to the line between Chicago and Denver and Colorado Springs, on which about 200 miles will be reballasted or resurfaced, as conditions demand. One of the divisions which will be resurfaced and strengthened is the Illinois division. The work here will proceed as fast as the new 100-lb. rails which have been bought for it are laid. The rest of this kind of work will be done in Kansas, Oklahoma and Arkansas, preference being given to those parts of the lines where the demands of traffic are greatest. Rock, disintegrated granite, burnt clay and gravel will be used as ballast, according to local conditions.

In addition to the improvements already referred to, the sum of about $600,000 is being spent on the St. Louis-Kansas City line of the Rock Island, and is to be made one of the best pieces of road in the West.

Railway Matters in Washington.

Washington, April 13, 1910.

General discussion of the administration railway bill was begun in the Senate on Monday and several amendments were offered. The discussion had not much more value than those of former sessions, but the votes which were taken on three amendments are taken to indicate that the administration party has a safe majority by which to pass the bill. Senator Cummins, of Iowa, proposed to define and limit the jurisdiction of the commerce court and was voted down 36 to 28. Another amendment with a similar purpose was rejected 40 to 28. Three amendments proposed by Senator Elkins, who had the bill in charge, were adopted. It was predicted that the discussion would occupy at least two weeks, the number of amendments to be offered being now given as 120. Senator Nelson, of Minnesota, joined the insurgents and denounced the bill as a sugar-coated and vicious piece of legislation designed for the benefit of the railways.

On Tuesday Senator La Follette, of Wisconsin, spoke three hours in criticism of the bill. Mr. La Follette gave most of his attention to Section 12, which authorizes one railway to acquire another, provided more than half of the stock of that other is already controlled. He took for his text the alleged evil of the acquisition of the Boston & Maine by the New York, New Haven & Hartford. He declared that President Taft and Attorney-General Wickersham had been guilty of gross neglect in not continuing the prosecution of the suit which was begun by President Roosevelt to annul the merger of the New Haven and the Boston & Maine, and declared that the governor and lawmakers of Massachusetts also were "enemies of the people." Senators Lodge, of Massachusetts, and Gallinger, of New Hampshire, made short but vigorous replies to the aspersions on their states, and pointed out glaring inaccuracies in Mr. La Follette's charges.

General debate on the bill was opened in the House on Tuesday by Representative Townsend, of Michigan, and by Chairman Mann, who explained the bill in detail. It is evident that there will be a long discussion in the House as well as in the Senate.

The Maryland Public Utilities Law.

The Public Utilities Commission which has been established by the Legislature of Maryland will have supervising power over all public service corporations in the State, including common carriers, steam railways, street railways, steamboats, canals and canal companies, ferryboats, gas and electric companies, telephone and telegraph companies, light, heat and refrigerating companies; water and water-power companies, and virtually every other species of public utilities corporation.

The commission has power to determine rates to be charged by each public corporation subject to the act. The rates are required by the act itself to be just and reasonable, and the commission is vested with power to conduct investigations. The commission is empowered to enforce its orders. Power is also given it, whenever it may deem it desirable to do so, to value the property of any public service corporation. The commission is to be appointed by the Governor and will be composed of three members, the chairman to receive $6,000 a year and each of the other two $5,000 a year. The terms of office will be six years. The Governor, on recommendation of the commissioners, will appoint a general counsel, salary $4,800 a year, and the general will appoint an assistant counsel at a salary of $3,000. The secretary of the commission is to get $3,000 a year.

St. Louis Railway Club.

At the annual meeting of the St. Louis Railway Club on April 8 the following officers were elected: President, E. A. Chenery; first vice-president, H. G. Pfeifer; second vice-president, Charles Burlingame; third vice-president, J. B. Carothers; secretary, B. W. Frauenthal; treasurer, C. H. Scarritt; members of executive committee, W. H. Elliott and Tipton Stilwell.

Secretary Frauenthal's annual report showed that the present membership is 1,185, and that the club has a balance in its treasury of $3,737.08. He stated that the present holder of the club's scholarship will graduate from the University of Missouri this year and that the executive committee desired to bring before the members the necessity of selecting another person for the scholarship and of designating the institution to which he shall be assigned, so that the members may aid the committee in taking proper action.

Railway Telegraph Superintendents.

The Association of Railway Telegraph Superintendents will hold its annual meeting at Los Angeles, Cal., on June 20 instead of May 20, as heretofore announced.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 7, 1910; Niagara Falls, Ont.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Fenna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31—June 3; Atlantic City.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
Car Foreman's Association of Chicago.—Second Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
General Superintendents' Assoc. of Chicago.—Third Wednesday in month; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Association of Special Agents and Police of U. S. and Canada.—May 10-13; Los Angeles, Cal.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting 2d Tuesday in October.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
Richmond Railroad Club.—Second Monday in month; Richmond, Va.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
Short Line R. R. Association.—First Monday in month; New York.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Nyquist, 1134 La Salle St. Station, Chicago.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The Attorney-General of Texas has ruled that officers and employees of the Texas State Railway cannot accept free transportation over other railways or give free transportation over the Texas State road.

It is reported in St. Paul that rates on live stock from St. Paul to Chicago will be increased about May 15; this to restore the equilibrium between live stock and dressed meat rates which was disturbed by the recent increase on packing house products.

In the last two days of March the movement of colonists westward and northward through St. Paul was heavier than ever before in a similar length of time, and the number of pieces of baggage passing through the station was 4,000. During the month of March 4,000 cars of immigrant movables passed through, of which one-fourth were destined to Canada.

The Hudson & Manhattan, operating the tunnels under the Hudson river at New York city, reports the number of passengers carried during the month of March as 4,398,017. The number of trains run during that month was 46,259, and 99.18 per cent. of these trains were run on time. During the rush hours trains regularly followed each other at intervals of 90 seconds, a record which, it is claimed, has never before been made by any railway operating under the absolute block system.

According to press despatches from Washington tariffs filed there indicate that the low rates on grain for export which have been announced by the New York Centdal to Boston will apply to New York City also, which means, no doubt, that the other roads leading from Buffalo will also make the reduction, and that it will apply to Philadelphia as well. The despatch indicates that this reduction is made only on grain coming from Canadian points. On wheat the rate from Buffalo is given as 4 cents a bushel, reduced from 5.5 cents.

The Lackawanna Steel Company and four other independent steel and iron concerns of Buffalo, N. Y., has petitioned the Interstate Commerce Commission to order reductions in the rates on coal and coke from the Connellsville section in Pennsylvania. The Pennsylvania and eight other roads are named as defendants. The complaint alleges that the present rates on coal and coke discriminate against Buffalo in favor of the United States Steel Corporation at Gary, Ind. The complainants have already secured an injunction from the Federal Court against a proposed advance of from $1.65 to $1.85 per ton. (March 18, p. 746.)

If any cotton raiser feels discouraged because of the spread of the cotton boll weevil, he should read the letter of President Finley, of the Southern Railway, which has just been published in the southern newspapers. Mr. Finley, in a lucid statement based on facts and conclusions presented by the Agricultural department, shows that although the pest has spread throughout the central and eastern part of Texas, and though it invades additional territory each year, those who conduct their farming operations intelligently are able to increase their crops in spite of the damage done by the insects. With proper selection of seed and preparation of the soil, the cotton farmer cannot only cope with the bugs, but at the same time can increase the amount of his crop. In other words, the same methods which tend to repress the weevil are highly profitable to the farmer without regard to whether this destroyer is or is not present in his fields.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 67-B, giving a summary of car shortages and surpluses by groups from November 25, 1908, to March 30, 1910, says: "There was an increase of 1,143 in the number of surplus cars, made up principally of miscellaneous equipment, box cars showing little change and coal cars a decrease of 1,030. The shortage was materially reduced, falling from 27,187 to 19,786. The box shortage decreased 2,700 and the coal 2,492 cars. The decrease in both

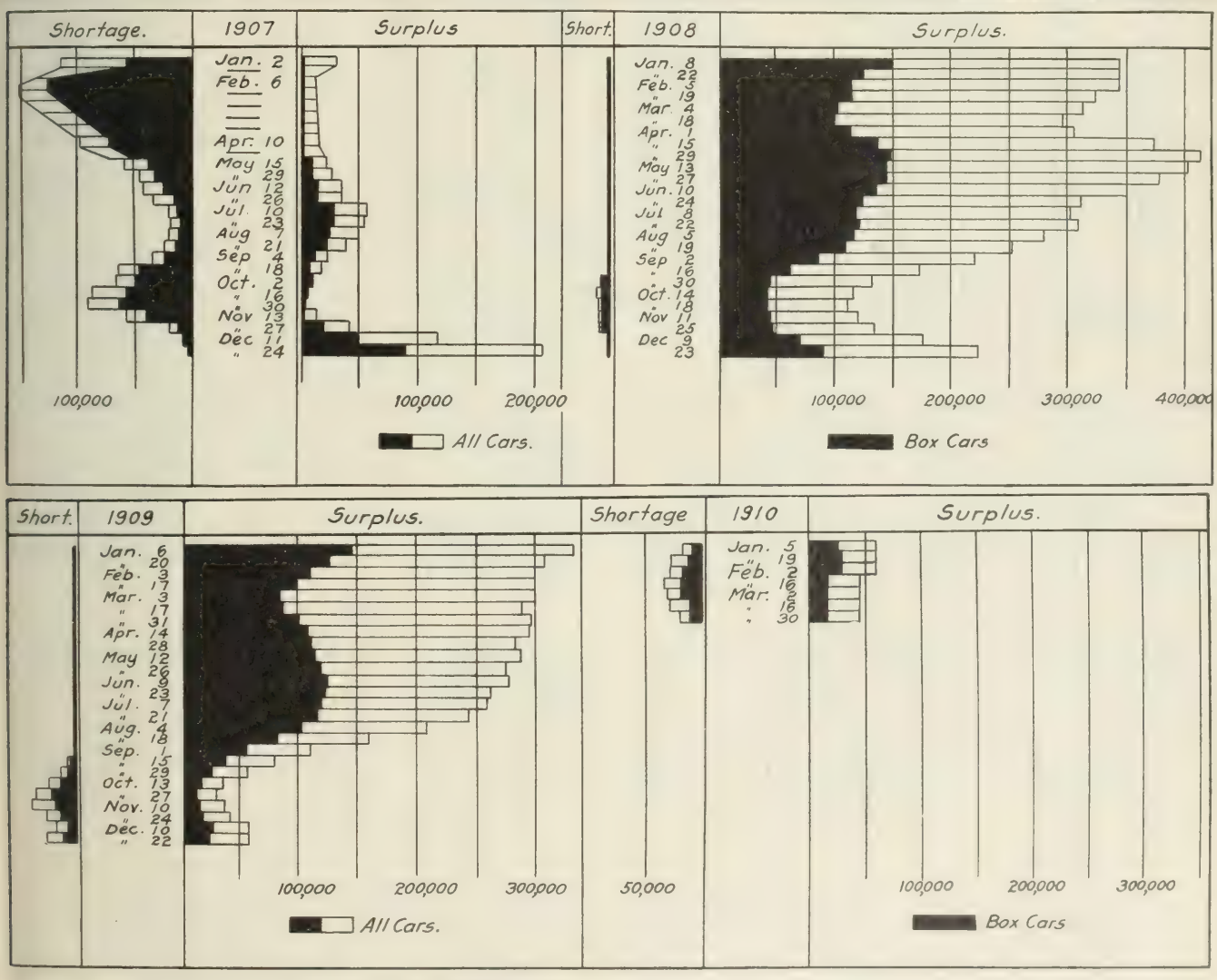
the surplus and shortage of coal cars was probably due to the anticipated suspension at the mines; the surplus being drawn on heavily for storage coal and the shortage being effected by the reduced demands for the following days' loading."

The accompanying table gives the car surpluses and shortages for March 30, 1910, and the charts show surpluses and shortages in 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1 —March 30, 1910	8	227	516	219	105	1,067	30	31	...	21	82
" 2— " 30, 1910	22	317	154	1,480	566	2,517	555	7	1,812	34	2,408
" 3— " 30, 1910	20	1,401	257	220	2,036	3,914	978	237	1,985	555	3,755
" 4— " 30, 1910	10	966	0	319	528	1,813	2,936	355	2,143	540	5,974
" 5— " 30, 1910	20	674	264	298	614	1,850	1,041	734	577	26	2,378
" 6— " 30, 1910	18	4,171	192	2,386	4,241	10,090	2,035	151	...	311	2,497
" 7— " 30, 1910	4	448	213	333	571	1,565	...	...	...	...	.....
" 8— " 30, 1910	14	731	22	59	1,037	1,849	58	12	129	105	304
" 9— " 30, 1910	9	998	253	280	536	2,067	...	...	...	859	859
" 10— " 30, 1910	18	3,822	1,072	1,658	4,731	11,283	265	77	3	119	464
" 11— " 30, 1910	7	2,079	3,173	148	1,357	6,757	912	...	...	153	1,065
Grand total	150	15,834	6,116	7,400	16,322	45,672	8,810	1,604	6,649	2,723	19,786

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

The charts show surpluses and shortages in 1907, 1908, 1909 and 1910.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 64, covering car balance and performance for September, 1909, says:

"The surplus equipment amounted during September to only 3.78 per cent. of the total, and the shop percentage was also slightly reduced. The total reduction on account of non-productive cars is therefore but 6.16 per cent., and as a consequence there is little difference between the averages, including surplus cars and those covering active cars only.

"There was a marked outward movement of cars during the month, bringing the total of cars on their home lines down to 67 per cent., the lowest figure since December, 1907. As usual in such a movement, there was a decided increase in the loaded car mileage, the percentage reaching 72.0, the highest

Freight Car Balance and Performance.

September, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,620	664,269	215,788	167,687	169,648	374,174	16,612	131,894	25,733	115,665	85,883	2,042,973
Average number of system cars on line	50,620	427,917	147,263	107,646	109,642	284,162	6,649	85,687	13,522	65,141	67,201	1,365,450
Railroad-owned cars: Av. foreign on line	30,053	211,983	73,679	43,227	42,402	118,434	12,828	50,715	21,144	52,907	16,229	673,601
Total cars on line	80,673	639,900	220,942	150,873	152,044	402,596	19,447	136,402	34,666	118,048	83,430	2,039,051
Excess	5,053	.....	5,154	.....	.....	28,422	2,865	4,508	8,933	2,383	.....	.....
Per cent. cars on line to total owned:												
Home	67	64	68	64	65	76	40	65	53	56	78	67
Foreign	40	32	34	26	25	32	77	38	82	46	19	33
All railroads	107	96	102	90	90	108	117	103	135	102	97	100
Private cars on line	3,378	41,464	10,110	2,163	6,140	14,517	1,729	8,124	2,031	8,520	3,163	101,339
Total, all cars on line	84,051	681,364	231,052	153,036	158,184	417,113	21,206	144,526	36,697	126,568	86,593	2,140,390
Per cent. of cars in shop	5.99	7.19	8.41	7.83	9.52	5.64	4.83	11.89	5.88	5.58	10.23	7.40
No. of freight engines owned	1,116	9,969	2,809	2,995	2,525	6,148	459	2,514	719	2,339	1,830	33,423
Av. cars on line per freight engine owned	75	68	82	51	63	68	46	58	51	54	47	64
Total freight-car mileage	42,883,263	487,223,629	145,644,671	109,242,687	109,404,543	322,878,002	28,676,586	89,986,654	28,610,633	110,122,868	76,800,614	1,551,474,150
Average miles per car per day	17.0	23.8	21.0	23.8	23.1	26.0	45.1	21.8	26.0	29.0	29.6	24.3
Per cent. loaded mileage	74.2	69.7	73.0	67.8	74.6	73.6	74.5	72.4	71.3	73.6	75.7	72.0
Ton-miles of freight, inc. Co. freight	446,552,690	7,914,584,747	2,273,056,258	1,796,570,025	1,588,873,949	3,324,247,314	405,264,033	1,315,340,855	355,257,787	1,656,505,608	1,054,236,173	22,130,489,439
Average ton-miles, including Co. freight:												
Per car-mile	10.4	16.2	17.2	16.4	14.6	13.8	14.7	14.6	12.4	15.3	13.7	15.2
Per loaded car-mile	14.0	23.3	23.5	24.3	19.6	19.0	19.6	20.5	17.4	20.8	18.1	21.2
Per car per day	177	387	160	391	337	339	699	318	323	442	406	367
Gross freight earnings	$5,446,886	$47,442,955	$14,200,745	$10,910,489	$10,921,559	$23,817,061	$3,444,755	$11,409,959	$3,861,004	$14,835,763	$7,234,971	$153,526,147
Average daily earnings: per car owner	$2.40	$2.38	$2.19	$2.17	$2.12	$2.74	$6.91	$2.88	$5.00	$4.49	$2.81	$2.61
Per railroad-owned car on line	2.25	2.48	2.14	2.41	2.41	2.54	5.90	2.79	3.51	4.23	2.89	2.63
All cars on line	2.16	2.33	1.09	2.38	2.32	2.43	5.41	2.63	2.63	3.95	2.79	2.50

October, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,397	664,309	215,634	167,336	174,167	360,924	16,153	132,923	27,473	115,859	85,571	2,035,746
Average number of system cars on line	46,151	392,942	131,190	100,377	98,610	258,229	6,119	78,806	12,296	63,319	61,990	1,250,029
Railroad-owned cars: Av. foreign on line	39,334	246,448	80,734	52,431	55,229	139,435	13,387	58,695	26,175	58,247	22,198	792,313
Total cars on line	85,485	639,390	211,924	152,808	153,839	397,501	19,506	137,501	38,471	121,566	84,188	2,042,342
Excess	10,088	.....	.....	.....	.....	36,740	3,353	4,578	10,998	5,707	.....	6,596
Per cent. cars on line to total owned:												
Home	61	59	61	60	56	71	38	59	45	55	72	61
Foreign	52	37	37	31	32	39	83	44	95	50	26	39
All railroads	113	96	98	91	88	110	121	103	140	105	98	100
Private cars on line	3,178	40,736	10,621	2,366	7,012	15,758	2,142	8,034	2,391	9,016	3,027	104,281
Total, all cars on line	88,663	680,126	222,545	155,174	160,851	413,422	21,648	145,535	40,862	130,582	87,215	2,146,623
Per cent. of cars in shop	4.91	6.25	7.13	7.32	8.87	5.16	4.67	11.05	5.44	5.15	8.47	6.59
No. of freight engines owned	1,126	9,968	2,805	3,005	2,584	5,944	446	2,555	759	2,341	1,825	33,358
Av. cars on line per freight engine owned	79	68	79	52	62	70	49	57	54	56	48	64
Total freight-car mileage	46,399,316	533,427,676	154,385,417	119,530,361	124,752,643	342,592,171	30,392,219	99,311,868	35,780,076	122,013,799	92,109,380	1,700,694,926
Average miles per car per day	16.9	25.3	22.4	24.8	25.0	26.9	45.3	22.0	28.2	30.1	34.1	25.6
Per cent. loaded mileage	75.4	70.5	74.8	69.7	75.9	74.5	79.8	82.0	71.7	74.8	76.1	73.4
Ton-miles, of freight, inc. Co. freight	511,808,447	8,719,694,979	2,438,119,222	1,884,600,210	1,751,797,986	2,934,669,758	477,969,689	1,387,592,110	400,101,523	1,858,378,279	1,432,009,735	23,796,741,938
Average ton-miles, including Co. freight:												
Per car-mile	11.0	16.3	17.3	15.8	14.1	14.4	16.2	14.0	11.2	15.5	15.5	15.4
Per loaded car-mile	14.6	23.2	23.1	22.7	18.2	19.4	20.3	19.2	15.6	20.7	20.4	21.2
Per car per day	186	414	396	392	354	291	757	323	316	465	530	379
Gross freight earnings	$6,077,383	$52,658,188	$15,122,983	$11,882,242	$12,886,903	$25,774,691	$4,014,944	$12,846,183	$4,645,213	$16,862,625	$9,359,618	$172,130,973
Average daily earnings: Per car owned	$2.60	$2.56	$2.26	$2.29	$2.41	$3.01	$8.02	$3.12	$5.45	$4.72	$3.53	$2.85
Per railroad-owned car on line	2.29	2.66	2.30	2.51	2.72	2.68	6.64	3.01	3.90	4.54	3.59	2.85
All cars on line	2.21	2.50	2.19	2.47	2.60	2.55	5.98	2.85	3.67	4.23	3.46	2.70

since October, 1907, and the second highest of which we have any record.

The tons per loaded car also show an increase, averaging 21.2 for the month. The effect of the increases in loaded mileage and tons per car is shown in the ton-miles per car per day, which for the active cars reached the record figure of 391, or nine ton-miles per car higher than the October, 1907, average.

The earnings per car on line for the active cars averaged $2.67, the same as the October, 1907, average, the highest of which there is any record.

	Average miles per day.		Average ton-miles per car per day		Average earnings per car per day.	
	Inc.surp. cars.	Exc.surp. cars.	Inc.surp. cars.	Exc.surp. cars.	Inc. surp. cars.	Exc. surp. cars.
December, 1907.	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908.	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908....	19.6	24.5	258	324	1.83	2.29
May, 1908.....	19.3	24.8	254	329	1.72	2.22
June, 1908.....	19.6	24.7	276	347	1.88	2.37
July, 1908.....	20.0	24.8	275	342	1.84	2.26
August, 1908...	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908...	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909.	21.7	25.9	306	365	2.04	2.43
March, 1909...	22.7	27.2	330	393	2.19	2.61
April, 1909....	22.4	26.8	310	371	2.13	2.54
May, 1909.....	22.5	26.8	304	362	2.05	2.45
June, 1909.....	22.4	26.5	314	371	2.13	2.52
July, 1909	22.0	25.8	309	362	2.09	2.45
August, 1909...	23.2	26.3	340	384	2.29	2.59
September,1909	24.3	25.9	367	391	2.50	2.67
October, 1909 .	25.6	26.4	379	392	2.70	2.79

In presenting statistical bulletin No. 66, covering car balance and performance for October, 1909, Mr. Hale says:

"During October the surplus had practically disappeared, being but 1.57 per cent. of the total equipment. The shop perceatage was reduced to 6.59 per cent., or 1.57 per cent. above the minimum figure. The difference in the averages for all cars and those for active cars is therefore very slight.

"The preponderance of interchange continued to be in an outward direction, and the cars on their home lines averaged only 61 per cent. of the total ownership, a reduction of six points under September. The result of this change is reflected in the loaded mileage, which increased to 73.4 per cent., the highest average of which we have any record.

"The tons per loaded car remain unchanged. The ton-miles per car per day for active cars show an increase of one ton over September, while the earnings per car increased to $2.79, or .12 higher than in September, denoting the movement of a larger proportion of the higher class commodities than in the preceding month."

The accompanying tables show car balance and performance for the periods covered by the reports.

Growth of Canada.

It is estimated at Ottawa that the settlers coming into Canada from the western part of the United States this year will number 150,000, the number thus far being over 50 per cent. above the number that came in last year, when the total for the season was 90,000. The number expected from Great Britain this year is 100,000.

A Suggestion for Irish Railways.

"The Potato Institute" is the name of the farmers' instruction train which is to run over the Denver & Rio Grande. This train, which is managed by the traffic department of the road in connection with lecturers from the Colorado Agricultural College, has been run in Colorado for three years in succession. Since the train was started the farmers have produced more potatoes on the same ground and have secured better prices for them.

Crop Conditions.

The crop reporting board of the department of agriculture estimates that the average condition of winter wheat on April 1 was 80.8 per cent. of a normal, against 82.2 on April 1, 1909; 91.3 on April 1, 1908, and 87.0 the average condition for the past ten years on April 1. The decline in condition from December 1, 1909, to April 1, 1910, was 15.0 points as compared with an average decline in the past ten years of 4.5 points. The average condition of rye on April 1 was 92.3 per cent. of a normal, against 87.2 on April 1, 1909; 89.1 on April 1, 1908, and 89.5 the average condition for the past ten years on April 1.

Comparisons for winter wheat and rye states follow:

States.	Condition winter wheat — April 1				Condition rye — April 1			
	1910.	1909.	10-yr. av.	Dec.1, 1909.	1910.	1909.	10-yr. av.	Dec.1, 1909.
Kansas	64	86	91	98	70	88	92	95
Nebraska	70	86	92	98	84	91	92	97
Indiana	84	68	81	98	90	75	88	98
Illinois	84	70	89	100	93	82	93	98
Missouri	69	79	90	98	80	85	92	98
Pennsylvania	89	87	86	86	91	90	89	87
Ohio	85	60	78	95	87	68	84	96
Washington	94	96	91	93	98	97	95	98
Oklahoma	87	83	86	98	87	89	88	96
Michigan	84	75	81	94	91	82	87	95
California	98	93	92	100	96	87	92	98
Oregon	93	97	93	94	97	98	98	100
Maryland	92	96	88	85	90	95	92	83
Idaho	97	97	97	100	99	99	97	99
Virginia	90	97	86	85	91	94	87	86
New York	94	88	88	96	96	88	90	96
Tennessee	84	92	87	95	86	93	87	95
Kentucky	84	81	85	97	88	80	86	96
Montana	97	..	..	99	97	97	96	98
North Carolina	90	93	89	89	90	94	88	90
Texas	89	66	79	95	82	50	78	93
West Virginia	88	88	83	91	90	94	86	91
South Carolina	88	92	88	92	89	91	88	94
Utah	94	97	..	97	99	97	100	95
Iowa	75	87	90	98	92	90	94	99
Colorado	96	..	..	93	93	96	88	95
Georgia	86	91	88	90	88	88	91	94
New Jersey	91	97	88	92	93	96	91	94
Arkansas	90	84	87	93	87	85	89	96
Delaware	96	98	88	88	94	95	90	87
Wisconsin	95	85	87	97	98	88	92	97
Alabama	85	90	89	95	90	88	89	92
Wyoming	97	99	..	95	97	90	96	99
Mississippi	90	90	88	94	..	..	..	..
Minnesota	..	..	..	..	96	90	87	93
United States	80.8	82.2	87.0	95.8	92.3	87.2	89.5	94.1

INTERSTATE COMMERCE COMMISSION.

Pullman Company Case.

For full report of this case see article in another column.

Rate on Iron Roofing Unreasonable.

Wheeling Corrugating Co. v. Baltimore & Ohio et al. Opinion by Commissioner Cockrell.

Commodity rate from Mississippi river to Nowata, Okla., reduced so as not to exceed class rate. (18 I. C. C., 125.)

Rule 27-D Western Classification Unreasonable.

Racine-Sattley Corps v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Lane.

The rule in western classification providing that shipments which are not marked in accordance with the requirements of the classification shall be subject to a rating one class higher than that otherwise applicable, was found to be unreasonable and reparation is awarded. (18 I. C. C., 142.)

Rate on Oak Ties Found Reasonable.

Continental Lumber & Tie Co. v. Texas & Pacific et al. Blocker-Miller v. same. Opinion by Commissioner Cockrell.

The rate on lumber and ties from certain points in Texas to El Paso, 825 miles, is 25 cents per 100 lbs. Between the same points a proportional rate of 18 cents on pine lumber and pine ties when destined to points in Arizona and New Mexico is charged. In the absence of a joint through rate the Texas & Pacific charged the lumber rate of 25 cents on oak ties for its portion of the through haul, and complaint asks a reduction of the rate on oak ties to the basis of rates on pine ties. The commission holds that a rate of a little over six mills per ton per mile on oak ties is not unreasonable and reparation is denied. (18 I. C. C., 129.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1910.
(See also issue of April 8.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta, Birmingham & Atlantic	670	$166,228	833,317	$210,949	$26,135	$34,082	$12,482	$91,570	88,118	$172,387	$38,562	.....	$10,000	$28,562	$15,700
Baltimore & Ohio	4,198*	4,952,823	863,165	6,166,605	819,571	1,378,349	148,623	2,325,332	133,267	4,805,142	1,361,463	-835,750	196,048	1,129,665	77,116
Central R.R. of New Jersey	668	1,423,246	293,750	1,828,708	116,630	300,242	26,132	518,778	37,309	999,691	829,017	1,817	95,918	734,946	263,107
Chicago, Indianapolis & Louisville	616	291,570	94,907	424,666	59,357	59,699	14,582	159,237	15,624	308,499	116,167	.....	22,200	93,967	49,328
Chicago, Milwaukee & Puget Sound	1,466†	644,691	54,236	717,641	69,316	58,724	27,288	305,870	9,950	471,148	246,493	1,501	22,560	225,434	.....
Chicago, Milwaukee & St. Paul	7,511	3,176,322	917,210	4,534,275	468,561	582,477	84,251	2,313,387	77,529	3,526,205	1,008,070	5,993	216,041	786,036	72,286
Chicago, Rock Island & Gulf	529	146,499	57,451	216,568	41,907	22,294	8,595	91,472	8,233	172,501	44,067	-- 250	8,593	35,224	--77,594
Cleveland, Cincinnati, Chic. & St. L.	1,982	1,511,904	467,279	2,171,566	180,482	386,245	84,767	956,146	48,653	1,656,293	515,273	-7,804	74,000	433,469	119,143
Delaware & Hudson Co.	843	1,182,741	157,483	1,391,917	111,683	228,764	16,864	567,748	38,710	963,769	428,148	--454	35,000	392,694	40,725
Denver & Rio Grande	2,506	1,330,537	282,145	1,681,881	142,706	327,365	36,492	685,106	44,343	1,236,012	445,869	4,784	69,000	372,085	183,674
Elgin, Joliet & Eastern	780	679,538	3	738,803	72,126	153,809	4,055	269,496	13,459	512,945	225,858	.....	19,500	206,358	69,606
Galveston, Harrisburg & San Antonio	1,338	572,530	213,444	825,775	125,138	127,261	32,174	338,286	26,830	649,689	176,086	--414	28,800	146,872	--12,985
Grand Rapids & Indiana	587	254,802	88,589	366,495	48,992	70,590	9,582	168,492	13,078	310,734	55,761	69	23,674	32,156	-- 2,067
Houston & Texas Central	789	293,758	88,344	414,527	64,630	46,876	16,648	218,356	18,519	365,029	49,498	.....	16,485	33,013	--38,023
Illinois Central	4,550	3,047,423	874,707	4,490,130	404,814	995,754	113,204	1,690,406	92,419	3,296,597	1,193,533	133	201,757	991,909	5,381
International & Great Northern	1,159	449,485	141,455	637,197	115,188	123,372	19,763	293,177	21,511	573,611	63,586	.....	22,000	41,586	--37,030
Lake Erie & Western	886	345,567	51,428	420,333	35,896	73,018	13,497	163,355	11,435	297,199	123,134	.....	17,950	105,184	71,742
Lake Shore & Michigan Southern	1,662‡	2,477,742	677,164	3,611,126	279,161	609,611	79,028	1,383,499	64,802	2,416,102	1,195,024	-4,768	135,000	1,055,256	268,803
Michigan Central	1,746	1,507,249	419,018	2,129,865	185,483	293,773	70,023	960,445	46,931	1,556,655	573,210	--7,480	110,000	455,730	38,224
New York Central & Hudson River	3,588	4,329,286	1,837,394	6,871,991	691,007	1,295,485	192,069	2,385,062	216,362	5,279,985	1,592,006	43,956	357,039	1,191,011	353,774
New York, Chicago & St. Louis	558	703,166	74,152	806,339	60,710	88,760	46,012	375,349	14,631	585,462	220,876	—2,052	27,060	191,825	109,593
New York, Ontario & Western	546	460,026	65,595	544,669	71,420	96,887	10,979	254,329	14,856	448,471	96,198	6,465	16,666	73,067	—36,311
Norfolk & Southern	602	148,589	40,232	199,406	13,918	25,521	3,429	65,936	13,701	122,505	76,901	—145	6,200	70,556	—1,482
Northern Central	467	750,713	141,477	945,255	139,888	211,356	13,995	448,987	24,254	838,480	106,775	446	24,708	82,513	98,721
Northern Pacific	5,849‡	3,276,021	1,037,598	4,620,754	538,405	641,063	81,301	1,994,964	88,794	3,344,527	1,276,227	4,094	333,841	946,480	—493,697
Oregon Short Line	1,508	1,132,321	293,670	1,518,496	131,691	180,062	32,989	412,635	31,607	788,984	729,512	—6,024	55,416	668,072	61,658
Philadelphia & Reading	1,024	2,745,361	523,103	3,412,273	219,430	627,907	32,963	1,144,647	61,322	2,086,269	1,326,004	38,764	73,522	1,291,246	261,744
St. Louis & San Francisco	4,726	1,966,281	699,164	2,901,471	295,288	351,190	89,869	1,123,318	114,524	1,974,190	927,281	.....	122,457	804,824	—139,388
St. Louis Southwestern	773	454,468	89,937	570,671	89,118	85,206	27,031	139,346	23,528	364,229	206,442	-845	18,490	187,107	—3,789
St. Louis Southwestern of Texas	703	194,342	54,582	270,063	96,169	67,724	11,238	129,154	15,797	320,082	50,019	-194	8,333	58,546	—9,014
San Antonio & Aransas Pass	727	188,087	68,542	275,444	54,935	48,814	4,879	117,194	8,998	234,820	40,624	.....	9,000	31,624	—14,916
San Pedro, Los Angeles & Salt Lake	979§	173,764	81,217	282,182	66,143	74,651	15,950	118,828	14,620	290,192	—8,010	1,549	21,287	—27,748	—188,000
Seaboard Air Line	2,995	1,207,196	374,462	1,741,085	220,783	227,968	57,864	552,030	46,153	1,104,798	636,288	—182	61,418	574,687	84,837
Southern Pacific Co.—Pacific System	6,060¶	4,112,195	2,399,072	7,082,387	980,525	883,122	144,265	2,103,475	176,418	4,287,805	2,794,582	—43,872	280,059	2,470,651	553,456
Texas & New Orleans	458	196,505	71,212	286,363	48,551	46,682	6,734	112,280	8,840	223,087	63,276	--869	11,835	50,572	—4,436
Texas & Pacific	1,885	838,655	286,923	1,185,533	182,779	217,914	18,708	505,353	34,100	958,854	226,679	7,291	38,394	195,576	32,325
EIGHT MONTHS OF FISCAL YEAR 1910.															
Atlanta, Birmingham & Atlantic	670	$1,273,739	$355,826	$1,721,826	$209,082	$268,583	$96,414	$672,485	$69,173	$1,315,737	$406,089	.....	883,265	$322,824	$82,978
Baltimore & Ohio	4,198*	44,317,592	9,281,770	56,659,064	7,282,123	10,648,072	1,185,428	18,767,754	1,040,129	38,923,507	17,735,557	—$419,152	1,521,049	15,795,356	1,511,839
Central R.R. of New Jersey	668	11,695,768	3,003,564	15,551,955	1,316,927	2,495,971	231,761	4,222,287	322,205	8,589,151	6,962,804	191,675	782,438	6,372,041	985,201
Chicago, Indianapolis & Louisville	616	2,620,465	966,021	3,912,526	534,617	523,965	110,812	1,255,687	118,630	2,543,711	1,368,815	.....	165,000	1,202,915	363,594
Chicago, Milwaukee & Puget Sound	1,466†	5,256,327	529,341	5,899,206	273,504	382,905	155,735	1,887,303	81,912	2,781,359	3,117,847	19,795	145,120	2,992,522	.....
Chicago, Milwaukee & St. Paul	7,511	29,612,839	9,685,453	42,700,532	5,916,520	5,238,817	871,071	17,233,779	761,130	30,021,317	12,679,214	164,477	1,665,210	11,178,481	—2,946,648
Chicago, Rock Island & Gulf	529	1,497,597	509,315	2,108,739	357,196	159,637	52,652	758,091	68,701	1,396,277	712,462	--2,010	48,409	662,043	139,470
Cleveland, Cincinnati, Chic. & St. L.	1,982	12,927,639	5,015,851	19,645,521	2,095,432	3,234,038	644,945	7,296,888	375,958	13,647,261	5,998,260	-48,944	582,328	5,366,988	1,396,460
Delaware & Hudson Co.	843	10,429,950	2,067,142	13,069,087	803,872	1,746,603	167,364	4,524,178	301,793	7,543,810	5,525,277	—266	271,469	5,253,542	213,327
Denver & Rio Grande	2,506	11,444,428	3,672,433	15,775,612	1,838,356	2,623,939	326,630	5,664,806	371,906	10,825,637	4,949,976	22,635	545,000	4,427,610	465,646
Elgin, Joliet & Eastern	780	5,634,700	146	6,110,345	589,869	1,177,523	33,135	1,854,882	126,864	3,782,273	2,328,072	.....	114,000	2,214,072	849,125
Galveston, Harrisburg & San Antonio	1,338	5,047,410	1,715,837	7,113,351	938,433	1,027,101	203,913	2,604,158	217,393	4,990,999	2,122,352	—19,229	235,308	1,867,815	59,944
Grand Rapids & Indiana	587	2,029,973	1,155,308	3,407,603	408,230	541,099	86,619	1,351,173	107,084	2,494,205	913,398	—2,051	174,130	737,217	4,433
Houston & Texas Central	789	2,817,854	981,542	4,065,755	511,293	448,952	139,698	1,546,991	155,781	2,802,715	1,263,040	.....	116,668	1,146,372	—28,008
Illinois Central	4,550	25,788,453	8,002,024	38,503,378	5,250,708	8,867,468	850,652	12,997,060	783,271	28,749,159	9,754,219	—26,470	1,726,485	8,001,263	488,107
International & Great Northern	1,159	4,183,917	1,317,863	5,867,070	962,221	939,467	154,895	2,395,716	170,011	4,622,311	1,244,759	.....	172,000	1,072,759	—99,989
Lake Erie & Western	886	2,952,494	581,113	3,721,591	472,846	645,088	102,269	1,297,176	82,837	2,600,216	1,121,375	.....	146,245	975,130	482,163
Lake Shore & Michigan Southern	1,662‡	21,456,534	7,313,802	32,350,891	3,706,839	4,756,503	767,471	10,135,395	494,974	19,861,182	12,489,709	—47,844	978,905	11,462,959	2,103,959
Michigan Central	1,746	12,664,176	4,688,285	19,113,068	2,364,308	2,478,751	553,219	7,040,328	328,710	12,765,316	6,347,752	-28,063	767,532	5,552,157	1,150,398
New York Central & Hudson River	3,588	37,890,245	19,966,256	64,406,378	7,949,237	10,533,294	1,618,923	23,103,588	1,418,429	44,623,531	19,782,847	143,667	2,992,296	16,934,218	3,438,716
New York, Chicago & St. Louis	558	5,931,665	979,913	7,150,481	555,680	727,462	379,835	2,712,422	109,265	4,484,664	2,665,817	10,492	252,109	2,403,216	734,779
New York, Ontario & Western	546	4,206,621	1,140,738	5,581,924	728,450	864,218	90,356	2,095,448	133,534	3,912,006	1,669,918	—30,801	133,323	1,505,783	53,636
Norfolk & Southern	602	1,118,305	463,445	1,709,502	189,763	212,988	31,234	527,219	113,617	1,074,821	634,681	2,514	48,100	589,095	133,626
Northern Central	467	6,654,361	1,428,049	8,554,237	968,175	1,652,436	108,777	3,691,760	173,604	6,594,752	1,959,485	6,134	197,667	1,767,952	397,113
Northern Pacific	5,849‡	31,278,305	15,091,696	49,286,060	6,517,682	6,067,027	658,041	15,870,193	736,878	29,849,821	19,436,239	571,008	2,064,616	17,942,632	—1,600,306
Oregon Short Line	1,508	9,456,366	3,542,257	13,774,433	1,318,219	1,262,772	221,131	2,978,523	251,614	6,032,259	7,742,174	-- 97	446,860	7,265,217	716,914
Philadelphia & Reading	1,024	23,272,371	4,590,654	29,097,568	2,105,254	6,037,311	301,876	8,700,240	493,529	17,638,210	11,459,358	122,565	587,594	10,994,329	1,354,217
St. Louis & San Francisco	4,726	17,735,918	6,921,355	26,567,724	3,943,770	3,931,030	641,869	9,116,314	797,330	18,430,313	8,137,411	.....	931,637	7,205,774	599,911
St. Louis Southwestern	773	3,865,148	925,595	4,999,689	648,182	717,835	202,906	1,097,916	174,881	2,841,720	2,157,969	6,852	168,136	1,982,980	335,084
St. Louis Southwestern of Texas	703	1,771,859	604,160	2,548,811	642,801	537,895	78,129	1,058,748	125,369	2,442,942	105,869	1,574	71,935	32,360	6,192
San Antonio & Aransas Pass	727	1,899,271	694,351	2,739,991	415,913	340,597	36,347	1,003,525	71,099	1,867,481	872,510	.....	72,000	800,510	—10,780
San Pedro, Los Angeles & Salt Lake	979§	2,633,529	1,764,508	4,715,104	834,904	787,343	207,406	1,569,504	131,247	3,530,404	1,184,700	--16,531	194,795	973,374	—227,744
Seaboard Air Line	2,995	8,895,179	2,830,299	12,931,929	1,777,205	1,769,323	458,272	4,088,554	403,639	8,496,993	4,434,936	—17,783	477,344	3,939,809	1,017,650
Southern Pacific Co.—Pacific System	6,060¶	38,089,172	21,096,251	63,317,326	7,337,512	7,958,162	1,012,307	16,288,130	1,602,005	34,198,116	29,119,210	68,420	2,000,489	27,050,302	5,663,059
Texas & New Orleans	458	1,732,777	654,561	2,539,212	370,567	408,015	55,405	943,260	70,801	1,848,048	691,164	10,170	99,965	601,369	173,427
Texas & Pacific	1,885	7,452,164	2,672,940	10,889,300	1,255,065	1,615,099	162,494	4,059,425	273,342	7,365,425	3,523,875	22,291	390,883	3,110,701	206,612

* Mileage operated on February 28, 1909, 3,992. † Began operations on August 1, 1909. ‡ Mileage operated on February 28, 1909, 1,511. ‡ Mileage operated on February 28, 1909, 5,673. § Mileage operated on February 28, 1909, 1,099; 126 miles not operated in 1910 on account of washout. ¶ Mileage operated on February 28, 1909, 5,598. -- In dicates Deficits, Losses and Decreases.

Rate on Agricultural Lime Unreasonable.

John A. Okerson v. Pennsylvania Railroad et al. Opinion by Commissioner Cockrell.

Reparation awarded on basis of lower commodity rate established subsequent to shipment. (18 I. C. C., 127.)

Rate on Dry Beans Unreasonable.

Stevens Grocery Co. v. Grand Rapids & Indiana et al. Opinion by Commissioner Clark.

Reparation awarded on L.C.L. shipments from Grand Rapids, Mich., to Newport, Ark. (18 I. C. C., 147.)

Reparation for Carrier's Mistake.

F. L. Cressey for J. H. Cressey & Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Cockrell.

Complainant is awarded reparation on account of the failure of the initial carrier to route traffic as directed. (18 I. C. C., 132.)

Rules in Regard to Bulky Articles Unreasonable.

J. R. Jones v. Southern Railway. Opinion by Commissioner Clark.

The assessment of a charge on an L.C.L. shipment that is too long to be loaded through the side door of a 36-ft. box car on a minimum weight of 4,000 lbs. is found to be unreasonable. (18 I. C. C., 150.)

Informal Rulings Made in Conference.

Free transportation may not lawfully be given to the officers and employees of a bridge company which makes annual reports but files no tariffs because it is a non-operating company.

In the absence of specific tariff provision therefor demurrage does not accrue on derrick cars, pile driver cars and similar cars that are not and ordinarily cannot be unloaded, when owned or leased by a contractor doing work on the line or when standing on storage tracks.

Through inadvertence a carrier quoted a northbound rate of 26 cents instead of a southbound rate of 29.5 cents. A sale having been effected on the basis of the rate quoted application is made for authority to refund on that basis. Within a few months after the date of the movement the southbound rate was reduced to 17 cents. Held that reparation on the basis of the northbound rate must be denied, but that an application for authority to refund on the basis of the subsequently established southbound rate would be entertained.

The tariffs of certain carriers provide a 10-party fare from A to B but no such fare from B to C. On inquiry whether it would be legal to ticket a party of ten from A to C on the basis of the party fare from A to B and the individual fares from B to C when such combination makes less than the joint through individual fare from A to C, it is held that while a party of ten, acting on their own initiative would have the right to use the party fare from A to B and to purchase such transportation as is available from B to C, the carriers may not ticket them through from A to C on such a combination and thus defeat their own published through fare.

Although the tariffs of a carrier provided that it would not accept shipments consigned to "Shipper's Order, Notify," where the party to be notified is not located at destination, it nevertheless accepted such a shipment, and because of its failure on the transfer billing to note the shipper's instructions to notify the consignee at a distant point demurrage accrued at destination. Held, that the claim has no standing except on the carrier's admission that its tariff rule was unreasonable and a showing that it has been changed; and if presented under such conditions and acted upon favorably, the order would require the maintenance of the newly established rule for a period of one year.

On inquiry as to the rates on a locomotive "on cars," from a point in New York to a point in the Province of Quebec, the carrier quoted a rate to Sherbrooke and a 7 cent local rate beyond, at 20 per cent. less than the actual weight. Charges were collected on that basis and the carrier now applies to the shipper for payment of an undercharge arising out of the fact that the tariff naming the rate beyond Sherbrooke contains no provision for a deduction from the actual weight of the shipment. The shipper makes the point that the rate beyond Sherbrooke is a Canadian rate and that the domestic carrier is therefore not prohibited by the act from adjusting the charges on the basis of the rate quoted by it. Held that it would be a violation of law to omit the collection of the undercharge.

In selling a round-trip ticket the carrier's agent neglected to punch the return limit in the margin. The ticket was used on the going journey in accordance with its conditions. The tariff permitted a stop-over at an intermediate point on the return journey. When the holder presented the ticket for validation that agent punched a return limit in the margin which rendered the ticket useless except for continuous passage back to the point of origin. Not observing this limitation the passenger stopped over, and on presenting the ticket at that point the agent marked it "Void," thus compelling the holder to purchase a ticket from that point to his home. He arrived there within the time limit under which the original ticket was sold, having traveled also over the route named in the tariff. Held that the holder was entitled to a refund of the excess fare paid on account of the carrier's error.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has adopted the uniform demurrage rules, as approved by the National Association of Railway Commissioners.

The Iowa Railroad Commission has ordered the uniform demurrage rules adopted by the American Railway Association to be put into effect on intrastate business. The uniform demurrage rules were already in effect on interstate business passing through Iowa.

The State Railroad Commission of Pennsylvania has issued an order requiring that street cars must always be stopped on approaching a grade crossing of a steam railway, and that the conductor must get off and go across the steam railway track ahead of his car, giving a signal, at the proper time, for the car to move forward.

The Oklahoma Corporation Commission has issued an order for a reduction of from 19 to 36 per cent. in present state class rates on all commodities except live stock. A hearing on the proposed new schedule has been set for April 25. Chairman Love announced that an order is being prepared canceling the commission's orders for rates on various commodities the enforcement of which was enjoined by Federal Judge Hook, and that a new scale of rates differing from the old enough to avoid conflicts with the court's order will be issued. The reduction ordered in class rates is regarded as in retaliation for the action of the railways in challenging in the courts previous orders of the commission requiring reductions in freight rates.

Texas Revaluation Refused.

Letter of Commissioner W. D. Williams to receiver of International & Great Northern.

We believe the law provides for only a single final valuation of any completed portion of a railway for stock and bond purposes. It makes due provision for the correction of errors, but none for revaluations. Even the purchasers of foreclosed lines must still remain subject to the original valuations.

If a policy of revaluation were to be inaugurated, then it would follow that a revaluation of its property could be required at the option of each railway company. Such an option would naturally be exercised only when it was confidently believed that changes had manifested themselves in the shape of increased values. And every time such a valua-

tion is increased more stocks and bonds will be issued, and once these have been issued they become fixed as burdens on the property.

Inasmuch as the commercial value of railways, just as of all other property, is constantly fluctuating, being up to-day and down to-morrow, or down to-day and up to-morrow, a policy of revaluation, if compelled by law, would, in the long run and inevitably, result in burdening the Texas railways with issues of stocks and bonds up to the highest of "boom" figures.

That a railway company has the absolute right to have its freight and passenger rates fixed with reference to its outstanding stocks and bonds was never attractive as a legal proposition, and it may be, as you say, that it has been definitely and for all time condemned by the supreme court of the United States. But it does not follow that the amount of stocks and bonds outstanding is no longer a factor in determining the reasonableness of rates.

And if this is done in ordinary cases where the state is not a party to the issuance of the stocks and bonds, much more weight may be given to the same facts, when, as here, in the case before us, the state controls not the freight and passenger rates alone, but the issuance of stocks and bonds as well, and this control is exercised in both cases through the same commission.

It is not unfair that each railway shall be valued at the time of its construction, or as soon afterward as is practicable, and that the amount of stocks and bonds to be issued against its property shall be fixed by its value as then found, and that this amount shall not be increased except as betterments and permanent improvements are afterward made. It is true that under this rule a railway constructed in 1898 might be valued at $20,000 a mile, while another line, built in 1908, of substantially the same character and quality, might, because of increased cost of labor and material, be valued at as much as $25,000 a mile. But this works no injustice as between the owners. Both the law and sound public policy require that the actual investment in railway properties shall be protected, but neither the law nor public policy demands more than this.

See an item in regard to the International & Great Northern in Financial News.

COURT NEWS.

The United States Circuit Court of Appeals, sitting at Louisville, Ky., April 11, refused the application of the Louisville & Nashville for an injunction against the order of the Interstate Commerce Commission reducing a certain rate from Montgomery to New Orleans and certain other cities. It appears that the rate in question, which had been voluntarily reduced to meet water competition, was restored when the water competition ceased, whereupon the commission ordered the lower rate continued.

In the supreme court of Mississippi April 11 the case of the State ex rel. R. V. Fletcher, Attorney-General, v. the Louisville & Nashville Railroad, was decided against the road. The court (Judge Alexander) holds that the company is liable to a fine of from $200 to $5,000 a day for violating the law which declares that foreign corporations domesticated in Mississippi shall not take their cases to the Federal court and annulling their right to do business in Mississippi if they do. The decision declares the state law constitutional. Chief Justice Whitfield dissented. He does not doubt that the United State supreme court will "knock the decision winding."

Suit has been filed at Columbus, Ohio, by Samuel Untemyer and others representing the minority stockholders' committee of the Kanawha & Michigan, of which John H. Stanton is chairman, seeking to prevent the confirmation of the sale of the Kanawha & Michigan majority stock to the Chesapeake & Ohio and the Lake Shore & Michigan Southern. The complainants in the suit say that the control of the Kanawha & Michigan by the Chesapeake & Ohio and the Lake Shore are competitors in Ohio, and that the objections which the lower courts found to the previous control of the Kanawha & Michigan by the Hocking Valley apply equally to the Lake Shore and the C. & O.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

O. H. Bower has been appointed auditor of the Wichita Valley, with office at Wichita Falls, Tex., succeeding W. Y. McCune, resigned.

William Lee Park, whose election as vice-president of the Illinois Central, with office at Chicago, has been announced in these columns, was born July 6, 1859, at Ovid, Mich. He attended the common schools and Baylie's College at Keokuk, Iowa, and began railway work in 1877 as a brakeman on the Union Pacific. He then served consecutively two years as brakeman, two years as freight conductor, two years as passenger conductor and eight years as assistant superintendent. In 1900 he was made superintendent and was appointed general superintendent, with office at Omaha, Neb., in 1904, which position he held until his recent appointment.



William L. Park.

Operating Officers.

A. T. Hollenbeck has been appointed superintendent of telegraph of the Chicago Great Western, with office at Chicago.

J. J. Mahoney has been appointed transportation inspector of the Atchison, Topeka & Santa Fe, with office at Newton, Kan.

P. G. Flaherty has been appointed acting master of transportation on the Eastern division of the Grand Trunk, with office at Montreal, Que.

A. C. Ridgway, assistant to second vice-president of the Rock Island Lines, has been appointed assistant general manager, with office at Chicago.

P. G. Walton, superintendent of the Southern Railway at Greensboro, N. C., has been appointed superintendent of the Chicago & Alton, with office at Bloomington, Ill., succeeding J. W. Mulhern, resigned.

T. C. Collopy has resumed his duties as assistant superintendent of the Oregon Short Line at Pocatello, Idaho, succeeding Frank E. Eisenhard, recently appointed acting assistant superintendent, assigned to other duties.

W. S. Fender has been appointed an assistant superintendent of telegraph of the Southern Pacific, with office at San Francisco, Cal. He will have charge of the telephone service and such portions of the telegraph service as may be assigned to him from time to time.

W. Rudd, trainmaster on the South Texas division of the Missouri, Kansas & Texas at Smithville, Tex., has been appointed trainmaster on the Fort Worth division, with office at Denison, Tex., succeeding W. N. King, transferred to the traffic department. Charles Stanton succeeds Mr. Rudd.

The jurisdiction of J. F. Murphy, superintendent of the Arkansas division of the Missouri Pacific-Iron Mountain system, with office at Little Rock, Ark., has been extended to include the Little Rock, Hot Springs & Western between Benton, Ark., and Hot Springs, and over the Pine Bluff & Western.

C. L. French, whose appointment as superintendent of the Connellsville division of the Baltimore & Ohio, with office at Connellsville, Pa., has been announced in these columns, began railway work on October 1, 1883, as a messenger in the train despatcher's office on the Cumberland division of the Baltimore & Ohio. He was later appointed operator and then train despatcher. On June 1, 1899, he was made chief despatcher, which position he held until August 1, 1902, when he was appointed assistant trainmaster. The following February he was made trainmaster at Cumberland, Md., remaining in that position until his recent appointment as superintendent of the Connellsville division.



C. L. French.

Traffic Officers.

B. O. Edwards has been appointed a traveling freight agent of the Central of Georgia, with office at Macon, Ga.

A. E. Devine has been appointed a traveling freight agent of the Trinity & Brazos Valley, with office at Houston, Tex.

J. F. Van Rensselaer, general agent of the Southern Pacific, with office at Atlanta, Ga., has resigned to engage in other business.

W. N. King, trainmaster of the Missouri, Kansas & Texas at Denison, Tex., has been appointed general agent, with office at Denison, a new office.

F. M. Steele has been appointed a commercial agent of the Chicago Great Western, with offices at Des Moines, Iowa, succeeding B. J. De Groodt, transferred.

T. H. Gorman has been appointed general agent of the American Refrigerator Transit Company, with office at Tyler, Tex., succeeding E. W. Rice, promoted.

J. L. Fox has been appointed a traveling freight and passenger agent of the El Paso & Southwestern and the Morenci Southern, with office at Pittsburgh, Pa.

W. F. Benning has been appointed a traveling freight agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Toledo, Ohio, succeeding T. F. Hartnett, promoted.

Charles H. Gomm, soliciting freight agent of the Queen & Crescent Route at Chicago, has been appointed commercial agent, with office at Dallas, Tex. Henry Hoving succeeds Mr. Gomm.

Donald Allen, traveling freight agent of the Missouri, Kansas & Texas at Fort Worth, Tex., has been appointed a traveling freight agent of the Atlantic Steamship lines of the Southern Pacific Company, with office at Galveston, Tex.

R. S. Gordon, general baggage agent of the Gulf, Colorado & Santa Fe at Galveston, Tex., has been appointed assistant general baggage agent of the Atchison, Topeka & Santa Fe system, with office at Topeka, Kan. J. B. Moore succeeds Mr. Gordon.

L. H. McCormick, district passenger agent of the Rock Island Lines at Pittsburgh, Pa., has been appointed general agent in the passenger department, with office at Chicago, succeeding A. B. Schmidt, resigned, to go with the St. Louis & San Francisco.

H. N. Drummond, temporarily in charge of freight traffic on the Minnesota & Iowa division of the Chicago, St. Paul, Minneapolis & Omaha north of Worthington, Minn., exclusive of the St. Paul, Minneapolis & Minnesota transfer, has been appointed a traveling freight agent in charge of that territory, with office at Mankato, Minn.

A. B. Schmidt, general agent in the passenger department of the Rock Island Lines in Chicago, has been appointed general agent in the passenger department of the St. Louis & San Francisco and the Chicago & Eastern Illinois, with office at Chicago.

M. F. Smith, commercial agent of the Chicago, Milwaukee & St. Paul at Dallas, Tex., has been appointed general agent of the Galveston, Harrisburg & San Antonio, with office at Houston, Tex., succeeding W. H. Taylor, resigned, to engage in other business.

James L. Harris, until a month ago general live stock agent of the Missouri Pacific-Iron Mountain system at Kansas City, Mo., has been appointed general live stock agent of the Chicago & Alton, the Toledo, St. Louis & Western, the Minneapolis & St. Louis and the Iowa Central, with office at Kansas City, Mo.

Engineering and Rolling Stock Officers.

E. H. Wade, master mechanic of the Chicago & North Western at Chicago, has been appointed supervisor of locomotives, with office at Green Bay, Wis.

D. Foley, supervisor of the Illinois Central at Carbondale, Ill., has been appointed an assistant roadmaster of the Chicago division, with office at Kankakee, Ill.

D. R. Day has been appointed supervisor of signals on the Northern Pacific, in charge of maintenance of signal apparatus on lines between Mandan, N. Dak., and Paradise, Mont., with office at Livingston.

H. L. Laughlin, formerly engineer maintenance-of-way of the Minneapolis, St. Paul & Sault Ste. Marie, has been appointed chief engineer of the Twin City & Lake Superior, with office at Minneapolis, Minn.

A. W. Thompson, chief engineer maintenance of way of the Baltimore & Ohio, has been promoted to chief engineer on the Baltimore & Ohio system, including the Baltimore & Ohio Southwestern, succeeding A. M. Kinsman, who was relieved at his own request and appointed consulting engineer. Mr. Thompson graduated from Allegheny college, Meadville, Pa., in 1897, and about two years later began railway work as assistant engineer of surveys on the Pittsburgh division of the Baltimore & Ohio. He was made assistant engineer of the Pittsburgh division in 1900 and the following year was appointed engineer of the Cumberland division. In 1902 he returned to Pittsburgh as division engineer, and the following year went back to the Cumberland division as superintendent. He was transferred to Wheeling in 1904 as superintendent of the Wheeling division. In 1907 he was appointed chief engineer maintenance of way, which position he held at the time of his recent appointment. Mr. Thompson is a member of the American Society of Civil Engineers, and a member and director of the American Railway Engineering and Maintenance of Way Association.



A. W. Thompson.

Earl Stimson, chief engineer maintenance of way of the Baltimore & Ohio Southwestern at Cincinnati, Ohio, has been appointed chief engineer maintenance of way of the Baltimore & Ohio, with office at Baltimore, Md. Mr. Stimson was born September 2, 1874, at Cincinnati, and was educated at Cornell university. He began railway work in June, 1895, as a rodman in the maintenance of way department of the Baltimore & Ohio Southwestern at Cincinnati. In 1898 he was made assistant division engineer at Chillicothe, Ohio, and in 1901 was appointed division engineer at Flora, Ill., and was subsequently transferred in the same capacity to Washington, Ind. In 1905 he was made engineer maintenance of way at Cincinnati, and in 1907 chief engineer maintenance of way of the Baltimore & Ohio Southwestern, which position he held at the time of his recent appointment.



E. Stimson.

Purchasing Officers.

A. E. Johnson, storekeeper of the Chicago & North Western at Kaukauna, Wis., has been appointed to the new position of traveling storekeeper for the entire system.

F. A. Bushnell has been appointed purchasing agent and general storekeeper of the Spokane, Portland & Seattle and the Astoria & Columbia River, with office at Portland, Ore., succeeding C. E. Thompson, resigned.

Augustin Herrera, whose appointment as purchasing agent of the National Railways of Mexico, with office at Mexico City, Mex., was announced in the *Railway Age Gazette*, Jan. 28, 1910, page 208, was born September 16, 1878, at Mexico City, Mex. He was educated in the Merchants' school, Mexico City, and began railway work March 1, 1895, with the Mexican Central. After serving in several minor positions in the material department he was made chief clerk of that department in 1901, and two years later was appointed material accountant with full charge of this branch until December 31, 1906. He was then appointed fuel agent, in charge of both oil and coal fuel supplies. Through a reorganization of the system, the title of fuel agent was abolished March 24, 1908, but Mr. Herrera's duties remained the same. In February, 1909, when the Mexican Central became part of the National Railways of Mexico, his duties were extended to cover the maintenance of the fuel service on the entire system. He was appointed purchasing agent of the National Railways of Mexico on January 1, 1910. The fuel department having been abolished and its operation transferred to the purchasing department, Mr. Herrera as purchasing agent also retains all his former duties as head of the fuel department.



A. Herrera.

Railway Construction.

New Incorporations, Surveys, Etc.

Algoma Central & Hudson Bay.—An officer writes that an extension is to be built from Hawk Lake Junction, Ont., at mile 164, north to a connection with the Canadian Pacific at Hobon, 31 miles. The company already has track laid from Michipicoten northeast to Josephine mine, 20 miles, which is about six miles from Hawk Lake Junction, and is operating a line from Sault Ste. Marie, Ont., to mile 69, leaving about 101 miles yet to be built to connect with the line at Michipicoten. On this section grading has been finished but a number of steel bridges are yet to be put in before track can be laid. It is proposed to finish this work soon. The company will then have a through connection from the Minneapolis, St. Paul & Sault Ste. Marie north to Michipicoten and eventually over the new line north to the Canadian Pacific. On the Manitoulin & North Shore grading has been finished from mile 14 to mile 22 and track laying will be started soon, completing a connection with the Canadian Copper Company's mill at Crean Hill mine. (April 1, p. 917.)

Aransas Terminal.—An officer writes that grading work has been started by local contractors. The company is now in the market for a 40-ft. drawbridge, also rails and ties, to be used on a section of two miles. There are some additional contracts yet to be let, which will probably be given to local contractors. The line is being built from Aransas Pass, Tex., southeasterly along the channel of the Aransas Pass Channel & Dock Co. to deepwater on the east side of Harbor Island, where docks and warehouses are to be built. From the shore at Aransas Pass the line will pass over a solid fill, 9,000 ft. long, crossing Red Fish bay, thence across Steadman Island, about 700 ft., and will then cross the old Corpus Christi channel on a 500-ft. trestle, with a drawbridge, to have an opening of 40 ft. at the center of the channel, thence crossing an arm of Corpus Christi bay over a fill to be about 1.5 miles long, continuing on Harbor Island to the east side of the island. The Aransas Pass Channel & Dock Co. will put up wharves and warehouses, also a grain elevator, a cotton compress and coal docks. E. O. Burton, president, Gibbs building, San Antonio; C. S. Corrigan, chief engineer, box 183, Aransas Pass. (March 11, p. 546.)

Bingham & Garfield.—According to press reports construction work will probably be started soon on a new line from Bingham Canyon, Utah, north to Garfield, on the San Pedro, Los Angeles & Salt Lake, about 20 miles. D. C. Jackling, general manager, Utah Copper Co., which has two smelters at Garfield, is quoted as saying that surveys have been made. Contracts for the construction work valued at $500,000 are said to be let. The company is not prepared at the present time to give any detailed information regarding this work. The general offices of the company are in the McCornick building, Salt Lake City, Utah.

Boston & Eastern (Electric).—An officer writes that the Massachusetts Railroad Commissioners have decided that this road should be built for public convenience and necessity. The company is now seeking an act which will allow it to build a tunnel under Boston harbor. The plans call for a line from Beverly to Boston, 41 miles, and the company is prepared to spend about $11,000,000. Arthur Sturges may be addressed, 110 State street, Boston.

Boston & Maine.—See New York, New Haven & Hartford.

Canadian Northern.—A contract has been given to the Gowan Construction Co. for building an extension from near Moose Jaw, Sask., southeast, and to the Northern Construction Co. for work from Vegreville, Alb., southwest towards Calgary, also on the Goose lake branch, building from Saskatoon, Sask., southwest.

Canadian Pacific.—An officer writes that the program for construction work to be carried out this year is as follows:

From Outlook, Sask., northwest to Macklin, on the Pleasant Hills branch, 147.7 miles. Contract for grading let to McArthur & Dutton, Winnipeg, Man.

Regina, Sask., south to Griffin, 79 miles. Contract not let.

Craven, Sask., north to Colonsay, on the Lanigan section, 110.3 miles. Contract for grading let to John Bradley, Brandon, Man.

Extension of the Weyburn line westerly from Forward, Sask., 25 miles. Contract for grading let to McArthur & Dutton, Winnipeg.

Extension of Kipp line northwest from Carmangay, Alb., for 30 miles. Contract for grading let to Foley, Welch & Stewart, St. Paul, Minn.

Extension of the Lauder line from Tilston, Man., west for 24 miles. Contract for grading let to P. Lamb, Winnipeg.

A high level bridge is to be built over the Saskatchewan river between Strathcona, Alb., and Edmonton. Contract not yet let.

A steel viaduct is to be built over the Saskatchewan river at Outlock, Sask. Contract not yet let.

Second-track to be laid from Winnipeg west to Portage la Prairie, 50 miles. Contract let to J. Hargrave & Co., Winnipeg. (April 8, p. 969.)

Improvements will be made by the Canadian Pacific, it is said, to its yards at Kamloops, B. C., at a cost of $175,000. The work is to be started soon.

Central Pacific.—See Southern Pacific.

Charles City Western.—Surveys are being made, it is said, for a line from Charles City, Iowa, southwest for about 20 miles. The company has a capital of $300,000. H. E. Bennett, assistant general manager, Charles City.

Charles, Crosbyton & South Plains.—Incorporated in Texas to build from Spur, Tex., to Lubbock, 68 miles, also from Crosbyton, northwest to Plainview, 52 miles. O. L. Spencer, H. W. Coonley, J. S. Coonley and E. H. Bailey, Chicago; A. Coonley and H. Coonley, Riverside, Ill., are interested.

Cherokee Belt & Interurban.—Preliminary surveys were made about two years ago and right-of-way, it is said, has been secured and finances provided to build the line. The company has a capital of $500,000 and plans to build a line from Skiatook, Okla., east via Collinsville and Claremore to Pryor creek, 45 miles. Work is now under way. The interurban service and freight office is to be handled by steam motive power, while for passenger traffic gasolene motor cars will be used. E. Batchman, president, St. Louis, Mo.; P. E. Montel, vice-president and general manager, Kansas City.

Cherryvale, Oklahoma & Texas.—A contract is said to have been given to the Continental Construction Co., Caney, Kans., to build the first section of five miles from Caney. The projected route is from Cherryvale, Kans., southwest toward El Paso, Tex., with a number of branches. B. J. Dalton, chief engineer, Lawrence. (Apr. 8, p. 969.)

Chicago, Milwaukee & St. Paul.—An officer writes that work is now under way putting in second-track between Camp Douglas, Wis., and West Salem, also on the section between Richmond, Minn., and Wabasha, a total of 90 miles, which it is expected will be finished this spring. This work includes rebuilding the original tunnel at Tunnel City, Wis., which was abandoned in 1876; with the completion of this work, the company will have a continuous double track between Chicago and Minneapolis, with the exception of a short section over the Mississippi river at La Crosse, Wis.

Chicago, Milwaukee & Puget Sound.—Grading work is expected to be finished in about 60 days on the branch from the main line at McLoughlin, S. Dak., about 25 miles west of the Missouri river, north to a crossing of the Cannon Ball river in North Dakota, thence westerly and northwesterly along the north fork of the Cannon Ball river to the western boundary of Hettinger county, at New England, 135 miles. Contract was let last year to McIntosh Brothers, Milwaukee, Wis.

Chicago, Rock Island & Pacific.—See "Improvement Work on Rock Island Lines," under General News.

Cumberland Valley.—According to press reports improvements are being made to complete the double-track between New Kingston, Pa., and Mechanicsburg, and between Greason and Newville. This will give a continuous double-track line between Harrisburg and Shippensburg, 40 miles. It is expected that the work will be finished in about three months. The improvements, besides shortening the distance between Greason and Carlisle, will eliminate several bad curves.

Eastern Montana Electric.—An officer writes that this company proposes to build through Yellowstone valley, Mont., via Billings and Laurel, through the Clark Fork district to Bear Creek. Work will probably be started this fall. A. C. Logan, president, and F. A. Kesselkuth, chief engineer, Billings.

East Texas Traction.—An officer writes that this company is only a preliminary association and that organization has not yet been completed. Definite action will not be taken until a report is filed by the Fred A. Jones Co., engineers, Houston, Tex. The proposed route is from Dallas, Tex., east to Terrell, 33 miles. S. B. Marshall, president; E. W. Morten, Jr., vice-president; C. L. Wakefield, secretary and manager, Dallas. (Feb. 4, p. 280.)

El Paso & Southwestern.—An officer writes that surveys are being made between a point on the main line and Tucson, Ariz. No plans have as yet been made for construction and the survey is simply being made to ascertain the cost of a line to that place. (April 8, p. 970.)

Fort Worth, Mineral Wells & Western (Electric).—An officer writes that contracts are to bet let about May 15 for a line on which both steam and electricity will be used as the motive power. The projected route is from Fort Worth, Tex., northwest via North Fort Worth, Azle, Springtown, and Agnes to Poolville, thence southwest via Adell, Authon and Blue Springs, to Mineral Wells, about 60 miles. Paul Hurley, secretary and treasurer, Fort Worth, Tex. (Sept. 24, p. 563.)

Fraser River Lumber Company's Road.—A contract has been given to S. H. Abbot, Seattle, Wash., it is said, for building a nine-mile extension of this logging line in the Cox district, British Columbia. It is said that it will cost about $10,000 a mile to build the extension.

Gallatin Valley (Electric).—An officer writes that a contract was given to Callahan Brothers, Logan, Mont., March 31, for grading and bridge work on an extension from Bozeman, northwest to Three Forks, 27.50 miles. Work was started April 6 and it is expected to have the line finished by September 1. (March 18, p. 750.)

Galveston-Houston (Electric).—A contract for grading is said to have been given to J. C. Kelso, Galveston, Tex., for the section from a point two miles beyond Texas City junction to Clear creek, 16 miles, and an additional contract for work on 19 miles has been let to Hartley & Ford, Bay City. The company was organized to build an electric line from Houston southeast to Galveston, 50 miles. (March 18, p. 750.)

Grand Trunk.—The governor has signed the bill passed by both houses of the state legislature of Rhode Island incorporating the Southern New England, under which name the Grand Trunk proposes to build an extension to Providence, R. I. The projected route is from Palmer, Mass., to which point the Grand Trunk now has a connection, through Rhode Island, connecting Woonsocket, Valley Falls and Pawtucket with Providence, reaching tidewater at the Providence river. (Feb. 18, p. 329.)

Hannibal & Northern Missouri (Electric).—Surveys are said to be made for this line from Hannibal, Mo., on the Mississippi river, northwest via Palmyra, Philadelphia, Bethel and La Plata to Kirkesville, about 100 miles and contracts are to be let about May 1. F. W. Latimer, president, Galesburg, Ill., and the Roberts & Abbott Co., are the engineers, Cleveland, Ohio. (July 30, p. 215.)

International Elevated Railroad.—Incorporated in Delaware, with $50,000,000 capital and office at Washington, D. C. The plans call for building monorail lines in various places. An incorporator writes that officers will be named about April 20. G. S. Schroeder, 1114 H street, Northwest, Washington, may be addressed.

Iowa & Dakota Interurban.—Incorporated in South Dakota,

with $500,000 capital and office at Yankton, S. Dak. The company plans to build from Sioux City, Iowa, northwest to Mitchell, S. Dak., about 135 miles. It is estimated that it will cost $25,000 a mile to build the line. The line will traverse Woodbury and Plymouth counties, Iowa, and Union, Clay, Turner, Yankton, Hutchinson, Hanson and Davison counties, S. Dak. The directors include: C. P. Wells, E. E. Bamford, H. E. Valentine, Centerville, S. Dak.; L. F. Phillips and W. G. Kirkpatrick, Wagner, and A. Mungson, Lake Andes

Johnstown & Altoona (Electric).—An officer writes that it is expected to begin grading work in June from South Fork, Pa., northeast via Portage, Cresson and Gallitzin to Altoona. The work will be fairly heavy; about 34 per cent. will be rock work. The company will build 12 bridges along the line and put up a power house. G. U. G. Holman, general manager, Johnstown. (March 25, p. 850.)

Kettle Valley Lines.—See Spokane & British Columbia.

Kinder & Northwestern.—An officer writes that a contract has been given to Hugh Walker, to build from Kinder, La., to timberlands. Track has been laid on three miles. A. J. Peavy, president; Frank Shutts, chief engineer, Shreveport. (Apr. 8, p. 970.)

Laclede, Dallas & Western.—Maps and profiles of the projected line from Phillipsburg, Laclede county, Mo., to Buffalo, Dallas county, are ready and the company will receive contractors' bids. H. W. Smith, American Bank building, Kansas City, Mo., is the chief engineer. (Feb. 18, 1910.)

Long Island.—This company will build during 1910 an additional track from Springfield junction, L. I., to Valley Stream, and two additional tracks from Valley Stream to Lynbrook. This will give a double-track line from Jamaica to Lynbrook and points beyond on the Montauk division. The double-track electrified line from Jamaica to Long Beach is expected to be put in operation some time this summer. The Jamaica improvement begins at Van Wyck avenue, where the main line improvement ends. The crossing at that point will be eliminated as well as those at Rockaway road, Beaver street, Catherine street, South street and at Division street. Arrangements will also be made for a new street under the railway at Guilford street. The improvements include the large new station and office building in Jamaica, extensive changes in the roundhouse, a new boiler plant, heating plant, ash pit, new water supply, gas plant and buildings for the men; there will be 1,810,000 cu. yds. of embankment, 213,120 lin. ft. of new track, 48,700 cu. yds. of concrete, and 3,850 tons of steel will be required for bridges. (March 4, p. 461.)

Marion Railway.—Incorporated in Illinois, with $10,000 capital, and office at Marion, Ill. The plans call for a line from a point on the Herrin Southern, about three miles southwest of Marion, to Marion, thence northerly to Johnson City, in Williamson county. The directors include: A. E. Harper, E. J. Hughes, L. D. Dody and C. A. Bickett, Chicago.

Mexican Pacific.—According to press reports from El Paso, Tex., this company has secured the concession held by the Mexican-American Holding Co. to build from Manzanillo, Mex., southeast down the west coast of Mexico to Salina Cruz, 930 miles. Joseph Castellot, vice-president, Mexico City. (April 1, p. 918.)

Midland Continental.—Organized to build from Pembina, N. D., southwest to Edgeley, about 212 miles. J. T. Adams, Columbus Savings & Trust Co. building, Columbus, Ohio, has the general contract, and will sublet 20 miles, it is said, between Edgeley and Jamestown. F. K. Bull, president, Racine, Wis.; G. P. Beach, engineer in charge of construction, Jamestown, N. D. (June 18, p. 1329.)

Missouri, Kansas & Texas.—An officer is quoted as saying that plans have been adopted for double-tracking the main line between Dallas, Tex., and Parsons, Kan., 380 miles. Extensions will also be built in Texas from time to time, but plans for this work have not yet been definitely decided upon. According to a report, an extension is to be built from San Antonio southeast to Kingsville, about 160 miles. (March 18, p. 750.)

Montana Roads (Electric).—The Chamber of Commerce of Missoula, Mont., is said to be negotiating with W. H. Smead, for the construction of an electric line from Missoula, Mont., north to Polson, about 75 miles.

New York & North Shore Traction.—This company expects to put in operation an extension from Flushing, L. I., to Whitestone about June 1.

New York, New Haven & Hartford.—In addition to double-tracking work on the Air Line division, plans are said to be made to put up a new bridge at Middletown, Conn., at a cost of $1,000,000, to replace the present single-track structure. Plans also said to have been approved to build connecting links on the Boston & Maine, to complete a through line for that company over its own tracks north to Sherbrooke, Que. Two short sections of the Central Vermont are now used in southeastern Vermont. It is said a connecting link is to be built from Brattleboro, Vt., to Hinsdale, N. H., to connect the Connecticut & Passumpsic division with the Ashuelot branch, and as soon as this work is finished a link is to be built from the east end of the Windsor, Vt., bridge, north to West Lebanon, N. H. From White River junction, just northwest of West Lebanon, south to South Vernon junction, is 74 miles. This section is used by both roads for through trains. Of this the 14-mile section from White River junction, south to Windsor, is a Central Vermont line; the next 50 miles south to Brattleboro is a Boston & Maine line, and from Brattleboro to South Vernon junction, 10 miles, the route is over a Central Vermont line.

North Carolina Roads.—Merchants and other residents of Wilmington, N. C., propose to build a line to connect the port of Wilmington with Knoxville, Tenn. Such a line would reach the coal fields in Tennessee. The Chamber of Commerce at Wilmington is said to be interested.

Omaha, Council Bluffs & Sioux City (Electric).—An officer writes that the projected route is from Omaha, Neb., east to Council Bluffs, Iowa, thence north via Beebeetown, Logan, Magnolia, Little Sioux and Onawa to Sioux City, about 100 miles, and that the prospects of building the line are good. About the middle of April the company will be in a position to give definite information. M. H. Miller, president, P. O. Box 974, suite 200, Youngerman block, Des Moines, Iowa.

Oregon Trunk Line.—According to press reports bids are to be opened April 18 for the construction of 111 miles of line between Madras, Ore., and the north line of the Klamath Indian reservation. Work is to be started May 1 and finished by January, 1911. J. F. Stevens, president, Portland, Ore. (April 8, p. 972.)

According to press reports work is to be started about June 1 on a branch line from Ashton, Idaho, southeast to Driggs, 40 miles. The line is to be built to open up new coal and oil fields in the Teuton valley. A branch is also to be built to coal properties in the Driggs district.

Ottawa, Rideau Valley & Brockville.—This company is being incorporated by the Canadian government to build a 60-mile line from near Ironside, in the township of Hull, about five miles from Ottawa, Ont., south through Ottawa and the counties of Carleton, Grenville and Leeds to Brockville, on the St. Lawrence river, opposite Morristown, New York, where connection will be made by ferry with the New York Central Lines. The line is to be built to develop the ore mines. It is expected that contracts will be let soon. There will be one bridge about 400 ft. long over the Rideau river and some other short bridges, not exceeding 100 ft. each. The line will be about 20 miles shorter than the existing line. Extensive water power will be developed on the Gatineau river about 2.5 miles from the mines. G. E. Kidd, 25 Sparks street, Ottawa, is solicitor. (Jan. 7, p. 69.)

Rutland Railway Light & Power Co.—Work is said to be under way on an extension of seven miles from Fair Haven, Vt., to Poultney.

Sacramento & Sierra (Electric).—Surveys have been made, it is said, for a line from Sacramento, Cal., northeast to Lake Tahoe, about 126.5 miles, but contracts have not yet been let. J. M. Graham, chief engineer, 37 Stoll building, Sacramento.

St. Louis-Kansas City (Electric).—An officer writes that

the company is not ready to announce the intermediate points along the proposed route from St. Louis, Mo., to Kansas City, 250 miles. The line is to be double-tracked and will be equipped with the latest electrical appliances. The right-of-way will be 100 ft. wide. The company owns 10,000 acres of coal lands and will put up a power plant. Satisfactory grades have been secured and work will probably be started by June. D. C. Nevin, president, Commerce building, Kansas City, and W. B. Cauthorn, chief engineer, Columbia.

Sanford & Troy.—See Seaboard Air Line.

Seaboard Air Line.—The Dunnellon branch was opened for freight traffic from Early Bird, Fla., southward to Anderson Mine, 17.4 miles, on March 28.

The Sanford & Troy, from Colon, N. C., to Cumnock, eight miles, was opened for freight traffic April 1.

The Agricola extension, from Edison junction, a point on the line between Plant City, Fla., and Nichols, was opened for freight traffic to Agricola, 12.5 miles, on April 11.

South Carolina & Western.—An officer writes that this company has been chartered to build from McBee, S. C., southeast via Hartsville and Darlington, to Florence, 40 miles. W. R. Bonsal, president and treasurer of the North & South Carolina, Hamlet, N. C., is interested. (Feb. 18, p. 380.)

Southern New England.—See Grand Trunk.

Southern Pacific.—According to press reports, the roadbed of the old line of the Central Pacific around the head of Great Salt Lake in Utah, is to be improved, to carry heavy trains. The present roadbed is equipped with light rails and the improvements are to be made to provide a route when traffic is blocked on the Ogden-Lucin cut-off across the Great Salt Lake.

An officer writes that owing to the steady rise in the Great Salt Lake, Utah, during the past few years, the company has found it necessary to do considerable work on the line across the lake in the way of raising embankments, riprapping, etc. Work is now about to be started to raise the west end of the long trestle 5 ft. higher than the present level on about 4,200 ft., that section being at this time about 5 ft. lower than the main trestle. This is to be accomplished by building a second-track trestle alongside the present trestle for the 4,200 ft., and when this is finished traffic will be turned over the new structure, and the work of raising the level on the existing structure will be started. This improvement will provide a double-track on the west end of the trestle only. There is at the present time a double-track from the west end of the trestle to Lakeside on fills. The company does not intend to double-track the entire line across the lake at present, although traffic conditions may warrant this being done later on. The work to be carried out at the present time will cost about $500,000, and it is expected will be finished this coming fall or early in the winter. In addition to raising the west end of the trestle, the company is also going to raise the fills both east and west of it about 3 ft. (April 1, p. 919.)

Spokane & British Columbia.—A contract is said to have been given to W. P. Tierney & Co. for a 10-mile extension of the Kettle Valley Lines up the north fork of the Kettle river in British Columbia. It is said that construction work on the Midway-Penticon section will be started in June.

Spokane International.—According to press reports a branch is to be built from a point between Ross station, Idaho, and Rathdrum, southeasterly to La Crosse.

Tombigbee Valley.—See an item in regard to this company in Railway Financial News.

Tucumcari, Portales & Gulf.—Organized to build from Tucumcari, N. M., southeast via Pyote, Tex., to Del Rio, about 465 miles. Surveys are said to be made for the first 50 miles, and bids are wanted for this section. M. J. Healy, president and general manager, Pyote. (Mar. 11, p. 548.)

Western Maryland.—A contract for the construction of the branch line from Cumberland, Md., northwest to a connection with the Pittsburgh & Lake Erie at Connellsville, Pa., about 83 miles, has been let to the Carter Construction Co., Pittsburgh. (March 25, p. 850.)

Railway Financial News.

Beaumont, Sour Lake & Western.—Stockholders are to vote May 27 on the question of authorizing an issue of first mortgage 6 per cent. bonds of 1910-1940, secured by a mortgage on the property at the rate of $30,000 per mile of line. The bonds are presumably to be deposited when issued under the new St. Louis & San Francisco (New Orleans, Texico & Mexico division) bonds.

Central of New Jersey.—Stockholders are to vote May 2 on the question of guaranteeing principal and interest on the $20,000,000 consolidated 4 per cent. mortgage bonds to be issued June 1, 1910, by the Lehigh & Wilkesbarre Coal Co.

Chicago, Rock Island & Pacific.—E. D. Kenna has been elected a director, succeeding H. S. Cable, resigned.

Delaware & Hudson.—Stockholders are to vote May 1 on the question of modifying the sinking fund ordinances of the company so as to permit the application of the sinking fund to defray the cost of increased reserves for coal or to the acquisition of property.

Detroit, Mackinac & Marquette (Land Grant).—No interest was paid on the income bonds of April 1. In 1908 1 per cent. was paid in April and nothing in October; in 1909 nothing was paid in April and 1 per cent. in October.

Hocking Valley.—Stockholders are to vote May 11 on the question of increasing the $11,000,000 outstanding common stock to $26,000,000. The plans of the management in regard to the new common stock have not been made public.

See an item in regard to this company in Court News.

International & Great Northern.—The Texas Railroad Commission has refused to make a revaluation of the property, on which revaluation a reorganization plan was to have been based. An abstract of the opinion of the commission is published in State Commission news. If the commission does not modify its present order the valuation fixed by the commission in 1895 will stand with the cost of subsequent betterments added. This will allow for a total valuation of $30,726,000, or $13,917,000 less than the amount required to provide for the debts and capital stock which Receiver T. J. Freeman estimates at $45,000,000.

The funded debt of the company consists of $11,291,000 first mortgage bonds, $10,391,000 second mortgage and $2,996,052 third mortgage bonds. There is $9,755,000 stock outstanding, making a total capitalization of $34,453,000. The company also has a floating debt of about $6,000,000 which with the unpaid interest on its second and third mortgage bonds amounting to $2,000,000 in addition to car trusts of $481,000 makes a total of $43,000,000. Allowing the floating debt and unpaid coupons or a total of $8,000,000 to be provided for out of the $31,000,000, a balance of only $23,000,000 would remain. This would provide for the first and second mortgage bonds and about $1,300,000 thirds, of which only $1,100,000 are outstanding in the hands of the public, the remainder being held by the Gould estate, which also owns all of the $9,755,000 capital stock.

To provide the necessary cash for the reorganization with the limited valuation allowed on the property some heavy assessments will have to be levied on either the bonds or stock or both. The price at which the third mortgage bonds are selling, in the neighborhood of 20, would indicate that these will be called on to furnish some of the cash. The firsts and seconds will probably remain undisturbed and their market price of 109 and 112, respectively, would seem to bear this out.

The Texas law provides that "in case of emergency involving the public interest or the existence of the property, the commission may permit the issuance of additional bonds, but in no case shall the aggregate amount of both stocks and bonds exceed the valuation of the property by more than 50 per cent." If this clause is invoked, the commission may permit the issuance of securities up to $45,000,000, or the full amount of the indebtedness of the International & Great Northern.

Kanawha & Michigan.—The minority stockholders' committee, headed by John S. Stanton, is to bring suit, it is understood, in the interests of dissenting stockholders to prevent the carrying out of the plan by which control of the road has been sold by the Hocking Valley to the Chesapeake & Ohio and the Lake Shore & Michigan Southern jointly.

The minority stockholders' committee, of which George D. Mackay is chairman, says that up to April 5 there had been delivered and paid for in cash, at $72 a share, $3,019,700 stock, and that holders of $371,300 additional stock had consented to the sale.

See an item in regard to this company in Court News.

Lake Shore & Michigan Southern.—This company sold a block of short-term notes in Paris to provide for the expenditures made in the purchase of the controlling stock of the Toledo & Ohio Central and an interest in the Kanawha & Michigan. No official statement has been made as to the amount of notes sold. Officers of the company are quoted as saying that the amount is not large.

Mohawk Valley Co.—See New York State Railways.

Missouri, Oklahoma & Gulf.—The Banque Franco-Americaine, Paris, has bought $2,950,000 bonds of the Missouri, Oklahoma & Gulf. This purchase, together with $2,500,000 bonds bought in 1909, makes $5,450,000, the entire outstanding bonded debt of the railway company.

New York, Philadelphia & Norfolk.—Stockholders are to vote April 7 on the question of increasing the capital stock from $2,500,000 to $3,750,000. All of the stock now standing is held by the Pennsylvania Railroad, with the exception of $7,250.

New York State Railways.—The New York Up-State Public Service Commission has given permission to the company to increase its stock from $23,140,200 to $23,860,200, and to make a first consolidated and refunding mortgage to secure $35,000,000 50-year 5 per cent. bonds, of which $4,508,634 bonds are to be issued at once. The $720,000 new stock is to be exchanged at par for stocks of the Rochester & Suburban, the Rochester & Electric and the Ontario Light & Traction Companies, now held by the Mohawk Valley Co. The $4,508,634 bonds now issued are for the purpose of refunding or discharging indebtedness of the subsidiary electric railway companies.

Pennsylvania Railroad.—A bill has been passed by the New Jersey legislature permitting the Pennsylvania Railroad to lease the property of the Pennsylvania Tunnel & Terminal Company, which built the North river tunnels of the Pennsylvania's New York extension.

Rock Island Company.—Percival Farquhar and F. S. Pearson have been elected directors, succeeding G. T. Boggs and R. L. Skofield, resigned.

St. Louis & San Francisco.—The company has sold to a syndicate of St. Louis bankers $6,000,000 New Orleans, Texas & Mexico first mortgage 5 per cent. bonds. These bonds are being offered to the public at 95, yielding about 5.35 per cent. Of the total $50,000,000 authorized bonds, $16,000,000 are understood to have been issued. Of the bonds issued $10,000,000 have been deposited as security for an issue of $8,000,000 three-year 5 per cent. notes.

See Beaumont, Sour Lake & Western.

St. Louis Southwestern.—This company has arranged to take over the Stephenville North & South Texas running from Stephenville, Tex., to Hamilton, 43 miles.

Sebasticook & Moosehead.—The reorganization committee says that nearly 90 per cent. of the outstanding bonds have been deposited with the Guardian Savings & Trust Co. of Cleveland under terms of the agreement of May 12, 1909. Bonds will be used for deposit under this agreement up to April 20, 1910. The road, which runs from Pittsfield, Me., to Mainstream, is to be sold by the receiver at an early date.

Tombigbee Valley.—The company has authorized $400,000 general mortgage 6 per cent. bonds of 1910-1935, secured by a mortgage at the rate of $3,000 per mile of line. F. J. Lisman & Co., New York, have bought $186,000 bonds issued against 62 miles of completed road. The Tombigbee Valley and the Alabama, Tennessee & Northern are controlled by the same interests, and it is planned to build within the next two years 80 miles of line to connect the two roads.

Tonopah & Goldfield.—George Wingfield has been elected a director, succeeding R. H. Rushton.

Underground Electric of London.—The report for the half year ended December 31, 1909, shows that full interest charges were earned on the £3,000,000 ($15,000,000) 4½ per cent. bonds. The bonds are followed by £5,200,000 6 per cent. income bonds. Since December 31 the earnings of all the controlled companies show an increase over last year.

United Railways of Yucatan.—Arrangements have been made for the sale, through the National Bank of Mexico, of £825,00 ($4,125,000) 5 per cent. mortgage bonds of the United Railways of Yucatan.

Vandalia.—This subsidiary of the Pennsylvania has declared a quarterly dividend of 1¼ per cent., payable May 25. This is at the rate of 5 per cent. annually and corresponds to the 5 per cent. annual rate heretofore paid in semi-annual payments. The Pennsylvania now pays its dividends quarterly instead of semi-annually.

Wabash.—The United States Circuit Court of Appeals has held that the lower court did not have jurisdiction in the suit brought by James Pollitz against the Wabash. The lower court decided on the fact that the refunding of the indebtedness of the Wabash by mortgages made subsequent to the indenture securing the debenture A and debenture B bonds was legal. The legality of this refunding was attacked by James Pollitz, a minority debenture B bondholder. Nearly all of both the debenture A and debenture B bonds have been retired under the refunding plan, but a small minority of the B bonds are still outstanding, and it is the contention of the complainant (Pollitz) that the provisions of the indenture securing these debentures is so worded that the Wabash cannot legally make a comprehensive mortgage secured on all its property while any debentures are outstanding, and there is no provision in the indenture by which the railway can compel the holders of debenture Bs to exchange their security for others.

FOREIGN RAILWAY NOTES.

The Austrian State Railroads are equipping 773 locomotives for burning crude petroleum. These are to be used not only on lines entering Galicia, where the oil wells are, but also on many steep grades and in tunnels in the Alps, where the smoke of coal is excessive and sometimes dangerous.

The government of Costa Rica has extended to December 31, 1911, the period for the free export of woods through the port of Puntas Arenas and other Pacific ports. Exception is made in the matter of cedar less than 40 centimeters in diameter, which will continue to pay the specified duty.

The Cape-to-Cairo Railway is now open from Khartoum southward 120 miles to Wad Medani, trains running each way three days in a week. Wad Medani is an important place on the Blue Nile, being the headquarters of the governor of the province. South of this place track is being laid at the rate of a mile a day. After running south 50 miles the line turns westward to Kosti, on the White Nile.

The passenger rates on the Russian railways were advanced July 1, 1908. They had been very low and were not raised very much. But the result has been unsatisfactory, the number of first-class passengers having decreased 10 per cent. and of second-class 7½ per cent., while the third-class increased 14 and the fourth-class 30 per cent. The number of third-class passengers was 123 times as great as the number of first-class.

Supply Trade Section.

The Linde Air Products Co., Buffalo, N. Y., will, on May 1, move its New York office from 346 Broadway to 30 Church street.

On May 1 the Chicago office of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., will be moved from the Fisher building to the Peoples' Gas building.

S. M. Wight, signal inspector, Lake Shore & Michigan Southern, at Cleveland, Ohio, has resigned to take a position with the General Railway Signal Co., Rochester, N. Y.

The Chicago offices of the Q. & C. Co., New York, will, after April 26, be located in the Peoples' Gas building. All matters pertaining to track appliances will be handled in this office.

The Stevens Point Foundry & Machine Co., Stevens Point, Wis., has been awarded the contract for furnishing all castings to be used on the Chicago division of the Soo line during the ensuing year.

Frank L. Norton, formerly manager of eastern sales of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has been elected vice-president in charge of sales, with office, as heretofore, at No. 1 Wall street, New York.

The Sellers Manufacturing Company, Chicago, will on May 1 move its general sales department from the Western Union building to the 12th floor of the new McCormick building, Michigan avenue and Van Buren street.

S. R. Fuller, Jr., formerly of the Gould Coupler Co., New York, has accepted a position as sales agent for the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo. Mr. Fuller will have headquarters at No. 1 Wall street, New York.

The Davenport Locomotive Works, Davenport, Iowa, announces that effective March 15, A. L. Hageboeck, vice-president in charge of commercial affairs, will be in full charge of the sales department, vice A. E. Rosenthal, resigned.

Benjamin K. Hough has been appointed Boston sales manager of the Wisconsin Engine Company, Corliss, Wis. Mr. Hough will have offices in the Oliver building, Boston, Mass., and will represent the company in the New England States.

George L. L. Davis, formerly with the U. S. Metal & Manufacturing Co., New York, has accepted a position as assistant to the vice-president of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., with headquarters at 1401 Syndicate Trust building, St. Louis, Mo.

The Ingersoll-Rand Company, Chicago, will install a complete compressed air equipment plant for the George W. Jackson Company, Chicago, for its contract on section 54 of the Catskill aqueduct at Yonkers, N. Y. The order includes compressors, drills, mountings and air re-heaters.

The Jewell Belting Co., Chicago, announces that it has relinquished the agency for the sale of mechanical rubber goods made by the Boston Belting Co., Boston, Mass. The latter company has opened an office at 177 Lake street, Chicago, with M. S. Curwen as manager of sales in charge of the office

The Federal Creosoting Company, Indianapolis, Ind., has been incorporated with a capital of $1,000,000. The new company is a consolidation of the Federal Creosoting Company, Toledo, Ohio; the National Creosoting Company, Paterson, N. J., and the Colonial Creosoting Company, Hillsboro, N. J.

Burton W. Mudge & Co., Chicago, will, on May 1, remove their general office from the Commercial National Bank building to temporary quarters in suite 1003, Peoples Gas building, until the southern portion of the same building is completed, when they will occupy offices overlooking Michigan avenue and Adams street.

Messrs. Edgar Allen & Co., Ltd., of Imperial Steel Works, Sheffield, England, are at present building and equipping an extensive plant at Chicago for manufacturing their Stag brand manganese steel products, railway frogs and crossings. This branch of the organization was recently incorporated at Springfield, Ill., with a capital stock of $500,000.

The Acme Railway Equipment Co., Philadelphia, Pa., has recently furnished its Acme uncoupling device for use on the following equipment: 2,150 cars for the Lehigh Valley; 5,000 miscellaneous cars for the New York, New Haven & Hartford; 2,000 box cars for the Boston & Maine, and 200 ore cars for the Minneapolis, St. Paul & Sault Ste. Marie.

A. E. Rosenthal, formerly sales manager of the Davenport Locomotive Works, Davenport, Iowa, has been appointed western representative of the Lima Locomotive & Machine Co., Lima, Ohio, and will open an office on May 1 at 1122 and 1123 McCormick building, Chicago. The Chicago office will handle the sales of direct-connected locomotives in particular, but the company is prepared to build all classes of engines, including standard switchers and road engines.

Frederick Mortimer Robinson, for the past six years sales agent of the Pressed Steel Car Company, Pittsburgh, Pa., died on April 2. Mr. Robinson was 33 years of age, and had formerly been connected with the Chesapeake & Ohio Railroad. He was a Knight Templar and a member of the Acca Temple of Shriners, at Richmond, Va., a member of the Commonwealth Club of Richmond, the Cleveland Coal Club, the Union Club of Pittsburgh, the Railway Club of Pittsburg, and the Virginia Historical Society of Richmond, Va.

The Union Switch & Signal Company, Swissvale, Pa., announces that George A. Blackmore will be associated with S. G. Johnson as assistant Eastern manager, announcement of whose appointment as general sales manager, with office in New York, was made in the *Railway Age Gazette* of February 4. W. M. Vandersluis has been appointed assistant Western manager, with office at Chicago, succeeding W. E. Foster, resigned. The Montreal office will be closed, and V. K. Spicer will be assigned to special duty at the Western office.

The Isthmian Canal Commission will receive bids until May 5 for steel rails, track frogs, switches, switch stands, tie plates, angle bars, rail braces, track bolts and spikes, galvanized roofing, rivets, bolts, nuts, boat spikes, iron and lock washers, chain, wire cable, boiler tubes, brass and copper tubing, babbitt metal, copper, brass, bronze, muntz metal, etc. (Circular No. 573); until April 28 for a track pile driver (Circular No. 573-B), and until May 9 for push cars, trolley hoist, angle bars, track spikes, banca tin, brass unions, flexible joints, air-brake hose, rubber belting, mineral lubricating oil, etc. (Circular No. 574.)

TRADE PUBLICATIONS.

Roll Crushers.—The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued bulletin No. 39 describing Jeffrey roll crushers, with a number of half-tone and line illustrations showing these crushers assembled and in detail.

Generators and Motors.—The Western Electric Co., New York, has just issued bulletin No. 5132-1 describing its type EC belt-driven, Hawthorne generators, and also bulletin No. 5360, describing its Hawthorne small power motors. These bulletins contain complete descriptions of the construction and operation of these generators and motors, with a number of illustrations of the different types of each.

Transformers and Rotary Converters.—The General Electric Co., Schenectady, N. Y., has just issued bulletin No. 3919, containing a very complete description of its facilities for the manufacture of transformers, along with illustrations and a description of the various processes in their manufacture. This company has also issued bulletin No. 4723 describing its regulating pole rotary converters, with capacities of from 300 to 3,000 k.w., with a voltage range between 240 and 300, to cover the usual lighting circuit requirements.

Designing Data.—The North Western Expanded Metal Co., Chicago, has issued a booklet, "Designing Data 1," which is a consolidation of booklets Nos. 1, 2, 3, 4 and 5, with parts of No. 6 and its overcoated house booklet, which were issued

in 1908 and 1909. The company has also issued booklet No. 8 on highway bridges. These publications contain a large amount of valuable information relating to building construction, being valuable reference books for architects, engineers, contractors and others interested in building construction.

Railway Motor Cars. Fairbanks, Morse & Co., Chicago, have just issued catalogue No. 101B on motor cars for railway service, including all types from the small car light enough for one man to handle to the large passenger car seating 35 people. Two new gasolene section cars are shown and the 35-passenger car is especially featured. The catalogue is made up in an attractive form and includes many excellent half-tones. Most of the illustrations are of cars in actual service, about 5,000 of the company's cars now being in use on the railways of this country.

Meters, Fan Motors, Arc Lamps, etc.—The General Electric Co., Schenectady, N. Y., in bulletin No. 4,721 describes its d.c. watthour meters, type C-6, C-7 and C Q; in bulletin No. 4,720 its steam and air flow meters; in bulletin No. 4,716, several types of prepayment watthour meters, made for two or three wire service and 100 to 120 or 200 to 240 volts, either direct or alternating current; in bulletin No. 4,719, its fan and small power motors for use with fans in residences, offices or public buildings, and also its fans for ventilating purposes; in bulletin No. 4,717 its flame arc lamps for lighting streets and large interiors; and in bulletin No. 4,722, the use of electric drive in cement plants.

Cardwell Friction Draft Gear.—The second story of the Animal Line Railway, which was created in the imagination of Bruce V. Crandall for the story of the Bettendorf Bears, has been written by the same author and published by the Union Draft Gear Co., Chicago. In the introduction the author dedicates the second story to the "children of the railway fraternity" who received his first effort so kindly, and a glance at the new book indicates that it will be as well received as was the former one. The theme is a draft rigging test conducted by Mr. Reynard Fox, the "G. M." of the Animal Line in the presence of all the animals, in which the superiority of the Cardwell friction draft gear is demonstrated. The story is supplemented by six full-page illustrations in color, showing the alleged experiences of the Animal Line with spring-gear and the subsequent adoption of the Cardwell.

RAILWAY STRUCTURES.

Altoona, Pa.—See Johnstown & Altoona (Electric) under Railway Construction.

Baltimore, Md.—A contract has been given to J. Henry Miller, Baltimore, Md., for the new union passenger station to be built by the Northern Central. (April 8, p. 947.)

Bassetts, Tex.—The St. Louis Southwestern has prepared plans for a new station following the filing of a complaint by the citizens. The new plans have been submitted to the citizens and to the state railway commission for approval.

Bemidji, Minn.—The Minnesota & International has opened its new district yards and freight houses for the handling of business at the new district terminal. A coal chute, a sand drying house, water tank and roundhouse have also been completed.

Big Springs, Tex.—The Texas & Pacific has let the contract to the Hughes O'Rourke Construction Co., Dallas, Tex., for a passenger station to cost $40,000. (Feb. 12, 1909.)

Birmingham, Ala.—An officer of the Atlanta, Birmingham & Atlantic writes that work was started last month by J. B. Anderson & Company, Birmingham, on a corrugated iron and brick freight house and office building for the Alabama Terminal Railway. The building is to be 20 ft. high, 38 ft. wide and 349 ft. long, on concrete foundations, and is being put up at Eleventh street and First avenue, in Birmingham. The cost of the improvements will be $15,000. (April 8, p. 974.)

Boyles, Ala.—An officer of the Louisville & Nashville writes that the company will put up the new shops at Boyles with its own men, and will probably not let any of the work. (Jan. 21, p. 167.)

Chicago.—The Baltimore & Ohio Chicago Terminal is to build new freight receiving and delivering stations. A new train shed will also be built at the Grand Central station and the interior of this building will be rearranged.

Defiance, Ohio.—The county commissioners are said to have decided to build a combined highway and street railway bridge in Defiance. The structure is to have two spans, with a total length of 400 ft.

Edmonton, Alb.—See Canadian Pacific under Railway Construction.

Ft. Worth, Tex.—The Northern Texas Traction Co. has plans made for a new car barn 100 ft. wide and 165 ft. long, to be built west of the present barns. It will have a concrete roof and floor.

Loraine, Ohio.—Contracts have been let for extensive improvements to the Baltimore & Ohio facilities for handling ore on its docks at Loraine, Ohio, to cost about $500,000. The 460,000-ton capacity ore handling and storage plant on Lake Erie, at the mouth of Black river, covers approximately nine acres and is used for storage and unloading purposes. The ore is to be unloaded from lake boats by three Brown hoisting unloaders made by the Brown Hoisting Machinery Co., Cleveland, Ohio, each to have a capacity of 350 tons per hour. The machinery will be operated by electric current, which will be generated in a new power house to be built adjacent to the storage yard. This building will be of brick construction, two stories high, 70 ft. x 90 ft., and will contain two 1,000-h.p. Buckeye engines and two 500-kw. Westinghouse electric generators, the current to be carried by cables in underground conduits to the conductor rails. The foundation walls carrying the unloaders and the tram bridge will be of concrete with steel reinforcement partly on solid ground and partly on piling. A concrete dock and timber cribbing, 845 ft. long, will be built along Black river.

Middletown, Conn.—See New York, New Haven & Hartford under Railway Construction.

Negaunee, Mich.—The Chicago & North Western and the Duluth, South Shore & Atlantic are considering the question of building a new $30,000 union station. It is reported that an agreement has been reached to build the new station directly west of the present building.

Newark, N. J.—The Pennsylvania Railroad is considering certain improvements at Market street, including rebuilding the present station and providing six tracks instead of the present four tracks. Nothing definite has as yet been decided.

Outlook, Sask.—See Canadian Pacific under Railway Construction.

Somerset, Wis.—Bids will be asked for about April 18 by the Minneapolis, St. Paul & Sault Ste. Marie to build a new bridge over the St. Croix river near Somerset. About 5,000 tons of structural steel will be used in the construction of the bridge. The improvements will cost about $600,000.

Stockton, Cal.—According to press reports the Southern Pacific will spend about $500,000 for improvements, including new yards and station buildings at Stockton.

Stratford, Ont.—The Grand Trunk has submitted a proposition to residents of that place agreeing to build a new station and put up a new foundry and other shops, at a cost of between $200,000 and $250,000. The city officials must agree to close a portion of Downie street and build a subway for street traffic under the railway tracks at Nile street.

Superior, Wis.—Work is now under way by Schmidt Brothers & Hill on the concrete foundations for the large new ore dock for the Great Northern being built at Allouez, Lake Superior. The United States Steel Corporation has the contract for the steel work. The new dock will cost $1,000,000. (Oct. 29, p. 832.)

Tampa, Fla.—The Tampa Union Station Co. has been incorporated to build terminals for the Tampa Northern, the Atlantic Coast Line and the Seaboard Air Line. The station building is estimated to cost between $175,000 and $200,000.

Two Harbors, Mich.—The Duluth & Iron Range has let the contract for building an ore dock to the Barnett & Record Co., Duluth, Minn.

Late News.

The items in this column were received after the classified departments were closed.

L. B. Rhodes, master mechanic of the Georgia, Southern & Florida, has been appointed superintendent of motive power of the Virginian Railway.

Grading work is said to be under way by Cain & Dickens, on an extension of the Laramie, Hahn's Peak & Pacific, from Foxpark, Wyo. The line is to be continued south via Walden, Colo., to Hebron, about 50 miles. (Mar. 11, p. 547).

The Pennsylvania Railroad on April 13 ran the first electric train through the tunnels under Manhattan Island and the East River. The train, made up of six construction cars and an electric locomotive, ran from the station in New York to the Thompson avenue viaduct in Sunnyside yard, Long Island City.

A. C. Spencer, general roadmaster of the Southern division of the National Railways of Mexico, at Queretaro, Mexico, has been appointed superintendent of construction, with office at San Juan, Nuevo Leon, in charge of the erection of the San Juan bridge. This is to be a reinforced concrete structure, of eight spans, each 175 ft. long, to have a total length of 1,400 ft., and will be one of the first reinforced concrete bridges built in Mexico.

Noble C. Butler, special master in the Chicago, Cincinnati & Louisville Railway bankruptcy, has recommended in a report to the Federal Court that the property be sold under foreclosure in its entirety, and that the proceeds after the payment of costs and expenses, receiver's certificates and preferred debts, be applied to the satisfaction of the mortgages. There are three divisional mortgages aggregating $3,154,000 and a general mortgage for $3,016,000.

The Delaware, Lackawanna & Western has made an increase of 6 per cent. in the pay of all employees in the transportation department, except the men on trains. The number affected is said to be 6,500. The 1,500 switchmen are given an increase of three cents an hour. The increase takes effect as of April 1. Men in road service, conductors, brakemen, enginemen and firemen are not included, as negotiations with committees of these classes are still going on.

Bids are to be asked for in from 30 to 60 days by the Arizona-Mexican Construction Co., Room 1408, 11 Pine street, New York City, to build under the name of the Arizona, Mexico & Gulf, from Tucson, Ariz., southwest to Port Lobos, in the state of Sonora, Mex., on the gulf of California, 210 miles. The line is to be built under the direction of the Development Company of America, New York. F. M. Murphy is president of the development company, also president of the railway company, with office at New York City.

As mentioned in another column, more than 50 manufacturers of railway equipment, materials and supplies attended at Columbus, Ohio, on Tuesday evening, April 12, a hearing before the Senate Committee on Commercial Corporations on the Woods Utilities Bill, to protest against the enactment, without substantial amendment, of that measure in the form in which it had passed the Ohio house. The demonstration was organized by the Railway Business Association through its Ohio Business Committee, of which A. M. Kittredge, president of the Barney & Smith Car Co., Dayton, Ohio, is chairman. S. P. Bush, president of the Buckeye Steel Castings Co., Columbus, Ohio, and Mr. Kittredge addressed the committee.

A number of railway counsels and representatives of interurban lines, express companies and railway employees, as well as the Ohio Shippers' Association, argued against the various provisions of the bill. The most comprehensive of these addresses was that of Hon. S. H. Durbin, representing the Baltimore & Ohio Railroad. Numerous further amendments to the bill which, as it passed the House, comprised 144 sections, were handed to the committee during the hearing. There was no witness in favor of the bill and the chairman did not even ask whether advocates cared to be heard.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

Grant Smith & Co., Chicago, has ordered two 10-in. x 16-in. 36-in. gage saddle tank locomotives from the Vulcan Iron Works.

James H. Corbett, railway contractor, Indiana, Pa., has ordered two 10-in. x 16-in. locomotives from the Vulcan Iron Works.

The Queen & Crescent Route denies the report that it is in the market for 10 Mallet locomotives, as reported in the *Railway Age Gazette* of April 8.

The Georgia, Southern & Florida has ordered four Pacific, nine consolidation and two six-wheel switching locomotives from the Baldwin Locomotive Works.

The Aransas Terminal Railway Co., building at Aransas Pass, Tex., expects to buy motive power in July. E. L. Burton, president, Gibbs building, San Antonio, Tex.

The Chicago, Rock Island & Pacific, reported in the *Railway Age Gazette* of April 8 as in the market for 25 Pacific and 34 consolidation locomotives, has ordered this equipment from the American Locomotive Co.

The Chicago Great Western, reported in the *Railway Age Gazette* of April 8, in an unconfirmed item, as being in the market for 41 locomotives, has ordered 15 consolidation, six ten-wheel passenger and 10 six-wheel switchers from the Baldwin Locomotive Works.

The St. Louis & San Francisco locomotive inquiry, reported in the *Railway Age Gazette* of April 8, should have read eight instead of 80 Pacific locomotives. Eight Pacific and five switching locomotives have been ordered from the Baldwin Locomotive Works and two Mallet locomotives, in addition to the five reported on April 1, have been ordered from the American Locomotive Co.

The St. Louis & San Francisco, as reported in the *Railway Age Gazette* of April 1, has ordered five Mallet locomotives from the American Locomotive Co. Delivery is specified for August, 1910.

General Dimensions.

Weight on drivers	360,000 lbs.
Total weight	417,000 lbs.
Cylinders	24½ in. and 39 in. x 30 in.
Diameter of drivers	57 in.
Type of boiler	Conical connection type
Working steam pressure	200 lbs.
Heating surface, tubes	4,903 sq. ft.
" " firebox	350 "
" " total	5,253 "
Tubes, number	348
" outside diameter	2¼ in.
" length	24 ft.
Firebox, length	120⅛ in.
" width	90¼ "
" material and maker	Otis steel
Grate area	75.2 R.R. Co.'s standard
Water capacity	8,000 gals.
Coal capacity	10 tons

The engines will be equipped with electric headlights and Walschaert valve gear.

The New Orleans, Texas & Mexico, as reported in the *Railway Age Gazette* of April 1, has ordered 5 Pacific, 13 consolidation and 5 switching locomotives from the Baldwin Locomotive Works and 12 consolidation locomotives from the American Locomotive Co. The engines are all to be delivered in August and September.

General Dimensions

	Pacific.	Consolidation.	Switching.
Weight on drivers	145,000 lbs.	180,000 lbs.	148,000 lbs.
Total weight	225,000 lbs.	201,000 lbs.	148,000 lbs.
Cylinders	26 in. x 28 in.	26 in. x 30 in.	20½ x 28 in.
Diameter of drivers	69 in.	63 in.	51 in.
Type of boiler	Ext. wgn top.	Ext. wgn top.	Straight top.
Working stm. pressure	160 lbs.	165 lbs.	185 lbs.
Heating surface, tubes	2,666 sq. ft.	.....	1,814 sq. ft.
" " firebox	177 "	.....	142 "
" " total	2,843 "	.....	1,956 "
Tubes, number	198	.....	315
" outside diam.	2¼ & 5 in	.....	2 in.
" length	20 ft.	.....	11 ft.

Firebox, length	108 in.	120 in.	72 in.
" width	68 in.	60 in.	66 in.
" matrl. & mkr.	Otis steel.	Otis steel.	Otis steel.
Grate area	51 sq. ft.	50 sq. ft.	33 sq. ft.
Water capacity	8,100 gals.	7,600 gals.	4,500 gals.
Coal capacity	8 tons.	8 tons.	

The Pacific and consolidation engines will have electric headlights, the Pacifics and 13 of the consolidations will have Emerson superheaters and the 12 consolidations will have Cole superheaters.

CAR BUILDING.

The Northwestern Pacific is in the market for 50 forty-ton and 100 fifty-ton box cars.

The Cincinnati Traction Co., Cincinnati, Ohio, has ordered 18 dump cars from Wonham, Sanger & Bates, New York.

The Isthmian Canal Commission will receive bids until April 29 for 12 thirty-ton steel flat cars. (Circular No. 573-C.)

The Lake Superior & Ishpeming has ordered 100 ore cars from the Clark Car Co., for delivery during the coming summer.

The Aransas Terminal Railway Co., building at Aransas Pass, Tex., expects to buy motive power in July. E. L. Burton, president, Gibbs building, San Antonio, Tex.

The Elgin, Joliet & Eastern, reported in the *Railway Age Gazette* of April 1 as being in the market for 500 steel hopper cars, has ordered this equipment from the Standard Steel Car Co.

Lewis T. Le Naire, Tribune building, New York, is asking prices on 50 box cars for early delivery to a South American railway. The order will probably be increased to 100 cars if satisfactory arrangements can be made.

The Coal & Coke Railway, reported in the *Railway Age Gazette* of April 1 as considering the purchase of 500 coal cars, is reported to have ordered this equipment from the Cambria Steel Co. This item is not confirmed.

The St. Louis & San Francisco, as reported in the *Railway Age Gazette* of April 8, has ordered six gasolene electric motor cars from the General Electric Co. The cars are to be divided into baggage, colored, smoking and first-class passenger compartments, with a total seating capacity of 89. The cars are of all-steel construction with mahogany interior finish, side entrance doors between the colored and smoking compartments and standard observation car rear platforms.

MACHINERY AND TOOLS.

The Boston Elevated has issued a list of about 25 machine tools of all types.

See item regarding machinery installations at Loraine, Ohio, under Railway Structures.

The Pennsylvania is in the market for four boring mills, one 16-in. lathe and one locomotive axle drilling lathe.

Press reports from South Bethlehem, Pa., indicate that the Bethlehem Steel Co. will install in its large plant the following equipment: Six thousand horse-power boiler, three gas engines for electric power, seven new locomotives and nine engines for blowing purposes at the blast furnaces, electrification of mill No. 1, new furnaces at press forge, addition to No. 1 tempering plant, additional tools for No. 6 shop and additional improvements to No. 2 shop. The total cost will amount to $2,795,000.

IRON AND STEEL.

The Louisville & Nashville has ordered from the American Bridge Co. 1,200 tons of structural steel for a viaduct at Henderson, Ky.

The Chicago City Railway, reported in the *Railway Age Gazette* of January 21 as in the market for 5,000 tons of rails, has ordered them from the Lorain Steel Co.

The Oregon Trunk is taking prices on 4,500 tons of steel for the Columbia river bridge at Celilo, Wash., mentioned in the *Railway Age Gazette* of Dec. 17, 1909, under Railway Structures.

General Conditions in Steel.—Chairman Gary, of the United States Steel Corporation, is quoted as follows: "There has been a steady increase in business since the lull in January. The United States Steel Corporation has now more than 5,000,000 tons of unfilled orders, and during March orders kept up with the capacity of the plants. At the present rate of booking, our mills should continue at full capacity through the rest of the year." According to the Department of Commerce and Labor, exports in iron and steel, not including ore, in February, 1910, were $13,949,082 as against $10,947,159 in February, 1909, and for the eight months ended February, 1910, they were $111,184,177 as compared with $91,275,211 for the same period in 1909, and $130,399,349 for the same period in 1908. Imports of iron and steel, not including ore, were $2,911,686 in the month of February, 1910, against $1,798,675 in the same month last year, and $24,157,560 in the eight months ended February, 1910, as compared with $13,400,630 and $21,170,314 in the eight months ended February, 1909 and 1908, respectively.

SIGNALING.

The Rock Island has just finished the change of night color indications of switches and signals on the following divisions: Nebraska, Missouri, Kansas, St. Louis, El Paso. The new colors are red, yellow and green.

The Chicago, Milwaukee & St. Paul is installing three-position, upper quadrant, automatic semaphore block signals between Chicago and Milwaukee, and is changing existing interlocking signals from lower to upper quadrant.

The East Penn branch of the Philadelphia & Reading, from Reading to Allentown, 35 miles, is to be made double track throughout its length, a seven-mile section of second track being now nearly finished; and with this work completed Hall automatic disk block signals will be installed throughout the branch.

Silica-Graphite Paint and Acid.

Corrosion is universally recognized as one of the worst known enemies of a paint applied to the surface of iron and steel, and rust on either side of the film means a certain and more or less rapid deterioration. The action of this corrosion



Three-Coat Dixon Steel Car Paint Skin.

(Removed from surface of steel car after one month's submergence in storage battery residue.)

seems to be that of cutting under the film of the paint and not only loosening, but causing it to disintegrate. Acid acts in the same manner as common rust to a certain extent, in that,

besides making a direct attack upon the paint film, it has a peeling effect when it has come into contact with the metal. The rapidity with which this peeling takes place depends upon the strength of the acid and the vigor with which it attacks the metal as well, as the resisting qualities of the paint film itself and its adhesion to the metal surface.

It appears from some experiments that have been made with the silica-graphite and steel car paints of the Jos. Dixon Crucible Co., Jersey City, N. J., that even a very strong acid may fail to have a direct effect upon the paint film, even though it be allowed to attack the painted metal surface and to ultimately remove it.

Such results are illustrated in the accompanying half-tone. It shows a paint film of silica-graphite and steel car paint that was originally applied to a sheet of boiler plate. One-half of each of two plates was painted with three coats of the two paints, respectively, and the whole submerged for two months in a bath consisting of the strong sulphuric acid solution of the residue of a storage battery. The acid attacking the metal worked beneath the paint films and succeeded, in the time given, in entirely removing the film of steel car paint and one-half of that of the silica-graphite paint, the other half of the latter remaining closely adherent to the metal.

An interesting feature of this test is that after a lapse of nine months, during which time these films have been subjected to every change of the atmosphere, they remain as soft and flexible as a piece of chamois skin. That the failure of the acid to cause any perceptible deterioration of the film is evidenced by the fact that, when viewed under a microscope, the whole surface is seen to be covered with the fine particles of silica and graphite. It is, therefore, undoubtedly due to the highly resistant and inert qualities of these pigments that the film was so thoroughly protected and shown to be about as nearly absolutely acid-proof as it is possible to make a paint.

Advance Power Co. Inspection Car.

Among the late types of motor-section and inspection cars shown at the exhibition of the Road and Track Supply Association in Chicago, March 14-19, was a 9-passenger inspection



Advance Inspection Car.

car made by the Advance Power Co., 140 Dearborn street, Chicago.

The Advance engine, with which this car is equipped, is of the two-cycle air and vapor cooled, two-cylinder opposed type, developing 20 h.p. This engine has no valves, gears, cams, springs, water connections, radiators or pumps. Simplicity durability and high power are obtained by a new method of handling the mixture of gasolene and air which keeps the engine cool, and gives perfect combustion.

Power is transmitted by the Advance rolling contact transmission, consisting of one large fiber-faced disc, keyed on the engine shaft and serving also as a flywheel, against the face of which are two smooth iron wheels on countershafts which are connected to the rear axle by a chain drive.

A single lever controls the movement of the car, the same speed being obtained in both directions. The speed is controlled by a hand wheel on a post resembling the steering gear of an automobile, which draws together or spreads apart the two smooth iron wheels on the face of the large disc, giving a positive and quick regulation from zero to full speed.

The accompanying cut illustrates the appearance of the car and shows clearly the compactness of the engine under the front end. The illustration also shows the braking apparatus, the gasolene tank under the rear seat and the simple, durable construction of the car body. This car has traveled thousands of miles and has a record of ⅞ of a mile in 60 seconds from a standing start to a standing stop, carrying six passengers. It has also been driven up a 12 per cent. grade with 10 passengers at 15 miles an hour from a standing start at foot of grade.

The Advance Power Company also makes motor section cars and double and single truck motor cars for passenger service which are equipped with Advance engines of suitable capacity and the Advance rolling contact transmission. All the special features described are fully protected by United States and foreign patents.

Osgood Automatic Beamless Scale.

In the accompanying half-tone is shown an automatic beamless scale designed for weighing L. C. L. freight, baggage, express, mail, merchandise, coal, etc. Further than providing a scale that is beamless, the Osgood patents, held by the Winters-



Osgood Automatic Beamless Scale.

Coleman Scale Co., Springfield, Ohio, provide for automatically indicating the required weights on a 12-in. diameter dial. The divisions on the dial are made red and black on a white background, and as there are less than three divisions per inch, they are easily and quickly read.

The weight of a load is transmitted through steel yard rods

to the central bearing of an equal arm lever. One-half of the load strain so transmitted is carried through a spring to a small cone pulley by a connecting rod and steel tape. The other half of the load strain is transmitted through a spring, hook rod and thermostat lever to a segment drum. Five-sixths of this load strain is absorbed by the fulcrum bearing, the remaining one-sixth only being transmitted to the indicating mechanism.

The long black hand is attached to the shaft of a pinion, which is operated by a rack attached to an aluminum rod, the lower end of which is hinged to the thermostat lever above mentioned. The smaller red hand is attached to the shaft of a pinion, operated by a rack secured to an aluminum rod, the lower end of which is hinged to another lever.

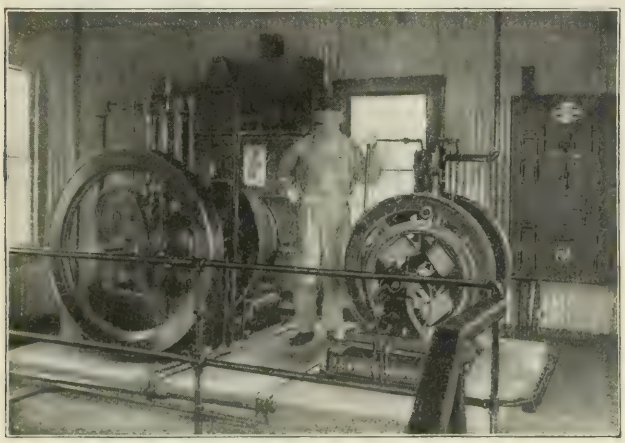
For the purpose of balancing, a cone pulley is employed, the cones of which are so connected that by means of a thumb-screw, which operates in conjunction with the quadrant shown, the movements of the hands are controlled in unison. When out of balance both hands can be brought back to zero or drawn back to allow for tare. Dashpots are used to prevent excessive vibration of the hands. The rods which connect the main lever with these dashpots are fitted with plungers, which are submerged in a special anti-freezing oil in the dashpots.

These scales are at present in use on the following railways: Atchison, Topeka & Santa Fe; Chicago, Rock Island & Pacific; Chicago, Burlington & Quincy; Chicago, Milwaukee & St. Paul; Chicago, Milwaukee & Puget Sound; New York Central & Hudson River; Long Island; Erie, and Delaware, Lackawanna & Western.

Charging Outfits for Storage Batteries.

The installation of electric signals on railways necessitates the use of a storage battery, which must be kept charged to insure the operation of signals.

The accompanying half-tone shows a charging outfit made by Fairbanks, Morse & Co., Chicago, and now in use in a plant of the Norfolk & Western. The large machine con-



Charging Outfit on Norfolk & Western.

sists of a 12-h.p. Fairbanks-Morse gasolene electric engine, direct connected to a 7¼-k.w. Fairbanks-Morse dynamo. The small outfit is a 6-h.p. special electric gasolene engine and a 3½-k.w. generator.

The Norfolk & Western has several of these sets in use on its line. These outfits are said to be both reliable and economical. Both engines and dynamos are made in the same shops.

Burton Track-Laying Machine.

The Burton Track-Laying Machine Co., Salt Lake City, Utah, will soon place on the market a track-laying machine patented by Charles W. Burton. It has been carefully tested, and a complete outfit is now being prepared for demonstrating its operation.

The machine consists of a platform mounted on standard trucks, having four posts, one at each corner, the tops of which are connected in pairs by cross-beams supporting three longitudinal hanging tracks. These tracks extend some distance behind the machine, reaching over the tie and rail cars, and in front over the roadbed. The cantilever ends are supported by over-truss rods. The rail car is attached directly behind the track-laying machine and the tie cars behind the rail car. The rails are transferred from the car to the roadbed by carriers running on the outside tracks, which have a special hoisting device to eliminate manual labor as far as possible. The tie carrier is an open car which is loaded with ties, hoisted by compressed air jacks, and run forward on the middle track. The ties are dumped automatically when the front wheel of the car strikes a sharp downward incline at the front end of the track. A bumper is arranged to stop the car suddenly on this incline and a roller in the floor of the car facilitates the dumping of the load. In operation, as soon as a loaded tie car passes the rail car, each rail carriage picks up a rail, fishplates being bolted to the forward end and temporary spacing bars clamped on the base during the raising. By this time the ties have been deposited on the roadbed, the car has been run back out of the way, and the ties properly distributed. The rail carriages are then run forward, the rails deposited on the ties and a single bolt inserted in the fishplate to secure the new rails to previous work. Since the ties and rails are brought forward on separate tracks, there is no interference between the two operations, and no delay in completing the track.

FOREIGN RAILWAY NOTES.

A British syndicate has received a contract from the Chilean government for the construction of a railway to parallel the coast for a distance of 446 miles, running from Pueblo Hundido, about 450 miles north of Valparaiso, and ending at Lagunas, about 60 miles southeast of Iquique. The road is to be completed within four years at a cost of $14,870,807 United States gold.

The Government of Panama has presented a proposal to the Canal Zone Government for the building of a railway between Panama and David by the Panama Railroad. The government wishes to contract with the Panama Railroad for the construction of the railway, a distance of 274 miles. In this is included a branch extending into the Province of Los Santos, also other branch lines that may be necessary for the complete development of the Republic.

The report of the Central Uruguay railway for the year ended June 30, 1909, shows gross earnings of $2,785,610 as compared with $2,040,220 in the previous year, with net profits of $1,348,058, or an increase of $168,385. On the eastern extension a section of 33 miles was opened to the public in November, 1908, additional sections being opened in July and August, 1909, respectively, so that the total length now being operated is 246 miles.

The line of railway to connect Medellin with the Cauca river at a point between the mouths of the Amaga and Poblanco rivers is reported by the Belgian consul at Bogota to be under active construction. The road is the property of a Colombian company capitalized at $1,000,000. The railway will serve a very fertile region and will be especially advantageous to coffee growers. During 1910 the company will place orders for 1,000 tons of rails of the Vignole pattern.

It is said that the contract for the 75 miles of connecting railway between Zacapa and Santa Ana, Salvador, has been let to Myron C. Keith, president of the United Fruit Co. The road will be standard gage and will be completed within 18 months. Surveys and locations have already been made and materials ordered. On the arrival of the materials work will be immediately commenced from the Santa Ana end of the line. This line will connect the Salvador Railway with the Guatemala Railway, thus making a link between the two republics.

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The British House of Lords has confirmed a decision of the county court at Liverpool compelling an employer to pay indemnity, under the Workmen's Compensation Act, to the widow of a man who dropped dead from aneurism of the aorta while at work tightening a rivet. The court held that this was an accident sustained in the course of employment, though the doctors testified that the weakness or debility of the artery was so advanced that the man might have died while asleep. This being so, the employer claimed that the occurrence was not an accident, as contemplated by the law. Physicians generally hold, where a diseased condition is the immediate cause of a workman's death, that any external happening accidentally arising in the course of a man's employment is not to be considered as a cause. It appears that the English courts have held that the term "accident" was to include cases where "something goes wrong with the human frame itself," such as the breaking of a blood vessel. If such a case is to be deemed accidental, then there must be some standard beyond which the man must not exert himself and, of course, no such standard can be established; for there would have to be a different one for men of different ages. The result of this interpretation of the law probably will be to drive employers rigidly to exclude from their service men with weak hearts or other bodily infirmities which are liable to develop sudden failures. The adoption of strict regulations by the employers will thus tend to throw out of work considerable numbers of men who, notwithstanding debility or chronic disease, desire to earn a livelihood, and who, under favorable conditions, are competent to do so. *Engineering*, which discusses this subject, thinks that the only solution of the difficulty will be to repeal the Workmen's Compensation Act and adopt in its place some national scheme of insurance.

E. E. Mote, manager of the Pacific Car Service Bureau, reports for February, the eighth month in which the California $6 demurrage rate had been in effect, that of the cars subject to that rate the percentage held overtime was only 0.87, the lowest figure yet shown. Of cars which contained interstate shipments and which, therefore, were subject to a rate of only $1 a day, the percentage held overtime was 4.30 in California and 5.43 in other territory. This difference between the result in California and that in other states would seem to indicate that the habit of unloading intrastate shipments promptly had influenced consignees to unload all shipments more promptly than formerly. The total amount of demurrage charged in California during the eight months ending with February was considerably less than in the preceding eight months, although the number of cars handled was about 23 per cent. more, showing that the high demurrage rate had its normal effect of reducing the use of cars as storehouses rather than imposing penalties on consignees. Mr. Mote has inquired of railway superintendents if they found that shippers were loading cars with the smallest possible quantity of freight in order to avoid demurrage, but the replies that he gets seem to indicate that such is not the case. Shippers are more careful than formerly not to order cars before they need them. The general manager of an electric line which does a considerable freight business thinks that a charge of $5 would be as effective as $6 a day.

Running the engine with the cab to the front, as in the case of Mallet locomotives, illustrated elsewhere in this issue, is the natural outcome of the increasing length of these engines. There was much comment, at the time the first of these excessively long machines were built, on the fact that the engineman had but little chance to see his rails ahead of him. In fact, he could see almost nothing of them except on curves to the right; and it was suggested that it would be well to move the cab to the front and place it over the waist of the boiler, as is done on the culm burners of the anthracite roads. The idea of running the cab at the front is not, however, a new one. When Forney patented his 0-4-4 locomotive, one of the claims he made for it was that it was designed to be run with the cab to the front, and thus give the driver a clear and unobstructed view of the rails ahead. But the idea did not take, and the engines were usually run in the regular way, except when used in a service where they were not turned at the end of a run. The question is as to how much additional safety is obtained by putting the driver where he can see the rails. On even the old-time light locomotives, the machine was running into an unknown territory whenever it was on a curve to the left or on a curve in a cut. And as for night work, the oil headlight would never have shown anything on the track at speeds of 50 miles an hour, in time to stop; so all our night work is practically done without a view ahead. European drivers do not even have the glimmer in front for company. Still, the idea of putting the driver where he can see what he is coming to before he gets there is a good one, and the arrangement of these oil burners should be widely imitated on similar engines.

The Woods Public Utilities bill, which has been passed by the Ohio House and is pending in the Senate, illustrates the current tendency to subject public service corporations to more and more detailed regulation. It has not been many years since there was pretty general agreement that regulation should be confined to fixing maximum rates and to a few requirements regarding service. It was then felt that so long as a few restrictions and requirements imposed for the protection of the public were observed the officers of public utilities should be allowed to operate them, as was once said by a distinguished federal judge, "upon the same principles which are regarded as sound and adopted in other trades and pursuits." The Woods bill carries to the logical extreme the theory prevalent now, that public authorities should interfere as much with the business of public utilities as, by the most extreme interpretation, can be held to be constitutional. It proposes to give the commission which it would create the power to fix not merely the maximum rates but the absolute rates to be charged by every public utility in Ohio; and no rate could be changed without the commission's consent. It specifically empowers the commission to prescribe the way that the accounts of all public utilities shall be kept, to fix the amount of the depreciation accounts that each shall carry, and to do many other things which it has heretofore been assumed should be left to the companies' managers. Finally, to make sure that the commission shall have all the authority and discretion that it may need to compel public utilities to do anything and everything that may seem good to it, the bill makes the sweeping provision that "the commission is vested with the power and jurisdiction to supervise and regulate every public utility in this state, and to do all things necessary *and convenient* in the exercise of such power and jurisdiction." In other words, it proposes to constitute the commission, the board of directors, the president, all the vice-presidents, the general manager, the traffic manager and the general auditor of every public service corporation in the State, and to make those who now hold these offices merely the commission's clerks and messengers. It would seem that no effort and no expense should be spared to get the most capable and expert men to perform duties of such magnitude and importance. Yet the bill provides salaries of only $5,000 per year each for the three members of the commission, and prescribes no qualifications for them, except that they shall not engage in politics, pursue any other business except the duties of their office, or have any pecuniary interest in any concern subject to the provisions of the act. One of the curious features of the situation is that there have apparently been in Ohio no abuses requiring, and no public agitation or demand for, the enactment of this or any other additional regulatory legislation. The Woods bill was substituted by the House for another bill almost without any discussion of it, and swiftly jammed through. Had not the Railway Business Association and representatives of the public utilities of Ohio appeared to protest against its enactment, it might have been made a law almost before the great majority of the people of the state knew that it had been introduced. The bill itself and the effort to hurry it upon the statute books without the public, or even the legislature, having had time or opportunity to consider it thoroughly, constitute a significant commentary on the spirit in which regulation of public utilities is now being carried on.

The number of persons killed in train accidents in the month of March, as shown in our list published to-day, was 158, and of injured 152; and the Government report, when it comes out three months hence, will show much larger numbers, of course. This frightfully large record well illustrates the fortuitous character of railway accident statistics. The worst accident in the list, that at Wellington, in the Cascade mountains, occurred under circumstances that can never affect ordinary railway operation, such as one has in mind when estimating the degree of safety with which our railways generally are managed; and the effect of this casualty list on the totals for the year is therefore quite abnormal. Nevertheless, this catastrophe occurred on an important through railway line, over which thousands of people travel every year in almost exactly the same frame of mind that possesses them when they ride over the prairies of Illinois. The derailment in Iowa is also quite unusual in that more than two score lives were sacrificed, while yet the speed of the train was low and there was no high precipice or rocky mountain or raging flood; no faulty bridge and no disastrous fire. In one particular, however, the circumstances of this accident were of a kind that is deplorably common; heavy, strong cars were mixed in the train with lighter ones, so that the lighter were quickly crushed by the heavier. Steel cars have already shown their value in collisions and derailments and the Rock Island road has been one of the foremost in introducing them; yet in this accident it pays the penalty of *not* having a train made up of cars of uniform size, weight and stiffness. In so far as this derailment was caused by running engines backward, the accident was again of a common kind; that is to say, many derailments occur under such circumstances when it seems quite probable that if the engine had been running "chimney first" it would have stayed on the track. Assuming that to turn these engines around would have been out of the question the point at issue was, How slowly must the train be run to insure safety? This had to be settled by the men in charge on the spot; and whether or not they, all of them, exercised good judgment may be a very difficult question to answer. To complete the picture of this month, so disastrous in the railway record, we must note a gigantic avalanche on the Canadian Pacific near Glacier, B. C., on the morning of March 5, about 1 o'clock, which buried and killed 50 or more men, with two rotary snow plows, and a rear collision at Mulheim on the Rhine, in Germany, March 30, in which 22 soldiers were killed.

THE NEW HAVEN'S RAISE OF PASSENGER FARES.

As an object lesson in the study of passenger fares and rates the New York, New Haven & Hartford stands unique among American railway properties and one may almost say among the railways of the world. Its great passenger density is familiar. For many years its passenger receipts exceeded the receipts from freight; and it was not until the New York & New England system, with its preponderating freight business, was acquired that an equation of freight and passenger receipts was reached. Since then freight business on the system has slowly forged ahead. Yet, for the calendar year 1909 passenger receipts were $24,035,266, as against freight receipts of $28,559,492. In any comparisons of passenger business it should be noted that in actual mileage—main line mileage—the New Haven system has remained almost stationary. In 1906 it had 2,056 miles, which in 1909 had actually decreased to 2,044. In the interval there had been additions of new tracks and sidings of 160 miles.

Many years ago the company reduced passenger rates over the 74 miles between New York and New Haven to 2 cents a mile, with resulting increase of passenger receipts between those points. Later the policy was extended to other parts of the system that had high passenger density, and, later still, to the whole system, in a modified sense, when a mileage book of a thousand miles was given for $20. The climax of the policy, in every case adopted *voluntarily*, came in 1906, when, beginning March 1 and ending November 1, a gradual reduction of tickets to 2 cents a mile on the whole system went into force. In his annual report for that year, written in the early autumn, President Mellen says: "Careful watch has been kept of the results and we are justified from the returns at hand in stating that the [passenger] business has been stimulated to such an extent that an increased income, both gross and net, is assumed as a result of the policy." Yet now, after nearly four years, the policy is reversed. The company has filed at Washington its notice of an increase of

10 cents on the fare between New York and Boston, which is understood to be preliminary to a pretty general lift of rates on the whole system, varying inversely with the passenger density of its various parts. The cause officially stated is the increase of wages forced by the employees of the company under the threat of a strike.

The situation on a railway property of this kind opens a subject of acute interest and of the utmost value, if its bearings on the economic ratio of passenger fares to gross passenger earnings can be ascertained. The fiscal year ending June 30 of the New Haven company would, if taken, split the sliding scale reduction of the eight months of 1906 in two parts. It is better, therefore, to take the calendar years from 1905 to 1909, inclusive, by months, which allow more accurate comparison for passenger revenue, not including excess baggage and other miscellaneous earnings. The tabulation is as follows:

	1905.	1906.	1907.	1908.	1909.
January ...	$1,376,963	$1,530,594	$1,594,016	$1,614,605	$1,687,333
February ..	1,261,977	1,378,539	1,428,238	1,509,917	1,577,792
March	1,464,601	1,513,632	1,678,095	1,620,589	1,744,098
April	1,625,820	1,697,672	1,782,568	1,761,321	1,900,736
May	1,690,828	1,750,870	1,896,496	1,766,743	1,954,455
June	1,753,286	1,922,768	1,971,738	1,829,733	1,977,426
July	1,962,653	2,042,011	2,239,262	1,981,177	2,269,960
August	2,035,472	2,175,649	2,497,167	2,144,227	2,301,121
September .	2,075,676	2,181,416	2,339,700	2,176,509	2,435,110
October ...	1,890,040	1,996,331	2,120,104	2,035,674	2,174,992
November .	1,720,178	1,769,874	1,947,149	1,885,188	2,054,786
December .	1,650,828	1,746,998	1,756,822	1,788,122	1,957,457
Total ...	$20,508,322	$21,706,354	$23,251,355	$22,113,805	$24,035,266

An analysis of the table shows some striking features. The year 1906, as stated, contains the eight months of final reduction to the two-cent a mile rate. Yet passenger gross earnings increased over 1905 $1,198,032, or somewhat more than 5 per cent. The year 1907, following the reduction, is yet more remarkable with its increase of gross passenger receipts over 1906 of $1,545,001, or a little more than 7 per cent. The year 1908 was the "post-panic" year with its general inroad on railway earnings. Gross passenger receipts fell off on the New Haven $1,137,550, or nearly 5 per cent. Yet passenger earnings maintained themselves better than freight, which fell off $3,636,898, or about 13 per cent. Finally, coming down to the calendar year 1909, passenger earnings leaped to a gain of $1,921,461, or nearly 9 per cent. During the three years since 1906, the year of the final reduction to 2 cents a mile, passenger earnings on the New Haven system have gained $2,328,912, or nearly 11 per cent.

In the face of such a showing, the New Haven's inversion of policy is a bold step. One might have expected, perhaps, an increase of freight rates as a substitute or, at least, as an antecedent policy; but, apart from other complications, the New Haven is forced to consider the effect of higher freight rates on the great factory interests of New England, now meeting intensive competition in the South and West; so the increase in passenger rates, sure to meet public outcry, nevertheless seems to have been along the line of least resistance. The reasoning of the company has probably been based on the theory that the main line traffic—and a few of the subsidiary lines in populous regions—have been carrying the weaker subsidiaries, of which the company has many; that increased fares is a better alternative than decreased service—though the latter may have to come later; and that by a carefully studied readjustment, with slight increases on the main stem and larger increases on the non-profitable subsidiaries, a higher total of gross earnings will be reached. Quite apart from other considerations, the low rates which the corporation has maintained in the past give the company the moral as well as the economic right to try the experiment. Like many other railway companies under the stress of adverse conditions, having their present climax in the demands of organized labor, the New Haven turns in any direction that may afford relief, albeit hypothetical.

Broader aspects of the question naturally suggest themselves. Manifold are the definitions of what constitutes a fair passenger rate with the actual service rendered to the public as its basis. Manifold also are the theories as to the point where the rate establishes greatest profit to the railway; and those theories vary much with local conditions. But it will generally be agreed that no railway should be compelled to maintain an unprofitable rate; and that dictum leads, with some logic, to the further proposition that in general, with due regard to future development of business, a railway has the right to seek the largest profit. The New Haven has tried exceptionally low passenger fares with success. It is now to readjust them upward in the hope of greater success. The returns after the new readjustment, coupled with the results of the readjustment downward four years ago, will be a unique and invaluable contribution to the data of passenger rate-making.

THE MALLET COMPOUND LOCOMOTIVE AND ITS LIMITATIONS.

The Mallet compound locomotives which have appeared in this country during the last few years have by their good performance won many friends. They have been introduced for use in slow, heavy service, and their capacity for doing work in such service and their low coal consumption have proved sufficient to overcome the obvious disadvantages arising from their complicated mechanism. It is not unnatural that their usefulness in the field to which they have been applied should stimulate a desire to widen their range of action; should raise the question as to whether by giving them larger wheels they may not be used effectively in road service upon schedules involving considerable speed. In view of a somewhat prevalent disposition to bring this question forward, it will be of interest to consider the extent of the handicap which must be overcome by the Mallet type when put into fast service.

First of all, its design as a vehicle is not well chosen for work at high speeds. All will not agree to this statement. Mr. Mallet himself will not. But the fact remains that a very heavy leading truck swiveling on a pin behind its rear axle and carrying its load on a transverse shoe along which the load must shift for considerable distances to permit the radial movement of the truck, while satisfactory at low speeds, is likely to be the source of some uncertainty upon rough or crooked track at high speed. The cost of maintaining the system of flexible steam piping and other details of mechanism which reach across from the fixed truck and boiler to the radial truck, will increase as speed is increased. Moreover, these considerations, while important, are entirely secondary to the fact that any results which at speed may be obtained by the use of the Mallet, excepting that of flexibility on tortuous tracks, can better be obtained by a machine of more simple design. It would be possible to design a Shay locomotive for work at speed, but it would not be good engineering; it would not be difficult to design a Mallet locomotive for work at speeds, but such a design would not constitute the adaptation of the simplest means to the desired end. The advantage to be derived from the use of the Mallet type on the main lines of American railways is to be seen in its ability to develop enormous force at the draw-bar, but these forces are possible only at low speeds.

At speed, whatever the type may be, it is the boiler and not the adhesion that limits the output of power. The moment the speed is increased by any considerable amount, high draw-bar forces become impossible and the wheel arrangement peculiar to the Mallet type unnecessary. The assumption even of a moderate speed will permit wheel arrangements, now common, to absorb the full power of the largest boilers now considered practicable. For example, assume that a locomotive is used which is to have sufficient boiler capacity to permit 2,000 h. p. to be developed in compound cylinders at all practicable speeds. Such a locomotive would require a boiler having in the neighborhood of 5,000 ft. of heating surface which, if fired with coal, would need to be supplied with 6,000 or 7,000 lbs. per hour. The draw-bar

force equivalent to 2,000 h. p. for several different speeds is as follows:

At	1	mile an hour,	the tractive force will be					750,000 lbs.
"	5	miles	"	"	"	"	"	150,000 "
"	7½	"	"	"	"	"	"	100,000 "
"	10	"	"	"	"	"	"	75,000 "
"	20	"	"	"	"	"	"	37,500 "
"	30	"	"	"	"	"	"	25,000 "
"	50	"	"	"	"	"	"	15,000 "

Assuming the driving axle of the proposed locomotive to carry a load of 50,000 lbs. and assuming the adhesion to be 25 per cent., each driving axle will serve to develop 12,500 lbs. tractive force. A Mallet compound having eight axles would be capable of developing a maximum tractive force of 100,000 lbs., which force is equivalent to the development of 2,000 h. p. in the cylinder at a speed of 7½ miles per hour. At speeds lower than this the adhesion derived from eight axles will not permit the cylinders to develop this rated power, and for speeds higher than this the full adhesion of eight axles will not be necessary to the development of 2,000 h. p. For all speeds above 7½ miles per hour its tractive power must depend upon its boiler capacity, and the possible draw-bar stress steadily declines as the speed increases. At 20 miles an hour it falls to 37,500, a stress which can be taken care of by a Pacific type engine, and at 30 miles an hour it falls to 25,000, a stress which under the assumption may be taken care of by an Atlantic type. At 50 miles an hour this 2,000 h. p. locomotive would exert at the draw-bar but 15,000 pounds, an amount which may easily be handled either by an Atlantic or a Pacific type locomotive. So that while the Mallet would have some advantage in starting, the moment it came to speed it would be performing service which could readily be secured by the use of a much simpler wheel arrangement.

CORROSION OF IRON AND STEEL.

Not long ago we were quite content to ascribe rusting of iron and steel to the presence of moisture, and let it go at that. Now we know only a little more. Of recent years various investigators have attempted to solve the chemistry of the matter and with various resulting theories, dependent, to a great extent, on the mental attitude with which the subject was approached. Whether any or all of them are correct does not seem to be quite proven so that the final Q. E. D. can be written, but it does seem as though the electrolytic theory was gaining ground fastest. While ostensibly discussing corrosion in general, a recently issued book by Alfred Sang is really an advocacy of the electrolytic theory.

When two or more alternatives are presented, most people prefer to take the simpler and more easily understood, on the principle of working along the lines of least resistance. For that reason the plausible carbonic acid theory has received a wide acceptance. It takes but a slight knowledge of chemistry to see how the "carbonic acid may attack the iron, converting it to a carbonate and releasing hydrogen, which unites with the oxygen present, as air or otherwise, to decompose the ferrous carbonate to ferric hydroxide or rust, leaving the same amount of acid as was originally present to react as before and form more rust." The theory is a logical one and is not disproven by the fact that rusting may take place when no carbonic acid is present. For that simply goes to show that, possibly, rusting may take place in two or more ways and from different causes. The same goal may be reached by different chemical routes.

On the other hand, the electrolytic theory presents a tangled mass of reactions, difficult for the layman to understand and so complicated that he is apt to abandon the attempt. It is, nevertheless, the most widely accepted theory at present, that of the peroxide of hydrogen having but a scant following. In brief, the electrolytic theory is based on the fact that "when two substances of different polarity are immersed in a suitable electrolyte, an electric current is set up and the substance from which the current flows tends to dissolve." Hence rusting depends on the presence of impurities in the metal or of a variation in the homogeneity of its structure. Water is the electrolyte and it forms the connection between the impurities and the pure metal. The current thus set up is active in the liberation of hydrogen, due to the solution of the iron.

That impure metals are dissolved or rusted more rapidly than those that are pure is an old story, as it was shown to be the case by Faraday as far back as 1822, but whether an absolutely pure and homogeneous metal would be rustless or not has not yet been proven, because of the non-existence of such a metal. But we do know that the tendency to rust decreases as the purity increases, so that it is at least logical to assume that when the perfect metal is obtained it will be rustless.

Meanwhile in the case of the metals with which we have to deal, it has been proven that hydrogen tends to promote corrosion. In fact, it is flatly claimed that it is essentially a cause of corrosion, though "it may be neither the first nor the whole cause."

So oxygen also appears to be necessary, and in the electrolytic theory it serves to remove the layer of gaseous hydrogen which may accumulate on the surface of the iron. But amid all of these chemical complications we swing back to the same point again and again, where we find the rate of corrosion dependent upon the structure of the material and the mechanical treatment to which it has been subjected. It is a repetition of the old story of homogeneity and purity. For example: "hard cast iron is less corrodible than soft cast iron of a similar composition, and it corrodes faster if cooled irregularly than if cooled uniformly and slowly," due probably to greater homogeneity, because of the greater percentages of combined carbon. "So, too, the more porous the material the more rapidly will corrosion proceed, and blowholes of any size invite rust." Increase of density serves to check the tendency to rust, whereas "carelessness of manufacture which tends to heterogeneousness is an invitation to corrosion and, in itself goes far to explain why modern steel, which is tortured into shape at such a high speed that the molecules are not permitted to readjust themselves, is said to be more corrodible than the metals produced a generation ago, when iron was produced in small quantities and was rolled slowly and allowed to cool naturally."

Then comes the effect of stress. It was shown fifteen or twenty years ago that when metal was subjected to stress it corroded more rapidly than when in normal condition. Whether this is because of an unevenness in the distribution of the stresses or not is not known. But it is at least certain that no stresses to which any mass is subjected can be distributed uniformly throughout it; from which it follows that there must be a variation in the structure, which brings us directly back to the effect of mechanical treatment on corrosion. For the strains thus induced "are really equivalent to straining the metal beyond its elastic limit," which, as we have seen, makes it more corrodible.

Mr. Sang calls attention in a final chapter of his book to the interesting phenomenon presented by the rusting of steel rails. It has been observed, in many instances, that rails in service rust far more slowly than those that are out of service. Galvanic action has been suggested, but it is not at all likely that the foot of the rail would owe its protection to a thin skin of dense and crushed metal in the top of the head." As a matter of consistency that crushed metal by varying the homegeneity of the metal should facilitate and not prevent corrosion, and this may be what it does when the rail is laid aside. The whole array of facts that have been collected seem to indicate that the vibration of the rails in service tends to protect them. No explanation has been vouchsafed, thus far, to explain this remarkable coincidence between use and absence of corrosion. It is simply known that the greater the density of traffic, and consequently the

greater and more frequent the vibration, the less the corrosion.

In default of a better explanation the *Railway Age Gazette* offers this as a tentative one which seems, at least, worthy of consideration.

It is well known that if a permanent steel magnet is struck with a hammer and caused to vibrate it will be injured magnetically and that if the treatment is kept up for a sufficient length of time it will be entirely demagnetized. Again, electric currents in iron and steel are always accompanied by magnetic phenomena, and our whole system of electro-mechanical operations is dependent upon magnetic action. According to the theory of corrosion under consideration, the cause lies in the formation of exceedingly weak electric currents. Now if, by the vibration to which the rails are subjected, the magnetization of their areas may be prevented, is it not reasonable to assume that this resistance to such magnetization which is set up will continue its influence and tend to check or even prevent the formation of the electric current itself, which is the supposed cause of the corrosion and, the cause being removed, the corrosion does not occur.

Non-homogeneity or the presence of impurities, of course, increases the tendency to generate electric curents, and the effect depends, apparently, upon the polarity of the impurity. The nature and the amount, of course, have a marked influence, and this, in turn, depends upon the condition of the mixture. The non-metals, except sulphur, seem to protect; while, in the case of metallic impurities, those which are more corrodible than iron will act unfavorably, while others, which are not so sensitive, will protect the iron with which they are alloyed. Here we have a striking example of the generation of a current between dissimilar metals in contact, which has received its most notable illustration in the thermo-electric pile.

So while no one has yet proven the electrolytic theory of corrosion to be true beyond all dispute, and it is not probable that for a long time it will be so proven, nor are we in any position to claim that it is the only true explanation, data is being accumulated to such an extent that it stands to-day as probably the most plausible explanation that we have and, as such, can be accepted tentatively until something else presents itself that can marshal an equal array of facts to prove the soundness of the hypothesis on which it rests.

NEW BOOKS.

The Corrosion of Iron and Steel. By Alfred Sang. McGraw-Hill Book Co., New York. 141 pages; 7½ in. x 5 in.; cloth. Price, $1.00.

The book opens with a plain statement of the composition of rust and the phenomena that accompany its formation. It then takes up the three main theories in explanation of that formation. The carbonic acid theory is stated fully and concisely, and the arguments in its favor are given in a manner to convey the idea that it cannot be discarded without better reasons being brought up against it than have yet appeared. The peroxide of hydrogen theory is dismissed after a short description. Then follows the real gist of the book, which is an elaborate discussion and exposition of the electrolytic theory. Chapter follows chapter showing how the phenomena of corrosion as manifested in the air, in water, in acid and under all conceivable conditions point to this theory as the most plausible explanation. This theory is treated more at length editorially in this issue. At the end of the book there are three sections that add greatly to its value. One is a list of references or authorities for the statements made in the text; the second is a valuable bibliography, and the third is a very complete index of contents. To those interested in the study of rust and rust prevention, the book cannot fail to be of great assistance, inasmuch as it is a brief but thorough digest of observation and existing data on the subject.

Contributed Papers.

WESTERN PACIFIC YARDS AND TERMINALS.

BY GUSTAVE E. LEMMERICH,
Formerly Engineer of Shops and Yards, Western Pacific.

In designing the yards and terminals for the Western Pacific a traffic tonnage statement was prepared as a basis, and in this work the available local statistics and annual reports of the Southern Pacific were freely used. From this



Fig. 1—Water Station.

study of traffic, together with estimates of probable annual increases in the territory to be served, the tonnage was classified under three heads:

1st. Tonnage in competition with the Southern Pacific and the Santa Fe.

2d. Non-competitive tonnage, or that strictly within the territory controlled by the Western Pacific.

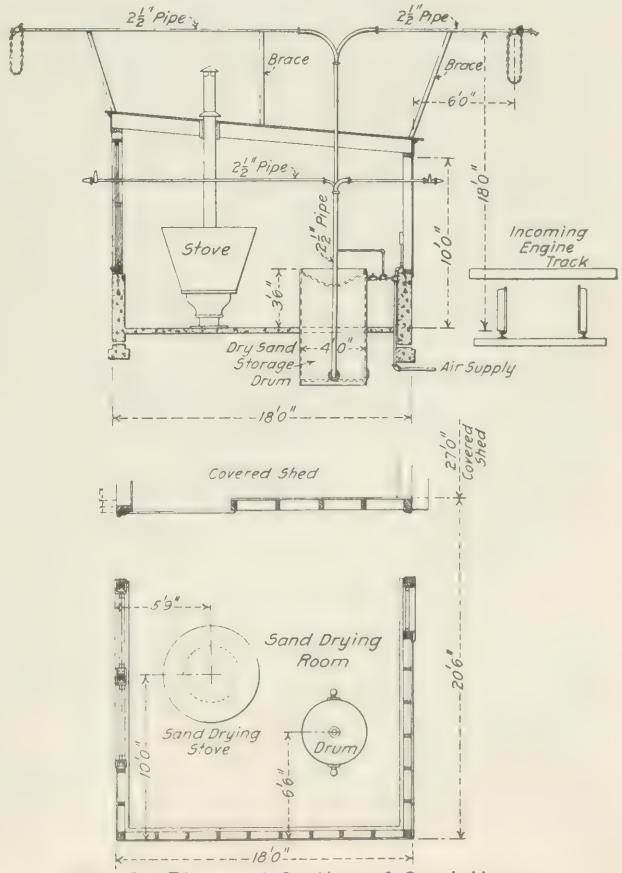


Fig. 2—Plan and Section of Sand House.

3d. Railway company freight.

Diagrams were prepared of the east and west bound movements showing probable amount of each class of tonnage and possible train movements in each division; these studies and diagrams, however, being matters the company does not make public.

For the general handling of operation and selection of economical operating divisions, computations of train mile costs were prepared, using as a basis the figures of Mr.



Fig. 3—Mill and Freight Car Shed at Oakland.

Berry for the average cost per train mile on the Union Pacific for 1902, as follows:

Maintenance of way and structures		$0.23
Maintenance of equipment		.25
Conducting transportation:		
Fuel	$0.13	
Balance	.45	
		.58
Taxes and general expenses		.11
Total		$1.17

The foregoing figures were adopted with the exception of fuel, this item being governed by: (a) delivery cost at respective division terminals, (b) ruling grades, (c) tonnage, and (d) type of engine. The fuel is coal between Salt Lake City and Winnemucca and oil from Winnemucca west.

A low contract for oil at 55 cents per barrel, delivered at Stockton, Cal., was in force at the time the calculations were made; 162 gallons of oil, weighing approximately two-thirds of a ton, being equivalent to one ton of coal. The freight to Oroville on a comparatively level grade was figured at 0.40 cents per ton mile for loaded oil cars and at 0.25 cents for empty returns. This made the cost of oil fuel per ton at Oroville, the division point, $2.75, as per following items:

Cost of oil	$2.12
Freight	.50
Miscellaneous	.13
Total	$2.75

The additional haul to the intermediate fuel stations on the 1 per cent. grade increased the cost per ton to $2.99



Fig. 5—Front View of Roundhouse at Oakland.

and $3.49, respectively. Freight is handled by a consolidation engine, 2-8-0, with 22-in. cylinder, 30-in. stroke, with driving wheels 57 in. diameter. Steam pressure, 200 lbs.; weight on drivers, 185,000 lbs.; weight of engine, 207,000 lbs.; weight of tender, loaded, 160,000 lbs.; total weight of engine, with tender, 367,000 lbs.

The division from Oroville to Portola has 20 miles of 0.4

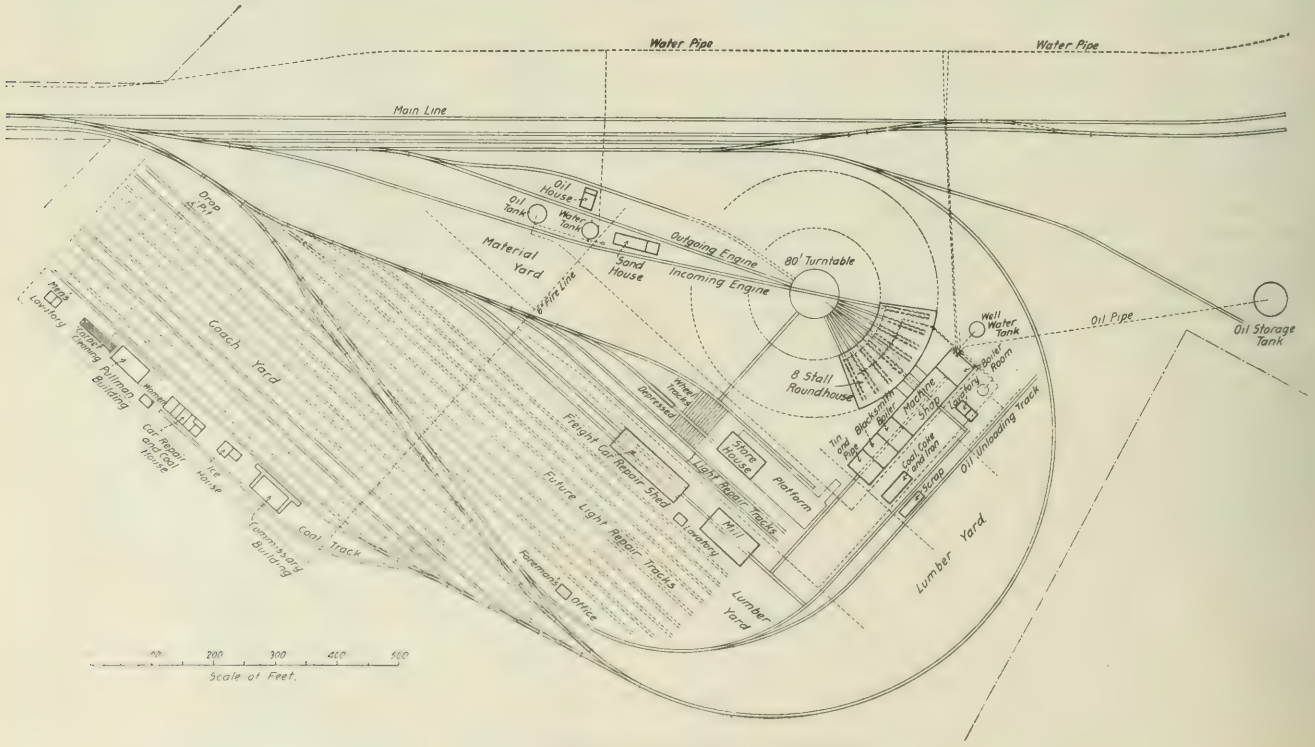


Fig. 4—Engine Terminal at Oakland.

per cent. and 100 miles of 1 per cent. grade, and for this division the following fuel costs were obtained:

1. For a train of 1,000 tons, exclusive of engine:

Movement at 21 miles per hour, 0.4 per cent grade	$0.31
Movement at 14 miles per hour, 1 per cent. grade	1.00

2. For a train of 1,500 tons, exclusive of engines, with helper service:

Movement at 18 miles per hour, 0.4 per cent. grade	$0.58
Movement at 15 miles per hour, 1 per cent. grade	.87
Helper engines on 1 per cent. grade	.87

Using the local fuel costs in the statistics of Mr. Berry, in



Fig. 6—Rear View of Roundhouse at Oakland.

place of his fuel costs, the costs per train mile were found to be as follows:

3. Train of 1,000 tons, exclusive of engine, on the 0.4 per cent. grade:

Berry's figures, exclusive of fuel	$1.04
Fuel	.31
Add for local conditions	.10
Total	$1.45
On the 1 per cent. grade	$1.04
Fuel	1.00
Add for local conditions	.21
Total	$2.25

4. Train of 1,500 tons exclusive of engines:

On the 0.4 per cent grade	$1.04
Fuel	.58
Add for local conditions	.13
Total	$1.75
On the 1 per cent. grade	$1.04
Fuel	.87
Add for local conditions	.27
Total	$2.18
Helper engines—Berry's cost, exclusive of fuel	$0.30
Fuel	.87
Add for local conditions	.03
Total	$1.20

Helper engines return light at 36 cts. per mile.

The computations based on assumed traffic for the Oroville-Portola division showed that a single train of about 30 cars will be more economical to handle than one of 40 to 45 cars with helper service, the efficiency of the two engines coupled being only about 85 per cent. An engine of the Mallet type is suggested as best for this division owing to the presence of reverse curves and numerous short tangents, with a train of about 40 cars, as being most economical and efficient.

For the first division point west of Salt Lake City, Wendover was selected, making this division 120 miles long. Water had to be carried to Wendover, a long distance and at a great expense, the place being on the edge of Great Salt Lake and having no water. It is also at the foot of a 1 per cent. grade of 33 miles. Shafter, at a distance of 160 miles from Great Salt Lake City, was considered also. It has a good water supply and the surroundings are good, so it was superior to Wendover as a living point. It is also well situated as a traffic point, the Nevada Northern having good prospects for a large tonnage both ways and a good future for extensions, probably to southern California. In selecting Shafter for the division point, tonnage would be sacrificed for speed to avoid large overtime charges and the 100 miles of nearly level track would not be utilized for tonnage. It was estimated that an annual saving of practically $100,000, basing the estimates on only a fair tonnage, would be saved by selecting Wendover rather than Shafter for a division point.

The general plans contemplate lap sidings as the preferable type, but for present needs only one siding was put in. Up grade trains are given the preference wherever practicable in the 1 per cent. grade. At some stations a short track was provided for placing bad order cars, etc.

In Fig. 1 a water station is shown. Water columns are used in preference to tanks placed at the track, the latter obstructing the view to the depot and increasing the cost of track maintenance at the tank. The water columns were placed at least 100 ft. from clearance point, that the siding may not be blocked. They are located for one stop at the depot and for taking water at the same time. On 1 per cent. grades water stations were placed, when practicable, at liberal distances apart to avoid bunching traffic at these stations.

The general layout for division terminals is the same, but a standard arrangement could not be strictly adhered to, for local conditions varied. Each point was made the subject of a special study and as some are in mountainous country the influence of topography is noticeable. At Oroville the old gold workings governed the layout and at Portola the mountains and the river were considerable factors. Winnemucca, Nev., is the dividing terminal between the oil burning and coal burning locomotives. This terminal is shown in Fig. 12, and the river influenced the location. A unique engine terminal is that at Oakland, Cal., shown in Fig. 4, with the balloon track for turning overland trains. The terminal property had its limits for development and is also located between two grade crossings with the Southern Pacific. The crossing nearest the mole had originally 13 tracks, later reduced to 5, and this crossing made necessary a stub track switch for the light repair yard. The suitability of this site for a location,



Fig. 7—Interior of Roundhouse.

in the future, of a marine repair yard was considered in the layout. It was also assumed that the engine terminal buildings at this point may be only temporary.

The engine terminals are in general of a standard design; all tracks leading to the turntable lining up with tracks in the roundhouse. The turntable is 80 ft. in diameter, operated by a Tatlow motor. Terminal coaling stations consist of an incline with coal trestle for storage and four 15-ton capacity Williams-White movable coal pockets. A locomotive crane is used to fill the coal pockets and chutes deliver the coal to the locomotives. This arrangement provides large coal storage at low cost and is economical for comparatively small terminals. A locomotive crane is assigned to each terminal to handle the coal and is useful for handling other material. An ashpit of the Erie type was selected in order to keep the locomotive crane busy.

The buildings are of uniform design, as shown in Figs. 3, 5, 6 and 7. Heavy timber construction, practically of mill type, was used throughout with the walls up to the window sills built of concrete, except at Oakland. The rear walls of all roundhouses have a wooden panel back of each pit, for about 15 ft., instead of concrete, so that runaway engines may cause a minimum amount of damage.

All the buildings were built by the company forces under

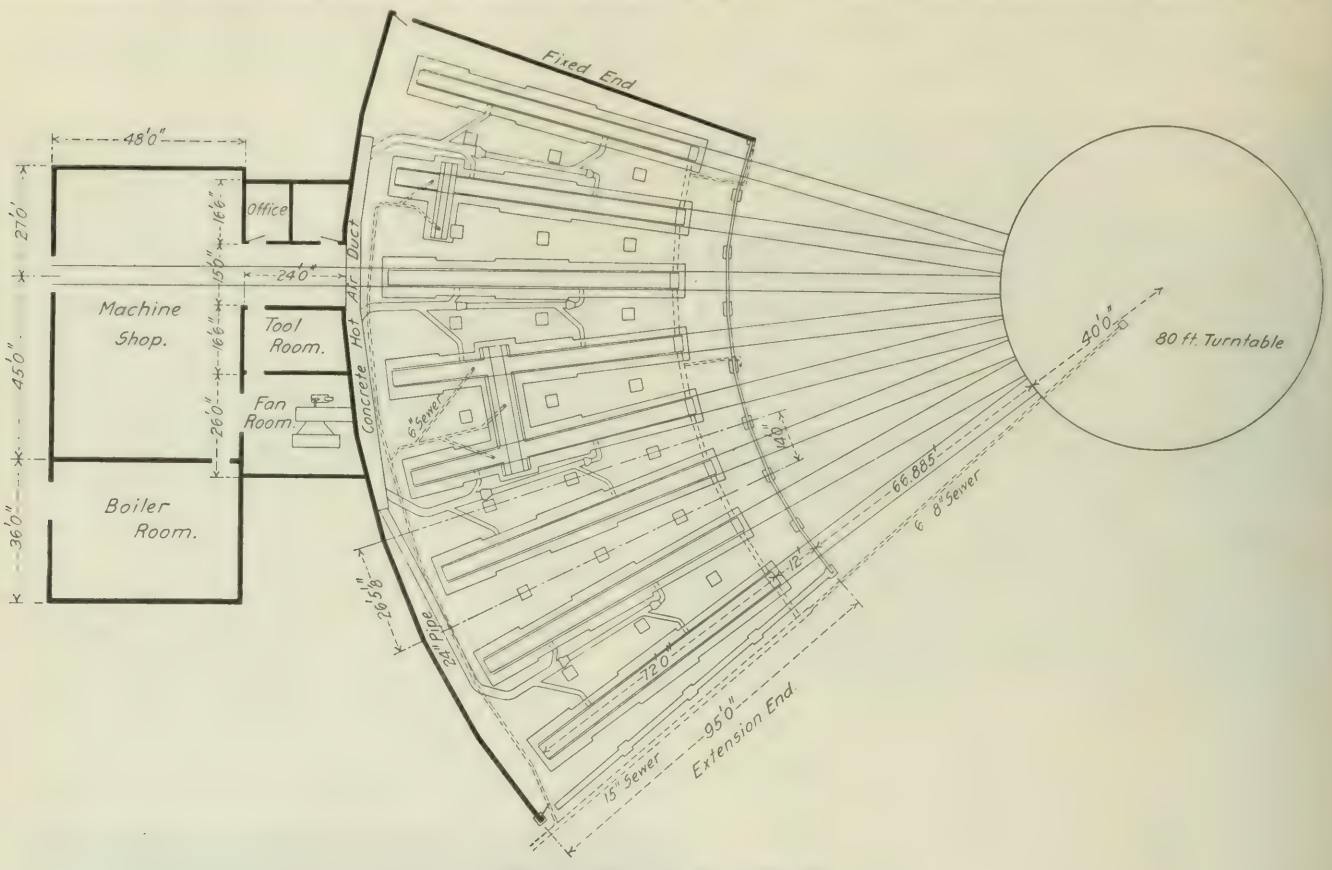


Fig. 8—Plan of Roundhouse.

Single truck pits and double wheel drop pits.

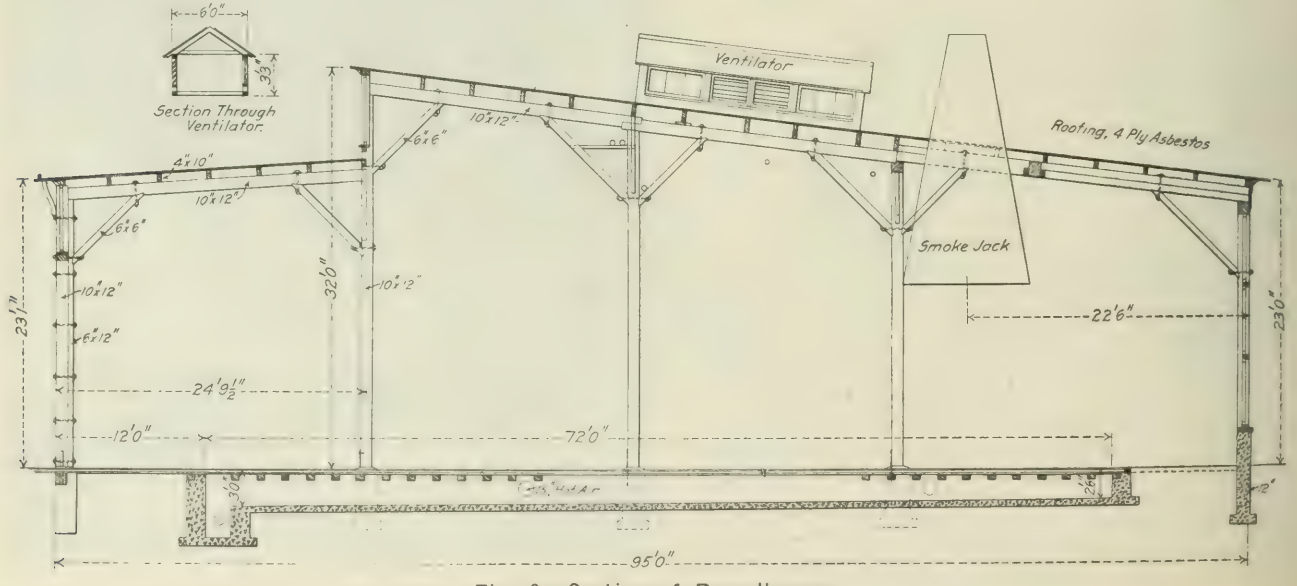


Fig. 9—Section of Roundhouse.

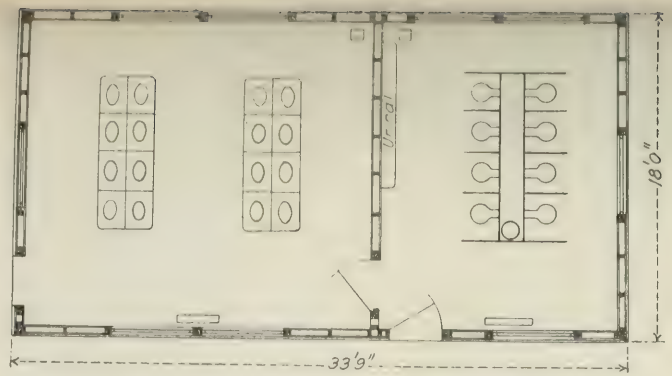


Fig. 10—Plan of Lavatory Building.

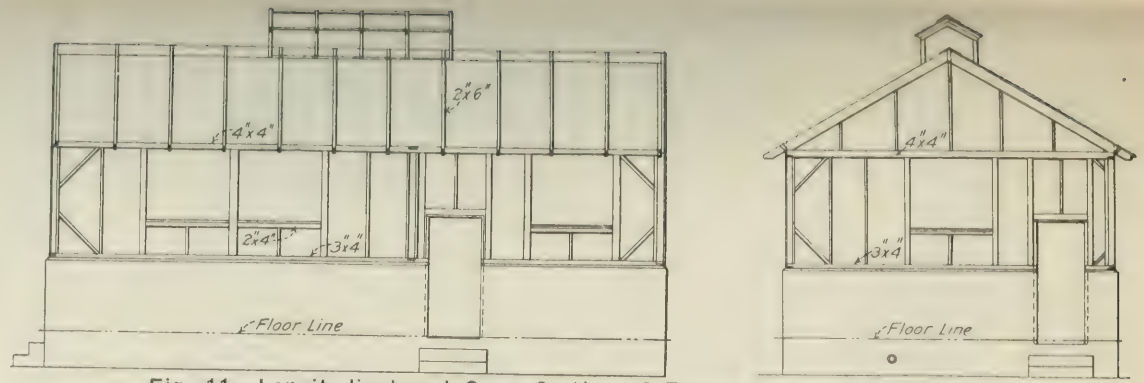


Fig. 11—Longitudinal and Cross Section of Frame; Lavatory Building.

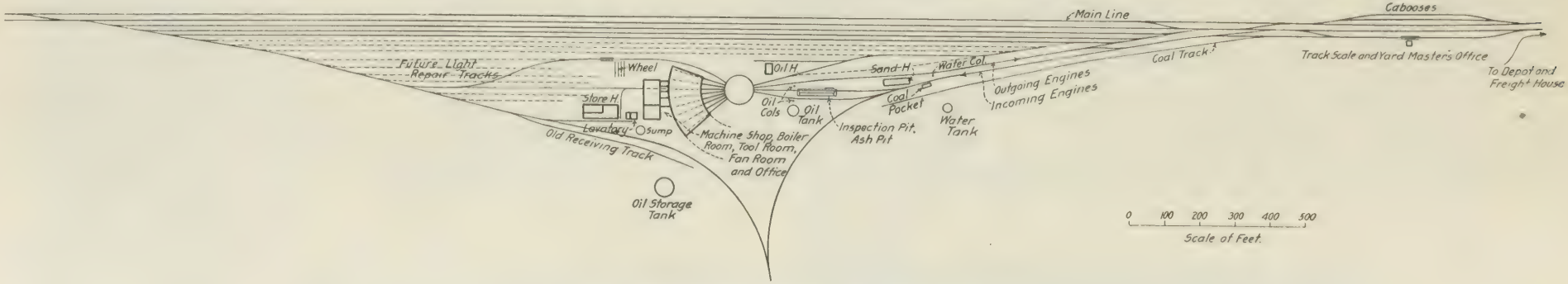


Fig. 12—Division Terminal at Winnemucca.

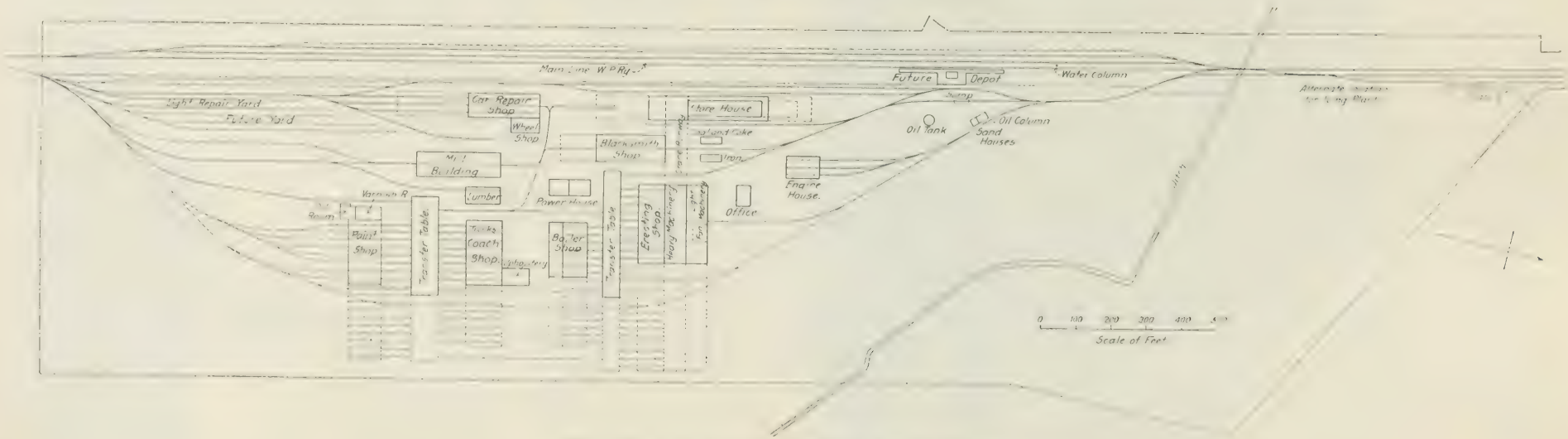


Fig. 13—General Layout of Sacramento Shops.

the supervision of the division engineers. They are well lighted and, for the purposes for which they are intended, are low cost structures. To save freight and permit of easy framing most of the lumber was surfaced on four sides. The roof boards were 2 in. x 8 in., dressed and matched, the

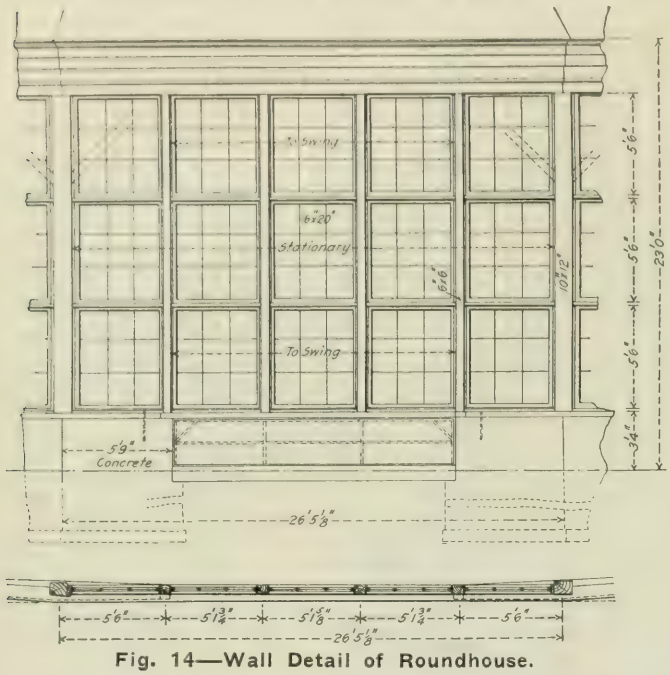


Fig. 14—Wall Detail of Roundhouse.

purlin spacing being arranged to provide for the use of boards of standard length, thus reducing waste and economizing on labor. All exposed interior woodwork, except millwork, above a certain height was painted with Asbestine water paint ap-

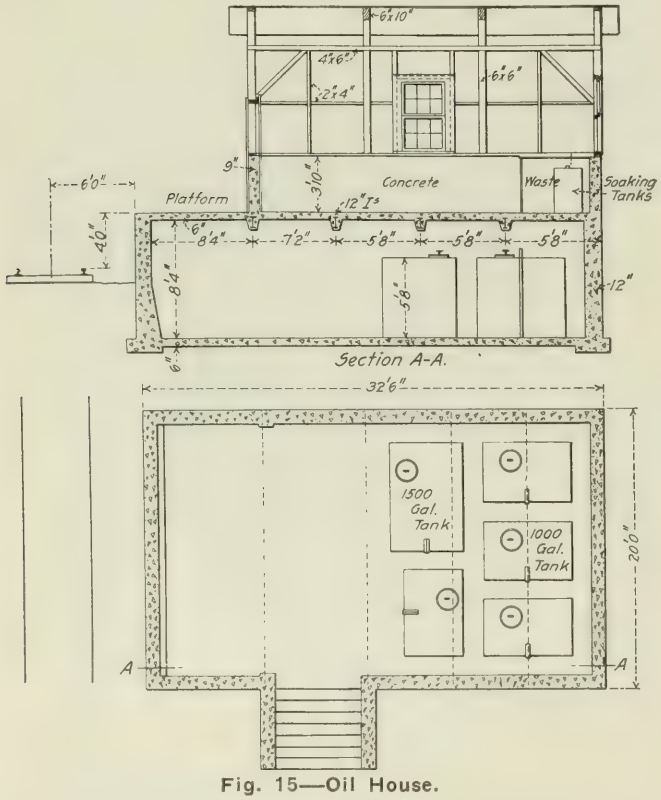


Fig. 15—Oil House.

plied with a brush and thus made practically fire-proof. Plain sash were used for the windows, doing away with box frames, fillers, trim and sash weights. Six and nine lights of 16-in. x 20-in. panes of double strength glass were used. The window sashes were arranged in multiples, stationary and swung and set between heavy studding. The swing sashes are group operated by Drouvé sash operating device.

The roundhouse, Figs. 8, 9 and 14, is 95 ft. deep. A section similar to that used by the Chicago & North Western Railway was used, owing to the fact that there is no snow in California, except in the Sierras; very little snow in Nevada, and the rainy season is short. The Western Pacific roundhouse however, is considerably higher and has good light and ventilation. The pits, smoke jacks and ventilators are similar to the Erie, 1905, roundhouse, described in the *Railroad Gazette*, June 15, 1906. The roundhouse floors are of gravel either oiled or grouted with cement mortar. Except in the warm region of California the houses are heated by the Sturtevant fan system with underground conduits and pipes.

A covered passageway connects the machine shop to the roundhouse, the offices being on one side and tool room on the other side. The fan room is back of the tool room, the arrangement being shown in Fig. 8. The machine shops at present have only a few tools for the running repairs. Only one boiler is at present installed in each boiler room, but room is provided for two boilers. All the pumps, including the fire pump, are placed in the boiler room. The Bowser oil system was adopted and the oil houses designed accordingly. A typical oil house is shown in plan and cross-section in Fig. 15, the excavation being extended under the platform to provide future increased storage. All floors and the walls up to the window sills are of concrete, the remainder of the structure being of wood. The store house is small but well lighted. The lavatory building, equipped with modern sanitary shop plumbing, is shown in Figs. 10 and 11. The sand house, Fig. 2, has air equipment for delivery of sand, and in general is similar to such buildings at small terminals. All terminals are provided with fire protection apparatus.

The main shops have not yet been built, but a study for the general layout is shown in Fig. 13. The main feature in this is the crane runway in the heavy machine section of the locomotive shop. This runway is extended both ways outside of the building and connects the store house, blacksmith shop and material yard with the main shop. If some other shape of property could have been obtained, this crane runway feature would have been used still more in the layout.

All designs and plans, etc., were submitted to V. G. Bogue, vice-president and chief engineer, for his approval.

MALLET LOCOMOTIVES FOR THE SOUTHERN PACIFIC.

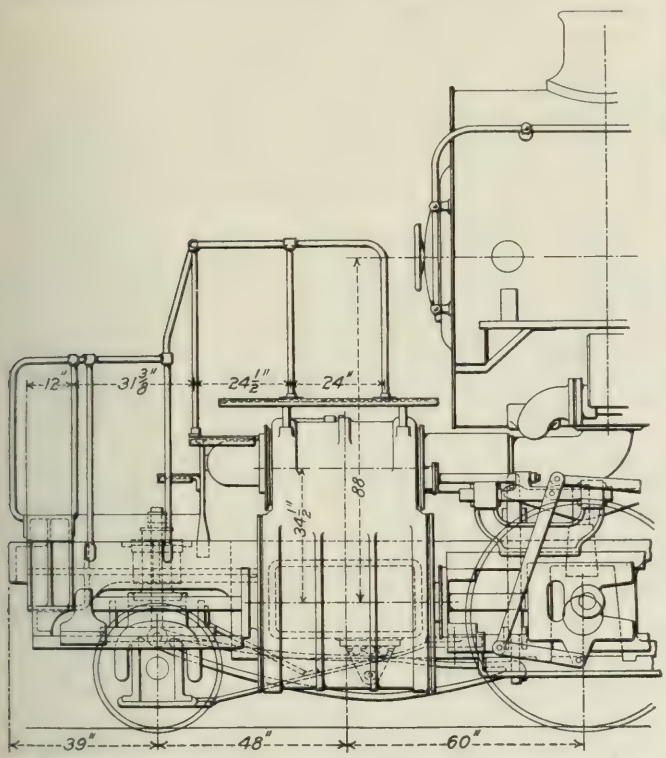
The Baldwin Locomotive Works recently completed 21 consolidation Mallet locomotives for the Harriman Lines. These are part of an order for 105 engines placed in the spring of 1909. The heavy Mallet engines have been assigned as follows: Three coal burners for the Union Pacific, three for the Oregon Railroad & Navigation Co., and 15 oil burners for the Southern Pacific. Apart from modifications necessary because of the change of fuel, the six coal burners are practically duplicates of Southern Pacific locomotives Nos. 4000 and 4001, which were built by the Baldwin Locomotive Works early in 1909, and illustrated in the *Railroad Age Gazette* of April 30, 1909. Experience gained in operating these engines through tunnels and snow-sheds has proved the desirability of placing the engine crew where a better view of the track can be obtained. Accordingly, the new Southern Pacific locomotves are designed to run with the fire-box end first, and the tender back of the smoke box. With a coal burning locomotive such a plan would, of course, be impracticable, but no difficulty need be anticipated when using oil as fuel.

In the new design the cab is entered through side doorways, reached by suitable ladders. An unobstructed view of the track is obtained through the front windows. The cab fittings are conveniently located within easy reach of the engineman, who occupies the right-hand side when looking ahead. The Ragonnet power gear is employed, and its cylinder is located as on the previous locomotives. It has, therefore, been necessary to run a shaft across the boiler back-head in order to

make connection with the operating lever. This arrangement, however, in no way interferes with the convenience of the cab fittings.

The main frames are securely braced under the cab by a steel casting, to which the bumper is bolted. The latter supports a stub pilot. The bumper is placed well forward to protect the occupants of the cab from buffing and collision shocks.

The deck-plate at the smoke-box end of the locomotive is of cast steel, and is provided with a chafing block and a suitable



Arrangement Between Engine and Tender; Southern Pacific Mallet.

pocket for the tender draw-bar. The tender is of the Harriman Lines standard design with rectangular tank, as equipped for oil-burning locomotives.

As far as the boiler, cylinders, machinery and running gear of this locomotive are concerned the design is the same as that of Southern Pacific engine No. 4000. The latter engine has now been in service a sufficient length of time to demonstrate its value; and the fact that 21 additional locomotives of the same type have been built for the Harriman Lines shows that the performance of these great engines has been fully up to expectations.

The following are those of the principal dimensions of these engines which differ from the engines described in the *Railroad Age Gazette* of April 30, 1909:

Weight on drivers	394,700 lbs.
" " front truck	22,100 "
" " rear truck	20,200 "
Weight, total engine	437,000 lbs.
" engine and tender	610,000 "
Tank capacity fuel	3,150 gals.
Tractive effort	89,425 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.41$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 4.88$$



Front End of Southern Pacific Mallet.

$$\frac{\text{Tractive effort} \times \text{diameter drivers}}{\text{Total heating surface}} = 797$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 61.58$$

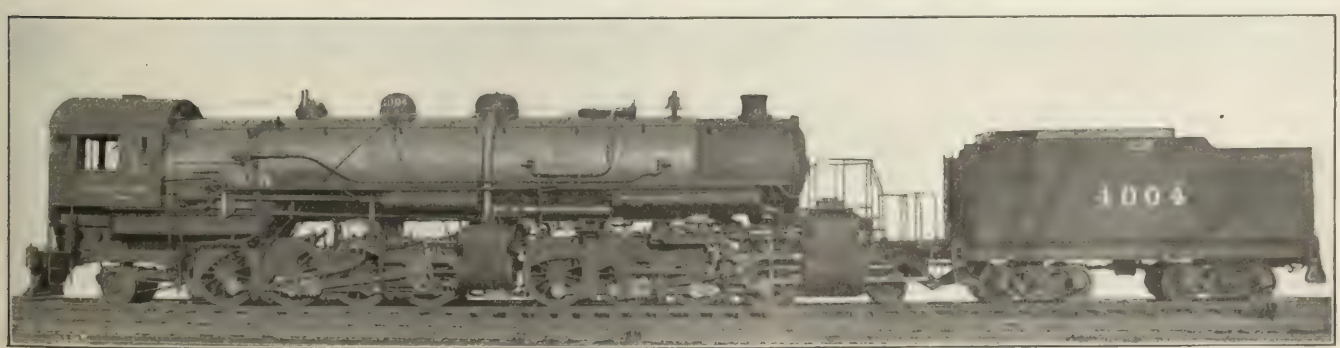
$$\frac{\text{Total weight}}{\text{Total heating surface}} = 68.35$$

STRESSES DEVELOPED BY COLLISIONS OF FREIGHT CARS.*

BY COL. B. W. DUNN.

It is comparatively easy to deal with static stresses and to provide adequate resistance for them. We can duplicate them and keep them in action and under observation as long as may be necessary to check the accuracy of our conclusions. This is not true of stresses due to impact. Their duration is too short to permit measuring their varying intensities by static testing machines. The fundamental relations between velocity,

*From a paper read before the New York Railroad Club.

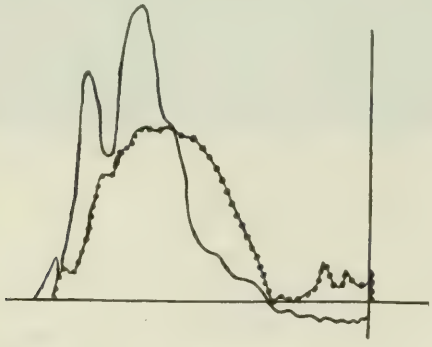


Mallet Locomotive; Southern Pacific.

momentum, path, intensity and work, are simple and well established, but it is difficult to secure an accurate time record of the path traversed by a moving body under the retarding or accelerating action of an unknown force. Without this record we cannot measure the varying intensity of the force, and without this intensity we cannot provide intelligently and accurately the resistances needed to protect our material from injury.

We do know from observation, that the destructive effects of car collisions increase very rapidly with speed and that the rules for coupling cars have been framed with a view to keeping this speed down to the lowest practicable limit. We also know that our train crews exceed more frequently than they observe the limit generally prescribed, of two miles per hour; that if they did observe strictly this limit, their work would be delayed in classification yards; that the automatic couplers and the "humps" are modern necessities and furnish an apparently unavoidable combination, tending, in a busy yard, to cause violations of the coupling speed rule.

Many yardmasters are prone to consider as permissible any coupling speed that does not cause a visible injury to the car, and the modern car will stand impacts that wrecked older models. Freight claim agents and auditors know that while the car has been strengthened, little has been done to protect its lading against these increasingly severe coupling shocks. Unless packages are ruptured and their contents visibly leaking or escaping, the sealed cars will go on to their destination



Enlarged Superimposed Gage Record.

Test No. 301. *Cards No.* 10. *Both Cards taken at same time. Springs, 80 lbs. per sq. in. Velocity, 5.1 m. p. h.*

and no subsequent tracer of the car's movement has yet been able to develop an acknowledgment of "rough treatment."

Leakage of an inflammable or explosive substance from its shipping container is a preliminary and a long step toward fire or explosion; and it has been the aim of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles to discover the real causes of the disasters it seeks to prevent. This policy led the chief inspector more than two years since to ask the assistance of the Pennsylvania Railroad in an experimental investigation of the probable effect of coupling shocks on packages of explosives in cars. Before describing and commenting on this investigation, it will be interesting to discuss car impacts briefly from a theoretical standpoint to refresh our minds on the fundamental principles involved.

To change the velocity of a body we must apply a force and the product of this force by the path over which it operates gives us the work accomplished. If the force is variable we must obtain this product by integration. When two modern cars collide, the variable resistance of the friction draft gear is first brought into play. The total path for the two gears in contact is about 4.8 ins. If this gear acts in service, and under shock, exactly as it does under laboratory testing conditions the diagram published in the pamphlets describing these gears will tell us the total force exerted on each car at each point in this path. The area under the curve, limited by any two values of the force, is the integral that represents the work accomplished.

An algebraic expression for this work, W, is

$$W = \frac{w\,(V^2 - v^2)}{2\,g}$$ in which

w is the weight of the car, g the acceleration due to gravity, V and v the velocities of the car corresponding to the two points considered. Assuming a solid bumping block to which a draft gear is attached, the total work corresponding to complete compression of the gears under laboratory conditions is about 36,000 ft. lbs. If the work is just able to stop a car weighing 150,000 lbs., we find by solution of (1) for V, ($v = o$), $V = 3.93$ ft. per second $= 2.68$ miles per hour. It appears therefore, that our rule limiting the coupling speed to two miles per hour does not provide any excessive factor of safety.

When our assumed car has more energy than can be absorbed by the friction draft gear, the excess must be dissipated by elastic or permanent deformation of the car itself. The path available for elastic movement is very limited, and the force must be correspondingly high to absorb an appreciable amount of energy. If our assumed car has, for example, a speed of 5 miles per hour, it will still be moving at a speed of 2.88 miles per hour, or 4.23 ft. per second, and its kinetic energy will be 90,300 ft. lbs., when the friction draft gears are solid. Even if we could assume a harmless elastic compression of the car frame of 1 in., the average force required to absorb this energy over this path would be 1,083,600 lbs., or about 7.2 lbs. per lb. of weight of car and lading. The maximum force would be about twice the average, or 14.4 lbs. per lb. of weight. If the elastic compression should be limited to ½ in., instead of 1 in., these values would be doubled.

Any movement of the lading permitted along the floor of the car would tend to prevent the application of these high pressures to the lading, but cases may well occur in which the advantage of this movement is apparent only. A 1,000-lb. package, for example, rigidly attached to the car, moving at a speed of 5 miles per hour, would receive a maximum pressure of, say, $1000 \times 14.4 = 14{,}400$ lbs. If it is free to slide along the floor, the force of friction (assuming co-efficient of friction $= 0.4$) would be about 400 lbs. and the energy of the package would be absorbed by a sliding of 2.1 ft. So far, the advantage of permitting it to slide is pronounced, the maximum force being reduced from 14,400 lbs. to 400 lbs. Suppose, however, that after sliding 1 ft. it comes into contact with a solid part of the car and that while the package is sliding this distance of 1 ft. the car has moved over its permitted path of 4.8 ins., and has not only been brought to rest but has acquired some velocity of rebound. The package, with a remaining relative velocity of at least 5.31 ft. per second, will then collide with a solid obstruction in the car. It will receive a maximum pressure per lb. of its weight much greater, probably, than it would have received if it had been rigidly attached to the car and the chances in favor of crushing it will be correspondingly increased.

The necessity for a thorough investigation of car impact stresses is apparent. The ordinary slidometer results are misleading for the reason that the sliding mass in the testing instrument is not restricted to the path of the car. The energy of this sliding mass at the instant of impact can be obtained from the slidometer record together with the maximum force (compression of slidometer spring) required to stop it. The maximum force applied to the car, and to its rigidly attached lading, especially after solidification of friction draft gears, is not measured; and this, unfortunately, is the force that is responsible for the damage we would like to avoid.

DYNAMIC MEASURES OF IMPACT STRESSES.

An accurate time-space record of the motion of the car after impact would enable us to calculate the force developed at any instant. This record can be obtained best by the trace

of a tuning fork. The fork could be attached to the car and made to trace its record on a stationary surface, or the surface could be attached to the car while the fork is stationary. Another method, and probably the most convenient one, would be to mount both the surface and the fork in the car, one rigidly attached to the car and the other free to continue its unretarded motion for a sufficient distance. The maximum of accuracy in tests of this nature results from the use of photography to record the trace of a fork of high frequency on the sensitized surface of a cylinder revolving uniformly and independently.

Assuming that an accurate time-space record for the car has been obtained, it will furnish, or enable us to construct to a suitable scale, a curve, whose ordinates represent compressions of the draft gear, or motion of the car after impact, and whose abscissas represent time of duration of this motion. The successive differences of ordinates separated by small and equal intervals of time, divided by the time interval, give us the successive velocities of the car and enable us to construct a second curve to show this velocity as a function of time. The first differences of ordinates of the velocity curve divided by the uniform time interval give us the successive decelerations of the car, and the product of these by the mass of the car and its lading give us the force exerted at any instant to stop the car. The method described amounts to a graphical differentiation of the time-space curve and is necessary, since the equation of this curve is not known.

TESTS AT ALTOONA.

To have investigated this problem by the scientifically accurate method described above would have cost more than was thought advisable for a preliminary investigation. The officials of the Pennsylvania Railroad very kindly offered to assist the Bureau of Explosives with any testing facilities available at Altoona and to construct any simple apparatus that could be devised for the purpose. Under the supervision of E. D. Nelson, engineer of tests, A. H. Elliott was placed in direct charge and these gentlemen consulted the writer from time to time.

Apparatus No. 1.—A strong cylinder, 14¾ in. long inside, and 14 in. inside diameter, was bolted securely to the steel underframe of Pennsylvania Railroad box car 18,079, whose weight empty was 45,300 lbs. One end of the horizontal cylinder was closed by a steel diaphragm 0.03 thick and through the rigid end a hole was threaded so that a plug could be inserted with a water tight joint to vary the interior volume of the cylinder. A steam indicator gage with a carefully calibrated spring was connected at the top and the cylinder filled with water. By forcing in the screw plug water was displaced and a slight outward deflection of the diaphragm produced. A solid metal cylinder 5 in. in diameter and weighing 100 lbs. was suspended by chains from the ridge pole of the car and its face adjusted to bear lightly against the center of the diaphragm. On impact, this weight was retarded by pressure from the confined liquid and the gage was relied on to register this pressure. The mass producing the pressure was the 100 lb. weight plus the small weight of a column of water of diameter equal to the gage piston and of length equal to the distance from the diaphragm to the piston. To calibrate this apparatus, the cylinder was mounted vertically and the gage readings noted for various weights resting on the diaphragm. The calibration curve was found to be a right line.

The essential point in any such apparatus is to restrict the test weight as rigidly as possible to the path of the car during the work of absorbing their respective energies. In theory, the only increase in path for the weight in this case was that due to the slight escape of water from the cylinder, to follow the movement of the gage piston, and this corresponded to only about one thousandth of an inch inward deflection of the diaphragm. Means were provided to rotate the gage cylinder to make the record of pressure a curve, but the amount of this rotation did not represent the path of the car after impact. It did furnish the basis for a rough measure of the duration of impact, since the rotation was due to the otherwise free motion of a pendulum weight having the velocity of the car at impact. When the impact speed was about five miles per hour the maximum pressure due to impact was produced in less than one hundredth of a second.

Apparatus No. 2.—A strong 3-in. pipe about 30 ft. long, completely filled with water after excluding all air, was bolted securely to the steel underframe of the car with an indicator gage attached to the impact end. The testing mass in this case was that of a column of water with inside length of pipe to gage connection and diameter of the gage piston, weight about 6¾ lbs. Its increase of path over that of the car was due solely to the change in length of the 3-in. column of water corresponding to the small movement of the piston.

Apparatus No. 3.—A small metal cylinder weighing 6¾ lbs., the weight of the active column of water in the second apparatus, was flexibly mounted in a horizontal position with one face in light contact with a steam indicator gage piston. This amounted, practically, to the ordinary slidometer arrangement and was subject to the objection that the testing weight still had only a partially compressed spring opposing its motion when the friction draft gears were solid. For this reason we should expect its recorded maximum pressures to be less than those given by the hydraulic apparatus and the difference to increase with the speed at impact.

The speeds at impact were obtained by allowing the test car to run down a grade under gravity and they were measured in miles per hour by a reliable electrical apparatus constructed for the purpose. For tests with apparatus No. 1, the moving car was allowed to collide with a draft of from seven to 11 empty steel cars with their hand and air brakes set. For tests with the other forms of apparatus, from four to six loaded cars were used. These cars weighed 39,100 lbs. empty, and about 150,000 lbs. each when loaded with coal.

It is unfortunate that accurate observations were not made on the movements of these cars and of their draft gears as a result of the impacts. If further tests are made, and it is important that they should be made, a solid bumping block should be used first that would restrict the path positively to compression of one pair of gears, and the effect of passing from this to various service conditions should then be determined. The substitution of a draft of loaded for a draft of empty cars increased very materially the severity of the conditions in these tests.

RESULTS OF TESTS.

The first important fact noted was that the gage records showed several alternations of pressure due apparently to wave motions in the liquid. The first pronounced maximum in the curve was accepted as the maximum pressure, although in some cases subsequent registrations were higher. Efforts were made to remove, or reduce, these alternations of pressure by using Apparatus No. 1 without the suspended 100-lb. weight and depending entirely on the mass of the liquid to affect the gage. The flexible diaphragm was also replaced by a solid head for the cylinder and, in another plan, cotton waste was packed into the cylinder with the water for the same purpose. The gage continued to show alternations of pressure, and it is now thought possible that this was due to the successively developed resistances of individual cars in the draft and that accurate observations would have shown small movements of these cars.

The gage pressures recorded were divided by the weights whose decelerations caused the pressures and the results, pounds of pressure per pound of weight, were plotted as a function of the speed at impact in miles per hour. An enlarged superimposed gage record is shown in the accompanying illustration. From the average curves constructed in this way the following table was prepared. It includes data for the three forms of testing apparatus described and for Ap-

paratus No. 3 when the draft gears were blocked to prevent their normal operation in cushioning the blow.

Table of Condensed Results.

Speed of car at impact, miles per hr.	Maximum pounds of pressure per pound of weight: Draft of empty cars. Apparatus No. 1. Draft gears, normal.	Draft of loaded cars. Apparatus No. 2. Draft gears, normal.	Draft of loaded cars. Apparatus No. 3. Draft gears, normal.	Draft of loaded cars. Apparatus No. 3. Draft gears, blocked.
2	1.6	2.8	2.3	7.0
3	2.8	4.6	3.6	11.4
4	4.1	7.0	5.0	18.0
5	5.8	10.6	6.6	...
6	7.9	18.0	8.5	...

The values in the above table are approximations only, even for the apparatus designated and for the special conditions applying to each test. We know that any change in the path over which the work of stopping the car is done will affect materially the maximum pressures applied to the car and to its lading.

The weakest point, under buffing shock, of the car used in these tests is believed to be the draft stops which are riveted to the center sills with nine ⅞-in. rivets each, driven into 1⅛-in. holes. Assuming an ultimate strength of 50,000 lbs. per square inch for these rivets, the draft stop ought to give way under a pressure of about 621,000 lbs. As the car with its testing apparatus weighed about 46,000 lbs., this corresponds to a pressure of about 13.5 lbs. per pound of weight of car. In two of the tests higher pressures (18) were recorded without apparent injury to these stops, but it must be remembered that these pressures were of short duration and that elastic movements of the car body tend to reduce the total pressures on these rivets without reducing the pressure on lading rigidly attached to the floor.

It must be admitted, however, that under another general check the results in the above table seem to be too high. If the friction draft gears acted normally, the energy absorbed by one pair, 36,000 foot lbs., corresponded to a speed of 4.9 miles per hour in the test car weighing about 46,000 lbs. The highest pressure would be caused by restricting the path to the actual compression of these two gears, 4.8 in., and the mean pressure, 90,700, is given by dividing the energy by this path expressed in feet. The maximum ought not to exceed twice the mean pressure, or 181,400 lbs., which gives us 3.9 lbs. of pressure per pound of car, for a speed of practically five miles per hour, to compare with the tabular values of 5.8, 10.6 and 6.6.

The conclusion seems to be forced that the measured values are affected by a serious error from some undiscovered cause, or that friction draft gears do not act in service as they do under laboratory conditions. It is possible that light may be thrown on this point by tests that have been made and with which the writer is not familiar. It does not seem unreasonable that the friction in these gears may act differently under a blow and under a static load. The wedges may jam, and the co-efficient of friction will vary with the condition of the surfaces in sliding contact. It would be an easy matter to test these possibilities by the use of a pendulum weight to strike these gears blows of known energy and quickness, and by measuring the corresponding compressions of the gears when in service and under laboratory conditions respectively.

The above discrepancies between theory, based on static measurements, and the results obtained by this investigation under dynamic conditions, emphasize, in the writer's opinion, the necessity for a further and more complete investigation of this important question and preferably by the Master Car Builders' Association. We need, for use by railway employees and loading foremen, definite rules for calculating the strength of blocking and bracing used to protect packages of valuable, fragile or dangerous freight from injury in transit.

DISCUSSION.

The discussion on Col. Dunn's paper was rather meager, as there were but three speakers. In presenting the details of the results obtained with the apparatus on his car, Col. Dunn called attention to the vibration in the pressures as indicated by the diagram. This rose to a maximum, dropped nearly to the zero line and rose again. He attributed it to the spring action of the draw-bars of the cars that had been struck, though no measurements were taken and it was only a surmise that this occurred. In his discussion, George L. Fowler suggested that such a vibration might have been caused by air in the pipes and apparatus itself. Although pains were taken to get all of the air out of the system it might well happen that comparatively large quantities had been entrapped. The roughness of the inside surface of the 3-in. pipe used would contain innumerable pockets which could hold enough air to make a very perceptible cushion and so cause the vibration. He recommended that, if water be used, it be boiled and then carefully put in so that no air would be entrained. Better than this would be the use of a mixture of alcohol and glycerine, which he had found to be most satisfactory in his own work.

It was especially urged that the work begun by Col. Dunn be continued until definite and thoroughly reliable results had been obtained. To do this it would be well to begin at the beginning and ascertain just what the practice was as to the speeds at which cars were run together in yards; the members present were challenged to produce one bit of accurate information as to what is being done in the yards, a challenge that received no reply. From this it was urged to be useless to attempt to regulate this matter until it was known what was to be regulated. It appeared, from what was said, that these experiments on the Pennsylvania Railroad under the supervision of Col. Dunn are the only ones ever made in the field, the data from which is available, and that everything remains to be done.

LOCOMOTIVE HEADLIGHTS AND OBSERVATION OF SIGNALS.*

BY PROF. C. H. BENJAMIN,
Dean of the School of Engineering, Purdue University.

Some experiments with headlights were made under my direction during the months of October and November, 1909. The experiments were conducted at the request of W. J. Wood, chairman of the Railway Commission of Indiana.

It was proposed originally to include oil, acetylene and electric lights in the experiments, but lack of time necessitated omitting the acetylene light. The object of the tests was to determine the relative effect of oil and electric headlights upon the reading of signal lights and the identification of obstacles, and by suitable laboratory experiments to determine the causes of the differences which might be found to exist. In order to arrange a programme which would be satisfactory to all parties concerned, I called into consultation H. F. Houghton, general superintendent of the Cleveland, Cincinnati, Chicago & St. Louis; D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines; Professor Harding, of the School of Electrical Engineering at Purdue University, and Professor Endsley, of the Department of Railway Engineering. A programme was arranged by this committee which was subsequently carried out as far as time and circumstances would permit.

Mr. Houghton offered for the location of the road tests a section of the Big Four tracks near Avon, Ind., where a complete system of block signals for double tracks was available. Mr. Houghton also provided the necessary engines, headlights and other accessories for the experiment. Mr. Crawford supplied, for the accommodation of the observers, an observation car such as is used on the Pennsylvania Lines for inspection of track. This car, having an open front end and tiers of seats in amphitheater style, made it possible for each observer to obtain a clear view of the track and signals.

* Abstract of a paper read before the Western Railway Club, Chicago, April 19, 1910.

It was thought best to have a considerable number of observers to minimize the effect of individual error or personal prejudice. The list as finally agreed upon was as follows: Commissioners Wood, Dowling and McClure, Chief Inspector Shane and Consulting Engineer Garman, of the commission; Messrs. Baldwin and Young, of the Big Four; Mr. Cook, of the Pennsylvania Lines; Professors Ludy and Harding, of Purdue University, and the writer. Each observer recorded the results of his observations independently without consultation with others and the records were collected and preserved as made.

Manipulation of the signals and other objects observed was made by Mr. Rose, of the Big Four, and Professor Endsley, of the university. No observer knew the actual aspect of the signal or the nature of any obstruction. The general method adopted in all of the tests was to run the observation car back several thousand feet from the home station, when the signal was given by whistle to those manipulating the lights, obstructions, etc. The car was then run slowly forward towards the station, stopping at regular intervals for observations. The distances from the home signal were determined by numbered stakes previously located. Each observer was instructed to record what he saw or did not see, without consultation with others.

The first series of tests included experiments in reading the home signal at various distances under three sets of conditions:

(1) With opposing electric headlight;
(2) With opposing oil headlight;
(3) With no opposing headlight.

This series was carried out with an electric headlight on the observation car and repeated with an oil headlight.

When an opposing headlight was used, it was located on the adjacent track and 200 ft. in front of the home signal.

A brief study of the results shows the disconcerting effect of an opposing electric headlight. There was no general recognition of the signal until the observers were within 1,500 ft. while (with opposing oil headlight) identification was practically unanimous at the full distance of 5,000 ft.

Or, to put it another way, with an opposing electric headlight, practical unanimity was secured at 800 ft. and with an opposing oil headlight, a similar unanimity existed at 4,000 ft., or nearly four times as far.

When there was no opposing headlight the signal was recognized at 4,000 or 5,000 ft. without much difficulty.

The tests just described were repeated using an oil headlight on the observation car.

As far as the relative effects of the opposing headlights are concerned, the conclusions are the same as before. With electric headlight opposing, there was no unanimity in the reading of the signals until the observers were within 1,000 ft. With oil headlight opposing, and with no headlight opposing, there was nearly unanimous recognition at 4,000 to 5,000 ft.

In comparing this second series with that first mentioned, one important difference is noticeable, there are numerous instances of green lights being seen by observers at distances of 800 ft. and under, where no green light should have been visible. These phantom lights must have been due in most cases to light reflected from the lens of an unlighted lamp behind a green roundel, passing through the roundel and thus becoming green. A direct reflection from a roundel will be white or yellowish and not affected by the color of the roundel. This has been proved by experiment.

In the first test with electric headlight the upper right hand signal had a green roundel with an unlighted lamp behind it. At 600 ft., eight observers saw a green light in this signal and at 400 ft., seven were thus deceived.

Other tests show similar false lights. The reason for the reflections being visible at this particular distance is due to the angle of reflection being right for the observer at this point. We thus have numerous examples of a light which was out showing at safety.

This effect was not noticeable when the car was equipped with an oil headlight, probably because the light was not powerful enough to cause reflections visible at this distance.

Somewhat similar to the tests which have been described were the experiments made on classification signals. The observation car was retired to a distance as before, another engine with opposing headlight was then run onto the same track near the home signal. This engine displayed classification signals unknown to the observers. The car moved slowly towards the engine and observations were made at 400, 300 and 200 ft.

A study of the results shows that when an approaching engine has an electric headlight, the green signal is invisible at 200 ft. and over, while a white signal can be seen at 800 ft. or more. The opposing oil headlight obscures the classification signals but little; both white and green signals were read correctly by all at 600 to 800 ft., while some observers saw them at double this distance.

The effect of an electric headlight on the car was to diminish the distance at which the classification signals became distinctly visible.

This is particularly noticeable when there is any rain or fog present; the electric light produces a wavering ghostly sort of radiance, which at times is confusing.

During the tests which are described in this paper, the sky was overcast and there was a slight rain in the early part of the night.

A car on siding not in the clear was not noticed by the majority, even some of the railway men failing in this regard.

Dummies on the track were hardly noticeable at distances of over 200 ft. And, finally, two coal cars squarely on the track only became noticeable at about 1,300 ft. and were not identified until the distance was reduced to about 1,000 ft.

As to my own observations, I will say that I should not have noticed them as soon as I did, but for their hiding some green signal lights further down the track, with which I was familiar.

Some weeks later, Prof. Endsley and myself rode on an engine from Indianapolis to Terre Haute and return. The engine on the westward trip was equipped with an electric headlight while on the return another engine with an oil headlight was used. Nothing particularly new was learned on this trip, but the observations confirmed the conclusions previously formed. Phantom lights, both white and green, appeared at intervals on home and distant signals during the outward trip. At one station where the lights were all out comparatively brilliant white lights were seen, first in the distant signal and later in some of the lamps of the home signal.

With the electric headlight, conspicuous objects, such as crossing guards or highway bridges, could only be seen at distances less than 1,200 or 1,500 ft. As the train had a speed of about 60 miles per hour, distances could be determined approximately by counting. The home signals could be seen at about 1,500 ft. with the electric light, but could be seen further when the oil light was used.

The presence of an opposing electric headlight obscured all signals, both block and classification. This seemed to us to constitute the strongest objection to the use of such a light.

Subsequent experiments on the electric and oil lights used in the road tests were made at Purdue University. The laboratory experiments showed the electric light used to be very weak in the red rays and strong in the green rays. This in part explains the prevalence of green reflections in dead signals and the greater obscuration of green classification signals.

Out-of-door tests showed reflections from red and green roundels, and these were much more brilliant when the roundel was in front of an unlighted signal lamp. Due to the greenish character of the electric light, it was easy to get green reflections, while no red was observed in the reflection from a red roundel.

The following conclusions are taken verbatim from my report to the railway commission:

A. That an electric headlight on the engine of a train has one marked disadvantage, namely, the causing of reflections from glass roundels and lenses, thereby producing false or phantom signals. This is not due entirely to any peculiarity of the electric light, but to its great power and intensity, as compared with ordinary signal lamps.

B. That obstructions on the track can not ordinarily be seen with an electric headlight at a sufficient distance to prevent the probability of accident.

C. That an opposing headlight adjacent to block signals so obscures them as to make it difficult to read them correctly at distances exceeding 1,000 ft.

The signal experiments were followed by some tests to determine the limits of the visibility of various obstructions on the track.

Previous to each test, the observation car was run back some 2,000 ft. and on signal some obstruction was arranged by Messrs. Rose and Endsley.

Neither the nature nor the precise location of any obstruction was known to the observers. As the car was run slowly forward, each one tried to locate and describe the obstacle. Only the electric headlight was used in these experiments.

A speeder or tricycle on track was noticed at a distance of about 700 ft., but was not fully identified until the distance was 300 ft.

D. That an opposing oil headlight allows such signals to be read correctly at distances of 4,000 ft. or less.

E. That the electric headlight on an approaching engine obscures the classification signals on that engine to a marked degree; that this is noticeably true of green signals, as these are almost entirely obliterated by the glare of the electric light.

F. That an opposing oil headlight allows either white or green signals to be read at a distance of 400 ft. or even more.

I feel justified at the present time in stating my personal opinion in this matter, with the understanding that it is only my opinion and does not in any way commit my associates.

All of the tests which I have seen tend to convince me that it is a disadvantage to the engineer and fireman of a train to have an electric headlight on his engine, since it interferes with the correct reading of signal lights; and that it is still more a disadvantage to the crew of an engine to have electric headlights on engines which they meet on parallel tracks and at stations. Furthermore, I do not consider that the greater illumination of the track ahead or of objects on the track is any compensation for the disadvantages which have been mentioned.

If it be admitted that the engineer's responsibility is chiefly to his train and to the passengers dependent on his skill and faithfulness, it is evident that whatever interferes with his correct reading of signals on track or engine is to be condemned, however much it may help to warn chance pedestrians of the approach of danger.

RAILWAYS IN ARGENTINA.

In 50 years Argentina has increased her length of railways from 23 kilometers to 25,000. The following figures, taken from the "Review of the River Plate," show the progress the country made during that period:

	Carried	
	Freight, tons.	Passengers.
1857 to 1860	22,248	520,637
1860 " 1865	140,104	2,004,752
1865 " 1870	641,990	7,159,304
1870 " 1875	1,849,730	12,037,756
1875 " 1880	3,661,317	12,369,308
1880 " 1885	7,377,171	18,614,025
1885 " 1890	20,896,262	41,455,352
1890 " 1895	31,392,114	59,449,472
1895 " 1900	50,794,332	82,725,001
1900 " 1905	77,314,504	101,852,186
1905 " 1910	145,200,000	202,400,000

TRAIN ACCIDENTS IN MARCH.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of March, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd
2.	Balt. & O. S.W.	Flora.	rc.	P. & Ft.	2	3
†3.	Illinois Cent.	Hanson.	bc.	Ft. & Ft.	3	8
*16.	N. Y. Cent.	Rochester.	rc.	P. & P.	1	3
22.	Louis. & Nash.	White Jn.	bc.	Ft. & Ft.	3	12
22.	Pennsylvania	Erie.	bc.	Ft. & Ft.	0	3

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
†1.	Pennsylvania	Rock Point.	unx.	Pass.	3	6
1.	Norf. & Westn.	Oakvale.	slide.	Ft.	1	2
†1.	Gt. Northern	Wellington.	slide.	Ft. & P.	89	15
*2.	Gt. Northern	Milan.	slide.	Pass.	2	10
*4.	Northern Pac.	Eddy, Mont.	unx.	Pass.	0	5
*5.	C., R. I. & Pac.	Smith Center.	b. rail.	Pass.	0	3
15.	N.Y., N.H. & H.	Springfield.	unx.	Pass.	0	3
†15.	M., K. & T.	Broken Arrow.	d. coupler.	Ft.	1	4
*20.	Gt. Northern	Rogers, Minn.	unx.	Pass.	1	13
20.	O. R.R. & Nav.	Pendleton.	unx.	Ft.	2	0
20.	O. R.R. & Nav.	Pendleton.	b. rail.	Ft.	0	0
21.	M.,St.P.& S.S.M.	Bismarck.	b. tire.	Pass.	0	28
†21.	Chic. Gt. Wstn.	Gladbrook.	unx.	Pass.	50	34

The accident at Wellington, Wash., March 1, when a passenger train standing at the station and a mail train standing nearby, but not occupied by passengers, were swept down the side of the mountain by an avalanche, is the worst railway disaster that has happened in this country for a number of years.* The list of casualties includes 51 passengers, 10 mail clerks, 22 trainmen and six other railway employees killed; and seven passengers, one mail clerk, six trainmen and one other railway employee injured.

These two trains had been detained at Wellington because of blockades on the line, due to heavy snow slides and to warm weather, which melted the snow on the mountainside. The accident was briefly reported in the *Railway Age Gazette* of March 4, page 459. An officer of the road writes: The slide occurred early in the morning of March 1. It was at a point where we have never had one before, and where, from the lay of the ground and conditions generally, no one ever expected such a thing. The snow on the top of the mountain was from 12 ft. to 18 ft. deep on a level, it being the heaviest snow that had ever fallen so late in the season in such a short space of time.

Prior to the storm, which began about February 20 and lasted practically ten days and nights continuously, most of the snow had melted; and then it turned cold and froze making the mountain rather slippery, and the heavy snow storm followed. In addition to this there was a heavy electrical storm, which is uncommon in the mountains. There was continuous lightning and the mountain was shaken by loud peals of thunder; and it is thought that this started the slide. There was a large number of other slides in the Cascade Mountains the same night. Some people are of the opinion that there was a slight earthquake shock which caused

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire Cars burned while running——P. or Pass., Passenger train——F. or Ft. Freight train (includes empty engines, work trains, etc.)——Asterisk Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

*The more recent railway accidents in the United States, which may be considered as of the first magnitude, are the following: Honda, Cal., May, 1907, number of persons killed, 32; Alta Vista, Kan., January, 1907, killed, 34; Terra Cotta, D. C., December, 1906, killed, 43; Woodville, Ind., November, 1906, killed, 48; Atlantic City, N. J., October, 1906, killed, 57; Adobe, Colo., March, 1906, killed 34; New Market, Tenn., September, 1904, killed 59; Eden, Colo., August, 1904, killed, 94

this slide, as the catastrophe here and the one in Canada occurred at practically the same time.

The derailment at Milan, Idaho, on the second, was caused by a landslide, and the engine and first three cars of the train fell down a 50-ft. bank. The train was the Oriental Limited, No. 2, and had on board about 175 passengers. The engineman had but a short view of the track ahead, and the train struck a mass of rocks at full speed. Three cars were destroyed by fire, being ignited by coals from the locomotive fire box. The fireman jumped off and was killed and the engineman was injured.

The newspaper accounts of the two derailments near Pendleton, Oregon, on the twentieth, indicate that the first one was of a locomotive, running without train, and both the engineman and the fireman were killed. The engine fell down the bank at the side of the road. But in the derailment it had broken a rail, and, there being no survivor to put out a signal, an extra freight train, which followed 20 minutes later, was thrown off the track, and the engine and five of its cars fell down the bank at the other side of the track and lodged in the Umatilla river. The men on the freight train escaped injury by jumping into the water. Here is an instance where the absolute block system would have prevented a derailment.

The derailment which occurred between the stations of Green Mountain and Gladbrook, Iowa, on the 21st, was reported in the *Railway Age Gazette* of March 25, page 841. At last accounts the number of persons reported killed and injured was as follows:

Passengers killed	44
Passengers injured	31
Employees killed	5
Employees injured	2
Others killed	1
Others injured	2

The train consisted of two engines and ten cars, both engines running tender first. The train belong to the Chicago, Rock Island & Pacific, but was running over the Chicago Great Western because of a blockade. It was, in fact, composed of two trains, backing from Marshalltown to Waterloo with the engines running backward, but preceding the cars. The train was running at about twenty-two to twenty-five miles an hour. The cause of the wreck has not been determined, and whether it was the forward tender or the forward engine which left the track first is not known. The pilot man of the Chicago Great Western, who was on the leading engine, was killed, as were all the rest of the men on both engines, except one. It is certain, however, that the forward engine left the track before the second engine did, and plunged immediately into the soft clay cut, causing the violent stoppage and consequent piling up of the cars. The first car from the engine was a sleeper; then came the lighter coaches, and then again a sleeper and other coaches. The chair car was crushed between the first sleeper and the coaches following, and it was in this car that most of the loss of life occurred. The day coach was completely wrecked, the wooden portion of the car being broken into splinters and the steel broken and rolled until the wreck of the car occupied a space but little larger than ten or fifteen square feet. The third car was badly wrecked, but was not totally demolished.

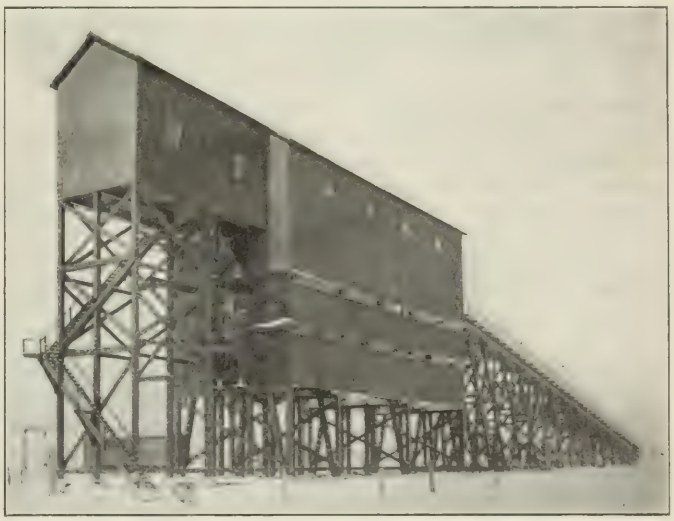
This accident was investigated by the state railroad commission of Iowa on March 29 and 30, but no report of the investigation has yet been issued. The newspaper accounts of this investigation say that it developed that the leading engine was the first to leave the track; that the roadbed at the point of derailment was soft, yet the track was in good condition; and that the speed of the train did not exceed 22 to 25 miles an hour. The commissioners examined 37 witnesses. Following the public hearings, representatives of the commission obtained statements from many eye-witnesses in the immediate vicinity of the wreck, who saw the train within 30 seconds after the accident. These witnesses were uniform in their statements that the train was running slowly and smoothly, and that there was no rocking or uneven motion to the tenders or engines. The accident occurred at the top of a grade on a straight piece of track.

The list of electric car accidents of which we have found reports in the newspapers as having occurred in the United States in the month of March includes three rear collisions, one butting collision, one derailment due to a runaway on a steep grade and one wreck of a street car by being struck by a locomotive. The derailment caused one death; and the butting collision, which was between high speed cars on an interurban line near Lima, Ohio, and was due to a mistake in connection with telegraphic orders, caused two. One of the rear collisions was at Sixth avenue and Twenty-third street, New York City, in the tunnel of the Hudson & Manhattan. The speed of the moving train was low, but credit was given to the anti-telescoping frames of the cars, and the device for preventing one car floor from forcing the floor of the next car upward, for mitigating the effects of the collision. The total number of persons reported injured in the six accidents was 84.

NEW LOCOMOTIVE TERMINAL OF THE VANDALIA AT TERRE HAUTE.

The Vandalia has about finished a complete new locomotive terminal at Terre Haute, Ind. The general arrangement with details of the principal structures is here illustrated. The house is located near the intersection of the Vandalia and the Southern Indiana and close to the Dewey cut-off line.

There are four tracks approaching the inspection pits for



Coaling Station at Terre Haute.

inbound and outbound engines. The inspection pits are about 925 ft. east of the roundhouse, and there are cross over tracks at each end so that engines on either of the approaching tracks can go on to either pit. The coal wharf spans seven tracks and the incline track leading to it is at right angles to the approaching tracks. The coal cars are taken around a 16-deg. curve to parallel tracks where there is storage for 12 loaded and 12 empty coal cars, and from this point they are delivered to the incline. The complete structure for the coal wharf was designed and built by the Roberts & Schaefer Company, Chicago. The sandhouse and water cranes are just beyond, and next are the ash pits, 400 ft. from the house.

The coaling station is a steel structure supported on wooden posts and provides coaling facilities for six engines. The coal cars are hauled up an incline of 1 in 20 by a Lidgerwood hoist having a duty of 36,000 lbs. at a speed of 35 to 40 ft. per minute. The drum is 40 in. in diameter by 40 in. face. The hoist is provided with steel gears, automatic brake and regular lowering brake, and is operated by a 50 h.p., 220-volt, General Electric motor running 850 revolutions per minute.

The upper floor is about 45 ft. above the track level. The coal pockets provide storage capacity for 750 tons of coal and are lined with No. 10 steel. The bottoms of the pockets have a slope of 45 degs. and are hoppered at the corners so that all the coal runs out by gravity.

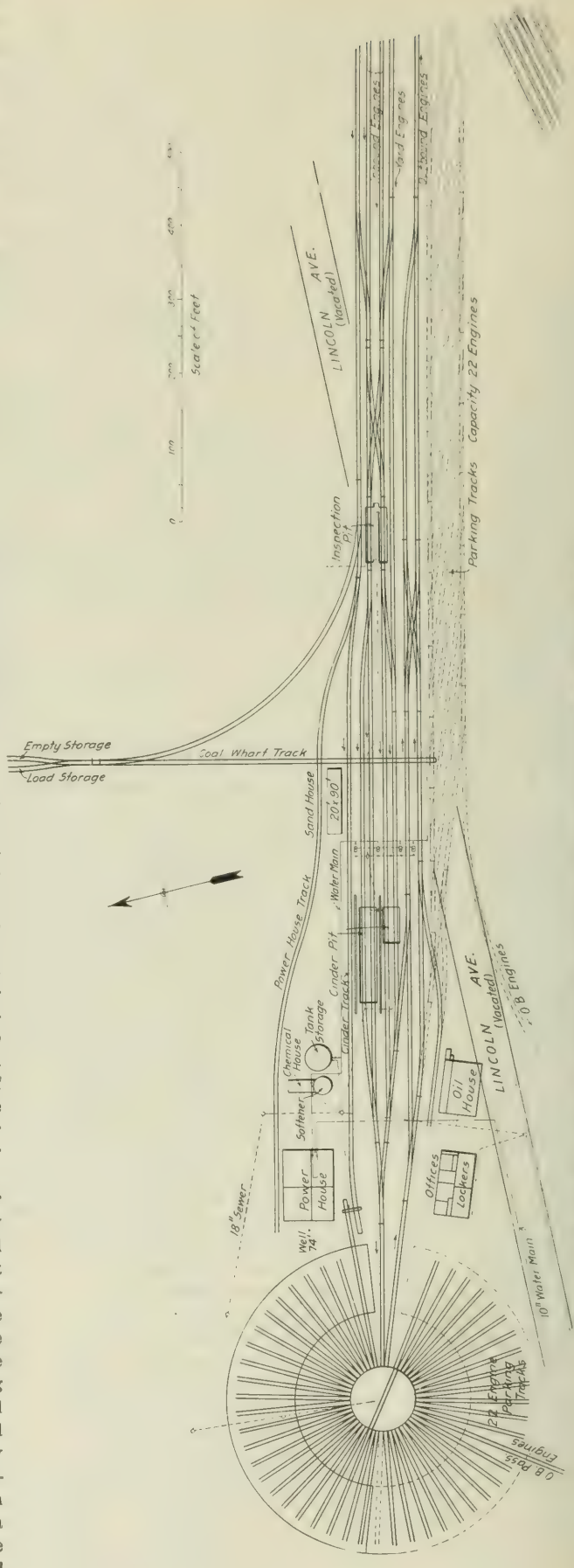
Two 36-in. plate girders support the track for the coal cars. The entire upper surface of the pockets is covered with ¾ x 6-in. breaker bars, spaced 6 in. in the clear, which prevent large lumps of coal from going into the pockets. The roof is of common boards covered with Perfected granite roofing. The sides are covered with Duck Back brand asbestos protected metal. The entire under side of the pockets is covered with ⅛-in. transite board in order to protect the structure from locomotive sparks. Six sets of under-cut gates and hooded aprons are provided for the delivery of the coal from the storage pockets to locomotives.

The dry sand bins are placed under the apex of the coal hoppers. There are three of these, two with a capacity of 12 tons and one with a capacity of 15 tons; they are provided with sand pipes for delivering sand directly from the bin to the locomotive. There are three independent steel sand drums, one for each bin, together with the necessary piping for raising sand by air pressure from the sand house to the sand bins.

The cinders are handled by clam shell buckets and gantry cranes, supplied by the Whiting Foundry Equipment Company, which also furnished the jib cranes for the roundhouse. There are two tracks over the ash pit and a cinder track alongside. From this point the tracks converge and two of them enter the roundhouse. To the north and near the roundhouse is a power house and chemical house with two tanks for water purification. The latter plant was installed by the L. M. Booth Company, Chicago; it is a "Type F" machine, the settling tank having a capacity of 206,300 gallons. A description of this type of water softener will be found on page 386 of the February 19, 1909, number of the *Railway Age Gazette*. It has a treating capacity of 40,000 gallons of water per hour and is of the automatic, variable rate, continuous treatment type, operating with full efficiency under all fluctuations between 25 per cent. and full capacity. The steel settling tank is 26 ft. 6 in. in diameter and 50 ft. high. Inside of it at the center is a cylindrical mixing tank 8 ft. 6 in. in diameter, and 47 ft. high. The slaking tank and chemical tank are in a small building on the ground level. Here the chemicals are prepared and the working parts requiring attention are concentrated so that it is unnecessary for the attendant to climb to the top of the tank for that purpose. The only attention required is from twenty to thirty minutes at intervals of twelve hours to refill the chemical tank and discharge the sludge. All power required for stirring, for mixing, for raising, treating chemicals, etc., is obtained from the water as it flows into the softener for treatment.

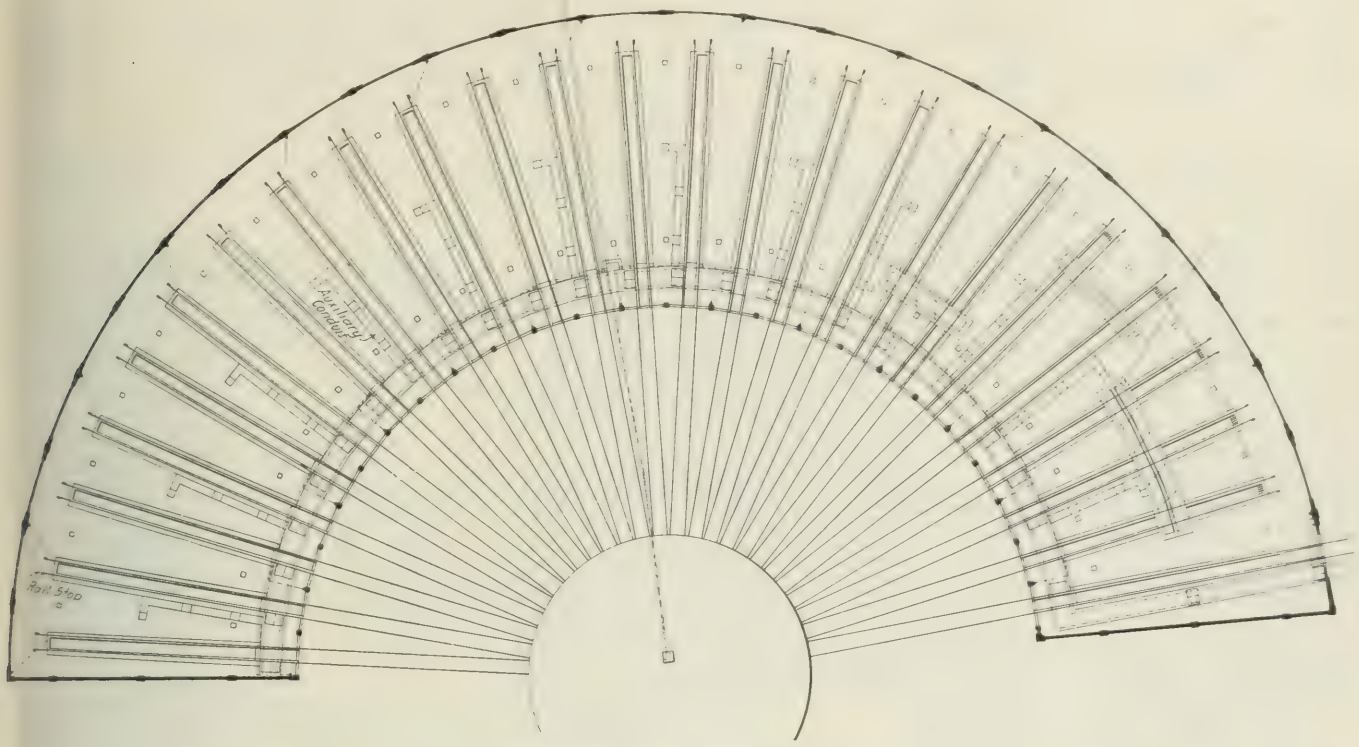
The chemical tank holds a supply of reagents for a 12-hour run at full capacity. The chemical regulator automatically and instantaneously varies the amount of reagents delivered to the mixing chamber in exact proportion to the amount of raw water entering, so that the treatment is uniform regardless of variations in the use or supply of water. The purpose of the mixing chamber is to bring and hold the chemicals and impurities in intimate contact during the time required for complete reaction and precipitation. This mixing chamber is of such size that one-half hour or more is required for the raw water with added reagents to pass through, and during this time they are continuously stirred together by slowly revolving paddles. The sludge formed in the treatment collects in the bottom of the main tank and is blown out every twelve hours by opening the sludge valve for a few seconds. To the south is the office and oil house. The oil house has a complete equipment of the Bowser tanks and measuring pumps.

The large roundhouse is 95 ft. wide and will eventually have

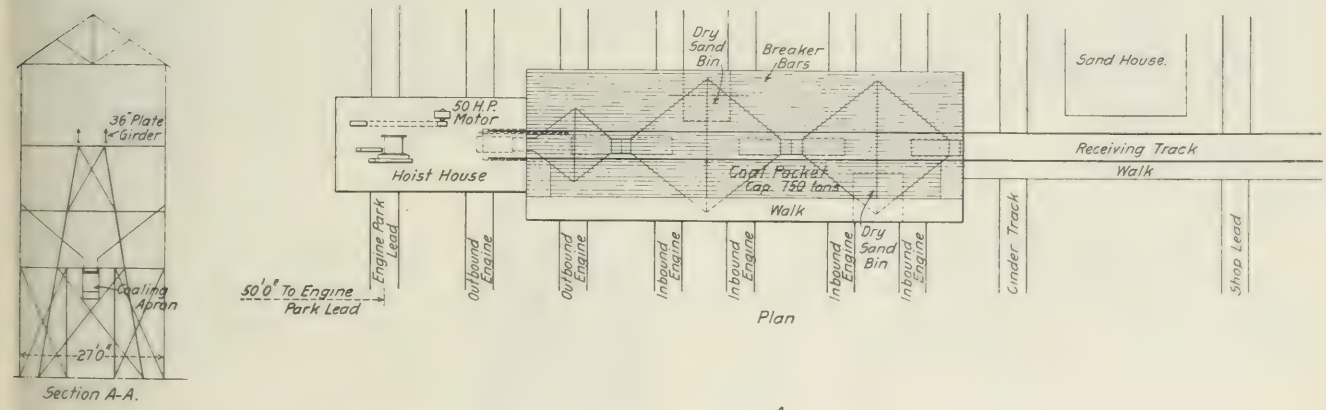


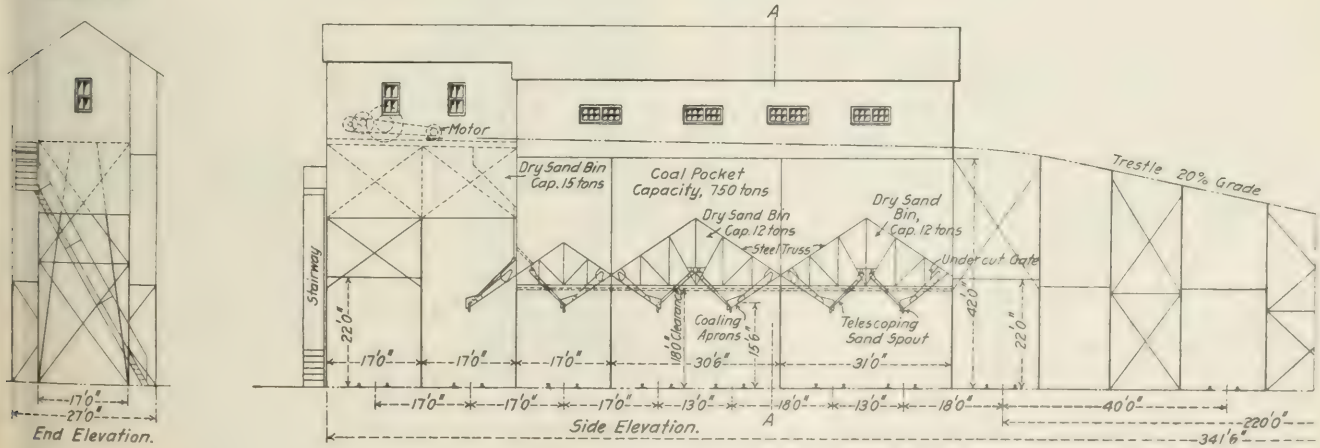
General Layout; Vandalia Locomotive Terminal at Terre Haute, Ind.

capacity for 47 engines. The half circle now building has a capacity for 25 engines. The turntable is 90 ft. long and the distance from the pit to the inner wall of the house is 75 ft. The plan shows the large pipe conduit on the inner circle for cold water, hot water, steam and compressed air pipes. There are three drop pits, one large one spanning three tracks for driving wheels, one for engine truck wheels and one for tender wheels. For driving wheels a special 15-ton Watson & Stillman hydraulic jack is used, and for truck wheels a telescopic air jack. The last two pits span two tracks. The cross section of the house shows it divided into three spans, one 16 ft. wide and 18 ft. 7¾ in. high at the outer circle; then a central section 58 ft. span with a high deck and deep wooden truss. The smokejack with a long hood extends through this deck. The swinging sashes in the upper deck provide a large opening for ventilation, as they are about 9 ft. long at the outer

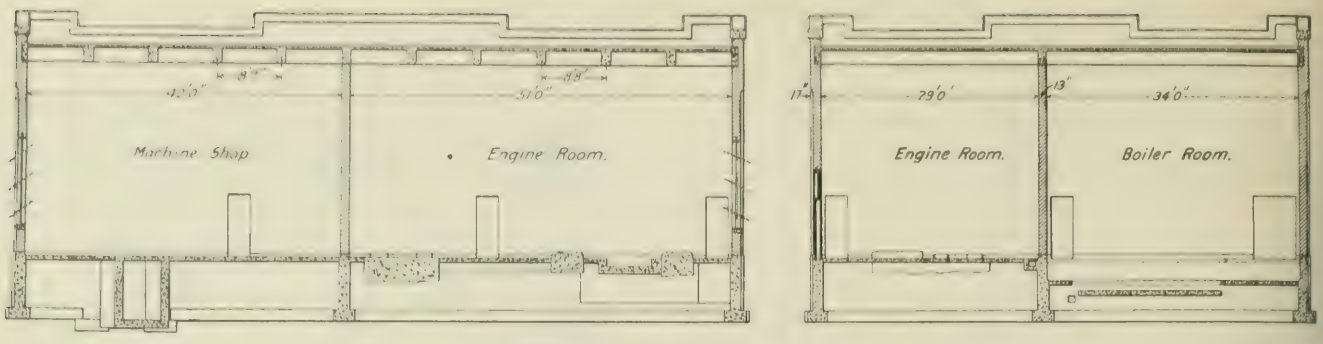


Floor Plan; 95-ft. Engine House.



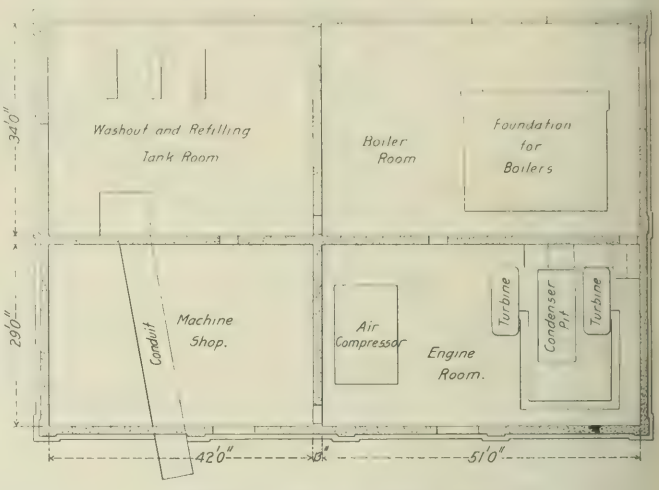


Coaling Station at Terre Haute, Ind.; 750 Tons Capacity.



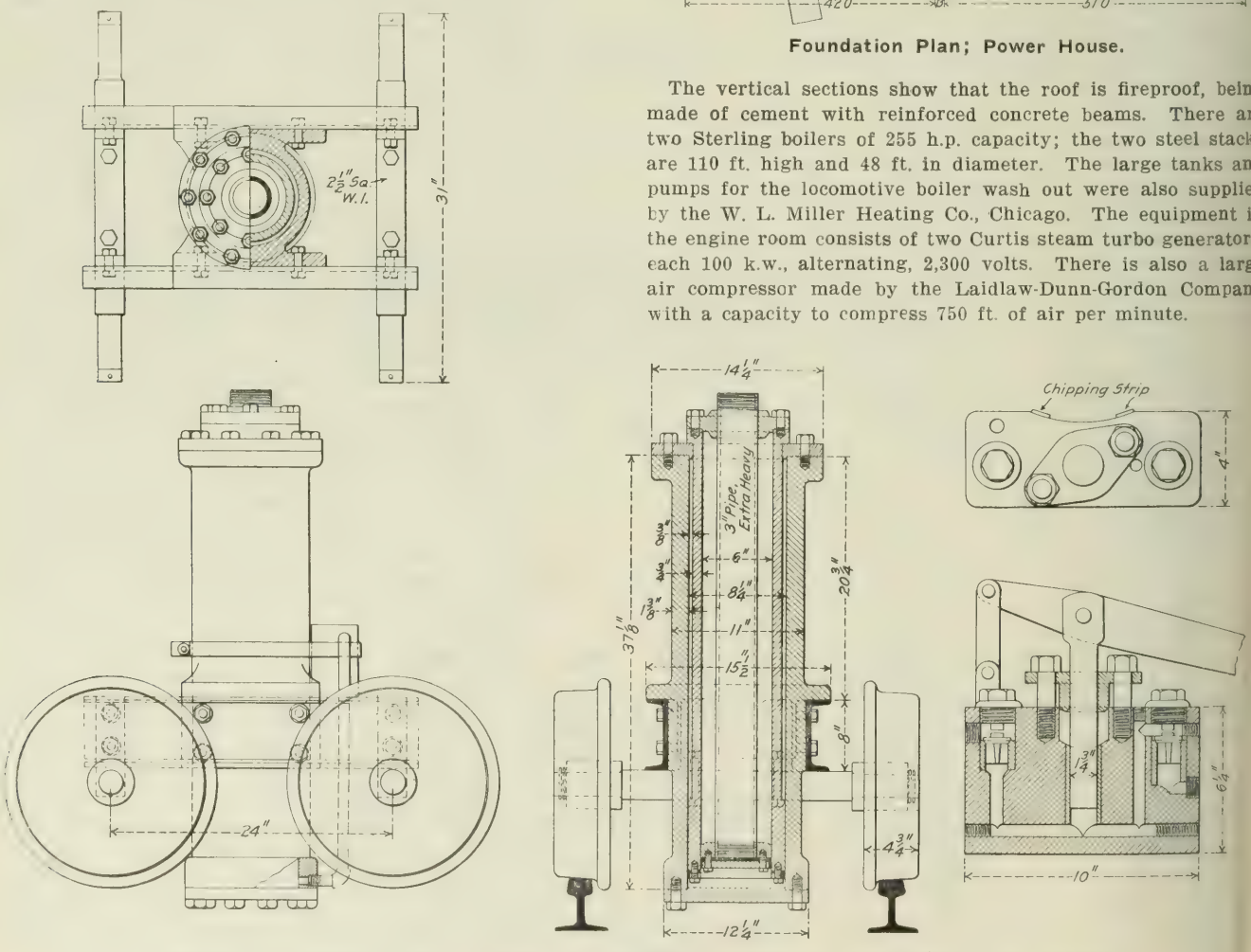
Sections of Power House.

circle; just under the sash there is a plank walk extending around the house. The span at the inner circle is 21 ft. wide and 18 ft. 5¼ in. high. The roof has a pitch of ½ in 12, and is covered with felt and gravel, to Barrett specification. The section also shows the jib crane attached to outer pillars having a swing of 10 ft. 9 in. The 6-in. cast-iron down pipe is inside the house along the inner posts and a 4-in. pipe inside the outer wall. In the power house are wisely concentrated several departments, each of which sometimes occupies a separate small building. In addition to the boiler room and engine room there is a machine shop and a good sized room for the washout and refilling system. The latter is perhaps here for the first time recognized as of such prime importance as an essential to roundhouse equipment as to have provision made for it in the building plan. The boiler room is 36 ft. x 51 ft.; the engine room, 29 ft. x 51 ft.; the machine shop, 29 ft. x 42 ft., and the tank room, 36 ft. x 42 ft.



Foundation Plan; Power House.

The vertical sections show that the roof is fireproof, being made of cement with reinforced concrete beams. There are two Sterling boilers of 255 h.p. capacity; the two steel stacks are 110 ft. high and 48 ft. in diameter. The large tanks and pumps for the locomotive boiler wash out were also supplied by the W. L. Miller Heating Co., Chicago. The equipment in the engine room consists of two Curtis steam turbo generators, each 100 k.w., alternating, 2,300 volts. There is also a large air compressor made by the Laidlaw-Dunn-Gordon Company with a capacity to compress 750 ft. of air per minute.



Details of Telescopic Jack for Drop Pit; Vandalia Locomotive Terminal at Terre Haute.

REINFORCED CONCRETE TRESTLES.*

There are, on most roads traversing the Mississippi valley, a great many pile trestles in river bottoms, and over bayous or swamps, which may not be filled and which, if replaced with steel bridges on permanent supports, would be extremely expensive. The necessity for retaining the entire existing opening is, in many cases, perfectly obvious. In most of these cases there is no need for spans of great length, there being neither ice nor drift to catch upon supports placed closely together. For such bridges, having lengths from 100 ft. to 1,000 ft. or more, the writer has devised a reinforced concrete construction, following the main features of the timber trestle.

The great economy of the pile trestle is largely due to the small amount of work necessary to be done in the field. There are no cofferdams, foundation pits, or falseworks, and little raw material has to be unloaded and cared for. All members are taken out and put in place, often largely by machinery, with a minimum of disturbance of the track and delay to traffic. A concrete structure embodying these features was built and tested, and after that had been completed a standard plan was drawn up, which plan is shown in Fig. 1.

This construction is suited only for shallow openings, and it is the writer's practice to limit the height of concrete pile trestles to 16 ft. from ground line to base of rail. For greater heights it is his practice to substitute thin piers for the pile bents, although at considerably increased cost. In Fig. 2 is shown a view of the first trestle built, and experience in its construction led to some modifications in accordance with the standard plan of Fig. 1.

In the bridges so far built, concrete piles of two kinds have been used—one being molded in horizontal forms and the other made by rolling in a machine, under the Chenoweth patents. The molded piles were 16 in. sq. at the butt, had a 4-in. chamfer at each corner, a taper of 4 in. in 30 ft. on each face, and were pointed at the tip. The reinforcement was assembled on a mandrel and the spiral hooping wound around it by turning the mandrel. After the hooping was in place it was tied at frequent intervals with No. 16 soft wire, and the complete reinforcement was then withdrawn from the mandrel.

The forms were of wood, unlined and made so that the sides could be removed as soon as the concrete was firm; the pile was left on the bottom boards until hard enough to stand handling. The concrete, composed of one part of cement to four and one-half parts of gravel, mixed to a slushy consistency, was poured in. The gravel was generally screened so that all the sand and pebbles one-half inch in diameter or less were retained and used, the coarser aggregate being rejected. The piles were allowed to harden at least 30 days before being shipped. This seems to be about the least time which can be allowed, as attempts to ship and drive piles of less age have not been successful. More extended seasoning is often easily obtained and is to be preferred.

Rolled piles are made in a machine consisting essentially of a movable platform, a shaft or mandrel, and means for moving and turning the piles, together with rolls for holding them in line during fabrication. The piles, when fabricated, are stored in a seasoning yard and sprinkled frequently to assist the hardening of the concrete.

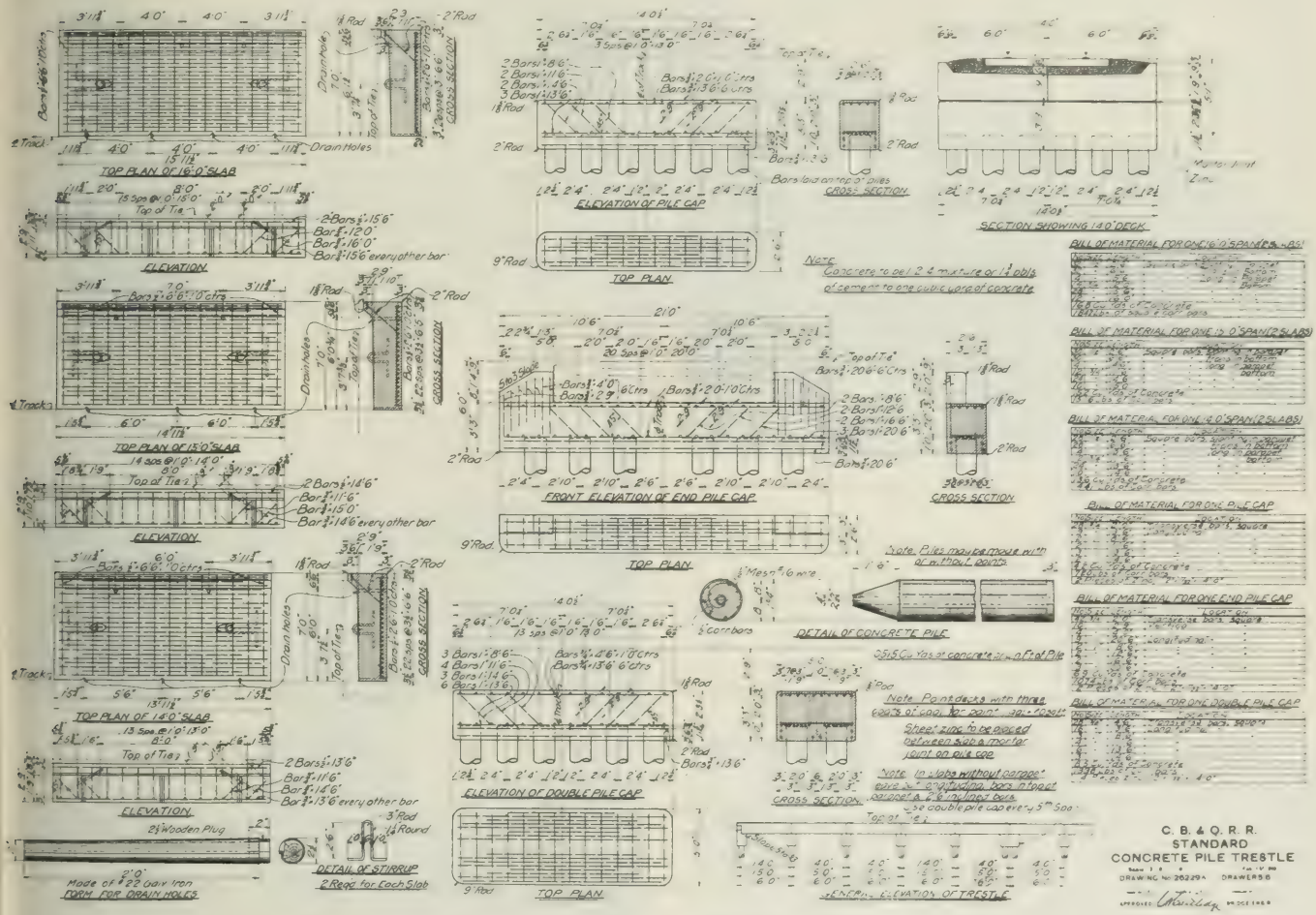


Fig. 1—Standard Concrete Trestle; Chicago, Burlington & Quincy.

*From a paper read before the Western Society of Engineers on April 13, by C. H. Cartlidge, bridge engineer, Chicago, Burlington & Quincy.

A somewhat incomplete comparison of the first year's costs of rolled and molded piling indicates that there is little difference in the cost of the two kinds. As the cost of making reinforcement for the molded piling was one of the principal items, it was decided to experiment with molded piling made without taper, the idea being to use a wire fabric, as reinforcement, which could be simply folded into a square and wired together at the lap, thus avoiding considerable labor. The cost of forms is also much reduced if they are not tapered. An efficient plant was designed, but in spite of the economy achieved no great difference in the cost has resulted, partly because of the difficulty of handling the square piles. On the whole, in the absence of definite comparative tests, the writer is inclined to favor the



Fig. 2—Reinforced Concrete Pile Trestle.

rolled pile. It is probable that each form of pile will be found to have its own place and use.

As yet, no soil has been encountered in which wooden piles could be driven and in which it has not been possible to drive the concrete piles. It is necessary to lift the drop hammer somewhat more slowly for the concrete pile than for the wooden pile, in order not to set the driver in vibration. A cushion of some elastic material must be placed between the hammer and the pile, and with this precaution very little damage to the head of the pile results, even after long continued driving. It is surprising how much punishment a well seasoned pile will stand. When it is necessary to drive the pile below the leads, as is generally the case, the follower is placed on top of the cushion. As the loads on these piles are great it is necessary to drive them to refusal, so that accurate knowledge of the required length is necessary. In case it is found that the piles so driven do not reach the elevation called for on the plans, the depth of the cap is increased accordingly. If it is found impossible or impractical to drive the piles to the depth anticipated, they can be cut off without difficulty. The cut need not be a smooth one, as the casting of the cap will take care of all irregularities of the head of the pile. Should settlement occur in a finished bent, the strength of the cap is important, so that the loads may be equalized and even settlement result. Experience has shown that the design of Fig. 1 provides sufficient strength. Slight settlement has taken place in two bridges but without causing cracks or damage. As the settlement was doubtless due to the fact that the piles had not been driven to refusal, a mass of concrete was placed about each settled bent, extending from just below the ground line to about three feet below; the slabs were jacked up to grade and a layer of concrete was placed between them and the caps. This is shown in Fig. 3.

The manufacture of the floor slabs is best accomplished in a convenient yard, where advantage can be taken of economical methods. It is necessary to provide a firm, unyielding bed. The sides and ends of the forms are removable, and as one span consists of two slabs, a temporary partition is placed in each form to be removed after a half span has been completed. A layer of paper is placed against the slab and the remaining half is cast. Drainage holes are also cast along the dividing line.

By referring to Fig. 1 it will be seen that U-bolts or stirrups are set in the upper part of the slab to permit of its being easily handled. These are set at an angle so that there may be a direct pull when attached to a chain, obviating the necessity for a toggle-beam when lifting and placing the slabs.

After the slabs have remained in the forms for from two to four weeks, they are lifted by a locomotive crane and piled to one side until hard enough for service, the minimum time for seasoning being three months. When seasoned they are readily erected by the same crane, a mortar joint being placed between the bottom of the slab and the cap.

After being erected the slabs are painted on top with a waterproofing compound, and the joints over the caps are filled with a mastic of tar or asphalt and sand. It is better to fill these joints with such material than to allow them to fill with sand, as the former will admit of the slight expansion necessary. Thus far, the best material for waterproofing, with which experiments have been made on work under the direction of the writer, has been found to be a paint made of coal tar, Portland cement and kerosene. This compound not only covers the surface but sinks into and bonds with it, so that two or three coats are sometimes required. It is put on with paint brushes like ordinary paint. Another valuable at-



Fig. 3—Concrete Girder Levelled Up After Settlement.

tribute is its ability to adhere to moist or even wet concrete. Still another, and not its least recommendation, is its very low cost.

The double bents are designed to take up such longitudinal stresses as might be apt to place undue bending on the piling. As a matter of fact the stiffness and weight of the floor are such that it is somewhat questionable whether the double bents are necessary. It seems well to put them in, however, as an extra precaution.

With men experienced in this work, several bridges of lengths of from 80 to 250 ft. have been built at a total cost of from $20 to $26 per lineal foot, and on lines carrying heavy

traffic, while in one or two short bridges of two or three spans, the cost has been as high as $45 per foot. For estimating, a cost of $30 per lineal foot plus a constant of $300 will be ample for the design shown.

For bridges having a height above the ground line greater than 16 ft., a plan involving the use of thin piers is preferable. Photographs of such structures are shown in Figs. 4 and 5. The piers are heavily reinforced and are generally founded on wooden piles cut off five or six ft. below the ground line. Because of the greater cost of these piers, it is generally economical to make the spans longer than 16 ft., spans of 18 to 25 ft. being common. A great number of such bridges have been built and have so far developed no defects. When the



Fig. 4—Through Girder Concrete Trestle with Piers.

spans are as long as 25 ft., however, it is impracticable to build the slabs in a plant away from the bridge, because of their great weight. In general, it has been found best to build them on false work adjoining their final position and jack them into position.

The writer wishes to lay especial stress upon the necessity for the use of the best materials and the most skilful labor on such work. The comparative novelty of reinforced concrete makes necessary a most efficient organization for the work, and the placing of all possible safeguards to insure its integrity. Such organization and safeguards have been in effect in the case of steel construction for so long that they have become matters of course, and when reinforced concrete is carried on with similar care and scrupulous watchfulness, no fear need be felt as to its value as a material of construction.

It is possible, under some specifications, to design short span steel bridges on concrete supports which will be as cheap as the designs described herein, but not, the writer believes, of equal strength to the bridges shown in these designs. Further, if the obvious advantages of ballasted, noncorrodible, fireproof bridges be considered, it will be seen that there is a preponderance of good qualities on the side of the reinforced concrete construction.

DISCUSSION.

Prof. Arthur N. Talbot (University of Illinois [by letter]): Concrete piles in foundations are usually placed in large groups and are so tied together by the structure itself that the individual responsibility of a single pile is much less than in a trestle. Concrete columns as frequently constructed are subject to possible variation in quality of concrete in different parts, giving opportunity for local weakness. Weak spots are especially apparent in a column which has to be driven as a pile. It might seem, then, that the concrete pile would be an element of weakness in a structure of this kind. To the writer the existence of weak spots in piles made by the rolling process seemed extremely probable, and, as there are others who may still hold this view, he presents the following tests of rolled concrete piles as having a bearing upon the strength and uniformity of this form of construction.

Compression Tests of Rolled Concrete Piles.

Specimen.	Length Ft.	Length in.	Equivalent diam., ins.	Area. sq. in.	Maximum applied load, lbs.	Av. unit stress, lbs. pr sq.in.	Age at test, mos.	Remarks.
1	24	4	14.4	163	280,000	1,720	4	Failed along a diagonal plane abt. 8 ft. from top.*
10	24	3	14.1	156	264,000	1,690	4½	Failed by shattering at top and bottom.
10A	19	9	14.1	156	401,000	2,570	12	This is No. 10, with the injured ends cut off.†
9	20	7	15.0	177	231,000	1,300	4	Shattered at top.
9A	19	3	15.0	177	350,000	1,980	12	This is No. 9, with the injured top cut off.‡
2	20	5	15.3	184	260,000	1,410	4	Failed at top by bulging & splitting. Wires broken at end.
7	20	3	14.4	163	271,000	1,660	4	Failed by shattering and splitting at top.
7A	17	0	14.4	163	319,000	1,960	4	This is No. 7, with about 3 ft. cut from top.§
7B	14	0	14.4	163	356,000	2,180	4½	This is No. 7A, with about 3 ft. cut from bottom. Failed by splitting near top.
4	20	0	15.0	177	214,000	1,210	4½	Failed by shattering and splitting at bottom.
5	16	6	15.0	177	257,000	1,450	4	Failed by bulging and splitting at bottom. Long cracks extending 18 in. high.
8	16	6	14.8	172	176,000	1,020	4	Shattered at bottom.
3	16	0	14.1	156	279,000	1,790	4½	Top shattered.

*Many wires broke and long rods buckled at and near point of failure.
†Failed along diagonal plane about 3 ft. from top.
‡Failed by shattering at bottom. (Original end.)
§Failed by shattering at bottom.

The rolled concrete piles were furnished for these tests by the American Concrete Company and were made at Racine, Wis., December 1, 1908, at the plant which fabricated the piles used in a bridge foundation. The concrete was reported to be one part Universal Portland cement, two parts Torpedo sand and four parts broken stone, size 1 in. and less. The lengths ranged from 16 to 24 ft. The section was somewhat elliptical, but the average diameter was about 14 in. The longitudinal reinforcement consisted of 5 or 6 half-inch square twisted steel bars spaced fairly uniformly and just within the light wire netting which surrounded the pile. There were several turns of No. 14 wire at intervals of about 16 in., which were for use in holding the concrete and netting in place after



Fig. 5—Concrete Trestle with Piers over 16 Feet High.

fabrication. It is seen that the steel reinforcement is light and will not give much additional strength. The piles were shipped to the laboratory when about two weeks old. They were fairly straight, with both ends square instead of having a point at one end. As is usual with this method, the irregular space at the end of the pile formed in the rolling process had been filled in with concrete at the time of fabrication. The tests were made in the 600,000-lb. vertical screw testing machine at the University of Illinois. A few hours before loading the pile was set in place in the testing machine and the ends were bedded in plaster of Paris. The lower end rested on the bed of the testing machine. The load was trans-

mitted to the top of the pile through a hemispherical bearing block. The results are given in the table.

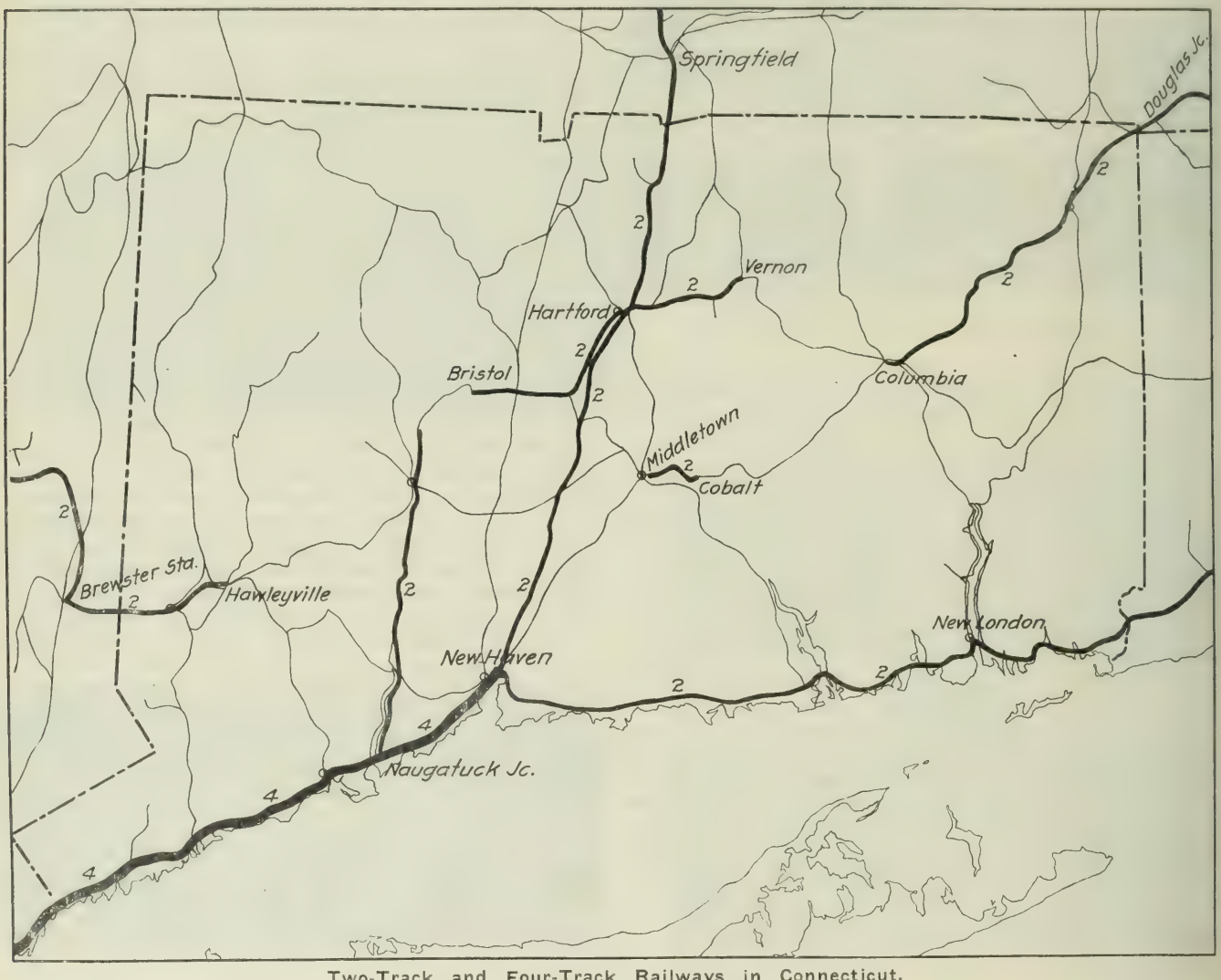
As might have been expected, failure came generally at the ends, where the finishing of the pile by filling concrete into the irregular space between the folds of the wire netting leaves unfavorable conditions for strength. It is evident, then, that the failures at the end are not representative of the full strength of the pile. In the three cases where the failed end was cut off, the second test, 7A, 9A and 10A, gave materially higher results, and where the second end was cut off, 7B, the test shows a still higher value and the pile broke near the end. The pile which broke away from the end, 10A, 3 ft. from the top, gave a strength of 2,570 lbs. per square inch. One pile, No. 6, not given in the table, had been broken in three places in handling, but it carried a load of 156,000 lbs. and failed by shattering at the bottom of the concrete. It will be seen that the piles in which the original end had been removed carried high loads and that there was no indication of lack of uniformity of concrete throughout the length of the piece. In fact, the appearance of the concrete and the action of the piles during test were those of dense and uniform concrete. It would seem that the method of fabricating these under pressure gives the uniformity which is to be desired. So far as the possible weakness of the ends is concerned, it must be borne in mind that the lower point is in the ground and that with the type of construction described by Mr. Cartlidge the upper end may be cut off, or, at any rate, embedded in the concrete cap where it will be protected from lateral failure.

Mr. Cartlidge, in reply to an inquiry, said the trestles were designed for a maximum load of from 25 to 30 tons per pile.

C. R. Dart (bridge engineer, Chicago Sanitary District) said that the Sanitary District last year drove 80 rolled concrete piles, 16 in. in diameter and 35 ft. long, in tough clay without injury to any pile. They were driven from 46 to 60 days after manufacture and none was injured in loading, transportation or unloading. Wooden piles driven in the same ground were, in many instances, badly split.

TWO-TRACK AND FOUR-TRACK LINES IN CONNECTICUT.

In the map published herewith, following those of other states printed in previous issues, we show the location of those sections of railway in Connecticut on which there are two or more main tracks. Four-track railways are distinguished from two-track by the added thickness of the lines in the drawing.



Two-Track and Four-Track Railways in Connecticut.

The termini of the several sections of two-track and four-track line are as follows:

CONNECTICUT.

New York, New Haven & Hartford.

	No. of tracks.	Approximate miles.
Portchester, N. Y., to New Haven, Conn.	4	47
New Haven, Conn., to Rhode Island line	2	69
Brewster, N. Y., to Hawleyville, Conn.	2	16
Naugatuck Junction, Conn., to Summit, Conn.	2	33
Bristol, Conn., to Vernon, Conn.	2	30
New Haven, Conn., to Springfield, Mass.	2	62
Middletown, Conn., to Cobalt, Conn.	2	6
Columbia, Conn., to Douglas Junction, Mass.	2	44

WHEELING & LAKE ERIE COAL TESTS.

Under the supervision of J. E. O'Hearne, master mechanic of the Wheeling & Lake Erie, at Norwalk, Ohio, a number of tests of run-of-mine and ¾-in. lump-and-nut coal were recently made to determine the economy in using each grade. The most recent tests, the complete report of which is given herewith, were made in passenger service, and every possible endeavor was made to have the same conditions during each test. The same locomotive and crew were used over identical runs, covering a total of 2,262 miles. Practically the same weight of train was hauled at the same rate of speed and the results should, therefore, be directly comparable. These conditions were provided after a number of former tests, the results of which were not entirely satisfactory on acount of the varying conditions. Notwithstanding the fact that the price of lump-and-nut coal was $1.10 at the mines and run-of-mine was $1.04, the former shows better results in every instance.

SUMMARY OF RESULTS.

Run-of-Mine Coal.

Car No.	Lump.	Nut and slack.	Total.	Percentage of lump to total.
40962	57,700	30,300	88,000	65.5
11846	30,300	24,400	54,700	55.3
40893	53,000	33,400	86,400	61.3
11157	33,200	18,800	52,000	63.8
9299	29,700	24,300	54,000	55.0
9932	35,200	19,800	55,000	64.0
Totals	239,100	151,000	390,100	61.2

Lump and Nut Coal.

Card No.	Lump.	Nut.	Total.	Percentage of lump to total.
8928	43,300	8,900	52,200	82.9
9225	44,600	9,700	54,300	82.1
9336	43,900	9,500	53,400	82.2
9919	45,200	5,900	51,100	88.4
Totals	177,000	34,000	211,000	83.8

Three samples from cars containing run-of-mine coal and three samples from cars containing lump-and-nut coal were taken.

Analysis of these samples were made by Crowell & Murray, Cleveland, Ohio. The results are shown in the following tables:

Kind of coal.	Run-of-mine			Lump-and nut			Averages Run-of-mine.	Averages Lump-and-nut.
Sample Nos.	1	2	3	4	5	6		
Moisture	2.65	2.95	3.22	.48	.94	.91	2.94	.78
Volatile matter.	41.53	39.51	38.49	43.33	42.91	42.79	39.84	43.01
Fixed carbon	47.81	49.73	49.39	50.22	49.81	49.78	48.97	49.93
Ash	10.66	10.76	12.12	6.45	7.28	7.43	11.18	7.05
Sulphur	4.22	4.24	3.73	4.27	4.89	4.53	4.06	4.56
B.t.u. dry coal.	13,216	13,292	12,905	13,924	13,658	13,520	13,137	13,701
B. t. u. coal as fired	12,866	12,990	12,490	13,857	13,530	13,397	12,782	13,595

The quality of coal was usual for the grade and district. No preparation was given the coal. Large lumps were broken by the fireman as needed and in general lumps were reduced to about one pound in weight before firing. The same fireman made each trip.

With the exception of four trips during the run-of-mine tests and one trip during the lump-and-nut tests, the same engineer made all trips.

The principal items logged during the tests are shown compared in the following statement:

Item.	Run-of-mine.	Lump-and-nut.
Date of tests	Dec. 14-Jan. 4	Jan. 17-Feb. 5
Train service	Passenger	Passenger
Train numbers	2 and 5	2 and 5
Locomotive number	2002	2002
Initial stations	Brewster, Rook	Brewtser, Rook
Destination stations	Rook, Brewster	Rook, Brewster
Train mileage	2262	2262
Engineer	W. C. Jones	W. C. Jones
Fireman	G. M. Basht	G. M. Basht
Recorder	F. P. Pfahler	F. P. Pfahler
Total time on trips	102:22	103:34½
Schedule time of trips	97:50	97:50
Number of intermediate stops	525	508
Time on trips standing still	26:55	28:19½
Time on trips in motion	75:27	75:15
Average speed	22.09	21.83
Average running speed	29.98	30.06
Total number of cars handled	95	91
Number of dead-head cars	5	0
Number of paying cars	90	91
Actual tonnage of cars	47689.50	46057.70
Number of car-miles	10679.4	10292.1
Number of actual ton-miles	537300.01	520904.67
Lbs. of coal fired on trips	192,997	171,913
Lbs. of dry ash and clinker accumulated on grates and in ash pans during trips	24,708	20,217
Lbs. of dry cinders in smokebox	2,151	1,826
Percentage of dry ash and clinker to total coal fired	12.38	11.32
Percentage of dry cinders in smokebox to coal fired	1.07	1.02
Lbs. coal fired per sq. ft. of grate area per trip-hour	43.16	37.98
Lbs. coal consumed per train-mile	85.31	76.08
Lbs. coal consumed per car-mile	18.07	16.70
Lbs. coal consumed per 100 ton-miles	35.919	33.00
Number of times fire cleaned	0	0
Number of times fire raked	0	0
Number of times grates shaken	48	36
Number of times ash pan cleaned	0	0
Maximum boiler pressure-lbs	190	190
Minimum boiler pressure-lbs	135	170
Average boiler pressure-lbs	183	186
Times injector applied	609	568
Times pop valves released	220	274
Average temp. tender tank feed water, deg. Fahr.	37.74	41.53
Average temp. of atmosphere	29.34	42.91
Average barometer, in.	29.04	28.79
Lbs. water consumed in boiler	1,180,631	1,110,272
Lbs. water evaporated per lb. coal.	6.117	6.458
Equivalent evap. from and at 212 deg. Fahr.	7.5318	7.9536

The lump-and-nut coal shows superior results to the run-of-mine in every instance. During January, 1910, the price of run-of-mine coal at the mines was $1.04 per ton; and the price of lump-and-nut coal was $1.10. Reducing the results obtained to dollars and cents, the comparisons are as follows:

Item.	Run-of-mine.	Lump-and-nut.	In favor of lump-and-nut.
Total coal used	$100.35	$94.55	$5.80
Cost coal per train-mile	.0443	.0418	.0025
Cost coal per 100 ton-miles	.01867	.01815	.00052

A number of roads, as well as the U. S. Government, are now buying fuel on a British thermal unit basis. Assuming that the run-of-mine coal, which shows an average of 12,872 B.t.u. per lb., as sampled, is worth $1.04, the lump-and-nut coal, which contains 13,595 B.t.u. per lb., as sampled, would be worth, on the same basis, $1.098 or practically as billed.

If the evaporation, form and at 212 deg. Fahr., be taken as a basis, the increase in favor of lump-and-nut is 5.6 per cent., and this increase applied to the price per ton would make the lump-and-nut coal worth $1.098 per ton.

From the results obtained, it developed that it would require 5.6 per cent. more run-of-mine coal than lump-and-nut coal due to the same amount of work. In 1909 there was handled 343,743 tons of coal at a cost of $8,805.69. An increase of 5.6 per cent. would necessitate the handling of 19,249.6 tons additional and the cost for the handling coal for the year in the amount of $493.11.

The coal handled at the principal coaling stations during 1909, the haul in miles and the ton-miles are set forth in the following statement. The haul is figured as originating at Pine Valley except Zanesville and Coshocton where it is figured as originating at Warwick mine, four miles east of Coshocton:

Station.	Tons handled.	Haul in miles.	Ton-miles.
Ironville	44,529	193.8	8,629,720
Norwalk	44,130	135.8	5,922,854
Brewster	35,589	65.0	2,313,285
Columbia	52,516	68.0	3,571,088
Pine Valley	49,427	....	....
Mingo Junction	15,459	15.3	236,522
Huron	8,835	146.5	1,294,327
Cleveland	39,052	134.4	5,248,588
Canton	40,025	76.0	3,041,900
Zanesville	9,093	25.3	230,052
Coshocton	1,875	4.0	7,500
Total	340,530	89.5	30,495,836

An increase of 5.6 per cent. in the ton-miles would amount to 1,707,766 miles. The cost of moving one ton one mile is estimated at 3 mills, and the cost due to the increased ton-miles would amount to $5,123.30.

There are two items not covered in the report to which attention should be called. One of them is the increased amount of fire thrown from the stack when using run-of-mine coal. While it is impossible to measure this, the increase over lump-and-nut is very great, and hazard of fire damage along right-of-way correspondingly greater. The other item is the damage to ash pans due to small particles of coal

falling through grates and becoming ignited in the ash pans. The damage due to fire in ash pans can only be estimated, but a 50 per cent. increase in ash pan work would very probably result from the use of run-of-mine coal. As ash pan repairs and renewals on this road now reach $7,000 per annum, a 50 per cent. increase in repairs would mean an additional $3,500.

To contain the 19,249.6 tons additional which would be required if run-of-mine were used, would require 481 cars, based on 40 tons per car. Assuming that the period required per car from the time car is placed at mine until it has been unloaded and moved to mine empty is 6 days, the per diem on additional cars would be 2,886. At 50 cents per diem it would be a charge of $1.443 from this source.

As the cost for fuel per 100 engine-miles is 25.6 cents less for the lump-and-nut than for the run-of-mine, the saving from this item (engine-miles in 1909 being 4,804,581) would be $12,299.52.

To sum up by the use of lump-and-nut coal the savings are:

First cost of fuel based on saving of 25.6 cts. per 100 engine-miles	$12,299.52
Saving in transportation of 1,707,766 ton-miles at 3 mills ea.	5,123.30
Saving in ash-pan repairs	3,500.00
Saving in cost of handling fuel	493.11
Saving of per diem on additional cars necessary to handle increased amount of run-of-mine coal	1,443.00
Loss in revenue from 19,249.6 tons coal, assume cost at 74.56 per cent. of 57.76 cts. –loss, 14.7 cts. per ton	2,829.69
Total loss due to use of run-of-mine coal	$25,688.62

No charge for switching has been added to these figures. No loss of revenue due to withdrawal from revenue service of the 2,992 car days necessary to transport additional run-of-mine fuel has been considered. There should be considered, also, the decreased hazard of fire damage, which, while it cannot be estimated, greatly favors the lump-and-nut coal.

INSTRUCTIONS FOR MAKING LOCOMOTIVE FUEL TESTS OF RUN-OF-MINE AND THREE-QUARTER GRADES OF COAL.

1. Both grades of coal should come from the same mine and care should be taken to see that each is of proper preparation for the grade, but that no special preparation is made.

2. A locomotive carrying 200 lbs. working steam pressure in first-class, tight and clean condition and adjustment with respect to ash-pan and dampers; rocking and drop-grates; firebox; flues; boiler; dry, steam and exhaust pipes; throttle valve; steam-blower; smokebox and stack draft appliances; piston or slide valves; motion gear and cylinder and rod packing should be selected for use throughout the test. All special equipment such as steam gage, water gage, try cock, lubricator, pop valve, injector and like devices should be tested to see that they are in good working order and record correctly before the test is commenced.

3. The grates, smokebox draft appliances and exhaust nozzle opening should be adapted and adjusted to suit the grade of coal to be tested.

4. The test should be made in passenger train service on account of the more uniform conditions and the less time required to complete a given number of trips, as compared with freight train service.

5. The fastest and heaviest trains of nearly uniform conditions and weight, day in and day out, should be selected. If necessary and practicable, deadhead equipment should be added to obtain similar conditions.

6. Not less than 10 round trips or 4,000 miles should be run with each grade of coal to be tested.

7. The same engineer and fireman should be retained throughout the test of both grades of fuel.

8. The tender tank water should be gaged in the usual manner at the start and finish of each train run, also before and after taking water at intermediate water supply stations. A record should be kept of the number of injector applications, as well as of the number of times the pop valves relieve during each trip, to determine the waste of water and steam, respectively, due to those causes.

9. Portable scales should be provided on the coaling tipples to allow weighing the coal in 300 or 400-lb. lots in a box placed on the scales, before the coal is dumped into the tipple pockets.

10. None of the weighed coal shall be used in preparing the fire at the engine house nor until the locomotive starts on its trip with the train. At the finish of the train trip, the coal remaining on the tender should be weighed out accurately with hand scales to determine the actual weight of coal used.

11. The depth and condition of the fire in the grates; the water level in the boiler and the steam pressure should be uniform at the start and finish of each train-trip to avoid the necessity for making adjustment in the weight of coal and water actually consumed on the trip.

12. A record should be kept of the steam pressure and gages of water in the boiler on leaving the initial terminal, on arriving at and departing from the principal stops, and on arriving at the destination terminal. Also for each 10-min. interval while running. The position of the throttle and reverse levers should also be recorded at the same time.

13. The following instructions should be complied with so far as practicable:

Before the commencement of a test-trip, the rocking and drop-grates, ash-pan dampers, ash-pan slides and steam jets, and grate and ash-pan operating gear should be examined and tested to see that all grates set level when latched and that all parts are in good working and in proper position. The smokebox and ash-pan should be clean and the smoke-stack and ash-pan steam blowers in good order. All necessary fire tools must be on the locomotive. The fire must be put in good condition on the grates by spreading and replenishing with fresh fuel, in small quantities at a time, until properly built up preparatory to starting with a full supply of water and steam in the boiler. Lumps of coal should be broken to as near the size of a man's fist as consistent before putting into the firebox. A thin clean fire should be maintained so that the fuel can be supplied with sufficient air through the grates for proper combustion, and produce a clear bright flame. Cross-firing should be practised to maintain an even bed, free from holes, and localized heavy or lumpy firing should be avoided. The use of the rake and "puddling" of the fire should be resorted to only when absolutely necessary to spread an uneven fire caused by uneven draft or improper firing. The banking of green fuel at the furnace doors should be restricted.

The grates should be kept well supplied with coal at the sides, ends and corners of the firebox, and not more than two or three shovelfuls, each scattering the coal, should be supplied at one time. Heavy intermittent firing should be avoided. Only sufficient fire should be kept on the grates as is necessary to prevent loss of heat on account of cold air passing through the grates so freely as to reduce the temperature of the gases, and to suit the way the locomotive is being operated.

Injectors and reverse and throttle levers should be operated to favor the firing when starting from a station and on heavy pulls. The smoke-stack blower should be used when necessary to prevent reduction in boiler pressure and the boiler feed should be increased to prevent release of steam through the pop valves.

Rocking grates must be shaken lightly and frequently, instead of violently at long intermittent periods, and, if possible, when steam is shut off. As a general rule, all rocking grates on passenger locomotives should be shaken every 30 miles. This practice will break any clinker that may be forming over or hardening between the grate openings and will allow dead ashes to fall into the ash-pans and keep the grates and fire clean. It will also allow the air to pass through the grates and fire and prevent the formation of clinker on the firebox flue and crown sheets, which occurs when air cannot get through the grates and must pass over the fire.

The practice of opening the furnace door unnecessarily should be avoided. When locomotives are drifting, the fires must be maintained in a clean and bright condition over the entire grate area, more especially at the flue sheet.

General News Section.

D. W. Bigoney, treasurer of the Erie Railroad, has received from Philadelphia $1,000 in conscience money.

On the night of April 19 at Clinton, Ind., two piers of the bridge of the Chicago & Eastern Illinois over the Wabash river were badly damaged by dynamite.

The Safety Appliance law, which has been passed by Congress and which was printed in the *Railway Age Gazette* last week, page 982, was signed by President Taft on April 14.

The Berkshire Street Railway Company, operating street and interurban lines in western Massachusetts, has offered prizes of $10, $5, $3 and $2 for the best displays of flowers along the lines of the company.

The gangs at work on new railways near Spokane, Wash., now aggregate an estimated number of 4,000, and the contractors are looking for 2,000 more. The scarcity of men is such that laborers are now being paid $2.50 a day; track layers, $2.50 to $2.75.

The reports of all baseball games played by the American, National and Western leagues will be sent by telegraph each day to three of the Rock Island's fast passenger trains, the Rocky Mountain Limited, the Golden State Limited and the Chicago-Kansas City Limited, and will be posted in the library cars.

The Attorney-General of Kentucky has given an opinion that the tax to be imposed by the state of Kentucky on the franchise of the Southern Pacific Company, which is incorporated in that state, should be calculated on a valuation of $5,000,000, instead of ten millions, as fixed by the State Board of Assessors.

At Lake Macdonald, near Kakoucache, Quebec, on Monday last a work train, engaged in the construction of the Transcontinental Railway, fell through a trestle 90 ft. high, and a large gang of men on the train fell into the lake at a point where it is 20 ft. deep. Ten men were killed and 23 injured, six of them fatally.

The eastbound mail train of the Southern Pacific was stopped by robbers last Saturday night two miles east of Benicia, Cal., and five bags of registered mail taken from the mail car. The robbers had crawled on to the tender while the train was crossing the ferry and subdued the engineman and fireman with pistols.

Near Altoona, Pa., recently, according to a press despatch, a track foreman of the Pennsylvania, who was walking on the tracks while off duty, was arrested and sentenced to ten days in jail. At about the same time one of the men belonging to this foreman's gang was walking on the track, when off duty, and was run over by a train and killed.

An officer of the Burlington says that the reports that this road will run through trains between Chicago and San Francisco in connection with the Denver & Rio Grande and the Western Pacific are without foundation. They seem to have grown wholly out of the fact that President Miller, of the Burlington, on a western trip rode over the Western Pacific.

The work of valuing all railway property in the state of New Jersey, begun last year under a commission of three, and interrupted recently because of discussions in the legislature concerning the expediency of appropriating further money for the work, is to be continued under the direction of Charles Hansel, acting under the State Board of Assessors. The legislature has appropriated $50,000 for the work.

From present indications the output of the Mount Clare shops of the Baltimore & Ohio for the month of April will be the largest in their history, even exceeding the record for March, when 45 locomotives underwent heavy repairs. About 2,200 men are employed at these shops, 1,600 of them being in the locomotive department. The steady increase of traffic on the system has necessitated a great deal of overtime work in order to keep the car and engines in condition. Mount Clare is the principal shop of the Baltimore & Ohio, and most of the heavy repair work and rebuilding of equipment is done there.

Vice-President Schumacker, of the Western Pacific, is appointing officers in the traffic department preparatory to opening the road for passenger business. The date for starting regular passenger trains is still uncertain because of difficulty in securing a sufficient number of men to repair the damage done to the road by high water at Great Salt Lake, Utah. Eight steel dining cars have been delivered to the road.

Mayor Kreisman has invited the presidents of the 14 railways composing the Terminal Railroad Association of St. Louis to meet with a joint committee of the municipal assembly and a committee representing the shippers of St. Louis at the Mercantile Club at 12:30 p. m. on April 27. The purpose of the conference is to consider the question of the abolition of bridge arbitraries at St. Louis.

E. P. Griffith, superintendent of telegraph of the Erie; J. C. Johnson, of the Pennsylvania, and C. M. Lewis, of the Philadelphia & Reading, acting as a committee of the Association of Railway Telegraph Superintendents, have undertaken to formulate regulations, in conjunction with the telegraph companies, by which receipts will be returned to the telegraph companies for telegrams delivered to passengers on trains.

The Nebraska Railway Commission is sending a circular letter to the railway commissions of other states, asking them to join it in petitioning President Taft not to appoint anyone who has been a railway attorney to succeed the late Justice Brewer on the United States Supreme Court. It looks as if this move is aimed directly at Lloyd W. Bowers, solicitor general of the United States, who, previous to his appointment to this office, was general counsel of the Chicago & North Western.

A correspondent, F. W. S., noting our reference last week to a luncheon as an alternative to the five-course dinner on certain dining cars, suggests that the buffet smokers of certain of the always-crowded trains might be made to serve as luncheon annexes to the dining cars. This would obviate much of the unpleasant waiting and would accommodate a portion of the passengers without detriment to the interests of the railway. Two or three sandwiches, a bottle of beer and a cigar would aggregate an expense not so far from the price of the table d'hote dinner and would suit some people even better than the full course dinner, quite aside from the matter of expense. Why not apply this to the Congressional Limited of the Pennsylvania road and the Merchants' Limited of the New Haven?

Governor Haskell of Oklahoma has issued a call for a special election to be held on June 11 at which there will be submitted to the people of the state a proposition to amend the provision of the state constitution which forbids consolidation of transmission and transportation companies in Oklahoma with similar companies in other states either by private or judicial sale. The proposed amendment gives express authority for consolidations such as are now prohibited and also grants to existing railways the right to extend their lines in the states without perpetuating the state organization for the construction and management of such extensions. The existing companies are also, whether local or foreign in their nature, to be given the right to exercise the power of eminent domain.

After the state's attorney of Cook county, Ill. (Chicago), refused to prosecute Benjamin Thomas, John C. Fetzer and Charles R. Kappes for alleged frauds against the Chicago & Western Indiana in the purchase of real estate, these persons and the directors of the road agreed to submit the question of whether frauds had been perpetrated, and of their extent, to arbitration by E. C. Field, vice-president and general solicitor of the Chicago, Indianapolis & Louisville. Mr. Field has rendered a report holding that Messrs. Thomas, Fetzer and Kappes should turn over to the Chicago & Western Indiana

$525,000. The directors of the Chicago & Western Indiana had alleged in a civil suit brought at Chicago by them and in evidence they furnished to the state's attorney that frauds had been committted amounting to $800,000. It is stated that Messrs. Thomas, Fetzer and Kappes will refuse to settle on the basis fixed by Mr. Field. In that event the civil proceedings against them will be pushed.

The Chicago & North Western is now using five oil-burning locomotives on its line from Chadron, Neb., to Lander, Wyo. There is an oil field in the vicinity of Lander in which about 30 wells have been bored and which is producing about 200 barrels of oil a day. Two or three new wells are being put down each week, and it is expected that the total number will reach 60 or 70 and that they will have a capacity of 400 to 500 barrels a day. The oil is of satisfactory quality. It is probable that the North Western will convert other coal-burning into oil-burning locomotives for use in this territory. The road is also running two engines between Casper and Lander with lignite coal, of which there are large deposits around Lander. It is being supplied from two mines, one at Lost Springs, Wyo., and the other at Inez. An officer of the road says that after considerable experimenting these engines have been so well adapted to the burning of lignite coal that the number and size of the sparks thrown out by them have been reduced to a point where the burning of such coal has become entirely safe.

The Blue Island Rolling Mill & Car Company has brought suit at Chicago against the Illinois Central for $35,000, which, it is alleged, the road owes it for repairs to its cars and for bar iron furnished to it. The suit is understood to be more or less directly connected with an investigation which Detective W. J. Burns has been making for President Harahan of alleged "grafting" in the repair of cars. The Chicago newspapers have printed a great many reports about the alleged "graft," but the officers of the Illinois Central have refused to confirm or deny any of these reports. President Harahan states, however, that Detective Burns has been investigating the matter of repairs of cars made by outside companies. He said on April 18 that until the investigation is finished he will not make any further statement in regard to it. It is understood that Detective Burns has made his final report to Mr. Harahan. The reports regarding the entire matter are very vague, but the understanding is that Mr. Harahan suspects that certain companies which nave been repairing the road's cars have been paid excessive prices for the service and that some persons who have been connected with the road have profited more or less thereby. Pending the investigation settlements of the Illinois Central's accounts for car repairs with various outside companies have been delayed. It is reported that the bills for 1909 of the American Car & Foundry Company and the Kankakee Car Company have been found correct.

Free Relief for U. S. Steel Employees.

E. H. Gary, chairman of the board of directors of the United States Steel Corporation, has announced the adoption of a plan of relief for employees injured at their work, and promises an early announcement of a plan for pensioning disabled and superannuated employees. The statement says:

This is a purely voluntary provision for injured men and their families, made by the companies without any contribution whatsoever from the men. In principle it is similar to the laws in force in Germany and other countries and to recommendations which have been made by the Employers' Liability Commission of New York and other states since our work upon this plan was begun.

Under this plan relief will be paid for temporary disablement and for permanent injuries and for death. The relief is greater for married men than for single men and increases according to the number of children and length of service. During temporary disablement single men receive 35 per cent. of their wages and married men 50 per cent., with an additional 5 per cent. for each child under sixteen and 2 per cent. for each year of service above five years.

For permanent injuries lump sum payments are provided, based on the extent to which each injury interferes with employment and upon the annual earnings of the men injured. In case men are killed in work accidents, their widows and children will receive one and one-half years' wages, with an additional 10 per cent. for each child under sixteen and 3 per cent. for each year of service of the deceased above five years.

For some years the subsidiary companies of the United States Steel Corporation have been making payments to men injured and families of men killed in practically all cases, without regard to legal liability. These payments have amounted to more than $1,000,000 a year, but it is believed that the plan now adopted will result in additional benefits. * * * All men are to receive the relief, even though there be no legal liability to pay them anything, which is the case in at least 75 per cent. of all work accidents. [Acceptance of a payment estops the recipient from claiming further damages and one who intends to sue for damages will, of course, take care not to accept the proffered gift.]

Experience will perhaps lead to some modifications of this plan, but it will be in operation for one year from May 1, 1910, and if it meets with success and approval from the men and the public, it is hoped that similar and possibly improved plans may be adopted in succeeding years.

Negotiations Concerning Wages.

E. E. Clark and P. H. Morrissey are sitting in New York this week as arbitrators in the questions concerning wages which have been referred to them by the New York Central and the committees of conductors and trainmen of that road. Representatives of the employees of the Boston & Albany are present at these hearings, and also delegates from the Lake Shore, the Michigan Central, the Cleveland, Cincinnati, Chicago & St. Louis and other central lines.

On Sunday last the Delaware, Lackawanna & Western announced that an agreement had been reached with representatives of the conductors and brakemen's brotherhoods to refer their controversies concerning wages to Messrs. Clark and Morrissey, that is to say, an agreement had been reached by which the officers of the Lackawanna and the representatives of its employees should be present at the hearings given by Messrs. Clark and Morrissey in the New York Central controversy, with a view to accepting their decision as binding on the Lackawanna the same as on the Central. This announcement followed a conference at Scranton Sunday evening, which, it is said, was the result of the announcement by the leaders of the Lackawanna employees that an order had already been sent out directing the men of these classes to strike throughout the lines of the company at 11:45 p. m. The strike order was rescinded at 9:30 p. m. On Saturday the officers of the brotherhoods had refused to accept the Lackawanna offer of a general increase of 6 per cent. and had sent out a circular alleging unfair treatment on the part of the railway company's officers. The despatches indicated that the enginemen and firemen were in constant consultation with the other brotherhood leaders and that these classes also would strike. The circular of Saturday asserted that the company had refused decent recognition of just demands; had been constantly trying to evade the issue and divide the men; had deferred conferences and refused to rectify evils; all with the purpose of imposing lower rates and less desirable conditions than prevailed on other roads. The officers of the company declare that they had offered to submit all questions to arbitration in a regular manner, but that they could not accede to the demand of the men that the New York Central arbitration should be accepted before it was known what the result of that arbitration would be.

The claims of the brotherhoods on all the roads north of the Pennsylvania—the New York Central, the Lackawanna, the Lehigh Valley and the Erie—have been based largely on the allegation that the rates were not uniform, were higher on some parts of a road than on other parts; but the fact seems to be that on all of these roads the rates generally have been for years less per mile than those on the Pennsylvania, while on the Baltimore & Ohio they have been substantially the same as on the Pennsylvania.

Representatives of the principal employees' brotherhoods are holding conferences at Albany with officers of the Delaware & Hudson. On Monday the representatives of these employees gave to the newspapers statements which were inter-

preted as threatening a strike of all the brotherhoods on the road, but no official statement justifies this interpretation.

The Lehigh Valley last week agreed with committees of its trainmen to increases in pay, dating from April 1, which are said to be as follows: Trainmen, passenger, from $2.10 a day to $2.25; baggage men, $2.20 to $2.35; trainmen, freight, $2.20 to $2.30; trainmen, local freight, $2.50 to $2.70; switchmen, 30 cents a day increase for all classes. Trainmen will receive extra pay for trips of over 10 hours; heretofore extra pay has not been allowed until after 12 hours.

The Baltimore & Ohio has made increases in the pay of its firemen which average 5½ to 6 per cent. On large passenger engines the rate is increased from 2.3 cents a mile to 2.4 cents a mile; on small engines from 2.2 to 2.3; on engines (freight) weighing 70 tons and over the rate has been increased from 2.80 cents to 2.95 cents. The increases to firemen in yards are from $2.40 to $2.55 a day; from 2.35 to $2.45, and from $2.30 to $2.40.

Press despatches from Boston April 17 report a strike of 400 track laborers, begun apparently by men employed on temporary work.

The Norfolk & Western has made an increase of 6 per cent. in wages of conductors.

The Chesapeake & Ohio, following conferences with representatives of the employees, has promised an important increase in wages. According to one report the principal classes of employees will receive an advance of over 9 per cent.

The New York, New Haven & Hartford has granted an increase of 20 cents a day to track foremen.

The Norfolk & Western has made an increase of 6 per cent. in the pay of trainmen and yardmen.

Railway Business Association Before Ohio Senate Committee

As noted in our issue of last week, page 1021, the Railway Business Association organized a demonstration at a hearing at Columbus, Ohio, on April 12, protesting against the passage by the senate of the Woods public utilities bill. Among the speakers were A. M. Kittredge, president of the Barney & Smith Car Co., Dayton, Ohio, and S. P. Bush, president of the Buckeye Steel Castings Co., Columbus, Ohio.

Mr. Kittredge said that those for whom he spoke had come to appear before the committee because they felt that the legislature of Ohio was in danger of making a mistake which would prove disastrous to many industries. They came in an entirely friendly attitude. They believed that the legislature desired to serve the people of the state well. They believed, however, that the Woods bill is a striking example of the mental dyspepsia that results from trying to do too much in too short a time with no opportunity properly to study the underlying facts. Those who manage large business enterprises realize that the difference between profit and loss is purely a matter of prudence in administration. They are prone, therefore, to ponder long over proposed changes in methods and they feel the legislature should do likewise. There were in the room at that moment, he said, men who do more business with the railways of Ohio, ship more freight, pay more freight bills, buy more transportation of all kinds in a month than that of all the members of the Ohio legislature put together for the past score years. They have their differences with the railways; sometimes sharp and acrimonious. Are they here to demand that the management of the railways be taken out of the hands of those who are trained to railway operation? No. They are here to say that before you enact a law drastic in its provisions, radical in its changes of business methods, costly in its enforcement not only to the state but to the railways, each member of the general assembly should be dead sure that you know what you are doing, why you are doing it, and that it is the consensus of public opinion that it is necessary.

"In order that I may qualify as one who knows something about freight rates, I would say that the Barney & Smith Car Co. of Dayton, with which I am officially connected, pays freight bills in years of normal activity of at least $600,000."

Mr. Kittredge said that 96 business houses of Dayton had signed a petition urging the utmost conservatism in dealing with the Woods bill. The Railway Business Association had sought to find if there is among the shippers of Ohio any grievance properly coming within the purview of the Railway Commission as now constituted that it has not taken cognizance of and does not possess power to cope with. It had been unable to find any.

Mr. Bush said that the group of interests represented by the Railway Business Association employs in good times throughout all the states about 1,500,000 men. In Ohio members of the association have about 800 establishments employing between 100,000 and 150,000 men. Whatever hurt the railways hurts them more, for the railway executive cannot be expected to plan and make betterments at a time when, by reason of pending measures, there is uncertainty as to the revenue he will be permitted to earn or the expenditures he will be compelled to make. There has been abuse of privilege from time to time, but, as laws have been enacted to correct and prevent them, the fundamental principle of freedom of individual initiative has been maintained. Of late, however, there has been observed a tendency to depart from this principle, a tendency which is illustrated by the Woods bill.

"Fortunately, when we urge that railways be fostered and not assailed," Mr. Bush continued, "we request what is in the public interest. If Ohio has laws which make it difficult for the carriers to render efficient service, and with profit, then her industries will sooner or later suffer in competition with the industries located in states which pursue a policy of encouragement to railways.

"We do not suppose for a moment that the gentleman who drew this bill or any of his colleagues who voted for it would knowingly injure the people and industries of the state, but we desire to emphasize that great injury may be done them if any mistake is made in the method used for the regulation of the railways.

"I say specifically the method proposed in this measure of making the government a partner in the management with powers much greater than heretofore deemed wise or necessary, is a new and untried one in this country and in my own humble judgment calculated to suppress that vigor and initiative which has characterized the wonderful railway and all other development of the entire country."

Railway Matters in Washington.

Washington, April 20, 1910.

The railway bill has made little progress in Congress during the past week, having been laid aside in the Senate on Friday last to allow consideration of the river and harbor bill.

There has been considerable discussion in the House, but no action of importance. Representative Mann thinks that the amendments can be passed on, and the bill brought to a vote, within two or three weeks. Anything like agreement in the action of the two houses seems to be considered hopeless, so that the last stage of the matter will be a series of protracted discussions by a conference committee.

The Maryland Public Utilities Law.

The new corporation law of Maryland was reported in the *Railway Age Gazette* April 15, page 1005. This law appears to be as full and detailed as that of New York. In addition to the features given in the report last week, the following are the principal provisions:

"Uniform systems of accounts may be required if the commission sees fit. Control over the issuance of new franchises or privileges and over the transfer of franchises is vested in the commission. The corporations subject to the act may, with the consent of the commission, issue stocks, bonds or other securities, payable more than 12 months after date, when necessary to acquire property or for the construction, completion, extension or improvement of their facilities, or for the improvement or maintenance of their service, or the discharge or lawful refunding of their obligations. In valuing the property of any public service corporation, such valuation shall be so made that as far as possible it shall not affect the value of bonds heretofore issued.

"The capitalization of merger agreements or franchises of public service corporations and the issuance of stocks is prohibited, except that the amount actually paid for a fran-

chise may be made the basis of capitalization and the issuance of stocks and securities.

"The amount of $75,000 per annum, or so much thereof as may be necessary, is appropriated for the salaries and expenses of the commission and for carrying out the purposes of the act. All acts or parts of acts heretofore passed fixing the rates of any public service corporation are repealed, and the powers of the commission to ascertain rates which are reasonable and just supersede all such acts prescribing rates.

"The repeal of these acts includes the repeal of the existing act fixing the price of gas in Baltimore city at $1.10, and gives the commission full power to reduce it to any figure which may be determined to be just and reasonable."

Japan's Control of Manchuria.

The American government's "neutralization" proposal, following closely on the abortive Fa-ku-men Railway agreement and by China's scheme to construct a line of her own from Chinchau through Tsitsihar to Aigun, illustrates the modus operandi of conquest by railway and its immediate results. The whole history of the South Manchurian Railway, both in Russian and Japanese hands, throws into the clearest relief the immense value for political and economic purposes of a railway concession in the hands of a strong power through territory administered by a weak one.

The present position of affairs in Manchuria clearly foreshadows the extension of Japanese predominance from those thin lines of steel to ever-widening spheres of activity; it shows once more the futility of such polite fictions as the Portsmouth treaty to check the forces of economic pressure; and it reveals in a startling manner the real helplessness of China's central government. Manchuria is dominated, throughout its vast length and breadth, by Russia's and Japan's rights of ownership in the Chinese Eastern Railway as completely as under definite rights of suzerainty, but the effects are more apparent from Harbin southward than in the less-frequented regions of Heilung Chiang. * * * No doubt but that the fate which is slowly but surely separating Manchuria from the Chinese empire is the inevitable result of the law of the survival of the fittest, and that the South Manchurian Railway provides the best and simplest means by which that result was to be attained. The grim facts of "economic gravitation" are beyond dispute as they are beyond remedy, and it were folly to deny their force, treaties and agreements notwithstanding.—*London Times.*

Unloading by Immersion.

The Delaware & Hudson has built at Lake George, N. Y., a marine railway to facilitate the unloading of small vessels from cars direct to the water. A track extends from the shore into deep water, permitting a boat having six feet draught to be floated clear of the cars. Then the cars are hauled out. We trust that this concession to the owners of boats has been duly considered, in regard to its possible importance as a factor in discrimination, by the Interstate Commerce Commission.

Water-Tight Freight-Car Doors.

The transportation department realizing that doors of freight cars are rarely water-tight, has devised a scheme for protecting these openings with strips of odorless water-proof paper. Small wooden wedges are driven between the door and door shoes. This forces the door up against the side of the car and holds it in place. The wedges, paper, wooden strips and nails necessary to equip one car cost about six cents. The water-proof paper used is an asphaltum paper made expressly for this purpose, and the small wooden strips that hold the paper in place and the wooden wedges are made from scrap lumber at the Springfield shops.

To insure against improper cars being loaded with flour or other mill stuff a flour inspection card is used. Car inspectors and agents have been notified that they are not to load a car with flour or other mill products, unless one of these cards is attached to the car. This card shows that the car was inspected and placed in condition for flour loading, and gives the name of the inspector, etc. An agent cannot sign a bill-of-lading for a car of flour unless this flour inspection card was detached from the car and attached to the duplicate bill-of-lading. The flour inspection card scheme has been in force on the Frisco about a year, but the papering and wedging has only been in use since the first of January.—*The Frisco-Man.*

Employers' Liability in France.

According to a report from the Consul-General at Marseilles, the employers' libility law of France, which has been in force 12 years, is now generally recognized as equitable, and the manufacturers are said to be entirely reconciled to it. Under this law there is a long list of fixed indemnities which, it seems, are not varied except in the case of an inexcusable fault, when the amount of damage for an injury may be substantially increased if the fault rests on the employer, or decreased if it rests on the employee. The term "inexcusable fault" seems to mean criminal negligence. The courts have frequently held that drunkenness comes within this definition. For total disability a workman receives a life pension equal to two-thirds of his salary; partial disability, one-half of the reduction in salary resulting from the accident; but if the salary has been relatively high, the pension will be smaller in proportion. During temporary incapacity half pay is allowed. Allowances to widows, in case of a fatal accident, are usually 20 per cent. of the deceased's salary; but in case of remarriage a lump sum is paid, equal to three annuities, and then the pension stops. In addition to the pensions, the employer has to pay the doctor, the apothecary and the undertaker.

Duties of Employer and Employee.

Both employers and employees must change their policies in important respects before we shall reach a final settlement of the industrial problem. The employers cannot hope for industrial peace as long as they demand for themselves privileges of combination which they will not grant to their employees. The employees, on the other hand, cannot expect a relationship between themselves and their employers which is satisfactory so long as they strive to bring about their relationship, not on their merits but by coercing the community to take their part. The pathway to success for them lies in quite a different direction. They ought to encourage all legislation which will make public opinion a direct factor in the settlement of industrial disputes because, so far as their claim is just, public opinion is certain to be on their side so long as their rights are denied.

Beyond this, they must strive to make the regulations of their unions so reasonable that employers, instead of being afraid of them, will turn to them, because through unions they can get better service than in any other way. I have no doubt there are many instances of such unions. I understand how difficult it is to make all unions of this character. I am entirely clear, however, that the labor movement will be strong, in this country, precisely in proportion to its success in doing these things. * * * If that day comes when employers use union labor by preference, it will not be long, then, before all the devices of stock ownership, pension funds and the like, which are now sometimes offered to workmen in order to win them from their unions, will be made available to them because they are members of unions. * * *—*Seth Low, Ex-Mayor of New York.*

Appreciation.

It would be a great thing for Vermont if the better farming special could become a regular train.—*Burlington Free Press.*

African Railways.

German Southwest Africa, which extends on the Atlantic coast from the mouth of the Orange river, about 28 deg. 40 min. south of the equator, northwards to 17 deg. 20 min., has a barren coast, but at some distance in the interior there

is more fertile land, and near the northeastern part some mines of importance. To develop what resources there are it is necessary to get to the interior. This is now done by means of three railways. The first of these extends from Swakopmund, near latitude 23 south, eastward by a circuitous route 237 miles eastward to Windhoek. It was built by the government of 2-ft. gage, and was indispensable, though very imperfect, during the revolt of the natives.

The second line was built by a mining company, also of 2-ft. gage, also beginning at Swakopmund and extending northeastward 352 miles through Otari, the mining center, to Tsumeb, with a branch 57 miles long from Otari eastward to Groatfoutein, and another uniting it with the first named line at Karbib 9 miles long. This was built to serve the mines, but has been acquired by the government, which now purposes to build a north and south line from Windhoek to Otavi, 328 miles, through the interior habitable region, but to make it of the "Cape gage," 3 ft. 6 in., and to change the Swakopmund-Windhoek line to the same gage.

The third line, of 3 ft. 6 in. gage, extends from Lüderitz Bay about 26 deg. 40 min. south nearly due east 227 miles to Keetmanshoop, with a branch 112 miles long from Seeheim to Kalkfontein.

The gage is chosen with the expectation of eventually forming a junction at the Cape railways, none of which, however, are within some hundreds of miles of the German territory, northwestern Cape Colony being, for the most part, barren.

In German East Africa the Usambara Railroad, begun by private enterprise in 1890, but soon taken over by the government, was opened from the sea not far south of British East Africa at different times til this year it reached Buiko, 108 miles. It is now proposed to extend it 107 miles further to Moschi, in the vicinity of Mt. Kilimanjaro, reaching a comparatively temperate and healthy country, capable of cultivation and production. The line is in a manner parallel with the British Uganda Railroad, but a few hundred miles further south. Like it, it is eventually to be extended to Lake Victoria Nyanza, reaching its southern end as the British line does its northern end.

American Railway Engineering and Maintenance of Way Association.

The board of direction of the American Railway Engineering and Maintenance of Way Association has prepared an outline of the work to be done by the various committees during 1910. Aside from the usual first paragraph regarding revision of the manual, each committee is told to make concise recommendations for the next year's work. The other instructions are as follows:

COMMITTEE I.—ROADWAY.

2. Collect all known formulae for determination of size of waterways and tabulate them in such manner that they may be intelligently compared. Also consider whether, by the introduction of factors suiting local conditions, a general formula for waterway areas could not be used in all cases.

3. Unit pressures allowable on the roadbed of different materials.

4. Tunnel construction and ventilation.

5. Investigate and report on the question of agricultural drainage in levee and marsh districts as they affect railways.

(a) Laws and assessments.

(b) Methods of construction of drainage channels through railways.

COMMITTEE II.—BALLAST.

2. Complete physical tests of stone for ballast.

3. Investigate the proper thickness of ballast to insure the uniform distribution of the loads on the roadbed.

4. Review report on gravel ballast and recommend methods for grading the different qualities.

COMMITTEE III.—TIES.

2. Continue compilation of statistics on life of treated and untreated ties. Digest the statistics and present conclusions derived therefrom.

3. Metal, composite and concrete ties.

COMMITTEE IV.—RAIL.

2. Continue the investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.

3. Report on the results obtained from the use of open-hearth and special alloy steel rails, and chemical composition of such rails.

4. Present reports on the results of tests made in conjunction with the Manufacturers' Committee on the various kinds of rail by means of the special machines at the Pennsylvania Steel Company's mill and the Sparrows Point mill of the Maryland Steel Company.

5. Report on any recommended changes in specifications for steel rails.

6. Present recommendation on standard rail sections.

7. Present report on rail joints, showing results of all tests at Watertown Arsenal, and recommending design and specifications.

8. Reconsider and report any recommended change in standard drilling for rails as given in the manual.

COMMITTEE V.—TRACK.

2. Prepare specifications for frogs, switch points and crossings, including the use of manganese or other special alloys.

3. Track fastenings used with treated ties.

COMMITTEE VI.—BUILDINGS.

2. Reinforced concrete coaling stations.

3. Roof coverings.

4. Tool houses.

COMMITTEE VII.—WOODEN BRIDGES AND TRESTLES.

2. Continue to co-operate with Committee II. of the American Society for Testing Materials and with other associations in the preparation, revision and adoption of uniform standard specifications for structural timber.

3. Continue the study of principles and methods of pile-driving, including information on pile-drivers and equipment, analysis of practical experience in pile-driving, the strength of sheet piles, recommended types of equipment of sheet piles, of concrete piles and of formulae for bearing power.

COMMITTEE VIII.—MASONRY.

2. Report upon the waterproofing of masonry, covering methods, results, cost and recommended practice.

3. Define monolithic construction. Revise report on the durability of all monolithic construction in arches or large abutments with wing walls.

4. Present typical plans of retaining walls and abutments, plain and reinforced, with comparison and recommended practice. This also requires theoretical consideration.

5. Continue investigation and report on the use of reinforced concrete trestles, typical designs and cost.

COMMITTEE IX.—SIGNS, FENCES AND CROSSINGS.

2. Report on ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.

3. Continue investigation of the use of concrete fence posts and submit recommendations.

4. Continue investigation as to the best form of track construction and flange ways at street crossings in paved streets.

COMMITTEE X.—SIGNALS AND INTERLOCKING.

2. Continue investigation of outline and description of a comprehensive and uniform signal system, suitable for general adoption, conferring with proper committee of the American Railway Association on subject.

3. Revise Mechanical Interlocking Specifications presented in Bulletin 108, and include wrought iron pipe as well as steel.

4. Review and resubmit Electric Interlocking Specifications, with statement of the results from experience.

5. Confer with Committee III. on Ties, and make report on the effect of treated and metal ties on track circuits.

6. Confer with Committee on Yards and Terminals in regard to capacity of terminal lay-outs.

COMMITTEE XI.—RECORDS AND ACCOUNTS.

2. Continue study of estimate forms for construction and maintenance work.

3. Recommend form for and system for keeping side-track records.

COMMITTEE XII.—RULES AND ORGANIZATION.

2. Confer with allied committees which have heretofore presented rules which have been adopted by the association with a view of harmonizing all such rules as have been considered by this committee.

COMMITTEE XIII.—WATER SERVICE.

2. Prepare specifications and plans of water tanks, including tanks of reinforced concrete.

3. Report on complete water stations where track pans are used.

COMMITTEE XIV.—YARDS AND TERMINALS.

2. Development of mechanical handling as a means of promoting rapidity and economy in the handling of freight.

3. Submit typical track layout for passenger terminal of medium size, both dead end and through, and analyze graphically the train capacity of the layout, conferring with committee on signals and interlocking.

COMMITTEE XV.—IRON AND STEEL STRUCTURES.

2. Report findings on effect of impact on bridges.

3. Recommend specifications for bridge erection.

4. Secondary stresses.

5. Influence of theory, experiment and experience on bridge design.

6. Rules for instruction and guidance of inspectors in mill, shop and fields.

COMMITTEE XVI.—ECONOMICS OF RAILWAY LOCATION.

2. Continue the consideration of all questions connected with railway location, grades, lines and improvement of grades and line affecting the economic operation with relation to traffic, tonnage, ratings, speed, density of traffic and financial consideration, with the special aim in view of establishing uniform methods and unit values for investigating and analyzing the relative changes and costs of comparative routes or proposed grade reductions and line corrections.

COMMITTEE XVII.—WOOD PRESERVATION.

2. Extend specifications to include Rueping, Lowry and other widely used processes.

3. Continue investigation of proper grouping of different timbers for antiseptic treatment.

4. Present specifications for timber and piles intended for treatment.

COMMITTEE XVIII.—ELECTRICITY.

1. Report on proper lateral and vertical clearance required for installation for electric traction. (See report of American Railway Association.)

2. Report on best safeguards to be used in connection with transmission line crossings over tracks, giving the recommendations in the form of specifications.

3. Insulation.

4. Maintenance organization.

5. Electrolysis.

COMMITTEE XIX.—CONSERVATION OF NATURAL RESOURCES.

1. Co-operate with and continue to report proceedings of the National Conservation Commission.

COMMITTEE ON UNIFORM GENERAL CONTRACT FORMS.

1. Review and revise general contract forms presented at the tenth annual convention.

International Railway Fuel Association.

The second annual meeting will be held at the La Salle Hotel, Chicago, May 23-26, 1910. Following are the subjects which will be discussed:

Papers Nos. 1 and 5 Consolidated.—"Grade of Fuel Most Suitable for Locomotive Use, Considering Cost Per Unit of Traffic and Best Interests of Producer." "Recommended Methods of Preparing Coal as to Size for Locomotives." J. G. Crawford, chairman, fuel engineer, C., B. & Q., Chicago; LeGrand Parish, S. M. P., L. S. & M. S., Cleveland, Ohio; Curtis Scovill, A. G. S. A., Central Coal & Coke Company, Dallas, Tex.

Paper No. 2.—"Standard Uniform Blank for Reporting all Items of Cost in Connection with Fueling Stations and Handling Fuel for all Types of Stations and Conditions." R. Emerson, chairman, consulting engineer, A., T. & S. F. Ry., Chicago, Ill.; F. V. Hetzel, chief engineer, Link Belt Co., Nicetown, Pa.; A. E. Averill, editor, *American Engineer and Railroad Journal*, New York; N. M. Rice, G. S. K., A., T. & S. F. Ry., Topeka, Kan.

Paper No. 3.—"Accounting for Fuel Consumed; Individual Records of Performance." W. E. Symons, chairman, C. & G. W., Chicago; E. A. Foos, C. C., Fuel, Rail and Tie Dept., C., B. & Q., Chicago; E. J. Roth, Jr., fuel inspector, B. & O., Baltimore, Md.

Paper No. 4.—"Methods of Purchasing Fuel with Regard Both to Traffic Conditions and to Producers' Interests. Relation between Producer and Railway." W. H. Huff, chairman, V. P., Victor-American Fuel Co., Denver, Colo.; L. L. Chipman, G. S. M., Fidelity Coal Mining Co., Kansas City, Mo.; W. K. Kilgore, fuel agent, C., M. & St. P., Chicago.

Paper No. 6.—"Methods of Supervision, Instruction and Encouragement in Locomotive Operation to Secure Greatest Efficiency in Fuel Consumption." D. Meadows, chairman, assistant division M. M., Michigan Central, St. Thomas, Ont.; W. C. Hayes, superintendent locomotive operation, Erie, New York; J. McManamy, R. F. of E., Pere Marquette, Grand Rapids, Mich.

Special Paper "A."—"Character of Membership that Should be Encouraged in the Association and Steps to Secure that Membership." S. L. Yerkes, fuel agent, Queen & Crescent System, Lexington, Ky.

Special Paper "B."—"Methods of Kindling Locomotive Fires." C. F. Richardson, assistant to G. S. M. P., C., R. I. & P., Chicago.

Special Paper "C."—"Mechanical Preparation of Fuel." Professor H. H. Stoek, professor of mining engineering, University of Illinois.

Railway Telegraph Superintendents.

The programme for the 29th annual convention of the Association of Railway Telegraph Superintendents, to be held in Los Angeles, June 20-24, includes the following subjects:

Wireless Telegraphy, by William Maver, Jr.; Education for efficient railway service, D. C. Buell (U. P.); Protecting telephone lines from lightning, M. E. Launbranch (U. S. Elec. Co.); Automatic block signaling, H. P. Ryner (Hoeschen Signal Co.); Telephone train despatching, E. E. Dildine (Nor. Pac.); Testing of telegraph and telephone circuits, V. E. Kissinger (C., B. & Q.); Telephoning to and from trains, E. P. Griffith (Erie).

A party of members will go in a special car from Chicago over the Santa Fe June 14 at 10 p.m., leaving Kansas City the 15th 11:30 a. m. All who expect to join this party should send early notice to Secretary P. W. Drew, 135 Adams street, Chicago.

Omaha Railway Club.

General Charles F. Manderson, formerly general solicitor of the Chicago, Burlington & Quincy, addressed the Omaha Railway Club on April 13 on the early history of railways in Nebraska. General Manderson located at Omaha in 1869 and has, therefore, witnessed the entire development of railways in Nebraska. His address drew a very interesting contrast between the railway facilities in the West when he moved to it and the public attitude toward them and the conditions at the present time. He opposed extensions of government regulation which tend to deprive the owners and officers of railways of the management of the properties.

American Society of Civil Engineers.

At the meeting held on April 20 a paper by Herbert M. Wilson, M. Am. Soc. C. E., entitled, "Federal Investigations of Mine Accidents, Structural Materials and Fuels, at the United States Testing Station, Pittsburgh, Pa.," was presented for discussion and illustrated with lantern slides. This paper was printed in "Proceedings" for February, 1910.

Traffic Club of New York.

At the meeting to be held on April 26, at the Hotel Astor, New York, R. N. Collyer, chairman, committee on uniform classification, will speak on "Uniform Classification."

Brotherhood of Railway Clerks.

The seventh annual convention of the International Brotherhood of Railway Clerks was held at New Orleans April 18-22.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 7, 1910; Niagara Falls, Ont.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York; May 31—June 3; Atlantic City
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—Third Wednesday in month; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City.; Third Friday in month; Kansas City.
RAILWAY ASSOCIATION OF SPECIAL AGENTS AND POLICE OF U. S. AND CANADA.—May 10-13; Los Angeles, Cal.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting October 11-13, Atlantic City.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RICHMOND RAILROAD CLUB.—F. O. Robinson; Second Monday in month, except June, July, August; Richmond, Va.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
SHORT LINE R. R. ASSOCIATION.—First Monday in month; New York.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, 1134 La Salle St. Station, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The canals of the state of New York are to be opened for traffic on May 15, except the Black river canal, which will not be opened until June 1.

Canadian vesselmen say that the low rates for export grain by way of Buffalo and the American Atlantic ports, recently announced, have already drawn three million bushels of Canadian grain that way.

A. T. Siler, chairman of the Kentucky Railway Commission, has announced that this commission will investigate the earnings of the Pullman Company in Kentucky to find if it would be justified in reducing sleeping car rates in that State.

The "Farmers' Special" of the Northern Pacific is as imposing as a transcontinental limited—sleeping cars, a dining car and five demonstration cars. In the period between June 20 and July 2 the train is to visit 50 towns in Montana, at each of which two-hour "institutes" will be held.

The Grand Trunk has announced in Chicago that it will make a rate of a fare and a third plus $2 for the annual meeting of the National Educational Association at Boston in July. The other Chicago lines have decided not to meet this rate except that the Wabash will meet it on business passing through Canada.

Between Syracuse and Rochester the New York Central has taken off three local passenger trains each way, for the reason, it is said, that the passengers are now traveling by electric lines. The Rochester, Syracuse & Eastern electric line, which was opened between Rochester and Syracuse December 16, is said to have received a heavy patronage. There is talk of putting on electric cars to run through between these cities without stopping.

Prof. Thomas Shaw, the agent of the Great Northern, who supervises the company's experiment farms in Montana, finding that large numbers of immigrants now pouring into that country do not understand the necessity of cultivating their farms in a way quite different from what they have been accustomed to in states east of the Mississippi, has issued a pamphlet giving outlines of what to do the first three years on a Montana farm so as to best conserve the moisture.

The Central Passenger Association lines have decided to make the same reduced rates this summer from Chicago to the East that they made last summer. The basis will be a fare and a third plus $1.50 for the round trip. On this basis the rate from Chicago to New York and return over the standard lines will be $28.20, over the Michigan Central $26.85, and over the differential lines $25.50. The rates will go into effect June 1 and will remain in effect until September 30. Each ticket will have a 30-day limit. The rates will be in effect in all the territory east of Chicago and north of the Ohio river.

The Interstate Commerce Commission has announced that an investigation of the matter of reduced rates on returned shipments has been assigned for hearing at Minneapolis, Minn., on April 22 and at Chicago on April 25. The testimony will be taken by Examiner Lyon. The investigation has grown out of the action of the carriers in Western Classification territory in withdrawing reduced rates on returned shipments in accordance with a previous ruling of the Commission. The National Industrial Traffic League has appointed the following committee to represent it at these hearings: W. J. Evans, H. C. Barlow, W. D. Hurlbut and C. A. Jennings, of Chicago; C. B. Gregory, of Rockford, Ill.; B. H. O'Meara, of Cedar Rapids, Iowa, and W. P. Trickett, of Minneapolis, Minn.

The General Electric Co., Schenectady, N. Y., has complained to the New York State Public Service Commission against the new national car demurrage rules, which have been put in force at Schenectady by the New York Central and the Delaware & Hudson. The General Electric Co. has in its plant 14 miles of track, seven locomotives and 21 cars, and complains that the railways are unreasonably charging demur-

rage on the General Electric Company's private cars when these cars are in the yards of the G. E. Co. Complaint is also made that notices of arrival of freight are insufficient. The company needs to know the contents of a car and where it came from in order to be able to know which one of the large number of buildings within the plant it should be sent to. Other features of the rules are also declared unjust.

The Interstate Commerce Commission has announced that it will give a hearing in Chicago on April 25 regarding the practice of the railways in granting reduced passenger rates limited to members of particular organizations. The National Association of Letter Carriers has complained to the commission that for its biennial convention at St. Paul, Minn., in September, 1909, it contracted with the Western Passenger Association lines for a rate of a fare and a half for the round trip on condition that 1,000 or more persons attend. Only 888 persons holding the certificates required by the association attended the convention, and its agents, therefore, refused to validate these passengers' tickets so as to entitle them to the reduced rate. It is alleged that 142 persons attended the convention on semi-tourist rates, which differed from those used by other persons attending the convention only in lacking the certificate feature, but that these were not allowed to be counted to make up the necessary 1,000 in attendance. The commission is asked to investigate and to order the roads to refund to persons who attended the convention an aggregate of $5,190.

J. C. Lincoln, president of the National Industrial Traffic League, has issued a circular letter to members of this association impressing upon them the desirability of co-operating with the railways to reduce, as much as practicable, the abuse and misuse of tariffs published by the roads. Last March the Southwestern Tariff Committee and the Western Trunk Line Committee issued notice that after April 1 the practise of distributing railway tariffs free would be discontinued, and that a charge of $1 per issue per calendar year would be made to those desiring to have their names continued on the mailing list. Negotiations between the shippers and the traffic officers of the railways resulted in these orders being rescinded. The National Industrial Traffic League concedes, however, that abuses have crept into the distribution of tariffs. The carriers could, to a large extent, remedy these, Mr. Lincoln says, by a more careful scrutiny of their mailing lists. "The shippers, on the other hand, he adds, "should co-operate with the railways in eliminating the unnecessary expense due to duplication in the distribution of tariffs. Each organization and firm is urged to examine their records and to notify the carriers to discontinue tariffs in which it is not interested; also to direct attention to those addresses which should be discontinued."

The Illinois Manufacturers' Association is conducting a campaign against the advance in coal rates from the coal fields in Indiana and Illinois to Central and Northern Illinois points, which has been announced by the railways. In a circular, John M. Glenn, secretary of the Association, says, "the consumers of coal in Illinois regard the advance as unnecessary, exorbitant and discriminatory; and it has been decided to appeal to the Illinois Railway Commission and request an investigation in order that the maximum rate on the schedule of charges if too high may be reduced." Mr. Glenn's circular is accompanied by a blank petition, which shippers are requested to fill out and send to the Illinois Railway Commission. The petition asks the Commission to "fix maximum and minimum rates which will be fair to carrier and consumer alike, because the advance as proposed will work great and unnecessary injury to the industries of Illinois and the other consumers of Illinois soft coal, and will be a discrimination against the industries of this state in favor of other states of the Union that use Illinois coal." Both the rates which the roads have been charging and the new rates which they propose to put into effect are less than the maximum rates heretofore fixed by the Commission. Mr. Glenn asserts in his circular that the advance in the rates means an increase of at least $2,000,000 a year in the revenue of the carriers. The advances have been published already in the *Railway Age Gazette*, and range from 8 to 12 cents a ton.

In its campaign to stimulate interest in scientific farming, the Pennsylvania Railroad has issued a handsome pamphlet telling what the road is doing to create traffic by co-operating with the farmer. In the last three years the road, we are informed, "has run educational trains and steamboats on practically all of its lines." [The steamboat from Altoona to Pittsburgh must have passed in the night.] It has distributed farming literature, established experimental farms and undertaken the education of its agents in agricultural diplomacy. The pamphlet sums up by saying: "What does it all mean to the railway? It means there will be more fertilizers to haul, more farm implements, more raw material from which these tools are made, more crops to haul and more passengers to carry. * * *" That this conclusion is amply justified is evidenced by the facts, which have been published in the *Railway Age Gazette*, concerning the large increases in shipments of farm produce from southern New Jersey and other regions traversed by Pennsylvania lines. The pamphlet cites striking instances of enterprise on the part of railways which has brought marked benefits to farmers. It was an agent of the Pennsylvania who, in an idle afternoon, developed the traffic in a certain grape growing region where now a thousand carloads are shipped every season. The Florida East Coast Railway, by supplying seed and building side tracks to the farms, developed the pineapple industry in Florida, whence the shipments now amount to a million crates annually. One of the Pennsylvania's "farmers' specials" in three days had audiences aggregating 5,000 men. If any critic is so rash as to claim that farmers cannot be taught much in 40 minutes, the Pennsylvania experts are ready to demolish his claim in short order.

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF DECEMBER, 1909

Name of company.	Adams Express.	American Express.	Canadian Express.	Can. Nor. Express.	Globe Express.	Great Nor. Express.	National Express.	Northern Express.	Pacific Express.	Southern Express.	United States Express.	Wells, Fargo & Co.	Western Express
Mileage of all lines covered: Rail lines	31,027	46,373	7,078	3,198	1,900	7,295	1,094	6,497	22,247	30,721	23,922	56,601	3,452
Other lines	3,461	1,210	2,792	20	.....	211	.....	261	608	1,648	611	5,189	4
Operating revenues:													
Express	$3,408,833	$3,458,650	$238,077	$37,547	$52,987	$257,341	$113,890	$329,379	$896,159	1,680,099	$1,607,032	$2,886,940	$69,070
Misc. transportation	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	163	331
Nontransportation	16,547	108,634	8,448	1,772	519	1,323	599	5,041	11,970	17,721	21,859	47,615	977
T'l receipts operation	3,425,380	3,567,285	246,525	39,319	53,506	258,664	114,490	334,420	908,134	1,697,820	1,628,891	2,934,717	70,378
Exprs. privileges—Dr.	1,735,547	1,604,606	122,744	14,977	26,519	104,021	42,467	159,759	434,094	795,353	746,487	1,393,400	29,660
Total	$1,689,833	$1,962,679	$123,781	$24,342	$26,987	$154,643	$72,023	$174,662	$474,041	$902,467	$882,404	$1,541,318	$40,719
Operating expenses:													
Maintenance	$100,518	$63,267	$1,707	$96	$170	$970	$643	$1,509	$11,012	$18,432	$43,177	$36,564	$647
Traffic	7,986	18,552	1,318	214	1,126	929	.....	2,625	6,507	5,017	20,893	17,575	972
Transportation	1,117,201	1,283,076	78,471	10,620	14,934	55,343	47,635	79,422	240,353	457,446	672,579	924,134	21,059
General	87,400	106,301	8,189	1,385	2,632	3,705	2,990	4,159	14,050	45,554	42,296	63,464	1,609
Total	$1,313,105	$1,471,196	$89,686	$12,316	$18,862	$60,947	$51,267	$87,716	$271,922	$526,450	$778,945	$1,041,733	$24,287
Net operat'g rev. or def.	$376,729	$491,482	$34,096	$12,026	$8,126	$93,695	$20,756	$86,946	$202,119	$376,017	$103,459	$499,584	$16,431
Taxes	12,798	8,207	1,150	130	550	2,752	18	3,500	4,948	11,628	9,204	16,621	455
Operating inc. or loss.	$363,931*	$483,276	$32,946	$11,896	$7,576	$90,943	$20,738	$83,446	$197,171	$364,389	$94,255	$482,963	$15,977

*Includes $21,608, paid Southern Express on account of operation of L. & N. line south of Saxton, July 1st to December 31, 1909.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1910.
(See also issues of April 8 and 15.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	142	$88,203	$30,413	$130,267	$17,051	$19,278	$3,341	$41,267	$5,230	$86,167	$44,100	.....	$4,350	$39,750	$25,419
Alabama Great Southern	309	230,638	68,833	329,194	35,846	60,122	9,571	107,261	11,536	224,336	104,858	—$723	11,808	92,327	13,598
Central Vermont	411	186,363	52,842	259,456	30,710	47,359	7,572	135,105	6,876	227,622	31,834	338	10,116	22,056	—1,102
Chicago & Alton	998	643,105	284,186	1,013,971	92,949	139,004	35,510	436,280	34,801	738,544	275,427	—2,158	49,000	224,269	—59,500
Chicago & Erie	269	378,892	47,323	466,300	32,770	85,649	18,263	188,025	9,072	333,779	132,521	.....	10,938	121,583	81,619
Chicago, Indiana & Southern	340	346,186	16,142	369,129	25,453	59,975	8,604	124,600	7,878	226,510	142,619	—234	13,500	128,885	84,271
Cincinnati, New Orleans & Tex. Pac.	337	558,940	122,069	720,991	80,602	121,193	20,130	194,290	17,711	433,926	287,065	—708	20,000	266,357	74,543
Cleveland, Akron & Columbus	212	141,606	31,171	185,178	33,108	37,546	2,324	59,336	3,518	135,832	49,346	.....	5,000	44,346	3,390
Cumberland Valley	162	169,389	38,811	219,848	23,105	29,142	3,427	73,929	5,569	135,172	84,676	233	4,083	80,826	2,407
Florida East Coast	583	134,796	219,996	405,010	41,795	59,086	6,636	108,022	7,645	223,184	181,826	.....	12,500	169,326	—15,689
Georgia	307	168,950	55,035	238,307	30,090	35,923	9,323	110,803	6,687	192,826	45,481	.....	2,083	43,398	—10,397
Georgia Southern & Florida	395	114,470	58,404	206,744	18,382	48,174	6,563	84,461	8,433	166,014	40,730	.....	8,119	32,611	—16,344
Hocking Valley	350	505,948	51,887	576,868	50,564	109,103	7,535	184,469	10,650	362,321	214,547	—5,516	20,769	188,262	133,268
Iowa Central	558	205,325	34,238	250,906	17,521	43,683	9,914	130,452	9,101	210,671	40,235	.....	7,493	32,742	14,363
Kanawha & Michigan	175	192,070	20,438	216,951	42,068	61,395	1,786	54,312	6,037	165,598	51,353	—25	6,846	44,482	42,029
Long Island	390	198,898	301,350	524,435	86,712	111,398	12,769	298,107	18,756	527,742	—3,307	16,132	33,232	—20,407	6,844
Louisiana Western	198	97,358	51,737	157,255	20,075	26,412	5,209	49,155	6,424	107,275	49,980	—759	5,500	43,721	—33,771
Minneapolis & St. Louis	1,027	233,248	63,953	321,093	32,996	44,627	15,314	170,239	13,955	277,131	43,962	190	17,986	25,785	—3,265
Missouri Pacific	3,287*	1,443,962	302,117	1,945,935	303,830	302,174	57,230	924,764	64,426	1,652,424	293,511	—4,332	79,385	209,794	.....
Morgan's La. & Tex. RR. & SS. Co.	358	227,990	101,173	352,356	48,162	39,223	9,287	151,736	13,729	242,137	110,219	—2,499	17,000	90,720	—5,581
Nashville, Chattanooga & St. Louis	1,230	689,576	182,268	929,281	116,435	138,802	33,552	321,591	23,928	634,308	294,973	—1,388	21,971	271,614	85,657
New Orleans & North Eastern	196	209,539	50,644	286,742	26,479	39,253	7,886	97,189	10,627	181,434	105,308	.....	8,200	97,108	35,249
New York, Philadelphia & Norfolk	112	192,246	22,890	229,797	28,066	40,466	3,406	88,923	9,070	169,931	59,866	.....	6,850	53,016	7,822
New York, Susquehanna & Western	151	140,797	43,890	210,938	17,371	18,683	1,374	78,433	3,994	119,855	91,083	2,982	11,317	76,784	—2,373
Northwestern Pacific	376	73,359	91,369	182,791	38,927	31,815	1,980	78,178	9,504	160,404	22,387	.....	10,988	11,399	14,235
Peoria & Eastern	351	176,210	46,520	239,770	22,647	58,437	5,062	95,023	5,232	186,401	53,369	.....	9,200	44,169	5,726
Pittsburgh & Lake Erie	191	1,062,377	96,068	1,188,226	112,285	106,615	13,019	304,128	20,477	556,524	631,702	—427	28,000	603,275	256,621
Rutland	468	115,402	53,942	193,637	22,232	30,989	5,394	89,911	4,998	153,524	40,113	.....	8,892	31,221	3,923
St. Louis, Iron Mountain & Southern	3,883†	1,578,851	413,915	2,165,272	425,028	310,861	58,937	726,945	75,308	1,597,079	568,193	6,163	78,530	483,500	399
Spokane, Portland & Seattle	420‡	179,635	47,203	237,757	57,374	24,438	3,580	92,143	7,471	185,006	32,751	—688	18,527	33,536	6,067
Toledo & Ohio Central	441	257,301	34,926	303,743	36,316	59,418	5,278	111,533	6,634	219,179	84,564	-1,425	14,564	68,575	42,314
Toledo, St. Louis & Western	451	220,884	28,405	267,328	35,084	44,618	10,883	106,435	9,035	206,055	61,273	.....	13,900	47,373	—19,245
Vicksburg, Shreveport & Pacific	171	71,205	29,525	112,386	21,528	17,655	3,081	36,226	4,845	83,334	29,052	.....	6,300	22,752	5,732
Wabash	2,515	1,568,915	430,391	2,176,373	200,350	321,867	76,090	930,017	65,208	1,593,532	582,841	—4,180	75,538	503,123	179,917
West Jersey & Seashore	356	116,792	167,135	305,944	81,755	46,378	8,051	162,831	9,368	308,383	—2,439	—4,798	20,037	—27,374	23
Wheeling & Lake Erie	458	418,692	32,439	480,389	52,352	92,584	6,650	195,708	13,738	361,032	119,357	27,737	19,804	127,290	54,943
EIGHT MONTHS OF FISCAL YEAR 1910.															
Alabama & Vicksburg	142	$729,422	$321,480	$1,130,383	$171,582	$175,289	$29,647	$345,487	$41,359	$763,364	$367,019	.....	$34,851	$332,168	$112,694
Alabama Great Southern	309	1,781,148	705,626	2,724,188	328,013	620,174	71,734	795,105	73,402	1,888,428	835,760	—$4,273	90,460	741,027	133,672
Central Vermont	411	1,609,098	721,058	2,503,970	289,795	465,799	69,747	1,050,304	58,398	1,914,043	589,927	6,449	80,933	515,443	186,412
Chicago & Alton	998	5,642,291	2,844,666	9,201,831	1,107,338	1,059,477	315,537	3,142,734	245,150	5,870,236	3,331,595	12,179	273,000	3,046,416	—248,653
Chicago & Erie	269	2,617,615	536,364	3,441,882	386,263	715,472	126,794	1,429,741	72,362	2,730,632	711,250	.....	87,508	623,742	310,052
Chicago, Indiana & Southern	340	2,257,111	179,784	2,490,671	343,096	429,307	68,241	832,210	65,036	1,737,890	752,781	166	101,503	651,444	284,436
Cincinnati, New Orleans & Tex. Pac.	337	4,562,696	1,048,082	5,906,037	666,665	1,114,719	155,447	1,606,121	142,638	3,685,590	2,220,447	1,346	160,000	2,059,102	496,593
Cleveland, Akron & Columbus	212	1,194,065	344,229	1,646,416	243,029	403,335	22,522	523,473	30,496	1,222,855	423,561	.....	41,042	382,519	—19,119
Cumberland Valley	162	1,425,801	412,117	1,922,193	249,183	192,197	34,535	570,337	47,769	1,094,021	828,172	4,302	32,669	799,805	64,184
Florida East Coast	583	879,042	752,088	1,883,118	281,098	317,481	38,254	677,248	66,612	1,380,693	502,425	.....	94,267	408,158	199,568
Georgia	307	1,395,684	560,707	2,074,454	259,191	310,346	77,772	799,190	56,346	1,502,845	571,609	.....	16,644	554,965	180,107
Georgia Southern & Florida	395	884,252	491,010	1,597,595	161,138	332,805	45,855	581,935	69,342	1,191,075	406,520	6,442	68,947	344,015	25,104
Hocking Valley	350	4,284,183	599,901	5,048,747	640,195	905,528	60,168	1,406,686	94,840	3,107,417	1,941,330	80,090	170,487	1,850,933	592,679
Iowa Central	558	1,779,076	370,857	2,247,730	281,537	346,632	70,151	945,191	71,142	1,714,653	533,077	.....	59,427	473,650	116,043
Kanawha & Michigan	175	1,580,296	214,226	1,830,730	354,286	417,156	17,743	448,843	35,119	1,273,147	557,583	—212	55,179	502,192	241,164
Long Island	390	1,985,056	3,877,450	6,147,696	638,128	818,176	119,471	2,618,225	151,642	4,345,642	1,802,054	573,445	265,859	2,109,640	580,116
Louisiana Western	198	903,095	412,287	1,382,981	144,015	218,082	45,672	382,166	53,307	843,242	539,739	—1,520	46,138	492,081	—52,431
Minneapolis & St. Louis	1,027	2,260,561	831,895	3,309,698	343,991	383,727	103,855	1,297,086	107,597	2,236,256	1,073,442	—526	153,494	919,422	45,400
Missouri Pacific	3,287*	10,790,636	2,692,440	14,886,614	2,268,833	2,213,637	388,938	5,986,687	415,113	11,273,208	3,613,406	25,330	540,675	3,047,401	.....
Morgan's La. & Tex. RR. & SS. Co.	358	2,417,976	775,623	3,377,502	423,693	378,359	81,225	1,138,445	102,584	2,124,306	1,253,196	—2,563	140,520	1,110,113	240,860
Nashville, Chattanooga & St. Louis	1,230	5,383,502	1,757,316	7,611,259	1,131,368	1,264,877	288,835	2,617,699	182,650	5,485,429	2,125,830	—7,217	165,471	1,953,142	262,019
New Orleans & North Eastern	196	1,663,577	416,578	2,258,244	226,702	350,733	69,505	762,886	83,626	1,493,452	764,792	.....	65,724	699,068	120,134
New York, Philadelphia & Norfolk	112	1,725,499	265,513	2,134,935	211,801	361,633	27,892	758,173	71,245	1,430,744	704,191	.....	51,200	652,991	143,578
New York, Susquehanna & Western	151	1,151,674	425,485	1,773,479	210,284	169,629	12,407	667,158	30,486	1,089,964	683,515	39,979	90,533	553,003	—9,032
Northwestern Pacific	376	867,317	1,072,045	2,106,434	373,216	259,656	20,504	733,595	76,984	1,463,955	642,479	.....	85,869	556,610	134,647
Peoria & Eastern	351	1,565,570	477,737	2,194,073	234,083	396,534	43,285	767,979	40,827	1,482,708	711,365	.....	70,194	641,171	174,915
Pittsburgh & Lake Erie	191	10,298,637	989,042	11,580,304	1,066,641	889,176	109,240	2,468,106	163,530	4,696,693	6,883,610	2,839	154,637	6,726,135	2,766,972
Rutland	468	1,159,783	748,521	2,132,522	295,986	299,981	51,664	776,558	44,289	1,468,478	664,044	.....	79,025	585,019	110,502
St. Louis, Iron Mountain & Southern	3,883†	12,743,568	3,592,962	17,729,825	2,653,099	2,436,199	443,469	5,493,898	546,523	11,573,188	6,156,637	41,198	572,649	5,542,789	713,842
Spokane, Portland & Seattle	420‡	1,544,918	511,230	2,140,683	391,877	218,914	24,933	744,396	52,330	1,432,450	708,233	551	212,237	496,547	387,279
Toledo & Ohio Central	441	2,346,018	423,188	2,888,365	380,710	468,102	44,964	903,313	52,905	1,849,995	1,038,371	58,593	113,895	983,069	18,729
Toledo, St. Louis & Western	451	2,070,989	311,758	2,536,866	297,600	374,878	59,019	821,518	69,919	1,622,934	913,932	.....	97,900	816,032	75,264
Vicksburg, Shreveport & Pacific	171	570,974	322,438	970,705	172,509	173,015	26,763	281,368	35,193	688,848	281,857	.....	52,418	229,439	36,823
Wabash	2,515	13,129,085	4,785,674	19,389,342	2,228,764	2,599,921	616,991	7,246,601	532,861	13,225,138	6,164,204	16,834	549,172	5,598,198	1,160,559
West Jersey & Seashore	356	1,091,569	2,413,962	3,760,565	644,056	442,741	109,561	1,520,070	69,199	2,785,627	974,938	8,969	160,297	823,610	103,467
Wheeling & Lake Erie	458	3,920,946	391,738	4,633,016	457,701	1,015,611	56,225	1,587,098	111,284	3,227,919	1,405,097	72,160	178,330	1,298,926	480,458

*Consolidation of Missouri Pacific Ry. and branches and Central Branch Ry., reported separately prior to August 9, 1909.

†Mileage operated February 28, 1909, 2,608 miles; beginning with February 1, 1910, this company's returns include: Arkansas & Louisiana Ry.; Mississippi River, Hamburg & Western Ry.; Arkansas Midland R.R.; Brinkley, Helena & Indian Bay R.R.; New Orleans & Northwestern R.R.; El Dorado & Bastrop Ry.; Farmerville & Southern R.R.; Little Rock & Monroe Ry.; Arkansas Southwestern Ry.; Coal Belt Ry.; Natchez & Western Ry.; Gardon & Fort Smith R.R. and Gurdon & Fort Smith Northern Ry., all previously reported separately.

‡Mileage operated February 28, 1909, 272 miles.

Proposed Amendment of Long and Short Haul Clause of Interstate Commerce Act.

A conference of presidents, vice-presidents and general counsel of western lines was held in Chicago last week regarding the proposed amendment of the long and short haul clause of the Interstate Commerce act. Amendments have been introduced in both the senate and the house. The amendment introduced by Senator Heyburn, of Idaho, would make section 4 read as follows:

"That it shall be unlawful for any common carrier subject to the provisions of this act to charge or receive any greater compensation for the transportation of passengers or of like kinds of property for a shorter distance than for a longer distance over the same line in the same direction, the shorter being principally included within the longer distance; but this shall not be construed as authorizing any common carrier within the terms of this act to charge or receive as great compensation for a shorter as for a longer distance."

This amendment would radically change the act in two respects. It would strike out the words, "under substantially similar circumstances and conditions," which the Supreme Court has construed to mean that carriers may charge more for a shorter than for a longer haul to meet water competition and controlling competition by other railways. It would also strike out the proviso in section 4 which allows the Interstate Commerce Commission in special cases, after application by a carrier and investigation by the commission, to authorize the carrier to charge less for a longer than for a shorter haul and prescribe from time to time the extent to which the carrier may be relieved from the operation of this section. In other words, the Heyburn amendment and others which are under consideration would establish a hard and fast rule prohibiting the charge for a shorter haul to be, under any circumstances, greater than that for a longer.

The proposition is of special concern to the lines west of Chicago which are largely engaged in transcontinental business and also to the lines in the Southeast where the basing point system of rate-making generally obtains. The officers of the western lines state that the effect of the proposed legislation would be to compel them not, as Senator Heyburn apparently thinks, to reduce their rates to interior points in the West, but to raise them to the Pacific coast, and that the advances to the Pacific coast necessarily would be so great as to preclude the railways from hauling to the coast any commodities except those which can hardly be carried by water no matter how low may be the water rates made on them.

The proposed change would greatly disturb business conditions throughout the South and West and be destructive to the commercial and industrial interests of many places. The western lines probably will offer pretty vigorous opposition to it.

INTERSTATE COMMERCE COMMISSION.

Rates from West Virginia to Windsor, Ont.

Windsor Turned Goods Co. v. Chesapeake & Ohio et al. Opinion by Commissioner Clark.

Reparation awarded where joint through rate exceeded combination of locals. (18 I. C. C., 162.)

Demurrage Charges Rightly Assessed.

Sage & Co. v. Illinois Central. Opinion by Chairman Knapp.

Demurrage which accrued through the failure of a rebilling notice to reach the defendant was held to be properly a charge collectable by the railway. (18 I. C. C., 195.)

Misrouting by Shipper and by Carrier.

Spreckels Brothers Commercial Co. v. Monongahela Railroad et al. Opinion by Chairman Knapp.

In the two cases decided no reparation was allowed where misrouting was due to shipper's mistake and reparation was allowed in the case where misrouting was due to carrier's mistake. (10 I. C. C., 190.)

Rates on Specific Shipments Found Unreasonable.

H. Lorleburg Co. v. New York, Chicago & St. Louis et al. Opinion by Commissioner Lane.

Four shipments from Loraine, Ohio, to Oconomowoc, Wis., and nine shipments from Detroit, Mich., to Oconomowoc were charged unreasonable rates and reparation was awarded. (18 I. C. C., 183.)

No Reparation on Intrastate Shipment.

E. P. Dobbs v. Louisville & Nashville Railroad Company. Opinion by Commissioner Cockrell.

Complainant shipped three carloads of canned peaches from Oakhurst, Ga., to Marietta, Ga., and from thence rebilled one car to Lexington, Ky., and two cars to Cincinnati, Ohio. Held, that the movement from Oakhurst to Marietta was an intrastate movement. Reparation denied. (18 I. C. C., 210.)

Water Rate Not on File.

Milburn Wagon Co. v. Lake Shore & Michigan Southern et al. Opinion by Commissioner Clark.

Reparation is denied on a shipment which moved on a combination of a rail rate that was filed with the commission and water rate that was not filed.

Reparation was awarded on shipments which moved under joint through rates that were higher than the combination of local rates via the same route. (18 I. C. C., 144.)

Routing and Instructions Binding.

Hollingshead & Blei Co. v. Pittsburgh & Lake Erie et al. Opinion by Chairman Knapp.

Direction by a shipper that a shipment be sent from Cleveland, Ohio, to Menominee, Mich., all rail, does not impose on carriers the duty of transporting such shipment via an across-lake route, when both rates are shown in the tariff, although via the latter route a lower rate is applicable.

Rate on Skylight Glass Reasonable.

W. P. Fuller & Co. v. Southern Pacific et al. and 10 other cases disposed of at the same time. Opinion by Commissioner Clements.

Complaint that rough, rolled, ribbed and wired skylight glass when given a specific rate should nevertheless have a lower rate when the tariff contains provision that skylight glass n.o.s. is given a lower rate is not sustained. (18 I. C. C., 202.)

No Discrimination in Demurrage Charges in Ohio.

Friend Paper Co. v. Cleveland, Cincinnati, Chicago & St. Louis. Opinion by Chairman Knapp.

All the railway companies in Ohio attack the state commission's right to prescribe demurrage rules on interstate traffic. The defendant in this case eliminated the average plan for assessing demurrage prescribed by the Ohio commission previous to its elimination by other roads in Ohio. This train of circumstances caused a loss to the complainant but does not afford a legal basis on which refund can be made. (18 I. C. C., 179.)

Higher Rate Southbound Than Northbound.

T. B. Littell v. St. Louis Southwestern et al. Opinion by Commissioner Harlan.

The through fares between Cairo, Ill., and Waco, Tex., having been reduced pending a contest in the courts as to the validity of the 2-cent per mile legislation in Arkansas and Missouri, were later restored when the enforcement of those statutes was enjoined. Because of its unusual size and the complications involved the defendants were unable to reprint the schedule showing the restored northbound fares until some weeks after the southbound fares had been raised to their former level. Although the complainant,

under these circumstances, had enjoyed the advantage of the lower rate on the northbound journey that fact affords no just ground for giving him the advantage of a like rate on the southbound journey. Reparation denied and complaint dismissed. (18 I. C. C., 187.)

Rate on Butter Boxes Unreasonable.

Roach & Seeber Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Chairman Knapp.

Complainant asks that butter boxes should be classified with wooden pails, tubs, etc., under class D rate. The commission finds that most of the articles under class D can be nested, while butter boxes cannot be nested. The commission refused to give butter boxes the class D rate, but finds that the rate of 15 cents per 100 lbs. from Milwaukee, Wis., to Waterloo is unreasonable and should not exceed 9 cents per 100 lbs. (18 I. C. C., 172.)

Attempt to Obtain Low Intrastate Rate Unsuccessful.

Wells-Higman Co. v. St. Louis, Iron Mountain & Southern et al. Opinion by Chairman Knapp.

Shipment was made in a roundabout way with rebilling at Wynne, Ark., at the expressed direction of the complainant, apparently to take advantage of a rate established by the railway commission of Arkansas from Wynne to Horatio. As it turned out, the actual rates charged were considerably higher than if the shipment had been made direct without rebilling, but since this rebilling was ordered by the complainant the complaint is dismissed. (18 I. C. C., 175.)

Switching Charges at Utica Reasonable.

Utica Traffic Bureau v. New York, Ontario & Western. Opinion by Chairman Knapp.

Defendant's charge of 30 cents per ton for switching carloads of coal from the New York Central tracks at Utica, N. Y., to the Utica Steam & Mohawk Valley Cotton Mill in that city, is alleged by complainant to be unreasonable. The Lehigh Valley and New York Central, which transport the coal from Bernice, Pa., at a rate of $1.50 per gross ton, absorb switching charges to the extent of $5 per car, and the amount of switching charges assessed on the 394 cars mentioned in the complaint in excess of the $5 per car absorbed by the line carriers averaged $2.95 per car. The switching tariff, in connection with the tariff of the line carriers, in effect names a through rate from the mine to the mill, and the shipper can complain only of so much of the switching charge as he is required to pay; and the amount actually paid, averaging $2.95 per car, is not found to be unreasonable for the service performed. (18 I. C. C., 168.)

Minimum Rate on Bulky Articles Unreasonable.

S. H. Knox v. Wabash Railroad. Opinion by Commissioner Lane.

The rule in the official classification providing that articles too long to be loaded into a 36-ft. box car through the side door shall be charged for on the basis of 4,000 lbs. minimum weight is held to be unreasonable and reparation awarded. (18 I. C. C., 185.)

Houston Structural Steel Co. v. Wabash Railroad et al. Opinion by Commissioner Prouty.

Rule in western classification applying first class rate and minimum of 5,000 lbs. to articles too large to be loaded through the side door of a 36-ft. box car, or too long to be loaded through the end window thereof, found unreasonable when applied to the shipment of structural steel in this case. Reparation awarded. (18 I. C. C., 208.)

Brunswick-Balke-Collender Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Cockrell.

Reparation awarded for an excessive charge made through the application of a rule providing a minimum weight for articles too bulky to be loaded in a box car through the side door. (18 I. C. C., 165.)

Shipper's Mistake in Routing.

Stone-Ordean-Wells Co. v. Philadelphia, Baltimore & Washington et al. Opinion by Commissioner Prouty.

The Baltimore & Ohio published a tariff showing a rate in connection with the Baltimore & Eastern Shore Transportation Co. from Ridgely, Md., to Duluth, Minn. As a matter of fact the Transportation company had stopped running steamers between Ridgely and a point on the Baltimore & Ohio and had gone out of business, so that it was impossible to make a shipment over the route indicated in the tariff of the Baltimore & Ohio. The complainant was told this, but finding that shipment could be made from Ridgely to Wilmington via the Philadelphia, Baltimore & Washington, and from there to Duluth via the Baltimore & Ohio and the Mutual Transit Co., the shipper ordered the goods sent over that route. The charges over the route via the P., B. & W. were higher than the charges quoted in the B. & O. tariff from Ridgely to Duluth, but the commission holds that since the shipper was notified of the mistake in the B. & O. tariff and persisted in ordering the shipment made, no reparation can be given him for the higher charges made on the shipment moving via the P., B. & W. (18 I. C. C., 160.)

Rates on Ties Unreasonable.

American Creosote Works, Ltd., v. Illinois Central et al. Opinion by Commissioner Cockrell.

When advised that complainant had entered into a contract under which ties were moving on a rate in effect defendants canceled this. It is held that complainant was directly damaged thereby in the matter of car supply. Following the doctrine in *Washer Grain Co. v. M. P.*, 15 I. C. C., 147, and *Joynes v. P. R. R.*, 17 I. C. C., 361, no reparation will be awarded.

Rate charged for the movement of ties from New Orleans to East St. Louis found to be unreasonable and unjustly discriminatory. Reparation awarded.

The difference in the charge for switching at Carbondale, Ill., and New Orleans, La., found not to be unjustly discriminatory.

Practice of defendants of charging complainant a rate per 100 lbs. while at the same time according to others a rate under which the weight of a tie was estimated at 100 lbs. per tie, found to be unreasonable and unjustly discriminatory. Reparation awarded. (18 I. C. C., 212.)

Reparation Justified.

F. R. Penn Tobacco Company v. Old Dominion Steamship Co. et al. Opinion by Commissioner Harlan.

The commission again expresses its appreciation of the importance of the principle that a reduction in rates, standing by itself and unaccompanied by other facts of convincing character, ought not to be accepted either as proving or necessarily tending to prove that previous higher rates were unreasonable; and also its appreciation of the principle that carriers ought not to be discouraged in their efforts to meet the views of shippers by making rate reductions and then being compelled to pay reparation on previous shipments on the basis of the lower new rate.

When, however, the rate actually collected on raw sugar from New York to Reidsville, N. C., is conceded by the defendants to have been "relatively out of line" and "wrong" when considered in connection with the rate then in effect to Winston-Salem and Martinsville, Reidsville being shortly thereafter grouped with those two points under a common rate, the commission is forced to the conclusion that the rate collected was unreasonable. Reparation awarded. (18 I. C. C., 197.)

Division of a Through Rate Attacked.

Copper Queen Consolidated Mining Co. v. Baltimore & Ohio et al. and 16 other cases in which substantially the same complaint was made. Opinion by Commissioner Cockrell.

Complainants ship coke from the West Virginia-Pennsylvania fields to their copper smelters at El Paso, Tex., and

Globe, Ariz. The through rate on this coke at the time complained of was $7.80 per ton to El Paso and $7.95 per ton to Globe. The reasonableness of this through rate is not questioned. The coke moves to El Paso and Globe via Chicago or Chicago rate junctions, the carriers east of Chicago receiving $2.65 of the total $7.80 rate to El Paso. The local rate from the West Virginia-Pennsylvania fields to South Chicago on furnace coal for blast furnaces and for smelting iron ore was at the time of shipment $2.35. Complainants ask reparation for the difference between the $2.65 rate paid on their coal and the $2.35 rate in effect on other coal.

The commission finds that no such reparation can be made. The joint through rates from the ovens to El Paso and Globe were units, and the division of the through rate cannot be made the subject of a complaint such as this. Reparation authorized by the act to regulate commerce is for damages or injuries suffered by complainant, and this commission will not award reparation where the case shows plainly that the demand is not based on a real damage or injury suffered by the shipper. (18 I. C. C., 154.)

STATE COMMISSIONS.

The Public Service Commission of New York, First district (New York City), has written to the Long Island Railroad Company a severe letter concerning the killing of nine persons on the tracks of the road in the three months of December, January and February under circumstances which the road cannot explain. Officers of the company declare that the cause of each of these fatal accidents is unknown. There is no information as to what trains, if any, struck the persons who were killed. The commission says it is impossible to believe that if an examination had been promptly and searchingly made those nine accidents would have remained unexplained. The commission is not willing to assume that absence of full reports from employees affords conclusive evidence that no employee knew anything about the cause of the fatalities.

The New York State Public Service Commission has refused its consent to the abandonment of the station of the New York & Ottawa Railroad at Brandon, Franklin county. Brandon 20 years ago was a village of considerable size, having probably about 1,200 inhabitants. It now consists of a few houses occupied by four families of a total population of between 20 and 25. The nearest railway station to the north is Madawaska, four miles distant, and to the south Bay Pond, 3.7 miles. There is no connection by highway between Brandon and Madawaska and the station at Bay Pond can be reached only by a private road leading across premises owned by William Rockefeller. At the entrance to this private road there is a sign posted saying "Private road, no admittance." There is no access to the station except over this private road. The total passenger receipts for passengers in and out of Brandon for the year ended November 30, 1909, were $455. Passenger trains were stopped at the station 530 times and a total of 954 passengers were handled in and out. Freight revenues from January 13 to November 5, 1909, were only $42. The commission says that if there were a desire to drive out these people of Brandon from their homes, it would be difficult to conceive a more efficacious plan to that end than to discontinue their station. If the station were discontinued they would be compelled to obtain access to the Bay Pond station over the private road of Mr. Rockefeller, and it is not believed to be good policy that people desiring to reach a railway station should be obliged to travel over a private road; the fact that Mr. Rockefeller is willing to allow this private road to be used at the present time for access to the station cuts no figure in the matter.

COURT NEWS.

The supreme court of Colorado, in the case of Derry against the Denver & Rio Grande, has affirmed a verdict for $1,000 damages for injuries due to the mistake or neglect of a porter of the Pullman Company. The court held that the Pullman porter was to be considered as one of the train crew.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. L. Sivley, assistant general solicitor of the Yazoo & Mississippi Valley, with office at Memphis, Tenn., has been appointed general attorney of the Illinois Central, with office at Chicago, succeeding W. S. Kenyon, recently resigned to become assistant to the attorney general of the United States. He will have charge of litigation on the Illinois Central system in the states south of the Ohio river. Mr. Sivley was born near Jackson, Miss., and in 1887 entered the University of Mississippi. He graduated from the legal department of that institution in 1893, after which he was for a number of years engaged in the general practice of law at Oxford, Miss. In 1906 he was elected professor of law in the University of Mississippi, and the next year was appointed assistant general solicitor of the Yazoo & Mississippi Valley.



C. L. Sivley.

William H. Wilson, whose appointment as assistant to the third vice-president of the Northern Pacific, with office at St. Paul, Minn., has been announced in these columns, was born July 20, 1864, at Weatherly, Pa. He received a high school education and began railway work in April, 1881, with the Lehigh Valley Railroad. In 1886 he went with the Dunmore Iron & Steel Company, and was then consecutively foreman, general foreman and master mechanic of that company, the Pennsylvania Coal Company and the Erie & Wyoming Valley Railroad, now a part of the Erie. From January, 1901, to March, 1903, he was master mechanic of the Erie at Dunmore, Pa., when he was transferred to Susquehanna, Pa., where he was in charge of four divisions. In November, 1905, he was appointed superintendent of motive power of the Buffalo, Rochester & Pittsburgh, which position he held until his recent appointment.



W. H. Wilson.

Einar Olsen has been appointed auditor of the Coahuila & Zacatecas, with office at Saltillo, Coahuila, Mex., succeeding E. C. Farrell, transferred.

D. E. Marshall has been appointed a division accountant of the maintenance of way department of the Gulf, Colorado & Santa Fe, with office at Temple, Tex.

T. J. Metzger has been appointed division accountant of

the transportation and maintenance of way departments of the Wheeling & Lake Erie, with office at Canton, Ohio.

C. O. Hunter, general solicitor of the Hocking Valley, with office at Columbus, Ohio, having resigned that office is abolished. John F. Wilson has been appointed solicitor, with office at Columbus, and he will report to the general counsel.

Daniel Willard, president of the Baltimore & Ohio and the Baltimore & Ohio Southwestern, has been elected also chairman of the board of the Cincinnati, Hamilton & Dayton, succeeding Oscar G. Murray, who remains on the executive committee.

George F. Randolph, first vice-president of the Baltimore & Ohio, at Baltimore, Md., has been elected also vice-president of the Baltimore & Ohio Southwestern, in charge of traffic, and George L. Potter, third vice-president of the Baltimore & Ohio, at Baltimore, has been elected also vice-president of the Baltimore & Ohio Southwestern, in charge of operation and maintenance.

Operating Officers.

J. Cannon, superintendent of the Missouri Pacific-Iron Mountain system at De Soto, Mo., has had his office changed to Poplar Bluff, Mo.

A. J. Bell has been appointed inspector of station service, Wheeling system, of the Baltimore & Ohio, with office at Wheeling, W. Va., reporting to the general superintendent.

L. C. Ullrich, assistant to the general manager of the Southern Railway, at Washington, D. C., has resigned to go to the Scullin-Gallagher Iron & Steel Co., with office at New York.

E. A. Dewey has been appointed superintendent of the Mexico North Western, with office at Chihuahua, Mex., succeeding E. Dimick, resigned to go with the National Railways of Mexico.

C. P. Bemis, trainmaster of the Chicago & Alton at Roodhouse, Ill., has been appointed superintendent of terminals at East St. Louis, Mo., succeeding T. M. Connelly, transferred. The jurisdiction of J. M. Baths, trainmaster at Dwight, Ill., has been extended to Roodhouse.

J. W. Adams, station master of the Baltimore & Ohio at Baltimore, Md., has been appointed inspector of passenger service, with office at Baltimore. Mr. Adams will have supervision over employees in passenger service and the equipment used on such trains, reporting direct to the head of the operative department.

A. K. Stone, trainmaster of the Central division, Isthmian Canal Commission, has been appointed master of transportation of the Panama Railroad, succeeding F. R. Blunt, trainmaster, at Cristobal, Canal Zone, Panama, resigned, and the office of trainmaster has been abolished. The agents heretofore reporting to the general superintendent will in future report to Mr. Stone.

J. Donahue, trainmaster of the Indiana division of the Baltimore & Ohio Southwestern at Cincinnati, Ohio, has been appointed superintendent of the Illinois division, with office at Washington, Ind., succeeding J. B. Carothers, promoted. F. M. Curry, assistant trainmaster of the Ohio division, at Parkersburg, W. Va., succeeds Mr. Donahue, and F. B. Mitchell has been appointed from the general superintendent's office to succeed Mr. Curry.

Traffic Officers.

P. A. Ziegenfuss has been appointed a freight and passenger agent of the Rock Island Lines, with office at Oakland, Cal.

T. T. Herndon has been appointed assistant general claim agent of the Missouri, Kansas & Texas, with office at Greenville, Tex.

W. C. Kilgore has been appointed a commercial agent of the Central of Georgia, with office at Birmingham, Ala., succeeding S. E. Cowin, resigned.

H. S. Mattes has been appointed a commercial agent of the Lehigh Valley, with office at Easton, Pa., and the office of traveling freight agent at that place has been abolished.

G. H. Hitchcock, Jr., has been appointed general freight and passenger agent of the Salt Lake & Ogden, with office at Salt Lake City, Utah, succeeding F. H. Worsley, resigned.

F. A. Brennan, traffic manager of the Licking River Railroad at Cincinnati, Ohio, has been appointed district agent of the Registered Tracer Company, with office at Cincinnati.

J. R. Cahill, city passenger agent of the Chicago, Rock Island & Pacific at Boston, Mass., has been appointed district passenger agent, with office at Pittsburgh, Pa., succeeding L. H. McCormick, promoted.

W. I. Laird, general agent of the St. Joseph & Grand Island at Chicago, has been appointed general agent in the freight department of the Chicago Great Western, with office at Chicago, succeeding J. C. Ilse, deceased.

J. B. Marshel, commercial agent of the Chicago, Milwaukee & St. Paul at St. Louis, Mo., has been appointed commercial agent at Dallas, Tex., succeeding M. F. Smith, resigned to accept service with another company.

E. C. Farrell, auditor, general freight and passenger agent of the Coahuila & Zacatecas, at Saltillo, Coahuila, Mex., has been appointed traffic manager, and the office of general freight and passenger agent has been abolished.

G. W. Quackenbush, having resigned as assistant general freight agent of the Chicago & Alton at Springfield, Ill., that office is abolished, and O. E. George is appointed general agent in charge of freight traffic, with office at Springfield.

George C. Whitney has been appointed a soliciting freight agent of the Queen & Crescent Route, with office at Dallas, Tex. A. C. Valentine has been appointed a traveling freight agent of the Queen & Crescent Route, with office at Dallas, Tex.

William H. Jarvis has been appointed a traveling freight agent of the Baltimore & Ohio, with office at Baltimore, Md., and J. L. Hayes has been appointed a commercial freight agent, with office at Wilmington, Del., succeeding J. Percy White, transferred.

Oscar A. Constans, general freight agent of the Baltimore & Ohio at Pittsburgh, Pa., has been appointed western freight traffic manager, with office at Chicago. He will have general charge of freight traffic of the lines west of the Ohio river and of the Baltimore & Ohio Chicago Terminal Company.

T. J. Walters, commercial freight agent of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed division freight agent at Pittsburgh, succeeding D. G. Gray, promoted, and N. L. Guilford has been appointed a traveling freight agent, with office at Huntington, W. Va., succeeding J. M. Andrew, resigned.

J. S. McCrea, New England freight agent of the Lehigh Valley at Boston, Mass., has been appointed a commercial agent, with office at Buffalo, N. Y. J. K. Dyer succeeds Mr. McCrea, with office at Boston. R. K. Barton, division freight agent at South Bethlehem, Pa., has been appointed assistant general freight agent, with office at New York, and Oliver M. Barres succeeds Mr. Barton, with office at South Bethlehem.

J. S. Carter, general agent, passenger department, of the Canadian Pacific, at Spokane, Wash., has been appointed city passenger agent at Winnipeg, Man. George A. Walton, district passenger agent at Brandon, succeeds Mr. Carter. J. E. Procter, district passenger agent at Calgary, Alb., succeeds Mr. Walton, at Brandon, and R. G. McNiellie, district passenger agent at Nelson, B. C., succeeds Mr. Procter, with office at Calgary. W. G. Wells, traveling passenger agent at Brandon, succeeds Mr. McNiellie, with office at Nelson.

D. G. Gray, division freight agent of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed general freight agent in that city, succeeding O. A. Constans, promoted. Mr. Gray was born on May 15, 1869, at Columbus, Ohio, and began railway work as a messenger on the Baltimore & Ohio, November 1, 1887. After serving in various clerical positions in the division freight office at Columbus, he was appointed chief clerk on June 1, 1896, and in July of the following year he

was promoted to chief clerk of the general freight office at Pittsburgh. In June, 1902, he was transferred to Columbus as division freight agent, and since July 1, 1905, was division freight agent at Pittsburgh, from which position he has just been promoted.

Engineering and Rolling Stock Officers.

The office of P. Carroll, division engineer of the St. Louis, Iron Mountain & Southern at De Soto, Mo., has been changed to Poplar Bluff, Mo.

J. B. Carothers, superintendent of the Illinois division of the Baltimore & Ohio Southwestern at Washington, Ind., has been appointed chief engineer maintenance of way, succeeding Earl Stimson, promoted.

Le Grand Parish, superintendent motive power of the Lake Shore & Michigan Southern at Cleveland, Ohio, has resigned to become president of the newly formed American Arch Company, New York.

T. J. Hamilton has been appointed a district master mechanic of the Chicago, Milwaukee & Puget Sound, with office at Deer Lodge, Mont. He will have charge of the line between Harlowton, Mont., and Avery, Idaho.

M. V. Hynes, division engineer of the Cincinnati, Hamilton & Dayton at Indianapolis, Ind., has been appointed acting engineer maintenance of way, with office at Cincinnati, Ohio, succeeding J. Tuthill, assigned to other duties.

R. H. Ford, principal assistant engineer of the Missouri Pacific-Iron Mountain system at St. Louis, Mo., has been appointed assistant to the chief engineer maintenance of way, with office at St. Louis, Mo., succeeding C. J. Welch, resigned. H. E. Hale succeeds Mr. Ford.

W. H. Williams, master mechanic of the Buffalo, Rochester & Pittsburgh, at East Salamanca, N. Y., has been appointed master mechanic of the Middle and Pittsburgh divisions, with office at Du Bois, Pa., and Harry Sneck has been appointed master mechanic of the Buffalo and Rochester divisions, with office at East Salamanca.

A. S. Kent, division engineer of the Chicago, Indianapolis & Louisville at Chicago, has been appointed engineer maintenance of way, with office at Chicago. Anton Anderson has been appointed division engineer of the First and Second divisions, with office at La Fayette, Ind., succeeding W. A. Wallace, resigned.

P. Gratton, roadmaster of the Kansas City Southern at Kansas City, Mo., has been appointed a general roadmaster in charge of the Kansas City terminals and the Northern division, with office at Kansas City. J. Gratton, roadmaster at Neosho, Mo., has been appointed a general roadmaster in charge of the system south of Mena, Ark., including the Texarkana & Ft. Smith Railway, with office at Texarkana, Tex.

James F. DeVoy, mechanical engineer of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., has been appointed an assistant superintendent of motive power, with office at Milwaukee, and J. J. Connors, district master mechanic at Dubuque, Iowa, has been appointed an assistant superintendent of motive power, with office at Dubuque. Charles H. Bilty, draftsman, succeeds Mr. DeVoy, and Walter Liddell, general foreman in the locomotive department at Dubuque, succeeds Mr. Connors.

OBITUARY.

William A. Hart, division superintendent of the Great Western Railway of England, died recently at London, England, at the age of 65 years. Mr. Hart had been connected with this railway company for more than 50 years.

Charles O. Johnson, vice-president and general manager of the Winona Interurban Railway Co., died recently at Pittsburgh, Pa., of heart disease, at the age of 55 years. Mr. Johnson was formerly in the traffic department of the Chicago Great Western.

Railway Construction.

New Incorporations, Surveys, Etc.

Arizona, Mexico & Gulf.—This company was incorporated in Arizona last month, and locating engineers are now in the field. Arrangements are being made for the early construction of the line. The projected route is from a point west of Winkelman, Ariz., on the Arizona Eastern, southwest to Port Lobos, on the Gulf of California in Mexico, about 210 miles. There is to be a branch from Phoenix southeast, crossing the main line, thence to Silverbell, and another branch from a point on the main line, south of the first branch crossing, northeast to Tucson. The Arizona-Mexico Construction Co., 11 Pine street, New York City, was organized under the laws of Arizona for the purpose of constructing the line. The construction company expects to ask bids for the work in May or June. The line is to connect with the Arizona Southern, but will be built by a separate company. B. P. Cheney, president, 81 Ames building, Boston, Mass.; Victor L. Mason, vice-president, New York. (April 15, p. 1021.)

Arizona Southern.—See Arizona, Mexico & Gulf.

Baltimore & Ohio.—An officer writes that the only extension work to be carried out by this company along Lost Creek valley, W. Va., will be a single-track line, one mile long, to the mine of the Upper Lehigh Coal Co.

Boston & Maine.—See New York, New Haven & Hartford.

Brownwood Southwestern.—An officer writes that grading contracts are to be let May 1 and construction is expected to be started in about 30 days. The projected route is from Brownwood, Tex., southwest to Rockwood, 30 miles. The route has not yet been definitely located. The company will carry out the track laying with its own men. There will be three trestles. R. A. Love, president, and A. B. Carson, engineer, Brownwood.

Canadian Pacific.—See an item in regard to this company in Railway Financial News.

Cheat River & Monongahela Valley.—An incorporator writes that this company was chartered in West Virginia to build from near Albright, Preston county, W. Va., northwest to the West Virginia-Pennsylvania state line at a point near Cheat Haven, Pa., about 20 miles. The company is not ready to give out additional information at the present time. E. N. Lantz, Kingwood, W. Va., may be addressed.

Chicago & Northwestern.—See Wisconsin Roads.

Chicago, Burlington & Quincy.—The main line between Galesburg, Ill., and Bushnell, 25 miles, will be double-tracked this year. Work was begun last fall on the building of 50 miles of double track on the La Crosse division, which extends from Savanna, Ill., to St. Paul, Minn., and this 50 miles will be finished this year.

Coos Bay, Oregon & Idaho.—An officer writes that the first 100 miles has been located from Marshfield, Ore., on Coos bay, east to Roseburg. The line is eventually to be extended east to Boise, Idaho. Grading contracts will not be let before July of this year. The line will cross the coast range with a 1 per cent. grade and 6 per cent. maximum curvature. Part of the work will be heavy rock work, with several short tunnels. On the first section of 100 miles the line will pass through heavy timber lands and coal fields. H. Clarke, president; F. A. Haines, chief engineer, Marshfield.

Easton & Washington Traction Co.—See Northampton Traction Co.

Elgin, Joliet & Eastern.—This company is to double-track its line from Joliet, Ill., east to South Chicago. The yards at Joliet are to be enlarged and additional car shops and coal chutes put up. Extensive improvements will also be made at Waukegan.

Grand Trunk.—According to press reports, surveys are now being made by the Southern New England Railway Company for the proposed line from Palmer, Mass., southeast to Providence, R. I., and plans for the terminals are being made. (April 15, p. 1015.)

Gulf Coast & Provident City.—The Railroad Commission of Texas has authorized this company to issue bonds to pay

for the first 31 miles of line north from Pierce, Tex., which is on the Southern Pacific. Contracts have been let and grading is to be started probably in June on a line from Pierce, north to a connection with an east and west line to be built from Glen Flora, on the Gulf, Colorado & Santa Fe, west to Provident City. Emil Reinbold, chairman and president, Kansas City, Mo. (April 8, p. 970.)

Hudson & Manhattan.—An officer writes that the only work now being carried out in the borough of Manhattan by this company is on the extension of the subway from Twenty-seventh street, under Sixth avenue, to Thirty-third street, with stations at Twenty-eighth street and Thirty-third streets. The work is being done by the Degnon Contracting Co. (Sept. 3, p. 426.)

An officer is quoted as saying that it is expected to open the extension from Twenty-third street to Broadway and Thirty-third street about October 1. The station at Thirty-third street will be about 800 ft. from the great new station of the Pennsylvania. When this part of the work is finished the company will be in a position to proceed with the construction of the extension north and east to the Grand Central Terminal at Forty-second street and Fourth avenue, for which a franchise was secured in May, 1909. The majority of the property owners' consents have been obtained. Regarding the proposed line to Newark, N. J., over the Pennsylvania's tracks the Hudson & Manhattan will have very little construction work to do. By agreement with the Pennsylvania through trains are to be run between the Hudson Terminal station in Manhattan and the Pennsylvania station in Newark. The agreement provides that the Hudson & Manhattan will furnish the track facilities between the Hudson Terminal and Summit avenue, Jersey City, from which point the tracks of the Pennsylvania will be used to Newark.

Intercolonial.—An officer writes that the contract recently let for a branch between Georges river, N. S., and Sydney Mines, 9.09 miles, was given to D. G. Kirk, Antigonish, N. S. The work will be light. Maximum grades will be 1 per cent.; maximum curvature, 3 degrees. There will be three steel bridges. (Apr. 8, p. 970.)

Lehigh Valley.—According to press reports, this company will start work soon on a classification yard at Hazel Creek Junction, Pa., a short distance from Weatherly.

Maine Central.—A contract has been given to the Fletcher-Lahey Co., Boston, Mass., for the elimination of the Raines hill crossing in Augusta, Me., and work is now under way. The cost of the improvements for abolishing this dangerous grade crossing is to be paid for as follows: The city of Augusta and the Lewiston, Augusta & Waterville Street Railway are each to pay 15 per cent., not exceeding $15,000; the state of Maine to pay 25 per cent., not exceeding $25,000, and the Maine Central will pay the rest of the cost.

New York Central & Hudson River.—An officer writes that the only improvement now being carried out at Utica, N. Y., is in connection with the elimination of the Genesee street crossing.

New York, New Haven & Hartford.—An officer writes that an investigation of the line from New Haven, Conn., northeast to Middletown is being made, with a view to future double-tracking. The construction of the new bridge over the Connecticut river at Middletown has been authorized, and work will be started in the near future. Regarding the new construction work to be carried out on the Boston & Maine in Vermont, to complete the line north to Sherbrooke, Que., we are told that the New Haven now has a through line to Sherbrooke. The lines now being surveyed will give it a line under its own control. The present route is over a 10-mile section between South Vernon and Brattleboro, belonging to the New London Northern, which is a part of the Central Vermont, and a 14-mile section between Windsor and White River Junction, owned by the Central Vermont. The construction of new lines on these two sections will enable the line to be handled much more efficiently and economically. (April 15, p. 1016.)

New York Subways.—Public hearings are to be held by the New York Public Service Commission, First district, on May 9 and 16, on the forms of contracts for the construction of new subways.

Northern Pacific.—According to press reports, a general contract has been given to Guthrie & Co., St. Paul, Minn., to build from Pingree, N. D., west to Wilton, about 90 miles. Sub-contracts are said to be let to Edward Sweringen, New Salem, N. D., and to James Tobia, Seattle, Wash., which calls for the completion of the work by October 1. Track laying and bridge building will follow the completion of the grading work as rapidly as possible. (Oct. 29, p. 828.)

Northampton Traction Co.—This company, operating a line from Easton, Pa., north via Nazareth to Bangor, with connections to Portland, is planning to build a four-mile extension from Portland north to the Delaware Water Gap. Such a line would complete electric line connections from Philadelphia north to Stroudsburg. Arrangements are said to be made to consolidate this company with the Easton & Washington Traction Co., which operates a line from Phillipsburg, N. J., northeast to Port Murray, 18 miles, and proposes to extend east, to obtain connections across the state of New Jersey to Jersey City.

Oklahoma City & Suburban (Electric).—An officer writes that contracts have been let to John Alley and to Matt Corrigan, both of Oklahoma City, Okla., to build lines in Oklahoma City, also from Britton, north to Edmund, and from a point between Oklahoma City and Greeley, south to Moore. Track has already been laid on 10 miles. W. A. Haller, Oklahoma City, may be addressed.

Okmulgee & Coalton.—Incorporated in Oklahoma with $50,000 capital and office at Okmulgee, Okla. The company plans to build from Okmulgee to Coalton, about eight miles. The estimated cost of the line is $150,000. The directors include: W. J. Cook, Muskogee; C. S. Dawley, N. D. Boyd, T. J. Baker, Walter W. Martin, E. F. Gill, A. F. Seidler, Leo O. Voorhis, G. W. Mecklin, A. D. Kennedy, John A. Belford and R. D. Carpenter, all of Okmulgee.

Oregon Short Line.—An officer writes that surveys have been made for an extension of the present second-track from Salt Lake City, Utah, north to Farmington, but it is undecided whether this work will be carried out during 1910.

The Salt Lake & Idaho was recently incorporated to build from a point on the Ogden-Lucin cut-off at Saline, Utah, north to Minidoka, to connect with the Oregon Short Line, about 150 miles. An officer writes that the projected route has not been definitely decided upon, and it is uncertain when the line will be built. (Apr. 1, p. 919.)

Work is now under way by the Utah Construction Co., Ogden, Utah, on a short branch from Vail, Ore., northwest to Brogan, 23.8 miles, and it is expected to have the work finished in the near future. An officer writes regarding the report that plans were made by the Southern Pacific to build from Vail, southwest to Klamath Falls, 260 miles, air line, that there is no prospect of doing any work in the immediate future on such a line. If an extension is built from Vail, westerly into central Oregon, it will be over an entirely different route from the line now under construction to Brogan. (Dec. 10, p. 1168.)

Oswego, Columbus & Cherryvale (Electric).—Organized in Kansas, with $50,000 capital and office at Oswego, Kan. The plans call for a line from Columbus west to Cherryvale, 47 miles. S. B. Miller, Oswego; D. Christman, W. J. Jones, G. Torbert, Altamont; D. Dunbar, Hallowell, and G. A. Mitchell, Cherryvale.

Payette Valley.—A contract is said to have been given to the Western Engineering Co., Emmett, Idaho, to build the 19-mile extension in Idaho. The company operates a 13-mile line from Payette, Idaho, southeast to New Plymouth. (March. 25, p. 850.)

Pennsylvania.—See Hudson & Manhattan.

Pensacola & Southwestern.—Organized in Louisiana, with $50,000 capital, to build from Millview, Fla., west via Lillian, Ala., to Point Clear, on Mobile bay, about 40 miles. The in-

corporators include: C. Barclay, Lillian; J. MacDonald and W. D. Stapleton, Bay Minette, Ala.

Portland, Eugene & Eastern (Electric).—According to press reports, financial arrangements have been made to build an extension through Eugene, Ore., thence east to McKenzie valley. It is expected that work will be started soon on the first section of a line between Eugene and Salem, as far north as Junction City, about 15 miles. The project to build a five-mile loop line around College hill, in the Southern part of Eugene, has been abandoned for the present, but may be taken up later on. Work is now under way by L. N. Roney on a large bridge over the Williamette river at Springfield, and a large power plant is being put up at Martins Rapids on the McKenzie river. (Jan. 28, p. 209.)

Quanah, Seymour, Dublin & Rockport.—Incorporated in Texas with $500,000 capital and office at Austin, Tex. The plans call for a line from the Texas-Oklahoma state line, five miles north of Quanah, southeast via Austin to Rockport, on the gulf coast, about 500 miles. The directors include: L. E. Walker, Marshall; W. R. Davie, H. E. Ford and A. J. Eilers, Austin; H. Koch, Quanah; G. S. Plants, Seymour: C. G. Johnson, Rockport, and M. C. Witchur, Dallas. Bonuses aggregating several hundred thousand dollars are said to have been subscribed in aid of the proposed line by residents of towns along the route.

St. Louis & San Francisco.—A grading contract is said to have been given to Kahmann & McMurray, and work is to be started at once on the Menardville end of the extension being built from Brady, Tex., southwest to Menardville, about 30 miles. It is expected to have the line opened by January, 1911. (March 11, p. 547.)

Salt Lake & Idaho.—See Oregon Short Line.

San Antonio & Aransas Pass.—This company has about finished the new grade from Altair, Tex., east to the Colorado river. This change was made necessary to reach the new bridge which is to be built over the river. The old bridge has been bought by the county and will be converted into a highway bridge. (See Altair, under Railway Structures, March 25, p. 853.)

San Diego & Arizona.—The Publicity committee of the Panama-California Exposition at San Diego, Cal., writes that surveys have been made by the San Diego & Arizona from the shores of San Diego bay east to the interior of the Imperial valley, about 150 miles, to which point it is expected to have the line in operation by 1911. An extension is to be built east to Yuma, Ariz., where connection will be made with the Southern Pacific, in all 220 miles. Track has been laid from San Diego south for 17 miles along the coast via Tia Juana to a point in Mexico, at the first crossing of the Tia Juana river, at which place a bridge is now being built. This bridge is to have a total length of 1,050 ft., with a ballasted deck structure on creosoted piling. The line is then to run southeasterly 10 miles to a point seven miles south of the international boundary, then through Matanuco canyon, continuing northeasterly 32 miles to a point near the east end of the Tecata valley, where it will recross the international boundary into California. From this point the route parallels the international boundary to the Jacumba valley, then runs north about 12 miles, thence down the Carrizo canyon and easterly to Imperial valley. There will be some long tunnels, including one stretch of 50,000 ft. in the mountain section, and a large number of bridges. In addition to the long bridge at the first crossing of the Tia Juana river there will be a steel viaduct at the second crossing, with concrete piers, 510 ft. long and 60 ft. above the river bed at the highest point. A mile east of this viaduct a similar structure will be put up, 180 ft. long, and in this section two tunnels are to be bored, one of which is to be 200 ft. long and the other 325 ft. long. The surveys for the line have cost $200,000 and over $1,000,000 has been paid for the right-of-way. It is expected to have the line finished to Yuma by 1913. The estimated cost of the line is $7,500,000. (Dec. 24, p. 1262.)

San Luis Southern.—This road has been finished on the first section from Blanca, Costilla county, Colo., to a point in southern Colorado. The line is to be extended south to Santa Fe, N. Mex. An extension is projected east to Trinidad, about 40 miles. L. D. Blauvelt, general manager and chief engineer, Blanca. (July 30, p. 215.)

Sioux Falls & Western.—According to press reports from Sioux Falls, S. D., surveys for this line will be started at once. The projected route is from Sioux Falls, west to Wheeler in Charles Mix county, on the Missouri river, about 125 miles. R. F. Brown and G. T. Blackman, Sioux Falls, are incorporators. (Mar. 18, p. 751.)

Southern New England.—See Grand Trunk.

Southern Pacific.—See Oregon Short Line.

Spokane International.—The Coeur d'Alene & Pend d'Oreille has been incorporated in the state of Washington with $600,000 capital and office at Spokane, Wash. The plans call for lines as follows: From the Spokane International near section 23, township 51, range five, west; southeasterly to Coeur d'Alene lake, and another line from section 33, township 53, range 3, west, 15 miles to Pend d'Oreille lake, also other branches and extensions in Idaho, Montana and Washington. The incorporators are: Austin Corbin, Albert Allen and George H. Martin.

Temiskaming & Northern Ontario.—An officer is quoted as saying that plans have been made for extensions and improvements. Contracts are to be let soon for new bridges. A new steel bridge is to be built to replace the present structure at Wild Goose. Double-tracking work is now under way between Cobalt, Ont., and North Cobalt, and new stations are to be put up at Matheson and at Cochrane. (Feb. 25, p. 429.)

Vancouver, Tabasco & Campeche Railway Construction Co.—Organized to build the proposed line from Santa Lucretia, Mex., at the junction of the Vancouver & Isthmus and the Tehuantepec National railways, to Campeche, Yucatan, at the western terminus of the United Railways of Yucatan, for which concession has been granted by the federal government. A company is also being organized under the laws of New Jersey by New York and London capitalists to finance the project. The company will have nine years in which to complete the line. A branch may be built to San Juan Bautista, and another from some point on the main line north to the port of Coatzacoalos. The organizers of the construction company are residents of Mexico and include: D. Chapeaurouge, J. J. Lemmens, J. W. Johnstone, L. Van Antwerp, K. Heynan, William P. Wood and some of the people identified with S. Pearson & Sons, Ltd. (April 1, p. 918.)

Western Washington Railway & Navigation Co.—Surveys are said to be made from Aberdeen, Wash., northeast to Colby, 78 miles. C. C. Quackenbush, president, Aberdeen.

Wisconsin Roads.—John J. O'Heron & Co., Chicago, has been given a contract for permanent work on the Galena, Madison, Iowa and the I. & M. divisions of the Chicago & Northwestern. There are 55 structures on this work and the contract includes pile driving, excavation, piers and culverts.

The new line short line for the Chicago & North Western to Minneapolis, Minn., and St. Paul, via Milwaukee, Wis., is to be built to relieve congestion on the Wisconsin divsion. The line will be 177 miles long, involving the laying of about 220 miles of track. From the Northern Wisconsin division at a point near Lake Michigan, eight miles north of Milwaukee, a double-track line will extend northwest about 43 miles to Clyman, which is on the line between Fond du Lac and Janesville. A double-track connection, eight miles long, will be made to the Madison division directly west of Milwaukee. From Clyman a single-track line will be built northwest to the eastern end of the Necedah branch, about 90 miles, and the branch from Necedah to Stowell, which is 13 miles, will be reconstructed and form part of the new line. From Stowell a single-track 23-mile line will be laid west to Sparta, on the main line, to the northwest. All the bridges and waterway openings are to be of permanent construction. The tracks will be laid with heavy steel, and will be heavily ballasted. (April 8, p. 969.)

Railway Financial News.

Buffalo & Susquehanna.—A protective committee, consisting of William Salomon, chairman; Gordon Abbott, Alexander Brown, Harvey E. Fisk, Benjamin Strong, Jr., Asa S. Wing, with H. G. Henry, secretary, has been formed. The committee asks holders of the first mortgage 4½ per cent. bonds of 1903 to deposit their bonds with the Bankers' Trust Co., New York. If a reorganization plan is prepared, depositing bondholders will be given three weeks in which to withdraw their bonds if they disapprove of the plan. The Buffalo & Susquehanna is one of the properties in which Fisk & Robinson, who failed recently, were largely interested.

Canadian Pacific.—The $37,000,000 realized from the sale of new stock is to be used for double-tracking existing lines, enlarging stations and general improvements, and not for building new mileage. The 600 miles of new single-track now being built is to be paid for from the sale of the debenture stock.

Chicago, Milwaukee & St. Paul.—A press despatch from St. Joe, Idaho, says that the Milwaukee Land Co., which is a subsidiary of the C., M. & St. P., bought timber lands in Washington, along the line of the Pacific coast extension before this road was built, paying in the neighborhood of $12,000,000 for them, and that these lands are now worth in the neighborhood of $30,000,000. The Milwaukee Land Co. is the holding company for all of the land owned by the St. Paul, but outside of this timber land in Idaho and Washington these holdings are not extensive. Of the stocks and bonds owned, carried on the balance sheet at $115,000,000, it is supposed that $100,000,000 is accounted for by first mortgage bonds of the Chicago, Milwaukee & Puget Sound.

Cincinnati, Hamilton & Dayton.—Harry Bronner has been elected a director to represent the 4½ per cent. noteholders, succeeding H. S. Redmond, deceased.

Grand Trunk Pacific Branch Lines.—The Grand Trunk is offering in London £1,270,500 ($6,352,500) 4 per cent. first mortgage bonds, due 1939, of the Grand Trunk Pacific Branch Lines Co., guaranteed principal and interest by the province of Saskatchewan. The offering price is £98 10s. per £100 bond, or 98½.

Kansas City, Mexico & Orient.—P. H. McMillan has been elected a director of the Kansas City, Mexico & Orient.

Lake Shore & Michigan Southern.—*The Commercial and Financial Chronicle* says that the total amount of Lake Shore notes recently sold in Paris was $8,500,000. The notes run for less than one year and bear interest at 4 per cent.

Metropolitan Street Railway (New York).—The property is advertised to be sold under foreclosure of the general collateral trust mortgage on May 12. The upset price is fixed at $10,000,000.

Northern Pacific.—The Northwestern Improvement Co. has filed a certificate in New Jersey showing that $6,775,000 capital stock has been paid in. The Improvement company was incorporated a number of years ago. All its stock is held by the Northern Pacific. It was from the profits of this Improvement company that 11.26 per cent. extra dividend was declared in 1908 on Northern Pacific stock. The *Wall Street Journal* says that contrary to common belief, the property assets of the Improvement company were not touched when the big distribution was made, and that the Improvement company now holds valuable coal properties and some timber and other lands.

Southern Railway.—George F. Baker, Jr., has been elected a director, succeeding James T. Woodward, deceased.

Terminal Railroad Association of St. Louis.—At the annual meeting the following new directors were elected: C. S. Clarke, to succeed A. G. Cochran; C. R. Gray, St. Louis & San Francisco, to succeed A. J. Davidson; W. L. Park, Illinois Central, to succeed I. G. Rawn, and F. O. Melcher, Rock Island, to succeed H. U. Mudge.

Wabash-Pittsburgh Terminal.—Pittsburgh holders of the first mortgage bonds say that they intend to form a protective committee to look out for the interests of the first mortgage Wabash-Pittsburgh Terminal bonds, independently of the committee of which the president of the Central Trust Co. of New York is chairman. The Pittsburgh bondholders have sent out a circular letter saying that they intend to employ counsel and to ask other bondholders to agree to a first assessment of 1¼ per cent. to defray expenses. The circular letter calls attention to the fact that the first mortgage bonds are "fully secured by traffic and trackage contracts between the Wabash Railroad, the Wheeling & Lake Erie and the Terminal Company."

"The Central Trust Co., as the trustees of $12,000,000 of alleged outstanding general mortgage bonds of the Wheeling & Lake Erie that are held in the interest of the Wabash Railroad as collateral for $8,000,000 of notes of the Wheeling & Lake Erie, originally guaranteed and now owned by the Wabash, is claiming in the pending proceeding that the trackage and traffic agreements above referred to are subject to this mortgage, and is not only seeking to deprive the Wabash Terminal first mortgage bondholders of the security of these agreements, but to cut out the stock ownership of the Wheeling Co. by a foreclosure.

"The president of the Central Trust Co. is, as you know, the chairman of the first mortgage bondholders' committee, and the distinguished counsel who are advancing the claim of the Central Trust Co. that the first mortgage bondholders are not entitled to the security of these agreements and are seeking to cut out the stock ownership in the Wheeling Co., are the same as the counsel for the bondholders' committee, whose duty it is to sustain those agreements and protect in every way the interests of the Terminal bondholders.

"In calling attention to this manifest inconsistency, we do not for a moment intend to reflect upon any of these eminent gentlemen. We are merely performing an unpleasant duty in explaining our reason for having reached the conclusion that there should be independent action, which we have no doubt will be quite a relief to the bondholders' committee. * * *"

The Railway Law of Costa Rica.

On December 8, 1909, the President of Costa Rica promulgated the railway law, which provides that no railway for the transportation of passengers and freight shall be built in the Republic without the consent of the congress, and that on the expiration of a railway concession, which in no case shall be granted for a longer term than 99 years, the entire railway, including rolling stock, buildings and grounds, shall become the property of the nation. All railway concessions are subject to the laws and regulations of Costa Rica now in force or which in future may be enacted, and no foreign contractor shall have the right to appeal to any laws other than those of Costa Rica in the settlement of any disputed questions that may arise in the construction, exploitation or management of the railway. No railway concession shall confer a monopoly upon any railway company, and the state reserves the right to parallel any railway for which a concession has been granted. Nevertheless, the concession may prohibit the construction of a parallel railway within certain limits for a period of ten years.

The sale or transfer of a railway concession before becoming valid is subject to the approval of the congress. In no case shall a railway concession, railway, telegraph or telephone line be sold, mortgaged or leased to any foreign power, nor shall a foreign government become a partner or owner of the stock or bonds of any railway company.

Companies or persons desiring to secure a railway concession must apply to the secretary of fomento, accompanying the application with a general plan or sketch of the line, showing the length of the road, the bridges, stations, culverts, etc., to be constructed, and the estimated cost of the road, all of which shall be subject, in case the concession is granted, to modification by the government. All railways operating in the Republic, whether organized abroad or not, are considered Costa Rican companies, and are subject to the laws of the land. The law provides for government inspection of railways, and specifies the manner in which freight and passenger tariffs shall be issued.

Supply Trade Section.

The McKeen Motor Car Co., Omaha, Neb., is building a 70-ft. motor car for the Pennsylvania.

The Isthmian Canal Commission will receive bids until June 27 for one steel ladder dredge. (Circular No. 575.)

The Chicago Bearing Metal Co., Chicago, has moved its office to rooms 520 and 521 in the new McCormick building, Michigan avenue and Van Buren street.

The Pyle-National Electric Headlight Co., Chicago, will, after April 23, be located in the new McCormick building, Michigan avenue and Van Buren street.

The Standard Steel Car Co., Pittsburgh, Pa., is building two new steel buildings at its plant at Ellwood City, Pa. They are to be respectively 80 x 340 ft. and 50 x 300 ft.

The Chicago office of the coupler department of the National Malleable Castings Co., Cleveland, Ohio, has been moved from the Old Colony building to 311 Railway Exchange.

The Hale & Kilburn Manufacturing Co., Philadelphia, Pa., will, on May 1, move its Chicago office from the fourteenth floor of the Fisher building to room 817 of the same building.

The Chicago sales office of the Railway Steel-Spring Co., New York, at the present time located at 1380 Old Colony building, will, after May 2, be at 1111 Peoples' Gas building.

Geo. E. Molleson Co., New York, has been appointed exclusive sales agent for the Tyler Tube & Pipe Co., Washington, Pa., to the railways east and south of the Ohio river.

The Interborough Rapid Transit Co., New York, has placed an order with the Westinghouse Traction Brake Co., New York, for electric pneumatic brakes to equip its subway express cars.

The Ingersoll-Rand Co., New York, has received an order from the Pittsburgh Contracting Co. for an equipment of air compressors and rock drills for use on section 53 of the Catskill aqueduct, New York.

C. H. Rhodes, for several years in the purchasing department of the American Steel & Wire Co., Chicago, at Pittsburgh, Pa., has been appointed purchasing agent for the company, with office in Chicago.

The Sherwin-Williams Co., Cleveland, Ohio, will, on May 1, move its city and railway sales offices from the Railway Exchange building, Chicago, to room 804 of the new Steger building, 39 Jackson boulevard.

The Norton Grinding Co., Worcester, Mass., has ordered six induction motors, two 7½-h.p. motors, three 10-h.p. and one 40-h.p. motor, three 100-k.v.a., 13,200-volt, 460-volt transformers from the Crocker-Wheeler Co., Ampere, N. J.

The Ostermann Manufacturing Co., West Pullman, Ill., announces that the name of the company has been changed to the West Pullman Car Works. The company will continue to build and repair wood and steel freight car equipment.

The Dearborn Drug & Chemical Works, Chicago, will, on May 1, move its general office and laboratory from the Postal Telegraph building to the 20th floor of the new McCormick building, Michigan avenue and Van Buren street. The company is sending out neat printed announcements of this change.

The Crocker-Wheeler Co., Ampere, N. J., has just sold to the Illinois Steel Co. the following electrical equipment: Four 110-h.p., compound-wound, d.c. motors; two 500-k.w. synchronous motor generator sets; fifty-one 25-h.p., series wound mill motors; twenty-six 50-h.p., series wound mill motors; five 12½-h.p., shunt-wound motors, and eighteen 25-h.p., shunt-wound motors.

J. M. Betton, New York, has purchased the interest in the patents, manufacture and sale of the injector sand blast apparatus, formerly owned by C. Drucklieb, New York. Mr. Betton has, for the past five years, managed this branch of the business, and he will continue the manufacture and sale of these machines. All standing accounts due Mr. Drucklieb should be referred to Mr. Betton.

Brown Brothers Co., Philadelphia, and Kuhn, Loeb & Co., New York, have concluded negotiations for the disposal of $10,000,000 first mortgage 30-year 5 per cent. bonds of the Baldwin Locomotive Works. These bankers recently underwrote the $3,000,000 bond issue of the Standard Steel Works Co., Philadelphia. The proceeds of the present sale are to be used to pay floating debt and provide additional working capital.

The Pittsburgh Testing Laboratory, Pittsburgh, Pa., announces that on account of the rapid growth in its cement testing department, it has recently opened cement laboratories at 511 Omaha building, Chicago, and at 309-10 Praetorian building, Dallas, Tex. This company has cement laboratories at Easton, Pa.; Pittsburgh, Pa.; Cincinnati, Ohio; Birmingham, Ala., and San Francisco, Cal., as well as cement chemists located at a large number of the different cement mills, and it is prepared to test cement either in its own laboratories or to make mill inspection of cement at cement mill.

L. C. Ullrich has resigned as assistant to the general manager of the Southern Railway to accept a position in the sales department of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo. Mr. Ullrich was born at St. Louis, Mo., on December 30, 1878, and entered railway service with the Denver & Rio Grande at St. Louis as a clerk in the general agent's office in March, 1894. In 1898 he was appointed chief clerk, which position he held until 1901. During the following year he was secretary to the general manager of the Mobile & Ohio at St. Louis, after which he became secretary to the vice-president and general manager of the Southern Railway, and later chief clerk to the same officer, which position he has just resigned to enter the sales department of the Scullin-Gallagher Iron & Steel Co. Mr. Ullrich will have headquarters at No. 1 Wall street, New York.

Le Grand Parish, superintendent motive power of the Lake Shore & Michigan Southern, has resigned to accept the presidency of the American Arch Company, New York. Mr. Parish has been in the service of the Lake Shore for many years and has served as superintendent motive power on that line since early in 1906. He needs no introduction to the readers of the *Railway Age Gazette*. His steady climb from storekeeper of the Lake Shore at Adrian, Mich., in 1891, to superintendent of motive power is a record that speaks for itself. He is second vice-president of the Master Car Builders' Association, with which he has been actively identified for many years, and in whose interest he has labored most effectively. He has also been active in the work of the Master Mechanics' Association and of the Western Railway Club, having served a term as president of the latter organization. Mr. Parish has had wonderful success in the handling of men, and is one of the best organizers among the railway officers of this country. The splendid organization of the motive power department of the Lake Shore is due largely to his personality and methods. The American Arch Company is a newly organized corporation and will make and sell locomotive arch brick. The company controls most, if not all, of the improved patented forms of arch brick, which have heretofore proven mechanically and commercially successful. The new corporation will hereafter conduct the arch brick business previously done by the American Locomotive Equipment



Le Grand Parish.

Company, Chicago, and the arch account handled up to this time as a department of the Franklin Railway Supply Company, New York. The officers of the American Arch Company are as follows: J. S. Coffin, chairman; Le Grand Parish, president; Charles B. Moore, vice-president; Samuel G. Allen, secretary and treasurer. The principal office of the company will be at 30 Church street, New York, with branch offices at: McCormick building, Chicago; 326 Endicott building, St. Paul, Minn.; 2318 Harney street, Omaha, Neb.: 327 Majestic building, Denver, Colo.; 2319 Budlong avenue, Los Angeles, Cal., and 795 Monadnock building, San Francisco.

March returns of the Western Electric Co., New York, show an increase of approximately 40 per cent. over March, 1909, and with one or two exceptions, this month was the largest March the company has experienced. The spring peak is attained in the quarter which includes March, April and May, and the fall peak in the quarter which includes September, October and November. Up to April 14 the fiscal year ending in 1910 showed a gain of about 45 per cent. over the corresponding period of a year ago. The officers of the company report that the improvement is well distributed between the associated Bell companies and outside operating companies, and that the electric light supplies and machinery branches are coming in for their share of the increased sales. Telephone apparatus and cable sales are about 25 per cent. ahead of the same period in 1909. The gains are well distributed geographically, indicating a fundamental prosperous condition of the country at large.

TRADE PUBLICATIONS.

Air Tools.—The Independent Pneumatic Tool Co., Chicago, has issued a four-page folder illustrating the Thor drills, grinders, wood-boring machines and pneumatic hammers.

Steel Furniture.—The O. M. Edwards Co., Syracuse, N. Y., has just issued a leaflet describing the steel furniture which it manufactures, including combination cabinets, steel bond boxes, etc

Bolt, Nut and Forging Machinery.—The Acme Machinery Co., Cleveland, Ohio, has just issued a new catalogue for 1910 containing a large number of half-tone illustrations, general specifications and prices of its bolt, nut and forging machinery

Chicago, Burlington & Quincy.—Two folders just issued by the Chicago, Burlington & Quincy describe the Yellowstone National Park and the means available for tourists to see the important points in a short trip. A large map of the park and a table of various tours with complete costs from points east are included.

Union Pacific.—"Railroad Signaling" is the title of a booklet issued by the passenger department of the Union Pacific. It is artistically made up, printed on heavy glazed paper, contains 20-full page illustrations in color and is bound in a neat embossed cover. The description covers all the devices for safeguarding train operation that are in use on the Harriman lines, and is written in an interesting style.

Chicago, Burlington & Quincy.—The passenger department of the Burlington Route has issued a booklet on the irrigated lands in the Billings and Sheridan district of Montana and Wyoming, which contains much of interest to the man who is looking for a farm in a good agricultural region or a business investment in a town. Another pamphlet gives similar information concerning the Big Horn Basin in Wyoming.

RAILWAY STRUCTURES.

Altair, Tex.—See San Antonio & Aransas Pass under Railway Construction.

Blandon, Pa.—Improvements are to be made by the Philadelphia & Reading, it is said, eliminating two grade crossings at a point west of Blandon. This is to be accomplished by putting up a three-span bridge, the work to be carried out by the American Bridge Co.

Butte, Mont.—Plans are said to be made by the Northern Pacific to put up a steel and concrete viaduct from South Butte to the flat. The cost of the proposed structure will be $16,000.

Carteret, N. J.—A recent fire destroyed about 300 ft. of the bridge over the Rahway river on the Sound Shore branch of the Central Railroad of New Jersey, about a mile east of Carteret.

Cleveland, Ohio.—On officer of the Lake Shore & Michigan Southern writes regarding the reports that a union passenger station is to be put up in Cleveland, that the reports are premature. Negotiations with the city of Cleveland have not yet been completed, in particular, with reference to the prices which the railway companies interested will pay to the city for the land needed for the site.

Cochrane, Ont.—See Temiskaming & Northern Ontario under Railway Construction.

Fort William, Ont.—The Canadian Pacific, it is said, will double the capacity of its shops at Fort William. This is to be accomplished by adding a structure, 70 ft. x 128 ft.

Houston, Tex.—Plans for the new Southern Pacific office building, to be nine stories high, at Franklin and Travis streets, in Houston, are being made. It is thought that bids will be asked for the work about June 1.

Matheson, Ont.—See Temiskaming & Northern Ontario under Railway Construction.

Middletown, Conn.—See New York, New Haven & Hartford under Railway Construction.

Millen, Ga.—The Central of Georgia is to build a new station, 40 ft. x 184 ft., at a cost of $12,000. The work is to be done by company forces.

Montreal, Que.—An officer of the Canadian Pacific writes that the company is about to make large improvements at the east end station, Place Viger, including rearrangement of the passenger station tracks and facilities, as well as of the present freight shed arrangements, covering the construction of inward and outward sheds, each 1,000 ft. long, having six tracks and transfer platform between them. (April 8, p. 969.)

New Castle, Ind.—An officer of the Lake Erie & Western writes that a plan is being considered to abandon the present union station used by the Lake Erie & Western and the Pennsylvania and to build separate stations in a more central location. If the plans are adopted, the Lake Erie & Western will build a modern station of brick or frame about 30 ft. x 100 ft. Plans and estimates are now being prepared, but no decision has yet been reached.

New York.—See Hudson & Manhattan under Railway Construction.

Raymond, Wash.—See Seattle, Wash.

Seattle, Wash.—The Northern Pacific has let a contract to the Puget Sound Bridge & Dredging Co., Seattle, Wash., for building a concrete and steel bridge over the west waterway. Contracts have also been let to Alexander Pierson, Seattle, Wash., for a steel bridge at Snohomish, Wash., and for another over the Willapa river at Raymond, Wash.

Snohomish, Wash.—See Seattle, Wash.

Springfield, Ore.—See Portland, Eugene & Eastern (Electric) under Railway Construction.

Stratford, Ont.—An officer of the Grand Trunk writes that no definite arrangements have yet been made for improvements to be made at Stratford. (April 15, p. 1020.)

Superior, Wis.—Announcement has been made by the Minneapolis, St. Paul & Sault Ste. Marie that work will begin at once on a large ore dock.

Temple, Tex.—The Gulf, Colorado & Santa Fe has had plans prepared for new freight offices and warehouses to be built at the foot of Main street, north of the present freight offices. The new office building is to be two stories high, 32 ft. x 52 ft. The warehouse will be 32 ft. x 220 ft., and will have concrete floors and platforms and rolling steel doors. Duplicate freight transfer sheds, 32 ft. x 234 ft., will connect with the warehouse, a single team track separating the two.

Tolland, Colo.—The roundhouse of the Denver, Northwestern & Pacific was burned on April 12. The building was a total loss, and a Mallet locomotive and a snow-plow which were in the building at the time were also considerably damaged.

Late News.

The items in this column were received after the classified departments were closed.

H. R. Safford, chief engineer maintenance of way of the Illinois Central, at Chicago, has resigned.

The Akron & Barberton Belt Railroad, Pittsburgh, Pa., has ordered one heavy switching locomotive from the Baldwin Locomotive works for delivery this summer.

M. J. Herrick has been appointed to the new position of general superintendent of freight transportation of the New York Central lines west of Buffalo, N. Y., with office at Chicago.

Harry L. Wyand has been appointed district passenger agent of the Chicago Great Western, with office at Cleveland, Ohio, succeeding Frank R. Mosier, resigned to go into other business.

The funeral of G. T. Hayes, of the advertising department of the Duntley Mfg. Co., Chicago, who died on April 17 of heart trouble, was held in Omaha, Nebr., on Wednesday of this week.

The Algoma Central & Hudson Bay has extended the time to April 30 for submitting bids for the clearing, grading and bridge work on the extension of 31 miles between Hawk Lake Junction, Ont., and Hobon, on the Canadian Pacific. (April 15, p. 1014.)

According to press reports location surveys will be made this summer by the Copper River & Northwestern for an extension from Chiltina, Alaska, north to Fairbanks, 250 miles. The line is now finished from Cordova north to mile post 102. (Dec. 17, p. 1213.)

An officer of the Tonapah & Tidewater writes that location survey has been made from a point on the Bullfrog & Goldfield Railroad, about two miles south of Cuprite, Nev., north to Ely. A re-survey is to be made of part of the route. Contracts for building the line have not yet been arranged for.

J. L. Fagan has been appointed master mechanic of the Denver & Rio Grande, with office at Grand Junction, Colo., with authority over the second district of the Second division and over the second district of the Third Division between Grand Junction, Somerset and Montrose, succeeding C. M. Hoffman, resigned.

The stockholders of the New York Central & Hudson River Railroad, at their annual meeting on April 20, at which 1,500,000 shares were voted, elected W. K. Vanderbilt, Jr., Lewis Cass Ledyard and Marvin Hughitt to fill vacancies caused by the deaths during the year of D. O. Mills, H. McK. Twombly and E. H. Harriman.

F. B. Seymour, superintendent of the Green Bay & Western, the Kewaunee, Green Bay & Western and the Ahnapee & Western, at Green Bay, Wis., has been appointed general superintendent of those roads and the Iola & Northern, with office at Green Bay, and H. E. Dutton has been appointed assistant purchasing agent of the four roads, with office at Green Bay.

A contract is said to have been given by the Bessemer & Lake Erie to T. A. Gillespie & Co., Pittsburgh, Pa., for grading and masonry on four miles of second-track work between Red Raven, Pa., and Russelton. The work includes the construction of arches under viaduct No. 12 and filling the same, and completing the fill at viaduct No. 13. The estimated cost of the improvements is $90,000.

Representative Mann, chairman of the Committee on Interstate and Foreign Commerce, has introduced in Congress a bill limiting the hours of labor of railway employees to fourteen hours daily, and providing for a ten-hour period of rest. This would modify the present law by making the working limit two hours shorter and the minimum rest time two hours longer.

Bids are wanted by William Garstang, superintendent motive power of the Cleveland, Cincinnati, Chicago & St. Louis, at Indianapolis, Ind., April 30, for improvements to be made at Beach Grove, Ind., at a cost of about $1,000,000. The plans provide for a complete water works system, including sewers, water and fire line, conduits for heat and power, and a reservoir and other facilities. The contracts for the work are to be let as soon as bids are received and considered. (See Beach Grove, Ind., under Railway Structures, Feb. 18, p. 383.)

Franchises are said to have been granted the Detroit, Lansing & Grand Rapids covering the entire route for an electric line from Detroit, Mich., northwest via Lansing to Grand Rapids, about 150 miles. It is probable that two lines will be built from some point in Eagle township to Lowell, one north to Portland, thence west via Saranac and Lowell to Grand Rapids, and the other west from this proposed junction point in Eagle township to Lake Odessa, thence to Lowell. H. M. Wallace, vice-president, and F. A. Bean, chief engineer, Detroit. (Sept. 17, p. 520.)

An officer of the Greenville & Spartanburg writes that surveys are not yet completed for an electric line from Greenville, S. C., via Greers, Taylors, Duncans, Fair Forest and Spartanburg junction to Spartanburg, about 32 miles. It has not been decided when contracts are to be let for the work, but it is expected to start the construction soon. There will be several bridges. E. H. McCullough, Greenville, may be addressed. (See Greenville, Spartanburg & Anderson, Jan. 14, p. 113.)

The Chicago, Rock Island & Pacific has ordered 50 steel underframe refrigerator cars from the Milwaukee Car Manufacturing Company; 200 steel underframe refrigerator cars fom the American Car & Foundry Company; 800 forty-ton box cars from the Pullman Company; 200 fifty-ton ballast cars from the Rodger Ballast Car Company; 500 stock, 500 furniture, 20 smoking cars, 20 three-compartment passenger cars, six baggage and mail cars, seven passenger cars and four postal cars from the American Car & Foundry Company, and five dining cars from the Pullman Company. All of the passenger equipment will be of steel.

The directors of the Lehigh Valley at a meeting in Philadelphia April 20 voted to recommend to the stockholders that the common stock of the company be increased from $40,334,800 to $80,000,000. A meeting of the stockholders has been called for June 22.

If the stockholders approve the directors propose thereafter to issue immediately $20,167,400 of stock, giving the present shareholders the right to subscribe pro rata at par for 50 per cent. of their holdings. The balance of the authorized increase will be reserved for future needs. The money received from the $20,167,400 of stock will be used for the retirement of $6,000,000 second mortgage 7 per cent. bonds, maturing September 1, 1910, for the retirement of other obligations of the company and for other purposes.

New through trains between New York city and Williamstown, Mass., and between New York and Keene, N. H., will be introduced with the summer schedules of the New York, New Haven & Hartford and the Boston & Maine. The train between Williamstown and New York will go on June 13 and the Keene train will be run after June 20. The Williamstown train will run by way of North Adams, Greenfield and Springfield. It will leave Williamstown at 7:35 a.m. and will be due in New York at 12:55. Returning, it will leave New York at 1:31 and be due in Williamstown at 6:50 p.m. Electric cars (on a line controlled by the New Haven) to and from Bennington, Vt., will connect with this train. The Keene train will leave New York at 11 a.m. and reach Keene at 5 p.m.; leave Keene at 2:20 p.m. and reach New York at 9 p.m.

Work has been started at La Union, Salvador, on the eastern division of the Pan-American Railroad, and the occasion was this week celebrated with banquets throughout the eastern part of the republic. The concession was granted to Miner C. Keith and Bradley M. Palmer, of the United Fruit Company.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, Milwaukee & St. Paul is in the market for 25 Mallet locomotives.

The Lehigh Valley has ordered five Atlantic type locomotives from the Baldwin Locomotive Works.

The New York Central & Hudson River has ordered six suburban locomotives from the American Locomotive Co.

The Pennsylvania Railroad has ordered 80 consolidation freight locomotives from the Baldwin Locomotive Works.

The Miller-Link Lumber Co., Orange, Tex., has ordered a 55-ton locomotive from the Lima Locomotive & Machine Co.

The Oregon Short Line is said to have ordered 47 locomotives from the American Locomotive Co. This item is not confirmed.

The Chicago, West Pullman & Southern has ordered two six-wheel switching locomotives from the Baldwin Locomotive Works.

The Southern Georgia & West Coast is reported to have ordered two 10-wheel locomotives from the Baldwin Locomotive Works. This item is not confirmed.

The Brownwood Southwestern, Brownwood, Tex., a new line under construction through Brown and Coleman counties, expects to buy motive power about June 1.

The Baltimore & Ohio, reported in the *Railway Age Gazette* of February 4 and 18 as figuring on a number of locomotives, has ordered 90 locomotives from the American Locomotive Co.

The Chicago, Milwaukee & St. Paul has ordered 20 Pacific locomotives from the American Locomotive Co. These engines will be duplicates of the 50 ordered from the same company, as reported in the *Railway Age Gazette* of October 29, 1909.

CAR BUILDING.

The Missouri, Kansas & Texas has ordered 75 side dump cars from the Wm. J. Oliver Co.

The Union Railroad is said to be figuring on 1,000 ore cars. This item is not confirmed.

The Interborough Rapid Transit Co., New York, is in the market for 100 steel subway cars.

The Baltimore & Ohio is said to be figuring on about 18,000 freight cars. This item is not confirmed.

The Brownwood Southwestern, Brownwood, Tex., a new line under construction through Brown and Coleman counties, expects to buy rolling stock about June 1.

The New Orleans Railway & Light Co., New Orleans, La., reported in the *Railway Age Gazette* of April 8 as figuring on cars, has ordered 50 electric cars from the St. Louis Car Co.

The Northern Pacific has ordered, from the American Car & Foundry Co., the 25 passenger refrigerator cars for which it was reported in the market in the *Railway Age Gazette* of March 4.

Y. Alexander, president of the Third National Bank of Lexington, Ky., contemplates the purchase of one gasolene or gasolene-electric motor car for use on a short steam railway in northern Kentucky.

The Colorado & Southern is reported to be building 175 box cars, 50 coal cars and 15 caboose cars at its Denver shops. The box and coal cars are narrow gage and the caboose cars standard. This equipment was included in the inquiry recently issued by this company, as reported in the *Railway Age Gazette* of March 11. This item is not confirmed.

The Denver, Northwestern & Pacific, as reported in the *Railway Age Gazette* of March 11, has ordered 25 flat cars, 50 stock cars, 150 box cars, 6 refrigerator cars and 275 gondola cars from the Pullman Co. The special equipment includes:

Axles	Pullman
Bolsters, body	Cast with underframe (Bettendorf on refrigerator cars)
Bolsters, truck	Steel
Brakes	Westinghouse
Brake-beams	Creco
Brake-shoes	A. B. S. & F. Co.
Brasses	A. B. C.
Couplers	Sharon 5 in. x 7 in.
Draft gear	Miner tandem
Dust guards	Positive
Journal boxes	Cast with side frames (Symington on caboose)
Paint	Sherwin-Williams
Side bearings	Cast with bolster (Woods roller on caboose)
Springs	Railway Steel Spring Co.
Trucks	Bettendorf
Uncoupling device	Carmen
Wheels	Griffin

MACHINERY AND TOOLS.

The Republic Iron & Steel Co. has ordered from the Case Crane Co., Columbus, Ohio, 12 electric cranes for its tube mills at Youngstown, Ohio. The Cranes range in size up to 50 tons, with a span of 115 ft.

IRON AND STEEL.

Toledo & Ohio Central.—See Hocking Valley.

The Erie is taking prices on 800 tons of bridge steel.

The Central of New Jersey is in the market for 200 tons of bridge steel.

The Chicago, Rock Island & Pacific is in the market for 500 tons of bridge steel.

The New York, Chicago & St. Louis is in the market for 1,600 kegs of spikes.

The Chicago, Burlington & Quincy is taking prices on 400 tons of bridge steel.

The Southern has ordered 700 tons of bridge steel from the Phoenix Bridge Works.

The Lake Shore & Michigan Southern is in the market for 650 tons of bridge steel.

The New York, New Haven & Hartford is in the market for 2,000 tons of bridge steel.

The Northern Pacific has ordered 300 tons of structural steel from the Lackawanna Bridge Co.

The Philadelphia & Reading is in the market for 600 tons of structural steel for an office building.

The Atchison, Topeka & Santa Fe has ordered 300 tons of bridge steel from the American Bridge Co.

The Pennsylvania Lines West have ordered 200 tons of bridge steel from the American Bridge Co.

The Boston & Maine is said to have ordered 11,000 tons of heavy rail sections from the Pennsylvania Steel Co.

The Hocking Valley and the *Toledo & Ohio Central* have ordered 1,600 tons of structural steel from the McClintic-Marshall Construction Co. for joint work at Columbus, Ohio.

The New York, Chicago & St. Louis has ordered 1,500 kegs of spikes from the Jones & Laughlin Steel Co., 5,000 tons of 75-lb. rails from the Lackawanna Steel Co., 14,000 rail joints from the Rail Joint Co., and 350 kegs of track bolts from the Lake Erie Iron Co.

General Conditions in Steel.—Following the announcements of general increases in wages by a number of the railways comes a similar announcement by the United States Steel Corporation. Although the final decision has not been given out, reports indicate that it will amount to 6 per cent. and

will be effective May 1. At the recent meeting of the presidents of the U. S. Steel subsidiary companies, the feeling was expressed that no material changes in finished steel prices in the next six months was expected. Reports are that practically all of the independent steel mills are assured of steady operations for the next four months with the orders which are now on hand.

SIGNALING.

The Union Pacific has just completed the installation of automatic block signals between Topeka, Kan., and Ogdensburg, 120 miles, single track.

The Cleveland, Cincinnati, Chicago and St. Louis is about to equip 32 miles on the Indianapolis division with telegraph block stations. Each station will be an interlocking plant to handle adjacent switches.

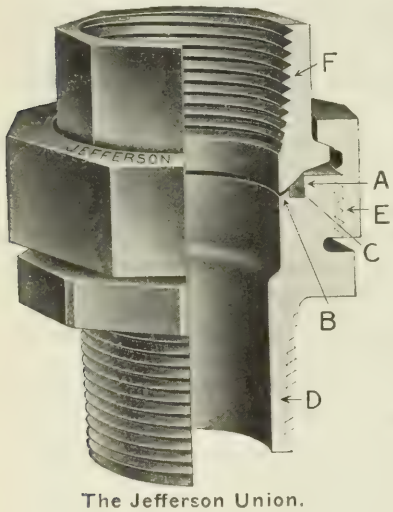
The C., C., C. & St. L. will also shortly install a combined mechanical interlocking plant and block station at Greencastle, Ind., and has under consideration a power interlocking plant at Springfield, Ill., to control about 100 functions.

The Rock Island has just put in service three-position, upper-quadrant, automatic block signals on 13 miles of single track between St. Joseph, Mo., and Rushville. There are 32 signals, two of which are dwarfs, dwarfs being used because of the excessive cost of installing high signals in a yard. Switch indicators are used at all switches remote from signals and in all other respects the installation is in accordance with the Rock Island standard practice as heretofore outlined. The section of track in question is used jointly by the Rock Island, the Santa Fe and the Missouri Pacific.

The Jefferson Union.

The accompanying illustration shows a new style male and female union, made by the Jefferson Union Co., Lexington, Mass.

The fitting is made of malleable iron and has a brass ring, A, which is embedded in the lower part of the union. This brass ring forms the seat or contact. As this ring is made from seamless brass tubing, it contains no blow holes to start leaks, as is often so with cast brass. The iron wall, B, is designed to absorb the heat and distribute it through the iron of the union, protecting the brass, as much as possible, from the temperature changes. The part, F, is free to move in the nut to provide for making a joint in piping which is not in alinement. The Jefferson union is made short so as to be applicable to short connections. Although made very short, any style of wrench with any width face may be used. The octagon flats of all three parts are so arranged that there is no interference. In the clamping nut the flats are outside and clear of the corners of the part D, having the external thread. On this part, D, the flats are outside and clear of the nut threads.



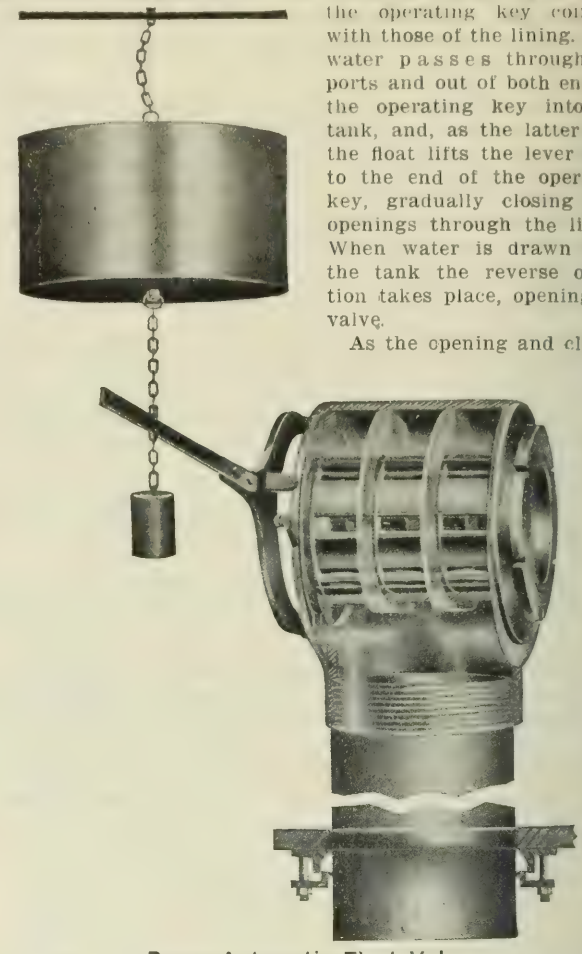
The Jefferson Union.

Poage Automatic Float Valve.

The accompanying illustration shows an automatic float valve made by the American Valve & Meter Co., Cincinnati, Ohio. It may be placed near the bottom of the tank or near the top, in which latter case it is easily accessible without letting the water out of the tank.

The body is a hollow cast iron shell, lined with hard brass. This brass lining is made with a series of ports, as is the key which operates in it. In filling the tank the ports of the operating key coincide with those of the lining. The water passes through the ports and out of both ends of the operating key into the tank, and, as the latter fills, the float lifts the lever fixed to the end of the operating key, gradually closing the openings through the lining. When water is drawn from the tank the reverse operation takes place, opening the valve.

As the opening and closing require but little movement there is little wear on the working parts of the valve and the key and lining are made tapering to provide for taking up any wear which does occur. Provision against shock on the main is made by having the valves open and close gradually.


Poage Automatic Float Valve.

This valve is made for connection to 2-in., 3-in., 4-in. and 6-in. wrought iron pipe of standard threads, although special connections will be furnished if desired. It is also furnished with an all-brass body in the 2-in., 3-in. and 4-in. sizes. The Poage automatic float valve complete includes the valve, galvanized iron float, brass chain, valve lever, lever weight and stuffing box for the tank. A copper float will be furnished if desired.

FOREIGN RAILWAY NOTES.

The Bababoya & Guaranda, incorporated in West Virginia, is to build a 40-mile electric line in Ecuador. The company has an authorized capital stock of $1,380,000, and the incorporators are Julio H. Cardon, of Guayaquil, Ecuador, and Benjamin F. Patterson, James G. Pugh, Martin H. K. Paulsen and John B. Timmerman, of Baltimore.

Negotiations are under way in regard to the extension of the Chinese Railway from Hsinmintun into the city of Mukden as far as the western gate, where the line would connect with the Antung-Mukden line. This would make the Antung line a feeder of the Chinese railway instead of the South Manchuria, and it is possible that the Japanese will hesitate about sacrificing this traffic.

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The Michigan Car Demurrage Supervising Bureau has now been in operation about four months, and the results have been satisfactory. Agents are giving more systematic and efficient attention to the collection of demurrage, and at many of the stations the number of delayed cars has been reduced. The railways of Michigan decided to abolish the car demurrage bureau and to establish this supervisory organization instead, largely because the need for a joint bureau to attend to collections no longer exists. The more general recognition of and compliance with uniform rules, and the promulgation of interpretations by the Interstate Commerce Commission, which have necessitated the strict management of the business of charging demurrage at all stations, have abolished or greatly simplified most of the perplexing questions formerly arising, and have opened the way for a restoration of the normal method, having each local freight agent make the collections in his own territory, the same as he collects freight bills. The supervising bureau employs five outdoor supervisors who are constantly traveling from station to station instructing the agents and making careful inspections of their records. The "lost motion," due to the employment of special checkers or special collectors at numerous stations to attend to the demurrage records and collections and nothing else, has been done away with; while at the same time it is practicable by the employment of competent inspectors for the central office to know, quite as fully as before, how the business is conducted.

An incident of the kind that bring public service corporations needless unpopularity occurred in Chicago recently. An accident on one of the elevated railways tied up its traffic during the evening rush hour. A city officer who was delayed at one of its stations demanded the return of the fare he had paid. The agent at first refused. A quarrel ensued, in which the other passengers, of course, backed the city official; and, finally, all their fares were refunded. The result has been the starting of an agitation in the press to force the various lines handling city and suburban traffic to comply with an ordinance requiring them to return fares within ten minutes after an accident has occurred which stops operation. The president of one of the elevated railways has given an interview to the newspapers, in which he says that its agents are required to return fares within fifteen minutes after such a delay if passengers demand it. It is perfectly clear, however that the company is entirely in the wrong. Everyone who uses it knows that its agents never refund fares except after unnecessarily long delays and most insistent demands. This is in violation of the spirit, if not the letter, of the city ordinance. It is also in violation of good policy from the standpoint of the railway itself. For its own good it ought, when such a delay as is specified by the ordinance occurs, to have its agents and guards voluntarily announce to all waiting passengers that they can get their money back. Its course in keeping all the fares it can without rendering value received for them, and in withholding as long as it can even those which it finally returns, makes critics and enemies of thousands of its patrons from whom it never receives complaints directly, but from whom it does hear indirectly in the form of opposition to every concession and franchise which it seeks at the hands of the public. What it loses indirectly in cash greatly exceeds what it gains directly in cash by keeping money that it ought promptly and voluntarily to return. Railways and other public service corporations are issuing a great deal of literature nowadays entreating the public to give them a "square deal" and telling people why it is to their interest to do so. These appeals and arguments are deprived of much of their proper effect by constant infraction by many public service corporations of their own duty to give the public a "square deal."

The accident bulletin issued by the Interstate Commerce Commission for the last quarter of 1909, the principal part of which is reprinted in this issue, is characterized not only by large totals, indicating the increased stress under which train operations are carried on under a greatly enlarged volume of business, but also by an unusual variety of those lessons which are given in these bulletins in the shape of detailed statements of the facts of the most disastrous collisions and derailments. Perhaps the most significant of these lessons is that given in the last paragraph, that giving the cause of derailment No. 4—an unstable tender. Derailments of tenders which are top-heavy or improperly loaded or not well designed have become altogether too familiar within the past few years. In this case the manager of the road on which an accident of that kind appears to have happened was frank enough to put into his report a lucid statement of his honest opinion. The most disastrous derailment in the bulletin (No. 12) has only five lines of explanation. This evidently was the accident at Greensboro, N. C., December 15, reported in the *Railway Age Gazette* February 11, page 297. The first collision of which

the details are given (No. 2) occurred under controlled manual block signaling—a system which now is in use on but few railways. Collision No. 10 must be the one which occurred October 9 at North Topeka, Kan., reported in the *Railway Age Gazette*, page 135. The statement concerning collision No. 12, which occurred at Jersey City, November 6, contains no facts beyond those already reported, except the statement that the road has taken measures to prevent similar accidents in the future. Collision No. 15, in which five persons were killed and 14 injured, occurred under circumstances showing the value of having switches properly interlocked, with levers concentrated in a cabin and with a single person (in the cabin) in sole control of switching and signaling operations. Collision No. 20 once more enforces the old lesson that most trainmen have to learn some of the simplest features of their work in the hard school of experience. In this case a brakeman of seven months' experience, sent out to flag a passenger train, allowed that train to get past him. He had been on duty about 17 hours, and a popular explanation of his failure would be that he was overworked. Railway men will say, however, that the trouble was not that he was sleepy, but that, when sitting down to rest under circumstances in which he might possibly fall asleep, he neglected the simple precaution of placing his red light in a position where it would be seen from the approaching train, whether he were awake or not. The paragraph concerning collision No. 27, that at Parnell, Ill., October 5, gives details in addition to those which were published in our account of the accidents of that month in our issue of December 10, page 1135. Collision No. 31 occurred at Lind, Wash., November 25, and was reported in the *Railway Age Gazette*, page 1230. The government statement gives some circumstances not shown in our report, but the accuracy of the statement ascribed to the engineman seems open to question. Here again was a case of a man who had been on duty over 16 hours, yet his error occurred under circumstances in which he must have been awake.

ELECTRIC HEADLIGHTS.

The action of the Indiana Railway Commission ordering the railways of that state to equip all locomotives in road service with high power headlights by July, 1911, is being contested by the roads in the courts and is causing the merits and demerits of electric headlights to be more closely investigated than ever before. The order does not specify the electric light, but it requires the lamps to have 1,500 candle power, which, in the present state of the art, is only met, it is believed, by the electric arc light. Electric headlights have been used on locomotives for 15 years and nearly 13,000 of them have been sold by one manufacturer, principally to the lines in the south and west. The states of Texas, Arkansas, Georgia, North Carolina, Missouri, Washington and Montana already have laws requiring their use, and the majority of the locomotives operated in Texas are now equipped. A number of the western trunk lines are using them, one having as many as 1,100 and seven or eight of them as many as 500 each.

Before issuing the order, W. J. Wood, chairman of the Indiana Commission, requested Prof. C. H. Benjamin, of Purdue University, to conduct some experiments to determine the relative effect of oil and electric headlights upon the reading of signals and the identification of obstacles on the track. The substance of Prof. Benjamin's report is given in his paper read at the last meeting of the Western Railway Club, a full abstract of which is published in our issue of April 22, 1910, page 1038. The paper is entirely unfavorable to the electric headlight. The author concludes that it is a disadvantage to the engineer and fireman to have an electric headlight on the engine, as it interferes with the correct reading of signal lights; that it is a still greater disadvantage to them to meet engines equipped with electric headlights on parallel tracks; and that the greater illumination of the track does not compensate for the disadvantages mentioned.

The railways have spent large sums of money in equipping locomotives with this device. It will be inquired why they have done so if competent and careful tests show it to be disadvantageous to the very men whom it was intended to benefit. A full reply to this question will be found in the abstract of the discussion on Prof. Benjamin's paper, which is published on another page of this issue. In discussing a question of this kind the surrounding conditions should be considered and general statements which lead to confusion and error should be avoided. When these conditions are taken into account it will be found that there are places where the high power headlight is desirable, and others where it is objectionable. On the single track lines in the south and west, which are poorly provided with signals and switch lights and where more obstructions, such as fallen trees, cattle, etc., get on the track, electric headlights have been found a protection against danger. The engineers on those lines prefer them to the oil light, and it is on account of their recommendation that they have been so largely introduced on single track lines. In the more densely settled eastern part of the country, where most of the lines have double track well protected by signals, and where obstructions on track are much less frequent, the high power headlight is not necessary, and it may be objectionable to some extent in the ways pointed out by Prof. Benjamin. In some of the states in the middle west, like Ohio, Indiana and Illinois, the conditions are not so easy to define as are those in the regions already mentioned. In those states there are lines having double track and many others with single track and numerous branch lines with few signals. While the electric headlight might be an advantage on some portion of these lines, it is not necessary and may be objectionable on other lines in the same state.

A safety appliance of this kind which is not generally useful and necessary should not be made the subject of a state law or of an order of a railway commission; and the railways are justified in contesting such laws or orders as an unreasonable exercise of the state's police power. It should not be necessary for them in defense of their case to show that the electric headlight is as objectionable as is claimed in Prof. Benjamin's paper. It ought to be sufficient to show that high power lights are not necessary in regions where there are multiple tracks protected by signals, and that a general order covering all lines in a state is unduly burdensome and expensive in proportion to the benefits that can be expected to be derived from it. Legislation and requirements relating to railway safety appliances may result in the public good when they are intelligently drawn and sensibly enforced, but many recent enactments and orders are so unreasonable that the railways are compelled to resort to the courts for the protection of their ordinary property rights.

NEGOTIATIONS WITH LABOR LEADERS.

The more than three months of negotiation and arbitration between the railways and their employees have been conducted in dignified fashion, with the firm determination on the part of the railways, at all hazards, to avoid strikes. This disadvantage in position has been due to the belief that public sentiment would support the strikers rather than the railways. The railways have been sinners, not in wage paying, but in other respects. A bad conscience, although concerning transactions of long ago, makes a bad stomach to fight on.

The result is an increase of millions to be paid in wages to train crews, switchmen, yardmen, telegraph operators and others, already, in the aggregate, overpaid, and these millions will in the natural course be paid by the "ultimate consumer." There is no question of the final result, that the bondholder and stockholder will not share the loss with those who pay the fares and the freight. Public opinion wavers, but its final judgment is fair.

In the East, the leaders of the conductors' and trainmen's

organizations are working on one main plan: To put wages on a uniform mileage basis on all roads in eastern territory; that is, west of Chicago and north of the main line of the Chesapeake & Ohio. Their first intention was to make the western scale apply. They began negotiations with the Baltimore & Ohio because, as they frankly admit, that road already paid the highest unit rates. The question was left to mediation under the Erdman act and the companies and employees accepted the decision, which put pay on a mileage basis but made the rates lower than the western scale. The labor leaders, therefore, modified their original plan and it is this Baltimore & Ohio scale which they are now working to make uniform.

Their argument for uniformity is that a man ought to earn as much in the East as in the West, and that the railways by putting their statistics of operation on a mileage basis show that they consider mileage to be the basic unit in railway operation. The fallacy of this argument has been frequently pointed out. The Baltimore & Ohio rates per mile before the recent settlement, although much higher than those of the New York state trunk lines, did not result in as much monthly pay as on at least some of the New York state roads. The following table gives the minimum, maximum and average monthly pay of one road under the present scale. The figures apply only to men who worked 20 days or more during the month. Figures taken from the actual payroll of the same company for a month give averages in general slightly lower, because the payroll includes, of course, men who work a very few hours per month:

	Minimum.	Average.	Maximum.
Passenger conductors	$90	$124.69	$144.00
Passenger brakemen	60	68.94	77.50
Freight conductors	90	109.22	120.00
Freight brakemen	63	74.26	90.00
Baggagemen*	60	69.64	82.00

*Also receive an average of $10 per month in addition, paid by express company for handling express.

The above figures, showing the high wages already paid by a road whose rates if expressed in cents per mile are much lower than those of the Baltimore & Ohio, is the obvious answer to the labor leaders' argument that the way to make wages uniform is to make uniform mileage rates. What is also to be considered is the fact that they are not taking into account the character of service on different lines. They ask all companies to pay the same wages, whether it be on a road a great part of whose mileage is not block signaled and where the trainmen have to get orders, throw switches, etc., or on a road where the block signal mileage predominates and all such work is done by signalmen or employees other than conductors and trainmen.

We have used the term "labor leaders" in the foregoing because we meant that and not employees. The way so-called "strike votes" are taken is an indication as to how much the employees themselves really know about what is going on. After a conference with railway officials the labor leader issues a circular to his men: "The railway offers an increase of 6 per cent. This would make the rate $6 for the run from —— to ——, 150 miles. The Baltimore & Ohio scale would give you $8 for this run. If the schedule we ask is not granted, we intend to ask you to leave the service of this company. If you are opposed to this you are to communicate in writing with the undersigned." This makes it hard for the conservative man to vote against the strike. It puts the initiative on him; he has to write and give his reasons and get in the limelight. The labor leader gives in such a circular only such instances of the effect of an increased rate as will indicate to the men the greatest advantages to be gained from the proposed scale. The returns from this circular are reported by the labor leader as a vote. Taking the very few negative replies which such a circular brings out, and counting all other members of the union as voting in the affirmative, it is not surprising that the result of the strike "vote" is "97 per cent. in favor of the strike."

WHAT IS THE RATE-MAKING POWER OF THE INTERSTATE COMMERCE COMMISSION?

For ten years after the original Interstate Commerce Act went into effect the Interstate Commission issued orders fixing railway rates. In 1897 the Supreme Court of the United States, in the Maximum Rate cases, held that in doing so it had exercised a power it did not legally have. The Interstate Commerce Act, as amended, has been in effect almost four years. Throughout this time the commission again has been exercising a power over rates which it probably does not legally possess. The act gives it a restricted authority to fix rates. There is not much doubt that the provisions conferring this authority are constitutional. But many of the orders the commission has been issuing seem open to successful attack on the ground that in making them it has disregarded and overstepped the limits fixed by Congress on its authority.

Section 15 of the Interstate Commerce Law, as amended, authorizes the commission, "whenever, after full hearing and complaint," it "shall be of the opinion that any of the rates, or charges whatsoever, demanded, charged or collected by any common carrier or common carriers, subject to the provisions of this act * * * are unjust or unreasonable, or unjustly discriminatory, or unduly preferential or prejudical, or otherwise in violation of any of the provisions of this act, to determine and prescribe what will be the just and reasonable rate or rates, charge or charges, to be thereafter observed in such case as the *maximum* to be charged; * * * and to make an order that the carrier shall * * * not thereafter publish, demand or collect any rate or charge for such transportation in excess of the *maximum* rate or charge so prescribed." This gives the commission authority to reduce a rate either because it is (1) discriminatory or (2) unjust or unreasonable—that is, excessive. It is in the exercise of its authority to reduce rates for the second reason mentioned and to substitute reasonable maximum rates, that it is believed the commission is going too far.

The language in which the law confers on the commission power to condemn excessive and substitute reasonable rates is given two interpretations. One is that it makes the commission, as to rates about which complaint is made, virtually the traffic manager of the railways. The commission, according to this interpretation, may and should substitute its judgment of what such rates ought to be for that of the managers of the railways; and so long as it does not cross the deadline of confiscation it may readjust and reduce them as it pleases. The commission has not in any opinion expressly adopted this interpretation. But it has adopted it by its acts. For example, in the Missouri River Jobbers' case, now pending in the Supreme Court, it substituted its judgment for that of the traffic managers' as to whether rates should break at certain basing points. It adopted the principle that the through rate ordinarily should be less than the sum of the local rates, and condemned the class rates between the Mississippi and the Missouri rivers, not because the evidence showed that, measured by the cost or the value of the service, they were excessive, but because they conflicted with its new principle of rate-making. Innumerable other instances could be cited where it has thus substituted its judgment for that of the traffic managers. In the very recent decision in Laning-Harris Coal & Grain Company versus C., B. & Q. (I. C. C. opinion No. 1169), it ordered the rate on anthracite coal from Chicago to Akron, Colo., reduced for no reason, apparently, but that the Burlington had made a rate from Chicago to Haigler, Neb., which was less per ton per mile, in spite of the fact that witnesses for the Burlington testified that they did not regard the rate to Haigler as remunerative, and that it had been produced largely by rates fixed by the Nebraska legislature, which are being tested in the courts. Again, in the case of Acme Cement Plaster Company versus C. G. W., et al. (I. C. C. opinion No. 1173), the commission ordered reductions in the rates on plaster from

Gypsum and Council Bluffs, Iowa, to various points in North and South Dakota. The complainants alleged unfair discrimination. The commission ruled against this allegation, and reduced the rates for no reason seemingly, but that they were higher proportionately than those made by the roads concerned on some other commodities. The fact that some of the reductions were but 2 cents per 100 lbs. shows that the commission is substituting its judgment for the discretion of the traffic managers as to minute details of their duties. The most experienced and acute traffic man would hesitate to say positively, as the commission did, whether 15 or 13 cents was the exact rate which would be most reasonable on cement plaster from Council Bluffs to Canton, S. D.

The other interpretation of the Interstate Commerce Act grants it power only to fix the highest limit up to which the traffic managers may exercise the discretion which the law leaves them. The lowest rate a railway can justifiably accept is one which will a little more than cover the expense which the handling of the traffic to which it applies adds to the other expenses of operation. The highest rate it can justifiably charge is one which falls a little short of the value of the service which it renders to the shipper. Sometimes the least for which the railway could afford to take the traffic is a little more than the most the shipper could afford to pay. Then the traffic cannot move. But usually between the maximum which the railway can charge without extortion and the minimum which it can accept without loss there is a substantial distance. Under the interpretation of the law we are now outlining the determination of the point at which between these limits any specific rate shall be fixed is, so long as there is no unfair discrimination, entirely within the discretion of the traffic manager. When a complaint is filed, the commission's first duty is to ascertain if the rate complained of exceeds this highest limit; in other words, is extortionate. If the commission finds that it does not, its duty is done. If it finds that it does, its duty is to fix, not the rate which it may think that the traffic manager ought to make for the greatest good of both the railway and the shipper, but merely the highest rate which will not be extortionate.

In view of the discussion of the Hepburn bill in Congress, its language as passed, and decisions of the Supreme Court, it seems probable that the second interpretation which we have outlined is the correct one. It was proposed in Congress to give the commission power to fix absolute rates. It was also proposed to give it power to fix minimum as well as maximum rates. Both these propositions were rejected. It was given power only to fix *maximum* rates. It cannot be assumed that Congress intended the railways should make any rates unreasonably low. Yet its idea in giving the commission power only to fix maximum rates was that the railways probably would make rates lower than those fixed by the commission. It must follow that Congress meant that the commission should fix not the exact rate which, in its judgment, the railway ought to make, but the rate more than which the railway could not charge without extortion.

The belief that this is all Congress meant to do, did, or, perhaps, could do, receives strong support from decisions of the Supreme Court. In one case (173 U. S. 684), it said:

"What the (railway) company may choose voluntarily to do furnishes no criterion for the measurement of the power of the legislature. Persons may voluntarily contract to do what no legislature would have the power to compel them to do. Nor does it furnish the standard by which to measure the reasonableness of the matter exacted by the legislature. The action of the company upon its own volition purely as a matter of internal administration and in regard to the details of its business which it has the right to change at any moment furnishes no argument for the existence of a power in a legislature to pass a statute in relation to the same business imposing additional burdens upon the company."

Of course, a commission which derives its powers from a legislature cannot exercise more power than the legislature itself. The case of Interstate Commerce Commission versus C. G. W. (209 U. S. 108), which arose under the Elkins Act and was decided by the Supreme Court after the amended Interstate Commerce Act went into effect, involved alleged unfair discrimination by the Chicago Great Western in charging higher rates on live stock than on packing house products. The court refused to hold, with the commission, that the rates on live stock were too high because the rates fixed on packing house products were lower, and said:

"It must be remembered that railways are the private property of their owners; that while, from the public character of the work in which they are engaged, the public has the power to prescribe rules for securing faithful and efficient service and equality between shippers and communities, *yet in no proper sense is the public a general manager.*"

Continuing, it quoted with approval the familiar language of Circuit Court Judge Jackson in Interstate Commerce Commission versus B. & O. (43 Federal Report 37, 50):

"Subject to the two leading prohibitions that their charges shall not be unjust or unreasonable and that they shall not unjustly discriminate so as to give undue preference or disadvantage to persons or traffic similarly circumstanced, the act to regulate commerce leaves common carriers as they were at the common law free to make special rates looking to the increase of their business, to classify their traffic, to adjust and apportion their rates, so as to meet the necessities of commerce and of their own situation, and relation to it, and, generally, to manage other important interests on the same principles which are regarded as sound and adopted in other trades and pursuits."

The only difference between the law when the court quoted this language of Judge Jackson with approval and as it stands now is that the commission, to enable it to enforce the "two leading prohibitions" mentioned, has been given the power to fix maximum rates in specific cases. How, in carrying out these two leading prohibitions, it can lawfully disregard the interpretation of the Supreme Court is hard to see.

In some of the recent public utterances of members of the commission there has been a note of complaint because the railways within the past two years have appealed to the courts from many of its important orders. They have intimated this is not the best course to take if the carriers want to keep on good terms with the commission, shippers and the public. For some months after the amended Interstate Commerce Act went into effect, the carriers showed an extreme desire to get on amicably with the commission and the public. In numerous instances they abided by requirements which they believed exceeded the commission's legal power. At last they felt that they must choose whether they would submit to the constant exercise of authority that they deemed illegal or fight out in the courts the question of the extent of the commission's legal power. They took the latter alternative. The issue seems apt to be a drastic curtailment of the authority the commission has exercised. If this is the result the commission will have no good ground to complain. It was created to enforce the law. It frequently condemns the railways for seeking to evade it. It, therefore, of all bodies, should show a constant disposition to keep well within the law instead of a persistent tendency to stretch it to the utmost limit, or even to overstep its boundaries.

NEW BOOKS.

Commercialism and Journalism. By Hamilton Holt. Published by Houghton Mifflin Co., Boston, Mass., 1909. 105 pages, cloth. Price, $1.00.

Mr. Holt is managing Editor of *The Independent*, and the book is a reproduction in type of a lecture delivered by him at the University of California—one of the Barbara Weinstock series of lectures on the morals of trade. He discusses the subject of ultimate power in control of the American journals and tells of the real conditions under which an editor nowadays has to work and of the forces that help and hinder him. While, unfortunately, Mr. Holt fails to show among his object lessons the increasing power of technical and trade papers in moulding public opinion, he has succeeded in painting a word picture of modern journalism in which the upward trend of the weekly and monthly periodicals, and the causes, stand out clearly.

Letters to the Editor.

THE SPEED LIMITS OF MALLET LOCOMOTIVES.

Philadelphia, Pa., April 9, 1910.

To the Editor of the Railway Age Gazette:

In the article, entitled "The Speed Limits of Mallet Locomotives," on page 870 of your issue of April 1, 1910, you call attention to some very important limiting factors, consisting mainly of resistances due to the friction of the steam, in passing the necessarily long reaches of pipes in the system, on its way through the engine. You do not, however, call attention to the effect of the very large volume of the receiver of these engines, as usually built, to say nothing of the very large reheaters which are sometimes used. These largely increase the ratio of expansion of the steam; in fact, to such an extent that I have serious doubts as to whether, under some conditions, there is sufficient pressure in the receiver to perform useful work in the low pressure cylinders.

A drop of pressure of the steam between the cylinders is, no doubt, beneficial, there being a valuable drying effect due to the free expansion. This is well illustrated by the indicator cards, which were published on page 93 of your issue of January 14, 1910, which were taken from the Mallet locomotive built by the Baldwin Locomotive Works for the Southern Pacific.

Neglecting the back pressure portions of the cards, we see that the release, which takes place nearly at the end of the stroke, is at approximately 155 lbs. abs. on the high pressure cards, while the initial pressure on the low pressure cards is approximately 75 lbs. abs., which indicates that the receiver volume must be about the same as the volume of the two high pressure cylinders. It is likely that this drop has a very good effect, as it is not enough to unduly lower the receiver pressure, but does lower it sufficiently to produce a slight superheating effect.

Taking for our next illustration, the large Mallet passenger engines built for the Atchison by the same works, we see that in addition to the usual receiver there is a large re-heater, the volume of which, after making allowance for the tubes, I find to be about 64 cu. ft. This added to the volume of the necessary passages makes the probable volume of the receiver about 75 cu. ft.

The total volume of the system through which the steam must pass between the high pressure valves and the atmosphere is probably as follows:

Two high-pressure cylinders	14.66 cu. ft.
Clearance volume of above, 15 per cent.	2.20 "
Receiver and reheater	75.00 "
Two low-pressure cylinders	36.75 "
Clearance volume of above, 15 per cent.	5.51 "
Total volume of cylinders and passages	134.12 cu. ft.

Assuming that the boiler of the engine is sufficient to supply steam to the high pressure cylinders at a cut-off of 75 per cent. at a speed of 50 miles per hour, we have a volume of 13.19 cu. ft. of steam, at a cut-off pressure of 165 lbs. abs., to be expanded to a volume of 134.12 cu. ft. Dividing 134.12 by 13.19 we find that the ratio of expansion is 10.25 to 1, and dividing 165 by 10.25 we find the terminal pressure to be 16.09 lbs. abs., or only 1.39 lbs. above atmosphere. This deduction neglects the small increase of pressure, due to the superheating in the receiver, which, at the speed assumed, would not be considerable.

To my mind, the M. E. P. developed in the low pressure cylinders with such a low terminal pressure would not be sufficient to overcome the internal resistance of the low pressure portion of the engine and under the conditions assumed it would be hauled at the expense of power developed in the high pressure engine. The result would be a net loss due to the free expansion caused by the volume of the devices used to promote economy. If a shorter ratio of expansion were attempted with this engine it would result in the expansion line of the low pressure diagram going below atmosphere at a greater net loss of efficiency.

The question which occurs to me after a consideration of the above deductions is: Would it not be better in designing a Mallet locomotive for any service to take advantage of initial superheating, place the high and low pressure cylinders as close together as possible so as to minimize receiver volume and prevent drop of pressure between the high and low pressure cylinders and then if a long expansion ratio is desired, increase the ratio of the cylinders? As the expansion would be practically continuous we would have the drying effect, due to the fall of pressure and the increased volume of the low pressure cylinders, assuming that the same size high pressure cylinders were used, which would result in greater power being developed. The use of large receivers between the cylinders of compound engines can not result in much good, as the resulting free expansion does not perform work except in the same manner that excessive clearance in the cylinders of a simple engine raises the expansion line at the expense of efficiency.

A discussion of the above question by your readers would, no doubt, be interesting, and I trust that such discussion will follow in subsequent issues of your valuable paper.

CHARLES F. PRESCOTT,
Mechanical Engineer.

WHICH LINE MAKES THE RATE?

London, England, April 14, 1910.

To the Editor of the Railway Age Gazette:

I have read with much interest Professor Ripley's paper in the *Railway Age Gazette* of April 1 under the above heading, and, as I observe that he quotes me as saying in my little book, "The Elements of Railway Economics," *sans phrase* that the short line makes the rate," perhaps you will allow me to say a word on the subject.

As a statement in an elementary text book for English students, I adhere to what I said. I am, of course, aware of the trunk line differentials. Further, I agree that, economically speaking, the "cheap" line would be a more accurate phrase than the "short" line, but for England and for long settled European countries the statement holds that the short line rules the rate.

There used to be one instance in this country, namely, between London and Guildford, where what I may call a trunk line differential existed for passenger traffic, and the South Western over its direct through line of 30 miles charged a higher rate than the South Eastern over its 43 miles of a roundabout branch; but the fares by both routes are now the same. There are many reasons why the fact that shortness is not necessarily cheapness has never emerged here. Capital cost is so large a proportion of total cost; terminal cost is so large a proportion of operating cost; local business is so large a proportion of through business; railway public opinion represses so sternly any inclination to cut rates, etc., etc.

Perhaps I may just add (for the sake of information, as the French say) for it is not strictly germane to my point, that the question how far the circuitous route is a reasonable route was recently before our Railway Commission Court in an important action dealing with through traffic from Ireland to the great English centers of population. In that case the court laid down that a route, convenient in other respects, and not longer by more than 50 per cent. than the shortest route, was a reasonable route, and as such entitled to through rates and to participate in the traffic. That the through rate would be the rate fixed by the shortest route was taken for granted.

W. M. ACWORTH.

Contributed Papers.

THE TRANSIT PRIVILEGE: ABUSES OF IT AND SOME PROPOSED REMEDIES.

BY S. O. DUNN,

Western Editorial Manager of the *Railway Age Gazette*.

The testimony taken by the Interstate Commerce Commission in its investigation of the transit privilege shows that this privilege is being greatly abused. It is being used as a means of securing by tariff authority special privileges which in many cases are in violation of the spirit, if not of the letter, of the interstate commerce act. It is conceded on all hands that these abuses cannot be allowed to continue. It is not desirable entirely to abolish the transit privilege. The problem to be solved is that of putting restrictions on it which will prevent its abuse, to the detriment of unfavorably situated shippers or the depletion of the revenues of the railways, without interfering with its legitimate use.

The transit arrangement is the privilege granted in many railway tariffs whereby the shipper may stop a commodity in transit, hold it for such period, and make such changes in it as may be specified in the tariff, and then forward it to destination, all for the through rate from the point of origin to the final destination, to which is added by some railways a small charge to cover the cost of stopping at transit points.

This privilege probably was first granted to millers of flour, its purpose being to put millers who, for one reason or another, had become unfavorably situated with reference to points of production of wheat and consumption of flour on a basis where they could compete with millers who were more favorably located. The earlier mills were generally established where the advantage of an abundant supply of grain, or cheap water power, or an adjacent center of population afforded the best prospect of establishing a profitable business. The rates on wheat and flour usually being approximately the same, a mill adjacent to the fields could buy wheat, grind it into flour and ship it to a large market as cheaply as a mill located at that market could buy the wheat, ship it there, grind it into flour and market it. As the demand grew for blended flour the millers at grain markets, who could buy various grades and ship the blended product, acquired an advantage over the western miller who had but one grade of grain available locally. The demand for wheat of the miller who was originally adjacent to the wheat fields also, in many cases, outgrew the local supply, either because his business expanded or because the wheat fields moved away from him. Then he found himself at a disadvantage in competing against the miller who was situated where there was a large local supply of grain on the one hand or a large local demand for flour on the other hand. The miller at Minneapolis, for example, could ship in wheat on a relatively low through rate, while the miller who was located midway, perhaps, between Minneapolis and the grain fields had to pay the local rate in on wheat and the local rate on flour. We will call the grain fields A, the intermediate point B, and the market C. If the miller at B was to stay in business it was necessary for the railway to make him a rate which would enable him to ship wheat from A to B and flour from B to C as cheaply as a miller at A could ship out flour from A to C or a miller at C could ship wheat from A to C. The railway might have protected the miller at B by reducing either or both of the local rates, A to B and B to C, so that their sum would equal the through rate from A to C, but by doing so it would have unnecessarily sacrificed its local revenues. The milling-in-transit privilege both enabled the miller at B to continue in business and conserved the road's local earnings.

Within recent years the transit privilege has been authorized on many commodities and at innumerable places. In some cases, as already stated, a special transit charge is made. Throughout Central Freight Association territory a transit charges of ½ cent per 100 lbs. is made on grain. On some of the western lines the charge on grain is 2½ cents per 100 lbs. Transit is allowed on grain for a number of purposes besides milling. It is permitted for concentrating it from different points, for grading, cleaning and mixing, for changing ownership or destination, for blending of grain products, etc. It is allowed at reconsigning points for holding grain or its products in railway cars or warehouses pending change of ownership or destination. These various privileges may be granted near the fields, or at any convenient point intermediate between the points of origin and final destination. They may be extended to cover specifically grain privileges at milling points or milling privileges at market points. It is conceivable that a carload of grain originating in Illinois may receive the market privilege at Chicago, the milling privilege in Michigan, the reconsigning privilege in New York state, and be held in New England for the mixing privilege. It appears that in some cases in the exercise of the transit privilege a shipper may have brought in wheat and shipped out corn on the same billing, or he may have brought in corn and shipped out wheat flour, or he may have brought in wheat in carloads and corn in carloads and shipped out mixed carloads of wheat flour and corn meal.

Next to grain the commodity on which the transit privilege is most important is cotton. In the large, loosely pressed bales in which it is packed on the plantations it is moved to compresses in which its bulk is much reduced, the transit privilege covering not only compression but also inspection and change of ownership or destination.

Lumber is given the transit privilege for the rough grades to be dressed into the more finished grades and for drying, sorting, storing and changing of ownership or destination.

Butter is held in transit for repacking, reworking and storing; eggs for repacking and storing; poultry to be killed, dressed and stored. Like other commodities, these undergo changes of ownership while in transit; and they have been allowed to be substituted for each other on the same billings.

The transit privilege is granted for the fabrication of various classes of structural iron and steel. Seed is cleaned, coffee roasted, metals smelted; and sugar, salt, wool, apples, hay, agricultural implements and numerous other commodities are allowed to be stored and to change ownership and destination while theoretically in course of transportation.

The main criticism made against the transit privilege is that under it substitution of tonnage not necessarily representative of an identical commodity goes on, and such irregular substitution involves a departure from the published tariffs. The various forms of substitution may be roughly divided into four classes. (1) Substitution of a given amount of a commodity which moved into the transit point subject to the transit privilege for an equal amount of the same commodity which also moved in subject to the transit privilege but from a different territory. (2) Substitution of a shipment not entitled to the transit privilege for a transit shipment, or of a transit shipment for a non-transit shipment. (3) Filling out a transit shipment with a like commodity not entitled to the transit privilege, when, by processes of manufacture, or sale at the transit point, the tonnage of the commodity which moved in on transit billings has been reduced. (4) Substitution of one transit commodity for a different transit commodity, each subject to the same rate, as wheat for oats, poultry for butter, etc.

The Interstate Commerce Commission was aware of the existence of abuses growing out of substitution of tonnage a long time ago, and on September 1, 1909, put into effect its Conference Ruling No. 76, relating to substitution of tonnage at transit points, which read as follows:

"A milling, storage, or cleaning-in-transit privilege cannot be justified on any theory except that the identical commodity or its exact equivalent, or its products, is finally forwarded from the transit point under the application of the through rate from original point of shipment. It is, therefore, not permissible at transit point to forward on

transit rate commodity that *did not move into* transit point on transit rate or to substitute a commodity *originating in one territory* for the same or like commodity moving into transit point from *another territory*, or to make any substitution that would impair the integrity of the through rate. It is not practicable to require that the identity of each carload of grain, lumber, salt, etc., be preserved, but, in the opinion of the Commission, it is not possible to lawfully substitute at the transit point any commodity of a different kind from that which has moved into such transit point under a transit rate or rule. That is to say, oats or the products of oats may not be substituted for corn, corn or the products of corn for wheat, nor wheat or the products of wheat for barley, nor may shingles be substituted for lumber, or lumber for shingles, nor may rock salt be substituted for fine salt, nor fine salt for rock salt; likewise, oak lumber may not be substituted for maple lumber, nor pine lumber for either oak or maple, nor may *hard wheat, soft wheat or spring wheat* be substituted either for the other. These illustrations are not given as covering the entire field of possible abuses, but as indicating the view which the Commission will take of such abuses as they arise.

"To the end that abuses now existing at transit points may be eliminated, carriers will be expected to conform their transit rules and their billing to the suggestions of this rule. In the event of the failure of any carrier so to do, reductions of legal rates caused by transit abuses will be regarded as voluntary concessions from legal rates."

Some shippers and carriers paid little attention to this ruling. The abuses at which it was aimed continued. Finally, some months ago, the Commission took steps indicating that it meant to enforce it. Immediately protests poured in from all directions.

It has been said that enforcement of the Commission's rule would impair the transit privilege and do great injury to some, and this probably is true; however, it is also true that other reforms eliminating unfair railway discriminations have been accomplished only at the cost of considerable inconvenience and hardships to many persons. The grain dealer who does any considerable business receives wheat from various territories and mixes it in the bins of his elevator. Similarly, in the manufacture of any particular grade of flour different grades of wheat from various territories are mixed. Compliance with the Commission's requirement that hard wheat, soft wheat and spring wheat shall not be substituted either for the other would, therefore, revolutionize the grain and flour milling businesses.

The Commission's ruling probably is too broad in some respects and too narrow in others to effect needed reforms without destroying legitimate and beneficial business practices. A good many people who have studied the situation believe that three changes ought to be made: (1) The carrier should in every case where the transit privilege is granted impose a charge for it. (2) The transit privilege ought to be denied to or withdrawn from every industry to which it is not a legimitate necessity. (3) Such changes should be made in the rates or such regulations should be enforced as will make impossible the evasion of the tariff rates appropriate to the several shipments in any transit transaction through improper substitution of tonnage.

(1) The purpose of all these arrangements is to afford what amounts to a combination of local services for one through rate. Each of these local services frequently involves as complete a transportation transaction as if a local rate was applied to it. Cars are prepared, placed, removed, waybilled, hauled and accounted for just as when used in purely local service. The local rates usually are reasonable and just for local service; and competitive conditions have reduced many through rates close to the cost of the service. It, therefore, seems probable that in many cases where the carriers have granted the transit privilege they have thereby so reduced their earnings that they are rendering the transportation service from the point of origin to the final destination for a return perilously close to or even less than the cost of the service. Since the granting of the transit privilege is a source of expense to the carrier and of profit to the shipper, it would seem that it would be reasonable and proper for the carriers to adopt a policy of uniformly imposing a charge for it, the charge varying in amount according to local conditions, the nature of the commodity and the conditions under which it is transported, all of which affect the cost and the value of the service.

(2) It will be found rather hard to draw a line between the commodities which should be allowed transit and those which should not. It seems to be essential to the regular flow of grain from the fields to the large primary markets and milling centers and thence to all parts of the United States and of the world. Probably it is equally essential to the free movement of cotton, too, from and through compress points. It is needed to enable butter, eggs and poultry to be concentrated for preparation for shipment under refrigeration to distant markets. No doubt there are some other commodities to whose free and satisfactory movement from points of production to points of consumption it is prerequisite. It must be borne in mind, however, that the carriers cannot afford to extend the privilege to all traffc, nor even to all traffic in the movement of which transit would be of value to the shipper. The ultimate effect of the unnecessary spread of transit is sure to be an excessive reduction of railway earnings. The criterion of whether transit should be granted to or allowed to be retained by an industry should be whether its enjoyment by that industry inures or would inure to the benefit of the public. If the demand for it grows out of changing conditions to which a few scattering concerns here and there find they are unable to adapt themselves, or if the demand for it is really a plea that the railways shall bolster up infant industries which it is sought to establish where general conditions are unfavorable to their establishment, or if the demand for its continuance comes from some concern to which it was granted on the infant industry plea and which has long since outgrown its swaddling clothes—in such cases it is evident that transit is sought to be acquired or retained on grounds that are not consonant with the interests either of the public or of the railways, and that it should be withheld or withdrawn. There seems no good reason, for example, why it should not be withdrawn entirely from the iron and steel industries. Nor does there seem any good reason why it should not be withdrawn from many interests whose use of it is connected with the speculative movement of commodities in which the freight rate is hardly an appreciable factor. A good example of such business is the concentration and holding of food products in cold storage.

(3) The devising of a plan or plans which will prevent substitution of tonnage that results in evasion of the legal rates presents a very hard and intricate problem. There are two standpoints from which the relation of freight rates to the transit privilege may be regarded. It may be argued that shipping a commodity into and out of a transit point on a transit billing is a very different thing from shipping certain quantities of a commodity into the transit point, selling them there and then shipping out on the transit billing other, but equal, quantities of the same commodity, which have been bought locally at the transit point or have moved into it on either transit or non-transit billings. The former is clearly a through shipment. The latter is two local shipments. Therefore, it may be contended that while the through rate may properly be applied on the former the sum of the local rates ought to be applied on the latter. It is replied to this that "wheat is wheat," "salt is salt," and that so long as the tonnage of a particular commodity which moves out of a transit point on a transit rate is the same as or less than the quantity of that commodity which moved into the transit point on a transit rate, no one is hurt and the integrity of the through rate is not affected. It may be quite true that the integrity of the through rate is not affected, but it seems clear that the through rate is applied on two local transactions; in other words, is substituted for the local rates, and that this involves a departure from the published rates unless such substitution is specifically provided for in the tariffs. Furthermore, the carrier is deprived of local revenues to

which it is entitled, and based on which the sale and purchase at the transit point was made.

The language of the commission's conference ruling No. 76 shows that it took the view that such substitution as is here referred to impaired the integrity of the through rate. For commercial reasons, however, it is impracticable to require that only the specific commodity which comes in on a transit billing shall go out on that billing. It is the universal practice in the grain and flour manufacturing businesses to put wheat from different territories into the same bins, where, of course, its identity is completely lost, or to mix the grain from different territories as may be necessary to such grading and blending as will make it marketable or fit to be ground into the various grades of flour. Furthermore, it is impossible to see who is hurt by thus mixing grain so long as only transit grain goes out on transit billings, under which it pays the legal rate from point of origin to point of destination. For example, suppose that a dealer brings in a carload of grain from A billed to B and another carload of grain from C billed to D. If, then, he ships the carload from A to D and the carload from C to B, he pays the full legal rate on the two carloads, and it is impossible to see who is hurt. The same thing may be said when the grain is mixed and ground into flour, one carload of which is shipped to B and one to D.

The improper substitution of tonnage must ordinarily be accomplished by shipment out on transit billings of commodities that did not come in on transit billings, or by sale locally of commodities brought in on transit billings, or by shipment out of transit commodities by carriers not parties to the transit billings, as, for example, by boats on the Great Lakes. The following is an example of substitution that affects the rates: The local rate from the Missouri river to Chicago is 12 cents; the local rate from Chicago to the Ohio river is 7 cents, and the sum of the local rates is 19 cents. The through rate from Missouri river points through Chicago to the Ohio river on a transit basis is 13 cents. Now, suppose a dealer at Chicago brings in grain from the Missouri river and sells it locally or ships it out by boat. The western line's billing entitling this grain to transit should then be canceled, but ordinarily it is not. Subsequently, the dealer ships from Chicago to the southeast a special kind of grain which originated at points in Illinois south and east of Chicago and which is not entitled to transit to the southeast through Chicago. He ought, under the published tariff, to pay a rate from Chicago to the Ohio river on this grain of 7 cents. What he sometimes has done is to ship it out on the billing on which he brought grain in from Kansas City. He ought to pay the local rate from Kansas City to Chicago on the grain disposed of at Chicago and the local rate from Chicago to the Ohio river on the Illinois grain, a total of 19 cents. What he has done by substitution of grain is to make two local shipments on a transit rate of 13 cents, and thereby cut the rate 6 cents. Such manipulation of rates as this is not peculiar to the Chicago market. It has been going on at almost every large grain market in the country.

Again, a miller ships in wheat on a transit billing and grinds it into flour. The total tonnage of the resulting products is somewhat less—perhaps 3 per cent.—than was the tonnage of the wheat. To make the tonnage that he ships out equal the tonnage he shipped in, he adds the products of grain that he has bought locally. In that case, on 3 per cent. of what he ships out, does he really pay any freight at all?

Similarly, a manufacturer of hardwood products largely embraced under the term "flooring," may, as shown at the hearing before the commission in Washington, ship in southern raw oak lumber from Cincinnati to Detroit, make it into flooring and ship it out to New York on a transit rate. When the lumber goes through the process of manufacture its tonnage is reduced about 50 per cent. Under transit rules that have been in effect in the past the shipper could fill out his tonnage from Detroit to New York with products of maple lumber that he had bought in northern Michigan and possibly brought to Detroit by lake. The true principle of the transit privilege has been that the shipper should ship out only the commodities or the products of the commodities that he shipped in. The shipper in this case, while paying the same freight rate which a shipper of oak flooring would pay from the south to New York, could make assorted cars of oak and maple at Detroit, which the shipper in the south could not do, or he could dispose of a given amount of oak locally at Detroit and ship to New York on the oak billing an equivalent tonnage of maple received from the north. Not only might this impair the rates, but it is complained by other dealers who are trying to sell oak in the Detroit market, and who do not have transit, that, owing to the advantage which it gives those who do enjoy it, they are able to undersell other dealers locally in the Detroit market.

Still another form of abuse is the substitution of one commodity, such as corn and its products, for another commodity, such as wheat and its products, or cottonseed meal for corn meal. Such substitution is provided for in the tariffs of some roads. There is no justification for it on any sound principle of rate-making. If corn may be substituted for wheat, why may not any commodity be substituted for another commodity which happens to move on the same rate? Abolition of even this indefensible perversion of the transit principle is apt, however, to greatly harm or even destroy some small but deserving industries. Scattered over New England are numerous small dealers and millers who are now permitted to ship in carloads of the various grains and ship out under transit billing mixed carloads of these grains and their products. If the existing transit privilege were withdrawn, the business of many of the wholesale and retail dealers in the various grains and their products and numerous small millers might be injured, for, while many of the small retailers can handle mixed carloads of the various grains and their products, the number that could handle solid carloads of these commodities is small.

There is no doubt that strict enforcement of the commission's ruling No. 76 would stop substitution involving impairment of the legal rates. But, as has already been indicated, this would force a revolution in some businesses, particularly the grain and flour milling, which would do much harm to those engaged in these businesses and to the public. The commission can hardly justify its position in pressing identity of traffic to the point of making a distinction between grades of the same materal or commodity having precisely the same general form and use.

Various methods for confining transit within legitimate limits without destroying it or compelling harmful revolutions in business methods have been suggested. One is the fixing of flat rates in and out of transit points to as great an extent as possible. Flat rates already are fixed in and out of many of the large markets, and it would seem that it should be feasible to apply them at practically all large centers.

Another scheme contemplates assuming that the quantity of a commodity forwarded on transit bears about the same ratio to the respective quantities of the commodity received from "long" and "short" rate points, as does the quantity of the commodity disposed of locally. It is, therefore, proposed that the railway shall open a book account with each shipper who desires to take advantage of the transit arrangement, requiring from him a bond for proper settlements. Suppose, then, a transit point at X, to which from a number of local points, A, B, C and D, the local rates vary, but from all of which the same through transit rate is made via X to certain large markets, E, F and G. When the commodity is shipped out of the transit point, X, the through rate from the point of origin to final destination is applied, and the local rate to the milling or storing point is refunded, except a 2½-cent transit charge. Accounts for inbound and outbound shipments would be kept, and in periodical settlements the inbound billings would be readjusted to the *average* local rate paid inbound on the commodity during the period. The require-

ment would be made that all grain purchased locally or which came in on non-transit billing should be included in the account. A settlement slip might then look something like the following:

Grain Rec'd.

From	Lbs.	Local Rate.	Freight.
A	100,000	20 cents	$20,000
B	100,000	15 cents	15,000
C	100,000	12 cents	12,000
D	100,000	6 cents	6,000
Local	100,000	..	.....
	500,000		$53,000

Average rate .....10.6 cents

Deducting from the average rate the transit rate of 2½ cents leaves 8.1 cents, which is the basis for refund.

Grain and flour forwarded to E .....100,000 lbs.
" " " " " F ..... 50,000 lbs.
" " " " " G ..... 50,000 lbs.

Total .....200,000 lbs.
at 8.1 cents equals $16.200

If more than this amount had been refunded, it would have to be returned by the shipper; if less, an additional payment would have to be made to the shipper by the railway. Under present arrangements the shipper undoubtedly would present for refund A bills for 100,000 lbs. at 17½ cents, amounting to $17,500; B bills for 100,000 lbs. at 12½ cents, amounting to $12,500; total, $30,000, leaving the balance of 300,000 lbs. disposed of locally to stand against the inbound tonnage received on lower rates or bought locally, the result being that the railway is out of pocket $13,800. There is ground for questioning if this plan is legal, as it really contemplates averaging the rates on a number of shipments instead of charging a specific rate on each specific shipment.

Another plan which has been proposed and which, in fact, is in use at some places, is to require the oldest "in" billing to be presented when a transit shipment is to be forwarded. Under this arrangement the results are fairer than they are when the shipper is allowed to select bills from "long" rate points so far as they are available, leaving the grain disposed of locally to stand against billings from "short" rate points. It may be, however, that the shipper who desires to forward three cars of flour, for example, will find that his three oldest billings are billings from "short" rate points which will expire within a few days, and that his next oldest billings are from "long" rate points. In that case he probably will hold the grain until his older billings have expired and then use his later and more advantageous billings, in this way securing a rate advantage.

Stil another plan which is proposed is to require that every time a transit company or its products is taken from a mill or warehouse, whether for local sale or for shipment out by water, or for shipment out by rail, billings to an equivalent amount shall be immediately canceled. If a commodity has been put through a process of manufacture which has reduced its tonnage, the billing canceled when its products are shipped out will be the equivalent in tonnage of the raw material which was shipped in. For example, if 100,000 lbs. of wheat are shipped in and ground into flour, the tonnage being thus reduced, say, 3 per cent., and 97,000 lbs. of flour are shipped out, billings for 100,000 lbs. of wheat will be canceled. No doubt billings would be canceled in the order of their age; and at any given time a miller or dealer would have billings for no more and no less than the equivalent of the commodity that he had on hand at that time. Unless this plan were administered scrupulously and in good faith, however, departures from the legal rates could be made under it.

The conditions met at different transit points vary widely. At some local consumption and local purchases are very small compared with the amounts of commodities shipped through on transit. At others the local purchases and consumption are relatively large. At some places, such as Milwaukee, Chicago and Buffalo, water transportation is available, while at most points all commodities move in and out by rail. To stop abuses of the transit privilege under these carying conditions will be difficult, and will, no doubt, require varying remedies. The plan most generally in use and the one which seems to offer the most satisfactory solution if lived up to in good faith, provides for filing with an authorized railway transit bureau at each transit point freight bills for all grain which is to be given the transit privilege; the bureau retaining the freight bills and giving the owner of grain receipts upon which the freight bills can be recovered if the transit privilege is availed of. The transit bureau should be enabled to check all grain into and out of the elevators, and transit privileges should only be given to grain going into elevators or mills which are subject to rigorous inspection.

Probably, however, it is conceded by all who have studied this subject that there is not, and cannot be made, any transit rule or arrangement which an unscrupulous shipper cannot "beat," especially if he has the active connivance, or even the more or less guilty acquiescence, of the railway. After the best rules practicable shall have been made, abuses of the transit privilege probably will continue. If this shall be the case, the commission shall have to choose between two alternatives. It will have to completely abolish the privilege or to institute such wholesale prosecutions for its abuse as have been requisite to stamp other forms of rebating.

THE WEATHERING OF COAL.

The Engineering Experiment Station of the University of Illinois has just issued Bulletin 38, which contains the results of experiments conducted to determine the change in weight, the change in colorific value and the amount of disintegration that are liable to occur in the grades of coal found in Illinois and neighboring states under different conditions of storage, such as in the open air in piles; in covered bins, and under water. These experiments were conducted by S. W. Parr, Professor of Applied Chemistry, and W. F. Wheeler, first assistant, Department of Chemistry. This bulletin reports a continuation of the experiments of the weathering of coal published under the same title in 1907 in Bulletin No. 17. The experiments described in the present bulletin deal with car-load lots of coal under conditions comparable with actual experience in the storage of coal. Car-load lots of both nut and screenings were exposed in covered bins, in open bins and under water, for a period of one year. The initial values were determined for the freshly-mined coal, and analyses were made approximately after two days, ten days, two months, six months and one year.

Coal of the type found in Illinois and neighboring states is not affected seriously during storage when only the changes in weight and losses in heating power are considered. The changes in weight may be either gains or losses of probably never over 2 per cent. in a period of one year. The heating value decreases most rapidly during the first week after mining and continues to decrease more and more slowly for an indefinite time. In the coals that have been tested, 1 per cent. is about the average loss for the first week and 3 to 3½ per cent. would cover the losses for a year, although in some instances the loss was found to be as high as 5 per cent. in a year.

The losses due to disintegration of the coal and to spontaneous ignition seem to be of far greater importance than any changes in weight and heating value, although they cannot be expressed in figures for comparison. The storage of coal of a size larger than is to be used would overcome part of this objection to storage, as the coal could be crushed to the most advantageous size just before firing. The larger sizes of coal are also much less liable to take fire spontaneously. Storage under water will prevent disintegration of the coal to a very large extent, and it will absolutely prevent any fire losses. Aside from these advantages in favor of storing coal under water, there seems to be very little to be said in favor of any particular method of storing coal.

RAY MORRIS.

Ray Morris, not quite 32 years old, after nine years in the *Railway Age Gazette* office, leaves this service to become a partner in the banking house of White, Weld & Co. He was born in New Haven, Conn., June 4, 1878, son of Ex-Governor Luzon B. Morris. His early education was in the Hopkins Grammar School in New Haven; he prepared for college at the Phillips Andover Academy, and graduated from the Academic department of Yale University in 1901.

The examination of one of the early stages of a man's career is liable to be quite as interesting to other young men as a record of complete life work. This is true only if it is taken at a turning point, so that it is a complete chapter in the volume. It is well to make such an examination with no purpose of flattery or criticism, but for its lessons only. Most boys and young men have at various times different ideas and intentions as to their career. Probably the larger proportion have no fixed ideas before attaining their majority.



Ray Morris.

Morris had a tremendous boy interest in ships and shipping. He does not know how early this interest began. It grew up with him until about the middle of his college course, when he spent a vacation in the Bath, Me., iron works. It was not the experience of a timekeeper and draftsman assistant in that iron works that discouraged him in his plans; it was rather the enlarged vision, which grew into a conviction, that ship designing and building had limitations not at all to his own mind. Nevertheless, the sea was long more than a dream to him; he had learned to know by sight every trans-Atlantic and coastwise steamer regularly entering the port of New York, and he had been on board most of them; he had traveled down the coast on a lumber schooner; he had been to England and Germany on oil tank steamers during two vacations. The shifting of his interest from ocean transportation to transportation by rail was due to the incident that his sister had become the wife of Professor Hadley, now president of Yale University. Hadley had previously been for several years an editorial writer for the *Railroad Gazette* and, before advising Morris definitely, he called at the office of the *Railroad Gazette*, and his suggestion was cordially received, to the effect that Morris should make his elective studies during the last half of his college course especially relative to qualifying himself for membership on the *Railroad Gazette* staff.

He came here in July, 1901, full of enthusiasm for the drudgery which was his first year's assignment. It involved hard work and extreme accuracy. It was estimated to be a full six days' a week work. It was a quantity of work such as no trade union would allow any of its members to exceed. Nevertheless, within half a year Morris had so organized it and so persistently economized time that he was able to report to Colonel Prout, then editor, that he could do it all regularly in an average of 3½ days, and that he had 2½ days of time to spare. Of course, he got a chance at more important undertakings; the kind that he was reaching out for. It involved hours of study in the Astor Library, letters and talks with railway men and, perhaps best of all, seeing things and using his own eyes. He produced results. His first important study was published in this paper in August, 1902—"A Review by Decades of American Deepwater Steamers in Atlantic Coastwise Service." This probably interested only a few railway officers, but it had a deep interest to that few. It was a complete piece of work and a long, grueling study for a young man.

Transportation by water continued to interest him, but his work tended more and more to comparisons with railway service. During the year 1903 he produced a series of six editorial articles on the enlargement of the Erie canal, both the case against it and the benefits to be derived from it. It is difficult even now, looking back over that series of articles, to find any errors or even omissions of due consideration of all the facts which bear on the subject. It was neither argumentative nor partisan, nevertheless it is safe to say that if the voters of New York had been made acquainted with his exposition the state would not now be engaged in its wasteful expenditure. This series of papers, submitted to Yale University, gained for him the degree of Master of Arts, three years after his graduation.

Early in 1903 Morris became managing editor of this paper.

Orderliness is an essential quality for a clerk or secretary; it saves time. It has a greater proportionate value to a man who has gone farther because it saves more valuable time. The managing editor's desk load of manuscripts, drawings, photographs and letters becomes dangerous in one day of neglect. Morris's method has been to clear it entirely by as early as 11 o'clock each morning. Letters were answered and obviously rejectable manuscripts were returned. Accepted manuscripts and material for illustrations were divided; those for his own consideration left on the desk for nearly immediate attention, while at 11 o'clock he started with considerable handfuls for a series of calls on the members of his staff. He had 12 men and some other assistants to keep busy and interested. He did not send for them; he went to their desks and so secured a daily thorough understanding with each one, both helping and directing, with the result of most enthusiastic team work.

Before lunch time he expected to have his desk entirely cleared, so that the afternoon could be left quite free for study, for writing and for interviews with men who had information. He always seemed to have in mind methods of

economizing time. He persisted in a budget form of appropriation of definite hours and even minutes for each piece of work and for each interview sought by himself. He developed a considerable skill in gently limiting the time of interviews sought by others.

Aside from hourly allotments of time, there were the daily divisions naturally resulting from the work of producing a weekly paper. The weekly editorial work is completed on Wednesday. On Thursday noon, Morris had a formal staff meeting, conducted in a thoroughly informal but wonderfully rapid fashion, the main object being to keep each man informed of what the other men were doing, to avoid duplication of work, to state general policies, and, as an indirect result, to cultivate zeal.

What might be called the organization in the small staff of a dozen men was as complete and clearly defined as in any railway corporation. All the men were encouraged to broaden themselves in general knowledge of railway work and, at the same time, maintain a specialty for minute study. The managing editor wanted, and obtained, specialists in traffic, operating, mechanics and engineering. For his own specialty of railway finance and administration, he had begun to qualify himself two years before he came to the office, and he never lost sight of it. Each man on his staff with a specialty had an understudy, and this developed good results. The understudy rapidly became a valuable assistant, and the system enabled the student to travel and become practically acquainted with railway working as well as with the ablest railway officers in the country. This knowledge and experience in the different departments of railway working is an essential to intelligent discussion of railway subjects. It was found by experiment that any member of the staff could be absent for as much as three weeks without inconvenience. Morris rarely allowed himself to be away longer than this, but he managed, with his developed skill in avoiding waste of time, to travel over and examine a representative part of the railways in the United States, and to have a pretty thorough knowledge of their sources of traffic and their methods of administration. Their methods of finance were more easily studied at home. In one case he sent a member of his staff for an absence of three months, pretty well covering the West, in making studies on one subject.

One important result of Morris's specializing, which happened to be the determining factor in his future career, was the making of a series of investigations and reports for bankers on railway and some industrial corporations and propositions. For about a year he was regularly retained by one banking firm for this work. It was only by great diligence and severe economy of time that he was enabled to do such outside work, but it was extremely valuable to him in the direct line of his work—a helpful check on his office work, and a constantly recurring incentive to thoroughness of a kind that is apt to be good for an editor. Moreover, it was remunerative, and his employers liked to see him get on. But he never had his eyes centered on a money return; it was always for knowledge.

The railway editor has a chance, when he has the ability to avail himself of it, of doing a good deal of good in the world in helping to a better understanding between the railways and the public. This always appealed strongly to Morris. He wrote five important articles for the *Atlantic Monthly*, one for the *Review of Reviews*, and for four years wrote nearly all the editorial articles in the Railway and Industrial Section of the *Commercial & Financial Chronicle*. Indeed, he was a frequent writer of editorial articles for newspapers and journals which get a broad audience in what we call the general public.

A rapid talker and writer on his chosen subjects, he sometimes gave an impression of cock-suredness to a careless observer. This may have been an early tendency, and it was not overcome by morbidly recognizing it as a fault and making mental efforts to correct it; it was simply banished by increasing knowledge and a sincere love of truth. The only successful editor is one who makes it his main business to discover the truth; whether he then tells it or keeps silent or lies about it is another matter.

It takes years to get facts which a trained man can in a few days make available. Morris gave a striking example of this by unusual speed in writing an important book on Railway Administration. The book is not yet published, but his work is done. On January 10, he had completed chapters including about 15,000 words. The publishers asked for the completed manuscript on the first of March; he had available 49 days, including Sundays. Daily work was rather engrossing, and, so far, he had usually adhered to his rule of doing no work in the evenings at home, but in the interpretation of this ruling he did not classify hard reading as being work. The time had come when he must work overtime in order to keep his engagement; the results are rather interesting. By making his office hours a little longer than usual, and by devoting an hour or two to the work in the evening, he produced an additional 72,000 words in that 49 days, being an average of 1,470 words a day. Few writers in the world have ever averaged more than 1,200 words a day in any writing requiring care and accuracy; few novelists have ever done it. Of course, Morris could not have done it without the years of thorough preparation for this particular job. Also, an essential factor in it was his persistent outdoor habit, and that radiant health that comes from a well ordered life and lots of exercise.

It might as well be added here that a man's home life is apt to be an overwhelming influence in determining whether or not such an unusual quantity of work is possible. Marriage is rather an important item to a young man. On October 4, 1906, Morris married Miss Katharine Grinnell and it has proved to be a good undertaking.

Aside from doing the plain duty of speaking frankly of an associate who has in a few years gone far, the object of this writing is to show young men what a young man can do; how far diligence is an absolute substitute for genius. He has made money without having that result for his direct object; he has obtained recognition and respect, but this has been incidental. He simply worked on his chosen subjects with an eye single to getting all the facts and developing the truth, "to do a good job," as he was apt to express it.

Surely this nine years of activity has in it some inspirations for the young man who wants to do something beyond making a living or getting rich. A university education in such a career is an essential, unless a man happens to have enough genius and persistence and physical energy to overcome the lack of it. The aim needs to be higher than either money or fame. The man who devotes his life and maintains his aim at getting rich is reasonably certain to get rich, and we do not need to cite any of the many examples to show that that success, alone, is really absolute failure. Striving for fame also usually succeeds, if it is accompanied by ordinary intelligence and persistence, but such fame so acquired usually results in its possessor being only a passenger. Knowledge, usefulness and permanent health are better targets, and success in this kind of aiming makes all the rest easy.

In this highly scientific period of the world's history, the distinction among successful men between the theorist and the practical man has disappeared. The subject of this writing illustrates this quite clearly; he has devoted the first brief section of his life to the deep and thorough study of one subject, accompanied by many and quite enough other investigations, which have had the result of broadening him, and he has already shown value in practising what he has studied. In one instance, a small railway was bought outright, based on his investigation and report, and he subsequently was asked to become a member of the executive committee and

comptroller. This task he accepted, not because he wanted any railway office, but because, for a time at least, the extra work involved in fulfilling with thoroughness the supervisory duties of this small railway company would give him fuller knowledge.

The real student is the real practical man. There are plenty of similar instances, and on a larger scale. A. H. Joline, a great railway lawyer, Judge Lovett and Judge Gary found themselves immediately qualified for presidential work. Younger professional men, such as W. D. Hines, of the Atchison, and Roberts Walker, of the Rock Island, have shown how quickly the thorough student can become the great administrator. The list of examples might be extended indefinitely to illustrate to young men that a life devoted to purposes of knowledge, usefulness and health is better than aiming at money or fame, and that orderliness, persistence, industry, a full quota of recreation and an avoidance of idleness are pretty good qualities to keep an eye on.

W. H. BOARDMAN.

NEW STEEL PULLMAN SLEEPING CAR.

The Pullman Company has already furnished a number of the steel sleeping cars to be used by the Pennsylvania Railroad when it opens its service through the tunnels into New York City. Four hundred and eighty-seven steel cars, including sleeping, parlor and observation cars, are being built for use on the Pennsylvania for Pullman service. The dining cars for the tunnel service have been built by the railway at its Altoona car shops; many of the steel coaches and mail cars have been in service more than a year.

Since the first steel sleeping car, "Jamestown," was built in 1907 a number of changes and improvements have been made in the designs so that the weight has been reduced to 137,200 lbs. The new sleeping cars are 73 ft. 6 in. long over end sills, and the underframe without fixtures weighs 27,000 lbs.; the two trucks weigh 40,000 lbs., leaving 70,000 lbs. for the weight of the upperframe, brakes, drawbars, buffers and all finish and fixtures. The sides are covered with metallic sheathing, whose chief merit is the ease with which it can be repaired and painted. The roof is made of steel sheets with expansion joints which are flanged upon each side of a carline rib and covered with a U-shaped cap on the outside.

The underframe is a combination of large steel castings,

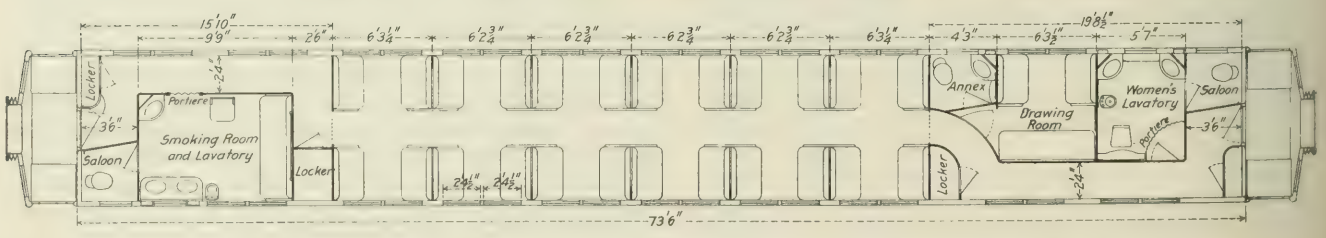


Interior View of Steel Sleeping Car.

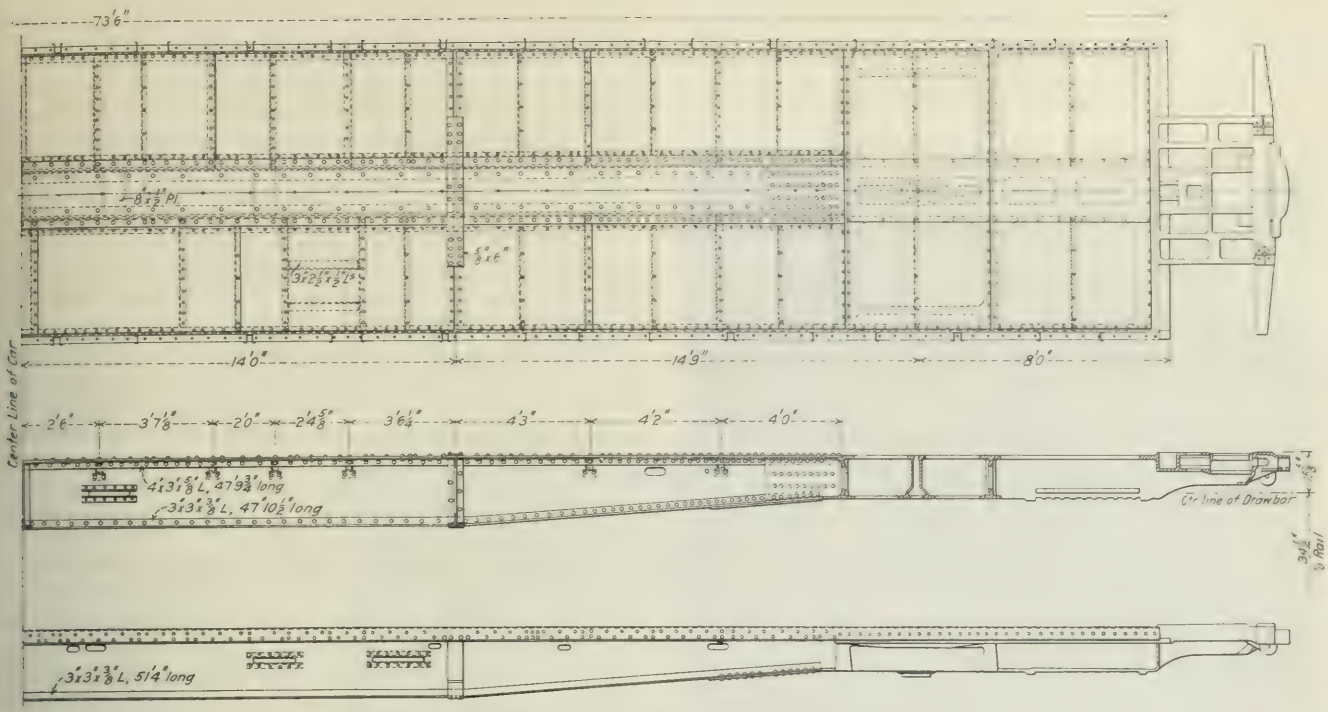
which form the end portions from the body bolsters to the end of the platforms, and structural steel girders forming the center sills which are the main compression members. The



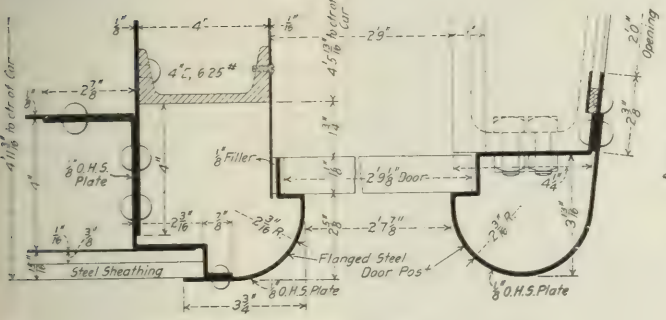
Pullman Steel Sleeping Car for Use on the Pennsylvania.



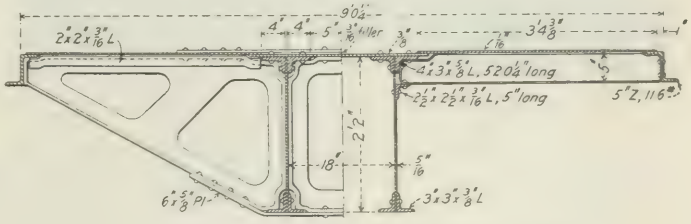
Plan of Pullman Steel Sleeping Car for Use on the Pennsylvania.



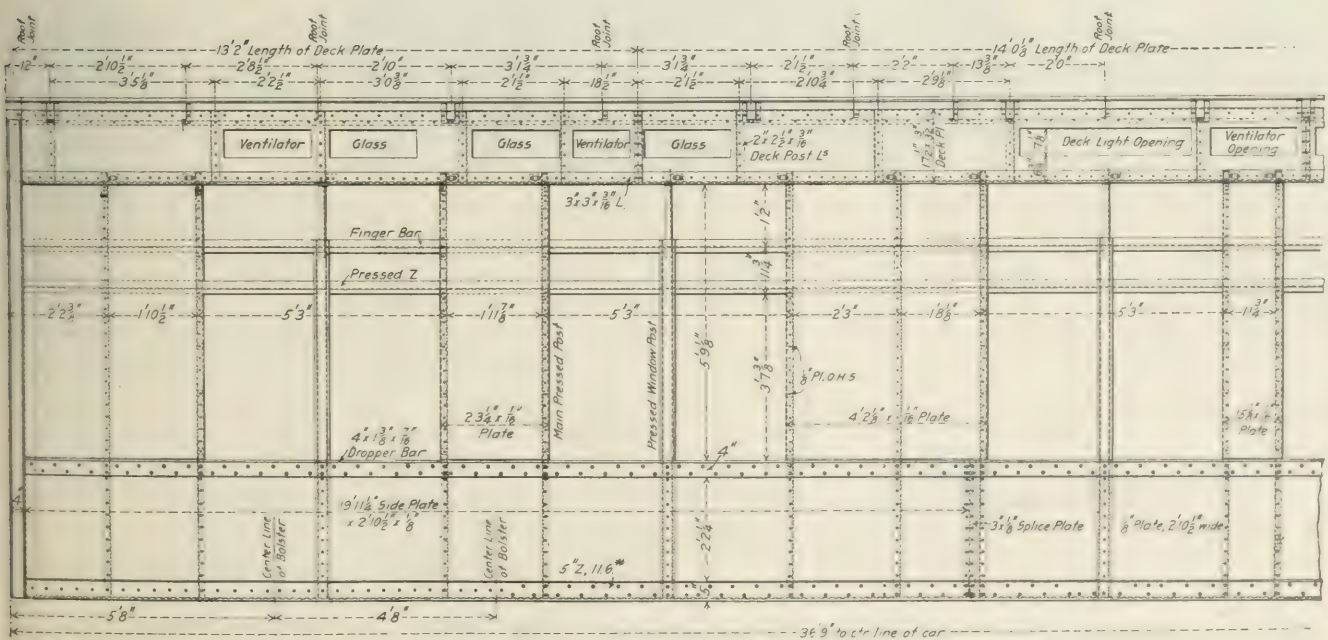
Plan and Elevations of Underframe of Steel Sleeping Car.



Body and Vestibule Corner Posts.



Sections Through Underframe of Steel Sleeping Car.



Side Framing of Steel Sleeping Car.

steel casting forms in one piece the double body bolster, the end sill, the platform with cored pockets for the buffer springs and the buffer beam. The center sills are deep fish-belly girders with a cover plate on top and are 26 in. deep at the center and 16 in. deep at the ends. They are built up of



Smoking Room of Steel Sleeping Car.

$\frac{5}{16}$-in. web plates with 3 x 3 x $\frac{3}{8}$-in. angles forming the lower flanges and 4 x 3 x $\frac{5}{8}$-in. angles for the top flanges. The cover plate is 30 in. wide and $\frac{3}{8}$ in. thick. Between this and the side sills there is a solid steel floor plate $\frac{1}{8}$ in. thick. The two main crossbearers have cast steel fillers; the shape and construction of these are plainly indicated in the view of the cross-section of the underframe. The side sills are 5-in. Z-bars, 11.6 lbs. per foot, and form the lower flanges of deep girders which include the side plates below the windows. These plates are 2 ft. 10½ in. deep and ⅛ in. thick; the top flange at the window sill is an angle 4 x 1⅜ x $\frac{7}{16}$ in. These deep girders, as well as the remainder of the steel side construction are designed to carry a large portion of the load.

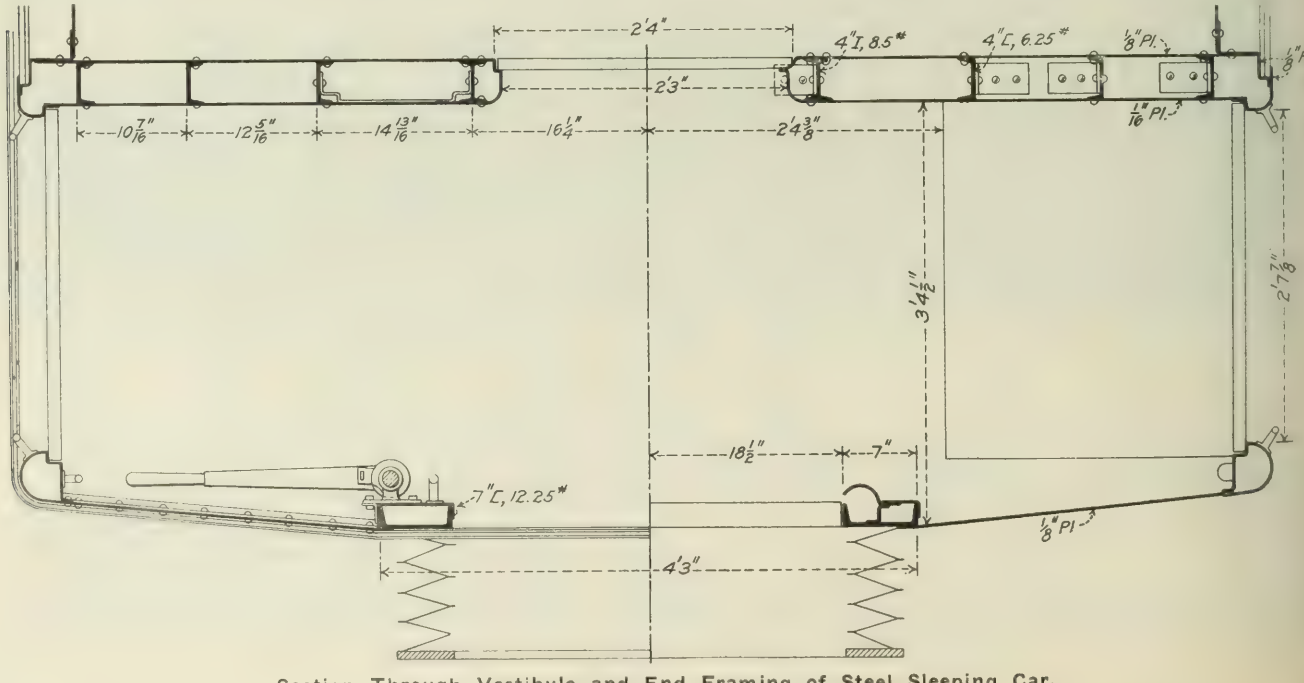
The posts are pressed steel and extend from the floor to the main plate. The plate is an angle 3 x 3 x $\frac{5}{16}$ in., and it completes the side construction, the upper and lower deck forming a separate construction which is built complete on the shop floor and then raised in position and riveted on.

The end walls and platform construction have been worked out in a very substantial manner and details of this portion of the car are included in the illustrations. The end door posts are 4-in. I-beams, 8.5 lbs. per foot. The corner post and two intermediate posts in the end wall are 4-in. channels, 6¼ lbs. per foot. The entrance door casings at the steps are ⅛-in. steel plate flanged closely to the shape of the present wooden casings; these also are shown in detail.

The buffing device is the Forsyth patent and the Waugh friction draft gear is used in connection with it. The interior arrangement of the car is shown in the floor plan. It contains 12 regular Pullman sections, 1 drawing room, women's lavatory and men's smoking room and lavatory, the latter being 9 ft. 9 in. long. The inside finish is entirely of metal with the exception of the sash and seat arms. The berth fronts and side panels are painted in imitation of mahogany, and the general appearance of the interior of the car is similar to that of cars finished in wood.

HENRY JOHNSON.

Henry Johnson, who was one of the early leaders in railway signaling in America, and who was a pioneer in England as well, died at his home, "Hazelmere," Rahway, N. J., April 5, at the age of 72; and this department of the railway world has lost its Nestor. Mr. Johnson had a prominent place in the development of the signaling art in Great Britain and then came to this country in time to do fundamental work here also. English ideas have borne a prominent part in the establishment of the science of signaling in the United States, especially in keeping experiments anchored in a reasonable



Section Through Vestibule and End Framing of Steel Sleeping Car.

degree to conservative methods, and Mr. Johnson was a chief exponent of those ideas.

He was born at Higham Ferrers, Northamptonshire, England, and on leaving school went into the shops of Stevens & Sons, signal manufacturers, and with this firm he worked 14 years. Then for 13 years he was with Saxby & Farmer as superintendent of construction. His period of service with this concern, the best known signal establishment in the world, covered the years in which, under pressure from the government, the railways of Great Britain began the introduction of interlocking for switches and signals, a comprehensive movement in which that country led the world, and which has been an important factor in making the English railways the safest in the world. Mr. Johnson superintended the construction of innumerable plants in the north of England, in Scotland and in Ireland, and he was the inventor of some of the most useful and best known appliances in use to-day. As an inventor, he is best known probably as the designer of the present style "A" (vertical) interlocking machine, the outside, bevel-edge detector bar and the cam action rail clip for detector bars. His invention of the liquid compensator, for use in wire lines for moving signals at a long distance from the cabin, brought him a silver medal from the International Inventors' Exposition at Kensington, London, in 1885. The anti-friction pipe carrier, the mechanical slot, the mechanical selector are other devices in the development of which he had a hand.



William W. Snow.

Some time before coming to America Mr. Johnson left the manufacturing business and was appointed superintendent of signals for the Lancashire & Yorkshire, which office he held for several years. He came to America in 1886, and was appointed manager of the Union Switch & Signal Co. In 1888, in conjunction with his nephew, Charles R. Johnson, he established the Johnson Railroad Signal Co., and built a factory at Rahway, N. J. In 1895 Charles R. Johnson died, and the company was sold to the National Signal Co., Easton, Pa. In 1896 Mr. Johnson joined John T. Cade in the establishment of the Standard Railroad Signal Co., and was for several years its president. The Standard, with the Pneumatic Signal Co. and the Taylor Signal Co., were the three companies which later were consolidated in the organization now known as the General Railway Signal Co. After the Standard became well established, Mr. Johnson retired from active business and for the last few years has lived in retirement at his home in Rahway.

Mr. Johnson had four children, namely, Arthur H., who is superintendent of telegraph and signals of the London & South Western; Hilda J., who died some time ago; Sidney G., who is general sales manager of the Union Switch & Signal Co., and Edward C., who died in 1900. His widow survives him.

Mr. Johnson was not only a walking encyclopedia of the history of railway signaling, but was a most agreeable person to meet outside of his profession. To his counsels many a signal engineer of the present day gives the credit for having been started along right lines. It is due largely to his efforts that the art of signaling has reached its present degree of perfection.

WILLIAM W. SNOW.

William Wait Snow died April 26, aged 81. During late years he has lived quietly at his home in Hillburn, N. Y., enjoying anniversaries, his children and grandchildren, his friends and the many who were dependent on him. His memory was good and in his long active life he stored up knowledge and gained wisdom, and so he was an ideal sage, always available and valuable to his friends and to the officers of the corporations he had once fathered.

Probably the most important and effective period of his life was the last quarter of the last century, and time so flies that its events are forgotten by most of the people who knew them and are largely unknown to the railway men of the present day. Mr. Snow was at Ramapo, in Rockland county, New York, near the New Jersey line, making cast iron car wheels, but he made better cast iron wheels than anyone else. He used Salisbury iron freighted from the mines in Connecticut, and his early idea was that honesty is a pretty good policy. He made rather a high-priced car wheel that was highly economical in service. He was, however, much more than a manufacturer. He became a great salesman in spite of the drawback of being naturally bashful, and this was because he was truthful, because he liked people, and because these two qualities were so plainly apparent to every railway officer he called on. His market was based on his character. His customers bought his product on his statements, knowing that they would not be deceived. In this and in many other qualities he was wonderfully like his most intimate friend, Aaron French, who made springs at Pittsburgh. But Ramapo was not an economical point for the manufacture of car wheels during the later period of fierce competition in cheap cast iron wheels. Mr. Snow foresaw the fading out of his business long before it began to fade out, and, moving a mile farther down the beautiful Ramapo valley, he founded a new village and a new works for making track material, and under his control the Ramapo Iron Works formed the basis for the new community. Another mile farther down the river there grew up under his influence the works of the American Brake Shoe & Foundry Co.

Mr. Snow was born in Heath, Mass., in 1828, a son of Colonel David Snow, who commanded a volunteer regiment during the war of 1812. He was sent to the village school

and later went to both day and night schools. It was some time before he found the right field for his activities. His parents first wanted him to be a minister; then he learned the bookbinding trade, at which he worked in Greenfield, Mass., and in Troy, N. Y. After about three years of this he volunteered to go around the Horn with a thousand young men to help the Americans in California fight the Mexicans. He wrote home that he was going, but his older brother went to Troy and made such a mental and physical impression on him that he changed his plans.

He then started in the foundry business, working with his brother at Woonsocket, R. I., and later in another foundry at Worcester, Mass. When he was 21 years old he married Olive Estes. In 1856 he went to Indianapolis, Ind., as foreman of a foundry, and later returned to Massachusetts, where, in a foundry at Millbury, he took out his first patent on a car wheel. He soon went to Fishkill Landing, N. Y., to make these wheels, and in 1857 moved to Newburgh, N. Y., under the advice of, and with some help from, Holmer Ramsdell, then president of the Erie Railroad, to make car wheels with Isaac Stanton, under the firm name of Snow & Stanton. The firm went under in the panic of that year and he went to work in the Washington Iron Works. Next he took charge of the Union Car Wheel Works at Jersey City, N. J. In 1866 he went to Ramapo and a few years later he helped to start a foundry at Waverly, N. Y. During later years he founded the Ramapo Iron Works, the Steel Tired Wheel Co., and, finally, the American Brake Shoe & Foundry Co.

His relations with his many employees were always ideal. He had built up these communities; he did not boss them, but everyone in the valley naturally came to him with their joys and sorrows and needs. He accepted all responsibility, but always with a kindly, gentle air of being favored with their confidence. There was a time when few people owned so many $500 to $1,000 mortgages as did Mr. Snow. He was often called a patriarch, but he was a wonderfully alert and effective one. He always liked to be, so far as possible, unknown in his good deeds; nevertheless, he was really masterful.

For diversion he always turned to nature. Even the Ramapo valley was not quiet enough for him. For vacations he wandered deeper and deeper into the then less known Adirondack woods, and he enjoyed them either alone, or with Aaron French, or some other intimate friend. He was a fisherman of the Isaac Walton type, not a particularly good fisherman, but with an infinite capacity for enjoyment of streams and lakes. He tried to enjoy hunting, but killing things with a rifle quickly became distasteful to him.

ACCIDENT BULLETIN No. 34.

The Interstate Commerce Commission has issued accident bulletin No. 34, showing the record of railway accidents in the United States during the three months ending December 31, 1909. The number of persons killed in train accidents was 244, and of injured, 4,149. Accidents of other kinds bring the total number of casualties up to 22,922 (1,073 killed and 21,849 injured).* These reports deal only with employees on duty and passengers. The casualties to passengers also include passengers traveling on freight trains, postal clerks, express messengers, employees on Pullman cars, etc.

Table No. 1.—*Casualties to Persons.*

Causes.	Passengers		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	23	1,561	120	1,106	143	2,667
Derailments	16	616	61	448	77	1,064
Miscellaneous train accidents	..	45	24	373	24	418
Total train accidents	39	2,222	205	1,927	244	4,149
Coupling and uncoupling	..	...	66	837	66	837
Other work abt trains or switches	..	...	44	5,044	44	5,044
In contact with bridges, etc.	2	9	30	347	32	356
Falling from cars or engines or while getting on or off	50	711	167	3,696	217	4,407
Other causes	14	746	456	6,310	470	7,056
Total, other than train accidents	66	1,466	763	16,234	829	17,700
Total, all classes	105	3,688	968	18,161	1,073	21,849

*The statistics here given present the record of the standard railways, for convenience called "steam roads," in distinction from electric railways. The accident statistics of those electric lines on which interstate traffic is carried, and which, therefore, are subject to the Federal accident law, are given in the last paragraph of this article.

The quarter here reviewed was one in which there was a large volume of traffic on the principal railways of the country, and those classes of casualties which occur mainly in the freight-train service show heavy totals. The only collision in which more than five persons were killed was that shown in the table of causes as No. 10, and the victims in that case were not passengers; yet the total of passengers killed in collisions is 23. The only derailment in which more than three persons were killed was that shown in the table as No. 12. But though accidents which are very prominent by reason of the large number of fatalities attending them are thus shown to have been comparatively few, the list of causes, as shown in the 15 notes explanatory of causes in Table 2A is more than usually varied. The comparisons of the principal totals follow:

Table No. 1A.—*Comparisons of Principal Items with Last Bulletin and with One Year Back.*

	Bulletins		
	No. 34.	No. 33.	No. 30.
1. Passengers killed in train accidents	39	56	34
2. Passengers killed, all causes	105	104	98
3. Employees killed in train accidents	205	137	150
4. Employees killed in coupling	66	38	44
5. Employees gilled, all causes	968	748	700
6. Total passengers and employees killed	1,073	852	798

The total number of collisions and derailments was 3,206, as follows:

Table No. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	426	$421,188	47	916
" butting	221	542,737	53	920
" train separating	119	38,696	2	57
" miscellaneous	979	445,343	41	774
Total	1,745	$1,447,964	143	2,667
Derailments due to:				
Defects of roadway, etc.	303	$322,808	23	363
Defects of equipment	680	512,275	8	135
Negligence	119	76,297	4	97
Unforeseen obstruction of track	82	93,670	20	116
Malicious obstruction, etc.	16	25,735	5	63
Miscellaneous causes	261	255,081	17	290
Total	1,461	$1,285,866	77	1,064
Total collisions and derailments	3,206	$2,733,830	220	3,731
Total for same quarter of 1908	2,684	1,940,133	173	2,616
Total for same quarter of 1907	3,964	2,962,470	197	3,813

Following is the usual list of class A train accidents—all in which the damage is reported at $10,000 or over, notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

Table No. 2A.—*Causes of Forty-four Prominent Train Accidents.*
[Note.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

No.	Class.	Kind of train.	Collisions. Killed.	Collisions. Injured.	Damage to engines, cars, & roadway.	Reference to record.	Cause.
1	R.	F. & P.	0	149	$1,650	43	Passenger train standing at station (9:15 p.m.) not properly protected at rear; atmosphere very smoky from forest fires. (The list of casualties in this accident includes 25 passengers entered as injured who "claimed" to have been injured.)
2	R.	F. & F.	0	0	1,700	18	False clear block signal. (See note in text.)
3	B.	F. & F.	1	1	2,085	51	Engineman of engine without train disregarded order to wait at a certain station. Fireman, 23 years old, in service one month, was killed.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars, & roadway.	Reference to record.	Cause.
4	B.	F. & F.	0	1	2,326	98	Train standing at water tank (9:45 p.m.) not properly protected by flagman; men in charge of train under the influence of liquor.
5	B.	F. & F.	0	0	2,690	52	Conductor and engineman, reading a number of orders, confused them and failed to wait at M, as directed in the order; but they also ran past an automatic block signal indicating stop.
6	B.	F. & F.	0	0	3,300	100	Men in charge of train waiting on a siding (1 a.m.) slept, and then mistook or carelessly assumed the identity of a passing train.
7	B.	P. & F.	3	15	3,407	42	Freight entering side track delayed; flagman did not go back to signal following passenger train. The persons killed were passengers on the freight train.
8	B.	F. & F.	0	2	4,000	86	False clear block signal. Leading train had been in block section an hour. Engineman also at fault for excessive speed in yard.
9	B.	P. & F.	0	14	4,027	12	Air brakes of freight train ineffective approaching station; angle cock on car next engine had been closed; cause unknown.
10	B.	F. & F.	15	41	4,100	1	Work train not protected by flag. (See note in text.)
11	M.	P. & F.	0	4	4,300	103	Passenger train (4 a.m.) ran into side of freight at crossover; engineman asleep. Fireman did not look for signal. Engineman on duty 12 hours.
12	M.	P. & F.	4	0	5,300	54	False clear block signal, due to fault in interlocking machine. (See note in text.)
13	B.	P. & F.	2	33	6,100	90	Misplaced switch. (See note in text.)
14	B.	F. & F.	2	4	6,500	16	Engineman of southbound train (who was killed) forgot meeting order. Conductor in caboose ostensibly was on the lookout approaching the appointed meeting station, but was not quite so vigilant as he should have been.
15	M.	P. & F.	5	14	8,200	92	Switching on main track in face of passenger train. (See note in text.)
16	M.	F. & F.	0	4	9,000	104	Eastbound train approached meeting point not under control; air brakes inoperative because angle cock behind tender had been closed by a trespasser.
17	B.	F. & F.	0	3	10,377	4	Conductor and engineman westbound forgot an order requiring them to wait at G; both experienced men.
18	B.	P. & F.	2	20	10,584	93	Misplaced switch. (See note in text.)
19	B.	F. & F.	0	2	10,875	89	Failure to protect by flag. (See note in text.)
20	B.	P. & F.	3	5	11,652	46	Flagman fell asleep. (See note in text.)
21	B.	F. & F.	1	3	12,200	5	Engineman disregarded order from despatcher; and also disregarded stop signal given by a flagman.
22	B.	F. & F.	0	0	12,300	13	Despatcher, overlooking an order on his record, sent out opposing extra trains without making for them a meeting point.
23	B.	F. & F.	1	5	12,600	11	Operator failed to deliver meeting order and engineman (who was killed) ran past an automatic block signal indicating stop.
24	B.	P. & F.	1	25	13,600	85	Engineman of freight ran past automatic block signals. Flagman of standing passenger train also held at fault.
25	B.	P. & P.	1	2	15,160	80	Failure to flag. (See note in text.)
26	B.	P. & F.	5	4	20,000	96	Conductor and engineman eastbound miscalculated time. (See note in text.)
27	B.	P. & P.	1	82	21,000	22	Misreading of time by watch. (See note in text.)
28	B.	P. & P.	3	41	21,500	82	Engineman ran past distant and home automatic signals indicating stop.
29	B.	P. & F.	4	36	23,800	20	Misplaced switch. (See note in text.)
30	B.	P. & F.	0	4	25,000	44	Freight starting out of station ran past fixed signal indicating stop.
31	B.	P. & F.	3	23	90,000	a45	Mistake of engineman in reading order. (See note in text.)
Total.....			57	537	$379,333		

No.	Class.	Kind of train	Killed	Injured.	Damage to engines, cars, & roadway.	Reference to record.	Cause.
Derailments							
1	D.	P.	1	33	$2,242	36	Broken rail. (See note in text.)
2	D.	P.	0	5	3,000	41	Broken tender wheel. Steel tire became loosened by reason of bolts of retaining ring having been sheared off from some cause unknown.
3	D.	P.	1	2	5,000	67	Landslide (5 a.m.);. Track watchman assigned to this section had deserted his post.
4	D.	P.	0	11	5,694	74	Unstable tender. (See note in text.)
5	D.	F.	0	0	7,500	123	Runaway on steep grade; freight train without engine had been left standing on grade with no hand brakes (or insufficient hand brakes) set.
6	D.	P.	2	19	11,000	121	Excessive speed through crossover track.
7	D.	P.	1	8	11,300	35	Trestle bridge weakened by fire. Dense fog prevented engineman from seeing fire until very near it.
8	D.	P.	2	72	11,700	125	Excessive speed (40 miles an hour or faster) entering 10° curve. Track in good condition. Engineman and fireman (who were killed) both experienced men.
9	D.	F.	0	0	12,000	117	Broken wheel.
10	D.	F.	1	6	19,900	76	Runaway on steep grade; cause not discovered; probably bad management of air brakes; engineman killed.
11	D.	P.	1	4	23,650	38	Rock on track in cut. Cut was in such good condition that employment of a track watchman had not been deemed necessary.
12	D.	P.	12	29	48,000	115	Broken rail; speed of train 40 miles an hour; curvature of line 1°; descending grade 1 per cent. Rail, 85-lb., in service 3 years. Rail found to have defect apparently due to over-heating in manufacture. Ten passengers killed.
13	D.	P.	3	47	63,000	112	Spreading of track; straight line; speed, 50 miles an hour. Cause obscure.
Total.....			24	256	$223,986		
Grand total.			81	793	$603,319		

Collision No. 2 was due primarily to the false clearing of a block signal. An eastbound train, *P*, was run from block station R to block station N without being announced by one signalman to the other. The "controlled manual" apparatus, which should have prevented the clearing of the signal at R, except after consent had been received from N, was out of order, so that the signalman at R could clear it wrongfully. The unlocking of the lever lock was due to grounding of the wire controlling the electric lock. Train *P* was held at N because of a preceding train in the block ahead, and while standing there, R sent on another train *W*, and it appears that this was accepted by N, the signalman at N not being aware that train *P* was standing a short distance in the rear of his home signal. The flagman of the standing train, *P*, is held responsible for not having gone back with stop signals. Both this man and the signalman at R had had several years' experience. The signalman had been on duty only 55 minutes. This signalman claims that he announced both trains but his statement is not accepted by the superintendent.

Collision No. 10, killing 14 laborers on a work train and injuring 38, and also killing one and injuring three trainmen, was caused by the forgetfulness of the conductor and engineman who, while occupying the main track with a work train, neglected to send out a flag to stop trains from the West. The collision occurred about noon. The conductor and engineman of the work train, when starting out in the morning, about 7 o'clock, were handed copies of an order requiring them to protect their train against a certain eastbound train after 10:30 a.m. This they did not do, both having forgotten the order. Both were experienced men, classed as capable, careful and intelligent.

Collision No. 12, in which four employees were killed, was

due to a fault in an electro-pneumatic interlocking machine. An eastbound passenger train, approaching J at ordinary speed, was turned through a cross-over track and collided with a locomotive moving westward on the westbound track, though the signals, both home and distant, approaching the cross-over, indicated that the switch was right for the passenger train to proceed along the main line. A train had passed through this cross-over a few minutes before, and after its passage the signalman in the cabin had moved the proper lever to reset the switches of the cross-over in position for movements along each of the two main tracks. For some reason unknown the switches did not respond to this movement of the lever and remained set for train movements through the cross-over. Assuming that the route was set along the main tracks "straight," the signalman cleared the signals for the passenger train. With the interlocking apparatus in good order he would have been unable to do this, as the signal levers would have been locked immovable; but by the loosening of a contact spring in the machine an improper electrical contact was completed, and the machine therefore failed to perform its function of preventing the wrongful clearing of the signals for a main-track movement. The trouble with the spring was that it was not properly fastened to its base. A more secure method of fastening for apparatus of this kind has now been adopted by the road.

Collision No. 13 was due to the misplacement of a switch by a brakeman 22 years of age, of 17 months' experience, and of good character. The freight train, eastbound, was standing on a side-track waiting for a westbound passenger train. The brakeman was under the impression that his train had entered the side track because the engine was leaking and for no other reason, and that as soon as the engineman could get up steam the train would proceed. On this presumption he set the switch to connect the siding with the main line; and a few minutes afterwards the passenger train came on at full speed, and, running into the siding, collided with the standing freight train. The line being curved and the view obscured, the passenger engineman had no view of the switch until he was very close to it. The fireman of this train, who could have seen this switch farther away, was killed.

Collision No. 15, occurring very early in the morning, before daylight, was due to the misconduct of a switch tender. The line on which it occurred is equipped with automatic block signals, and at the yard in question the yardmaster, who supervises the operations of switching engines, authorizes such engines to occupy the main track when a passenger train is due, provided he has received definite information that the train is behind time. Before allowing a switching engine to enter the main track a switch must be set connecting the siding or cross-over with the main track, and the setting of this switch automatically causes the setting of the block signal for that section in position to stop any approaching train. At each switch there is an electric indicator by observing which the attendant, when he is about to set a switch, can see whether or not the block section is already occupied; that is to say, whether or not an approaching train has already passed the block signal. When the indicator thus indicates, he must not set the switch for the siding. In this case the switch tender, a man of three years' experience, set the switch for the siding without looking at the indicator and without having received authority from the yardmaster. His statement that he had received a hand-motion signal from the yardmaster is not accepted by the superintendent, the evidence showing that such could not have been the case.

Collision No. 18 was due to a misplaced switch, the lock of which had been taken off and the light of which had been extinguished; and the officers of the road are satisfied that the switch was misplaced by unknown persons intending to wreck the passenger train. The collision occurred at about 9 p.m. The switch was known to have been in the right position and with its light properly burning at 7 p.m. It had been used at 8:25 p.m., but as the switch rail and all the other appurtenances were found in perfect condition, it is concluded that the switch could not have been left misplaced at that time. The approach to the switch is on a curve of 6 deg., shortening the view, and there was also a dense fog; and, in consequence of the fog, the engineman did not note the absence of the light until he was very close to the switch. This engineman was a runner of 29 years' experience.

Collision No. 19, occurring on a single-track line, is reported as due to wrongful or careless dependence on an automatic block signal. A freight train about to enter the siding at S was not stopped at the proper place and had to be set back a short distance (on the main line) to be in position to enter the siding. It was moved back so as to foul the next block section in the rear, but no flagman was sent back, and a following train came on and collided with the rear of the first named, the second train having entered the block (under a clear signal) before the backing freight entered it. The men in charge of the backing freight believed or assumed that the signal at their end of the block was clear, indicating that no train was approaching; but the superintendent concludes that this signal changed from "clear" to "stop" before the caboose passed it. The omission of the train to stop before reaching the side-track switch is reported as due to an error on the part of a telegraph operator.

Collision No. 20, between a northbound passenger train and southbound freight, was due to the neglect of a flagman and the failure of a delayed freight train to give suitable notice of its wherabouts. The freight was delayed five miles north of D. After about four hours the engine of this freight ran forward to D, carrying a flagman, who was left there to stop the northbound train, the engine then returning to its train, one car of which was off the track. The flagman, after remaining at this station about seven hours, was sitting on the steps of the caboose of a freight train standing on the side track, with his lantern on one of the lower steps of the caboose, between his feet. While so sitting he fell asleep and was not aroused until the northbound passenger train came along and passed him; and then it was too late to give a signal to the passenger train, which passed on and collided with the freight about four miles north. The red lantern, being on the steps of the caboose, was hidden from the view of the engineman of the passenger train. It appears that this flagman was wide awake only a few moments before the passenger train passed. He had been in the service seven months. The conductor of the freight train is censured for not having advised the train despatcher of his movements. The operator at D was authorized by the despatcher to clear his fixed signal for the passenger train. The conductor and the flagman of the freight had been on duty 16 hours and 59 minutes, their train having been delayed 11 hours and 48 minutes by the breaking down of a car. The operator at D and the despatcher are held blameless, for the reason that the delayed freight was not obliged to come to D to clear the passenger train, but could use a side track between D and the point where the breakdown occurred. Both despatcher and operator therefore were held justifiable in assuming that the men in charge of the freight would protect their train adequately by flag.

Collision No. 25 occurred within yard limits, and the responsibility is charged against the conductor and engineman of the northbound train and the engineman of the southbound. The northbound train, belonging to road A, was running on the track of road B, this beig its regular route for a short distance within the yard. Its right on the track of road B was the same as that of a yard train—it must keep out of the way of regular passenger trains of road B. In this case the passenger train of road B was 1 hour and 50 minutes late, and the train of road A appears to have occupied the main track without being officially informed as to how late the southbound train was. The collision occurred at the diverging track where the northbound train was to leave the track of road B. A flagman was sent out to stop the southbound train, but he did not succeed in doing so. Either he did not start

soon enough or did not go far enough, or else the southbound engineman did not properly heed the flagman's signals. The report is inconclusive, because of a disagreement between the officers of the two roads as to the facts in the case and the conditions governing. Under the rule the southbound train should have approached this junction with speed under full control.

The train at fault in collision No. 26 was an eastbound regular freight holding an order to run 10 minutes late. It ran only three minutes late. The engineman says that he trusted to his memory that he was due at F at 7:39; whereas that was the time by a time-table which had expired, and the correct time was 7:49. The conductor says that before reaching F he examined the time-table, but by mistake read the time against T, the next station west of F.

Collision No. 27 between a southbound regular and a northbound extra passenger train, occurring about 10 p.m., badly damaged both engines and destroyed three cars carrying passengers. One passenger was killed and 75 passengers and seven trainmen were injured. The northbound passenger train was running on a telegraphic order, according to the terms of which it should have kept clear of the southbound. The primary reason for its failure to do so, according to the report, was the mistake of the conductor in reading the time by his watch. He says that he gained the impression that he had 15 minutes more time to reach F than actually was the case. The trains met on a curve at speeds estimated at 30 or 40 miles an hour. The conductor's explanation of his mistake with the watch was that while his regular watch was being repaired he carried one in which the dial was in a different position as related to the top of the case; but it appears that at the time of the accident he had resumed the use of his own watch, and had been carrying it for several days. This conductor had been in the service 16 years. The engineman was also at fault for disregarding the time order, but the report has no reference to his testimony, as he was badly injured and was confined to the hospital.

Collision No. 29 was due to the careless misplacement of a switch by a brakeman. A westbound freight train stood on the siding waiting for an eastbound passenger train to pass. While it stood there the front brakeman of the train went to the switch, some distance forward from the place where the locomotive stood, unlocked it, and turned it so as to let the passenger train enter the side track. The passenger train came on at about 50 miles an hour and collided with the freight engine. Both engines were very badly damaged, and the first two cars in each train were demolished. Two mail clerks, one engineman and one fireman were killed, and 30 passengers and six employees were injured. The engineman of the freight is held blameworthy for not seeing that the switch near his engine was in the proper position; the passenger engineman is held blameworthy for not observing a semaphore signal which was in the stop position, warning him that the switch was wrong; the conductor and the fireman of the freight are also held responsible, as well as the engineman, and the fireman on the passenger train is held blameworthy for not co-operating with his engineman in keeping a lookout for the semaphore signal. The brakeman primarily at fault has been in the service three years, the passenger engineman 23 years, and the others named two years or more each, except the passenger fireman, whose term of service has been only eight months. The semaphore which was in position to warn the passenger engineman that the switch was in the wrong position is situated exactly opposite the switch and is 18 ft. high. It moves simultaneously with the switch. It was clearly visible for many hundred feet, the line of the road being straight for two miles west. It had been in the warning position two minutes or more before the passenger train arrived.

Collision No. 31, occurring at 12:10 a.m., and causing three deaths and 23 injuries, was due to the mistake of an engineman in reading an order. This engine was running without a train and there was no conductor. It was running west, backward, and met an eastbound passenger train at a point where, in consequence of a curve in the line and a hill on one side, there was a very short view. The three men on the engine of the passenger train, engineman, fireman and pilot, were killed. The westbound engine had been standing for some time at L, on a side track, about 1,200 ft. west of the station. On receiving from the telegrapher at the station an order to run to the next station, the engineman directed the fireman to set the switch for the movement to the main line. After this movement the fireman reset the switch for the main line and the engine proceeded. While waiting on the side track the engineman had made some repairs to his engine, one of the driving-wheel springs having got slightly out of place; and in the explanation which he gave after the collision he says that while at work on the engine he sustained a blow by a hammer on his forehead and that, temporarily, he lost his memory; and that he had no recollection of receiving the order or of starting his engine, nor of the collision. The testimony of the fireman, however, indicates that at no time did the engineman behave otherwise than in a rational manner, nor had he said anything to the fireman or to the telegrapher (who delivered the order) about having been hurt.

The order directed the engine to run from L to P, but to meet the eastbound passenger train at L; that is to say, the movement to P could not be begun until after the passenger train had arrived at L. The engineman proceeded, however, in precisely the same way that he would have done had there been no meeting clause in the order.

This engineman is 29 years old and had been in the service of the company about nine months, with a satisfactory record up to the time of this collision. He was thrown out of the cab and sustained some injuries. He had been on duty about 16 hours and 30 minutes. His regular hours of duty on that day were from 7 a.m. to 7 p.m., on a pushing engine, but he had been delayed about two hours on account of a blockade of trains due to the failure of the boiler of a locomotive.

The very heavy loss occasioned by this collision is due in part to the destruction of six passenger cars by fire. When the train came to rest after the collision, one of the cars was standing immediately over a large mass of burning coals which had fallen out of the firebox of one of the engines, and before it was possible to extinguish the fire an acetylene tank exploded, spreading the fire and rendering it uncontrollable.

Derailment No. 1 was due to a broken rail. The engine passed over the track at this point in safety, but the engineman felt a jar and applied the brakes so that his train was stopped in about 900 ft. The first seven cars of the train were derailed, and the eighth and ninth (the last) were derailed and overturned. The rail was of a size weighing 100 lbs. to the yard, and was 33 ft. long, laid in 1904. There was a flaw near one end. It appears that the rail had been broken by a train which passed over the track about 30 minutes ahead of the one which was derailed. In this leading train some disturbance was noticed by a messenger in the tenth car, and also by the conductor. The conductor pulled the cord to give the whistle signal in the cab of the locomotive to stop the train, but the air pipe through which this signal would have to be effected had been broken, evidently at the time the train passed over the broken rail, and therefore no signal reached the engine. The disturbance lasted only two or three seconds, and as the train ran on smoothly the conductor did not attempt to apply the air-brakes; but he went to the rear to consult the rear brakeman, and the train ran more than a mile before it was stopped, the stopping being finally effected by the automatic application of the air-brakes, due to the bursting of an air hose, caused primarily, no doubt, by something flying up from the track at the time the broken rail was passed. At the same time several pedestals and journal boxes were broken. The flagman of this train was sent back to search for the defect or obstruction, but he did not reach

the point of trouble until after the following train had passed over the broken rail and had been derailed.

Derailment No. 4 is attributed to faults in the tender of the locomotive. The report says: "The speed of the train was about 45 miles an hour. The tender was about half full of water, and contained about 18,000 lbs. of coal, placed mostly toward the back of the tender, and therefore resting principally on the rear truck, leaving the front truck with a light load only. The center of gravity of the tender is high. The vertical oscillation or galloping of the tender, due to unevenness in track, would tend to still further decrease the weight on the front truck; and this, together with the swinging or rocking of the tender allowed by the side-bearing clearance, which was slightly excessive, caused by the intermittent soft spots or imperfections in the low rail of the track, further influenced by the surging of the water in the tender, would at the moment when these effects acted in the same direction produce side strain sufficiently intense to relieve some of the wheels of their load, and even lift the wheels, and naturally would first affect the guiding wheels of the truck having the last load, which in this case was the first pair of wheels.

"This derailment can only be attributed to the combination of all or part of the effective causes named. This conclusion is borne out by the fact that there have been quite a number of mysterious tender derailments where the leading wheels left the track, not only on our own railway, but on others; and while opinions have varied somewhat as to the cause, in many cases it has been attributed to what might be termed the synchronism of the different motions of the tender itself and that of the engine, with the undulations produced by track imperfections."

ELECTRIC RAILWAYS.

On electric railways there were reported 53 collisions and 13 derailments, in which the total damage to rolling stock and roadway was $19,316. In train accidents five passengers and one employee were killed and 209 passengers and 22 employees were injured. Accidents of other kinds bring the total casualties up to 26 persons killed and 642 injured. The largest item under the head of accidents other than train accidents is that showing the persons killed (seven) and injured (305) in falling from vehicles or while getting on or off vehicles; and these were nearly all passengers.

FOREIGN RAILWAY NOTES.

Residents of the province of Hunan, China, are prepared to furnish funds for the construction of a line through that province.

The Spanish authorities have granted permission to the Sociedad Anonime Tranvias de Valladolid to electrify its lines and to do a freight business.

It is said that improvements are to be carried out on the Japanese railways, broadening the gages to standard, and constructing new lines and extensions.

At Muggia, Austria, March 31, a passenger train was blown off the track by a tornado. The cars fell down a bank and were wrecked. Four persons were killed and 18 injured.

The plans submitted by the directorate general of railways of the Argentine Republic for building an 88-mile section of the railway from Embarcacion to Jacuiba have been approved. The estimated cost is $2,922,400.

Japanese foreign trade in January amounted to $16,000,000 in exports, two-thirds of the increase of $3,000,000 being due to manufactured articles, and the imports $19,700,000, an increase of $5,000,000 due to increased cost of raw materials received.

Contracts have been awarded for the building of a line from Montallegro, Italy, to Siculiana. This line will form part of a through line from Sciacca to Porto Empedocle. The contracts were let to Italian firms, but the carrying out of the work may necessitate the purchase of some materials from firms outside Italy.

The imports from the United States into Mexico through the port of Nuevo Laredo are showing a decided increase this year. On March 24 the imports amounted to $107,000. This increase is partly due, probably, to the large quantities of wheat and corn which, under the suspension of tariff duties on the latter and reduction on the former, are finding a market in Mexico.

The Japanese Diet has cut from $150,000 to $100,000 the appropriation asked for by the Department of Communications for the purpose of investigating hydro-electric potentialities in Japan. Meanwhile the interest in electric enterprise seems to be growing. There are six electric railway projects now being considered in Osaka, including one to Kyoto, three to Kobe, one from Nishinomiya to Kobe, and one from Osaka to Nishinomiya.

SOME ENGINEERING FEATURES OF THE DETROIT RIVER TUNNEL.

In the issues of the *Railroad Gazette* for Feb. 16 and 23, 1906, there was published a description of the method to be pursued in the construction of the tunnel for the Michigan Central, under the Detroit river between Detroit, Mich., and Windsor, Ont. The method originated with W. J. Wilgus and has been executed by W. S. Kinnear as chief



Concrete Anchor.

engineer. It was the novel one of constructing tubes in the form of steel shells; sinking them into a trench dug in the bottom of the river; uniting them end to end; embedding them in a concrete casing and finally giving them a concrete lining. No compressed air was to be used in the subaqueous portion of the work except for the divers by whom the bolts, fastening the ends of the tube sections together, were placed.

In considering this plan it must not be confused with that of sinking independent caissons that were joined end to end, as in the case of the Metropolitan Railway under the Seine at Paris. There the regular caisson method of sinking was followed, using compressed air in the usual manner. The caissons were independent sections to be sure and were afterwards joined together to form the tunnel. The Detroit tunnel, on the other hand, was formed by excavating a ditch across the bed of the river, setting a core in it and filling

around with concrete, no caisson work being done at all.

The evolution of the idea is interesting and direct. The water in the river is 50 ft. deep in places and it was the natural desire of the engineers to keep as high as possible so as to avoid long or heavy approach grades; and so, when studying the situation, regrets were expressed that the bottom was not of rock so that the minimum of cover could be used. This suggested the excavation of a trench and filling it with an artificial rock (concrete) and then tunneling through that. But why tunnel? Why not sink a core and



Tubes on Ways Before Sheathing.

form the concrete around it? That was the birth of the idea and the completed tunnel is the result.

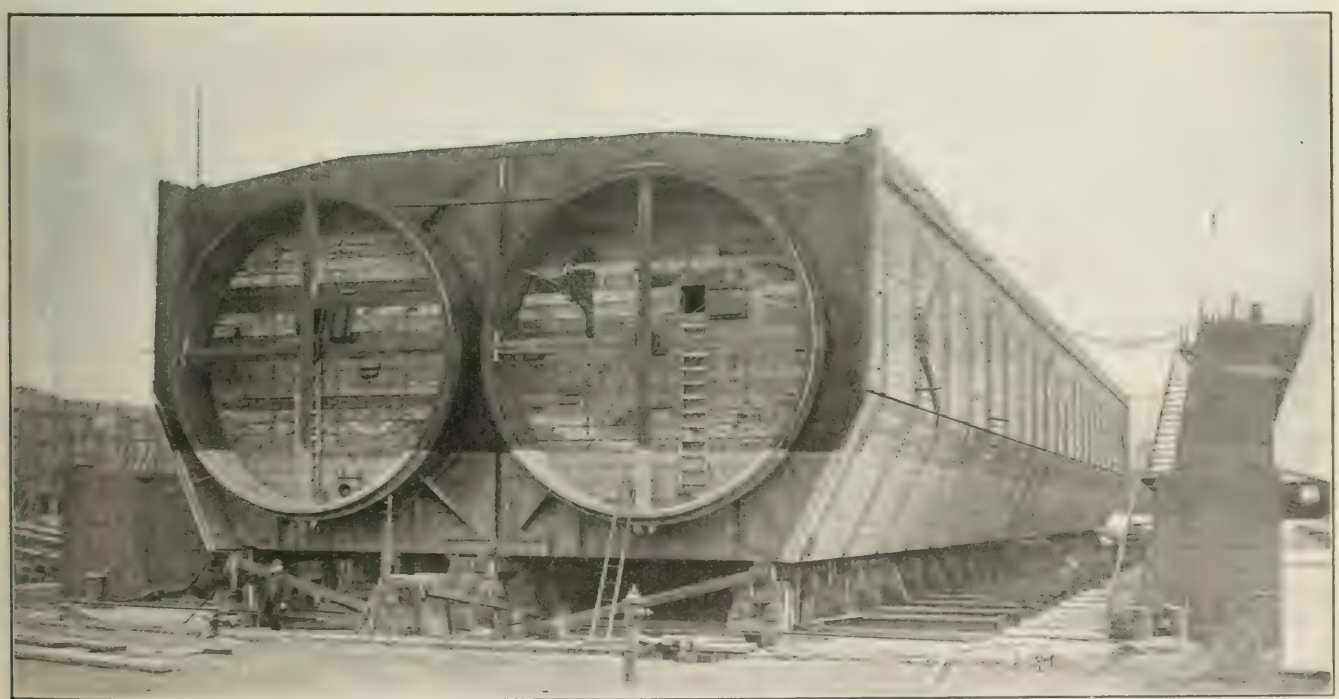
The scheme, simple as it appears in outline, was novel and daring in the magnitude of the undertaking and the depths of water to be encountered, but the results have fully justified it, for the completed work is dry and considered by its engineers to be one of the strongest subaqueous tunnels in existence.

While the general scheme was one of simplicity itself, it is evident to anyone versed in such matters that, in its execution for the first time, problems of novel character would be constantly arising, the solution of which would tax the resourcefulness of the engineers to the utmost in order to reach a successful consummation. These problems cropped up from the very start. They began by presenting unexpected difficulties in the excavation of the trench in the bottom of the river in which the tubes were to be laid. The greatest depth of water at the point of crossing is about 50 ft. and the excavation was carried some 22 or 23 ft. below this, or 74 ft. from the surface. A bucket dredge was equipped to work to 40 ft. and did excellent work, taking out 1,500 cu. yds. per day. It was the intention to let this dredge lead and follow with a clamshell for the balance, but when the latter was set to work it was found to be unsuited to the task and that, at the rate which it could dig, the time required would be so long as to place it outside the pale of consideration. The first step, then, was to reconstruct the bucket dredge and adapt it for working to depths of 60 ft. But, although braces and strengthenings were added, breakages occurred to such an extent that the idea had to be abandoned. This was especially caused by the breakage of the spuds and the great expense attending the same. The solution was found in the designing of a special clamshell capable of removing 700 cu. yds. per day of 12 hours on an average with a maximum output of 1,200 cu. yds.

The material to be removed from the river bed and from the approach tunnels was a stiff blue clay, and the total net quantity was about 700,000 cu. yds.

The methods of removal were dredging from the river bottom and tunneling both with and without a shield in the approaches. It was thought at first that the drifts could be driven without using compressed air and some of the work was done in that manner for the center wall. A drift was first carried forward for one of the lower quarters and that section of wall built, then the next lower quarter was removed, after which the two upper quarters in succession. A part of this, as already stated, could be done without air, but for much of the work air under pressure of from 10 to 20 pounds or even more was required.

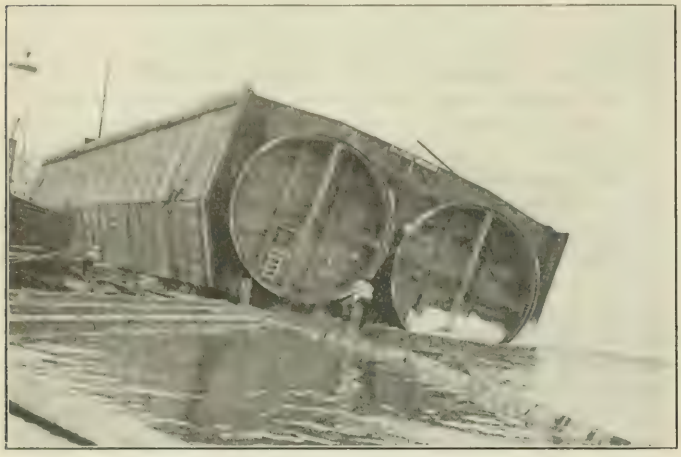
One of the points brought out in this work was the action of this stiff clay in its production of pressures. Stated in a general way, it was found that these pressures closely followed what would have been produced by a liquid having the specific gravity of the clay. With the depth of cover beneath which the workings were carried this created an



Tubes in Dry Dock.

enormous pressure; a pressure which, it was found, followed the law of liquids and increased to the bottom. Taking this broadly some of the physical difficulties of the work may be appreciated.

Surface indications of the flow of this material were followed closely and some interesting manifestations and conclusions therefrom were obtained. For example, the present line of the Michigan Central approaches the river through a cut, and the tunnel line passes beneath it on a slightly divergent line. At one point the center of one of the tunnels is directly beneath one of the main tracks, while the other is beneath the slope of the cut on one side. The increased weight due to the height of the bank above the track caused it to settle very noticeably, but to a varying degree to a vanishing point out on one side, while there was no settling at all of the track on the lower level. In fact, it was not resurfaced during the whole of the work. It seemed as though the settling of the bank had raised the track enough to compensate for its own settling and held it to grade.

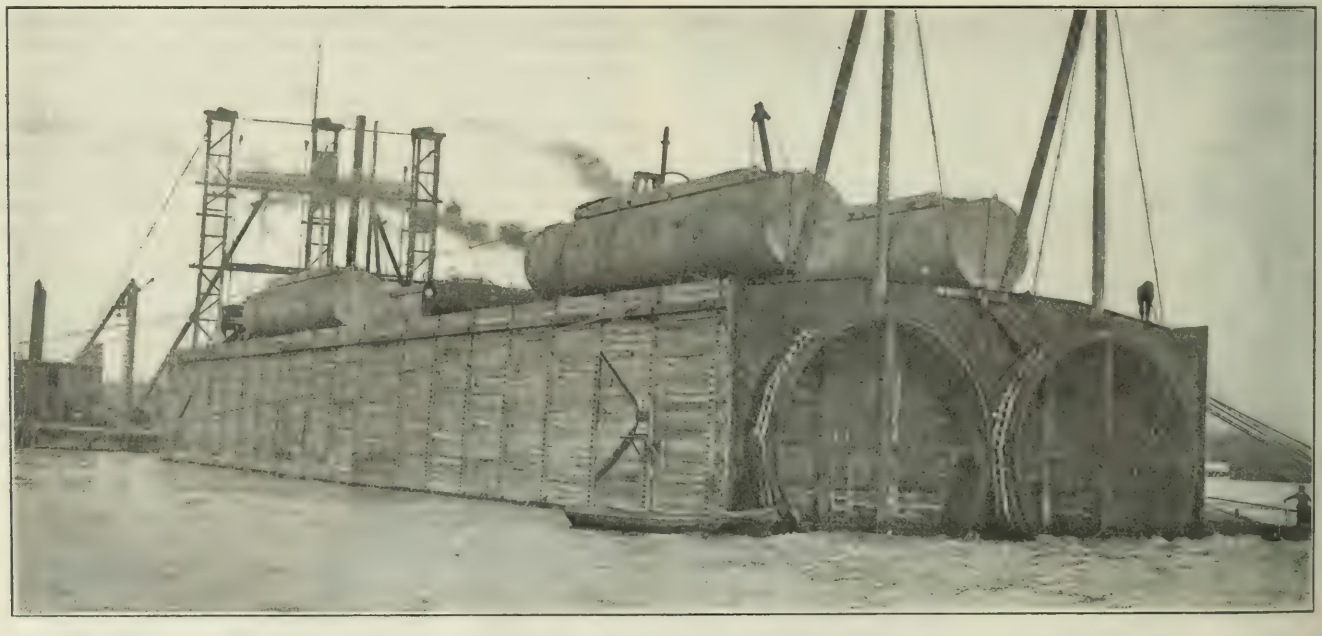


Launching Tubes.

That this is so appears to have been proven by the behavior of a bank upon which a four-story brick building was standing and near which the tunnel passed. The conditions were identical with those previously cited, as the bank on which the building stood was one side of a cut. Adjacent to the brick building was a low shed of no great value. When the tunnel was carried beneath it (the shed) the bank settled about 6 in. Before driving the heading along the building a pile of gravel whose weight was nearly equal to that of the bank was heaped upon the tracks immediately over the line of the tunnel. This load confined settlement to a small area, caused the breaking away of the section loaded from that underlying the building and checked the flow of the material, with the result that the maximum settling of the building was less than ½ in. and no cracks were formed in the walls. After the tunnel had been completed the gravel was removed.

So, in the excavation for the center wall. The work was done in the order indicated on the diagram. After the two lower quarters had been removed and the wall built one of the upper quarters was taken out and timbered. The work was heavily done and stood all right until the other quarter was removed, when the timbering was crushed by the pressure. The suggested explanation of what happened is shown by the illustration. When the timbering was put in, the clay arched over and the two ends rested as indicated by the full line on the remaining quarter and the side. But, when the fourth quarter was removed, the arching took the form indicated by the dotted line, so greatly increasing the load on the timbering that it was crushed.

A final instance of this earth pressure may be cited as shown by the behavior of the timbering in the shafts. When they were first put down they were timbered far more heavily than the contractors considered to be necessary; but, as the work proceeded, even this proved to be insufficient and had to be increased. No measurements of the pressures actually obtaining were made, so that the work leaves no record other than that of the experience. But this is of such a character as to demonstrate that the usual formulas for earthwork pressures were sadly awry in this instance.



Tubes Ready for Sinking.

In carrying out the excavations on the land sections to the union with the subaqueous portion two distinct methods were employed. On the Detroit side of the river a shaft was sunk at a distance back from the shore, from which the land end of the approach was driven. Outside of this a heavy cofferdam was built and the excavation carried in the open back to the shaft. The dam was formed of 8-in. by 16-in. piling, built to tongue and groove and filled in with clay between walls.

At the Windsor end, the tunnel was carried out to the point of union with the subaqueous section, and then the trench excavated up to the face of the work, and the tubular section attached when sunk.

In all of the approach tunnel work there was nothing novel in the methods of procedure. The work was along lines that had been tried before, and was subject only to such changes as local conditions set up; so that, aside from the special problems that had to be solved it is about the subaqueous section that the real interest centers. The details of these sections had, of course, to be carefully worked out and all conditions were provided for as far as possible. They were designed to be built on the shore, launched like a ship and towed to their location. According to this plan they were built upon the regular ways in the regular manner. It so happens that the method of launching on the Great Lakes differs from that of the coast. It is customary to launch ocean-going ships stern foremost, but all lake vessels are launched sideways or broadside on, for good and sufficient constructional reasons. Hence these tubes were built parallel to the shore and launched in the usual manner. With the sheathing up the sides, as shown in the photograph, they offered a much greater resistance to the movement of the whole into and through the water than a ship with its partially rounded hull and greater buoyancy. It was because of this and especially because of the latter deficiency that trouble was experienced, by sticking on the ways and not getting into the water. This trouble was overcome by carrying the sheathing back beneath the tube in the form of a flooring for a distance of 15 ft. from the outer edge, as indicated on the engraving. With this flooring on our space was formed at the outer edge and the buoyancy correspondingly increased. This not only decreased the angle at which the tubes left the ways, but the increased buoyancy lifted them out of the water and so brought about a material lessening of the resistance to movement through the water. It was a matter of no moment whatever, whether this flooring was water-tight at the joints or no, for the movement was so rapid that, under the worst of conditions, sufficient water could not leak in to do any harm either by lowering the buoyancy or increasing the resistance to the motion. Before this precaution was taken some of the tubes were slightly damaged in the launching and had to be sent to dry-dock. Afterwards there was no trouble whatever.

After the tubes had been launched they were towed about 50 miles down the river to location and there sunk. In the towing there were no difficulties encountered other than those that would naturally arise in the handling of so large and unwieldly a vessel. The sinking, too, was easily accomplished, though it involved the exercise of great care and skill. In this the river currents played an important part.

It has been found that, in all streams, where accurate current measurements have been made, that the greatest velocity is not at the surface, but a short distance below it, showing that the resistance of the air and the wind sets up a frictional opposition to the flow that modifies it. This was found to be true in a general way in the Detroit river. The current velocities varied from point to point, according to the distances from the bottom and the shore, as well as according to the direction and strength of the wind. The figures given, herewith, can, therefore, only be regarded as approximations. The average surface velocity may be taken at 2.3 ft. per second, increasing to about 2.33 ft. a short distance below the surface and then gradually decreasing to about 1.61 ft. per second at the bottom. It was in this current then of approximately two miles an hour that the tubes had to be sunk. They had to be sunk to a true vertical and horizontal bearing. Their alinement with each other must be exact, and they had to be held accurately in position during the whole process of lowering. No definite measurements were taken of the strain on the holding cables imposed by the current impinging against the exposed sides of the tubes. They were located broadside to the current and the upstream side measured 260 ft. by 29 ft. As velocities of 3.4 ft. per second were observed, this will be taken as the maximum which, if distributed evenly over the whole surface, would produce a pressure of 62,275 lbs., which, with the swaying of the tubes, might well run the load up to from 35 to even 40 tons. As the tubes approached the bottom, the load decreased until at the low velocity of 1.17 ft. per second found in some places it fell to about 7,775 lbs. With these stresses to be carried it is evident that a firm holding was necessary. The ordinary heavy ship anchors were found to be quite inadequate. They were dragged along the bottom by the pull and had to be abandoned. In their place, slabs of concrete from 10 ft. to 12 ft. square and 18 in. thick were formed, fixed in the bottom of the river, and the anchor lines built into them. An ordinary snatch block in these lines with winch engines on anchored and stayed scows was found to be sufficient to hold the tubes in place.

Before starting to sink the tubes grillages were sunk into the trench, and spaced so as to form a bearing and support for the adjacent ends of the tubes. These grillages were formed of 12-in. beams, and were carried on spuds or spurs



Tubes Partly Sunk.

that were driven into the bottom. They were lowered into place and then tapped with a pile driver until they were slightly below the level that the bottom of the tubes was to occupy.

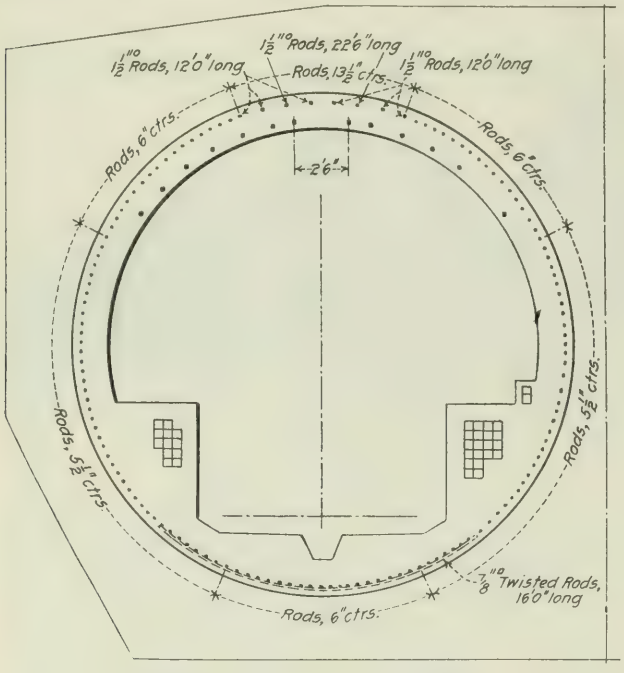
These preparations made, everything was in readiness for the sinking of the tubes. For floating down the river bulkheads had been built into each end, and every alternate tube was fitted with pressure bulkheads capable of sustaining the pressure due to the head of water. They were towed to location and valves in the two ends were opened and water admitted. As they filled the water naturally accumulated at one end more than at the other and that end settled the faster. The tubes were prevented from up-ending by semi-bulkheads built down from the tops of the tubes into the interior, as indicated on the sketch. Then, as the tubes tilted air pockets were formed in the lower ends, adding to the buoyancy at that point and maintaining an equilibrium. Independent air cylinders were placed on top, so as to keep the whole system on the surface when the tubes had been entirely filled. The balance was very even and the whole was so slightly lighter than the water that it would have floated with only these auxiliary air cylinders just above the surface. The second sinking was done by lowering a grillage of beams or counterweights down on top of the tubes by means of a floating derrick. As the supporting ropes

for this were eased off the weight depressed the tubes, and as they were tautened they came up. The weight so supported was about seven tons, so that by carrying a portion of this seven tons on the hoisting ropes, the whole 550 tons in water or 975 tons in air of tubes were fully controlled.

The leveling and alinement of the tubes was done by means of masts rising above the surface and by transits and levels on the shore.

As already stated, the supporting grillage at the bottom was driven down to a level slightly below that of the bottom of the tubes. When the latter were lowered to place, a diver was sent down, who placed wedges on the grillage, by which a proper footing for the tubes was formed. The latter were supported at or near the ends only, and so accurate was the leveling of this whole piece of work done that there was no perceptible variation from true from one end of the tunnel to the other.

The alinement was, if anything, an even simpler matter than the leveling. Four heavy projecting pins were fastened into one end of the tubes. At the other end corresponding holes were formed. Then a line was led out from the tube already down and into the one being sunk. As the tube went down this line was overhauled, drawing the tubes together, until the pins on one entered the dowel holes on the other, when the two were drawn forcibly together. This set one end of the new tube in true and perfect alinement, and it was merely necessary to shift the easily-handled outer end of the fresh one into line and the work was done. A curious incident, illustrative of the ease and at the same time the difficulty with which

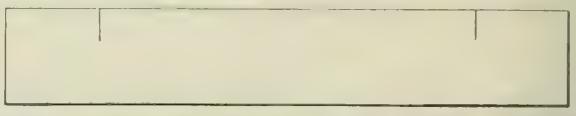


Reinforcement at Tube Joints.

these tubes were adjusted occurred in connection with the sinking of the first one at the Detroit end. It had been brought to a firm abutment with the approach, at the shore end, but the outer end had swung nearly two feet out of line. Tugs were attached and every effort made to drag it along the grillage into place, but to no avail. The next morning the steamer from Cleveland came up the river at full speed without slowing down and raised such a swell that the tube was lifted from the grillage and, strange to relate, was dropped in exactly true alinement, so that it did not have to be moved, adding another to the unexpected freaks of inanimate things.

With the tubes down, the first step was to place the connecting bolts through the flanges, and this was done by divers, and involved the only use of compressed air in the subaqueous section. This was easy and quick work, although the men were working in deep water.

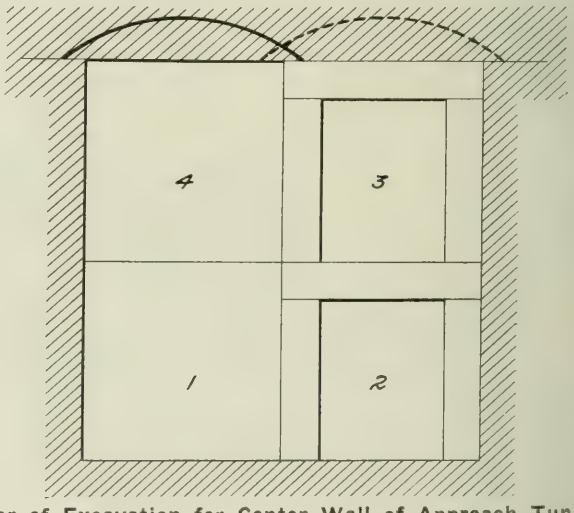
With the tubes down and bolted, it was necessary to imbed them in their shell of concrete before removing the water for the inside lining. It will be borne in mind that the tubes were carried on the grillage at the ends only; that they were clear of the bottom of the trench throughout the central portion, and that there was a clear space below them at the grillage at the ends. The concrete was deposited through a long chute from a tremie scow. As a matter of fact, the pressure of the superincumbent water was such that the concrete was very well compacted, and cores taken at a distance from the point of delivery showed that it was fully as dense and strong as that formed in the air, while in the immediate vicinity of the delivery chute, where it was subjected to the direct head of the



Sketch of Longitudinal Section, Showing Partial Diaphragms Used in Sinking Tubes.

mixture reaching to above the surface of the water, it was exceedingly hard and was some 50 per cent. stronger than the air-formed concrete. Owing to the depth of water and the improbability of interfering with navigation, coupled to the desirability of keeping the approach grades down as low as possible, the top of the tunnel is in some places above the natural bottom of the river. It is protected at such points by rip-rap, so that no anchor grappling it could possibly do any damage.

The forming of the concrete about the tunnels was controlled by the tremie scows above. In the first place a concrete floor of 1-4-7½ mixture was spread beneath the tubes. The excavation had sloping sides and the bottom was readily accessible. The floor A was thus formed up to the bottom of the tubes. This



Order of Excavation for Center Wall of Approach Tunnel.

firmly supported the tubes from end to end. Three tremies were then set to work to fill in and build up the concrete around the steel tubes. The sheathing at the sides served as the outer forms and the steel tubes as the core. One chute came down just inside the sheathing and one between the tubes, or at the points B, C and D. The concrete was sent down very wet so that it would flow and find its own level, and the chutes were raised as the space filled up. This formed a block of concrete of practically rectangular section with the two tubes running through it. The space between the sheathing and the slope of the banks was then refilled with clay, so that the tunnel stands embedded in the bottom.

With the concrete laid there was, thus, a column of concrete laid out into the river, abutting against the approach walls and capable of withstanding any end thrust to which it might be subjected. It was lined by the steel tubes and

cut up into compartments by the diaphragms in the latter. Then, as the work advanced, a section of the tubing would be freed from water, the temporary bulkheads cut away and the workmen would advance into it and put up the inner lining, or tunnel proper, working in the usual manner with wooden forms and without using any compressed air.

When the internal lining was placed a concrete mixing plant was erected on the shore at the head of the shaft, and the concrete sent down through a chute to cars on a temporary track in the tunnel. These cars were then hauled out to the point where the work was in progress. The mixture used was a 1-2-4 and was formed of Portland cement with sand and fine gravel.

As already stated, the leveling of the tunnel was true, while the alinement was out but a fraction of an inch. The last tube dropped into place with exactly the calculated clearance between its end and the Windsor approach walls, which was about 18 in.

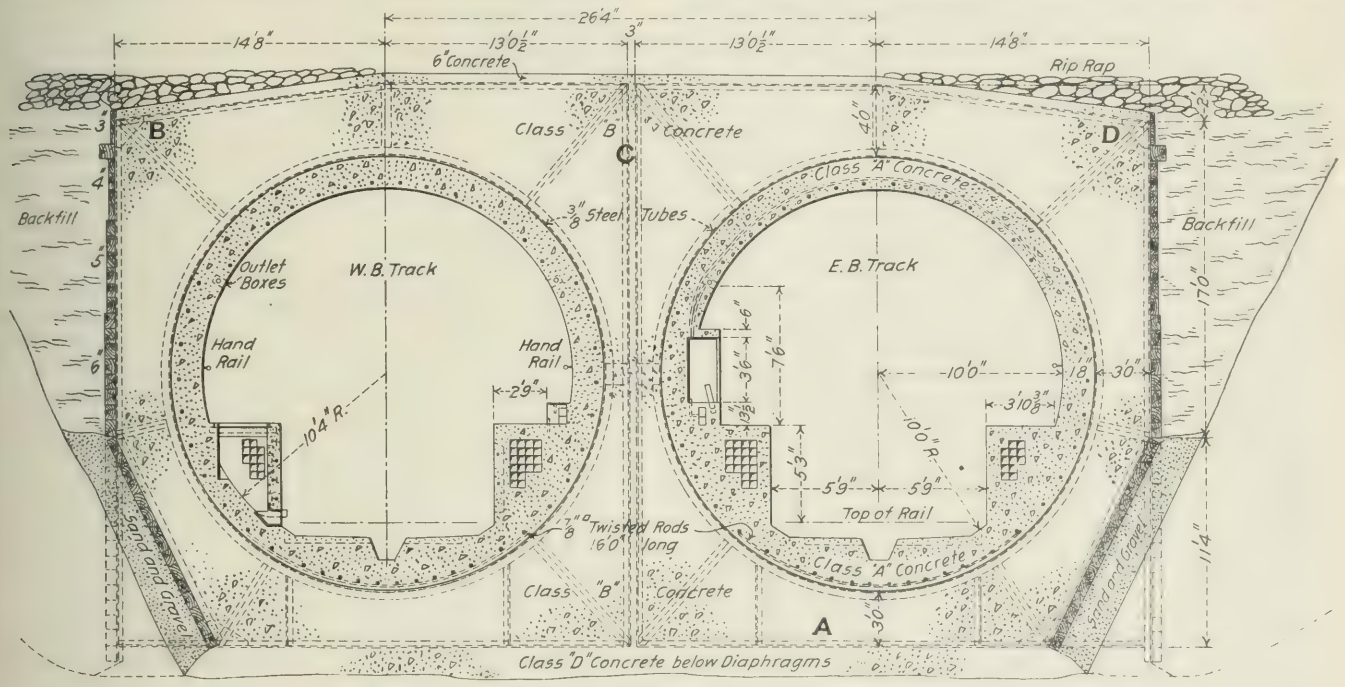
As it stands the tunnel is very dry. The steel tubes have served as a water proofing and are tight. In the approach tunnels the minor leakages are drying of themselves, and in but one or two places will any attention be needed from the contractors. The novel method is, therefore, a success. and a similar plan is being used for one of the tunnels under the Chicago river, where a single section will be sunk. Its success, too, is not limited to its engineering features, but touches the financial side of the question, for not only has the cost been more than two million dollars less to the railway company than any other type of construction would have been, but it has been a profitable undertaking to the contractors.

In finish the section is one of the largest, if not the largest, subaqueous tunnels in existence. The conduit bench is large, roomy and with ample headroom. There is one upon each side and access is obtained by ladders set staggering at 50 ft. intervals, so that the trackmen have an opportunity to seek refuge every 25 ft.

The track construction is permanent and has been tested in service and under observation for more than two years in the open and has been found to be satisfactory in every particular (*Railway Age Gazette*, November 20, 1908, p. 1384). It is formed by embedding short wooden ties measuring 36 in. by 11 in. by 8 in. in the concrete flooring and spiking the rails to them with the intervention of tie plates. The rail used will be of 100-lb. section.

Outside on the Detroit approach the value of the ground is such that the natural slope could not be used, so that vertical concrete retaining walls are resorted to. But in Windsor the work in the approach cut resembles more the finished product of an old and prosperous road than what we are accustomed, in this country, to associate with a newly constructed line. The tendency of the clay to flow and the probability of trouble with a natural bank led to a complete drainage of the slopes. Drains are carried up at right angles to the track, and the whole slope has been sodded; then, at the bottom, there are tile drains to carry off the water so that no trouble is anticipated, and when the tunnel is opened to the public it will present the finished appearance, in whole and in detail, of an old and well-established line.

In the preparation of this article great assistance was rendered by Messrs. W. J. Wilgus, the advisory engineer; W. S. Kinnear, the chief engineer, and B. Douglas, the tunnel engineer, by whom the facts and data were contributed. All unite, however, in laying the burden of the credit for the successful completion of the work upon the shoulders of William Butler, of the Butler Bros. Construction Co., who were the contractors. As the contract was let, the work became a mutual affair. Instead of offering plans for a hard and fast design upon which bids were to be made and in accordance with which the work was to be done, four alternative plans were presented for competition. The contractors were asked to choose the one from among them that they preferred, or to bid on any other plan of their own; the conditions only being that a strong watertight tunnel should be delivered to the tunnel company. The Butler Company chose the one that has been used, and after having made their selection and submitted plans that were approved they were given a free hand to work out the details as they pleased. On them devolved the detail of the construction of the tubes, their sinking into position, the placing of the concrete and the meeting of the thousands of emergencies that were sure to arise, and that did arise with daily and hourly frequency, with all imaginable variations and inconceivable persistency. And it is in the meeting of these unexpected conditions and the resourcefulness shown in overcoming them that the engineers unite in giving the credit to Mr. Butler.



Section of Completed Tunnels.

LOCOMOTIVE HEADLIGHTS AND OBSERVATION OF SIGNALS.

At the meeting of the Western Railway Club on April 19 the paper on "Electric Headlights," by Prof. C. H. Benjamin, of Purdue University, was read and fully discussed. As the paper presented the principal objections to high-power headlights, and as we published it in our issue of April 22, in the following abstract of the discussion the greater space is given to the remarks of those speakers who favored the electric headlight:

Professor Benjamin—I wanted to present this paper to the railway men because I know there has been a feeling in Indiana that our report must have been in favor of the use of electric headlights, and, while under the circumstances we did not feel justified in giving any opinion as to what kind of light should be used, we did give conclusions which I have read to you to-night, and I have seen no reasons since to change my mind, and believe that those conclusions have been substantiated by all the experiments that have been made.

H. T. Bentley (Assistant Superintendent Motive Power, C. & N. W.)—The tests reported agree practically with those made on our road by Professor Chamberlain and Max Toltz about two years ago. At that time there was a great deal of confusion of colors when an opposing headlight was placed in position so that the observers had it staring them in the face. In the Big Four tests, as reported by Professor Benjamin, the car was stopped at a predetermined point and the observers were called on to say what they saw. It would have been a very different matter if they had been traveling at the rate of 60 miles an hour and had been required immediately to make up their minds as to what was on the track, instead of leisurely taking the time and seeing for themselves at their convenience. The fact that false lights have been seen in these tests is a very serious matter, and the green light means "safety; proceed." Now, if the engineer is traveling at 50 or 60 miles an hour and sees a green light he is not going to stop, and this phantom light may be a very serious thing for the man on the engine. The obscuring of classification signals is also a serious matter, and I notice the observers could not distinguish them until they were within a few hundred feet. There are also other signals, such as hand signals, semaphores and block signals, all up for a certain purpose, to protect the engineer and the people on the train, and anything that will eliminate the effectiveness of those lights should be very seriously considered before it is put into use. After spending millions of dollars in putting up automatic block signals, everything should be done to keep the signal lights and indications so clear that there would be absolutely no excuse for a mistake. Before men become engineers they have to take examinations in vision and color perception, and if we go to that trouble to get men whose eyesight is absolutely correct and then do something that gives false indications, we are certainly working in the wrong direction. A headlight should give sufficient light so that the engineer could see people trespassing on the track, or other obstructions, or could have an indication that a train was approaching. I have ridden on engines where electric headlights were in operation, and while passing through the glare of the electric light I found that it was practically impossible to read the signals which should have governed. The dangerous part of the road is rounding curves, and the electric headlight does not do very much good, but a signal placed at such a dangerous location will help the engineer to know that everything is clear. It is said that where electric headlights are used on the prairies the cattle stand on the track dazed, notwithstanding the whistling and the ringing of the bell. In marine service more extensive and exhaustive tests have been made with electric lights than on railways, and it has been proved that a mist or rain acts as a curtain so that electric light will not penetrate to the same extent that oil light would. It is a serious breach of the rules for one steamship captain to direct the rays of an electric searchlight at the pilot house of a boat opposing him for fear that some obscuration of signals will take place. It has been said also that it is possible with an electric headlight for a man to magnetize his watch, and I have seen reports of a creditable watch inspector to that effect.

W. E. Symons (C. G. W.)—The electric headlight was an innovation, but it proved so valuable on many lines that it was used for the combined purpose of improving the service and as an advertising feature, and there are roads where the electric headlight's strongest friends are in the passenger department. In the south, where there are stretches of timber 40 miles long, we were troubled by trains being stopped by trees which were blown across the track. We equipped passenger locomoties with electric headlights between Jacksonville, Fla., and Atlanta, Ga., which prevented numerous accidents where, with an oil lamp, the obstructions would not have been seen in time for the train to be stopped.

W. R. Scott (assistant general manager, Southern Pacific: It seems to me that in connection with the operation of trains and different kinds of headlights different conditions, circumstances and viewpoints should be considered. On lines that have been properly equipped with automatic signals and switch lights if there was any obstruction on the track other than a tree or something of that kind you would immediately have the danger signal, or if there was any switch misplaced or a car not in clear the same thing would obtain. Under these conditions it does not make much difference what kind of a headlight you have. The headlight is of more benefit to the man approaching than to the man behind it. It gives an indication of the train that is coming or the location of the train, and the man behind the headlight, if the road is properly equipped with signals and switch lights, can always read those at safe distances and correctly. There is no question but what the electric headlight is good in some cases and under some conditions, and it is likewise true that in many cases it is objectionable. On double track, where there is a density of traffic and where the roads are equipped as I have stated, I do not believe that any benefit could be derived from the electric headlight. On the other hand, on roads not so equipped, where obstructions should be seen in order to avoid accidents, the electric headlight will save in many cases. We have had some experience in getting false indications from electric lights on the roundel, and I can corroborate what has been said on this subject in the paper. It is only fair to state that notwithstanding you get a false light occasionally when the focus is not exactly correct, at the same time the signal blade can always be seen, so that there is no reason why the engineer would accept that as a signal and be governed by it, because he can always see the signal blade in plenty of time to read it properly.

M. A. Ross (Treasurer and General Manager Pyle National Electric Headlight Co.): This paper has brought out a good many facts that I have not come in contact with and some, for instance, phantom lights, I believe we should look into carefully. I cannot understand how they get some of these results unless the headlight was not in good condition. Under certain conditions the fusing of the bottom electrode, which is of copper and which we use to keep the focal points in the reflector, will show a green light. This is brought about by the speed of the dynamo being too high, so that it will heat up the copper to fusing point. This may have been the condition at more than 700 ft. I, myself, have seen a mile post 32 telereason for thinking that the headlight was not in proper condition is that it failed to show an obstruction on the track at more than 700 ft. I, myself, have seen a mile post 32 telegraph poles from the engine, and, after considerable experience with electric headlights, will say that they produce a clear view of the track practically as good as daylight for one-half to three-quarters of a mile. If the light is in correct focal position with the reflector you get no better results than

you would with an oil light, although you may have 3,000 candle-power, and if the copper electrodes fuse a little the focal point with respect to the reflector is too low, and it throws the arc up too high, and that will account for some of the phantom lights. As to the benefit of the electric light on curves, there is no doubt but what you can see the reflection from the headlight for a great many miles. I have been told that you can see it for 20 miles and that you can trace the location of the train by the direction in which the reflection is thrown, and collisions have been prevented by the observation of that reflection. The electric headlight came into use 15 years ago, and it has been gradually extended so that there are now something like 13,000 in use. Most of them, for some reason, are sent into the southern states, particularly into Texas, where they are so universally liked that their use has extended to nearly all the engines in that state. I understand that railway officers there are glad to put them on, as they consider them a good investment, and I do not know of any railway that has put on electric headlights of its own volition that did not find them a good investment. Ten or twelve years ago a test similar to the one described in the paper was made on the Big Four with colored lights, and we are unable to find any conflict in colors, and the officers of the Big Four were so well satisfied with the high power headlights that they equipped all their passenger trains with them and are using them yet. While these lights have not been used in the east to any great extent, in the states where they are using them I have yet to hear of any case where they have caused an accident. Any engineer that I have ever heard of who has used an electric headlight any length of time is very much in favor of it, and you will agree that engineers are not backward in objecting to anything put on their engines which they do not like or that would not be of benefit. Whether it would be wise to equip with the electric headlight engines in Indiana, Ohio and Pennsylvania, where traffic is dense and trains very frequent, I do not know, but that it is a great safety device has been demonstrated wherever used. In Georgia they require electric headlights on mail trains. In Texas they have been used for years on some roads without switch lights and they do not miss them. The engineer sees the position of the signal, and that, I believe, is the coming method of signaling on railways, because it is one which is absolutely positive and depends on position and not on the light. We all know how blinding it is to look into a firebox. One cannot see anything for a few minutes afterwards. But the fireman becomes so accustomed to it that after looking in it he will be able to read signals correctly at once. He knows how to adjust his eyes to such difficulties, and the engineers have their own way of doing this when they meet an approaching train. In the tests described in the paper everyone was looking directly into the headlights, and, naturally, would be blinded. An oil headlight would not blind because it would be too feeble. An engineer meeting an electric headlight will not look directly into it, but will get something between it and his eye, such as the corner of the cab, and this stops that blinding effect immediately. I have had 15 years' experience in putting electric headlights on engines and riding engines, being an old locomotive engineer, and I have never seen the time or condition when I could not see signal lights in their true color and true position.

T. R. Cook (Pennsylvania R. R.)—I was very much surprised myself at the outcome of these tests. We had markers put on the track at 2,000 and 3,000 ft. distant, as it was assumed that we could see them that far. But we were unable to see some obstructions at a few hundred feet distant. The actual position of the semaphore arms could be distinctly noted with sufficient accuracy to be distinguished without the use of lights. I have investigated the headlights and have had considerable experience with them in the past three or four years, and it appears to me, as the case now stands, we do not have to give any consideration to the electric headlight as a headlight, that is, we can produce light in any given direction of any intensity with other means than the electric light, so that it is not a question of argument of an electric headlight against an oil headlight; it is a question of argument of intensity and distribution of the light we want. It is impracticable to get sufficient intensity of light to give the effect of daylight and allow the man to see the position of the signals without interfering with the absolute indication of colors.

W. C. Squire (W. E. Bossert Manufacturing Co.)—An ordinary headlight is 10 or 12 ft. above the head of the rail. That would make some difference in any observation, and the question of lowering headlights is important. On some roads they are dropped to the center of the front end, but the location of the headlight itself must have some relation to the position of the engineman who is looking at an opposing train.

C. P. McGinnis (traveling engineer, M., St. P. & S. S. M. Ry.): The electric headlight is helping the signal question to be resolved into one of position rather than color. I have noticed this in piloting new engineers over the line at night. I have asked old engineers about the colors of the numerous signals, and, to my great astonishment, practically all of them told me they did not know. They had only paid attention to the position of the blades, and I found that to be the only logical way to get the exact position of the switches where there are a great manl lights together. I have counted as many as 23 lights within 200 ft., and these lights are come upon suddenly in rounding curves. I do not think there is any engineer that can pick out the right lights in order to tell just where he is going without slowing down too much to maintain schedule time, but he does carefully observe the signal blades. I find the electric headlight is a factor of safety in getting the train over the road. It assists in locating small stations so that the brakes are applied at the proper time. It is of especial advantage in winter time when snow forms outside the cab window. On an engine equipped with electric headlights this screen can be seen through without looking out of the side window. These few advantages that I have mentioned have caused our company to equip our passenger engines with electric headlights. It has been said that the electric headlight magnetizes the engineer's watch, but I have used a galvanometer and have not been able to detect a current 14 in. away. I have a watch which think is a good one and it only varies about 20 seconds a month, though I have frequently been on engines equipped with electric headlights. I do not think that 2 per cent. of our engineers who are on engines equipped with electric headlights would care to have them taken off and replaced with oil lamps. In fact, when making some changes, engineers objected to taking engines not equipped with the high-power headlight.

Professor Benjamin: In closing there is one thing I wish to say, that from my observation both on this road test on the Big Four, and also in riding on the locomotive, I believe it is entirely possible to see ordinary colored signals if you are using headlights and have no opposing electric light at a distance of upwards of a mile. I do not think it is possible to see anything in the nature of a big tree, or anything of that character, no matter what color it is or how large it is, at a distance of much over a quarter of a mile, and this should have some bearing on the question of using sempahore arms instead of lights for safety or danger signals. Under ordinary circumstances any engineer can see the colored lights at sufficient distance to make him entirely sure of the condition of the road ahead of him, and he certainly cannot see the arms or blades at a sufficient distance so that he would be entirely safe in going ahead at full speed.

On motion of Mr. Manchester, the club authorized the executive committee to print an extra lot of copies of the proceedings of the meeting so as to make general distribution of them to the railways and the railway commissioners of the different states.

General News Section.

In a fire at Depew, N. Y., April 26, the storehouse of the New York Central car shops, together with a part of the machine shop, was destroyed; estimated loss, between $60,000 and $75,000.

Secretary Ballinger, of the Department of the Interior, has withdrawn from entry approximately 13,500,000 acres of coal lands in southeastern Montana, believed to contain valuable deposits, pending examination and classification as to their values.

The New York legislature has passed a bill, which has been approved by the Governor, providing for the issuance of $7,000,000 in 4 per cent. bonds for the improvement of the Cayuga and Seneca canals. These canals are to be made a part of the barge canal system.

The battleship Indiana has been fitted with a brake with which, it is said, the vessel can be stopped in half its own length when going at good speed. The brake consists of movable wings which are attached to each side of the ship and which are controlled directly from the engine room.

The Colonial Creosoting Co., of Millsboro, N. J., which is a short distance west of Bound Brook, is to treat by the Lowry preservative process 400,000 ties for the Lehigh Valley. These ties are to be delivered during the present year, and the order may be increased. The Colonial works have a capacity of a million sleepers annually.

The Massachusetts Legislature has passed a law forbidding street railways, when allowing passengers to ride on the platforms, to require them to do so at their own risk. The proposition which was before this body, to impose fine and imprisonment on a railway officer violating the laws forbidding the merger of two railways, was rejected by the Senate without a word of debate and without a division.

The railways in Texas have notified the State Railway Commission that if reductions in their Texas rates on cotton are made as proposed they will be compelled to reduce expenditures for improvements. The improvements contemplated for the next two years aggregate $25,000,000, but this may have to be cut down to $10,000,000. The work planned includes about 150 miles of new line and large numbers of new cars and engines.

The railways doing interstate business in Oklahoma have appealed to the state supreme court from the order of the Corporation Commission requiring them to establish general offices in the state by June 1. They allege that the order violates the 14th amendment and the commerce clause of the Federal Constitution. They allege that the order requires them to vest the authority of a general manager in the hands of a local agent, which is unreasonable and unjust.

The evidence which has been obtained by W. J. Burns, a detective, in regard to alleged "grafting" in the repair of cars for the Illinois Central by outside companies, is to be turned over to John E. W. Wayman, state's attorney of Cook County (Chicago), with a view to starting prosecutions if it shall seem to Mr. Wayman that it furnishes ground for them. The evidence is now in the hands of the law department of the road, and officers of the company have indicated that they believe it is sufficient to secure some convictions on serious charges.

The western railways, as usual, are advertising widely that April 30 will be celebrated as "California raisin" day. The day will be celebrated throughout California, and the railways which are interested in traffic to and from that state have put up colored posters in their stations and other conspicuous places and are distributing numerous folders describing the raisin and how it is grown and cured and used. The Chicago & North Western and the Rock Island lines have announced that raisins will be served in various ways on all their dining cars on April 30.

An officer of the Hocking-Sunday Creek Traction Co., Nelsonville, Ohio, writes that the McKeen motor car will be operated exclusively on the line which is now under construction. One of the standard 6-cylinder, 200-h.p. cars has been in regular service since February 12, and has not missed a trip on its schedule, although the first run was made in 13 in. of snow, and although, about 10 days later, 8 in. of snow and a severe sleet storm tied up practically all of the traction lines in that section. When the line is finished six motor cars and six trailers will be used.

The Great Northern Railway is using telephones for train despatching on 2,100 miles of its lines and has ordered apparatus to be installed on six more divisions, the Fergus Falls, Breckenridge, Northern, Dakota, St. Cloud and Cascade divisions, a total of 1,900 miles. Western Electric telephones and Cummings-Wray selectors will be used, these having been adopted as standard by this railway. Two hundred and ninety stations are to be equipped, while 350 additional telephones will be installed at sidings and at stations which are not open during the whole 24 hours.

According to a press despatch from Harrisburg, Pa., one of the operating men of the Cumberland Valley has been arrested on the charge of tampering with a signal light. The report is denied by officers of the road, but it persists. Surprise tests made during the past three years have resulted in the discharge of several enginemen, and, it is said, they have now retaliated by causing the arrest of the man who conducted the tests, and he is understood to be out on $3,000 bail. It is a criminal offense to tamper with signals, but whether a railway has the right to change signals in order to test the enginemen has never been tried out in the courts.

The Ohio committee of the Railway Business Association on Monday of this week laid before the Senate of that state a protest against the Woods bill for a public utilities law. The protest was signed by several hundred merchants and manufacturers of the state. Following its presentation, the committee on commercial corporations reported the bill, with important amendments, but without recommending its passage. On the floor of the Senate a motion to take up the bill this week was defeated, by a vote of 15 to 11, so that it is now at the bottom of the calendar, where it is behind 59 other measures.

The directors of the United States Steel Corporation have declared a quarterly dividend of 1¼ per cent. on the common stock, placing the stock on a 5 per cent. basis, as compared with a 4 per cent. basis. E. H. Gary, chairman of the corporation, issued a statement in which he said that conditions justified an increase, but that it was the opinion of the present members of the finance committee that future disbursements should be declared in the shape of extra dividends when earnings justify such increases. The net earnings for the quarter were $37,616,876, comparing with $22,921,268 in the corresponding quarter of last year. Unfilled tonnage aggregated 5,402,514 tons, comparing with 3,542,595 on the corresponding date of last year.

Dining cars and lunch baskets constitute, evidently, a subject of genuine "human interest," and the correspondent who last week suggested that a train ought to have both a dining car and a buffet did not exhaust it. Another writer, C. E. L., thinks reserved seats might be provided for. He says: On the important through trains, where the dining car has a conductor and a collector, or two men occupying similar positions, one looking after the financial features and the other acting as head waiter, why not have one of these men pass through the train, quietly and unostentatiously, and present his menu to the passengers, take their order and assign them a seat at a certain table, at a definite hour? Then he could have things ready for them at the proper time. The present

practice of announcing dinner ready and then running everybody in promiscuously, each in some other's way, is always confusing. The passengers get into the dining car or into the vestibules, only to stand there looking with eager and hungry eyes on the festive board and gambling as to which man is going to get done first and who will get his seat! What could be more uncivilized?

The new Forest Products Laboratory at Madison, Wis., is finished, and will be opened on June 4, 1910. A short program has been prepared for the opening exercises, and demonstration work will be in progress, so that visitors may make a satisfactory inspection of the plant. The testing which it is proposed to do here has been described in the *Railway Age Gazette*. It is hoped that those in charge will receive the co-operation of all wood-using industries. Within a month or two a number of positions in connection with the work will be filled with engineers of wood preserving, timber testing and chemical engineering. Candidates will receive consideration according to their engineering training and practical experience.

As a result of the negotiations incident to the strike of tugboat pilots in New York harbor, on April 1, the officers of the railways having to do with this feature of the railway service have formed an organization, called the Associated Marine Departments, with a view to conserving the interests of the licensed officers employed by the railways—masters, mates and pilots—whenever they are called before the United States inspectors, and also in case attempts shall be made to coerce or interfere with them while they are attending to their duties. The chief "general agent" of the new association is Captain N. L. Cullin, who seems to have been an officer of a union of these pilots. He has resigned his position in the union. The prime movers in the formation of the association were the Central of New Jersey, the Baltimore & Ohio, the Delaware, Lackawanna & Western, the Erie and the Lehigh Valley, the roads against which the men had struck, but it is understood that the other railways will give it their support. According to the *Marine Journal*, from which we take these facts, the railways have taken this measure, looking to a more intimate understanding between the employers and the employees, because there has been undue favoritism in the relations between the supervising inspector of the New York district and the man who led this strike. By breaking down this "unfair alliance" it was felt that an era of fair dealing could be brought in.

Telephones for train despatching are being put up on the line of the Norfolk & Southern between Norfolk, Va., and Washington, N. C., 136 miles. Gill selectors are used, these and the other instruments being furnished by the Western Electric Co. Besides the 20 stations, there will be eight booths at sidings fitted up with telephones for the use of conductors stopping at such sidings. Portable telephone sets are to be provided on some of the trains, so that by the use of a "fish pole" communication may be established with the despatcher's office at any point along the road.

The Virginian Railway has ordered Western Electric telephones and Gill selectors for the equipment of train despatching lines throughout its first and second divisions; and when this work is completed the entire line of this company will be provided with telephones for despatching. On the Third division, from Roanoke to Deepwater, the telephones are nearly ready to go into service. On the First and Second divisions, for which the apparatus has just been ordered, the bells at the stations will be rung by the current from a battery situated at the despatcher's office. Thirty-one stations will be thus equipped. This division will have 27 telephones at places other than stations.

Good Winter Service.

During the entire period of continuous cold weather, ice and snow from December 3 to January 17, not a single accident was reported and we did not find it necessary to cancel a single passenger train. There isn't another road in the territory which makes such a showing. We were handicapped, too, by being short of power.—*Vice-President Ross, Chicago & Alton.*

Improvements on the Chicago & Alton.

By the time the Alton has spent 40 per cent. of the $18,000,000 it is now raising by a bond issue there will not be a finer property in all the West. By the fall we will have in service thirty more heavy freight engines, ten Pacific type passenger engines and ten switching engines. We are now double-tracking between Bloomington and Atlanta, twenty miles, and between Iles and Nilwood, twenty-six miles, and bringing the maximum grade down to three-tenths. This work is costing $900,000. This done, we shall be able to increase our trainload from 2,700 tons to 4,000 tons, without employing pusher engines. The Alton will then be double-track from Chicago to Nilwood, 210 miles. Between Nilwood and St. Louis there are several more sections of double-track, bringing the total to 232 miles.

"Shop capacity is being enlarged at various points. We are elevating our tracks in Chicago and Joliet. At Lincoln and Bloomington we are erecting handsome new passenger stations. At Peoria a large new terminal is being built by a subsidiary company of the Alton, and at East St. Louis we have consolidated the Alton's freight and engine terminal with the Clover Leaf's.

"On the Clover Leaf we have just finished grade reduction to 35 ft. to the mile at East St. Louis, going east to the Mississippi valley bottoms. This means an increase in the maximum train haul from 1,200 to 1,600 tons. The Clover Leaf is gravel ballasted except in the eastern division, where the ballast is rock. We have contracted for 50,000 yds. of rock for the eastern division, or about 33 miles of rock ballast.—*G. H. Ross, vice-president.*

Railway Matters in Washington.

Washington, April 27, 1910.

The next hearing in the government case for the dissolution of the union of the Southern Pacific and Union Pacific railways will not take place until October 1.

The Supreme Court of the United States has granted a writ of certiorari in the case against the Atchison, Topeka & Santa Fe concerning the working hours of telegraphers, which means a rehearing of the case.

The appointment of Governor Charles E. Hughes, of New York, to the vacancy on the Supreme Court, with the announcement that Governor Hughes will not take his seat in the court until October, is understood to make it certain that the Standard Oil and American Tobacco cases will not be taken up for rehearing by the court until the fall term.

The bill to amend the interstate commerce law continues to drag in both houses of Congress. In the Senate this week the leaders had nearly or quite agreed that a vote should be taken on May 7, but Senator La Follette, of Wisconsin, objected, and everything is again at sea until it shall be known how long a time Mr. La Follette's speech will occupy. On Monday Senator Doliver, of Iowa, delivered a long speech. It was devoted largely to politics. He presented, however, a cogent criticism of the proposition to have the Department of Justice take out of the hands of the commission the function of defending the government in rate cases, and also showed what inconsistency and uncertainty would be sure to arise under a law giving the commission power to change rates frequently. Stable rates are more important to the industries of the country than low rates, yet the Interstate Commerce Commission can order changes whenever it pleases; these orders expire by limitation at the end of two years, and the result will be perpetual unrest.

On Tuesday Senator Clapp made a long speech, and he and other senators kept up the talk for four hours, but it was mostly politics, and only a few senators gave attention to the speakers.

The executive committee of the National Association of Railroad Commissioners met here last week and discussed those provisions in the administration bill which are thought by some commissioners to threaten the power of the indi-

vidual states. One of these provisions is that giving the federal authorities power to regulate the issue of railway stocks and bonds. The railway commissioners of Minnesota appear to have been the originators of this alarm, and Commissioner Staples of that state remained here after the committee adjourned with a view to seeing that the Congressmen should not ignore his protest. It is said that the committee will ask the railway commissioners in all states to join them in their protest.

Congressman Sulzer, of New York, last Monday introduced in the House the railway rate bill which was introduced by Mr. Hearst in the Fifty-eighth Congress.

Proposed New Subways in New York.

The New York State Public Service Commission, first district, has prepared a form of contract proposed for the construction, equipment and operation of the Tri-Borough Subway route, in so far as that route is offered to private capital to build, equip and operate. This form is the forerunner of another covering the construction of the subway only and by funds derived from the sale of city bonds. It has not been decided which method shall be followed in the case of the Tri-Borough route, and the question will depend upon whether attractive bids are received on construction and equipment by private capital. A public hearing will be held May 9 on the form of contract first mentioned, and a week later a hearing will be given on a form of contract, to be published in the meantime, providing for the construction of the Tri-Borough route with city funds and the equipment and operation by private capital. This second form of contract will cover the Tri-Borough route in sections, and will follow the general form of the contracts for the construction of the Fourth avenue (Brooklyn) route, which have already been let.

Mayor Gaynor and other officers favor building the Broadway-Lexington portion of the Tri-Borough system with city money, and have set aside $13,000,000 to start the work. Commissioner Bassett has filed a dissenting opinion against both proposed contracts, holding that the terms are not as attractive as they should be to bidders.

The Tri-Borough system includes the Broadway-Lexington line, from the Battery to 135th street, with one branch thence to Pelham Bay Park and another to Woodlawn; the Canal and Centre street routes in Manhattan, and the Broadway-Lafayette avenue loop in Brooklyn, crossing the Manhattan and Williamsburg bridges.

Ownership will vest in the city from the start, whether the line is built with private capital or city funds. In the private capital scheme the contractor would receive his recompense in a lease of the road for operation for a term of years long enough to enable him to amortize the cost of the road.

It is provided in the proposed contract form that work must be started within sixty days after the agreement is signed, and the entire route completed within four years. When one-half of the line is finished the contractor must begin installing the equipment, the road to be put into operation as fast as sections are completed. It is expected that work will be begun this coming autumn. Negotiations are practically completed with the Interborough company for the construction of extensions in connection with the tunnels to Queens and Brooklyn.

All work will be done in tunnel in Manhattan south of 138th street and on the Broadway-Lafayette avenue loop in Brooklyn, excepting the portion of Lafayette avenue east of Bedford avenue. The rest of the work will be in open trenches.

The right is reserved to the commission to allow other railways to use the tracks; the rate of fare is to be five cents for the entire length of the system; no part of the road or stations is to be used for advertising purposes.

The contractor must furnish equipment approved by the commission, and provide for the operation of 10-car trains at not exceeding one and one-half minutes' headway and averaging not less than 25 miles an hour, including stops. Cars must be of steel, and all the latest improvements in equipment are demanded.

It is provided that within three months after the contract is made, the commission and contractor shall each appoint an engineer, and 30 days later shall agree upon a third engineer, and the three are to constitute a Board of Arbitration to supervise the entire work. If the commission and contractor cannot agree upon the third engineer, he will be named by the Chamber of Commerce.

The contractor must specify the exact terms upon which he is willing to operate the road for a period of years, based on the percentage of cost he is willing to set aside annually to amortize the cost. The term will depend upon the amount the contractor is willing to set aside each year, and therefore the bidding will be determined chiefly by the time clause of the different competitors.

Railways on Paper.

Between 1900 and 1908 the Canadian Parliament authorized 65 companies (outside of the Canadian Pacific, Grand Trunk, G.T.P. and Canadian Northern) to build over 37,000 miles of railway. Of this, not 500 miles has been built, and of the 65 companies granted privileges to build, only 13 have taken advantage of their privilege. Senator Davis has introduced in Parliament a bill to provide for the granting of railway charters by the Railway Commission instead of by Parliament. The Railway Commission would be in a much better position to check the feasibility of a scheme; to regulate the issuing of bonds, and to secure the building of the road according to requirements.—*Canadian Engineer.*

Timber in Brazil.

Consul-General Anderson, of Rio Janeiro, in a report to the State Department, says that the railways in Brazil have difficulty in supplying themselves with ties and timber, though in the northern hemisphere the country is popularly supposed to be covered with forests. It appears, however, that useful trees are greatly scattered, that some kinds of them are heavier than water, and so cannot be floated, and that, therefore, the cost of transportation is prohibitive. The Paulista Railway Company, the largest in southern Brazil, having 691 miles of track, has planted a nursery of eucalyptus and other trees covering 250 acres, besides conducting a number of less extensive experiments. Recently the company has bought land on which to plant a million more eucalyptus trees. It is expected that after a period of 15 years it will be found that eucalyptus large enough for ties will have been shown to cost about 15 cents a tree.

Free Relief for International Harvester Company's Employees.

The International Harvester Co., employing 25,000 men and operating factories, twine mills, lumber mills, steel mills, mines and railways, has announced the establishment of an industrial accident department similar to that announced last week by the United States Steel Corporation (page 1052). The new department begins operations May 1. The railways operated by this company are the Illinois Northern, the Chicago, West Pullman & Southern, the Owasco River and the Deering Southwestern. In general, the scheme is similar to that of the Steel Corporation. Further details, as given in a circular issued by the Harvester company, are as follows:

In case of death there will be paid three years' average wages, but not less than $1,500 nor more than $4,000.

In case of the loss of a hand or foot, one and one-half years' wages, but in no event less than $500 nor more than $2,000.

For the loss of both hands or both feet, or one hand and one foot, four years' wages, but in no event less than $2,000.

In case of other injuries, one-fourth wages during the first 30 days of disability; if disability continues beyond 30 days, one-half wages during the continuance thereof, but not for more than two years from the date of the accident. Thereafter, if total disability continues, a pension will be paid.

Provision is made so that the employees may increase the benefits to be paid during the first 30 days of disability to an amount equal to half-wages. This is accomplished by the

creation of a benefit fund, to which employees earning $50 a month or less will contribute 6 cents a month, employees earning more than $50 and less than $100, 8 cents a month, and employees earning more than $100, 10 cents per month. These small contributions will, together with the one-fourth wages paid by the company, be sufficient to provide half-pay for all injured employees during the first 30 days of disability.

This arrangement for contributions from the employees toward paying the benefits for the first few weeks of disability is modeled after the German law, recognized as one of the most successful of European laws dealing with this subject. As a reason for desiring this contribution from the employees it is stated:

"The company earnestly desires the co-operation of its employees in the payment of benefits during the first 30 days of disability because it wishes every employee to assist in the prevention of accidents. The company has expended large sums in safeguarding machinery, and in the effort to protect its employees from injury, but without the active co-operation of the employees many accidents cannot be avoided. Under this plan the company and the employees equally divide the payment of benefits during the first 30 days of disability, and thus every employee becomes financially interested in guarding against accidents and in seeing that his fellow workmen are equally careful. It is hoped that this mutual interest will lead to active co-operation on the part of the employees, and that, thereby, accidents will be reduced to a minimum."

A comprehensive scheme for the administration of the plan is provided. A department known as the Industrial Accident Department is created. This is to be managed by a board of managers composed of five members appointed by the company.

Negotiations Concerning Wages.

Officers of the Delaware & Hudson, following extended conferences, have agreed with representatives of the several classes of brotherhood employees concerning an advance in the pay of conductors, trainmen, enginemen, firemen and telegraphers. The wages of the conductors and trainmen are to be adjusted in accordance with the award of the Board—Messrs. Clark and Morrissey—which has arbitrated the controversies concerning the same classes on the New York Central & Hudson River. The enginemen, firemen and telegraphers will receive an advance of about 8 per cent.

The Lehigh Valley, having some time ago settled the questions of wages of enginemen, firemen, conductors and trainmen, has made advances averaging 6 per cent. in the wages of its other employees, including the clerical forces. The new rates go into effect May 1.

The Central of New Jersey has increased the pay of several classes of its employees and is still negotiating with others.

Officers of the New York Central Lines west of Buffalo have agreed with representatives of the conductors and trainmen to submit their questions concerning wages and conditions of work to Messrs. Clark and Morrissey, the same arbitrators who have been chosen for a similar function on the New York Central Lines east of Buffalo. On the Cleveland, Cincinnati, Chicago & St. Louis an agreement for an increase in pay has been reached with the Brotherhood of Locomotive Engineers.

Officers of the International Order of Railroad Machinists are asking for an increase of pay for machinists on most of the prominent roads west of Chicago.

The Erie has advanced the pay of firemen an average of 8.2 per cent. The firemen on the largest passenger engines will receive $2.90, and on the heavy freight engines $2.60. The pay of enginemen, telegraphers, switchmen and freight handlers already has been adjusted. Negotiations with the conductors, trainmen and shopmen are still pending. The order concerning firemen takes effect as of April 15. It is the result of a ten-days' conference.

The Southern Railway has made an increase of 31½ cents a day in the pay of members of the Brotherhood of Carmen. The membership of this brotherhood includes car builders, car repairers, car cleaners and others.

The Southern Railway and the Order of Railway Telegraphers have joined in choosing arbitrators to adjust the wages of telegraphers on the company's lines.

The Seaboard Air Line and the Southern Pacific have agreed with representatives of the telegraphers on their lines to refer to Messrs. Knapp and Neill pending controversies concerning wages and working conditions.

The Wheeling & Lake Erie has increased the pay of machinists, boiler makers, blacksmiths and other shopmen; 8 per cent. for the skilled laborers and 6 per cent. for others.

The brotherhoods of conductors and brakemen announce that they are conferring about increases of pay with the Pennsylvania, the Philadelphia & Reading, the Central of New Jersey, the Erie, the New York, Ontario & Western and a number of other lines. It will be recalled that on the two roads first named general advances in pay have just been ordered.

Corporation Manners.

One of the great transcontinental railways has decided to open "a school of manners" for its employees. A need which has not been so clearly seen, nor yet supplied, is that of a "school of manners" for the corporations themselves. Not long ago a street railway company, which marks the stopping places of its cars by white posts, discontinued a stopping place that had been established for years. No notice was given to the public, nor was the white sign obliterated until some time after the change was made. People were merely left to discover the change by fruitless waiting. That was bad corporation manners. The withholding of news that the public has a right to know, as, for example, the cause and extent of delays to trains or the seriousness of an accident, is another piece of corporation discourtesy that is exceedingly common.—*Youth's Companion.*

The Damage Claim Industry in Texas.

The *San Antonio* (Tex.) *Republic* of April 16 makes two vigorous editorial attacks on the "damage claim industry" which flourishes to such a notorious degree in Texas, but which, according to the *Republic*, finds its most nourishing soil in Bexar country, where San Antonio is situated. The *Republic* asserts that in a personal damage suit it is impossible for a corporation, and especially a public service corporation, to get justice in Bexar county, and it quotes the testimony of L. W. Earnest, claim agent of the San Antonio & Aransas Pass, in the recent trial of H. J. Cleary versus T. J. Freeman, receiver of the International & Great Northern. Mr. Earnest said: "Labor union influence and those affiliated with labor unions are responsible for much of the damage suit industry." He asserted that a combination exists whereby damage-suit lawyers have numerous "strikers" or "boosters" who drum up business for them, and that the railways cannot get representative juries for their cases in Bexar county. Frequently in damage suits he and attorneys for his road have made lists of jurymen who they believed attorneys for plaintiffs would object to and in almost every instance these names had been "scratched." "All you have got to do in this county," said Mr. Earnest, "is to get a crutch and walk down the street. You'll be stopped a dozen times in two blocks by some "booster" recommending a firm of damage-suit lawyers." Mr. Earnest offered to give names of alleged "boosters" and "strikers," but the newspaper report says "he was not pressed to do so." In commenting on the situation, the *Republic* says:

"Friends and neighbors, better that San Antonio should be known as the headquarters of anarchists or the bloody black hand, than the chosen center where legitimately invested capital and the fruits of honest industry are confiscated under the forms of bastard laws. All Texas feels the evil effect of the iniquitous attacks upon corporate wealth by Bexar county juries, but more particularly and more damagingly does San Antonio. There must be a change, * * * through the repeal of the manifestly unjust class and pernicious laws that disgrace the statute books of Texas.

It is the duty and the interest of every citizen to lend his aid to the creation and promotion of a healthy public sentiment that shall demand a repeal or a material modification of the obnoxious laws."

Burlington Relief Department.

The last report of the relief department of the Chicago, Burlington & Quincy for the year ending December 31, 1909, includes a summary of its operations from the establishment of the bureau on June 1, 1889. The cash balance on December 31, 1908, was $51,113. The receipts during the year were as follows: Net contributions of members, $545,595; interest on monthly balance paid by the railway company, $1,054; income from investments, $20,625; total receipts, $567,275. The cash balance at the end of 1908 and the receipts during 1909 made the total resources $618,388. The benefits paid amounted to $573,646, leaving a cash balance on December 31, 1909, of $44,742. The receipts and benefits paid from June 1, 1889, to December 31, 1909, were as follows (cents omitted):

Net receipts from members	$7,201,049	
Bequests from deceased members	2,115	
Deficiencies paid by railway company	42,532	
Interest paid by railway company	138,405	
Income from investments	132,343	
		$7,516,446
Benefits paid on account of sickness	$3,212,035	
Benefits paid on account of accident	3,763,130	
		6,975,165
Receipts in excess of benefit orders paid		$541,281

The payments by the railway from its own funds in establishing, operating and maintaining the relief department from 1889 to 1909, inclusive, have been as follows:

Expenses of establishing and operating, 1889 to to 1908, inclusive	$1,206,304	
Operating expenses, 1909	81,706	
Total operating expenses, 1889-1909		$1,288,011
Deficiencies paid		42,532
Total		$1,330,544

In addition, the company has given, without charge, the time of officers and clerks in other departments of the service used in attending to relief department business, the service of the law department, the rent, care, heating and lighting of the offices of the department in Chicago and of all the medical examiners' offices owned by the company; also the use of express, mail, telephone, telegraph, transportation and other facilities. The value of these services and facilities is much greater than the cash paid by the company for the support of the department.

Railway Building in Arabia.

A party of French engineers are said to be making surveys for a line from the seaport of Hodeidah, Arabia, to Sana, the largest and most important inland city in southern Arabia, about 100 miles. The cost of constructing such a line would be great, as the route is through a mountainous section. It is understood that the engineers are to submit a plan of construction to the Turkish government at Constantinople by July, and that a concession to build the line will be given to the company that will build for the lowest price. It is understood that the competition will be limited to French companies, as French capitalists are supplying the money for the work.

Railway Building in Northern Syria.

With the concession already granted to the French company for an extension of its lines from Hama to Tripoli of Syria, which must be completed before two years from the date of the granting of the concession, it will be seen that an era of railway development has arrived that will completely revolutionize the whole commercial status of Northern Syria. At present all goods are transported in wagons, on camels, horses and donkeys, from the interior of the country to Aleppo, and the major portion thereof continues in the same manner to the port of Alexandretta. The proposed railways will facilitate the transportation of grain, licorice root, wool, hides, cattle, sheep, etc., from the inland, and of cotton goods, manufactures, petroleum, sugar, etc., from the coast. This will very soon open up the vast uncultivated area along the Euphrates river, greatly increasing the output of products in general.

The Traveling Engineers' Association.

The eighteenth annual convention will be held at the Clifton hotel, Niagara Falls, Can., August 16-19, 1910. The following subjects will be discussed:

"Fuel Economy," under the following heads: (a) Value of present draft appliances. Can they be improved to effect fuel economy? (b) Firing practices, including the prevention of black smoke: (c) Roundhouse practices; whether it is more economical to knock or bank fires at terminals; d) Whether it is more economical to buy a cheap fuel of a low heat value, or a higher priced fuel of a greater heat value; (e) Devices and appliances for use on engines and tenders to prevent waste en route.

"Superheat as Applied to Locomotives."

"How Can the Traveling Engineer Best Educate the Present Day Fireman to Become the Successful Engineer of the Future?"

"Latest Developments in Air Brake Equipment and Its Effect on Train Handling."

"What Progress Has Been Made in Reducing the Cost of Locomotive Lubrication, and is it Advisable to Place this Item Entirely Under the Control of the Road Foreman or Traveling Engineer?"

"New Valve Gears as Compared with Stephenson or Link Mation, Referring Particularly to Economy of Operation and Maintenance and also Necessary Procedure in Case of Break-Downs."

Chicago Railway Club.

The annual election of the Chicago Railway Club will take place on May 14. A ticket has been nominated, which is headed by Charles G. Hall, general advertising agent, Chicago & North Western, for president, and George T. Gunnip, general agent passenger department, Atchison, Topeka & Santa Fe, for vice-president; C. Nyquist for secretary and treasurer; H. D. Howe, T. E. Waymen, E. P. Skene and F. A. Lehman, for directors. Plans for enlarging and improving the headquarters of the club at 112 Monroe street, Chicago, are under way, and it is expected that during the next year the club under the new officers will carry on active work along various lines.

Engineers' Society of Pennsylvania.

The second annual convention will be held in the House of Representatives, Pennsylvania State Capital building, Harrisburg, Pa., June 1-4, 1910. These conventions are organized and directed by this society, but all members of the engineering profession in Pennsylvania are invited to attend and take part in the discussions and business meetings.

Railway Clerks.

The International Brotherhood of Railway Clerks, at its conference in New Orleans last week, elected as president for the ensuing year J. J. Carrigan, of Memphis, Tenn. The next convention will be held in Boston in 1912.

Canadian Society of Civil Engineers.

At the meeting of the general section held on April 28 a paper entitled "Some Recent Developments in the Purification of Public Water Supplies" was read by R. S. Lea, M. Can. Soc. C.E.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 7, 1910; Niagara Falls, Ont.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18; New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues.; N. Y.; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—H. C. Donecker, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
General Superintendents' Assoc. of Chicago.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—Fourth Saturday in month; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wed.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City.; Third Friday in month; Kansas City.
Railway Association of Special Agents and Police of U. S. and Canada.—May 10-13; Los Angeles, Cal.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting October 11-13, Atlantic City.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
Richmond Railroad Club.—F. O. Robinson; 2d Monday; Richmond.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
Short Line R. R. Association.—First Monday in month; New York.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Nyquist, 1134 La Salle St. Station, Chicago.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16 19; Niagara Falls, Ont.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The New York Central is to run a Farmers' Special in the northern part of New York State in the week beginning May 9.

The Pennsylvania has made a reduction from $2.40 a ton to $1 a ton in the rate on cement from Philadelphia to Atlantic City, 56 miles.

"Facts for Farmers" is the title of a book which has been issued by the Delaware, Lackawanna & Western for free distribution. The author of the book is De Witt Carpenter, a farmer of Homer, N. Y., and it is endorsed by H. J. Webber, acting director of the New York State College of Agriculture, Cornell University.

The Morgan and Mallory steamship lines have made large reductions in rates on iron and steel articles from New York to Galveston. This action is said to have been occasioned by the advent of a new steamship line from Baltimore to Galveston, and this notwithstanding that, it is said, all of the vessels between New York and Texas are doing a heavy freight business.

President Tuttle of the Boston & Maine has announced that passenger rates will be advanced, probably June 1, except in the case of suburban rates, which will not be changed. The amount of the increase has not been announced, but it is expected that it will be about 10 per cent., so as to bring the rates back to the figure which prevailed before the general reduction in February, 1907.

The New York Assembly has passed and the Senate Judiciary Committee of New York has voted to support the bill of Assemblyman Parker increasing the powers of the New York Public Service Commissions, both First and Second districts, thus giving the New York City district commission the right to regulate the issue of transfers on street railway lines through a provision which gives both sections of the commission power to make joint through rates between electric railways.

The stocks of anthracite coal on hand at the present time are so large that there is, it is said, a good deal of price cutting by the coal operators who sell to the wholesalers. There has been some restriction of production, but it is said that this has not been sufficient as yet to produce any apparent effect on prices. The total production of anthracite in the year 1909 was 61,969,885 tons. For the last seven years the average production has been over 61 million tons, as compared with an average in the preceding seven years of less than 44½ million tons.

The Colorado & Southern, the Denver & Rio Grande, the Chicago, Burlington & Quincy and the Union Pacific have filed notice that they will appeal from a recent order of the Colorado Railway Commission requiring them to reduce their coal rates from Louisville, Colo., to Denver, and from Denver to Littleton. On the other hand, the Santa Fe has filed notice that it will not appeal from the commission's ruling requiring reductions in the rates from Denver to Littleton. The rate from Denver to Littleton had been $1 and the commission ordered it reduced to not more than 50 cents.

Traffic Club of Chicago.

Friday evening, April 22, was "get together" night at the Traffic Club of Chicago. The first of a series of smokers was held and a Dutch lunch, supplemented by clay pipes and tobacco, was served. Entertainment was furnished by John A. Hand's orchestra; F. A. Butterworth, of the Pere Marquette; S. E. Kiser, of the Chicago *Record-Herald*, and Harry K. McEvoy, legerdemain artist.

Traffic Club of St. Louis.

The Traffic Club of St. Louis will entertain President Taft at a formal dinner at the Jefferson Hotel the evening of May 4 at 6:30. The dinner will be served at tables seating four, six and eight persons, and those desiring to attend or to make reservations of seats are requested to notify A. F. Versen, secretary-treasurer, as promptly as possible.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1910.
(See also issues of April 8, 15, and 23.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Ann Arbor	301	$116,348	$26,980	$149,605	$13,738	$25,304	$3,088	$56,554	$5,161	$103,845	$45,760	$22,572	$12,330	$10,858	$10,559
Arizona Eastern	217*	97,080	28,511	132,199	20,777	10,968	887	28,075	485	61,192	71,007	.....	4,469	66,538	40,636
Atlantic & St. Lawrence	167	103,803	15,441	142,584	12,763	15,207	3,861	78,744	3,197	113,772	28,812	.....	6,435	22,377	—36,093
Buffalo & Susquehanna	361	111,683	10,795	128,789	30,501	62,759	1,975	75,137	7,453	177,825	—49,036	63	4,000	—53,099	—51,271
Canadian Pacific Lines in Maine	233	85,224	22,659	114,309	14,619	21,092	3,901	50,763	2,708	93,083	21,226	.....	5,000	16,226	16,826
Carolina, Clinchfield & Ohio	225†	91,193	7,880	101,683	11,655	16,113	5,177	26,916	9,157	69,018	32,665	.....	4,000	28,665	37,635
Central New England	278	180,188	20,673	214,748	23,569	19,287	1,268	66,598	2,931	113,653	101,095	.....	11,500	89,595	11,438
Charleston & Western Carolina	340	109,437	20,086	136,166	21,734	15,899	3,259	38,170	4,820	83,882	52,284	.....	4,475	47,809	10,634
Chicago, Cincinnati & Louisville	284	85,385	16,850	108,759	20,244	24,146	7,810	61,103	5,682	118,985	—10,226	.....	3,410	—13,636	—16,072
Chicago, Peoria & St. Louis	255	125,573	17,048	148,877	20,996	29,877	6,962	69,876	5,295	133,006	15,871	.....	4,500	11,371	13,145
Colorado Midland	337	120,236	18,647	152,452	13,659	37,035	9,998	80,633	6,083	147,408	5,043	776	8,625	—4,358	—11,648
Detroit, Grand Haven & Milwaukee	190	101,246	30,013	155,608	12,594	22,938	5,290	70,245	4,429	115,496	40,112	40	2,727	37,345	19,041
Detroit, Toledo & Ironton	441	103,982	9,132	123,686	23,079	24,894	2,646	67,777	4,819	123,215	471	.....	6,510	—6,039	15,491
Evansville & Terre Haute	310	114,305	46,216	179,352	22,162	36,613	5,532	62,878	6,490	133,675	45,677	844	9,035	35,798	—2,521
Fort Worth & Denver City	454	253,328	102,571	375,066	40,229	48,595	6,366	121,250	14,811	231,251	143,815	515	9,938	133,362	35,724
Grand Trunk Western	336	359,884	110,831	499,550	49,751	74,157	14,524	192,288	12,313	343,033	156,517	—1,898	29,190	125,429	64,372
Gulf & Ship Island	307	128,531	27,707	164,911	35,811	28,415	1,428	50,809	7,312	123,775	41,136	.....	6,254	34,882	—2,834
Louisiana & Arkansas	226	86,933	11,884	102,844	16,769	16,085	2,189	29,888	4,341	69,272	33,572	.....	2,725	30,847	—6,818
Louisiana Ry. & Nav. Co.	350	87,316	14,406	115,981	19,432	12,191	4,763	48,486	5,764	90,636	25,345	.....	4,250	21,095	17,855
Midland Valley	324	85,129	22,455	113,101	17,029	18,403	1,874	32,964	4,924	75,195	37,906	4,808	8,000	34,714	46,760
Minneapolis, St. Paul & S. S. Marie	2,495‡	592,408	163,801	826,776	84,550	124,630	22,342	335,920	20,445	587,887	238,889	—4,108	46,370	188,411	—4,511
Nevada Northern	165	94,527	11,749	109,850	5,639	13,297	278	27,251	4,209	50,675	59,176	.....	3,000	56,176	10,856
New Orleans Great Northern	276§	89,535	25,966	122,406	17,651	14,365	2,686	29,266	5,282	69,250	53,156	—76	1,250	51,830	43,962
New Orleans, Mobile & Chicago	403	109,150	22,841	141,307	18,063	14,289	2,193	45,264	8,503	88,312	52,995	.....	3,543	49,452	21,596
Oregon R.R. & Nav. Co.	1,476‡	700,305	246,988	1,006,471	140,245	111,418	25,750	400,068	31,057	708,538	297,933	4,830	42,190	250,913	—20,070
St. Joseph & Grand Island	319	85,606	27,493	121,333	50,930	17,224	6,372	56,401	5,714	136,641	—15,308	150	5,388	—20,546	—55,229
St. Louis, Brownsville & Mexico	455	80,184	45,111	135,309	34,570	10,114	2,551	50,978	7,398	105,611	29,698	.....	3,500	26,198	1,620
Santa Fe, Prescott & Phoenix	257	82,752	27,901	117,699	16,143	8,897	3,300	29,622	5,142	63,104	54,495	.....	100	54,495	8,562
Southern Indiana	236	94,741	11,096	106,853	12,439	25,759	1,994	38,088	4,886	83,166	23,687	552	6,928	17,311	—5,285
Tennessee Central	292	77,479	21,894	105,881	22,996	12,533	3,468	29,917	7,729	76,643	29,238	.....	4,200	25,038	3,181
Toledo, Peoria & Western	248	64,640	31,322	100,786	12,237	19,040	2,834	37,685	2,969	74,765	26,021	.....	6,000	20,021	20,405
Trinity & Brazos Valley	455	132,126	18,965	155,976	37,895	26,240	5,984	76,886	11,396	158,401	—2,425	.....	3,500	—5,925	—1,328
Virginian	444¶	145,513	13,177	164,457	21,842	22,196	5,640	55,845	7,207	112,730	51,727	190	13,000	38,917	.....
Western Maryland	543°	467,192	47,201	534,940	32,017	60,272	7,082	178,009	11,594	288,974	245,966	.....	18,500	227,466	.....
Wisconsin Central	1,030♁	514,313	70,034	648,115	57,119	95,990	18,970	247,478	15,853	435,410	212,705	551	32,874	180,382	87,701
Yazoo & Mississippi Valley	1,370	536,099	157,681	746,775	121,078	135,776	17,098	265,803	22,876	562,631	184,144	848	34,930	150,062	63,090
EIGHT MONTHS OF FISCAL YEAR 1910.															
Ann Arbor	301	$829,857	$327,543	$1,242,511	$168,501	$156,504	$32,310	$430,461	$35,218	$822,994	$419,517	$29,777	$98,645	$291,095	$56,238
Arizona Eastern	217*	768,431	201,569	1,031,581	300,760	79,366	12,713	229,850	22,577	645,266	386,315	.....	48,022	338,293	—19,145
Atlantic & St. Lawrence	167	680,601	213,457	984,589	241,513	105,673	27,705	330,787	24,840	730,518	254,071	.....	51,485	202,586	22,140
Buffalo & Susquehanna	361	1,334,825	153,107	1,543,562	274,506	451,602	17,169	614,819	62,597	1,420,693	122,869	—234	32,000	90,635	—132,758
Canadian Pacific Lines in Maine	233	452,055	169,982	682,047	162,323	113,789	35,835	302,434	25,353	639,734	42,313	.....	40,000	2,313	14,882
Carolina, Clinchfield & Ohio	225†	585,940	91,861	698,319	87,559	114,328	39,675	164,139	54,939	460,640	237,679	.....	27,500	210,179	217,194
Central New England	278	1,631,069	231,011	1,964,867	333,366	175,498	12,985	589,890	25,771	1,137,510	827,357	.....	57,000	770,357	214,250
Charleston & Western Carolina	340	776,955	218,695	1,051,051	230,997	131,774	24,576	338,570	29,415	755,332	295,719	.....	35,800	259,919	60,628
Chicago, Cincinnati & Louisville	284	773,617	208,436	1,039,771	186,600	179,427	68,537	478,095	47,555	960,214	79,557	.....	27,250	52,307	84,335
Chicago, Peoria & St. Louis	255	974,688	211,710	1,258,625	176,217	244,439	52,539	478,406	41,405	993,006	245,619	.....	33,900	211,719	103,078
Colorado Midland	337	1,161,770	268,433	1,617,490	195,592	268,527	82,290	701,988	45,524	1,293,921	323,569	—3,008	75,460	245,101	—87,322
Detroit, Grand Haven & Milwaukee	190	808,253	388,577	1,375,298	179,357	188,871	46,765	550,113	42,120	1,007,226	368,072	70	21,818	346,324	82,018
Detroit, Toledo & Ironton	441	874,483	109,174	1,063,988	227,401	199,473	23,383	506,035	33,620	989,912	74,076	316	52,082	22,310	—41,923
Evansville & Terre Haute	310	1,079,121	416,977	1,654,947	189,089	248,804	41,022	488,579	52,923	1,020,417	634,530	7,191	71,302	556,037	114,874
Fort Worth & Denver City	454	2,262,339	1,189,618	3,607,594	375,612	451,208	53,370	1,063,294	115,885	2,059,369	1,548,225	—2,308	66,396	1,479,521	346,453
Grand Trunk Western	336	2,586,860	1,259,014	4,096,750	450,863	584,078	164,179	1,500,041	103,104	2,802,268	1,294,482	7,689	233,520	1,053,273	115,704
Gulf & Ship Island	307	1,051,062	286,564	1,425,898	272,469	237,919	10,587	419,162	58,799	998,936	426,962	.....	40,304	386,658	103,516
Louisiana & Arkansas	226	701,836	114,447	848,818	132,964	141,525	13,976	215,679	34,509	538,653	310,165	.....	15,560	294,605	80,093
Louisiana Ry. & Nav. Co.	350	689,519	126,800	911,331	178,418	105,380	38,778	372,277	44,571	739,424	171,907	.....	31,400	140,507	125,461
Midland Valley	324	649,850	219,978	913,871	146,951	174,456	15,274	255,155	38,281	630,117	283,754	4,973	64,000	224,727	205,308
Minneapolis, St. Paul & S. S. Marie	2,495‡	7,428,555	2,424,376	10,395,179	880,115	1,013,838	193,291	2,901,792	178,749	5,167,785	5,227,394	103,513	591,965	4,738,942	1,477,819
Nevada Northern	165	805,834	117,040	954,943	49,163	90,195	2,683	197,051	28,530	367,622	587,321	.....	24,136	563,185	163,546
New Orleans Great Northern	276§	637,301	234,675	922,230	164,717	125,314	17,624	234,859	38,788	581,302	340,928	—641	8,200	332,087	293,506
New Orleans, Mobile & Chicago	403	827,610	223,560	1,127,301	169,522	108,775	17,316	345,675	67,876	709,164	418,137	.....	29,136	389,001	66,583
Oregon R.R. & Nav. Co.	1,476‡	6,453,480	2,941,737	9,972,503	1,070,031	871,442	239,239	3,151,943	261,520	5,594,175	4,378,328	—151	438,325	3,939,852	—96,239
St. Joseph & Grand Island	319	749,133	278,463	1,110,550	274,032	128,467	50,827	439,697	39,330	932,353	178,197	34	44,586	133,577	228,189
St. Louis, Brownsville & Mexico	455	611,002	311,277	983,791	261,508	82,491	20,327	340,941	52,787	758,054	225,737	.....	26,000	199,737	47,594
Santa Fe, Prescott & Phoenix	257	664,959	228,245	950,072	146,217	72,155	22,311	241,164	41,340	523,187	426,885	.....	360	426,525	36,654
Southern Indiana	236	803,337	115,855	931,190	117,670	147,852	17,139	262,385	39,078	584,124	347,066	—284	55,428	291,354	101,674
Tennessee Central	292	671,900	250,002	973,921	141,139	108,621	28,244	307,260	64,155	649,419	324,502	.....	33,597	290,905	79,416
Toledo, Peoria & Western	248	485,098	279,556	805,461	131,253	135,313	18,655	286,321	25,201	596,743	208,718	.....	37,000	171,718	52,727
Trinity & Brazos Valley	455	1,302,506	154,982	1,489,110	283,155	253,398	43,708	673,765	90,125	1,344,151	144,959	.....	28,853	116,106	—31,347
Virginian	444¶	1,048,008	139,390	1,243,695	200,771	216,886	46,972	375,787	58,585	899,001	344,694	3,344	92,667	255,371	.....
Western Maryland	543°	954,508	97,940	1,094,061	67,567	123,508	13,738	367,099	24,343	596,255	497,806	.....	37,000	460,806	.....
Wisconsin Central	1,030♁	4,281,712	1,005,531	5,610,692	710,021	773,734	179,895	1,929,145	131,590	3,724,385	1,886,307	5,697	238,427	1,653,577	256,622
Yazoo & Mississippi Valley	1,370	4,789,462	1,540,320	6,780,904	1,378,460	1,256,425	132,280	2,214,097	189,800	5,171,062	1,609,842	21,294	286,390	1,344,836	238,861

*Consolidation of: Arizona & Colorado R.R.; Gila Valley, Globe & Northern Ry.; Maricopa & Phoenix R.R.; combined mileage operated on February 28, 1909, 186 miles. †Mileage operated on February 28, 1909, 184 miles. ‡Mileage operated on February 28, 1909, 2,395 miles. §Mileage operated on February 28, 1909, 92 miles. ‖Mileage operated on February 28, 1909, 1,327 miles. ¶Began regular operations on July 1, 1909. °Reorganized company; began operations January 1, 1910. ♁Mileage operated on February 28, 1909, 1,130 miles. — Indicates Deficits, Losses and Decreases.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 69, giving a summary of shortages and surpluses by groups from November 25, 1908, to April 13, 1910, says: "The change in conditions since our last bulletin is quite marked, the general suspension of coal shipments in several districts having resulted in an increase of 33,458 in the coal car surplus and the practical elimination of the slight shortage in this class. There was also an increase of 4,693 in box car surplus and a decrease of 5,089 in the shortage of this class. The total surplus is 84,887, an increase of 39,215. The shortage totals 7,530, a decrease of 12,256."

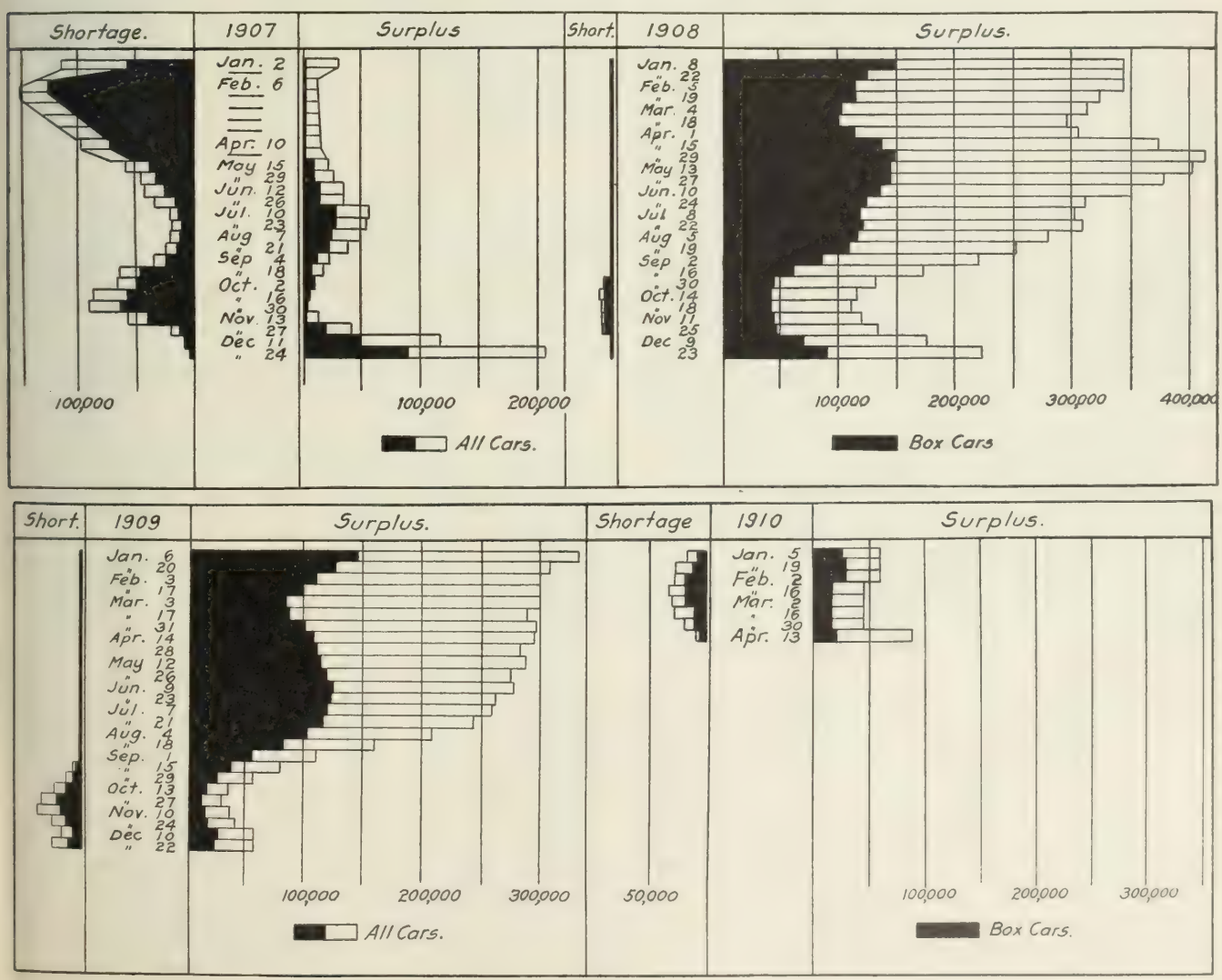
Southwestern Rate Case.

Commissioner Prouty, of the Interstate Commerce Commission, at Kansas City, Mo., on April 20 finished taking testimony in the case brought by the Southwestern Shippers'

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1- April 13 1910	8	365	663	355	278	1,661	.....	104	.....	15	119
" 2— " 13, 1910	21	515	343	7,744	757	9,359	116	1	325	3	472
" 3— " 13, 1910	22	2,064	583	19,309	2,263	24,219	270	315	...	574	1,159
" 4— " 13, 1910	10	1,113	2	240	978	2,433	1,319	329	912	100	2,660
" 5— " 13, 1910	18	1,840	72	1,049	999	3,960	278	370	127	...	775
" 6— " 13, 1910	20	7,689	166	5,780	5,017	18,652	1,055	64	11	241	1,371
" 7— " 13, 1910	2	427	109	527	421	1,484	.....	...	.....	...	.....
" 8— " 13, 1910	12	860	50	2,968	1,288	5,166	103	74	14	7	198
" 9— " 13, 1910	9	578	183	202	643	1,606	.....	...	.....	91	91
" 10— " 13, 1910	18	3,701	1,006	2,536	5,525	12,768	189	39	17	9	254
" 11— " 13, 1910	6	1,375	691	48	1,465	3,579	391	...	.....	40	431
Grand total	146	20,527	3,868	40,858	19,634	84,887	3,721	1,296	1,433	1,080	7,530

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4— West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

Traffic Association for reductions in freight rates from Atlantic seaboard territory via Galveston to points in Kansas, Oklahoma, Texas and Colorado. As has been stated in the *Railway Age Gazette*, the demand of the complainant was that rates should be made to points in the states mentioned which would be no higher than those made to points on the Missouri river. At present the rates to points west of the Missouri river, such as Oklahoma City and Wichita, are based on the Mississippi river combination, but are to some extent affected by the rates via Galveston, the rates to points north of Oklahoma City in Oklahoma and Kansas being in no case higher than those to Oklahoma City. The reductions sought would average about 30 per cent.

The theory of the complainants was that points such as Wichita and Oklahoma City should have rates as low as or lower than those to Kansas City because, as was contended, they were closer to water transportation—that is, were nearer the Gulf of Mexico than Kansas City. It was contended that six miles of transportation by water cost about the same as one mile of transportation by rail, and, figuring on this basis, it was sought to show that the constructive mileage from Galveston to Oklahoma City, for example, was only 900 miles, while the all-rail distance from New York to Kansas City is almost 1,500 miles.

The railways met the complainants on their own ground. S. H. Johnson, assistant freight traffic manager of the Rock Island lines, was their principal witness. It was shown that rates for water and rail hauls are usually divided by the water and rail lines, not on the basis of 6 to 1, but on the basis of 3 to 1, and it was contended that on the basis of constructive mileage Oklahoma City and points similarly situated, which are complaining that their rates are too high, really have more favorable rates than Kansas City has now. To begin with, Kansas City is only 458 miles from Lake Michigan, while Oklahoma City, for example, is 525 miles from the Gulf. Furthermore, a haul from New York to Kansas City via the Erie canal, the Great Lakes and the shortest rail line includes 1,391 miles by water and 458 miles by rail. Reucing this to constructive mileage by dividing the water distance by 3 and adding to it the rail haul makes a constructive mileage of 921 miles. On a lake and rail basis, the rail haul from New York to Lake Erie is 411 miles; thence by water to Chicago, 889 miles, and thence by rail to Kansas City, 458 miles. Reducing the water part of the haul to constructive rail mileage, makes the constructive mileage from New York to Kansas City 1,165 miles. The average rail distance between points in seaboard territory and New York is 306 miles. The ocean haul from New York to Galveston is 2,190 miles. The rail haul from Galveston to Oklahoma City is 525 miles. Reducing the water mileage to constructive rail mileage by dividing by 3, makes the constructive rail mileage from seaboard territory to Oklahoma City via Galveston 1,561 miles, or 396 miles more than the constructive mileage from New York to Kansas City via lake and rail, and 640 miles more than the constructive mileage from New York to Kansas City via canal, lake and rail. The density of the traffic moving from Kansas City to the East is also very much greater than that of the traffic moving from the East to Oklahoma City via Galveston. It was therefore contended that the rates to Oklahoma City and points similarly situated, are now relatively lower rather than relatively higher than those to Kansas City. The present first-class rate from New York to the Missouri river is $1.47 and to Oklahoma City $1.80.

The railways also sought to show that the existing rates from Atlantic seaboard territory via Galveston to Oklahoma City and also the local rates from Galveston to Oklahoma City are lower in proportion than those from St. Louis to Galveston. On the basis of three miles water to one mile rail, the constructive mileage from seaboard territory to Oklahoma City via Galveston, as already stated, is 1,561 miles, and the rail distance from St. Louis to Oklahoma City is 542 miles. The constructive mileage from seaboard territory to Oklahoma City is, therefore, 288 per cent. of the mileage from St. Louis to Oklahoma City. Even on the basis of four miles by water to one mile by rail, the constructive mileage from seaboard territory via Galveston to Oklahoma City is 1,378, or 256 per cent. of the mileage from St. Louis to Oklahoma City. While the mileage from seaboard territory to Oklahoma City is so much greater than that from St. Louis to Oklahoma City, the commodity rates from seaboard territory to Oklahoma City are only 133 per cent. of those from St. Louis, and the class rates only 146 per cent. It was also shown that while there are about 120 commodity rates from St. Louis to Oklahoma City and only about 20 from Galveston to Oklahoma City, the commodity rates from Galveston embrace everything shipped out locally in large quantities by the manufacturers and importers of Galveston.

One of the points relied upon by the shippers was the contention that a reduction in rates from Galveston to points in Oklahoma, Kansas City, etc., could not help but benefit the railways because, as they asserted, there is an empty car movement northward from Galveston. The testimony on behalf of the railways showed, however, that on every railway except one the empty car movement is southward instead of northward, the preponderance of the northward traffic being due to the large amount of lumber shipped north, which exceeds the tonnage of grain hauled south. It was contended by Mr. Johnson (R. I.) that even if the empty car movement were northward the proposed reduction should not be required. He said that whether railways should reduce their rates to secure movement for empty cars should be left to the discretion of their traffic managers. If they could gain anything by doing so they would make the reduction voluntarily. The effect of the proposed reductions might be to cause a heavier movement of traffic northward from Galveston, but this, if it did result, would be due to diversion of traffic to this route, which otherwise would move by more direct routes and would, therefore, tend to cause an empty car movement elsewhere.

Various statements were introduced by the railways to show that they could not afford to make the reductions of rates demanded. One of these was prepared by H. U. Mudge, president of the Rock Island lines, and estimated that the cost of reproducing the Rock Island lines would be $60,000 a mile, and that on this basis the net earnings of the road during the last fiscal year amounted to only about 3 per cent. on the value of its property.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 68, covering car balance and performance for November, 1909, says:

"The surplus during November averaged 1.29 per cent. of the total equipment. There was a further reduction in the shop cars also, the average being 5.75 per cent., the lowest figure since January, 1908. Under these conditions, there was but little variation between the averages for all cars and those for active cars only.

	Average miles per day.		Average ton-miles per car per day.		Average earnings per car per day.	
	Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908 ...	19.6	24.5	258	324	1.83	2.29
May, 1908	19.3	24.8	254	329	1.72	2.22
June, 1908 ...	19.6	24.7	276	347	1.88	2.37
July, 1908 ...	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909.	21.7	25.9	306	365	2.04	2.43
March, 1909...	22.7	27.2	330	393	2.19	2.61
April, 1909 ...	22.4	26.8	310	371	2.13	2.54
May, 1909	22.5	26.8	304	362	2.05	2.45
June, 1909 ...	22.4	26.5	314	371	2.13	2.52
July, 1909	22.0	25.8	309	362	2.09	2.45
August, 1909..	23.2	26.3	340	384	2.29	2.59
September, 1909	24.3	25.9	367	391	2.50	2.67
October, 1909..	25.6	26.4	394	407	2.70	2.79
November, 1909	25.4	25.9	405	413	2.68	2.73

"The cars on their home lines averaged lower than at any time since June, 1907, being 57 per cent., or one point lower than the October, 1907, average. The loaded mileage, however, shows a falling off, the average being 71.2 per cent. as against 73.4 per cent. in October. This result taken in connection with a shifting of the group percentages would appear to indicate the beginning of an empty homeward movement of cars.

"The average miles per car per day held up well; the aver-

CAR BALANCES AND PERFORMANCES IN NOVEMBER, 1909

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	W. Va., Virginia, No. and So. Carolina,	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	73,393	664,702	215,230	168,133	178,737	374,183	16,150	136,323	27,488	116,584	97,916	2,071,165
Average number of systems cars on line	52,926	358,501	115,604	93,070	90,713	256,540	5,795	74,951	11,834	60,910	66,439	1,187,483
Railroad owned cars Av. foreign on line	15,434	271,305	88,107	56,867	61,702	162,908	14,963	66,979	28,728	59,857	29,491	885,441
Total cars on line	98,360	630,006	203,711	149,937	152,115	419,448	20,758	141,930	40,562	120,767	95,930	2,072,924
Excess	22,967	.....	.....	.....	.....	44,905	4,608	4,707	13,071	4,157	.....	1,759
Per cent. cars on line to total owned												
Home	70	54	51	55	51	69	36	55	13	52	68	57
Foreign	60	11	41	34	34	13	93	18	105	52	30	43
All railroads	130	95	95	89	85	112	129	103	118	104	98	100
Private cars on line	3,216	10,971	9,738	2,865	6,761	17,107	2,278	9,734	2,376	8,752	2,881	106,682
Total, all cars on line	101,576	870,977	213,449	152,802	159,176	436,555	23,036	150,767	42,938	129,519	98,811	2,179,606
Per cent. of cars in shop	3.84	6.89	6.89	6.71	8.00	3.90	1.52	9.98	4.76	4.93	6.88	5.75
No. of freight engines owned	1,128	9,962	2,805	3,007	2,593	6,239	446	2,591	753	2,382	2,095	33,951
Av. cars on line per freight engine owned	90	88	76	51	61	70	52	58	56	56	47	64
Total freight car mileage	4,285,172	325,201,118	147,817,812	119,862,913	102,577,596	317,968,495	28,152,884	96,867,655	37,349,816	119,575,781	99,121,032	1,658,150,474
Average miles per car per day	119	257	231	261	253	244	412	224	289	308	334	254
Per cent. loaded mileage	71.3	68.8	73.3	70.4	72.6	72.8	76.4	70.2	69.0	71.9	74.2	71.2
Ton miles of freight, inc. Co. freight	518,220,098	5,777,098,296	2,428,929,303	1,905,560,905	1,767,460,700	5,017,922,372	444,402,192	1,557,657,351	451,275,629	1,798,144,894	1,529,140,305	24,125,212,901
Average ton miles, including Co. freight												
Per car mile	111	167	178	159	148	154	161	150	121	152	154	154
Per loaded car mile	154	244	243	226	187	217	210	215	175	213	208	224
Per car per day	170	130	126	116	373	381	684	337	350	468	516	405
Gross freight earnings	$3,033,926	$54,928,886	$14,024,883	$11,951,388	$12,242,982	$24,902,564	$3,817,351	$12,115,488	$4,371,101	$16,863,207	$9,711,812	$168,196,570
Average daily earnings. Per car owned	$2.62	$2.38	$2.27	$2.37	$2.30	$2.87	$7.88	$3.04	$3.30	$4.81	$3.32	$2.83
Per railroad owned car on line	2.01	2.72	2.39	2.66	2.70	2.53	6.13	2.93	3.59	4.72	3.39	2.85
All cars on line	1.95	2.52	2.28	2.61	2.58	2.41	5.62	2.74	3.39	4.39	3.29	2.68

age of 25.4 was but two-tenths lower than the October figure.

"The average tons per loaded car set a new record of 22.4, one ton higher than the best average heretofore recorded.

"This loading resulted in the establishment of a new record for the ton-miles per car per day, which reached 405 for all cars and 413 for active cars, despite the decrease in miles per car per day and per cent. of loaded mileage.

"The average earnings per car on line is $2.68, which while two cents lower than the October, 1909, figure, is one cent higher than the highest average previously recorded, i.e., that for October, 1907. This decrease under last month when taken in connection with the increased ton-mile per day figure indicates quite clearly that the traffic handled was made up of a larger proportion of the lower rated commodities. This is quite natural in view of the fact that October marks the close of the fall merchandise traffic and November the beginning of the winter business."

Correction should be made to figures included in Bulletin No. 66 for October, 1909, published in the *Railway Age Gazette* of April 15, 1910, page 1008, as follows: Ton-miles per car per day, Iowa, Ill., Wis., Minn., 291, should be 379. Grand total, 379, should be 394; same, excluding surplus cars, 407.

INTERSTATE COMMERCE COMMISSION.

Rate on Agricultural Implements from Chicago to Wsiconsin Points..

International Harvester Co. of America v. Chicago, Milwaukee & St. Paul. Opinion by Commissioner Lane.

Complaint is dismissed because of incompleteness of record. (18 I. C. C., 222.)

Rates on Horse Blankets.

Forest City Freight Bureau v. Ann Arbor Railroad et al. Opinion by Commissioner Clark.

Because of the diversity of goods shipped as horse blankets, no change will be ordered in the classification rating. (18 I. C. C., 205.)

Previous Ruling Reversed.

Marshall & Michel Grain Company v. St. Louis & San Francisco et al. Opinion by Commissioner Clark.

Previous report and order were based upon admission by defendants which, on further investigation, were found to have been inaccurate and incorrect. Previous order rescinded and new order in accord with the facts entered. (18 I. C. C., 228.)

Rates Found Not Unreasonable.

J. H. Wilson Saddlery Co. v. Chicago & Southern et al. Opinion by Commissioner Lane.

Claim for reparation on L.C.L. shipments of harness leather denied. (18 I. C. C., 220.)

Delray Salt Co. v. Detroit, Toledo & Ironton et al. (Original Petition.) Opinion by Commissioner Prouty.

Rate charged on shipments of salt from Detroit, Mich., to Memphis, Tenn., was the correct tariff rate. (18 I. C. C., 245.)

Failure to Post Supplement to Tariff.

Kiel Woodenware Co. v. Chicago, Milwaukee & St. Paul. Opinion by Chairman Knapp.

By supplement to its tariff defendant limited the application of a rate of $2.50 per 1,000 ft. on logs from certain points to Kiel, Wis., to sawed logs 10 ft. or more in length, the rate having previously had no limitation in that respect, and by reason of failure to post said supplement as required by the act, complainant was not advised of the change in rate and on certain shipments of logs made by it the rate was corrected to 4 cents per 100 lbs. It is admitted that had complainant been informed of the change in rate, it could and would have sawed the logs in length to which the $2.50

rate was applicable. The commission may award reparation in the amount of the difference between the rate exacted from complainant and the rate under which the traffic would have been forwarded had defendant not failed to post its tariff. (18 I. C. C., 242.)

Failure to State Conditions of Low Rate.

Southern Cotton Oil Co. v. Louisville & Nashville et al. Opinion by Commissioner Harlan.

The initial carrier having quoted a published rate on cotton linters, issued bills of lading showing that rate, but neglected to advise the complainant that it was applicable only on shipments moving under a released valuation, and charges were consequently collected at a higher rate. Under these circumstances the defendants had reasonable notice of the shipper's desire to have the benefit of the lower rate, and it was the duty of the defendants to have secured the shipper's signature to the released-valuation clause. Reparation awarded.

Cotton Goods Rates Unreasonable.

Louis Rosenblatt and Moses Rosenblatt, doing business under the firm name and style of H. Rosenblatt & Sons, v. Chicago & North Western et al. Opinion by Commissioner Harlan.

Through rates exacted on shipments of cotton drills, cotton-duck cloth, and overalls and jackets, from Wheeling, W. Va.; Cincinnati, Ohio, and Michigan City, Ind., to Beloit, Wis., exceeded the combinations on Chicago and are found unreasonable. Reparation awarded.

A shipment from Fort Wayne to Beloit described in the complaint and shipping papers as cotton piece goods, consisted of "triplex cloth," which is composed of cotton cloth and cotton shoddy, held together with a composition of rubber. The cotton-piece-goods rate was not legally applicable thereon, and until the complainant pays the lawfully published rate, the commission will express no conclusion as to the reasonableness of the rate or charges. (18 I. C. C., 261.)

Reparation Awarded.

William K. Noble v. Pittsburgh, Shreveport & Pacific et al. Opinion by Commissioner Clark.

Carload rate on coiled elm hoops from Tallulah, La., to Lime City, Tex., found unreasonable. (18 I. C. C., 224.)

G. W. Ryan v. Great Northern et al. Opinion by Commissioner Cockrell.

Through class rate in excess of combination of locals found unreasonable. (18 I. C. C., 226.)

Southern Timber & Land Co. v. Southern Pacific et al. Opinion by Commissioner Prouty.

Rate on hub blocks from Will's Point, Tex., to Stockton, Cal., found unreasonable. (18 I. C. C., 232.)

Glavin Grain Co. v. Chicago & North Western et al. Opinion by Chairman Knapp.

Carload rate on corn from Glidden, Iowa, to Chetek, Wis., found unreasonable. (18 I. C. C., 241.)

Platten Produce Co. v. Kalamazoo, Lake Shore & Chicago et al. Opinion by Commissioner Prouty.

Reparation awarded because of erroneous routing of shipments of grapes. (18 I. C. C., 249.)

Royal Metal Manufacturing Co. v. Chicago Great Western. Opinion by Chairman Knapp.

The evidence shows that complainant was overcharged and defendant should make reparation without an order. (18 I. C. C., 255.)

William Rotsted Co. v. Chicago & North Western. Opinion by Chairman Knapp.

Charges on mixed shipments of oats and flaxseed screenings in bulk found unreasonable. (18 I. C. C., 257.)

Delray Salt Co. v. Pennsylvania Railroad et al. Opinion by Commissioner Clements.

Present rate on rock salt from Cuylerville, N. Y., to Detroit, Mich., found unreasonable and lower rate prescribed. (18 I. C. C., 259.)

Alexander Sprunt & Son v. Seaboard Air Line. Opinion by Commissioner Harlan.

Finding that many of its through rates on cotton to Wilmington, N. C., exceeded the sum of its local rates on Columbia, S. C., the defendant made a general readjustment involving substantial increases, among other points, from North and Olar, S. C. Within six weeks the former rate from each point, which had been in effect for eight years or longer, was restored and subsequently remained in effect for nearly a year. Complainants having shipped cotton during the interval are awarded reparation on the basis of the restored rates. (18 I. C. C., 251.)

STATE COMMISSIONS.

The Railway Commission of Indiana is going to publish a monthly bulletin giving information about changes in rates affecting points in Indiana. The railways have been requested to include with new tariffs data concerning increases or decreases in which shippers in Indiana will be interested, and the monthly bulletin will be compiled from this information.

The Railroad Commission of Indiana has issued a circular on tender derailments. A circular on the subject was issued September 1, 1909, seeking to ascertain the causes of such accidents, but the information elicited was not satisfactory and another general investigation will be made. For a period of six months commencing May 1 the carriers are required to report every case of a tank derailment on main track, answering fully and definitely the questions propounded in a form furnished by the commission.

The New York State Public Service Commission, Second district, has issued an order requiring the International Railway, running electric cars between Buffalo and Lancaster, about ten miles, to refuse to carry short-distance passengers on these cars in the city of Buffalo, complaints having been made that these cars are crowded and are delayed seriously by stopping to take and leave passengers within the city of Buffalo. The order specifies the territorial limits within which the rule must be applied and the method to be adopted in giving it the necessary publicity.

The Railroad Commission of Indiana has issued a circular to all steam railways advising them that the condition of cars and engines in many of the yards "is practically as bad as it was three years ago." The commission therefore has directed its inspectors to make affidavits in all cases of penalty defects. If these affect state traffic the commission will commence suits for penalties in state courts; if the movement is interstate, the affidavit will be sent to the secretary of the Interstate Commerce Commission.

One of the large companies writes the commission as follows: "In common with other roads we have had no little trouble with the derailment of locomotive tenders, which was principally due to short wheel base and necessarily rigid construction of these tenders. We have increased the length and reduced the height of tenders, keeping the center of gravity as low as possible. They have been increased in length from 22 ft. to 28 ft., with wheel base of 24 ft. Reservoirs are fitted with longitudinal and lateral sheets to prevent oscillation of water. We have not entirely eliminated tender derailments but the long tenders have given no trouble in this respect."

COURT NEWS.

The New York State Court of Appeals, reversing the judgment of the Appellate Division of the Supreme Court, has sustained the constitutionality of the law of the state limiting to eight hours a day the working time of railway telegraphers. The decision was in a suit brought to recover a fine of $100 against the Erie Railroad.

The United States Circuit Court of Appeals at St. Louis has rendered a decision allowing the Updike Grain Company, the Nebraska-Iowa Grain Company and the Crowell Lumber & Grain Company of Nebraska damages in the sums of $6,310, $1,613 and $314, respectively, against the Union Pacific. These concerns allege that the Union Pacific discriminated against them by allowing the Peavey Grain Company three-quarters of a cent a bushel for elevating all grain consigned to it at

Omaha, Neb., when the grain was unloaded within 48 hours, while denying the same allowance to the complaining companies. The decision of the court of appeals upheld the decision of the lower court, but reduced the judgments. If the judgments allowed by it are not satisfactory to the litigants the cases are ordered remanded for a new trial.

Rejection of Tariff by Interstate Commission Does Not Make Rate It Contains Illegal.

Judge Morris L. Ritchie, of the Third Judicial District Court of Utah, has rendered a decision in the case of the Oregon Short Line versus the Consolidated Wagon & Machine Co., in which he makes the interesting and important ruling that the fact that a schedule of rates filed by a railway with the Interstate Commerce Commission is returned by the commission because, in the commission's opinion, it is defective, does not make the rates the schedule contains illegal and of no effect. Judge Ritchie holds that when it appears "that the schedule in question is actually received by the commission and ought to have been filed and was improperly rejected by it, it was in legal effect filed. * * * The receipt of a lawful schedule imposed upon the commission the duty of filing and that, in the eye of the law, that constituted a filing, is amply supported by the authorities."

The decision directly conflicts with the view seemingly taken by the commission that when, for any reason, it rejects a tariff this prevents the rates in the tariff from becoming effective. The facts in the case were as follows:

Certain shipments of hay were forwarded from Spencer, Idaho, to Yellowstone, Mont., the terminus of the Oregon Short Line's Yellowstone Park branch. The road's distance tariff applied on the portion of the line from Spencer to Warm River. Beyond Warm River the branch line was in the hands of the construction department. The only tariff carrying rates on that portion of the line had been rejected by the Interstate Commission because it carried on the title page the notation, "Shipments to be accepted only at convenience of construction department." The agent at Spencer quoted to the shipper a rate of 14 cents, which was arrived at by applying the distance tariff through from Spencer to Yellowstone. There was no authority for this, as the tariff filed with the Interstate Commission fixed a rate of 19 cents, which was the distance tariff rate from Spencer to Warm River plus the construction department's rate from Warm River to Yellowstone. The shipper paid only the 14-cent rate and the road sued it for $152.78, being the difference between freight charges under the 14 and the 19-cent rates.

It was sought by the defendant to show the 19-cent rate was illegal by a deposition of Secretary Moseley, of the commission, stating that the tariff was rejected because it was in violation of the commission's special circular No. 6. The road, while admitting that the commission may regulate the *form* in which schedules are to be prepared, denied that such regulations can go further, and contended that so long as the rate itself is free from ambiguity and uncertainty and its application is affirmative and definite the commission has no power to make other requirements concerning it in any other respect. The court held that the powers of the commission and its officers and employees are to be construed just as strictly as are the rights and powers of the shipper or the public. The commission cannot enlarge or expand the provisions of the law to include powers thought desirable by it. The only uncertainty in the tariff was not as to what the rate was, but as to whether the construction department could accept freight from shippers. As the law did not give the commission power to reject tariffs for any such reason the court reached the conclusion "that it was beyond the power of the commission to reject the schedule for the sole reason that it contained the clause stated."

As is well known, the commission has made very strict and detailed regulations as to the way in which tariffs shall be printed and filed and has rejected many because, in various particulars, they did not meet with its requirements. Its course in this respect has been the subject of much criticism and complaint. The decision is important, as being the first, it is believed, in which this part of its power has been passed on, and it is not improbable the case will be appealed.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Sir William C. Van Horne, chairman of the board of the Canadian Pacific, at Montreal, Que., has resigned.

J. A. Hanley has been elected vice-president in charge of traffic of the Rock Island Southern, with office at Chicago.

Ogden Mills has been elected president of the Virginia & Truckee, with office at New York, succeeding D. O. Mills, deceased.

C. B. Heiserman, solicitor of the Sixth district of the Pennsylvania Lines West at Urbana, Ohio, has been appointed general solicitor, with office at Pittsburgh, Pa.

C. E. Benton has been appointed general attorney of the Missouri Pacific-Iron Mountain system, with office at Ft. Scott, Kan., succeeding J. H. Richards, resigned.

W. P. Wissmann has been appointed auditor of the Wisconsin & Michigan and the Lake Michigan Car Ferry Transportation Company, with office at Chicago, succeeding F. B. Huntington, resigned.

J. B. Sheean, general attorney of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul, Minn., has been appointed general solicitor, with office at St. Paul, succeeding to the duties of Thomas Wilson, general counsel, deceased.

Gabriel Morton has been appointed secretary and assistant to the president of the Kanawha & Michigan, with office at Charleston, W. Va. W. J. Bienemann has been appointed auditor; E. N. Bennett has been appointed treasurer, and Norton Monsarrat has been appointed general attorney.

George K. Lowell has resigned as vice-president and general manager of the Ann Arbor Railroad and the Manistique & Lake Superior, with office at Detroit, Mich., to devote all of his time to the receivership of the Detroit, Toledo & Ironton. W. D. Holliday has been appointed assistant to the president of the Ann Arbor, in charge of all traffic. Joseph Goldbaum has been appointed auditor, with office at Detroit, and John T. Walsh has been appointed cashier.

The Alaska Northern having taken over the property of the Alaska Central, O. G. Larabee, receiver of the latter road, has been elected president, with office at Spokane, Wash., succeeding R. D. Miller. J. C. Williams has been elected vice-president and traffic manager. J. A. Haight, secretary and treasurer, has been elected secretary, with office at Seattle, Wash. F. G. Jennett has been elected treasurer and A. H. Wheatley has been elected assistant treasurer. See item under Railway Financial News.

Marshall M. Kirkman, vice-president in charge of accounts of the Chicago & North Western at Chicago, having resigned, Lewis A. Robinson, comptroller of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul, Minn., has been appointed comptroller, with office at Chicago, and will assume the duties heretofore performed by Mr. Kirkman. Charles D. Brandriff has been appointed general auditor, reporting to the comptroller. Joseph B. Redfield, auditor, assistant secretary and assistant treasurer, having been assigned to other duties, Charles L. Lowe has been elected assistant secretary and assistant treasurer, with office at Chicago. Arthur B. Jones has been appointed local treasurer, and Harry L. Armstrong, assistant local treasurer, both with office at Chicago.

Operating Officers.

Paul Shoup has been appointed assistant general manager of the Southern Pacific electric lines, with office at San Francisco, Cal.

S. W. Parham, auditor of the Columbia, Newberry & Laurens, at Columbia, S. C., has been appointed also car accountant, succeeding F. J. Parham, resigned to go into other business.

W. M. Netherland, general storekeeper of the Southern Rail-

way at Washington, D. C., has been appointed assistant to general manager, with office at Washington, succeeding L. C. Ullrich, resigned.

W. J. Robertson, car accountant of the New York, Chicago & St. Louis, at Cleveland, Ohio, has been appointed superintendent of car service, and the position of car accountant has been abolished.

W. G. Howell has been appointed trainmaster of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Riverside, Ohio, succeeding J. V. Kennedy, appointed superintendent of terminals at Cincinnati, Ohio.

W. J. Sullivan has been appointed chief train despatcher and division operator of the Birmingham sub-division of the St. Louis & San Francisco, with office at Birmingham, Ala., succeeding A. B. Woodward, resigned.

O. S. Keith, superintendent of transportation of the Illinois Central and the Indianapolis Southern at Chicago, having resigned, John M. Daly, car accountant, will assume the duties of both positions with the title of general superintendent of transportation.

A. T. Hollenbeck, whose appointment as superintendent of telegraph of the Chicago Great Western, with office at Chicago, has been announced in these columns, was born October 12, 1867, at Fairmount, Ill. He attended the common schools until 1882, and began railway work with the Chicago, St. Paul & Kansas City, now part of the Chicago Great Western, in February, 1890, as operator; he was then consecutively cashier, wire chief and manager up to 1893. Previous to 1890 he was for some time an operator for the North American Telegraph Company. In 1893 he was made chief clerk in the telegraph department, which position he held until his recent promotion.



A. T. Hollenbeck.

O. Meadows has been appointed trainmaster of the First and Second districts on the Eastern division of the Western Pacific, with office at Winnemucca, Nev. The jurisdiction of F. L. Corwin, trainmaster at Elko, Nev., will hereafter include only the Third and Fourth districts of this division. S. J. Stewart has been appointed chief despatcher, with office at Elko, succeeding J. L. Perry, assigned to other duties.

Following the organization of the Northwest system of the Baltimore & Ohio, in charge of F. C. Batchelder as general superintendent of the lines west of Chicago Junction, Ohio, including the Baltimore & Ohio Chicago Terminal, T. W. Barrett, trainmaster at Garrett, Ind., has been appointed superintendent of the Chicago division, and J. M. Trimble, assistant trainmaster at Garrett, succeeds Mr. Barrett. The headquarters of the operating officers of the Chicago division have been transferred from Chicago to Garrett.

H. J. Merrick, superintendent of freight transportation of the Lake Shore & Michigan Southern, the Chicago, Indiana & Southern, the Lake Erie & Western and the Lake Erie, Alliance & Wheeling at Cleveland, Ohio, has been appointed general superintendent of freight transportation of all the New York Central Lines west of Buffalo. O. C. Smith, car accountant of the Lake Shore & Michigan Southern and the Lake Erie & Western at Cleveland, has been appointed superintendent of car service of the four roads mentioned above, with office at Cleveland. G. A. Codling, inspector of freight service of the Lake Shore and the Lake Erie & Western at Cleveland, has been appointed car accountant of the four roads mentioned, with office at Cleveland.

F. W. Egan, superintendent of the Western division of the Grand Trunk at Detroit, Mich., having been granted leave of absence, the following appointments have been made: J. Ehrke, assistant superintendent at Battle Creek, has been appointed acting superintendent, with office at Detroit; F. G. Bement, trainmaster at Durand, Mich., has been appointed trainmaster of the Twenty-fifth district, main line, and the Twenty-sixth district, with office at Battle Creek, and all reports previously made to the assistant superintendent will in future be made to the trainmaster. O. F. Clark, trainmaster at Pontiac, has been appointed trainmaster of the Twenty-fifth district (C., S. & M.), the Twenty-seventh, Twenty-eighth, Twenty-ninth districts, and the Pontiac, Oxford & Northern, with office at Durand.

Traffic Officers.

H. J. Hansen has been appointed a soliciting freight agent of the Mobile & Ohio, with office in Chicago.

Thomas F. Butler has been appointed general freight agent of the Ann Arbor Railroad, with office at Detroit, Mich., succeeding H. C. Bell.

J. W. Jones has been appointed a commercial agent of the Central of Georgia, with office at Memphis, Tenn., succeeding W. C. Kilgore, transferred.

James F. Taylor has been appointed a commercial agent of the Chicago, Milwaukee & St. Paul, in charge of business in Florida, with office at Tampa, Fla.

A. J. Dutcher, a traveling freight agent of the Harriman Lines, has been appointed general agent, with office at Atlanta, Ga., succeeding J. F. Van Rensselaer.

Guy C. Knickerbocker, passenger and freight agent of the Wabash at Lafayette, Ind., has been appointed traveling freight agent, with office at Toledo, Ohio.

J. F. Youse, general agent of the Hocking Valley at Toledo, Ohio, has been appointed general freight and passenger agent of the Kanawha & Michigan, with office at Charleston, W. Va.

F. A. Curry, commercial agent of the Lake Erie & Western at Buffalo, N. Y., has been appointed an industrial agent of the New York Central lines east of Buffalo, with office at New York.

S. MacClurkan, traveling freight agent of the St. Joseph & Grand Island at Chicago, has been appointed general agent, with office at Chicago, succeeding W. I. Laird, resigned to accept service elsewhere.

Edward Siegwald, traveling freight agent of the Norfolk & Western at Columbus, Ohio, has been appointed general freight and passenger agent of the Marietta, Columbus & Cleveland, with office at Marietta, Ohio.

A. F. Sullivan has been appointed a traveling freight agent of the Toledo, St. Louis & Western, the Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, with office at Minneapolis, Minn., succeeding O. L. Hill, resigned.

William Rieger has been appointed a traveling freight agent of the Toledo, St. Louis & Western, the Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, with office at New York, N. Y., succeeding G. Howard Hart, resigned.

Engineering and Rolling Stock Officers.

R. B. Darby, assistant engineer of motive power of the Lake Shore & Michigan Southern, at Cleveland, Ohio, has resigned, to go to the Pilliod Company, New York.

Charles Coleman, master mechanic of the Chicago & North Western at Eagle Grove, Iowa, has been appointed master mechanic, with office at Winona, Minn.

J. G. Hartley has been appointed supervisor on Division No. 6 of the Pennsylvania Railroad, with office at Williamsport, Pa., succeeding G. H. B. English, promoted.

R. D. Stewart has been appointed general superintendent and chief engineer of the Laramie, Hahns Peak & Pacific, with office at Laramie, Wyo., succeeding J. J. Argo, appointed locating engineer.

Morris K. Trumbull, engineer of track elevation for the city of Chicago, has been appointed principal assistant engi-

neer of the Chicago & Western Indiana and the Belt Railway Company of Chicago, with office at Chicago.

L. G. Curtis, division engineer maintenance of way of the Chicago division of the Baltimore & Ohio at Chicago, has been appointed engineer maintenance of way of the recently organized Northwest system. E. D. Jackson, assistant engineer at Baltimore, Md., succeeds Mr. Curtis. (See item under Operating Officers.)

Lewis B. Rhodes, whose appointment as superintendent of motive power of the Virginian Railway, with office at Norfolk, Va., has been announced in these columns, was born in 1864 at Macon, Ga. Mr. Rhodes received his education in the high schools at Macon and began railway work in the latter part of 1880 on the Central of Georgia. He was later a machinist, and was then appointed foreman on the same road. In 1889 he left that company to go to the Georgia, Southern & Florida, since which time he has been consecutively to 1900 locomotive engineer, shop foreman, general foreman and foreman of locomotive repairs. He was appointed master mechanic on the same road in 1900, which position he held at the time of his recent appointment as superintendent of motive power of the Virginian Railway.



Lewis B. Rhodes.

John B. Carothers, whose appointment as chief engineer maintenance of way of the Baltimore & Ohio Southwestern, with office at Cincinnati, Ohio, has been announced in these columns, was born February 26, 1863, at Cutler, Washington county, Indiana. He was educated at a normal university, and began railway work in 1888 as a rodman in a surveying party. From 1889 to 1891 he was with the Seattle, Lake Shore & Eastern and its successor, the Northern Pacific as a transitman. He was then for four years out of railway service, and in June, 1895, became an assistant engineer on the Baltimore & Ohio Southwestern at Cincinnati; a year later he was made division engineer on the Springfield division at Flora, Ill., where he remained until April, 1902, except for a year, when he was out of service on leave of absence. He was later division engineer on the Ohio division and also on the Indiana division. In February, 1904, he was made superintendent of the Ohio division at Chillicothe, Ohio, where he remained until November, 1905, when he was made superintendent of the Illinois division, with office at Washington, Ind., from which position he has just been promoted.



J. B. Carothers.

Purchasing Officers.

J. F. Holzemer has been appointed purchasing agent of the Kanawha & Michigan, with office at Columbus, Ohio.

Railway Construction.

New Incorporations, Surveys, Etc.

Anadarko & Western.—Incorporated in Oklahoma with $50,000 capital, to build a 50-mile line through Caddo county, Okla., at a cost of about $1,000,000. The proposed route is from Alden, northwest via Anadarko to the Caddo-Grady county line, about 30 miles. The incorporators include: C. H. Deford, G. D. Driskell and W. F. McCracken, all of Anadarko.

Asherton & Gulf.—This company, operating a 32-mile line from Asherton, Tex., to Asherton junction, is to be extended, it is said. The plans call for a line from Asherton, Dimmit county, west to Eagle Pass.

Atchison, Topeka & Santa Fe.—The directors have approved plans calling for an expenditure of $31,000,000 during 1910 for improvements and new equipment. Of this $12,000,000 is to complete work already authorized and under way, and $19,000,000 is for new work. For double-tracking 123 miles west of Albuquerque, N. Mex., as a part of the double-track plan from Chicago to the Pacific coast, $4,000,000 will be spent, $2,000,000 for grade revision work between Galveston, Tex., and Coleman, and $2,000,000 for a new double-track bridge over the Missouri river, south of Kansas City, Mo.

Baltimore & Ohio Chicago Terminal.—According to press reports about $5,000,000 will be spent for improvements on this line, including elevating the tracks, building extensions, etc.

Bangor & Aroostook.—Work has been resumed on the extensions of this company's line in Aroostook county, Me.

Bartlett-Florence.—An officer is quoted as saying that financial arrangements have been made to build extensions as follows: From Florence, Tex., on the western end, northwest to Lampasas, about 25 miles, and another from Bartlett, southeast to a point near Houston, about 160 miles. (Dec. 17, p. 1212.)

Bellingham Eastern Logging & Railway Co.—This company has been incorporated in the state of Washington, with $10,000 capital and office at Bellingham, Wash. D. J. Cain, F. W. Bonness, Jr., and T. R. Walters are interested.

Canadian Northern.—A contract for constructing the first section of 20 miles from Victoria, B. C., west towards Barclay sound, it is said, will be let within the next six weeks, and work is to be started in the near future on the Canadian Northern town site at Port Mann, on Vancouver island. It is expected that construction work will be started on the mainland from New Westminster about June 1. (April 1, p. 917.)

Canadian Roads.—Application will be made to the Alberta legislature for a charter by J. Revillon, Edmonton, Alb., representing Revillon Brothers, Paris bankers, to build a line from Edmonton northwest via Sturgeon Lake to Grande prairie, on Peace river, 250 miles. The guarantee to be asked for by the company will not be as high as that given to the Alberta & Great Waterways.

Chicago & Alton.—An officer is quoted as saying that double-tracking and grade reduction work is now under way between Bloomington, Ill., and Atlanta, 20 miles, as well as between Iles and Nilwood, 26 miles. With the completion of this work, which is to cost $900,000, the company will have a double-track line from Chicago to Nilwood, 210 miles. Between Nilwood and St. Louis, Mo., there are several stretches of double-track, bringing the total up to 232 miles. The shop capacity is being enlarged at various places. Track revision work is now under way in Chicago and at Joliet. Subways are being built at Springfield, Bloomington, Normal and Jacksonville. New passenger stations are being put up at Lincoln and at Bloomington, and at Peoria a large new terminal is being built by a subsidiary company. At East St. Louis the Chicago & Alton's freight and engine terminal has been consolidated with the Toledo, St. Louis & Western. About 6,000 tons of rail will be used for double-tracking work and 9,000 tons for renewals. The Toledo, St. Louis & Western has just

finished work reducing the grade to 35 ft. to the mile at East St. Louis, going east to the Mississippi valley bottoms.

Chicago, Burlington & Quincy.—Under the name of the Paducah & Illinois it is planned to build a bridge across the Ohio river at Metropolis, Ill., and extend the line to Paducah, Ky., 12 miles up the river. Application has been made to the War Department for authority to bridge the stream.

Chicago, Rock Island & Pacific.—According to press reports, surveys are being made for a line from Mangum, Okla., south to Quanah, Tex., 45 miles.

Chicago Subways.—George W. Adams, incorporated, has submitted a plan for building a system of subways in Chicago at a cost of $75,000,000. The question will be taken under consideration by the city council before June 1.

Cincinnati, Portsmouth, Pomeroy & Pittsburgh Electric.—An officer writes that plans and specifications will be ready in about 90 days. The company was organized to build an electric line from Cincinnati, Ohio, northeast to Pittsburgh, Pa. C. P. Sanborn, chief engineer, Huntington, W. Va.

Coeur d'Alene & Pend d'Oreille.—See Spokane International.

Detroit, Lansing & Grand Rapids (Electric).—An officer writes that surveys are being made and franchises have been granted for a line from Detroit, Mich., northwest to Grand Rapids, about 150 miles. It is probable that two lines will be built on the section between Eagle township and Lowell. Oliver H. Laa, president, and F. A. Bean, chief engineer, 706 Union Trust building, Detroit. (April 22, p. 1070.)

Elgin, Joliet & Eastern.—An officer writes that second-track will be laid from Frankfort, Ill., east to Matteson, 7.5 miles, at a cost of $90,000. The grading contract has been let to John Marsch, Chicago. Short sections of second-track will also be laid at Hartsdale, Ind., and at Dyer, at a total cost of about $12.000. A grading contract for second-track work has been let to A. F. Hartigan & Co., Gary, Ind., on a section of 5.5 miles from Griffith, north to Ivanhoe Sand Pit, to cost $83,000. The company is also planning to put up a 15-stall reinforced concrete engine house at Waukegan, Ill., a new 80-ft. turntable, coal chute, penstock, cinder pit, sand towers and a sand storage bin, to cost $93,000, and is figuring on building a 17-stall reinforced concrete roundhouse at East Joliet, as well as a large cinder pit, to be served by a gantry crane, coal chutes, sand towers, sand storage bin, roundhouse, foreman's office with necessary track changes, to cost $164,000. Plans are under way to enlarge the yards at East Joliet, at a cost of $282,000. A six-stall reinforced concrete engine house is to be built at the mill yard of the Illinois Steel Co., Joliet works, together with a cinder pit, at an estimated cost of $25,000. Bids will be asked for the reinforced concrete engine houses within the next two or three weeks. The masonry for maintenance of way renewals and second-track work will be carried out by the Newkirk & Powers Construction Co., Joliet. The railway company will do the track laying. (April 22, p. 1064.)

Evansville, Mt. Carmel & Northern.—Work is under way on the grading for the new single-track line from Mt. Carmel, Ill., to Evansville, Ind. Connection will be made with the Cairo division of the Cleveland, Cincinnati, Chicago & St. Louis at Mt. Carmel and with the Louisville & Nashville at Evansville. The excavation on the line includes 1,400,000 cu. yds. of earth, 125,000 cu. yds. of loose rock and 125,000 cu. yds. of solid rock, including about 250,000 cu. yds. of borrow to make necessary fills. About 1,150,000 cu. yds. of this work will be handled by steam shovels and the rest by teams. Concrete for abutments and piers will amount to about 20,000 cu. yds. The largest bridge on the line is over the Wabash river. It will have six 150-ft. fixed spans and a hand-operated swing span 235 ft. long, providing two 100-ft. clear channels. There will be 1,100 ft. of wooden pile trestle at each end of this bridge and three other trestles of 1,000 ft. each on the line. The Walsh Construction Co., Davenport, Iowa, has the general contract, which calls for the completion of the first section of the work from Mt. Carmel across the Wabash river by August 1, 1910, and the remainder by December 23, 1910. W. C. Johnson, division engineer, Evansville, Ind., is in charge of construction. (April 1, 1910.)

Everett & Tacoma.—This company has given a mortgage to secure an issue of $5,000,000 of bonds. The funds are to be used for building an interurban line from Everett, Wash., south to Tacoma, about 65 miles. The company was incorporated about a year ago in the state of Washington with $2,500,000 capital by G. M. Cochran, E. Colburn, E. Wright and O. E. Grossman, all of Snohomish.

Grand Trunk Pacific.—Funds are to be secured by the Grand Trunk Pacific Branch Lines Co. to carry out work on the following lines: Regina, Sask., southwesterly to the United States boundary, 155 miles; Regina west via Moose Jaw to various places, 110 miles; Bigger, Sask., in a southwesterly direction, 50 miles; Prince Albert branch, 110 miles, and on the Cut Knife branch, 50 miles, a total of 475 miles. These branch lines will be operated by the Grand Trunk Pacific and will form feeders for the main line of that company.

Great Northern.—J. W. Stewart & Co., who were recently given a contract by the Vancouver, Victoria & Eastern for work between Princeton, B. C., and Abbottsford, have sublet a 21-mile section between Abbottsford and Chilliwack to the Martin Welch Co. Sub-contracts for the section from Chilliwack to Hope will be let soon. East of Hope mountain work is now under way on an 18-mile section between Princeton and Otter flat. (Jan. 21, p. 164.)

Lake Arthur, Jennings & Northern.—This company, which was organized last year in Louisiana, is said to have financial arrangements made to start work on a line from Jennings, La., north to Alexandria. B. B. Bliss, secretary; E. P. Fox, general manager; Jennings.

Lake Erie & Pittsburgh.—An officer writes that this new line will probably be opened for business about June 1 from Mill Creek junction, near Cleveland, Ohio, southeast to the Cleveland & Pittsburgh connection near Ravenna, 27 miles. (Dec. 17, p. 1213.)

Minneapolis, St. Paul & Sault Ste. Marie.—According to press reports, grading work has been started on the first section of the cut-off from New Richmond, Wis., to the St. Croix river. The work includes putting up a steel bridge over the St. Croix river and continuing the extension west to Withrow, Minn., in all 17 miles. Contracts are said to be let to Foley, Welch & Stewart, St. Paul, Minn. (March 18, p. 750.)

A contract is said to have been given to Fred A. Baxter, Superior, Wis., for grading the ore line and the yards between Mayline, south of Superior, and the dock site on St. Louis bay. The contract is valued at $50,000.

An officer writes that a contract has been given to Foley, Welch & Stewart, St. Paul, Minn., for building a branch from Medford, N. Dak., west to Drake, about 135 miles.

New York, Westchester & Boston.—See Westchester Northern.

Oregon Trunk Line.—In addition to the work for which bids were asked April 18 contracts will be let soon, it is said, for building 40 miles to carry the line south to the north end of Klamath lake. (Jan. 28, p. 209.)

Paducah & Illinois.—See Chicago, Burlington & Quincy.

Palacios, San Antonio & Pecos Valley.—An officer writes that the company was organized to build from Palacios, in Matagorda county, Tex., northwest via San Antonio, in Bexar county, to Pecos, in Reeves county, about 480 miles. The preliminary survey is expected to be finished this summer. No contracts have yet been let. There will be a roundhouse, some shops and terminal buildings. J. P. Pierce, president; H. W. Dean, secretary and manager, Palacios.

Philadelphia, Bethlehem & New England.—Incorporated in Pennsylvania, with $250,000 capital, to build a 25-mile line from Nazareth, Pa., northwest to Durham Furnace. Charles M. Schwab is said to be the principal promoter.

Rome & Northern.—Contracts will probably be let in May to build the extension of this road from Gore, Ga., northeast to Tunnel hill, 33 miles. H. M. Smith, chief engineer, Rome. (March 25, p. 850.)

St. Louis Southwestern.—According to press reports, this company has bought the property and rights of the Stephenville North & South Texas, operating a 43-mile line from Hamilton, Tex., north to Stephenville. An amendment to the charter of the S. N. & S. T. is said to have been filed, providing for the constructing of 93 miles as follows: From Hamilton, Tex., southeast to Gatesville, 32 miles; from Hamilton, northwest to Comanche, 35 miles, and from Stephenville, northwest to Thurber, 26 miles.

Scio-Lacomb & Jordan Valley.—Incorporated in Oregon, with $50,000 capital and office at Scio, Ore. The plans call for a line from Munkers, in Linn county, east to Scio, thence to the Jordan valley. The incorporators include: A. G. Prill, E. C. Peery and C. Wesley.

Spokane International.—An officer writes that the Coeur d'Alene & Pend d'Oreille has been incorporated to build from the Spokane International at a point 25 miles east of Spokane, Wash., southeasterly to Coeur d'Alene City, Idaho. The work is to be started this coming summer. Maximum grades will be 1.4 per cent. and maximum curvature 10 degs. It has not been determined whether contracts will be let or the work carried out by the railway company with its own men. D. C. Corbin, president, and E. G. Taber, chief engineer, Spokane. (April 22, p. 1066.)

Stephenville North & South Texas.—See St. Louis Southwestern.

Temple & Northwestern.—Contracts are said to have been given to C. M. McConnico and to J. S. Moore, both of Lufkin, Tex., for grading work from Temple northwest to Hamilton, about 65 miles. The work is to be started at once. W. J. McDaniel, president; W. E. Dozier, engineer, Temple. (March 18, p. 751.)

Texas Central.—Work is now under way by Bucy & Burkhead on a section of about seven miles east of Rising Star, Tex. This is on the extension being built from DeLeon west to Rising Star. Col. C. H. Sharman, chief engineer, Rotan. (March 11, p. 547.)

Toledo, St. Louis & Western.—See Chicago & Alton.

Union Pacific.—An officer is quoted as saying that second-track work has been finished from Omaha, Neb., west to Watson's ranch, about 201 miles, and 25 miles additional have been finished west towards North Platte. Work is being carried out to complete the section from North Platte west to Julesburg, Colo., about 80 miles, and to fill in the gaps between Watson's ranch and North Platte, about 75 miles. Similar work has been finished on the following sections: Cheyenne, Wyo., west to Buford, 20 miles; Lookout, west to Hanna, 40 miles; Rawlins, west to Wamsutter, 41 miles; Point of Rocks, west to Blairtown, 16 miles, and Green river, west to Granger, 30 miles.

Vancouver, Victoria & Eastern.—See Great Northern.

Westchester Northern.—A hearing is to be given on May 9 to consider the application of this company for a certificate of public convenience and necessity. The company is being organized by parties interested in the New York, Westchester & Boston to build from the terminus of that company's proposed line at White Plains, N. Y., north to Danbury, Conn., and Brewster, N. Y., about 45 miles. It is expected that contracts will be let for building the line as soon as the certificate is granted. (Dec. 17, p. 1214.)

Wrightsville, Adrian & Lyons—Organized in Georgia to build from Wrightsville, Ga., southeast to Lyons, about 40 miles, with a number of extensions. The route has not been definitely decided upon. T. J. James, president; W. F. Staten, secretary, both of Adrian; E. J. Sumner, treasurer, Wrightsville.

Zacatecas & Orient.—Gustavo Madero, Monterey, Mex., representing the Madero interests, associated with the Franco-Espanol Bank of Paris, France, it is said, will build this line. The projected route is from Comacho, Zacatecas, Mex., on the Mexican Central, to the Mazipil mining district, with a branch to Bonanza, in all 250 miles. The government of the state of Zacatecas, it is said, guarantees 5 per cent. interest for a period of 20 years on the investment.

Railway Financial News.

Alaska Northern.—This company having taken over the property of the Alaska Central, the following have been elected directors: George Turner, R. D. Miller, O. G. Larabee, E. H. Morrison, F. W. Lowe, J. C. Williams and F. G. Jennett. See item under Railway Officers.

Baltimore & Ohio.—See Baltimore & Ohio Chicago Terminal.

Baltimore & Ohio Chicago Terminal.—The directors have authorized an issue of $50,000,000 4½ per cent. 50-year bonds secured by a mortgage on the entire terminal property. About $33,000,000 bonds are to be issued at once and turned over to the Baltimore & Ohio, to be held in its treasury. Of this amount, $28,000,000 is to reimburse the Baltimore & Ohio for expenditures made in buying the property and $5,000,000 is for improvements to be made to the terminal property.

G. F. Dominick, Jr., chairman of the Chicago Terminal Transfer minority stockholders' committee, says that litigation against the transfer of the property to the B. & O. is pending in the United States court and the suit is being pushed.

Boston & Albany.—This company has asked the Massachusetts railway commission for permission to issue $2,000,000 4 per cent. 25-year bonds to reimburse the New York Central & Hudson River for additions and improvements.

Chicago & North Western.—W. A. Gardner, vice-president, in charge of operation, has been elected a director, succeeding H. McK. Twombly, deceased.

Chicago, Milwaukee & St. Paul.—*The Wall Street Journal* says that the directors of this company are expected very shortly to authorize an issue of bonds, probably about $50,000,000, for extensions, equipment and improvements. It is said that the bonds are to be convertible into stock at par in about five years and are to be offered to stockholders at par.

Chicago, Rock Island & Pacific.—This company has sold to Speyer & Co., New York, $1,714,000 first and refunding 4 per cent. bonds. Of the total amount sold by the company, $220,000 refunding bonds were issued against an equal amount of Choctaw, Oklahoma & Gulf equipment trust certificates, which matured April 1, and $1,494,000 were issued against an equal amount of Choctaw collateral 4 per cent. bonds, series H, which mature May 1. The entire issue of refunding bonds has been resold by the bankers.

Hocking Valley.—See Kanawha & Michigan.

Kanawha & Michigan.—Suit has been filed against Nicholas Monsarrat, Charles H. Hickox and J. H. Hoyt by representatives of a minority stockholder of the Kanawha & Michigan charging conspiracy and misappropriation of funds during the time that the defendants were directors of the Hocking Valley and of the Kanawha & Michigan.

New York Central & Hudson River.—See Boston & Albany.

New York, Philadelphia & Norfolk.—The Virginia State Corporation Commission has approved an amendment to the charter of the N. Y. P. & N. giving the company power to increase its capital stock from $2,500,000 to $3,750,000. It is understood that the new stock will be issued as an extra dividend in lieu of preferred dividends which have been earned in recent years, but have been put into expenditures to the extent of $1,250,000, it is said.

Savannah, Augusta & Northern.—Judge Speer, in the United States court, has confirmed the sale of the road by the receiver to W. J. Oliver for $250,000.

Third Avenue (New York).—The receiver has come to an agreement with the city authorities as to past due franchise taxes, and has made a payment of $1,000,000 on account, leaving $665,000 still to be paid. The payment of $1,000,000 was made from the proceeds of a sale of receiver's certificates.

Judge Lacombe has approved the deed transferring the property of the Third Avenue to the reorganization committee, which bought it at foreclosure sale March 1.

Supply Trade Section.

The National Car Coupler Co., Attica, Ind., is building two additions to its plant.

The Cleveland Twist Drill Co., Cleveland, O., will, on May 1, move its Chicago branch office to 9 North Jefferson street.

On April 26 the Chicago offices of the Q. & C. Co., New York, were moved to the new People's Gas building on Michigan boulevard.

The Commercial Acetylene Co., New York, will remove its western office on April 22 to the People's Gas building, Michigan avenue and Adams street, Chicago.

The Chicago Railway Equipment Co., Chicago, has moved its sales office from the Fisher building to the new McCormick building, Michigan avenue and Van Buren street.

The Blue Island Rolling Mill & Car Co., Chicago, will move its offices from the Fisher building to room 1020 McCormick building, Michigan avenue and Van Buren street.

The Consolidated Car Heating Company, Albany, N. Y., announces that on May 1 its New York office will be moved from 42 Broadway to the Singer tower, 149 Broadway.

The D. & A. Post Mold Co., Three Rivers, Mich., has orders for a 200-mold plant for the Delaware, Lackawanna & Western, and for two 60-mold plants for the Pennsylvania Lines.

The Dressel Railway Lamp Works, New York, will move its Chicago office on May 1 from the Western Union building to suite 1216 of the Peoples Gas building, 150 Michigan avenue.

Charles Conlisk, well known to many of the "old-time" supply men, died at his home at Stevens Point, Wisconsin, April 16. Mr. Conlisk was connected with William Sellers & Co., Inc., for a number of years, and retired some two years ago.

W. F. La Bonta, formerly purchasing agent of the Chesapeake & Ohio, has accepted a position as representative of the Union Spring & Manufacturing Co., Pittsburgh, Pa. Mr. La Bonta's headquarters will be in the American National Bank building, Richmond, Va.

James L. Norris, Jr., counsellor in patent causes and solicitor of American and foreign patents, F and Fifth streets, N. W., Washington, D. C., announces that he will continue the business of his father, who died March 5 last. Mr. Norris was associated with his father for seven years, and the business has actually been under the management of James L. Norris, Jr., since June, 1906.

Mason & Hanger, contractors for one of the siphon tunnels on the New York water supply extension, are installing in their plant at Cornwall, N. Y., two large Ingersoll-Rand Corliss duplex air compressors, with a capacity of 5,200 cu. ft. per minute. These contractors have also placed an order for a full equipment of Ingersoll-Rand rock drills, mountings, steels, etc., for the carrying on of their work.

Tom Brown, formerly master mechanic of the Juniata shops of the Pennsylvania Railroad at Altoona, and later connected with the Westinghouse interests, the American Car & Foundry Co. and E. Keeler & Co., has been appointed a special representative of the Westinghouse Air Brake Co., and is giving considerable attention to the draft gear question. Mr. Brown's headquarters are at 165 Broadway, New York City.

C. A. Nathan, chairman of the executive committee of the railway supply men exhibiting at the International Railway General Foreman's convention at Cincinnati, May 3-7, advises that about 150 companies are to be represented and that arrangements are completed for displaying the exhibits in the corridor of the Grand Hotel adjacent to the convention hall. S. P. Egan is chairman of the entertainment committee, and his plans include a varied program.

The Isthmian Canal Commission will receive bids until May 11 for locomotive cranes, inspection car, copper ladder rungs, wattmeters, chain blocks, lights, axes, adzes, machettes, scrubbing brushes, locks, hinges, gongs, vacuum gages, foot valves, cocks, iron and vitrified pipe fittings, brass chain, screws, rivets, nails, hasps and staples, copper gaskets, grommets, small shop tools, saws, twist drills, corundum wheels, manila rope, rubber belting, insulating paper, chalk line, lumber, etc. (Circular 577.)

The Westinghouse Air Brake Co., Pittsburgh, Pa., announces that the decision of the United States Circuit Court of New York, holding its improved locomotive brake equipment to be an infringement upon the claims of the Corrington patent No. 762,282, has been reversed by the United States Circuit Court of Appeals by a unanimous decision, and that this court has upheld the contention of no infringement and the absolute invalidity of the patent in question and has ordered the bill against the Westinghouse company dismissed.

The Pressed Steel Car Co., Pittsburgh, Pa., is installing at its McKee's Rocks plant three 500-k.w. Westinghouse low-pressure steam turbines to utilize the exhaust from the large complement of non-condensing air compressors and direct-acting hydraulic pumps. In the electric power station, which is separate from the air compressor and pump house, there are installed a 1,000-k.w. Westinghouse low-pressure turbine and more than 1,500-k.w. capacity in high-pressure turbine apparatus. The McKee's Rocks plant furnishes electrical power to several mills in the vicinity of the Pressed Steel Car plant, and this energy is largely derived from the exhaust of the pumping and compressing apparatus, in some of which the steam is used non-expansively.

The Indian Refining Co., Cincinnati, Ohio, has recently established a railway lubricating department, which is the result of the company's increasing business with railways in connection with its contract work for rolling stock lubricating oils on a mileage guarantee basis. J. U. Smith, formerly with the Galena Signal Oil Co., Franklin, Pa., has been appointed manager of the railway lubricating department of the Indian Refining Co., with headquarters at the First National Bank building, Cincinnati. J. F. Gettrust and Floyd Davidson, formerly with the Galena Signal Oil Co., and T. U. Franklin, formerly purchasing agent of the Toledo & Western Traction Co., are associated with Mr. Smith. The company has branch offices in many large cities, with its general offices in Cincinnati.

R. B. Darby, formerly assistant engineer of motive power of the Lake Shore & Michigan Southern at Cleveland, Ohio, has accepted a position as mechanical engineer of the Pilliod Co., New York. Following his graduation from Purdue University in 1901, he entered the engineering department of the New York Central & Hudson River at West Albany, N. Y. In March, 1903, he went to the Gould Coupler Co., New York, and in the latter part of April of the same year he became mechanical engineer of the New York, Chicago & St. Louis, which position he resigned to become chief draftsman of the Pittsburgh & Lake Erie on August 1, 1904. On February 15, 1905, he entered the services of the Iake Shore & Michigan Southern, becoming chief draftsman on April 1, 1906, and in June, 1908, he was made assistant engineer of motive power, which position he has just resigned to become mechanical engineer of the Pilliod Co.

TRADE PUBLICATIONS.

Pressed Steel Brake Shoes.—The Pittsburgh Brake Shoe Co., Pittsburgh, Pa., has just issued a leaflet descriptive of its pressed steel brake shoes for freight cars.

Work Done.—Westinghouse, Church, Kerr & Co., New York, have just issued their pamphlet No. 4, which contains descriptions of a large amount of steam and electric railway construction which this company has handled.

Chloride Accumulator.—The Electric Storage Battery Co., Philadelphia, Pa., has issued bulletin No. 121 which contains a general description, with illustrations, of the installation of its chloride accumulator in mills of the Indiana Steel Co. at Gary, Ind.

Locomotive Fireboxes.—The Wm. H. Wood Loco Firebox & Tube Plate Co., Media, Pa., has just issued a pamphlet containing copies of a number of letters received from engineers and railway mechanical men regarding the firebox manufactured by this company.

G. A. R. Encampment.—The Lehigh Valley has issued a pamphlet containing a large amount of general information of interest to those expecting to attend the Forty-fourth National Encampment of the Grand Army of the Republic, to be held at Atlantic City, N. J., September 19-24, 1910.

Motorman's Valves.—The National Brake & Electric Co., Milwaukee, Wis., in bulletin No. 388 describes its national type motorman's valve and its motorman's valve with national type C sander valve attached. Both half-tone and line illustrations accompany a very complete description.

Linseed Oil and Enamel.—The Sterling Varnish Co., Pittsburgh, Pa., has just issued a catalogue descriptive of its raw refined linseed oil and black and clear iron enamels. A number of full-page half-tone illustrations show steel bridges, tank cars, factory buildings, etc., which have been painted with these products.

Branch Exchange Switchboards.—The Western Electric Co., New York, has just issued bulletin 1005, which is the third of a series of nine bulletins to be issued on telephone exchange apparatus. This bulletin describes the types of branch exchange equipments designed for use in business establishments, factories, etc.

Radial Trailing Truck.—The American Locomotive Co., New York, has just issued bulletin No. 1003 containing a description of this company's latest construction of radial trucks with outside bearings. This type of truck is particularly applicable to 4-6-2, 2-6-2, 2-8-2 and other types of locomotives, having two trailing wheels and more than four coupled driving wheels.

Denver & Rio Grande.—The passenger department of the Denver & Rio Grande is distributing a pamphlet entitled "Around the Circle," written by Edwin L. Sabin, after a trip of 1,000 miles through the Colorado Rockies. The Denver & Rio Grande has instituted these trips over two routes, both starting and ending at Denver, Colo., one being made entirely by rail and the other including a short trip by stage. The pamphlet gives full description of both tours with many illustrations.

Great Northern.—The Great Northern has issued a directory of theatres and public halls in the towns on its line. The towns are arranged alphabetically under the states and provinces and all information necessary for planning a theatrical tour is given. Another booklet just published by this company gives homeseekers fares to the Northwest with information about the train service and numerous photographs of the country traversed by the line. Still another folder describes the land in Chouteau county, Montana, which has just been restored to homestead entry by the government.

Hydraulic Jacks and Pressure Pumps.—Probably the most complete description of hydraulic jacks and pressure pumps ever issued in catalogue form is that of Richard Dudgeon, New York. This catalogue, No. 8, and of recent issue, contains 86 pages, 4½ in. x 7¼ in., of heavy glazed paper, which is necessary when using the high class illustrations with which the catalogue is well filled. Not only are descriptions of a wide range of jacks and pressure pumps given, along with tabulated specifications, sizes, capacities, etc., but also a large amount of valuable information on this general subject which is not to be found elsewhere in such available form.

RAILWAY STRUCTURES.

AMARILLO, TEX.—The new reinforced concrete steel combined passenger station and Harvey eating house, for the Eastern Railway of New Mexico has been opened for business. (Sept. 10, p. 480.)

AUGUSTA, GA.—An officer of the Georgia & Florida writes that work is now under way by the company's men putting up a brick freight house in Augusta. The building will be 47 ft. x 358 ft., one story high, and cost $25,000.

BLOOMINGTON, ILL.—See Chicago & Alton under Railway Construction.

DALLAS, TEX.—The Railroad Commission of Texas has again taken action in regard to the union station improvements to be made in Dallas. The commission has issued a new order requiring the railways entering Dallas to submit plans by July 1 for building two new union stations. It is proposed that one station shall be used by the Houston & Texas Central, the Texas & Pacific and the Texas & New Orleans, and the other by the Santa Fe, the St. Louis Southwestern, the Rock Island, the Trinity & Brazos Valley and the Missouri, Kansas & Texas. (Dec. 31, p. 1322.)

EAST JOLIET, ILL.—See Elgin, Joliet & Eastern under Railway Construction.

GARRETT, IND.—The Baltimore & Ohio is putting up an office building in Garrett.

INDIANAPOLIS, IND.—The Terre Haute, Indianapolis & Eastern Traction Co., according to press reports, will build a power station and car shop, which are made necessary by the purchase of the Indianapolis Traction & Terminal Co.

KANSAS CITY, MO.—The Wabash is to rebuild and enlarge its freight station. Large platforms for handling automobiles will also be added. The total cost of the improvements will be about $30,000.

See Atchison, Topeka & Santa Fe under Railway Construction.

LAKE SUPERIOR, ONT.—Bids are wanted by P. E. Ryan, secretary, Transcontinental Railway at Ottawa, Ont., May 2, for the construction of a station at Lake Superior. The work to be finished before September, 1910.

LINCOLN, ILL.—See Chicago & Alton under Railway Construction.

LINCOLN, NEB.—A fire in the yards of the Chicago, Burlington & Quincy on April 21 destroyed the old roundhouse, an ice house, a coal chute, 30 box cars and quantities of lumber. There were no locomotives in the roundhouse as the old building has been replaced by a new one, and there was nothing in the ice house except some cement being used for building work.

LIVINGSTON, TENN.—The Livingston Terminal Co., organized to build, own and operate terminal yards, has practically completed the necessary grading and work is now under way on an $1,800 frame station. The total cost of the terminals will be about $22,000.

MCADAM JUNCTION, N. B.—See Woodstock, N. B.

MINNEAPOLIS, MINN.—The Chicago, Milwaukee & St. Paul will demolish grain elevator B as well as a number of warehouses between Ninth and Tenth streets in Minneapolis, to make room for enlargement of its freight terminals.

NELSON, ILL.—The Chicago & North Western is building a new roundhouse and machine shop at a cost of about $65,000.

NEW YORK.—The New York, Westchester & Boston is making plans to build stations at the following places: Morris Park, Pelham Parkway, Allerton avenue, Dyer avenue, Gunrill road and Baychester avenue, in the borough of the Bronx; South Third avenue, East Sixth street, Fulton avenue and Columbus avenue, in Mount Vernon; also at North Pelham; Pelhamwood; at Webster avenue and North avenue, in New Rochelle; Lincoln avenue, in Mount Vernon, and at North New Rochelle. It is probable that bids for the work will be asked for in the near future.

PEORIA, ILL.—See Chicago & Alton under Railway Construction.

PHILADELPHIA, PA.—Bids are in for a five-story brick and steel office building to be built at Ninth and Spring Garden streets in Philadelphia for the Philadelphia & Reading. The bids range from $231,745 to $263,245.

POCAHONTAS, ARK.—An officer of the St. Louis & San Francisco writes that work will be started before August, and

completed within two years, putting up a steel drawbridge, with a 280-ft. channel span, over the Black river at Pocahontas. The work is to cost $100,000 and will be carried out entirely by the company's forces.

Portland, Me.—It is said that the Boston & Maine will put up a 75-stall roundhouse at Thompson's point, in Portland.

Quebec, Que.—An officer of the Quebec Railway, Light, Heat & Power Co., Ltd., writes that the company has bought a plot of ground, 74 ft. x 150 ft., at Crown and St. Joseph streets, centrally located in the city of Quebec. The ground is to be used as a site for an eight-story office building, to be of steel and tile or reinforced concrete construction. The improvements will cost about $250,000. Work is to be started in May, removing the present buildings and excavating for the foundation. Contracts for the work have not yet been let.

According to press reports, bids are to be asked for building the Quebec bridge some time in May. (Dec. 17, p. 1218.)

Renovo, Pa.—The Pennsylvania Railroad has plans made for putting up a brick and steel boiler shop, 80 ft. x 250 ft., at Renovo, to cost about $118,000. It is thought that bids for the work will be asked for in the near future.

St. Louis, Mo.—The Terminal R. R. Association of St. Louis is building a reinforced concrete stack for ventilating its tunnel, replacing a similar structure of steel. The new stack is 30 ft. in diameter and 126 ft. high above street level.

St. Stephen, N. B.—See Woodstock, N. B.

Shively, Cal.—Work is said to have been started by the Northwestern Pacific on a new terminal station at Shively.

Truscott, Tex.—The Kansas City, Mexico & Orient is locating a site in Truscott for a combined passenger and freight station, to be 24 ft. x 70 ft.

Vancouver, Wash.—An officer of the Spokane, Portland & Seattle writes that a car shop is to be built and the present machine shop is to be enlarged. Considerable work is to be done in filling trestles between Lyle, Wash., and Cooks Station, about 75 miles east of Portland; various small passenger stations are to be built and six or seven passing tracks will be laid.

Waukegan, Ill.—See Elgin, Joliet & Eastern under Railway Construction.

Wellington, Kan.—Plans have been approved for an addition to the Atchison, Topeka & Santa Fe roundhouse, which will give it a capacity of 28 stalls. It will be entirely rebuilt to conform to the company's standard for that class of buildings.

Woodstock, N. B.—According to press reports, the Canadian Pacific will spend $100,000 during the coming summer in improvements at various points along the Atlantic division. There is to be a new station at Woodstock, to cost $20,000. At McAdam Junction a large addition is to be built to the station and hotel, and the terminal facilities at St. Stephen will be considerably extended.

Increasing Cost of Living in China.

In no other land has railway construction accomplished such changes as in China, and in no other country has it such a future. Wherever one travels in the interior the natives are found asking, Is the railway coming? or, When will it come? In the Loess country of central China the wagon roads are exceptionally bad, and as the bridges are never repaired there is steady deterioration in road communication, and a consequent steady increase in the cost of living. Along the Pekin-Hankow line the growth of prosperity is quite extraordinary. Around every station the settlements have extended, the houses are of a better type, and the inns, warehouses and coal yards have been greatly improved. Farmers within reach of the railways in regions that formerly grew enough only for their own needs can now sell their products in the great markets of Pekin in the north, and at Hankow on the Yang-tse. The Pekin-Hankow railway, although under inefficient control, is one of the most productive trunk lines in the world.—*Zion's Herald.*

Late News.

The items in this column were received after the classified departments were closed.

The Buda Company, New York, has moved its New York office from 26 Cortlandt street to room 716, No. 30 Church street.

E. S. Clapp has been appointed storekeeper of the Chicago & North Western, with office at Kaukauna, Wis., succeeding A. E. Johnson, promoted.

F. J. Angier, manager of the tie and timber department of the Chicago, Burlington & Quincy, at Galesburg, Ill., has resigned to go into other business.

The Pittsburgh & Lake Erie will take up its options on about 28 parcels of land in the village of Dickerson Run, Pa. The site will be used for a large yard.

J. W. Gerber has been appointed general storekeeper of the Southern Railway, with office at Washington, D. C., succeeding W. M. Netherland, promoted.

C. E. Thompson, purchasing agent of the Spokane, Portland & Seattle and the Astoria & Columbia River at Portland, Ore., has been appointed purchasing agent of the Idaho & Washington Northern, with office at Spirit Lake, Idaho.

Samuel Moody, assistant passenger traffic manager of the Pennsylvania Lines west of Pittsburgh, with office at Pittsburgh, Pa., has been appointed passenger traffic manager, succeeding E. A. Ford, retired on a pension. A sketch of Mr. Moody's railway life was published in our issue of March 11, page 544.

Louis Paulhan, during the afternoon and night of April 27-28, made the flight from London to Manchester, 183¾ miles, in 12 hours and 12 minutes, which included the time consumed in stopping at Litchfield. This flight won the $50,000 prize offered by the (London) *Daily Mail* for the first aviator who should fly from London to Manchester within 24 hours, with not more than two descents to the ground. The stop made by Paulhan was at Litchfield, which is 118 miles from London. Paulhan left London at 5:20 in the afternoon and arrived at Manchester at 5:32 Thursday morning.

An advance in freight rates has been made by all common carriers, to take effect June 1, on wool in the grease, via all rail and lake and rail routes, from St. Paul and Duluth to all Atlantic seaboard points. The general increase is 10 cents per 100 lbs., which, in some instances, means an advance of 25 per cent. These increases from present rates are made at principal points from Duluth and St. Paul: Albany, old rate 53 cents, new rate 63 cents; Baltimore, old rate 52, new rate 62; New York, old rate 55, new rate 65; Boston, old rate 60, new rate 70; Buffalo, old rate 37, new rate 47; Philadelphia, old rate 53, new rate 63; Newport News, old rate 52, new rate 62.

H. R. Safford having resigned as chief engineer maintenance of way of the Illinois Central and Indianapolis Southern to become vice-president of Edgar A. Allen & Co., Sheffield, Eng., that office is abolished, and L. W. Baldwin, division superintendent, of the Yazoo & Mississippi Valley at Greenville, Miss., has been appointed engineer maintenance of way, with office at Chicago. Lawrence A. Downs, assistant to chief engineer maintenance of way, has been appointed assistant engineer maintenance of way, with office at Chicago. D. J. Brumley, principal assistant engineer, has been appointed engineer of construction. L. W. Baldwin and D. J. Brumley report to A. S. Baldwin, chief engineer. J. J. Gaven, superintendent of the Tennessee division of the Illinois Central at Fulton, Ky., has had his jurisdiction extended to include the Birmingham division, succeeding Tracy L. Dubbs, appointed superintendent of the Yazoo & Mississippi Valley, to succeed L. W. Baldwin, promoted. The jurisdiction of J. G. Neudorfer, superintendent of the Mississippi division, has been extended to include the Jackson district and the Tennessee division with office at Water Valley, Miss. The jurisdiction of Thomas E. Hill, superintendent of the Louisiana division at McComb, Miss., has been extended to include the New Orleans division, with office at New Orleans, succeeding Oliver M. Dunn, assigned to other duties.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, Indianapolis & Louisville is negogiating for six consolidation locomotives.

The Columbia & Puget Sound has ordered three locomotives from the American Locomotive Co.

The Norfolk & Western has ordered 10 class M-2 locomotives from the Baldwin Locomotive Works.

The National Railways of Mexico have ordered 14 Mallet locomotives from the Baldwin Locomotive Works.

The Valdosta, Moultrie & Western has ordered one ten-wheel locomotive from the Baldwin Locomotive Works.

The Louisville, Henderson & St. Louis has ordered two 10-wheel locomotives from the Baldwin Locomotive Works.

The Atchison, Topeka & Santa Fe has ordered 23 Atlantic, 12 Pacific and 10 Mallet locomotives from the Baldwin Locomotive Works.

The Boston & Maine, reported in the *Railway Age Gazette* of March 25 as being in the market for four Mallet locomotives, has ordered four 2-6-6-6 oil-burning Mallets from the American Locomotive Co., for delivery during September and October, 1910.

General Dimensions.

Weight on drivers	272,000 lbs.
Total weight	316,000 lbs.
Cylinders	22 in. and 35 in. x 30 in.
Diameter of drivers	61 "
Type of boiler	Extended wagon top; radial stay
Working steam pressure	200 lbs.
Heating surface, tubes	4,448 sq. ft.
" " firebox	196 "
" " total	4,644 "
Tubes, number	406
" outside diameter	2 in.
" length	21 ft.
Firebox, type	Wide
" length	108⅛ in.
" width	65¾ "
" material and maker	Steel; Worth Bros.
Grate area	49.7 sq. ft.
Water capacity	7,500 gals.
Oil capacity	3,000 gals.

Special Equipment.

Axles	Carnegie steel
Boiler lagging	Ehret Mfg. Co., 85 per cent. magnesia
Brakes	Westinghouse-American, E. T. No. 6
Brake-beams	Diamond special
Brake-shoes	Am. Brake-Shoe & Fdy Co.
Brick arch	For oil burning
Couplers	Tower
Driving boxes	Hunt-Spiller gun iron
Headlight	Acetylene
Injector	Hancock composite, No. 11 x 11
Journal bearings	Hardy bronze
Oil burning system	Heintzelman, with Booth burner
Piston and valve-rod packings	United States
Safety valve	Ashton
Sanding devices	Hanlon
Sight-feed lubricators, 1 Detroit triple, 1 Detroit quadruple	
Springs	Railway Steel-Spring Co.
Staying	Bethlehem Steel Co.
Steam gages	American
Tires	Midvale
Tubes	Worth Bros.
Valve gear	Walschaert
Wheel centers	Steel

CAR BUILDING.

The Baltimore & Ohio is in the market for 120 passenger cars.

The Harriman Lines have ordered 424 passenger equipment cars from the Pullman Co.

The Columbia & Puget Sound is building 35 forty-ton coal cars at its Seattle, Wash., shops.

The Utah Light & Railway Co., Salt Lake City, Utah, is in the market for 12 city and 12 interurban electric cars.

The New York Central & Hudson River has ordered 1,000 steel hopper cars from the American Car & Foundry Co., and 1,000 general service cars from the Pressed Steel Car.

The Chicago, Burlington & Quincy has ordered 40 chair cars, eight dining cars and one club car from the Barney & Smith Car Co., and 10 chair cars from the American Car & Foundry Co.

The Kansas, Lawton & Gulf, a line incorporated in Oklahoma, is reported in the market for 10 flat, 10 box and five passenger cars. This item is unconfirmed. J. M. Bellamy, Lawton, Okla., is a director.

The Pennsylvania Lines East, reported in the *Railway Age Gazette* of April 1 as being in the market for passenger equipment, has ordered 60 P-70, 8 P B-70, 15 M P-54 and 15 M P-54 B coaches from the American Car & Foundry Co.; 34 P-70 and 14 M P-54 coaches from the Standard Steel Car Co., and 25 M P-54 coaches from the Pullman Co., making a total of 171 steel coaches.

MACHINERY AND TOOLS.

The Pennsylvania has issued a short list of machine tools.

The New York Central has issued a list of machinery to cost about $50,000.

The Itshmian Canal Commission is in the market for a number of small tools as noted in Supply Trade News. (Circular No. 577.)

The Pressed Steel Car Co., McKee's Rocks, Pa., is installing three 500-k.w., Westinghouse, low-pressure turbines to operate on the exhaust steam from the air compressors and hydraulic pumps.

The Illinois Steel Co., South Chicago, has ordered from the Standard Engineering Co., Ellwood City, Pa., an electrically-driven structural mill having five stands of 24-in. and three stands of 21-in. rolls.

IRON AND STEEL.

The Great Northern is in the market for 6,000 tons of bridge steel.

The Chicago Great Western is in the market for 5,000 tons of bridge steel.

The Lake Shore & Michigan Southern has ordered 12,000 tons of rails from the Lackawanna Steel Co.

The St. Louis, Brownsville & Mexico has ordered 2,000 tons of 80-lb. rails from the Pennsylvania Steel Co.

The Pittsburgh, Shawmut & Northern has ordered 6,500 tons of structural steel for a bridge over the Allegheny river near Freeport, Pa.

The National Brake & Electric Co., Milwaukee, Wis., has ordered 200 tons of structural steel from the American Bridge Co. It is to be used for an addition to the foundry.

General Conditions in Steel.—Although at the present time most of the steel mills are reported operating close to capacity, it is though that this condition will not long continue, as orders for April are expected to show a falling off as compared with those of March. Reports indicate considerable cutting in prices of fabricated material, but that competition for new business has not caused shading to be general.

SIGNALING.

The New York, New Haven & Hartford is to erect automatic semaphore signals on the line between Middleboro, Mass., and Buzzard's Bay, 20 miles, double track. The arms of these signals will be pivoted near the center, like those which were put up two years ago on the line between Burnside, Conn., and Vernon, and which were described in the *Railroad Gazette* of January 17, 1908. Being pivoted midway of the length of the arm and the blade being below the fulcrum, the signal, when

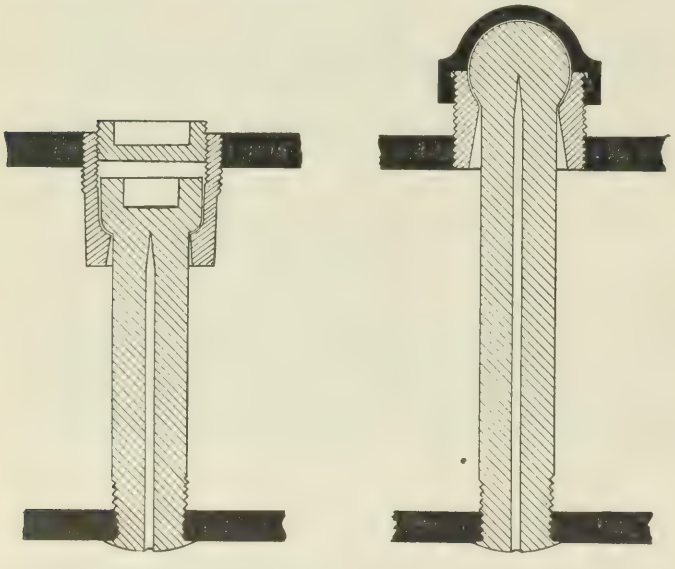
in the proceed position, has the appearance of being in the upper left-hand quadrant. As the reader will recall, numerous signals of this style are in use on the New York division of the New Haven road, where the signals are suspended from the overhead bridges which carry the high-tension electric wires used for the electric propulsion of trains, and the type has given entire satisfaction. No engineman has misunderstood them. Signals of this kind are also in use at a few points on the New Haven where most of the signals are of the ordinary lower left-hand quadrant style.

Tests of Harrington's Automatic Stop.

On Friday of last week members of the Block Signal and Train Control Board of the Interstate Commerce Commission made a series of tests of the automatic stops which are in use on the Northern Railroad of New Jersey between Jersey City and Englewood, N. J. These stops, installed by the inventor, S. H. Harrington, 120 Liberty street, New York City, have been in use on this road, which is a division of the Erie, for about two years. The essential feature of the device is a weight suspended high above the track in such a way that if it is passed when in the stop position it will strike a horizontal transverse lever fixed on the roof of the cab of the locomotive and, by moving that lever, open a valve and cause the application of the air-brakes throughout the train. As arranged on the Northern of New Jersey, the weight is suspended from a horizontal rod supported on the post of the distant signal. The clearing of the signal lifts the weight out of the engaging position. The weight consists of a short iron bar. It is suspended loosely by a chain and is of such size and weight as to cause the movement of the lever on the locomotive cab by its inertia alone, without being rigidly fastened to its support. The tests were entirely successful. The Signal Board has had inspectors watching these stops for several months, and during this time has made a large number of tests. These will be the subject of a report to be made by the Board.

Flexible Staybolts with Hollow Stems.

The accompanying drawings show a proposed application of hollow staybolt iron in the manufacture of Acme and Tate flexible staybolts. The hollow iron is closed and upset on the headed end in the same manner as if it were solid iron, which, apparently, it actually becomes.



Proposed Application of Hollow Iron to Acme and Tate Flexible Staybolts.

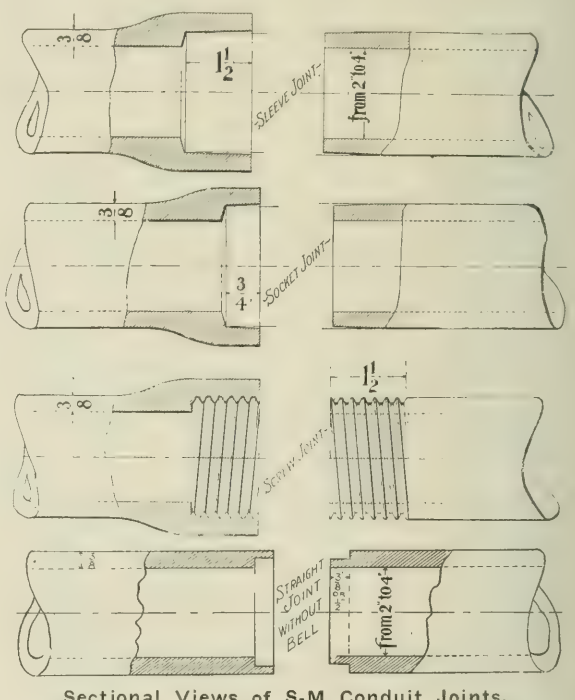
The hollow staybolt is especially valuable from the standpoint of self-inspection, as the fracture permits water to reach the channel and appear at both ends of the bolt. The flexible staybolt is designed for movable attachment to the outer and rigid attachment to the inner sheet. The movable connection permits the bolt to freely respond to the movements of the inner or fire sheet, due to expansion and contraction.

As it is impossible to detect broken flexible staybolts by the hammer sound on account of the head attachment, it is necessary to remove the caps to determine with complete assurance that a bolt is broken. This removal and subsequent replacing of the caps requires time, and to overcome these difficulties the hollow flexible staybolt is designed. There is, however, a question regarding the use of hollow iron in this connection on account of the fact that all the water which reaches the channel of the bolt will pass into the firebox rather than part of it going to the outside sheet, as is the case in hollow iron as used in an ordinary staybolt.

Conduit for Underground Cables.

A new cable conduit recently placed on the market by the H. W. Johns-Manville Co., New York, known as the J-M fiber conduit, is shown herewith. It is made of indurated fiber, a material used extensively for insulating purposes. The fiber is molded into shape under high temperature and pressure so as to be free from grain or laminations. This process gives each length of conduit a solid ⅜-in. one-piece homogeneous wall, with high tensile strength for light weight conduit.

The most interesting feature of this new conduit lies in the



Sectional Views of S-M Conduit Joints.

bell joints. One end of each section is molded to an enlarged size so as to be fitted to the joining section without any reduction in the wall thickness of either piece. This makes a very strong and rigid connection.

Installation methods in some instances necessitate the use of straight joints, and the manufacturers have also arranged to make this new conduit with straight joints, as shown in one of the illustrations herewith.

The inside wall joints of this conduit are smooth, being machine molded. Each length of conduit is also smooth throughout its bore, which greatly facilitates the work of inserting cables. The manufacturers claim that, by reason of their being no seams or roughness at the joints and as the air tight joints prevent particles of concrete from seeping through, a No. 6 wire can be pushed through each conduit from manhole to manhole without the use of ropes and rods.

Tests made of this conduit with ⅜-in. thickness of wall are said to show that it has an average puncture voltage of 40,800 dry and 33,000 volts after 40 hours immersion in water. A variety of fittings, such as bends, elbows, tees, etc., provide for all of the changes of direction in trenches. Two, three and four-way junction boxes are provided for branch and service connections.

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The railway situation in Congress grows more and more confused, and at this writing the majority, pledged to carry out the proposals of the Republican platform, as formulated by President Taft, does not know whether it is a majority or not. The uncertainties of the last two months, as noted in our news columns weekly and in the editorial column March 25 and April 1, are more pronounced than ever, except that increasing confusion makes probable the failure of all railway legislation. Each of the President's principal proposals—to establish a special court, to permit consolidations under certain conditions, to permit traffic agreements between competing roads, and to regulate railway capital issues—has been virtually rejected in one house or the other, at one time or another. The votes which have been taken in the House have been in Committee of the Whole, and may not indicate accurately the final sentiment of the members; but the significant fact is that the opponents of the President's measures, believing that the first three of them are too favorable to the railways, have determined to block their passage, and to emphasize their opposition they have brought in two others which they are sure will hurt the railways, the long-and-short-haul provision and the valuation of the physical property of all railways. They seem to have the votes to carry their proposals, or at least enough to throw all questions into a conference between the two houses, where the whole bill could be easily killed. The proposition to regulate capital has enemies on both sides, because of its real or supposed infringement of State rights. It is plain that there is no intelligent and well-settled public sentiment behind any of these propositions, and, therefore, it can hardly be called a misfortune if all of them fail. The people should be satisfied with non-action, because they do not know what they want, and the railways had not expected astonishing benefits in any event.

With the granting of a charter to the Southern New England to connect the Grand Trunk system with Providence, R. I., by a line from Palmer, Mass., the Canadian corporation's new invasion of southern New England territory and the seaboard may be said to have advanced nominally another step. It remains to be seen whether the Grand Trunk actually builds the new line or uses its charter as a "big stick" to knock out concessions for itself. The stick itself is not so formidable a weapon for railway polemics as the original charter seemed to portend; for the charter, as a legislative fact, has been hedged about with costly if not deadly restrictions. There are restrictions of grade crossings; restrictions bearing on the use of the rival New Haven's terminals and terminal approaches; and, in general, the consequential obstacles always existing when a new line seeks entry into populous urban territory. The obstructions, indeed, are such that Grand Trunk authority has been quoted to show that it may have to appeal for future charter easements. Also, the cost of the proposed line is not likely to be less than $8,000,000 or $10,000,000, complicated with the Grand Trunk's financing of its Pacific extension. Meanwhile come foreshadowings of New Haven counter-strokes by cutting out the Grand Trunk's connecting links in the Boston & Maine north of Springfield, Mass. In brief, the situation in New England places the New Haven and Grand Trunk in attitudes of gesticulation with weapons raised to strike; but a treaty is more likely than a blow. It is a familiar pose, with conditions pointing to a revival of the negotiations of a year or so ago looking toward traffic agreements by which the Grand Trunk acquires rail access to New York City via the New Haven.

The Prussian minister of railways, in explaining the cause of a collision, talks exactly like certain railway men to be found in other parts of the world—not so far away as Prussia. A summary of this minister's remarks on the Mulheim collision is given in another column: the experience of the Prussian railways with automatic stops has been unsatisfactory, and at best an automatic stop makes enginemen less alert; experiments with audible cab signals are "under way," but how these will turn out remains to be seen; experiments with automatic registering apparatus, to reveal to the superintendent every instance of overrunning a signal have been begun; and, finally, careful selection and training of engine-

men is the most hopeful direction in which to make improvement. Calmness, presence of mind and ingrained devotion to duty are the qualities desired. Whether the "Opposition" in the Prussian Landtag devotes its ingenuities to picking flaws in the ministers' statements we do not know; but there are some obvious things which a member of the opposition might have said on this occasion. In considering "unsatisfactory" experience with automatic stops the very satisfactory experience with stops on the thousands of express trains of the Interborough Rapid Transit in New York City for five years past ought to be mentioned. The reasons why this experience is worthless in Prussia ought to be stated. As to automatic stops causing enginemen to be less alert, the Interborough people will probably testify that this supposed weakness gives them no serious trouble. When a railway manager does not know what to expect from an audible cab signal he should be asked if he has heard from England, where the Great Western Railway has used such signals with considerable satisfaction for three or four years. Automatic apparatus to register all of an engineman's errors in reading signals is attractive in theory, but Minister von Breitenbach's experimenters probably will tell him that expenditures of time and money in this direction give far less promise of useful results than those in the other directions suggested. And, finally, if selection and training of men is the most important thing to be attended to, the public would like to know, no doubt, just what degree of progress has been and is being made toward perfection in this respect. Ingrained devotion to duty is excellent as an ideal and also is exemplified in practice by thousands of employees, but if Germany is at all like America there should be added one more ideal: *intelligent* devotion to duty. The most deplorable railway disasters are those which are due to error or neglect on the part of an employee who was wholly devoted but was not highly trained.

CONCRETE CULVERT CONSTRUCTION.

Two types of concrete slabs for flat top culverts and short span bridges are in common use. The one most frequently used consists of I-beams encased in concrete; the other is reinforced concrete. In the I-beam construction, the concrete does not add strength, its purpose being to protect the steel and furnish a rust-, decay,- and fireproof deck for ballast. The steel is designed to carry the entire load of track and traffic in addition to the weight of the concrete. Such construction is wasteful, and, also, it is questionable whether or not the concrete encasement is actually a protection for the steel. It is believed by many competent engineers to be in reality a detriment. The large flat surfaces of the steel beams are not ideal for obtaining perfect adhesion to concrete, and the vibration necessarily set up soon destroys such adhesion as may exist. When separation occurs, the concrete immediately above and below the steel is sheared, and all such slabs have cracks plainly denoting the position of each beam. The cracks are indicated by lines of rust running to the surfaces of the concrete and water leaks into and through the slabs along these cracks.

Rust takes up more room than uncorroded iron and steel, this fact being taken advantage of in at least one commercial waterproofing material for concrete, which is composed of iron in finely divided form. This being mixed with the concrete expands as it rusts, thus filling the pores and reducing voids to a minimum. There is a practical limit to the expansion which may be allowed, but this is aside from the subject. The fact to be considered is whether the rusting of the encased steel beams may not largely increase the widths of the cracks and tend to further separation of the steel and concrete. This rust cannot decrease the space between the steel and concrete, for the concrete is set before rusting begins and the surfaces in contact are smooth, except where the concrete is sheared, and here the rust particles will lodge and by swelling exert an expansive force, first evident on the lower surface of the slab. Nothing can be done to protect the surface of the steel after corrosion begins without destroying the concrete envelope. The evil day may be postponed by first pickling the steel and then giving it one or two coats of whitewash and using a liberal amount of hydrated lime in the concrete. In defense of the preference shown by some designers for the encased I-beam slab the fear is expressed that vibration due to traffic may destroy the bond between the concrete and steel in reinforced slabs. The facts do not warrant such fear, and the continued use of the hybrid slab with steel beams encased in concrete is due to a conservatism that is opposed to economy and efficiency.

Tests made by Prof. H. C. Berry at the University of Pennsylvania in 1908 showed that reinforced concrete beams six weeks old tested for the effect of repeated loading were not affected materially by as many as one million repetitions of high working stresses. Duplicate beams were made and one set tested to failure in the ordinary manner while the others were subjected to repeated loading sufficient to cause higher stresses than are ordinarily allowed in good practice, after which they were tested to failure. Both sets of beams showed the same ultimate strength. These tests confirmed others made before by well known investigators, and prove that vibration does not affect the bond between concrete and the reinforcing steel embedded in it, provided the stresses do not run over one-half the elastic limit of the steel and over one-half the ultimate strength of the concrete. That is, reinforced concrete has a permanent elastic or fatigue limit about equal to 50 per cent. of its ordinary ultimate strength.

The use of reinforced concrete with conservative working stresses and due allowance for impact can safely be accepted as good practice in railway construction. Reinforced concrete slabs are not an experiment. The material has been used for about fifty years. The most suitable steel is that sold at the lowest pound price and in regular sections so placed in the concrete that the latter in setting grips it firmly. The adhesion is perfect and the compressive strength of the concrete is developed. This results in the use of less than half the steel required for I-beam slabs and requires little, if any, more concrete than that necessary to encase the steel beams.

THE BOND PROBLEM.

From time to time during the last three years we have had occasion to point out the scope and magnitude of bond transactions in railway finance. What may be called a bond period for the railways was not long ago in clear evidence, and the more so if the term "bond" is used to describe the short note. Outwardly the bond and the short note differ, the one being a mortgage security, the other an unsecured note of hand. The distinction holds sharply in the case of a weak railway corporation, but practically it fades away, as regards security, when the railway corporation is conservative, solvent and dividend paying. There is, in such a case, a difference in the interest rate, due to the investor's favor for the "long" security, but little or none in certitude of maturity payment. Using, then, the term "bond" broadly, the change of the last few months has been striking. The old bond period has diminished to low terms, particularly so in railway bonds of the first grade which have increased in their investment return a considerable fraction of one per cent.—that is to say, decreased proportionally in selling price. And municipal bonds of high grade have followed the same rule as compared with the immediately pre-panic time.

This change in the status of the railway bond is logical. In the reaction from the lower panic prices, when also the conservative investor sought the bed rock railway security, his disposition since to accept a little edge of risk for the sake of the higher return is elemental in human nature. But

far deeper than that as a fiscal force is the increased cost of living. This may not affect the investor of normal surplus income or the mere speculator or the man of reckless extravagance—the man who mortgages his home for an automobile—but it does affect the vast group of smaller investors with, at most, their few thousands a year derived from interest and dividends. The burden of high prices which they carry as "ultimate" consumers has driven them to a changed viewpoint. In the case of the railways, temptation, not to say positive urgency, for the sake of increased income leads them away from the senior to the junior security and the old 4 or even 3½ per cent. return asked for has risen to 4½ and 5. The demand for a similar increased return on railway stock investment falls in the same economic category. "Institutional" investment, though under the restraint of law, has measurably followed suit. So the railway corporations, for a period more or less indefinite, must, in their new financing, pay a higher rate to get their money.

The direction of such new financing, especially in bonds, is an interesting problem of the future. It will vary, of course, with separate corporate conditions. We have already seen the situation reflected lately in the case of half a dozen large railway companies which have put out new stock, usually at par to old stockholders. It has for them the joyous realisms of an immediate "melon," but for the corporation not always so jocund results when the melon ripens into a large increase in the dividend requirement. In the more important matter of bond financing, the railway short note may practically be ruled out as a device to meet a temporary exigency like that of the panic period—though it appeals to a certain class of investors who like what is next to cash in hand. In the case of old, long mortgage bonds maturing, the railways will probably follow precedent and refund with consolidated mortgage bonds at a somewhat increased interest rate. The real bond question for the railways to answer, however, will be the placing of new bonds for extensions or improvements, where they must respond to the average investor's demand for at least a fair security bearing a higher interest rate. Will it be a junior sub-mortgage bond or a debenture? Will it be a collateral bond based on outside securities held in trust? Or will it be the convertible bond, not necessarily bearing a high interest rate but appealing to some new investors with speculative hopes based on future convertible values, and appealing also to the confidence of old stockholders?

With half a dozen directions in which it may move, the main trend of future bond financing at the present juncture of bond depression is interesting. The unpleasant fact in the situation is that the higher rates for new railway funds comes at a time when other demands, like those of labor, are pressing hard on the managements. The cheering fact is that the investment conception of the railway bond as an ultimate *security* remains unimpaired. If to it can be added as coming facts the conceded right and the reality of increased railway rates, the bond problem will simplify itself and the higher bond rate for the investors be a relatively trifling item in railway budgets.

GENERAL ELECTRIC COMPANY.

In the 11 months ended December 31, 1909, the General Electric Company was able to save for net earnings 9.1 per cent. of gross sales, as compared with net earnings of 6.5 per cent. of gross sales in the fiscal year ending January 31, 1909. This was after charging off for depreciation of plants $2,447,984 in 1909 and $1,524,295 in the previous fiscal year. Gross sales in the 11 months of 1909 amounted to $51,656,632 and in full year 1908 to $44,540,676. After adding to this amount the profit from sales of stocks and bonds and subtracting from it depreciation, heretofore mentioned, and interest accrued on debentures, the company's report shows a profit for the 11 months of 1909 amounting to $6,493,671, and for the previous full 12 months' fiscal year of $4,802,253. From the profits of the 11 months the total dividends for the year, including those paid January 15, 1910, amounted to $5,214,352, were paid. In the previous year $5,214,026, including dividends paid in January, 1909, in the previous year, was paid. This left a surplus at the end of the 11 months of $1,279,319, as compared with a deficit at the end of the previous fiscal year of $411,773. It will be noted that a somewhat larger percentage was written off for factory plants last year than in previous years, due to the fact that a greater number than usual of the year's extensions thereto was for other than strictly productive purposes, as real estate, warehouses, etc.

The total sales billed in the 11 months were $51,656,631, as against $44,540,676 in the previous 12 months, and total orders received amounted to $54,360,562 in the 11 months, as against $42,186,917 in the previous 12 months. During the last fiscal year orders received during the first six months were at yearly rate of $49,769,000, and for the last five months were at yearly rate of $69,670,000. The year 1907 was the best from the point of view of orders received of any year in the history of the company, and during that year orders received totaled $60,483,659.

Unfilled orders as of December 31, 1909, were about $15,600,000, as compared with $13,000,000 at the close of the previous year. The total number of separate orders and contracts received was 9 per cent. greater in the 11 months under review than in the previous fiscal year, and the average value per order was 20 per cent. larger than in the previous year. A slightly greater proportion of orders called for payment on shipment in 1909 than in 1908, and 69.1 per cent. of orders specified 30 days in 1909, as compared with 68 per cent. calling for payment within 30 days in 1908.

The balance sheet shows cash on hand December 31, 1909, of $17,623,467, as compared with their cash on hand January 31, 1909, of $22,233,571. The company had accounts payable of $2,753,617 and dividends payable of $1,303,592, a total of $4,057,209. At the close of the previous fiscal year the company had accounts payable of $2,836,835. It will be noted that the company has changed the date of closing its fiscal year from January 31 to December 31, so as to comply with the requirements of the new corporation tax law. Therefore the dividends payable in January were not a current asset in 1908, because they had been paid before the balance sheet was drawn up, while they were a current asset in 1909, since the balance sheet was not drawn up before their payment. Subtracting these dividends due in January from the cash on hand December 31, 1909, the company had a working capital of well over $6,000,000, which would appear ample. Notes and accounts receivable amounted to $19,377,972 last year, as compared with $18,873,058 the year before. Merchandise inventories show assets of $25,150,036 at the end of 1909, as compared with $18,393,899 at the close of the previous fiscal year. In the inventory, active selling, finished and partly finished apparatus and supplies were valued at factory cost; inactive or slow selling apparatus and supplies at 50 per cent. of factory cost and obsolete apparatus and supplies at scrap value. In estimating the value of notes and accounts receivable, which were carried at a book value of $19,377,972 in 1909 and $18,873,058 the year before, a conservative reserve has been charged off from the face value of accounts and notes for depreciation. This reserve for depreciation charged off from the face value of notes to arrive at book value amounted to $1,840,000 in 1909 and $1,906,825 in 1908.

The fulness and frankness of the General Electric Company's annual reports and the conservatism with which inventories and valuations have been made has been commented on before in these columns. It is worth while, however to call attention again to this practice. In conservatism in making inventories and valuations the General Electric by no means stands alone, but in the fulness of information contained in its annual report it is an exception to most industrial companies, and we do not believe that this policy of frankness has given competitors information that has hurt the business.

Contributed Papers.

KEEPING RECORDS OF TEST TIES.

BY F. J. ANGIER.
Superintendent Timber Preservation, C., B. & Q.

In the *Railway Age Gazette* of March 17 I note the following comments in answer to questions propounded by the Tie Committee of the American Railway Engineering & Maintenance of Way Association:

"It is suggested that instead of dating nails, a certain number of test ties be put in, those of each kind and date being put at a certain mile post."

"Better results would be secured if statistics were kept on a few representative sections only."

"Section foremen's reports contain many errors; too much guess work is required, and the foreman does not keep the same position long enough."

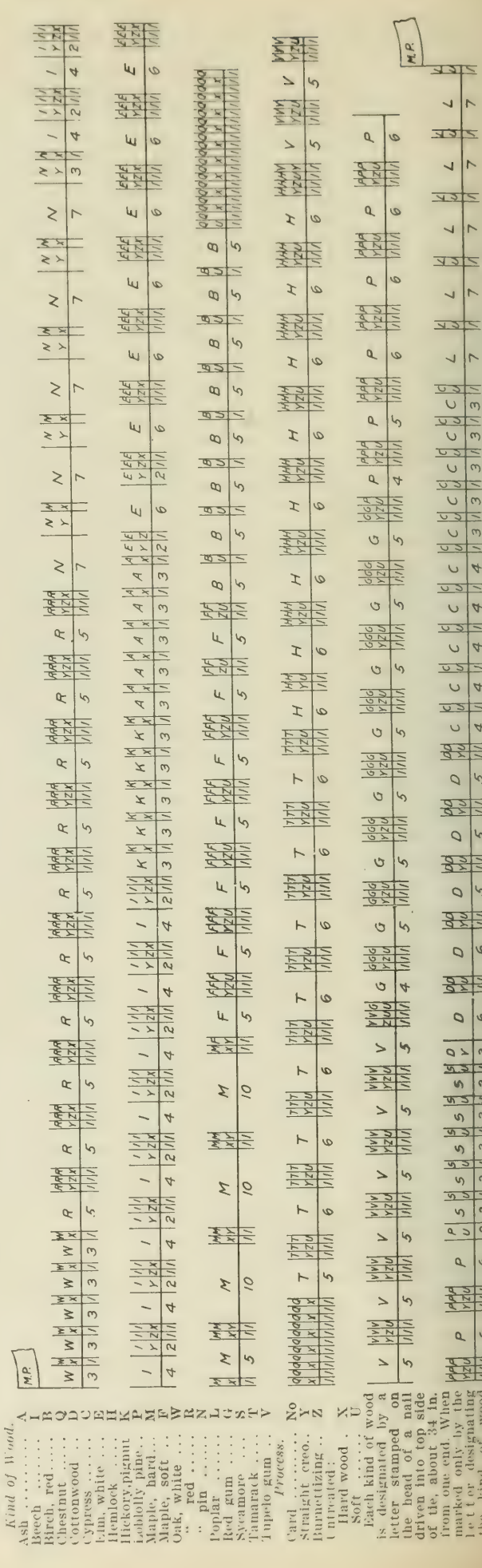
The Burlington has special test tracks on every division over its entire system, and has abandoned the dating nail, with the exception of these special tests. For ten years it was the practice on the Burlington, as it is now on many railways, to drive a dating nail in every treated tie. This nail was for the express purpose of enabling the management to keep a record of treated ties. Without the nail there would be no practical way of telling whether the tie was treated or untreated, or whether it had been treated one, two or more years before.

Treated ties are shipped to every section on the system. There are nearly 1,500 sections. Every section has a foreman in charge. To keep a record of the treated ties, every section foreman must report the number put in track and the number taken out of track. He must state in his report the year in which they were treated by examining the dating nail, and he must further state why they were removed from the track, whether because of decay, rail cut, burning or breakage. This record should be made each day that he puts in or takes out treated ties, and at the end of the month a full report of the month's work must be sent to the roadmaster for his approval, and then sent to the office where a permanent record is kept for the system.

Now for a correct and complete record we must depend on 1,500 section foremen to send in correct reports. We must assume that all of these men are competent to make these reports and understand just what is wanted, and that they are able correctly to decipher the figures on the heads of thousands of battered and rusty dating nails. No matter how many letters are written or how many sermons are preached, there will be thousands of ties placed in the track without dating nails in them, and thousands of *untreated* ties with dating nails which should not have been driven in them.

For argument's sake we will make the very broad assumption that there are some railways with a superior class of section foremen, and that the reports received at headquarters are absolutely correct. Under such circumstances what kind of a record do we have when every tie contains a dating nail? A tie is a tie, it matters not whether it is made of oak, pine, chestnut, maple, beech or any one of the twenty other species of wood. Your record then cannot show you which kind of wood is giving the longest life. There may possibly be some particular wood that is giving only one third or one-half the life of other treated wood, but how are you to know from the record? Your record shows that so many ties are taken out each year, some for decay, others for rail-cut, breakages, etc., but does your record say that gum ties are breaking in greater numbers than hickory, or that maple ties are being destroyed much more by rail cutting and spiking than beech or ash ties? These are the questions you want answered, and they never can be answered by the present method of putting a dating nail in every tie, and depending on the nail and the section foreman to give you a report.

After an experience of ten years with such a record, the



Burlington abandoned it and we now use the following method:

The Burlington system is divided into 19 divisions. On each division we have placed 1,000 special test ties, and other test ties will be put in from time to time as the management approves. A description of one of these test tracks will answer for all. One thousand ties were carefully treated and marked as shown in the the accompanying table:

Office Records, Experimental Ties.

Kind of wood.	Treated: Card process No. ties.	Mark.	Straight creosote No. ties.	Mark.	Burnettizing No. ties.	Mark.	Untreated No. ties.	Mark.	Total No. of ties.
Oak, white	15	W	..	....	..	....	5	W-X	20
" red	50	R	10	R-Y	10	R-Z	10	R-X	80
" pin	35	N	15	N-Y	..	....	5	N-X	55
Beech	40	I	20	I-Y	10	I-Z	10	I-X	80
Hickory, Pignut	15	K	..	....	..	....	5	K-X	20
Ash	15	A	..	....	..	....	5	A-X	20
Elm, white	42	E	10	E-Y	7	E-Z	8	E-X	67
Maple, hard	35	M	3	M-Y	..	....	5	M-X	43
Maple, soft	35	F	8	F-Y	7	F-Z	5	F-U	55
Birch, red	40	B	..	....	..	....	8	B-U	48
Chestnut	15	Q	..	....	..	....	15	Q-X	30
Tamarack	47	T	8	T-Y	8	T-Z	8	T-U	71
Hemlock	47	H	8	H-Y	7	H-Z	8	H-U	70
Tupelo gum	40	V	9	V-Y	7	V-Z	8	V-U	64
Red gum	39	G	8	G-Y	7	G-Z	9	G-U	63
Loblolly pine	45	P	7	P-Y	7	P-Z	10	P-U	69
Sycamore	15	S	..	....	..	....	5	S-U	20
Cottonwood	27	D	8	D-Y	..	....	5	D-U	40
Cypress	35	C	..	....	..	....	10	C-U	45
Poplar	35	L	..	....	..	....	5	L-U	40
Total	667		114		70		149		1,000

Explanation.—Each kind of wood is designated by a letter stamped on the head of a nail driven into the tie, on the top side about 34 ins. from one end.

Burnettizing process (or straight zinc chloride) is designated with the letter "Z" following the letter designating the kind of wood. For instance, "R-Z" means a red oak tie treated with zinc chloride only.

Straight creosote process is designated with the letter "Y" following the letter designating the kind of wood.

Card process (or a mixture of creosote and zinc chloride), has no letter, and a tie containing only the letter designating the kind of wood in addition to the dating nail "09" means that it has been treated with the card process.

Untreated ties are designated with the letters "X" and "U." "X" means that it is an untreated "hardwood" tie, and "U" an untreated "softwood" tie.

Notice that each kind of wood, as well as each kind of treatment, is designated with dating nails. A careful record is kept of every charge of ties treated and used in this test to show the details of the treatment as to seasoning, steaming, pressure, vacuum, etc., as well as the amount of preservatives injected. Whenever a tie is removed, it cannot be disposed of until permission is given from the timber treating department; its location in track is determined by the blue print record reproduced herewith.

There it will be noted that the ties are placed in one continuous stretch of track, and alternated with the different kinds of wood, and with the different methods of treatment and with untreated ties. This test need be made but once in ten years. The record will show not only the relative lives of treated and untreated ties but also the relative lives of the different kinds of wood and the different processes of treatment, not only from the standpoint of preservation, but also from a mechanical standpoint. It will show whether a cottonwood, a poplar or a pine tie will fail from rail or spike wear sooner than a birch, tamarack or hemlock, etc. Again, only 19 section foremen instead of 1,500 are required to look after these tests, and, being so few in number, a representative of the timber treating department inspects these test tracks each year, or oftener, as the case may require, and personally sees that these 19 foremen understand and are properly looking after these tests. The general manager, the general superintendent and the superintendent are all personally interested and have handed down explicit written instructions to all concerned. Suitable stakes with copper plates mark the beginning and ending of every test track.

Last, but not least, is the saving in dollars and cents effected by this method as compared with the method of dating every tie. To put a dating nail in every tie treated on the Burlington (about 2,300,000 per year) would cost in round numbers $8,000 a year for labor and material. In ten years this would amount to $80,000. To make the special tests, placing 5,000 ties on each division, once during ten years, would cost about $5,000. The saving in ten years would, therefore, be $75,000.

UNIT COAL AND THE COMPOSITION OF COAL ASH.

The Engineering Experiment Station of the University of Illinois has just issued Bulletin 37, which contains the results of investigations made by S. W. Parr, Professor of Applied Chemistry, and W. F. Wheeler, first assistant, Department of Chemistry. These investigations were made to obtain the properties and a more definite determination of actual or unit coal.

By unit coal is meant the organic material which is involved in combustion, as apart from the mineral constituents which, in their natural state, enter into the composition of all coals. From the experiments described in the bulletin, it appears that when similar cases are compared, the variations in composition are chiefly in the extraneous matter; that for a given district, and more especially for a given mine, the value of the unit coal is practically constant. The heating value of the actual coal may vary considerably, but when the portion of the whole which is not coal is eliminated, the resulting material is of constant value.

Tables exhibit the thermal and chemical properties of coals, chiefly from Illinois, but also from other portions of the United States. Attention is called to the necessity of careful methods in determining the ash content. Certain districts, especially in Illinois, contain a peculiarity in the ash composition, heretofore overlooked, viz., the existence of calcium carbonate in sufficient quantity to make it advisable to modify the usual ash determination to account for this constituent, which may occasionally be met to the extent of 5 or 6 per cent. of the total weight of the coal.

The conclusions of these investigations are summed up on one page of the bulletin as follows:

1. The actual or unit coal of a given deposit or region is remarkably uniform in composition, as shown by the constancy of heat values, when calculated to such unit substance.

2. The true percentage content of the actual or unit coal hinges upon the correct determination of the inorganic constituents of the coal. The present methods of analysis fail to take account of such constituents as the hydration of the shaley or clayey portions of the ash or the carbon dioxide content of earthy carbonates. The presence of chlorine compounds may sometimes be sufficient in amount to require consideration and estimation.

3. Coal with an ash of unknown composition should be examined for carbonates and chlorides. If the combined amount of these constituents approximates 0.5 per cent., the ash determination should be made at a temperature sufficiently high for their complete elimination, and a correction made for the ash value thus obtained by adding the amount of CO_2 and Cl found.

4. Apart from the corrections which may be called for on account of the presence of CO_2 or Cl, a factor for hydration is necessary, amounting to 8 per cent. of the ash as determined, minus the ferric oxide resulting from the decomposition of the iron pyrites.

5. The assembling of the corrections indicated may be embodied in a simple formula, easy of application, and under two headings as follows:

For coals free from carbonates and chlorides

$$\text{Unit B.t.u.} = \frac{\text{Indicated Dry B.t.u.} - 5{,}000\ S}{1.00 - (1.08\ \text{Ash} + 22/40\ S.)}$$

For coals with carbonates and chlorides

$$\text{Unit B.t.u.} = \frac{\text{Indicated Dry B.t.u.} - 5{,}000\ S}{1.00 - [(\text{Ash at high temp.} + CO_2 + Cl)\ 1.08 + 22/40\ S.]}$$

Copies of this bulletin may be obtained gratis by addressing W. F. M. Goss, Director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

REST HOUSE FOR SECTION MEN.

The rest house for section men shown in the accompanying photograph, as well as a spring house of similar design, were built last fall just south of Eltonburg, Pa., on the Pennsylvania Railroad. The greater part of the work of constructing them was done by a foreman and rodman. The slabs for the work were given to the company by a lumberman near Eltonburg, and the posts were cut in the woods near the spring house. The foreman, C. V. Jaeger, and the rodman, Palmer, spent three full Sundays on the work, and a foreman of carpenters, Gorman, spent one Sunday. No charge was made for the time which these men put on the work. The watch box was originally a standard box, and was in need of repair.



Rest House for Section Men; Pennsylvania Railroad.

The supervisor, J. W. Keenan, decided to repair the building at the least possible expense by covering it with slabs, thus making it ornamental as well as useful. He made a working sketch for his foreman and sent the latter and a rodman to visit several bungalow sheds in the neighborhood. They worked the details out as the building progressed, and the photograph shows the results. It is intended that the bungalow shall be used as a watch box and as a place for trackmen to eat their lunch during severe weather. The shelter over the spring house was erected from material left over from the watch box. Its purpose, of course, is to keep leaves from falling into the spring, as this spring is an excellent one and strong in all seasons of the year. The total cost of the material in the two buildings was $7.85.

FOREIGN RAILWAY NOTES.

There has been published in the *Chinese Official Gazette* a description of a proposed railway to be built from Haichau, in the province of Kiangsu, to Chinese Turkestan. It is estimated that the road will cost about $10,500,000. It is proposed to develop the port of Haichau, which lies on the seacoast about half way between Chesio and Shanghai. The road will extend westward through the Yellow River valley.

Senator Knox, in his recent note to the powers proposing the neutralization of the Manchurian railways, announced that a syndicate of Americans and Englishmen had obtained from China a concession for the construction of a railway from Aigun, in Northern Manchuria, to Chin-Gow, and that the governments of the United States and Great Britain intended to support the enterprise diplomatically. This announcement brought from Russia an expression of disapproval of the undertaking, on the ground that the route proposed would be open to strategic objections in case of war. Russia also protested to China against the concession, alleging that China had agreed that only Russian capital should be employed in the building of railways north of Peking in case the railways were not financed by the Chinese themselves. China replied that the agreement cited had been abrogated by Russia's failure to protect China from Japan as promised. As far as known Russia has not withdrawn her objections.

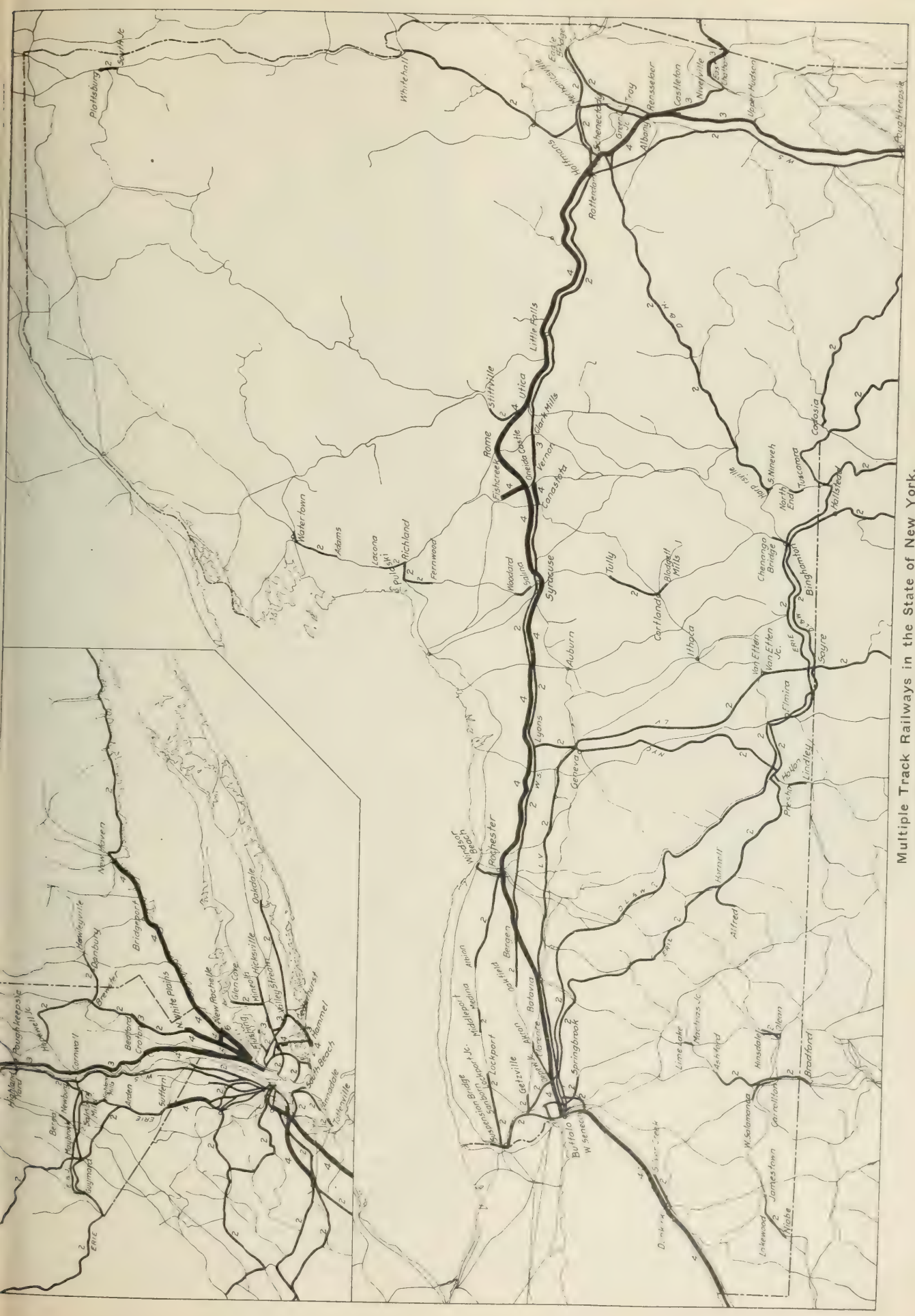
MULTIPLE TRACK RAILWAYS IN NEW YORK STATE.

Following the maps of double-track railways in the New England States, printed in previous issues, we give herewith a similar map of the state of New York, in which there are long stretches of three-track as well as four-track line, and one short piece of road with five tracks. In the list given below the approximate mileage is given for those sections of considerable length. On the New York Central, between Albany and New York, both on the east side and on the west side of the Hudson river, the changes from two-track to three-track occur so frequently and are so subject to further changes by additions of new track that we have not attempted to indicate the sections graphically. The principal termini of these sections are shown in the table. The Harlem division of this road, which is shown with two or more main tracks as far north as Brewster, is undergoing reconstruction at the present time. The four-tracking has been entirely completed only as far as Wakefield, 12 miles from the Grand Central Terminal. The southern end of the Putnam division of the Central is obliterated by the five-track line of the Hudson division, by reason of the necessarily small scale of the map. The Putnam division is double track from One Hundred and Fifty-fifth street, New York, northward to the junction with the Yonkers branch of that division, and thence over the branch to the terminus in Yonkers.

In and around Buffalo there are numerous sections of two-track line which could not be clearly shown on the map because of the small scale.

NEW YORK STATE.

	No. tracks.	Approx. miles.
Boston & Maine.		
Eagle Bridge to Troy	2	21
Eagle Bridge to Rotterdam Junction	2	42
Central New England.		
Poughkeepsie Jctn to w. end Highland Yd	2	3
Berea to Maybrook	2	3
Delaware, Lackawanna & Western.		
Buffalo to Hallstead, Pa.	2	217
Binghamton to Chenango Bridge	2	11
Blodgetts Mills to Tully	2	16
Delaware & Hudson.		
Plattsburg to South Junction	2	5
Whitehall to Albany	2	78
Green Island Junction to Troy	2	2
Mechanicsville to Harpursville	2	126
Nineveh to South Nineveh	2	1
North end to Tuscarora	2	3
Lake Shore & Michigan Southern.		
Buffalo to West Seneca	2	5
West Seneca to Dunkirk	4	34
At Dunkirk	2	2
Dunkirk to State line	4	25
Lehigh Valley.		
Buffalo to Sayre, Pa.	2	177
Van Etten Junction to Van Etten	2	1
Depew Junction to Tonawanda Junction.	2	11
Tifft Farm to Harlem Avenue Junction..	2	..
Buffalo, Rochester & Pittsburgh.		
Buffalo to Buffalo Creek	2	2
Ashford to Bradford, Pa.	2	29
New York Central & H. R.		
Buffalo to Albany	4	301
Albany to Rensselaer	2	1
Rensselaer to Castleton	4	8
Castleton to Croton	2	100
Fishkill Landing to Chelsea	3	3
Camelot to Poughkeepsie	3	5
Staatsburgh to Rhinecliff	3	5
Barrytown to Tivoli	3	4
Linlithgo to Greendale	3	2
Stockport to Newton Hook	3	3
Croton to New York City	4	34
155th street to Yonkers	2	8
New York to Wakefield	4	12
Wakefield to Brewster	4	39


Plattsburg
South Ad
Whitehall
Fort Edward
Fort Miller
Schuylerville
Mechanicville
Schenectady
Green Is.
Troy
Albany
Rensselaer
Castleton
Rhinecliff
Poughkeepsie
Upper Hudson
Rotterdam Jct.
Shortsville
Little Falls
Utica
Rome
Oneida Castle
Clark Mills
Vernon
Canastota
Fisher's
Water town
Adams
Lacona
Pulaski
Richland
Fernwood
Woodard
Salina
Syracuse
Tully
Carland
Bloddell Mills
Auburn
Ithaca
Van Etten
Van Etten Jct.
Erie
Chenango Bridge
Binghamton
Sayre
Elmira
Corning
Addison
Lindley
Painted Post
Hornell
Alfred
Lyons
Geneva
Rochester
Windsor Beach
Batavia
Attica
Middleport
Medina
Albion
Ashfield
Bergen
Lockport
Mansion Bridge
Gelzville
Florence
Springbrook
Buffalo
W. Seneca
Lime Lake
Machias Jct.
Ashford
Hinsdale
Olean
Broadford
W. Salamanca
Carrollton
Jamestown
Niabe
Lakewood
Dunkirk
Silver Creek
Coposia
Tuscarora
North End
Hollsteads
S. Nineveh
Oswego
New Haven
Bridgeport
Hawleyville
Danbury
Brookfield
Bedford
Cornwall
Maybrook
Poughkeepsie
Highland Falls
Beacon
Newburgh
Montgomery
Campbell Hall
Salisbury Mills
Arden
Sutherland
White Plains
New Rochelle
Glen Cove
Flushing
Mineola
Hicksville
Oakdale
Valley Stream
Far Rockaway
Rockaway Beach
Hammel
South Beach
Islip
Patchogue
Bellport
Greenport
Riverhead
Jamesport
Cutchogue
Southold
Mattituck
Orient Point
Shelter Island
Sag Harbor
Montauk
Amagansett
East Hampton
Bridgehampton
Sagaponack
Southampton
Speonk
Westhampton
Quogue
Eastport
Manorville
Riverside
Calverton
Wading River
Miller Place
Port Jefferson
Northport
Huntington
Greenlawn
Babylon
Amityville
Freeport
Hempstead
Jamaica
Long Island City
Flushing
Whitestone
Bayside
College Point
Great Neck
Manhasset
Port Washington
Roslyn
Glen Cove
Locust Valley
Oyster Bay
Glen Head
Glenwood
Syosset
Woodbury
Jericho
Hicksville
Westbury
Carle Place
Mineola
Garden City
Hempstead
Valley Stream
Lynbrook
Rockville Centre
Freeport
Baldwin
Merrick
Wantagh
Seaford
Massapequa
Amityville
Babylon
Bay Shore
Islip
Sayville
Oakdale
Great River
Central Islip
Hauppauge
Smithtown
St. James
Port Jefferson
Northport
Huntington
Greenlawn
Cold Spring Harbor
Lloyd Harbor
Huntington
Centerport
Northport
Kings Park
Smithtown
St. James
Port Jefferson
Setauket
Stony Brook
Port Jefferson
Wading River
Riverhead
Calverton
Manorville
Riverside
Eastport
Speonk
Westhampton
Quogue
Southampton
Sagaponack
Bridgehampton
East Hampton
Amagansett
Montauk
Sag Harbor
Shelter Island
Orient Point
Greenport
Southold
Cutchogue
Jamesport
Mattituck
Riverhead
Wading River
Miller Place
Port Jefferson
Setauket
Stony Brook
Smithtown
St. James
Kings Park
Northport
Huntington
Greenlawn
Cold Spring Harbor
Lloyd Harbor
Centerport
Northport
Huntington
Greenlawn
Babylon
Amityville
Freeport
Baldwin
Merrick
Wantagh
Seaford
Massapequa
Amityville
Babylon
Bay Shore
Islip
Sayville
Oakdale
Great River
Central Islip
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Port Jefferson
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St. James
Port Jefferson
Setauket
Stony Brook
Port Jefferson
Wading River
Riverhead
Calverton
Manorville
Riverside
Eastport
Speonk
Westhampton
Quogue
Southampton
Sagaponack
Bridgehampton
East Hampton
Amagansett
Montauk
Sag Harbor
Shelter Island
Orient Point
Greenport
Southold
Cutchogue
Jamesport
Mattituck
Riverhead
Wading River
Miller Place
Port Jefferson
Setauket
Stony Brook
Smithtown
St. James
Kings Park

	No. tracks.	Approx. miles.
Troy to Rensselaer	2	7
Hoffman's to Rotterdam Junction	2	4
Buffalo to Suspension Bridge	2	24
Tonawanda to Getzville	2	5
Rochester Junction to Windsor Beach	2	10
Lyons to Hollon	2	75
Fresho to Lindley	2	4
Mount Kisco to Bedford	3	3
Spuyten Duyvil to Yonkers	3	4
Suspension Bridge to Lockport	2	19
Middleport to Medina	2	4
Albion to Rochester	2	31
Richland to Pulaski	2	4
Woodard to Salina	2	5
South Schenectady to Carman	2	4
Utica to Stittville	2	10
Watertown to Adams	2	14
Lacona to Richland	2	6
Pulasko to Fernwood	2	4
West Shore (N. Y. C. & H. R.)		
Tappan to West Nyack	2	4
West Nyack to Haverstraw	3	8
Haverstraw to Stony Point	2	3
Stony Point to Tompkins Cove	3	2
Tompkins Cove to Jones' Point	2	2
Jones' Point to Iona Island	3	2
Iona Island to Fort Montgomery	2	2
Fort Montgomery to Highland Falls.	3	4
Highland Falls to Esopus	2	34
Esopus to Ulster Park	3	2
Ulster Park to Lake Katrine	2	10
Lake Katrine to Mount Marion	3	3
Mount Marion to Saugerties	2	3
Saugerties to West Camp	3	4
West Camp to Catskill	2	7
Catskill to West Athens	3	5
West Athens to Clark's Mills	2	124
Clark's Mills to Vernon.	3	9
Vernon to Oneida Castle	2	5
Oneida Castle to Canastota	4	6
Canastota to Oakfield	2	137
Akron to Depew Junction	2	11
Boston & Albany.		
Rensselaer to Niverville	3	15
Niverville to East Chatham	2	14
East Chatham to State line	3	9
Hudson to Upper Hudson	2	1
New York, Chicago & St. Louis		
Silver Creek to Dunkirk	2	9
New York, New Haven & Hartford.		
Woodlawn to Cannecticut line	4	14
Harlem River to New Rochelle	6	12
Hopewell Junction to Danbury, Conn.	2	34
New York, Ontario & Western.		
Cadosia to Cornwall	2	108
Pennsylvania.		
Buffalo to Springbrook	2	11
Lime Lake to Machias Junction	2	2
Hinsdale to Olean	2	7
Staten Island R. T. Co.		
Cranford Junction, N. J., to South Beach	2	12
Clifton to Annadale	2	8
Pleasant Plains to Tottenville	2	2
Erie.		
Suffern to Buffalo	2	393
Newburgh to Salisbury Mills.	2	9
Hornell to Alfred	2	9
Hinsdale to Olean	2	5
Carrolton Junction to W. Salamanca	2	8
Waterboro to Lakewood	2	14
East Buffalo to International Junction	2	4
International Junction to Int. Bridge	2	..
N. J. state line to Sparkill	2	2
Highland Mills to Guymard Junct'n, N.Y.	2	42
Arden Junction to Vail Gate, N. Y.	2	..
Lakewood to Niobe, N. Y.	2	9
Bergen to Fish Creek, N. J.	4	..
Long Island.		
Long Island City to Holban	2	..
Holban to Floral Park	3	..
Floral Park to Hicksville	2	10
Long Island City to Springfield	2	13
Springfield to Valley Stream	3	3
Valley Stream to Oakdale	2	31
Woodside Junction to Flushing	2	5
At Bayside	2	..
Mineola to Glen Cove	2	9
Hammell to Cedarhurst	3	3
Cedarhurst to Valley Stream	2	3
Flatbush Avenue to Railroad Avenue	2	4
Railroad Avenue to Woodhaven Junction	4	3
Woodhaven Junction to Jamaica	2	2
Fresh Pond Junction to Manhattan Beach	2	..
Bay Ridge to Manhattan Beach Junction	2	..
Glendale Junction to Ozone Park	2	..
Ozone Park to Ramblersville	4	..
Ramblersville to Sea Side	2	..
Sea Side to Rockaway Park	4	..

[1] Except as noted in next six lines.

SIDE TRACK AGREEMENTS.

BY LUIS JACKSON,
Industrial Commissioner, Erie Railroad.

Side track agreements are frequently the cause of some friction when first presented to shippers who are negotiating with the railway for a side track connection. The clauses of the railway company's agreement seem arbitrary to the shipper. Having had about twenty years' experience in arranging for side track connections with manufacturing plants, I give my views on the clauses of the agreement.

They were doubtless well thought out by the railway officials of an earlier date, but the reasons for the creation of these clauses have been lost sight of by many of the present day officials, as I frequently find that they inadequately explain to the shipper the reasons for the clauses. Furthermore, the shipper sometimes consults his lawyer, who makes a protest, but when the matter is fully explained the protest is withdrawn. This has been my experience in numbers of cases. There is railway law, admiralty law, insurance law, etc., all with their various intricacies, and a general lawyer, like a general medical practitioner, thinks he understands all cases. When the agreement is referred to a lawyer or a layman, who has not given previous thought to, or had experience with, the subject, his first view is that the agreement is somewhat one-sided. Similarly in proposed new railway laws the statement, "All rates shall be equal," immediately appeals to the general public as highly just, whereas it is most unjust until the clause is amended to read, "All rates shall be equal under similar circumstances and conditions."

The first principle in relation to a side track agreement is that the railway is not a common carrier when it is operating on a private side track. When it leaves its own rails to go on a private side track it is giving a service not covered by the regular freight rate. If the rate from one station to another be 25 cents per 100 lbs., the road gets that rate whether the shipper loads the freight in cars on a private side track or takes it to the station. The argument that when the shipper has a private side track the railway benefits in receiving the goods in carload lots without handling will not apply, because the benefit is not only to the railway but to the shipper as well. When the shipper carts his goods to the station it costs him, for team hire, an average of $1 a ton, and it costs the railway about 25 cents per ton for platform handling. Therefore, the side track saves the shipper and the railway, between them, an average of $1.25 per ton. The manufacturer who has no side track is at a disadvantage compared with the manufacturer who has, the difference being an average of $1 per ton, or 5 cents per 100 lbs., for cartage. In the eastern states and in large cities many manufacturing plants have grown from small beginnings. When they were first started a side track was never considered, and even after they expanded it was thought that as the goods manufactured were light a side track was not essential, so many plants have no side track facilities, while their competitors have.

The clause in the track agreement on height and width for clearance is generally acceded to, but the fire and personal injury clauses are the ones which raise most objection. The railway company's side track agreement stipulates that the road shall be held harmless by the shipper from fire or personal injury while operating on the track of the shipper, whether through the railway's negligence or not (wilful negligence excluded). Notwithstanding all the precautions that may be taken there is a risk of fire at the factory from locomotive sparks. Furthermore, the railway company has no police powers on private ground, and the shipper's employees may carelessly leave around cotton waste or other inflammable material which the locomotive might set on fire. An employee of the shipper may recklessly cross or lie down on the tracks, or do something which a trained railway employee will not do. The railway stipulates that it must be held harmless from personal injury risks. In operating on a private side track it takes care of its own men and its own equipment, and the shipper must take care of his. The railway's freight rate is from the nearby station. In going on the shipper's ground it is giving an extra service. It cannot, besides this, be expected to insure him. If the shipper operates on his side track with his own locomotive it is clear to him that he is taking some additional risk, and he says to his

insurance company, "I am operating an engine on my grounds and this must be covered in the fire insurance policy." Fires are mostly accidental or caused through negligence, and the insurance company covers him, whether or not the fire be caused through the negligence of his engineer. The same principle applies to employer's liability policies. The shipper must invariably protect himself by having a clause in his policies stating that he has his own railway on the ground, or that he has on the ground a side track operated by a railway company. The shipper must see to it that he is insured. Some insurance companies charge a slight additional premium on the policy when there is a track on the ground. Such a charge, however, is usually insignificant, and in most cases there is no extra charge. Even if the shipper operates on his track with his own locomotive it is essential that he sign the side track agreement, as experience proves that the one or two locomotives of a shipper are crippled at times and the railway has to be called on to help out.

If a railway received $50,000 gross freight a year from a manufacturing plant costing $1,000,000, and its locomotive set fire to and entirely destroyed the plant, the loss falls on the owner of the plant. If the railways were held responsible it would take about a hundred years of $50,000 gross freight a year to pay for $1,000,000 net loss. If the railway did not exempt itself from these fire and personal injury risks, it would have to take out regular insurance policies on every manufacturing plant with which it had a side track connection, thereby duplicating the insurance already taken out by the manufacturer. As the big lines each have several thousand manufacturing plants with side tracks, this extra insurance outlay on the part of the railways would amount to millions and necessitate a raise in freight rates to cover the item. The shipper who had no side track would have to pay this extra freight rate for the benefit of his competitor, who not only had the advantage of a side track but was getting insured besides.

When railway officials present side track application forms or agreements they should explain some of the clauses a little to the shipper. It is impossible to write a track agreement in legal form so that it will be smooth and pleasing to the shipper. It must and does state in unmistakable language exactly what is meant.

FAIR RETURN ON THE VALUE OF PROPERTY A FALLACIOUS STANDARD.*

The changing of rates under the power vested in the Interstate Commerce Commission is a continuing process. It is a process that goes on day by day, and every rate that is changed tends to call for a change in some other rate. The more precedents the commission establishes in that direction the more it is going to be bound and influenced by those precedents in the future. A notion which has a great deal of support in magazine articles and considerable support among prominent members of Congress and others in public life is that railway rates ought to be so reduced from time to time as that no more than a fair return shall be earned upon the property of the railway company as a whole. It is assumed by these gentlemen that the Supreme Court of the United States has established that doctrine. That is entirely incorrect. The Supreme Court has never decided any such standard for making rates and has never even considered the question. All the Supreme Court has ever decided upon this subject is that *one* rule by which to determine whether rates fixed by legislative authority are so low as to deprive a railway company of its property without due process of law, is that if under those rates the company would earn less than a fair return upon the fair value of its property, then those rates are unconstitutional because too low. That is as far as the Supreme Court has gone. It has dealt solely with the question as to whether these rates were so low as to be unconstitutional. It will be entirely consistent for the Supreme Court to hold in a proper case and upon a proper showing that regardless of the question of a fair return it is unconstitutional to deprive a railway company of the right to charge a rate that is reasonable for a specific service. When the Supreme Court comes to consider the legality of rates fixed by the Interstate Commerce Commission under the Interstate Commerce Act the court will have the right to pass upon a new question, which it has never had occasion to pass upon with respect to the rates which have been before it in the past. All those rates in the past have been rates fixed by state authority, and when the Supreme Court is considering rates fixed by state authority the court, generally speaking, cannot consider at all anything but the question whether those rates violate the Constitution of the United States. The court does not ordinarily consider whether the rates fixed by a state commission conform to the statutes of the state. That is not a federal question. But when it comes to considering the question whether rates of the Interstate Commerce Commission are lawful, then the question whether those rates conform to the Interstate Commerce Act is just as much a federal question as the question whether they conform to the Constitution of the United States. . . . The court, regardless of the question of fair return, will have the right to decide upon the fair value of the service—to decide upon the reasonableness of the rate as a fair compensation for a specific service performed.

And the commission when it deals with the rates of the railway company has absolutely no warrant for any assumption that it has the right to correct rates upon the theory that it may reduce them simply because upon the business as a whole the returns are more than what the commission regards as a fair return upon what it regards as the fair value. The commission's duty is to consider whether specific rates are just and reasonable, and if unreasonable to fix others which are just and reasonable. It is its duty to consider from a commercial standpoint the fair value of the service rendered and the question of reasonableness of the rate for that specific service.

It is essentially unjust to declare that a railway company has no right to earn more than a fair return, fixed by public authority, upon the fair value of the railway as fixed by public authority. When that assertion is made sight is entirely lost of the proposition that that leaves a railway company to take care absolutely of all the risks of years of depression when it is impossible for it to earn a fair return. Therefore averaging the bad years when it is impossible for it to earn an adequate return wth the good years when it is not allowed to earn more than a fair return, it follows as a mathematical certainty that the general average of railway earnings of this country upon that theory never could equal a fair return.

The division of regulation in this country into state regulation and federal regulation introduces still another element of injustice. If the fair return theory is correct, then it follows that the railways must not earn more than a fair return on their state business in any state and must not earn more than a fair return on their interstate business The question of reurn is thus split up among numerous subdivisions of the traffic A company which cannot make as much as a fair return with respect to any of these subdivisions of its traffic would not be permitted to recoup itself out of any other subdivision of the traffic, because it would be separately accountable to the federal government and to each state government and would be held down to the so-called fair return by each. In other words, our theory of railway regulation in this country multiplies the possibilities and probabilities of forcing the average return of the railways to a point far below a fair return on the property as a whole if each jurisdiction acting separately is to keep the railway within the fair return as a maximum for the business subject to that jurisdiction.

Another striking peculiarity about this standard, from

*From an address before the Traffic Club of Pittsburgh, March 18, by Walker D. Hines, acting Chairman of the Executive Committee of the Atchison, Topeka & Santa Fe.

which its advocates can never escape, is that they make the rates dependent upon the value, while at the same time the value is necessarily dependent to a substantial extent upon the rates. The more they cut down the rates the more they reduce the value, and the more the value is reduced the more the rates can be reduced in the future. So that the rule would work in a circle, always favoring reductions in railway rates.

Any such rule, as applied to railway rates, is utterly impracticable. This fair return theory necessarily attaches itself to the fair value of each separate railway. But each railway has its own value, influenced by its own conditions, which are perhaps very different from the conditions of other railways. Railway rates, however, can not be made a separate proposition for separate railways because the rates are established by competition between the railways. The theory overlooks the fact that rates can not be peculiar to each separate railway, but must be adjusted with a view to competition between all the railways. So the impracticability from that standpoint is manifest.

Take an aggregate return upon all the traffic of a railway company and it is beyond the bounds of human power to apportion that return upon any basis of cost of service or cost plus profit among the many thousands of articles which are transported, so that rule breaks down absolutely when you come to apply it to specific instances, and the only way to make rates is to make them for specific traffic. This rule is asserted as a rule for controlling rates, and yet it is a rule which cannot possibly be applied to any one specific case.

Assume that some tribunal should say that, as a whole, a railway company was making $1,000,000 too much and should set about reducing the rates so as to reduce the total return to that extent. You would have several thousand different rates, and the effort to cut down each rate so as to get rid of that supposed unlawful revenue would be a thing that could not be accomplished. A horizontal reduction on those rates would be the mathematical way to do it, and yet that would not accomplish it. It might stimulate traffic in some directions and reestablish the same supposed unlawful returns that existed before. And again a horizontal reduction would make such an insignificant change in all rates as to have no practical bearing upon commercial conditions, and yet as to have a very serious bearing on the railway revenues as a whole.

When these theorists assume that the railway must not have more than what they call a fair return upon the fair value of its property, they necessarily assume that the railway investment is a complete thing like an investment in so many bonds. But no railway investment is ever complete. The railway is a growing proposition all the time. It is bound to grow to meet the necessities of increasing traffic, and, more than that, it is bound to expend more money in improvements and in betterments and in extensions in order to adapt itself to the changing conditions of society. The nice, comfortable theory of the magazine writers entirely loses sight of that actual necessity of the situation. Where does that money come from that the railways have to add to and to put into their properties year after year? . . . A prominent railway company in the last three years, all the time paying regular dividends on its common stock, paid out $16,000,000 in dividends on its common stock, but applied over $20,000,000 out of its so-called net earnings to improvements of the property. Such expenditures inure immediately to the benefit of the public in improved service, but not to the benefit of the stockholders at all except as in the future they may be reflected in increased earnings.

I do not mean to imply that railway rates in the aggregate exceed what can properly be regarded as a fair return upon the present fair value of the property. On the contrary, the investments in railways are so enormous and the cost of operating railways so stupendous and railway rates are relatively so low that returns from railways are strikingly inadequate as compared with returns in other lines of business. . . . The true policy in this matter is that inasmuch as the railways in this country are built by private capital and must be operated at the risk of private capital, they ought to be allowed to make their rates, so long as those rates are not so high as to be unreasonable and oppressive. That is a negative rule which can be applied and enforced in view of commercial considerations. You do not have to compute these elaborate calculations in order to determine whether or not a given industry or shipper is oppressed by railway extortion. That is a thing which can be determined by the application of common sense to the surrounding commercial conditions. It has been in the past and can be in the future.

REFORMED PASSENGER TARIFFS IN ITALY.

BY PH. TAJANIE.
Engineer of the State Railways and Associate Professor at the Royal Polytechnic of Milan.

Italy is indebted to state management for a complete reform of passenger tariffs; and the new tariffs, based on a study of those previously adopted in other countries, have proved successful.

The tariff which was in force on the Italian railways in 1905, when the state began the operation of the lines, was among the highest in Europe, and the rates increased in proportion to the length of the journey so that they were really prohibitive for very long ones. Return trip and other common reduced rate forms were in use, but their field of application was very limited and there was very little travel. The rates in different countries on the Continent compared as follows:

Table A.—*Comparison of the Prices of Trips in the Different Countries of Continental Europe.*

(Prices are in centimes per kilometer.)

	Class 1.	Class 2.	Class 3.
Italy:			
For express trains	12.76	8.93	5.80
For local trains	11.60	8.12	5.80
France:			
For express and local trains	11.20	7.56	4.93
Switzerland:			
For express and local trains	10.40	7.30	5.20
Austria:			
For express and local trains	7.95	4.77	2.65
Germany:			
For express and local trains	8.75	5.62	3.75*

*Tax not included.

The number of trips in relation to the population was much smaller in Italy than in other countries, in spite of the fact that in certain seasons the country is over-run with tourists. The following figures taken from the statistics of 1900 are cited to show the relation between the number of travelers and the population of different countries of Europe:

	Rides for 100 inhabitants.		Rides for 100 inhabitants.
England	2,282	France	796
Switzerland	1,259	Austria	355
Belgium	1,426	Italy	171
Germany	978		

Not only is the travel small, but long-distance travel is still less. Out of 100 travelers on our railways in 1903

70.46 went a distance of ..... 25 kilometers.
27.69 " " " " ..... 25 to 300 Km.
1.70 " " " " ..... 300 to 600 Km.

and only

0.15 " " " " ..... 600 kilometers.

It is true that the long journeys are often divided into stopping places, but there is no doubt that our tariff was out of proportion to the incomes of the great majority of the inhabitants. Besides this, it should be considered that the elongated form of our peninsula is accountable for the great distance between the northern and southern parts, which for economic and social reasons should be brought into closer relationship. Whatever have been the efforts which have been made since the time of the political unification between the northern provinces, with their numerous industries, and the southern provinces, which are exclusively given over to agriculture, there has always existed a disparity in their economic condition, which the government has tried to eliminate to the interest of all. One of the best ways of attaining such an end is that of encouraging the transportation of produce from

end to end of the peninsula, as well as the multiplication of personal relations between the inhabitants of the North and those of the South.

The short-distance traffic was not considered of much importance on its own account. Efforts have been repeatedly made to increase it, but they have amounted to nothing. The increase of the number of trains, stopping local trains between stations to accommodate the small, out-of-the-way towns unprovided with stations, allowing peasants going to the markets to transport their products as baggage, was not sufficient to develop the traffic of the towns and suburbs. Rural car lines, which in Italy are widely diffused, are able to make the cost of travel very small, not only on account of reduced cost of improvements, but also because they are exempt from the tax of 16 per cent. which is paid on railway tickets.

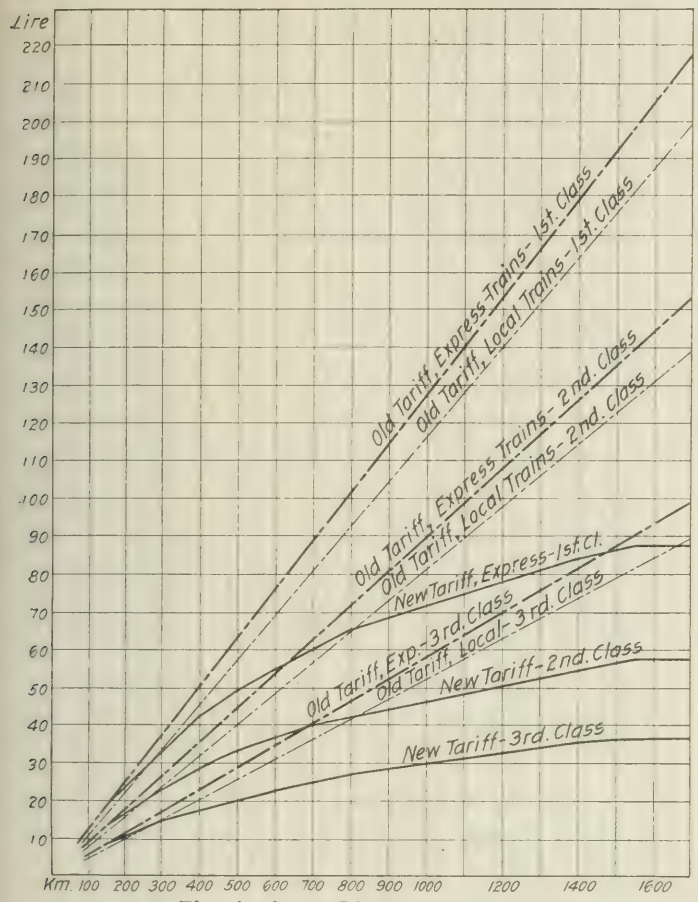


Fig. 1—Long Distance Tariff.

On the other hand, appreciable results have been obtained by the adoption of an "economical management" system, consisting of the application—following the example of the great French lines—of appropriate methods on the subsidiary lines forming part of the main system. The idea was to reduce the expenses and increase the number of trains. The expense of management was not successfully reduced, but the tariff was reduced and there followed such an increase in traffic that the reform became very profitable on many of the lines. The reduction had no very marked effects, however, on the longer lines. Extraordinary results were obtained when, with the reduction of the tariff, electric traction was adopted with increased frequency of trains.

On the line between Milan and Varese, equipped with the third-rail electric system, which runs through a zone rich in industries and terminates at Milan, a mixed electric and steam traction service was introduced and trains were run consisting of a greater number of cars than could possibly be drawn by steam locomotives.

Various experiments made led us to think that a new tariff reform would have to be made for all the lines, but in a rather limited radius, for, as we have seen, a reduction has scarcely any effect in stimulating travel beyond a certain limit.

Little by little, the problem relative to the reform of passenger tariff was taken up, and finally the arrangements for long distance and short distance journeys were considered separately.

One of the noticeable faults in our method was the inadequate service of the local trains in comparison with the express trains. A remedy was tried in changing over a number of local trains into express trains (which was also made necessary on account of the increased traffic) but besides this, it was deemed imperative to make such a decided difference in the tariff, as to induce many people to prefer local trains as a matter of expense.

For local trains, first-class passage remained almost entirely unused, and it was thought best to abolish it, but for reasons of policy the second class was ostensibly abolished, while keeping the first and the third. But in truth, whatever were the inside fittings of the coaches, the price of this new first class corresponded to that of the original second class.

For long distances a changeable tariff, based on the Belgian plan, has been in force since November 1, 1905; this is shown by the curves in Fig. 1. For the first 150 km. the prices remain the same; above this distance they decrease, and at about 250 km. the new express rates become less than the old for local trains. From 270 km. on, the prices vary by increments

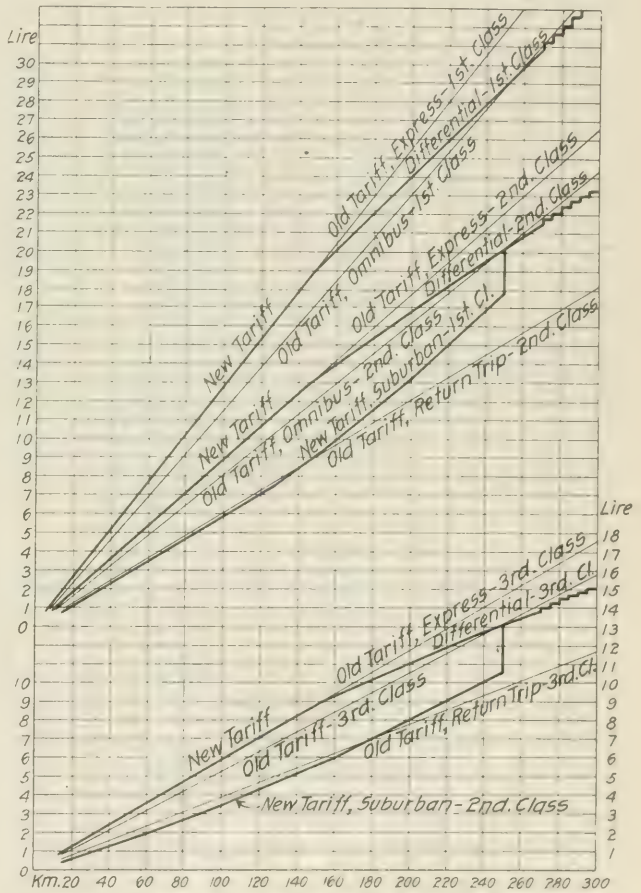


Fig. 2—Short-Distance and Suburban Tariff.

of 5 km. to a distance of 650 km. and from there on by increments of 10 km. From 1,550 km. the tariff remains constant; that is to say, it does not cost anything more, although the distance may become greater. A long trip in Italy costs only 87.50 lire for first class, 57.80 lire for second class, and 36.80 lire for third class. Thus for 1,550 km. (963 miles), or for any greater distance, the first class fare is only $16.89 (1 lira = 19.3 cents), or 1¾ cents a mile. The third class fare, 36.8 lire, amounts to only 7.3 mills per mile.

The importance of the reductions made is shown in Table B, containing examples of trips chosen at random from among those most frequently made between the more important towns, and from those which must be made in going from the extreme interior of the peninsula to the frontier stations. Counting 1 lira as 10 pence or 20 cents, the new rates in English and American money, per mile, are as shown in the lower part of the table, lines *a*, *b*, *c*, *d*, *e*, *f*, corresponding to the items in the upper part which are indicated by the same letters.

TABLE B.—*Typical Fares in Italy (In lire).*

Journeys.	Distances. Kilometrs.	Miles.	Old price. Class 1.	Class 2.	Class 3	Present price. Class 1.	Class 2.	Class 3.
A Turin-Rome ...	658	409	84.0	58.80	38.20	59.40	38.60	24.75
B Naples-Venice .	800	497	102.10	71.50	46.40	64.75	42.55	27.30
C Milan-Naples ..	884	549	112.80	78.0	51.30	67.80	44 70	28.55
D Modane-Brindisi	1,190	739	150.85	106.30	69.05	76.50	50.60	32.30
E Palermo-Iselle .	1,703	1,058	217.35	152.15	98.80	87.50	57.80	36.80
F Girgenti-Modane	1,788	1,111	221.80	155.25	100.85			
a Pence per mile						1.45	0 95	0.60
Cents per mile						2.90	1.90	1.21
b Pence per mile.						1.30	0.86	0.55
Cents per mile						2.60	1.72	1.10
c Pence per mile						1.23	0.81	0.52
Cents per mile						2.47	1.63	1.04
d Pence per mile						1.03	0 68	0.44
Cents per mile						2.07	1.37	0.87

e and *f* (see second paragraph above).

Naturally, such a tariff should not be available for a stop over and it was decided that between the two terminals of a trip the traveler should be allowed to go by but one way, the shortest.

This rule, which is perfectly logical, admits, however, of

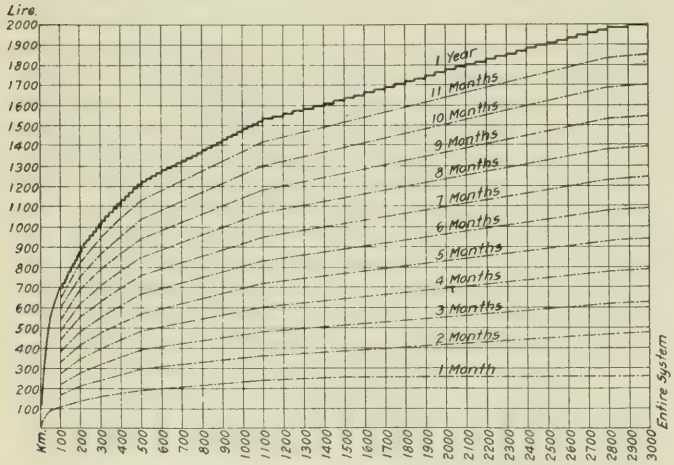


Fig. 3—Season Ticket Tariff, First Class.

two kinds of exceptions under the form of "choice of route" and "change of route." That is to say, in one case the traveler has the right to choose between two or more routes which run between the two extreme points of his journey, although the price is calculated upon going the most direct; in the other case a change from the route most direct to a longer one is permitted, in spite of the price, basing on actual distance.

It is known that similar tariffs exist in many other countries. Austria, Russia, Denmark and even Hungary have tariffs which are a good deal alike as we shall see. But practical difficulties were encountered in Italy, particularly with the great variety of ticket forms. Each station, however, was furnished with an information-board on which was indicated the shortest route between the station in question and each of the other stations on the line, and a schedule in which were listed the prices to the successive distances. It takes but two minutes to issue a ticket by consulting the board and the schedule. It is true that two minutes is too much time, but for the very frequent trips the tickets are already printed; and in spite of the reduction of the tariff, the long distance journeys will always constitute a small percentage of the total.

The differential tariff is not proof against abuse or illegitimate use of tickets. A continuous trip of 1,000 km. may be used for 500 km. by one traveler and for the remaining 500 km. by another. Such a mis-use of tickets cannot be carried out without a prearranged plan between those interested and the risk of losing a portion of the ticket price would certainly prevent a majority of travelers from trying to commit a fraud. Besides, this is treated as a misdemeanor to be severely punished; this has the effect of being a check, although it is very difficult, not to say impossible, to catch the culprits.

In spite of the existence of such a danger of fraud, it was decided to be liberal in the matter of the validity of the ticket and a day's run is fixed at 100 km.; that distance accomplished, a new 100 km. is commenced. Such a period terminates the day after the ticket is issued, and the validity of the ticket ends at midnight of the second day. The traveler is allowed to make one stop-over in 300 km.; two up to 600 km.; three up to 900 km.; four up to 1,000 km., and five stop-overs if longer than that. The length of the stops must altogether not exceed the time limit of the ticket.

In the first year of the application of the tariff there were favorable results. An excessive growth of long trips was not expected. The receipts the first year were one-half million lire, calculated net from the percentage increase which has been verified from year to year, as a phenomenon independent of the variations of the tariffs and resulting from the development of the traffic.

For the short distance travel it was thought necessary to make a very low tariff and covering, as before stated, only two classes, first and third, and not applicable to express trains.

The tariff for short distances was made on the principle of *increasing* the rate with the increase of distance. The diagram no longer takes the form of a convex curve, but a concave form, and the sum of the prices of two trips is *less* than the price of a trip equal in distance to the sum of the first two.

Figure 2 shows the old tariff and the two new tariffs; the rates for the longer distances serving for express trains and those for the short distances (suburban tariff) serving for local trains.

This second tariff has its field of application limited to 250 km., for the result of experience has shown that for more than this distance express trains, rather than local trains, are used, and will be provided with third class coaches.

In conclusion, up to 250 km., there will be a choice of traveling by express or by local, the former being in two classes, and the latter in three classes; but the travel in local trains will cost much less than in express, and this in a measure will result in freeing the express trains for the extraordinary mass of travelers found in the localities near large cities.

As can be seen from the diagram, the new tariff for the first class is less than the old second class.

In order that the reader may have a complete idea of the new tariff, we reproduce below a table in which are indicated all the prices from 10 to 250 km., and the different rates per kilometer, which increase instead of diminish, as in the case of the long distance tariff. The tax is included in the price.

TABLE C.—*Local Rates.*

Distance		Class 1. Fare, lire.	Centimes per kilomtr.	Cents per mile.*	Class 2. Fare, lire.	Centimes per kilomtr.	Cents per mile.*
Kilometers†	10.	0.50	5.0	1.61	0.25	2.5	0.80
	20.	1.05	5.5	1.77	0.55	3.0	0.97
	30.	1.65			0.85		
	40.	2.25			1.20		
	50.	2.85			1.55		
	60.	3.45	6.0	1.93	1.90	3.5	1.13
	70.	4.05			2.25		
	80.	4.65			2.60		
	90.	5.25			3.00		
	100.	5.85			3.40		
	110.	6.50			3.80	4.0	1.29
	120.	7.15			4.20		
	130.	7.80	6.5	2.09	4.60		
	140.	8.45			5.05	4.5	1.45
	150.	9.10			5.50		
	200.	13.35	8.5	2.74	8.00	5.0	1.61
	250.	17.85	9.0	2.90	10.50		

*To get the rate in pence per mile, divide by 2.

†10 kilometers equal 6.21 miles; 50 equals 37.07; 100 equals 62.14; 150 equals 93.21, and 250 equals 155.35.

Shop Section

There are indications that some foremen regard their own kinks and economical methods as a trade secret, of more value if kept to themselves than if published. The contrary is true. We have received letters from the general officers of 92 railway companies urging and encouraging us in this undertaking to educate foremen, and saying in various ways that they will recognize any of their men who make good suggestions in our shop edition. Five of them say that they will duplicate any prizes won by their men in our shop kink competitions. A much larger number ask us to especially call their attention to foremen who send us good suggestions. The foreman who thinks and devises ways of saving time has now a fine chance to improve his condition. The prize money is the smallest element in it.

We have been surprised and delighted at the results of the competition which closed on April 15. Eleven of the manuscripts on "How the Foreman Can Promote Shop Efficiency" are so good that we shall have to publish them. The first prize of $50 was awarded to William G. Reyer, general foreman of the Nashville, Chattanooga & St. Louis at Nashville, Tenn., and the second prize of $25 to George H. Roberts, assistant machine foreman of the New York, New Haven & Hartford at Readville, Mass. Among the other manuscripts which deserve mention because of their excellence, and with no attempt to arrange them in the order of their merit, are those submitted by C. J. Drury, general roundhouse foreman of the Atchison, Topeka & Santa Fe at Albuquerque, N. Mex.; J. S. Sheafe, mechanical inspector of the Illinois Central at the Burnside shops, Chicago; C. L. Alden, foreman heavy freight car repairs, New York Central & Hudson River, West Albany, N. Y.; Elmo N. Owen, general foreman, Southern Pacific, Bakersfield, Cal.; Edgar T. Spidy, instruction card inspector, Canadian Pacific, Angus shops, Montreal; W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.; O. D. Buzzell, general foreman car department, Atchison, Topeka & Santa Fe, San Bernardino, Cal.; J. T. McSweeney, smith shop foreman, Baltimore & Ohio, Mt. Clare shops, Baltimore, Md.; also a manuscript from a foreman of a southern railway, who does not wish to have his name known, referring largely to the handling of locomotives at terminals. The two best papers and one of the others are published in this issue; the remaining ones will appear in a later issue.

Another shop kink competition will be held, to close June 15. As in the previous competitions, there will be a first prize of $50 and a second one of $25. Those who are not awarded prizes, but whose kinks are considered worthy of publication, will be paid at our regular space rates. The awards will be based on the best collection of from three to five kinks, although there is no objection to the competitors sending in a greater number, allowing the judges to base their decision on what they consider to be the best five in the collection. Please make the descriptions of the kinks and their operation as complete as possible. Many of the descriptions which have been received in former contests have been so brief as to leave much to the imagination of the judges. Remember that the reader has only a drawing or a photograph to look at, and some things which may be perfectly plain while watching the device in operation do not appear clearly on the drawing and must be carefully explained. Shop kinks are devices to make a saving in time or labor, and their value will be more apparent if a statement is made as to the increase in efficiency due to their use, or of the average time which is required to turn out a piece of work with them.

It has been suggested that more attention be given in our columns to the work of the car repair department. The statement has also been made that although there are about 40 cars to every locomotive in this country, the technical journals have, to a great extent, overlooked the interests of the car department and have concentrated their attention on the locomotive repair shops. That this is, in some degree, true is due to the fact that the work of the car department is not so complicated and does not require such extensive and elaborate equipment as does the locomotive repair shop. On the other hand, the modern car repair shop, handling both freight and passenger cars, does a great variety of work requiring considerable special equipment and should offer a fruitful field for special devices and methods for saving time and labor. This is specially true where it is necessary to repair steel underframe or all-steel equipment.

To meet the demand for information concerning the work of this department we have in preparation a series of articles entitled "Car Repair Shop Notes," the first of which appears in this number. To some of our readers certain of the devices described in connection with the Erie car shops at Buffalo may appear almost too simple or too common to warrant mention. Visits to several other car repair plants have demonstrated, however, that work similar to that which is being done by these apparently simple and common devices is being performed by much more complicated or awkward devices or methods at other plants. It will, therefore, be the intention, in this series of articles, to draw attention to all devices or methods, no matter how simple, which are used to advantage in any one shop or repair yard, but which are not found to be in general use in other shops.

Unfortunately most of us are so constituted that we are inclined to give entirely too much attention to the details of our work and not enough to the fundamental principles which underlie it. Again, the proper principles for the upbuilding of an organization may be determined, but as the work progresses they may be largely lost sight of or be distorted in working out the details. To successfully and continuously keep up a high efficiency it is necessary to have the fundamental principles always clearly in mind.

On another page Harrington Emerson outlines what he considers to be the twelve fundamental principles underlying efficiency work. Some of those familiar with Mr. Emerson's work may disagree with him as to the way in which these principles should be applied, but they must admit the correctness of the principles. Successful managers or organizers, whether in the railway shop, the repair yard or some other department of a railway, or in industrial plants, may express their ideas in a different form, but in general they agree closely with Mr. Emerson. In looking back over your experience, do you find that your success has been due to the use of some or all of these principles? Would not your success have been greater if you had made use of all of them?

In adopting the basic principles relating to the handling of apprentices, as recommended by the Master Mechanics' Association, there is a tendency on some roads to give too much attention to the schoolroom work and not enough to the shop work. At several shops where efforts are being made to improve the courses of instruction, first-class schoolrooms have been provided and equipped and good instructors have been placed in charge, but no shop instructors have been appointed to see that the apprentices are properly instructed in shop work. As the object of apprenticeship is to make good me-

chanics, it would seem that greater stress should be placed upon the training in the shop. On the New York Central Lines there is an instructor at each shop whose duty it is to look after the apprentices in the shop and see that they are properly instructed on each job and that they are shifted from one class of work to another at proper intervals to give them a thorough training in the trade. At the Topeka shops of the Atchison, Topeka & Santa Fe, where there are about 170 apprentices, ten shop instructors are employed, and it is considered to be a paying proposition, although it was not the intention of the Santa Fe to commercialize the apprenticeship work. That company does not make any regular appropriation for the apprentice work, but it is considered a regular part of the shop expense and is so charged. It has been found that the work of the drawing room and shop instructors has made it possible for the apprentices to do a great deal more and a much better class of work than formerly.

LOCOMOTIVE REPAIRS WITHOUT REMOVING DRIVERS.

A large part of the labor in the construction of new locomotives is expended in roughing out and finishing forgings and castings, and the cost of labor in erecting the parts is only about 16 per cent. of the total labor charge. A large part of the labor involved in repairing locomotives is required to take the machinery apart, clean it, distribute it to the various machines or benches and then return the parts to the erecting shop and put them together. The principal machine work is in taking up wear, and it does not require the renewal of the larger parts or expensive roughing out and finishing. The labor of handling the parts in mounting and dismounting in the erecting shop or roundhouse thus becomes the principal item of the labor charge, and in the effort to economize the cost of labor in locomotive repairs this charge can be reduced by less frequent shoppings and by special methods of construction which enable the driving bearings to be removed and refitted without removing the drivers. It is the general practice to shop locomotives once a year for heavy repairs, and the number of repair pits required is usually calculated on this basis. Freight locomotives do not average more than 40,000 miles per year and passenger engines 80,000 to 100,000 miles. After making this mileage they are taken to the shop where the machinery and running gear are all removed, leaving the bare boiler and cylinders.

With large locomotives the mere handling of all these heavy parts is laborious and expensive and probably exceeds the actual cost of the machine work in making repairs. The aim should be, therefore, to keep the engine out of the shop as long as possible, having proper regard to excessive lost motion and injury to track due to worn tires. The extent to which this can be carried is illustrated by occasional records of very high mileage between general repairs, and if the same care is exercised in the construction and operation of other locomotives there is no good reason why such records should not become more numerous. On the Cleveland, Cincinnati, Chicago & St. Louis a Pacific locomotive hauled nine heavy passenger cars 288 miles per day, and from November, 1907, to December, 1909, made 200,580 miles without shop repairs. No new tubes were put in; no tires were turned. The engine received only light repairs in the roundhouse between trips. It was operated by double crews and kept in excellent condition by their careful attention. The left main wedge was lined down four times and the right one twice, thus preventing the locomotive from pounding on its boxes.

Another record of high mileage between general repairs was made by a Baldwin balanced compound Atlantic type on the Santa Fe. It hauled a heavy passenger train 364 miles per day, and from the time it was delivered new until it required general repairs it made 227,900 miles. The conditions under which such remarkable service is obtained should be investigated, and the aim should be to bring up the average mileage between shoppings to something approaching these figures.

The heavy labor cost which attends the removal of driving wheels in the ordinary roundhouse has suggested to some motive power officers the possibility of making most running repairs to locomotives without removing the driving wheels. One cause for removing drivers is the necessity of renewing tires on account of flat spots, irregular wear, or thin flanges. On some roads it is now the practice to renew tires without removing the wheels. With a good gas heater and exact gages for boring tires for proper shrinkage, this has been made possible, the time required for tire renewal being greatly lessened, and the cost of the repairs being largely reduced. Driving boxes with removable brass bearings, which may be removed without dropping the drivers, have been in successful use for several years, and this is now the established practice of one large railway. Designs have also been made for driving boxes with dovetailed removable hub liners, so that these can be renewed without performing the laborious task of taking out the drivers for so small an item of necessary repairs.

Pursuing the scheme still further, plans have been made for, and locomotives are now building with frames having flanges on the pedestal faces the full width of the box fit, so that flangeless shoes and wedges can be used, and on engines with underhung springs the shoes and wedges can be removed without taking down the spring rigging. With the Walschaert valve gear where eccentrics and link motion have been removed from between the drivers and the space is clear, the locomotive construction lends itself to modifications of the usual driving gear details for the purpose of reducing the labor required in taking up wear and renewing the heavy bearings, by such methods as are described above. This is an interesting development and one adapted to effect large economies in locomotive running repairs and to increase mileage between shoppings. It is expected that a paper on the subject, describing more fully the possibilities as well as actual experience with some such new designs and with illustrations of them, will be presented at the next convention of the Master Mechanics' Association.

LOOSE TIRES.

The frozen track of the lines in the Northwest has been rough and rigid during the past winter to a degree unparalleled in a generation, and it has resulted in the fracture of large locomotive details to an alarming extent. The breakage of main frames, rods and crank pins has been more than double that of the winter months of previous years. The number of loose and broken tires has also been unusually large, and it has demonstrated that the ordinary methods of fastening tires are not sufficient for such unusual conditions. Quite a number of tires have broken with a clean fracture, showing that the combined stresses due to shrinkage and severe blows were equal to the resistance of the steel section.

The tendency of tires to become loose depends to some extent on the diameter, thickness, shrinkage and the method of fastening. The Master Mechanics' Association in 1907 adopted standard shrinkage allowances for tires, which are the same for cast iron and cast steel wheel centers, and, while general experience may have recommended such a rule, it is certain that the compressive strength of the two kinds of centers is not the same and that many of the cast steel centers offer less resistance to compression than those made of cast iron. At the time the new rule was adopted the shrinkage for centers above 66 in. was made 1/60 in. per foot of diameter and 1/80 in. for centers less than 66 in. The standard area of the spokes for cast steel centers was at the same time increased to 5.9 sq. in. at the small end and 9.8 sq. in. at the large end. This has materially improved conditions and reduced the compression of cast steel centers, but there are in service

numerous centers with spokes having a much smaller cross-section, which will continue to give trouble by excessive compression due to the flexure of the spokes, causing loose tires. With tires held in place by shrinkage only much depends on the area of the metal subjected to compression, and the larger this area with a given compression, the more secure will be the fastening. Many driving wheels, both steel and iron, have a circumferential core 1½ to 2 in. wide, which reduces the bearing area nearly one-third, but the present Master Mechanics' standard for wheel centers without retaining rings shows a solid rim 5 in. wide with a tire bearing over the whole surface.

Another condition which affects the extent of the tire bearing area is the smoothness or roughness of the finish of either the tire or the wheel center. If these are finished with a pointed tool and rapid feed the corrugated or serrated surface thus produced causes the tire to rest on these high edges instead of on the broad surface of a smooth finish. With the pressure of the shrinking tire, the high ridges are crushed and the tension of the tire tending to hold it on the center is reduced. It is thus easily possible to create conditions by rough finish which will eventually cause loose tires. When tires are changed at a roundhouse without removing the drivers, the work may not be done with as great accuracy as in the shop, where there are better facilities and where the tires are changed so frequently that the men are more skilled. This may to some extent explain the loosening of tires.

The majority of tires on American locomotives are held in position entirely by the pressure due to shrinkage, and this has a very uncertain and indefinite value. If the center was entirely rigid the large amount of shrinkage now used would not be permissible, as the stress produced in the tire would be over 40,000 lbs. per sq. in.; but this is largely reduced by the amount of compression of the center, which depends on the conditions we have above considered, so that it is impossible to calculate with any degree of accuracy the magnitude of the force tending to hold the tire securely in position. For this reason the fastening of tires by shrinkage only must be regarded as not entirely safe or satisfactory for large drivers. The pressure tending to hold the tire on becomes less as the tire is worn and the area of the section which resists stress is correspondingly reduced. For this reason all railways have adopted limits of thickness for the last turning and limits of wear for tires in different classes of service. These limits vary with different lines, but they do not appear to have been made larger for the Northern lines, where the service is the most severe.

The limit of thickness of the tire for the last turning for passenger engines with large wheels varies from 1¾ in. to 2¼ in., the large limit being used by lines to the south of those allowing the smaller thickness. For the limit of wear there is a variation from 1½ in. for the Northern district and 2 in. for the Middle Western lines. For heavy freight engines, some Northern lines allow tires to be turned down to 1⅝ in. and to wear down to 1⅜ in., while others further South make these limits 2¼ in. and 2 in., respectively. A tire worn to, say, 1½ in. thick has already been slightly elongated by the rolling effect, and its area of cross-section is so small that it would stretch slightly under shrinkage stress, and either of these things may be sufficient to cause it to become loose.

The Master Mechanics' standard drawing for wheel center and tire, without retaining ring, shows the tire with a lip ⅛ in. deep and ⅜ in. wide on the outer rim. This is a useful safeguard against tires falling off when slightly loose, but it is not generally used. It requires a little more time and care in boring the tire, but is comparatively inexpensive and should be adopted for the large and heavy freight locomotives now in use. For passenger engines the best protection against loose tires is the retaining ring, but this, too, is not used to any great extent on Western lines. An inquiry as to the practice of lines west of Chicago shows that eight railways do not use retaining rings for tires on the larger drivers of express passenger locomotives, while one company has adopted it for all large passenger engines, and another uses it on 84-in. drivers only.

The experience of the past winter will doubtless lead to better practice in fastening tires. For the larger freight engines the inside lip on tires should be adopted and the limits for the last turning and for the tire wear should be increased. For passenger engines retaining rings should be used on all the larger drivers, and for all sizes, both freight and passenger, greater care should be taken to finish the bearing surface of both tire and center to a smooth surface.

HIGH DUTY DRILLING MACHINES.

Drilling machines have been redesigned and improved so as to work under the ordinary speeds and pressures required by high speed drills, but until recently no machines have been made which would drive the best steel drills up to the maximum capacity. Seventy feet per minute has been regarded as a good cutting speed, and .012 in. per revolution as normal feed, while 8 to 10 horse power motors have been thought sufficient for the heavier drill presses used in locomotive shops. In order to take advantage of the remarkable cutting power of the high speed drills now on the market the American Locomotive Company has had the tool makers design special drilling machines, with sufficient capacity to drive any of the drills to the limit of their endurance in drilling one hole in hard machinery steel.

The tests of these machines have shown remarkable results. An indication of the power of the new drill press is afforded by the use of an 8-in. belt and the consumption of over 50 h.p. in forcing a 1½-in. drill through 10 in. of steel in one minute. The cutting speed has been increased to 123 ft. per minute, and the feed per revolution to as high as .04 in. Running at 284 revolutions per minute, with a feed .04 in., a 1½-in. drill removed 20 cu. in. of steel per minute, and the depth of hole drilled per minute was 11.36 in. This work consumed over 60 h.p., as measured by the output of the electric motor, but it wore out or broke the drills, overheated the belt and far exceeded the capacity of the drills or the machine for regular useful work. Having obtained a drilling machine of sufficient power to use up the drills it will now be possible to determine the feeds and speeds for drills of different diameters, which will give the greatest output in useful work, having proper regard to economy in the cost of renewing the drills.

Working under such heavy duty it will be found necessary to force the cooling liquid to the point of the drill and some changes in its composition may be found necessary. The equality of the steel in the drills may be further improved to meet the new conditions, and when this process of forcing removal of metal by drilling is well developed the drill press will become a new and different tool from what it has been in the past. When it is made a high speed and a high power machine it may compete with some of the other standard tools which are used in shaping out rough forgings, such as the slotter or the cold saw. The slotter has the same drawback as the planer in being a reciprocating machine which is idle during the return stroke, and the drill press, having a continuous operation like the milling machine, may be used to advantage in place of the slotter. In working out the bearing seats of solid end main rods, or similar work, it is possible that the core could be roughed out by a high power drill in a shorter time than by slotting. Slots and keyways, which depended on the old and slowly opertaing drill press for their cutting, will be produced much faster and the time usually taken for drilling the numerous holes in locomotive details will require complete readjustment when the heavy duty high speed drill comes into use.

Contributed Papers.

THE MOTIVE POWER DEPARTMENT ORGANIZATION OF THE CHICAGO, BURLINGTON & QUINCY.

BY M. K. BARNUM,
General Inspector Machinery and Equipment, C., B. & Q.*

An intimate connection with several large railways and a study of others justifies the assertion that the mechanical department of the Chicago, Burlington & Quincy has one of the most efficient, logical and simple organizations to be found. This opinion is supported by the results obtained during the recent severe winter with its extreme cold, heavy snows, shortage of power and large volume of freight business. Under these unfavorable conditions the locomotives of the Burlington averaged over 10,000 miles per engine failure (two minutes delay to a passenger train or five minutes to a freight), while some of the other good roads averaged less than 5,000 miles, and one western road made only about 900 miles per failure. This record could only have been made by keeping the power in excellent condition. The condition in which it was kept was such that the number of locomotives held out of service for repairs over 24 hours averaged but 8.2 per cent. of the total number owned, while very few other roads had less than 12 to 15 per cent., and one had 25 per cent. of its motive power shopped.

The accompanying charts show graphically the relations existing between the various officers, but some explanations are necessary for a clear understanding of the authority and duties of each position.

THE GENERAL ORGANIZATION.

On account of the large territory covered by its nearly 10,000 miles of line, the Burlington system is divided into two grand divisions which are officially designated as the Lines East of Missouri River and the Lines West of Missouri River. For brevity they are commonly spoken of as "Lines East" and "Lines West."

Each grand division has a general manager, who reports to the vice-president in charge of operation in Chicago, and has his complete staff of officers. The general manager of the Lines East is located in the general offices at Chicago, but the headquarters of the Lines West are in Omaha, where the general manager is the highest ranking officer.

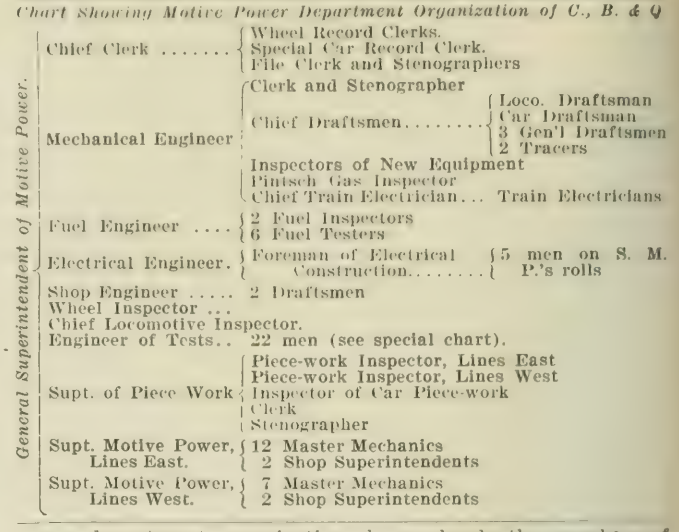
Although Omaha is 500 miles from Chicago, the general manager of the Lines West is over 1,000 miles from the extreme limit of his line in the Northwest, which is about 1,550 miles from Chicago. These distances furnish a brief but sufficient explanation why the Burlington requires a somewhat different organization in general, and for the mechanical department in particular, from that which has been found to meet the needs of such roads as the Lake Shore and the New Haven.

The Burlington has about 1,200 passenger cars, 55,000 freight cars and 1,600 locomotives. The equipment will be substantially increased when present orders for new rolling stock are filled.

THE GENERAL SUPERINTENDENT OF MOTIVE POWER.

The general superintendent of motive power reports to the vice-president in charge of operation, but co-operates and keeps in touch with both general managers, the general superintendent of transportation and the purchasing agent. He is an executive officer in every respect and allows more authority to all members of his staff than is customary on other roads. This practice stimulates initiative and pride in their work and has obtained the very best of results, as it relieves the general superintendent of motive power of less important details and permits him to devote more time to the larger mechanical questions. His chief clerk handles all of the routine matters, including correspondence not requiring his personal action. The working lines are not sharply defined between the various men on the staff of the general superintendent of motive power, and special investigations are often assigned to one or the other as may seem best under existing circumstances. The accompanying diagram of the motive power department organization shows clearly the members of and the arrangement of the general superintendent of motive power's staff.

Chart Showing Motive Power Department Organization of C., B. & Q.



MECHANICAL ENGINEER.

The mechanical engineer has more than the usual authority and responsibility, as he supervises not only the designing of new cars and locomotives, but also the train lighting and the shopping of passenger cars. The inspectors who represent the railway at the car and locomotive builders' shops report to him. He also looks after the improvements in arrangement, heating, lighting, etc., of passenger cars and performs many of the duties that are usually done by the master car builders of other roads. The duties of the various men on his staff are pretty clearly defined by their titles and seem to need no further explanation.

FUEL ENGINEER.

The fuel engineer looks after the distribution and inspection of locomotive fuel and takes personal charge of all coal tests on locomotives. He recently made a series of tests to determine the shrinkage of coal when exposed to the weather for various lengths of time. The coal analyses are made by chemists in the laboratory under supervisión of the engineer of tests.

The purchasing agent buys all fuel and watches the demand and supply at all points on the road, but the fuel engineer and his men co-operate with him and inspect it at the mines, check the scale weights and, in short, see that the railway receives the amount and quality of coal for which it contracts and pays.

ELECTRICAL ENGINEER.

The electrical engineer attends to the plans for and installation of electrical apparatus for power and light in shops and other company buildings, but the train electrician, under direction of the mechanical engineer, looks after the train lighting matters.

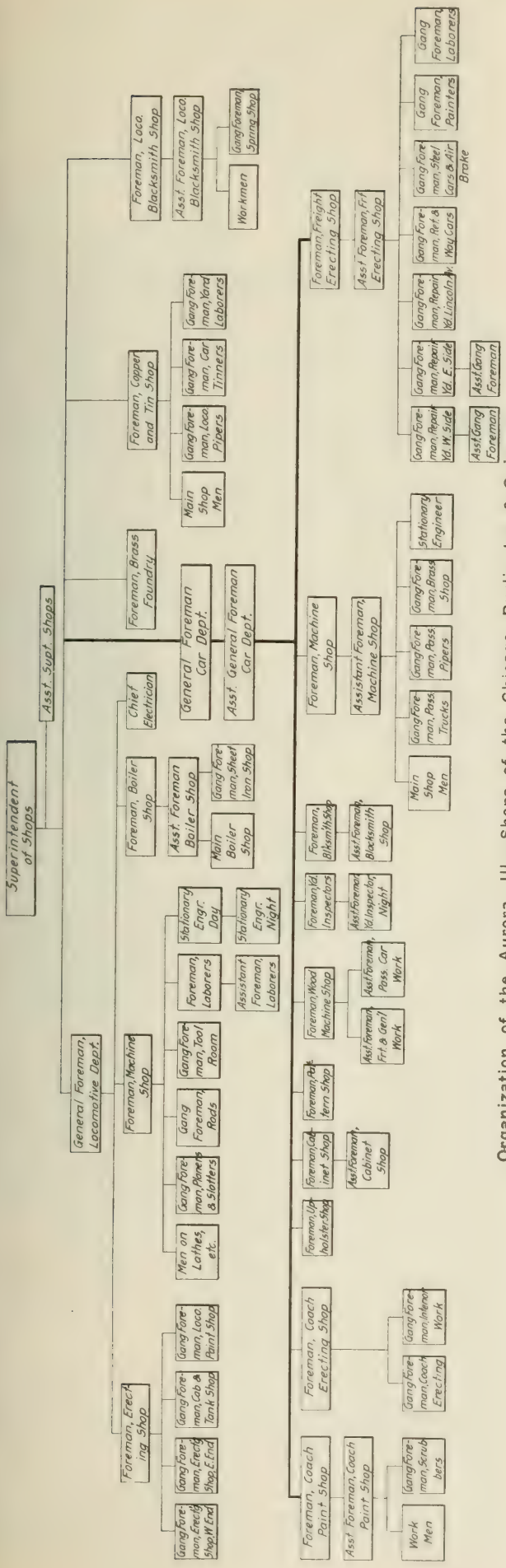
SHOP ENGINEER.

The shop engineer studies all questions of shop design and improvements, and has two draftsmen who work up the details of changes in power plants, etc. At present he is giving most of his time to the building of the new shops at Havelock, Neb., developing some details and inspecting the construction as it progresses under a contract with Westinghouse, Church, Kerr & Company.

WHEEL INSPECTOR.

The wheel inspector looks after the inspection and testing

*Since writing this article Mr. Barnum has been appointed general superintendent of motive power of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley.



Organization of the Aurora, Ill., Shops of the Chicago, Burlington & Quincy.

of cast iron wheels at the foundries, inspects wheels that have failed to meet the guarantee and follows up all questions arising in connection with the fitting up and use of wheels at the various shops and on the road.

CHIEF LOCOMOTIVE INSPECTOR.

The chief locomotive inspector receives and studies the reports of defective machinery, follows up the performance of new devices on locomotives, such as superheaters, draft appliances, valve gears, etc., and makes such special investigations as may be directed by the general superintendent of motive power. He is thoroughly familiar with shop and locomotive practice, and is a most useful member of the staff.

ENGINEER OF TESTS.

The engineer of tests has charge of the chemical and physical laboratories at Aurora, Ill., of the test car when used

Engineer of Tests	Assistant Engineer of Tests.	Clerk Stenographer 3 Mechanical Assistants 7 Chemists 2 Helpers Water Engineer Water Inspector 5 Material Inspectors

for tonnage ratings and of most other testing work, except coal tests which are supervised by the fuel engineer. There are usually about 22 men on the rolls of the engineer of tests, as shown on the chart, which also indicates the duties performed by most of them.

The three mechanical assistants are principally occupied with tonnage ratings, brake shoe tests and other similar work in the physical laboratory or on the road. The water engineer spends most of his time on plans for improving the quality of water supplied for boilers, while the water inspector follows up the improvements already made and sees that arrangements for water treatment are kept up so that the expected results will be obtained. The material inspectors visit the various mills, foundries and factories where they inspect supplies, ordered by the purchasing agent, before shipment.

SUPERINTENDENT OF PIECE-WORK.

The superintendent of piece-work has general supervision over the methods and prices used for piece-work in all shops of the system. Probably the success of piece-work on the Burlington has been due more to the ability and personality of the superintendent of piece-work than to any other one man, although all of the officials of the mechanical department, from the general superintendent of motive power to the master mechanics, foremen and piece-work checkers, are entitled to much credit. The superintendent of piece-work makes up the schedule of prices for all shops, but the price recommended for each particular job originates with the foreman and inspector directly in charge of the job and is fixed after a fair trial and agreement with the man doing the work. After approval by the general foreman and master mechanic or superintendent of shops the price is passed upon by the superintendent of piece-work, who then sends it to the superintendent of motive power for final approval.

The superintendent of piece-work spends most of his time visiting the various shops adjusting questions that arise about prices and methods of work. He knows intimately most of the piece-workers and has been kept busy of late adjusting the numerous increases in piece-work prices which have followed the raises in day rates.

SUPERINTENEDNT OF MOTIVE POWER—LINES EAST.

The superintendent of motive power of the Lines East has supervision over fourteen master mechanics and superintendents of shops in charge of 1,020 locomotives. The duties of most of the men on his staff, as shown on the accompanying chart, are sufficiently described by their titles, but a few need some explanation.

The piece-work inspector has also been shown on the staff of the superintendent of piece-work, as he reports jointly to him and to the superintendent of motive power. The foreman

of construction equipment supervises the repairs to pile-drivers, steam shovels, derricks, etc.

Chart Showing Organization of Superintendent of Motive Power of Lines East.

Supt. of Motive Power, Lines East

- Chief Clerk — Clerks of Car and Loco. Records; Bill Clerks, File Clerk; Stenographers
- Assistant Chief Clerk
- General Car Inspector
- General Boiler Inspector
- Piece-work Inspector
- Air-brake Instructor
- Mechanical Inspector — Speed Recorders and Miscellaneous Work
- Mechanical Inspector — Fuel Economy and Special Duties.
- Foreman of Construction Equipment.
- Supt. of Aurora Shops — See special chart
- Supt. West Burlington Shops. — See special chart
- M. M., Chicago Division — 75 Locomotives—1 Road Foreman
- M. M., Aurora Division — 147 Locomotives—2 Road Foremen
- M. M., Galesburg Division — 125 Locomotives—2 Road Foremen
- M. M., La Crosse Division — 75 Locomotives—1 Road Foreman
- M. M., Beardstown Division — 74 Locomotives—1 Road Foreman
- M. M., Burlington Division — 20 Locomotives.
- M. M., Ottumwa Division — 109 Locomotives—2 Road Foremen
- M. M., Creston Division — 62 Locomotives—1 Road Foreman
- M. M., St. Joseph Division — 125 Locomotives—2 Road Foremen
- M. M., Hannibal Division — 75 Locomotives—1 Road Foreman
- M. M., Brookfield Division — 84 Locomotives—1 Road Foreman
- M. M., Centerville Division — 49 Locomotives—1 Road Foreman

The shops at Galesburg, Ill.; La Crosse, Wis.; Beardstown, Ill.; Creston, Iowa, and St. Joseph, Mo., are small, having only four to six locomotive erecting pits, and come under the division master mechanic, with a general foreman in full charge. The Hannibal, Mo., shops hold twelve locomotives, but are also under the division master mechanic, as his division is compact and has but 75 locomotives.

The Aurora, Ill., and West Burlington, Iowa, shops repair cars and locomotives for all divisions, being the largest shops on the Lines East, and their importance and the number of men employed make it expedient to have a superintendent of shops in charge who has no responsibility for locomotives, enginemen or other matters pertaining to the handling of trains. The organizations of the Aurora and West Burlington shops are shown on separate charts as they differ in size and details.

THE AURORA, ILL., SHOPS.

These shops are located 37 miles from Chicago and handle all the heaviest passenger car repairs for the system. The force varies between 1,200 and 1,500 men. This shop is an excellent example of what can be accomplished in old and inadequate shops with fairly good machinery, a thoroughly efficient organization and first class supervision. The passenger car erecting and paint shops hold only 32 cars but turn out about 60 cars a month, with paint and varnish and general repairs, when running to their full capacity.

The locomotive shops give general repairs to about 18 engines a month and build some new switch engines, but the erecting pits are in an old roundhouse which is too small to take in any of the heavy power purchased during the last seven or eight years.

WEST BURLINGTON SHOPS.

These shops handle the heaviest locomotives and with a force of about 500 men turn out 22 to 24 engines a month, and also make heavy repairs to a large number of freight cars, but no passenger cars are now overhauled there. The organization is shown in full on the accompanying chart which does not seem to need any further explanation.

Locomotive cylinders and other large castings are made in a local foundry and machined in this shop before shipment to the division shops where they are to be applied; also the boilers for new locomotives are usually made here with a hydraulic riveter even though the work of erection may be done at the Aurora or Havelock shops.

SUPERINTENDENT OF MOTIVE POWER—LINES WEST.

The superintendent of motive power of the Lines West has under his supervision nine master mechanics and superintendents of shops and about 555 locomotives which run over nearly 5,000 miles of line, as the Lines West comprise about one-half the mileage of the Burlington system, although using only about one-third of the total number of locomotives.

The plan of organization is similar to that of the Lines East, as previously described, but there are less men on the superintendent of motive power's staff. The shops at McCook, Neb.; Alliance, Neb., and Sheridan, Wyo., hold only 4 to 6 locomotives and come under the supervision of the division

Organization of the West Burlington Shops.

Supt. of Shops.

- Chief Clerk
  - General Time-keeper
  - Assistant Chief Clerk
  - 4 Clerks
  - Stenographer
  - 2 Office Boys
- Timekeeper
- Clerk
- Machine Shop Foreman
  - Foreman
  - 2 Piece-work Inspectors
  - 38 Machinists
  - 25 Handy Men
  - 10 Helpers
  - 15 Machinist Apprentices
  - Wh'l Gang Boss: 4 Handymen, 5 Helpers
- Erecting Shop Foremen (2)
  - Piece-work Inspector — 1 Clerk
  - 22 Machinists
  - 10 Handy Men
  - Pipe Gang Foreman — 7 Pipe Men
  - 3 Apprentices
  - 11 Helpers
  - 3 Crane Men
  - Boiler Maker
- Supply Foreman
  - Clerk
  - 2 Delivery Men
- Bl'ksmith Shop Foreman
  - Clerk
  - 16 Blacksmiths
  - 2 Forgers
  - 2 Frame Makers
  - 3 Heaters
  - 20 Helpers
  - 5 Hammer Boys
  - Supply Man
  - Laborer
  - 2 Firemen

General Foreman Loco. Dept.

- Boiler Shop Foreman
  - Clerk
  - 14 Boilermakers
  - 11 Machine Men
  - Flue Welder
  - 2 Ash Pan Men
  - 21 Helpers
  - Boiler Washer
  - 9 Apprentices
  - Supply Man
  - 2 Laborers
  - Flange-fire Heater
  - Machinist
- Tin Shop Foreman
  - 4 Tinsmiths
  - Coppersmith
  - Laborer
- Machine Rep'r Gang F'rm'n
  - 9 Machinists
  - 2 Helpers
- Lbr. Gang Boss
  - Boss Engine Cleaner—10 Laborers
  - 43 Laborers
- Loco. Paint Gang Boss
  - 5 Painters
- Engin'r Power Plant
  - 7 Firemen
- Steam Pipe Fitters (2)
  - 3 Machinist Helpers
- Engine Tamer and Helpers
- Yard Engineer and Helper
- Electrician and Helper
- Pumper
- 3 Watchmen

General Foreman Car Dept.

- Repair Track Foreman
  - Gang Boss
  - Piece-work Inspector
  - 3 Car Inspectors
  - 68 Car Repairers
  - 64 Trucksmiths
  - 2 Air-brake Men
  - 2 Oilers
  - 13 Laborers
  - 2 Supply Men
  - 4 Clerks
  - Bench Carpenter
  - Door Maker
- Coach Repair Shop Formn
  - 14 Carpenters
  - 4 Trucksmiths
  - Upholsterer
  - 2 Laborers
- Wood-Mill Foreman
  - Clerk
  - 10 Wood Machinists
  - 5 Helpers
  - 2 Scrap-saw Men
  - Saw Filer
  - Oiler
  - 10 Laborers
- Car Paint G'ng Boss
  - 7 Painters
- Wrecking Foreman
  - Craneman
- 2 Mill Wrights

Pattern Shop Foreman

- Assistant Foreman
- 2 Pattern Makers
- Apprentice
- Laborer

- Draftsman
- 2 Special Apprentices
- Stenographer
- Blue-print Clerk
- Janitor

master mechanic who has a general foreman to handle the details. Each master mechanic has charge of the outlying roundhouses on his division. The Denver roundhouse and passenger yard are under a general foreman reporting to the

Chart Showing Organization of Superintendent Motive Power—Lines West.

Supt. Motive Power, Lines West	Chief Clerk	Assistant Chief Clerk, Car Record Clerk, Bill Clerks, 6 File Clerks, etc., Stenographers		
Asst. Supt. Motive Power	General Car Inspector			
	Gen'l Boiler Inspector			
	Piece-work Inspector			
	Air-brake Instructor			
	Chief Draftsman			
	Supt. Havelock Shops	See special chart		
	Supt. Plattsm'th Shops	See special chart		
	M.M., Omaha Division	1 Road Foreman—	70	Locos.
	M.M., Lincoln Division	2 Road Foremen—	95	Locos.
	M.M., Wymore Division	1 Road Foreman—	72	Locos.
	M.M., McCook Division	2 Road Foremen—	107	Locos.
	M.M., Alliance Division	2 Road Foremen—	87	Locos.
	M.M., Sterling Division	.....	38	Locos.
	M.M., Sheridan Divis'n	2 Road Foremen—	86	Locos.

McCook master mechanic; the roundhouses at Edgemont, S. D., and Deadwood, S. D., are under the master mechanic at Albany, Neb.

ROAD FOREMAN OF ENGINES.

Each division has one or two road foremen who are, in effect, assistant master mechanics, having supervision over the enginemen and following up the condition and operation of locomotives on the road. One road foreman cannot properly look after more than about 100 locomotives and a corresponding number of enginemen, and on the Lines West, where several divisions have from 340 to nearly 400 miles of main line, besides branches, two road foremen have been found desirable for 85 or more locomotives. The road foremen examine enginemen for employment and promotion, investigate all but the more serious infractions of rules and have given most efficient assistance to the master mechanics in reducing the number of engine failures and improving the locomotive service generally. Road foremen are always selected from among the most capable locomotive engineers, due weight being given to their personal habits and executive ability; many of the master mechanics, some superintendents and one superintendent of motive power have made their first step from the ranks as road foremen of engines. They co-operate with the superintendent and trainmaster, but report to the master mechanic, by whom they are selected and appointed with the approval of the superintendent of motive power.

HAVELOCK LOCOMOTIVE SHOPS.

This shop, located seven miles from Lincoln, Neb., maintains all the modern power belonging to the Lines West, and can give general repairs to about 400 large locomotives a year. A new machine and erecting shop, new power plant and general storehouse will be built and ready for use before next winter, which will increase the capacity of this shop 50 to 75 per cent. The chart shows the shop organization which is unusually simple, but very efficient. No car work is done here as running repairs are made in the Lincoln yard and general repairs at the Plattsmouth shops, only 50 or 60 miles away.

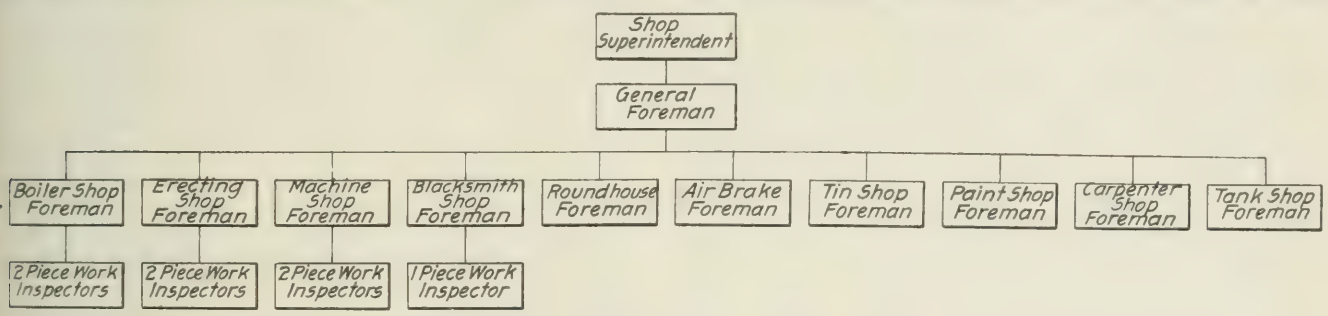
PLATTSMOUTH, NEB., SHOPS.

This is the oldest shop on the Lines West and is now limited to car work. A large number of freight cars receive heavy repairs and the passenger car work is second in importance only to that done at Aurora, as between 30 and 40 cars a month are painted, varnished and given other necessary repairs, during the season when the cars can be spared from service and are being prepared for the heavy summer passenger travel. The organization here is also quite simple, but efficient, and the chart indicates pretty clearly the duties of each position.

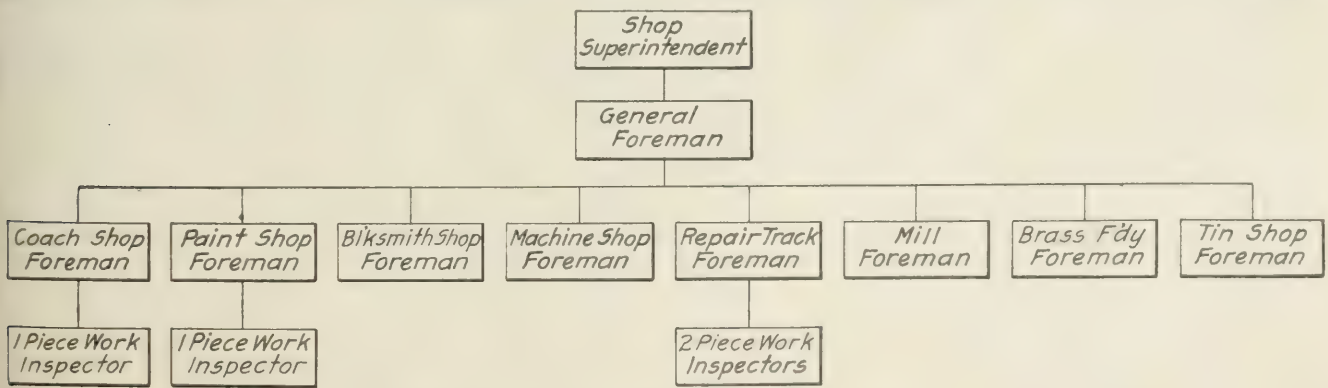
GENERAL NOTES.

Although this mechanical department organization has proved very efficient, it might possibly be still further strengthened by the addition of a master car builder or an assistant general superintendent of motive power reporting to the general superintendent of motive power and having exclusive jurisdiction over all car work. This would relieve the mechanical engineer of much work which now causes him at times to be overloaded, and the increased supervision over car repairs would undoubtedly be a profitable expenditure for the company.

The Burlington has for many years followed civil service rules in filling official positions and makes all foremen and master mechanics by promoting men from the ranks, or from lower positions, so there are many cases of men who have been in this company's service over forty and some even fifty years.



Organization of the Havelock, Neb., Shops.



Organization of the Plattsmouth, Neb., Shops.

HOW THE FOREMAN CAN PROMOTE SHOP EFFICIENCY.

FIRST PRIZE ARTICLE.

BY WILLIAM G. REYER,
General Foreman of the Nashville, Chattanooga & St. Louis, at Nashville, Tenn.

To be capable of promoting shop efficiency, a foreman should be able to readily read human character; also a man of ideas, quick to grasp any shop kinks and willing to take any good suggestions, even if offered by an apprentice. He should be capable of looking ahead and of keeping his men at work so they can do the greatest amount of work economically. He should work out plans to shorten labor as much as possible, not overlooking good workmanship, and at all times setting a good example to his men by his interest in his work and his hustling to push it.

The foreman should be in his shop when the whistle blows to see that his men start to work on the dot instead of hanging around in groups of two or more talking and discussing the topics of the day. Further, he should not permit his men to come to work five and ten minutes late; this makes a bad impression in the shop. He should be able to place his men to the best advantage, following them up during the day and seeing that they do not neglect their work, always treating them in a gentlemanly manner, and, above all things, not playing favorites; treat all employees alike at all times, especially so in the shop.

Your men should work with you at all times. If you find you have a laggard or kicker get rid of him at once. Keep tab on the number of hours it takes to do the different classes of work and when you have reached what you consider a good standard, see that the work is gotten out in the required time. Should your men begin to fall behind find out at once where the difficulties are, and if they can furnish no good reason give them to understand it will not be tolerated. Never let up on trying to shorten the time in getting out the work.

Foremen should at all times be ready to make improvements, as well as capable and willing, where a workman lacks in taking the best advantage of his work, to show him and see that he thoroughly understands the advantages of your methods. Short cuts sometimes reduce the cost and save lots of time. A foreman should keep abreast of the times, reading up on subjects that treat on his line of business. If you can get a trip to a more modern shop, always take advantage of it and see that you come away with some good points and are able to introduce and successfully carry them out in your own shop.

To get the best efficiency out of your men, be kind to them but firm, always letting them know that you mean exactly what you say and that your orders are to be strictly obeyed and carried out to the letter. Should you have to reprimand one of your men, send for him and lecture him privately; if this does not have the desired effect then resort to suspension or dismissal from the service, as the case may warrant. To abuse and reprimand employees in the presence of others will do no good, but tend to lower your standing in the estimation of those present.

The foreman should bear in mind that economy is one of the first essentials; always watch your scrap material and see that good serviceable material is not thrown in with the scrap, especially as relates to bolts, studs, nuts, washers, castings of various descriptions, etc., which are frequently thrown in the scrap in dismantling and then have to be replaced with new material in reassembling.

All mistakes should be thoroughly looked into and investigated to place the responsibility where it belongs. If you find that a workman through carelessness spoils a job, suspend him, and if the same thing happens the second time the best plan would be to dismiss him from the service. If an apprentice spoils a job, he should be reprimanded and made to understand that this kind of work will not be tolerated. Impress on his mind the fact that you are endeavoring to make a first class mechanic of him. The habits formed by an apprentice in the beginning follow him through life.

In securing apprentices a foreman should endeavor to get those who have a grammar school education; if you can take them on probation it is much better, as a young boy frequently starts at a trade that he is no more suited to than he is for flying. Should a foreman find an apprentice that is not adapted to learn the trade, he should transfer him to some other department or dismiss him from the service. A foreman should let the apprentice understand that he can come to him at any time for advice; always treat him in a manner that will encourage him to come to you for information, as it is the duty of the foreman to instruct and enlighten the apprentice to the best of his ability. A foreman should push the apprentice so that he will learn all branches of the trade and be sure that he is started right in the first place. Bear in mind that you cannot put a man's head on a boy's shoulders; some boys will have their pranks; they are so full of life that it bubbles over. This type of boy, as a general rule, makes the best mechanic. If you catch an apprentice at any of his pranks, etc., lecture him and let him know and understand that the shop is a place for work and not for play.

In handling men engaged on machine work, the foreman should find out just what class of work and kind of machine each man is best adapted to and place him accordingly. Some men, who are considered all-around machinists, can work better on certain machines than on others. At the present day with the various kinds and grades of high speed tool steels on the market, if a foreman will watch the feed and speed of the machine, he will be surprised at the amount of work it will turn out. Push the machine for all it is worth. If you have no demonstrator, take the best man you have on a machine and see just what the output of his machine is and see that other men come up to this standard.

A foreman should keep himself posted on the best machines on the market and not only recommend them but in a conclusive manner show the management the importance of securing them. If you are turned down once or twice on the question of new and improved machinery do not despair, but try again. We were after a certain machine two years ago and finally landed it and now consider it one of the best labor savers in railway machine shop work. This is a Landis taper bolt machine; since installing it we have made some changes whereby we not only turn the bolt but cut to proper length and thread it ready to be applied; this is all done on the one machine. Before this machine was installed holes were reamed in the erecting shop, then the lathe man would have to go to the engine to get the length and size of the bolt required and then turn it to suit. I have now installed taper reamers and templates whereby bolts are kept in stock and the erecting shop workmen get them out of stock and ream the holes to suit. By this method we not only save time but secure a perfect fit, which is not done with the lathe turned bolt. With the changes we have made on the Landis taper bolt machine it turns out the work of five lathes and is operated by only one man.

About a year ago we installed a Landis valve stem and piston grinding machine; we applied a bevel gear attachment to it to grind all guides. This stopped all filing of guides, which not only saves time but the cost of files as well and makes a much more satisfactory job. Again, we have applied to slotters, wheel lathes and boring mills a brake attachment, making them much more convenient to operate and saving time as well.

We were making packing rings on a lathe and changed from it to a boring mill; we got up a gang cut-off tool which completes a blank of nine rings at once in two hours and thirty minutes, where it used to take eight hours. We installed a horizontal miller and have applied cutters and a clamping device that allows us to finish shoes and wedges

ready for application to the engine in one operation. By showing the management the importance of purchasing a draw stroke shaper we now finish our driving box brasses ready for application in one operation, requiring thirty minutes from the time the brass is taken from the floor until it is removed from the machine ready to be pushed into the box. Formerly to do this work it took three operations requiring one hour and fifteen minutes, leaving a saving in time of forty-five minutes to each brass. Furthermore, we get a perfect fit of our brasses, resulting in better service.

The management installed in our shop an oxy-acetylene welding outfit, which has proven a wonderful labor saver. The instructor that installed it only gave us a very limited amount of information, but we have worked out the problem ourselves and are successfully welding all patches in firebox side sheets, seams, fire door collars, link work, cracks of all descriptions, etc. At first we had no end of trouble with our welds cracking, due to contraction, but we have overcome this trouble and are in a position to do any kind of work that is within the limit of the outfit. This machine has saved this company thousands of dollars.

Foremen should pay particular attention to shop tools and see that they are in good condition, see that air pipes in the shop are tight; if using oil for fuel, see that there are no leaks in the pipes and that the oil has the proper combustion in the oil furnace. The foreman should be on the alert to take advantage of every little turn to save both labor and material, keeping a good record of everything that comes under his charge and exerting every effort to improve the shop efficiency. He should see that a competent man is employed to look after all shop machinery and tools and that they are kept in good condition at all times, keeping in mind the question of working out convenient and labor saving devices, for these are the things which promote shop efficiency.

In conclusion, I would say be at all times courteous, energetic and pushing to the best advantage, endeavoring to instill into the men under your charge the importance of the greatest output at the least cost.

SECOND PRIZE ARTICLE.

BY GEORGE H. ROBERTS.

Assistant Machine Foreman of the New York, New Haven & Hartford, at Readville, Mass.

Rankine gives the mechanical definition of efficiency as: The ratio of useful work to energy expended. In the mechanical department of a railway that means: The ratio of locomotives and cars kept in service in good repair to the money expended. A good ratio can only be obtained by the co-operation of every official from the highest to the lowest. Each foreman should do his utmost toward promoting harmony in the shop, as friction weakens the organization and consequently decreases the output of the shop.

One of the first steps toward organization and harmony is for each foreman to forward an article or articles to the next foreman as soon as he has completed his work on them. This system will save time and establish a chain of work passing from one department to another. It enables each foreman to give his attention to his work in hand, as otherwise he will have to go or send to the other departments to ascertain how much material is ready for him to move to his department. In some cases there is a line of men and foremen going to and from machine and smith shops. This can all be avoided by the delivery system.

The foreman has an excellent opportunity to promote shop efficiency as he is in personal touch, or should be, with the work at all stages. He can make personal observations of the work and decide whether new or old material shall be used and the amount of labor to be performed. Possibly he can make the old go another run and thereby effect a saving and promote the efficiency of the shop, as every little saving in each department soon counts up in the shop as a whole.

The apprentice system gives the foreman another excellent opportunity to promote the shop efficiency by using the apprentices more in the sense of young mechanics and not placing them on some operation and forgetting them. They can be distributed throughout the machine, fitting and erecting shops, and a system can be established of changing them from machine to machine and from bench to floor work. In some shops the writer has noticed apprentices all in a bunch on bolt lathes and bolt cutters. This is detrimental to any shop, as the boys will be boys and are more or less inclined to play. By placing them in more important positions, such as on large lathes, boring mills, planers, etc., they will forget their boyishness and get down to business. The writer uses his apprentices on such work as rod work, machining bushings, brasses, and on eccentrics, eccentric straps, cylinder boring, cylinder bushings, etc. The younger ones are moved from the small drill, lathe, shaper, grinding machines, etc., to the heavier work. They understand that in order to "get there" they must work.

There is always a chance for improvement, and the foreman can promote efficiency by continually improving on some operation. If he is machining an article day in and day out there must be a better and cheaper way of doing it. In order to keep in touch with doings in other shops he should subscribe for one or more mechanical papers. Each shop is doing some job cheaper than some other one or possibly cheaper than any. From time to time he will find something that just solves his problems; possibly an idea that he has been trying to work out for months.

One often hears a foreman say, "I haven't time to think out such things." His organization should be such that he will have the time to study the conditions of his shop or department. Possibly he is doing some operation on a lathe or boring mill that, by making a special cutter, could be done on a drill press at a saving of from 50 to 75 per cent. The writer made a cutter with five blades to bore the large holes in exhaust pipes to hold the exhaust tips. This is now done on a drill press in 45 min. (2 holes 5 in. diameter), where formally it required 1½ hours on a boring mill. It used to require 2 hours to drill and tap eccentric straps complete (18 operations). This was cut to one hour by making a revolving jig to hold the eccentric strap. It can be revolved to all positions required to complete the drilling and tapping. We also have a sliding jig for a lathe or boring mill to bore and turn eccentrics complete with one setting, saving the time required to mount them on an arbor. Another device is an attachment on the carriage of a lathe to hold rocker boxes for boring. This can be adjusted to any height, the boring bar being carried on the centers of the lathe. This allows the use of as heavy a bar as is possible on a horizontal boring mill and boxes are bored in the same time as required on a mill. The advantage is that the box can be bored on any lathe and not interfere with the work on the mill just for one box. This could be used in the roundhouse machine shop to advantage.

The foreman should be willing to accept any suggestions from his men to improve the methods of doing the work. Oftimes very valuable suggestions are obtained in this manner.

One very important item is for the foreman to have someone trained to act in his absence. Many a foreman makes the great mistake of trying to carry the whole shop on his own shoulders. Each man should be given his own particular responsibility, as by dividing it the foreman will have the time to "think out" new schemes. A foreman should be like the general of an army and be able to stand back to take a broad view of things in general and not overburden himself with details. Then when things come to him he should take some action to improve the situation. He should have a system of checking the work and locating the weak points. If an article continually shows up behind he should take some step to improve it. The writer, to improve the piston rod

work, centers and cuts to length in the Gisholt turret lathe, doing the work in one-half the time required on an engine lathe. By making a special arrangement to hold pistons (or piston heads) on a boring mill they are finished in one setting, saving the time required to turn them over to finish the flange left by holding them in chuck jaws. They are now finished on an ordinary 36-in. boring mill in from 2 to 2½ hours. A milling cutter was made to machine the boss on a rocker arm in 30 minutes. The cutter is formed to make the large radius desired on large rocker arms.

The machine work on different articles should be done as near the fitting up gangs as possible, or if this is not possible he can move the benches nearer the machines and effect a saving in trucking back and forth. The foreman should have only enough finished castings on hand to protect himself. He derives the same protection by having two crossheads finished as six would give. If he keeps too many finished castings on hand he ties up a lot of money. When the engines are stripped the various parts should be inspected and material gotten in to replace worn or broken parts requiring renewal. Castings and forgings can be made and finished in large quantities cheaper, but if this time and material was spent directly on the engines going through the shop the efficiency would be greater, as nearly all labor and material would be directed on the engines to be repaired and put in service in as short a space of time as possible. Castings and forgings should have the engine or order number stamped in figures of white or red so the workmen can make proper distribution of the labor on the time slips.

In the machine shop opportunities to promote the shop efficiency continually present themselves in such matters as changing the finish on castings to save time in machining them. For instance, by adding more finish on the joint of the front cylinder heads the finishing of the broad face of the head could be eliminated and still the head would be just as serviceable as though it was finished all over. When such instances arise the foreman should make a sketch showing the change he recommends and give a complete description explaining what he expects to save by the change.

The machine foreman can promote his shop efficiency another way by having an inspector to examine and fill out forms showing the work necessary on motion work, etc. The inspector can caliper cylinders, crank pins, driving axles, etc., and give this information to the machine men on rod bushings, pistons, driving boxes, etc., saving much time that the machine would stand idle while the sizes were being taken by the operator. Often the wheel storage tracks will be found the entire length of the shop from the rod gang, causing a great deal of walking for the machine man on rod bushings and brasses. The same thing occurs with the piston job. Excellent results have been obtained by having these sizes taken by the inspector.

In closing will say that the foreman to promote shop efficiency is the one continually on watch to make some little improvement; each item may be small in itself but the total is considerable.

BY J. S. SHEAFE,

Mechanical Inspector of the Illinois Central at the Burnside Shops, Chicago.

The late Francis W. Cushman, member of Congress from the state of Washington, in his last address before the House, told of an early home built by his brothers and himself in the far West. It was decided that each brother, there being four, should erect one side according to his own ideas. The house, when finished, served its purpose in a way, but it was not in an ornamental way and it was necessary to do considerable work in smoothing over the rough places. It was finally decided that it would have been better had there been a master builder from the start. We will, therefore, lay aside the question of the necessity for a foreman, or general foreman, being exactly what his title indicates. From the martinet to the foreman who is satisfied for all hands to have an equal share in directing his organization is a long step; there must be the middle path which preserves discipline together with appropriate and judicious dispensation of it.

Loyalty is the grandest asset that a workman can possess and is paid the highest price. A loyal man with less skill can, for a certainty, far outstrip the better mechanic who is a grouch or who is indifferent to his work. The greatest stress should be laid upon this necessity for improved shop efficiency as it embraces all members of a shop organization from the mechanic of recognized ability to the man who sweeps the floor. How is this to be obtained? Most assuredly not by a foreman who is securely anchored within his own ego, nor by one who has no word of recognition for well directed effort. Such a one is the unsuccessful man whose output is mediocre, always has been and never will be otherwise.

That simple little word of one syllable, *tact*, so easy to recognize, yet so hard to acquire, is the secret which the big men in every walk of life have used. "Knowledge is weight, tact is momentum"; a mountain has weight and is harmless; let it move and gain momentum and there is "something doing." Just so with tact over other personal assets. It is always admitted that the first necessity is loyalty, otherwise known as system, organization, skill, equipment, or any one of a dozen different things, when a shop is known by its ability to show a high efficiency. It is the tact of the foreman that has brought about loyalty; the fact that an old fashioned shop with ancient tools in some cases has the best output when compared with other shops perfectly equipped in every way bears out this statement. The point is that the foreman with tact *will have* the loyalty of his entire force. This is every whit as reasonable as any problem in Euclid.

We now find ourselves in a poorly equipped shop, mechanically, but the human equipment is splendid, and in the shop equation the unknown quantity is always this same human equipment and the equation must be solved by the foreman to find its value, and the degree of shop efficiency attained depends upon the ability of the foreman to solve it.

Very well, watch the good mechanic! He is not content to work in all sorts of dirt, in dirty overalls, but will, in every instance, keep himself clean and his surroundings in order. Now every mechanic who is his opposite will, in general, be found to be possessed of an inferior ability, although this is not meant to infer that he cannot be brought to an understanding of his shortcomings by proper counsel. He will be the sooner educated in a desire for cleanliness if he has been tactfully handled and hence made loyal to his foreman unknown to himself. Let the foreman give him a little encouragement even if not altogether deserved. It will work wonders. Let the foreman put himself behind the cleaning up movement and then note the different air in the shop as well as the awakened actions of every man therein.

Work taken to the machine side should be kept in line and removed as soon as finished. The best man is apt to slacken his speed if he finds the "rush jobs" left for two or three days after completion and it is also certain that the pride of almost every man will spur him on a bit to increase the efficiency of his particular machine if the work, when finished, is taken at once to the place intended. In a railway shop space is always limited, therefore avoid using it for a storage place to any degree; elbow room is very necessary and should be maintained at the maximum. A clean and orderly shop will make its condition felt, and the additional operating expense for the necessary cleaning is bread cast upon the waters.

Co-operation is of vital importance. This is not to be looked upon as loyalty, but rather as the kindly relations between the various departments. A side rod or other forging is brought from the blacksmith shop with enough stock on to make two. Now comes the foreman who is tactful. The blacksmith foreman sees the error and it is remedied quietly

and with cordial relations sustained and strengthened. Is any one of us immune from the effects of words of reasonable explanation? The grand aim we have in view is "let us reason together," and not the idea of self-infallibility, such as the Quaker felt when he said to his wife, "All the world is queer but thee and me, and I sometimes think that even thee is a little off." This may seem superfluous but it is the cause preceding the effect, and the effect is shop efficiency. A man who can and does handle these little questions in such a manner that the plant as a whole approaches the close bonds of a happy family, insures better unity, and in unity there is strength; a strong shop will distance a weak one, and the race is won without any improvement in the equipment.

Modern equipment is a splendid asset but expensive. The general foreman of the right caliber is a cheaper proposition. He will take his laurels in any old shop, and his salary, in comparison with results, can not be found on the pay-roll with a magnifying glass.

There is that something in every man that is always looking for and paying tribute to class distinction. After promotion has landed a man in the foreman's position he is apt to feel that his success was not only well deserved but was very tardy in reaching him, and that it is impossible to keep a good man down; he underestimates his really dependent situation and sometimes does not see that the men under him are to make or mar his record.

Two heads are better than one. All right then! What if we have every man in the shop using his head in the interests of increased output and hence increased efficiency! Get them to think. Let them know that when they have given you a good idea, either as to a particular job, or as to some improvement in the tools or equipment, that the same idea will be passed on by you tagged with the name of the man suggesting it, and not with this important detail overlooked. The men will then commence to take a livelier interest in the shop as a whole. They have to. They cannot help it. A little present of $5 given each month to the one who has made the best suggestion for the shop starts competition. Friendly rivalry! When this exists in a shop the clock does not become tired of being stared at.

The machine side is perhaps able to show the greatest efficiency improvement, as the opportunity for losing time in the work is more easily possible. A man on the pit side must accomplish so much at any certain work or it is easily discernible by the foreman. A planer running far beyond the work on both sides is a usual occurence and is especially expensive for short work. One inch too much travel of the table each way on a 10-in. cut means a loss of 20 per cent. while the machine is running. A lathe taking two or three roughing cuts, instead of one, and other machines doing the same, and a massive drill press doing light work are particularly prevalent in railway shops and can be remedied. Here again the tactful foreman is worth many times his salary. The other fellow can remedy the case temporarily, but as soon as his back is turned the machine hand will get into his former practice and waste his energy watching for the boss.

The abuses evident in special cases can hardly be dealt with other than by the foreman in charge studying the particular case and determining upon the most feasible remedy. By abuses is meant general indifference to work, abusing the tools, washing up before the whistle blows, running the tools at low efficiency, incompetency, insubordination and so on. Most of these cases can be adjusted and remedied by careful attention to the individual. There are some men who cannot be influenced and who will never become competent or amenable to discipline. With these, after a fair tryout, there is only one thing to do, and all foremen have had experience in performing that unpleasant one thing; but, act with despatch and get it over as pleasantly as possible. One little portion of anything rancid will spoil a whole lot of wholesome product.

Intelligent discussion and "talking it over" will take away the obstacles in almost any shop. This is a good thing and should be adopted more generally than it is. A meeting of a foreman with his immediate staff is, or ought to be, an opportunity for each man to get rid of the particular idea, or ideas, which he has in his mind, and many of them will prove valuable ones. United effort always has stood and always will stand for success; a collective discussion of a shop problem spells success at the beginning.

A foreman is judged generally by the men as, "He is a prince," or "He don't know nothin'." This must indicate merely the degree of popularity and brings us again face to face with the indefinable human trait, as subtle as the undertow of a body of water; it cannot be analyzed but it appropriates every man who comes within its influence.

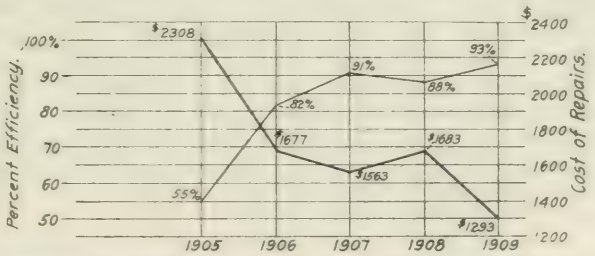
We cannot improve mankind by laying down certain directions nor can we do so by following any particular line any more than the medical profession can produce one panacea for all human ills. This is a large question and must be dealt with in a general manner. Begin and end not so much as to what a foreman can do with the facilities at hand, because they are different in every shop, but with his own improvement, individual and positive.

THE FUNDAMENTAL PRINCIPLES OF EFFICIENCY.*

BY HARRINGTON EMERSON.

It is of "efficiency" in railway operation that I wish to speak to-night, and I define "efficiency" as attaining standards of time, place and cost. In spots there is very high efficiency in the operation and maintenance of American railways, but the easily determined wastes due to preventable inefficiency still aggregate one million dollars a day; wastes that would as inevitably disappear, if properly attacked, as the inequalities revealed by a railway survey disappear when the cuts and fills are finished for any predetermined grade and curvature. It costs to build a railway with low grades and mild curves, *but as a rule it not only does not cost to attain high efficiency, but high efficiency of operation and maintenance always results in lessened costs since high efficiency means the elimination of waste.*

Costs, operation, difficulties take care of themselves the moment we forget all about them, and substitute the one ideal of "efficiency." The practical results of substituting the ideal of efficiency for worry about costs is shown in the diagram above, in which the efficiency of labor, in the same shops, with the same men, the same equipment, the same foremen, and on the same schedules was gradually increased from 55 per cent. to 93 per cent., the cost of locomotive repairs dropping over $1,000 each, yet the locomotives averaged heavier, hauled more tons and made more miles per failure. If this road had 2,000 locomotives the direct saving was over $2,000,-



Efficiency of Labor and Cost of Locomotive Repairs.

*From a paper read before the Railway Club of Pittsburgh, which, however, Mr. Emerson, after the presentation and discussion of the paper, has very kindly revised and amplified for our use. For instance, the original paper enumerated eight fundamental principles underlying efficiency. Mr. Emerson has enlarged upon these, increasing the number to twelve and considering each one more fully. The last five paragraphs have also been added to the original paper.

000, but in addition each locomotive hauled 3,300,000 more tons and in one year the net earnings increased $3,000 per locomotive, an additional gain of nearly $6,000,000, due to the ability to haul more freight.

One railway in the United States maintains its freight cars for $37 per annum. Another railway in similar service spends over $100. The $37 cars cost $100 less to build, weigh 6,000 lbs. less for the same capacity. At $37 on 50,000 cars there is an annual saving of $3,150,000 in maintenance cost alone below the rival figures.

Efficiency, like any other branch of applied knowledge, has its own laws. These laws are absolute. You cannot have high and continuous efficiency if any one of these laws is neglected. Wherever there is high efficiency it will inevitably be found that it is attained by observance of one or more of all these laws.

These principles are twelve in number.

(1) *Inspiration, enthusiasm*, the desire to accomplish.

(2) *Common sense*, usually flagrantly lacking in human affairs and to some extent on even the best railways.

(3) *Special Expert Advice.*—Specialists generally furnish the methods best suited to the principles as applied. The line officials use what is furnished. Few railway presidents would be competent to design a bridge, design a locomotive or freight car, design a steam engine or a dynamo, design a machine tool, or analyze tool steel or keep his own accounts. If the president needs expert advice as to all these matters, how much more does the worker at the bottom of the line need advice?

(4) *Discipline.*—Discipline means that there must be specific duties for everyone and that he must perform them. Discipline does not mean severity, harshness, arbitrariness.

(5) *The Fair Deal.*—In spite of the ten commandments, in spite of the Golden Rule, in spite of all our laws and customs, in spite of the desire of most of us to have the other man do the fair thing, the fair deal is often lacking in the relations of employer and employee, of corporation and client or customer.

(6) *Definite and Specific Standard Practice Instructions.*—As to some matters—time tables and rules for train employees—these are very minute and exact; as to other matters wholly lacking. Most of the best shop practices are carried around under one's hat and are not reduced to writing.

(7) *Reliable, Immediate and Adequate Efficiency Records.*—These include cost distribution. Proper records give positive and incontrovertible knowledge. In usual operations nine-tenths of what goes on is guess work. Most of us would make the wildest guesses about the opertions of his own body, and we know less about our own work.

(8) *Scheduling and Despatching.*—The principles of a train time table and control of train movement by despatchers can be and should be applied to shop and other maintenance operations.

(9) *Time study work* gives the necessary facts for proper schedules and despatching. Time study is a principle, not a method. There are many different methods just as there are many methods of determining a quantity of wheat—weight, measure, estimate, guess, counting the grains, etc.; that method is preferable which gives the greatest amount of accuracy in the shortest time and with the least trouble.

(10) *Standardized Conditions.*—You give the locomotive engineer both a locomotive and a clear track; you give him water tanks and coal chutes; you give him a set of signals. You rely far more on the conditions than you do on the man. The Pennsylvania Railroad has more engineers than it has engines capable of pulling the 18-hour train. When conditions are standardized it is not difficult to find men.

(11) *Standardized Operation.*—When conditions are standardized it is easy to realize standard operation. It is an easier task to run the 18-hour train on time than to run a local freight. The more conditions are standardized the more we can demand a standard operation.

(12) *Efficiency Reward.*—Efficiency reward is a principle. It is one of the fundamental laws of the universe. The most efficient in some line or other obtain the biggest rewards. The most efficient have survived, the inefficient have perished. Every worker, from president down, ought to be compensated, partly at least, on the basis of his efficiency.

The particular form of efficiency reward is not a principle, but a method. In France they reward a lifetime of efficiency by a button of the Legion of Honor, which entitles a man to a military funeral. In England they give him a title, in China they bonus his ancestors, in this country he pulls down the money. The so-called bonus method is a definite increase of wages based on a definite and measurable increase of average efficiency. High efficiency is impossible for either man, gang or shop until many of the other principles have been recognized and made effective; therefore, a bonus is the last—not the first—thing to be offered. Upright and conscientious management, including foremen, good tools, proper work and health conditions precede bonus.

When I am given the privilege of examining the organization and operation of a large plant, it is not the details that interest me. The men about the plant are far more competent than I am to give an opinion as to details. I look for evidences of lack of common sense, for lack of discipline, for unfair conditions, for inadequate records, for unstandardized conditions, for unstandardized operations, and I base my estimate of preventable wastes on the observance of principles, not of details. It is not the system, the particular form of blank, that counts. It is the ideal behind any and all system that counts.

The methods used to determine losses are so positive, so absolute, so indisputable and so simple, that any competent committee of qualified experts could verify the conclusions, and the name of any one of fifty railways could be drawn by lot and a similar investigation would show that it was contributing its quota to the loss of one million dollars a day. Do not imagine that I, an outsider, am slandering a great business of which I know nothing. I have been intimately associated with railway planning and maintenance for nearly thirty years. I have also learned intimately about other businesses, and the losses complained of are universal and inevitable under our present methods of inadequate check.

Railway management is not worse than the average; it is, on the contrary, in many respects better. The railways of the United States, as to special operations, set up and realize as high standards as the world has ever seen. The 18-hour trains between New York and Chicago, the fastest and longest run high speed trains in the world, maintain a standard of promptness of 99.96 per cent. A man living on the line could set his clock by these trains. Here is a case of: (a) Reliable records. (b) Standardized conditions. (c) Standardized performance. (d) Continuously attained.

In the accounting department standards are equally high. Not a cent is spent untraced, or without authority. Here also: (a) There are abundant records. (b) Standard methods of bookkeeping. (c) Specialized for the operation. (d) Balances have to be made.

The whole auditing and accounting is in the hands of specialists who take their inspiration not from the board of directors, not from the executive officers, but from standards that are not only older than railroading, but which antedate the discovery of America.

Standardized conditions in railway operation have already been referred to. Among the most important of these are track and way. No higher standards are conceived, created and maintained than the track, way and bridges of a first-class American road. Here again there are: (a) Records, not always adequate. (b) Standards of construction. (c)

Standard realization. (d) The work being conceived and put into effect by specialists, engineers.

Enough to show that in these respects and many others American railways set up and realize high standards, and to justify what I am about to say as to absence in much of railway operation of: (a) Adequate and reliable records. (b) Standardized conditions. (c) Standards of performance. (d) Definite responsibility and reward. (e) Competent specialists.

Usually the man who best executes is not always the best man to create proper conditions, and the best creator is not always the best doer. A locomotive engineer, even though he takes the 18-hour train over his division in perfect manner every day, neither created the track, the locomotive, the despatching or the signal system, but, on the other hand, the inventors and improvers of these matters were never fitted for locomotive engineers. Let it not, therefore, be supposed that I am in any way criticizing the great operating contingent in American railways. They do what they can, and no higher body of men exists. My criticism of results is based, not on the inefficiency of the men, but on the: (a) Inadequate records. (b) Inadequate and inferior conditions. (c) Inadequate special skill.

To illustrate what I mean: There is no railway east of the Rocky Mountains in which locomotives ought not to be maintained in first-class operating condition for five cents per locomotive mile. I go further, and believe four cents is an ideal to be striven for and ultimately reached. This does not mean that if a railway only had two locomotives, and they collided, the maintenance expense that year would not exceed five cents; it does not mean that if there were so little business that each locomotive only made 10,000 miles in a year, five cents could be realized; it does not mean that every locomotive or every division will come down to five cents, or that any locomotive on some divisions will come down to this figure. It does mean that any railway with 10,000,000 miles a year of mixed freight and passenger service ought to maintain its power for $500,000.

We actually find, however, astonishing variations for similar operations. Comparing the locomotive maintenance costs of five trunk lines operating between the same terminals between 400 and 500 miles apart, under largely similar conditions, in round figures, it costs:

Road A— 6 cents a mile.
Road B— 8 cents a mile.
Road C—10 cents a mile.
Road D—12 cents a mile.
Road E—16 cents a mile.

Assuming 30,000,000 locomotive miles a year, and a $0.06 a mile standard:

Road A wastes nothing.
Road B wastes $600,000.
Road C wastes $1,200,000.
Road D wastes $1,800,000.
Road E wastes $3,000,000.

My assistants and myself have been in the shops of all these companies, and, as to a large part of the loss, we know, in part, why and where it occurs. If, as to every minute operation, there were a standard and a record, showing actual cost compared with standard cost, it would be easy for every man, every foreman, every superintendent, to check what was going wrong. Many railway records are not available for six weeks after the fact has occurred, and as to many facts, not available for more than a year. It has been my experience that if you give a fireman a water-glass and a gauge, he will watch them, and make a strong effort to maintain standards; and it has also been my experience that if standards are supplied to shop and track men and if records are available from hour to hour, a strong effort will be made to attain and maintain standards, and that it is just as easy to maintain a shop or roundhouse efficiency of 99.96 per cent. as it is to maintain this efficiency in a train schedule.

In a very large locomotive shop conditions were first standardized, and then standards of performance were furnished. The shop went on as before, same equipment, same work, same men, same foremen and other officials, but standards as to his own particular duties were set up for every man.

The results were as follows:

Month.	No. of men.	Hours — Standard	Hours — Actual.	Efficiency.
1st	21	2,011.2	3,613.9	55.6
2d	50	4,350.2	7,418.8	58.6
3d	77	7,649.6	12,748	60.0
7th	251	27,051.8	41,463	89.3
12th	656	122,736.4	126,534.4	97.0
13th	731	120,357.5	120,478	99.9
14th	771	148,841	146,434	101.7
15th	819	155,276.5	160,701	96.5

The 819 men have by no means reached the highest efficiency, as is shown by the table of classification below, averages wages assumed at $0.30 an hour and working hours at 250 in the month:

Workers.	Average efficiency, per cent.	Wages.	Bonus, per cent.	Bonus.
61	30.4	$4,575	....	....
33	45.4	2,475	....	.....
50	55.8	3,750	....	.....
72	64.6	5,400	.....	.....
216				
81	74.2	$6,075	1.1	$66.82
76	84.3	5,472	5.8	317.37
74	95.0	5,500	15.0	825.00
90	105.9	6,750	25.9	1,748.25
94	114.6	7,950	34.6	2,439.30
64	123.9	4,800	43.9	2,107.20
56	132.4	4,200	52.4	2,200.80
26	145.3	1,950	65.3	1,271.35
19	154.1	1,425	74.1	1,055.95
6	163.3	450	83.3	374.85
17	196.4	1,275	116.4	148.40
603		$61,147		$12,555.29

Total wages	$61,147.00
Total bonus	12,555.29
Average bonus per cent. to bonus workers	27.9%
Average bonus to all workers	20.5%

If 603 men out of 819 earn bonus it is evident that the schedules are not severe.

In a particular gang of 32 men, an average efficiency of 95.8 per cent. was attained, standard time being 7.211.6 hours, actual hours 7.523.5. The highest man showed 139.2 per cent. efficiency, the lowest 7.8 per cent. These men were on the same kind of work, under the same foreman. Each man was receiving the same rate of wages. In the name of commonsense and justice, what are you going to do with such conditions? Bury your head in the sand like an ostrich and pretend that these differences do not exist? Object, as some of the union officials do, to any records or checks that show up these differences? Assuming the cost per hour of operation being $0.30 for wages, $0.30 for machine charge and $0.25 for overhead expenses on the man, we have an hourly average operating cost of $0.85 an hour. The man and machine work 250 hours in the month at a cost to the company of $212.50.

The table shows how the cost of work per hour varies as efficiency varies:

Efficiency, per cent.	Hours — Worked.	Hours — Standard.	Cost, per mo.	Cost, standard hour.	Relative costs.
60	250	150	$212.50	$1.42	167
100	250	250	212.50	.85	100
140	250	350	212.50	.61	72
2	250	20	212.50	10.62	1.248

This is an actual record—not an imaginary one—taken from a railway shop.

Are you going to pay full wages to the man who only delivers one-twelfth of a fair day's work?

Are you going to allow work to cost $10.62 that ought to be done for $0.85?

Are you going to pay the same wages to the man who does, in the same month, seventeen and a half times as much work as some other man?

Are you going to pay the same wages to the man who makes a given job cost $0.61 as to the man who makes the same job cost $10.62?

Everyone of the twelve fundamental principles are violated when such evils are not remedied.

Shop Kinks.

FROM THE ELIZABETHPORT SHOPS OF THE CENTRAL RAILROAD OF NEW JERSEY.

SHOE AND WEDGE CHUCK.

The half-tone illustration, Fig. 1, shows a small planer which handles the finishing of shoes and wedges. The chuck shown upon the bed and in the drawing, Fig. 2, is of a design which differs from any yet illustrated. One flange of the shoe

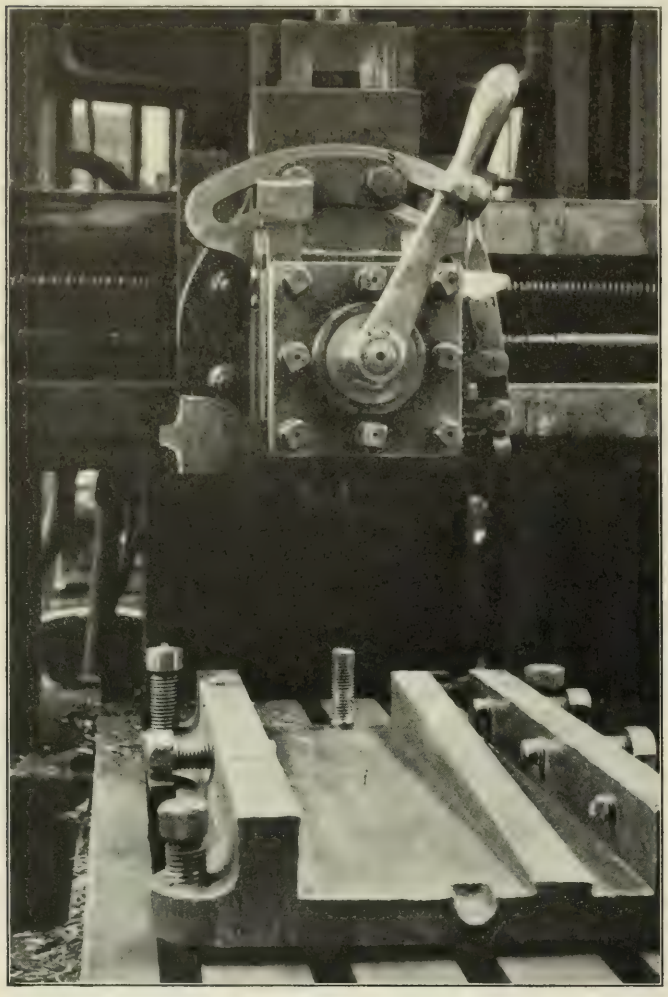


Fig. 1—Shoe and Wedge Chuck on Small Planer.

or wedge is placed between the set screw points and the cast partition of the chuck, against which it is clamped by the set screws. Reference to the drawing, Fig. 2, shows a part circular plate and a long tapered key. The slot in the plate engages the pin in the bottom of the chuck. This plate and wedge hold the other flange against the single set screw on the left-hand side of the chucks.

The adjustments for height to get the pop marks in position are gotten by the four vertical corner screws, which adjust the entire chuck.

A turret tool holder is used on this machine. It is capable of holding four tools, one for roughing, one for finishing and two for the fillets, only three of which are shown.

PACKING RING TOOL.

The drawing, Fig. 3, shows a tool for use on a lathe for finishing up Dunbar cylinder packing rings. The sliding tool post provides for setting the tool to finish a number of rings to a given size and in case of the tool's cutting edge wearing, it is only necessary to readjust the tool. The steel guide pin receives the side thrust of the packing ring, and, if desired, both sides of the ring may be machined at the same time by replacing this guide pin by a cutting tool. The work for which this tool was designed was formerly

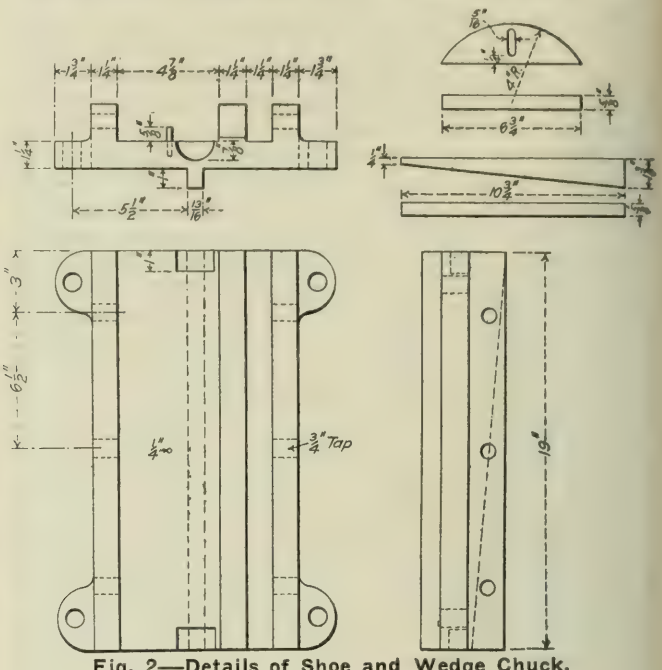


Fig. 2—Details of Shoe and Wedge Chuck.

done with a forked tool, through the ends of which steel cutters were driven on an angle, and held by set screws. It

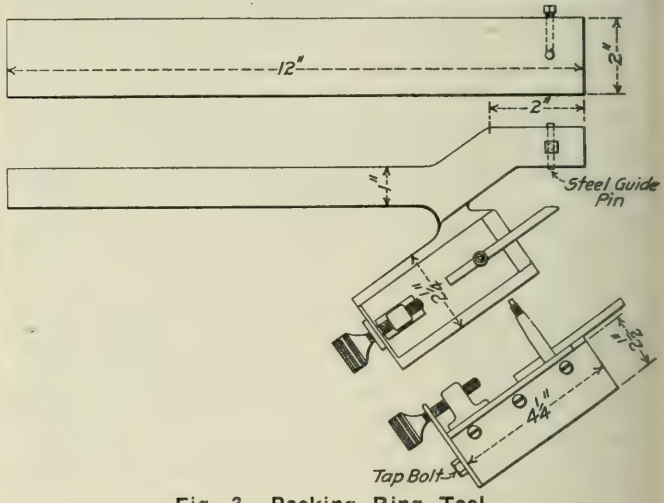


Fig. 3—Packing Ring Tool.

was difficult, however, to get the fine adjustment of the cutting edges, which fact is emphasized in the tool shown.

FROM THE SHOPS OF THE EASTERN RAILWAY OF FRANCE.

DEVICE FOR BORING HOLLOW SPHERES.

A handy device for boring hollow spheres, and one which is in use in a French machine shop, is shown in Fig. 4. In the drawing the piece to be turned is shown in section, and is carried by a chuck or hollow spindle of lathe. The tool is carried by a worm gear, supported by a bar held in the tool post. The spindle and worm operate the feed and are turned by a handle. For adjusting, the tool is turned so that the center of the gear coincides with the axis of the lathe spindle. If the center line corresponds with that of the piece, it is fed directly into the work until the center of the worm gear coincides with the center of the surface with the turn. When

this is done, the tool is fed through the circumference by turning the hand wheel. With this device, the internal surface of a sphere can be bored through any number of degrees, provided there is an opening of sufficient size on one side to admit the tool. The radius of the surface so turned is equal to the distance from the point of the tool to the center of the

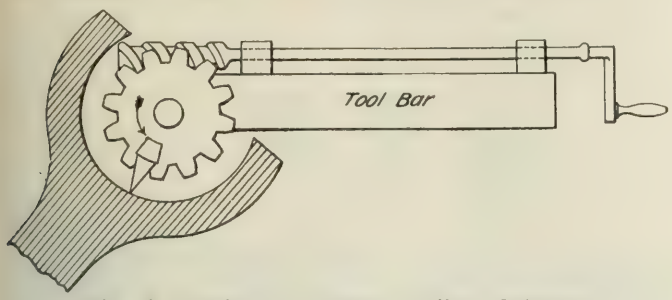


Fig. 4—Device for Boring Hollow Spheres.

worm gear and can only be varied by readjusting the tool A study of the design will show that it is not necessary to adjust the spindle so that the center line coincides with that of the lathe spindle, although in this position the greatest radius of turning can be obtained.

DEVICES FOR GENERAL SHOP USE.

BOILER OR TANK JACKS.

Where small shells or boilers are handled, such as the main reservoirs of locomotives, it will be found convenient to have jacks with adjustable heights. Two of these are shown in Fig. 5. The stem of the jack is threaded to fit the nut in the stand, which nut operates to raise or lower the jack. Where

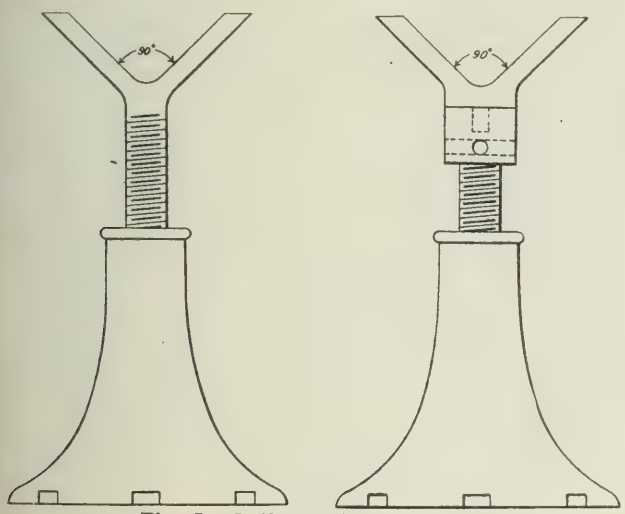


Fig. 5—Boiler and Tank Jacks.

the arrangement is to be used for hoisting main reservoirs into place, the Y-shaped head is made separate and has a small stem that drops down into the head of the screw, as shown by the dotted lines in the drawing. With this jack, a reservoir may be raised and held in position while the fastenings are being adjusted.

PISTON ROD EXTRACTOR.

A piston rod extractor, which was designed some years ago and has performed good service, is shown in Fig. 6. Two straps, A, A, are set over the piston rod and the apparatus respectively, and are held in position by the bolts B. The apparatus consists of a cylinder C, in which there is a piston, the stem D of which projects and is brought to a bearing against the end of the piston rod. The strap prevents the cylinder from backing off when pressure is applied. The projecting end of the cylinder at E is fitted with a coarsely threaded screw F, whose head receives a turning bar through a drilled hole. The end of the screw works through a leather packing, the space between it and the piston being filled with white lead, which acts as a pressure medium. In using, the device is adjusted so that the stem of the plunger bears against the piston rod, after which the screw is run in. This displaces the white lead, the thrust of the screw being multiplied in proportion to the square of its diameter to that of the piston.

PISTON RINGS.

The most economical point of cut-off in a steam engine lies back of the half stroke—and with the increasing temperatures and pressures of modern practice it is getting further back each decade. [Experiments involving higher steam pressures than 140 lbs. go to show that the most economical cut-off for all speeds, of the experimental locomotive, is somewhere between one-quarter and one-third stroke.—W. F. M. Goss, in Locomotive Performance, 1907.] Piston rings will ever be a

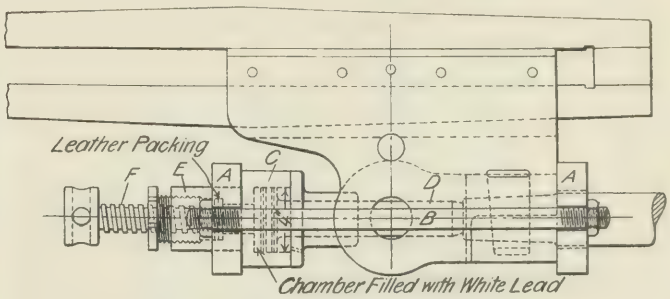


Fig. 6—Piston Rod Extractor.

necessity, as engine cylinder bores will tend to wear hour glassing. Where a cylinder is "hour-glassed" or, what is more rare, "barreled," in longitudinal section, set out rings are scarcely to be considered and steam-packed or ordinary spring rings will be most popular.

While piston rings have any freedom of motion radially, there will be rattling and other noises caused by them, especially through neglect. There are several causes for this condition.

The first perhaps is a too long or too short stroke or unevenly adjusted piston, so that at one or both ends the rings either overrun or underrun the counterbore. Where the ring overruns, as shown in the left-hand drawing in Fig. 7, then the steam, particularly if there be lead, strikes the outer surface of the ring compressing it until it re-enters the cylinder bore. These alternate contractions and expansions of the rings at each end of the stroke often cause a noise. If the trouble occurs at only one end of the cylinder (usually due to improper adjustment of crank and wrist-pin brasses) it may often be remedied by setting out the brasses so that the rings will not override the counterbore at either end. This bad adjustment is mostly likely to occur when the brasses are so arranged that tightening at the wrist-pin end of the connecting rod lengthens it, and tightening at the crank pin end shortens it or vice versa.

When a case of faulty design, the ring should be turned smaller by the amount of the overrun, and the groove will then have to be lined-up accordingly. Where the ring does not reach the counter-bore there is apt to be shouldering for a width equal to the underrunning. The gouging out of the bore up to the edge of the shoulder and the striking of the ring against this shoulder makes the noise. Where the shoulder takes place at one end only and the piston overruns at the other, the stroke should be equalized. When there are shoulders at both ends, either the piston-head or the follower should be turned out and new rings put in (which is seldom possible or advisable) or the counter-bore should be lengthened so as to include the length of the shoulder.

Another cause of piston rings slamming is due to water behind the rings. Where steam enters it condenses and the motion of the rings against this water makes a good deal of noise. A steam-tight lap ring to cover the main ring joint will stop the trouble, nad where this is practicable, the ring should be revolved—in a horizontal engine—so as to bring the joint at the bottom. The ring or rings should be pinned to the piston to allow the water to leak out at the bottom.

Where this cannot be done, small holes should be drilled to free the water.

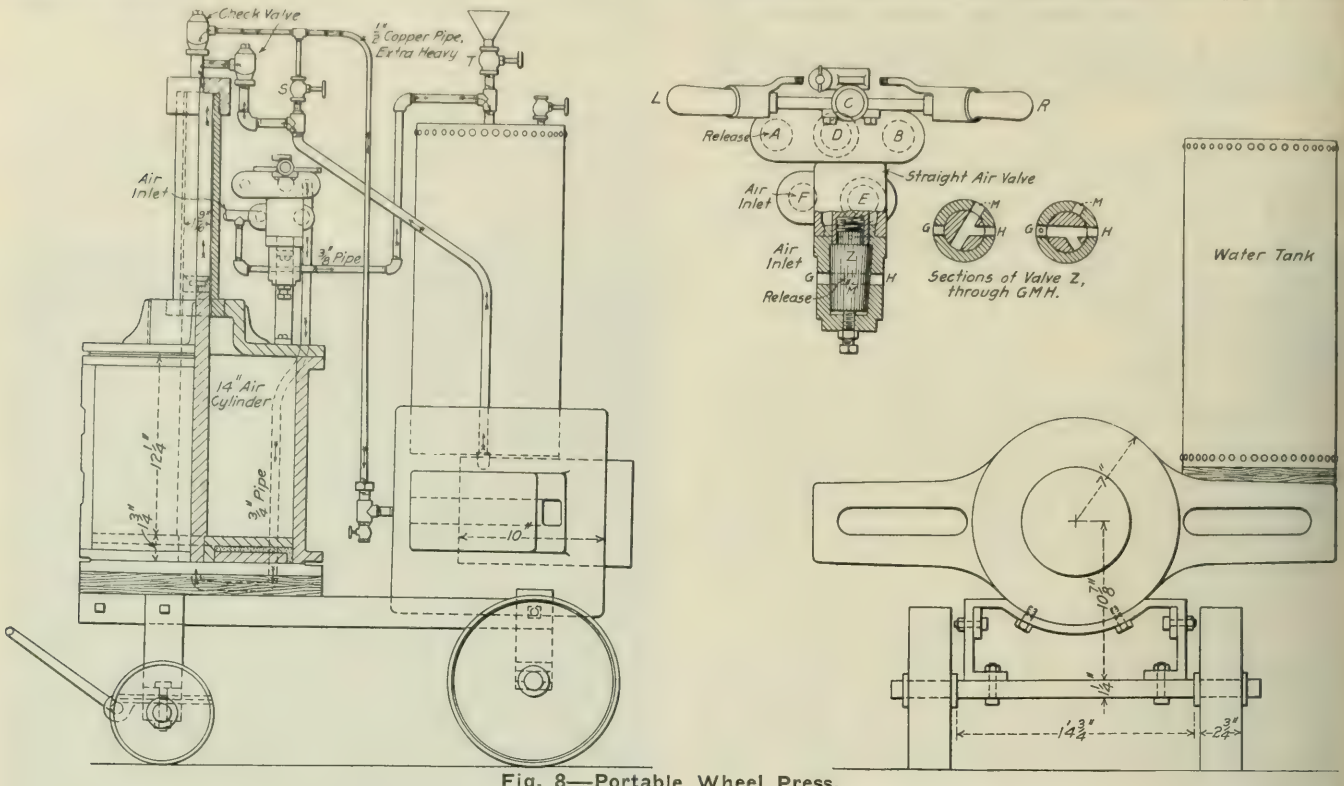


Fig. 8—Portable Wheel Press.

It often happens that a spring ring proves to be a trifle loose, and this may be overcome by drilling small holes so that steam pressure will set them out. If these holes come above the rod, then the water of condensation cannot get out, and if drilled below the rod it is more satisfactory. If the rings slam a great deal and the steam consumption increases at the same time under the same load, it is a sign of a broken ring, and the engine should be shut down at once.

Some builders make spring rings with the outer and inner circles concentric while others turn them eccentric and make the cut in the thin side. This gives the best results after the correct eccentricity of the inner and outer diameter is found. There are likely to be a few cut cylinder-bores during the experiments of obtaining, by this means, equal pressure all around the piston circumference.

PORTABLE WHEEL PRESS.

The drawing, Fig. 8, shows a portable combined pneumatic and hydraulic wheel press with capacity up to 190 tons. It is mounted on a 4-wheel truck so that it can be used in the roundhouse or in any part of the shop. The ordinary work of pressing a wheel on the axle is accomplished with this machine in three minutes. It was designed by John Horne, draftsman of the Chicago, Burlington & Quincy shops at St. Joseph, Mo. The 14-in. piston in the air cylinder operates a $1\frac{9}{16}$-in. hydraulic plunger, which forces water into the ram in the press. The air cylinder is operated by a valve, shown in section, and the connections of the various parts are explained as follows:

When the handle is in the center, air is cut off. The handle in position R opens valve E and closes valve D, making connection to the 14-in. air cylinder through F E B, as shown by arrows, also closing air inlet in valve Z at G and making connection through H and M to the atmosphere, as shown on section of valve Z at G M H, raising the 14-in. air piston and the $1\frac{9}{16}$-in. water piston, forcing water into the ram. The handle in position L closes valve E and opens valve D, making connection B D A from the 14-in. air cylinder to the atmosphere; also opening the air connection on valve Z through G H, as shown on the section of valve Z, to the top of the water tank, forcing water through the pipe at the bottom of the tank to the top of the $1\frac{9}{16}$-in. piston, forcing the piston down and filling it with water ready for another stroke. Each stroke moves the ram ¾ in. To force the ram back, put the handle in the center and open globe valves S T.

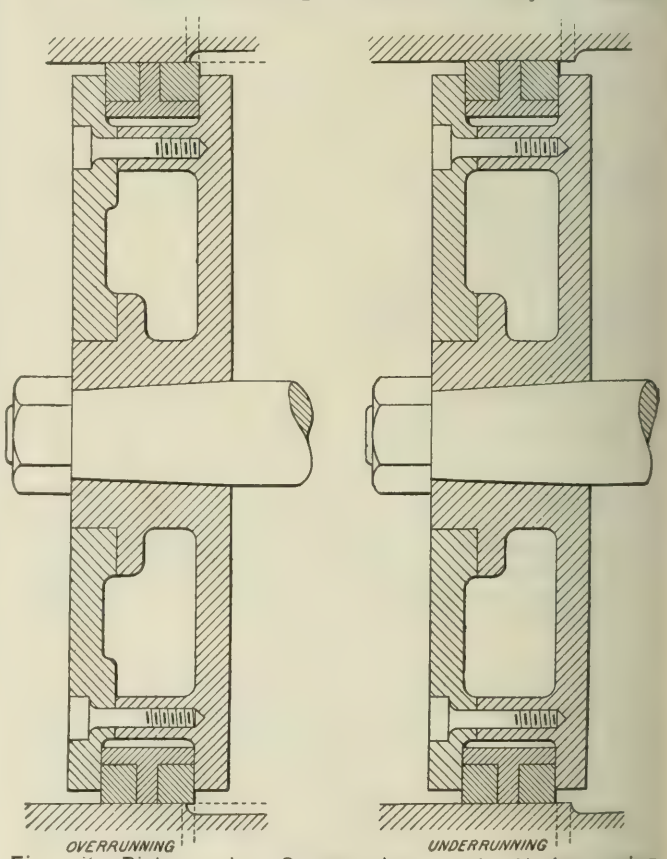


Fig. 7—Pistons in Overrunning and Underrunning Positions.

CAR REPAIR SHOP NOTES FROM THE ERIE RAILROAD AT BUFFALO.

BY ROY V. WRIGHT,
Mechanical Department Editor of the *Railway Age Gazette.*

The car repair plant of the Erie Railroad at Buffalo is the largest one on that system. It is the most important point for passenger car repairs, heavy repairs having been made to 55 such cars during the month of March. In addition, seventy 70,000-lb. capacity twin hopper coal cars were rebuilt and equipped with steel underframes, five new cabooses were built, and heavy repairs were made to more than 100 freight cars,



Fig. 1—Steel Center Sill Cut with Oxy-Acetylene.

many of them of all-steel or steel underframe construction. Very few light repairs are made at this plant.

The shops are very old, but the force is well organized and probably turns out its work as efficiently and economically as any other car repair shop in the district. Over 725 men are employed at the present time. Based on the total pay-roll, including supervision, 86 per cent. of the force is working piecework. This is probably as high an average as it is possible to obtain on this basis.

Both the shops and the car repair yards in the vicinity of Buffalo are under the jurisdiction of R. Gunn, superintendent of car shops. J. McKenna is the general foreman at the Buffalo shops. We are indebted to T. Rumney, general mechanical superintendent, E. A. Westcott, superintendent car department; to the above named gentlemen, and to the various department foremen for courtesies extended in connection with the gathering of data for this article.

OXY-ACETYLENE FOR STEEL CAR REPAIRS.

In looking over the plant in search of labor and time saving methods and devices the most striking feature encountered was the use of oxy-acetylene cutting apparatus in connection with the repairs to steel cars and the cutting off of the rivets connecting the coupler and coupler yoke. As far as we have been able to find, this is the first place where the oxy-acetylene apparatus has been used for steel car repairs, if indeed it is not the only place where it is used for this purpose at the present time. The results that are being gained from its use are so important that it will undoubtedly soon be used extensively at points where considerable repairs are made to either steel or steel underframe cars.

The center sills on hopper and gondola cars, especially the older equipment, are often cracked or broken near the bolster, and it is necessary to cut the sill off and splice on a new end. In doing this the practice on most roads is to drill a number of holes in the sill with a pneumatic drill and cut it off with a pneumatic chipping hammer. This is a rather difficult task, as it is hard to set the brace, or "old man," for the air drill, and after the holes are drilled it is not an easy matter to cut the sill, as the workman must work in an awkward position. With the portable oxy-acetylene apparatus it is a comparatively simple matter to cut the sill. The apparatus is placed alongside the car, and the operator can easily go under the car and direct the flame on a chalk mark showing where the sill is to be cut. A center sill cut in this



Fig. 2—Cutting a Steel Channel with an Oxy-Acetylene Torch.

manner is shown in Fig. 1. It was practically impossible to take a photograph while this operation was being performed, but the way in which the operator handles the torch is plainly shown in Fig. 2. A 12-in. or 14-in. channel, such as used for center sills, can be cut through in from two to two and a half minutes, at a cost, including labor and material, of about one-sixth of what it would be by the method formerly employed and described above. This cost, however, presupposes that the oxy-acetylene apparatus is in more or less constant use and does not have to be specially prepared for each opera-

tion. Where it is only used occasionally the expense would, of course, be higher.

Even after the center sill is cut, where the car is equipped with a built-up bolster, the most difficult part of the job remains, and that is cutting the rivets which connect the center sill to the bolster. These rivets are difficult to get at and it is



Fig. 3—Rivet Heads Are Cut Off Flush, but Plate Is Not Injured by Oxy-Acetylene Flame.

a tedious job to remove them by ordinary methods. With the oxy-acetylene apparatus the rivet heads can easily be cut off in a very short time. At first thought it would seem impossible to cut off the rivet by melting through the head without injuring the sheet, but that it may be done without doing so is indicated by Fig. 3, which shows two ⅝-in. rivets whose heads have been cut off. The molten metal, which is blown to one side by the force of the flame, has adhered to the sheet as shown, but the sheet itself is not touched.



Fig. 4—Cutting Off Rivet Heads on End of Steel Car.



Fig. 5—Cutting off Rivet Head on Coupler Yoke with Oxy-Acetylene Torch.

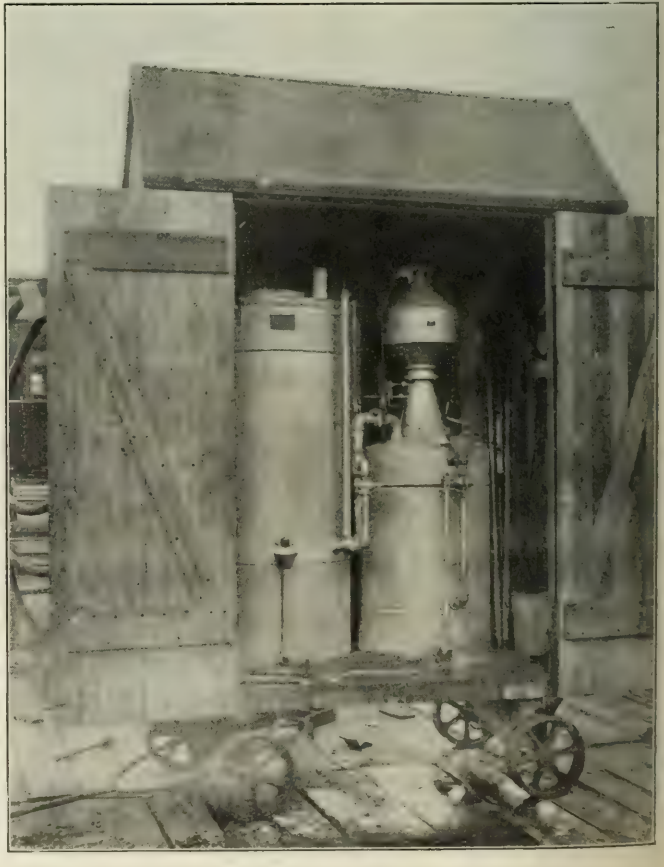


Fig. 6—Acetylene Generator Mounted on a Truck.

In Fig. 4 the operator is shown cutting off a rivet head on the end of a steel car. It is probably as quick and as cheap to cut off such rivets with a cold chisel and sledge as to do it with oxy-acetylene, and these rivets are usually cut off in that way unless the oxy-acetylene apparatus happens to be handy. However, the chisel bar method requires two men as against one with the cutting apparatus, and there is no danger of flying rivet heads injuring passersby with the latter method.



Fig. 7—Oxygen Tank, Torch, Etc., Used with Oxy-Acetylene Cutting Apparatus.

Unknown to the operator, the writer timed him while he was cutting off five of the rivet heads. It took less than two minutes.

The easy and cheap removal of coupler yokes from damaged couplers has been a difficult problem to solve. Many devices have been designed for this purpose, but some of them have gone to the scrap heap and a large percentage of the remaining ones are not giving the best of satisfaction. From the results that are being gained at the Buffalo shops it would appear that the oxy-acetylene apparatus offers a most satisfactory solution to the problem. To illustrate its adaptability



Fig. 8—Heating a Steel Center Sill with Crude Oil Burner.

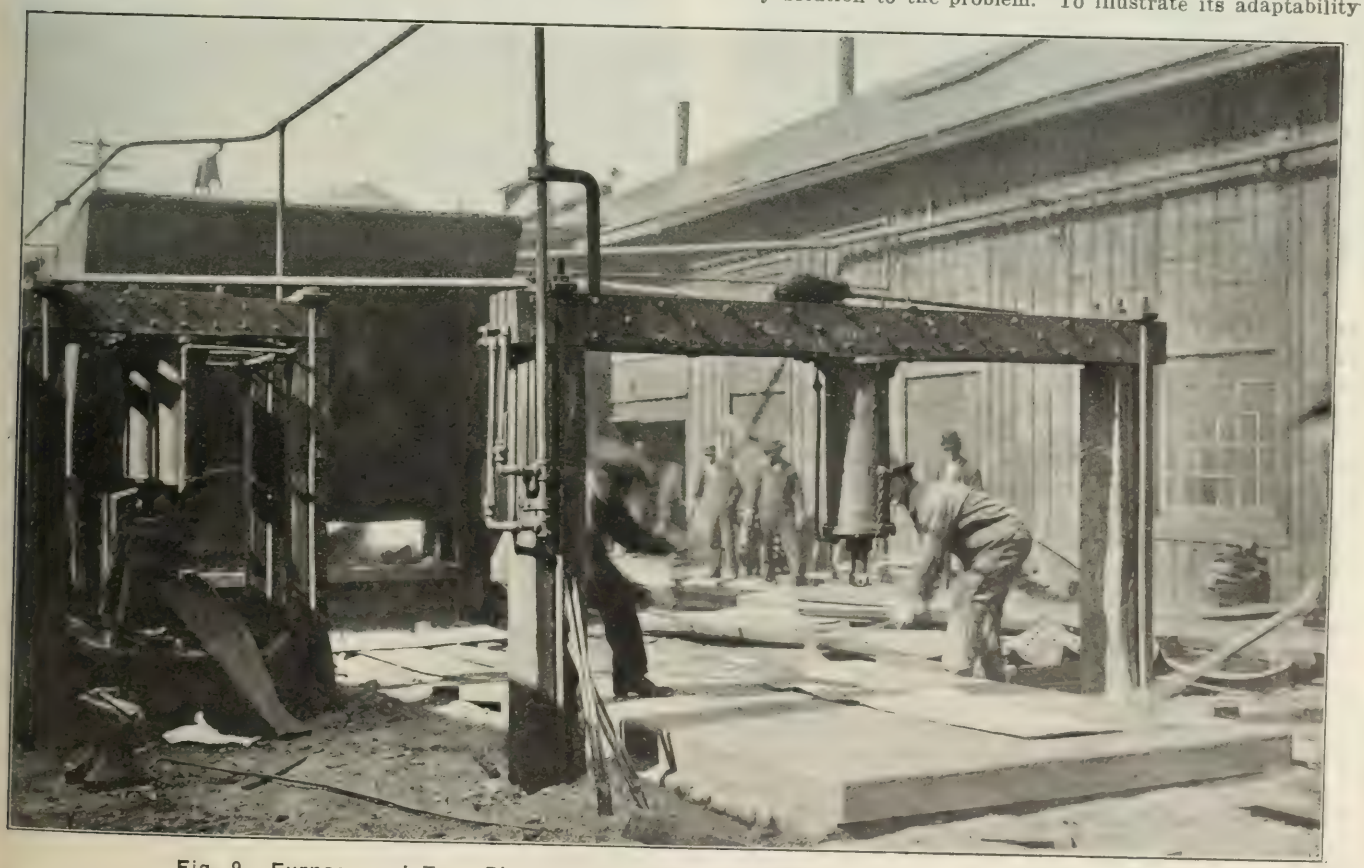


Fig. 9—Furnace and Face Plate for Heating and Straightening Large Steel Car Parts.

for this purpose a little demonstration was made. Three couplers were stood on their heads. The rivet heads on the first yoke were very large and square (Fig. 5) and it required 1¼ minutes for cutting off each head. On the other two yokes they were of the ordinary size for a 1⅛-in. rivet and required an average time of only five-eighths of a minute per rivet. The six rivet heads on the three coupler yokes were thus cut off by one man in five minutes.

A general view of that part of the machine that is used for generating the acetylene, and which is carried on a truck, is shown in Fig. 6. It is a comparatively simple matter to charge this generator. It was designed for stationary use but was placed on a truck by the railway company to make it portable. The manufacturer now makes a portable outfit which is more conveniently and compactly arranged. The rest of the apparatus is shown in Fig. 7. The vessel or tube, which is supported by the tripod, is filled with water and the acetylene gas passes through it; all danger of air backing up

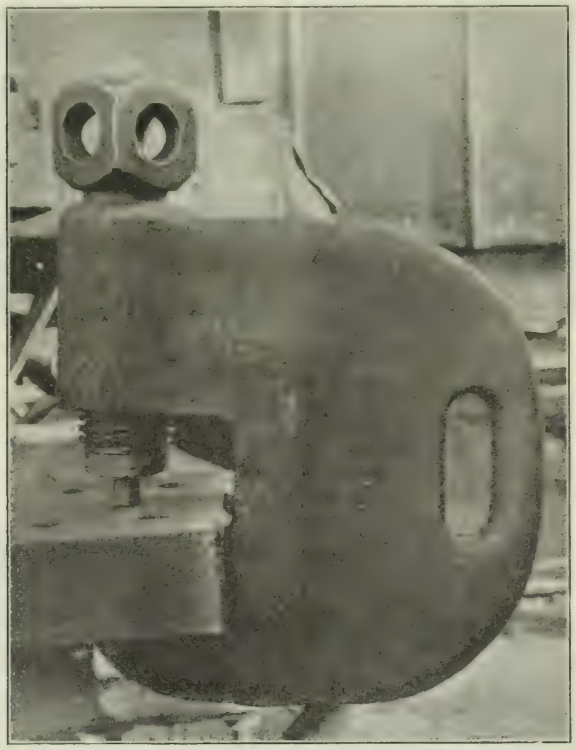


Fig. 10—Portable Punch for Light Work.

into the generator or of back fire is thus eliminated. The oxygen is contained in small tanks, as shown at the right. These tanks are filled by the manufacturer and contain 100 cu. ft. of oxygen under 1,800 lbs. pressure per square inch. The oxygen is mixed with the acetylene and ignited, the burner for this purpose being shown in the illustration. This particular apparatus was furnished by the Linde Air Products Co., of Buffalo.

REPAIRING PARTS OF STEEL CARS IN PLACE.

It is quite often possible to straighten or repair damaged parts of steel cars in place. For this purpose a Ferguson portable heater and kindler is used. The flame from such a burner playing on the center sill of a steel underframe is shown in Fig. 8. Where it is necessary to heat the bottom of a member of a steel underframe on a wooden car the oil burner cannot be used, because of the danger of igniting the wood. For such purposes a small size of open top rivet heating forge may be used to advantage.

STRAIGHTENING PRESS FOR DAMAGED STEEL PARTS.

At one end of that portion of the yard which is used for repairing steel cars is a large oil furnace for heating the damaged parts, and an iron face plate and press for straightening them. This is shown in Fig. 9. The furnace was furnished by the Railway Materials Co. and is 8 ft. 10 in. wide, 20 in. high and 13 ft. 11 in. deep inside. It has an opening at the far end 15 in. high and 45 in. wide, making it possible to pass the end of a long sill or other piece of material through the furnace, so that it may be heated in the middle or at any other part. One of the burners is purposely lowered for heating parts locally. The house or hood was built over the furnace to protect it from the weather.

The iron face plate upon which the parts are straightened is 7 ft. wide, 10 ft. long and 6 in. thick. Most of the parts are straightened, after they are properly heated, by two or three men using sledge hammers. In some instances it is quicker to admit air to the cylinder, which is supported by the frame work, and clamp down one end of the piece on the face plate while the men drive down and straighten the other end. The air cylinder is about 8 in. in diameter.

To the left in Fig. 9 is shown another press, having two 8-in. air cylinders, which are controlled by one valve and operate simultaneously. This was intended for pressing out such parts as side stakes, using special dies. There is not much of this work to be done, however, and it is only used occasionally.

CRUDE OIL STORAGE.

Crude oil for use in the above mentioned oil furnace and for the furnaces in the blacksmith shop is stored in two 6,000-



Fig. 11—Truck for Transporting Mounted Wheels.

gal. tanks, which are placed in a pit below the ground level. This is covered over with timbers. The oil is unloaded into these tanks from the cars by gravity and is forced from them to the furnaces by admitting air to the tanks under a pressure of 15 lbs. per sq. in.

PORTABLE PUNCH FOR LIGHT WORK.

It is often necessary to drill a ⅝-in. or ¾-in. hole in steel plates on trucks or car bodies when an air drill is not available or too much time would be required for setting it up. In such cases the small punch shown in Fig. 10 is of value. It will punch ⅝-in. or ¾-in. holes in plates up to ⅜-in. or ½-in. in thickness. The jaw opening is 2¾ in. wide, and the reach from the center of the punch is 2⅝ in. The screw is 2¼ in. in diameter.

PULL-IN CLAMPS.

In repairing and reinforcing the sides of gondola or hopper cars it is often necessary to pull them in to the proper position. To do this a clamp has been made with a turnbuckle, 28 in. long over all, at the center. The 1¾-in. rods which fit in the turnbuckle are upset at their outer ends to form a hook 4 in. wide and 1¼ in. thick in section.

LIFE OF STEEL CARS.

Although the Erie Railroad has many steel cars which have been in service for 12 or 14 years, no serious trouble has been had from deterioration due to rust or corrosion. It is to be expected that floor sheets which have been in service for such a length of time may need renewing when the car is so badly damaged that these sheets must be removed and be heated in the furnace. The loss in thickness, due to rust and corrosion, and also scaling due to the heating, sometimes makes them too thin to warrant replacing them on the car. It has been observed that the steel deteriorates less rapidly when the cars are kept in constant service than if they are allowed to lie idle or to remain loaded with damp cinders or coal. A number of underframes were examined on hopper cars that had been in service for 14 years and were found to be in excellent condition.

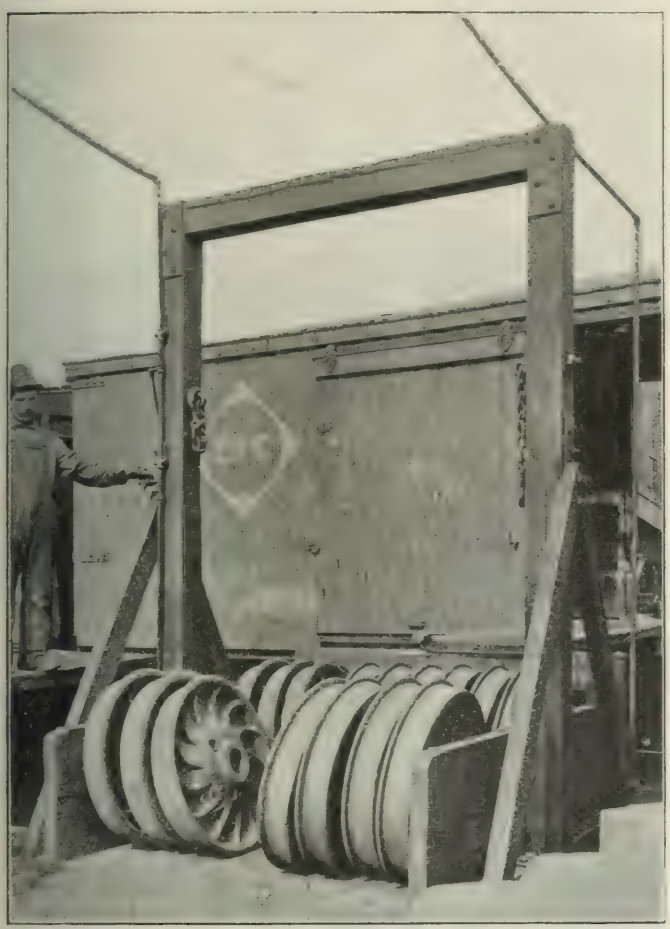


Fig. 12—Sixteen Car Wheels on Hoist Ready to Be Raised.

CART FOR MOUNTED WHEELS.

A convenient cart for moving mounted wheels about the yard is shown in Fig. 11. To pick up a pair of wheels this is tipped over to one side enough to allow the wheels and axle to be run under it. The hook is placed under the center of the axle, and then by bearing down on the handle of the cart the front wheel is raised off the ground, the fork at the same time coming down over the axle near the rear wheel. A bolt or rod is slipped through the holes in the fork underneath the axle, and by raising the handle of the cart both wheels are lifted clear of the ground. As the axle is hung from near the center the weight may be very evenly balanced. To unload the wheels, the operation as described is reversed. The wheels on the cart are 42 in. in diameter and have steel tires 2 in. wide. A spring which supports the upper end of the I-bolt, from which the hook that carries the axle is suspended, makes the cart ride more easily.

WHEEL HOIST.

A convenient hoist for loading and unloading wheels from cars is shown in Figs. 12 and 13. As many as 16 wheels may be placed on the platform of the hoist at one time. By admitting air to an 18-in. cylinder placed in the pit underneath the platform it may quickly be raised to a level with the floor of a flat or box car. To guard against accident, due to a sudden fall in the air pressure or other cause, the two hooks which are shown attached to the uprights are slipped under iron rods at the top of the side walls of the platform. The platform is 6 ft. wide between the sides and 8 ft. long. To steady it, braces or brackets are attached to the under side and bear against the uprights, the sides of which are covered with steel plates. There are three of such brackets to each upright, and there are also smaller brackets at about the middle of each end of the pit, these latter brackets bearing against plates which are attached to the walls of the pit. The uprights or columns are of timber, about 7 in. x 7 in. in section. A movable loading platform extends from the car to the hoist.



Fig. 13—Wheel Hoist Raised to Level of Car Floor.

The air cylinder is constructed of two 18-in. cylinders, one on top of the other, and connected to form a single cylinder. These were at one time used on portable air jacks for raising loaded freight cars or passenger cars, but proved to be too heavy and bulky to be used advantageously for that purpose.

TIMBER HOIST.

Large timbers are often loaded in gondola or hopper cars and are difficult to unload unless some special provision is made for doing so. For this purpose a stationary hoist extending over two tracks is used, as shown in Fig. 14. The timber is unloaded from the cars on lorry trucks and transferred to any part of the yard. The cylinder on the hoist is

12 in. in diameter and has a stroke or lift of 8 ft. It is operated from the platform at the right by the use of an old engineer's valve. The cylinder is supported by a small carriage, which operates on two sheaves on a track of bar iron.

STORAGE RACK FOR STEEL BARS.

The material rack for storing steel rods and bars, shown in Fig. 15, is built better and is more substantial than racks



Fig. 14—Timber Hoist.

ordinarily used for this purpose. It is 40 ft. long and about 17 ft. deep and rests on concrete piers, there being five of these extending the full length of the rack. The cast iron uprights are about 9 ft. high and are spaced 2 ft. center to center lengthwise and about 4 ft. 3 in. center to center crosswise. These cast iron standards are about 1½ in. x 5 in. in



Fig. 15—Partial View of Steel Storage Rack.

section, with ribs at the middle of each side, making the maximum width at the bosses 4 in., tapering down to a minimum of 2½ in. midway between the cross rods. The 1⅛-in. cross rods have pipe spacers upon which the material rests. The cross rods are spaced vertically about 1 ft. center to center, except for the lower one, which is 18 in. above the base, and the upper one, which is 6 in. below the under side of the top timber. It will be seen that the two upper rows are divided lengthwise into smaller sections by the use of pieces of ½ in. x 2½ in. iron placed midway between the cast iron posts. The rack is tied at the ends by two sets of diagonals of 4 in. x ½ in. iron; one set of these is shown in a partial side and end view of the rack, Fig. 16. The timbers used at the top and bottom to tie the structure together are 5 in. x 8 in. It is the intention to cover the rack over to protect the material from the weather.

PAINT SPRAYER.

As on many other railways a paint sprayer is used for painting freight equipment. It saves greatly in labor, although the winds at Buffalo prevent any saving in material, if indeed they do not at times offset at least a part of



Fig. 16—Partial Side and End View of Steel Storage Rack.

the advantage of the saving of time and labor. The operator realized that he was being timed when the following test was made, and it probably represents considerably better than average practice, although in order not to get the paint on too thick it is necessary for the operator to either keep moving or to shut off the device and stop. The time, taken from when he started operations with a full can of paint (one gallon until he had finished one side and one end of a 36-ft. 70,000-lb. capacity gondola car, inside height 3 ft. 11 in., was five minutes and ten seconds. This included the time for the partial refilling of the can of paint, which required 30 seconds, and also the touching up of two or three spots at the finish, which required about 20 seconds. The operator usually wears a mask over his nostrils. The car was thoroughly and evenly covered and only a very few drops of paint dripped off. The paint seemed to have penetrated

into all the cracks and crevices. The paint sprayer is shown in operation in Fig. 17.

The paint sprayer (Fig. 18) weighs about 6¾ lbs. when empty and 16 lbs. when filled. In addition, the weight of that part of the air hose which hangs from it must be considered. By pressing the handle at the side, air is admitted through a ½-in. pipe. A spring automatically closes the valve when



Fig. 17—Painting a Car with the Spraying Machine.

pressure is removed from the handle. The mixture of paint and air is forced out through the T on the ¼-in. pipe, no special nozzle being required. About three gallons of paint are required for the first coat on a new gondola car, such as described above.

ELLIPTICAL SPRING TESTING APPARATUS.

A home-made device for testing the elliptical springs on

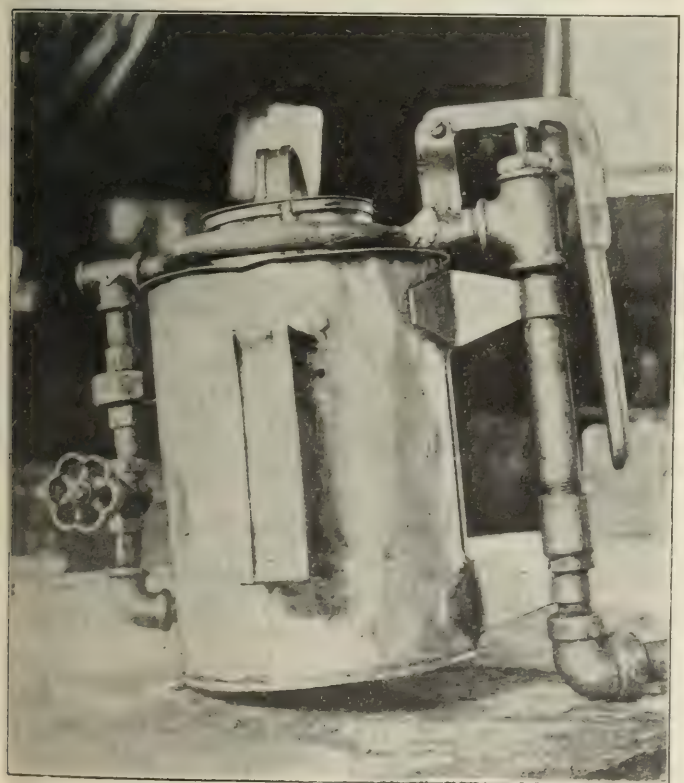


Fig. 18—Paint Sprayer Used for Painting Freight Cars.

passenger equipment is shown in Fig. 19. The air cylinder is 18 in. in diameter and was taken from an old hydraulic jack. The pressure per square inch on the cylinder is indicated by the air gage. A table on the wall back of the machine shows the total pressure on the spring to correspond to the various gage pressures, and is as follows:

Pressures					
Gage.	Total.	Gage.	Total.	Gage.	Total.
10	2,544	42	10,687	70	17,812
20	5,089	45	11,451	75	19,085
25	6,361	48	12,214	80	20,357
30	7,634	50	12,723	85	21,629
35	8,906	55	13,995	90	22,902
38	9,669	60	15,268	95	24,174
40	10,178	65	16,540	100	25,447

The springs are checked as to the height under the load which they must carry on the car, and if found deficient are reset. Ordinarily the springs are tested only when there is some question as to their capacity. The apparatus is also

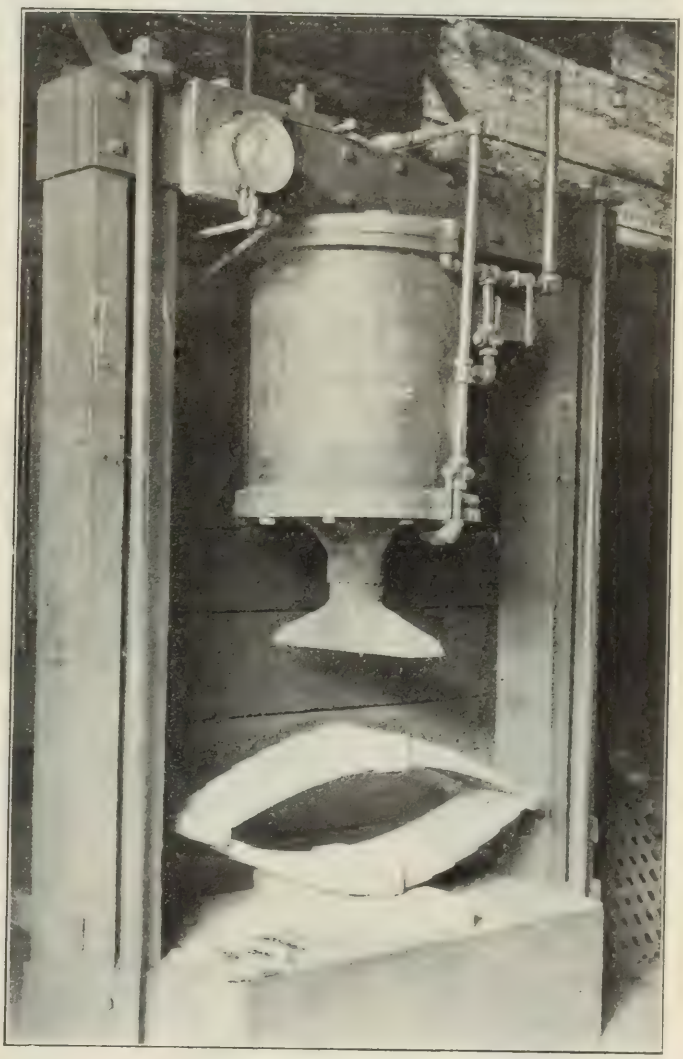


Fig. 19—Spring Testing Apparatus.

found useful for compressing the springs and placing a clamp over them to facilitate placing them in the trucks. Formerly a spring was used to force the piston upward when the pressure was released, but it did not prove strong enough, and provision was made for allowing the air to enter underneath the piston when it was desired to force it upward.

MAKING CABOOSE STEPS.

The law requiring the lowering of caboose steps has made it necessary to provide thousands of new brackets for these steps. A bulldozer at the Buffalo shops manufactures all of these for the system. The problem was to devise dies by

which all of the bends could be made in one heat and practically one operation. It was done by making two sets of dies, as shown in Fig. 20, and using a separate cylinder for operating each set. One die acts in advance of the other and completes its work before the other one starts to move. Ten-inch air brake cylinders are used. At present the bolt holes

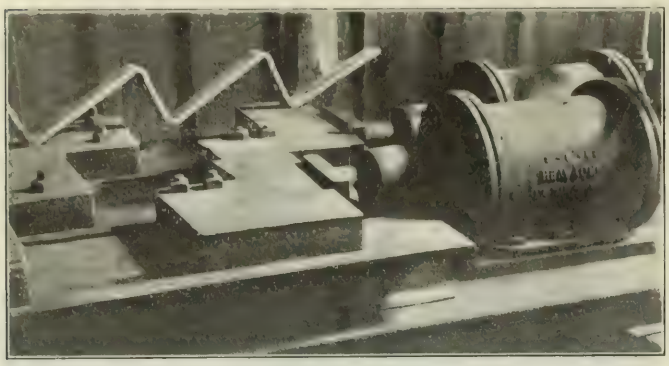


Fig. 20—Bulldozer and Dies for Making Caboose Steps.

in the brackets are drilled after they are bent. Experiments are being made with a view to punching the holes in the ½ in. x 2-in. bar and bending it afterwards. This can, of course, only be successfully accomplished by heating the bars uniformly and to the same temperature and having the conditions of handling standardized.

GUARD FOR CROSS CUT SAW.

A splendid safety guard for use on cross cut saws has been devised by W. T. Duffin, foreman of the passenger car department, and is shown in Fig. 21. This guard of galvanized iron

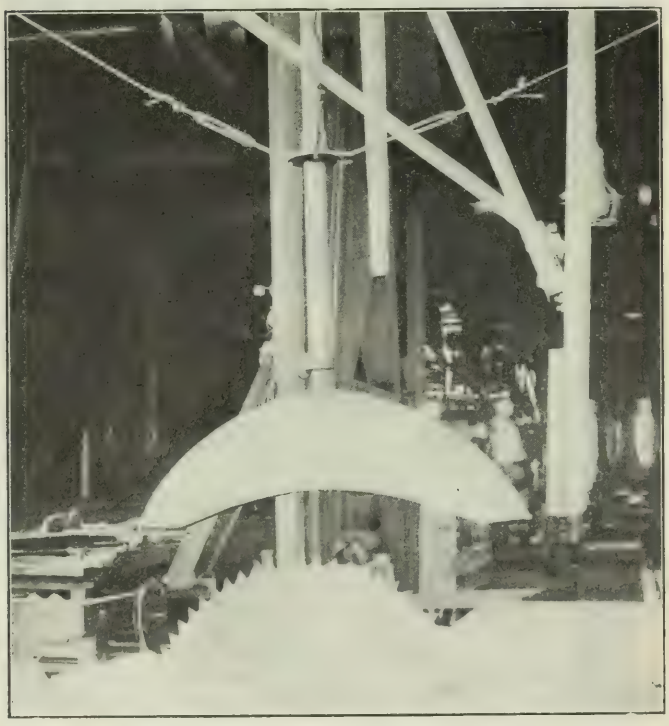


Fig. 21—Substantial Safety Guard for Cut-off Saws.

is attached to the lower end of a piece of pipe, which fits in another piece, as shown, and which has a cord attached at its upper hand which extends upward through the pipe and over a couple of pulleys to a counter weight in a box alongside one of the columns. The guard may thus be easily moved up and down and be adjusted to suit the size of the timber to be cut. When placed in the desired position it may be temporarily fastened by means of a set screw.

THE ECONOMICAL USE OF COAL.

The Pennsylvania Railroad has recently issued a revised circular containing detail and complete instructions to enginemen and firemen for the economical use of coal on locomotives, which reads as follows:

Enginemen and firemen must work together so as to save coal and reduce smoke, and when taking charge of a locomotive must see that the fire, grates and ash pan are in good condition, so as to prevent engine failures on the road.

Enginemen must include in their reports all defects causing leaks of steam or water in any part of the locomotive, as the repair of these defects will avoid loss of coal.

The burning of bituminous coal in a locomotive requires air, which must be admitted through the grates and through the fire door. Smoke means waste of coal and must be avoided. Large quantities of coal placed in the firebox at one time cool down the fire, cause smoke and waste coal; small quantities at regular intervals will keep the fire bright, prevent smoke and take less coal to keep up steam pressure. Lumps of coal should be broken in pieces not larger than three inches. A bright and level fire over the whole grate must be carried whenever possible. When a sloping fire is used, no more coal should be banked at the door than is necessary.

To prevent smoke and to save coal, the fire door must be placed on or against the latch after firing coal or using the scraper, slash bar or hook, and when on sidings, in yards, at terminals or before starting. Before the throttle is closed, the blower must be used and the door placed on the latch. Firemen must stop firing long enough before steam is shut off to prevent smoke and waste of coal.

Dead spots in the fire must be avoided when running with throttle closed, as this frequently causes the flues to leak.

The grates must be shaken as often as is necessary to clear the fire of ash and clinker in order to admit sufficient air, and in such a manner as to avoid the loss of good fire. Care should be taken to place the grates level after each operation.

The waste of steam at safety valves must be avoided. One shovel full of coal is required to make the steam that escapes from a safety valve in one minute.

The sprinkling hose attached to the injector must be used frequently to keep down dust on the foot plate and in the cab and to wet the coal in the tender. However, too much water on the coal should be avoided, as to some extent this practice is the cause of flues stopping up. Coal must not be allowed to collect or remain on the foot plate, but should be swept into the coal space of the tender and not out on the tracks.

Engines must not be brought into terminals with a dead fire, which will cause the flues to leak; nor with too heavy a fire, which will cause waste of coal.

When banking or cleaning fires, the blower should be used as lightly as possible. After the fire has been cleaned of ash and clinker, the clean fire must be placed at the front end of the grates and maintained in good condition. When cleaning fires or with a banked fire, excessive use of the injectors must be avoided, as this will result in injury to the flues.

After taking coal at coaling stations, the fireman must do the necessary trimming of the coal pile to insure the prevention of coal falling off of tenders while in transit, which is both wasteful and dangerous to passing trains, trackmen, etc.

Coal can be saved by the proper use of the injector in pumping the locomotive regularly, and by taking advantage of every opportunity to fill the boiler when not working the locomotive to full capacity; also by using the injector to avoid the safety valves blowing off.

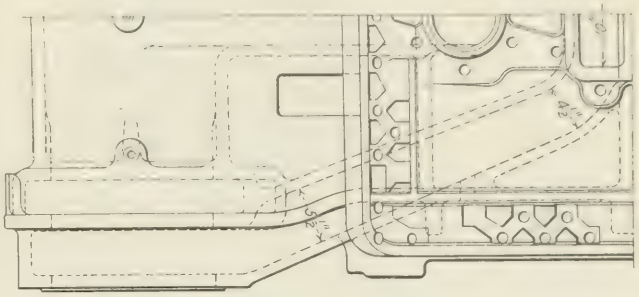
Coal will be saved by always working the locomotive (except when starting) with a full throttle when the cut-off is one-quarter of the stroke or greater; but if one-quarter cut-off with full throttle gives more power or speed than is needed, the reverse lever should be left at one-quarter cut-off and the throttle partially closed as needed.

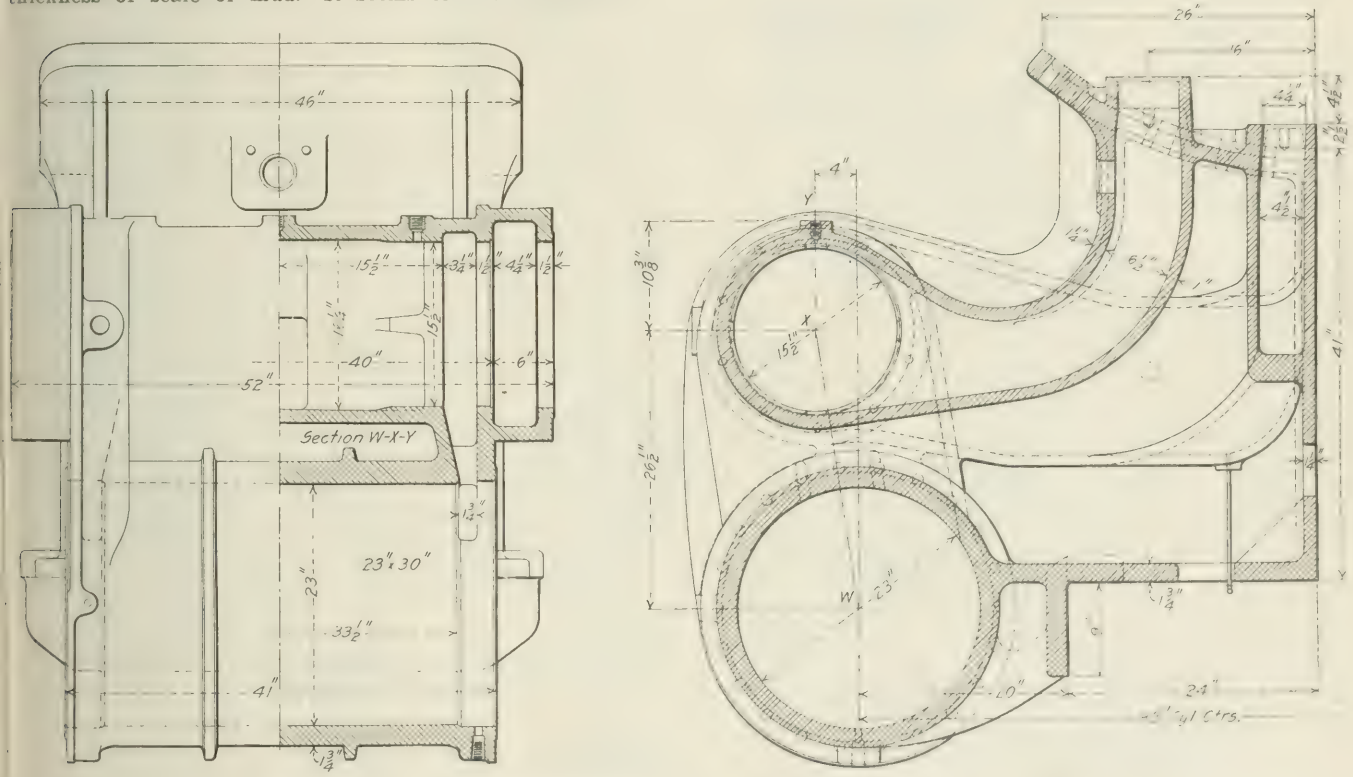
CONSOLIDATION LOCOMOTIVE, CHICAGO, MILWAUKEE & ST. PAUL.

The Chicago, Milwaukee & St. Paul has built at the Milwaukee shops during the past year about 100 large locomotives, including 25 of the consolidation type here illustrated. The company has also given orders for 50 similar locomotives to the American Locomotive Company and 50 to the Baldwin works. The St. Paul has also built 25 mikado locomotives, which have larger boilers and are much heavier, and are found useful for service on mountain grades, but for general freight service the consolidation engine is lighter per unit of tractive effort and is found preferable to the mikado type.

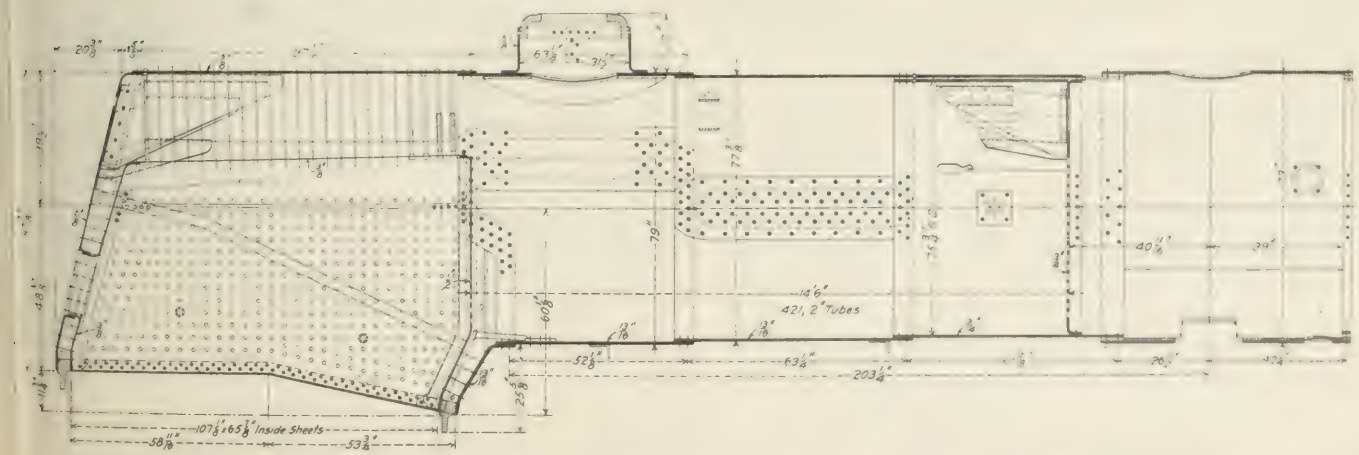
The consolidation has cylinders 23 x 30 in.; driving wheels, 63 in. in diameter; weight on drivers, 189,200 lbs., and with 200 lbs. of boiler pressure the maximum tractive effort is 42,800 lbs. The boiler shell is made of three cylindrical sheets, the front one 75¾ in. outside diameter and ¾ in. thick. The other shell sheets are $\frac{13}{16}$ in. thick. There are 421 2-in. tubes spaced ⅝ in. apart. This is somewhat closer than the usual practice, which is ¾ to ⅞ in. The wider spacing allows better circulation, especially if the tubes accumulate any extra thickness of scale or mud. It seems to have been demonstrated that the evaporating capacity of the boiler is not reduced by the use of the smaller number of tubes required by the wider spacing.

The working boiler pressure on the St. Paul is still maintained at 200 lbs. on new engines, though the general practice in the West in recent years has been to reduce this to 170 or 180 lbs. The firebox is radially stayed, and the firebox side sheet is nearly vertical, while the outer sheet inclines slightly

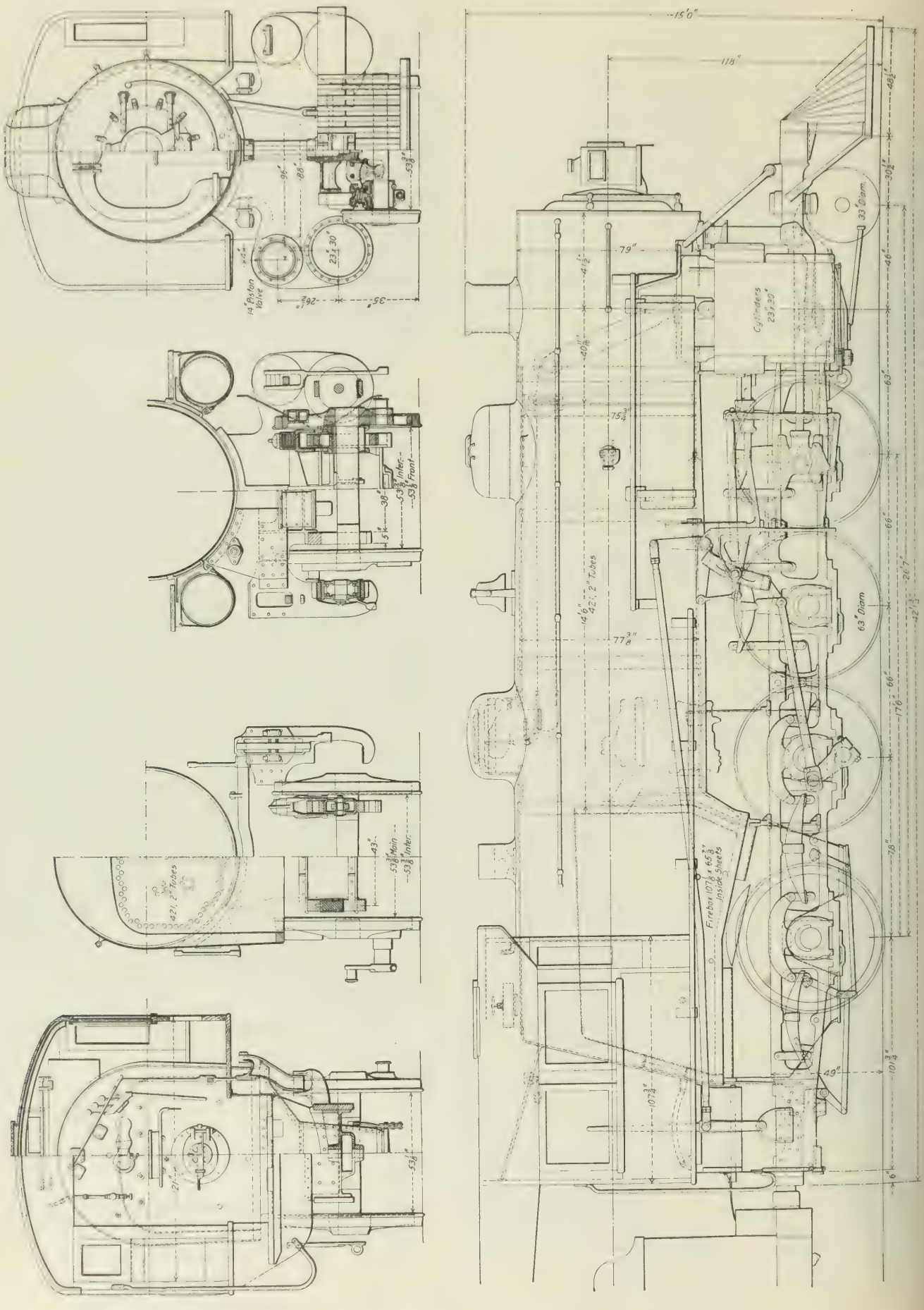




Cylinder Details; Chicago, Milwaukee & St. Paul Consolidation Locomotive.



Longitudinal Section Through Boiler of Consolidation Locomotive, Chicago, Milwaukee & St. Paul.

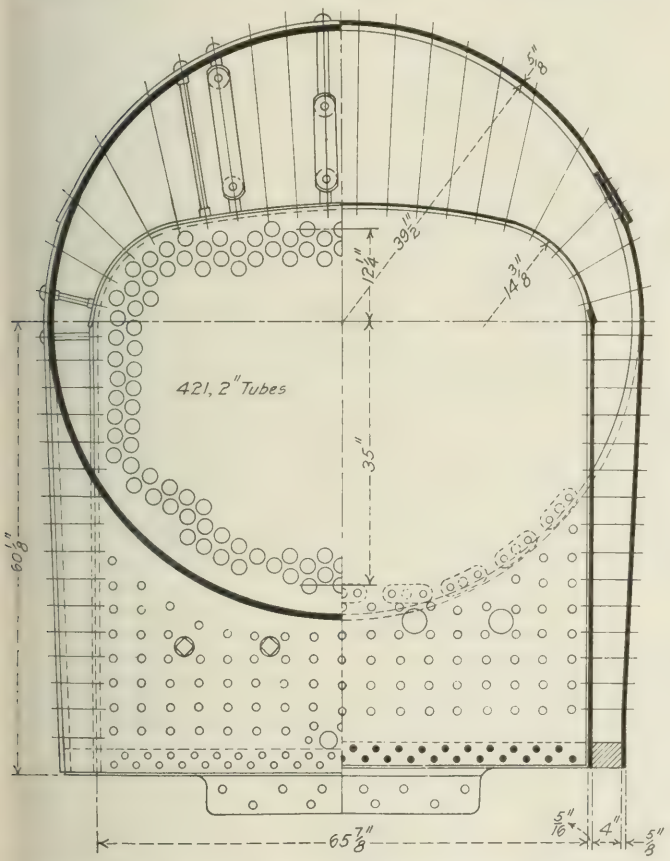


Elevations and Sections; Consolidation Locomotive for the Chicago, Milwaukee & St. Paul.

outward, increasing the width of the water leg from 4 in. at the mudring to 6 in. at the top.

The brick arch is supported on four 3-in. tubes. The firebox is deeper at the front end to provide a good depth of fire below the tubes; the distance from the mudring to the lower tubes is about 2 ft. The water space at the throat is 6¼ in. wide, providing good circulation to the side sheets. The simple gear for operating the ash pan doors is shown in the general plan. They swing on parallel links and close with a flat face against the hopper. The frames are wrought iron, 5 in. thick, 5½ in. deep over the pedestals, and 4½ in. deep between pedestals. They are braced laterally on both the top and bottom bars, ribbed castings being used for this purpose.

The cylinders are shown in detail. The saddle and cylinder are in one casting, and the piston valve chest center is 4 in. outside the center of the cylinder, so as to provide a well balanced arrangement of the valve gear levers. The walls of the cylinder are 1¾ in. thick and those of the valve chest are 1¼ in. thick; there is a very short and direct passage for the steam from the chest to the cylinder. The arrangement



Cross Sections Through Boiler of Consolidation Locomotive.

of the Walschaert valve gear is shown plainly on the general drawings. There is a substantial crosshead and guide for the valve stem which distributes the pressure at this point over a large area and must be useful in preventing the rapid wear of valve stem packing. The main and side rods, driving and truck axles and many other forgings are of wrought iron made of scrap billets well hammered. When thus made iron locomotive forgings are much cheaper than steel, and are found satisfactory in the service of this railway. The tank has a capacity for 7,000 gals. of water and 10 tons of coal. The tender frame is made of heavy channels with wide rectangular brace plates.

The principal dimensions, weights and ratios are given below:

Ratios.

Weight on drivers ÷ tractive effort	4.42
Total weight ÷ tractive effort	5.04
Tractive effort x diameter of drivers ÷ heating surface	800.30
Total heating surface ÷ grate area	69.04
Firebox heating surface ÷ total heating surface, per cent.	6.37
Weight on drivers ÷ total heating surface	56.16
Total weight ÷ total heating surface	64.02
Volume, both cylinders, cu. ft.	14.40
Total heating surface ÷ volume of cylinders	233.97
Grate area ÷ volume of cylinders	3.38

General Data.

Service	Freight
Fuel	Bituminous coal
Tractive effort	42,800 lbs.
Weight on drivers	189,200 "
Weight on front truck	26,500 "
Weight of engine, total	215,700 "
Weight of engine and tender	350,250 "
Wheel base, driving	17 ft. 6 in.
Wheel base, total	26 " 7 "
Wheel base of engine and tender	60 " 2 "

Cylinders and Valves.

Cylinders, diameter and stroke	23 x 30 in.
Valves, type	Piston
Valves, diameter	14 in.
Valves, maximum travel	6¼ "
Valves, steam lap	1 "
Valves, exhaust clearance	0
Valves, lead	¼ in.

Wheels and Journals.

Driving wheels, diameter	63 in.
Driving journals, main	10 x 12 "
Driving journals, other	9½ x 12 "
Truck wheels, diameter	33 "
Truck journals	6½ x 12 "

Boiler

Working pressure	200 lbs.
Diameter, first ring	75¾ in.
Firebox, width and length	65⅞ x 107⅛ "
Tubes, number	421
Tubes, diameter	2 in.
Tubes, length	14 ft. 6 in.
Heating surface, tubes	3,173.5 sq. ft.
Heating surface, firebox	195.7 "
Heating surface, total	3,369.2 "
Grate area	48.8 "

Tender.

Journals	5½ x 10 in.
Water capacity	7,000 gals.
Coal capacity	10 tons

THE COMPENSATION OF WORKMEN.*

BY H. L. GANTT.

In any discussion of this subject, however much we may differ as to the means by which our end is to be accomplished, we all must agree that if there is a final solution it must be an equitable one. Any solution, therefore, which is based upon the ability of the more powerful party to impose its will on the other, is only temporary and liable to be reversed. High wages can only be paid permanently for high efficiency, and any attempt to get high wages without a corresponding efficiency can only be temporarily successful. This is an economic law, and any man or body of men that exacts a compensation out of proportion to the service rendered will ultimately come to grief.

The supreme importance of efficiency as an economic factor has only recently begun to dawn upon the world. The Japanese, in their war with Russia, gave us an illustration that we should not forget. The present tension between Germany and England is due almost exclusively to the fact that the efficiency of the Germans is greater than that of the English. That labor, both skilled and unskilled, is, as a rule, inefficient is an undoubted fact, but it leads us to ask about the efficiency of management. Not long ago I visited a machine shop, whose name was for a long time well and favorably known throughout the East, and saw a 24-ft. boring mill being driven at a snail's pace by a 4-in. single belt. The steel chips that were being removed were cool enough to be picked up by the hand without discomfort, and the workman was trying to while away the weary hours by reading a week-old newspaper. The cutting tools were of modern high speed steel, but tools made from old files would probably have done satisfactory work at the speed used. To be sure the new steel tools needed less grinding than the old files would have needed, but the special value of high speed steel is not that it makes less labor for the workman, but that it is capable of doing so much more work at the same time. This case is not a question of workman, but of management, and until those at the head of this establishment

*Read before the National Metal Trades' Association, Hotel Astor, New York, April 14, 1910.

realize that efficiency of operation is more to be considered than the length of time a tool will last, it will be impossible for them to take again the place they once held in the industrial world. If they had even the elements of a modern cost system the value of the time element would begin to dawn upon them.

Turning again to the workman we ask why is he inefficient. A little consideration of the methods of compensation that oftenest exists leads us irresistibly to the conclusion that there is but little inducement offered to him to be anything else. We can hardly expect him to understand the importance of a subject so many better educated people so utterly fail to appreciate, hence the only inducement that appeals to him is the immediate one of increased pay. We must not expect him to learn any more than this except by a long series of object lessons. It is therefore up to the educated man to learn economic laws and set the workmen an example by conforming to them.

Under the system of day work that oftenest exists but little provision is made for awarding extra compensation to the efficient man, and under the most common form of piece work, he is liable to be penalized by having his rate cut if he does much more than was expected. Any attempt to remedy this condition is praiseworthy, and the metal trades have made more progress in this direction, by far, than any other industry. We realize, however, that although a start has been made, it is only a start, and that very much remains to be done. Hence we naturally ask what the next step is.

While studying the operation of a large factory recently, we discovered one department in which the orders were handled in a most creditable manner. On talking with the clerk who had charge of these orders, we found that he had devised the method himself, and this was confirmed by the fact that we saw a mild imitation of his method in another department. We called attention to his work in our report, and got the reply that the work of his department was nearly always on time. Our suggestion was that, as a temporary expedient, much improvement could be gotten by relieving him of his routine duties and having him install his method in the other departments. There are in many plants, both among the mechanics and clerks, men who are far more capable than the average, and who, if they had the chance, could do much to increase the efficiency of the whole plant by teaching their methods to those whose methods are less efficient.

The question at once arises as to why we do not make foremen of such capable mechanics, and the reply comes just as quickly that they often have no ability as executives and make very poor foremen. We realize, however, how much the efficiency of the shop would be increased if the other workmen had their efficiency. The best way to get this increase of efficiency is to make our expert men instructors, and award additional compensation to those that learn. This is a step in the direction along which we have been working, and according to which, in its best development, we have succeeded in increasing the average efficiency of shops to a point greater than that of the best workman before we started. As our time is limited I shall not go into the details of our method, but will refer you to my paper on "Training Workmen," read before the American Society of Mechanical Engineers at their New York meeting, December, 1908.

In brief, our method is to put into the shop a system of orders and returns that ensures any work being done as we direct. Then each job is analyzed by the best expert available, who specifies the sequence of the operations and ultimately how they shall be done. Plans are then made and orders issued to have the work done as the expert directs. Finally, each operation is studied in detail by an expert, who determines the best method and shortest time in which it can be performed. A task is then set in accordance with the study of the expert, who gives detailed written instructions for carrying out his methods.

The workmen are paid additional compensation when they accomplish the task in the time and manner specified, and the foreman, who acts as an interpreter of the directions of the expert and an instructor, is awarded additional compensation for each workman who performs properly each day all his tasks. In order that the foreman may be induced to give his attention to the least efficient man, he is given additional compensation if all his task workers succeed.

I wish to say one word about arbitration of labor questions. As a temporary expedient it is often the best we can do and should be used when necessary; but as a fixed industrial policy arbitration of questions involving compensation is absurd, for the arbitrators can never know enough about the real problems involved to effect a permanent solution. If, however, the policy of encouraging efficiency is adopted, and the best use is made of scientific knowledge, the results are often so marked that both sides can get greater benefits than those they were contending for. Any board of arbitration should recognize the limitations of its decisions, and should insist as a part of its finding, that some reasonable method of rewarding efficiency be installed.

For several years past the writer has been training workmen on the lines indicated above, and although his work has usually been with people older than the ordinary apprentice, his results have been successful to a degree entirely unanticipated. About five hundred of those so trained are textile workers who are now earning at an average of 40 per cent. more than previously, and turning out over 100 per cent. more work, some as much as 300 per cent. more. The average wage cost per unit has been reduced to about 60 per cent. of what it was.

One other result, which was to be expected in a general way, is that the trained workman, working under expert teachers, should also produce better work, but we were not quite prepared to find the extent to which this was so in some cases.

If we wish to improve the ordinary workman up to a point where his work compares favorably with that of the efficient workman, we must do so by making it to his financial interest to learn, and to that of the expert workman to help us teach, for the ordinary workman must be taught and trained.

FOREIGN RAILWAY NOTES.

According to reports on the progress of the Alcobaca Railway, which is being built between Alcobaca, Brazil, and Praia de Rainha, this line is now finished to a point on the Tocantins river below Itaboca Falls, and a temporary Decauville line has been built connecting the finished section of the railway with the steamers which ply the river above the falls. Work on the railway will be pushed rapidly with the beginning of the dry season, and it will not be long before the line will reach a point above the falls, and thence to Praia da Rainha, which will be for the present the terminus of the line.

In commenting on the necessity of raising rates on the Swiss railways the federal council says: "Thus, much as it is deplored, one of the cherished hopes of the nationalization of our railways is shattered. The necessity is, however, apparent to place the railways on a sound financial footing and to avoid continual deficits. It must now be acknowledged that the original reduction of the traffic rates went too far, and that the construction of new buildings, addition of new trains and other improvements must proceed slowly. The Swiss Federal Railways is not the only administrative undertaking that made a poor showing during the last year (1909) between receipts and expenses. A number of Swiss private railways, the Austrian State Railway, the Austrian Southern Railway and the Würtemberg State Railway have been obliged to raise rates to cover growing expenditures."

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.

The sixth annual convention of the International Railway General Foremen's Association was called to order at the Grand Hotel, Cincinnati, Ohio, May 3, 1910, at 10 a. m., by the president, T. H. Ogden, general foreman of the Atchison, Topeka & Santa Fe at Dodge City, Kan. Rev. Charles Frederick Goss of the Avondale Presbyterian Church, invoked the Divine blessing.

PRESIDENT OGDEN'S ADDRESS.

President Ogden, in making his presidential address, spoke as follows: "The practice of economy which we were compelled to establish during the past few years will in many cases be well continued under normal conditions and if you will bear with me to-day I will dwell for a time on the subject of rigid economy in the shop and roundhouse, as it is a subject of vital importance and should be given careful and continuous attention. I emphasize this matter the more forcibly because of the fact that it was recently called to my attention by the head of one of our large railway systems, who stated that he was interested in our organization and hoped that we would make a record to be proud of, but he regretted to say a great many foremen had apparently lost sight of the many little leaks about the shop and roundhouse. The lack of proper care of tools and supplies in the operation of the plant is an item of greater importance than the average foreman may think, and extensive investigation has demonstrated the fact that the expense at some stations is greatly in excess of what it should be and could be avoided if the foreman would take the matter in hand and stop not only that leak and many other similar ones.

"A few years ago railway mileage was counted by the hundreds and heads of departments were personally acquainted with the most of the men under them, while to-day the railway mileage is counted by the tens of thousands and the heads of the departments are far removed from the men in the ranks and only know them by the reports showing the results of their work and the cost of doing it. We have become mere cogs in the great wheel of progress, known only by the work we perform and the results we obtain.

"Another vital matter which has been brought to my notice is the question of harmony and co-operation which should exist between the general foreman and the foremen and men under him, as well as with the master mechanic and the higher officials of the mechanical department and the members of other departments with whom we come directly in contact. We should not lose sight of the fact that in harmony and co-operation in our shop organization lies our strength upon which depends our efficiency and success. We must not allow a feeling of distrust to be created among our foremen or workmen. Keep close together, as in addition to harmony and co-operation we should practise team work with our men and with the enginemen and with the other officials.

"It has been stated to me since our last meeting that many foremen show indifference to the work reported by the enginemen; we must not overlook the fact that by maintaining harmony with the enginemen we gain their confidence and support, which is essential to our success and will be recognized by our superiors as ability to assume positions of leadership and responsibility. So let us in our various positions strive to create a harmonious feeling and to keep out the feeling of distrust among our shop force and all with whom we are associated in the performance of our duties. If we can accomplish this our work will be easy and our efforts to install new ideas in the shop work will meet with approval and success and we will have the support of all in the systematic and economical operation of our department."

F. C. Pickard (C., H. & D.): Yesterday a foreman told me he could not get away to attend the convention. Whenever a man is in that condition, and is holding the position of general foreman, there is something wrong with the man and his organization.

The efficiency of the mechanical department depends upon the co-operation of the general foreman and his subordinates, and also of the other departments. One most essential thing for increasing the efficiency of the mechanical department is in the handling of locomotives. The first step in the matter is attention to the time that a locomotive is cut off in the yard until it can be made ready. That calls forth an effort on the part of every foreman and every individual that may come under your supervision.

We have a plan on our road by which we call together every shop foreman on Monday morning and we discuss the various things of interest to our department. We might say to the general foreman, "We only got out five engines last week and we should have gotten out six." There is a representative of the store department there. The delay may be on account of the material; if it is, he tells us what efforts have been made to get it and what service we are going to get in the future. It may be the blacksmith shop is at fault. Perhaps the blacksmith shop lacked air pressure. It may be the machine production. In this way the discrepancies of the various departments are put before the head of the department and the best of results are obtained.

You men are daily coming in contact with the men under you. Do not criticize an individual and not question him. The success of almost every mechanical man is brought about by questioning him and getting him to think. Whenever you get him to thinking you are going to get results, and he will produce the highest efficiency that lies in his power and ability.

Another thing that is attracting considerable attention is fuel economy. We have in this country about 63,000 locomotives. If each and every individual of the mechanical departments of the railways would set about to obtain efficient results in the roundhouse and in each department, we could save a million tons of coal a year.

We inaugurated an apprentice school on our road about six months ago. When it was first suggested some of the men said we did not have the facilities, but we made them. We took two box cars, put them together and put windows in them, and you would be surprised at the results we are getting from the apprentice boys that started in the school six months ago. They are all students. There should be more students among the mechanical men.

You have all noticed the "Shop Kinks" that have been brought out by the *Railway Age Gazette*. It is performing a great service. We had a wheel lathe that was not producing results at all. By a little kink that we attached to the machine we increased the output fifty per cent. I recall another shop that had three machines, a coach wheel lathe, an old type lathe and a modern machine. The modern machine was working 15 hours; the coach wheel was working 9 and the other 10 hours a day. After they collected the shop kinks and put them on those machines, one man did all the work, and I have seen that man stop and turn car axles.

Angus Sinclair (*Railway and Locomotive Engineering*):—In addressing the International Railway General Foremen's Convention, I am conscious that I am speaking to a body of men whose daily duties exercise very great influence upon the economical operation of the 300,000 miles of railways on this continent. It is a fortunate thing for a railway company when the right kind of man has been selected to fill the position of general foreman; for his ability means the difference between good and inferior work or what is even of greater consequence, his influence makes the difference between harmony and discord in the shops where he has charge.

Railway construction began in the United States in 1830, when the total population of the country was less than 13 millions. The greater part of the population were engaged in agricultural operations and very few people were trained to mechanical pursuits. The conditions of life had made nearly all farmers and their help familiar with the handling of tools and they readily acquired skill when subjected to a little training in a machine shop. When the demand for mechanics arose to build and repair locomotives, thousands of rustics crowded away from the fields to manufacturing centers and proved themselves worthy of the call they had received.

An experience that the Baltimore & Ohio went through proved that the American workman could be depended upon to extend his operations very promptly to exact work when necessary. In 1830 Peter Cooper had experimented on the Baltimore & Ohio track with a tiny locomotive of his own design and construction which worked so well that the company in the following year offered a prize of $4.000 for a locomotive of 3½ tons weight capable of meeting certain conditions. Think of a 3½-ton locomotive for hauling trains! In response to this offer five locomotives were brought to the company, all designed and built by native workmen, all different in form and none of them imitating British types. Three were built by machinists, one by a watchmaker and one by an inventor, one of these handy men that have done so much to advance American industries.

In connection with the building of the Cooper locomotive that I have mentioned, part of the work was done by an apprentice in a Baltimore machine shop named James Milholland. That lad displayed so much mechanical ability that he was made shop foreman before he had finished his apprenticeship. He made his mark afterwards as a locomotive designer and inventor of improvements to railway machinery, and James Milholland is entitled to be regarded as the first general railway shop foreman. It was in such management as his that the succeeding improvements on the locomotive were

effected which made it the most efficient and convenient engine to be found in any country.

I am inspector of technical education of the Erie Railroad. It is the purpose of that road to give its shop apprentices instruction concerning the technical phases of a mechanic's work. The young men learn in a few years the technical principles of the business that have come to you from long experience and unaided study. The successful training of the apprentices depends very much upon the attitude of the general foremen towards them. To their credit I have found that all the foremen in the Erie shops have given hearty co-operation in carrying out the management's policy towards the apprentices, but I have known of other cases where the desire to educate apprentices was frustrated by the opposition of superintendents and foremen.

SECRETARY-TREASURER'S REPORT.

Mr. Bryan reported a total membership of 297, including active, associate and honorary members. There is a balance of $258.56 in the treasury. Mr. Bryan is entitled to great credit for the way in which he has handled the business affairs of the association. From a state of heavy indebtedness a couple of years ago, he has, by hard work, so improved its financial condition that after the proceedings of the present convention are published and all bills are paid it is expected that there will be a balance of about $1,000 in the treasury.

SHORTER CONVENTIONS.

The members of the association made a very wise decision in amending the by-laws to reduce the length of future conventions from five to three days and to hold one session each day from 9 a. m. to 1 p. m., instead of two sessions a day as at present.

THE FOREMAN AND HIS MEN.

BY W. L. KELLOGG,

Superintendent of Motive Power and Cars, C., H. & D.

Mr. Kellogg, who has shown a great interest in the work of the association, spoke on the relations which should exist between the foreman and his men, the address being enthusiastically received. He said:

"Your association is too well known and its benefits too thoroughly established to require comment from me on the subject. I will, therefore, confine my remarks to the relations existing between foremen and workmen and their bearing on the cost of output and the peaceful adjustment of wage agreements. Foremen ordinarily come from the ranks of their craft and are representative men. It is true that when elevated to the position of foremen, their dignity should be added to and their loyalty to their employer should be manifest in their every action. This need not, however, raise an inseparable barrier between the foreman and the craft, through learning the rudiments of which he has earned his elevation.

"Nothing speaks so ill for the future success of a newly created foreman as to lose his good-will and respect of his men. To keep their good-will he need not remain one of the boys. The confidence which his superiors placed in him in elevating him to the position carries with it to his associates a certain amount of respect, which in their hearts they feel, although they may not make voluble expression of it. He need not hold himself aloof from the men, but, on the other hand, should join with them so far as possible in expressions of thought on matters concerning their welfare and the welfare of their employer. I have placed their welfare ahead of that of their employers. It perhaps would have been better had I reversed the order, for such must always be the case; the employee can only prosper with his employer. No employer can long continue to benefit his employees unless he himself is prospering. A foreman, as a rule, is better informed on matters pertaining to the welfare of the employer than are the men. Intelligent co-operation between the foreman and the men spells success by the shortest method possible.

"In this day of advancement and enlightenment it is difficult to get men to exert themselves in blind effort. Everyone works toward a goal, be that goal what it may, and I firmly believe that much of the unfortunate agitation, which is sweeping wide over our country, is due to the fact that our men are forced to their task in a blind effort to produce so many pieces of this or that article, with little or no idea of what the results of their labors are, or what the component parts of the material they work upon consist of, or to what future use they will be put. Their goal is one expressed in dollars and cents, with which they are compensated for their production. The workman has little of interest to turn his thoughts to except the increase of his earning capacity. He has little or no love for his work or interest in his profession, and no attachment for his shop, or pride in his organization, and falls an easy prey to the agitator who talks to him of the one goal he knows.

"I believe it is the duty of you gentlemen at your staff meetings to impress this thought upon your subordinate foremen and advise them by every means possible to instil into their men a knowledge of their work, an interest in their output and a pride in their shop and the organization.

"I appreciate that this is a difficult matter, particularly where you have a large foreign element to contend with, but it should never be forgotten that the foreigner of to-day is the American of to-morrow, and that our railways, great as they are, and our American institutions ranking foremost with those of the nations of the world, are the creation of laborers, the great part of which were foreigners a generation past.

"I believe you have only to look to your foremen to convince yourselves that the interest which they take in the welfare of their employers is prompted by motives other than that of the compensation which they receive. I have found this to be the case many times when foremen have volunteered their services for work other than called for by the routine of their occupation and I look back with a great deal of pride to many instances where employees in the rank and file have done the same, but unfortunately must confess that this spirit which has in times past been of such great physical, as well as moral, support seems to be on the decline and I can only attribute it to a growing distance between the workmen and their immediate superiors. If it be admitted that the human interest factor in the output of the hands be pertinent to the increased volume of work, I consider it far more pertinent to the control of the wage situation.

"Nothing is so difficult to combat as the lack of intelligence and the most difficult man we have to handle is the one, who made valuable by his ability to do some one thing well, has grown lopsided in his intellect and believes that his ability as a workman or mechanic leaves him equally able to legislate for himself and his fellow employees in matters economic and politic.

"You all have in your employ broadminded workmen developed both in their arts and craft, and at the same time conversant with their other surroundings. With these men you have little to contend with. Their daily duties are performed systematically and regularly and matters pertaining to their business affairs can be handled amicably and equitably.

"Unfortunately these men are not ordinarily selected by their associates as their leaders and representatives when the question of shop rules or wage schedules are to be discussed. All too frequently you are called upon to receive committees who you well know are not made up of men best qualified to handle such matters for their associates. Often the committee represents the radical element, who after having enjoyed the benefits of their labors for a period and knowing the whys and wherefores of their occupation, and nothing of whether their employers are enjoying a profitable business or not, and having no other idea than personal advancement, regardless of equity, cannot be made to appreciate the unfortunate position in which you yourselves are placed when obliged to decline their requests or demands. I do not mean by this that the private affairs of your company should be scattered broadcast among your employers, but it is right that they should know something of the business in which their energies are expended.

"Your foreman has lost his most valuable asset if he is not able to keep in sufficiently close touch with his men, to act as their counselor or adviser, and exert his influence at all times toward peace and harmony, counseling the men to uniform activity and energy, pointing out to them the possibilities of their future success through the success of their employers, encouraging them in habits of temperance and morality, in the establishment of savings accounts and the building of homes, and counseling them when selecting representatives and leaders to pick conservative men, men qualified to appear for them when meeting their superior officers on matters of mutual interest.

"The success of their craft can well be likened to the success of a nation, our own great country having been built up as the result of physical application of the energies given us. The most successful labor organizations of this country to-day should be pointed out to the men as the ones which have had the most conservative leaders and in which the men have lent themselves to their surroundings and endeavored to advance with their employers, and to the advantage of their employers, and who have not brought disaster on their employers through their endeavors to advance solely at their expense.

"I believe the personal interest feature of your work should be enlarged on at all times. The highest importance should at all times be attached to having foremen keep in closest personal touch with the men under them, displaying an interest in their personal welfare, with elicitude for them in sickness and organizing relief for them in case of need; help-

ing the indifferent workman by endeavoring to get him up to the standard of his more successful associates; singling out the men who will not, or cannot, fit in harmoniously with the balance of the crew and dropping them from the service. They may be valuable elsewhere, if not to you, and it is a mistake, not only for the company and its employers in general, but to the individual as well, to retain a man where he does not fit and where his presence produces discord.

"By this, I do not mean that your shops should be converted into social clubs or benevolent societies, or that all your men should be of one accord or belief. On the contrary, avoid clannishness, which begets narrowness and ignorance of surroundings, which is responsible for the greatest evils with which we have to contend.

"Our mixture of races, who with their varying habits and creeds, producing an enviable rivalry, harmonized and properly guided as necessity arose, has made us the great nation that we are. Our greatest law is equity; our greatest learning, common sense."

GAZETTE COMPETITION.

The announcement made by the secretary that W. G. Reyer, general foreman of the Nashville, Chattanooga & St. Louis, at Nashville, Tenn., had been awarded first prize in the *Railway Age Gazette* competition on "How a Foreman Can Promote Shop Efficiency," was received with much enthusiasm. Mr. Reyer is one of the most active members of the association.

SELF-CLEANING ASHPANS.

BY C. T. WALTERS,
General Foreman, Great Northern, St. Paul, Minn.

There are two styles of ashpans used by the Great Northern—solid bottom and hopper. To clean the solid bottom ashpan, we use, with very good success, what is known as an ashpan swipe, which has been in use on the road for years. The swipe is made of one cast iron column which is placed crosswise in the pan from 4 in. to 6 in. from the front of the pan. Bases are cast on the column 4½ in. apart, and tapped for ½-in. gas pipes. The pipes are screwed into the column and are 4 in., 18 in. and 30 in. long. The number of ½-in. pipes depends on the width of pan. After you have placed the swipe in the pan, cut a hole in the side of the pan to admit a one and one-half inch pipe, which is screwed in the column, and connect it to a 1½-in. cock, which is placed on the side of the firebox from 6 in. to 10 in. above mud ring or in the most convenient place to get at. The handles to open the cock to blow out the pans are in the cab. When necessary to clean the pan open the back damper and then the cock and you have a clean pan. It is not necessary to keep the cock open more than 20 to 30 seconds. This device is used only on the light power.

On the heavy power we use a drop bottom or hopper pan. The doors of the hoppers are connected by levers to a shaft bolted on the engine frame. On the shaft is a lever for opening and closing the doors of the pan. There is a quadrant notched to hold the doors closed. This style of pan is standard on our road, taking the place of the slide bottom pan which was in use for only a short time, as the slides were very hard to open, caused by ashes getting into the grooves. In cold weather the slides would freeze up, causing delays.

Discussion.

The discussion indicated that most of the members used water jets for cleaning shallow ashpans. A number reported the Talmage system as very satisfactory. About 15 seconds are required for the thorough cleaning of pans using this system. Ashpans with slides in the bottom were generally condemned as troublesome in winter, as they freeze tight and are difficult to open. Swinging doors, suspended by links, free themselves more easily and are to be preferred for this reason.

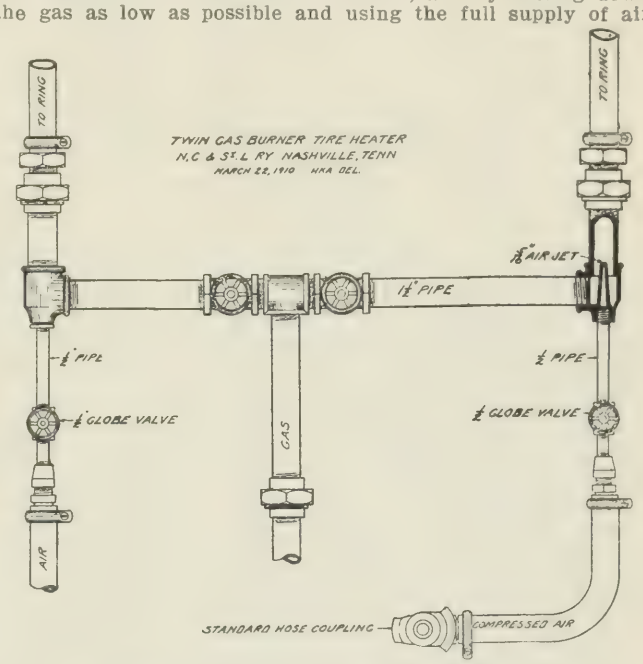
Several members referred to the objection to ashpans which leak; first, because the fine ashes fill up the ballast spaces and prevent proper drainage; second, they are the frequent cause of fires. J. H. Painter (Atlantic Coast Line) said they flanged the hopper door 2½ inches around the edges and the fine ashes formed a seal and prevented leakage. A rim adjustment was not required as the door might not be entirely closed, but the flanged rim would still protect the pan from leakage. Members from northern lines reported considerable trouble from the freezing up when water jets were used. Wm. Hall (C. & N. W.) said they used on large engines two blow-off cocks, one in front of the ashpan and one at the back end and the ashes were blown out with considerable force; this method was satisfactory. Various methods of admitting air were described and for large engines the simplest and most direct was to drop the ashpan as much as 4 inches from the mud ring, thus allowing a larger free air space which would not leak ashes. By placing the ash valve or cover beyond the ashpan, and using properly proportioned jets the pan can be cleaned in less than ½ minute and there is less liability of freezing. To show the force of the water jets ashpans were fitted with bricks and they were cleaned out by the jets in 15 seconds. It is important that in all ashpan designs a sufficient opening be made so that men can get in to repair the grate-shaker connections.

COMMERCIAL GAS AS A FUEL.

I.

BY WM. G. REYER,
General Foreman, N., C. & St. L., Nashville, Tenn.

The drawing shows a gas burner for removing tires. When we first began to use gas, we had a 1-in. pipe with ⅛-in. holes, 1-in. pitch for a 56-in. tire. We used an average of 600 to 700 ft. of gas to a tire, but got better results when we changed the pipe and put the holes in on an angle so they would cover the full width of the tire, and by cutting down the gas as low as possible and using the full supply of air



Sketch of Burner Using Gas as Fuel.

with a ½-in. air supply. We now take off a tire with an average of 275 to .325 ft. of gas. We are using a double pipe, taking off two tires at once, but use about the same amount of gas to the tire, the only difference being the time saved in heating.

We experimented with a double pipe around each wheel, but did not get very good results as the gas could not get around quick enough. It takes about 12 to 20 minutes to remove a tire with gas, according to thickness of tire; we did about the same with gasolene.

II.

BY H. D. KELLEY,
General Foreman, C. & N. W., Chicago.

For the past 18 months we have been using commercial gas as fuel at the Chicago shops of the Chicago & North Western for applying and removing driving wheel tires, babbitting cross heads, babbitting driving boxes, rod brasses and shrinking steel spiders on piston rods. Formerly we used gasolene as fuel. Commercial gas has proven to be much more satisfactory for the following reasons: By always being ready for use. Doing the work much quicker. Being safer to handle. Doing the work cheaper.

Before writing this paper, I made some very extensive tests with both commercial gas and gasolene. The tests were run for about four weeks, first with gasolene, then with commercial gas, applying and removing driving wheel tires, only. With gasolene a large iron tank, holding about 50 gallons, was used. A gage was placed on this tank and graduated to read in gallons. The test was run for 12 days. The time for heating each tire was kept, as well as the amount of gasolene used. At the end of the 12th day, the time for heating the tires was added together and divided by the total number of tires handled, giving the average time per tire for heating. The total gallons of gasolene used in 12 days, was added together and divided by the number of tires heated, thus giving the average gallons per tire.

With commercial gas, a meter was used and the test was

run for 12 days. The time for heating each tire was kept, as well as the amount of gas; at the end of the 12th day the total time was added together and divided by the total number of tires heated, giving the average time per tire for heating. The total cubic feet of gas used in 12 days was added together and divided by the number of tires heated, giving the average number of cubic feet per tire. With both commercial gas and gasolene, I took the inside diameter of the tire, in inches, and added them together for each test, and divided the number of inches into the amount of gas or gasolene used, getting the cost per inch of diameter for both tests. This, I think, gave me a good comparison between gas and gasolene.

The following table gives the time and cost per average tire, or better still, the actual cost per inch of diameter for heating locomotive tires: Gasolene at $0.10 per gallon. Commercial gas at $0.85 per 1,000 cubic feet.

Inside diam. of tire.	Gasolene.	Commercial gas.
42 in.	$0.1365	$0.1143
44 "	.1431	.1191
46 "	.1495	.1251
52 "	.1690	.1415
56 "	.1920	.1523
62 "	.2015	.1689
68 "	.2210	.1850
74 "	.2405	.2013
Average time, per tire	17.52 min.	15.5 min.
Average cost per tire	$0.175	$0.1433
Av'ge cost per diameter, inch	.00325	.00272

In this test commercial gas showed a saving of about 16 per cent.

Discussion.

W. G. Reyer (N. C. & St. L.):—A man was talking to me who advocated the use of coal oil. He said he got better results. He has a system of coil pipes that generate a gas. If we use only 10,000 feet of gas a month it costs $1.00. I do not think you will find commercial gas any cheaper than gasolene, though it is safer. The coal oil burner is much safer, better and cheaper.

W. Smith (B. & O.):—At our station we use crude oil for running repair work and changing tires, but we think gasolene is much more satisfactory. It doesn't flame up so high and there isn't so much trouble in burning running boards and cabs as with crude oil.

C. L. Dickert (Central of Georgia): We have tried gas, gasolene and coal oil. First we used gas; then we went to gasolene and had an explosion, and now we use coal oil very satisfactorily. We use a home made heater and a ring, but instead of drilling holes in it we saw it with a hack saw about every 2½ in. It makes a much better burner.

Mr. Smith: We get better results by mixing carbon oil with the crude oil—a little less carbon oil than crude oil.

President Ogden: In my experience in using carbon oil, if we did not thin it with fuel oil there was too much carbon, and we were unable to keep the holes in the pipe cleaned out long enough to heat a tire.

W. C. Groening (Pere Marquette): At the shops at Grand Rapids we cannot get gas, but we use 87 deg. gasolene. It affords a better gas, is a quicker heater and gives better results. With a common gasolene there is a blazing, but with the 87 test we get a good blaze and intense heat. What test gasolene did Mr. Kelley use?

Mr. Kelley: It was 68.

C. H. Voges (C., C., C. & St. L.): I saw a demonstration in the Collinwood shops. They have a 2-in. pipe with ⅜-in. holes, and it makes an intense heat. They use a combustion chamber. They put a 3½-in. tire, 72 in. in diameter, on in 21 minutes. We have been using gasolene for the last five or six years and it has given good satisfaction.

H. M. Brown (C. & O.): At the shop where I am located we have not had an opportunity of using gas for heating a tire, but use 150 deg. oil. With the class of labor that we employ to take off a tire and put it on, it is absolutely safe and very satisfactory. We have never used gasolene on account of explosions. We also use the same burner for preheating frames for thermit welding, or for a tank frame that may be bent. With 150 deg. oil a higher heat can be obtained than with gasolene that is low of specific gravity.

ORGANIZATION AND SYSTEM.

F. C. Pickard, master mechanic of the C., H. & D., upon being elected a member of the association, said:

"You must not build a fence around you so that you cannot be approached at any time. The master mechanic or the general foreman cannot be the whole thing. You may have a strong leader but he cannot do it all. He is simply the pivot which the organization swings around. Each individual forms a cog in the gear wheel. If one is missing the whole part goes roughly. Whenever a man gets it into his head that his shop is all right; that his organization is all right, he is the wrong fellow. He is a back number. You can go away and stay for thirty days and when you come back you will find some changes.

"Another important function in connection with your duties is to watch the despatch of power, especially at the present time when we have more business than we can take care of. Every hour an engine is around a terminal means something.

"We have a system in our shop known as the card index system. We know each and every engine that is coming into the shop 30, 60 or 90 days in advance. Each foreman consults it and sees what is necessary and confers with the storekeeper so as to have his material on hand. Our shop was built in 1879 and is classed as a back number. Last month we took an engine in on April 11 and on the 19th we turned it out of the shop and it went into service on the 20th. It received a new set of driving boxes, shoes and wedges, and a firebox. We built an extra back end for the boiler. This we are doing for every class of engine we have on our system. This matter was lined up in one of our staff meetings with the storekeeper, and when the engine arrived on the pit each man had his part to look after. We had a flat car with a new firebox end on it, and it was placed behind the engine, one end of the car being empty. The other box was cut off on Tuesday morning, taken out to the turntable and pushed on the flat car which was turned, pushed back in and the other end put on the boiler. The jaws were faced on Monday and the shoes and wedges laid off on Tuesday. In order to get out of the way of the machinist, the blacksmith had to make two welds on the frames. We put him at that Monday evening. By planning and lining up these things we got wonderful results."

ADVISABILITY OF INSTALLING A HOT WATER WASHOUT AND FILLING SYSTEM.

I.

BY C. H. VOGER,

General Foreman, C., C., C. & St. L., Bellefontaine, Ohio.

The National hot-water locomotive boiler washing and filling system was installed and placed in operation at the Bellefontaine roundhouse in December, 1909. It is equipped with two Dean duplex pumps 12x8½x12 in.; the capacity of the filling pump is 500 gallons per minute; the washout pump will wash three boilers at a time with a pressure of 90 lbs. The filling storage tank has a capacity of 12,000 gallons, and the washout tank a capacity of 85,000 gallons.

In the operation of the system, the steam and water are blown out of the locomotive through a blow-off line between the pits and into a filter in the washout tank. In this filter the steam and water strike a baffle plate, where the steam is separated from the water; it then rises and passes through the blow-out steam pipe into an open heater on the filling tank. The steam and water passing to the filter opens a flop valve, which is connected to the fresh water line valve. This heats the cold water, automatically admitted by the blow-off steam and water, and in a sufficient quantity to refill the boiler. The heated water follows from the open heater to the storage tank for filling purposes. A thermostat is placed in the storage filling tank and controls a live steam valve, which is opened when the temperature of the filling water is below the desired temperature. In connection with the filling tank there is a float valve for the purpose of controlling the admission of fresh water to the filling tank when the level of the water falls below a certain point. In this manner we always have a minimum amount of water for filling purposes.

It takes 1 hour 56 minutes to wash and fill a boiler, including the cooling of the boiler and letting out of the water. You can wash a boiler quicker than this, but I doubt if you can do it right. The water in the washout tank is ordinarily about 185 deg. Fahr., being regulated by a valve on the cold water line. This valve is actuated by a thermostat inserted in the tee in the suction line, the thermostat assuring a positive temperature of the washout water. The filling water is ordinarily about 190 to 200 degrees Fahr.

This plant saves water, saves fuel, removes the mud and scale in the boiler before it gets baked, and saves leaky flues.

II.

BY C. L. DICKERT.

General Foreman, Central of Georgia, Macon, Ga.

The time consumed for our washing system at Macon, Ga., using the plant installed by the National Boiler Washing Co., Chicago, is as follows:

Washing Broad Firebox Consolidation, 1700 Class, 22 x 30 in.

Coupling blow-off hose	3 min.
Blowing off boiler, 50 lbs. steam, 2 gages water	40 "
Removing 22 mud plugs	15 "
Washing boiler	20 "
Putting in mud plugs	7 "
Filling boiler, 1 gage water	14 "
Getting 50 lbs. steam	30 "
Total, 2 hrs. and 9 min., or	129 min.

Washing Narrow Firebox Consolidation, 1030 Class, 21 x 32 in.

Coupling hose	3	min.
Blowing off boiler, 90 lbs. steam, 1 gage water	42	"
Removing 18 mud plugs	16	"
Washing boiler	31	"
Putting in plugs	12	"
Filling boiler	7	"
Getting 50 lbs. steam	34	"
Total, 2 hrs. and 25 min., or	145	min.

This class of boiler is the most difficult we have to wash.

Small 1500 Class Engines, 18 x 24 in.

Coupling hose	4	min.
Blowing off boiler	18	"
Removing plugs	11	"
Washing boiler	9	"
Putting in plugs	3	"
Filling boiler	5	"
Getting 50 lbs. steam	23	"
Total, 2 hr. and 13 min., or	73	min.

Temperature—Washing, 150 deg.; filling, 200 deg.

System of Washing in All Cases.

1. Crown sheet.
2. Flues at front end near checks.
3. Belly of boiler and bottom flues from front end of boiler toward firebox.
4. Back head, above and below fire door.
5. Sides.
6. Throat and back flue sheets.
7. Arch pipes.

Washing water, 140 lbs. pressure; filling water, 180 lbs. pressure.

Discussion.

Mr. Kelley: We have the hot water system for washing boilers in Chicago. Our average time turning engines with the hot water system is not much quicker than it was with cold; about 2½ hours from the time the engine gets in the roundhouse. It does save considerable leaky flues and staybolts.

W. Smith (B. & O.): A previous speaker said that very little time is saved in washing out the boilers with hot water. If a boiler is filled with hot water it requires 35 minutes to get steam up. With the very best fires possible it takes at least an hour on the heavy engines, and we are fortunate if we can make it in that time with cold water.

Mr. Kelley: The gentleman probably misunderstood me in regard to the saving. There is a saving, but the prime object in installing the system is to save the boiler from failure on the road.

Mr. Reyer: Before we installed the hot water system, when we blew an engine out steam would be all over the roundhouse; but now we see no steam at all. Men can work on any part of the engine while it is being emptied. The boilermaker tells me that there is a decided improvement on the boilers.

Mr. Dickert: We have less trouble with boiler failures since we began using the system. Our boilermakers were on a strike for six weeks and we did not have a delay on account of a boiler failure.

A. L. Ball (C., I. & S.): There is a big advantage in using the hot water system. If you take an engine off of the road and draw the fire out and have the arch brick hot, it is almost impossible to put the cold water in it. If you cool the arch brick down you crack the brick.

President Ogden: If we did not have a hot water system on the Santa Fe we would be almost tied up. We could not turn the power fast enough. It saves time and it saves fireboxes. The large engines on the coast lines take from 8 to 10 hours to cool.

A motion was carried to the effect that it was the sense of the meeting that the hot water washout system is a great improvement over washing out with cold water.

OXY-ACETYLENE WELDING.

I.

J. M. DAVIS.

General Foreman Colorado & Southern Denver, Col.

The pressure of the oxygen in the hose leading to the burner or torch is 25 lbs. per square inch. We use acetylene under a pressure of 6 lbs.; this will weld all metals except cast iron, and when that is to be welded there should be about 9 lbs. pressure, but not more. We use a small Monarch air hammer with a diamond point chisel for cutting out and following up the crack. We use strips of ¼ in. boiler steel for welding in cast steel, such as car truck frames and bolsters, and in fact all mild steel or boiler sheets in fireboxes. In welding cast iron I have stick castings made ⅛ in. x 12 in. long. These are of as mild or soft a cast iron as possible.

II.

BY W. T. LAUER.

General Foreman, Erie Railroad, Huntington, Ind.

In my opinion, the process when fully developed in the United States will be better than that in France and Germany, where it is already past the experimental stage and is being used in applying new sections of boilers with a great deal of success. I have seen considerable small welding of cast-iron and steel, such as automobile cases, large water pump castings, excentric blades and other small castings, where apparently the work was done very successfully. The process is also being used successively in cutting channels and all other classes of iron.

In boiler work, it is undoubtedly in an experimental stage. However, the results obtained are very gratifying, although the successful handling depends almost entirely upon the operator, who must be thoroughly conversant with his apparatus and must have sufficient knowledge of boilers to overcome (by annealing and pre-heating the plates in the vicinity of the weld) the strains set up by the action of the metal at different temperatures.

I also find that free end patch welding is being done successfully in practically all cases, but that oval, round or rectangular patches that require welding on all sides cannot always be figured out successfully, and that welding a patch of this description is just as liable to be a failure as it is to be a success. Furthermore, I find that satisfactory results are being obtained in building up wasted corners, also welding up small cracks in the knuckle of flue sheets; where this work has been done, engines have been running several months without leakage.

Discussion.

Mr. Kelley: I have had experience with acetylene welding; some of it has not been very successful. I have tried to weld up cracks in main rods and side rods, tongues and shafts; tried some boiler welds and cranks on motion valve gear. I have also had the representatives of the different firms call on me and tell me what they could do; but I would like to have them do it. It is certainly a wonderful process and in time will develop into something. In a large piece of iron the important thing is to take care of the expansion and contraction. We have to keep it hot. We have a great many frames broken on our big power, and it would certainly be a saving if we could get at the frame and weld it without dismantling the engine. I have repeatedly asked the representatives to come around to my place and do the welding for me, but none of them have as yet tackled the job. In welding small pieces such as cast iron, wrought iron or steel, we are rather successful, but in going into the heavy pieces of iron you have to preheat it, but how long can you keep it that way? A man cannot stand over a fire and weld anything with a torch. The metal that goes in must be at about 2,500 deg. It is certainly expanded to about its limit. It draws in and draws away from the other portion of the iron when it cools.

Mr. Reyer: I have a small oxy-acetylene plant, and what success we have had with it I attribute to the foreman boilermaker. We have been able to weld crossheads, fire door frames, side sheets and put patches on the firebox, etc. We had trouble at first with our patches in the firebox, and I am willing to admit that the first one or two engines came back to us. You have to take care of the expansion and contraction if you ever make a success. A great deal depends upon how the operator handles it. We have never been able to make a satisfactory weld in anything that is cylindrical in shape. We made a weld, but when it cooled off it cracked worse than before. These experts tell us what they can do, but they have never been able to do it for us. We have never attempted to weld a frame, but we have welded links with success. We attempted to weld some rocker arms, but found we were on the wrong track and stopped it. It only welds through the surface and is dangerous. The firebox proposition is a great saving. It costs about half. The patch has to be applied in such a way that the expansion and contraction is taken care of. The operator must take time enough to make a thorough weld. If you taper the edges back too much you will get a failure. The short taper will do better.

R. V. Wright (*Railway Age Gazette*): The Elizabethport shops of the Central of New Jersey have been doing successful thermit welding on frames for several years. They pre-heat and get splendid results, not only on frames but on much more difficult work. They are repairing spokes on driving wheels. A great many have tried this with poor results because they do not pre-heat properly.

Secretary Bryan: We have used thermit for welding frames. In fact that is all we use it for. We have welded in the neighborhood of 75 or 80 of these, and have never had but one failure, and that was on account of its not being properly heated.

Mr. Boyden: We are using thermit on the Erie and have had one failure. That was due to the fact that the frame was not properly pre-heated. We average ten or twelve a month. These welds are made by an apprentice with the aid of a helper.

SUPERHEATERS.

BY A. L. BALL,
General Foreman, C. & I. S., Kankakee, Ill.

In the last 25 years, steam pressures on locomotive boilers have been gradually increased from 140 to 225 lbs. working pressure. The result has been that the cost of boiler repairs has been very much increased on account of the decreased life of firebox, staybolts and flues. Superheating affords a convenient means of adding heat to steam without increasing its pressure; also the advantage to be obtained by enlarged cylinders. There is no question but that considerable economy is obtained by the use of superheated steam, preferably of reduced pressure, say of 160 pounds, to avoid excessive boiler repairs. This is especially desirable in bad water districts, and it is possible to effect considerable economy in this direction. The smokebox type of superheater develops a low superheat of 25 to 50 deg. F. The single loop fire tube superheater a moderate superheat of 100 to 125 deg. F. The double loop fire tube a high superheat of 175 to 250 deg. F.

Saturated steam at 160 lbs. has a temperature of 370 deg., at 200 lbs. 388 deg. and at 225, 397 deg., or an increase in heat of about 27 deg. for practically the entire range of pressures in locomotive practice.

The low degree of superheat as afforded by the smokebox superheater adds 35 to 40 deg., which is more than can be obtained by means of high pressures.

Moderate and high superheat, on the other hand, affords a convenient and practical means of adding from 100 to 250 deg. of heat. When superheated steam has received, say 175 deg. of additional heat after removal from contact with the water, it is found that 175 deg. of heat can be extracted at a constant pressure before it reaches the saturation point. Therefore, its expansion will partake of the properties of gas and the loss due to the condensation and re-evaporation of the cylinder walls will be largely avoided.

If the superheat is high enough to supply not only the heat absorbed by the cylinder walls, but also the heat equivalent of the work done during the expansion, then the steam will be dry and saturated at release. The firebox temperatures in locomotives must be at least 1800 to 2200 deg. The smokebox temperatures will range from about 550 to 700 deg.

Tests made on superheaters show a saving of 12 to 20 per cent. in fuel and a saving in water of 15 to 25 per cent., it being larger because more fuel is required for the production of one pound of superheat than for the same quantity of saturated steam.

In order to obtain 150 to 175 deg. of superheat and over, it is necessary to resort to the fire tube form of superheater, as it is not possible by any designs of smokebox superheaters to get sufficiently high temperatures in the smokebox without using a large 10 or 12-in. flue in the bottom of the boiler, as in Schmidt's earlier designs. The use of these large flues have been abandoned, even by Schmidt, on account of the extra cost of installation and maintenance, and practically all the designs recently equipped with the Schmidt system have used the fire tube style.

One disadvantage of the smokebox type is that the entire extra weight is concentrated at the front end in a line approximating the vertical center of cylinders. This means with a four-wheel leading truck that all the extra weight is practically added to the truck. On the other hand, the fire tube type distributes the weight much more uniformly.

The Germans have abandoned the smokebox type in favor of the fire tube, chiefly on account of the concentration of weight at the front end, the extra cost and the necessity of using a large tube to raise the temperature of the smokebox gases. Furthermore, they attach much importance to the greater simplicity, ease of application and dismantling; and they state that these advantages have proven of such practical value that for all new locomotives the fire tube type is being used at the present time.

While at a first glance the smokebox type may appear to possess some attractive features, especially in the utilization of the waste heat in the smokebox gases, in practice it is found impossible to obtain more than a few degrees of superheat without increasing the diameter of the boiler tubes, as the temperature of the smokebox gases is not sufficiently high to impart more than 25 to 35 deg. over the normal temperature of the saturated steam in the boiler. It is, therefore, practically little better than a drier and the economics in fuel and water which may be obtained are insignificant as compared with the use of superheated steam of 200 to 250 deg.

It is probable that the trials made in the West with the smokebox superheater are largely in bad water districts where on account of boiler foaming an abnormal amount of water is carried to the cylinders. It is, therefore, possible that in the East where these conditions do not exist to the same extent that the relative economy would be very much less.

The economy in water and coal increases very rapidly with the higher temperatures, and with 150 to 200 deg. of superheat, a conservative estimate of the saving in coal is 20 per cent. and in water 25 per cent.

At the present time the application of superheaters to locomotives constitutes the most attractive and practical forms of improving their power and efficiency. The cylinders can be enlarged to permit greater ratios of expansion, economy of water and fuel and the use of lighter engines which will develop a greater amount of horse-power per unit of weight than is possible with the saturated steam locomotive.

About the only additional care required in the operation of locomotives supplied with superheaters capable of heating the steam to high temperatures, is blowing out the flues after each trip to remove accumulation of soot and cinders. This, however, is the regular practice on some roads with saturated steam locomotives and probably well repays the slight extra cost on account of the better conductive qualities of the tubes when they are in a clean condition.

One of the claims made in favor of the smokebox type is that it is better adapted for application to old locomotives in which it is desirable to reduce the pressure. The principal difference in cost is the renewal of the tube sheets required with the fire tube type, but in case the firebox was worn out or if engines selected for the application of superheaters required new firebox tube sheets there would be practically no difference in the cost of application.

To renew the boiler tubes requires dismantling of the smokebox type of superheater, as usually constructed, but most of the small flues can be removed, especially those in the bottom of the boiler in the later form of fire tube type without dismantling the superheating apparatus.

The superheating tubes in the smokebox type seem to be exposed to a great deal more cutting action from the cinders, as they are at right angles to flues and the gases, than the fire tube type, which would make them very short lived.

The higher degree of superheat, the more the diameter of the cylinders can be increased over the normal dimensions, and consequently increase the starting power, and greater ratios of expansion can be obtained for certain types of engines within the limits of suitable factors of adhesion.

The most economical results with the fire tube type are obtained with a superheat of 180 to 280 deg., with boiler pressure of 160 lbs., the temperature of the saturated steam is 370 deg. and the temperature of the superheated steam at the figures named would be 550 to 650 deg. With suitable design of piston valve and proper lubrication no special difficulty has been experienced in actual operation.

For a superheat of 200 deg. the increase in volume is approximately 25 per cent., so that with the safe cut-off the weight of steam required is 25 per cent. less than with saturated steam with the same pressure. Generally the cut-off can be decreased with superheated steam so that additional economy is obtained by the greater ratio of expansion, which added to the fact that superheated steam does not condense until it has given up all its superheat adds still further to its economy.

As the limits of tractive power at medium and high speeds is largely a question of the ability of the boiler to generate sufficient steam, it will be apparent that a locomotive capable of developing the same tractive power with 80 per cent. of the normal consumption of fuel will show a large increase in tractive power assuming the same amount of coal per hour is burned as in a saturated steam locomotive. This increase under favorable conditions may amount to 30 or 33 per cent.

VICE-PRESIDENT BOYDEN'S ADDRESS.

Mr. Pickard spoke this morning of the expense of a mechanic walking from the locomotive to the store room. We have a system in Cleveland known as the material delivery gang system; it consists of a foreman at $60 a month, two assistants at 17 cents an hour, four helpers at 13½ cents an hour, and one messenger boy at 10 cents an hour. We do not allow a mechanic or helper to go to the storeroom. We have twelve miles of industrial track around our plant. A foreman must anticipate his wants 30 minutes in advance, with the exception of the roundhouse foreman, where there is a 10-minute delivery. A foreman may want 12 nuts delivered to engine 1250. At intervals through our plant we have little red boxes. He makes out his order and puts it in one of these. The messenger boy takes it up and the material is delivered to the engine, or wherever it is to be used. It costs us on an average of 2⅛ cents per order. I think if the general foremen would do this they would find a great saving. A good many of the laborers we have are foreigners, and when they went to the storeroom did not know what they wanted.

In the morning we make every man go to the tool room and draw the necessary tools for the job he left the night before. He is not allowed to go to the tool room again before night. We have the same system in the machine shop. We have one boy who takes back all the tools that the mechanic is through with and sees to the drawing of new tools. I would like to know what experience you have had in getting the tools in at night. We had a lot of trouble with the jacks. They got in the roundhouse and were not returned the next day. If a man draws a jack to-day and it is not in the tool room when he quits, he loses an hour the next day. When it hits their pocketbooks they are a little more careful.

I told Mr. Reyer that we got 8 engines out with 6 machinists on the floor. He did not believe me. I would be glad to have any of you come and see. I do not say I do it every month. We work piecework and have 8 pits, and every pit has a drop. There are two handy men who dismantle the engine with the exception of the ashpans, front ends and pipe work. There is a handy man in the boiler department who takes care of the ashpans. Besides the 6 machinists on the floor, we have 3 handy men. Another man is what we call a roust-about. In our motion work the man that handles the links completes the job and sets the valves. The rods are taken down by the handy man and delivered to the fitting shop; the cab mountings are handled in the same way. There is a machinist on the floor that puts the cab work up, but he does not overhaul it. There is mighty little left for the six men on the floor.

There is no system like piece work with the class of men we are getting to-day. You get up here and say you have 200 machinists. What do you do with them? You are spending a lot of money in looking after those machinists, but when you put the men on piecework you do not have to do so. We have an assistant general foreman who times all new operations. The men get so that the minute they get hold of a new job they look him up and say: "Come and time the new job that I have." We have never cut the price in Cleveland with the exception of where the company has spent money in buying new tools.

We endeavor to be fair to the men and fair to the company. We do not work piecework on a job until the piecework schedule has been signed by five men—the assistant general foreman, the general foreman, the master mechanic, the shop specialist and the mechanical superintendent. And the price cannot be changed without the consent of the five people that signed the cards. The prices are there so that the men can read them just as well as the foreman. I do not know of a place where the price has been cut for three years.

Another thing in handling men, the general foreman should watch the language used by the foremen among their men. We hold a meeting with the representatives of each one of our departments the first Monday of every month. It is held in my office. All foremen are barred. These representatives get the grievances of all the men if they have any. Our first question is what they have for the betterment of the service. After we have gone through that we ask each individual what personal grievance he may have, and it would surprise you to know what we get through these meetings. They are well worth holding.

THE WIDE FIRE BOX.

I.

BY C. BOWERSON.

General Foreman, T., St. L. & W., Frankfort, Ind.

The Toledo, St. Louis & Western has 30 locomotives with wide fireboxes, and it is not an unusual thing for the boiler foreman to hold an engine for a patch or a few staybolts just when you want a power most. While we have eliminated our staybolt trouble to a certain extent by applying the flexible staybolt, nothing has been found to stop the cracking of the firebox sheets.

We have 10 engines with the narrow firebox, carrying 200 lbs. of steam, the same pressure as carried by the engines with the wide firebox. These engines have been in service for seven years without a patch in the firebox, while the thirty engines with the wide fireboxes have each had from one to four patches. The majority of our boiler failures are on engines equipped with the wide firebox; they cannot be cooled down without starting the flues to leaking. The cost of maintenance of the wide firebox is more than double that of the narrow firebox. During last year we renewed 492 staybolts in 10 of the large engines with the narrow firebox, and 1,925 staybolts in 10 of the large engines with the wide firebox, nearly four times as many. A narrow firebox engine coming off the cinder pit does not require nearly as much attention as one of the wide firebox engines. There is but very little difference in the fuel and water consumption betwen the two classes.

II.

BY C. H. VOGLS.

General Foreman, C., C., C. & St. L., Bellefontaine, Ohio.

The wide firebox gives a more equal expansion, is more easily kept clean and has less leaky and broken staybolts. After the narrow firebox is in service six or eight months the flanges of the back flue sheet check from the rivet holes to the caulking edge, making it necessary to hold the engine in, remove rivets, scarf sheet and rerivet or apply patch bolts or plugs. In the wide firebox the flanges are rarely found with fire checks. The wide firebox has a greater grate area and it is easier to draft an engine to make it burn an even fire. It is also much easier for the fireman, on account of the distance he has to shovel the coal, to keep a good fire against the flue sheet, causing less failures on account of flues leaking.

In the wide firebox with the side sheets almost straight, it is practically impossible for scale to lodge on staybolts, but it will drop from any part of the boiler over the firebox to the water bar, where it can be easly washed out; in the narrow firebox when the heavy scale becomes detached, it will in nine times out of ten lodge on the staybolts, causing mud to form, and if allowed to remain, the side sheets will become mud burned and crack, making it necessary to take the engine out of service to plug cracks or patch.

Widening the water leg to prevent the side sheets from cracking, in my opinion, would result in a failure, as the water would bubble away from the side sheets with a ⅛-in. water leg the same as from a 4-in. leg. We have had engines in both freight and passenger service for four and five years with the wide firebox that have no checks in the firebox; on the other hand, the engines doing the same service with the narrow firebox, will, in three or four years' time, have received half side sheets or will have several patches on them. To overcome the cracking of side sheets keep the boilers clean. The only way to do this is to make the roundhouse boilermaker responsible for the boiler washing. When he sees the good results and the manner in which it lightens his work on fireboxes, he will not allow the boilers to go out half washed, but will take time to see that they are washed thoroughly and the cracking of side sheets will be reduced about 40 per cent.

I would recommend two rows of flexible staybolts above the horizontal seam, on account of the rigidity of this part. We discovered more broken staybolts at this point than any other place; 223 broken staybolts were removed on the high pressure boilers in one year. In five years' time we removed 2,200 caps to test the flexible staybolts and found only three bolts broken.

III.

BY H. O. OLSON,

Foreman Machine Shop, D. & I. R. R.R. Co., Two Harbors, Minn.

When comparing the two types of fireboxes it is important that the locomotives shall be used under the same conditions, and be the same size. As a general rule, the engines with the wide firebox are much heavier and are expected to handle a greater tonnage. Long before locomotives had reached their present enormous size and power, it was found that the old style of narrow firebox would not give sufficient grate area for what was supposed to be the economical combustion of fuel. It was not considered economical to burn coal at a higher rate of combustion than 75 lbs. per hour per sq. ft. of grate surface. That this idea is no longer universal is shown from the fact that narrow fireboxes burning 180 lbs. of coal per square foot of grate area are considered economical by some. This is made possible on account of being able to maintain a deep fire in the deep narrow fireboxes so that there is little chance for an excess of air to get through the bed of fuel and decrease the efficiency of combustion. But there is no doubt in my mind that a wide firebox gives better results in fuel economy than the narrow on account of the greater grate area compared with the heating surface than can be had with the narrow, providing the wide firebox is deep enough so that a good body of fire can be maintained at all times. A wide firebox of the same depth in front of the toboggan firebox, or not less than 36 in. under the flues is not an impossibility and would probably give better results from a firing standpoint and also cost less to keep in repair, but if the wide firebox is too shallow it may not be economical in fuel on account of holes being torn in the fire and too much cold air being admitted, reducing the temperature of the gases and interfering with proper combustion. In this case, there is no question but that the cost of repairs is greater, caused by the thin fire allowing the cold air to come in contact with

the flues and side sheets, causing leaks and cracks due to the variation in expansion and contraction.

As a general rule engines with wide fireboxes are much heavier and handle a larger tonnage which apparently increases the cost of repairs. This should be considered in comparing the wide with the narrow fireboxes and the repairs and also the fuel should be figured on the tonnage basis. On the Duluth & Iron Range road we have engines with both the narrow and the wide firebox, and those with the wide firebox have required more repairs than those with the narrow, although they have shown better fuel economy. This saving of fuel will more than pay for the extra expense of repairs, especially if the cost is figured on the ton-mile basis.

Discussion.

Mr. Kelley: The wide firebox is *the* firebox, and most railways are buying it. We have had less trouble with the narrow box than we had with the wide firebox due to more than one reason. The wide firebox is in heavy service, kept out on the road, and the narrow box, as a rule, is in light service. The last paper read mentioned the number of staybolts breaking. That is probably due to construction more than anything else.

One of the papers was in favor of flexible staybolts. They may be good things, but I know of no reason at the present time for applying a flexible staybolt. Recently we had trouble with staybolts breaking on one of our larger engines, but found that it was due to the faulty construction of the firebox. The cracking of sidesheets can be partially remedied by corrugating the sidesheets. We corrugate all our sidesheets. The sheets do not crack where we can wash our boilers properly.

The writer of one of the papers was not in favor of the wide leg on the firebox. I think we ought not to go to an excessive width, but the wide leg is a good thing. It gives a better chance for circulation and there is not so much chance to clog. You can clean it better and get better results. A narrow firebox that sets down between the frames with the O. G. shape gives practically no trouble where the boiler is kept clean.

An engine was delivered to our system along in the latter part of 1888. On one side of the firebox we have removed the sidesheets four or five times; the other side has the original sheets. On neither side of this boiler did we find at any time excessive mud. The engine was on a good run and was in fairly good condition.

I have another engine in mind which was exhibited at the Columbian Exposition in Chicago. It has been running ever since with the original sidesheets. It uses about 180 lbs. of steam, and has been running with practically no broken staybolts. It is a deep narrow firebox.

I believe it is conceded by mechanical men throughout the country that high pressure is not a good think for boilers, and lowering the pressure will eliminate some of the trouble. Many of the roads are cutting down the steam pressure and increasing the cylinder diameter, which gives the same power and does away with many boiler troubles. Many say that we ought to drop the steam pressure below 180 lbs., and some roads have cut it to 170 lbs. for the new power, especially freight power, and up to this time with good results.

Mr. Reyer: We have three classes of fireboxes: Narrow, intermediate and wide. As far as the life of the sidesheets and fireboxes is concerned, we find that the narrow firebox lasts much longer. We have had them last as long as thirty years. The intermediate gives us the next best life, and the wide firebox the shortest life. We have had to remove them after from four years to eight years. Much depends on the steam pressure. The higher the pressure the shorter the life. We are using flexible staybolts in wide fireboxes. The power should be handled carefully at the cinder pit in order to insure longer life and get the best results from an engine.

Mr. Kelley: A great deal of our boiler trouble is due to the handling of the engine. I can take an engine off of a run, put it over the cinder pit and handle it so roughly that when it goes to the roundhouse it will leak like a sieve. If it goes out on the road there will be an engine failure. This is due to allowing the cold air to rush in when it is over the pit. The hostler pulls the throttle right open, drawing fresh air through the flues. That is where a great deal of the boiler troubles start. It is man failure and not an engine failure.

Mr. Buckingham: In my experience, I find that the first thing a hostler does is to put on the blower, put in a big fire and put on the injector. I have a flat rule that no hostler can put water in a boiler unless he has fire in it. We have a rule that the air pump should be shut off when cleaning a fire; that is, the blower should just be cracked, just enough to pull the gas.

Mr. Reyer: About the handling of engines on the pit; our roundhouse is about two miles from the terminal station. The engineer makes the report out and the engine is turned over to the hostler. The cinder pit men have strict orders just to crack the blower, but we have to watch them very closely or they turn the blower on and fill the boiler up. We have had as many as 100 flues leaking, when the engine came in absolutely tight. I think it was wholly due to the cold air causing the contraction of the metal.

Mr. Motta:—We have had very little trouble with the wide firebox. We use oil for fuel, so we have very little trouble on the cinder pit.

Mr. Smith:—A wide firebox is generally conceded to be 10 per cent. more economical than a narrow one. My experience has been that the wide firebox will run with a bigger nozzle than a narrow box will. A wide firebox engine, when on a siding for a few hours, consumes more coal than a narrow firebox under similar conditions. This is easily compensated for when the engine is in service.

ELECTION OF OFFICERS.

C. H. Voges, general foreman of the Big Four at Bellefontaine, Ohio, was elected president; T. F. Griffin, general foreman of the Big Four at Indianapolis, Ind., first vice-president; J. A. Boyden, general foreman of the Erie at Cleveland, Ohio, second vice-president; E. A. Murray, master mechanic of the C. & O., Lexington, Ky., third vice-president; H. D. Kelley, general foreman of the C. & N. W. at Chicago, fourth vice-president; L. H. Bryan, general foreman of the D. & I. R. at Two Harbors, Minn., secretary-treasurer. The following were elected members of the executive committee in addition to T. J. Finerty of the International & Great Northern and L. H. Bryan of the D. & I. R., whose terms have not yet expired: E. F. Fay, Union Pacific, Cheyenne, Wyo.; F. C. Pickard, master mechanic, C., H. & D., Indianapolis, Ind.; Wm. Hall, C. & N. W., Escanaba, Mich.

Secretary Bryan: The *Railway Age Gazette* has sent representatives to our convention at great expense and has held its forms open until Saturday in order to publish promptly all the details of this convention. That is something that has never been done for any other organization by that paper. This enterprise on its part in order to get all the news and minutes of the convention before the mechanical people should be appreciated by our members.

Mr. Ball: I move that the *Railway Age Gazette* be extended a vote of thanks for their courtesy in publishing our proceedings so fully.

The motion was seconded by several members and carried unanimously.

LOCATION OF POINT OF WATER DELIVERY TO LOCOMOTIVES.

I.

BY H. M. BROWN,
Assistant M. M., Chesapeake & Ohio, Hinton, W. Va.

If it were possible to feed an ordinary locomotive boiler with an injector with water under high temperature, it would not make much difference where the water was delivered into the boiler; but as it is not possible to get satisfactory work out of an injector with water at a temperature much above 100 deg. F., it is best, I believe, to deliver it at a point as far removed from the firebox as is possible, and high up, if not on top of the boiler. The old, and generally accepted, practice of introducing the feed water into the boiler below the high water level, still prevails, although in some cases, the water is introduced into the steam space of the boiler, particularly where check valves of the Phillips pattern are used on top of the boiler.

We have applied the above mentioned type of boiler check to a number of locomotives on our road on top of the boiler and as close as possible to the front flue sheet. This is, in our opinion, the best point of water delivery, because the water enters into the steam space of the boiler and, passing through such a high temperature, is heated to a much higher degree than is otherwise the case, thus preventing, to a great extent, the difference of temperatures at various points on the boiler plates.

This avoids the injurious effects of expansion and contraction to a much greater degree than if the water was delivered at, or near, the bottom of the water space of the boiler. This has been satisfactorily proven by the use of the Phillips check and a material saving in the consumption of coal has been effected. That the old practice has been retained for such a long time, is probably due to the mistaken idea that the injector will not work properly if the delivery is connected to the steam space of the boiler.

The principal advantage claimed for the Phillips check is that it is not connected with the water and is thus not likely

to corrode easily, calling for less frequent repairing; it will also remain in good working condition much longer without regrinding or resetting, materially reducing the cost of maintenance. Should it become necessary to grind or repair the checks, not being in the water space, only the steam need be blown off and the fire banked, which greatly facilitates the despatching of engines. We find that the use of the check results in a very heavy deposit of mud and scale around the end of the flues and around the dry pipe, making it absolutely necessary to install near the check and on each side, wash-out plugs to loosen and wash out the scale and deposit. While there are a great many advantages to be derived from the use of a check of the above pattern, one of the greatest difficulties that is encountered, and a very serious one, is the fact that it is almost impossible to keep the joint between the check and the boiler tight, which not only results in the rotting out of the jacket but is a continual annoyance by keeping the sand wet.

The last fifty engines we received were equipped with checks of this pattern, and have been a continual source of trouble from this cause. It is due to having a heavy wrought iron branch pipe; the expansion from this pipe tends to break the joint, causing the check to leak and run down over the boiler and the steam to sweat the sand box, resulting in delays and in some instances failures due to the sand not running.

We have been experimenting with a high pressure pump arranged on one of our through freight engines, the pump utilizing a portion of the exhaust, combining the steam with the water from the tank and placing the water in the boiler at about 280 to 300 deg. at the mud ring. It has proven to be a great success in the test we have made, which has not been thoroughly enough to warrant further application at present. We have been enabled to save a great amount of coal, and the engine on which it was tried has not had a staybolt fracture, nor have the flues given any trouble whatever, since its application.

II.

BY A. F. BRADFORD.
General Foreman, C., C., C. & St. L.

Many roads are experimenting with the method of injecting the water into the boiler above the water line, the injected water being sprayed in and by the time it reaches the water line it is hot. By this method there will be no trouble with the flues on account of forcing the cold water against them, but, will the boiler steam as well and operate as economically as where the water is fed in below the water line? Some say the engines steam better and also that it is more economical. I should think that the steam would be of poorer quality and also that more economy would be gained by placing the feed water inlet below the water line on the side of the boiler back of the flue sheet. The engines on the P. & E. division of the C., C., C. & St. L. are fed in this manner and no trouble whatever has been found with the flues. A shield or box is placed on the inside of the boiler over the feed water inlet, and the injected water instead of coming in direct contact with the flues is forced upward and is warmed thoroughly before striking them, in this manner a better circulation is obtained for the injected water is first forced up, then as the warmer water from below comes up, the cooler water goes down, giving a good circulation and causing the boiler to steam better.

By feeding the water in below the water line a better quality of steam would be obtained, for if the cold water was sprayed in the steam, it would make the steam wet or of poor quality and dryness of steam is quite a factor in the operation of a locomotive. Even if the spray is not placed close to the steam dome, it is plain that the steam would not be of the same quality as if no water was mixed with it. We have an engine in the shop that is being equipped with a double check spray feed, placed on top of the boiler, but have no data as to its performance.

III.

C. W. SEDDON,
Superintendent Motive Power and Cars, Duluth, Missabe & Northern Ry., Proctor, Minn.

The point of water delivery to a locomotive boiler is a subject that has long been neglected. At least 75 per cent. of the engine failures on the average railway are due to boiler troubles, principally tubes, crown and staybolts leaking. The usual remedy applied is to send a boilermaker inside of the firebox to hammer up the staybolts, calk and expand the tubes and oftentimes roll them. Every time this operation is done the life of the tubes and staybolts is shortened, and in a short time tubes have to come out on account of beads worn out and staybolts with heads gone. Usually the tubes in front of the fire door have to be replaced first. The general opinion is that this is caused because of the cold draft from the fire door striking this point.

It is a well-known fact that where cold water mixes with hot water, the cold water will fall and settle to the bottom of the lowest point of a boiler; which in a locomotive would be around the water leg and bottom flues. Now with the old method the custom is to deliver the water in the boiler in a two-inch solid volume, the boiler check being located in the front course of boiler about midway up so that when engine is working hard, using both injectors, there are two solid streams of cold water being forced into the boiler mixing with the hot water. What is the result? The only possible thing that can happen to this cold water, is to settle around the water leg and bottom of tubes, cooling this part of the boiler. This variation in temperature is bound to contract the sheets and tubes, causing them to leak and in many cases the side sheets crack and the staybolts break. Is it not reasonable to suppose that if this feed water is heated to the same temperature as the water in the boiler, that a great deal of flue and firebox trouble can be cured?

Some three and one-half years ago we received two locomotives from a locomotive builder. After putting them in service we found it impossible to make a round trip of one hundred and fifty miles in passenger service because of tubes leaking. This continued until the transportation department condemned them and ordered them off the road until they could be put in shape to do business. We then turned engines over to the builder, advising them to either overcome the difficulty, or take the engine back. They sent out an expert who worked for six weeks trying every possible thing he could think of to overcome the trouble, and finally he gave it up as a bad job. I came to the conclusion that the trouble must be due to the

We connected an elbow to the boiler check on the inside of the boiler and carried the feed water as near to the surface of the water level in the boiler as possible before discharging it. After trying this we found we were able to make about two round-trips without the engines failing. This experiment proved that the trouble was due to feed water conditions. I then decided to deliver the water into the steam space in a spray and thus improve conditions still more. A copper pipe was connected to the boiler check, extending about 18 in. inside, with ⅜-in. holes drilled on the upper side to keep the water in suspension as long as possible, allowing the feed water to absorb heat from the high-pressure steam before mingling with other water in boiler. After applying feed water in this manner the trouble entirely ceased and from that day to this we have not had a minute's delay charged against these engines because of tube or boiler trouble.

Later on we had another engine giving trouble from tubes leaking, and in order to further demonstrate what could be done I decided to change the feed water and apply it in the same manner as in the other cases; after the engine came in leaking badly we made the change and sent it out without permitting the boilermaker to go inside to make repairs, the engine going out in the same condition as when it came in. The result was the leak stopped and from that time until engine went into shop, some six months later, we never found it necessary to send a boilermaker into the firebox. This convinced me beyond any doubt whatever that the old way was entirely wrong and I immediately ordered all our locomotives to have the feed water applied in the manner described. This order was put into effect about July, 1907, and in the spring of 1908 we had all of our power so equipped.

I have followed the matter up closely since that time and find our engines steam more freely, burn less fuel and reduce boiler repairs to a minimum; where we were using five and six boilermakers on roundhouse running repairs we now have but two, one man days and one man nights, and it is very seldom that either of these men is ever required to go into a firebox. We have also found that about 90 per cent. of the foreign matter is deposited immediately underneath the spray pipe, or in the front course of boiler. We have since placed a pan under spray pipe to catch all deposits before allowing them to fall and mingle with the tubes. This can be cleaned by removing the dome cap or connecting a pipe and blow-off cock, so arranged as to carry it away.

I am also informed that one railway which was troubled with bad water and boiler foaming that after applying feed water in this manner the trouble from foamy boilers was almost entirely eliminated, and I presume this is due to the fact that all solids or foreign matters are immediately precipitated and not allowed to mingle with the other water in the boiler.

The question has been asked whether if the holes in the spray pipe will clog up and put the injectors out of com-

mission. In the first place, if copper pipe is used, this is not apt to occur, as scale will not adhere to copper as readily as to iron or steel pipe. Also the spray pipe is so arranged that it can readily be removed if this condition should occur. In our three and one-half years' experience we have never found it necessary to remove one pipe from this cause.

Our records show that we have made a saving of at least 10 per cent. in fuel, 75 per cent. in boiler repairs, an increased tonnage of 10 per cent., and at the close of our ore season engines tie up in better shape than ever before. I am, therefore, thoroughly convinced that the only proper place to deliver feed water into a locomotive boiler is in the steam space, and the finer it can be broken up and held in suspension, the better results will be obtained.

Mr. Smith: It seems to me that this device makes claims for economy that, on the face of it, don't seem to be correct. No matter how the water is delivered, it must be heated to the boiling temperature. It seems to me that the only real advantage of such a device is the freedom from flue troubles.

G. H. Brown (International Correspondence Schools): On the Illinois Central Railway in the fall of '75, when S. S. Hayes was superintendent of motive power, they introduced water in their boilers in a similar manner in many cases, and in some instances they had another dome to the boiler. This dome was filled with scrap iron and the water, passing the checks, percolated through the scrap iron and then into the boiler.

J. J. H. McDonald (International Correspondence Schools): I am of the opinion that where the water is dropped down through the steam into the steam space that there is considerable benefit to be derived.

NEXT MEETING PLACE.

The selection of the next meeting place was discussed freely among the members. Though that question is left with the executive committee to settle, a vote was taken and Chicago was the unanimous choice of the convention.

NEXT YEAR'S WORK.

In discussing the work for the coming year there was a strong feeling expressed that the association had been unfortunate in the choice of the subjects selected for consideration at its meetings. The association is in splendid shape financially and has a good membership. By a better choice of subjects it is felt that it would not only widen its sphere of influence among the foremen, but would secure the co-operation of the higher officials in seeing that the foreman attended the meetings and engaged actively in the work of the association. In a nutshell, the idea expressed was that the meeting of the association should be devoted to the consideration of such subjects connected with the details of the shop and roundhouse work as would insure an increase in efficiency among its members. The executive committee has started actively to do this and the prospects for the most successful meeting next year are very bright.

Mr. Motta:—I believe we ought to confine our attentions to the handling of men, handling of the apprentices and the handling of the different classes of work that come under our jurisdiction. It is by our efficiency that we hold our positions; those are the subjects we ought to discuss, and also the best method of despatching the work. We may have a method that we think is all right, but if any of us should walk through the shop, some apprentice boy could give us pointers on some branch of the work. I believe in giving credit to any man who can produce an idea. It may be crude, but once you have an idea you can easily develop it.

PROFESSOR SCHNEIDER'S ADDRESS.

Prof. Herman Schneider, University of Cincinnati, spoke as follows:

I want to talk to you in a rather informal way this afternoon on the matter of apprentices. It will seem rather strange to you, and may even seem an effrontery, that a university professor should attempt to talk to you foremen on this question. It so happens, however, that for four years I have been in intimate relations with the machine shops of Cincinnati on a co-operative basis between the university and the shops for the training of the mechanical engineer. The scheme is a very successful one and I will explain a few of the details.

Our plan is to have students in mechanical engineering spend one-half the time in the commercial shops and one-half the time in the university. This week half the engineering students are working as apprentices in the commercial shops, the other half are in the university studying engineering. Next Monday morning these two sections will change about. These young men get the regular, rigid, stiff apprentice training of the machine tool shops of Cincinnati. They are under all the rules of shop discipline that the other men are under. At the university they take the regular mechanical engineer's course, and it is because we have operated that course successfully for four years that I have nerve enough this afternoon to come down and talk to you on this question.

Following the work which was started at the university, a number of other towns have taken up a similar arrangement. At Fitchburg, Mass., there is an arrangement between the high school and all the shops of the town for the training of machinists and of mechanical engineers. The details are similar, except that the course is four years in length, the students alternating between the high schools and the shop. Students, of course, are paid for the work while at the shop.

The fundamental principle underlying this work is the thing I want to try to impress upon you; that is, that the prime feature of apprentice training is in the shop and not in the school. In order to get successful mechanics and successful engineers, you have to take the school to the shop and not attempt to take the shop to the school.

Here in Cincinnati we have another arrangement for the machine shop apprentice, which is called a continuation school. It is a co-operative scheme between the public schools of Cincinnati and the machine shop. The idea is to take the instruction to the boy that is already on the job in the machine shop. The shops agree to send their apprentices one-half day per week to a school teacher especially selected to give the theory upon which the work is based. That school has been operating long enough to show that it is successful. Some of our best firms have a large number of apprentices there. The Fay & Egan Co. has 60 apprentices whom it sends a half day per week to the school. The shop pays the boy for the time he is in school just as though he were in the shop. You might imagine that it would be a rather expensive plan, but, as a matter of fact, you will find that the efficiency of the boys has increased so greatly since they have been in this school that it is not only no cost to the company, but there has been a certain gain. The thing that I am attempting to point out to you is a scheme whereby you have the old apprenticeship system with something new added, namely, a shop instructor.

Under the old system of production the foreman had time to instruct the men; under modern production, the foreman has to get out the work, the engines have to be got out. In the shop you can teach manual dexterity better than any place else, and a thorough appreciation of all the details necessary can be worked out and obtained only in a commercial shop worked under the right conditions.

Many attempts have been made to organize trade schools for teaching the boys the trades. The statistics available on those schools are rather interesting, and show that in nearly every case the boy who was trained in a trade school for a machinist never gets into the trade. That is not astonishing when you consider the training that they get. Time is not an element of their education. Most of it is on a certain type of manual training, such that when the boy has finished with it he does not want to be a machinist; he would rather be a draftsman at $50 a month than a machinist at $75. The same thing is true of the foundry schools. They give the fellows so much chemistry that when they get out they think they are chemists, but not for worlds could you get them to go into the foundry and do dirty work. It seems to me it would be hopeless to attempt to teach a trade in a school and expect the results that you men have to get from the skilled mechanic. There seems to be no other way of doing it than through some co-operative scheme.

I am at the present time retained by one of the trunk railways to work out an educational scheme to cover all departments, mechanical, maintenance of way, traffic, operation, finance, etc. In every case the thing that we shall attempt to do will be to take shop instructors into the shop, or to the work, taking the apprentices from their work at certain set times and giving them instruction and paying them while they are getting it.

There will be a great many different details to work out. In some of the shops the company will pay for the instructors; at other points the public schools will be brought into play, as in Cincinnati. We attempt to solve two questions when confronted with the problem of training of men. The first is what do these particular men need to know to make them more efficient in their work; what can we put into their heads to make them more efficient? The second is: when can we get at the man with a thorough, practical instructor? We do not attempt to teach them manual dexterity, because we know the shop itself will handle that much more thoroughly than any professional educator can do it.

The whole problem, in my opinion, will come back to the old apprenticeship system, with a shop instructor added to improve the workkman's mental efficiency in connection with

his manual dexterity. You will solve the problem by bringing into your shop an instructor who will teach the practical side, giving the boys while they are at the school a thorough practical training. The thing has got to be solved through a co-operative agreement between a school which your company may own, or which may be a part of the public school system, and your shop to work in very close harmony.

I want to go back a moment to our university work. We have a bunch of men whom we call shop co-ordinators. There are three of these men. It is their job to be out in the shop every afternoon and in the university every morning. This afternoon they are out in the shop observing what our student apprentices are doing. They go out and watch those young men on the machines, and observe every operation. It gives them industrial intelligence on the job. They keep that up throughout the whole year. The next week during the morning they have these men in classes and they point out to them the why and the wherefore of everything they have been doing during the past week. We have to give the men what the Germans call industrial intelligence and show them why they are doing a job and why they are doing it in a certain way. They must be taught the mechanical short cuts. They do not need to know the whole book of algebra, or geometry, but there are certain fundamental principles which are tremendous time savers. The manufacturers expect to get efficient mechanics out of our school because we have been careful to select shop instructors who keep their feet on the earth. They will not use a rule unless they can show a man how to use it to do a better job. The whole aim must be to give mental efficiency which will assist in improving manual dexterity.

I believe that with some of you conditions are such that you cannot employ a shop instructor. You may not have enough apprentices, or perhaps the railway will not stand for the expense. Please note this. The public school men of this country are hunting for some way to solve for themselves this tremendous problem of industrial education. In your own town you will find the problem is bobbing up in various forms and it has got to be met in some way. You men are not directly involved in commercial occupations, but you are indirectly involved because the volume of your business depends on the volume of commercial business done in this country. Those who have studied commercial statistics realize that there must be a solution of the problem of training for commercial pursuits.

Take a town like Cincinnati. Here are 400 distinct trades. We have had a great many officers ask us to point out a means for the training of men on some co-operative basis. We have had tailors, employers of women in the line of dressmaking, millinery, shoemaking, etc., appeal to us, and careful attention to the situation has disclosed the fact that there is a dearth of skilled artisans in practically every line of trade that is represented in this big industrial city. There is the same cry in all the other industries as in the machine shop; the schools have got to teach the trades. Consider what that means; if we are going to solve the problem of industrial education in that way we will have to teach two or three hundred trades at least. We will have to equip the schools with all the different types of machinery represented, and we will have to do that for all the children that go into the trades in Cincinnati.

It costs about $25 per child per year for the average public school instruction in the United States. When you put manual training into the public schools you run the cost up to $55 per child per year. When you put industrial trade training in, as in Milwaukee, the cost per child per year runs up to $400. When you consider the cost of equipment and the cost of training, you will see that the training for all the trades, for all the children, would bankrupt a city.

In the broader view of solving this problem of industrial education there seems to be just one way of doing it, and that is to take the school to the boy or girl who is on the job. Statistics prove that after they have been educated in schools the majority do not follow the trade for which they have been prepared. The one thing we are pleading for is a combination of the school and the shop, for efficiency and for all that goes to make a better mechanic. It seems to us after a trial both of the university end and the public school end, as I have indicated by the experience of the Fay & Egan Co. and others, such as the Cincinnati Planer Co., the Cincinnati Milling Co., etc., that is the only feasible scheme. It is less expensive than the public school instruction of the little boy or girl in the first to the fifth or sixth grade, and it does more work for efficiency in one year than can be obtained in four years of instruction without the combination. That may seem like a pretty broad assertion, but we have the time cards on it.

In a large eastern department store a manager asked if there was some scheme whereby he could train his 8,000 clerks. The proposition was: What do you want the people to know? We want them to know the psychology of work and have a scientific knowledge of the things they are handling. When can we have the people in the school? You cannot have them; they are employed. We said, "Are all your clerks busy all the time?" "No, we can spare half of our clerks until about 10 o'clock in the morning, when the women come down to do shopping." So that particular store now has a school whereby such teachers go into the store until about 10 o'clock. The efficiency there has increased remarkably. It is a safe proposition to tie up with a school or organize a school of your own. The expense involved will be more than paid by the increased efficiency of the workers.

H. D. Kelley (C. & N. W.): For some years past we have been particularly interested in apprentices. We have two apprentice instructors at Chicago who devote their entire time to the apprentices. We do not take the boy to the school room, as the New York Central, the Grand Trunk and the Santa Fe do, giving him training during working hours, but as he is working on his job we have these men follow him up and show him just how it should be done, giving him good advice and seeing that he follows a complete schedule that is laid out for his training. The boy who enters the shop is required to have a certain education. Then every fall we advise him to go to night school. We fortunately are situated near the Lewis Institute, where a boy can get first-class instruction at very little cost. After he has served a certain time we put him in the drawing room and keep him there six months; then we bring him back to the shop. We tried some years ago to have the company give the boy a certain amount of school instruction during working hours, but it was not prepared to do so and we organized a class to meet one night each week. We get the boys to take up a certain line of study. We assign a subject to a boy and he must write a paper; then it is discussed. The apprentice instructor is chairman.

The annual banquet was held on Friday night. After dinner a vaudeville entertainment, which was enthusiastically received, was given under the direction of the Railway Supply Men's Association.

RAILWAY SUPPLYMEN'S ASSOCIATION.

The following were elected members of the executive committee of the Railway Supplymen's Association for the ensuing year: J. W. Motherwell (*chairman*), Ashton Valve Co., Boston, Mass.; James C. Younglove (*secretary-treasurer*), H. W. Johns-Manville Co., New York; W. L. Allison, Franklin Railway Supply Co., New York; W. G. Wallace, American Steel Foundries Co., Chicago; B. J. Nelly, Jenkins Brothers, New York; F. E. Ransley, Greene, Tweed & Co., Chicago.

ATTENDANCE.

The following active members attended the convention. A number of associate members were also present. Several members were accompanied by their wives and families:

A. L. Ball, Gen. For., C., I. & S., Kankakee, Ill.
F. Bauer, Indianapolis, Ind.
F. M. Baumgardner, Y. & M. V., Vicksburg, Miss.
A. Barnes, Chicago.
B. A. Beland, R. H. For., St. L. & S. F., Springfield, Mo.
C. Bowersox, Gen. For., T. St. L. & W., Frankfort, Ind.
J. A. Boyden, Gen. For., Erie, Cleveland, Ohio.
A. F. Bradford, C., C., C. & St. L., Urbana, Ill
H. M. Brown, Asst. M. M., C. & O., Hinton, W. Va.
L. H. Bryan, Gen. For., D. & I. R., Two Harbors, Minn.
J. E. Buckingham, U. S. Yards Co., So. Omaha, Neb.
R. W. Burnett, I. C., Mattoon, Ill.
E. D. Colon, Grand Rapids, Mich.
C. L. Dickert, Gen. For., C. of Ga., Macon, Ga.
J. J. Donovan, C., N. O. & J. P., Ludlow, Ky.
A. E. Douglass, C., C., C. & St. P., Cincinnati, Ohio.
W. S. Dresser, C., C., C. & St. L., Peru, Ind.
W. H. Dunlap, L. & N., Covington, Ky.
Henry Eisele, Wabash, Ft. Wayne, Ind.
J. A. Finical, Erie, Galion, Ohio.
F. W. Fritchey, G. F., C., C., C. & St. L., Sandusky, Ohio.
A. B. Fromm, C., I. & S., Gibson, Ind.
C. W. Fromm, C., I. & S., Kankakee, Ill.
H C. Gillispie, Russel, Ky.
William S. Gray, L. & N., Covington, Ky.
T. F. Griffin, Gen. For., C., C., C. & St. L., Indianapolis, Ind.
W. Griffith, G. F., Pere Marquette, Ft. Thomas, Ont., Can.
W. C. Groening, Pere Marquette, Grand Rapids, Mich.
William Hall, C. & N. W., Escanaba, Mich.
B. F. Harris, G. F., C., H. & D., Cincinnati, Ohio

J. H. Henfield, Erie, Port Jervis
C. M. Hitch, Gen. Car. foreman, C., H. & D., Cincinnati, Ohio.
J. J. Houlihan, Wabash, Ft. Wayne, Ind.
J. S. Johnson, R. H. For., D. & I. R., Two Harbors, Minn.
H. D. Kelley, C. & N. W., Chicago.
W. L. Kellogg, S. M. P., C., H. & D., Detroit, Mich.
P. C. Leary, N. & W., Roanoke, Va.
J. A. LeMieux, R. H., C., C. L., Peru, Ind.
J. E. Lester, C., N. O. & T. P., Ludlow, Ky.
J. P. McCuen, Supt. M. P., Q. & C., Ludlow, Ky.
William Mills, C., H. & D., Indianapolis, Ind.
C. W. Moats, P. & L. E., Beaver Falls, Pa.
W. L. Monning, storekeeper, C. & O., Covington, Ky.
Stephen Motta, National of Mexico, Aguascalientes, Mex.
E. A. Murray, M. M., C. & O., Lexington, Ky.
T. H. Ogden, Gen. For., A., T. & S. F., Dodge City, Kan.
J. H. Painter, Supt. Shops, A. C. L., Rocky Mount, N. C.
F. C. Pickard, M. M., C., H. & D., Indianapolis, Ind.
W. G. Reyer, Gen. For., N., C. & St. L., Nashville, Tenn.
W. Rose, C., H. & D., Cincinnati, Ohio.
H. L. Roth, C., N., O. & T. P., Ludlow, Ky.
J. W. Savage, Q. & C., Ludlow, Ky.
H. Scatchard, N. & W., Roanoke, Va.
J. Schlageter, Toledo Ter. Co., Toledo, Ohio.
C. J. Scudder, Pere Marquette, Saginaw, Mich.
H. J. Sentman, P., C., C. & St. L., Bradford, Ohio.
S. Skidmore, C., C., C. & St. L., Cincinnati, Ohio.
W. Smith, B. & O., Benwood, W. Va.
W. T. Smith, S. M. P., C. & O., Covington, Ky.
A. Telford, Pur. Agt., Q. & C., Cincinnati, Ohio.
George Tozzer, P. A., C., C., C. & St. L., Cincinnati, Ohio.
R. W. Turney, C. & O., Huntington, W. Va.
R. B. Van Wormer, A. C. L., Waycross, Ga.
C. H. Voges, C., C., C. & St. L., Bellefontaine, Ohio.
W. H. Wallace, Indianapolis, Ind.
F. J. Walsh, Gen. For., C. & O., Thurmond, W. Va.
R. W. Woods, Gen. For., C. & O., Clifton Forge, Va.
Thomas Zinkan, C., C., C. & St. L., Delaware, Ohio.

EXHIBITS.

The exhibitors at the convention, including the products exhibited and the representatives present, were as follows:

Armstrong Bros. Tool Co., Chicago.—Armstrong tool holders and ratchet drills. Represented by Paul Armstrong, James W. Barber.

Ashton Valve Co., Boston, Mass.—Pop safety valves and steam gages. Represented by J. W. Motherwell.

Celfor Tool Co., Buchanan, Mich.—Celfor twist drills and reamers. Represented by J. J. Dale.

Chicago Pneumatic Tool Co., Chicago.—Pneumatic tools. Represented by Charles E. Walker, Thomas Aldcorn, J. C. Campbell, C. E. Walker, Jr.

Crane Company, Chicago.—Valves, steam fittings and locomotive specialties. Represented by G. S. Turner.

Crucible Steel Co. of America, Pittsburgh, Pa.—Catalogues descriptive of high grade tool steel. Represented by F. A. Lawler, William Stevenson.

Curtain Supply Co., Chicago.—Curtain fixtures; vestibule curtain release handles; improved vestibule curtain hook No. 6, with steel roller; vestibule diaphragms. Represented by Stanley W. Midgley.

Dearborn Drug & Chemical Works, Chicago.—Circulars descriptive of Dearborn feed water treatment; boiler compounds. Represented by Paul T. Payne.

Detroit Lubricator Co., Detroit, Mich.—Bullseye locomotive lubricator with oil control valve; also double and single sight feed air pump air cylinder lubricators. Represented by A. D. Howard.

Joseph Dixon Crucible Co., Jersey City, N. J.—Samples and catalogues descriptive of graphite. Represented by F. R. Brandon.

Fairbanks, Morse & Co., Chicago.—Duff-Bethlehem forged steel hydraulic jacks; steam pumps, hoists, track tools, etc. Represented by J. L. Jones.

J. A. Fay & Egan Co., Cincinnati, Ohio.—Photographs of woodworking machinery. Represented by S. P. Egan, Cliff E. Egan.

Franklin Railway Supply Co., New York.—Franklin driving box lubricators; McLaughlin flexible joints; Franklin vertical and horizontal fire doors; Franklin steam grate shakers; Security brick-arch; Franklin steam chest plug; McLaughlin lock-nuts. Represented by W. L. Allison, R. G. Coburn, Paul Weiler.

Garlock Packing Co., Palmyra, N. Y.—Garlock packings. Represented by J. J. Pokorney.

Gold Car Heating & Lighting Co., New York.—Combination vapor and pressure system for car heating; steam hose couplers; engine and temperature car regulators. Represented by W. H. Stocks, J. O. Brumbaugh.

Goldschmidt Thermit Co., New York.—Thermit and appliances for welding frames; pipe welding and foundry applications. Represented by J. G. McCarty.

Green, Tweed & Co., New York.—Palmetto self-lubricating packing; Favorite reversible ratchet wrench. Represented by F. E. Ransley, B. M. Bulkley.

Hunt-Spiller Manufacturing Co., Boston, Mass.—Hunt-Spiller gun iron for locomotive castings. Represented by J. G. Platt.

Jenkins Brothers, New York.—Valves; Jenkins '96 packing. Represented by B. J. Neely, C. F. Beckwith.

H. W. Johns-Manville Co., New York.—J-M packings; J-M Immovable guy anchor; descriptive circulars of Johns-Manville products. Represented by James C. Younglove, C. F. Murphy.

The E. A. Kinsey Co., Cincinnati, Ohio. Norton grinding wheels; Homestead valves; Use-Em-Up drill sockets; Sterling back saws; Williams Superior drop-forgings. Represented by F. C. Bentley.

Nathan Manufacturing Co., New York. Nathan lubricators; injectors; Klinger water gages; Coale mufflers and pop valves; Hart valve. Represented by C. A. Nathan, J. S. Seeley.

Otley Manufacturing Co., Chicago.—Eureka steam joint cement; graphite paints and lubricants. Represented by Benjamin F. Otley.

Storrs Mica Co., Owego, N. Y.—Storrs Never-Break mica chimneys and globes. Represented by Charles P. Storrs.

Strong, Carlisle & Hammond Co., Cleveland, Ohio.—Randall graphite sheet lubricators. Represented by B. E. Carpenter.

Talmage Manufacturing Co., Cleveland, Ohio.—Talmage system ash-pan cleaner door. Represented by J. G. Talmage, J. F. Walker, E. H. Janes.

West Disinfecting Co., Cincinnati, Ohio.—Disinfecting appliances. Represented by Charles F. Pierce.

Westinghouse Air Brake Co., Pittsburgh, Pa.—Catalogues descriptive of Westinghouse galvanized annealed steel hose clamps; centrifugal dirt collector; compound air pumps; improved triple valve test racks for cleaned or repaired triples; E. T. locomotive brake equipment, etc. Represented by I. H. Brown, J. S. Siegrist, R. W. Williams.

GERMAN WATER SOFTENER.

A recent development in Germany of a method of water softening and preventing boiler incrustations is accredited to a German chemist, Dr. R. Gans, professor and chief of the Laboratory for Soil Investigations of the Royal Prussian Geological Institution of Berlin. It consists in filtering the water through a composition called permutit, by which the calcium or lime, manganese, iron and magnesium compounds are, it is claimed, wholly removed. When desired the compounding of the permutit may be such as to leave either the lime or magnesium in the water.

Permutit is obtained by smelting alumina with an alkaline carbonate and the addition of quartz. The resulting compound, after having been washed until free from alkali, is a granulous or even laminated soda-aluminum silicate or natrium-zeolith, which is capable of exchanging its entire content of sodium, not only for calcium and magnesium, but also for metals. If, for example, the water to be softened contains in solution lime sulphate or sulphate of calcium, the latter will, when brought into contact with permutit, part with its lime or calcium, which is replaced by sodium, so that there remain in the filter sulphate of sodium and calcium-zeolith. This reaction may be expressed chemically as follows: $Na_2Al_2Si_2O_8 + CaSO_4 = CaAl_2Si_2O_8 + Na_2SO_4$.

When the attractive power of permutit for the lime or other substance which renders the water hard has become wholly exhausted, it may be completely regenerated by the use of common salt, or even denatured salt, which in Germany costs about 75 cents per 220 lbs. The action of the salt in the regeneration of the permutit consists simply in replacing the element of calcium in the calcium-zeolith with two parts of sodium, thus giving the original natrium-zeolith. The following formulas show this chemical change: $CaAl_2Si_2O_8 + 2NaCl = Na_2Al_2Si_2O_8 + CaCl_2$. The affinity of the calcium in the zeolith combination being stronger than that of the sodium, an excess of the salt must be used to effect the complete transformation to the sodium-zeolith. The operation is simple. The salt is first dissolved in requisite quantity, and after the filter has been freed from water at the close of the day, half of this brine is allowed to flow in and remain two hours, after which the outlet, and at the same time the inlet, are so regulated that the remainder of the brine will flow through the filter during the night. The following morning the filter is flushed until the surplus salt and the deposit of bichloride of calcium which has been separated from the calcium-zeolith have been completely washed away. It is then ready for use again.

Permutit costs about 8 cents per pound. A plant using for 10 hours daily 35.3 cu. ft. per hour of water having 25 degs. of hardness needs about 220 lbs. of permutit. The apparatus to hold this quantity, including the mounting, costs about $82. Such plants complete are being sold by the company controlling the patents for about $250.

It is the company's intention to sell to individual firms in other countries the right to manufacture the composition. Some of the European rights have already been sold. An American company is negotiating for all rights for manufacturing in the United States, for which a large sum and a royalty for each pound manufactured are asked.

General News Section.

The Postal Telegraph Cable Co. announces that on June 1 the wages of the operators in its important offices will be increased at varying rates from 5 per cent. upward.

All the offices of the Chicago & Eastern Illinois which were formerly in the La Salle street station, Chicago, have been moved to the McCarmack building, Michigan avenue and Van Buren street.

The Massachusetts legislature has passed and the Governor has signed a law making it obligatory on employers of labor, in advertising for help during labor disputes, to explicitly mention in their advertisements that a strike, lockout or other labor disturbance exists. The maximum penalty for violation is $100.

The Northern Pacific is still expanding its farming operations, and has lately bought a very large tract of fertile land near Kent, Wash., where fruit, meat and vegetables will be provided for the dining cars of the road. Five hundred or more cows and other animals are already on the farm and 150 Japanese laborers have been engaged. Near Paradise, Mont., another large farm of the company is devoted to raising garden vegetables.

W. L. Park, vice-president of the Illinois Central, formerly general superintendent of the Union Pacific, has introduced on the Illinois Central the practice, which has been in vogue on the Union Pacific for several years, of inviting disinterested citizens to sit with officers of the company in their investigations of train accidents. At Jackson, Miss., R. L. Sanders joined with officers of the road in declaring that a recent derailment was due to malicious loosening of a joint in the track.

Louis Brennan, of London, maker of the gyroscope monorail car described in the *Railway Age Gazette* of Nov. 26, 1909, has received orders for two cars to be sent to Alaska, where it is said a company of Americans headed by John Ballaine, plans to build a railway of 100 miles long from Matamiska coal fields toward Fairbanks. Laying only a single rail, it is expected that the cost of the road will be not over $3,000 a mile. It is said that one of Mr. Brennan's gyroscope cars has carried passengers at the rate of 26 miles an hour.

The report that an officer of the Cumberland Valley, who had made some surprise tests, had been arrested for illegal tampering with signal lights, is declared by an officer of the road to be absolutely without foundation. The report, it will be recalled, included a rumor to the effect that the instigators of the arrest were enginemen who had felt themselves injured by tests which were made by the officer. The reporter who thought that the enginemen instigated arrests was mistaken; he should now tell us who instigated the rumor.

Charles Hansel, appointed by the governor of New Jersey to continue the work of valuing the railway property of the state—which was carried on last year by a commission consisting of Samuel Whinery, Charles Hansel and Frank Stevens—announces that Louis Focht is to assist him, with the title of chief engineer in charge of permanent way. Mr. Focht was for 10 years engineer of the Eastern division of the Lehigh Valley and was with that company altogether 14 years. For the last dozen years he has been engineer to the State Board of Assessors in New Jersey.

A conference between committees representing the municipal assembly of St. Louis, the shippers of St. Louis and the railways entering that city was held on April 27 at the Mercantile Club for the purpose of discussing the question of the abolition of bridge arbitraries at St. Louis—the charges for carrying freight across the Mississippi river. On motion of Benjamin McKeen, general manager of the Vandalia, it was decided to have sub-committees appointed to represent the various interests, and the conference then adjourned subject to call by these sub-committees.

According to a Massachusetts paper, the principal freight station of a prominent railway—the name of which does not begin with B—has got along three months without scales, except a track scale. Where the tally man had to state the weight of a shipment of which the consignor had given no weight, he has arrived at the correct figure by the secret processes of his own mind. It appears that the state sealer of weights and measures condemned the scale, which had long served in this freight house, and forbade its use; and not in three months was the railway able to supply a new scale to take its place.

The American Express Company has taken over the express business on the Oregon & Washington, superseding Wells-Fargo & Co. F. R. Parsons, route agent of the American Company, was quoted at Tacoma as saying that express matter would in future be transported from New York to Puget Sound in four days. This record would be made possible by the use of the express specials of the American Company, which leave New York each evening, running over the New York Central and Michigan Central to Chicago; from Chicago to Fremont, Neb., over the Chicago & North Western; thence over the Union Pacific, Oregon Short Line and Oregon Railroad & Navigation lines to Portland in time for morning delivery there on the fourth day. The Oregon & Washington car, which will be part of the train, will leave Portland in the morning, arriving at Puget Sound points in the afternoon.

According to a bulletin issued by the Bureau of Labor at Washington, the Canadian law to facilitate mediation in industrial pursuits is now quite generally approved by the general public and by most employers. It has been in force three years and at the end of two years and five months boards of mediation (of three persons each) had been appointed and acted in 59 disputes, involving 65,500 employees. The principal usefulness of a board is in bringing the parties to a controversy together for an amicable discussion. The law applies to a limited number of industries, mainly the public utilities and coal mines. The leaders of the railway unions are said to be divided in their opinions of the value of the law but, on the whole, are more favorably inclined than at first. The law has not prevented strikes in every case where it has been applied, and in some cases strikers have defied it with impunity, but there is no apparent likelihood that it will be repealed.

The Mulheim Collision.

As already noted in the *Railway Age Gazette*, a rear collision of passenger trains at Mulheim-on-the Rhine, Germany, March 30, resulted in the death and injury of a large number of soldiers. An express train ran into the rear of a special train which was conveying furloughed soldiers back to their regiments, and 19 persons were killed instantly and 56 injured, of whom three died afterwards. This collision is spoken of as the most serious accident, in its consequences, that ever happened on the Prussian State railway system. A week later von Breitenbach, the responsible Minister, before dicussing the estimates for the coming year in the Prussian House of Delegates, spoke of this accident at some length. It occurred, he said, on a part of the system which about a year before had been constructed and equipped in a manner which experts considered to be as nearly perfect as modern engineering could make it. All switches were protected by home and distant signals, and all were connected electrically with an interlocking system. The accident occurred in broad daylight and there was no fog or anything to prevent seeing the signals, yet the engineman of the express ran past both the distant and the home signal; past the signal tower, where a red flag was displayed, a horn blown, and desperate warnings shouted, and into the rear of the special train, which was about to enter a siding. This engineman had run express trains for years and was perfectly familiar with the line. He had been on duty 4¾ hours. He will be tried on a criminal charge.

As to what can be done to prevent such accidents in the future, the Minister was at a loss what to say. At the place

where the accident occurred, everything had been provided to secure safety which the technical authorities desired. It had been suggested that provision might be made to stop automatically a train which overruns a signal. "Unfortunately, I must confess that the experiments made hitherto in this direction have yielded unsatisfactory results, and this not only on the Prussian State railways, but, I believe, everywhere else. The automatic braking of trains, to prevent overrunning signals, we, in common with all railway managers of Central Europe, reject, and we reject it because we consider it to increase and not to decrease danger; we fear that such a method, independent of the will of the engineman, will only lead him to be less alert, which could not be permitted. We know, too, that the apparatus for such braking must under all circumstances work promptly, while it is subject to very various influences, which we cannot control." Experiments are under way to provide an automatic acoustic signal on the engine, so that an error or negligence of the eyes may be corrected by the ear. How these experiments will turn out remains to be seen, but there is danger that all remedies for negligence will result in lessening the attentiveness and alertness of the enginemen. There is hope that these qualities in the men may be cultivated and increased by self-registering apparatus which will show every case of over-running signals, whether it results in accident or not. The Prussian lines are beginning to test such devices, and will soon have more of them. Generally the management hopes most from a careful selection and training of the men, especially of the locomotive men. Safety in operation depends overwhelmingly on moral qualities—calmness, presence of mind and ingrained devotion to duty.

The Western Indiana Real Estate Fraud Case.

The Chicago & Western Indiana has renewed its suit in the courts at Chicago against John C. Fetzer for alleged frauds committed by him in acquiring real estate in Chicago for this road. The road seeks from Fetzer $525,000, out of which it claims he defrauded it, and $75,000 damages additional, a total of $600,000. In connection with this action it is announced that Benjamin Thomas, former president, and Charles R. Kappes, former real estate agent of the road, who were alleged to be implicated in the frauds with Fetzer, have paid to the road $76,000.

Judge Kersten, of the criminal court, on petition of the state's attorney, has ordered the impaneling of a special grand jury to investigate charges made by Mr. Fetzer that the Chicago & Western Indiana had used a "slush fund" of large proportions to bribe members of the Chicago council and of the Illinois legislature. It will be recalled that, as previously stated by the *Railway Age Gazette*, the board of directors of the Chicago & Western Indiana laid the evidence of the alleged frauds before State's Attorney Wayman and asked him to seek the indictment of Messrs. Thomas, Kappes and Fetzer. The state's attorney, however, refused to move for indictments. The charges made against Messrs. Thomas, Kappes and Fetzer were outlined in the *Railway Age Gazette* in its issue of January 28, page 197.

The action of Judge Kersten in calling a special grand jury grew out of a bill filed by Fetzer in an attack made by him on the award made by E. C. Field, who was chosen to arbitrate the differences between the Chicago & Western Indiana and Messrs. Thomas, Fetzer and Kappes after the original suit was brought. Mr. Field, as will be recalled, held that these men should pay to the road $525,000. Mr. Fetzer implies that at least part of this money was used by the road in getting a bill through the Illinois legislature a year ago to remove a cloud from the legality of a bond issue for $50,000,000. In his declaration he quotes a letter from F. A. Delano, president of the Wabash and one of the directors of the Western Indiana, to Mr. Thomas, in which Mr. Delano said: "I believe we should in a quiet way get the legislation which Judge Henry and our counsel concluded is desirable." A bad construction is sought to be put on Mr. Delano's use of the word "quiet."

Mr. Delano has issued a statement in reply. He says that on January 21, 1907, $8,000,000 of three-year notes which were secured by the consolidated mortgage bonds of the Chicago & Western Indiana were sold to the Illinois Trust & Savings Bank and to Lee, Higginson & Company. After the notes had been sold, counsel for the Boston bankers discovered what he thought was a flaw in the original incorporation of the road. After a good deal of discussion as to the best method of removing the cloud, the question was left to W. J. Henley, general counsel of the Western Indiana, and Wells H. Blodgett, general counsel of the Wabash. The only interest Mr. Delano had in the matter was as a director of the Western Indiana, representing the Wabash, and as a member of the committee of the board that negotiated the sale of the notes. C. N. Travous, general solicitor of the Wabash, under date of February 25, writing to Mr. Delano for himself and Mr. Blodgett, recommended that it would be advisable to get a validating act passed, and shortly after receipt of this letter Mr. Delano wrote to Mr. Thomas the letter quoted in Mr. Thomas' declaration. Continuing, Mr. Delano says:

"It seems to me that the necessity for so handling a matter of this extreme delicacy ought to be sufficient explanation for the use of the expression 'in a quiet way.'" Mr. Delano adds:

"Mr. Thomas, then president of the road, stated in my presence to Morton D. Hull, a member of the legislature, that no money whatever was being or would be used to bring about the passage of the act, and explained to Mr. Hull in fullest terms the reason for the bill. I personally know that a number of members of the legislature, as well as of the Chicago newspapers, took pains to find out all about this bill and satisfied themselves that it was a perfectly proper measure before voting for it.

"The important thing for the public to remember is that this story of a 'slush fund' is gotten up by Fetzer or his counsel to divert public opinion from the real issue. The Chicago & Western Indiana was robbed and is demanding restitution of the money. It is no adequate defense to say that this money, though stolen, was used for the benefit of the railway company in corrupting the legislature or the city council or any one else.

"I feel confident that no such use was made of the money, but, if it were, that is only all the more reason for thorough ventilation of the case."

Woods Public Utilities Bill Defeated.

The Woods Public Utilities Bill, which had been passed by the lower House of the Ohio legislature, was defeated in the Senate on April 28 by a vote of 22 to 10. Its defeat undoubtedly was largely due to work done by the Ohio Business Committee of the Railway Business Association. The Railway Business Association throughout the discussion took the position that fuller consideration should be given to any such measure before it was adopted than had been given to the Woods bill. Largely through its work a public sentiment was created which resulted in hundreds of letters and telegrams being sent to Senators by business men from all parts of the state, and in the adoption of resolutions condemning the Woods bill by the Chambers of Commerce of Cleveland, Columbus and Dayton, and the Board of Trade and the Real Estate Exchange of Canton. The result was not only to make the members of the Senate realize the crudity of the bill but to also create a very strong doubt as to whether it had the backing of public sentiment.

Railway Matters in Washington.

Washington, May 4, 1910.

The bills to amend the Interstate Commerce law have been discussed at great length during the past week, and the leaders of the majority have had to submit to such important amendments that they not only begin to think that no satisfactory law can be passed, but have become so discouraged that they will be satisfied apparently to let the bills fail—rather than have them passed in a very unsatisfactory form. The first important amendment was one offered by Representative Bartlett, of Georgia, to include telegraph and telephone companies in the term "common carrier." This was passed in the House by a vote of 109 to 73, notwithstanding strong arguments presented against it by Messrs. Mann and

Townsend. A proposition to cut out the clause establishing a commerce court came within three votes of being adopted. In this and other votes the insurgents, aiming mainly to strengthen their positions politically at home, finding that they had nearly or quite enough strength to defeat any proposition not satisfactory to them, proceeded to demand whatever they wanted. On Friday Mr. Madden, of Illinois, proposed an amendment to require the Interstate Commerce Commission to make a physical valuation of all the railways in the country, and it was adopted in the house by a vote of 130 to 67. The Democrats voted for this solidly and it was supported by many regular Republicans. In the Senate the regulars held their ground, but a proposal of Senator Cummins to weaken the clause permitting railways to make traffic agreements with each other—which is only a reasonable modification of the anti-pooling and anti-trust laws—was rejected by the rather narrow vote of 35 to 29.

On Monday of this week, after a protracted conference, the leading regular Republican senators virtually admitted that the insurgents would have their way and eliminate from the bill all of the important sections above mentioned, and also that allowing a railway which owns more than half of another to acquire the rest of that other's stock. On Tuesday both the Senate and the House adopted, with little or no discussion, amendments which would cut out the section permitting traffic agreements, and in the Senate a motion by Senator Nelson to eliminate section 12, authorizing mergers, was adopted without debate. On the same day a proposition to make the long and short haul clause universal, eliminating that feature of it which permits a suspension where water competition exists, was adopted by a vote of 172 to 48.

The Accident Law.

The law to require monthly reports of all railway accidents, superseding the law now in force, which was passed in 1901, and authorizing the Interstate Commerce Commission to investigate accidents, has finally passed both houses of Congress. It goes into effect 60 days after it is signed by the President, which means about July 1 next. As finally agreed on in the conference committee, the law requires monthly reports (as at present), but these reports must embrace all accidents instead of being confined to train accidents and to casualties to passengers and employees. That is to say, accidents to wayfarers at highway crossings; to trespassers and others walking on the tracks, and in fact all classes of injuries to persons must, under the new law, be reported monthly and in detail. Heretofore those accidents which are not included in the monthly reports have appeared only in the tables of totals sent in by the railways with their anuual financial reports. In this way the total for the country has been made public many months later than the facts gathered in the monthly reports. Under the new law a serious injury to the roadbed, as, for example, by flood, must be reported, even though it does not cause a derailment. The railways are relieved from the duty of reporting the total number of accidents in their annual reports. The section giving authority to investigate includes "collisions, derailments or other accidents resulting in serious injury to person or to the property of a railroad." The commission, or its investigator, may subpœna witnesses and require the production of papers, etc., and shall be provided by the carriers with all reasonable facilities. Where a state commission investigates an accident the Interstate Commerce Commission shall, if convenient, make its own investigation at the same time in connection with the investigation by the state officers. The commission is to exercise its discretion as to making public its reports and findings concerning accidents. As in the present law, facts gathered by the commission shall not be admitted as evidence in any suit for damages, and the same applies to its findings or conclusions.

Negotiations Concerning Wages.

The Baltimore & Ohio has increased, by 6 per cent., the pay of all employees receiving $200 a month or less, except those classes with which agreements have recently been made. The increase applies to the pay rolls for the month of April.

The Atlantic Coast Line has made an increase of about 6 per cent. in the pay of agents, clerks and other employees on salaries who receive $125 a month or less.

The New York, New Haven & Hartford and the Boston & Maine have made an increase of about 7 per cent. in the pay of freight handlers in Boston and other cities.

The Boston & Maine has increased the pay of locomotive firemen.

The Gulf, Colorado & Santa Fe has made an increase of 6 per cent. in the pay of its employees not belonging to labor unions in the states of Louisiana, Texas and Oklahoma.

The Cincinnati, Hamilton & Dayton and the Chicago, Indianapolis & Louisville have agreed to make the same advances in pay that are recommended by Messrs. Clark and Morrissey for the New York Central Lines west of Buffalo. These rates have to do only with the wages of conductors and trainmen (brakemen).

The Kanawha & Michigan has agreed to pay its conductors, brakemen and yardmen the rates recently adopted on the Baltimore & Ohio.

The Central of Georgia has increased the pay of section foremen.

The Erie Railroad is negotiating with representatives of conductors and brakemen regarding wages.

The Delaware, Lackawanna & Western has offered to firemen an increase of 8½ per cent. in wages.

The Cincinnati, Hamilton & Dayton has increased the pay of switchmen.

A press despatch from Sedalia, Mo., May 2, says that the machinists in the shops of the Missouri Pacific at that place have struck for an increase of pay. They demanded an increase of from 36 cents an hour to 40 cents; the company offered 39 cents. About 125 members of the International Association of Machinists in the employ of the Baltimore & Ohio Southwestern went out on strike May 2.

Freight handlers in Chicago have rejected an offer of an increase of one cent an hour in their pay.

A Correction.

In the report of the discussion on the subject "Locomotive Headlights and Observation of Signals," which was printed in our issue of April 29th, page 1098, H. T. Bentley, assistant superintendent of motive power, Chicago & North Western, was quoted as referring to certain tests which were made by Prof. Chamberlain and Max Toltz two years ago as having been made for the Chicago & North Western. These tests were made at St. Paul under the direction of Messrs. Chamberlain and Toltz, and were for the Great Northern.

Southern Pacific Oil Lands.

One of the most prominent oil operators of California has stated to the writer that Southern Pacific has between 65,000 and 75,000 acres of proved oil lands, in addition to a great domain of unproved lands lying in the oil districts. It owns alternate sections for some 20 miles through the Midway field that promises to be one of the largest in the world, and also through the rich Kern field. At the present time the price of proved lands in California fields ranges from $1,000 to $4,000 an acre. Should the Southern Pacific sell its entire holdings in the oil fields, exclusive of those it controls through the Associated Oil Co., conservatively figured the aggregate windfall to the shareholders would be well above $100,000,000.

Allowing for the increase of the outstanding Southern Pacific stock to $335,000,000, to include $62,000,000 that would be issued at the instance of holders of approximately $80,000,000 bonds, convertible at 130, the above estimated proceeds would mean a special dividend of approximately $30 a share. At this rate Union Pacific's plum, as the holder of 1,266,000 shares of Southern Pacific, shown on the books as of March 4, 1910, would be over $37,000,000.

The public has had no conception of the magnitude of the equity inhering in Southern Pacific stock, by virtue of the oil properties which have been included in the company's annual reports only under the 14,000,000 acres of lands owned. Seeming indifference to this asset on the part of investors not unacquainted with its existence has been due chiefly, perhaps, to the general impression that the Southern Pacific

would retain these lands for fuel supply, and that any benefit to stockholders would accrue only gradually in the form of greater net earnings, through decreased operating expenses.

It may be noted now that the company's fuel oil supply is assured for a half century through its majority holding of the stock of the Associated Oil Co., which handles almost 40 per cent. of the output of California, and has under ground, on its own owned and leased lands an estimated minimum supply of over 600,000,000 barrels. At present the Harriman lines are consuming about 10,000,000 barrels per annum.—*Wall Street Journal.*

Higher Degrees at Massachusetts Institute of Technology.

The Massachusetts Institute of Technology will this year, for the first time, confer the degree of Doctor of Engineering in course. The institute has heretofore given a good many second degrees for advanced study in engineering, and a few degrees of Doctor of Philosophy to students who have pursued advanced study in chemistry and other more general sciences, but it has not heretofore conferred a doctor's degree on a student for extended advanced study of engineering. H. S. Osborne, who is carrying out work for the degree of Doctor of Engineering, in a recent lecture, gave the results of studies he has made of the effect of high voltages on insulating material. He has formulated theories of these effects which are in closer harmony with experimental facts than the theories usually stated. Professor Harold Pender will lecture to graduate students next year on the high voltage alternating transmission and utilization of power, and more attention will be given to the conditions arising from the utilization of the power. Professor Jackson will lecture to graduate students on the organization and administration of public service companies, and in addition to this year's subjects will take up the theory underlying methods of charging for service by public service companies.

Grand Trunk Exhibit at Brussels.

The Grand Trunk building and exhibit at the Brussels International Exposition includes not only a great variety of features in connection with the Grand Trunk, but deals exhaustively with the Grand Trunk Pacific. A magnificent collection of grains in the straw, grasses and other products of Western Canada are on view. The Mountain division is represented by handsome oil paintings of scenes in the Yellowhead Pass and on the Skeena river, British Columbia. There is a moving picture exhibit. This is in an annex to the main Grand Trunk building, and entertainments will be given daily of mining scenes in Cobalt, harvesting, threshing and other agricultural scenes in Western Canada, and the construction of the Grand Trunk Pacific Railway.

Railway Business Association on Proposed Federal Legislation.

Bulletin No. 2 of the Railway Business Association shows that from March 4, 1909, to April 19, 1910, no less than 11,682 bills, exclusive of pension bills, were introduced in Congress, and that of these 109 exclusively affected railways. The bulletin reviews various proposed enactments. One of the amendments to the administration bill referred to is that which provides that no carrier "shall charge any greater compensation as a through rate than an aggregate of the local rates." In reference to this the bulletin says:

"During the hearings a member of the House committee raised the question whether such prohibition would not deprive the Interstate Commerce Commission in certain classes of cases of the power to fix interstate rates by requiring that the rate should not exceed the sum of the rates fixed by two or more state commissions. We have found in the testimony no manifestation of a demand for federal legislation increasing the present indirect power of state commissions over interstate business."

Continuing the bulletin says:

"We urge members of Congress to be on their guard against the illusion that invisible and inaudible advocates people the air and must be propitiated. They may well challenge every amendment that knocks at the portals and demand to know who stands sponsor and on what grounds. In the case of the full crew bills, when the opposition evidence was all in a member of the committee exclaimed:

"'I am trying to find out the origin of this bill and why it was brought in here.'

"No witnesses whatever appeared in favor of it. We suggest this committeeman's question as a standing interrogatory:

"'What is the origin of this proposition? Why was it brought in here?'

"We hope nothing will be done in haste to be repented at leisure. Recently employers and employees have had leisure enough.

"A reduction of lawmaking to the correction of evils demonstrated, by remedial legislation carefully digested and precise in its terms, leaving naught to chance, creating no possibilities of endless litigation to ascertain its intent and meaning, is what this association is striving for. For lawmaking as a mere exercise of power, striking at an object wildly and in the dark, good in part, perhaps, bad in part, doubtless, full of vague phrases and seriously disturbing to the business interests of the country, there is no excuse and there should be none of it.

"We submit that Congress should refuse to enact any amendment in further regulation of railways which has not been thoroughly discussed before committees and its desirability and necessity demonstrated by an expression of widely entertained opinion and belief that it constitutes a remedy for an existent evil injurious to the public welfare. The mere ambition to insert during the period following public hearings some amendment possibly expressive only of somebody's personal view should be steadfastly resisted."

The bulletin contains a digest of railway bills pending in Congress and the action which has been taken in regard to them.

Storekeepers' Convention.

The Railway Storekeepers' Association will hold its convention at the Planter's Hotel, St. Louis, Mo., May 16-18. The following subjects will be discussed:

"By What Unit of Measure Is the Efficiency of a Storekeeper Properly Determined?" H. C. Pearce, G. S. K., Southern Pacific, San Francisco, Cal.; C. H. Drazy, S. K., C. B. & Q., Aurora, Ill.

"Economy in Mechanical Contrivances for Handling Material." J. F. Slaughter, S. K. M. K. & T., Denison, Tex.

"Economy of the Piece Work System in the Handling of Supplies." D. C. Curtis, piece work inspector, C. B. & Q., Chicago.

American Association of Refrigeration.

The first annual meeting will be held at the Hotel Astor, New York, May 9-10. This association is affiliated with the International Association of Refrigeration, which will hold its second international congress of refrigeration in Vienna, Austria, October 6-12, 1910. The Railroad Refrigerator Service Association of the United States has designated its secretary as an official delegate to attend the second international congress of refrigeration at Vienna.

American Society of Civil Engineers.

At the meeting held on May 4 a paper entitled, "The New York Tunnel Extension of the Pennsylvania Railroad: The Site of the Terminal Station," was presented by George C. Clark, M. Am. Soc. C. E. Another paper, entitled "The Water Supply of the El Paso & Southwestern Railway from Carrizozo to Santa Rosa, N. Mex.," was given by J. L. Campbell, M. Am. Soc. C. E.

Central Railway Club.

The next regular meeting will be held at the Hotel Iroquois, Buffalo, N. Y., on Friday, May 13. F. Darlington, electrical engineer, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., will present a paper entitled "Present Status and Tendencies of Railroad Electrification in America."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 7, 1910; Niagara Falls, Ont.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues.; N. Y.; May 31-June 3; Atlantic City.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.. 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City.; Third Friday in month; Kansas City.
RAILWAY ASSOCIATION OF SPECIAL AGENTS AND POLICE OF U. S. AND CANADA.—May 10-13; Los Angeles, Cal.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting October 11-13, Atlantic City.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

Edwin B. Grosvenor, acting for the attorney-general, has appealed to the Supreme Court of the United States from the decision of the lower court in the commodity clause case.

Governor Hadley, of Missouri, has sent out circular letters to members of the state legislature asking their opinions as to the advisability of a special session to pass a 2½ cent railway fare law.

An officer of the New York Central says that calculations preparatory to increasing local freight rates are now being made by that company and that new tariffs will be filed, probably to go into effect September 1, or soon thereafter.

The steamer lines between New York and New London, Providence, Fall River and New Bedford announce fares for this season about 25 cents higher than last summer. The through first-class fare between New York and Boston via Fall River, is $4.

The Pennsylvania is to restore the 15-cent differential in the freight rates on coal shipped to the Atlantic seaboard from the Georges Creek region, have secured from the Interstate Commerce Commission for this purpose a modification of the order which was issued some time ago.

The attorney-general of Ohio says that he has possession of the minutes of the Coal Traffic Association, composed of roads in that state, disclosing the action taken by the association to make its transportation rates different to different consignees where, presumably, the circumstances and conditions were not different.

The Erie & Western Transportation Company, operating the Anchor Line, the lake line of the Pennsylvania Railroad, has added a new passenger steamer to its fleet, the "Octorara." The "Octorara" is a sister ship of the "Tionesta" and "Juniata," but has many additional modern improvements. The Anchor Line fleet on the Great Lakes now consists of 14 steamers, with a combined capacity of 50,000 tons.

Temporarily—for a few nights only—the farmers' special train will have to take a back seat. "Fish Planting by a Railroad" is the latest. The Lehigh Valley is helping the fish commissioners of New York and Pennsylvania to stock the streams in these two states with fish. The Pennsylvania commissioner has already sent out 300 cans of trout fry for "planting" along the line of the road. Trained attendants accompany each consignment of fish to see that they are fed at regular intervals and planted scientifically. More than two dozen streams in Pennsylvania, tributary to the Lehigh and Susquehanna rivers, have been stocked with fish year after year.

The New York, New Haven & Hartford has completed revised passenger tariffs, to go into effect June 1, and has filed them with the Interstate Commerce Commission. In accordance with the newspaper announcements made some weeks since, large numbers of local single-ticket rates have been increased by five cents, a change which, evidently, is intended to maintain the rates still at the nominal basis of two cents a mile, while yet in every case giving the benefit of fractions—and a little more—to the company. The tariffs, however, announce other increases which will make a much greater disturbance: advances in the rates on season ticket fares to and from New York. For example, the monthly rate between New York and Mount Vernon, 14 miles, 60 rides, is advanced from $5.60 to $6.75; New York and Stamford, 33 miles, from $9 to $10.80; New York and New Haven, 74 miles, from $16 to $22. The lower of the two rates here given is not the lowest which has hitherto been in force, as the company has sold, also, monthly tickets of its older form, good only six days in a week, for about 10 per cent. less than these rates.

It is announced in Boston that the Boston & Albany proposes to make an advance of 12 per cent. in local passenger fares, which will put the rates on the main line back where they were about three years ago, when they were reduced from 2¼ cents a mile to 2 cents. Officers of the Boston & Maine say that increased rates for the Fitchburg division of that road have already been filed with the Interstate Commerce Commission. This division is parallel to the main line of the Boston & Albany.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$96,237	$33,243	$139,253	$16,752	$22,284	$4,158	$43,730	$5,271	$92,195	$47,058	.....	$4,350	$42,708	$21,264
Bangor & Aroostook	546	286,448	50,050	349,085	37,107	34,169	2,851	85,867	12,172	172,166	176,919	.....	1,500	175,419	37,215
Bessemer & Lake Erie	201	416,452	21,985	449,415	53,584	105,163	7,842	124,485	7,234	298,307	151,108	.....	6,000	145,108	114,651
Central New England	278	215,984	23,936	254,548	24,070	19,368	1,153	69,810	2,640	117,041	137,507	.....	11,500	126,007	34,046
Central R. R. of New Jersey	668	1,503,756	339,424	1,933,097	142,162	338,415	27,106	545,435	40,567	1,093,685	839,412	—$6,108	112,410	720,894	—231,610
Chicago & North Western	7,638	4,357,896	1,393,263	6,280,608	470,378	759,458	36,683	2,717,940	117,111	4,101,570	2,179,038	—8,382	290,000	1,880,656	191,185
Chicago, Cincinnati & Louisville	284	98,098	20,208	125,536	20,108	23,368	7,615	66,056	5,769	122,916	2,620	.....	3,410	—790	729
Chicago Great Western R.R.	1,486*	869,778	197,910	1,145,452	124,867	151,015	41,305	511,517	36,429	865,133	280,319	—393	29,043	250,883	.....
Chicago, Peoria & St. Louis	255	126,333	20,951	154,928	20,240	28,777	6,740	67,448	5,298	128,503	26,425	.....	4,500	21,925	9,946
Chicago, Rock Island & Gulf	529	166,150	57,564	237,882	53,108	22,471	8,983	90,474	8,595	183,631	54,251	—232	8,593	45,426	—36,277
Chic., St. Paul, Minneapolis & Omaha	1,739	950,334	325,294	1,366,660	154,161	125,546	21,661	490,243	30,882	822,493	544,167	—934	60,895	482,338	166,106
Colorado & Southern	1,248	719,175	101,258	859,901	124,216	150,615	12,435	289,382	24,520	601,168	258,733	—614	22,219	235,900	85,701
Colorado Midland	337	129,167	20,182	169,868	20,100	34,546	9,882	84,978	5,464	154,970	14,898	—920	8,625	5,353	423
Cumberland Valley	162	183,737	42,540	236,260	41,751	36,667	4,164	78,660	6,912	168,154	68,106	478	4,083	64,501	—5,956
Delaware, Lackawanna & Western	931†	2,046,141	518,580	2,741,983	190,431	444,171	52,944	802,024	55,988	1,545,558	1,196,425	10,915	118,650	1,088,690	—293,202
Detroit & Mackinac	369	96,652	24,591	126,636	15,225	20,212	1,861	35,608	2,850	75,756	50,880	—131	8,000	42,749	—7,483
Duluth, Missabe & Northern	293	110,291	37,398	152,868	69,749	79,435	1,214	65,449	10,126	225,973	—73,105	—807	6,207	—80,119	—12,300
El Paso & Southwestern Co.	901‡	539,331	89,763	660,216	82,763	85,019	7,590	184,140	25,299	384,811	275,405	—799	19,360	255,246	—42,081
Gulf & Ship Island	307	144,674	31,669	186,359	34,365	22,162	1,513	50,503	7,816	116,358	70,001	.....	5,263	64,738	20,864
Gulf, Colorado & Santa Fe	1,518	663,723	227,640	962,285	255,433	148,148	23,609	392,255	32,478	851,923	110,362	.....	35,758	74,604	—110,942
Hocking Valley	350	656,537	63,875	743,472	72,906	150,027	7,407	199,164	14,995	444,499	298,973	1,612	25,258	275,327	187,842
Kanawha & Michigan	175	223,523	24,251	252,167	42,114	62,660	1,766	60,249	3,770	170,559	81,608	2	6,997	74,613	51,629
Kansas City Southern	827	644,283	121,449	843,827	88,716	93,089	25,228	309,422	30,614	547,069	296,758	.....	29,064	267,694	3,733
Lehigh Valley	1,441	2,612,234	337,666	3,047,406	267,531	506,567	73,875	915,534	61,232	1,824,739	1,222,666	—21,626	94,600	1,106,440	120,276
Maine Central	932	532,767	199,509	774,733	72,575	116,695	6,274	270,974	21,623	488,141	286,592	1,486	35,993	252,086	26,175
Midland Valley	324	110,199	28,460	147,134	19,633	22,623	2,100	39,592	5,049	88,997	58,137	—1,071	6,000	51,066	54,272
Missouri & North Arkansas	365	51,052	20,564	76,718	23,525	11,801	1,829	27,940	3,304	68,399	8,319	.....	3,900	4,419	3,721
Missouri, Kansas & Texas	3,072	1,485,441	629,147	2,261,802	404,098	286,193	70,956	938,119	76,441	1,775,807	485,995	8,239	94,744	399,490	—90,995
New Orleans & North Eastern	196	247,477	48,869	318,167	27,554	43,891	11,166	95,409	12,068	188,088	130,079	.....	8,200	121,879	41,395
New Orleans Great Northern	275§	94,633	29,311	130,258	19,322	18,154	2,373	31,619	4,880	76,348	53,910	—92	1,250	52,568	38,277
New York, New Haven & Hartford	2,045	2,565,363	1,946,509	4,970,928	489,167	558,177	31,671	2,022,439	136,206	3,237,660	1,733,268	97,095	350,000	1,480,363	178,349
New York, Ontario & Western	546	596,238	102,057	720,600	71,694	113,115	13,772	275,967	16,696	491,244	229,356	—2,836	16,667	209,853	—17,905
Norfolk & Southern	602	201,183	48,664	260,503	31,347	35,552	3,544	68,580	12,937	151,960	108,543	—348	6,200	101,995	4,304
Pere Marquette	2,331	1,071,503	268,718	1,446,079	126,845	183,943	36,334	588,146	29,498	964,766	481,313	11,027	84,625	407,715	62,474
Southern Ry.	7,050	3,629,643	1,144,679	5,153,645	567,491	986,603	118,990	1,669,204	148,354	3,490,641	1,663,004	—3,490	178,311	1,481,203	175,294
Vicksburg, Shreveport & Pacific	171	73,927	33,452	116,380	23,538	20,986	4,185	37,927	4,688	91,324	25,057	.....	6,300	18,757	6,173
NINE MONTHS OF FISCAL YEAR, 1910.															
Alabama & Vicksburg	143	$825,660	$354,723	$1,269,636	$188,334	$197,573	$33,805	$389,218	$46,629	$855,559	$414,077	.....	$39,201	$374,876	$133,957
Bangor & Aroostook	546	1,665,223	489,859	2,266,027	332,980	256,915	25,685	623,124	95,559	1,334,263	931,764	.....	13,500	918,264	150,939
Bessemer & Lake Erie	201	5,292,101	250,485	5,620,943	540,900	955,040	66,029	1,388,256	90,150	3,040,375	2,580,568	.....	87,210	2,493,358	852,526
Central New England	278	1,847,054	254,947	2,219,415	357,436	194,866	14,138	659,700	28,411	1,254,551	964,864	.....	68,500	896,364	248,297
Central R. R. of New Jersey	668	13,199,525	3,342,988	17,485,052	1,459,089	2,834,385	258,867	4,767,722	362,773	9,682,836	7,802,216	$185,567	894,848	7,092,935	753,591
Chicago & North Western	7,638	37,341,218	13,917,844	55,734,553	7,931,607	7,058,160	973,832	22,196,296	941,029	39,100,924	16,633,629	—44,114	2,114,000	14,475,515	—1,613,793
Chicago, Cincinnati & Louisville	284	871,715	228,645	1,165,308	206,708	202,795	76,152	544,152	53,324	1,083,131	82,177	.....	30,660	51,517	85,064
Chicago Great Western R.R.	1,486*	5,059,498	1,457,182	7,025,971	789,003	835,261	287,708	3,090,370	239,524	5,241,866	1,784,105	—10,747	191,405	1,581,953	.....
Chicago, Peoria & St. Louis	255	1,101,022	232,661	1,393,553	196,457	273,216	59,280	545,854	46,703	1,121,510	272,043	.....	38,400	233,643	113,024
Chicago, Rock Island & Gulf	529	1,663,748	566,880	2,346,621	410,303	182,108	61,636	848,566	77,295	1,579,908	766,713	—2,242	57,002	707,470	103,192
Chic., St. Paul, Minneapolis & Omaha	1,739	7,319,678	3,302,521	11,416,173	1,390,324	1,292,960	212,690	4,237,933	253,348	7,387,255	4,028,918	—1,261	489,658	3,537,999	282,775
Colorado & Southern	1,248	5,800,869	1,233,242	7,401,574	956,291	1,181,777	123,937	2,355,617	194,263	4,811,885	2,589,689	—4,689	195,519	2,389,481	381,936
Colorado Midland	337	1,290,937	288,616	1,787,359	215,692	303,073	92,173	786,965	50,988	1,448,891	338,468	—3,928	84,085	250,455	—86,899
Cumberland Valley	162	1,609,538	454,657	2,158,453	290,934	228,863	38,699	648,998	54,681	1,262,175	896,278	4,780	36,753	864,305	58,228
Delaware, Lackawanna & Western	931†	19,786,596	5,201,761	26,616,110	2,199,661	3,634,719	477,905	7,251,927	509,595	14,073,807	12,542,303	218,482	1,160,050	11,600,735	797,078
Detroit & Mackinac	369	634,545	226,753	911,519	145,744	147,314	18,440	293,018	24,910	629,426	282,093	906	78,341	204,658	9,274
Duluth, Missabe & Northern	293	8,964,741	315,368	9,344,989	789,872	780,988	13,626	1,288,458	110,012	2,982,956	6,362,033	27,284	460,261	5,929,056	1,576,933
El Paso & Southwestern Co.	901‡	4,358,082	786,201	5,397,209	758,198	719,168	90,208	1,474,284	206,051	3,247,909	2,149,300	—7,870	181,891	1,959,539	—120,429
Gulf & Ship Island	307	1,195,736	318,233	1,612,257	306,834	260,082	12,099	469,664	66,615	1,115,294	496,963	.....	45,567	451,397	124,380
Gulf, Colorado & Santa Fe	1,518	6,415,150	2,264,634	9,273,478	1,924,040	1,401,317	216,270	3,497,860	276,028	7,315,515	1,957,963	.....	312,234	1,645,729	—1,115,038
Hocking Valley	350	4,940,720	663,776	5,792,220	713,101	1,055,555	67,575	1,605,850	109,835	3,551,916	2,240,304	81,702	195,746	2,126,260	780,521
Kanawha & Michigan	175	1,803,820	238,477	2,082,897	396,401	479,816	19,509	509,092	38,888	1,443,706	639,191	—210	62,176	576,805	292,793
Kansas City Southern	827	5,245,224	1,060,084	7,010,217	774,273	892,660	231,083	2,411,915	270,872	4,580,803	2,429,414	.....	239,972	2,189,442	—93,005
Lehigh Valley	1,441	22,275,469	3,217,186	26,428,555	2,716,968	4,379,827	663,975	7,880,374	533,706	16,174,850	10,253,705	—29,047	851,400	9,373,258	1,464,670
Maine Central	932	4,082,244	2,222,560	6,703,531	938,147	952,455	66,686	2,259,681	197,920	4,414,889	2,288,642	24,523	321,382	1,991,783	330,856
Midland Valley	324	760,050	248,438	1,061,005	166,584	197,079	17,374	294,748	43,330	719,115	341,890	3,903	70,000	275,793	259,581
Missouri & North Arkansas	365	385,095	188,883	614,625	185,900	84,312	14,086	222,772	24,920	531,990	82,635	.....	35,100	47,535	61,737
Missouri, Kansas & Texas	3,072	13,388,640	5,836,551	20,455,567	2,983,756	2,524,242	502,641	7,493,943	665,765	14,170,347	6,285,220	—10,226	820,606	5,454,388	458,671
New Orleans & North Eastern	196	1,911,055	465,448	2,576,411	254,256	394,624	80,671	856,295	95,694	1,681,540	894,871	.....	73,924	820,947	161,530
New Orleans Great Northern	275§	731,934	263,987	1,052,489	184,038	143,469	19,998	266,478	43,668	657,651	394,838	—733	9,450	384,655	381,783
New York, New Haven & Hartford	2,045	22,156,615	18,603,852	44,794,868	4,827,122	4,928,889	234,314	17,117,869	1,139,763	28,247,957	16,546,911	981,854	2,955,000	14,573,765	3,619,453
New York, Ontario & Western	546	4,802,859	1,242,795	6,302,524	800,145	977,332	104,128	2,371,415	150,230	4,403,250	1,899,274	—33,637	150,000	1,715,637	—70,642
Norfolk & Southern	602	1,319,488	512,110	1,970,006	221,110	248,540	34,778	595,799	126,554	1,226,781	743,225	2,166	54,300	691,091	137,929
Pere Marquette	2,331	8,310,370	2,841,373	12,020,887	1,458,589	1,559,317	305,745	4,780,589	267,429	8,371,669	3,649,218	22,269	501,959	3,169,528	567,603
Southern Ry.	7,050	28,885,730	11,114,494	43,335,525	5,067,164	7,380,480	1,036,369	14,193,696	1,296,261	28,973,970	14,361,555	8,332	1,496,313	12,873,574	1,406,352
Vicksburg, Shreveport & Pacific	171	644,902	355,891	1,087,086	196,047	194,001	30,947	319,295	39,882	780,172	306,914	.....	58,718	248,196	42,997

*Began operations on September 1, 1909. †Mileage operated on March 31, 1909, 893 miles. ‡Mileage operated on March 31, 1909, 867 miles. §Mileage operated on March 31, 1909, 91 miles. — Indicates Deficits, Losses and Decreases.

Extensive Advances in Freight Rates West of Chicago.

W. H. Hosmer, representing the principal railways west of Chicago, has filed tariffs at Washington showing substantial increases in a large number of important commodities to go into effect June 1. The tariffs thus far filed have to do only with commodity rates, but it is understood that more general advances will soon be announced. The territory covered is practically all that between Chicago and the Missouri river, including St. Paul and Minneapolis. Taking the tariffs from Mississippi river points to Missouri river points as typical, some of the changes, as given out at the office of the Interstate Commerce Commission, are as follows, in cents per 100 lbs.:

	Old rates.	New rates.
Beer	17 cts.	20 cts.
Enameled brick	12½ "	15 "
Cereal food products	20 "	22 "
Pig lead	6¼ "	8½ "
Hides	30 "	35 "
Steel pipe	13½ "	16 "
Scrap iron	10 "	12 "
Base bullion	12½ "	15 "
Wood pulp	12½ "	15 "

The Chicago, Milwaukee & St. Paul has notified the Interstate Commerce Commission of a general advance in freight rates of from 10 to 20 per cent. This information comes in a despatch from Washington and seems to be a forerunner of similar notices from other roads west of Chicago.

Forged Bills of Lading.

Following the failure of a large cotton buying firm in Alabama—Knight, Yancey & Co.—on April 21, press despatches were printed to the effect that forged bills of lading for shipments of cotton aggregating over $2,000,000 in value had been discovered at New York, Liverpool and other places to which cotton from the southern states had been shipped. These statements are in very general terms, no names, dates or detailed amounts being given; but there seems to be no doubt that large numbers of such papers have been uttered. It appears to be the settled opinion of some of the traffic officers of prominent railways in the southern states that railway companies' blanks have been used a great deal by shippers for the purpose of collecting payments for cotton before the cotton was actually shipped. It seems likely that this has been done by some parties who subsequently covered their tracks, so far as possible, by shipping the cotton called for by the spurious bills of lading, the genuine bills received from the railway for these shipments being then destroyed. In this way a forged bill might be accepted by a railway agent, and, the cotton appearing according to the terms of the bill, the forgery would never be discovered. A prominent cotton man, explaining to a reporter the way in which shipments are mixed at the compresses in the southern states, says:

"Let us say that an eastern firm buys 100 bales at Decatur, another 100 at Macon and a third 100 at Hogan. This cotton is shipped to Atlanta to the compress and local bills of lading are taken from each town to Atlanta. At Atlanta the 300 bales are graded, and, say, 10 bales are taken from Decatur's shipment and 10 from another and mixed. It is graded to suit the market to which it is to be shipped. It is rebaled. Now, the railways have a through rate from Decatur to Liverpool, let us say. So the firm takes the local bill of lading for 100 bales from Decatur and gets in exchange from the railway a through bill from Decatur to Liverpool for 100 bales, when, as a matter of fact, only 10 of the 100 Decatur bales have been used. When this is repeated indefinitely it can be seen what possibilities there are for fraud.

"Then again business here is done largely on credit, on the honesty of the shippers. A shipper gets blank bills of lading from a railway agent and coolly forges the agent's signature to them. Cotton is sold altogether on bills of lading. Hence the bills are negotiable paper in any cotton market. Let the shipper be a big one. Let him tell the agent that he has cotton to ship and requires five cars at once. It is possible that the cars are not available at once. So, to satisfy the shipper, the agent may prepare bills of lading for the cotton to be shipped, and it may never be shipped. But the bills may be negotiated at any cotton center."

INTERSTATE COMMERCE COMMISSION.

The commission has granted a petition for the reargument of the case of W. J. Jennison Co. et al. v. Great Northern et al., which case was decided March 15, and the order reducing the rate on flour from Minneapolis to New York from 23 cents to 21½ cents per 100 lbs. was made effective May 10. Pending the reargument the effective date of the order will be suspended.

Rates on Salt Unreasonable.

Delray Salt Co. v. Michigan Central et al. Opinion by Chairman Knapp.

Rate from Detroit, Mich., to Buffalo, N. Y., and New York City found unreasonable. (18 I. C. C., 268.)

Rate on Steam Shovel K. D. Reduced.

Vulcan Steam Shovel Co. v. Missouri Pacific et al. Opinion by Commissioner Clements.

The shipper who tenders a shipment which should move under one bill of lading cannot be required to pay higher charges because he yields to the demand of the carrier's agent to have two bills of lading made. In this case two bills of lading were issued on a steam shovel which started on its journey completely set up, but accompanied by a car to carry parts not attached, and later the shovel was taken apart and loaded on to the car. (18 I. C. C., 265.)

STATE COMMISSIONS.

The Illinois State Railway Commission has given notice that it will hold a hearing in Chicago on May 5, when the railways of the state will be required to show cause why the commission should not reduce its present schedule of maximum rates on coal. The railways recently advanced coal rates in Illinois, but left them substantially lower than the commission's own maximum schedule.

The Public Service Commission of New York, First district (New York City), has been enabled, by a law which has just been passed, to authorize the construction of moving platforms. This is understood to assure the construction of the moving platform under Thirty-fourth street, Manhattan, the privilege for which was applied for by the Continuous Transit Securities Co. some months since. (Dec. 10, 1909, p. 1155.)

The Texas Railway Commission on April 29 issued an emergency order, requiring the railways operating lines to the Gulf in Texas to continue to absorb loading charges at Texas ports on foreign and domestic traffic destined to interior points in Texas. Some time ago the railways issued tariffs announcing that they would discontinue the absorbing of port loading charges. The commission will give a hearing on May 10 to whether it shall issue an order requiring the permanent continuance of this practice or allowing its discontinuance and making such reductions in the carload rates from the ports as will off-set the discontinuance of the absorption of the loading charges.

Refund Ordered.

Somo River Lumber Co. v. Wisconsin & Northern; Minneapolis, St. Paul & Sault Ste. Marie, and Chicago, Milwaukee & St. Paul.

Complainant asks refund on shipment of lumber which took a rate equaling the sum of locals while a competing line had a lower rate in effect. Since the movement of the shipment the through rate has been put in effect. The application of the complainant is granted.

Osceola Mill & Elevator Co. v. Minneapolis, St. Paul & Sault Ste. Marie.

Petition alleges overcharges on certain shipments of rye and barley from various points in Wisconsin to Osceola, Wis. The rate contended for had been agreed on between the parties, but the respective tariff was not made effective until after the shipments had moved.

Held that the rates exacted were unusual and exorbitant under the circumstances.

New Richmond Roller Mills Co. v. Chicago, St. Paul, Minneapolis & Omaha.

In this case it is alleged that certain grain shipments stopped at Hudson for storage and cleaning were charged the sum of the local rates; that such charges are unreasonable and that the through rate with stoppage in transit privilege should have applied, for the reason that such rates were in effect prior to the shipments and were made effective subsequent to such shipments, and that Hudson is practically in the same situation as other points enjoying such rates.

The rate exacted was unusual and exorbitant and refund ordered.

Joint Rate Ordered.

City of Neenah v. Wisconsin Traction, Light, Heat & Power Co., Wisconsin Electric Railway.

This petition asks the commission to order the respondent street railways to establish joint rates within the city of Neenah. The power of the commission to establish such joint rate is denied by the respondent on the ground that there is no mechanical union of tracks, and that, therefore, respondents are not connecting carriers. By stipulation this question was submitted for determination in advance of the investigation into the merits of the case.

It is held that carriers may form connecting lines for the purpose of interchange of traffic although no mechanical union of tracks exists. The objection is overruled.

COURT NEWS.

The Supreme Court of the United States, in decisions issued this week, has sustained the anti-trust laws of Mississippi and Tennessee.

The United States circuit court at Guthrie, Okla., has temporarily enjoined officers of the state of Oklahoma from collecting from the Atchison, Topeka & Santa Fe and the Missouri, Kansas & Texas the state tax levied on them for 1908 and a portion of the local taxes. The railways allege that the state board of equalization reduced the assessment on all other property below its fair cash value but left the assessment of the railways at their fair cash value.

The Chicago & Alton has been indicted at Kansas City by a federal grand jury on a charge of having on April 2, 1908, sold thirty-three round-trip tickets from Kansas City to Chicago for $12.50, the second class rate, and allowed the passengers holding them the privileges of first class passengers in sleeping and parlor cars. It is also alleged that ten persons were sold second class tickets and allowed first class privileges on November 7, 1908, and that at later dates 16 other persons were sold second class tickets and given privileges to which under the law their tickets did not entitle them.

The Indiana Supreme Court has rendered a decision upholding the so-called Carmack section of the Interstate Commerce law. A man named Daniel J. Mitchell shipped a carload of apples from Dureith, Indiana, to Smyrna, Fla. He prepaid the freight to the C., C., C. & St. L., the initial carrier. The road gave him a bill of lading limiting its liability to damages occurring on its own line. The apples were delayed 19 days on the road and were practically a dead loss to Mitchell, and he sued the Big Four for the damages, which had taken place on connecting lines. The court held that a railway which accepts a shipment to be transported to another state on another line cannot defend an action in a state court by a bill of lading relieving it from liability beyond its own line. It said that a state court has a right to guarantee a citizen all his rights under a federal statute, and it is only when a federal statute is the foundation of the action that the federal courts have exclusive jurisdiction to construe it. If a shipper does not have an opportunity to consign his goods subject to the common law liability of the carrier, the carrier cannot set up a limited liability and compel the shipper to send his goods subject to it or not ship at all.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. I. Miller, until recently president of the Chicago & Eastern Illinois, has been appointed receiver of the Buffalo & Susquehanna.

Charles Jensch has been appointed general auditor of the Chicago, St. Paul, Minneapolis & Omaha, with office at St. Paul, Minn.

D. E. Schuckhart, auditor of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex., has resigned. D. W. McLeod, chief clerk in the auditor's office, has been appointed acting auditor.

B. P. Waggener, general attorney of the Missouri Pacific for northern, eastern and central Kansas and Nebraska, has been appointed general solicitor for Kansas, Nebraska and Colorado, with headquarters at Atchison, Kan.

A. L. Conrad, auditor of disbursements of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed assistant general auditor with office at Chicago. E. H. Bunnell, Mr. Conrad's chief clerk, has been appointed acting auditor of disbursements.

Marshall M. Kirkman, whose retirement from the position of vice-president of the Chicago & North Western has been announced in these columns, was born July 10, 1842, in Morgan county, New York. He began railway work in 1856 as messenger boy for the Chicago & North Western, and was with that company continuously until his resignation. In 1860 he was made train despatcher of the road, which at that time only extended from Chicago to Oshkosh, Wis. Later he dropped operating and train despatching to take charge of all freight accounts, and little by little all the accounts of the company were given into his charge. In 1870 the local finances of the company were also entrusted to him and the accounts and finances remained thus jointly in his charge from 1870 to the date of retirement. In 1889 he was appointed chairman of the committee of railway accounting officers to act with the Interstate Commerce Commission's representative in harmonizing railway accounts with the various departments of the government. He was also made a member of the committee of 25 on "corporate, fiscal and general accounts," which has practically secured uniformity of railway accounts. He was active in forming, and was made the first president of the Association of American Railway Accounting Officers, which has done much towards securing closer co-operation in the handling of interline traffic. As early as 1861 Mr. Kirkman commenced editing a railway manual for his own use, and more than ten years later the manuals that had been prepared were published in book form by the *Railroad Gazette*. In 1896 he issued the "Science of Railways" in 17 volumes, a work which is still on the market. Mr. Kirkman is also the author of several novels, the first being a story of Illinois, "The Romance of Gilbert Holmes." It is an historical novel, having among its characters Abraham Lincoln, Stephen A. Douglas and Blackhawk. His last publication, in 1909, was the "Alexandrian Novels," three romances under the titles, "Alexander the Prince," "Alexander the King" and "Alexander and Roxana."



M. M. Kirkman.

The books include historical notes giving a complete account of Alexander's life.

Operating Officers.

M. B. Bayer has been appointed supervisor of transportation of the Oregon & Washington, with office at Tacoma, Wash.

A. E. Campbell has been appointed trainmaster of the Musselshell division of the Chicago, Milwaukee & Puget Sound, with office at Miles City, Mont.

J. H. Fraser, general superintendent of the Detroit, Toledo & Ironton and the Ann Arbor at Toledo, Ohio, has resigned from his position with the latter road.

E. E. Betts, car service agent of the Chicago & North Western, has been appointed superintendent of transportation, with office at Chicago, the position of car service agent having been abolished.

George Masten, chief train despatcher of the Seaboard Air Line at Richmond, Va., has been appointed a trainmaster, succeeding A. Ramseur, resigned. R. C. Watkins succeeds Mr. Masten, with office at Richmond.

W. E. Watt, assistant trainmaster of the Grand Trunk at Richmond, Que., having resigned, that position has been abolished, and all reports previously made to the assistant trainmaster will in future be made to J. J. Connelly, trainmaster at Island Pond, Vt.

W. T. Stewart, purchasing agent and general superintendent of the Gulf & Ship Island, has been appointed superintendent. Mr. Stewart will be in charge of the operating and purchasing departments, reporting to the first vice-president, his former position having been abolished.

Winslow T. Perkins, superintendent of the Eastern division of the Boston & Maine, at Boston, Mass., having resigned, the jurisdiction of William Merritt, superintendent of the Western division, at Boston, has been extended over the Eastern division, which will be combined with the Western division.

C. B. Gorsuch, trainmaster of the Pittsburgh division of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed superintendent of the Wheeling division, with office at Wheeling, W. Va., succeeding O. Rickert, resigned. M. H. Cahill, division operator of the New Castle division, succeeds Mr. Gorsuch, with office at Pittsburgh.

Robert Finney, general superintendent of the Pittsburgh system of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed general agent at Pittsburgh, and W. C. Loree, general superintendent of the Wheeling system, has been transferred to the Pittsburgh system. U. B. Williams, superintendent of the Monongah division, at Grafton, W. Va., succeeds Mr. Loree. H. R. Laughlin, trainmaster at Grafton, succeeds Mr. Williams.

The operating department of the Chesapeake & Ohio having been reorganized, the following changes have been made: C. E. Doyle, vice-president and general manager, has been appointed vice-president, in charge of operation; E. W. Grice, general superintendent, West Virginia general division, at Hinton, W. Va., has been appointed general manager; E. P. Goodwin, general superintendent, Kentucky general division, at Covington, Ky., succeeds Mr. Grice, and J. P. Stevens, superintendent of the Cincinnati division, at Covington, succeeds Mr. Goodwin. C. C. Walker, superintendent of transportation, at Richmond, Va., has been appointed general superintendent of transportation.

John J. Driscoll, whose appointment as superintendent of the Cumberland division of the Baltimore & Ohio, with office at Cumberland, Md., has been announced in these columns, was born in 1866 and entered the service of the Baltimore & Ohio as a telegraph operator in March, 1882, at Pittsburgh, Pa. In August, 1886, he was made train despatcher, and was promoted to night chief despatcher in June, 1896. The following August he was transferred to the Connellsville division as chief train despatcher and division operator. He was promoted to assistant trainmaster at Rockwood, Pa., February 1, 1902, and in June of the following year was made trainmaster of the Connellsville division. He was appointed superintendent of the Connellsville division in December, 1906, which position he held at the time of his recent appointment as superintendent of the Cumberland division.

Thomas J. Foley, assistant to the vice-president and general manager of the Illinois Central, has been appointed assistant general manager, with office in Chicago. Mr. Foley was born on August 26, 1866, at Convoy, Ohio, and began railway work as a telegraph operator on the Pennsylvania Lines West, December 20, 1878. He served the Pennsylvania in various positions, resigning as transportation inspector in 1901 to become assistant to the general manager of the Baltimore & Ohio. He served as superintendent of the Chicago division and general superintendent of the Wheeling system of the Baltimore & Ohio, resigning the latter position in 1905 to become chief despatcher of the Union Pacific. In 1907 he was appointed superintendent of the Omaha terminals of that company, which position he resigned March 15, 1910, to become assistant to vice-president of the Illinois Central.

John M. Daly, whose appointment as general superintendent of transportation of the Illinois Central, with office at Chicago, has been announced in these columns, was born June 18, 1863, at Peoria, Ill. He began railway work as a clerk on the Toledo, Peoria & Western on April 1, 1877, and later held similar positions with the Wabash and the Chicago & North Western. In 1885 he was appointed car accountant of the Chicago Great Western at St. Paul, Minn., and in 1888 he became assistant general superintendent of that company. He resigned that position to become car accountant of the New York, Chicago & St. Louis at Cleveland, Ohio. In 1889 he became superintendent of transportation of the Illinois Central and later served in the same position with the Delaware, Lackawanna & Western. In 1901 he was appointed inspector of transportation on the government railways of Canada and in 1902 he again became superintendent of transportation of the Illinois Central, with office at Chicago. In 1906 he was appointed car accountant, which position he held until his recent appointment as general superintendent of transportation.



John M. Daly.

Traffic Officers.

C. L. Hogan, commercial agent of the Chicago Great Western at Kansas City, Mo., has resigned to go into other business.

Oscar L. Hill has been appointed passenger traffic agent of the Illinois Traction Company, with office at Springfield, Ill.

Alex. C. Johnson has been appointed passenger traffic manager of the Chicago & North Western, vice Warren B. Kniskern, resigned.

James S. Etchberger, traveling passenger agent of the Seaboard Air Line at Columbia, S. C., has been transferred to Savannah, Ga.

H. E. Thatcher, general agent of the Hocking Valley at Cincinnati, Ohio, has been appointed general agent at Toledo, Ohio, succeeding J. F. Youse, resigned.

E. B. Butterworth has been appointed traveling freight agent of the Cincinnati, Hamilton & Dayton, reporting to the division freight agent at Toledo, Ohio.

The title of F. M. Whitaker, vice-president and traffic manager of the Chesapeake & Ohio, at Cincinnati, Ohio, has been changed to vice-president in charge of traffic.

J. F. Beyer has been appointed a traveling passenger agent of the Illinois Central, with office at Dubuque, Iowa, succeeding J. F. Jackson, resigned, to go to another company.

John V. McCarty, soliciting freight agent of the Nashville, Chattanooga & St. Louis at St. Louis, Mo., has been appointed

a commercial agent, with office at St. Louis, succeeding W. C. Bates, resigned.

C. H. Ogilvie, commercial freight agent of the Missouri Pacific-Iron Mountain system, at Cairo, Ill., has been appointed soliciting freight agent at Dallas, Tex., succeeding T. V. Murray, Jr., resigned, as previously announced in these columns.

J. H. Burgis, city passenger and ticket agent of the Grand Trunk at Chicago, has been appointed general agent, passenger department, in charge of the states of Washington, Oregon and Idaho, of the Grand Trunk, the Grand Trunk Pacific, and the Grand Trunk steamship lines, with office at Seattle, Wash.

Oscar A. Constans, who has been appointed western freight traffic manager of the Baltimore & Ohio, in general charge of freight traffic of the lines west of the Ohio river, and of the Baltimore & Ohio Chicago Terminal Co., with office at Chicago, was born at Columbus, Ohio, on November 23, 1862. Mr. Constans was educated in the grammar and high schools of Columbus, and began railway work in the freight office of the Baltimore & Ohio at Columbus in 1883, since which time he has been in continuous service with that company. In May, 1884, he was made secretary to C. S. Wright, then assistant general freight agent, and on May 15, 1891, was promoted to chief clerk of the freight department at Pittsburgh. About four years later he was made division freight agent at the same place. He was transferred in May, 1897, to Columbus, as division freight agent, and on June 1, 1902, was appointed division freight agent at Cleveland. Mr. Constans was appointed general freight agent at Pittsburgh on February 1, 1907, which position he held at the time of his recent appointment.



O. A. Constans.

J. B. Parker, eastern traffic agent of the Central of Georgia at New York, has been appointed assistant general freight agent, with office at Savannah, Ga. W. C. Bates succeeds Mr. Parker, with office at New York. O. C. Pope has been appointed a soliciting agent, with office at Birmingham, Ala., succeeding C. E. Henson, resigned.

B. H. Coyle, commercial agent of the Wabash Railroad at St. Louis, Mo., has been appointed general agent of the freight department, with office at St. Louis. J. B. Hayes, commercial agent at Alton, Ill., has been appointed commercial agent at East St. Louis, in charge of freight and passenger business from Poag, Ill., to East St. Louis and Belleville.

Engineering and Rolling Stock Officers.

F. M. Corbett, trainmaster of the Chicago & Alton at Springfield, Ill., has been appointed roadmaster.

W. H. Gardner, Jr., superintendent of roadway of the Gulf & Ship Island, has been appointed chief engineer, his former position having been abolished.

J. J. Connors, district master mechanic of the Chicago, Milwaukee & St. Paul at Dubuque, Iowa, has been appointed assistant superintendent of motive power for the lines west of the Mississippi river.

The title of F. J. Stimson, engineer maintenance of way of the Grand Rapids & Indiana, at Grand Rapids, Mich., and of C. L. Barnaby, engineer maintenance of way at Fort Wayne, Ind., has been changed to division engineer.

A. J. Isaacks, master mechanic of the Chicago Great Western at Clarion, Iowa, has been appointed master mechanic of the southern division with headquarters at Des Moines, Ia., succeeding T. H. Yorke, resigned. J. W. Johnson, locomotive foreman at Oelwein, Ia., succeeds Mr. Isaacks.

The engineering department of the Chesapeake & Ohio having been reorganized the following changes have been made: F. I. Cabell, engineer maintenance of way at Richmond, Va., has been appointed chief engineer maintenance of way; F. B. Isaacs, division engineer at Richmond, has been appointed engineer maintenance of way of the Virginia general division; C. W. Johns, assistant engineer maintenance of way at Hinton, W. Va., has been appointed engineer maintenance of way of the West Virginia general division, and L. B. Allen, division engineer at Ashland, Ky., has been appointed engineer maintenance of way of the Kentucky general division.

John T. Wilson, assistant engineer of the Baltimore & Ohio at Baltimore, Md., has been appointed district engineer, with jurisdiction over the territory between Philadelphia, Pa., and the Ohio river at Parkersburg, W. Va., and Wheeling, with office at Baltimore. R. N. Begien, division engineer maintenance of way of the Philadelphia division at Philadelphia, has been appointed assistant to the chief engineer, with office at Baltimore, and E. T. Brown, division engineer maintenance of way of the Shenandoah division at Winchester, Va., succeeds Mr. Begien, with office at Philadelphia. G. T. Warren, assistant division engineer at Cumberland, Md., succeeds, Mr. Brown, with office at Winchester.

Leigh G. Curtis, whose appointment as engineer maintenance of way of the Northwest system of the Baltimore & Ohio and Baltimore & Ohio Chicago Terminal, with office at Chicago, has been announced in these columns, was born at Hamilton, Ohio, on November 28, 1864. Mr. Curtis graduated from the Ohio State University as civil engineer in 1899 and began railway work with the Baltimore & Ohio as civil engineer at Zanesville, Ohio, the same year. In 1900 he was made assistant engineer of the Wheeling & Lake Erie at Cleveland, Ohio, returning to the Baltimore & Ohio in 1901 as assistant engineer at Zanesville. He was then for one year assistant division engineer at Garrett, Ind., and in 1903 became division enginer maintenance of way at Chicago, from which position he has just been promoted.

The motive power department of the Chesapeake & Ohio having been reorganized the following changes have been made: J. F. Walsh, superintendent motive power at Richmond, Va., has been appointed general superintendent of motive power; J. R. Gould, master mechanic at Richmond, has been appointed superintendent of motive power of the Virginia general division; C. H. Terrell, master mechanic at Huntington, W. Va., has been appointed superintendent of motive power of the West Virginia general division, and W. T. Smith, master mechanic at Covington, Ky., has been appointed superintendent of motive power of the Kentucky general division. W. P. Hobson, master mechanic of the Ashland division at Lexington, Ky., has been appointed master mechanic of the Cincinnati division, succeeding W. T. Smith, and E. A. Murray, foreman machine department at Covington, succeeds Mr. Hobson.

D. J. Brumley, whose appointment as engineer of construction of the Illinois Central was announced in our issue of April 29, page 1118, was born on March 19, 1865, near Leipsic, Ohio. He graduated in civil engineering from the Ohio State University in June, 1895, and at once entered railway work as assistant section foreman on the Louisville & Nashville. He soon became assistant engineer of the Columbus & Hocking Coal & Iron Co., and after a short time returned to the Louisville & Nashville as assistant supervisor. He held a number of positions in the engineering department of this road, being appointed assistant engineer of the Louisville and Cumberland divisions in 1899. In 1901 he served for a short time as roadmaster on the Mexican Central, but again returned to the Louisville & Nashville, becoming roadmaster of the Main Stem, first division. He was appointed in 1904 division engineer of the Indianapolis Southern and in 1905 principal assistant enginer of the Indianapolis Southern, the Illinois Central and the Yazoo & Mississippi Valley, which position he held until his recent appointment as engineer of construction of these lines.

Purchasing Officers.

J. H. Waterman, storekeeper of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed superintendent of timber preservation, with offices at Galesburg, Ill., succeeding F. J. Angier, resigned. J. H. Ellis succeeds Mr. Waterman.

G. L. Pollock, purchasing and supply agent of the Wheeling & Lake Erie at Cleveland, Ohio, has been appointed purchasing agent of the Chicago & Western Indiana and the Belt Railway of Chicago, in charge of the purchasing and supply departments, with office at Chicago, effective May 9, succeeding C. C. Nash, assigned to other duties. Mr. Pollock was born December 8, 1874, at Burlington, Ia. From May 9, 1892, to November 1, 1904, he was in the purchasing department of the Chicago, Burlington & Quincy, and after a short period of service with a manufacturing company was made chief clerk of the purchasing department of the Wabash. He resigned that position on May 1, 1906, to become purchasing agent of the Wheeling & Lake Erie, and on Feb. 1, 1909, his jurisdiction was extended over the supply department of that company. J. F. Marshall, general storekeeper of the Wheeling & Lake Erie at Canton, Ohio, succeeds Mr. Pollock.

OBITUARY.

Isaac Bond, for many years a master mechanic on the Erie Railroad, died recently at his home in Hornell, N. Y., at the age of 70 years.

G. B. Reeve, former vice-president and general manager of the Grand Trunk Railway of Canada, died at his home at La Mirada, in southern California, on May 1. Mr. Reeve was born October 23, 1840, in the county of Surrey, England, and began railway work in 1860 as a freight clerk on the Grand Trunk. About two years later he was made a telegraph operator and the following year he was appointed train despatcher. He was later agent and then assistant general freight agent, and in 1881 he was appointed traffic manager of the company's western line (the Chicago & Grand Trunk). This office he held for 15 years, and in the last six years of the period he was also traffic manager of the Chicago, Saginaw & Mackinaw. In 1896 he was appointed general traffic manager of the Grand Trunk system, and in December, 1900, was made second vice-president and general manager.

General Edward P. Alexander, former president of the Central Railroad & Banking Co. of Georgia, died at Savannah, Ga., on April 28. General Alexander was born May 26, 1835, in Wilkes county, Ga., and was educated at the United States Military Academy at West Point, N. Y. He began railway work in May, 1871, as superintendent of the Charlotte, Columbus & Augusta, now a part of the Southern Railway. He held this office for a year, and then for three years was president of the Savannah & Memphis, now a part of the Central of Georgia. From May, 1875, to July, 1878, he was president of the Western Railway of Alabama, and then for two years was president of the Georgia Railroad & Banking Co. For one year (1880) he was vice-president of the same company, and from May, 1880, to July, 1882, he was also vice-president of the Louisville & Nashville. In 1882 for a short time he was president of the Central Railroad & Banking Co. of Georgia, and was again chosen president of that company in January, 1887, holding the office until March, 1892. From November, 1887, to April, 1892, he was also president of the Port Royal & Augusta and the Port Royal & Western Carolina railways, now the Charleston & Western Carolina. At the outbreak of the war in 1861 he resigned as second lieutenant in the United States Engineer Corps and entered the Confederate army. He served through the war, becoming brigadier general and chief of artillery. At Gettysburg he directed Lee's artillery. From 1866 to 1870 he was professor of mathematics and engineering at the University of South Carolina. In 1887 he wrote a book, "Railway Practice," published by Putnams, dealing briefly with the economic questions then before Congress and the public. General Alexander was a daring and brave soldier, an upright, honest and high minded trustee of others' property, and a public spirited citizen in the best sense of the term. In private life he won innumerable friends by his amiable and sincere character, and those who were his associates in the railway world speak of him in the highest terms.

Railway Construction.

New Incorporations, Surveys, Etc.

ATLANTA, BIRMINGHAM & ATLANTIC.—According to press reports, this company will have the extension from Bessemer, Ala., northeast to Birmingham, 10 miles, finished soon, and the company will be operating trains over its own line into Birmingham, about May 20. (Dec. 3, p. 1106.)

BOSTON & ALBANY.—This company is planning to carry out improvements during 1910 to cost $1,971,700. The work includes a new station and eliminating the grade crossings in Worcester, Mass., to cost $400,000. A large amount of money is to be spent enlarging the freight yards at East Cambridge, Mass.; Natick, South Bramingham and at Westfield. There will also be a large amount of bridge renewal work, the construction of a third track between Greenbush and Rensselaer and an addditional two-track tunnel at State Line.

CANADIAN PACIFIC.—Construction work will probably be carried out this year on the line which has been located from Merritt, B. C., to Penticon, about 75 miles, in the southern end of the Okanagan valley.

CHICAGO, MILWAUKEE & PUGET SOUND.—This company has bought property in Spokane, Wash., for a terminal, at a cost of $2,000,000, and will build a 25-mile branch from the main line north to Spokane, at a cost of about $500,000. A large number of additional branch lines are also to be built. The Chicago, Milwaukee & St. Paul will carry out a large amount of double-tracking and enlargements of yards and terminal facilities and will also make other improvements.

According to press reports, this company is buying land for right-of-way along North river, Wash., which indicates that a branch will be built from the Grays Harbor & Puget Sound, at Cosmopolis, south to Willapa bay, and thence to Portland, Ore.

CHICAGO, MILWAUKEE & ST. PAUL.—See Chicago, Milwaukee & Puget Sound.

CHICAGO, ROCK ISLAND & GULF.—According to press reports, the cut-off built under the name of the Tucumcari & Memphis, from Amarillo, Tex., west to Tucumcari, N. Mex., 110 miles, will be opened for traffic soon. (Nov. 26, p. 1036.)

DAUPHIN ISLAND RAILWAY & HARBOR CO.—Organized in Alabama to carry out dredging work in lower Mobile bay and Dauphin bay, and provide a coaling station at that point. The company also intends to build a railway from the island to the mainland at Cedar Point, which will eventually be extended north to Mobile, or connect with an existing road at a point south of Mobile. George T. Bishop, president and treasurer, Cleveland, Ohio.

DAWSON LUMBER CO. ROAD.—According to press reports from Libby, Mont., a logging line is now in operation from Libby for eight miles, and plans are being made to build a six-mile extension to the mines south of Libby.

DELAWARE, LACKAWANNA & WESTERN.—An officer writes that a contract has been given to Timothy Burke, Scranton, Pa., for change of alinement on the section between Analominck, Pa., and Henryville. The work involves the excavation of about 198,500 cu. yds. of earth and 54,000 cu. yds. of rock, as well as the construction of 20,500 cu. yds. of concrete masonry.

DENVER, KINGFISHER & GULF.—The Chamber of Commerce of Oklahoma City, Okla., has given this company a bonus of $100,000 and work is to be started within 30 days on the line. The projected route is from Oklahoma City northwest to Denver, Colo. Shops and terminals are to be built at Oklahoma City. W. M. Bonson, Dubuque, Iowa, and C. G. Jones, Oklahoma City, are said to be interested.

DENVER, LARAMIE & NORTHWESTERN.—Track laying is now in progress on the extension under construction north via Greeley, Colo. It is expected to have the section completed and in operation to Greeley by May 15. (April 8, p. 970.)

ELIZABETHTOWN TERMINAL.—An officer writes that the proposed route is from Westport, N. Y., on the Delaware & Hudson, west to Elizabethtown, in Essex county, eight miles. The company will build two frame combination freight and pas-

seiger stations, one combined roundhouse and machine shop, and some smaller structures. V. R. Coon, general manager, Elizabethtown. (Nov. 19, p. 989.)

Elkton, Fairhill & Oxford Railway & Power Co.—Incorporated in Maryland, with $50,000 capital, to build an electric line from Elkton, Md., north via Cherry Hill, Fairhill and Lewisville, Pa., to Oxford, about 16 miles. H. Hess, Elkton, may be addressed.

Gainesville, Oklahoma & Western.—Construction contracts are to be let this month, it is said. Preliminary surveys have been made from Gainesville, Tex., southwest to Bridgeport, 54 miles. J. Whaley, president; F. B. Truax, chief engineer, Gainesville. (April 1, p. 972.)

Gulf, Colorado & Santa Fe.—A contract is said have been given to W. F. Barbour & Sons for building a four-mile section east from Brady, Tex., on the extension from Lometa west to Brady. (Feb. 25, p. 429.)

A contract is said to have been given to the A. M. Moore Construction Co., Kansas City, Mo., for building the branch from San Angelo, Tex., northwest to Sterling City, about 50 miles. (See Atchison, Topeka & Santa Fe, Feb. 25, p. 428.)

Houston & Bay Shore Traction.—Under this name an electric line is to be built from Houston, Tex., east to La Porte, about 25 miles. The company expects to secure a charter in the near future and begin work in about 60 days. The principal promoter is A. F. Irvin, Detroit, Mich.

Kansas City Union Traction.—An officer writes that surveys have just been made and maps and profiles are being prepared for a line from Parsons, Kan., south via Altamont to Edna, thence west via Valeda to Coffeyville, about 40 miles. The work will include one steel bridge. A power house and a car barn are to be built at Altamont. Barney McDaniel, secretary; Archer, Rollins & Co. are the consulting engineers, Kansas City, Mo.

Kansas, Lawton & Gulf.—According to press reports, work has been started at Walter, in Comanche county, Okla. The company was organized to build from a point in Comanche county north via Oklahoma City to the Kansas state line. Plans made to also build a line from Comanche county south to Wichita Falls, Tex. The office of the company is at Walter. Dr. A. W. Green, president; J. M. Bellamy, vice-president, Lawton. (Feb. 18, p. 379.)

Lake Shore & Michigan Southern.—An officer writes that the only double-tracking work now being carried out is on the old Oil City branch between Sandy lake, Pa., and Polk junction, nine miles.

Lehigh Valley Transit.—See Philadelphia & Western.

Louisiana-Texas Roads.—According to press reports, J. C. Whitney, Carthage, Tex., associated with the Commercial Club of that place, is back of a project to build a line from Shreveport, La., west to Longview, Tex., thence southwest via Henderson, Jacksonville, Fairfield and Mexia to Waco, about 240 miles.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes that a grading contract has been given to Foley, Welch & Stewart for work on the cut-off from New Richmond, Wis., west to Withrow, Minn., 17 miles. Contract for the bridge over the St. Croix river has not yet been let. According to press reports, bids for building the bridge are wanted May 7, and about May 15 contracts will be let for 4,500 tons of structural steel for the bridge, which is to be 2,680 ft. long, 185 ft. above the river, and will cost about $600,000. (April 29, p. 1114.)

Montreal, Kapatchewan & Rupert Bay.—Organized to build from Montreal, Que., northwest to the main line of the Grand Trunk Pacific, about 194 miles. Surveys are being made. The line will traverse the counties of Maisonneuve, Jacques, Cartier, Laval, Two Mountains, Argenteuil, Labelle, Wright and Pontiac. H. Gervais, T. Berthiaume and other residents of Montreal are interested in the project.

Muskogee Transit Co.—According to press reports from Guthrie, Okla., a charter has been granted this company, with $100,000 capital. The plans call for building about 225 miles of electric interurban lines through the counties of Muskogee, Wagoner, Tulsa, Creek, Okmulgee, McIntosh, Sequoyah and Cherokee in Oklahoma. The incorporators include: E. W. Mangson, O. J. Barwick, St. Louis; T. Bixby, T. P. Smith, Muskogee, and O. D. Revell, Asheville, N. C.

North Jersey Rapid Transit Co.—This company has filed an amendment to its charter, increasing the capital stock from $1,000,000 to $2,000,000, and has filed a map showing the surveyed route for the line. Work is now under way from Paterson, N. J., via Glen Rock and Ridgewood to Hohokus, and the line will eventually be extended to Allendale and Suffern, N. Y., about 15 miles. Wm. Barbour, president, Paterson.

Northwestern Railroad.—See Oregon Short Line.

Oregon Short Line.—According to press reports, work is to be started soon on an extension of the Northwestern Railroad, building from Huntington, Ore., north along the Oregon-Idaho state line, following the Snake river to Lewiston, Idaho. The line is already finished as far as Homestead, Ore., and this section is to be turned over to the operating department in a short time. (March 11, p. 547.)

Oregon Trunk Line.—According to press reports, a contract has been given to H. C. Henry, Seattle, Wash., to build from Madras, Ore., south to the northern boundary of the Klamath Indian reservation, 125 miles. (April 29, p. 1114.)

Philadelphia & Western.—A syndicate, represented by Edward B. Smith & Co., is said to have secured control of the property and rights of this company, operating a 11.5-mile line from Philadelphia, Pa., west to Strafford. Plans are said to be made for building a connecting line from a point on the P. & W. near Bryn Mawr, Pa., north via Conshohocken and Norristown to the Lehigh Valley Transit Co.'s line near North Wales, about 20 miles. The work will include putting up a bridge over the Schuylkill river near Conshohocken. The cost of the new line will be about $2,000,000.

Quanah, Acme & Pacific.—An officer is quoted as saying that surveys are being made for an extension from Paducah, Tex., southwest to El Paso, about 550 miles. Of this 125 miles will be through New Mexico. Application has been made for authority to register $388,000 of bonds for the completed line from Quanah south to Paducah, 38 miles. (March 25, p. 850.)

Quanah, Seymour, Dublin & Rockport.—An incorporator writes that the prospects of building this line are good. It is expected that grading contracts will be let soon. The projected route is from Quanah, Tex., southeast via Seymour, Dublin, Austin, Lockhart, Gonzales and Victoria to Rockport, on the gulf coast, about 500 miles. L. E. Walker, president, box 317, Austin, Tex. (April 22, p. 1066.)

Red River Valley & Texas.—Contracts for grading have been let for work on the section from Loveland, Okla., west through Carter and Stephens counties. The projected route is from Ardmore, west to Childress, Tex., about 200 miles. F. L. Mercer, president and general manager, and G. Kenfaver, chief engineer, Davidson, Okla. (March 18, p. 751.)

St. Louis, Iron Mountain & Southern.—Double-tracking work, to cost $770,000, is to be carried out by this company, it is said, on the Arkansas division, from a point north of Little Rock, Ark., just south of Jacksonville northeast to Bald Knob, 47 miles. An additional track will be laid from the White river bridge just south of Newport, north to Diaz, 4.7 miles. Grading contracts said to be let to the Walsh Construction Co., Davenport, Iowa, and to Ball & Peters, Little Rock. Contracts for trestle bridges said to be let to Burke & Joseph, Cape Girardeau, Mo.

Springfield, Nixa & Southern Interurban Railway & Power Co.—Surveys are said to be made for a line from Springfield, Mo., south to the James river, about 19 miles. J Owan, president; W. H. Schreiber, chief engineer, Springfield.

Toledo & Ohio Central.—Surveys are said to be made for a three-mile cut-off to be built at Kenton, Ohio. Contracts for the work are to be let as soon as the plans are completed

Tucumcari & Memphis.—See Chicago, Rock Island & Gulf.

Railway Financial News.

Algoma Central & Hudson Bay.—The affairs of this company, which is in the hands of a receiver, are to be reorganized under the plan of the Lake Superior Corporation. The $3,000,000 first collateral trust mortgage bonds of the Lake Superior Corporation secured on A. C. & H. B. collateral will be cancelled and the railway company will be recapitalized as follows: 50-year 5 per cent. first mortgage bonds, $6,750,000; 5 per cent. non-cumulative preferred stock, $5,000,000; common stock, $5,000,000. In consideration for a guarantee of principal and interest of the railway company bonds the Lake Superior Corporation will receive the $5,000,000 common stock and will hold $1,125,000 of the preferred stock for the benefit of the railway.

Ann Arbor.—The company has made a trust agreement securing $660,000 equipment bonds, series A, November 1, 1909, due $33,000 semi-annually beginning May 1, 1910, on 500 steel gondola cars and 300 steel underframe box cars which were ordered from the Standard Steel Car Co., deliverable between October 1, 1909, and February 1, 1910. Of the total cost of the cars, $166,888 was paid in cash.

Buffalo & Susquehanna.—Through the application of the United States Trust Co., New York, in an action to foreclose the 4½ per cent. first mortgage bonds of the Buffalo & Susquehanna, H. I. Miller, former president of the Chicago & Eastern Illinois, has been appointed receiver of the Buffalo & Susquehanna. There have been authorized $100,000 receiver's certificates.

Central of New Jersey.—Stockholders have approved the guarantee by the Central of New Jersey of the principal and interest of $20,000,000 consolidated 4 per cent. bonds of the Lehigh & Wilkesbarre Coal Co., to be dated June 1, 1910. All but $315,000 of the new bonds will be issued to refund outstanding bonds, and this refunding will effect an annual saving in interest charges of $135,995.

Chesapeake & Ohio.—See Hocking Valley.

Cleveland, Cincinnati, Chicago & St. Louis.—M. E. Ingalls, chairman of the board of directors, is to resign at the next meeting of the board. He is to retain his interest in the road but is forced through ill health to resign his position as chairman.

Delaware & Hudson.—Stockholders are to vote May 10 on the question of amending the sinking fund ordinance so as to permit the sinking fund to be used to pay the cost of the company's increased reserves of coal. Five cents per ton of coal mined has been paid into the sinking fund for about 11 years and about $3,500,000 in all has been paid into the fund. This fund has been used to buy and retire stock, but on December 31, 1909, there was $1,201,538 unspent in the fund. Coal lands bought to increase reserves have cost about $5,500,000, for the purchase of which the company has been reimbursed through the issue of $2,500,000 bonds. This leaves about $3,000,000 yet to be financed.

Hocking Valley.—A temporary injunction has been granted restraining the company from borrowing money to be used to retire the $15,000,000 preferred stock. This injunction was granted in connection with the application of representatives of minority stockholders who are seeking to prevent the sale of control of the property to the Chesapeake & Ohio.

International & Great Northern.—A protective committee has been formed to look out for the interests of holders of third mortgage bonds. Alvin W. Krech is chairman and E. T. Jeffery and G. P. Butler are the other two members of the committee. The committee represents a majority of third mortgage bonds and ask deposit of these bonds with the Equitable Trust Co. of New York up to and including May 31.

Lake Superior Corporation.—See Algoma Central & Hudson Bay.

Maryland & Pennsylvania.—The bill passed by the Maryland legislature authorizing this company to extend its lines, which now run from York, Pa., to Baltimore, Md., to tidewater, has been signed by the governor. Hambleton & Co., Baltimore, Md., say:

"It would seem that the bill granting the M. & P. the right to extend to tidewater on any route it may acquire, from its present line east of Towson to the east side of the Patapsco river, in Baltimore county, is of very much more importance than would appear on the face of this simple right. In fact, it appears to us that the owners of the M. & P. have obtained the right to a belt line around Baltimore. The connection between the M. & P. and the railway which covers the Canton company's property would give a connecting road between the Baltimore & Ohio, the Pennsylvania and the Western Maryland, and also afford facilities for the Western Maryland to ship its cars by floats from its Port Covington terminal to the terminal at Lazaretto Point." * * *

Missouri Pacific.—Potter, Choate & Prentice, New York, are offering a block of first refunding 6 per cent. bonds of the Kansas & Colorado Pacific of 1908-1938, guaranteed principal and interest by the Missouri Pacific, at a price to yield about 5.30 per cent. These bonds are part of an authorized issue of $50,000,000, of which $20,687,000 have been issued. Of the bonds issued, $3,972,000 are in the hands of the public and the balance of the bonds are deposited under the Missouri Pacific first and refunding mortgage.

Norfolk & Southern.—The United States Supreme Court has denied the petition of the Van Dyke-Zell syndicate for a writ to review the decision of the lower courts affirming the sale of the property on December 7, 1909, to the representatives of the reorganization committee for $8,500,000. This permits of the sale of the bonds of the new company under the reorganization plan.

Norfolk & Western.—J. B. Thayer, vice-president in charge of traffic of the Pennsylvania Railroad, has been elected a director of the Norfolk & Western, to succeed L. C. Weir, deceased.

Philadelphia Rapid Transit.—Stockholders are to vote June 20 on the question of authorizing an issue of indebtedness from $5,000,000 to $10,000,000. The city council of Philadelphia had previously been asked to authorize a $2,500,000 loan, and an officer of the Transit company says that since it is necessary to call a special meeting of stockholders to act on this $2,500,000 loan, it is thought best to get permission to borrow additional sums if occasion arises, but it is not the intention at present of the company to increase the original sum asked for from the city.

Pittsburgh & Shawmut.—Hallgarten & Co., New York, are offering privately the unsold portion of $3,000,000 first mortgage 5 per cent. redeemable bonds of December 1, 1909-1959, at 94½, yielding about 5.30 per cent. on the investment. The Pittsburgh & Shawmut runs from the southern terminus of the Pittsburgh, Shawmut & Northern at Brockwayville, Pa., to Knoxdale, 37 miles. This road was built in 1908 and is now being extended from Knoxdale to Freeport, 65 miles. Beside being a first lien on the mileage now in operation and on the mileage under construction, the bonds are secured by $11,953,000 Pittsburgh, Shawmut & Northern refunding 4 per cent. bonds and by the entire outstanding $3,607,200 stock of the Allegheny River Mining Co. The total authorized issue of these bonds is $12,000,000.

St. Louis & San Francisco.—Speyer & Co., New York, have arranged to buy $7,500,000 general lien 15-20 year 5 per cent. bonds. Of these bonds, $2,000,000 have been sold to French bankers, who previously took a block of the bonds, so that there are now about $10,000,000 bonds placed in Paris. Of the balance of the bonds now sold, a block has been sold to the Deutsche Bank of Berlin.

Southern Pacific.—This company has asked the Texas Railroad Commission for copies of records of value and other data concerning the Texas Central. It is supposed that the Southern Pacific is to take over the Texas Central property in the near future. See an item in General News in regard to this company.

Texas Central.—See Southern Pacific.

Supply Trade Section.

The Hobart Allfree Company, Chicago, has moved its office from 470 Old Colony building to suite 1380 of the same building.

Gerard Van Schaick has been elected president of the W. K. Kenly Company, Chicago, succeeding his brother, A. P. Van Schaick, resigned.

McCord & Co., Chicago, have moved their Chicago office from the Old Colony building to the Peoples Gas building, Michigan avenue and Adams street.

The General Railway Co., Chicago, has moved its Chicago office from the Monadnock building to the Peoples Gas building, Michigan avenue and Adams street.

The Wood Preservers Association announces that the office of F. J. Angier, secretary and treasurer, has been moved to 1033 First National Bank building, Chicago.

The McKeen Motor Car Co., Omaha, Neb., shipped, on April 25, two 55-ft. cars to the North Coast, Spokane, Wash., and one 70-ft. car to the Virginia & Truckee, Reno, Nev.

The Standard Coupler Co., New York, announces the removal of its Chicago office from the Fisher building to 1005 Peoples Gas building, Michigan avenue and Adams street.

The Union Draft Gear Co., Chicago, owing to its greatly increased business has found it necessary to add two private offices to its suite in the Monadnock block. The suite number is now 542-548.

Effective May 1, Arthur P. Van Schaick is appointed district sales agent of the Lackawanna Steel Company, New York, in charge of the Chicago office and territory, succeeding Charles R. Robinson.

Thomas E. Carliss, superintendent Jersey City plant of the Chicago Railway Equipment Co., Chicago, has accepted a position as general superintendent of the Buffalo Brake Beam Co., with headquarters at Buffalo, N. Y.

The Missouri Valley Electric Light Co., Missouri Valley, Iowa, has recently installed a 500-k.w. Westinghouse turbine generator set for furnishing local light and power. The turbine is of the complete expansion type, utilizing steam at 125 lbs. and exhausting into a vacuum of 28 in.

The Standard Steel Car Co., Pittsburgh, Pa., has installed two 500-k.w. low-pressure steam turbines at its Burnham, Pa., plant. These turbines utilize the waste steam of the main equipment and are designed for a vacuum of 28 in., having Westinghouse-Lablanc condensers. The energy thus conserved is applied to two 500-k.w. generators, which furnish light and power for the shops.

F. J. Angier, who recently resigned as manager of the tie and timber department of the Chicago, Burlington & Quincy at Galesburg, Ill., has accepted a position with the Kettle River Quarries Company, with office in the First National Bank building, Chicago. On retiring from the Burlington, Mr. Angier was presented with a set of silverware by the men of the road's tie treating plant at Galesburg.

J. B. Comstock, for six years with the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., at its East Pittsburgh works, and for four years manager of its publication department and printing plant, severed his connections with that company in April to accept a similar position with the P. & F. Corbin Company, New Britain, Conn. Prior to Mr. Comstock's connection with the Westinghouse Company he filled the same position with the Corbin Company as that to which he has recently been recalled to assume.

Butler Keys, for many years with the Consolidated Car-Heating Company, Albany, N. Y., and recently with the Home Rubber Company, Trenton, N. J., has been appointed manager of the sales department of the Hemming Manufacturing Company Garfield, N. J., with headquarters at 2 Rector street, New York. This company owns the Hemming and Gummon patents and has completed a specially designed plant at Garfield, N. J., for the manufacture of fireproof and waterproof molded insulating materials, under these patents.

Jay Robert McColl, for the past five years in charge of the engineering work of the heating and ventilating department of the American Blower Co., Detroit, Mich., has resigned to become a member of the firm of Ammerman, McColl & Anderson, successors to the engineering firm of Brush, Anderson & Ammerman, consulting engineers, Penobscot building, Detroit. Just before entering the engineering department of the American Blower Co., Mr. McColl was a professor of thermodynamics and engineering at Purdue University, and previous to this connection he was a member of the engineering department of the University of Tennessee.

H. Harrison Kress, who has been in charge of the publicity department of the A. S. Cameron Steam Pump Works, New York, has been appointed advertising manager of the Jeffrey Manufacturing Co., Columbus, Ohio. Mr. Kress has been a student of publicity in all its phases for several years and has been active in those organizations which are helping to put publicity work and advertising on a higher plane. At the time of accepting his new position, Mr. Kress was also treasurer of the Advertising Men's League of New York and secretary of the Technical Publicity Association, with which latter organization he will remain as a member of the executive committee.

Frank P. Smith, recently elected vice-president of the Hobart-Allfree Company, Chicago, with office at 30 Church street, New York, began his business career as an oiler on the Mississippi river steamer Savannah, of the Northern Line Packet Company, which plied between St. Louis and St. Paul. His first railway job was as a locomotive fireman on the Iowa and Minnesota division of the old Milwaukee & St. Paul. After serving there and on the St. Paul & Chicago Railroad for three years, he came east to fire on the Panhandle; but in a few months returned west as a fireman on the Indiana division of the Wabash. While on that road he followed the regular routine of six months' service as machinist's helper. He later served successively as locomotive engineer on the Union Pacific; fireman, Rockford, Rock Island & St. Louis (now the St. Louis division of the Burlington); fireman, Wabash; fireman and locomotive engineer, Winona & Minnesota (now Minnesota division of the Chicago & North Western), and engineer on the Wabash, the St. Louis & Iron Mountain, the Chesapeake & Ohio, the Kentucky Central, the Louisville, New Orleans & Texas (now Yazoo & Mississippi Valley), the Louisville & Nashville, the Kansas City, Memphis & Birmingham and the Richmond & Danville (now part of the Southern Railway). Mr. Smith left the Richmond & Danville to return to the Chesapeake & Ohio, but in 1892 entered the employ of C. C. Jerome, Chicago, to sell metallic packing. In October, 1896, he went to the Hancock Inspirator Company and stayed there



Frank P. Smith.

until the end of last year, when he resigned to go with the Hobart-Allfree Company.

H. R. Safford, who has accepted a position as vice-president of the Edgar A. Allen & Company, Sheffield, Eng., with headquarters in Chicago, was born in 1875 and graduated from Purdue University in 1895. He entered the service of the Illinois Central as rodman in 1896 and has been with that company continuously until his recent resignation. He held consecutively the offices of resident engineer, assistant engineer, road master, principal assistant engineer, assistant chief engineer and chief engineer maintenance of way. Mr. Safford is a member of the American Railway Engineering and Maintenance of Way Association and of the American Society of Civil Engineers.

The Isthmian Canal Commission will receive bids until May 26 for its annual estimate for the period ending June 30, 1911, including miscellaneous supplies, such as hand cars, push cars, warehouse trucks, wheelbarrows, jacks, anvils, vises, forges, shovels, spades, picks, hammers, machinists', blacksmiths' and track tools; garden tools, machetes, drills, saws, pipe tools, shears, belt punches, files, scythestones, tool handles; differential, snatch and tackle blocks; wire-rope attachments, sister hooks, hose clamps, brooms, brushes, garbage cans, squilgees, valves, cocks, pipe fittings, cotton mop heads, solder, sash cord, oakum, manila rope, marline, vitrified sewer pipe, brick, fire clay, asbestos cement, rosin, caustic soda, carbolic acid, tie plugs, etc.

John Heman Converse, president of the Baldwin Locomotive Works, Philadelphia, Pa., died at his home in Rosemont, Pa., on May 3, after an illness of but a few days. Mr. Converse was born at Burlington, Vt., on December 2, 1840. He received his early education in the public schools of that town and entered the University of Vermont in 1857, graduating with the class of 1861. After graduation he went into the editorial department of the Burlington (Vt.) *Daily and Weekly Times*, where he remained three years. In 1864 he went to Chicago and worked for two years on the Chicago & North Western. In 1866 he went to the Pennsylvania Railroad at Altoona, Pa., under Edward H. Williams, then general superintendent. In 1870 he secured a position with the Baldwin Locomotive Works through Mr. Williams, who had become one of the proprietors. Three years later he became a member of the firm, in which he has been actively engaged ever since. Mr. Converse was entrusted with the general business and financial management of the company as apart from the mechanical department. In addition to the successful management of the business affairs of this manufacturing business, Mr. Converse has for many years held directorships and taken active parts in the managements of numerous financial and other institutions. Among these are the Philadelphia National Bank, the Philadelphia Trust Co., the Real Estate Trust Co. and the Philadelphia Savings Fund. Since 1899 he has been a member of the board of directors of City Trusts, at first serving at the head of the committee having in charge the Girard estate. He was also a member of the Philadelphia Board of Public Education, president of the Fairmont Park Art Association, trustee of the Presbyterian Hospital and of the Pennsylvania Academy of Fine Arts. During the war with Spain, Mr. Converse served as president of the National Relief Commission organized in Philadelphia. His contributions to churches, charities and various educational and civic institutions have been constant and generous; he had a large and broad sympathy with progressive humanitarian and religious movements. One of the principal buildings of the Presbyterian Hospital in Philadelphia was erected entirely at his expense. He also gave liberally to the University of Vermont, his Alma Mater, of which he was a trustee and to which he has given three buildings. In 1897 the university conferred upon him the degree of LL.D. Mr. Converse's career exemplifies to a marked degree the value of a trained intellect in extensive business affairs and in fidelity in the administration of great trusts. Going to Philadelphia 30 years ago practically unknown, he became one of its foremost citizens. He was a member of the New England Society of Pennsylvania and the Pennsylvania Society of Sons of the Revolution.



J. H. Converse.

In taste, education, experience and general training, Mr. Converse would seem to have been in every way unqualified as an industrial manufacturer, and his entrance into the Baldwin partnership was a surprise to his friends. Nevertheless, he proved to be valuable—almost invaluable—to his associates. He found a sphere of usefulness in the institution because the undertaking was so huge that the conduct and financing of the business afforded scope for all his powers. The partnership, only recently changed to a corporation, undoubtedly built up a kind of friendship, individual respect and loyalty to the name that is quite uncommon in companies. The requirement of unanimous consent in any important action promoted this result. And so it always seemed that Converse, with no knowledge of mechanics, and possibly not all clear as to how a locomotive propelled itself, was apparently the most admiring and enthusiastic partner over the developments and creations of Henszey, Austin and Vauclain.

TRADE PUBLICATIONS.

Copper-Clad Wire.—The Duplex Metals Co., New York, has issued a leaflet regarding the Great Northern's first order for No. 9 B. & S. G. copper-clad wire of 80,000 lbs., and also the same company's 11 repeat orders for this wire, making a total of 912,287 lbs.

Concrete Mixing Machines.—The William B. Hough Co., Chicago, has issued a 24-page booklet of an historical character dealing with the evolution of the Ransome mixer. The first mixer illustrated was built in 1850 by Frederick Ransome and the last is the present machine which was patented in 1907 by A. W. Ransome, a grandson of Frederick Ransome.

Bolt Threading Machines.—The Newton Machine Tool Works, Philadelphia, Pa., in its catalogue No. 46 describes the Newton bolt-threading machines with automatic die heads. The catalogue contains an amount of detail information regarding these machines and also a number of illustrations showing other machines which this company manufactures.

Concrete Mixing Plants.—The T. L. Smith Co., Milwaukee, Wis., has just issued a 24-page booklet illustrating a number of plants designed by contractors and engineers for economically mixing concrete. Construction foremen will find it helpful because of the practical character of the work illustrated. Several of the plants shown are in use on railways, the mixers being mounted on cars.

Steel Sash, Etc.—David Lupton's Sons Co., Philadelphia, Pa., has just issued its catalogue No. 4 covering the following specialties: Lupton steel sash, rolled steel skylight, hollow metal windows, Waldmire louvers, Pond continuous sash and Pond operating device. The catalogue contains a large number of drawings and photographs illustrating these specialties in detail and also in complete installation.

Lifting Jacks.—The Joyce-Cridland Co., Dayton, Ohio, has just issued its new 100-page catalogue A, which contains a list of this company's complete line of jacks for all purposes, and also discussions of the construction and recent improvements in this line of jacks. The relative merits of various types of jacks, such as hydraulic, lever, automatic, automatic geared, screw, telescoping, etc., are also discussed.

Graphite.—The United States Graphite Co., Saginaw, Mich., has issued a general catalog No. 20 giving a brief description of all the company's products. A second publication describes its graphite mines in Mexico. This booklet includes a reprint of the report of Frank L. Hess, of the United States Geological Survey, after an inspection of the U. S. Graphite

Co's mines. A number of photographs and maps illustrate the description.

Tractive Power Tables.—The American Locomotive Co., New York, has issued, in its standard size form for loose leaf cover, bulletin No. 1002 containing eight 9½-in. x 14-in. tables of tractive powers of simple locomotives at 100, 150, 160, 180, 190, 200, 210 and 220 lbs. boiler pressure. Several other half and full-page tables and charts are given, the data covering the following subjects: Speed; cylinder volume; interior area, heating surface and weight of tubes; middle ordinates and tangent deflections; metric conversion and locomotive classification tables.

RAILWAY STRUCTURES.

Altamont, Kan.—See Kansas City Union Traction under Railway Construction.

Baltimore, Md.—Work is to be started at once on the new union passenger station to be built by the Northern Central in Baltimore, and will be pushed as rapidly as possible. It is expected that the improvements will be finished by July, 1911. A large amount of excavation work will be carried out in adjusting the tracks to the proper level for an entrance into the new station. The contract has been given to J. Henry Miller, Baltimore. (April 15, p. 1020.)

Cambridge, Mass.—An officer of the Boston & Maine writes that a contract has been given to Edwards & Monahan for putting up a one-story frame structure, 40 ft. x 756 ft. 6 in., and another 40 ft. x 556 ft. 6 in. at Bridge street, in Cambridge. The buildings are to be tin covered and all doors on the track side provided with Ritter doors.

Conshohocken, Pa.—See Philadelphia & Western under Railway Construction.

Elizabethtown, N. Y.—See Elizabethtown Terminal under Railway Construction.

Jermyn, Tex.—The Gulf, Texas & Western has completed a passenger station, general office building and machine shops at a total cost of $25,000.

Mexico City, Mex.—The National Railways of Mexico is said to be making plans for a large office building and terminal station to be built in Mexico City.

Montreal, Que.—The Grand Trunk Railway agrees to have plans ready by August 1 for a viaduct to be built from Bonaventure station to St. Henri, where the line diverges to the south and east to Wellington street subway. The cost of the improvement is estimated at $8,000,000.

New Richmond, Wis.—See Minneapolis, St. Paul & Sault Ste. Marie under Railway Construction.

Philadelphia, Pa.—An officer of the Philadelphia & Reading writes that a contract has been given to Cramp & Co., Commonwealth building, Philadelphia, for the five-story brick and steel fireproof office building, to be built at Ninth and Spring Garden streets, in Philadelphia. (April 29, p. 1117.)

Savannah, Ga.—Work is to be started at once on improvements to the union passenger station in Savannah. Contracts for the work, which will cost about $20,000, have been let.

Spokane, Wash.—See Chicago, Milwaukee & Puget Sound under Railway Construction.

Topeka, Kan.—The Atchison, Topeka & Santa Fe has let the contract to Bennett & Allen, a local contracting firm, for building the office building mentioned in the *Railway Age Gazette* of November 5, 1909.

Waycross, Ga.—Bids for the construction of the new passenger station in Waycross have been opened by the Atlantic Coast Line, and contract will be let soon. The cost of the improvements will be about $50,000.

Winnipeg, Man.—The Dominion Bridge Co. has been given a contract for building the Lombard street bridge over the Red river in Winnipeg, Man. A contract has also been given to this company by the Canadian Pacific for two new steel bridges. One bridge is to be built at Headingly and the other at Souris. Both bridges will replace the present existing timber structures.

Worcester, Mass.—See Boston & Albany under Railway Construction.

Late News.

The items in this column were received after the classified departments were closed.

The Oregon & Washington is said to be making plans for constructing a large freight yard at Centralia, Wash.

The Ingersoll-Rand Company, New York, announces the removal of its Chicago office from the Old Colony bulding to the Peoples Gas building.

The United States Light & Heating Company, New York, announce the removal of its Chicago office, on May 1, from the Monadnock building to the Peoples Gas building.

At Cincinnati, May 3, Edgar S. Cooke, formerly employed by the Cleveland, Cincinnati, Chicago & St. Louis, was indicted in connection with the embezzlement of which Cashier Warrener was convicted some months since.

After protracted conferences the New York Central has advanced the pay of firemen about 7 per cent. The conference never reached the stage where it was necessary to call in the services of a member of the Grand Lodge of the Brotherhood.

H. G. Selby, commercial agent of the Chicago, Milwaukee & St. Paul, at Buffalo, N. Y., has been transferred to St. Louis, Mo., succeeding J. B. Marshel, transferred, as previously announced in these columns. J. H. Skillen, commercial agent at Pittsburgh, Pa., succeeds Mr. Selby.

The St. Louis, St. Charles & Northern Traction has been organized at Middletown, Mo., to build an electric line from St. Charles, Mo., north via Troy, Olney, Marling, Middletown, Mt. Carmel, Laddonia, Mexico, Paris and points north. C. B. Duncan, president, Olney; E. R. Race, vice-president, Mexico, and C. Pearson, secretary, Middletown.

Rumors from generally well informed sources say that the Chicago, Milwaukee & St. Paul has made arrangements through Kuhn, Loeb & Co., New York, to sell in Paris $50,000,000 bonds, and that the Cleveland, Cincinnati, Chicago & St. Louis is also to sell in Paris $10,000,000 debenture bonds. The Union Pacific, Southern Pacific and Missouri, Kansas & Texas are also now mentioned as possible successful borrowers abroad.

At Mobile on Wednesday 4,200 bales of cotton, consigned to the Elder-Dempster Company by the bankrupt firm of Knight, Yancey & Co., and part of which was stowed in the hold of the steamer Meltonian, was seized by a United States marshal. The court has dissolved the injunction in the case and placed the cotton in the hands of the marshal for disposal. Unless a replevin bond of $300,000 is given by the owners of the cotton it will be unloaded from the steamer. With a view to minimizing frauds in cotton bills of lading the Galveston Cotton Exchange, in a resolution transmitted to the bill of lading conference in Liverpool, urges all bankers and importers to refuse to accept any bills of lading from any port after August 21, 1910, that are not signed by authorized ship agents after the cotton has been delivered into their custody on their wharves.

The United States Steel Corporation has established a pension fund of $8,000,000 which is to be consolidated with the $4,000,000 fund created by Andrew Carnegie several years, and the whole used as a fund to provide for the payment of pensions to disabled or superannuated employees of the corporation. A plan for the relief of men injured and the families of men killed in work accidents while in the employ of the corporation was adopted on April 15, as recently announced. The fund will be known as "The United States Steel and Carnegie Pension Fund," and the net proceeds will be administered by a board of twelve trustees for the benefit of employees of all subsidiary companies of the United States Steel Corporation. Eight of the trustees have been appointed by the corporation and four by Mr. Carnegie.

The Steel Corporation has just increased the wages of its 200,000 employees an average of 6 per cent., the added expenditure for this purpose being about $9,000,000 a year. It has also declared against Sunday work and in favor of giving employees in its manufacturing plants at least twenty-four hours' continuous rest each week.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Cuba Company, New York, will buy from 15 to 20 locomotives.

The Chicago & Eastern Illinois has ordered five six-coupled switchers from the Baldwin Locomotive Works.

The Kansas City, Mexico & Orient has ordered 10 consolidation locomotives from the American Locomotive Co.

The Chicago, Indianapolis & Louisville, reported in the *Railway Age Gazette* of April 29 as negotiating for six consolidation locomotives, has ordered this equipment from the American Locomotive Co.

CAR BUILDING.

The New York, Chicago & St. Louis is building 400 box cars.

Morris & Co., U. S. Stock Yards, Chicago, are in the market for 200 beef cars.

The Long Island has ordered 100 freight cars from the Pressed Steel Car Co.

The Nevada Copper Belt Railway has ordered 50 hopper ore cars from the Pressed Steel Car Co.

The Chicago, Milwaukee & Gary has ordered six caboose cars from the American Car & Foundry Co.

The Cudahy Packing Co., South Omaha, Neb., is in the market for steel tank cars for cotton seed oil.

The Grand Trunk has ordered 1,000 steel underframe box cars from the Western Steel Car & Foundry Co., and 500 automobile cars from the American Car & Foundry Co.

The San Antonio & Aransas Pass, reported in the *Railway Age Gazette* of March 25 as being in the market for 12 caboose cars, has ordered this equipment from the Mt. Vernon Car Manufacturing Co.

The Union Railroad, mentioned in the *Railway Age Gazette* of April 22, in an unconfirmed item, as figuring on 1,000 ore cars, advises that it has under consideration the purchase of 1,000 steel gondola cars.

The St. Louis, Brownsville & Mexico, reported in the *Railway Age Gazette* of March 25 as in the market for caboose cars, has ordered six standard cars of this type from the American Car & Foundry Co.

E. H. Young, Galveston, Texas, has ordered 26 steel underframe tank cars from the German-American Car Company, Chicago. Twenty-three of the cars have a capacity of 8,000 gals., and three a capacity of 7,000 gals.

The Louisville & Nashville, reported in the *Railway Age Gazette* of March 18 as in the market for 1,400 steel underframes, has ordered 700 from the Cambria Steel Co., 500 from the American Car & Foundry Co., and 200 from the Pressed Steel Car Co.

The St. Louis & San Francisco, reported in the Railway Age Gazette of April 8 as figuring on freight cars, has ordered 250 automobile cars from the Standard Steel Car Company and 500 similar cars from the American Car & Foundry Company. Inquiries are now out for 500 box, 500 stock-dump and 250 tank cars.

The Pennsylvania steel passenger car equipment, mentioned in the *Railway Age Gazette* of April 29, and also a number of other steel cars now building in the company's shops, will have the following special equipment:

Axles	5 in. x 9 in. and 5½ in x 9 in.
Bolsters, truck	Pennsylvania steel plate
Brakes	Westinghouse
Brake-beams	7 in. channel
Brake-shoes	Cast-iron steel back
Brasses	P. R.R. type
Couplers	Pitt, McConway & Torley Co.
Curtain fixtures	Curtain Supply Co.
Curtain materials	Mercerized cotton, Pantasote back
Doors	Steel
Door fastenings	P. R.R. type
Draft gear	Westinghouse friction
Draft gear	P. R.R. type
Heating systems	P. R.R. type; P. R.R. C. I. radiators P. R.R. steam 2-in. pipe
Journal boxes	5 x 9 in. and 5½ x 9 in., P. R.R. type

The Virginian has ordered 500 fifty-ton steel gondola cars and 500 fifty-ton steel hopper cars from the Pressed Steel Car Co. The gondola cars will be 40 ft. long, 9 ft. 4 in. wide and 4 ft. 6 in. high, inside measurements, and 41 ft. 5½ in. long, 10 ft. ½ in. wide and 8 ft. 3¼ in. high, over all. The hopper cars will be 30 ft. 11⅞ in. long and 9 ft. 4 in. wide, inside measurements, and 32 ft. 5⅜ in. long, 10 ft. ½ in. wide and 10 ft. 2 in. high, over all. The following special equipment will be used on all cars:

Axles	V. R.R. standard
Bolsters, body and truck	Pressed steel
Brakes	Westinghouse
Brake-beams	Damascus
Brake-shoes	Streeter
Brasses	Magnus Metal Co.
Couplers	Major Buckeye Steel Castings Co.
Draft gear	Farlow-Westinghouse
Dust guards	V. R.R. standard
Journal boxes	Symington, torsion lid
Paint	St. Louis Surfacer & Paint Co.
Side bearings	V. R.R. standard
Trucks	V. R.R. standard, arch bar
Wheels	Cast iron; Central Car Wheel Co.

MACHINERY AND TOOLS.

The Boston & Maine is in the market for machinery for its new shops at Somerville, Mass.

SIGNALING.

Upper right-hand quadrant semaphore signals will be used exclusively for new work and renewals hereafter by the Chicago & North Western both for block and interlocking signals. They will all work in three positions.



Henry Johnson.

An account of the life of the late Henry Johnson, who died on April 5, was published in the *Railway Age Gazette* last week, page 1086. We were unable to get a satisfactory portrait of Mr. Johnson from which to publish an engraving with that article, but, through the courtesy of Sidney G. Johnson, we are able to show herewith a halftone engraving made from a portrait included in a group which was taken several years ago. This picture, though small, will be recognized as a good likeness of Mr. Johnson in the years when he was in active business.

IRON AND STEEL.

The New York Central is taking prices on 2,500 tons of bridge steel.

The Michigan Central is taking prices on 1,400 tons of bridge steel.

The Minneapolis, St. Paul & Sault Ste. Marie will buy 1,500 tons of structural steel for a bridge over the St. Croix river.

The Chicago, Burlington & Quincy, reported in the *Railway Age Gazette* of April 22 as in the market for 400 tons of bridge steel, has ordered 375 tons from the Pennsylvania Steel Co.

General Conditions in Steel. As generally happens in the second quarter of the year, the steel industry is experiencing a lull. It is, however, thought that this condition will be but temporary. The present activity of the mills is due to the large tonnage on the books of the various companies. There is a feeling that a good buying movement will set in after some definite assurance is gotten regarding the crop conditions. It is estimated that the earnings of the United States Steel Corporation in April aggregated close to $14,000,000.

The General Electric Company.

The annual report of the General Electric, reviewed elsewhere in this issue, shows that the total area of floor space in buildings and factories of the General Electric was 7,180,000 sq. ft. at the end of 1909, as compared with 7,000,000 sq. ft. floor space occupied at the end of the previous fiscal year. Last year there were 30,000 employees on the pay rolls, as compared with 23,300 the year before. The extensions during the past year and those projected for construction in the immediate future consist principally of buildings for the storage of raw material and finished products. The rapid increase in the number and capacity of hydro-electric properties that has taken place in the last few years gives interest to the statement in the report of Vice-President Rice on manufacturing and engineering that the company's "engineers have improved the design of devices required in such installations which must be capable of successful operation at the enormous pressure of 100,000 volts and over. Such devices consist of switches, transformers, lightning arresters, circuit breakers and insulators, all capable of operating successfully and reliably under the most severe conditions."

The application of 1,200-volt apparatus on interurban railways has steadily increased, and it has been found possible to operate cars on both the 1,200 and 600-volt service. The commercial success of the high-voltage direct-current railway system is ascribed to the inherent simplicity and economy of the system, as well as to the skill of the engineers in installing such systems. More than 66,000 h.p. of 1,200-volt direct-current motors are now in operation or on order. Among the larger railways using this system may be mentioned the Indianapolis & Louisville Traction Company, the Southern Pacific's Oakland, Alameda & Berkeley division, the Washington, Baltimore & Annapolis Electric Railway and the Milwaukee Electric Railway.

Flange Lubricators.

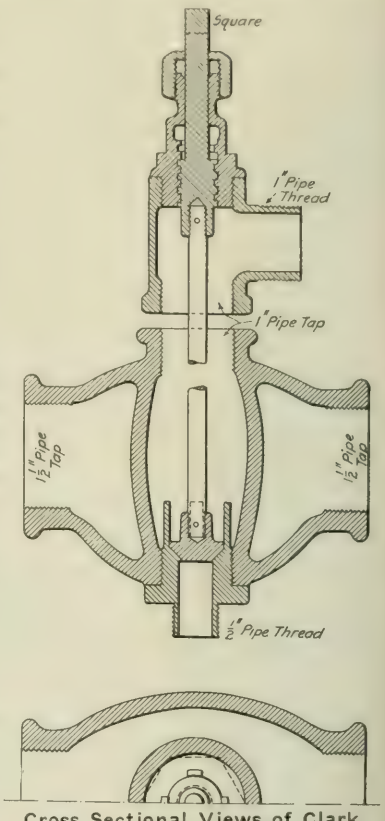
In our issue of March 4, 1910, page 508, we described the Martin flange lubricator, saying that this device had been applied to the forward driving wheels on 69 consolidation engines on the Southern Pacific, and that the results thus obtained were those published in the *Railway Age Gazette* of January 15, 1909, page 119. We were misinformed. J. C. Martin has no contract with the Southern Pacific for the use of his driving wheel flange lubricator. He had simply issued a license in favor of that road and other Harriman lines, granting them the privilege of using it. No Southern Pacific locomotives are equipped with his device. The lubricator referred to in the article published January 15, 1909, mentioned above, is not the Martin patent.

T. F. Bellhouse, Sacramento, Cal., assistant roundhouse foreman of the Southern Pacific, is one of the patentees of a lubricator the Southern Pacific is now using.

Shop Equipment.

Clark Drip Valve for Car Heating.

The drip valve here illustrated is the invention of a conductor on the Grand Trunk Railway, and it has been in successful use for several years. The valve can be placed directly in the steam line or in a branch leading from the steam line and under the car floor. The upper connection is made to the return pipe. The vertical section shows an enlarged cavity, through which live steam circulates on its way through the train line. The inner chamber is closed to live steam and being connected to the return pipe the condensation collects and fills it and the water is kept warm by the surrounding live steam. In this way the drip valve shown at the bottom is always protected against freezing. The valve is opened when the car is being heated at terminals and then closed until sufficient condensation accumulates, so that the temperature of the car is reduced; and the valve is then again opened and all water removed. It is also opened when entering terminals or when steam is cut off more than 30 minutes. The drip valve is intended to be used in connection with a temperature regulator, or reducing valve, which will limit the amount of steam admitted to the car. The important function of the drip valve is to prevent the waste of steam which ordinarily takes place from open drips which are left open to prevent freezing. The tests of the Clark valve indicate that trains can be successfully heated by a lower train line pressure than is generally used, and a lower pressure will prolong the service of rubber steam hose which is damaged to such a large extent by high-pressure steam. This improved drip valve has been patented by W. T. Clark, room 32, Dearborn station, Chicago.

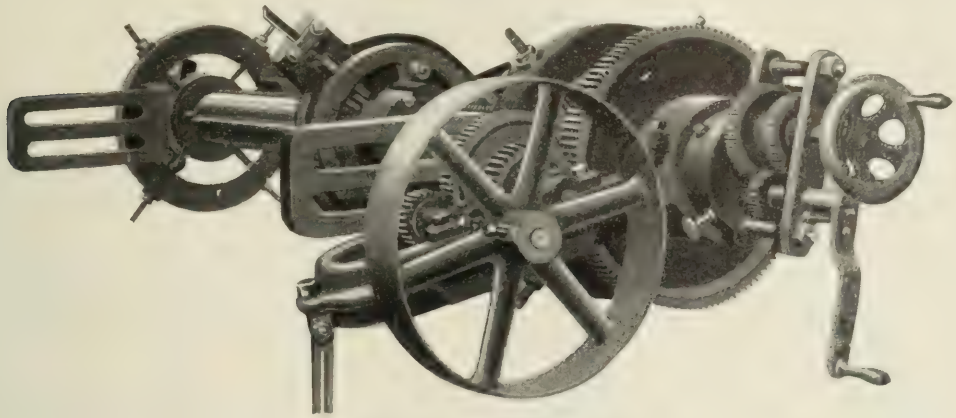


Cross Sectional Views of Clark Drip Valve.

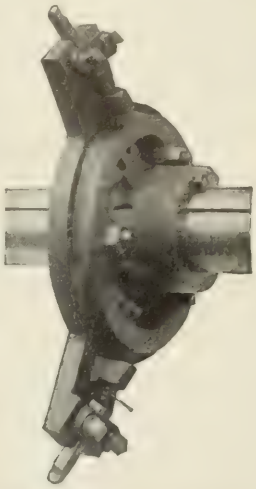
Ryerson Cylinder Boring Bar.

The cylinder boring bar here illustrated was designed by the Ryerson company to meet the requirements of high speed and heavy cuts which are prominent in present day machine shop practice. In addition to being of heavy construction throughout, the new boring bar possesses several features not found in the older types. It has a positive, continuous feed which eliminates the objection to its old star feed, which was intermittent. One of the important features of the improved Ryerson boring bar is that the feed produces a smooth surface throughout the whole cut, as the depth is always uniform. There are two feeds on the No. 1, or 4-in. bar, and three on the No. 2, or 6-in. bar, and a light or heavy feed may be had by merely shifting the gears. The tool holder surface is placed at an angle in the head, thus permitting the use of perfectly straight square cutting tools. With this construction the cylinder can be bored or bushed in the

roundhouse without taking down the guides or removing the back cylinder head. The cutting tool is so firmly clamped that there is no tendency to chatter, which defect is always noticeable in a machine in which crooked or offset tools are used. The different size tool heads may be easily attached. The smallest, or master head, is permanently located on the bar and is so arranged that all the others fit to it positively. The arrangement of the bar head is such that the tool-holding heads can be quickly moved from one end of the bar to the other without the necessity of screwing them laboriously and slowly the full length by hand. The 4-in. bar is arranged to bore cylinders up to 30 in. in diameter and 44 in. long, and the 6-in. bar will bore up to 50 in. in diameter and 35 in. long. When the end of the bar is located in the stuffing box of the back cylinder head these bars will bore up to 50 in. long.



Ryerson Cylinder Boring Bar.



Straight Tool Holder.

Barrett Geared Ratchet Jack No. 400.

The Duff Manufacturing Company, Pittsburgh, Pa., makers of the Barrett jacks, have just placed on the market, through Fairbanks, Morse & Co., Chicago, an improved geared ratchet jack, known as the Barrett jack No. 400. This jack is designed for handling the heaviest loaded freight cars, coaches or locomotives, its lifting power being 40 tons. It is single-acting, raising the load only on the down stroke of the lever. The automatic lowering device is thrown in by a reversing lever, and is dropped out of the way when not in use.



Barrett Geared Ratchet Jack, No. 400.

The operation of the jack is as follows: The lifting bar is raised by a hardened steel pinion, which turns on its own bearings in bronze bushings. A large gear is secured on the hub of this pinion and is revolved by a small hardened steel pinion which meshes with it. This small pinion is made of special crucible machinery steel, and revolves on its own bearings in bronze bushings. On the hub of this small pinion is a ratchet mechanism which is turned by a pawl in the socket lever, a retaining pawl also being provided. There is no movement of the lifting pawl in the socket lever, which eliminates wear at that point.

The Duff Manufacturing Company tested these jacks in actual service for about two years before placing them on the market, so that practically all places where wear usually occurs might be protected. All wearing surfaces turn in bronze bearings which are of easy access and may be easily renewed if necessary. Back of the lifting bar or rack is placed a special bronze plate, which can be adjusted to take up any wear that may occur and keep the rack and large pinion in proper mesh.

This jack raises a load of 40 tons to a height of 17 in. It weighs but 275 lbs., so that it may be easily carried from place to place and is convenient to handle. Further details of its construction and use are given in a special bulletin issued by Fairbanks, Morse & Co.

Stanton Coach and Window Cleaner.

The Stanton window washer which was described in the *Railway Age Gazette* of April 1, has also been used for washing coaches on 70 steam and electric lines. The results obtained are said to be better than by the older methods, as the grit and dust are flushed off and not scoured off, all pol-

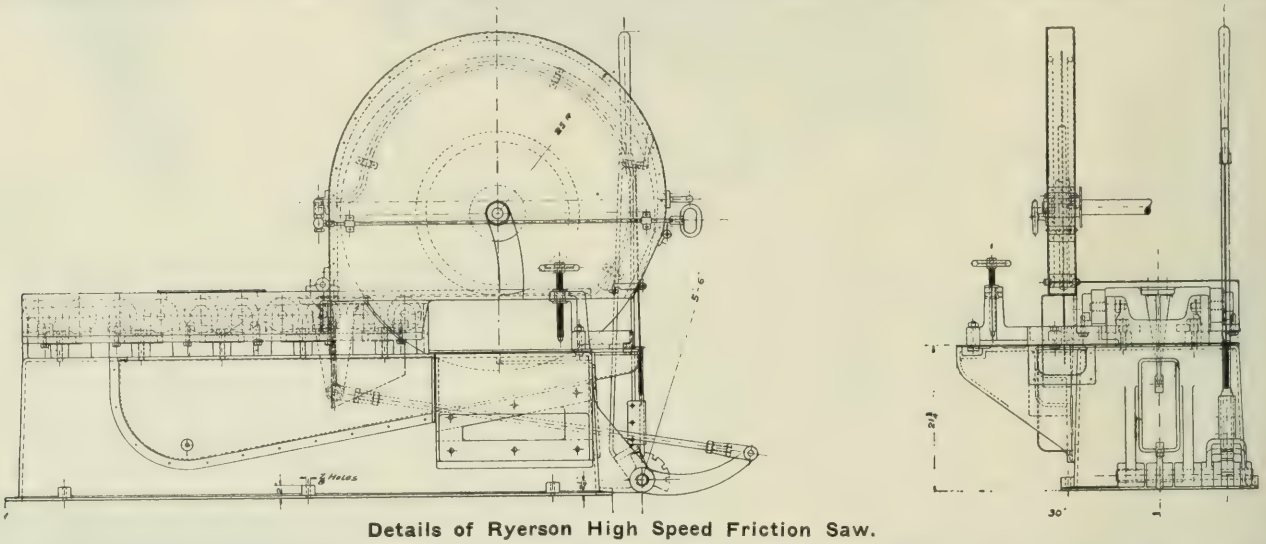


Coach Window Washing with Stanton Cleaner.

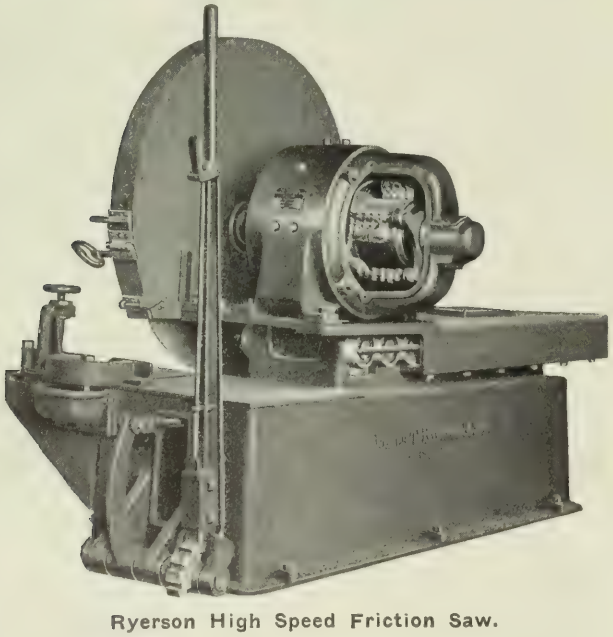
ished surfaces being left in good condition. Window casings, transoms and all corners can be easily cleaned with this device, for an abundance of clean water is sprayed through the brush by a patent sprayer, as described in the former article. The brushes and handle are made of the best material so that repair costs are small. The use of this device reduces the necessary labor, and it is claimed that there is enough saving to pay for the cleaner in a few days. The device is handled by Geo. R. Stanton, 1302 West Main street, Decatur, Ill.

Ryerson High Speed Friction Saw.

The high speed friction disk is the most rapid and efficient machine for cutting steel shapes, and it is now extensively used at the large steel mills and the principal structural and car shops throughout the country. This machine, as built heretofore, is heavy and expensive, requiring high power motors, massive foundations and supplementary equipment, entailing a cost of nearly $5,000. This high cost has prevented the general introduction of these machines in the average sized car shop, and the experience of the Ryerson company in installing car shop equipment has shown the necessity of a lighter machine, which would be compact, self-contained and lower in first cost and maintenance. This company has been experimenting for some years with the idea of producing such a machine, and it has now placed on the market the high-speed friction saw, which we here illustrate.



Details of Ryerson High Speed Friction Saw.



Ryerson High Speed Friction Saw.

It has a capacity to cut continuously 15-in., 80-lb. beams in 28 to 30 seconds, and occupies a floor space 7 ft. x 4 ft., no foundation other than a good floor being necessary. The motor is 52 h.p., with special design as to winding. The saw blades, or disks, vary in diameter from 44 in. to 52 in., depending on the current and the voltage of the motor. They are held firmly in place by hollow steel collars which extend to within 8½ in. of the edge. The blade revolves in a steel hood having perforated pipes connected with the water supply controlled by a valve at the rear of the hood, so that water is only used during the actual time of cutting. The motor and saw are mounted on a strong trough-shaped casting which travels on roller guides arranged both horizontally and vertically. These are plainly shown in the illustration. The carriage is arranged so that small beams and other shapes may be cut on a bevel or miter at any desired angle. For such mitering there is a swinging clamp on the table on which an arc is described. This miter feature of a friction saw is entirely new, as no other saws have been built in this way. With this saw it is unnecessary to clamp the work down when straight cutting is done. There are no adjustments or feeds to watch or regulate, and the machine may be used in rapid succession on beams, angles, channels, tees or rails with no change or adjustment.

The high-speed friction saw is manufactured and sold by Joseph T. Ryerson & Son, Sixteenth and Rockwell streets, Chicago.

Never Slip Safety Clamp.

The accompanying illustration shows a new design of clamp for handling sheet iron in shops. The clamp is designed to firmly grip the plate and prevent its slipping out and falling during transit by an overhead crane. This precaution is especially necessary in shops where plates are transferred about the building and over the workmen.



Never Slip Safety Clamps as Used.

The clamp is made of forged steel to give it the greatest possible strength. There are three sizes, adapted for carrying sheets up to 2 in. in thickness. Close inspection of the clamps in the photograph shows that the weight of the sheet acts to force the holding teeth of the movable dogs into the sheet, gripping it firmly. This clamp is made by the Never Slip Safety Clamp Co., New York.

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Hearings are now being taken in proceedings for forcing the Southern Railway to give up its present terminal site at Memphis, Tenn. Besides being of interest, because of the large amounts of money involved, these proceedings are a good illustration of demands often made on a railway company, demands which, though inherently unfair, can be supported by superficially good arguments. The Southern Railway acquired its terminals in Memphis before the Civil War through a charter granted to a company which has since been taken over by the Southern Railway. The city has grown up around these terminals, largely because jobbers and manufacturers, as well as shippers of all classes, found it convenient to be near the railway station. On one side of the terminals, which are extensive and well adapted to their present use, lies the business section of Memphis. The business community finds the location of the terminals convenient and economical. On the other side lies a good residential section of the city, and the residents of this section now complain that the terminals, as now located, are a nuisance, and are seeking to have the city take the terminal property away from the railway and make it into a park. Of course, the city is to make some compensation to the railway company, and proposes to have the railway company establish new terminals at some other point. It must be borne in mind that the railway company did not originally build into the heart of a big city, but that the city grew up around the railway company's terminals. The question is, how far a railway company can be deprived of its property and ordered to make changes in its mode of operation, etc., because, through no fault of its own, it would now be more desirable from the point of view of adjoining property holders to have the terminals located somewhere else.

Prevention of accidents is a subject that has always taken a considerable share of every railway manager's attention, but never until now, so far as we can recall, has a road employed a man to make that his whole business, as the Chicago & Northwestern has done in appointing Mr. Richards to that task. (See April 1, page 905.) This course is logical, surely, for railway accidents are very destructive, both to property and to happiness; and so serious a disease demands the most expert doctor—that is, a specialist. The general manager, burdened with a great variety of other cares, is in somewhat the same situation as the family physician who has on his hands a dozen patients, each requiring a specialist in a different specialty. Specialist Richards differs, however, from the surgeon in that instead of himself cutting out appendixes or correcting deformities, he must try to instruct the sick person how to cure himself. If, as stated in the newspaper accounts, he is to inquire particularly into accidents which occur to employees from causes other than train accidents—that is, which are attributable usually to their own fault or the fault of a fellow employee—this is particularly true. In short, Mr. Richards is not a specialist in the prevention of accidents—there are too many kinds of accidents for anyone to attempt that role—but in the art of teaching other people how to qualify themselves as preventers. This is no easy job; and yet the lecturer, the inspector and the fault finder are by no means to be classed as useless or ornamental. Instruction in first aid to the injured has produced very definite results, as where a freight brakeman has saved the life of a man injured a hundred miles from a hospital. Instruction and reproof in the handling of explosives has reduced the railway death list from that cause immensely. Why should not instruction be proportionately successful in other lines? Doctor Richards cannot prevent a freight handler from dropping an anvil on his foot or a brakeman from falling off a car, but he can set men to thinking for themselves on these matters; and as regards many classes of accidents this is all that anyone can do. One of the best things that could be done for thousands of railway employees would be to compel them to read Mr. Richards' book on accidents at least six times, and to stand an examination on it.

In the Interstate Commerce Commission's conclusions in the exhaustive discussion of the substitution of tonnage at transit points there is one unconsciously naive comment on the question of agreement between railways in the making of rates. This comment made public by a commissioner so soon after section 7 of the administration railway bill has been dropped by Congress shows how ridiculous is the present law forbidding rate agreements and how unpractical is the attitude of Congress toward it. Commissioner Cockrell, in discussing competitive practices, says in his opinion: "The commission

is confident that if the carriers will join in the cancellation of the arrangements which they have built up for the purpose of withholding business from each other, they will be relatively as well off as they are now. * * *" Our only comment on this would be to suggest that the words "will join" be put in italics.

The conclusions of the commission as to the abuse of the transit privilege are sound insofar as they attack present conditions, but its only suggestion as to how these conditions may be remedied is to point out the benefits that have been derived from the adoption of the flat rate at the Missouri river. In the abstract of the case published in our news columns we do not print any of the discussion of the various kinds of abuses that have arisen under the transit rules, because these discussions have been very fully covered by the article published in the April 29 issue of the *Railway Age Gazette*, page 1078. The position taken by the commission is simply that it intends to enforce, by criminal proceedings against railways and shippers, if necessary, the conference ruling made on June 29, 1909, but it leaves the method of carrying out this ruling entirely to railway managers.

The decision of the arbitrators in the case of the New York Central & Hudson River conductors and trainmen is published in another column. Its merits and faults need not be discussed. The test of time is better. The effect on the conductors of fast trains between New York and Buffalo of a daily wage of $10.56 is worth watching with mild interest. The especial interest is in the personnel of the board which made the award. So it is worth while to follow the way these two men, who had been leaders of labor unions, conducted the proceedings. After the arbitrators had asked some questions so as to have it clearly understood exactly what questions they were to decide and whom their decisions would affect, A. B. Garrettson presented the case for the conductors. He took up one by one the changes asked by the employees, giving the reasons why they thought it just that they be granted. After rehearsing the history of the present movement to get the western wage scale in uniform operation on all roads in eastern territory, and giving his arguments for uniformity, he took up the proposals seriatim. W. G. Lee followed for the trainmen, speaking only of such particular points as Mr. Garrettson had not already covered in detail. A. H. Smith presented the railway's side. He began with a summary of the operating and competitive situation, earnings and recent improvements made by the New York Central. He pointed out that the work of conductors and trainmen was easier on a block signaled road than on other roads, showing how the New York Central is unique as an operating proposition, particularly concerning the work of employees. Mr. Morrissey said that he had never worked under block signals and asked questions as to the difference which this system made in the men's duties. A significant interchange on the subject of double heading occurred when Mr. Smith said he did not see why it was any harder on trainmen to ride behind two engines than one if the two engines did not pull a longer train than a single engine hauled over the greater part of the division. Mr. Lee thought that when an operating man made such a statement he did not feel that it required any answer. Mr. Smith said: "You are not going further into this then?" Mr. Lee said: "No," and Mr. Smith remarked, "I am disappointed." After Messrs. Garrettson and Lee had spoken again Mr. Smith spoke in rebuttal. W. C. Brown said that while the cost of living was now high, there were signs that it would soon decrease. It would not be fair to increase wages now to agree with the present cost of living because, as the labor leaders present knew as well as anybody, there would be a strike if they later tried to reduce wages to agree with the reduced cost of living. Throughout the hearings the attitude of the labor leaders toward the railway officers, and vice versa, was courteous and gave the impression that all the principals were trying unselfishly to work out what was best for the community at large. The questions asked by the arbitrators were to the point and indicated a fair state of mind. When either side put in statistics, questions were asked to make clear exactly where the statistics came from and what importance was claimed for them. The accuracy of statistics given by the railway company was not disputed. Sometimes the arbitrators called on the labor representatives for statistics for which they turned and asked the railway officers, saying that they would accept the figures they found for them.

THE GRAND TRUNK IN CANADIAN POLITICS.

A great debate in a parliamentary body brings out facts and side lights on fact. Such a field-day of debate came in the Canadian House of Commons on April 28. Its subject was the Grand Trunk's project of building, with large government aid, its new transcontinental line from Moncton, N. B., to the Pacific; and the immediate motion before the House was a resolution of the opposition calling for a royal commission to investigate alleged abuses in the financing and construction of the line. Through some 60 large pages of that document of the Commons which corresponds to our own *Congressional Record* the long debate pours—so long, indeed, and with such copious arrays of figures that the compass of a single day's session seems too narrow. That the debate is laced through with partisanship and that the final vote upon the motion appears to have followed party lines rigidly rather adds to than subtracts from its material meanings.

The original and main facts in the case are that seven years ago the Grand Trunk Pacific, a child of the Grand Trunk, entered into a compact with the Canadian government for a great transcontinental line. There were to be two divisions—from Winnipeg westward and from Winnipeg eastward. On the westward division, for some 900 miles of prairie construction, Canada was to indorse the Grand Trunk Pacific securities at the rate of $13,000 per mile and for the rest of the construction to the Pacific through the Rocky Mountains, some 850 miles, the government indorsement was to be at the rate of 75 per cent. of actual cost. The section from Winnipeg to Moncton, about 1,800 miles, Canada was to build herself and, when built, pass over to the Grand Trunk Pacific under a lease for 50 years. But for 7 years no rental was to be paid by the company and for the remaining 47 years 3 per cent. upon the cost of the division with interest added to the capital up to the date of transfer.

It is hard to condense nearly 60 pages of Canadian forensics into two paragraphs, but we take the plunge. The opposition leaders in their broad frontal attack charged that the Prime Minister, Sir Wilfrid Laurier, had, in 1903, asserted that the total money cost to Canada would be, finally, not more than $13,000,000, which figure had since grown "to a fabulous sum"; that between Quebec and Winnipeg, 1,404 miles, a suppositious route of milk and honey, pasture and grain lands, had turned out barren rock; that original estimates of the cost of the line based on engineering guesswork had been vastly exceeded and thirteen contracts alone show a rise from $37,340,723 to $60,792,969; that the eastern division by itself would entail a gross outlay by the Canadian people of $218,000,000, not including terminals and equipment; that the total cost of the whole transcontinental line (estimated) would be $318,000,000, of which Canada would at the outset pay $280,000,000 and again equipment and terminals not included; that the Grand Trunk Pacific with about a third the mileage of the Canadian Pacific would carry about the same fixed charges; that contracts for cuts showed in gross shape substitution of rock for soil for the benefit of the bidders; that the cost of four-tenths of the $10,000,000 to build the new Quebec bridge had not been charged to the transcontinental line as it should be; that between Moncton and Quebec the new line paralleled

the governmental Intercolonial for 100 miles and would shorten distance but 28 miles to gain which the government would pay the same number of millions or $1,000,000 a mile; that the government, while binding the offspring, the Grand Trunk Pacific, to favor Canada ports, had refused to bind the parent, the Grand Trunk, which could and would divert the new trade to Portland and its proposed new line to Providence, R. I., the latter line to cost $10,000,000, and that the contracting corporation would very likely in the end abandon the unprofitable eastern division and let the government operate it.

To these allegations of opposition speakers the government chiefly replying, it must be allowed pretty weakly, through Mr. G. P. Graham, Minister of Railways and Canals, answered: That engineers' estimates and returns showed in one case opposition error of $16,000,000, in another $42,000,000; that the Quebec bridge was a project before there was any thought of the transcontinental railway; that careful preliminary engineering would have indefinitely delayed the building of the through line which the people of Canada had definitely approved and which the opposition itself had favored; that Portland and Providence would be ports only for the overflow of business; that what on this side of the border line we should call "graft" in excavation contracts, had been exaggerated; and that the attack of the opposition was unpatriotic and of a nature to embarrass the Grand Trunk Pacific in raising funds abroad. In the outcome the government showed that in place of specific rejoinders it had the votes. The motion for a royal commission was turned down by 105 nays to 62 yeas, Sir Wilfrid Laurier, who had not spoken in the debate, being present and voting with the nays.

All of which indicates that with the railway in politics things are doing above our northern border and other things are brewing. As one little corner of the future it will be interesting to note how government pledges of Providence as merely an "overflow" point will square with the Grand Trunk's recent assurance that that city will be a big terminal and main port. In wider aspects the Canadian case brings a kind of negative consolation to us on this side the Canadian boundary. Railway questions we have had, are having and shall have enough of in Congress and to spare. But among them are not the complications of federal subsidies for railways and the scandals of which the Credit Mobilier exposures of 1873 were the climax and end. Is our Canadian neighbor to pass through the same disciplinary experience?

THE "LONG AND SHORT HAUL" QUESTION.

The "long and short haul" question usually bobs up when regulation of railway rates is being considered. As might have been foreseen, some long and short haul amendments have been propsed to the federal administration's railway bill. We published the Heyburn amendment in our issue of April 22, page 1060. Its enactment would prohibit the charging of a higher rate for a shorter than for a longer haul over the same line in the same direction under any circumstances whatever. The amendment reported favorably by the House committee on Interstate and Foreign Commerce is not so stringent. It provides that it shall be unlawful to charge more for a shorter than for a longer haul over the same line *or route*, "or to charge any greater compensation as a through route than the aggregate of the local rates"; provided that the Interstate Commerce Commission may, in special cases, authorize a higher charge for a shorter than for a longer haul, and provided further, that no rates lawfully existing at the time of the passage of the proposed amendment shall be required to be changed by reason of its provisions prior to the expiration of six months after its passage, nor in any case, where application shall have been filed with the commission, until a determination of such application by the commission. Senator Bristow, of Kansas, made a long speech a few days ago, in which he cited numerous freight rates west of the Missouri river to show that the railways under the existing long and short haul clause are discriminating between communities. No one denies that the railways in many cases are charging lower rates for longer than for shorter hauls, or that this involves discrimination, and, in many instances, very great discrimination. The real question is not whether there is discrimination, or even great discrimination, but whether there is wilful, unfair and harmful discrimination..

If some of these gentlemen who talk so much about railway affairs and know so little about them would but recognize the fact that the traffic managers of railways are influenced by the same motives as other commercial human beings, they might get a better understanding of why they sometimes make lower rates for long than for short hauls. Men like Senator Bristow always assume that this must be due to the caprice, prejudice, cupidity or malevolence of the traffic manager. But railways and their traffic managers are not in business to display caprice or to vent malevolence. They are in business to make money. This being so, is it not as plain as a pike staff that if something did not prevent them they would always charge more for a longer than for a shorter haul, simply because a longer haul costs more? Our friends who cannot imagine the traffic manager being influenced by any but sinister motives reply that the real reason why he sometimes thus disregards distance is that he wants to build up some communities at the expense of others. But why should he want to build up one community on his road at the expense of another on his road? He wants to get the largest practicable revenue for his railway; and if, for example, he makes a lower rate to San Francisco than to Reno, Nev., it is not because he loves San Francisco more or Reno less, but because, owing to controlling water competition at San Francisco he cannot get as high a rate to San Francisco. If he could get the same aggregate amount of revenue by always charging a higher rate for a longer haul he would always do so. When he accepts a lower rate to a more distant point it is almost invariably due to controlling competition at the more distant point which is not met at the nearer point, and usually the controlling competition is water competition.

Critics of the traffic manager's method of making rates reply that if he voluntarily reduces the rate to the more distant point to meet competition he should be compelled to proportionately reduce the rates to intermediate points. To force him to adopt this policy is the purpose of the Heyburn amendment. If it were passed, the railways would have to choose whether they would raise their rates for the longer or reduce them for the shorter hauls. Which they would do would depend on which they thought would least reduce their earnings. The transcontinental roads probably would raise their rates to the Pacific coast. That would eliminate *railway discrimination*, but it would not remove the *discrimination in rates*, because the steamship lines would still make lower rates to the coast than the railways make to the interior. If those who favor the Heyburn amendment really want to stop discrimination what they should do is to advocate a law to prohibit the steamship lines from making lower rates to the coast than the railways make to the interior. The railways then would cheerfully raise their rates to the coast and reduce them to the interior, and the discrimination would be abolished. But what our lawmakers who want to "soak" the railways actually do is to pass laws for the building of the Panama canal and the development of other waterways to compete with the railways and to cause them to reduce their rates, and then yowl because the roads fulfil expectations by meeting the low water rates, but without making equivalent reductions to points which the bounty of the government has not yet provided with waterways.

The amendment reported favorably by the House committee strikes out of the present section 4 of the act the words, "under substantially similar circumstances and conditions," which have been construed by the Supreme Court to give the railways the legal right to disregard the long and short haul clause when the circumstances of the hauls are, in the judgment of their managers, substantially dissimilar. The amendment, therefore, gives the commission complete power and discretion to determine when and where a lower rate may or may not be charged for a longer haul. It has been complained that the law as it stands gives the railways the power of "life and death" over communities. This is not true, but the proposed amendment would give this power to the commission. It seems probable the commission would construe the act as amended as in its early history it did the original interstate commerce act. It held then that market conditions and the competition of carriers were not sufficient to justify a higher charge for a shorter than for a longer haul. In the case of the San Bernardino Board of Trade versus A., T. & S. F., *et al*, it held that "the water competition which justifies a greater charge for a shorter distance by railways must be actual; possible competition will not justify such greater charge." These rulings were nullified by the Supreme Court, which said in one case: "Shall the government undertake the impossible but injurious task of making the commercial advantages of one place equal to those of another? It might as well attempt to equalize the intellectual powers of its people." If Congress should pass the proposed House amendment, the commission would be justified in assuming that Congress meant it to undertake this "impossible but injurious" task.

The enactment of the House amendment probably would be a less evil than the passage of the Heyburn amendment. The results, however, would depend mainly on the wisdom with which the commission administered the law. If it applied the long and short haul principle rigorously it would not only seriously reduce the revenues of many railways, but would greatly injure many commercial centers, without, however, stopping discrimination in freight rates. For, as we have said, that can never be stopped until the water lines are compelled to raise and keep their rates proportionately as high as the rates of the railways.

NEW BOOKS.

Cotton Mills of Alabama and Georgia. By H. E. Anschutz, C.E., Montgomery, Ala. Published by the author. Leatherette; 3¾ in. x 6 in.; map 20 in. x 30 in. Price, $1.00.

This little booklet contains a map, on a scale of about 1 in. to 18 miles, of Alabama and Georgia, showing the location of cotton mills. Accompanying the map is an index giving the index number of the mill, the county and town in which it is located, the number of spindles in the mill, the cotton consumption and the kind of power used. Besides showing the cotton mills it shows the location of water-power plants.

The Earning Power of Railroads, 1910. Compiled and edited by Floyd W. Mundy, of James H. Oliphant & Co. Published by James H. Oliphant & Co., New York and Chicago. 461 pages.

The 1910 edition of this book brings up-to-date statistics and facts relating to the earning power of nearly all the railways in the United States, Canada and Mexico. The introductory chapters explain the fundamental principles to be applied by the investor in studying the value of securities of a railway. The tables which follow give statistics as to earnings, mileage, capitalization, tonnage, etc. The figures given are in nearly every case taken from the annual reports of the railways, and are generally for the fiscal year ended June 30, 1909. The figures given are well selected and the book forms a handy reference for one wishing to obtain the main facts in regard to the present condition of railway properties.

Practical Talks on Contracting. Published by The Contractor Publishing Co., Chicago. Illustrated. Cloth; 6 in. x 9 in.; 128 pages. Price, $1.50.

From time to time valuable articles on the administrative features of contracting work appear in *The Contractor*. The book under review is a compilation of the best of these. Frank B. Gilbreth presents his ideas on organization in an article entitled "Systematizing a Contractor's Office." E. S. Hanson makes a careful study of conditions and methods in an article entitled "Between Profit and Loss," and also writes on "How Contractors Use Photography." A. O. Davison, in four articles, describes organization and office system for construction work, points out important things to consider in estimating, and gives his experience in the operation of camps and commissaries. C. Arthur Worden discusses, in five articles, liability insurance; purchasing, tool and equipment records; daily reporting system; and earthwork records. The remarkable changes taking place in the business of the contractor are partly due to such books as this. The contractor is no longer the rough workman risen from the ranks, but is a high-grade business man. He knows that all of contracting is not comprised in the actual work of construction, but that the manager is a factor fully as important as the working superintendent. This book is a good example of modern educational tendencies. The authors of the articles are practical men; they describe conditions as they find them and tell what they do in their daily work to reduce loss and insure profits.

Contributed Papers.

REASONABLE FREIGHT RATE.

BY F. H. PLAISTED,
Assistant General Freight Agent, Oregon Short Line.

I.

A common carrier, being a quasi-public concern, differs from strictly private concerns in two important particulars. (1) In selling its transportation the law permits it to discriminate between dissimilar things under the same conditions and between the same things under dissimilar conditions, but not between different persons or localities for carrying the same thing under the same conditions. (2) The law requires that the carrier's rates shall be *reasonable*, but has furnished no definition of reasonableness. Out of the widely different conceptions of *what is* a reasonable rate arise countless controversies.

COMMODITIES SOLD ON THE BASIS OF THEIR VALUE.

But if the business of the carrier differs from that of other concerns in the features just cited, it remains true that except for those limitations imposed by law and public policy, the carrier's business is just like any other business and, theories to the contrary notwithstanding, the application to it of rules or principles inapplicable to any other business will be found, if not impossible, at least ill-adapted to promote the welfare either of the carrier or the patron of the carrier.

The world's commodities are sold at prices based on value rather than cost. True, value has a relation to cost, as we shall see, still, generally speaking, it is proper to say of all commodities traded in by the people, railway transportation included, that the price to-day is fixed, not on basis of the cost to the seller, but rather of the value to the buyer. Experienced railway traffic men and many economists who have given the question careful study maintain that railway transportation, like any other commodity, can be sold in no other way on a basis fair to the shipper, fair to the carrier and meeting the ever-changing necessities of commerce. On the other hand, there are many American people who, ignoring

the rule governing the sale of all things else, contend that a different plant must apply to the business of the carrier and that the price of transportation shall be based solely on cost of service, the extremists advocating the European "zone" system or an out-and-out distance tariff, distance being a crude measure of cost of service.

Well convinced that as all trained railway men realize that the companies can permanently prosper only with their patrons, not at the expense of their patrons, so the studious and conservative element among the people equally realize that the public can permanently thrive only with the carriers, not at the expense of the carriers, and granting in the beginning general honesty of purpose on both sides of the controversy, who is to say whether the railway men or their critics know best? Between these two methods, so earnestly defended by opposing advocates, who is to decide? Believing that a frank statement of the reasons for the faith that is in us may assist toward a solution, we offer, from the railway point of view, these comments as to the merits of the two plans: cost of service vs. value of service as a basis for finding the reasonable freight rate.

IF COST OF SERVICE, WHAT COST?

It may be well to inquire at the outset what is meant by the term "cost of service" as used by the advocates of that plan? There are at least two bases for figuring cost of service in the running affairs of every concern:

(1) The entire cost of conducting the enterprise, which must include not only general cost of maintenance, operation and administration, but taxes, insurance, depreciation and other expense incident to operation, as well as so-called "fixed" charges (interest and the like): all items, in short, which go to make up the total burden and charge against the business. Of these some will vary with the volume of business done; others will remain the same and yet others nearly the same whether the plant is run to full capacity or not.

(2) Additional cost of doing additional business, as, in the case of a railway, of running an additional train; hauling an additional car; securing additional tonnage for a car which is being hauled or loaded; obtaining "back" loads for cars otherwise returning empty, etc.

For brevity these two bases will hereafter be designated as "entire cost" and "additional cost." They are two very different things, and as it is well for the truth seeker in the beginning to avoid confusion of terms, it is hoped, without going further into detail at this time, that the difference is manifest.

There are those who have reasoned that the lowest rate per ton per mile in effect anywhere on a railway may be assumed to cover at least the cost of the service, and that it would be fair to use this as a basis for rate making generally. Such reasoning is misleading. If by "cost of service" they mean to say "entire cost," then they are completely mistaken in believing that any abnormally low rate found to be in effect may be assumed to cover that; if they mean only additional cost of doing additional business, then they are generally correct so far, but to conclude from that that it will do to predicate rates generally on such a basis, one must first be able to believe that fixed charges, general maintenance charges and other items making up the entire cost of running a railway, but which are omitted in figuring additional cost of additional business, will get themselves paid in some way without any provision for raising the sum necessary out of the revenues of the business.

The cost of transportation per unit, say for hauling one ton one mile, using in the calculation merely additional cost of handling the additional ton, is necessarily much lower than the cost per unit if we mean entire cost of maintaining the enterprise. Additional cost, plus a profit, which, though small, may prove attractive to the carrier in disposing of surplus capacity and at the same time affording a necessary assistance to the business of a dependent producer, may yet well be, and in fact generally is, considerably below the figure required to meet the entire average cost of conducting the business. Hence, to say that abnormal rates, based on additional cost plus a small profit, may be assumed to cover entire cost, and may therefore be used as a measure for making all rates, is to assume that which is untrue and conclude that which is unfair. That the disposition to draw this unwarranted conclusion often acts as a deterrent to the carriers in affording necessary assistance to production which they might otherwise afford cannot be doubted.

GENERALITIES WILL NOT ANSWER.

If the business of railroading is to prosper and the demands of an expanding commerce are to be provided for, the returns from the entire volume of transportation sold must cover the entire cost of conducting the business plus a profit sufficient to attract the investment of the necessary additional capital, i. e., equal to the returns from other gainful occupations where the risk is no greater. That much is probably apparent without argument to support it. It is as true of the railway as of any other business.

But while it is easy to speak in averages and to agree upon generalities, is it, after all, very much to the purpose? John Doe, being told that the average of freight rates in America is lower than in Europe, replies that he is gratified to learn that that is so, but insists, nevertheless, that his freight rate is too high. Asked why he thinks so, he says that it is "because Richard Roe pays less"; and there we have the trouble in concrete form, which is not to be disposed of by any statement of generalities. It is not the body of rates, generally, that is challenged; it is the individual rate or the relation of rates. How is the rate in which John Doe is interested to be adjusted fairly with relation to other rates? Here we have thousands of John Does and Richard Roes interested in the movements of hundreds of different commodities and in hundreds of different movements of the same commodity. How is the price for these services to be apportioned on a basis fair to all? That is the problem and it is here it becomes necessary to leave averages and plunge into concrete things.

"ADDITIONAL COST" THE BASIS OF BUSINESS EXTENSION.

The object of the entire body of rates is to earn the cost of the service plus a fair profit, but while one rate is a normal rate, based on entire cost, another is an abnormal rate, based on additional cost, and which cost will form the basis depends upon the value of the service to him who buys it. When the traffic man figures close, as frequently he must in seeking to extend his business and protect the interests of the producer in his territory, in thinking of cost of service it is additional cost he has in mind as marking his danger line. From that he reasons just as the salesman of any other commodity reasons. The producer of the commodity offers the producer of the transportation what he considers to be the value of the service to him. That is, if he finds the rate in effect does not permit him to reach the desired market, he endeavors to demonstrate the fact to the railway traffic man, and his statement is that the rate is "prohibitive" or that his "business cannot stand" more than so and so. In other words, that if its price is marked at more than such a figure it will be more than its value to him, the transaction will not be made and the additional business will not be done. The transaction is just like any other transaction in merchandising. If the value of the service offers a profit over entire cost the railway salesman is well satisfied, indeed; if it be below that, yet promising some margin over additional cost of undertaking additional business, a bargain is usually struck and the necessary rate made. That is especially likely to be so if there are incidental benefits; as continued operation of a mine or manufacturing plant if the lower rate is established, where the alternative might mean a shut-down, because both the carrier and the community realize revenues in other ways by reason of such operations; the establishment of a new industry in the

territory, which aids development and brings other earnings to the carrier as an incident to its activities; the saving of a surplus agricultural product, as hay or fruit or vegetables, which, otherwise unsalable, would spoil and waste, yielding no returns to the producer and no business to the carrier, while if sold and hauled at some price, this value will be preserved to the producer and there will be in addition to the small profit out of the rate made for it, return hauls of other commodities purchased with these values to augment the business of the railway. Examples might be multiplied of these inducements to the traffic manager to sell his transportation at abnormally low rates, often dangerously near to the additional cost of doing the additional business.

The two principal counter influences are: First—The knowledge, ever present, that as all traffic cannot be carried on that basis, such adjustments must be undertaken only when the necessity for them is clearly demonstrated; and, second, the danger, also ever present, that pseudo-economists and not overcareful critics generally, challenging rates always by comparison, may be able, by citing some abnormal rate made because it was necessary, to force rates elsewhere to an abnormal basis when it is not necessary, i. e., where the necessity of the producer is served by the normal rate.

WATER AND MARKET COMPETITION.

Two of the prominent moving causes to the establishment of abnormal rates, based on additional cost, are: First, the existence at certain points of the competition of water carriers, either actually present, or, as defined by the commission and the courts, "potential," that is possible in case rail rates are not based so as to prevent it; or, second, market competition, being the competition of other producers of similar articles so situated as to cheaper cost of their output, proximity to the market or cheaper transportation to the market that the producer dependent upon the carrier for his entrance to such markets must receive its utmost assistance to reach them, i. e., the carrier as well as the producer himself must make close prices, basing them on additional cost only, in order to enable such business to be done at all.

The situation at the Pacific coast terminals and at many other points in the country presents both of these aspects; that of water competition which impels the carriers leading from the Atlantic to the Pacific to meet the competition of the ships, and that of market competition which induces the same or other carriers to equalize the interior producer by making the same rates, although in that case no water competition, as such, actually exists. In that state of things it devolves upon the carrier either to assist the producer dependent upon it for entrance to such markets in equalizing his price there so far as it can, or see the industry on its own line excluded therefrom. Yet when the railways have met that responsibility, to the incalculable benefit of producing communities all over the country, it has been received, not with praise that the carriers should have reduced some of their profits to the lowest possible limit where it was necessary in order that production might be fostered and widely diffused, but rather with bitter criticism that they would not therefore similarly reduce all their profits, whether it was necessary from the standpoint of the producer or not, and so go bankrupt.

POLICY FOLLOWED HAS MADE THE NATION GREAT.

It is the fact that the railways have realized their responsibility and met that situation that has made the country great; has made it grow in the interior as well as along the coast line as no country ever did before or ever could under any other policy, "Zone" system, distance tariff or what not. It is the effort to cripple the carriers' ability to continue that policy by attempting to use the cheapest rates resulting from it anywhere as the measure and maximum of all railway revenues which threatens the continuance of the nation's commercial and industrial welfare. Some railway critic has said that the practice of the railways in making abnormal rates, to meet water competition, from coast to coast, and other abnormal rates, to meet market competition, from the interior to the coast is forcing this country to "run to fringe." Is not the fact the other way about? If there were no railways the country would be nothing but fringe; densely populated only along the coast or the rivers. That much seems apparent. It is believed it is safe, also, to assert that if it were not for the policy of the railways to afford the interior producer his outlet to coast markets by basing rates when necessary on additional cost only, the result would be very much the same: the great interior empire would be bottled and would languish. That it has not done so; that the producer throughout the whole land is prospering, as no producer in any other country ever prospered; that even the ever-complaining jobber, having prosperous producers to whom to sell, is also prospering; that the whole country is growing and developing commercially and industrially as no land ever did elsewhere, ought to serve in some measure to justify the method of railway rate making which has been in vogue, to admonish caution against hurrying too rashly into the adoption of some other undemonstrated method, and to some extent to mollify the railway critic and induce him to see the justice of allowing the carrier a liberal share in the prosperity which its policy has been so potent in assisting to create.

THE RATE, TO BE REASONABLE, NEED NOT BE ALWAYS THE SAME.

Must a freight rate, in order to be reasonable, be always the same? Evidently not. It undergoes wide variations, some of which, being understood, are approved; while others, being misunderstood, are condemned.

The rate may vary on different articles for the same distance, according to weight, bulk, volume of movement, market value, etc. This is understood and sanctioned. It may vary for the same commodity for different distances, and that is approved so long as the rate rises with the distance. When, however, because of the necessity of the producer as against market competition, or because the carrier is compelled by water competition, abnormal rates, based with reference to additional cost only, are established, lower for the longer distance than the normal rate for the intermediate shorter distance, that is not comprehended and is criticised and denounced.

HIGH GRADE AND LOW GRADE TRAFFIC.

There are commodities which are low grade commodities because they sell for low prices. There are markets which are low grade markets because they are markets of low price levels, not only of many commodities, but of wages, including what the railway buys there as well as what it sells there—the result of conditions to which the railway must adjust its business and assist in adjusting the business of its dependent producer, but which it cannot control or attempt to reproduce elsewhere under different circumstances. Traffic may be low grade, (1) because the commodity carried is a low grade commodity, or (2) because the market to which it is carried is, with reference to that commodity at least, a low grade market. Traffic may be high grade because of the reverse of these states of things. Traffic which is low grade from either cause necessitates the establishment of abnormal rates, based on additional cost only, or the business of the carrier, as well as of the producer dependent upon it, must suffer loss; a loss, be it understood, which cannot benefit the shipper of high grade traffic, be it a higher valued commodity or a commodity moving to a higher grade market.

When higher rates, based a margin over entire cost, are charged on valuable commodities, while lower rates, based a margin over additional cost, are applied on heavy, cheap commodities, because otherwise the producer of the low grade article could not move it at all, the public seems to understand why that class of traffic may be taken at less than its full share of entire cost. It does not think because of that that the carrier should reduce all other rates to the same basis. But when there is other traffic which is low grade because of

commercial conditions, and for which the carrier is also compelled to make abnormal rates, based a margin above additional cost, or lose the business both for itself and its dependent producer, that is viewed in an entirely different light. Abnormal rates on that traffic, although not made from choice, but for the same compelling reason as in the other case, arouse the demand for the same rates on all traffic. How is it possible to make this matter clearer?

Although, barring the minor element of insurance, the cost of haulage is precisely the same, no complaint is heard because a car of dressed stone pays more freight than a car of rough stone; a car of high grade ore more than a car of low grade ore; a car of merchant bar iron more than a car of scrap iron; but when, similarly, traffic the ships would otherwise take, or an article produced in the interior which could not otherwise move to markets where the price is set by similar articles reaching there by water, is taken at abnormal rates, based on additional cost only, because if not taken at such rates it cannot be taken at all—what then? Loud protests unless the carrier stands ready to duplicate that basis on all its business, which it cannot do any more than any other concern could measure the profits of all its transactions by the profits of its cheapest transaction.

WHERE IS THE DIFFERENCE?

Will not some advocate of the universal cost of service doctrine please point out the difference between hauling a car of scrap iron 1,000 miles for a less rate than is charged for hauling a car of merchant bar iron 500 miles; and hauling a car of bar iron 1,000 miles to a market where the price is set by the same article reaching there by water at a less rate than is charged for hauling bar iron 500 miles to an intermediate market where the producer does not meet such competition and hence is able to pay the normal rate? Both these adjustments are made under the value of service plan. Since the cost of service advocates condemn the one, why do they not also condemn the other? What constitutes the difference? Under the cost of service basis a car of scrap iron moved 1,000 miles should pay double the rate for moving a car of bar iron 500 miles. Why doesn't it? Because the value of the service is less, and if the rate were not made on that basis the business would not move at all. The fact that such a rate is made where it is necessary, however, furnishes no reason why it must also be made when it is not necessary, which is just as true of the bar iron moving 1,000 miles to the coast market compared with the bar iron moving 500 miles to an interior market, as it is of scrap iron moving 1,000 miles to a scrap iron market compared with bar iron moving 500 miles to a bar iron market.

PRICES OF TRANSPORTATION ARE MADE IN THE SAME WAY THAT OTHER PRICES ARE MADE.

The carriers have always used the same method in marketing their commodity employed by other concerns in marketing other commodites. They have based their prices on the value of the service to the purchaser. We insist that not only is this the same method used by all others and that we are not different from others, but that it is the only policy under which the development of this country could have taken place and its diversified resources have been utilized, as well as being the only method of rate making which is logical and which, under the constant action of competitive productive forces, equalizes and counterbalances itself.

Value of the service, as used in fixing the price of transportation, means, roughly, fixing it at the delivered value of the article transported, less its F. O. B. cost and a profit sufficient to attract capital to its production. Having ascertained what that is, the traffic man is quickly able to determine whether his company can afford to engage in the transaction; whether, by joining hands, the producer of the commodity and the producer of the transportation will be able to enter a new field and extend the business of both. Generally speaking, that is the way in which a large proportion of rates are made; all rates, in fact, where we are seeking, as we usually are, to build up the territory and extend its business, and it is precisely the same method employed by those marketing other commodities and building up the business of other enterprises.

We build upon a foundation of *normal* rates, applying on traffic flowing in or out as an incident to the territory's productive activities, a superstructure of *abnormal* rates calculated to enlarge and extend those activities and consequently our own business and revenues as well as the business and revenues of the communities served. We believe the quarrel the people who share in the benefits of that policy think they have with us because of it can proceed only from misapprehension which it is the object of this article to remove. We sell as others sell on the basis of the value of what we have to sell. True, there is a large number of higher priced articles which move at rates away below the value of the service so calculated, but in striving to extend the business we hover continually between cost of service (figured more frequently than not on additional cost merely) and value of the service. When there is a margin ever so slight we generally attempt to enter the field.

PLAN IS ITS OWN CHECK AGAINST ABUSE.

That policy, pursued by every railway on practically every commodity, at least every heavy, important commodity, of commerce, is what welds the nation into an industrial whole and makes every section of the country competitive. This is true even as to points entirely local to one line, because other lines and producers on other lines, striving to extend their business and pressing for entrance into local territory, having reciprocal benefits to offer and controlling other competitive tonnage which they use as a leverage, generally succeed in securing the same treatment in local territories as elsewhere. Thus this method of rate-making, while fostering the diffusion of production and the activities of the producer, automatically protects the interests of the consumer by widening his choice of market, and while furnishing the maximum of elasticity and affording the freest possible movement of commerce, is its own check against its abuse.

(*To be continued.*)

SNOW REMOVAL BY STEAM HEAT.

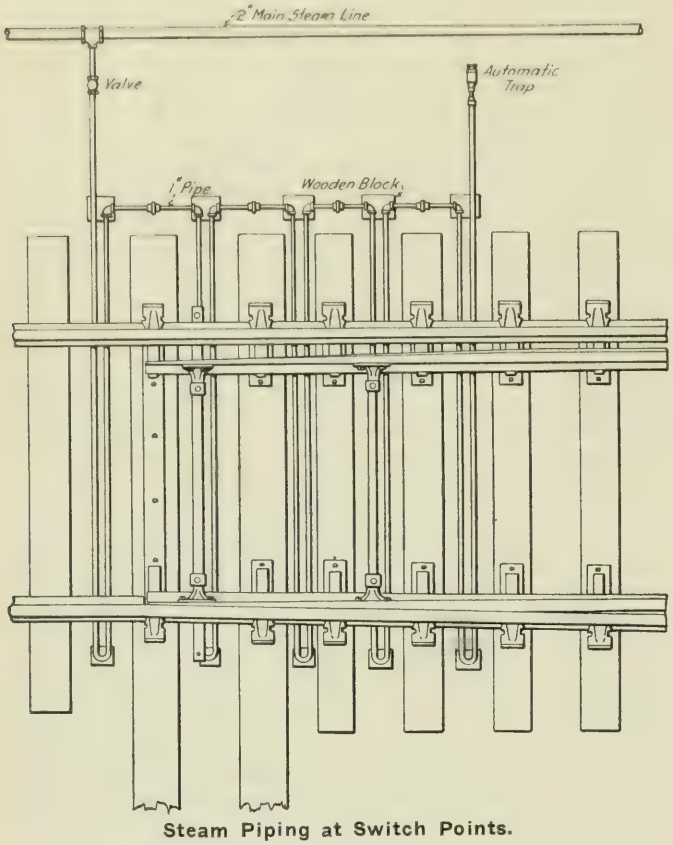
Trying to keep switches open by the use of brooms and shovels and by the application of salt, while effective in a storm of small proportions, is often futile in a blizzard of several days duration, even when a large body of men are employed with these tools. This is particularly true in terminal yards and at busy junction points where lack of room, the large number of switches and slip crossings, and perhaps difficulty in getting enough men, make it almost impossible to keep pace with the storm. The use of steam, gas or other heating agent for melting snow is not a new idea, but its mode of application and its effectiveness is always of interest. We are indebted to J. W. Foote, division engineer of the Erie Railroad at Jersey City, N. J., for the following information:

At the Erie Railroad terminal at Jersey City a system of steam pipes has been installed with decided effect. The steam is obtained from the power house in the Jersey City yard through a two-inch main and thence carried by one-inch pipes to each switch, two lines of pipe being placed between the switch ties under the points, the ballast first being removed. Automatic traps are placed to allow the condensed steam to run off, preventing freezing.

The plant was installed at a comparatively low cost to cover 26 sets of points and has been in service three years with excellent results. Throughout the several severe storms of the winter 1909-1910 the operation of the terminal interlocking plant was uninterrupted, and only a small force of men were required to clean the pipe lines and detector bars of the plant. The snow melts as it falls and no attention to

the points is required. The cost of maintenance is small, and but little steam is required to render the system effective.

The layout shown by the accompanying sketch could be ex-



Steam Piping at Switch Points.

tended to cover the detector bars and pipe runs of mechanical interlocking plants, the greatest source of trouble in a storm. This would make the maintenance of the plant practically automatic.

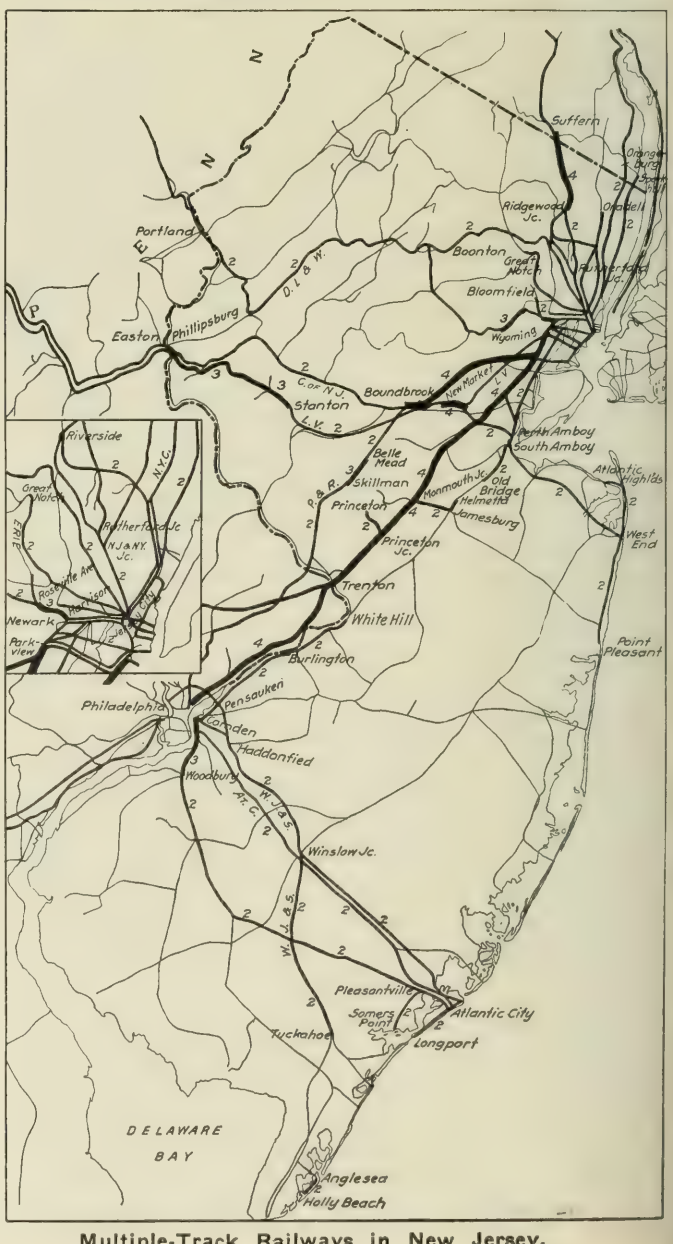
MULTIPLE TRACK RAILWAY LINES IN NEW JERSEY.

The map given herewith has been made to show the two-track, three-track and four-track railways in the state of New Jersey. In the small rectangle in the left central portion of the diagram the lines in and near Jersey City are shown on a larger scale. Similar maps of other eastern states have been printed in previous issues. The termini of the sections of line having more than one track are as follows:

NEW JERSEY.

Central of New Jersey.

	No. tracks.	Approx. miles.
Jersey City to Bound Brook	4	30
Bound Brook to Easton, Pa.	2	43
Newark to Jersey City	2	7
Newark to Perth Amboy	2	16
Perth Amboy to Point Pleasant	2	38
Atlantic Highlands to West End	2	10
Delaware, Lackawanna & Western.		
Hoboken to Portland, Pa (except as shown in next five lines)	2	..
Hoboken to West End Tunnel	4	1
West End Tunnel to Harrison	2	7
Harrison to Roseville avenue	3	2
Roseville avenue to Highland avenue	2	4
Highland avenue to Wyoming	3	2
Wyoming to junction with Boonton line	2	13
Roseville avenue to Bloomfield	2	6
Chester Junction to Port Morris	3	4
Erie.		
Bergen Junction to Sparkill, N. Y.	2	24
West End to Riverside	2	17
Jersey City to Ridgewood Junction	2	16
Ridgewood Junction to Suffern, N. Y.	4	11
Rutherford Junction to Ridgewood Junction	2	10
Rutherford Junction to Oxadell	2	11
G. L. Junction to Great Notch	2	14
Bergen Junction to Newark	2	7
Lehigh Valley.		
W. Newark Junction to Potters	2	2
Potters to Newmarket	4	16
Newmarket to Stanton	2	24
Stanton to Phillipsburg	3	23
South Plainfield to Perth Amboy	2	9
Newark to Jersey City	2	8
Pennsylvania.		
Jersey City to Newark	2	8
Newark to Trenton	4	48
Newark to Jersey City (N. Y. Bay R.R.)	2	7
Newark to Meadows (freight)	2	5
Rahway to Perth Amboy	2	7
Princeton Junction to Princeton	2	3
Frankford avenue, Phila., to Pensauken	2	2
Pensauken to West Haddonfield	2	7
Camden to Burlington	2	18
East Burlington to White Hill	2	8
Jamesburg to Helmetta	2	2
Old Bridge to South Amboy	2	7
Monmouth Junction to Jamesburg	2	6
New York Central (West Shore).		
Weehawken to Dumont	2	13
Dumont to Haworth	3	2
Haworth to West Norwood	2	3
West Norwood to Tappan, N. Y.	3	2
West Jersey & Seashore.		
Camden to Atlantic City	2	59
Atlantic City to Longport	2	7
Camden to Woodbury	3	9
Woodbury to Atlantic City	2	56
Pleasantville to Somers Point	2	7
Anglesea to Holly Beach	2	2
Atlantic City.		
Camden to Atlantic City	2	56
Winslow Junction to Tuckahoe	2	27
Philadelphia & Reading.		
Bound Brook to Belle Mead	2	10
Belle Mead to Skillman	3	4
Skillman to Pennsylvania boundary	2	25



Multiple-Track Railways in New Jersey.

TRANSPORTATION AND HANDLING OF STEAM COAL.

The committee on fuel supply of the Boston Chamber of Commerce has published a report on the buying and handling of steam coal, which was prepared to be of use to manufacturers and large coal consumers in selecting the coal best suited to their needs and in having it transported and handled by the most economical methods.

The committee on fuel supply was appointed in September, 1908, and its duties were outlined as follows: "To consider the fuel supply of New England—its source, quality and quantity, and questions affecting its cheaper production and supply; also the most approved means and appliances for the economic consumption of fuel." With these objects in view, the committee felt that an important part of its duty was to furnish all the information available to enable the consumers to obtain heat and power at a minimum cost, and to encourage the use of modern methods in the handling of fuels.

The field of work thus laid out was so broad that the committee decided to discuss one portion of it at a time, confining its first report to a study of the quality of the steam coals* and the method of their transportation.

This report gives a comprehensive survey of the rate situation with comparisons shown graphically by maps; tables of analyses of coals from the various districts that supply New England; production and consumption statistics, and other information of interest to coal consumers. The report is intended to illustrate to consumers the value of an intimate knowledge of the rate situation, transportation facilities, and the quality and freight cost of the different kinds of coal; and it is hoped that the report may be found useful as a handbook.

During the last 20 or 30 years coal has become of increasingly greater importance, not only to our industries but to our every-day life, and there seems to be every indication that this rapid growth will continue. A great increase has occurred at the same time in the use of electricity for light and traction until it has now, to a great extent, revolutionized the more antiquated systems of lighting, and has replaced the use of horses in our street railway traffic; in addition, there has been considerable substitution of steam and electric power for manual labor, and as auxiliary to water power. In the last ten years the mileage in electric railways in New England has increased from 2,220 miles in 1897 to 4,795 miles in 1907, or 116 per cent.; and the total production of electricity has increased to a much greater extent; this, coupled with the general increase in the use of power to supply the conveniencies of every-day life, has caused the consumption of coal in New England to increase much more rapidly than the value of manufactured products.

	1900	1905	Increase	Per cent. of Increase
Maine	$112,959,098	$144,020,197	$31,061,099	27.5
New Hampshire	107,590,803	123,610,904	16,020,101	14.9
Vermont	51,515,228	63,083,611	11,568,383	22.5
Massachusetts	907,626,439	1,124,092,051	216,465,612	23.8
Rhode Island	165,550,382	202,109,583	36,559,201	22.1
Connecticut	315,106,150	369,082,091	53,975,941	17.1
New England	$1,660,348,100	$2,025,998,437	$365,650,337	22 0

(Compiled from U. S. Census Report on Manufactures, 1905)

Value of Manufactured Products in New England.

In 1908 New England's total coal consumption was about 24,000,000 tons for which over $100,000,000 was paid. Exact statistics for previous years are not obtainable, but it has been estimated that there was an increase of approximately 100 per cent. in steam coal consumption in the ten years from 1898 to 1908.

An analysis of the expenditure of $100,000,000 shows that in round numbers only about $30,000,000 was paid for this coal at the mouth of the mine, while the remaining $70,000,000 was paid to the transportation companies and coal dealers for the delivery of the coal to the consumer.

	Anthracite	Bituminous	Total
Coal tonnage discharged at New England ports	5,095,518	10,917,029**	16,012,547
Coal tonnage received all rail	3,512,059	4,547,294**	8,059,353
Total tonnage	8,607,577	15,464,323	24,071,900

Includes railroad supply coal.

New England's Coal Consumption in 1898.

This high proportion of freight cost is due to the distance from the coal fields to New England and makes the problem one of great importance to our manufacturers. A consumer of coal in New England must bear in mind the large proportion of the total cost of fuel which the freight rate constitutes and must consider the quality of coal the more carefully. He must avoid paying a high freight rate on an inferior grade of coal, unless the price at the mines is enough lower to net him more available heat value per dollar than if the better coal were purchased. On the other hand, it must be remembered that the quality of some of the higher priced coals is not always proportionate to the price asked, so it is not always true that either the lowest priced coal on the one hand or the "best" coal on the other is the most economical to buy.

The importance of the relation between the cost of transportation and the quality of coal cannot be too strongly emphasized, as when a sufficiently high freight rate is paid, the better the coal the more economical it is. The relation between the quality of two coals remains constant regardless of price or freight, while the delivered prices grow proportionately closer as the freight becomes greater. The following case illustrates this relation:

B. t. u.*		Ratio of Quality	Price at Mines		Ratio of prices at Mines	Price at Mines	+	Freight	=	Delivered Price		Ratio of Delivered Prices
A 13500	=	93.1	$1.05	=	84	$1.05	+	$1.50	=	$2.55	=	92.7
B 14500		100.	1.25		100	1.25	+	1.50	=	2.75		100.
						or $1.05	+	$2.25	=	$3.30	=	94.3
						1.25	+	2.25	=	3.50		100.
						or $1.05	+	$3.00	=	$4.05	=	95.3
						1.25	+	3.00	=	4.25		100.

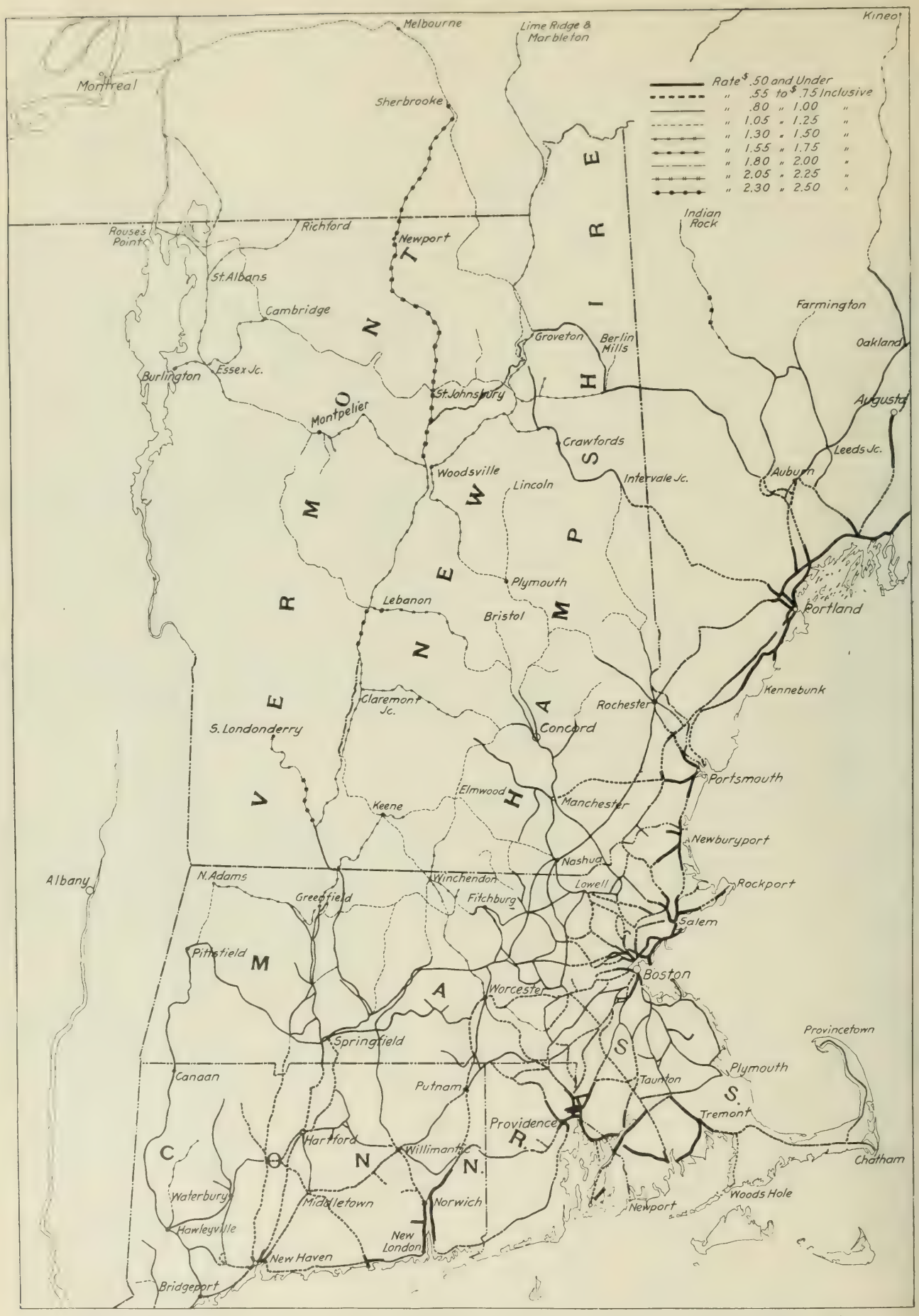
In the case above cited a coal containing 13,500 B.t.u. (A) sells at mine for $1.05, and one containing 14,500 B.t.u. (B) sells at mine for $1.25, the B.t.u. in A being 93.1 per cent. of the B.t.u. in B, while the mine price of A is 84 per cent. of the mine price of B. It is clear from this that for ordinary steam purposes, it having been assumed in this particular example that the value of the coal is based on the B.t.u., the lower grade coal A is much more economical at the mine than B. However, when a freight rate of $1.50 is paid on both A and B, the ratio of the delivery price rises to 92.7 per cent., very nearly corresponding to the B.t.u. ratio, so that the advantage in favor of the lower grade coal is practically wiped out, and when a freight rate of $3 is paid, which is not far from the average freight rate from the mines to interior New England points, the ratio rises to 95.3 per cent., thus making the higher grade coal the more economical. Similar instances might be cited in which the relation of price to B.t.u. would vary from the one quoted, but the above is shown simply as a typical example

	1903	1904	1905	1906	1907	1908
Pennsylvania bituminous	$1.32	$1.08	$1.08	$1.12	$1.16	$1.13
Maryland	1.66	1.33	1.28	1.33	1.34	1.31
West Virginia	1.31	.99	.96	1.06	1.11	1 06
Pennsylvania anthracite	2.28	2.13	2.05	2.07	2.14	2.13

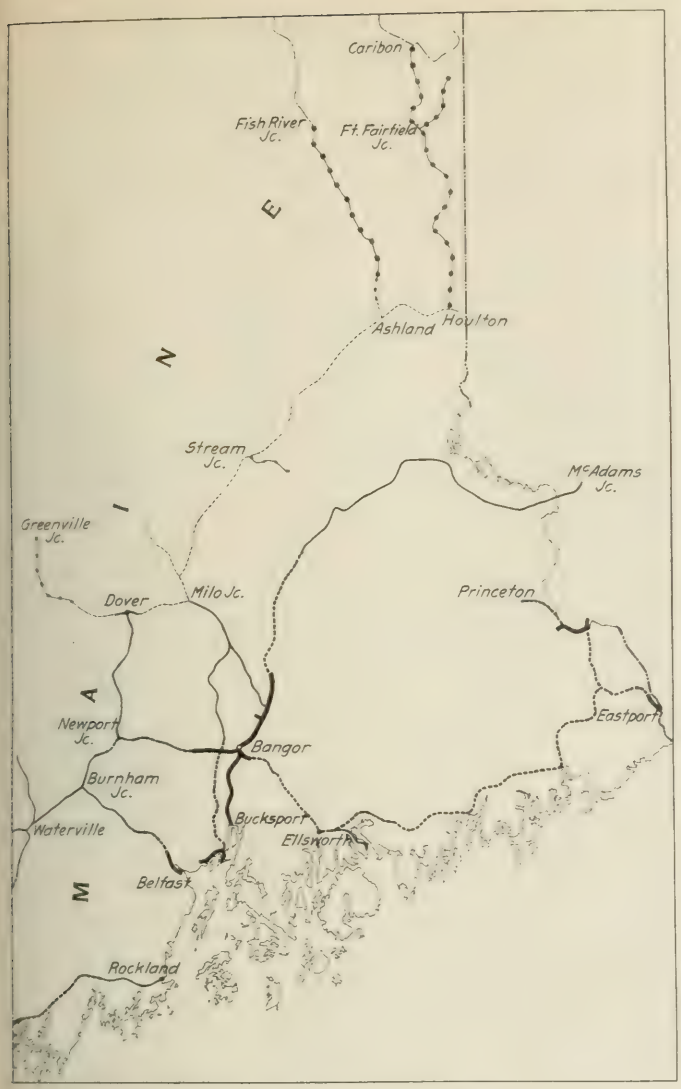
Compiled from U. S. Geological Survey "Mineral Resources of the U. S."—1908.

Average Price of Coal at Mines, 1903-'08, by States.

*In addition to bituminous coal, the sizes of anthracite known as No. 2 and No. 3 buckwheat are included under the heading of steam coals in this report.



Map of New England States, Showing Rates from New England Tidewater on Bituminous Coal.



Portion of Tidewater Rate Map.

of the difference in relations between high and low grade coals according to the amount of freight paid.

COAL ROUTES AND RATES.

In order to give a clear idea of the basis upon which New England's coal rates are made, a brief outline of the routes by which bituminous coal reaches us is given.

Coal routed all rail is loaded on the cars at the mouth of the mine, shipped over the originating lines to the junctions with the New England roads along the Hudson river: Boston & Maine at Mechanicville or Rotterdam Junction; Boston & Albany at West Albany Transfer; Central Vermont Railway, and Rutland Railroad, via Rouses Point; New York, New Haven & Hartford at Jersey City, or Maybrook Junction; and is carried by these lines either direct to the consumers or to the local dealers who store it for subsequent distribution.

About 70 per cent. of our coal reaches us by tidewater. This is loaded on the cars at the mines and shipped over the coal roads in train-load consignments to the seaboard, the distance varying from 200 to 400 miles. The principal ports of transhipment are Newport News, Norfolk, Philadelphia and Baltimore. At these ports the coal is dumped from the railway piers into the sailing vessels, barges or steamers, and transported to the various ports along the New England coast, where it is delivered direct to such industries or dealers as have discharging plants at tidewater; or else transferred through public discharging plants to cars for reshipment.

To get a good understanding of the coal rate situation, a study must be made of the maps and tables accompanying this report. There are two maps, one showing the all-rail rates from the mining districts to New England territory, and the other the rates from New England tidewater inland. These maps are compiled from the published tariffs issued by the railways, effective August 1, 1909.

The maps are so compiled that a consumer by comparing the rates with tables of analysis can get, approximately, the relative value of all coals, whether shipped via all-rail or tidewater. He can determine exactly the lowest all-rail rates from any coal field to his plant, and the approximating comparison of the tidewater rates.

In addition to the figures, giving the actual rates, line symbols are used to bring out broad variations in the rates, thus showing the general principles upon which the rates are based. Each line symbol on the map covers a 25-cent range of rates. [On the map from which these illustrations were made, colors are used instead of these line symbols.] Wherever there is a change of rate within the same color group, it is indicated by means of a transverse red line at the point where the change occurs.

This system of symbols brings out clearly the effect of competition on rate-making; not only where two or more roads supply coal to the same district, but also the broader influence that tidewater competition has on the all-rail rates. For instance, the tidewater rates show a rapid rise inland from distributing ports, while the all-rail rates eastward increase with some degree of regularity until they approach tidewater, when they gradually decrease; the result being that the through combination of rail and tidewater rates meets the all-rail rates at points varying from 25 to 50 miles from tidewater.

The chart shows the average monthly vessel rate from Hampton Roads or Philadelphia to Boston. The rates to other New England ports may be approximately determined from the following table:

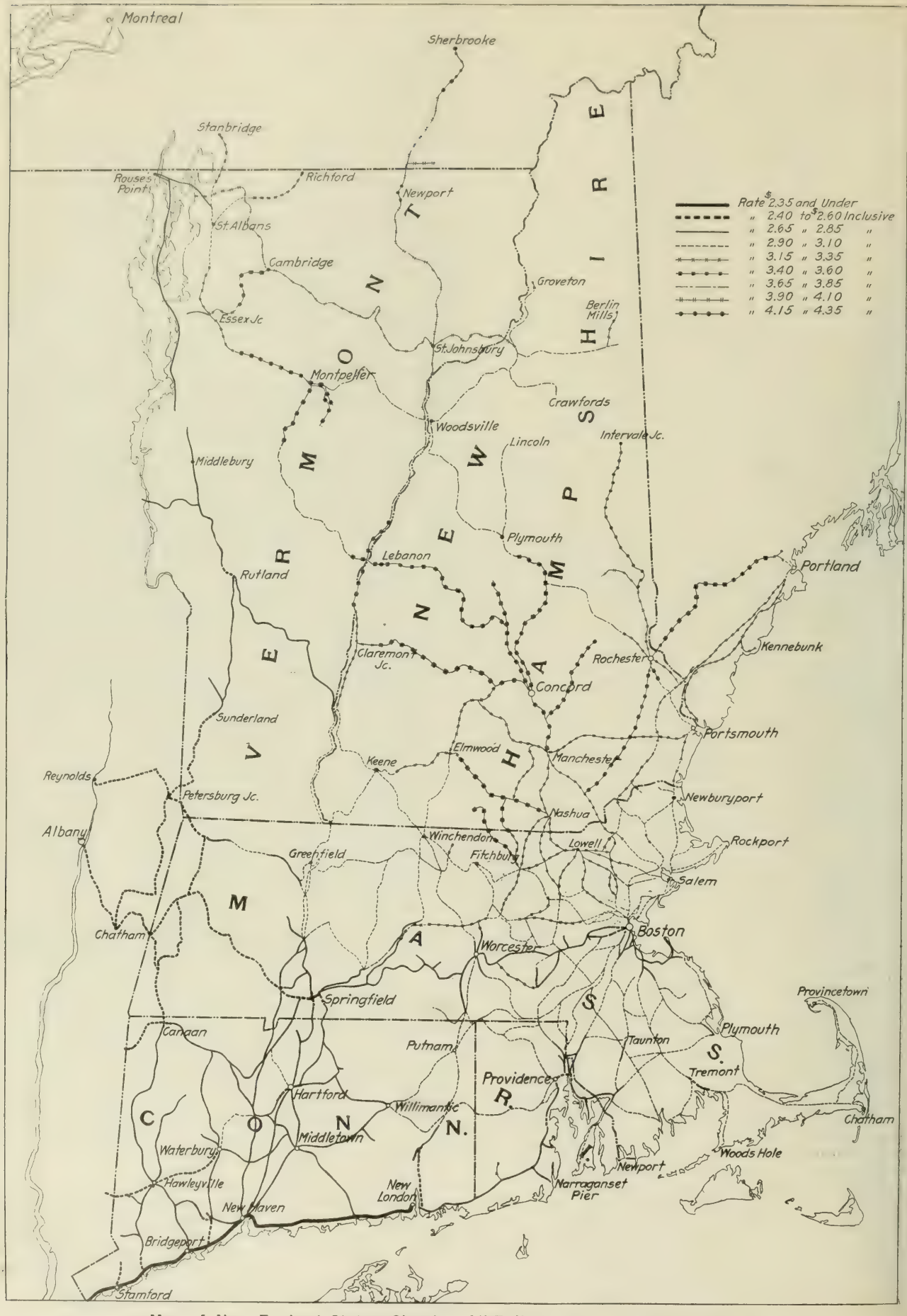
Salem and Portland	Same as	Boston rate
Newburyport	15 to 25 cts.	more than
Portsmouth	5	" " " " "
Bath	10	" " " " "
Gardiner	20 to 30	" " " " "
Augusta	25 to 40	" " " " "
Belfast	20	" " " " "
Bangor	15	" " " " "
Bucksport	20 to 25	" " " " "
Searsport	10	" " " " "
Calais	25	" " " " "
Eastport	25	" " " " "
Providence	10	" less " " "
Fall River	10	" " " " "
New Bedford	10	" " " " "
New Haven	5 to 10	" " " " "
Norwich	5 to 10	" " " " "
Allyn's Point	5 to 10	" " " " "
New London	5 to 10	" " " " "
Wareham	25	" more " " "
Hyannis	25	" " " " "
Fairhaven	25	" " " " "

The above variations in rate are due, first, to the depth of water at the various ports, which controls the draft of vessels entering; second, to arbitrary towage charges incurred at points where towing is necessary on account of narrow winding channels, tides and currents, and third, to distance.

Since the publication, by the Boston Chamber of Commerce, of the maps, information has been received that the railways, complying with a decision of the Interstate Commerce Commission, have ordered a reduction in rates of 15c. per ton on shipments from the Georges Creek, big vein, and Elk Garden districts when for reshipment by wated. The revised rates will then be the same as those applying on Georges Creek, small vein coal, as shown in table on tidewater map.

TRANSPORTATION OF COAL.

During the last decade great advances have been made in the methods of handling coal, both by rail and water, in its passage from the mine to the consumer. Coal roads have been built that run at a very low grade direct from the mines to tidewater, over which unbroken trainloads of from 2,500 to 3,000 tons are run direct to the piers, where expensive plants of the most modern type load the coal into vessels.

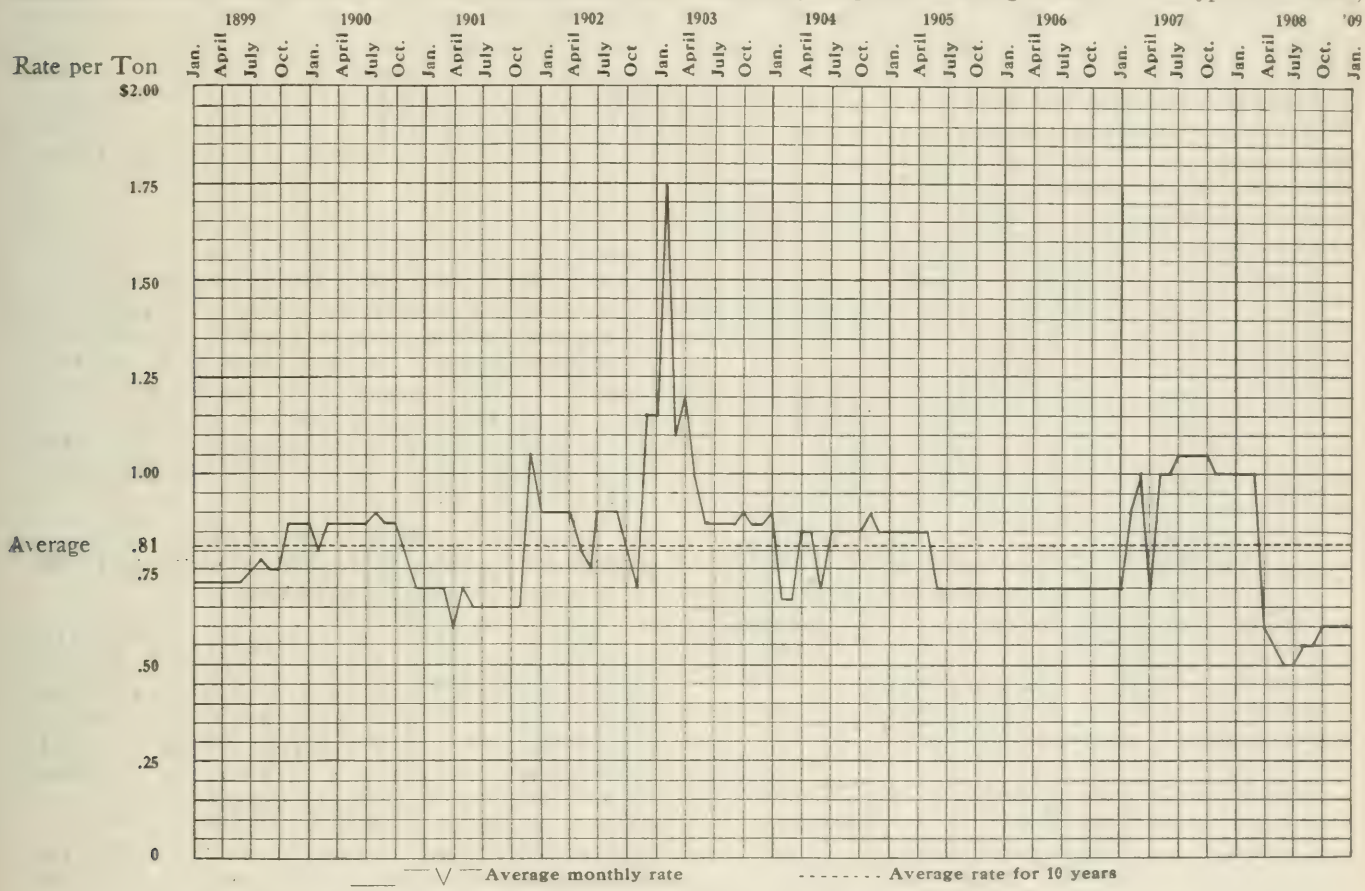


Map of New England States, Showing All-Rail Rates on Bituminous Coal.

Steamers and barges especially built for coal transportation have, to a large extent, replaced the schooners and tramp steamers in the trade to the more important receiving ports; discharging plants at the receiving ports have been greatly improved; the railways are substituting dump cars for the old shovel-out cars; and the more progressive consumers are establishing trestles, conveyors and other mechanical devices so that their coal may be stored and handled on the most economical basis.

This development, however, has been very uneven: for example, even in New England's largest industrial centers, located on the main lines of transportation, many antiquated appliances and methods for handling coal are still in effect. Such uneven development may be a temporarily necessary accompaniment of any rapid transition such as that which coal transportation is at present undergoing.

As has been shown, the facilities of the producers and the transportation lines are fast becoming modernized; but the consumers, owing to the diversity of their individual interests, have not as yet concentrated their efforts toward improving their facilities and adopting modern methods, although it is certain that the railways would find it to their own interest to encourage in every way the adoption of improved methods as rapidly as the consumers would do their share; but there is no reason why consumers, transportation lines and producers should not all work together to adopt the best modern methods for handling coal.



Average Monthly Vessel Rates on Coal, from Hampton Roads and Philadelphia to Boston.

WATER-BORNE COAL.

There are many problems in the handling of coal by water which have not yet been thoroughly worked out. The economy in the transportation of coal by sailing vessels comes from the comparatively small original outlay, natural motive power and the cheapness of operation. Consequently, when engaged in a class of traffic where regularity of service is not required, and delays cause little inconvenience, the sailing vessel is the cheapest method of transportation. On the other hand, a coal steamer, while requiring a large original outlay and large expense to operate and maintain, is capable of much more regular service than the sailing vessel, and is, therefore, best suited for a trade where speed and service on schedule time are needed.

It is becoming more and more essential to have a constant and well regulated supply of coal arriving at our larger receiving ports in order to obtain the greatest economy in operation of railways, discharging plants and vessels. This is due to the large amount of money required for the original investment and for the maintenance of a modern discharging plant, and to the heavy demurrage collected on coal when lying in the harbor waiting to be discharged.

At present the handling of water-borne coal at our larger ports is greatly hampered throughout by the great variety of vessels engaged in the trade. For, first: no loading or discharging plant can be built so as to handle economically steamers, barges and sailing vessels of all types and sizes; second, as all vessels must wait their turn at each end of their trip, the quickly loaded and discharged modern coal steamers that rely on their speed and regularity of service to obtain economy are often delayed several days by schooners which have been retarded by a storm and have arrived in a fleet with the first favorable wind, and many of which cause further delay, having hatches and holds so constructed as to make them very slow and difficult to unload; and third, no loading or discharging plant, or railway terminal, can be run economically when there is such great irregularity in the supply of business. Consequently, a system should be developed whereby ports with a large demand for coal can be mainly supplied by steamers of a standard type running regularly between plants specially built for loading and discharging them; while the smaller ports capable of receiving light draft vessels only and the irregular trade will continue to be supplied by barges and sailing vessels.

UNLOADING AT DESTINATION.

There seems to be no stage of the handling of coal where the installation of modern methods is more needed than at the unloading plants of the consumers and dealers. The methods in use at present, like all other stages of the handling of coal, are in a state of transition between the old custom of shoveling out all cars by hand and the modern method of unloading by dump cars run on trestles and by grab buckets, conveyors and other appliances. In 1908 about 55 per cent. of the coal delivered along the lines of the three largest New England railways had to be shoveled from the cars at a labor cost of about 15 cents per ton; the other 45 per cent., which was delivered almost entirely to large consumers and local dealers, was unloaded chiefly by trestle dumps.

Owing to this diversity of conditions, the railways find it almost impossible to arrange the distribution of cars to satisfy all. They are called upon to furnish modern plants entirely with modern cars and old-fashioned plants with shovel-out cars. As a result, the consumer installing a trestle has to figure on having from 10 to 35 per cent. of his coal delivered to him in shovel-out cars, and the true economy of modern apparatus is not realized.

This is only a temporary drawback, for as more trestles are installed, fewer shovel-out cars will be used by the railways, inasmuch as the roads find it to their advantage to get the rapid car circulation made possible by quick unloading and are therefore replacing as fast as possible their worn out cars by various types of modern dump cars.

A circular was sent to a large number of steam-coal consumers requesting information as to what facilities they had for handling modern coal cars. The form of and results of which are as follows:

DATA ON CONSUMPTION AND FACILITIES FOR HANDLING COAL OBTAINED BY CIRCULAR SENT TO INDIVIDUAL PLANTS

225 FIRMS REPRESENTING 1,724,075 TONS.

1. The distribution of the above tonnage was as follows:

Massachusetts	1,524,695
Maine	105,550
New Hampshire	41,500
Connecticut	38,660
Rhode Island	11,870
Vermont	1,800

2. About 25 per cent. of the firms did not know what particular kind of coal they were using.

3. Out of 225 firms, 48 state that they have facilities for handling dump cars. The percentage of dump cars supplied by the railways to these 48 firms was as follows:

20	were supplied with practically 100 per cent.
3	" " " between 75 and 90 per cent.
2	" " " " 50 and 75 per cent.
2	" " " " 25 and 50 per cent.
3	" " " less than 25 per cent.
2	" " " none.

16 did not specify.

4. Large coal consumers having no storage facilities, thus requiring daily or weekly deliveries from local dealers.

Number.	Total tonnage.	Average tonnage.
42	86,150	2,050

5. Steam coal consuming industries having railway connections, but lacking facilities for handling modern dump cars:

Number.	Total tonnage.	Average tonnage.
26	101,200	3,900

Of these 26 industries, six, consuming annually 46,000 tons, team their coal from dealers to their plants.

6. Source of coal purchase by above firms:

Mining district.	Tonnage.
New River	598,350 tons.
Pocahontas	269,635 "
Georges Creek	206,165 "
Cambria County	141,905 "
Somerset County	127,000 "
Clearfield	84,565 "
Canadian	68,000 "
Anthracite—buckwheat and bird's-eye	67,200 "
Broad Top	14,515 "
Pittsburgh	14,500 "
Westmoreland	1,700 "
Tioga	1,600 "
Kanawha	1,000 "
Not specified	127,940 "
Total	1,724,075 tons.

An analysis of statements showing the cost of unloading at individual plants, which were kindly furnished by several large New England manufacturers, shows that there is a saving of from 8 to 12 cents per ton in the operating cost of unloading coal by trestle over the old method of shoveling out cars on sidings. A great advantage is also gained by quick unloading, assured storage facilities and prompt release of cars. One of these letters is as follows:

June 2, 1909.

Mr. JOHN S. LAWRENCE, Chairman Committee on Fuel Supply, Boston Merchants' Association, Boston, Mass.

Dear Sir: In reply to your letter of April 28th, we give below some figures in regard to the cost of unloading coal from drop-bottom, drop-sides and shoveler cars:

Cost of Unloading a 25-Ton Car of Soft Coal.

Drop-bottom car	$0.60
Drop-sides car	.72
Shoveler car	1.75

Cost of Unloading a Cargo of 1,468 Tons Recently Received.

13	drop-bottom cars,	25 tons	$9.80
32	drop-sides "	25 "	22.64
21	drop-sides "	17 "	15.12
66		1,468 tons	$47.56

$47.56 = $0.0324 per ton.

This cargo was received on an empty trestle; coal received on a full trestle costs just twice as much, or $0.0648 per ton, as the coal has to be trimmed back.

In the last few years many small consumers have come to realize that a considerable saving can be made in their fuel bill by erecting a modern unloading plant; and under normal conditions the trestle seems to give the greatest economy and satisfaction. But the cost of installation varies so greatly with the local conditions that it is impossible to estimate the quantity of coal which must be handled annually to make a trestle an economical investment. Most of the New England railways make it a custom to encourage private concerns to install modern unloading plants by furnishing plans and estimates of cost.

BILLS OF LADING.

In the past there has been much complaint on the part of consumers that the coal received has not been that which was ordered, and they have been unable to substantiate their claims because of failure to have in their possession a copy of the bill of lading. Consumers, therefore, should make it a practice to secure bills of lading for every car of coal, as they furnish certification of the exact car shipped in case of dissatisfaction with the quality of the coal received

In a subsequent issue of the *Railway Age Gazette* that portion of the report referring to the analysis and buying of steam coal will be published.

INCREASES IN MOTIVE POWER EXPENSES DUE TO SEVERE WEATHER.

The severe weather of last winter caused extremely heavy increases in the expenses of the motive power departments of various railways, and especially those in the West. The reports of the Chicago & North Western show that its operating income for January, 1910, was $818,818 less than for the same month in 1909, and the main reasons given for this decrease in net earnings are increases in operating expenses due to inability to get sufficient fuel at reasonable prices, engine failures and a superabundance of snow and ice. The fuel bill for January alone, it is said, amounted to $300,000. The published reports regarding the Chicago, Milwaukee & St. Paul show that its operating expenses for the eight months ended February 28, 1910, were $4,000,000 greater than for the corresponding period of last year, and that of these additional expenses $345,000 was due to increased cost of locomotive repairs, $900,000 to increased expenditures for fuel, and $496,000 to increased wages of enginemen and trainmen.

Another western line, whose motive power expenses were likewise very heavily increased by the severe weather, has made a detailed investigation of all the various conditions which caused the increase. No doubt the conditions which produced these results on the railway in question are similar to those which brought about similar results on other roads, and, therefore, the following very full abstract of a report of its investigation, which related principally to operation during the month of December, 1909, will, no doubt, be of widespread interest to motive power and operating officers:

Just at this time a large number of new engines, equipped with devices which were new to the enginemen were received.

These engines came at a time when the weather was extremely cold, and the power already in service was affected thereby. Under these conditions the efficiency of the engine handlers and attendants became low. The service was also seriously affected by the natural tendency of the older and more experienced enginemen to seek every excuse and subterfuge to lay off in order to escape the extreme weather and the new engines, thus bringing into service a large number of less experienced, also inexperienced enginemen.

The roundhouse facilities at one of the principal terminals were altogether inadequate, due to reconstruction, and the same is true of another roundhouse which was too small. Engines were practically unhoused much of the time during the extreme weather at both points.

The analysis which has been made shows that the greater part of the increase in engine failures during the winter months was caused by trouble with boilers. Seven distinct reasons for the failures stand out clearly, as follows: Cold weather; long time on the road; increase in coal consumption; poor coal; absence of regular crews from engines; inexperienced firemen; receipt of a large number of new engines at times when conditions were adverse. Each one of these items will be discussed more in detail: it seems evident that each of these causes contributed to a greater or less degree to the large increase in engine failures for the months of October, November and December.

The United States weather bureau reported for December, 1909:

"The month was decidedly cold, somewhat moist, with a percentage of sunshine slightly above normal. It was the coldest December on record (twenty-three years), the mean temperature of the division being 8.3 degrees below normal."

The speed of freight trains fell off in December, 1909, about 10 per cent. compared to November, showing that the engines were on the road that much longer, resulting in increased strain on fireboxes and boilers, and this, with the cold weather, would naturally tend to increase boiler failures. The amount of coal burned per 1,000 ton-miles increased very much during the months of October and November, 1909, and in December reached the highest point in three years.

Eastern Division.

1909.		Previous High Mark.	
October	215 lbs.	January, 1909	258 lbs.
November	255 "	February, 1908	266 "
December	270 "		

This result is, in a measure, due to the severe weather conditions, and indicates that the engines were working harder than ever before, with resulting increased deterioration of fireboxes and flues. There can be no question but what a large per cent. of the coal received during the last three months of the year was of an inferior quality, which no doubt was due to the large demand for better grades of coal for commercial and domestic uses. Furthermore, it was observed that much of the coal delivered to the engines during December had been exposed to rains and freezing, resulting in a large amount of ice being mixed with the coal when received. The result of the inferior coal, and the ice in the coal, was an increase in failures due to engines not steaming.

Each of the large freight engines on the Eastern division had a number of different engineers and firemen during the month, and this condition alone is enough to increase the engine failures to a marked degree. Note particularly engine 521, assigned to the Eastern division with 12 engineers and 20 firemen. This engine had seven failures as follows: 1, air equipment; 1, valve; 1, motion work; 4, leaky flues. Also engine 475 on the Southern division with 16 engineers and 17 firemen. This engine had three failures as follows: 2, not steaming, grates loose; 1, dump grates broken. Engine 482 on the Middle division with 15 engineers and 18 firemen had three failures as follows: 1, broken valve stem; 1, engine lame; 1, engine valves blowing. Engine 670 on the Western division with 12 engineers and 15 firemen had four failures as follows: 1, broken eccentric strap; 1, not steaming; 1, loose eccentric strap; 1, broken valve and rocker arm. Engine 1028 on the same division with seven engineers and 15 firemen had three failures as follows: 1, broken piston; 1, broken side rod pin; 1, not steaming.

The statistics appearing above would seem to indicate that at least during the month of December the policy of keeping regular crews assigned to engines had not been followed, and this at a time when the rigors of winter demanded that experienced men, familiar with their engines, should be in charge of them.

As stated above, a number of the older enginemen apparently avoided service during December. In such case it would seem that an extra crew should have been assigned to the engine until the regular crew reported for duty, instead of a new crew each trip. As a corollary to the disposition of the older men to avoid service during the rigorous weather and the coming of the new engines, it became necessary to promote a number of firemen and hire new firemen. About 100 new firemen were employed on the Eastern lines alone from October 1 to December 31. So large an increase in the number of inexperienced firemen under such unfavorable weather conditions caused a large number of failures because of sheer inability of the new men to fire the engines.

During the month of December there were received on the line, and placed in service, 27 new engines. These are of the most modern type of locomotive and contain innovations with which roundhouse forces and enginemen were not familiar. These engines were set up and broken in during this period and in consequence contributed a larger proportion of failures than would have resulted from older engines in similar service under the same conditions. Seven of the new engines which were received were assigned to the Eastern division and 24 failures occurred on them during the month of December, 11 of which were front end failures and 10 firebox failures. The evident weakness of the front end of these new engines is being rectified.

The failures for December, 1909, for the entire system increased in all cases over October and November, and reached new "high" records since May, 1907, as follows:

Cause of failure.	Dec., 1909.	Previous high record.	
Air equipment	99	October, 1907	76
Pistons & packing	76	July, 1907	70
Injectors	84	September, 1907	68
Foaming	36	January, 1909	32
Fireboxes	275	December, 1907	110
Front end	80	December, 1907	50

The increase in failures due to air equipment may be traced almost wholly to the extremely cold weather. The failures due to hot bearings, valve and valve motion, pistons and packings, injectors and foaming all show increases, but not to the alarming extent of the failures due to leaking and not steaming.

A further subdivision relates to boiler and firebox failures for the system, as well as on the Eastern lines, under the following headings: Leaky flues, leaking firebox, firebox troubles, grate rigging, steam pipe leaking, nozzle leaking, front end rigging misplaced. There is a general increase for October, November and December, 1909, in all cases except front end rigging misplaced. However, there is an increase in leaky flues, and an enormous increase in fire troubles and grate rigging failures. The following tables cover Eastern lines only:

Failures Due to Leaky Flues.

1909.		Previous high records since June, 1906.	
October	58	September, 1907	50
November	70	November, 1908	50
December	70		

Failures Due to Fire Troubles.

October	20	October, 1906	19
November	28	November, 1907	18
December	123	January, 1909	15

Failures Due to Grate Rigging.

October	21	August, 1907	21
November	28	November, 1907	20
December	49	February, 1909	19

The following tables for the Eastern lines show that the money spent on repairs to engines has increased about twice

as rapidly as the gross tonnage, which should indicate that the engines were kept in better repair than the year previous:

	Increase over 1908.		
	October, 1909.	November, 1909.	December, 1909.
Repairs to locomotives	39.7	38.3	45.0
1,000 gross ton-miles	18.3	21.9	13.9
Locomotive miles	14.0	17.3	17.7

From what has been stated it is obvious that the increase in engine failures was not due to the poor condition of the power, or lack of force to maintain it, but to the severe weather and the unusual and unfavorable conditions attending locomotive operation when the temperature continued very low during several months.

THE NECESSITY OF CARE IN THE INTERPRETATION OF RAILWAY STATISTICS USED COMPARATIVELY.

BY ERNEST RITSON DEWSNUP.
Professor of Railway Administration, University of Illinois.

The growth in importance of the railway has given to its statistics a publicity and a popularity hardly exceeded by those of any other economic undertaking, and of no country is this truer than the United States. Governmental activity has been a stimulating cause of this abundance of information, but the railways themselves have come to realize that it is good policy to be less reserved in their relations with the public than they have been. Thus, a much larger amount of information has been made accessible than government schedules have called for. The facts available, however, have not always been analyzed with due discrimination. Statistical material is highly dangerous to handle, and even those familiar with its treatment have to act with the utmost wariness and discretion. Its way is not so plain that a wayfaring man, though a fool, need not err therein. Defective comparison, arising out of the omission of vital facts, is common. Certain more or less traditional methods of presentation are followed that assume to carry with them illuminating exposition of vital points of railway development and operation, but are more remarkable for what they fail to tell than for anything they do tell. Brevity is the soul of wit in railway statistics as elsewhere, but it can be pushed to the verge of obscurity and, quite frequently, to the point of insufficiency. Another class of defects in statistical comparison arises from a lack of appreciation of the real significance of the data used: the statistician fails to make himself acquainted with the intrinsic worth of his figures. Nothing can be more inimical to the soundness of statistical logic than a hasty acceptance of material used at its superficial value. It is absolutely essential to scrutinize rigidly methods of compilation. Carelessness or oversight in this connection is responsible for many erroneous analyses and vicious comparisons. The following pages contain a brief review of some of the more important railway statistics in the use of which for comparative purposes the writer has observed more or less serious errors. Some of the points touched upon raise issues of considerable dispute, and, if it seems that such are treated too cavalierly, it must be remembered that this is inevitable in a general treatment of restricted length; at a subsequent time it may be possible to discuss these issues more in detail.

FREIGHT HOUSE TONNAGE COSTS.

A good example of the difficulties besetting the path of the statistician without adequate technical knowledge of his facts is to be found in freight house tonnage costs. Freight house operation seems to be very similar, in a general kind of way, wherever it is carried on, and, therefore, fairly capable of being measured as to its efficiency by the actual per ton costs of handling. As a matter of fact, however, while a ton of freight is a uniform unit so far as mere weight goes, it is a very variable one, indeed, with respect to its handling. One consignment of freight may require twice as much handling as another of equal weight. Thus a ton of general merchandise will consume more of the working time of weighers, truckers and stowers than a ton of iron bars. And a ton of merchandise in twenty different packages will be a longer handling proposition than a ton of similar freight in five packages. Freight houses called upon to handle large quantities of mail-order house shipments usually have this factor of increased cost to contend with, no small amount of such business being in very small packages, consigned to an innumerable variety of addresses. Dissimilarity in the nature of the freight handled manifests itself to the highest degree in the railway terminals of districts with different producing interests, but it may be found in terminals located in the same district, and, to the extent that it exists, renders tonnage costs entirely unreliable as a test of relative efficiency. I have heard of this consideration being ignored even by railway officers in comparing the tonnage costs of freight stations at different points on the lines under their jurisdiction. The officers concerned were perhaps relatives of the newly-appointed division superintendent who, being requested by shippers on his division to provide them with double decker cars, objected on the ground of the expense that would be involved in raising the bridges.

Another element with an important influence upon tonnage cost is the size of the freight business handled. The small freight house seems able to give an appreciable lead to its bigger brother in handling costs, this arising largely from the fact that the bigger freight house required for the business of the latter increases the trucking that has to be done. It ought to be possible, however, to offset much, if not all, of this increase by the introduction of mechanical appliances in the larger houses, but, so far, American freight houses are not remarkable for their achievements in this direction. The more important English terminals, it is interesting to note, have made considerable progress in the utilization of hydraulic and electrical power.

Where delivery of freight is undertaken or arranged for by the railways, local conditions may cause, at some stations, an abnormal amount of rehandling, which, of course, leaves its mark upon the tonnage costs. Variations of cost, arising from such cause, do not exist in this country to the extent that they do, for instance, in England. In very rare instances do railways here undertake the delivery of freight. But it is essential to bear in mind this rehandling element of cost when comparing American with English performances or the costs of various English goods depots. At some important points in England the amount of warehousing, as it is termed, is considerably above the normal, an appreciable portion of the inward freight, instead of being sent out directly by the wagons of the company or of its carting agents, having to be raised by crane to a second, third, or even fourth, story, trucked over a floor often of large area, with the reverse operation to be gone through when the consignee calls for the freight. Sometimes the agent is allowed extra tonnage on this warehousing for the purpose of making costs comparable; thus, for every ton warehoused, a ton and a half, say, would be reckoned in computing the average cost, but this practice is by no means universal.

Tonnage costs as between one terminal and another may be affected by differences in the quality of labor available for freight-house work. Should it happen that the labor environment of two terminals differed very materially, it would be unfair to the local management at the less favorably situated one to accept tonnage costs as indicative of relative efficiency without adjustment being made for this difference. Occasionally very special labor conditions introduce a still further disturbing element. I cannot think of a better illustration than the casual labor so effectively made use of at several of the London goods depots. Where labor of this kind can be procured but a minimum full-time or regular working force needs to be maintained, the casual labor, waiting around the office for a job, being brought in for the busy period at a comparatively low rate of wage per hour. Ordinarily, such labor would be regarded as unreliable and inefficient for the

class of work to be done, but in London this does not seem to be the case. In fact, a considerable number of these men become more or less regular "half-timers," and vacancies in the full-time force are filled from their ranks quite frequently. Strange as it may appear it sometimes happens that such promotion is refused, the chosen ones preferring the comparatively go-as-you-please conditions of casual employment to the more rigid requirements of regular work. The result of such labor arrangements is to enable the terminals thus advantageously situated to keep their tonnage costs far below what they would normally be.

Freight-house costs, it is hardly necessary to observe, may be "in" or "out;" that is to say, the costs of working inbound or outbound freight. The two are essentially distinct. Under normal conditions, the cost of working inbound freight should run lower than that of outbound, since the former freight can be unloaded with greater dispatch and less irregularly than is the case with the corresponding operations of loading.

Tonnage costs are commonly relied upon as a fair basis for the comparison of efficiency in the *same* freight-house from period to period, and, as a rule, justifiably so. But, even in this case, the value of the comparison depends upon the absence of change in the general nature of the tonnage handled as well as on other conditions. But traffic conditions alone being taken into account, it is quite possible that a change in these might increase tonnage costs, say, from 35c. to 37c. a ton, in spite of a real improvement in the working efficiency of the house during the period of comparison.

From what has been said it appears very evident that as a comparative measure of relative efficiency of management the tonnage cost of handling may prove to be a very misleading guide, especially when applied to different terminals, but, at times, even when applied to the same terminal.

YARD CAR COSTS.

Yard car costs also require considerable care in their use. As a test of relative skill of management, they fail because of the differences in labor quality, in nature of work to be done, in the physical condition of the yard, in climatic and other conditions. But they may be, and frequently are, rendered entirely useless for statistical purposes because of the lack of a uniform system in compiling them. Thus, some terminals base their yard costs per car upon the number of cars received and forwarded in trains and received from and delivered to connecting lines. In other cases, not only these car movements are included, but also many of the internal movements, such as cars to and from transfer tracks, cars to and from team tracks, and so on. This difficulty as to what properly constitutes a car movement could be overcome by agreement, but at the present time it still presents a serious obstacle to the successful comparison of yard costs as they are actually furnished by different terminals. In every case, it is necessary to go behind the figures given and to analyze their method of compilation.

PASSENGER AND TON-MILEAGE COSTS.

Passenger and ton-mileage costs have been made much use of by practical men and by theorists, but, frequently, with a careless disregard of the limits of their usefulness. More than one writer has been content to assume the propriety of measuring the general operating efficiency of one railway system against that of another by means of the costs of operation per passenger or per ton per mile. Such a comparison is too unreliable to be depended upon as a guide to relative efficiency. It takes for granted that labor, physical, traffic and other conditions are fairly similar, though, in fact, they are frequently extremely dissimilar. To say that one road operates its freight traffic at eight-tenths of a cent per ton-mile and another road at six-tenths of a cent is to throw absolutely no light upon the skill with which the freight traffic of the respective roads is worked. The road with the higher ton-mile cost may be the one most efficiently operated. The only real value of such traffic mileage costs is in keeping track of the movement of operating costs on the same railway, or, preferably, on the individual divisions comprising a railway. I say preferably, as regards the latter, because the general average for the railway as a whole may have remained unchanged over the period of investigation and yet the real operating conditions may have materially altered, progression on some divisions being counterbalanced by retrogression on other divisions. Even within the limits of a single railway it may be decidedly unfair to measure the operating results of one division against those of another—conditions must be substantially similar before cost results can be accepted as the basis of such a comparison.

The value of ton-mile costs has been emphasized by some because of a belief that they afford a scientific basis for the establishment of reasonable rates. Yet, it is not possible to allocate, other than by arbitrary pro-rates, more than, at the most, about 75 per cent. of even the transportation and maintenance costs to the respective freight and passenger services. And since, as a matter of practical necessity, a railway must pay interest on funded debt, interest on current liabilities, rents for leased lines, taxes, and, for future protection, permanent improvement expenditures charged to income, there still remains nearly 30 per cent. of the total expenditures, essential to the working of the system, which again can be allocated only on a more or less arbitrary pro-rating basis. Thus, close upon half of the annual costs of maintaining a railway organization and securing its operation are, in the present state of our knowledge of railway costs, incapable of being accurately divided. The actual cost might vary materially from the pro-rated cost, and, to the extent of this variation, the reliability of the latter as a criterion would be impaired.

But even if it were practicable to allocate to the freight service as a whole its proper proportion of costs, it would still be a far cry to the distribution of these costs between the multitude of commodities transported by the railway under very varying conditions of speed, equipment facilities, terminal handling and so forth. There are some happily-dispositioned writers and regulative bodies who see all these difficulties vanishing into thin air when resort is had to some magical pro-rating basis as train mileage or gross ton-mileage, or the like. These engineers of philosophy are so much in advance of many of us poor mortals that they have no trouble in determining the roadway maintenance expense due to a 50-mile an hour 500-ton through express passenger train as compared with that due to a 12-mile an hour 2,500-ton freight train, stopping, maybe, at almost every siding. Their attitude is picturesque, but unconvincing.

It should be said further that if an allocation of costs to each unit of freight could be satisfactorily made, the problem of reasonableness would still remain unsettled. The theory of reasonable rate determination with reference to traffic mileage costs means, I take it, the fixing of a rate at a figure allowing a reasonable rate of profit above cost of operation; but, as a practical proposition, how is the latter to be determined? It should certainly be reasonably related to the risks and difficulties of the business, but who is to fix the specific nature of that relation? Are the risks of railway business equal to, less than, or greater than, those of banking, insurance, steel manufacture? If not identical, what percentage of variation in profits will represent the variation in risk? Again, absolutely uniform efficiency of management cannot be expected, and uniformity of working environment is, of course, impossible. Hence, one series of railway operations under control of railway company X will be handled much more economically than a corresponding series controlled by railway company Y, resulting in a lower cost per unit of traffic. Is X to be allowed to charge rates similar to Y, and, if so, is the extra large profit it secures as a result of its greater efficiency a reasonable rate of profit? On the other hand, if its rates are adjusted so as to reduce its

rate of profit to the same level as that of Y, will there not result territorial rate discrimination quite as clear-cut as anything that occurs under the present commercial system of rate making?

TRAIN AND ENGINE-MILE AVERAGES.

Other interesting operating statistics are train and engine-mile averages, which, in their general form, have less utility than some would ascribe to them. A passenger train-mile covers everything from the more or less dilapidated crawling local on branch lines to 60 miles an hour luxuriously appointed expresses on the main line, from a train of an engine and one car to one with a dozen or more cars. Similarly, the freight train mile coerces into statistical uniformity the humblest way freight with, perhaps, a total weight of a couple of hundred tons behind the tender to the 100-car, 3,000-ton train; it connects the slow "dead" freight train with the high-speed "manifest" train: coal train, live stock, merchandise train—all are indiscriminately mingled in the average. An arithmetical average is obtained, it is true, but one of treacherous utility, unless environed by a galaxy of interpreting, modifying and saving clauses, only to be used by the initiated, and even then with the greatest circumspection.

It is still customary, on the part of some transportation students, to depend upon engine mileage as a reliable basis upon which to establish comparative efficiency statistics of an important brand of railway operation. The value of such statistics depends very largely upon the way in which they are put together. But general averages of engine-mile costs can hardly be regarded, under any conditions, as affording the means of drawing conclusions of any practical worth. The engine-mile, in its general form, is itself variable. Its elements may be freight or passenger or switching engine, high-speed Atlantic or low-speed consolidations, with tractive powers of infinite variety. Obviously, when such engine mileage is used as a measure of costs, it fails lamentably to serve any useful purpose. To do this it must be limited to engines of the same general class, and even then its definiteness is not altogether satisfactory. Clearly, a compound unit of performance which allows for the influences of physical conditions, such as gradient and curvature, and also for speed, is the only sort of unit really suitable even in a restricted analysis of engine mileage costs. Uniform units of work done need to be established and engine costs related to these; this the engine-mile average fails to do.

FREIGHT CAR TON MILEAGE.

Freight car efficiency is a matter of great railway interest and its proper measurement seems to be logically based upon the performance of the average car in loaded car miles. The calculation of this would ordinarily be a very simple process, namely, the division of the total ton mileage by the number of cars employed. Unfortunately for the student of railway reports, it is not obtainable so easily as one would suppose from the foregoing. In the first place, the freight cars reported as owned, both in the statistics furnished in the annual reports of the Interstate Commerce Commission and in very many railway reports, are those owned on the last day of the fiscal year. It is obvious that the loaded car miles are made by the actual cars in operation, some of which have been in service throughout the year, others for less periods varying from several months to but a few days. Evidently, the equivalent number of cars owned throughout the year is required as the divisor, otherwise the quotient will be more or less inaccurate as a test of efficiency. In the second place, the ton mileage reported is the result of work done both by home and foreign cars. Cases have been known in which the cars upon the lines of a railway have exceeded by as much as one hundred per cent. the number owned by it. Under such conditions, even if the equivalent number of cars owned throughout the year were available, the quotient of total ton mileage divided by the same would be very far from representing the exact work of the cars. Of course, in dealing with statistics of the United States as a whole, this possible source of error disappears except in so far as car relations with Canada and Mexico affect the situation, and any disturbance of results from such would be so small as to be negligible. In the third place, reported ton mileage is made up of tonnage hauled by the railway both in its own cars and in privately owned cars. Here again it is apparent that the car ton mileage obtained in the usual fashion is in error. The private cars working the ton mileage need to be included, or better, for purposes of the comparison of efficiency of the freight car operation of different roads, the ton mileage of private cars excluded. The latter is preferable because of the special conditions surrounding certain classes of private car movement, ensuring frequently a superior performance to that of the railway owned car, and, further, because of the differences, as between railways, in the extent of this private car traffic.

But supposing that all these difficulties in the determination of freight car performance are satisfactorily met, the greatest caution is still required in interpreting the results. It is quite conceivable that a lower ton mileage average may represent as great or greater operating efficiency on the part of the railway concerned as the higher one of another road. This arises out of the varying influence on mileage of different species of traffic. The larger the proportion of local freight traffic, the lower will tend to be the mileage made, but the reduced ton mileage average by no means infers less efficiency. Again, the existence of an unusually large percentage of colliery traffic will ordinarily exercise a depressive influence upon the ton mileage, on account of mine delays and unloading time allowances. Demurrage regulations are also a factor not to be overlooked in deducing results from ton mileage performances of railways situated in different territories. If the legal loading or unloading free time is 48 hours in the territory of one road and 96 hours in the territory of another, mileage movement in the latter case is restricted. The restriction is not effective to the extent of the difference in legal time, it may be noted, since there would be in both territories a large number of shippers who would not make use of the legal maximum.

THE OPERATING RATIO.

The operating ratio is generally accepted as a statistic of great value. Yet in the usual form of the percentage of total annual operating expenditure to total annual operating revenue, its value is liable to exaggeration. The same operating ratio may conceal any number of changes in efficiency of performance from year to year. Thus, in a certain year, extravagant operation during the season of light traffic may be counterbalanced by an abnormal increase of business during the period of heavy traffic, with the result that the operating ratio stands at the same level as, or even lower than, in the previous year when, say, greater uniform efficiency of operation was obtained throughout the year. The general operating ratio may frequently fail to indicate movements in maintenance of roadway, maintenance of equipment, traffic, conducting transportation, and general administration, in which considerable variations may occur and yet leave no record in the general ratio. The mere statement that the operating ratio is this and that in years of comparison is meaningless from the point of view of operating efficiency until most careful scrutiny is made of its component factors. An increase in it may cover greater efficiency, a decrease relatively greater inefficiency, and a stationary position either one or the other.

Error can easily be made in comparing operating ratios of different systems by reason of opposed financial policies in the roads compared. For example, the ratios are not comparable in the case of two systems, one of which charges as much of permanent improvement expenditure as possible to repairs account and the other as little as possible.

PASSENGER ACCIDENT AVERAGES.

Passenger train accident figures are of all railway statistics

the ones which are most profusely presented to and most eagerly devoured by the public. It goes without saying that the presentation of numbers of killed and injured without reference either to the conditions out of which the accidents arose or to the relation of these numbers to the traffic is a very partial and defective, therefore improper, method of comparing safety in travel on different systems. Nor are such averages as number killed and number injured per so many passenger journeys of appreciable value in endeavoring to measure the relative frequency of accident.

It is necessary, in the first place, to segregate accidents arising out of passenger train movement and beyond the control of the passenger, from the rest, and, in the second place, to average these accidents upon the passenger train mileage, so many accidents per one million train miles, and, associated with this average, should be the average number killed and average number injured per one million train miles. The latter figures emphasize the waste of human life and efficiency, but to my mind the former averages are the more valuable. The number killed and injured in a collision or derailment is almost a pure matter of chance, influenced by car structure, by presence of inflammmable oils, live coals, etc., by distribution of passengers in the cars, and by other circumstances. An accident that, by all theory, ought to have caused the most serious disaster may be trifling in its effect; an accident that normally would have produced a few injuries may, unexpectedly, result in lamentable loss of life. So that really, relative efficiency, in the matter of avoiding accidents in passenger traffic, would be shown best, not by reference to persons killed and injured, but by the number of train accidents per million passenger train miles, and such figures would form a desirable addition to every report of railway accidents. Railways have a natural aversion to display their weaknesses in the form of train accidents, but it would exert a beneficial influence upon them if they were required half year by half year to publish in the leading daily papers a full statement on oath showing the relationship of their accident roll during the period to the amount of traffic they handle. At the same time it would be unfair to the railways to pass on without saying that several roads have been and are devoting great attention to the removal of the causes of accidents. Surprise checking, public investigations, and so on, are some of the methods that promise satisfactorily.

MILEAGE STATISTICS.

Little need be said here about mileage statistics. It is obviously inaccurate to compare the extent of railway systems by route, or geographical, miles. Such a comparison ignores the capacities of the systems compared, as represented by additional tracks and varying yard facilities. It is like comparing two factories on the basis of the number of machines employed, without reference to the capacity of the same. Of late years this has been rectified in some private and official statistics by showing, in addition to route mileage, single track mileage, and, in some cases, mileage of yards and sidings. Even when this information is given, further analysis is required if one is to gain a useful idea as to the real meaning of the mileage to the community. When comparing the mileage of railways or railway systems, the student needs always to ask himself the question as to the extent to which effective distribution of mileage has been attained, and effectiveness in this case should refer to the general economic interests of the country, for, after all, such interests in the long run underlie private progress and success. The distribution of the mileage is an important consideration, since, in two regions of equal area and equal railway mileage, the mileage may be well spread in one and very badly spread in the other. It is to the ultimate economic interests of any state or country that its railway mileage should be located so as to give reasonable, though not necessarily uniformly equal, accessibility to all districts. Over-concentration of mileage in one part, a not uncommon phenomenon, is frequently accompanied by lack of facilities in other parts. Again, an area intermediate between two other areas may have a fairly considerable railway mileage much more calculated to serve the interests of the other areas than those of its own. Mileage per unit of area or per unit of population is a useful figure, but incomplete. Equality in these respects may hide very real differences of utility and an area with an inferior showing may really be better served.

TRAFFIC MEASUREMENT.

Limits of space forbid much attention in this article to the statistics of traffic measurement, though the subject is one worthy of detailed discussion. It is generally understood that, for purposes of comparison of freight business, ton-mileage is a more adequate basis than actual tonnage. Yet even ton-mileage is unsatisfactory; its general nature necessarily deprives it of efficiency as a measure where conditions are different, as is commonly the case. The tonnage movement measured may be largely one of minerals "foreign received" and "foreign delivered," or it may be largely one of merchandise locally collected and distributed. In amount of work involved, in value of service to the railway, the traffic of one road would be poles apart from that of the other, but no indication whatever of these differences would find expression in the general ton-mileage figures. In every case of summarized statistical presentation of freight traffic conditions it should be made an invariable rule to show grouped commodity ton-mileage; in most instances the requirements of general comparison would be met by a classification into forest products, mine products, agricultural products, manufactures, merchandise and miscellaneous. From statistics of this kind one is able to form a fairly intelligible idea of the traffic of roads compared and their relative importance in this respect, which is more than can be said of the lumped ton-mileage figures. A further division might be made into *local*, *through-originating*, *through-terminal* and *through-transfer*, understanding by these terms the ton-mileage of freight forwarded from and delivered to stations on company's system (local), forwarded from local stations to "foreign" points (through-originating), received at local stations from "foreign" points (through-termnal), and received from "foreign" stations for delivery to "foreign" stations (through-transfer). This would complicate somewhat any general tabulation of statistics, but not seriously, when the information deducible from the addition is taken into account. Briefness of exposition and economy of space are idle virtues if they are secured at the expense of intelligibility.

CAPITALIZATION STATISTICS.

Capitalization per mile is a statistic which incompetent hands are capable of badly mis-using. Intrinsically the figure is worthless, for comparison useless, unless qualified by a whole host of explanatory clauses. Yet it is frequently used in comparing costs of different systems. The practice is faulty because (1) the comparison is made on geographical mileage whereas the expenditure has been made on track mileage, (2) the manipulation of capital in the form of nominal additions has varied considerably from system to system so that the ratios of real costs are very different from those of nominal costs, (3) the existing extent of capital has been influenced to no small degree by differences in policy as to the handling of betterment expenditures. In any case, since conditions of legal procedure, land acquisition, labor supply and so forth, vary most widely in railway building, it is hard to see how much wiser one is for knowing that Railway X cost $70,000 a mile and Railway Y $250,000, even when adjustment has been made for artificial differences in capitalization. Certainly, without a very detailed knowledge of the underlying conditions, it would be hazardous to assert that the former road was economically built and the latter extravagantly. The costliness of a machine is relative to the

work it does, and hence, of the two, the $70,000 road may happen to be the extravagantly built one.

Capitalization statistics evidence great variations in capital per mile of line, and this fact, correlated, as it has been, with spectacular feats of financial legerdemain on the part of certain railways, has wrought a conviction in the minds of many that overcapitalization is a common condition of American railways, influencing unfavorably the level of rates. Now it is unquestionable that considerable nominal additions have been made to railway capital, but against such increases need be set off the also considerable portions of revenue that have been expended in permanent improvement, as well as those decreases in capital that have occasionally occurred in transfer of ownership. It is impossible to determine the relative size of these items, and he is a man of easy conviction who is prepared to argue that, for the railways of the United States as a whole, the former is materially greater than the latter. And if it is, the difference must be very much less than most people credit. The previous statement infers that the proper measure of railway capitalization is actual original investment in the property plus the cost of improvements whether paid for out of capital or out of revenue. If railway building were to be started all over again, the restriction of capitalization within these limits would be justifiable, theoretically, at any rate. It is to the interest of the investing public, and of the community at large, that the real profit capacity of every railway property should be apparent on the face of its balance sheet and income account; only when capitalization is identical with actual investment, is it practicable to keep track of the real profitability of the undertaking. It would surely seem that actual investment in the building and improvement of a railway is the logical basis of capitalization, though it may be a very untenable one from the standpoint of business men and their traditional methods. But, comes the objection, is it not proper, even theoretically, to allow X or Y to increase the capitalization of a railway he purchases up to the limit of the price actually paid? Does not this price represent to him a real investment? Plausible though this seems, I can hardly admit that it is theoretically justifiable. What X or Y pays to secure the profits to which each certificate of the capitalization entitles him represents his valuation of the property; thereby he decides with what rate of profit he will be satisfied. The money he pays goes, not into the railway, but into the pocket of its former owners. There is no valid reason why his valuation and what he purchases, namely, the investment of a million dollars, or whatever it may be, in the production of a certain utility, should be equalized. In fact, logically they cannot be. The investment for the purpose of producing the utility, and it is immaterial whether some part of this investment was judiciously made or not, is one thing, and his investment for the purpose of securing the profits arising out of that utility is another. As a matter of fact, the purposes underlying increase of capitalization, following acquisition of a property, are frequently those relating to speculative trading or to the concealment of rate of profit. This does not deny the justification, either at the time of a purchase, or at any other time, of an increase in capitalization equal to those permanent improvement expenditures out of the revenue of the property not previously taken into capital account, or, of course, of an increase in capitalization for the purpose of securing funds which are intended to be, and actually are, sunk in the business. I fully realize that the application of the theory now stated would have retarded the promotion and construction of certain railways, but the history of railway enterprise in this country, especially for the couple of decades or so following the Civil War, leads one to believe that this retardation might have had advantages of its own, and that there would have been less economic loss from foolish location and unduly speculative building.

A business undertaking is sometimes capitalized at an amount over and above that necessary to carry on the business, only a part of the amount called for by each share being actually subscribed, this arrangement having advantages in enabling further capital (within the limit of the share liability) to be obtained with certainty, promptness, and frequently with economy. In such cases, the real capital is the subscribed capital, and the law should require every official statement of capitalization of such a company, and every stock exchange quotation, to be accompanied by figures showing the subscribed value of each stock certificate.

Sufficient has been said to indicate the rashness of a sweeping charge of overcapitalization, since it is clear that the only real and satisfactory test of capitalization cannot be applied. This difficulty has induced financial writers to suggest the application of cost of reproduction or of market valuation of securities as suitable criteria. The latter is but a function of income-earning power, representing an averaging down of profits, and bears no relation to the investment. Capitalization on this basis serves but to hide the real profitability of the investment. And, anyhow, the market prices of securities bought and sold on the exchange form an unreliable guide, because these are the prices usually of but limited amounts, and it by no means follows that an offering of the whole issue at one time would secure similar prices. Cost of reduplication is obtaining more favor than market valuation, but, obviously, as costs and conditions of construction are constantly changing, the cost of reduplication may be far removed from the actual costs, and hence this fails as an accurate criterion. Yet in the case of the majority of American railways, a physical valuation of the existing property would probably represent a reasonably fair maximum capitalization, and capitalization much in excess of this, though not necessarily fictitious, must be looked upon with suspicion. If physical valuation is to be accepted as a satisfactory test of capitalization, the charge of general overcapitalization must forthwith disappear, as it may safely be said to be impossible to reproduce the railways of the United States for the amount per mile represented by their capitalization.

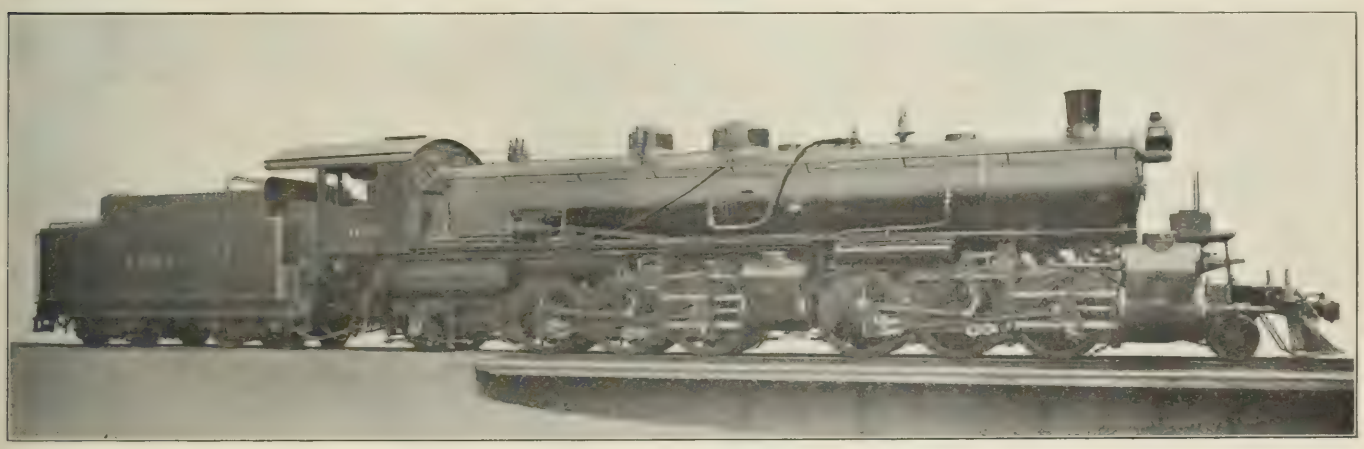
The effect of overcapitalization upon rates falls too much outside the scope of this article to justify more than a brief reference. It is difficult to imagine that, under the competitive conditions so characteristic of a large part of the railway business of the United States, degree of capitalization can definitely influence transportation rates. The capital invested in railways is largely sunk once and for all. Track, locomotives, cars and appliances will deteriorate, even if not used. Hence, any rate that returns, in the estimation of the railway manager, somewhat more than sufficient to defray wear and tear due to the traffic and cost of transportation will be better than no traffic. This is, under ordinary conditions, the nether limit of rates, a limit to which they rarely descend, but the existence of which, nevertheless, is powerful in influencing the actual level at which they settle. Such favorable conditions for the exercise of competition prevent the railway manager from basing his rates upon the capitalization. Thus it happens that, in the case of a group of important western roads, the one with more than three times the capitalization of any of its rivals is forced, by the exigencies of competition, to give even lower rates than the others. Where a condition of monopoly exists, it is possible that overcapitalization may have a general effect upon rates, if the rates, before the excess of capital is superimposed, are such that an appreciable increase in them would neither lessen present traffic nor prevent the development of future traffic to any appreciable extent. If the railway, under such monopolistic conditions, is already exacting the return which gives it the maximum net profit, then an increase in rates would be inconceivable, as it would slow down the traffic and represent a voluntary reduction of profit to a point below the

maximum. The conditions under which cases of capitalization tend to affect the general level of rates are much more likely to occur in local than in through traffic, but even local rates fail to show many instances of increase that can be definitely ascribed to manipulation of capitalization.

The foregoing survey of some of the more important railway statistics has been by no means exhaustive, but enough has been said, it is hoped, to emphasize the limitation attaching to them, especially as usually presented, and the necessity of a careful and intelligent interpretation. Neither railway officials nor writers employing such statistics have always exercised good judgment in this respect. Too frequently may they be found resorting to reasoning which suggests, as a well-known statistician remarked some years ago, "a man trying to lift himself over a fence by his boot straps." It is, indeed, extremely easy in statistical elaboration to pass from one assumption to another until out of a mass of figures certain results are obtained which are accepted as precise and accurate without recognition of their hypothetical basis. Only by extreme vigilance can errors of this kind be avoided. In so far as the previous discussion may act as a reminder of this "proneness to error" in statistical reasoning, it will have served its purpose.

MALLET LOCOMOTIVE FOR THE BURLINGTON.

Mallet locomotives are being developed with such rapidity and in such a variety of forms as to overshadow those of the older designs. The great length of boiler shell, necessitated by the peculiar construction and arrangement of the running gear, lends itself readily to the introduction of fuel-saving devices that cannot be economically applied to the ordinary locomotive, such as reheaters and feed-water heaters.



Mallet Locomotive; Chicago, Burlington & Quincy.

A description of a Mallet locomotive with a reheater and a feed-water heater, built for the Atchison, Topeka & Santa Fe, was published in the *Railway Age Gazette*, of November 26, 1909. This same combination, but with a different arrangement of parts has been recently applied to ten locomotives of the 2-6-6-2 type, built for the Chicago, Burlington & Quincy by the Baldwin Locomotive Works. As the road already has eight engines of the same type in service without the superheaters and feed-water heaters, an opportunity is now afforded to compare the two in regular work. The new locomotives will be used in freight service on maximum grades of 1.6 per cent. They are designed to traverse 20-deg. curves and are equipped to burn liquite. The boiler is of the separable type with the superheater in the rear section. It is straight topped with a radially stayed wide firebox. The side water legs incline slightly inward as they rise, and both the throat and back head are sloped. The barrel of the boiler proper is composed of three rings, and these have butt jointed seams on the top center line, with diamond welt strips inside. The dome is placed on the middle ring. A combustion chamber is located in the forward end of the boiler proper, and this chamber is surrounded by a separable joint designed in accordance with the well known practice of the builders.

The superheater, which is of the Emerson type, is placed in the combustion chamber, and the dry pipe communicates directly with its headers. There are two of these and they are set vertically on either side of the combustion chamber. The heating surface of the boiler tubes amounts to 2,708 sq. ft. and is made up of 28 tubes 5 in. in diameter, in which the superheater pipes are placed, and 218 of 2¼ in. diameter. Each header consists of a steel casting in which two cavities are cored as shown in the section. One of these cavities, A, the one placed at the front, extends from the connection with the dry-pipe to the bottom where it is blanked. The other, B, runs from the bottom, where it connects with the steam passage in the saddle to the high-pressure cylinder, to the top where it is blanked. Opposite the header are the large tubes in the boiler in which the superheater pipes are placed. They are set in two vertical rows, seven in each row, 13½ in. between the centers of the rows, as shown on the cross section of the shell. These tubes are set opposite each other in the two rows, and not staggered so that there is a clear space of 8 in. between them. This is occupied by three rows of 2¼ in. tubes set and staggered in the usual manner.

On each side of the header there are two connections for the superheater pipes, one to the front section, A, for the saturated steam and the other to the rear section, B, for the delivery of the superheated steam. The superheating is accomplished by passing the steam through a coil of four pipes, arranged as in the Cole superheater, but with a difference in the details of the fittings. The tubes themselves are $1\frac{5}{16}$ in. outside diameter and of No. 9 wire gage. They are expanded into the header openings at 1, 1, of the cross section and the opening beyond is closed with a 1¼-in. plug. The fittings at the rear end of the tubes are steel castings in the form of a flattened return bend, with the upper one set 8 in. ahead of the lower. One is a simple bend, but the other has lugs cast upon it, on which it rests on the lower pipes. This holds the nest together and prevents a racking of the connections which might otherwise occur. The pipes are clamped together outside the boiler as shown, so that the nest is practically brought together as in a single piece. The course of the steam, then, is from the dry-pipe into the front cavity of the header, thence back and forth through the four superheater tubes to the rear cavity of the header, from which it goes to the high-pressure cylinder.

The combustion chamber, in which the superheater headers

are placed, is almost wholly in the rear section of the boiler. From the front tubesheet to the joint is 60⅝ in. and from the joint to the face of the feedwater heater tubesheet it is 8 in., thus making the total length of the combustion chamber 5 ft. 8⅝ in.

The front section of the boiler contains the feed-water heater, the reheater and the smokebox. The feedwater heater is of the same type as that used on the Atchison, Topeka & Santa Fe locomotive already referred to. That is to say, it consists of a nest of firetubes set in two tube sheets and surrounded by water. In this case the tubes are longer and have a greater heating surface than in the Santa Fe locomotive. In the latter they were 76 in. long and contain 1,279 sq. ft. of heating surface. In the Chicago, Burlington & Quincy locomotives they are 8 ft. 11 in. long, 2¼ in. in diameter, 406 in number and have 2,172 sq. ft. of heating surface. The tubes do not, however, occupy the whole section of the boiler. On the center line there is a flue 17 in. in diameter, in which the pipes for the reheater are placed.

The reheater consists of a nest of 19 tubes 2 in. in diameter, rolled and beaded into headers at each end. These headers are steel castings, fitted with ball joints at their outer extremities, that serve as connecting points with the intermediate steam or receiver pipes. The reheater flue is 9 ft. 8 in. long over its flanges and the distance between the reheater headers is 10 ft. 8½ in., so that they stand off 6¼ in. from the flue at each end. This 6¼ in. gives the requisite space for the gases to turn and be drawn into the flue from the combustion chamber. The headers are carried by cast iron pipes rising from the bottom of the shell. At the rear the connection is made from the exhaust passage in the high pressure saddle, and at the front to the ball-joint elbow of the flexible intermediate steam pipe, the flange of which is riveted to the bottom of the shell.

From this point on the arrangement of piping to the low-pressure cylinders and for the exhaust from it is the same as that used as a standard by the Baldwin Locomotive Works and illustrated in connection with the description of the Mallet locomotive built by them for the Atchison, Topeka & Santa Fe.

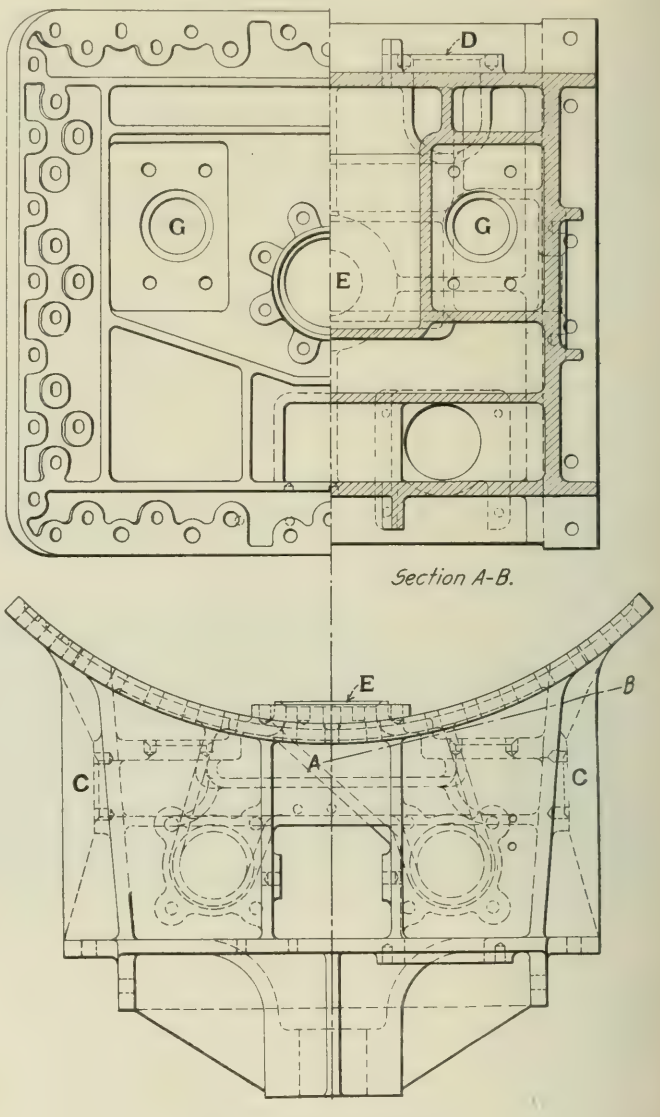
As in the case of the Atchison, Topeka & Santa Fe locomotive the injectors deliver directly into the feed-water heater, which is kept full of water at all times. The check is set 24 in. back from the front end, and the water that is crowded out leaves at the top and comes down the sides through the bent pipe, as shown, to the regular boiler check.

There is one link in the steam passage system from the dome to the smokebox that deserves attention. It is in the saddle for the high-pressure cylinders. It will be remembered that the superheated steam is delivered at the bottom of the headers on each side. These discharge into the openings, G G, in the top of the saddle. From here there is an elbow passage leading to the side at C C, where a direct connection is made to the cylinder. The exhaust, however, takes a somewhat roundabout course. It leaves the cylinder at the rear and passes through a return bend pipe, shown at H on the outline elevation of the engine, and delivers into the saddle at the point D on its rear face, there being one of these connections on each side. From here there is a cored passage to the central outlet, E, where the intermediate or receiver pipe is seated. The bottom of the saddle carries the usual bracket for the pin connection of the front frame.

The frames are of cast steel 5 in. wide, with a single hinge connection. The frames of the rear engine have separate back sections, also of cast steel. The pedestal binders are of the same material and are lugged and bolted to the pedestals. The front truck is equalized with the leading driving wheels through an inverted leaf spring suspended from yokes placed over the forward driving boxes. The back end of the equalizer rests on the middle of this spring. The rear truck is of the "Hodges" pattern with outside journals. The side swing is taken by the spring hangers which are jointed for the purpose.

The boiler is supported on the front frames by two waist bearers, both of which are normally under load. The front bearer carries the controlling spring and acts as a support for the low pressure guide bearers. The high pressure guide bearers are bolted to a specially designed steel casting, which also serves as a support for the link bearings. Two waist sheets support the boiler barrel over the rear frames and the mud ring is carried by sliding shoes in front and a buckle plate at the rear.

Reversing is effected by the Baldwin power gear and the two reverse shafts are connected by a single reach rod placed

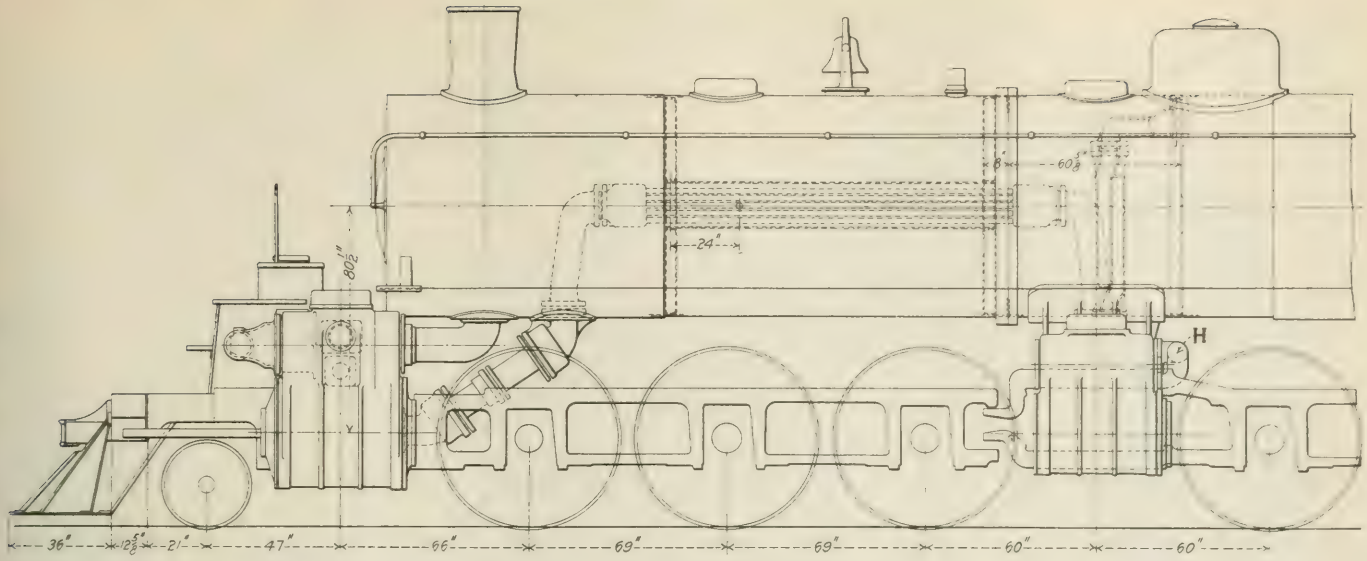


High Pressure Saddle.

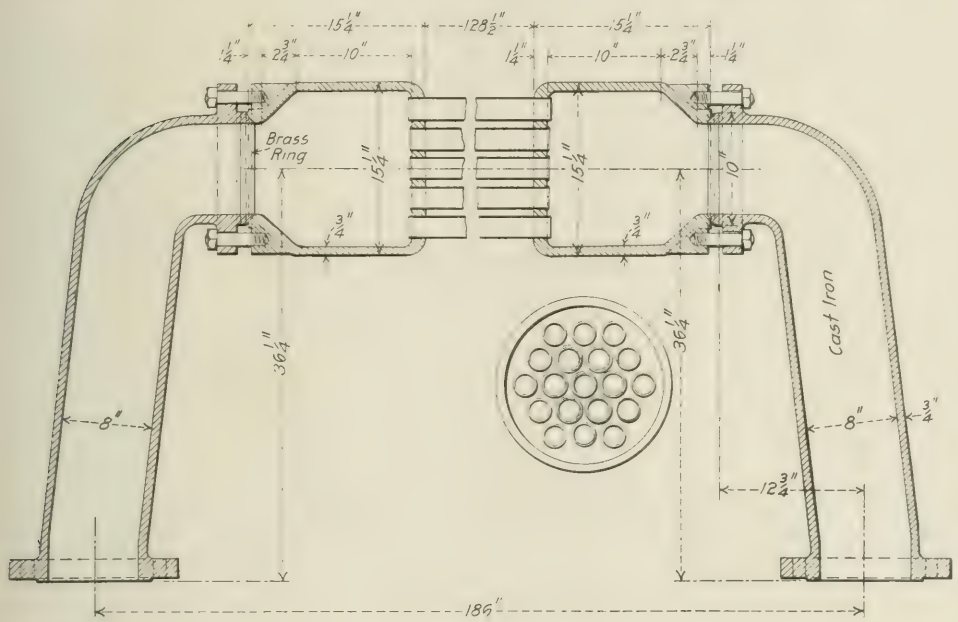
on the center line and fitted with a universal joint. Both valve motions are simple in design and have eccentric rods of ample length. The links of the front engine are trunnioned on cast steel supports, which are placed outside the second pair of drivers and span the distance between the two waist bearers.

In order to avoid flexible oil pipe connections the low pressure cylinders are lubricated by two sight feed oil pumps driven from the forward valve motion. The high pressure cylinders are lubricated from the cab in the usual manner.

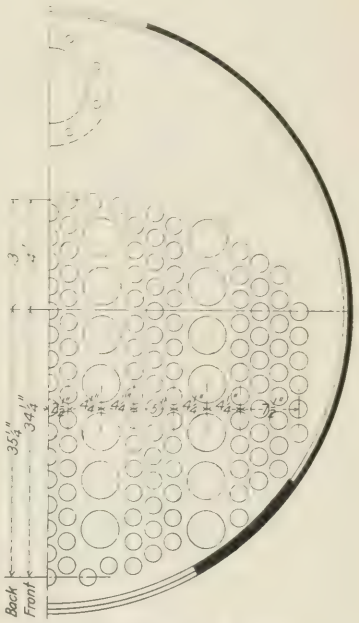
The tender is designed in accordance with the railway company's practice. The frame is composed of 12-in. steel channels and the tank is of the water bottom type. The



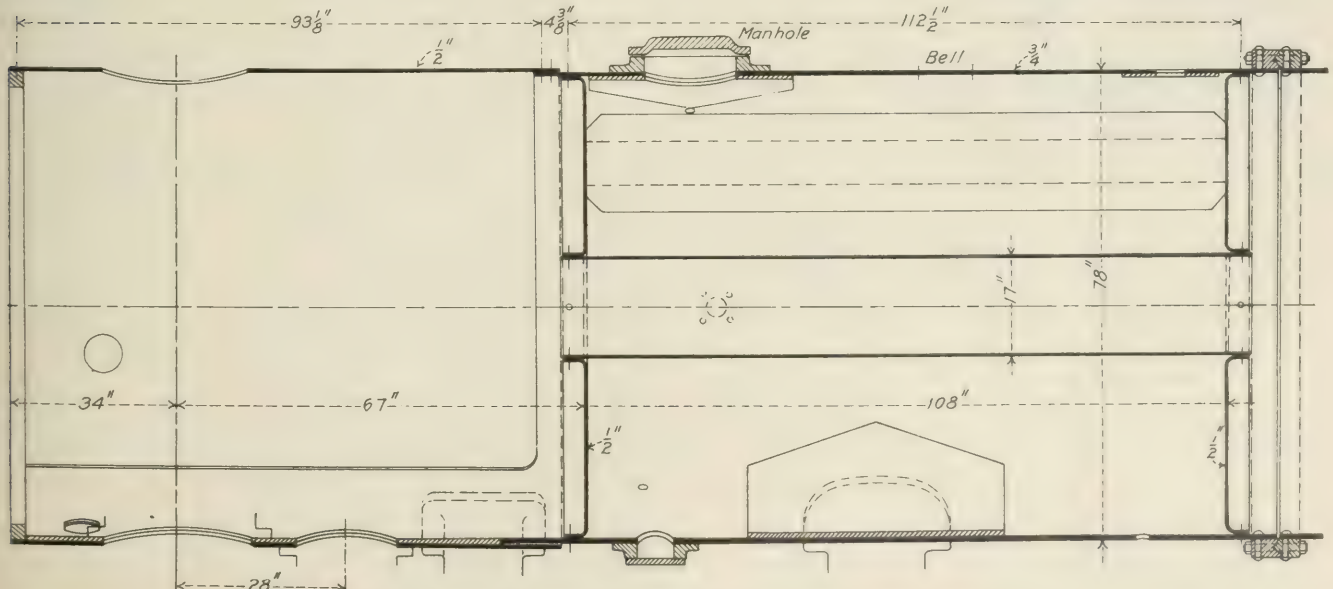
Part Side Elevation, Showing Piping.



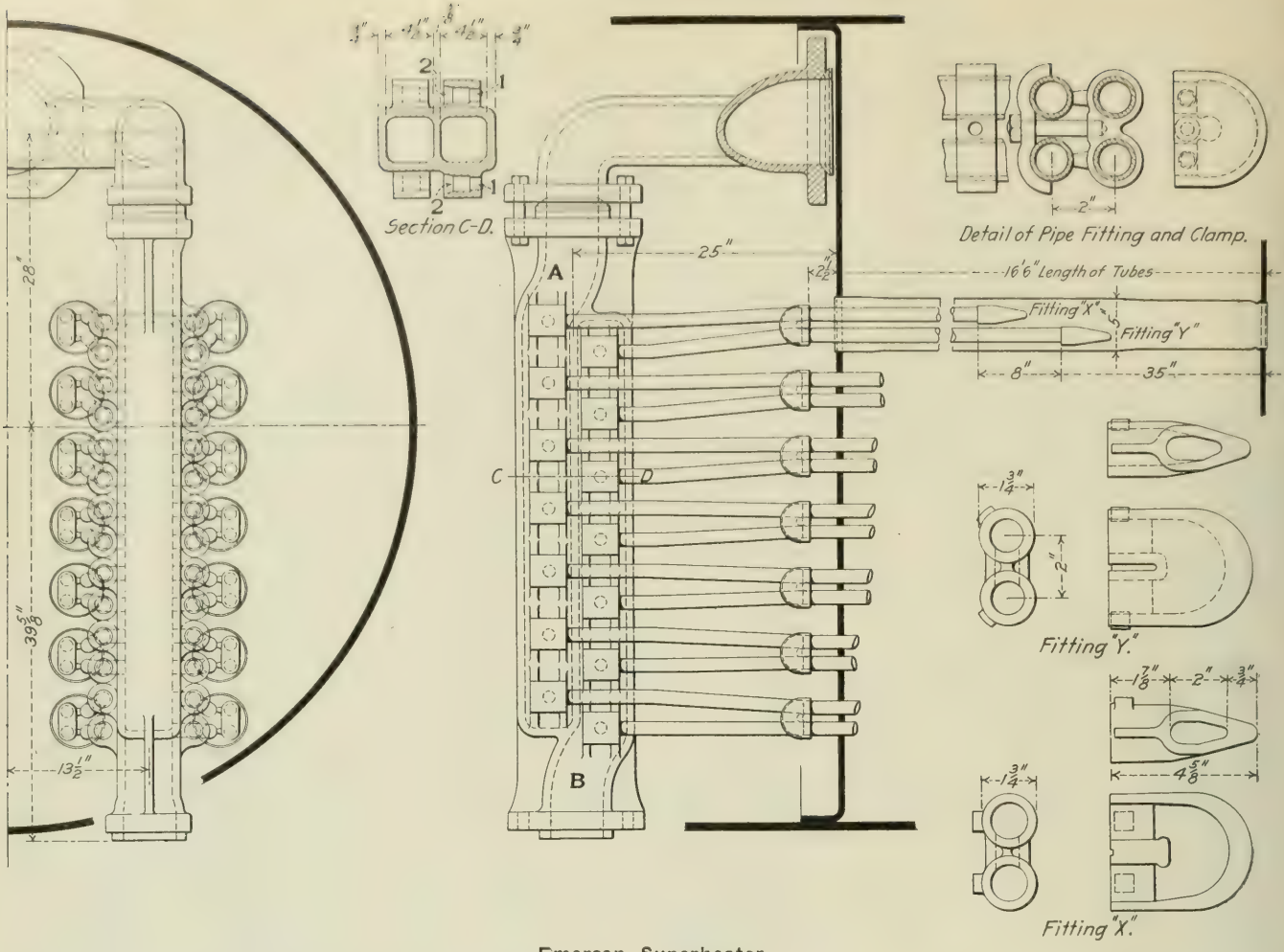
Emerson Reheater.



Half Section of Boiler.



Front Part of Boiler, Showing Feed Water Heater and Reheater Flue.



Emerson Superheater.

trucks are of equalized pedestal design with "Standard" forged and rolled steel wheels having rims 3 in. thick.

These locomotives are of exceptional capacity, and the heating surface of the feed-water heater is greater than that provided in any engines previously constructed by the builders. The principal dimensions are presented in the following table:

Ratios.

Weight on drivers ÷ total weight	84.19*
Weight on drivers ÷ tractive effort	4.32
Total weight ÷ tractive effort	5.13
Tractive effort x diam. drivers ÷ heating surf.	886.44
Heating surface ÷ grate area	79.78
Firebox heating surface ÷ total heat'g surface	4.12*
Weight on drivers ÷ total heating surface	59.82
Total weight ÷ total heating surface	71.03
Displacement of 2 h. p. cylinders	15.39†
Total heating surf. ÷ displacement of h. p. cyls	330.73
Grate area ÷ displacement of h. p. cylinders	4.14

*Per cent. † Cu. ft.

General Data.

Service	Freight
Fuel	Lignite
Tractive power	70,500 lbs.
Weight on drivers	304,500 "
" on front truck	21,000 "
" on rear truck	36,150 "
" total	361,650 "
" of engine and tender	515,000 "
Wheel base, driving	33 ft. 0 in.
" " " rigid	11 " 6 "
" " " total	51 " 5 "
" " of engine and tender	83 " 2½"

Cylinders.

Type	Compound
Diameter	23 and 35 ins.
Stroke	32 in.

Valves.

Type	Balanced piston

Wheels.

Driving, diameter	64 in.
Driving journals	10 x 12 "
Front truck, diameter	30 "
Front truck, journals	6 x 8 "
Rear truck, diameter	42½ "
Rear truck, journals	8 x 14 "

Boiler.

Working pressure	200 lbs.
Diameter first ring	78 in.
Thickness of sheets	¾-in.
Firebox, length and width	120 x 78¼ in.
" water spaces—front, 4½ in.; sides & back, 4	"
" sheets, thickness—sides, back and crown, ⅜-in.; tube sheet, ⅝-in.	
" depth, front	75¾ in.
" depth, rear	72¼ "
Tubes, diameter	5 in. and 2¼ "
" material, 5 in.	Iron
" material, 2¼-in.	Steel
" thickness, 5-in.	No. 9
" thickness, 2¼-in.	No. 11
" number, 5 in.	28
" number 2¼-in.	218
" length	16 ft. 6 in.
" feedwater heater, number	406
" feedwater heater, diameter	2¼ in.
" feedwater heater, length	8 ft. 11 in.
Heating surface, firebox	210 sq. ft.
" " boiler tubes	2,708 "
" " water heater	2,172 "
" " total boiler	5,090 "
" " superheater	464 "
Grate area	65.2 "

Tender.

Tank, capacity water	8,000 gal.
Tank, capacity, coal	13 tons
Wheels, diameter	37 in.
Axles, size of journals	5½ x 10 in.

RAILWAY CONCESSION IN STATE OF BAHIA.

Through the efforts of Mr. Pierre Paul Demers, formerly United States Consul at Bahia, Brazil, representing the contract which Henry J. Connill entered into with the state government of Bahia, Brazil, in September for the construction of a railway 62 miles in length has been revised. By the terms of the new contract the line will have a length of about 280 miles, extending from Camamu Bay to the Great Falls on the Jequitinhonha river. The line will traverse a very rich and hitherto unexplored region.

General News Section.

Telephones are now used for despatching trains on the St. Louis & San Francisco between Springfield, Mo., and Monett, and the telephone system is now complete from Kansas City via Springfield to Monett.

The Central of Georgia is dredging for a new slip at its water front property in Savannah, a work which will cost about $250,000. The contract has been let to the Atlantic Dredging Co., Philadelphia, Pa.

The Western Pacific is now running a regular passenger and freight train daily between Oroville, Cal., and Portola, about 100 miles east. Connection is made by an automobile stage line with Quincy, the county seat of Plumas county.

The city of New York has had its borrowing limit increased by $97,000,000 by a law which authorizes the omission in computing the debt limit of bonds of the city which are self-sustaining—those issued to build the subway and those representing the cost of docks which have a permanent income.

The United States Civil Service Commission announces an examination, June 15, for candidates for 50 positions as surveyor in the Philippines at $1,400 a year each. Applicants should write to the Commission at Washington for forms 2 and 375. They do not have to appear at any place for examination.

A compromise has been made at Louisville between the Southern Pacific and the state auditor of Kentucky, which, it is said, will end the litigation over the amount of taxes that this road shall pay. Under the terms of the compromise, the state will receive $172,500; Jefferson county, $100,000, and the agent of the auditor, who brought the suit, $21,000 as penalties. The company is to pay taxes on the following valuations for the years mentioned: 1907, $5,800,000; 1908, $8,000,000; 1909, $9,000,000; 1910, $9,000,000. The Southern Pacific is a Kentucky corporation but has no property in that state.

President Charles M. Hays, of the Grand Trunk, announces that the company will give three free scholarships, each covering four years, in the Faculty of Applied Science of McGill University, Montreal, to apprentices and other employees of the company under 21 years of age and to minor sons of employees. These scholarships will be awarded under competitive examinations, to be held June 13. Scholarships will be granted for one year and be renewed from year to year, to cover the four years, provided the holder makes satisfactory progress. The holders of these scholarships will be required to serve the road as student apprentices during vacation periods, and, at the option of the company, for two years after completing the college course. The conditions of admission are to be had from the Registrar of the University, Montreal.

Railway Matters in Washington.

Washington, May 11, 1910.

The administration bill finally came to a vote in the House yesterday and was passed by a vote of 200 to 126. Just before the passage of the bill Representative Mann, of Illinois, offered an amendment making mergers of railways legal under certain circumstances. It prohibited mergers of competing lines, but permitted mergers not "substantially competitive," if approved by the Interstate Commerce Commission. This amendment was defeated by a vote of 169 to 160, on the ground that it would break the force of the Sherman anti-trust law. The Democrats made an effort to have the bill recommitted with instructions to eliminate the sections creating the commerce court and to make certain other changes that had been proposed from time to time by the Democrats in the progress of debate. The motion to recommit was defeated—176 to 167.

The Senate has done little on the bill during the past week, a tacit agreement having been reached to postpone action until next week. At the present writing the majority for the administration appears to be more confident that the bill can be passed, but there is still the prospect of discussion of considerable length in conference between the two Houses.

The President's Railway Proposals.

What President Taft proposes to do in the way of amending the Interstate Commerce law has been, in a measure, lost sight of by the confusing and purposeless discussion in Congress, and the amendments that have found favor in one house or the other have left the public in ignorance, not only of what Congress is likely to do, but of what the substance of the discussions really is. At this juncture the President himself has come out in a speech clarifying the situation, and some of the discouraged Congressmen have again assured him that the bill will pass. In this speech, delivered at Passaic, N. J., last Monday, President Taft summarized the administration bill as follows:

"The bill amending the Interstate Commerce law is pending in both houses. It has been amended in the House and also in the Senate. * * * the bill has not been emasculated in either house; it contains almost all of the remedial features of the original administration bill, and those things which have been omitted are neither substantial nor vital.

"In the first place the bill contains a series of sections creating a Commerce Court, which is to absorb all the jurisdiction now had by the Circuit and District Courts on review by injunction suit or otherwise of the proceedings of the Interstate Commerce Commission.

"This court was to be created by five new circuit judges appointed by the President, one of whom was to be supplanted each year by designation of another circuit judge by the Supreme Court. The advantage of the court is that we shall have a court of experts at Washington, very familiar with the whole business of interstate commerce and the decisions affecting it, and will be able to dispose of the business before it promptly and give efficacy to the orders of the Interstate Commerce Commission that are legal.

"The whole object of the court is expedition, and the whole defect of the interstate commerce procedure heretofore has been delay. I regard the Commerce Court as practically the most important feature in the bill. Thus far it has remained in the House, although by a close vote, and it has not been stricken out in the Senate.

"Another feature of the bill is to give the Attorney-General complete control over the litigation after it has left the Interstate Commerce Commission and gets into court. Heretofore the Interstate Commerce Commission itself has controlled the litigation in the courts, and it presented the anomaly of a quasi-judicial tribunal suing in its own behalf to confirm its own judgments. It was thought wiser to give this to the Department of Justice, but amendments have been introduced by which shippers who have an interest may be heard by special counsel if they desire, under regulations of the court.

"Another section requires companies, by their agents, to furnish a statement in writing of the rate applicable to a described shipment between stated places under tariffs to which such company is a party, or a penalty for failure.

"The other provisions authorize the commission not only to review rates, but classifications, and enable the commission of its own motion to investigate the question whether any rate is unjust or unreasonable, or unjustly discriminatory, or unduly preferential, or prejudicial, or otherwise in violation of any of the provisions of the act.

"Another provision requires the commission to establish through routes and joint rates, and to do this upon complaint or upon its own initiative, and it is given to the shippers to select among these routes thus established the route which they prefer.

"Section 13 provides that no railway corporation * * * shall hereafter issue * * * stock except upon the payment of the par value thereof or any bond without payment of not less than the par value thereof; or if sold at less than par, then at not less than its reasonable market or selling value, to be ascertained by the commission; and that no property or other thing than money shall be taken in payment to the corporation for stock or bonds except at its fair value, which shall be ascertained and certified by the commission.

"There are also provisions for reorganization and merger, which contain similar limitations as to the issue of stocks and bonds. The features that I have detailed remain in the bill.

"Two sections have been stricken out. Section 7, attempted to legalize the making of traffic agreements not to last longer than thirty days [no such time limit in the bill as presented.—Editor.] between competing lines as to rates, but forbade pooling. This was declared for in the platform and recommended to Congress in two or three messages of President Roosevelt. The purpose was to legalize the practice that will prevail whether the law permits or not.

"It seems to me essential that rates should be fixed temporarily at the same amount in order to prevent a rate cutting where each time the fixing of rates is had. No one suggests the wisdom of instituting prosecutions under the anti-trust law to prevent this practice, and it seemed wise, therefore, to formulate its limitations to continue and recognize it as lawful, but the fear that it might impair the efficacy of the anti-trust law in some indefinite way was so strong among some members of the Senate that it was thought wise to withdraw the section.

"Section 12 was also withdrawn. That is the section that forbids the acquisition by one railway company of the stocks in a competing line, but where such an acquisition has already been made of 50 per cent. authorizes the acquiring company to increase its holdings to 100 per cent.

"This was not with the view of strengthening the control of the acquiring company, for 50 per cent. is all that it needed, but it was to keep open a market to the minority stockholders to sell to the majority stockholders. This, too, it was thought, in some way infringed on the anti-trust law, and the whole section was dropped.

"I am hopeful the section may be restored to the extent of forbidding future acquisition by one line of stock in a competing line. It is true that such an act affecting interstate commerce might be part of a conspiracy to restrain competition and so restrain trade and be punishable under the Anti-Trust act, but it would greatly facilitate prosecutions, if the specific act of the acquisition of stock in a competing line could be denounced and punished or prevented by injunction.

"I think it will be seen from this review that the railway bill, which, in many respects, is the most important of the administration measures, still retains its important features, and I am hopeful that within the next two weeks we shall see the passage of the bill in both houses, the adjustment of the differences between the two houses, and its final enactment.

"It means a great step forward in the power of regulation intrusted to the Interstate Commerce Commission subject to a court review. It does not transfer—and I should be loath to do this—from the board of directors to the Interstate Commerce Commission the power of running and operating the railway. It still leaves wide discretion in the owners of the property, but the powers exercised by the commission, I feel confident, can be exercised for good and will not remove the existing motives of enlightened selfishness for the improvement by the owners of railways in the methods and cost of transportation."

Fire Control on the Great Northern and Northern Pacific.

Secretary Wilson, of the Department of Agriculture, has made an agreement with the Great Northern and with the Northern Pacific for co-operation of the Government Forest Service and the railways to prevent damage to the national forests from fires. The companies agree to clear and keep clear of inflammable material a strip of varying width, as conditions may demand, up to 200 ft. outside of the right of way, and to provide all locomotives which do not burn oil with suitable spark arresters and other standard equipment to prevent the dropping of fire. It is also stiuplated that every effort will be made by the companies to operate their locomotives so as not to cause fires. Prompt notification to forest officers of all fires discovered by employees of the railways is provided for, and telephone lines to make this possible will be put up by the Forest Service. Except for salaries of regular employees the cost of fighting fires which start within 200 ft. of the railways will be borne by the companies and of all others by the Forest Service, unless it shall be shown in the first case that the railways were not responsible, or in the second case that they were responsible for the outbreak of the fire.

The Forest Service will regularly patrol the rights of way during the fire season. The Northern Pacific, being a land-grant company, owns a great amount of timber on the alternate sections along its line. The Great Northern, although it is not a land-grant road, also has property at stake in its buildings and the line itself, operation of which may be seriously interfered with by forest conflagrations. The value of heavy timber in mountainous regions as a deterrent to avalanches, landslides and floods is also to be considered as well as the general industrial prosperity of the country.

Tests of Washed Grades of Illinois Coals.

The Engineering Experiment Station of the University of Illinois has issued Bulletin No. 39, by C. S. McGorney. This bulletin presents the results of an elaborate series of boiler tests made in connection with a 210-h.p. brick-set water-tube boiler, equipped with a chain grate stoker. The fuel employed was washed Illinois coal of the various sizes commonly used for steam purposes.

The objects of the tests were: (a) To determine the relation of the size of coal to the economy and rate of evaporation obtainable; (b) To determine the effect of varying rates of combustion upon the economy for each of the different sizes experimented upon; (c) To determine the effect of different depths of fuel beds upon efficiency and capacity; (d) To make a study of the effect of fuel beds upon the draft required.

Comparisons made along these lines and the discussion thereof together with the conclusions drawn constitute the major part of the bulletin. Descriptions of the methods of making and recording furnace observations, and methods for sampling flue gases will be found of particular interest. The following are some of the conclusions derived from the series of tests: (1) The greatest economy was obtained with coal from ¾-in. to 1-in. in size, though the difference in economy obtained from all sizes above ⅜-in. was not large; (2) Any rate of combustion commonly employed in stationary practice may be obtained by the use of all the sizes tested except that of ⅜-in. and under; (3) The thermal efficiency decreases slightly with an increased rate of combustion and apparently in a linear relation; the horse-power is approximately proportional to the rate combustion; (4) The thickness of the fuel bed, within the limits employed in the experiments, seems to have little effect upon the efficiency, the maximum difference being approximately 2 per cent.

Copies of this bulletin may be obtained gratis upon application to W. F. M. Goss, director of the Engineering Experiment Station University of Illinois, Urbana, Ill.

Samuel Spencer.

At Atlanta, Ga., on Saturday, May 21, the employees of the Southern Railway will dedicate a bronze statue of Samuel Spencer, first president of that company, who was killed in a collision on the road November 29, 1906. The statue is by Daniel C. French and it was paid for by 30,000 employees, each subscribing a fixed percentage of his salary for the month of March, 1907. It is a portrait statue of heroic size, set upon a pedestal of Knoxville marble, and it stands on the plaza of the Atlanta terminal station. The statue will be presented to the state of Georgia and the city of Atlanta by President W. W. Finley and an address will be made by Judge Alexander P. Humphrey, of Louisville.

Long Island Railroad Offices in Manhattan.

The Long Island Railroad has abandoned its plans for putting up a $1,000,000 office building in Jamaica, and instead will build a less expensive two-story structure to provide offices for the division superintendent, dispatchers, trainmen, paymaster and minor officers.

The principal offices of the company will be transferred about August 1 to the new Pennsylvania Terminal building, at Thirty-third street, Manhattan, where the offices of

the president, general superintendent, real estate agent, purchasing agent and the electrical superintendent will be established. The Long Island will rent the entire third floor of the Pennsylvania station, at the Eighth avenue end of the building. The office space thus acquired will have a frontage of 250 ft. on Thirty-third street, 250 ft. on Thirty-first street, and the whole length of the building on Eighth avenue (about 470 ft.).

Besides the offices of President Peters and the others named, the legal department, the claim department and the general secretary will be moved from Cedar street, Manhattan; the offices of the traffic manager, the general passenger agent and the auditor, from Twenty-ninth street, Manhattan, and the office of the chief engineer of electrical traction, which is a joint office of the Long Island and Pennsylvania roads, will be moved to the Pennsylvania station. About 200 men in all will thus be transferred.

At Jamaica will be the offices of the superintendent, the trainmaster, paymaster, superintendent of police, superintendent of stations, car record office, chief surgeon, relief association and superintendent of express. This will involve the transfer of 100 men from Long Island City.

The offices of the chief engineer and the engineer of maintenance of way, now in Jamaica, will remain there.

Superintendents' Views on Freight Car Interchange.

The American Association of Railroad Superintendents, at its semi-annual meeting in Chicago approved the following uniform interchange rules, and they were recommended to the American Railway Association for adoption, with the exception of rule 5, which was sent to the Master Car Builders' Association:

Rule 1. M. C. B. rules shall govern unless otherwise provided herein.

Rule 2. All cars must be received in interchange, regardless of condition, with the following exceptions:

(a) Defects constituting violation of the law.

(b) Empty cars furnished for loading, not safe and serviceable for the commodity to be loaded.

(c) Empty foreign cars, on an order from the Chief Interchange Inspector (where Chief Interchange Inspectors are employed), if car is found to be in general worn-out condition as outlined in M. C. B. Rules 125 and 126.

Rule 3. Where a shipment of liquids is received in a leaky condition, immediate notice by telephone, to be confirmed in writing, shall be given to the delivering road, but receiving road shall at once take measures to stop the leak, making transfer if necessary, and ascertain, by weighing or measuring, amount of loss up to such time; party at fault to be responsible for any expense incurred under this clause.

NOTE.—It is recommended that each Division show a list of the industries and their location where cars containing liquids may be transferred.

Rule 4. The delivering road shall pay the cost of transfer:

(a) When transfer is due to defective equipment that is not safe to run according to M. C. B. rules, except when, without making transfers, repairs can be made in 24 hours as per M. C. B. Rule 106. Where allowance for both car under load and empty is made the empty allowance shall be used.

(b) When transfer is necessary on account of car being improperly loaded according to M. C. B. specifications, provided adjustment cannot be made in equal to 10 working hours of one man, or when due to car being loaded in excess of 10 per cent. above marked capacity.

(c) When transfer is due to delivering road not desiring its equipment to go beyond junction points.

The receiving road shall pay the cost of transfer:

(d) When cars cannot pass clearances or be moved through on account of any other physical disability of receiving road.

(e) When receiving road desires transfer to save cost of mileage or per diem.

Rule 5. Should car be delivered with car owners' or old defects and road receiving damage it further, causing a combination denoting unfair usage, the receiving road will be responsible only for the damage done by it. This rule applies to switch or intermediate movements only.

Opinion on Texas 16-Hour Law.

Assistant Attorney-General Rowland, of Texas, has written an interesting opinion for the State Commissioner of Labor construing the Texas 16-hour law. The Commissioner of Labor inquired if the law was violated in such a case as the following: A crew leaves D for G, a distance of 150 miles, and when it reaches C, which is 50 miles from G, has been on duty 16 consecutive hours. There is another crew right behind it which has been on duty only 6 hours. The first crew is instructed to deadhead to G with the second crew. As soon as G is reached, the crew that was deadheaded from C to G is ordered to take charge of and operate another train, the company claiming that it was off duty during the 10 hours it was being deadheaded. The men say that they cannot rest while being so deadheaded and that when they have worked 16 consecutive hours they are entitled under the law to spend 10 hours resting at such hotel, boarding-house or other place as they may choose. The opinion of Assistant Attorney-General Rowland as to whether the law is violated or complied with in such a case is as follows:

"The title of the law referred to by you declares that it is 'An act to promote the safety of employees and travelers upon railroads in this state by limiting the hours of service of conductors, engineers, firemen and brakemen.' Section 1 prohibits the requiring or permitting certain classes of railway employees therein named to be or remain 'on duty' for more than 16 consecutive hours and requires that as much as 10 hours 'off duty' shall follow sixteen hours of continuous service. This law nowhere makes use of the word 'rest,' but employs the expression 'on duty' and 'off duty.'

"However, in view of the avowed purpose of the act as stated in its title, it is evident that the idea of rest after 16 hours of continuous service was in the mind of the legislature. If a railway company, after any of its employees of the classes mentioned in said act have been on duty continuously for 16 hours, does not then relieve them from further carrying out its orders for a period of 10 hours, but on the contrary continues to control their actions in furtherance of its own purposes and does so under such circumstances that the men's rest is materially interfered with, we are of the opinion that this is a violation of the law."

Special Train for Mechanical Conventions at Atlantic City.

In accordance with its usual custom the Pennsylvania system will run a fine special, electric-lighted train from Chicago to Atlantic City for the accommodation of members of the American Railway Master Mechanics' Association and the Master Car Builders' Association and their friends desiring to attend the conventions of these associations at Atlantic City, June 15-22. The train will leave the Union Station at Chicago at 3 p.m., Monday, June 13, and reach Atlantic City at 12 o'clock, noon, the following day. It will be composed of modern Pullman sleepers, observation cars, library, smoking and Pennsylvania dining cars. The fare will be $26 for the round trip. Tickets will be on sale with 30 days return limit, and will permit of stop-over privileges at Philadelphia, Washington, Baltimore and Pittsburgh, returning. Should it be desired, however, to have the privilege of stopping at Washington and Baltimore, it will be necessary to so state at the time of purchasing tickets. Diagrams are now in the office of the city ticket agent of the Pennsylvania lines at 248 South Clark street, Chicago. Reservations may be made by applying to him, or to G. G. Beltzhoover, district passenger agent, Chicago.

Increases of Pay.

The yard men of the New York, New Haven & Hartford will receive increases of pay based on those granted to yard men on the New York Central, as announced in another column.

The Erie has increased the pay of firemen 6 per cent.; and to those who fire the heaviest engines a much larger increase will be given.

Dr. Neill, the government mediator, has been taking testimony on the question of the pay of the telegraphers of the Seaboard Air Line.

The Missouri, Kansas & Texas and the Kansas City Southern have increased the pay of machinists three cents an hour.

Negotiations between the Erie Railroad and its conductors and trainmen were ended last week without agreement. The men are voting as to further action, the result of the vote to be announced May 16.

The Pennsylvania Railroad has granted certain increases of pay to its telegraphers, in addition to the general increase recently made. It also extends passes to more employees in the telegraph department, and has made a change in the rule for bidding in vacancies.

The Wabash-Pittsburgh Terminal has increased the wages of machinists and shop men, effective June 1. The raise is said to average something over 5 per cent.

The Chicago, Rock Island & Pacific has made a flat increase of three cents per hour in the pay of machinists.

The threatened strike of freight-handlers in Chicago will not take place. By a unanimous vote of the members of the Brotherhood of Freight-Handlers in favor of accepting the compromise offered by the roads an increase of two cents an hour in the wages of the men paid by the hour and $5 a month to those paid by the month was accepted.

New York Central Wages.

The decision of the arbitrators, E. E. Clark and P. H. Morrissey, on the wages of conductors and brakemen on the New York Central, gives the men practically all they asked for except on the long passenger runs (440 miles), and in the matter of double heading. The rates awarded for passenger runs of 5,500 miles a month and those awarded to through freight conductors on the main line are less than asked for and less than the standard, but on the first of next January these classes are to have the standard rates.

The arbitration covered the pay and certain conditions of employment of passenger and freight conductors, assistant conductors, baggagemen, brakemen, flagmen, yard conductors and yard brakemen. The agreement to arbitrate was signed April 12, and the award takes effect as of April 1. The report of the arbitrators says:

"For many years rates of pay of trainmen and yardmen in the territory east of Chicago, St. Louis and the Mississippi river have been lower than in the territory west of that line, and the differences were widened by substantial increases secured on the western lines in 1903 and 1907. The employees on the eastern lines had their requests and proposals for increases of pay all ready for submission to the managements of the roads when the financial depression of 1907 occurred. * * *

"Differing views have always been entertained and expressed as to the effect that should be given to changes in the cost of living. Whatever opinions may be held in connection with temporary fluctuations in such cost it must be and is conceded that present conditions warrant and require readjustment of wages of men who, like those here involved, have not had such readjustment. Evidently we have reached a permanently new basis of living and living costs which calls for substantial increase in wages to these men.

"It happened that the efforts of the employees * * * were first made on the Baltimore & Ohio, and modifications made in that settlement necessarily established precedents of great weight. * * *

"* * * We shall award the rates and rules which we regard as the proper standards in this territory. At the same time we shall prescribe certain exceptions, due to local conditions, which are peculiar to this line, and shall postpone the effective date of a part of the increases awarded, solely because the increases and the percentage of increase necessary to reach those standards on this system are much greater than were necessary on any system in this territory upon which settlement has been made, and much greater than will be necessary on any system in this territory of which we have knowledge."

The arbitration is set forth under 16 heads. The arbitrators first name the rates asked for (which were the same as those demanded of the B. & O.); next the rates actually agreed on in the B. & O. negotiations, and then the award. We omit the original demands as, when the matter finally went to arbitration, the employees, in substance, demanded nothing higher than what they had got from the B. & O.

ARTICLE A—PASSENGER RUNS.

B. & O. rates (cents per mile): Passenger conductors, 2.68; minimum per month, $125. Baggagemen handling express, 1.65; minimum $79. Baggagemen not handling express, 1.55; minimum per month, $75. Brakemen, 1.50; minimum per month, $70.

The New Haven and the Boston & Maine granted these rates and made minimum rates per day of 10 hours or less as follows: Conductors, $4.20; assistant conductors, $3.35; baggagemen, $2.75; brakemen, $2.55.

The arbitrators are impressed with the force of the New York Central's argument that its long runs are easier on the men, and they find established precedents for differentiating between fast through trains on long runs and slower trains and shorter runs; and they award the following as the standard passenger-train rates (in cents per mile):

Conductors	2.68
Assistant conductors	2.15
Baggagemen	1.55
Rear trainmen (flagmen)	1.525
Brakemen	1.50

Exceptions.—Men running through between New York or Weehawken and Buffalo or Suspension Bridge: Conductors, 2.40; baggagemen, 1.39; rear trainmen, 1.37; brakemen, 1.34.

On through passenger runs (on the principal divisions) other than those in the preceding paragraph, on which the crews run more than 5,500 miles a month: Conductors, 2.50; baggagemen, 1.45; rear trainmen, 1.42; brakemen, 1.40; but on January 1 next the men covered by this paragraph shall have the standard rates of 2.68, etc. On all shorter runs the arbitrators leave the rates to be adjusted between the company and the men, but award that these men shall have their pay increased in harmony with the relation of their runs to the longer runs.

ARTICLE B—SHORTER PASSENGER RUNS.

On runs of less than 155 miles a day the minimum allowances shall be, for each day the men are used, as follows: Conductors, $4.20; assistant conductors, $3.35; baggagemen, $2.75; brakemen, $2.55. These day-rates, it will be seen, are the same as those granted on the New Haven. Regularly assigned employees who report for duty the entire month and do not lay off of their own accord are to receive minimum sums per month, excluding overtime, as follows (same as B. & O. and New Haven except as to rear trainmen): Conductors, $125; assistant conductors, $100; baggagemen, $75; rear trainmen, $72.50; brakemen, $70.

ARTICLE C—MINIMUM DAY—PASSENGER.

Ten hours or less, 155 miles or less to be a day's work, overtime to be computed from the time men are required to report and do report for duty, and to continue until they are relieved from duty at the end of the run; rates for overtime per hour: Conductors, 42 cents; assistant conductors, 33 cents; baggagemen, 25 cents; rear trainmen, 24 cents; brakemen, 24 cents. Overtime is to be computed for each employee on the basis of actual time. The arbitrators hold that there is no good reason why the employee should work 29 minutes for nothing or why the company should pay one hour's pay for 31 minutes overtime.

New York Central passenger train employees on short turnaround runs, no single trip of which exceeds 80 miles, including suburban service, shall be paid overtime for all time actually on duty or held for duty in excess of eight hours (computed on each run from the time required to report for duty to end of that run) within 12 consecutive hours; and also for all time in excess of 12 consecutive hours computed continuously from time first required to report to final release at end of last run. All other New York Central passenger train employees shall be paid for overtime on the basis of 20 miles per hour, computed from the time required to report for duty until released, and separately for each part of a round-trip run. This paragraph, being an innovation, takes effect June 1.

In passenger train service on the Boston & Albany the Boston-Springfield and Springfield-Albany runs shall be paid overtime on the above basis of 20 miles per hour. On all other Boston & Albany passenger runs ten hours or less shall constitute a day, and all time in excess of ten hours, computed continuously from the time required to report to final release at the end of last run, shall be paid for as overtime.

ARTICLE D—MILK TRAINS.

Pay to be increased by the same percentage as in through freight service.

ARTICLE E—NO REDUCTION IN CREWS.

Reductions in crews and increases in mileage shall not be made for the purpose of offsetting the increases in wages; but this shall not prevent readjustment of runs in short turnaround and suburban service that are paid for under minimum rules, provided the number of crews is not reduced.

ARTICLE F—THROUGH AND IRREGULAR FREIGHT.

The arbitrators grant the B. & O. rates: Conductors, 3.63

cents a mile; flagmen, 2.525; brakemen, 2.42. Runs of less than 100 miles to be paid for 100 miles; but by agreement certain employees may make two or more short runs in continuous service without being entitled to 100 miles for each trip. On the main line these rates are not to take effect until January 1 next; until that time the rates shall be: Conductors, 3.4 cents; brakemen, 2.35 cents.

ARTICLE G—LOCAL FREIGHTS.

The arbitrators grant the B. & O. rates: Conductors, $3.975 per day; flagmen, $2.80; brakemen, $2.70. Ten hours or less, or 100 miles or less, will constitute a day.

ARTICLE H—MINIMUM DAY—FREIGHT.

Ten hours or less, or 100 miles or less, a day's work. On runs of over 100 miles overtime will be paid on a basis of speed of 10 miles an hour. Time to be computed from hour of reporting to hour released, as in passenger service. On the New York Central heretofore time has been computed from 30 minutes before the leaving time of the train. The arbitrators hold that where men have duties to perform before leaving they should be paid for the time thus occupied.

ARTICLE I—WORK TRAINS, ETC.

Work and wrecking trains to be paid through freight rates, except that the present minimum of $2.50 a day for brakemen shall be continued.

ARTICLE J.

Mixed trains, pushers, etc., to remain in the classes that they are now in and to have the same increases as the other freight men in those classes.

ARTICLE K.

Rates for special or incidental services to be increased in harmony with the other increases.

ARTICLE L—DEADHEADING.

An inflexible rule is impracticable. On the Boston & Albany trainmen deadheading have received full pay, and this rule shall be continued, with an exception as to extra men. On the New York Central men deadheading on passenger trains will have one-half mileage rates for the class of service in which they are engaged; on freight trains, full mileage rates; when running with light engines or with engine and caboose, through freight rates; this on both roads.

ARTICLE M—DOUBLE HEADINNG.

The demand was for discontinuance of double heading with trains of over 30 cars, except in case of inclement weather and in case of accident, etc. On the B. & O. this was not granted, and it was agreed that an effort should be made to have a conference, on this subject, with all the roads in the eastern territory, and the New Haven and the Boston & Maine left the question in the same situation.

The percentage of double heading in freight service on the New York Central is small, and therefore the arbitrators decide that the N. Y. C. and the B. & O. shall join in the proposed conference.

ARTICLE N—PAY OF YARDMEN.

The men demanded the Chicago rates. Since that demand was presented the Chicago rates have been increased three cents an hour, and the N. Y. C. and the B. & A. previous to the arbitration had voluntarily made the same increase. But there are six different scales of pay. On the B. & A., the New Haven and the B. & M., the different yards were classified in groups, according to the importance of the yard. The arbitrators think there should be only three groups, and for the highest group they award one cent an hour less than the Chicago rates, which will make the rates the same as those which have for a long time prevailed at Buffalo and at New York City, and which have recently been adopted at Cleveland. The award, therefore, for all of the large yards is, in cents per hour: Day conductors, 37; night conductors, 39; day brakemen, 34; night brakemen, 36. In one yard on the B. & A. and 11 yards on the N. Y. C. the rates are one cent less than these in each case, and in all other yards they are two cents less. In all yards the day's work is ten hours; actual overtime to be paid for pro rata.

ARTICLE O—NO RATES TO BE REDUCED.

Neither this award nor any minor adjustment made under it shall reduce a compensation now paid for any service.

In numerous instances at present employees have certain days off, which privilege affects the compensation. These allowances are in general to be abolished. The pay of baggagemen who handle express business is left to be settled between the officers and the committees of employees, but their increases must be in harmony with those awarded. Numerous allowances for constructive mileage are to be discontinued, with certain exceptions.

ARTICLE P—SIXTEEN-HOUR LAW.

This proposal developed no substantial difference of opinion between the parties to this arbitration, and the award is:

(a) Under the laws limiting the hours on duty, crews in road service shall not be tied up unless it is apparent that the trip cannot be completed within the lawful time; and not then until after the expiration of 14 hours on duty under the Federal law, or within two hours of the time limit provided by state laws if state laws govern.

(b) If road crews are tied up in a less number of hours than provided in the preceding paragraph, they shall not be regarded as having been tied up under the law, and their services shall be paid for under the pay schedule of the road.

(c) When road crews are tied up between terminals under the law, they shall again be considered on duty and under pay immediately upon the expiration of the minimum legal period off duty applicable to the crew, provided the longest period of rest required by any member of the crew, either eight or ten hours, shall be the period of rest for the entire crew.

(d) A continuous trip shall cover movement straight-away or turn-around from initial point to the destination train is making when required to tie up. If any change is made in the destination after the crew is released for rest, a new trip shall commence when the crew resumes duty.

(e) Road crews tied up under the law shall be paid the time or mileage of their schedule, from initial point to tie-up point. When such crews resume duty on a continuous trip, they shall be paid miles or hours, whichever is the greater, from the tie-up point to the next tie-up point, or to the terminal. This does not permit crews to be run through terminals unless such practice is permitted under the pay schedule.

(f) Road crews tied up for rest under the law, and then deadheaded into terminal, with or without caboose, shall be paid therefor as per paragraph (e) the same as if they had run the train to such terminal.

(g) Train employees tied up in obedience to law shall not be required to watch or care for engines or perform other duties while so tied up.

(h) Yard employees who are relieved for rest in compliance with law shall be permitted to resume work when the lawful rest period is up and to work ten hours or be paid for ten hours.

Investigation of Western Indiana Real Estate Deals and the Alleged Legislative "Slush Fund."

Wm. J. Henley, formerly president of the Chicago & Western Indiana, was on May 6 indicted by a state grand jury at Chicago for the alleged embezzlement from the road of $28,000 on May 9, 1907. The indictment of Mr. Henley grew out of an investigation begun by the state's attorney of Cook county, Ill., of alleged bribery of members of the legislature of Illinois to secure the passage of House Bill No. 777, which was enacted to remove a cloud from a bond issue of the Chicago & Western Indiana. The indictment of Mr. Henley seems to have been based on testimony given by John C. Fetzer, Benjamin Thomas, who preceded Mr. Henley as president of the road, and Charles R. Kappes, its former real estate agent, who are being sued by the road for alleged frauds in the purchase of real estate for it.

At the time House Bill No. 777 was passed, Mr. Henley was general solicitor of the road. Members of the state's attorney's staff at Chicago are quoted as saying that the $28,000 in question was paid to Mr. Henley by Mr. Fetzer for distribution among members of the legislature to procure the passage of the bill in question. No accounting was made of the money, according to the company's books, and it is alleged that Mr. Henley either did distribute it among the legislators or kept it himself.

All of the directors and several of the officers of the Chicago & Western Indiana were called to testify before the grand

jury. It is understood that F. A. Delano, president of the Wabash, and other directors told the grand jury of the alleged frauds committed against the road by Thomas, Fetzer and Kappes. The directors who testified all said that they had no knowledge of the bribing of legislators and that they did not believe that there was any bribery in connection with the enactment of House Bill No. 777.

Telephone Train Dispatching on the Great Northern.

The Great Northern has begun the installation of a very extensive telephone train dispatching system, which will involve the stringing of approximately 4,600 miles of wires and the installation of 726 telephone stations. It is expected to have all this installation completed by Jan. 1, 1911.

The service is now being installed on the Spokane division from Troy, Mont., to Leavenworth, Wash., a distance of 337 miles, and will be in operation within the next three weeks. Materials and equipment are also being assembled for the installation of the service on the following divisions: Lake District, 455 miles. Fergus Falls division, Minneapolis to Barnesville, Minn., and Willmar to Sandstone, Minn., 348 miles. Breckenridge division, Breckenridge, Minn., to Devil's Lake, N. D., and Casselton, Minn., to Larimore, N. D., 255 miles. Northern division, Barnesville, Minn., to Crookston, Minn., 348 miles. Dakota division, Barnesville, Minn., to Neche, N. D., and Redland, Minn., to Devil's Lake, N. D., 301 miles. Cascade division, Leavenworth, Wash., to Seattle, Wash., and Everett, Wash., to Vancouver, B. C., 265 miles.

Questions for Discussion at the International Railway Congress.

Following is a list of the questions which are to be discussed at the eighth session of the International Railway Congress, to be held at Berne, Switzerland, next July, together with a list of the reports that are to be made, i.e.: under the first subject a report is to be made covering France, Belgium, Italy, Spain and Portugal; another covering Austria-Hungary, Rumania, etc.; another covering countries using the English language, and another for all other countries. We give the names of the "reporters" who will represent English-speaking countries.

Section I.—Way and Works.

I.—Rail-joints.

A. Reduction in the number of joints by increasing the length of the rails. Maximum length to be adopted for ordinary track rails. The welding of rail-joints.

B. The strengthening of rail-joints.

France, Belgium, Italy, Spain and Portugal; Austria-Hungary, Rumania, Bulgaria, Servia, Turkey and Egypt; Countries using the English language, Mr. Ross, Great Northern Railway, London; Other Countries.

II.—Strengthening the track and the bridges with a view to increasing the speed of trains.

A. Increasing strength of road on account of increased weight of locomotives and speed of trains. Means for increasing the speed on curves without increasing the superelevation of the outer rail to a corresponding extent. Economy of maintenance to be realized from the use of a stiffer track. Cross-section and quality of the rail. The spacing of wooden sleepers and their seats. Substitution of other materials for wood in making sleepers.

B. The suitable strengthening of existing metal bridges proportionately to the increase in the weight of the locomotives and in the speed of the trains.

Austria-Hungary, Bulgaria, Rumania, Servia and Turkey; America, Mr. Byers, Missouri Pacific, St. Louis; Spain and Portugal; France and Italy; Holland and Belgium; Russia; Great Britain, Mr. Jacomb-Hood, London & South Western, London; Other Countries (A); Other Countries (B).

III.—Junctions and swing-bridges. Elimination of slacking.

Arrangement of the road appliances for passing at high speed over switches and swing-bridges.

France, Italy, Spain and Portugal; Great Britain, Mr. Morgan, London, Brighton & South Coast, London; America, Mr. Besler, Central of New Jersey, New York; Other Countries.

IV.—Long railway tunnels.—Construction, ventilation and operation.

Methods used in constructing, ventilating and operating long railway tunnels.

Submarine tunnels; Alpine tunnels; Great town tunnels in Great Britain, Mr. Fox, consulting engineer, 28 Victoria street, Westminster, London; tunnels in mountainous countries (the Alps excepted) and great town tunnels (Great Britain excepted).

Section II.—Locomotives and Rolling Stock.

V.—The use of steel. Special steels.

A. Use of steel in the construction of locomotives and rolling stock; freight and passenger wagons entirely of steel.

B. Use of special steel of high resistance in the making of the various parts of locomotives and rolling stock (tires, axles, springs, couplers, boilers, etc.).

America (A), Mr. Crawford, Pennsylvania Lines West of Pittsburgh, Pittsburgh; All Countries except America; America (B), Mr. Ettenger, Southern Railway, Washington; Countries belonging to the German Railway Union; Great Britain (B), Mr. Worsdell, North Eastern Railway, Gateshead; Other Countries.

VI.—Improvements in locomotive boilers.

A. Boilers with smoke tubes; precautions in constructing and maintaining tubes and tube-plates.

B. Boilers with water tubes. Steam superheaters and valve gear for superheated steam. Feed water heaters.

C. Damages to boilers, blisters, cracks and corrosions. Means employed for preventing these damages. Purification of the water and disincrustants or antifouling compounds.

Russia (A and C); America (A and B), Mr. Vaughan, Canadian Pacific, Montreal; Austria-Hungary, Rumania, Bulgaria, Servia and Turkey (B); Russia; France, Belgium, Italy, Spain and Portugal (B); Austria-Hungary, Rumania, Bulgaria, Servia and Turkey (A and C); France, Belgium, Italy, Spain and Portugal (A and C); Great Britain, Mr. Fowler, Midland Railway, and Mr. Archbutt, Midland Railway, Derby; Other Countries.

VII.—Steam locomotives for very high speeds.

Steam locomotives for obtaining regulation speeds exceeding 60 miles an hour.

America, Mr. Garstang, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis; Other Countries.

VIII.—Electric traction.

Electric traction on large railways. Continuous current. Aletrnating current (monophase or polyphase). Comparative net cost.

Germany; America, Mr. Gibbs, Long Island Railroad, New York; Other Countries.

Section III.—Working.

IX.—Large stations.

A. Large passenger stations.—Best arrangement of tracks so as to increase their working capacity and ensure safety in shunting operations. Improved mechanical appliances for the conveyance of luggage, etc.

B. Large goods stations.—(1) Arrangements of tracks: (*a*) to allow the continuity of movement of vehicles which require shunting and which are separate from the time the train bringing them has arrived until the train taking them away is being made up; (*b*) to prevent such movement from being interfered with by the arrival or departure of trains; (*c*) to stop without shock such separate vehicles at the end of the successive movements required; (*d*) to start them off again.

(2) New appliances for handling goods.

America, Mr. Jaggard, Pennsylvania Railroad, Elmira; Russia, Austria-Hungary, Rumania, Bulgaria, Servia and Turkey; Other Countries.

X.—Operation of switches and signals.

A. Improved centralized installations for operating switches and signals. The use of water, of compressed air, of electricity, for working the transmissions. Electric interlocking. Route levers.

B. Arrangements adopted to prevent switches taken from the facing or the trailing side from changing their position before the whole train has passed.

C. Use of diagrams to facilitate the consideration of the

full utilization of tracks along passenger platforms and the modifications to be made, in cases of urgency, in the way these tracks are used.

Holland; Austria-Hungary, Bulgaria, Denmark, Germany, Luxemburg, Norway, Rumania, Russia, Servia, Sweden, Switzerland and Turkey; America, Mr. Carter, Chicago & North Western, Chicago; Other Countries.

XI.—PASSENGER TICKETS.

Different types of passenger tickets. Systems enabling the number of blank tickets to be reduced. Simplified tickets for stopping places. Apparatus for printing tickets (and checking them) as and when required.

All Countries.

XII.—MOTOR VEHICLES.

The use and cost of motor vehicles or self-moving cars.

Great Britain, Mr. Riches, Taff Vale Railway, Cardiff; America, Mr. Clark, Buffalo & Susquehanna Railroad, Buffalo; Other Countries.

SECTION IV.—GENERAL.

XIII.—RAILWAYS AND WATERWAYS.

The investigation of the influence of waterways considered as feeders and as competitors, on railways.

Great Britain, Mr. Jebb, Shropshire Union Railways and Canal Company, Birmingham; America, Mr. Hoyt, New York Central Lines. Rochester; Other Countries.

XIV.—STATISTICS.

A. Principles of statistics of railways in operation.

B. Uniform classification of working expenses.

Great Britain, Mr. Acworth, The Albany, Piccadilly, London W.; English Colonies, Mr. Price, general manager, Central South African Railways, Johannesburg; Other Countries.

XV.—MOTOR CAR SERVICES.

Porterage, cartage and connecting services by motor car.

All Countries, Mr. Inglis, Great Western Railway, London.

XVI.—PERISHABLE GOODS.

Suitable measures for developing the traffic in perishables; packing, refrigerator vans, appliances for keeping temperature constant, etc.

Countries using the English language, Mr. Culp, Southern Railway, Washington; Other Countries.

SECTION V.—LIGHT RAILWAYS.

XVII.—LINES BELONGING TO MAIN RAILWAYS BUT HAVING NOT MUCH TRAFFIC.

Simplification in operating lines belonging to main railways but having not much traffic.

All Countries.

XVIII.—THE WORKING OF LIGHT RAILWAYS.

Examination of the results of the different systems used in operating light railways (leasing, operating jointly with corresponding main railway, working by concessionary himself, with or without guarantee or subvention from the authorities granting the concession.)

All Countries.

XIX.—LOCOMOTIVES AND ROLLING STOCK OF NARROW-GAGE LIGHT RAILWAYS.

A. Types of the latest locomotives used on narrow-gage light railways, with due consideration to the profile of the line and the class of traffic.

Is it advisable: (1) to protect the wheels and the moving parts by a metal cover; (2) to have a foot-plate at each end of the locomotive? What regulations are there on the subject?

B. What are the latest types of carriages and wagons used on narrow-gage light railways?

All Countries.

XX.—TRANSSHIPMENT.

Examination of the different systems adopted for the exchange of goods between lines of different gages (transshipment at the same level, sunk or raised tracks, trucks for taking cars of another gage, tracks with three or four lines of rails, etc.).

All Countries.

NOTE ON THE UTILITY OF STUDYING THE QUESTION OF FREIGHT CAR INTERCHANGE AND DEMURRAGE.

A. Regulations for the interchange use of freight cars between railways and penalties for delays and misuse of freight cars by railways.

B. Regulations to prevent delays and misuse of freight cars by shippers and consignees.

By Mr. Allen, secretary, American Railway Association, New York.

American Society of Mechanical Engineers.

At the spring meeting to be held at Atlantic City, N. J., May 31-June 3, the following papers will be read and discussed:

Machine Construction and Operation.

The Shockless Jarring Machine. Wilfred Lewis.
A Comparison of Lathe Headstock Characteristics. Prof. Walter Rautenstrauch.
The Strength of Punch and Riveter Frames made of Cast Iron. Prof. A. L. Jenkins.
Improved Methods in Finishing Stayholts and Straight and Taper Bolts as Used in Locomotives. C. K. Lassiter.

Gas Power.

A Regenerator Cycle for Gas Engines Using Sub-Adiabatic Expansion. Prof. A. J. Frith.
Gas Engines for Driving Alternating-Current Generators. H. G. Reist.
Two Proposed Units of Power. Prof. Wm. T. Magruder.
Some Operating Experiences with a Blast Furnace Gas Power Plant. H. J. Freyn.

Miscellaneous Papers.

The Mechanical Engineer and the Textile Industry. H. L. Gantt.
The Elastic Limit of Manganese and Other Bronzes. J. A. Capp.
The Hydrostatic Chord. R. D. Johnson.
The Resistance of Freight Trains. Prof. Edw. C. Schmidt.

Power Transmission.

Improvements in Lineshaft Hangers and Bearings. Henry Hess.
Experimental Analysis of a Friction Clutch Coupling. Prof. Wm. T. Magruder.
An Improved Absorption Dynamometer. Prof. C. M. Garland.
Critical Speed Calculation. S. H. Weaver.

Western Railway Club.

The annual meeting of the Western Railway Club will be held at the Auditorium Hotel, Chicago, on Monday evening, May 16, instead of on Tuesday, May 17, the date fixed by the by-laws. The reason for this change is that it has been the custom to have an evening of entertainment following the election of officers, and on this occasion it has been arranged that Frank L. Smith, cashier of the Corn Exchange National Bank, Chicago, will give his illustrated monologue on "Early Railroading and other Things in and Around Chicago." Every old railway man in and around Chicago has been invited to be present, and an evening of rare historical entertainment and amusing incidents connected with early railway days is promised.

Omaha Railway Club.

At a mass meeting held May 11 George A. Post, president of the Railway Business Association, addressed the club on the subject of railway regulation. The meeting was an open one and was attended by a large number of representative citizens and business men of Omaha, Neb.

International Railway Fuel Association.

At the opening session of the second annual meeting, which will be held at the Hotel La Salle, Chicago, May 23-26, 1910, H. J. Slifer, general manager, Chicago & Great Western, will make an address.

New England Railroad Club.

At the regular meeting held at Copley Square Hotel, Boston, on May 10, a paper entitled "The Section Forces in Railroading" was presented by L. G. Morphy, designing engineer, Boston & Albany.

Imperial Russian Technical Society.

The international exhibition of electricity applied to railways will be held in St. Petersburg, Russia, from August 15 to November 15, 1910.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13, Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 7, 1910, Niagara Falls, Ont.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues; N. Y.; May 31-June 3; Atlantic City.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
RAILWAY ASSOCIATION OF SPECIAL AGENTS AND POLICE OF U. S. AND CANADA.—May 10-13; Los Angeles, Cal
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City.; Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting October 11-13, Atlantic City.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The Southern Pacific has put on a new through night train from San Francisco to Los Angeles by the Coast Line. This, with the Owl train of the old line, makes two through night trains each way between the cities named.

The Metropolitan Steamship Co., running the fast passenger steamers "Yale" and "Harvard" through between New York and Boston, around Cape Cod, announces that the service will be begun for the season on May 23. These steamers are to burn oil under their boilers instead of coal, as heretofore.

The Pennsylvania Company has been indicted at Pittsburgh for failure to collect from the American Steel & Wire Co. a reconsignment charge on certain carloads of coke. The coke was first shipped from Youngwood, Pa., to Allegheny, then reconsigned to Newburgh, Ohio. The tariffs provide that a charge of $2 per car shall be made for reconsigning. The failure to collect this charge is the basis of the indictment.

Following the announcement of increases in commutation ticket rates to New York by the New York, New Haven & Hartford, the reporters gather that all of the prominent lines leading into New York city are preparing to make similar increases; but they do not succeed in getting any definite figures and some of the roads deny that any action has been decided on. Officers of the Long Island road say that no increase is contemplated on that company's lines.

The New York State Senate has adopted an amendment to Assemblyman Parker's public service law amendment bill so as to give the public service commissions power to regulate commutation and mileage rates on railways. A delegation from Westchester county went to Albany to ask Governor Hughes to send a special message to the legislature on this question, but the special message was not needed. This agitation has been brought about by the increases in the New York, New Haven & Hartford commutation rates.

The Illinois Manufacturers' Association has started a movement to oppose the various increases in freight rates that the railways are announcing. Its secretary, John M. Glenn, says that he will call a conference of shippers on this subject which probably will be held at Chicago on May 20. The association is also protesting specifically against the advances in rates on coal from southern Illinois to Chicago and other northern points. At its instance the Illinois Railway Commission has ordered a hearing regarding these rates on May 23. The Illinois and Indiana Coal Operators' Association, the Chicago Association of Commerce and other shippers' organizations are acting with the Illinois Manufacturers' Association.

Through the mediation of the Interstate Commerce Commission the representatives of the trunk lines interested in the rates on import freight from Boston, New York, Philadelphia and Baltimore have come to a temporary agreement. The agreement provides that the Interstate Commerce Commission shall make a full investigation of the rates on import freight at Boston, Philadelphia and Baltimore in the fall, after the resumption of business by the commission. In the meantime the roads running to Philadelphia have agreed not to cut the rate on import freight, so that as matters now stand the rates to New York, Boston, Baltimore and Philadelphia will be all the same. Philadelphia claims a differential rate as compared with Boston.

Traffic Club of Chicago.

On May 10 the Traffic Club of Chicago gave a farewell luncheon in honor of E. A. McCormick, who was recently appointed vice-president in charge of traffic of the Southern Pacific, with office at San Francisco. John T. Stockton presided at the luncheon and S. M. Felton, president of the Chicago Great Western, was toastmaster. The other speakers, all of whom paid high tributes to Mr. McCormick, were J. C. Stubbs, W. A. Gardner and F. T. Bentley. At the speakers' table there were seated Julius Kruttschnitt, John Sebastian, C. G. Burnham, P. C. Stohr, J. G. Woodworth, J. W. Blabon, E. W. McKenna, W. B. Scott, W. L. Ross, General Frederick D. Grant, D. W. Cooke, I. G. Rawn, W. A. Gardner and F. T. Bentley.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1910.
(See also issue of May 6.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,458	$5,228,517	$1,857,563	$7,772,258	$1,180,121	$1,244,979	$138,911	$2,328,772	$152,326	$5,045,109	$2,727,149	. . . .	$273,816	$2,453,333	$438,518
Atlantic Coast Line	4,484	2,246,527	698,974	3,136,235	336,259	103,812	47,196	889,655	80,692	1,757,614	1,378,621	.....	95,500	1,283,121	121,273
Baltimore & Ohio	4,198*	6,132,829	1,413,811	7,643,398	823,842	1,351,879	145,625	2,545,544	143,505	5,010,395	2,633,003	$22,032	213,131	2,397,510	766,183
Boston & Maine	2,242	2,275,314	1,076,996	3,622,954	325,940	511,277	46,981	1,839,364	97,338	2,820,900	802,054	1,777	181,767	618,510	25,087
Central of Georgia	1,915	848,688	236,411	1,176,890	178,373	194,539	32,145	348,739	60,138	814,234	362,656	4,158	45,200	321,914	58,293
Chesapeake & Ohio	1,938	2,384,648	376,938	2,886,697	300,609	503,726	42,541	752,748	18,363	1,647,987	1,238,710	1,939	80,500	1,160,149	339,248
Chicago, Burlington & Quincy	9,021	5,639,575	1,690,127	7,910,775	1,163,395	1,375,660	133,897	2,525,437	215,983	5,414,372	2,496,403	14,201	215,576	2,266,623	21,717
Chicago, Rock Island & Pacific	7,393	3,516,998	1,372,900	5,199,285	875,436	777,340	153,674	2,197,720	149,572	4,153,742	1,045,543	11,908	236,899	796,736	415,593
Cincinnati, Hamilton & Dayton	1,036	578,236	118,230	774,433	100,385	144,119	24,257	322,326	19,719	610,806	163,627	.....	26,889	136,738	29,837
Delaware & Hudson Co.	843	1,482,537	180,166	1,760,251	97,767	230,050	14,545	617,170	11,981	1,001,513	758,738	264	55,000	723,474	238,108
Denver & Rio Grande	2,505	1,524,377	353,963	1,955,958	175,708	297,160	42,733	728,274	14,098	1,285,273	670,685	943	69,000	600,742	216,588
Erie	1,961	3,181,324	682,864	4,142,033	275,726	726,880	94,196	1,347,154	71,025	2,514,981	1,627,052	39,313	108,930	1,478,809	130,564
Illinois Central	4,550	3,853,142	950,035	5,497,829	429,668	1,196,663	98,035	1,776,769	91,360	3,595,495	1,902,334	4,379	220,109	1,677,846	460,785
Louisville & Nashville	4,594†	3,631,724	876,772	4,790,530	815,523	791,943	96,578	1,410,272	81,030	3,225,346	1,565,184	36,557	125,580	1,476,161	220,610
Mobile & Ohio	1,114	690,819	109,038	932,386	111,895	184,478	34,171	306,558	35,451	672,553	259,833	2,778	22,065	234,990	5,586
Nashville, Chattanooga & St. Louis	1,230	767,677	194,539	1,022,562	165,255	159,178	35,814	349,725	23,022	732,994	289,568	593	21,971	267,005	31,041
New York, Chicago & St. Louis	558	905,260	92,353	1,029,649	71,297	126,231	42,729	387,360	13,917	641,534	388,115	1,777	27,000	359,338	142,780
Norfolk & Western	1,951	2,765,697	304,000	3,154,285	316,544	503,813	48,041	875,139	56,968	1,800,505	1,353,780	981	92,800	1,261,961	388,077
Northern Central	467	845,634	167,814	1,065,193	152,993	213,353	13,042	475,516	25,405	880,309	184,884	477	24,708	160,653	19,674
Northern Pacific	5,849†	4,086,121	1,274,578	5,719,139	658,386	717,052	91,804	2,054,963	79,224	3,601,429	2,117,710	11,541	405,237	1,700,932	781,184
Oregon R.R. & Nav. Co.	1,476§	755,453	276,708	1,113,671	219,567	131,558	24,276	399,940	28,578	803,919	309,752	3,445	59,302	247,005	149,558
Oregon Short Line	1,508	1,170,946	334,272	1,631,211	229,707	208,659	22,065	425,918	35,836	922,185	709,026	3,221	55,416	650,389	154,613
Pennsylvania Co.	1,415	3,283,723	603,564	4,217,789	634,097	812,193	70,342	1,532,247	78,841	3,127,720	1,090,069	5,115	117,389	937,265	230,585
Pennsylvania R.R.	3,947	10,562,830	2,609,078	13,924,572	1,635,926	2,807,766	149,999	4,736,017	326,996	9,656,703	4,267,869	144 096	197,526	3,926,246	1,213,886
Philadelphia & Reading	1,024	2,777,657	679,349	3,607,462	283,373	618,876	35,965	1,159,893	62,763	2,160,870	1,446,592	12,399	75,202	1,383,789	225,080
Phila., Baltimore & Washington	717	760,900	613,648	1,505,716	240,576	255,435	25,943	600,065	37,564	1,159,583	346,133	.....	35,772	310,361	3,648
Pitts., Cincinnati, Chicago & St. L.	1,468	2,602,868	593,336	3,549,579	542,721	661,358	68,591	1,228,728	59,944	2,564,342	985,237	753	107,706	876,778	195,847
St. Louis & San Francisco	4,726	2,515,246	760,294	3,518,359	402,687	458,527	81,443	1,197,667	82,134	2,222,458	1,295,901	.....	122,158	1,173,443	93,477
St. Louis Southwestern	773	532,305	99,099	656,096	120,705	89,301	24,241	134,533	23,103	391,883	264,213	652	18,490	245,071	44,431
St. Louis Southwestern of Texas	703	205,046	55,944	283,886	120,031	69,012	9,020	148,474	14,815	361,352	77,466	257	8,333	86,056	28,631
Southern Pacific Co. Pacific System	6,070‖	4,665,319	2,537,922	7,688,768	1,007,269	977,052	144,920	2,230,498	201,621	4,561,360	3,127,408	8,282	280,058	2,839,068	109,505
Texas & Pacific	1,884	921,948	326,860	1,313,701	166,990	209,209	24,130	554,541	34,207	989,077	324,624	3,172	44,764	276,688	137,130
Union Pacific	3,411"	3,113,654	781,988	4,264,978	591,926	572,697	109,800	1,104,310	127,316	2,506,049	1,758,929	17 205	123,250	1,618,474	86,207
Vandalia	827	614,220	175,102	877,508	136,218	169,097	25,963	315,507	22,727	669,512	207,996	.....	25,199	182,797	25,199
Wabash	2,515	1,820,582	513,390	2,521,441	292,612	321,938	75,592	972,872	77,726	1,740,740	780,701	3,382	75,538	704,781	211,732
Yazoo & Mississippi Valley	1,370	640,144	171,716	875,095	144,617	141,955	16,144	286,240	24,875	613,832	261,263	1,378	34,930	227,711	113,571
NINE MONTHS OF FISCAL YEAR, 1910.															
Atchison, Topeka & Santa Fe	7,458	43,604,088	15,629,097	64,339,104	10,505,724	9,850,069	1,273,619	18,568,722	1,372,191	41,570,325	22,768,779	. .	2,306,690	20,362,089	849,574
Atlantic Coast Line	4,484	15,662,123	5,152,812	22,386,196	2,960,078	3,155,265	374,788	6,752,875	623,300	13,866,306	8,519,890	.....	854,000	7,665,890	1,115,087
Baltimore & Ohio	4,198*	50,150,421	10,395,582	64,302,463	8,105,966	11,999,951	1,331,053	21,313,298	1,183,631	43,933,902	20,368,561	141,185	1,734,480	18,192,896	2,278,023
Boston & Maine	2,242	19,124,313	11,048,266	32,542,463	3,850,962	4,013,402	379,037	14,247,792	742,159	28,233,612	9,308,851	52 776	1,580,111	7,780,716	797,525
Central of Georgia	1,915	6,345,796	2,309,568	9,465,850	1,313,355	1,462,239	272,098	2,781,451	377,743	6,236,886	3,228,964	31,882	431,557	2,849,089	417,939
Chesapeake & Ohio	1,938	18,829,890	3,704,921	23,470,941	2,410,397	4,390,331	394,637	6,300,451	167,062	13,938,571	9,532,373	6,522	638,500	8,892,351	1,993,270
Chicago, Burlington & Quincy	9,021	44,773,783	16,947,018	67,147,796	11,083,580	11,734,727	1,259,889	21,059,932	1,663,462	46,801,590	20,346,206	133,916	1,940,264	18,272,026	401,487
Chicago, Rock Island & Pacific	7,393	30,349,232	14,062,428	47,496,183	7,673,529	6,196,377	1,192,689	17,742,222	1,291,038	34,095,855	13,400,328	115,953	1,933,626	11,050,749	78,908
Cincinnati, Hamilton & Dayton	1,036	5,052,393	1,278,877	7,071,300	912,359	1,224,184	198,401	2,818,722	229,218	5,382,887	1,691,113	.....	255,678	1,435,735	196,935
Delaware & Hudson Co.	843	11,912,188	2,217,309	14,829,339	901,639	1,976,653	181,910	5,111,347	348,775	8,545,321	6,284,015	330	706,169	5,977,016	451,436
Denver & Rio Grande	2,505	12,968,805	4,026,396	17,731,570	2,014,064	2,921,399	369,363	6,300,080	116,003	12,110,909	5,620,661	21,692	614,000	5,028,553	682,234
Erie	1,961	26,127 468	6,482,316	35,193,556	3,760,069	6,258,004	815,997	11,523,374	707,274	23,064,718	12,128,838	207,612	2,057,856	10,963,370	1,491,612
Illinois Central	4,550	29,611,596	8,952,060	44,001,208	5,680,376	10,064,131	948,687	14,773,829	877,631	32,344,654	11,656,554	30,850	1,946,394	9,679,110	27,322
Louisville & Nashville	4,594†	28,809,389	8,084,553	39,276,988	5,155,770	6,196,524	822,394	11,787,020	771,589	24,733,297	14,543,691	22,460	1,131,170	13,434,681	2,420,990
Mobile & Ohio	1,114	5,779,798	980,468	7,858,942	934,301	1,422,050	273,222	2,562,936	287,638	5,480,167	2,378,775	22,108	199,731	2,156,936	—74,694
Nashville, Chattanooga & St. Louis	1,230	6,151,180	1,951,856	8,633,821	1,296,623	1,424,055	324,649	2,967,121	205,671	6,218,122	2,415,399	7,810	187,412	2,220,147	293,060
New York, Chicago & St. Louis	558	6,836,926	1,072,266	8,180,130	626,977	853,693	422,564	3,099,482	123,182	5,126,198	3,053,932	12,268	249,110	2,792,554	877,560
Norfolk & Western	1,951	22,132,283	2,964,691	25,923,927	2,596,250	4,368,875	401,321	7,402,903	522,663	15,292,012	10 631,915	9,438	782,400	9,840,077	2,066,254
Northern Central	467	7,499,996	1,595,893	9,619,430	1,121,169	1,865,789	121,819	4,167,275	199,009	7,475,061	2,144,369	6,612	222,376	1,928,605	377,439
Northern Pacific	5,849†	35,364,126	16,366,275	55,005,200	7,176,068	6,784,080	749,815	17,925,156	816,102	33,451,251	21,553,949	559,168	2,469,853	19,643,564	2,381,190
Oregon R.R. & Nav. Co.	1,476§	7,208,933	3,218,145	11,086,174	1,289,598	1,003,000	263,515	3,551,883	290,098	6,398,091	4,688,080	3,596	497,626	4,186,858	245,197
Oregon Short Line	1,508	10,627,313	3,876,530	15,405,645	1,547,926	1,471,431	243,196	3,401,441	287,150	6,954,444	8,451,201	3 818	552,277	7,915,606	562,300
Pennsylvania Co.	1,415	31,002,754	5,689,524	39,727,857	5,104,825	6,394,710	629,231	12,681,433	674,769	25,484,968	14,242,889	30,323	1,338,153	12,879,413	3,592,561
Pennsylvania R.R.	3,947	89,442,000	23,365,985	120,393,952	14,526,517	22,420,481	1,493,508	40,010,903	2,782,350	81,233,759	39,160,193	956,335	1,771,736	36,426,122	8,108,688
Philadelphia & Reading	1,024	26,050,028	5,270,004	32,705,030	2,388,627	6,656,188	337,841	9,860,133	556,291	19,799,080	12,905,950	134,964	662,795	12,378,119	1,429,137
Phila., Baltimore & Washington	717	6,616,824	5,328,886	13,261,020	1,936,698	2,275,174	218,246	5,201,280	287,643	9,919,010	3,342,010	.....	321,915	3,020,095	347,591
Pitts., Cincinnati, Chicago & St. L.	1,468	21,033,637	5,658,549	29,865,058	4,088,448	5,099,811	612,854	9,845,039	534,146	20,180,298	9,684,760	7,661	994,845	8,682,254	2,008,700
St. Louis & San Francisco	4,726	20,254,165	7,681,650	30,086,083	4,346,457	4,389,557	723,312	10,313,981	879,464	20,652,771	9,433,312	.....	1,054,605	8,379,217	506,434
St. Louis Southwestern	773	1,397,153	1,024,691	5,655,785	768,888	807,136	227,147	1,232,449	197,984	3,233,604	2,422,181	7,503	186,627	2,228,051	379,515
St. Louis Southwestern of Texas	703	1,976,906	660,101	2,832,696	762,832	606,908	87,148	1,207,222	140,184	2,804,291	28,402	1,830	80,268	53,696	22,138
Southern Pacific Co. Pacific System	6,070‖	42,754,492	23,634,173	71,006,095	8,344,781	8,935,244	1,157,227	18,518,628	1,803,626	38,759,176	32,246,619	76,702	2,280,547	29,889,370	5,772,565
Texas & Pacific	1,884	8,374,112	2,999,801	12,203,001	1,422,056	1,824,307	186,624	4,613,966	307,549	8,354,502	3,848,499	25,163	435,647	3,387,689	363,742
Union Pacific	3,411"	28,173,819	8,247,436	40,049,491	5,895,585	4,320,559	1,010,877	9,723,260	896,218	19,846,500	20,202,991	10,426	1,144,776	18,987,789	1,596,376
Vandalia	827	4,985,896	1,676,777	7,440,139	1,057,677	1,319,495	218,279	2,673,880	172,280	5,441,611	1,998,528	.....	218,074	1,780,454	342,054
Wabash	2,515	14,949,667	5,299,064	21,913,783	2,521,375	2,921,860	692,583	8,219,473	610,587	14,965,878	6,947,905	20,216	624,710	6,302,979	1,372,291
Yazoo & Mississippi Valley	1,370	5,429,603	1,712,037	7,655,998	1,523,077	1,398,381	118,424	2,500,337	211,675	5,781,893	1,871,105	22,672	321,230	1,572,547	347,432

*Mileage operated on March 31, 1909, 3,992 miles. † Mileage operated on March 31, 1909, 4,388 miles. ‡ Mileage operated on March 31, 1909, 5,695 miles. § Mileage operated on March 31, 1909, 1,327 miles. ‖ Mileage operated on March 31, 1909, 5,598 miles. " Mileage operated on March 31, 1909, 3,310 miles. — Indicates Deficits, Losses and Decreases.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 69-A, giving a summary of car shortages and surpluses by groups from December 23, 1908, to April 27, 1910, says:

"The total surplus is 102,085, an increase of 17,198, about one-half of which is box cars, the remainder being divided between coal and miscellaneous. The increase in miscellaneous is due to an accumulation of coke cars in group 3 (Middle). The total shortage is 5,766, a decrease of 1,764, which is accounted for by the box car figures.

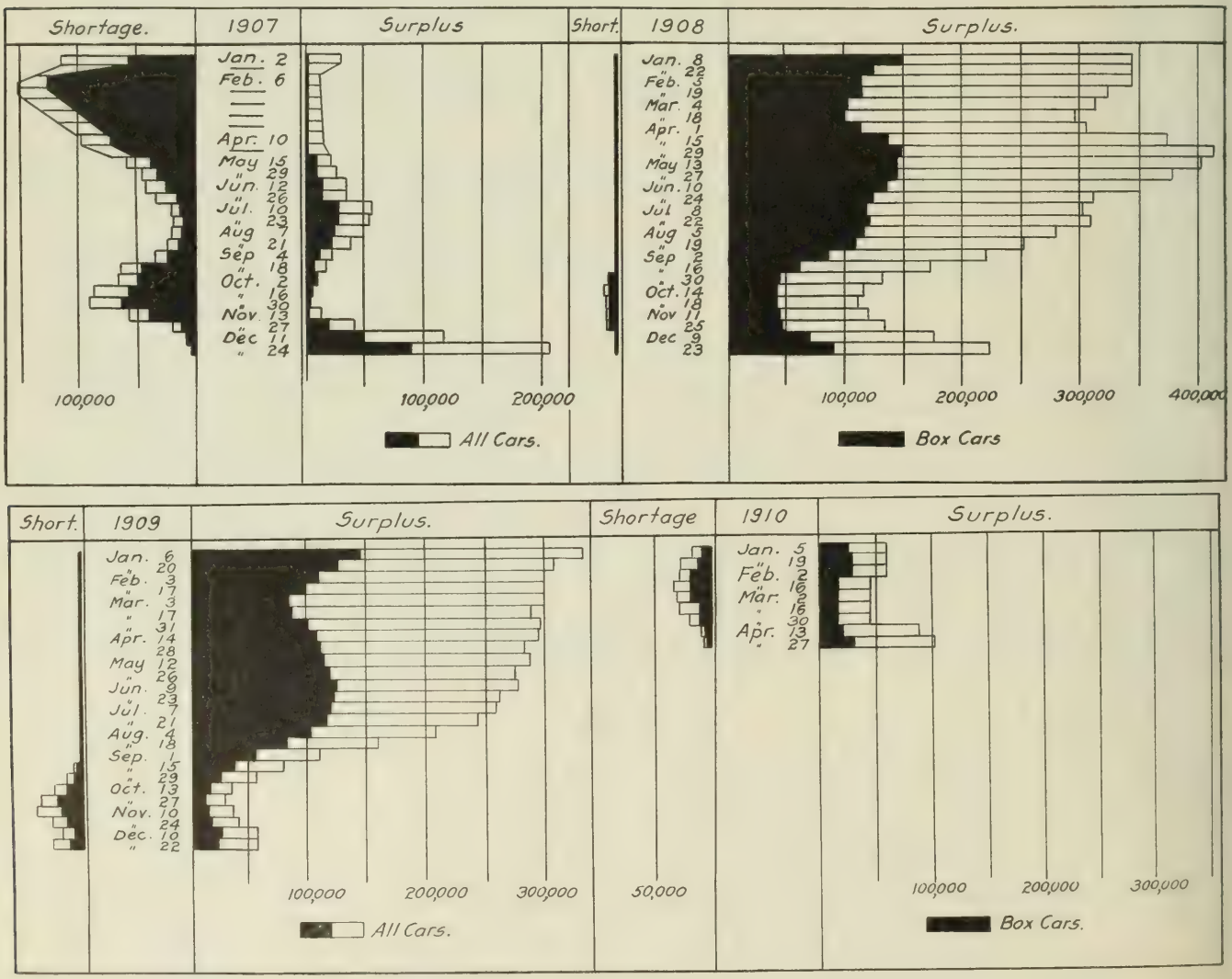
"The increase in surplus coal cars is most noticeable through the West and Southwest, while the largest increases in box are in groups 3 (Middle) and 5 (Southern)."

The accompanying table gives surpluses and shortages by groups of roads for the last period covered by the report, the chart shows total surpluses and shortages in 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1 April 27, 1910	8	214	483	471	212	1,380	84	97	80	10	271
" 2 " 27, 1910	21	1,264	177	5,474	674	7,589	62	15	15	36	128
" 3 " 27, 1910	23	6,308	2,249	20,309	6,317	35,183	75	235	455	479	1,244
" 4 " 27, 1910	10	1,266	2	314	869	2,451	52	598	850	...	1,500
" 5 " 27, 1910	19	3,026	94	2,395	874	6,389	121	346	42	...	509
" 6 " 27, 1910	19	6,720	359	6,080	4,099	17,258	535	77	15	233	860
" 7 " 27, 1910	4	932	124	403	734	2,193	...	...	...	...	...
" 8 " 27, 1910	14	3,019	318	4,519	2,375	10,231	...	...	15	4	19
" 9 " 27, 1910	10	1,287	180	279	912	2,658	...	...	...	...	...
" 10 " 27, 1910	20	4,069	586	4,102	4,728	13,485	500	130	5	43	678
" 11 " 27, 1910	5	1,261	181	45	1,781	3,268	349	89	67	52	557
Total	153	29,366	4,753	44,391	23,575	102,085	1,778	1,587	1,544	857	5,766

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

Minneapolis and Chicago Grain and Flour Rates.

A conference took place in Chicago last week between officers of the Minneapolis-Chicago lines and representatives of the Chicago Board of Trade regarding grain and flour rates from Minneapolis to Chicago and the East. The Chicago grain and flour interests claim that the rates in question discriminate against them and are seeking a readjustment. They indicate that if their demands are not complied with they will appeal to the Interstate Commerce Commission. The rates regarding which special complaint is made are as follows:

	Domestic.	Export.
Rates paid by Minneapolis miller:		
Through, Minneapolis to New York	25.0	21.5
Flour, Minneapolis to Chicago	8.3	7.5
Flour, Chicago to New York	16.7	14.0
Rates paid by Chicago miller:		
Through, Minneapolis to New York	26.7	24.0
Wheat, Minneapolis to Chicago	10.0	10.0
Flour, Chicago to New York	16.7	14.0
Differences against Chicago miller	1.7	2.5

It is pointed out that this adjustment puts the miller at Chicago at a disadvantage as compared with the miller at Minneapolis on domestic shipments of flour to New York of 1.7 cents per 100 pounds, or 3.4 cents per barrel, and on export flour of 2½ cents per 100 pounds, or 5 cents per barrel; and it is claimed that these differentials disable the miller at Chicago from competing with the miller at Minneapolis.

The Chicago miller also has another ground for complaint. There were inspected at Minneapolis in 1907 11,860,680 bushels of winter wheat and in 1908 18,364,490 bushels. This winter wheat was drawn from Kansas City and Omaha and carried a rate of 19½ cents from Kansas City and 18½ cents from Omaha via Minneapolis to Chicago, with transit privileges at Minneapolis, this through rate being based upon the local rate of 12 cents, Kansas City to Minneapolis, and 11 cents, Omaha to Minneapolis, plus the rate of 7½ cents, Minneapolis to Chicago. The product of this wheat paid the lines from Minneapolis to Chicago 7½ cents per 100 pounds. On the other hand, the rate on wheat, Minneapolis to Chicago, is 10 cents. It is contended that this difference between the rates on flour and on wheat is an unfair discrimination, the Interstate Commerce Commission having held that transportation charges for wheat and flour should be substantially the same.

The Chicago millers contend that they have a right to the same rate on wheat from Minneapolis via Chicago to points in central freight association, or trunk line territories, as is made on flour from Minneapolis to the same destination. To bring about this condition they suggest that the carriers put wheat with milling in transit privileges at Chicago in their through flour tariffs from Minneapolis. It is suggested that the roads make a 7½-cent rate on wheat from Minneapolis to Chicago, locally, in place of the present 10-cent rate.

The roads have indicated an unwillingness to make the readjustment sought by the Chicago grain and flour interests. It is pointed out that the rate on wheat from the Missouri river to Chicago is the same as it is from the Missouri river to Minneapolis, that is, 12 cents, and that therefore when the Minneapolis miller ships wheat from the Missouri river to Minneapolis, grinds it into flour and ships the flour to Chicago, he has paid a rate of 19½ cents as compared with the 12 cents which the Chicago miller pays from the Missouri river direct to Chicago. It is conceded by the roads that the fact that the flour rate, Minneapolis to Chicago, is lower than the wheat rate gives the Minneapolis miller an advantage, but it is stated that the flour rates are made to meet water competition on the lakes, and that the Chicago miller has an advantage over the Minneapolis miller in the fact that on wheat originating north and west of Minneapolis he gets a through rate, while the Minneapolis miller, who grinds this grain and then ships the flour to Chicago, has to pay the sum of the local rates, and it is pointed out by the roads that if they give the transit privilege asked for at Chicago they at once would be asked to grant a similar privilege at Minneapolis, which would impair their earnings.

It has been suggested that the roads can eliminate the alleged discrimination against Chicago millers by raising the flour rate. Minneapolis to Chicago, to the same basis as the wheat rate; that is, 10 cents, and Chicago interests say this will be satisfactory to them. In reply to the contentions that the flour rate cannot be advanced because it is controlled by water competition, the Chicago milling interests say that the wheat rate is equally subject to water competition, and that if it can be maintained at 10 cents the flour rate also can be.

Crop Conditions.

The crop reporting board of the department of agriculture estimates that on May 1 the area of winter wheat to be harvested was about 29,044,000 acres, or 714,000 acres (2.5 per cent.) more than the area harvested in 1909, and 4,439,000 acres (13.3 per cent.) less than the area sown last fall (33,483,000 acres). The average condition of winter wheat on May 1 was 82.1, compared with 80.8 on April 1, 83.5 on May 1, 1909, and 86.7, the average for the past ten years, on May 1.

The average condition of rye on May 1 was 91.3, compared with 92.3 on April 1, 88.1 on May 1, 1909, and 89.4, the average for the past ten years on May 1.

Details for winter wheat and rye states follow:

Winter Wheat.

States.	Per cent. abandoned.	Acres remaining to be harvested.	Condition May 1		
			1910.	1909.	10-year av'ge.
Kansas	35.0	4,027,000	65	84	87
Nebraska	28.5	1,978,000	67	83	91
Indiana	5.0	2,627,000	82	77	80
Illinois	7.0	2,139,000	80	78	88
Missouri	17.5	1,821,000	73	82	90
Pennsylvania	2.3	1,556,000	93	88	87
Ohio	4.5	1,944,000	86	70	80
Washington	8.2	676,000	95	93	92
Oklahoma	3.0	1,556,000	87	81	86
Michigan	5.5	869,000	84	82	79
California	5.0	1,088,000	94	81	84
Oregon	6.0	467,000	95	93	96
Maryland	1.1	794,000	93	96	90
Idaho	4.0	345,000	98	93	95
Virginia	2.8	785,000	92	98	90
New York	1.5	444,000	97	85	85
Tennessee	6.5	887,000	83	92	88
Kentucky	6.5	731,000	83	84	88
Montana	15.0	258,000	98	87	..
North Carolina	3.0	652,000	85	92	87
Texas	3.3	1,252,000	91	60	76
West Virginia	3.5	404,000	90	92	86
South Carolina	4.3	453,000	81	89	87
Utah	5.0	155,000	94	93	..
Iowa	28.0	126,000	77	87	90
Colorado	10.0	104,000	94	..	..
Georgia	5.8	268,000	83	93	89
New Jersey	3.0	111,000	96	97	88
Arkansas	3.0	181,000	92	87	87
Delaware	1.8	118,000	98	96	90
Wisconsin	5.0	66,000	92	84	85
Alabama	8.0	123,000	80	91	90
Wyoming	4.8	37,000	94	96	..
Mississippi	5.0	2,000	87	91	86
United States	13.3	29,044,000	82.1	83.5	86.7

Increases in Rates.

The increases in fares on the New York, New Haven & Hartford, noticed last week, include 50-ride family tickets, and on these the advance is in some cases as high as 25 per cent. This appears from the announcement in the bulletin of the New York State Public Service Commission. In abolishing the old style season tickets, good only six days in a week, school commutation tickets are included and, according to the commission's bulletin, pupils of schools will now have to pay 85 per cent. higher fare than heretofore. The commission also figures that on some of the season tickets the increase will be 48 per cent.

The same bulletin announces "advances too numerous to specify" in local round-trip fares on the Harlem division of the New York Central.

The advances in fares on the Boston & Albany in New York State are based on two-mile groups so that, for example, the rate for 35 miles (85 cents) is equal to 2.43 cents a mile.

INTERSTATE COMMERCE COMMISSION.

Shipper Must Load Package Freight.

Utica Traffic Bureau v. New York Central & Hudson River et al. Opinion by Commissioner Clark.

Rule 8B of the official classification provided prior to Jan. 1, 1909, that "the owners will be required to load and unload freight in carloads, except that the carriers reserve the right to load and unload at their expense." On January 1 the words "except the carriers reserve the right to load and unload at their expense" were stricken out and the carriers no longer

furnished tally men and helpers for loading and unloading package freight. Complainant asks that these words be restored to the rules, and the complaint points out that tally men are furnished at New York City, Troy, Rochester and other places. Defendant acknowledged this and said that competitive conditions make it necessary at New York City and other places, and at Troy and Rochester it is done by order of the New York Public Service Commission on intrastate business and, therefore, also done on interstate business. The commission has discussed the subject of loading and unloading package freight very fully in the Wholesale Freight & Produce Association v. A., T. & S. F., 17 I. C. C., 596 case, and following the decision in that case the complaint in the present case is dismissed. (18 I. C. C., 271.)

Reparation Denied.

J. I. Lamb Co. v. Michigan Central et al. Opinion by Commissioner Clark.

Complaint was based on a shipment of grapes from South Haven, Mich., to La Crosse, Wis. (18 I. C. C., 279.)

White Brothers v. Southern Pacific, and four other cases. Opinion by Commissioner Clements.

These cases raise the same question as was considered in *White Brothers v. A., T. & S. F.*, 17 I. C. C., 288, and reparation is denied because of insufficient evidence of unreasonably high through rates. (18 I. C. C., 308.)

Reparation Awarded.

Southern Cotton Oil Co. v. Atlantic Coast Line Railroad et al. Opinion by Commissioner Clark.

Rate on cotton seed hulls from Fayetteville, N. C., to Cartersville, Ga., found unreasonable. (18 I. C. C., 275.)

H. B. Maris v. Southern Pacific et al. and seven other cases. Opinion by Commissioner Clements.

The complaints are of the same character as in the case of Kindelton v. Southern Pacific, 17 I. C. C., 251. From the reasons given in that case the charge of 85 cents of defendant for hardwood lumber in carloads from points west of Mississippi to Pacific terminals was found unreasonable, and a rate of 75 cents was established. Reparation is now awarded on certain shipments moving at the time the 85-cent rate was charged. (18 I. C. C., 301.)

Exception to Through Rate Rulings.

Winona Carriage Co. v. Pennsylvania Railroad et al. Opinion by Commissioner Lane.

Complainant made less-than-carload shipments of bar steel over defendants' lines from Johnstown, Pa., via Chicago, to Winona, Minn., for which the rate for through L. C. L shipments was charged. It appears that a combination rate made up of the L. C. L rate to Chicago plus the carload rate from Chicago would be less than the through L. C. L. rate. On complaint requesting reparation upon the basis of the combination of the L. C. L. rate and the carload rate; it is held that the case presented does not disclose a typical through rate in excess of the combination of locals such as has been condemned in general terms by the commission. Complaint dismissed. (18 I. C. C., 334.)

Compress Rates Upheld.

Anderson, Clayton & Co. et al. v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Cockrell.

The complaint alleges that the Traders' Compress Co. imposes certain charges for applying owners' or shippers' patches to cotton bales in their compression and for storage on cotton remaining in the compress at concentration points after the expiration of fifteen days, and that every service performed in connection with the cotton from the point of origin to destination, including the services so charged for by the compress company, are included in the through rate, and an obligation rests on the carriers to protect the owners or shippers against such charges. The facts shown do not justify any order against defendant carriers; the carriers have the right to compress cotton in transit; they have the right to grant or allow shippers or owners the privilege of concentrating uncompressed cotton at designated compresses on their lines for such treatment as such shippers or owners may desire to give, with the right of such shippers or owners to deliver the cotton back to the carriers for transportation to interstate or foreign destinations at the through rate from points of origin. (18 I. C. C., 340.)

Pacific Coast Switching Cases.

Associated Jobbers of St. Louis v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Lane.

Attack is made on the charge of $2.50 per car made by the defendants for delivering or receiving carload freight to and from industries located on spur or side tracks when the freight is moved incidentally to a line haul. Complaint contends that the charge is illegal, inasmuch as the service for which it is made is an ordinary incident of carriage, and that the charge should be included in the freight rate; and in addition the complaint says that the charge is a discrimination under section 2 of the act to regulate commerce, and that it constitutes an unlawful preference under section 3. Complaint also attacks the rate of $2.50 per car charged the shipper by the delivering carrier where the shipment is received from a foreign carrier and delivered to the consignee on spur tracks belonging to the delivering carrier. This rate is attacked because the delivering carrier receives in addition to the $2.50 paid by the shipper, $7.50 per car paid by the foreign line which turns over the car to the delivering carrier. The charge for delivering cars on spur tracks when this delivery is incident to the line haul is made, so far as is known, only at Los Angeles, San Francisco and San Diego. The spur tracks are within the switching limits of these cities. These industrial spur tracks are not private, in that the carrier may use them for purposes of its own, as for storage of cars, as leads to other industries, and sometimes for public delivery. The charge made for delivery on these tracks is in addition to what would be charged for delivery on the team tracks of the railway. The complainant's view that these tracks are portions of the terminal facilities of the carrier with whose lines they connect, and together with the team tracks and other yards form the terminal facilities of these carriers, is upheld by the majority of the commission.

The American railway rate has always been recognized as covering the full service which the carrier gives in furnishing the car, a proper place at which to load it, the conveyance of that loaded car and its terminal delivery. These various services may be broken up into their component parts and a separate charge made for each, as is done in England, but this is not the American practice. The refinement of the English method in stating rates does not appeal to the mind of the American railway man for the same reason, perhaps, that American hotelkeepers do not make a separate charge to their guests for light and soap.

The theory of the defendant is that in placing the car on a side track it is giving a terminal service in the nature of cartage by rail, ignoring the fact that this so-called cartage antecedes any delivery. The commission is convinced that the placing of a car on an industrial track involves no additional expense over placing the car on a team track. The Supreme Court of the United States in its opinion in the Union Stock Yards case holds that a carrier may charge a reasonable rate for a delivery which it cannot make on its own line, and that this rate when separately stated must be judged as to its reasonableness by itself. The commission following this opinion holds that the charge of $2.50 made by the delivering carrier when the delivering carrier is not one that got the haul of freight before it arrived at the switching limits of the city is reasonable, but the commission condemns as illegal the charge of $2.50 for delivering or receiving freight on spurs or side tracks within switching limits when such carload freight is moved incidentally to a system line haul.

Commissioner Prouty concurring:

While it costs the railway no more to make delivery on a spur track than on a team track, it is worth more to the shipper to receive his carload freight in this way; but, on

the whole, the shipper by furnishing the track pays all he ought to for the privilege.

Commissioner Harlan also concurring:

My point is that the defendants, in separating the spur track service from the line haul to these three points, Los Angeles, San Francisco and San Diego, and dealing with it as an additional service for which an additional charge may be made, depart from the general practice of carriers and their own practice at other points, and in doing so thereby violate not only section 3 of the act, but section 1 as well. The inequality of the situation is emphasized by the fact that identical rates for all classes of traffic from trunk lines and other defined territory have been extended to some 97 points at or near the Pacific coast, including San Francisco, Los Angeles and San Diego. At all these points, except the three involved, the terminal rates include the movement of cars to and from store door on spur tracks directly connected with the terminals of the defendants.

Chairman Knapp dissenting:

In my opinion the order directed to be entered is unwarranted for two reasons: First, because the charge in question is not unlawful and therefore the commission is without authority to compel its discontinuance; second, because the order is not justified by the facts and circumstances disclosed by the investigation.

Manifestly the exaction of an additional switching charge for private or spur-track delivery cannot be condemned unless such charge violates some provision of the regulating statute. Inasmuch as the charge in controversy is made under definite and proper tariff authority, the commission has no power to require its elimination unless it contravenes one or more of the first three sections of the act.

To hold that this charge violates the first section involves a finding that it is either in and of itself unreasonable, that is to say excessive in amount, or that the aggregate charges for line haul and switching are unreasonable; and there is no evidence to support such a finding. The commission has repeatedly found that terminal rates to Los Angeles and other Pacific coast points are forced down by water competition to a lower basis than the defendants might lawfully exact, and there was really no pretense that the line rate plus the switching rate results in unreasonably high charges for the entire transportation. The real point in controversy is not whether this charge of $2.50 a car is more than it ought to be, but whether defendants have the right to make any charge whatever, and I do not perceive that the record presents a question of unreasonableness under the first section.

This charge does not violate the second section. It is not within the prohibition against "any special rate, rebate, drawback, or other device," nor can it be said that spur-track delivery to a private industry is "like" service with public team-track delivery. If this section is violated, the defendants are liable to indictment, and a criminal prosecution would be the appropriate proceeding.

Nor does this charge violate the third section, on the showing now made. To say that the team-track consignee, who pays only the line rate, but must incur the expense of cartage from the team track, is given "undue or unreasonable preference or advantage," and that the spur-track consignee, who pays $2.50 per car more and saves from two to at least four times that amount of cartage, is subjected to "undue or unreasonable prejudice or disadvantage," is so palpably at variance with the conceded facts in this case, and with common experience and observation, as not to admit of serious argument.

The majority report condemns this charge as "illegal and unjust." In my judgment this conclusion is untenable, because the charge is not illegal unless it violates some law which this commission does not administer and under which it can grant no relief. To hold that it is unjust, in view of the undisputed facts, is merely to declare the opinion that although not in contravention of the act it is a charge which in equity and good conscience ought not to be made; and this opinion would seem to rest mainly upon the finding that no extra charge for spur-track delivery appears to be made anywhere in the United States except at Los Angeles, San Francisco and San Diego. In other words, the custom which elsewhere prevails operates in some way to make the charge unlawful at the three places where it is imposed. I am not aware of any theory by which the obligations of carriers or shippers can be measured by *preponderance of custom*, since it is elementary that the custom which makes law must be continuous and generally observed in the locality where the question of right arises.

Without reviewing the authorities in point it seems clear to me that spur-track delivery is a service which carriers are not bound to perform at common law.

Without attempting to decide whether these industry tracks in Los Angeles are a part of the defendants' terminals or strictly private sidings, there is no question that the service performed for spur-track consignees is a different service from that performed for team-track consignees, and a much more valuable service. (18 I. C. C., 310.)

Pacific Coast Jobbers and Manufacturers Association v. Southern Pacific et al. Opinion by Commissioner Lane.

The Associated Jobbers of Los Angeles v. A., T. & S. F. case followed. (18 I. C. C., 333.)

Ruling on Transit Privilege.

In the matter of the substitution of tonnage at transit points. Opinion by Commissioner Cockrell.

On June 29, 1909, the commission issued its conference ruling No. 76-A, as follows:

76-A. SUBSTITUTING TONNAGE AT TRANSIT POINT (adopted June 29, 1909).—A milling, storage, or cleaning-in-transit privilege cannot be justified on any theory except that the identical commodity or its exact equivalent, or its product, is finally forwarded from the transit point under the application of the through rate from original point of shipment. It is, therefore, not permissible at transit point to forward on transit rate commodity that did not move into transit point on transit rate, or to substitute a commodity originating in one territory for the same or like commodity moving into transit point from another territory, or to make any substitution that would impair the integrity of the through rate. It is not practicable to require that the identity of each carload of grain, lumber, salt, etc., be preserved, but, in the opinion of the commission, it is not possible to lawfully substitute at the transit point any commodity of a different kind from that which has moved into such transit point under a transit rate or rule. That is to say, oats or the products of oats may not be substituted for corn, corn or the products of corn for wheat, nor wheat or the products of wheat for barley, nor may shingles be substituted for lumber, or lumber for shingles, nor may rock salt be substituted for fine salt, nor fine salt for rock salt; likewise oak lumber may not be substituted for maple lumber, nor pine lumber for either oak or maple, nor may hard wheat, soft wheat, or spring wheat be substituted either for the other. These illustrations are given not as covering the entire field of possible abuses, but as indicating the view which the commission will take of such abuses as they arise.

To the end that abuses now existing at transit points may be eliminated, carriers will be expected to conform their transit rules and their billing to the suggestions of this rule. In the event of the failure of any carrier so to do, reductions of legal rates caused by transit abuses will be regarded as voluntary concessions from legal rates.

Following this ruling numerous protests were received from shippers at transit points (particularly from millers at milling-in-transit points) to the effect that it was too strict and that its application would destroy all the benefits of transit privileges. The shippers making these protests petitioned the commission to make an investigation into the matter of substitution of tonnage in transit, and asked that they be permitted to explain their practices and set forth their necessities. In response to these protests and requests the present inquiry was instituted.

One striking fact developed by this inquiry is that the transit privileges have been needlessly multiplied by the carriers. The interest which prompts this needless extension of the privilege is apparent. A carrier bringing raw material to a competitive transit point desires always to make certain that the product of such raw material shall go forward by its line. The

most evident method of securing this result is to collect something more than the net rate for the transportation of the raw material to the transit point upon delivering such raw material to the industry, the excess collection to be credited upon the rate for the forwarding of the finished product from such point. In such cases it is evident that the industry must pay a penalty if it uses any other means of transporting the finished product than the one provided by the carrier which transported the raw material. An analysis of the transit tariffs filed with us shows that the arrangement is in many cases not a privilege at all, but a burden upon the industries to which it applies. Such an arrangement frequently amounts to a requirement by the carrier that the industry shall in advance put up a bond that the finished product shall be forwarded by such carrier's line.

This competitive policy of the carriers, which results in many unnecessary transit arrangements, has also resulted in many pretended transit arrangements which cannot be justified as such. We have before us, for instance, tariffs which provide for the forwarding of agricultural implements, vehicles, etc., as the transit of inbound shipments of logs. Unless all tariffs are to become "transit tariffs," such arrangements as those last mentioned must be condemned as unlawful. An agricultural implement is bound to be largely composed of other materials than wood, and may be entirely composed of such other materials. It is a manufactured product, having its first being at the factory where it is made. Its shipment from the factory is not in any proper sense a continuation of the shipment of the log from the forest to the mill.

In Conclusion.—The hearing has failed to demonstrate that the commission's ruling was too strict. It has demonstrated that various practices, as above outlined, have resulted in the violation of published rates, to the injury of shippers not taking advantage of such practices. Fraud cannot be defined in this matter of abuse of transit any more than in any other line of activity. The commission will not undertake to frame a code of transit rules. The traffic officials of the carriers have the duty and the responsibility under the law of initiating rates. They all agree in the statement that the system of rates devised by them is impracticable, and will result in great injury to carriers and business interests unless exceptions and privileges in the nature of transit are introduced. The commission does not condemn the transit privileges as such, but it does hold that the responsibility for safeguarding and policing them, to the end that the lawfully published rates shall be collected, rests entirely upon the carriers. This is not saying that shippers will be excused in any case where they defeat published rates by any abuse of transit privileges. The duty of shippers to pay published rates is precisely the same as the duty of the carriers to collect such rates. Except in very rare instances, carriers give rebates or concessions only upon soliciation by shippers. In such case the liability of the carrier yielding to the solicitation is no greater or different than that of the shipper making it.

It is the duty of shippers to submit to all necessary policing of their shipments if they desire to enjoy transit privileges. They may also fairly be required to certify that shipments offered by them are entitled to go forward upon the transit rates. Such certifications, however, do not excuse carriers from determining for themselves and at their peril that shipments carried at other than the regular local rates from the point of shipment are entitled to the exceptional or transit rates. Carriers will not be allowed to put in transit privileges either through competition with each other, or through the desire to hold local rates up to the highest possible point, without taking entire responsibility for the results of such privileges and the uses made of the same.

The commission is convinced that if the carriers will join in the cancellation of the arrangements which they have built up for the purpose of withholding business from each other they will be relatively as well off as they are now, while the elimination of these arangements will decrease their expense of bookkeeping and supervision and will be for the benefit of all the industries affected. The commission is also convinced that if carriers will yield somewhat in the matter of local rates to and from transit points, it will be possible to make such rates equal to the present published transit rates in many cases without serious loss of income to the carriers and to their final profit. In every case where it is possible to replace transit privileges with flat rates it should be done.

At none of the large warehousing markets are the difficulties in the way of the adoption of a flat-rate system any greater than were those presented at Missouri River points some years ago when the commission condemned the unlawful arrangement of rates on grain. As a result of the commission's action the full local rates upon grain to these points are now paid regardless of the final disposition of such grain. Outbound shipments of grain from these points are carried at a flat rate regardless of the point of origin, providing the grain be "from beyond." While still open to some legal objection, the system is far in advance of the system which it succeeded, and is so much in advance of the transit privileges generally throughout the country that it may well be accepted as a model by traffic managers desirous of remedying chaotic and unlawful practices upon their lines. The commission is convinced that in no other way can transit rates to and from the large storage markets be arranged unless carriers are to take an impossible burden of policing and supervision and shippers be subjected to extremely annoying rules.

The commission has been asked by numerous shippers, including the grain dealers along the Ohio river, the grain dealers in inter-mountain territory, and the lumber and shingle manufacturers of the Pacific coast, to condemn the transit privilege entirely as illegal. This the commission is not prepared to do, the present order of the investigation affording no warrant for such action.

It is the law which has binding force upon both shippers and carriers in this matter, rather than rulings of the commission, which simply represent the commission's view of the law. The commission's duty is to enforce the law, and this duty it is determined to perform. Ruling 76-A of the commission, *supra*, may be taken, together with this opinion, as indicating the comimssion's knowledge of the abuses shown by this investigation, and its demand upon both carriers and shippers that these and all similar abuses be prevented. If the abuses are prevented the law will be satisfied. If the abuses are not prevented the law will not be satisfied, no matter how ingeniously the machinery provided obscures the fact that the law is evaded.

We are convinced that shippers and carriers fully understand the commission's position and their own practices. It is needless to say that the continuance of such abuses as are above outlined will compel the commission to resort to criminal prosecution, to include both shippers and carriers, to secure obedience to the law rather than to any further or other form of moral suasion. (18 I. C. C., 280.)

STATE COMMISSIONS.

W. A. Bowden has been appointed chief engineer of the Department of Railways and Canals of Canada. Mr. Bowden has been designing engineer of the department for the last five years.

Louisiana: New Orleans Interests Upheld.

New Orleans Board of Trade v. Louisiana & Arkansas Railway et al.

The petition in this case asks that the commission establish the same scale of rates from New Orleans to Minden as are carried from New Orleans to Sibley.

Minden is a station on the Louisiana & Arkansas five miles north of Sibley, and is the junction point of the Vicksburg, Shreveport & Pacific with the Louisiana & Arkansas. There is no line competing with the Louisiana & Arkansas at Minden.

The rates to Sibley from New Orleans are lower than the rates from New Orleans to Minden, Sibley being an intermediate point. This condition is brought about by the competition of the Vicksburg, Shreveport & Pacific, but does not seem to be justified by the existing conditions. New Orleans competes with St. Louis and Memphis on through business at Minden. The interstate rates from St. Louis to Minden and Sibley are higher than the rates from St. Louis to Shreveport, Shreveport being a jobbing point, selling largely to

Minden and the surrounding territory. Under the present adjustment of rates Memphis has a differential in rates to Minden on certain classes. It was also shown by the evidence submitted that on a number of commodities the rate is lower from Memphis and St. Louis to Minden than the rate from New Orleans. The short line distance from New Orleans to Minden is 299 miles, the distance from Memphis to Minden is 327 miles, and the distance from St. Louis to Minden is 540 miles.

Rates from New Orleans are ordered reduced to Minden to basis of Sibley rates.

The New Orleans Board of Trade v. Gulf, Colorado & Santa Fe et al.

The plaintiffs in this case ask that certain reductions in rates be made between New Orleans and stations on the Gulf, Colorado & Santa Fe Railway west of Oakdale. In seeking to sell its commodities along this line of railway New Orleans comes into direct competition with Houston and Galveston, from which lower rates are in force.

On this point the commission will say that the principle of establishing rates in order to meet legitimate competition, whether that competition be all rail, or all water, or part rail and part water, or interstate, or between points in the same state, is so well settled as to need no defense when the conditions under which the traffic is handled over two competing lines are substantially the same.

New Orleans, the great metropolis of the South, is not entitled to any preferential rates, but it is entitled to receive fair and reasonable rates to any territory in the state of Louisiana, as well as to points in other states where it competes with cities of like importance.

There has been no evidence introduced in this case by the defendant to show that the rates proposed by the New Orleans Board of Trade are not reasonable in themselves, and the comparisons submitted show that there are rates in effect to points as far distant from New Orleans as points on the Gulf, Colorado & Santa Fe Railway which are as low, and in some cases lower, than the rates proposed by the plaintiffs in this case. These proposed rates are therefore ordered to be put in effect.

Louisiana: Baton Rouge Interests Upheld.

The Baton Rouge Board of Trade v. the New Orleans, Texas & Mexico.

The Baton Rouge Board of Trade asks that the rates on classes and commodities from Baton Rouge to points on the New Orleans, Texas & Mexico as far as Eunice, La., be reduced 33⅓ per cent. below the rates from New Orleans to that territory, Baton Rouge being approximately 80 miles nearer this station than is New Orleans. The commission believes that the demand of plaintiffs, if granted in its entity, would place the local jobbers of Eunice, Crowley, Opelousas and Lafayette and Lake Charles at a disadvantage and would create an unjust discrimination against them, therefore a reduction of 20 per cent. in rates is ordered.

The Baton Rouge Board of Trade v. Yazoo & Mississippi Valley; Illinois Central and the New Orleans Board of Trade, intervenors.

The Baton Rouge Board of Trade filed with the commission a petition asking that the freight rates on classes and commodities between Baton Rouge and Hammond be made the same as rates on similar commodities from New Orleans to Hammond. The Yazoo & Mississippi Valley denies the reasonableness of this request, and in order to meet the allegations of the complaint, that the present adjustment creates an unjust discrimination against Baton Rouge by allowing the jobbers of New Orleans, with whom it competes, more favorable freight rates, the Illinois Central, under the same management as the Yazoo & Mississippi Valley, filed a request with the commission asking that it be permitted to advance its rates from New Orleans to Hammond. The New Orleans Board of Trade objects to this advance in rates.

Many years ago the Illinois Central put in a lower scale of rates between New Orleans and Hammond than apply at intermediate points in order to meet the competitive rates of water craft which operate between New Orleans and Wadesboro, a landing on the Natalbany river a few miles southwest of Hammond. The Illinois Central has, however, never complained that these rates are unreasonable or not justified by the competitive conditions until this case arose. When the Baton Rouge & Hammond division of the Yazoo & Mississippi Valley began operating, rates were established between Baton Rouge and its stations without making any reductions at Hammond to meet the low rates already in effect from New Orleans.

The commission believes that if the Yazoo & Mississippi Valley was under a different and distinct management from the Illinois Central the Baton Rouge shippers would not have to come before it in order to secure the adjustment asked for, since two cities, situated as are Baton Rouge and New Orleans, both competing for business at a junction point, would be afforded equal rates, although actual water competition might exist from one of the cities and not from the other. The request of the Illinois Central for permission to advance its rates between New Orleans and Hammond is denied and the Yazoo & Mississippi Valley is required to comply with the demands of plaintiffs.

COURT NEWS.

The United States Circuit Court of Appeals, in an opinion by Judge Noyes, has affirmed the decision of the lower court, imposing a fine of $20,000 on the Standard Oil Co. for accepting illegal rebates on oil shipped from Olean, N. Y., over the Pennsylvania, the New York Central and the Rutland, to points in Vermont.

The Indiana Railroad Commission has secured an important decision in connection with the enforcement of its orders. Judge Anderson, of the Federal court, and Judge Remster, of the Indianapolis circuit court, have ruled that railway companies must immediately begin to obey the orders of the railway commission after the lower courts have affirmed such orders, and that the railway companies must put the orders in operation pending appeals to the higher courts. In some cases the orders of the commission have been nullified by appeals that have remained undecided for two years or more.

Judge Chas. Remster, of the Indiana circuit court at Indianapolis, has rendered a decision holding that when the Railway Commission of Indiana issues an order to a railway, and the railway appeals from it to a court, and the court upholds the commission, the order of the commission at once becomes effective and the railway must obey it, pending appeal to a higher court. In May, 1909, the commission fixed switching rates which the Chicago, Indianapolis & Louisville was required to apply at Bloomington, Ind. Judge McMasters, of the Marion county superior court, upheld the commission. In another case the commission issued an order fixing rates on coal and other commodities from New Albany, Ind., to points in the northern part of the state. The road appealed from the commission's order to the federal court, which also upheld the commission. Judge Remster ruled that the road must obey both these orders pending appeals. Heretofore the roads in Indiana have refused to obey orders of the commission which they litigated until they had been upheld by the highest court to which appeal was made.

The supreme court of New York, Appellate division, Third department, has decided in favor of the Public Service Commission, Second district, in the suit of the commission to require the New York Central to secure the approval of the commission before issuing equipment trust certificates. In the issuance of such certificates to the amount of $30,000 000 the company contended that such certificates were not obligations of the railway company, like stocks and bonds, inasmuch as they were issued by the Guaranty Trust Co., and not by the railway company. The decision holds that such certificates come within the terms of section 55 of the Public Service Commission's law. The New York Central having issued certificates as above in 1907, without the consent of the commission, argued that the certificates were simply contract obligations between the railway company and the issuing trust company. The court, however, holds that no company is liable to pay equipment trust certificates but the railway company itself, and that the railway must not accomplish by indirection what it has been forbidden by the statute to do directly.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. W. Seaman has been elected president of the Manistee & Grand Rapids.

A. P. Tugwell has been appointed treasurer of the Tremont & Gulf, with office at Winnfield, La., succeeding N. D. Patterson, resigned.

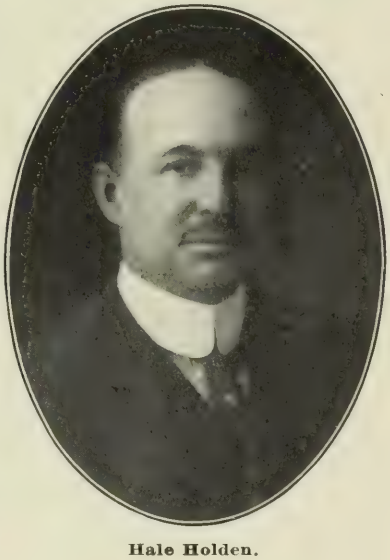
N. P. Ramsey has been appointed vice-president and general manager of the Ashland & Western, succeeding W. D. Holliday, whose resignation has been announced in these columns.

H. B. Voorhees, superintendent of the Philadelphia division, and general agent of the Baltimore & Ohio at Philadelphia, Pa., has been appointed an assistant to the president, with office at Baltimore, Md.

The office of C. B. Seger, general auditor of the Southern Pacific, Union Pacific, Oregon Short Line, Oregon Railroad & Navigation Co. and the Pacific Mail Steamship Co., has been transferred from Omaha, Neb., to Chicago.

W. F. Dickinson has been appointed general attorney of the Rock Island lines, with office at Chicago. He will have charge of all litigation and questions arising under federal statutory laws, and will perform such other duties as may be assigned to him.

Hale Holden, whose appointment as assistant to the president of the Chicago, Burlington & Quincy Railroad Company, with office at Chicago, has been announced in our issue of March 4, page 458, was born August 11, 1869, at Kansas City, Mo. Mr. Holden graduated from Williams College in 1890, and from the Harvard Law School in 1893. Since July 1, 1907, he has been with the Chicago, Burlington & Quincy as general attorney, with office at Chicago, until February 21, 1910, when he was promoted to his present position, as assistant to the president.



Hale Holden.

The officers of the Norfolk Southern, formerly the Norfolk & Southern, are as follows: E. T. Lamb, president; Frederick Hoff, vice-president; Chadbourne & Shores, general counsel; Matthias Manly, treasurer; Morris S. Hawkins, secretary, and Nelson W. Runnion, assistant secretary, all with offices at Norfolk, Va.

E. K. Boisot has been elected president of the Illinois Southern, with office at Chicago, succeeding J. W. Walsh, who has been elected vice-president. A. F. Williams has been appointed auditor, and F. O. Wetmore has been appointed treasurer, all with offices at St. Louis, Mo. W. T. Abbott, general attorney, has been appointed general counsel, with office at Chicago.

The organization of the accounting department of the Chicago, St. Paul, Minneapolis & Omaha, under the immediate supervision of Charles Jensch, general auditor at St. Paul, Minn., is as follows: J. H. Gordon, auditor freight accounts; J. P. Plunkett, auditor disbursement accounts; F. E. Beatty, auditor passenger accounts, and F. V. Caesar, auditor freight overcharge claims.

Charles D. Brandriff, whose appointment as general auditor of the Chicago & North Western, with office at Chicago, has been announced in these columns, was born at Millville, N. J., February 18, 1874. He graduated from the Missouri Valley High School in 1891 and from the University of Michigan in 1897. He entered railway work as a clerk in the Missouri Valley, Iowa, storehouse of the Chicago & North Western in November, 1897, and was later transferred to a similar position in the Chicago storehouse. In February, 1900, he was made assistant general bookkeeper in the office of the vice-president in charge of accounts, and in January, 1903, he was promoted to general bookkeeper, the position he leaves to become general auditor.

Operating Officers.

Henry J. Horn has been appointed assistant general manager of the Chicago, Burlington & Quincy, with office at Omaha, Neb.

R. S. Serbyshire has been appointed superintendent of the Central Ontario, with office at Irondale, Ont., succeeding G. A. Hoag.

Mott Sawyer has been appointed superintendent of the Bellingham Bay & British Columbia, with office at Bellingham, Wash.

G. W. Hamilton has been appointed chief despatcher of the Third and Fourth districts of the Western Pacific, with headquarters at Portola, Cal.

Charles W. King, assistant superintendent of the Utah lines of the Denver & Rio Grande at Salt Lake City, Utah, has resigned, and the office has been abolished.

M. B. Murphy has been appointed a trainmaster of the Canadian Northern, with office at Winnipeg, Man., in charge of the eastern section of the Second division.

Edward W. Duval, assistant to the general manager of the Canadian Pacific at Winnipeg, Man., has been appointed superintendent of terminals, with office at Calgary, Alb.

N. J. Hudson has been appointed transportation inspector of the Los Angeles division of the Atchison, Topeka & Santa Fe, with office at Los Angeles, Cal., succeeding A. F. Hunt, assigned to other duties.

J. C. Wood has been appointed general agent, operating department, of the Chicago, Milwaukee & St. Paul, with office at Pittsburgh, Pa., succeeding J. H. Skillen, assigned to other duties, as previously announced in these columns.

W. W. Rider, general superintendent of telegraph of the Cleveland, Cincinnati, Chicago & St. Louis and other New York Central lines, has had his authority extended over the Toledo & Ohio Central and the Zanesville & Western, with office at Chicago.

W. B. Hyde, chief clerk in the freight department of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed inspector of station service, with office at Pittsburgh, and Alvah E. Day, of the transportation department, at Baltimore, Md., has been appointed inspector of station service on the main line system.

The position of trainmaster at Springfield, Mass., of the Boston & Albany, in charge of the examination on train rules, vision, color, sense and hearing, has been abolished, and S. C. Bostwick has been appointed examiner, with office at Springfield, in charge of examination on vision, color, sense and hearing. Examinations on train rules will be conducted by the trainmasters in their respective districts.

Thomas Brennan, assistant superintendent and superintendent of telegraph of the Chicago, Indiana & Southern at Gibson, Ind., has been appointed assistant superintendent at Danville, Ill. W. L. Connelly, trainmaster at Danville, has been appointed superintendent of telegraph at Gibson, the office of

trainmaster having been abolished. These changes were reported erroneously in these columns April 8, page 966.

H. R. Laughlin, who has been appointed superintendent of the Monongah division of the Baltimore & Ohio, succeeding U. B. Williams, began railway work in February, 1884, as a telegrapher at Oakland, Md. He was then appointed train despatcher of the Cumberland division of the Baltimore & Ohio, at Grafton, W. Va., and in July, 1900, was made chief despatcher of the Wheeling division. In October, 1902, he was appointed a trainmaster at Wheeling, W. Va., and the following January was transferred to the Monongah division, which position he held at the time of his recent appointment as superintendent of the Monongah division.

Joseph Donahue, whose appointment as superintendent of the Illinois division of the Baltimore & Ohio Southwestern, with office at Flora, Ill., has been announced in these columns, was born at Mitchell, Ind., March 28, 1868. He received a high school education and entered railway work in May, 1884, as clerk to the roadmaster of the Ohio & Mississippi, now a part of the B. & O. S. W. He learned telegraphy while holding this position and in 1886 was made night operator at Medora, Ind. He held various positions as operator until 1894, when he was made despatcher on the Louisville district. In 1905 he was promoted to night chief despatcher at Washington, Ind. He was appointed trainmaster of the Springfield division in 1907 and trainmaster of the Indiana division the same year, the position he held until his recent promotion.

C. B. Gorsuch, whose appointment as superintendent of the Wheeling division of the Baltimore & Ohio, with office at Wheeling, W. Va., has been announced in these columns, entered the service of the Baltimore & Ohio in June, 1886, as a telegraph operator on the Pittsburgh division at Summit Point, Pa. About four years later he was appointed clerk in the office of the division operator, remaining in that position until June, 1893, when he was promoted to chief train despatcher. He was made division despatcher in September, 1899, and was promoted to trainmaster of the Pittsburgh division May 1, 1902, which position he held at the time of his recent appointment as superintendent of the Wheeling division.



C. B. Gorsuch

James Paul Stevens, whose appointment as general superintendent of the Kentucky lines of the Chesapeake & Ohio, with office at Covington, Ky., has been announced in these columns, was born December 25, 1885, at Peru, Ind. Mr. Stevens was educated in the common schools and began railway work in January, 1900, with the Chesapeake & Ohio as operator, copier and despatcher on the Richmond division. In January, 1904, he was appointed assistant trainmaster on the Cincinnati division, and three months later was made chief despatcher on the same division. He remained in this position until February, 1907, when he was appointed assistant superintendent of the Cincinnati division, which position he held until the following January. In September, 1908, he was appointed superintendent of the Cincinnati division, with office at Covington, Ky., remaining in this position until his recent appointment as general superintendent of the Kentucky general division.

U. B. Williams, who has been appointed general superintendent of the Wheeling system of the Baltimore & Ohio succeeding W. C. Loree, began railway work in November, 1871, as a telegraph operator on the Baltimore & Ohio, at Cameron, W. Va. He was appointed a train despatcher June 1, 1875, at Fairmont, W. Va., and three years later was made agent and operator at Cameron, becoming train despatcher at that place in December, 1880. He was appointed chief despatcher of the Monongah division in January, 1884, with office at Grafton, and in November, 1886, was made trainmaster on the same division, from which position he was promoted to superintendent of the Wheeling division in November, 1901. Mr. Williams was appointed superintendent of the Monongah division in April, 1903, which position he held at the time of his recent appointment as general superintendent of the Wheeling system.

Traffic Officers.

J. L. Jackson has been appointed immigration agent of the Central of Georgia, with office at Savannah, Ga.

Ross Brown has been appointed a district passenger agent of the Iowa Central, with office at Oskaloosa, Iowa.

W. A. Ward has been appointed general freight and passenger agent of the Central Ontario, with office at Irondale, Ont.

W. B. McConnico has been appointed a contracting freight agent of the Yazoo & Mississippi Valley, with office at Baton Rouge, La.

William B. Johnson has been appointed agent of the Southern Pacific at Baltimore, Md., succeeding Benjamin R. Barber, deceased.

E. A. Turner has been appointed commercial agent of the International & Great Northern at Dallas, Tex., succeeding George Simpson, resigned.

H. W. Hoey has been appointed general agent of the Hocking Valley at Cincinnati, Ohio, succeeding H. E. Thatcher, transferred to Toledo, Ohio.

W. A. Horne has been appointed general freight and passenger agent of the Tombigbee Valley, with office at Mobile, Ala., succeeding A. V. B. Gilbert.

J. C. Havely has been appointed district freight and passenger agent of the Western Pacific and the Denver & Rio Grande, with office at Sacramento, Cal.

A. J. Rich has been appointed a soliciting freight agent of the Nashville, Chattanooga & St. Louis, with office at St. Louis, Mo., succeeding J. V. McCarty, promoted.

Paul F. Bonorden has been appointed city passenger and ticket agent of the Chicago Great Western at Omaha, Neb., succeeding Marshall Craig, resigned to accept service with another company.

R. M. McWilliams has been appointed a commercial freight agent for the Missouri Pacific-Iron Mountain System, with office at Cairo, Ill., succeeding C. H. Ogilvie, transferred, as previously announced in these columns.

J. C. Hammond, agent of the Wabash Railroad at Alton, Ill., has been appointed a commercial agent, with office at Alton, in charge of freight and passenger business, succeeding J. B. Hayes, transferred to East St. Louis.

Arthur C. Irons, chief clerk in the general passenger department of the Chicago Great Western, has been appointed assistant general passenger agent, with office at Chicago, succeeding R. F. Malone, resigned to go into other business.

A. J. Dutcher, traveling freight agent of the Union Pacific and the Southern Pacific, with headquarters at Chicago, has been appointed general agent of the freight and passenger departments at Atlanta, Ga., vice J. F. Van Rensselaer, resigned.

William Humphreys, traveling freight agent of the Southern Railway at Cincinnati, Ohio, has been appointed soliciting freight agent at Louisville, Ky. J. L. Martin, traveling freight agent of the Queen & Crescent, at Atlanta, Ga., succeeds Mr. Humphreys.

Stephen Y. Baldwin, commercial freight agent of the Dela-

ware & Hudson, at Pittsburgh, Pa., has been appointed a general agent, freight department, with office at Albany, N. Y., and James Fitzsimmons has been appointed general agent, freight department, with office at Chicago.

J. H. Dengel, contracting freight agent of the Chicago Great Western at Kansas City, Mo., has been appointed commercial agent, succeeding C. L. Hoga, whose resignation has been announced in these columns. W. M. Hogue, soliciting agent, succeeds Mr. Dengel; and H. Miller, chief clerk, succeeds Mr. Hogue.

T. M. Schumacher, vice-president of the Denver & Rio Grande and the Western Pacific, has been appointed assistant traffic director of the Harriman lines, with office at Chicago, succeeding E. O. McCormick, whose appointment as vice-president of the Southern Pacific has been announced in these columns.

James C. Ferguson, general agent, freight and passenger departments of the Union Pacific, with office at Denver, Colo., has been transferred to Detroit, Mich., succeeding Francis B. Choate, general agent freight and passenger departments at Detroit, and Mr. Choate succeeds Mr. Ferguson at Denver.

E. J. O'Hayer, Jr., chief clerk to the passenger traffic manager of the New York Central lines west of Buffalo, N. Y., with office in Chicago, has been appointed general eastern passenger agent of the New York Central lines at New York, succeeding to the duties of L. F. Vosburg, assistant general passenger agent.

T. O. Jennings, general agent of the Frisco lines at Chicago, has been appointed assistant general freight agent. E. S. Stephens, freight claim agent, succeeds Mr. Jennings. B. H. Stanage has been appointed assistant general freight agent at Chicago, his duties to include those previously performed by Mr. Stephens.

Engineering and Rolling Stock Officers.

W. D. Hodge has been appointed chief engineer of the Denver, Laramie & Northwestern, with office at Denver, Colo., succeeding E. A. Buck.

G. H. Cravens has been appointed chief engineer of the Memphis, Paris & Gulf, with office at Nashville, Ark., succeeding H. C. McCluer.

F. M. Whyte, general mechanical engineer of the New York Central Lines, has resigned to go to the New York Air Brake Co., New York, effective June 1.

The office of S. P. Hull, engineer maintenance of signals of the New York Central & Hudson River, has been transferred from New York City to Albany, N. Y.

J. Drinkwater, district roadmaster of the Temiskaming & Northern Ontario at Englehart, Ont., has been promoted to inspector of work and forces in the road department, with jurisdiction over all lines.

W. F. Plate, division roadmaster of the Gulf, Colorado & Santa Fe, at Temple, Tex., has resigned. Samuel Lincoln, division roadmaster at Conroe, Tex., has been transferred to Temple, succeeding Mr. Plate.

C. M. Hoffman, master mechanic of the Denver & Rio Grande at Grand Junction, Colo., has been appointed assistant superintendent of the Idaho division of the Oregon Short Line, in charge of motive power, with headquarters at Pocatello, Idaho, vice A. H. Gairns, resigned.

E. O. Faulkner, manager of the tie and timber department of the Atchison, Topeka & Santa Fe, has had his jurisdiction extended over the timber lands owned by the company. George E. Rex, who has served as Mr. Faulkner's assistant, has been appointed manager of tie treating plants.

W. F. Kaderly, master mechanic of the Southern Railway, has been appointed superintendent of motive power of the Georgia, Southern & Florida, with office at Macon, Ga. L. B. Rhodes, master mechanic, having resigned, that position is abolished, and all employees heretofore reporting to Mr. Rhodes will in future report to the superintendent of motive power.

E. C. Sasser, master mechanic of the Southern Railway at Alexandria, Va., has been appointed master mechanic at Spencer, N. C., succeeding W. F. Kaderly, resigned to go to another company. C. H. Kadie, master mechanic at Charleston, S. C., succeeds Mr. Sasser, with office at Alexandria, and W. B. Lipscomb, foreman locomotive repairs at Selma, Ala., has been appointed master mechanic at Charleston, succeeding Mr. Kadie, transferred.

R. N. Begien, whose appointment as assistant to the chief engineer of the Baltimore & Ohio, with office at Baltimore, Md., has been announced in these columns, was educated at the engineering school of Harvard University and was a member of the class of 1897. Mr. Begien was a member of the Nicaragua Canal Commission, in Central America, for three and a half years, resigning that position to go to South America to become a railway engineer in Ecuador. The following year he returned to the United States and took a position in the engineering department of the District of Columbia. He was appointed assistant engineer of the Baltimore & Ohio in August, 1902, at Somerset, Pa., and was made division engineer of the Philadelphia division in June, 1908, which position he held at the time of his recent appointment as assistant to the chief engineer.

Lewis W. Baldwin, whose appointment as engineer maintenance of way of the Illinois Central, with office at Chicago, has been announced in these columns, was born in Waterbury, Md. He graduated in civil engineering at Lehigh University with the class of 1896, and entered the engineering department of the Illinois Central at once. He was appointed track supervisor of the Illinois Central in 1900, roadmaster of the Yazoo & Mississippi Valley in 1901, roadmaster of the Illinois Central in 1902, and was promoted to trainmaster in 1904. He was transferred to a similar position on the Indianapolis Southern in 1905, promoted to superintendent of that road in 1906, and made trainmaster of both the Illinois Central and the Indianapolis Southern in 1908. In November, 1908, he was appointed superintendent of the Yazoo & Mississippi Valley, the position he held until his recent promotion.

John T. Wilson, whose appointment as district engineer of the Baltimore & Ohio, with jurisdiction over the territory between Philadelphia, Pa., and the Ohio river at Parkersburg, W. Va., and Wheeling, with office at Baltimore, Md., has been announced in these columns, was educated at the Massachusetts Institute of Technology and began railway work as a rodman in 1886 on the Pittsburgh & Lake Erie. About two years later he went to the engineering department of the Pennsylvania Railroad as a transitman, and was then appointed draftsman and later promoted to assistant engineer. He was appointed resident engineer of the Pittsburgh & Western, now part of the Baltimore & Ohio, in December, 1897, and subsequently became engineer maintenance of way. In August, 1902, he was appointed resident engineer of the Baltimore & Ohio at Wheeling, W. Va., and division engineer two years later. In August, 1905, he was made assistant engineer, with office at Baltimore, Md., and while in that position was engaged in the work of rebuilding the old main line between Relay Station, Md., and Washington Junction. The large classification freight yard at Brunswick, Md., was built under his direction, as well as the double-track steel bridge over the Susquehanna river, which was opened in January of this year.

OBITUARY.

William J. Post auditor of the Bessemer & Lake Erie and the Union Railroad, died May 8, at his home in Pittsburgh, Pa., at the age of 49 years.

John I. Kinsey, who died April 28 at Easton, Pa., at the age of 83 years, was master mechanic on the Lehigh Valley Railroad for over 40 years. He entered the service in 1856 at the South Easton, Pa., shops. In 1897 he was appointed superintendent of machinery of the Morris Canal. Mr. Kinsey was an honorary member of the American Railway Master Mechanics' Association since 1868.

Railway Construction.

New Incorporations, Surveys, Etc.

Alberta Midland.—See Canadian Northern.

Astoria Southern.—Incorporated in Oregon with $500,000 capital, to build from Young's bay, Ore., at Astoria, to points on Nehalem bay and to points in Tallamook county. Right-of-way is said to have been secured and it is understood that work will be started soon. The incorporators include: L. W. Humphreys, W. E. Thomas and O. J. Kraemer, all of Portland.

Atlantic Coast Line.—Plans have been made to extend the double-track system from Savannah, Ga., to Jesup, and this work will be started soon. Tentative plans are being made for eventually extending the double track to Jacksonville, Fla.

Atlantic, Quebec & Western.—The New Canada Co. was organized some time ago to build an extension of this road from Port Daniel, Que., northeast to Gasby. It is expected that the line will be opened for traffic by July as far as Grand river, 30 miles from Port Daniel, leaving about 50 miles yet to be built to complete the line to Gasby. Work has been finished from Port Daniel on a section of 20 miles, which was constructed through solid rock, and included piercing a 600-ft. tunnel. At Gasby Landing there is a depth of 40 ft. of water and a pier, 300 ft. long, is to be built at a cost of $300,000. It is the intention to make this place an ocean port. Trains are now in operation from New Carlisle northeast to Port Daniel, 22.3 miles. (Dec. 3, p. 1106.)

Boston & Albany.—An officer writes that the company intends to carry out improvements during 1910 to cost about $2,000,000. A contract has already been let for the new station at Worcester, Mass., and work on the elimination of crossings cannot be started for some time, as this is dependent upon the work which the New York, New Haven & Hartford is to carry out. The work at East Cambridge, Mass., Natick, South Framingham and Westfield is practically all track work, which will be done by the company's men. Contracts have been let to the American Bridge Co. for the steel work for bridge renewals. Plans for third-tracking between Greenbush, N. Y., and Rensselaer will probably be ready to ask for bids for the work in about two weeks, and about the same time bids will probably be asked for the tunnel work at State Line. The larger part of this work will be handled by the company's men, with the exception of the third-tracking and tunnel work. (May 6, p. 1183.)

Boston & Maine.—Announcement is said to be made that the Boston & Maine will make Salem, Mass., an important freight center, and plans are under way for extensive improvements at that place. The work will include the removal of grade crossings and revision work in the tunnel, to provide two tracks in place of the existing single track. (Jan. 21, p. 164.)

Canadian Northern.—Engineers have been at work for several months locating a new route for an extension from Port Arthur, Ont., east to Sudbury. The new line will cross the divide between Port Arthur and Nipigon at an elevation of 220 ft. lower than it is now crossed by the Canadian Pacific; this means that a 0.4 per cent. grade has been secured.

An officer is quoted as saying that an extension will be built this coming summer from Edmonton, Alb., west into the Brazeau coal fields in the foot hills of the Rocky mountains. The charter of the Alberta Midland Railway covering this route is said to have been secured and the line is to be subsidized by the government.

Canadian Pacific.—The Canadian Pacific has filed plans for a new entrance and underground line through the city of Ottawa, Ont. The company proposes to secure from the Dominion government a section of the Rideau canal, which it proposes to drain and use for a roadbed for the new line, also to pierce an underground tunnel from near the post-office to Wellington street, thence under Wellington street to the surface at a point near the waterworks aqueduct property. From this point the line will be built to a connection with the present line at the Union station.

A new branch, called the Langdon branch, on the Western division, has been opened for business from Ensign, Alb., which is on the Calgary section, 1.5 miles from Langdon, north to Acme, 39 miles.

Connellsville & State Line.—See Western Maryland.

Cumberland Valley.—Double-tracking work will be carried out, it is said, on the section from Hagerstown, Md., south to the Potomac river, 12 miles. The work includes building a steel bridge over the Potomac river at Falling Waters, W. Va.

Dayton, Lebanon & Cincinnati Railroad & Terminal Co.—This company has completed an extension from Hempstead, Ohio, north to Dayton, four miles, and the line is opened for business.

Detroit, Lansing & Grand Rapids (Electric).—Bids are wanted by F. A. Bean, chief engineer, 706 Union Trust building, Detroit, Mich., May 14, for the surveys and plans for an electric line from Brighton, Mich., southeast to a point near Detroit, about 35 miles. The work to be completed within 90 days after the signing of the contract. (April 29, p. 914.)

Dominion Atlantic.—The legislature of Nova Scotia has passed a bill authorizing the Provincial government to guarantee bonds for the construction by the North Mountain Railway of a 15-mile line.

Everett-Tacoma.—An officer writes that this company has recorded a mortgage for $5,000,000 to secure funds for building a line from Everett, Wash., south via Snohomish, Monroe, Tolt, Falls City, Issaquan and Renton to Seattle, about 65 miles, with a branch from this line south to Tacoma, 20 miles additional. The line is to have a grade of 1 per cent. and maximum curvature of 10 degs. O. E. Crossman, president, and Eliott Colburn, chief engineer, Snohomish. (See Everett & Tacoma, April 29, p. 1114.)

Fernwood & Gulf.—This road is now in operation from Fernwood, Miss., east to Knoxo, 27 miles.

Fort Wayne & Springfield (Electric).—This company, operating a 22-mile line from Fort Wayne, Ind., southeast to Decatur, is said to have surveys made for a 28-mile extension south to Portland, Ind. The company will do the work with its own forces.

Georges Creek & Cumberland.—See Western Maryland.

Georgia, Southern & Florida.—See Jacksonville, Fla., under Railway Structures.

Grand Trunk.—Double-tracking work is to be extended, it is said, on this road from St. Rosalie, Que., east to Richmond and Sherbrooke.

Grand Trunk Pacific.—According to press reports, this company has finished the line from Watrous, Sask., north to Prince Albert, and work was resumed recently on the Tofield-Calgary branch. A contract was let this spring to J. D. McArthur, Winnipeg, Man., for the remaining 135 miles on this branch in Alberta. (March 25, p. 850.)

Great Northern.—According to press reports from Great Falls, Mont., this company has started condemnation proceedings for a right-of-way through Fergus county, in Montana. This is for a line to be built from Haucks siding, on the Billings & Northern, northeast to a junction with the main line of the Great Northern at a point near Mondak, Mont., about 350 miles.

Gulf, Colorado & Santa Fe.—A contract is said to have been given to the C. H. Sharp Co., Kansas City, Mo., for grade revision work on the Lampasas branch between Temple, Tex., and Lometa, 72 miles.

A contract is said to have been given to build a mile and a half of track from the yards in the northern part of Temple, Tex., to the Temple-Northwestern. It is said the Temple-Northwestern will use the Santa Fe terminal in Temple.

Kansas City, Mexico & Orient.—An officer writes that the company will build the branch from San Angelo, Tex., south to Del Rio, and that the National Railways of Mexico will build from Allende, Mex., north to the Rio Grande. A bridge

is to be built at this point over the Rio Grande for the joint use of both these companies. Contracts have been let by the K. C., M. & O. for grading 42 miles from San Angelo south, and this work is now under way. (March 11, p. 547.)

Kansas, Lawton & Gulf.—An officer writes that a contract has been given to the Avery Engineering & Construction Co., Walters, Okla., for building the line from Walters south to Wichita Falls, Tex., also from Walters northeast via Duncan and Chickasha to Oklahoma City, Okla., in all about 140 miles. Fifty teams are now at work and grading has been finished on four miles. There will be four trestles. F. Avery, chief engineer and general manager, Walters. (May 6, p. 1184.)

Laclede, Dallas & Western.—Construction work is said to be under way between Phillipsburg, Laclede county, Mo., and Buffalo, Dallas county, 22 miles. An extension of eight miles is projected from Buffalo west. B. B. Joffee, president, and H. W. Smith, chief enginer, American Bank building, Kansas City. (April 15, p. 1016.)

Marshall & East Texas.—This road has been extended from Blocker, Tex., south to Elysian Fields, seven miles. (Nov. 26, p. 1037.)

An officer writes that no definite plans have yet been made for an extension of the road from Elysian Fields, Tex., south, but work on this extension will probably be carried out during 1910 if conditions are favorable. Improvements have been made to the existing line, improving the track and bridges. (Jan. 7, p. 68.)

Milner & Northside.—This road has been opened for traffic from Milner, Idaho, south to Oakley, 21 miles. The officers of the company are the same as those of the Idaho Southern.

Missouri, Oklahoma & Gulf.—This company a short time ago sold $3,000,000 of bonds in France. It is understood that the extension from the present northern terminus at Wagoner, Okla., north to Kansas City, Mo., will be built. The company expects to have the line finished on the southern end to Denison, Tex., by August 15. (March 4, p. 461.)

National Railways of Mexico.—See Kansas City, Mexico & Orient.

North Dakota Roads (Electric).—According to press reports, right-of-way has been secured for an electric line from Center, N. Dak., in Oliver county, southwest to Hettinger, about 110 miles. Charles Whitmere is said to be in charge of the work.

Northern Electric.—This company has filed articles of incorporation authorizing the construction of a branch from Marysville, Cal., west via Yuba City to Colusa, 30 miles. (Feb. 18, p. 380.)

Northern Pacific.—According to press reports, construction work on the new water grade line from Tacoma, Wash., northwest via Point Defiance and the Narrows to Tenino, will be started about June 15. Bids are being asked for the work and the contract will be let about May 15. (Feb. 25, p 429.)

North Mountain.—See Dominion Atlantic.

Oregon Electric.—Franchises have been granted this company by the towns of Albany, Ore., and McMinnville. The company plans to build extensions this coming summer from Salem, south to Albany, 30 miles, and from the main line at Tigard, about 10 miles south of Portland, southwest to McMinnville, 40 miles. The work, it is understood, will include one tunnel and some heavy steel bridge work over the Santiam and Yamhill rivers. It is said that the Hill interests have bought the line.

Peninsular Railway Co. (Electric).—According to press reports, surveys have been made for a branch from Palo Alto, Cal., east to the bay of San Francisco, about five miles.

Philadelphia & Suburban (Electric).—A charter has been granted this company to build elevated and subway lines in Philadelphia, Pa. Application has been made to the Philadelphia councils for a municipal franchise. As soon as the franchise is granted the work will be started on the Broad street subway. It is intended to have the line in operation in 1913. S. S. Neff, president, 416 Franklin Bank building, and E. O. Lewis, counsel, Philadelphia. (Dec. 3, p. 1108.)

Portland, Gray & Lewiston (Electric).—Work is under way on an electric line from Lewiston, Me., south via Auburn, Gray, West Falmouth and Deering to Portland, 35 miles. The estimated cost of the line is $800,000. It is expected that the line will be finished during the summer of 1911. The work is being carried out by day labor. There will be two steel and eight concrete bridges, to be built by Fred T. Ley & Co., Springfield, Mass. W. S. Libby and H. M. Dingley, Lewiston, are back of the project.

Prescott & North-Western.—This road has been extended from Helbig, Ark., north to Cox, seven miles.

Rock Island Southern.—Announcement is said to be made that through freight, passenger and express service will be started May 15 on the extension from Monmouth, Ill., north to Rock Island, Moline and Davenport, Iowa, 50 miles. (April 8, p. 971.)

St. Johns River Terminal Co.—See Jacksonville, Fla., under Railway Structures.

Scio, Lacombe & Jordan Valley.—An officer writes that this company was organized to build from Munkers, Ore., east to Scio, thence to the Jordan valley and Lacombe, 35 miles, and that the prospects of building the line are good. There will be three bridges or tunnels and a number of station buildings. A. G. Prill, Scio, may be addressed. (April 29, p. 1115.)

Southern.—See Jacksonville, Fla., under Railway Structures.

Southern Pacific of Mexico.—The Sinaloa division has been extended from La Dura, Sonora, north to Tonichi, 18 miles.

Southwestern New York Traction.—Contracts are to be let soon, it is said, for a line from Bolivar, N. Y., east to Wellsville, 15 miles. C. M. Van Curen, president; E. M. Bedford, chief engineer, Bolivar.

Sparks Western.—An extension of this road has been opened from Ellenton, Ga., northwest to Pineboro, five miles.

Texas Roads (Electric).—H. M. Hyatt, representing the Empire Construction Co., St. Louis, Mo., is organizing a company in Dallas, Tex., to build an electric line from Dallas southwest to Cleburne, about 50 miles. A charter is to be secured and work started at once. The proposed route is from Dallas west via Eagle Ford to Grand Prairie, thence southwest through Webb, Mansfield, Lillian, Pleasant Point, Alvarado and Mosston, to Cleburne.

Application has been made to the city of Beaumont, Tex., for a franchise to use streets in that city for the operation of an electric street railway system and to put in an electric light and power plant. It is understood that John W. Gates, Port Arthur, is interested in the proposition, which also includes the construction of an interurban electric line from Beaumont southeast to Port Arthur, about 20 miles, for which survey has been made.

Joseph Edwards, Mansfield, Tex., is back of a project to build an electric line from Cleburne northeast to Dallas, about 50 miles.

Western Maryland.—The Connellsville & State Line Railway Co. was recently incorporated with $700,000 capital, to build the section of about 68 miles in Pennsylvania of the new line from Cumberland, Md., north to the Pittsburgh & Lake Erie at Connellsville, Pa. The part of the line from the Pennsylvania state line, south about 15 miles to Cumberland, Md., will be built by the Georges Creek & Cumberland, a subsidiary line of the Western Maryland. Contract for the work has been let to the Carter Construction Co., Pittsburgh. According to a report, there will be a tunnel, 2,400 ft. long, also one 1,400 ft. long, and several smaller tunnels. (April 15, p. 1017.)

West Washington Railway & Navigation Co. (Electric).—Preliminary survey is said to be made for a line from Grays Harbor, Wash., northeast towards Seattle, 77 miles. C. C. Quackenbush, president; W. B. Sammons, chief engineer, Aberdeen.

Railway Financial News.

ABBOTSFORD & NORTHEASTERN.—See Minneapolis, St. Paul & Sault Ste. Marie.

ALTOONA & BEECH CREEK.—The property of this company was sold for $15,100 under foreclosure to H. A. Davis. The road runs from Juniata, Pa., through Wopsononock to Daugherty, 15 miles.

ATLANTA, BIRMINGHAM & ATLANTIC.—The protective committee, George C. Clark, chairman, representing the $8,000,000 joint notes due May 1, 1910, of the Atlanta & Birmingham Construction Co. and the Atlanta, Birmingham & Atlantic Railroad, have arranged to pay the interest due on May 1 and to pay $605,025 principal on condition that the holders of the notes surrender them and accept in payment for the remainder of the principal new 5 per cent. notes due May 1, 1912, with interest guaranteed by the stockholders of the Construction company or by the syndicate which has underwritten the $800,000 raised from stockholders of the Construction company. The new notes are to be secured by the same collateral that now secures the old notes, and included among the present collateral are equipment bonds amounting to $666,000, and cash amounting to $362,000. This cash may be applied to paying new notes and canceling them if the present plan becomes effective. The equipment bonds are to be sold. The cash to be provided by the Construction company and by the sale of collateral will, it is expected, permit a pro rata payment of about 20 per cent. on account of the principal of the old joint notes.

BALTIMORE & OHIO.—The company has sold to Kuhn, Loeb & Co., New York, $40,000,000 three-year notes to pay for new equipment, construction and betterments.

BEECH CREEK RAILROAD.—W. C. Brown, Rembrandt Peale, E. V. W. Rossiter and R. A. Shillingforth have been elected directors, succeeding W. K. Vanderbilt, H. McK. Twombly, W. D. Kelly and James Kerr, resigned.

BUFFALO & SUSQUEHANNA RAILROAD.—Interest on the $9,510,000 4 per cent. bonds of the Buffalo & Susquehanna Railroad, which is leased by the Buffalo & Susquehanna Railway, will, it is understood, be defaulted on July 1, and the 4 per cent. guaranteed dividend on the stocks of the Railroad company will not be paid, thus breaking the lease of the Railroad to the Railway company. In view of the appointment of a receiver for the Railway company, as announced in these columns last week, a protective committee for the Railroad company bondholders has been formed. This committee consists of Alvin W. Krech, chairman; John L. Billard, James S. Kuhn, Robert Windsor and Asa S. Wing. The committee ask the deposit of first refunding 4 per cent. bonds with the Equitable Trust Co., New York.

CENTRAL NEW ENGLAND.—The Philadelphia committee, C. S. W. Packard, chairman, for the minority 5 per cent. general mortgage bondholders has made a settlement for the (approximately $500,000) bonds they represent. These bonds are to be paid for in cash at par.

CHICAGO & ALTON.—In connection with a statement that the company is to issue $18,000,000 bonds, a director is quoted as saying that "the Alton has, through lack of facilities, been unable to handle more than 60 per cent. of the business it has been offered, and the need of a security issue that will provide greater transportation power is easily apparent. * * * It will be eight years before all of the $18,000,000 is spent." It is said that only $3,500,000 of the new bonds will be issued this year.

CHICAGO, MILWAUKEE & ST. PAUL.—The possibility of the sale of new securities abroad, mentioned in the Late News columns last week, has been unofficially confirmed, and it is understood that the company has nearly concluded negotiations with Kuhn, Loeb & Co., New York, for the sale of $50,000,000 15-year 4 per cent. debenture bonds.

Holders of Milwaukee & Northern first mortgage bonds due June 1, 1910, are offered the privilege of extending their bonds at 4½ per cent. for three years, with the first mortgage lien to remain unimpared. Holders of bonds who do not wish to extend them will be paid in cash at par.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—The sale of 50,000,000 francs ($10,000,000) 4 per cent. debentures in Paris through J. P. Morgan & Co. has been confirmed.

DELAWARE & HUDSON.—Robert C. Pruyn has been elected a director, succeeding Dumont Clarke, deceased.

DENVER, LARAMIE & NORTHWESTERN RAILROAD.—This company has taken over the Denver, Laramie & Northwestern Railway, and has made a mortgage to secure an authorized issue of $22,500,000 first mortgage 5 per cent. bonds of April 1, 1910-1940. The bonds are to be issued at $30,000 per mile to pay for building 750 miles of road. The authorized capital stock of the company amounts to $30,000,000. The D., L. & N. Railway bonds, issued to pay for 56 miles of road between Denver, Colo., and Greeley, are to be called for payment at 102.

MEMPHIS, DALLAS & GULF.—See Memphis, Paris & Gulf.

MEMPHIS, PARIS & GULF.—Stockholders are to vote May 16 on the question of increasing the authorized capital stock from $640,000 to $6,260,000, and on the question of authorizing an issue of $6,260,000 5 per cent. 30-year bonds, and on the question of changing the name of the company to Memphis, Dallas & Gulf. The road runs from Murfreesboro, Ark., southwest to Ashdown, 41 miles. There is now outstanding $640,000 20-year 6 per cent. bonds, of which $420,000 are guaranteed principal and interest by the Nashville Lumber Co. Of the new 5 per cent. bonds, $840,000 are to be reserved to retire the bonds now outstanding.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The Abbotsford & Northeastern, running from Athens, Wis., to Abbotsford, 15 miles, has been taken over by the Soo and is now operated as a branch of the Chicago division.

MISSOURI, KANSAS & TEXAS.—Speyer & Co., New York, have bought $10,000,000 of a new issue of 4½ per cent. debenture bonds.

NATIONAL RAILWAYS OF MEXICO.—The $125,000,000 second preferred stock of the National Railways of Mexico has been placed on the official list of the Paris Bourse (Parquet).

NEW YORK CENTRAL & HUDSON RIVER.—See an item in regard to this company in Court News.

NORFOLK SOUTHERN RAILROAD.—The Corporation Commission of Virginia has granted a charter to this company, which is the successor of the Norfolk & Southern Railway.

OREGON ELECTRIC.—Control of this company has been bought by James J. Hill and associates. The company has outstanding $1,950,000 common stock, $160,000 6 per cent. cumulative preferred stock and $2,000,000 first mortgage bonds of 1908-1933. The road runs from Portland, Ore., to Salem, 49 miles, and from Garden Home to Forest Grove, 21 miles.

QUAKERTOWN & EASTERN.—The property of this company was sold for $10,000 under foreclosure on May 6 to C. C. Harring, representing the bondholders. The road runs from Quakertown, Pa., to Riegelsville, 19 miles. No trains have been run, it is said, over the road for five years.

ST. LOUIS, BROWNSVILLE & MEXICO.—The Texas Railroad Commission has authorized the company to issue $7,256,000 bonds under the new mortgage. The valuation of the road as fixed by the commission is $10,726,380.

SOUTHERN RAILWAY.—The company has sold a block of development and general mortgage 4 per cent. bonds of 1906-1956 in Germany, through J. P. Morgan & Co., New York.

UNITED RAILWAYS (PORTLAND).—The control of this company has been bought by James J. Hill and associates.

WABASH-PITTSBURGH TERMINAL.—Kuhn, Loeb & Co. and Blair & Co., both of New York, who have been the bankers in charge of the Wheeling & Lake Erie and the Wabash-Pittsburgh Terminal reorganizations, have decided not to try to keep the two companies together in a common reorganization plan, and will concern themselves only with the reorganization of the Wheeling & Lake Erie, leaving the reorganization of the Terminal company to the Terminal company's bondholders' committee.

WHEELING & LAKE ERIE.—See Wabash-Pittsburgh Terminal.

Supply Trade Section.

The Mather Horse & Stock Car Co., Chicago, has moved its office from 1320 Marquette building to 501 People's Gas building.

The Hurley Track Laying Machine Co., Chicago, has moved its office from the Railway Exchange building to 1408 Fisher building.

The Thomson-Thomson Co., Philadelphia, Pa., will, on May 15, move its offices to 509 Bulletin building, northeast corner of City Hall square.

The Adreon Mfg. Co., St. Louis, Mo., has moved its Chicago sales office from the Western Union building to the McCormick building, 193 Michigan avenue.

The Gulick-Henderson Co., inspecting engineers, New York, announces that F. B. Morse has been appointed assistant to the president, succeeding T. W. Cohill, resigned.

The McKeen Motor Car Co., Omaha, Neb., has completed a 70-ft. motor car for the Buffalo, Rochester & Pittsburgh. It was shipped from Omaha May 6, via the Wabash.

The Chicago sales office of the Pennsylvania Steel Co., Steelton, Pa., and the Maryland Steel Co. has been moved to suite 1005-1007 McCormick building, 193 Michigan avenue.

The Illinois Steel Co., Chicago, has made a large addition to its warehouse at the north works in Chicago. A two-story addition to the office building has also been completed.

The Cement Products Exhibition Co., 115 Adams street, Chicago, has announced that the New York cement show will be held in the Madison Square Garden December 14-20, 1910, and the Chicago show in the Coliseum, February 17-23, 1911. A general prospectus of both these exhibitions is now being prepared which will give complete information for exhibitors, including diagrams of space available.

Walter C. Kerr, president of Westinghouse, Church, Kerr & Co., New York, died on May 8 at Rochester, Minn., to which place he had gone to undergo an operation. He had been actively engaged with the affairs of the company up to the time of his going west on March 1. Mr. Kerr was born at St. Peter, Minn., on November 8, 1858. He was educated in the public schools of that town and later went to Cornell University, where he was graduated in mechanical engineering in 1879. He was subsequently an instructor and also an assistant professor, until 1883, in the Sibley College of Mechanical Arts, after which he became allied with the Westinghouse interests. His life work was in connection with the engineering organization of which he was president for many years and of which he was an officer from its organization in 1884. His forceful personality and gift of organization was responsible for the development of Westinghouse, Church, Kerr & Co. from its small beginning to its present place in the engineering operations of the world. Mr. Kerr was a trustee of Cornell University since 1890 and also a member of Cornellian council recently formed to raise money for the university. He was a member of the American Institute of Electrical Engineers, the Canadian Society of Civil Engineers, the American Society of Mechanical Engineers, New York Railroad Club, Psi Upsilon Club, Duquesne Club of Pittsburgh, New York Yacht Club, the Seawanhaka Corinthian Yacht Club, the Richmond County Country Club and the Franklin Institute. Mr. Kerr's home is at Beeches, in Dongan Hills, Staten Island, N. Y.



W. C. Kerr.

RAILWAY STRUCTURES.

ABILENE, TEX.—The Texas & Pacific has started work on its new passenger station, which was mentioned in the *Railway Age Gazette* of November 26. Negotiations have been carried on for the building of a union station, but no decision has been reached.

BETHLEHEM, PA.—The Lehigh Valley Transit Co. has bought land as a site on which it will build a steel structure, to cost $100,000, for a north approach to the New street bridge.

CHEBOYGAN, MICH.—The Detroit & Mackinac is to petition the county supervisors for the right to bridge the Cheboygan river.

FALLING WATERS, W. VA.—See Cumberland Valley under Railway Construction.

FORT WILLIAM, ONT.—The contract for building additions to the Canadian Pacific machine shops at Fort William, Ont., is said to have been given to M. H. Braden, Fort William. (April 22, p. 1069.)

GALVESTON, TEX.—The Gulf, Colorado & Santa Fe has given contracts to the Union Bridge & Construction Co., Kansas City, Mo., for the construction of two concrete and steel bridges on the Lometa-Brady extension.

GLENDON, PA.—A contract has been given to S. W. Chiles, South Bethlehem, Pa., for putting up a steel highway bridge, 130 ft. long, over the Lehigh Valley tracks and the canal. The bridge will cost $15,575.

GROSSE ISLE, MICH.—The Grosse Isle Railroad has been organized in Michigan, with $50,000 capital, to build a bridge to carry street railway cars from the mainland to Grosse Isle. The incorporators include: K. B. Alexander, E. Voight, W. E. Brown and H. L. Wilton.

IDAHO FALLS, IDAHO.—According to press reports, the Oregon Short Line will build a bridge over the Snake river.

JACKSONVILLE, FLA.—A large amount of work is to be carried out by the St. Johns River Terminal Co., improving the terminal facilities at Jacksonville for the Southern Railway and the Georgia, Southern & Florida. Increased facilities for the handling of traffic will cost $250,000, on which work is now under way. The plans call for enlarging the freight yards north of Bay street between Catherine and Marsh streets, additional property adjoining the yards having recently been bought for this purpose. The tracks south of Bay street along the river front between Catherine and Maine streets are to be enlarged and rearranged. The Clyde Steamship Co. is to build large piers and terminals along the river front between Market and Washington streets, plans for which have been made. A large warehouse is also to be built for import and export traffic. Land has been bought as a site on which shops are to be built for the Southern Railway, the Georgia, Southern & Florida and the St. Johns River Terminal Co. J. B. Munson is president of the St. Johns River Terminal Co. (November 19, p. 995.)

KANSAS CITY, MO.—The Missouri & Kansas Terminal Building Co. has been formed to build a $2,000,000 union electric railway station in Kansas City. The building is to be of stone construction, two stories high. W. B. Strang, president, Kansas City.

LORAIN, OHIO.—Contracts have been let by the Baltimore & Ohio for improvements to the dock and ore handling facilities at Lorain, to cost $500,000. James Stewart & Co., New York, has the contract to erect the docks, also for the machinary for handling the ore, and to construct a storage yard. The Great Lakes Dredging Co., Cleveland, Ohio, will do the dredging

work. The ore handling machinery will be supplied by the Brown Hoisting Co. The power house will be 73 ft. x 121 ft., instead of 70 ft. x 90 ft., as originally planned, and will be built by P. Farrell, Cincinnati. Work on the improvements will be started at once. (April 15, p. 1020.)

MARSHALL, TEX.—Work is said to have been started by the Marshall & East Texas on new shops in the southern part of Marshall. There will be eight buildings, including a roundhouse and an improved coal chute. (Jan. 21, p. 168.)

MIDVALE, OHIO.—The Northern Ohio Traction & Light Co. is to build a new power house with a probable capacity of 6,000 k.w.

NEW YORK.—The New York Public Service Commission, First district, advises the Board of Estimate that it is desirable to postpone the proposed enlargement work at the Centre street subway station in the borough of Manhattan, changing the station from a four-track to a six-track station. The Board of Estimate has already appropriated $875,000 for changes in stations, and it would require $1,500,000 to pay for additional land should the six-track station be built at Centre street.

NORTH BRANCH, MINN.—The Northern Pacific is receiving bids for building an equipment building and a machine shop. The cost of the two buildings is estimated at $58,000.

PARIS, TEX.—The Gulf, Colorado & Santa Fe and the Paris & Great Northern have reached a satisfactory agreement with the citizens of Paris concerning the proposed union station, mentioned in the *Railway Age Gazette* of August 13, 1909.

PORTLAND, ME.—See Portland, Gray & Lewiston (Electric) under Railway Construction.

PORTLAND, ORE.—See Oregon Electric under Railway Construction.

PRAIRIE VIEW, TEX.—The railroad commission has approved plans for a new passenger station for the Houston & Texas Central.

RITZVILLE, WASH.—The Northern Pacific has let the contract for building a $15,000 passenger station mentioned in the *Railway Age Gazette* of March 4.

ROCKFIELD, QUE.—The Railway Commission of Canada has ordered the construction of a bridge at Rockfield over the tracks of the Grand Trunk and the Montreal Park & Island Railway.

SAVANNAH, GA.—It is expected to have the additions now being made to the Central of Georgia's office building in Savannah completed by June 15. The cost of the improvements is $45,000.

The Gadsden Contracting Co. has finished the work of building the foundation for the 13,000-ft. trestle across the Savannah river, 14 miles from Savannah. It is expected to have all the work finished by July 1.

SAVANNAH, N. Y.—The New York Public Service Commission, Second district, has ordered the Rochester, Syracuse & Eastern to build a station at Savannah, in Wayne county. The company must submit plans for the new station by May 30 and have the work finished by October, 1910.

SPRINGFIELD, MO.—The Missouri Pacific has let the contract for building a $45,000 passenger station to be located on Water street between Jefferson and Benton streets.

TORONTO, ONT.—An officer of the Grand Trunk writes that some bridges are to be built in connection with the general separation of grades through the city of Toronto. The date for asking bids for the work has not yet been determined.

WICHITA FALLS, TEX.—The railways entering this place are said to have plans made and will spend a large amount of money for new buildings in Wichita Falls. The improvements include shops, roundhouses, office buildings and freight terminals.

WILKESBARRE, PA.—Plans are being made by the city officials and representatives of the railway companies entering Wilkesbarre for the removal of grade crossings in that city. The question of putting up a union passenger station is also under consideration.

Late News.

The items in this column were received after the classified departments were closed.

The Oregon Short Line is planning to build a viaduct over its yards from the east to the west side of Pocatello, Idaho.

The Chicago, Milwaukee & St. Paul will spend $1,500,000 elevating 2½ miles of the line on Bloomingdale avenue, Chicago.

Llewellyn A. Shaver, solicitor for the Interstate Commerce Commission, died suddenly at his residence in Washington, D. C., on May 11, from heart disease.

The Union Pacific has arranged to install wireless telegraph stations at Cheyenne, Wyo., and Sidney, Neb., for train despatching. It has not arranged for the intermediate stations.

The sale of the International & Great Northern under foreclosure of the second and third mortgage has been ordered. The question of priority of claims is reserved to be determined later.

The Chicago, Milwaukee & St. Paul, reported in the *Railway Age Gazette* of April 22 as being in the market for 25 Mallet locomotives, has ordered this equipment from the American Locomotive Co.

The Philadelphia & Reading is planning to make improvements, it is said, in Reading, Pa., to include a new station at Olney street, enlarging the freight station and the removal of the car shops further north.

The Rome & Northern will be opened for passenger traffic May 15, from Rome, Ga., north to Gore, 20 miles. The company proposes to immediately build an extension from Gore northeast to Tunnel Hill, 33 miles.

The New York State Railways and the Mohawk Valley Co. have each declared initial dividends of 1½ per cent. on their common stock, payable July 1. Control of both companies is held by the New York Central & Hudson River.

Sir Thomas Shaughnessy, president of the Canadian Pacific, has been elected also chairman of the board of directors, succeeding Sir William Van Horne, resigned. A. R. Creelman has been elected a director, succeeding Sir George Drummond, deceased.

The Chicago & Northwestern has ordered 75 locomotives of various types from the Baldwin Locomotive Works and the American Locomotive Company. Information as to the exact division between the companies is not obtainable at this time.

The New York Public Service Commission, First district, has extended the time to June 15, 1911, for the completion of the subway extension of the Hudson & Manhattan subway under Sixth avenue, from Twenty-third street to Herald square, in the borough of Manhattan, New York City.

The New York Public Service Commission, Second district, has served on the New York, New Haven & Hartford the complaint of William P. Hickok and Buell G. Tallman against the increase in commutation rates between Mount Vernon and the city of New York. The company has been required to make answer within ten days.

Passenger officials of the Central of New Jersey say that an increase in both passenger and freight rates is contemplated. They say, however, that anything definite as to the ratio of increase will not be given out within ten days or two weeks. At the Lehigh Valley offices it was stated that no such change would be put into effect within the next few months.

The Indiana Railroad Commission has denied the petition of the Grand Rapids & Indiana Railway Company to be relieved from complying with the general order requiring all railways having specified minimum earnings to adopt the block system. The company represented that its earnings were only slightly in excess of the minimum specified, and that while the company had the money on hand to install the block signals, it believed greater safety could be assured by using the money for betterments in other things. The commission, however, refused to grant the relief asked for.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Grand Trunk is said to be figuring on 50 locomotives. This item is not confirmed.

The Scio-Lacombe & Jordan Valley advises that it will buy motive power within 60 days. A. G. Prill, president, Scio, Ore.

The Atlantic Coast Line has ordered 10 ten-wheel passenger, six 10-wheel freight, six consolidation and seven switching locomotives from the Baldwin Locomotive Works.

The Chicago, Burlington & Quincy, reported in the *Railway Age Gazette* of March 11 as in the market for 25 switch locomotives, has authorized the building of these engines at company shops. Inquiries are now out for 50 Mikado locomotives.

The National Railways of Mexico, as reported in the *Railway Age Gazette* of April 29, have ordered 14 Mallet locomotives from the Baldwin Locomotive Works.

General Dimensions.

Weight on drivers	300,000 lbs.
Total weight	338,000 lbs.
Cylinders	33 in. x 32 in.
Diameter of drivers	56 "
Type of boiler	Straight top
Working steam pressure	220 lbs.
Heating surface, tubes	4,310 sq. ft.
" " firebox	210 "
" " total	4,520 "
Tubes, number	350
" outside diameter	2¼ in.
" length	21 ft.
Firebox, length	124 in.
" width	78 "
" material	Steel
Grate area	67.1 sq. ft.
Water capacity	9,000 gals.
Fuel oil capacity	4,000 gals.

Special Equipment.

Brakes	Westinghouse
Couplers	Simplex
Headlight	Pyle-National Electric
Injector	Nathan
Sanding devices	Leach
Sight-feed lubricators	Nathan
Springs	Railway Steel Spring Co.
Staying	Falls Hollow
Steam gages	American Steam Gage & Valve Co.
Tubes	Mannessman (Germany)
Valves	Hobart Allfree

The Norfolk & Western, as reported in the *Railway Age Gazette* of April 29, has ordered 10 class M-2 locomotives from the Baldwin Locomotive Works.

General Dimensions.

Weight on drivers	220,000 lbs.
Total weight	260,000 lbs.
Cylinders	24 in. x 30 in.
Diameter of drivers	56 in.
Boiler, type	Wagon top
Boiler, working steam pressure	200 lbs.
Heating surface, tubes	4,281 sq. ft.
" " firebox	179 "
" " total	4,460 "
Tubes, number	386
Tubes, outside diameter	2¼ in.
" length	18 ft. 10 "
" material	Carbon steel
Firebox, type	Radial stay
" length	99⅞ in.
" width	64¼ "
" material	Crucible steel
Grate area	45 sq. ft.
Tank capacity	9,000 gals.
Coal capacity	14 tons

Special Equipment.

Boiler lagging	Sectional manganese
Brakes	Westinghouse-American
Brake-beams	N. & W. standard
Couplers	M. C. B.
Driving boxes	Steeled cast-iron
Headlight	16 in. oil burners
Injector	Monitor
Journal bearings	Brady Brass Co.
Piston and valve rod packings	U. S. Metallic
Safety valve	Ashton
Sanding devices	Leach
Sight-feed lubricator	Nathan
Springs	Union Spring & Mfg. Co.
Tires	Latrobe
Valve gear	Walschaerts

The Baltimore & Ohio, reported in the *Railway Age Gazette* of April 22 as having ordered equipment, has ordered 95 simple consolidation locomotives from the American Locomotive Co.

General Dimensions.

Weight on drivers	198,580 lbs.
Total weight	220,300 lbs.
Cylinders	22 in. x 30 in.
Diameter of drivers	60 "
Type of boiler	Straight
Working steam pressure	205 lbs.
Heating surface, tubes	2,668.46 sq. ft.
" " firebox	179.30 "
" " total	2,847.76 "
Tubes, number	324
" outside diameter	2 in.
" length	15 ft. 8¾ "
Firebox, type	Wide
" length	107⅝ in.
" width	75⅜ "
Grate area	57.05 sq. ft.
Water capacity	7,000 gals.
Coal capacity	15 tons

Special Equipment.

Axles	O. H. steel
Brakes	Westinghouse No. 6 E. T.
Brake-beams	Diamond special
Driving boxes	Elvin
Headlight	Schroeder
Injector	45 Simplex, 50 Hancock
Journal bearings	Brass
Piston and valve rod packings	U. S. Metallic
Safety valve	Two 4-in. Coale
Sanding devices	Hanlon
Sight-feed lubricators	Nathan
Springs	B. & O. specifications
Staying	Radial
Steam gages	Ashcroft
Steam heat equipment	Gold
Tires	Standard
Tubes	Seamles steel
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The Baltimore & Ohio has issued inquiries for 1,000 box cars.

The Illinois Traction Company is in the market for 14 interurban cars.

The Nashville, Chattanooga & St. Louis is building 200 box cars at company shops.

The Argentine Government Railway is in the market for 118 passenger cars of various types.

The Western Maryland is said to be figuring on 600 freight cars. This item is not confirmed.

The Chicago Short Line expects to order 10 to 15 fifty-ton general service cars in a short time.

The Scio-Lacombe & Jordan Valley advises that it will buy rolling stock within 60 days. A. G. Prill, president, Scio, Ore.

The Illinois Traction System is reported in the market for 21 city cars for the Chicago, Ottawa & Peoria. This item is not confirmed.

The Metropolitan Street Railway, Kansas City, Mo., is said to be in the market for 25 electric cars at once. This item is not confirmed.

The Los Angeles Ry., Los Angeles, Cal., reported in the *Railway Age Gazette* of April 1 as in the market for 90 electric cars, has ordered this equipment from the St. Louis Car Co.

The Mexico Northwestern, reported in the *Railway Age Gazette* of April 8 as in the market for 200 box cars and 60 stock cars, is reported to have ordered the box cars from the Pullman Co.

The Toledo, St. Louis & Western, reported in the *Railway Age Gazette* of November 19, 1909, as in the market for 750 box cars, which inquiry was later withdrawn, is again asking prices on this equipment.

The Utah Light & Railway Co., Salt Lake City, Utah, reported in the *Railway Age Gazette* of April 29 as in the market for 12 interurban and 12 city cars, has ordered this equipment from the St. Louis Car Co.

The Colorado & Southern, reported in an unconfirmed item in the *Railway Age Gazette* of April 22 as building freight cars at the Denver shops, has under construction 150 narrow gage box, 50 narrow gage coal and 50 narrow gage stock cars, also 15 standard gage caboose cars.

The Harriman Lines passenger equipment order to the Pullman Company, including 424 cars, as reported in the *Railway Age Gazette* of April 29, will be divided as follows: 189 coaches, 87 chair, 59 baggage, 35 postal, 25 dining, 12 observation, 16 baggage and postal and one passenger baggage and mail. Excepting the diners and observation cars, this equipment will have all-steel underframes and all-steel bodies. The Oregon Short Line will receive 56 coach, 10 chair, five baggage, five postal, six diner and five combination cars; the Union Pacific will receive five diners; the Oregon Railway & Navigation will receive two postal, eight baggage, four combination, two chair and 12 coaches. The Oregon & California will receive four postal, six baggage, five combination and 10 coaches; the Central Pacific will receive 38 coaches, 30 chair, 10 baggage, 11 postal, five diner and five observation cars; the Southern Pacific will receive 58 coaches, 45 chair, 25 baggage, nine postal, seven diner and seven observation cars; the Arizona Eastern will receive one passenger and mail car; the Oregon & Washington will receive 15 coaches, five baggage, four postal, two diner and two combination cars.

MACHINERY AND TOOLS.

The Kansas City, Mexico & Orient is in the market for three or four machine tools.

IRON AND STEEL.

The Philadelphia & Reading has ordered 200 tons of bridge steel from the McClintic-Marshall Construction Co.

The New York Central has ordered 600 tons of structural steel from the Lackawanna Bridge Co. for its Buffalo, N. Y., freight sheds.

The Southern is reported to have ordered 10,000 tons of rails from the Maryland Steel Co. in addition to the order reported in the *Railway Age Gazette* of March 25.

The Central of New Jersey, reported in the *Railway Age Gazette* of April 22 as in the market for 200 tons of bridge steel, has ordered 300 tons from the Phoenix Iron Works.

The New York, New Haven & Hartford, reported in the *Railway Age Gazette* of April 22 as in the market for 2,000 tons of bridge steel, has ordered this material from the American Bridge Company, and has also ordered 1,100 tons from the Boston Bridge Co.

General Conditions in Steel.—Orders for railway steel during the past week have been light. Reports indicate that tenders have been made for 50,000 tons, of which scarcely 15,000 tons have been placed. In industrial lines, however, there is said to be about 200,000 tons in inquiries, and the estimating departments of the fabricating shops are very busy on these prospective contracts. The United States Steel Corporation at the present time is operating between 80 and 85 per cent. of its capacity. This means a reduction in output between 10 and 15 per cent., as the Steel Corporation has at no time since the recovery in steel operated its mills in excess of 95 per cent. of capacity.

SIGNALING.

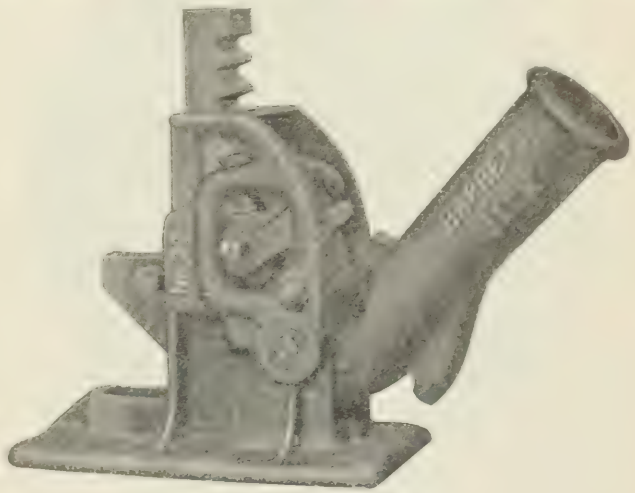
The Chicago Great Western will buy all the signals and relays to equip its tracks from Chicago to Oelwein from the General Electric Co.

The Rock Island has just completed the installation of automatic block signals between Valley Junction and Neola, on the Iowa division, 116 miles of single track. There are 136 signals and three crossing bells. All signals work in the upper right-hand quadrant, giving indications in three positions. Switch indicators are used at switches remote from signals. In these and in all other respects this installation conforms to standard Rock Island practice as heretofore described. The signals, indicators and relays were furnished by the Union Switch & Signal Co.

A New Design Track Jack.

A new Barrett track jack, designed especially for use on the electrical zone of the New York Central, by the Duff Manufacturing Co., Pittsburgh, Pa., is shown herewith. The jack is intended especially for use outside the track on the third rail side.

The new jack, weighing 55 lbs., is much shorter than other track jacks, its height when closed being 10 in., with a 5½-in. lift. When the base of the rail rests on the toe of the rack, the top of the rack is level with the top of the rail, and there



Barrett Track Jack.

is sufficient clearance between the track and rail to permit the car wheel flanges to pass. When it is necessary to stop work on the track to permit a train to pass, the jack can be quickly dropped and the wooden handle removed from its socket. The socket drops down out of the way and the jack can be left under the rail while the train is passing. There should be a considerable saving in time in not having to remove and reset the jack every time a train passes, and especially so where the trains are frequent.

Composition and Action of Abrasives.

The department of tests of the Norton Company, Worcester, Mass., recently made a study of natural abrasives and artificial aluminous abrasives and their effects in dry and wet grinding. Some of the conclusions of these investigations are given herewith.

The efficiency of aluminous abrasive materials used in the manufacture of grinding wheels depends largely on purity and structure. The accompanying illustrations are micro-photographs of aluminous abrasives in the grain and characteristic chips made during a grinding operation. Aluminous abrasives are those which depend for their abrasive action on their alumina content. The purity and structure are plainly shown under the microscope.

The chief impurities, or foreign minerals that are detrimental, are oxides of iron and titanium and silica. In some cases these foreign minerals are merely intermixed with the abrasive and can easily be separated mechanically. In other cases the impurities or foreign minerals are chemically or mechanically combined with the abrasive grain. Purification of the latter forms of impure abrasives is practically impossible. All commercial forms of natural abrasives have impurities or foreign material of this class to a greater or less degree.

In all aluminous abrasives, the abrasive efficiency is directly proportional to the amount of crystalline allumina present. When silica is combined with alumina it makes a brittle grain of weak structure which is not a satisfactory abrasive. When iron oxides are present the grain lacks the necessary abrasive qualities. The tendency of such a wheel is to heat or burn the material being ground and consumes a great deal of horse power.

Fig. 1 shows some grains of Naxos emery as they appear

under the microscope. This carries considerable quantities of impurities or detrimental minerals. This form of abrasive material may be likened to a sponge whose voids have been filled with impurities. The abrasive shown in Fig. 2 has only a small amount of combined impurities and no mechanically mixed impurities. In the latter illustration a tendency toward crystallization is evident, whereas in Fig. 1 the abrasive grains are entirely amorphous. The shape of the grain in Fig. 1 is not as good for abrasive purposes, being more round or blunt and is without the sharp cutting edges of the other.

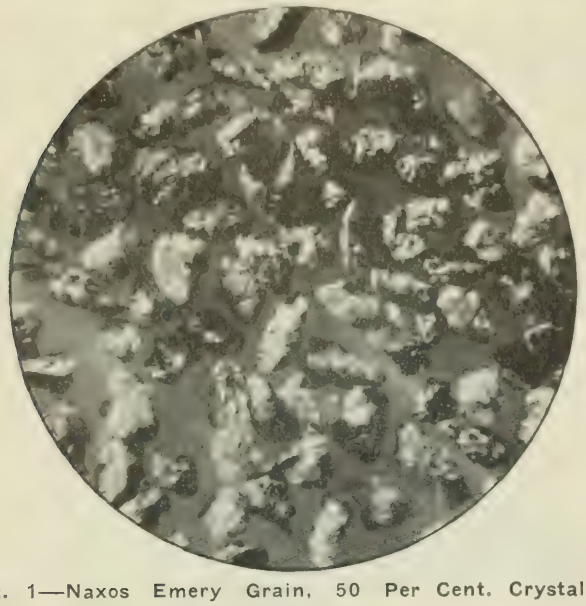


Fig. 1—Naxos Emery Grain, 50 Per Cent. Crystalline Alumina.

Natural abrasives seldom run above 85 per cent. in crystalline alumina and those that run as high as 80 per cent. or over are considered an exceptional grade. The common emery in use runs only as high as 40 to 50 per cent. in crystalline alumina. In the artificial aluminous abrasives it is possible to get any degree of purity desired. The purity depends on the electric furnace treatment. Alundum runs from 92 to 98 per cent. pure alumina.

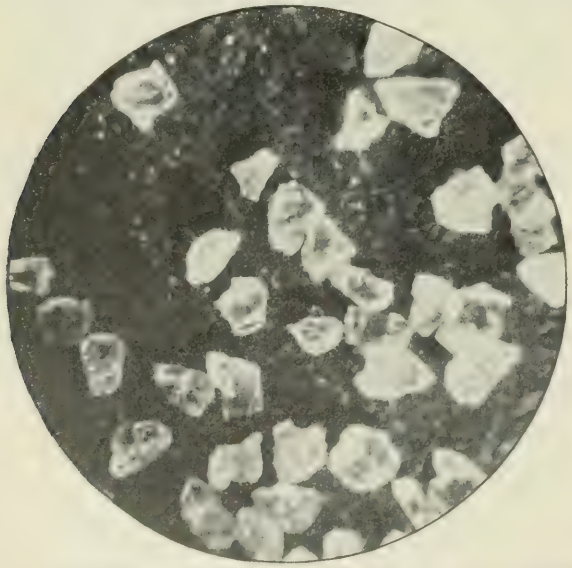


Fig. 2—Alundum Grain, 92 to 98 Per Cent. Crystalline Alumina.

One of the chief requisites of a grinding wheel is its ability to remove stock without changing the temperature to the extent of injuring the material ground. In Figs. 3 and 4 two lots of grinding chips as they appear under the microscope are shown. One lot of chips, Fig. 3, was caught under a grinding wheel made of an abrasive material such as shown in Fig. 1. The other lot, Fig. 4, was caught under a grinding wheel made of an abrasive material of a high degree of purity. The material ground was the same, under the same conditions.

It is not the intention to infer that the cutting properties of a wheel depend entirely on the abrasive used in its manufacture. There are many conditions that should be considered: for example, grade of hardness. Fig. 3 shows that there was so much heat generated that portions of the chips were melted as indicated by the globules shown in the picture. Fig. 4 shows more perfect chips produced with a cool cutting wheel. The microscope shows them to be clearly shavings identical with the cuttings of steel tools, except that there are many different shapes, widths and lengths due to the fact that the cutting points of the grinding wheel are of different shapes and angles of clearance.



Fig. 3—Manganese Steel Chips, Produced by Dry Grinding with an Emery Wheel.

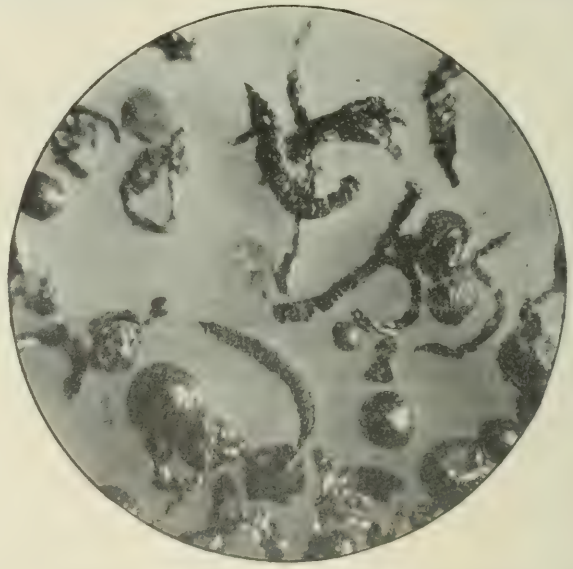


Fig. 4—Manganese Steel Chips, Produced by Dry Grinding with an Alundum Wheel.

A wheel that produces great heat in grinding should be avoided, not only for the reason that it would have a tendency to injure the metal being ground, but it is evident that it consumes a great deal more power and will not produce as much work in a given time as a wheel that grinds with less friction. The most efficient grinding wheel is one that will cut off the most stock in a given time and with the least horse power. The power consumed by grinding machines is rarely considered by superintendents and works managers.

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One finds oneself in a mist of confusion when the test of either equity or economics in railway re-valuation is applied in such a case as the South Station at Boston. Its cost of construction some twelve years ago was $15,015,000; it is capitalized at $500,000 in stock and $14,000,000 of 3½ per cent. bonds under the title Boston Terminal Co., the New York, New Haven & Hartford holding four-fifths of the stock and the Boston & Albany one-fifth. The former corporation pays 75 per cent. of the interest taxes and operating cost; the latter company, 25 per cent. During the last fiscal year those three items aggregated $989,060, while the income from concessions was $316,615, so the net loss to the two corporations was $672,445. Under the valuation of the New Haven made by J. F. Stevens, the terminal probably goes in at an increase to $20,000,000, perhaps more. When it comes to re-valuing upward such a property, there are several viewpoints. The two corporate railway owners may see with approval the added valuation that justifies the "fair return" and a sustained dividend, or even, more remotely, the increase of rates to maintain that dividend, but not with so much approval the higher valuation that challenges increased taxes. As an operating plant, the terminal is a railway necessity, but also means an enormous operating loss—like other big terminals. It is from one view a great asset, from another a great liability. It adds to adjacent realty values, but it cannot logically be tested by them, for its uses are different and its realty is not marketable; nor from the narrow and theoretical view of the stockholders of the two railway companies can a big valuation of a property that subtracts permanently and every year $672,445 from his dividend be regarded as genuine. What is a really just valuation of such a property, considered separately, as it is own technically by a separate corporation, is a problem to perplex wiser heads than those carried by most of the Solons who sit in legislative halls.

The deadlock resulting from the demand by investors for a high income yield on securities, and the refusal of the stronger railway companies to pay high rates of interest for their money, has been apparently broken by the action of some companies in finding in Europe a market for their securities. This solution of the problem might have been suggested by the fact that for the past three months we have been buying more from abroad than Europe has been buying from us; and, notwithstanding the exports of gold to London, the balance of trade—in this case what we owe in excess of what Europe owes us—has been strongly against the United States. The sale abroad of what are believed to aggregate about $124,000,000 bonds within the past three weeks should, as soon as the sales have been finally confirmed, temporarily put the balance of trade in our favor. Of course, when interest payments begin, and, looking much further ahead, the payment of the principal when it falls due, some new way will have to be found either for more borrowing abroad or for paying back our debts with gold or through the natural sale of food products after the movement of crops. The companies that have found it convenient to borrow in Europe are: The Chicago, Milwaukee & St. Paul, which has arranged for the sale of $50,000,000 4 per cent. 15-year debenture bonds in France; the Baltimore & Ohio, which has sold to Speyer & Co. and Kuhn, Loeb & Co. $40,000,000 three-year 4½ per cent. secured notes, which the bankers have placed largely abroad; the St. Louis & San Francisco, which has sold partly in France and partly in Germany $7,500,000 5 per cent. 15 to 20-year bonds; the Missouri, Kansas & Texas, which has sold $10,000,000 4½ per cent. debenture bonds to Speyer & Co., who presumably will place a considerable part of these debentures abroad; the Cleveland, Cincinnati, Chicago & St. Louis, which has sold $10,000,000 4 per cent. debentures in France; and the Seaboard Air Line, which, under the plan of reorganization, sold to a syndicate $18,000,000 adjustment bonds, of which $6,700,000 have been sold abroad. In addition to these sales of American securities in Europe light is thrown on the attitude of European bankers toward American securities by the listing on the Paris Bourse (Parquet) of the second preferred stock of the National Railways of Mexico, of which there is authorized $125,000,000. It will be seen that the tendency is for European investors to take the securities of roads like the Baltimore & Ohio and the St. Paul with very high credit and with securities of the first class to offer. The St. Louis & San Francisco is an exception, and there are plenty of other exceptions. For instance, $2,500,000 Missouri, Oklahoma & Gulf first mortgage 5 per cent. bonds were recently offered in Paris at a price yielding about 5.4 per cent. Probably one reason why American investors are demanding a higher return on their investment

is because they can get it. There are three classes of bonds and stock which compete now with securities of railways for capital that a few years ago were, relatively, little dealt in. These are: industrial bonds, public service corporation and street railway bonds and stocks and power company and hydro-electric bonds and stocks. The securities of these corporations have come before the investor in about the chronological order indicated. All of these enterprises are willing to pay a higher interest rate than are the stronger railways. Moreover, the ones that are successful can well afford to pay this rate.

EFFICIENCY IN RAILWAY SUPPLY DEPARTMENTS.

The seventh annual meeting of the Railway Storekeepers' Association, which was held at St. Louis this week, brings to mind the growing importance of that branch of the railway service known as the "Storehouse" or "Supply" department. It is gradually becoming better understood that the providing and distributing of the raw material from which transportation is manufactured is a factor of railway operation which is worthy of careful and scientific study. Considering the magnitude of the interests involved and the opportunities presented for large economies by concentrating, in competent hands, the authority and responsibility for properly conserving the enormous quantities of material which are called for in the daily operations of a large railway, it seems strange, at the first glance, that those interests should have been comparatively neglected for so long a time.

On the other hand, it must be remembered that a railway is primarily designed for the transportation of people and commodities, and the essence of its being is the movement of trains. Hence the interest and attention of managing officials is focused in the first instance upon the operating department, and from the beginning men have been specially selected and carefully trained for that branch of the work. The trains once in motion, the procuring of their lading becomes the prime necessity and the traffic department the center of managerial activity. The engineering, mechanical and maintenance of way departments, each in turn, play their part and have been recognized as requiring specially trained talent for their proper organization. But the storehouse, which is really the commissary and the magazine of the railway, has been so far removed from the "firing line" that it has, until recently, been almost overlooked and has generally failed to receive the attention and study to which it is really entitled.

It is only within the last twelve or fifteen years that the attention of the managing officials has been turned seriously in that direction, and while the progress and improvement in the methods of supervising the vast stocks of materials, which railways necessarily carry, has been quite marked, it must be admitted that, with some few notable exceptions, the recognition which has been accorded to the storehouse department has been somewhat less than is its due, and the full realization of its ultimate value as a factor in railway economics has not yet been universally reached.

The work of the Railway Storekeepers' Association is bringing this important branch of the service more prominently before the eyes of the railway managers, and the need for carefully trained men in positions of responsibility and for a higher grade of intelligence in the rank and file of the department, is making itself felt. In a sense, the movement is still in its infancy, but the advantages to be derived from the careful application of scientific principles to the control and handling of supplies, by men who are properly qualified by special training for the work, are becoming so manifest as to demand and receive greater consideration.

Perhaps the most important work which has yet been undertaken by the association is that covered by the report of the committee on the "Classification of Material." It marks the first attempt toward securing uniformity in the methods of accounting for the material in charge of the department, and to some extent emphasizes the desirability of placing all the material belonging to the railway, which is not in actual use, under the sole direction and control of the general storekeeper. In a general way, this classification is based upon the uniform method prescribed by the Interstate Commerce Commission for the operating accounts of the railways, so that it will fit in well with the general scheme. It has been the endeavor to make it so elastic as to meet the requirements of any railway, large or small, and yet rigid enough to secure the desired uniformity in the accounts, by which alone the operations of one road can be fairly measured by those of another. This question has been the subject of careful study by committees of the association for some three years and the advantages to be derived from its practical application to the work of the department would seem to be so marked that it can hardly fail to attract favorable notice.

THE COMMISSION'S REPORT ON TRANSIT.

We commented briefly last week on the report of the Interstate Commerce Commission "In the Matter of the Substitution of Tonnage at Transit Points." The report, which was prepared by Commissioner Cockrell, is in the main a very fair and able document and shows that while the commission is determined to stop impairment of the integrity of the legal rates through abuse of the transit privilege, it is also earnestly desirous to do this, if possible, in a way that will not cause any unnecessary business disturbance and losses.

In one respect the report is confusing and perhaps even inconsistent. The commission seems to recognize the commercial necessity for the mixing of different varieties of the same commodity, such as varieties of wheat to make a uniform high grade of flour, and even of different commodities, such as different grains to make mixed feeds, and even upholds the legitimacy of the mixed carloads of grain moving out of New England points on transit billings. On the other hand, it asserts that the hearing has failed to show that its ruling 76-A, in which it condemns the substitution of a commodity originating in one territory for the same or like commodity moving into a transit point from another territory, was too strict, and says that it has been shown "that transit rules and regulations and railway billings which do not distinguish between such commodities as hard wheat and soft wheat, or as yellow corn and white corn," etc., "leave wide open the opportunity for practices which defeat rates, violate the act, and injure honest shippers." Perhaps, however, the inconsistency is more apparent than real. What it probably means, for example, is that the complete substitution of a carload of soft wheat originating in Illinois for a carload of hard wheat originating at Omaha and destined to Cincinnati on a through rate would be illegal, because such substitution would impair the integrity of the through rate, while mixture of the two grains for milling purposes and the subsequent forwarding of the resulting flour on proportionate parts of the through billings, as it would not impair the integrity of the through rates, would be legal. If this be its position it seems reasonable and proper.

Other parts of the report are not open to similar possible misapprehension. The substitution of one commodity for another, as oats for wheat, is emphatically and unanswerably condemned. The same is true of its comments on the practice of putting a raw material through a milling process whereby, as in the case of wheat, the tonnage is reduced from 1½ to 3 per cent., and whereby, as in the case of lumber, it is reduced not less than 50 per cent., and then filling out the tonnage with commodities shipped in on non-transit billings or bought locally. The lumber manufacturers enjoying the transit privilege contend that this practice gives them no unfair advantage over a competitor located at the point of origin of the raw material; but it does give them a very

marked advantage over the manufacturer who ships his raw material to a point where it is to be manufactured and the finished product is to be marketed. The true principle of transit is that if a commodity is put through a manufacturing process at the transit point and its tonnage is thereby reduced 3, or 10, or 50 per cent., there should be shipped out on the transit billings 3, or 10, or 50 per cent. less tonnage than was shipped in. Otherwise the integrity of the rate is destroyed, the shipper forwarding on his billing tonnage on which he actually pays no rate at all.

The commission severely and justly criticizes the railways for recklessly and indiscriminately extending the transit privilege for merely competitive purposes. The effect has been greatly and needlessly to reduce railway earnings, and in many cases unfairly to injure shippers competing with those having the transit privilege and even in some cases to injure the shippers having the privilege.

The commission's original ruling, the disgraceful conditions disclosed by its investigation and its report have put squarely on the carriers the responsibility and duty of promptly and effectively policing the transit privilege, so as to reduce to the minimum the possibility of its use as a device for rebating, and on the shippers the responsibility and duty of complying promptly and in good faith with all reasonable regulations for this purpose. It has practically given immunity for past offenses, but at the same time indicates that it will proceed vigorously against them in future. If there is any criticism to be offered of the commission's course in this matter, it is that it has acted too leniently. The full and fair warning that it now has given should be heeded. The solution of the problem of putting transit on a proper basis may be difficult, but it can be solved if those concerned will set about the matter, not with the aim, as in the past, of seeing how closely they can run to the law without colliding with it, but with the purpose of keeping always well within its limits. If as much ingenuity is exercised in the future to devise means of complying with the law as has been used in the past in devising means to evade it, transit will speedily be put on a fair, legal and tolerably satisfactory basis.

A NEW PRINCIPLE FOR FIXING THE WAGES OF RAILWAY EMPLOYEES.

Perhaps the most important development in the railway labor situation since early in the year the consideration of a readjustment of the various wage scales was begun is the decision rendered by the federal board of arbitration at Chicago regarding the wages to be paid by the railways to members of the Switchmen's Union of North America. This decision was of importance partly because, being the first rendered by an arbitration board under the Erdman act in a controversy directly and indirectly involving the question of the wages to be paid to a very large number of railway employees, it established a precedent for similar future boards. And being a precedent, it derived additional importance from one principle which the majority of the board laid down as fundamental in the settlement of differences over wages between railways and their employees. The principle in question as enunciated is of such significance that it is surprising how little comment it has evoked.

The grounds on which the switchmen sought increases in wages were that the cost of living had increased since the last advance in their pay in 1906; that railway employees were handling an increased tonnage of traffic per man; that wages in other crafts had risen; and that the earnings of the railways were such as to enable them to pay higher wages. The representatives of the railways controverted more or less all these propositions, but mainly the last one. It was pointed out by them that the country was just emerging from a period of business depression in which the roads had been among the principal sufferers; that the cost of all kinds of railway equipment and supplies was increasing; and that the financial future was uncertain; and, therefore, it was argued, the roads could not afford to increase wages. This was particularly true of three of the railways involved, the Chicago Terminal Transfer, the Chicago Great Western and the Pere Marquette, which had not earned their fixed charges for three years. It was contended that to increase wages would be practically to confiscate the properties of these roads. The majority of the board, in awarding an increase of wages, said that it would be unfair to consider solely the effect of its award on either the most or the least prosperous roads, and then added:

"We are of opinion, however, that the interests of those holding the stocks and securities of all these companies requires the continued operation of these lines. This being so, we are also of opinion that these companies must be regarded as able to pay operating costs, including, of course, just and reasonable wages to the class of employees parties to this arbitration."

What was meant by the foregoing, as was made clear by S. S. Gregory, chairman and umpire of the board, in rendering the majority opinion, was that it is cheaper for a road to go on operating even if it does not earn its fixed charges than to quit operating altogether, because if it goes on operating the loss to its security holders is only partial, while if it suspends operation the property at once becomes practically a dead loss. "And, therefore," said Mr. Gregory, "it has seemed to the majority of the board that in the case of every one of these roads, entirely irrespective of the question whether they were able by operation to pay fixed charges or not, the roads should be operated, and as incident to that, upon the same theory upon which a court will order the purchase of necessary supplies at reasonable and proper prices, there must be payment of reasonable and proper wages."

This reasoning seems to ignore or repudiate the right of those who invest their money in railways to receive a "just and reasonable" return from it; the employee must get his maximum "just and reasonable" wage even if the owners of the property are thereby reduced to less than nothing. A good rule works both ways. The principle enunciated is in substance that the amount of money a road is making is no criterion of what wages it should pay; that the true criteria are the cost of living and the amount of the wages being paid in other industries; and that a railway must pay just and reasonable wages even if the effect be to so increase its operating expenses as to keep it in a state of chronic bankruptcy. But if employees should not share in a road's adversity, on the same principle they should not share in its prosperity. It follows that they have no right, if and when they are already receiving wages that are reasonable, measured by the cost of living and the amounts paid in other businesses, to demand higher wages on the ground that the profits of the railways have increased. On this theory they have no interest whatever in the well-being of their employers.

But it is as impossible to thus divorce the interest of railway labor from the interest of the railway as it is to divorce the interest of the public from that of the railway. The principle laid down is an economic half-truth. A road can better afford to operate temporarily for earnings that are less than its operating expenses, than to stop operation entirely. Perhaps it could better afford to operate permanently for less than interest on its actual cash investment than to quit operating entirely. But that it could not operate permanently with its operating expenses exceeding its earnings is self-evident. And that it would be advantageous to its employees as a whole for it to increase wages at a time when it was not earning interest on its investment is also very questionable. For, while each employee that it kept on its payrolls would get more money, the road, other things remaining equal, would be forced to reduce the number of men that it employed. The public also is entitled to some consideration from an arbitration board organized under the law and acting for the public, even if the owners of the railways are not. Now, it is obvious that an increase in wages which is made in disregard of the earn-

ing capacity of the railways and which, therefore, other things remaining equal, is sure to force the roads, or at least some of them, to reduce the number of their employees or to curtail their expenditures for maintenance, equipment, etc., is apt to injure the public by impairing the transportation service rendered to it.

The arbitration board in passing on the wage question in this case was acting for the federal government. By regulation of rates through the Interstate Commerce Commission the government, to a large extent, may and does control the amount that railways may earn. Acting for the government the arbitration board said to the railways, in effect: "We hold that you should increase the wages you pay regardless of what rates you can charge and what profits you can earn." Suppose, now, that the government through the Interstate Commerce Commission should say to the railways, "We will regulate your rates regardless of what wages you have to pay." It is only fair to assume that the authorities that regulate rates will see how unjust, and how foolish from the standpoint of public expediency it would be for the government to adopt the policy of thus withholding from its left hand information as to what its right hand was doing. They must see that if a board of arbitration, in determining what wages a railway ought to pay, cannot or will not take into consideration its ability to pay them, then the power that regulates its rates must take this into consideration in determining the rates which it is reasonable for the railway to charge. Otherwise the roads are in danger of being ground exceeding fine between the upper millstone of government regulation of rates and the nether millstone of government regulation of wages. Shippers who oppose increases in rates to recompense the railways for advances in wages seem to proceed on the theory that all raises of wages should come out of the pockets of the owners of the roads, since the wages are paid to men who are employed by the owners of the railways and not to men who are employed by the shippers. But in the long run wages must be paid out of earnings; and the only sources from which earnings are derived are the charges paid to the railways by shippers and travelers; and if the government says that the railways must increase their wages it must allow the roads to get the wherewithal to pay them from the only sources from which it can be obtained.

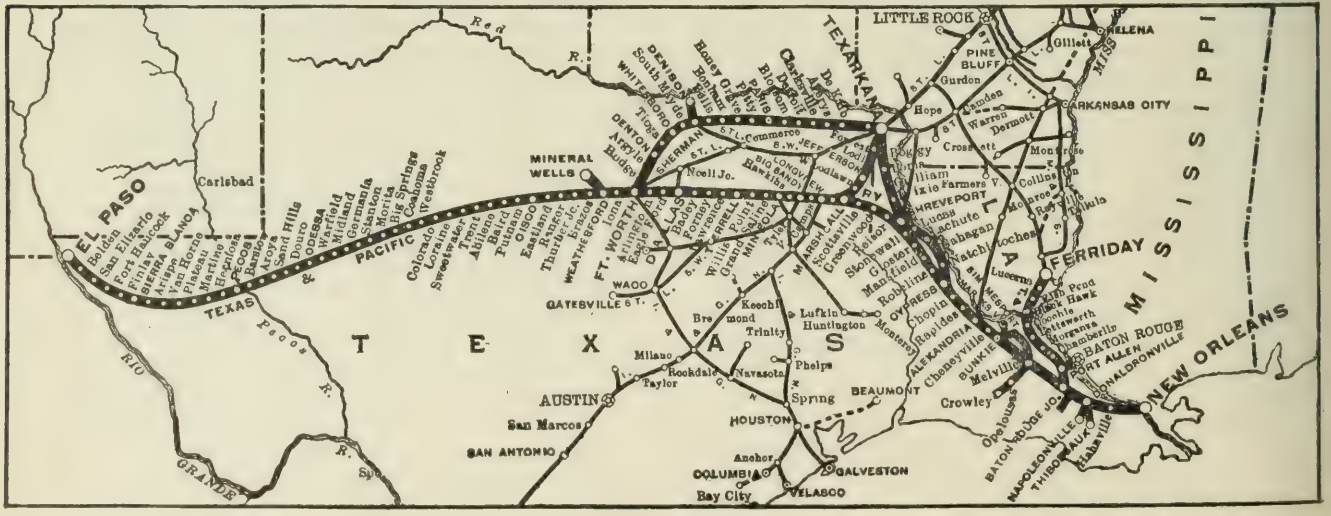
TEXAS & PACIFIC.

The Texas & Pacific is operated in three divisions—the Louisiana division, which is the main line from New Orleans, La., to Shreveport, the Eastern division from Shreveport to Fort Worth, Texas, and the Rio Grande division, from Fort Worth to El Paso, 620 miles. This mileage operated as the Rio Grande division, stretches across what was originally desert, yielding almost no local traffic. Exclusive of the mileage between Sierra Blanca, Tex., and El Paso, the company operates 1,792 miles, of which 1,371 miles is main line and 421 miles is branch line mileage.

In 1892 the Eastern division earned gross $3,000,000, the Louisiana division $2,300,000, and the Rio Grande division $1,700,000; in 1909 the Eastern division earned $5,200,000, the Louisiana division $4,500,000, and the Rio Grande division $5,250,000. It will be seen, therefore, that in 17 years the earnings of the Eastern division and the Louisiana division have not quite doubled, while the earnings from the Rio Grande division have increased between three and four times, and it is through the development of the country tributary to the Rio Grande division that the Texas & Pacific has the best chance to better its earnings in the future. It is estimated that the population of Texas is being increased by immigration at the rate of about 75,000 a year. The greater portion of these settlers are locating in the newer sections of the state—the Pan-Handle section, the middle west section and the extreme southern section, where farming is spreading into country hitherto used only for stock raising. This increase in population is especially rapid along the line of the Texas & Pacific between Abilene and Toyah. The growth is not confined to the country immediately along the line of the road, but extends to counties and towns 40 and 50 miles away from the railway.

The year 1909 was not a good one for agricultural products. The cotton crop was particularly poor and the movement of grain and other agricultural products was also comparatively light; nevertheless, the Texas & Pacific had gross earnings from freight amounting to $10,200,000 in 1909, as compared with $9,400,000 in 1908. Total earnings from transportation amounted to $14,960,000 in 1909, as against $13,900,000 in 1908 and $16,700,000 in the highly prosperous 1907 year. This good showing is due to the more prosperous general business conditions and to the development of Texas that is rapidly taking place. The increase in earnings from the Rio Grande division amounted to $645,000, or more than half the total increase in earnings, and the increase in net revenue on the Rio Grande division was $406,000, comparing with a total increase in net revenue for all three divisions of $424,000.

Freight statistics show that on the entire line 5,400,000 tons of freight were carried in 1909, an increase over 1908 of 490,000 tons. Of this total increase in freight tonnage, 382,000 tons came from local freight. Manufactures, merchandise, etc., made up 22 per cent. of the total tonnage carried in 1909 and furnished 1,200,000 tons of freight. This compares with about 1,000,000 tons furnished by manufactures and merchandise in 1908. Products of forests furnished 23 per cent. of the


LITTLE ROCK
HELENA
Gillett
PINE BLUFF
Gurdon
Hope
ARKANSAS CITY
Warren
Dermott
Monticello
Crossett
Collins
Tillula
SHREVEPORT
Lucas
Bethany
Mansfield
Robeline
Natchitoches
FERRIDAY
Lucerne
Pendleton
Hawk
Pollock
Winnfield
Pineville
Pitkin
Kinnebo
Kisatchie
Merryville
Chopin
Rodessa
Longstreet
Cotton Valley
Scottsville
Greenwood
Belcher
Gladewater
Hallsville
Marshall
Elysian Fields
Harleton
Waskom
Karnack
Jonesville
Logansport
Converse
Many
Zwolle
Noble
Florien
Leesville
Sugartown
Deridder
Longville
Singer
Lake Charles
Sulphur
Orange
Beaumont
Port Arthur
Sabine Pass
Crowley
Opelousas
Baton Rouge Jct.
Baton Rouge
Port Allen
Donaldsonville
Napoleonville
Thibodaux
Raceland
Houma
Morgan City
NEW ORLEANS
Algiers
Gretna
Westwego
Harvey
Avondale
Boutte
Hahnville
Destrehan
Norco
Kenner
Lafitte
Metairie
Jefferson
Carrollton
Audubon Park
Canal St.
Esplanade
Elmira
Lockport
Thibodaux
Houma
Morgan City
Berwick
Patterson
Franklin
Centerville
Jeanerette
New Iberia
Avery Island
Delcambre
Abbeville
Kaplan
Gueydan
Lake Arthur
Jennings
Welsh
Iowa

total tonnage in 1909 and 22 per cent. in 1908; products of mines furnished 26 per cent. in 1909 and 23 per cent. in 1908. Cotton furnished 140,000 tons of freight in 1909 and 210,000 tons in 1908. Thus, while the tonnage of cotton was only 2.6 per cent. of the total tonnage in 1909 and 4.2 per cent. in 1908, the revenue from the carriage of cotton was 5.86 per cent. of the total freight revenue in 1909 and 9.03 per cent. in 1908. Of the total 559,000 bales transported in 1909 Texas contributed 358,000 and Louisiana 201,000 bales. There has been a heavy decrease in the production of cotton in Louisiana due to the boll weevil, and the acreage of land planted with cotton has, in the past few years, been decreasing because of the fear of planters of this cotton pest. This decrease in cotton acreage in Louisiana, it is thought, will be largely compensated for by an increase in the acreage of sugar and cane. The bad cotton crop in Texas last year was due largely to the prolonged drought.

The average revenue trainload was 222 tons last year, comparing with 221 tons the year before. The average revenue per ton per mile was the same in 1909 as in 1908, namely, 1.03 cents. The average revenue per passenger per mile also remained the same in 1909 as in 1908 and amounted to 2.43 cents.

Transportation expenses amounted to a total of $10,900,000 in 1909 and to $10,300,000 in 1908. This comparatively slight increase in expenses in connection with the considerable increase in gross earnings reduced the operating ratio from 73.93 to 72.91. The Texas & Pacific is spending considerably more on maintenance of way and structures. In 1907 $1,700,000 was spent; in 1908 $1,800,000, and in 1909 $1,900,000. Transportation expenses in 1907 amounted to $7,000,000; in 1908 to $5,700,000, and in 1909 to $5,900,000. After the payment of taxes, interest on bonds, $360,000 to improvement account and $660,000 to equipment account, the company had a surplus for the year of $688,000. This compares with payments of $305,000 to improvement account, $601,000 to equipment account in 1908, in which year $863,664 was paid in dividends on the income bonds, so that the company showed a deficit of $598,650 for that year.

From a financial point of view, the chief difficulty that the Texas & Pacific has had has been the impracticability of funding or paying off a rather large floating debt. The balance sheet of December 31, 1909, shows bills payable of $5,660,000. This is less by about $200,000 than the bills payable at the end of 1908. Besides this payment on account of floating debt, the company has increased the stock of cash on hand from $297,000 in the treasury at the end of 1908 to $860,000 on hand at the end of 1909. A floating debt the size of that shown by the Texas & Pacific would be dangerous under ordinary circumstances, but the Texas & Pacific is under the particular protection, probably, of George Gould, its president, so that the Gould interests would be willing to lend the road what money it needs until such time as it can fund this debt. It is certain from the revenue account that the road is not paying an excessive interest on its debt. The total interest and discount, exclusive of interest on bonds, amounted last year to $324,000, and if all of this is interest on the floating debt, the company is only paying a little over 5½ per cent. for its money.

The outlook for next year is particularly good. Nearly all the forces that were at work in 1909 to better the earnings of the property are still active, and, in addition, there is a prospect of a very much better cotton crop, with consequent larger tonnage from this source and increased prosperity of cotton planters.

The frankness and completeness of the annual report of the Texas & Pacific is well worthy of imitation by other roads. There are few, if any, annual reports published that go into fuller details or give more frankly the figures that are essential to one who wishes to make a true estimate of the condition and earning power of the property. For instance, an unusual number of figures are reduced to a per mile basis, the age of various classes of equipment is given, and unit costs of transportation and maintenance are worked out. The following table shows the results of operation in 1909 compared with 1908.

	1909.	1908.
Mileage operated	1,885	1,885
Freight revenue	$10,220,148	$9,401,569
Passenger revenue	3,762,061	3,528,484
Total operating revenue	14,960,653	13,917,315
Maintenance of way	1,943,376	1,800,898
Maintenance of equipment	2,405,788	2,171,407
Traffic	215,793	190,207
Transportation	5,938,115	5,735,105
Total operating expenses	10,908,319	10,288,808
Taxes	535,576	558,429
Net operating income	3,516,758	3,070,078
Gross corporate income	3,573,993	3,197,896
Net corporate income	1,708,952	1,170,602
Improvement account	360,175	304,803
Equipment account	660,414	600,785
Dividend on income bonds	.....	863,664
Surplus	688,363	*598,650

*Deficit.

NEW BOOKS.

Designing and Detailing of Simple Steel Structures. By Clyde T. Morris, C.E., Professor of Structural Engineering, Ohio State University. The Engineering News Publishing Co., New York. Cloth; 6 in. x 9 in.; 201 pages; illustrated. Price, $2.25.

This book does not deal with stresses in structures, the assumption being made that the student is familiar with such work. It takes up the little things glossed over in nearly all books dealing with roof and bridge design, but which in practical works are brought most sharply to the attention of the young designer. The author could not have written such a thoroughly good work without considerable experience at the designing board. It is full of practical information, and a careful reading will enable a student soon to feel at home in a drafting office.

Tables and Diagrams for Obtaining the Resisting Moments of Eccentric Riveted Connections. By E. A. Rexford. The Engineering News Publishing Co., New York. Cloth; 8 in. x 10 in.; 32 pages. Price, $1.00.

Many partial failures of steel structural work occur through faulty design of riveted connections transmitting eccentric stresses. This is due primarily to one or both of two causes, namely: (1) to close adherence to office-developed standards, and (2) lack of time in which to investigate the matter fully. In this little book the author gives diagrams for graphical calculation to lessen the clerical work involved. The stress per rivet is plotted as an ordinate and that due to bending stress as an abscissa, the values in shear being plotted as curves with a common center. The distance from the origin of coordinates to the intersection of any ordinate and abscissa represents the resultant shear. There are 29 plates, each containing four diagrams, with a blank page for notes facing each plate. Directions for use are fully given, with examples.

Civil Engineering as Applied in Construction. By Leveson Francis Vernon-Harcourt. Second edition, revised by Henry Fidler. Published by Longmans. Green & Co., New York and London. Cloth; 6 in. x 9 in.; 625 pages, 368 figures in text. Price, $5.00.

This book is an encyclopedic compilation for the benfit of students. It is intended principally for British students. Part I, in 6 chapters, contains 81 pages dealing with materials, preliminary operations, foundations and roads. Part II, in 12 chapters, has 202 pages dealing with railway, tunnel and bridge engineering. Part III, in 7 chapters, fills 94 pages dealing with river and canal engineering and irrigation works. Part IV, in 5 chapters, has 60 pages, and deals with dock works and maritime engineering. Part V, in 4 chapters, and having 44 pages, deals with sanitary engineering. The index is full and complete. Nothing is attempted in the way of mathematical discussion, but in a few places simple explanations are given of mechanical principles involved, in order to render descriptions of certain work intelligible. Foot notes and references to original sources abound. References are made to American and foreign publications and society proceedings, giving the best examples of current civil engineering practice.

Letters to the Editor.

EFFICIENCY AND UNIONISM.

To the Editor of the Railway Age Gazette:

In your issue of May 6 you publish an article by Harrington Emerson under the title, "The Fundamental Principles of Efficiency," which should be read by every railway officer in America, with special reference to the exhibit of roads "A, B, C, D and E," of which Mr. Emerson claims definite knowledge. The perusal of the article is especially recommended to the various board of directors, also the gentlemen in Wall Street who are primarily responsible for labor conditions as they exist on American railways.

Mr. Emerson makes a masterly statement of a plain business matter. His point is that to bring about an improvement it is simply necessary to introduce business methods into a business proposition. It sounds simple—inaugurate some system, piece work or bonus, that will automatically give the workman increased compensation for increased efficiency. He is right; but, upon considering the matter carefully, it will strike the mechanical officer that in carrying out this apparently simple program he will encounter some difficulties, and to understand these difficulties it would be well to make a brief analysis of the causes leading up to the present-day condition of inefficiency.

Twenty years ago the shop mechanic knew his business and took pride in doing a job quickly and well. The new man who came into the shop had to be able to hold up his end among his fellows. If he proved to be a botch workman his associates made life so unpleasant that his stay was usually short. This condition has been exactly reversed. Unionism has developed and spread. The new man is now quickly informed what pace will be allowed, and if he exceeds this pace his "brothers" will make life too unpleasant to be endured. The ambition of the present-day mechanic, imbued with union principles, is to get all the money possible for as little work of as poor a quality as possible.

Labor organizations are strong, or at least are so considered, and they are pledged to secure the abolition of piecework of any other system that puts the workman in a position where he must stand on his own merits. Therefore to inaugurate any system that will bring about increased efficiency the railway which contemplates the innovation must first enter upon an expensive fight with organized labor—and here is where the operating officer strikes his snag. If he gets into trouble with organized labor he gets into trouble with the powers that be, for peace must be preserved at any price.

Mr. Emerson cites the case of a railway, name not given, which made a remarkable improvement during the years 1905 to 1909, inclusive, by establishing a system of rewards for individual efforts. It is not hard to guess what road is referred to. A complete statement of the case would include the information that conditions on this railway were extraordinarily bad prior to and during 1905, and that as a preliminary step toward establishing said system the road in question had cleared the way by elimination of labor organizations from the problem through a long and expensive strike.

Mr. Emerson believes that motive power east of the Rocky Mountains should be maintained for five cents per locomotive-mile, and I believe he is right. I have personal knowledge that in the fiscal year 1899 the cost of locomotive repairs on a mountain division of a certain transcontinental railway was a small fraction under five cents per locomotive-mile. For the fiscal year 1909 the cost was 14 cents per mile. Practically the same class of power was in service and it was kept in equally good condition during both years. In 1899 this railway had no labor schedules, nor did it recognize any labor organization. By 1909 the labor organizations practically controlled the shop output. In the meantime money had been spent practically without limit to improve conditions. Double track had been constructed at congested points, side tracks lengthened, grades reduced, water service improved, antiquated shops and tools replaced by modern facilities, all conditions tending toward cheaper and better service improved. During the ten years, pay of shop men had been increased and cost of material had risen, which would offset some of the improvements and account possibly for a fraction of the increase in expenses, but the major portion of the increase was due to unionism, and nothing else.

This particular railway has kept "peace" with labor organizations and is paying for it. Considering locomotive mileage, the increase in expenses would amount to, roughly, $250,000 per year—this for one item on one division. Now, take into account the general decrease in efficiency in all departments of the entire road and estimate to suit yourself the amount railways are paying for allowing labor organizations to set the pace.

In our daily papers and our magazines we are constantly receiving every conceivable sort of an explanation for increased cost of living—a deep question apparently and one upon which the writer has no opinion to advance. But he would respectfully submit this query: How much of the increased cost of the daily necessities of life is traceable to the general letting down in efficiency of our modern industrial machine due to the development of unionism during the last dozen years?

MASTER MECHANIC.

COMPARATIVE PAY OF TRAINMASTERS AND TRAINMEN.

To the Editor of the Railway Age Gazette:

I value your paper very highly, but unfortunately my salary makes it hard for me to meet my living expenses and keep up the life insurance necessary for the protection of my family. Therefore, I will pay my subscription by July 1, if you will wait. It is a curious fact that the salaries of most railway officers have not increased, as have the wages of members of organized labor. I believe most trainmasters, superintendents and assistants of like character work for less, if paid by "the piece," than do the enginemen and conductors working under them. Such is my case.

I often wonder whether or not it is policy to be educated and for one to try to improve one's self mentally when the men who are fortunate enough to be on lists as enginemen or conductors can draw more money than their boss.

———,
Trainmaster.

TON-MILE STATISTICS.

New York, May 13, 1910.

To the Editor of the Railway Age Gazette:

In reading the Reports on Statistics prepared for the International Railway Congress at Berne I have come across a reference to the report on statistics made by the committee appointed by the English Board of Trade. It is true that this report was published nearly a year ago, but I have not seen any comments on one of the minority findings, which is of especial interest to American railway men.

I find in this report that the majority of the committee gave a mild approval of statistics based on the ton-mile, while an active minority filed a vigorous dissent. The conclusions of this minority are in number twenty-three. The twenty-third reason for objecting to ton-mile statistics reads as follows:

"23. A large number of leading railway men in the United

States of America consider they are of no practical value."

This statement may, of course, be correct, but I must confess that in a somewhat large acquaintance of leading railway men in the United States of America I cannot remember having heard this adverse opinion expressed.

As the report has been printed in the *Bulletin* of the International Railway Congress it may be as well for the United States delegates to fortify themselves somewhat on this detail. The report does not show that any officers of purely American roads testified on this matter, but Mr. Hays, of the Grand Trunk, testified to the value of ton-mile statistics, and I think there is no doubt that almost all the railway men on this continent, both north and south of the Canadian line, agree with him. ARTHUR HALE.

[The twenty-third reason is an indefinite statement. The basis for it is not given in the committee's 438 pages of "Minutes of Evidence," but it is known that members of the committee obtained by correspondence the opinions of railway officers in the United States, and that they were nearly unanimous in the opinion that ton and passenger mile statistics are valuable. Nevertheless the minority, above referred to, did not intend to mislead anyone. Many officers assigned "practical value" solely to the daily inexact returns of tons hauled one mile, available as immediate lessons to the operating officers.—EDITOR.]

SPEED LIMITS OF MALLET COMPOUNDS.

Topeka, Kan., April 27, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Referring to the editorial on "The Speed Limits of Mallet Compound Locomotives" in your issue of April 1, I infer from it that there is considerable objection to the method of baffling steam in that type of engine. Soon after the Mallet passenger engine went into regular service in the mountains on our lines in California I made tests to get some preliminary data regarding its performance. It appeared to me, when first studying this engine, that there would be considerable frictional resistance in the steam passing from the high to the low pressure cylinders, but the indicator cards do not show that such is the case. The back pressure on the high pressure piston, as shown by indicator cards, is only 7 lbs. greater than the initial pressure, or pressure of admission of the low pressure cylinder; that is, the frictional resistance of the steam in its passage through the low pressure superheater, dry pipe connections and valves is only 7 lbs. In the Jacobs superheaters the baffling plates are used in order that there may be an impingment of the steam directly against the tubes in the superheater. An inspection of the detail construction shows that the passage way through the superheater is ample, so that little frictional resistance is offered by the superheater itself. The steam pipe connections are, I believe, too small. The larger reserve volume offered by the low pressure superheater is of great value in maintaining a good admission line to the low pressure cylinders.

In connection with the performance of the Mallet I notice also that a speed limit seems to be placed on this engine, and I am informed by Mr. Vauclain, superintendent of the Baldwin Locomotive Works, that our 1,300 class passenger Mallet engines were designed for a maximum speed of 36 miles per hour. These engines unfortunately, on account of changes in schedule, were placed in service in a territory where there are about 80 miles of 2.2 per cent. rolling grade and 60 miles of 0.6 per cent. to 1 per cent. grade. In order to make schedule time over this latter territory it is necessary that the engines make an average of 45 miles per hour, including stops. Very often during the tests the engines made 60 miles per hour and they have even made up time over that portion of the territory where the grades are light.

H. B. MCFARLAND,
Engineer of Tests, Atchison, Topeka & Santa Fe.

Contributed Papers.

EQUIPMENT DEPRECIATION AND REPLACEMENT.

BY WILLIAM MAHL,
Vice-President, Union Pacific and Southern Pacific Systems.

The writer has received a number of requests for a statement showing the "Per Cent. of Cost of Equipment Vacated to Total Original Cost" for each of the companies for which the average was published in statement No. 1 in a previous article. [*Railway Age Gazette*, March 4, 1910.] In response to these requests the accompanying statement is now submitted. As the "per cent." is the important unit the amount of money involved is omitted.

The large per cent. for the Nevada & California and the South Pacific Coast is caused by the disposal of their narrow gage equipment. Each of the companies disposed of its equipment as it was destroyed, worn out, or sold when its further use became unprofitable and dealt with it in its operating expenses as they did with any other detail of its transportation plant which required replacement in the course of the maintenance of the property.

It will be seen from the statement that the "per cents." differ widely as to years and as to companies for the same equipment. The complications which would result from the use of a fixed per cent. for renewal or depreciation and the adjustments which would constantly become necessary to bring the charges into accord with the actual facts and the actual expenditures are apparent.

The classifications of the Interstate Commerce Commission provide that there should be charged in respect to equipment condemned, destroyed, or sold:

To "operating expenses"—(*Renewals*) the original cost (estimated if not known), record value, or purchase price of all equipment condemned, destroyed, or sold, less (*a*) the amount previously charged (since July 1, 1907) for depreciation up to date of retirement and (*b*) scrap value of salvage or the amount received from sale of equipment retired; and to "Profit and Loss" the depreciation which had accrued prior to July 1, 1907, so that in effect the year's charges bear the entire cost of the equipment vacated less the salvage value.

Also another charge to "operating expenses"—(*Depreciation*) for a monthly charge representing depreciation on the cost of the equipment in service.

The Southern Pacific Company, in the absence of any facts about "Depreciation" (other than the replacement of equipment as it was vacated), thought it best to continue its past practice, and charge to the operating expenses, as "Renewals" only, the cost of all equipment vacated (less salvage value) had made no charge to "Depreciation" or to "Profit and Loss."

As an illustration of the practical working out of the two methods, the following statement prepared from information given in the published annual reports of the railways for the year ended June 30, 1909, may be of interest. The amounts charged to "Renewals" and to "Depreciation" of freight cars only have been selected, as a greater number of freight cars are annually vacated, destroyed, or condemned than of other equipment, and, therefore, the renewals may be assumed to be about the normal annual depreciation.

In the absence of more accurate information, the average number of cars in service during the year was assumed to be one-half of the aggregate number of cars on hand at the beginning and at the close of the year.

As the names of the companies are not essential for this illustration, numbers have been substituted for them. With the exception of companies Nos. 3, 7 and 8, the Profit and Loss accounts of the companies did not disclose any charges for "Depreciation" accruing prior to July 1, 1907, and, therefore, it was assumed that none were made.

Those familiar with the physical operation of a railway know that the efforts of the management are constantly directed towards the improvement of the physical character of the property and of its efficiency to the end that its service to the public may be still further increased thereby.

The staff to whom is committed the maintenance of its equipment is alert in adopting any design or device by which the durability and service of the equipment is augmented. It is a well known fact that, as locomotives, cars or other equipment are taken into the shops for repairs or renewals, details of construction which have proven themselves weak are replaced with details of greater strength either in design or by the substitution of material of greater durability. It is the exception when a locomotive, car or other equipment leaves the shops after a general overhauling that it has not been improved in design, durability and service.

In thus making repairs and renewals to its equipment, the management has fully discharged the obligation which rests upon it to keep unimpaired the capital account of the property entrusted to it by the owners and the obligation to the public in respect to the cost of operating its railway.

No 1.- Per Cent. of Original Cost of Equipment Vacated to Total Original Cost, Charged to Operating Expenses.

Companies.	Years in operation.	Locomotives- 1909.	1908.	1907.	Average.	Passenger train cars- 1909.	1908.	1907.	Average.	Freight train cars.- 1909.	1908.	1907.	Average.	Work equipment- 1909.	1908.	1907.	Average.
Central Pacific	40	2.70	0.60	0.86	1.38	1.26	1.07	1.72	1.35	4.59	7.07	4.79	5.47	2.28	0.86	1.08	1.41
Gal., Harrisb'g & San An	32	.34	...	...	.12	.17	.11	.16	.15	3.21	4.07	9.50	5.85	1.51	1.65	4.51	2.59
Houston, E. & W. Texas.	25	...	4.03	...	1.36	...	...	...	...	4.87	3.85	.92	3.16	...	8.94	5.71	4.39
Houston & Shreveport...	25	...*	...*	...*	...*	...*	...*	...*	...*	...	...	...	...	...*	...*	...*	...*
Houston & Tex. Central.	36	13.02	...	2.00	4.99	...	.20	3.24	1.18	9.24	7.50	2.33	6.21	3.89	.84	.24	4.95
Iberia & Vermilion.....	16	...*	...*	...*	...*	...*	...*	...*	...*	...	...	...	...	...*	...*	...*	...*
Louisiana Western	29	...	...	...	...	...	.05	...	.02	1.43	1.34	2.12	1.64	.39	7.07	4.52	3.64
Morgan's La. & Tex. Co..	43	...	...	...	...	...	.69	...	.23	.68	.91	3.35	1.63	.20	3.32	8.63	3.44
Nevada & California....	27	9.01	...	4.47	4.61	...	...	...	...	5.69	11.85	15.95	11.75	...	4.35	...	1.52
New Mexico & Arizona..	27	...*	...*	...*	...*	...*	...*	...*	...*	...*	...*	...*	...*	...	...	...	...
Oregon & California....	37	4.19	...	1.02	1.73	...	...	.33	.11	9.39	6.70	8.42	8.15	.57	1.11	2.97	1.57
Sonora Railway	26	6.82	...	12.14	6.64	...	...	...	...	7.49	6.19	3.20	5.52	1.23	...	...	.44
Southern Pacific	38	1.26	.47	1.48	1.07	2.41	2.28	2.50	2.39	3.44	3.98	3.70	3.70	1.16	.86	1.62	1.22
South Pacific Coast.....	29	6.44	41.56	31.99	29.94	.02	13.50	5.17	6.38	4.70	11.50	28.83	17.70	15.15	41.92	1.67	20.75
Texas & New Orleans...	33	...	...	...	...	.05	...	.17	.07	.95	1.09	2.78	1.63	1.37	1.92	6.37	3.23

*None owned.

No. 2.—*Average Charge Per Freight Train Car Owned, Per Year.*

Years ended June 30:	Charged to operating expenses— Renewals.	Depreciation.	Total.	Charged to profit and loss.
Southern Pacific Co., 1907.	$26.10	.....	$26.10	.....
" " " 1908.	23.39	.....	23.39	.....
" " " 1909.	19.05	.....	19.05	.....
No. 1, 1909.....	4.51	$18.38	22.89	.....
" 2, 1909.....	2.71	13.12	15.83	.....
" 3, 1909.....	.43	6.63	7.06	$7.58*
" 4, 1909.....	1.99	11.59	13.58	.....
" 5, 1909.....	1.93	9.50	11.43	.....
" 6, 1909.....	.06	19.70	19.76	.....
" 7, 1909.....	5.73	13.82	19.55	14.54*
" 8, 1909.....	1.92	2.66	4.58	*20.88†
" 9, 1909.....	24.56	.....	24.56	.....
" 10, 1909.....	1.09	13.94	15.03	.....
" 11, 1909.....	4.76	15.02	19.78	.....
" 12, 1909.....	7.44	17.69	25.13	.....
" 13, 1909.....	.35	24.18	24.56	.....

*The charges to Profit and Loss by these companies did not show separately the amounts charged for account of depreciation for locomotives, passenger train cars, freight train cars, and work equipment. The entire amount was therefore carried against freight train cars, which, of course, is not a proper unit, but it furnishes some information as to the amount taken up in the year's expenses for account of depreciation for all equipment.

† Includes depreciation and other charges.

In conclusion, the hope is again expressed that the Interstate Commerce Commission will amend its "Classification of Operating Expenses" by omitting altogether the provisions for "Depreciation" and amend the provisions for "Renewals" to read "This account includes the current cost for reproducing in kind, or in capacity, all equipment condemned, destroyed or sold, less scrap value of salvage or the amount received from sale."

With this change in the classification and the credit to "Equipment" for the cost of the equipment condemned, destroyed, sold or otherwise disposed of as now provided in the classification of the Interstate Commerce Commission for "Additions and Betterments," the commission, the owners of the property, and the public will have some reliable information of the relation between the cost of the equipment vacated and the amount taken up therefor in the Operating Expenses.

THE AIR BRAKE ASSOCIATION.

The seventeenth annual convention of the Air Brake Association was held at Indianapolis, Ind., commencing May 10. John R. Alexander (Pennsylvania Railroad) presided and 292 members attended. John F. McNamee, editor and manager of the *Brotherhood of Locomotive Firemen and Engineers' Magazine*, in addressing the meeting announced that this Brotherhood had recently established a correspondence school for the instruction of engineers and firemen.

The president in his address said that passenger car brakes are more efficient than those on locomotives and there is opportunity for further improvement in engine brake equipment. The brake companies are constantly making changes in their fixtures, and this might be regarded as objectionable, but it should be remembered that railway conditions are changing rapidly and it is necessary for the brake manufacturers to keep their equipment up to the most exacting requirements of railway practice. He added that the Air Brake Association should be careful to maintain its high standing among technical societies by deliberation and wisdom in its recommendations and in demanding carefully prepared papers of prime importance.

The secretary reported a membership of 1,137, including 217 new members; the treasurer's report showed a balance of cash on hand amounting to $2,117.

The first paper, "Tests to Determine the Effect of Low Temperature on Air Brake Hose and Coupling Gaskets," was prepared by W. T. Hatch (Canadian Pacific). [It appears elsewhere in this issue.] It was the general opinion of members that the quality of air brake hose is constantly depreciating because of the high price of rubber, and that some of it does not contain any rubber, but is made of substitutes. A. S. Williamson (University of Illinois) said the tests described in the paper were not made under pressure, nor did the materials receive repeated bending while subjected to low temperature; they were prepared to do that kind of testing at Urbana, as they had a refrigerating plant as a part of their laboratory equipment. The "non-freezing" hose now purchased by the Canadian Pacific costs 15 cents per piece more than the regular M. C. B. air brake hose. It was thought desirable to have some change made in the M. C. B. specification for brake hose which would secure this "non-freezing" quality.

A paper on "Air Pumps and Main Reservoir Capacity for Freight Service" was presented by P. L. Langan (Delaware, Lackawanna & Western), who described a number of tests which were made on that road to get reliable data as to the proper capacity of pumps and reservoirs for various conditions of service; as a result of these tests the author recommends the following air pump capacities:

Grade.	Pumps.	No. of cars loaded.	Mixed train.
1¼ per cent.	One 9½ in.	40	55
1½ "	" 9½ "	35	50
2 "	" 9½ "	30	40
1¼ "	Two 9½ "	65	75
1½ "	" 9½ "	55	65

Grade.	Pumps.	No. of cars loaded.	Mixed train.
2 "	" 9½ "	45	55
1¼ "	One 11 "	60	70
1½ "	" 11 "	50	60
2 "	" 11 "	40	50
1¼ "	Two 11 "	80	90
1½ "	" 11 "	70	80
2 "	" 11 "	55	65

To determine what is the necessary pump and main reservoir capacity it is necessary to consider the intensity of braking and the loss of air through leakage. The maximum intensity of braking is limited to 1¼-in. brake pipe for transmitting air with the relatively small differential that is permitted between the head and rear end pressures. The first series of tests were running tests with sixty 40-ton cars on an 80-ft. grade. Then standing tests were made on a 100-car train made up on two tracks so that the first and last cars were directly opposite. It was found that two 11-in. pumps would charge this 100-car train in 11 minutes; one 11-in. pump in 22 minutes, and one 9½-in. pump in 56 minutes. The best method of charging long trains when the engine is equipped with proper pump capacity is with the valve in running position; a higher pressure is obtained in a shorter time in the release position, but a uniform charge in the train should be sought and a few minutes should be sacrificed to get it. In regard to the capacity of main reservoirs: While on level road a relatively small pump capacity and large main reservoir volume could be used to advantage, on grade work increased main reservoir volume will not compensate for inadequate pump capacity. The pumps should be of sufficient size to handle the longest train without crowding them to the work, and while large main reservoir capacity can be dispensed with, sufficient pump capacity is indispensable. Mr. Langan said: "Having taken into consideration the varying conditions on different railways, I feel justified in recommending a uniform main reservoir capacity, and this should be for freight locomotives not less than 50,000 cu. in. nor greater than 65,000 cu. in., and the extensive tests recorded in the paper fully justify this recommendation." The fact was also brought out that large reservoirs will not make up for small pump capacity and the life of the air pump is longer when it is not overworked by too rapid action; also that main reservoirs may be too large for small pump capacity, as it requires too long to charge them to working pressure.

In the afternoon of May 10 a large number of the members went to the car yards near the Pan Handle shops, where some air brake instruction cars were on exhibition. These were from the Pennsylvania, the Hocking Valley, the Illinois Central, the Erie, the New York Central, Big Four and the Chesapeake & Ohio.

On Wednesday morning a report on "Air Pump Piping" was read by G. W. Kiehm (*Railway and Locomotive Engineering*), chairman of the committee. The report contained drawings showing the sizes of pipes, the location of lubricator and governor for single pumps, and for one pump on each side of the boiler or two pumps on one side; also a drawing of an engine exhaust nozzle with an annular opening and connection for the air pump exhaust, which has been tested and is recommended. The committee's conclusions and recommendations are as follows: (1) That the standard method of piping as shown on the drawings be adhered to. (2) That 1¼-in. steam pipe, 1¼-in. governor, 1¼-in. steam valve, be used when two pumps are applied to a locomotive, whether they are 9½-in. or 11-in. (3) There should be little back pressure on the pump and no undue resistance to the escape of exhaust steam. (4) The air pump exhaust nozzle illustrated in the report is recommended. (5) The practice of piping a pump exhaust into the cylinder saddle should be discontinued. (6) An exhaust pipe running along outside the engine stack can be used on freight engines, but is objectionable on passenger on account of the noise in stations. (7) The main exhaust should not be less than 2 in. in diameter when two 9½-in pumps are used. (8) A 2½-in. exhaust pipe for two 11-in. pumps. (9) There is no objection to the use of exhaust steam for train heating purposes if the steam is obtained by methods that will not interfere with the air pump exhaust. (10) Attention and emphasis is given to the importance of dispensing with elbows in exhaust pipes, using instead easy bends of as large a radius as possible.

A large part of the morning session was occupied with a discussion of the report on "Air Brake Instruction and Examination," and it was then carried over to the following day for further consideration. The report was read by H. A. Wahlert (Texas & Pacific), and its more important statements and recommendations are as follows: Most air brake instruction cars carry locomotive and car equipment for injectors, headlights, valve motion, bell ringers, heating apparatus, car lighting, etc., all of which occupy space, leaving less room for the installation of the air brake equipment. Instruction on these outside subjects diminishes the time for actual air brake work instruction, and for that reason cars carrying these equipments cannot give as thorough air brake instruction as they could if they were entirely free of such outside distractions. Enginemen and trainmen should be taken for instruction separately, and good results can be obtained by giving enginemen from five to six sessions, while the trainmen require only three to four sessions, these sessions being from two and a half to three hours' duration. An instructor may be taken from either shop or road service, if he is a well-posted air brake man, blessed with an amiable disposition, good commonsense and the ability to impart to others the knowledge in his possession in an agreeable, yet firm, manner.

The report contains special instructions for trainmen, machinists, car men and officials. It states that the schedule should provide that the car visit all important points on the road once a year and the men should be notified by bulletin of the approach of the car. Examinations should be made by road foremen when promoting firemen to engineers, but in other cases the instructor should attend to the examination. All enginemen and trainmen should be re-examined at periods not exceeding two years. The instructor should be allowed to leave his car for about two months each year and go on the road and find whether the men are carrying out the instructions received in the car; also in making tests, making repairs, riding with engineers in both passenger and freight service, and giving cab instruction. This would also prevent the instructor from becoming too technical and his mind would be kept broadened by his experience and contact with road conditions.

In the discussion of this report a considerable diversity of opinion was exhibited in regard to the methods and value of the instruction, the character of the examinations, and especially the methods of rating men as the result of examination on air brake fixtures and practice. The report suggests that the traveling engineers should examine firemen in air brake practice for promotion to engineers, but this was objected to by some engineers, who said the air brake instructor was the proper man to examine and rate all trainmen. Further discussion brought out the fact that the subject may be divided into, first, that part relating to the construction and mechanical features of the air brake equipment; and, second, that part relating to the operation of this equipment on the engine and cars; and that two ratings might be used, one as the result of the air brake instructor's examination in regard to the equipment, and the other the result of the traveling engineer's examination as to the operation of the air brake equipment on the engine.

For the special equipment in the instruction car, one member recommended the use of by-pass valves which would artificially create the various defects in the triple valves and their connections. On some lines the number of men requiring air brake instruction is so large that it is necessary to have school rooms at terminals and these rooms are fitted with equipment somewhat like that in the instruction car. These rooms

are always available where there are large numbers of men, while the instruction car is transient and not always at hand when required. It seems important that each railway system should adopt a standard air brake instruction book so that the examinations and ratings should be uniform over the whole line, and this is especially important for the examination of firemen and engineers.

The recommendation of the committee that car repairmen clean triples was not generally approved, as better practice would send triples to the air brake repair shop for cleaning. Objections were also made to machinists or shop men occupying positions as air brake instructors, as the instructor should be an engineer who is familiar with the regular operation of the brake on the locomotive in stopping trains.

W. P. Garabrant (Pennsylvania Railroad) made a progress report on "Brake Cylinder Connections and Brake Cylinder Leakage."

George Christenson (H. W. Johns-Manville Co.) read a paper on "Brake Cylinder Leakage," and described a new form of expander ring for the leather cylinder packing which his company is introducing and which, it is claimed, reduces brake cylinder leakage to a large extent. This new ring has a flat side which causes the leather to have a larger bearing against the cylinder wall. A short discussion followed on the bad effects of closed exhaust ports in retaining valves, often resulting in cracked and broken wheels. It was suggested that the inspection of these valves include a test of the ports by a short wire, to see if they are free and clean.

On Wednesday afternoon, W. V. Turner, chief engineer of the Westinghouse Air Brake Co., gave a lecture on "Brake Operation and Manipulation in General Freight Service," illustrated by numerous diagrams with the aid of the stereopticon. This was introduced by diagrams showing the results of tests made to determine the cylinder and retaining valve leakage on box cars received at the air brake works. They proved that on some cars the initial pressure of 45 to 50 lbs. in the cylinder leaks off 10 to 15 lbs. per minute or 5 lbs. in 30 seconds, and in others 20 to 30 lbs. per minute, while an occasional good packing would only leak 5 lbs. in 2 minutes. These tests also showed that most of the retaining valves leaked so badly that they were practically useless. A new retaining valve designed by T. L. Burton, of the Philadelphia & Reading, was described and recommended by Mr. Turner. This valve is attached directly to the triple, and is provided with a gauge connection so that the brake cylinder and retaining valve leakage can be tested, and made a part of regular inspection. This was regarded as a very important improvement in the method of testing freight brakes.

On Thursday morning the discussion on "Air Brake Instruction" was resumed, and the methods employed by the Westinghouse Air Brake Co., in its instruction and rating were commended as superior in some respects to those in other instruction cars. It was the general opinion that the instruction should extend to work on the road in operating trains. L. A. Ogden, an engineer from the Grand Rapids and Indiana, said the engineers felt that the greatest opportunity for improvement was in the proper maintenance of brakes on the cars and instruction should strongly be directed to that part of the work. Attention was called to the disparity in the amount of instruction given to shop apprentices and to that given to engine and trainmen. On the New York Central one air brake instructor has charge of the teaching of 9,000 men in the construction and operation of the air brake, while every shop has its apprentice school with a corps of instructors. A resolution was adopted to continue the committee for another year, but to eliminate from the next report methods of instruction and give special attention to examinations and ratings on air brake operation, and submit definite recommendations for this part of the work.

T. L. Burton (Central of New Jersey and Philadelphia & Reading) read an elaborate paper on "Stopping Passenger Trains by Emergency Brake Application." This paper makes up a pamphlet of 34 pages, dealing with the fundamental principles and formulae involved in the calculation of the energy of a moving train and the forces producing retardation, all leading up to the calculation of the brake power necessary to stop an engine and train of given weight from a certain speed in a given distance. The paper is illustrated with diagrams from which such information may be obtained directly and without laborious calculation. One of these curves shows at a glance the loss in the coefficient of retarding force resulting from increased weight of vehicle and increased brake shoe pressure. If the factor of retardation of the heavy cars which we have to-day is to be the same as it was with the lighter cars, it is evident that the efficiency of the brake cylinder and brake gear must be increased or the coefficient of brake shoe friction must be increased, or the brake power must be increased, so that the product of three factors will be the same as it was heretofore on the lighter equipment.

The particular question as to how best to make these increases is probably receiving more attention by motive power officials than has been given to any subject in connection with the passenger train brake, and while the problem is not yet solved, the opinion was expressed that no practical or economical means will be devised for increasing the brake gear and cylinder efficiency to fully compensate for the loss in the coefficient of brake shoe friction due to increased shoe pressure on extremely heavy cars. For such cars the only solution seems to be a higher coefficient of brake shoe friction or higher brake power, the latter of which means increased cylinder power. One air brake company has provided practical means for increasing the cylinder value as well as the brake cylinder efficiency for emergency application and has made some wonderful developments in that direction. It remains for the railways and brake shoe companies to increase the brake gear and brake shoe efficiency. As the coefficient of brake shoe friction varies with the pressure and temperature, considerable advantage is gained by increased shoe area, thus providing better means for radiating the heat generated by high pressure. Increasing the shoe area means the use of larger shoes or an increased number of M. C. B. Standard shoes. The former can be accomplished by using a flange shoe. Such shoes have been found objectionable when used on brakebeams having rigid heads, but this does not apply where the brake heads fit loosely on the beam so that the shoe can properly adjust itself to the tread of the wheels, thus preventing flange pinching. Flange shoes can also be used on the beamless type of truck. When flange shoes are used the efficiency of the brake is not only increased by larger shoe area, but also from the fact that part of the shoe pressure is acting at a greater distance from the axis of rotation than the point at which the rail pull is applied. To increase shoe area by increasing the number of shoes virtually means a clasp brake, that is, a shoe on each side of the wheel. Such shoes have been used on one large road for a number of years, and while, to some extent in disfavor, this was largely due to their being used on light cars. They could not have been an entire failure or they would have been replaced long before this. As the problem is to stop the car without regard to truck tilting, the clasp brake seems to recommend itself for heavier cars. A clasp brake is now being applied to 65 cars under construction for the Philadelphia & Reading, and it is estimated that this will so increase the brake efficiency that the cars can be stopped in the same distance that is now required for stopping cars 30 or 40 per cent. lighter, equipped with the single brake per wheel. Placing shoes on both sides of the wheels has merits in the way of reducing journal pressure, journal and brass movements, and this advantage increases with the weight of the car. The paper was discussed by W. B. Turner, J. P. Kelly, S. G. Dudley and William Owens, and a vote of thanks was given to Mr. Burton.

A paper on the "Cleaning of Cylinders and Triples" was

read by C. P. McGinnis (Minneapolis, St. Paul & Sault Ste Marie), which described at length the repair trains which are sent out in the spring for several months' work by the Great Northern, the Duluth and Iron Range and the Duluth, Missabe & Northern. These trains repair idle cars scattered along the road and 20 or 30 men are employed in cleaning cylinders and triples. They aim to clean all cylinders and triples which have not had attention in the previous six months and foreign cars are included in the work.

T. L. Langan discussed the subject of light and heavy application of brakes by the engineer's valve. He explained that this should be governed by the length of the train and should be as low as would be sufficient to move all triples in the train. By experiments with a dynamometer car it was found best, with mixed trains, to place not more than 10 light cars next to the engines; less shock is obtained by this method.

In the afternoon the members and their ladies met for a group photograph, after which the members assembled for an informal smoker, at which time the question of the proper method of applying the brakes with trains of various lengths, speed and weights, was further discussed.

The report of the committee on "Recommended Practice" was read by G. R. Parker. It covered minor changes in previous recommendations; also some additions, the most important of which covered the location of retaining valve piping and the test for retaining valves and their piping on repair tracks.

Mr. Burton proposed the election of Mrs. Parkins, wife of J. A. Parkins, air brake instructor, Atchison, Topeka & Santa Fe, as associate member of the association. Members stated that they had questioned Mrs. Parkins and found her knowledge of brakes such as to justify this action. She was elected by a unanimous vote.

The following officers were elected:

President—T. L. Burton, Central Railroad of New Jersey and Philadelphia and Reading.

First Vice-President—W. P. Huntley, Chespeake & Ohio.

Second Vice-President—H. A. Wahlert, Texas & Pacific.

Third Vice-President—W. J. Hatch, Canadian Pacific.

Secretary—F. M. Nellis, Westinghouse Air Brake Co.

Treasurer—Otto Best, Nashville, Chattanooga & St. Louis.

Executive Committee—S. H. Draper, Northern Pacific; J. A. Albers, New York Central Lines; J. T. Slattery, Denver & Rio Grande.

SPECIFICATIONS FOR AIR SIGNAL HOSE.

The Pennsylvania Railroad has just issued specifications, No. 55-A, for air signal hose, which supersede those issued on November 15, 1904, and reading as follows:

All air signal hose under these specifications is to be canvas wrapped hose not less than three-ply, and should be flexible without kinking easily. The rubber and cotton fabric should be the best of its kind made for the purpose, and no rubber substitute or short fiber cotton will be allowed.

Wrapped air signal hose is to consist of a three calendar inner tube 1⅛ in. inside diameter, straight its entire length and $\frac{3}{32}$-in. thick, surrounded by and well fastened to three plys of friction duck cut on the bias, each ply being separated by a distinct layer of rubber. Over this is to be a $\frac{1}{16}$-in. cover, and at each end a $\frac{1}{16}$-in. cap vulcanized on; not pasted or cemented fast. The cover and cap to be of the same material as the inner tube.

Air signal hose is to be furnished in 22-in. lengths and variations exceeding ¼-in. from this length will not be permitted. The rubber caps at each end are not to be less than $\frac{1}{16}$- or more than ⅛-in. thick. The inside diameter of the hose must not be less than 1⅛ in. nor more than $1\frac{3}{16}$ in., and the outside diameter must not exceed $1\frac{13}{16}$ in. The hose must be smooth and regular in size throughout its entire length.

Each length of hose must be branded with a badge plate of red or white rubber vulcanized fast to the cover, giving the following information:

The name or initials of the railway company for whom the hose is made; the nominal size of the hose as designated by its internal diameter; the month and year in which the hose is made; the name of the manufacturer and the serial number.

A set of letters and figures in tabular form to be used to show the date of application and removal. The lowest number on the badge plate giving the years in connection with the table must be the year in which the hose is made. The following four numbers representing the years, being those consecutively following that in which the hose was made.

The letters and figures in the badge plate must be $\frac{3}{16}$-in. high and $\frac{1}{32}$-in. high in relief, except the serial number, which must be ½-in. in height and $\frac{1}{32}$-in. in relief. [The general form of this badge plate is shown and conforms to M. C. B. Standard.—ED.]

Each lot of 200 or less must bear the manufacturer's serial number. This serial number, which should commence with 1 on the first of the year and continue consecutively until the end of the year, should not be duplicated, even though the hose bearing the original number be rejected. All hose which is made under these specifications for use on the roads included in the Pennsylvania Railroad Company, Lines East and West of Pittsburg, should bear this consecutive serial, and not a separate one for each road.

For each lot of 200 or less one extra piece is to be furnished for test. On the receipt of a shipment at the storehouse one hose will be selected from each lot, properly tagged and sent R. R. S. to Engineer of tests, Altoona, Pa. Shipments must not be used until the sample hose has successfully passed the following tests:

Three inches will be cut from any part of the sample hose to be used for the friction test and stretching test of the tube. The remainder of the hose will be subjected to a hydraulic bursting pressure of 400 lbs. per sq. in. for 10 minutes, which it must stand without failure. At a pressure of 100 lbs. per sq. in. the hose must not expand more than $\frac{3}{16}$ in. in diameter.

A section 1 in. long will be taken and the friction determined by the force and time to unwind the hose, the force being applied at right angles to the line of separation. With a weight of 25 lbs. suspended from the separated end, the separation must be uniform and regular and the average speed must not exceed 6 in. in 10 minutes.

A 1-in. section of the rubber tube will be cut at lapped or thickest part. Marks 2 in. apart will be placed on the test piece, which will then be stretched quickly until the marks are 8 in. apart and immediately released. The piece will then be re-marked as at first and must remain stretched for 10 minutes without breaking. It will then be released and the distance measured between the marks, 10 minutes after the release. In no case must the test piece show defective rubber or a permanent set of more than ¼ in. between the 2-in. marks last applied.

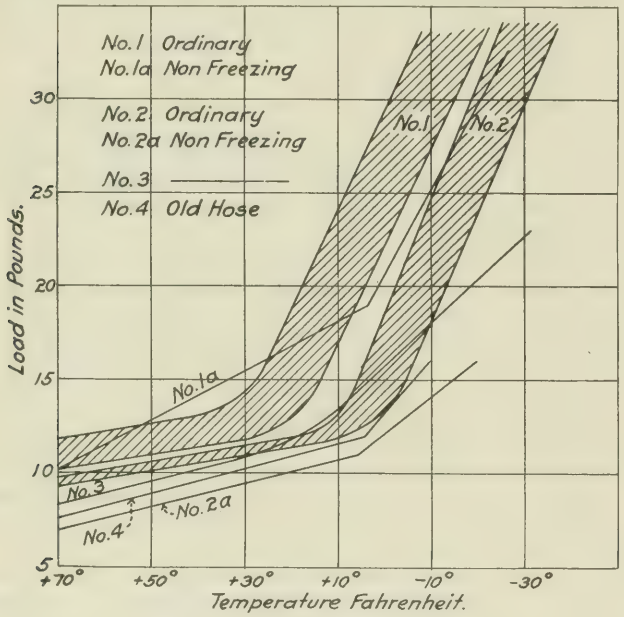
If the test hose fails to meet the required test, the lot from which they are taken may be rejected without further examination. If the test hose is satisfactory, the entire lot will be examined and those complying with the requirements herein set forth will be accepted. All rejected hose will be returned to the manufacturers, they paying freight charges both ways.

Samples representing rejected hose will be preserved at Altoona for one month from the date of test report. In case of dissatisfaction with the results of tests, manufacturers must make claim for a rehearing, should they desire to do so, within that time. Failure to raise a question within one month will be construed as evidence of satisfaction with the tests. The samples will then be scrapped and no claim for a rehearing will be considered.

TESTS TO DETERMINE THE EFFECT OF LOW TEMPERATURES ON AIR BRAKE HOSE AND COUPLING GASKETS.*

At the St. Paul convention, in a paper entitled "Brake Pipe Leakage; Its Causes and Preventions," the committee endeavored to show that air brake hose and gaskets contributed largely to brake pipe leakage, and a number of tests had been made to determine the possibility for and amount of moisture absorbed by hose.

The tests herein described have been conducted along the same lines, with one object in view, that of the elimination of the stiff or frozen pipe. This is a serious trouble with northern railways, so much so that trains are often shortened to enable the company to comply with the laws of the railway commission regarding the percentage of brakes to be operated in a train. When trains not exceeding 25 cars in length have to be shortened it is reducing the earning capacity of the locomotive. These tests were conducted to prove, to our satisfaction at least, that there was a decided difference in the effect of cold on the different makes of hose. We considered that could this point be clearly established, we could expect the manufacturers to supply hose at least as good as the best we might find in our experimental work.



Results of Hose Freezing Tests.

In measuring the flexibility of hose, one end was fastened to a specially built wooden form and the other drawn around into an arc subtending an angle of 90 deg. A spring balance was used to measure the amount of pressure exerted. This was thought to be the simplest way of measuring the flexibility of the complete hose, and while probably not as accurate as some would desire, it was very easily and accurately done and was at least of comparative value for our tests. If one grasps a piece of hose at the ends and bends it around until they are about 19 in. apart, the hose will have a parabolic shape. We used a government tested spring balance reading to 31 lbs. in ounces. This spring balance was not sufficiently strong for some of the hose at the temperature at which we worked. For temperatures down to 4 deg. Fahr. above zero, work was done in a cold storage plant, and for lower temperature we had a special freezing box, using fine ice and calcium chloride to produce the desired temperature.

After notifying the different manufacturers of the tests and requesting from them samples of what they considered would meet the requirements, each manufacturer furnished several pieces. The results of the tests are shown in the diagram. Figures are used to represent the different manufacturers.

Referring to the diagram, the upper shaded portion includes all tests on the ordinary hose supplied by manufacturer No. 1. This includes 12 pieces furnished our stores one month previous to the test. Running through this shaded portion is a single line marked No. 1a. It shows the results of the test on special non-freezing hose supplied by the same company. This hose is not much better than its ordinary hose.

The lower shaded portion shows the results of tests on 10 pieces of ordinary hose of the same age as above, furnished by manufacturer No. 2. It is uniformly better than that of No. 1 as regards withstanding lower temperatures. The lowest line of the curves is Marked No. 2a, and is the result of a test of this manufacturer's special non-freezing hose. This is the best piece yet tested as regards withstanding cold without loss of flexibility. The line marked No. 4 represents old hose removed from cars. Line No. 3 represents tests made on new hose from manufacturer No. 3.

This series of tests satisfied us that there was considerable difference in the stiffening effects of different temperatures upon different makes of hose. We recommend that manufacturer No. 2 furnish us with several hundred lengths of his non-freezing hose to be placed in service test, and that manufacturer No. 1 be notified that his hose is not satisfactory from a cold test standpoint. As all hose tested passed the M. C. B. tests, it was recommended that we include in our specification that all hose accepted must not require more than 15 lbs. pressure at zero to pull it through the curve or arc testing board.

A peculiar condition of the old hose was that six pieces, maintained at 4 deg. above zero for one day, tested at an average of 10 lbs. 10 oz., while the same hose after 30 days at that temperature required 20 lbs. 6 oz. to pull it through the same degree of arc. The same six pieces of hose were then immersed in water of about 80 deg. Fahr. for 12 hours, after which they were returned to the cold storage room for 24 hours at 8 deg. above, and they averaged 10 lbs. 10 oz.

This would indicate that the length of time that hose is kept at a low temperature affects the stiffness which develops, also that the addition of a few grains of moisture makes no apparent difference in the amount of stiffening. Five other pieces of old hose, soaked under the same conditions as the six lengths mentioned, averaged an increase of four grains of water only.

The results of these tests were that 3,000 non-freezing hose were purchased and placed in actual service and tested by aplying to an entire train the hose supplied by two different manufacturers. By putting one of each on each car of a train running from North Bay to Moose Jaw, a distance of 1,454 miles, with a temperature ranging from 24 deg. Fahr. above to 40 deg. Fahr. below zero, the hose seemed quite flexible at all times and could be coupled and uncoupled with ease. One other test was made over three divisions on the north shore of Lake Superior, with the rear half of the train equipped with special hose while the front half had the ordinary. The special hose gave equally good results while the ordinary hose could hardly be bent from its frozen shape. As yet the special hose has not been in service sufficiently long for any definite conclusions to be made regarding its length of life, although it is thought that there will be a noticeable increase. We feel so sure of this that the purchasing department has instructions that all future hose must be of the non-freezing kind.

As the hose gasket plays a very important part in the prevention of brake pipe leakage, tests similar to the hose tests were made and the attention of the rubber company was called to this as well. It was found that when many of the gaskets were subjected to anything like zero weather, they could not be bent without freezing. New specifications were made, and all test hose were equipped with the new gasket and the improvements were very noticeable. The new specifications follow.

*From a paper read by W. J. Hatch at the meeting of the Air-Brake Association, Indianapolis, Ind., May 10-13, 1910.

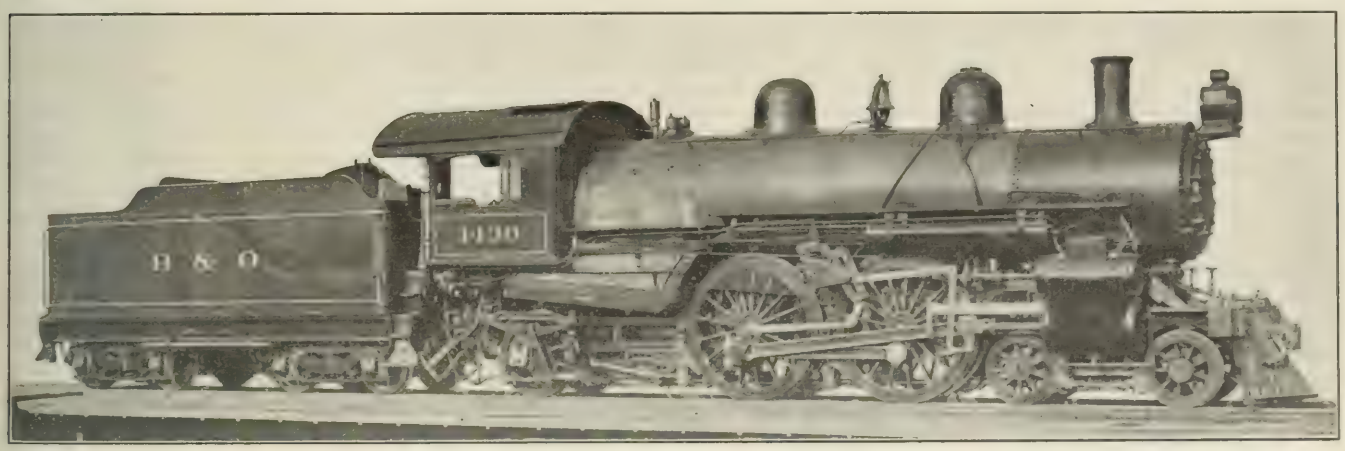
Rubber gaskets for air hose shall be purchased in lots of not less than 1,000 and shall be delivered to this company in boxes containing 1,000 each. There shall be printed, stamped or stenciled on the box the name of the manufacturer, the size and number of gaskets, and the month and year of manufacture.

On receipt of a shipment, 50 gaskets shall be selected at random and gaged without standard gasket gage. If any are found untrue to the gage, the box from which the samples were taken shall be returned to the manufacturer.

At a temperature of 70 deg. Fahr., the gasket shall be soft and pliable and shall return to its original shape after being pressed together between the thumb and first finger, and when cooled to a temperature of zero deg. Fahr., there shall be no appreciable difference in softness and pliability. If at zero deg. Fahr. there is any hardness in the gasket, it shall be considered unfit for our service, and if one-half of 1 per cent. of the test hose of any box shows a loss of softness and pliability, the entire box under test shall be returned to the manufacturer.

ATLANTIC TYPE LOCOMOTIVES FOR THE BALTIMORE & OHIO.

Owing to the exacting requirements of present day passenger service it has become necessary on many roads to introduce six-coupled locomotives for handling express traffic. The Pacific type is specially adapted for this class of work, since it combines high tractive effort at starting with ample boiler power. It is generally recognized, however, that for the fastest service a four-coupled engine is preferable because of its simplicity and reduced internal friction when compared with the six-coupled type. Even on railways having roadbed and bridges of the most substantial construction, it is, however, sometimes impossible to secure the required power in a four-coupled locomotive, and three pairs of drivers must then be employed.



Atlantic Type Locomotive; Baltimore & Ohio.

With this in mind the recent completion by the Baldwin Locomotive Works of twenty-six Atlantic type locomotives for the Baltimore & Ohio is of considerable interest. These are a straight-forward design of high-speed locomotive, in which special attention has been given to securing ample strength in structural details. The tractive force approaches that of many large six-coupled locomotives, thus fitting the engine for heavy as well as fast service. These engines are designated as class "A-3," and are similar in many respects to the class "A-2" locomotives which have been in service for some time. The principal changes, apart from a general revision of details, consist in the substitution of a radial stay boiler for one of the Belpaire type, and the use of piston valves with Walschaert gear, instead of slide valves with Stephenson gear.

The new engines exert a tractive effort of 27,400 lbs., and the weight on drivers is sufficient to enable this to be fully utilized under ordinary conditions. The boiler design is characterized by liberal flue spacing, giving room for free circulation, a large grate and a moderate amount of well disposed heating surface. A total of 206 sq. ft. of heating surface and 4.86 sq. ft. of grate area are provided for each cubic foot of cylinder volume. The effective arrangement of the heating surface and the relatively large grate area should insure free steaming under exacting service conditions.

Among the details of the new locomotives, attention may be called to the frames, which are of forged iron, 5 in. in width throughout. Each frame is forged in one piece with the exception of the double front rails. The transverse bracing is exceptionally strong and includes broad steel castings placed above the front and main driving pedestals, and a specially designed brace, also of cast steel, which is placed midway between the driving axles and is bolted to both upper and lower frame rails. The method of supporting the boiler barrel on the frames is of interest. The transverse brace over the main driving pedestal has double waist sheets bolted to it at the front and back, and these waist sheets are, in turn, bolted to T-irons riveted to the underside of the boiler shell. A similar pair of waist sheets is placed at the back of the brace over the front driving pedestals. A single sheet is used to brace the guide bearer and the boiler shell.

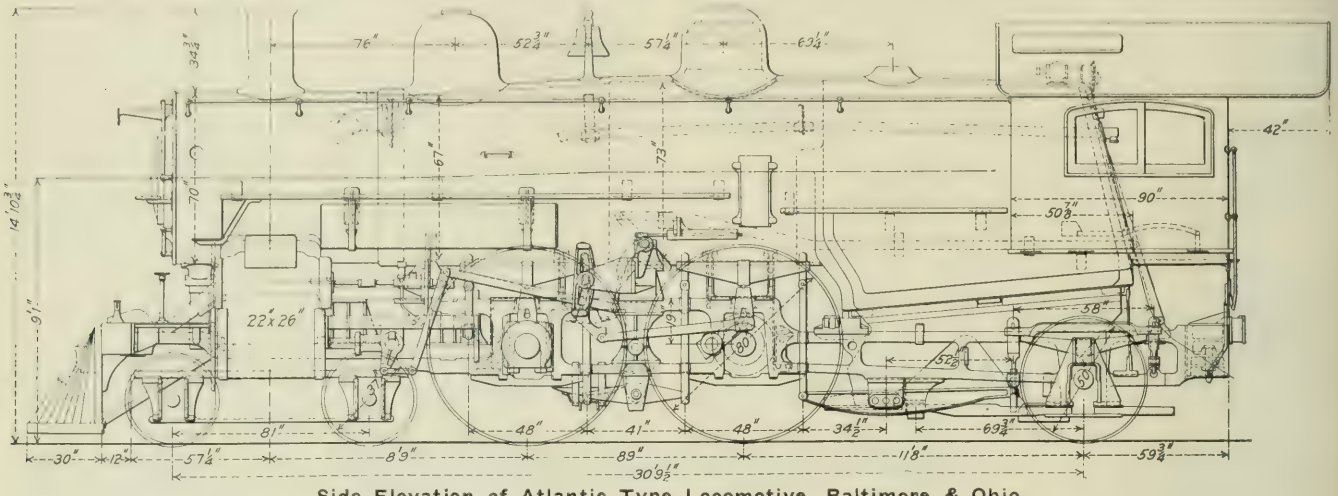
The front truck has a cast steel saddle and a cast steel bolster hung on three point suspension links. The back truck is of the Hodges type, with outside journals, and is placed under the rear end of the firebox, 11 ft. 8 in. back of the main drivers. The side swing is taken by the spring hangers and is sufficient to enable the locomotive to traverse 14 deg. curves.

Each cylinder is cast in one piece with its half saddle, and is lined with a ¾-in. bushing. The steam distribution is controlled by outside admission piston valves, 14 in. in diameter. These are set with a maximum travel of 6 in. and a lead of $\frac{5}{16}$ in.; the steam lap is 1 in. and the exhaust lap zero. The valve gear is simple in design, and is arranged with all its parts in practically one plane. The link bearings are bolted to a steel casting, which spans the frames between the drivers and supports the reverse shaft bearings also. The guides are a modification of the Laird type. They are of cast iron, enclosed at the sides, and are made in halves. The crossheads are of cast steel, with brass wearing surfaces. They are very light and have ample bearings on the guides. The rods are of I-section, the main rod having a forked end at the back, while the side rods have solid ends.

The boiler is of the extended wagon-top type, with two rings in the barrel. The first ring is tapered and has an outside diameter of 67 in. at the front end. The diameter of the dome ring is 73 in. The tubes are spaced 3 in. between

centers, and are kept well clear of the shell. The mud ring has a width of 4½ in. all around, and the water legs are widened towards the top. Flexible staybolts are freely used, especially in the throat, the total number employed being 428. The two injectors and their check are placed on the back head and the feed is delivered near the front end of the barrel by means of an internal pipe. The firedoor opening is formed by flanging both sheets outward. A sleeve is riveted to the inside flange, and a ring is interposed between this sleeve and the outside flange.

The tender frame is constructed of 13-in. steel channels, with wood bumpers. The trucks are of the equalized pedestal type and have cast steel bolsters and solid rolled steel wheels, with rims 2½ in. thick. The tank is rectangular in cross section and is equipped with a water scoop operated by compressed air.



Side Elevation of Atlantic Type Locomotive, Baltimore & Ohio.

The principal dimensions and ratios are as follows:

Ratios.

Weight on drivers ÷ tractive effort	4.23
Total weight ÷ tractive effort	6.93
Tractive effort × diameter drivers ÷ heating surface	932
Total heating surface ÷ grate area	42.3
Firebox heating surface ÷ total heating surface	7.14 per cent.
Weight on drivers ÷ total heating surface	49.3
Total weight ÷ total heating surface	80.8
Volume of cylinders	11.4
Total heating surface ÷ volume cylinders	206
Grate area ÷ volume cylinders	4.86

General Data.

Gage	4 ft. 8½ in.
Service	Passenger
Fuel	Bituminous coal
Tractive effort	27,400 lbs.
Weight in working order (est.)	190,000 "
" on driving wheels (est.)	116,000 "
" on front truck (est.)	39,000 "
" on rear truck (est.)	35,000 "
" of engine and tender (est.)	344,000 "
Wheel base driving	7 ft. 5 in.
" " total	30 " 9½ "
" " engine and tender	59 " 9½ "

Cylinders and Valves.

Type	Simple
Diameter and stroke	22 by 26 in.
Valves	Balanced piston

Wheels and Journals.

Driving, diameter	80 in.
" thickness of tires	4 "
" journals	10 x 13 "
Truck, front, diameter	37 "
" front, journals	6½ x 12 "
" rear, diameter	50 "
" rear, journals	8 x 14 "

Boiler.

Type	Wagon top
Working pressure	205 lbs.
Outside diameter, first ring	67 in.
Thickness of sheets	½-in.
Firebox, length and width	109 x 72 in.
" depth, front and back	70 and 57 "
" sheets	S. and B., 5/16-in.; C., ⅜-in.; T., ½-in.
" water space	4½ in.
Tubes, number and diameter	247, 2¼ in.
Tubes, length	15 ft. 1 in.
Heating surface, firebox	168 sq. ft.
" " tubes	2,182 "
" " total	2,350 "
Grate area	55.5 "

Tender.

Wheels, diameter	36 in.
Journals, size	6 x 10 "
Water capacity	7,000 gals.
Fuel capacity	15 tons

REASONABLE FREIGHT RATES.

BY F. H. PLAISTED,
Assistant General Freight Agent, Oregon Short Line.

II.

THE PRODUCER OF FIRST IMPORTANCE.

Railway traffic men, whether or not they have stopped to define their feelings have ever appreciated the predominant interest of the producer and the consumer in the price at which transportation is sold. This interest has been their first care, and while they have sometimes gone far in equalizing conditions for one jobber or jobbing point as against another, they have always considered that the channel through which the articles a community must buy and import shall flow is of minor importance to such community compared with the constant and profitable employment of its productive energies. As a producer the citizen wants to be busy and to make a profit from his business. As a consumer he looks only at the price he pays and it concerns him little to whom or through whom he pays it. The same citizen who is the producer is also the consumer, for whoever consumes must first produce. If he is a prosperous producer he is an able consumer, and to serve the citizen in his first capacity is to serve him in all capacities. The same railway policy which equalizes the producer at one end of the line, by enabling him to sell in all possible markets, acting from the opposite direction equalizes the consumer at the other end of the line, by enabling him in buying to choose from the largest number of markets, and these primary necessities of the public having been met, the question of through what particular channels distribution shall occur sinks in comparison to secondary importance. Distribution and its profits concern many, but production and its profits concerns all, even the distributer, for he must have prosperous producers for customers.

The despatches of October 4, 1909, quote Commissioner Prouty as saying during the course of the second Spokane Rate Hearing:

> "I do not think the Commission will give much weight to the effect this decision (on Spokane rates) will have on jobbing territory. It does not matter a great deal to the people of Spokane whether they purchase their goods through Spokane jobbers or through jobbers from other points, but it does concern them very much whether they are compelled to pay more for those commodities on account of the rates charged, etc."

To this might be added only that it concerns them still more whether the rate adjustment established by the railways tends to keep their productive energies profitably employed. If it does, and considering their rates there, inbound and outbound together, the general adjustment is fair and reasonable and both community and carriers are prospering, it is hard to see what good ground there should be for complaint. In point of fact in these complaints from the jobbers or which are

fomented by the jobbers' associations, criticism is generally based on comparisons rather than on the rates themselves, the lowest basis carried by the railway anywhere, whether under different conditions or not, being selected as a measure for all its tariffs. It is our opinion that when the jobber lives by the rule of using his thinnest profit as the maximum for all his profits it will be time enough for him to endeavor to enforce that rule for others.

THE LIMITS OF A REASONABLE RATE.

There are, then, two boundary lines between which the price of transportation must be fixed, and being so it will be just and fair to all concerned. First—It must not be higher than the producer can afford to pay, or he will be unable to ship at all. Second—It must not be lower than the cost of service, or the carrier will be unable to make the rate at all. Between these if it be somewhere below entire cost, yet somewhat above additional cost of doing additional business—if the conditions require that—it will be an abnormal, but still a reasonable rate. Or it may, if its value to the shipper be sufficiently great, exceed the entire cost, and then it will be a normal and still a reasonable rate, working injustice to no one, and this although it may be higher than the rate for another commodity or for the same commodity under other circumstances. The value of the service to the producer, in other words, is the only reliable measure for the reasonable rate; the only measure fair and equitable to all and resulting in the greatest good to the greatest number.

It frequently happens, against our advice when we are sufficiently informed as to the conditions in advance, that industrial enterprises are mislocated, where, despite anything we can do they are foredoomed to failure, and then generally the railway is blamed for it, although no rates it could possibly have made would have saved the day. When the value of the service to the producer falls below even the additional cost to the railway, then, manifestly, there is no help for it. The business cannot go on. The lengths to which railway men have sometimes gone in the effort to save these unfortunate situations have resulted in the establishment of rates whose promise of return of even the additional cost of doing the business was dubious, besides which these tariffs have been eagerly seized upon for comparisons through which to force reduction in railway revenues elsewhere.

What, in reason, is it necessary for us to do to demonstrate to the people the fact that when an extension of business is undertaken at barely the additional cost, or slightly above that, of performing the additional service, it does not follow, for a carrier any more than for any other concern, that all its revenues may be struck down to that level? Prices so based are expected to yield a small profit which may be applied toward general expenses and so aid to that extent the ability to grant concessions elsewhere, but they produce less than the entire average cost of doing business and to duplicate them on all the business done would mean bankruptcy to a railway just as selling all commodities at a 5 per cent. profit because sugar is sold at a 5 per cent. profit, would mean bankruptcy to a grocer. Surely the people can see that, if they will take the time to look deeply enough into the subject.

AGAIN—WHAT IS A REASONABLE FREIGHT RATE?

A reasonable freight rate for the movement of a product is one which furnishes that unit of transportation at a price the carrier can afford to make and the producer can afford to pay. The value of the service is its measure in one direction, and the cost of performing the service in the other direction. While, with minor variations according to bulk, weight, volume and insurance of the commodity handled, one unit of the railway's commodity is just like another, its value to the producer may be large in one instance and small in another. In one case its price may fairly be based with reference to entire cost of conducting the enterprise; in another case it must be based with reference only to additional cost of doing additional business or it will not be sold at all, depriving the carrier of so much profit which it must then earn on other business or go without, as well as depriving the producer of the outlet sought. Were all rates adjusted with reference only to the higher basis much business could not be done at all. Industrial stagnation would ensue. Were all rates adjusted with reference only to the lower basis the carriers must be bankrupted.

ELASTIC CONDITIONS A NECESSITY.

It would seem that even a superficial survey of the industrial situation throughout the American continent should demonstrate that, as production could have reached its present high state of prosperity, efficiency and wide diffusion only under the most elastic transportation conditions ever established, so if this desirable state of things is to continue the quality of elasticity in our transportation system must not be impaired.

The great commercial nations of history have been those possessing the coast line, the harbors and the ships, and hence the most untrammeled commerce. The sea captains were never required to measure all tne charges by their lowest charge. They carried some goods cheaply and charged higher rates for others, or higher rates under some conditions than for the same goods under other conditions. They carried some tonnage free or even paid for it as ballast in one direction in order to secure a profitable cargo returning, and no one talked to them about each commodity paying its "just share," etc. They were often merchants as well as carriers, or they were the partners of merchants, as, in the absence of the matter, the carriers of to-day are the partners of merchants and producers. There being no "'right of eminent domain" for the orators to seize upon as a reason why their business should be set apart under rules different from those under which all other business was done, they went along carrying the products of the country whose flag they flew to the markets of all the world at rates enabling them to enter those markets, and returning laden with the products of all the countries of the earth to lay them in the lap of the consumer back there at home. In short, they provided for the country whose flag they bore that freedom of movement which insured the unrestricted action of its productive forces resulting in its power and greatness. Is there no lesson for us in this? What the sea captains have done for the maritime nations of history the railway captains have done for this great continental nation of to-day, and will continue to do unless, run regulation mad, our people insist upon the enforcement of rules which will render them powerless. Without the railway the great interior would still be a desert. Without the railway policy of providing that elasticity in charges tending to equalize producing conditions throughout the continent it must have remained very much the same.

The word "discrimination," as flippantly used by the railway critic, appears to have undergone a change of meaning in our language, at least in our railway language. To be discriminating once meant to be judicious, discerning, discreet. To-day there are those who seem to assume that any discrimination is unlawful discrimination. How can it be so? On what authority or on what reason is that assumption based? The law prohibits undue preference and unreasonable discrimination, but there is discrimination which is not only not unlawful, but is absolutely essential if productive conditions are not to stagnate, yet some advocates to-day seem bent on eliminating all discrimination, all judgment, all "horse sense" from the railway business. A transportation system with these elements absent will be a transportation system lacking all elasticity—the very vitalizing quality which has made our great country what it is. Is it not possible to strike the happy medium in regulating, and while eliminating unlawfulness, such as the rebate and preference which is not based on uncontrollable facts, yet to retain that elastic, quickly adaptable, fluid quality of our rate adjustment, which is a prime necessity if productive activity is not to be choked and congested, as it

certainly will be if the day ever arrives when the entire fabric of railway prices must be revised on some uniform "Cost of Service" plan?

"ENTIRE COST" WIDELY DIFFERENT FROM "ADDITIONAL COST."

The three elements composing the thousands of transactions between men going forward every day are: First—The cost of producing the thing; second, the cost of transporting it from producer to consumer, and, third, the price realized for it at destination.

Of these the second (transportation), being far the most flexible, expanding or contracting as conditions have required, has supplied the community where production failed, relieved the community where surplus production occurred, found widening markets for the producer and choice of markets for the consumer, fetched and carried between the manufacturer in the older and the producer of raw material in the younger states, annihilating distance, equalizing the flow of the country's commerce, binding together widely separated sections and welding into a nation what must otherwise have remained, commercially, if not politically, a mere group of provinces. That it is most natural and desirable that it should be so; that it has been and will be so, unless, under the spur of amateurish criticism, our public authorities destroy its elastic quality, and that if prosperity and diffused productive effort are to continue, this must not happen, it would seem should be apparent on the most cursory examination.

The cost of making the thing and the price that may be realized for it are always more or less fixed. Markets fluctuate, but averages do not ordinarily vary through an extended range, or when they do, cost price and price realized tend to vary together. True additional cost as differing from entire cost is a factor in the matter, the same as with a railway, but not to the same extent, for it must be borne in mind that of all the world's producers a railway company has the largest surplus product constantly for sale; the largest surplus and the most quickly perishable, for it must be disposed of each day or so much of it is gone forever. For this reason the difference between entire cost and additional cost in railway operations is more consequential. The original cost of the plant, as well as its upkeep, is enormous, and the resulting burden of fixed charges and charges which are almost fixed correspondingly heavy; but, given the plant and the equipment, maintained as it must be maintained if any business is to be done, and it follows from those very conditions that extension of business may be undertaken, when necessary, on an additional cost basis more disproportionate to entire cost than would be possible for any other producing concern. For this reason it is that transportation "sold close," when the dependent producer's necessities have required that, on the abnormal or additional cost basis, has fixed the attention of observers, and by its sometimes startling deviation from the normal rate, has aroused in the minds of those who are not familiar with these principles, first the suspicion and afterward the conviction that the normal rate is wrong, whence arises the demand that the normal rates shall be reduced everywhere to the abnormal basis.

Will the public authorities be hurried by this uninformed clamor into a course, which, on the one hand, if it results in fixing all rates at the abnormal level or an approximation thereof, will cripple or destroy the transportation business, or, on the other hand, if it results in fixing all rates at the normal level, or even at the average between normal and abnormal, for the reason that at such rates much business cannot move, will stifle commerce and industry; or will they require time for that careful investigation which will separate the problem into its elements, until what is material and what is immaterial, what is true and what is false and what is best and fairest for patron and carrier alike shall be made to appear?

The very attempt to "fix," be the fixing above or below a fair average rate, involves its dangers, for of all elements in our commercial life, conditions under which transportation occurs are the very ones which cannot be fixed and which it is more or less dangerous to try to fix at all. In aiming at a desirable stability it will not do to attain a disastrous rigidity, and if our public authorities rise to the measure of their opportunities they will perceive in time that the great duty resting upon them is to find a way to curb the undesirable tendencies of this giant without crippling his ability to perform the work of the giant that he is. The people and the people's representatives are strong enough to bind his arms and chain his legs and throttle him, body and brain, if they will, but wise people and wise representatives of the people, in the exercise of their wisdom, will find a way to curb and not destroy him or his power for good.

TRANSPORTATION IS THE SPRING ON WHICH COMMERCE RIDES.

Inland commerce was originally conducted almost wholly on the rivers, lakes and canals, and we still speak aptly of the "channels" of commerce. The canal, once dug, and the water turned through the sluices, would float a thousand boats as easily as one. *Additional cost* meant only the cost of operating the additional boat, and the difference between operating a boat half laden or operating it full laden was almost negligible. It is much the same with the railway, and from that basic fact of the wide difference between entire cost and additional cost in railway operations better appreciated and utilized by American than by European railway managers, has resulted the American Railroad Policy, sharply different from the European "zone" plan, which has constituted American transportation the spring which prevents American Production and commerce from riding on a "dead axle," and so permits it to ride farther and faster and with greater ease than any other continental commerce in the world. In the reduction of friction is found the source of its efficiency. Is the spring to be broken or thrown away? Whenever it vibrates under the jolt of the producer's necessity in passing a bad place in the road is it to be held to the most depressed position it assumes under the strain, until it will be no spring at all, or will the people be wiser and still ride easily as they have done? More easily, perhaps, than they will ever realize until they have tried the road in Mr. Regulator's rigid vehicle or some form of cost of service plan.

The fathers wisely forbade in the constitution the imposition of tariffs between the States, preferring to leave internal commerce so far as might be unfettered, that thereby this country might become in fact, as well as in name, industrially as well as politically, the United States of America. Will the sons now impose transportation conditions so inflexible as to prove more effective than any state tariff could be in preventing uninterrupted exchange of product for product between American communities? It is unbelievable, yet the country is filled with rate fixers who propose "zone" systems or other hard and fast schemes which commend themselves so readily to him who perceives the evils and imperfections, but overlooks the benefits of the transportation policy under which American progress has outstripped the world.

IS THE PACIFIC COAST PREFERRED IN RATE MAKING?

It is often alleged in our intermountain country here that the coast is being favored by the railways. Is it? The coast possesses its advantages. The ocean is there and the ships are there. But has not the interior compensating advantages which furnish the reasons why some men live there and all do not live on the coast? There are mountains of ore there, and beds of coal, and fertile, productive valleys and plains, and ranges for the flocks and herds, and forests of timber and the thousand and one rich natural resources which have attracted men, but which would have remained practically untouched but for the coming of the railway and with it the railway policy of opening the way for the movement of the vast tonnage produced there to its distant markets? Are the people of the interior generally making less money than the people on the coast? If so, it is a wonder we have any in-

terior population, or that we ever got one in the first place. But we don't believe it is true, for we have been told and the Interstate Commission has been told, more or less tearfully, by the sea dwellers, particularly the jobbing sea dwellers, that the natural advantage of their location is being nullified by the disposition of the railways to favor the interior. What are we, then, to believe, in view of these conflicting complaints? This, if you please, that neither story is altogether so and that those who have had so much to say on the subject, while they have been at pains to search our tariffs and point out any disadvantages they could discover, particularly from the jobbing standpoint, have been equally careful not to mention their respective advantages.

It is our desire to be fair and just to all and to charge no more than the reasonable freight rate to any, the question being what is to determine the reasonable rate. By the jobbers' measure it seems frequently to be a rate that will let him into the territory and keep his competitor out of it; or when he talks of "an even break" he means an even break on the last commodity and to the last station in what he calls his natural zone, the views of competing jobbers as to what their natural zones are being never very harmonious. Although on 90 per cent. or upwards of the commodities dealt in at some point in disputed territory, the freight adjustment may favor the jobber, he will remain silent as to these, while bitterly complaining of his disadvantage on the other 10 per cent. Although at 90 per cent. or over of the points within the lines of what even he is pleased to designate as demarking his "naturally tributary" territory, the freight adjustment favors him, he will omit mention of these, while harping on his troubles at the other 10 per cent. of points. We are unable always to accept the jobbers' idea of what is a reasonable adjustment, even if different jobbers' notions about it ever coincided, which they do not and never will.

Freight rates must be reasonable, but they cannot be made with a tape line; rather their reasonableness is to be tested in the light of their primary purpose of transporting from him who makes to him who consumes. If they well serve that purpose, then they are not to be made the football of contending middlemen, demand "equalization" (which always means *reduction* to the lowest basis discoverable) from public authorities until there will be so little left to equalize that the power of the carrier to perform its elemental function of carrying from him who makes to him who uses will have been seriously impaired. Realizing that our tariffs are never perfect, we constantly readjust them to the changing conditions, but we cannot undertake to equalize the distribution of every commodity from every point of production, through every jobbing center to every point of consumption in the territory in dispute. We find ourselves entirely unable to keep pace with the demands of rival jobbers in overlapping territory in this respect and feel that we must generally content ourselves with making the rate reasonable from the producer's standpoint, basing it on the value of the service to him and leaving jobbing points and distributive channels for the several commodities to arrange themselves to some extent by natural selection and jobbers to equalize the transportation element in their business somewhat as they equalize other elements, offsetting some of the disadvantages they tell us about by utilizing some of the advantages they don't tell us about.

The persistence with which complaints are pressed by the jobbing faction in the community leaves little room for doubt of the conscientious belief of the complainants that they have real grievances; still, despite the many alleged abuses, there is not a city on the map from which these complaints emanate which is not in a flourishing condition, and we have yet to find the jobber who is not flourishing with the rest of the community. Will the jobber be fair and frank enough to look deeply into this question with us and try to discover whether after all the comparisons on which he has relied are based entirely in reason and on sound economic principles? Will he examine with us closely and in detail into this problem to determine whether it is not possible, granting that our adjustments always lack much of perfection, to work out the solution step by step, rather than to hurry to some cure which may be worse than the disease?

Some able railway officer has said (in the "Traffic Bulletin" of October 9, 1909) that "the existing rates are in theory very wrong, but in practice have made the country very rich." Mr. S. O. Dunn, of the *Railway Age Gazette*, in his able article on "The Protective Tariff and Railroad Regulation," has pointed out that while it is frequently shown why the government can deal differently with the common carrier than with others, the reason is not apparent why it should do so. And we insist that when salesmen in other lines of business base their own prices on value, yet contend that the price of the carrier's commodity be based solely on cost, it seems incumbent upon them to explain why that is so and how it will be better so, either for the carrier or the people.

Generally, not always, the trouble flows from mutual mistakes, either of the facts or the economic principles underlying the facts. While no traffic man would claim perfection for his work, even that part of it limited to his own territory where he has no need to barter with connections in order to secure so much as possible of what he wants or the shipper on his own line wants, still, he will be found to be a sincere believer in the general justice of his course. It is the task of the traffic officer to protect and foster the industries already located in his territory, to extend the business done there, and to originate business by exploring and opening up new avenues for productive effort. He is the diplomat who negotiates and the general who fights for the entrance of the producer dependent on his line, into territories served by other lines. The traffic official who appreciates and lives up to his opportunities is invaluable to the communities his company serves as well as to his immediate employers.

It must be explained, this business of ours, not alone to the primary critics of railway matters, but more important still, explained, and again and again explained to the great, fair, justice loving American public. It must be dwelt upon until that great public, the fairest on earth and the most capable of understanding the explanation, once its interest is aroused, has grasped the salient points of the problem and is prepared to render its final judgment. Then, if still it disapproves, the time will have come to abandon our contention and try "zone" systems, distance tariffs or some other plan which the people insist shall be substituted for the present method.

The time seems at hand when the arguments of those who advocate the cost of service plan must be met. Speaking in general terms, at least, they are clear as to what they desire. They want all rates based on "the cost of service, plus a fair profit." Since they are opposed to basing some rates on entire cost and others on additional cost, and since the fact is patent that all rates cannot be based on additional cost, it is fair to assume that in speaking of "cost of service" the advocates of that plan must mean "entire cost of service, plus a fair profit." They want each individual rate based in that way. They want each commodity to pay "its just proportion"; at least they want it charged its just proportion. If then some commodities will not move, or will not move to some markets, they have not made it clear to us what is to be done. They want rates based on distance, which is a rough measure of cost of service, which they say will be simple and easily understood, and they want rates simple and easily understood. In their opinion that will be best for them and best for us. They want our lowest rate to measure all our rates, so we must be careful what we make the lowest rate, even if in being careful we stop business sometimes. That appears to be the program, and before we get into the details it seems simple enough.

For our part we cannot avoid the conviction that when the details are reached the smash will come, and since we advocate the contrary and present plan of basing our prices as every-

one else bases prices, on the value of the service, contending that that is the only method under which the maximum movement at the minimum rate can occur, it devolves upon us to say how it is practically applied, how it produces the reasonable rate and how it is, in fact, fairest and best for all.

CONCLUSION.

While the laws require the commissions to prevent discrimination and enforce reasonable rates, they have furnished no exact rules by which discrimination and reasonableness are to be determined. Left thus to their own resources, what are the commissions to do? Baffled by the intricacies of the problem, many people have urged upon the authorities a resort to a more or less rigid adherence to the distance tariff principle as an escape from its perplexities, but in the opinion of those having practical railway experience some other test of reasonableness than mere weight or distance, or, if you please, "cost of service," in any of its various forms will have to be found if wide industrial disturbance is to be avoided. In order to attain reasonableness is there in fact any necessity for revolutionary methods? When the question is presented as to how railway transportation is to be sold the presumption ought to be, until good reasons to the contrary appear, that, within the limits imposed by law, it should be sold in the same way any other product is sold. Why should it not? Is it not of significance that railway traffic men, hundreds and thousands of them, composing an element in American citizenship second to none in intelligence and patriotism, who have devoted their lives to a study of this problem at short range, are a unit in believing that no different rule can be applied to the sale of transportation than that applying to all other things, and should not the American public and American railway commissions, before demanding some sweeping change, require very strong reasons why this rule, universal as to other lines of business and supported by unanimous judgment of the men who know *this* business, should be set aside?

THE LONG AND SHORT HAUL QUESTION.

BY A PRESIDENT.

Whether the tariff is entirely a local issue is debatable. But the long-and-short-haul clause is pre-eminently a local issue; *ab ovo usque ad mala*, as it were, not to mention other commodities. Anyone who sat in the Senate last week, hearing the surf of Smoot of Utah pounding upon the piles of Washington, the clatter of Clapp of Minnesota striving to drown the dispassionate logic of Bailey of Texas, would surely have believed the issue as local as the pork barrel.

The House of Representatives had passed *an*, not *the*, Administration bill. And *quanto mutatus ab illo!* Then the Senate began to ponder. Finally it ceased pondering. The ceasing was enlivened by a harlequinade, with back somersaults, by Senator Aldrich and his entire company of "regulars." And here is the result. This is how, by a vote of 57 to 10, the Senate wants the long-and-short-haul clause to look, henceforth and forevermore:

Sec. 4. That it shall be unlawful for any common carrier subject to the provisions of this act to charge or receive any greater compensation in the aggregate for the transportation of passengers, or of like kind of property, for a shorter than for a longer distance over the same line or route in the same direction, the shorter being included within the longer distance, or to charge any greater compensation as a through route than the aggregate of the local rates; but this shall not be construed as authorizing any common carrier within the terms of this act to charge or receive as great compensation for a shorter as for a longer distance.

Thus much from the bill as it passed the House. Note the insouciance with which the sum of the locals is made the maximum through rate. Bear in mind that this passage was not debated in House or Senate. Remember also that the whole long-and-short-haul clause was not considered in committee. And then, in all charity, let us forgive the insertion of this "sum of the locals" heresy. After all, it puts the rate-making power back into the several states. So we strengthen the commission in one breath, and in the next give the vital secret of that strength back to our "home folks."

But the Senate did not stop here. There's much worse to come. As for instance:

Provided, however, That the Interstate Commerce Commission may from its knowledge, or from information, or upon application, ascertain that the circumstances and conditions of the longer haul are dissimilar to the circumstances and conditions of the shorter haul, whether they result from competition by water or rail; then it may authorize a common carrier to charge less for the longer than for the shorter distances for the transportation of passengers or property; but in no event shall the authority be granted unless the commission is satisfied.

Senator Paynter must answer for this delicate implication that the commission itself may possibly know something, aside from what it can find out upon inquiry. Here's a-hoping.

The next patch is a segment of clear blue sky; its intentions are honorable, viz.:

that all the rates involved are just and reasonable and not unjustly discriminatory nor unduly preferential or prejudicial.

The ceremonies conclude with a saving clause, a sort of prayer for those at sea, originated by Senator Dixon. It reads:

That no rates or charges lawfully existing at the time of the passage of this amendatory act shall be required to be changed by reason of the provisions of this section prior to the expiration of six months after the passage of this act, nor in any case where application shall have been filed before the commission, in accordance with the provisions of this section, until a determination of such application by the commission.

To summarize, the clause is as honest an attempt to be fair as could possibly be made by men who know nothing of the subject.

The Senate's aggregate, or conglomerate, intellect evidently worked somewhat thus:

A. Existing rates:
   (1) preserved in force for 6 months.
   (2) also preserved in force additional time while under consideration by the commission, the Court of Commerce and the Supreme Court.

B. Future rates:
   (1) carrier needn't establish any.
   (2) if it does, however, the commission will preserve lower rates for long hauls wherever proper.

Chairman Knapp has said that it takes seven expert rate clerks eight days to examine the tariffs filed with the commission in *one day*. Thousands of rate schedules are filed every week. At a conservative guess, one-quarter of these schedules involve the long-and-short-haul principle in some aspect or other. Should the Senate's section 4 become law, the harrassed traffic officer will have to decide, in every such case, whether to keep his existing schedules and pray that the litigation respecting them may be unceasing and perhaps at the same time see a competitor getting the business, or to embark upon the pains and perils of getting the commission's approval to new tariffs, with the possible result of new commission-made adjustments that will utterly disrupt existing conditions. *Some* railways will be sure to choose the latter course. The commission's work will speedily fall behind with the daily throngs of such applications, and soon it will be impossible to get action on them as fast as necessary to keep pace with changes in ownership, opening or abandonment of waterways, completion of new mileage and all the other matters that require the long-and-short-haul rate adjustments.

The very worst thing about the Senate's clause is that it takes from the carrier the right to decide whether the competition to a given point is sufficient to justify a lower rate thither than to intermediate points. This is not said by the carriers from a selfish viewpoint. *For the commission is to be left without any standards whatever, and its action is not to be subject to review.* Contrary to the impression prevailing among the Senators, there will be no appeal from its orders under this clause unless they contravene the Federal constitution. The recent Illinois Central case settled this; and the new Court of Commerce is, at this writing, not to have any powers not "now possessed by circuit courts of the United States and judges thereof." Both the railways and the shipping public have countless reasons for wishing to preserve the

equilibrium now maintained by existing long-and-short-haul discriminations. But their judgment is to be ousted in favor of the commission's, whose fiat will be final. For trained judgments anxious to see the largest possible traffic and the widest freedom of markets, it is proposed to substitute the decision of commissioners who are, as far as the actual traffic and trade are concerned, the veriest lookers-on in Vienna.

It may be that the Man from Mars would ordain a distance tariff for us. Such may be the ideal method. But our mundane brains have worked out the present system as best fitted to our needs and development, and as best warranted to give equal opportunity to all producers and all consumers. Very likely certain intermountain rates are unjustly high. But the Senate, in order to correct a few abuses that have been vigorously played up by one or two insistent senators, is willing to enact a law that will destroy the entire rate fabric, raze the prestige of many centers of trade and raise that of others, and result in confusion, loss and disaster. Let us hope that the Senate will see the error of its course before the Administration bill even gets as far as conference.

CHINESE LOAN NEGOTIATION CLOSED.

It is understood that the banking interests of Great Britain, Germany, France and the United States have reached an agreement as to the Chinese loan, and that the four countries will participate equally in a loan of $30,000,000, and that the countries shall have equal rights and opportunities in all matters relating to the purchase of materials, and that engineers of foreign countries shall be employed on different sections of the work in equal proportion under the direction of the Chinese director general. The loan provides for building a line from Canton north to Hankow, 600 miles, and from Hankow west to Ichang, 533 miles.

RAILWAY STOREKEEPERS' ASSOCIATION.

The seventh annual meeting of the railway storekeepers was held at St. Louis, Mo., on May 16, 17 and 18. Several interesting papers were read and discussed. The most important report received was that on "Material Classification" by a committee composed of the following: T. D. Reed, chairman; J. H. Ellis, L. A. Williams, T. W. Flannagan, H. E. Rouse and N. M. Rice. The committee had been considering this subject three years, and reported a complete classification, grouped under four heads, namely, Maintenance of Way and Construction, Maintenance of Equipment, Conducting Transportation and General. This method of grouping will permit of an analysis being made of material expenses by departments, if desired, and will make the material classification conform very closely to the classification of operating expenses of the Interstate Commerce Commission.

The list of officers elected for next year will be found on page 1286.

The following are abstracts of some of the papers presented:

Handling and Arrangement of Supply Cars.

I.

BY A. S. M'KELLIGON,
Southern Pacific.

This paper is a review of the supply car system as in operation on the Tucson division of the Southern Pacific. Our purpose is to deliver on a regular day every month of the year, to section foremen and others, what material they require for the ensuing thirty days; to pick up all tools and material in need of repairs, and all scrap on the entire division.

We have two regular supply cars fitted up, one being the oil car, the other a living car for the supply car storekeeper and his helper, in which is also stored supplies for station men, pumpers, etc. We add to this equipment, three common standard freight cars in which is stored all spikes, track bolts, track tools, etc., for section men and supplies for signal maintainers on the block signal system. To this equipment we usually add on leaving El Paso three empty flat cars, with side boards, and one empty box car, the latter being used to load all second-hand track tools for repairs, such as picks, tamping bars, shovels to be rehandled, etc., as well as all other material of that nature. On the three flat cars we load all scrap, endeavoring as far as possible to keep the different classes of scrap separated. In one car we load all the car scrap, second-hand material, such as brake beams and couplers, which we find along the right-of-way. It is always understood that this scrap is assembled at section tool houses and piled conveniently near the tool house close to the track, where it can be loaded in the least possible time. For this purpose we have an air derrick with a capacity of three tons, with the superintendent's business car and a caboose for the crew, makes up our supply train.

This train is run as a special on the 18th of each month, and is also used as a pay train, pay checks being delivered to the section foremen, extra gangs, etc., by a regularly authorized division paymaster. On this trip are the superintendent, storekeeper and the several roadmasters, who go over their respective districts. At times we have the division engineer with us. It takes four days to make the main line trip from El Paso to Yuma, a distance of 560 miles. Every tool house is entered, personally gone over by the superintendent, storekeeper and roadmaster, pump houses, pumpers' quarters and station quarters inspected. Wherever the section foreman has a surplus of tools they are turned over to the supply cars and due credit allowed. Where he may have an insufficient supply, he is fitted out with what is necessary to do good work. Every tool delivered is inspected. The superintendent knows when he leaves each section that every section foreman is equipped with tools and material to do good work for the following thirty days. Requisitions are, of course, always made out by the section foreman, approved by the superintendent, and are in the hands of the supply car storekeeper four or five days previous to the date the supply cars are scheduled to leave Tucson. On the ground ofttimes these requisitions are reduced or increased in quantity, as the case may be, as conditions may have changed between the time the section foreman placed his order and the arrival of the supply cars, so that it will be seen that this trip is not only to deliver material, but is one of a monthly inspection by the officer in charge of the division, with his assistants. The turning in of old tools and material for the new is carried out and followed rigidly. We even insist upon the return of material which is not further usable, but which in its return shows good faith. Every third month we go over the branch, about 80 miles in extent, the only one we have at present operated under this division. Every pound of scrap is picked up, and when the supply cars arrive at Yuma, which is the western terminus, the superintendent is satisfied that the division behind him is thoroughly cleaned of scrap and in absolutely first-class working order, as to tools and material necessary to do first-class work, and also that every man has been correctly paid.

When these supply cars were first instituted, we picked up so many track tools that I do not believe we ordered a new track tool for nearly two years. Handcars are also picked up on this trip and left at Tucson, our division headquarters, on the trip west, unloaded and repaired. The car with the second-hand tools is also set out, all tools being immediately repaired and all shovels re-handled in the shops, so it is evident that with but very little addition of new tools, the same tools we pick up one month are repaired and given out the following month. Thus, the only charge made against operating accounts for this class of material is that of labor and what material is required to repair such tools. As before mentioned, we always take the derrick car, with which we load all frogs in need of repairs, as well as handcars, and

almost every trip during the past four or five months we have picked up wrecked cars, loading wheels, bolsters, etc., which in each case means the saving of sending our 100-ton derrick and crew to the scene of the wrecked car. Of course, the trucks are separated by a couple of car men sent out for this purpose on passenger train in advance. The saving in the operation of the supply cars cannot be correctly figured; they are so diversified and so many. Following are some of the things they eliminate:

They have reduced O. S. and D. reports on damaged and company freight 95 per cent. They save local freight crews handling this class of supplies, which almost invariably means overtime to them. They save revenue trains handling this class of freight. They save local freight trains from being burdened with a lot of material sent in haphazard from sections and stations from month to month for repairs. They save the loss and leakage of oils on shipments made by local freight and consequent damage to commercial freight, which is often loaded along with company supplies. They pick up all the scrap and get it to the mills, instead of leaving it for the roadmaster to drift a car, which is handled by local trains, set out at station after station, and then the scrap is only half picked up. They reduce complaints from section men and others as to non-receipt of material, as we hold their receipt for material delivered on their requisitions.

Before the advent of the supply cars we ran a scrap train with an extra crew over this division a number of years ago. When we arrived at Yuma, the western terminus, we had picked up forty-four carloads of scrap. We now average about ten or twelve carloads of scrap per month, representing all kinds of scrap and second-hand material.

The Los Angeles division several years ago ran a strictly scrap train once only. It took them about three months to complete the division, including all branches, and the value of this train figured over $40,000, and the operating accounts were credited with that amount.

Our division superintendent feels that only by accompanying the monthly supply cars, noting conditions, can an approving officer be qualified to correctly sign these monthly requisitions for material.

There was considerable antagonism against the supply cars when they were first inaugurated, but section foremen and roadmasters would now be a unit in opposition against their discontinuance, and they were the ones who looked upon it with suspicion and distrust when first inaugurated.

On a trip in the early part of last January we were accompanied over this division by the general storekeeper, and on the completion of the trip he requested that I give him the figures as to the value of the material delivered and the value of material picked up, which I also give herewith:

Material delivered	$3,769.15
Second-hand tools and scrap picked up	2,510.97

We issued 50,000 lbs. of track spikes at $2.06 per cwt., which means a money value of $1,236; also 10,000 lbs. of track bolts at $2.98 per cwt., $298, or a total of track spikes and track bolts issued, $1,534. The difference in price between the above new and the same amount of scrap picked up would be 70,000 lbs. (35 tons) wrought at $15 per net ton, or $525. The net difference between the new and the scrap of this specific material issued is $1,009. It will be observed from this that the difference is not in the volume of material picked up, as against that issued, but only in the price as against the new and the scrap, and this is covered mainly by the track bolts, track spikes, etc.

At our Tucson store there is not a pound of freight which goes through the local freight house. What we cannot load in car lots the supply cars deliver. We do our own billing; in fact, the local freight house is not troubled with us at all.

The inspection given by the superintendent and his assistants has had a wonderful effect on the general appearance and tidiness of tool houses, as there was a time when each section man had so much miscellaneous material in these tool houses that they had hardly room enough to get their handcars inside and they were ordering material which they had buried under sacks of spike hole plugs, etc. The inspection of sectionmen's tool houses and their equipment, as one feature only, will be a commendation to the supply cars.

II.

BY C. H. ROST,
Chicago & Eastern Illinois.

On the road with which I am connected we operate four cars, consisting of:

1.—Car with necessary shelves for miscellaneous material and supplies for all departments. This car is arranged with ample space to provide sleeping accommodation for attendants.

2.—Car with necessary racks and shelves in one end for roadway tools, the other end floor space for spikes and track bolts.

3.—Car with necessary tanks with self-measuring pumps for oil supply; also contains waste bin and necessary racks for oil cans.

4.—Ordinary system box car for stationery. This car is loaded by the stationery department, supplies being loaded in station order, and car is released as soon as empty.

The first three cars mentioned are provided with end doors, to enable attendants to pass from one to the other while train is in motion. They travel on local freight trains when making deliveries, and cover the entire line of 1,000 miles in ten days, two attendants being required to handle the work.

One of the greatest advantages gained by operating the car is the picking up of old material, a large percentage of which can be repaired at a small cost and reissued. We insist on old material being turned in when new is drawn. On return of the cars this is closely inspected; any worth repairs is immediately put in shape to be reissued and the worthless scrapped, credit as to its worth being allowed the department to which it properly belongs. If this material was not picked up and taken care of by the cars, it would reach the scrap dock in scrap cars, and would nearly all be worthless, and unfit for repairs when received in this manner. The value of the material picked up for repairs by the supply cars will more than pay the expense of operating them.

Once each year, usually in October or November, in connection with the supply cars, we run what is known as an "Economy Special." Accompanying the special are all division officers, representative of the stationery department, and last but not least, the storekeeper. Every building on the right-of-way—stations, towers, shops, roundhouses, car repairers' shanties and handcar houses—in fact, everything resembling a building is entered by this army of co-workers, and all surplus serviceable material and tools, including those needing repairs, is picked up by the special and returned to the general store.

The first trip of this kind was inaugurated three years ago, and the result was amazing to all, the material picked up representing a greater value than was anticipated. The result of this trip cannot be based alone on the value of the material reclaimed, its influence being worth much more to the company, as the trip one year later demonstrated; less than 10 per cent. of the material picked up on the initial trip was gathered in on the second. Some of the older men on the line are talking about it yet, as we gave them all a thorough housecleaning.

Branch lines of from 10 to 40 miles are not covered by the cars, as the small amount of material to be taken care of would not justify the time consumed. Oil cans and tools needing repairs are sent to junction points, and orders are taken care of by the cars at these points and are shipped from there. Branch lines, however, are covered by supply cars once each year when run in connection with the "Economy Special."

Economy in Mechanical Contrivances in Handling Material.

I.

BY N. A. MEARS,
Lake Shore & Michigan Southern.

The expense of operating a magnet varies with the size as far as the electricity is concerned, but the labor cost for both the crane and the magnet is from $5 to $10 per day, and sometimes less.

The saving by the use of the magnet is really quite a figure, although it is usually figured as compared to hand work, and not considered with the crane as a necessary feature. In rough figures, the crane and magnet save from $15 to $50 per day, according to how fast they are operated and the material handled. On the following items the saving shows what can be accomplished.

Loading locomotive tires	Per Ton
By hand	$0.17
By crane	.08
By crane magnet	.04
Loading heavy cast	**Per Ton**
By hand	Almost impossible
By crane	.20
By crane and magnet	.03

You will note that on these items the magnet reduces the cost of handling over the crane cost, particularly on account of the necessity for a good hold on the heavier items when handled by chains or hooks.

II.

BY J. F. SLAUGHTER,
Missouri, Kansas & Texas.

The same standard of excellence should be observed in regard to locating storerooms as in planning machine shops.

The equipment for handling supplies should be selected with a view of securing the greatest results with the least outlay.

The subject is one of supreme importance because of the improvements occurring from day to day in the shops which call for heavier material being brought for repairs to new and better equipment.

The store department should have the same facilities for handling the material. Platforms should be built with a view of using a traveling electric hoist or air hoist. If the work is not of sufficient volume to justify this expense, then an overhead runway for trolleys should be erected and a differential pulley block used. This runway should extend over the tracks for unloading material from open cars.

In addition to this, a small, swinging air crane should be built on the edge of the platform to swing into covered cars for loading and unloading frogs, switches and other heavy material. The cost of erecting these conveniences is small compared with the labor expended year after year by the old methods.

Yards should be located easily accessible, with ample room for switching and suitable for convenient and economical handling of lumber and material. This also requires careful study to see that adequate ground is secured for future growth. As a rule, yard facilities are about as follows:

Spur tracks into storeroom, one into the scrap yard, one into lumber yard, one into wheel and axle yard and one into casting and bolster yard. This necessitates material going in and coming out the same way, consequently often incurring extra expense and making an economical method impossible. Loading and unloading cannot be done at the same time; one must wait on the other, and, as a result, retards the quick movement of supplies.

Let us now see what the economy will be in providing a few mechanical contrivances: The most useful piece of machinery would be a locomotive crane, as it can be used for many purposes.

First, in unloading piling and lumber from open cars. I find it costs $6 per car to handle by hand where cars must be moved by hand back and forth to properly assort them on ways of their respective lengths. This same work can be done with a crane for $1.40 per car, or a saving of $4.60.

Car and engine bolsters cost to handle by hand $5 per carload of seventy-five; these can be handled by locomotive crane for 75 cents, or a saving of $4.25.

One hundred 4¼x8 axles—by hand $5.50, by crane $1.50, saving of $4. Mounted wheels to axles—by hand 75 cents per car, by crane 17 cents, saving 58 cents. These are only a few instances for which the crane can be used, but it is not necessary for me to enumerate further.

I also find in handling scrap that the cost by hand for an average of 100 cars is $7 per car; with the crane it is $2.83, or a difference of $4.37 in favor of the latter.

The same saving can be accomplished in loading piling and heavy lumber. We all know that the cost is greater to load bridge material than it is to unload it.

It probably would be of interest to some of you to know that there is a number of roads that still use the old method of loading, which is like this: Eight or ten men are placed in a coal car, and by the use of ropes drag 7x15x28 to 32-ft. stringers into the car at a cost of from $8 to $10, while this should be accomplished for $1.40. There are many contrivances that are money savers, but none that has come under my observation that equals the locomotive crane for all round use.

Some of their good points:

As a labor saver they haven't any equal; then the amount of material that can be placed in limited space due to the height it can be piled, which, by the way, is quite an item around most shops. This also lessens the amount of ground to be kept clean. It practically eliminates building platforms for frogs, switch points and other heavy material. When labor is scarce your work is not very badly affected.

Handling of Scrap with Crane and Magnet.

BY F. D. REED,
Chicago, Rock Island & Pacific.

The economical handling of scrap can only be accomplished by having proper facilities in the way of scrap docks, cranes and electric magnets.

When you take into consideration that every dollar's worth of scrap sold represents an original outlay ordinarily of from $3 to $10, and in some cases $15, and even more, the necessity for economy in handling is very apparent.

We have at our Silvis general store what we believe to be a very convenient scrap dock, equipped with a traveling crane and magnet, for handling scrap. The dock is the height of car floor, 50 ft. wide, 900 ft. long, with tracks on either side, with capacity of twenty-five cars each. On one end of the dock a space 110 ft. long has roof over it and is used as a stripping shed. The equipment of this stripping shed consists of large motor driven shears for cutting heavy scrap, cutting yokes off of couplers, etc., small shears for cutting old bolts to usable lengths for rethreading, and an air hammer for straightening rods and bolts. The balance of the dock is divided into storage and sorting bins for storage and handling of the various grades of scrap, and sheds for storage of borings and turnings, rope, rubber, waste paper, etc. The dock proper, outside the stripping shed, is served with a 4-ton capacity Gantry type of traveling crane, with cantilever ends. The distance between centers of running rail, or crane, is 34 ft., cantilever ends 19 ft. long, making the crane bridge 72 ft. long, so that the crane will span the entire dock and the tracks on either side of same, to permit the scrap being loaded or unloaded from cars on track at either side of the dock. With this crane we use a 52-in. diameter electric lifting magnet, with which all scrap, including borings and turnings, is handled. The roofs of the boring and turning sheds are

hinged and open out, permitting the use of magnet in loading and unloading same. Scrap that cannot be handled with magnet, such as rope, rubber, glass, waste paper, etc., usually received in closed cars, is handled in steel skips, 5 ft. wide, 8 ft. long, 4 in. high, which are placed at the door of the car, material thrown in same, then the skips are picked up by the traveling crane and the material emptied into proper bins.

Scrap coming from the line, as you all well know, is invariably mixed in the cars, and must be sorted to grade, and the usable material recovered. To accomplish this we have on our dock four large what we call "sorting bins" distributed along the dock. These sorting bins are 40 ft. by 32 ft., and have small partitions or bins around the side, open toward the center. Scrap, when being unloaded from cars with magnet for sorting, is dumped into the center of these sorting bins, scrap sorters sort it and put the different grades in the small bins around the side of the sorting bin.

Miscellaneous scrap can be unloaded with crane and 52-in. magnet for from 2 to 5 cents per ton, and when sorted can be loaded by one man, namely, the crane operator, with magnet, for from ½ to 1½ cents per ton, depending upon the grade of scrap handled. In handling No. 2 railway wrought, which all of you know consists of track bolts, spikes and other small scrap, the magnet will handle on an average of 2,200 lbs. each lift, and our crane can handle a magnet load every 40 to 45 seconds, or about 3 tons every two minutes, the load, of course, varying according to the grade of scrap being handled, running from 1,300 lbs. per lift on busheling up to 2,200 lbs., as mentioned above, for No. 2 wrought. Sorting of scrap to grade is the most expensive item in the handling of scrap. This must be done by hand, but the way we handle it here, by dumping it into sorting bins as it is unloaded with the magnet, it can be sorted at minimum expense and a great deal cheaper than it can be done if it was unloaded by hand, and the different grades trucked to the various bins and sorted for storage. Sorting of scrap, the way we handle it here, can be done for from 4 to 7 cents per ton; in other words, we can handle scrap in and out with our facilities for from 10 to 12 cents per ton, including the sorting. Prior to May, 1909 (at which time our crane and magnet were installed), when all scrap was handled by hand, the cost per ton in and out ranged from 30 to 35 cents per ton, which is about what it is costing any railway to-day that handles scrap by hand, or with even very good modern facilities for handling, and to keep it down to this figure they must have good and convenient scrap dock arrangements and an efficient organization.

The cost of installing a Gantry type of crane, equipped with magnet, is less than a locomotive type of crane, and is better adapted for handling scrap, and on a scrap dock that handles from 2,500 to 3,000 tons of scrap per month enough would be saved in labor alone in one year to pay for the cost of installation. Furthermore, with facilities of this kind equipment can be released more readily and cars turned into commercial service, which means a great deal to a railway during heavy business seasons, when equipment is scarce. We recover large quantities of usable material from our scrap continuously, but this is being reduced gradually, and, I might say, has been reduced at least 50 per cent. during the past two years, due to our following it up closely with the outside points shipping in the scrap. Every car of scrap we received containing good material was reported to the man in charge at point scrap was loaded, and his attention called to the number of items of good material received as scrap, and we kept it up to such an extent that very little usable material at the present time is being received with the scrap, except in roadway pickup cars, in which you always find considerable quantity of material lost off from equipment in transit, which, of course, will always occur.

This practice not only cuts out the unnecessary handling of the good material after receipt at scrap dock and shipping it, in many cases, right back to point it came from, but cuts out the expense to the railway of hauling it over the line and back again, which cost at least $0.003 per ton per mile; also educated the men on the line to take better care of their material; in fact, it forced them to familiarize themselves with conditions, as they knew if they continued to allow good material to go in as scrap they would hear from it, and if no improvement, it would be taken up with them through the head of their department, and I might say that we experienced but very little difficulty in getting it lined up, as the other departments worked closely with us in this matter.

To facilitate recovery of usable material from scrap at outlying points, we arranged to have small scrap docks built, of size to suit the conditions, with separate bins for various grades of scrap, and at points where conditions would warrant we had installed small shears and bolt cutting machines, so they could work over old bolts up to their requirements. This not only made it possible for outlying points to take care of their requirements almost entirely of all short lengths of bolts, but put the material in usable condition at once, and cut out the $0.003 cents per mile expense to and from main scrap dock and cut out all expense of handling at scrap dock, loading, etc., which more than offset the extra handling, if any, at points where the recovery work was done.

The introduction of crane and magnet for handling scrap was the means of solving one of the most serious problems we had to contend with, and that was—the labor question. In the west, especially during summer and fall, when demand for labor on farms and construction work on railways and outside work is heavy, it is almost impossible to get ordinary laborers in sufficient numbers to meet the requirements, and labor-saving devices, or machinery for doing the work, are an absolute necessity. Last summer and fall a great deal of municipal and government improvement work was being done in Davenport, Rock Island and Moline, Ill., and a number of times during that period we only had three and four men, outside of the scrap dock foreman and crane operator, on our scrap dock, but we were able to operate the dock very successfully and keep the cars loaded with scrap down to a minimum. If we had no crane and magnet with this small force, we would have been practically out of business, causing a heavy accumulation of cars loaded with scrap, and would have heard from the transportation department in very forcible terms regarding the number of cars tied up that were badly needed for commercial service.

Economy of the Piece Work System in Handling Supplies.

BY D. C. CURTIS.

If we are going to get the largest possible output for the smallest cost, we must interest the man doing the work more than paying him by the hour. A man's interest must be vital if we are to get the best there is in him. We must pay for what we get, and not for what we do not. We must get 100 cents' worth of work for every dollar paid out. This the piece work system accomplishes, as its organization and introduction shows.

At first blush it would seem to be a difficult matter to resolve the handling of supplies into given factors or units. This is not so, as we have a unit to issue or receive everything we handle in the store department, and a record to refer to that is permanent. Lumber is handled per thousand feet B. M. Iron, castings, coal, sand, etc., are handled by the ton. Pipe is handled by the foot. Mixed merchandise is handled by per package of 100 lbs. or less, over 100 lbs. to 200 lbs., etc. Filling requisitions and delivering material to the shops is handled by per item, per piece or per pound, depending upon the kind of material and the local conditions.

Filling requisitions and delivering material shows a very large saving put on piece work, due to the amount of lost motion that creeps in under the day work basis. Shop men will ask what has happened to the store men after they have been put on piece work, as they no longer stop to talk, but

drop the material and hurry away for more. The men group their work, taking or getting all the material wanted from the different sections at one time. One foreman, planning the getting and placing of material, is only one part efficient as compared with a whole gang of four to eight men planning the same thing. In establishing piece work for a delivery gang composed of foreigners, who did not know the material and could not understand English, the prices were based on what was considered fair. The foreigners could not make one-half their day rate with the prices set, and were transferred. English speaking laborers were hired in their place, and they, being able to use their heads, made from 30 to 50 cents per hour.

The men should be given to strictly understand that after a price is approved it will not be changed unless conditions are changed. They can make as much money as it is possible for them to make, and will be paid accordingly. As soon as the men are assured that they will be paid for what they do, they will work their heads as well as their hands and feet, and will take advantage of everything possible. For instance, in one of our yards a derrick gang use long bridge bolts to handle 6-in. cast-iron pipe. These bolts are put in the end of the pipe to slip the sling around, enabling them to handle very quickly six to ten pieces at a time. These bolts are carried on the derrick to be used when needed. When loading a small order the men run ahead of the derrick with bolts and sling and load the pipe without stopping. It is impossible to get work done this way at an hourly rate, but there is money in this method for both the men and the company, as shown below:

Work done on hourly basis on which price was based:

Labor	$2.50
Use of derrick	2.00
Total	$4.50

Work done piece work in one-half the time:

Labor, P. W. rate	$2.00
Use of derrick	1.00
Total	$3.00

Saving, $1.50, of 33⅓ per cent

We had four men in one of our lumber delivery gangs and the day we were about ready to start piece work one man quit, and the other three refused to work until another man was put in his place. The piece work system was explained to the three men, and they were asked if they would do the work on this basis, which they agreed to do. Soon after, one of the three left the service of the company, and the remaining two are handling this work, together with a large increase, in about 70 per cent. of their regular working time, making a high rate of pay. The company is saving one man's time and about 30 per cent. of three men's time on this particular work.

At one of the large icing stations, where an average of 100 cars per day are iced, and some days as many as 250 cars, it was necessary under the day work system to take a large force of men from one of the other departments to help during rush hours. However, since piece work has been installed the regular force has handled the work without delaying a single train or having a complaint from the shippers. The men know the more they hurry the more they make.

On one of the scrap docks it was impossible under the day work system to keep the pile of miscellaneous mixed scrap sorted and cleaned up as fast as it came in with the regular gang assigned to this work, it being necessary to put on additional help to prevent congestion. Ninety days after piece work was installed the regular gang cleaned up this scrap without additional help, and now take care of it and have time to do other work; yet a better foreman than the man in charge of this dock cannot be found.

It is impossible to work unintelligent foreign laborers to advantage. A gang cannot be divided, sending one man for a given article, another to the shop for manufactured material, and have others sorting out material. The foreman has to take the whole gang with him, or have part idle, to get even a given size of bolt or article of any kind, as the thing wanted has to be pointed out and motions used to direct their movements.

With the piece work system we are able to hold the men after we have them educated. In May, 1908, a storekeeper hired 50 Austrians who had just come to this country, and they, after becoming familiar with the conditions, were put on piece work. Thirty-five of the original 50 are still working for this storekeeper, one having died and the others leaving the service. The men are making good wages, and it is needless to say they are an efficient force. For increased and intelligent effort men make enough for the work to be attractive. The longer men stay, the more proficient they become, the more money they make, fewer mistakes and breakages occur, and discipline is easier.

Piece work keeps men and methods of doing work out of ruts, as the men are continually scheming short cuts and new kinks. It gives us machines and tools with which to handle work quickly. To show a saving in having machinery to handle material is a very simple problem in arithmetic when on a piece work basis; *i.e.*, lumber handled by hand costs 5 cents to 85 cents per 1,000 ft., B. M.; with a derrick, 15 cents per 1,000 ft., B. M.

Piece work forces the storing of material in the most convenient places for handling. In one of the large new storehouses recently built the connecting rods for engines are kept in a closed rack in the center of the house, without lifts of any kind to handle them with. Piece work would very quickly show the saving to be made by putting these rods where they could be handled with a small crane at a great saving.

Piece work gives a contented set of men, each man in business for himself. Men would rather work piece work than day work, as is shown by the engine men and trainmen being paid by the mile, miners by the ton, etc. These men would not think of going back to the hourly unit. The rapid, intelligent workman receives wages in proportion to work done; ability is paid for.

By What Unit of Measure Is the Efficiency of a Storekeeper Properly Determined.

I.

BY W. M. DICKINSON,
Southern Pacific.

Efficiency is reflected in results of store department operations as shown on paper, by which the operations of one railway may consistently and accurately be compared with the operations of another. Should you wish to compare one division with another of the same railway, efficiency is reflected in the same manner.

Efficiency may be measured by a combination of four units, some of which we have heard much about, both on paper and in convention chambers, others of which, while of equal or more importance, have rarely been touched upon.

The first is service given. Service given is reflected in the ability of the storekeeper to furnish material to the railway market he supplies with speed and accuracy consistent with good maintenance and operation and, at the same time, does not allow his mind to be unduly influenced by heavy calls and rush orders, and always holds himself in such a position that he can reduce his operations as fast as consistent when the heavy calls and hurry orders suddenly cease.

When the storekeeper is in position to furnish the proper material for the proper use, he is at once placed, automatically, in a strong position to demand a much more economical use of the particular item. He can, with consistency, demand the return of the old for the new, and get it. He can require employees to work with less reserve stock, having established a so-called confidence in the store department that the proper material, when required, is forthcoming at once in reasonable amounts. But when by false economical practices, his stock is reduced so that he cannot furnish the

proper materials and tools with which to work, the body of employees lose confidence in him, and at once order double the quantity necessary, in order to form a little stock of their own for the purpose of meeting the requirements when the storekeeper fails to provide the material.

The second unit of measure is the operation on low stock values, or ratio of disbursements to stock controlled.

This is commonly known as a "storekeeper's paper record," and judgment should be rendered on this unit only when coupled with a knowledge of conditions, such as deliveries, distance from markets, amount of betterments and improvements under way, traffic, market and financial conditions, which, of course, mean the consideration of how long it has been since a sudden change in financial and business conditions have caused managements to abandon large projects and immense amount of work; or suddenly proceed from dull times to great activity, which procedure is usually followed by all railways in the immediate locality, and which, of course, tends to exhaust markets and congest traffic.

During the past year an article appeared in the *Railway Storekeepers' Magazine*, also in the *Railroad Age Gazette*,* in which the writer not only measured, but sat in judgment and condemned, the efficiency of storekeepers in general, to the extent of stating that it required $43,000,000 more invested in stock at the close of the fiscal year ending June, 1908, than at the close of the fiscal year ending June, 1906, for doing the same amount of work, on a unit styled as "car mileage density."

The writer of this article, occupying a high position, certainly had the knowledge that the financial panic at the close of the year 1907 had suddenly changed conditions of great activity, calling for immense amounts of materials, which congested markets and required from three to six months deliveries, to conditions extremely opposite, wherein all work was abandoned and nothing done except that which was absolutely necessary to insure safety of employees from injury or the safe operation of trains.

That efficiency was lost is shown by excerpts from the article, as follows:

After styling money invested in railway stocks as "Unproductive Capital," the article proceeds a little later as follows:

"There is less accurate information obtainable regarding the necessity for carrying such large stock of material than about any of the other branches of railway operation. It seems to be generally accepted as one of the evils which must be endured and which in the absence of definite knowledge of the subject must be left wholly to the judgment of 'different individuals' which is only another way of saying that it must be guessed at."

A little later you will find the following quotation:

"It seems incredible that there should be no method devised for regulating the expenditure of this sum, or at least of ascertaining within reasonable limits whether we are guessing correctly or not."

The statement covers 32 railways, and undoubtedly your railway and my railway are included.

I wish right now to serve notice that the sentiment expressed in the two paragraphs above quoted is not agreed to. The facts are entirely the reverse. Our work is producing, the money invested in our stocks is under our perfect control, and we are not guessing at it.

The merchant invests his money in stock and carries it on his shelves and in his warehouse for sale on the theory that it will be turned over so many times per year, and with the turning over earnings will be produced. Why? Not because he needs the material for his own use, but because it is more valuable to the consumers, and he knows that he can turn it over at a profit.

It therefore follows that all materials and supplies are more valuable to the consumer, which, in this case, is the railway, than to the jobber or merchant handling them. The railways, therefore, invest money in stocks of material, not because they expect to make a profit by sale, but because they expect to save expense by the use of it.

Stocks are unproductive only in so far as they are obsolete and scrap, and quite often it is advisable to hold scrap on hand for higher market prices, which in many instances pay several times the interest on the amount invested, which, of course, is a producing feature.

Let us look at it from another viewpoint. Let us suppose that railways invest no money in these so-called "unproductive stocks." Experience has taught us that the practice would result in needless expense many times exceeding the rate of interest on the capital properly invested by disorganization, delays to equipment and the following loss of business, which is caused by absence or lack of material, power or equipment.

The stock balances are invariably used in their totals in these vague statements which are placed before the managements and, of course, the stock balances include not only the storekeeper's stock balance, but the value of all other stocks in hands of all other departments, which cannot be changed one cent higher or lower by him, because they are not controlled by him, and when not in his control he cannot be responsible. I refer to such items as fuel, ties, rail, etc.

It is generally conceded that the money invested in these items is controlled and set apart by the policies of the various managements before the purchases are made, and is that part of the stock balance over which the storekeeper has no control.

An analysis of the stock balance will serve to so simplify it that amounts controlled by the store department can be easily distinguished from that portion controlled by the policies of the various managements and comparison made with an accurate degree of intelligence.

A simple classification might be as follows: 1—Ties. 2—Rails. 3—Fuel. 4—Scrap. 5—Material on hand for construction, improvement and betterments. 6—Material on hand for the actual maintenance and operation for which the storekeeper is entirely responsible.

After you have the material balance analyzed and properly segregated, another important provision must be made before we apply the unit of measure in order to get accurate and consistent comparison of the performance of one road with another. This provision should be a standard method of accounting for the material.

It will be granted by a man searching for the truth that if one railway carries scrap in operating accounts and credits the same account only after the scrap is sold, it will show a higher state of efficiency than another railway that credits operating accounts with the scrap when it is removed and carries it in the material and supplies accounts until it is sold.

It will also be granted that the railway charging material to operating or maintenance accounts when it is shipped from the store will also show a higher state of efficiency than the railway which charges operating accounts only when the material is applied.

Standard accounting should also specify and define what is commonly known as a disbursement. In other words, the railways that include transfers as a disbursement will show a higher state of efficiency than those railways which show only material actually supplied.

We are now in position to apply the proper unit of measure. The article referred to is figured on a unit of car mileage density, principally for the reason that in this factor are represented not only the work done by the motive power and rolling equipment, but also the use made of all facilities provided for expediting its movement, such as roundhouses, coal chutes, water stations, shops, interlocking and signal apparatus, terminal facilities, etc., all of which go toward making possible a greater density of traffic and which demand the use of material for their maintenance and operation, somewhat in proportion to the amount of service which they render.

This argument might apply if railways were working under the policies and practices common 10 years ago, namely, that rolling stock and equipment be repaired only when it is needed. This policy has been entirely reversed during the

*See *Railroad Age Gazette*, July 30, 1909, page 191.

last decade, and progressive railways now place their rolling stock and equipment in good condition during the dull seasons of the year, to have them in readiness for the heavy business period.

This same policy is extended to the maintenance of roadway track, and it is therefore easily understood that proportionally more material is disbursed in the repairs and maintenance of our railways during that period of the year when the car mileage density is the lowest.

Furthermore, it is a well established fact among railway men that during the busy seasons when rolling stock and equipment are in extremely heavy demand, repairs sufficient only are made to keep the equipment in service, whereas if the demands for the equipment were not heavy, more material and more labor would be consumed. This tends to show how little relation exists between the unit of measure suggested and the efficiency to be measured.

Geographical and maintenance of way conditions, such as grades, mountain ranges, which require from three to five engines per train, with 3 to 4 per cent. grades, with every mile a curve, as compared with railways running through the middle western States, such as Iowa, Kansas, Nebraska and Illinois, will illustrate the inconsistency of using the car mileage density basis as a unit of measure, in determining the amount of stock to be carried.

The figures I am about to give you are taken from reports of the American Railway Association's committee on car efficiency, and are authentic and reliable.

On October 30, 1907, this committee reported a shortage of 86,811 cars. This abnormal shortage reflects a corresponding loss in car mileage density, the storekeeper's unit of measure at that time. To show the sudden change to the reverse, this same committee reported that on April 29, 1908, there was a surplus of 413,605 cars, also there were 197,000 cars in shops, making a total of 610,605 idle cars. Storekeepers will also please note the loss of car mileage density. This was the highest number of idle cars reported during the panic, and on July 8, 1908, which are the figures nearest obtainable to the end of the fiscal year, they reported a surplus of 303,560 cars, with 232,000 cars in the shops, making a total of 535,560 idle cars.

In an editorial in the *Railroad Age Gazette* of January 24, 1908, we find the following:

"On January 8 the American railways, including Canadian lines, found it necessary to store 14 per cent. of their car equipment. No such surplus of cars as shown by these reports has ever before existed on the American railways. The nearest approach was in May, June and July, 1903, but the surplus of cars then was only from a quarter to a third as great as that at the present time."

This is quoted to show the inconsistency of measuring the operations of the store department, particularly the stock balances, on a basis of car mileage density, on June 30, 1908, when we had 535,560 idle cars against the same period, with the same unit on June 30, 1906, when we were in a period of great activity, at which time cars were not only short, but at a great premium and with entirely different business and financial conditions.

My object in reviewing this matter is to prove that "storekeeping" has advanced to the same point of scientific perfection as other departments of the railways. Every transaction can be followed and any reasonable exhibit of the work performed can be prepared and comparisons made with the application of the proper unit of measure.

The third unit of measure is the cost of operation per $1,000 of material handled.

The fourth unit should be the condition and appearance of facilities and property under his charge.

In order to place these units before you for the sake of expression or criticism, I have placed their relative value as follows:

1—40 per cent. service given.
2—30 per cent. ratio of stock controlled to disbursements.
3—20 per cent. cost of operation.
4—10 per cent. appearance and condition of property.

100 per cent. efficiency.

II.

BY C. H. DRAZY.
Chicago, Burlington & Quincy.

The one great aim in arriving at a plan of measure is that it may be applicable to railways in general, so that a proper comparison might be made between the various railways.

The various conditions surrounding the railways appear to be a hindrance to any plan; local arrangements, geographical locations, topographical surroundings, etc., make most any plan appear unjust for comparison, the number of locomotives, cars, number and kind of yards, and terminals, bridges and buildings, water stations, miles of track, and many other points go to make the methods suggested seem either impossible or unfair as a means of comparison; and yet, considering all of these conditions and apparent reasons why comparison would not seem possible, the fact still remains that a method of comparison should be determined.

As is generally known, the quantities of material released on large railways is no small factor, and many times affects the stock balance very seriously. This condition, of course, is more frequent where improvements are going on extensively. To illustrate what the stock balances consist of, I have analyzed the stock balances representing a mileage of 27,486 miles of track, 3,573 locomotives, 2,664 passenger cars and 119,250 freight and other cars, the total stock represented by these balances being divided to bring out as nearly as possible to do so what they principally consist of:

Cross ties	$3,969,222
Rail	3,549,932
Coal	1,108,115
Improvements and constructions (excluding rail and ties)	916,846
Ice	94,256
Chemicals, tie treating	61,435
Commissary	88,044
Stationery	92,001
Scrap	232,934
Locomotive and car repairs	2,689,430
Permanent way, track, buildings and constructions	1,640,008
Train supplies, etc.	330,920
Total	$14,773,143

Deducting from these figures the repair materials, it would be rather hard to justify the amount carried if it were considered as one stock and compared with the figures representing the expenditure as material for repairs; but there are still other conditions which in any general summary are not readily revealed, the principal of which are as follows: It is found that this stock is carried on 39 stock reports, there being that number of store points represented, and a still farther search brings to light the fact that there are a total of 120 small stocks scattered on the territories of the 39 store points, and known in some cases as sub-stocks, others as working stocks, and still others as shop stocks. These facts are some of the factors which have a very severe bearing on any measure of comparison which we might make.

My view of the measure would be a system of classification which would give the storekeeper his stock balances properly classified each month and divided under the general uses for which the material is to be consumed. It should be a division as shown under the heading "General Accounts" in the classification of operating expenses as prescribed by the Interstate Commerce Commission. I would then measure the stock by the amount of labor expended for repairs charged under each

of the general accounts. I mean by this, taking, for example, the general heading, "Maintenance of Equipment"; the practice is to figure the cost of repairs to equipment, engines and cars, per engine and per car. The percentage which the material bears to the total is easily determined, and the number of days' supply carried could easily be ascertained under such a plan.

A measure of this kind would, no doubt, come nearer to giving us a fair comparison than any of those used at the present time. It would be found that under such a plan some of the stocks would seem excessive, but when the general conditions were compared it would reveal many local conditions tending to increase the amount of stock necessary to maintain the equipment, and no doubt would bring to light many local conditions which could be improved; and the vast amount of money tied up in railway material stocks in the United States is, no doubt, one of the greatest known fields for development and improvement.

Handling Stationery.

BY E. E. HEROLD,
Baltimore & Ohio.

The stationery department of the Baltimore & Ohio is probably handled differently, in so far as the purchasing and printing of forms are concerned, from that of any other system.

No printer or binder is allowed to furnish his own paper or material. The stock or paper for all printed forms or books is supplied of the proper size and weight and in a uniform manner. Knowledge, of course, has to be had of the capacity of all printing establishments doing printing or binding, so that sheets larger than their press capacity will not be sent them.

Printers that haven't the proper capacity are not given consideration when a long run of any form is ordered. Only the large concerns can be considered in instances of this kind because of the necessity of supplying sheets large enough that will meet the capacity of the large size printing presses, thereby reducing the press work to the lowest possible notch.

By this arrangement uniformity of papers and full count are positively secured in every case, provided, of course, the proper check is arranged for in the receiving department. Our receiving clerks are not allowed to receive or see original or duplicate bills or any memo showing the quantity ordered, which arrangement makes it absolutely necessary to count all supplies as received, but if the quantities are very great approximate measurements or weights are utilized.

No special water mark papers are considered or adopted, because doing so would limit competition and make it necessary to confine purchase of papers to the particular mill or jobber controlling the water mark or dandy roll, as it is known by the paper trade generally.

All new forms used originate with the head of each department, but none is printed until thorough investigation is made as to whether or not it can be substituted by any other form in use, as to size, grade of paper, whether or not it abolishes any previous form, quantity that is necessary for a term of 12 months, etc. After all information is in hand, it is not then printed until referred to an official connected with the president's office for his approval.

In a great many instances the investigation brings out the fact that after all the proposed form can be dispensed with without jeopardizing the service in any manner. The fact that all of the departments know that it is necessary to go into detail when a new form is proposed keeps down requests to a minimum.

Duplication of forms is prevented by a card system, showing numbers of all forms, quantities printed, disposition, who originated same and the users.

No old forms are destroyed without positive orders. All forms that are superseded by revised or new ones are used until exhausted, and the new forms not issued on any requisition until then, and to prevent any error in this connection the shipping clerks are given to understand that all revised and new issues of any form are to be placed at the bottom of supply in hand and the old used first. Arrangement of our stock is such that this can be done with the least possible trouble.

This company aims to carry a three months' supply of all material at all times, which includes miscellaneous stationery articles of forms of which there is little likelihood of any change being made, a six months' supply is carried, and in some instances, when the price is attractive, twelve months' supply is carried, and the proper handling of supplies is impossible with less than a three months' stock.

All forms which are considered special or used by one department are shipped direct to that department, and not carried in the stationer's storehouse. In addition to the usual number printed on such forms, the letters "spl" are affixed to indicate that it is a special form, and it is generally understood by all of our people that when these letters are printed no stock of that form is carried by the stationer and, therefore, 60 days' notice must be given him in advance of being needed. The clause embodying these instructions is also printed on the back of our requisition.

Requisitions must be made promptly on the forms provided for the purpose for a 30 days' supply only, but a 45 days' supply should be on hand when order is made. No supplies are shipped without requisition being in hand, except in extraordinary emergencies, and only then on approval of superintendents and heads of departments.

We carry out this rule to the letter, making exceptions only when requisition calls for new forms, daters, typewriters and supplies for any new station or department.

We classify stations to some extent, and keep record of every item ordered from every point. We find this system saves a great amount of stationery, because experience has taught us a great many agents and others on the system will copy their requisitions from month to month verbatim, ignoring the fact whether or not it includes rulers, waste baskets, or any other article of a staple nature.

Most departments are not given the best grade of material and neither are all of the executive departments given all of one brand or all of the best grade of any material. For example, if our car service department orders an entire supply of the best grade of any one article carried, the question is taken up so as to ascertain whether or not a small supply of the best and a preponderance of the second grade would not answer every requirement, and in nearly every instance a concession is made on the part of the official in charge. Superintendents, for example, for their personal use, are furnished with a dozen expensive pencils, and for the use of the office force a cheaper grade, costing less than half, is supplied. No small station is given other than the cheaper grades of stationery.

We have employed in our own printing plant, approximately 80 men, and practically print every page of our tariffs, both freight and passenger, and find (at least) an average saving can be made of 50 per cent., based on the charges of the commercial printers. Our printing establishment is given the same opportunity to bid on "long runs" in competition with commercial printers, and no partiality is shown. In a great many instances commercial printers name a price more attractive on "straight runs" than our own establishment. We only give preference to our printing office in so far as tariffs or time-tables are concerned.

A printing office of this character can handle hurried circulars, forms, general notices, specifications, at a very much less cost than if given to commercial printers with orders to make immediate delivery; that is to say, price is charged for actual time consumed, and one never knows if this is the case with charges made by commercial printers. Where no estimates can be obtained for the lack of time or otherwise, it seems to the writer that a printing office is a necessary adjunct to a railway, if the price of printing at all is considered.

General News Section.

The number of trees planted by the Forestry Department of the Pennsylvania Railroad this spring has been about one million.

The strike of machinists in the shops of the Baltimore & Ohio Southwestern at Washington, Ind., has been ended by the employment of new men to fill all of the positions.

The Merchants & Miners' Transportation Co. has ordered from the New York Ship Building Co., Camden, N. J., two steamships, each 333 ft. long, for use on the line between Baltimore and Jacksonville.

The San Pedro, Los Angeles & Salt Lake, which has done no through business since December 31 because of the great flood of that day in Nevada, washing away about 90 miles of track, will be reopened for through passenger and freight traffic June 15.

The output of the new shops of the St. Louis & San Francisco at Springfield, Mo., for the month of April was 42 locomotives and 46 passenger cars. Of the locomotives, seven were given new fireboxes. The shop worked 25 days during the month and had an average of 720 men in the locomotive department. During this time there was no overtime work.

At Cleveland, Ohio, on Saturday last, the Brotherhood of Locomotive Engineers dedicated its new 14-story building. Over 1,000 members of the brotherhood were present, their annual convention having been held at Detroit the same week. The merchants of Cleveland decorated their buildings in honor of the occasion and the governor of the state was present.

The Alaska Northern Railroad has a steamship on the way from Japan with 3,000 tons of coal; and the Seward Commercial Club has sent a protest to Congress against the condition which makes necessary the importation of Japanese coal, while Alaska has such a large quantity of undeveloped coal. Carrying coal to Seward is as unreasonable, this club thinks, as would be the carrying of coals to New Castle.

An officer of the Chicago, Burlington & Quincy is quoted as saying that there is a shortage of laborers all over the country. It is very difficult to find men enough to do the work on existing lines in the West, to say nothing of the construction of new railways. Of the men sent from Chicago, St. Louis, etc., to new work in the West in the course of a year from 75 to 90 per cent. will leave to work on the farms or elsewhere. This officer says that men are equally scarce in the East.

When the striking machinists of the Missouri Pacific at Sedalia, Mo., were paid off on May 14 for labor done in April, each was handed a personally addressed letter telling him that the company was willing to pay its machinists 39 cents an hour and to give them the same conditions of employment as had been accepted by the machinists of the Missouri, Kansas & Texas and the St. Louis Southwestern; and that if the strikers did not return to work by May 16 their connection with the company would cease entirely. The men did not return to work.

The railways are not the only encouragers of farmers. At Fort Smith, Ark., the Commercial League has established 100 demonstration farms in the surrounding country, and has engaged, at a salary of $2,500 a year, an expert from the Department of Agriculture at Washington, to superintend these farms and instruct the farmers. We judge that the experiment has been going on for one or more years, as, according to the reports, highly satisfactory results have already been accomplished. It is estimated that by the more intelligent selection and use of seeds and fertilizers, the yield of crops in one county (surrounding Fort Smith) has been increased $500,000 in a single year.

The report of delays to passenger trains in the state of New York during the month of March, issued by the Public Service Commission, Second district, shows that during that month 60,202 passenger trains were run. Of these 85 per cent. were on time at division terminals. The average delay for each late train was 29.6 minutes; the average delay for each train run was 4.4 minutes. The principal causes of delay were waiting for trains on other divisions, 32.3 per cent.; waiting for train connections with other railways, 12.0 per cent.; train work at stations, 9.8 per cent.; trains ahead, 7.6 per cent.; engine failures, 6.8 per cent.; meeting and passing trains, 5.5 per cent., and wrecks, 4.8 per cent.

Arbitration of the demand of the members of the firemen's brotherhood working on 49 lines west of Chicago was begun in Chicago on May 16. The arbitration is being conducted under the Erdman act and the arbitrators are Timothy Shea, vice-president of the Brotherhood of Locomotive Firemen and Enginemen, representing this organization; W. R. Scott, assistant general manager of the Southern Pacific, selected by the railways, and Judge William Lea Chambers, who was selected by Messrs. Knapp and Niell. Judge Chambers is chairman of the board and umpire. He was at one time chief justice of the international court at Samoa and subsequently a member of the Spanish claims commission.

The number of surprise tests made on the Pennsylvania Railroad (26 divisions) during the past year is 300,000, or an average of over 800 a day. In about one-fourth of 1 per cent. of the cases faults were detected, but none of these was sufficient to do any damage. Eight divisions showed perfect records. An officer of the road says that in the three years that these tests have been carried out the percentage of failures has been decreasing and the number of accidents has decreased also, and by a far greater percentage. Only about one-sixth of the tests had to do with block signal rules; the rest were made in connection with rules governing flagmen, and the use of fuses, torpedoes and other signals; trains ahead of schedule time, and signalmen relieving each other.

The Canadian Pacific, according to Montreal papers, has issued an order that the employees in the general freight office at Montreal, beginning May 10, shall work from 8 a. m. to 5 p. m., instead of from 9 to 6; and on Saturdays shall stop work at 12 o'clock instead of 1. This is with a view to giving more daylight hours off in the afternoon than have been allowed in former years. In other words, the plan is the adoption of the English "light-saving scheme" without changing clocks. The company has under consideration the adoption of a similar change in other departments. It is said that the clerks have advocated this change, but now that it has been adopted they are worrying as to whether they will be able to get up early enough in the morning, especially those who come into the city by suburban trains and who may find the hours of the trains not so convenient under the new arrangement. An instrument of torture, known as an alarm clock, is said to be having a large sale now in Montreal.

A British Board of Trade accident report quite out of the ordinary is a short one which has just been issued, signed by Lieut.-Col. Druitt, on the death of a woman and her little boy, who were struck by a passenger train at a grade crossing at Townley, on the Lancashire & Yorkshire, March 6, at 9 o'clock in the evening. The crossing is close to the ends of the platforms at the station, and the gates across the roadway were closed, but the small gates for foot passengers were not closed; and the woman, being somewhat excited for fear of losing her train, walked on to the track dragging the boy, notwithstanding the warning shouted to her by the station master. The conclusion of the inspecting officer is that the accident was due entirely to misadventure; but he recommends that the company consider the advisability of having the small gate locked on the approach of trains. (It is regularly locked for non-stopping trains.) The company does not consider that the amount of traffic at the station warrants the cost of the erection of a foot bridge, and the inspector finds no fault with this conclusion. The report says that no previous accident is known to have occurred at this crossing; certainly none in the last 20 years—a statement which, if

made concerning a crossing close to a station on a busy railway in America would be received with incredulity.

Railway Matters in Washington.

Washington, May 18, 1910.

The administration bill is still being discussed in the Senate and the hope has been expressed that a vote would be reached this week, but at this writing it is impossible to predict this with any certainty. Yesterday the Senate spent five hours on the bill without making progress. The most important discussion thus far held in the Senate was that of last Friday, when the proposal to stiffen the long-and-short-haul law came up. After the presentation of a variety of amendments to that section, a compromise was adopted, by a vote of 56 to 10, striking out of section 4 of the existing law the words: "under substantially similar circumstances and conditions," and adding the following:

Provided, however, that the Interstate Commerce Commission may, from its knowledge, or from information or upon application, ascertain that the circumstances and conditions of the longer haul are dissimilar to the circumstances and conditions of the shorter haul, whether they result from competition by water or rail; then it may authorize a common carrier to charge less for the longer than for the shorter distance for the transportation of passengers or property; but in no event shall the authority be granted unless the commission is satisfied that all are just and reasonable and not unjust discriminatory nor unduly preferential or prejudicial, etc.

It is provided, however, that this section shall not go into effect for six months, nor in any case where application has been made to the commission for a modification of the clause, until such application has been acted on. After this amendment was adopted the senators set about trying to see what they had done; and, according to most of the reporters, each faction claimed that it had won a victory. In reality the principal change provided for in the proposed amendment seems to be that the commission will have discretion to decide what is and what is not a circumstance warranting the relaxation of the long-and-short-haul rule. As the law now stands any dissimilarity of conditions warrants a railway in ignoring the rule, the Supreme Court having thus decided. Under the proposed law the question as to whether or not existing conditions are dissimilar will depend on whether or not the commission "ascertains" that there is a dissimilarity.

There is still the prospect of a long discussion in conference and the administration senators were accused by their opponents of voting for propositions which they expected to have killed in conference. The House bill, as it came to the Senate last week, provides for the establishment of a commerce court and for making the long-and-short-haul section absolute; the commission is empowered to suspend increases of rates for 120 days, if complaint is made; the shipper is to have the right to route his freight; the making of a false quotation by a station agent is penalized; physical valuation of railways is authorized; telegraph and telephone companies are declared to be common carriers, subject to the law; a railway which has made low rates to meet water competition may not raise those rates without showing good cause; supervision of the issue of railway stocks and bonds is authorized, and the law is extended to apply to water transportation in Hawaii.

Express Rates.—A resolution has been introduced in the lower house of Congress to appoint a congressional committee to investigate express companies throughout the country. The Merchants' Association of New York has lately passed resolutions on this subject and the committee appointed at the conference of commercial bodies, held at the Merchants' Association rooms May 11, is to carry the subject to the Interstate Commerce Commission on behalf of the "Express Rate Conference of Associated Commercial Organizations of the United States." Among the bodies interested in this conference are the Boston Chamber of Commerce, the New Orleans Chamber of Commerce, the Baltimore Merchants and Manufacturers' Association and the Philadelphia association bearing the same name.

Inspection of Boilers.—The House Committee on interstate and foreign commerce has this week listened to arguments in favor of the bill, which has been before it all winter, providing for federal inspection of locomotive boilers. Herman E. Wills, representing the Brotherhood of Locomotive Engineers, argued in favor of the bill.

The Supreme Court has restored to the docket for reargument the suit which was begun by the Baltimore & Ohio to test the constitutionality of the law requiring railways to make monthly reports of overtime by trainmen and telegraphers.

Express Companies' Earnings Excessive.

The Merchants' Association of New York has submitted a report on the earnings and charges of express companies, and on the showing made in this report a large number of the merchants' associations and chambers of commerce of various cities have decided to send a petition to the Interstate Commerce Commission complaining of the rates and earnings of express companies. The report claims that the present method of making express charges is unfair and illogical. The service which the express company performs is largely a terminal service, and the cost of this service does not vary with the distance over which the express matter is shipped [there are some expenses incident to this service which would seem to vary with distance; as, for instance, wages of messenger accompanying express matter]. The express companies pay the railways a certain fixed percentage of their gross receipts on each package of express, and the railway furnishes the car, transportation, etc. Out of the charge of 50 cents for a package weighing 100 lbs. sent from Yonkers to New York City the railway company gets 23.85 cents for its service and the express company gets 26.15 cents. Out of the charge of $14.50 for 100 lbs. sent by express from San Francisco, Cal., to New York City the railway gets $6.9165 and the express company $7.5835. The claim of the Merchants' Association's report is that the cost of service of the express company on the shipment to San Francisco is little higher than the shipment to Yonkers.

The report then makes an examination of the assets and liabilities and receipts and expenses of the four express companies. It assumes that the receipts from investments should cover earnings on capital invested in other than the plant strictly necessary to conduct the express business, and finds that the net earnings from operation in the express business are exceedingly high. The report goes on the theory that the capital invested in real estate should be allowed a return of 5 per cent. charged out of earnings, and that the total amount of money invested in real estate should be excluded from net capital. On this theory the four express companies have the following capital. The net earnings shown are for 1909:

	*Net capital used in express business.	†Net earnings.	Percentage earned on capital.
Adams	$3,886,036	$1,519,641	39
American	1,716,004	1,809,254	106
United States	1,894,803	468,031	25
Wells-Fargo	4,488,453	3,175,502	71

*Exclusive of value of real estate.
†After deducting 5 per cent. for rate charged on value of real estate.

Increases of Pay.

Messrs. Clark and Morrissey, arbitrators, have awarded the conductors and brakemen on the Lake Shore & Michigan Southern and the Michigan Central, with few and slight exceptions, the standard rates of wages which were awarded on the New York Central (east of Buffalo) which were the same as the rates granted on the Baltimore & Ohio. On the N. Y. C. the rates fixed for the very long passenger runs were lower per mile than the standard, and, in the case of certain other runs the date on which the standard rates should take effect was made January 1, 1911. On the Lake Shore and the Michigan Central there are no such exceptions or postponements. Mr. Garrettson, chief of the conductors' brotherhood, says that the average increase on the Lake Shore and the Michigan Central is 9 per cent., and in the freight service 16 per cent., which means, we suppose, that in the passenger service it is much less than 9 per cent. He says that on the New York Central the average increase was 29 per cent., the rates on

that road having formerly been much lower than on the lines west of Buffalo. The percentage of increase on the Lackawanna was also high, but not so high as on the N. Y. C.

The foregoing statement was given out on Monday. On Tuesday it was announced that Messrs. Clark and Morrissey had rendered a similar decision in the cases of the Cleveland, Cincinnati, Chicago & St. Louis, the Chicago, Indiana & Southern and the Lake Erie & Western, except that in some cases the full increase is postponed until January 1, 1911, as was done on the New York Central. Messrs. Lee and Garrettson made the following joint statement

> The award we received to-day cleans up the entire situation in the arbitration of the demands. We have only three large roads to settle with—the Erie, whose trainmen and conductors vote on the question of a strike is being canvassed; the Central of New Jersey, which is now conferring with the men, and the Reading, the men on which have not yet started conferences with the officials.

The yard conductors and trainment of the Pittsburgh & Lake Erie are to receive the same rates of pay as those prevailing in other yards in that territory; that is to say, one cent an hour less than the Chicago rates.

According to a press despatch, the conductors, brakemen, enginemen and firemen of the New York, Philadelphia & Norfolk have been granted a substantial increase in pay over and above the 6 per cent. which they received in the recent general advance.

The Central New England has raised the pay of its employees to the basis of the rates recently adopted on the New York, New Haven & Hartford.

The New York, New Haven & Hartford, following extended conferences with representatives of the telegraphers brotherhood, has agreed to raise the pay of telegraphers and signalmen. According to reports, signalmen in towers will receive 5 per cent. increase and telegraphers in stations 7 per cent.

The Baltimore & Ohio Southwestern has increased the pay of its conductors and trainmen to the basis recently adopted on the Baltimore & Ohio. It is said that the increases range from 11 per cent. to 30 per cent.

The Cincinnati, New Orleans & Texas Pacific has made an agreement with its shopmen by which about 1,600 employees in this department will have their pay increased 3½ per cent.

A Long Delayed Act of Justice.

W. F. Baker, police commissioner of New York City, has issued a general order designed to put a stop to the outrageous arrests of innocent locomotive runners and motormen that have been common in the city. The order says:

"In the case of persons injured or killed by railway engines or cars or street cars or trucks, or the like, the engineer, motorman, driver, or other employee should not be arrested without a warrant, unless it be obvious on the facts, after careful observation or examination, that the case is not one of accident, but that he is guilty of manslaughter or some other felony, intentionally or through gross negligence.

"Let the practice of arresting such persons without warrant cease, unless as aforesaid. The proper way is to make a thorough examination of the facts and then apply to a magistrate for a warrant, unless the case be one in which the person is plainly guilty of a felony. In the case of all such accidents, let full information thereof be secured, with the names and addresses of all witnesses thereto, and the names and addresses of the engineer, motorman, or driver, as the case may be, and entered on the blotter."

Valuation in Texas.

The order of the Federal court at Dallas, Tex., requiring that the International & Great Northern be sold at foreclosure to satisfy the second and third mortgages, subject to the first mortgage, has called forth another statement from the railway commission of Texas regarding the revaluation of this property. The letter, which was written by Chairman Mayfield for the commission, states that the stock and bond law of the state was passed after an exhaustive discussion and was predicated on the theory that the securities outstanding of the railways of the state consisted largely of water and operated as an "unjust and outrageous burden upon those who pay freight and passenger charges to railway companies." It is stated that attention has been repeatedly called by the commission to this state of affairs and that the appointment of receivers has been asked for "to sell out these railways in order to get rid of this fictitious indebtedness, that the people might be enabled to obtain reasonable freight rates and at the same time justify the same before the Federal courts." It is indicated that the plight of those who have claims against the railways mentioned, excites profound commisseration of the commission, but "it ought not to be expected that the commission would discredit itself and neutralize the virtues of the stock and bond law in order to bring about a condition that will compel the payment of such claims."

Condition in Southern Mexico.

A director of the Pan-American Railway says that the connection between the Pan-American and Guatemalan railways, by the bridge over the Suchiate river, will be completed within ninety days. He says: "This road promises to be an important link in a transcontinental system. The road is owned by American interests. A million dollars will be spent on it. The territory served is the most productive in the entire republic of Mexico. The climate is hot, but not unhealthy. The country produces coffee, cattle, copper, cacao, caoutchouc, sugar cane, pineapples, oranges, and all kinds of tropical fruits, and hard woods.

"A number of large rubber plantations are along the line. The one at Zacualpa is claimed to be the largest in the world, having between eight and ten million growing trees. Land in this section is now selling for one-tenth of what similarly productive lands in southern California can be bought, and it is estimated that ten acres of land in this section can create more wealth than eighty acres of the best agricultural land in the Middle West."

Public and Private Enterprise Contrasted.

The latest announcement is that the great central library in Manhattan will be completed and opened in about a year.

Promises like that have been made before, but the chances are that the great marble palace at Forty-second street and Fifth avenue will be available as now planned. * * *

The history of the building furnishes an instructive contrast between the methods of municipal construction and those of private business. The destruction of the old reservoir preparatory to the construction of the library began in 1897, and since the building contract in 1901, the library cost has risen from $2,500,000 to $10,000,000. Long after the old reservoir was down and the library under way, the Pennsylvania Railroad began the construction of the great marble palace which is to serve as its station, at Seventh avenue and Thirty-first street. That building is at least as large (much larger); its construction must have been quite as difficult; the completed work is a noble and dignified example of architecture, and yet the building will be ready for use this summer. Private construction has been rapid and efficient; municipal construction has been slow and halting, with changes of plan during its progress as well as the usual delays in working.—*Brooklyn Eagle.*

Hours-of-Service Law to be Enforced.

Secretary E. A. Moseley, of the Interstate Commerce Commission, has written a letter to the railways notifying them that the law limiting the working hours of trainmen and telegraphers is to be enforced. He says: "Some of the railways in reliance upon the opinion of the circuit court of appeals for the seventh circuit, reversing the decision of Judge Landis in the case against the Atchison, Topeka & Santa Fe, have been violating the provisions of the hours of service law by splitting the period of service into tricks, or sub-periods, in such manner as to stretch out the full period to a longer number of hours than that permitted by the statute.

"It is but fair that these and all other railways should

be notified that on April 25, the Supreme Court of the United States issued a writ of certiorari, directed to the circuit court of appeals of the seventh circuit, requiring it to transmit the record in the case against the Atchison to the Supreme Court for review.

"The issuance of this writ indicates that there is great doubt as to the maintenance of the position taken by the circuit court of appeals, and prima facie shows a disposition on the part of the Supreme Court to sustain the hours of service law according to its scope and tenor, and to the purpose and intent of its framers.

"As the Interstate Commerce Commission is charged by law with the duty of enforcing the provisions of this act, it is deemed proper to notify you at this time that if violations of returns and provisions of that act are continued the commission will consider it to be its duty to institute proceedings in the various courts having jurisdiction of the same to enforce the law."

Capitalization and Earnings of Industrial Companies.

The following figures are taken from the advance sheets of Poor's Manual for Industrials, a new book to be published by the Poor's Manual Co. The figures are only for companies making returns to Poor's so that while the number of companies refusing to make returns was comparatively small the total figures are only approximately correct for all corporations in the United States.

Capitalization of Corporations in the United States.

	Stock.	Bonds.	Total.
Light, water and power companies	$2,108,233,079	$1,392,653,050	$3,500,886,129
Mining companies	2,001,925,586	66,850,265	2,068,775,851
Telephone and telegraph companies	788,709,274	352,025,050	1,140,734,324
Manufacturing and miscellaneous companies.	8,233,035,721	2,585,694,207	10,818,729,928
Total	$13,131,903,660	$4,397,222,572	$17,529,126,232

Interest and Dividends.

	Interest.	Rate.	Dividends.	Rate.
Light, water & power companies	$69,219,335	4.97	$63,867,681	3.03
Mining companies	3,741,783	5.59	58,866,089	2.94
Telephone & telegraph companies	18,463,462	5.24	37,356,517	4.73
Mfg. & miscellaneous companies	140,251,087	5.42	368,721,516	4.47
Total	$231,675,667	5.27	$528,811,803	4.02

Income Account of All Companies Making Complete Returns.

	Total.
Gross earnings	$2,165,786,215
Operating expenses	1,629,171,411
Net earnings	$536,614,804
Interest	109,483,337
Balance	$427,131,467
Dividends reported	227,787,831
*Other deductions	54,570,981
Surplus	$144,772,655
Stock	4,924,774,780
Bonds	2,238,966,992
Total	$7,163,741,772

*May include dividends unreported.

Percentage of Earnings and Expenses.

	Light, water and power section.	Mining section.	Telephone and telegraph section.	Manufacturing and miscellaneous section.	Total.
P.c. gross to capital...	15.27	32.79	25.50	37.51	30.23
" net to capital.....	6.84	9.35	9.34	7.32	7.49
" expenses to gross.	55.20	71.49	63.34	80.48	75.22
" interest to bonds..	4.88	5.07	5.24	4.81	4.88
" dividends to stock.	3.99	5.29	5.67	4.63	4.62

Seniority of Telegraphers on the Pennsylvania.

The new telegraph regulations on the Pennsylvania Railroad make the following changes:

Supplementary to regulation No. 2: "All temporary and prolonged vacancies of six months or more duration will be bulletined in the same manner as new positions and permanent vacancies, and filled by the senior operator making application in writing."

Supplementary to regulation No. 5: "When an office is closed or reduction of force is made, seniority on the division entitles the employee affected to any position held by another whose seniority is less than his own; and the employee affected shall have his right, regardless of the rate of pay he formerly received or the rate of pay the position to which his senior rights entitle him. Such senior rights, however, shall not apply to offices where priority exists."

Contributions to the Burlington's "Conscience" Fund.

J. N. Redfern, superintendent of the relief department of the Chicago, Burlington & Quincy, this week received two letters from Galesburg, Ill., signed "W. H." enclosing, one of them $65, and the other $100, which the writer said he wrongfully drew out of the relief department on sick and accident cases, which did not come within the rules of the department. In the first letter, which contained the $65, he said that other instalments would follow at regular intervals. He repeated this statement on sending the second instalment and requested that receipt of the money should be announced in the Chicago morning papers so that he might know it had been received.

Telephone Despatching on the Santa Fe.

The Atchison, Topeka & Santa Fe is engaged in constructing telephone despatching circuits which, when completed, will put all of its main lines under telephone operation. The mileage of first circuits in service is 2,457.8, and the mileage of second circuits in service is 65.9, making a grand total of 2,523.7 miles. The mileage of first circuits under construction is 3,171.9 and the mileage of second circuits, 1,253 miles, making a grand total under construction of 4,424.4 miles, and a grand total of 6,948 miles of telephone miles will be in use when present installations are finished.

Track Inspection.

In making the 1909 inspection of track of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern, four committees were appointed, and for each committee the following ratios of relative value were assumed by which to multiply the figures showing average condition of track of a given section:

Committee No. 1—Line		20
	Surface	25— 45
Committee No. 2—Joints		15
	Spacing Ties	10— 25
Committee No. 3—Drainage, Ditches and Banks		15
	Policing	5— 20
Committee No. 4—Spiking		5
	Switches and Sidings	5— 10
Total		100

The best two sections on the Alabama Great Southern got ratings of 92.55 and 88.85, respectively, while the corresponding C. N. O. & T. P. figures were 91.21 and 90.55. The general average condition by divisions was 81.15 on the A. G. S. and 85.85 on the C. N O. & T. P.

Snow Sheds and Re-alinement on the Great Northern in the Cascades.

An officer of the Great Northern writes that so far as it is now known this company will build about one mile of new wood snow sheds on the Cascade Mountains. In addition to this there will be a change of line in the vicinity of Berne, Wash., the first station east of the Cascade tunnel, about 6,000 ft. long, which, in addition to very materially improving the alinement, will avoid some points where there have been bad snow slides in the past and save the expense of putting in snow sheds there. In addition to the foregoing there probably will be built about 3,000 ft. of concrete snow shedding near Wellington, where the recent catastrophe took place. The wooden sheds before mentioned are to protect places which in

the past have been entirely free of snow slides, or have only had slides which have been easily handled by the plows without seriously interfering with traffic.

Western Railway Club.

The annual meeting of the Western Railway Club was held at the Auditorium Hotel, Chicago, Monday evening, May 16. The secretary reported a membership of 1,516, and the treasurer a balance of cash on hand of $1,303. The following officers were elected for the ensuing year: President, J. F. De Voy, assistant superintendent of motive power, Chicago, Milwaukee & St. Paul; first vice-president, C. B. Young, mechanical engineer, Chicago, Burlington & Quincy; second vice-president, T. H. Goodnow, master car builder, Lake Shore & Michigan Southern; secretary and treasurer, J. W. Taylor; directors, H. La Rue, G. H. Bryant and W. B. Hall; trustees, D. L. Barnes, W. F. M. Goss, C. A. Seley and F. W. Sargent. The members were entertained by an illustrated lecture on Early Railroading and Other Things In and Around Chicago, by Frank L. Smith, cashier of the Corn Exchange National Bank, Chicago. The members presented Secretary Taylor with a new purse containing a large roll of new greenbacks in recognition of years of efficient service.

Transportation Club of Toledo.

The officers of this club for the ensuing year are: President, E. N. Kendell, commercial agent B. & O.; first vice-president, Thomas Conlon, New York Central lines; second vice-president, Walter Blank, American Can Co.; treasurer, E. L. Adams, Red Line Fast Freight; secretary, L. G. Macomber, Woolson Spice Company.

New York Railroad Club.

At the meeting to be held on Friday, May 20, a paper entitled "The Inequalities of Expansion in Locomotive Boilers and Possibility of Eliminating the Bad Effect Therefrom," by D. R. MacBain, assistant superintendent motive power, New York Central & Hudson River, will be presented and illustrated with lantern slides.

American Society of Civil Engineers.

At the meeting of May 18 a paper entitled "Pressure Resistance and Stability of Earth," by J. C. Meem, M. Am. Soc. C. E., was presented for discussion and illustrated with lantern slides. This paper was printed in the April number of the proceedings.

Chicago Railway Club.

At the annual election on May 14, Charles G. Hall, general advertising agent of the Chicago & North Western, was elected president. The other nominees mentioned in the *Railway Age Gazette* of April 29, page 1104, were also elected.

Brotherhood of Railway Station Employees.

At the convention of the Brotherhood of Railway Station Employees at Portland, Me., May 12, P. J. Doyle, of Boston, was elected president for the ensuing year; secretary, B. B. Small, Portland, Me.

American Society of Demurrage Officers.

By letter ballot, the time and meeting place of this association has been changed from Niagara Falls, Ont., June 7, to Omaha, Neb., June 17.

Argentine Centennial Exposition

The International Exhibition of Railways and Land Transport will be held at Buenos Aires, Argentine Republic, from May until November, 1910.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Railway Association.—W. F. Allen, 24 Park Place, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues; N. Y.; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—H. C. Donecker, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
General Superintendents' Assoc. of Chicago.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wed.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting October 11-13, Atlantic City.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio.
Richmond Railroad Club.—F. O. Robinson; 2d Monday; Richmond.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Ry. Financial Officers.—C. Nyquist, La Salle St. Sta., Chicago.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
Train Despatchers' Assoc. of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
Transportation Club of Toledo.—L. G. Macomber, Woolsen Spice Co., Toledo.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

Within the past ten days nearly every railway in Indiana has sent to the State Railroad Commission new freight tariffs, many of which show increases of 8 cents a ton or more in the rates on coal.

Beginning May 22 the Central of New Jersey, in connection with the Philadelphia & Reading, will run a through fast train each way between New York and Harrisburg by way of Allentown, 180 miles. The time through will be 4 hours 50 minutes.

The number of passengers carried in the subway trains of the Interborough Rapid Transit Co., New York City, in the ten months ending April 30 last, was 467,848,217, which is an increase of 42,168,105 over the number carried in the corresponding period of the preceding year.

The attorneys-general of various states are conferring at St. Paul, Minn., this week on the question whether state governments should take action on the complaint against the rates of express companies, which has recently been formulated by the Merchants' Association of New York City.—(See Washington letter).

Beginning May 22, the Black Diamond Express of the Lehigh Valley will be made up wholly of parlor cars, and the time between New York and Buffalo will be shortened 30 minutes. A new train, the Central New York Express, will be put on to take a part of the travel. The night train leaving New York at 8 o'clock will start an hour later and reach Buffalo at the same time as now.

The Canadian Pacific announces that beginning May 29 trains 1 and 2 will be run through between Montreal and the Pacific coast, making two through trains each way daily. During the winter these trains have not been run west of Calgary, and from Calgary to Revelstoke, 267 miles, there has been only one train a day each way. A new train is to be put on between St. Paul and Seattle via Calgary.

The Land and Industrial Department of the Southern Railway has just issued its annual directory of textile mills along the Southern and the Mobile & Ohio, a book of 32 pages. It gives the names and capacity of all mills on the lines, the character of output and the kind of power used. The textile mills number 758, and contain 188,723 looms and 8,277,866 spindles. At the beginning of this year there were under construction 17 new mills.

At a conference in New York City last week between representatives of the Trunk Line Association, the Central Freight Association and the New Orleans lines, an agreement was reached, it is said, on a basis for the readjustment of rates on sugar in carloads from the seaboard to western interior points, which have been unsettled since about a year ago, when the Illinois Central made a reduction of 4 cents per 100 lbs. from New Orleans.

Shippers Protest Against Advances in Freight Rates.

A meeting of shippers representing commercial organization in all parts of the country and especially in the middle west, was held in Chicago on May 17 to protest against advances in freight rates. The meeting was called to order by W. H. Burns, vice-president of the Illinois Manufacturers' Association, and was addressed by Mr. Burns, Congressman James McLachlan, of California; William D. Haynie, counsel of the Illinois Manufacturers' Association, and others. Mr. McLachlan advocated legislation for the establishment of a government steamship line from the west coast of Panama to San Francisco as a means of regulating freight rates. This was opposed by delegates who thought that this would be the first step toward general government ownership of transportation facilities. This brought on a discussion in which one delegate at great length, and to the evident annoyance of the leaders of the movement, vigorously advocated government ownership of railways. A permanent organization was formed by the election of J. E. Wilder, of Chicago, as chairman, and E. E. Williamson, of Cincinnati, as secretary.

A resolution was adopted demanding that the question of proposed advances in freight rates be arbitrated before the Interstate Commerce Commission, and a conference committee of seventeen was chosen to "carry on the fight." The committee includes C. C. Barber, Tiffin, Ohio; Andrew F. Wilson, New York; John Kirby, Jr., Dayton, Ohio; J. M. Bellville, Pittsburg; S. C. Meade, New York.

At a preliminary meeting on Monday delegates from 37 commercial organizations sent a long telegram to President McCrea, of the Pennsylvania. The message recalled Mr. McCrea's telegram of October 18, 1909, in which he said that no general increase in freight rates was under consideration. Attention was called to the fact that Francis Le Bau, freight traffic manager of the New York Central lines recently was quoted as saying that both class and commodity rates in eastern territory would be advanced. It was stated that this statement differed from that of Mr. McCrea, and he was asked to state explicitly his present views on the subject.

The Farmer, the Railway and the Middleman.

It is not prices received by farmers which make living expenses high, but the profits of the dealers handling the foods between the farmer and consumer.

The Florida farmer receives $2.25 for a bushel of green beans, the railway gets 50 cents for the 800 mile haul to New York and the consumer pays $6.40 for this same bushel of beans. There is 35 per cent. for the grower, 8 per cent. for the carrier and 57 per cent. for the dealer. This is not a fair division.

Thirty cents a dozen was the average price of eggs in New York last year, while the farmers of Arkansas and Missouri received 15 cents. The freight was two cents a dozen. The men who receive the eggs at a freight station in New York and deliver them to the consumer take 13 cents a dozen profit.

The rice farmer of Texas, Louisiana and Arkansas gets 2½ cents a pound for the grain and the consumer in New York pays 10 cents a pound for this rice. The freight is 1½ cents a pound. If the rice farmer were paid 3½ cents (one cent more than he is now getting) and the dealer took one cent profit, (which is 25 per cent.) the New York consumer would get 20 pounds of rice for a dollar, instead of 10 pounds as now. * * * The farmers and the railways have something to co-operate with and something to co-operate for. The products and supplies of the farms constitute 40 per cent. of the freight of the western railways. It is to our interest to work with you in bettering your marketing facilities, for the more prosperous you are the more business you have for us. In working out economies, the consumer is also benefited. First, let us eliminate the men who talk radical ideas to foster hatred and malice between the producer and transporter. Taking your products from your farms to the market and in aiding you to get the best prices are the ways in which we can profitably work together. We do not need any middle agent. We can talk straight at one another and save money by doing so. In short, let us work together.—From an address by B. F. Yoakum, chairman of the St. Louis & San Francisco, before the Farmers' Union at St. Louis.

Increases in New York City Commutation Fares.

The Erie Railroad announces that season ticket fares between New York City and suburban points are to be increased. The tariffs have not yet been made public, but the percentages of increase as given out, appear to be somewhat less than those recently announced by the New York, New Haven & Hartford. Reporters inquiring at the office of the Trunk Line Association learn that the Pennsylvania and the Central of New Jersey are intending to make similar increases.

President Ralph Peters, of the Long Island, replying to a committee of passengers, says that when the trains of his road run through to Seventh avenue, New York City, the season ticket fares will probably be made about $2 a month higher than the present rates to Long Island City. To the Long Island city rate, however, the passenger has to add about $1 a month for fares on the ferryboats.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1910.
(See also issues of May 6 and 13.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$257,704	$79,464	$370,769	$36,740	$66,974	$9,736	$120,657	$8,349	$242,456	$128,313	—$1,563	$11,522	$115,228	$26,781
Buffalo, Rochester & Pittsburgh	567	664,174	73,864	757,935	124,025	156,578	10,649	220,390	12,687	524,329	233,606	211	15,000	218,817	54,387
Central Vermont	411	237,753	62,281	329,075	28,575	48,492	6,990	148,269	6,655	238,981	90,094	369	10,116	80,347	10,960
Chicago & Alton	998	778,920	303,207	1,172,492	99,873	142,159	39,818	443,137	30,957	755,944	416,548	1,364	49,000	368,912	—2,904
Chicago & Eastern Illinois	965	1,010,748	149,401	1,223,060	119,773	198,568	20,705	422,283	31,405	792,734	430,326	—1,065	29,900	399,361	66,624
Chicago & Erie	269	389,547	59,310	485,944	36,126	102,699	16,992	213,062	7,798	376,677	109,267	.....	10,939	98,328	60,135
Chicago, Indiana & Southern	340	379,254	19,797	408,977	35,644	77,379	9,032	144,857	9,285	276,197	132,780	80	13,500	119,360	76,465
Chicago, Indianapolis & Louisville	615	384,769	114,534	542,856	67,971	76,366	16,730	197,235	17,409	375,711	167,146	.....	26,200	140,946	35,974
Chicago, Milwaukee & Puget Sound	1,466*	885,218	104,890	1,004,595	59,366	109,995	25,899	337,757	10,466	543,483	461,112	3,984	22,560	442,536	.....
Chicago, Milwaukee & St. Paul	7,511	4,269,558	1,122,584	5,793,837	434,236	521,831	84,098	2,361,793	94,762	3,496,720	2,297,117	5,727	216,041	2,086,804	170,884
Cincinnati, New Orleans & Texas Pac	337	623,433	131,639	793,924	63,991	136,906	21,165	219,766	18,603	460,431	333,493	612	20,000	314,105	80,473
Cleve., Cincinnati, Chicago & St. L.	1,982	1,901,355	566,386	2,690,818	307,164	430,268	76,457	1,036,838	54,083	1,904,810	786,008	—8,328	74,000	703,680	226,235
Elgin, Joliet & Eastern	781	817,538	6	881,458	69,241	167,098	4,468	291,448	12,070	544,325	337,133	.....	22,450	314,683	30,955
Florida East Coast	583	225,976	249,414	533,601	45,282	41,982	13,028	123,223	8,618	232,133	301,468	.....	15,234	286,234	2,636
Fort Worth & Denver City	454	275,564	122,349	417,774	43,238	56,642	5,787	129,714	14,911	250,292	167,482	2,076	9,938	155,468	62,600
Galveston, Harrisburg & San Antonio	1,338	633,965	228,348	911,804	169,954	115,172	26,005	330,321	27,723	669,175	242,629	—782	28,800	213,047	83,157
Grand Rapids & Indiana	587	306,740	115,787	451,455	47,314	80,579	10,115	185,637	13,125	336,770	114,685	—326	23,674	90,685	11,446
Great Northern	7,129†	3,287,664	1,089,932	4,667,643	645,180	680,702	80,832	1,499,894	78,753	2,985,362	1,682,281	—12,668	211,919	1,457,694	13,538
Houston & Texas Central	789	276,518	104,149	415,682	62,714	58,797	15,724	200,356	21,550	359,141	56,541	.....	16,485	40,056	—28,177
International & Great Northern	1,159	537,207	152,075	731,189	129,075	150,053	19,583	328,267	23,048	650,026	81,163	.....	20,000	61,163	33,269
Iowa Central	558	272,823	44,833	328,926	25,545	46,028	7,360	141,113	10,258	230,304	98,622	.....	9,725	88,897	23,728
Lake Erie & Western	886	394,382	61,898	479,717	74,217	89,835	12,514	169,609	10,858	357,033	122,684	.....	17,950	104,734	78,424
Lake Shore & Michigan Southern	1,662‡	2,983,882	806,807	4,226,539	497,363	640,662	92,581	1,495,262	82,871	2,808,739	1,417,800	4,213	135,000	1,278,587	153,943
Long Island	390	275,071	377,773	679,555	95,679	112,907	11,287	339,828	17,494	577,195	102,360	36,525	33,232	105,653	30,481
Michigan Central	1,746	1,798,186	522,699	2,572,946	281,203	346,575	62,164	980,408	49,378	853,218	853,218	—4,899	113,000	735,319	157,018
Minneapolis & St. Louis	1,027	295,182	91,810	414,427	33,518	46,041	10,601	168,069	12,804	271,033	143,394	115	16,943	126,336	10,089
New York Central & Hudson River	3,588	4,987,670	2,190,530	7,989,742	1,466,393	1,652,260	239,491	3,283,909	202,779	6,844,832	1,144,910	42,622	364,451	823,081	—819,574
Peoria & Eastern	351	202,865	54,811	277,718	32,811	39,619	5,105	101,680	5,446	184,661	93,057	.....	9,200	83,857	30,076
Pittsburgh & Lake Erie	191	1,371,916	119,837	1,524,745	160,016	127,856	15,434	341,106	23,607	668,019	856,726	—572	27,200	828,954	471,650
Rutland	468	142,611	75,705	247,013	30,865	32,807	6,008	103,122	6,487	179,289	67,724	.....	9,072	58,652	17,680
Seaboard Air Line	2,995	1,436,095	419,245	2,035,274	261,897	263,351	64,402	617,807	45,931	1,253,388	781,886	—1,883	67,765	712,238	102,719
Texas & New Orleans	458	222,945	91,264	333,516	65,873	39,113	7,307	122,116	10,017	244,426	89,090	1,387	11,835	78,642	16,622
Toledo & Ohio Central	441	341,090	43,242	397,123	53,056	67,646	5,346	119,709	6,005	251,762	145,361	—3,864	14,971	126,526	75,855
Toledo, St. Louis & Western	451	265,747	31,757	316,479	36,651	44,051	7,898	107,647	8,855	205,102	111,377	.....	13,900	97,477	—5,381
West Jersey & Seashore	356	157,010	257,506	436,875	85,449	56,349	11,089	193,830	9,471	356,188	80,687	6,621	20,037	54,029	36,434
Wheeling & Lake Erie	458	535,761	40,738	609,589	62,481	118,811	6,764	207,785	12,563	408,404	201,185	4,687	21,096	184,776	87,895
NINE MONTHS OF FISCAL YEAR, 1910.															
Alabama Great Southern	309	$2,038,853	$785,091	$3,094,957	$364,754	$687,148	$81,470	$915,762	$81,751	$2,130,885	$964,072	—$5,835	$101,982	$856,255	$160,454
Buffalo, Rochester & Pittsburgh	567	5,741,694	739,239	6,774,203	750,335	1,392,997	83,978	1,866,095	117,484	4,210,889	2,563,314	913	121,000	2,443,227	1,009,844
Central Vermont	411	1,846,852	783,339	2,833,045	318,370	514,291	76,737	1,178,572	65,054	2,153,024	680,021	6,818	91,050	595,789	197,372
Chicago & Alton	998	6,421,212	3,147,874	10,374,323	1,207,212	1,201,637	355,354	3,585,871	276,107	6,626,181	3,748,142	—10,815	322,000	3,415,327	—251,558
Chicago & Eastern Illinois	965	7,432,934	1,396,357	9,292,568	872,786	1,698,607	198,783	3,163,073	290,928	6,224,177	3,068,391	—12,110	272,424	2,783,857	559,695
Chicago & Erie	269	3,007,163	595,675	3,927,826	422,389	818,172	143,786	1,642,803	80,160	3,107,310	820,516	.....	98,446	722,070	370,188
Chicago, Indiana & Southern	340	2,636,366	199,581	2,899,648	378,739	506,686	77,273	977,067	74,322	2,014,087	885,561	246	115,003	770,804	360,901
Chicago, Indianapolis & Louisville	615	3,005,235	1,080,555	4,455,383	602,588	600,331	127,542	1,452,922	136,039	2,919,422	1,535,961	.....	192,100	1,343,861	399,568
Chicago, Milwaukee & Puget Sound	1,466*	6,141,545	634,231	6,903,801	332,870	492,901	181,634	2,225,060	92,377	3,324,842	3,578,959	23,779	167,681	3,435,057	.....
Chicago, Milwaukee & St. Paul	7,511	33,882,398	10,808,037	48,494,369	6,350,756	5,760,648	955,169	19,595,572	855,892	33,518,037	14,976,332	170,204	1,881,251	13,265,285	—1,875,763
Cincinnati, New Orleans & Texas Pac	337	5,186,129	1,179,722	6,699,961	730,656	1,251,625	176,612	1,825,887	161,241	4,146,021	2,553,940	734	180,000	2,373,206	577,066
Cleve., Cincinnati, Chicago & St. L.	1,982	14,828,994	5,582,237	22,336,339	2,402,596	3,664,306	721,402	8,333,726	430,041	15,552,071	6,784,268	—57,272	656,328	6,070,668	1,622,695
Elgin, Joliet & Eastern	781	6,452,239	152	6,991,110	659,110	1,344,621	37,603	2,146,330	138,934	4,326,598	2,665,205	.....	136,450	2,528,755	880,080
Florida East Coast	583	1,105,018	1,001,503	2,416,720	326,380	359,463	51,282	800,471	75,230	1,612,826	803,894	.....	109,501	694,393	202,204
Fort Worth & Denver City	454	2,537,904	1,311,967	4,025,368	418,850	507,850	59,157	1,193,008	130,796	2,309,661	1,715,707	4,385	76,334	1,634,989	409,053
Galveston, Harrisburg & San Antonio	1,338	5,681,375	1,944,185	8,025,155	1,108,387	1,142,273	229,919	2,934,479	245,116	5,660,174	2,364,981	20,011	264,108	2,080,862	23,213
Grand Rapids & Indiana	587	2,336,714	1,271,096	3,859,058	455,544	621,677	96,734	1,536,811	120,208	2,830,975	1,028,083	—2,377	197,804	827,902	15,878
Great Northern	7,129†	34,300,987	10,637,594	47,502,310	7,068,883	5,562,501	673,893	13,328,177	735,695	27,369,149	20,133,161	227,105	2,613,323	17,747,243	3,003,768
Houston & Texas Central	789	3,094,372	1,085,691	4,481,438	574,007	507,749	155,423	1,747,347	177,331	3,161,857	1,319,581	.....	133,152	1,186,429	—56,185
International & Great Northern	1,159	4,721,125	1,469,938	6,598,259	1,091,296	1,089,520	174,478	2,723,983	193,060	5,272,337	1,325,922	.....	192,000	1,133,922	66,720
Iowa Central	558	2,051,899	415,690	2,576,657	307,082	392,659	77,511	1,086,305	81,400	1,944,957	631,699	.....	69,152	562,547	139,771
Lake Erie & Western	886	3,346,876	643,012	4,201,309	547,062	734,924	114,783	1,466,785	93,695	2,957,249	1,244,060	.....	164,196	1,079,864	560,587
Lake Shore & Michigan Southern	1,662‡	24,440,416	8,120,609	36,577,430	4,204,202	5,397,166	860,052	11,630,657	577,845	22,669,922	13,907,508	52,037	1,113,905	12,741,546	2,257,893
Long Island	390	2,260,127	4,255,223	6,827,251	733,806	931,083	130,758	2,958,054	169,136	4,922,837	1,904,414	609,970	299,092	2,215,293	610,598
Michigan Central	1,746	14,462,363	5,210,984	21,686,014	2,645,510	2,825,327	615,383	8,020,735	378,089	14,485,044	7,200,970	32,962	880,532	6,287,476	1,307,416
Minneapolis & St. Louis	1,027	2,555,744	923,705	3,724,125	377,509	429,769	114,456	1,465,155	120,400	2,507,289	1,216,836	—641	170,437	1,045,758	55,489
New York Central & Hudson River	3,588	42,877,916	22,156,785	72,396,121	9,415,690	12,185,554	1,858,415	26,387,497	1,621,207	51,468,363	20,927,758	186,290	3,356,748	17,757,300	2,619,142
Peoria & Eastern	351	1,768,436	532,548	2,471,792	266,894	436,154	48,390	869,659	46,273	1,667,370	804,422	.....	79,394	725,028	204,991
Pittsburgh & Lake Erie	191	11,670,554	1,108,880	13,105,049	1,226,657	1,017,032	124,674	2,809,213	187,137	5,364,713	7,740,336	3,410	181,837	7,555,089	3,238,623
Rutland	468	1,302,394	824,227	2,379,536	326,851	332,788	57,672	879,681	50,775	1,647,767	731,769	.....	88,098	643,671	128,183
Seaboard Air Line	2,995	10,331,275	3,249,545	14,967,204	2,039,103	2,032,673	522,674	4,706,361	449,570	9,750,381	5,216,823	19,666	545,109	4,652,047	1,120,369
Texas & New Orleans	458	1,955,722	745,825	2,872,729	436,440	447,127	62,713	1,065,376	80,818	2,092,474	780,255	11,556	111,800	680,011	190,050
Toledo & Ohio Central	441	2,687,109	466,431	3,285,488	433,766	535,748	50,310	1,023,021	58,911	2,101,756	1,183,732	54,729	128,866	1,109,595	94,585
Toledo, St. Louis & Western	451	2,336,737	343,516	2,853,346	334,251	418,930	66,917	929,165	78,774	1,828,037	1,025,309	.....	111,800	913,509	69,883
West Jersey & Seashore	356	1,248,579	2,671,469	4,197,440	729,506	499,089	120,650	1,713,900	78,670	3,141,815	1,055,625	2,348	180,334	877,639	139,901
Wheeling & Lake Erie	458	4,456,708	432,479	5,242,605	520,183	1,134,422	62,989	1,794,883	123,847	3,636,324	1,606,281	76,847	199,426	1,483,702	568,354

*Began operations on Aug. 1, 1909. †Mileage operated on March 31, 1909, 6,960 miles. ‡Mileage operated on March 31, 1909, 1,511 miles. — Indicates Deficits, Losses and Decreases.

A Reduction to El Paso.

Under a new freight routing agreement between the El Paso & Southwestern and the Rock Island, the rate on freight from New York to El Paso has been cut practically to half of the former rate. About 45 El Paso merchants have agreed to use the new route and, instead of paying the all-rail rate of $1.84 (first class) from New York, they now get it at 90 cents, effecting a saving of 94 cents; and it is probable that the new rate will be extended to points in Arizona. The rate from New York to El Paso, by all-rail route is $1.84 (first class). The Southwestern and Rock Island roads now propose to have the freight shipped by the Texas Steamship Company to Texas City, a port eight miles north of Galveston. The steamship rate from New York to Texas City is only 25 cents (first class). It is proposed to send the freight from this point over the Trinity & Brazos to Fort Worth, from there to Tucumcari over the Rock Island and from Tucumcari to El Paso over the Southwestern. When the freight is taken from the steamers at Texas City, it is rebilled by a forwarding agent there, on the authority of merchants whose goods are to be handled, for which a charge of 1 cent per 100 lbs. is made by the transfer agent. The classification in Texas as established by the railway commission permits the making up of carload lots from Galveston or Texas City to El Paso by the mixing of freight.

The Texas Steamship Company has seven ships plying between New York and Texas City, with an eight-day run between port and port. If faster service is desired, the Morgan or the Mallory lines may be used, whose ships ply between New York and Galveston. The Morgan line ships make the run in five days and the company docks three ships a week at Galveston; the Mallory line ships make the run in six days and this company docks two boats a week at Galveston. The rate on the Morgan and Mallory lines, however, is 50 cents from New York to Galveston and the charge for handling and forwarding at Galveston is five cents per 100 lbs. making the rate over these lines from New York to El Paso $1.19, as against 90 cents if handled on the line of the Texas Steamship Company.—*El Paso Herald.*

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 70, covering car balance and performance for December, 1909, says:

"December was unusually severe on railway operation, and the effects are plainly reflected in the performance figures.

	Average miles per day.		Average ton-miles per car per day		Average earnings per car per day.	
	Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.
	cars.	cars.	cars.	cars.	cars.	cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908 ...	19.6	24.5	258	324	1.83	2.29
May, 1908	19.3	24.8	254	329	1.72	2.22
June, 1908 ...	19.6	24.7	276	347	1.88	2.37
July, 1908 ...	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909.	21.7	25.9	306	365	2.04	2.43
March, 1909...	22.7	27.2	330	393	2.19	2.61
April, 1909 ...	22.4	26.8	310	371	2.13	2.54
May, 1909	22.5	26.8	304	362	2.05	2.45
June, 1909 ...	22.4	26.5	314	371	2.13	2.52
July, 1909	22.0	25.8	309	362	2.09	2.45
August, 1909..	23.2	26.3	340	384	2.29	2.59
September, 1909	24.3	25.9	367	391	2.50	2.67
October, 1909..	25.6	26.4	394	407	2.70	2.79
November, 1909	25.4	25.9	405	413	2.68	2.73
December, 1909	22.2	23.0	342	353	2.43	2.51

"There was a marked drop from the high record shown by all averages in November. The miles per car per day averaged 22.2, and with the elimination of the small number of idle cars (3.30 per cent. of the total), the active cars made 23.0 miles per day, the lowest average of which we have record. The loaded mileage continued to decrease, the average being 69.9 per cent. The loading per car averaged 22.2 tons which, while slightly below November, is higher than any previous figure. The ton miles per car per day and the

Car Balances and Performances in December, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina, Ala., Ga., Fla.	Ky., Tenn., Miss.,	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,518	663,679	220,692	168,759	174,555	331,514	16,646	133,764	27,488	117,182	115,227	2,045,024
Average number of system cars on line	41,780	363,594	115,881	90,680	89,960	225,831	6,361	74,429	12,138	62,078	67,222	1,149,954
Railroad-owned cars: Av. foreign on line	40,860	270,553	88,994	58,688	62,617	143,988	16,200	63,361	28,081	55,426	26,603	855,371
Total cars on line	82,640	634,147	204,875	149,368	152,577	369,819	22,561	137,790	40,219	117,504	93,825	2,005,325
Excess	7,122	.....	.....	.....	.....	38,305	5,915	4,026	12,731	322	.....	.....
Per cent. cars on line to total owned:												
Home	55	55	53	54	51	68	38	56	44	53	58	56
Foreign	54	41	40	35	36	44	98	47	102	47	23	42
All railroads	109	96	93	89	87	112	136	103	146	100	81	98
Private cars on line	3,174	42,192	10,832	3,218	7,103	16,618	2,168	7,775	2,374	8,580	3,308	107,342
Total, all cars on line	85,814	676,339	215,707	152,586	159,680	386,437	24,729	145,565	42,593	126,085	97,133	2,112,667
Per cent. of cars in shop	3.87	5.12	6.32	5.59	8.46	4.21	3.90	9.71	5.55	4.83	6.56	5.58
No. of freight engines owned	1,167	9,941	2,873	2,991	2,593	5,422	462	2,547	756	2,359	2,102	33,213
Av. cars on line per freight engine owned	74	68	75	51	60	71	54	57	56	53	46	64
Total freight-car mileage	42,922,046	496,517,427	137,509,487	116,970,682	115,052,444	206,981,121	22,102,592	86,286,303	32,184,540	106,519,749	84,424,620	1,447,471,011
Average miles per car per day	16.1	23.7	20.6	24.7	23.8	17.4	28.8	20.0	24.4	27.3	28.0	22.2
Per cent. loaded mileage	72.6	66.9	72.6	67.0	74.1	73.0	77.8	69.2	67.1	69.5	75.8	69.9
Ton-miles of freight, inc. Co. freight	466,920,555	8,208,038,003	2,009,985,165	1,789,874,907	1,713,952,409	2,132,494,988	335,362,343	1,275,750,790	366,250,902	1,563,225,164	1,271,909,187	21,153,764,413
Average ton-miles, including Co. freight:												
Per car-mile	10.9	16.5	16.6	15.3	15.0	14.4	16.7	14.8	11.9	15.1	15.1	15.5
Per loaded car-mile	15.0	24.7	22.9	22.8	18.6	19.9	21.4	21.5	17.9	21.8	20.0	22.2
Per car per day	176	392	357	378	361	212	509	296	296	413	426	342
Gross freight earnings	$5,375,866	$47,312,440	$12,410,326	$18,976,141	$11,532,262	$17,770,646	$2,913,229	$10,682,686	$3,575,315	$14,298,883	$7,938,500	$153,051,199
Average daily earnings: Per car owned	$2.30	$2.32	$1.93	$3.63	$2.15	$2.08	$5.28	$2.58	$4.20	$3.39	$2.22	$2.48
Per railroad-owned car on line	2.10	2.42	2.08	4.10	2.46	1.84	4.28	2.50	2.87	3.98	2.13	2.52
All cars on line	2.02	2.27	1.97	4.01	2.40	1.75	3.90	2.37	2.71	3.70	2.64	2.43

average daily earnings of all cars on line both show a decrease, the former from 405 to 342 and the latter from $2.68 to $2.43.

"The shop percentage shows a further reduction to 5.58 per cent., probably reflecting the results of the retirement of worn out equipment during the preceding 18 months."

Unlimited Freight Room in Regular Steamers.

The decision of the Cunard Line to go in for more of the biggest ships is in line with recent developments in the shipping trade. While all steamers going to Europe are this spring crowded to their fullest capacity, and the fastest ships will always be patronized by those to whom speed is essential, the really popular ocean steamer is the large one of 18 to 20 knots speed—comfortable and stable at sea. The new leviathan of the Cunard Company is to be of this type, and will not be a competitor in speed with the Lusitania and Mauretania. This compromise type of boat, with its great cargo capacity and its comparatively great speed, is driving from the North Atlantic the tramp steamer, which in turn, superseded the sailing vessel. A few years ago the 10 to 12-knot tramp running backward and forward across the North Atlantic was a familiar phenomenon. Of late, the British shipyards have been filled with idle vessels of this character; even since the revival of business in the ocean carrying trade the trend is toward other quarters of the globe rather than across the North Atlantic. The lower rates of the tramp are being successfully met by the big eight-day cargo steamers, with their greater regularity and their additional income derived from large numbers of cabin passengers.—*Evening Post, New York.*

INTERSTATE COMMERCE COMMISSION.

Back Haul Charged For.

Charles R. Lull & Co. v. Minneapolis, St. Paul & Sault Ste. Marie. Opinion by Chairman Knapp.

The complainant made a shipment from Minneapolis, Minn., to Amherst, Wis., which on arrival the consignee refused to accept. On instructions from the complainant the shipment was sent back to Marshfield, Wis., and a charge was made for each haul. The complainant asked that a charge for one haul only be made, but it is held that the transportation from Amherst to Marshfield was a back haul and not a reconsignment privilege. (18 I. C. C., 355.)

No Misrouting of Shipment.

Gamble-Robinson Commission Co. v. Chicago, Burlington & Quincy et al. Opinion by Chairman Knapp.

Complaint dismissed. (18 I. C. C., 357.)

Complaint Dismissed.

George Henley et al. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Clark.

Complaint involves one intrastate shipment and one shipment barred by the Statute of Limitations. (18 I. C. C., 382.)

Rate on Yellow Pine Lumber Reduced.

C. E. Ferguson Saw Mill Co. v. St. Louis, Iron Mountain & Southern et al. Opinion by Chairman Knapp.

Rate on cypress and yellow pine lumber from Woodson, Ark., and Little Rock to Memphis, Tenn., reduced from 14 cents per 100 lbs. to 10 cents. (18 I. C. C., 391.)

C. E. Ferguson Saw Mill Co. v. St. Louis, Iron Mountain & Southern. Opinion by Chairman Knapp.

Little Rock, Ark., and Woodson should be accorded the same rates to points in Oklahoma, Kansas and Missouri as are given to points in the zone extending from Memphis, Tenn., to Wynne, Ark. (18 I. C. C., 396.)

Relation of Rates on Plaster and Plaster Board.

Sackett Plaster Board Co. v. Buffalo, Rochester & Pittsburgh et al. Opinion by Commissioner Clements.

The commission finds that the present relation complained of by which plaster board takes a much higher rate per ton than plaster resulted in unjust discrimination, and the defendants are ordered to reduce the difference between the rates on the two commodities. (18 I. C. C., 374.)

Limitation Clause.

Acme Cement Plaster Co. v. St. Louis & San Francisco et al. Opinion by Commissioner Prouty.

The limitation clause in the Act to Regulate Commerce continues to run against a claim involving reparation for an excessive rate between two points when an informal complaint in regard to an intermediate switching charge had been made, since the informal complaint nowhere attacks the rate. (18 I. C. C., 376.)

Agent's Misstatement Causes Higher Rate.

Ohio Iron & Metal Co. v. Wabash Railroad et al. Opinion by Commissioner Cockrell.

An erroneous statement of the defendant's agent resulting in a shipment moving over the lines of the defendant at a higher rate than that in force via another route does not entitle the complainant to reparation. (18 I. C. C., 299.)

Complainant Not Damaged.

Consumers Ice Co. et al v. Atchison, Topeka & Santa Fe. Opinion by Commissioner Clark.

Reparation is sought because the rate on slack coal was for a time higher to El Paso than to a nearby point intermediate between El Paso and point of shipment of coal. This discrimination did not result in damage to complainant, and since the rate was not unreasonable *per se*, the complaint is dismissed. (18 I. C. C., 277.)

Loading and Unloading Rules Found Unreasonable.

Schultz-Hansen Co. v. Southern Pacific et al. Opinion by Commissioner Clark.

Complaint says that the Southern Pacific rules for loading and unloading carload freight are unreasonable, and the commission holds that these rules do not conform to the requirements of the law. It is usual for shippers to load and receivers to unload carload freight, but at places where competition has demanded it, carriers perform this service, but the commission requires this fact to be shown in the published tariffs and all terminal charges must be shown. The present tariffs of the defendant provide that the railway employees may unload or load carload shipments or may refrain from doing so. Such a provision is not a proper one. The carrier must have the right, after consignee's free time has expired, to unload and release its equipment, and where defendant's rules provide for loading and unloading without charge carload shipments of specified commodities at specified points where peculiar conditions obtain, they are not a discrimination, and it is only where the loading or unloading is left to the judgment of the carrier that such a provision becomes a discrimination. (18 I. C. C., 234.)

Rates on Coal to Georgia and Florida Territory.

Andy's Ridge Coal Co. et al. v. Southern Railway et al. Opinion by Commissioner Prouty.

The relative rates on coal from the Coal Creek field in Tennessee and from the Apalachia field in Virginia are considered. The complainants say that the rates made by the

Southern Railway from the Apalachia field are a discrimination against the Coal Creek field. For various reasons the cost of producing steam coal in the Apalachia field is from 25 to 35 cents per ton less than the cost of producing steam coal in the Coal Creek field. The two coals are about the same quality and sell for about the same price. Rates to three different markets for consumption are involved: First, Nashville, Tenn.; second, Carolina territory; third, Georgia and Florida territory. The rate of the Southern Railway from Coal Creek to Nashville is $1.25, and the rate from Apalachia is $1.45. The distance from the Apalachia field is 431 miles and from the Coal Creek field 208 miles, of which 200 miles is over the same route as is taken by coal from the Apalachia field. The Southern Railway rate from Apalachia is controlled by competition with the Louisville & Nashville. The commission holds that there should be a difference of at least 45 cents between the Apalachia rate and the Coal Creek rate, but since the Coal Creek-Nashville movement is an intrastate one, no order can be made.

The rates into Carolina territory are not found unreasonable.

The present differential between Coal Creek and the Apalachia fields and Atlanta, Ga., through which coal passes to Georgia and Florida points, is somewhat too small, and the difference between the rate from the Apalachia field and the Coal Creek ought not to be less than 35 cents. (18 I. C. C., 405.)

Reparation Denied.

Townley Metal & Hardware Co. v. Chicago, Rock Island & Pacific. Opinion by Commissioner Prouty.

A shipment moving under a joint rate was not given a reconsignment privilege which was contained in a local tariff of the delivering carrier. The commission upholds this action of the defendant. (18 I. C. C., 378.)

A. Coors v. Southern Pacific et al. Opinion by Chairman Knapp.

C. A. Lammers Bottling Co. v. Baltimore & Ohio et al. Opinion by Chairman Knapp.

Rate on bottle caps from Baltimore, Md., to Denver, Colo., not found unreasonable. (18 I. C. C., 352 and 354.)

White Brothers v. Southern Pacific et al. and four other cases. Opinion by Commissioner Clements.

The questions raised are the same as those considered in White Brothers v. A., T. & S. F., 17 I. C. C., 288, and there is not sufficient evidence to show that through rates from points east of the Mississippi river to San Francisco on hardwood lumber were unreasonable. (18 I. C. C., 308.)

Kentucky Wagon Manufacturing Co. v. Illinois Central et al. Milburn Wagon Co. v. Toledo, St. Louis & Western et al. Opinion by Commissioner Clark.

A rate which was fixed unusually low because of water competition was raised temporarily, but was later forced down again by the water competition. Since the higher rate was not unreasonable in itself, no reparation for shipments moving under that rate can be made. (18 I. C. C., 360.)

Reparation Awarded.

National Refining Co. v. Atchison, Topeka & Santa Fe. Opinion by Commissioner Lane.

Shipments of petroleum from Coffeyville, Kan., to Enid, Okla. (18 I. C. C., 389.)

Colorado Bedding Co. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Cockrell.

Shipment of compressed cotton from St. Louis, Mo., to Pueblo, Colo. (18 I. C. C., 409.)

Fred. G. Clark Co. v. Buffalo & Susquehanna. Opinion by Commissioner Clark.

Rate on oil in tank cars from Stanards, N. Y., to Struthers, Pa., found to be unreasonable. (18 I. C. C., 380.)

Chatfield Manufacturing Co. v. Louisville & Nashville et al. Opinion by Commissioner Clements.

Rate on roofing paper and materials from Carthage, Ohio, to Nashville, Tenn., unreasonable. (18 I. C. C., 385.)

Ocheltree Grain Co. v. Texas & Pacific et al. Opinion by Commissioner Harlan.

On a carload of corn shipped from Ninnekah, Okla., to Lettsworth, La. (18 I. C. C., 412.)

Tioga Coal Co. v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Lane.

Demurrage charges collected on one box-car loader shipped from Ottumwa, Iowa, to Tioga, Colo., were without warrant of tariff authority. (18 I. C. C., 414.)

Willamette Pulp & Paper Co. v. Northern Pacific et al. Opinion by Commissioner Lane.

A rate of 80 cents per 100 lbs. on print paper from Sartells, Minn., to Los Angeles, Cal., Oakland and San Francisco found unreasonable, and the rate should not have exceeded 75 cents. (18 I. C. C., 388.)

Zang Brewing Co. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Cockrell.

Wooden bungs L. C. L. should have taken the fourth class rate of 92 cents per 100 lbs. instead of the second class rate of $1.45 per 100 lbs. Charges on a mixed carload shipment also found unreasonable. (18 I. C. C., 337.)

A. S. Block & Co. v. Louisville & Nashville. Opinion by Commissioner Lane.

Carload rates on strawberries from Pomona, Tenn., and from Humboldt to St. Louis are the same, and 308 crates of strawberries were shipped from Pomona, stopping en route at Humboldt, where 217 additional crates were placed in the car. Since the carload rates are the same, the rate that should have been charged by the carrier was the carload rate from Humboldt. (18 I. C. C., 372.)

National Manufacturing Co. v. Chicago Great Western et al. Opinion by Commissioner Lane.

An agent of the initial carrier quoted a certain rate on a shipment through a mistake, and after the shipment had started tried to divert the shipment so that it would move over a route on which the quoted rate applied. The request was made in time, but for some reason the routing was not changed, and the question as to liability is raised. Notwithstanding the fact that the Chicago Great Western—the initial carrier—was negligent, yet the other lines engaged in the movement should have had reasonable rates, and since the rate that they had at that time was unreasonable, they are held liable for the reparation. (18 I. C. C., 370.)

Elevation in Transit Question Discussed.

H. Gund & Co. v. Chicago, Burlington & Quincy. Opinion by Commissioner Lane.

Complainant asks reparation, on all grain passing through its elevators in the state of Nebraska which was shipped through Missouri river points to eastern destinations, on the ground that an allowance for elevation in transit was made by the defendant to complainant's competitor at Nebraska City, a Missouri river point. The question of elevation allowance has been discussed before by the commission, and the commission knows from special investigation that this allowance is unduly discriminatory and serves to strengthen dealers in grain who receive it as against competitors at other points on the same railway who do not receive it. The orders of the commission in the matter of Allowance to Elevators, 14 I. C. C., 315; Traffic Bureau Merchants Exchange of St. Louis v. Chicago, Burlington & Quincy, 14 I. C. C., 317, 331, 510, have been suspended by the United States circuit court on the ground that the findings of fact by the commission were mistaken. While the commission recognizes that on questions of law the commission should yield to the courts, it is also understood by the commission from repeated decisions of the supreme court that the courts are not competent to determine questions of fact within the jurisdiction of the commission. With all due respect to the circuit court, the commission is constrained by the facts to adhere to its view that these allowances are unduly preferential, and therefore declines at this time, and until its position shall have been finally ruled on by the higher courts, to extend the benefit of this system of elevator allowance to complainant's elevators. (18 I. C. C., 364.)

STATE COMMISSIONS.

The State Railroad Commission of Texas has authorized the Texas & Pacific to make a stopping-in-transit rate of $5 per car on pine lumber, ties, telegraph poles, etc., for creosoting and cutting into paving blocks.

The State Railroad Commission of Texas has ordered that all roads in the state sell tickets for parties of 14 or more passengers at 1½ cents a mile. This rate has been granted heretofore to baseball teams, and the present order has been issued for the reason, it is said, that there has been discrimination in the granting of the reduced rate.

The Indiana Railway Commission has denied the petition of the Grand Rapids & Indiana for exemption from its recent order directing the installation of block signals. The road claimed that the money required for the installation of signals could be expended in other ways that would benefit the public more. The commission held, however, that it was unable to concede that where, as on parts of the G. R. & I., there is a movement of 20 to 30 trains a day at certain seasons of the year operation can be conducted safely without block signals. It was shown that accidents had been very infrequent on this road, but in reply to this the commission says: "Accidents do not occur in the normal and ordinary course of business and transportation; safety appliances are not made, as a rule, to protect from daily accidents. The accident is the extraordinary and unlooked for and unexpected event, and it is for this very thing that block signals were provided, so that the unexpected and unlooked for may not happen."

Louisiana: Passenger Train Ordered on Logging Road.

Railroad Commission of Louisiana v. The Kentwood & Eastern.

The Kentwood & Eastern operates a narrow gage road, running from Kentwood, La., to Hackley, the eastern terminus being in the forest, about ten miles from Hackley, and also a branch from Kentwood to Bolivar. Its main line, including the line to Bolivar, is 44 miles long.

At present the passenger service furnished by the company consists of a mixed train, leaving Kentwood daily, except Sunday, at 11 a.m., and arriving at Hackley at 1:20 p.m.; leaving Hackley at 2:05 p.m., and arriving at Kentwood at 5 p.m. Passengers are also carried on logging trains between certain points only. While the trains are presumed to run on their schedule time, as a matter of fact, they are seldom, if ever, on time, the trip from Hackley to Kentwood, a distance of 31 miles, frequently takes five hours.

The Kentwood & Eastern Railway is chartered to carry both freight and passengers. It has a contract with the American Express Company and with the United States Government for the transportation of mails. Its freight and passenger earnings (gross) for the year ended June 30, 1909, were $172,942, and its operating expenses were $121,535, leaving a net income for the year $51,407. After deducting interest, rents for lease of a portion of its line, and taxes, there remains a surplus for the year of $24,479, which, added to the surplus of previous years, makes the total surplus on June 30, 1909, of $44,003. It appears, therefore, that the company is making a fair profit.

Where any railway line or system, as a whole, is making a fair return on its investment, the commission will not decline an order requiring reasonable improvements to be made in any branch of the service, which is shown to be inadequate, unsuitable or insufficient to meet the just demands of the public.

The Kentwood & Eastern is therefore required, beginning not later than May 10, 1910, to operate a passenger train, each way, daily. The train to leave Hackley not later than 8 a.m., and to arrive at Kentwood not later than 10:15 a.m., and, returning, to leave Kentwood at 1 p.m., and arrive at Warnertown in time to make connection with the southbound afternoon train on the New Orleans Great Northern. Not later than June 10, 1910, the company is required to provide first-class passenger coaches and combination baggage cars and coaches for the train.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. W. Seaman has been elected president of the Manistee & Grand Rapids, succeeding W. M. Simpson.

W. H. Beardsley, treasurer of the Florida East Coast, at New York, has been elected a vice-president, with office at New York.

W. W. Vincent has been appointed auditor of disbursements of the Chicago Great Western, with office at Chicago, succeeding R. H. Scott, resigned.

The title of E. W. Sprague, district claim agent of the Illinois Central and the Indianapolis Southern, with office in Chicago, has been changed to assistant chief claim agent. His office and jurisdiction remain unchanged.

Le Roy Kramer, assistant to the vice-president of the Chicago, Rock Island & Pacific, has been appointed assistant to the second vice-president, succeeding A. C. Ridgeway, whose promotion has been announced in these columns.

Henry Belin Voorhees, who was appointed an assistant to President Daniel Willard, of the Baltimore & Ohio, as previously announced in these columns, was born at Saratoga Springs, N. Y., on January 22, 1876, and graduated from Rensselaer Polytechnic Institute, Troy, N. Y., as a civil engineer in 1896. He began railway work on March 1, 1897, as assistant supervisor of the Shamokin division of the Philadelphia & Reading at Tamaqua, Pa., remaining with that company for nearly five years. During this period he was consecutively supervisor, assistant trainmaster and trainmaster. In December, 1901, he went to the Baltimore & Ohio as assistant engineer at Pittsburgh, and in July of the following year was made division engineer at Baltimore. A year later he was promoted to assistant to general superintendent of transportation, with office at Baltimore, and on February 1, 1905, was appointed superintendent and general agent of the Philadelphia division at Philadelphia, which position he held at the time of his recent appointment.



Henry B. Voorhees.

Operating Officers.

J. L. Hurd has been appointed car accountant of the Northern Pacific at St. Paul, Minn.

L. W. Armstrong has been appointed general manager of the Savannah, Augusta & Northern, with office at Statesboro, Ga.

H. D. Hathaway, chief clerk to the general manager of the Buffalo & Susquehanna at Buffalo, N. Y., has been appointed general superintendent of the Buffalo, Attica & Arcade, with office at Arcade, N. Y.

A. Igo, who has been on leave of absence, has resumed his duties as assistant superintendent of the Oregon Short Line at Pocatello, Idaho, and G. H. Collier, acting assistant superintendent, has resumed his duties as train despatcher.

G. A. Brown has been appointed superintendent of car service of the Chicago Great Western, with office at the Grand

Central Station, Chicago. C. J. Fellows, car service agent at Chicago, has resigned and the position has been abolished.

The operating department of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley will in the future have jurisdiction over the dining service department, and the superintendent in charge of that department will report to the vice-president.

J. M. Rapelje, superintendent of the Northern Pacific, at Missoula, Mont., has been appointed superintendent of the Idaho division, with office at Spokane, Wash., succeeding A. Beamer, resigned, effective May 12. M. M. Fowler, acting superintendent of the Rocky Mountain division, has been appointed superintendent, with office at Missoula, Mont.

I. B. Richards, superintendent of transportation of the Northern Pacific at St. Paul, Minn., has been made general superintendent of lines west of Paradise, Mont., with office at Tacoma, Wash., succeeding B. E. Palmer, resigned. P. H. McCauley, car accountant at St. Paul, succeeds Mr. Richards, and L. J. Baird, chief clerk to the car accountant, succeeds Mr. McCauley.

Traffic Officers.

W. C. MacRae has been appointed a contracting agent of the Central of Georgia, with office at New York City.

M. J. Allen has been appointed a commercial freight agent of the Continental Line (fast freight), with office at Kansas City, Mo.

R. D. Crocker has been appointed a traveling freight agent of the Southern Railway, with office at Dallas, Tex., succeeding W. T. Rembert, resigned.

J. R. Mockbee, traveling freight agent of the St. Louis Southwestern at Waco, Tex., has been appointed freight agent at Greenville, Tex. Lane Satterwhite, assistant freight agent at Waco, succeeds Mr. Mockbee.

The office of Stephen Y. Baldwin, recently appointed general agent, freight department of the Delaware & Hudson, is at Pittsburgh, Pa., and not at Albany, N. Y., as erroneously reported in our issue of May 13, page 1233.

W. D. Carrick, general baggage agent of the Chicago, Milwaukee & St. Paul and the Chicago, Milwaukee & Puget Sound, has been appointed general baggage agent also of the Tacoma Eastern, with office at Milwaukee, Wis.

E. J. West has been appointed a traveling freight agent of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern at Atlanta, Ga., succeeding J. L. Martin, whose resignation has been announced in these columns.

Engineering and Rolling Stock Officers.

N. S. Kimball, district master mechanic of the Chicago, Milwaukee & St. Paul at Greenbay, Wis., is to be retired on account of old age.

J. D. Maupin, general foreman of the Trinity & Brazos Valley at Teague, Tex., has been appointed master mechanic. L. M. Jacobs succeeds Mr. Maupin.

J. T. Carroll, master mechanic of the Lake Erie & Western at Tipton, Ind., has been appointed superintendent of motive power of the Baltimore & Ohio, with office at Pittsburgh, Pa.

D. R. MacBain, assistant superintendent of motive power of the New York Central & Hudson River at Albany, N. Y., has been appointed superintendent of motive power of the Lake Shore & Michigan Southern, with office at Cleveland, Ohio, succeeding Le Grand Parish, whose resignation has been announced in these columns.

James S. Sheafe has been appointed engineer of tests of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with headquarters at the Burnside shops, Chicago, reporting to the general superintendent of motive power. The test department will make inspections and tests not only for the mechanical and supply departments, but also for other departments of the road needing its services.

F. H. Reagan, assistant superintendent of the Collinwood shops of the Lake Shore & Michigan Southern at Collinwood, Ohio, has been appointed a master mechanic of the Lake Erie & Western, with office at Tipton, Ind., succeeding J. T. Carroll, resigned to go to another company. B. F. Kuhn, general foreman, locomotive shops, at Collinwood, succeeds Mr. Reagan, and B. H. Montgomery, assistant general foreman at the Collinwood shops, succeeds Mr. Kuhn.

R. B. Kendig, mechanical engineer of the Lake Shore & Michigan Southern at Cleveland, Ohio, has been appointed general mechanical engineer of the New York Central Lines, with office at New York, effective June 1, succeeding F. M. Whyte, whose resignation has been announced in these columns. A. R. Ayers, assistant master mechanic of the Lake Shore & Michigan Southern at Elkhart, Ind., succeeds Mr. Kendig; T. H. Goodnow, master car builder at Englewood, Ill., succeeds Mr. Ayers; J. W. Senger, supervisor of materials and coal, at Cleveland, succeeds Mr. Goodnow, and H. G. Griffin, general shop inspector, succeeds Mr. Senger.

Lawrence A. Downs, whose appointment as assistant engineer maintenance of way of the Illinois Central, the Yazoo & Mississippi Valley and the Indianapolis Southern has been announced in these columns, was born in Greencastle, Ind., May 9, 1872. He graduated from Purdue University in 1894, and entered railway service the same year on the Vandalia. He went to the Illinois Central in 1896, and has served that road continuously in the positions of assistant engineer in maintenance and construction, roadmaster on five different divisions, and assistant to chief engineer maintenance of way, which position he leaves to become assistant engineer maintenance of way of the three companies.



Lawrence A. Downs.

James F. Walsh, whose appointment as general superintendent of motive power of the Chesapeake & Ohio Railway, with office at Richmond, Va., has been announced in these columns, was born in March, 1857, at Cleveland, Ohio. Mr. Walsh began railway work in September, 1871, on the Cleveland, Columbus, Cincinnati & Indianapolis, now a part of the Cleveland, Cincinnati, Chicago & St. Louis. From his beginning in 1871 down to 1892, he was consecutively apprentice, locomotive fireman, locomotive engineer and shop foreman. He left railway work in 1892 to become the mechanical expert for the Galena Oil Co., and ten years later he returned to railway work as superintendent of motive power on the Chesapeake & Ohio at Richmond, which position he held at the time of his recent appointment as general superintendent of motive power.



James F. Walsh.

Purchasing Officers.

William A. Summerhays, assistant general storekeeper of the Illinois Central at Chicago, has been appointed general

storekeeper of that company, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago, succeeding John M. Taylor, resigned.

F. D. Reed, general storekeeper of the Chicago, Rock Island & Pacific at Silvis, Ill., has been appointed assistant to the vice-president, succeeding LeRoy Kramer, whose promotion has been announced in these columns. D. Kavanaugh, district storekeeper at Silvis, succeeds Mr. Reed; J. C. Kirk, district storekeeper at Shawnee, Okla., succeeds Mr. Kavanaugh, and C. H. Rost, storekeeper of the Chicago & Eastern Illinois at Danville, Ill., succeeds Mr. Kirk.

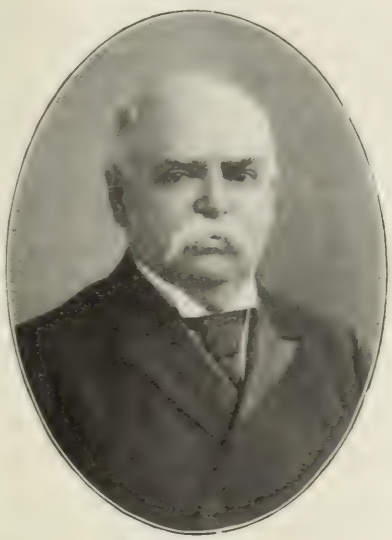
Special Officers.

F. H. Lotterhos has been appointed land and industrial commissioner of the Liberty-White, succeeding H. B. Myers, assigned to other duties.

OBITUARY.

James Hedley, at one time superintendent of the York & North Midland Railway of England, died on May 15 in New York City at the age of 87 years. Mr. Hedley was born at Northumberland, England, and was the father of Frank Hedley, vice-president and general manager of the Interborough Rapid Transit Co., New York, and E. M. Hedley, of the Galena Signal Oil Co., Franklin, Pa. Mr. Hedley's ancestors have been connected with railway operation in England since the days of the "Rocket."

Max Riebenack, comptroller of the Pennsylvania Railroad, died at Atlantic City, N. J., on May 14. Mr. Riebenack was born October 12, 1844, and entered the service of the Pennsylvania Railroad on October 19, 1863, as a clerk in the military transportation office at Altoona, Pa. The following year he was transferred to Philadelphia in the same position, and was later made corresponding clerk and cashier to the general passenger and ticket agent. In 1869 he was made chief clerk of foreign tickets and in April, 1872, he was appointed assistant auditor of passenger receipts. He was promoted to auditor of passenger receipts in April, 1880. In October of the following year he was made assistant comptroller in addition to his former position of auditor of passenger receipts. On account of Mr. Riebenack's important duties, in November, 1899, the board relieved him from the direct responsibilities of the position of auditor of passenger receipts, and since February 1, 1905, he has been comptroller. This position he held at the time of his death. Mr. Riebenack was a member of the advisory committee of the Relief Department and was also a member of the building committee in connection with the Broad Street station, Philadelphia, the duties of this committee being to locate and furnish the rooms in that building to accommodate the general officers and other clerks.



Max Riebenack.

Mr. Riebenack was one of the best known railway accounting officers in the country, having been a prominent member of the accounting officers' association. He had also appeared before various scientific bodies. In connection with his work in the relief and pension departments he gathered information on the subject from all over the world, and the reports which he made for the International Railway Congress were published in a book, "Railway Provident Institutions," in 1905.

Railway Construction.

New Incorporations, Surveys, Etc.

Abilene & Southern.—A contract is said to have been entered into between the city officials of Abilene, Tex., and the Abilene & Southern for building an extension from Abilene north via Anson to Hamlin, about 40 miles. It is expected that work will be begun soon on the section from Anson to Hamlin. (Dec. 10, p. 1166.)

Canadian Northern.—A resolution has been filed providing for a government guaranty of the bonds of the Canadian Northern Alberta Railway, which proposes to build a line from Edmonton, Alb., west to the coal fields near the Brazeau river and the headwaters of the MacLeod river. The guaranty is to be for $13,000 a mile for the first 50 miles and $25,000 a mile for an additional hundred miles, and supersedes a previous guaranty of bonds of the Edmonton, Yukon & Pacific.

Canadian Northern Alberta.—See Canadian Northern.

Chicago, Burlington & Quincy.—The improvements to be carried out during the next 12 months include a line from Kirby, Wyo., southeast to the Powder river, 104 miles, to cost between $5,000,000 and $6,000,000. A line is to be built from Scribner, Mont., northwest to Laurel, 53 miles, to connect with the Northern Pacific, and another line from Greeley, Colo., south to Hudson, as part of an extension from Denver north to Cheyenne, Wyo., by which the Burlington will use its own tracks instead of those of the Union Pacific. An extension is to be built from Herrin, Ill., south to Metropolis, on the Ohio river, 38 miles. Double-tracking work on 75 miles is to be carried out at a cost of $1,700,000, to include the lines from Savanna, Ill., northwest to Galena Junction; Saluda, southwest to Bushnell; East Dubuque, north to Rutledge, Wis.; Grand Crossing, north to Lytle. Track elevation work, as already planned to be carried out in Chicago, will cost $732,000.

Chicago, Milwaukee & St. Paul.—Work has been finished on the branch from Mobridge, S. Dak., southwest to Firesteel, about 50 miles, and this will probably be the terminal of the Timber Lake branch for some time to come. A number of grading outfits are at work on the Fox River line further south, and it is expected to have the line finished to Faith, in the northeast corner of Meade county, ready to receive shipments of cattle this fall.

Chicago, St. Paul, Minneapolis & Omaha.—This company has applied to the Wisconsin Railroad Commission for authority to build a line into Superior, Wis., and through that city to its ore docks on St. Louis bay, 6.38 miles. The cost of the improvements, including the ore docks and other facilities, will be about $780,000.

Choctaw, New Castle & Western.—According to reports work is to be started at once on a line from the Rock Island near Alderson, Okla., southwest to Savanna, on the Missouri, Kansas & Texas, 11 miles. G. W. Stone, president, Oklahoma City.

Edmonton, Yukon & Pacific.—See Canadian Northern.

Eureka & Palisade.—An officer writes that recent high waters washed out several miles of this company's line between Palisade, Nev., and Eureka, 84 miles. Plans for reconstructing the line have not yet been definitely decided upon.

Gainesville, Oklahoma & Western.—An officer writes that preliminary survey has been made and work has been started on the permanent location for a line from Gainesville, Tex., southwest via Era, Slidell and Greenwood to Bridgeport, 56 miles. Contracts for the work will be let this month. J. Whaley, president; F. B. Truax, chief engineer, Gainesville. (May 6, p. 1183.)

Grand Trunk Pacific.—The National Transcontinental Railway Commission reports that actual construction work has been started on the only remaining gap on the Eastern division. This is on the section between Nepijon, Ont., and Abitibi. Work is now under way on the entire line from

Moncton, N. B., west to Superior Junction. It is expected to have the line in operation by the fall of 1912. The completed section from Winnipeg, east to Superior Junction, will be in operation by September of this year.

Houston & Texas Central.—Application has been made by this company to issue bonds, part of the proceeds of which are to be used for improvements, to include putting in heavier rail and new terminal buildings at North Zulch, Tex.

Huntington, Lewiston & Juniata Valley Traction.—An officer writes that contracts have been let to W. D. Cassone and to the Pennsylvania Excavating Co., both of Allentown, Pa., for building a new line in Pennsylvania. Between 300 and 400 men are now at work. The plans call for a line from Mount Union north via Mill Creek to Cold Spring Park, 18 miles, with a line running northeast from Mill Creek to Reedsville, thence south to Lewistown, 30 miles. Some of the work has been finished. R. W. Jacobs, president and general manager; J. Murray Africa, chief engineer, Huntingdon.

Louisville, Lincoln Farm & Mammouth Cave Traction.—Contracts are to be let about June 1, it is said, for building 50 miles of line from Glasgow, Ky., northwest to Mammouth Cave, thence northeast to Hadgenville. J. M. Richardson, president; C. Vandenburgh, general manager, Glasgow.

Mannington & Smithfield.—Incorporated in West Virginia to build from Mannington west to Smithfield, about 16 miles. F. W. Bartlett and S. A. Hendrickson, Mannington, are incorporators.

Minneapolis, St. Paul & Sault Ste. Marie.—This company has given bonds to secure funds for building lines as follows: From Moose Lake, in Carlton county, Minn., northwest to a point near McGregor, Aitkin county, 23 miles, and from Lawler, Aitkin county, westerly to Cuyana, in Crow Wing county, 37 miles.

Moorefield & Virginia.—This company will build a line from Moorefield, in Hardy county, W. Va., south to Peru, 20 miles. W. B. Cornwell, president; W. Trapnell, general manager and chief engineer, Romney.

Oregon Trunk Line.—According to press reports the charter of this company is to be revised to permit the company to build an extension from the proposed terminus at the northern boundary of the Klamath-Indian reservation, Ore., west to the Pacific & Eastern, at Medford, about 60 miles. (May 6, p. 1184.)

Pacific & Eastern.—See Oregon Trunk Line.

Paris & Mount Pleasant.—An officer writes that this company was organized to build from Paris, Tex., southeast to Mount Pleasant, 53 miles. Grading on the first section from Paris to Bogota, 25 miles, has been finished and contract for track laying and bridge work has been let to D. J. Grigsby, Dallas. There will be a 2,100-ft. trestle. R. F. Scott, president, and H. B. Bobberty, chief engineer. N. H. Ragland, secretary and general agent, Paris. (Dec. 17, p. 1214.)

Paul City, Sycamore City, Sabetha & Southwestern.—Surveys are said be made for a 21-mile line to be built in Nebraska. J. H. Miles, president, Falls City, Neb.; G. Campen, chief engineer, Lincoln.

Phillipsburg & Susquehanna Valley.—This company is said to be planning to build an extension from its present terminus at Fernwood, Pa., southwest to Utahville, four miles.

Prairie Farm & Southwestern.—Application has been made to the Wisconsin Railroad Commission for a certificate of convenience and necessity, to build from Prairie Farm, southwest to Emerald, 16 miles. G. E. Scott, president, Prairie Farm. (April 1, p. 918.)

San Pedro, Los Angeles & Salt Lake.—According to press reports the section of this road damaged by floods between Caliente, Nev., and Leith, 29 miles, on which service was temporarily discontinued, will be rebuilt and ready for the operation of through trains about June 15. (March 4, p. 461.)

Wamego & Rock Creek Valley.—This company is said to be asking bids for grading 20 miles from West Moreland, Kan., south to Wamego. The work, which involves the excavation of 367,000 cu. yds. of earth, is to be completed in one year. C. C. Eastman, chief engineer, West Moreland.

Railway Financial News.

Alberta Railway & Irrigation.—This company, controlled by the Canadian Pacific, has called for payment on July 30 its outstanding (at last accounts $928,465) 4 per cent. prior lien debenture stock.

Atlanta, Birmingham & Atlantic.—The committee, George C. Clark, chairman, representing the joint first collateral trust 5 per cent. notes, say that over 95 per cent. of these notes have been deposited under the plan for the payment of interest and part of the principal and the extension of the remainder of the principal.

Baltimore & Ohio.—The $40,000,000 notes sold by this company to Speyer & Co. and Kuhn, Loeb & Co., both of New York, are three-year 4½ per cent. secured notes of June 1, 1910-1913, being part of an authorized issue of $50,000,000, the remaining $10,000,000 being reserved to retire one-year notes due March, 1911. The notes are secured by the deposit of $6,000,000 first preferred stock of the Reading Co., $14,000,000 second preferred stock of the Reading Co., $10,000,000 common stock of the Reading Co. and $28,000,000 Baltimore & Ohio Chicago Terminal first mortgage 4 per cent. bonds. The notes were all resold by the bankers, a large part being placed abroad.

Baltimore & Ohio Chicago Terminal.—The company has made a mortgage securing $50,000,000 4½ per cent. and 4 per cent. bonds of April 1, 1910-1960. Of these bonds $28,000,000 4 per cent. bonds are to be issued to the Baltimore & Ohio at once to pay for the cost to the B. & O. of the terminal property. Of the remainder, $5,000,000 4½ per cent. bonds may be issued for proposed extensions and additions and $15,800,000 bonds are reserved for the enlargement, betterment and extension of the properties covered by the mortgage or for the purchase of equipment therefor.

Boston & Maine.—Thomas W. Lindsley has been elected a director, succeeding William Whiting, resigned.

Brooklyn Rapid Transit.—A quarterly dividend of 1¼ per cent. has been declared, payable July 1, on the $45,000,000 stock. Since April, 1909, 1 per cent. has been paid quarterly. The present dividend declaration increases the annual dividend rate from 4 per cent. to 5 per cent. The Brooklyn Union Elevated, a subsidiary of the B. R. T., has declared an initial dividend of 5 per cent. on its $13,000,000 common stock. The B. R. T. owns $12,530,831 of this common stock.

Brooklyn Union Elevated.—See Brooklyn Rapid Transit.

Canadian Pacific.—Control of the Dominion Atlantic Railway, running from Halifax, N. S., to Yarmouth, 290 miles, has been bought by Canadian Pacific interests.

Central New England.—The New York, New Haven & Hartford interests, it is said, are trying to buy the minority stock of the Central New England, and are offering 23 for the preferred and 12 to 13 for the common. Joseph Moore, Jr., of Philadelphia, asks stockholders who are willing to sell preferred at 50 and common at 25 to communicate with him with a view to opening negotiations with the New Haven. Of the $4,800,000 common and $3,750,000 preferred the New Haven owned on June 30, 1909, $4,432,776 common and $3,420,285 preferred.

Chesapeake & Ohio.—See Hocking Valley.

Chicago & Alton.—Effingham, Lawrence & Co., New York, recently offered at 99⅞ to yield 5.22 per cent. a block of the $2,500,000 collateral trust 5 per cent. convertible notes of March 15, 1910-March 15, 1913. These notes are secured by and convertible into $3,500,000 improvement and equipment mortgage 5 per cent. bonds due 1930, of which $18,000,000 have been authorized.

CHICAGO, CINCINNATI & LOUISVILLE.—The foreclosure sale of this property set for May 17 has been postponed to June 17.

DOMINION ATLANTIC RAILWAY.—See Canadian Pacific.

HOCKING VALLEY.—J. M. Sheets and H. T. Booth were appointed receivers by Judge Kincaid on May 16 in the state common pleas court. Immediately after this appointment the company obtained from the Federal circuit court an order setting aside the order of Judge Kincaid and restraining the receivers from taking possession. The Chesapeake & Ohio has made an official statement of the proceedings that have so far been taken in the purchase by the Chesapeake & Ohio of a controlling interest in the Hocking Valley and a joint interest with the Lake Shore & Michigan Southern in the Kanawha & Michigan. The circular, after describing these steps, says in part:

The plaintiffs claimed that the transactions which we have mentioned were part of a combination between the Lake Shore and the Chesapeake & Ohio to restrain competition between the Toledo & Ohio Central, the Kanawha & Michigan and the Hocking Valley, and, alleging that they would be injured thereby, asking for an injunction and receiver and procured a restraining order prohibiting the Hocking Valley from proceeding with the retirement of its preferred stock and from holding the special stockholders' meeting, and also from recognizing the Chesapeake & Ohio as one of its stockholders. This restraining order was issued ex parte on the filing of a $1,000 bond.

The Hocking Valley promptly moved for a modification of the restraining order so as to permit the completion of retirement of its preferred stock, a large part of which had already been redeemed. After argument the court, of its own motion, appointed J. M. Sheets, ex-attorney-general of the state of Ohio, who several years ago instituted quo warranto proceedings against the Hocking Valley for forfeiture of its charter, and C. O. Hunter, until recently general solicitor of the company, a committee to examine the books of the company and report concerning certain facts alleged in adffidavits submitted by the Hocking Valley and disputed on the hearing. This examination and report were made something more than a week ago and corroborated in substantially every respect the statement that had been made on behalf of the company. Notwithstanding this report the court thereupon ordered an argument on the question whether the plaintiffs had any standing to maintain the suit and whether their motive in bringing the same was material. This question was argued a week ago. Counsel for the plaintiffs also attempted to argue for the appointment of a receiver, but the judge in open court promised counsel for the railway company that he would take no action in that matter without affording them opportunity to be heard concerning it.

Argument was closed on Tuesday of last week. To-day the judge read a long opinion in which he decided practically every question involved in the case, and going outside of the questions that had been argued indicated, as we are informed, that he was prepared to appoint receivers.

Upon its becoming apparent that the court was proceeding to take up that subject forthwith counsel for the railway company filed a petition and bond for removal of the cause to the United States Circuit Court for the Southern district of Ohio upon the ground that it involved a question arising under the laws of the United States. On this fact being reported to the judge, which was done at once, he announced that he would then proceed to appoint receivers, notwithstanding the removal, and named J. M. Sheets and H. J. Booth receivers. Of course the railway company contends that even if the case had not been removed there would have been no ground whatever for the appointment of receivers, and that the cause having been removed the judge was wholly without jurisdiction to make any order in the matter.

We need hardly say that the Chesapeake & Ohio and the Lake Shore are not engaged in any combination in restraint of trade or otherwise. The Chesapeake & Ohio has purchased its interest in the Hocking Valley in absolute good faith for the purpose of developing its business as one of the great competitors for business in that section.

The New York Stock Exchange has listed $1,584,000 additional first consolidated mortgage 4½ per cent. bonds. The proceeds of the sale of these bonds has been used to retire $1,584,000 Ohio & West Virginia first mortgage 7 per cent. bonds which matured May 1, 1910. Owing to the temporary injunction granted to three minority stockholders, the special meeting to vote on the question of authorizing an increase of common stock from $11,000,000 to $26,000,000 has been postponed from May 11 to a later date to be fixed when the suit in regard to the injunction has been decided.

INTERBOROUGH RAPID TRANSIT.—The Guaranty Trust Co., New York, is offering a block of Interborough Rapid Transit 5 per cent. mortgage bonds of 1907-1952 at 102¼, yielding about 4⅞ per cent. on the investment. Of the total $55,000,000 bonds authorized there are $11,655,000 outstanding. $28,030,800 pledged as security for 6 per cent. convertible notes and $15,314,200 issuable for additional property. The Interborough Rapid Transit operates about 25 miles of subway and 37 miles of elevated road in New York city. The company is controlled through stock ownership by the Interborough-Metropolitan Company.

INTERNATIONAL & GREAT NORTHERN.—See an item in General News in regard to the sale of this property.

FREDERICK RAILROAD.—The company has made a mortgage securing $1,500,000 first and refunding 5 per cent. bonds of 1910-1960. The bonds are to be issued to refund outstanding bonds and to provide for extensions and improvements. The road runs from Thurmont, Md., to Frederick, 17 miles, and it is proposed to extend the road from Thurmont to Emmittsburg and thence to Gettysburg.

GRAND TRUNK WESTERN.—The company is to pay on December 1, under the optional provision of the mortgage, 85 per cent. of the principal and all interest earned and accrued on the second income mortgage bonds, of which $1,500,000 were originally issued.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The New York Stock Exchange has listed $1,207,000 additional first consolidated mortgage 4½ per cent. bonds. Of the proceeds of the sale of these bonds $1,200,000 was used to pay for extensions (see this company under Railway Construction) and $7,000 was exchanged for a like amount of Minneapolis & Pacific first mortgage bonds.

MISSOURI PACIFIC.—The New York Stock Exchange has listed $29,806,000 series A convertible 5 per cent. first and refunding mortgage bonds of 1909-1959, which, having been underwritten, were offered to stockholders at 95 in January, 1910. Of the bonds listed $19,700,000 were issued in exchange for $19,700,000 underlying bonds as follows: $16,715,000 Kansas & Colorado Pacific first refunding bonds, $2,983,000 Kansas City Northwestern first mortgage bonds and $2,000 Kansas City Northwestern series A bonds.

NEW YORK, NEW HAVEN & HARTFORD.—See Central New England.

NORFOLK & WESTERN.—This company has taken over the operation of the Blackstone & Lunenburg and the Pocahontas & Western, two coal roads in Virginia, five and eight miles long respectively.

OREGON & SOUTHEASTERN.—The mortgage trustee has brought suit to foreclose the mortgage under which it is said $250,000 bonds are outstanding. The road runs from Cottage Grove, Ore., to Disston, 20 miles.

ST. LOUIS & SAN FRANCISCO.—It is said that this company has sold in France a block of 4½ per cent. bonds of a new issue.

SEABOARD AIR LINE.—It is understood that the syndicate which underwrote the $18,000,000 adjustment bonds has sold abroad the remaining $6,700,000 bonds previously unsold, and that these bonds are soon to be offered to the public in London.

Supply Trade Section.

The Standard Car Truck Co., Chicago, has moved its general offices from the Old Colony building to 1522 McCormick building.

The Power Specialty Co., New York, has moved its Chicago office from The Rookery to the People's Gas building. R. B. Nutting is manager and R. H. Wyld assistant manager.

A. R. Sutter, formerly with the Consolidated Car Heating Co., New York, in the Chicago sales office, is now in the employ of the Railway Specialty & Supply Co., Monadnock block, Chicago.

The Electric Storage Battery Co., Philadelphia, Pa., announces that it has just opened two new sales offices; one located at 729 Ford building, Detroit, Mich., and the other at 1424 Wazee street, Denver, Colo.

The James Brady Foundry Co., Detroit, Mich., has recently increased its plant and has installed a second 3-motor a.c., 10-ton, 41-ft. span Northern traveling crane made by the Northern Engineering Works, Detroit, Mich.

S. T. Fulton, formerly assistant to B. L. Winchell, president of the St. Louis & San Francisco, has accepted a position in the sales department of the Railway Steel-Spring Co., New York. Mr. Fulton will have offices at Chicago, succeeding J. L. Woods, resigned.

Charles H. Ferry, formerly president of the Chicago Tire & Spring Co., Melrose Park, Ill., died suddenly in Phoenix, Ariz., May 2, at the age of 59. Mr. Ferry was born in Utica, N. Y., and after graduating from Yale he practised law in Chicago and later entered the manufacturing field.

The Globe Stove & Range Co., Kokomo, Ind., has recently increased its plant and installed a Newton cupola of 14 tons hourly capacity and an outfit of ladles and trucks for an industrial railway, all of which equipment was furnished by the Northern Engineering Works, Detroit, Mich.

The Western Elaterite Roofing Co., Denver, Colo., is building an addition to its factory to enable the output to be increased to meet the growing demand for elaterite roofing. The paint department will also be enlarged and an elaterite floor covering will be added to the list of the company's products.

E. S. Marshall, sales agent of the American Car & Foundry Co., St. Louis, Mo., who was formerly general master mechanic of the St. Louis Southwestern, has been placed in charge of the railway lubricating department of the Pierce Fordyce Oil Association, Dallas, Tex., successors in Texas to the Waters Pierce Oil Co.

The General Electric Co., Schenectady, N. Y., has placed a contract with the Aberthaw Construction Co. for a new reinforced concrete building at Lynn, Mass. It is to be fireproof, 51 ft. x 130 ft., and three stories high. The exterior walls are to be reinforced concrete frame, paneled with brick, and very large window area. The floors and roof are to be girderless or mushroom type reinforced concrete.

The United Equipment Co. has been organized, with offices at 50 Church street, New York, and Great Northern building, Chicago, by Lucian C. Brown, Captain L. R. Doty and R. W. Davies, to handle steel cars, underframes and miscellaneous railway supplies. Mr. Brown and Mr. Davies were formerly with the Ralston Steel Car Co., Columbus, Ohio, and Mr. Doty was formerly with the Pittsburgh Coal Co., Pittsburgh, Pa.

The Isthmian Canal Commission will receive bids until May 24 for steel flat cars, steel castings, bronze, muntz metal, rivets, driftbolts, boat spikes, nails, tacks, wire, pipe and fittings, valves, cocks, fusible plugs, drills, drill sleeves and sockets, stocks and dies, taps, wire-rope thimbles, lathe dogs, wrenches, hammers, saw blades, files, hoes, peavies, track levels, vises, warehouse trucks, gasolene furnaces, force cups, oil cans, hinges, door-knobs, window glass, steel tapes, marline, belting, belt dressing, desks, chairs, beds, mattresses, oilcloth, lumber, piles, etc. (Circular 582.)

At the second annual meeting of the Engineers Society of Pennsylvania to be held at Harrisburg June 1-4, the following companies will have exhibits: Publicity Bureau of the Westinghouse Manufacturing Co., Pittsburgh, Pa.; Pennsylvania Steel Co., Steelton, Pa.; J. G. Brill & Co., Philadelphia, Pa.; the Rail Joint Co., New York; the *Engineering News*, New York; Ingersoll-Rand Co., New York; Pressed Steel Car Co., Pittsburgh, Pa.; American Car & Foundry Co., New York; McGraw Publishing Co., New York; Allis-Chalmers Co., Milwaukee, Wis.; General Electric Co., Schenectady, N. Y., and Western Electric Co., New York.

The Isthmian Canal Commission will receive bids for the following supplies to apply on its annual estimate for the period ending June 30, 1911: Cross and switch ties, until May 28 (Circular No. 579); malleable iron castings, repair parts for flat and dump cars, until June 1 (Circular No. 581); miscellaneous supplies such as stovepipe elbows, nails, screws, belt rivets, cotters, padlocks, galvanized buckets, oil cans, oilers, torches, locomotive headlights, lanterns, lantern globes, steam gages, grease cups, window glass, clocks, oars, leather belting, rawhide belt lacing, leather, cotton canvas, railway flags, toilet paper, etc., until June 4 (Circular 583).

The Russian-American Trade and Industry Agency has been incorporated with Bruno Wunderlich & Co., Moscow, Russia, and special attention is to be given American manufacturers. One of the shortcomings of American exporters is the inability to trade direct with the buyer. It is the custom now to be represented in Russia by middlemen located in Germany, England, France or other European countries. The result is that by the time American goods reach the Russian customer they have been subjected to three or four commissions and cost 20 to 35 per cent. more than European manufactured goods. Bruno Wunderlich & Co. claim that their position is unique in this respect and can sell American goods of high class direct to customers in Russia and Siberia. They have been established for over 40 years and furnish good references.

The Ingalls-Shepard Forging Co., McCormick building, Chicago, has been organized to build a plant at Harvey, Ill., for making drop-forgings, light and heavy forgings of general character, and general steam hammer work, especial attention to be paid to railway work. The plant is now nearing completion and will be put in operation by the last of May. The shop will be equipped with drop hammers, board drops up to 2,500 lbs., steam drop hammers from 4,000 to 9,000 lbs., Ajax forging machines from 2 to 5 in. bulldosers, pneumatic cushion hammers, and a complete shop for making dies. F. A. Ingalls is president and treasurer of the new company and Charles C. Shepard is vice-president. Mr. Shepard, who was the founder, and Mr. Ingalls, who later was made president of the Buda Foundry & Manufacturing Co,. Chicago, were the principal owners of that company until January 1, 1904, when the plant was sold to the present owners.

O. M. Stimson & Co., mechanical, consulting and inspecting engineers, has been incorporated to make investigation, inspection, specifications, drawings and reports on industrial plants, machinery and railway equipment, including cars, locomotives and materials. O. M. Stimson, who will have direct charge of the business, has had a varied experience in inspection work. After serving an apprenticeship in the engineering department of the U. S. Navy Yard, he entered the car and manufacturing business in 1886. He has served as foreman, stockkeeper and mechanical engineer of the Lafayette Car Works, Lafayette Ind., estimating engineer for the Pullman Co., manager of the Southern Car & Foundry Co., master

car builder for Swift & Co., and for the past year he has been engaged in work of the character to be taken up by the new company. The company has offices at 1335 Old Colony building, Chicago.

TRADE PUBLICATIONS.

Lifting Magnets.—The Electric Controller & Manufacturing Co., Cleveland, Ohio, has just issued a four-page leaflet, describing its E. C. & M. lifting magnets.

Conveying Machinery.—The Jeffrey Manufacturing Co., Columbus, Ohio, has issued booklet No. 38, containing a large number of illustrations, with descriptive captions, of its conveying machinery.

Electric Fan and Air Purifier.—The American Blower Co., Detroit, Mich., has issued an attractive catalogue, No. 269, describing its Sirrocco electric fan and air purifier, for use in offices and residences.

Vanadium Bronze Bells.—The Vanadium Metals Co., Pittsburgh, Pa., has just issued a circular containing a report of some comparative tests made to demonstrate the superiority of Victor vanadium bronze bells.

Newton Cupola.—The Northern Engineering Works, Detroit, Mich., has just issued catalogue No. 51, describing its Newton cupola. The pamphlet contains a number of illustrations and some valuable data on this subject.

Tilting Crucible Furnace.—The Rockwell Furnace Co., New York, has issued its Bulletin M, containing a number of illustrations and some descriptive matter of its tilting crucible furnace, to be used with oil or gas fuel.

Water Supply.—The Lucas Pump Co., Dayton, Ohio, has issued a leaflet describing the Lucas-Dayton combination outfits for water supply, using open tank or pneumatic pressure, either power-driven or automatically controlled.

Railway Supplies.—The Walter A. Zelnicker Supply Co., St. Louis, Mo., has issued its leaflet No. 103, which contains a list of the railway supplies which it handles. This company has also issued a leaflet describing its double clutch car mover.

Denver & Rio Grande.—"Camping in the Rockies" is the title of a booklet issued by the Denver & Rio Grande describing suitable locations for a vacation camp giving valuable suggestions as to the necessary equipment and numerous estimates of the expense for such an outing.

Flexible Steel Armored Hose.—The Sprague Electric Co., New York, has just issued its catalogue No. 516, describing Sprague flexible steel armored hose for compressed air or steam. A number of illustrations show this hose as used in connection with air and steam drills in both railway shops and construction work.

Horizontal Drilling and Boring Machines.—The Pawling & Harnischfeger Co., Milwaukee, Wis., has issued a folder calling attention to the compauy's horizontal drilling and boring machines. A photograph of an installation of three of the company drills is included and a partial list of companies using these machines is given.

Change of Location.—An attractive announcement of the change of location of the general offices and laboratories of the Dearborn Drug & Chemical Works, Chicago, has just been received. A heavy card, bearing pictures of the McCormick building, in which the new offices are located, the company's factory, and several interior views in the plant, has the printed announcement attached by a gray cord.

Chicago & North Western.—The Chicago & North Western issued special menu cards for the Asahi Round the World party which traveled from San Francisco to Chicago in a special train handled as a second section of the San Francisco Overland Limited of the Chicago, Union Pacific and Northwestern Line. The party consisted of 63 prominent Japanese who are en route to the Japanese-British Exposition to be held in London this summer. The party left Omaha at 11:45 p.m. April 26 and arrived at Chicago at 1:05 p.m. April 27, taking breakfast and lunch on the Chicago & North Western diner. The menu cards were printed in both English and Japanese and were bound in neat green covers tied with green cords.

Union Pacific.—The passenger department of the Union Pacific has issued a 94-page booklet on the Columbia River, giving the history of its discovery and early exploration, and descriptions of the scenery along its course. The historical events are illustrated with drawings and the scenery is shown in numerouus photographs. Colorado and Its Attractions is a folder giving interesting information on Colorado resorts and some of the principal hotels. Two folders on the South Platte Valley and the North Platte Valley describe the agricultural opportunities in those regions. Hotels and resorts on the Union Pacific and its connections are listed alphabetically in a 28-page booklet just published. Three pamphlets give summer tourist excursion fares, homeseekers' fares and convention rates, and three others describe the trip to the Yosemite Valley, to Yellowstone Park over the new line, and to Lake Taboe, California.

RAILWAY STRUCTURES.

BALTIMORE, MD.—The Western Maryland has bought seven acres of improved property at Lazareta point, including terminals at the foot of York street, and will spend $250,000 putting up two six-story concrete warehouses. At Lazareta point the company now has a water front of 1,100 ft., with over 500 ft. on the shipping channel. The company is said to be negotiating for other property for terminals, and has plans made calling for an expenditure of $3,000,000 for betterments in and around Baltimore.

BEAVER, PA.—The new steel bridge for the Pittsburgh & Lake Erie under construction for the past two years over the Ohio river from Beaver, Pa., to Monaca, has been placed in operation. The steel superstructure cost $1,500,000; the masonry work $250,000, and the approaches about $500,000. The masonry work was carried out by the Dravo Construction Co., Pittsburgh, and the steel work was erected by the McClintic-Marshall Construction Co.

BELLE VERNON, PA.—Bids, it is said, are being asked by the Pittsburgh & Lake Erie for putting up a brick passenger station in Belle Vernon.

BLOOMINGTON, ILL.—According to local press reports, the Chicago & Alton has offered to spend about $1,000,000 on additions to its shops and a new union passenger station, if the city will furnish the necessary land.

CINCINNATI, OHIO.—The Cincinnati Union Depot Terminal Co. has been organized with a capital of $1,000,000 for the purpose of building terminals at a cost of $25,000,000. Plans have been prepared for the buildings and application to the city for a franchise will soon be made.

DENISON, TEX.—The Missouri, Kansas & Texas will begin work in a few days, it is said, on the concrete foundations for five shop buildings, to be built in Denison. (April 1, p. 922.)

HOBART, IND.—The Pennsylvania Lines West will build a $40,000 brick and stone passenger station. Price & McLanahan, architects, Philadelphia, Pa., will receive bids about June 12.

HOLDREGE, NEB.—According to press reports quoting an officer of the Chicago, Burlington & Quincy, that company will build passenger stations at Holdrege and Grand Island, to cost $25,000 each. A station will also be built at Peru, Neb.

KANSAS CITY, MO.—An officer of the Kansas City Southern is quoted as saying that plans are nearing completion for ex-

tensive improvements to be made to the shops in Kansas City. The cost of the work will be about $250,000.

London, Ont.—The Canadian Pacific is said to have bought land in the east end of London, near Quebec street, to be used as a site on which it will build shops, a roundhouse, station and office building. (Jan. 7, p. 71.)

McAdam Junction, N. B.—An officer of the Canadian Pacific writes that two additions are being built to the hotel and station at McAdam Junction. The improvements include a one-story addition on the station end of the building, 32 ft. x 76 ft., to provide additional accommodations for baggage and express, and another on the hotel end of the building, 36 ft. x 76 ft., two stories high, to provide kitchen, dining room and lunch room accommodations. (April 29, p. 1118.)

Medford, Ore.—The Southern Pacific has begun work on a $40,000 passenger station mentioned in an unconfirmed item in the *Railway Age Gazette* of November 26, 1909. The building will be 164 ft. long and 42 ft. wide, built of pressed brick. It is located at Fifth and Front streets, two blocks north of the present depot.

Metropolis, Ill.—Application has been made by the Chicago, Burlington & Quincy to the government for permission to build a bridge over the Ohio river at Metropolis. A hearing has not yet been arranged with the government engineers.

Middletown, Conn.—A contract is said to have been given to the American Bridge Co. by the New York, New Haven & Hartford for building the bridge over the Connecticut river at Middletown. The plans call for a bridge 1,200 ft. long. It is understood that the work will be finished during 1910. (April 22, p. 1065.)

Minneapolis, Minn.—According to press reports the Northern Pacific has plans made for enlarging its terminals in northeast Minneapolis, to be carried out at a cost of about $1,000,000. A building permit is said to have been taken out for the construction of buildings, including shops, a 30-stall roundhouse, coal shed, sand house, machine shop and office building, to cost $125,000.

North Zulch, Tex.—See Houston & Texas Central under Railway Construction.

Omaha, Neb.—The Union Pacific will build new car shops and a planing mill at an approximate cost of $400,000. Current reports that a new freight house would be built are denied.

Portland, Ore.—Plans, it is said, will be made at once by the Hill lines for a new passenger station in Portland, to be built on the site of the present terminals.

St. Stephen, N. B.—An officer of the Canadian Pacific writes that the present wharf accommodation is to be removed and a new wharf with about 600-ft. frontage provided. The present freight shed will be moved to accommodate the proposed rearrangement of tracks, and in addition six new tracks will be added to the freight layout to provide trackage facilities for the freight shed wharves and team track work. A further rearrangement of the entrance to the yard provides for a switch lead independent of the main track. The new wharf will be of pile construction and placed about 150 ft. from the present shore line, with back filling, to provide for the additional trackage. (April 29, p. 1118.)

Toledo, Ohio.—According to press reports the Cincinnati, Hamilton & Dayton will spend $2,175,000 for improvements at Toledo. Of this amount $100,000 is to be used for improving the grain elevators and $75,000 for a new machine shop and roundhouse. (Feb. 18, p. 383.)

Topeka, Kan.—The Atchison, Topeka & Santa Fe will build a $50,000 paint shop in addition to the improvements previously reported in these columns.

Trinidad, Colo.—The Atchison, Topeka & Santa Fe will build a two-story brick freight house.

Woodstock, N. B.—An officer of the Canadian Pacific writes that a new station, 33 ft. x 118 ft., is to be built of pressed brick, with stone trim and overhanging slate roofs. The station is to have shelter platforms. (April 29, p. 1118.)

Late News.

The items in this column were received after the classified departments were closed.

The Baltimore & Ohio is now in the market for 50 consolidation and 30 Mallet locomotives.

The Louisville & Nashville is building 1,200 freight cars of various types in its company shops.

The Baltimore & Ohio is now in the market for from 2,500 to 5,000 box cars and 2,000 coke cars.

The Union Stock Yards, Omaha, Neb., has ordered one six-coupled switcher from the Baldwin Locomotive Works.

The Crystal Tank Line, reported in the *Railway Age Gazette* of April 8 as being in the market for 100 tank cars, has ordered this equipment from the American Car & Foundry Co.

The Pullman Company has filed a bill in the United States circuit court against the Interstate Commerce Commission to enjoin the commission from enforcing the new berth rates recently fixed by the commission.

According to press reports it is expected that work will be finished about June 15 on the extension of the Arizona & California from the bridge over the Colorado river near Parker, Ariz., west to Bengal, Cal. (Sept. 17, p. 520.)

A contract is said to have been given to the A. B. Corey Construction Co., Ogden, Utah, by the Southern Pacific, for work to include repairing damages caused by early spring floods, putting in sidings and double-track extensions through Nevada.

A contract is said to have been given to Thompson & Scott, St. Louis, Mo., to build the extension of the Stephenville North & South Texas, recently reported sold to the St. Louis Southwestern, from Hamilton, Tex., southeast to Gatesville, 32 miles. W. C. McCoy, J. H. Kilbeck and G. J. Gammett are said to have reached an agreement with the contractors to complete the first 18 miles south of Hamilton.

Daniel Willard, president of the Baltimore & Ohio, has been elected president of the American Railway Association, succeeding F. A. Delano. H. U. Mudge was elected vice-president, and I. G. Rawn, president of the Chicago, Indianapolis & Louisville, and C. R. Gray, vice-president of the St. Louis & San Francisco, were elected to the executive committee. The following delegates were appointed to the International Railway Congress to be held at Berne, Switzerland: Daniel Willard, W. F. Allen, Arthur Hale, J. F. Wallace, William Mahl, C. W. Bradley, W. J. Harahan and G. L. Connor.

The annual convention of the Railway Storekeepers' Association was held at St. Louis, Mo., May 16 to 18. D. A. Williams, general storekeeper of the Baltimore & Ohio, presided. The address of welcome was made by the Hon. F. H. Kreisman, mayor of St. Louis; it was responded to by the president and by Eugene Chamberlain, chairman of the Freight Car Repair Pool of the New York Central Lines. Abstracts of the papers presented are published elsewhere in this issue. The association is in a prosperous condition, having 519 members, of whom 210 were in attendance, representing roads in all parts of the United States, Canada and Mexico. The officers for the ensuing year are as follows: President, J. H. Waterman, superintendent of timber preservation, C., B. & Q., Galesburg, Ill.; first vice-president, W. F. Jones, general storekeeper, N. Y. C. & H. R., New York; second vice-president, J. R. Mulroy, general storekeeper, St. L. & S. F., Springfield, Mo.; secretary-treasurer, J. P. Murphy, general storekeeper, L. S. & M. S., Cleveland, Ohio.

FOREIGN RAILWAY NOTES.

A federal loan of $20,000,000 was recently floated in Paris for the construction of the Goyas Railway of Sao Paulo, Brazil.

It is proposed to build a number of short lines in the neighborhood of Soochow, China, to reach Huchow, Kiangyan, Tanyang City and Ku-Yang, which will serve as feeders for the Shanghai-Nanking Railway.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Mexico North Western has ordered four consolidation locomotives from the American Locomotive Co.

The Temiskaming & Northern Ontario has ordered four Pacific locomotives from the Kingston Locomotive Works.

The Cuba Company, reported in the *Railway Age Gazette* of May 6 as making inquiries for locomotives, has ordered 10 locomotives from the American Locomotive Co. for July delivery.

The Iowa Central, reported in the *Railway Age Gazette* of April 8 as being in the market for 10 consolidation locomotives, has ordered the equipment from the Baldwin Locomotive Works.

The Minneapolis & St. Louis, reported in the *Railway Age Gazette* of April 8 as being in the market for 10 consolidation and two Mogul switching locomotives, has ordered this equipment from the Baldwin Locomotive Works.

The Paris & Mt. Pleasant Railroad, Paris, Tex., a new line building from Paris, Tex., to Mt. Pleasant, 53 miles, is in the market for motive power for immediate delivery. N. H. Ragland, secretary and general agent, Paris, Tex.

The Chicago & Alton, reported in the *Railway Age Gazette* of April 8 as being in the market for 10 mogul switch, 10 Pacific and 30 Mikado locomotives, has ordered 20 Mikado and 10 Pacifics from the American Locomotive Company, and 10 mogul switchers from the Baldwin Locomotive Works.

The Lehigh Valley, as reported in the *Railway Age Gazette* of April 22, has ordered five simple Atlantic type locomotives from the Baldwin Locomotive Works.

General Dimensions.

Weight on drivers	95,000 lbs.
Total weight	183,000 lbs.
Cylinders	20 in. x 26 in.
Diameter of drivers	77 in.
Type of boiler	Wide firebox
Working steam pressure	200 lbs.
Heating surface, tubes	2,705 sq. ft.
" " firebox	165 "
" " total	2,870 "
Tubes, number	320
" outside diameter	2 in.
" length	16 ft. 3 in.
Firebox, type	Wide
" length	108 in.
" width	102 in.
" material	Steel
Water capacity	6,500 gals.
Coal capacity	13 tons

CAR BUILDING.

The Chicago Great Western is in the market for about 12 passenger cars.

The Temiskaming & Northern Ontario is said to have ordered 12 cinder cars and 50 steel underframe box cars.

The Cuba Eastern is in the market for miscellaneous freight equipment, including 30 and 40-ton box, flat and some cane cars.

The Lehigh Valley is said to be in the market for eight coaches and four combination cars. This item is not confirmed.

The Atchison, Topeka & Santa Fe has ordered 17 baggage and eight mail and baggage cars from the American Car & Foundry Co.

The Harriman Lines have ordered a number of freight cars from the American Car & Foundry Co., but the exact number and details are not available at this time.

The Paris & Mt. Pleasant Railroad, Paris, Tex., a new line building from Paris, Tex., to Mt. Pleasant, 53 miles, is in the market for rolling stock for immediate delivery. N. H. Ragland, secretary and general agent, Paris, Tex.

The Interborough Rapid Transit Co., reported in the *Railway Age Gazette* of April 22 as being in the market for 100 steel subway cars, has ordered 75 closed motor passenger cars from the Pressed Steel Car Co. These cars will have a capacity of 52 passengers and will weigh 73,400 lbs. They will be 38 ft. 8 in. long, 8 ft. ½ in. wide and 8 ft. 1⅞ in. high, inside measurements, and 51 ft. ½ in. long, 8 ft. 10 in. wide and 11 ft. 10½ in. high, over all. The bodies and underframes will be of steel. The special equipment includes:

Axles	Not yet placed
Bolsters, body	Built-up
Bolsters, truck	Not yet placed
Brakes	Westinghouse automatic
Brake-shoes	National Brake-Shoe Co.
Couplers	Not yet placed
Curtain fixtures	National Lock Washer Co.
Curtain material	Pantasote
Doors	Side
Heating system	Consolidated electric
Journal boxes	Symington
Lighting system	Electric
Seats	Heywood Bros. & Wakefield Co.
Ventilators	Swing steel shutters
Wheels	Solid rolled steel
Window fixtures	Polished brass

Harriman Lines.—The passenger cars recently ordered from the Pullman Co. will have the following details: 189 coaches, seating capacity 72, weight 94,000 lbs., over-all measurements, length 67 ft. 8¾ in., width 9 ft. 11⅛ in., height 14 ft.; 85 chair cars, seating capacity 60, weight and measurements same as coaches; 59 baggage, weight 82,500 lbs., inside measurements, length 60 ft. ⅞ in., width 9 ft. 1¼ in., over-all measurements, length 63 ft., width 9 ft. 11⅛ in., height 14 ft.; two combination chair and smoker, same as chair cars; 12 observation cars, seating capacity 40, weight 120,000 lbs., over-all measurements, length 80 ft. 9¾ in., width 10 ft. ⅜ in., height 14 ft. 11½ in.; 25 diners, seating capacity 30, weight 128,000 lbs., over-all measurements, length 80 ft. 2¾ in., width 10 ft. ⅜ in., height 15 ft. 1⅞ in.; 35 postal, weight 108,000 lbs., inside measurements, length 60 ft. ½ in., width 9 ft. ⅞ in., over-all measurements, length 63 ft., width 9 ft. 11⅛ in., height 14 ft.; one combination passenger, baggage and mail car, over-all length 71 ft. 11 in., inside length 34 ft. in passenger compartment, 15 ft. in mail compartment and 20 ft. in baggage compartment; 16 combination baggage and postal cars, weight 118,000 lbs., over-all measurements 71 ft. 11 in., width 9 ft. 11⅛ in., height 14 ft., inside measurements, length in mail compartment 30 ft., length in baggage compartment 39 ft. ½ in. The coaches, chair, baggage, postal, chair and smoking and baggage and postal cars are of all-steel construction, and the other cars have steel underframes and wood bodies. Delivery is specified as soon as possible on the wooden equipment, and to begin September, 1910, on the steel cars. The distribution of the equipment to the various lines of the system was given in the *Railway Age Gazette* of May 13.

MACHINERY AND TOOLS.

The Delaware, Lackawanna & Western has issued a list of machine tools for its Scranton, Pa., shops, to cost about $75,000.

The Boston & Maine has ordered an electric traveling crane of 120 tons capacity and 65-ft. span from the Shaw Electric Crane Co., Detroit, Mich.

IRON AND STEEL.

The Baltimore & Ohio has ordered 300 tons of bridge steel from the American Bridge Co.

The Coal & Coke Railroad has ordered 300 tons of bridge steel from the American Bridge Co.

The Chicago, Rock Island & Pacific has ordered 2,600 tons of bridge steel from the American Bridge Co.

The Weatherford, Chicago & Brazos Valley, a new line under construction, is in the market for 60-lb. rails for laying 51 miles of line. J. B. Saylor, chief engineer, Weatherford, Tex.

SIGNALING.

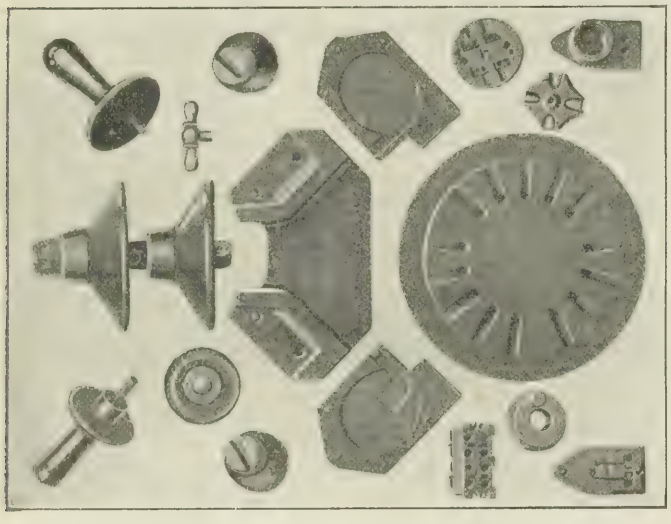
The Chicago, Milwaukee & St. Paul is installing three-position upper-quadrant, automatic semaphore block signals on double track between St. Paul and Minneapolis.

An officer of the Oregon Short Line writes that 300 miles of new automatic block signals, the construction of which has heretofore been announced, are now being put up. They are on the Utah and Idaho divisions of the road. When this work is finished the Idaho division will be completely signaled from Granger, Wyo., to Huntington, Ore., a distance of 540 miles. The signaling of the Utah division will be completed from Sandy, Utah, to Cache Junction, 100 miles. It has been reported that an appropriation has been made for installing signals on the Southern Pacific line across Great Salt Lake. As a matter of fact there is no new construction to be done on this line, as it is already fully signaled; but the officers of the road are considering using the staff system on that portion of the line where the salt water of the lake interferes with the working of the track circuits.

Insulating Material.

A new insulating composition, Hemit, is being introduced by the Hemming Manufacturing Co., New York. Parts of electrical machinery and apparatus in which this material is used are shown in the accompanying illustration.

Hemit is a composition molded under pressure into various shapes and forms. It is said to be very hard, although not brittle, and that it will take a high polish. It is made to be both fire and waterproof, with high tensile strength, and to be immune to contraction, so that expanding metal parts may



Electrical Machinery Parts Using Hemit Insulating Material.

be fixed in place during the molding process. Among some of the more important uses of this composition are the following: Switch handles and bases; bushings; spools; controller parts; field magnet spools; commutator rings; brush holders; solenoid housings; socket rings and gears; arc shields; telephone receivers; sleeves; washers; trolley, telegraph and high tension insulators; snap switch parts; push buttons; contact plugs; telephone mountings, etc.

Hydraulic and Screw Jacks.

The Duff-Bethlehem hydraulic jack is forged from steel, which eliminates leakage at the joints, reduces the weight, and increases the strength. The ram and pump chamber are forged together and the cylinder and base are one piece so there is no joint at the base where most of the leakage in the old jacks occurred. The makers state that the Duff-Bethlehem jack is 30 per cent. to 80 per cent. lighter than the various cast jacks of similar capacity, which is an important consideration in shop practice. Two men can easily carry the forged steel jack while the old type had to be moved on a truck. The strength of forged steel is so great that the jacks can bear a large extra pressure without danger, which permits their use on any kind of a foundation. The valves are improved and are so placed that the jack will operate in any position with its full range of lift. The working parts are few and easily replaced, repairs being made without the use of special tools.

Figs. 1 and 2 show two types of these jacks. The telescope

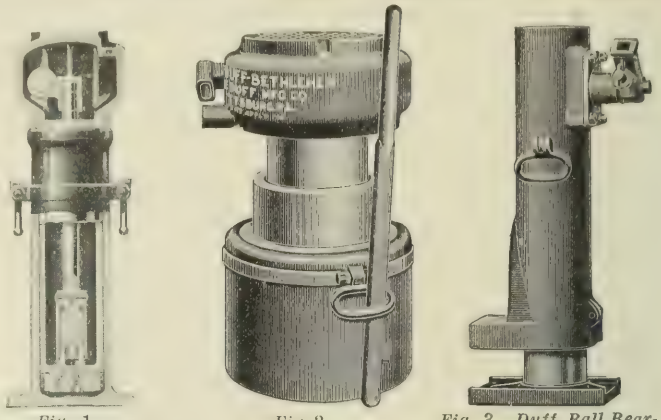


Fig. 1. *Fig. 2.* *Fig. 3. Duff Ball Bearing Jack.*

Duff-Bethlehem Hydraulic Jacks.

Hydraulic and Screw Jacks.

jack is made in capacities from 30 tons to 250 tons, with various ranges of lift. Other types include the plain, broad base, wrecking, fixed claw, journal box, and independent pump jacks, which are made in hundreds of sizes. The independent pump type has the jack and pump separated, connection being made with a flexible copper tube. This type is convenient where a limited space is available and is made in capacities of 100 to 500 tons.

The Duff ball bearing screw jack, shown in Fig. 3, is made in a number of types and sizes, including all the sizes used in car shops and roundhouses. All gears are of high carbon steel, are drop forged and have machine cut teeth. The bearings have large balls, separated by a bronze cage to prevent friction between the balls. An additional bearing on the bevel pinion takes the thrust at that point, which reduces the friction and makes the operation of the jack easier

Fairbanks, Morse & Co., Chicago, carries a full line of Duff-Bethlehem forged steel hydraulic jacks, Duff ball bearing screw jacks in addition to the fell-known Barrett track jacks.

Mazdafor Illumination for Train Sheds and Freight Depots.

The Sterling Electric Manufacturing Co., Warren, Ohio, reports that the question of better lighting for train sheds and freight depots with Sterling Mazdafor clusters has been demonstrated in, and accepted by the management of the Big Four terminal station at Louisville, Ky. The freight sheds are 130 ft. wide by 480 ft. long, with a driveway 45 ft. in width running through the center. On the sides of this driveway are the ingoing and outgoing freight platforms, and through the center of the driveway nine Sterling Mazdafor clusters were installed, which are said to be giving equal distribution of light throughout the building.

This installation is subject to rough usage, including almost continual vibration by the constant handling of cars through and along the sides of the building.

The lamps are hung from iron girders the same as arc lamps, so that they may be raised or lowered to suit the convenience of the trainmen. This installation was put in under the supervision of Walter S. Moore, superintendent of terminals at Louisville, and is said to have given entire satisfaction as to illumination, cost and current consumption.

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Some odd though transitory vagaries in railway receipts are pretty sure to follow the coming readjustments upward of passenger fares. It is due, in large degree, to the legal requirement of thirty days' notice in filing the new rates. Thus a commuter may on the twenty-ninth day buy a long-time commutation ticket and make a gain if his old ticket has but a short time left to run. In like manner the steady traveler on regular unlimited tickets may—if he has the cash—lay in a stock of regular tickets at the old rate to be used for a greater or less part of the new rate period. Then there is the increased prospective purchase of mileage books, in either the case where the price will not be raised or where it is feared that it will be raised. Such conditions forecast, for the short periods immediately preceding the increase of rates, a considerable enlargement of passenger receipts, to be followed by temporary diminutions later. Finally, there is a factor, usually minor, to be reckoned in, due to some transfer of passenger traffic to the competing electric lines. In a case like the New Haven, with hundreds of miles of paralleling electric lines owned by itself, this means only the shifting of receipts from one pocket to the other; in other cases it means, generally within narrow limits, a real subtraction from passenger revenue more or less persistent. All these influences referred to bear mainly on short distance passenger traffic, probably to be made good or show positive gains a little later in long-distance business. But for a few months following the increased fares one may look for some interesting, not to say puzzling, disturbances in passenger receipts of the steam roads, and, in some instances, opportunity for edifying study.

The bill to amend the Interstate Commerce act, which has been approved by the House of Representatives in committee of the whole, directs the Interstate Commerce Commission to "proceed forthwith to investigate and ascertain the value in money of all the property of every railway in the United States." In determining this value, the commission is directed to ascertain "the original cost of construction, the amount expended in permanent improvements, betterments and extensions, what portion of the earnings have been invested in permanent improvements, betterments and extensions, and the extent to which such earnings are represented by stocks and bonds. It shall also ascertain the original cost and value of the right-of-way and terminal grounds, and the present value thereof exclusive of improvements, also the value of the improvements." The valuation shall be *prima facie* evidence before the commission and in the federal courts. Railway managers do not regard the plan for a general valuation with such apprehension as they did a few years ago. They are confident that if fairly made it would show that the cost of reproducing the physical properties as a whole would greatly exceed the aggregate capitalization of railways, this being based largely on the results of the valuations made by the commissions in Minnesota, Washington and other states. Those who oppose valuation do so mainly because they think it will be worthless in fixing reasonable and non-discriminatory rates. The value of the property becomes a factor to be considered in the regulation of rates only when it is contended that rates fixed or proposed are confiscatory; and the fixing of rates that are reasonable and rates that barely avoid confiscation are two entirely different things. However, regulating authorities show a strong tendency to try to reduce rates to where they will barely yield a "fair return"—in other words, to where they will barely avoid confiscation. A valuation might, perhaps, be useful as drawing distinctly the limit beyond which regulation of rates cannot go without confiscation. If a valuation is made, we shall be surprised if it does not show that the railways as a whole are not now earning "a fair return on the fair value" of their properties. It would be interesting then to observe the attitude commissions and shippers would take toward the general advances in rates which it would clearly justify.

The experiments, made by Mr. McBain, showing the inequality of expansion of locomotive boiler sheets, as described on another page, are of considerable practical value, but should be carried still further. Considering the high cost of maintenance of wide fireboxes, it seems remarkable that so little has been done to determine exactly what takes place in different parts of the firebox and boiler under various conditions of operation. Entirely too much energy has been expended in developing theories on this subject, most of which have been of very little practical benefit, and Mr. McBain is to be congratulated on confining his remarks almost entirely

to actual facts. The suggestion that the difference in the expansion of the inner and outer sheets of the firebox is due to the outer sheet being hotter is, of course, out of the question. In this connection L. R. Pomeroy called attention to the experiments made by A. E. Manchester, superintendent of motive power, Chicago, Milwaukee & St. Paul, which showed conclusively that fusible plugs placed near the inside sheets were subjected to a higher temperature than that due to the boiling water, indicating that the water was forced from contact with the sheet by the steam. A little over a year ago C. A. Seley, mechanical engineer, Chicago, Rock Island & Pacific, read a paper before the Western Railway Club in which he suggested that the failure of the straight side sheets of wide fireboxes might be due to the formation of a film of steam on the side sheet preventing its coming into direct contact with the water and thus becoming overheated. On the narrow firebox with the ogee sides this film of steam is swept away by the circulation of the water. It is true that the difficulties with the wide firebox have been overcome to some extent by the use of flexible staybolts. There are, however, many things about the action of the boiler that are not clearly understood, and much is to be desired in the direction of fewer failures and reduced maintenance costs. The experiments should be followed up by more elaborate ones, using the data obtained by Mr. McBain and others as a basis. The exact temperature of the sheets and of the water in various parts of the boiler could be accurately obtained by the use of pyrometers. These, including their installation, might cost $500 or $600, surely not more than $1,000, and this expense would be repaid many times over by improvements which could be made in boiler design because of the information obtained.

VANDALIA RAILROAD.

The Vandalia gives the Pennsylvania its entrance into St. Louis. Of the total $14,606,200 stock outstanding, on which the Vandalia is paying 5 per cent. dividends, the Pennsylvania Company owns $11,633,400. In January, 1905, the Terre Haute & Indianapolis, the St. Louis, Vandalia & Toledo and the Indianapolis & Vincennes, all lines radiating from Indianapolis and Terre Haute, were consolidated as the Vandalia Railroad, but for some years before this the separate roads had been controlled by Pennsylvania interests and operated in harmony. In 1909 the company operated 827 miles of line.

Total operating revenue amounted to $9,100,000 in the calendar year 1909, an increase of $555,000 over 1908, almost the entire increase in revenue coming from increased freight earnings. Operating expenses, including taxes, amounted to $7,100,000, an increase over 1908 of $380,000. After the payment of fixed charges there was left net income of $900,000 last year, comparing with $740,000 the year before. Freight revenue, which forms 65 per cent. of total revenue, amounted last year to $5,960,000. This is an increase of $520,000 over the year before. The number of tons carried one mile in 1909 was 981,000,000, an increase over 1908 of 106 million, and the average revenue per ton per mile was 6.69 mills in 1909, which is less by 0.24 mills than in 1908. The average trainload last year was 313 tons, an increase of 21 tons over the year before.

Products of mines form 58 per cent. of the total tonnage carried by the Vandalia and last year the tonnage of these products amounted to 5,100,000 tons, an increase of 600,000 tons over 1908. Most of this tonnage was furnished by bituminous coal, of which product 4,500,000 tons were carried in 1909 as against 3,900,000 tons carried in 1908. Manufactures furnish 17 per cent. of the total tonnage and the tonnage of these products amounted to 1,500,000 tons in 1909 as against 1,300,000 tons in 1908.

As we have said, expenses were greater by $380,000 in 1909 than in 1908. Almost the entire amount of this increase came through greater expenditures on maintenance of way and maintenance of equipment. These expenditures in 1909 were $1,350,000 for maintenance of way and $1,600,000 for maintenance of equipment, an increase of $150,000 in maintenance of way and $193,000 in maintenance of equipment. Transportation cost $3,400,000, which was only very slightly ($5,000) more than the cost in 1908. This good showing was made notwithstanding the fact that the total tonnage carried one mile increased over 13 per cent.

President Wood says: "The amount of high-class freight carried by your company necessitates the running of a large number of freight trains at comparatively high rates of speed, and as this business is increasing very rapidly and there are also a large number of very fast passenger trains, it will be necessary to proceed steadily with the double-tracking of your main line, of which 84 per cent. is still single track." In connection with the remark about fast passenger trains, it will be recalled that the Pennsylvania's 24-hour train between New York and St. Louis uses the Vandalia.

The general business depression of 1908 continued to affect the earnings of the Vandalia until about August, 1909, when improvement in business conditions set in, so that 1909 earnings do not show the effect of a full year of more prosperous business.

The following table shows the earnings and expenses in 1909 and 1908:

	1909.	1908.
Total mileage operated	827	829
Freight revenue	$5,959,002	$5,438,667
Passenger revenue	2,180,535	2,166,255
Total operating revenue	9,136,286	8,582,670
Maintenance of way	1,353,491	1,201,854
Maintenance of equipment	1,573,463	1,380,429
Traffic	281,105	256,116
Transportation	3,391,917	3,386,633
Total operating expenses	6,822,782	6,436,637
Taxes	286,500	292,500
Net operating income	2,027,004	1,853,533
Gross corporate income	2,057,835	1,876,797
Net corporate income	896,261	739,592
Dividends	730,308	729,570
Ex. exp., revising grades, etc.	150,000	.....
Surplus	15,954	10,022

DEPRECIATION RESERVES.

In another column we publish an article by Henry L. Gray, engineer of the Washington Railway Commission, entitled The Necessity of Depreciation Reserves. A good deal of attention recently has been given to the matter of maintaining depreciation accounts. The views expressed by Mr. Gray are interesting as those of an officer of a railway commission. In our issues of March 4, April 8 and May 20 we published interesting papers on the same general subject by C. I. Sturgis, general auditor of the Chicago, Burlington & Quincy, and William Mahl, vice-president of the Harriman Lines.

Mr. Gray implies the necessity of an annual charge equal to the estimated average annual depreciation. Admitting, for the purposes of this discussion, that the depreciation fund accumulated during a series of years should be sufficient to renew a plant when it has reached a certain depreciated condition, still it is not in accord with commercial usage to require that such total charge shall be distributed in equal annual or monthly amounts. Manufacturing establishments generally provide larger contributions to depreciation funds in "fat" than in "lean" years. The reason advanced for requiring a fixed monthly or annual charge is that it prevents unusual fluctuations in the accounts. Such fluctuations necessarily occur, however, between "fat" as compared with "lean" years, because in the former there are not only the expenses involved in carrying on a larger business but also larger earnings available for maintenance and repairs. Statisticians are too apt to try to reduce figures to a dead level instead of having them reflect the actual fluctuations caused by changes in conditions. It would seem to be more proper to have the figures reflect the conditions, and if desired, have

an explanation of the particular conditions influencing the current figures. It would seem to be best for the directors to decide how much shall be set aside for depreciation in each year, and if desired, state their reasons for deciding on a larger or smaller amount. The excessive tendency referred to, of statisticians to reduce figures to a dead level, is illustrated by the requirement of the New York Public Service Commission, mentioned by Mr. Gray for a depreciation fund which is really a combined maintenance and depreciation fund, as the commission intends it to be drawn on for all expenditure chargeable to the repair and renewal accounts.

Mr. Gray suggests charging to depreciation the "cost of rolling stock * * * distributed over a period corresponding to its probable life." But not only does the natural life of rolling stock and other parts of a railway plant vary with the geographical conditions and the size of each road, but it also varies in men's minds, each giving different stress to the various factors, such as demand for greater capacity, accidental destruction, change of type, etc.

Mr. Gray says that "in no case should a sum exceeding the original cost of the existing plant be charged against such (depreciation) fund." It may properly be held that it is not the original cost, but the estimated cost of replacement that should be the basis for a depreciation charge. We believe it may properly be contended that if a bridge wears out, it is the duty of the management to replace it with a bridge of like kind, regardless of the fact that the cost of steel may have gone up or down. It is a common practice (and a proper one) for a railway which is going to replace a steel bridge with a better one, to charge to maintenance what it would have cost to replace the old bridge in kind and to charge the excess cost of the new bridge to additions and betterments. Under Mr. Gray's plan the charge to maintenance would be the original cost of the bridge, and under this scheme in a case where the new bridge is no better than the old, there might be a considerable charge to additions and betterments because of the increased price of steel.

Mr. Gray talks about setting aside a "sum" and argues that it would not necessarily remain idle for a term of years. But if actual money were set aside, it would necessarily be idle and in some cases for a considerable period. But a depreciation fund is not, and ought not to be, a cash, but an expense account.

The aim of a railway management should be to so keep up the property out of earnings as to maintain its earning capacity and its capacity for giving good service to the public. So long as it does that it does its duty to its stockholders and to the public, and if its accounting system shows clearly that it has done its duty to its stockholders and to the public, and how it has done it, its accounting system is correct and should not be required to be so modified, in order to meet the views of theorists, that it will indicate what has not been done and ought not to have been done.

THE INCREASE OF DIVIDENDS.

Since January 1, 1910, twelve railway companies have raised their dividends, either in the form of an increase of the regular rate or as an extra cash payment. The list includes the New York Central, the Louisville & Nashville, the Reading, the Lake Shore and the Chesapeake & Ohio; and increases by other large corporations, notably the Pennsylvania Railroad, are credibly forecast as things of the near future. If these increases were simply a matter of the net earnings meeting a certain dividend requirement they would still have a fiscal interest as an index of the reaction from a period of industrial depression in which the railways had their share. For, taking the year 1908 as the 12 months of depression and the year next following as the one of recovery, the reaction upward must be deemed a remarkable one, contrasting dramatically with the five years required for a similar recuperation after the panic of 1873. The optimists who call the panic of 1907 and its sequels a "rich man's" affair will see in the increased railway dividends of the last four months a confirmation of their oft-repeated theorem. And it is not surprising that the railway investor, not necessarily very optimistic, finds in these dividend increases his confidence in the railway security strengthened.

But quite apart from such personal equations the increase of dividends has one unique aspect. Such increases are normally coexistent not only with high railway earnings but with a period when prospective obstacles to the continuance of those earnings are at least minimized. Extra and increased dividends, in other words, have been declared usually under a clear sky and in fair weather; while now they are being paid not, to be sure, under a sky deeply overcast, but under a sky bearing some clouds. The increased earnings, gross and net, are here, but the wage question is not settled; the offsetting increase of rates has yet to be carried through; there is railway legislation pending in Congress, and two important decisions are hung up for a time in the United States Supreme Court but sure to come next autumn. Overhanging the situation also are the improvements, reduced during the depression and in many cases representing considerable outlays which have been postponed to an era of prosperity and larger traffic. Conditions such as these argue strongly for a conservative dividend policy and the delay of added returns to the stockholder, although his cry for them, oppressed as he is by his increased cost of living, is loud.

The side in favor of the dividend increases has, however, its plea. In some cases, notably that of the New York Central, the increased dividend is not so much an absolute increase as the return to an old rate temporarily interrupted. In a number of other cases the increase may fairly be called the partial reaping of a harvest which had nearly ripened when the panic period struck in. Such is the case of the Reading, long years in recovering from the policy of President Gowen and his great purchases of coal lands, but making good at last after dividends had failed for decades. In other cases there had been, preceding the panic period, the higher organization and improvements making for economies of operation which are now coming into play. Nor is it to be forgotten that the Pennsylvania Railroad has not yet increased its dividend, notwithstanding high earnings and the near approach of the time when the opening of its great New York terminal will fatten them. Wages must increase but the extensive and continuous negotiations are centering to the point where the railway managers know the upper limitations; the increase of rates is almost as sure as the increase of wages; new railway legislation in Congress is at its worst nebulous, both in form and consequences; and the highest federal tribunal, already divided, does not become more sinister with Governor Hughes on the supreme bench.

In the final analysis the question of an increased dividend reverts, obviously, to the fiscal condition of the particular railway corporation. A company like the Lackawanna, with vast accumulation of assets and small capital, can almost ignore —as in fact it has ignored—general railway situations and declare big dividends during industrial and commercial adversity. A railway corporation at the other extreme may, for special causes, be unable to sustain dividends even in a period of general prosperity. But in its secondary analysis the bearing of general conditions such as we have outlined becomes important and suggestive when the great group of railway dividend payers is taken collectively. That their presidents and directors have in so many cases voted for the dividend increase is, in itself, a note of confidence. They have personal as well as corporate reputations to sustain, and an occasional "dummy" director does not vitiate the whole board and still less does he impair—rather add to—the responsibility of the man who sits at the head of the table.

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.

It has been pointed out that the Pan Handle performs much the same service for the Pennsylvania system as does the Big Four for the New York Central Lines. This is more or less true, but the fact that the Pennsylvania road runs between Pittsburgh and the Great Lakes, as well as forming a connection between the Pennsylvania Lines East and the cities of Cincinnati, Indianapolis and Louisville, gives it a character quite different from that of the Big Four.

The P. C. C. & St. L. operates the Southwest System of the Pennsylvania Lines West. Of the 1,469 miles operated in 1909 it owned 1,133 miles. The company does not control through stock ownership any very important lines of the Pennsylvania system. The greater part of its own stock is owned by the Pennsylvania Company, which operates the Northwest System of the Lines West, and is in turn controlled by the Pennsylvania Railroad. Such a road as the Pan Handle, serving Pittsburgh and the middle west, reflects in its own earnings very quickly and quite accurately the manufacturing prosperity or depression of the country. Naturally, therefore, in 1909 the road made a very good showing, for besides the better turn in business generally, the United States Steel Corporation's plant at Gary, Ind., was in operation and the effect of this was shown almost immediately in the earnings of the P. C. C. & St. L.

The opening of the Gary plant resulted in an immediate increase in the coal and coke tonnage from the West Virginia coal fields for the Gary and Chicago districts. In this connection it is worth remembering that the Western Maryland is now building a line from Cumberland, Md., north to Connellsville to form a connection with the Pittsburgh & Lake Erie of the New York Central Lines, and when this line is built the New York Central and the Western Maryland will be able to compete with the Pennsylvania in hauling coal into Gary.

In 1909, total operating revenue of the P. C. C. & St. L. amounted to $36,000,000. This is an increase of $4,900,000 over 1908. Expenses, including taxes, amounted to $25,900,000 last year and to $22,5000,000 the year before, an increase of $3,400,000; so that net operating revenue were greater in 1909 than in 1908 by $1,500,000 and totaled last year $10,100,000. The revenue from freight was $24,700,000 in 1909, or $4,000,000 greater than in 1908, and the tonnage carried amounted to 32,900,000 tons, an increase of 21 per cent. The ton mileage increased 20 per cent., while the freight train mileage amounted to 10,500,000 miles, and was but 11 per cent. greater than in 1908. The average revenue per ton per mile amounted to 6.41 mills, a decrease of 0.03 mills from 1908, while the revenue per freight train mile amounted to $2.36, an increase of 18 cents over 1908. The average train load was 368 tons, an increase of 30 tons over the average train load in 1908.

In 1909, 7 per cent. of the total tonnage carried was furnished by products of agriculture, 3 per cent. by products of animals, 55 per cent. by products of mines, 5 per cent. by products of forests, 26 per cent. by products of manufactures, 1 per cent. by merchandise and about 3 per cent. by miscellaneous articles. The tonnage of bituminous coal carried in 1909 total 12,500,000 tons, an increase of 1,700,000 tons. This is the largest increase shown in the tonnage of any commodity, but the largest percentage of increase is shown in the tonnage of bar and sheet metal, which tonnage amounted to 1,990,000 tons in 1909, an increase of 900,000 tons over 1908. The total tonnage of products of agriculture and also of products of animals was less in 1909 than in 1908.

Of the total increase in operating expenses of $3,400,000, $1,700,000 was an increase in cost of maintenance of way, $800,000 an increase in maintenance of equipment and $800,000 an increase in cost of transportation; so that maintenance of way cost $4,900,000 in 1909, maintenance of equipment cost $6,200,000 and transportation expenses cost $12,000,000.

The company borrowed from the Pennsylvania Company $2,000,000 during the year for advances for construction, making the total due the Pennsylvania Company by the P. C. C. & St. L. $3,800,000. During the year the company increased its annual dividend rate on the common stock from 4 per cent. to 5 per cent., 4½ per cent. being paid in 1909. On January 26, 1910, after the close of the fiscal year, an allotment of common stock aggregating $7,015,600 was made to stockholders, both preferred and common, who were given the right to subscribe at par to the extent of 12½ per cent. of their holdings. The money from this sale of stock is being used to pay off indebtedness and to pay for permanent improvements and additions to the property.

In order that the company may take care of the increasing traffic, both freight and passenger, resulting from the operation of the Gary plant, the directors have authorized grade revisions and double-tracking of 106 miles of single track line between Columbus and Chicago, and the revision of grades and double-tracking of 34 miles running from Richmond to Knightstown on the Indianapolis division. On the completion of the work now under way and to be undertaken in the near future the ruling grades between Chicago and Bradford will be 0.3 per cent., and between Columbus and Indianapolis will be 0.7 per cent.

In the nine months since the close of the fiscal year the company has earned operating income amounting to $8,682,251. This is greater than the operating income for the corresponding nine months of 1908 by $2,008,700.

The following table compares the results of operation in 1908 and 1909:

	1909.	1908.
Mileage operated	1,469	1,472
Freight revenue	$24,706,600	$20,659,359
Passenger revenue	7,240,853	6,839,918
Total operating revenue	35,970,833	31,075,098
Maintenance of way	4,928,406	3,215,225
Maintenance of equipment	6,172,357	5,343,686
Traffic	775,622	717,547
Transportation	11,996,129	11,204,436
Total operating expenses	23,575,158	21,170,637
Taxes	1,342,560	1,355,106
Net operating income	10,053,115	8,549,355
*Gross corporate income	9,839,789	8,579,899
Net corporate income	5,488,641	4,042,870
Dividends	2,662,708	2,519,015
Extra. expenditures fund	1,600,000	385,000
†Surplus.	107,116	71,133

*After the deduction of rentals paid roads operated on basis of net operating revenues.

†After the deduction of sinking fund contributions and payments on account of principal of car trusts.

THE CONTROVERSY OVER ADVANCES IN FREIGHT RATES.

Two years ago, when the railways were considering making numerous advances in freight rates, the shippers vigorously opposed it on the ground that this should not be done at a time of commercial depression. Their opposition was successful. Prosperity has now returned. The prices of materials and supplies are again rising. General increases in wages are being given to railway employees, most of them in pursuance of decisions of boards of arbitration representing the public. Again the railways propose to make advances in freight rates. And now the shippers oppose it because, as they argue, railway net earnings are increasing and the roads do not need higher rates. The theory that rates should not be raised in hard times because times are hard, and that they should not be raised in good times because times are good is convenient for the shippers but not wholly logical.

The question whether rates generally, or specific rates and schedules of rates, should be raised should not turn entirely, or perhaps even mainly, on the amount of the net earnings of the railways, past, present or prospective. The main point is not whether the *earnings* of the railways are reasonable, but whether their *rates* are fair and reasonable and would be rendered unfair and unreasonable by advances. We have never heard any shipper or industrial traffic manager having an expert knowledge of traffic affairs say he thought the rates of American railways as a whole are too high. We have heard many of them say they believe that on the average

they are too low. In the shippers' meeting at Chicago last week we saw shippers and representatives of shippers who concede in private conversation that many commodity rates are too low; most of them, however, ship on class rates. We saw there men who have told us that they believe many class rates are too low; most of them, however, ship on commodity rates. They were all there opposing advances in rates, not because they did not think that some advances would be justifiable, but because they did not want their own rates raised, whether justifiably or otherwise.

Those who admit that there ought to be some advances do so because as practical business men they recognize more or less clearly that railway rates—except those they pay themselves—ought to bear some fair proportion to the prices of commodities and the wages of labor. Now, measured in dollars and cents, there have been many reductions in rates and many advances during the past ten years. Meantime there have been many advances in the prices of commodities and the wages of labor and almost no reductions; and, after pending readjustments of wages are made, a ton-mile or a passenger mile of transportation will buy probably 40 per cent. less of labor and materials than it would ten years ago. Measured in money, railway rates have, on the average, remained about stationary; measured in the things bought with money they have greatly declined.

Moreover, everyone familiar with railway charges knows that there are in the tariffs many rates which were made in the days of cut-throat competition and rebating for the especial benefit of certain industries, or groups of industries, and which are so low as to be unfairly discriminatory. None but the beneficiaries of these rates will try to defend them. It is generally conceded that there ought to be a readjustment to eliminate them. Railway men contend that a general readjustment should be effected by advancing rates that are relatively low rather than by reducing rates that are relatively high. The implication of the argument of shippers, that the railways do not "need" higher rates, must be that discriminations should be eliminated by reductions rather than by advances. In fact, this is what some of them expressly contend.

The fact that net earnings are larger now than they were in the year of depression following the panic of 1907 can scarcely be accepted as demonstrating, as spokesmen of the shippers assume, that rates are high enough. Net earnings do not now equal the current rate of interest on the aggregate capitalization of the railways, or on what it probably would cost to reproduce their physical properties. How many of the business concerns represented at the shippers' meeting would agree that their prices were high enough if their profits were that small? Most of them would think they were doing very poorly if they earned less than 15 or 20 per cent.; and many of them earn much more. And the advances in wages which are being made threaten materially to reduce the already narrow margin of railway profit. At the shippers' meeting one of the speakers denied and ridiculed a statement that the aggregate advance in wages would amount to $100,000,000, basing his opinion on the aggregate wages paid in 1908. The total wages paid by railways in that year were $1,051,632,225, an average of $721 per employee. The number of employees was 1,458,244, or 213,830 less than in 1907. Assuming that the railways have now as many employees as they had in 1907; that until the recent advances in wages they were paying them on the average as much as they did in 1908; and that the advances in wages being made will average 8 per cent., the aggregate increase in wages will be $96,445,000. This is 25 per cent. of the total amount of dividends declared in 1908. The same speaker asserted that the average advance in rates will be 15 per cent. The advances in all rates made or in contemplation, would not average even one-third of 15 per cent. on the entire traffic, for no advances have been made or are contemplated on a large part of the traffic. Now, an increase of 5 per cent. over the freight earnings in 1909 would amount to but $84,000,000, and an advance of 7 per cent. to but $118,000,000.

The shippers demand that the reasonableness of past and proposed advances in rates shall be submitted to arbitration by the Interstate Commerce Commission. If they and the commission will agree to arbitration on a fair basis, the roads might be justified in accepting their proposition. But if an arbitration agreement were made, it should provide that the commission should not consider merely whether both earnings and expenses are increasing, and how much, but whether each of the higher rates and schedules of rates is, or will be, excessive in proportion to the value of the service rendered for it, and in proportion to other rates, and whether the result of the advances will be, not that the railways will be enabled to earn a trifle more than the current rate of interest, but that they will be enabled to earn profits excessive as compared with those earned by other industries. The determining of this latter point would involve full and frank disclosure by the various shippers of the profit they are making. It should be agreed that if it should be found that the higher rates would impose no undue burden on commerce and were not adapted to yield railways profits disproportionate to those earned in other industries, the decision of the arbitrators should be in favor of the advances.

If the shippers will not agree to submit their case to the commission on fair terms the roads would much better refuse arbitration. No doubt the shippers would then go to the courts for injunctions to restrain collection of the advanced rates until their reasonableness could be determined by the commission. In that event the roads could appeal to the courts from an unsatisfactory decision of the commission, while if they voluntarily submit the question to arbitration they would be bound to abide by its results. If the shippers will not arbitrate under conditions they would be willing to have applied to their own businesses, the roads would better fight out definitely and finally the question of their right to adjust their rates with a reasonable regard to their own interests as well as to those of the shippers.

NEW BOOKS.

Patent Laws of the World. By John P. O'Donnell. 57 Palace Chambers, Westminster, S. W., London. Price 2*s.* 6*d.*

This is the fifth edition of Mr. O'Donnell's well-known synopsis of the patent laws of all countries. Following the brief chapter of general information, the principal points of interest to a applicant are given in a uniform arrangement under each country. The British patent law of 1907, which came into force two years ago and which allows the revocation of a patent if the article is not made in Great Britain, is summarized at considerable length.

Official List of Open and Prepay Stations. No. 4.—A list of freight stations on the railways of the United States, Canada and Mexico. St. Louis, Mo.: F. A. Leland, Agent, Century Building.

This fourth issue of this useful work brings the information down to April 15, 1910, and, as heretofore, supplements will be issued on the first and fifteenth of each month, the supplements being consolidated so that not more than three will be in effect at any time. The book, which fills 284 pages, shows, in two lists, one alphabetical and the other geographical, the names of all stations, with notes to indicate whether or not there is an agent in charge, whether freight must be prepaid, and such other special information as is usually found in freight tariffs. These bits of special information, which naturally would take the form of foot-notes, are brought together in the front of the book, and they fill 15 pages. In some cases these notes are given in apparently excessive detail. For instance, all freight billed to a certain station in the state of Pennsylvania must be prepaid, except carload shipments to certain parties, and the names of these parties—

42 of them are all given in full. The book printed a year ago contained the stations on 450 railways; in the present issue there are many more. We have not taken the pains to count them, but the publisher informs us that the book contains all stations on all railways in the United States, Canada and Mexico, "with very few exceptions." The work is filed with the Interstate Commerce Commission, the same as a tariff would be, the publisher having secured legal authority from each of the roads represented, and it is approved by the Interstate Commerce Commission. No railway is shown in the book except by proper authority, and each of the companies participating in the publication obligates itself to furnish the publisher promptly with notices of all station changes.

Letters to the Editor.

PRESSURE ON RETAINING WALLS DUE TO FROST.

Washington, D. C., May 10, 1910.

To the Editor of the Railway Age Gazette:

In connection with the discussion in your issue of April 15, on A New Theory for Earth Pressure, it occurs to me that engineers neglect in designing retaining walls to consider the effect of pressure due to frost, which greatly increases the lateral thrust during the winter. A consideration of retaining wall failures will show they are chiefly the result of frost stresses. Another formidable agency in the destruction of these walls is ground water. This coadjutor of frost not only increases the normal earth thrust, but, hindered from egress by the face of the wall, percolates downward, softening the foundation soil. During winter, ground water escaping through outlets usually provided is frozen and seals the outlets. The hydraulic head increases until the water flows over the top, or escapes beneath the wall. If the failure of the wall is not so conspicuous as to necessitate rebuilding, there are two remedies that will delay further injury.

(1) Substitute for the earth surface of the embankment a concrete pavement extending back from the wall several feet, on an up-slope and edge it into the embankment, below frostline if practicable, and let this pavement extend an unbroken surface over the top of the wall to its outer edge. This pavement should be reinforced in order to bridge over the earth surface adjoining the wall or settlement of the embankment will crack it and let surface water through to the inner face of the wall. Beneath the pavement should be a foot of gravel or stone.

(2) Enlarge ground water openings and have no metal outlets. During dry weather when there is no frost run a tile drain near the outer face of the wall as deep as the bottom of the foundation, if practicable, connecting at intervals with sewer or other outlet. This is unnecessary in a sandy substratum. The trench may be refilled with concrete, if adjacent to the wall, or piling may be driven at intervals along the line of the wall a foot or two from its face, and a tile drain constructed. For new construction, if subsurface drainage is available, the tile drain should be laid and connected near the inner face of the wall.

As a general proposition, retaining walls are costly and uncertain structures when exposed to frost and ground water, and should not be constructed unless unavoidable.

In cities, when necessary to elevate or depress tracks with permanent structures, a reinforced concrete storage building or hollow wall should be constructed on the site of the proposed wall. This building may be substituted for the entire embankment, or for so much of it as the demand or use for storage and the unit cost of concrete and of embankment will justify. Pages of theory may be written on earth pressure and walls designed and constructed with a factor of safety which in the course of a year may be lost by hydraulic pressure combined with frost thrust. There is an example near Washington of a long retaining wall, 25 ft. high, built at extravagant cost where there was space to construct the preferable and usual embankment slope.

The proper way to design a retaining wall, when exposed to frost, is to figure a proper thickness for earth pressure, add a proper thickness for hydraulic head, of one-half height of wall, and horizontal frost-thrust against the upper tenth of the inner face of the wall equal to a hydraulic head of one-tenth the height of the wall, plus 10 ft. The extravagant cost of retaining walls, if thus designed, should discourage their use. Dry storage space for ties and other timber along railway lines is sufficiently valuable to justify engineers in substituting for solid retaining walls, whenever possible, a concrete building that will retain the embankment securely and provide a structure at less cost and of some utility.

R. H. PHILLIPS, C. E.

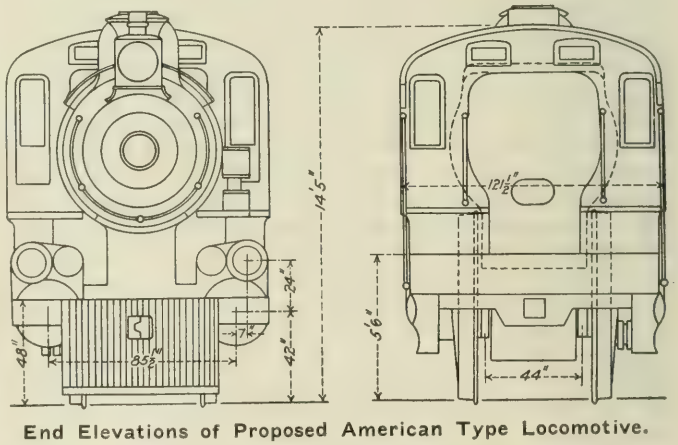
[Two methods have been adopted for centuries to minimize the effect of frost action on retaining walls, and both have proved satisfactory when used with intelligence. The first method is to make the wall heavier than would be demanded by ordinary conditions; the second is to lessen the top thickness by a short slope at the back of the wall in order that the forward thrust may be diverted upward. The importance of drainage is insisted on by all men of experience and when walls fail because of inadequate provision for drainage the designer is at fault. The idea of substituting buildings is not new; its feasibility is largely dependent on cost and the value of the land thus occupied. The rear walls of such buildings must necessarily be retaining walls, or the structures may be viaducts, and there is nothing but excessive cost to hinder the construction of viaducts designed to permit the use of the space under the deck. This, in fact, has been done in many places, but the question of cost is paramount and thus leads to the building of retaining walls where otherwise excellent opportunities exist for the provision of storage space. Retaining walls have been used so long that the percentage of failures is really small and the cause of such failure is generally the lack of provision for proper drainage.—Editor.]

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Brooklyn, N. Y., March 23, 1910.

To the Editor of the Railway Age Gazette:

I have read with a great deal of interest the discussion in recent issues of the *Railway Age Gazette* regarding the



End Elevations of Proposed American Type Locomotive.

limited speed of passenger locomotives, and, like Mr. Fry, think that the modern express engine is humiliated to a great extent. Numerous examples can be cited which would show that rather heavy trains are frequently hauled by Atlantic

type engines which maintain a speed above sixty miles an hour for considerable distances; as, for example, some of the trains on the Pennsylvania. For example, the Pennsylvania Special (the eighteen-hour train to Chicago) is scheduled to regularly make the run from Jersey City to North Philadelphia, 84 miles, in 83 minutes, and the engine doing this work is, or was until recently, No. 10, a class E-3d which, as is well known, is an Atlantic type engine having 22-in. x 26-in. cylinders, 80-in. drivers and a total weight of 188,600 lbs.

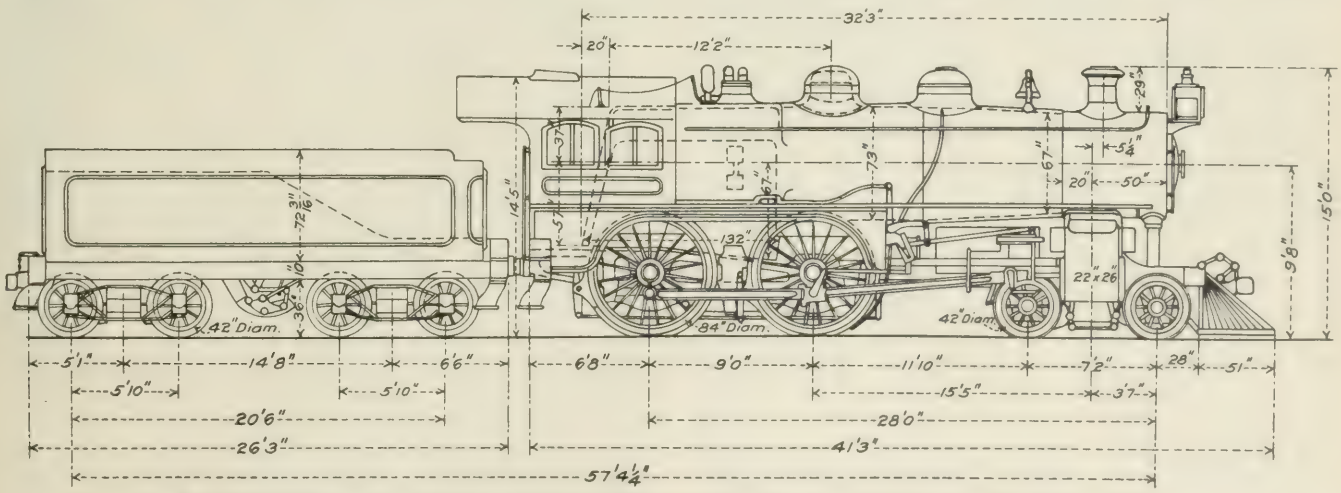
This discussion has prompted a train of thought in my mind along somewhat different lines: For many years the standard express engine in this country was the American, or eight-wheel type, and the latest designs of this type of engine were the Pennsylvania, class D-16a of 1895, and the New York Central, class L-3; the former has 18½-in. x 26-in. cylinders, 80-in. drivers, steam pressure of 185 lbs., total weight on driving wheels of 91,600 lbs. (about 250 of these were built). The latter has 19-in. x 24-in. cylinders, 77-in. drivers, steam pressure 200 lbs., 94,400 lbs. on driving wheels. These engines were very efficient until the trains became too heavy.

It is generally conceded that the American type engine was abandoned for high speed work in order that an engine might be designed providing a wider grate and a heavier weight on the driving wheels, and the Atlantic type of engine was the result. After the Atlantic type became popular, we began to have boilers having very long tubes and other dimensions greatly in excess of anything ever attempted in the eight-wheel type.

The writer does not wish to retrograde, but has given the subject considerable thought, and the question has arisen—was the eight-wheel engine abandoned too soon? The eight-wheel was probably our most flexible engine as regards design. In considering the question, I have prepared a sketch of the American type engine with the proportions of the Atlantic type, the sketch and general dimension being submitted herewith, and the following points will be noted: The boiler is very high, being 9 ft. 8 in. to the center, which is 3 in. less than the height to the center of the boiler on the Pennsylvania, class K-28, Pacific engine; the connecting rod is very long, being 11 ft., which is several inches less in length than the connecting rod of the Pennsylvania Atlantic engine; the firebox, being narrow, may be criticised, and yet the Milwaukee road has some efficient engines of the Atlantic and Pacific types having narrow boxes. The sketch shows an ordinary two-cylinder engine with Walschaert's valve gear, but the flexibility of the eight-wheel design would admit of the application of three cylinders, or four cylinders balanced, more readily and with less complication than can be applied to Atlantic or Pacific types, due mainly to the greater distance between the cylinder saddle and forward drivers; for more than two cylinders on the latter type of engines necessitate either a bifurcated connecting rod as in the Vauclain type, or inside cylinders projecting beyond the outer ones as in the Cole type. On the other hand, in the refinement of design of the eight-wheel engine the application of three or four cylinders would permit of their being placed in the same position, viz., between the truck wheels, and all would drive on the forward axle and guides, cross-heads and connecting rods would be identical for all the cylinders.

Inasmuch as in the future locomotive, lines of development

	N. Y. C. & H. R.	Penn. R.R.	N. Y. C. & H. R.	C., M. & St. P.	Penn. R.R.	L. S. & M. S.	Penn. R.R.	Experim'nt'l design.
Locomotive	No. 947	No. 1651	No. 3000	No. 951	No. 10	No. 4724	No. 7067	.....
Class	I–3.	D–16A.	.....	.....	E.3–D.	.....	K–28.	.....
Type	4-4-0	4-4-0	4–4–2	4–4–2	4–4–2	2–6–2	4–6–2	4-4-0
Built by	R.R. Co.	R.R. Co.	Schenectady	Baldwin.	R.R. Co.	Brooks.	Pittsburgh.	.....
Built in year	.....	1895.	1904.	.....	1905.	1905.	1907.	.....
Cylinders	19x24 in.	18½x26 in.	15½, 26x26	15, 25x28	22 x 26 in.	21½x 28 in.	24 x 26 in.	22 x 26 in.
Drivers, diameter	77 in.	80 in.	79 in.	85 in.	80 in.	79 in.	80 in.	84 in.
Length of main rod	.....	7 ft. 8¼ in.	.....	.....	11 ft.5⅞ in.	.....	10 ft. 5 in.	11 ft. 0 in.
Firebox, inside width	.....	40 in.	75¼ in.	60 in.	72 in.	73¼ in.	80¼ in.	40 in.
Firebox, inside length	.....	119⅝ in.	96⅛ in.	107 in.	111 in.	108 in.	111 in.	122 in.
Tubes, number	364	310	390	268	315	322	343	315
" diameter	2 in.	1⅞ in.	2 in.	2¼ in.	2 in.	2¼ in.	2¼ in.	2 in.
" length	.....	11 ft. 5¾ in.	16 ft. 0 in.	19 ft. 0 in.	15 ft. 0 in.	19 ft. 6 in.	21 ft. 0 in.	16 ft. 0 in.
Heating surface, tubes	2,224 sq.ft.	1,746.6 sq.ft.	.....	3,008 sq. ft.	2,474 sq. ft.	3,678 sq. ft.	4,222 sq. ft.	2,638 sq. ft.
" " firebox	180 "	171.4 "	.....	168 "	166 "	198 "	205 "	180 "
" " total	2,404 "	1,918 "	3,446 sq. ft.	3,194 "	2,640 "	3,905 "	4,427 "	2,818 "
Grate area	30.7 "	33 "	50.3 "	45 "	55.5 "	55 "	61.8 "	34 "
Weight on drivers	94,400 lbs.	91,600 lbs.	121,600 lbs.	105,966 lbs.	109,033 lbs.	170,000 lbs.	183,900 lbs.	120,000 lbs.
Weight, total	146,400 lbs.	134,800 lbs.	200,000 lbs.	204,119 lbs.	176,600 lbs.	245,000 lbs.	272,500 lbs.	180,000 lbs.
Boiler, min. inside diameter	65 in.	60 in.	72¼ in.	66 in.	67 in.	70 in.	79¾ in.	67 in.
" height to center	.....	8 ft. 11½ in.	9 ft. 3 15/16 in.	9 ft. 6 in.	9 ft. 3 5/16 in.	9 ft. 6in.	9 ft. 11 in.	9 ft. 8 in
" working steam pressure	200 lbs.	185 lbs.	220	220	205	200	205	205
Driving wheel base	8 ft. 6 in.	7 ft. 9 in.	7 ft. 0 in.	7 ft. 6 in.	7 ft. 5 in.	14 ft. 0 in.	13 ft. 10 in.	9 ft. 0 in.
Distance c. of rear driver to c. of trailer	.....	.....	9 ft. 6 in.	.....	11 ft. 8 in.	10 ft.11 in.	10 ft. 0 in.	.....
Total wheel base, engine	23 ft. 8 in.	22 ft. 9½ in.	27 ft. 9 in.	32 ft. 2 in.	30 ft. 9½ in.	34 ft. 3 in.	35 ft. 2½ in.	28 ft. 0 in.
Tractive effort per lb. of M. E. P.	112.52 lbs.	111.24 lbs.	.....	.....	157.30 lbs.	148.95 lbs.	187.20 lbs.	149.81 lbs.
Tractive effort, total	18,003 lbs.	16.464 lbs.	.....	.....	25,797 lbs.	23,832 lbs.	30,701 lbs.	24,569 lbs.



Proposed Design of American Type Locomotive for Heavy High Speed Passenger Service.

must be such as to provide a very refined valve gear resulting in high efficiency in steam consumption, and as this probably means more than two cylinders, it is obvious that with but one kind of connecting rod, etc., for all cylinders, the complications of three or four cylinders will be greatly reduced; in fact, almost as little as in an ordinary two-cylinder engine, and an eight-wheel engine having but four axles does, of course, develop less internal friction than is found in Atlantic and Pacific types with their additional axles.

General Dimensions.

Weight on drivers	120,000 lbs.
" on truck	60,000 "
" total	180,000 "
" tender	132,500 "
" engine and tender	312,500 "
Valve gear	Walschaert
Main rod, length	11 ft.
Boiler, type	Belpaire, sloping top
Firebox, width and length	40 x 122 in.
Tubes, number and diameter	315; 2-in.
Tubes, length	16 ft.
Heating surface, firebox	180 sq. ft.
" " tubes	2,638 "
" " total	2,818 "
Grate area	33.8 "
Tender, capacity, coal	11 tons
Tender capacity, water	5,500 gals.

It is the writer's firm conviction that a very efficient engine could be designed along the lines herein set forth, and such an engine would undoubtedly attain very high speed with a train within its capacity, say, not exceeding six or eight cars.

The table on the preceding page compares the more important dimensions of several typical modern express engines with the design referred to above.

C. B. CHANEY, JR.

Contributed Papers.

AMERICAN RAILWAY ASSOCIATION.

The spring session of the American Railway Association was held in New York May 18 with an attendance of 150. The executive committee announced the delegation to the International Railway Congress on behalf of the association, as given in our last issue, namely, the president, the general secretary and the general agent, J. F. Wallace, Kansas City, Mexico & Orient; William Mahl, Union Pacific; Charles W. Bradley, Western New York Car Demurrage Association; W. J. Harahan, Erie, and Geo. L. Connor, former passenger traffic manager of the New York, New Haven & Hartford.

The committee on maintenance has under consideration the questions of the conservation and growth of timber by the railways and of boiler inspection, but only reported progress. The number of freight cars fitted with air brakes January 1, 1910, was 2,208,210 out of a total in service of 2,235,553.

The committee on relations between railroads presented an amendment to Rule 11 of the Code of Per Diem Rules, which was adopted, to take effect July 1 next. This rule regulates the settlement of claims for errors in per diem reports. As revised, it provides that demands for corrections shall be presented after four months and within one year from the last day of the month in which the per diem was earned. The former provision for continuance of negotiations is retained, but the privilege of continuance shall cease if a claimant neglects his case for six months. Provision also is made for keeping alive a claim where per diem has been reported to the wrong road, and also for suitable correction of the accounts when per diem has been reported to the right road but for the wrong car. These changes were recommended by the Association of Transportation & Car Accounting Officers.

The committee presented a Code of Switching Reclaim Rules, which was adopted.

The association adopted a resolution requesting members to advise the Association of Transportation and Car Accounting Officers of all difficulties which have arisen from car marking. That association has a committee which is striving to promote simplicity and uniformity. Also said association was requested to keep a record of the marking of freight cars and to suggest changes, reporting progress to the American Railway Association.

The committee recommended a number of amendments to the instructions that go with the National Code of Car Demurrage Rules, and these were adopted.

In connection with the committee's report interesting statistics were presented showing the progress made in the improvement of the interchange reports, also a summary of the statistics of freight car balance and performances, car surpluses and shortages which are regularly given in the *Railway Age Gazette*.

The committee also stated that it had rendered an interpretation on Car Service Rule 14, covering the empty movement of tank cars, which was adopted by the association, as follows:

Question—From what date should mileage be counted to obtain balance required at end of first accounting period?

Answer—From the date when the first tariff filed with the Interstate Commerce Commission took effect, which provided for equalization of loaded and empty mileage and payment for excess empty mileage, even if such tariff did not include all the details of Car Service Rule 14.

The committee on the safe transportation of explosives made a report in which was included its minute on the death of Dr. C. B. Dudley, president of the bureau, which occurred on December 21, 1909. The minute reads in part:

In the death of its president, this bureau has sustained an irreparable loss that is shared by all of the important organizations of scientific and professional men of which he was a member, and by the railway service of this country of which he was a distinguished ornament.

His activities in promoting the safe transportation of dangerous articles extended over a period of twenty years, and he was head of a committee of experts which presented a most complete and able report that laid the foundation of the structure upon which the regulations for the safe transportation of explosives were formulated. His life was an example of loyalty, industry and integrity, and he had an encouraging and elevating optimism.

Theodore Voorhees (P. & R.) has been elected chairman of the committee and president of the bureau of explosives. Several amendments to the Regulations for the Transportation of Explosives and Inflammable Articles as recommended by the committee were adopted, as also a uniform code of rules covering precautions necessary in handling wrecks involving oil cars.

The committee on electrical working, George Gibbs chairman, has not yet had time to gather the necessary data for making a report on the present status of electric traction on steam railways nor to formulate standards for electrical devices, but recommends members to read the report made by Mr. Gibbs for the International Railway Congress, published in the Bulletin of the Congress for January, and the report prepared for the New York Railroad Club in April. Attention is called to the fact that the standards for third-rail working conductors, presented by the committee in September, 1907, and March, 1908, are in all probability very nearly what will be finally adopted, and therefore it is time to withdraw objections. If every road tries to provide for its special equipment an agreement will never be reached.

Daniel Willard was elected president and H. U. Mudge first vice-president; and Messrs. C. R. Gray and I. G. Rawn members of the executive committee. The following were elected members of the committee on transportation: Baltimore & Ohio Southwestern; New York Central & Hudson River; Union Pacific. The following were elected members of the committee on maintenance: Chicago & North Western; Chicago, Rock Island & Pacific; Philadelphia & Reading. The following were elected members of the committee on relations between railways: Chicago, Milwaukee & St. Paul; Illinois Central; Southern.

The association decided to hold its next meeting in St. Louis November 17, 1910.

THE NECESSITY OF DEPRECIATION RESERVES.

BY HENRY L. GRAY, ASSOC. M., A. S. C. E.,
Engineer, Railroad Commission of Washington.

Depreciation of railway property consists of a lessening in value or a death of the capital invested in such property. It may be due to wear and tear, such as the wearing out of an integral part of a plant; to obsolescence, or the replacement of a serviceable machine by one of a later type; to inadequacy, or the replacement of a smaller machine with a larger; and to public demand, such as the elevation or depression of tracks, required by ordinance. Whenever a component part of a plant is removed from the service and sold or scrapped, that part of the plant has depreciated the full amount possible.

As the fundamental principle of investment is that capital shall remain unimpaired, it follows that with the death of capital provision must be made to renew the plant when it has reached a certain depreciated condition, and, as the different parts depreciate at different rates, the amount of money expended for depreciation will vary with the years, sometimes being small and sometimes large; and as the actual yearly amount necessary to be paid out for depreciation cannot be accurately anticipated, a certain sum should annually be placed in a depreciation reserve which will provide for expenditures for depreciation during any year and keep the plant in first-class condition. Such annual charge is just as important an item of expense as is the cost of conducting transportation; in case that such accounts are not maintained and the annual net revenue distributed in the form of dividends, each stockholder is virtually presented with a small portion of the plant; and such dividends do the added harm of causing the public to invest in stocks on the face of the returns, unaware of the day of reckoning that awaits.

Unless it may be considered that bond sinking funds correspond to depreciation funds, it may be said that it has not been the practice of steam and electric railways to maintain depreciation reserves, all replacements due to depreciation being charged to repairs and renewals, which has had the effect of frequently "bunching" the heavy expenditures and unbalancing operating expenses. Had such expenditures been made from a fund accumulating through a period of years, each year would bear its proportionate part of the burden, operating expenses would not fluctuate to such a marked extent, and it would not be necessary to await the "fat" years before making much-needed replacements. It is now recognized that such depreciation reserves are not only legitimate but highly necessary, the Interstate Commerce Commission and several state commissions providing for depreciation accounts.

It is difficult to distinguish between "depreciation" and "maintenance," authorities differing as to just what items of expense should be paid for from the depreciation fund. The New York Public Service Commission, Second District, provides for a depreciation fund, which is really a combined maintenance and depreciation fund, as it intends drawing upon it for all expenditures chargeable to the repair and renewal accounts. In the case of the Wisconsin Railroad Commission vs. the Milwaukee Ry. & Light Co., many expert witnesses testified in regard as to what should be considered as depreciation, their opinions ranging from that of Professor Cooley, who considered that all major repairs and renewals should be paid from the depreciation fund, to that of Mr. Olds, superintendent of rolling stock, who considered that all repairs should be charged to maintenance and only the replacement of the component parts of a system, such as cars, generators, etc., should be charged to depreciation. This latter view coincides with that of the Interstate Commerce Commission, which body, though silent in regard to the depreciation of way and structures, clearly provides that in the case of equipment the cost of the rolling stock shall be distributed over a period corresponding to its probable life, and that charges to depreciation shall cease when the original cost shall have been charged off. Prior to the issuance of the recent instructions by the Interstate Commerce Commission the general opinion seemed to incline toward charging all renewals and a certain portion of repairs to depreciation. This view is incorrect and not consistent with the proper use of such funds.

The line between the depreciation account and the maintenance account should be closely drawn, in order to avoid endless trouble for the accounting department. In setting up a depreciation fund the plant should be divided into its component parts, the different units paid for, such as rails, generators, ties, locomotives, cars, wire, boilers, etc., the more complete the itemization the more correct the result; the probable life of each unit should be ascertained, the possible scrap value assumed and the annual depreciation determined by dividing the cost, less scrap value, by the probable life. The sum of the depreciation of the individual items will represent the annual depreciation of the plant, and against this fund should be charged the cost of the different units, less scrap value, as they are replaced. Any increase or decrease in the cost of new parts should be charged or credited to capital, and the depreciative reserve modified accordingly; and in no case should a sum exceeding the original cost of the existing plant be charged against such fund. For example, all new ties placed in the road should be charged to depreciation, excepting ties replacing those destroyed by accidents, and the same would apply to rails and fastenings. The renewal of a commutator should be charged to maintenance, but should the entire generator be scrapped or abandoned the new generator would be paid for from the reserve. The replacement of a wheel or axle of a car, or a set of grate bars of a locomotive would also be charged to maintenance. In fact, a piece of equipment might be repaired to such an extent that there would be but little of the original left, and all of such repairs should be charged to maintenance; but it is highly probable that long before this point was reached it would have become uneconomical to repair it further, and it would be abandoned and charged to depreciation. The painting or shingling of a building should be charged to maintenance, but should the building be torn down and a new one built, a sum reresenting the cost of the old building would be provided from the depreciation fund. Should such a building burn down, that portion of the depreciation fund which related to such a building should be used in replacing the structure, but the remainder should be charged to maintenance. Accidents are not due to depreciation and should not be paid for from the reserve, nor should such a fund ever be called on to provide for repairs.

The life and annual depreciation of the several elements of a railway depend upon the location, climate, character of material and use. Under the same traffic a tie should last longer in the dry climate of Arizona than in the wet climate of Puget Sound, but rails should last longer in the latter, owing to the absence of sand. A frame building will have a shorter life in western Oregon than in Colorado, but the annual depreciation in dollars will not be greater owing to the smaller cost. While every railway system will practically require a different set of mortality tables, yet they will not vary greatly. The following table is used by the writer for the state of Washington, and is approximately correct for that state. Items which are not considered as being subject to depreciation are omitted. In fact, however, there is no element of a railway which does not depreciate excepting real estate, and perhaps the grade, but, as with steel bridges, the depreciation in many cases is so small it is almost negligible.

Item.	Per ct. annual depreciation.
Ballast	8
Ties	15
Rails (main track)	3
Fastenings	5
Frogs and switches	7
Plank paving	8
Track laying	5
Timber tunnel lining	8
Combination bridges	6

Item.	Per ct. annual depreciation.
Howe truss bridges	9
Pile and frame bridges	10
Wooden culverts	10
Crossings and signs	8
Fences and cattle guards	8
Telephone and telegraph instruments	6
Poles and fixtures	8
Covered copper feeder	2
Trolley wire	5
Rail bonds	3
Brick buildings	2
Frame buildings	3
Shop machinery	6
Water and fuel stations	4
Roadway tools	10
Interlocking and signal apparatus	7
Substation apparatus	5
Storage batteries	15
Furniture and fixtures	3
Passenger cars, steam	3
Passenger cars, electric	5
Freight cars, steam	4
Freight cars, electric	4
Steam locomotives	3
Electric equipment of cars	5

Many street and electric railway systems have practised setting aside a certain portion of the gross earnings each year to cover "maintenance and depreciation," but there has been little effort to distinguish between the two accounts. The ordinances of the city of Chicago permit the street railway companies to so set aside 14 per cent. of the gross earnings each year, 6 per cent. to cover maintenance and 8 per cent. to cover depreciation, but this is considered by many to be too small an allowance. In the Milwaukee rate case previously referred to, Mr. Beggs, president of the Milwaukee company, stated that a total allowance of 15 per cent. of the gross earnings would be ample to take care of maintenance and depreciation for his company. Professor Cooley considered that 24 per cent. would be sufficient to cover maintenance and the depreciation due to wear and tear, but would not cover obsolescence nor inadequacy. Stone & Webster, in their connection with the street railways of Chicago, recommended in two cases that 21.77 per cent. and 23.70 per cent. of the gross earnings should be set aside, and in their testimony before the Railroad Commission of Washington stated that 25 per cent. was an ample allowance. Mr. Gore, the accountant retained by the city of Milwaukee, recommended 16.5 per cent. as the annual allowance to cover maintenance and depreciation, while Mr. Caflin, of the United States Securities Co., considered that 17 per cent. was a fair proportion and would be about equally divided between maintenance and depreciation.

From 1900 to 1908 the average yearly expenditure for maintenance and depreciation by the railways of the United States was 27.74 per cent. of the gross earnings from operation, having been 13.58 per cent. for maintenance of way and structures and 14.16 per cent. for maintenance of equipment. It should be noted that maintenance of equipment has gradually increased until it exceeds maintenance of way and structures.

While depreciation bears a rather vague relation to the gross earnings, inasmuch as the more business a road does the more property it will own, and the more depreciation there will be, yet it is evident that any attempt to provide for a depreciation fund on a basis of gross earnings is illogical, and, although it may be based upon the past experience of the older roads, it would be but a crude method for a new road to adopt. The proper method, that of ascertaining the life of the capital invested in the plant, and setting aside each year a sum which will replace the plant when it is worn out, is not only logical but easily worked out. It does not indicate that the fund should remain idle for a term of years, as it would be constantly drawn on, as only the average life of the elements of the plant can be ascertained, and such average lives range from a few years to twenty or thirty years. In the case of street railways much testimony has been given as to the percentage of the cost of such systems to be annually set aside to cover depreciation, but the different authorities vary widely, owing somewhat to a difference of opinion as to what constitutes depreciation. In the previously mentioned Milwaukee case, Mr. Starrett, an electrical authority, who included a certain amount of major repairs in the charge to depreciation, would allow 7.88 per cent., considering 5.59 per cent. due to wear and tear, 1.79 per cent. due to obsolescence, and 0.5 per cent. due to inadequacy. Professor Cooley would allow 7.67 per cent., while the heads of departments of the Milwaukee Railway & Light Co. agreed upon 6.68 per cent., both of the last including major repairs. Stone & Webster, in the two Chicago cases, specified 5.59 per cent. and 5.68 per cent. Dickson, Wilmot & Steritt, accountants, specified 5.37 per cent., while Foster's Handbook informs us that 3 per cent. of the cost of plant should be set aside annually to cover renewals.

All of the above percentages are based upon the cost of plant; a false premise at best, as such cost might include large expenditures for real estate and grading, two items which appreciate rather than depreciate. But they are probably not much affected by these two items, for, as a rule, street railway companies do not own expensive terminals and the grading is not heavy, but in the case of steam roads the cost of plant would be greatly different from the cost of property subject to depreciation. The above percentages also include a certain amount of repairs, which in a way destroys their comparative value.

The writer has just completed the appraisal of an electric road in Washington, the Puget Sound Electric Railway, having 64 miles of track, which was practically at its period of maximum depreciation, and afforded great opportunity for study. It was found that the annual depreciation was 5.47 per cent. of the cost of property subject to depreciation, but only 2.64 per cent. of the total cost of plant. This line maintains over seven miles of pile bridges, which depreciate rapidly in the wet climate of western Washington (which climate is also very hard on equipment), but also uses the third rail system, which depreciates but little, so that it may be said that the figure of 5.47 per cent. is rational. In the case of the steam roads of Washington, appraised in 1906, it was found that the annual depreciation on the Oregon Railway & Navigation Co.'s lines was 4.74 per cent. of the cost of the property subject to depreciation, and 2.49 per cent. of the total cost of plant, while the annual depreciation on the Great Northern lines was 4.48 per cent. in the one case and only 1.63 per cent. in the other. The first two percentages substantially agree, the difference between the last two being due to the fact that the Great Northern owns extensive terminals in the state, while the Oregon Railway & Navigation Co. does not. These two roads are fairly representative of the railways of the United States, their total expenditures for maintenance and depreciation for 1906 being 22.5 per cent. and 21.1 per cent. of the gross earnings, and their construction is of a permanent character.

The laws of Washington require the railway commission to ascertain not only the cost of reproduction, but also the depreciated value and market value of the railways within the state, and the writer, working in this connection, has given the subject of depreciation considerable study, and has reached the following conclusions: (1) That depreciation is a term separate and distinct from maintenance, and includes obsolescence and inadequacy, and excludes repairs. (2) That a depreciation fund should be maintained to insure the life of the capital invested. (3) That a depreciation fund should be based upon the cost of property subject to depreciation. (4) That the percentage of annual depreciation in terms of the cost of property subject to depreciation is greater for electric roads than for steam roads. (5) That a fair average annual allowance for depreciation on steam roads would be 5½ per cent. of the cost of property subject to depreciation; for electric roads 6½ per cent., and for street railways, where construction is more permanent, 5 per cent. (6) That if the average annual expenditure due to depreciation is so determined, and such a sum be placed each year in the depreciation reserve, it will not be excessive, and will be sufficient to maintain the capital unimpaired.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.

The second annual meeting of the International Railway Fuel Association was held at the La Salle hotel, Chicago, May 23-26. Eugene McAuliffe, general fuel agent, Rock Island, presided. The first morning session was occupied by routine business and the reading of the secretary's and treasurer's reports; the association has 300 members and a balance of $696 in the treasury.

S. L. Yerkes submitted a report on "Character of Membership That Should Be Encouraged in the Association." He said in part: "The fuel bill of the railways of the United States represents in round numbers $300,000,000 per annum, including the cost of the movement from the mines to points of consumption, and for unloading from cars through fueling plants to locomotive tenders. Of every dollar earned by our roads, approximately 12 cents is paid out for fuel. Any association, therefore, that has to deal with railway fuel and its consumption has a broad and important field to cover.

"While this association is primarily a railway association, yet it was decided at the organization meeting in November, 1908, to ask the coal producer and representatives of engineering firms manufacturing fuel-handling devices to join as associate members, and the results already secured by the co-operation on the part of the associate membership show that the step was a wise one.

"From the railway standpoint we want as members of our association all men responsible in any way for railway fuel. The fuel agent or purchasing agent who does the buying combines his knowledge of operation and economics with that of the fuel inspector who is on the ground at points of production and fully conversant with the conditions that effect purchases, adding to both the experience of the men who make a study of fuel-handling devices.

"We want the engineer of tests, who can answer from a technical standpoint as to the uses various coals can be put to; we want the mining engineer, who, on such lines as are coal producers, assists so largely in the preparation of coal; we want the accountant, whose knowledge of costs is so important to the man at the head of the fuel department; we want the traveling engineer and the traveling fireman, whose work with the apprentice fireman means so much in the size of the coal bill.

"The coal operator as the producer is an important factor in economy. To-day coal represents the largest tonnage handled by the railways, and it is also the most widely scattered. To serve the best interests of both buyer and producer they must work together to overcome the problems which the coal producer has to meet at certain seasons and in certain districts. Closer contact of the buyer and producer as brought about through this association will surely bring results.

"The representatives of firms manufacturing fuel-handling devices are important members of this association. These men are specialists and we want the benefit of their advice on the question of economical handling of fuel.

"Our association is a year and a half old. The membership has increased from 35 at the organization meeting to over 300 at the present time."

Methods of Supervision, Instruction and Encouragement in Locomotive Operation to Secure the Greatest Efficiency in Fuel Consumption.—The report was read by the chairman, D. Meadows, Michigan Central. It gives replies to questions and circulars sent out, with little discussion or definite opinion of the committee. The principal replies to the questions are as follows: "The supervision of fuel economy is generally looked after by the road foreman of engines and his assistants." Most members advise both class and individual instruction, but emphasize the superior value of the latter. Most roads have a progressive system of examination for firemen which includes fuel economy. The reports indicate that individual locomotive performance sheets are not made out on the majority of roads. In regard to premiums or prizes as an incentive to engineers to improve and maintain a good fuel record, all replies show that no such system is now employed, the impression being that it would tend to make the engineers dishonest. All agree that the most vital essential in fuel economy, outside the purchasing price, consists in keeping the engine in thorough repair; eliminating all leaks, blows and waste of steam; having ample grate area and heating surface; having good facilities for caring for power; enginemen trained to burn the fuel economically; avoiding unnecessary delays, and securing the quality of coal as specified in the contract. Following is an abstract of the latter part of the report:

A number of roads keep inspectors at the mines, who closely watch the loading of coal into the cars, see that cars are properly cleaned before being placed under the tipple, the inspector having authority to reject all cars which contain a high percentage of non-combustible matter, slack, etc. Those reporting in favor of inspectors at the mines claim that they receive a better grade of coal, due to this inspection, also a better loading of cars, thus requiring less cars to haul the same tonnage. It is claimed that the cost of inspecton at the mines is more than balanced by the better grade of fuel received. The majority of roads do not employ inspectors at the mines but put it up to the coal company to see that the coal is properly prepared and cleaned. It would appear that the latter method is the wiser. All coal companies employ experienced men to supervise the loading of cars, and throw out any impurities, bone coal, etc., that may have passed the men in the mine. This being a fact, why should it not be up to the coal company to deliver a grade of coal suitable to the contract or requirements of the contractor? Assuming that a railway uses 1,000,000 tons of coal a year, which is a small average estimate, at one-fourth cent per ton for inspection at the mines, the inspection will cost $2,500, a large sum to expend in looking after what should legitimately be done by the producer.

The inspectors for some railways must inspect the coal from a number of mines, and as these are often a considerable distance apart, it follows that while they are watching the loading at one mine the work is being neglected at another. You can form but a very poor opinion of the coal from the appearance of the top of the car, more particularly if it is loaded with run of mine coal. The top of a car of run of mine coal looks about as good as one loaded with coal that has passed over a commercial screen. This is due to the methods followed in loading.

We believe that greater economy will be effected by the railway consumer, contracting for a certain class or grade of coal, instructing its coal dock foremen as to the quality of coal contracted for, and holding all cars that do not come up to standard. The company's inspector should occasionally visit the mines and watch the preparation of the coal. He then will be in a position to say if the coal company is honestly trying to prepare and deliver the quality of coal contracted for.

The committee believes that in selecting coal, railways should be guided by practical tests, or in other words, should select a certain engine and assign it to a certain service, this service to compare with ordinary service on that division; weigh the coal, calibrate the tank, so as to know in pounds or gallons the amount of water used each trip, and figure the evaporation results from that data. Select the coal that shows the greatest evaporation per dollar of cost. We believe this will be much more satisfactory than a laboratory test intended to determine its calorific value and its chemical constituents.

All railways should endeavor to select a certain or suitable grade of coal, assign it to a certain territory and have it definitely understood that no change will be made except in grave emergency. This will enable the mechanical department to draft the engines to obtain the best results from the fuel, rather than having to draft the engines to burn the poorer

class of fuel to the detriment or waste of other classes. Enginemen also will become familiar with the fuel used and handle it more economically.

Coal should be placed on the tender of engines in such size that the fireman can devote his entire time and attention to feeding it to the fire. If the lumps are larger than 3 in. square, whether the firemen break these lumps or not, a certain amount of coal is wasted. The better coal is prepared before being placed on the tender the more economical its use will be.

A locomotive performance sheet showing consumption in pounds per ton mile per hour would create a rivalry among the enginemen that would bring about good results. A performance sheet showing the engine miles made per ton of coal is not worth the paper it is written on, and a sheet on the ton or thousand ton mile basis is very little better. None of these are of value if there is not some fairly accurate method of determining the amount of coal used by each engineman each trip. At the present time most roads run their engines in what is called "the pool." An engineer takes one engine from the home terminal and returns on another, and probably changes firemen half way over the division. The coal is put on the engine by a man who receives a small wage and who has no other aim in connection with his work than to properly coal the engine and have his accounts straight at the end of each week or month. He has full authority to say how much coal the tender will hold, and should he be short of checks for coal given out, immediately proceeds to make checks for more coal than he puts on the engine. This may appear to some as an exaggeration, but we believe it is the practice on the majority of roads in America. Under such conditions a comparative sheet of any kind is valueless, and the time of the office man consumed in making out this report might better be used in some more profitable work. Some roads, however, weigh the coal put on tenders, or have some fairly accurate way of measuring it. On these roads a performance sheet based on the ton mile per hour basis puts into the hands of the master mechanic or road foreman something fairly accurate and reliable, from which they can select the weak, careless or inefficient men and put them in a way of doing better. It also will assist the road foreman in locating engines that need attention.

The supervision of coal placed on tenders and the performance obtained from the use of this coal is not given anything like the attention it deserves. Until some accurate method of knowing how much coal is put on tenders, what percentage of it is consumed at the engine house, also some accurate method of determining the amount of work done for the coal consumed is arrived at, the desired results can scarcely be expected.

Methods of Purchasing Fuel with Regard to Traffic Conditions and Producer's Interests.—This committee, W. H. Huff, chairman, urged closer co-operation between the railway fuel agent and the mine operator. The fuel agent who couples with his coal contract a regulated activity in the direction of supplying cars to the mines is the miner's good Samaritan and his own best friend. Spasmodic efforts are unavailing, unbusinesslike and a positive detriment to the railway and coal producer alike. Inattention to the coal supply until it becomes acute, and over-attention until it equals congestion, are evils of railroading well worth considering. The committee believed that there is a common ground upon which the railway and the coal producer can meet. Neither can prosper without the other, therefore they should give proper regard to each other's interests.

Kindling Locomotive Fires.—C. F. Richardson submitted a report on this subject, from which the following is taken:

The most satisfactory method of firing up locomotives is that of using fuel oil, either a safe crude or refinery residuum, for saturating ordinary mill shop shavings or borings. Under this plan the grates are bedded over with coal to a depth of 3 or 4 in. and two bushels of oil-saturated shavings are spread over the top. The shavings are ignited by throwing into the firebox a small handful of burning waste, the oil contained in the shavings furnishing sufficient fuel of rapid and quick igniting quality and thoroughly igniting the coal before the shavings are consumed.

In order to prepare for the use of fuel oil and shavings a small building or condemned box car should be installed in a convenient place for the storage of dry shavings; in one end of this structure a metal box should be placed for use in mixing the material. For an average-size roundhouse a steel box 2½ ft. wide by 2½ ft. deep, and from 6 ft. to 8 ft. in length will usually hold a sufficient amount of shavings to take care of the fires required for one shift of twelve hours. The shavings should be shoveled into the mixing box and the oil be poured over them; they should be thoroughly mixed with a rake or shovel. It is necessary and advisable to install a small steam coil underneath the metal box to keep the oil warm and in a fluid state; the expense for the coil and the steam is more than offset by the saving in fuel oil used, the warm oil more thoroughly saturating the shavings with the result that only half as much oil will be used as compared with the amount necessary when no heating arrangements are provided. In average practice 3 gallons of oil will be required per locomotive fire built to saturate the necessary amount of shavings, and the cost of oil varying from possibly 1½ cent to 3 cents per gallon delivered, the expense incident to securing shavings is usually nominal.

In computing the expense of firing up locomotives the steam used for blower purposes should be taken into account; it has been demonstrated that less blowing is required with oil and shavings than with wood or with the oil atomizer. A number of tests have been made demonstrating that the coal required to build a fire from wood is equal to that where oil and shavings are made use of, it being evident that the heat units obtained from the combustion of the wood are practically lost, this due to the fact that large volumes of cold air pass through the grates as the result of uneven ignition.

In portions of the cotton raising country cotton seed hulls have been substituted for shavings with good effect, the hulls being saturated in the same manner as shavings, and applied on top of the coal in the firebox. In portions of the southwest a number of tests have demonstrated that fires can be built from fuel oil and hulls at a cost of 7½ cents per fire, the hulls costing $5 per ton f. o. b. cars.

It is the opinion of the committee that except in the case of roads operating in a territory where wood is plentiful and where the number of locomotives handled is not sufficient to justify the installation necessary for the use of oil and shavings, the use of wood should be abandoned. From an operating standpoint fires built under the plan outlined leave the terminal in a much better condition than when built through the medium of either wood or oil atomizers.

Grade of Fuel Most Suitable for Locomotive Use, Considering Cost Per Unit of Traffic and Best Interests of Producer.—J. G. Crawford, chairman of the committee, reported in part as follows: This subject was considered from the standpoint of a railway being supplied with bituminous coal from mines on its own line. The case of a road supplied with coal from mines located on other lines is similar except for the fact that it is unnecessary for it to take as much interest in the welfare of the coal operator. From the standpoint of the operating department of a railway the most desirable coals are those which cost the least per ton-mile, including the f. o. b. mine, cost of haulage, cost of handling at chutes, cost of firebox repairs, cost of handling ashes, cost of delays to trains caused by poor coal and all other points directly and indirectly affecting the cost of coal per ton-mile, not limiting the cost of coal per ton-mile to such costs ordinarily charged in operating statistics.

For the best interests of the railway and the coal operators the most suitable coals to use are those the purchase of which causes the net earnings of both the railway and the coal operators to be at a minimum. It is believed that by proper

co-operation the net earnings of both the railway and operators can be at a maximum and that it is not necessary for the net earnings of the coal operators to be below maximum in order that the railway make maximum net earnings, the prosperity of both a railway and its coal operators being interdependent.

Granting the above to be the case it may be necessary for the railway to purchase coal—

1. From mines producing coal of quality undesirable to the motive power department.

2. From mines whose cost of production necessitates that the selling price be higher than that of other available coals which increases the cost of coal per ton-mile.

3. Of other than the size desired by the motive power department.

For the best interests of all concerned the coal will therefore be supplied from several mining districts and by a large number of mines. Under these circumstances it will not be uncommon for a large railway to be purchasing coal of 30 per cent. range in heat value. Where coals of widely different character or heat value are used it is not advisable to use them indiscriminately but to keep them grouped so that an engine district will receive only one character of coal; this will require two kinds of coal to be kept only at the chutes at division points separating engine districts using coals of different character. This factor should be considered in determining the tonnage of coals to be used so that it will not be necessary at times to send coal of 70 per cent. rank into a district regularly supplied with 100 per cent. coal.

As a general proposition there do not seem to be sufficient advantages to offset the disadvantages of supplying passenger engines with lump coal and engines in other service with mine run. It is desirable to keep a uniform grade as well as a uniform character of coal in an engine district. There are probably some cases where it is necessary to furnish passenger engines with lump coal, while freight engines in the same territory are using mine run, but this should only be done to avoid possible engine failures resulting from poor coal.

The results of only one test bearing on the evaporative efficiencies of different sizes of coal from the same mine have been furnished and they are given below. The analysis and B. T. U. determination based on mine samples is as follows:

	Per cent.
Moisture	13
Volatile matter	35
Fixed carbon	41
Ash	11
Total	100
Sulphur	4
British thermal units	11,300

The coals tested were ¾ in. and 1¼ in. lump made over a bar screen, the former prepared by the removal as screenings of 27 per cent. of the mine run hoisted and the latter by the removal of 38 per cent. of the mine run hoisted. Over 200 tons of each of these coals were used on the same engine hauling the same trains, and the difference between the two coals was 1 per cent. and that in favor of the ¾-in. coal, thus proving that both coals were of equal evaporative value. The cost of the 1¼-in. coal would have been at least 10 cents more per ton, yet it gave no greater evaporative value nor could a more uniform steam pressure be maintained with it than with the ¾-in. lump.

Coal high in slack requires a smaller tip to produce the stronger draft. This means more back pressure.

We believe that the tendency is to exaggerate the detrimental effect of slack in locomotive coal.

An article in the *Railway Age Gazette* of April 22, 1910, page 1049, gives results of tests made on the Wheeling & Lake Erie, mine run and ¾-in. lump coal being tested under similar conditions. The results of these tests showed that the ¾-in. lump had 5.6 per cent. greater evaporative value than the mine run.

The results of the two cases cited show the importance of every railway knowing the locomotive evaporative value (not the laboratory calorimeter value) of every important grade of coal from every important mining district which is supplying or which might supply coal. It is only when this knowledge is at hand that a railway can tell whether it is purchasing the most economical size of coal from each district and whether or not it would be economy to increase the tonnage from some districts and decrease the amount taken from others. The difference between the cost of fuel purchased on a basis of mutual interest to the railway company as a whole and the coal operators, and the cost of fuel as it might be purchased to the best interests of the motive power department should be known. This difference is rightly chargeable to the cost of obtaining freight and passenger traffic, though under present accounting systems the notive power department is charged with it and the cost of coal per ton-mile is increased.

The foregoing refers to locomotive coal, but stationary boiler coal, though costing only a small percentage of the amunt paid for locomotive fuel is, nevertheless, an item of importance. Little attention is given to stationary boiler coal, and many plants are using high-grade coal, though the remodeling of the boiler plants to use slack coal would pay good interest on the investment. From both the standpoint of the railway and the coal operators stationary boiler plants should be equipped to burn slack coal, thus helping the operators to some extent when there is a surplus of screenings being made at the mines. Using screenings at boiler plants, especially outlying ones, does away with the loss of coal by theft.

Coal should be broken to the proper size before being put on the tender. From the standpoint of preparation egg coal is ideal, as it requires no breaking at the chutes, but only a limited quantity of this coal is available. Where hard, flinty coals are used some type of mechanical breaker should be used, thus reducing the cost of handling through coaling plants and insuring proper preparation, which results in fuel economy.

Standard Uniform Blanks for Reporting All Items of Cost of the Handling of All Railway Fuel.—The committee, N. M. Rice, chairman, believes that three forms can be arranged to require the minimum amount of clerical work, and at the same time furnish all necessary information. The first form is entitled "Daily Fuel Station Report." It is to be filled out by the day foreman at each fuel station and mailed to the officer in charge of the fuel department at the close of each day. The second blank is intended to furnish exact information as to how each chute is operated from day to day, and to permit the average operation for any number of days to be quickly obtained. Upon the entry on the last day of the month the report is completed without any further accounting. This report may be arranged to be made out in triplicate or otherwise, and copies may be forwarded to the officers interested immediately upon receipt of the last daily report. The third blank suggested is one by means of which comparison between stations of the different types can be made.

Mechanical Preparation of Coal.—H. H. Stoek, professor of mining engineering, University of Illinois, read a paper on this subject, an abstract of which follows:

The mechanical preparation of coal refers to the treatment to which such fuel is subjected in order to prepare it for use. This preparation includes sizing, washing, coking and briquetting.

The mechanical treatment of coal aims to size it so that it may be burned to better advantage and to increase the relative amounts of the fuel constituents, fixed carbon and volatiles, by decreasing the non-fuel elements such as moisture and ash, and to decrease the deleterious elements—sulphur and phosphorus.

The moisture in coal occurs:

1. In the essential composition of the coal, and this part cannot be removed, except by heating the coal to a temperature of 212 deg.

2. Coal may hold moisture just as a sponge holds water, and the amount of this moisture depends largely upon weather conditions and the way in which the coal is stored. In a damp climate coal left exposed to the air will mechanically absorb

a considerable amount of water, while in a dry climate the mechanically held water will be given off. Except in the case of washed coal, coal is seldom treated for the specific purpose of removing the moisture, except as it is stored in piles and thus allowed to dry out by exposure to the atmosphere. Many coals, however, when thus stored give off gases that have a fuel value and disintegrate so that the decrease in fuel value thereby is greater than any gain through the elimination of moisture by drying.

Sizing of Coal.—For many years the only treatment to which bituminous coal was subjected was to dump it over inclined bars which separated the very fine material called slack from the lump coal, and in many cases even this amount of screening was not done and the coal was shipped run-of-mine. Although this method still prevails to a considerable extent, a large amount of bituminous coal is now sized and some of the most recent tipples contain appliances for separating seven or eight sizes.

The object of sizing coal is to secure a product that can be burned more advantageously than unsized coal. A compact coal that contains but little volatile matter burns on the surface and the combustion extends gradually inward. Hence it is advantageous to have lumps of approximately equal size so that the air can reach the surface of the coal as uniformly and as readily as possible, for if large and small lumps are mixed the passageways for the air between the large lumps are stopped by the small lumps and the burning of the coal thus interfered with. It is not practicable to size very soft coals, such as Connelsville or Pocahontas, and, moreover, there is not the same necessity since the coking in the furnace soon destroys the effect of the sizing. However, even with such coals, a large lump mixed with fine coal will lie practically dead for a long time and must be broken up in the furnace to secure the most effective burning. Thus far, there has been very little breaking of bituminous coal in order merely to size it for fuel purposes to supply a demand for certain sizes. Coal is, however, crushed before coking and is broken and sized before washing to secure the best results. The time may come when bituminous coal will be broken to secure certain sizes just as is done with anthracite; in fact, certain tipples recently built have crushers installed for this purpose looking toward the necessities of the future.

The sizing of coal is done in one of two ways:

1. By inclined bars.

2. By screens which may be (a) revolving or (b) shaking.

In the agreement between the coal operators and the United Mine Workers the standard screen is a series of inclined bars over which the run-of-mine coal is dumped. These screens separate the lump from the slack or screenings. The agreement in regard to these screens made in 1898 and generally still used in the territory specified is as follows:

"Screens hereby adopted for the state of Ohio, Western Pennsylvania and the bituminous district of Indiana shall be uniform in size, 6 ft. wide by 12 ft. long, built of flat or acorn-shaped bars of not less than ⅝ in. surface, with 1¼ in. between bars, free from obstructions, and such screens shall rest upon a sufficient number of bars to hold the bars in proper position."

Except for the sizes prepared on these standard bar screens there is a wide variation in the sizes of bituminous coal in different localities and there is no uniformity or standard in regard to either names or sizes in different states or even in different parts of the same state.

In Pennsylvania and Ohio, though the nut coal screen usually has a ¾-in. space between the bars, a ⅝-in. space is frequently used. The term pea coal is applied to the size passing over ⅝-in., ½-in. and ⅜-in. mesh, and where this size is made the material passing through the screen is slack. In some parts of Pennsylvania anything passing through a ¾-in. screen is called slack, while in other sections of the same state anything passing through ¼ in. is slack. In fact, the terms slack and lump are absolutely indefinite—slack means usually the smallest size shipped from any given plant and lump the largest size.

Illinois has not only taken the lead in the screening and marketing of unwashed coal, but she is also the leader in the washing of coal for steam and fuel purposes. The practice in regard to the screening of washed coal in Illinois is quite largely followed in the few washeries built in other neighboring states where washing is done for steam and fuel purposes.

The washeries in these states commonly prepare five sizes of coal, although some few prepare only three and a few washeries prepare seven. Where the five sizes are made they are numbered as follows:

No. 1	coal	through	3	to	1¾	inches
" 2	"		1¾	"	1	"
" 3	"		1	"	¾	"
" 4	"		¾	"	¼	"
" 5	"		¼	"	0	"

These last two sizes have to be separated by the use of a spray of water on the screens. In fact, water spray is often used on the sizing screens for all the different sizes, as it not only facilitates sizing but gives the coal a brighter and cleaner appearance for the market.

Cleaning of Coal.—The cleaning of coal should begin in the mine, and in general and as far as possible the impurities should be separated there by hand, thus decreasing the amount of useless material hauled and hoisted to the surface. It is not always possible for the operator to secure the amount of cleaning that he desires in the mine, and, moreover, with the poor light in the mine it is impossible to clean the coal as thoroughly as can be done on the surface. At present over 50 per cent. of the coal mined in the United States is shot off the solid, and even where the coal is undercut by machines an excessive amount of powder is used. Solid shooting, too much powder, and payment on the run-of-mine basis result in an excessive amount of fine and dirty coal, and complicate the coal cleaning problem of the mine operator.

Coal Washing.—The principal method of purifying bituminous coals is by washing.

The technical meaning of coal washing is a separation of impurities from the coal due to a difference in the specific gravity, and it does not mean merely a washing off by a spray of water of the mud or refuse adhering to the surface, although this latter use of the term sometimes is found.

The object of washing coal is two-fold:

1. To reduce the amount of ash in the coal intended for fuel purposes and thus to increase its fuel value.

2. To reduce the amount of sulphur in a coal intended for coking so that a coke can be made which will be usable in the manufacture of iron. At the same time certain amounts of ash producing impurities are removed, but the prime object is usually the removal of the sulphur.

Coal is a comparatively cheap material that must be handled in large quantities, quickly and at a minimum of expense. Hence, while the same general principles apply to the washing of coal as to the concentration of ores, the selling price of coal will not usually permit the cost for equipment or treatment that is possible with the more valuable ores. The principle underlying all coal washing machinery depends upon the difference in specific gravity between coal and the impurities mixed with it. The average specific gravity of coal and of the materials which must be considered in connection with the washing of coal are as follows:

Coal.		Ash forming impurities.		Sulphur sources.	
Anthracite.	1.5	Shale	1.60	Iron pyrites	4.2
Bituminous	1.25—1.35	Slate	2.10	Calcium sulphate	2.32
		Fireclay	1.90		

If a mixture of pieces of coal, slate and pyrites of approximately the same size be agitated in water and then allowed to settle, the heaviest, which is the pyrites, will go to the bottom, the next heavier, or the slate, will settle on top of the pyrites and the lightest, or the coal, will be on top of the slate or may even float on top of the water. A piece of coal 1 in. in diameter, a piece of slate 1.6 in. in diameter and a piece of pyrites 1-12 in. in diameter will weigh the same, and

falling in water will settle in about the same stratum, and if there is this difference in the relative sizes of the pieces of the three materials there will be little or no separation of them. The more nearly the particles of the different materials are of the same size the more readily can they be separated. If it were merely a question of separating pure pyrites and pure slate from pure coal the problem would be comparatively simple, but it must be borne in mind that the slate merges gradually into bone coal, and the bone coal in turn merges gradually into coal, and these may be mixed in any proportions. Furthermore, pyrites, instead of being pure and occurring in lumps or balls by itself, may be finely divided and mixed throughout the coal. If this happens to be the case, a separation by washing is practically unattainable.

It is usually necessary in washing any particular material to establish an arbitrary distinction between coal, bone coal and slate, as for instance, to call everything coal having a specific gravity of less than 1.35, everything between 1.35 and 1.45 or 1.50 bone coal, and everything having a higher gravity, slate. Coal is broken preparatory to washing it in an ordinary toothed roll, and then sized either in revolving screens or shaker screens, or in an hydraulic classifier.

Machines used for washing coal are classed under four general heads:

1. Trough washers, of which the Scaife is an example.
2. Inverted cone washers like the Jeffrey.
3. Bumping tables like the Campbell.
4. Jigs, of which there are a large number of different types.

The cost of washing coal varies widely in different localities, and in Illinois alone, figures have been furnished the writer varying from $0.02½ to $0.20 a ton. It has been impossible from the data at hand to prepare a statement of the costs under differing conditions that would be of value. Many quote their costs as simply the labor employed in the washing without including the interest on their investment and the depreciation of the plant. A cost of $0.10 per ton will apply in a number of Illinois plants.

Until quite recently, the coal washing industry in the United States could be said to be in an experimental state, owing to the fact that there was such a great amount of high-grade coal in the Appalachian and other coal regions that could be marketed and coked without preliminary washing. As the coal fields have been more extensively developed, and as competition between districts has become more keen, and also since the Connellsville region is being rapidly exhausted, the demand for washed coal both for domestic and coking purposes, has increased. Another item which has given an impetus to the coal washing industry is the extensive introduction of late years of by-product coke ovens. The use of these ovens renders it possible to coke coal which cannot be coked in the bee-hive oven. It has also been demonstrated that it is possible to coke certain coal after washing which cannot be successfully coked before washing, on account of the large amount of impurities contained. The low-grade coals of the Rocky Mountain states can be greatly improved by washing, and many of them can be coked only after they have first gone through the washing process.

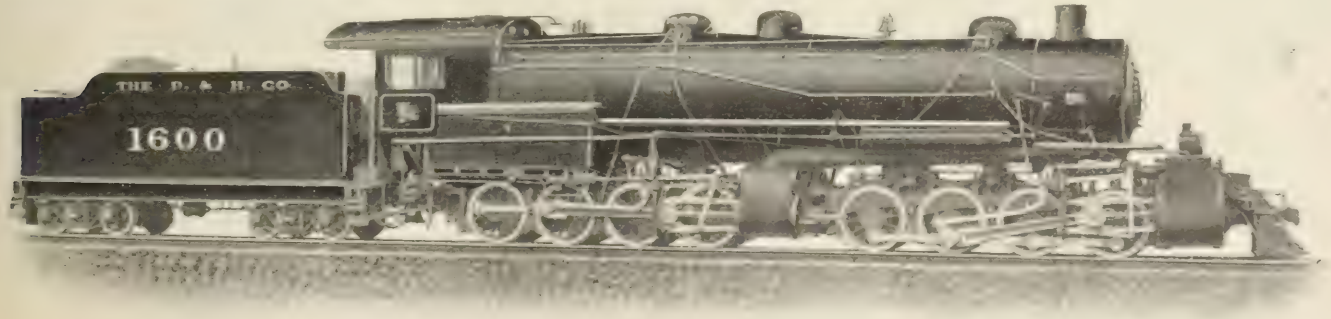
Illinois is the chief center of coal washing for domestic purposes. In Alabama, the coal is washed mainly as preliminary to coking, and in Pennsylvania it is washed both for coking and domestic purposes. There are a few washeries in Montana and Washington, where the coal is washed for railway use, although thus far there has not been much demand on the part of the railways for washed coal.

Not all coal can be washed successfully or economically, and coal washing is by no means the panacea for all the ills of the coal market that some enthusiastic advocates would have us believe, but that the industry has a future and that the problem is worthy of the closest study of engineers we are assured. It must be borne in mind, however, that each coal washing proposition is a distinct problem, and that there is no universal coal washing process or machinery. Each problem must be separately studied and extensive laboratory tests made before an expensive plant is erected, for by such examinations and tests it is generally possible to say whether a certain coal can be washed and thereby rendered fit for a specific purpose. There are reliable firms of engineers who specialize along this line and have testing laboratories for making such preliminary tests.

Coking of Coal.—The introduction of by-product ovens has given an interest in the subject to many connected with mechanical pursuits because most of these by-product plants are located in large cities and many of them have been established with a view to utilizing for fuel or illuminating purposes the gaseous products which are wasted in the ordinary bee-hive oven.

MALLET ARTICULATED COMPOUND LOCOMOTIVE FOR THE DELAWARE & HUDSON CO.

Six of the most powerful locomotives ever built have recently been delivered to the Delaware & Hudson Co. by the American Locomotive Co. They are designed for pusher service over a portion of the Wilkesbarre and Susquehanna division of the road. The division extends from Carbondale, Pa., to Oneonta, N. Y., a distance of 95 miles. The movement of heavy traffic over this division is northbound, and it is for this work on a heavy grade out of Carbondale that the engines are to be used. The traffic is made up for the most part of loaded coal trains and at the start there is a six-mile grade of from 1.363 to 0.68 per cent. Starting out of Carbondale the grade rises at a rate of from 1.36 to 1.363 per cent. for a little more than five miles. It then eases off and ranges from 0.68 to 0.88 per cent. for a little less than 14 miles. The total rise in the 19 miles is 945 ft. or at an average of about 0.94 per cent. not compensated. In addition to the grade, the road is very crooked, having 83 curves of from 1 deg. to 6 deg. 30 min. As a whole, these curves average about 5 deg. It will be seen that the run is over an exceedingly difficult piece of track. Having passed the summit, the road drops down into Oneonta, a distance of about 75 miles, on a fairly even grade of about 1 per cent.



Mallet Articulated Compound Locomotive for the Delaware & Hudson.

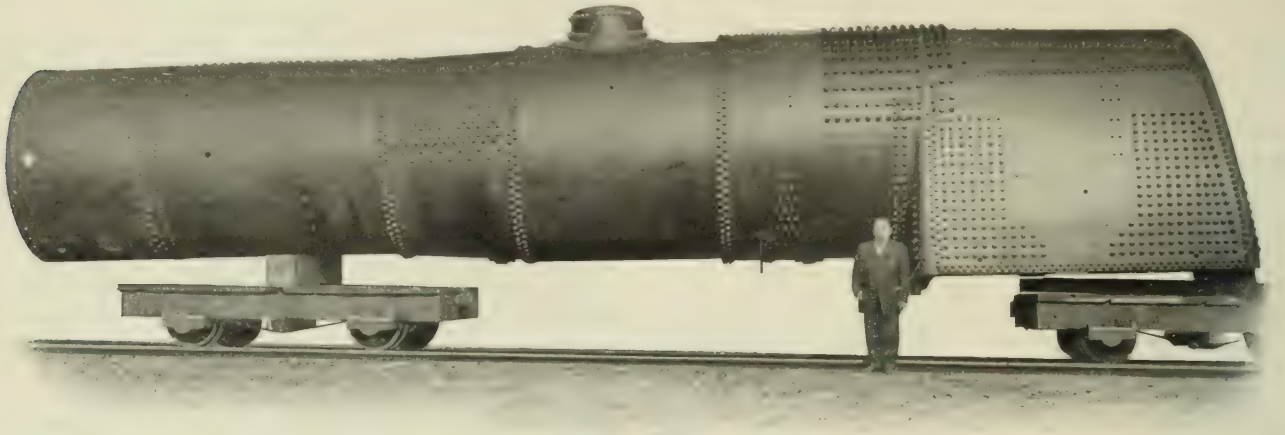
Hitherto the freight traffic on this division has been handled by consolidation locomotives, known on the road as Class E-5, having a theoretical maximum tractive power of 49,690 pounds, a total weight of 252,000 pounds and a weight on driving wheels of 223,000 pounds. A single Class E-5 engine can very satisfactorily handle a 2,600-ton train from Ararat to Oneonta, but it requires the assistance of two locomotives of the same class, as pushers, to haul this load up the 19-mile grade to Ararat, at which point the pushers cut loose. With this power a speed of about 10 miles per hour can be maintained on the six-mile ruling grade from Carbondale to Forest City and a speed of 15 miles per hour over the remaining 14 miles of the ascent.

With a view to reducing the operating expenses of the division and facilitating the movement of trains, the officials of the Delaware & Hudson Company decided to investigate the efficiency of the Mallet type locomotive for this service. The aim was to secure a pusher engine of this type of sufficient power to move the maximum train load up the hill with two engines instead of three.

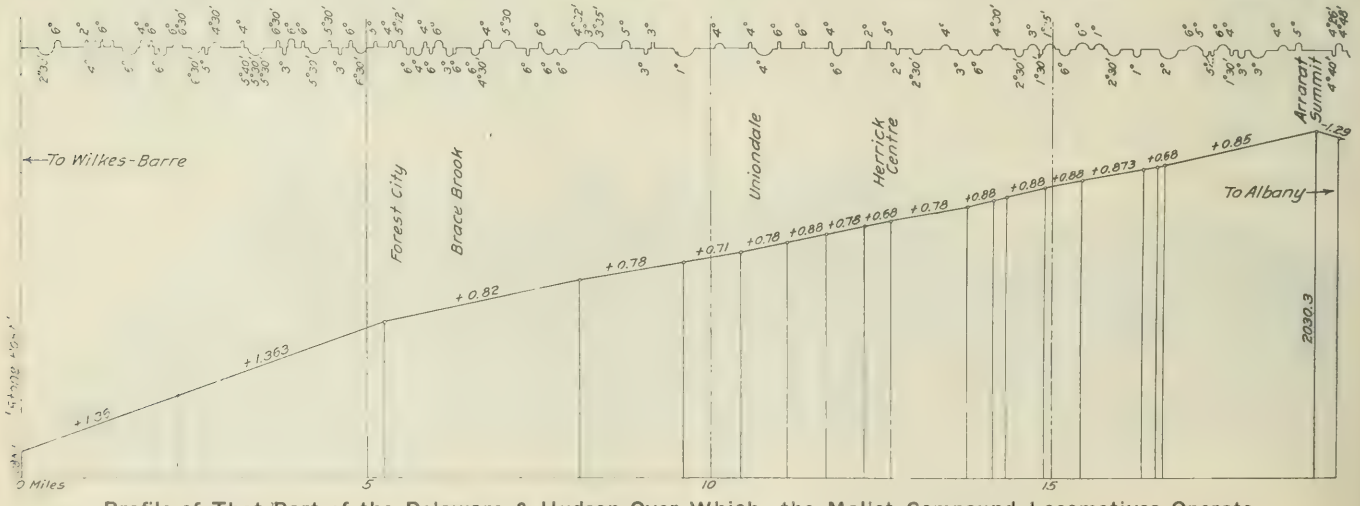
In the fall of last year one of the heavy Mallet engines built by the American Locomotive Company for the Erie Railroad was borrowed and put into pusher service on the 19-mile Ararat grade. A number of test runs were made, which proved that a single Erie Mallet engine easily did the work of two of the Class E-5 consolidation locomotives. Following these tests six Mallet engines were ordered from the American Locomotive Company and put into service. These engines are of a straight forward design, embodying but slight modifications from the designs of previous locomotives of this type, of lesser weight and power, constructed by these builders. The wheel arrangement is of the 0-8-8-0 type, and the design is based on the articulated locomotives built for the Erie Railroad in 1907, with 35,000 pounds increase in weight and 10 per cent. more power, thus giving a good margin of power to meet the varying conditions of service on the line of the Delaware & Hudson.

The general appearance of the locomotive is shown in the illustrations. In working order it has a total weight of 445,000 lbs., all of which is carried on the driving wheels. The high-pressure cylinders are 26 in. in diameter by 28 in. stroke, and the low-pressure cylinders are 41 in. in diameter with the same stroke. With the boiler pressure of 220 lbs. and driving wheels 51 in. in diameter, the theoretical maximum tractive power, working compound, calculated by the American Locomotive Company's formula, is 105,000 lbs. As this formula, which is applicable only to articulated locomotives built by the American Locomotive Company, is based on the results obtained from a large number of indicator cards, taken under various service conditions, it is found that the tractive power thus calculated represents very accurately the actual power that the locomotive can develop at a piston speed of not over 250 ft. per minute. With the American Locomotive Company's system of compounding, the normal maximum tractive power working compound can be increased about 20 per cent. by changing the engine into simple. The maximum tractive power of these engines working simple is thus 126,000 lbs.

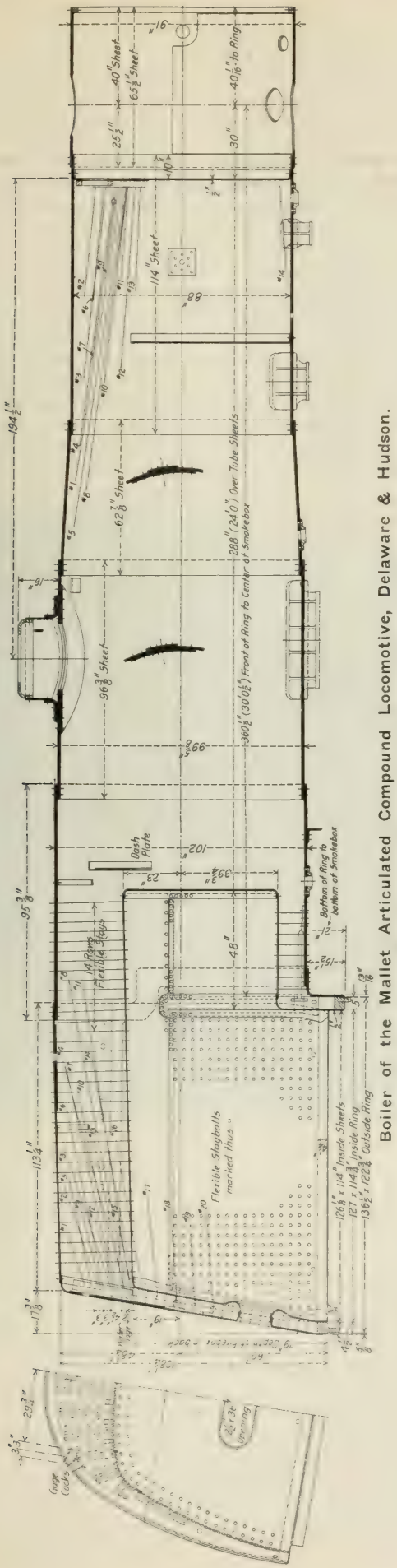
With the same average weight per driving axle and a rigid wheel base 2 ft. 3 in. shorter, these articulated locomotives, under normal working conditions, have over twice the power



Boiler for Delaware & Hudson Mallet Articulated Compound Locomotive.



Profile of That Part of the Delaware & Hudson Over Which the Mallet Compound Locomotives Operate.



of the Class E-5 consolidation locomotives, and in case of emergency can exert a tractive power more than two and one-half times as great as the latter. One of these engines as a pusher and a Class E-5 locomotive in the lead, will easily take a 2,600 ton train up the grade, where it previously took three Class E-5 locomotives. The six articulated locomotives in this order will, therefore, relieve 12 of the consolidations from this service without sacrificing any tonnage, and with a saving in operating expenses due to handling less units.

Apart from the increase in size and power, the principal changes in the design from that of the Erie engines, are a different arrangement of high-pressure steam pipes, and the location of the cab over the firebox. Owing to the large diameter of the boiler, it was thought desirable in this instance to locate the high pressure steam pipes underneath the running boards, as shown in the illustration of the side elevation. Steam is led from the throttle through a dry pipe to the smokebox, where it is divided in a tee-head and passes into two branch pipes, one in either side of the smokebox, in the same manner as in a single expansion engine. From these branch pipes, to which they are connected through elbows with ball joints, two wrought iron steam pipes extend back underneath the running board, one on either side of the boiler, to the high pressure cylinders. An elbow covers the steam passage in the cylinders, to which the steam pipe is joined by means of a specially designed connection having a ball joint at either end and fitted with a slip joint. This construction permits of the expansion and contraction of the steam pipe, due to variations in temperature, and also facilitates removing and putting it up when repairs are necessary.

Although the ostensible reason for this location of the steam pipes was to clear away an obstruction on the side of the boiler, that might, otherwise, block the view ahead of the engineman, it really makes but little difference. The firebox is so wide and so nearly fills the whole space between the walls of the cab that the front window is very small and is set so high that, when the man is in his seat, the opening ahead is above his line of vision; hence he would, in any event, be unable to see his rails, and he must lean out of the window in order to do so. Whether the signals would be difficult to catch through this small opening is doubtful, but it is quite certain that the driver will put his main dependence upon the side windows for the view ahead.

The design of the cylinders follows the company's usual practice. The low-pressure cylinders are the largest ever applied by these builders, being 41 in. in diameter by 28-in. stroke. Steam is distributed to the high-pressure cylinders by 14-in. piston valves having inside admission and ample port area to meet the requirements. The low-pressure cylinders are equipped with Mellin double ported balanced slide valves, which have been used so successfully on the articulated locomotives. Special provision has been made for strengthening the valve yoke. This is stayed by two longitudinal bolts which pass through cored passages in the valve. The bolts, which are 1 in. in diameter, are fitted with 1-in. wrought iron pipe thimbles, which act as spacers. By-pass valves of the standard pattern are provided for the low-pressure cylinders. These are located in chambers in the side of the cylinder castings and automatically establish communication between the two ends of the cylinder when the throttle is closed.

The valve gear, which is, of course, of the Walschaert type, is reversed by the same hydro-pneumatic reversing gear that was used on the Erie engines. A slight modification from the arrangement employed on previous engines of the articulated type has been made. This modification consists, first, in connecting the piston rod of the reversing engine to a downward extension of the arm on the main reverse shaft, instead of to the main reverse lever itself. Also, the handle of the main reverse lever which ordinarily projects above the deck of the cab is in this instance cut off, thus providing more

room in the cab. A separate handle for the main reverse lever is provided, which can be easily applied in case it is necessary to operate the lever by hand in case of an accident to the power gear.

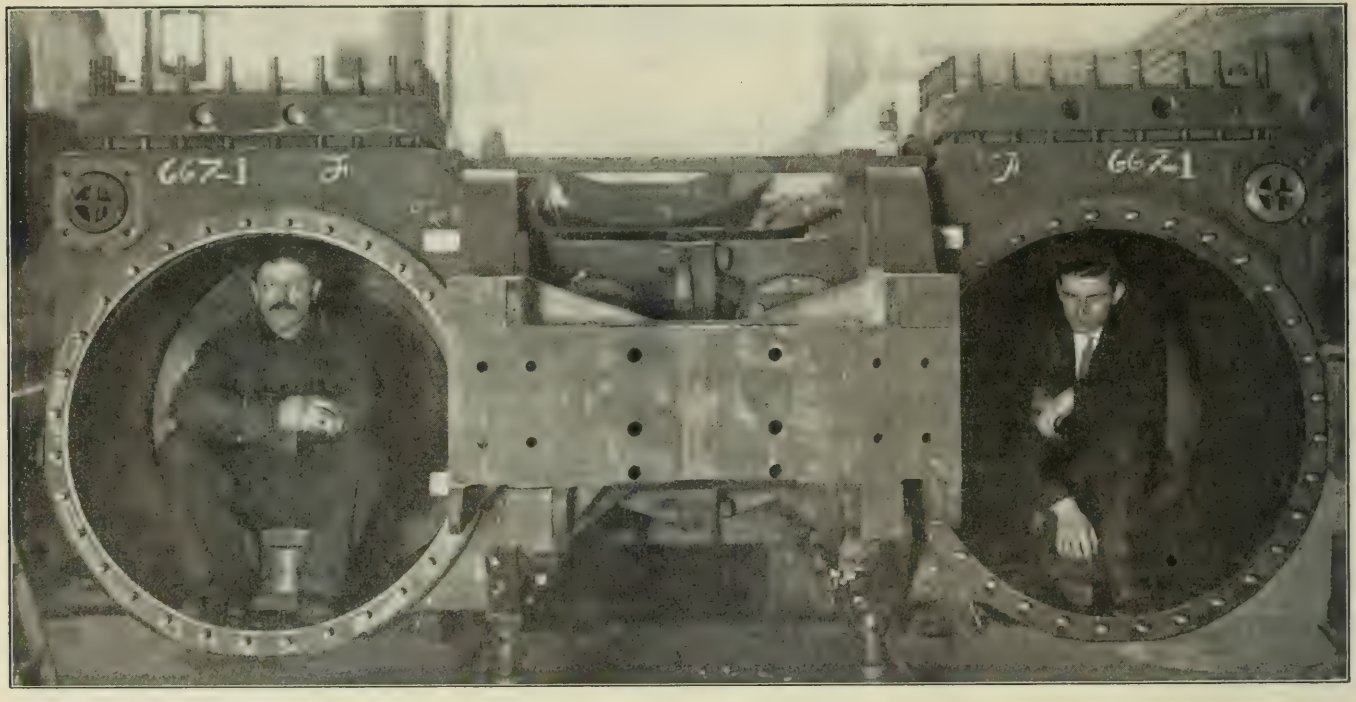
The frames throughout are of Vanadium cast steel of large section and were made by the Union Steel Casting Co., of Pittsburgh. The frames of the rear engines have a single front rail cast integral with the main frame, while those of the front system are provided with double front rails, the lower one of which is in one casting with the main frame. Both sets of frames are 5½ in. in width throughout, except that portion of the lower front rails of the front frame which is underneath the cylinders. This portion is reduced to 3¼ in. in width, and is reinforced by an auxiliary rail 4 in. wide, bolted to the inside of the lower rail and extending the full length of the cylinders. Over the pedestals, the upper rails of the main frames are 6½ in. deep, while between pedestals the depth of section is 5 in., except at those points where the equalizing beam fulcrum castings are introduced, where it is increased. The bottom rails of the frames are in the main 4¾ in. deep, except above the pedestal caps, where the depth of section is increased to 5¼ in.

A single articulated connection is used between the front and rear systems. This is formed by a cast steel radius arm rigidly bolted to a cast steel pocket casting securely bolted to the bottom rails of the rear frames, which also extends back underneath the high pressure cylinder saddle, to which it is bolted. The coupling is made by means of a vertical pin 6 in. in diameter, inserted from the top. This gives a very strong and substantial connection between the two engines, and at the same time the use of the single articulated connection permits of the vertical movement of the two frames relative to each other, without any binding in the joint.

An exceptionally strong and substantial system of frame bracing is employed. In the front and back systems there are in all 16 cross braces between the frames, taking into consideration the high and low-pressure cylinder castings. All the cross ties are of cast steel and of such a construction as to provide the maximum of strength with the minimum weight. With but one or two exceptions, the several cross-ties extend down to the bottom rails of the frames and are secured to the frames by both horizontal and vertical bolts. The location and arrangement of the cross braces are shown in the illustrations.

Two features which have proved very successful in the articulated locomotives built for the Erie Railroad have been incorporated in this design. These are the floating balance device and the side spring buffers at the frame union. The floating balance device which is located between the second and third pair of drivers of the front system immediately back of the boiler bearing, which carries the spring centering device, consists of a pair of spring supported columns. These have ball and socket connection at their upper ends with the saddle casting of the boiler bearing to a similar connection at their lower ends with two castings hinged at one end to the bottom of the cast steel cross tie between the lower rails of the frames. The outer ends of these hinged castings rest in "U" bolts and are supported by coil springs seated on the cross tie. These columns serve to support the portion of the weight which would otherwise come on the main boiler bearing thus relieving that bearing of excessive pressure. In this instance, the total initial compression of the springs is about 30,000 lbs. This detail was illustrated in connection with the Erie locomotive in the *Railroad Gazette*, October 4, 1907, page 388. With this arrangement that part of the weight of the boiler that is carried by the front system is divided up between three point supports, namely, the self-adjusting sliding balance valve, located between the third and fourth pair of driving wheels, the spring supported columns and the pair of adjustable hinged bolts which connect the frames of the two systems. The surface of the boiler bearing is located between the second and third pair of driving wheels which are normally not in contact, so that this bearing does not support any weight except under unusual conditions. With this construction the columns are free to sway in any direction, while they support a load equal to the total compression of the four springs. In this case, the total initial compression of the springs is about 30,000 lbs., which amount is taken off the main boiler bearing.

Besides relieving the main boiler bearing of the load which they support, the floating columns throw a certain load on the equalizing bolts in the rear of the frames; since the three supporting points constitute a system of support similar to the balanced beam, with the main boiler bearing as the



Low Pressure Cylinders for Mallet Compound Locomotive.

fulcrum, the loads carried in the supporting columns and the equalizing bolt as the weights applied at either end. Consequently, if the system is in equilibrium, for any load supported by the floating columns, the equalizing beam must receive a load having the same proportion to the other as the respective distances of the floating columns and the equalizing bolts from the main boiler bearing have to each other.

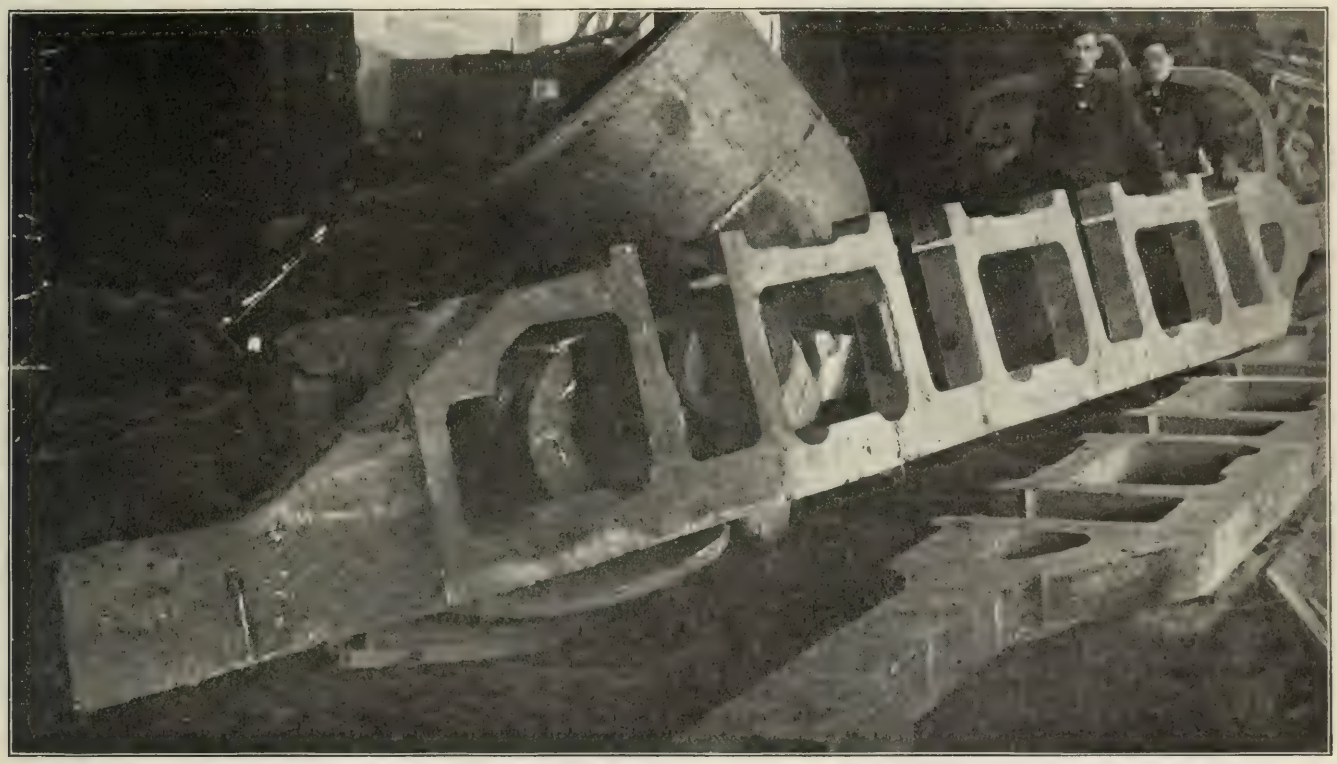
As the sum of the loads supported at each of the three points is equal to that part of the weight of the boiler that is carried on the front system, the total amount of the load removed from the main boiler bearing, by the introduction of the floating balance device, is equal to the sum of the load supported by the columns themselves and that thrown on the equalizing bolts. In this engine, the floating columns are 52 in. from the main boiler bearing, and the equalizing bolts are 65½ in., so that with 30,000 lbs. supported by the columns, about 54,000 lbs. is removed from the main boiler bearing. In passing through curves, the horizontal component of the force exerted by the springs is expected to counteract the increasing resistance of the centering spring, and thus maintain a practically uniform side resistance on curves of different radii. In engines of the articulated type of ordinary weight, the floating balance device is not necessary, but in designs of such enormous weight as the engines here illustrated, where the bearing pressure on the boiler support would otherwise be excessive, its distinct advantage is apparent.

The side spring buffers are located in the pocket casting of the articulated connection, one on either side, and as far apart as possible. They are so designed that, when the engine is on a tangent, the buffers just touch the bumper castings bolted to the cast steel crosstie at the ends of the rear frames. Thus, when the engine enters a curve one or the other of the buffer springs is compressed. When the engine is curving, these buffers serve to direct the pushing force through the center of the wheel base of the front engine instead of through the flange of the outside forward driving wheel as it would be were it not applied. In pushing, the resistance of the head load tends to swing the front system about the center of its wheel base when the engine is passing through a curve, thereby increasing the flange friction of the front driving wheels. The action of the spring buffer is to counteract this side push of the load head, and thus reduce the resistance. In cases where the wheel base is comparatively long, as in the present instance, and the engine is engaged in pushing service, these buffers have been found to be very effective. Apart from its enormous size, the boiler is of special interest because of the careful attention with which every detail of the design is worked out to provide the greatest efficiency. The boiler is of the radial stayed type with conical connection sheet. At the first course the barrel measures 90 in. in diameter outside, while the outside diameter of the largest course is 102 in. The barrel is fitted with 446 tubes 2¼ in. in diameter and 24 ft. long. The arrangement of the tubes is clearly shown in the illustrations of the boiler cross-section. A liberal width of bridges between the tubes is provided, 3⅛ in. between centers.

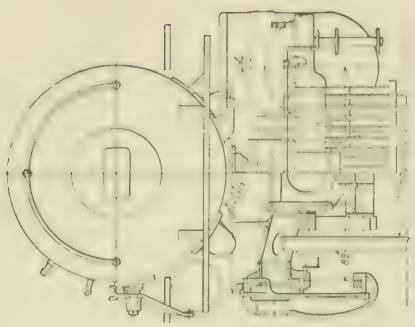
A 4-ft. combination chamber is radially stayed to the shell of the boiler. Ample space is allowed between the combustion chamber and the shell of the boiler on all sides to insure good circulation of the water. The width of the water space is not less than 8½ in. and increases to 11¼ in. at the bottom.

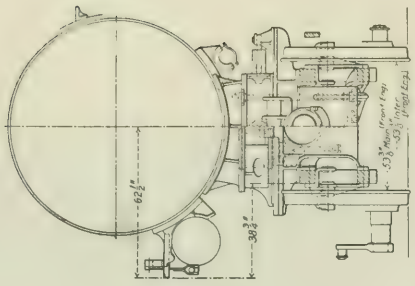
Over the crown of the combustion chamber and down to the second row of staybolts above the center line of the boiler flexible staybolts are used. All the plates of the boiler shell, are, of course, very thick, the heaviest plate being $1\frac{3}{16}$ in. thick, and the lightest 1 in. The firebox is 114 in. wide and 126⅛ in. long, and provides a grate area of 100 sq. ft.

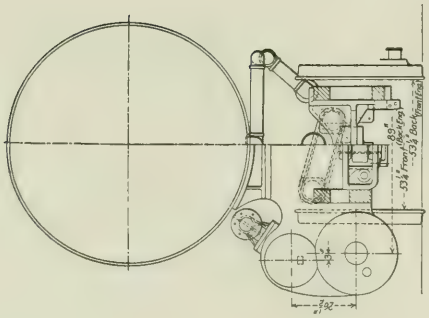
The detail to first attract attention in this boiler, aside from its great size, is the length of the tubes. This dimension has been gradually increased from the 14 ft. and 16 ft. standards of a few years ago, until a length of 20 ft. has been successfully used. But 24 ft. is very unusual and there is no record in this office of the previous use of such length. Whether a tube of 24 ft. in length would be workable and economical under ordinary conditions is difficult to say. It is well known, of course, that the temperature of the escaping gases is such that the last few feet of these excessively long tubes do not seem to possess any very great amount of steam producing capacity.

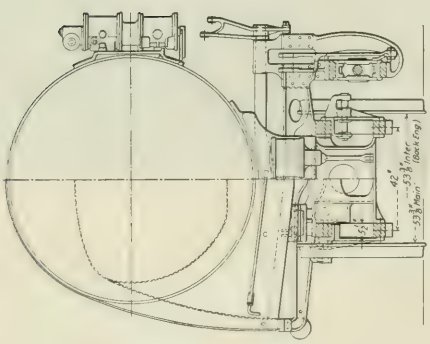


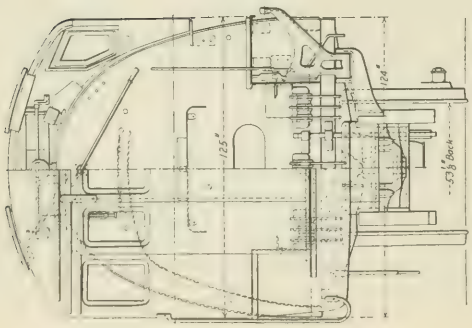
Vanadium Cast Steel Frames for Delaware & Hudson Mallet Locomotive.

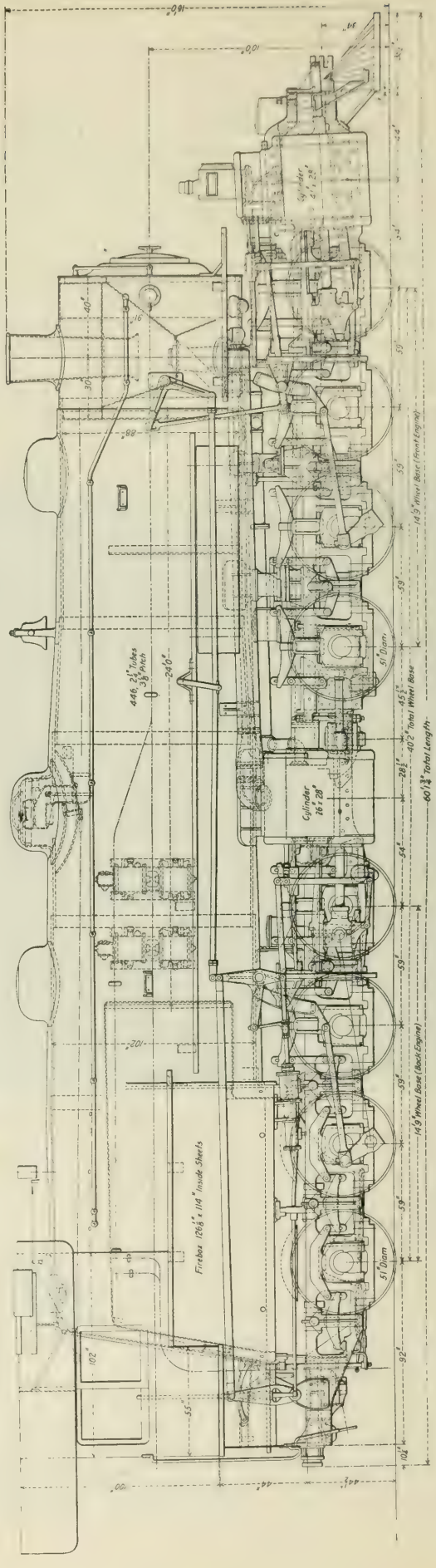








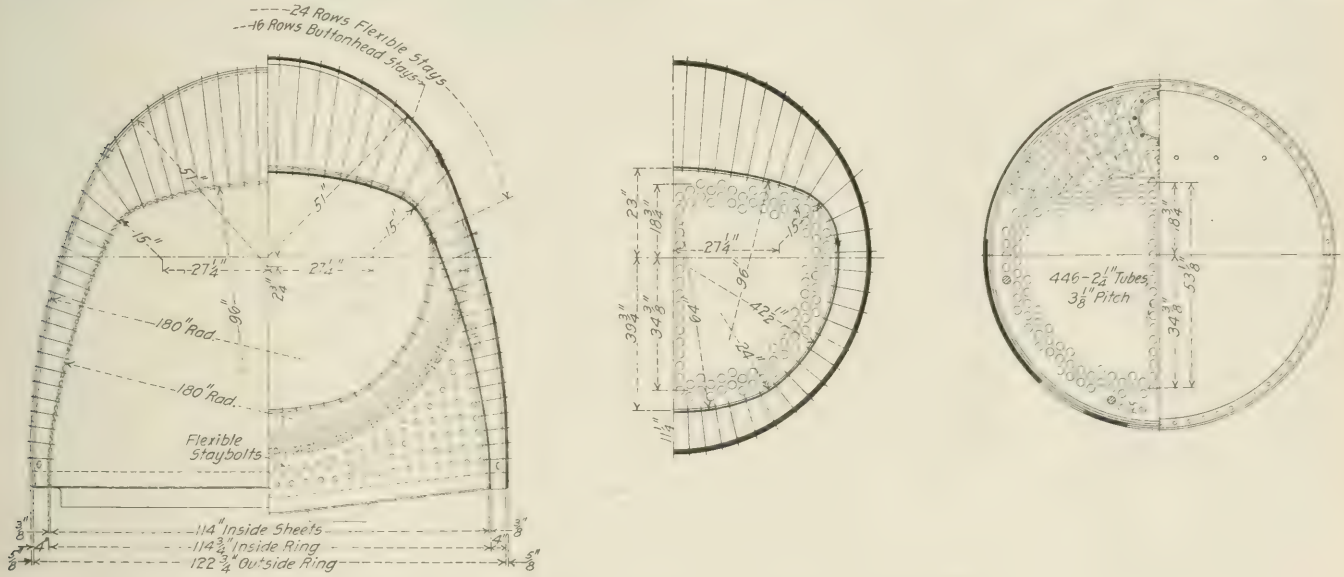




Elevations and Sections; Delaware & Hudson Mallet Articulated Compound Locomotive.

In order to meet these objections and utilize the long tubes to the utmost, an innovation has been introduced into the boiler in the form of a ½-in. plate set 5 ft. 6 in. back of the front tubesheet. This plate forms an intermediate tubesheet and is drilled to receive and support the tubes. With this support any excessive vibration of the tubes is prevented, and as far as any mechanical conditions are concerned they have the same support as tubes of 18 ft. 6 in. in length, which, for a diameter of 2¼ in. will cause no trouble.

To this mechanical advantage must be added another in the domain of evaporative efficiency. The boiler is divided by this plate into two parts, and it is into the short forward portion that the feed water is delivered from the injector. Hence all of the water in the after part must reach it by flowing over the top of the plate as over a weir. So, although the water in each portion is subjected to full boiler pressure and the surfaces are in contact with the saturated steam, it is very evident that the temperatures of the water in the two will not be the same and that that in the forward section will be the cooler of the two. The result will be that the difference in the temperatures of the water and the gases, at the front of the tube, will be greater than could possibly be the case without the plate, and there should be an appreciable



Cross-Sections of Boiler, Mallet Articulated Locomotive.

increase in the evaporative efficiency of this last 5 ft. of tube. As to just what this may be, only service can show.

In this connection there are a number of details that should be observed. The circulation in this front portion should be watched and determinations made as to whether or not the water from the injector settles to the bottom as it is supposed to do in an ordinary boiler, or whether there is a general diffusion and uniform distribution of the heat, and also as to just how much the temperature of the gases is reduced below that of the ordinary boiler having tubes of from 19 to 20 ft. in length; a reduction that would be a measure of the efficiency of this last five ft. in this arrangement of boiler.

Two Chicago sight feed flange oilers are provided for oiling the flanges of the front and back wheels of each system when the engine is passing through a curve. These are located on the back head of the boiler and oil is fed from them by steam pressure through a pipe line, from which there are leads to the above-mentioned wheels. A single firedoor is provided in the firebox, equipped with a Franklin automatic opener. Iron sliding doors are provided at the back of the cab, which may be closed when the engine is backing.

The tender is fitted with a water bottom tank of large capacity. The tank carries 9,000 gallons of water and the coal space holds 14 tons of coal. In the design of the tender frame special care was taken to provide a strong and rigid construction. The longitudinal sills are constructed of 15-in. steel channels weighing 33 lbs. to the foot; and top and bottom cover plates are used. Both the front and rear bumpers are of cast steel. The tender trucks are of the four-wheel arch-bar type, the design following the Delaware & Hudson Company's standard practice; and have a carrying capacity of 100,000 lbs. each.

SERVICE TESTS.

Immediately upon the delivery of the first of these locomotives an inquiry was set on foot in order to ascertain as to how nearly they came to meeting the requirements, and the result of this preliminary work is that they have been found capable of performing the work demanded. In the preliminary test the Mallets were pitted against two of the E-5 consolidation locomotives that were formerly put at the rear of the train. These engines had cylinders 23 in. in diameter, with a stroke of 30 in. The driving wheels were 50 in. in diameter and carried 222,000 lbs., the total weight of the engine being 250,000 lbs. The total heating surface was 3,716 sq. ft. and the rated tractive effort is 49,690 lbs. The method of observation was to put a man on the train who noted the floating car that was sometimes pulled by the engine ahead and again pushed by the one at the rear. The results of this are given in the following table, which shows the work done by the pusher locomotive, regardless of the total weight of the train, or that hauled by the leading engine.

Preliminary Test Summary. Pushing Engines.
Class-H Engines 1600 and 1601 against Class E-5 Engines 1035 and 1039.

Pusher engines.	Run No.	Average tonnage pushed.	Average lbs. coal burned.	Average ton-miles per 1,000 tons coal burned.	Average ton-miles per 1,000 tons coal burned at average speed, 9.42 —Miles per hour—	Average actual speed
1600	3, 4	1,450	11,125	4,887,640	4,887,640	9.42
1601	8, 9	1,412	12,375	4,278,800	4,150,690	8.63
E-5—1035 & 1039.	5, 6, 7	1,522	17,300	3,299,100	3,563,030	11.7

From this it appears that, although the speed was less, and the actual tonnage pushed was less with the Mallets than with the consolidations; the ton-miles hauled per 1,000 lbs. of coal burned was about 39 per cent. more. This work is shown in detail in the second table which covers the work of one week. Incidentally, this table also shows the comparative amounts of coal used and water evaporated with the two methods of pushing. On the day of the heaviest load 13,530 lbs. of coal were burned in the firebox of the Mallet in 2 hrs. and 36 min., and in that time the water evaporated was 11,589 gallons. Roughly speaking, this is at the rate of about 7.14 lbs. of water per lb. of coal, and this holds, with slight variations for the other runs. In the case of the consolidations, on

the date of their heaviest coal consumption, they burned 17,850 lbs. of coal and evaporated 11,860 gallons of water. This gives a rate of evaporation of a little less than 5.54 lbs. of water per lb. of coal.

There is no data at hand as to the condition of these engines,

Weight of engine and tender in working order	611,800 lbs.
Wheel base, driving, rigid	14 ft. 9 in.
" " total	40 ft. 2 in.
" " of engine and tender	75 ft. 7¼ in.
Cylinders.	
Type	Compound
Diameter	26 and 41 in.
Stroke	28 in.

The Delaware & Hudson Motive Power Department Test.
Pushing Engines, W. C. Tower, Carbondale, to Ararat Summit.

Run	No. 3.	No. 4.	No. 8.	No. 9.	No. 5.	No. 6.	No. 7.
Date	Apr. 23, a.m.	Apr. 23, p.m.	Apr. 30, p.m.	May 1, a.m.	Apr. 28, p.m.	Apr. 29, a.m.	Apr. 29, p.m.
Head engine	1044	1034	1018 & 1008	1033	1046	1048	1020
Number of cars moved:							
Pusher engines	27	26	28	27	34	28	29
Head engine	16	15	31	16	13	14	14
Tonnage:							
Actual, in train	2,304	2,432	3,105	2,225	2,188	2,312	2,279
Light weight cars	765	739	1,065	750	768	767	762
Weight contents	1,539	1,693	2,040	1,475	1,420	1,545	1,517
Actual, pushed by pusher engines	1,400	1,503	1,406	1,418	1,497	1,546	1,522
P. ct. train pushed by pusher engines	60.76	61.8	45.28	63.73	68.4	66.86	66.78
Actual running time between:							
W. C. tower to Forest City	49 min.	45 min.	70 min.	46 min.	31 min.	38 min.	45 min.
Forest City to Ararat Summit	71 min.	74 min.	86 min.	66 min.	57 min.	56 min.	64 min.
Miles per hour:							
W. C. tower to Forest City	6.12	6.66	4.27	6.49	9.81	7.94	6.66
Forest City to Ararat Summit	11.65	11.18	9.62	12.5	14.47	14.78	12.85
Data from W.C. tower to Ararat Summit:							
Average pressure: Head pusher	.....	.....	.....	.....	178	198	210
Rear pusher	206	198	190	208	193	205	199
Pounds coal burned: Head pusher	.....	.....	.....	.....	8,850	8,860	8,800
Rear pusher	12,000	10,250	13,530	11,220	9,000	8,840	7,550
Gallons water used: Head pusher	.....	.....	.....	.....	5,948	6,351	7,249
Rear pusher	9,736	8,748	11,589	8,717	5,912	5,129	7,707
Actual running time	2 hr. 0 min.	1 hr. 59 min.	2 hr. 36 min.	1 hr. 52 min.	1 hr. 28 min.	1 hr. 34 min.	1 hr. 49 min.
Average miles per hour	9.38	9.45	7.21	10.05	12.79	11.98	10.33
Kind of coal: Soft	50 per cent.	50 per cent.	50 per cent.	50 per cent.	See Note.	See Note.	See Note.
Pea	50 per cent.	50 per cent.	50 per cent.	50 per cent.	See Note.	See Note.	See Note.
Engine numbers, pusher engines:							
Head pusher engine	.....	.....	.....	.....	No. 1035.	No. 1039.	No. 1035.
Rear pusher engine	No. 1600.	No. 1600.	No. 1601.	No. 1601.	No. 1039.	No. 1035.*	No. 1039.*

Note.—Different grades and the per cent. are: Pea, 47.4; Buckwheat, 33.5; Grate, 2.3; Stove, 0.7; Bird, 1.3; Ches. 2.4; Screen, 1.7, and Soft, 10.7.
*Bad rail—snow and rain.

but, as the test was made for the private information of the railway officials, and not for publication or the exploitation of the Mallet locomotive, it is fair to presume that engines in good condition were selected for the work. The difference in the evaporative efficiency of the boiler is, therefore, very significant, and shows how very much more economical the large unit is than the small one, and why, though pushing a smaller tonnage, the work of the Mallet was the more economical when put upon the basis of coal consumption per ton-mile. It must be borne in mind, too, that probably the internal resistances of the Mallet were more than those of both of the consolidations combined, and finally that there was a handicap in the fact that, on one engine one man was required to handle from 5 to 7 tons of coal, whereas 4½ tons was the maximum for one man on the consolidations. Further tests, and tests of greater refinement are to be made with these engines, which, when completed will be made public. Meanwhile what has already been done serves to demonstrate that the adoption of Mallets on this pusher grade has been a movement in the direction of economy of operation, and if the design can be so improved that the internal resistances will be less, the value of the type will be proportionately increased.

The principal dimensions and ratios of the design are given in the following table:

Ratios.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.24$$

$$\frac{\text{Tractive effort} \times \text{diameter drivers}}{\text{Heating surface}} = 807.81$$

$$\frac{\text{Total heating surface}}{\text{Grate area}} = 66.29$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 5.32^*$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 67.13$$

$$\frac{\text{Displacement of 2 h.p. cylinders, 17.2 cu.ft.} \times \text{Total heating surface}}{\text{Displacement of 2 h.p.cylinders}} = 385.41$$

$$\frac{\text{Grate area}}{\text{Displacement of 2 h.p.cylinders}} = 5.81$$

*Per cent.

General data.

Service	Pusher
Fuel	Mixture bituminous and anthracite coal
Weight, total in working order	445,000 lbs.

Valves.

Type, high pressure	Piston
Type, low pressure	Double ported slide
Steam lap, high pressure	1⅛ in.
Steam lap, low pressure	1 "
Exhaust lap, high pressure	5/16 "
Exhaust lap, low pressure	7/16 "
Lead	3/16 "

Wheels.

Driving, diameter	51 in.
Driving axles—size of journals	10 x 12 "

Boiler.

Working pressure	220 lbs.
Firebox, length and width	126⅛ in. x 114 in.
Firebox, water spaces	F., 5 in.; S., 4 in.; B., 4½ "
Firebox sheets, thickness	Crown, sides and back ⅜ "
	tube sheet 9/16 "
Tubes, number	446
Tubes, material	Spellerized steel
Tubes, diameter and length	2¼ in. x 24 ft.
Heating surface, tubes	6,276 sq. ft.
Heating surface, firebox	353 "
Heating surface, total	6,629 "
Grate area	100 "
Exhaust pipe	Single
Exhaust nozzle, diameters	6½ in., 6¾ in., 7 in.
Smokestack, diameter	18 in.
Smokestack, top above rail	16 ft.

Tender.

Tank, capacity, water	9,000 gals.
Tank, capacity, coal	14 tons
Wheels, diameter	33 in.
Axles, size of journals	5½ x 10 in.

TELEPHONES FOR EMERGENCIES ON TRAINS.

Since the establishment of telephone lines by railways the carrying of telephones on passenger trains and wrecking trains has been noticed frequently in these pages; but it has remained for the Erie Railroad to publish examples of actual use of the portable telephones where passenger trains have been delayed between stations. In the *Erie Railroad Employees' Magazine* for April mention is made of two occasions calling the telephone apparatus into use. On January 13 Engine 2551 on Train 3 broke a side rod about one-half mile east of Cochecton station, and inside of four minutes after the break the conductor was in communication with the train despatcher.

On January 22 Engine 2563 on Train 5 knocked out a cylinder head one mile east of PS Tower at 12:48 a. m., and at 12:52 a. m. the despatcher was fully advised of the occurrence. A relief engine was sent from Callicoon, which started Train 5 on its way at 1:30 a. m., with a total delay of 42 minutes. It

is estimated that the delay without the telephone would have been much longer. Both these occurrences were after dark, the second being about midnight. Probably with daylight to



An Erie Conductor Telephoning to the Train Despatcher.

aid in locating the proper wires on the telegraph poles, communication could have been established in less time.

It is not alone in rushing information to headquarters concerning such accidents and getting help quickly that the portable sets show their value, but also in saving wear and tear on the despatcher's nerves. In the case of Train 5 above stated, the train left NO Tower about 12:43 a. m. and was expected at PS about the time of the accident. It would have taken from 10 to 15 minutes to get a man a mile west through the snow to the tower, and in the meantime the train despatcher would have been giving his imagination full sway in order to account for the non-appearance of the train at PS.

The picture shows Conductor J. H. Fisher, of Train No. 1, on the Delaware division. The engineman and fireman are supposed to be engaged in taking down a broken side rod. Conductor Fisher is not a man with white hair and moustache. The appearance of these features in the photograph is due to reflection of light from the bright surfaces of the telephone apparatus.

EXPANSION OF LOCOMOTIVE BOILER SHEETS.

Important facts concerning the inequality of expansion in locomotive boilers, based upon thoroughly practical tests and observations of boilers in operation extending over a long period, were brought out by D. R. MacBain, superintendent of motive power of the Lake Shore & Michigan Southern, in an illustrated address at the May meeting of the New York Railroad Club. The most important fact was that with the fire at a high temperature and good circulation in the boiler the outer firebox sheets expand more than the inner ones. The tests which showed this can best be described in Mr. MacBain's own words.

"Fig. 1 shows some tramming done to determine if, under certain conditions, there is a difference between the amount of expansion that takes place in the inner and outer sheets of a firebox. This work was carried out most carefully and under conditions which we believe were such as to give a very fair idea of what takes place in a locomotive firebox when the temperature of the fire is high and circulation of water is good. The process of making these determinations was as follows:

"A wide firebox boiler was selected; trams of solid steel were prepared, and a set of marks were made on the inner and outer sheets from these trams. The boiler was then fired up and, when the pressure reached 200 lbs. and the pops had been open for a few minutes, the fire was drawn hastily, during which process the trams were tried to their respective marks on the outside sheets; immediately afterward (within a few minutes) the trams, in the proper order, were tried to the marks on the inner sheets, and the data shown below is the result, indicating that the expansion of the outer sheets of the

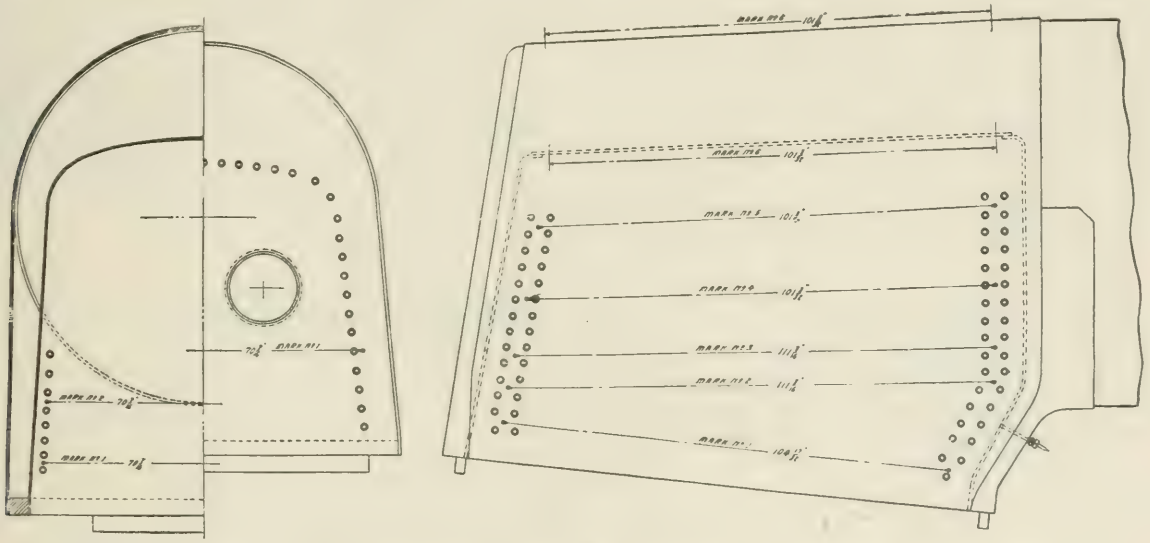


Fig. 1—Location of Tram Marks to Determine Difference in Expansion between Inner and Outer Firebox Sheets.

firebox was greater, in every case, than that of the inner sheets.

	Outside wrapper sheet		Inside of firebox		Difference in
Mark.	Location.	Expansion.	Location.	Expansion.	expansion
No. 1.	Side sheet	in.	Side sheet	in.	in.
" 2.	" "	-in.	" "	-in.	-in.
" 3.	" "	in.	" "	in.	-in.
" 4	" "	in.	" "	in.	-in.
" 5.	" "	in.	" "	in.	-in.
" 6.	Wagon top.	in.	Crown "	in.	in.
" 1.	Throat sheet.	-in.	Tube sheet.	in.	3/64-in.
" 2	" "	in.	" "	in.	in.
" 1.	Black head.	-in.	(No record on door sheet.)		

This apparently accounts for the breakage of the back heads and throat sheets along the outer row of staybolts; also the vertical cracks in the side sheets, as well as cracks at the water bar holes. When the fire was first started,

and before circulation was fully established, the needle extending through the throat sheet moved out $\frac{1}{32}$ inch, and later, when circulation was established and the steam pressure began to raise, the needle moved backward about $\frac{1}{16}$ inch. The first movement of the needle throws some light on the cause of side sheets puffing along the fire line, as they sometimes do.

The diagram in Fig. 2 shows the result of a recent investi-

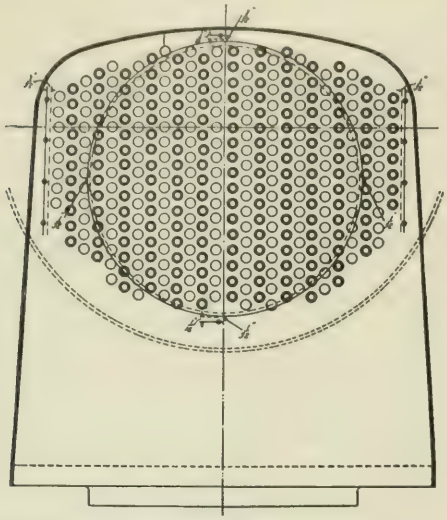


Fig. 2—Expansion of Tube Sheet Due to Prossering.

gation made by F. A. Linderman, supervisor of boilers of the New York Central & Hudson River, to determine the direction and extent of expansion in a flue sheet resulting from prossering in a set of new flues. The inner or dotted circle was scribed before the flues were put in and the outer one after they were prossered. The expansion of the sheet is very noticeable, especially at the top. This distortion is serious, especially when the process of prossering is employed at least once every 30 days during the time the engine remains out of the shop. "It has been our experience that the prosser expander is less injurious in this respect than the ordinary roller expander, but, nevertheless, the question 'What can be done to curtail the use of expanders of any kind in making running repairs?' seems to be in order."

Fig. 3 shows the firebox of a large Pacific type locomotive, to which templates were fitted while the boiler was cold, and the effect in movement of the templates when steam was raised to 200 lbs. pressure. The templates lifted $\frac{3}{32}$ in. at each end, and had their bearings on the wagon top, extending between points A and B, the zone covered by the three rows of bolts that caused trouble through excessive breakage. Another set of templates were fitted to a boiler of similar design, into which a special installation of flexible staybolts had been made, and, under hydrostatic test, up to 25 per cent.

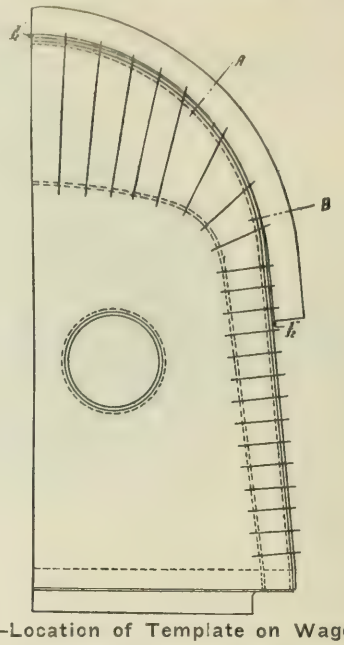


Fig. 3—Location of Template on Wagon Top.

above the rated steam pressure, the templates retained their fit on the wagon top, apparently indicating that the distortion noted above was due to expansion and not to pressure or to the use of the flexible staybolts.

To relieve the cracking of side and back sheets and back flue sheets in wide fireboxes, flexible staybolts were applied as shown in Fig. 4. Satisfactory results have been obtained with this arrangement on both the New York Central and Michigan Central. A full installation in the throat sheet, set loose as follows, is also advisable:

First row above mud ring	Tight
Second row above mud ring	$\frac{1}{32}$-in. loose.
All others	$\frac{1}{16}$-in. loose.
And the back flue-sheet braces	$\frac{3}{32}$-in. loose.

This will increase the life of a modern firebox from 50 per cent. to 75 per cent.; the loose installation of flexible staybolts in the throat sheet and slack braces to back flue sheet being considered necessary in order to avoid excessive staybolt and flue-sheet breakages, at the same time reducing the

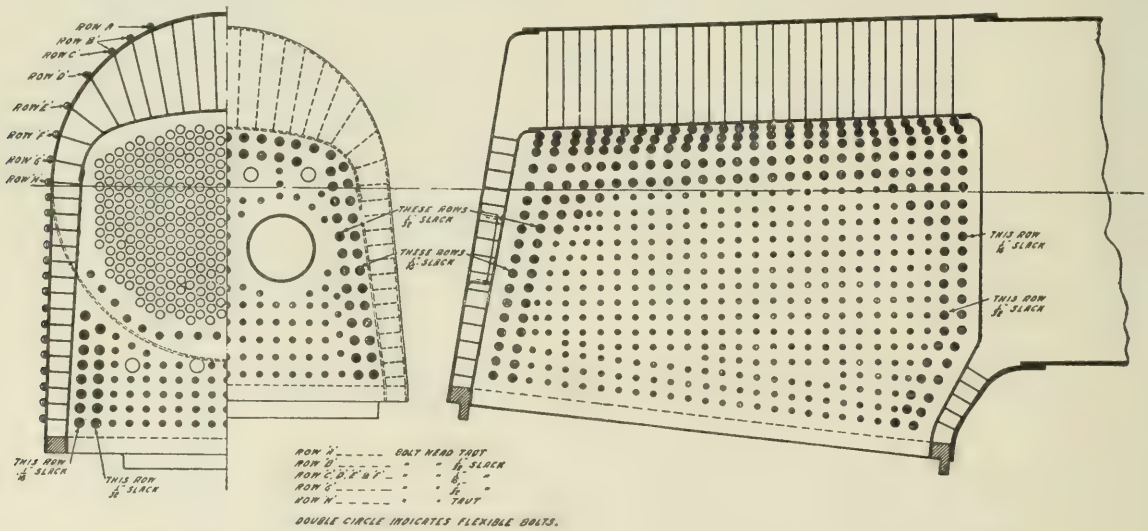


Fig. 4—Arrangement of Flexible Staybolts Which Eliminated Firebox Failures.

strain on the arch-flue anchorages, the latter being quite a source of trouble when they begin to blow, especially at the front end.

In January, 1907, the firebox of an Atlantic type locomotive in heavy passenger service was given a complete equipment of flexible staybolts, including the radial stays. It was the intention to have made this firebox of one piece, but, owing to a defect in one of the side sheets, a half side sheet had to be applied; up to February 1 of this year, at which time the last examination was made, the engine had made 243,000 miles without one broken staybolt, without any vertical cracks in the side sheets, without any trace of a crack in the back head or throat sheet, and without any cracks, or any sign of a crack, leading away from the arch tube holes in the back flue sheet, nor has there ever been a tool on the side sheet seam. The engine has never been held one moment for boiler work, other than that of expanding the flues, since it went into service in February of 1907.

Inasmuch as it has continually carried a double brick arch—the old Coffin-McGeath brick arch installation—the record of this side-sheet seam is remarkable. It is believed that the results obtained are due to the loose installation of staybolts and radial stays referred to above.

To ascertain, if possible, why the back flue sheet, and the front one, too, for that matter, become deflected or distorted, the New York Central installed a set of flues in one of their large Pacific type locomotives about one year ago. The theory was that while the locomotive was working and the fire hot, with the circulation good, the expansion in the boiler proper

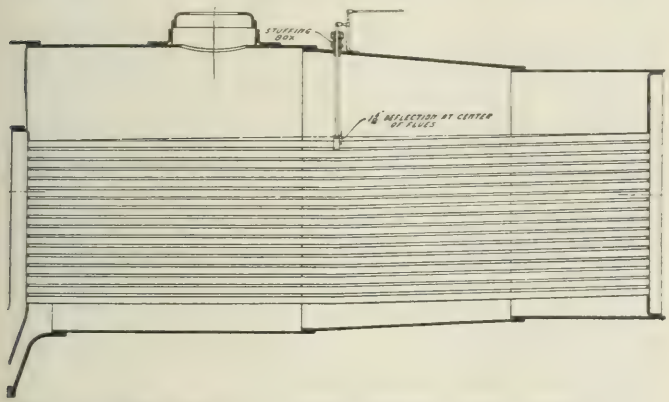


Fig. 5—Arrangement of Flues to Determine Difference in Expansion between Them and the Boiler Shell.

(between the flue sheets) was greater than that in the flues. The results of this test were rather remarkable. The standard gage flue on the New York Central is No. 11 B. W. G., and for this test No. 13 B. W. G. was used. One-half of the flues—those designated by the double ring in Fig. 2—were safe-ended with No. 11 B. W. G. and the other half were not safe-ended. The setting was according to standard practice, with the following exception: Mr. Linderman, supervisor of boilers, personally supervised the job, and each flue, before it was stuck at each end, was depressed at the center 1 5-16 in., Mr. Linderman personally doing the depressing and, at a signal from him, the man at each end stuck the flue in the sheet and expanded it. The whole set of flues (382) was applied in this way, and as a result they had a sag of about 1 in. more than normal when the job was completed.

A needle was attached to one of the top flues at the center and extended up through the shell, as shown in Fig. 5. It was attached to a recording device to show what, if any, movement took place under the various conditions of service from the time the fire was started in the box until the completion of a trip on the road. Fig. 6 shows the movement of the tube, to which the needle was attached, from the time the fire was started until 200 lbs. pressure was raised. Almost immediately after the fire was started the needle began to pull downward, and continued in that direction fully ⅛ in., and remained practically stationary for a few moments; then it began to rise and continued in that direction until about ⅛ in. above the normal position, at which point the steam pressure began to raise, and the rise of the needle from that point up to 175 lbs. pressure was gradual; from 175 lbs. to 200 lbs. it was rapid, with the result that the total rise of the needle above the normal line was $\frac{1}{16}$ in. The rapid rise of the needle between the time the pressure increased from 175 lbs. to 200 lbs. cannot be accounted for, unless it did not work in the stuffing box quite as freely as it should; however, the packing in the stuffing box around the needle was very loose.

Arrangements were then made to make a road test, and the record is shown in Fig. 7. It will be noted that, immediately upon starting out, the needle began to pull downward, as shown by the solid lines; the dotted lines being the record

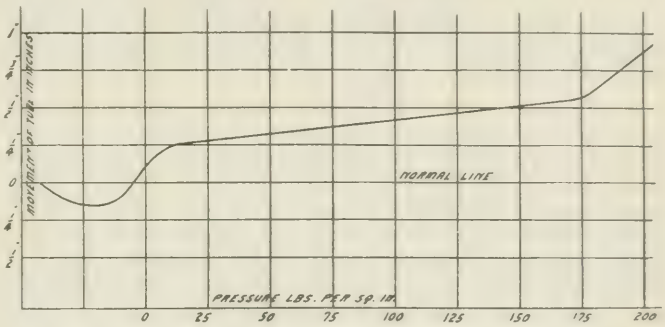


Fig. 6—Movement of Boiler Tubes in Getting Up Steam.

made after the throttle was closed and while drifting. The maximum downward pull on the needle was $\frac{3}{16}$ in., this point having been reached while the engine was being worked hard and running at good speed.

This engine was afterward put into regular service on heavy passenger trains, and at the same time another engine of exactly the same class, having a set of the standard No. 11 B. W. G. flues, set to correspond with standard practice, was put on in the same service; an accurate record of the cost of maintenance was kept of both. The engine with the special flues and special setting, in making 69,856 miles, never failed, while the engine with standard flues and standard setting, in making 71,774 miles, had a few detentions charged to it on

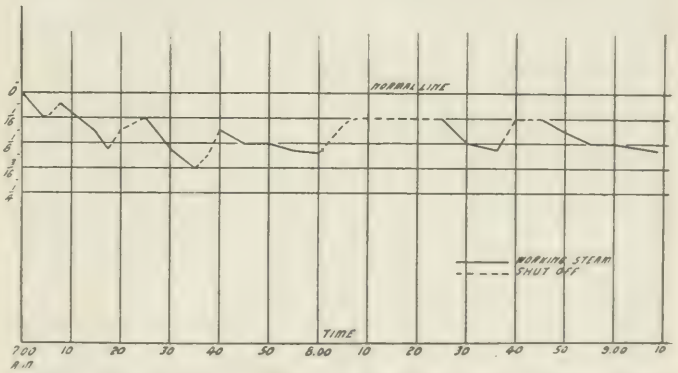


Fig. 7—Movement of Tube in Road Service. West Albany to Rotterdam City.

account of "flues leaking." The cost of maintenance of both engines is as follows:

Special flues and special settings: Cost per mile for flue work at engine houses $0.0143
Standard flues and standard settings: Cost per mile for flue work at engine houses 0.0195
Percentage in favor of special setting ..... 26.7 per cent.

At the time these figures were made up there was no perceptible difference in the condition of the flues in the firebox of either engine, and the No. 13 beads seem to have stood the working as well as the No. 11 beads, which is believed to have been due to the fact that the No. 13 beads did not leak as often as did the No. 11 beads, and therefore did not require to be worked as much.

General News Section.

Vice-President Rea, of the Pennsylvania, is quoted as saying that the East river tunnel of that company, by which trains of the Long Island Railroad will enter Manhattan, New York City, will be in operation about August 15.

The Western Pacific has resumed the running of through freight trains between Salt Lake City and San Francisco after a suspension of about four weeks, made necessary by the serious damage to the company's track along the south shore of Great Salt Lake.

Henry S. Jacoby, professor of bridge engineering in Cornell University, has been granted a long leave of absence, and beginning July 1, will travel for seven months in the United States and Canada, visiting the bridge departments of railways and cities.

On Friday last, the day of the funeral of King Edward of Great Britain, the trains of the Canadian Pacific, the Grand Trunk and the Canadian Northern were stopped at 1 o'clock in the afternoon, for a period of three minutes, out of respect to the memory of the late king. The same order was issued on the steamer lines controlled by the Grand Trunk.

The Chicago, Rock Island & Pacific is making tests of washed gravel for ballast on its Iowa lines. A portion of the sand is being removed by screening the gravel as it is pumped out of the river. If the experiments which are now being made on a small scale show that the material gives good satisfaction in the track, its use may be continued.

According to an article in the *Telegraph & Telephone Age*, messages transmitted over ocean cables may now be received by sound. With apparatus devised by Dr. Isidor Kitsee, of Philadelphia, messages have been transmitted over a cable between New York and Canso, N. S., 800 miles, at a speed of 30 to 35 words a minute, and received, through the medium of two relays, on a sounder.

At Spencer, Mass., last week Thursday, May 19, the citizens of the town, acting with the Howe Memorial Association, dedicated a monument to Elias Howe, inventor of the sewing machine; William Howe, inventor of the Howe truss bridge, and Tyler Howe, inventor of the spring bed. William and Tyler Howe were brothers and Elias was their nephew. The three were born in Spencer in the same house, and the monument, which is a granite shaft 10 ft. high, bears on its face a bronze medallion portrait of each.

The Seaboard Air Line now has in use a telephone despatching circuit which is 272 miles long. It has 51 selector stations and 65 telephones. This line extends from Richmond, Va., southward to Raleigh, N. C., 156 miles, and the line on the Portsmouth division (116 miles long), which diverges from the Richmond-Raleigh line at Norlina, is looped into the main line. By this arrangement the despatcher at Richmond keeps track of the trains throughout the two lines—from Richmond to Raleigh and from Portsmouth to Norlina.

In connection with the dedication of the statue of Samuel Spencer at Atlanta last week, an officer of the Southern Railway said that the Terminal station, in front of which the statue stands, has increased the value of real estate in the vicinity of the station much more than the total cost of the station (which was $2,000,000), and possibly many times this sum. The station, which was built by the Southern, the Central of Georgia and the Atlanta & West Point, was opened May 14, 1905. It was in an unpromising part of the city, and most of the buildings in the vicinity had become dilapidated, but now the ten business blocks adjacent to the station are among the best in the city.

Increases of Wages.

The Erie road, after protracted negotiations, has agreed with committees of its conductors and brakemen on an increase of wages. In general, the Baltimore & Ohio scale has been adopted, and it is said that this means an increase on the Erie of about 10 per cent. The full increases, however, do not go into effect for more than a year, the company having presented strong arguments based on the insufficiency of the company's earnings to pay the higher rates. Freight conductors, for example, will receive $3.50 per 100 miles on June 1 next, and the standard rate, $3.63 per 100 miles, on July 1, 1911. The arrangement with freight brakemen is based on the same rule. Passenger conductors will receive $2.50 per 100 miles June 1, 1910, and they will receive $2.68 on September 1, 1911.

The settlement with the yardmen provides for dividing the yards into three groups, in the order of their importance, as was done on the New York Central, the pay in group No. 2 being one cent an hour less than in group No. 1, and the pay in group No. 3 being two cents an hour less than in group No. 1.

The conductors and trainmen on the Staten Island Rapid Transit Railroad, which is controlled by the Baltimore & Ohio, have had their pay increased in accordance with the Baltimore & Ohio settlement, but a later date is set for the full increases go into effect.

The Central of New Jersey has increased the pay of locomotive enginemen at rates varying from 7 to 12½ per cent.

The Delaware, Lackawanna & Western has increased the pay of firemen an average of 12 per cent. The leaders of the conductors' and brakemen's brotherhoods report that the agreement with the Lackawanna concerning increases of pay has not yet been signed, the road holding that certain exceptions from the standard rates, which were granted by the arbitrators on the New York Central, apply on the Lackawanna also, whereas the labor leaders claim that the exceptions in the New York Central case are based on local conditions and in no sense apply to the settlement with the Lackawanna.

The Boston & Maine has agreed with its telegraphers to increase their pay about 7 per cent.

Frank J. Ryan, state railway commissioner of Kansas, has been chosen by the telegraphers of the Missouri Pacific as arbitrator in the dispute between the company and themselves concerning wages. The member chosen by the railway company is General Manager A. W. Sullivan, and these two will this week select a third arbitrator.

Charles P. Neill, government mediator, has gone to Houston, Tex., to consider questions at issue between the Southern Pacific and its telegraphers. The government mediators have suspended consideration of a similar dispute on the Seaboard Air Line, but this matter will be taken up again soon.

William Reynolds Vance, dean of the faculty of law at George Washington University, Washington, D. C., has been appointed as the third arbitrator in the controversy between the Southern Railway and its telegraphers. The selection was made by Dr. Neill and Chairman Knapp.

Railway Matters in Washington.

Washington, May 25, 1910.

The railway bill has been discussed in the Senate during the past week on only two or three days, but more progress has been made than in the past, and it is now expected that a vote will be reached this week, or at least in the early part of next week. A long time was spent last week in discussing that provision of the bill which gives the attorney-general charge of the defense of orders of the Interstate Commerce Commission when they are attacked in the courts, and an amendment was finally adopted which requires that the commission shall be notified of the commencement of proceedings and gives it the right to intervene. Individuals, associations and communities interested may also intervene, and the attorney-general shall not discontinue proceedings in the face of an objection by any such party. The section allowing the

Interstate Commerce Commission to delay the adoption of increases in rates was changed so as to allow the commission 120 days in which to act. This week the principal subject of controversy has been an amendment proposed by Senator Cummins making this time practically unlimited. Senator Cummins proposes that no increase shall become effective until approved by the commission. The senator has secured a good deal of support for this proposal, and the insurgents claimed on Monday that they could carry it through. They declared that the notices of intention to advance rates, which have been given out freely by the railways during the past week or two, show conclusively the need of more rigid governmental regulation of this matter. On Tuesday, however, the republicans secured the aid of some of the conservative democrats and proposed an amendment extending the time allowed the commission from 120 days to six months, and it now looks as though this compromise would be substituted for Senator Cummins' proposal. In addition to this, the regular republicans and the democrats are understood to have agreed to cut out the sections of the bill providing for the regulation of stock and bond issues; and with this done, it is expected that the bill can be passed and sent to conference. Senator La Follette still has a long speech unfinished, however.

The Senate, in passing this week the bill to provide for the construction of two new battleships, adopted an amendment to the bill cutting out the clause which allowed contractors, in giving bonds to the government, to deposit railway, county and municipal bonds.

Tentative Rules Adopted for Regulation of Oxy-acetylene Blow-Pipe Industry.

A meeting of manufacturers of apparatus and appliances used in connection with the oxy-acetylene blowpipe was held at the Congress Hotel, Chicago, May 11, 12, 13 and 14. The purpose was to study the rules and regulations drawn by the engineers of the National Board of Fire Underwriters in conjunction with some of the manufacturers to safeguard the industry. There were present forty-three peasons connected directly or indirectly with the use of the oxy-acetylene blowpipe principle or with the insurance companies. The conference lasted four days and the rules and regulations proposed were agreed to with but slight modifications. The discussion covered every phase of the construction of every part of the apparatus, as well as its proper location and rate of operation; oxygen production and compression, and subjects relating to the storage of acetylene in cylinders filled with acetone and asbestos.

It was agreed that no apparatus should be permitted to operate at a higher pressure than 15 lbs. to the square inch, unless it should be by means of an approved, water-jacketed, three-stage compressor, compressing into cylinders also approved, not only by the insurance people but by the railway authorities; cylinders to be filled with porous material and acetone. In some cases manufacturers, not realizing the danger of high pressures and hoping to operate the generators more rapidly, had tied down the safety valve so that excessive pressures were likely. It was also agreed that the rules should stipulate that the generator should not be permitted to generate gas too rapidly. A limit was adopted which declared that no generator shall deliver carbide into water unless there shall be one gallon of water to each pound of carbide, and that this carbide must not be fed into the water in less than five hours.

The sub-committee of the National Board of Fire Underwriters, having agreed to these resolutions, further agreed to recommend their adoption by the engineers of the National Board. It is hoped they will go through practically without change.

Pullman Company Resists Reduction of Its Rates.

The Interstate Commerce Commission has extended the time to July 1 in which the reductions made by the commission in Pullman car rates by a former decision become effective. The Pullman Company had filed a petition in the United States circuit court at Chicago on May 18 for a temporary injunction restraining the Interstate Commerce Commission from enforcing its recent order requiring the company to reduce its rates between Chicago and St. Paul, St. Paul and Seattle and other points, and to make its rates for upper berths less than for lower berths. Judge Grosscup set May 25 as the date for the hearing.

In its bill the Pullman Company denies the constitutionality of the provision of the interstate commerce law which makes sleeping car companies common carriers. It states that its business is more in the nature of a hotel keeper than of a transportation line. It claims most of the credit for having developed sleeping cars that are safe, comfortable and convenient, and states that "travelers have never been able to enjoy sleeping car accommodations such as they receive from your orator, except as they have been created and invented by your orator and by its promoters and by others whose rights have been purchased." It states that it never had and does not now have any railway on which its cars are, or have been used, nor any motive power for hauling them, nor any right-of-way over any railway, and is not and never has been a carrier.

British Railway Accidents.

The British Board of Trade has issued its railway accident tables for the last calendar year, from which it appears that only one passenger has been killed in a train accident in the United Kingdom in two years—an unexampled record. The summary is as follows:

Great Britain and Ireland, 1908 *and* 1909.

	—Year, 1909—		—Year, 1908—	
	Killed.	Injured.	Killed.	Injured.
Passengers, in train accidents	1	390	.....	283
Passengers, other causes	82	2,148	102	2,242
Employees, train accidents	16	129	6	164
Employees, other causes	318	4,599	376	4,976
Other persons, train accidents	...	26	...	7
At highway grade crossings	63	36	51	44
Trespassers	459	133	479	118
Miscellaneous	32	131	29	150
Total	971	7,592	1,043	7,984

A large portion of the trespassers are suicides; in 1909 nearly one-half.

Give Us "More Taffy and Less Epitaphy"—Stubbs.

J. C. Stubbs, director of traffic of the Harriman system, was one of the speakers at a dinner given at the Blackstone Hotel in Chicago last week by friends of E. O. McCormick, in honor of Mr. McCormick's appointment as vice-president of the Southern Pacific. The title of Mr. Stubbs' talk might have been "Taffy" in the best sense of that word, the tenor of his remarks being that railway officers and employees ought, and in the future must, give the public more civil, courteous and considerate treatment. The following extracts from Mr. Stubbs' talk will be interesting to railway men throughout the country:

"Many years ago I was instructed to write a letter upon a matter in controversy, to be addressed to an officer of another railway company and signed by Mr. Huntington. I knew it was difficult to acceptably express the ideas of Mr. Huntington, hence took great pains and thought I was successful. The documents fairly bristled with points, every one of which was intended to pierce the other party's position. It was great 'I' for our side, and a very little 'U' for his.

"With some pride the letter was presented for signature, when, to my amazement and humiliation, a pen was drawn through all the pointed paragraphs, and I was instructed to try again. I protested that the letter stated only the truth. The reply was: 'That may be. A man may be a liar. He may know it. Yet it would be unwise to tell him so and seldom wise to let him suspect that you thought so." That letter was revised three, and written four times before it was signed. The trouble was I did not understand the value of pleasing manners in a controversy. When approved, the letter was a great 'U' and small 'I.' The controversy was steadily and agreeably settled. This was not 'craft,' but was the kind of 'taffy' I am speaking about.

"Persuasion is the strongest force in society to-day. It is

the style and power of the pulpit, the forum, the shop and the market place. One cannot easily be persuaded to adopt your doctrine, or give you the desired verdict, or to buy your goods, or even to give you superior service, unless he feels that you count him worthy of something better than you ask him to be or to do. He will deny as a duty or a right what he will freely grant as a privilege or favor; hence this kind of taffy, as the art of making others pleased with themselves, has a definite social and commercial value.

"It has come to pass that a pleasant smile, agreeable manners, the things that are summed in the term 'good address,' afford a fair start to fortune in any walk of life. Why is it so? Is it not because they are peculiar to talent or sagacity or that they are always or even often associated with great industry or energy: Is it because they operate agreeably upon others. The good-natured possessor of these happy gifts, without seeming effort, unconsciously it may be, feeds the customer or client with the sweet 'taffy' of good will, which inspires its object with a consciousness of worth and importance, makes him larger and better in his own eyes, and is much more effective than spoken compliments.

"The merchant seeks for such qualifications as much in the clerk who sells tape and needles as in the salesman who jobs goods to the value of many thousands of dollars a year.

"The lawyer addresses the court with a deference which sometimes amounts to burlesque when the mental and physical stature of the men are contrasted. He talks to the jury in a confidential tone as though he were counseling with friends in full sympathy with his views and aims.

"The preacher no longer teaches depravity of man and threatens him with eternal burning. His theme is: 'God so loved the world.' He exalts man, lifts him up as the object of Divine love, and pictures to him the joys of the future state.

"Railway managers admonish their employees that patience and politeness, those obliging attentions which elevate their object in his own esteem, are to characterize all their official intercourse with the public. Even in resistance they must strive to please. I am aware that there is little new in the foregoing. Many present are like the speaker, they know but they fail to do.

"When they would do good, evil is present with them. I have chosen the topic to emphasize and energize what is known and believed by us all. Because we have fallen upon new times. The changed conditions under which we shall hereafter conduct the enormous business interests which railway transportation represents, imperatively call for the exercise of the persuasive faculty in every department of the service, particularly those officers who must meet the public and answer its complaints before commissions and courts. I deny that the statutes we are facing and the more extreme measures which we shall yet face are most of them well timed, or that all of them are wholly just. Nevertheless they can be amended or prevented in one way only. By changing public sentiment. That can be done by the tactics of the Huntington letter to which I referred.

"The guest of the evening was chosen for his new position because he has given abundant evidence of fitness for a difficult work under these new conditions. His spirit of comity and disposition to friendly intercourse with his fellowmen are attested by this fine compliment which you are paying him to-night. It stamps your approval upon the judgment of the officer who nominated him and the directors who appointed him. His fellow officers have therefore a share in your compliment, and for them I thank you heartily, and for you and for us all, according to the definition I have given of my text, I shall ever pray:

"Give us more Taffy
And less Epitaphy."

Transportation and Car Accounting Officers.

This association will hold its summer meeting at the Antlers' Hotel, Colorado Springs, Colo., June 21 and 22. Reports on the following subjects will be presented by the various committees: Car service and per diem, office methods and accounting, handling railway business mail, conducting freight transportation, conducting passenger transportation, and joint interchange and inspection bureaus.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Railway Association.—W. F. Allen, 24 Park Place, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues; N. Y.; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—H. C. Donecker, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.: Thursdays; Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
General Superintendents' Assoc. of Chicago.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wed.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Association of Special Agents and Police of U. S. and Canada.—May 10-13; Los Angeles, Cal.
Railroad Clue of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting October 11-13, Atlantic City.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio.
Richmond Railroad Club.—F. O. Robinson; 2d Monday; Richmond.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Ry. Financial Officers.—C. Nyquist, La Salle St. Sta., Chicago.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
Train Despatchers' Assoc. of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
Transportation Club of Toledo.—L. G. Macomber, Woolsen Spice Co., Toledo.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The Central of New Jersey has announced new tariffs for suburban season tickets to and from New York, to take effect July 1, which show increases of about 3 per cent., in most cases not over 25 cents a month.

The decrease in shipments over the New York, Ontario & Western is due to the fact that that company no longer carries freight to the West at less than the standard rates. New York reporters hear that the other lines have recompensed the Ontario for this loss by allowing it to take a larger share of certain eastbound traffic.

The Great Northern has applied to the United States circuit court at St. Paul for an injunction against the enforcement of the recent order of the Interstate Commerce Commission reducing the charges for berths in the sleeping cars of the company. Action of the Pullman Company, similar to this, is reported elsewhere.

A press despatch from Austin, Tex., says that the railways will apply to the courts for injunctions against the enforcement of the order of the State Railroad Commission reducing freight rates on cotton. It is declared that the reduction, which in most cases amounts to four cents per 100 lbs., will mean a loss of $1,000,000 a year to the railways.

The New York, New Haven & Hartford is now taking freight from New York City to the West by way of New Haven. The freight moves from New York to New Haven by boat and thence by rail, by way of the New Haven and the Boston & Maine, to Newport, Vt., where it is delivered to the Canadian Pacific. It is said that 30 cars a day are being moved over this route.

The New York, New Haven & Hartford is preparing new tariffs for passenger fares on branch lines and for some short distance trips on main lines, which, it is said, will show increases from 2 cents a mile to 2¼ and 2½ cents. The announcement seems to indicate that for long distance rides on the main lines the present rate of approximately 2 cents a mile is to be continued.

The agencies of the Colorado Midland outside of Colorado, with the exception perhaps of the one at Salt Lake City, will be closed about July 1, and thereafter its interests will be looked after by the agencies of the Chicago, Burlington & Quincy. The Colorado Midland has outside agencies at Salt Lake City, San Francisco, Chicago, New York, Los Angeles, St. Louis, Pittsburgh, Kansas City and Omaha.

The Wabash Pittsburgh Terminal, in connection with the West Side Belt Railroad, has resumed the running of regular passenger trains over the West End Belt Line to and from Clairton, Pa. For the past two years this road has been used only for freight. There is one train a day each way between Pittsburgh and Clairton, 21 miles; two trains between Pittsburgh and Bruceton, 12 miles, and three trains between Pittsburgh and Castle Shannon, 7 miles.

A press despatch from Albany, N. Y., says that two banks in that city hold drafts aggregating $377,000 against an insolvent grain firm, which are based on false warehouse receipts. According to the accounts, these warehouse receipts, which do not represent goods either in storage or in transit, have been foisted on the banks by a conspiracy between a local freight agent of the Delaware & Hudson Co., who was discharged a month ago, and a representative of the firm of grain dealers which is involved.

A controversy has arisen between some of the railways and the larger live stock shippers in regard to the space in the cars which must be afforded animals in transit in order to make unloading unnecessary and still comply with the 28-hour law. When animals have proper food, water, space and opportunity to rest they are not required to be unloaded. The Department of Agriculture having been appealed to by both railways and shippers has announced tentatively that if cars are not loaded beyond the minimum weight fixed by the tariffs the department will not, for the present, raise the question as to whether sufficient space is provided for the animals to rest; but it is the intention of the department to institute a number of test cases and secure rulings from the federal courts as to what space must be afforded. The Secretary of Agriculture holds that where live stock is not unloaded en route "into properly equipped pens for rest, water and feeding" the cars must be provided with facilities for feeding and watering in transit, and animals must, when so fed and watered, receive proper feed and water.

The total shipments of freight over the trunk lines from New York to Buffalo and Pittsburgh and beyond in the month of March amounted to 182,792 tons, as below:

	1910		1909	
March—	Tons.	P. c.	Tons.	P. c.
New York Central	37,050	20.3	27,257	15.3
Pennsylvania	34,002	18.6	32,633	18.3
Erie	22,820	12.5	19,733	11.1
Baltimore & Ohio	15,646	8.5	13,965	7.8
West Shore	7,898	4.3	9,497	5.3
Lackawanna	24,440	13.4	19,544	10.9
Lehigh Valley	25,890	14.2	15,261	8.5
Ontario & Western	9,998	5.5	36,644	20.5
Central of New Jersey	5,048	2.7	4,081	2.3
Total	182,792		178,625	

Hearing Regarding Coal Rates in Illinois.

The Illinois Railway Commission began a hearing at Chicago on May 23 concerning the advances recently made by the railways in coal rates from mines in southern and central Illinois to Chicago and other points in northern Illinois. The old rates varied from 50 to 95 cents per ton; the new rates vary from 60 cents to $1.07 per ton; the advances varying from 8 cents to 12 cents. The higher rates become effective June 1. At the hearing on May 23 representatives of the shippers asked that the commission suspend the advances pending an investigation of the books of the railways by expert accountants to ascertain if increases in the expense of operation justify the advances. Representatives of the railways replied that they would be glad to thus open their books to show whether they need the advances if the shippers likewise would open their books with a view to showing that, as alleged in their complaint, they could not afford to pay the higher rates. The representative of the shippers replied that the legal status of the railways and of the shipper were different. Chester M. Dawes, general counsel of the Burlington, retorted that the shippers themselves had invited investigation of their books by asserting in their pleadings that they could not afford to pay the higher rates. Counsel for the Commonwealth Edison Company accepted the challenge of the railways and said it would produce its books.

One of the roads most concerned is the Chicago & Eastern Illinois, and spokesmen for the shippers especially referred to it as a road which is making a large amount of money out of its coal traffic. W. H. Lyford, general counsel for the Chicago & Eastern Illinois, said that the prevalent notion about the profits this road derives from its coal traffic are incorrect. Sixty per cent. of its tonnage is coal, but only 40 per cent. of its earnings are derived from that source. It is true that it pays 10 per cent. dividends on its common stock, but its common stock is only about 10 per cent. of its total capitalization, and its earnings on its total capitalization in 1909 were only 4.45 per cent.

It is probable that the contest over these coal rates will be hard fought and the result of large importance. The advanced rates are much below the maximum coal rates fixed by the commission itself. How low the coal rates from Illinois mines have been in the past is illustrated by the earnings of one of the large roads engaged in this traffic. Its average rate per ton per mile on all traffic last year was 7.89 mills. Its average rate on all commodities except coal was 9.5 mills, and its average rate on coal only 3.9 mills. While coal always moves in carloads and often in trainloads, there is usually no back loading for the empties, so the cost of the service is not relatively very low. The operating ratio of the road in question is about 60 per cent. On this basis the average cost of hauling its traffic, not taking into account fixed charges and dividends, was 4.7 mills, which is substantially less than the average rate it is getting on coal. The roads will present facts of this sort to the commission and are pretty confident of winning their case.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1910.
(See also issues of May 6, 13 and 20.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses: Maintenance						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Ann Arbor	301	$136,914	$32,893	$179,289	$30,249	$23,122	$3,982	$63,515	$10,233	$131,101	$48,188	$1,347	$12,330	$37,204	$16,701
Arizona Eastern	312*	140,300	41,171	191,732	26,868	9,839	2,163	38,225	5,002	82,097	109,635	.....	4,469	105,166	40,425
Atlanta, Birmingham & Atlantic	670	205,380	36,451	255,901	30,187	35,952	13,758	97,117	8,862	185,876	70,025	.....	10,000	60,025	29,809
Atlantic & St. Lawrence	167	103,224	21,863	137,182	9,209	17,495	3,835	66,659	2,997	100,195	36,987	.....	6,436	30,551	—12,350
Buffalo & Susquehanna	361	149,408	15,021	171,943	35,782	72,276	2,432	77,961	7,416	195,867	—23,924	—27	4,000	—27,951	—48,178
Canadian Pacific lines in Maine	233	101,340	41,702	149,073	10,937	26,135	4,426	55,119	3,203	99,820	49,253	.....	5,000	44,253	19,245
Carolina, Clinchfield & Ohio	255	101,419	10,372	114,223	10,935	21,640	6,082	23,173	11,205	73,035	41,188	.....	4,000	37,188	32,588
Charleston & Western Carolina	340	133,940	23,127	163,593	24,588	17,160	2,906	45,820	3,920	94,394	69,199	.....	4,475	64,724	1,463
Cincinnati Northern	248	99,832	14,607	119,013	19,304	17,203	2,616	40,084	3,473	82,680	36,333	.....	4,500	31,833	10,092
Detroit, Grand Haven & Milwaukee	190	125,309	35,223	179,772	3,198	28,818	5,306	78,499	4,104	119,926	59,846	—28	2,727	57,091	40,007
Detroit, Toledo & Ironton	441	115,126	10,872	136,210	28,522	25,632	2,269	68,609	4,855	129,887	6,323	.....	6,510	—187	—900
Georgia	307	195,011	64,564	274,482	34,401	36,543	9,622	107,565	7,936	196,067	78,415	.....	2,083	76,332	21,478
Georgia Southern & Florida	395	126,211	57,175	211,584	20,182	55,314	6,557	86,011	8,840	176,904	34,680	.....	8,119	26,561	—30,908
Grand Trunk Western	336	396,394	120,360	549,631	39,749	86,484	15,450	216,521	12,006	370,210	179,421	1,711	29,190	148,520	39,009
Louisiana & Arkansas	255	105,681	13,183	123,164	15,226	18,263	2,176	30,804	4,577	71,046	52,118	.....	3,248	48,870	12,165
Louisiana Ry. & Nav. Co.	350	100,976	14,311	127,762	25,211	12,099	5,163	48,147	5,936	96,556	31,206	.....	4,250	26,956	12,993
Louisiana Western	198	105,308	51,596	165,715	31,823	25,697	6,002	49,757	7,322	120,601	45,114	568	5,500	40,182	42,710
Louisville, Henderson & St. Louis	200	88,805	28,885	124,008	22,727	9,806	3,688	36,944	2,507	75,672	48,336	273	2,500	46,109	38,979
Minneapolis, St. Paul & S. S. Marie	2,495†	791,891	260,936	1,114,213	93,476	144,790	22,826	354,197	21,702	636,991	477,222	2,162	67,980	407,080	28,234
Missouri Pacific	3,883‡	1,713,094	364,571	2,284,031	401,041	347,556	58,196	940,224	64,126	1,811,143	472,888	3,547	79,385	389,956	.....
Morgan's Louisiana & Texas R. R. & S. S. Co.	358	245,744	97,834	396,160	64,931	43,375	10,658	132,971	13,775	265,710	103,450	—606	17,000	85,844	—15,939
New Orleans, Mobile & Chicago	403	119,217	25,651	154,839	26,512	15,261	2,191	45,115	8,627	97,706	57,133	.....	3,543	53,590	17,006
New York, Susquehanna & Western	151	171,676	50,410	248,438	22,448	23,235	1,982	87,586	5,156	140,407	108,031	2,046	11,316	98,761	4,231
Northwestern Pacific	376	81,990	104,413	207,343	41,010	37,305	2,700	79,821	9,346	170,181	37,161	.....	10,988	26,173	3,833
Pittsburgh, Shawmut & Northern	240	104,376	7,714	114,339	10,294	34,958	1,152	40,602	3,028	90,034	24,305	.....	1,595	22,710	16,816
St. Joseph & Grand Island	319	98,366	33,395	140,876	89,816	16,200	6,908	58,661	5,419	177,004	—36,128	10	5,389	—41,507	—68,378
St. Louis, Iron Mtn. & Southern	3,287§	1,914,169	455,855	2,556,838	310,332	346,020	58,931	787,948	70,628	1,573,859	982,979	—5,230	78,530	899,220	304,305
Santa Fe, Prescott & Phoenix	257	80,088	28,838	120,109	10,575	9,583	2,688	30,746	5,050	58,642	61,467	.....	100	61,367	5,152
Southern Indiana	236	113,801	13,520	128,756	18,487	24,767	1,857	42,296	4,651	92,058	36,698	.....	6,928	29,770	—5,225
Spokane, Portland & Seattle	420△	248,160	65,584	324,949	61,873	26,901	3,477	122,311	7,317	221,879	103,070	1,930	19,200	81,940	104,149
Tennessee Central	292	84,927	26,617	118,028	30,035	14,772	3,496	37,393	13,733	99,429	18,599	.....	4,200	14,399	—9,412
Toledo, Peoria & Western	248	64,431	32,064	101,425	14,990	19,145	2,944	39,648	3,233	79,960	21,465	.....	6,000	15,465	2,935
Trinity & Brazos Valley	455	139,897	23,208	167,383	34,806	25,761	6,468	87,615	10,652	165,302	2,081	.....	3,500	—1,418	8,749
Virginian	444‖	178,728	16,787	202,237	23,986	35,011	4,914	59,531	7,459	130,901	71,336	524	13,000	58,860	.....
Western Maryland	543°	576,156	59,239	656,420	47,130	76,477	7,565	206,922	11,834	349,928	306,492	.....	18,500	287,992	.....
Wisconsin Central	1,076◊	713,805	111,580	863,239	79,074	93,418	19,990	308,022	17,100	517,605	345,634	598	32,080	314,152	130,003
NINE MONTHS OF FISCAL YEAR, 1910.															
Ann Arbor	301	966,771	360,437	1,421,801	198,749	179,627	36,292	493,976	45,452	954,096	467,705	—28,431	110,975	328,299	39,537
Arizona Eastern	312*	990,404	304,963	1,379,134	374,509	95,210	18,417	322,869	32,135	843,140	535,994	.....	52,544	483,450	58,638
Atlanta, Birmingham & Atlantic	670	1,479,119	392,277	1,977,727	239,269	304,536	110,171	769,602	78,035	1,501,614	476,113	.....	93,265	382,848	112,787
Atlantic & St. Lawrence	167	783,825	235,320	1,121,771	250,722	123,168	31,540	397,446	27,838	830,714	291,057	.....	57,920	233,137	9,790
Buffalo & Susquehanna	361	1,484,234	168,129	1,715,506	310,288	523,878	19,601	692,781	70,013	1,616,561	98,945	—261	36,000	62,684	—180,936
Canadian Pacific lines in Maine	233	553,396	211,684	831,121	173,260	139,924	40,261	357,553	28,557	739,555	91,566	.....	45,000	46,566	34,127
Carolina, Clinchfield & Ohio	225	687,359	102,234	812,542	98,494	135,968	45,756	187,313	66,144	533,675	278,867	.....	31,500	247,367	249,782
Charleston & Western Carolina	340	910,895	241,823	1,214,644	255,585	148,935	27,482	384,389	33,335	849,726	364,918	.....	40,275	324,643	62,092
Cincinnati Northern	248	737,040	162,088	942,369	128,746	165,940	25,112	326,942	25,027	671,767	270,602	.....	38,501	232,101	146,681
Detroit, Grand Haven & Milwaukee	190	933,563	423,800	1,555,070	182,555	217,689	52,071	628,613	46,223	1,127,151	427,919	41	24,545	403,415	122,025
Detroit, Toledo & Ironton	441	989,610	120,046	1,200,198	255,924	225,105	25,652	574,643	38,475	1,119,799	80,399	316	58,593	22,122	—42,823
Georgia	307	1,590,696	625,270	2,348,936	293,592	346,889	87,394	906,755	64,282	1,698,912	650,024	.....	18,727	631,297	201,585
Georgia Southern & Florida	395	1,010,464	548,185	1,809,180	181,320	388,119	52,412	667,945	78,183	1,367,980	441,200	6,442	77,066	370,576	—5,804
Grand Trunk Western	336	2,983,255	1,379,374	4,646,381	490,612	670,562	179,629	1,716,566	115,109	3,172,477	1,473,904	9,400	262,710	1,201,793	154,713
Louisiana & Arkansas	255	807,518	127,630	971,982	148,190	159,788	16,153	246,483	39,086	609,700	362,282	.....	18,807	343,475	92,258
Louisiana Ry. & Nav. Co.	350	790,495	141,111	1,039,093	203,629	117,479	43,941	420,424	50,507	835,980	203,113	.....	35,650	167,463	138,455
Louisiana Western	198	1,008,403	463,883	1,548,696	175,837	243,780	51,674	431,923	60,629	963,843	584,853	—952	51,638	532,263	95,142
Louisville, Henderson & St. Louis	200	540,796	301,463	896,565	200,299	75,887	34,079	283,947	25,473	619,685	276,880	2,400	22,500	256,780	44,561
Minneapolis, St. Paul & S. S. Marie	2,495†	8,220,447	2,685,313	11,509,392	973,591	1,158,629	216,116	3,255,989	200,451	5,804,776	5,704,616	101,351	659,744	5,146,023	1,506,053
Missouri Pacific	3,883‡	12,503,731	3,057,011	17,170,646	2,669,874	2,561,193	447,135	6,926,911	479,239	13,084,352	4,086,294	—28,877	620,060	3,437,357	.....
Morgan's Louisiana & Texas R. R. & S. S. Co.	358	2,663,720	873,457	3,746,663	488,624	421,734	91,883	1,271,416	116,360	2,390,016	1,356,647	—3,169	157,520	1,195,958	224,920
New Orleans, Mobile & Chicago	403	946,828	249,211	1,282,141	196,034	124,036	19,507	390,790	76,503	806,870	475,271	.....	32,680	442,591	83,589
New York, Susquehanna & Western	151	1,322,350	475,896	2,021,917	232,731	192,864	14,390	754,744	35,642	1,230,371	791,546	-37,932	101,850	651,764	13,264
Northwestern Pacific	376	949,307	1,176,459	2,313,776	414,226	296,961	23,203	813,415	86,331	1,634,136	679,640	.....	96,857	582,783	138,481
Pittsburgh, Shawmut & Northern	240	789,934	82,198	889,290	116,853	239,797	9,408	297,752	29,694	693,764	195,526	.....	14,143	181,382	179,975
St. Joseph & Grand Island	319	847,499	311,858	1,251,427	363,848	144,667	57,735	498,359	44,749	1,109,358	142,069	- 25	49,974	92,070	-296,567
St. Louis, Iron Mtn. & Southern	3,287§	14,657,734	4,048,817	20,286,664	2,963,430	2,782,219	502,400	6,281,846	617,152	13,147,047	7,139,617	46,428	651,180	6,442,009	1,018,147
Santa Fe, Prescott & Phoenix	257	745,047	257,083	1,070,182	156,792	81,739	24,998	271,911	46,390	581,830	488,352	.....	460	487,892	41,806
Southern Indiana	236	917,138	129,375	1,059,947	136,157	172,619	18,996	304,681	43,729	676,183	383,764	-284	62,356	321,124	96,449
Spokane, Portland & Seattle	420△	1,793,078	576,814	2,465,633	453,750	245,815	28,410	866,707	59 648	1,654,330	811,303	1,379	231,437	578,487	491,428
Tennessee Central	292	756,828	276,620	1,091,949	171,173	123,394	31,740	344,653	77,888	748,848	343,101	.....	37,797	305,304	70,004
Toledo, Peoria & Western	248	549,530	311,620	906,887	146,243	154,458	21,599	325,968	28,435	676,703	230,184	.....	43,000	187,184	55,662
Trinity & Brazos Valley	455	1,442,404	178,190	1,656,494	317,961	279,159	50,176	761,380	100,777	1,509,453	147,041	.....	32,353	114,688	22,597
Virginian	444‖	1,226,736	156,177	1,445,932	224,757	251,897	51,886	435,318	66,044	1,029,902	416,030	3,868	105,667	314,231	.....
Western Maryland	543•	1,530,664	157,180	1,750,482	114,697	199,986	21,303	574,021	36,177	946,183	804,298	.....	55,500	748,798	.....
Wisconsin Central	1,076◊	4,995,517	1,117,112	6,473,931	789,095	867,153	199,885	2,237,167	148,690	4,241,990	2,231,941	6 295	270,507	1,967,729	386,625

*Mileage operated on March 31, 1909, 281. †Mileage operated on March 31, 1909, 2,395. ‡New company began operations August 9, 1909. §Mileage operated on March 31, 1909, 2,608.
△Mileage operated on March 31, 1909, 272. ‖Began regular operations July 1, 1909. °New company began operations January 1, 1910. ◊Mileage operated on March 31, 1909, 1,130.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 71 giving a summary of car shortages and surpluses by groups from December 23, 1908, to May 11, 1910, says:

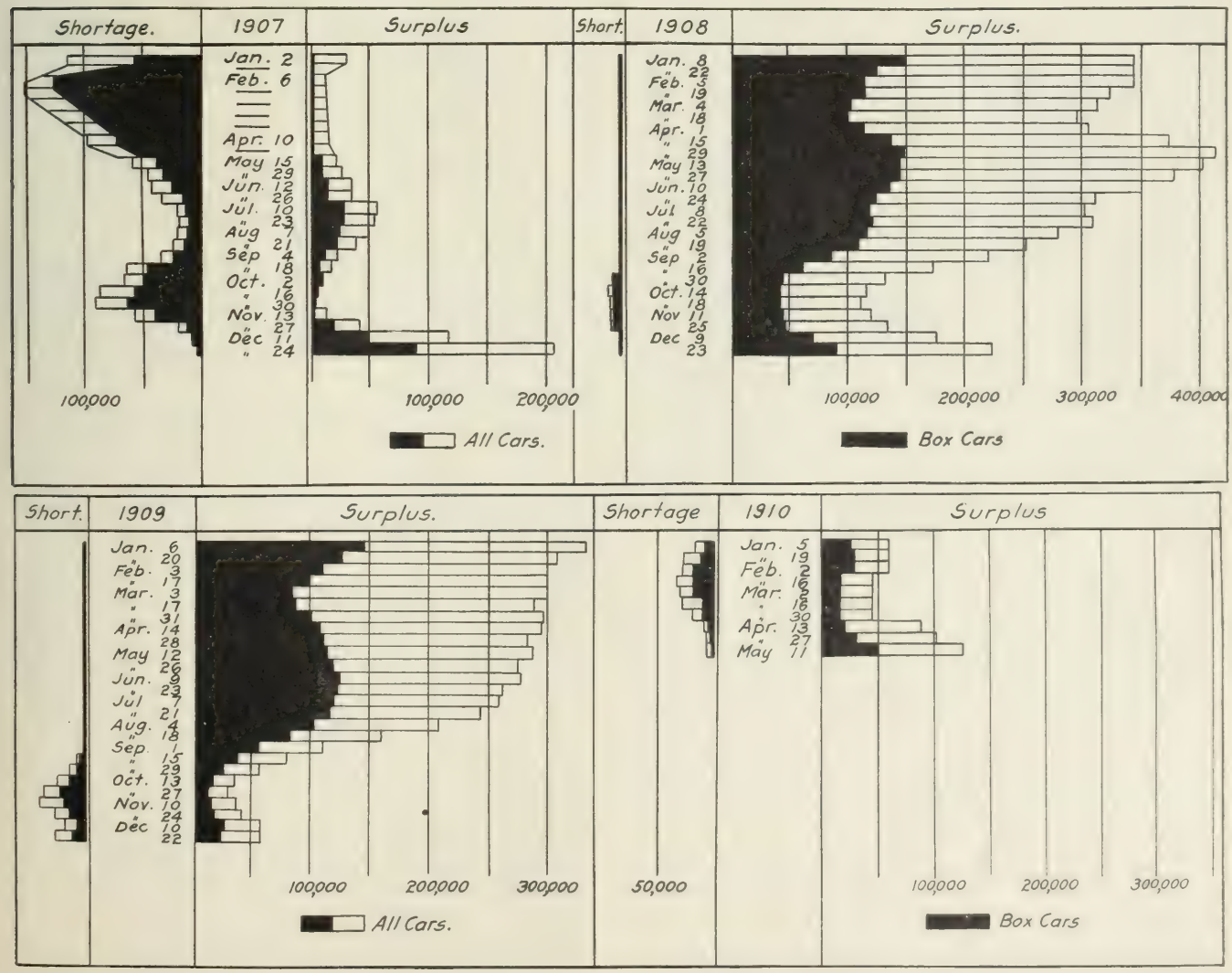
"There is an increase in the surplus of 25,063 cars, bringing the total up to 127,148, the highest figure since August, 1909. The box car surplus increased 15,630 and miscellaneous (largely coke and stock cars), increased 9,432. The increases are chiefly on the roads lying in group 2 (Eastern), which shows a total surplus of 27,150 as compared with 7,589 in our last bulletin. Box cars in this group increased 4,686 and miscellaneous cars increased from 674 to 11,179, about one-half of the increase being in coke cars. The coal car surplus, while showing little change in the total figures, varied somewhat in the group totals. Group 2 (Eastern), shows a considerable increase in the surplus of this class, while groups 5 (Southern), and 10 (Pacific) report decreases.

"The total shortage is 4,555, a decrease of 1,211 under the figures in our last bulletin."

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1—May 11, 1910	8	41	190	476	301	908	92	304	130	...	526
" 2— " 11, 1910	23	5,950	231	9,790	11,179	27,150	3	12	14	29	58
" 3— " 11, 1910	25	13,374	634	19,087	3,906	37,001	25	25	300	79	429
" 4— " 11, 1910	10	2,139	3	720	627	3,489	15	655	2	..	672
" 5— " 11, 1910	20	3,168	24	1,542	1,232	5,966	5	210	2	..	217
" 6— " 11, 1910	19	7,764	262	5,762	4,645	18,433	936	70	412	412	1,642
" 7— " 11, 1910	4	743	100	252	867	1,962	...	...	...	...	...
" 8— " 11, 1910	12	3,299	404	5,760	2,705	12,168	...	...	39	3	42
" 9— " 11, 1910	9	1,570	198	249	1,046	3,063	35	...	...	...	35
" 10— " 11, 1910	22	4,836	831	2,414	6,016	14,097	8	80	6	48	142
" 11— " 11, 1910	5	2,112	206	10	583	2,911	...	66	...	726	792
Grand total	157	44,996	3,083	46,062	33,007	127,148	1,119	1,422	905	1,109	4,555

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

The accompanying table gives surpluses and shortages by groups and the diagram shows total surpluses and shortages in 1907, 1908, 1909 and 1910.

Ready-Made Farms.

The "ready-made farms" of the Canadian Pacific in western Canada have proved a great success. A. S. Walter, the agent of the road who conducts to their new homes along the line of the road the parties of immigrants from England, says that these new settlers are greatly delighted with the treatment accorded them. On the 80-acre farms the company had sown 50 acres of wheat before the immigrants arrived, and had also started potatoes and other vegetables.

Some of these English farmers are experts at chicken raising and other specialties. One party of farmers, not finding cattle to their liking, have sent back to England for 60 cows. Where the railway company thus prepares the farms, it also builds churches and school houses, and promises to establish a creamery as soon as one is needed. Next year it is proposed to have a hundred farms—800 acres—prepared for settlers. The irrigation works now being carried out by the Canadian Pacific will cost $12,000,000. The lands already irrigated have been fully occupied by farmers.

Increase in Rates on Sugar and Coffee.

The trunk lines have canceled their commodity rates on sugar and coffee in carloads from Atlantic seaboard cities to Duluth, St. Paul, Minneapolis, Kansas City, Omaha and points taking the same rates, and beginning June 30 the rates will be increased from 16 to 39 per cent., the fifth class rates applying. Some of the changes are as follows: From New York present rate to Duluth—Sugar, 36 cents; coffee, 31 cents; new (fifth class) rate, sugar, 42 cents; coffee, 42 cents; increase, sugar, 17 per cent.; coffee, 36 per cent. From Boston, present rate to Duluth—Sugar, 38 cents; coffee, 35 cents; new, sugar, 44 cents; coffee, 44 cents. From New York, present rate to St. Paul, Minneapolis, etc.—Sugar, 36 cents; coffee, 33 cents; new, sugar, 42 cents; coffee, 42 cents. From New York, present rate to Kansas City, Omaha, etc.—Sugar, 41 cents; coffee, 39 cents; new, sugar, 53 cents; coffee, 53 cents. Baltimore, present rate to Kansas City, Omaha, etc.—Sugar, 38 cents; coffee, 38 cents; new, sugar, 52 cents; coffee, 52 cents. Philadelphia, present rate to Kansas City, Omaha, etc.—Sugar, 39 cents; coffee, 39 cents; new, sugar, 53 cents; coffee, 53 cents.

At the same time the trunk lines have filed new tariffs from the Atlantic seaboard westward on all import freight, in which the rates from Philadelphia are reduced to the basis of those from Baltimore, thus wiping out the differential in favor of Baltimore. On first class and second class this reduction from Philadelphia is two cents; on the other classes one cent. It is said that these tariffs are to be kept in force until such time next autumn as the Interstate Commerce Commissioners, acting as arbitrators, shall decide the long pending questions about the differentials in these tariffs from the different cities.

Controversy Over Advances in Freight Rates.

The committee appointed by the meeting of shippers at Chicago last week to conduct a campaign against advances in freight rates has instructed its chairman and secretary to ask the officers of the railways in Official Classification territory for a conference on the question of submitting the advances in rates proposed by these roads to arbitration by the Interstate Commerce Commission. In reply to the telegram sent by the shippers to James McCrea, president of the Pennsylvania, regarding the proposed advances in rates, calling his attention to the fact that in October, 1909, he said that the eastern railways were not contemplating advances in freight rates. Mr. McCrea answered as follows:

"The statement made by me in October, 1909, to which you refer was in answer to a communication addressed to me from Cincinnati and signed by a number of the trades associations represented at your meeting, and correctly presented the situation existing at the time. Since then conditions have materially changed in respect to the further increase in wages and materials and consequent cost of operation. Our company has recently had the question under consideration and it is quite probable an advance in some rates will be made."

T. A. Griffin, president of the Griffin Wheel Company, has prepared a petition which is being circulated among shippers in Chicago, especially railway supply concerns, opposing a campaign against any advances in rates. The statement by Mr. Griffin is in part as follows:

"We recognize the fact that our business is largely affected by the amount of material that railways purchase, which is now reduced to a minimum and at consequently minimum prices, because their net earnings are and will be reduced by the great increase in operating cost, and it is almost impossible on their prospective earnings to present a good reason to investors to purchase their securities or make loans. The only way to change this situation is to increase their earnings by an advance in rates.

"We do not indorse or advocate unreasonable advances, but we deprecate any movement in opposition to the proposed advances that is based upon a denial of business reasons or puts forth deductions that are misleading, incorrect, or unfair, as has been done."

Mr. Griffin has written a letter to members of the Illinois Manufacturers' Association, to which he belongs, expressing similar views.

President Ripley of the Santa Fe in an interview says:

"I do not believe the railroads will gain any benefit from discussing this question, as it seems to make no difference what we say or whether the position we take on rate and revenue matters is sound or not. The shippers seem to constitutionally oppose any increases in rates irrespective of the justice of the railroads' contention. People in other lines of business have increased their selling prices fully 50 per cent. and the price of labor has gone up from 30 to 40 per cent. The public says there shall be no strikes and insists that the railroads shall arbitrate the question of wages. So we are hard hit on both sides. What the shippers stated in their mass meeting regarding increasing net railroad earnings is not true. Net earnings are decreasing everywhere."

Some western shippers propose to hold a mass meeting at Omaha to oppose advances in freight rates in the west.

INTERSTATE COMMERCE COMMISSION.

Reparation Denied.

E. F. Rose et al. v. Boston & Albany et al. Opinion by Commissioner Cockrell.

The L.C.L. rate on motor cycles from points in the East and Middle West to the Pacific coast found unreasonable and a reasonable rate prescribed, but no reparation awarded. (18 I. C. C., 427.)

Rates from the West to Chattanooga Reduced.

Receivers & Shippers Association of Cincinnati v. Cincinnati, New Orleans & Texas Pacific et al. Chicago Association of Commerce v. Pennsylvania Company et al. Opinion by Commissioner Prouty.

In 1894 this commission decided what is known as the *Freight Bureau cases*, 6 I. C. C., 195, and ordered certain reduction in rates from Cincinnati to Chattanooga and other southern points, but the courts declined to enforce this order upon the ground that the commission had no power to fix a future rate. Under the Hepburn Act the commission was invested with such power and thereupon the present proceedings were begun for the purpose of obtaining the benefit of the holding of the commission in the former cases, but only the rates from Chicago and Cincinnati to Chattanooga are involved. On the facts disclosed by the record, it is held that it is not clearly apparent that rates from the east discriminate against the west, and that, if so, that discrimination under all the circumstances of the case is not undue; but that present rates on numbered classes from Cincinnati to Chattanooga are unreasonable to the extent that they exceed 70 cents first class, 60 cents second, 53 cents third, 44 cents fourth, 38 cents fifth and 29 cents sixth class.

There can be no such thing as judicial estoppel in the proceedings of this commission, since its orders are not judgments nor is it a judicial body. If that principle could be

applied to the decisions of the commission it is manifest that it could have no application here, since the parties are not the same as they were in 1894.

It is apparent that if distance is to be taken as the standard, rates from the complaining cities are much higher than from their rival trade centers on the Atlantic seaboard; but where water competition enters as a factor some different basis of comparison than distance must be found.

The testimony shows that while the Cincinnati, New Orleans & Texas Pacific is ordinarily regarded as part of the Southern Railway system, its operation is in fact entirely distinct from that of the Southern Railway. It is certainly doubtful whether in view of the *Commodities cases*, 213 U. S., 366, it can be affirmed that there is such a connection between the Southern Railway and the Cincinnati, New Orleans & Texas Pacific that these two companies can be held responsible under the third section of the act for the rates of one another.

Within certain limits a railway company is bound to protect its territory, and within those limits this commission may consider the rates and their effect upon the movement of traffic. The east and the west find a common market in this section of the south, and in determining whether the present rates from the west are reasonable one subject of inquiry is the movement of traffic under the present rates. The fair inference from the testimony seems to be that the relation in rates between the east and the west which has been in effect for the last third of a century does not to-day abnormally promote the movement of traffic from either section.

Neither the east nor the west has any vested right to sell a certain amount in this southern territory. Each section is entitled to a reasonable rate and to do what business it can under that rate.

In determining the reasonableness of rates from the west to southern territory the interests of all competing lines must be considered and not merely that line which can handle the business cheapest. (18 I. C. C., 440.)

Running of the Law of Limitations.

W. L. Blinn Lumber Co. v. Southern Pacific et al. Opinion by Commissioner Lane.

Two carload shipments of timber were delivered to the Southern Pacific on January 29, and April 11, 1906, at San Pedro, Cal., consigned to Charleston, Ariz. The established rate at that time was $8.10 per ton. The complainant asks reparation for the difference between $8.10 per ton and $4.25 per ton. Complaint was not made until January 6, 1909, but payment of freight charges was not made until January 30, 1907. Defendant claims that the law of limitations barring complaints before the commission as to unreasonable rates charged more than two years before the complaint, begins to run as soon as the shipment has been made. Complainant claims that the law does not begin to run until the freight charges are actually paid. While it is the common law rule that a cause of action does not accrue until actual payment has been made, so that there may be a basis in law for recovery, this rule is necessarily modified as to carriers subject to the provisions of the act to regulate commerce. There can be no waiver on the part of the common carrier of its right to collect its tariff rates; it must on the delivery of a shipment, charge whatever rates its schedules call for or it is guilty under the law of granting a concession effecting a discrimination. A shipper who does not promptly pay the lawful rate accepts at his own risk the fact that the time for the appeal to the commission is running against him. The complaint is dismissed.

Commissioner Harlan concurring:

Irrespective of any private understanding as to the rate, and even if the carrier, through error or otherwise, has misquoted the rate, the acts to regulate commerce impose the obligation on the carrier to collect and on the shipper to pay the published rate. Nothing can excuse any omission of duty in this regard. The gist of this proceeding is an attack on the unlawfulness of the published rate, and there can be no recovery of damages except on a finding in support of that allegation. The wrong done the shipper with respect to shipments already made arises out of the publication by the carrier of an unlawful rate. The bar of the law of limitations, therefore, begins to run when the obligation of the shipper to pay the unlawful rate has become a completed obligation.

Commissioner Cockrell dissenting:

I am unable to concur in the report of the commission in this case. I can find no provision in the interstate commerce law requiring carriers to collect the lawful tariff charges on the delivery of the shipment or to refuse an extension of time to the shipper for paying the charges. The law of limitations is very plain: "All complaints for the recovery of damages shall be filed with the commission within two years from the time the cause of action accrues." The phrases "recovery of damages" and "cause of action accrues" are perfectly plain and well defined terms of law, and they are to be interpreted in the reasonable sense, such as must have been in the mind of the legislature when they were used. The commission in January, 1908, said: "A cause of action accrues, as the phrase is used in the act, on the date the freight charges are actually paid." It would have been better if Congress in framing the law of limitations had said "within two years from the time the shipment is delivered." To the essential intent of the report in this case I should give my hearty approval if the same were addressed to Congress, but as a report on a specific case I must dissent. Commissioner Prouty also dissents. (18 I. C. C., 430.)

Blodgett Milling Co. v. Chicago, Indiana & Southern et al. Opinion by Commissioner Lane.

Complaint dismissed because barred by the statute of limitations. See Blinn Lumber Co. v. Southern Pacific above. Commissioners Prouty and Cockrell dissent.

Effect of State Rate on Interstate Rates.

E. E. Saunders and T. E. Welles doing business as E. E. Saunders & Co. v. Southern Express Co. Opinion by Commissioner Harlan.

Mobile, Ala., and Pensacola, Fla., are situated on the gulf of Mexico, about 54 miles apart, and for a number of years have been competitors in Alabama territory for the sale of fish. Pensacola has of late years gotten considerably the greater part of this business through the adoption of more up-to-date methods of catching and handling the fish. The defendant express company had until recently the same rate from Mobile to Selma, Montgomery, and other points in Alabama as from Pensacola. The State Railroad Commission of Alabama recently ordered a reduction in the rate from Mobile to Alabama points and the complainant in this case doing business in Pensacola asks a reduction in the rates on fish from Pensacola, claiming that the defendant discriminates against Pensacola in favor of Mobile.

The defendant says that it protested against the action of the state commission in reducing its rate out of Mobile, and it claims that the Mobile rate is unjust. The reasonableness of Pensacola rates in themselves is not questioned in this case, but the commission, from investigation of its own, is convinced that no reduction that the commission could fairly require the defendant to make would do more than merely modify the discrimination in the defendant's rates of which complaint is made.

While the defendant's general merchandise rate on express matter between Mobile and Birmingham is $1.20, its fresh fish rate under the order of the state commission is but 55 cents per 100 lbs. The Interstate Commerce Commission, from a rather wide knowledge of fish rates, concludes that the rates out of Mobile are lower than the commission would feel justified in requiring the defendant to maintain on fish shipments out of Pensacola to the same points. While on general principles of comity the action of the state commission in fixing a rate on state traffic must be treated with all due respect * * * from what has been said, it is clear that with all the light on the question that the record and our own investigation give us, we cannot accept the Alabama rates as a fair basis for fixing the defendant's rates to the same points from Pensacola. Since the defendant's state rates are held down under compulsion of an order by the state commission, an order by this commission (the I. C. C.) requiring it to desist from the resulting discrimination against Pensacola would be equivalent to an order requiring the defendant to reduce its Pensacola rates to the level of the state rates out of Mobile. The Pensacola fish dealers appear to

be without present redress before this commission so far as the discrimination complained of is concerned. Whatever authority may be vested in the courts for the redress of such wrongs, it seems reasonably clear that this commission may not lawfully interfere with an order effecting the rates imposed on the defendant by order of the Alabama commission. It is not altogether clear that existing legislation affords redress against a discrimination as between two points situated as Mobile and Pensacola are when the discrimination results from an order by a state commission. But unless some such power is lodged somewhere under appropriate legislation, it is evident that state-made rates, if established in pursuance of a narrow or selfish local policy, may not only hinder and harm interstate traffic, but may, if adjusted with that end in view, take from a point in another state a business that naturally belongs to that point or in which it is entitled at least to participate, on the basis of equal rates and equal opportunity.

The defendant is one concern and one instrument of commerce operating through and across those invisible lines that separate the several states from one another. If it voluntarily makes a distinction between traffic that moves from a point in one state to a point in another state and traffic that moves between points in the same state, and gives to the state traffic lower rates than to the interstate traffic moving under substantially similar conditions, it imposes on the latter a burden that it ought not justly to bear, and it discriminates against one community in favor of another. The same burden and discrimination follow if instead of voluntarily so adjusting its rates it is compelled so to adjust them by the action of a state commission. It may be that this anomaly in transportation necessarily results from our dual system of government and that a remedy is beyond reach without some amendment to the national constitution.

It may be, but on that point we express no opinion, that the Congress may constitutionally protect interstate commerce, as well as the carriers that are engaged in interstate transportation, by requiring that any state traffic moved by such a carrier shall bear its just proportion of the cost of operation and yield its proper proportion of profit to the carrier; and that with such an end in view it may authorize this commission to fix minimum rates, at least, for state traffic when moved by carriers engaged also in interstate transportation; or that it may provide that no carrier engaged in the interstate transportation of passengers or property may at the same time carry state traffic at rates that are less than the rates exacted by it for interstate carriage of like distance and under like transportation conditions. It has, however, not attempted any such legislation, and whether such an enactment would stand the test of scrutiny by the courts under the constitution as it now stands, and if so, whether it would be desirable from the standpoint of a broad public policy, are questions that must ultimately be determined by the legislative power and therefore cannot profitably be discussed by the commission in this proceeding.

Notwithstanding what has been said we shall not close this record until advised of the result of the defendant's further efforts in its attempt to get the state commission's order in regard to Mobile rates modified. (18 I. C. C., 415.)

STATE COMMISSIONS.

The New York Public Service Commission, First district, has decided that the railways operating ferryboats from Jersey City terminals to New York and doing no other transportation business within the state of New York are not under the law required to make returns as to accidents on these ferryboats. The commission, following in general the argument of the supreme court in the Covington Bridge Co. v. Kentucky case, holds that the operation of the ferryboats is already under the jurisdiction of the federal authorities and the state railway commission does not need to regulate this traffic.

COURT NEWS.

The supreme court of Nebraska has handed down a decision holding it illegal for a railway to pay for newspaper advertising by giving transportation.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

John F. Stevens, president of the Oregon Trunk Line, has been appointed also general manager of the Oregon Electric Railway Co.

G. W. Martin has been elected vice-president and general manager of the Phillipsburg & Susquehanna Valley, with office at Phillipsburg, Pa.

A. D. Bethard, assistant general manager of the Missouri, Kansas & Texas of Texas, at Dallas, Tex., has been appointed vice-president and general manager.

J. W. Mulhern, whose resignation as superintendent of the Chicago & Alton at Bloomington, Ill., has been announced in these columns, has been appointed assistant to the second vice-president and general manager of the Western Pacific, with office at San Francisco, Cal.

William F. Dickinson, whose appointment as general attorney of the Chicago, Rock Island & Pacific, with office at Chicago, has been announced in these columns, was born in Rockford, Ill., in 1877. He took his A.B. degree at the University of Wisconsin in 1901 and graduated in law from the same university in 1903. He entered railway service as assistant to the commerce counsel of the Chicago, Rock Island & Pacific, March 13, 1907. In 1909 he was made eastern attorney, with office in New York, the position he leaves to become general attorney.

Operating Officers.

J. H. Johnson has been appointed a trainmaster of the Northern Pacific at Mandan, N. Dak.

J. C. Muir has been appointed general superintendent of the Evansville & Terre Haute, succeeding J. O. Crockett, resigned.

F. C. Hutchinson, chief clerk to general manager of the Northern Pacific, at St. Paul, Minn., has been appointed a trainmaster, with office at Mandan, N. Dak.

Thomas R. Limer has been appointed superintendent of transportation of the Hocking Valley. The position of superintendent of car service having been discontinued.

C. M. Bryant, superintendent of the Missouri, Kansas & Texas of Texas, at Smithfield, Tex., has been appointed assistant general manager, succeeding A. D. Bethard, promoted.

W. A. Durham has been appointed assistant general manager of the Missouri, Kansas & Texas, with office at St. Louis, Mo. His former positon, general superintendent in Texas, has been abolished.

W. S. Anderson has been appointed car service agent of the Oregon Short Line and Southern Pacific Lines East of Sparks, with office at Salt Lake City, Utah, succeeding A. F. Brewer, transferred.

W. R. Hudson has been appointed general superintendent of the Norfolk Southern, in charge of operation and maintenance, and C. P. Dugan, car accountant, has been appointed superintendent of transportation, both with offices at Norfolk, Va. The office of car accountant has been abolished.

Traffic Officers.

John Bickel has been appointed commercial agent for the Duluth, South Shore & Atlantic at Chicago.

Ira F. Kurtz has been appointed a traveling freight agent of the Lehigh Valley, with office at South Bethlehem, Pa.

Robert S. Ruble, city passenger agent of the Union Pacific at Omaha, Neb., has been appointed assistant general passenger agent, with office at Omaha.

M. J. Allen has been appointed a commercial freight agent of the Baltimore & Ohio and the Baltimore & Ohio Southwestern, with office at Kansas City, Mo.

J. H. C. Clark has been appointed a traveling agent, freight department, of the Erie Railroad, with office at Chicago, succeeding S. M. Wilcox, assigned to other duties.

W. H. Davidson, assistant ticket agent of the Atchison,

Topeka & Santa Fe at Dallas, Tex., has been appointed city passenger and ticket agent of the St. Louis & San Francisco.

B. W. Redfearn, general dairy agent of the St. Louis & San Francisco at St. Louis, Mo., has been appointed general perishable freight agent in charge of dairy and perishable freight traffic, excepting live stock, the position of general dairy agent having been abolished.

F. C. Coley, assistant general passenger agent of the New York, New Haven & Hartford, has been appointed first assistant general passenger agent of that company, also of the New England Navigation Co., with office at New Haven, Conn. C. A. Call has been appointed assistant general passenger agent of both these companies, with office at Boston, Mass., and A. H. Seaber, assistant general passenger agent, with office at New York.

W. B. Groseclose, general freight agent of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has been appointed assistant freight traffic manager, with office in Chicago. J. W. Allen, general freight agent of the Missouri, Kansas & Texas of Texas, with office at Dallas, Tex., succeeds Mr. Groseclose. J. L. West, assistant general freight agent of the Missouri, Kansas & Texas at St. Louis, Mo., succeeds Mr. Allen. W. W. Miller, assistant general freight agent at St. Louis, Mo., succeeds Mr. West. E. S. Briggs, assistant general freight agent of the Missouri, Kansas & Texas of Texas, at Houston, Tex., succeeds Mr. Miller. E. H. Coombs succeeds Mr. Briggs.

Engineering and Rolling Stock Officers.

Dean Hinman has been appointed supervisor of tracks of the Chicago Great Western.

W. J. Carnahan has been appointed roadmaster of the St. Louis, Brownsville & Mexico at Kingsville, Tex., succeeding B. F. Lawler, transferred to Bloomington as roadmaster on the Fort O'Connor division.

Marshall Craig, whose resignation as city passenger and ticket agent of the Chicago Great Western at Omaha, Neb., has been announced in these columns, has been appointed assistant engineer of the Waterloo, Cedar Falls & Northern, with office at Waterloo, Iowa.

John D. Maupin, whose appointment as master mechanic of the Trinity & Brazos Valley at Teague, Tex., has been announced in these columns, was born in 1869 at St. Catherine, Mo. He entered railway service in 1887 as a machinist apprentice on the St. Louis, Iron Mountain & Southern. After completing his apprenticeship he served in the mechanical department of the Iron Mountain, the Texas Central, and the Trinity & Brazos Valley, being general roundhouse foreman and general foreman. He left the position of general foreman of the Trinity & Brazos Valley to become master mechanic.

W. P. Hobson, whose appointment as master mechanic of the Cincinnati division of the Chesapeake & Ohio, with office at Covington, Ky., has been announced in these columns, was born June 29, 1869, in Goochland county, Va. He received his education in the public and private schools of Virginia, and began railway work on September 1, 1886, in the Chesapeake & Ohio shops at Huntington, W. Va., as a machinist's apprentice. Four years later he went to Hinton as a machinist, and in April, 1891, was promoted to night roundhouse foreman. Ten years later he was promoted to general roundhouse foreman at Clifton Forge, Va., remaining in this position about three months, when he was made assistant master mechanic on the Huntington division, with office at Hinton. In December, 1904, he was appointed master mechanic of the Kentucky division at Lexington, Ky., and on May 1, 1910, he was transferred to the Cincinnati division.

James S. Sheafe, whose appointment as engineer of tests of the Illinois Central has been announced in these columns, was born in Holden, Mo., October 12, 1876. He graduated in the literary course from the University of Washington, Seattle, Wash., and in mechanical engineering from the Massachusetts Institute of Technology. He entered railway service as a freight brakeman on the Northern Pacific in May, 1897. He held numerous minor positions until 1903, when he entered the South Tacoma shops of the Northern Pacific as a special apprentice. In 1904 he entered the service of the Great Nothern, serving that company as draftsman and later as locomotive foreman. In 1906 he went to the Illinois Central as machinist at McComb, Miss., was soon made general foreman at Indianapolis, Ind., and in 1907 was appointed mechanical inspector at Chicago, the position he leaves to become engineer of tests.

Purchasing Officers.

William A. Summerhays, whose appointment as general storekeeper of the Illinois Central, with headquarters at the Burnside shops, Chicago, has been announced in these columns, was born in Chicago, August 11, 1879. He entered railway service in the maintenance of way department of the Illinois Central, June 15, 1898. He was made assistant general storekeeper in charge of maintenance of way and signal material in November, 1901, and held that position until his recent appointment.

OBITUARY.

George S. Sinclair, auditor of receipts of the Missouri, Kansas & Texas, with office at St. Louis, Mo., died May 17 from a stroke of apoplexy. He was 46 years old and had served the Missouri, Kansas & Texas for about 22 years.

John Rocney, a former president of the Boston, Hartford & Erie, now a part of the New York, New Haven & Hartford, and for many years connected with railway and electrical work, died May 18 at his home in Brooklyn, N. Y., at the age of 71 years. Mr. Rooney was born in the north of Ireland, and after coming to America he studied law, and then entered railway work, having been connected at various times with the Southern Minnesota, the Iowa Eastern and then with the Boston, Hartford & Erie. After leaving railway service Mr. Rooney was connected with several electrical companies which have been absorbed by the Westinghouse Electric & Manufacturing Co.

Charles H. Platt, formerly general superintendent of the Western district of the New York, New Haven & Hartford, died May 20 in New York City. Mr. Platt was born May 30, 1850, at Stepney Depot, Conn., and began railway work in 1868 with the Housatonic Railroad, now a part of the New York, New Haven & Hartford, as agent and operator at his native town. In 1872 he was appointed general freight and passenger agent of the Shepaug Railroad, and two years later he was made superintendent of the same road. In 1881 he went to the New York & New England and was made superintendent of construction on the Western extension. Both of these roads are now included in the New York, New Haven & Hartford. In November, 1889, he was appointed general manager of the Grand Central Depot, New York City, and remained there three years. In June, 1892, he was appointed general superintendent of the New York, New Haven & Hartford, and in July, 1898, on the reorganization of the operating department he was made general superintendent of the Western district. Since his retirement from that office in 1903 Mr. Platt had lived in New York City.

Richard Price Morgan, consulting engineer, who has for many years been recognized as an authority in the construction of railways, died at his home in Dwight, Ill., May 20. Mr. Morgan was born in Stockbridge, Mass., September 17, 1828. He was the son of a veteran engineer who bore the same name. Mr. Morgan entered railway service as a rodman on the Hudson River Railway during its construction. He was one of the early railway commissioners of Illinois, and served on many other commissions of a public and private character; made the plans for the first design for an elevated railway in New York, a beautifully designed steel gothic arch for Broadway; was the chief factor in the building of the Chicago & Alton, and was its first general superintendent. He was a trustee of the University of Illinois, from which he received the degree of Doctor of Engineering. He was intimate with Abraham Lincoln during the time that he was engaged in building the Chicago & Alton through central Illinois. The Prince of Wales on the occasion of his visit to this country in 1860 was entertained at Mr. Morgan's home in Dwight. Mr. Morgan is survived by two sons, one of whom, Dwight C., is vice-president and general manager of the Pittsburgh, Shawmut & Northern.

Railway Construction.

New Incorporations, Surveys, Etc.

Altus, Wichita Falls & Hollis.—See Wichita Falls & Northwestern.

Arizona Eastern.—See Phoenix & Buckeye.

Asherton & Gulf.—According to press reports work is to be started at once on an extension of this road from Asherton, in Dimmit county, Tex., west to Eagle Pass. Plans are being made to build an extension from the eastern terminus at Artesia east to a point on the Gulf of Mexico, probably at Corpus Christi, about 150 miles. (April 29, p. 1113.)

Camden & Trenton Traction.—Incorporated in New Jersey, with $675,000 capital, to operate an electric line from Trenton, N. J., south to Camden. The incorporators are: F. Evans, E. A. Martin and C. R. Renz, and are said to be the owners of the Camden & Trenton Street Railway.

Cleveland, Cincinnati, Chicago & St. Louis.—Grant Brothers, Champaign, Ill., are said to be carrying out double-tracking work between Anderson, Ind., and Pendleton. Costello Brothers, St. Louis, Mo., the contractors, sublet the work to Grant Brothers.

Dallas-Cleburne Interurban.—An officer writes that it is uncertain when work will be started on this line. The projected route is from Dallas, Tex., southwest via West Dallas, Eagleford, Cain, Webb, Mansfield, Lillian, Alvarado and Mossston to Cleburne, about 50 miles. The work includes putting up a large bridge over the Trinity river, and a large power house is also to be built. G. C. Hamington, president, Indianapolis; Joseph Edwards, chief engineer, Mansfield. (See Texas Roads, May 13, p. 1237.)

Denison & Pacific Suburban.—Organized in Texas to build a number of suburban electric lines to points on the Texas & Pacific in Texas. L. S. Thorne, president; W. Cumming, vice-president, Dallas.

Elizabethtown & Trenton.—Incorporated in New Jersey, with $250,000 capital, to operate a line from Milltown, N. J., via New Brunswick, to Elizabeth. The directors include: I. Shupp, Jr., Philadelphia; C. L. Rihl, C. A. Entrekin, Ardmore, Pa.; J. W. Kelly, A. E. Garwood, H. H. Aikens, Llanerch, Pa., and J. R. Turner, Basking Ridge, N. J.

Elizabethtown Terminal.—This company has given a mortgage to secure an issue of $150,000 of bonds. The company was incorporated in September, 1909, in New York, with a capital of $80,000, to build from Westport, N. Y., on the Delaware & Hudson, west to Elizabethtown, eight miles, and work is now under way. V. R. Coon, general manager, Elizabethtown. (May 6, p. 1183.)

Emporia & Ahoskie.—A company is being organized and expects to ask for a charter this month. Most of the right-of-way has been secured for a line from the Atlantic Coast Line at Emporia, Va., southeast via Margarettsville, N. C., Pendleton and Murfreesboro to Ahoskie, 54 miles. The work will include three small bridges. W. S. Goodwyn, Emporia, may be addressed.

Gulf, Colorado & Santa Fe.—An officer writes that a contract has been given to J. T. Shortall, Kansas City, Mo., for grading work between Temple, Tex., and Lometa. The amount of this work is about 800,000 cu. yds. (May 13, p. 1236.)

Gulf, Texas & Western.—The last spike has just been driven on the first 75 miles, which completes the construction of this line from Seymour, Tex., east to Jacksboro, affording connections via the Rock Island at Jacksboro from Seymour to Fort Worth and Dallas. The line is to be extended east to Dallas with a branch to Fort Worth, and will be extended on the west to a connection with the Santa Fe at Lubbock. (Dec. 3, p. 1107.)

Iowa City, Ottumwa Southwestern (Electric).—Incorporated in South Dakota, with offices at Pierre, S. Dak., and Iowa City, Iowa, to build from Iowa City southwest to Ottumwa, 70 miles. An officer writes that a contract has been given to A. Steffen, Davenport, Iowa, to build the line. F. Tanner, vice-president, Iowa City. (Dec. 17, p. 1213.)

Kansas, Oklahoma & Panama.—Incorporated in Oklahoma, with $1,000,000 capital, to build from Liberal, Kan., south through Beaver, Harper, Woodward, Ellis, Roger Mills, Beckman, Greer, Jackson and Tillman counties, in Oklahoma, with a branch from Sayre, Okla., east to Oklahoma City. The headquarters of the company will be at Sayre. R. W. Ruffin, Hamilton; J. W. Lytle, W. F. Crawford, Indianapolis, Ind.; D. B. Richardson, J. A. Whitehurst, G. L. Bennett and D. W. Mann, Sayre, are interested.

Laclede, Dallas & Western.—A contract is said to have been given to Davis & Blair, Joplin, Mo., to build from Phillipsburg, Laclede county, Mo., west to Buffalo, Dallas county, 22 miles. The line is eventually to be continued west of Buffalo for eight miles. B. B. Joffee, president; H. W. Smith, chief engineer, American Bank building, Kansas City. (May 13, p. 1237.)

Marietta, Columbus & Cleveland.—This company, operating a 49-mile line from Marietta, Ohio, west, thence northwest to Palos, with a branch to Sharpsburg, is said to have surveys made for an extension from the present terminus at Palos south to Athens, about 16 miles. Connection is to be made at Athens with the Hocking Valley.

Mexican Roads.—According to press reports from Mexico City, Leandro Fernandez, representing the Department of Communications and Public Works, and Lic. Francisco Alfaro, representing A. B. Adams, Incorporated, have entered into an agreement for the construction of a railway from Puebla south via coal mines at Tezcatalan and Tlaxiaco, Oaxaca, to Lake Chacahua, near the Pacific coast.

Moorefield & Virginia.—An officer writes that it has not yet been definitely decided to build this line. The projected route is from Moorefield, Hardy county, W. Va., south to Peru, 20 miles. W. Trapnell, general manager, Romney. (May 20, p. 1282.)

Nashville, Chattanooga & St. Louis.—An officer writes that contracts have been given to H. H. Thrasher and L. C. Gunter, Chattanooga, Tenn., at $90,000, for eight miles of second-track work from Wauhatchie west to Whiteside. The maximum grade will be 1 per cent. and the work will be rather heavy.

New Jersey Rapid Transit.—An officer of the North Jersey Construction Co. writes that work is now under way building a line from Paterson, N. J., north via Fairlawn, Glenrock, Ridgewood, Hohokus, Waldwick, Allendale, Ramsey and Mahwah, to Suffern, N. Y., of which the six miles from Paterson to Hohokus is finished. Contracts have been let for grading, bridges, etc., on the rest of the line to local contractors. All bridges are to be of reinforced concrete and steel construction, including a large bridge over the Erie Railroad and the proposed line of the Erie Terminals Co., which will be an overhead structure, about 1,300 ft. long. Contracts are let and work is now under way on car barns, substations and office buildings. G. G. Bogart, president; E. A. Hoffman, chief engineer, Paterson.

New York Central & Hudson River.—Application has been made to the New York Public Service Commission, Second district, for an order permitting this company to build a detour east of Oneida, N. Y. On the existing main line between Oneida and Verona there is a heavy grade going east, and to avoid this it is proposed to detour track No. 4. The proposed new route intersects three highways in the town of Verona. One of these highway crossings is to be carried under the proposed tracks, another over the tracks, and a portion of the third highway is to be discontinued and travel diverted to one of the other crossings.

Application has also been made for an order to permit the construction of a cut-off on the Rome, Watertown & Ogdensburg division between Watertown, N. Y., and Sanferds. It is proposed to construct a double-track line for freight, partly in the town of Pamelia and partly in the town of Le Ray. The present main line passes through a thickly populated district of Watertown on the southerly

side of the Black river and Factory street, crossing many highways at grade. The company has recently constructed a new freight house on the north side of the river, and has discontinued its use of the freight house on the south side. The proposed cut-off crosses two highways in the town of Pamelia. These are to be carried under the railway, a crossing at the division line between the town of Pamelia and Sanfords is to be carried over the railway, and another near Sanfords in the town of Le Ray is to be carried under the railway. The proposed cut-off will lessen the dangers of the grade crossings in the city of Watertown, provide a much better grade and facilitate the operation of through freight trains.

Northern Pacific.—According to press reports surveys are now being made south of Ryder, N. Dak., for a line to be built from the present western terminus of the branch at Turtle Lake, N. Dak., west via a point south of Ryder, thence crossing the Missouri river into McKenzie county.

North Missouri Central (Electric).—An officer writes that a contract has been given to the M. A. Talbott Construction Co., Baltimore, Md., and work is to be started June 6 on a line from Jefferson City, Mo., north to Columbia, 28 miles, thence northeast to Mexico, an additional 31 miles. The company also plans to put up a power house, car barn, three terminals and two substations. O. F. Spaete, 1304 New National Bank of Commerce building, St. Louis, Mo., may be addressed.

Oregon Short Line.—An officer writes that the Salt Lake & Idaho is to be built from Saline, Utah, on the Southern Pacific main line, north to Burley, Idaho, on the Minidoka & Southwestern, 150.49 miles. Maximum grades will be .7 per cent. ascending and .7 per cent. descending. Total ascents westbound, 1,407 ft.; total descents westbound, 1,469 ft. Maximum curvature, 4 degs.; total curvature, 2,304 degs.; total curvature, 30.89 miles. The work to be carried out includes eight steel bridges, to have a total length of 220 ft. There will be 34 pile trestles, aggregating 1,065 ft. W. H. Bancroft, president, and William Ashton, chief engineer, Salt Lake City. (April 22, p. 1066.)

Payette Valley.—An officer writes that this company, which operates a 13-mile line from Payette, Idaho, southeast to New Plymouth, is building an extension from New Plymouth southeast to Emmett, 19 miles, under the name of the Payette Valley Extension Railroad. The grading contract has been let to the Northwestern Engineering Co., Emmett, and about one-fifth of the grade has been finished. Eleven cars of rails and spikes are on the ground and ties are being received. The company expects to have the line in operation to Emmett by August 1. (April 22, p. 1065.)

Pittsburgh & Shawmut.—See Pittsburgh, Shawmut & Northern.

Pittsburgh, Shawmut & Northern.—Contracts are said to have been let recently for work on the Pittsburgh & Shawmut, now building from Knoxdale, Pa., to Freeport, as follows: For bridges, including four high viaducts, two crossings of the Mahoning creek, a large bridge over the Allegheny river at Mahoning, and 26 plate girder and "I" beam bridges, to the American Bridge Co. The plans for the bridge over the Allegheny river at Mahoning have already been approved by the Secretary of War. The structure is to have a channel span, 400 ft. long, and three shorter spans, each 200 ft. Contracts for the construction of branch lines to Oakland and to Tidal have been let to the J. H. Corbett Construction Co., and it is expected that this branch work will be finished about the same time the main line is completed. A contract for the work on the main line between Knoxdale and the Allegheny river was let last year to the J. H. Corbett Construction Co. (Jan. 14, p. 1114.)

Phoenix & Buckeye.—An officer writes that the projected route is from Phoenix, Ariz., westward for 50 miles towards Yuma. Last year the company secured considerable right-of-way and $25,000 in bonus subscriptions and the legislature has also passed a ten-year tax exemption act. The failure to secure financial backing induced the company to open negotiations with the Arizona Eastern interests to take over the assets of the company and build the line to the east side of the Hassayampa river by August, 1910. This proposition will be accepted, provided the company will secure an ordinance permitting it to build a line into Phoenix from the west, as well as secure some additional rights-of-way. L. H. Landis, general manager, Phoenix.

Quanah, Acme & Pacific.—An officer writes that this company, which now operates 43 miles of railway from Quanah, Tex., west via Acme to Paducah, in Cottle county, has engineers at work in the direction of both Roswell, N. Mex., and El Paso, Tex., to secure the shortest and best route across the plains to El Paso; also for branch lines to the west and northwest of the Panhandle country. The ascent to the plains and through the Cap Rock region offers considerable difficulties, which can only be overcome by expensive work, consisting of deep cuts and high fills. The engineering corps expects to submit plans about the middle of June for overcoming most of these difficulties. (May 6, p. 1184.)

Rangeley Lakes & Megantic.—Incorporated in Maine with a capital of $100,000 to build from a point at or near Oquossoc, Me., on the Rumford Falls branch of the Maine Central, northerly, following the Kennebago river to the Canadian border, about 30 miles. The new line will traverse an important lumbering, fishing and hunting section. Lucius Tuttle, president of the Boston & Maine and the Maine Central, is president of the new company, and stockholders of both these companies are interested.

Salt Lake & Idaho.—See Oregon Short Line.

Salt Lake & Ogden.—According to press reports this company has completed the electrification of its line from Salt Lake City, Utah, north to Ogden, 35.50 miles, and electric trains are now in operation. (April 8, p. 971.)

San Antonio, Rio Grande & Tampico.—According to press reports application has been made to the Railroad Commission of Texas to issue bonds for $1,440,000 on 90 miles of this line, under construction from San Antonio, Tex., southwest to a point in La Salle county, 90 miles. The line is eventually to be extended to a point in Mexico. It is said that grading has been finished on 18 miles and it is expected that about 45 miles will be in operation this year. The Harrison Engineering Co., New York, are the engineers and contractors. J. F. Edwards, president, and G. W. Nock, chief engineer, San Antonio. (March 25, p. 850.)

Vera Cruz, Tabasco & Campeche.—A contract has been entered into between the Mexican government and this company for the construction of this line from Santa Lrucrecia, on the Tehuantepec National, northeast to Campeche, where connection is to be made with the United Railways of Yucatan. The line is to be about 470 miles long. A preliminary survey has already been made. In addition to the subsidy granted by the federal government, it is said that the states of Chiapas, Campeche and Tabasco will grant liberal subsidies to the proposed line. Donato Chapearpuge, president, Mexico City. (See Mexican Roads, April 1, p. 918.)

Western Maryland.—Negotiations are pending with the city officials of Baltimore, Md., for water front property, 50 ft. x 350 ft., adjoining the Port Covington terminals. The company proposes to make improvements at this place to cost $500,000, including piers. An officer is quoted as saying that the company intends to spend not less than $5,000,000 at Baltimore within the next few years. (May 13, p. 1237.)

Wichita Falls & Northwestern.—An officer writes that work is now under way on a line from Elk City, Okla., north to Hammond, about 20 miles. The company sublets the grading work by miles or short sections, and does its own bridging and track laying and putting up new buildings. The work involves the handling of 23,000 cu. yds. per mile. Maximum grade is to be .75 per cent., maximum curvature 3 degs. The Altus, Wichita Falls & Hollis is building from Altus, Okla., west to the Texas-Oklahoma state line, 42 miles, and the Wichita Falls & Wellington is building from the Texas-Oklahoma state line west to Wellington, Tex., 15 miles. Both these companies have the same officers as the Wichita Falls & Northwestern, and the work is being carried out on the same plan of letting contracts. (April 8, p. 971.)

Wichita Falls & Wellington.—See Wichita Falls & Northwestern.

Railway Financial News.

Alabama & Vicksburg.—Stockholders are to vote June 10 on the question of increasing the authorized capital stock.

Buffalo & Susquehanna.—A committee has been organized to protect the interests of the preferred stock, and asks the deposit of preferred stock with the Central Trust Co., New York. The committee consists of J. N. Wallace, chairman; Frank Bergen, Walter P. Bliss, Henry Evans and J. S. Frelinghuysen; David Rumsey is counsel and Hugh Rankin, secretary, 46 Cedar street, New York.

Central New England.—The company has asked the New York Public Service Commission, Second district, for permission to make a mortgage for $25,000,000 and to issue immediately $12,419,000 bonds to refund outstanding bonds. The commission on August 11, 1909, refused permission to the company to make a new mortgage because provision was not made for $2,331,376 bonds outstanding owned by others than the New York, New Haven & Hartford. The company in the present application has sought to overcome the objections of the commission.

Chesapeake & Ohio.—The directors have declared a quarterly dividend of 1¼ per cent., payable June 30, on the outstanding $62,798,300 stock. This compares with quarterly dividends of 1 per cent. paid since June, 1909, and places the stock on a 5 per cent. annual basis, as compared with a previous 4 per cent. annual basis. From 1899 to 1908 1 per cent. was paid annually.

Chicago, Cincinnati & Louisville.—The amounts found to be due, including interest, under the order of foreclosure sale, are as follows: $1,425,315 on receiver's certificates; $3,431,000 on general and refunding mortgage bonds; $2,050,126 on Cincinnati, Richmond & Muncie mortgage bonds; $860,394 on Chicago & Cincinnati mortgage bonds, and $676,560 on Cincinnati & Indiana Western mortgage bonds. There is also considerable floating debt, said to be about $1,500,000.

Florida Railway.—There was recently offered in Paris $4,000,000 first mortgage 5 per cent. bonds at 472 francs (par value $100, 518 francs). The company has a line in operation from Live Oak, Fla., to Perry, 59 miles, and is authorized to build a line, including the portion now in operation, from Tallahassee to Fernandina and Jacksonville, 224 miles.

Geneva & Auburn.—See an item in regard to this company in State Commissions.

Georgia Railroad & Banking Co.—Stockholders have adopted a resolution requesting the directors as soon as possible to increase the annual dividend on the $4,200,000 stock from 11 per cent. to 12 per cent. The road is operated under lease by the Louisville & Nashville and the Atlantic Coast Line, the rental being $600,000 per year, which is equal to 11 per cent. on the stock and interest on outstanding bonds. On January 1 $1,000,000 6 per cent. bonds matured and were refunded at 4 per cent., reducing the interest charge by $20,000, which is about one-half the amount required to pay an additional 1 per cent. in dividends.

Houston & Texas Central.—The Texas Railroad Commission has authorized the company to issue $2,383,000 first mortgage 30-year 6 per cent. bonds to be secured on the line from Mexia to Nelleva, 94 miles. The company is authorized to issue $484,393 additional bonds as required for completion and improvement of the road.

Los Angeles Pacific Co.—An official of the Southern Pacific says that his company has bought from General M. H. Sherman and E. P. Clark their minority interests in the stock of the Los Angeles Pacific Co. It is said that the Southern Pacific now owns the entire capital stock of the Los Angeles Pacific.

New York, New Haven & Hartford.—See Pennsylvania Railroad.

Pennsylvania Railroad.—Wm. A. Read & Co. and Kountze Brothers, of New York, and Edward B. Smith & Co., of Philadelphia, are offering $11,000,000 Pennsylvania general freight equipment trust 4 per cent. certificates of May 2, 1910, due in annual instalments of $1,100,000 from May 1, 1911-1920, at varying prices for the different maturities, yielding 4½ per cent. on all maturities. The equipment certificates are guaranteed principal and interest by the Pennsylvania Railroad.

In regard to rumors that the Pennsylvania Railroad has been acquiring additional stock of the New York, New Haven & Hartford, President Mellen, of the New Haven, says that the total holdings of the Pennsylvania Railroad now amount to about $6,000,000 stock of the New Haven. This is an increase of about $5,000,000 over the amount of stock held at the end of the calendar year 1909.

Pittsburgh & Shawmut.—The following directors have been elected: Henry Bronner, H. E. Huntington, Edwin Hawley, Frank Trumbull, Theodore P. Shonts, W. H. Taylor. General Thomas H. Hubbard remains on the board.

St. Louis Southwestern.—An equipment trust agreement has been made securing $460,000 series A 5 per cent. equipment trust certificates dated April 1, 1910, due in 10 annual instalments of $46,000 each, beginning April 1, 1911.

Southern Indiana.—The following reorganization committee has been elected by the committees representing the several bond issues: E. K. Boisot, chairman, representing the general mortgage 5 per cent. bondholders' committee; A. G. Hodenpyl, representing the first mortgage 4 per cent. bondholders' committee; Charles D. Smithers, representing the Chicago Southern 5 per cent. bondholders' committee, and M. B. Johnson, representing Cleveland interests.

Southern Pacific.—See Los Angeles Pacific Co.

Wabash.—See Wabash-Pittsburgh Terminal.

Wabash-Pittsburgh Terminal.—Judge Taylor, of the United States district court of Northern Ohio, has appointed May 26 as the date on which he will hear the application of the Mercantile Trust Co., trustee of the Wabash-Pittsburgh Terminal first mortgage bonds, for an order directing the receiver of the Wheeling & Lake Erie to account for all moneys that should have been paid over to the Terminal Co. since August 22, 1908, under trackage and traffic contracts. Since the above date the Wheeling has made no payments under an order of the court permitting the receiver to suspend the same. In a few days by direction of the Mercantile Trust Co. the receivers of the Terminal railway are to commence suit against the Wabash Railroad for the amounts due from that company to the Terminal railway under the same tri-party contract. The Wabash at the time the Wheeling discontinued making payments ceased making payments also. The court will be asked for an accounting in the case of the Wabash and in the case of the Wheeling for an order directing the receiver to set aside as a special deposit the sums already due and to segregate in the future from the Wheeling's earnings such amounts as might be due under this contract and to hold these subject to the determination by the court of the validity of the contract and the rights of the Terminal railway bondholders herein.

From June 30, 1908, to June 30, 1909, the amount due from the Wheeling was $162,104, representing the money due for the fiscal year, subsequent to suspension of payments. For the Wabash it amounted to $71,589. For the fiscal year to end on June 30 next these amounts will be considerably in excess of the above figures as a result of more normal traffic conditions this year, as compared with the previous year.

The highest amounts ever paid over under these contracts was in the fiscal year ending June 30, 1907, when actual receipts from the Wheeling were $248,340 and from the Wabash $132,075, a total for the Terminal Co. of $380,415. The sums due for the current fiscal year are expected to closely approximate these amounts.

Washington, Baltimore & Annapolis.—This company, which guarantees the interest on the Baltimore Terminal Co. first mortgage 5 per cent. bonds, made arrangements for the payment of the interest on these bonds (due March 1, 1910), to be paid May 19 at the Citizens Savings & Trust Co., Cleveland.

Wheeling & Lake Erie.—See Wabash-Pittsburgh Terminal.

Supply Trade Section.

The Camel Co., Chicago, has moved its offices from the Old Colony building to the McCormick building.

The Barnett Equipment Co., New York, has moved its office from 2 Rector street to room 1409, 30 Church street.

At the quarterly meeting of the Ward Equipment Co., New York, held May 24, a 5 per cent. dividend was declared, payable May 27.

The Indianapolis Switch & Frog Co., Springfield, Ohio, has opened an office at 1528-1529 McCormick building, Chicago, in charge of J. C. Jameson.

The Duplex uncoupler and automatic release, manufactured by the National Railway Devices Company, Chicago, will be used on the 1,000 Chicago, Burlington & Quincy gondola cars recently ordered of the Pressed Steel Car Co.

Recent shipments of Newton cupolas, reported by the Engineering Works, Detroit, Mich., include a 12-ton-hour capacity cupola to the Specialty Foundry Co., two 9-ton-hour capacity cupolas to the Ford Motor Co., one 5-ton-hour capacity cupola to the Massey Gin & Machine Co., one 3-ton-hour capacity cupola to the Hamden Foundry Co., and one 7-ton-hour capacity cupola to the Orrville Pump Co.

The Isthmian Canal Commission will receive bids until June 9 for steel, iron, bronze, copper, steel and copper tubing, pipe and fittings, exhaust valve, stovepipe, wire cable, rivets, bolts, nuts, taps, reamers, dies, bits, files, jacks, diaphragm pumps, boiler-tube expanders, machinist's clamps, engine lubricators, oilers, gage glasses, garbage cans, steam whistles, gaskets, leather fillet, leather belting, cardboard, etc., (Circular No. 585); and until June 17 for lumber, piles and vanadum steel chain (Circular No. 584).

S. W. McMunn, president of the Brown Process Company, Chicago; the Cameron Septic Tank Company, the Monarch Supply Company and several others, who died at Chicago on April 29, was born at Sharon, Ohio, on March 20, 1850. He organized the American Brake Company in 1880. He also organized the Car Coupler Company. In 1890 he was a special sales representative of the Carnegie-Phipps Company, and in 1894 went with the Otis Steel Company. He was also an organizer of the Kindl Car Trunk Company and the United States Steel Piling Company.

TRADE PUBLICATIONS.

Electric Fans.—The Sprague Electric Co., New York, has issued its catalogue No. 321 containing full descriptions, with illustrations, of its electric fans.

Kerosene Torch.—The Hauck Manufacturing Co., New York, has recently issued pamphlet No. 31 describing its new patented kerosene torch suitable for general shop work.

Steel Mine Timber.—The Carnegie Steel Co., Pittsburgh, Pa., has recently issued a new edition of its pamphlet on steel mine timbers which contains data and tables for the use of mining engineers.

Gas Compressors.—The Ingersoll-Rand Co., New York, has issued bulletin No. 3.017, containing a general description of the design, parts and installation of its gas compressors, along with a number of illustrations of completed installations

Road Preservatives.—The Barrett Manufacturing Co., New York, has just issued a pamphlet containing a number of full-page illustrations of country and city roads and avenues on which its Tarvia has been used as a binder with macadam.

Nut and Bolt Fasteners.—The United Nut Lock Co., Springfield, Mass., has issued a pamphlet describing the "Hugtite" nut and bolt fastener, which is adapted for steam and street railway equipment of all classes, motor-driven vehicles, general machinery, etc.

Electric Hoists.—The Sprague Electric Co., New York, has issued catalogue No. 233 containing general descriptions of its electric monorail hoists. A number of half-tone illustrations show this hoist in detail and others illustrate car and locomotive shop installations.

Garland Devices.—Burton W. Mudge & Co., Chicago, has issued an announcement that hereafter Garland ventilators and all other Garland devices will be sold exclusively by this company. The folder calls attention to the application of this ventilator to passenger cars.

Elaterite Water Proofing.—The Western Elaterite Roofing Co., Denver, Colo., is distributing a folder bearing an extract and illustration from an article on a "Reinforced Concrete Water Tank in Mexico," which appeared in the *Railway Age Gazette* of September 10, 1909. The company's Werco liquid waterproofing cement was used in this tank with good results.

Mazda Economy Diffusers.—The General Electric Co., Schenectady, N. Y., has issued bulletin No. 4,729, superseding bulletin No. 4,660, which illustrates and describes the various types of Mazda economy diffusers. The special advantages claimed for this type of diffuser are wide range of capacity, relatively low intrinsic brilliancy, with excellent diffusion and economical distribution of light.

Generators and Exhaust Fans.—The Crocker-Wheeler Co., Ampere, N. J., has issued bulletin No. 119, superseding bulletin No. 107, on direct-current lighting and power generators; bulletin No. 121 on small engine type direct-current generators, and bulletin No. 124, superseding bulletin No. 112, on exhaust fans. These are the standard bulletins for loose leaf covers issued by this company and contain a number of detail and installation illustrations.

RAILWAY STRUCTURES.

Belle Vernon, Pa.—An officer of the Pittsburgh & Lake Erie writes that bids are being asked for putting up a brick passenger station in Belle Vernon, to cost $15,000. (May 20, p. 1285.)

Celilo, Ore.—A contract is said to have been given by the Oregon Trunk Line to Porter Brothers for building the substructure of the large bridge over the Columbia river near Celilo. It is understood that the contract is valued at $650,000. Contract for the steel superstructure will probably be let in a few days. (Dec. 17, p. 1218.)

Cincinnati, Ohio.—The Cincinnati Union Depot Terminal Co. has been incorporated with $1,000,000 capital. The company proposes to build a union station in the central southern part of Cincinnati. The location proposed for the main building is on the north side of Third street between Walnut and Main streets, nearly an entire square. The president is A. S. White, president of the Columbia Gas & Electric Co., and the other officers are: Vice-president and general manager, J. E. Bleekman, and secretary and treasurer, F. R. Williams, treasurer of the Cincinnati Trust Co. The other directors are: G. H. Worthington, Cleveland; G. L. Seasongood, L. J. Hauck and C. Bentley Matthews. The promoters of this company say that their scheme is designed to benefit all of the railways entering the city; but the principal companies do not appear as yet to have given their approval of the idea; and the project at present seems to be one to build a large office building, 20 stories high, with a view to deriving an income from office rents. It is reported that some of the interurban lines are interested. An officer of the Pennsylvania says that that company has no connection with the new company and that no definite conclusions as to a union station have been reached by the interested railways; and an officer of the New York Central Lines makes a statement to substantially the same effect. (May 20, p. 1285.)

Clinton, Iowa.—Contracts are said to have been given by the Chicago & North Western to P. V. Clarke, Clinton, Iowa, for building 15 reinforced bridges, four on the Anamosa branch, one on the Iowa division, and 10 on the Iowa & Minnesota division.

Columbia, Mo.—See North Missouri Central under Railway Construction.

Eureka, Kan.—The Atchison, Topeka & Santa Fe plans to build a one-story brick station with tile roof.

Great Bend, Kan.—The Atchison, Topeka & Santa Fe will build a new passenger station of brick, 40 ft. x 150 ft., modern in every respect. A new roundhouse to cost $40,000 is also to be built.

Hoboken, N. J.—The Public Service Railway Co. has opened for traffic its large new terminal at Ferry street and Hudson place in Hoboken.

Kankakee, Ill.—The Chicago, Indiana & Southern has prepared plans for a concrete trestle over the Kankakee river, to cost $50,000.

Lafayette, Ind.—According to press reports the Chicago, Indianapolis & Louisville has given a contract to the Lafayette Engineering Co. for building an addition to the repair shops in Lafayette. The new building is to be 110 ft. x 175 ft., and will join the present end of the western building. The contract is said to be worth $30,000. Machinery is to be installed at an additional cost of about $25,000. Six new engine pits will be built, one of which will be a drop pit. Work on the improvements is to be started at once and finished within 60 days.

Leesville, La.—The Arnold Co., Chicago, has the contract for building a new locomotive repair shop for the Kansas City Southern. Work has already been started.

Mahoning, Pa.—See Pittsburgh, Shawmut & Northern under Railway Construction.

Minneapolis, Minn.—An officer of the Great Northern is quoted as saying that a new union station will be built in Minneapolis. The work is to be finished in about 18 months.

Northtown, Minn.—The Northern Pacific has let the contract to a Minnesota firm for building a brick roundhouse to cost $35,000.

Oroville, Cal.—The Southern Pacific, it is reported, will build a new passenger station.

Pensacola, Fla.—An officer of the Louisville & Nashville writes regarding the reports that land has been bought in Pensacola, to be used as a site for a passenger station to cost over $200,000, that the company does not at present contemplate the construction of a passenger station at Pensacola.

Portland, Ore.—The Spokane & British Columbia has received permission from the state to bridge the Columbia river near the mouth of the San Poil river.

Quebec, Que.—According to press reports a site has been selected by the Grand Trunk Pacific for terminals in Quebec.

St. Louis, Mo.—The St. Louis Southwestern has bought three city blocks and plans to build freight terminals. The property is adjacent to the present stations of the Wabash and the Missouri Pacific.

St. Paul, Minn.—The Great Northern has let the contract to a St. Paul firm for building a one-story brick and steel foundry building to cost $85,000.

Seattle, Wash.—The Great Northern is to build a roundhouse in the local yards.

Wheaton, Ill.—The Aurora, Elgin & Chicago wants bids about May 30 for building a three-story brick station and office building.

Wichita, Kan.—The Chicago, Rock Island & Pacific will build a power plant, roundhouse and repair shop. Plans are not yet completed.

Late News.

The items in this column were received after the classified departments were closed.

The Delaware, Lackawanna & Western is in the market for machine tools.

The Pennsylvania is reported in the market for 7,000 tons of structural steel for bridges.

The proposed advance in coal rates in Illinois is to be suspended for 60 days. The Interstate Commerce Commission will be asked at once to suspend the increased tariffs already filed, which were to have become effective on June 1.

The Cincinnati, Hamilton & Dayton is to install at its Toledo, Ohio, ore docks, a rotary converter of 600 to 800 k.w. capacity, a d.c. generator and other machinery for the operation of its ore handling plant. (February 18, Railway Structures.)

The Terminal Railroad Association of St. Louis has announced an increase of 5 per cent. in the wages of its 5,000 employees who receive less than $200 a month. The Toledo & Ohio Central has increased the wages of conductors, brakemen, yardmen and switchmen.

The Indiana Railroad Commission has held that the Terre Haute, Indianapolis & Eastern Traction, in issuing to miners special tickets or trip books at a lower rate than is charged the general public, such transportation not being accessible to any other class of patrons is guilty of discrimination.

The Post Office Department has ordered all railways to install improved catching and delivering apparatus for mail bags at stations where trains do not stop before May 1, 1911. The Burr device, heretofore described in the *Railway Age Gazette*, has already been approved and recommended for installation.

Contracts are to be let by the New York Central & Hudson River for double-tracking a section of about 21 miles between Lockport, N. Y., and Albion. It is expected to have the work finished this coming fall. The shops at East Buffalo are to be enlarged by adding another building. The cost of the shop improvements, including equipment, will be about $140,000.

Authority has been given the Westchester Northern Railroad by the New York Public Service Commission to construct its line from a connection in White Plains with the New York, Westchester & Boston to Lewisboro on the Connecticut border, and also a branch road from Pound Ridge to connect with the New York, New Haven & Hartford at the Connecticut border. The road is a New York, New Haven & Hartford subsidiary.

The United States Circuit Court of Appeals yesterday denied the petition of the Standard Oil Co. of New York for a rehearing of the appeal in the action instituted against it by the government, because of an admitted but trivial inaccuracy in the court's opinion rendered May 13. This opinion affirms the $20,000 fine imposed by the district court of western New York for violations of the Elkins act in accepting concessions from railway companies on shipments of oil between Orlean, N. Y., and Rutland and Bellows Falls, Vt.

In the speech made by Senator La Follette on the railway bill now before Congress he said that nine of the provisions of the bill were of no value to the public. The four provisions of value to the general public found by Senator La Follette in the bill are: Authorizing the commission to control classification and to issue orders based upon investigations made on their own initiative. Authorizing the commission to establish through rates and authorizing the shipper to route his own shipment. Providing penalties for incorrect statement of rates by a railway company. Authorizing the commission to suspend a proposed new rate for four months.

The New York Public Service Commission, Second district, has denied the application of the Geneva & Auburn Railway for authority to issue $50,000 6 per cent. cumulative preferred stock. Some time ago the railway company obtained

permission to refund $450,000 outstanding bonds by the issue of $400,000 new bonds. The company now says that at the time this refunding was done it agreed to issue to bondholders $50,000 preferred stock in addition to the bonds. The commission holds, however, that since the refunding has already been done, and since the railway made no mention of its intention to issue preferred stock at the time it made its application for a bond issue, it is now in a position of asking for permission to issue stock for nothing, and therefore application is denied.

Joseph Richardson, chief clerk to the third vice-president of the Pennsylvania Railroad, has been appointed assistant to the third vice-president. The general coal freight agent will hereafter report to the freight traffic manager instead of to the third vice-president as heretofore. J. G. Searles, general coal freight agent at Philadelphia, Pa., has been assigned to other duties on account of ill health, and Robert H. Large, coal freight agent, succeeds Mr. Searles. Supervision of the freight traffic of the Erie & Western Transportation Co. will now be under the direction of the freight traffic manager of the Pennsylvania Railroad, and Walter Thayer, formerly eastern manager of the Anchor Line, has been promoted to general freight agent of the Erie & Western Transportation Co. and assistant general freight agent of the Pennsylvania Railroad.

The increase in the fares on the Boston & Maine, on all except the Fitchburg division, will go into effect July 1, owing to the fact that the rates could not be made up in time for June 1, as they had to be filed with the Interstate Commerce Commission for 30 days before going into effect. The Fitchburg division rates were completed in time. The rates on the Massachusetts Central division will be increased slightly, the largest increase being 19 cents, this being to Northampton, Hadley and South Amherst. The first increase is made at Gleasondale, which is 26 miles from Boston, at this point the fare being increased two cents. At a number of the stations beyond Gleasondale the fares were increased two cents. The most important changes were as follows: Clinton Junction, from 70 to 76 cents; Clinton, from 75 to 80 cents; Bondsville, from $1.60 to $1.68; Belchertown, from $1.71 to $1.81; Pansy Park, from $1.80 to $1.93; South Amherst, from $1.85 to $1.99; East Hadley, from $1.95 to $2.11; Hadley, from $1.98 to $2.17; Amherst, from $1.90 to $2.06; Northampton, from $2.04 to 2.23.

The Southern Railway has just announced details of its most recent car, locomotive and rail orders, involving a total expenditure of $7,290,000. The order included 75 locomotives ordered from the Baldwin Locomotive Works at an expense of $1,500,000, as follows: Thirty-eight consolidation freight, 25 Pacific type passenger, 10 switching and two Mallet freight for delivery during September or October. There were 3,620 all-steel 50-ton coal and coke cars to cost $3,900,000, as follows: Two thousand to be built by the Western Steel Car & Foundry Co., 1,120 by the Cambria Steel Co., and 500 by the Standard Steel Car Co. It is expected that these cars will be in service by July, 1910. The 10 combination passenger and baggage cars, as reported in the *Railway Age Gazette* of April 8, will be built by the Hicks Locomotive & Car Works at a cost of $90,000. In addition to the above, the company is building at its Lenoir car works 1,000 steel underframe ventilated box cars and 200 steel underframe stock cars, and 205 steel underframe ventilated box cars for the Georgia & Florida. Upon the completion of this work about August 1 construction will be started on 1,000 additional steel underframe, 40-ton ventilated box cars for the Southern. The steel rail and fittings, representing an outlay of $1,800,000, will be used in improving the lines by replacing lighter rail and also in the carrying out of the company's plans for double-tracking its more important lines. The completion of work on 60 miles of double-track under construction will give 244 miles of double-track between Washington, D. C., and Atlanta, Ga., while there are 95 miles of double track now in use on other lines of the system. Thirty thousand tons of this rail will be furnished by the Tennessee Coal, Iron & Railroad Company from its Birmingham plant; 10,000 tons will be furnished by the Maryland Steel Company, and 6,000 tons by the Cambria Steel Company.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Butte, Anaconda & Pacific has ordered one consolidation locomotive from the American Locomotive Company.

The Chicago Junction has ordered five six-wheel switching locomotives from the American Locomotive Co.

The Morgantown & Dunkard Valley is in the market for one 16-ton switching locomotive. J. Martin, general manager, Morgantown, W. Va.

The Long Island, reported in the *Railway Age Gazette* of May 6 as having ordered 100 freight cars, has ordered 100 swing side gondola cars from the Pressed Steel Car Co. These cars will have a capacity of 50 tons and will weigh 45,000 lbs. They will be 37 ft. 5 in. long, 9 ft. 4 in. wide and 3 ft. 10⅜ in. high, inside measurements, and 40 ft. 2 in. long, 10 ft. 2 in. wide and 8 ft. 8⅛ in. high, over all. The bodies will be of wood and steel and the underframes of steel. The special equipment includes:

Axles	Open-hearth steel
Bolsters, body and truck	Steel
Brakes	Westinghouse
Brake-beams	L. I. standard
Brake-shoes	Cast iron M. C. B.
Brasses	Ajax
Couplers	M. C. B.
Draft gear	Westinghouse
Journal boxes	Cast iron
Paint	L. I. standard
Springs	Union Spring & Mfg. Co.
Trucks	5½ in. x 10 in. arch bar
Wheels	Cast iron M. C. B.

CAR BUILDING.

The Alfalfa Products Company, Fremont, Neb., is in the market for a number of large tank cars.

The Northern Pacific is reported as being in the market for 1,000 all-wood refrigerator cars. This item is not confirmed.

The Slippery Rock & Grove City, an electric line under construction from Slippery Rock, Pa., to Grove City, is in the market for electric cars.

The Pacific Fruit Express, mentioned in the *Railway Age Gazette* of March 25 as considering the purchase of 2,000 refrigerator cars, is said to have ordered this equipment from the Pullman Co. This item is not confirmed.

The Northwestern Pacific, reported in the *Railway Age Gazette* of April 15 as being in the market for freight equipment, has ordered 100 flat cars, 50 box cars and 15 gondola cars.

The Louisville & Nashville, reported in the late news of last week as building 1,200 freight cars at company shops, is building 1,400 cars, 700 each at the South Louisville and the New Decatur shops. All materials for these cars has been ordered.

The Chicago Great Western, reported in the *Railway Age Gazette* of May 20 as being in the market for passenger cars, has ordered five 60-ft. coaches, two combination buffet, library, smoker and chair cars, and one dining car from the Pullman Company. This equipment will be all-steel.

The Harriman Lines freight equipment order, mention of which was made in the *Railway Age Gazette* of May 20, includes 12,440 cars, as follows: 5,750 fifty-ton box cars, with Bettendorf under and side frames; 1,000 fifty-ton automobile cars, with Bettendorf frames; 1,800 forty-ton stock cars, with steel underframes; 65 caboose cars, with steel platforms; 1,325 fifty-ton flat cars, with Bettendorf underframes; 1,200 fifty-ton all-steel Hart convertible cars; 150 fifty-ton hopper bottom coal cars, with steel underframes; 750 fifty-ton steel underframe tight bottom gondola cars, and 400 fifty-ton steel underframe drop bottom gondola cars. The box, automobile, stock and caboose cars were ordered from the American Car & Foundry Co.: the flat cars from the Bettendorf Axle Co.; the Hart convertible cars from the Rodger Ballast Car Co., and the coal and gondola cars from the Cambria Steel Co.

The following box cars are for delivery in October: For the Union Pacific, 750; Oregon Short Line, 800; Oregon Railroad & Navigation Co., 1,200; Central Pacific, 520; Southern Pacific, 780; Southern Pacific of Mexico, 100; Arizona Eastern, 100; Sonora Railway, 50; Oregon & Washington, 250; Galveston, Harrisburg & San Antonio, 500; Louisiana Western, 200; Houston East & West Texas, 100; Morgan's Louisiana & Texas, 100; Texas & New Orleans, 300; Texas Central, 300. The following automobile cars are for delivery in November: For the Union Pacific, 500; Central Pacific, 200, and Southern Pacific, 300. The following stock cars are for delivery in November: Union Pacific, 300; Oregon Short Line, 300; Oregon Railroad & Navigation, 200; Oregon & California, 100; Central Pacific, 200; Southern Pacific, 300; Galveston, Harrisburg & San Antonio, 200; Houston & Texas Central, 100; Southern Pacific of Mexico, 50, and Sonora Railway, 50. The following caboose cars are for delivery in October and November: Union Pacific, 25; Oregon Short Line, 20; Oregon Railroad & Navigation, 12, and Southern Pacific of Mexico, five. Delivery of the following flat cars begins August 15: Union Pacific, 200; Oregon Railroad & Navigation, 300; Oregon & California, 100; Central Pacific, 240; Southern Pacific, 360; Sonora Railway, 100, and Arizona Eastern, 25. Delivery of the Hart convertible cars begins August 15, as follows: Union Pacific, 750; Oregon Short Line, 150; Central Pacific, 120, and Southern Pacific, 180. Delivery of the coal cars begins August 15, as follows: Oregon Short Line, 100, and Southern Pacific of Mexico, 50. Delivery of the tight bottom gondola cars begins August 15, as follows: Southern Pacific, 450, and Central Pacific, 300. The drop bottom gondola cars are for the Oregon Short Line.

IRON AND STEEL.

The Monongahela has ordered 900 tons of rails.

The Wichita Falls & Northwestern has ordered 1,000 tons of rails.

The Cincinnati, Hamilton & Dayton has ordered 1,500 tons of structural steel for a bridge near Hamilton, Ohio.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 4,600 tons of structural steel for its Beech Grove, Ind., shops.

SIGNALING.

The Federal Signal Co. has taken the contract to make and install an interlocking plant for the Philadelphia & Reading at Oley street, Harrisburg, Pa.

The School of Railway Signaling, Utica, N. Y., has lately enlarged its quarters and now occupies the entire front of the first floor of the Williams building. This correspondence school, now four years old, has 1,000 students, some of them residing in France, Japan, Central America and other foreign lands. The officers of the school are: H. C. Williams, president; F. B. Harrington, vice-president; E. J. Weitzel, secretary and treasurer; F. C. Lavarack, director of instruction, and C. J. Gomph, registrar.

New City for Steel Workers.

Woodlawn, the new city which is being built by the Jones & Laughlin Steel Company, Pittsburgh, Pa., adjoining the new furnaces, steel, rod, wire and tin mills of the company's Aliquippa department, will add a beautiful new suburb to Pittsburgh. It is estimated that within a year its population will be 10,000

Work was commenced on Woodlawn last summer and some of the houses were completed in time for winter occupancy by Jones & Laughlin employees, while others are being taken almost as fast as they are finished. The new works are attracting iron and steel workers of the better class and the new town is designed to give them the very best homes with the most beautiful, convenient and healthful surroundings. The houses being put up by the company contain from six to ten rooms and bath, are built of brick, cement or frame, or combinations of these materials, and are in every respect as attractive and convenient as any suburban town in the district, and are above the average city home in point of comfort and convenience.

Woodlawn is situated on the main line of the Pittsburgh & Lake Erie, which is building a handsome new station there for frequent and fast trains to the city.

Millis Combination Door and Hanger.

The Millis combination door and hanger, handled by the Planet Co., Chicago, is illustrated in the accompanying cuts, Figure 1 showing its application to a single deck stock car and Figure 2 to a double deck car. The door is entirely of metal and suspended from the car by a 1-in. pipe, twice the length of the door opening. The frame of the door is made of angle irons, the corners being connected by gusset plates to prevent lateral motion. The slats are either angle irons or light T-irons, riveted to the frame with two rivets at each end. The hangers are malleable iron and form a part of the frame. The rollers are so boxed in that if they break the door can drop only a quarter of an inch and will still operate. The roller pin is protected from wear by being squared at the back to prevent its turning in the casting. It is held in place by a cotter key which cannot shake out. The pipe rail is placed immediately under the top angle tile, which, in double deck cars, prevents manure from the upper deck from lodging on the lower door rail and preventing the operation of the door. The bottom of the door is a half inch above the top of the floor to allow accumulations to flow out under the door, which eliminates much of the trouble in the operation of such doors. In case of accident the door can be taken from the car by removing two bolts, and repairs can be easily made.

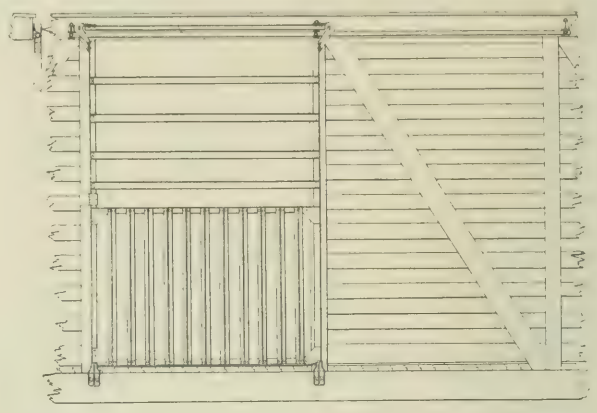


Fig. 1—Millis Door on Single Deck Stock Car.

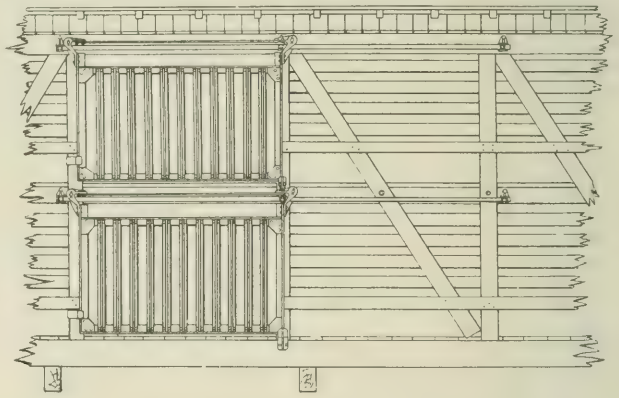


Fig. 2—Millis Door on Double Deck Stock Car.

The makers claim for the door that it is non-destructible, cannot be lost, and will operate under all conditions and in all climates. A number of the doors have been in actual service for the past two years, and are said to have given good satisfaction.

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The decision of the Supreme Court upholding the Interstate Commerce Commission in what may be called the boldest order that it ever made, that in the Mississippi-Missouri River case, foreshadows the final triumph of the idea that, as judges of the facts in railway rate questions, the Interstate Commerce Commission shall be recognized as the supreme authority. If the commission keeps within the rules of the law and the decisions of the courts on law questions, its ability to judge what is a reasonable rate will not be questioned. And yet, this decision is barely carried—4 to 3—so the full text of the decision and of the views of the dissenters will be awaited with great interest. As the agitator who calls himself a "shipper" has at last learned how to "claim everything," and to do the job with much skill, the questions which will come before the commission in the immediate future promise to be of the weightiest character. It is to be hoped that increased power will give the commission an increased sense of responsibility. And as a majority of the members of Congress and apparently about 90 per cent. of the voters of the country seem to think that any measure of rate regulation which comes short of confiscating the railways' property is not only reasonable but desirable and necessary, those railway officers who have the ability to educate public opinion must now gird up their loins for renewed efforts at their Herculean task. As all true education depends not only on sound logic but also on the fullest possible knowledge of all the facts involved, it will mean much for real progress toward a really intelligent public opinion if there can be more frankness in the presentation of railway arguments, with entire freedom from sophistry.

The second annual meeting of the Railway Fuel Association did not fulfil the expectations raised by the initial meeting held last year. The papers were hardly as good as last year's and the discussions were unduly prolonged by a few speakers who often prevented general and profitable discussion. The representatives of the coal producers did not take any very active part either in the preparation of papers or in the discussions, this being due partly, no doubt, to the fact that they were actively engaged in negotiating with their employees about wages. The economic relation of the coal and lumber businesses to that of the railway is a matter which should be treated in a more business-like manner. There are questions relating to the fuel supply of railways, for example, which involve the quality of coal, its preparation and sizing, inspection and shipment, etc., which could be investigated by committees composed of representatives of both producers and consumers and presented in reports giving valuable facts and figures which would be worthy of record and which could be used to advantage by the members of the association in investigating their own local conditions. It is work of this kind, with earnest general discussion, which will make the fuel association useful and helpful to the railways and to those who purvey to them. The value of personal contact outside of the meeting hall and the value of conversation among fuel specialists is perhaps equal to that of the formal session, and it alone may well justify the anuual meetings. Instruction relating to methods of nring and economical coal combustion on locomotives is making good progress, and is becoming so specialized that some railways have instruction cars for this purpose, and special classes and instructors in the school rooms at terminals. All of this involves elementary education which may properly be considered by the association, but its time must not be too fully occupied by such matters or it will become little better than a primary school.

The Interstate Commerce Commission's statistical report for the year ending June 30, 1907, came out about a year and a half ago. Ever since then searchers for the various kinds of information that have to be got out of this book have been told "Nothing yet published that is less than 17 months old; nothing less than two years old," and so on down to

the first of the present month, when it was "Nothing less than two years and ten months old." At last the Government Printing Office has issued the "text" of the report for 1908, which the statistician finished last September. These figures are one year and ten months old. The railways took two months to make the reports, the statistician took a year to do his job, and the printer eight months to do his.

The voluminous tables which make up the bulk of the book are still in the printer's hands, so his part of the work is still unfinished. The impairment of the value of these statistics by old age is now more regrettable than ever, because a number of new features have been introduced, more useful than what has been given in former years. The statistical report for 1908 gives a table showing the primary expense accounts for the systems of roads as they are grouped by the commission. That is, it is possible to find what the Pennsylvania—meaning the Pennsylvania system—spent as a whole for ballast, or for any other of the primary accounts under maintenance of way; and so for each one of the 58 systems in the country operating more than 500 miles of line each. These 58 systems on Dec. 31, 1909, operated 210,479 miles of road, or nearly 89 per cent. of all the railways in the country. This grouping of roads in systems and the publication of the details of expenses should be of considerable value in making comparisons, especially if taken in connection with the tables showing road and track mileage and details of equipment. Unfortunately this information as to mileage and equipment is not given in the tables, so that for these figures the student of the affairs of any particular road would have to go to the reports of the company. The monthly statements of revenues and expenses that are now being published by the commission have been described before. The present report says that it is proposed to publish these reports within 60 days of the close of the month to which the figures apply, one month being allowed for railways to compile their statements, and the remaining 30 days being used for compilation and publication at Washington. The commission, however, requires the report to be made in duplicate, and as soon as it receives them makes one set of reports at once accessible to the public, that is, to anyone calling at the office of the commission. This is a long step in the right direction of furnishing to the public as promptly as possible the information which the commission gathers. When this 1908 volume finally appears in its complete form we shall have also, says the statistician, a complete income account and profit and loss account for each road.

The Pennsylvania Railroad reports that in the two years ending December 31 last only one passenger was killed in a train accident, though the number of passengers carried was 299,762,658. This record is that of the whole of the Pennsylvania system, embracing 11,180 miles. The passenger mileage was 7,170,568,517. The number of passenger train collisions in 1909 was two less than in 1908 and of freight train collisions 15 less. The number of freight train derailments was 69 less. The passenger train mileage of the system for the two years was over 118,000,000, equal to running a train nearly 5,000 times around the world. The freight train mileage during the same time was about 125,000,000. This is a fine record, whatever the basis of comparison, but it is fair to add, as does the company in its statement, that the track mileage of the Pennsylvania—24,000 miles—is large in proportion to the road mileage, indicating that it is a busy road. On a system so largely made up of four-track lines the enormous freight train mileage is a significant item in a record of safety, for to keep passenger trains safe it is necessary to maintain high standards also in the construction and operation of the freight tracks and freight cars. The passenger death record here given for the 118,000,000 train miles in two years is the same as that of the railways of Great Britain and Ireland for the same two years—one death in each case. In Great Britain during that time the passenger train mileage was probably over 500,000,000, and the freight train mileage about 330,000,000. Looking at percentages alone this might seem to indicate that the British railways are three or four times as safe as the Pennsylvania; but to see the unreliable character of comparisons between such exceedingly attenuated ratios as 1 in from 300,000,000 to 3,000,000,000, we need only observe the record of the year 1910, which will include the Stoat's Nest derailment on the London Brighton & South Coast in January, in which 8 persons were killed. This will reduce the British roads' ratio of safety, in the item which we are considering, from 1 in 3,000,000,000 to 1 in 400,000,000, calculating roughly. The pleasing thing to remember is that both on the railways of England and on those with which comparison is here made, the officers are striving to make the lives of passengers as safe as possible, without regard to the fine-spun mathematical studies of the statistician.

STATISTICS OF RAILWAYS FOR YEAR ENDED JUNE 30, 1908.

The text, twenty-first annual report of Statistics of Railways of the United States, covers the year ended June 30, 1908. An abstract of the preliminary figures, as given out by the Interstate Commerce Commission, was published in the *Railway Age Gazette* of January 10, 1910. With the putting in effect of the classification of expenditures for additions and betterments and the final ruling on the form of general balance sheet statement, the general structure of the accounting system prescribed by the Interstate Commerce Commission and prepared under the direction of Prof. Henry C. Adams has been completed. The general form prescribed for revenues and expenses and freight and passenger statistics has now been in use for some time, and its merits and demerits have been quite fully discussed. The form of general balance sheet, however, was prescribed, effective July 1, 1909, and in his latest report Professor Adams comments on this form at some length. He says that in preparing a balance sheet there are three conflicting interests which the balance sheet may be made to serve—the interest of the management, the interest of the investor and the interest of the public.

Briefly, the interest of the management, according to Professor Adams, is to make the cost of property correspond as closely as possible to the outstanding stock and bonds, and the proper interest of the management should be to make this cost of property as low as possible; in other words, to charge to expenses not only cost of running the property, but also cost of improvement of the property. This ideal management has as its aim the showing of the greatest possible margin between earning power of the railway and interest and dividend requirements. If the betterment of the property is *not* capitalized dividend and interest charges do not increase.

The interest of the investor—and by this Professor Adams apparently means of the stockholder—is to have the showing of the value of the property, over and above the par value of outstanding securities, as high as possible, because of the effect on the market price of the securities. Also, he wants the value of the property, whatever the amount of securities issued against it, to be carried at as high a figure as possible, so that in a dispute as to freight rates the investor may claim a fair return on as high as possible cost of property.

The interest of the public—and this, of course, is the interest that Mr. Adams has in mind when prescribing a form of general balance sheet—demands that the "property ledger should record every item of property which an appraiser would find should an appraisement be undertaken, and from the point of view of the public, at least, the figures entered on the property ledger against the several items of property there recorded should be the amount of money actually spent in creating the property rather than, as the management de-

sires, the amount of securities issued, or, as the stockholder desires, the commercial valuation of the property." As a matter of fact, the public's real interest is better served by a balance sheet drawn up on the lines suggested by Professor Adams as being in the interest of the management than by any other method of making a balance sheet. A fundamental error that underlies Professor Adams' discussion of the balance sheet is in the assumption that were it possible to get at a physical valuation of railway property it would suddenly become possible to determine what is a fair freight rate. The drawing up of a balance sheet is the final step in the rendering of an account by the management of a property to its owners. The intimate relationship and responsibility of a management to the owners of the property should be kept clearly distinct from the general responsibility of a railway company to the public. Freight rates come in the later class of responsibility and should be as utterly disregarded in the discussion of the balance sheet as in practice the form of the balance sheet is disregarded in making a freight rate.

There can be no dispute as to the right of the public to know what is being done, but all of the essential information required by the public is so fully covered by the income statement and the statement of revenue and expenses prescribed by the Interstate Commerce Commission, that it is the public's own fault if they do not know the facts.

The theory on which the balance sheet of the Interstate Commerce Commission is drawn up is that since it is impossible to get a physical valuation of railway properties, the estimate made by the railway management of the valuation of the property on June 30, 1907, will be taken for a starting point, and each year this sum shall be written up, as it is called in bookkeeping, that is, increased by the sum of everything which is spent to better or improve the property. For illustration, we will assume that bare maintenance of a certain property last year cost $1,000,000, and in the judgment of the management the property, to render adequate service to the public and to keep abreast of its competitors, needed an additional $500,000 spent on it for improvements and betterments. The management may decide that half of this sum, $250,000, actually increases the earning power of the property, and therefore it is good business policy to capitalize this $250,000 and issue securities to reimburse the treasury. The other $250,000, in the judgment of the management, who, we must remember, are responsible to the owners of the property to keep its earning capacity unimpaired, ought properly to be charged to the income from the property this year. Thus far good business management and the theory of the commission agree, but now good business demands that this sum be charged to expenses and entirely written off, so that the balance sheet will show only an increase of $250,000 in the value of the physical property owned.

The commission holds that this $250,000 spent from income has increased the value of the property by just that much, so that the balance sheet shows a total increase of $500,000, and that since the sum of $250,000 was spent from income and was not capitalized, it is a liability of the business to the owners, that is, the stockholders. Therefore, $250,000 is credited on the balance sheet as a liability under the head of appropriated surplus, there is no guarantee to a stockholder that at some later time the management will not capitalize this appropriated surplus. The theory that everything spent on the property which does not come under the head of expenses (theoretically determined by the commission) adds to the value of the property may be good theory, but it is unquestionably bad business.

If the stockholder is injured through a mistake in the theory of the commission he has no means or redress; if he is injured through the bad business judgment of the management he can at least change the management.

RAILWAY BONDS IN EUROPE.

In 1906 the Pennsylvania Railroad placed successfully a loan of $50,000,000 with a French syndicate which took and marketed that amount of 3¾ per cent. 15-year bonds. The next year came the so-called "European loan" of the New York, New Haven & Hartford—$27,985,000 twenty-five year 4 per cents, taken by a French and German syndicate. These two may be considered pioneer loans of the kind; and, in the case of the New Haven's loan, the experience of the high rate paid when subtractions were made for taxes and commissions was not then such as to encourage a repetition of a foreign loan venture. In the interval of three years since then, the home market, except during the last six months, has been, generally, able to digest new railway bond issues. During a large part of the time, as was natural in a post-panic period, investors turned to good railway bonds—included in that term being the large issues of short notes of dividend-paying companies—as alternatives to securities of a junior type and more speculative. With the return of prosperity, owing to various causes, not only has the American bond market narrowed but the interest rate requirement has increased. Railway companies have, therefore, during the last few months been turning to foreign markets. Including the St. Paul issue of $50,000,000 fifteen-year 4 per cents, the total negotiations in England, France and Germany, since January 1, 1910, have been probably well up toward $300,000,000.

There is one feature of this striking movement which does not seem to have been noticed or, at least, not sufficiently emphasized. Practically all of these bond placings have been those of American steam railway corporations. One loan of a prosperous telephone company, amounting to $15,000,000, appears to have been the only noteworthy exception; and the failure last year—though due to government intervention—to secure French listing of United States Steel stock is in this connection a point worth passing notice as evidence of the foremost place of the railway in the foreign investor's mind. This is logical and, in a sentimenal investment sense, psychological. The European investor apparently resembles the American investor in his views on the railway security. The railway is an old institution. Under honest conditions of operation and with fair judgment in the original project it has demonstrated its stability and value. It has survived the shocks of panic and of legislative attack, and, in many cases, even the deeper perils of "high finance." Naturally the conservative foreign investor first turns to it. In our own country the historical order of conservative railway investment has been first the property near home; second, the property further away ranging from the old frontier to the Pacific; and, later still, there has been considerable diversion of railway investment into street railway and industrial securities, attracted by the higher rate of interest, and which, but for stock watering, would have come sooner. The foreign investor is now at that secondary stage when from ultra-conservative and low return investment at home he turns to conservative investment away from home—with the railway most prominent in his fiscal eye. And the old investment demand for the American railway bond, large as it has been and "digesting" a big amount of securities, promises to grow larger still and more systematic. The European private transaction is expanding into the syndicate transaction.

Looked at from our own side of the Atlantic there are some other interesting phases of these foreign bond dealings. It is undoubtedly true that the railways are paying—in the interest rate—a high price for these foreign sales. The rate of the St. Paul loan, for example, with syndicate profits, commissions and taxes out, is estimated at from 5.10 to 5.50 per cent. annually, and other loans probably run still higher. At such a high return as that it would seem as though our home market ought to absorb a promise to pay of a strong dividend-paying railway. There is, however, a more ultimate and far-sighted view taken by some, at least, of the railway

financiers. The large loans abroad are at bottom an exploitation of a new field of investment. As their high security becomes evident to the foreign investor, and also more familiar, future loans of the kind can be negotiated on better terms. The loans break the way for a broader foreign market hereafter, at the same time relieving the home market of any glut of bonds; and finally, by reflex action, very likely lowering the interest requirement and rate here as well as abroad. Nor is it a bad thing for us in times of railway legislation to have the foreigner holding the security for which we have received the cash. Admit that he spends the interest abroad—or most of it—yet is this country the richer by the added earning power of the railway plant built by exotic funds. One may even go further and cite a certain added respect by nation and states for the foreign-held debt, shared by every legislator except the one of the type of him who years ago was the inverted hero of the phrase, "What have we to do with abroad?"

Assuming that the negotiation of railway loans abroad reaches large proportions, it has, on the other hand, both its limits and its perils. Its limits may be somewhat vaguely descried in its drain of foreign capital, the consequent higher interest to be obtained by the foreign investor in his home market, and, possibly, new governmental limits in the form of high taxation, already prejudicial to the loans in France. In the line of positive danger is the probability that the success of conservative railway bonds in Europe will later tempt the foreign investor into other bonds less conservative, where final defaults would seriously impair our foreign credit. It is here that the call comes for the foreign bankers and syndicates to be on the watch lest their gilt edged underwritings be followed by speculative underwritings. To them, even more than to the individual investor, the *caveat emptor* applies. The new movement should blaze the way to higher railway credit, not lower. And along with the satisfaction that the foreigners are taking *en bloc* our railway bonds, first should go rational precaution that the foreign investor should not suffer at the last.

NEW BOOKS.

Bridge and Structural Design. By W. Chase Thomson, Assistant Engineer, Dominion Bridge Co., Montreal, Que. The Engineering News Publishing Co., New York. Second edition. Cloth; 6 in. x 9 in.; 192 pages; illustrated. Price, $2.00.

The draftsman or designer who is not a graduate of a technical school is handicapped by his lack of acquaintance with mathematics, mechanics and the properties of materials. In a few offices classes are formed for instruction, and to some extent the gulf between graduate and non-graduate draftsmen is bridged. In 1905, Mr. Thomson published a little book containing lessons given by him to draftsmen employed by the Dominion Bridge Co. The language was plain and the mathematics simple, so the book became popular with the men for whom it was intended. This second edition has been entirely rewritten and the number of pages nearly doubled. Chapter I contains definitions, composition and resolution of forces, the lever and moments. Chapter II treats of shearing and bending stress in beams with formulae relating to beams and gives worked examples for beam sizes. Chapter III discusses deflection of beams, and Chapter IV columns and struts. Chapter V takes up loads and unit stresses with rivets and riveting. The remaining chapters contain worked examples of structures, those discussed being, in order: Example in Office Building Construction; Design of a Simple Roof Truss; Design of Roof Truss Supported by Steel Columns; Design of a Plate Girder; Design of a 50-ft. Through Warren Girder Highway Bridge; Design of a 120-ft. Pin-connected Pratt Truss Highway Bridge. The simplicity and clearness of statement of the first edition have been preserved in this new edition. It would be difficult, well-nigh impossible, to simplify the mathematical work. No calculus is used and the equations given are elucidated by worked-out examples.

CAR LOAD RATINGS AND MIXED CAR LOADS.*

BY R. N. COLLYER,
Chairman, Uniform Classification Committee.

The year 1887, which witnessed the establishment of the Interstate Commerce Commission and the nationalization of public regulation of carriers, also marked the important step toward classification uniformity, when the Westbound, Eastbound, Joint Merchandise and Middle and Western States Classifications were merged into the Official Classification. The publication of this consolidated issue was the signal for an attack on the carriers, of great importance at the time, the effect of which seems to be very clearly in evidence to-day.

Complaint was made against the several eastern trunk lines by Thurber and others representing the New York Board of Trade; by T. L. Greene, of New York, manager of the Merchants' Freight Bureau and representing 281 retail merchants in six different states; and by F. H. Leggett & Co., of New York. Although these cases are based on the complaints of different parties, the principles underlying them are the same, and because the commission in its decision laid down several fundamental rate and classification propositions, and because the immediate and later effects of the cases have apparently been so far reaching, I wish to direct your attention to them in some detail.

The complaints alleged violations of sections 2 and 3 of the act (which forbid unjust discrimination and undue or unreasonable preference or advantage). The objection to the new classification was stated to be that it classified a great number of articles, particularly grocery staples, in less than carload quantities, at a higher rate than they were classified in the former Westbound Classification, which made fewer distinctions between carload and less than carload quantities. It was further claimed that the difference in rates between C. L. and L. C. L. shipments was too great, and was not justified by the difference in the cost of transportation, and therefore constituted an unjust discrimination prohibited by the Interstate Commerce Law. The complaints filed August 1, 1887, were argued through 1888 and determined in 1890.

The cases possess unusual interest for us from a traffic standpoint, because in them (a) the jobber makes his plea for classification construction calculated to conserve his interests in shipment from the eastern distributing points; (b) the carriers in a successful defense of the classification make it clear that their interests from the standpoint of net revenue warrant the establishment of carload ratings, and incidentally that insofar as this may favor the eastern producer and hurt the eastern jobber, the eastern carrier accepts the responsibility for that result; and (c) finally because in these cases the equity of higher rates for less carload than for carload quantities of freight is upheld and the resulting discrimination is justified.

In meeting this attack the trunk lines made an exhaustive study of conditions surrounding the transportation of carload vs. less carload freight and while we cannot get into the case thoroughly we may judge their views by several quotations from the argument prepared by Albert Fink, then commissioner for the trunk lines:

"From statements, comprising not only the result of observation at New York, but at other points in the country, the great difference in weight in loading a car with miscellaneous freight and with carload freight is fully established. This marked difference is not the result of any local or accidental causes, but is founded in the fixed and permanent conditions under which C. L. and L. C. L. freight has to be transported. In regard to carload lots entitling shippers to lower rates a guarantee is given that a certain amount of tonnage will be forwarded in one car on the same day, which tonnage utilizes the carrying capacity of that car to its full, or to a considerable extent. In the case of miscellaneous freight no such guarantee is given. This freight is offered in small lots directed to many consignees at different destinations, and the carriers assume the risk of getting a sufficient quantity of freight to utilize the carrying capacity of the cars. The freight must be forwarded, whether there is a sufficient quantity or not. As a rule it is found that there is not, and most of the cars have to be forwarded

*From a paper read before the New York Traffic Club, April 26, 1910.

with comparatively small loads in them. It may happen sometimes, as is likely to be the case with freight destined to large trade centers, that a sufficient quantity of miscellaneous freight can be collected together to make a full carload or a load equal to the prescribed C. L. lot minimum weight, but these cases are the exception to the rule. This is fully proved by the fact that the average load of miscellaneous freight, per car, is so small. If there were many such cases it would raise the average weight of miscellaneous freight per car more nearly to the average carload quantity.

"Assuming that the average load of miscellaneous freight is 7 tons per car, and the average load of carload freight is 15 tons, which is the highest average loading of L. C. L. freight, and the highest of C. L. freight, as ascertained by observation on the different trunk lines, the cost of hauling L. C. L. freight would be 47 per cent. greater than C. L. freight. Taking the lowest average of C. L. freight at 14 tons, and the lowest average of L. C. L. freight, 4.3 tons, the increased cost of L. C. L. freight as compared with C. L. freight would be 100 per cent. If an estimate were based on the highest average C. L. and the lowest average L. C. L. shipment, the difference would be still greater.

"While it is impossible to fix exactly the difference in cost, there can be no doubt that the limits of these differences may be considered to lie between 47 per cent. and 100 per cent. This, however, does not include the increased cost of the terminal expenses, handling, loading and delivering L. C. L. freight, which at New York are shown to be 3 cts. per 100 lbs., and which is greater at local stations than at large terminal stations, nor does it include the additional cost of such miscellaneous or L. C. L. freight as has to be transferred en route to destination, which is about 2⅓ cts. per 100 lbs.; neither does it include the increased cost of hauling and distributing small quantities of freight between the local stations of a road, which is very considerable, as compared with the cost of carload or through freight."

Several sound propositions were enunciated in the Interstate Commerce Commission's decision, but the most tangible result to complainants is found in the following:

"Under the Official Classification, the articles known in trade as grocery articles are so classified as to discriminate unjustly in rates between carloads and less than carloads upon many articles, and a revision of the classification and rates to correct unjust differences and give those respective modes of shipment more relatively reasonable rates is necessary, and is so ordered."

Your attention has been invited to these cases because of their having been the force which accelerated the tendency toward an increase in the proportion of carload ratings. The classifications which in 1887 were merged into the new Official Classification show the following comparison in articles classified:

Classification.	Articles classified.	Carload items.	Percent. of C.L. to total.
Middle and Western States	1,689	905	54 per cent.
Eastbound	1,763	773	44 "
Westbound	1,021	137	14 "
Official No. 1	2,580	1.211	46 "

The eastern carriers having made a pretty fair start in the number of carload ratings, a valiant defense of the carload principle and a strong case for the economic soundness of the carload unit, it is interesting to note the logical result, in the steady increase in the proportion of carload ratings to the whole number of items classified, as shown in succeeding issues of the Official Classification:

	Ratings		
Official classification effective.	Total.	C. L.	Proportion, C. L. to total.
1. April 1, 1887	2,580	1,211	45 per cent.
4. Aug. 15, 1888	2,093	1,674	54 "
6. Aug. 15, 1889	3,571	2,012	56 "
8. Feb. 2, 1891	4,523	3.015	66 "
31. Jan. 1, 1908	5,852	4,325	72.4 "

It will be noted that during the time in which the cases were being argued the proportion of carload ratings increased from 46 per cent. to 56 per cent., and that in the year of the decision this proportion mounted to 66 per cent. This was followed by a slight recession and then the proportion increased gradually to the present figure of 72.4 per cent.

I have referred to the change in the situation westbound from the East, because it serves to illustrate the growth of the Official Classification away from the other classifications in this important matter, to wit: the establishment of carload ratings for the express purpose of encouraging the movement of freight in carload quantities, as contrasted with the establishment of carload ratings only when and insofar as the fostering of commercial interests made carload ratings necessary.

This difference in practice is at the root of a very live issue in the construction of a classification to apply throughout the country. In Mr. McCain's report, to which I have referred, the relative proportion of carload to less than carload ratings in the western and southern territories is shown in the following tables, to which I have added the figures representing present conditions:

	Classification					
	Western.			Southern.		
Year.	T'l items.	C. L.	Ratings, per cent.	T'l items.	C. L.	Ratings, per cent.
1887	1,672	666	39.83	1,177	175	14 87
1893	3,658	1,731	47.32	1,752	270	15 41
1908	5,229	1,690	29.8	3,503	773	22 1

It will be seen from the foregoing that while in the Official Classification there has been a steady growth both in the number and in the proportion of carload ratings to the whole number classified, in the Southern Classification there has been a much smaller growth in number and proportion, while in the Western Classification there seems to have been a slight increase in number and a radical decrease in the proportion of carload ratings to the whole.

It would seem unnecessary to do more than remind you that the manufacturer's interest usually lies both in the receipt of raw materials and in the outward movement of products, in round lots, while the jobber who may take in the carload is interested in redistribution over the widest range of territory possible on any quantity basis. It is obvious that the eastern lines with the great preponderance of manufacturing interest will find self-interest in one direction, while other territories with a different commercial balance, will view the question each as its own self-interest indicates, and that this attitude of the lines on these questions will be modified by commercial changes growing particularly out of increases in manufacturing.

P. W. Doyle, Commissioner of the Traffic Bureau of the Business Men's League of St. Louis, has outlined what seems to me to be not only the full flower of the jobber's view of rate making, but also the complete antithesis of the manufacturer's view as represented in the Official Classification principle of carload ratings. While these are Mr. Coyle's personal views and will doubtless be held by some to be academic and impractical, I am glad that in this expression the jobbers' theory of distribution has been followed to its logical conclusion.

I placed them before you with greater pleasure because of the frank avowal of selfishness therein, an acknowledgment which in no way weakens the force of the presentation from his standpoint:

"This Bureau stands on the general proposition that there should be no carload ratings except on articles requiring the entire use of the car for their transportation, such as basic commodities, structural material, or agricultural products, etc., shipped in bulk.

"We are a jobbing and distributing community, and applying the element which always exists in trade—selfishness—we do not desire to stimulate the growth of other jobbing or distributing interests, but aim to distribute our commodities as far as possible, direct to the retailer or consumer. While this policy, we believe, redounds to our interest, it must necessarily also redound to the interests of the carrier.

"We contend, as a matter of principle, that there should be but one unit of weight as the basis of rating, except, of course, as to the cases above enumerated; or that when the carload unit is also used on commodities taking less than carload rates, there should be no greater difference between the C. L. and L. C. L. ratings than that which can be measured by the expenses of handling which is borne by the shipper instead of the carrier, and the element of risk, which may be avoided by more careful or secure loading as a result of the method of loading by the shipper. Any greater difference we believe should be viewed, and quite reasonably so, as an unreasonable discrimination in favor of the carload shipper. It may be said in support of a greater difference between C. L. and L. C. L. ratings that the average per car loading is greater under the C. L. rating. If that be true and is a proper element to be taken into account as between individuals or commodities, we believe it should be applied as between shippers or committees.

"In connection with this Bureau we have a committee for the purpose of scrutinizing the quality of transportation furnished by the several lines radiating from this city and based upon the facts which we are thus able to obtain, the facilities of the Bureau are used with a view to so concentrating our shipments as to give as great daily tonnage as possible to the lines furnishing the best service. In this way we largely increase, and practically guarantee daily movement of less than carload shipments in carloads.

"Therefore, if the average loading is to be taken into account as an element of rating, we should have a lower rating on shipments thus handled in through package car service. Obviously, however, this would be a discrimination in favor of the shippers using the package car service as against other less than carload shippers or other communities where such shipments could not be thus concentrated; but as we view it, a no greater or more unreasonable discrimination than taking into account average loading as an element in making carload ratings. On the other hand, it might quite reasonably be contended that the carriers should have greater compensation for handling shipments in carloads, because of the better or more expeditious service which can be rendered on shipments thus handled. Hence, viewed from that angle, if there should be any discrimination in the rating of packages or general merchandise shipments, it might, in our estimation, be more reasonably based on preferred service than on the double unit of loading."

There opinions are recognized as being widely at variance with the practice of the Eastern lines, but in so far as they are in agreement with the practice of Western and Southern lines they must be faced in the effort to reach uniformity in classification.

I suppose we may assume that ethically there should be one rate unit for any given article offered for shipment between specified points, in a specified form, and that the carrier as a public servant is not justified in recognizing quantity as an element that justifies differing rate units.

Certainly there is no inherent right to a rating for freight proportioned to quantity. As an abstract question of right there should be no variation of the charge per unit for any given service offered by a public service corporation, dependent upon quantity. Otherwise our boasted equality of privilege would take flight. If there is one rate per unit dependent upon the shipment of 100 lbs. of freight, and a less relative charge for the movement of 30,000 lbs., in theory the lower cost unit should be followed into trainloads, as well as to carloads. Many traffic men, failing to see that the C. L. rating is a discrimination, although justified, fall into the error of supposing that the carrier can base rates on quantity beyond carloads. Practice and the authorities have recognized that a carload unit may be justified by difference of expense in handling, but beyond the carload there has been, so far as I know, no unit of charge for a greater quantity at a lower rate, nor can there be, without great danger to carrier and public alike.

The carload movement of freight is a thing of growth from small beginnings and the normal rate may be accepted as the smaller unit, the one within the reach of every shipper; therefore, it seems reasonable to assume that until the growth of business has shown the necessity for a carload rating, no such rating should be made.

When the time has arrived for the establishment of a carload rating, that rating should be made largely with respect to the lesser quantity rating previously established and the spread between the ratings should be made with respect to the carriers' approximate saving in transportation.

Unless some unusual conditions exist there should be no such spread as between first and fifth class, which on the New York-Chicago scale represents an advantage for the carload shipper of 150 per cent. as compared with his smaller competitor. There is no ordinary condition of transportation warranting such a spread, and its existence is hazardous alike to the carrier and the public. On this the commission said:

"A difference in rates upon carload and less than carloads of the same merchandise between the same points of carriage so wide as to be destructive to competition between large and small dealers, especially upon articles of general and necessary use, and which, under existing conditions of trade, furnish a large volume of business to carriers, is unjust and violates the provisions and principles of the act."

In Mr. Fink's able presentation, the average per car loading for merchandise from New York by all lines was shown as between 4.3 tons and 7 tons. Since that time there has been an intensification of competition for merchandise from New York, a large increase in the distribution of merchandise cars and a steady increase in the number of carload ratings, and I am satisfied from inquiry that the eastern line merchandise loading will not exceed 10,000 lbs. per car under favorable circumstances, and this figure approximates the minimum figure cited by Mr. Fink 20 years ago. One of the eastern lines making a specialty of merchandise movement has favored me with advice of averages which also indicates that so far as that company is concerned there has been no increase in the average merchandise tonnage per car, while the report of the same company indicates an increase of 60 per cent. in the average loading of C. L. freight. These figures cannot be expected to more than approximate the true condtion, but there can be no question as to the great improvement of the average per car tonnage, and if the per car loading of merchandise has shown no great improvement, and of this I am satisfied, the situation is certainly signifi cant.

If conditions were otherwise normal, we would find that in the eastern territory, because of dense population and intense producticity, there is a heavier average loading per car for merchandise than is found in the West or South. Information as to the loading on representative western lines shows an average loading for merchandise cars from main terminals above 15,000 lbs. and relatively heavy loading from other points; while another large granger line shows an average of seven tons for 5,618 merchandise cars. One of the large southern lines shows loading from three terminal points 29,917 merchandise cars, average 12,874 lbs. Another southern line shows average merchandise loading at terminal points running seven, eight and up to 14 tons average. Still another southern line shows above 2,500 merchandise cars from one station with an average above 14,000 lbs.; from other points 683 cars average above 22,000; 1,355 cars average above 13,000 and 1,058 cars average above 14,500 lbs.

These figures only go to show, as might be expected, that with a greater number of any quantity ratings, the tonnage of merchandise cars would be greater, but this point is emphasized by the results shown in these sparsely settled territories.

The most marvelous development of traffic and railway earnings in the last decade has been in the southern and western territories. Am I mistaken in saying that seven out of eight of our leading eastern lines have western men at their heads, and it is to be supposed that they were all wrong in their western views and are all right in the eastern view? You may reply that these are questions of traffic rather than of operation, and that the preference for carload movements is eminently fitting for the eastern traffic situation. I would remind you that the root of the question is whether it is to the carriers' best interest to engage in retailing transportation or to hold out the carload rating as an inducement to the shipper to concentrate and handle freight in carload quantities.

It will be said, furthermore, that expense for terminal service is a fixed charge, that the proportion of terminal expense increases rapidly with the decrease in average rate, and that this will particularly affect the eastern lines, but this is as true with regard to carload as to less carload freight. It seems to me to be not entirely sound to figures that all of the elements that enter into the cost of transportation of less than carload shipments can be regarded as representing a saving by moving the freight in carloads. For instance, a large element in the expense of handling less than carload shipments is represented in the transfers and light car movements, in connection with distribution of freight in local trains; the carload movements do not in any material way displace the movement of less than carloads to local points. Carload freight, other than heavy commodities, moves most generally to the centers to which merchandise moves in through cars well loaded. Furthermore, the L. C. L. rating is presumptively made to cover the expenses incident to L. C. L. transportation.

The question as to what constitutes a common ground seems to be one of fact; given a general recognition of the commodity as being one entitled to a carload rating in any territory, it follows naturally that if there is a genuine carload movement of that commodity there should be continuance of the carload rating. There is no definite rule as to what constitutes a genuine carload movement, but we may hope that when a case now before the Supreme Court has been determined, we shall know more as to the carriers' rights; whether regulations may be made with the discriminating judgment and discernment characteristic of successful industry, or by the more stolid inflexible methods shown in governmental departments.

Pending this adjudication by the Supreme Court, I strongly adhere to the proposition that the carriers, having the right to make reasonable regulations, have not exceeded that right in requiring a common ownership as condition to carload ratings, when such regulation is necessary to protect the carriers from loss through collusion, generally instituted by persons not legitimately parties to the transportation transaction. Beyond ownership, the freight should, of course, be subject to one shipper, one consignee, and one bill of lading requirements. Necessity, rather than quantity, should determine the establishment of C. L. ratings; not whether goods are produced or can be offered for transportation in large aggregate quantities, but rather, whether the individual who finally says the freight is consuming the commodity so steadily as to make the item of freight charges thereon a matter of considerable concern to the public.

Obviously this would limit to L. C. L. ratings the articles which are in themselves rather the fruits than the instruments of industry. Articles that are traffic producers, such as fuel, raw materials, productive implements or machinery, building materials and goodstuffs, other than luxuries, should have pre-eminent consideration as C. L. commodities, and are generally so treated.

The determination of carload ratings on this basis will materially reduce the number now provided in the Official Classification, while it will generally increase the number in the Western and Southern Classifications. If because of territorial conditions such a carload rating is utterly repugnant to the lines in any territory, or if the carload movement is localized, between two manufacturers for instance, and not likely to be legitimately extended in other territories, there would seem to be no reason why the carload provision should not be taken care of by commodity issue as a substitute for the carload classification provision.

Those of you who have followed me through these devious paths have probably anticipated my arrival at the question of the mixed carload provisions of the several classifications. The Official Classification theory of carload ratings has its corollary in rule 10, which has been in the Official Classification since the first issue without material change. Rule 10 reads as follows:

"When a number of different articles of the same class are shipped at one time by one consignor to one consignee and destination, in carloads, they shall be taken at the rate of 100 lbs. for such class in carloads, and at the highest minimum carload weight provided for either of the articles, actual weight to be charged for if in excess of the minimum weight. If the articles (provided with L. C. L. and C. L. rating) are of more than one class, the carload weight and the minimum carload weight attaching to such rate for the articles in the highest class shall be charged on all the articles that make up the carload, actual weight to be charged for when in excess of the specified minimum weight, excepting as provided in Rule 7(A); and also excepting that where the actual or estimated weight of the articles in any one class equals or exceeds the minimum carload weight (actual weight if in excess of the minimum weight) and carload rate provided for same, and the other articles may be charged for at the L. C. L. class rate to which they belong."

Such a rule is the legitimate offspring of the theory that the carrier is the beneficiary in almost any movement of freight in carloads as compared with the movement of the same freight in smaller consignments. If the theory is sound it is difficult to see why the forwarding company, whose business and profit is in relieving the carrier of the concentration and distribution of merchandise, is not a genuine benefactor instead of the freight scalper and seller of illegal transportation that he is represented to be.

The Official Classification Rule represents a practice that differs materially from the Classification practice in the West and South.

From the standpoint of equity the rule is to be commended strongly, in that it is applied without discrimination and applies practically throughout the Classification. But so broad an application does not seemed to be called for by commercial considerations and insofar as it extends beyond commercial necessity it is obnoxious in principle to the Western and Southern Lines.

There seems to be no sound reason for including in the provisions for mixed carload ratings articles that are widely dissimilar in nature and rating, and if such articles are gathered and shipped in carloads, there may readily come in a freight rate adjustment that gives to certain shippers an undue if not unfair advantage over smaller competitors.

It would seem possible to somewhat restrict the application of this rule with mutual advantage and without material hardship to any legitimate traffic movement. The question as to what commercial necessity is comes to the front immediately and it is in the method of determining this that the danger of unwitting discrimination lies. It thus becomes the task for an expert, without bias, to determine what mixed carload ratings are justified by conditions, and to most men in the traffic world the qualification "without bias" would seem to be almost equivalent to being "without practical experience."

In such matters the classification should certainly be consistent within itself, and prejudice or territorial interest should not prevent the establishment of specific mixed C. L. ratings hitherto unrecognized, when articles produced and sold under similar conditions are under consideration. The Western and Southern Classifications have consistently opposed miscellaneous mixed car movements. Their theory seems to be that every rating represents within itself the satisfactory charge for the transportation represented and that no occasion exists for encouraging the shipper to perform terminal service at the carrier's expense; hence it is not the practice to provide carload ratings or provisions for the express purpose of encouraging shipments in carload quantities, and when carload ratings are provided they are supposed to represent a legitimate commercial necessity and a genuine carload movement.

If the suggestions set forth in the foregoing mark out the ground on which the territories can get together, then there can be in a uniform classification no room for a mixed carload rule such as Rule 10 of the Official Classification, nor can there be included therein any provision for carload ratings on articles that are not known to move in carload quantities. In the absence of a general rule providing for mixed carload ratings such mixtures as are commercially necessary would of necessity be provided for specifically. Likewise in the absence of proof of carload movement of many commodities now provided with carload ratings, such carload ratings would be discontinued.

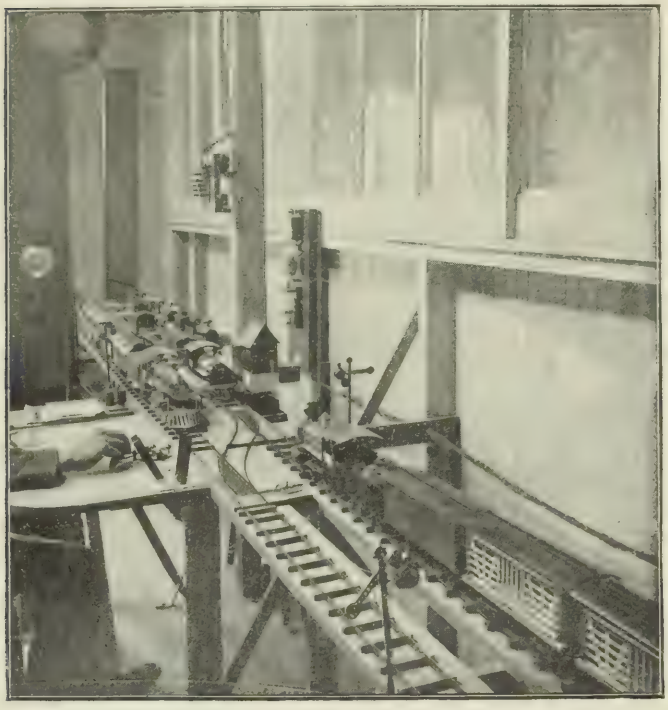
It has seemed to me necessary to place these differences in classification principles in sharp contrast. They must be recognized. Uniformity of classification can only be attained when these contrasts have been harmonized. The demand for Uniform Classification has come from the commercial interests. The carriers have responded, not sparing thought or expense. The carriers can bring the work to a successful issue with fair consideration for conflicting interests.

You shippers should be prepared to prove the genuineness of your interest in the work, by a spirit of concilliation within your own ranks; you should readily concede non-essentials, and take a liberal view as to what the essentials really are.

THE ELMIRA SCHOOL FOR STATION AGENTS.

The Railway Commercial Training School, 156 Lake street, Elmira, N. Y., is a complete establishment for giving young men the kind of schooling necessary to make them station agents, and it has been in successful operation for five years. On April 30 of this year the number of pupils in the school was 33, and the number enrolled since the beginning of the school is 262. The manager of the school is E. E. Tingley, and his principal assistant is L. J. Baird. The school is an independent establishment, but it is fostered by the Erie Railroad, and a large proportion of its graduates are now in service on that road. Mr. Tingley is an experienced train despatcher. Instruction is given in all of the different kinds of work that have to be done in the office of a "one man" railway station.

In learning telegraphy the student is established as in charge of an imaginary telegraph station on a short circuit, and, in addition to this, a train wire on which orders are



A Station on the Elmira & Southern Tier Railroad.

being constantly sent is run into the school so that students can be trained in copying actual messages.

Block signaling practice is taught by means of a miniature railway with actual trains propelled by electric motors, and there are crossover tracks, miniature signal cabins and other appliances to make the operations as nearly true to life as is practicable. The small signals along the line are so arranged that when cleared by the operator they turn on the power in the engine, and when set at stop they turn off the power so as to cause the stopping of the approaching train. Full size signals are also set up in the school room as object lessons. Pupils are taught to block from station to station by Morse telegraph, by telephone and by bell code.

In freight office work everything is done as for a station of an imaginary road the "Elmira & Southern Tier," and almost everything has an air of reality except the consignors and consignees. The principal guide is a manual prepared by E. W. McKenna and George B. Cochrane. Mr. McKenna is now a vice-president of the Chicago, Milwaukee & St. Paul, and Mr. Cochrane, now deceased, was formerly a vice-president of the Erie in charge of the traffic department. This manual opens with an introduction of about 20 pages, from which the novice can get a fair general idea of the whole philosophy of organizing, building and operating a railway. Following this, the duties of the agent are explained at length, the whole book filling 140 pages. Indeed, the first criticism that occurs to the reader is that there is a great deal of matter in the book which the young beginner either cannot fully comprehend or else, if he can comprehend it, will spend his time rather unprofitably in studying it. That is to say, there are many details which he will study with profit only after he needs them in actual work. This, however, is no detriment to the book so long as the teaching is in the hands of one who rightly guides the pupil.

Lectures are given occasionally by a railway officer.

In all of the freight office and ticket office work the students are required to carry on actual transactions as much as possible. Regular ticket cases are provided and sales are made. School "money" is used as in ordinary business colleges, and cash accounts must be balanced as rigidly as in real life. The student is drilled daily for about three months in the proper method of dealing with freight forwarded and freight received, so that he becomes familiar with all of the usual blanks.

Pupils may enter the school at any time, and the teachers calculate usually to graduate them in six months, though sometimes a longer time is required. No vacations are provided for. The entrance requirements are rigid, as the manager has no desire to spend his time on pupils who are not likely to graduate. All who complete the course satisfactorily are offered positions at stations.

The average age of the students is from 17 to 21 years, though suitable candidates are accepted between 17 and 25 years. There are generally a few young women in the school and a good number of these have made satisfactory station agents. The tuition for the complete course is $30, which includes all necessary stationery and other supplies. In many cases graduates who complete their work at a time when there is no opening exactly suited to them, take a post graduate course of four to eight weeks as assistant to the agent, at a small station, and are paid at the rate of $25 a month while thus learning. If there is an opening for an assistant at a station where an assistant is regularly employed the graduate may stay much longer than six weeks, or until he can be promoted.

Total number of students thus far taught in the school, as before stated, is 262. The details are as follows:

In railway service	133
Left school before finishing course	58
Left railway service after being appointed	38
In school April 30	33
Total	262

Graduates are now in the service of the Erie, the Delaware, Lackawanna & Western, the Pennsylvania, the Lehigh Valley, the Buffalo & Susquehanna, the Delaware & Hudson, the New York Central, the Central of New Jersey, and other roads.

The illustration shows one of the stations on the miniature railway in the school. The train on the main track nearest the operator is westbound passenger train No. 3. A westbound freight has been set off on the eastbound track to clear the road for No. 3. Two trains consisting each of an engine and a caboose, and a third, consisting of an engine only, are standing on the side track east of the station and south of the main line. The eastbound freight is held by the home signal in the center of the picture. The toy semaphores shown in the illustration were made in Germany. Since this view was taken these have been superseded by signals of home manufacture.

The Danish railways have done away with the first-class on all trains except those which connect with foreign trains. An examination of the earnings of the different classes of cars has shown that, for the same capacity, the first-class cars earn less than two-fifths as much as the second and third-class cars.

TRACK-LAYING MACHINE RESULTS.

The Erie & Jersey, a low-grade freight line built by the Erie Railroad, extends from Guymard, N. Y., to Highland Mills. In order to insure operation by January 1, 1909, and for economy, it was decided to use a track-laying machine. The grading was far enough advanced to allow the track-laying to start in the latter part of August. This gave a limit of four and a half months in which to lay and ballast two tracks over 40 miles of line. The Hurley machine (*Railroad Gazette*, March 13, 1908) was used, and we are indebted to C. K. Conard, assistant engineer, for the following:

After many trials with fewer men, it was found that the best results were obtained with 50 men, working as follows:

1 General foreman.
1 Foreman.
1 Lineman stretching a light rope at proper offset distance from center line.
2 Tie spacers.
1 Tie marker, placing marks on ties so that center of tie will be set midway between rails.
1 Clamp man, applying hoisting clamp to rails before lowering.
1 Clamp man on ground disengaging hoisting clamp and steadying rail.
8 Spikers, four to each rail.
4 Nippers, two to each rail.
2 Bolters, one to each rail.
1 Clamper, holding angle bars for bolts.
2 Barmen, holding rail to gage.
1 Spike peddler.

25 Total in front of wheels of machine.

1 Engineer, in charge of the machine.
1 Assistant, working rail conveyor, as rails leave the friction rolls.
1 Bolter, removing bolts as rails leave the roll.
1 Fireman.
1 Watchman (night).
2 Feeding ties to dogs at rear of machine.

7 Total on machine.

2 Breaking out ties.
8 Spacing ties.
1 Watching and guiding ties.

11 Total attending to the ties.

1 At rear hoist.
1 Advancing rails on rollers.
2 Placing angle bars, and one bolt on front end of rail.
2 Bolting to forward rails.
1 Tightening bolts.

7 Total feeding the rail.

Cost of Laying Track.—Nearly all of the second track on the Erie & Jersey was laid by hand. As most railway companies are familiar with this cost on their own line, it seems advantageous to compare it with the cost of the first track in order to give a correct idea of what the cost with the machine would be under the same conditions.

With a machine laying a mile per day the cost was as follows:

Laying Track by Machine.

1 General foreman at $5.00			$5.00
1 Engineer at $5.00			5.00
1 Fireman at $2.25			2.25
1 Foreman at $3.50			3.50
50 Laborers at $1.50			75.00
1 Watchman (night), at $2.25			2.25
Machine, coal and oil			30.00
Full bolting and spiking after passage of machine:			
1 General foreman at $5.00			$5.00
1 Foreman at $3.50			3.50
50 Laborers at $1.50			75.00
Loading material—ties:			
1 Foreman at $3.00			3.00
35 Laborers at $1.50			52.50
Engine and crew			35.00
Rails and fastenings:—			
1 Foreman at $2.00	$2.00		
20 Laborers at $1.50	30.00		
Total	$32.00		
6,963 lin. ft. of rail and fastenings loaded.			
This gives per mile of track	$48.53		
Engine and crew	35.00		
Total rail and fastenings			$83.53
Total per mile of track			$380.53

Laying Second Track by Hand.

Spacing ties, spiking and full bolting 3,000 ft.:			
2 Foremen at $3.00	$6.00		
74 Laborers at $1.50	111.00		
Total	$117.00		
Per mile			$205.92
Loading ties:—			
1 Foreman at $3.00	$3.00		
35 Laborers at $1.50	52.50		
		$55.50	
Unloading ties:			
1 Foreman at $3.00	$3.00		
6 Laborers at $1.50	9.00		
		12.00	
Engine and crew		35.00	
			$102.50
Loading rail and fastenings, same as for machine			48.53
Unloading rail and fastenings:			
2 Foremen at $2.00		$4.00	
28 Laborers at $1.50		42.00	
Total		$46.00	
Above worked four hours		18.40	18.40
Total per mile of track			$375.53

It should be realized, of course, that these figures do not represent the cost of continuing the work day by day; but they are representative figures for each class of work under similar conditions. The cost of laying the first track of a double track railway by hand is variable, depending largely on the accessibility of the roadbed for teams, as the ties are usually transferred from the tie car to the front by this means. The second track should be laid at a fairly regular cost

So far as the track laid by machine is concerned, it is not possible at this date to determine which track was so laid. When laying down grade there is a tendency to open the joints. Clips for the proper temperature expansion are a necessity. From the experience with the machine the following may be accepted: (1) On a new line 25 miles long, or more, the machine will prove economical. (2) The track laid with the machine will be as satisfactory as track laid by hand. (3) The organization will be reduced in number by 150 to 200 men. (4) It is feasible to lay one mile of track per day up to a limit of 12 or 15 miles from the supply base. (5) The danger of injury to men is largely reduced.

BLOCK SIGNAL MILEAGE JANUARY 1.

The Interstate Commerce Commission has issued its bulletin showing the mileage of railways in the United States worked by the block system on January 1, 1910. As in former years the bulletin contains, besides the principal table, which we reprint herewith, other tables, No. 2, No. 3 and No. 4, showing the kinds of automatic signals in use and the methods and apparatus used with the manual block system. By reason of lack of space these supplementary tables must be deferred to a future issue.

The total length of road in the United States operated under the block system on January 1, 1910, was 65,758 miles. Of this mileage, 14,237.7 was automatic and 51,520.3 was manual. There was an increase of 2,047.1 miles in the length of road covered by the automatic block system, and of 4,162.2 miles in the manual system, over January 1, 1909; total increase, 6,209.3 miles.

The present report contains the following roads which have not heretofore reported block signals: Chicago, Indianapolis & Louisville; Cincinnati, Indianapolis & Western; Cincinnati Northern (New York Central Lines); Elgin, Joliet & Eastern;

Name of railroad.	Increase.		Decrease, non-automatic.
	Automatic.	Non-automatic.	
Baltimore & Ohio		116.0	
Baltimore & Ohio Southwestern		914.4	
Boston & Maine	180.1		
Chicago & Alton	248.6		248.6
Chicago & North Western	115.8		
Chicago, Milwaukee & Puget Sound		453.3	
Chicago, Rock Island & Pacific	385.1	733.1	
Delaware, Lackawanna & Western	57.0		
Lake Erie & Western (see note)		853.2	
Maine Central	128.7		
Minneapolis, St. Paul & Sault Ste. Marie		193.6	
New York Central & Hudson River	62.9		55.8
New York, New Haven & Hartford			102.1
Norfolk & Western	71.3		150.3
Northern Pacific	39.8	110.7	
Pennsylvania Company	88.2		89.0
St. Louis & San Francisco	129.8		112.0
Southern		235.8	
Galveston, Harrisburg & San Antonio (Southern Pacific)	125.3		
Southern Pacific—Pacific system	177.6		
Union Pacific	85.5		
Oregon Short Line	40.3		

Principal Changes of the Year.

RAILWAYS WORKED BY THE BLOCK SYSTEM, JAN. 1, 1910.—(*See next page.*)

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and non-automatic.		Total passenger lines operated.		Percentage block signaled (miles of track).
					Total.						Total.						
	Single track.	Double track.	Three track.	Four track.	Miles of road.	Miles of track.	Single track.	Double track.	Three track.	Four track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Atchison, Topeka & Santa Fe:																	
Eastern Lines	4.5	45.4			49.9	95.3	437.2	427.6	12.9		877.7	1,331.1	927.6	1,426.4	2,521.6	3,024.0	47.0
Western Lines	33.4	2.4			35.8	38.2	541.8	23.9			565.7	589.6	601.5	627.8	2,681.2	2,707.5	23.2
Coast Lines	12.9	1.0			13.9	14.9	4.3				4.3	4.3	18.2	19.2	1,751.9	1,754.0	1.1
Gulf, Colorado & Santa Fe	10.8				10.8	10.8	2.1				2.1	2.1	12.9	12.9	1,401.7	1,401.7	.6
Atlanta & West Point							81.0	6.0			87.0	93.0	87.0	93.0	87.0	93.0	100.0
Atlantic Coast Line		2.2			2.2	4.4	395.0	92.8			487.8	580.6	490.0	585.0	3,825.7	4,568.1	12.8
Baltimore & Ohio	16.2	168.5		4.6	189.3	371.5	305.0	596.6	87.0	14.9	1,003.5	1,818.7	1,192.8	2,190.2	3,143.3	4,212.7	38.0
Baltimore & Ohio Southwestern							922.6	49.0		2.2	973.8	1,029.7	973.8	1,029.7	973.8	1,029.7	100.0
Baltimore & Sparrows Point								3.0			3.0	6.0	3.0	6.0	4.7	9.4	63.8
Bessemer & Lake Erie							90.6	104.5			195.1	299.6	195.1	299.6	188.3	292.8	99.0
Boston & Maine	4.5	536.3	0.5	2.1	543.4	1,086.9		4.8			4.8	9.6	548.2	1,096.5	2,238.6	2,801.6	39.2
Boston, Revere Beach & Lynn		13.8			13.8	27.6							13.8	27.6	13.8	27.6	100.0
Buffalo, Rochester & Pittsburgh							297.9	124.1			422.0	546.2	422.0	546.2	422.0	546.2	100.0
Butte, Anaconda & Pacific	7.9				7.9	7.9							7.9	7.9	25.7	25.7	30.7
Caldwell & Northern							2.4				2.4	2.4	2.4	2.4	23.4	23.4	10.3
Central of Georgia							52.3	7.4			59.7	67.1	59.7	67.1	1,915.9	1,915.9	3.5
Central of New Jersey	13.0	165.5	2.4	31.5	212.4	477.2							212.4	477.2	469.7	748.6	63.8
Central Vermont							1.5				1.5	1.5	1.5	1.5	403.3	403.3	.4
Chesapeake & Ohio		48.1			48.1	96.2	1,208.6	256.1			1,464.7	1,735.7	1,512.8	1,831.9	1,527.1	1,856.2	98.7
Coal River							69.3				69.3	69.3	69.3	69.3	69.3	69.3	100.0
Chicago & Alton	416.1	144.9			561.0	705.9	141.2				141.2	141.2	702.2	847.1	998.9	1,143.0	74.1
Chicago & Eastern Illinois		98.4			98.4	196.8	163.8	57.5			221.3	278.8	319.7	475.6	693.0	849.5	56.0
Chicago & North Western		706.4	13.1	2.4	721.9	1,461.7	2,415.5	115.3			2,530.8	2,646.1	3,252.7	4,107.8	6,874.5	7,774.2	47.3
Chicago & Western Indiana		17.8			17.8	35.6		6.3	3.2		9.5	22.2	27.3	57.8	27.3	57.8	100.0
Chicago, Burlington & Quincy		23.0		5.0	28.0	66.0	8,152.5	502.2	19.1	1.4	8,675.2	9,219.8	8,703.2	9,285.8	8,272.5	8,855.1	100.0
Chicago Great Western	.2	7.9			8.1	16.0	264.2	26.8			291.0	317.8	299.1	333.8	1,473.7	1,508.6	22.1
Chicago, Indianapolis & Louisville							537.7				537.7	537.7	537.7	537.7	578.0	578.0	93.0
Chicago, Milwaukee & St. Paul	5.9	42.6			48.5	91.1	3,486.7	385.4			3,872.1	4,257.5	3,920.6	4,348.6	6,550.2	7,266.0	58.4
Chicago, Milwaukee & Puget Sound							1,076.0				1,076.0	1,076.0	1,076.0	1,076.0	1,399.8	1,399.8	76.8
Chicago, Peoria & St. Louis Ry. of Ill	1.2				1.2	1.2							1.2	1.2	226.9	226.9	.5
Chicago, Rock Island & Pacific	319.9	279.6			599.5	879.1	1,151.8				1,151.8	1,151.8	1,751.3	2,030.9	7,554.9	8,018.9	25.3
Chicago, St. Paul, Minneapolis & Omaha		6.4			6.4	12.8	585.5	64.1			649.6	713.7	656.0	726.5	1,478.5	1,563.8	46.8
Chicago Terminal Transfer	.8	5.4			6.2	11.6							6.2	11.6	45.8	66.9	17.3
Cincinnati, Hamilton & Dayton		7.5			7.5	15.0	31.2	20.4			51.6	72.0	59.1	87.0	448.0	481.0	18.1
Cincinnati, Indianapolis & Western							41.8				41.8	41.8	41.8	41.8	381.0	381.0	11.0
Colorado Midland							2.0				2.0	2.0	2.0	2.0	254.6	254.6	.8
Cornwall & Lebanon							8.3	13.7			22.0	35.7	22.0	35.7	22.0	35.7	100.0
Cumberland & Pennsylvania							4.3		3.0		7.3	13.3	7.3	13.3	31.3	34.8	38.2
Cumberland Valley		6.7			6.7	13.4	19.6				19.6	19.6	26.3	33.0	162.2	203.7	16.2
Davenport, Rock Island & Northwestern							40.6	1.1			41.7	42.8	41.7	42.8	41.7	42.8	100.0
Delaware & Hudson	163.6	222.2	4.3	17.5	407.6	690.9	.6				.6	.6	408.2	691.5	743.9	1,042.4	66.4
Delaware, Lackawanna & Western	52.1	473.9	6.2		532.2	1,018.5	5.8				5.8	5.8	538.0	1,024.3	922.1	1,421.6	72.0
Duluth & Iron Range							14.8	2.0			16.8	18.8	16.8	18.8	168.0	240.0	8.3
Duluth, South Shore & Atlantic							4.2				4.2	4.2	4.2	4.2	593.4	593.4	.7
Durham & Southern							56.0				56.0	56.0	56.0	56.0	56.0	56.0	100.0
Elgin, Joliet & Eastern	1.0	3.0			4.0	7.0	9.2				9.2	9.2	13.2	16.2	223.9	269.8	4.9
Erie		62.0		13.6	75.6	178.4	643.5	581.5			1,225.0	1,806.5	1,300.6	1,984.9	2,110.8	2,276.2	85.6
Chicago & Erie							240.4	8.4			248.8	257.2	248.8	257.2	248.8	257.2	100.0
Columbus & Erie							12.6	9.8			22.4	32.2	22.4	32.2	22.4	32.2	100.0
Erie & Jersey		42.3			42.3	84.6							42.3	84.6	Freight line.		
New Jersey & New York		10.5			10.5	21.0	26.1				26.1	26.1	36.6	47.1	51.8	61.3	76.6
New York, Susquehanna & Western and Wilkes-Barre & Eastern							20.7				20.7	20.7	20.7	20.7	208.4	208.4	9.9
Grand Trunk	1.1	1.6			2.7	4.3							2.7	4.3	686.6	1,014.9	.4
Great Northern	8.2	62.0			70.2	132.2	259.7				259.7	259.7	329.9	391.9	7,100.0	7,263.4	5.4
Hocking Valley							74.7				74.7	74.7	74.7	74.7	336.4	385.2	19.4
Illinois Central	28.6	235.1		12.0	275.7	585.5		5.0			5.0	10.0	280.7	595.5	4,122.0	4,996.5	.1
Yazoo & Mississippi Valley	6.6				6.6	6.6							6.6	6.6	1,191.7	1,299.4	.5
Iowa Central							11.0				11.0	11.0	11.0	11.0	502.3	502.3	.2
Kanawha & Michigan	.8				.8	.8	1.3				1.3	1.3	2.1	2.1	162.9	162.9	1.2
Kansas City, Clinton & Springfield							2.5				2.5	2.5	2.5	2.5	156.7	156.7	1.6
Kentucky & Indiana Bridge & R. R. Co							5.6	3.4	.7		9.7	14.6	9.7	14.6	9.7	14.6	100.0
Lackawanna & Wyoming Valley							1.0	2.4			3.4	5.8	3.4	5.8	22.6	43.4	13.4
Lehigh & New England	.7				.7	.7							.7	.7	156.7	156.7	.4
Lehigh Valley	14.1	421.2	34.6	11.1	481.0	1,004.6	675.0	60.6			735.6	796.1	1,216.6	1,800.7	1,180.6	1,728.0	100.0
Long Island	4.0	80.7	3.3	3.7	91.7	190.1		22.7			22.7	45.4	114.4	235.5	391.9	549.5	43.0
Louisville & Nashville	32.9	19.3			52.2	71.5	167.4	48.9			216.3	265.2	268.5	336.7	4,048.0	4,399.4	7.6
Maine Central	274.1	45.7			319.8	365.5							319.8	365.5	907.7	959.5	38.1
Marquette & Southeastern							3.7				3.7	3.7	3.7	3.7	50.8	50.8	7.3
Minneapolis, St. Paul & Sault Ste. Marie							2,181.3	4.4			2,185.7	2,190.1	2,185.7	2,190.1	3,095.2	3,099.6	70.6
Missouri, Kansas & Texas	3.0				3.0	3.0	8.6				8.6	8.6	11.6	11.6	3,072.0	3,072.0	.4
Missouri Pacific	43.0	17.7			60.7	78.4	27.1	7.0			34.1	41.1	94.8	119.5	3,676.2	3,724.1	3.2
St. Louis, Iron Mountain & Southern	84.3	8.6			92.9	101.5	6.8	1.1			7.9	9.0	100.8	110.5	2,536.6	2,592.0	4.3
Mississippi Central							150.0				150.0	150.0	150.0	150.0	150.0	150.0	100.0
Mobile & Ohio		4.7			4.7	9.5	42.4				42.4	42.4	47.1	51.9	825.0	825.0	9.6
Monongahela	.5				.5	.5							.5	.5	48.0	66.3	.8
Nashville, Chattanooga & St. Louis							92.8	10.3			103.1	113.4	103.1	113.4	1,230.1	1,240.4	9.1
Newburgh & South Shore							.1	5.2			5.3	10.5	5.3	10.5	Freight line.		
New York & Long Branch		38.0			38.0	76.0							38.0	76.0	38.0	76.0	100.0
New York Central Lines:																	
Boston & Albany		164.3	21.1	21.5	206.9	477.7		1.0			1.6	3.2	208.5	480.9	376.3	648.7	74.1
Chicago, Indiana & Southern		5.0			5.0	10.0	17.4				17.4	17.4	22.4	27.4	313.0	346.6	7.8
Cincinnati Northern							206.1				206.1	206.1	206.1	206.1	206.1	206.1	100.0
Cleveland, Cincinnati, Chicago & St. Louis							549.0	318.4			867.4	1,185.8	867.4	1,185.8	1,762.6	2,099.4	56.5
Lake Erie & Western							862.8	9.0			871.8	880.8	871.8	880.8	832.4	841.4	100.0
Lake Shore & Michigan Southern	6.9	256.9	99.5	157.1	520.4	1,447.6	1,033.6	21.1			1,054.7	1,075.8	1,575.1	2,523.4	1,450.6	2,398.2	100.0
Dunkirk, Allegheny Valley & Pittsburgh							90.3				90.3	90.3	90.3	90.3	90.3	90.3	100.0
Lake Erie, Alliance & Wheeling							87.7				87.7	87.7	87.7	87.7	87.7	87.7	100.0
Michigan Central		271.9			271.9	543.9	901.1	19.1			920.2	939.3	1,192.1	1,483.2	1,192.1	1,483.2	100.0
New York Central & Hudson River		152.8		56.0	208.8	529.6	1,715.1	627.0	25.1	264.3	2,631.5	4,101.8	2,840.3	4,631.4	2,853.5	4,644.5	99.7
Peoria & Eastern							3.6	1.7			5.3	7.0	5.3	7.0	337.9	339.6	.2
Pittsburgh & Lake Erie		106.5	4.9	37.4	148.8	377.3	19.8	2.9			22.7	25.6	171.5	402.9	183.9	406.1	98.9
New York, New Haven & Hartford	20.5	235.8			256.3	492.1	155.4	208.9		75.8	440.1	876.4	696.4	1,368.5	1,899.4	2,901.0	47.2
New York, Ontario & Western	36.0	109.7			145.7	255.4							145.7	255.4	492.8	621.3	41.1
Norfolk & Western	4.1	134.2			138.3	272.5	1,345.1	161.7			1,506.8	1,668.5	1,645.1	1,941.0	1,719.3	2,003.6	95.1
Northern Pacific	1.5	57.7			59.2	116.9	1,068.6	321.6			1,390.2	1,711.8	1,449.4	1,828.7	4,994.1	5,448.0	33.5
Northwestern Pacific	2.5	11.4			13.9	25.3	250.5				250.5	250.5	264.4	275.8	330.6	342.0	80.6
Pennsylvania		58.6	3.0	184.2	245.8	871.4	1,320.0	707.8	35.0	192.4	2,255.2	3,597.2	2,501.0	4,468.6	3,232.0	5,239.9	85.4
Cleveland, Akron & Columbus							126.5	15.6			142.1	157.7	142.1	157.7	177.8	195.8	80.5
Cincinnati & Muskingum Valley							11.4				11.4	11.4	11.4	11.4	148.4	148.4	7.7
Grand Rapids & Indiana								2.2			2.2	4.4	2.2	4.4	436.5	444.6	1.0
Northern Central							287.5	119.8		21.3	428.6	612.3	428.6	612.3	439.7	635.6	96.3
Pennsylvania Company		173.0	26.0	41.7	240.7	590.8	200.4	425.2	3.0		628.6	1,059.8	869.3	1,650.6	1,314.4	2,111.1	78.4
Philadelphia, Baltimore & Washington		15.6		21.0	36.6	115.2	107.3	147.1	17.1	14.6	286.1	511.2	322.7	626.4	639.4	945.5	66.2
Pittsburgh, Cincinnati, Chicago & St. Louis		7.2		2.1	9.3	22.8	610.5	397.4	43.8	17.8	1,069.5	1,607.9	1,078.8	1,630.7	1,416.3	2,030.1	84.7
West Jersey & Seashore		87.7	6.3		94.0	194.3	46.2	33.5			79.7	113.2	173.7	307.5	318.2	455.6	67.5

RAILWAYS WORKED BY THE BLOCK SYSTEM, JAN. 1, 1910.—*(Continued; also See Notes at Bottom of Table.)*

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and non-automatic.		Total passenger lines operated.		Percentage block signaled (miles of track).
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Peoria & Pekin Union								6.0			6.0	12.0	6.0	12.0	15.4	24.6	48.8
Pere Marquette	12.9				12.9	12.9	19.0				19.0	19.0	31.9	31.9	1,537.0	1,544.2	2.1
Philadelphia & Reading	6.3	285.7	39.6	15.9	347.5	760.1	156.4	122.0			278.4	400.4	625.9	1,160.5	874.4	1,440.0	80.6
Atlantic City		86.9			86.9	173.8	22.6				22.6	22.6	109.5	196.4	163.6	251.6	78.1
Northeast Pennsylvania	2.9	1.8			4.7	6.6	1.7				1.7	1.7	6.4	8.2	25.5	27.3	30.0
Perkiomen							38.1				38.1	38.1	38.1	38.1	38.1	38.1	100.0
Philadelphia, Newton & New York	4.1	1.9	1.5		7.5	12.4							7.5	12.4	21.7	26.6	46.6
Reading & Columbia							35.7				35.7	35.7	35.7	35.7	53.2	53.2	67.1
Queen & Crescent Route:																	
Alabama Great Southern	91.7	.4			92.1	92.5							92.1	92.5	290.5	294.8	31.7
Cincinnati, New Orleans & Texas Pacific	265.2	69.9			335.1	405.0	.7				.7	.7	335.8	405.7	335.8	405.7	100.0
Richmond, Fredericksburg & Potomac							9.7	78.0			87.7	165.7	87.7	165.7	87.7	175.4	100.0
St. Joseph & Grand Island							.3				.3	.3	.3	.3	251.6	251.6	
St. Louis & San Francisco	138.6	32.7			171.3	204.0	275.6	4.1			279.7	283.8	451.0	487.8	4,726.6	4,763.4	10.2
St. Louis Merchants' Bridge Terminal		5.9			5.9	11.8		1.1			1.1	2.2	7.0	14.0	9.9	19.8	70.7
St. Louis Southwestern	.4				.4	.4							.4	.4	621.5	621.5	
San Pedro, Los Angeles & Salt Lake	1.1				1.1	1.1							1.1	1.1	403.2	403.2	.2
Seaboard Air Line							213.5				213.5	213.5	213.5	213.5	2,739.1	2,739.1	.1
Southern		3.0			3.0	6.0	1,594.7	239.7			1,834.4	2,074.1	1,837.4	2,080.1	6,647.8	6,942.0	30.0
Southern Illinois & Missouri Bridge		4.6			4.6	9.2							4.6	9.2	4.6	9.2	100.0
Southern Pacific, Atlantic System:																	
Galveston, Harrisburg & San Antonio	215.3				215.3	215.3							215.3	215.3	1,270.5	1,274.9	16.9
Louisiana Western	103.6				103.6	103.6							103.6	103.6	140.3	140.3	73.9
Morgan's Louisiana & Texas	95.3				95.3	95.3							95.3	95.3	241.9	282.1	33.9
Texas & New Orleans	109.8				109.8	109.8							109.8	109.8	438.5	441.9	24.9
Southern Pacific: Pacific System	1,939.1	135.1		1.0	2,075.2	2,213.3	95.4				95.4	95.4	2,170.6	2,308.7	6,343.6	6,493.2	35.5
Staten Island Rapid Transit		10.0			10.0	20.0							10.0	20.0	10.0	20.0	100.0
Spokane, Portland & Seattle							5.4	3.0			8.4	11.4	8.4	11.4	405.6	408.6	2.8
Terminal Railroad Association of St. Louis		6.0			6.0	12.0		1.1			1.1	2.2	7.1	14.2	12.7	25.5	55.7
Ulster & Delaware	24.4				24.4	24.4							24.4	24.4	126.3	126.3	19.8
Union		.6			.6	1.2	1.4				1.4	1.4	2.0	2.6	7.4	14.8	17.9
Union Pacific	846.6	459.2		1.7	1,307.5	1,769.8	10.9				10.9	10.9	1,318.4	1,780.7	3,415.9	3,919.4	45.4
Oregon R. R. & Navigation Co	415.7				415.7	415.7							415.7	415.7	1,309.1	1,309.1	31.7
Oregon Short Line	367.3	6.9			374.2	381.1							374.2	381.1	1,473.2	1,480.1	25.7
Vandalia							199.8	38.1			237.9	275.9	237.9	275.9	797.0	843.4	32.6
Virginia & Kentucky							.6				.6	.6	.6	.6	4.8	4.8	12.5
Virginian							2.2				2.2	2.2	2.2	2.2	Freight line.		
Wabash		7.2			7.2	14.4	1,726.7	94.0			1,820.7	1,914.7	1,827.9	1,929.1	1,954.9	2,056.1	93.8
Wabash Pittsburg Terminal		4.1			4.1	8.2							4.1	8.2	59.8	63.9	12.8
Washington Southern								32.2			32.2	64.3	32.2	64.3	32.2	64.3	100.0
Washington Terminal		1.1		1.0	2.1	20.4							2.1	20.4	2.1	20.4	100.0
Western Ry. of Alabama							138.0				138.0	138.0	138.0	138.0	138.0	138.0	100.0
Total	6,277.7	7,049.6	266.3	644.1	14,237.7	23,811.4	42,843.5	7,822.2	249.9	604.7	51,520.3	61,658.4	65,758.0	85,484.0	162,526.3	189,512.6	

Bessemer & Lake Erie. These figures include 8.9 miles of road on which no passenger trains are run.

Chicago, Burlington & Quincy.—The single track non-automatic mileage includes 652.1 miles of road on which only one engine is in service.

Lake Erie & Western. Includes Fort Wayne, Cincinnati & Louisville and Northern Ohio; 34 miles used only for freight traffic.

Michigan Central. 243.1 *miles double track automatic in Canada not shown in this table.*

Kanawha & Michigan, Lehigh & New England; Mississippi Central; Spokane, Portland & Seattle; Virginia & Kentucky; Western Railway of Alabama.

In table 1 the percentage of block-signaled mileage to the total passenger mileage operated is computed on track mileage instead of road mileage, as in previous reports. In computing the number of automatic block sections (Table 2) the unit is the distance from the home signal at the entrance of a section to the home signal which marks the beginning of the next block section. Where there are two or more main tracks the sections are counted separately for each track. The principal changes of the year (miles of road) are shown, page 1339.

The bulletin contains also a list of roads on which telephones are used in transmitting train orders, from which it appears that this means of communication for this purpose is now in use on 26,344 miles of road. We copy from this table the figures concerning all of the roads shown which operate 100 miles or more of line. This table contains nearly 300 roads, and a large proportion of it is made up of names of very short roads,

Railway Lines on Which the Telephone Is Used for the Transmission Train Orders.

Names of railways.	Telephone. —Miles of road—	Total operated. —Miles of road—
Atchison, Topeka & Santa Fe:		
Eastern lines	1,412	5,564
Coast lines	393	1,908
Gulf, Colorado & Santa Fe	193	1,518
Santa Fe, Prescott & Phoenix	6	364
Texas & Gulf	96	96
Atlantic Coast Line	139	4,181
Baltimore & Ohio	20	3,474
Boston & Maine	51	2,294
Chesapeake & Ohio	135	1,703
Chicago & North Western	551	7,638
Chicago, Burlington & Quincy	2,437	8,948
Chicago, Milwaukee & St. Paul	337	7,481
Chicago, Milwaukee & Puget Sound	635	1,462
Chicago, Rock Island & Pacific	642	7,393
Chicago, Rock Island & Gulf	48	530
Coal & Coke	191	191
Cumberland Valley	54	162
Delaware, Lackawanna & Western	900	957
Denver & Rio Grande	32	2,598
Boca & Loyalton	45	45
Detroit & Mackinac	70	263
Duluth & Iron Range	168	169
Erie	146	1,869
Escanaba & Lake Superior	80	142
Georgia & Florida	80	284
Great Northern	1,511	6,536
Illinois Central	1,076	4,577
Omaha Bridge & Terminal	10	24
Kansas City, Clinton & Springfield	3	155
Lehigh & New England	90	170
Lehigh Valley	159	1,394
Louisville & Nashville	251	4,598
Nevada-California-Oregon	27	224
Sierra Valleys	37	37
New Orleans, Mobile & Chicago	7	401
Newton & Northeastern:		
Fort Dodge, Des Moines & Southern	200	200
New York Central lines:		
Cleveland, Cincinnati, Chicago & St. Louis	110	1,848
Chicago, Kalamazoo & Saginaw	56	56
Detroit & Charlevoix	43	52
Fulton Chain	2	2
Lake Shore & Michigan Southern	255	1,575
Lake Erie, Alliance & Wheeling	88	88
Little Falls & Dolgeville	2	14
Michigan Central	757	1,792
New York Central & Hudson River	497	3,195
New York, Chicago & St. Louis	132	523
New York, New Haven & Hartford	11	2,003
Norfolk & Southern	97	592
Norfolk & Western	210	1,942
Northern Pacific	597	5,698
Northwestern Pacific	117	408
Ohio Electric	242	242
Ohio River & Columbus	24	24
Pennsylvania	1,126	5,299
Grand Rapids & Indiana	8	592
New York, Philadelphia & Norfolk	16	112
Philadelphia, Baltimore & Washington	11	694
Waynesburg & Washington	29	29
Wheeling Terminal	5	10

Names of railways.	Telephone.	Total operated.
	Miles of road	
Philadelphia & Reading	28	1,099
Williams Valley	8	11
Pittsburgh, Shawmut & Northern	29	230
Sandy River & Rangeley Lakes	78	105
Seaboard Air Line	149	2,987
Southern Pacific (Pacific system)	292	6,112
Corvallis & Eastern	21	140
Spokane & Inland Empire	165	178
Union Pacific	123	3,384
Oregon Short Line	49	1,509
Virginian	470	472
Wabash:		
Wabash Pittsburg Terminal	4	64
Wheeling & Lake Erie	6	442
Wisconsin & Michigan	8	128

of light traffic, many of which probably never had a telegraph line.* Where the whole length of line operated by a railway is greater than the length of line operated with the telephone it is assumed that on the balance of the mileage the Morse telegraph is used.

TRAIN ACCIDENTS IN APRIL.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of April, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
7.	Louis. & Nash.	Saxton.	xc.	P. & Ft.	1	2
7.	Georgia	Berzelia.	bc.	Ft. & Ft.	2	5
8.	Balt. & Ohio.	Triadelphia.	bc.	Ft. & Ft.	1	4
8.	N. Y. Central.	Rome.	rc.	Ft. & Ft.	1	..
9.	Nor. Pacific.	Spokane.	bc.	P. & P.	0	30
*10.	Balt. & Ohio.	Fetterman.	rc.	P. & Ft.	1	4
11.	C., R. I. & P.	Garrison.	....	P. & Ft.	1	14
20.	Penn.	Pittsburgh.	xc.	P. & P.	0	11
22.	C.,C.,C. & St.L.	Sanford.	xc.	P. & Ft.	3	8
28.	West. Pac.	Chalona, Nev.	bc.	Ft. & Ft.	0	3
30.	Ill. Cent.	Chicago.	rc.	P. & Ft.	0	2

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
1.	Norf. & West.	Watts Tank.	unx.	Pass.	1	1
8.	N. Y. Central.	Rome	acc. obst.	Pass.	0	20
8.	Trinity & B. V.	Corsicana.	washout.	Ft.	1	1
14.	Nor. Pacific.	Spokane.	b. wheel.	Ft.	4	7
16.	Balt. & Ohio.	Clarion.	unx.	Ft.	4	0
*18.	Ill. Cent.	Jackson.	malice.	Pass.	4	4

The butting collision at Seventh avenue, Spokane, Wash., on the evening of the ninth, was between eastbound and westbound passenger trains of the Spokane, Portland & Seattle, which run on the Northern Pacific track at this point. Twenty-seven persons (25 passengers and two trainmen) were injured, but none of them fatally. The collision occurred on a high trestle. The westbound train had run about 150 ft. beyond the meeting point. The eastbound train was entirely within its rights. The westbound train should have stopped at Seventh avenue, as the signal was against it and it had no block card authorizing it to go beyond Seventh avenue, which is a telegraph office at the end of the double track at the west end of Spokane yard. The approach to Seventh avenue is on a curve to the left and the engineman asked the fireman if the signal was all right. The fireman looked out and said, "yes," but he must have mistaken the switch light for the train order signal, which was in the stop position. When the engineman got far enough around the curve so that he could see the train order signal, he noticed it was against him and set the brakes, but was unable to stop until he had run past the signal and collided with the eastbound train.

The collision at Pittsburgh, on the twentieth, occurred at a switch in the yard of the Union station, an incoming and an outgoing train being thrown together, on conflicting tracks, by the premature movement of a switch. Prompt action on the part of one of the enginemen in reducing his own speed and signaling by whistle to the other train averted a disastrous smash-up. It appears that the detector bar failed to perform its function of keeping the switch lever locked until after the train had passed over the switch.

The collision on the twenty-eighth is reported as having been caused by a sand storm which obscured the view of the enginemen of the two trains, which were approaching each other at moderate speed.

The persons killed in the derailment of a freight train near Spokane, Wash., on the fourteenth, were all trespassers —four killed and seven injured. The derailment was due to the breaking of a wheel on the third car from the engine, and 20 loaded cars fell down the bank.

The derailment near Clarion, Pa., on the sixteenth, was of a narrow-gage locomotive running without a train. The persons killed were the engineman, the fireman, section foreman and one other man, not an employee of the road; and, according to the accounts, the fatal derailment was caused by running the engine at reckless speed; that is to say, the men were having a "joy ride" which terminated in death.

The persons killed in the derailment at Jackson, Miss., on the eighteenth, were mail clerks, and their bodies were partly burned up, the wreck having caught fire and destroyed the mail car before it was possible to make effective use of the fire extinguishers on the train. Some of the passengers were taken out of the cars through the windows, but none was seriously injured. A committee of officers of the road, who investigated this wreck, in conjunction with a prominent citizen who was invited to take part, decided that the derailment was due to the malicious loosening of the rails in the track.

Of the ten electric car accidents reported in the newspapers in the month of April, three occurred at crossings of steam railways, freight trains running into street cars. In each of these three accidents ten or more persons were injured, and in one of them—at Springfield, Ill., on the eighth—one person was killed.

FOREIGN RAILWAY NOTES.

The railway from the great Swedish iron ore deposits at Gellivari and Kiruna, which passes across Norway north of the polar circle to reach the ice-free port of Narvik, which is provided with the latest Yankee notions for transferring ore from car to ship, is sufficiently Arctic in the highlands. In the middle of July, 1902, it was necessary to shovel snow from the roadbed in order to lay the rails at a point only 1,700 ft. above sea level.

The Uganda Railway, which carries lion-hunters, etc., does not yet show signs of becoming directly profitable. Its earnings were a trifle less last year than the year before, when they were less than in 1906-07. The 584 miles earned last year $733,000 gross and $324,000 net, which is about 1.2 per cent. on the cost. When beef cattle have taken the place of the countless herds of zebras, giraffes, buffaloes and antelopes of various kinds in the country along the line, it will have a large livestock traffic, and Boer immigrants from South Africa are making a beginning in this, but last year the line carried only 9,528 head.

*As long ago as 1905 the list in the *Official Guide*, giving the names of the telegraph companies operating over the railways of the country, showed 94 roads which reported "telephone" (no telegraph company).

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Shop Section.

The shop kink competition, announced last month, will close June 15. A first prize of $50 and a second prize of $25 will be given for the two best collections of from three to five kinks. Competitors may submit a greater number, allowing the judges to base their decision on what they believe to be the best five in the collection. Collections of kinks that are not awarded prizes, but which are worthy of publication, will be paid for at our regular space rates. The descriptions of the kinks and their operation should be made as clear and as complete as possible to avoid the possibility of any misunderstanding on the part of the judges. The kinks may refer to any class of work done in a railway shop, car repair yard or engine house. Data as to the average time required for doing the work with the kink, or of the time saved by its use, will add to the value of the contribution.

"We may go on making special machines and special devices all we please, but the human hand, which plays such a large part in this world, must be directed carefully and intelligently to get the highest efficiency." This sentence, taken from Mr. Owen's article on "How the Foreman Can Promote Shop Efficiency," is a good example of the broad and comprehensive manner in which the foremen treated this subject in the recent competition. A consulting engineer, noted because of his knowledge of, and interest in, railway mechanical department organization, remarked after he had read the three essays in the May 6 issue: "We have certainly got to take our hats off to the men who prepared these articles. I have a high regard for the shop superintendents and foremen with whom I have come in contact, but I must say I am somewhat surprised, but greatly delighted, at the big way in which they have tackled the subject. It certainly requires a higher grade of generalship to manage their shops in these days than it did to handle the entire motive power department of most railways 15 years ago." This gentleman will be even more surprised when he reads the essays in this number, for they are not far behind the leaders in the competition. The field covered is so broad, and each contestant has looked at it from such a different angle, emphasizing those things that have appealed to him most strongly and have been of the greatest assistance in his work, that the reader finds the last article just as interesting and helpful as the first, although he may read all of them at one sitting. For instance, while each one has something to say on the general subject of the handling of men, no two treat it in exactly the same way as to details, although they all agree more or less as to the general principles. It is doubtful if a more practical treatise on railway shop management has been published than is found in the combination of the 11 articles which received special mention in the competition, all of which will be published in our shop numbers. Their value is all the greater from the fact that they come from foremen in each of the three branches of the mechanical department—locomotive shops, car shops and repair yards and engine houses.

Shop schedules have been used in a number of shops for a long time with remarkable results in increased output. It is strange that so few shops have followed up this advantage by installing what may be termed a despatching system. Piecework, which has been quite generally adopted in railway shops, has emphasized the importance of carefully planning the work in advance so that the men will know exactly what job is ahead of them and will not only not have to waste time in looking it up, or getting an assignment, but will have an opportunity of studying it over in advance in order to save as much time as possible when they actually start to work on it. It is thus only a logical step to install a central despatching office in charge of an expert who will have exact advance information as to every job that is to be done, and will see that these jobs are assigned to the proper machines in such order as will give the most effective results in holding up and increasing the output. Each machine will thus be kept in constant operation, the material for the next job being delivered to it well in advance of the completion of the piece of work in hand. The despatcher must, of course, have records from which he will know the average time required for each job, and he must also be informed as to the time that each workman starts on a job in order to plan and assign the work to the best advantage.

The first shop to adopt such a system was at Topeka on the Santa Fe. In one form or another it is being tried out and installed in other shops. It is a step nearer to the ideal system developed by Fred W. Taylor and described in various papers which he has presented before the American Society of Mechanical Engineers. Mr. Taylor is so far in advance of the times that it will probably be a generation or more before his ideas are fully put into effect, but the splendid progress which has been made in shop management during the past few years is gradually but surely approaching his ideals. Mr. Spidy's reference to the card system of instruction in his article on "How the Foreman Can Promote Shop Efficiency" should receive careful consideration from this standpoint.

A convention of railway men had just closed. The official stenographer, a young lady, leaned back in her chair as she finished writing the last sheet of the report and exclaimed: "I am getting awfully tired of that word 'harmony.' In 15 years I have heard it thousands of times at railway conventions of all kinds. Isn't it about time they stopped talking about it and did something?" It is to be hoped that the word, or one of its synonyms, such as team work and co-operation, will be heard even more frequently at our conventions and in our organizations, for it is being recognized more and more that the efficiency of an organization depends almost entirely on the degree to which it is permeated by the spirit of co-operation. That its importance is understood by the foremen who are in close touch with the actual workers, or the men in the ranks, is indicated by the references to it in the articles that were submitted in the *Railway Age Gazette* competition on "How a Foreman Can Promote Shop Efficiency." Three of these, including the first and second prize articles, were published in the issue of May 6; three others appear in another part of this number.

Team work, or co-operation, can only be obtained when the employee realizes that it is to his best interest to co-operate with his employer; in other words, the workman must be assured of concrete returns for the additional effort which he puts forth. A prominent works manager recently said that if every one of his men could be brought to a full realization of what the company was preparing to do for them and of its interest in them, the additional effort which they would make because of their greater interest in its welfare would not only make it possible for the company to pay higher wages than its competitors, but the additional profits would be sufficient to warrant it in keeping the shop in operation during periods of depression, even if the men had to be used in doing work for which the company would never

be fully compensated. This, of course, would be an ideal condition, but the man who proposed it is known not as a philanthropist but as a hard-headed business man.

The article on the care and handling of the electrical equipment of the New York Central & Hudson River, which appears in this number, brings out some of the most interesting features of what the motive power department found necessary in the maintenance of the equipment for the 58 miles of its electric division into New York City. It has been a huge experiment. Electric locomotives of the design used had not previously been subjected to service conditions. Although in their main features the company's most recently built locomotives correspond with its first ones, several alterations have been made, chief among which is the substitution of the four-wheel for the two-wheel trucks, increasing the wheel base from 27 ft. to 36 ft. A number of minor alterations have been made in the design of both the locomotive and the motor car equipment, the necessity for which has become apparent through the constant and rigid inspections that the equipment receives. Good team work is apparent in the organization. The enginemen are best acquainted with the equipment in actual service, and make full reports of troubles. The shop foremen know the equipment best as concerns design and actual alterations and repairs and meet with the superintendent every two weeks for discussion and general planning. A private telephone system connects all the offices interested in this work.

The representative reports reproduced in the article are interesting as illustrating the careful attention to details which is necessary. For instance, when a contact shoe is broken by striking an obstruction beside the track, the immediate communication of this fact to the office of the superintendent electrical equipment is necessary in order to prevent a similar accident happening to a closely following locomotive. As the equipment was at first, to a large extent, experimental, so it is yet as regards the details of its operation and maintenance, which are being closely watched. It is this part of the subject that should appeal to steam railway motive power departments as presenting methods which should be applicable to their equipment.

IMPROVED METHODS OF HEATING AND WELDING.

The principal objection to the ordinary method of heating metal by a coal fire is the long time required and the consequent expense for the workmen's time which is virtually wasted while they are waiting for the metal to heat. The forge fire in the smith shop answers very well for small pieces, but it is slow and dirty and is gradually being superseded by the oil or the gas furnace. Most of the new smith shops and forges are equipped with oil furnaces, but the new shops of the Delaware, Lackawanna & Western at Scranton have a special gas house and producer for making water gas. At the Altoona shops of the Pennsylvania a large gas plant is used in connection with the forge furnaces. Other shops favorably situated in the natural gas belt use that kind of gas for most heating purposes about the shops as well as for steam making.

For portable heaters, such as are used in heating tires, crude oil, gasolene and commercial gas have all been used successfully. At the Collinwood shops of the Lake Shore crude oil is used for such purposes, but it is first gasified in a muffler or firebrick retort and is not used directly from the burner where it is atomized. There are some objections to the use of gasolene for heating, the principal one being its liability to sudden flaming or explosion, causing destruction of property by fire. Gasolene is so volatile that there is a constant loss by evaporation when the vessel containing it is not tightly closed; the large consumption for other purposes has caused the price to rise, so it is no longer the most economical fuel for portable burners. At 10 cents per gallon for gasolene and 85 cents per 1,000 cu. ft. for commercial gas, careful tests have shown a saving of 16 per cent. in heating tires with the gas. The cost of fuel for heating a tire 62 in. inside diameter was 20 cents for gasolene and 16.9 for commercial gas. The average time required per tire was 17.5 minutes with gasolene and 14.3 minutes with commercial gas. The cost of crude oil for the same purpose has been reported as low as 15 cents and as high as 30 cents, the difference being doubtless due to the comparative efficiency of the burners.

Rapid progress is being made in the new welding processes in railway shops. In the welding of frames by such methods a considerable amount of skill is required to prevent fracture in the weld or in another part of the frame by shrinkage, and some experience is required to give the proper amount of preheating. If the weld is made on one member of a double barred frame it is necessary to heat the other member with a torch in order to get equal expansion and contraction in both members to prevent unequal strains. Where thermit is used the fractured part is forced open about ¼ in. by a jack so as to allow for the contraction when the metal cast around the frame cools. The pressure is gradually released on the screw jack as the weld cools. On some railways this nice adjustment has not been obtained and a number of frames have subsequently broken at the welds, but where the work has been properly done the welds are entirely successful.

Autogenous welding is attaining much importance and prominence throughout the world. In Germany there are over 1,000 welding plants using the oxy-acetylene blow pipe, and there is a similar number in France; also large numbers of plants in Italy and Belgium. In England while there are good oxy-acetylene gas plants, the men are not properly taught to handle the apparatus. The result is the work performed is of an inferior character and this hampers the success of the industry. This is also true to some extent in the United States, but the methods that are employed to insure success in Germany and France are being gradually introduced here. Germany has an association devoted to autogenous welding, recruiting its members entirely from users and manufacturers of welding plants. The work of instruction in the new art of welding is carried on through periodicals and the institution of free courses in teaching it; in this way the workmen are made familiar with the new process by practical demonstrations. The fundamental principles are also taught. Free courses of instruction in autogenous welding were inaugurated in France about a year ago and they are open to foremen and workers in any line of trade which can be benefited by the use of the process.

The fire risk involved in the use of the acetylene apparatus is a matter that is assuming much importance, and a meeting of the manufacturers of the apparatus and appliances used in connection with the oxy-acetylene blow pipe was held recently in Chicago. The object was to study the rules and regulations drawn to safeguard the industry by the engineers of the National Board of Fire Underwriters. These rules should interest those in charge of railway shops using the apparatus, as they call attention to methods that are dangerous, as well as to the proper means of safeguarding the plants and apparatus.

With the construction of the railway between Corrientes and Asuncion, which was contracted for by the Minister of Public Works on January 20, 1910, the Argentine North East Railway and the Central Railway of Paraguay will be joined and direct communication between Buenos Ayres and Asuncion established. Hitherto all passenger and freight traffic between these points has been dependent upon water transportation. The national government will contribute £2,000,000 toward the construction of this important link in her international railway system.

Contributed Papers.

HOW THE FOREMAN CAN PROMOTE SHOP EFFICIENCY.*

BY C. J. DRURY,

General Roundhouse Foreman of the Atchison, Topeka & Santa Fe, at Albuquerque, New Mex.

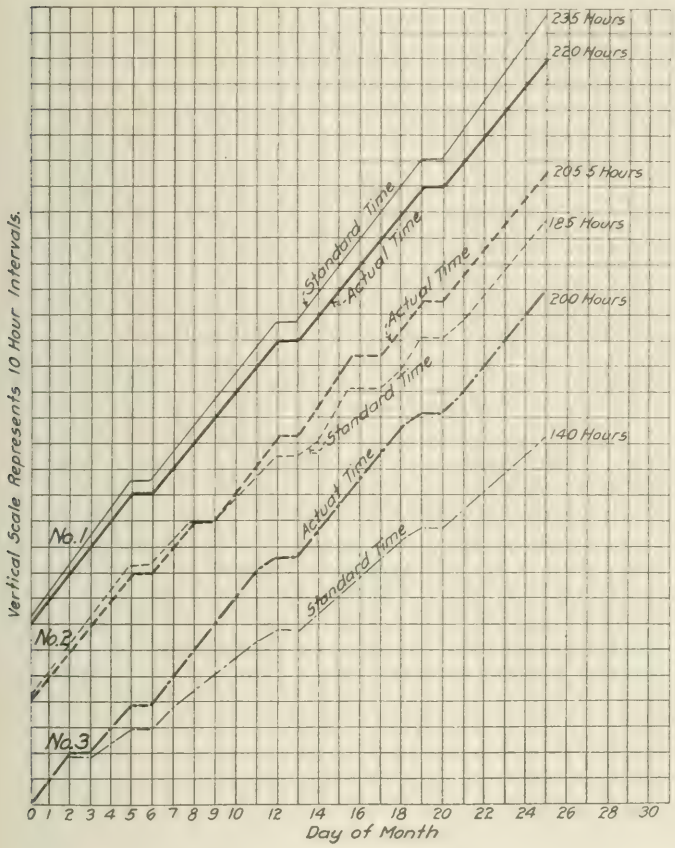
Harmony within his shop and in its relation to associated shops is a condition which every foreman should try to produce. At the same time discipline should not suffer for the sake of harmony. No shop can attain ideal or high efficiency if harmony does not exist. We may force, fight or drive work through the shop, but we will not attain high efficiency if good feelings do not exist between helper, mechanic, foreman, master mechanic or superintendent. Contention should be avoided.

Having harmony, better supervision should be one of the next essentials towards producing shop efficiency. We have found in recent years that we require more foremen than were formerly needed because of the recently designed power and the modern machines and equipment that have been placed in our shops to hasten the output. It is often the case that, in place of three or four boilermakers, machinists or carpenters being needed, it is a foreman that is lacking. There is scarcely anything that will cause the efficiency of a shop to drop quicker than through having the foreman supervise a greater number of men or a larger amount of work than he can cover. A foreman should keep his tools, machines and equipment in the best possible condition so that they can be crowded to the full capacity all the time.

The work in the shop should be specialized even to the smallest operation. Past experience has taught us that on special work a man becomes most proficient; he has tools and kinks fitted up for the work he is to carry on, therefore he can more readily do the job, while his neighbors perhaps would spend considerable time in looking for the tools to do the work. The matter of specializing should be given very close attention by the foreman. We find in specializing the work that the amount of supervision required is not as great as when the work is otherwise carried on. Specializing the different operations should be practiced in the roundhouse as well as in the other departments.

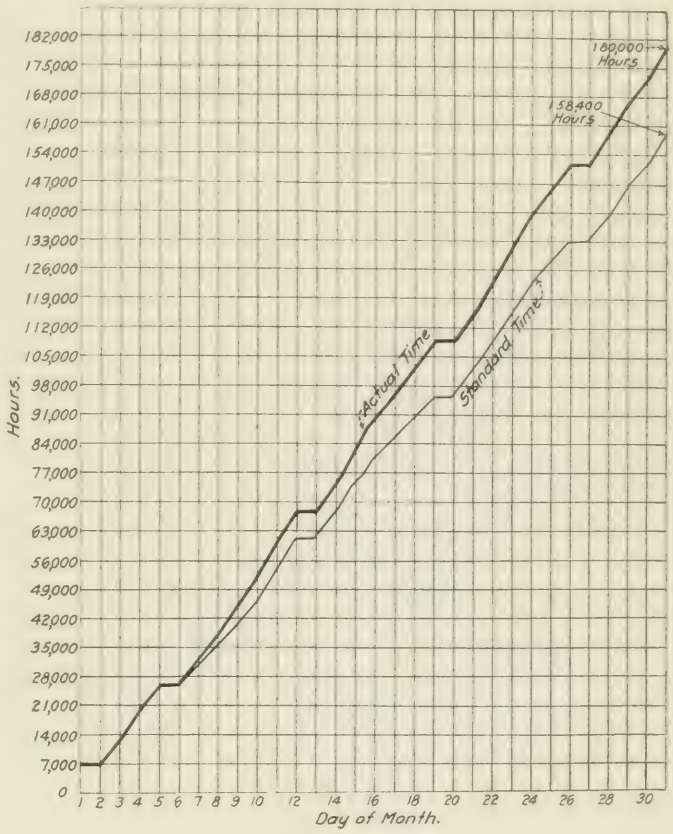
A shop should not be run where one man is depended upon to do certain particular work. We should be educating our men in such a manner that if a mechanic happens to quit or absent himself, his work can be taken up by another without allowing the efficiency of the shop to suffer.

It has also been found that the scheduling of the work through the shop tends to create a higher efficiency. For example, a locomotive going to the shops for general repairs is dated in, perhaps on the first of the month, and booked out for the twentieth. The stripping could be scheduled to be finished on the first day, the shoe and wedge work the fourth, the driving box and spring gang the tenth, boilermaker work



Record of Individual Workmen.

No. 1. Ideal Workman.		No. 2. Spasmodic Workman.		No. 3. Poor Workman.	
Efficiency = 107%.		Efficiency = 90%.		Efficiency = 70%.	
220 hrs. at 36c.	$79.20	205.5 hrs., 36c.	$73.98	200 hrs. at 36c.	$72.00
20% bonus	15.84	Bonus	7.33	Bonus	.16
15 hrs. gain....	5.40				
Total wage	$100.44	Total wage..	$81.31	Total wage..	$72.16
Actual rate,	45.6c.	Actual rate,	39.5c.	Actual rate,	36.08c.



Record of Entire Shop.

Per cent. efficiency.	Hours.	Men rated at 25c. per hour.	Surcharge at 40c. per hour.	Bonus.	Total.
88	180,000	$45,000	$75,000	$3,744	$120,744
100	158,400	39,600	63,360	7,920	110,880
Loss to company					$9,864
100	180,000	$45,000	.....	$9,000	$54,000
88	180,000	$45,000	.....	3,744	48,744
Loss to men					$5,256
Average rate per hour, without bonus					$0.25
" " " " with bonus at 88 per cent.					.275
" " " " with bonus at 100 per cent.					.30

*These articles were submitted in the competition on this subject, which closed April 15. The first and second prize articles and one other were published in the *Railway Age Gazette* of March 6, 1910.

the fifteenth, rodmen the eighteenth, and so on through all operations. At present this system is being used on the Atchison, Topeka & Santa Fe Railroad, and in a short time after the introduction it was found that we were able to cut down the time of detention in the shop. By assigning a date for the completion of the different operations it keeps the shop working under a sort of pressure, which certainly creates efficiency. Close inspection should be followed up by the foreman to see the jobs personally as they are being assembled. While we are striving for high efficiency we should watch the quality of our output as well as the amount.

The correct handling of apprentices is very important in maintaining high efficiency. In shops where as many as ten or twelve apprentices are employed there should be an instructor appointed, whose duties are confined to the mechanical education of the boys. Also in larger shops the school system of instructing in mathematics and drawing should be practised. This kind of an apprentice system is thoroughly inaugurated upon the Atchison, Topeka & Santa Fe, and we have shops where the efficiency of apprentices have increased from 88 per cent. to 105 per cent. efficiency under it.

An individual effort system whereby the workman is compensated for his special efforts by a cash merit is a great promoter of high efficiency. I do not exactly favor a piece work system, but do approve of a system where an employee is paid an hourly or monthly rate, and given a cash consideration for his increased efforts on an efficiency basis. An individual record should be kept. By keeping record of the information shown on the accompanying chart, the efficiency of the workman is known and his advancement to a position of greater usefulness can be determined.

By setting "standard time" on each operation performed by each workman, a totaling of standard times for all operations of all men and the actual time taken can be determined, showing the efficiency of each shop department and for the shop as a whole. By thus determining the efficiency of each department a much better comparison of the amount of work turned out can be reached than by any old haphazard manner of counting the number of engines or cars repaired. This old method is inconclusive owing to there being no set measure of the amount or character of the work done on each car or engine, nor of the condition of the car or engine when received at the shop and when again placed in service. The attempted classification of character of repairs now in vogue is mostly based on the amount of money spent with scarcely any reference to the amount of work done. This method may show for the shop with a poor organization and high and inefficient labor costs a more creditable output than that of a shop with good administration and low and efficient labor costs.

A shop run as above recommended will operate at a high efficiency and will make creditable earnings both for employee and employer.

BY E. T. SPIDY,

Instruction Card Inspector, Canadian Pacific, Angus Shops, Montreal, Canada.

The shop foreman's success in this direction depends, to a large extent, on the limits to which he can exercise his power to make alterations in the shop and its methods of working, and the amount of co operation he receives from his superiors, as well as from the men under his charge. A foreman is in reality the pivot upon which the smooth running of the shop depends. He has to bear the load laid on him by his superiors in his responsibility for efficient output, and he has also to keep his men "well oiled" in order to ensure the smooth running of the "inner" working of the shop. This double responsibility must always be kept in view. The situation is governed by two words which are the keynotes of all efficient shop management. They are system and co operation. Bear in mind that when you have a system that ensures the co-operative efforts of the men, and gives them confidence in your acting right towards them, so surely will your output be increased.

The following discussion is intended to be helpful to the foreman who intelligently desires to make the most of the machinery in his care. The questions and suggestions are based on an average machine shop, where all the machinery may not be of latest type, but where the best possible efficiency is desired. The questions are not arranged in order of importance, for it would be difficult to decide which was the most important.

"*Is my piecework system in good condition—can I improve it in any way?*" The foreman is often called upon to set a price for a piece of work. Considering the multifarious duties he has to perform, it is almost beyond reason to expect that all the prices he makes are good, either from the employer's or employees' point of view, and his knowledge as to what a job is worth is often left to the workman's honesty on the first piece, or to his own judgment in comparing it with similar jobs. A foreman does not get the time to study each job sufficiently. The time has come when uncertain methods like this have to be abandoned and more accurate information on the subject obtained. The situation may be improved by the setting apart of a man, whose duty it should be to study the work, the machine, the man, and the conditions under which he works, and also to set the price. This man will be responsible for any information the foreman should require with reference to the work and must be on hand when the foreman approves of the price submitted. Not only will this man relieve the foreman of a vast amount of work, but in a short time he will be of great value to him. He will be able to not only supply the foreman with details as to the condition of the machines, but also to suggest new tools, jigs, etc. He will become an expert in this line. In selecting him the best possible judgment must be used, for the success of the system will depend largely on him. He must be a man of average experience, fairly well educated and a good workman, a man of activity and energy, and one not afraid of the feeling he will at first arouse. More than likely the workmen will be prejudiced against him at first, but he must work to gain their confidence, so that finally with their co-operation the best results or maximum efficiency will be attained. His success in obtaining the co-operation of the men will do more toward efficiency than any driving system that exists or ever did exist.

"*Have I machines that are overburdened or doing a class of work for which they are not suited?*" It may not be possible to rearrange the machines in the shop, but as it is the foreman's duty to assign the work to them he should be careful that it is proportioned equitably and not to have a light machine doing a class of work beyond the range it was designed for. He should be on the lookout to avoid congestion. More machine failures are to be traced to the unsuitability of the work operated on than from any other cause, and this may often be obviated by a little discretion in assigning the work to the machines.

"*In what condition are the machines? Are they in a state of good repair?*" This is a point too often neglected and often a couple of men may be seen around the shop continually "patching up" the machines. To maintain efficiency it is necessary to keep up a high standard of repair, and when anything goes wrong to have it repaired properly rather than to "patch it up for the time being," for it pays in the long run in the life of the machine.

"*Do any machines require respeeding?*" The progress made during the past few years in high-speed steel, and the cutting speeds possible with it, as compared with ordinary carbon steel have made it necessary to revise the speed of the machines in order to take full advantage of its properties. There is little gain in using high-speed steel tools unless

they are operated at their maximum cutting speed. Certain machines may have a large enough range to cover this, but many will be found deficient. Drilling machines require attention especially in shops where they are not of modern type. While in the case of lathes, boring mills, etc., feed and depth of cut may be easily increased, a fast feed on a drill necessitates a high cutting speed for efficient work, and a machine is required to run up to 300 r.p.m. to keep in tune with modern high-speed drills.

"Am I using the best steel obtainable? Do I know what the best steel is?" This is a question well worth studying and will pay well, for a large item on the expense account depends on it. It is admittedly more the work of a specialist, but the foreman should know, as so many new and different steels are at present on the market, all of which claim to be the best. No doubt many have special features worth consideration, and they should be tested to find which one is best suited to each class of work and the machines. No definite rule can be laid down as conditions vary greatly, so experiment is the only satisfactory method of obtaining any reliable information.

"Are my tool standards correct?" All shops nowadays have tool standards in some condition or other, and it will not be necessary to emphasize having a standard shape for grinding cutting tools to. Standardization may be carried too far, however, because good practice shows that work of large diameter requires different cutting lip angles on the tools from that required by average work. Much information on this point may be obtained from grinding machine manufacturers and although too much reliance must not be placed on it, yet modified by results of experiments, a considerable saving may be effected.

"Do the men receive their tools in a satisfactory way?" This question of distribution is important, for in order that a machine may pay the best dividends it must be in constant use. Therefore when tools require replacing they should be collected from the men and new tools delivered to them, thus avoiding the necessity of their walking to the tool stores to wait about or otherwise waste time. A man may be permitted to grind his tool when it only requires "touching up," but when he has any amount of metal to grind away it should be sent to the tool grinding department. A sufficient number of grindstones should be in the shop and should be well placed to avoid the men congregating at them.

"How is the tool room stocked? Are there sufficient tools ready for delivery?" Nothing will tend to drag back a shop more than a deficiency in the number of tools. Having decided what steel is best, have a quantity of tools made so that the workman will not have to slow down his machine because he is obliged to use an inferior tool. Firms are naturally slow about buying a lot of high speed steel on account of its high price, but first decide if it is worth it, and, if it is, get enough tools made to be of use to you and not enough to "go on with." The expense of the more elaborate tools, such as milling cutters, jigs, etc., requires that a system of checking be adopted that the tool may be traced if needed urgently anywhere else. Small metal checks with the men's number on will answer admirably, the man giving a check for each tool he receives, the check being placed where the tool was taken from. Obviously there must be a systematic arrangement of tools in the tool room to operate this system successfully.

"Do the men have trouble in getting their work?" It is the foreman's duty to see that the men are supplied with work, but apart from seeing that the work is suitable to the machine, he must employ a method by means of which the men know what is to be done next, and not to have them waiting on him or any of the gang bosses for information. It is not possible without an extensive system of instruction to entirely eliminate this difficulty, but much may be done by careful forethought. This matter is receiving much attention from some of the more progressive concerns, and card systems of instruction to the men are being developed to a high degree.

"What kind of hoist service have the men at their machines for individual use?" The individual hoist service a man has at his command has much to do with his output. The position of the machine and the roof construction of the shop are the main factors in determining the overhead rail arrangement applicable. Compressed air hoists of the cylindrical type are being gradually recognized as superior for this purpose, although not always applicable by reason of their length, but a power hoist of some description should be used in preference to hand blocks. Where machines are arranged in lines, end to end, a continuous overhead rail is economical as it will not be necessary to supply a hoist to each machine. This system is also good in connection with heavy bench work, where the work may be transported from the vise to the shop trucks or anywhere required. When machines are separated a radial crane track is very serviceable, or, where this type is undesirable, a semi-circular rail suspended from the girders and serving two or three machines is often good. The foreman should have little difficulty in finding the type best suited to his requirements.

In Conclusion.—Many foremen may say that they have not the time to study these questions in the detail, but let them remember that unless they do give thought to these details they will progress little beyond their present state. It is in considering the details that progress is to be obtained, for it is the little parts that make the whole. Much may even be attained by the judicious placing of apprentices. See that the men are provided with sufficient light. See that there is an adequate supply of water or cutting compound; a system of overhead supply to each machine with a return flow to the pump beneath the floor is worth considering. Belts should be looked after and an indicator system should be employed to enable the workman to locate the belt-lacer when required. This indicator system may also be employed for other officials, if considered necessary. If the foreman has not the time to look to these details, then it is up to the management to give him such assistance that he may be in the position to consider them. There must be harmony in the management and, although somewhat difficult to obtain, the co-operation of the workmen. When combined with systematic organization, no doubt remains as to ultimate results.

BY ELMO N. OWEN.

General Foreman, Southern Pacific, Bakersfield, Cal.

Each shop has its special or local conditions which must be studied intelligently. One foreman can accomplish a great deal by himself, but if all the foremen do not pull together, individual effort will not count for nearly what it should; they should all be in friendly touch with one another. Some men, in the handling of a number of subordinate foreman, think it best to keep up a constant contention and bickering among them. Such is not the way to get the best results, and in the end it will pay small dividends on the capital invested.

Let us begin with the machine foreman to see what he can do to improve the efficiency of a shop. The machine side of a railway shop controls and almost dictates the output of any shop, for if work is put up to the floor men at the right time and in right quantities, that side will get the work done. The machine foreman's duties are many and varied. He should know which engine came in last and which is first out, and usually, along with taking care of the back shop work, he must take care of the roundhouse work. The secret of his success will lie in his being able to handle the rush work without throwing half finished jobs out of the machine that will take a great deal of time to reset, when

a few minutes longer would have completed them without delaying the roundhouse job materially. One of the things I learned early in my experience as a machine foreman was never to throw a half completed job out of a machine unless the urgency of another case absolutely demanded it; if good judgment is used few cases will be found so urgent, for work can be shifted from one machine to another and with a few minutes wait, time and money can nearly always be saved and the rush work will be done on time.

Railway shops are fast approaching a manufacturing basis by doing work on a store order system, and a machine foreman finds an opportunity to increase his output by making parts in constant demand in large quantities so as to reduce the cost per piece, for it is a well known fact that several pieces can be finished cheaper than one or two. In this connection, it seems strange that so many large railway companies go on keeping up expensive organizations at remote points, paying highest prices for labor with the consequent labor troubles, besides the time and trouble trying to keep a reliable set of mechanics, when a large manufacturing plant located where labor is plentiful, shipping facilities good, health conditions first class, if conducted on a manufacturing basis would pay large returns on the investment, and the shop efficiency could be raised to its highest plane.

Another important duty of any foreman is to see that he thoroughly understands all about a piece of work brought to him so as to be able to intelligently direct the handling of it. In doing this he will avoid many mistakes and be able also to rush to completion any piece of work. Often a foreman is notified that he will be sent a certain job which he cannot have at once; he should acquaint himself with all the details connected with it and plan how the work will be done, by whom and where; then when he receives it no delay will occur in starting. It is surprising how this will increase the output.

A foreman must see that each man has work enough ahead of him at all times for at least a day in advance, for a man who hasn't a little ahead of him will be afraid of running out of a job, but if he has work all around him will keep busier and be more contented.

As has been said, one of the most important things for shop efficiency is team work among the various foremen; some foremen will advance the work under their control without a thought of the other foreman, often hindering and putting the others back. This should never be allowed, for it will not help pay dividends. Personal feeling (antagonistic) should not enter into the acts of any foreman, but he should place himself above a thing that debases or belittles anyone if he is to be altogether successful.

The successful handling of men in itself is a large factor in the output of any shop and here is where the individual foreman can get in his best work. For my part, I do not believe men should ever be abused, but always treated kindly. Abuse may have answered in days of slavery, but in modern times it finds no place; as soon as you undertake to drive a man in these times he leaves you, then you are looking for a man to take his place, and possibly get one not so competent, besides the unnecessary expense of educating him to your methods and shop conditions. Kind treatment will keep a man contented, and he will be a far greater factor in increased output than if abused. Kindness does not mean favoritism—far from it—and favoritism should not be shown.

Even in administering a rebuke, kindness can be shown, and you thereby win a man's respect and loyalty, whereas, ill treatment will at once make him antagonistic. Reprimands rightly given sink deep and make lasting impressions and seldom call for a second along the same line and may not call for it in any way again. In so far as the individual foreman handles his men to make them loyal and works in harmony with his fellow foreman, just so far is the output of any shop brought to its greatest efficiency. A kind word to a man costs nothing and pays great returns.

There is a tendency among labor organizations to-day to decrease or rather hamper output and keep it down, and here is where individual effort and kind treatment of men by the foremen comes into play, doing more to overcome this hateful condition than any other one thing, for the individual workman of to-day is and can be made as loyal as ever, except in a few cases and one is not long in finding them out. A man who abuses his employees soon finds that while he is looking they are all working and when his back is turned they are all loafing, while if he treats them respectfully they work as well when his back is turned as at any other time. Some will say all I may have said about the treatment of men has very little to do with output of the shop or shop efficiency, but all I ask is that any man try either method and compare results.

To show how a shop was brought to a high state of efficiency by one master mechanic I will explain his methods. To begin with, he held a foremen's meeting once each month, to which all foremen were invited, and they came with the understanding that each was to give a statement showing in what way he had improved facilities for handling the work in his department or at any place in the shop. All the improvements were discussed and other subjects were brought up and suggestions of all kinds offered for betterment. A copy of the proceedings was sent to each foreman showing who had made improvements. If one had done nothing that could be reported, he was likely to be given some good natured raillery; the writer got it sometimes but never felt hurt, indeed he felt spurred on to do better the next time. Two years of the most pleasant work of my life were spent under that master mechanic and better team work among foremen was never seen and their feeling of pleasure in their work was, to a certain degree, passed down the line to the individual workmen. Would anyone doubt that such methods added to the efficiency of that shop?

We may go on making special machines and special devices all we please, but the human hand that plays such a large part in this world must be directed carefully and intelligently to get the highest efficiency.

REPAIRING LOCOMOTIVES AT THE SAYRE SHOPS.

The Lehigh Valley shops at Sayre, Pa., have established a new time record in repairing locomotives. For the seven months from September 30, 1909, to May 1, 1910, one locomotive was turned out for every three and a half working hours. A detailed statement of the work done is shown in the following table:

Month.	Rebuilt.	New fireboxes.	Back-flue sheet.	Engines, total.	Hours worked.	Hrs. worked per engine repaired.
October, 1909...	..	5	6	50	168	3.4
November, 1909..	1	4	5	47	152	3.2
December, 1909.	1	4	5	52	184	3.5
January, 1910...	1	6	5	53	168	3.2
February, 1910..	1	3	6	41	153	3.7
March, 1910.....	1	4	8	47	198	4.2
April, 1910.....	2	6	11	61	212	3.3
Total	7	32	46	351	1,235	3.5

The Lehigh Valley repair shops at Sayre are the largest under one roof in the United States. The force of employees includes 1,000 men who work on locomotives alone, 450 on freight cars, and 150 on passenger cars. The plant covers 57 acres.

The northern section of the Tientsin-Pukow Railway, China, has been completed to Chuang Chow, and construction trains are utilizing the track for carrying material.

The railway board of the Japan government railways has under its jurisdiction 2,500 locomotives, 6,000 passenger and 35,000 freight cars. It is proposed to increase the number in each division by about 5 per cent. to meet the increased traffic.

Shop Kinks.

FROM THE WEST MILWAUKEE SHOPS OF THE CHICAGO, MILWAUKEE & ST. PAUL.

REACH ROD JAW SLOTTING TOOL.

The gang slotting tool shown in Figs. 1 and 2 was specially made for reducing the labor cost on new locomotives. A hundred or more jaws were ordered at one time, and finished in large lots. Under the old method of slotting with a single tool, it required two hours per jaw. With the gang tool having three cutters, the central portion and the two outside faces are finished at one operation, the time required being only 35 minutes.

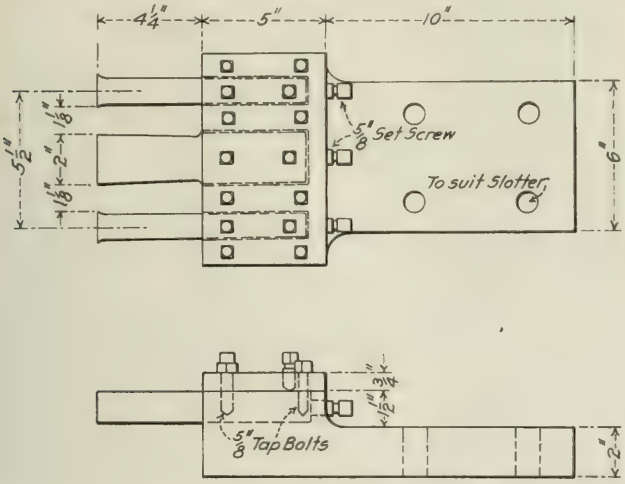


Fig. 1—Reach Rod Slotting Tool.

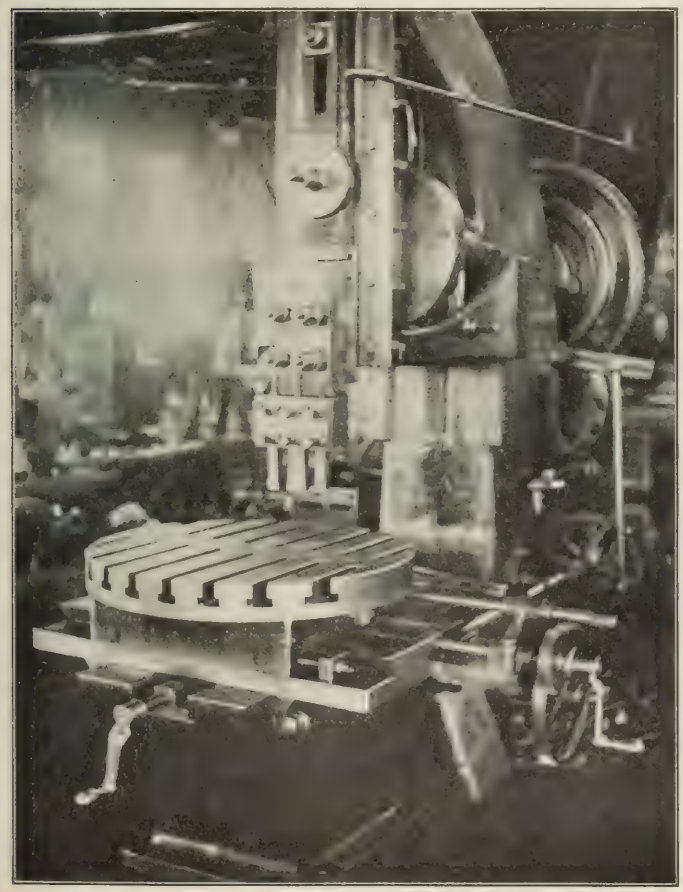


Fig. 2—Reach Rod Slotting Tool in Operation.

AIR PUMP CENTERING STAND.

The stand for centering air pumps, shown in Fig. 3, is intended to overcome the difficulty of chucking them for reboring. The outside diameter of the slip ring A is a sliding fit in the counterbore of the air pump. The boss B fits neatly into a hole in the center of the boring mill table. The pump is placed on the stand and the slip ring is pushed up into the counterbore. The pump is then clamped down to the boring mill table and the slip ring is pushed far enough out of the way to permit of boring the centered cylinder. This device saves about 15 minutes in reboring each pump cylinder.

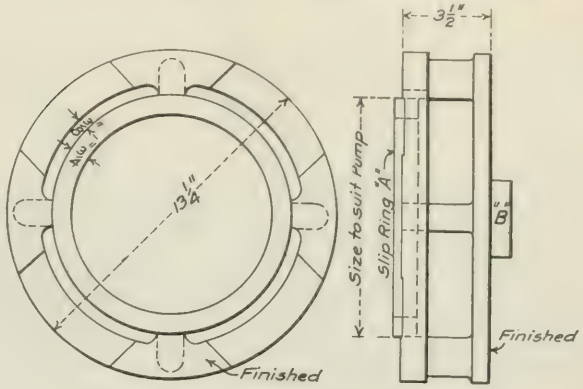


Fig. 3—Air Pump Centering Stand.

PACKING RING GANG TOOL.

A gang tool for turning and finishing cylinder packing rings is shown in Figs. 4 and 5. While it is usual to employ gang tools for cutting off the rings from the finished cast-iron pipe, this device includes a roughing tool in the same arbor with the six cutting-off tools. The rough casting is just large enough to permit of cutting five rings and is finished on the inside with a regular cutting tool. The outside is turned with a tool in the second mill head and the rings are separated and finished on the sides by the narrow gang cutters. The number of rings finished by the ordinary method with a single tool is one per hour, while the gang cutter will finish three rings per hour.

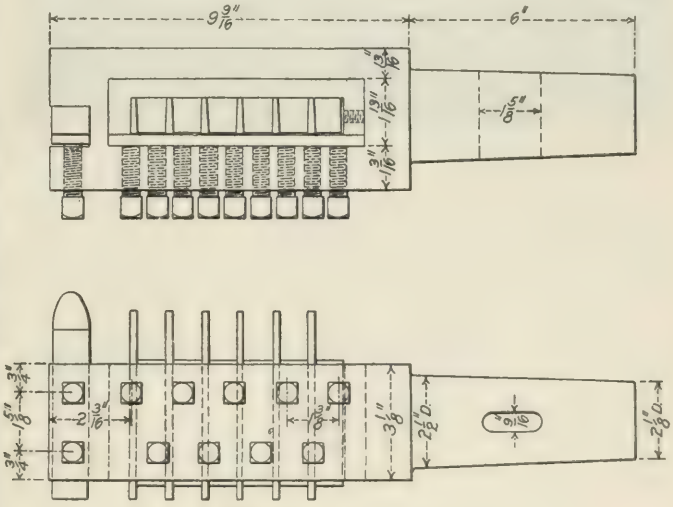


Fig. 4—Packing Ring Gang Tool.

SHAPER SLOTTING TOOL.

The slotting of the diagonal ports in bushings for piston valves is a slow process at best and usually requires considerable filing after the slotting is completed. By the use of an angular cutting edge on the broaching tool shown in Fig. 6, most of the diagonal ports can be finished on the small slotter. The photograph, Fig. 7, illustrates the manner in which the bushing is chucked on the shaper, and the drawing shows the

shape of the broaching cutter. The old method of slotting these ports required 8 to 10 hours, but by this improvement the work can be done in 4 hours.

POWER ROLLS FOR FLANGING.

A method of off-setting the flange of the conical connection sheet of boiler shells by the use of the power rolls instead of by the usual method of flanging by hand is shown in Fig. 8. A short piece of an old driving axle about 8 in. in diameter and 10 in. long is placed on the two lower rolls near the flange end of the sheet and another piece, smaller in diameter, is placed near the other end. The difference in the diameter of these pieces is made sufficient to flange out the end of the

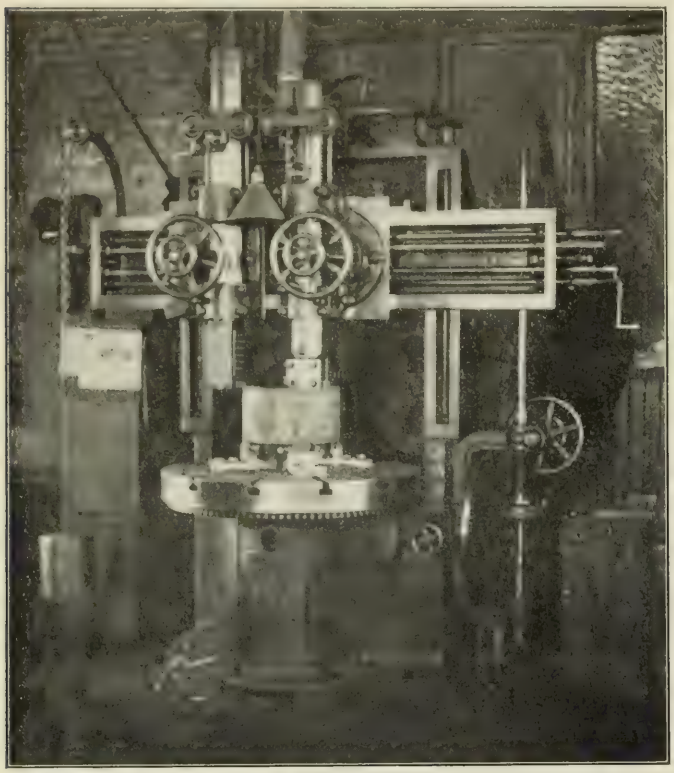


Fig. 5—Packing Ring Gang Tool in Operation.

sheet for a short distance when it is desired to have a horizontal seam for the rivets. We believe this is entirely original with A. N. Lucas, the boilermaker at West Milwaukee, and have the impression that it is not used at other boiler

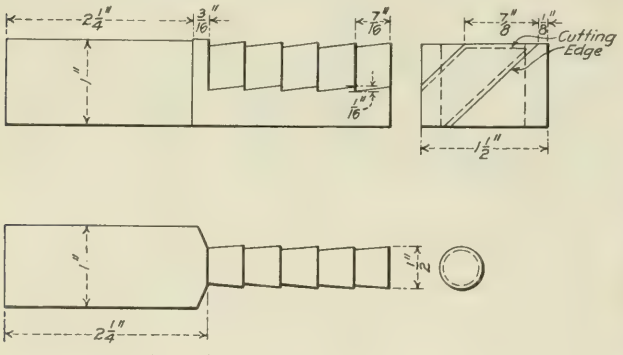


Fig. 6—Shaper Slotting Tool.

shops. It requires three hours to flange this conical connection on the rolls, while the old method of flanging requires about eight hours.

KINKS FROM VARIOUS SOURCES.

GREASE PRESS.

A press for molding the grease to fit the grease cups on locomotive connecting rods is shown in the photograph, Fig. 9. It is in use at the East Buffalo shops of the Delaware, Lackawanna & Western. The power is furnished by two 8-in. air-brake cylinders, placed tandem. The grease is placed in one end of a third cylinder of the same size. The grease hopper is

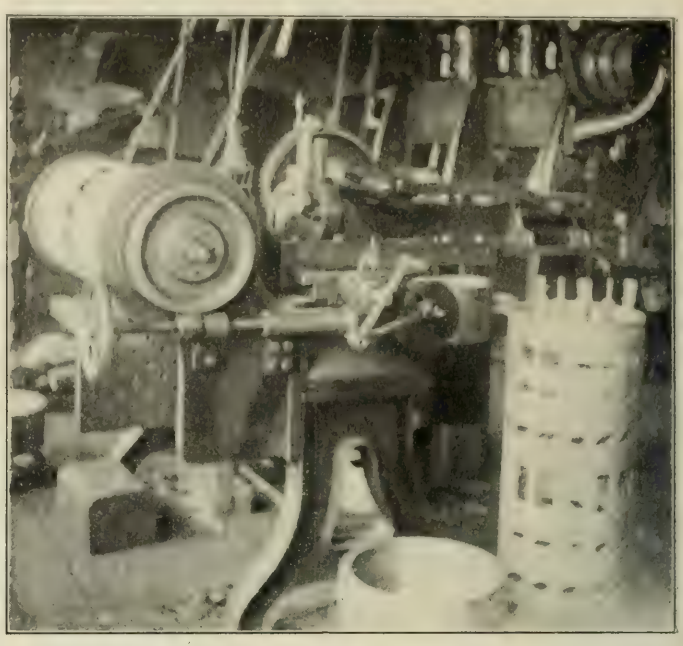


Fig. 7—Shaper Using Special Tool on Valve Bushing.

made of light copper plate, is 7½ in. high, 6¼ in. square at the top, and has an opening into the cylinder about 3½ in. square. The grease is pressed out through the pipe at the left-hand end of the cylinder, and is cut into pieces of the proper length by means of the box, part of which is shown just behind the cake of grease that is being pressed out. The cutting is done with a simple form of knife made of a piece of thin sheet iron and shown in the photograph.

To return the pistons to their initial positions, air is admitted to the left end of the middle cylinder by means of a three-way cock. The apparatus is bolted on a steel plate, ¼ in.

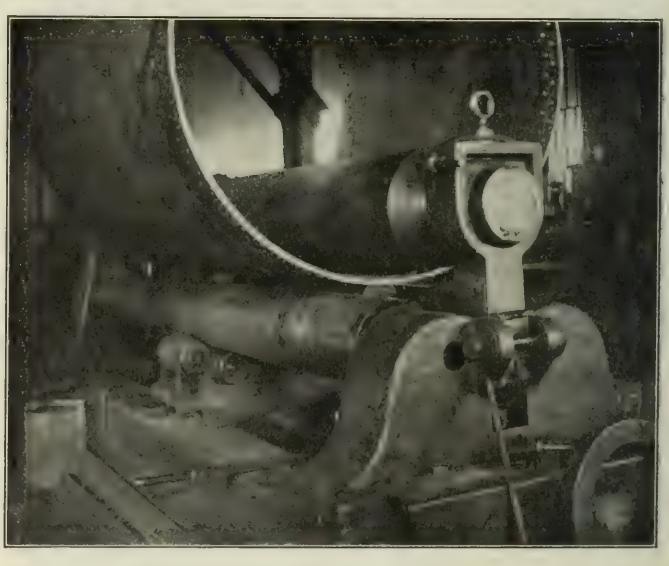


Fig. 8—Power Rolls for Flanging.

thick and 7 ft. long, which is flanged down on the sides and is supported by cast iron legs, braced by wrought iron straps. The middle cylinder and the one containing the grease are tied together by two ⅜-in. rods, as well as being bolted to the table. A shelf for the storage of the grease cakes, built of 3/16-in. steel plates, is fastened to the wall at the right of the press, and contains three compartments.

HOSE COUPLING AND NIPPLE MACHINE.

Compressed air is now almost universally used for applying couplings and nipples to hose. There are many designs of machines used for this purpose, one of which, in service on the Southern Railway, is shown in Fig. 10. It consists mainly of three cylinders, A, B and C, mounted on a bench. The A cylinder is vertical and contains a piston whose rod is attached to the upper part of the hose clamp D. The cylinder A, made of a piece of 4½-in. pipe, has a spring which tends to maintain the piston in its upper position. The piston rods of the two end cylinders B and C carry holders that take the nipple and coupling respectively. The hose is placed between the clamps and the air is admitted to the vertical cylinder. The clamps are 20 in. long, with a clamping surface of 14 in. A flare at the ends allows for the increase in the hose diameter, due to the insertion of the metal pieces.

METHOD OF HANDLING COACH TRUCKS.

An ingenious method of utilizing the weight of a coach for power in lifting the truck from its wheels, which is employed at the Skaguay, Alaska, shops of the White Pass & Yukon Route, is shown in Fig. 11.

The jacks are quite similar in construction to those used at the Elizabethport shops of the Central Railroad of New Jersey, as illustrated and described in the *Railway Age Gazette* of April 1, page 873. The jack, illustrated herewith, has 6-in. gas pipe plungers, the top ends of which are left open. In placing

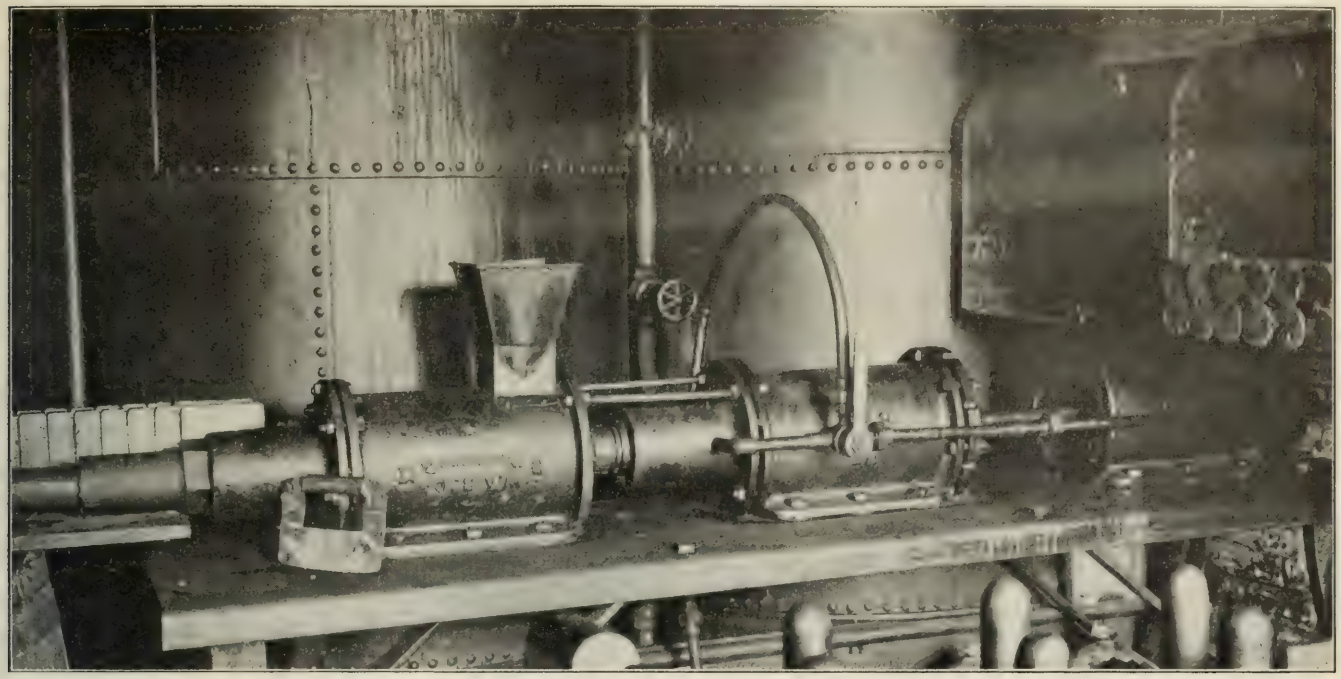


Fig. 9—Press for Preparing Grease Cakes for Connecting Rod Grease Cups.

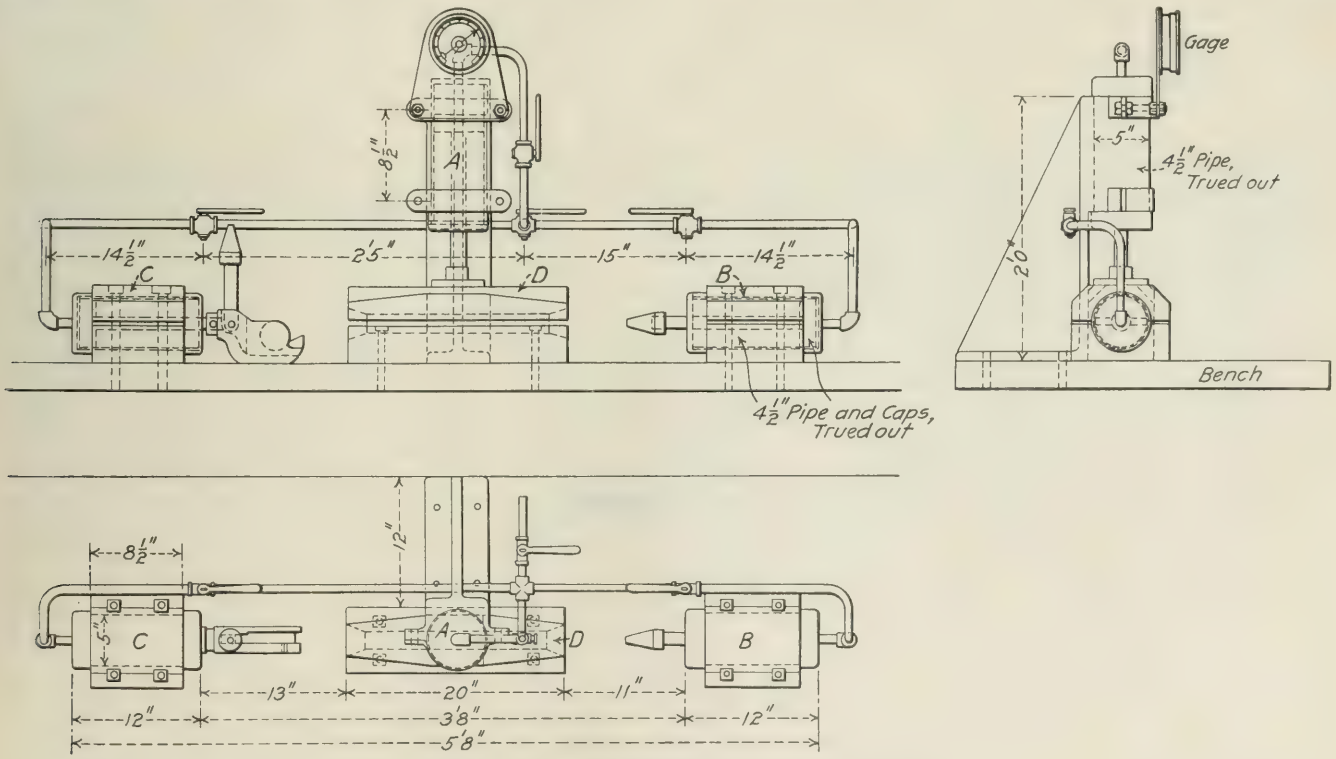


Fig. 10—Hose Coupling and Nipple Machine.

the jacks under a coach, wooden filler blocks of sizes such that they will just go under the car bolsters, are used. As several lengths of these filler blocks are kept on hand, any height may be obtained without using additional blocking. The car is then raised to the position shown in the upper illustration and the truck is run out. One of the walking-beam chains is attached to the truck frame and the other to the coupler shank.

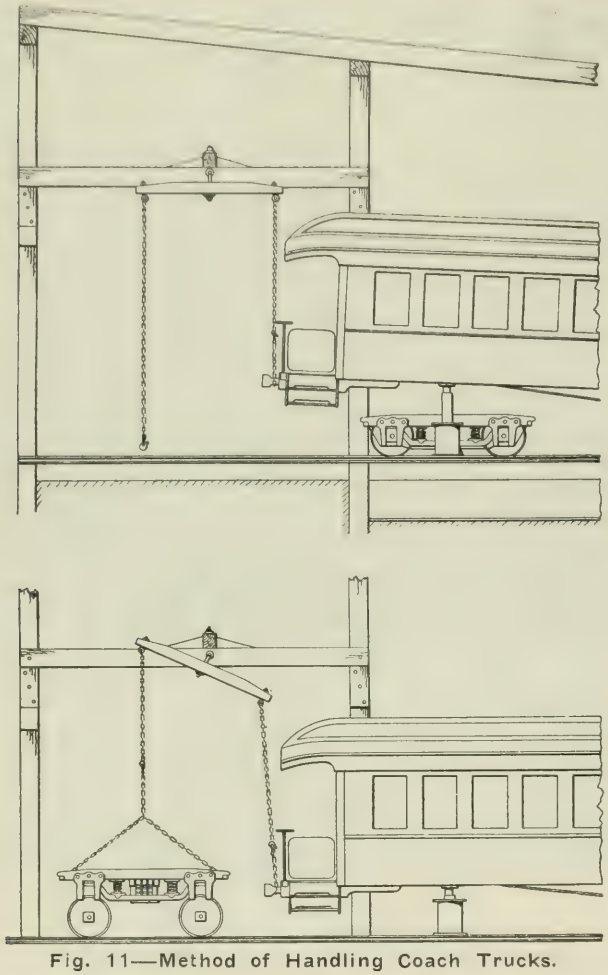


Fig. 11—Method of Handling Coach Trucks.

The coach is then lowered and its weight acts to raise the truck from its wheels.

The coach is allowed to stand on the jacks while the wheels are being changed, the entire job being the work of one man. We are indebted to H. Ashley, master mechanic, W. P. & Y. R., for the drawing and data.

LARGE MILLING CUTTERS.

The shops of the Eastern Railway of France are using some large milling cutters of both solid and inserted tooth design. The accurate making of a large milling cutter is usually considered very difficult. In this shop, cutters are made 10 in. in diameter by 16 in. long, weighing 400 lbs. When inserted teeth are used, there is a solid soft steel hub in two parts fitted with spiral steel blades. The two parts of the hub are placed end to end, and each blade is made in two pieces, set lengthwise of each section.

BY JAMES STEVENSON,

Foreman, Pennsylvania Railroad Shops, Olean, N. Y.

REMOVING DRIVING-BOX CELLARS.

A method of removing tight-fitting driving-box cellars without damaging them, as is the case when using a sledge hammer, is shown in Fig. 12. The boxes are first rolled over on the axles. The apparatus is swung above the axle from a traveling air hoist and the fulcrum of the lever, made in the form of a double clamp and bolted at the bottom, is fastened to the axle. The U-shaped piece of metal is then placed in position, bearing against the box only, after which the cellar bolts are removed. The other box is used for a foundation for the air

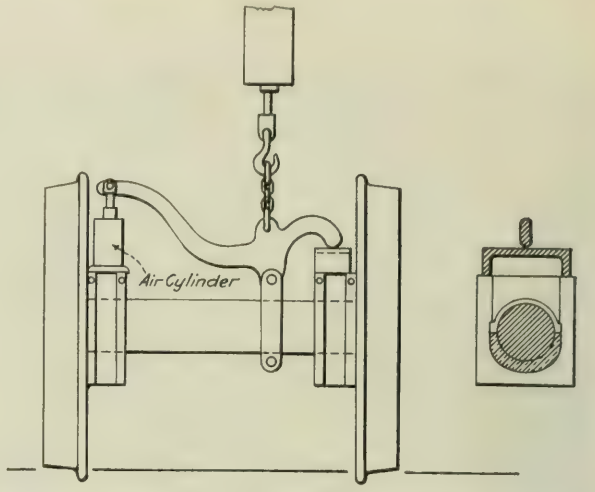


Fig. 12—Method of Removing Driving-Box Cellars.

cylinder. When the air is applied the box is forced down and off of the cellar, which latter is used as the cylinder foundation when removing the opposite box.

TRUCK SIDE MOVEMENT INDICATOR.

A method of obtaining a card or diagram of the side movement of a locomotive truck is shown in Fig. 13. A bracket is bolted to the truck side frame on the center line of the truck. This bracket should be sufficiently long to project some distance ahead of the cylinder so as to clear it at all times. The

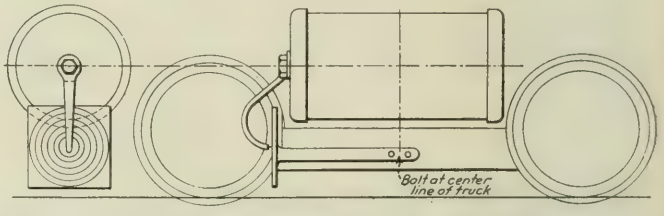


Fig. 13—Truck Side Movement Indicator Arrangement.

bracket carries a 12 x 12-in. board, on which is placed a card having 1-in. graduations by concentric circles.

A piece of ¼-in. pipe is bent to the shape shown, and one end is fastened at the cylinder head stud and the other provided with a pencil, which bears against the diagram sheet. When the locomotive is standing on straight track the pencil should touch the center of the diagram. Lateral movements of the truck, while running, will be recorded, and in case of alterations for side movement, their effects can be noted.

A consular report says that a concession granted by the government of Honduras early in 1909 for constructing a railway from Iriona, on the Atlantic, to the inland city of Juticalpa, and embracing the option of extending lines to Tegucigalpa and the Pacific port of Amapala, was financed in Chicago, with a capital of $5,000,000, and incorporated under the laws of the state of Delaware as the North & South Interoceanic Railroad. Engineers have completed the location survey to Juticalpa, 144 miles, and grading for a standard-gage road was begun in October last. The work involved is of considerable magnitude, as it is intended to jetty the mouth of the Gualaya river, on which Iriona is situated, and deepen the channel to a depth sufficient to enter vessels drawing 30 ft.; to lay out a town site with proper drainage, install water and electric-light plants, and erect a wireless station.

CAR REPAIR SHOP NOTES FROM THE DELAWARE, LACKAWANNA & WESTERN AT EAST BUFFALO.

BY ROY V. WRIGHT,
Mechanical Department Editor of the *Railway Age Gazette.*

The car repair plant of the Delaware, Lackawanna & Western at East Buffalo employs about 250 men. During the month of March 11,769 freight cars were repaired as follows: 31 received No. 1, or heavy repairs, which includes cars receiving longitudinal sills and other repairs; 35 received No. 2, or heavy repairs, which includes cars that receive new roofs, together with any of the following: New end or ends, floor, draft timbers, end sills, bolsters, needle



Fig. 1—Freight Car Repair Shop.

beams, new sides, new inside lining, post or braces, side plates and end plates, or any two of these items that require 16 hours or more to renew; 349 received No. 3, or ordinary repairs, including any one of the items mentioned above that requires more than 10 hours or less than 16 hours to renew; 11,354 received light repairs, which is equivalent to repairs that can be made by one man in less than 10 hours.

Only light repairs are made to steel cars at this point, cars requiring heavy repairs being sent to the shops at Keyser alley. Passenger equipment that lays over at Buffalo is cleaned at the East Buffalo shops and any light repairs are made that may be necessary.

The car repair plant is in direct charge of the general foreman of the division, C. G. Anderson, who reports to B. H. Hawkins, the division master mechanic. We are indebted to T. S. Lloyd, superintendent motive power and equipment; J. C. Fritts, master car builder, and to the above mentioned gentlemen and their assistants, including William Anthony, mill foreman, and Martin Hoffman, car repair foreman, for assistance in gathering the data for this article.

NEW CAR SHOPS.

At present the work in the car repair department is being carried on under difficulties, as a new shop is being built to replace the mill, car shop, etc. The building is almost completed and the equipment will be installed within the next few months. It is 84 ft. wide and 484 ft. long; one end,

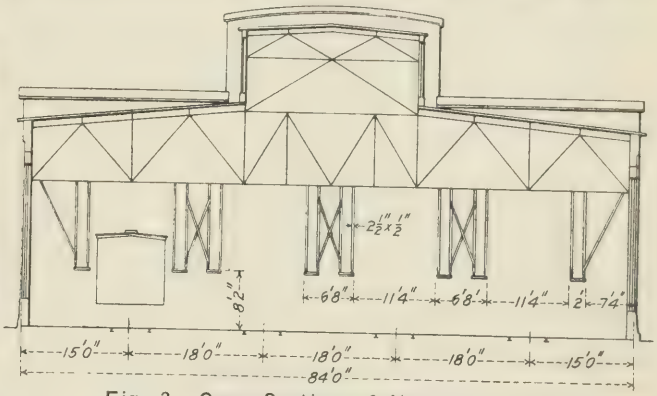


Fig. 3—Cross-Section of New Car Shop.

about 200 ft. long, will be used for the mill, offices and for lumber storage; the other end will be used for freight car repairs and will have a capacity for 20 cars, or five on each of the four tracks. There is a lorry track between each pair of repair tracks. The space between the rails of each track is filled with concrete; the rest of the floor in the car repair end will be of wooden blocks. A general idea of the construction of the building may be obtained from the interior and exterior views and the diagram of the cross



Fig. 2—Interior of New Freight Car Repair Shop and Mill.

section, as shown in Figs. 1, 2 and 3. The roof trusses are heavier in the mill end of the building because of having to support the electric motors and the countershafs for the machine tools. The walls are of brick resting upon a concrete foundation. The ends of the steel roof trusses rest on the brick pilasters. The roof is of reinforced concrete 4 in. thick and is covered with four layers of tar paper and a slag roofing. The building will be heated by steam, the radiators being placed along the side walls underneath the windows. Compressed air and other piping is carried overhead on the roof trusses. Arc lights will be used for lighting the car repair end of the shop and a combination of arc and incandescent lights will be used in the mill end. The large window area in the side walls and the skylights provides splendid daylighting.

NUMBER OF WORKMEN ON A CAR.

The men work in gangs of two men each and are divided into two classes, truck men and carpenters. The truck men do the work on the trucks, underframe and draft rigging; the carpenters do all the work on the roof, sides and floor of the car. Except in emergency, not more than four men can work on one car at the same time—a truck gang and two carpenters.

LOCKERS FOR THE MEN.

An expanded metal locker is provided for each workman in the shops and the repair yard. These lockers are placed in the freight car shop and are 1 ft. wide, 1 ft. deep and 5 ft. high inside. They are examined three or four times a week to see that no inflammable material is allowed to accumulate in them. They were manufactured and furnished by Merritt & Co., of Philadelphia.

WORKMEN'S TOOL BOXES.

Considerable friction developed at one time because of the



Fig. 4—Platform for Material Reclaimed from Scrap.

workmen stealing tools from each other's boxes. These boxes are of the usual type, 12 in. x 7½ in. x 24 in. over all, with half of the top and half of one side open. To overcome the difficulty three compartments or closets were built in one corner of the freight car shop, each about 9 ft. long and containing two shelves, making three divisions in each. Each workman's tool box is numbered and must be put in a certain place in one of the compartments when he finishes his work in the evening. The man in charge locks the compartments when the boxes have been placed in them. If any of the men work overtime, the night watchman sees that the boxes are properly put away. In the morning the men take out

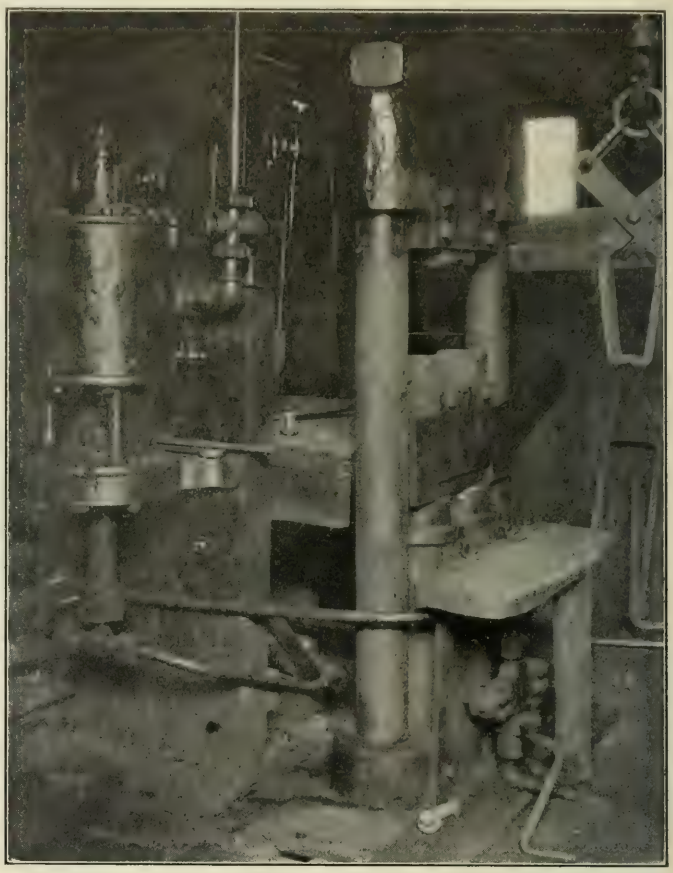


Fig. 5—Hydraulic Press for Shearing Off Coupler Yoke Rivets.

their boxes when they start to work and if any boxes remain the compartment is locked so that the contents cannot be tampered with. This scheme is giving splendid results.

RECLAIMING MATERIAL FROM SCRAP.

All scrap material gathered on the division is shipped to the East Buffalo shops and sorted into different classes. It is carefully examined by an expert and such parts as are fit for use are transferred to what is known as a second-hand platform, which is partially shown in Fig. 4. When material is taken from this platform no charge is made against the car for it. At one end of the platform is a shed containing a hydraulic machine for cutting off the coupler yoke rivets; beyond this is a small blacksmith shop where bent or broken parts are straightened and repaired, and yokes are riveted to couplers.

HYDRAULIC PRESS FOR SHEARING COUPLER YOKE RIVETS.

A hydraulic press, or shear, designed at the East Buffalo shops has recently been installed for shearing off coupler yoke rivets and is giving satisfactory results. The rivets are sheared at both ends where the yoke fits against the coupler. The body of the rivet drops out of the coupler end, and the two ends of the rivet either drop out, or may be easily knocked out, of the yoke. The disadvantage of most devices designed for doing this work is that they cut the rivet head off at one end only, and if both of the rivets are not headed up on the same side, it is almost impossible to drive one of them out. With this machine, although the work is done

quickly, there is no danger from flying parts as with a drop machine. The apparatus is shown in detail in Figs. 5, 6, 7 and 8. The columns of the machine are forged from old axles. The coupler is raised by an air hoist on a gib crane and the yoke is slipped into place as shown in Fig. 8. Water is admitted to the cylinders by the three-way cock (Fig. 7) and the ram is raised so that the coupler is forced against the top die, or former, as shown in Fig. 8. By means of the three-way cock the connection to the main water supply line is then cut off and the pressure in the cylinders is increased by starting up a 9-in. locomotive air pump, the lower part of which has been bushed down to $\frac{15}{16}$ in. and is connected by a T and two check valves to the water supply line and the cylinders of the press. From 10 to 14 strokes of the air

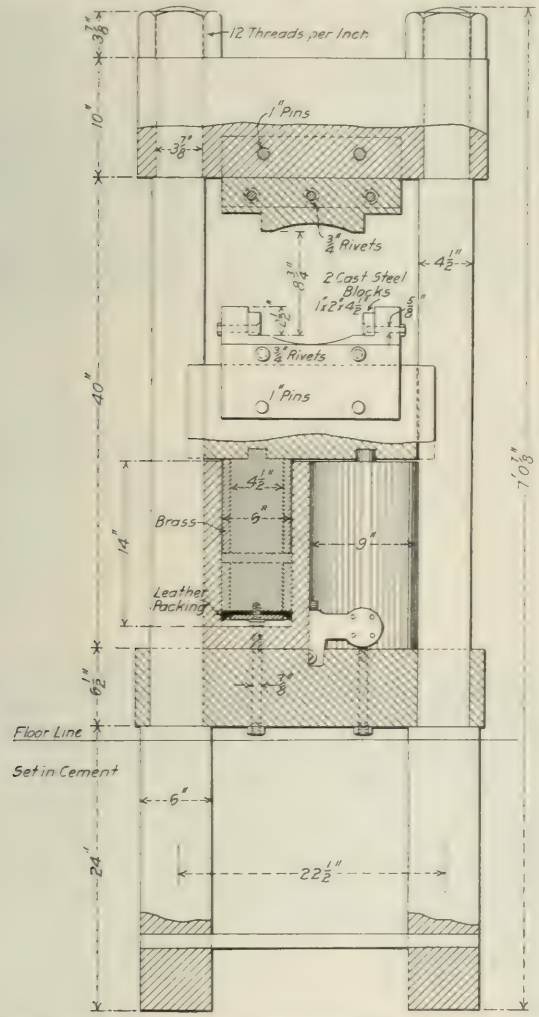


Fig. 6—Hydraulic Press for Removing Yokes from Couplers.

pump are required to increase the pressure in the cylinders sufficiently to shear off the two 1⅛-in. rivets at both ends. The air pump is then shut off and just enough water is drained from the cylinders to allow the yoke and coupler to be removed and another one to be slipped into place.

MAKING BOX CAR DOORS.

Accuracy and rapidity in the building of box car doors is secured by the use of a cast iron plate 3¾ in. thick and 7 ft. 3 in. wide by 8 ft. 6 in. long. On two sides, at right angles to each other, are flanges 2 in. high, as shown in Fig. 9. The door frame is laid on the plate, as shown by the photograph, and the siding is placed on it and nailed to it. Near the back of the plate will be seen what appears to be a boss with a handle on it. This is a cam which fits into a cavity in the plate; it was intended by turning the handle to force the siding boards tightly against each other and hold them there while they are being nailed on the frame. There were three of these cams. This practice has been discontinued, however, as it has been found that the dry lumber, when it becomes exposed to the rain and moisture, swells, with re-

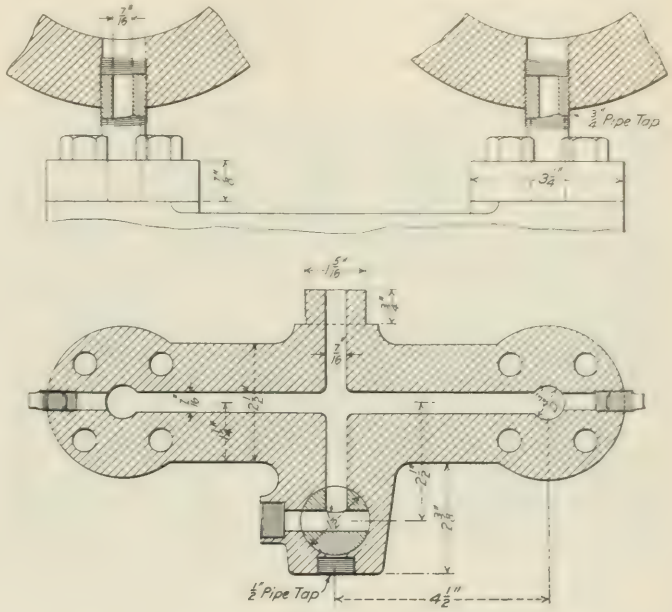


Fig. 7—Three-Way Valve on Hydraulic Press.

sulting injury to the appearance of the door. Underneath the table are a number of bins containing all of the necessary nails, castings, screws, etc.

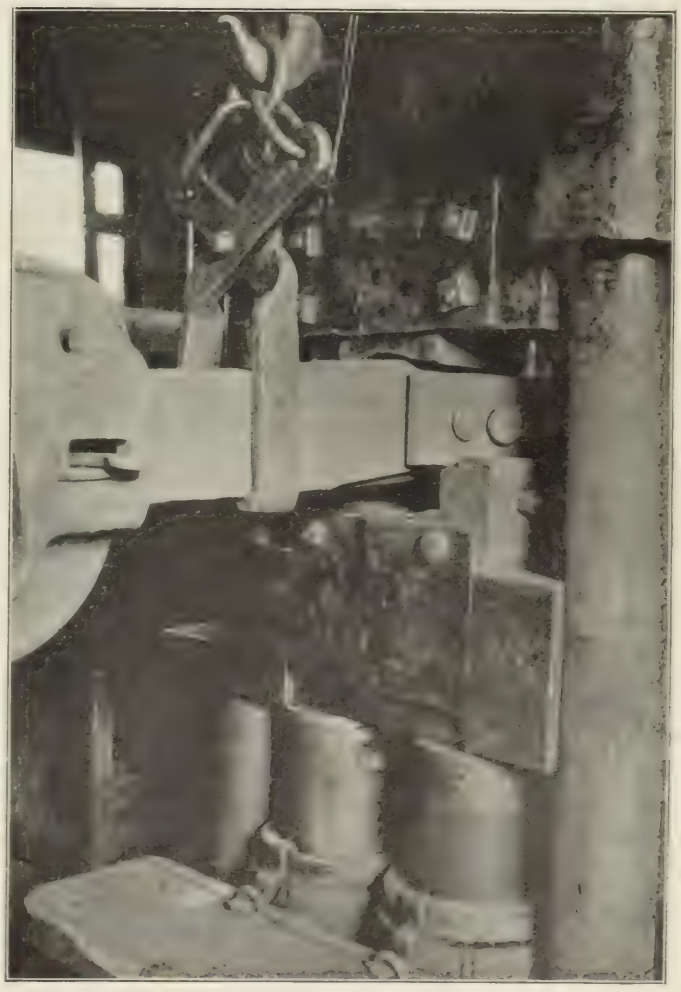


Fig. 8—Coupler Yoke Rivets About to be Sheared.

REPAIRING FLOORS OF GONDOLA CARS.

In repairing or replacing the floors on wooden gondola cars it is necessary to remove or raise the sides or box out of the way. To economize space in the freight car shop an ingenious arrangement has been provided for hanging the box up out of the way above the car. As shown by the photograph, Fig. 10, ⅞-in. rods are hung from I-bolts in the



Fig. 9—Iron Table for Building Box Car Doors.

wooden roof trusses. These rods are upset at the lower end and formed into a hook 1¼ in. square in section and 3 in. wide. The sides of the car are loosened from the under frame and pried up a couple of inches. The car is then jacked high enough so that the hooks, two on each side, may be placed under the sides. The underframe is then lowered, leaving the sides hanging in the air.

JACKING UP LOADED CARS.

All of the jacking up and lowering of loaded cars is done

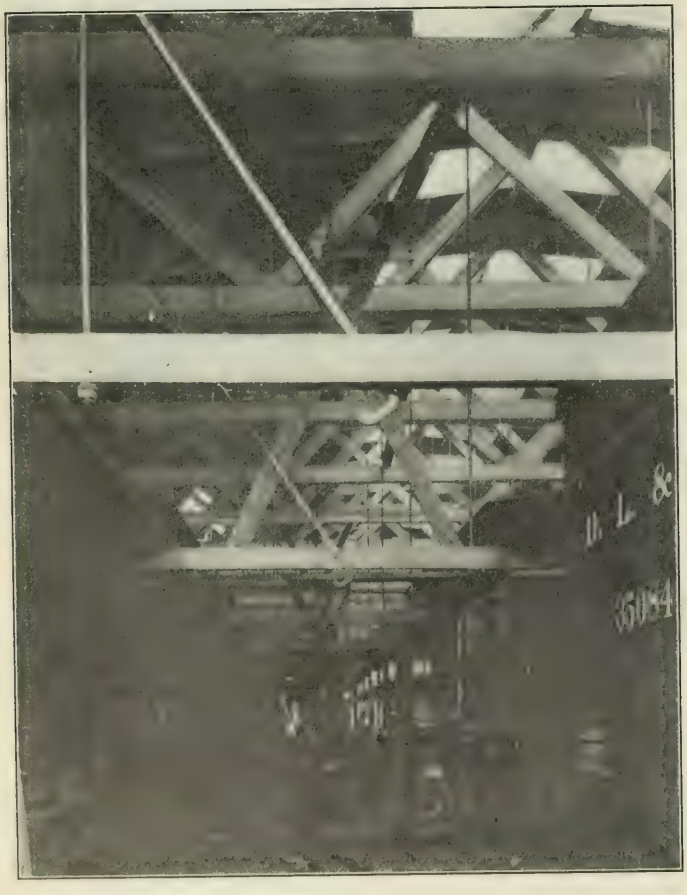


Fig. 10—Hooks or Hangers for Supporting Gondola Sides.

by two men with two air jacks; these are shown in position at one end of a loaded car in Fig. 11. The inside diameter of the air cylinders is about 20 in. and the stroke is 22 in.; the piston rods are 4 in. in diameter. The air supply for both cylinders is controlled by one valve, so that the pressure

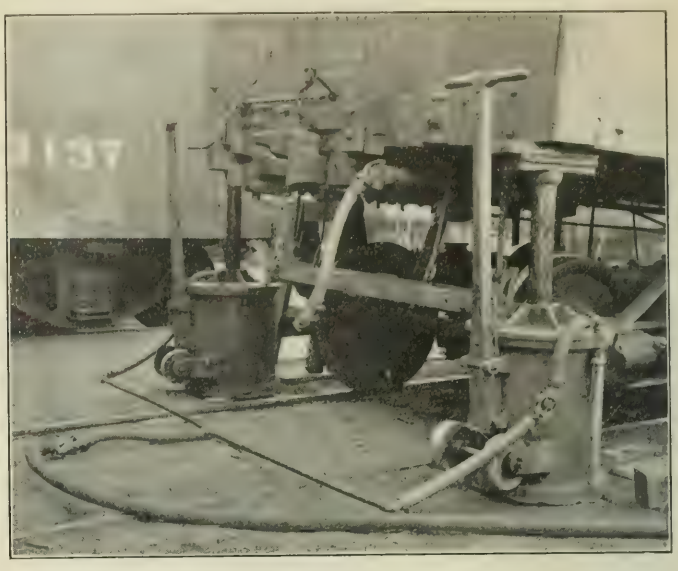


Fig. 11—Air Jacks for Loaded Cars.

is equalized and both jacks work together. While the jacks are quite heavy, the men seem to have no trouble in handling them about the yard. The light cars are jacked up by ratchet jacks by the gang of men working on tne car.

PREPARING PACKING FOR JOURNAL BOXES.

The method of preparing the packing for journal boxes is especially good. The waste must soak in the oil for not less than 24 hours and must contain four pints of oil to each pound of waste. This proportion was determined upon after

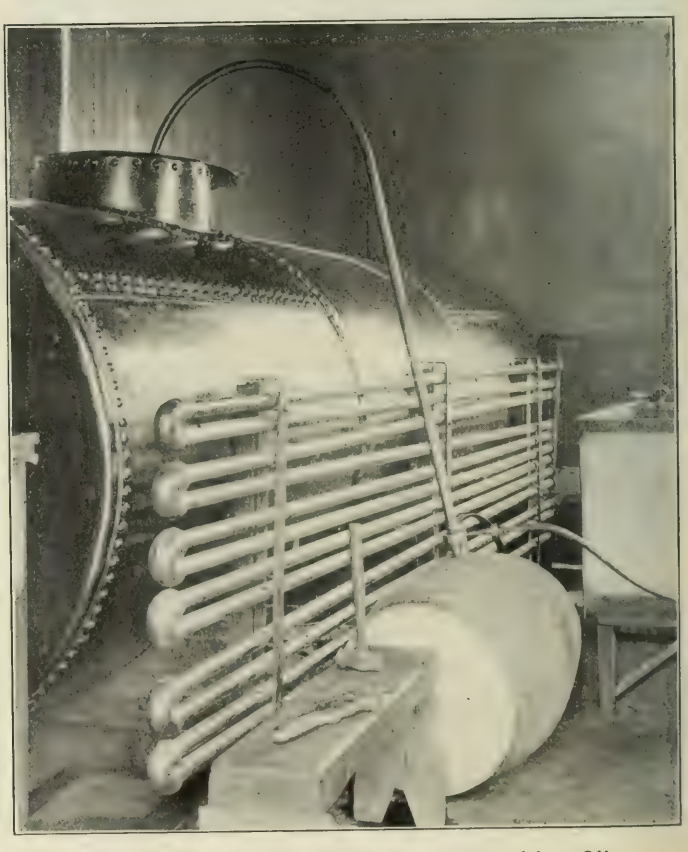


Fig. 12—Storage Tank for Journal Packing Oil.

considerable practical experimentation. Five pints and four and a half pints to each pound of waste were tried and found to be excessive. The waste is stored in a compartment, or bin, 7 ft. x 5½ ft., which may be extended by slats as high as is necessary. The oil is received in barrels and is forced by compressed air into a tank having a capacity of 36 barrels, or about 1,800 gals. To do this the bung is removed from the barrel and a brass plug is screwed in the hole. A piece of 1¼-in. pipe slips through a hole in the plug and extends to the lower side of the barrel. The upper end of this pipe is bent over and drops down into the manhole of the large tank, as shown in Fig. 12. The air enters the top of the barrel through a ½-in. pipe in the brass plug. A rubber gasket on the large pipe at the top of the brass plug prevents the air from escaping at the joint. The maximum air pressure is automatically controlled, so that there is no danger of bursting the barrel. The steam pipes alongside the tank keep it warm and heat the room in cold weather.

On the other side of the room are five tanks (Figs. 13 and 14) constructed of ¼-in. steel, 32 in. in diameter inside and 36 in. high. These are supported on 9-in. I-beams resting on the concrete floor. To prepare the packing 90 gals. of oil are run into one of these tanks, and to this is added 80 lbs. of wool waste, the latter being put in carefully in order to saturate it thoroughly with the oil. This mixture is allowed to stand not less than 24 hours. At the end of that time, or when the waste is needed, the globe valves in the 1½-in. pipe at the bottom of the tank are adjusted so that the surplus oil can drain into an empty tank. When the height of the oil has reached about the same level in both tanks, as determined by putting a measuring stick down through the vents at the sides of the tanks, the ⅝-in. plate or piston is pressed down on the waste until 50 gals. of oil have been forced into the second tank. The oil is measured by a measuring stick properly calibered. The packing then contains 40 gals. of oil, or four pints to each pound of waste, and is ready for use. As shown by the drawing, each tank contains a cast iron strainer near the bottom.

The lower head of the air cylinder is a casting and has two arms which extend down over the sides of the tank. Each of these is riveted to a ½-in. plate, which has a flange 25 in. long extending under the horizontal members of the 4-in. x 3-in. x ½-in. angles, which are riveted to the sides of the tanks. These angles are tied to each other at the ends and between the tanks by 3½-in. x ⅝-in. iron braces, which are turned over at the ends and riveted to the angles. When the cylinder is not exerting pressure it rests on four 4-in. rollers,

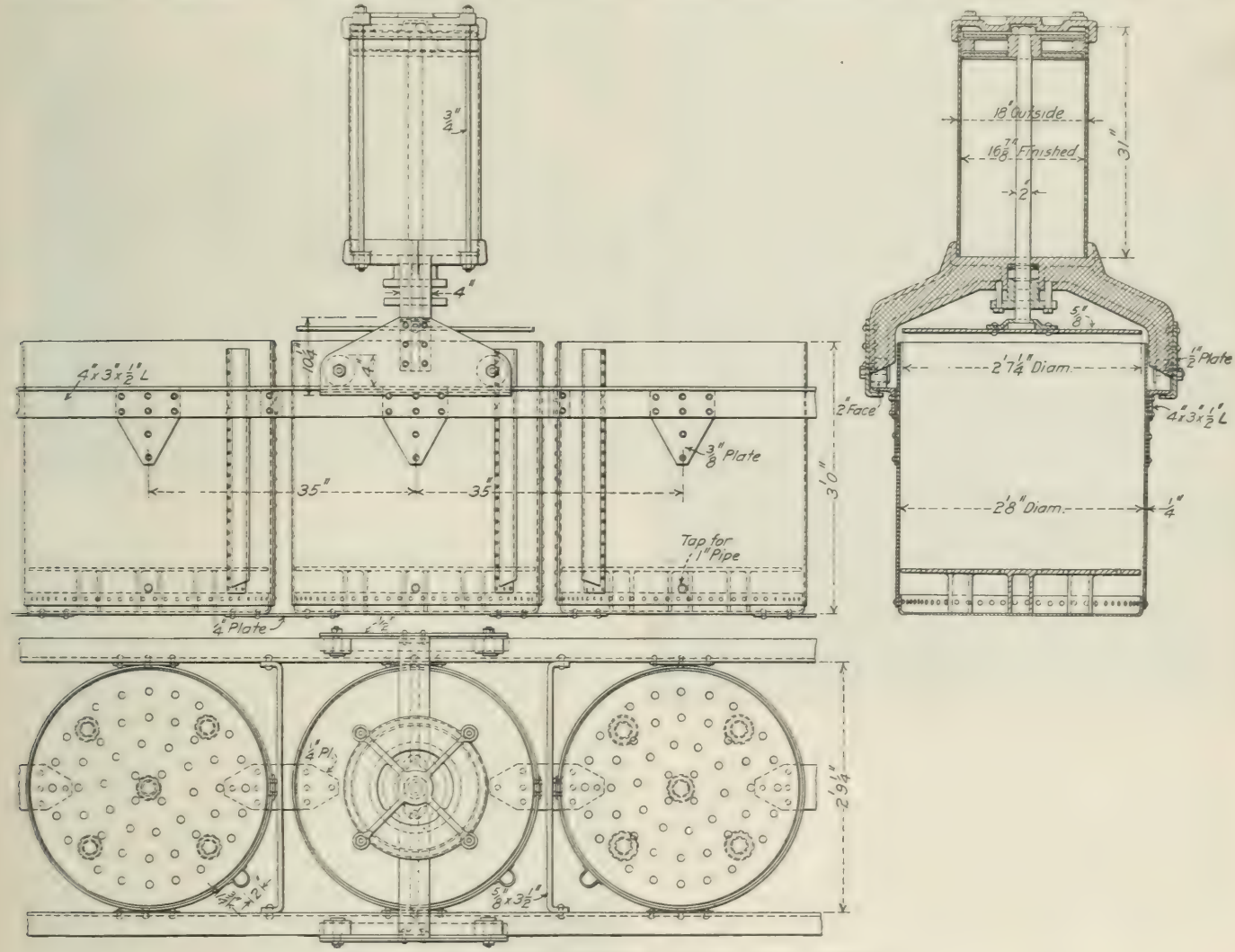


Fig. 13—Tanks for Preparing Journal Box Packing.

2 in. wide, which run on the top of the angles; the cylinder can thus be moved easily from one tank to the other. Air is admitted to either side of the piston by means of a three-way cock. The cylinder is constructed of a piece of pipe, 18 in. outside diameter, which screws into the two cast iron heads. In addition to this the heads are tied to each other by four ¾-in. rods. The cylinder has a stroke of about 27 in., the piston rod being 2 in. in diameter.

Oil is transferred from the storage tank to the smaller tanks in the following manner: A small tank holding 20 gals. rests on the floor at one end of the storage tank and below it. The oil is allowed to flow into this small tank by gravity and when it is filled the connection to the storage tank is closed. By admitting air to the top of the 20-gal. tank, all of the oil can be forced out of it into any one of

the other tanks in a few moments; it is delivered to the tanks through the spigots shown in Fig. 14.

The prepared waste is transferred to a galvanized iron vat 30 in. x 60 in. x 30 in. high. This contains a strainer at the bottom and the surplus oil is drawn off from time to time and sprinkled back over the top of the waste. The waste is also handled about occasionally to make sure that it is as nearly uniformly saturated with oil as possible.

TRESTLE FOR SUPPORTING CARS.

An especially good trestle is used for supporting the car bodies; it is substantial, durable and may be placed so that it will clear the trucks, allowing them to be run out from under the car. One of these trestles is shown in Fig. 15. The base is made in the form of a T, the long member being placed

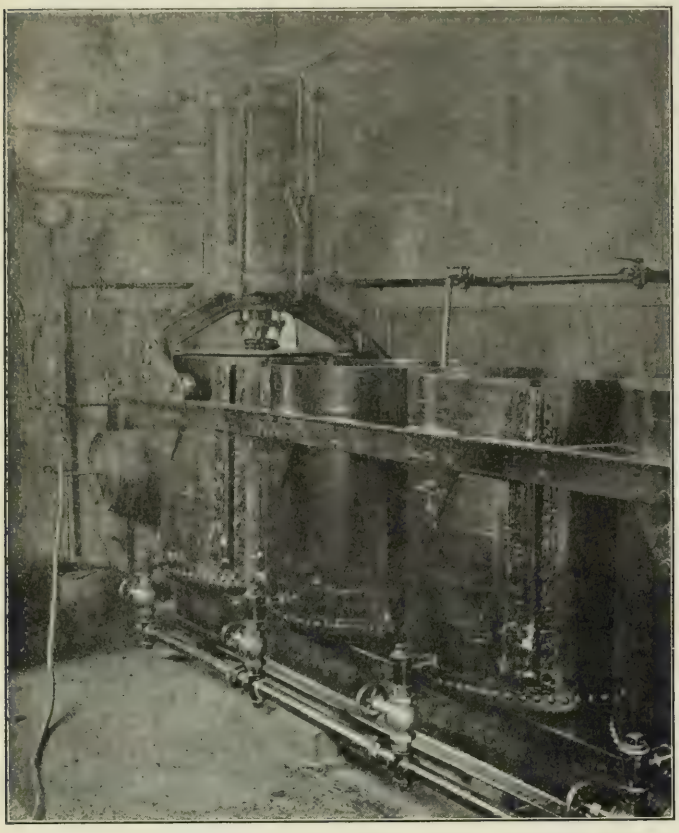


Fig. 14—Tanks and Press for Preparing Journal Box Packing.

nearest the car and parallel to it. The trestle is constructed entirely of 1¾-in. x 6-in. timbers, except for a 1¾-in. x 3-in. piece which ties the legs together at the front and about half way up. The base plank at the front is 3 ft. long. The rear leg extends back 2 ft. from the front of the trestle. The flat surface at the top is 5¼ in. x 10½ in. and the trestle stands 3 ft. 10 in. high.

TRUCK FOR MOUNTED WHEELS.

Between each pair of standard gage tracks in the repair yard is a lorry track. By the use of the truck shown in Fig. 16 mounted wheels may be transferred about the yard over these tracks. The wheels of the truck are 15 in. in diameter and the axles have 1⅝-in. journals. The body is made up of two pieces of 3-in. x 10-in. plank, 5 ft. 9 in. long. That part upon which the wheels run is protected by a steel plate, except for a space at the middle, which is scooped out slightly to prevent the wheels from rolling off.

When these trucks cannot be used, or where it is necessary to have trucks for pulling the mounted wheels under the car, the two small trucks, shown in Fig. 17, are used. To lift the mounted wheels it is only necessary to back these trucks underneath the journals and bear down on the truck handles. The 10-in. wheels are 3 in. wide. The 2½-in. x 12-in. wooden block, on which the journal rests, is supported on a 1-in. x 2½-in. piece of iron, which is turned at each end to provide the truck journals. The wooden block is covered with a copper plate where it comes in contact with the

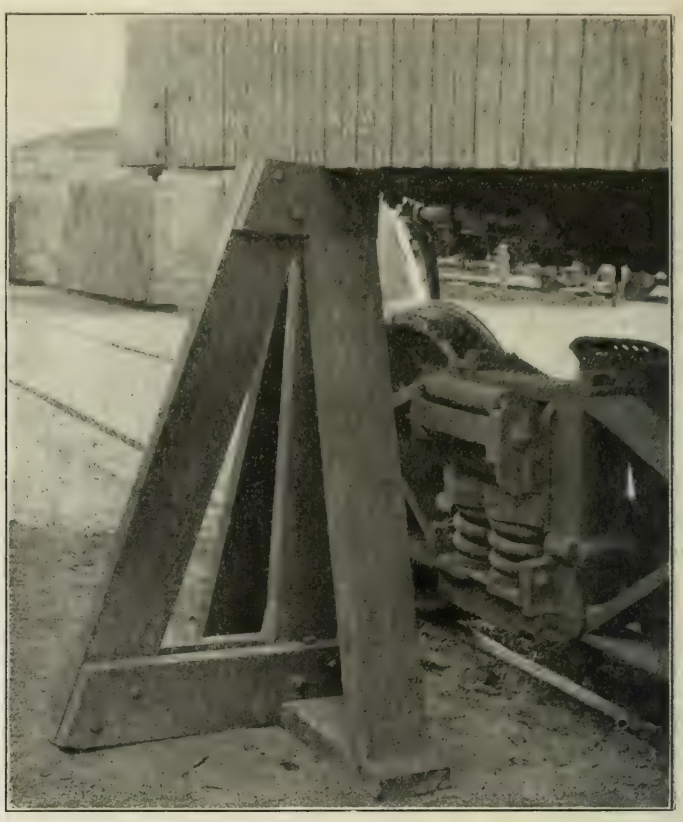


Fig. 15—A Good Trestle for the Car Repair Yard.

journal. The truck handle is made of 1-in. iron rod. One man pulls the forward truck and another pushes the rear one.

DROP PIT FOR WHEELS.

A drop pit for removing a pair of wheels from a truck without taking it from under the car, and without raising the car except for a couple of inches, is shown in Fig. 18. It is quite similar to the drop pits often used in engine houses. The car is placed with the wheels to be taken out directly over the pit; when not in use the pit is covered over with loose planks. The car is jacked up a couple of inches and the air brake levers, brake shoes and the lower tie straps of the truck are disconnected. The air jack is run under the center of the axle and the pair of wheels is raised just enough to

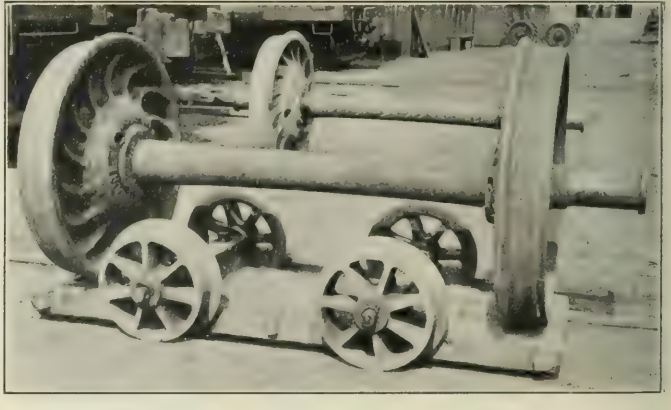


Fig. 16—Truck for Transporting Mounted Wheels on Lorry Tracks.

allow the sections of the track over the pit to be disconnected and pushed aside. The wheels are then lowered into the pit and the truck is pushed to one side; the wheels are raised and rolled off alongside the car. Another pair is lowered into the pit and placed under the car. The cylinder of the air jack is 12 in. in diameter and has a lift of about

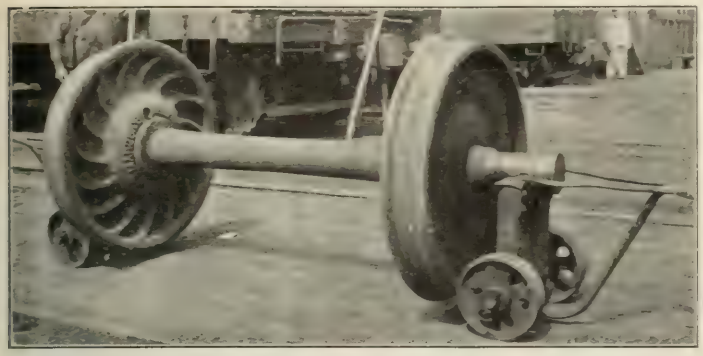


Fig. 17—Trucks for Transporting and Pulling Mounted Wheels Under Car.

4 ft. The pit is 48 in. wide at its upper portion, which is 42 in. deep. The lower part of the pit into which the air cylinder projects is about 21 in. wide and 48 in. deep. Twelve-inch wheels, placed 36 in. apart lengthwise, center to center, are used on the truck.

CRANES FOR HANDLING MATERIAL.

Several types of cranes are used for handling material about the yard. In Fig. 19 is shown a revolving crane on a truck; it is used for various purposes, including the handling of wheels, axles, etc. In the background of the same view is shown a gib crane with an air hoist for handling wheels. A large air operated crane placed on a flat car is used for loading and unloading heavy material. The division wrecking crane is located at this point and is also available for handling heavy material.

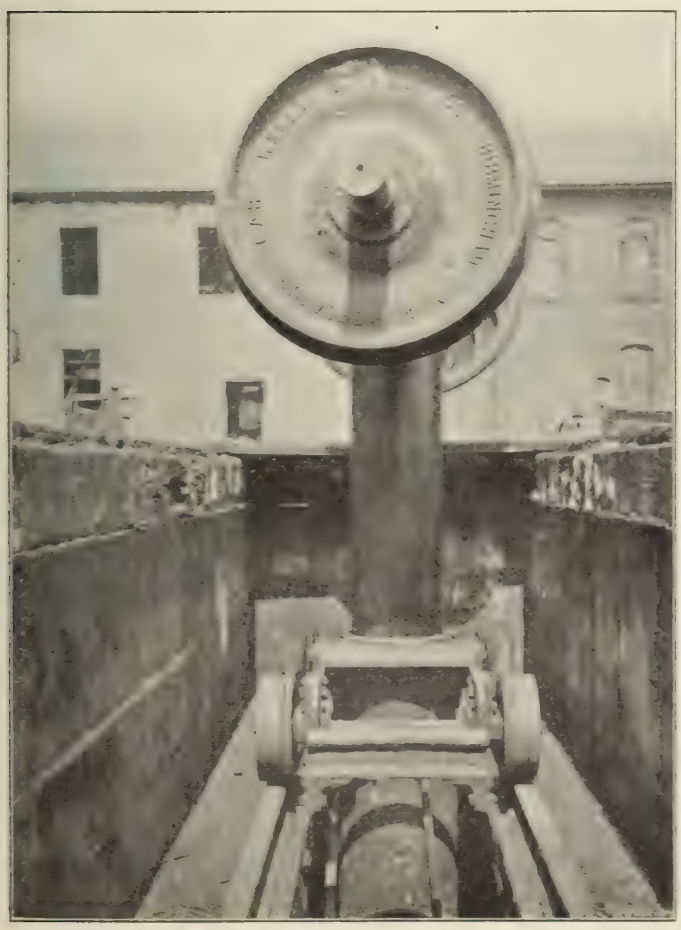


Fig. 18—Pneumatic Hoist in Wheel Drop Pit.

FIRST AID TO THE INJURED.

A few years ago a number of the workmen decided to chip in and buy a few medical supplies, which were placed in charge of one of the young men in the office. When the matter was brought to the attention of the company it immediately undertook to supply the necessary material for "First Aid to

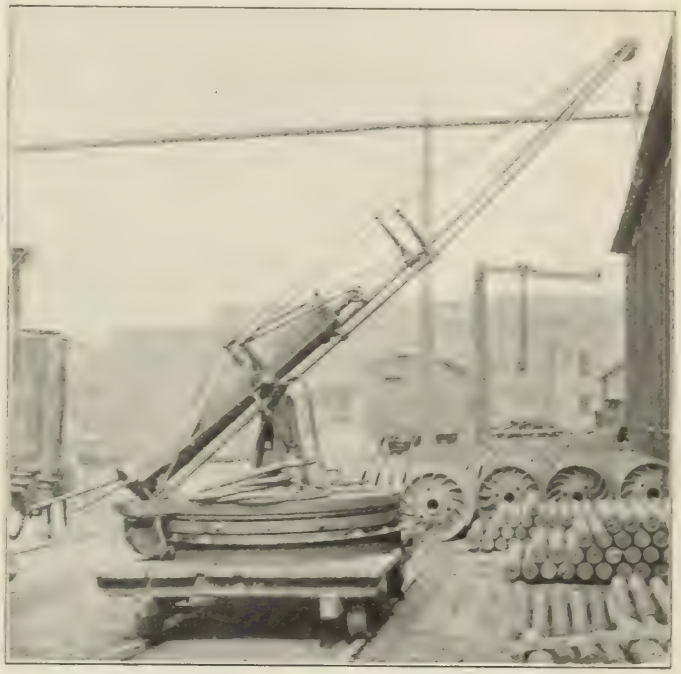


Fig. 19—Cranes for Handling Wheels and Axles.

the Injured." The men, however, have continued their support, the funds contributed by them being used for supplies for relieving such troubles as headache, earache, stomach troubles, etc., which do not properly come under the head of injuries. There is no question but what a case well filled with material for treating injuries, and in charge of men properly instructed as to its use, will pay for itself many times over in the course of a year, or even a few months, if the question is considered from a financial standpoint only.

THE NICARAGUA NATIONAL RAILWAY.

There is only one railway in operation in Nicaragua. It traverses a comparatively small district in the extreme western portion of the Republic and, including its several branches, has a total length of 171 miles. About 20 miles of the southeastern end of this railway penetrates into one of the principal coffee-growing sections of Nicaragua, a somewhat mountainous region, the highest point of which is 1,644 ft. above the sea level. With this exception the road runs through comparatively low and unbroken country, devoted chiefly to agricultural and stock-raising industries.

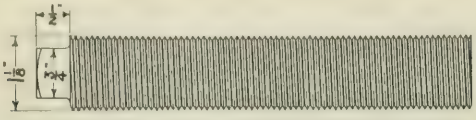
The gage of the road is 42 in., and the weight of rails 30 to 40 lbs. The road was built by sections, covering a period from 1884 to 1903. Its present general condition, due to defective construction work and inadequate upkeep, is bad. The rolling stock is limited in amount and of an inferior order, and the service, both passenger and freight, is poor.

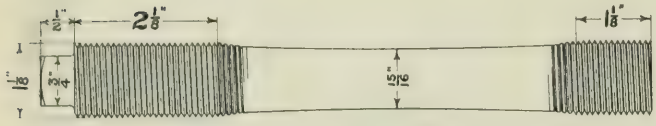
The road is the property of the Nicaraguan Government, but on December 26, 1903, it was leased for a term of 10 years to a citizen of Germany. This contract provides that of the earnings of the road 25 per cent. shall be paid to the Nicaraguan Government, 10 per cent. shall be devoted to repairs, and the residue, 65 per cent., shall go to the holder of the lease, who must pay therefrom the expenses of operation.

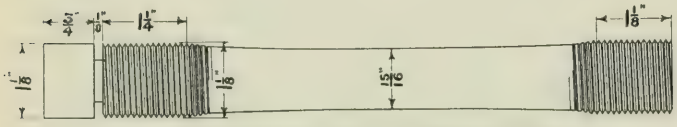
FINISHING STAY-BOLTS AND STRAIGHT AND TAPER BOLTS FOR LOCOMOTIVES.*

BY C. K. LASSITER.
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The locomotive boiler of average size contains about 1,500 staybolts, the number varying from 1,200 in the smaller sizes to 2,000 or more in the heavier types. They vary in length from 4¼ in. to 10½ in. for the water-space bolts, which constitute about 75 per cent. of the total number, to about 28 in. for the radial and crown bolts. Probably no part of the boiler







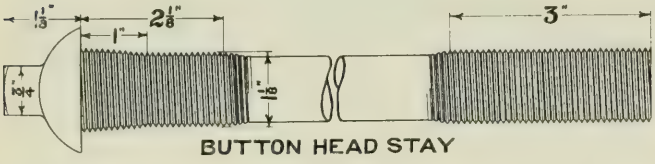


Fig. 1.

is subject to more destructive conditions than these small staybolts. The most serious strains are those due to expansion and contraction of the inner sheet, which bends the bolts and causes them to break close to the outer sheet. This is especially true of the side or water-space stays, which are comparatively short and have very little flexibility.

The material used is a high grade of refined iron, close-grained and tough. The pitch being very important on account of entering the second sheet, these stays were formerly cut to length from the bar, drilled for centers and threaded on engine lathes. The center-drilling was not always concentric and considerable time was required to center the rough bolt so that a good thread could be obtained. This method proving too expensive, bolt cutters were used for the work, but the results were not entirely satisfactory. It was difficult to cut the threads full and smooth with one passage of the chasers and the second passage was taken at the sacrifice of pitch, as well as of time, because there was not enough material to remove to carry the chasers along properly. The introduction of the lead screw in bolt cutters brought about a very considerable improvement in pitch, but still there was trouble in getting the thread smooth for the reason that the chasers were not always as accurate as the lead screw, under which conditions the threads would be rough or torn.

About thirty years ago the idea was conceived of concaving the bolts or reducing them in the center below the root of the thread, the object being to provide flexibility to compensate for the expansion between the inner and the outer sheets. Laboratory tests showed that a bolt reduced in the center would withstand about twice as many vibrations before breaking as one on which the threads were left straight for the full length. For many years it was the accepted practice to reduce a bolt in diameter on engine lathes after it was threaded in the bolt cutter and drilled for centers.

In 1900, Alonzo Epright, an engineer in the employ of the Pennsylvania Railroad, designed machines which were fully automatic in that they made from the bar, threaded and concaved, all diameters of side stays up to 10 or 11 in. in length. The author has no knowledge of the production of these machines and therefore can make no comparison of costs.

The vertical type of machine for threading these bolts was used to some extent and it seemed that if the proper chaser could be made the best results would be obtained from this type of machine because the weight of the head would assist the chaser to give an accurate pitch. In the horizontal or bolt cutter type the chaser must carry along the vise and carriage to the detriment of accuracy in the lead. Also, the flow of oil would assist in washing away the chips, which were troublesome in the horizontal machine. Furthermore, the vertical type of machine is more convenient to operate, one man attending six or eight spindles with ease.

After a great deal of experimenting a die head was developed in which, with chasers properly ground, the limit of accuracy of 0.01 in. in 8 in. can be maintained without the use of the lead screw, which is more nearly a perfect pitch than many staybolt taps in daily use. Where a proper lubricant is used a very fine, smooth thread can be obtained at a uniform cutting speed of 20 ft. per minute. The turning or reducing tools are shown in Fig. 2, the cutting points being visible at the center, back of the chasers. To these tools are attached the crossheads *KK*, which are actuated by profilers or formers passing through the spaces *LL*, over which the head is drawn by the chaser, the staybolt acting as a lead screw.

The staybolt-threading machine is shown in Fig. 3. The several die heads are attached by small rods to straps passing over the pulleys on a shaft at the top of the machine. The operator grasps one of the strap handles with his right hand and, by the aid of the rotating pulley over which the strap passes, raises the die head until it comes in contact with the

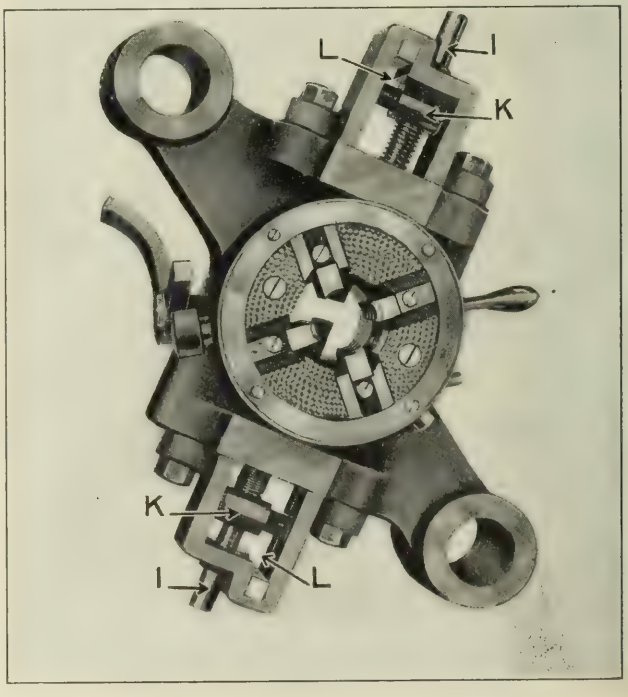


Fig. 2—Die Head for Threading Staybolts.

*Presented at the spring meeting of the American Society of Mechanical Engineers, at Atlantic City, May 31-June 3.

bracket which closes the die. With his left hand he places the squared end of a staybolt in a holder underneath the die and allows the head to drop until the chasers begin to cut, when he moves to the next die head and repeats the operation. By the time he has placed all the heads in operation,



Fig. 3—Staybolt Threading and Reducing Machine, with Special Grinder for Cutting Tools.

the first bolt is finished, the die having dropped automatically when the threading was completed. In Fig. 3, the die head at the right is shown raised sufficiently to insert the staybolt in place; the next at the left is just beginning to thread the bolt and the two other die heads are in still lower positions.

A comparison of costs by the two methods, taking a 7½-in. side stay as an average length, is about as follows:

Former Practice.

Threading in bolt cutter, usually taking two cuts at 20 cts.	$0.40
Drilling for centers	.22
Concaving or reducing on engine lathe	.75
Cost per hundred	$1.37

Present Practice.

Present cost, threaded the entire length or threaded and concaved for all sizes and lengths, per hundred	$0.13

Using the average number of stays, a saving of labor cost of $18.60 per boiler is obtained with a minimum of rejected stays.

METHODS OF DRILLING STAYBOLTS.

The telltale holes which are drilled in the staybolts have been the cause of considerable expense and annoyance. Some railways drill them after the stays are placed in the boiler, with pneumatic hand drills. Under these conditions there is danger that the hole may not be central. It often happens that the drill runs through into the water space or is broken off in the hole. In either case it is necessary to remove the bolts and put in others. Sometimes the holes are drilled on a vertical drilling machine before being placed in the boiler. Even then the breakage of drills is very large, averaging about 16 to the boiler, and each broken drill means a staybolt thrown away. An automatic machine has been devised for drilling these holes before the stay is placed in the boiler. The staybolts are fed from a hopper and automatically centered in position for the drill. When the hole is bored about one-third of the depth, the drill is withdrawn and the bolt is carried forward in the turret mechanism which holds it to a second and a third drill, completing the hole. Each drill is 0.01 in. smaller than the preceding one, providing for a minimum of friction and a maximum of clearance for chips. The holes are of uniform depth and in the center of the bolt. The average breakage is about three or four drills to the boiler.

Comparison of Costs.

Drilling in the boiler, per hundred (to which should be added the cost of replacement)	$0.90
Drilling under drill press, per hundred (to which should be added cost of drills and waste of material and labor	.45
Drilling in the automatic machine, per hundred (with the minimum number of broken drills and bolts destroyed)	.12

METHODS OF FINISHING STRAIGHT AND TAPERED BOLTS.

The usual method of finishing straight and tapered bolts for locomotives was to drill for centers, place in engine lathes, face under the head, turn the body taper, turn the part to be threaded straight and to proper size, face down the thread end to length and shape, leaving the center intact, test and file to accuracy, and cut off center point, after which the bolt was ready to be threaded in the bolt cutter and to have the hexagon head changed to any special shape desired.

About 1889, S. M. Vauclain designed and used a turning head in connection with a vertical machine for bolts up to 12 in. long. Under rights obtained from him the Pennsylvania Railroad placed an equipment of this kind in its Altoona shops and that was the only railway known to the author using other than engine lathe methods in finishing bolts.

As a great many straight and tapered bolts used in locomotives are 12 in. to 20 in. in length and even longer, it became necessary to design for this work a turning head which would handle taper bolts up to 18 or 20 in. in length and up to 1¾ in. diameter of thread, and straight bolts in any length up to 27 in. and up to 2½ in. diameter. It may be quite possible to go beyond these dimensions should the specifications require. These requirements have been met by a special machine of the vertical, multiple-spindle drill type, with which is used a special cutter head shown in Fig. 4. This head is the real or essential means of producing these bolts, either straight or taper and cylindrically true to the axis, the machine being simply a proper means of driving and feeding the bolt during the turning operation.

The cutter head consists of a retaining shell of cast iron, the bore of which must be round and straight; six segments, three of which are rigidly fastened to the shell, the other three having a limited amount of freedom and being fastened

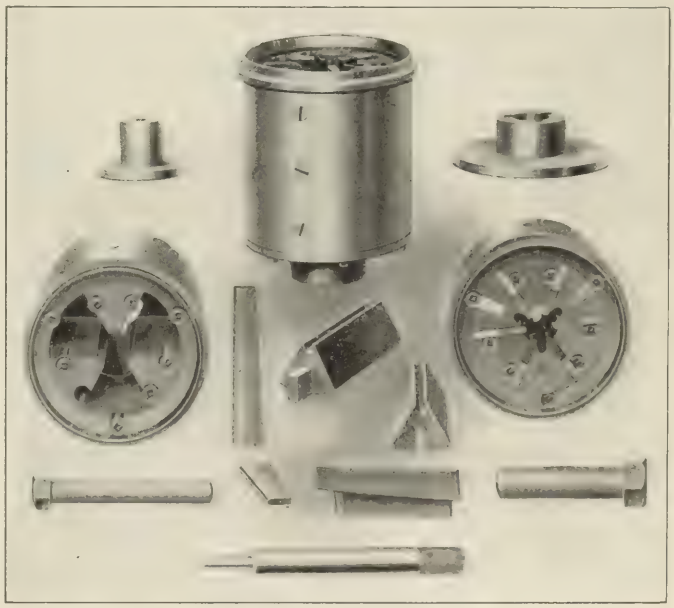


Fig. 4—Cutter Head and Attachments.

in place by a taper key with an adjusting screw located in the center of the radius with a bearing on the shell; and three blades, alternating with three guides, placed between the segments and backed up with taper keys and adjusting screws. The taper keys in connection with a certain amount

of taper on the blades and guides, have sufficient movement to provide for about one-eighth inch adjustment for re-grinding of the blades, or with the same amount on the guides, one-quarter inch in diameter of bolts. It will readily be seen that when an accurately ground plug gage of the size that it is desired to turn the bolt is placed centrally in the head, the blades and guides can be adjusted to their proper position. The three loose segments are then forced forward by the taper key, clamping the blades and guides rigidly in their proper working position.

The economical use of this method of turning bolts, particularly in the railway shops and locomotive works where taper bolts are largely used, necessitates a change of system. The usual practice, especially on repair work, has been to carry in stock only standard sizes of forgings, though in some cases the more common sizes were placed in stock finished. With the engine lathe located near the locomotive being repaired, the bolts were fitted to the hole after the least possible amount of reaming had been done that would clean up the hole. The improved system contemplates the turning, facing under the head, and placing in stock of standard sizes in lengths of 6, 9, 12, 15 and 18 in., varying in diameter under the head by thirty-seconds of an inch. Stock may be kept in sixty-fourths of an inch if desired, but very few holes will be found which require less than thirty-seconds of an inch to clean up. In fact, the chief reason for carrying the intermediate sizes would be to save the hole when it cannot be cleaned up within the next thirty-second. Standard reamers are used, with collars or marks to indicate when they have been driven to the required depth. All bolts have standard hexagon heads conforming to the thread diameter.

Bolts are specified with relation to the length and the diameter under the head, and the stock size next longest is used. Under these conditions not more than 3 in. must be cut off to bring the bolt to the proper length. The stock bolts are then taken to the bolt-altering machine, which is a quick-acting hand machine equipped with collet chucks and split bushings for the various diameters of the bolts. The end may be cut off to the proper length and turned for cotter pins, and the head changed to countersink, box head, button head, or whatever may be required. After threading on the bolt cutter, the bolt is ready to drive in place without further fitting.

A comparison of costs by the two methods, taking a 1⅛-in. × 9-in. bolt as an average would be about as follows:

Engine Lathe Practice.	Cost per hundred.
Drilling for centers	$0.22
Turning in lathe	2.50
Altering in lathe	$2.50 to 3.50
Threading in bolt cutter	.22
Cutting off center points	.10
Present Practice.	
Pointing the blank	$0.12
Turning by the method described	.45
Cutting off and changing points and heads where necessary on the bolt-altering machine	$0.40 to .60
Threading in the bolt cutter	.22

A device is now being perfected by which the threading can be done automatically at the same time the turning is done. This not only eliminates the bolt cutter charge of $0.22 per hundred, but assures a full, uniform thread absolutely in line with the body of the bolt and square with the facing under the head. When used in connection with a nut faced square with its thread the most satisfactory bolt is obtained.

A combined turning and threading device implies a modified form of the cutter head previously described, underneath which is attached a die head of special construction. This die head is carried on four or more vertical rods or guides which are attached to a ring to which the cutter is fastened. Provision is made for squaring the die head with the cutter head at the time it begins cutting the thread, and at the same time automatically placing the die head in a position where it is free to move in a vertical plane up or down in exact proportion to the difference between the feed and the pitch of the thread to be cut. An automatic knock-out is provided which opens the die head and passes to one side,

Table of Stock Sizes.

Showing Eight Threaded Diameters of Bolts and Thirty-Two Diameters Under the Head

Thread Diameter	¾				1				1				1¼			
Diameters under head	11/16	11/16	11/16	¾	11/16	11/16	11/16	1	1 1/16	1 1/16	1 1/16	1¼	1 1/16	1 1/16	1 1/16	1¼
Length under head	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	...	...	...	...	9	9	9	9	9	9	9	9	9	9	9	9
	...	...	...	...	...	...	...	...	12	12	12	12	12	12	12	12
	...	...	...	...	...	...	...	...	...	...	...	...	15	15	15	15
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18	18

Thread diameter	1¼				1¼				1½				1¾			
Diameter under head	1 5/16	1 5/16	1 13/16	1¼	1 13/16	1 5/16	1 13/16	1¼	1 13/16	1 5/16	1 13/16	1¼	1 13/16	1 13/16	1 13/16	1¼
Length under head	6	6	6	6	6	6	6	6	...	...	...	...	...	...	...	...
	9	9	9	9	9	9	9	9	...	...	...	...	...	...	...	...
	12	12	12	12	12	12	12	12	12	12	12	12	...	...	...	...
	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18

allowing the threaded bolt to go through to any length within the feed of the machine. Under these conditions it will be seen that so long as the length of the thread to be cut is the same, the length of bolt to be turned is immaterial. The device is very simple in its construction and does not call for a skilled mechanic to adjust or operate it.

A LOCOMOTIVE REBUILT IN 24 HOURS.*

On April 6 the Hornell shops of the Erie undertook to establish a record in repairing an H-21 consolidation locomotive, and the surprising result obtained affords a most striking object lesson of the value of thorough organization and harmonious united effort on the part of all concerned in the work. Engine 1734, of the Buffalo division, with a mileage of 47,485 placed to her credit since the last overhauling, which was at Hornell, Sept. 29, 1908, was put on the stripping pit and work began at 7 a.m.

H. T. Chamberlain, the general foreman, had previously talked the matter over with his foremen, each one being lined up as to his particular duties on the engine, and impressed with the importance of seeing that all work of even the minutest detail should be done not only promptly, but "well done," so that no criticism could fairly be raised after the engine was completed. The foremen of departments in turn had their men lined up as to what was to be required of them, so that almost before the sound of the 7 o'clock whistle had died away a large gang of men were busy attacking every part of the engine simultaneously, each one intent upon his own specific work. During the first hour there were over 60 men engaged at this work with the remarkable result that by 8.30 the engine was almost completely stripped and much of the work was well under way in the repair departments.

In undertaking work of this kind in an effort to make the very best time, naturally the longest and heaviest jobs were the ones which had to be gone after at the very start, and every moment of time utilized and every point made in order to advance that work. So it was that the front end, flues and driving wheels were assailed at the very first onslaught, and while these larger items were being "got after" other men were busy on the numerous details all over the engine.

The pedestal braces were marked and stamped with the figures for closing in the blacksmith shop before being removed. The first brace was delivered to the blacksmith shop at 7.30 a.m., the others following in quick succession. As quickly as they were received the blacksmiths proceeded to close them to fit the frames; the work was completed and de-

*From the Erie Railroad Employees Magazine for May, 1910.

livered back to the engine at 9 o'clock. The braces were then refitted to the frames and nine new bolts fitted by 11 a. m. The last pedestal was down and the engine raised and the wheels rolled from under at exactly 8.25 a. m.

The driving boxes were then marked and removed and the first driving wheels were placed in the lathe at 8.45 a. m., and the last tire turned and wheels delivered to the erecting shop at 3 p.m. In the meantime both main pins had been removed from the wheel centers and two new ones were fitted and pressed in and riveted over, also one new No. 2 crank pin removed and a new one fitted and applied. The right No. 1 and left No. 4 flanges were worn so thin that it was impossible to turn the tires again, so they were removed and two second-hand tires were applied and turned to size. One driving journal was returned. In addition to the new crank pins, three new crank pin collars were turned, polished and applied, 5 old collars trued up in the lathe and polished, and new nuts were turned and fitted to the new main pins. This was all completed and delivered to the erecting shop by 3 p.m., the work being thoroughly inspected and pronounced good. The engine frames were cleaned, white-leaded and tested for cracks by 9.30 a.m. The bolt gang removed 50 frame and pedestal bolts and new ones were fitted and applied, this work being completed by 5 p.m.

The driving boxes were removed from the journals immediately after the wheels were removed from the engine, the first one being delivered to the machine department at 8.30 a. m., and the last one at 8.50 a. m. Upon inspection it was found that 7 new crown brasses were required and also new brass hub liners on all the boxes. The new brasses were procured from the store department, turned, planed, pressed in, drilled and dowelled, old babbitt cut out from the side of the boxes and the boxes delivered at the fire to be poured with brass for lateral at 12 m. The heat was ready at 12.25 and the work of pouring was completed at 12.30 p.m All driving boxes were then replaned on the shoe and wedge faces, the first one being completed at 1.30 and the last one at 3 p. m.

Boxes were then rebored to fit the journal and faced for lateral, grooved and cellars refitted, and all but the main ones tinned on journal bearings, the first one being completed and delivered to the erecting shop at 2.30 p.m., and the last one at 5.30 p.m. On account of having to be spotted to the journal the main boxes were finished first, both of these being delivered at 2.30 p.m. They were immediately spotted and the grease cellars fitted and applied by 3.30 p. m. The last box was placed on the journals and completed at 5.40 p.m., and at that time the driving wheels were placed under the engine.

In the meantime the engine was squared, the jaws filed up and the pedestals refitted and box centers marked on frames, the old shoes and wedges were scraped and a complete new set was fitted up and applied; new wedge bolts and standard wedge bolt brackets were fitted to them. The first box size was obtained at 1.20 p.m., while the box was still on the planer. The men could wait no longer, and the first shoe and wedge was laid off and delivered to the machine to be planed at 2.30 p.m., this work all being completed and the full set delivered back to the engine at 5.30 p.m.

The wheeling operation was completed, wheels trammed and reported ready for main and side rods at 10 p.m. The first main rod was removed and delivered to the rod department for repairs at 7.30 and the last piece of the side rods at 8.40 a.m. The rod bolts and brasses were found upon inspection to be in very bad shape. It was necessary to ream the back end and main rods and straps and fit new bolts and also fit new bolts to the main connection spade straps, both sides, and to fit and apply new brasses and bushings all around. The work was all completed and the rods delivered back to the engine at 4 p.m., and at 12 o'clock, midnight, they were all applied ready for service and the last man in the fitting department was through with the engine.

While this work was pushed rapidly along, the same good progress was being made in other departments of the shop. For instance, the steam chests and valves were completely removed and all parts delivered for repairs by 7.30 a.m., and before 8 o'clock the valves were returned to the engine and at 8.10, one hour and ten minutes from commencing the work of stripping, the valve yokes also were received at the engine, having been inspected, examined for valve fit and the stems trued up. The valves and valve strips had been replaned and were ready for the re-spotting. Both valve seats on the cylinders were found to be in bad condition and they were refaced and the valves spotted. All steam chest studs were removed and annealed; complete new gaskets were applied to the steam chests and the pressure plates were re-lined and planed.

The valve rods were received back at the engine at 9 o'clock, having been fitted up with new bushings on the back end, one pin refitted and one new pin turned and fitted complete. The whole steam chest job, comprising valves, valve rods and glands, relief valves, steam chests, covers and casings, cylinder ports blown out with air and cleaned and port openings marked on valve stems, was completed in every detail by 4 o'clock in the afternoon, at which time the men engaged on that work went to work on another engine.

The air equipment and driver brake rigging were removed from the engine at the earliest possible moment. The air equipment, such as engineer's brake valve, double check valve, straight air valve, air pump, air gauge, triple valve, governors, straight air reducing valve and safety valve were delivered in haste, as though they were perishable goods, to the air brake department by 7.30 a.m., and all parts except the air pump were replaced on the engine by 1 p.m., having been thoroughly cleaned, overhauled and tested at the test rack. The driver brake rigging was also ably taken care of by the regularly assigned men who removed all parts in time to allow the wheels to come out before 8 a.m., the remainder being stripped by 9 o'clock. This work was given a complete overhauling, including reaming and rebushing of six of the hangers, removing old and fitting and applying new hanger posts or pins (one of which had to be drilled out of the bracket, it being impossible to remove it otherwise). New brake shoes were keyed on and fitted all around, and new brake pins were turned and applied complete and all lost motion was taken up in connections. New ends were welded on the brake beams and returned; the slack adjusting screws were removed, greased and reapplied and the brake cylinders tested.

The spring rigging was taken care of immediately after the drivers were removed, and at 8.30, just five minutes after the wheels were rolled from under, and before the engine was let down upon the blocks, all the rigging was removed with the exception of four equalizers, which, however, were removed half an hour later.

At 8.35 all spring hangers were delivered to the blacksmith shop for repairs, such as holes plugged and gib holes closed to fit the gibs. At 8.45 three spring saddles and eight driving box equalizers were delivered to the blacksmith to be welded out on box fit, the equalizers to have the holes plugged in addition. The blacksmiths turned out these jobs in an incredibly short space of time, and the pieces, one after the other, hot from the fire, were turned over to the machine side.

Here, not to be outdone by the blacksmiths, the machinist quickly completed his work and the parts were delivered back to the engine to be applied. The result was that the last piece of spring rigging was completed ready to apply by 2.30 p.m. By this time much of the rigging was already applied and immediately upon finishing the laying out of the shoes and wedges and getting them out of the way, the remaining pieces were put up so quickly that when the painter came around with his automatic spraying machine, just about 3 p.m., he found that all was O. K., on the left side and he "sprayed her black all over, inside and out." Just 40 minutes later, at 3.40 p.m., the other side was treated to a similar dose of "black fluid," and the engine was ready for her wheels.

The story of the applying of the wheels has already been told and we must now see what had been doing in other and equally important lines. Promptly at 7 a.m. the boiler inspector entered the firebox and at 7.15 reported seven broken staybolts located. By this time the gauges, injectors and other cab work were being removed, and the jacket and lagging were completely stripped from the firebox at 7.35 a.m. The seven staybolts were renewed complete by 9.15, and at 10.30 a.m., the jacket and lagging were replaced. Four new sections of jacket were made and fitted to both sides of the firebox, and the jacket on the boiler-head was repaired. Injectors were thoroughly overhauled; steam and air gauges overhauled and tested and pops and whistle removed, overhauled and reapplied; all of this work being completed by 1 p.m. All cab valves, main nigger-head valves, starting valves and dome blow-off valve were repaired, valves ground and stems repacked, boiler checks overhauled and ground and adjusted for lift, and whistle rigging overhauled and rebolted in cab. At 2.30 p.m., all of this work was reported finished and, upon inspection, was found to be O. K.

The engine bell and frame were removed from the boiler and the holes reamed in the frame and new pins turned and fitted complete; the bell was put in lather and polished and the bell ringer cleaned, overhauled and tested, new pins being applied. This work was all re-applied at 2 p.m. The cylinder heads, pistons and crossheads were removed complete at 8.40 a.m. The cylinders were examined at 8 a.m., and the right one reported to be bored, and the left one O.K. Upon inspection it was found that the guides did not need planing or grinding, and so the work of relining and rebolting them was begun at 9 o'clock and completed at 11.30 a.m., on both sides, six new bolts being fitted. Work was commenced at 8.45 on boring the cylinder and at 1.15 p.m., just four and one-half hours later, the machine was removed and the cylinder marked "O. K." The two new pistons were turned down to size, the left one being delivered to the engine at 9.35 a.m., and the right one at 1.30 p.m. Both sides were then closed up and the whole job was completed at 2.15 p.m., both piston glands having been overhauled and vibrating cups renewed and new gaskets applied.

The motion work and everything appertaining to it was stripped and overhauled complete, the first pieces, namely, eccentrics, hooks and straps, being delivered to the fitting department at 8.40 a.m., and the last piece, the rockers and lift shaft, at 9.45 a.m. All of this work was delivered back to the engine before 1.30 p.m. The transmission bars were returned to the engine at 11.15, rocker boxes at 11.40, links, lift shaft and reverse lever at 1.15 p.m.

The repairs on the motion work comprised the following items: Lift shaft bearings turned up and boxes counterbored, babbitted and rebored; new bushing fitted in the arm for the reach rod pin; reverse lever and quadrant overhauled, all holes reamed and new pins applied; also new latch spring, new pin in foot of lever, new pins in both ends of reach rod and new bushings for it; links closed and blocks refitted and riveted, saddles re-turned and three new link saddle bolts fitted and new bushings for all hook pins; transmission bars and hangers fitted with new bushings and pine re-turned; two new eccentric hook pins were made and the old ones refitted. Eccentrics were removed, new set screws and split keys applied, and keys fitted in eccentrics and axle. The eccentric straps were closed, rebored and reapplied; the rocker boxes were stripped and the left shaft was scraped. The boxes were rebabbitted and bored and a new shaft fitted and applied to the left one. All of this work was completed and reapplied by 4.30 p.m., and at 7.30 p.m., after the main wheels were squared and completed, the work of setting valves commenced, the men having been instructed to report for the purpose at 7 p.m. All the necessary adjustments were made and this operation was completed and the gang went home about midnight.

All the grates and grate rigging were removed complete before 8 a.m.; 16 new studs were applied and all grate connections were overhauled and new pins applied, the work being completed at 6.20 p.m.

The ashpan was removed complete and the sides repaired and reapplied, new studs being applied to the mud ring for this purpose. The hoppers were beyond repair and were cut up and new hoppers were applied in their place, this work being completed by 5 a.m., April 7. The work of painting the engine was followed up at intervals whenever opportunity afforded.

Work on the cab was begun promptly at 7 a.m. on May 6. The cab was washed inside and outside by 7.30, sand-papered and priming coat applied by 8, sand-papered and color applied from 10 to 11 a.m. Lettering was done from 12 to 1.30, noon, and between 3.30 and 4 p.m., the varnish was applied. The sash and doors were washed, sand-papered, two coats of ground color applied and graining and varnishing completed by 2 p.m. Standard green enamel was applied inside of the cab and the roof was painted. The jacket was cleaned, sand-papered and painted and the engine finished complete below the running boards as the opportunity came. Engine truck, drivers, pilot, smokebox, front end, and all pipes were carefully attended to.

Repairs to the tender progressed as rapidly as did the work on the engine. The cistern was raised from the frames and tested, all leaking rivets removed and interior braces reriveted, 250 rivets being applied. Tank valves were removed and replaced with the new ones, valve rods were removed and refitted complete, new brake staff flue applied, new shoveling sheet applied, manhole cover repaired with new hinges. The tender trucks were completely dismantled and 40 rivets were renewed in the frame and bolsters. New column bolts and box bolts were applied complete. The brake rigging was overhauled on the trucks and frames, including the hand brake. Four new brake beams were applied in accordance with standard practice, the old beams not coming up to specifications. A new coupler was applied. The top center plates and side bearings were rebolted complete and the safety appliance removed and made standard. The old drawbar was below standard and was replaced with a new one with new pins complete; new tank hose was also applied. Air pipes were examined and tested; also brake cylinders, air reservoir and triple valve. The cistern body was washed, scraped and sand-papered, and one coat of priming applied between 7 and 8 a.m. Sand-papered and first coat of color applied from 9 to 10. Second coat of color applied to cistern from 11 to noon. Lettering was done from 1 to 3 p.m, and varnish applied from 4 to 4.30 p.m. The trucks were cleaned and painted from 11.30 a.m., to 3 p.m., and the coal space and cistern top cleaned and painted between 7 and 11 a.m. Front end of cistern was painted from 3 to 4.30 p.m. With the exception of two men these departments closed down at 6 p.m, all the work except a few small jobs being completed. Repairs were made to cab doors, windows and floors, pilot and bumper beam. Repairs to steam chest casings, dome casing, testing of reservoirs, rebuilding of engine truck, overhauling of cylinder cocks and rigging and numerous other jobs cannot be spoken of in detail, for space forbids. All these items, however, were given close attention and the necessary repairs and alterations were made.

It was of the utmost importance that the flues should be gotten out with as little delay as possible, and to this end at 7 a.m., the netting and diaphragm boys crawled inside the smokebox and proceeded to strip them while a gang got busy on the front and door. Some difficulty was experienced in getting off many of the nuts, but difficulties only served to stir the men to greater activity, and exactly at 7.45 the boiler front and door were removed and laid aside, and at 7.46, one minute later, all the netting and diaphragm was out and the boys were busy in getting it in shape to be reapplied.

The front and netting being out of the way gave a chance

for the steam pipe gang to get busy. The dome cap, throttle rigging and stand pipe had already been removed and now the throttle valve, which had a very bad seat, was reground. At 8.24 sharp, out came the exhaust pipe and down went the plug over the cavity left open in its place. At 8.57 down and out came steam pipe No. 1, and at 9.03 out came steam pipe No. 2. Twenty minutes later the dry pipe was hustled out of its resting place and delivered at the "grinding mill."

This rapid work let in the flue-cutting gang at the front end, the back ends already being cut off, or nearly so, the work being completed only five minutes later. At 9.03 a.m., when the steam pipes were out of the way the boys applied the frame and motor for cutting flues, this operation taking just 10 minutes, and at 9.13 the first revolution of the cutter was made. At 11 a.m. the last of 370 flues was cut off. The remaining few flues had to be cut by hand. At 10.30, an hour before all the flues were cut, the gang started backing out and removing the flues, and at 1.30 p.m the last one was placed on the rack, and 15 minutes later they were delivered at the rattler.

At this time the boiler was scaled, and cleaned and washed. The dry pipe, tee head and stand pipe had already been ground. The dry pipe was put in, the flue sheet joint ground, the tee head applied, all broken steam pipe bolts and studs removed, the steam pipe rings ground and the exhaust seat spotted and the work completed by 5 p.m.

At 1 p.m. the flue gang commenced to apply coppers in the back sheet, this operation being completed by 4 p.m. The flues were poled off, cut to length, ends opened and filed and delivered in front of the engine ready to apply at 6.35 p.m.

Tubes were inserted in their proper place in the boiler, this operation taking 75 minutes, or in other words about 5 flues per minute or one every 12 seconds. They were quickly rolled and at 11.45 p.m. the flue men called for water for the boiler.

Men had reported for this work at 11 p.m., in anticipation, and in quick response had the water running in the boiler in less time than it takes to tell it. Four bursted flues were discovered with the hydrant pressure and at 12.35 a.m., when the hydrostatic pressure was applied, two others developed. The test was completed at 12.38 a.m.

The water was drained out and the bursted flues removed, flues prossered and beaded and finished at 3.30 a.m., April 7. Fifteen minutes earlier the steam pipe gang got in the front end and commenced applying exhaust and steam pipes, completing the job one hour and a half later, the men going home at 4.30 a.m., of the 7th. The netting and diaphragm were then applied, this work being completed at 5.58 a.m., of the 7th. While the boys were inside applying the netting, the front end men were also busy putting up the front and door, this job being commenced at 4.30 and completed at 5.30, with headlight, marker brackets and all work complete.

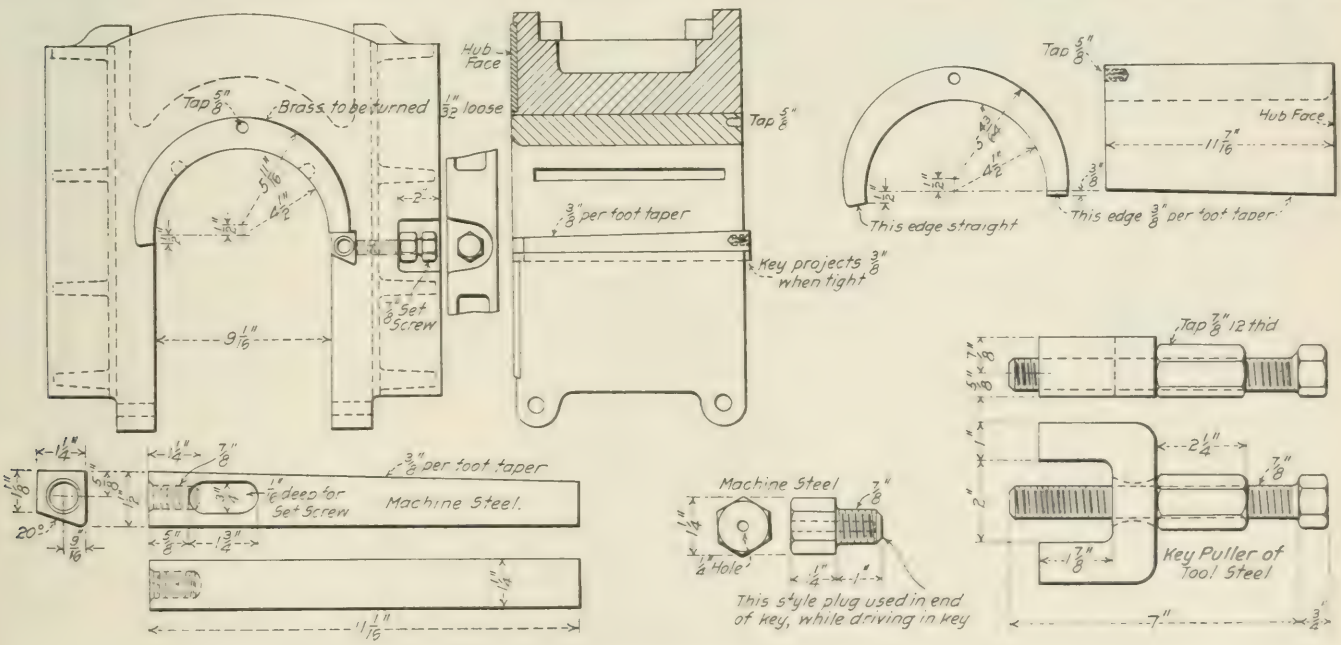
The crew of the engine was called for 5.30 a.m., and the engine ordered for a 7 o'clock train. At 5 a.m. of the 7th the engine was pulled outside and the tank coupled, the regular tank man being called for that purpose. A fire was started in the firebox at exactly 6 a.m., and in 40 minutes we had 150 pounds of steam. Before 7 o'clock the required pressure was obtained, the pops were set, air again tested, the air pipes, reservoirs and engineer's valve having already been tested from the shop line, the brakes were adjusted and certificates posted in cab. As the whistle sounded the 7 o'clock call to work, Engine 1734 passed over the turntable out to her train, which left at 7.33 a.m., from the yards.

The Hornell Shops established the remarkable record of 24 hours and 33 minutes from commencement of work back to revenue service, eclipsing all other records.

The trip up the division was made most successfully, and after returning to Hornell, Engineer Peck advised he had nothing to report, the engine being in fine shape. At 6 o'clock on the evening of the 7th she left Hornell yards with a full tonnage train, making the run to Buffalo in good time, and has since then been in daily service, pulling fast freight over the division.

REMOVABLE DRIVING BOX BEARING.

A description of the removable driving box bearing here illustrated was published by the *Railway Age* three years ago when it was first introduced. It is now possible to give results obtained in several years' service and figures showing the cost of renewing driving box bearings by this method as compared with the ordinary one, where the box and drivers are removed and the brass pressed in. It also forms a part of a change in the methods of making locomotive repairs employed by a western line where the expense of taking down the drivers is avoided. The device and the fixtures for finishing the box and bearing were designed and patented by Charles Market, shop foreman, Chicago & North Western, Clinton, Ia.



Markel 9x11½-inch Removable Driving Box Brass.

The box is slotted in the usual way, but the brass is turned 1/32 of an inch smaller in diameter than the box fit. The brass is also planed tapered on one side, 3/8 in. to the foot, to corre-

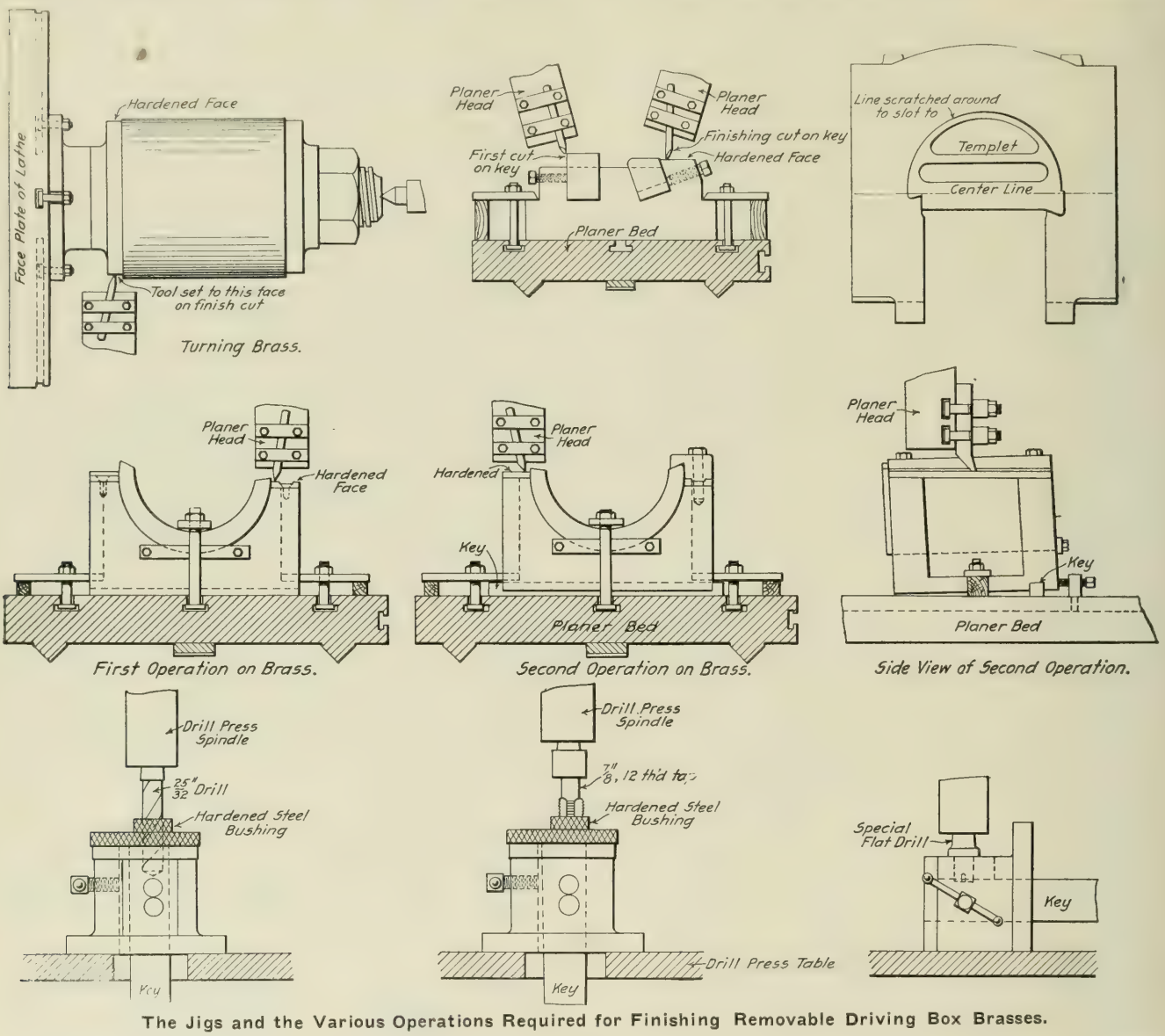
spond with the taper of the wedge. The wedge fits into the dovetailed portion of the box and the upper side is tapered so as to be parallel with the tapered portion of the brass. The brass is held in position entirely by the wedge, which is driven in so as to require 40 tons hydraulic pressure to start the brass. There is a hole in the end of the brass for removing it by hand; also a tapped hole in the end of the wedge to receive the device for pulling it.

The advantages of the device are that the wedge secures a perfect fit of the brass in the box and any tendency to become loose is corrected by an adjustment of the tapered wedge. It is possible to remove a driving box brass and put in a new one and have the engine ready for service without dropping the axle or dismantling the engine in any way. This work can be done in four hours and thus prevent the much longer delay required when the wheels are entirely removed for renewing the brass.

The other important advantage is that the driving box bearings can always be kept tight, while under ordinary practice they are allowed to run loose for some time before repairs are made, and in the meantime they contribute largely to broken frames, crossheads, eccentrics, straps and pins. With the Markel device the bearings may be worn down to any thinness desired—even to ½ in. thick. Under this system it is desirable to make the box, brass and wedges in duplicate and interchangeable, so that they can be fitted up and kept in stock. For this purpose Mr. Markel has designed jigs that make the bearings and key exactly alike without measurements, and the work is done quickly. One of these jigs for finishing the tapered key is shown in the drawing. The key is made from cold rolled machine steel and is planed on the top and bottom sides; when it is first placed in the jig a ⅛-in. cut is taken. The planed surface is then placed face downward in the jig and the planer tool is brought to a hardened face, which sets it for the proper thickness, and one cut is taken across the key. It is thus cut to the proper size and taper, and no calibrating or measurements are required.

One of the drawings shows the removable driving box brass and details as applied to a 9½ x 12-in. axle. The original trial brass was applied on April 9, 1906, to a right front box on an Atlantic type engine with a 9 in. x 12 in. journal and 20 in. x 26 in. cylinders. This engine is in heavy fast passenger service on a 202-mile division. The brass is still in service, has never been loose, and up to February 1, 1910, had made 261,049 miles at no labor or material cost since its application. The other three pressed-in brasses on this engine have been renewed twice during this time, because they were loose in the boxes and large on the journals. The Chicago & North Western has had 10 heavy freight and passenger engines equipped complete with these brasses since 1906, and has renewed them at different times without dismantling any part of the engines except taking down the cellar, or the two eccentrics, if on a main box.

Following is the record of the removable brasses on Atlantic-



The Jigs and the Various Operations Required for Finishing Removable Driving Box Brasses.

type engine No. 464 since their application on July 4, 1906. On February 26, 1907, the left main brass was renewed while the wheels were under the engine at a cost of $3.20 for labor and six hours' loss of time to the engine. On the basis of $10 a day for a locomotive, the saving made was $29.25 in favor of removable brasses. In June, 1908, this brass was closed and rebored for the axle fit while the wheels were under the engine at a labor cost of $6.21, the work requiring six hours. This cost includes the lining down of one wedge; the total estimated saving caused by the use of the removable brass was $26.33. The mileage made with these brasses has been very good and they have proved the most economical brasses used on the Iowa division as to mileage, expense of labor and loss of time to the engine.

The figures below show the saving effected by the use of the removable brass as compared with the pressed-in brass. The removable brass was renewed February 26, 1907. It being a main brass, the two eccentrics had to be removed from the axle. The cost was as follows:

New brass (cost of material)	$21.49
To bore to axle fit.	.19
For labor to apply to box	3.20
Loss of time to engine, 6 hrs.	2.46
Total cost.	$27.34

To apply standard brasses the engine would have to be dismantled and the main wheels dropped, causing an expense of:

New brass (cost of material)	$21.49
Labor for all work	15.00
Loss of time to engine, two days	20.00
Total cost	$56.49

This shows a saving of $29.25 for the removable brass. The removable brass was removed, closed and rebored for axle fit, June 29, 1908. It being a main brass, the two eccentrics had to be removed from the axle. The cost was as follows:

Sheet iron shim	$0.10
Labor on shim	.05
Labor to apply brass & complete ready for service	6.21
Loss on time to engine six hours	2.46
Total cost	$8.82

If this had been a standard pressed-in brass the engine would have had to be dismantled and the wheels dropped. The cost would have been:

Sheet iron shim	$0.10
Labor	.05
Labor to supply and equip engine for service	15.00
Loss of time to engine two days	20.00
Total cost.	$35.15

This is $20.33 more than for the removable brass.

If the removable brass becomes loose in the box the cost of repairs is as shown below. If front or back brass is loose it can be tightened in one hour; if a main brass, in four hours:

Average labor cost	$0.92
Loss of time to engine.	1.68
Total cost	$2.60

The standard pressed-in brass, if it becomes loose in the box, costs as follows to make repairs, including dismantling, dropping wheels, tightening brass in the box and assembling all parts ready for service:

Labor	$15.00
Material	.10
Loss of time to engine two days	20.00
Total cost	$35.10

Costs $32.50 more than removable brass.

The cost is thus $32.50 more than for the removable brass.

During the calendar year 1909, 349 miles of railway were opened for traffic in all Brazil. Of this total, 100 miles were on the various lines of the Brazil Railway Company between Sao Paulo and Rio Grande do Sul. On the Northwestern of Brazil Railway, in process of construction from the state of Sao Paulo to the Bolivian border, some 25 miles were opened for traffic, and about 42 miles of line were opened on the Victoria-Diamantina Railroad, in Espiritu Santo and Minas Geraes. The remaining extensions were on the various lines under the control of the federal government.

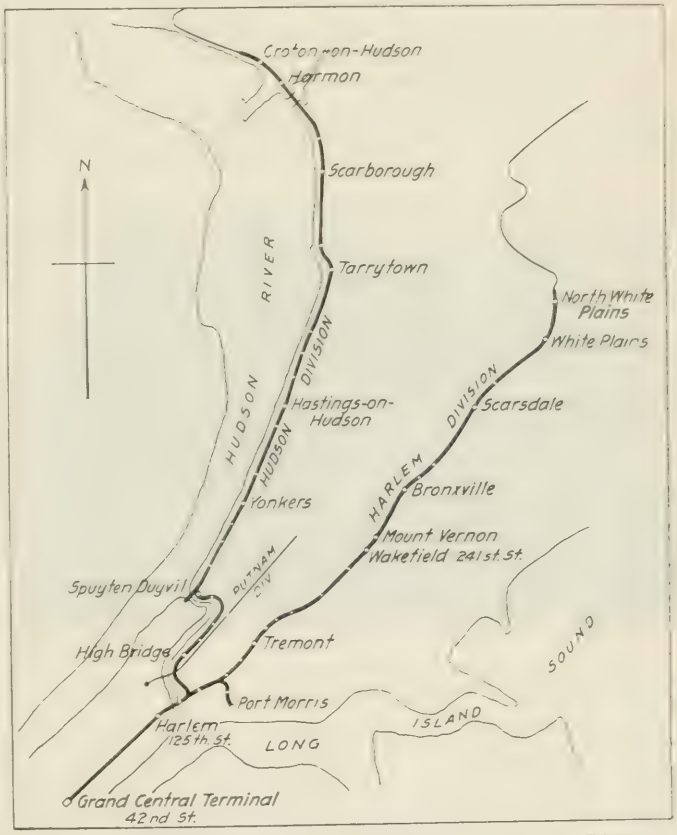
CARE AND HANDLING OF ELECTRICAL EQUIPMENT, NEW YORK CENTRAL & HUDSON RIVER.

BY F. E. LISTER,
Associate Editor of the *Railway Age Gazette.*

The care and handling of the electrical equipment of the New York Central & Hudson River has developed an organization which differs in many ways from that required for steam equipment. While this organization and its working may not be directly applicable to steam railways, it illustrates a number of methods which could be applied, in part at least, to advantage in handling steam railway equipment.

MILEAGE AND TRAIN SERVICE.

The electric division of the New York Central covers a total of 58 miles. It has two branches: that part of the Harlem division running from the Grand Central station, New York City, to North White Plains, 24 miles, with a 1.8-mile branch from Melrose to Port Morris, and that part



Electric Division; New York Central & Hudson River.

of the Hudson division, from Grand Central station to Croton-on-Hudson, 34 miles. The electrical operation of the Harlem division is completed to North White Plains, while on the Hudson division, the third rail at present extends only to Yonkers, 15 miles from the Grand Central station. The two divisions use the same track as far as Mott Haven Junction, 138th street, just across the Harlem river, where the Hudson division turns west to the Hudson river, which it follows north to Albany and Troy, while the Harlem division goes northeasterly to Chatham.

There are 61 trains per day over the Hudson division, 44 of which handle suburban business. All through trains on this division are handled between the Grand Central station and High Bridge, eight miles, by electric locomotives, while the multiple-unit trains, which take care of the bulk of the suburban business, operate between the Grand Central station and Yonkers. When electrification of this division is complete the multiple-unit trains will run to Croton-on-Hudson and the through trains will be handled to and from this point by electric locomotives. The present steam locomotive ter-

minal at High Bridge will be replaced by a new 30-stall roundhouse at Harmon, one mile south of Croton.

There are 48 trains per day over the Harlem division, all of which handle suburban business. The multiple-unit trains operate to North White Plains, while those trains that are destined for points beyond this, as well as those coming from the north, are handled by electric locomotives between North White Plains and the Grand Central station.

EQUIPMENT.

The electrical equipment necessary to meet the requirements of this service consists of 45 locomotives, 137 steel motor and 49 steel trailer cars. The motor and trailer cars are used only in the multiple-unit train service.

The locomotive, of which illustrations and descriptions have been published in the *Railway Age Gazette* on several occasions, weighs about 200,000 lbs., has a driving wheel base of 13 ft. and a total wheel base of 36 ft. It is equipped with four 600-volt d.c. motors of 550 h.p. each, giving a normal rating of 2,200 h.p. and a maximum of 2,800 h.p. The Sprague General Electric multiple-unit control is used, there being two master controllers, one in each end of the main cab, for operating in either direction. The control system carries a minimum of 300 and a maximum of 750 volts.

The steel motor car weighs 106,000 lbs., is 60 ft. long and has two motors. The multiple-unit trains are usually made



High Bridge Force.

For light and general inspection and repairs to electric locomotives.

up of two motor cars to one trailer car, six cars per train, and all operated from the controller of the leading car.

The inspection and repair of locomotives and cars is at present handled at four points: Lexington avenue (Grand Central station), High Bridge, North White Plains and Harmon. General terminal inspection and light imperative repairs are handled at Lexington avenue; light and general inspection and light repairs of locomotives at High Bridge; general inspection and light repairs to cars and light inspection of locomotives at North White Plains; all general heavy repairs are handled at Harmon.

The above outline covers the existing condition, which is in part temporary, pending the completion of the third-rail extension from Yonkers to Croton-on-Hudson. When this is completed, probably within another year, the locomotive work, which is now handled at High Bridge, and the general inspection of cars, now done at North White Plains, will be taken to Harmon. The present Harmon shops were built with this end in view. The 30-stall roundhouse to be built at Harmon will provide a terminal for the steam locomotives which are now cared for at High Bridge, between which point and Grand Central station the through trains are handled by electric locomotives. When the proposed electrification is completed, steam passenger locomotives will not approach nearer than 34 miles to New York City on the Hudson division and 24 miles on the Harlem division. All inspection and repairs to both locomotives and cars, save the light terminal inspection at Lexington avenue, will be handled at the general shop at Harmon.

In following the details one important idea must be kept constantly in mind. When electrical operation was inaugurated on the New York Central, about five years ago, an entirely new organization was formed for prosecuting a work for which no previous experience was available from which to formulate the handling of details. The electric locomotive was a very recent development, knowledge of the operation of which was confined almost entirely to test results, without any data as to its performance in actual and con-

FORM E F 31. C.R.I. 9-15-09-1M.

March 14 1910

Supt. Electric Equipment.

Dear Sir —

I beg to report the following {Defect / ~~Detention~~} occurred on

March 13 1910

Northbound X Southbound ____ Harlem Div ____ Hudson Div X

Train No. Poled from Lex. Time 1:30 A. M Place ____

Detention in mins ____

Elec Engine Cars 3227 in train ____

Motorman ____ Operating Inspector ____

Condition of equipment reported by Edwards

~~Defect~~ / ~~Detention~~ } was Ground #1 Armature

Repairs made en route ____

Condition found when inspected by me at High Bridge

Date March 13 Time ____ M., was as follows.

Found #1 Armature had been flashed over from commutator to spokes of wheel. This carbonizing canvass head to end casing of commutator which was grounded.

My opinion as to cause is as follows:

This could have been caused by reversing engine and giving it too much current and also could be caused by brake shoe dust accumulating on canvass head allowing current to carry across.

Present condition of equipment (if any repairs made, state repairs in detail, giving location, time and date)

Cleaned up armature and canvass head, tested same and found O. K. in service.

NAME J. Van der Bogart

POSITION Foreman

NOTE—If brake trouble, give piston travel, and state condition of brake valves.

Armature Defect Report.

tinued service. This same condition, to some extent, was true of the multiple-unit train equipment. It was plainly necessary to institute experimental work, and on a large scale, at the outset. The result has been an organization having a very systematic check on details. A number of reports, reproduced herewith, show the extent to which detail work is necessary to maintain a check on defects in equipment with the idea of discovering the weak points.

The successful operation of this system depends largely on systematic inspection, which must be constant and rigid. All general inspection is based on a mileage of 1,200 miles for both locomotives and cars, although either may be inspected before making this mileage in case of reaching the shop for repairs.

HIGH BRIDGE LOCOMOTIVE INSPECTION.

As previously stated, light and general inspection and light repairs of electric locomotives are handled at High Bridge.

E. E. 11 C.H.S. 8-15-08-500

New York Central & Hudson River R. R. Co.

ELECTRICAL DEPARTMENT.

March 16, 1910.

Supt. Electric Equipment.

Dear Sir:

REPORT OF CONTACT SHOES BROKEN.

Equipment No. 3208 Date March 14, 1910.

Number of Shoes 1 Train No. Poling South

Location of damage No. 2 End, B. side

Cause

Struck some thing at 54th Street.

Reported by Engineer Hoyt.

(Signed) J. Vander Bogart.

Upon the arrival of any car or Locomotive at your station with Contact Shoes missing, telephone the information at once, fill out this report and forward as above.

Broken Contact Shoe Report.

E. E. 14. C.H.S. 1-1649-1M.

New York Central & Hudson River R. R. Co.

ELECTRICAL DEPARTMENT.

Date March 31 1910

Supt. Electric Equipment.

Dear Sir:

The following changes were made on Electric Locomotives Pony Truck Boxes

NUMBER	CHANGED		DATE CHANGED
	No. 1 End	No. 2 End	
3229	2	2	
One Box on No. 2 End Trailer Wheel			
One Box on No. 2 End Leading Wheel			
Two Boxes on No. 1 End Leading Wheel			

Changed No. 1 End 2

Changed No. 2 End 2

Completed - - -

Still due - - -

J. Van der Bogart Foreman.

Report of Electric Locomotive Changes.

Light inspection is made between trips while general inspection is made on the mileage basis of 1,200 miles. The day force is shown in the illustration; the night force has but three men. The inspection shed, a frame structure, has two longitudinal tracks, one of which is served by a drop pit. This shed will accommodate four locomotives at a time, two on each track. As a locomotive inspection necessitates holding it out of service but a few hours, this shed provision meets the requirements, especially since a locomotive may be partly inspected outside the building.

On arrival at the general inspection shed, the locomotive is first gone over by the general inspector, whose duty it is to locate all of the heavy work required, so that it may be placed in the shop accordingly. When in the shop, the first work is to blow the dust from the armatures, field coils, brush holders, running gear, etc., using a jet of air at about 115 lbs. pressure. The general inspection and repair work then follows, each of the several inspectors being responsible for a certain part of the work on all locomotives.

One man, for instance, goes over the journal boxes, removing all of the waste and refilling the boxes with either new waste or with the old waste loosened up and re-oiled. There are two inspectors who work in the secondary cabs, one in each. Their work includes the filing or replacing of contactor tips. The tips are made of hard copper, but, due to



North White Plains Force.

For light and general inspection and light repairs to cars and light inspection of locomotives.

arcing, they become burned so badly that proper contact is impossible. In the majority of cases, filing will correct them, but new ones are often necessary. The secondary cab work also includes inspection of the rheostats, covering the tightening of the grid bolts and replacing of new for broken grids. After completing this work, the dust and filings are blown down with an air jet. An air equipment inspector goes over the compressor, air gage, brake cylinder, brake valve, feed valve, signal reducing valve, distributing valve and overhead trolley valve. A record of the periodical inspection and repairs of the air brake equipment is stenciled in the cab. The light inspection includes only the more important parts and the foundation brake rigging for piston travel and general defects. The general wiring and the controllers and switches are gone over, the motors and trucks are cleaned, the motor and truck bearings oiled, the contact shoes and beams inspected; in fact, every part of the locomotive is examined where a defect might cause trouble on the road. In itself, the inspection is what would naturally be expected, but the interesting feature, and the one which so decidedly differs from that of a steam locomotive, is that the details to be watched are much more numerous. A general inspection of an electric locomotive might be likened to the running repair work on a steam locomotive. On the steam locomotive the repairs are confined almost entirely to those reported by the engineman, such as closing rod-brasses, packing pistons

and valves stems, lining down wedges, packing all boxes, washing the boiler, cleaning injectors and engineer's valve, etc. On an electric locomotive all parts are inspected and repaired, whether reported or not.

An inspection record card is kept for each locomotive, and as the work of each kind is completed the inspector records the fact by signing for the work which he has done. This record serves two purposes: the foreman can know just how far the work on any locomotive has progressed, and in case of a faulty inspection causing subsequent trouble he knows where to place the blame.

After the inspection is completed, the foreman's office reports that the locomotive is "O. K. for service." The despatcher's office then sends a crew for the locomotive and it is placed on the O. K. track to await orders. This O. K. track adjoins the main line and over a portion of it is an inspection shed for handling light work between trips, such as replacing brake or contact shoes.

The final duty of the foreman's office each day is to make a record of the locomotives which have been or are in the shop on that day. A copy of one of these daily locomotive reports is as follows:

Daily Report.

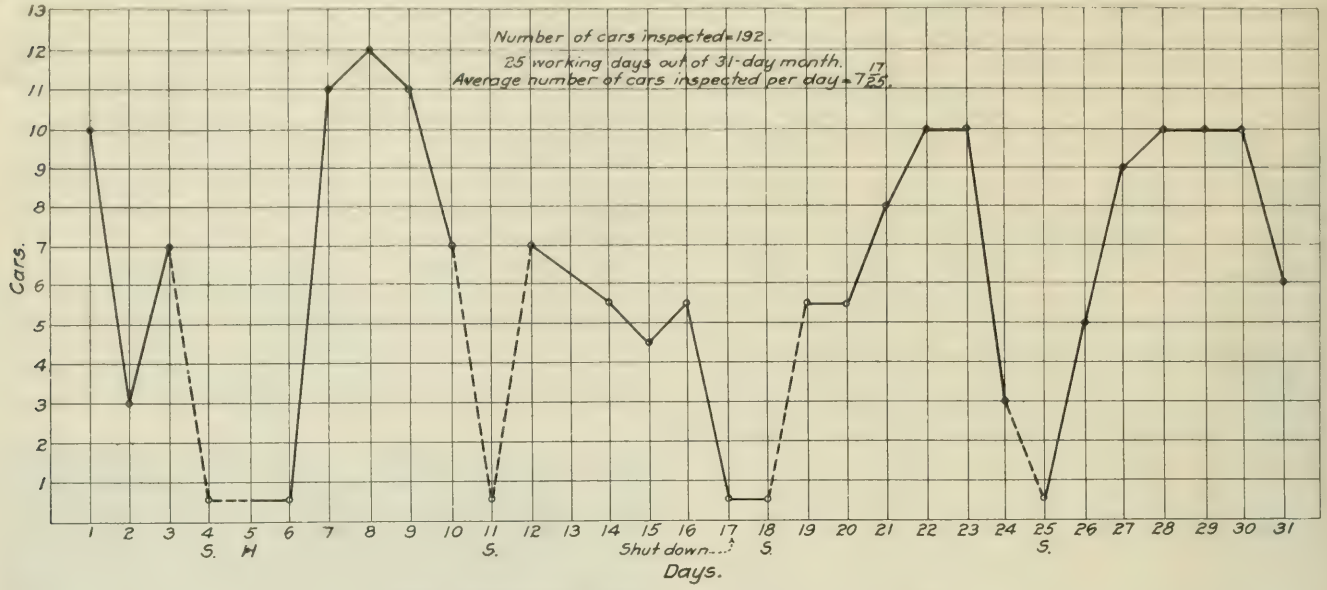
April 7, 1910.

3235. Inspected, O.K., in service.
3232. Inspected, O.K. in service.
3201. Reverser trouble repaired, O.K. at inspection shed.
3219. Inspected, O.K. at inspection shed.
3228. Broken tire, changing armature.
3229. Under inspection. No broken shoes.

J. VAN der BOGART, Foreman.

When the night despatcher phones to the O. K. shed for information regarding inspected locomotives ready for service, the information is given him from this report.

Reproductions of the printed report forms, which are given herewith, and also copies of the "Day" and the "Night" report pages of the book in which all the O. K. track inspection is kept, are particularly interesting, in that they show a system which differs very decidedly from steam locomotive practice. For instance, "cotter key in brake hanger pin" and "adjusted signal whistle" are defects which would be repaired without comment in an ordinary roundhouse, but not so in connection with the electric locomotive. This record book, copies of two reports of which are given herewith, is kept at the O. K. inspection shed for two weeks, when it is sent to the office of the superintendent of electrical equipment and replaced at the inspection shed by a similar book just returned from the office. From these daily reports the superintendent of electrical equipment is in a position to know just what parts of the equipment require the most inspection or renewal, where designs are faulty, etc.



Cars Inspected at North White Plains, July, 1909.

O.K. Inspection Shed Report.

DAY.

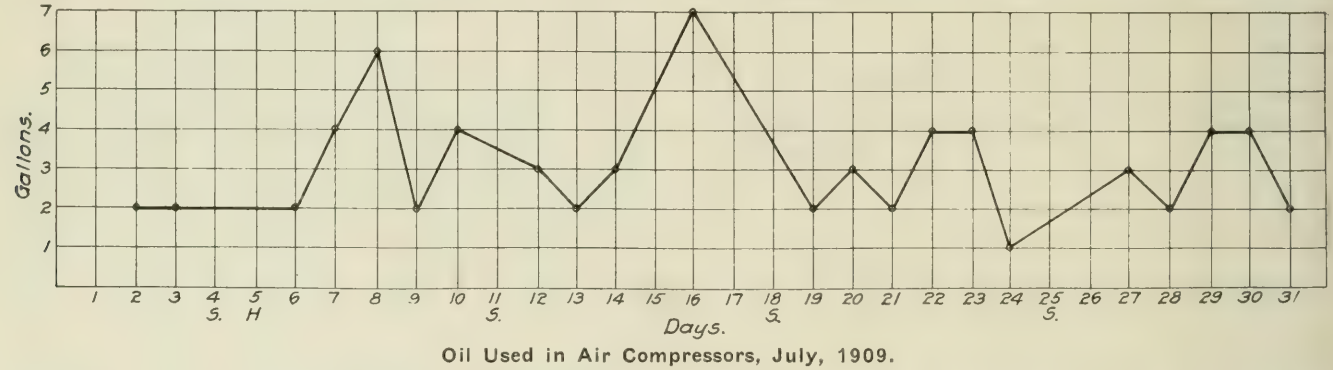
Thursday, April 7, 1910.

3209. Reported hot box, No. 2 end, B. side and trailer wheel.
3242. Reported for brake-shoes. Placed two second-hand shoes, No. 3 driver, A. side and No. 1 driver, B. side. Adjusted piston travel.
3222. Gasket in train line air hose, No. 2 end. Two broken thrust bolts, No. 2 driver. Drilled out holes and replaced thrust bolts.
3224. Came up on train No. 51. Broken contact shoe caused by broken spring. Made up new shoe.
3235. Cotter key in brake hanger pin, No. 3 driver, A. side.
3244. Cotter key in brake hanger pin, No. 1 driver, A. side.
3239. Open circuit on headlight, No. 1 end. Repaired same.
3230. Reported for reverser trouble.
3218. Repair cab light, one 10-c.p., 140-volt lamp.
3212. Repair cab light, one 10-c.p., 140-volt lamp.
3221. One oil cup for marker, one 1,000-amp. fuse in tool box.
3230. One wick for marker, one red disc.
3242. One red disc.

O.K. Inspections:

3235	3242	3239	3228	3218
44	12	21	30	09
22	08	24	14	23

Filed all contactors; bled reservoirs; signal whistles, overhead trolleys and piston travels tested. Brake arms, bells, knuckles and pony wheels oiled.



Oil Used in Air Compressors, July, 1909.

NIGHT.

Thursday, April 7, 1910.

3230. New light of glass, 15 in. x 25½ in., No. 2 end, A. side, main cab.
3246. Cut out and spotted to go down on No. 90. One 1,200-amp. fuse put in tool box.
3232. Two 140-volt lamp in cab circuit.
3235. Sent 40-amp. pump switch to Ryan's car for No. 12. Van Atten on train No. 40.
3212. One 1,200-amp. fuse put in tool box.
3233. Repairs on broken window sash slide piece and new light of glass, No. 2 end, A. side.
3201. From repair shop and put in service.
3219. From repair shop and put in service.
3245. Sent to repair shop. (Orders from Ryan's car.)
3244. Sent to repair shop for inspection
3238. Sent to repair shop for inspection.
3221. Came up on No. 79. Broken contact shoe, No. 1 end, B. side. Caused by leading wheels running off track in yard while in switching service during the day. For detailed report see Ryan's car. Put on new contact shoe. Held engine at this shed. Pump running hot, also needs brake-shoe, No. 1 end, B. side.

O.K. Track Inspections:

3217	3242	3223	3208
22	46	07	19
12	09	14	21
32	30	18	30
		37	

3237. Sand trouble removed.
3208. Sand trouble removed.
3212. Adjusted signal whistle.
Reservoirs bled, contactors filed, signal whistles and knuckles O.K.

Several of the items reported above were for "fuses placed in tool box." Each locomotive tool box should contain three 3-amp., six 4-amp., four 10-amp., two 15-amp., three 25-amp., two 40-amp., four 1,000-amp. and four 1,200-amp. fuses, and it is the duty of the inspector to see that these fuses, 28 in all, are maintained in the tool box.

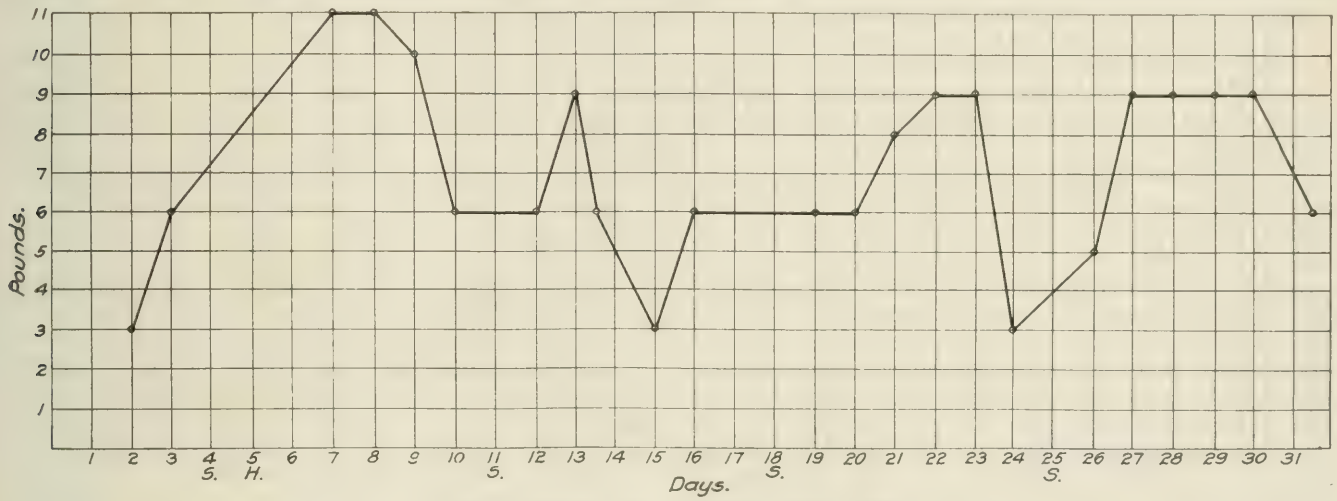
Reference to the reproduction of the "Report of Contact Shoes Broken" shows the check which is maintained on accidents. The information is telephoned to the office of the superintendent of electrical equipment and steps at once taken so that a similar accident will not happen to the next locomotive passing the same point.

The report on changes of pony truck boxes is one which is made out for purposes of record, and shows where changes are necessary, giving a line on the action of the trucks in service.

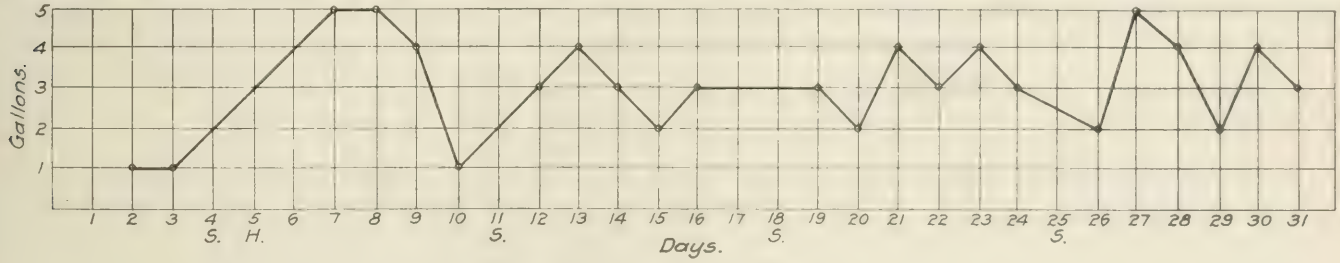
The defect report gives a complete history of a grounded armature and also the opinion of the foreman as to the cause of the defect. The value of this report lies in the superintendent of electrical equipment having available data on actual service troubles on which to base alterations in the designs of equipment and parts. This same form is used for detention reports, and a two-minute detention, caused by blowing out a defective train line gasket, is sufficient cause for making out a full report.

NORTH WHITE PLAINS CAR AND LOCOMOTIVE INSPECTION.

The work handled at North White Plains includes light and general inspection and light repairs to cars and light inspection of electric locomotives. The light inspection of motor cars is made between trips; the general inspection is made after 1,200 miles have been run, the same as for the locomotives. The mileage record form, reproduced herewith, shows the method employed for keeping account of each car's actual mileage and for transferring them from service to the inspection shed at North White Plains. The printed form contains the numbers of all the motor cars. The report is made out for every 24 hours, ending 11.59 p. m., and contains the mileage which each car has made since its last shopping. Each day's mileage is added to the record, and when a car has made more than 900 miles, an X is placed after the number. This indicates that it will soon be due for a general inspection. It is necessary to allow about 300 miles in this way, as a car will usually make this amount before it can be placed in a train due for the inspection shed. The yardmaster who makes up the trains at the Grand Central Station must use the cars during the day so that at night he will have two five-car trains for the inspection shed. These are used for late trains and are sent to the inspection shed on arrival at North White Plains. As they are taken out of service they are replaced by cars that have just been inspected. An average of 10 cars per day must be inspected in order to keep within the mileage limits. Each car makes, on an average, 100 miles per day, so that general inspection is due about every 12 days.



Gear Grease Used on Cars, July, 1909.



Coach Oil Used, July, 1909.

Reference to the mileage report of April 9 shows that 10 cars, those whose mileage figures have lines drawn through them, have just been received at the shed. It also shows that 16 cars, those opposite which no mileage is recorded, are out of service, either at the inspection shed at North White Plains or the shop at Harmon. The North White Plains facilities

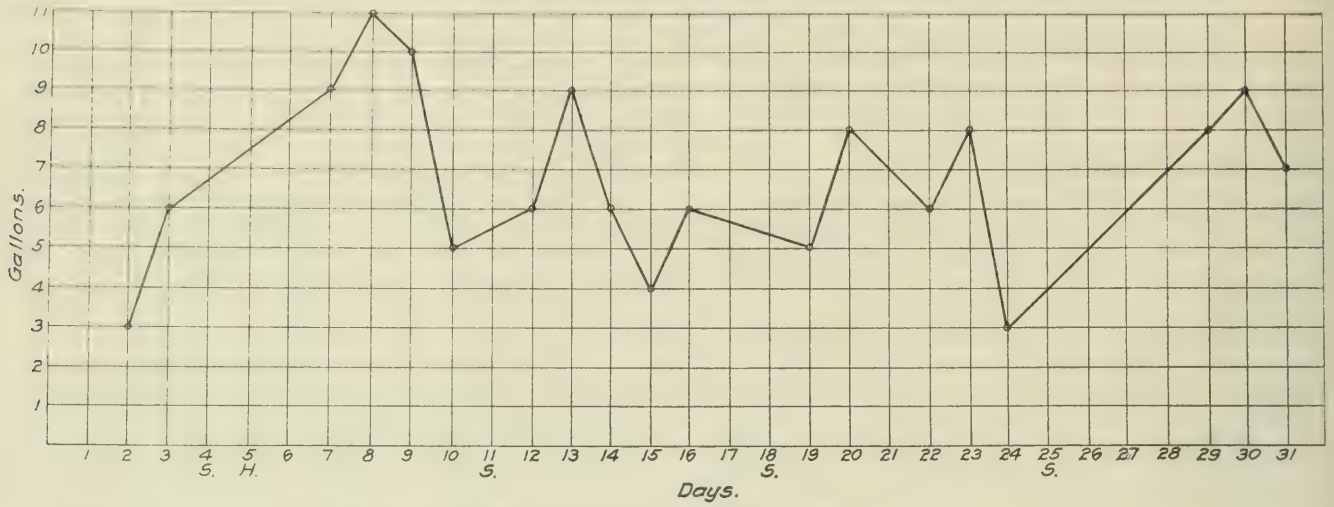
include a brick building, about 400 ft. x 40 ft., containing three longitudinal pits. Two of these are used for car work and the other for locomotive work.

General inspection of a motor car includes going over the air compressor, motors, trucks, car body, brakes, contactors, reverser, circuit breaker, controllers, switches, general wiring, motor and truck bearings, gear greasing, and contact shoes and beams, in fact, all general electrical and mechanical work which may be handled without other facilities than pit space.

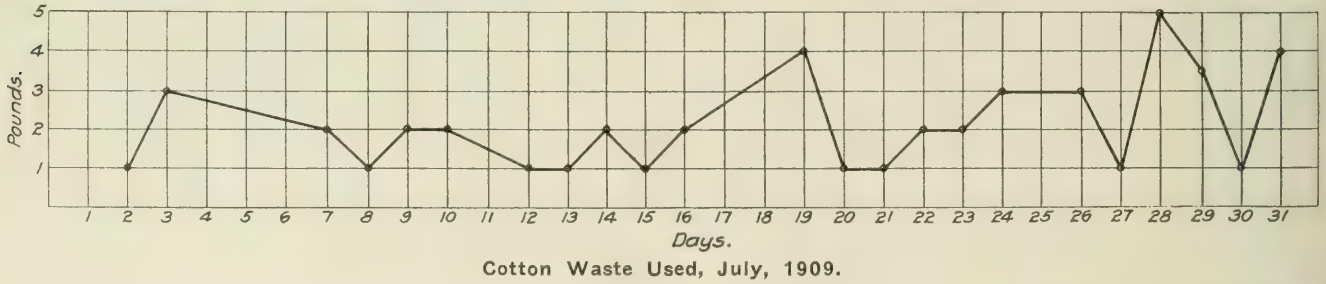
The running gear and electrical equipment are first cleaned with an air jet. Each inspector has his own portion of the work to perform on all cars, and, on completion of it, he indorses the car's repair card, as is the case with the locomotive inspection. This card is kept on file for record of work done and for future reference. Each inspector has two small record books. One of these is filed at the office while the other is in use. During the day he records the work which he handles, turning the book in at the end of the day and receiving the other one in exchange. The office makes a record in the shop book of all work done during the day. There are two of these shop books, one of which is kept in the office of the superintendent of electrical equipment for two weeks, when it is exchanged for the one at the shop.

In addition to the general work mentioned, considerable special work must be covered. This includes defects which have become evident in service. For instance, the manufacturer's design of the piston in an emergency valve provided for no packing rings. Trouble was experienced and the design was changed at the shop to include a packing ring. The trouble ceased and it was then decided to change the pistons of all valves. Special work also includes a number of parts of the equipment that are gone over only at stated intervals. For instance, compressors every twelve months; feed valves, four months; triple valves, three months; brake valves, three months; signal valves, six months; signal whistle valves, one year, and brake cylinder valves, one year. To have a check on this special work, separate records are kept of each kind of work, under headings as follows: Pistons with packing rings installed; compressors inspected; triple valves inspected, etc. At the beginning of the day's work, the office sends a list of special work to be done, and when it is reported back as completed, a record is made accordingly.

A number of diagrams given herewith are interesting as showing methods of keeping graphical records which show at a glance general shop conditions. These records are local with the North White Plains shop and are valuable only as an indication of the fluctuations in the work and the supplies used. The record of cars inspected during July, 1909, shows a total of 192 cars for the month. It will be noticed that no cars were allowed to remain in the shed over Sundays. The record of oil used in air compressors shows a total of 69 gals. In general, it corresponds with the number of cars inspected, but as it is a record of oil drawn from the storeroom on the several dates rather than that actually used on those days, it should not be expected to conform more closely. The results of service tests of oil consumption are interesting and establish valuable oil records. Car No. 3004 was placed in service on December 20, 1909, with the indicated amounts of oil and yarn in its armature bearings, journals and axle caps; it was inspected on January 10, after a mileage of 1,148 miles, and it was found that no additional oil or yarn was necessary. It was again inspected on January 18, after making 1,084 miles since January 10, and still no oil or yarn was necessary. On January 31, however, the armature bearing box was found to contain but 11 pints of oil and the axle caps but 11 half-pints. An additional pint was added to the armature bearings and a half-pint to each axle cap, after which the car was run until March 13, making a total of 3,281 miles on the supply which it had on going into service after its January 31 inspection. The total mileage made from December 20 to April 2 was 7,893 miles, the record showing that 14 pints of oil were used on each armature bearing, 12 half-pints on each journal box and 14 half-pints in each axle cap. The test of car No. 4054 does not show such good results. The total mileage in this case was 5,738 miles.



Electric Car Oil Used, July, 1909.



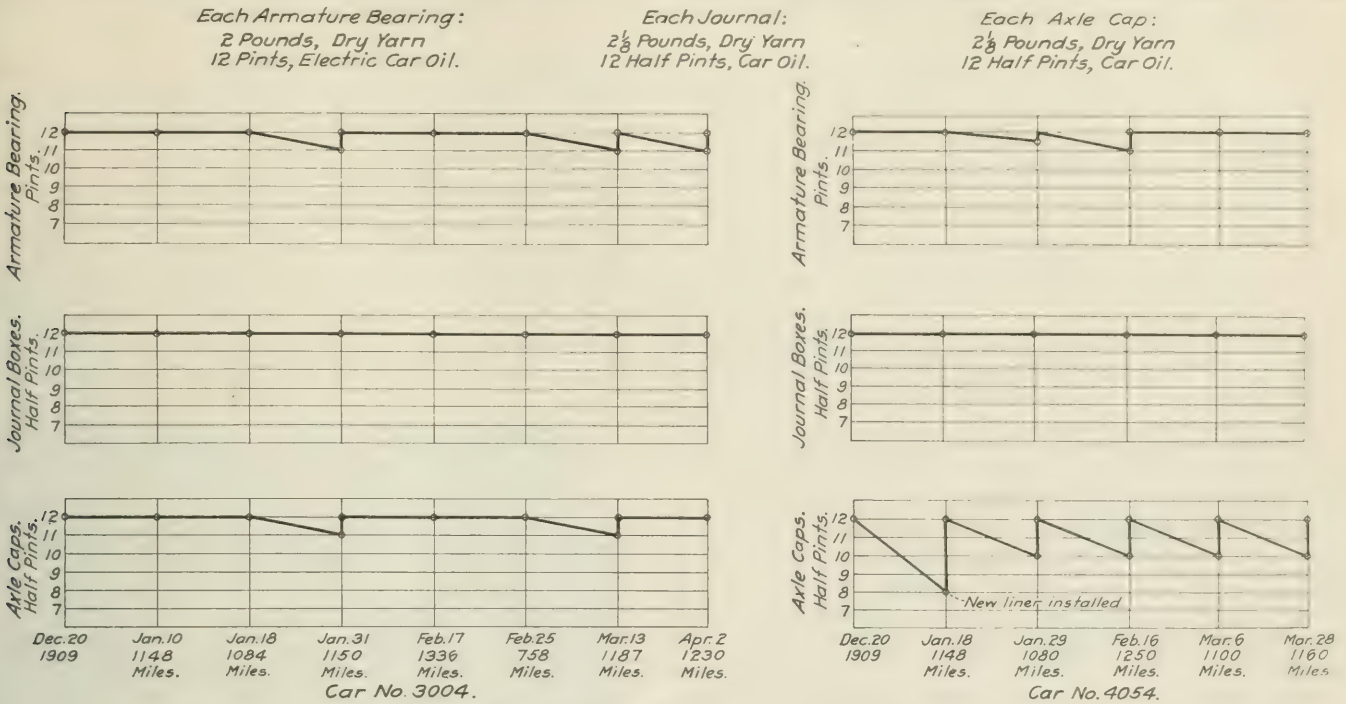
Cotton Waste Used, July, 1909.

HARMON REPAIR SHOP.

At Harmon, 33 miles from Grand Central Station, is the general repair shop, and to this point all of the inspection

work will be transferred on the completion of the electrification of the Hudson division.

The main portion of the shop has a 450-ft. frontage and is 190 ft. deep. There is an L-extension on the east end, 60 ft. wide and extending 260 ft. beyond the rear wall of the main building. This L-extension, to be used for car and locomotive inspection work, has three longitudinal tracks, two for cars, each having a capacity for six cars, while the third will take ten locomotives. The electric locomotive repair shop adjoins the inspection shed and has four longitudinal tracks. The car repair shop is separated from the locomotive shop by a heavy wall and has ten tracks for two cars each. At present the two tracks at the western end are used for truck repairs. Several repaired trucks are always kept in stock, so that they may be substituted for damaged or defective ones. The machine shop occupies the western end of the building, and is 75 ft. wide by 190 ft. deep. The 30-stall roundhouse will be built just west of the shop, so that the machine shop will be between the electrical and steam work. The shop offices occupy the second floor above the machine shop.



Tests of Oil Consumed by Two Cars.

FORM E. E. 13 C.B.S. 1-19-10-500.

New York Central & Hudson River Railroad Co.

ELECTRICAL DEPARTMENT

Messrs. Bickford / Bullock / Ryan & Van Atten / Sears — New York, April 9 1910

Mr. _____

Dear Sir: *Below please find the mileage of Electrical Car Equipment for the 24 hours ending 11:59 P. M.* April 8 1910

Car Number	Mileage	Car Number	Mileage	Car Number	Mileage	Car Number	Mileage	Car Number	Mileage
3000	482	3030	---	3060	779	3090	97	3120	424
3001	154	3031	604	3061	584	3091	210	3121	1024
3002	932	3032	752	3062	~~1172 X~~	3092	807	3122	518
3003	564	3033	578	3063	~~1064 X~~	3093	78	3123	270
3004	280	3034	890	3064	1054 X	3094	614	3124	336
3005	602	3035	984	3065	814	3095	97		
3006	164	3036	34	3066	1065 X	3096	937		
3007	348	3037	---	3067	834	3097	34	4394	
3008	---	3038	208	3068	386	3098	58	4395	
3009	---	3039	984	3069	---	3099	48	4396	
3010	408	3040	698	3070	---	3100	904	4397	
3011	290	3041	561	3071	~~1030~~	3101	1004	4398	
3012	634	3042	612	3072	464	3102	620	4399	
3013	96	3043	544	3073	~~956~~	3103	----		
3014	326	3044	630	3074	634	3104	154		
3015	590	3045	116	3075	797	3105	566	4350	
3016	874	3046	---	3076	916	3106	96	4351	
3017	630	3047	154	3077	398	3107	967	4352	
3018	700	3048	592	3078	---	3108	950	4353	
3019	---	3049	192	3079	651	3109	---	4354	
3020	499	3050	400	3080	---	3110	714	4355	
3021	144	3051	~~1190 X~~	3081	~~1349 X~~	3111	436		
3022	~~1108 X~~	3052	724	3082	436	3112	---		
3023	606	3053	851	3083	1044	3113	348		
3024	~~1084 X~~	3054	510	3084	1088 X	3114	1054 X		
3025	---	3055	154	3085	716	3115	---		
3026	~~1045~~	3056	960	3086	352	3116	---		
3027	512	3057	1063 X	3087	987	3117	204		
3028	584	3058	702	3088	555	3118	960	10	Cars for inspection at 10 A. M.
3029	~~1042~~	3059	614	3089	705	3119	594		

Daily Mileage Report.

The following machine tools are installed in the machine shop:

Wheel press, 500-ton, Niles-Bement-Pond, New York.
Horizontal boring mill, single head, Putnam Machine Co., Fitchburg, Mass.
Horizontal boring mill, double head, Bullard Machine Tool Co., Bridgeport, Conn.
Shaper, Gould & Eberhardt, Newark, N. J.
Lathe, 16-in., Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.
Lathe, 30-in., Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.
Lathe, 24-in., Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.
Axle lathe, double head, Niles-Bement-Pond, New York.
Tool lathe, Henley Machine Co., Torrington, Conn.
Slotter, 18-in., T. C. Dill Machine Co., Inc., Philadelphia, Pa.
Plate rolls, 72-in., Niles-Bement-Pond, New York.
Combination punch and shear, Hilles & Jones Co., Wilmington, Del.
Bolt cutter, double head, Acme Machinery Co., Cleveland, Ohio.
Bolt cutter, single head, Hurlburt-Rogers Machine Co., South Sudbury, Mass.
Planer, 30-in., double head, Niles-Bement-Pond, New York.
Drill press, 4-spindle, Bickford Drill & Tool Co., Cincinnati, Ohio.
Drill press, Cincinnati Machine Tool Co., Cincinnati, Ohio.
Radial drill, Bickford Drill & Tool Co., Cincinnati, Ohio.
Pipe threading machine, D. Saunders' Sons, Yonkers, N. Y.
Car wheel lathe, double head, Niles-Bement-Pond, New York.
Driving wheel lathe, Niles-Bement-Pond, New York.

All of these machines are new with the exception of the driving wheel lathe. The larger ones have individual motor drives, and the smaller ones are in motor driven groups.

Provision has been made for future extensions as follows: An inspection shed equal in size to the present one; a car repair shop about two-thirds the size of the present one, and an extension on the machine shop which will be slightly more than double its present size.

The car repair shop is equipped with three 18-ton electric traveling cranes, made by Alfred Box & Co., Philadelphia, Pa. When fully equipped, this shop will have five of these cranes, each serving two tracks. The crane service in the machine shop will consist of five 2½-ton electric telpher hoists. The shop now has one 5-ton Sprague Electric Co., New York, telpher hoist which serves the middle of the shop.

One corner of the machine shop is devoted to air brake work and another to the repair of electric motors; adjoining this is the tool room. The general storehouse for the electric division is located at Harmon and at present occupies a portion of the machine shop end of the building. The blacksmith shop contains two forges, one steam hammer made by the Chambersburg Engineering Co., Chambersburg, Pa., and one double wheel emery grinder.

In the power room are three Western Electric, 150-volt, 220-amp., d.c., generators, direct connected to vertical engines made by the Shepherd Engineering Co., Franklin, Pa.; one underwriters fire pump of 1,500 gals. per minute capacity, sufficient to maintain six 1⅛-in. smooth nozzle fire streams; one

New York Central & Hudson River R. R. Co.

ELECTRICAL DEPARTMENT.

DAILY REPORT ON EQUIPMENT.

Date April 11 1910. Ending 6 P. M. Location No. W. Plains

FORCE	DAY	NIGHT
Foreman	1	
Inspectors and Helpers	17	4
Repair Men	1	
Laborers		1
Car Cleaners and Wipers		
Oilers and Hostlers	4	
Total No. of Men on duty	23	5

EQUIPMENT	O. K.	Disabled
Motor Cars		
Trailer Cars		
Combination Cars		
Electric Engines		

Numbers of Cars Received	Date Received	Date of Cars Shopped	Class of Repairs	Date to be Ready for Service	Date Ready for Service	REMARKS
3066	4/9	4/9	Insp.	4/9	4/9	Went South in Service this A. M.
3081	"	"	"	"	"	
3026	"	"	"	"	"	
3039	"	4/11	"	4/11	4/11	
3051	"	"	"	"	"	In Yard
3062	"	"	"	"	"	
4063	4/10	"	"	"	"	
4071	"	"	"	"	"	
3073	"	"	"	"	"	
4300						
4307						
*4303						Extra Cars
3369						
3396						
3345						
Engine						
3221	4/11	4/11	Insp.	4/11	4/11	Gaged Shoes O. K. Adjusted Brakes 5⅛" to 5"
3229	"	"	"	"	"	" " " " " 5⅛" to 5"
3245	"	"	"	"	"	" " " " " 6" to 6"
3233	"	"	"	"	"	" " " " " 6⅛" to 6"
3224	"	"	"	"	"	" " " " " O. K.
3216	"	"	"	"	"	" " " " " O. K.

I Certify the Above to be Correct

(over) H. L. Bullock Foreman

Daily Equipment Report.

Cochran feed water heater and receiver, made by the Harrison Safety Boiler Works, Philadelphia, Pa.; one compressor of 1,500 cu. ft. of free air per minute capacity, made by the Chicago Pneumatic Tool Co., Chicago; and a motor-generator set. The boiler room contains five 100-h. p. locomotive type, hand fired boilers, two of which are used at a time during the summer and three in winter when additional steam is required for heating purposes.

The Harmon shop does not now handle any inspection work, except on those cars which have reached the shop and have made the mileage necessary for general inspection.

The pits in this shop are especially adapted for car work. They are 32 in. deep and have steps leading into them at the ends. The shop floor, level with the top of the rails at the ends of the pits, gradually slopes down from the pit line to 14 in. below the top of the rail. This puts the car or locomotive in an advantageous position for working on the running gear.

The cars are equipped with radial draft gear, which, on account of its extending to the track bolster, is often bent if the car is handled roughly. These are quickly straightened by placing a rail across the buffer plate, anchoring its ends to the rails and then lifting up on the car end with an electric crane hoist.

Six combination passenger-baggage motor cars are being built. They are being made from trailer cars by cutting the baggage doors near one end. The metal is cut by a circular saw, motor driven. This method is rapid and does not damage the sheets.

INSTRUCTION OF ENGINEMEN AND FIREMEN.

The enginemen and firemen who handle the electric locomotives, and the motormen who operate the multiple unit trains, are recruited from the steam department. These men require instruction only in handling the electric equipment, being acquainted with the train operation generally. R. E. Hewitt, an engineer who has had an extensive experience in the electrical field in connection with both the manufacture of



Harmon Force.

For general repair work.

electrical equipment and the operation of electric surface, elevated and subway lines, is in charge of the instruction of enginemen and firemen. The equipment is described by the instructor and the men question him when any point is not understood. After going over the electric locomotive and the motor car equipment thoroughly and answering all questions, the instructor has the men make note of the more important points in small note books. During the course of instruction special stress is placed on service troubles and methods of handling them on the road. A number of men may be taken out on the line with a locomotive or train and common service troubles may be made to occur by the instructor. For instance, if the main control, negative control or 40-amp. fuse is blown, or if the switch in any one of the fuse boxes does not make good contact, it is impossible to move the engine. This condition is illustrated by removing a fuse or only partly closing a switch. The buss and train line jumpers are explained and their functions illustrated.

The instructor also impresses on the men the importance of making full and immediate reports of all service troubles. The renewing of a lamp switch fuse is sufficient cause for a report, as its blowing out may be a tell-tale to some more serious trouble, which, if not discovered when the locomotive reaches the inspection shed, may cause trouble the next trip.

C. H. Quereau is superintendent electrical equipment and we are indebted to him for many courtesies and privileges extended. E. Sears is general foreman at Harmon, J. Van der Bogart is foreman at High Bridge and H. L. Bullock at North White Plains, to whom we are also indebted for assistance.

MASTER BOILER MAKERS' ASSOCIATION.

The fourth annual convention of the International Master Boiler Makers' Association was held at Niagara Falls, Ont., May 24-27. The following subjects were reported upon and discussed: The Standardizing of Blueprints for the Building of Boilers; Best Method of Applying and Maintaining Tubes; Flexible Staybolts Compared with Rigid; Steel vs. Iron Tubes; Standardizing of Shop Tools; Standardizing of Pipe Flanges for Boilers; Best Method of Staying the Front Portion of the Crown Sheet on Radial Stayed Boilers; Radical Departures in Boiler and Firebox Construction; Extent of Cracking of Firedoor Holes and the Means of Prevention.

Radical Departures in Boiler and Firebox Design.—The paper dealt exclusively with the locomotive boiler and gave descriptions of the Wood and Jacobs fireboxes, the brick combustion chamber in use on the Central of Georgia and the several types of boilers that have been applied to Mallet locomotives. The discussion, however, hinged about the Wood and Jacobs fireboxes and dealt especially with the value of corrugations as a preventative of staybolt breakages. It was considered too soon to make any positive statements as to the probable life of the Jacobs firebox, but in a year's service no repairs have been necessary except the calking of the tubes. The Wood firebox was criticised on the basis that the staybolts should be put in the convex portion of the sheet instead of the concave, and that this location causes them to leak. Further than this it was stated that it was exceedingly difficult to patch the box.

The discussion drifted into the consideration of corrugated sheets generally. It appeared that many members had had experience with corrugated side sheets. It was shown that the corrugated sheets in use some twenty years ago had developed a tendency to crack and had been generally condemned, and even where they had not failed their use was discontinued. In one case side sheets with horizontal corrugations were used because it was thought that the inequality in vertical expansion between the inner and the outer sheets was what should be cared for. It worked well for a time, but after 28 months of service the sheets began to crack and could not be patched. From this and other experiences the speaker had reached the conclusion that when the life of the ordinary flat side sheet is not more than two years it will pay to use a corrugated sheet. Not because a longer life will be secured, but because during the life of the sheet there will be less trouble with leaky staybolts. But, if the life of the sheet is more than two years, nothing will be gained by using a corrugated sheet.

The scale seems to be the greatest enemy to the life of a corrugated sheet. The incrustation forms in the hollows and cannot be readily removed, thus resulting in cracking, though there may be a great improvement in the leaky staybolts. It is not at all uncommon to find from ½ in. to ⅝ in. of scale on these sheets.

Closely allied to the matter of corrugation is that of the radius of curvature used in the flanging. Various radii have been used up to as much as 3 in., with the idea of easing off on the bending stresses. These large radii do not seem to have been successful and it was the general consensus of opinion that a radius of ¾ in. was better than a longer one though it was not so stated officially. The variations in the experiences with corrugated sheets was accounted for by the variations in material, water and usage. Where the water was good, and the material also, it was possible to get good results; but with material that was anything but first class or with water yielding a high per cent. of incrusting matter, the corrugated sheet would be sure to crack and fail, though it might afford a temporary relief from leaky staybolts.

It was also intimated, though not directly stated, that the use of the corrugated sides and crown had given little or no relief in the matter of the broken flange of the back tube-sheet.

Inequality of Expansion in Locomotive Boilers.—The paper on this subject, presented before the New York Railroad Club by D. R. MacBain, was read. An abstract of it appears in the *Railway Age Gazette* May 27, page 1311.

Standardizing Pipe Flanges for Boilers.—The committee merely recommended the adoption of the standards already offered by the American Society of Mechanical Engineers; also some used in Canada and a few used by Crane & Co.

Staying the Front End of the Crown Sheet in Radially Stayed Boilers.—The committee reported to the effect that no method of bracing has yet been designed to entirely eliminate bending and cracking at the top flange of the flue sheet of radial stayed boilers; a 2-in., 3-in. and as much as a 6-in. radius have been tried at the top of the flue sheet to overcome the cracking with no better results than were had with the usual ¾-in. radius. Although the primary cause of the bending and cracking is the stretching or lengthening of the flue sheet, it is obvious that the inelasticity of the crown sheet prevents it from readily adjusting itself to the increased length of the flue sheet. This condition is wholly responsible for the bending of the flange and largely so for the cracking.

While the initial cause of the stretching, distortion and cracking is the abuse of the flue sheet, it is evident that if it were free to move at the top, there would be no bending or consequent cracking of the flange. Increasing the margin above the flues mitigates the evil somewhat, but does not eliminate it. In good water districts very little trouble is experienced with the top of the flue sheet in radial stayed boilers. It is in the bad water districts, as a rule, where the flue sheet is abused with the sectional expander, on account of flue leakage, that the trouble occurs.

Other cases of kindred firebox sheet failures are cracks in the lower half of side sheets along the calking edge of the flue sheet, longitudinal cracks in the crown sheet along the calking edge of the side sheet, and longitudinal cracks in the quadrant of the wrapping sheets, all due to unequal expansion.

Another serious condition found in connection with the tee bar arrangement is a deflection in the crown sheet of from ¼ in. to ¾ in. at either end of the tee bar due to the tee bar coming down at the ends, and the crown sheet going up just beyond the tee bar; the radius of the tee bar becoming smaller to such an extent that when a new flue sheet is applied it is necessary to change the radius of the bar. This condition does not exist where the eye bolt and sling stay or some other more flexible form of stay is used.

A modified form of the radial stayed boiler is in use, with a flat crown sheet, having tee bars on the crown and roof sheet connected by braces. The crown sheet has a smaller radius at the sides than the one ordinarily used. These crown sheets are said to crack, in time, longitudinally along the bend. The crown bar and the Belpaire boiler are said to be more satisfactory as far as the upper flange of the flue sheet is concerned.

In the discussion it was suggested that some relief could be obtained from the cracking of the tube sheet flanges by leaving a wider margin above the top rows of tubes. Also that the plugging of a flue hole was apt to stretch and strain the metal so as to make trouble. It was generally conceded that the firebox held by radial stays gave more trouble than either the crown bar or Belpaire type. This was explained on the basis of the difference in the dimensions of the inner and the outer sheets, as well as the shape in which the crown sheet has a tendency to arch up. Under ordinary conditions of construction the sling stays and T bars are very rigid so that the ordinary radial stays are quite as good.

It often happens, however, that where a flange breaks the material is blamed, whereas it may be altogether due to the

treatment that the material has received, for work may have been done upon it at too high or too low a temperature. The best heat for this flanging is a bright cherry red, and cracking may result from working it when too hot as well as when too cold.

Excellent results have been obtained by what was called a modified form of Belpaire firebox, where the inner sheet was made to agree with the outer in general contour; with such a design there had been no failures in four years.

Horizontal cracks may be formed because of the lack of any provision to take care of the vertical expansion of the firebox, so that it is well to make the holes in the sling stays oblong and of ample length to take care of this upward expansion. This is especially necessary in bad water districts. Gusset stays also seem to help matters under these conditions.

The method of setting the tubes also has an important influence on the stretching and cracking of the flange of the tube sheet. It has been found to be better to start the expanding of the tube at one side and go around and around the nest, gradually working in towards the center. If this is done, the metal of the tube sheet is being constantly worked in towards the center, and the expansion is in that direction. The result is that the sheet can and does bulge either to the front or back, and when all of the tubes are set it is in a condition of equilibrium. Whereas, if the expanding is done from the center to the outside, there is a great upward pressure put upon the flange connection to the crown sheet with the corresponding danger of cracking.

In this connection the flexible staybolt may be considered a good thing provided the tubes have been properly set. But if the tube sheet has been stretched by an improper setting of the tubes they will be of but little value in preventing the cracking of the flange.

Cracking of Fire Door Sheets.—Closely allied to the cracking of the tube sheet is the cracking of fire door sheets, upon which a report was presented. It started out with the broad statement that cracked door sheets were almost as common as leaky tubes, though not as harmful to the steaming qualities of the locomotive. The trouble seems to be a universal one regardless of the shape of the door opening. The committee laid the cause of the trouble not on the abuse to which the metal had been subjected in working, or the cooling effect of the air, but to the "breathing" movement of the sheets from unequal contraction and expansion. This is demonstrated by the fact that the fractures always develop on the inside of the knuckle first, and radially with the various curves of the hole. It was suggested that any contemplated changes should be along the lines of stiffening the connection between the two plates.

In the discussion it was shown that the O'Connor door opening invariably gave satisfactory results provided it was properly applied. The O'Connor door has a swell on the inner sheet that forms a flexible connection by which a considerably relative movement between the two sheets is permitted without overstraining the metal. It is necessary that the staybolts should be kept well away from the opening so that it may not be too rigid. No staybolt should pass through the swell.

As far as the shape of the door is concerned it has no influence whatever on the cracking. The elliptical or oblong door does, however, possess the disadvantage of affording a place at the top for the accumulation of scale. One door was described that had larger radii in the upper than in the lower corners. With this the cracks usually occurred in the lower corners.

In the construction of the door flanges it has been found that a radius of ¾ in. is as good as a larger one. And as for repairing, most excellent results have recently been obtained by welding in patches. This has been done on both sides of the door and so neatly that the location can hardly be detected. But, if a patch is to be put on in any other manner it is best to use a latch bar and drive the rivets all of the way around and not use bolts.

Steel vs. Iron Tubes.—The report was very short and to the effect that "steel tubes give just as good service as iron tubes and *vice versa.*" As for welding, where an oil furnace is used there is no difficulty or secret in welding steel tubes. In an open coke or coal-fire some difficulty is encountered, due to the impurities in the fuel.

A statement was presented from the Erie from which it appeared that the total cost of working the same number of steel and iron tubes was about 20 per cent. more for the iron than for the steel. Another report showed a very favorable relation to exist for steel tubes. Out of 298 tubes of steel and iron, half and half, making 103,663 miles, 14 steel tubes were found pitted and scraped. In the same lot there were 49 iron tubes that had to be scraped. Neither kind give any very great amount of trouble when in use. In another case, there were 26 scrap steel and 20 scrap iron tubes. In a third 20 scrap steel and 6 scrap iron tubes. In some cases the beading of the steel was found to be in good condition, while that of the iron was soft and spongy. It, therefore, appears that on the whole there is not much to choose between the steel and the iron tubes.

Flexible Staybolts and the Best Methods of Applying.—The report was merely a statement of the successful operation of flexible staybolts upon a heavy locomotive. In the discussion it developed that this type of bolt is giving splendid satisfaction. One member reported that on locomotives with full installations, no broken bolts had been found in 30 months' service. It appears, too, that the bolt is doing much to preserve the fireboxes. Where the flexible bolts are applied the firebox sheets remain smooth and flat; whereas, with the rigid bolts they become corrugated or cracked. It was thought that if complete installations were put in, and three or four rows of sling stays were used at the front in addition, there would be no trouble in the bulging or cracking. From only one road did there come any report of broken bolts and these were in the outer rows of the throat sheet of a Wootten firebox.

As for the method of inspecting flexible bolts, it is a matter of some difficulty to get satisfactory results. They should be inspected at least once every 30 days as a precautionary measure, even though breakages are almost unknown. The methods used are to put on an air, steam or water pressure of from 100 lbs. to 125 lbs. per sq. in. and then tap the bolt on the inside with a hammer. Of the three, the use of water pressure has proven to be the most satisfactory.

The breakages, when they do occur, are invariably found immediately under the head. A cause for this breakage was given in the carelessness which sometimes obtains in the tightening. If a bolt is drawn down too tight with a long handled wrench, it follows that it must carry an excessive load that may result in fracture. But, if they are properly put in, a number of speakers seemed to think that there could be no danger of breakage.

At the conclusion of the discussion the association voted that in its opinion the use of the flexible staybolt was the best known means of relieving the strains of expansion and contraction in the sheets.

Applying Tubes.—The opinion of the committee was that the best method of applying tubes is to have them fit perfectly tight in the copper ferrule. The copper should be tightened in the sheet with a sectional expander, and should not be rolled. Then, to tighten the tubes, use a roller expander and a small motor, and do just enough work to hold the tube while belling out. They should then be expanded with a Prosser expander that $\frac{1}{16}$ in. wider than the thickness of the sheet, and beaded with a standard beading tool.

The best method of caring for tubes while on the road is to have them kept clear of all cinders and soot, and to avoid

all sudden changes of temperature in the firebox by opening the fire door to prevent the boiler from popping; keep a good, live fire next to the tube-sheet, maintain a regular delivery of the feed, in short, keep the temperature in the boiler as uniform as possible and a clean fire.

Where arch tubes are used they are a great protection, especially if the arch is set close to the tube-sheet, where it can prevent the cold air from striking the tubes. In such cases there is little trouble from leaky tubes, and engine failures as a result thereof. As a precautionary measure, the tubes and the top of the arch should be cleared of cinders whenever the boiler is washed out. On the Lake Shore & Michigan Southern the tubes are expanded with a Prosser expander every thirty days, whether they need it or not. It may seem useless, but the recompense comes in not having any tube failures on the road.

The tools recommended for the work are a Prosser expander and a standard beading tool to conform and take in $\frac{3}{16}$ in. stock to the firebox end.

On the Rock Island the practice is to cut off any excess of metal that may have developed by flow or otherwise and to ream out the holes, into which the copper ferrules are fitted and rolled. The tube is then entered and beaded about 2/3 down and is then expanded with a Prosser expander and calked. It was urged in behalf of this method that it insured an even expansion of the tube when the sheet was awry. Under such circumstances any upsetting that takes place will be at an angle with the tube and will make the work uneven unless this method is employed.

Another member used a Prosser expander with a long stroke hammer every 30 days. There was some difference of opinion as to the value of using a belling tool to square the end of the tube, and as to the best method of turning the tube over. It was especially urged that it would be far better to straighten the sheet, and that this should always be done; for, when a sheet is out ⅛ in. in the width of the tube hole it is time to make it right.

While no formal action was taken it was generally considered that a time limit should be put on the life of tubes, and that three years is the maximum that they should be allowed to remain in place without renewal. It was also recommended as especially advantageous to the circulation and for the strengthening of the bridge between tubes to reduce a 2¼-in. tube to 2 in. by welding on a 9-in. piece at the firebox end. This is especially true when the dome is immediately over the tubesheet, where it seems to have a tendency to lift the water, unless this improved facility of circulation is provided. It has also been found that tubes so reduced are much more easily kept clean, because anything that enters the 2-in. portion is very easily swept along out of the larger section.

The use of but two sizes of copper for ferrules was deprecated in that, when the holes were reamed out, they would not always fit, and it would be better to keep five or six sizes in stock, from which one could always be found that would fit the hole. It was added in the final discussion that the life of tubes was sometimes doubled by using this reduction at the back end.

Standardizing Drawings.—It was urged that this standardization be made to include the form and method of laying out of certain parts of the boiler, such as back heads and throat sheets so that the work can be done in advance of the bringing of the engine into the shop for repairs. This should also include the foundation ring, which should be finished inside and out and all holes laid off from accurate skeleton box templates with center lines and holes, both longitudinal and transverse; all holes to be drilled before assembling sheets, except the plug holes in the outside corners which may be drilled after the sheets are laid off.

Again all flanged work should be turned and fitted accurately to box or band templates at the flange fire; all the firebox plates should be laid off accurately from template for rivet holes. The same should be true for holes in the back head, side and roof sheets. The cylinder courses should be bisected; the dome collar should be put up and fitted. There are other matters that should be taken into consideration, which would tend towards the development of a cheaper maintenance as well as construction. It was also shown that this matter was one that could not be carried forward without the assistance and co-operation of the superintendents of motive power. It will be necessary to secure their co-operation but it was thought that if the economy resulting from this standardization was shown them that the manufacturing companies could be brought into line to work in accordance with such recommendations as might be made.

Federal Boiler Inspection.—At the closing session there was an animated discussion condemnatory of the Federal bill, S. 6702, providing for governmental inspection of locomotive boilers. At the end of the discussion the following resolutions were passed unanimously:

Whereas, A bill known as No. S. 6702 has been presented to the Congress of the United States for the avowed purpose of promoting the safety of employees and travelers upon railways by compelling all common carriers to equip their locomotives with safe and suitable boilers and appurtenances thereto, and,

Whereas, The language employed in the said bill by which such safety is to be obtained is indefinite and uncertain and in no way conveys any engineering information whatever that can serve as a guide for boiler construction and maintenance, and,

Whereas, The bill provides for a system of inspection that is impossible of execution with the force that will be available, thus rendering it absurd and useless, and,

Whereas, There is no method suggested by which competent inspectors will be selected, and,

Whereas, It provides that the government will undertake the inspection without assuming any responsibility for the same, and,

Whereas, Such a system of inspection will tend to lessen the vigilance of employees without, at the same time, relieving them of responsibility, and,

Whereas, The training of the men made eligible for inspectors is not sufficient to insure their competency, and,

Whereas, Such a system of inspection will hamper commerce by delaying engines at terminals, and,

Whereas, The expense involved will be very great without any compensating advantages therefor, and will, therefore, be a burden to maintain; therefore be it

Resolved, That we, the International Master Boiler Makers' Association, condemn the said bill, S. 6702, as it is now drawn, as not only useless but detrimental to the best interests of the railways, their employees and the traveling public, and unanimously deprecate its passage and urge that it be reported unfavorably, and that it be further

Resolved, That copies of this resolution be sent to congressmen and senators in charge of the bill and members of the Interstate Commerce Commission and the press.

The following officers were elected: President, A. M. Lucas, general foreman boiler maker, Chicago, Milkaukee & St. Paul, Milwaukee, Wis.; first vice-president, Geo. W. Bennett, general foreman boiler maker, New York Central & Hudson River, Albany, N. Y.; second vice-president, J. W. Kelly, general foreman boiler maker, Chicago & North Western, Oak Park, Ill.; third vice-president, T. W. Lowe, general boiler inspector, Canadian Pacific, Winnipeg, Man.; fourth vice-president, John T. Johnson, assistant boiler inspector, Atchison, Topeka & Santa Fe., Los Angeles, Cal.; fifth vice-president, F. A. Linderman, boiler inspector, New York Central & Hudson River, Albany, N. Y.; secretary, H. D. Vought, 95 Liberty street, New York; treasurer, Frank Gray, foreman boiler maker, Chicago & Alton, Bloomington, Ill.

Omaha, Nebraska, was selected as the place for the holding of the next convention.

General News Section.

The fourteen railways centering in Denver and vicinity have increased the pay of yardmen 3 cents an hour.

The Pennsylvania Railroad has renewed for 20 years, from July 1 next, its general contract with the Pullman Company.

The Toledo & Ohio Central has agreed to increases varying from 14 to 38 per cent. in the wages of its conductors and brakemen.

The Pennsylvania, which now uses telephones for a large part of its business west of Harrisburg, is preparing to introduce them on the main line east of Harrisburg.

Gov. Hadley of Missouri is quoted as saying that representatives of the railways in that state have informed him that they will equip all locomotives with acetylene headlights.

The Missouri Pacific has adopted the open-shop system so far as the machine departments of the shops at Little Rock, Sedalia and other important points are concerned. Non-union machinists are being engaged.

The St. Louis & San Francisco is installing new telephone circuits for train despatching on about 500 miles of line; from St. Louis to Springfield, from Springfield to Thayer, and from Amory, Miss., to Birmingham, Ala.

The New York legislature has passed an amendment to the labor law providing for the making of voluntary agreements between employers and employees as a basis for compensation in case of the death or injury of the employee. Railway corporations are expressly exempted from the application of this amendment.

The New York State Superintendent of Public Works has awarded barge canal contract No. 63 to H. S. Kerbaugh, Inc., of Philadelphia, for $1,990,043, and No. 73 to E. H. Graves of Cleveland, O., for $767,467. Contract No. 63 is for the improvement of twelve miles of the Erie Canal in Monroe County, and No. 73 for dredging a channel in the Hudson River between Northumberland and Stillwater, 15 miles.

The Western Electric Co., which has furnished a very large proportion of the telephones now used by the railways of the country for train despatching, is now putting on the market a selector of its own design, which is claimed to be the simplest yet made. It is a simple step-by-step apparatus, and requires no local battery or relay at the way station. No polarized circuits are used and tests have shown the instruments capable of high speed combined with accuracy.

It is reported that the Order of Railway Telegraphers has won its contention with the Missouri Pacific and allied lines for an eight-hour day in all large offices. About 1,000 men are affected by the agreement. The telegraphers had been working nine hours with time and a half for all time worked over nine hours. Hereafter the overtime will commence with the ninth hour instead of the tenth. In offices where two telegraphers are employed the day will consist of nine hours, overtime being paid for work longer than nine hours.

Messrs. Clark and Morrissey, arbitrators in the dispute between the New York Central and its conductors and trainmen, have decided against the Delaware, Lackawanna & Western in the claim made by that road that certain clauses in the New York Central arbitration applied also to the Lackawanna. These clauses are those in which certain increases of pay on the New York Central were ordered to take effect several months in the future. The present decision is in effect that on the Lackawanna all of the increases are to go into effect at once.

E. F. McPike, refrigerator service agent of the Illinois Central and secretary of the Railroad Refrigerator Service Association, has been appointed the delegate of the association to the second international congress of refrigeration to be held in Vienna, Austria, October 5 to 11, 1910. The railways of this country have in service about 100,000 refrigerator cars, and improvements are being made in their construction continually. These international meetings of men interested in refrigeration furnish an opportunity for exchanging ideas and profiting by experience gained in other countries.

On Saturday, May 21, the Michigan Central ran an excursion train of 12 cars, all well filled, from Windsor, Ont., to Falls View station, 224 miles, in 224 minutes; and, following this, another train of the same length made the same distance in seven minutes less; and both trains ran through without a stop. In making these fine runs the road had what in scriptural language might be called a great cloud of witnesses, or rather two great clouds. All of the passengers in both trains were critics of the highest grade; they were members of the Brotherhood of Locomotive Engineers, who had been holding their great biennial convention in Detroit.

Railway Matters in Washington.

Washington, June 1, 1910.

Senator La Follette has finished his three days' speech denouncing the principal provisions of the administration railway bill, and Senator Cummins has so far succeeded in his endeavors to secure a variety of amendments that he has gone home to Iowa for ten days or more. The action of these two senators does not, however, give the promise of an immediate vote on the bill, as had been expected, for a number of other senators have now proposed other amendments. Most of these recent proposals are nothing more than attempts to reopen questions which were settled two or three weeks ago by the adoption or rejection of amendments which had been long considered, so that at present the prospects are again considerably mixed. Among the amendments which have been adopted in the Senate is one providing for the supervision of telegraph and telephone companies by the Interstate Commerce Commission. A provision with this purpose was adopted in the House, but this one is different in some respects. Senator Cummins' amendment to require all increases in rates to be approved beforehand by the Commission, was rejected by a vote of 29 to 43. Following this, the Senate adopted unanimously an amendment proposed by Senators Jones and Paynter, giving the Commission ten months instead of four months to consider proposed increases, provided the Commission is not able to complete its examination of the tariffs within four months. The section regulating the issue of stocks and bonds was stricken out by an almost unanimous vote.

An amendment offered by Senator Cummins was adopted providing that in all cases where an increase of rates, which has been made since January 1, 1910, is challenged, the burden of proof to show the new rates just shall rest on the carrier.

On Monday last a large delegation of shippers from the Middle West, accompanied by 20 Congressmen, called on Attorney-General Wickersham and asked him to take action in the courts under the anti-trust law against the railways in the Western Trunk Line Committee, which have announced radical increases in freight rates to go into effect June 1, and yesterday the Attorney-General complied with their wishes by asking for an injunction in the United States district court of Hannibal, Mo. The court granted a temporary injunction and the court will fix an early date for a hearing on the question of issuing a permanent injunction. The defendants are all of the roads in the Western Trunk Line Committee, which means all of the principal companies between Chicago and the Missouri river as well as a number of others. The petition charges that in organizing the Western Trunk Line Committee these roads were suppressing competition; that at their monthly conference, if a road suggests a change in rates and the other roads agree to it unanimously, the change takes effect, and all members are thus guilty of combining.

The attorney-general's visitors were largely from a meeting held at Omaha, May 24, when representatives of shippers of 15 cities, most of them west of the Missouri river, met and ap-

pointed the committee, instructing it not only to go to Washington to file a complaint, but also to induce shippers to bombard their representatives in Congress with telegrams denouncing the advances in rates. This was done and for a day or two telegrams flooded the capital. The committee was headed by W. J. Evans, of Chicago.

Mail Bag Delivering Apparatus.

The recently announced order of the Post Office Department relating to the use of improved devices for catching and delivering mail bags at points where trains do not stop, was in the shape of a letter from the second assistant postmaster general to the general superintendent of the Railway Mail Service, instructing him to see that all railway companies be notified that "they would be expected to take steps within one year to equip their lines with either the Burr device or some other equally satisfactory." The Burr device was described in the *Railway Age Gazette* of October 15, 1909 We are informed by Mr. Hollyday, acting second assistant postmaster general, that a number of the larger railways are taking steps to co-operate with the Post Office Department by looking into the merits of the Burr device or by testing other devices of their own selection.

Delays of Cars at Interchange Points.

In its report to the semi-annual meeting, held in New York recently, the American Railway Association's committee on relations between railroads presented the table given herewith, showing reasons for the rejection of cars by inspectors at 14 prominent cities for the month of November last. It will be seen that 77 per cent. of the rejections were due to mechanical reasons and 23 per cent. to transportation reasons; and that a large majority were due to causes entirely foreign to defective safety appliances.

The committee reports that a plan for a joint inspection and interchange bureau has been experimentally adopted at the Union Stock Yards, Chicago, under the auspices of the General Superintendents' Association. The plan is similar to that in effect at Pueblo, Colo., and heretofore described. The plans in use at Pueblo, Denver and Cincinnati continue to give satisfactory results.

Transfers and Set-Backs for a Month.*

LOADED CARS OFFERED BY CONNECTIONS AND REJECTED, DURING NOVEMBER, 1909

		No. of railroads from whom information was—		Number of cars rejected for different reasons. (See footnote for Key.)												Total loads rejected.
		Requested.	Received.	21	22	23	24	25	26	27	28	29	30	31	34	
1.	Buffalo	14	5	8	80	..	..	..	..	..	..	..	..	3	..	91
2.	Cincinnati	9	9	..	2	..	..	..	..	..	..	13	75	39	..	129
3.	Cleveland	7	5	58	167	..	..	1	12	2	17	70	25	100	..	452
4.	Chicago	28	22	105	61	7	16	..	..	17	15	45	32	98	24	420
5.	Denver	5	5	38	246	50	569	2	..	..	2	..	..	..	..	907
6.	Detroit	8	2	..	..	..	..	..	..	..	..	..	..	..	..	..
7.	Indianapolis	7	3	..	3	..	1	..	..	..	..	..	..	..	..	4
8.	Kansas City	15	15	175	102	58	8	..	..	24	7	6	57	..	..	437
9.	Omaha, including Council Bluffs	10	6	170	54	..	..	..	..	1	..	11	5	..	..	241
10.	Peoria, including Pekin	14	11	54	105	..	..	..	..	..	..	..	..	..	..	159
11.	St. Louis Terminals	21	10	243	..	55	..	..	..	..	..	41	39	1	..	559
12.	Toledo	14	5	5	38	20	4	2	..	10	1	19	8	..	8	115
13.	St. Paul and Minneapolis	9	5	89	173	16	50	..	..	1	2	..	..	..	..	331
14.	Davenport, Moline & Rock Island	4	4	4	36	..	..	..	..	..	..	6	..	..	..	46
	Total	..	..	949	1,067	186	648	5	12	55	44	211	241	241	32	3,691

KEY: 21—Bad order cars (penalty defects); lading classed as transferable. 22—Bad order cars (not penalty defects); lading classed as transferable. 23—Bad order cars (penalty defects); lading classed as non-transferable. 24—Bad order cars (not penalty defects); lading classed as non-transferable. 25—Loaded in excess of clearances. 26—Loaded in excess of bridge capacities. 27—Damaged lading, including leaky tanks. 28—Improperly loaded, including overloads. 29—No billing. 30—Wrongly billed. 31—Embargoes. 34—Delivered in error.

*From a report issued March 30, by a committee of mechanical officers of lines in Chicago, for the month of November, 1909.

Albany to New York by Airship.

On Sunday last, May 29, Glenn H. Curtiss flew from Albany to New York City, 137 miles, in three hours 32 minutes, and he won a prize of $10,000 which had been offered by the *New York World*. He stopped for rest for just one hour, at a point near Poughkeepsie, about half way, so that his actual time in motion was two hours 32 minutes, for the 137 miles, an average rate of 54.06 miles an hour. He landed near the northern part of Manhattan island, thereby complying with the conditions of the prize giver, and then resumed his flight and finally landed on Governor's island, New York harbor, about 15 miles farther south. The aeroplane was fitted with floats to prevent sinking in case it should fall into the water, and the flight was over the Hudson river all of the way, except in a few places where distance was saved by cutting across the land. The motor of this aeroplane is 50 h.p., and the whole machine, with the man in his seat, weighs about 1,000 lbs. About seven gallons of gasolene was used in the trip from Albany to Poughkeepsie, the capacity of the reservoir being ten gallons. Curtiss started from Albany at 7:03 a. m., and reached Poughkeepsie at 8:26; left Poughkeepsie at 9:26 and reached Spuyten Duyvil at 10:35. This flight was not so long as that of Paulhan from London to Manchester, 186 miles, recently made, but surpassed it in speed. At Storm King a gust of wind caused Curtiss' machine to drop suddenly about 40 ft. or more, but the aviator succeeded in righting it quickly. Mr. Curtiss' wife and friends started from Albany in a special train over the Hudson division of the New York Central a few minutes after he set sail, and followed the flight through, keeping the airship in view a good part of the way.

Increase in Night Letter Telegrams.

Many uses have been found for the night letter telegrams which were not even thought of by the originators. One Chicago concern sent out in one night 1,000 50-word telegrams, advertising its products. The results were so satisfactory that it is said the same firm will send out 10,000 more similar telegraph letters in the near future. Many brokers who are accustomed to send out daily market reports to customers throughout the country, are using the night letter telegrams for this purpose. On one night recently two New York business houses sent 4,200 and 4,400 night messages respectively. In a telegraph office in a small southern city where one operator would ordinarily handle all of the night business 500 letter telegrams were filed recently in one night.—*Telegraph Age.*

Hints to Station Agents.

In prohibition Kansas some of the express companies send peculiar complaints to the railroad commissioners. A Cloud county man recently filed a long complaint with a certain company against its local agent. "Whenever I receive a shipment of liquor," said the man, "the agent tells all the old topers in town, and they hound me to death for social drinks. I want you to order your agent to keep his mouth closed in the future when I receive liquor."

An officer of an express company was out instructing a local agent how to handle his business. "As soon as the train

departs," said the officer, "first take in your money, next your small packages and last your big packages." "That's where you are mistaken," said the local agent. "Out here we must take in the liquor packages first. The gang around the depot will pay no attention to packages of money, but they will steal the liquor packages if I turn my back."—*Chicago Inter-Ocean.*

Instructing Lehigh Valley Agents.

Charles S. Lee, general passenger agent of the Lehigh Valley, proposes to put the instruction of his ticket agents on a basis where he will be able to more accurately estimate the value of the results obtained than ever before. He has instructed the district passenger agents to hold meetings for catechising the agents every month. On the Lehigh Valley, as on most railways, there are many men at the smaller stations whose duties require them to look after not only the passenger business, but also the freight, the telegraphing and the checking of baggage; and to be a general information bureau as well. As the stations are small these men cannot be paid very large salaries and in consequence they are not always so full of ambition to build up business as might be desired. A school should not only produce a better class of men to select from for higher positions, but also encourage the men to feel that the company is taking an interest in them. Then some of them will become sufficiently interested to study conditions themselves with improvement of themselves as well as increasing the business of the company.

The district passenger agent, who is supposed to be thoroughly posted, will ask each man all sorts of questions; as, for example: How many miles does the Lehigh Valley system comprise? Through what state or states does it run? What are the principal towns along its lines? Is it double-tracked all the way or only part way? Is it electrically blocked or what system is used? What are the principal trains? If a man wished to go from your station to ——— what train would be the best for him to take to reach his destination promptly? Over what line does the Lehigh Valley run through cars west of Suspension bridge and south of Bethlehem? If a man is going to Boston what would be the best way for him to go from your station and at what station in Boston would he arrive if he took your recommendation? How is checked baggage taken through Geneva for a passenger going to a local point on the New York Central?

This scheme is to be warmly commended. Not only will it mean better service to the public in every way; it will be beneficial in getting the men together so that they can meet each other personally.

French Railway Employees and Police.

The organization of railway employees in France is not always mild spoken. In the course of a demonstration at Rouen not long ago, they came into conflict with the police, and some of them were clubbed and others arrested. Thereupon a general convention of the Congress in Paris resolved to prepare for a general strike on all lines in case the Minister should not give satisfaction. The Marseilles branch moved that the organization appropriate several thousand francs for the purchase of revolvers, with which members should defend themselves against the police, but this was too much for the convention. The employees of the State Railway are said to be among the most active advocates of violent measures.

American Society for Testing Materials.

The following is the programme of the thirteenth annual meeting, to be held at Atlantic City, N. J., June 28-July 2, 1910, with headquarters at the Hotel Traymore.

FIRST SESSION, TUESDAY, JUNE 28, 3 P.M.

Minutes of the twelfth annual meeting.
Annual report of the Executive Committee.
Report of Committee A-3: On Standard Specifications for Cast Iron and Finished Castings. Walter Wood, chairman.
Tests of Cast Iron Arbitration Test Bars. C. D. Mathews.
Some Recent Tests of Cast Iron. A. E. Outerbridge, Jr.
Notes on the Annealing of Steel Castings. Albert Sauveur.
Untruly and Unevenly Chilled Car Wheels. T. D. West.
Report of Committee E-1: On Standard Methods of Testing. Gaetano Lanza, chairman.
Report of Committee B-1: On Standard Specifications for Hard-Drawn Copper Wire. J. A. Capp, chairman.
The Forest Products Laboratory; Its Purpose and Work. McGarvey Cline.
Election of Officers.
Miscellaneous Business.

SECOND SESSION, TUESDAY, JUNE 28, 8 P.M.

The Closing of Blowholes in Steel Ingots. Henry M. Howe.
Measured Strains in a Steam Boiler under Hydraulic Tests. James E. Howard.
Copper-Clad Steel; Its Metallurgy and Properties. Wirt Tassin.
Tests on Steel and Wrought-Iron Beams. H. F. Moore.
Strength of Steel from I-Beams. E. L. Hancock.

THIRD SESSION, WEDNESDAY, JUNE 29, 10 A.M.

On Steel.

Report of Committee A-1: On Standard Specifications for Steel. William R. Webster, chairman.
Low-Carbon Streaks in Open-Hearth Rails. M. H. Wickhorst.
Elongation and Ductility Tests in Rail Sections under the Manufacturers' Standard Drop-Testing Machine. P. H. Dudley.
The Influence of Titanium on Segregation in Bessemer-Rail Steel. G. B. Waterhouse.
Cupro-Nickel Steel. G. H. Clamer.
Test of a Structural Steel Plate Partly Fused by Short-Circuited Electric Current. A. W. Carpenter.
Report of Committee A-8: On Standard Specifications for Cold-Drawn Steel. C. E. Skinner, chairman.
Further Notes on the Heat Treatment of Steel. William Campbell.

The afternoon of Wednesday, June 29, will be reserved for sea-bathing, sailing, fishing, golf and general recreation.

MEMORIAL SESSION.

The memorial session, in honor of the memory of Dr. Charles B. Dudley, late president of the International Association for Testing Materials and of the American Society for Testing Materials, will be held on Wednesday, June 29, 8 p.m.

FIFTH SESSION, THURSDAY, JUNE 30, 10 A.M.

On Cement and Concrete.

Report of Committee C-1: On Standard Specifications for Cement. George F. Swain, chairman.
Aluminates: Their Properties and Possibilities in Cement Manufacture. Henry S. Spackman.
The Effect of Sodium Silicate Mixed With or Applied to Concrete. Albert Moyer.
Comparative Tests of Lime Mortar Both in Tension and Compression; Hydrated Lime and Sand, Lump Lime and Sand, and Cement, Lime and Sand. E. W. Lazell.
Tests on Reinforced Concrete Columns Subjected to Repeated and Eccentric Loads. M. O. Withey.
The Distribution of Stress in Reinforced Concrete Beams, Including a Comparative Study of Plain Concrete in Tension and Compression. A. T. Goldbeck.
A Sand Specification and Its Specific Application. W. A. Aiken.

SIXTH SESSION, THURSDAY, JUNE 30, 3 P.M.

On Preservation Coatings and Oils.

Report of Committee D-1: On Preservation Coatings for Structural Materials. S. S. Voorhees, chairman.
Report of Committee A-5: On the Corrosion of Iron and Steel. A. S. Cushman, chairman.
A Method for Testing the Protective Power of Paints when Applied to Iron and Steel. W. H. Walker and M. T. Jones, Jr.
Another Solubility Test on Protective Coatings. G. W. Thompson.
Vermillion Paint for Railway Signals—Results of an Investigation. Robert Job.
The Painting of Cement and Concrete Structures. Charles MacNichol.
Classification of Fine Particles According to Size. G. W. Thompson.
Report of Committee D-2: On Standard Tests for Lubricants. A. H. Gill, chairman.
Report of Committee D-3: On Standard Methods of Analysis of Fats and Oils. C. N. Forrest, chairman.

The evening of Thursday, June 30, will be reserved for an engineering smoker.

SEVENTH SESSION, FRIDAY, JULY 1, 10 A.M.

On Testing Machines and Apparatus.

The 600,000-lb. Testing Machine of the University of Wisconsin. H. F. Moore and M. O. Withey.
The Scleroscope. A. F. Shore.

This paper will be followed by a general discussion on "Tests of Metals for Hardness," to be opened by Mr. A. F. Shore, Mr. Bradley Stoughton and Mr. A. S. Sauveur.

Some Testing-Laboratory Accessories. J. Madison Porter.

Brinell Ball-Test Applied to Wood. W. K. Hatt.

Apparatus for Repeated Loads on Concrete Cylinders and a Typical Result. H. C. Berry.

An Autographic Rubber-Testing Machine. T. Y. Olsen.

The Work of the Structural Materials Testing Laboratory during the Past Year. R. L. Humphrey.

An exhibit of photographs and drawings of testing apparatus, contributed by the Testing Laboratory of the Engineering College of the University of Wisconsin, will be displayed at this session.

EIGHTH SESSION, FRIDAY, JULY 1, 3 P.M.

The Deterioration of Soluble Bitumen. Prévost Hubbard and C. S. Reeve.

The discussion of this paper will be opened by Mr. S. R. Church, Mr. A. W. Dow, Mr. W. H. Fulweiler, Mr. Clifford Richardson and Mr. Albert Summer.

Improved Instruments for the Physical Testing of Bituminous Materials. Herbert Abraham.

Necessary Reforms in Specifications for Petroleum Products. Albert Sommer.

A New Machine for Testing Pitch. T. Y. Olsen.

Report of Committee D-8: On Waterproofing Materials. W. A. Aiken, chairman.

Report of Committee D-9: On Standard Tests of Insulating Materials. C. E. Skinner, chairman.

Report of Committee D-5: On Standard Specifications for Coal. J. A. Holmes, chairman.

Fuel Investigations, U. S. Geological Survey; Progress During the Year Ending June 30, 1910. J. A. Holmes.

The evening of Friday, July 1, will be reserved for recreation.

NINTH SESSION, SATURDAY, JULY 2, 10 A.M.

Report of Committee C-3: On Standard Specifications for Paving and Building Brick. L. W. Page, chairman.

Report of Committee D-4: On Standard Tests for Road Materials. L. W. Page, chairman.

Report of Committee C-4: On Standard Specifications for Vitrified Clay and Cement Sewer Pipe. Rudolph Hering, chairman.

Report of Committee D-7: On Standard Specifications for the Grading of Structural Timber. H. von Schrenk, chairman.

Report of Committee A-6: On the Magnetic Testing of Iron and Steel. J. W. Esterline, chairman.

A Comparison of Magnetic Permeameters. Charles W. Burrows.

The Exponential Law of Endurance Tests. O. H. Basquin.

Miscellaneous Business.

Machine Tool Builders' Convention.

The National Machine Tool Builders' Association held its semi-annual convention at Rochester, New York, May 24 and 25. The committee on the "Standardization of Motors" reported considerable progress in securing the co-operation of the motor builders. Fred L. Eberhardt described the apprenticeship system in force at the Gould & Eberhardt works in Newark, N. J. The apprentices are bound and indentured according to the apprenticeship laws of New Jersey. The parents of the apprentices must pay $1 per week for about three-fourths of the four-year course; this amount forms the collateral for a bond which the father or guardian is required to execute. If the apprentice completes his term satisfactorily the money is returned, but if not, it is forfeited.

J. B. Doan, of the American Tool Works Company, discussed such phases of the tariff question as are of interest to the machine tool builders. Prof. F. B. Dyer, superintendent of the Cincinnati schools, described the work which is being done by the continuation schools. This scheme undoubtedly marks one of the most important advances in industrial education and was outlined in a general way in Prof. Schneider's address before the International Railway General Foremen's Association as reported in the *Railway Age Gazette* of May 6, page 1170. William Lodge and R. K. Le Blond discussed the advantages and disadvantages of the cone and gear drives. The cost of maintenance and the relative efficiency of these two types should be studied carefully by the prospective purchaser. A resolution was adopted urging Congress to pass a bill for the creation of a patent court of appeal. A. H. Hitchcock, of *Hitchcock's List*, and John A. Hill, of the *American Machinist*, spoke on "Direct Advertising vs. Trade Paper Advertising."

Railway Policemen.

The Railway Association of Special Agents and Police of the United States and Canada (which will be known henceforth by another name) held its annual meeting at Los Angeles, Cal., May 10, 11, 12 and 13. It was the fourteenth annual convention. The following officers were elected for the ensuing year: President, H. H. Germain (A., T. & S. F.), Topeka, Kan., re-elected; first vice-president, J. J. Landers (N. Y. C. & H. R.; second vice-president, P. J. Kindelon (S. P.); third vice-president, F. H. Schlapbach (C. of Ga.); secretary, W. C. Pannell, inspector, Southern Railway and Chesapeake Steamship Co., Baltimore Md., re-elected.

The convention changed the name from that given above to the "International Association of Railway Special Agents and Police."

It was decided to publish a quarterly journal to be called "The Railway Special Agent and Police," as an official journal of the association, in order to bring the different members in closer touch with each other. The first issue will appear in July.

The next annual convention is to be held in Chattanooga, Tenn., in April or May, 1911.

Among the subjects discussed at the meeting were proper and improper methods of securing confessions from prisoners; trade marks; disposition of journal bearings; organization of a railway police department, and advantages of automatic car seals. The members enjoyed numerous excursions and other entertainments provided for them by the railways of southern California and by the citizens of Los Angeles. The association now has 318 members, representing 79 railways, covering 162,000 miles of line.

American Society of Civil Engineers.

At the regular meeting held on June 1, two papers describing the New York tunnel extension of the Pennsylvania Railroad, entitled "The Meadows Division and Harrison Transfer Yard," by E. B. Temple, M. Am. Soc. C. E., and "The North River Tunnels," by B. H. Hewitt and W. L. Brown, Members, Am. Soc. C. E., were presented. These papers were published in the April proceedings.

New York Railroad Club.

To accommodate those going to the annual conventions of the M. C. B. and A. R. M. M. Associations at Atlantic City, N. J., the Central Railroad of New Jersey will run a special train of Pullman parlor cars, leaving New York city, foot of West Twenty-third street, at 3:20 p. m., and foot of Liberty street at 3:40 p. m. on Tuesday, June 14.

Railway Mail Clerks' Association.

At its annual convention at Kansas City, Mo., on May 24, the Railway Mail Clerks' Association of America adopted a resolution asking the government to prohibit railways from using wood mail cars between locomotives and steel cars, or between steel cars.

Yardmasters.

The second annual inspection trip of the General Yardmasters' Association will be run out of Indianapolis June 7. Yardmasters from other cities, including Chicago, Cincinnati and Louisville, have been invited to make the trip over local lines, visiting yards, warehouses and points of interest in the vicinity of Indianapolis.

The Traffic Club of New York.

At the regular monthly meeting held at the Hotel Astor on May 31, Welding Ring, president of the New York Produce Exchange, addressed the club on the subject: "Waterways and Waterborne Traffic and Subsidies as Affecting Shipping."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Railway Association.—W. F. Allen, 24 Park Place, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues; N. Y.; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—H. C. Donecker, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
General Superintendents' Assoc. of Chicago.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit. Mich.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wed.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Association of Special Agents and Police of U. S. and Canada.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; regular meeting, June 14; New York.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio.
Richmond Railroad Club.—F. O. Robinson; 2d Monday; Richmond.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Ry. Financial Officers.—C. Nyquist, La Salle St. Sta., Chicago.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
Train Despatchers' Assoc. of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
Transportation Club of Toledo.—L. G. Macomber, Woolsen Spice Co., Toledo.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The earnings of the Indiana railways are being greatly benefited by labor troubles in the Illinois coal fields. The Indiana coal is given practically a free hand to the northwest market and the lake docks. Coal is selling at the Indiana mines for $1 a ton above the normal price.

Following a conference with the Nevada State Railroad Commission, the Nevada Northern Railroad has announced reductions of 22½ per cent. in its freight tariffs; and this will apply to interstate as well as intra-state rates. The commission had threatened to order reduction of 30 per cent.

The Los Angeles Limited, which was formerly run from Chicago to Los Angeles over the Chicago & Northwestern, the Union Pacific and the San Pedro, Los Angeles & Salt Lake, and which was taken off when a large part of the track of the Salt Lake road was washed away by floods last January, will be put on again on Sunday, June 12. Its schedule time between Chicago and Los Angeles will be 68½ hours.

The Southern Railway is preparing to resume the running of special peach trains from Atlanta to northern cities, running the trains as sections of the fast mail No. 36, and bringing the peaches into New York and the other principal cities on the second morning. Peaches shipped from points around Atlanta reach that city in time to start northward about midnight of the same day, close behind No. 36. At a recent conference with the peach growers the company asked for suggestions as to improvements, but was told that all the shippers asked was to have the good service of last year repeated. In that year the Southern Railway carried 84 per cent. of the peaches from Georgia and had only one claim for damages on this freight. It is estimated that shipments this year will be two or three times as great as last year.

The increase in rates on coal in Illinois which the railways had announced would be made on June 1, has been suspended pending an investigation by the Illinois Railway Commission of its reasonableness. Chairman Berry interrupted the hearing on May 24 to say that the investigation would be interminable if the commission allowed both sides to continue to introduce statistics regarding tariffs, earnings, etc., and suggested that both the railways and the shippers submit to the commission all the statistics and documentary evidence that they desire to; indicating that the commission would then turn the data over to its experts with the object of finding out just what the true situation is. He said the first purpose of the commission was to find out just what is the financial status of the railways involved. He suggested that if the railways did not care to agree to a suspension of rates, the commission had the power to make the present rates the maximum rates. This hint was effective. The Indiana Manufacturers' and Shippers' Association has filed a complaint with the Indiana commission against advances in rates from Indiana points similar to those which are being made from Illinois mines.

Judges Grosscup, Seaman and Baker of the United States circuit court heard arguments at Chicago on May 25 on the petition of the Pullman Company for an injunction to restrain the Interstate Commerce Commission from reducing the rates of this company between Chicago and St. Paul, St. Paul and Seattle and other cities. The Chicago, Milwaukee & St. Paul, the Great Northern and the Santa Fe filed petitions to be allowed to intervene as co-complainants against the commission. George B. Fernald, general attorney of the Pullman Company, contended in his argument that this company is not a common carrier but more in the nature of a hotel company, and that therefore its rates are not subject to public regulation. An affidavit of Robert T. Lincoln, president of the company, was filed, stating that if the rates fixed by the commission were put into effect they would, because of competition, compel a reduction in all sleeping car rates west of the Missouri river. Burton Hanson, general solicitor of the St. Paul, in his petition stated that this road is now operating sleeping cars between Chicago, St. Paul, Butte, Mont., and other points, and by August 1 expects to be operating them to Tacoma and Seattle, and that if the Pullman Company makes a reduction, the St. Paul will be compelled to make corresponding reductions.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1910.
(See also issues of May 6, 13, 20, and 27.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atlanta & West Point	93	$54,826	$32,872	$96,417	$13,322	$17,627	$4,460	$31,955	$3,605	$70,969	$25,448	$239	$4,331	$21,356	$11,063
Atlantic City	166	62,668	48,878	116,128	25,404	21,323	1,991	61,298	704	110,720	5,408	—2,933	7,000	—4,525	—13,272
Belt Ry. of Chicago	21	.....	.....	181,027	10,804	22,714	506	101,019	6,194	141,237	39,790	.....	5,000	34,790	—32,898
Butte, Anaconda & Pacific	46	92,161	5,800	104,189	11,665	21,624	576	42,879	2,978	79,723	24,466	.....	2,000	22,466	—12,632
Chicago Terminal Transfer	90	.....	2,861	126,547	13,992	24,280	323	73,108	4,885	116,588	9,959	638	18,558	—7,961	607
Cincinnati & Muskingum Valley	148	71,727	17,815	94,644	13,132	12,073	1,754	30,539	2,022	59,520	35,124	.....	3,110	32,014	16,080
Cleveland, Akron & Columbus	212	164,678	36,794	215,059	34,312	43,883	2,450	73,582	3,247	157,474	57,585	.....	5,000	52,585	16,649
Cleveland Terminal & Valley	93	80,225	16,799	122,802	14,375	14,063	1,508	41,015	1,568	72,529	50,273	.....	3,104	16,869	30,534
Duluth & Iron Range	168	91,779	27,340	125,661	61,671	47,974	395	61,800	8,103	179,943	54,282	4,427	5,098	63,807	—29,892
Duluth, South Shore & Atlantic	613	194,525	69,276	276,893	34,650	28,424	8,083	97,700	6,190	175,047	101,846	6	18,000	83,852	37,620
Eastern Ry. Co. of New Mexico	227	47,827	30,498	83,855	19,824	10,290	1,179	24,490	2,184	57,967	25,888	.....	3,930	21,958	—5,568
Evansville & Terre Haute	310	156,930	50,483	228,671	26,627	32,559	4,812	66,995	5,813	136,806	91,865	759	10,023	81,083	22,820
Houston, East & West Texas	191	76,390	25,490	108,084	13,529	11,530	1,056	37,762	3,477	67,355	10,729	.....	3,079	37,650	6,211
Indiana Harbor Belt	106	.....	.....	224,887	13,437	24,808	1,994	122,469	5,639	168,348	56,540	1,490	5,500	52,530	54,990
Lehigh & Hudson River	97	107,697	3,404	112,217	10,484	16,437	1,301	59,572	3,259	71,053	41,163	.....	2,750	38,413	9,555
Monongahela	65	140,091	2,624	143,937	18,273	9,107	200	29,720	1,924	59,224	84,713	.....	1,200	83,513	40,993
Nevada Northern	165	122,468	13,627	140,460	8,457	12,097	331	27,604	3,688	52,177	88,283	.....	3,365	84,917	24,540
New York, Philadelphia & Norfolk	112	218,842	30,322	264,773	35,388	43,522	2,719	95,311	12,288	189,228	75,545	.....	6,850	68,695	7,482
Pecos & Northern Texas	198*	118,513	21,692	146,281	20,222	27,849	2,227	50,807	3,935	105,010	41,241	.....	2,097	39,144	13,654
Port Reading	21	101,953	.....	102,857	8,332	3,643	30	24,793	92	36,890	65,967	3,967	3,000	66,934	—34,755
Richmond, Fredericksburg & Potomac	83	113,740	85,835	220,938	31,477	19,700	2,089	64,425	5,299	122,990	97,948	.....	200	97,748	31,549
St. Louis, Brownsville & Mexico	494†	98,849	47,183	156,813	43,639	12,740	2,405	54,682	6,590	120,056	36,757	.....	3,500	33,257	—13,825
St. Louis, Merchants' Br. Terminal	9	.....	6,735	194,880	22,346	5,160	341	73,898	6,029	107,775	87,105	.....	9,700	77,405	40,085
San Antonio & Aransas Pass	727	205,628	74,751	297,827	59,441	50,027	4,698	120,338	8,768	243,272	54,555	.....	9,000	45,555	4,159
San Pedro, Los Angeles & Salt Lake	979‡	202,365	72,090	289,401	181,703	70,555	17,558	137,441	15,261	422,518	—133,117	843	22,432	154,706	—357,168
Southern Kansas Ry. of Texas	125	114,271	19,127	137,903	17,654	29,936	2,149	44,755	3,946	98,440	39,463	.....	2,325	37,138	14,115
Spokane & Inland Empire	168	32,570	37,062	72,912	28,645	4,572	1,193	25,155	5,881	65,446	7,466	9,801	3,300	13,967	—9,243
Spokane International	141	66,119	20,874	89,422	15,329	7,024	2,084	27,476	3,283	55,196	34,226	.....	4,458	29,768	15,114
Terminal R.R. Ass'n of St. Louis	34	.....	248	251,192	23,091	30,198	512	91,643	6,812	152,257	98,935	17,429	40,366	75,998	—1,165
Texas Central	268	48,206	23,492	79,104	13,554	14,139	1,375	26,643	3,570	59,281	20,123	.....	2,137	17,986	11,212
Ulster & Delaware	129	47,110	14,926	66,246	7,545	13,103	898	32,735	2,382	56,663	9,583	18	3,200	6,401	—17,410
Union R.R. Co. of Baltimore	9	96,865	19,267	117,587	9,632	.....	876	4,921	1,803	17,232	100,356	.....	4,465	95,890	12,260
Union R.R. Co. (of Pennsylvania)	31	.....	.....	269,022	22,545	54,812	120	110,854	3,270	191,601	77,421	5,345	2,500	80,266	99,474
Virginia & Southwestern	188	93,998	11,017	107,734	12,415	23,455	1,338	33,074	3,239	73,521	34,213	.....	5,209	29,004	10,414
Washington Southern	35	35,483	39,459	96,619	10,083	7,943	954	37,207	2,191	58,378	38,241	.....	2,345	35,896	5,997
Western Ry. of Alabama	133	68,822	31,816	109,797	21,221	17,518	4,856	27,946	4,795	76,336	33,461	161	3,812	29,488	13,548
NINE MONTHS OF FISCAL YEAR, 1910.															
Atlanta & West Point	93	$432,325	$324,347	$827,863	$102,742	$146,625	$43,421	$260,438	$36,131	$579,357	$248,506	$538	$38,982	$210,062	$83,127
Atlantic City	166	532,465	768,776	1,360,300	230,660	140,040	20,628	646,442	9,871	1,047,641	312,659	31,696	63,000	217,963	70,505
Belt Ry. of Chicago	21	.....	.....	1,550,975	118,511	215,344	5,138	729,357	55,903	1,124,253	426,722	.....	45,000	381,722	174,330
Butte, Anaconda & Pacific	46	795,014	74,015	920,708	87,302	181,612	4,982	376,169	19,215	669,310	251,398	.....	18,918	232,480	62,844
Chicago Terminal Transfer	90	.....	22,100	949,602	132,027	226,867	4,703	476,098	44,852	884,547	65,055	7,024	145,998	—73,918	3,834
Cincinnati & Muskingum Valley	148	568,222	168,522	783,623	142,944	106,826	15,847	264,983	13,165	543,765	239,858	.....	28,318	211,540	89,125
Cleveland, Akron & Columbus	212	1,358,743	381,024	1,861,474	277,341	447,217	24,972	597,056	33,743	1,380,329	481,145	.....	46,042	435,103	—2,470
Cleveland Terminal & Valley	93	652,642	136,015	960,736	124,427	114,591	14,108	380,298	18,818	652,242	308,494	.....	30,628	277,866	77,936
Duluth & Iron Range	168	6,536,852	203,375	6,809,623	780,080	498,963	3,187	1,158,818	95,295	2,536,343	4,273,280	9,245	322,378	3,960,147	1,165,951
Duluth, South Shore & Atlantic	613	1,562,262	729,683	2,421,665	359,192	261,134	80,482	887,903	60,219	1,648,930	772,735	6,388	170,146	608,977	215,475
Eastern Ry. Co. of New Mexico	227	392,017	298,710	733,177	167,427	95,047	9,109	195,539	21,731	488,853	244,324	.....	32,167	211,857	53,225
Evansville & Terre Haute	310	1,236,051	467,460	1,883,619	215,716	281,363	45,835	555,574	58,736	1,157,224	726,395	7,950	81,325	637,120	137,695
Houston, East & West Texas	191	673,336	247,762	974,336	171,483	76,469	15,713	325,911	30,508	620,084	354,252	.....	19,701	334,551	37,240
Indiana Harbor Belt	106	.....	.....	1,586,609	256,736	182,414	15,465	840,875	43,135	1,338,625	247,984	6,377	38,959	202,648	173,148
Lehigh & Hudson River	97	1,009,750	33,619	1,056,338	137,255	118,026	10,747	374,948	33,766	674,742	381,596	.....	24,675	356,921	151,334
Monongahela	65	1,074,135	20,870	1,108,301	133,542	84,411	2,283	230,953	15,398	466,587	641,714	.....	10,600	631,114	265,881
Nevada Northern	165	928,303	130,667	1,095,403	57,620	102,292	3,014	224,656	32,218	419,800	675,604	.....	27,502	648,102	188,087
New York, Philadelphia & Norfolk	112	1,944,341	295,835	2,399,708	247,189	405,155	30,610	853,485	83,532	1,619,972	779,736	.....	58,050	721,686	151,060
Pecos & Northern Texas	198*	958,653	198,815	1,204,430	191,235	175,419	16,960	353,753	35,919	773,286	431,144	.....	16,773	414,371	107,688
Port Reading	21	855,269	.....	864,260	69,721	4,922	270	228,214	1,020	304,147	560,113	34,062	27,000	567,175	67,780
Richmond, Fredericksburg & Potomac	83	859,979	569,559	1,616,215	242,868	199,235	21,762	529,185	43,264	1,036,318	579,897	.....	1,800	578,097	117,778
St. Louis, Brownsville & Mexico	494†	709,850	358,461	1,140,604	305,147	95,231	22,732	395,623	59,377	878,110	262,494	.....	29,500	232,994	33,768
St. Louis, Merchants' Br. Terminal	9	.....	50,218	1,402,922	200,277	36,321	5,530	540,636	46,369	829,133	573,789	.....	57,645	516,144	184,428
San Antonio & Aransas Pass	727	2,104,899	769,103	3,037,818	475,355	390,624	41,045	1,123,864	79,866	2,110,754	927,064	.....	81,000	846,064	6,621
San Pedro, Los Angeles & Salt Lake	979‡	2,835,895	1,836,598	5,004,504	1,016,608	857,898	224,963	1,706,945	146,508	3,952,922	1,051,582	—15,688	217,226	818,668	584,912
Southern Kansas Ry. of Texas	125	956,683	176,633	1,165,501	144,546	204,723	17,495	375,414	33,310	775,488	390,013	.....	17,802	372,211	198,534
Spokane & Inland Empire	168	347,212	541,095	935,640	125,142	52,029	17,169	249,598	61,339	505,278	430,363	116,968	26,100	521,231	258,341
Spokane International	141	531,623	185,506	736,862	93,665	43,102	17,267	235,513	42,578	432,125	304,737	.....	24,595	280,142	130,111
Terminal R.R. Ass'n of St. Louis	34	.....	2,263	2,060,313	273,363	156,655	7,937	691,962	54,909	1,184,825	875,488	135,455	254,611	756,332	43,906
Texas Central	268	490,622	271,444	826,298	141,848	114,836	14,021	252,416	33,916	557,037	269,261	.....	24,526	244,735	41,278
Ulster & Delaware	129	483,778	277,099	798,494	97,407	107,737	10,607	322,688	22,212	560,651	237,843	1,026	28,800	210,069	10,196
Union R.R. Co. of Baltimore	9	885,520	172,150	1,072,694	99,463	5,510	.....	49,904	16,816	166,693	906,001	.....	40,188	865,813	188,964
Union R.R. Co. (of Pennsylvania)	31	.....	.....	2,964,631	261,725	466,766	1,010	983,616	31,828	1,744,945	1,219,686	11,999	28,842	1,232,844	684,572
Virginia & Southwestern	188	786,380	103,666	918,871	124,541	190,024	12,420	273,399	30,188	630,572	288,299	.....	39,528	248,771	32,520
Washington Southern	35	286,046	279,407	745,589	70,322	77,388	9,685	275,256	19,393	452,044	293,545	.....	21,104	272,442	42,766
Western Ry. of Alabama	133	509,923	317,477	897,257	150,591	155,951	46,943	235,736	44,378	633,599	263,658	3,061	34,310	226,286	45,772

*Mileage operated March 31, 1909, 152 miles. †Mileage operated March 31, 1909, 454 miles. ‡Total mileage 1,099 on March 31, 1909; 126 miles not operated during March, 1910, on account of washout. Indicates Deficits, Losses and Decreases.

Further Increases in Suburban Fares.

The New York Central & Hudson River has issued revised tariffs of suburban passenger fares to and from New York City, to go into effect July 1. The new rates are calculated on about the same basis as those of the New York, New Haven & Hartford, heretofore announced, but the increases in some cases are less because the present rates on the Central are not so low as those of the New Haven. Following are sample rates for 60 rides a month:

	Miles from New York.	Fare—Present.	Fare—New.
Yonkers	15	$5.90	$6.75
Tarrytown	25	7.60	8.25
Peekskill	41	10.30	11.05
Mount Vernon	14	5.60	6.50
White Plains	23	7.35	8.10

Fifty-trip family tickets are to be advanced June 25 by about the same percentage as the monthly tickets.

The New York State Public Service Commission, second district, after hearing complaints from people in Mount Vernon and New Rochelle, N. Y., finds that the New York, New Haven & Hartford has not posted its increased rates on season tickets to and from New York City, and that, therefore, the advances cannot go into effect June 1, as announced by the company. It appears that the New Haven road with these tariffs pursued the same course that has been common with interstate tariffs; the tariffs are kept in the ticket office and a notice is posted in the public rooms giving the information that the tariffs may be seen by anyone on application to the agent.

The Erie has filed with the Interstate Commerce Commission its increased fares for season tickets, to take effect July 1. The new rates are calculated on the following basis: Sixty rides a month, not over eight miles, one cent a mile; for nine miles, 4 per cent. less; for 10 miles another 4 per cent. is deducted, and so on up to 30 miles, for which distance the rate is five mills a mile. The minimum price of a monthly ticket (60 trips) is $5.50. Ten-trip tickets are sold at two cents a mile and 50-trip family tickets, good for one year, at 1.6 cents per mile. Following are sample fares:

	Miles from New York.	Fare—Present.	Fare—New.
Paterson	21	$5.80	$6.95
Suffern	32	8.00	9.55
Newark	9	4.60	5.50
Nutley	14	5.50	6.20
Montclair	13	5.50	6.35

The Delaware, Lackawanna & Western announces increases in suburban season-ticket fares to and from New York similar to those which have already been announced by the New York Central, the New Haven and the Erie. The new Lackawanna tariffs go into effect June 28. Following are a few typical items:

	Miles from New York.	Fare—Present.	Fare—New.
Newark	9	$4.60	$5.50
Orange	13	5.50	6.20
Summit	21	6.45	7.65
Bloomfield	13	5.50	6.05
Montclair	15	5.50	6.35

The Lehigh Valley has followed the lead of the other roads running into New York and has filed with the Interstate Commerce Commission new tariffs showing increases in commutation rates on just about the same scale as the increase on the Central of New Jersey.

Distance Rates in Iowa.

Clifford Thorne, a candidate for the Republican nomination for membership on the Railway Commission of Iowa, recently made a speech in which he called attention to the fact that the growth of manufactories in Iowa has been slower than in surrounding states. Every state adjoining Iowa, except Nebraska and South Dakota, he said, has a larger output of manufactured products than Iowa. The volume of manufactured products of Minnesota is almost double that of Iowa; of Missouri, two and a half times as large; of Illinois, nine times as large. Mr. Thorne contended that the reason for the backward development of manufacturing industries in Iowa is that that state enjoys less favorable interstate freight rates than other states, and he demanded that an exhaustive investigation of these rates be made by the state commission. Railway men who are familiar with the freight rates of Iowa say that Mr. Thorne is "barking up the wrong tree." The real drawback to manufacturing industries in Iowa is the system of state rates prescribed by law and by the railway commission, which are based more completely on distance than the rates in any other state. In no other state is the long and short haul principle so rigorously enforced, the consequence of which is that between many points the railways having the long lines do not meet the competition of the railway having the short line. The distance tariffs prescribed by the Iowa commission give shippers in that state low rates for short hauls and relatively high rates for long hauls, the effect being that the market of the manufacturers of the state is rigorously limited. The consequence is that manufacturers in other states can undersell the manufacturers of Iowa at all points to which goods have to be shipped from any considerable distance. Railway traffic men say that so long as it is the policy of the government of Iowa to keep rates on approximately a mileage basis it will be impossible for the people of that state to develop any considerable manufacturing industry.

INTERSTATE COMMERCE COMMISSION.

Definition of Carload Shipment.

Sunderland Brothers Co. v. Missouri, Kansas & Texas et al. Opinion by Commissioner Harlan.

When a car is demanded and loaded by the shipper and is handled as a carload and no minimum carload weight is legally provided, the carload rate, if less than the L.C.L. rate, must be applied on the actual weight. This ruling does not in any way limit the right of railways to fix a minimum carload weight. (18 I. C. C., 425.)

Discrimination Against Red Wing, Minn.

Frederich & Kempe Co. et al. v. New York, New Haven & Hartford et al. Opinion by Chairman Knapp.

Red Wing, Minn., lies intermediate between trunk line territory and St. Paul, Minn. It also lies nearer trunk line territory than other points to which rates from trunk line territory are the same as they are to St. Paul. Red Wing, however, has higher rates from trunk line territory than has St. Paul, although it has the same rates from Central Freight Association territory. The commission finds that no point of any importance south of St. Paul takes as high rates as Red Wing, and that freight moving all rail from Central Freight Association as well as from trunk line points passes through Chicago or Milwaukee, La Crosse and Winona on its way to Red Wing, and that transportation conditions are precisely the same whether the traffic originated in trunk line of Central Freight Association territory. Rates to Red Wing from trunk line territory are therefore ordered no higher than those from trunk line territory to St. Paul. (18 I. C. C., 481.)

Misrouting by Connecting Line.

Duluth & Iron Range Railroad v. Chicago, St. Paul, Minneapolis & Omaha et al. Opinion by Commissioner Harlan.

A connecting line receiving a shipment without instructions may demand instructions from the initial carrier, but if, instead of pursuing that course, it assumes the responsibility of routing the shipment it must accept the resulting liability for any damage in the way of increased charges that necessarily and directly flows from its mistake in selecting the wrong route. It is not excused by the fact that the shipper had given correct routing instructions which the initial carrier had neglected to note on the transfer billing.

Connecting lines from the nature of their larger traffic and wider opportunities for knowing what are the reasonably direct routes ought in many cases to relieve small initial carriers of the responsibility for correct routing; and, with respect to shipments to distant and unusual points, the initial carrier, as well as its immediate connections, ought not to be held to any greater duty than that of indicating the usual or proper gateway to destination. In such cases responsi-

bility for specific routing would seem more logically to attach to the carriers beyond the gateway. (18 I. C. C., 485.)

Rate on Burnt Cotton.

Simon Lesser v. Georgia Railroad et al. Opinion by Commissioner Harlan.

The real contention of the petitioner is that the rate on mixed jute and cotton refuse or tailings should be extended to burnt cotton on the theory that burnt cotton in reality is cotton refuse. Notwithstanding the fact that the value of burnt cotton is less than that of uninjured cotton, the traffic in this damaged cotton is so small, and the difficulties of making satisfactory regulations regarding the shipment of burnt cotton and the difficulties of a clear distinction between burnt cotton and cotton so slightly injured as to have the same value as uninjured cotton is so great that no lower rate should be ordered on burnt cotton than is applied on uninjured cotton. (18 I. C. C., 479.)

STATE COMMISSIONS.

The Mississippi State Railroad Commission has adopted for use in that state the average rule for the collection of car demurrage, which is prescribed in the code of the American Railway Association and by the Interstate Commerce Commission.

The Pennsylvania State Railroad Commission has engaged Ford, Bacon & Davis, engineers, of New York City, to investigate the operation of the Philadelphia Rapid Transit Company, which works the principal surface, subway and elevated street railways in that city. The chief engineer of this firm is Charles F. Uebelacher.

The Kansas Railway Commission has ordered heavy reductions of express rates in that state. Some of the reductions ordered are as follows: 12 per cent. on all merchandise where the rate per 100 lbs. is over $1; 15½ per cent. in rates in excess of 90 cents per 100 lbs., and 52 per cent. in rates for shipments of parts of agricultural implements.

The New York Public Service Commission, Second district, has decided that the New York, New Haven & Hartford cannot on June 1 legally charge the higher commutation rates that were to become effective June 1 because the railway had neglected to file the new tariffs in certain stations on its lines 30 days before the effective date of these tariffs. The new tariffs had been filed with the state commission 30 days before June 1.

The Indiana Railroad Commission has heard and taken under advisement an application from the Lake Shore & Michigan Southern asking to be relieved from a recent order of the commission ordering block signals on a subsidiary line running from Elkhart, Ind., to White Pigeon, Mich. Representatives of the road stated that the train movement is very light and that the telegraph block system now mainained is quite sufficient.

The Pennsylvania Railroad Commission recommends that the Lehigh Valley amend its rates on coal in order to conform to the statute of 1907. The complaint was based on the charge that the railway was charging the complainant a higher rate on coal than it charged other shippers on coal shipments for longer distances. The defense of the railway was based on the fact that it had never accepted the new constitution of 1874 and that the enforcement of the statute of 1907 forbidding a railway to charge more for a shorter than for a longer haul of the same commodity would be an abrogation of the contract between the Lehigh Valley and the state of Pennsylvania.

The State Railroad Commission of Pennsylvania has held that railways must check baggage through to destination on a combination of two or more tickets. The specific complaint was based on the refusal of the Pennsylvania Lines West to check baggage from a point west of Pittsburgh through to Philadelphia on two tickets, one from the point west of Pittsburgh to Pittsburgh and the other from Pittsburgh to Philadelphia. The sum of the cost of the two tickets was less than the through rate on a through joint ticket. This ruling of the Pennsylvania state commission contrasts with the recent ruling of the Interstate Commerce Commission, which held that a railway should not be compelled to check baggage through to destination on a combination of two tickets where the sum of the cost of the two tickets was less than the through rate.

The New York Public Service Commission has not sustained the complaints of the Syracuse Traffic Bureau, the Utica Traffic Bureau and certain shippers of Troy, as to assistance given by various railways in loading and unloading carload package freight. In the Syracuse case in some instances the assistance asked for in the complaint was given prior to January 1, 1909; in other instances this was not done and undue preference resulted from the rule then in effect. In Utica the practice had not been general of carriers entering that city affording such service, and because of the manner in which team track freight is handled at Utica the relief asked for would not prove of direct benefit to the shipper. In the Troy case the shippers asked that the rule of the companies be extended so as to include all carload freight. The commission here holds that a determination granting the petition must rest on a showing that the furnishing of such assistance is reasonable, and it at this time sees no reason for extending the application of its previous order concerning assistance by tallymen at Troy.

Wisconsin: Abandonment of Unprofitable Branch Lines.

H. W. Brown v. Janesville Street Railway.

The defendant had abandoned a branch line of its system because its operation was unprofitable. The commission holds that if a railway system does not earn enough revenue to pay cost of operation and maintenance because one or more branch lines are operated at a loss so great as to counterbalance the profits on the rest of the system, the interests of the public may be best served by the abandonment of the unprofitable branches. (4 W. R. C., 757.)

Wisconsin: Arrangement of Train Schedule.

H. W. Barker v. Chicago, Milwaukee & St. Paul.

The railway company, after an experiment with a certain local passenger schedule, decided to change the schedule. The complainant asks that the former schedule be put in effect. The commission holds that the arrangement of the train schedule is primarily a matter for the railway management, that the law requires interference by the commission with established schedules only when such schedules do not meet the reasonable requirements of the public. Petition dismissed. (4 W. R. C., 751.)

Wisconsin: Marking L. C. L. Shipments.

Wisconsin Butter Manufacturers and Milk Producers Protective Association v. Chicago & North Western et al.

This case is similar to the *So. Wis. Cheesemen's Prot. Assn. et al. v. Wisconsin Central*, and the complainant claims that the rule in western classification requiring the marking of every package of butter and eggs with the full name of the consignee is unreasonable. The commission again holds that this rule is unreasonable, and besides ordering the defendants in this case to change this rule in their tariffs, the commission recommends that all carriers change the rule on all L. C. L. shipments. (4 W. R. C., 494.)

Wisconsin: Rate and Cost of Service.

Webster Manufacturing Co. v. Chicago, St. Paul, Minneapolis & Omaha.

In a petition asking that a rate on lumber be reduced from 7.5 cents per 100 lbs. to 6.5 cents, the commission holds that while railways are ordinarily entitled to rates that are high enough to cover cost of operation and reasonable returns on the investment, nevertheless the reasonableness of a rate is largely measured by the cost of service to the carrier, modi-

fied by commercial and competitive conditions. The rate complained of is discriminatory and the lower rate asked for in the petition is not found to be unreasonably low when measured by cost of service to the carrier. (5 W. R. C., 95.)

Wisconsin: Spur Tracks Part of Public Facilities.

Eden Independent Lime & Stone Co. v. Chicago & North Western. Union Lime Co. and Nast Brothers Lime & Stone Co. interveners.

This case is given a rehearing to permit interveners to state their objections to an order of the commission requiring the Chicago & North Western to build a spur track to the plant of the complainant. The interveners claim that the facilities of the railway are already taxed to the full, and that the building of a new spur track would interfere with the business of the interveners who already have spur tracks to their plants. The commission holds that the spur tracks of a railway are as much a part of its property as are its other tracks, and that therefore their use belongs to the public as a whole and is not confined to the company whose plant they run to. In the present case, if the claim of the interveners as to crossing of defendant's tracks can be sustained, they should enter a complaint on the ground of inadequate service against the Chicago & North Western and not join with the C. & N. W. in a protest against the addition of new facilities. The Chicago & North Western is required to build the spur track asked for in the original petition. (4 W. R. C., 788.)

COURT NEWS.

The railways of Oklahoma have appealed to the state supreme court from the order of the corporation commission requiring them to establish general offices in Oklahoma by June 1. The court has issued an injunction restraining the commission from enforcing the order while litigation is pending.

The United States circuit court at St. Paul, May 28, refused to consider the application of the Great Northern for an injunction against the enforcement of the Interstate Commerce Commission's order to reduce sleeping car rates. It was held that the Great Northern should go to Chicago and join the Pullman Company in the similar suit instituted there.

John J. Seddon, special master in chancery of the United States circuit court at St. Louis, has filed his report in the suit of the Missouri, Kansas & Texas and other railways to restrain the Interstate Commerce Commission from enforcing its order reducing the rates on cattle moving from the Southwest. The railways alleged that the commission's order was confiscatory. The special master finds that the rates are not confiscatory and recommends that the suit be dismissed.

The supreme court has also decided against the Interstate Commerce Commission in the Denver rate cases. The court also upheld the circuit court in granting an injunction against the enforcement of the statute of March 19, 1907, relating to the stoppage of interstate commerce trains at Lathrop, Mo. The court affirmed the judgment of the lower court in favor of the Atchison, Topeka & Santa Fe, whose charter also was being threatened because it had removed a suit from a state to a federal court.

The supreme court of the United States, by a vote of four to three, has sustained the order of the Interstate Commerce Commission for the reduction of freight rates in the Missouri river rate case. This case, heretofore reported in the *Railway Age Gazette* (Sept. 3, 1909), was based on orders of the commission issued in June, 1908, reducing the proportion between the Mississippi river and the Missouri on freight rates from the Atlantic seaboard to points west of the Missouri. The reduction on first class was about 9 cents per 100 lbs., and on other classes in proportion. The circuit court in the Northern district of Illinois issued an injunction against the commission on the ground that the order discriminated unjustly against intermediate localities. The commission and consignees in Missouri river cities appealed from this decision.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Eugene Corley, secretary to the president of the Texas Midland, has been appointed assistant to the president, with office at Dallas, Tex.

C. T. Scaife has been appointed chief claim agent of the Illinois Central, with office at Chicago, succeeding Lawrence H. Kellogg, resigned.

Joseph M. Bryson, assistant general counsel of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has been appointed general solicitor.

Edwin Travis Lamb, who has been elected president and general manager of the Norfolk Southern, as previously announced in these columns, was born on June 29, 1863, at Richmond, Va. He attended a school conducted as an adjunct to William and Mary College until 1878, when he discontinued his studies there to engage in the lumber business. Three years later he began railway work as a receiving clerk in the construction department of the Chesapeake & Ohio at Newport News. That company was then building its lines into Newport News, and Mr. Lamb received his first insight into practical construction work. Six months later he was promoted to chief clerk at the export pier. He remained in that position for about two years and then went to New York as chief receiving clerk for the United States & Brazil Mail Steamship Company. Six months later he returned to Newport News as chief clerk on the export pier of the Chesapeake & Ohio, and joint representative of the C. & O., the United States & Brazil Mail Steamship Company and the Ducal Line. In 1888 he became agent for the Richmond & Danville at Danville, Va., and in March, 1890, was placed in charge of the Richmond & Danville deepwater terminal at West Point, Va., as general forwarding agent, and also acted as joint representative of the Old Dominion Steamship Company, Merchants & Miners Transportation Company, the Clyde Steamship Company, the York River Line and the Richmond & Danville, Railroad. In 1896 the Southern Railway absorbed the Richmond & Danville and transferred its deepwater terminal from West Point, Va., to Norfolk, Va., with Mr. Lamb in charge as general agent at Norfolk, having control over its entire business at that point. He organized and superintended the construction of the Southern Railway's new terminal, one of the largest and best equipped on the Atlantic coast. He also at this time acted as general agent of the Chesapeake Steamship Company. In November, 1906, he was appointed superintendent, and his jurisdiction extended over the Norfolk division of the Southern, in addition to the duties of his former position, and on June 15, 1909, he was made general manager for the receivers of the Norfolk & Southern, which position he held at the time of his recent election as president and general manager of the Norfolk Southern, successors of the Norfolk & Southern.



Edwin T. Lamb.

Carroll M. Bunting, assistant comptroller, has been apponted comptroller of the Pennsylvania Railroad and controlled lnes east of Pittsburgh and Erie, succeeding Max

Riebenack, deceased. Edward A. Stockton, assistant comptroller, has been appointed to the new position of deputy comptroller, and John S. Donaldson, auditor of miscellaneous receipts and accounts, has been appointed assistant comptroller, succeeding Mr. Bunting, all with offices at Philadelphia, Pa.

C. L. Nash has been appointed auditor of the Interstate Railroad, with office at Stonega, Va. Mr. Nash was previously for seven years a traveling auditor and provincial treasurer under the United States Treasury Department in the Philippines and was later with the Bureau of Statistics and Accounts of the Interstate Commerce Commission. At the time of his recent appointment Mr. Nash was in the office of A. H. Plant, comptroller of the Southern Railway, with office at Washington, D. C.

Sir George S. Gibb, formerly general manager of the North-Eastern Railway, of England, and until now chairman of the Underground Electric of London, is widely known and has many friends among railway officers in this country, where he has visited frequently, making close studies of American railway practice. His studies here as well as in Europe resulted in a rather startling reformation, both in the administration and in the accounting, of the North-Eastern Railway. The guiding principle of his scheme, entirely new in England, was the separation of the commercial work from the technical work. He established also a system of accounting quite like that which prevails here; that is passenger-mile and ton-mile records and other statistics designed to furnish a more accurate method of comparison of one year's work with another, and also to form a basis for studies of economy in working. In carrying this out he received the cordial support of his own directors and loyal service from his associates and employees, but the bitter opposition of substantially all other British railway companies. His reformations were not alone in form. With, as he believed, a clearer and a more definite knowledge gained from his statistics, he was enabled to make intelligently somewhat radical changes in locating and arranging his trans-shipping and connecting points so as to get more nearly full carloads. Observing the results so obtained, he was also enabled to determine somewhat accurately the economic size and capacity for his cars and trains on different divisions. All this seems somewhat commonplace to an American railway officer. It is notable when we consider that the work was done by a Scotch lawyer, with no railway experience except in the law department and against the advice of practical men in Great Britain, many of them close friends and men for whose attainments he had a profound respect. Unassuming and always affable, cautious and full of regard for others, he nevertheless followed his own lights. He was not quick in making these changes—he was slow, studious and cautious.



Sir George S. Gibb.

On the death of Mr. Yerkes the affairs of the Metropolitan District Railway and the underground tubes, then in course of construction, were in an almost hopeless condition, all candidates for a receivership, and it was not surprising that this self-contained railway officer was invited to become chairman and managing director. In view of his remarkable success with the North-Eastern Railway and his comfortable situation there, it was surprising that he accepted the newly offered responsibility; that is, it would be surprising to one who did not know Sir George. He had solved hard problems, he was quite ready to undertake more difficult ones, and apparently did not consider the disheartening effect of probable failure. He began the new work in 1906. Both the Metropolitan District and the Tubes have passed through their crises. They are reasonably safe as financial propositions. They are as well organized and in as good shape for making the most of their opportunities as it is probably possible for any one to have made them; and at this point, instead of quietly enjoying the fruits of his hard labor and great anxieties, he is making an entire change in the field of his activities.

A new department, or bureau, was established in England last year by the enactment of the Development and Road Improvement Funds law. Sir George has accepted the post of chairman of the Road Board so created, and its functions are to make advances to highway authorities for the construction of new roads, and also to construct and maintain new roads. It involves great undertakings and great responsibilities and there are many hard problems to solve, but, as Sir George expresses it: "There will be no anxiety—no dividends to earn."

Sir George was born 60 years ago in Aberdeen. He studied law and went to London early, finding no prepossession in his favor because he was a Scot—indeed, somewhat the reverse of it. He was also somewhat handicapped by a burr, which is perhaps more intense in Aberdeen than in any other part of Scotland. Nevertheless, he came up rapidly in the law department of the Great Western Railway and later the North-Eastern Railway, until in 1891 he became general manager of the North-Eastern at a time when it was passing through a crisis. His later railway experience is indicated above.

Many of his activities have been outside of his regular calling. The Boer war developed radical defects in the war office and Gibb was made a member of the committee which thoroughly investigated and reorganized that office in 1901. It was probably largely due to this service that he received the honor of Knighthood in 1904. He was also an efficient and effective member of the Royal Commission on London Traffic, which visited this country a few years ago studying the traffic conditions of the principal cities.

Taken altogether, Sir George's career shows an unusual example of sturdy and studious character. It is probable that he has been rarely, if at all, in error in his conclusions on great questions and, having arrived at a conclusion, he is unalterable. His investigations have always been so thorough and deliberate that he had a justifiable confidence. His new work is such as many of our railway officers might well envy—the duties of a sage rather than an administrator, with an opportunity for great usefulness.

N. P. Ramsey, whose appointment as vice-president and general manager of the Ashland & Western, with office at Ashland, Ohio, has been announced in these columns, was born in Pittsburgh, Pa., May 30, 1848. He entered railway service in 1872 on the Bell's Gap Road and continued with that company until 1879, when he was made general freight and passenger agent of the Pittsburgh, New Castle & Lake Erie. He held positions consecutively as auditor of the Pittsburgh Southern, chief clerk in the accounting department of the Baltimore & Ohio at Pittsburgh, general freight and passenger agent of the Pittsburgh, Chartiers & Youghiogheny, auditor of the Dayton, Fort Wayne & Chicago, general manager of the Cincinnati, Wabash & Michigan, special agent of the Wabash in charge of mail traffic, and secretary and treasurer of the West Virginia & Ohio Construction Co. He will continue to hold the latter position.

Operating Officers.

J. M. Davis has been appointed general superintendent of the northern district of the Southern Pacific, succeeding J. H. Young, resigned.

David O. Ouellet, chief despatcher on the St. Louis, Iron Mountain & Southern, has been appointed trainmaster at Little Rock, Ark. W. J. Potts succeeds Mr. Ouellet.

F. L. Corwin, trainmaster on the Eastern division of the Western Pacific, at Elko, Nev., has been transferred to the Western division, with office at Sacramento, Cal.

T. L. Dubbs, superintendent of the Illinois Central at

Corinth, Miss., has been appointed division superintendent of the Yazoo & Mississippi Valley at Memphis, Tenn., succeeding John F. Porterfield, transferred.

E. J. Lampert, superintendent of the Missouri, Kansas & Texas, at Kansas City, Mo., has been appointed superintendent of transportation at Denison, Tex. A. G. Peek, agent at McAlester, Tex., succeeds Mr. Lampert.

W. Rudd, trainmaster of the Missouri, Kansas & Texas of Texas at Denison, Tex., has been appointed superintendent at Smithville, Tex., succeeding C. M. Bryant, whose promotion has been announced in these columns.

C. Peter Clark, vice-president and general manager of the Buffalo & Susquehanna, at Buffalo, N. Y., has resigned. J. O. Crockett, who recently resigned as general superintendent of the Evansville & Terre Haute, at Evansville, Ind., succeeds Mr. Clark as general manager of the Buffalo & Susquehanna, with office at Galeton, Pa.

T. W. Evans, superintendent of the Rochester division of the New York Central & Hudson River, at Rochester, N. Y., has been appointed superintendent of the Buffalo division, with office at Buffalo, succeeding I. H. McEwen, transferred. F. E. McCormack, superintendent of the Ontario division at Oswego, succeeds Mr. Evans, with office at Rochester, and S. J. Kearns, assistant division superintendent at Syracuse, succeeds Mr. McCormack, with office at Oswego.

Albert E. Clift, superintendent of the St. Louis division of the Illinois Central, with headquarters at Carbondale, Ill., has been appointed general superintendent of the lines south of the Ohio river, and the headquarters of the general superintendent of these lines has been moved from Memphis, Tenn., to New Orleans, La. Mr. Clift succeeds Henry McCourt, assigned to other duties. John F. Porterfield, division superintendent of the Yazoo & Mississippi Valley, at Memphis, Tenn., succeeds Mr. Clift.

Traffic Officers.

B. R. Bloodworth has been appointed a traveling freight agent of the Central of Georgia.

H. L. Resing has been appointed commercial agent of the Pacific & Idaho Northern at Weiser, Idaho.

G. A. Griffin has been appointed a traveling passenger agent of the Mobile & Ohio, with office at Meridian, Miss.

R. H. Heard, general agent of the Chicago Great Western at Minneapolis, Minn., has resigned to engage in private business.

C. C. Graves has been appointed general freight and passenger agent of the Raleigh & Charleston, with office at Marion, S. C.

B. J. Libbe, general agent freight department of the Atchison, Topeka & Santa Fe at St. Louis, Mo., has resigned to go into other business.

William J. Oliver has been appointed a soliciting agent of the Southern Railway, with office at Norfolk, Va., succeeding R. D. Miller, promoted.

G. M. Kridler has been appointed general agent of the Toledo & Ohio Central and the Zanesville & Western, with office at Pittsburgh, Pa.

U. S. Pawkett has been appointed traffic manager of the Pecos Valley Southern, a road building south from Pecos, Tex., with office at Dallas, Tex.

J. R. Randolph has been appointed a traveling freight agent of the Central of Georgia, with office at Jacksonville, Fla., succeeding J. E. Roach, resigned to go to another company.

G. L. Townsley has been appointed Pacific Coast agent of the St. Louis Southwestern at San Francisco, Cal. His territory will comprise California, Nevada, Oregon, Washington and Arizona.

E. M. North, division passenger agent of the Atlantic Coast Line at Savannah, Ga., has been appointed assistant general passenger agent, with offices at Savannah, and his former position has been abolished.

L. V. Druce, commercial agent of the Grand Trunk, the Grand Trunk Pacific and the Grand Trunk Pacific Steamship Co., Ltd., at Seattle, Wash., has been transferred to Vancouver, B. C. F. L. Norman succeeds Mr. Druce, with office at Seattle.

D. J. Bill has been appointed a commercial agent of the Lake Erie & Western, the Fort Wayne, Cincinnati & Louisville and the Northern Ohio, at Buffalo, N. Y., succeeding F. A. Curry, whose promotion has been announced in these columns.

The following appointments have been made on the Star Union Line: Wm. J. Barr, traveling freight solicitor, with headquarters at Spokane, Wash.; Edward S. Yeaton, traveling freight solicitor, with headquarters at Seattle, Wash.; Judson T. Smith, now agent at Fargo, N. D., traveling freight solicitor, with headquarters at Portland, Ore. I. C. Furber succeeds Mr. Smith.

J. B. Rector has been appointed traffic manager of the Estacado & Gulf, with office at McCauley, Tex. Mr. Rector served the Atchison, Topeka & Santa Fe for 17 years, resigning in 1908 to accept a position as agent of the St. Louis & San Francisco. In his new position he will have charge of the freight and passenger business of the new line building into Robey, Fisher County, Tex.

Wm. B. Groseclose, whose appointment as assistant freight traffic manager of the Missouri, Kansas & Texas, with office in Chicago, has been announced in these columns, was appointed a commercial agent of the St. Louis, Arkansas & Texas Ry. of Texas, now the St. Louis, Southwestern Ry. of Texas, in 1888. He was promoted to general agent and later to general freight agent of this road, which position he resigned to become general manager of the Tyler Car & Lumber Co., Tyler, Texas. In 1895 he was appointed assistant general freight agent of the Missouri, Kansas & Texas Ry. of Texas, at Houston, Tex., and three years later he was made assistant general freight agent of the Missouri, Kansas & Texas at St. Louis. In 1901 he was promoted to general freight agent, the position he leaves to become assistant freight traffic manager.



W. B. Groseclose.

W. E. Lowes has been appointed an assistant general passenger agent of the Baltimore & Ohio, with office at Baltimore.

D. N. Bell, division ticket agent of the New Jersey division of the Pennsylvania Railroad at Philadelphia, Pa., has been appointed an assistant general passenger agent, with office at Philadelphia, and R. J. De Long, division ticket agent of the West Jersey & Sea Shore at Philadelphia, succeeds Mr. Bell.

B. W. Redfearn, who has been appointed general perishable freight agent of the St. Louis & San Francisco, with office at St. Louis, Mo., began work on the Frisco in December, 1905 as dairy freight agent in charge of the butter, egg and poultry traffic; in June, 1907, his jurisdiction was extended over the Rock Island Lines, with title of general dairy agent, and at the time of the separation of the Rock Island-Frisco Systems he retained his position as general dairy agent of the Frisco Lines. Coming to the Frisco, he was general manager and traffic manager of the Jean-Hurst-Redfearn Produce Co., which during its existence was the largest poultry and egg concern in the country. Mr. Redfearn is 42 years of age.

Engineering and Rolling Stock Officers.

Jule Brown, traveling engineer for the St. Louis Southwestern, has resigned to enter private business.

Donald R. MacBain, whose appointment as superintendent of motive power of the Lake Shore & Michigan Southern, with office at Cleveland, Ohio, has been announced in these columns, was born October 23, 1861, at Queenston Heights, Ont. He was educated in the common schools and began railway work as a machinist's apprentice October 9, 1876, on the Canada Southern, now a part of the Michigan Central. Two years later he was promoted to locomotive fireman, remaining in that position until November, 1882, when he was appointed a locomotive engineman. In May, 1890, he was appointed a traveling engineer, and ten years later was made master mechanic at Michigan City. In April, 1901, he was transferred to St. Thomas, Ont., and about a year later was transferred to Jackson, Mich. He was appointed assistant superintendent of motive power of the Michigan Central in July, 1906, and was transferred in the same capacity to the New York Central & Hudson River in April, 1908, which position he held at the time of his recent appointment as superintendent of motive power of the Lake Shore & Michigan Southern, the Chicago, Indiana & Southern and the Indiana Harbor Belt.



D. R. MacBain.

M. Flanagan, foreman of the machine department of the Chesapeake & Ohio at Richmond, Va., has been appointed master mechanic of the Richmond division, with office at Richmond.

Charles H. Terrell, whose appointment as superintendent of motive power of the Chesapeake & Ohio, at Huntington, W. Va., has been announced in these columns, was born on March 1, 1858, in Hanover county, Va. Mr. Terrell was educated in the public schools and began railway work on June 11, 1874, with the Chesapeake & Ohio as machinist apprentice. He served the full apprenticeship as machinist, and left the service of the Chesapeake & Ohio five years later, and then worked as a machinist in various shops, returning to the Chesapeake & Ohio in 1883 as a machinist. Two years later he went to the Utah Northern, now a part of the Oregon Short Line, as a night roundhouse foreman at Eagle Rock, Idaho. He then went to the Chicago & North Western as roundhouse foreman at Missouri Valley, Iowa, and again went to the Chesapeake & Ohio in the fall of 1886 as machine foreman and later as general foreman. In 1903 he was promoted to master mechanic on the Kentucky division, which position he held at the time of his recent appointment as superintendent of motive power of the West Virginia general division.



C. H. Terrell.

A. McGill has been appointed roadmaster of the second division of the St. Louis, Brownsville & Mexico, succeeding W. F. Sparks, resigned to enter private business.

C. D. Magner has been appointed division roadmaster of the Gulf, Colorado & Santa Fe, at Conroe, Tex., succeeding Samuel Lincoln, whose transfer has been announced in these columns.

C. D. Purdon has been appointed chief engineer of the St. Louis Southwestern, and W. T. Eaton, chief engineer of the St. Louis Southwestern of Texas, succeeding M. L. Lynch, retired from both companies.

J. W. Senger, whose appointment as master car builder of the Lake Shore & Michigan Southern has been announced in these columns, has been appointed also master car builder of the Chicago, Indiana & Southern and the Indiana Harbor Belt, with office at Englewood, Ill., succeeding T. H. Goodnow, resigned to go to another company.

J. T. Carroll, whose appointment as superintendent of motive power of the Pittsburgh system of the Baltimore & Ohio, has been announced in these columns, was born on June 12, 1875, at Cassadaga, N. Y., and was educated at Purdue University, Lafayette, Ind. On September 10, 1891, he entered the service of the Brooks Locomotive Works as draftsman, remaining with that company until January, 1896, since which time he has been consecutively draftsman on the Erie Railroad, the Chicago, Rock Island & Pacific and the Chicago & North Western. In August, 1899, he was appointed mechanical engineer of the New York, Chicago & St. Louis, and has been on New York Central Lines west of Buffalo since.



J. T. Carroll.

OBITUARY.

W. R. Tiffin, superintendent of the Grand Trunk at Allendale, Ont., died May 29 at Barrie, Ont. Mr. Tiffin was born in 1844 at Hamilton, and began railway work in 1860. He was appointed superintendent of the Northern division of the Grand Trunk in January, 1897.

Charles Cameron Clarke, vice-president and director of the New York & Harlem Railroad and the New York & Putnam, and former vice-president of the New York Central & Hudson River, died on May 25 at his home in Ossining, N. Y. Mr. Clarke was born at Canandaigua, N. Y., February 24, 1823. He was appointed auditor of the Hudson River Railroad on May 19, 1854, and two years later was made treasurer of the company. Soon after the consolidation of the Hudson River with the New York Central & Hudson River in 1869 he was chosen treasurer of the new company and held the place for over 20 years. He was appointed first vice-president of the New York Central & Hudson River in May, 1883, and remained in that position until November, 1900. For many years while vice-president Mr. Clarke had the oversight of both the financial and the accounting departments of the road, and his duties were almost synonymous with those of what used to be called the managing director. Mr. Clarke was a widower and left three children, Charles C. Clarke, who is a professor in Yale University; Mrs. Charles T. Titus, of Utica, and Francis Cameron Clarke, a purchasing agent of the New York Central Lines.

Railway Construction.

New Incorporations, Surveys, Etc.

Abilene & Southern.—A contract is said to have been given to Rose & Ellis for grading four miles out of Hamlin, Tex., on the proposed extension from Abilene north via Anson to Hamlin, about 40 miles. (May 20, p. 1281.)

Alaska Short Line.—The lower house of Congress has passed a bill extending the time to June, 1911, to begin work on this line. The projected route is from Cooks Inlet, Alaska, northwest across southwest Alaska to Anvik, 360 miles.

Algoma Central & Hudson Bay.—A contract is said to have been given to the O'Boyle Brothers Construction Co., Sault Ste. Marie, Ont., for the clearing, grading and bridge work on the 31-mile extension between Hawk Lake Junction, Ont., and Hobon. (April 22, p. 1070.)

Atlanta, Birmingham & Atlantic.—This company is said to have started operating trains on June 1 over its own tracks, into Birmingham, Ala., via the new extension from Bessemer, northeast to Birmingham. (May 6, p. 1183.)

Bingham & Garfield.—Work is said to be under way by the Utah Construction Co., building this line from Bingham, Utah, north to Garfield, 17 miles. The work includes 300,000 cu. yds. of earth excavation, 800,000 cu. yds. of rock excavation, 1,000,000 cu. yds. of embankment and 6,200 lin. ft. of rock tunnels, also 7,000 cu. yds. of concrete masonry and three steel and concrete bridges. Subcontracts are said to be let to Boyer Brothers, Taylor Brothers, W. M. Smith, R. Palfreyman, the Wasatch Construction Co. and F. Meyers & Co.

Caldwell, Roswell & Big Bend Interurban.—An officer writes that this company was organized in Idaho, with $250,000 capital, to build an electric line from Caldwell, Idaho, northwest via Roswell to the Big Bend, 27 miles. Maximum grades will be 0.5 per cent. and maximum curvature 4 degs. H. W. Dorman, president; H. S. Williams, chief engineer, Caldwell.

Canadian Northern.—This company is said to have secured $40,700,000 in Europe for the railway and allied projects in western Canada. Part of the funds are to be used for development as follows: For the Canadian Northern, $5,000,000; Winnipeg street railway development, $1,000,000; new steamships for the Canadian Northern Railway subsidiary companies, $3,000,000, and for the Duluth, Winnipeg & Pacific Railway, $4,700,000. The completion of the D., W. & P. from Virginia, Minn., south 74 miles to Duluth, will provide a through connection from Edmonton, Alb., via the Canadian Northern and the Chicago & North Western into Chicago. (See Duluth, Rainy Lake & Winnipeg, Feb. 25, p. 429.)

A contract is said to have been given recently to C. J. Merry & Co. for building 35 miles of line between Shell Brook, Sask., and Battleford, the work to be finished during 1910. It is expected to have the line from Prince Albert southwest to Battleford finished during 1911.

Carnesville Railway.—Organized in Georgia, with $200,000 capital and office at Toccoa, Ga. The plans call for a line from Toccoa south via Mize and Redhill to Carnesville, 20 miles. The incorporators include W. S. Erwin, E. S. Hunnicutt, Clarkesville; W. G. Davis, Toccoa; W. H. Parker, Mize; W. P. King, Redhill, and J. R. Hall, Carnesville.

Central Ohio Promoting Co.—An officer writes that under this name a company has been organized in Ohio with $25,000 capital to build an electric line from Columbus, Ohio, east to Zanesville. The projected route from Columbus is via Reynoldsburg, thence southeast to Holden, and east via Coyle and Glenford to South Zanesville. There is to be a branch from a point south of Columbus, at Franklin, east to a connection with the main line at Holden, and another branch from the main line at a point east of Columbus, south via Groveport and Canal Winchester to Amanda, thence east via Rockbridge to Corning, with spur lines to Shawnee and to Newstraits. J. L. Holden, president and treasurer; Albert E. Boone, general manager and assistant secretary. The offices of the company are at 403 Hayden-Clinton building, Columbus.

Coeur d'Alene & Pend d'Oreille.—See Spokane International.

Denver & Rio Grande.—An officer writes that the recent press reports concerning plans of this company for future construction are very much exaggerated. On May 18 the company awarded contracts to the Utah Construction Company as follows: Grading double track from Swallows, Colo., to Goodnight, 10.5 miles, involving removal of about 550,000 cu. yds. of grading. Work to be commenced at once and finished by September. There will also be three double-track 85-ft. bridges to be erected and a number of 16 and 24-ft. I beams, all on concrete masonry. Track is to be laid with 85-lb. steel and ballasted with slag.

The same firm was awarded a contract to grade double-track between Pando, Colo., and Pando Tunnel, on the Mountion division, 1.75 miles. There will be about 60,000 cu. yds. of grading. This work is to be finished by July.

Denver, Laramie & Northwestern.—According to press reports the extension from Milliken, Colo., north to Greeley, 12 miles, has been finished and trains are now in operation. An extension is projected north of Greeley towards Laramie, Wyo. (May 6, p. 1183.)

Duluth, Winnipeg & Pacific.—See Canadian Northern.

Gilmore & Pittsburgh.—An officer writes that construction work is nearly completed on the line building from Armstead, Mont., west to Salmon City and to Gilmore, Idaho. The McArthur Brothers' Construction Co., New York, are the contractors. According to press reports, plans have been filed in Montana to build from the eastern terminus at Armstead, north to Butte, with a connection from this line east to Whitehall. It is understood that the Hill interests are back of this project. (Jan. 7, p. 68.)

Holton Inter-Urban.—An officer writes that this company expects to build some time this year, under the name of the Imperial Valley Railway, extensions from the present western terminus of the Holton Inter-Urban at El Centro, Cal., to a point southwest of El Centro, and another line from El Centro, west to Seeley, with a branch running north from both these lines via Imperial to a point east of that place. A line is also to be built from the existing line at a point near the eastern terminus, at Holtville, southwest to Calexico, and another line is to be built from a point south of Holtville, north via Holtville, thence west via Brawley, and then to a point northwest of that place. Track laying is now under way on the line west to Seeley, and it is expected to have this work finished by July, 1910. At the present time the company is using steam as its motive power on the existing line from Holtville, west to El Centro, 11 miles. W. F. Holt, president and general manager, Redlands.

Imperial Valley.—See Holton Inter-Urban.

McCrory & Beedeville.—Organized in Arkansas to build a 14-mile line from McCrory, Ark. Right-of-way is now being secured. C. Hailey, president; G. G. McCrory, general manager and chief engineer, McCrory.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes that this company has work under way as follows: Extension from Moose Lake, Minn., northwest via McGregor, Cass Lake and Bemidji, to Plummer, 192 miles. Grading and bridge work is expected to be finished by July and track laying in September, 1910. The work is moderately heavy, mostly through earth. The line is to have maximum grades of 0.3 per cent. and maximum curvature of 1 deg. There will be steel bridges over the Mississippi river and Leech Lake river, and a union station at Bemidji, to be used jointly with the Minnesota & International.

The Cuyuna, Minn., line has been graded, track laid on 48 miles, and ballasting work is nearing completion.

On the line from Medford, N. Dak., west to Drake, 130 miles, it is expected that the grading, bridges and track laying will be completed this summer. The character of this work is moderately heavy, with light grades and easy curva-

ture. A contract for building this line was let some time ago to Foley, Welch & Stewart, St. Paul, Minn.

NUECES VALLEY RAILROAD.—A charter has recently been filed with the Secretary of State of Texas. It provides for the construction of a railway from Beeville, Tex., to Eagle Pass, 175 miles. Lee Frisby, of Austin; R. M. Buck, of Fort Smith, Ark.; W. A. Frisby, of Beeville, and others are the incorporators. It is stated that the road has been financed in Philadelphia and that the construction contract will soon be let.

OKLAHOMA PUBLIC SERVICE & INTERURBAN.—An officer writes that contracts were let recently to Dan Sweeney & Co. for dirt work, and to M. B. Ryan for bridge construction and culverts on 14 miles of electric line in Oklahoma. The company will also put up a power house, substations, a terminal building, car barn and shop building. L. J. Lampke, president, and R. A. Sturgeon, chief engineer, Stillwater.

PENNSYLVANIA RAILROAD.—The track elevation work on the Kensington branch of the Pennsylvania Railroad in the northeastern part of Philadelphia, Pa., which was started in 1907, has been finished. The improvements included the elimination of 33 grade crossings on Trenton avenue. The grade crossings eliminated also include one at Lehigh avenue, where the tracks of the Pennsylvania cross some five or six tracks of the Philadelphia & Reading.

The extension of the Bedford & Hollidaysburg Railroad from a point 2.44 miles north of Imlar, Pa., passenger station, to Brookes Mills, 10.85 miles, has been completed, together with a number of sidings and is now being operated as a part of the Bedford division.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—A contract is said to have been given to the Walsh Construction Co., Davenport, Iowa, for double-tracking work from McAlmont, Ark., northeast to Bald Knob.

SIOUX CITY & EASTERN TRACTION CO.—Incorporated in Iowa to build an interurban line from Sioux City, Iowa, southeast to Denison, about 70 miles. The officers of the company are: A. H. Tennis, president; W. B. Goodrich, vice-president; H. C. Fedderson, treasurer, and W. L. Harding, secretary, Sioux City.

SLIPPERY ROCK & GROVE CITY STREET RAILWAY (ELECTRIC).—An officer writes that a contract has been given to A. De Mayo & Co., Ashtabula, Ohio, to build from Slippery Rock, Butler county, Pa., north via Armstrong and Redmond, to Grove City, Mercer county, nine miles. Maximum grades 2¼ per cent., maximum curvature 16 degs. There will be a 90-ft. steel bridge and another 20 ft. long. It is expected to have the line in operation by October 15 of this year. Surveys and rights-of-way have been made and contracts are to be let for building 20 miles additional between Slippery Rock and Butler, at which point connection is to be made with the Pittsburgh, Butler and Harmony lines. J. P. Barr, president; J. A. Jolliffe, secretary; S. L. McClure, general manager, and H. B. Graves, chief engineer, Grove City.

SPOKANE INTERNATIONAL.—According to press reports construction work has been started on the Coeur d'Alene & Pend d'Oreille. The company was organized to build from a point on the Spokane International, 25 miles east of Spokane, southeasterly to Coeur d'Alene City, Idaho. Rails for the entire line are on the way, and it is expected to have the track laying finished in about 60 days. D. C. Corbin, president; E. G. Taber, chief engineer, Spokane. (April 29, p. 1115.)

TALLAHASSEE & GULF.—Organized in Florida, with $10,000 capital, to build from Ocklocknee south through Leon and Wakulla counties, to the Gulf of Mexico, about 40 miles. J. H. Morfleet, president and general manager, Ocklocknee.

TEMISKAMING & NORTHERN ONTARIO.—Bids are wanted by A. J. McGee, secretary and treasurer, Toronto, Ont., up to noon June 8, for clearing, grading, embankment protection, driving of piles, culverts and laying tiles that may be required in connection with the construction of a branch between North Bay, Ont., and Nipissing Junction.

TUSCALOOSA MINERAL.—An officer writes that the prospects of building this line from Tuscaloosa, Ala., east to Brookwood, are good. The company expects to let contracts as soon as the survey is finished. The line will traverse a mineral and timber section of Tuscaloosa county for about 18 miles. The work will include one bridge over Hurricane creek. F. G. Blair, president, and Woolsey Finnell, chief engineer, Tuscaloosa.

UNITED RAILWAYS CO. (ELECTRIC), PORTLAND, ORE.—This company, operating a 17-mile line from Portland, Ore., west via Burlington, will push construction work on the extension west to the Pacific coast at Tillamook, in all about 80 miles. John F. Stevens, president of the Oregon Trunk Line, has been elected president of the United Railways Co.; L. B. Wickersham, chief engineer, has been made vice-president, succeeding respectively T. L. Greenough and C. D. Fullen, resigned. (Sept. 10, p. 479.)

VIRGINIA & SOUTHWESTERN.—This company expects to have work finished soon on the branch line from Moccasin Gap, Va., southwest to Persia, Tenn., 47 miles, where connection is to be made with the Rogersville branch of the Southern Railway. The line is being built in the valley of the Holston river. (Dec. 17, p. 1214.)

WEST SHORE RAILROAD (ELECTRIC).—Organized in Pennsylvania to operate a line from Wilkesbarre, Pa., northeast to Pittston, about 10 miles, via the boroughs of Fortyfort, Wyoming and Exeter. Contracts for the work will be let in about four weeks. There will be 2,000 ft. of trestle work, about 10 ft. high. J. L. Dunn, secretary, 54 Public square, Wilkesbarre, and W. T. Hutchins, engineer, Wyoming.

FOREIGN RAILWAY NOTES.

The first section of the railway from San Antonio, in the Argentine, to Nahuel Huapi, has been opened. From this enterprise the government expects that there will be opened to the public a large district of rich land some of which is to-day almost unknown.

A despatch from Kingston, Jamaica, says that J. P. McDonald has been granted a franchise to build about 400 miles of railway in Hayti. The proposed roads will run from Gonaides to Hinche and Grosmore, and from Port au Prince to Cape Haytien and Arcahare.

The agreement made in 1909 between Persia, Great Britain and Russia by which the Persian government agreed not to grant any railway concession to any third power has expired, and the Paris *Temps* says that Great Britain and Russia propose that the agreement should be renewed.

In 1851 the first railway was built in Chili. In 1856 Brazil had a railway open to traffic, and Argentina was beginning to push its solitary line indefinitely across her limitless prairies. There is now no republic in South America without at least one railway. Actual mileage of road does not, however, tell the story of what has been accomplished. Although there are only 37,000 miles of railway in the whole continent these few threads of modern industrial life have revolutionized travel on the southern continent and given access to much useful territory. The one-time mysterious city of La Paz, the active capital of the Republic of Bolivia, altitude 12,300 ft., was formerly as hidden as Lassa in Tibet, and the traveler was lost for weeks who dared to climb the rocky barriers beyond which it lay. But to-day two railways carry passengers from the west coast in less than 48 hours to this lofty interior; a third line is pushing northward from the frontier of Chili to bring La Paz closer yet to the Pacific, while a fourth road, advancing from Argentina, will soon place the city within 1,500 miles of the Atlantic seaboard. Quito in Ecuador is now only six days from Panama, for the railway fills the gap in transportation which lately could be overcome only by a week's travel over hazardous paths on the patient mule. Bogota in Colombia is reached in a day from the Magdalena river, and before the year is forgotten Asuncion in Paraguay, five days by steamer up the river Parana, will be linked to Buenos Ayres by bands of steel.—*Review of Reviews.*

Railway Financial News.

Baltimore & Ohio. It is said that this company is to sell the controlling interest in the stock of the Valley Railroad (Virginia) to the Southern Railway. The Valley Railroad runs from Harrisonburg, Va., to Lexington, 62 miles, and is operated by the B. & O. as agent. The B. & O. owns $1,703,000 stock and $750,000 bonds.

Beaumont, Sour Lake & Western.—The outstanding first mortgage 6 per cent. bonds of 1905, at last accounts amounting to $267,567, have been called for redemption at par on May 27 at the office of the company.

Berkshire Street Railway.—See New York, New Haven & Hartford.

Canadian Northern.—President William Mackenzie has arranged for the sale in Europe of the following bonds for Mackenzie-Mann properties: Five million dollars Canadian Northern debentures; $4,700,000 Duluth, Winnipeg & Pacific first mortgage bonds, guaranteed by the Canadian Northern; $1,000,000 Winnipeg Electric bonds; £1,500,000 ($7,500,000) 5 per cent. debenture stock; $6,000,000 Brazeau Coal Fields & Railway guaranteed 3½ per cent. bonds; £2,054,800 ($10,274,000) Canadian collieries (Dunsmuir) first mortgage bonds.

Chicago & Alton.—Further details of the mortgage securing $18,000,000 30-year 5 per cent. equipment and improvement bonds of this company show that in addition to the $3,500,000 bonds already issued and deposited under $2,500,000 5 per cent. notes, the company may issue $1,000,000 bonds each succeeding year until 1913, and $1,500,000 bonds each year thereafter until the entire $18,000,000 have been issued.

Chicago, Cincinnati & Louisville.—The upset price on this property, which is to be sold on June 23 under foreclosure, has been fixed at $5,200,000. The property will be sold subject to unpaid equipment liens ranking prior to the mortgages foreclosed, aggregating with interest $618,934.

Chicago, Milwaukee & St. Paul.—It has been formally announced that Kuhn, Loeb & Co., New York, have arranged for the sale to French bankers of 250,000,000 francs ($50,000,000) 4 per cent. 15-year debenture bonds. The bonds will be in denominations of 500 francs ($100) and 2,500 francs ($500), and have been admitted to official quotation on the French Bourse. The bonds will be issued entirely in foreign denominations, probably at the price of 97 per cent.

The *Wall Street Journal* says that contrary to the published statement that St. Paul was compelled to pay 5½ per cent. for the 15-year loan secured in Paris, the money cost the railway only a trifle over 5 per cent., the net to the railway being 88, on a 4 per cent. security. Bankers who conducted the negotiations say that the $50,000,000 bonds could not have been placed in this country on a less than 6 per cent. basis.

Chicago, Rock Island & Pacific.—The New York Stock Exchange has listed $982,000 additional refunding mortgage 4 per cent. bonds due 1934. These additional bonds were issued to acquire $1,000,000 Tucumcari & Memphis first mortgage bonds, which have been deposited with the trustee of the refunding mortgage. The Tucumcari & Memphis runs from Amarillo, Tex., to Tucumcari.

There has now been listed to date a total of $86,118,000 first and refunding mortgage 4 per cent. bonds, of which $29,818,000 were issued for refunding purposes, $15,000,000 for general corporate purposes, $23,800,000 for the acquisition of property or securities and $17,500,000 for improvements.

Delaware & Hudson.—Stockholders have voted to authorize a change in the application of the sinking fund moneys, to permit the sinking fund to be used to pay the cost of the company's increased reserves of coal.

Duluth, Winnipeg & Pacific.—The $1,525,000 bonds of April 30, 1909, have been called for exchange for an equal amount of first mortgage bonds of the Duluth, Winnipeg & Pacific, guaranteed principal and interest by the Canadian Northern.

See also Canadian Northern.

Hocking Valley.—Following the filing of affidavits of prejudice against Judge E. B. Kinkead, of the Common Pleas Court, who appointed the Hocking Valley receivers, by James H. Hoyt, second vice-president of the road, and counsel, Federal Judge Sater, in the United States Court at Columbus has assumed jurisdiction in the case. Judge Sater upheld the petition of the railway for removal of its case to the Federal Court on the ground that the complaint of Mannington and the dissatisfied minority stockholders contained averments of violation of the Sherman anti-trust law, and held that the Federal court therefore clearly has jurisdiction. Judge Sater ruled also that the action of the Hocking Valley in seeking relief in the State Circuit Court after filing a motion to remove to the United States Court did not constitute a waiver of any of its rights, as that action came after the motion to remove and therefore was null. The most important point decided was that the right of injunction does lie in equity cases under the Sherman law, the railways having contended that it did not.

The action of the Common Pleas Court in appointing receivers is annulled. The temporary injunction which was granted against the retirement of the $15,000,000 Hocking Valley preferred stock stands, however, until reviewed by the United States Court.

Interborough-Metropolitan.—Arrangements have been made for the extension, until June 1, 1911, at the same rate of interest, of the $2,500,000 6 per cent. collateral trust six months' notes, due June 1, 1910. These notes are a part of the $8,000,000 6 per cent. six months' collateral notes put out on May 27, 1907, by the Interborough-Metropolitan for the purpose of providing the New York City Railway with funds to electrify various horse car lines and to meet the cost of other improvements then contemplated.

It was the original intention of Interborough-Metropolitan to take up these six months' notes at their maturity, by issuing in their stead 5 per cent. three-year notes. Subsequent events, did not, however, permit this, and at the maturity of the notes approximately one-half were paid off and the remaining portion renewed for the six months.

Missouri, Kansas & Texas.—Stockholders are to vote on July 30 on the question of authorizing a mortgage securing $125,000,000 5 per cent. general mortgage bonds. These bonds will be used for refunding securities now outstanding and for additions and betterments. It is expected that $10,000,000 of the bonds will be issued immediately.

New York, New Haven & Hartford.—The Massachusetts committees on street railways and on steam railways sitting jointly have voted to report the bill authorizing the New Haven to own stock in the Berkshire Street Railway and to require the building of certain street railways by the Berkshire company.

Norfolk & Western.—The New York Stock Exchange has listed $10,993,000 additional convertible 10-25 year 4 per cent. bonds, which were recently offered to stockholders. The proceeds of these bonds will be used approximately as follows: Three thousand eight hundred dollars for second-track, $200,000 for yards, $100,000 for sidings, $3,100,000 for branch lines and $3,800,000 for equipment.

Southern Pacific.—It is said that the bankers of the Southern Pacific, presumably Kuhn Loeb & Co., New York, have have arrangements for the sale of about $10,000,000 bonds of the Southern Pacific in Germany.

Southern Railway.—See Baltimore & Ohio.

Texas Central.—R. H. Baker, formerly president of the Trinity & Brazos Valley, has taken an option, expiring June 4, on the controlling interest of the Texas Central.

Tucumcari & Memphis.—See Chicago, Rock Island & Pacific.

Valley Railroad (Va).—See Baltimore & Ohio.

Western Ohio.—Hayden, Miller & Co. are to buy $500,000 Western Ohio second mortgage 6 per cent. bonds. These bonds are convertible at par into a new issue of Western Ohio first preferred 7 per cent. stock. The proceeds of the new loan will be used to retire the outstanding Western Ohio notes due 1912.

Supply Trade Section.

Charles Chew Mickle, general manager of the Trojan Car Coupler Co., New York, has resigned, effective June 1.

Geo. A. Rees has been elected second vice-president of the Chicago Pneumatic Tool Co., with office in the Fisher building, Chicago.

The King-Lawson Car Company, New York, has moved its office from 17 State street to room 288, Metropolitan tower, No. 1 Madison avenue.

Burton W. Mudge & Co., Peoples Gas, Light & Coke Company's building, Chicago, have been appointed western sales agents for the Baker-Pilliod locomotive valve gear, manufactured by the Pilliod Co., Swanton, Ohio.

The Joliet Railway Supply Co., Chicago, has received orders for Huntcon brake beams specified on the following recent car orders: 1,000 New York Central, from Pressed Steel Car Co.; 1,000 Chicago, Burlington & Quincy, from Pressed Steel Car Co.; 1,500 Grand Trunk, from American Car & Foundry Co.; 250 Duluth & Iron Range.

The Acme Railway Equipment Co., Philadelphia, Pa., reports that its Acme universal uncoupling device is being applied to 500 gondola cars for the New York, Ontario & Western; 250 box cars and 250 gondola cars for the Pittsburgh, Shawmut & Northern, building at the Berwick plant of the American Car & Foundry Co., and to 700 box cars for the Maine Central, building at the Sagamore, Mass., plant of the Standard Steel Car Co.

The Indianapolis Switch & Frog Co., Springfield, Ohio, reports extensive sales of its manganese solid bronze crossings and switch points, and that it had recently placed on the market several new designs which embody features said to be of exceptional merit. This company's universal type manganese frog, adaptable for railway work, makes it possible for this company to carry regular sizes and numbers of manganese frogs in stock for the various weight of rail for immediate delivery.

TRADE PUBLICATIONS.

Lighting Transformers.—The Allis-Chalmers Co., Milwaukee, Wis., has issued Bulletin No. 4022 describing the lighting transformers which it builds. Copies may be had on application to the company.

Water Softener.—The Dodge Manufacturing Co., Mishawaka, Ind., has issued two hangers illustrating the Eureka water softener. One shows an exterior view and the other a colored cross section to illustrate every step in the process. The cards are 14 in. x 26 in. and the engraving is especially well done.

Great Northern.—"To the Scenic North West" is the title of a descriptive booklet issued by the passenger department of the Great Northern. The larger cities and resorts reached by this line are well described and illustrated. Another booklet of 144 pages issued by the industrial department gives business openings along the lines of this company. The information is conveniently arranged for ready reference and a large part of the book is devoted to short descriptions of the towns in which there are business openings. Another booklet is devoted to the special train which will take a delegation of Minneapolis business men on a trip through the northwest May 22-30. The booklet gives a short description of Minneapolis with a number of well selected photographs. It is bound in a neat green cover, bearing a colored view of the Great Northern's bridge across the Mississippi.

RAILWAY STRUCTURES.

AUGUSTA, GA.—The Georgia & Florida has let the contract for the addition of a second story to its terminal building at a cost of $125,000.

AVIS, PA.—An officer of the New York Central & Hudson River writes that a contract has been given to the Lackawanna Bridge Co. for putting up a semi-hreproof steel frame and concrete freight car shop, one story high, 200 ft. x 350 ft., at Avis, and the company is now buying tools and equipment.

BEMIDJI, MINN.—See Minneapolis, St. Paul & Sault Ste. Marie under Railway Construction.

BINGHAM, UTAH.—See Bingham & Garfield under Railway Construction.

CELILO, ORE.—An officer of the Oregon Trunk Railway writes that a contract for building the substructure of the large bridge over the Columbia river at Celilo, Ore., from the state of Oregon to the state of Washington, has been let to Porter Brothers, Portland, Ore. Contract for the superstructure and erection of the bridge will be let by Jno. F. Stevens, president, Portland, Ore. There are to be 30 spans, as follows: Five 75-ft. deck plate girder spans, one 230-ft. draw span through truss, one 320-ft. through span, six 230-ft. through spans, sixteen 102-ft. plate deck girder spans. Total length of bridge, 3,957 ft., including the two Y connections on the north end. In addition to crossing the Columbia river, the bridge crosses the Oregon Railroad & Navigation Company's double track on the south side of the river, with a clearance of 22 ft., and the United States canal with a draw span 230 ft. long, 115-ft. span on each side of the center pier. The 320-ft. span is across the main channel of the Columbia river. All the foundations for piers will be on solid rock and the foundations for each pier will be above low water in the river. The bridge crosses just above what is known as the Celilo Falls, and will be a very picturesque location. The line of the Oregon Trunk Railway connects with the Spokane, Portland & Seattle Railway at the north end of the bridge with a Y on 8 deg. curves, part of which is on the bridge. The remainder of the bridge is on a tangent. The bridge is expected to be finished about June 1, 1912. Pending the completion of the bridge the company will operate a ferry across the river about three miles east of the bridge to transport track and other material across the river to complete the first 150 miles of line now under construction.

CLEBURNE, TEX.—The Gulf, Colorado & Santa Fe has prepared plans for a power plant, the equipment for which has not yet been decided on.

GONZALES, TEX.—According to press reports, the San Antonio & Aransas Pass will soon begin work on a new passenger station in Gonzales.

HAMMOND, IND.—The Indiana Railroad Commission has ordered the Chicago, Indianapolis & Louisville to build a new passenger station in Hammond.

KANSAS CITY, KAN.—The Missouri Pacific passenger station will be opened for service June 1. It is a three-story building of buff brick. (February 11, 1910.)

LOGANSPORT, IND.—The Pennsylvania Railroad plans to build a new double-track bridge over the Wabash river to replace the present single-track structure.

MONTREAL, QUE.—The Canadian Pacific has decided to reconstruct the large bridge over the St. Lawrence river, just above Montreal, at a cost of $1,500,000. The present bridge, which is single-track, will be made a double-track structure.

NEW CASTLE, IND.—The Lake Erie & Western has started work on a combined passenger and freight station at New Castle. (Apr. 22, p. 1069.)

SPRINGFIELD, MO.—The St. Louis & San Francisco has taken a 10-year lease on a 3-story office building of pressed brick to be built at Olive and Jefferson streets.

STILLWATER, OKLA.—See Oklahoma Public Service & Interurban under Railway Construction.

SWALLOWS, COLO.—See Denver & Rio Grande under Railway Construction.

TUSCALOOSA, ALA.—See Tuscaloosa Mineral under Railway Construction.

WEATHERFORD, TEX.—The Gulf, Colorado & Santa Fe has prepared plans for a $15,000 passenger station.

Late News.

The items in this column were received after the classified departments were closed.

Bellow & Morritt, Tuckahoe, N. Y., have ordered one saddle tank locomotive from the American Locomotive Company.

Plans have been submitted by the Oregon Short Line, it is said, to the city council of Pocatello, Idaho, for a viaduct and subway, to cost $200,000.

The Atlantic Coast Line will build seven additional warehouses on its waterfront property in Savannah, at a cost of about $100,000. Extensive improvements are also to be made to the wharves at a cost of about $150,000.

An officer of the Chicago, Milwaukee & St. Paul writes that land approximating about 800 acres has been bought west of Franklin Park, to be developed for yard purposes. Plans are not yet sufficiently advanced to give any particulars.

Attorneys for the twenty-five western railways temporarily restrained from advancing freight rates by Judge David P. Dyer, of the United States Circuit Court, will meet at once in St. Louis to plan an answer to the government's suit.

An officer of the Chicago, Burlington & Quincy writes that nothing definite has been done towards building a bridge over the Ohio river at Metropolis. Application has been made for authority to build the bridge, but it has not yet been granted.

The Oregon & Washington is said to have plans made and is ready to ask for bids for constructing a viaduct and retaining wall of reinforced concrete, to have a total length of 2,500 ft., in Seattle. The cost of the improvements will be about $200,000.

James R. Paterson, for many years advertising manager of *Railway and Locomotive Engineering*, and since April 1 a representative of the Commercial Acetylene Co., New York, died at Cranford, N. J., on May 31. He was prominent in the railway supply business.

All the employees of the Atchison, Topeka & Santa Fe Railway receiving less than $80 a month are to receive an increase of 10 per cent. in wages. This applies to all employees except those with whom the company has union agreements. The raise went into effect June 1.

The Pennsylvania Railroad has filed a new tariff of fares between points on the eastern end of its New York division and New York. This tariff shows a slight increase in the cost of regular commutation forms of ticket as well as in some forms of one-way and excursion tickets.

F. W. Coolbaugh, president of the Provincial Steel Co., Cobourg, Ont., who organized the company, constructed its plant and put it on a successful operating basis, has sold his interest to Robert Heath, of England, and returns to Philadelphia, Pa., to devote his time to his interests in the United States.

The Pine Bluff & Northern was granted a charter May 26 to build from Pine Bluff, Ark., north to Searcy, 80 miles. The work will be light, being mostly dirt work. The company expects to begin the construction work soon. Walter J. Miller, president, Lamar, Mo.; F. C. Kyte, engineer, Carlisle, Ark.

Contracts have been let for the general construction of the Beech Grove shops for the Cleveland, Cincinnati, Chicago & St. Louis to the Warren Construction Co., Chicago; for the structural steel, to the McClintic-Marshall Co., Pittsburgh, Pa., and for the yard system, including tunnel, sewer, water, etc., to the Carson-Payson Co., Danville, Ill.

The railways in Trunk Line territory have granted the application of the Merchants' Association of New York for merchants' rates to that city. The fare granted is a rate and one-half for the round trip, under the certificate plan, effective on 16 dates, arranged in four series of four each as follows: July 16-19, inclusive; August 13-16, inclusive; August 27-30, inclusive, with the usual fifteen-day limit.

The Central of New Jersey has filed increased commutation rates, effective July 1, from New York city to New Jersey points. The advances average from 10 to 12 per cent. over present rates. The road will continue the sale of commutation tickets on the scale basis. A regular commuter who purchases a commutation ticket during the life of the tariff is given a reduction each month for a full year.

General Manager A. T. Dice, of the Philadelphia & Reading, has signed an agreement with representatives of the conductors and trainmen granting the standard rates of pay and service conditions secured on most of the other railways in the East. Similar negotiations have been concluded on the Central of New Jersey. The new schedules in both cases were made effective as of May 1 last. These two roads are the only ones on which settlement has been made without the necessity for convening the grievance committees of the trainmen and conductors. At a conference some weeks ago, President Baer assured the trainmen that on the Reading and Jersey Central rates of pay should be brought up to any standard which might be established in the East. The award of the arbitrators on the New York Central lines, East and West, was considered to have established the Baltimore & Ohio scale of wages as standard. The officials of both roads, after conferences with the trainmen and conductors, applied these rates voluntarily and agreements to this effect have been signed.

When the railway bill was taken up in the Senate Wednesday Senator Stone of Missouri spoke in support of his proposed amendment regulating issues of stocks and bonds. This is really the Dolliver amendment reoffered by Senator Stone. The La Follette amendment directing the physical valuation of railways was defeated by a vote of 30 to 25. After the defeat of the La Follette amendment, Senator Cummins introduced another form of an amendment providing for physical valuation, and it was defeated by a majority of two votes, 28 Senators being a line-up of the insurgents and Democrats, voting for the amendment, while 30 regular Republicans voted in the negative.

An amendment by Simmons (Democrat, N. C.) providing that in administering the "long and short haul" clause, no rate should be made by the Interstate Commerce Commission that will destroy water competition, was adopted.

An amendment by Senator Burton (Republican, Ohio) supplementing the Simmons amendment protecting water transportation from ruinous railway competition was agreed to by an almost unanimous vote, there being only one vote against it, that of Senator Frye of Maine. There were 53 votes for it. Burton's amendment provides that the Interstate Commerce Commission may fix the minimum rate to be charged by a railway in competition with water transportation companies; also that a railway competitor, once having lowered its rates, cannot increase them again without consent of the Interstate Commerce Commission.

Chairman Elkins accepted an amendment offered by Shively (Democrat, Ind.) giving to shippers a right of action in civil suit against a railway, its agents or officers who refuse to give information (on application of the said shipper) concerning rates, routes, etc. Under the bill (section 8) the government can proceed against a railway and its agents to recover $250 for each refusal to give a shipper the information. Shively said his amendment was to make it certain that the shipper did not lose his right of action for damages growing out of such refusal to give information.

Senator Burton of Ohio secured the adoption of an amendment imposing heavy penalties on railways and their agents who give information concerning shipments to any corporation or person not authorized to receive it. It also penalizes the corporation or person improperly receiving or soliciting such information. This amendment is aimed at the Standard Oil Co., which, Senator Burton explained, had been improperly obtaining information regarding shipments by its competitors, as shown in recent cases against the Standard.

Senator Newlands (Democrat, Neb.) on Wednesday offered his amendment for federal incorporation of holding companies; this amendment was defeated without division or roll call. He said in his speech before the Senate that he would substitute the United States for New Jersey as the sovereign incorporating agent.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Canadian Pacific is said to have ordered 10 consolidation locomotives from the American Locomotive Co.

The Northern Pacific Terminal Co. has ordered three six-wheel oil-burning switching locomotives from the American Locomotive Co.

The Boston & Maine has ordered 10 mogul freight, 10 six-wheel switch, 20 eight-wheel passenger and 10 consolidation locomotives from the American Locomotive Company.

The Chicago, Burlington & Quincy, reported in the *Railway Age Gazette* of May 13 as being in the market for 50 Mikado locomotives, has ordered these from the Baldwin Locomotive Works.

CAR BUILDING.

The Carolina, Clinchfield & Ohio is in the market for 250 box cars.

The Georgia Railroad is in the market for 65 box, 25 coal and 10 stock cars.

The Georgia & Florida has ordered four coaches from the Hicks Locomotive & Car Works.

The Oklahoma Public Service & Interurban Lines, R. A. Sturgeon, Stillwater, Okla., are in the market for electric cars.

The Canadian Pacific is said to have ordered 203 refrigerator, 76 box, 50 horse, 14 stock, 25 flat, five freight and one ballast car from its Angus shops. This item is not confirmed.

The Missouri, Kansas & Texas has ordered 200 automobile, 50 steel underframe flat and 50 gondola cars from the American Car & Foundry Co. This equipment is in addition to that previously reported.

The Baltimore & Ohio, reported in the *Railway Age Gazette* of May 20 as being in the market for box and coke cars, has ordered 1,000 40-ton capacity box cars from the Standard Steel Car Co. for delivery this fall.

The St. Louis & San Francisco has ordered 500 box cars, divided equally between the Pullman Co. and the American Car & Foundry Co. This company is still in the market for the 500 automobile cars and 250 tank cars mentioned in the *Railway Age Gazette* of May 6.

The Interborough Rapid Transit Co., New York, has ordered 40 trailer cars from the Wason Manufacturing Company, 40 motor cars from the Jewett Car Company and 20 motor cars from the Cincinnati Car Company. This equipment will be used on the elevated lines.

The Harriman Lines freight cars, reported in the *Railway Age Gazette* of May 27, will have the following dimensions: Box, over all, length, 41 ft. $1^{1}/_{16}$ in.; width, 10 ft. 6 in.; height, 14 ft. 8¾ in.; inside, length, 40 ft., ⅛ in.; width, 9 ft. 2 in.; height, 9 ft. 2¼ in.; light weight, 40,650 lbs. Automobile, general dimensions, same as box; side doors, height, 8 ft. 8⅞ in.; width, 9 ft. 8½ in.; end doors, height, 8 ft., 9⅜ in.; width, 7 ft. 6 in.; light weight, 43,460 lbs. Stock cars, over all, length, 37 ft. 10 in.; width, 9 ft. 11⅛ in.; height, 13 ft. 5¼ in.; inside, length, 36 ft. 6⅛ in.; width, 8 ft. 5⅜ in.; height, 8 ft. ¼ in.; light weight, 35,241 lbs. Flats, over all, length, 41 ft. 2¼ in.; width, 9 ft. 10½ in.; height, 6 ft. 9½ in.; inside, length, 40 ft. 10 in.; width, 9 ft. 4½ in.; height, 3 ft. $10^{13}/_{16}$ in.; light weight, 30,500 lbs. Hart convertible, over all, length, 41 ft. 6 in.; width, 10 ft. 9⅜ in.; height, 8 ft. 4¼ in.; inside, length, 40 ft. as a gondola, 30 ft. as a hopper; width, 8 ft. 8 in.; height, 3 ft.; cubic capacity as a gondola, 1,040 cu. ft., as a hopper, 928 cu. ft.; light weight, 39,500 lbs. Hopper bottom coal cars, over all, length, 31 ft. 6 in.; width, 10 ft. 5⅞ in.; height, 10 ft. 9⅛ in.; inside, length, 30 ft. ¼ in.; width, 9 ft. 6 in.; height, 5 ft. 9¼ in.; capacity, 1,650 cu. ft.; light weight, 39,600 lbs. Drop bottom gondolas, over all, length, 41 ft. 10 in.; width, 10 ft. 4¾ in.; height, 8 ft. $8^{9}/_{16}$ in.; inside, length, 40 ft. 4 in.; width, 9 ft. 4⅞ in.; height, 4 ft. 6 in.; light weight, 40,270 lbs. Tight bottom gondolas, dimensions same as drop bottom gondolas; light weight, 37,000 lbs.

IRON AND STEEL.

The Great Northern has ordered 3,500 tons of bridge steel from the American Bridge Co.

The Colorado & Southern has ordered 550 tons of bridge steel from the Wisconsin Bridge Co.

The Chicago, Lake Shore & South Bend has ordered 800 tons of 70-lb. rails from the Illinois Steel Co.

The Toledo & Ohio Central has ordered 400 tons of bridge steel from the Toledo-Massillon Bridge Co.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 4,400 tons of structural steel for bridges and ore chutes from the American Bridge Co.

The Illinois Traction System has ordered 1,000 tons of bridge steel from the McClintic-Marshall Construction Co. for a viaduct at Springfield, Ill.

The Chicago, Milwaukee & St. Paul has ordered from the Wisconsin Bridge Co. 650 tons of bridge steel for a viaduct in Idaho, and 1,000 tons for a viaduct at St. Paul, Minn.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 1,500 tons of bridge steel from the McClintic-Marshall Construction Co. for its Wabash river bridge at Mt. Carmel, Ill.

General Conditions in Steel.—Although there are some fairly large steel orders pending, the steel market, as regards new business is quiet at the present time. Consumers seem to show an inclination to hold out of the market, but the manufacturers are said to be looking for activity in the near future. Structural steel orders placed during May were the largest so far this year and rails were also more active. From the standpoint of earnings, many of the independent steel companies report an average increase of nearly 10 per cent. in May over April, with prospects of their mills running full for the next four months at least.

SIGNALING.

Alternating Current Signaling Patent Decision.

On May 28 Judge Ray, of the United States Circuit Court, Southern District of New York, rendered an important decision. Two suits were brought by the Union Switch & Signal Co., Swissvale, Pa., against the General Railway Signal Co., Rochester, N. Y., for infringement of the Struble patents in the installation made by that company on the New York Central & Hudson River, Electric Zone. A third suit was brought by the General Railway Signal Co. against the Long Island Railroad for infringement of the patents of S. Marsh Young in the installation of electric block signals made by the Union Switch & Signal Co. on the electrified portion of the Long Island Railroad. The defense of this latter suit was assumed by the Union Switch & Signal Co. The text which follows consists of verbatim excerpts from the opinion of Judge Ray:

"The Union company claims that Struble was and is the pioneer in the matter of block signaling on electric railways; that he was the first to provide a system of electric block signaling on electric railways; that he was the first to provide such a system wherein interference between the signaling and power circuits was prevented, and that he accomplished this by using a current for signaling which was different from the car propulsion current; that is, by using a direct current for operating the car motors and an alternating current for energizing the signal relays. The Union company contends that no prior patent or publication shows this, and that as the claims of the Struble patent do, the fact of pioneership is established.

"The defendant, the General company, insists that the

Struble patents are void for want of patentable novelty; that defendant does not infringe and that during the pendency of the applications the claims were unwarrantably amended by including new matter. The defendant says that these patents relate simply to the application of the ordinary block signaling system then in common use on steam railways to an electric railway system; that is, that the patents in suit merely add or apply the old block signaling system to the electric railway without making any changes of adaptation or securing any new and different results, and refers to several prior patents which it claims show this. The defendant says there was 'no invention involved in adding Schreuder, Roome and Spang systems to an electric railway'; 2, 'The Struble patents are anticipated'; 3, 'Defendant does not infringe'; and 4, that the patents in suit contain new matter not disclosed in the original application, and that, while an application for a patent and the claims may be amended, under no circumstances can the application be amended into a new or a different invention than that first claimed. The defendant insists that the new matters introduced into the Struble applications were not only not disclosed in the original application, but were and are directly contradictory thereto. Also that the rights of Stillwell and of Young accrued before Struble made either of the claims upon which suit is brought. . .

The Union company says that the first work of closed track-circuit signaling on electric railways was done by it in 1900-1901 on the Boston Elevated under this last mentioned patent [Struble, 590,600] and under the direction of Struble and employed what it terms the "All-direct-current idea of means for the reason there was a direct current for the signaling current and a direct current for the car propulsion current." Waterman (plaintiff's expert) says of it "Struble's Boston railway system was based on a definite and positive direction of flow of the propulsion current in the rails and a signal current, which was also a direct current applied to flow in an opposite direction in the rails, and hence was limited to special cases where uniform direction of flow of the propulsion current could be secured."

The complainant (Union company) says that the art rested here until Struble made the next advance step by introducing into the art the "Distinctive current idea of means" shown by the patents in suit, in which an alternating current, differing in character from the direct current used for propulsion purposes, was employed in the track signaling circuit. This is what the complainant says is the generic invention of the patents and that it solves the problem of applying the closed track circuit system of signaling to electric railways, and that this idea of means involves a distinguishing apparatus in its embodiment and this irrespective of whether one or both track rails are used to return the car propulsion current; that the specific two rail return invention in all its forms, is one of the advantages growing out of the generic invention and that because of this distinctive current idea of means it is possible to retain the ordinary two rail return by the use of "reactances" in various location on the track way. Waterman says, "The fundamental idea of means upon which the arrangements of the patents in suit are made may properly be designated for brevity as the distinctive current idea of means, since the fundamental conception was the application to the rails of a signal current of distinctive characteristics from that necessarily existent in the rails for purposes of propulsion."

If it be true that a system of automatic electric signaling has been devised for electric roads and put in successful operation, and this system is such that this direct propulsion current by leakage or going astray does not seriously interfere with the signals, or their operation, or operative effectiveness, we have a most valuable discovery and invention; one the value of which cannot be overestimated. I think this has been done and that Struble is entitled to the credit. I do not find it anticipated, or that by taking the suggestions of the prior art and bringing them together and applying them to electric railway signaling, Struble was doing the work of the mechanic skilled in this art. It was an important field and an open one. It was not an obvious thing to do. I am clear that the inventive faculties of many were exercised in the effort but that those of Struble accomplished the desired object. * * *

There was an interference declared in the patent office between Struble and Young involving the very questions presented here. The examiner of interferences awarded priority of invention to Young, but this was reversed by the Board of Examiners in Chief and the decision of this board was affirmed by the commissioner. On appeal to the Court of Appeals, District of Columbia, this decision of the commissioner was affirmed. Samuel Marsh Young, appellant, v. Jacob B. Struble, respondent, Patent Appeal No. 597, opinion by Justice Van Orsdel, filed December 14, 1909. This thorough examination of the question of priority of invention as between Young and Struble by four tribunals, so to speak, examiner, board of examiners, commissioner and Court of Appeals, and the conclusion reached, while not binding on this court, is entitled to great consideration and respect. I would not follow the judgment of the commissioner and the Court of Appeals did they not agree with my own judgment. I have carefully examined the authorities cited by the learned counsel for the General company, the evidence and the able argument presented, but am forced to the conclusion that the decision was right. While the opinion of Justice Van Orsdell does not embrace all that might be said, it covers all the salient and determining points and is quite conclusive.

It seems clear, if the Court of Appeals was talking to the point involved, that the commissioner and court decided the question of priority of invention of this two-rail return system in combination with the use of the alternating current for signaling and direct current for propulsion, both currents using the same rails, the one current not mixing, so to speak, with the other, and the use of a signal and signaling apparatus capable of distinguishing between the two currents and answering to the one and not to the other, etc., all in electrical signaling on electric roads. The court points out the dates of filing by Struble and Young and also the amendments of Struble to his applications for his patents now in suit and discusses and determines his right to make such amendments. I cannot read that opinion other than as deciding between Struble and Young, that Struble was the first to invent, claim, etc., and that he had the right to make and file the amendments now challenged. * * *

These being my conclusions there will be a decree in favor of the Union Switch & Signal Co., complainant in the suits brought by it against the General Railway Signal Co., and in favor of the Long Island Railroad in the suit brought against it by the General company and Young. I think the successful party in each case should have costs. In view of the interests involved, and assuming the defendant parties will desire to take an appeal, the issue of an injunction will be suspended pending such appeal or appeals provided same is taken within thirty days and prosecuted with diligence, but a suitable bond should be given to pay all costs and damages awarded by the final decree in case of affirmance and suitable orders to that effect may be submitted with the proposed decrees. This will save formal applications.

Southern Siamese Railway Equipment.

The first specifications for tenders for the Southern Siamese Railway were issued on July 19, 1909, and were for tools and other plant, but on account of the limitation of time in delivery did not permit of bids from abroad, and therefore the contracts were awarded to local firms. The second specifications for tenders for five tank locomotives, five rail wagons and 125 ballast wagons were issued on September 18, 1909, and the tenders were opened on January 28, 1910, comprising 41 for engines and 42 for ballast wagons. The tenders from German firms were the lowest, ranging as low as $21,731 for engines and $36,295 for the ballast wagons. Two American firms tendered for engines at $34,650 and $29,569, respectively. No bids for ballast wagons from American firms were received. The lowest bid from British firms for engines was $27,730. The railway department states that several of the tenders are accompanied by letters in which extra rates are asked for if the more approved class of design and material should be required. In awarding the contracts the engines were ordered from an English firm at its bid of $27,730, although German tenders were lower. The award for the wagons was given to a French firm at $47,450.

Shop Equipment.

American Full Universal Triple Geared Radial Drill.

The illustrations herewith are of a triple geared radial, a new development in drills being introduced by the American Tool Works Co., Cincinnati, Ohio. This machine, built in 4-ft., 5-ft., 6-ft. and 7-ft. arm sizes, is very rigid, accurate in its alinements and arranged to be operated with greatest possible ease. The 4-ft. arm size is designed to pull a 6-in. pipe tap, while the 6-ft. arm size is designed to pull an 8-in. pipe tap. The frictions in the tapping attachment are this company's patented double band type, which consists of an internal expanding and an external contracting friction in one. The company claims that there is perhaps no one feature in the machine which is more responsible for its great pulling power than this double band friction, since the power of the radial drill is not dependent upon the size of the gearings, shafts, etc., but rests entirely with the capacity of the frictions, and the power that can be transmitted to the twist drill is only equal to that which causes the friction gears to slip.

The design of the arm is intended to eliminate the weaknesses heretofore encountered. It is made in the form of upper and lower tube sections, bound together in the box by a double wall of metal and further reinforced by transverse ribbing. The ways carrying the wide and rigid saddle are formed on the front wall. The saddle is firmly locked at any point along the arm by a clamping device, which also binds together the double arm section and the saddle into a compact unit, affording great strength for resisting strains. The arm is clamped to the column by two binder levers and is raised and lowered rapidly by a double-thread coarse pitch screw hung on ball bearings. This lever cannot be operated until slightly raised from its bearings, thus guarding against accident through unintentional movement while the arm is clamped to the column. The arm is rotated in a circle by a worm wheel cut in the periphery of the arm flange. This movement, in connection with the swiveling pin, permits drilling and tapping at any angle.

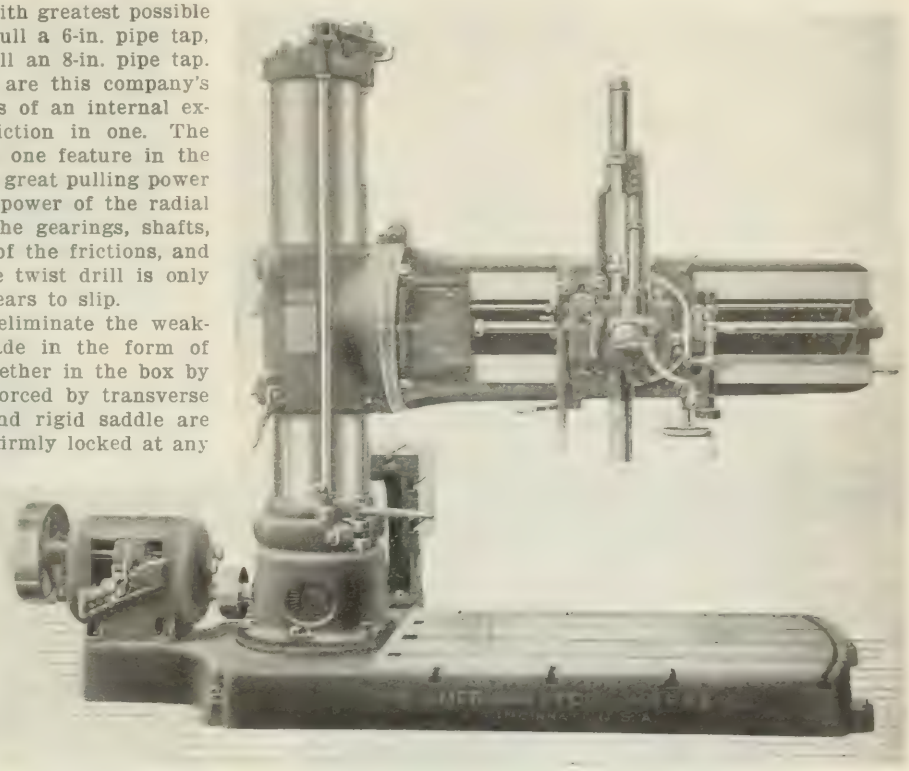
The head is of compact design and equipped with steel triple gears. It may be swiveled through a circle by a hand wheel and worm which engages a worm gear fixed to the head. This feature is of special value in setting the spindle for angular drilling. The worm holds the swiveling head in any position and eliminates the possibility of accidents through the head swinging around of its own weight when the clamping bolts are loosened. The head is moved rapidly along the arm by multiple gearing and a rack through the same hand wheel that swivels the head.

The saddle shaft, which forms a part of the power transmitting elements between the arm shaft and the spindle, is offset to one side of the spindle and is mounted in two long bearings, one of which is integral with the saddle and the other with the swiveling head. Power is transmitted from the saddle shaft through miter gears to a shaft in the front of the head from which the spindle is driven through spur gears. The spindle has 24 speed changes, speed box or cone pulley drive, with double friction counter shaft advancing in geometrical progression, ranging from 19 to 314 r.p.m. The wide range of speeds obtainable with its power and rigidity render this drill equally efficient when using either the ordinary carbon or high-speed twist drill, and particularly fits it for a wide range of tapping requirements.

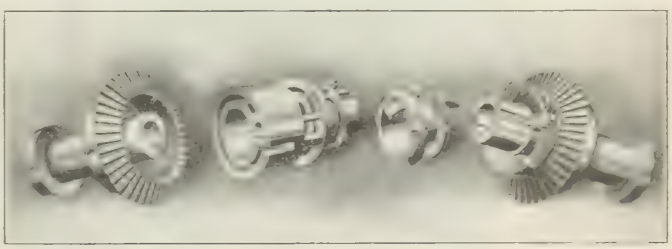
The triple gears are made of steel and provide one direct and two reduced speeds through the spur gears and the positive clutches. They are operated from the front of the head saddle by a convenient lever without stopping the machine. The triple gears are mounted on the back of the saddle and are fully enclosed by the upper walls of the arm, thus permitting the universal arm to be rotated through a circle. The feeding mechanism is located on the head and provides eight distinct rates of positive geared feed covering a range in geometrical progression from .006 in. to .060 in. per revolution of spindle. This mechanism is controlled by two dials, on the face of which the respective feeds are plainly indicated. The feed train is engaged and disengaged at the worm wheel through a friction clutch and lever, which lever also controls the quick advance and return of the spindle.

The depth gage and automatic trip are of improved and simplified design and will trip the spindle at any point within the limit of travel. This trip acts automatically at the full travel of the spindle to prevent any breakage to the feed mechanism, which latter may be tripped by hand at any point. The tapping mechanism is mounted on the girdle portion of the arm. This mechanism operates through double band friction clutches. The lever for operating this mechanism is placed on the front of the saddle and controls the starting, stopping and reversing of the spindle. Owing to the fact that the tapping attachment is located between the speed box and the triple gears, the frictions receive the benefit of the triple gear ratio and have comparatively light duty to perform, thus making possible unusually heavy tapping without undue strain and also permitting taps to be withdrawn at high speeds.

The column is of the double tubular type, the sleeve or outer column revolving on conical roller bearings. The column may be clamped in any position by a patented V clamping ring, which when clamped, binds the column sleeve firmly to the inner column or stump, which extends through the entire length of the sleeve and has a long bearing for the



American Full Universal, Triple Geared Radial Drill.



Double Band Friction Clutches.

outer column at both top and bottom. This construction provides the equivalent of a double column and affords great rigidity.

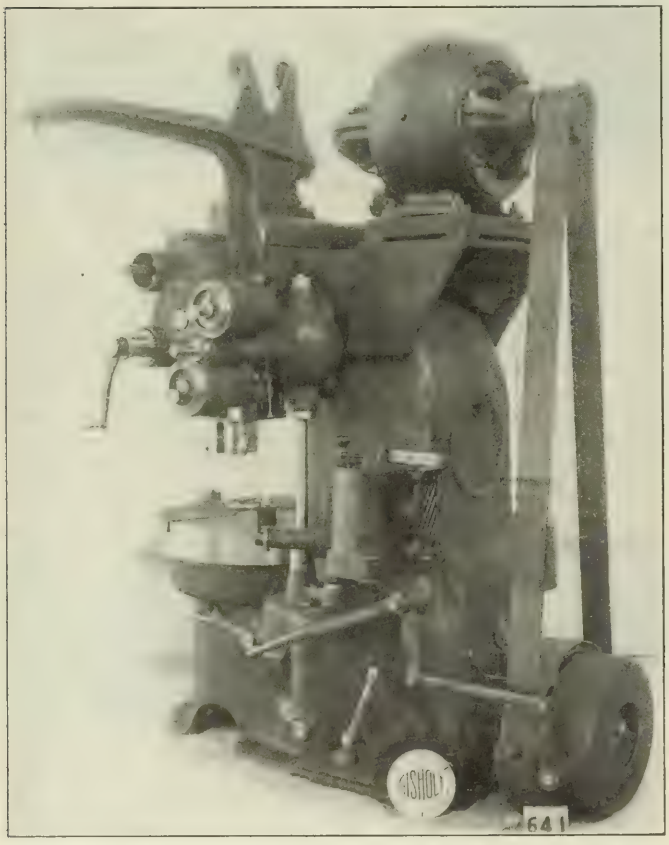
The speed box is of the cone and tumbler type, providing eight changes of speed. All gears in the box are made of steel, of coarse pitch and wide face, of the B. & S. 20-deg. involute pointed tooth system. An auxiliary train of gearing between the pulley and cone shaft is also provided.

The plain box table has a 28-in. x 28-in. top surface and also a liberal side surface, thus providing the equal of an angle plate. A universal table, consisting of a swivel base on which is mounted a heavy housing which carries the tilting top of the table, may be supplied with this machine. Its top can be swiveled to any angle within 90 deg., and either face can be set in vertical position by a segment and worm operated through a pair of reduction gears.

Renewable bronze bearings are used throughout this machine. The increased speeds and feed possible with the most modern machine tools require that they have very good lubricating facilities, and this feature is said to have received very careful consideration in the design of this machine. All gears subjected to severe duty are made of steel, the pinions being cut from bar stock while the gears are made from high grade steel castings. The regular equipment of this machine includes a plain box table, counter shaft, cone pulley drive and wrenches.

Gisholt Boring Mills.

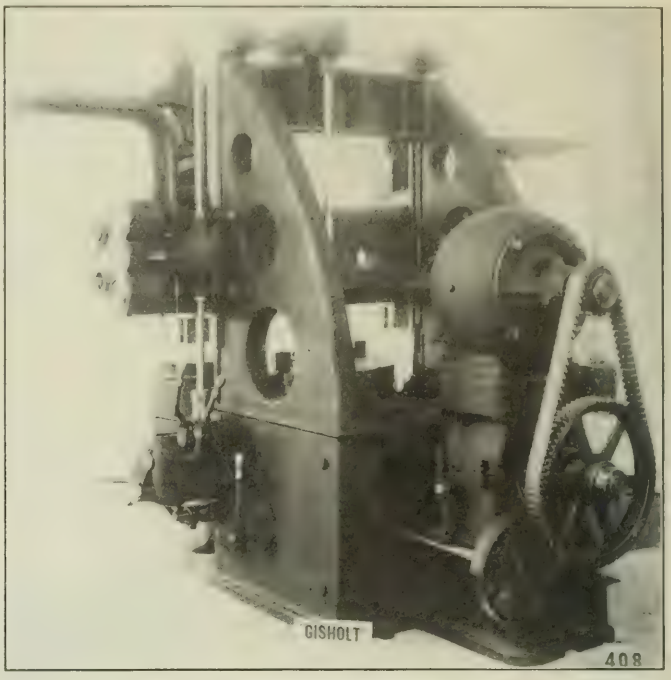
In addition to its large business in the manufacture of the Gisholt turret lathe, the Gisholt Machine Co., Madison, Wis., is now building a line of boring and turning mills in sizes from 30 in. to 84 in., and its long experience in the manu-



Gisholt Single-Head Boring Mill.

facture of lathes has been especially useful in the production of boring mills for rapid and accurate work, having important departures from the ordinary standard designs. The friction head stock was adapted to the boring mills and was successful from the start. By a convenient arrangement of levers the operator was given complete control of the table while standing at his usual position, and this was at once recognized as a decided improvement in this type of machine tool.

The work usually finished on boring mills is of such a character that measuring by caliper and scale is necessary and at each scaling of the work there is required a stopping of the table, thus needlessly consuming much time. The Gisholt mills were, therefore, equipped with micrometer in-



Gisholt Double-Head Boring Mill.

dexes on all feeds, enabling the operator to produce more accurate work than had been possible before. A feed trip was also designed for these mills so that the operator is able to set the feed so it would stop automatically at any desired point and this feed trip is positive and accurate. For rapid work, mechanism is required for quick and easy changes in feed and table speeds and the machine should be sufficiently powerful for the heaviest work of high speed steel. By the combination of the above devices in the Gisholt mills they now occupy in the trade a position as essentially rapid production machine tools. The 30 and 36-in. machines have single swivel heads and the large mills have double heads. The single head machines when belt-driven have a 4-step cone-pulley with two speed counter shafts and eight feeds. The double head mills are equipped with friction back gear headstock, giving six changes of speeds and through the two speed counter-shafts a total of 12 table speeds are available. These mills are also designed for motor drive and the illustration shows the design for this purpose in the single and double head mills.

In the former a variable speed motor, ranging from 400 to 600 r.p.m. is used. The 30-in. mill requires a 3-h.p. motor and the 36-in. a 4½-h.p. motor. The drum type non-reversing controller is conveniently located. In the larger sizes above 36 in. the motor is mounted directly on the head stock and the connection is made by silent chains or gears. The motor has a speed ranging from 600 to 900 r.p.m. and the power ranges from 7½ to 11 h.p.

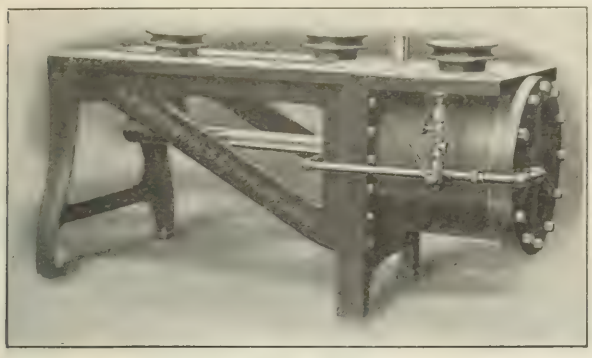
Pipe Bender.

This machine, made by H. B. Underwood & Co., Philadelphia, Pa., can well be considered a power bender and a bulldozer. It has a 20-in. diameter cylinder with a stroke of 15 in. The table is rectangular in shape, of ample dimensions and has numerous holes for the convenient location of dies or pins. By merely changing the position of the resistance studs many different shapes may be made without the use of a large number of dies.

The ram is placed underneath the table and slides in a

strongly built guide. Projecting from the ram and above the table is a stud on which any suitable size roller may be placed. This machine may be operated by either steam or compressed air, metallic packing being used with the former and leather packing with the latter. Compressed air, however, offers many advantages where it is possible to use it.

The piston takes air on both sides at all times. The operating valve is so made that only the amount of air required for actual bending is used. The air is transferred from the front side of the piston to the back side, and it is forced forward, due to the fact that the available area of the back side of the piston is the greater by an amount equal to the cross section area of the piston rod. This feature permits the piston being moved very short distances or held stationary at any position for measuring, etc.

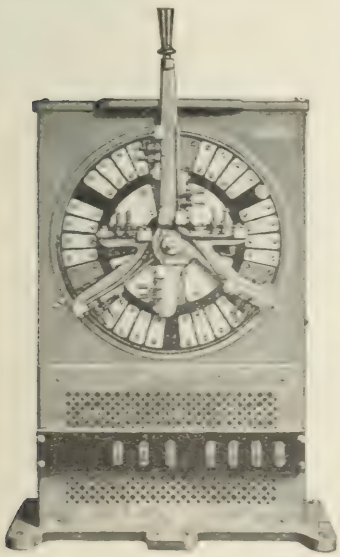


Underwood Pipe Bender.

A New Line of A. C. Controllers.

Until quite recently direct-current motors have been used most extensively for operating electrically-driven cranes and mill machinery. The flexibility and ease with which alternating current may be transmitted has, within the past few years, resulted in a large and increasing use of alternating-current motors for these applications.

For this character of work the series-wound direct-current motor has the desirable characteristic of high starting torque. In alternating-current motors this feature is very closely approached in the slip ring type of motor, and for the operation of cranes, mill tables and other reversing work of a similar nature, the development of the alternating-current motor has leaned heavily towards the use of the slip ring motor. Speed and torque control are obtained by inserting and varying resistance in the secondary winding of the motor.



A. C. Slip Ring Motor Controller.

The Electric Controller & Manufacturing Company, Cleveland, Ohio, has developed a comprehensive line of manually operated controllers for slip ring a.c. motors from 1 to 100 h.p. These controllers follow as closely as possible in design and construction the a.c. controllers which this company has been manufacturing for years. The wearing parts on its a.c. and d.c. controllers are, to a large extent, interchangeable.

The controller illustrated is for use in connection with reversing slip ring motors, either two-phase or three-phase. The resistance is self-contained, it being necessary to connect but seven leads to the controller. Where heavy currents are to be handled cast grid resistance is employed, and particular precautions are said to have been taken to insure satisfactory insulation.

All contacts are mounted on a vertical slate face, so that mill dust cannot settle between segments and causing short circuits. All contacts are of heavy copper and reversible. The use of screws or bolts with special threads has been avoided, and so far as possible wearing parts have been designed so that they can be manufactured by the user in his own repair shop.

The operation of all of these controllers is by a lever motion, which the manufacturers consider advantageous for crane and mill service. Although the cut illustrates a controller for slip ring motors only, the company has furnished and is prepared to supply controllers for squirrel cage motors and a.c. commutating motors.

Pneumatic Staybolt Riveter.

The Independent Pneumatic Tool Company, Chicago, has designed a new tool for driving staybolts in locomotive fireboxes. It is constructed the same as the long stroke hammer with a barrel and plunger, but instead of the regular handle, it is provided with a holder-on, or plunger barrel, intended to hold the tool against the staybolt. The tools are used in pairs, as illustrated, one on each end of the staybolt, and they are started and stopped at the same time. This prevents the possibility of the staybolt being loosened while the second end is riveted over. The best way to drive staybolts in locomotive boilers with this device is to block the boiler up and place one of the drivers with the holder-on end on the ground with the set or hammering end on the staybolt, the second staybolt driver being placed inside the firebox, with the set against the opposite side.



Pneumatic Staybolt Riveters in Use.

When one side of the firebox has been completed the boiler is turned over and the staybolts driven, and in this way no extra support needs to be provided for the holder-on end. Two different centers are supplied, one cup-shaped and one pointed. The former fits over the end of the staybolt already in place and the pointed center fits into the hole before the staybolt is put on.



Pneumatic Staybolt Riveter.

The machines are provided with a throttle valve and a cut-off valve the same as the regular pneumatic hammer. After the set is placed on the staybolt the cut-off valve is open, and the plunger is held against the rear support, the

tool is ready for operation. The throttles on the two tools are then open at the same time and the hammers start. A locking device is provided for the trigger, so that the operator's hands are free to turn the tool back and forth while driving. Two different sets are provided, one plain and one with a taper point in the center. The former is cupped like the river set. It has a raised flange in the shape of a clover blade instead of two. This is for the purpose of reducing the surface in contact with the staybolt and gives the piston a better chance to upset the staybolt. The set is used on the inside of the firebox and the pointed set on the outside drill end, the point preventing it from closing the hole.

The valve mechanism is a new construction, both valve and block being hardened and ground. These staybolt drivers are a great improvement over the old method, as one man easily handles each tool, and the tools being self-supported, do not tire the operator with constant jar.

Magnetic Chucks.

The locomotive builders and machine tool makers are using magnetic chucks to advantage on planers, shaping machines and surface grinders, but few railway shops have adopted them, and it may be of interest to give some account of them. Magnetic chucks are used for holding iron or steel parts on machine tools without the use of bolts, straps or jaws. They are adapted to flat pieces either parallel or taper, such as gibs, keys, straight edges; for facing piston rings, discs,

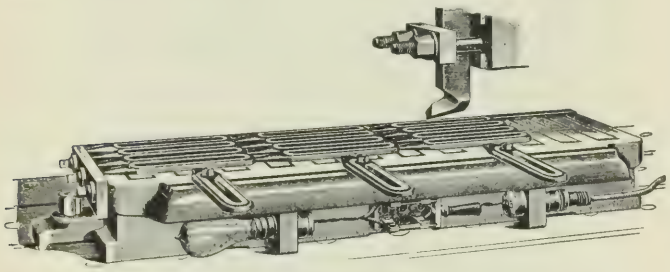


Fig. 1—Walker Magnetic Planer Chuck for Parallel Work.

washers and collars. They were first introduced in 1896 by the Walker Co., Worcester, Mass., and are now generally used in the more progressive machine shops. A number of difficulties have been overcome and the art has progressed so far as to make standardization possible. It was found desirable in large chucks to build them in separate magnetic sections, any one of which could be used separately. In making chucks for grinding machines it was necessary to adapt them to the floods of water used.

On large chucks, due to the action of residual magnetism, the work is sometimes difficult to remove after the switch is open. This was overcome by the use of a demagnetizing

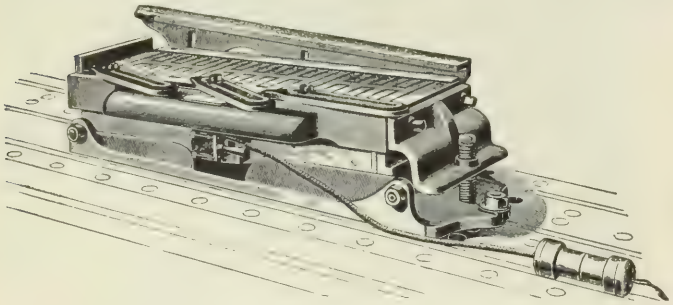


Fig. 2—Walker Magnetic Planer Chuck for Tapering Work.

switch, which frees the chuck face and leaves the work loose. The work itself is sometimes magnetized. For planer work magnetic chucks are not adapted for high work or for short pieces, or for work with a small area of contact surface. Where these chucks are adaptable for planer work they are a very desirable fixture, saving time, insuring greater accuracy, and enabling difficult work to be held that would seem almost impossible to hold by ordinary means. The planer tool will become magnetized and fine iron particles will adhere to it, but this is not found a serious objection.

Fig. 1 shows a large Walker chuck for a planer, which may be made either 31 or 36 in. long, and Fig. 2 shows another planer chuck arranged for holding tapering work. The chuck

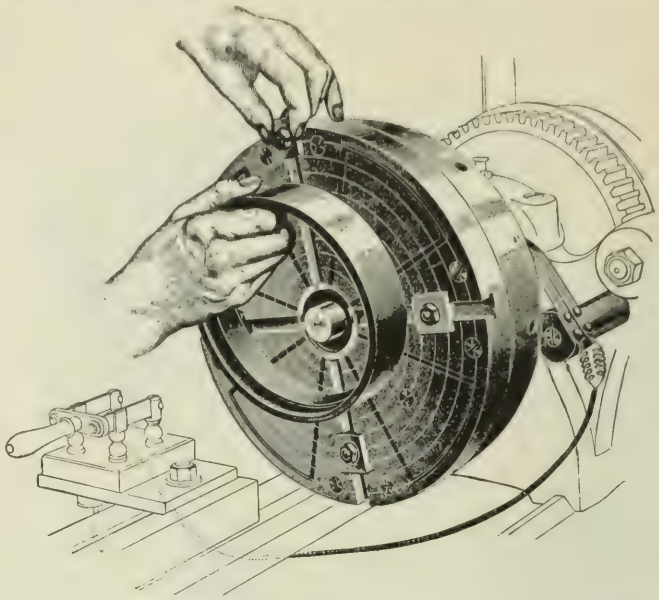


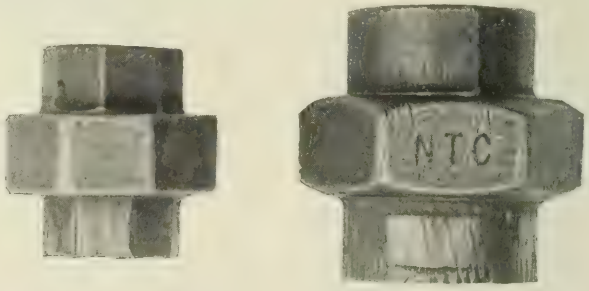
Fig. 3—Walker Magnetic Face Plate Chuck for Lathe.

is hinged on the bolt at the left, elevated by the screw in the end shield, and clamped by the bolt at the right. The principal use of magnetic chucks is for grinding purposes, and they are especially useful in the tool room. They are also used on rotary face plates as shown in Fig. 3, and are specially adapted for facing piston and packing rings, etc.

Alternating current cannot be used for these chucks. If water is used, the chucks must be specially fitted. The magnetic chucks here illustrated are manufactured by the pioneers in this industry, O. S. Walker & Co., Worcester, Mass.

Kewanee Pipe Union Test.

In the accompanying illustration are shown two Kewanee unions, an octagon and a round. These were taken at random from stock and tested as follows: The unions were placed in a steam line having three valves connected by nipples, there being a union on either side of the center valve. After tightening the union connections with an ordinary wrench, steam



Kewanee Pipe Unions.

pressure was admitted, the outer valve opened, the air blown from the piping and the valve closed. After allowing the pressure to act for a time, the steam was shut off, the outer valve opened to blow out the steam and the union unscrewed from the brass end. This operation is said to have been repeated over 1,000 times on each of the unions, and that neither showed the slightest sign of leakage of steam.

After the completion of this test, each union was taken to the company's union department and there subjected to the usual test, that of 100 lbs. air pressure under water. Each of these two unions is said to have been absolutely tight during the second test.

These unions are made by the National Tube Co., Pittsburgh, Pa.

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In the general news columns there is published at some length an abstract of the majority opinion of the United States Supreme Court in the Missouri river rate case. A careful reading of the opinion will show that the court confined itself very strictly to the narrow question of whether the Interstate Commerce Commission had or had not the power to make the order reducing that portion of the through rate from Atlantic seaboard cities to Missouri river cities charged by the railways between the Mississippi and the Missouri. The majority opinion emphasizes strongly the attitude of the court as treating the orders of the Interstate Commerce Commission as presumably reasonable; but, on the other hand, apparently neither in this case nor in the cases cited in this opinion, does the court hold that it will not inquire into the reasonableness of the commission's orders if sufficient evidence is presented to show that the order worked an injustice to the railways concerned. An abstract of the Denver case is not published because it simply follows the reasoning and conclusions in the Missouri river rate case. In the short dissenting opinion, written by Justice White and concurred in by Justice Holmes and Justice Lurton, stress is laid on the fact that the dissenting justices do not think it necessary to go at length into the reasons for their dissent, because "the reasoning by which the court now gives to the order of the commission the narrow basis thus stated as the solution of that question, depends upon the idiosyncrasies of this particular case, and involves no principle of general importance."

If a distant signal is too far back from the home signal, so far that enginemen may run a good distance after passing it before reducing speed, it ceases to be of practical value and its use is an absurdity; this is the view of Mr. Arkenburgh, as expressed in another column. As there are a good many signals thus placed and as we seldom, if ever, hear of any bad results from their use, this strong language is somewhat surprising; but as Mr. Arkenburgh is in close touch with operating officers in the middle west we must assume that the view which he expresses is not entirely without support. We must assume that western runners do not properly heed the distant indications. In the effete east, however, the requirement that a runner shall learn the length and character of every block is not considered burdensome. And those officers who are most thoroughly old-fashioned in their habits of mind feel ashamed if they have to confess to the presence on their division of any runners who do not know the road perfectly. Moreover, where some of the trains run at 70 miles an hour and it is therefore necessary to put the distant three or four thousand feet back, it is inevitable that slow trains shall get the distant indication too early; but with good discipline the thing can be managed. But Mr. Arkenburgh's remedy is quite illogical. He cannot trust his runners to hold an indication in mind for a minute or two, yet he proposes to trust them to "pick up" home signals without any landmark whatever. As, in time of fog or blinding snow, this would necessitate serious and frequent reductions in speed, he would have to do a good deal more trusting than he bargained for. Unless his trains were all slow and easy to manage he would have to trust the runners to lose time and then trust them to have the courage to face the superintendent who, very likely, expects them to accomplish both safety and speed, however poor the facilities. Not the least of the difficulties of the general manager is that of finding superintendents who can be trusted not to take this unreasonable attitude towards enginemen.

The present railway commission of Connecticut consists of three members with a salary of $3,000 each. It has been for years an infirm body in its personnel, a "political" commission in its recognized character and a target of just criticism by those familiar with railway affairs in the state. One of its members, who lately died, was a party "boss," and one of the present members is now handling the canvass of United States Senator Buckley, who is a candidate for re-election. Reform of the commission is, however, at its dawn. Following last year's strenuous and unsuccessful fight for a new public service commission—a matter sure to figure actively in the coming state campaign—the State Business Men's Association has published a new bill significant in its pointings toward betterment. It raises salaries from $3,000 to $7,500, equalizing them with those of the higher state judges; increases the number of commissioners from three to five; allows them to hold shares in the public service corporations of which they have purview; and, should it pass the legislature in proper shape, will forbid all political activity on the part of the commissioners. The proviso al-

lowing stockholdings is, in particular, a cheering reaction from the policy of some states which seem to go on the theory that a man must divest himself of interests and become a pauper to qualify for a public service commission. In that category has belonged Connecticut, which refuses to let her railway commissioners hold either steam railway or street railway shares. The new bill, which is almost sure to be the leading measure before the next state legislature, prefigures what must sooner or later be the trend of state railway commissions in the country at large. Their expanded powers, higher responsibilities, and the call not only for integrity but for trained knowledge, some, at least, of it technical, must inevitably raise ere long the average personnel. In such a commission it is the man rather than the law that counts, and the ounce of training, courage, experience, judgment and personal quality is worth in practice the ton of statute.

One of the stock arguments for stringent regulation of railway rates is that the government, by making large grants of land to some roads, made it possible for them to be built and thereby acquired the right to limit their earnings to a "fair return." If some of those who use this argument would investigate just what the roads got out of their land grants they would be both enlightened and surprised. For example, the land donated to the Union Pacific in what is now the state of Wyoming included a 400-ft. strip through the state for 445 miles, or approximately 22,196 acres. In 1862 this was worth, at the government's price, $1.25 per acre, or $27,745, an amount less than what it would now cost to reproduce a half mile of the Union Pacific. Besides this, the government gave the Union Pacific 5,000,000 acres in Wyoming. While, as already stated, the government's price was $1.25 per acre, the Union Pacific sold over 70 per cent. of this grant for from 44 cents to $1.25 per acre. It underbid the government in selling land to settlers because it was anxious to develop the country along its lines and thereby increase its traffic. Then it was a benefactor. When now it charges high enough rates for hauling freight for the people whom it thus settled along its lines to earn a return approximating the ordinary rate of commercial profit, it is a malefactor!

The Florida East Coast Railway is best known to the many fashionable (and other) people who pass over it on their way to and from the winter resorts on the east coast of Florida during the season. At that time they find fine, luxurious passenger trains, which are often crowded, and are not much bothered by meeting or passing freight trains. This tourist traffic fairly begins in December, gets into full swing in January (the finest hotels not opening till then), and comes almost to a full stop by the end of April. There is but a very narrow strip of cultivable land—at least of cultivated land—between the sea and the piny woods in the north and the everglades in the south, some of which is very valuable, because it permits the growth of some semi-tropical fruits and has a climate for winter market-gardens, with a direct outlet to market. The monthly reports of earnings made to the Interstate Commerce Commission show some of the effects of this peculiar state of things. In the year to June 30, 1909, this line earned gross on its 584 miles $3,373,554, or $5,576 per mile; and net, $1,835 per mile, against $937 net per mile the previous year, when it averaged 535 miles of road. Of these earnings nearly 34 per cent. was from passengers. There seems nothing very remarkable in that. But in the five months ending with November, 1909, the passenger earnings were $207,785, while in the following three months they were $544,303—an average of $41,557 in the first five months, and of $181,434 in the winter months—which suggests some problems in the use of equipment, trainmen, etc. The freight traffic is also heavier in winter, but the contrast is not so great. It yielded an average of $92,707 per month, June to November, and $138,501 for the three winter months. This fluctuation of traffic with the seasons affects the profits to a much greater degree. For the first five months of the fiscal year the Florida East Coast Railway was a charitable institution in 1908, the working expenses and taxes having been $136,132 greater than the gross earnings. And in 1909 the net for these five months was but $54,870, an average of $10,974 per month; while in the three months of last winter they rose to $353,288, or $117,763 per month. The railway at its best, however, is not a mine of gold. It is known that it, or its owner, owns a chain of large and popular hotels on the line, which are usually well filled and sometimes crowded from early in January until near the middle of April; and he, or the company, owns a considerable amount of land on the line. Whether these enterprises altogether yield a satisfactory interest on the investment cannot be told by reports of the railway's earnings; but people will draw their own inference as they see it pushed vigorously through the sea to Key West.

THE ARRESTED ADVANCES IN FREIGHT RATES.

By the agreement reached by President Taft and representatives of the railways at conferences at the White House on Monday and Tuesday the railways both gain and lose. The western roads will be allowed to collect the advances which they already have put into effect. The roads in general will be relieved of their fears of sweeping prosecutions of all roads under the anti-trust law. On the other hand, the conferences seem to have settled it that no more important advances in rates will be made in the United States without the previous express approval of the Interstate Commerce Commission. After the bill now pending in Congress is passed, the roads will have no legal right to make advances against which anyone complains, until the commission has considered the complaint; and the action of the administration in attacking the western roads in the courts under the Sherman act has practically put this provision of the bill into effect before its enactment. To all intents and purposes the day when the railways of this country can freely initiate their interstate charges is past. We have government regulation of rates in full flower. The real rate making power is no longer the traffic managers, but the Interstate Commerce Commission. The traffic managers may still make reductions, but as they no longer have power to raise rates which they have reduced, it is possible that the number of volutary reductions they will make in the future will be very small compared with what it has been in the past.

The course of the government stops advances in rates until after the pending railway bill shall have been passed and gone into effect and the commission, acting under it, shall have had time to investigate the reasonableness of the proposed advances. It will be at least a week or two before the new law goes into effect. It will take the commission probably a long time after that to make its investigation of the proposed advances, even though it does not adjourn soon for its summer vacation. Consequently, even if the commission shall finally hold some or all of the proposed advances reasonable, it will be a long time before the railways will be able to begin to collect them. Meantime federal boards of arbitration continue to render decisions in favor of advances in wages, which not only go into effect at once, but which are retroactive. Only last week the board which arbitrated the differences between the western railways and their firemen made an award of advances in wages of 10 to 12 per cent. which was made effective from May 16; and the roads already are paying increased wages to many other classes of employees.

Wages, like death and taxes, are certain; income, for the next few months at least, is uncertain. The railways will be in the same situation as that of which merchants and manufacturers complain when a congressional discussion of the tariff on imports unsettles all their calculations for months

at a time. The commission at best must be slow; and we shall be lucky if important rate questions do not get into the courts, which are likely to be slower. The President has the fairest intentions, no doubt; and the commission has not been intentionally unfair to the railways. But the roads do feel that unintentionally it has been unfair. Perhaps they are mistaken about this. Perhaps its seeming unfairness has been due to the fact that heretofore it has had power when it found an unfair discrimination to correct it only by reducing the higher rate. It may be that when the general question of advances in rates is presented to it, it will show that it is just as willing to correct discriminations by raising rates that are too low, as by reducing those that are too high. If so, it may be practicable to make a general readjustment which will put charges as a whole on a fairer basis. However that may be, it is evident that the main thing to be aimed at and hoped for now is the early presentation to the commission, and, if necessary, to the courts, of the general question of whether the roads are entitled to changes in their tariffs which will increase their earning capacity. The sooner that question is settled the better it will be for every industrial, commercial and financial interest. Nobody denies that the railways have to bear their full share of the burden of the "increased cost of living," nor that as a whole their rates have remained nearly or quite stationary for years. By all rational analogies the burden of proof should be on the government (or the shippers) to show that the volume of railway business has increased in the very large percentage that would be necessary to offset the great increases in expenses that are being everywhere reported.

COMPOUNDING AND SUPERHEATING IN LOCOMOTIVES.

The successful application of compounding or superheating to locomotives depends to a large extent on the consistent observance of a few fundamental principles, which, though plainly laid down in the text books and taught in the technical schools, have not always been properly recognized in connection with locomotive operation. Thus, the relation of the economy of compounding to speed in locomotives has not been understood or there would not have been so many compound express locomotives built with the expectation of saving a large percentage of fuel. Neither would the failure of these engines to show a good economy have discouraged the application of the compound principle to the slower moving freight locomotives.

With the gradually increasing use of superheating on locomotives there is a liability of similar confusion and disappointment. It is an interesting fact that with superheating the relation of speed to economy is reversed; that is, more saving will be obtained from the application of superheating to passenger engines than to the slower freight locomotives. An appreciation of these facts seems to have dictated the policy of the Lancashire & Yorkshire Railway in its efforts to save fuel by compounding and the use of superheaters.

The methods used and the reasons for them are explained in a very interesting paper read at a meeting of the Institution of Mechanical Engineers, March 17, 1910, by George Hughes, chief mechanical engineer of that railway. On this line compounding has been applied only to freight engines, and superheating has effected less economy on them than on passenger engines. In the paper referred to the author points out that the value of compounding largely depends upon reduction of the range of temperatures in the cylinders and that high piston speed of itself reduces this range in express service even with early cutoff, but these conditions do not exist in slow running freight engines. A piston speed of 600 ft. per minute appears to be the critical point. Below this speed condensation in the cylinder is sufficient to justify a reduction of the range of temperature by compounding. Above 600 ft. per minute the period is too short for the interchange of much heat between the steam and the cylinder walls, and little improvement can be effected by compounding passenger engines.

With a 30-in. stroke of piston and 62-in. wheels at 25 miles per hour the piston speed is 632 ft. per minute, and this is a high average speed for freight service. Passenger locomotives with 30-in. stroke and 84-in. wheels make 1,116 revolutions at 60 miles per hour, and at 45 miles per hour, which may be taken as a fair average running speed, the piston speed is 837 ft. per minute; with smaller drivers the speed would be still higher. The rule thus applies well to American practice and in a simple manner explains the failure of our compound passenger locomotives to show a fuel economy superior to equivalent simple engines. The four-cylinder balanced compounds, which have been built in large numbers in this country, may have been justified on account of their balanced feature, as the extra pressure on the rails at high speed is comparatively small in amount. These engines also have an advantage over those with two cylinders in their large cylinder volume and larger hauling capacity at high speed, but so far as we are informed a superior fuel economy has never been demonstrated by their measured performance.

Four-cylinder balanced compounds have also been built with large drivers for fast freight service, but it is a remarkable fact that this arrangement of cylinders has not been applied to consolidation engines where the slow piston speed would enable them to operate with maximum economy. The enormous freight traffic of this country is largely hauled by simple consolidation locomotives. Mallet compounds have, in many instances, shown a fuel economy of 25 or 30 per cent., and in some cases 40 per cent., in coal per 100 ton-miles, as compered with the simple consolidation locomotive previously used, but this saving would not be nearly so large if the comparison were made with compound consolidation locomotives. Many railways do not have heavy mountain grades which would justify the use of Mallet compound engines, but there is no good reason why they should not obtain a substantial improvement in fuel economy by the use of four-cylinder balanced compound consolidation locomotives.

The fuel economy secured by highly superheated steam in passenger service has been fully demonstrated and on account of the lower cost of application it might be considered a more attractive method of saving coal in freight service than by compounding. But under ordinary conditions an equal amount of saving by superheating is not to be expected in that service. The reason for this is given in Mr. Hughes' paper. We have not before noticed this important point referred to in discussions of superheating in locomotives. The test of compound freight engines, compared with those with the superheater, showed that a proper interpretation of the time element is necessary, because this element can place the coal consumption on either side of the balance sheet. The superheater freight engine showed an advantage in fuel economy over the compound after deductions were made for detentions, shifting and other time losses incident to freight service, but when these detentions were included the compound was more economical than the superheater. These results indicate that the frequent stoppage of trains is prejudical to superheating. When there is a stop of about four minutes the temperature of the superheater elements drops to about that of saturated steam, and they must be reheated after each stop. The absorption of heat in this process reduces the economy. The same thing occurs on an undulating line where the engine is running down grade with a closed throttle much of the time.

The improvements in locomotives intended for the saving of fuel, which are now receiving the most attention, are the compound feature in the Mallet articulated locomotive for freight service and the use of the superheater for passenger engines, but the consolidation type of engines, which is doing the large bulk of the work on railways, is built as a simple

engine, being the same in principle as it was when it first appeared on the Lehigh Valley in 1866. Consolidation engines are consuming about twice as much coal per annum as engines in passenger service, and the saving of fuel that might be effected by compounding the very large number of engines of this type now in service offers one of the largest opportunities for economy at present afforded to the mechanical departments of railways.

NEW BOOKS.

Metal Spinning. By C. Tuells and W. A. Painter. The Industrial Press, New York. 38 pages; 9 in. x 6 in.; paper. Price, 25 cts.

This treatise, No. 57, is one unit in a comprehensive series of reference books, each covering one subject. The whole series comprises a working library of mechanical literature in which the mechanical engineer, the master mechanic, the designer, the machinist and tool maker will find the special information he wishes to secure, selected, carefully revised and condensed. This treatise gives a description of spinning in general and outlines some of the methods and tools used in spinning for rapid production.

Surveyor's Handbook. By T. U. Taylor, Chicago. The Myron C. Clark Publishing Co. 310 pages; 4½ in. x 6½ in.; 116 illustrations; flexible cover. Price, $2.00.

To a man who can read understandingly, this little book contains a great deal of information. It is one of those productions that would be of value to an engineer who has been out of practice for a time and has become rusty in the matter of details, and to whom a suggestion is quite sufficient to bring everything back again. The book, however, does more than suggest; it takes up the details of surveying and the handling and use of instruments in a manner that even a novice could follow. For example, in the chapter on chain surveying, there are the usual descriptions of the various types of chains and tapes, with formulae for temperature, sag and stretch corrections. This is followed by chapters on compass and transit surveying, in which methods and operations are well covered with brief descriptions. Leveling and computation of earthwork, city surveying and methods of correction are treated in the same concise way. In fact, there is very little in the work of the surveyor that is not touched upon, and, indeed, pretty well covered in this little book. At the end there are the usual tables of logarithms of numbers and sines, cosines, tangents and cotangents, and a table of earthwork computations.

Letters to the Editor.

THE INTERNATIONAL RAILWAY FUEL ASSOCIATION.

Chicago, June 6, 1910.

To the Editor of the Railway Age Gazette:

I note on page 1331 of your issue of June 3 editorial comment on the second annual meeting of the International Railway Fuel Association. I beg to endorse the statements contained in your editorial, and in doing so I feel that deserved criticism of the work of this most important association will always make for improvement. I have never heard disputed the statement that fuel is, while one of the most important, at the same time one of the most neglected features of railway operation. Everybody admits the fact, but, withal, we do not rise to the occasion. Progress is no doubt being made, but the work is moving slowly.

We were unfortunate in holding our convention at a time when the coal mines of six states, and serving an immense area of territory, were suffering an unwarranted suspension of activity; this fact was not only responsible for keeping a great many of our members away from the meeting, but also prevented the more active members from giving the work of the association the attention its importance warranted during the period immediately preceding the meeting. What the International Railway Fuel Association needs is the active co-operation and encouragement of the general managers of the railways whom its membership serves, and it is the intention of the Executive Committee to make a direct appeal to these gentlemen to give the association such assistance and encouragement as will insure a meeting next year of a character that will not in any measure be disappointing.

The association, to the best of its ability, tried to get before the railway and coal consuming public the immense economic loss that the railways are suffering at the present time, due to the mine suspension referred to above, and if this organization can ultimately secure by some means an elimination of unwarranted mine suspensions no apology for its existence need be made.

Eugene M'Auliffe,
Member, Executive Committee.

THE MALLET LOCOMOTIVE.

Boston, Mass., April 25, 1910.

To the Editor of the Railway Age Gazette:

Your recent articles* on the internal and track resistances of Mallet locomotives and your later comments* on the adaptability of this type for high speeds are of great interest. The large frictional resistance must have been anticipated by all thoughtful persons.

It is a matter of surprise to me that the Mallet locomotive "takes" as much as it does and no doubt a part of it is due to capable salesmanship. That their use is wise in most cases where adopted I do not doubt, for their economy in fuel, repairs and attendance per ton-mile must be lower than with other types. This comes, of course, from their enormous size and the compound feature. It can no longer be said that American railway men are afraid of complication, for the Mallet locomotive is the maximum of complication thus far placed on wheels. "Complication" was familiar to my ears 18 or 20 years ago when I was trying to introduce a compound locomotive. It is, of course, justifiable when much is to be gained by it, and it would seem, now, that this is fully understood. Everything possible must be done to reduce the cost of hauling freight, and hence the justification of the Mallet locomotive.

The Mallet locomotive, however, is far from being a machine that is satisfying to the imagination, for who can contemplate an extraordinarily long boiler with an engine under one end rigidly connected to it, and another under the other end not rigidly connected to it, and "hitched" to the former by a link and pin. The front engine moves violently sidewise with irregularities and curvature of track and it must often appear as if the boiler was going over the fence. It is prevented from doing so only by the comparatively short wheel base under the trailing end. Such an arrangement must require courage on the part of both designer and operator and is surely "unmechanical."

There is another way, however, to design a double-truck locomotive, such that the friction will be less than with the Mallet; it will take curves and irregularities with "sweetness," and it may be operated at the greatest possible speed with safety. I refer to the Fairlie locomotive. This engine should now be appreciated in this country. Such engines when built with two steam trucks have thus far had boilers with the firebox midway between the ends, two sets of tubes, two smokeboxes and two smokestacks. This arrangement for oil burning might be used now, but for coal burning it could not be tolerated, and of course if the engines were compounded it would hardly be practicable unless each

*"The Mallet Locomotive in Service," March 11, page, 513. "The Speed Limits of Mallet Locomotives," April 1, page 870; April 29, page 1077; May 20, page 1249. "Performance of Mallet Engines on the Great Northern," April 15, pages 979 and 997. "The Mallet Compound Locomotive and Its Limitations," April 22, page 1025.

truck was a compound. The center firebox has some advantages. It can be of any width and length, on grades the water level does not change, and if there are any objections to long tubes it overcomes them. There is no reason, however, why a boiler with the firebox at one end and a smokebox at the other cannot be mounted on two center bearing swing trucks and all connections be satisfactorily made for pulling a train. What, then, is the objection to such a locomotive? I can see nothing except a few more flexible steam pipes, one set of which would contain high-pressure steam. William Mason successfully solved this part of the problem when he introduced the Fairlie locomotive into this country, and some of them (single ended) can be seen on the Boston, Revere Beach & Lynn, where no other type has ever been used. Mason built only one double-end locomotive, named "Janus," which was finally sold to the Lehigh Valley.

Such a locomotive would track and ride as easily as a Pullman car, and for the same reasons. Likewise it would take curves at high speed. The center bearings would be large in diameter, and, in view of the great success of Timkin roller bearings in automobiles, could rest securely on conical rollers operating in grease in a tight casing, which would still further reduce the internal and track resistances.

Referring to your article in the April 22 issue, wherein you seek to show the lack of need of Mallet locomotives for high speed; when one sees the frequency with which the Twentieth Century Limited and other fast trains are provided with two locomotives, the reason for an extra heavy and powerful locomotive is almost apparent. The same causes of economy would result from their use as is the case in freight service.

In regard to the common types of locomotive for extra heavy and fast passenger service, the consolidation type is still available and may be provided with larger boilers and cylinders than ever, and can probably be, in some satisfactory way, compounded. The late Geo. S. Strong used to say that the consolidation type of locomotive would sometime surely be used for passenger service.

F. W. DEAN.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Philadelphia, Pa., May 28, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The letter of C. B. Chaney, Jr., which appears on page 1294 of your issue of May 27, is of particular interest to me, as I too have for some time been of the opinion that the eight-wheel engine was abandoned too soon. I think, however, that the design submitted by Mr. Chaney would hardly be practicable for high-speed service, although I have no doubt that at speeds of 60 miles per hour and less, which are now quite common, the design would prove to be very efficient.

As several of our railways are successfully maintaining regular schedules which require speeds of 60 miles per hour, let us pass to the consideration of a train speed of 80 miles per hour, which we may consider exceptional at present. At the speed of 80 miles per hour, the 7-ft. driving wheels of Mr. Chaney's experimental design would make 320 revolutions per minute. At this speed it is fair to assume that if the boiler supplied plenty of steam to the engine we could get a mean effective pressure of 60 lbs. per square inch and the engine would develop 1,756 h.p. Twenty-eight lbs. per horse-power-hour is a good average water rate for a simple engine of present designs. At this rate, the engine would require 49,168 lbs. of water per hour to be evaporated by the boiler, which is at the rate of 17.44 lbs. per square foot of heating surface per hour. Assuming that a pound of coal will evaporate 7 lbs. of water, it would be necessary to burn 7,024 lbs. of coal per hour, which is at the rate of 208 lbs. per square foot of grate surface per hour. These rates of evaporation and combustion are exceptionally high, and I doubt if they could be successfully maintained under service conditions.

However, I do not consider these valid arguments on which to reach the conclusion that the eight-wheel engine cannot be adapted to heavy, high-speed passenger service. As Mr. Chaney has suggested, the application of refined valve gears to well designed compound cylinders and the use of superheated steam would easily place the eight-wheel engine in the front rank of high-speed power, for the fact that the eight-wheel engine has less internal resistance than any other type has never been seriously disputed.

I think that it is entirely within the range of possibility to reduce the water rate of locomotives to 20 lbs. per horse-power-hour. At this rate Mr. Chaney's engine would only require the evaporation of 35,120 lbs. of water per hour. Assuming that by the application of a superheater the evaporative heating surface of the boiler was reduced to 2,400 sq. ft., the rate of evaporation would be 14.63 lbs. per sq. ft. of heating surface per hour. If 1 lb. of coal would evaporate and superheat 6 lbs. of water to steam at a pressure of 205 lbs. per sq. in. and a temperature of 500 degs. F., it would only be necessary to burn 5,853 lbs. of coal per hour, which is at the rate of 173 lbs. per sq. ft. of grate surface per hour. These figures are easily within the limits of past performances and no doubt could be attained without unduly increasing the back pressure to produce draft.

To accomplish the above results I would suggest that Mr. Chaney convert his eight-wheel engine to a three-cylinder compound, with a cylinder ratio of not less than 1:2.75, and clearance not more than 3½ per cent. of the high-pressure piston displacement and 2½ per cent. of the low-pressure piston displacement. Use one high-pressure cylinder placed on the center line of the engine and two low-pressure cylinders placed outside in the usual position on simple engines. Quarter the outside cranks and place the inside crank 135 degs. equidistant between the outside ones. This arrangement would give an engine nearly balanced as to reciprocating weights and would not be destructive to the track, even with the great weight of 120,000 lbs. on the driving wheels, four in number.

I would suggest a Pielock superheater with 418 sq. ft. of heating surface. This would leave 2,400 sq. ft. of evaporative heating surface in the boiler, which should be ample for the requirements of the engine. The high-pressure cylinder should be equipped with plug valves communicating through the cylinder ports with the high-pressure valve chest, so that when starting full boiler pressure could be admitted to the low-pressure cylinders; thus a starting tractive effort of 36,427 lbs. could be exerted, all of which could be utilized by the use of sand. After the engine is under headway, the adhesive weight of 120,000 lbs. should be sufficient.

I would suggest to Mr. Chaney that the Corliss steam distribution, or a close approximation to it, should be used on the high-pressure cylinder, while the valves of the low-pressure cylinders should work at full stroke at all times with a constant cut-off of about 85 per cent. of the stroke. With this arrangement compression could be adjusted to not exceed 4½ per cent. of the piston displacement in the low-pressure cylinders, while in the high-pressure cylinder the compression would vary with the point of cut-off from 5 per cent. to 2½ per cent. of the piston displacement. This would make it possible to reduce the cylinder clearance to the lowest possible volume and secure maximum economy in the use of steam.

I am firmly of the opinion that at some not far distant day some one will be found who will be progressive enough to take the retrograde step, which Mr. Chaney mentions, which will reveal to the engineering world the fact that the possibilities of the eight-wheel engine have not nearly been realized; at least, with respect to high-speed passenger service.

CHAS. F. PRESCOTT,
Mechanical Engineer, B. A. P. Co.

THE ERECTION OF THE ST. PAUL'S MISSOURI RIVER BRIDGE.

BY J. H. PRIOR.*

The Chicago, Milwaukee & St. Paul recently completed the construction of a new bridge over the Missouri river at Mobridge, S. Dak., where this road connects with its Pacific coast extension, the Chicago, Milwaukee & Puget Sound. The bridge was designed and constructed by the bridges and building department of the road, under the direction of C. F. Loweth, engineer and superintendent of bridges and buildings.

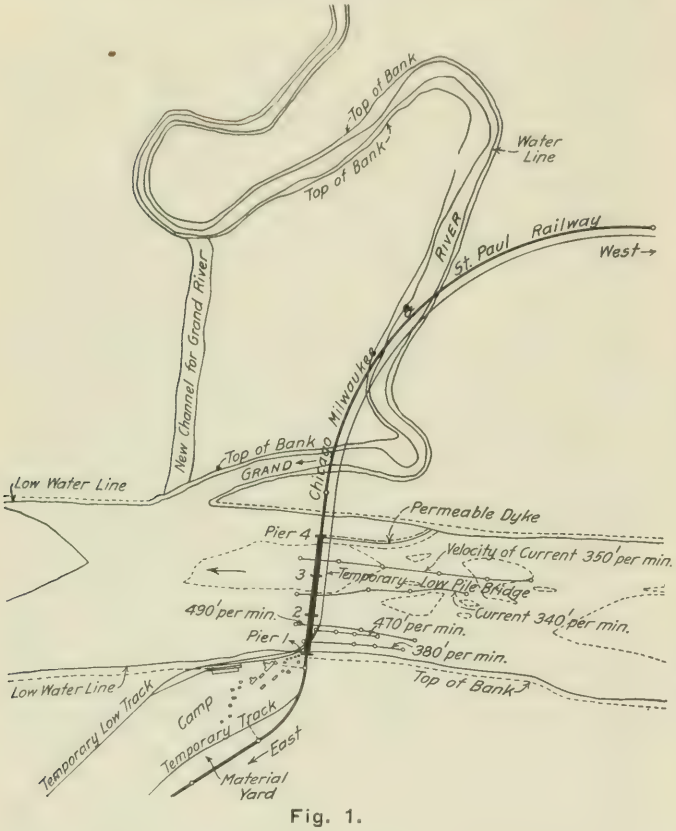


Fig. 1.

At the site of this bridge the low water channel has a width of 1,450 ft., which increases 100 ft. at times of high water. As an act of Congress required a clear headroom of 50 ft. above ordinary high water, the grade of the track on the bridge was placed at an elevation of 65 ft. 6 in. above low water. The bridge was designed for Cooper's E-55 loading per rail, and consists of three 420-ft. through pin-connected truss spans over the main channel, approached from the east by one 125-ft. deck span, and from the west by 283 ft. of steel trestle. A long wood frame trestle approach has since been partially, and will ultimately be wholly, replaced by an earth embankment.

In Fig. 1 the location of the bridge is shown and in Fig. 2 it is shown in outline. The abutment forming the east end is set back a safe distance from the water's edge, and the trestle at the west end is protected by a permeable dyke and woven willow mattress and stone riprap.

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ERECTION.

The 125-ft. deck truss at the east end and the 420-ft. main channel spans were erected on falsework by means of an ordinary bridge traveler, but no falsework was used for the erection of the steel trestle at the west end. A temporary pile bridge 90 ft. upstream from the permanent bridge, as shown in Fig. 1, was used to get material across the river for construction of the railway and to serve the construction work on the permanent bridge, although not most conveniently located for this second purpose. This pile bridge was in continuous use from the time the foundations were started until the main channel spans were swung clear of the falsework.

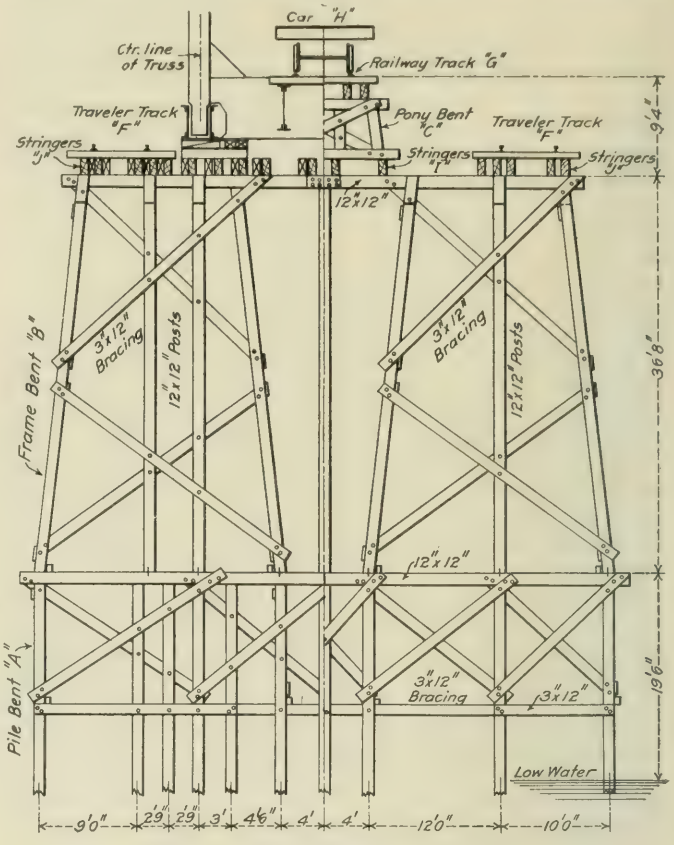


Fig. 3. (See Also Page 1410.)

The falsework for the main channel spans (Fig. 3) consisted of pile bents A, extending 19½ ft. above low water and supporting frame bents B, 36 ft. 8 in. in height, which in turn support the stringers carrying the traveler track and also the stringers carrying the pony bents which support the railway main track. Main bent E, located midway between panel points, carries the traveler and railway track only, and is of somewhat lighter construction, but consists of three stories similar to bent D.

Such of the pile bents A, which formed the lower story of the falsework, as were driven in the ground, which was above water and dry during their construction were driven by a track driver running on a temporary track which was

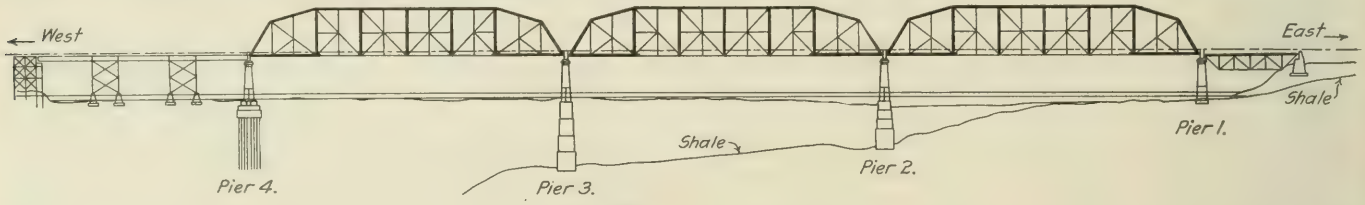


Fig. 2.

laid on the bents already driven, the track driver driving one bent in advance, piles being cut off and capped, and stringers and ties placed on the cap to permit the pile driver to move forward.

The piles for the falsework were carried out on the temporary pile bridge (Fig. 1) on push cars and rolled off into the stream at a point opposite where they were to be driven. The pile bents A (Fig. 3) were driven by a pile driver mounted on a scow, as shown in Fig. 4. On one side of the scow a longitudinal timber, A, was attached at a distance from the center of the leads which would give the correct

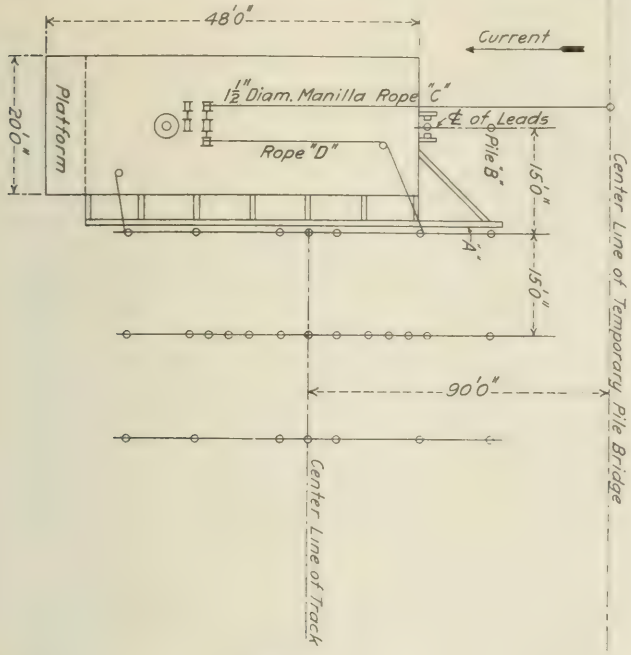


Fig. 4.

spacing of the piles from center to center of the pile bents. The scow was placed with this timber bearing against the piles in the last bent driven, and the pile, B, in the new bent driven. The driving of the remaining piles in the new bent followed, the scow being allowed to float down stream each time a distance equal to the spacing of the piles.

The frame bent B (Fig. 3) consists of nine 12 x 12 posts, the four outer posts on each side being braced as a unit and in such a manner that these four posts could be lowered from the track on the completed bents, A, with a derrick car and braced back to the finished portion of the falsework so as to support the stringers and track, thus completing a panel of falsework. The half-bents mentioned, consisting of four outer posts together with their bracing, were assembled to a template on a platform on shore, the platform being near enough to the track to be within reach of the derrick car, and were then picked up by the derrick car and carried out and put into place.

The piles for the falsework bents were driven from a scow in the manner just described, but the frame bents B for this portion of the falsework were assembled in a horizontal position on top of the pile bents and then erected into position by the derrick car, one panel at a time in advance of the completed portion of the falsework, the derrick car operating from the railway track which rested on the steel floor beams and stringers. In order to permit the derrick car to operate from the railway track it was necessary to carry on the erection of the steel floor fast enough to place the floor beams and stringers next to the end of the falsework structure as soon as the bents upon which they rested were erected. As soon as erected the bracing of Fig. 3 was placed, giving stability to the bent. The pony bents C were not used in this portion of the falsework, the derrick car being carried by the steel floor beams and stringers, each panel of which was placed as soon as the frame bents were raised into position. Although Fig. 3 is not a sketch of this portion of the falsework, it shows at D how the steel floor was placed from which the derrick car was operated. The material for this portion of the falsework was that which had been previously used in span I, and was now available, as span I had been erected and swung clear of the falsework.

The traveler which spanned the truss (Fig. 5) moved longitudinally on the traveler track F, Fig. 3 and Fig. 5. The railway main track G was supported by the pony bents C, Fig. 3 and Fig. 5, until the erection had proceeded to a point where the pony bents C, together with the stringers which they support, were removed, and the track placed with the steel stringers and floor beams of the permanent bridge, as shown at D and D1, Fig. 3.

As shown in Fig. 3, the bents are placed 15-ft. centers. This permitted of the use of the railway company's standard bridge material to a great extent without cutting, and made the second-hand timbers from the bridge only slightly less valuable than new material. It was possible to make the intermediate bents E of lighter construction than the bents D, at the panel points, as they carry only the traveler and the railway track, the dead load of the trusses being carried by bents D.

The traveler used in erecting the 420-ft. spans is shown in Fig. 5, and consists of three bents 85 ft. high, made long enough to erect one full truss panel of 60 ft., or two sub panels of 30 ft. each, without moving, and extending 3 ft. beyond the panel point at each end, in order to afford a plat-



Chicago, Milwaukee & St. Paul Bridge over the Missouri River at Mobridge, S. Dak.

form for the men while making the connections at three separate panel points.

The traveler was supported by a runway on each side consisting of two rails marked "Traveler Track F," shown in Fig. 5. A runway of two rails instead of one gave a wider platform for the engines, increased the stability of the traveler, and afforded a place for the men to stand while driving the pins, and a place for them to work when the main track G was loaded with cars. Fig. 5 shows an outline of the traveler, the detail drawings from which the material was ordered and the traveler was framed, being made in advance. The maximum load for which the traveler was designed was a top chord section which weighed 52,000 lbs.

The general arrangement of the traveler lines is shown on Fig. 5. Power was furnished by four 30-h.p. hoisting engines on the platform, two on each side. Each engine had two drums and three spools, as shown in Fig. 5 in a diagrammatic manner. Tie beams L, M and N are similar to the tie beam K. Tie beam K is carried by the stringers D, and has passed through it a U bolt E, which carries the blocks a and b, which are rove with six parts of ⅝-in. diameter steel cable, the lead line a, b, of which passes through a snatch block d at the top of the traveler, thence to the snatch block e at the bottom of the traveler and thence to the forward hoisting drum q of the engine. From the tie beams L and M (Fig. 5) are suspended four part tackles, a3-b3 and a2-b2, and are suspended in a similar manner to the tackles from the tie beam K, the lead lines a3-b3 and a2-b2, of which pass through the snatch blocks d and f respectively, at the top of the traveler, thence to the snatch blocks e and h, respectively, at the bottom of the traveler, and thence to the rear hoisting drums p and r of the engines, respectively. The blocks b1 and a1, suspended from tie beam N, have similar lines arranged, Fig. 5.

The tie beam K, in addition to transmitting the load in the tackle to the stringer D, acts also as a strut and prevents the lateral pull of the tackle when hanging at an angle with the vertical from overturning the stringer D, or pulling it laterally from its true position.

There are two runner lines from each engine which were used to raise some of the lighter members; such as the line m-n at T (Fig 5), which passes from the load which it is supporting to a sheave m, through a sheave n, through a sheave t, and thence to the winch head X on the engine.

In making the drawing Fig. 5, some minor details of the traveler were slightly changed to simplify the drawing, one 2-sheave block being shown at points D and N instead of the two 1-sheave blocks used at these points on the traveler.

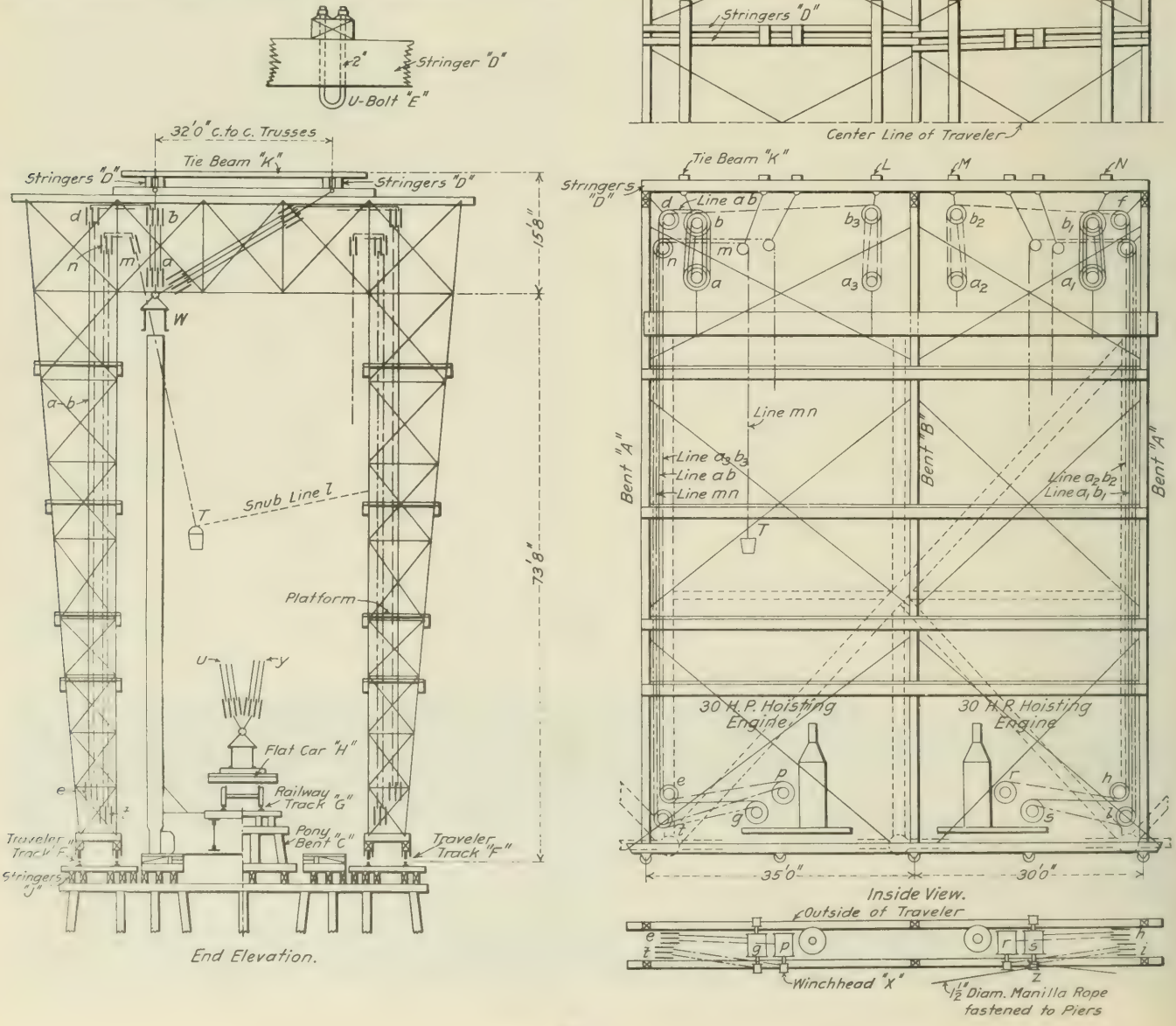


Fig. 5.

The traveler was only used for the erection of trusses, the floor system and bottom laterals having been put in with a derrick car. Fig. 5 shows the heavy top chord section being placed in its final position. The chord was run out on a flat car, H, to a point opposite its position in the truss. The tackles a-b to a3-b3 from the tie beams K, L, M, etc., were attached to the chord by a chain sling. The lead lines

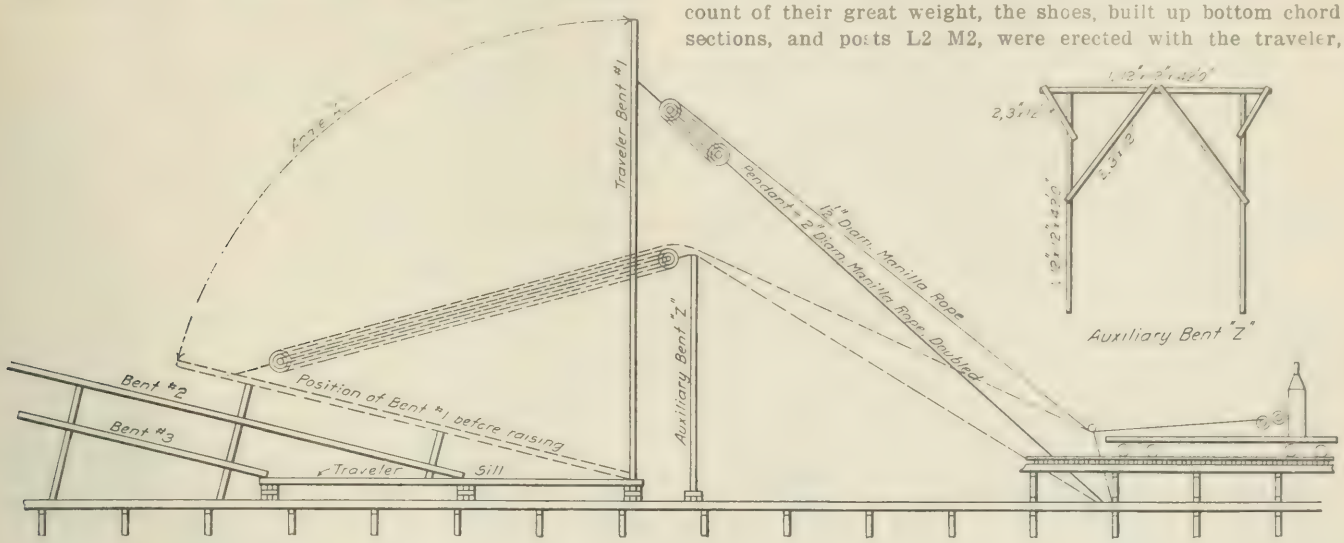


Fig. 6.

on all tackles were hauled in until the chord was lifted clear of the car. By increasing the velocity of haul of the lead lines of the tackles in position u over those in position y, the load is given a considerable lateral movement, bringing it to the position W at a low velocity, but remaining under control of the tackle y.

The lighter members were raised, as shown at T, Fig. 5, by means of a tackle from one side of the traveler only, and when raised from the car were prevented from swinging laterally with any great amount of force by the snub-line 1.

The traveler received its motion longitudinally by means of a line fastened to the piers at the ends of the span and containing enough slack to permit its being wound when required three or four times around one of the spools of the hoisting engine, as shown at Z.

Each bent of the traveler was framed in six sections on a platform on shore. These sections were carried out to a point on the falsework where the sills of the traveler had been previously placed and bolted together. The three bents were placed partly one above the other, as shown in Fig. 6, the feet of the bents being chained in their true position to the sills of the traveler, which in turn were fastened to the falsework. The first bent was raised by means of auxiliary bent, Z, 42 ft. high (Fig. 6), by means of the seven part block and tackle, one end of which was fastened to the top of the traveler bent and the other end of which rested on the top of the auxiliary bent, the lead line of which passed over the top of the auxiliary bent, thence down to a snatch block fastened to the falsework, and thence to a spool on the engine of the derrick car. The end of the tackle nearest the auxiliary bent was a three sheave block held by a double 2-in. manila pendant rope passing over the top of the auxiliary bent and fastened to the falsework. The bent was raised into position by hauling on the lead line, which caused the tackle to pull on the top of the traveler bent until it was revolved through the angle A to a vertical position. The second and third bents were raised in a similar manner except that the traveler bents already erected were used instead of the auxiliary bents.

The material yard was located, as shown in Fig. 1, about one-quarter mile from the east end of the bridge. The steel was shipped to the material yard from the shops in gondola cars as fabricated and unloaded by a derrick car. It was sorted and piled in the material yard as it was unloaded. The heavy material was unloaded on the temporary track at C, Fig. 1, and the lighter material was strung through a distance of a mile from A to B and beyond on both sides of the main track.

The 420-ft. spans were erected on the bents shown in Fig. 3, on which the pony bent C was used. First, on account of their great weight, the shoes, built up bottom chord sections, and posts L2 M2, were erected with the traveler,

the material being carried out on flat cars running on the railway track G, Fig. 3, which rested on the pony bents C, then lifted from the flat cars and placed in their proper location by the traveler tackles a-b to a3-b3, Fig. 5, in the manner previously described for the top chord. Following

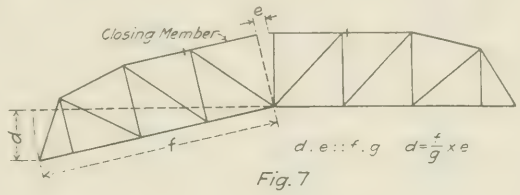


Fig. 7

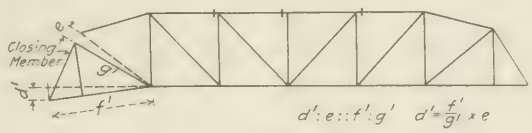


Fig. 8.

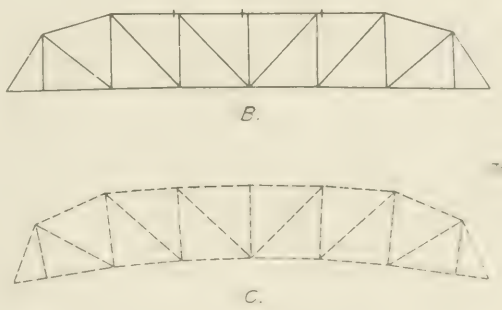


Fig. 9.

this the floor system and bottom laterals were put in by a derrick car. In order to place bottom laterals and floor beams, the pony bents C and stringers L of Fig. 3, just in advance of the portion of the floor already placed and occupying approximately the position of the steel floor beams and stringers about to be erected, were removed by derrick car, No. 1, Fig. 3, which had been backing away from the por-

tion of the structure already erected. This derrick car No. 1 removed the temporary floor in advance of the portion of the steel work about to be erected and placed the material from the temporary floor upon the falsework alongside, where it could be picked up and carried off the structure when the floor was connected. After derrick car No. 1 had removed the panel of temporary floor immediately in front of it, it moved backward and picked up the next panel of floor to the west. Simultaneously with this, derrick car No. 2, Fig. 3, had been operating as follows: A load of floor beams and stringers were pushed out on a flat car in front of the derrick car and unloaded on the falsework alongside of the track as near as possible to their final position longitudinally. The flat car in front of the derrick car was then pulled out and the derrick car returned and placed the floor beams and stringers, which it had just unloaded, in their final position.

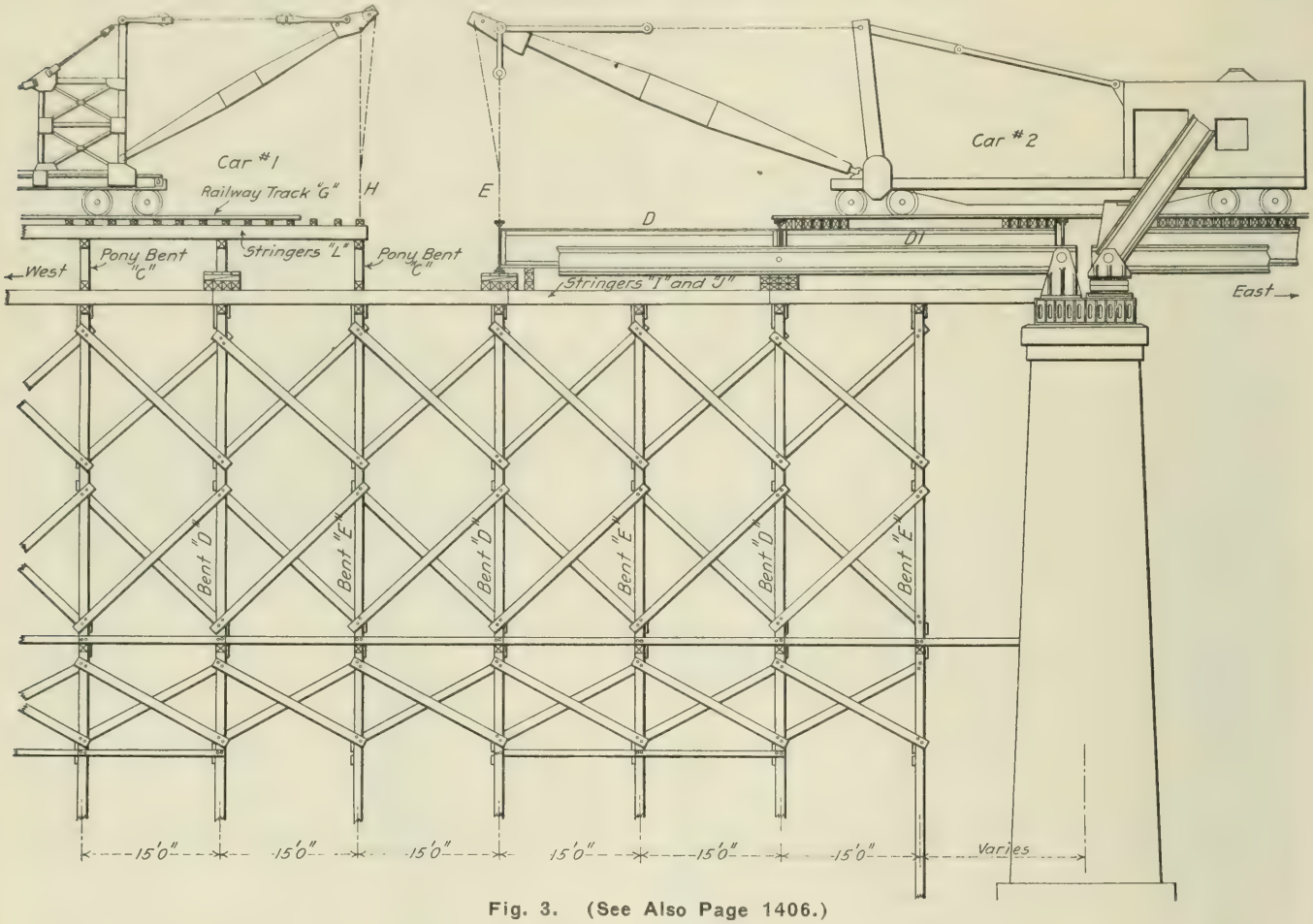


Fig. 3. (See Also Page 1406.)

During the entire time that the floor system and bottom laterals were put in by a derrick car, the gap or the break in the track between points H and E, Fig. 3, was open. After the floor beams, stringers and bottom laterals were placed, the track was restored and all material erected from this stage onward was brought out under the traveler on cars.

The steel floor having been placed, the end connections of the floor beams formed a convenient support to which all vertical posts could be fastened and be made secure without much guying. These posts, together with the other web members and the remainder of the bottom chord, were next erected in the following manner: Enough material for one full panel of bottom chord and web members was run out at one time on flat cars on the railway track G, Fig. 3 and Fig. 5, and erected by the traveler. Pins were then driven, except top chord pins.

Starting with the center of the span and working to the east end, the top chord section, batter posts and top struts were put in, the pins being driven as the several panel points were reached. The traveler was then started back to the center of the span putting in the top laterals and completing the sway bracing of the span which it has just erected. The movement of the traveler continued past the center of the span to the west end, erecting the remainder of the top chord, batter posts and bracing. The pins were driven with a steel ram 6 in. in diameter by 16 ft. long, and weighing 1,600 lbs., suspended from the top of the traveler and operated by men working from whichever platform in Fig. 5 was just below the pin to be driven. All bottom chord splices were riveted before the span was swung, and all other connections were riveted after the span was swung. Two crews of nine men each were used on this traveler, one crew on each side. An average of about 14 days was required to erect each span, counting from the time that the first work was done in placing the shoes until the span was swung clear of the falsework.

On account of the danger of the approaching high water, the erection of the steel followed closely on top of the erection of the falsework. One derrick was either employed in upending the frame bents B, Fig. 3, which were assembled on tops of the pile bents A below or else was employed in placing the stringers. As soon as the panel of falsework had been completed this car moved back to pick up and place the steel floor beams and stringers necessary to complete the panel. In this way the erection of the falsework and the erection of the steel upon it were carried on practically simultaneously.

The end posts on the end top chord section at one end were the last members of the truss to be erected as previously described. This was due to some features of camber blocking shown in Figs. 7, 8 and 9. In Fig. 9, in full lines at B, is shown an outline of the truss when subjected to the dead load of its own weight. In dotted lines at C is shown to an exaggerated scale an outline of this truss when resting on the camber blocking, each panel being distorted, as is shown in dotted lines, and to an exaggerated scale at D in

such a manner as to make the diagonal distance b less than the diagonal distance c and less than the true fabricated length of the member which will be located in the diagonal b. It is a simple matter to give each panel the shape shown at A by means of camber blocking, as the rectangle, the top and bottom of which are formed by the top and bottom chords respectively and the sides of which are formed by posts, approximate a four-sided figure each side of which consists of a stiff member but which is hinged at the corners. As the length of the diagonal distance b is less than the member occupying this position, by decreasing the amount of camber blocking, the panel at A can be brought toward a position shown by light lines E in which the distance center to center of end pins on diagonal b is exactly equal to the distance center to center of end pins of the member which occupies this position in the structure. Allowance is, of course, made for the conditions of sag, temperature, etc., under which the member is being erected.

This use of the camber blocking permits making the necessary adjustments so that all members of the truss can be erected except the closing side. If the center section of top chord, Fig. 7, is chosen for the closing member any error between the fabricated length of the top chord and the space left for it in the truss in amount equal to e would make it necessary to alter the elevation of truss by the amount d equal to $\frac{f \times e}{g}$, but if the end post is chosen as a closing member the total amount of vertical movement required for a similar error of like amount is shown in Fig. 8 to be $\frac{f' \times e}{g}$ or about 3/5 of the foregoing. An advantage is also obtained through the pin connection at either end of the end posts which permits of the use of the large force available from a pilot nut driven by a ram to force the last member into position. The steel trestle approach at the west end, for which no falsework was built, was erected as follows:

As the bridge was erected from the east toward the west, it was necessary to carry the material for the steel trestle through the 420-ft. spans. As the portals and the transverse bracing for these spans limited the clear head room, it was impossible to bring out columns for the steel trestle suspended from the boom of the derrick car, without fouling the transverse bracing of the trusses. Two columns, therefore, were loaded on a flat car which was pushed out ahead of the derrick car to a point near the west end of span III, adjoining the trestle approach. The columns were then lifted from the car by the derrick car boom, one column being placed each side of the track resting on the floor beams, as there was sufficient room to store these in this position for a few hours. Following this, two panels of transverse bracing for one bent and laterals for one girder span were loaded on a flat car in the same manner, pushed out and unloaded on a few temporary timbers laid from the top flange of the stringers to the bottom chord of the truss. The lateral bracing for one girder span which had been placed on the same car with the transverse bracing for the bents was unloaded by being merely thrown from the car onto the track between the rails. The members being light and containing no large projecting gusset plates, their position between the rails did not effect the clearance for cars moving over them.

The flat car was then pulled in the clear, the derrick car returned and picked from its position one column, to the top of which had been fastened longitudinal and transverse guy lines. The derrick car moved forward with the column at the end of the boom on the portion of the structure already completed, the length of the boom, 80 ft., permitting it to place the column a full span in advance of the completed portion of the structure. The remaining column of the same bent was placed in a similar manner and the two upper panels of transverse bracing were placed by being carried out on the boom of the derrick car and lowered by runner line into place.

THE SUCCESSFUL LOCOMOTIVE MECHANICAL STOKER: PENNSYLVANIA LINES WEST OF PITTSBURGH.

For the past ten years or more it has been generally recognized that a mechanical stoker for locomotives was desirable, because of the increasing demands made on the strength and endurance of the fireman by the growing proportions of the motive power. With the advent of the Mallet locomotive, what was desirable before becomes an absolute necessity, if this type of power is to be used in road service. For, as was recently pointed out in the *Railway Age Gazette* in a note on the performance of the Mallets on the Erie Railroad, no human being has the strength to fire one of those machines over a long division, if it is worked to capacity.

With this incentive a number of stokers have been developed and put on the market. They have succeeded in doing the main thing for which they were designed; that is, maintain the steam pressure on a run where the engine was worked with the usual trains and speeds. But they have failed, so far as any data that has been made public indicate, in two other essentials of prime importance. They have not only failed to show any economy in comparison with hand firing, but they have developed an excess of coal consumption. Then, they have failed to suppress smoke. In fact, no hand firing would be permitted that could not do the work with less.

With these general conditions and results before him, D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West of Pittsburg, attacked the problem. His first step was to analyze the conditions obtaining in hand firing. The coal is spread or laid on the top of the incandescent mass beneath, with the result that the volatile gases are immediately driven off, and a cloud of black smoke is emitted from the stack. If the same system is followed with a mechanical stoker the trouble with smoke is simply exaggerated. The machine, not possessing the intelligence of the man, will simply persist in scattering the coal, and green coal must necessarily fall upon that which is still unignited, increasing the density of the smoke and the corresponding waste of heat units in the unconsumed gases.

It therefore seemed desirable in the development of a new type of stoker to so arrange the distribution of the coal upon the grates that this excessive development of smoke, with the resultant waste of heat, would be avoided. In short, it was planned to have the stoker utilize the contained heat of the coal to the utmost and, to do this, it must work under practically smokeless conditions.

In addition to these theoretical or chemical requirements, as they might be called, it was decided that the stoker must do all of the work, from the tender to the firebox. And as it was to do this, it was laid down as an essential requisite that it should be built in so as to form an integral part of the locomotive itself and not be a mere appendage that could be detached and thrown to the ground in case of failure or breakage; while at the same time it should in no way obstruct the regular firedoor, but the latter could be used at once, as usual, in case hand firing became necessary for any reason.

Further, the development of design must be such that it can be readily applied to existing locomotive equipment without radical and expensive changes, not only to facilitate the application, but also to obtain immediate results in case the design meets the exacting requirement.

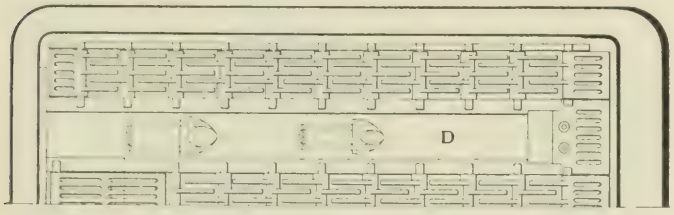
Starting in with the chemical aspects of the case, the only available means of distilling the gases and raising them to the ignition temperature before they could escape into the tubes was along the lines of the underfed stoker. This was a revolutionary innovation, but as it offered the surest solution of the smoke difficulty as well as giving promise of economical results, it was chosen and work started along these lines.

The problem as laid out, then, was to produce a mechanical stoker that should maintain the desired steam pressure under

all conditions of working of the engine; should be practically smokeless, and should show an economy of fuel consumption that, if not exceeding or equaling that of the best hand work, should be better than the average; or, even better than the average of the most skilful man, when his lapses due to fatigue and long runs are taken into account.

The problem stated and the method planned, it remained to develop a mechanism to do the work. The only precedent was the underfed stokers of stationary work. They were tried and failed in the great requisite of maintaining the steam pressure. Then followed a long period of experimenting, which space does not permit following, and which would be of interest solely as an exhibition of the steps that were taken and the reasoning that was applied until a machine was developed that could be depended upon to do all of the stoking from the time an engine left the roundhouse until it was run over the cinder pit at the other end of the division.

If the fireman were to be spared it was quite as essential that a conveyor should be provided to take any grade of coal from the tender and deliver it to the stoker as that the latter should be able to put it into the firebox in the proper manner after it had received it. Hence it was a part of the plan to design a conveyor that could be built in so as to form a part of



Half-Plan of Grate Used with Crawford Locomotive Mechanical Stoker.

the locomotive and not obstruct the fireman should hand firing at any time become necessary.

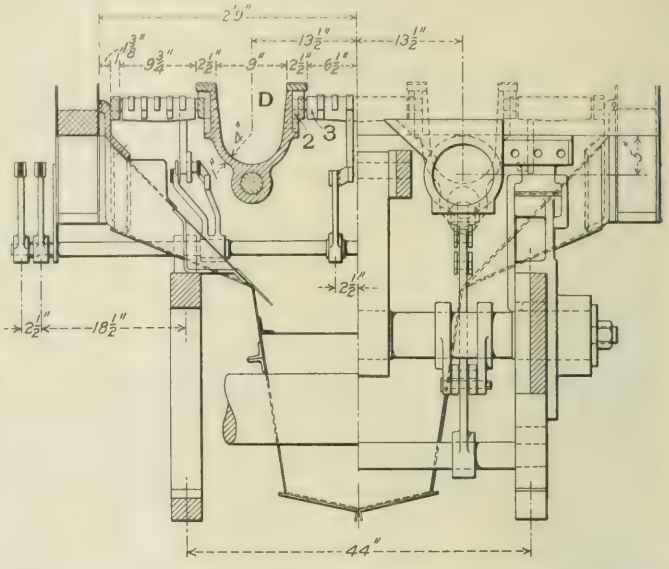
After several years of work a stoker has been evolved that meets the requirements outlined above.

Skipping the intermediate steps we come to the machine in its latest stages as applied to a consolidation locomotive of the Pennsylvania Lines West. This locomotive is of the Pennsylvania H6b class, and of the following general dimensions:

Diameter of cylinders	22 in.
Stroke of piston	28 in.
Weight on drivers	179,000 lbs.
Weight on engine	202,000 "
Steam pressure	205 "
Heating surface, firebox	166.5 sq. ft.
" " tubes	2,677 "
" " total	2,844 "
Size of firebox, inside	66 x 107 in.
Grate area	49.04 "
Diameter of drivers	56 in.
Tractive effort on 85 per cent. boiler pressure	42,168 lbs.

This engine is now run in regular service, with the various tonnage loadings belonging to its class, on the divisions over which it is worked.

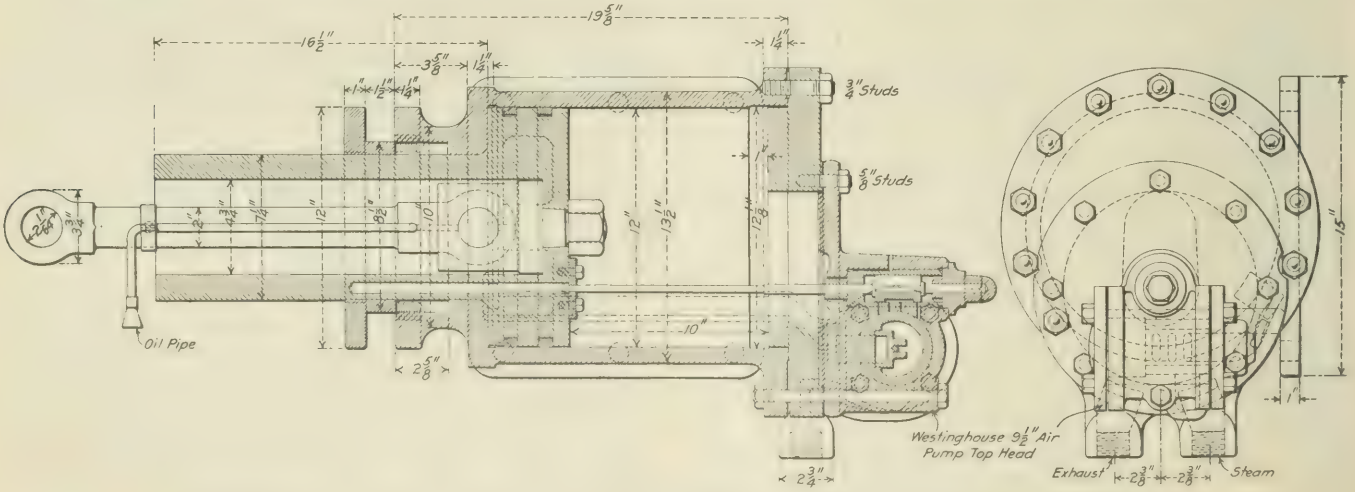
A person looking for a change in the appearance of the engine due to the application of the stoker would be disappointed. There is nothing to indicate that the stoker has been put on, with the exception of a large cylinder bolted to the back end of the frames on the fireman's side. And even that might very readily be mistaken for a driver brake cylinder. This cylinder has a diameter of 15 in. and a piston stroke of 10



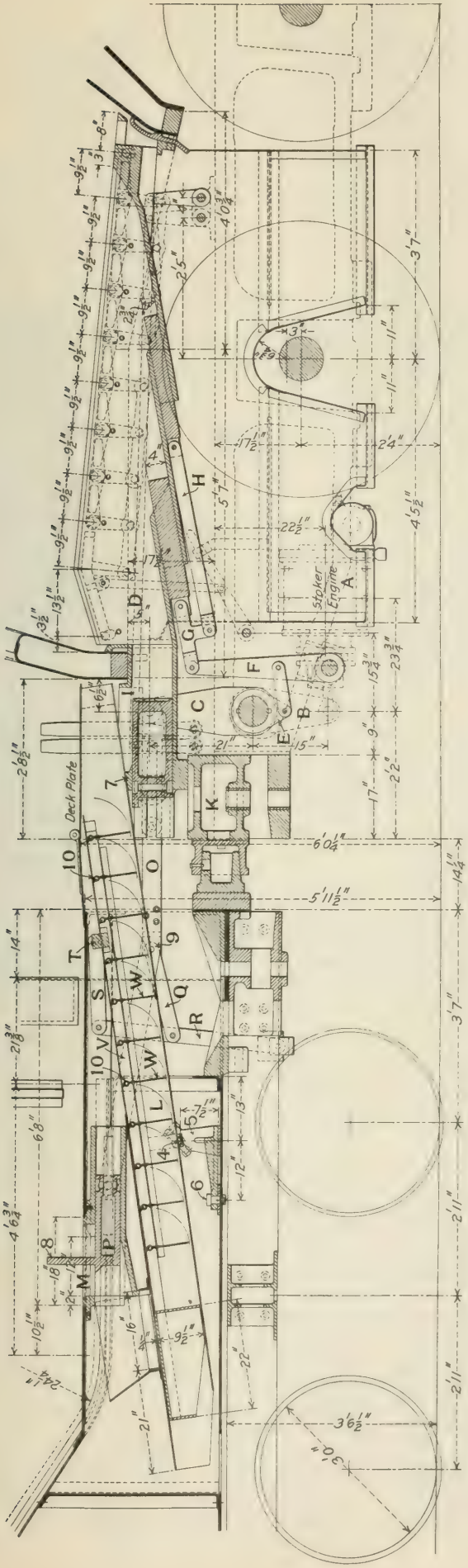
Cross Section Showing the Arrangement of the Crawford Locomotive Mechanical Stoker.

in. The piston rod, which is of the trunk type, with a pivoted connection, takes hold of the lower end of a heavy rocker arm B, shown in the diagrammatic engraving.

The piston of the stoker cylinder or engine works back and forth as in any engine and is operated by the ordinary valve motion of the Westinghouse 9½-in. air pump. The method of construction is clearly shown in the engraving. The piston is made with a trunk to serve as a guide and thus shorten the connections. The valve head is set off on one side so that the reversing stem will enter a hole drilled in the wall of the trunk in which it is to play. All of this is standard Westinghouse construction, even to the tappet plate against which the button of the reversing stem strikes. The advantage of using a reversing mechanism that has been worked out and which is carried in stock, so that in case of failure a replacement can be drawn and applied, is apparent.



Details of the Engine Which Operates the Crawford Locomotive Mechanical Stoker.



Crawford Locomotive Mechanical Stoker and Coal Conveying Apparatus.

In the cab the firedoor is as free to be used as on any locomotive, and the only changes to be seen are two openings, like scuttles or hatches, through which coal can be shoveled to the stoker in case of the failure of the conveyor. These are covered by lids and offer no obstruction to any work to be done. The shaft of the rocker is carried in heavy cast bearings bolted to the frames, and at the center there is attached the upper arm C, which actuates the stoker proper, and the conveyor. This arm projects up between the two conveyor troughs. The arrangement of these is shown in the cross-section and the plan. From these engravings it will be seen that there are two troughs set 27 in. apart from center to center and at equal distances on either side of the center of the firebox. They have a width of 9 in. and a total depth of 20 in. or 18 in. below the bottom of the grate at the back. These hoppers D are of cast iron and have a projecting lip 1, reaching out over the air space 2, between the wall and the grate. This lip is an example of the close attention to detail that has been demanded in the development of the mechanism. It was not used on the present design, but, on a design now under construction, has been provided to prevent the loss of such quantities of unconsumed fine coal as dropped down through the space 2. It has developed that there was the same opportunity for loss down through the space 3, but by properly proportioning the width of the grate fingers to the air inlets in combination with the movement of the coal across the hot plate cokes it and causes it to agglutinate so that the pieces are too large to be lost, and this source of waste is entirely obviated.

The trough D extends from a point about 24 in. back of the firebox, forward and upward to the dead grate at the front. Its depth, therefore, decreases from 20 in. at the back end to nothing at the front.

In the bottom of the trough are cast two recesses which are now cylindrical, but which it is intended to make rectangular. They serve as sheaths into which the plungers withdraw on the backward stroke.

As the upper rocker arm has a length of 21 in. as compared with 14 in. for the lower arm, the stroke of the main back plunger, which has a diameter of 8 in., is 15 in. The forward and intermediate plungers are 4 in. and 2¾ in. in diameter, respectively, but will be made rectangular 3 in. x 2½ in. and 4 in. x 3 in. They are moved in the opposite direction to that of the main plunger. That is to say, when the latter is moving forward they are moving back and *vice versa*. This reversal of the motion is accomplished by using a downwardly projecting rocker arm E, connected to a lever F, which is pivoted at its lower end and is coupled at its upper to the two smaller plungers by the bars G and H.

It will be seen, then, that so long as the stoker engine is at work the plungers are moving backward and forward, pushing the coal in front of them to the forward end of the trough. But as they progressively decrease in size from the back to the front there is a corresponding decrease in the amount of coal moved. Here, too, a good deal of experimental work had to be done.

As it is, there is a nearly uniform bed over the whole of the grates, and the whole upper surface is kept aglow. The grates proper are in three sections. They are of the ordinary finger pattern, as shown on the plan, and occupy the areas between the troughs and the sides of the firebox, as well as that between the troughs themselves. The coal thus rises up and falls out on the grates, and in the designs under construction passes over the plates 1, which are renewable. The actual operation will be taken up later.

Thus much for the stoker proper. It is a complete mechanism in itself and can be operated with any means of coal delivery. That used, however, is an intermittent conveyor, which delivers the coal at I, in front of the main stoker plunger. With the conveyor there is also combined a crusher that breaks the larger lumps of coal into a proper size for

DAILY TRIPS OF ENGINE EQUIPPED WITH STOKER.

Date	Tons	Train Loads.	Train Empties.	Rate.	Time, hrs., min. Total.	Time, hrs., min. Running.	Time, hrs., min. Loco. deten.	Av ge. Stm. press	Av ge. Speed.	Fire, approx. Hook'd.	Fire, approx. Shak'n.	Stoker fire, per ct.	Smoke.	Remarks.	Miles
Jan 25, 1910..	885	21	..	Fast freight.	4:23	3:45	..	197.6	26.0	25	9	96[1]	.....	Low tonnage; lack of frt.	
" 27, 1910....	990	27	..	Fast freight.	3:35	3:21	..	202.5	29.4	10	9	100	Bel. 2 & 3.	Good run of mine coal.	
" 27, 1910....	990	27	..	Fast freight.											
" 28, 1910....2,163		32	13	13 T. over A	6:30	5:00	..	196	19.5	11	35	100	.....	Poor coal.	
" 28, 1910....1,461		22	13	14 T. less A.											
" 29, 1910....1,300		3	50	A	7:11	5:36	..	193.3	17.3	17	16	93[2]	.....	Front sec. pan filled up.	
" 29, 1910....2,000		15	50	A											
Feb. 1, 1910....1,074		28	..	Fast freight.	4:28	3:44	..	201	26.2	10	16	100	.....	Stkr put too much ahead	
" 2, 1910....2,113		21	17	37 T. less A.	6:35	5:11	..	196.6	18.8	24	28	100	.....	Cnveyr not hndlg enough.	
" 2, 1910....1,469		23	10	7 T. less A.											
" 3, 1910....1,245		..	50	55 T. less A.	9:03	6:33	7	191	14.9	46	41	90[3]	.....	Hand firing did not help pressure.	
" 3, 1910....1,986		4	64	14 T. less A.											
" 4, 1910....2,090		31	..	10 T. less A.	6:40	5:11	..	202.5	18.8	25	39	100	Considrble	Good coal; plenty steam.	
" 4, 1910....1,474		23	..	A											
" 5, 1910....1,270		25	2	30 T. less A.	6:50	5:11	.	190.4	18.8	38	38	93[4]	Lrge amt.	Too much coal in box.	
" 5, 1910....2,000		37	9	A											
" ‡6, 1910....1,230		31	..	Fast freight.	....	....	..		Good.	12	11	100	.....	Shkr br. caught in plungr	
" 7, 1910....1,150		25	2	.....	7:20	5:34	..	198	17.5	28	25	100	Lrge amt.	Knees on conveyor broken, fire thin ahead.	
" 7, 1910....2,000		42	4	A											
" 8, 1910....1,000		25	8	.....	4:50	3:56	..	194	24.8	23	22	100	.....	Fire clinkered once; good at end of trip.	
" 9, 1910....1,264		3	48	36 T. less A.	7:00	4:41	..	198.5	20.9	28	37	100[5]	.....	Coal brns fster thn Pitts	
" 9, 1910....2,000		6	59	A											
" 9, 1910.... 560		6	11	.....											
" 10, 1910....2,025		38	3	About B. ..	7:16	5:20	..	195	18.3	39	44	100	Very little.	Back grate stuck.	
" 10, 1910....1,475		27	3	A											
" 11, 1910....1,000		..	45	.....	9:52	7:19	..	180	13.3	22	33	75[6]	.....	Clinkered; too much hkg.	
" 11, 1910....1,845		15	45	.....											
" 14, 1910....1,225		4	45	75 T. less A.	9:45	5:54	26	180	16.5	37	46	92[7]	.....	Clinkered at center.	
" 14, 1910....1,977		14	52	23 T. less A.											
" 15, 1910....2,135		40	4	15 T. less A.	7:19	5:32	..	201.9	17.6	42	41	100[8]	Lrge amt.	Bk grates stk; good trip.	
" 15, 1910....1,463		28	2	12 T. less A.											
" 21, 1910....1,264		31	..	Fast freight.	6:52	5:02	..	195	19.4	40	30	98[8]	.....	Aux. plgr red. to 2⅞ in.	
" 22, 1910....2,148		30	22	.....	7:45	5:37	10	185	17.3	30	44	100[8]	.....	Conveyor out of order; too much coal ahead.	
" 22, 1910....1,463		19	22	.....											
" 23, 1910....1,255		..	51	.....	8:55	6:21	5	180	15.3	19	31	100	.....	Conv. out of order, back.	
" 23, 1910....1,500		4	52	.....											
" 24, 1910....1,756		26	19	21 T. less C.	6:49	5:07	..	202	19.1	10	21	53[9]	.....	Pin, plunger to cross arm raised out of place.	
" 24, 1910....1,331		18	19	6 T. less B.											
" ‡25, 1910.... ...		..	..	Fast freight.	....	....	..	200	....	5	7	100	.....	Good trip.	
" ‡26, 1910....2,125		47	..	A	....	5:45	..	200	....	18	17	100	.....		
" ‡26, 1910....1,475		32	..	A											
Mar. 1, 1910...1,000		10	37	300 T. less A	7:10	5:03	10	197.4	19.3	29	34	100	Not much.	Conveyor in shop; good trip for steam.	
" 1, 1910...1,973		27	38	23 T. less A.											
" 2, 1910... 965		25	..	.....	4:04	3:38	10	200	26.9	10	20	100‖	.....	Too much coal ahead; good trip.	
" 3, 1910...1,280		34	..	20 T. less A.	5:49	4:26	..	200	22.0	19	29	100	Fair.	Front plunger reduced; good trip for steam.	
" 3, 1910...1,543		32	10	¾ of A.....											
" 4, 1910...2,169		34	9	19 T. plus A.	6:52	4:35	..	202	21.3	6	25	100	None.[17]	Lower flue stopped up; good trip.	
" 4, 1910...1,463		23	8	13 T. less A.											
" 5, 1910...1,290		8	39	10 T. less A.	7:15	4:42	20	198	20.8	23	27	100	.....	Ash pan filled up.	
" 5, 1910...2,000		24	49	400 T. less A											
" 9, 1910...1,220		.	48	Fast freight.	....	....	..	...	....	..	..	...	.....	Not full trip; lack frt.	
" 10, 1910...1,300		30	6	A	6:25	4:52	..	198	20.0	31	30	98[10]	.....	Good trip.	
" 10, 1910...1,462		32	6	538 T. less A											
" 11, 1910...2,140		41	5	10 T. less A.	7:53	5:42	6	196	17.3	24	36	96[11]	Considrble	Good trip when stoker ran.	
" 11, 1910...1,458		29	..	15 T. less A.											
" 15, 1910...2,130		34	..	20 T. less A.	6:23	4:54	..	202	19.9	26	18	66[12]	.....	Conveyor out of order; handlingtoo much coal	
" 15, 1910...1,474		23	..	A											
" 16, 1910...1,239		27	1	61 T. less A.	6:12	4:56	..	195	19.8	35	31	100	No. 2-3 av.	Conveyor did not furnish quite enough coal.	
" 16, 1910...1,995		21	27	5 T. less A.											
" 17, 1910...2,150		38	5	A	6:50	5:02	..	200	19.3	27	40	100	Considrble	Fine trip for steam.	
" 17, 1910...1,475		27	55	A											
" ‡18, 1910...1,280	27			A	7:05	4:57	..	Good	20.0	19	26	100[13]	.....	Part front grate blocked.	
" ‡18, 1910...1,957	52			A											
" ‡19, 1910...1,470	38			Fast freight.	6:04	5:31	..	Good	18.0	21	20	100	.....	Good trip.	
" ‡19, 1910...1,470	..			.....											
" ‡20, 1910...1,296	35			Fast freight.	5:25	4:25	..	Good	23.5	19	26	100	.....	Good trip.	
" ‡20, 1910...1,296	..			.....											
" ‡21, 1910... 900	28			Fast freight.	3:35	3:27	..	Good	31.0	14	18	90[14]	None.	Good trip.	
" ‡21, 1910... 900	..			.....											
" 25, 1910...2,000	..	79		A	9:04	5:43	30	190	17.5	35	44	97°	Less thn 1		
" 25, 1910...2,000	..	79		A											
" 26, 1910...2,130	45	..		A	6:11	5:00	..	199.5	19.8	14	29	100	Less thn 1	Fine trip.	
" 26, 1910...1,458	31	..		A											
" 29, 1910...1,300	..	58		A	8:48	6:15	..	199.5	15.7	27	36	94°	Less thn 1		
" 29, 1910...1,997	11	58		A											
" 30, 1910...2,154	33	22		A	7:34	5:38	..	200.4	17.5	12	19	94.4°	Less thn 1		
" 30, 1910...1,478	31	4		A											
" 31, 1910...1,998	15	51		A	6:46	5:38	..	197.8	17.8	24	26	92.3[15]	Ave,. .47.		
" 31, 1910...1,998	15	51		A											
April 1, 1910...2,112	38	..		A	6:41	4:42	..	200.9	21.0	18	27	100	Less thn 1		
" 1, 1910...1,479	26	..		A											
" 2, 1910...1,918	48	..		A	7:37	4:47	..	200.8	20.4	18	24	100	Less thn 1		
" 2, 1910...1,918	48	..		A											
" 3, 1910...1,208	38	..		Fast freight.	4:32	3:51	..	197.8	25.8	20	24	100	Ave.. .42.		
" 4, 1910...1,974	12	46		A	6:52	5:30	..	199.5	17.7	30	39	100	.....		
" 5, 1910...1.125	20	13		C	5:07	4:16	..	199.5	23.2	21	28	100	.....		
" 7, 1910...2,151	40	14		A	8:47	6:08	..	198.5	16.1	35	39	100[16]	.....		
" 7, 1910...1,478	26	12		A											
" 8, 1910...1,300	35	..		Fast freight.	4:30	4:05	..	200	24.8	10	12	100	Low.	Col. to Denn.	100
" 9, 1910...2,150	33	12		A	8:00	6:55	..	195	14.1	25	20	100	"	Denn. to Col.	100
" 9, 1910...1,475	33	..		A											
" 10, 1910... 950	25	..		Fast freight.	4:40	4:15	..	200	23.0	11	12	100	"	Col. to Denn.	100
" 11, 1910...2,150	38	17		A	7:03	4:57	..	200	19.8	28	29	100	"	Denn. to Col.	100
" 11, 1910...1,465	24	11		A—10T....											
" 12, 1910... ...	..	..		.....	Stoker meeting at Col.										

Date.	Train—Tons.	Loads.	Empties.	Rate.	Time, hrs., min.—Total.	Running.	Loco. deten.	Av'ge.—Stm. press.	Speed.	Fire, approx.—Hook'd.	Shak'n.	Stoker fire, per ct.	Smoke.	Remarks.	Miles
" 13, 1910	1,260	20	..	Fast freight.	7:25	5:33	..	200	17.6	29	17	100	Low.	Col. to Denn.	100
" 13, 1910	1,250	22	..	Fast freight.											
" 14, 1910	1,100	40	..	Fast freight.	5:10	4:25	..	188	21.1	11	15	100*	"	Denn. to Col.....	100
" 15, 1910	1,280	33	..	Fast freight.	7:24	4:58	..	197	19.7	20	17	100	"	Col. to Denn.	100
" 16, 1910	2,150	59	..	A	8:10	6:50	..	200	14.3	20	24	100	"	Denn to Col.	100
" 16, 1910	1,475	40	..	A											
" 21, 1910	1,290	24	..	A	7:50	6:39	..	200	14.7	15	9	100	"	C. to D.; fine trip	100
" 21, 1910	2,000	24	25	A											
" 22, 1910	1,000	32	..	Fast freight.	9:14	4:58	..	198	19.9	17	10	100	"	Denn. to Col.	100
" 23, 1910	1,993	14	47	A	7:30	5:29	..	200	17.9	22	16	100	Low.†	Col. to Denn.	100
" 24, 1910	1,020	24	2	Fast freight.	4:53	4:08	..	195	20.6	25	20	100	"	Denn to Scully....	90
" 26, 1910	2,172	55	..	.....	1:52	1:13	..	200	18.0	8	5	100	Very little.	Alleg. to Conway..	22
" 26, 1910	2,860	45	..	.....	1:15	1:15	..	198	17.6	10	10	100	.....	Conway to Alleg..	22
" 27, 1910	2,397	44	..	.....	2:35	1:25	..	202	15.5	4	7	100	Very little.	Alleg. to Jacks R.‡	22
" 27, 1910	4,360	80	1	.....											
" 28, 1910	1,507	28	1	.....	5:18	4:38	18	187	13.2	28	30	90§	.....	Conway to Alliance	60
" 29, 1910	1,495	33	3	.....	3:45	3:33	..	197	17.2	12	19	90¶	Very little.	Alliance to Conway	60
" 30, 1910	4,080	64	2	.....	1:41	1:31	..	200	14.6	10	8	100	Low.	Scully to Conway.	24
May 4, 1910	1,515	24	..	A—35T....	6:38	4:25	..	195	18.8	21	17	100	"	Col. to Bradford..	83
" 4, 1910	1,300	27	..	Fast freight.	4:03	3:24	..	200	24.4	7	7	100	"	Bradford to Col...	83
" 6, 1910	800	22	..	Fast freight.	3:15	2:59	..	185	32.8	26	21	100	.....	Col. to Denn.‖....	100
" 7, 1910	1,264	38	..	Fast freight.	6:20	4:24	..	195	19.1	30	25	100	.....	Denn. to Scully‖..	90
" 7, 1910	830	28	..	Fast freight.											
" 9, 1910	3,965	59	..	.....	2:55	2:15	..	200	9.8	16	14	100	Low.	Scully to Conway.	24
" 10, 1910	260	6		.....											
" 10, 1910	1,110	18		.....	3:24	2:38	..	200	23.2	4	1	100	.....	Conway to Alliance	60
" 10, 1910	1,396	22		.....											
" 11, 1910	1,475	14	15	.....	7:05	4:18	12	200	14.2	20	16	100	Low.	Conway to Alliance	..
" 11, 1910	1,490	7	33	.....											
" 11, 1910	400	6	..	.....											
" 11, 1910	830	13	..	.....	4:21	3:00	..	195	20.3	16	14	100	.....	Conway to Alliance.	..
" 11, 1910	200	3	..	.....											
" 11, 1910	384	10	..	.....											
" 12, 1910	1,426	21	..	.....	4:17	3:00	..	200	20.3	10	14	100	Low.	Alliance to Conway	..
" 12, 1910	797	5	14	.....											
" 12, 1910	680	13	..	.....											
" 12, 1910	882	17	..	.....	5:00	3:55	..	200	15.6	13	18	100	"	Conway to Alliance.	..
" 12, 1910	917	4	30	.....											
" 12, 1910	825	2	30	.....											
" 13, 1910	1,501	21	..	.....	5:15	3:05	..	200	19.8	12	14	100	"	Alliance to Conway.	..
" 13, 1910	1,022	8	21	.....											
" 14, 1910	3,311	63	2	.....	1:28	1:28	..	202	13.6	7	4	100	"	Conway to Alegheny	..
" 14, 1910	3,700	59	..	.....	2:11	1:53	..	200	11.7	13	11	100	"	Scully to Conway..	..

*Fire burned in holes in forward end of firebox.
†Low, except when hooked.
‡Allegheny to Jack Run and Jacks Run to Conway.
§Flues badly honeycombed and leaked slightly.
¶Pin conveyor rigging lost out.
‖Poor coal.
° Main plunger stuck in trough. Design has been changed to prevent trouble from stoker sticking and stopping.
δSmoked when hooking and shaking.
△More than with Pittsburgh coal.
‡Reported by train crews.
[1] Conveyor did not furnish enough coal.
[2] Fire clinkered, bad grates.
[3] Bad coal, hard running train.
[4] Fire clinkered from hooking.
[5] Tecumseh coal.
[6] Tecumseh coal, conveyor rocker arm became disconnected.
[7] Fire too light in forward end of firebox.
[8] Forward end of trough clogged with coke and ash.
[9] 100 per cent. until stoker stuck.
[10] Did not fire stoker heavy enough.
[11] Stoker engine stopped.
[12] Stoker worked too slow.
[13] Best trip to date.
[14] Coal blocked over crusher for short time.
[15] Conveyor clogged, overloaded engine.
[16] Stoker miles to date, 6,610.
[17] Except when hooking and shaking.

use in the firebox. As already stated the conveyor is worked from the upper end of the long rocker arm C, in unison with the main coal plunger. The conveyor, however, is a tender attachment, while the stoker belongs to the engine. The tail-piece or drawbar casting K of the engine is of the usual form and the trough casting of the stoker rests upon it, and is rigidly fastened so that it must follow all of the movements of the locomotive. If this is so, it follows that the conveyor must be so flexibly attached to the tender that its delivery end can follow every movement of the locomotive, and this has been done.

Although there are two stoker troughs for the delivery of the coal to the firebox, there is but one conveyor trough to carry the coal to the stoker. The trough is indicated at L on the engraving and extends from a point back of the opening M, in the floor of the tender, to the opening I, in front of the main stoker plunger, rising on a gentle incline for the whole distance. The coal is thus delivered on a double incline between the plungers, in front of which it falls for delivery into the firebox. The back end of the conveyor trough is carried by trunnions 4, which rest in bearings in the casting 5. This holds the back end and, while giving it the same vertical motion as the tender, permits the front end to move up and down with the engine and stoker, on top of which it rests at 7.

The horizontal motion is cared for by pivoting the casting 5 on the vertical pin 6, and carrying the whole load on a plate in the suitable stop lugs that are attached to the sills. The pin 6 is set but 19 in. ahead of the hole in the tender floor, while the distance out to the point of discharge is 10 ft. 1 in.; hence the lateral movement at the back end is very small.

The conveyor itself differs from others that have been used, not only in the intermittent character of its operation, but in the mechanism used for the propulsion of the coal.

The to-and-fro motion is obtained through the connection O, that runs back to the crusher P. The crusher is formed of a plunger working back and forth in a sneath that is fastened beneath the floor. The plunger traverses the opening and breaks the large lumps of coal that may be in front of it. Projecting from its upper surface are some rods 8, that are used to stir up the coal and prevent it from arching over the opening and failing to come down.

From the point 9 on the connection O, a short rod Q extends back to the lever R, which is pivoted at its lower end to the tender. From the upper end the connection S runs to the cross piece T, to which the longitudinal pieces V of the conveyor are attached. These longitudinal pieces are set one on each side of the conveyor trough, and are connected at intervals by rods 10, on which a series of fingers W are strung. These are made of 2-in. x $\frac{5}{8}$-in. iron, and there are six on each bar.

When the stoker is in motion the conveyor moves to and fro with the main plunger. As the fingers move back they rise and drag back over the coal, but on the forward movement they dig down into it and push it along. They are prevented from swinging back of their vertical position by stops. The reason for using several of these fingers in a row is to

make it possible for one to lift and slide over a large lump of coal that may be in its way, while its mates can work according to the size of the coal with which they come in contact.

It thus appears that every provision is made for taking the coal from the tender and putting it in the firebox. No attempt has been made to have the apparatus work continuously or automatically. The duty of the engine is subject to constant variation, and so must be the action of the stoker. It is started and stopped by the opening of a steam valve on the fireman's side of the cab, and can be so controlled that it will make any desired number of strokes, delivering about 28 lbs. of coal at each stroke.

The device, as constructed during the experimental stage, and in its present state of development, is fully covered by patents and pending applications in this country, as well as in Canada, England and France.

SERVICE RESULTS.

With the stoker so designed, the question is, how does it work and to what extent does it meet the requirements that have been set up for it?

In the preparation of the engine for the road the fire is built in the usual manner and the coal is put into the firebox by hand until steam is raised, so that the stoker can be worked, after which it can be made to do all of the work until the engine reaches the end of its run.

For several months the engine has been in service hauling the regular tonnage. At first it was run on the Southwest System between Columbus and Dennison, a distance of about 100 miles. At present it is working between Conway, the classification yard 23 miles west of Pittsburgh, to Crestline, on the northwest system, a distance of 165 miles. Daily reports of the performance of the engine and the stoker are made to the superintendent of motive power, showing the tonnage hauled, the time, speed, average steam pressure, the number of times the fire was hooked and shaken, the general character of the smoke emitted, and the proportion of the work done by the stoker. In this series of reports, running from January 25 to May 14, and covering 81 trips, there were but 18 on which the stoker failed to do all of the work; and of these 18, but three in which it did less than 90 per cent. of the work.

In the handling of the fire, that is to say, the hooking and shaking, there seems to be no regularity, as yet, as to the frequency of the intervals at which it is done. It is dependent upon the character of the coal, the manner in which the driver works the engine, the weight of the train, with a possible influence due to weather conditions. That the work done on the fire is insignificant is shown by two test runs that were made in which the firemen did not know that they were being observed. In one case, on a hand-fired engine, on a run of 100 miles occupying 7 hrs. and 15 min., the door was open 1 hr. and 10 min.; in the other, fired with a stoker, occupying 7 hrs. and 50 min., or 6 hrs. 39 min. of running time, the door was open 6 min. In neither case was the time that the door was held on the latch, due to an excess of steam pressure, taken into account. The difference is too significant to need comment. As for smoke prevention, it is doubtful if better results can be obtained. It is practically smokeless, in that the smoke produced is so faint and thin that the most exacting would have difficulty in finding an excuse for a complaint and under no consideration could it be called, even by the most critical, a nuisance. Under working conditions the smoke, when compared with the Ringelmann Chart, is almost clear, but with the hooking and shaking of the fire 20 per cent. of No. 1 Chart is reached, and sometimes exceeded. An average of 15 second readings during a 3-hr. 51-min. trip on the road gave a grade of .42 of the Ringelmann Chart. The greatest contrast is observed when the locomotive is being worked its hardest. As an instance of this, on a hard pull up a long, heavy grade, comparative observations were made between the stoker locomotive and a hand-fired helper of the same class, both locomotives being worked to their maximum capacity. The average of smoke readings taken every 15 seconds indicated for the stoker .39 of the No. 1 Chart, and for the hand-fired 3.84 of the No. 3 Chart. On a recent trip the engine was observed while working up the ruling grade near Sewickley. It was fully loaded and was working hard with the lever down in the corner. It was cool enough to condense the exhaust, and between the cloud of vapor so formed and the top of the stack there was a clear space through which objects could be distinctly seen. There was no discoloration except at one point where the fire was hooked, when there was a darkening, but nothing to compare with that emitted from the stacks of other engines working on the grade, and there was nothing to be seen of the sooty cloud that floats off as a locomotive passes. Riding on the engine it is possible to see the trace of a faint brown haze at all times. When the fire is hooked this darkens perceptibly, but fades within five seconds of the closing of the door. It is only when the engine is shut off and is drifting that smoke really appears. Under these conditions the smoke is black and does not differ materially from an ordinary locomotive under the same conditions.

In this respect the results differ materially from those of other stokers that have been observed. In these there was either a constant emission of black smoke, far worse than that of any ordinary locomotive, or the same emission alternating with a lightening as the plunger was drawn back and admitted air to the firebox.

Observations made on a recent trip go to confirm the reports already alluded to. With a train consisting of 18 loaded and 16 empty cars, weighing 1,484 tons, the engine worked west from Conway, holding its steam pressure constantly at 200 lbs. while taking .87 per cent. grades, one of which was nearly 9 miles long. In this the stoker did all of the work of firing. In fact, it has been learned by experience that, if the steam falls and the stoker will not bring it up, it is useless to resort to hand firing. Hand work cannot accomplish what the stoker will not do.

It seems evident from this that the stoker can be made to do all of the hard work of the fireman, but that does not mean that the man will not have to be as keenly alive as ever to his duties or that he will not have to be as busy and closely attentive. The stoker is possessed of no intelligence. It simply puts coal into the firebox in an exceedingly efficient manner. It delivers, at each stroke, about twice as much coal as would be delivered by an ordinary shovelful. Hence it cannot be worked continuously and the fireman must use the same judgment that he does now. His manipulation of the machine depends upon the work being done and what is to be done in the immediate or near future. He must anticipate grades, up or down, and be ready for them when they are reached. He will be obliged to watch his fire even more closely than at present, because of the difficulty of doing so. With the hand-fired furnace it is always possible to look in at the door and see its condition, and place the coal accordingly. With this stoker fire the coal, coming in and up from the bottom, is always intensely aglow, and it is quite impossible to see as to its condition. To assist in this a large peephole has been placed above the firedoor. By covering this with blue glass it becomes possible to make the desired observations. The fireman then will have to be fully as skilful as ever, and, freed from his heavy manual work, will have an opportunity to keep a closer watch over the combustion of the coal and produce better results than have heretofore been considered possible.

As for the economy of fuel to be effected, that is unknown as yet. That there will be some is to be expected, because of the evidently better combustion that is obtained, as shown by the absence of smoke. It is not expected that it will do better than the most skilful of firemen, but it will be better than the average, or even better than the average work of the

best man when long runs and fatigue are taken into account.

Up to the present but one engine has been equipped, and with this the experimenting has been done. The work has, however, reached such a stage in its development that the company feels warranted in extending the service. Twenty-five additional locomotives are, therefore, to be equipped with the stoker for trial service. Of these fifteen will be assigned to the lines west and ten to the lines east. Meanwhile, an engine will be put in the testing plant at Altoona for the determination of the relative fuel economy of the stoker, and the information so obtained will be published in the columns of the *Railway Age Gazette* as soon as it is in a condition to be given to the public.

BOAT AND RAIL TELPHER TRANSFER PLANT.

The Illinois Central has a large freight yard about three miles down stream from Memphis, Tenn., on the Mississippi river, adjacent to which a new telpher plant has been recently installed to lessen the cost and facilitate the transfer of commodities between boats and cars.

The terminal has greatly interested planters remote from railway facilities and convenient to the river. It has resulted in increased traffic for the railway, something that always follows improvements in terminal and transfer facilities. Such installations, which are novel in America, are more common on some of the rivers of Europe where there is close co-operation between river and rail transportation.

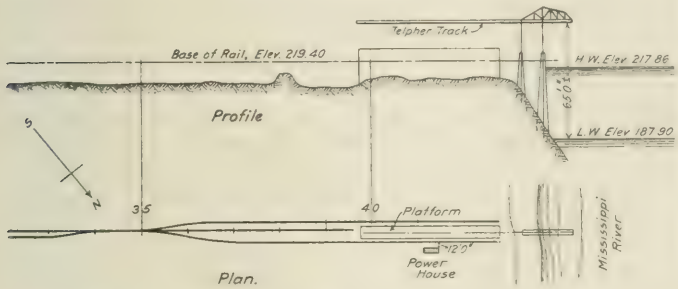


Fig. 1—Plan and Profile of Telpher System.

Fig. 1 shows in plan and profile the plant, which consists of a loading platform on shore with telpher system ending in a cantilever truss over the river. A 30-ft. barge is used at present as a loading platform under the truss, but it is expected future development in handling river traffic will permit of using the telpher to load and unload direct from boats.

Fig. 2 is a view of the plant as built, the photograph having been taken at extreme high water, a time when the bank of the river is usually submerged two to three feet. The river bank is quite abrupt and extends back practically level from the river, the land being of the character common to the Mississippi river bottoms: rich soil and alluvial silt. The terminal can be used at all stages of the river, the extreme difference between high and low water being about 30 ft. An embankment was built to a height well above high water and upon this was placed a platform 32 ft. x 300 ft. with track on each side. The wooden trestle built over the platform to carry the telpher is shown in Fig. 2. It occupies a little more than one-third the width, leaving a clear loading platform on each side. At present cotton, which is the principal commodity handled, is carried from the boat by telpher and deposited at any desired point on the platform, being rolled into the cars at the side. In Fig. 1 a track ending at the platform is shown. The intention is to extend the telpher over this track so that gondola and flat cars may be loaded and unloaded direct, thus eliminating handling on the platforms.

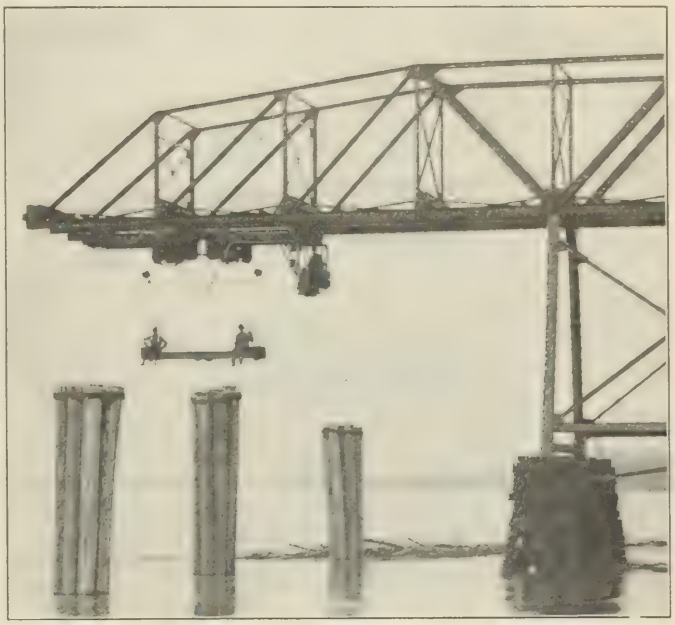


Fig. 3—Boat and Rail Telpher.

Fig. 3 shows the river end with steel cantilever truss. Since this view was taken additional cluster piles have been driven for protection. The overhang of the cantilever is 60 ft. The counterweight of concrete is connected to and forms a part of the pile capping under the steel columns. All foundations are timber piles.

Each 5-ton hoist of the carriage is equipped with a 25-h.p. electric hoist and a 10-h.p. motor for traveling. The lifting speed is 60 ft. per minute and the travel speed is 600 ft. per minute. The motors take power from an overhead trolley. The capacity is 300 bales of cotton per hour or an

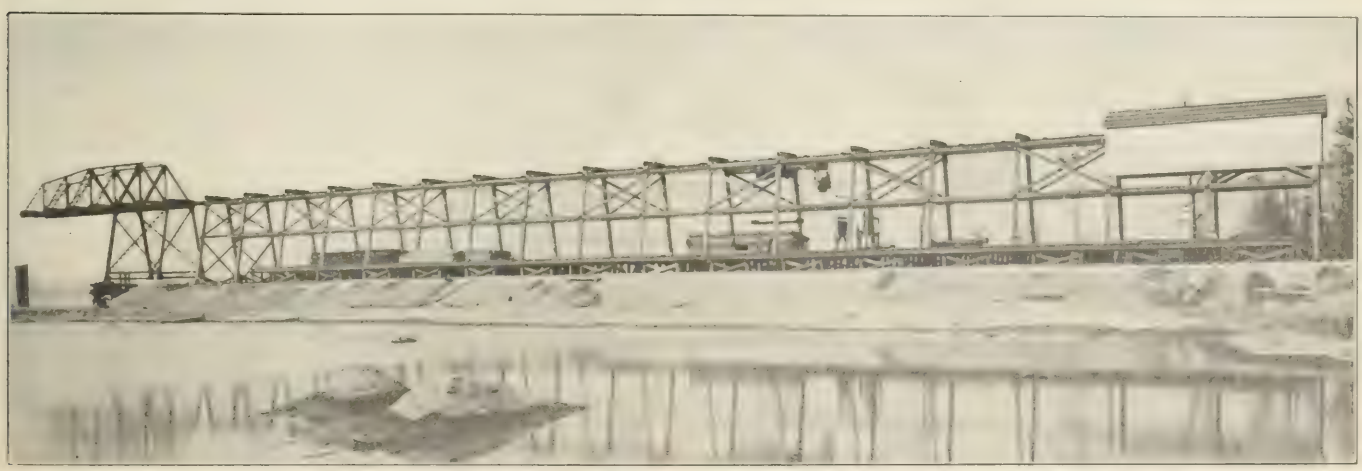


Fig. 2—Boat and Rail Telpher.

equivalent quantity of other material. A special type of low 4-wheeled truck has been built to handle the cotton and the 16 ft. spacing of the hooks will be good in the handling of lumber and logs.

The equipment consists of two 5-ton Sprague electric hoists

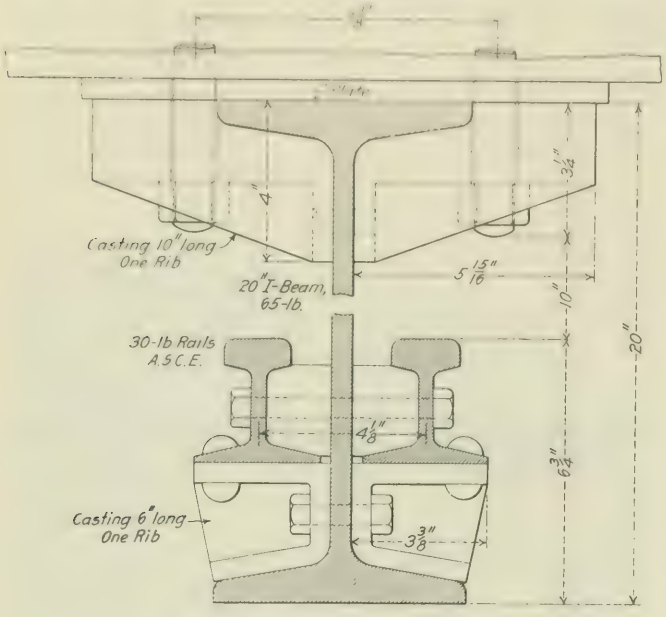


Fig. 4—Details of Telpher Track.

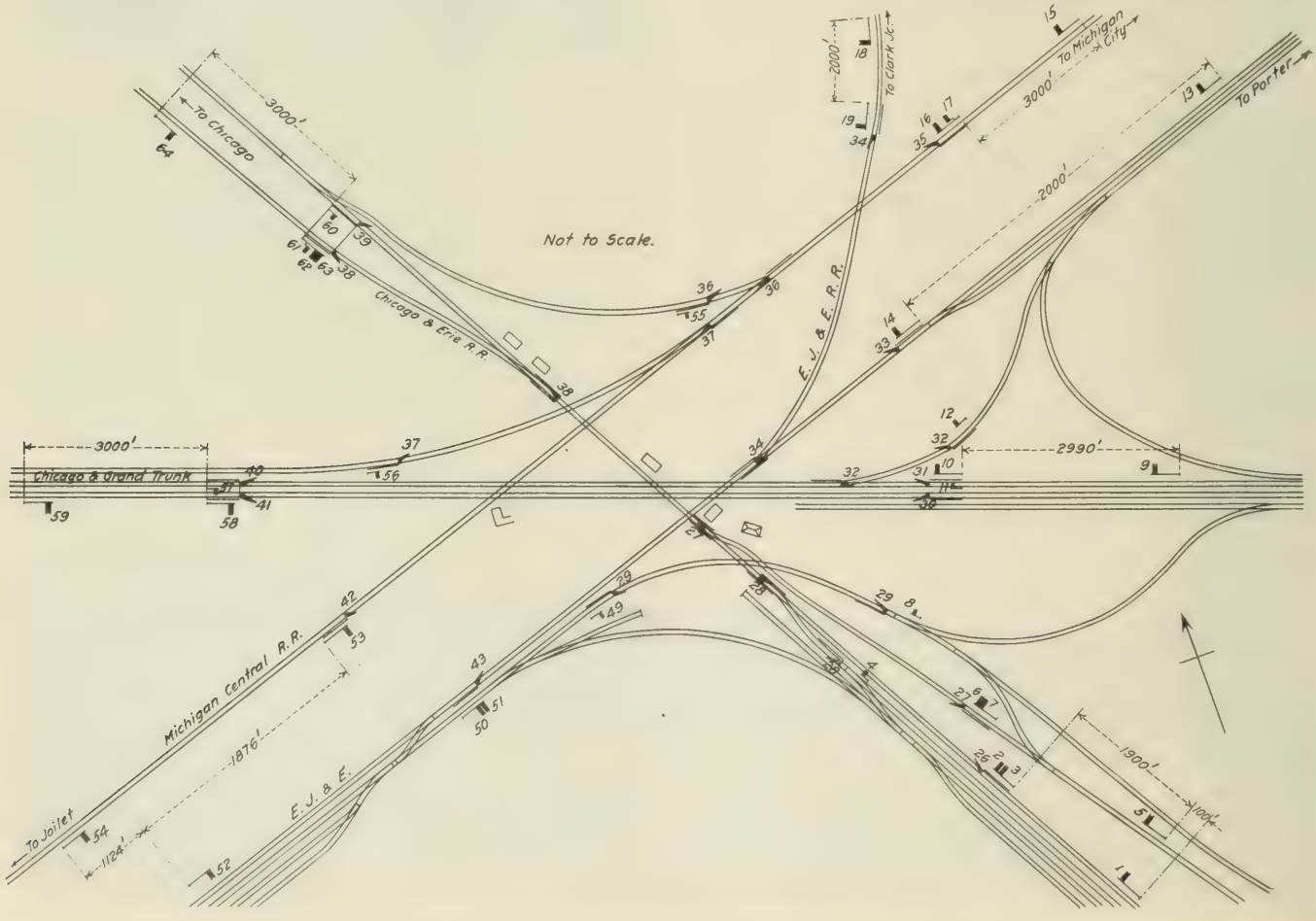
so attached together that they make a single trolley carriage controlled by one operator riding with it. The track consists of a single line of standard 20-in., 65-lb. steel I-beams, the two 4-wheeled trucks being carried on the lower flange. In this particular instance two 30-lb. rails are used, as shown in Fig. 4. The usual method is to carry the load on wheels directly on the flange and normal to the slope. The engineers of the Illinois Central say that the continued passage of a heavy machine over the flanges of the I-beams turns down the outstanding flange. In their investigation of this type of carrier they found a number of failures of track from this cause. The use of the rail is expected to guarantee perfect alinement, and, if it is ever necessary, renewal of wearing surface without disturbing the carrier. The web, by means of the special castings, will assist the flanges and eliminate failures caused by flanges bending.

To A. S. Baldwin, chief engineer of the Illinois Central, is due the credit for the idea of this terminal. The plans were prepared and work directed by R. E. Gaut, engineer of bridges and buildings, and F. L. Thompson, assistant engineer of bridges. The work was directly under the superintendence of F. O. Draper, superintendent of bridges.

GRIFFITH INTERLOCKING.

The Federal Signal Co. has just completed an electric interlocking plant at Griffith, Ind., for signaling a crossing of the Erie, the Michigan Central, the Elgin, Joliet & Eastern and the Grand Trunk. The machine has a 64-lever frame with 35 levers for 35 signals, 18 levers for 19 derails and 7 switches, and 11 spare spaces. The machine, signals and switch movement are similar in most respects to those installed on the Cleveland, Cincinnati, Chicago & St. Louis, at Indianapolis, and heretofore described in the *Railway Age Gazette* (see issues of June 18 and June 25, 1909). Since then, however, several improvements have been introduced in the machine and the circuits, and these are in use at Griffith.

The indication, instead of coming directly from the battery,



Electric Interlocking Switch and Signal Apparatus, Griffith, Indiana.

now consists of a single impulse from the secondary of an induction coil situated in the tower. There is usually only one indication coil for a plant. The primary circuit is closed at the lever when in indicating position and the impulse from the secondary goes out through a contact on the lever, over the last operating wire to the function and back through common. The indication coil is in this circuit and is so constructed as to respond only to the high voltage current generated by the induction coil. The lever indicating apparatus has been so modified as to adapt it to this change in indication circuits.

On the Erie there is electric approach and detector locking; on the other roads there is detector locking only. Electric locks are applied to the lever quadrants for this purpose. Detector bars are also provided throughout. There is an annunciator to show the approach of a train to each distant signal, 9 of them in all. The electric locking circuits are operated by a potash primary battery consisting of 40 cells, two sets of 20 in parallel. There are 9 electric locks, 15 track relays and 8 secondary relays.

The signals on the Erie work in the upper right hand quadrant. Those on the other roads work in the lower right hand quadrant. The plant was built for the Elgin, Joliet & Eastern.

WORKING OF THE EDUCATIONAL BUREAU OF THE UNION PACIFIC.

The educational bureau of information of the Union Pacific was established on September 1, 1909. Its objects, and the plans for carrying them out, were outlined in official circulars which were published by the *Railway Age Gazette* in its issues of September 3 and November 26, 1909. The actual workings of such an institution are more interesting and important, however, than its purposes and plans, because its actual workings, like its results, depend not only on the efforts and good intentions of those who establish and conduct it but also on the attitude assumed toward it by those it aims directly to benefit. The bureau has now been in existence long enough to make it practicable to tell what it is doing and how it is doing it, from which some reasonable inference may be drawn as to how much it is adapted to accomplish.

Numerous railways have adopted methods for the instruction ad training of special classes of their employees with a view of fitting them to do special kinds of work, or of fitting them to do better the special work in which they were already engaged. In many cases special instruction has been provided for mechanical apprentices. The Southern Pacific has provided a broad course of study and training to fit promising young men for officers, and its plan for this purpose has been extended to the other Harriman lines. The Union Pacific, it is believed, is the first railway to establish a bureau under the supervision and having the active cooperation of its principal officers to try to give instruction and training to all its officers and employees, and to each according to his special needs on the particular railway and in that particular branch of the service of that railway, with which he is connected. The response to the efforts of the management to thus increase directly the efficiency of those on its pay roll and indirectly the efficiency of the operation of the road is interesting and significant. It has about 20,000 employees. Of these 1,014 had, up to about the middle of April, applied for and begun to receive from the bureau the instruction and training it was established to give. Some of these have not gone on with the work they began, but 908 were still on the rolls of the bureau. This number included 95 officials, among them being chief dispatchers, yardmasters, division foremen of engines, master mechanics and assistant superintendents. About 100 of the students are Japanese track laborers; the work of the bureau is permeating down to and influencing the efficiency of the lowest strata of employees. Since early in December the bureau has corrected over 1,500 lesson papers. In the first week in March it corrected 140; in the second week, 119; in the third week, 103, and in the fourth week, 114. The next week it corrected 125. It is now correcting an average of 125 lesson papers weekly.

What has been done, although very considerable, is no criterion of what can and probably will be done in the future, for up to the present time only a few of the instruction papers, which are in preparation, have been finished and printed, and for this reason the bureau has made almost no special effort to bring the advantages that it affords to the specific attention of the great bulk of the employees. Practically all of the applications for studentships which have been received have come in response to the initial circulars announcing the establishment of the bureau. It is believed from experience up to the present time that when all the instruction papers are finished and all employees are familarized with the scope and objects of the institution a very large proportion of the total number will without any urging enter their names on its student rolls and take the courses which are specially adapted to their requirements.

The main objects of the bureau have already been stated in the *Railway Age Gazette*. They are (1) to assist employees to assume greater responsibility; (2) to increase the knowledge and efficiency of employees, and (3) to prepare prospective employees for the service. Its use is open to all employees free of any charge. Its work is controlled by a board of supervisors, consisting of the following: A. L. Mohler, vice-president and general manager; J. A. Munroe, freight traffic manager; Charles Ware, general superintendent; R. L. Huntley, chief engineer; C. E. Fuller, superintendent motive power and machinery. Mr. Ware succeeded W. L. Park, formerly general superintendent, when Mr. Park left the Union Pacific to become vice-president and general manager of the Illinois Central. Mr. Park was one of the prime movers in establishing the bureau and took a great and active interest in it.

It is said, however, that the germ of the plan of adopting some method to educate all employees of the road was a remark by the late E. H. Harriman in criticism of the course of the management of his own and other roads in going outside of their own ranks to get men to fill vacancies. He thought the managements should work out some system of training men to fill all vacancies. The officers of the Union Pacific felt that that scheme would work best which would benefit all employees equally and would give all, as nearly as practicable, an equal change for promotion according to their abilities and irrespective of their past education, or of any support that they might receive from influential persons. They thought it would be best to try to teach every employee something without any charge and to try not so much to fit some especially to be officials as to give all a change to become officers if they took advantage of the opportunities offered them for instruction and experience.

One of the points on which they lay stress is that the bureau has absolutely nothing to do directly with operation. Its purposes are exclusively educational. It aims to fit men for promotion and its records are open to the officers to use as a guide in determining who are best equipped for promotion, but the decision who shall be promoted is absolutely in the same hands as it was before the bureau was established.

The road was fortunate in having available a man who was unusually equipped to carry out these plans. D. C. Buell, who was made chief of the bureau, graduated from Purdue University as a mechanical engineer. He was then employed on different roads for six years, being engineer of tonnage tests and inspector of transportation on the St. Louis & San Francisco for three years, and being later engaged in special work on the Minneapolis & St. Louis, the Minneapolis, St. Paul & Sault Ste. Marie, the Burlington and the Denver & Rio Grande. He was doing fuel work on the Union Pacific when the educational bureau of information was established. G. W.

Sever, assistant chief of the bureau, had been equipped for this work by 25 years experience on the Union Pacific as accountant, station agent and office man.

The correspondence school plan was adopted because it was believed it was best adapted to meet the peculiar requirements of the situation. The correspondence course being used is better for men on the Union Pacific than any general correspondence course could be, because it deals, not with railway work generally, but with work on the Union Pacific specifically and is as to that road official.

An advisory board acts with the chief of the bureau in carrying on its work. It is composed of H. J. Stirling, auditor; J. Sundland, the chief engineer's office engineer; A. H. Fetters, mechanical engineer; J. C. Young, signal engineer; C. J. Lane, first assistant general freight agent, and John A. Sheean, assistant general attorney for Nebraska. The operating member of the board formerly was T. J. Foley, formerly assistant superintendent but now assistant general manager of the Illinois Central. No successor to Mr. Foley on the board had been named at the time this article was written. This board is composed, as will be noted, of an expert from each of the departments. It plans the various courses of reading and study, passes on applications for courses and assigns the work to be done by each student, determines whether questions asked by employees and officers shall be answered, and passes on the answers prepared, etc. It also advises the chief of the bureau on such matters as he brings up and outlines the policy to be pursued in handling new matters suggested by his work. It meets every Monday evening at 7.30 o'clock, and its sessions are usually attended by some of the general officers. If some special matter of a good deal of importance is to be considered or acted on, other officers are asked to attend. For example, on one evening when the course for the preparation and training of station helpers was under consideration, an assistant superintendent from each of the five divisions of the road was called in to advise.

Perhaps at first some of the members of the advisory board were disposed not to take its work seriously. They are now all deeply interested and deeply serious. The bureau imparts information in two ways. (1) It answers specific questions sent in to it by officers and employees, and (2) it gives those who desire them courses of study adapted to their special needs.

Each question asking for specific information is carefully scrutinized by the chief of the bureau and the advisory board to find out if the person asking it has any motive other than that of securing helpful information. The reason for this is that there is always danger that somebody may try to get a ruling on some point relating to discipline which, if made, might prove awkward both for the questioner's superior officer and for the bureau; and therefore questions which might relate to discipline, however indirectly, are not answered. If the question is considered a proper one it is referred to that officer whose special line of work makes him most competent to answer it, and his answer is sent to the advisory board and by it to the employee. The answer to such a question becomes official information and subsequently will always be made by the bureau in response to the same question.

It was thought that the answering of questions in this way would be one of the most important functions of the bureau. The number of questions received, however, has not been so large as was anticipated. Up to the time material for this article was obtained 140 questions asked by 47 men had been answered. The fact that each man who asked any questions at all had asked an average of three shows that when one has once asked and got a satisfactory answer he is encouraged to ask more. Probably the main reason why only a comparatively few requests for specific information have been received is that employees and subordinate officials dislike to disclose their ignorance in regard to matters which perhaps it may be thought they should know. As a matter of fact, however, the person who answers a question usually does not know who asked it, and it is expected that when this, and the fact that the management very much desire employees and officers to make use of the bureau to secure prompt and accurate information become known, the number of questions received and the number from whom they come will largely increase.

All employees who take a course of study are required to begin by reading a paper prepared by the bureau entitled "How to Study," and next to familiarize themselves with the history and geography of the Union Pacific. "History of the Union Pacific" was prepared by C. J. Lane, first assistant general freight agent. Its purpose was stated to be "to review the history of the Union Pacific, and with such brevity as will bring the story safely within the inceptor's evening hour of study." It would be an indifferent writer indeed who could not make a history of the Union Pacific interesting. Mr. Lane proved not to be an indifferent writer, and produced a paper which is fascinating to one not connected with the road and must be more fascinating to those who are. It contains only 59 good sized type-written pages.

The papers next prepared deal with the geography of the road. It operates in five states, Nebraska, Wyoming, Colorado, Utah and Kansas. The student is required to first read a general geography of the road and then to study that paper relating specifically to its geography in the state in which he works. The advantages of having officers and employees familiar with the geography of a road are numerous. For example, the home seeker on a passenger train is pretty apt to question the conductor about the nature and resources of the territory which the road serves, and intelligent answers may be the means of getting him to settle in its territory and become one of those who furnish it traffic. It has been the aim to write the papers on geography so as to make them no less interesting than instructive, and the story is told of a conductor who was formerly employed on the Nebraska division, but who is now on the Wyoming division, who while laying over began at 7.30 p.m. to read the geography of the road in Nebraska and never quit until 11 p.m., when he finished it.

The student having finished the prescribed papers on history and geography is started on a study of those things a knowledge of which will directly increase his efficiency as an employee—mechanical engineering, section work, transportation, traffic, maintenance of way, civil engineering, station work, air-brake operation, locomotive firing, locomotive running, or what not. The way that the papers dealing with the different special subjects have been and are being prepared is novel and interesting. Take, for example, the paper on "Track." That part of it which deals especially with maintenance was assigned to the assistant division engineer, who was considered the best expert on the road on the maintaining of track; that part of it dealing with tunnels was assigned to the man who handles tunnel matters, and likewise such matters as the construction of double track, new construction, rails and fittings, etc., were assigned to experts on these various subjects. Each man's paper was read and approved by his immediate superior, and then the various writers were called into the bureau to confer. Each read his paper aloud and the others criticised questionable statements, suggested things that had been left out, etc. When differences of opinion arose, the matter involved was submitted to vote and the majority ruled. After this the papers were taken away by their writers for revision and correction. When they were returned to the bureau they were submitted to the chief engineer to be edited and approved by him, and finally they were illustrated and published by the bureau.

In a similar way the course in station work was prepared by the agents at a number of important stations who held a three days' conference at Omaha to correct, revise and pass on what had been prepared. In like manner the courses for

locomotive firemen and enginemen were prepared by the road foremen of engines and revised and approved by the master mechanics and superintendent of motive power. A paper on combustion was written by Mr. Buell, the chief of the bureau, read by him to the road foremen and approved by them and subsequently passed on by the engineer of tests, the mechanical engineer and superintendent of motive power. A pamphlet describing the construction and operation of the first Mallet articulated compound locomotives bought by the Union Pacific was published, placed in the hands of the enginemen and studied by them before these engines ever reached the tracks of the road. A splendid pamphlet on "Courtesy" was printed and circulated among all employees with the object of improving the treatment given to the public. A paper on track tools containing illustrations of all the tools used, and the correct method of using them has been printed in both English and Japanese, the Japanese on each page being a literal translation of the English on the facing page. In addition, the Japanese track laborers have been furnished with grammars and dictionaries so that they can use this paper in learning the English language. For the first time the management of the road knows that its Japanese employees understand the rules applicable to them and their work.

The chief of the bureau and the advisory board exercise a good deal of care in selecting the course of study which an employee shall be given. A chief clerk to an engineer who was engaged on construction was provided with a course in Maintenance of Way Accounting. An assistant division engineer who wanted to better qualify himself for his present position is being given enough algebra, geometry and trigonmetry to equip him to go further in the study of railway civil engineering. A fireman is given only a locomotive engineer's course until he has passed his examination for promotion to engineer. After he has passed his promotional examination he is given a course that will better enable him to perform his duties as an engineer. An employee is not allowed to take a course of study relating to matters outside of his department without the authority of the general superintendent. When, however, there is good reason for it, an officer or employee may be allowed to carry two or three courses.

When it is decided that a man is good material for promotion a plan is worked out in some cases for preparing him for advancement. For example, a trainmaster on the Utah division was taken from the service and assigned to student work at the same rate of pay and expenses allowed him in regular service. He worked three months in charge of an extra section gang. He was then given three months experience in repairing and caring for locomotives in a locomotive shop. At the time material for this article was secured he was filling a temporary vacancy in the operating department. It was intended that when he was relieved he should be given two months' experience in the accounting department where he would come in direct touch with the incorrect reports often made by freight and passenger conductors and station agents. It was intended after that to have him go through the company's station agent school and then serve a short period of apprenticeship in the store department and in the general offices, including those of the traffic department. It was thought that at the end of this time he would be qualified to be promoted to assistant superintendent when a vacancy took place. The bureau, of course, had nothing to do with transferring him from one place to another. This was handled by the operating department. What the bureau did was to aid him to get a knowledge that would fit him for his prospective duties.

In many cases the names of students who are making good progress are brought to the attention of the officials interested for their information. Once having given the officials this information the duty and authority of the bureau have been exhausted.

This, like all other correspondence schools, has to have a good "follow-up" system to get some of its students to keep up their studies. In the first place, of course, the student is required to answer a list of questions relating to the subject dealt with in his instruction paper before another instruction paper will be sent to him. The questions are framed with the design of causing the student to do a maximum amount of study and a minimum amount of writing. Failure to deserve a grade of 75 per cent. or more may result in his being asked to study the lesson and answer the questions again. If the questions relating to a lesson are not answered within 60 days he is sent a form letter calling his attention to the fact and urging him to answer the questions and go on with the course. If no reply to this is received within 15 days, Mr. Buell writes him a personal letter, and if this does not bring a reply he is dropped from the student rolls.

When an employee desires instruction in regard to some matter a course in which would not be suitable to any considerable number of employees, a special course is devised for him. One of the interesting features of the work of the bureau is that all of its instruction papers are reviewed by the road's law department before they are sent out to students to see that they contain nothing that the law department cannot back up.

As before stated, one of the purposes of the bureau is to "prepare prospective employees for the service." The most important work it is doing in carrying out this purpose, is to conduct a school for station helpers at its headquarters in Omaha. This school is in direct charge of an employee of the road who has had 25 years' experience in station work on the Union Pacific. Students must be at least 18 and not more than 30 years of age. Practically all of them are boys and young men who have received enough instruction at telegraph schools along the road to send 20 words a minute. They are allowed three hours daily for practicing telegraphy and given five hours' station work. A practice circuit has been established in the school room, and an arrangement has been made so that the students can cut in on the road's telegraph lines. All the forms used in regular railway station work are provided and are used by the students precisely the same as they are in regular station work. The room is open at night and there is seldom an evening when some of the boys are not in it practicing with the key. Before a boy is allowed to begin taking the course he must pass a severe physical examination and he must pay his own expenses while in Omaha taking the course, and pay for his transportation to that city. He is usually kept in the school three or four weeks. Formerly the station agents on the Union Pacific protested against being required to take student station helpers, but the training being given in the bureau's school is so effective that most of the station helpers it turns out do good work from the start, and now the station agents instead of objecting to taking them are asking for them. They must serve at least three months as station helpers for $25 to $35 a month before they are considered for promotion to a telegraph position. Frequently talks are made to the boys by officers of the company, Mr. Mohler, Mr. Stirling and Mr. Lane and others having addressed them at different times. The school now has 20 students. Up to the time material for this article was obtained, 68 graduates of it had been furnished as station helpers, and of these 24 have been promoted to operators.

In the line of fitting prospective employees for the company's service, the educational bureau also makes investigations regarding those not already in the company's service who apply for positions. Up to the middle of April it had investigated 388 applicants, and in the quarter from January 1 to March 31 it investigated 253. Of those investigated it recommended the employment of about one-fourth, and of these about one-half had been given positions. Special consideration is given to the applications of relatives of present employees. The bureau also keeps in touch with the universi-

ties, colleges, high schools and technical schools for the purpose of having at all times material on hand desired by the various departments of the road. Generally speaking, it is not its aim to get applications or to help qualify men for advanced positions, although it is glad to have on file the names and qualifications of men fit for such positions. No person will be put on this available list without having passed a severe medical examination. The record of each applicant's physical test and his general personal history are kept in the "positions material file." An applicant who has had no railway experience and who has relatives in the service is given any course of study he wants.

The majority of applications for positions are referred to the bureau of investigation, although there is no rule requiring this. The principle according to which the operating department co-operates with the bureau was well stated in one of the circulars regarding the bureau, which was issued last August. "Persons registering with the bureau may indicate the particular line of work they desire to follow. They will be given every opportunity for learning the elementary methods and requirements of the department they wish to enter, and while it is not promised that positions will be given to all applicants, it is, however, expected that the various departments will avail themselves of this opportunity for filling vacancies in their ranks by individuals registered with this bureau who have taken advantage of the opportunity to qualify themselves for the positions desired."

The work that the educational bureau of the Union Pacific is doing seems admirably adapted to secure some very important ends. It seems adapted to increase the loyalty of employees who, it would seem, can hardly fail keenly to appreciate the efforts and expenditures the company is making for their improvement. It seems adapted to increase the efficiency of employees and thereby to increase and improve the services rendered by them to the company. And as many of the instruction papers directly or indirectly suggest to employees how they may treat patrons of the road better and why in their own interest and that of the road they should do so, the bureau seems well adapted to promote better treatment of the public and thereby to foster more satisfactory relations between the public and the road.

THE PRINCIPLES GOVERNING THE ARRANGEMENT OF AUTOMATIC BLOCK SIGNALS.

BY W. H. ARKENBURGH.

The art of signaing a railway is the art of so arranging signals that train movements will be expedited and the capacity of the road thereby increased to the maximum consistent with safety and the demands of traffic. This involves providing such indications or aspects, and so placing the signals, that an engineman will be at all times informed of the condition of the track a sufficient distance ahead of his train to enable him to stop short of any obstruction against which it is possible for a signal to give warning. Therefore, the problem of signaling a road is an operating problem.

While a train is moving there are only three things which a block signal need tell an engineman in order that he may properly control his train; they are: 1, "It is safe to proceed"; 2, "Prepare to stop (apply brakes)"; 3, "Stop." It is time enough to tell an engineman why he has been stopped and what to do next, after he has brought his train to a stand. Therefore, those signal aspects which tell an engineman what to do after he has stopped, have no place in this discussion, as they do not affect the capacity of the road.

The location of, or more properly, the position occupied by, the block signals with respect to each other and to the various physical characteristics of the road is the factor in signaling most vitally affecting the operation of trains. Those physical characteristics of a road which it is necessary to consider in placing block signals may be divided into two groups, primary and secondary. Primary physical characteristics are: (a) grade, (b) curvature, (c) view, (d) switches, (e) stations and yards, (f) interlocking plants, (g) tunnels. These should be considered purely from an operating standpoint. Secondary physical characteristics are: (h) kind of ballast, (k) cuts, fills and the nature of the subgrade and soil, (l) bridges, (m) parallel tracks, (n) highway crossing bells. These introduce engineering problems. How the various physical characteristics influence signal location may be briefly stated as follows: (a) Signals must not be placed on heavy grades, where, if a train should be stopped, it could not start again or could start only with extreme difficulty; this would cause serious delay and often injury to draft rigging. (b) Signals must not be placed on sharp curves, as these have the same effect as adverse grades; they offer resistance to train movement. (c) Signals must not be placed where the view from an approaching train is obscured by curves, buildings, overhead structure, trees or other objects. An engineman needs time in which to read the signal indication so as to be able to act upon it. Therefore he must have an unobstructed view of a signal for a greater distance than that through which his train will run in the time necessary to read the signal indication. (d) Signals should be so placed with reference to a switch that a train may be stopped as near as possible to the switch, should it be necessary or desirable to stop before passing it. Thus trains may "close up" and avoid proceeding slowly for a long distance into an unoccupied block. (e) Signals should be so placed at stations that a train occupying the station block will not unduly delay a following train (compare d), but will permit it to approach as near as may be to the station before stopping. This involves also the provision of a short station block with a starting or advance signal; this to be near the fouling point of the outgoing passing track switch, if there be one. This will not only permit a train to approach close to the switch when in use (see d), but also will allow a train to clear the station block in good season to admit a following train. It is evident that the entering signal of a station block should be so placed as to be beyond the rear end of any train that might stop at the station, otherwise a following train would be held one block farther back and thereby delayed. Likewise it is expedient to place the signal in the rear of the entering signal as short a distance back as safety will permit for the same reason, as well as to prevent serious delays due to switching on the main line beyond the entering switch. (f) Interlocking plants affect signal locations much as do switches and stations in that a short approach block should be provided, both to expedite closely following trains and to give a distant indication for the interlocking home signal not too far beyond the braking distance; also an advance signal should be provided as close in as possible, in order to allow a train to clear the plant quickly and release the route for a following train. This advance signal can be much closer than would an ordinary block signal on the open road as the distant indication for the home signal can be made to repeat for it also. (g) Each tunnel should constitute one absolute block with the entering signal as near as may be to the portal. A tunnel block should not be divided for the reason that a train should not be admitted unless the track is clear for it to pass all the way through. A train should never be stopped in a tunnel because of the effects of darkness and foul gases on the persons (employees and passengers) concerned. For this reason the outgoing signal should be placed at a distance equal to the maximum train length from the outgoing portal. (h) The nature of the ballast limits the practicable length of track circuits. Therefore, where the ballast is of itself or owing to local conditions a good conductor of electricity, track circuits must be made comparatively short. This may make it expedient to shorten a block somewhat rather than go to the expense of providing an additional track circuit. (k) Cuts and fills may influence signal locations as they obstruct or improve the view or as they make difficult and expensive the construction

of signal foundations at a point which would otherwise be the logical place for a signal. The nature of the subsoil must be considered for the same reason, viz., it is more expensive to build foundations in rock, quicksand, etc., than in loam. (l) Bridges affect signal locations in the same manner as cuts and fills; moreover, it is inexpedient to stop a train on a bridge because of the possible danger to persons stepping off the train. (m) Parallel tracks, owing to the expense of spreading them so as to provide clearance for a signal, and if this cannot be done, the cost of a bracket post or bridge, may influence signal locations. It may be better to place a signal so as to avoid the additional cost, even though the location chosen may not be all that could be desired otherwise. (n) It may be expedient from the standpoint of economy, so to place a signal with relation to a highway crossing bell, that an additional track circuit will not be required. Also, when possible, signals should be so placed that trains stopped by them will not cause the bell to ring all the time they are standing, as this is a source of annoyance to the public as well as a drain on the battery.

The principles here set forth cannot be applied equally well in practice to double and single track signaling. On the double track the choice of a signal location is not nearly so restricted as on single track. Each track of a double track is usually signaled for movements in one direction only, therefore the effect of a signal in a certain location need be considered only in relation to trains moving in the established direction. This is not the case on single track, for there the effects of overlaps and the relations of opposing signals must be considered. On double track the signals may be placed in general where most expedient from an engineering standpoint, as usually, 500 ft. one way or the other will not materially affect the operation of trains. Therefore if by placing a signal some distance from the position it would normally occupy, considering operation alone, and if safety is not sacrificed, an appreciable amount of money can be saved, it is expedient to do so.

So much for the physical characteristics of a road and their relation to signal locations. It is necessary now to consider the relation of the signals to each other.

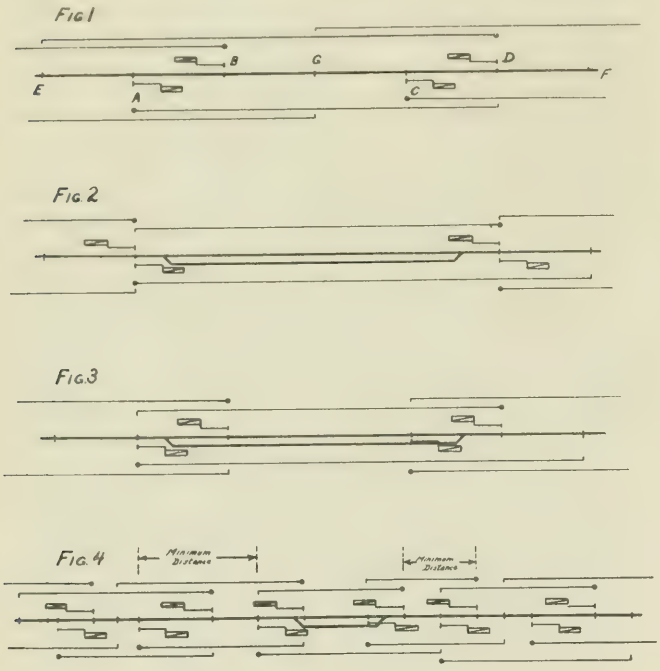
With any arrangement of signals trains running at full speed will be spaced a distance apart (measuring from engine to engine) equal to the length of the block plus the distance from the approach indication (distant signal) to the home signal (usually one block) plus the distance the train will run while a signal arm is moving from the stop to the proceed position, plus the length of the preceding train. Therefore to accommodate maximum traffic of any one class, signals should be so spaced that the length of a block (B) that is, the distance between home signals is equal to Br + T + X. Here Br is the braking distance for a train, T is the distance the train will run at full speed while the engineman is acting on the signal indication, X is a certain factor of safety. The warning, or approach indication, to be discussed later, should be given when possible at the same point as the home or stop indication. With this arrangement trains are able to follow each other at full speed two blocks apart with perfect safety, for should the first train stop, the following one would receive warning in time to stop at the entrance to the occupied block. Such an arrangement will accommodate a maximum number of trains of a given class, for it will permit trains to follow one another as closely as it is safe to follow. The part played by the various factors of the formula for the length of block is as follows: Br; it must be possible to stop a train running at full speed between the warning and stop signals in order that it may not over-run the stop signal and collide with a train that may be standing just beyond. T; should an engineman fail to see a signal until just before passing it, he might not be able to stop, if required to do so, were the distance his train will run while he is acting on the signal indication not added to the length of the block. The length of the train will affect the number of trains that can be run, for a signal will not commence to clear till after the last car of a train has passed it. Likewise the time required for a signal arm to move from the stop to the proceed position will affect the number of trains it is possible to run. The factor of safety needs no explanation. It should not, however, ordinarily be less than 20 per cent. In determining the braking distance for a train the grade of the track and any other conditions constantly affecting the speed of the train should be considered separately for each block. Of course, in practice, it is not possible to apply rigidly the principles above set forth. The physical characteristics of the road as before explained would greatly modify them even if it were always economically desirable to provide for the greatest possible number of trains on any given section of road. Moreover no account has been taken of the overlap as applied to single track signaling. Other factors also enter into the problem. There are always several classes of traffic to be considered, slow and fast trains; trains of different lengths, and yards and terminals through which speed is limited. Considering these the blocks may be considerably shortened, and should be, so that trains may close up. In presenting the formula for maximum traffic, it was given as applied to one class of trains only; that is to say, maximum number of trains of a given speed. The subject of signaling for trains of different speeds on the same track has been discussed previously. Suffice it to say here that signals spaced for trains of one particular speed, say fast express, are not suited to slower trains, such as heavy freight and vice versa, where such trains must follow each other closely; for a slow train will not be able to clear a long block fast enough to leave a proceed signal for a following train, which will thereby be delayed; and short blocks suited to slow trains are apt to be of less length than the braking distance for fast trains and consequently dangerous.

On single track when signals are used to afford head as well as following protection, some amount of capacity must be sacrificed; this for the reason that overlaps must be used. It is customary to place signals between stations governing in opposite directions, toward each other, a certain distance apart, usually not less than 1,500 feet, so that there will always be that much space between two opposing trains which may be stopped by such signals. This is called "staggering." Theoretically it is not necessary, as every train is supposed to stop at an adverse home signal. Theoretically, also, there should be no maximum limit, but it sometimes happens that two trains are so stopped in spite of train orders and therefore it is expedient to reduce as much as possible the distance that a flagman must walk or ride a velocipede. Now, considering two sets of staggered signals, in order that where two trains are approaching each from opposite directions each shall have a stop signal between it and the other train, it is necessary to provide an overlap; in other words, the home indication must govern beyond the next signal in advance. Calling the four signals respectively A, B, C and D, Fig. 1, A must govern to D and D to a point beyond A. It is not necessary for each to overlap the other; the long overlap can be at either end. Now a train approaching A will set B and D at stop, while a train from the opposite direction will set C at stop. Therefore the two trains will be stopped at C and D, respectively. This rule applies to any number of sets, as each group of four consecutive signals should be considered a unit so far as overlaps are concerned.

It is usual to provide a cut section at some point on each side of each pair of staggered signals, at which the overlap can end, as E, F, G, Fig. 1, thus reducing the length of the overlap and proportionately increasing the capacity of the road if the distance between pairs is great. This cut section, however, should not usually be less than 1,500 feet from the nearest signal, for reasons that are obvious when fast trains are considered.

The proper arrangement of signals at stations on single track presents some difficulties, but in general the principles outlined for double track apply. If signals are placed op-

posite (directly across the track from each other) Fig. 2, beyond the outer switches, no protection is afforded to a switching train against a train about to leave the station. If signals are staggered, the entering signals beyond the switches and outgoing signals at the fouling points, Fig. 3, it is impossible to use the main track beyond the outgoing signals without the liability of seriously delaying incoming trains. However, the amount of protection afforded by this arrangement would seem to warrant its use. To minimize delays as much as possible it is best that the first set of staggered signals beyond the station be placed the minimum distance as calculated from the formula for maximum traffic given above. The space between this set and the next can be as great as desired. With such an arrangement, Fig. 4,



trains can do switching on the main track a much greater time than if the intermediate sets of signals were spaced at equal intervals.

The foregoing illustrations show the most economical method of overlapping signals at stations. It will be observed that only one entering signal overlaps beyond the station. This overlap should be in the direction opposite to that of superior trains; in other words, if westbound trains are superior the overlap should extend to the east. With this arrangement if two trains of the same class are to meet, the inferior train will have to stop at or near the entering signal in any event in order to open the passing track switch to take the siding, therefore it will not be delayed by the stop signal set by the superior train, and the superior train will not receive a stop signal until it reaches the outgoing signal, if the inferior train comes in with but little time to spare. Thus movements are facilitated to the greatest degree possible. Heretofore it has been usual to overlap both entering signals beyond the station, but this is not necessary for safe operation, and it will cause delays that would not occur under the arrangement outlined. By placing the signals as shown in Fig. 4, and arranging the overlaps accordingly, the greatest facility is provided for switching movements. And the signals are closely spaced at stations, thus allowing trains to close up for following movements where it is most desirable to do so. At some excessively long yards it is necessary to place intermediate signals between outgoing signals. When this is the case they can usually be treated in the same manner as staggered signals between stations.

In order that an engineman may properly control his train, it is necessary to provide not only a stop indication, but also a caution, or perhaps more properly, an approach indication. That is to say, an engineman should be told at some point whether he is approaching a stop or a proceed signal. Without this information he might not see a stop signal in time to bring his train to a stand before reaching it. This indication is usually given at the entrance of the block in the rear, thereby combining two signals in one for purposes of economy in the matter of posts, battery, battery housing and other accessories. Where two-position signals are in use and the approach indication is given by an arm of distinctive shape and a separate light (of distinctive color), it has been the practice on many roads to erect a separate distant signal within the block at a distance from the home signal equal that given for maximum traffic. This practice is the only correct one to follow where home signals are placed, as they often must be on roads of thin traffic, a distance apart much greater than the braking distance for fast trains. It is usually poor policy in such cases to combine the indications on one post, as the approach indication then ceases to be of practical value owing to the fact that it is not given at the point where the engineman must begin to act upon it (apply brakes). This renders it an absurdity, for an engineman will be obliged to learn the length and characteristics of every individual block so that he may know at what point, after having passed an adverse distant indication, to begin to stop. This, if practicable at all, would put too great a strain on the man's memory and enhance the risks due to the human equation. It would seem better to abolish the indication altogether, trusting to an engineman's knowledge of the road to pick up his home signal indication in time to stop, and as an aid, to so place the signals that a good view of each could be obtained for a sufficient distance. Special intermediate distant signals could be used at points where a good view could not be had. By doing this a considerable amount of money could be saved on many installations. It is perfectly feasible to provide separate approach indications with a three-position signal system. The home signal can be made to work between 0° and 90° and a three-position signal governing to the end of the block and repeating for the signal in advance erected at the proper point to give a correct approach indication. The only factor to be considered in such a system is that of cost, which would be high. The manifest advantages of telling an engineman exactly where to begin to apply brakes, are not, however, to be underestimated. Nervous strain on enginemen, wear on brake and draft rigging and consumption of fuel due to needless stops and slowing up of trains, and sudden stopping at a stop signal whose approach indication is absent or has been forgotten, should be taken into account.

On single track the distant indication is of little or no value for opposing movements between stations for obvious reasons; nevertheless it is extremely useful for following movements and it can be made very useful for giving information to enginemen approaching stations. Here the distant indication for the entering signal should serve also for the next signal in advance. When this is done with the arrangement of signals which I have described neither of two trains approaching a station from opposite directions will receive a full clear signal at the last intermediate signal and then receive a stop signal at the entrance to the station, as can otherwise happen. If a separate distant signal is provided, it should be arranged with track circuit control to a point sufficiently far from the opposite end of the station to accomplish the same result.

Wherever signals are closer together than provided for by the formula for maximum traffic, the distant indication for the first signal should also govern the approach to the second, otherwise an engineman will not have time to stop at the second signal should it be against him. In such a case, the second signal should also have a separate distant indication at the first, so that an engineman will not resume speed at the first signal, finding it clear, only to meet a stop signal a short distance beyond. Interlocking plants are points where this situation is most often met.

General News Section.

The New York, New Haven & Hartford has increased by 8 per cent. the pay of 5,000 employees in its shops.

The New York State Civil Service Commission announces examinations June 25 of candidates for various positions, including civil engineer, for the Public Service Commission, second district, on grade crossing work; salary, $2,000 to $2,400.

The question of the wages of the employees of the Connecticut company (operating the street railways in Connecticut owned or controlled by the New York, New Haven & Hartford) is to be left to arbitration, the board consisting of one man chosen by the company, one by the employees and the third by these two arbitrators. Clarence Deming, associate editor of the *Railway Age Gazette*, has been named by the company; the employees have not yet made a choice.

An officer of the Northern Pacific writes that this road now supplies nearly all of its dining cars running out of Seattle with milk and eggs from cows and chickens on poultry and dairy farms owned and operated by the company, and that it is just starting a truck garden at Paradise, Mont. All of these enterprises are in more or less of an experimental stage, and the company has not as yet arrived at a conclusion of the desirability of extending its experiments. It has not yet decided whether it can produce better supplies for its dining cars itself than it can procure from outside sources.

Trains entering and leaving the Grand Central Station, New York City, now use the new platform-tracks exclusively, the last two tracks on the old level having been abandoned on Sunday last. On the upper level of the new part of the station—which is at the east side and 15 or 20 ft. below the level of the tracks in the old station—24 tracks are now in use, and on the level below this, used at present wholly for suburban trains of the New Haven road, six or eight tracks are in use, though more than twice this number are finished. The arrangement of nearly all of these tracks on the upper level and all on the lower level is temporary. When the whole of the new tracks are finished the principal platforms will be nearer the center of the yard, and the tracks now in use will be spare or will be used for storage. The excavation for the new station and tracks, largely hard rock, is now considerably more than half done.

Railway Matters in Washington.

Washington, June 8, 1910.

The administration bill was passed by the Senate on Friday last, at 10 o'clock in the evening, after a discussion extending over 12 weeks. The vote was 50 to 12, the minority being all Democrats.

The final action in the Senate was to take up the House bill and, after striking out the whole of the substance of that bill, putting the Senate bill, which had been framed in committee of the whole, in place of the House bill; that is to say, the Senate bill under the House title. The principal features of the bill as it now goes back to the House are:

1. Provision for a court of commerce to consider appeals from decisions of the Interstate Commerce Commission.
2. Amendment of the long and short haul provision of the present law so as to allow a greater charge for the short haul only with the consent of the commission; and forbidding the fixing of a lower rate for the purpose of destroying water competition.
3. Rates to be furnished in writing on application of a shipper; penalty for error, $250.
4. Authority given the commission to investigate the propriety of any new rate.
5. Shippers given the right to designate a through route or part of a route.
6. Telegraph and telephone companies subjected to jurisdiction of the commission.
7. The government, rather than the commission, is made defendant in all cases coming before the court, but the commission and other interested parties are allowed to intervene.
8. Federal courts are forbidden to suspend the operation of state laws except when the matter is presented to a justice of the Supreme Court or a circuit judge and is heard by three judges, one of whom shall be a Supreme Court judge or a Circuit Court judge.

It will be seen that from the bill as it stood three months ago the following features have been cut out: (a) the provision to permit traffic agreements contrary to the anti-trust law; (b) the provision to permit one road owning 51 per cent. of another to buy the remaining 49 per cent., and (c) the requirement that stock and bond issues shall be subject to federal regulation.

Yesterday (Tuesday) the House, after a long debate, voted down a proposition, strenuously urged by the insurgents, to accept the Senate bill as it stands, the insurgents and most of the Democrats believing that in a conference between committees of the two Houses the conservatives would secure the most important advantages. The "regulars" won this vote by a narrow margin—162 to 156. Now the bill will go to conference. The conferees on the part of the House are Messrs. Mann, Wanger and Adamson, and those on the part of the Senate are Messrs. Elkins, Aldrich and Foster. Mr. Mann, in arguing for reference of the bill to a conference, declared that the Senate had been careless in many of its amendments. One of the provisions inserted in the Senate allows consignees who have suffered by the incorrect quotation of a rate to recover damages, which would open an easy way of granting rebates. The Senate had cut out the clause giving the Interstate Commerce Commission authority to regulate charges; had refused to give interurban roads the privilege of having through rates over standard railways, and had made a mistake in adding the clause to put telegraph and telephone companies under the authority of the Interstate Commerce Commission. In the conference the representatives of the lower House will probably try to have retained the clause providing for physical valuation of railways.

The bill, as it left the Senate, was to go into effect 60 days after approval by the President, but the President has this week sent a special message to Congress recommending that the clause empowering the commission to suspend tariffs announcing increases of rates shall go into effect at once.

On Monday Messrs. Ripley, of the Atchison; Delano, of the Wabash, and Felton, of the Chicago Great Western, came to Washington and conferred with President Taft about the injunction suit brought by the administration against the western roads, as heretofore announced. After long discussion, in which four members of the Cabinet and two members of the Interstate Commerce Commission participated, the railway men, acting for all the roads against which the injunction had been issued, agreed to suspend those advances which were enjoined until after Congress shall take action on the bill which is now before it; and President Taft agreed to refrain from prosecuting the injunction suit. The President, as above noted, sent a message to Congress designed to hasten action. On the following day the President conferred with Messrs McRea, of the Pennsylvania; Brown, of the New York Central, and Finley, of the Southern, and these three, speaking for the eastern lines, agreed also to suspend the tariffs which have recently been issued, as well as any other action looking to increase the freight rates, until Congress shall have acted; or, if action should not be taken in Congress by the first of July, the railways would submit any proposed advances to the Interstate Commerce Commission. Mr. Finley said that as yet his road had taken no action looking to increases in rates. The western men told the President that their proposed increases affected only 1½ per cent. of their tonnage.

The judiciary committee of the House has taken action looking to the appointment of a commission to investigate employers' liability and workmen's compensation.

The Congressional proposal to discuss a bill to limit the

power of the courts in the issuance of injunctions is said to have been dropped for the present session.

On Monday the House passed the Stevens bill, H. R. 25,335, regulating the issuance of bills of lading. This proposed law aims to make a carrier responsible for bills of lading, even though an agent issues a bill when no goods have been received. Under the common law, the carrier may, in such a case, deny liability, on the ground that it is not responsible in damages for the unauthorized acts of an agent. The bill also holds a railway liable if it delivers goods for which an order bill of lading has been issued without requiring the surrender of the bill. This bill has been promoted before Congress by the committee of bankers who for many months have been trying to provide better safeguards against the serious frauds that have been committed in connection with bills of lading recently. In this connection it is of interest to note that representatives of the Southeastern Cotton Buyers' Association are going to Europe to try to secure agreement on a plan to have bills of lading certified by a bank at the shipping point.

Some western railway men have been in Washington this week conferring with the Interstate Commerce Commission in regard to a postponement of the date at which some of the requirements of the safety appliance laws shall take effect. These gentlemen also conferred with the commission in regard to the law fixing the standard height of drawbars, and the commission will probably issue a revised order defining more accurately the standard height. Separate heights will be prescribed for railways of 3 ft. and 3½ ft. gages and those of 2-ft. gage.

Advances in Wages of Firemen and Enginemen.

A federal board of arbitration composed of Judge William L. Chambers, Washington, D. C., chairman; W. R. Scott, assistant general manager Southern Pacific, and Timothy Shea, vice-president of the Brotherhood of Locomotive Firemen and Enginemen, on June 4 rendered a decision awarding the members of this organization employed on 49 railways west of Chicago, increases in wages of 10 to 12 per cent. The advances in wages was granted mainly on the ground that the cost of living has increased. The following summarizes the awards made by the board:

Firemen in main line and branch passenger service, an increase of 15 cents per 100 miles or less.

Firemen in through and irregular freight, mixed, work, wreck, gravel, helper, pusher, snow plow and branch service (except Mallet type engine), an increase of 15 cents per 100 miles or less; provided that on coal burning engines firemen in this service shall receive an additional increase of 15 cents per 100 miles or less.

Firemen in local or way freight service, an increase of 25 cents per 100 miles or less over through freight rates established by this arbitration, except on roads having an eight-hour day or 12½ miles per hour basis for such runs. On lines where increased rates of wages are now allowed in local or way freight service over through freight rates such differentials will be maintained.

Firemen on Mallet type engine shall receive $4 per 100 miles or less in all classes of service. This rate shall also apply on lines where the schedules provide for trip basis in helper or pusher service in accordance with rules in effect.

Firemen in yard service shall be granted an increase of 25 cents a day.

Where rate of pay is provided for transfer service, firemen shall be granted an increase of 25 cents per day.

On lines where rates of pay are negotiated through the Brotherhood of Locomotive Firemen and Enginemen committees for hostlers, switch engineers and engine despatchers, such employees shall be granted an increase of 25 cents per day.

The above increases shall be based on rates of pay in effect January 1, 1910, except that the differential as between through and local freight shall be based on the through freight rate established by this arbitration. Overtime shall be paid pro rata.

The arbitrators agreed on nearly all the points decided on, although Mr. Shea filed a dissenting opinion setting forth his reasons for not concurring in some parts of the decision of the majority.

Illinois Central Brings Suit for Alleged Frauds in the Repairing of Cars.

The Illinois Central brought suit on June 6, in the Cook County (Ill) Circuit Court, at Chicago, against some of its former officers and four car equipment companies for alleged frauds against the railway in the repairing of cars. The former officials of the Illinois Central named in the bills are: Joseph E. Buker, formerly superintendent of the car department; William Renshaw, formerly superintendent of machinery; O. S. Keith, formerly superintendent of transportation, and Joseph M. Taylor, formerly general storekeeper. The five companies with which these defendants are alleged to have connived in defrauding the railway are the Blue Island Car & Equipment Company, the Memphis Car Company, the American Car & Equipment Company, the West Pullman Company, formerly the Ostermann Manufacturing Company, and the International Car Company. There was no suit against the Blue Island company, as it had already brought suit against the Illinois Central for an accounting, but the allegations made against this company are similar to those made against the other companies.

An injunction against the Central Trust Company of Chicago was sought to prohibit it from paying any of the $226,000 in cash and notes which it is alleged the West Pullman Company paid to Ostermann and which is now held by the Central Trust Company.

The allegations of the Illinois Central are, in brief, that, about June, 1906, Messrs. Buker, Renshaw, Keith and Taylor entered into a conspiracy to defraud the railway, and in pursuance of this conspiracy recommended that the repairing of cars in the company shops be discontinued and that contracts for the work be given to the five companies mentioned. It is alleged that, this action having been taken, they made an arrangement with the five car companies under which cars were sent to them to be repaired and bills were rendered and paid which were exorbitant. It is also charged that large quantities of paints, oils, ties, lumber, bolts, etc., belonging to the railway were delivered to the car companies and were used in the repair of the railway's cars, after which the railway was charged for them. It is also alleged that the repair companies took parts from some of the Illinois Central cars, used them to replace parts of other cars, and then charged the railway for this. It is alleged that the four officers received stock in the repair companies, for which they paid nothing, and that they received a portion of the moneys said to have been fraudulently obtained from the railways in the guise of dividends on this stock. The total amounts paid to the defendant companies and the amounts of the payments which are alleged to have been obtained by fraud are as follows:

	Amount paid.	Alleged fraudulent.
Blue Island Car & Equipment Co.	$1,460,310	$400,000
Ostermann Co.	2,525,936	750,000
Memphis Car Co.	939,396	300,000
American Car & Equiment Co.	299,230	100,000
International Car Co.	8,882	5,000
Totals	$5,233,754	$1,555,000

Society of Railway Club Secretaries.

The annual meeting will be held at Marlborough-Blenheim Hotel, Atlantic City, N. J., June 18, 1910, at 10 a.m. One of the most important matters to be taken up is a proposed plan for widening the scope of the society, which, if adopted, will result in the organization of the American Association of Railway Secretaries, the membership of which shall be composed of the secretaries of all railroad organizations, except such as are identified with organized labor. In the preliminary submission of this matter to the secretaries, it has met with such favor as to lead to the expectation that a permanent association of the character stated will be formed. For obvious reasons, it is proposed that the secretaries of railway clubs shall continue their present organization known as the Society of Railway Club Secretaries as a railway club section of the general association. It is believed that in the

event of this undertaking being successfully carried out, the proposed association will be of advantage to its members in the solution of problems connected with their work, as well as any other matters of mutual interest. The annual dinner of the Society of Railway Club Secretaries will be held on the evening of June 18, at Atlantic City, time and place to be announced later.

Enrollment M. C. B. and M. M. Conventions.

W. W. Rosser, chairman of the Enrollment Committee of the Railway Supply Manufacturers' Association, has issued a notice asking that all those who reach Atlantic City on or before the evening of Tuesday, June 14, enroll and get their badges on either the afternoon or evening of that day. The enrollment booth will be open until 10 o'clock on Tuesday night. By respecting this request considerable congestion will be avoided on Wednesday morning.

M. M. and M. C. B. Conventions.

The sessions of the conventions will be held in the Greek Temple on the Million-Dollar Pier. The enrollment committee will be located in the entrance to the pier. Members of the associations, immediately upon arrival, should go to the enrollment booth, register and procure membership buttons. Members of the M. C. B. Association should note particularly that there will be a morning and afternoon session each day. Those who are members of both associations and expect to attend both conventions, should register twice, once for each convention. The program is as follows:

M. C. B. ASSOCIATION.

Wednesday, June 15.—Morning Session.

Opening exercises	10:00 a.m. to 11:50 a.m
Discussion of reports on:	
Nominations	11:50 a.m. to 12:00 m.
Revision of Standards and Recommended Practice	12:00 m. to 12:30 p.m.

Afternoon Session.

Discussion of reports on:	
Train Brake and Signal Equipment	2:00 p.m. to 2:30 p.m.
Brake Shoe Tests	2:30 p.m. to 3:30 p.m.
Rules for Loading Materials	3:30 p.m. to 4:00 p.m.

Thursday, June 16.—Morning Session.

Discussion of reports on:	
Rules of Interchange	10:00 a.m. to 10:30 a.m.
Coupler and Draft Equipment	10:30 a.m. to 11:00 a.m.
Car Wheels	11:00 a.m. to 12:00 m.
Safety Appliances	12:00 m. to 12:15 p.m.
Freight Car Trucks	12:15 p.m. to 12:30 p.m.

Afternoon Session.

Discussion of reports on:	
Splicing Underframes	2:00 p.m. to 2:30 p.m.
Car Framing, Roofs and Doors	2:30 p.m. to 3:00 p.m.
Tank Cars	3:00 p.m. to 3:30 p.m.
Train Pipe and Connections for Steam Heat	3:30 p.m. to 4:00 p.m.

Friday, June 17.—Morning Session.

Discussion of reports on:	
Consolidation of Master Car Builders' and Master Mechanics' Associations	10:00 a.m. to 10:30 a.m.
Classes of Cars	10:30 a.m. to 11:00 a.m.
Salt-water Drippings from Refrigerator Cars	11:00 a.m. to 11:15 a.m.
Mounting Pressures on Wheels and Axles	11:15 a.m. to 11:45 a.m.
Individual paper on "Design of Axle to Carry 50,000 Pounds," by E. D. Nelson	11:45 a.m. to 12:00 m.
Springs for Freight car Trucks	12:00 m. to 12:30 p.m.

Afternoon Session.

Discussion of reports on:	
Train Lighting and Equipment	2:00 p.m. to 2:30 p.m.
Lumber Specifications	2:30 p.m. to 3:00 p.m.
Unfinished business, etc	3:00 p.m. to 3:15 p.m.
Election of Officers	3:15 p.m. to 4:00 p.m.

M. M. ASSOCIATION.

Monday, June 20.

Opening exercises	9:30 a.m. to 10:45 a.m.
Discussion of reports on:	
Mechanical Stokers	10:45 a.m. to 11:00 a.m.
Revision of Standards	11:00 a.m. to 11:15 a.m.
Individual paper by W. S. Hayes on "Fuel Economies"	11:15 a.m. to 12:00 m.
Topical discussions:	
"Self-dumping Ash Cans," by H. T. Bentley, C. & N. W.	12:00 m. to 12:30 p.m.
"Apprenticeship Education," by F. W. Thomas, A., T. & S. F. Ry.	12:30 p.m. to 1:00 p.m.
Discussion of report on:	
Motive Power Development	1:00 p.m. to 1:30 p.m.

Tuesday, June 21.

Discussion of reports on:	
Widening Gage on Curves	9:30 a.m. to 9:45 a.m.
Steel Tires	9:45 a.m. to 10:00 a.m.
Safety Appliances	10:00 a.m. to 10:15 a.m.
Superheaters—Individual paper on "Locomotive Performance Under Different Degrees of Superheat," by Prof. C. H. Benjamin, Purdue University	10:15 a.m. to 12:00 m.
Individual paper on "Locomotive Frame Construction," by H. T. Bentley, C. & N. W. Ry.	12:00 m. to 12:30 p.m.
Report of Committee on Safety Valves	12:30 p.m. to 1:00 p.m.
Report of committee on:	
Lumber Specifications	1:00 p.m. to 1:30 p.m.

Wednesday, June 22.

Discussion of report on:	
Train Brake and Signal Equipment	9:30 a.m. to 10:00 a.m.
Individual paper on "Freight Train Resistance," by Prof. E. C. Schmidt, University of Illinois	10:00 a.m. to 11:00 a.m.
Discussion of reports on:	
Locomotive and Shop Operating Costs	11:00 a.m. to 11:45 a.m.
Design, Construction and Inspection of Locomotive Boilers	11:45 a.m. to 12:00 m.
Consolidation of Master Mechanics' and Master Car Builders' Associations	12:00 m. to 12:15 p.m.
Resolutions, Correspondence, etc	12:15 p.m. to 12:30 p.m.
Election of Officers	12:45 p.m. to 1:30 p.m.

Terminal Officers' Association of Chicago.

The Terminal Officers' Association of Chicago, composed of terminal superintendents, trainmasters, general yard masters, and other railway officials in charge of terminal trains and yard operation, has been organized. Its object is to bring the railway companies having terminals in Chicago "into closer and more effective relationship as regards the conducting of terminal business of mutual interest, through an organization composed of officials actively concerned in the directing of terminal operations." W. D. Dunning has been elected president of the association, and W. B. Gibbs secretary.

American Street and Interurban Railway Association.

The annual convention of the American Street and Interurban Railway Association will be held at Atlantic City, N. J., October 10 to 14, inclusive. The exhibits of the Manufacturers' Association will be held on the Million Dollar Pier.

Western Society of Engineers.

F. Darlington, of Pittsburgh, read a paper before the Western Society of Engineers on June 7 on "The Economic Considerations Governing the Selection of Electric Railroad Apparatus."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues; N. Y.; May 31-June 3; Atlantic City.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.: Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit. Mich.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.
RAILWAY ASSOCIATION OF SPECIAL AGENTS AND POLICE OF U. S. AND CANADA.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; regular meeting, June 14; New York.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
TRANSPORTATION CLUB OF TOLEDO.—L. G. Macomber, Woolsen Spice Co., Toledo.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

An officer of the Western Pacific announces that through passenger trains will begin running over that road in August.

In the province of Quebec a law has been passed requiring that after January 1, 1911, railway tickets, bills of lading and other papers to be used by the public shall be printed in both the French and the English languages.

It is given out at Ottawa that the Railway Commission of Canada has been negotiating with the Interstate Commerce Commission of the United States with a view of attempting regulation of rates on trans-Atlantic steamship lines. It appears that the co-operation of the British government in London is to be sought.

The Pennsylvania has announced increases in season-ticket fares between New York City and stations within 60 miles, or thereabouts. The increases vary from nothing to 20 per cent., but in most cases they are about the same as those heretofore announced by the Central of New Jersey; that is to say, not over 4 or 5 per cent.

The Spokane, Portland & Seattle has announced reductions in rates on wool to the Atlantic seaboard, taking effect July 8, and the Oregon Railroad & Navigation Co. has followed with a similar reduction. Some of the new rates are: From the Dalles, $1.43 per 100 lbs.; from Pendleton, $1.38; from Heppner, $1.80; from Enterprise, $2.32.

The Atchison, Topeka & Santa Fe has established an agricultural department, at the head of which will be Professor J. T. Tinsley, formerly connected with the New Mexico Agricultural College. Experiments will be conducted extensively in all sections reached by the Santa Fe system, including regions where only "dry farming" can be successful.

The Rock Island lines have made several changes in the schedules of their through passenger trains. They now have morning, noon and night service from Chicago to Colorado points. The "Mountaineer" will leave Chicago at 1.25 p.m., reaching Denver the following afternoon at 5.20. The "Rocky Mountain Limited" and the "Colorado and California Express" will continue to run on their present schedules with the exception that the former train eastbound will leave Denver at 9 a. m., reaching Chicago in time for connection with the 18-hour trains for the East. A new train, "The Twin City Special," will leave Chicago at 6 p. m. for St. Paul and Minneapolis, arriving at St. Paul at 8 a. m. Announcement is also made that the running time between Kansas City and St. Louis will be shortened almost an hour.

On Thursday of last week the steamship City of Montgomery, of the Savannah Line, sailing from New York to Savannah, carried a shipment of 5,000 bales of cotton which was grown in the southern states, had been sold and delivered in England, and subsequently was bought there by Americans for use in mills in the South, where there is a scarcity because of the large quantities that have been sold for delivery in May and June. The City of Montgomery is a new vessel, the largest freight carrier in the Atlantic coastwise service, and fitted with the finest passenger accommodations of any vessel plying between New York and any port north of Key West.

The eastern trunk lines last week filed with the Interstate Commerce Commission at Washington tariffs showing increased freight rates on a large number of commodities to Chicago and other western points. From the sample items which have been published it appears that most of the increases range between 5 and 10 per cent. For example, taking from New York to Chicago, we find:

	Rate.	
	Old.	New.
Bagging	30	33
Mahogany	25	27
Starch	25	27

Many of the items which are published represent commodities which do not move in any great volume from the Atlantic seaboard to the West, and, therefore, it is impossible to make any estimate of the probable effect of the changes in the rates. Notices were also given of advances between Chicago and the Ohio river; but, as will be seen by our Washington letter, all these advances probably will be postponed.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 71-A, giving a summary of car shortages and surpluses by groups from January 20, 1909, to May 25, 1910, says:

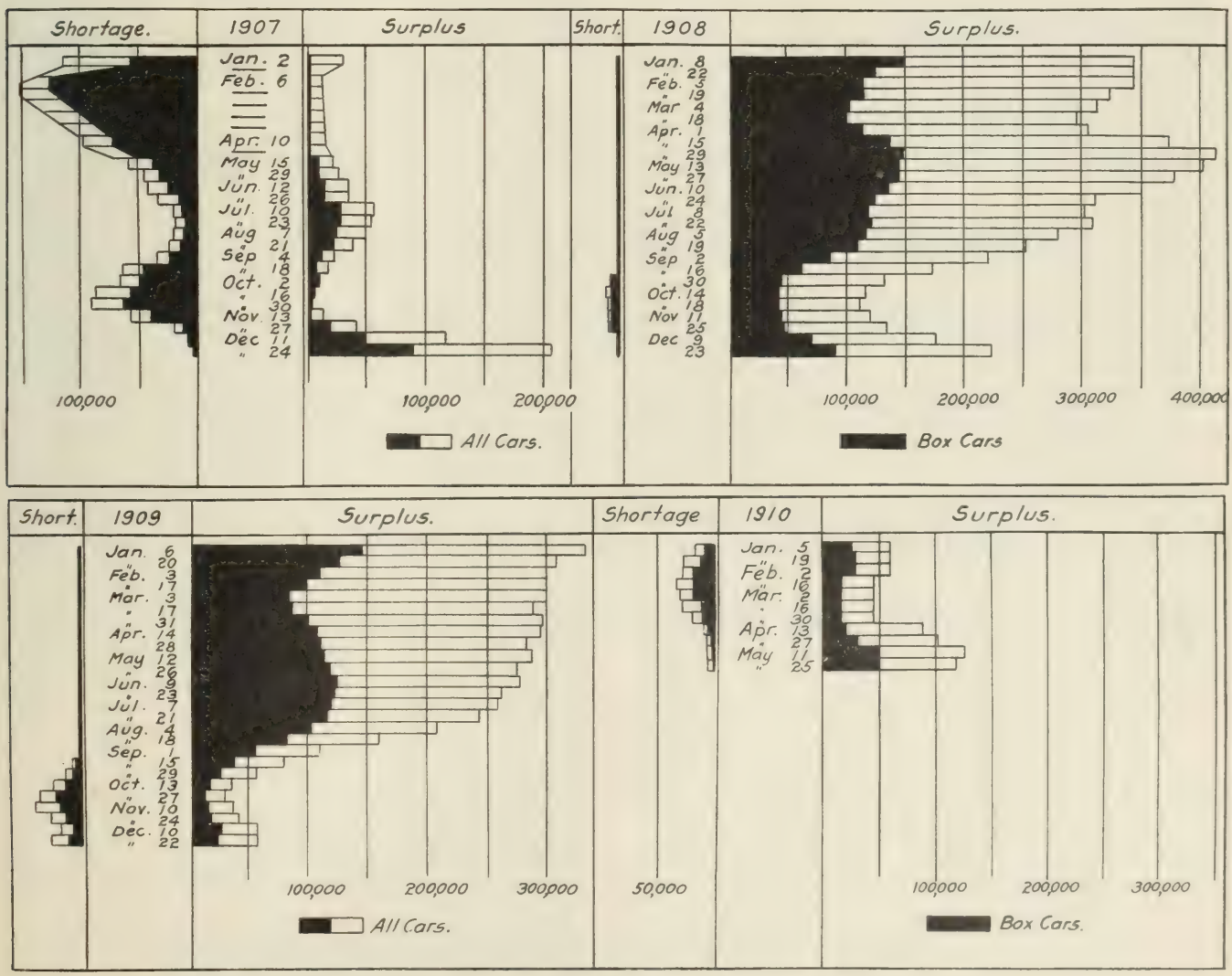
"The total surplus reported for this period is 115,390, a decrease of 11,758 cars. The box car surplus shows an increase of 3,330, while coal cars decreased 16,174. Flats and miscellaneous cars are about stationary. The heaviest decrease is in group 6 (Northwestern), where both box and coal show decreases of 50 per cent. and 40 per cent. respectively. Group 3 (Central), which reports the next largest decrease, follows the grand totals more closely, the box car surplus in this territory having increased, while coal cars decreased about 50 per cent. There is little change in the shortage, which totals 4,729 cars, as against 4,555 in our last bulletin."

The accompanying table gives surpluses and shortages by groups on May 25, and the charts show total bi-weekly freight car surpluses and shortages in the years 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—May 25, 1910	8	20	2	77	77	176	138	301	75	17	531
" 2.— " 25, 1910	21	7,128	131	4,787	10,999	23,045	...	20	8	4	32
" 3.— " 25, 1910	22	16,180	871	9,429	3,371	29,851	31	100	475	115	721
" 4.— " 25, 1910	10	1,384	38	388	966	2,776	223	442	1,225	30	1,920
" 5.— " 25, 1910	20	3,050	131	2,422	1,269	6,872	...	243	...	...	243
" 6.— " 25, 1910	17	4,034	397	3,152	3,325	10,908	837	21	20	14	892
" 7.— " 25, 1910	4	1,524	72	188	1,091	2,875	...	...	...	...	...
" 8.— " 25, 1910	15	6,837	497	6,407	4,088	17,829	2	...	19	4	25
" 9.— " 25, 1910	8	1,795	262	632	1,276	3,965	...	...	...	...	...
" 10.— " 25, 1910	24	4,517	858	2,391	6,176	13,942	15	13	15	28	71
" 11.— " 25, 1910	5	1,857	25	15	1,254	3,151	170	96	...	28	294
Grand total	154	48,326	3,284	29,888	33,892	115,390	1,416	1,236	1,837	240	4,729

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4— West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909, and 1910.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net	Taxes	Operating income (or loss).	Increase (or dec.) comp. with last year
Atchison, Topeka & Santa Fe	7,459	$5,168,460	$1,837,190	$7,917,792	$1,466,274	$1,151,515	$159,867	$2,336,683	$178,315	$5,292,654	$2,625,138		$273,816	$2,351,322	$256,000
Atlantic Coast Line	4,483	1,992,234	603,725	2,812,401	330,838	342,772	41,117	837,677	76 292	1,628,696	1,183,705	.....	95,500	1,088,205	304,304
Boston & Maine	2,242	2,146,081	1,119,737	3,539,685	377,855	459,994	43,478	1,499,346	84,282	2,464,955	1,074,730	$1,107	165,489	910,348	7,455
Central R.R. of New Jersey	668	1,724,354	349,850	2,185,003	208,379	328,197	25,652	556,824	40,100	1,159,152	1,025,851	11,653	85,320	928,878	14,584
Chesapeake & Ohio	1,938	2,192,484	407,107	2,700,953	326,971	496,386	45,534	732,625	53,339	1,654,855	1,046,098	2,285	80,500	963,313	171,204
Chicago & Eastern Illinois	965	538,340	150,180	737,747	99,140	129,226	25,224	310,617	31,081	595,288	142,459	1,075	29,900	111,484	141,817
Chicago & North Western	7,638	3,854,868	1,307,612	5,787,015	675,591	737,976	94,818	2,537,043	117,759	4,163,187	1,623,828	22,518	215,571	1,300,663	460,023
Chicago, Burlington & Quincy	9,028	4,521,296	1,687,365	6,803,593	1,486,330	1,114,880	115,420	2,348,306	199,905	5,264,841	1,538,752	956	29,043	204,532	.....
Chicago Great Western R.R.	1,487*	801,091	215,714	1,095,330	167,453	127,779	45,909	482,286	37,371	860,798	234,532	9,687	237,500	419,145	671,853
Chicago, Rock Island & Pacific	7,393	3,073,592	1,325,045	4,719,460	916,785	747,650	169,714	2,060,360	158,619	4,053,127	666,332	170	60,895	384,008	72,539
Chic., St. Paul, Minneapolis & Omaha	1,738	828,730	309,416	1,225,920	146,140	149,181	22,144	436,636	26,786	780,887	445,033	.....	26,908	40 129	—1,926
Cincinnati, Hamilton & Dayton	1,036	552,428	115,764	758,031	190,990	142,216	24,712	312,113	20,963	690,994	67,037	1,032	21,823	142 497	23,624
Colorado & Southern	1,248	620,350	108,219	769,013	135,200	167,135	15,260	261,974	24 092	603,661	165,352	488	35,000	764,498	69,057
Delaware & Hudson Co	843	1,380,666	191,822	1,756,841	115,209	227,426	18,440	556,827	38,954	956,856	799,985	30,150	118,650	1,400 762	258,029
Delaware, Lackawanna & Western	930	2,375,415	550,070	3,116,489	286,787	405,531	60,888	818,364	55,657	1,627,227	1,489,262	417	69,000	604 295	181,489
Denver & Rio Grande	2,517	1,433,282	396,169	1,906,882	222,912	289,658	46,055	632,047	43,333	1,234,004	672,878	22,312	108,930	1,130,641	182,426
Erie	1,961	2,708,868	665,763	3,660,379	303,663	675,235	99,480	1,224,559	86,559	2,389,496	1,270,883	363	263,587	1,215,113	104,062
Great Northern	7,129†	3,778,378	1,135,832	5,197,107	1,209,764	718,092	76,587	1,629,400	83,901	3,717,744	1,479,363	.....	41,298	115,054	242,789
Gulf, Colorado & Santa Fe	1,518	622,755	221,261	914,830	343,447	186,188	24,314	402,519	32,208	988,676	—73,846	.....	29,664	266 442	—7,177
Kansas City Southern	827	657,015	115,186	851,247	88,043	98,923	31,510	305,850	31,415	555,741	295,506	26,962	94,600	1,380 449	246,458
Lehigh Valley	1,441	2,858,492	332,577	3,306,136	276,739	484,731	80,029	909,085	53,541	1,804,125	1,502,011	27,516	125,580	1,049,243	14,481
Louisville & Nashville	4,594‡	3,202,507	882,294	4,394,263	836,195	798,113	104,636	1,584,860	126,152	3,249,956	1,144,307	459	35,993	176,747	17,452
Maine Central	932	442,908	210,245	697,894	100,700	108,319	9,538	241,766	25,290	485,613	212,281	1,125	95,000	358,886	195,986
Missouri, Kansas & Texas	3,072	1,403,043	596,803	2,233,637	401,374	273,379	53,804	971,267	81,052	1,780,876	452,761	4,140	25,196	247,684	17,057
Mobile & Ohio	1,114	651,556	137,907	927,439	112,208	164,509	31,852	304,852	36,998	650,419	277,020	101,228	350,000	1,509,170	93,433
New York, New Haven & Hartford	2,044	2,677,125	1,973,764	5,079,352	714,583	522,971	27,132	1,933,112	123,612	3,321,410	1,757,942	7,556	404,661	1,533,278	469,880
Northern Pacific	5,849§	4,357,400	1,461,719	6,186,156	1,253,092	779,999	83,620	2,070,817	68,245	4,255,773	1,930,383	6,424	147,800	628,875	146,644
Pennsylvania Co.	1,415	2,831,354	605,083	3,771,414	604,755	801,213	70,548	1,425,422	86,287	2,988,225	783,189	459	35,993	176,747	17,452
Pennsylvania R.R. Co.	3,947	9,374,547	2,507,729	12,730,952	1,660,217	2,707,988	175,331	4,521,678	307,197	9,372,411	3,358,541	115,817	197,526	3,045,198	135,512
Pere Marquette	2,328	985,073	265,658	1,353,013	151,459	175,681	41,641	547,936	30,477	947,194	405,819	13,220	84,395	334,644	45,744
Philadelphia, Baltimore & Washington	717	795,060	582,963	1,537,829	235,249	270,965	28,566	626,250	32,375	1,193,405	344,424	.....	35,772	308,652	—20,100
Pitts., Cincinnati, Chicago & St. Louis	1,468	2,180,274	600,436	3,119,830	412,682	674,061	67,380	1,164,634	68,248	2,387,005	732,825	1,039	112,426	619,300	83,049
Southern Ry.	7,050	3,267,422	1,110,780	4,773,435	558,474	855,165	132,576	1,626,840	145,429	3,318,484	1,454,951	9,714	161,937	1,302,698	170,949
Texas & Pacific	1,885	844,883	312,658	1,221,513	150,640	249,489	19,561	564,997	35,246	1,019,923	201,590	—2,249	38,000	161,331	56,962
Union Pacific	3,411‖	2,786,305	818,625	4,012,866	757,969	470,804	92,684	1,077,375	97,803	2,496,635	1,516,231	—8,325	123,250	1,384,656	—92,563
Vandalia	827	433,100	177,573	695,040	160,567	176,062	23,475	293,097	19,670	672,871	22.170	.....	25.199	3,029	—119,545
TEN MONTHS OF FISCAL YEAR, 1910.															
Atchison, Topeka & Santa Fe	7,459	48,772,549	17,466,287	72,256,896	11,971,998	11,001,583	1,433,487	20,905,405	1,550,506	46,862,979	25,393,917	.....	2,680,506	22,713,411	—1,105,574
Atlantic Coast Line	4,483	17,654,358	5,756,537	25,198,597	3,290,917	3,498,036	415,905	7,590,552	699,593	15,495,003	9,703,594	.....	949,500	8,754,094	1,719,391
Boston & Maine	2,242	21 270,395	12,168,004	36,082,148	4,228,817	4,473,396	422,515	15,747,098	826,741	25,698,567	10,383,581	53,384	1,745,901	8,691,064	804,980
Central R.R. of New Jersey	668	14,923,880	3,692,838	19,670,056	1,667,468	3,162,582	284,520	5,324,545	402,873	10,841,988	8,828,068	173,915	980,169	8,021,814	768,175
Chesapeake & Ohio	1,938	21,022,374	4,112,032	26,171,898	2,737,368	4,886,718	440,171	7,038,769	490,401	15,593,427	10,578,471	8,807	714,000	9,855,664	2,164,475
Chicago & Eastern Illinois	965	7,971,274	1,546,537	10,030,316	971,926	1,827,833	224,007	3,473,691	322,009	6,819,466	3,210,850	13,185	302,324	2,895,340	417,878
Chicago & North Western	7,638	41,196,087	15,225,457	61,521,568	8,607,198	7,796,136	1,068,650	24,733,339	1,058,788	43,264,111	18,257,457	51,791	2,404,000	15,801,666	—1,473,085
Chicago, Burlington & Quincy	9,028	49,295,080	18,634,383	73,951,389	12,569,910	12,849,606	1,375,310	23,408,238	1,863,367	52,066,431	21,884,958	156,434	2,155,835	19,572,689	58,536
Chicago Great Western R.R.	1,487*	5,860,589	1,672,896	8,121,302	956,457	963,040	333,617	3,572,656	276,895	6,102,665	2,018,637	11,703	220,448	1,786,486	.....
Chicago, Rock Island & Pacific	7,393	33,422,825	15,387,473	51,915,644	8,590,314	6,944,027	1,362,403	19,802,582	1,449,657	38,148,983	13,766,661	125,640	2,171,126	11,469,895	750,762
Chic., St. Paul, Minneapolis & Omaha	1,738	8,148,409	3,611,937	12,642,093	1,536,464	1,442,141	234,835	4,674,568	280,134	8,168,142	4,473,951	1,390	550,554	3,922,007	355,305
Cincinnati, Hamilton & Dayton	1,036	5,604,821	1,394,642	7,832,331	1,103,349	1,366,400	223,117	3,130,835	250,180	6,073,881	1,758,450	.....	262,586	1,495,864	495,009
Colorado & Southern	1,248	6,421,220	1,341,461	8,170,587	1,091,491	1,348,911	139,198	2,617,591	218,355	5,415,546	2,755,041	5,721	217,342	2,531,978	405,560
Delaware & Hudson Co	843	13,293,155	2,439,131	16,586,180	1,016,848	2,204,079	200,349	5,698,174	382,729	9,502,179	7,083,001	—1,018	341,469	6,741,514	520,493
Delaware, Lackawanna & Western	930	22,162,011	5,751,832	29,732,600	2,486,448	4,040,250	538,792	8,070,291	565,253	15,701,034	14,031,566	248,631	1,278,700	13,001,497	1,055,098
Denver & Rio Grande	2,517	14,402,087	4,422,566	19,638,453	2,236,976	3,211,057	415,418	7,022,127	459,336	13,344,914	6,293,539	22,109	683,000	5,632,648	863,723
Erie	1,961	28,836,337	7,148,080	38,853,935	4,063,732	6,933,239	915,477	12,747,933	793,833	25,454,214	13,399,721	229,924	1,066,786	12,103,011	1,674,037
Great Northern	7,129†	38,079,366	11,773,426	52,699,418	8,278,647	6,280,593	750,480	14,957,577	819,596	31,086,893	21,612,525	226,742	2,876,911	18,962,356	3,107,830
Gulf, Colorado & Santa Fe	1,518	7,037,905	2,485,895	10,188,308	2,267,487	1,587,505	240,585	3,900,378	308,237	8,304,192	1,884,116	.....	353,442	1,530,674	—1,357,827
Kansas City Southern	827	5,902,239	1,175,270	7,861,464	862,316	991,583	262,593	2,717,764	302,287	5,136,543	2,724,921	.....	269,037	2,455,884	—100,182
Lehigh Valley	1,441	25,133,961	3,549,764	29,734,691	2,993,707	4,864,558	744,003	8,789,459	587,247	17,978,974	11,755,717	—56,010	946,000	10,753,707	1,711,128
Louisville & Nashville	4,594‡	32,011,897	8,966,848	43,671,251	5,991,966	6,994,636	927,030	13,171,880	897,741	27,983,253	15,687,998	49,976	1,257,050	14,480,924	2,435,472
Maine Central	932	4,525,153	2,432,806	7,401,425	1,038,846	1,060,774	76,224	2,501,447	223,210	4,900,502	2,500,923	24,982	357,375	2,168,530	348,308
Missouri, Kansas & Texas	3,072	14,791,683	6,433,354	22,689,205	3,385,130	2,797,621	556,446	8,465,209	746,817	15,951,223	6,737,982	—9,101	915,606	5,813,275	262,684
Mobile & Ohio	1,114	6,431,354	1,118,375	8,786,381	1,046,509	1,586,559	305,074	2,867,809	324,635	6,130,586	2,655,795	—26,248	224,927	2,404,620	—57,637
New York, New Haven & Hartford	2,044	24,833,740	20,577,616	49,874,220	5,541,705	5,451,860	261,446	19,050,980	1,263,376	31,569,367	18,304,853	1,083 082	3,305,000	16,082,936	3,712,886
Northern Pacific	5,849§	29,721,826	17,827,994	61,191,356	8,429,160	7,564,078	833,465	19,995,973	884,348	37,707,024	23,484,332	567,024	2,874,514	21,176,842	—2,851,371
Pennsylvania Co.	1,415	33,834,109	6,294,608	43,499,271	5,709,580	7,195,923	699,779	14,106,855	761,056	28,473,193	15,026,078	—36,746	1,481,044	13,508,288	3,445,687
Pennsylvania R.R. Co.	3,947	98,816,547	25,873,715	133,124,903	16,186,734	25,128,469	1,668,839	44,532,581	3,089,547	90,606,170	42,518,733	-1,072,152	1,975,262	39,471,320	8,244,200
Pere Marquette	2,328	9,295,443	3,107,032	13,373,900	1,610,048	1,734,998	347,386	5,328,525	297,906	9,318,863	4,055,037	35,489	586,354	3,504,172	618,348
Philadelphia, Baltimore & Washington	717	7,411,884	5,911,849	14,798,848	2,171,947	2,546,140	246,812	5,827,499	320,017	11,112,415	3,686,433	.....	357,716	3,328,718	327,494
Pitts., Cincinnati, Chicago & St. Louis	1,468	23,213,912	6,258,985	32,984,888	4,501,130	5,773,872	680,234	11,009,672	602,395	22,567,303	10,417,585	—8,763	1,107,271	9,301,551	2,091,749
Southern Ry.	7,050	32,153,153	12,225,275	48,108,961	5,625,638	8,235,644	1,168,946	15,820,536	1,441,690	32,292,455	15,816,506	18,047	1,658,281	14,176,272	1,577,301
Texas & Pacific	1,885	9,218,995	3,312,459	13,424,514	1,572,696	2,073,796	206,185	5,178,963	342,795	9,374,435	4,050,079	—27,712	473,647	3,548,720	420,704
Union Pacific	3,411‖	31,260,125	9,066,062	44,062,357	4,653,554	4,791,363	1,103,562	10,800,634	994,021	22,343,134	21,719,223	—48,752	1,298,026	20,372,445	1,500,813
Vandalia	827	5,418,996	1,854,350	8,135,180	1,218,244	1,495,557	241,754	2,966,977	191,950	6,114,482	2,020,698	.....	243,273	1,777,425	192,509

* Began operations Sept. 1, 1909; for previous returns, see Chicago Great Western Ry. † Mileage operated on April 30, 1909, 6,960 miles. ‡ Mileage operated on April 30, 1909, 4,388 miles. §Mileage operated on April 30, 1909, 5,695 miles. ‖ Mileage operated on April 30, 1909, 3,310 miles. — Indicates Deficits, Losses and Decreases.

Controversy and Litigation Over Advances in Railway Rates.

Conferences on Monday at Washington, as noted elsewhere, have settled it that there will be no more important advances in freight rates without previous approval of the Interstate Commerce Commission. On the evening of May 31 Judge Dyer, of the United States district court, issued an injunction at Hannibal, Mo., restraining the western railways from putting into effect on June 1 advances in rates which were provided for by Tariff A114, which had been filed some weeks before with the Interstate Commerce Commission. The petition which led to the issuance of this injunction was signed by Attorney-General Wickersham and was filed for him by Frederick N. Judson, of St. Louis, acting as special counsel for the government. It alleged that the advances in rates in question were made by agreement in violation of the Sherman anti-trust law and attacked the Western Trunk Line Committee, through which the advances have been announced, as an illegal organization and all the rates in question as illegal because they had been made by concerted action of the carriers.

Immediately following the issuance of this injunction there were reports that railways all over the country would order severe retrenchments and the stock market was greatly demoralized. The prices of even the best railway securities declined heavily and negotiations for the sale of additional securities in United States and Europe were suspended.

STATEMENT BY E. P. RIPLEY.

Speaking of the general situation as related to the government's application to the court, President Ripley, of the Atchison, Topeka & Santa Fe, said:

"It is true that there is a direct conflict of statement between the railways and the shippers as to the condition of railway earnings.

"In their resolutions adopted at Chicago May 7, the shippers make the bald statement that an analysis of the figures of the Interstate Commerce Commission indicates that the net income per mile of road for 1907 has increased 345 per cent. over 1897. Also that the returns for the first seven months of the fiscal year 1909-1910 show a substantial increase in net operating income, thus indicating a healthy growth of business and relatively cheaper operating cost.

"Now, these statements are absolutely untrue, and the shippers have been deceived by those who made the computations. Where the returns for the calendar year 1907 showed earnings from operation of $11,548 per mile, those for 1909 showed only $11,086, or $462 less, per mile. For the first three months of the calendar year 1910 the returns show gross earnings of $2,734 per mile, against $2,618 for the corresponding months of 1907, or a gain of $116 per mile. But any elation over this improvement is chastened by the fact that the expenses have increased from $1,770 per mile for the three months of 1907 to $1,927 for 1910, causing a net loss of $41 per mile. There is no chance for juggling with figures or deception on the railroad side—every item of our business is spread before the world. Our gross earnings are increasing, but our net earnings are declining.

"But that isn't the worst of it. Such results as are now being obtained—poor as they are—arise from policies that are cumulative in evil for the future, because the properties are not being improved or even kept up to the proper standard. If we are fortunate enough a few years hence to have full crops and active business, and if the railways are then unable to do what they are expected to do, these same shippers will perhaps perceive that they ought to have seconded rather than opposed the efforts of the railways for better conditions. And again that isn't the worst of it—we have recently increased wages to a large amount, and the decrease in net earnings will surely be greater.

"I am not alluding especially to Atchison conditions. Our directors have been conservative and our stockholders have spent on our property much money that they might properly have claimed in dividends, but even the strongest among us cannot stand under present conditions, and the weaker will, of course, drop first."

J. E. Wilder, of the shippers' committee, which was appointed to oppose advances in rates, made public a letter received from President Delano of the Wabash in response to the committee's proposition to submit advances in rates to arbitration by the Interstate Commerce Commission.

STATEMENT BY F. A. DELANO.

Mr. Delano pointed out that shippers have a right under the law to complain of a rate, and the Interstate Commerce Commission is required to hear the complaint. "This being the case, it would simply be a work of supererogation on my part or that of any railway official to say that we would submit this case to arbitration. You have the right to demand an inquiry, and the Interstate Commerce Commission has the right to determine whether the rates proposed are proper or not. Speaking for myself, I am not afraid to have this matter thoroughly ventilated and all the cards placed face uppermost upon the table. I, and others as well, fear only the result of delay. We do not want to wait until we are in the bankruptcy courts before we are permitted to adjust rates to our requirements.

"It should be borne in mind, furthermore, that an arbitration by the Interstate Commerce Commission, while binding the railways parties to it, would not bind any shipper except those subscribing to the arbitration and, regardless of the decree made by the commission in regard to the general policy, would not bind the commission in respect to any particular rate or discrimination complained of by any shipper. Considering this, the result of arbitration in this case would be futile and of no avail.

"It is probably safe to say that the members of your association who have signed the protest are quite as large, if not larger, owners of railway securities as the men to whom your appeal is addressed. I mention this simply to point out to you that the railway officials addressed are not serving their own selfish interests in urging an advance in rates, but are acting as the paid trustees of all the stockholders, and as such, held responsible by their boards of directors for the honorable and efficient discharge of their duties. These duties, in a general way, require that they shall give adequate service to the public; that they shall deal fairly with their employees; that they shall make an honest return to the creditors of the railway—which includes not only the holders of their mortgages (bondholders), but also the creditors for their supplies; and that they shall finally report, through the directors, to the stockholders, the virtual owners of the property.

"In these several duties these executive officers are subject to supervision on behalf of the public and the employees by legally constituted authorities—the Interstate Commerce Commission, and the commissions of the several states. In respect to the owners of the property and to the creditors of the railways, they are under supervision by the creditors themselves, acting directly through their attorneys and representatives, as provided under the laws of the various states and the federal government, which in a general, and sometimes a very specific way, protect them in their rights. In short, the railway officials of the country are made fully accountable and responsible under the law.

"If the rates proposed cannot be defended, they will be leveled down; but I, for one, am unwilling to accept the responsibility and accountability required under the law if all authority in the making of rates is taken away from me. It isn't fair, Mr. Wilder, (and I think you will agree with me) that we should be held responsible for the payment of all the bills, the salaries of employees and many other requirements and at the same time be deprived of any control over our income. Men who have given their lives to the study of this question think they know what they need, and I may be permitted to remark that the bankers who loan us money and the business houses who sell us materials do not submit to arbitration the question of what we shall pay them.

"It is argued by some of the gentlemen who have joined you in making this appeal that class rates are high enough and that it is commodity rates which should be advanced. In response to this, I can state that my own judgment is that both class and commodity rates are in many cases too low. In an endeavor to readjust matters, I have had in mind two cardinal principles; *first*, that no rates should be made below the actual cost of transportation; *secondly*, that as all commodities cannot make the same contribution towards the renewal and depreciation accounts and towards the interest

on the capital invested, the amount which should be charged over and above the actual cost of service must vary somewhat in proportion to the value of the article, favoring at all times raw materials as against finished products, and finished products handled in large quantities as against those which are luxuries and are handled in small quantities.

"Bearing these principles in mind, it is my conviction that the rates on the higher classes of L.C.L. business between New York and Chicago, which form the basis of all rates in the territory east of the Mississippi river and north of the Ohio, are very considerably too low: That considering the fact that rates on many of the low class commodities cannot or should not be advanced, and that these commodities should be carried in the future as they have been in the past, at very near cost; and considering the further fact that the relative movement of the high-grade commodities is small as compared to that of the low-grade commodities, it is not too much for the railroads to ask that the first-class L.C.L. rates should be advanced 20 per cent. In connection with this statement, it should be borne in mind that, measured in money, railway rates have in the last few years remained about stationary on the average. Measured in the things bought with money they have greatly declined.

"I notice by the public prints that you hold the Wabash up as a shining example of a road which has made large gains in its net earnings in the last eight months. This is true because we are comparing with the two poorest years in our history, and had we not shown a considerable gain, we should be facing a very serious situation to-day. In the year ending June 30, 1908, with the most stringent economy, neglecting every expenditure which was not demanded by the requirements of safety, we ended up the year with a deficit of $250,000 below our fixed charges. The year following was slightly better, the deficit being approximately $150,000. In these two years our income mortgage bondholders received no return on their investment. The holders of the preferred stock and common stock did not receive, and have never received since the road was reorganized twenty years ago, a dollar on their investment.

"The necessity of maintaining credit has made it necessary for all the railways to say as little as possible about their misfortunes and to make the most of their prosperity, but the tremendous advances in the prices of materials and the increases in wages which are just becoming effective have so far altered the situation that it is little short of desperate, and some means of obtaining increased revenues is absolutely necessary."

Cotton Crop Conditions.

The crop reporting board of the United States department of agriculture estimates that the area planted to cotton this year (1910) in the United States, including that already planted and expected to be planted, is about 102.8 per cent. of the area planted to cotton last year, equivalent to about 33,196,000 acres, as compared with 32,292,000 acres indicated by the bureau's revised estimate of last year's planted area, an increase of about 904,000 acres, or 2.8 per cent.

The condition of the growing crop on May 25 was 82.0 per cent. of a normal condition, as compared with 81.1 per cent. at the corresponding date in 1909, and 80.9 per cent., the average condition for the past ten years on May 25. Details by states follow:

States.	Rev. figures indicating acres planted in 1909.	Area planted in 1910, preliminary estimate.— Per ct.*	Acres.	Condition May 25 1910.	1909.	10-year av'ge.
Virginia	26,000	130	34,000	90	85	86
North Carolina	1,420,000	104	1,477,000	84	83	83
South Carolina	2,550,000	102	2,601,000	78	83	82
Georgia	4,763,000	101	4,811,000	81	84	82
Florida	250,000	108	270,000	80	91	87
Alabama	3,570,000	102	3,641,000	83	83	80
Mississippi	3,450,000	96	3,312,000	82	78	80
Louisiana	1,100,000	99	1,089,000	76	74	80
Texas	10,100,000	104	10,504,000	83	78	78
Arkansas	2,375,000	103	2,446,000	81	84	82
Tennessee	754,000	103	777,000	86	85	83
Missouri	84,000	105	88,000	87	93	85
Oklahoma	1,850,000	115	2,128,000	84	84	84
California	.....	..	18,000	90	..	..
United States	32,292,000	102.8	33,196,000	82.0	81.1	80.9

*Compared with 1909.

INTERSTATE COMMERCE COMMISSION.

Reparation Awarded.

William K. Noble v. Toledo & Western et al. Opinion by Commissioner Clark.

Railway's mistake in misrouting. (18 I. C. C., 494.)

Complaint Dismissed.

Snyder-Malone-Donahue Co. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Clark.

Carload rate on cattle from South Omaha, Neb., to Cushman, Mont., is not unreasonable. (18 I. C. C., 498.)

Storage-in-Transit on Rice.

Bayou City Rice Mills et al. v. Texas & New Orleans et al. Opinion by Chairman Knapp.

Millers of rice at Houston, Tex., complain that they are subjected to disadvantage because storage-in-transit and reconsignment privileges are provided at Houston on rice destined to New Orleans, La., while similar privileges are denied at Louisiana points on rice destined to Houston; and by the maintenance of a rate of 19 cents from Houston to New Orleans while according a rate of 15 cents from Clinton, Tex., a point about eight miles south of Houston, the traffic from Clinton passing through Houston to reach New Orleans. We are not warranted in finding that there is any unjust discrimination because of the failure of rail lines reaching New Orleans to provide for transit privilege on shipments of rice from New Orleans to Texas, and a prima facie case of dissimilarity of conditions between Houston and Clinton under the fourth section has been made. As the facts now appear no order which might disturb the whole system of rice rates in that section of the country will be entered. Complaint dismissed without prejudice. (18 I. C. C., 490.)

STATE COMMISSIONS.

The South Dakota Railroad Commission has moved its office from Sioux Falls to Pierre, where it will be quartered in the new state house.

The Railroad Commission of Louisiana has ordered that the minimum weight to be applied on carload shipments of household goods and emigrant movables be fixed at 20,000 lbs.

The Railroad Commission of Louisiana has ordered that within switching limits at Lake Charles all interchange switching of cars shall be executed within 36 hours from the time the switching order is filed, except for unavoidable cause of delay.

By a general order taking effect June 10, the Oklahoma State Corporation Commission repeals all orders affecting the concentration and compressing of cotton. The difficulties of managing this matter are so great that the commission finds itself unable to cope with them.

The Railroad Commission of Louisiana has ordered put into effect a comprehensive reduction in both class and commodity rates between New Orleans and Winnfield. The class rates put into effect are as follows: First class, 80 cents per 100 lbs.; second class, 70 cents; third class, 60 cents; fourth class, 45 cents; fifth class, 34 cents; A class, 35 cents; B class, 30 cents; C class, 27 cents; D class, 26 cents; E class, 25 cents.

Wisconsin: Petition for Added Facilities.

Charles Pischel v. Chicago, St. Paul, Minneapolis & Omaha.

The petition asks for the building of a depot and maintenance of an agent at Lampson. The evidence shows that the cost of building this station and the maintenance of a regular agent would probably absorb at least the total revenue from the station, making due allowance for operating expenses. The petition is denied. (4 W. R. C., 783.)

COURT NEWS.

The Missouri River Rate Case.

The Interstate Commerce Commission v. the Chicago, Rock Island & Pacific et al. Burnham, Hanna, Munger Dry Goods Co. et al. v. the Chicago, Rock Island & Pacific et al. Opinion by Justice McKenna, U. S. Supreme Court.

The question in the case is the validity of an order of the Interstate Commerce Commission reducing the class rates charged by the appellee railway companies on through freight shipped from the Atlantic seaboard to Kansas City, and St. Joseph, Mo., and Omaha, Neb., cities on the Missouri river and called throughout the record, and in this opinion, Missouri River Cities.

The reduction was made in that part of the through rate which applied to the haul between the Mississippi and Missouri rivers. Explaining its order of reduction, the commission said the through rates from Atlantic seaboard terminals to the Missouri river cities are made by adding together the rates from points of origin to the Mississippi river crossings, using proportional rates when such were available, and the local rates from the Mississippi crossings to the Missouri river cities. The through rates the commission pronounced to be unreasonably high, "because those portions of the through rates which apply between the Mississippi river crossing and the Missouri river cities are too high. These are defendants' 'separately established rates,' which are 'applied to the through transportation,' and, therefore, the through rates should be adjusted by reduction of those factors or parts thereof which are found to be unreasonable."

The circuit court in granting an injunction restraining the Interstate Commerce Commission from enforcing its order said that the differential of 9 cents on merchandise from the Atlantic seaboard to the Missouri river cities, whatever be the principle upon which the order was based, will be "to protect to a certain degree the Missouri river jobbers and manufacturers within a certain zone of territory against the jobbers and manufacturers of Central Traffic Association territory * * * as also to open up to the Atlantic seaboard," in its trade with the Missouri river, "zones of territory, the advantages contained in the differential against the competition of both the intervening Central Traffic Association territory and the Missouri river territory." And this, it was asserted, was the exercise of a "power artificially to apportion out the country into zones tributary to given trade centers, to be predetermined by the commission, and non-tributary to others." This, it was further said, was a "power essentially different in principle from the mere power of naming rates that are reasonable."

We make these quotations from the opinion of the court because they put, in a clear and condensed way, the ultimate contention of the companies and the evil, as they see it, in the order of the commission, and which is intended to be exhibited by their voluminous pleadings and arguments. And such, it is insisted, was the conscious purpose of the commission, a view in which the circuit court concurred, deducing it from certain avowals of the commission in its report.

Such purpose and the want of power in the commission to execute it is the foundation of the court's opinion.

Is it true that the Interstate Commerce Commission by its order exercised a power "artificially to apportion out the country into zones tributary to given trade centers," and intentionally exercised it to protect the Missouri river cities against the competition of other cities? If that be the necessary conclusion the judgment of the circuit court it may be contended was right. Such conclusion we should certainly be reluctant to adopt. From whatever standpoint the powers of the Interstate Commerce Commission may be viewed, they touch many interests, they may have great consequences. They are expected to be exercised in the coldest neutrality. The commission was instituted to prevent discrimination between persons and places. It would indeed be an abuse of its powers to exercise them so as to cause either.

The outlook of the commission and its powers must be greater than the interest of the railways or of that which may affect those interests. It must be as comprehensive as the interest of the whole country. If the problems which are presented to it therefore are complex and difficult, the means of solving them are as great and adequate as can be provided.

We return therefore to the question of the power of the commission and its purpose. The complainant before that body presented two issues, the effect of the rates from the Atlantic seaboard as discriminating against the Missouri river cities in favor of St. Paul and Minneapolis, and their unreasonableness of and in themselves. The first we may immediately put out of view. It was decided adversely to the complainants before the commission, and we may say at the outset that the contention of the railway companies that it was the only issue presented to the commission is not justified.

The second issue was decided in favor of the complainants, the commission finding that the through rates were unreasonable of and in themselves, and was caused by the charge from the Mississippi river crossings to the Missouri river cities.

It is certain that the subject has taken on more complexity than it had before the Interstate Commerce Commission, and the commission has made this the basis of a motion to dismiss the suit as to the intervening railways, and all the intervening merchants and manufacturers, on the ground as to the railways, among others, that the order does not run against or operate upon them, and that no right of theirs can be determined by the decree. On the ground as to the intervenors, that over the matters herein the courts exercise only the jurisdiction conferred by the act to regulate commerce, and not general equity powers, and that the matter to be determined is not the respective rights of shippers or localities, but the validity of the order of the commission, and that the intervenors have a complete remedy by application to the commission. And we may say here, as adding to the complex effect and interest of the questions presented, that the chambers of commerce and boards of trade of certain Eastern cities have presented a brief in defense of the order, asserting a vital interest in its preservation, and exhibiting and illustrating the discrimination, as they contend, exists against them by the breaking of rates.

Let us see, therefore, upon what grounds the commission proceeded. The commission is accused by the railways of attempting to substitute an artificial system of ratemaking for a long-established system, and to protect or foster particular localities of production and distribution. Certain remarks of the commission are cited to support the charge. We think the charge puts out of view all else that was said by the commission, puts out of view the comprehensive consideration the commission took as exhibited in the explicit declaration made after quoting the local class rates between the rivers in cents per hundred pounds, that "these are the rates that are added to the rates up to the Mississippi river crossings to make up the through rates from the Atlantic seaboard to the Missouri river cities. Are these rates, as so used, and the through rates resulting therefrom, unwarrantably high or unduly discriminatory or unjustly prejudicial? Can they be changed without doing injustice elsewhere?"

We think the charge also puts out of view the disclaimers of such purpose in the answer of the commission in its report to Congress, and its insistence that it is constrained by the law to act only on complaint to it and that it is open at all times to be appealed to redress the grievances any shipper or locality may have. Nor did the commission ignore or underestimate the manner in which the lines of railways had been extended or the system of rates or ratemaking which had resulted. That is the system of making rates upon certain basing lines or points. Rates "break" at such points, it was proved, as a result of building independent lines westward.

It was the sense of the commission, however, that such points could not be immovable forever and fixed forever against power of changing, or that through rates based on such points must be exempt from regulation, no matter what their character, or be constituted at the will of the railway of the sum of local rates or the sum of rates from one basing point to another, however unjust the rates might be. Indeed, as pointed out in the brief of the appellants in No. 664, the railway companies adhere to no such construction of rates. As there said, "the Pacific coast terminal rates, the Washington and Spokane common point rates, the Oklahoma rates

and the El Paso and Texas common point rates are each and all a departure therefrom, and all are much less than the rates ordered by the commission."

As we have said, the commission is the tribunal that is intrusted with the execution of the interstate commerce laws, and has been given very comprehensive powers in the investigation of and determination of the proportion which the rates charged shall bear to the service rendered, and this power exists, whether the system of rates be old or new. If old interests will have probably become attached to them and, it may be, will be disturbed or disordered if they be changed. Such circumstance is, of course, proper to be considered and constitutes an element in the problem of regulation, but it does not take jurisdiction away to entertain and attempt to resolve the problem. And it may be that there cannot be an accommodation of all interests in one proceeding. This the commission has realized and expressed. The commission, meeting a possible suggestion that if the part of the through haul, which consisted of the rate between the rivers, was too high, all rates between the rivers might be too high, said:

"If the local class rates of defendants between the Mississippi and Missouri rivers were reduced, it would give the same degree of advantage to all the producing and distributing centers on and east of the Missouri river, and their relative advantages or disadvantages would not be changed, while a very serious inroad upon the revenues of the carriers would inevitably result, and at a time of industrial depression when it could not well be borne. Such a change would necessitate corresponding changes in the rates to and from intermediate points, and would probably be reflected in changes in commodity rates as well. The local class rates between the rivers are high, but this is not the time to precipitate such a violent change as would follow an important reduction of them. The first class rate from Buffalo to Chicago, about 540 miles, and from Pittsburgh to Chicago, about 465 miles, is 45 cents. From Cincinnati to Chicago, 306 miles, it is 40 cents."

We may say in passing that the passage thus quoted is one of those which is adduced to support the contention that the commission's purpose was to introduce a new system of rate-making and build up certain distributing centers. We do not think so. It only shows that the accusation that all rates between the rivers were too high might be justified, but that it would be unjust to the carriers to reduce them at that time. It is somewhat strange that that which was done in the interest of the carriers should be brought forward by them to attack the action of the commission. It is very clear that by a voluntary reduction by them of such rates the equality of opportunity dependent upon them would be restored. We make this observation to bring out clearly the relation of the railway companies to the grievance complained of. That the companies may complain of the reduction made by the commission so far as it affects their revenues is one thing. To complain of it as it may affect shippers or trade centers is another. We have said several times that we will not listen to a party who complains of a grievance which is not his. *Clark v. Kansas*, 176 U. S. 114, 118; *Smiley v. Kansas*, 196 U. S. 774.

But, it may be said, such limitations upon the companies is not of consequence, for shippers and trade centers are here with complaints. It is doubtful if they are properly here, or rather were properly permitted to intervene. We have said that the act to regulate commerce was intended to be an effective means for redressing wrongs resulting from unjust discrimination and undue preference, and this must be so, whether persons or places be sufferers. *T. & P. Railway Co. v. Abilene Oil Co.*, 204 U. S. 426. We have also said that the primary jurisdiction is with the commission, the power of the courts being that of review and is confined in that review to questions of constitutional power and all pertinent questions as to whether the action of the commission is within the scope of the delegated authority under which it purports to have been made. *Interstate Commerce Commission v. Illinois Central R. R. Co., supra.*

The order of the commission besides is strictly limited. It was intended to determine nothing, and it determines nothing but that the through rates on Atlantic seaboard shipments to the Missouri river cities are too high. That order is alone open to review. Whether other persons, cities or areas of territory have grounds of complaint, the way is open by application to the commission for inquiry and remedy. In that inquiry many elements may enter upon which the judgment of the commission should first pass, and of which the courts should not be called upon in advance to intimate an opinion. The reasons for this we have indicated, and they will be found at length in the cases which we have cited.

One question remains for discussion, the finding of the commission upon the character of the rate, whether it is unreasonable as decided. Such decision, we have said with tiresome repetition, is peculiarly the province of the commission to make, and that its findings are fortified by presumptions of truth, "due to the judgments of a tribunal appointed by law and informed by experience." *Illinois Central Railroad Company v. Interstate Commerce Commission*, 206 U. S. 454, and cases cited. The testimony in this case does not shake the strength of such presumptions. We have seen that the circuit court refrained from expressing an opinion upon anything but the power of the commission. Circuit Judge Baker, dissenting from that view, went further and said:

"The complainants are common carriers whose rates on certain traffic are directed to be reduced by the order complained of. Two grounds for injunction are alleged. One is that the new rates are confiscatory. There is no proof whatever that the rates which the commission prescribed as just and reasonable are not sufficient to pay the cost of handling that traffic, to cover that traffic's full proportion of maintenance and overhead expenses, and to return to the carriers an ample net profit. Furthermore, proof is lacking that, if the carriers should reduce other rates to correct what they claim is the maladjustment caused by the commission's order, the reduction would not leave them abundant net returns. For the purpose of this hearing, therefore, it must stand as an agreed fact that the present reduction is neither directly nor indirectly obnoxious to the charge of taking private property without just compensation."

We concur in these conclusions.

Decree reversed and the case remanded with directions to dismiss the bill and all proceedings in the circuit court.

Justice White dissenting.

The court below enjoined the execution of the order of the commission because it was of the opinion that that body had exceeded the powers conferred upon it by the act to regulate commerce, since it had based its order upon the assumption that it was its duty under the act to secure a relatively equal share of the volume of interstate commerce to communities and places, and therefore that it was its province to alter otherwise legal rates for the purpose of correcting the inequalities which otherwise would arise from the competitive rivalry between sections and places. As, in my opinion, the court below was correct in the view which it took of the order of the commission, and was right in holding that the power which the order manifested was not conferred by law, I dissent from the judgment of reversal now announced. It does not, however, seem to me necessary that I should do more than state the fact of my dissent for the following reasons: The judgment of reversal is based, not upon the ruling that the commission possessed the authority to make the order if it was based upon the assertion of power upon which the court below found the order must necessarily rest, but exclusively upon the theory that the court below, while rightly holding that the commission had not the power which it assumed that body had exerted in making the order, had nevertheless mistakenly enjoined the order because it did not exert, or attempt to exert, the power which the court conceived had been called into play in making it. In other words, although the opinion now announced excludes the authority which the lower court deemed the commission had exerted by the order in question, it nevertheless maintains the order because of the conclusion that the order was but an exertion by the commission of its authority on complaint that a rate was unreasonable of itself, to correct such rate by substituting a reasonable rate therefor. Although I am unable to agree with the reasoning by which the court now gives to the order of the commission the narrow basis thus stated, as the solution of that question depends upon the idiosyncrasies of this particular case and involves no principle of general importance, it seems to me I am called upon to do no more than simply to state my inability to agree.

Justice Holmes and Justice Lurton join in this dissent.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. R. Berry, assistant general freight agent of the Chicago Great Western, at St. Joseph, Mo., has been appointed assistant to the vice-president, with office at St. Joseph, Mo.

Joseph H. Young, formerly general superintendent of the Southern Pacific, is now exercising the duties of vice-president and chief operating officer of the Copper River & Northwestern, with headquarters at Seattle, Wash., and it is understood will be elected to the above positions in November.

Operating Officers.

A. B. Apperson has been appointed trainmaster of the Western division of the Chicago Great Western, with office at Clarion, Iowa, succeeding H. W. Hamilton, assigned to other duties.

C. J. Brown has been appointed trainmaster of the south Texas division of the Missouri, Kansas & Texas, with headquarters at Smithville, Tex., succeeding C. E. Stanton, appointed traveling engineer.

P. J. Lynch, assistant superintendent of the Grand Trunk at Allandale, Ont., has been appointed superintendent of the Northern division, with office at Allandale, succeeding W. R. Tiffin, deceased, and the position of assistant superintendent at Allandale has been abolished.

J. H. Jackson, assistant superintendent of the St. Louis & San Francisco, at Springfield, Mo., has been appointed superintendent at Birmingham, Ala., succeeding J. G. Lorton, granted leave of absence on account of his health. C. O. Yoakum succeeds Mr. Jackson.

J. D. McMillan has been appointed trainmaster of the Northern division, Districts 8, 9 and 10 of the Grand Trunk, with office at Lindsay, Ont., succeeding J. Irwin, resigned, and W. J. Piggott has been appointed trainmaster of the Northern division, Districts 11, 12, 13 and 14, with office at Allandale, Ont.

J. J. O'Neill, assistant superintendent of the Chicago, St. Paul, Minneapolis & Omaha, at St. James, Minn., has been transferred to Eau Claire, Wis., succeeding E. E. Nash, who has been appointed private secretary to vice-president of the Chicago & North Western. J. R. Welsh, assistant superintendent at Spooner, Wis., succeeds Mr. O'Neill.

E. C. Manson, superintendent of the Salt Lake division of the Southern Pacific, has been appointed general superintendent of the Oregon Short Line, succeeding J. M. Davis, resigned to accept a position as general superintendent of the Northern district of the Southern Pacific. T. F. Rowlands, assistant superintendent, succeeds Mr. Manson. F. C. Smith, despatcher, succeeds Mr. Rowland.

C. L. Harris, general superintendent of the St. Louis-Louisville lines of the Southern Railway, at St. Louis, Mo., has been appointed general superintendent of the Western district, with office at Birmingham, Ala., succeeding W. R. Hudson, resigned to go to the Norfolk Southern. B. G. Fallis, superintendent of the Charlotte division at Greenville, S. C., succeeds Mr. Harris, with office at St. Louis, Mo.

Alva C. Elston, superintendent of the New York division of the Erie Railroad and branches, and of the New Jersey & New York, at Jersey City, N. J., has been appointed superintendent of the Buffalo division and branches of the Erie Railroad, and manager of the Union Steamboat Line, with office at Buffalo, N. Y., succeeding Charles A. Brunn, assigned to other duties. Robert S. Parsons, superintendent of the Susquehanna division and branches, at Hornell, N. Y., succeeds Mr. Elston, with office at Jersey City, and Clarence D. Taylor, trainmaster at Hornell, succeeds Mr. Parsons.

R. M. Leech, superintendent of the Mexico and Queretaro divisions of the National Railways of Mexico, at City of Mexico, Mex., has been appointed general superintendent of transportation of all divisions of the system north of Gonzalez Junction and San Juan del Rio, and R. E. Comfort, general superintendent of the narrow-gage lines at City of Mexico, has been appointed general superintendent of transportation in charge of the Mexico and Queretaro divisions of the standard-gage lines and all divisions of the narrow-gage lines of the system. These officers will be in full charge of all transportation matters, and both will have offices at Colonia station, City of Mexico. W. H. Schmeiding, superintendent of car service at City of Mexico, has been appointed superintendent of transportation, in charge of all matters pertaining to the movement and distribution of passenger and freight equipment, tonnage, demurrage, switching and car service matters in general, and in addition thereto will perform such other duties as may from time to time be assigned to him by the general superintendents of transportation.

Traffic Officers.

R. D. Williams has been appointed district passenger agent of the Union Pacific, with headquarters at Denver, Colo.

Theodore Davis has been appointed an agent of the Erie Despatch, with office at Columbus, Ohio, succeeding W. R. Sibley, resigned.

F. L. Norman has been appointed commercial agent of the Grand Trunk at Seattle Wash., succeeding L. V. Bruce, transferred to Vancouver, Wash.

C. V. Link has been appointed a general agent of the Southern Indiana, representing the traffic and transportation departments, with office at Bedford, Ind.

The Steel-Hardin-Dillon Co. has been appointed export and import agents of the Rock Island Lines, with headquarters at New Orleans, La., succeeding J. H. W. Steel & Co.

The Erie Despatch agency at Saginaw, Mich., has been abolished, and the territory heretofore covered by that agency will be under the jurisdiction of the agent at Detroit.

G. A. Smith has been appointed division freight and passenger agent of the Eastern division of the Chicago Great Western, with office at Chicago, Ill., succeeding R. W. Goodell, promoted.

G. C. White has been appointed industrial agent of the West Coast Route, which includes the Sonora Railway and the Southern Pacific Railroad of Mexico, with headquarters at Guaymas, Mex.

P. A. Sullivan, traveling freight agent of the International & Great Northern, at San Antonio, Tex., has been appointed a commercial agent, with office at San Antonio, succeeding G. E. Marshall, resigned to go into other business.

W. F. Wilson has been appointed a commercial agent of the Southern Railway, and W. T. Turner has been appointed a soliciting agent, succeeding M. R. Yates, resigned to go into other business, both with offices at Richmond, Va.

James E. Roach, whose resignation as traveling freight agent of the Central of Georgia at Jacksonville, Fla., has been announced in these columns, has been appointed commercial agent of the Clyde Steamship Co. and the Mallory Steamship Co., with headquarters at Tampa, Fla., succeeding L. S. Scroble, transferred.

R. W. Goodell has been appointed general agent, freight department, of the Chicago Great Western, with office at Minneapolis, Minn., succeeding R. H. Heard, whose resignation has already been announced in these columns. George O. Somers has been appointed a general freight agent, with office at Chicago, succeeding W. E. Pinckney, resigned, and Robert J. Sefton has been appointed a traveling passenger agent at Seattle, Wash., succeeding George P. Guyot, resigned.

Guy S. McCabe, general western and division freight agent, has been appointed general western freight agent and division freight agent of the Chicago Terminal Division of the Pennsylvania Co., with office at Chicago, succeeding William Borner, appointed assistant to the freight traffic manager of the Pennsylvania Lines West, with office at Chicago. James E. Weller, division freight agent of the Pittsburgh, Cincinnati, Chicago & St. Louis, at Pittsburgh, Pa., succeeds Mr. McCabe.

Engineering and Rolling Stock Officers.

George S. Goodwin has been appointed assistant mechanical engineer of the Rock Island Lines, with office at Silvis, Ill.

R. H. Howard, engineer maintenance of way of the Chicago & Eastern Illinois, with office at Chicago, has resigned. L. C. Hartley, signal engineer, succeeds Mr. Howard.

P. A. Rainey has been appointed assistant supervisor of signals on the Eastern Pennsylvania division of the Pennsylvania Railroad, with office at Harrisburg, Pa., succeeding F. J. Bauman.

Ben Johnson, assistant locomotive superintendent of the United Railways of Havana, at Havana, Cuba, has been appointed superintendent of motive power of that company and the Havana Central, with office at Havana, succeeding Charles J. Thornton, resigned. A sketch of Mr. Johnson's railway life was published in our issue of December 31, 1909, page 1319.

E. J. Searles has been appointed assistant to J. D. Harris, general superintendent of motive power of the Baltimore & Ohio, with office at Baltimore, Md. Mr. Searles is a mechanical engineer and a graduate of John Hopkins University. He served as a mechanical apprentice in the shops of the Pennsylvania Railroad in 1896, and from 1902 to 1904 was engineer of motive power of the Baltimore & Ohio at Pittsburgh. Since 1904 he has been engaged in the railway supply business.

Purchasing Officers.

T. Duff Smith has been appointed fuel agent of the Grand Trunk Pacific, with office at Winnipeg, Man.

OBITUARY.

Charles E. Doyle, vice-president and general manager of the Chesapeake & Ohio, died June 5. Mr. Doyle was born on May 29, 1851, in Missouri, and was appointed superintendent of the Cairo, Vincennes & Chicago, now a part of the Cleveland, Cincinnati, Chicago & St. Louis, in February, 1888. In May of the following year he was appointed a superintendent of the Pittsburgh & Western, now a part of the Baltimore & Ohio, remaining in that position for about one year. In February, 1890, he went to the Chesapeake & Ohio and for the next seven years he was superintendent of the Peninsula, Richmond, Washington and James River divisions of the Chesapeake & Ohio, at Richmond. On January 1, 1897, he was made general superintendent of the Eastern division. He was appointed general manager in January, 1901, and in July of last year was elected also vice-president.

Joseph S. Harris, formerly president of the Lehigh Coal & Navigation Co., and later president of the Reading Company, died June 2, at his home in Germantown, Pa. Mr. Harris was born in Chester county, Pa., April 29, 1836. He began railway work in April, 1853, as a rodman and topographer on the North Pennsylvania, now a part of the Philadelphia & Reading. About a year later he entered the service of the United States as an officer of the coast survey. In 1856 he was detached on duty with the Kentucky Geological Survey to trace and mark a parallel of latitude in Kentucky, and from March of the following year to April, 1864, was assistant astronomer of the northwest boundary survey; and while in this service he was also from February to September, 1862, the first officer of and later was in command of the United States steamer Sachem, attached to Farragut's Mississippi River squadron. From April, 1864, to April, 1868, he was a civil and mining engineer in private practice at Pottsville, during which time he was also engineer of the Lehigh & Mahanoy Railroad. From April, 1868, until the fall of 1870 he was chief engineer of the Morris & Essex Railroad. In 1870 he entered the service of the Philadelphia & Reading Coal & Iron Co., and later that of the Lehigh Coal & Navigation Co. In 1880 he was made general manager of the Central Railroad of New Jersey, and held that position about two years. From March, 1882, to May, 1893, he was president of the Lehigh Coal & Navigation Co. In the fall of 1886 he was made receiver and afterward vice-president of the Central of New Jersey, and in 1892 was also vice-president of the Philadelphia & Reading Railroad and the Philadelphia & Reading Coal & Iron Co. From May, 1893, to November 30, 1896, he was receiver and president of the Philadelphia & Reading, and from December 1, 1896, until his retirement, in 1901, he was president of the reorganized road, the Reading Company, the Philadelphia & Reading Railway and the Philadelphia & Reading Coal & Iron Company. He leaves four children.

Railway Construction.

New Incorporations, Surveys, Etc.

Alabama Roads.—Application has been made for a charter to build a line from Decatur, Ala., southwest to Falls City, about 50 miles. The company has offices at New Decatur. E. H. Allison, president, and D. W. Day, vice-president.

Alaska Northern.—Contracts, it is said, are to be let soon for the construction of 170 miles from the present terminus in Alaska to the Matanuska coal fields and to a point on the Susitna river in the direction of the Iditarod gold fields. An officer is quoted as saying that the cost of the extension will be $7,000,000. The line will follow an old survey to mile 146, from which point a line will run to the Matanuska coal fields, 38 miles, and another line will run towards Iditarod. O. G. Labree, president, Spokane, Wash. (Nov. 12, p. 942.)

Algoma Central & Hudson Bay.—An officer writes that contracts have been given to the O'Boyle Brothers Construction Co., Ltd., Sault Ste. Marie, Ont., for work on an extension from Hawk Lake Junction, Ont., north to Hobon, on the Canadian Pacific, 31 miles. The work will be difficult. Maximum grades will be 0.6 per cent. and maximum curvature 12 degs. The work includes 17 trestles; a roundhouse will also be built at Hobon. (June 3, p. 1390.)

American Central.—An officer of the Central Construction Co., of Mobeetie, Tex., writes that surveys have not yet been finished on the section from Miami, Tex., via Mobeetie, Wheeler, Texola, Okla., Mangum and Olustee, to Vernon, Tex., 160 miles. It is expected that contracts will be let in September or October of this year to build the line. There will be two heavy bridges. W. E. McClintock, chief engineer, Mobeetie. (March 25, p. 849.)

Argentine Central.—See Montezuma & Western.

Argentine Tunnel.—See Montezuma & Western.

Canadian Northern.—According to press reports, this company is asking for bids to build about 60 miles of line in British Columbia from Port Mann, which is opposite New Westminster, east along the south bank of Fraser river. (April 29, p. 1113.)

Canadian Northern Quebec.—According to press reports, this company is planning to carry out work this summer on a new line from Hawkesbury, Ont., east to Montreal, to provide direct service with Ottawa. Bids are now being asked for the work. From Hawkesbury the line will cross the Ottawa river and run through Carillon, Que., St. Andrews and St. Eustache to Hochelaga and Montreal. The route and location maps have been approved by the railway commission. The Dominion Parliament has voted subsidies in aid of the construction of this line, not exceeding 65 miles, as well as a line from Arundel to a point in the united townships of Preston and Hartwell, Que., not exceeding 30 miles. An officer is quoted as saying that the company has under consideration the question of providing big terminals in Montreal, but plans are not sufficiently advanced to give any particulars.

Canadian Pacific.—A contract is said to have been given to Savin & Stevens, Victoria, B. C., for building a section of 20 miles on the Esquimalt & Nanaimo. (Nov. 12, p. 943.)

Chicago & North Western.—This company is said to have filed plats with the State Land Department of South Dakota for the line projected over a year ago, to be built from Dallas, Gregory county, S. Dak., west to Mellette county.

Chicago, Milwaukee & St. Paul.—This company has given contracts for the last stretches of double track between Chicago and St. Paul to be completed this summer, making the St. Paul the first double track line between Chicago and Minneapolis and St. Paul. (April 15, p. 1015.)

Copper River & Northwestern.—According to reports the first train was recently run over the new cantilever bridge at the Miles Glacier, Alaska, over the Copper river, establishing train service to Mile 104. About 28 miles of track remains to be laid to complete the line to the mouth of the Chitina river, where the government is building a trail

to the Valdez-Fairbanks trail. It is believed that the completion of the road to the mouth of the Chitina will shorten the journey to Fairbanks by four or five days. (Dec. 17, p. 1213.)

Delaware, Lackawanna & Western.—Representatives of this company and officials of the city of Bloomfield, N. J., have reached a tentative agreement for improvements to be made on this road from Bloomfield to Montclair, which it is understood include a double-track elevated line between these two places. No action will be taken until the plans are approved by the city council as well as the railway officials.

Esquimalt & Nanaimo.—See Canadian Pacific.

Fernwood & Gulf.—An officer writes that this company recently completed an extension of six miles from Tylertown, Miss., east, and the line is now in operation from Fernwood east to Knoxo, 27 miles. An additional five miles will be finished by July 1, which carries the line to a point nine miles west of Columbia. It is probable that a further extension will be built to Columbia. The line traverses a timber section, passing numerous lumber mills, also several large turpentine stills.

Forest City, Fertile & Mason City.—Incorporated in South Dakota, with $400,000 capital, and offices at Watertown, S. Dak., and at Forest City, Iowa. The company was organized to built from Forest City, Iowa, east through the counties of Winnebago, Hancock, Worth and Cerro Gordo, to Fertile, thence southeasterly to Mason City, 40 miles. The incorporators include: P. O. Koto, C. N. Christopherson, C. S. Isaacs, Forest City; A. M. Sheimo, Baldwin, Wis.; A. L. Sheirn and M. J. Hawley, Watertown, S. Dak.

Gainesville, Oklahoma & Western.—According to reports this company is ready to let contracts for work on 20 miles of line. Location survey has been made for 12 miles. The company was organized to build from Gainesville, Tex., southwest via Era and Greenwood to Bridgeport, 56 miles. J. Whaley, president; F. B. Truax, chief engineer, Gainesville. (May 20, p. 1281.)

Gilmanton Railway.—Permission has been granted the Wisconsin Construction Co. to build a line from Gilmanton, Wis., through the Waumandee valley.

Great Northern.—An officer writes that it is expected to have track laid on the branch from Stanley, N. Dak., northwest to Montrose, about 50 miles, by August. Most of the grading has been finished. Morris & Shepard are the contractors. (April 8, p. 970.)

Horse Cave & Eastern.—Incorporation will be asked for by a company under this name, in Kentucky, to build from Horse Cave, Ky., on the Louisville & Nashville, southeast via Hiseville and Knob Lick to Edmonton, 25 miles. The line is eventually to be extended southeast to Burkesville, on the Cumberland river, an additional 25 miles, at the edge of a coal and timber district. The company proposes to use gasolene or gas-electric motor cars for passenger and mail service, and steam will be used as the motive power for handling freight. Location surveys will be made in July. Louis Edwards, 1463 Arlington avenue, St. Louis, Mo., is the promoter.

International & Great Southern.—A charter has been granted in Oklahoma to the Hines-Chicago Construction Co., Oklahoma City, Okla., with $50,000 capital, to build a line for this company, which was chartered several years ago. The projected route is from Oklahoma City, northwest to Trinidad, Colo. The company has filed a mortgage for $3,500,000, covering the right-of-way and other property. The incorporators include: P. A. Hines, F. Karasec, Chicago, and S. C. Glasgow, Oklahoma City.

Memphis, Dallas & Gulf.—This company, it is said, has taken over the rights and property of the Ultima Thule, Arkadelphia & Mississippi, operating a 22-mile line from Daleville, Ark., to Sparkman, also the Antoine Valley Railroad, and will use these lines to form part of its proposed line from Memphis, Tenn., southwest to Dallas, Tex. (See Memphis, Paris & Gulf, April 8, p. 970.)

Missouri Pacific.—An officer writes that a contract was given on May 28 to the Walsh Construction Co., Davenport, Iowa, for double-tracking work on the Arkansas division from McAlmont, Ark., to Bald Knob. A contract for grading in connection with second-track work on the Missouri and Arkansas divisions between Poplar Bluff, Mo., and Harviell and Diaz, Ark., and White River, has been let to Ball & Peters, Little Rock. A contract for the trestle bridging required in connection with the above grading work has been let to Burke & Joseph, Cape Girardeau, Mo. (See St. Louis, Iron Mountain & Southern, June 3, p. 1391.)

Montezuma & Western.—Under this name a company is said to have been formed by Denver capitalists and has secured control of the Argentine Tunnel Railway Co. and the transcontinental tunnel, which was planned to connect Clear Creek, Colo., with Summit county. It is said that the new owners will complete the tunnel at once, and then build from Denver, Colo., southwest to Leadville, about 100 miles. It is understood that the company has secured control also of the Argentine Central, operating a 16-mile line in Colorado, from Silver Plume to the summit of Mount McClellan, and will operate that road in connection with an extension to Grays Peak.

Mount Adams.—Survey is said to be made for the first 20 miles of this line and contracts are to be let for the work about July 20. The company was organized to build from White Salmon, Wash., north to Glenwood, about 40 miles. R. Lauterbach, president, White Salmon.

Nebraska & Dakota.—Incorporation has been asked for in South Dakota by this company, with a capital of $4,500,000 and headquarters at Pierre, S. Dak., and a business office in Chicago. The plans call for a line from Murdo, S. Dak., south via the counties of Lyman, Mellette, Todd and Tripp, in South Dakota, and Keyapaha, Rock, Loup and Garfield, in Nebraska, to Burwell, 180 miles. The incorporators include: A. Martin, P. Miller, S. C. Ware, B. McWilliams and C. J. Ruebling, all of Chicago, and L. L. Stephens, Pierre.

New York, New Haven & Hartford.—The New York Public Service Commission, Second district, has consented to the abandonment by the New York, Westchester & Boston of that portion of its route which is northerly and westerly of White Plains in Westchester county, N. Y., between that place and Hall's Corners, now Elmsford. (April 29, p. 1114.)

The New York Public Service Commission, Second district, has issued an order that there shall be no grade crossings on the New York, Westchester & Boston main line from the boundary line between the city of New York and the county of Westchester to the city of New Rochelle, and on the branch line from the city of Mount Vernon to White Plains. The order specifies the type of bridge or subway which shall be constructed at each crossing, of which there are 44 in the city of Mount Vernon, village of North Pelham, city of New Rochelle and town of Eastchester, Scarsdale and the village of White Plains.

New York, Westchester & Boston.—See New York, New Haven & Hartford.

Oklahoma-Kansas.—Organized in Kansas to build from Galena, Kan., northwest via Riverton to Columbus, also from Riverton south via Baxter to Miami, Okla. As soon as the survey is finished arrangements will be made to finance the proposition and build the line. Dr. C. M. Jones, T. F. Cole, E. B. Morgan, J. M. Cooper, Baxter Springs; J. S. Shomon, Galena, and Dr. W. L. McWilliams, Miami, are interested.

Oregon Railroad & Navigation Co.—It is said that this company will resume operations in the Clearwater Valley, Idaho, and that this coming summer extensive improvements will be carried out by the Harriman system in Idaho and Oregon, simultaneously. The work includes building the extension from Joseph 12 miles east to Lewiston, the junction of the Northern Pacific and the Camas Prairie, over which the O. R. R. & N. Co. has joint trackage rights, into the white pine belt along the north and middle forks of the Clearwater. The line has been surveyed and right of way secured.

Oregon Trunk Railway.—According to press reports, H. C. Henry, Seattle, Wash., who has the contract for an extension of this line, has sublet the work to Nelson Brothers, to build the 126 miles from Madras, Ore., south to the north end of the Klamath-Indian reservation. (May 20, p. 1282.)

Pacific & Idaho Northern.—According to press reports, work is to be started at once on an extension of this road from the present terminus at Evergreen, Idaho, northeast to Meadows, 17 miles. It is expected to have trains in operation over this extension during 1910. (Dec. 3, p. 1108.)

Prairie Farm & Southwestern.—Construction work has been started on this line, projected from Prairie Farm, Wis., southwest to Emerald, 16 miles. Grading has been finished as far as Bushey lake. G. E. Scott, president, Prairie Farm. (May 20, p. 1282.)

Quincy Western.—An officer writes that this road will be put in operation on June 15 for both freight and passenger traffic between Hartwell, Cal., on the Western Pacific, and Quincy, in Plumas county, about seven miles. (Oct. 29, p. 828.)

Rapid City, Black Hills & Western.—This company, operating a line from Rapid City, S. Dak., west to Mystic, 34 miles, is said to have announced that it will build an extension this year west into the coal fields of Wyoming.

Rock Island, Texico-Farwell & Gulf.—An officer writes that arrangements for the construction of the line projected under the name of the Tucumcari, Portales & Gulf have been made, and the construction work is to be started at once. The projected route is from Tucumcari, N. Mex., southeast to the Gulf of Mexico. The first work to be carried out will be on a section of 57 miles from Texico-Farwell. Contracts for grading and track laying on 50 miles have been let on the section north of Pyoti, Tex., and an additional 50 miles will be let for the section south of Pyoti, through the irrigated belt to Fort Stockton. Heavy subsidies in land grants and cash have been given to the company. Complete surveys and reports have been made from Texico to the Rio Grande, as well as to Faulkner, Mex., a total of about 570 miles. Address M. J. Healy, Texico, N. Mex. (See Tucumcari, Portales & Gulf, April 15, p. 1017.)

San Luis Southern.—An officer writes that this company has track laid on 20 miles and work under way on an additional 20 miles from the Denver & Rio Grande connection at Blanca, Colo., south to a point in Costilla county. The work will be light, being mostly prairie construction. Maximum grades will be 0.8 per cent. and maximum curvature 4 degs. F. E. Brooks, president, Colorado Springs; L. D. Blauvelt, chief engineer, Blanca.

Seaboard Air Line.—This company opened an extension of its Dunnellon branch on June 4. The branch runs from Early Bird, Fla., southward, and includes Camp's Phosphate Railroad, which has been bought by the Seaboard Air Line. The new extension is from Anderson Mine via Dunnellon and River Mine, to section 20-C Mine, 20.54 miles from Early Bird.

Temiskaming & Northern Ontario.—An officer writes that contracts were to be let on June 7 for building an extension from the present southern terminus at North Bay, Ont., east to a connection with the northern terminus of the Grand Trunk at Nipissing Junction, three miles. (April 22, p. 1066.)

Tucumcari, Portales & Gulf.—See Rock Island, Texico-Farwell & Gulf.

Ultima Thule, Arkadelphia & Mississippi.—See Memphis, Dallas & Gulf.

Western Maryland.—A contract is said to have been given to the Conestogo Construction Co., Pittsburgh, Pa., for building a section of 10 miles on the extension from Cumberland, Md., north to Connellsville, Pa. Sub-contracts are said to have been given by the Carter Construction Co., Pittsburgh, Pa., to Foley Brothers & Co., for work on a heavy section between Markleton and Ohio Pyle, six miles, and to Connolly & Wood for the masonry work from Cumberland, north to the Pennsylvania state line. (May 13, p. 1237.)

Wisconsin Roads.—Incorporation has been asked for by a company at Madison, Wis., to build from Fennimore to Bagley, 29 miles. The incorporators include: J. F. Morse, W. E. Lewis, F. Alexander, G. Monroe, F. Kolb, A. Kooley and W. Leighton.

Railway Financial News.

Buffalo & Susquehanna Railroad.—Edward B. Smith has been chosen a member of the first refunding 4 per cent. mortgage bondholders' protective committee, succeeding Asa S. Wing, resigned.

Central New England.—Joseph Moore, Jr., representing minority stockholders, has received a reply to his letter to President Mellen, of the New York, New Haven & Hartford, in which President Mellen says that he will discuss negotiations for the purchase by the New Haven of the minority stock of the Central New England, but he "should not be willing, as at present advised, to pay anything like the price you name in your letter" ($50 for the preferred and $25 for the common).

A contract has been made with the Poughkeepsie City & Wappingers Falls Railway by which that company will run electric cars for passengers over the Hospital branch of the C. N. E. between the main line and the Hudson River State Hospital and between the hospital and the junction with the New York Central.

Hocking Valley.—The court order prohibiting the Hocking Valley from retiring $15,000,000 preferred stock has been dissolved, but the restraining order prohibiting the Hocking Valley, the Chesapeake & Ohio and the Lake Shore & Michigan Southern from voting stock of the Kanawha & Michigan has been continued for 10 days for final hearing on request of the plaintiffs.

Metropolitan Street Railway (New York).—This property has again been ordered sold on July 1 under foreclosure of the general mortgage and the collateral trust mortgage. At the time formerly appointed for the sale under the collateral trust mortgage alone no bids were received.

Michigan Central.—The company is now engaged in making arrangements for the sale to French bankers of $17,500,000 4 per cent. debenture bonds of 1909-1929. This is the unsold portion of an authorized issue of $25,000,000 and the proceeds will be used in part, it is understood, to reimburse the New York Central & Hudson River for advances necessary to retire $10,000,000 Michigan Central notes which matured and were paid off on February 1, 1910.

New York, New Haven & Hartford.—See Central New England.

The Massachusetts Lower House has passed by a vote of 137 to 76 a bill permitting the New Haven to buy and operate the Berkshire Street Railway. The bill has already passed the Massachusetts Senate.

Roscoe, Snyder & Pacific.—See Texas & Pacific.

Southern Indiana.—The federal court at Indianapolis has ordered the sale of the property of the Southern Indiana under foreclosure of the general mortgage of 1906, under which $3,212,000 bonds are outstanding. A similar order was made by Judge Kohlsaat at Chicago on June 2 at the same time that he ordered the sale of the Chicago Southern under foreclosure of the first mortgage. The amount due, including interest, under the mortgage of the Southern Indiana is $3,547,115 and the road is sold subject to the first 4 per cent. mortgage of 1901, under which there is due $7,537,000, with interest from February 1, 1909, and to the unpaid purchase price of equipment due to the Barney & Smith Car Co. amounting to $349,106, and to the American Locomotive Co. amounting to $48,437. There are outstanding $382,000 6 per cent. receiver's certificates, due November 1, 1910.

Southern Pacific.—Kuhn, Loeb & Co., New York, have made arrangements for the sale in Germany of $25,000,000 bonds of the Southern Pacific.

Texas & Pacific.—This company has loaned $157,511 to the Roscoe, Snyder & Pacific, and the loan is secured, it is understood, by a first mortgage note. The Texas Railroad Commission has already authorized the Roscoe, Snyder & Pacific to issue $261,500 bonds secured on 50 miles of road in addition to the first mortgage note given to the Texas & Pacific.

Supply Trade Section.

The Standard Railway Equipment Company, St. Louis, Mo., has moved its general office to the Frick building, Pittsburgh, Pa.

J. L. Connors has been appointed sales manager of the Ralston Steel Car Co., with headquarters at Columbus, Ohio, in charge of all sales of the company.

The Duplex uncoupler and automatic release, manufactured by the National Railway Devices Co., Chicago, will be used on the 1,000 New York Central automobile cars to be built by the Merchants Despatch Transportation Co., Rochester, N. Y.

A. D. McAdam, who was recently elected vice-president of the St. Louis Surfacer & Paint Company, St. Louis, Mo., and western sales-manager of the Ohio Malleable Iron Company, Columbus, Ohio, will have his office at 1101 Fisher building, Chicago, after July 1, 1910.

The Westinghouse Electric Co. has sold to Kuhn, Loeb & Co. an issue of $4,000,000 three-year 6 per cent. notes to refund an issue of $6,000,000 6 per cent. notes coming due in August. The new notes are being offered for subscription at par. The balance of the maturing issue is to be paid off in cash set aside at the time of reorganization, and this will call for slightly more than $2,000,000.

A. Beamer, who recently resigned as superintendent of the Idaho division of the Northern Pacific, is now president of the A. B. C. Train Operating Co., Chicago, and is devoting his entire time to the advancement and introduction of the A. B. C. system of train operation of which he is the patentee and which has been in operation on the main line of the Northern Pacific, west of Paradise, Mont., for the past three years.

The Isthmian Canal Commission will receive bids until June 21 for air-brake hose, rubber belting, packing, gaskets, copper tubing, bolts, rail benders, saws, diaphragm pumps, water gages, hose couplings, flue cleaners, plate glass and other supplies (Circular No. 588), and until June 20 for lumber, manganese sheels for revolving screens for rock crushing plant, steel castings, firebox steel, crucibles and hose couplings (Circular 587); and until June 23 for steel castings—repair parts for steam shovels (Circular No. 586).

The armature shifting type of variable speed motor, known as the Lincoln variable speed motor, and manufactured by the Reliance Electric & Engineering Company, Cleveland, Ohio, will hereafter be known as the Reliance adjustable speed motor. The change is made necessary to better describe this type of motor in accordance with present standard terms adopted by the American Association of Electric Motor Manufacturers, and also to avoid confusion with the Lincoln Electric Company, also of Cleveland.

Geo. E. Pratt has been elected vice-president in charge of sales of the Crawford Locomotive & Car Co., Streator, Ill., with headquarters at Streator. Mr. Pratt started as a machinist apprentice in the Taunton Locomotive Works, Taunton, Mass. He served in a number of clerical positions on eastern railways, was in charge of finances and details in the building of the Chautauqua Lake Railway, Jamestown, N. Y., and served 13 years as contracting agent of industrial and car manufacturing concerns. He is a member of several railway clubs and was the first secretary and treasurer of the New England Club.

The executive committee of the Signal Appliance Association, at a meeting on April 19, voted that it would not be wise to make exhibits at the October meeting of the Railway Signal Association at Atlantic City, space in the hotels being unavailable and the cost of space in other places being found to be from 25 cents to 28 cents a square foot. On request from signalmen and others this action was reconsidered on May 23, but the decision was substantially reaffirmed. That is to say, the Appliance Association will take no action in regard to exhibits. This, of course, will not prevent individuals from exhibiting in their rooms, in the hotels or elsewhere. Neither does the present action in any way affect the social and entertainment features of the convention.

W. P. Bettendorf, president of the Bettendorf Axle Co., Bettendorf, Iowa, died at his home in Bettendorf, Friday, June 3, after an operation for peritonitis. The funeral services were held Monday, June 6. Mr. Bettendorf was born in Mendota, Ill., July 1, 1857. He was the eldest of four children. J. W. Bettendorf, the only one of the children now living, worked with his brother in developing the Bettendorf interests. Mr. Bettendorf accompanied his parents when they moved from Illinois to Missouri and later to Kansas, where he attended the St. Mary's Mission school. In 1874 he became a machinist apprentice with the Peru Plow Co., serving the full term. As a result of his interest in agricultural implements he invented the first power lift sulky plow in 1878. He later developed a metal wheel and the machinery necessary for its manufacture. He granted a shop right to the Peru Plow Co. for making this wheel, but as this branch of the business grew, the name of the company was changed to the Peru Plow & Wheel Co. In 1886 Mr. Bettendorf and his brother, J. W., took over the manufacture of the Bettendorf wheel in a plant at Davenport, Iowa. In 1889 the Bettendorf Metal Wheel Co. was incorporated, with which he was connected until 1892, when he developed a steel gear for farm wagons. After three years of experimental work he built the machinery necessary for making steel gears. This machinery was sold to the International Harvester Co. in 1905, but the Davenport company still manufactures the gears under contract. In addition to this business the company manufactured steel car trucks, steel underframes for cars and complete cars. The Bettendorf Axle Co. was organized and incorporated January 1, 1895, with W. P. Bettendorf as president and his brother, J. W., as secretary. After sustaining very severe fire losses at the plant in Davenport, Iowa, a new plant was established about three miles east of the city at the town of Gilbert, now Bettendorf. This plant now employs 800 men and has recently been enlarged by the addition of a foundry and erection shop.



W. P. Bettendorf.

TRADE PUBLICATIONS.

Gas Analysis Instruments.—The Carb-Ox Co., Chicago, has issued a 16-page booklet describing its gas analysis instruments and allied specialties. The instruments made by this company are all portable and while they may be used as laboratory instruments are particularly designed for practical work.

Electric Fixtures.—The Safety Car Heating & Lighting Co., New York, has just issued a very handsome catalogue, printed on heavy glazed paper, containing illustrations and descriptions of the electric car lighting fixtures which it manufactures. The aim has been to accurately show the design of the fixtures and to present a comprehensive collection from the great variety of designs made by this company. The designs shown represent all the principal schools of art, and this method of presentation should be helpful in meeting the

requirements of various classes of cars, and especially in those cases where quick delivery is essential. Special attention has been given to the photometric tests. The designs are worked out to insure a maximum interchangeability of parts.

Hardware.—The Russell & Erwin Manufacturing Co., New York, has issued Vol. 10 of its general catalogue covering the very extensive line of builders' hardware which it manufactures. This company's car door hardware, padlocks and switchlocks are particularly adapted for railway use. The catalogue contains over 1,200 pages, 10½ in. x 12 in., of heavy glazed paper, made up in loose leaf form. An admirable system of numbering the pieces and indexing them permits of easy and rapid location of any item.

About one-quarter of the catalogue is devoted to door hardware designed to harmonize with the interior decorations of the different periods and styles of architecture, such as: Elizabethan, English Renaissance, Georgian, Gothic, Greek, Louis XIV., Roman, Romanesque, etc. Each period is given as a separate unit and prefaced with an explanation of its tendencies in architecture and interior decoration. Besides this building hardware, designed to harmonize more directly with the interior decoration, an extensive line of plain hardware, appropriate for buildings and cars of all classes, is shown. The last section of the catalogue covers cabinet and trunk locks, miscellaneous hardware and mechanic's tools.

RAILWAY STRUCTURES.

Bloomington, Ill.—The citizens have accepted the offer of the Chicago & Alton to build a new roundhouse and passenger station if the city would furnish land at a cost of $165,000. It is reported that the roundhouse will contain 44 stalls and that the new station will cost $75,000.

Goldfield, Nev.—According to press reports, work is now under way by the Tonopah & Goldfield putting up shops, a roundhouse and office building at Goldfield. (Feb. 11, p. 332.)

Hobon, Ont.—See Algoma Central & Hudson Bay under Railway Construction.

Marshall, Ind.—The Cincinnati, Hamilton & Dayton passenger station was burned June 3.

Montreal, Que.—See Canadian Northern Quebec under Railway Construction.

Mt. Olive, Ill.—The Wabash plans to build a 300-ton coaling station.

New Westminster, B. C.—According to press reports, the Canadian Pacific will make improvements to its New Westminster station. The work includes a 25-ft. addition to both ends of the station, for which contract has already been let. The cost of the improvements will be about $15,000.

Omaha, Neb.—The Chicago, Burlington & Quincy has prepared plans for a new freight house to consist of two buildings 64 ft. wide; one for inbound, the other for outbound freight. The buildings will be over 900 ft. long ultimately, although only a portion of this length is to be built now. The construction is of brick with steel truss roof, wooden floor, foundations on concrete piers, a portion of which are supported on piles. Four tracks are laid between the two buildings. (July 23, 1909.)

San Bernardino, Cal.—The Atchison, Topeka & Santa Fe expects to begin work in a short time on a new machine shop.

Saspamco, Tex.—The San Antonio & Aransas Pass is building new passenger stations at Saspamco and Tuleta.

Tennyson, Tex.—According to press reports, the Kansas City, Mexico & Orient will start work soon on a stone passenger station at Tennyson.

Tuleta, Tex.—See Saspamco, Tex.

Van Buren, Me.—A new bridge is to be built at once over the St. Johns river, to cost $75,000. It will probably be a combined highway and railway bridge.

Late News.

The items in this column were received after the classified departments were closed.

H. H. Westinghouse has been elected president of Westinghouse, Church, Kerr & Co., Ltd., succeeding the late W. C. Kerr.

R. S. McCormick has been appointed chief engineer of the Algoma Central & Hudson Bay and the Manitoulin & North Shore, with office at Sault Ste. Marie, Ont.

Frank L. Sheppard, general superintendent of the New Jersey division of the Pennsylvania Railroad, at Jersey City, N. J., has been appointed general superintendent of the Pennsylvania Tunnel & Terminal Railroad Co.

L. S. Bourne has been appointed superintendent of the Tennessee Central, succeeding W. H. Fox, resigned, and P. B. Smith has been appointed trainmaster. W. L. Wene has been appointed purchasing agent, succeeding E. A. Mann, resigned, all with offices at Nashville, Tenn.

W. C. Hurst has been appointed superintendent of the Northern and Southern divisions of the Cincinnati, Hamilton & Dayton, with office at Dayton, Ohio, succeeding J. M. Scott, resigned, and C. L. Brevoort, trainmaster at Cincinnati, Ohio, has been appointed superintendent of terminals, succeeding M. J. Griffin, resigned. Mr. Brevoort's jurisdiction will extend from Cincinnati to New River Junction, and he will report to the superintendent at Dayton.

The area sown to spring wheat is about 19,742,000 acres, or 1,349,000 acres (7.3 per cent.) more than sown last year. The condition of spring wheat on June 1 was 92.8 as compared with 95.2 on June 1, 1909; 95.0 on June 1, 1908, and 93.0 the June 1 average of the past ten years. The condition of winter wheat on June 1 was 80.0, as compared with 82.1 on May 1, 1910; 80.7 on June 1, 1909; 86.0 on June 1, 1908, and 81.9 the June 1 average of the past ten years. The condition of rye on June 1 was 90.6, against 91.3 on May 1, 1910; 89.6 on June 1, 1909; 91.3 on June 1, 1908, and 89.9 the June 1 average of the past ten years.

The general executive committee of the Railway Business Association held a meeting at the Hotel Belmont, New York City, on Wednesday afternoon, at which A. M. Kittredge, president of the Barney & Smith Car Co., Dayton, Ohio, was elected a vice-president, and S. P. Bush, president of the Buckeye Steel Castings Co., Columbus, Ohio, was appointed an executive member. An appeal was made to Congress, the railways and the shippers, asking that each of these interested classes do everything that is possible to clear the way for an early decision by the Interstate Commerce Commission on the question of higher freight rates. In its appeal to Congress the commission urges immediate action on the railway bill and recommends that the provision giving power to the Interstate Commerce Commission to pass on the reasonableness of increased freight rates be enacted to go into effect on its passage. The railways are asked to facilitate the work of the commission by so arranging their schedules and having their reasons therefor so clearly presented that the commission will not have to ask for explanations. A demand is also made that the railways explain more fully to shippers their reasons for increased rates. In its appeal to shippers the committee urges that they look on the railways as on any other business concern, for whose solvency the management is responsible and not the government. The committee says: It has been said recently in the heat of controversy that in the discussion of freight rate matters "railway supply men are not to be regarded as business men" or identified with *shippers.* Why not? Companies furnishing equipment, materials and supplies to the railways pay more than $250,000,000 a year in freight bills, or 15 per cent. of the total freight revenue of all the railways. As managers of one of the largest groups of industries in the country we have a right to be heard like any other business men. If there is an advance we must pay our share. We are no more eager than others to assume new burdens, but while we are deeply interested in seeing that the carriers have adequate revenues we know that the public welfare is equally involved.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Spokane International has ordered one locomotive from the American Locomotive Company.

The Shannon Copper Co., Clifton, Ariz., has ordered one locomotive from the Baldwin Locomotive Works.

The Colorado & Southern has ordered 10 Pacific and five Mikado locomotives from the Baldwin Locomotive Works.

The Czarnikow-Rionda Co. has ordered one mogul freight locomotive from the American Locomotive Co. It will have 19-in. x 24-in. cylinders, 54-in. driving wheels and a total weight of 113,000 lbs.

The Atchison, Topeka & Santa Fe is having built at the Baldwin Locomotive Works plant two locomotive tanks having a capacity of 12,000 gals. of oil. The tanks are equipped with equalized trucks.

B. T. Babbitt has ordered a four-wheel saddle tank switching locomotive from the American Locomotive Co. It will have 11-in. x 16-in. cylinders, 33-in. driving wheels and a total weight of 38,000 lbs.

The Belmina Consolidated Asbestos Co. has ordered a four-wheel saddle tank locomotive from the American Locomotive Co. It will have 9-in. x 14-in. cylinders, 29-in. driving wheels and a total weight of 24,000 lbs.

The Northwestern Pacific has ordered from the American Locomotive Co. four 10-wheel passenger locomotives with 20-in. x 26-in. cylinders, 63-in. driving wheels and a total weight of 168,000 lbs.; also two six-wheel switchers with 19-in. x 24-in. cylinders, 51-in. driving wheels and a total weight of 120,000 lbs.

CAR BUILDING.

The United Fruit Co., New York, is in the market for 100 cars.

The Canadian Pacific has ordered 211 fifty-ton Otis coal cars from the Hart-Otis Car Co.

The Toronto, Hamilton & Buffalo has ordered six Hart convertible cars from the Hart-Otis Car Co.

The Halifax & Southwestern has ordered 20 thirty-ton Hart hopper ore cars from the Hart-Otis Car Co.

The Philadelphia Rapid Transit is to buy 20 electric cars for elevated service. This item is unconfirmed.

The Cudahy Oil Tank Line, reported in the *Railway Age Gazette* of May 6 as in the market for cars, has ordered 10 all-steel tank cars of 125 and 250 bbls. capacity.

MACHINERY AND TOOLS.

The Chicago & North Western is taking prices on 59 machine tools in addition to those mentioned in the *Railway Age Gazette* of March 11.

The Detroit United Railway has installed 10-ton hand-power Northern cranes, 30-ft. to 34-ft. span, in two of their substations. These were furnished and installed by the Northern Engineering Works, Detroit.

IRON AND STEEL.

The Boston Elevated is in the market for 500 tons of rails.

The New York, Chicago & St. Louis is in the market for 2,000 tons of bridge steel.

The Northern Pacific has ordered 7,000 tons of bridge steel from the American Bridge Co.

The Chicago Great Western has ordered 1,500 tons of bridge steel from the American Bridge Co.

The Milwaukee Electric has ordered 3,300 tons of structural steel from the Worden-Allen Co.

The Pennsylvania Lines West have ordered 3,600 tons of bridge steel from the American Bridge Co.

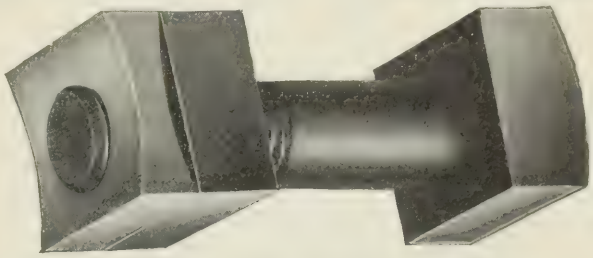
The Seaboard Air Line has ordered 16,600 tons of O. H. rails from the Tennessee Coal, Iron & Railroad Co.

The Tucumcari, Portales & Gulf is in the market for 60 or 65-lb. rails, new or relay, for July or August delivery at Texico, N. Mex.

General Conditions in Steel.—It is expected that the temporary understanding that has been arrived at between the government and the railways, in relation to the proposed increase of freight rates, will encourage the railways to go ahead with improvements and extensions. Some small orders have been placed during the past few days and the indications are that they will be followed by large ones.

The "Boss" Nut Lock.

The accompanying illustration shows what is known as the "Boss Nut," a device of remarkable simplicity. It accommodates itself to bolts of rated size, which may be undersize, by bending or yielding backward until its threads meet the bolt threads, each set of threads registering more deeply into the thread-valley. A nut holding device of this character should be indestructible, and in its application strengthens



The Boss Lock Nut.

the hold of the common nut used with it, by increasing the number of threads involved in the function, as well as performing the work of a high-class nut lock by leaving its rigid position when necessary in being wrenched home, and curving back to more perfectly and tightly fit the bolt, where it will remain until wrenched off. It can be removed with the same wrench as the common nut, either with it, or singly, and may be re-applied any number of times. It is manufactured by The B. M. Osbun Company, Chicago.

Steel Barges.

Considerable interest has been manifested lately in the improvements contemplated by the United States government to make the inland rivers, particularly the Ohio and Mississippi, navigable during a longer period each year. In order to make these rivers of general benefit to shippers, the first essential is continuous service, and with such service will come the craft in which available cargoes can be transported. During the past few years a great many boats and barges of steel construction have been designed and built at the Ambridge plant of the American Bridge Company, New York.

Barges have been built for transporting coal, oil, sand and other bulk commodities, but to no marked degree have steel barges been used to transport steel products. It is therefore of considerable interest to note that an order has just been placed with the American Bridge Company for 10 steel barges to carry the products of the subsidiary companies of the United States Steel Corporation for the Pittsburg district mills to Cincinnati, Louisville, St. Louis, Memphis, Vicksburg, New Orleans and other ports on the Ohio and Mississippi rivers. Arrangements have been made with the Monongahela River Consolidated Coal & Coke Company to tow the barges. These are not the first steel barges to be used in carrying steel, as the fleet of steel coal barges built by the American Bridge Company for the American Steel & Wire Company, 30 of which are now in commission, have, for several years, been carrying coal to the mills and billets from the Shoenberger works to Rankin and Braddock on the return trip to the coal mines. For some time past steel rails, wire, nails, cotton, ties, pipe, etc., have been carried to southern ports by the Monongahela Consolidated Coal & Coke Company for the constituent com-

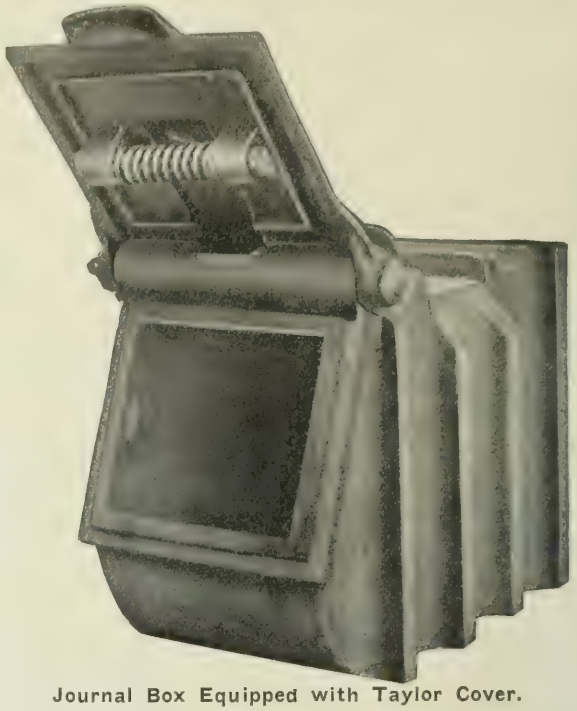
panies of the Steel Corporation in wooden model barges and some are still in service. The tonnage handled in this way has been from 40,000 to 65,000 gross tons annually. The maximum tonnage of steel rails alone is said to have been as much as 150,000 gross tons in one year, and the average number of round trips for a barge at present is two per year. With improved river conditions and continuous available water, this might be increased so that each barge would make at least five round trips to New Orleans annually, call at a correspondingly larger number of intermediate ports, and with such service, at least 250,000 gross tons of steel products could be distributed annually from the Pittsburgh district to Ohio and Mississippi ports.

The accompanying drawing shows the type of barge now being built. It is 200 ft. long over all, 36 ft. beam, and 10 ft. 6 in. deep, the deck being crowned 8 in. at the center. The sheer at bow and stern is 18 in. After due consideration, the scow type was adopted, the rakes fore and aft being the same. The barge is of steel construction throughout with the exception of a 4-in. wood floor in the hold. Plates, angles, beams and channels, such as are ordinarily rolled are used throughout, no special section being employed. Five transverse watertight bulkheads and a longitudinal truss divide the hold into eight compartments. Openings are located in the deck centrally over each compartment, and are made large enough to receive rails 33 feet in length below deck.

A cargo box covers the greater portion of the deck, and this also is built of steel plates and shapes with the exception of the sides, which are of galvanized corrugated steel. Three sliding doors on each side of the barge, and one at each end permit loading and unloading nails and other wire products, ample space having been made for loading materials through the roof of the cargo box, hatches being provided immediately over the deck opening so that rails, pipe and structural material can be lowered into the hold by a crane through both openings. Provision has also been made for loading 60-ft. rail and 70-ft. structural material through the two central roof hatches, this material, however, to be carried on the deck and not in the hold. The roof hatches have steel plate covers, amply stiffened with angles and designed to be weather proof. As it is customary to carry mixed cargoes, it was necessary to design barges of a sufficient cubical capacity to carry the bulky and comparatively light material, such as field fencing and barbed wire, and when such cargoes are carried, a cargo box will be required. For rails, pipe and structural material, if not over 33 ft. long, the hold only will be needed to carry the material, but for the long lengths of structural material and rails the deck will be used, although other materials can also be carried in the hold. The draft of the barge loaded to its capacity is 9 ft., provision having been made for 18-in. free board. The barge light will draw 26 in.

Taylor Improved Journal Box Cover.

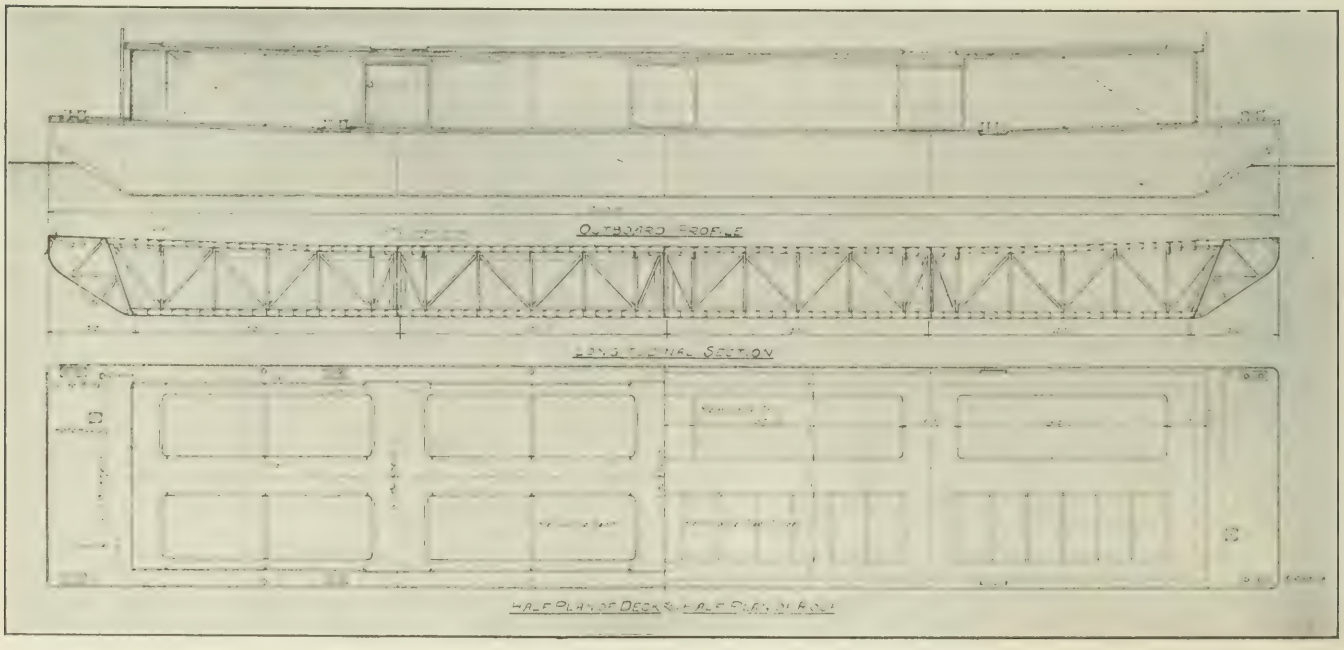
The accompanying illustration shows a box having an improved journal box cover made by the W. P. Taylor Company, Buffalo, N. Y. The illustration shows the self-locking device, consisting of dogs, a spiral spring on the cover and raised projections on the inside of the box. This device, used with the M. C. B. flat spring, closes the cover automatically and holds it tight. The hinge lug, being the full width of the box, is intended to prevent water and dust from entering at the top. The box has two faces, one of which is set back



Journal Box Equipped with Taylor Cover.

¼ in., and the cover is shaped to correspond, to make the front of the Taylor box dust proof.

The malleable iron cover is pressed to a tight joint around the lower face and along the back of the hinge by hydraulic pressure. The hinge pin is secured by a nut and then riveted to prevent the cover from being removed or stolen. This company is prepared to furnish this style of lid and face for any design of box. The grade of iron used for these boxes is said to be made from a special mixture which gives the greatest strength and best wearing quality.



Steel Barge for United States Steel Corporation.

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A good idea of the enormous brake power required for heavy passenger cars at high speeds may be gained by an inspection of the exhibition foundation brake rigging specially designed for that purpose. This equipment is as rugged as a bull-dozer and has all the attributes of an engine of destruction. The battery of 18-in. cylinders for heavy brake work in another group might be mistaken for the mortar guns used by General Grant at the siege of Vicksburg. The great weight of this brake rigging adds to the burden of non-paying equipment which is required to be hauled in trunk line express service. So long as railway managers place no limit on the weight of passenger car equipment, the tendency will be to continually increase it, and it is now so heavy that two large Pacific locomotives are required to maintain the schedule time. There must be a point reached where all this ceases to be profitable in any sense. To those who inspect the brake equipment above referred to, and which is regarded as necessary for present conditions, we submit the question, whether the sensible, economic, practical maximum limits of the weight of passenger equipment has not been reached and there should now be a movement tending to reduce this to some rational proportions.

Twenty years ago the Master Car Builders' convention was held at Old Point Comfort. William McWood was president, having served in that capacity for the two previous years, 1888 and 1889. John W. Cloud began his first year as secretary of the association, and continued in that office nine years until 1899, when he was succeeded by the present secretary, Joseph W. Taylor. The active members then numbered 141, representative members 100, and associate members 6, a total of 247. Prominent among those taking an active part in the convention but not now living were F. D. Adams, J. N. Barr, B. K. Verbreyck, J. Townsend, R. C. Blackall and E. B. Wall. It is interesting to note that one of the principal reports related to "The Use of Pressed Steel and Malleable Iron in Car Construction," and that the only shop in this country with large presses for car work at that time was the Fox Pressed Steel Works at Joliet, Ill., which made nothing larger than the Fox flanged steel truck frame. The first exhibit of this truck was at Alexandria Bay in 1888. In 1890 Charles Schoen was making pressed steel stake pockets and center plates in his small shop in Philadelphia, but he had visions of larger things, and had designed a steel gondola weighing 18,000 pounds, which was illustrated in the *Railroad Gazette*, May 23, 1890. This was the beginning of that remarkable work in pressed steel car construction which Mr. Schoen carried on during the next ten years, and which has developed into such an enormous industry. The proceedings of the convention of 1890 are contained in a pamphlet one-half inch thick and those of 1910 form a volume two inches thick indicating that the amount of the material presented at the latter meeting in the way of reports and discussion was three or four times the amount presented at the convention of 1890. In each case the time required was three days so that whatever complaint is now made over the deliberation in reading long reports can be met by the statement that the larger business of the association is now transacted and finished in the usual time appointed for the convention.

The experience of the American Street and Interurban Railway Association at its last two annual conventions probably has a lesson for the railway mechanical associations. The meetings of this association, having in view both the attendance and the size of the exhibits, are more nearly comparable to those of the mechanical associations than any others held in the country. In October, 1908, the Street and Interurban Railway Association met in Atlantic City. It was thought advisable to meet elsewhere last year, and it went to Denver. The auditorium there proved adequate for the exhibit, but the hotel accommodations were quite unsatisfactory. The hotels were so unequal to the demand that it was necessary to crowd about twice as many persons into each room as was compatible with comfort. This alone would have been bad enough. In addition, the hotel men raised their prices so that not only were there about twice as many people in a room as was consistent with comfort, but each had to pay about twice as much for accommodations as should have been asked even if satisfactory accommodations had been provided. The result is that in October, 1910, the Street and Interurban Railway Association will return to Atlantic City. We think of only two structures in the country, except at Altantic City, where the large exhibit made by the Railway Supply Manufacturers' Association could be housed under a single roof. These are Convention Hall, at Kansas City, Mo., and Madison Square Garden, at New York. But the hotel capacity at Kansas City is too small for the crowds that are drawn by the meetings of the mechanical associations; and while the hotel capacity of New York is, of course, the largest in the United States, the current demands on it always are so great that the hotel proprietors will not reserve so many rooms for an annual affair as are required for the meetings of the mechanical associations. The hotel capacity of Chicago is very large, and is growing fast, but there, as in New York,

the hotel proprietors are loath to reserve a large number of rooms, and, besides, the Coliseum would not be adequate for the Railway Supply Manufacturers' exhibit. All things considered, Atlantic City is unquestionably the best place in the country for the conventions of the mechanical associations; and so long as the Hotel Men's Association here deals fairly with them, the argument for continuing to come here will be very strong.

There used to be a saying, "Once a newspaper man, always a newspaper man." It is quite true now, but no more so than its paraphrase, "Once a railway man, always a railway man." In view of the frequent changes in railway service personnal, retirements from service for other reasons than because a pension is available, and the numerous recorded instances in which it is stated that "Mr. So-and-So has resigned to accept a position with"—some manufacturer of or dealer in railway supplies—this statement would, at first thought, seem to require some qualification; but it is at least more true than Voltaire was willing to admit any general statement to be. The fact is that in these days of specialization few men can claim to know it all in either the newspaper or the railway business, and perhaps to some extent both the terms "newspaper man" and "railway man" are misnomers; but there is no occasion for a quarrel about that. The point is that a man is a mechanical engineer by education or growth, a machinist or a locomotive engineman who has passed to a higher state of existence or the one in control of the operation and repair of the cars which he at first learned to build as something more than an ordinarily skillful carpenter. The men who rise to the highest positions simply become a little more really railway men than they were before. The publisher who now buys the kind of manuscript he used to hope to sell is perhaps in the same view the real newspaper man. But the man who continues as a mechanical engineer or a chemist, or what-not, is no less a mechanical engineer or a chemist because he works for a railway company. The late Charles E. Perkins, formerly president of the Chicago, Burlington & Quincy, once said: "I do not know what you mean by the education of a railway man. I suppose a railway lawyer is much the same as any other lawyer and a civil engineer employed by a railway does not thereby cease to be a civil engineer." The application of all this is that nearly every one of the class of men to whom these remarks are specially directed—the mechanical men—if he leaves the service of the railway by whom he has been employed, almost invariably finds his business and his social relations among the people who deal in the articles he is accustomed to use, and is confronted with the same problems with which he has been accustomed to struggle. He only grapples the problem from a little different standpoint. To return again to the illustration concerning the newspaper man, it matters little as to his general status and designation whether he is trying to produce manuscript that a publisher will buy, or whether he, as publisher, is trying to select for purchase such material as his public will read with joy and pay for with alacrity. On this basis, therefore, from a psychological standpoint and for the purposes of academic discussion, which is all that is intended here, we may return to our original conclusion—"Once a railway man, always a railway man."

CONSOLIDATION.

One of the most important subjects to be considered by the associations is that of "Consolidation." The committees on this subject were instructed to present the arguments both for and against consolidation. The main arguments in its favor are that, excepting the legislative functions of the Master Car Builders' Association, the work of the two organizations is along the same lines and that their union would economize the time of those who do executive and committee work between conventions and of members attending the conventions. There are some arguments on the other side which we have heard advanced, and which merit consideration.

One of these is, that the union of the two associations and the holding of the convention of the consolidated organization in a single week probably would keep many from attending who are now able to attend the meeting of the one or the other association. This is because part of the mechanical officers of many roads, especially western lines, attend one of the conventions, and as soon as it adjourns go home to relieve the mechanical officers who have not attended the first convention, so as to enable them to attend the second. If there were only one convention it would last so short a time that only part of the officers of these roads would be able to attend. Furthermore, if the consolidated association should do all of its work in one week, it is probable that there would have to be several afternoon sessions; and this would so curtail the time available for members to inspect the exhibits that the value of the exhibit would be considerably impaired, and the incentive of the supply men to maintain it at its present high standard would be considerably reduced.

Some of the higher mechanical officers, particularly those on eastern roads, may, perhaps, reply that they could get along very well if there were no exhibits. But this view will not be shared by the majority of the members of the associations. Most of the members have little opportunity except at the time of the conventions to see and study the new devices being put on the market from year to year. If their opportunity to observe them at that time were reduced, the educational value of the conventions to them would be much lessened. Even the two days between the two conventions are by no means wasted. They are spent by many members in the interchange of ideas both among themselves and with representatives of the supply concerns, and in viewing the exhibits.

There probably is more sentiment against consolidation in the Master Car Builders' Association than in the Master Mechanics' Association. This is partly because it is felt that the Master Car Builders' Association ought to be allowed to go on independently with the very important legislative work of framing and perfecting the rules covering the interchange of equipment which it has done so successfully in the past. Another reason is the feeling that the importance of the car department in its relation to shop management and car design is not now as fully recognized by railway management as it should be, and that consolidation might tend to decrease the time and attention given to these matters, whereas the consideration given to them should be increased. Furthermore, it is felt by many that consolidation would not tend to improve the legislative work of the Master Car Builders' Association, as the motive power officers who have jurisdiction over the car department, and are therefore directly interested in the Master Car Builders' Association's work, are already members of it.

The proposition to unite two organizations which for a long period of years have done such important work is a serious matter. Mr. McKenna in his address last year as president of the Master Car Builders' Association, said: "Unless improvement is possible, changes should not be favored." Perhaps Mr. McKenna's statement should be changed to read, "Unless improvement is *probable*, changes should not be favored." There are many members of both associations who have not been convinced of the probability of improvement by the change proposed. But it must be conceded, as we said in the *Daily* last year, that the reasoning in favor of it is quite persuasive."

FRANK H. CLARK.

Rarely if ever has a man appeared before the Master Car Builders' Association as its presiding officer who has previously occupied so modest a position as a speaker upon the floor of the convention, as has Frank H. Clark, who presides at the meetings this year. This is far from saying that the honor conferred upon Mr. Clark was an accident or undeserved on account of the work he has done for the association. It is only another way of saying that he is emphatically a man of action rather than of words. What he has to say is summed up in a few words which go directly to the point. What he has had to do has largely been done before he came to the convention and his thoughtful consideration and sound judgment are reflected in the reports of other committees than those of which his name appears as chairman or member.

Mr. Clark's training has been such as to make him, now that he has risen to the top of his chosen line of work, much more of a thinker than of a talker. As the quiet student working out complicated problems or carrying on difficult tests in the multifarious lines of work in the office and in the field for the late David L. Barnes—as the chief draftsman and mechanical engineer of the road of which he is now general superintendent of motive power, he was in each position cultivating the faculty of getting to the bottom of things rather than of talking about them and guessing that the result would be so-and-so when he or some one else did get there. This training, as well as incidental work during the first period named as assistant to the then western editorial representative of the *Railroad Gazette*, emphasized the importance of accuracy and closeness of observation, terseness and clearness in putting into shape for report or publication and carefulness in drawing no conclusions not supported fully by the data in hand. Hence the soundness of judgment characterizing his actions as an administrative officer, which has been recognized by those who have placed him in a position such as few men have reached at his age and an appreciation of which has been shown by his fellow-officers of other roads in electing him to the presidency of their most influential association.

Mr. Clark is entirely a product of the West. Born at Pecatonica, Ill., in 1865, graduated from the University of Illinois in 1890; a few years of training with one of the most active and progressive of consulting engineers the mechanical railway field had up to that time known; this constitutes his history until he became chief draftsman of the Chicago, Burlington & Quincy in 1894. In 1899 he was appointed mechanical engineer, in 1902 he became superintendent of motive power and three years later general superintendent of motive power of the entire Burlington system. These few words give the outline of his official history. Notwithstanding the hard work necessarily called for by the rapid march of growing official duties, he has found time in the last ten years for much work for the association over which he now presides, though, as intimated, it appears less in the reports of discussions than in connection with committee reports. Among the subjects in which his work has been conspicuous are collarless journals, high-speed foundation brake gear, outside dimensions of box cars, automatic couplings for steam heat and air brake apparatus, and the annual revision of the rules for loading long material. He was a member of the committtee on the revision of the constitution and by-laws and became a member of the executive committee in 1907. He should, perhaps, be classed as a locomotive man rather than as a car man and the proceedings of the Master Mechanics' Association indicate an even greater degree of activity in the affairs of that association.

M. C. B. OFFICERS FOR 1909-1910.

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First Vice-President.—T. H. Curtis, L. & N., Louisville, Ky.

Second Vice-President.—Le Grand Parish, Cleveland, O.

Third Vice-President.—A. Stewart, Southern Ry., Washington, D. C.

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Secretary.—Jos. W. Taylor, 390 Old Colony Building, Chicago.

M. M. OFFICERS FOR 1909-1910.

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Second Vice-President.—H. T. Bentley, Chicago & North Western, Chicago, Ill.

Third Vice-President.—D. F. Crawford, Penna. Lines West, Pittsburgh, Pa.

Treasurer.—Angus Sinclair, New York.

Executive Members.—D. R. MacBain, A. S. M. P., N. Y. C. & H. R., Albany, N. Y.; J. F. Walsh, S. M. P., Chesapeake & Ohio, Richmond, Va.; C. A. Seley, M. E., C. R. I. & P., Chicago; F. M. Whyte, C. M. E., New York Central Lines, New York; T. Rumney, M. S., Erie R. R., New York; T. H. Curtis, S. M., L. & N., Louisville, Ky.

Secretary.—Jos. W. Taylor, 390 Old Colony Building, Chicago.

PROGRAM; M. C. B. ASSOCIATION.

WEDNESDAY, JUNE 15, 1910.

Morning Session.

Address by the President	10:00 A. M. to 11:00 A. M.
Reading of the minutes of the last meeting	11:00 A. M. to 11:05 A. M.
Report of Secretary and Treasurer	11:05 A. M. to 11:20 A. M.
Assessment and announcement of annual dues; appointment of Committees on Correspondence, Resolutions, Obituaries, etc.	11:20 A. M. to 11:30 A. M.
Election of Auditing Committee	11:30 A. M. to 11:35 A. M.
Unfinished Business	11:35 A. M. to 11:40 A. M.
New Business	11:40 A. M. to 11:50 A. M.
Discussion of Reports on:	
Nominations	11:50 A. M. to 12:00 M.
Revision of Standards and Recommended Practice	12:00 M. to 12:30 P. M.

Adjournment.

Afternoon Session.

Discussion of Reports on:	
Train Brake and Signal Equipment	2:00 P. M. to 2:30 P. M.
Brake Shoe Tests	2:30 P. M. to 3:30 P. M.
Rules for Loading Materials	3:30 P. M. to 4:00 P. M.

Adjournment.

THURSDAY, JUNE 16, 1910.

Morning Session.

Discussion of Reports on:	
Rules of Interchange	10:00 A. M. to 10:30 A. M.
Coupler and Draft Equipment	10:30 A. M. to 11:00 A. M.

Car Wheels ..... 11:00 A. M. to 12:00 M.
Safety Appliances ..... 12:00 M. to 12:15 P. M.
Freight Car Trucks..... 12:15 P. M. to 12:30 P. M.
Adjournment.

Afternoon Session.

Discussion of Reports on:
Splicing Underframes ..... 2:00 P. M. to 2:30 P. M.
Car Framing, Roofs and Doors..... 2:30 P. M. to 3:00 P. M.
Tank Cars ..... 3:00 P. M. to 3:30 P. M.
Train Pipe and Connections for Steam Heat ..... 3:30 P. M. to 4:00 P. M.
Adjournment.

FRIDAY, JUNE 17, 1910.
Morning Session.

Discussion of Reports on:
Consolidation of Master Car Builders' and Master Mechanics' Associations ..... 10:00 A. M. to 10:30 A. M.
Classes of Cars..... 10:30 A. M. to 11:00 A. M.
Salt-water Drippings from Refrigerator Cars ..... 11:00 A. M. to 11:15 A. M.
Mounting Pressures on Wheels and Axles ..... 11:15 A. M. to 11:45 A. M.
Individual paper on "Design of Axle to Carry 50,000 Pounds," by E. D. Nelson, Engr. Tests, Pennsylvania Railroad ..... 11:45 A. M. to 12:00 M.
Springs for Freight Car Trucks.. 12:00 M. to 12:30 P. M.
Adjournment.

Afternoon Session.

Discussion of Reports on:
Train Lighting and Equipment.... 2:00 P. M. to 2:30 P. M.
Lumber Specifications ..... 2:30 P. M. to 3:00 P. M.
Unfinished business; Reports of Committees on Correspondence, Resolutions, and such other committees as may be named during the convention ..... 3:00 P. M. to 3:15 P. M.
Election of Officers..... 3:15 P. M. to 4:00 P. M.
Adjournment.

M. C. B. COMMITTEES.

STANDING COMMITTEES.

Arbitration

J. J. Hennessy (chairman), C. M. & St. P., W. Milwaukee, Wis.; E. D. Bronner, Mich. Cent., Detroit, Mich.; T. W. Demarest, Penna. Lines, Ft. Wayne, Ind.; W. A. Nettleton, Rock Island Lines, Chicago; J. S. Lentz, Lehigh Valley, S. Bethlehem, Pa.

Standards and Recommended Practice

R. L. Kleine, Penna. R. R., Altoona, Pa.; John Hair, B. & O. S. W., Cincinnati, O.; T. M. Ramsdell, Chesapeake & Ohio, Richmond, Va.; W. E. Dunham, Chicago & North Western, Winona, Minn.; T. H. Goodnow, L. S. & M. S., Chicago.

Train Brake and Signal Equipment

A. J. Cota (chairman), C. B. & Q., Chicago; F. H. Scheffer, N. C. & St. L., Nashville, Tenn.; R. K. Reading, Penna. R. R., Buffalo, N. Y.; E. W. Pratt, C. & N. W., Chicago; R B. Kendig, L. S. & M. S., Cleveland, O.; T. L. Burton, C. of N. J., Jersey City, N. J.; B. P. Flory, N. Y. O & W., Middletown, N. Y.

Brake Shoe Tests

W. F. M. Goss (chairman), University of Illinois, Urbana, Ill.; J. R. Onderdonk, B. & O., Baltimore, Md.; Wm. McIntosh, Jersey City, N. J.

Coupler and Draft Equipment

R. N. Durborow (chairman), Penna. R. R., Altoona, Pa.; G. W. Wildin, N. Y., N. H. & H., New Haven, Conn.; F. W. Brazier, N. Y. C. & H. R., New York; T. H. Curtis, L. & N., Louisville, Ky.; F. H. Stark, Pittsburgh Coal Co., Coraopolis, Pa.; Thos. Roope, C. B. & Q., Lincoln, Neb.; W. E. Symons, Chicago.

Rules for Loading Materials

A. Kearney (chairman), N. & W., Roanoke, Va.; C. E. Fuller, Union Pacific, Omaha, Neb.; A. Stewart, Southern Ry., Washington, D. C.; Wm. Moir, Northern Pacific, St. Paul, Minn.; J. S. Lentz, Lehigh Valley, S. Bethlehem, Pa.; W. F. Keisel, Jr.; Penna. R. R., Altoona, Pa.; L. H. Turner, P. & L. E., Pittsburgh, Pa.

Car Wheels

Wm. Garstang (chairman), C. C. C. & St. L., Indianapolis, Ind.; W. C. A. Henry, Penna. Lines, Columbus, O.; A. E. Manchester, C. M. & St. P., W. Milwaukee, Wis.; R. W. Burnett, Can. Pac., Montreal, Can.; R. L. Ettenger, Southern Ry., Washington, D. C.; A. Kearney, N. & W., Roanoke, Va.; O. C. Cromwell, B. & O., Baltimore, Md.

Safety Appliances

C. A. Seley (chairman), C. R. I. & P., Chicago; A. Lamar, Penna. Lines, Ft. Wayne, Ind.; T. H. Curtis, L. & N., Louisville, Ky.; C. B. Young, C. B. & Q., Chicago; Le Grand Parish, Cleveland, O.; H. Bartlett, B. & M., Boston, Mass.; T. M. Ramsdell, C. & O., Richmond, Va.

SPECIAL COMMITTEES.

Freight Car Trucks

A. Stewart (chairman), Southern Ry., Washington, D. C.; J. J. Tatum, B. & O., Baltimore, Md.; A. S. Vogt, Penna. R. R., Altoona, Pa.; J. F. DeVoy, C. M. & St. P., W Milwaukee, Wis.; G. A. Hancock, St. L. & S. F., Springfield, Mo.

Splicing Underframes

R. E. Smith (chairman), A. C. L., Wilmington, N. C.; W. F. Bentley, B. & O., Baltimore, Md.; H. L. Trimyer, S. A. L., Portsmouth, Va.; I. S. Downing, L. S. & M. S., Collinwood, O.; F. A. Torrey, C. B. & Q., Chicago.

Car Framing, Roof and Doors

W. F. Bentley, B. & O., Baltimore, Md.; J. A. McRae, Mich. Cent., Detroit, Mich.; R. S. Miller, N. Y. C. & St. L., Cleveland, O.; C. F. Thiele, Penna. Lines, Columbus, O.; G. W. Lillie, St. L. & S. F., Springfield, Mo.

Tank Cars

A. W. Gibbs (chairman), Penna. R. R., Altoona, Pa.; C. M. Bloxham, Union Tank Line, New York; J. W. Fogg, Chicago Ter. Trans., E. Chicago, Ind.; Wm. McIntosh, Jersey City, N. J.; S. K. Dickerson, L. S. & M. S., Cleveland, O.

Train Pipe and Connections for Steam Heat

I. S. Downing (chairman), L. S. & M. S, Collinwood, O.; C. A. Schroyer, C. & N. W., Chicago; H. E. Passmore, T. & O. C., Kenton, O.; T. H. Russum, B. & O., Baltimore, Md.; J. J. Ewing, C. & O., Richmond, Va.

Classes of Cars

Jas. Miliken, P. B. & W., Wilmington, Del.; J. N. Mowery, Lehigh Valley, S. Bethlehem, Pa.; F. M. Whyte, N. Y. Cent. Lines, New York.

Salt-water Drippings from Refrigerator Cars

M. K. Barnum (chairman), Illinois Central, Chicago; G. W. Lillie, St. L. & S. F., Springfield, Mo.; W. E. Sharp, Armour & Co., Chicago; E. W. Pratt, C. & N. W., Chicago; P. Maher, C. & A., Bloomington, Ill.; D. C. Ross, Mich. Cent., Detroit, Mich.; W. C. Arp, Vandalia, Terre Haute, Ind.

Mounting Pressures for Various Wheels and Axles

E. D. Nelson, Penna. R. R., Altoona, Pa.; A. Forsyth, C. B. & Q., Aurora, Ill.; W. T. Gorrell, Phila. & Reading, Reading, Pa.; J. F. Walsh, Ches. & Ohio, Richmond, Va.; W. P. Richardson, P. & L. E., Pittsburgh, Pa.

Springs for Freight Car Trucks

F. M. Gilbert, N. Y. C. & H. R., New York; W. F. Keisel, Penna. R. R., Altoona, Pa.; M. H. Wickhorst, C. B. & Q., Aurora, Ill.; T. A. Lawes, Southern Indiana, Bedford, Ind.; H. C. May, L. & N., Louisville, Ky.

Train Lighting and Equipment

T. R. Cook, Penna. Lines, Ft. Wayne, Ind.; Carl Brandt, L. S. & M. S., Cleveland, O.; Ward Barnum, L. & N., Louisville, Ky.; J. H. Davis, B. & O., Baltimore, Md.; E. A. Benson, Pullman Co., Chicago.

Lumber Specifications

G. N. Dow, L. S. & M. S., Cleveland, O.; G. H. Gilman, Northern Pacific, St. Paul, Minn.; R. W. Burnett, Can. Pac., Montreal, Can.

Consolidation

F. H. Clark, C. B. & Q., Chicago; W. A. Nettleton, C. R. I. & P., Chicago; C. A. Schroyer, C. & N. W., Chicago.

Arrangements

F. H. Clark, C. B. & Q., Chicago.

Nominations

J. S. Lentz, L. V., S. Bethlehem, Pa.; J. F. Deems, N. Y. Central Lines, New York; W. H. Lewis, N. & W., Roanoke, Va.; A. W. Gibbs, Penna. R. R., Altoona, Pa.; J. E. Buker, Chicago.

PROGRAM; M. M. ASSOCIATION.

MONDAY, JUNE 20, 1910.

Prayer	9:30 A. M. to 9:35 A. M.
Address of President	9:35 A. M. to 9:50 A. M.
Intermission	9:50 A. M. to 9:55 A. M.
To allow those who wish to retire to do so, although all are requested to remain.	
Action on minutes of convention of 1909	9:55 A. M. to 10:00 A. M.
Reports of Secretary and Treasurer.	10:00 A. M. to 10:15 A. M.
Assessment and announcement of dues; appointment of Committees on Correspondence, Resolutions, Nominations, Obituaries, etc.	10:15 A. M. to 10:25 A. M.
Election of Auditing Committee	10:25 A. M. to 10:30 A. M.
Unfinished Business	10:30 A. M. to 10:35 A. M.
New Business	10:35 A. M. to 10:45 A. M.
Discussion of Reports on:	
Mechanical Stokers	10:45 A. M. to 11:00 A. M.
Revision of Standards	11:00 A. M. to 11:15 A. M.
Individual Paper by W. S. Hayes, Supt. Loco. Operation, Erie R. R., "Fuel Economies"	11:15 A. M. to 12:00 M.
Topical Discussions:	
"Self-dumping Ash Cans," by H. T. Bentley, A. S. M. P., C. & N. W.	12:00 M. to 12:30 P. M.
"Apprenticeship Education," by F. W. Thomas, Supervisor of Apprentices, A. T. & S. F.	12:30 P. M. to 1:00 P. M.
Discussion of Report on:	
Motive Power Development	1:00 P. M. to 1:30 P. M.

Adjournment.

TUESDAY, JUNE 21, 1910.

Discussion of Reports on:	
Widening Gage on Curves	9:30 A. M. to 9:45 A. M.
Steel Tires	9:45 A. M. to 10:00 A. M.
Safety Appliances	10:00 A. M. to 10:15 A. M.
Superheaters	
Individual paper on "Locomotive Performance Under Different Degrees of Superheat," by Prof. C. H. Benjamin, Purdue University	10:15 A. M. to 12:00 M.
Individual paper on "Locomotive Frame Construction," by H. T. Bentley, A. S. M. P., C. & N. W.	12:00 M. to 12:30 P. M.
Report of Committee on Safety Valves	12:30 P. M. to 1:00 P. M.
Report of Committee on Lumber Specifications	1:00 P. M. to 1:30 P. M.

Adjournment.

WEDNESDAY, JUNE 22, 1910.

Discussion of Report on:	
Train Brake and Signal Equipment	9:30 A. M. to 10:00 A. M.
Individual paper on "Freight Train Resistance," by Prof. E. C. Schmidt, University of Illinois	10:00 A. M. to 11:00 A. M.
Discussion of Reports on:	
Locomotive and Shop Operating Costs	11:00 A. M. to 11:45 A. M.
Design, Construction and Inspection of Locomotive Boilers	11:45 A. M. to 12:00 M.
Consolidation of Master Mechanics' and Master Car Builders' Associations	12:00 M. to 12:15 P. M.
Resolutions, Correspondence, etc.	12:15 P. M. to 12:30 P. M.
Unfinished Business	12:30 P. M. to 12:45 P. M.
Election of Officers Closing Exercises	12:45 P. M. to 1:30 P. M.

Adjournment.

M. M. COMMITTEES.

STANDING COMMITTEES.

Mechanical Stokers

T. Rumney (chairman), Erie R. R., New York; E. D. Nelson, Penna. R. R., Altoona, Pa.; C. E. Gossett, Iowa Central, Marshalltown, Iowa; J. A. Carney, C. B. & Q., West Burlington, Iowa; Geo. Hodgins, 114 Liberty street, New York.

SPECIAL COMMITTEES.

Revision of Standards

W. H. V. Rosing (chairman), Mo. Pac., St. Louis, Mo.; T. W. Demarest, Penna. Lines, Ft. Wayne, Ind.; F. M. Gilbert, N. Y. C. & H. R., New York; J. D. Harris, Baltimore & Ohio, Baltimore, Md.; H. T. Bentley, C. & N. W., Chicago.

Motive Power Development

Robt. Quayle (chairman), C. & N. W., Chicago; C. E. Fuller, Union Pacific, Omaha, Neb.; R. N. Durborow, Penna. R. R., Altoona, Pa.; Angus Sinclair, 114 Liberty street, New York; J. G. Neuffer, Ill. Cent., Chicago; G. W. Wildin, N. Y. N. H. & H., New Haven, Conn.; C. H. Quereau, N. Y. C. & H. R., New York.

Superheaters

L. R. Johnson (chairman), Can. Pac., Montreal, Can.; F. F. Gaines, Central of Georgia, Savannah, Ga.; R. D. Hawkins, Great Northern, St. Paul, Minn.; H. W. Jacobs, A. T. & S. F., Topeka, Kan., W. J. Tollerton, C. R. I. & P., Chicago.

Widening Gauge on Curves

F. M. Whyte (chairman), N. Y. C. Lines, New York; W. H.

Lewis, N. & W., Roanoke, Va.; F. C. Cleaver, Rutland R. R., Rutland, Vt.

Steel Tires

A. Stewart (chairman), Southern Ry., Washington, D. C.; A. S. Vogt, Penna. R. R., Altoona, Pa.; Wm. Moir, Nor. Pac., St. Paul, Minn.; E. D. Bronner, Mich. Cent., Detroit, Mich.; H. D. Taylor, P. & R., Reading, Pa.

Safety Appliances

C. A. Seley (chairman), C. R. I. & P., Chicago; T. H. Curtis, L. & N., Louisville, Ky.; C. B. Young, C. B. & Q., Chicago; Le Grand Parish, Cleveland, Ohio; Henry Bartlett, Boston & Maine, Boston, Mass.

Lumber Specifications

R. E. Smith (chairman), A. C. L., Wilmington, N. C.; J. F. De Voy, C. M. & St. P., Milwaukee, Wis.; T. W. Demarest, Penna. Lines, Ft. Wayne, Ind.

Train Brake and Signal Equipment

A. J. Cota (chairman), C. B. & Q., Chicago; F. H. Scheffer, N. C. & St. L., Nashville, Tenn.; R. K. Reading, Penna. R. R., Buffalo, N. Y.; E. W. Pratt, C. & N. W., Chicago; R. B. Kendig, L. S. & M. S., Cleveland, Ohio; T. L. Burton, P. & R., Jersey City, N. J.; B. P. Flory, N. Y. O. & W., Middletown, N. Y.

Locomotive and Shop Operating Costs

H. H. Vaughan (chairman), Can. Pac., Montreal; Le Grand Parish, Cleveland, Ohio; W. C. A. Henry, Penna. Lines, Columbus, Ohio; G. W. Seidel, C. R. I. & P., Silvis, Ill.; M. J. McCarthy, C. C. C. & St. L., Indianapolis, Ind.

Consolidation

D. F. Crawford, Penna. Lines, Pittsburgh, Pa.; H. H. Vaughan, Can. Pac., Montreal, Canada; G. W. Wildin, N. Y. N. H. & H, New Haven, Conn.

Arrangements

G. W. Wildin, N. Y. N. H. & H., New Haven, Conn.

Design, Construction and Inspection of Locomotive Boilers

T. H. Curtis (chairman), L. & N., Louisville, Ky.; D. R. MacBain, N. Y. C. & H. R., W. Albany, N. Y.; A. E. Manchester, C. M. & St. P., W. Milwaukee, Wis.; A. W. Gibbs, Penna. R. R., Altoona, Pa.; W. H. V. Rosing, Mo. Pac., St. Louis, Mo.; W. E. Symons, Chicago; G. H. Emerson, Great Northern, St. Paul, Minn.

CORNELL DINNER.

As in previous years, the Cornell men attending the convention will hold a banquet on the evening of Saturday, June 18. The dinner this year will again be held at the Hotel Chelsea.

Cornell men are requested to register at the Booth of the *American Engineer and Railroad Journal*, on the north side of the main building opposite the centre stairway, as soon as possible, so that the committee may have information as to the number of plates to order.

The plans for his year's dinner indicate that it will be the best ever held, and all Cornell men are urged to so arrange their affairs as to be present.

In the provisions of the concession of the French government to private companies to operate railways there is an article which provides that locomotives shall be built on the latest models, that they must consume their own smoke and that they must satisfy all the conditions prescribed by the state administration. Passenger coaches also must be built on the latest models.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.

The officers and members of the Executive Committee of the Railway Supply Manufacturers' Association are the real burden bearers of these annual gatherings. Once the joint committee of the Master Car Builders' and the Master Mechanics' Associations has decided where the convention shall be held, their troubles begin—and they never end. Even if Atlantic City continues to draw the annual prize, there's going to be considerable wailing and gnashing of teeth; because this year's Exhibit Committee was besieged with applications for space that couldn't be filled. But should the vote favor any other location, what's going to happen? It will be sad to contemplate, unless something new in the way of facilities puts in an appearance between now and the end of the year.

The Executive Committee is composed of twelve members, who represent seven geographical districts. The 1909-10 committee consists of the following:



Edward M. Grove,
President.

First District—New England states; one member, Albert C. Ashton, Ashton Valve Company, Boston, Mass.

Second District—New York and New Jersey; three members, Thomas Aldcorn (treasurer), Chicago Pneumatic Tool Company, New York City; A. L. Whipple, Whipple Supply Company, New York City; and Charles P. Storrs, Storrs Mica Company, Owego, N. Y.

Third District—Pennsylvania, Maryland, District of Columbia and West Virginia; two members, Edward M. Grove (president), The McConway & Torley Company, Pittsburgh, Pa.; and B. E. D. Stafford, Flannery Bolt Company, Pittsburgh, Pa.



L. R. Phillips,
Vice-President.

Fourth District—Ohio, Indiana, Michigan, Kentucky and Tennessee; two members, S. P. Bush, Buckeye Steel Castings Company, Columbus, Ohio; and A. D. McAdam, St. Louis surfacer and Paint Company and Ohio Malleable Iron Company, Chicago.

Fifth District—Illinois, Wisconsin, Iowa and Minnesota; two members, L. R. Phillips, (vice-president), National Tube Company, Chicago, Ill.; and W. H. Miner Company, Chicago, Ill.

Sixth District—Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama and Mississippi; one member, A. C. Langston, Jenkins Brothers, Atlanta, Ga.



Charles P. Storrs.



S. P. Bush.



Albert C. Ashton.



B. E. D. Stafford.
Chairman, Exhibit Committee.



A. L. Whipple.
Chairman, Badge Committee.



Arthur C. Langston.



A. D. McAdam.



E. L. Adreon.

Members of the **Executive Committee** of the Railway Supply Manufacturers' Association.

Seventh District—States west of the Mississippi river, including Louisiana but excepting Iowa and Minnesota; one member, E. L. Adreon, American Brake Company, St. Louis, Mo.

With each annual meeting, four members retire and their successors are elected for three year terms. Those who will retire this year, are: Thomas Aldcorn (Second District); S. P. Bush (Fourth District); W. H. Miner (Fifth District); and A. L. Whipple (Second District).



Thomas Aldcorn.
Treasurer.

In the *Daily* of June 23, 1909, we printed a brief history of the Railway Supply Manufacturers' Association. At the last annual convention a committee, consisting of Samuel G. Allen (chairman), A. L. Whipple, Harry W. Frost, E. V. Sedgwick, E. M. Gold, A. L. Humphreys, C. C. Pierce, George A. Post, Mark A. Ross and Albert Waycott, was appointed to revise the constitution and bylaws. Its report will be received and acted upon at Saturday's meeting.

The Executive Committee's plans are carried out by several committees. This year's committees are:

Finance—W. H. Miner, W. H. Miner Company, Chicago (chairman); A. C. Ashton, Ashton Valve Company, Boston, Mass.; and A. C. Langston, Jenkins Brothers, Atlanta, Ga.



John D. Conway.
Secretary.

Exhibit—B. E. D. Stafford, Flannery Bolt Company, Pittsburgh, Pa. (chairman); Charles P. Storrs, Storrs Mica Company, Owego, N. Y.; and S. P. Bush, Buckeye Steel Castings Company, Columbus, Ohio.

Entertainment—J. Will Johnson, Pyle-National Headlight Company, Chicago (chairman); Bertram Berry, Heywood Brothers & Wakefield Company, New York; Ross F. Hayes, Curtain Supply Company, New York; C. M. Garrett, Garrett Supply Company, Chicago; J. L. Connors, Ralston Steel Car Company, Columbus, Ohio; W. J. Walsh, Galena-Signal Oil Company, Chicago; H. E. Oesterreich, Wendall & McDuffie Company, New York; Phillip J. Mitchell, Phillip S. Justice & Company, Philadelphia, Pa.; Leonard J. Hibbard, L. J. Hibbard Company, New York; J. C. Younglove, H. W. Johns-Manville Company, Chicago; E. S. Toothe, Nathan Manufacturing Company, New York; Frank Martin, Jenkins Brothers, New York; G. L. Walters, Adams & Westlake Company, Chicago; George Groobey, Buckeye Steel Castings Company, Atlanta, Ga.; Charles P. Williams, Chicago Railway Equipment Company, New York; Charles A. Knill, Charles H. Besly & Company, Chicago; F. B. Ernst, American Steel Foundries, New York; C. A. Dunkelberg, S. F. Bowser & Company, Fort Wayne, Ind.; Ralph G. Coburn, Franklin Railway Supply Company, Chicago; J. H. Janes, Talmage Mfg. Company, Cleveland, Ohio; H. A. Neally, Joseph Dixon Crucible Company, Boston, Mass.; George R. Carr, Dearborn Drug & Chemical Works, Chicago; George Moses, James B. Sipe & Company, Pittsburgh, Pa.; William Miller, Adreon Manufacturing Company, Chicago; Herbert Green, Grip Nut Company, Chicago; C. W. Wardell, Welsbach Company, Gloucester, N. J.; Edward Payson Smith, Standard Railway Equipment Company, Chicago; J. Soule Smith, American Steel Foundries, Chicago; and Thomas Farmer, Jr., Consolidated Car Heating Company, New York.

The Entertainment Committee is divided into thirteen subcommittees, as follows:

Door.—In charge of entrance at all entertainments. Messrs. Hays (chairman), Hibbard, Knill, Williams, Walters and Green.

M. C. B. Reception.—In charge of M. C. B. Reception, Wednesday evening. Messrs. Farmer (chairman), Hays, Garrett, Ernst, Carr, Connors, Berry, Green and Coburn.



J. Will Johnson.
Chairman, Entertainment Committee.

Marshalls.—To escort officers of the two associations and their laciations and their ladies, to all formal receptions and to the two balls. Messrs. Garrett (chairman), Mitchell, Martin, Groobey, Dunkelberg, Janes, Moses, Neally and E. P. Smith.

Afternoon Entertainments.—In charge of all afternoon entertainments. Messrs. Berry (chairman), Hays, Oesterreich, Walters, Carr and Janes.

M. C. B. Ball.—In charge of M. C. B. ball, Thursday evening. Messrs. Connors (chairman), Walsh, Toothe, Younglove, E. P. Smith, Martin, Moses, Garrett, Oesterreich, Berry, Wardell and Farmer.

Introduction.—The members of this committee will devote most of their time at the M. C. B. and M. M. balls, and at all informal dances to introducing members and guests, and their families, who care to dance. Walsh (chairman), Miller, Ernst, Mitchell, Dunkelberg, Neally, Farmer, Janes, Groobey, Coburn and E. P. Smith.

Base Ball.—In charge of base ball game, Saturday afternoon. Messrs Hibbard (chairman), Connors, Mitchell, Martin, Ernst, Walsh and E. P. Smith.

Military Euchre.—In charge of euchre party, Friday evening. Messrs. Younglove (chairman), Berry, Connors, Dunkelberg, Oesterreich, Mitchell, Hays, Toothe, Knill, Walsh, Carr, Miller, Coburn and Ernst.

Saturday Evening's Entertainment.—In charge of entertainment, Saturday evening. Messrs. Dunkelberg (chairman), Carr, Wardell and J. Soule Smith.

M. M. Reception.—In charge of M. M. reception, Monday evening. Messrs. Ernst (chairman), Hibbard, Neally, Moses, Hays, Knill, Toothe, Coburn, Williams, Green, Oesterreich and J. Soule Smith.

M. M. Ball.—The committee that will be in charge of M. M. ball, Tuesday evening. Messrs. Hibbard (chairman), Younglove, Berry, Garrett, Connors, Old, Farmer, Mar-

tin, Toothe, Janes, Ernst, Coburn, J. Soule Smith and Oesterreich.

Ushers.—In charge of seating guests and distributing programs at all entertainments. Messrs. Mitchell (chairman), Groobey, Ernst, Janes, Moses, Neally, Toothe, Martin, Dunkelberg, Miller and Wardell.

Informal Dance.—In charge of all informal dances. Messrs. Oesterreich (chairman), Garrett, Hays, Hibbard, Knill Farmer, Carr, Old, Toothe, Martin and Miller.

Enrollment Committee.—W. W. Rosser, The T. H. Symington Company, Chicago (chairman); H. D. Hammond, National Malleable Castings Company, Indianapolis, Ind.; A. E. Hooven, Railway & Engineering Review, New York; Oscar F. Ostby, Commercial Acetylene Company, New York; J. W. Dalman, American Steel Foundries, Chicago; W. A. Polk, Patterson-Sargent Company, Cleveland, Ohio; W. S. Hammond, Jr., Consolidated Car Heating Company, Chicago; Allen S. Barrows, Pantasote Company, Chicago; F. V. Green, Westinghouse Air Brake Company, New York; M. S. Simpson, Pressed Steel Car Company, Pittsburgh, Pa.; Harry F. Jefferson, United & Globe Rubber Manufacturing Company, Pittsburgh, Pa.; George A. Murphy, Hewitt Supply Company, Chicago, and James G. Mowry, Patton Paint Company, Milwaukee, Wis.



W. W. Rosser,
Chairman, Enrollment Committee.

Transportation Committee—Lucian C. Brown, The United Equipment Company, New York (chairman); Joseph H. Kuhns, Republic Rubber Company, Chicago; C. O. Taylor, Ball Chemical Company, Chicago; Joseph M. Brown, Peter Gray & Sons, Chicago; W. R. Parker, John Lucas & Company, Chicago; F. W. Edwards, Ohio Injector Company, Chicago; J. L. Ponic, James B. Clow Company, Chicago; F. E. Symons, Ralston Steel Car Company, Columbus, Ohio; W. J. Caton, Thomas E. Colo Lumber Company, Philadelphia, Pa.; Frank M. Grigg, Adams & Westlake, Philadelphia, Pa.; John D. McClintock, Wm. Sellers & Company, Incorp., Philadelphia, Pa.; J. Allen Dillon, National Tube Company, New York; P H. Ferguson, Pittsburgh Steel Products Company, New York; William B. McCarthy, Rostand Manufacturing Company, Milford, Conn.; George Trigg, John Lucas Company, Philadelphia, Pa.; J. H. Klink, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; G. S. Stuart, Franklin Manufacturing Company, Franklin, Pa.; E. A. Stillman, The Watson & Stillman Company, New York; Joseph A. Renton, Kerite Insulated Wire & Cable Company, New York; T. W. Brander, Brander Supply Company, New York; and Carter Blatchford, Spencer-Otis Company, Chicago.



Lucian C. Brown,
Chairman, Transportation Committee.

Badge Committee.—A. L. Whipple, Whipple Supply Company, New York (chairman); Charles P. Storrs, Storrs Mica Company, Owego, N. Y.; and S. P. Bush, Buckeye Steel Castings Company, Columbus, Ohio.

It will be a hard matter for the next committee to furnish a badge for the supply contingent that will beat this year's in neatness and attractiveness of design and finish. And they were made by a member of the Railway Supply Manufacturers' Association—the American Railway Supply Company.

While all the badges under the control of the Railway Supply Manufacturers' Association will be alike in design, the enamel centres will differ in color. The badges to be worn by members of the association will have red centres, while the badges of the women members of their families will have white centres. Green and green and white centre badges, respectively, have been provided for male and female guests who are residents of Atlantic City. The women guests of members of the Master Car Builders' and American Railway Master Mechanics' Association will wear badges with white centres.



The general understanding is that the work of the Badge Committee begins and ends with the task of making the badges. But this isn't so. To prove it, let someone who is not legitimately entitled to adorn his person with one of these metal passwords try to "work" the coveted prize. Not only will he not succeed; but he'll get a lesson in diplomacy to boot. To the chairman of the present committee is due much of the credit for stopping the indiscriminate distribution of badges that existed for so many years. He had an uphill fight; but he won.

This article would be incomplete without a word of commendation for the Exhibit Committee. Of all the thankless jobs connected with the committee work of these conventions, that of the Exhibit Committee is in the superlative degree. Its members get a whole lot of abuse of which they're conscious; and some choice selections of which they happily know nothing, unless it be that their ears tingle unusually long and severe at times. During the past few weeks we've run across more than one person who "could have done better," had the undertaking fallen to his lot; but the result speaks for itself. And the bulk of allotments were made in one day with a precision and speed that showed careful planning and a thorough understanding of the situation. While it is unfortunate that all comers could not be given space on the pier, it is hard to see where the committee is to blame.

LOCATION OF OFFICE OF SUPPLY ASSOCIATION.

The location of the office of the secretary of the Railway Supply Manufacturers' Association in the Exhibition Hall, just beyond the Aquarium Court at the left, is a great improvement over having it upstairs, away from the exhibits, as it was last year. J. D. Conway, the secretary, will be in the office from 8.30 a. m. to 5.30 p. m.; and as much more as may be necessary. Mr. Conway is to be congratulated on the systematic way in which the detail work of his office is being handled and the good results which are being obtained. These things, together with a plentiful supply of good humor, are bound to make his first year on the job a big success.

ENTERTAINMENTS.

The Entertainment Committee has endeavored to furnish entertainment for the members and guests of this year's conventions that will at once help to promote sociability and be in keeping with the high standard of the last few years. The program follows; but our readers may expect to find further references to this feature of the convention in the *Daily* from day to day.

WEDNESDAY, JUNE 15.

9.30 a.m.—Grand march from Marlborough-Blenheim Hotel to Convention Hall, Million Dollar Pier.

10.30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3.30 p.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

9 p.m.—Reception by the president and officers of the Master Car Builders' Association in the Blenheim Exchange, Marlborough-Blenheim Hotel. Miss Alice Shaw, La Brillante Siffleuse.

10.30 p.m.—Dancing, ball room, Marlborough-Blenheim Hotel.

THURSDAY, JUNE 16.

10.30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3.30 p.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

9.30 p.m.—Forty-fourth annual ball of the Master Car Builders' Association, Entrance Hall, Million Dollar Pier.

FRIDAY, JUNE 17.

10.30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3 p.m.—Adept mistic. Miss Eva Fay, in her wonderful work of thaumaturgy, occult demonstrations. Miss Vera Berliner, violinist. West Solarium, Marlborough-Blenheim Hotel.

9 p.m.—Military euchre, Entrance Hall, Million Dollar Pier.

SATURDAY, JUNE 18.

10.30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

2 p.m.—Baseball parade from Million Dollar Pier to special trolley cars.

3 p.m.—Baseball game, East *vs.* West; at Pennsylvania Railroad Company's Inlet Park Baseball Grounds.

9 p.m.—All-star vaudeville show, at Apollo Theatre.

SUNDAY, JUNE 19.

11 a.m.—Special program by Marlborough-Blenheim Orchestra, Blenheim Exchange, Marlborough-Blenheim Hotel.

MONDAY, JUNE 20.

9 a.m.—Grand march from Marlborough-Blenheim Hotel to Convention Hall, Million Dollar Pier.

10.30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3 p.m.—Piano, song and story recital, Willa Holt Wakefield, West Solarium, Marlborough-Blenheim Hotel.

9 p.m.—Reception by the president and officers of the American Railway Master Mechanics' Association, Blenheim Exchange, Marlborough-Blenheim Hotel. Cadets de Gascogne, direct from La Scala Theatre, Milan, Italy.

TUESDAY, JUNE 21.

10.30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3.30 p.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

9.30 p.m.—Forty-third annual ball of the American Railway Master Mechanics' Association.

The music in connection with the convention will be supplied by the Old Guard Band and Orchestra of New York, Henry Conrad, Director.

The Transportation Committee has provided roller chairs for members and guests of the convention from June 15 to June 23, both inclusive. Stations will be located at the main entrance of the Million Dollar Pier; at the Marlborough-Blenheim Hotel; and at Chalfonte. The chairs may be had from the Pier from 9 a.m. to 7 p.m.; from the Marlborough-Blenheim Hotel from 9 a.m. to 6 p.m.; to both grand balls (Thursday night of this week and Tuesday night of next week) 8.30 p.m. to 10 p.m.; and to the Military Euchre (Friday night) 8 p.m. to 10 p.m. Unoccupied chairs may be stopped anywhere on the Boardwalk, except between the Marlborough-Blenheim Hotel and the Million Dollar Pier; and they may be used in either direction. Chairs will not be permitted to wait at any given point more than 15 minutes.

The Country Club of Atlantic City has extended the privileges of its club house to all members and guests of the convention. Admission to the grounds will be by badge.

MR. HOOLEY ON ATLANTIC CITY.

"I see be th' pa-apers," remarked Mr. Hooley to his friend Dennissey, one morning in May as the latter strayed into his place to get the news of the day, "I see be th' pa-apers that the McHannix clan 's goin' to hold its annooal convintion at 'Tlantic City agin this year."

"What's the McHannix clan?" inquired Mr. Dennissey, as if that was what he was expected to ask.

"'Tis some relrod min—th' la-ads that boss th' shops, 'nd till th' min how t' run th' engines, and build th' ca-ars,' 'nd to burn shlate 'nd coal, 'nd kape up stame. Wanst in th' year, in Joon, whin th' air's bammy 'nd th' wather's fine, they arl get together 'nd talk about ut, 'nd aich wan finds out what th' other la-ad is doin' so's not to make th' same misthake himself. 'Tis a fine pla-ace, too, is 'Tlantic City. Th' Mare's a frind av mine, 'nd I'm thinkin' I'll be takin' me vacation on th' sayshore at th' same time, account av th' rates."

"What's th' Mare got to do about ut?" asked Mr Dennissey.

"'Tis plain ye niver were at 'Tlantic City," replied Mr. Hooley emphatically. "Th' Mare av 'Tlantic City 's a bigger man than th' hull state av Noo Jersey, 'nd whin th' mimbers av th' legislachoor passed an ord'nance to shut up some pla-aces he's got there be th' Boordwa-alk, he t'rew away th' keys, th' Mare did, 'nd says, says he, 'Th' dures won't shtay shutted,' 'nd 'tis a fact, they didn't, they're shwinging arl th' time 'nd whin th' wither gets hot, they're tuk off th' hinges t' save them for th' shtormy winther. He cudn't shut a dure 'nd not hit somebody in th' face, ''nd far be ut fr'm him,' says th' Mare, 'far be ut fr'm him.'

"'Nd y'ought to see th' hot'ls, Dinnissey, 'nd th' Boordwa-alk. Th' Boordwa-alk 's six miles long, 'nd as wide as Halsted street, 'nd it's set up on pegs in th' sand——"

"They's pigs in th' mud on Halsted street," interrupted Mr. Dennissey, "'nd it's twinty-two miles long, 'nd th' boordwalks jump, 'nd they's th' stock—"

"Iv ye intherrupt me story, I'll not take ye with me whin I go with th' McHannix clan," Mr. Hooley replied, crushingly. "On wan side av th' Boordwa-alk is th' hot'ls, 'nd th' shops where they sill th' pitcher postal ca-ards that Ooncle Sam won't lave go in th' mails, 'nd th' Arminians 'nd Toorks 'nd th' Japs have closin'-out sales ivery day in th' year, 'nd where ivery few minuts ye see a sthrate 'nd aisy way down hill 'nd swingin' dures at th' ind av it that it's aisy to get through whin ye're goin' some. Th' other side's th' ocean, Dinnissey, th' bra-ad 'Tlantic—'th' say, th' say, th' open say!' as Barry

Cornwall says, says he, 'th' cereal blue, with sapfire tints whin th' light's good.' What's th' sapfire tints I dinnaw, but me poetic frind sid that, 'nd they's tints on the beach that ye'd wish to have fire in iv ye go in bathin' in Joon whin th' wind's wrong. Thin they's th' sand sculptuaries. Th' byes shovel up a hape av sand, 'nd wit ut with wather whin th' tide's in 'nd thin they'll make a sthroke with a trowl on it anny time ye'll throw 'em a nickel. They make hids in th' wit sand 'nd ye can till which is Tiddy be th' tathe 'nd th' giglamps, 'nd which is Prisidint Taft or Shakspire or Abr'm Lincoln by th' name undher ut, 'nd to catch th' nickels they sprid out a sheet, 'nd to catch dimes and quarthers they paint on th' sheet, 'To Pay f'r me Univairsity Coorse.' Wan av thim is good at ut. He's been there tin years, 'nd the last time I inquired he'd got so far on his coorse 's to be learnin' spellin' fr'm a sign painter. But I'm thinkin' th' sand 'nd th' wather 'll hold out, 'nd th' nickels, too, iv th' McHannix clan goes there ivery year.

"But th' hot'ls, Dinnissey, 'nd th' boordin' houses. Th' lot av 'em 'll accommodate tree hunthred thousand people iv they'll double up 'nd most av thim do, forby thim that stays on th' Boordwa-alk 'nd takes rooms undther ut. Th' biggest wan 's th' Marlbrew-Blennom, 'nd it's two hot'ls like th' Aujitoryum 'nd th' Annix was before they got to fightin' to see which th' tunnel belonged to. But it's laid out like th' streets av Boston, 'nd whin ye think ye're goin' to ye'er room ye a'n't goin' that way at all, at all, 'nd ye don't know where ye are till ye come to th' caffy. Th' passageways arl lead to th' caffy, Dinnissey, 'nd ye can find th' lift whin ye get there. Gin'rally, though, it's because there a'n't much lift that ye get away. Iv ye're stoppin' somewhere ilse th' rollin'-chair man gets th' rist."

"What hot'l 'll ye shtop at?" inquired Mr. Dennissey.

"Th' Marlbrew-Blennom. Me frind Ta-aylor, that's th' sicriturry av th' McHannix, takes apawtments there. But they's wan big hot'l that's named afther ye, Dinnissey, but that th' say's at th' froont ind instid of behind. Th' Dinnis 's a good hot'l, Dinnissey, 'nd I'll advise ye to stop there. Ye'll have no thrubble findin' ye'er way to th' caffy, f'r they a'n't anny. Th' hot'l belongs to some Shakers fr'm th' City av Broth'ly Love—ye mind th' place where they killed so many min doorin' th' sthrike riots last spring—'nd th' Shakers don't like caffys. There's wan at the Shilburne acrost th' way. That's owned be Honest Jawn Onemaker. He's fr'm th' City av Broth'ly Love, too, but he's that honest himsilf 't he niver thinks av lockin' th' dure, 'nd whin th' Mare threw away th' keys, as I told ye, Jawn he says to th' Mare, says he, 'T'row mine wit' 'em, Frank, t'row mine wit' 'em," says Jawn.

"Thin they's th' Shawlfont, that's another good hot'l. It's kipt be me friend Bill. He's th' prisidint av th' Hot'l Min's Assoshyation, 'nd they arl stand in wit' Bill. He don't need no caffy. 'Nd arl th' way on th' Boordwa-alk, Dinnissey, fr'm th' Chilsy at wan ind 'nd th' R'y'l Pallis 't th' other, it's hot'ls, 'nd thin some more hot'ls. Ye c'n take ye'er choice 'nd they'll take ye'er money. They're no respictors av persons iv th' persons 've got th' money, 'nd iv ye haven't they don't respict avin ye'er baggage. Behint th' hot'ls they's th' boordin' houses, 'nd thin 'Tlantic Av'noo, 'nd thin th' relrod yards, 'nd thin th' long, low reach av livil bog 'nd sand av Noo Jersey where they raise squabs 'nd muskeeters f'r th' hot'l tables. They're quail on th' meenyou, 'nd they stack up th' bills in the orfis till ye go away.

"Th' R'y'l Grand Lodge av Emseebees goes t' 'Tlantic City at th' same time," continued Mr. Hooley, "'nd they's an assoshyation that looks afther thim 'nd th' McHannix at th' same time—th' shupply min, that dale in th' things th' relrod min wud have to buy iv they did n't have wint. They're th' dalers, 'nd th' relrod min are th' conshumers 'nd hold hands in th' game. Iv ye go wit' me, Dinnissey, ye'll pretind ye're ayther a shupply man or a relrod man, a daler or a conshumer. Since th' Int'shtate Commerce C'mission 's cut out th' passes, they's apt to be a little dilicacy among th' conshumers about acceptin' cutsies they can't return, like hot'l bills, 'nd fam'ly expinses, 'nd—other things, fr'm th' dalers that's goin' to thry to sill thim goods f'r th' relrod. Wud ye go as a daler, or as a conshumer, Dinnissey?"

"I'm not that dilikit. 'Tis your dale," replied Mr. Dennissey. "I'll hold me hand 'nd conshume."

"Ye'll not be th' only wan," thoughtfully remarked Mr. Hooley as if to himself.

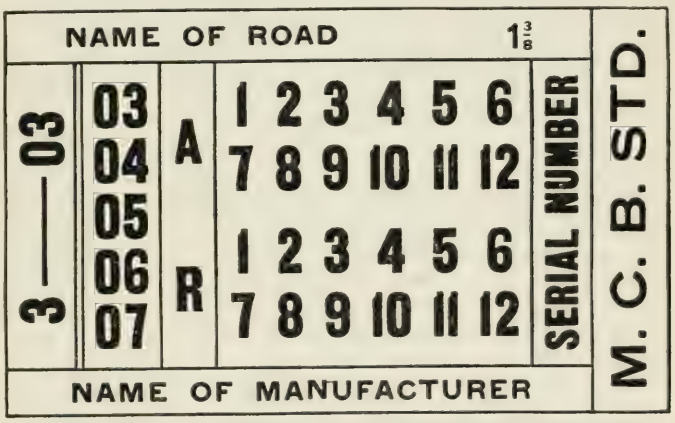
M. C. B. AIR HOSE RULE.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The English language we may well be proud of. It furnishes words which convey just that shade of meaning to be desired, but in its very richness of expression there lurks a danger. Those who have undertaken to frame a set of rules realize most keenly the care one needs to exercise in selecting these thought conveyers.

The language and general style of the Master Car Builders' rules furnish a splendid opening for the critically inclined. Their defenders would doubtless say the intent of the rules is the meat, and the words only the shell, but how can we reach the one except through the other?

The early M. C. B. rules, like their early framers, were of the rough-and-ready type. The later authors and finishers of these rules have added polish in some cases, but in a commendable desire to be wholly respectful to those whose shoes they have undertaken to fill, the original language, construction and underlying principles are carried forward year by year to a degree which, as an evidence of loyalty to the pioneers, is nothing short of touching. Once in a while—a long, long while—someone who has watched the progress of events urges that a new principle be adopted—a new theory applied. The most effective of punishments—silence—is meted out to him. If any of the self-styled "practical" schools (those



The above gives outline of modification of label. Extension being on right hand end

who have little use for "theory") deign to notice the claims of such a daring individual, it is to dub him "dreamer." For a practical man to dream dreams seems quite impossible, so we proceed to forget the dreamer and he finally wonders how he could have so deluded himself. He wishes only to have his first offense forgiven, and may be counted on to lift no more a voice in favor of any change.

But is not every rule based upon some theory? The early theory of M. C. B. rules was that car interchange was an evil, necessary perhaps, but an evil for all that, and rules calculated in the beginning to make interchange as difficult as possible were formulated. And even today more effort is exerted to fit present conditions to old theories than to fit old practices to new needs. As an illustration let us consider rule 33, the M. C. B. air-hose rule.

Generally speaking, a 1⅜-in. air hose is standard, and a 1¼-in. air hose is non-standard. An air hose standard as to size becomes non-standard, however, in the absence of a stand-

ard label. Here is a picture of a standard label, without which no air hose is standard:

It is estimated that 1,250,000 freight cars of railway ownership are fitted with standard air hose. That would leave 1,000,000 as having non-standard hose.

The distinction between "standard" and "non-standard" will be pointed out, but, for the present, suffice it to say, there is great variance of opinion as to the correct definition of either term. Decision 799, just issued by the M. C. B. Arbitration Committee expressly to clear up the situation, adds to the feeling of confusion, if possible, rather than removing the doubts that had been entertained.

But of one point there is no room for a difference—namely, rule 33, after many postponements, was adopted, effective September 1, 1909. Under this rule, standard air hose became non-standard at midnight, August 31, of that year. Railway cars fitted with hose, which at 11.59 P. M. were standard and at 12.01 A. M. the following day were non-standard, were located about as follows:

	No. Cars.
On home lines	600,000
On foreign lines	400,000

What is true of the railway car applies also to the private car. On September 1, 1909, it is estimated than 100,000 private cars were away from home, and that at least 40 per cent of these had non-standard air hose. For several years all car owners knew the change from the 1¼-in. to the 1⅜-in. air hose was coming; indeed, the time set for the change was extended more than once, so as to give every car owner opportunity to meet the requirements. But at the stroke of midnight, August 31, 1909, a great financial responsibility was lifted from the car owner and placed upon the car borrower, notwithstanding all the advance warning the owner had been given. To say that the owner was relieved with respect to equipping every one of these 440,000 non-standard cars would not be entirely true, but to say that the railway or private line that had given least heed to fitting its cars with standard hose profited most by this midnight change would be absolutely true.

If the lines having possession of these 440,000 non-standard cars at the commencement of September 1 had then and there fitted them with standard hose, the owner would have had to pay the bill and this shift of financial responsibility would not have taken place. Such a course was utterly impossible. It would have tied up the transportation system from one end of this country to the other.

It is probably not far from the mark to say that 1,000,000 loaded cars are constantly in transit in this country. Using the estimates that have been made as to the ratio existing between cars fitted with standard air hose and those fitted with non-standard air hose, it would appear that 400,000 loaded non-standard cars were in transit on September 1, 1909, and the act of interchanging one of these transferred the responsibility for the air hose from the car owner to the borrower.

Supposing, for example, that on August 31, 1909, a private line refrigerator car was loaded by the owner, located on the Chicago, Burlington & Quincy, with freight for Boston, routed via the Burlington, Pennsylvania and New York, New Haven & Hartford. Let us say the Burlington delivered the car to the Pennsylvania September 1. On the date of loading the air hose was standard, and on the date of delivery to the Pennsylvania it was non-standard.

Had the Chicago, Burlington & Quincy stopped the car with its freight for Boston and fitted it with standard hose (assuming again the rule is sufficiently clear for even an expert to determine what is standard), the private line (the car owner) would have paid the bill. If the Chicago, Burlington & Quincy did not so equip the car (whether because of having no standard hose at the repair points through which it passed, or to save the delay to the lading), but left the work to be done after the lading was removed, then the car owner is relieved of payment. The New York, New Haven & Hartford, upon fitting the car with standard hose, bills the Pennsylvania, unless the car carries a Chicago, Burlington & Quincy defect card. The Pennsylvania pays the bill and counterbills the Burlington, and there the matter ends.

From this it will be seen that all, absolutely all, private line cars having non-standard air hose that were away from home on September 1, 1909, have been or will be equipped with standard hose without expense to the owner, unless by chance the road which had possession of the cars on that date equipped them before offering them in interchange.

The theory is that to penalize the Chicago, Burlington & Quincy, in the case cited, for not standardizing the car in transit is good practice. This theory permeates the rules. We have been exceedingly faithful to the early conception of interchange and to the supposed advantage of making it difficult rather than easy.

At the outset it was believed that Rule 33, being a mechanical department rule, affected only the mechanical people. Speedily it was discovered that the rule's influence extended far beyond the department framing it, and affected the movement of traffic. Action of some sort to keep open the avenues of interchange became imperative. Thereupon Rule 33 was studied by the transportation people in addition to the mechanical people. Some understood it one way, and some another. They may be excused for this misunderstanding. The rule says standard hose must be used, but does not say what "standard" is. It contains a footnote that a 1¼-in. hose, if properly branded, shall be considered standard if applied prior to September 1, 1909. This seemed to bar applying any 1¼-in. hose after that date. Some cities figured it out one way and some another. They asked the M. C. B. Arbitration Committee to tell them what is right, and decision 799 was for that purpose.

But to base a good decision on a poor rule is no easy task, and the M. C. B. Arbitration Committee may be excused for recoiling from the thought of framing a definition of "standard." But how about the car interchange inspector—the man on the ground?

It is true the M. C. B. book of diagrams gives a cut of a standard hose. This book is furnished to the general mechanical officers, but not to the men who inspect cars. Word has been passed to the inspectors that the standard effective September 1, 1909, changed from 1¼ to 1⅜ in. That seemed easy, but is it? A 1⅜-in. hose not branded to show who manufactured it is non-standard. A 1⅜-in hose minus any of the markings is non-standard. A 1⅜-in. hose with label pasted on it is non-standard. A 1¼- in. hose, with all the necessary brands, if applied since September 1, 1909, is non-standard (or was until decision 799 came out), but if applied before September 1, 1909, is standard. No wonder an interchange inspector has lots to look after. It is a pity he cannot be left free to inspect more for "safety" and less for "protection."

To protect his company from the standpoint of car repair bills, the inspector is forced to inspect the cars minutely, must use great precision and not become confused respecting the rules enacted for protection. To protect his company from the standpoint of making good time on the shipment, he needs only to inspect for safety. If he finds a car equipped with a good hose minus only a portion of the brand, he cannot always bring himself to remove the hose and replace it with one no better, so he sometimes lets the car go forward. Perchance when his company offers the car to another line a defect card is required because one of the marks is missing. If the inspector who passed the car to save delaying its load is reprimanded for letting it come upon the line, he is inclined to take no chances next time, even if he does delay the freight.

When the M. C. B. Arbitration Committee, in February, defined "standard" please note the change they made in the footnote to Rule 33. The footnote of Rule 33 states in substance that a "non-standard" air hose (1¼ in.) will be considered "standard" if applied before September 1, 1909. The interpre-

tation of the Arbitration Committee in decision 799 changes the little word "applied" to read "manufactured"; therefore, a "non-standard," hose under the latest ruling, is "standard" if manufactured prior to September 1, 1909, no matter when applied.

It would appear, therefore, that a standard air hose made non-standard by a technicality may now be replaced by a non-standard hose which has been made standard by a technicality. Please again let sympathy go out to the man on the firing line. He needs a judicial mind in addition to his hammer. His title should be "Judge" rather than "Inspector."

A 1¼-in. hose, if applied any time after September 1, 1909, was non-standard and subject to carding, but on the issuance of decision 799 it became standard. But the most startling feature of decision 799 is that the committee is empowered not only to interpret rules, but empowered also to even change the wording of the rules which they interpret. If the members of the M. C. B. Association frame rules so imperfect that one of their committees must needs change the very language—assuming any committee has such authority—its members, in deep humility, should extend their apology to those railway people who work under M. C. B. rules, and who treat with such dignified consideration rules that would be radically revised except for the inherent conservatism of mankind.

Framed by men who disclaim authority in transportation or traffic matters, the rules constitute one of the most potent factors that exists today in transporting the traffic of this country. Did any one within the limit of his memory ever hear of the framers of the rules of interchange asking for the coöperation of other branches of railway service in formulating rules suited to transportation needs? Is there any one with a memory so exceeding short who has not heard, in one way or another, the wish expressed that the M. C. B. rules of interchange be let strictly alone?

But the rules of interchange are not sacred. Even assuming the rules are based on sound operating and accounting principles, the language used in expressing those principles discredits them. Mechanical men do not—cannot—understand them alike; their meaning is obscure; the language is ambiguous; in many cases, yet a suggestion, however mildly put, however discreetly offered, has served only in the past to start a rumor that certain inalienable rights were being interfered with.

The M. C. B. rules may be treated under two headings, (1) those relating to making repairs to cars, (2) those relating to making an inventory of a car's condition each time it is surrendered by one railway to another railway. The former division should be revised to permit of standardizing repair material and simplifying car repair settlements. The latter must be revised so as to make car interchange easy and inexpensive. There must be less inspection for protection and more inspection for safety. A new theory must permeate the rules of interchange. The movement of cars beween railways is now a transportation necessity and the rules must finally be framed to recognize this fact. The M. C. B. defect card will ultimately have to be discarded, just as the passport has ceased to be necessary in order to travel throughout Europe, except in Russia and in Turkey. The country whose people travel least use passports most. Fortunately for America, this abandoned European custom never secured a footing here. But its counterpart, the defect card, is with us and is fastened so firmly upon the American transportation system that there is apt to be as much difficulty in throwing off its evil effects as might be expected in petitioning the authorities of Turkey to abandon the passport system there.

OPERATING OFFICER.

Belgian railway voters going to elections are granted a reduction of 50 per cent, return tickets being available until midnight on the day following election.

BELL TELEPHONE SERVICE ON PIER.

Special arrangements have been made by The Delaware & Atlantic Telegraph & Telephone Company (Bell System) to give the visiting members a thorougly efficient telephone service. To this end the names of members who register are entered on a telephone list, together with their firm or company connections, the number of their exhibition space, telephone number and hotel address.

This list is used by the operators at the Bell convention exchange located on the pier, to enable them to readily locate any member called.

Everything possible has been done to provide an efficient toll and long distance service. The switchboard which has been installed for the conventions has a capacity of 200 lines and is placed in a private room in order to insure good service. The instruments are of black enamel and have a collecting device for toll and long distance calls. Special Japanese water-proof cord is used in connecting each station, in order to eliminate the effect on transmission caused by the dampness of the sea air.

Over 125 telephones have been installed in the exhibit booths, and besides these there are 10 stations located in prominent positions on the pier to be used for night service.

In addition to the telephones on the pier, members will find them in every room in the large hotels; and, in fact, every where on the island a convenient Bell telephone will be found readily at hand, for there are 6,590 stations in hotels, business places and residences in Atlantic City.

From any one of this large number of telephones a member may reach his home town in a twinkling, for "every bell telephone is a long distance station," and the Bell system connects more than 40,000 cities, towns and villages. A greater number of messages is sent each year by Bell telephone than the combined total of letters, telegrams and railroad passengers.

The publication of the Daily during the convention is greatly facilitated by the Bell service. Our line between the office on the pier and the print shop in Philadelphia is continuously "busy," day and night.

MAIL.

All mail matter addressed to individuals or concerns on the Million Dollar Steel Pier will be distributed from the temporary postoffice located in Secretary Conway's office, at the shore end of Exhibition Hall.

M. C. B. LINE OF MARCH.

Members of the Master Car Builders' Association should note that for the opening session this morning the line of march will be from the entrance of the Marlborough-Blenheim Hotel, down the pier to the Greek Temple. The line will be led by the Old Guard band, and will start at 9.30 A. M. sharp. Similar conditions will govern the march preceding the opening session of the Master Mechanics' Association on Monday morning, except that the course down the pier will be on the other side from that taken today.

On the Belgian state railways, under the law, every railway car, without exception, must be provided with a brake of sufficient power to stop the car without any help from horses or locomotives.

On the Belgian light meter gage railways freight must be taken away from the station within eight hours of time of delivery, night hours and Sundays and holidays being excepted. Demurrage is provided for freight unloaded but not taken away at the rate of two-fifths of a cent per day per $20 worth of goods. Demurrage for freight not unloaded is charged at the rate of five cents per hour per car.

SPECIAL TRAIN FROM NEW YORK.

Those who came from New York Tuesday afternoon on the Special Train of the C. R. R. of N. J. for the New York Railway Club and its friends were agreeably surprised to find Mr. and Mrs. William McIntosh on board. Mr. McIntosh has spent seven or eight months in Arizona, New Mexico and on the Western Coast of Mexico.

The train consisted of five parlor cars with about one hundred people aboard. The fact that this is smaller than usual is said to be because of the number who have sailed or are about to leave to attend the meeting of the International Railway Congress at Berne, Switzerland.

Among those on the train were Mr. and Mrs. George L. Fowler, Mrs. George E. Molleson, Charles Waughop, B. R. McBain, Supt. of Motive Power, Lake Shore & Michigan Southern Ry.; F. M. Whyte, New York Air Brake Company; George C. Isbester, Q. & C. Company; G. G. Davis, General Foreman Car Department, Cleveland, Cincinnati, Chicago & St. Louis; William T. Henry, New York Air Brake Company; E. L. Janes, American Brake Shoe & Foundry Company; C. E. Chambers, Supt. of Motive Power, Central Railroad Company of New Jersey; George W. Rink, Mechanical Engineer, Central Railroad Company of New Jersey; R. L. Thomas, B. M. Jones & Company; L. F. Purtill, New York Belting & Packing Company, and Miss Purtill; E. A. Robbins; S. D. Anderson, Standard Railway Equipment Company, Mrs. Anderson and Miss Lee; J. A. Warren; E. A. Averill, *American Engineer & Railroad Journal;* George L. Bourne, Railway Materials Company; Mr. and Mrs. C. H. Boaz.

SPECIAL TRAIN FROM CHICAGO.

The Pennsylvania M. C. B. & M. M. special train from Chicago arrived at Atlantic City at 1.50 P. M. yesterday. The special was in charge of George C. Beltzhoover, special agent, passenger department of the Pennsylvania Road, and consisted of one stateroom car, one observation car, one composite club car, six 12-section drawing-room and stateroom cars and two Pennsylvania dining cars. The "happy family" of passengers, consisting of Railway and Supply men, enjoyed a pleasant, though uneventful, trip.

Among those on board were the following: J. F. DeVoy, Mechanical Engineer, Chicago, Milwaukee & St. Paul; C. A. Seley, Mechanical Engineer, Chicago, Rock Island & Pacific; A. E. Manchester, Supt. Motive Power and Machinery, Chicago, Milwaukee & St. Paul; John Ponge, Ex-Master Mechanic and Master Car Builder, Minneapolis & St. Louis; E. A. Gilbert, W. H. Miner Company; E. H. Gold, Chicago Car Heating Company; W. S. Batholomew, Westinghouse Air Brake Company; L. H. Phillips, National Tube Company; M. A. Garrett, M. A. Garrett Manufacturing Company; J. H. Leonard, Bloomington, Illinois; C. R. Blanchard, American Steel Foundries; F. L. DeLong, Chicago Railway Equipment Company; J. J. McCarthy, Chicago-Cleveland Car Roofing Company; William R. Parker, John Lucas Company; John Paige, Inter-Ocean Steel Company; C. B. Young, Mechanical Engineer, Chicago, Burlington & Quincy; F. L. Olds, Chicago Varnish Company; Frank W. Furry, Ohio Injector Company; Mr. Ford, Crerar-Adams Company; W. H. Dangel, Scully Steel and Iron Company; E. R. Hibbard, Grip Nut Company; G. L. Walters, Adams & Westlake Company; W. H. Forsyth, Curtain Supply Company; W. J. Schlacks, McCord & Company; R. T. Brydon, Wadsworth-Howland Company; James Garretson, Acme Supply Company; D. O. Ward, B. O. Osbun Company; J. J. Hennessy, Master Car Builder, Chicago, Milwaukee & St. Paul; George R. Carr, Dearborn Drug & Chemical Works; J. D. Purcell, Dearborn Drug & Chemical Works; J. T. Luscombe, Master Mechanic, Eastern Division of the Toledo & Ohio Central; G. H. Pearsall, Joseph T. Ryerson & Son; W. T. Van Dorn, W. T. Van Dorn Coupler Company; W. H. Hooper, Chicago Car Heating Company; S. T. Rowley, Waugh Draft Gear Company; Mr. Baker, Murphy Varnish Company; W. A. Smith, *Railway & Engineering Review;* W. E. Magraw, *Railway List Company;* H. O. Procunier, Moon Manufacturing Company; William White, National Boiler Washing Company; G. A. Hagar, Lackawanna Steel Company; C. H. Hobbs, Lackawanna Steel Company; J. M. Brown, Peter Gray Company; E. P. Schmidt, Urbana, Illinois; L. F. Wilson, C. N. Stevenson, E. C. Griffith, C. S. Jones, G. A. Stone, G. J. Hartz, F. W. Edwards, L. R. Wells.

LIST OF EXHIBITORS.

Although the exhibit space has been increased to 71,453 sq. ft. or about 6,000 sq. ft. over that of last year and 13,653 sq. ft. over that of 1908, it was necessary to turn away thirty-five firms who desired to exhibit, but could not be accommodated because of lack of space.

The exhibit space is divided off as shown by the accompanying diagram, and is subdivided, in general, as follows:

Main Building	12,048 sq. ft.
Machinery Hall	12,060 sq. ft.
Aquarium Court	6,233 sq. ft.
Exhibition Hall	12,448 sq. ft.
Annex Court	6,014 sq. ft.
Annex	11,988 sq. ft.
Hotel Men's Annex	10,180 sq. ft.
Pier End	482 sq. ft.
Total	71,453 sq. ft.

The additional space over last year was gained by moving the Greek temple or convention hall farther out on the pier, and by utilizing every bit of available space between it and the Boardwalk. In the main building the fountain has been removed from the center of the ball room and pergola-like structures have been placed at the sides and the corners. By this arrangement four exhibit spaces have been gained near the stairways without interfering in any way with the effectiveness of the decorations. Noticeable improvements in the arrangement of the exhibit space are the V-shaped fronts to the booths in the Exhibition Hall and the floral decorations in the Annex.

The number of exhibitors has increased from 200 in 1909 to 228 this year. The following list, including the names of the exhibitors, information as to the nature of the exhibits, the names of the representatives and the space numbers, is almost complete.

Owing to the hustling of the committee on exhibits, under the leadership of B. E. D. Stafford, and the competent way in which the secretary of the Railway Supply Manufacturers' Association, J. D. Conway, has handled the details, the exhibit booths are further advanced than at the same period last year; but exhibitors have not been quite as prompt in getting their stuff to Atlantic City as in previous years.

The diagram showing the arrangement of the exhibit space will be found of value in locating any particular exhibit, as the spaces are numbered and the number of each exhibitor's space is shown in the following list:

Acme White Lead & Color Works, Detroit, Michigan.—Railway paints, enamels, colors and varnishes. Represented by D. E. Robinson, K. J. Bowers and H. C. Cater. Space 304.

Adams & Westlake Company, Chicago, Ill.—Electric, gas and oil car lighting fixtures; basket racks; car hardware; white Ajax metal washstands; signal lamps and lanterns; white Represented by E. L. Langworthy, G. L. Walters, C. B. Carson, F. N. Grigg and E. H. Stearns. Space 405.

American Arch Company, New York, N. Y.—Booth for reception of visitors. Represented by Le Grand Parish, C. B. Moore and J. W. Nicholson. Space 410.

American Balance Valve Company, Jersey Shore, Pa.—Jack Wilson balanced high pressure slide valves; semi plug piston valves; Walschaert valve gear, and Wilson Stevens valve gear. Represented by J. T. Wilson, Frank Trump and C. C. Young. Space 384.

American Brake Company, St. Louis, Mo.—Automatic slack adjuster and flexible metallic joint for use between the engine and tender. Represented by E. L. Adreon. Space 27.

American Car Screen Company.—Space 212.

American Brake Shoe and Foundry Company, Mahwah, N. J.—Locomotive brake shoes; locomotive brake heads; coach brake shoes; car brake shoes. Represented by Otis H. Cutler, J. S. Coffin, J. B. Terbell, F. W. Sargent, E. W. VanHouten, W. S. McGowan, E. L. Janes, E. B. Smith, G. R. Law, R. M. Brower, A. H. Elliot, F. H. Coolidge, R. E. Holt, E. A. Gregory, F. L. Gordon, J. S. Thompson and L. R. Dewey. Space 411.

American Car and Foundry Company, New York, N. Y.—Booth reserved for social purposes only. Represented by Scott H. Blewett, S. S. DeLano, William C. Dickerman, Clark D. Eaton, John McE. Ames, A. E. Ostrander, George A. Johnson, William F. Lowry, H. P. Field, Jr., and William M. Hager. Space 528.

American Car Screen Company, Pittsburgh, Pa.—Adjustable Ventilators. Represented by L. S. Klein. Space 212.

American Engineer and Railroad Journal, New York, N. Y.—Represented by J. S. Bonsall, F. H. Thompson, E. A. Averill and Oscar Kuenzel. Space 22.

American Locomotive Sander Company, Philadelphia, Pa.—Leach locomotive pneumatic track sanders. Represented by Morris B. Brewster, C. B. Ford, C. L. Mellor, J. S. Mace, H. M. Wey and E. Curtiss. Space 427.

American Mason Safety Tread Company, Boston, Mass.—Mason safety treads; Empire treads; Karbolith composition floors for coaches and buildings. Represented by Henry C. King. Space 438.

American Nut and Bolt Fastener Company, Pittsburgh, Pa.—Diamond truck equipped with Bartley positive fasteners; stand showing application of multiple and wood fasteners, and other designs of Bartley fasteners. Represented by Milton Bartley, Harvey Bartley, Edwin M. White, Christopher Murphy and Robert Spencer. Space 320.

American Radiator Company, Chicago, Ill.—Steam and hot water boilers; radiators; tank heaters; hot blast heaters; improved car heaters; packless valves; temperature regulators and automatic air valves. Represented by James H. Davis and J. H. Ives. Space 329.

American Railway Steel Tie Company, Harrisburg, Pa.—Steel ties. Represented by S. S. Blair, Jno. G. Snyder and J. E. Striewig. Space 100.

American Steel Foundries, New York, N. Y.—Andrews side frames; cast-steel bolsters; Simplex bolsters; Susemihl side bearings; springs; brake beams; R. E. Janney coupler; Simplex couplers; Davis steel wheels; Economy draft arms; miscellaneous steel castings. Represented by Wm. V. Kelley, R. P. Lamont, W. W. Butler, Geo. E. Scott, D. W. Call, R. H. Ripley, J. C. Davis, T. D. Kelley, J. V. Bell, G. F. Slaughter, F. K. Shults, W. Ross Gravener, Geo. C. Murray, P. J. Kalman, Theodore Cook, D. T. Harris, J. W. Dalman, A. R. Brunker, W. A. Blanchard, A. S. Crozier, T. H. Hopkirk, R. E. Janney, P. M. Armendaris, G. G. Floyd, F. B. Ernst, C. E. Bauer, J. Soule Smith and Louis E. Jones. Space 157.

American Vanadium Company, Frick Building, Pittsburgh, Pa.—Vanadium alloys; vanadium iron and steel products, such as railway machinery and engineering steels; vanadium steel forgings; vanadium steel castings; vanadium cast-iron cylinders, bushings, piston rings, valves, etc.; vanadium brass, bronze and aluminum. Represented by James J. Flannery, Joseph M. Flannery, Wm. J. Bird, Geo. L. Norris, C. L. Hastings, R. B. Steele and M. V. Prendergast. Space 211.

Anchor Packing Company, Philadelphia, Pa.—Metal and fibrous packings and mechanical rubber goods. Represented by L. E. Adams and W. R. Haggart. Space 164.

Armstrong-Blum Manufacturing Company, Chicago, Ill.—Marvel power hack saw machines; portable grinders for lathes and planers; lever punches and shears; metallic weather strip for coaches. Represented by Francis J. Blum and George J. Blum. Space 119.

Armstrong Brothers Tool Company, Chicago, Ill.—Tool holders, ratchet drills and machine shop specialties. Represented by Paul Armstrong and James W. Barber. Space 117.

Barco Brass and Joint Company, Chicago.—Flexible joints and steam connections between engine and tender and between cars; exhaust horns and valves for gas and gasolene engines, inspection cars, etc. Represented by F. N. Bard. Space A 2.

Besly & Company, Charles H., Chicago, Ill.—No. 14 Besly spiral disc grinder, Helmet spiral circles, temper taps, oil and babbitt. Represented by Edward P. Welles, Charles A. Knill and W. H. Allen. Space 166.

Bettendorf Axle Company, Davenport, Iowa.—One 50 ton, single center sill Bettendorf steel underframe mounted on Bettendorf trucks; one 40 ton, double center sill Bettendorf steel underframe mounted on Bettendorf trucks; one model of all steel box car; one Bettendorf truck for demonstrating how easily same can be assembled and dismantled. Represented by J. W. Bettendorf, E. Bettendorf, J. H. Bendixen, A. F. Macpherson, G. N. Caleb, E. E. Silk, W. G. Ransom and C. J. W. Clasen. Space 200.

Bird & Company, J. A. & W., Boston, Mass.—Repolin signal joint paper; refrigerator felt; red and black paper. Space 425.

Bowser & Company, Inc., S. F., Ft. Wayne, Ind.—Oil storage system complete; long distance, self-measuring pumps; power pumps; automatic registering oil meters; oil storage tanks of all sizes and shapes, with pumps for handling and measuring all kinds of lubricating, paint, and other oils, including gasoline, etc.; suitable for storehouses, machine and paint shops, round houses, engine rooms, signal towers, automobile garages. Represented by C. A. Dunkelberg, L. F. Johnson, W. T. Simpson and F. T. Hyndman. Space 30.

Boyle & Company, Inc., John, New York, N. Y.—Bayonne roof and deck cloth, a scientifically treated cotton duck for car roofing; cotton ducks, cotton drills and sheetings for head linings, upholstering, etc. Represented by E. L. Dayton and W. F. O'Connor. Space 318.

Brill Company, J. G., The, Philadelphia, Pa.—Brill No. 27-M. C. B. 3 truck, a Master Car Builders' type of truck for high speed electric and steam passenger service; solid forged wheel pieces, including pedestals; woven cane, canvas lined and unlined, for car seats. Represented by J. W. Rawle, W. H. Heulings, Jr., A. H. Pease, S. M. Wilson and J. N. Nind, Jr. Space 403.

Brown Automatic Hose Coupler Company, Cleveland, Ohio.—Hose couplers. Space 316.

Buck Boring Bar Company.—The Buck boring bar. Space 155.

Buckeye Steel Casting Company, Columbus, Ohio.—Major, Columbia and Universal couplers; truck and body bolsters; truck frames; journal boxes; pivoted yoke. Represented by J. C. Whitridge, Geo. Groobey, G. T. Johnson and F. L. Allcott. Space 511.

Buffalo Brake Beam Company, New York, N. Y.—Brake beams for all classes of cars, locomotives and electric equipment, meeting Master Car Builders' standards and railway companies' requirements. Represented by S. A. Crone, Edwin Strassburger, Thomas E. Carliss, Roland C. Fraser, C. E. Barrett and C. J. Zacher. Space 490.

Burroughs Adding Machine Company, Detroit, Mich.—Burroughs adding machine, electrically driven, for railroad accounting. Represented by F. A. Willard, E. G. Griffith and A. H. Cato. Space 480.

Butler Drawbar Attachment Company, Cleveland, Ohio.—Friction draft gear; Piper patents for 9⅛ yoke; the same for 6½ yoke narrow sill spacing; Piper's patents combined with Farlow attachment; Tandem spring draft gear. Represented by Geo. L. Weiss and W. B. Waggoner. Space 317.

Buyers' Index Company, Chicago, Ill.—Purchasing agents' buying list. Represented by Lloyd Simonson, B. J. Beaton, F. B. Cozzens and Mr. Frame. Space 35.

Carborundum Company, Niagara Falls, N. Y.—Carborundum and Aloxite wheels, sharpening stones, rubbing bricks; Carborundum paper and cloth; Garnet paper; Carborundum valve grinding compound. Represented by George R. Rayner, C. C. Shoemaker, Charles Nicholson, R. H. Hogg and C. C. Lathrop. Space 103.

Cardwell Manufacturing Company, Chicago, Ill.—See Union Draft Gear Company. Space 476.

Carnegie Steel Company, Pittsburgh, Pa.—One section of standard railway track laid with 100 pound rails and Duquesne joints on steel cross ties, with various type fittings; one section portable track for industrial railways laid on steel cross ties; various samples of rails, cross ties and Duquesne joints; nickel-plated samples steel sheet piling; pyramid of spike and bolt kegs bound with patent steel hoops; pair of high record Schoen freight car wheels; 33-in. Schoen steel engine truck wheel with large back hub; 36-in. Schoen passenger train car wheel; 33-in. Schoen tender truck wheel; 34-in. Schoen steel wheel for street railways; 34-in. Schoen steel wheel for interurban railways; 33-in. freight car wheels rolled to a finish—one made by the Schoen process and one made by the Slick process of manufacture; exhibit of soft

welding and threading steel, composed of car truck section, arch bars, locomotive and car forgings, with samples of screw stock. Represented by H. P. Bope, Sam'l A. Benner, John C. Neale, W. G. Clyde, L. C. Bihler, W. A. Bostwick, E. E. Slick, John McLeod, E. S. Mills, R. B. Woodworth, V. S. Yarnall, N. B. Trist, John W. McGrady, L. W. Conroy, W. F. Evans, Charles Orchard and James B. Bonner. Space 412.

Carter Iron Company, Pittsburgh, Pa.—Stay-bolt iron, chain cable iron, engine bolt iron. Represented by Christopher Murphy and Robert Spencer. Space 21.

Celfor Tool Company, Chicago, Ill.—Celfor high-speed drills, reamers, countersinks, three-lipped drills, Rich flat drills, Celfor duplex and precision chunks, reamer sockets, etc. Represented by E. B. Clark, William Brewster, M. L. Hanlin, J. J. Dale, Chas. A. Bucher and Edwin B. Ross. Space 133.

Central Electric Company, Chicago, Ill.—Okonite wires, cables, cords and tapes, car fans, wall, oscillating and exhaust car lamps; tungsten, tantalum and gem shallow flush switches; train connections with automatic runaround opalus shade. Represented by Charles E. Brown, J. M. Lorenz and D. Woodhead. Space 335.

Chase & Company, L. C., Boston, Mass.—Goat brand car plushes in plain and frieze effects; Angora mohair showing process of manufacture; Chase's car seat duck. Represented by Frank Hopewell, R. R. Bishop, Jr. and W. P. Underhill. Space 10

Chicago Pneumatic Tool Company, Chicago, Ill.—Air compressor and four special drills. Represented by Thomas Aldcorn, C. E. Walker, G. A. Barden and A. B. Inness. Space

Chicago Car Heating Company, Chicago, Ill.—Vapor system of car heating; atmospheric pressure heating system; multiple regulation heating system; heating systems for sleeping cars, private cars and special cars; steam-hose couplers; end train-pipe valves; control valves; supply valves; cut-out valves; vertical steam traps and car heater fittings. Represented by Egbert H. Gold, Jos. E. Buker, Thos. F. Downing, Frank F. Coggin, Edw. A. Schreiber, W. H. Hooper, B. A. Keeler, Eugene E. Smith, C. B. Benson and J. R. Reniff. Space 224.

Chicago Railway Equipment Company, Chicago, Ill.—Brake beams of the "P. C." Creço, "E. L." Creco, Creco, Diamond, National Hollow, Kewanee, Drexel, Reliance, Sterlingworth, Ninety-six and Monarch types; Monitor bolsters; Creco roller side bearings; Creco slack adjuster; Creco journal box and lid; automatically adjustable brake heads; Rigio removable leads. Represented by E. B. Leigh, Arthur Wyman, F. T. DeLong, F. G. Ely, B. F. Pilson, Raymond H. Pilson, G. A. Sweringer, C. P. Williams and C. H. Williams, Jr. Space 505.

Chicago Steel Car Company, Chicago, Ill.—Models of tank car, steel underframes and reinforcements. Represented by J. E. Chisholm and H. C. Priebe. Space 435.

Chicago Varnish Company, Chicago, Ill.—Car sides, showing "Ce Ve Process" of saving in cost of painting cars. Represented by O. H. Morgan, O. R. Ford, T. M. Murray, Geo. S. Bigelow and F. L. Olds. Space 482.

Chisholm & Moore Manufacturing Company, The, Cleveland, Ohio.—Complete line of our cyclone high-speed chain hoists, from ½-ton to 30-ton, inclusive; also some of our matchless I beam trolleys; a working model of our 5-ton cyclone hoist with cover removed, showing the internal construction of this hoist. Represented by H. E. Dickerman and W. E. Ludlow. Space 45.

Cleveland Car Specialty Company, Cleveland, Ohio.—Pressed steel carlines for freight cars; pressed steel end tie bands for freight cars; pressed steel side posts, window posts, door posts; upper and lower deck carlines, main carlines, etc., for passenger cars; pressed steel carlines for baggage and express cars; pressed steel spring plank for car and tender trucks; pressed steel automobile side frames and braces. Represented by Geo. L. Weiss, W. S. Bidle, Jos. A. Costello and W. B. Waggoner. Space 317.

Clow, James B. & Sons, Chicago, Ill.—Automatic closets; drinking fountains; lavatories; Triumph heaters for signal cabins; Buena radiators. Represented by J. L. Ponic and L. J. Elliott. Space 420.

Coe Brass Manufacturing Company, The, Ansonia, Conn.—Extruded metals in great variety of intricate designs especially adapted to railway car construction and ornamentation; also for use in electrical and other apparatus. Represented by E. J. Steele, Charles E. Van Riper, William W. Cotter and William H. Rippere. Space C.

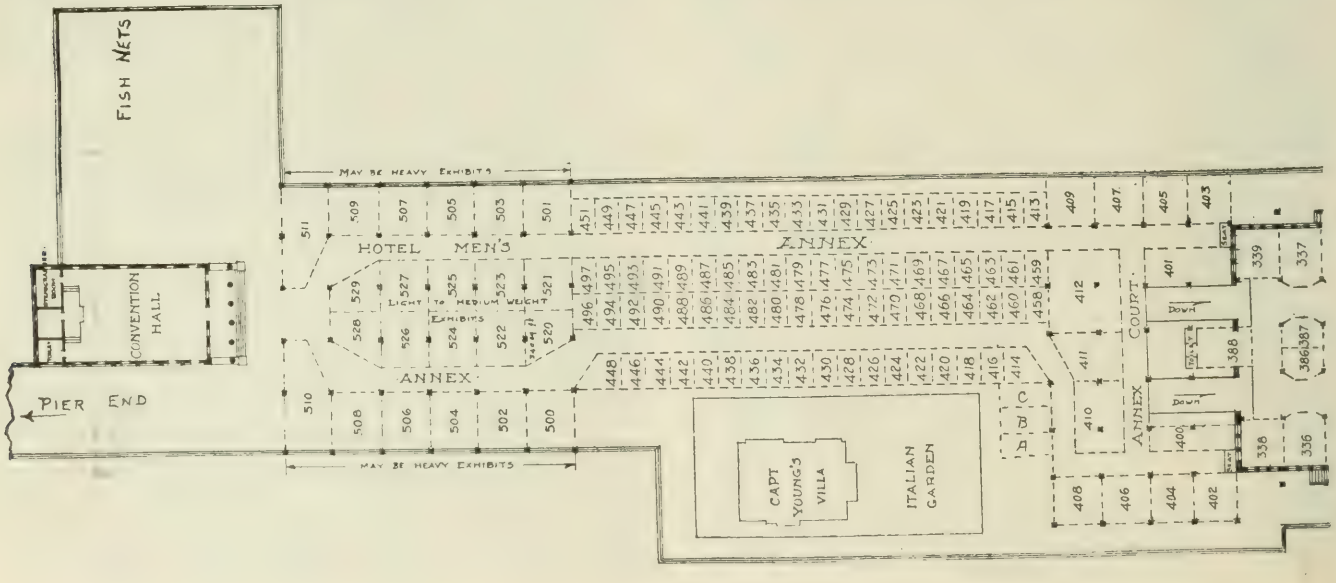
Coe Manufacturing Company, W. H., Providence, R. I.—Coe's ribbon gold leaf and Coe's gilding wheels. Space D 2.

Commercial Acetylene Company, The, New York City, N. Y.—Acetylene headlights; markers and tail lights for locomotives; acetylene signal lamps and car lighting system; acetylene safety storage tank, showing asbestos packing; flashing apparatus as used by U. S. Government for buoys, beacons and lighthouses, with sun valve, which automatically shuts of and turns on the gas. Represented by H. G. Doran, R. J. Faure, Oscar F. Ostby and E. T. Sawyer. Space 201.

Commonwealth Steel Company, St. Louis, Mo.—Catalogues; printed matter; models, etc. Represented by H. M. Pflager, Geo. E. Howard, Boone V. H. Johnson, Frank S. Barks and C. F. Frede. Space 315.

Consolidated Car-Heating Company, Albany, N. Y.—Steam couplers with automatic locks; steam traps, both vapor and pressure; electric heaters and switches for 600 and 1,200 volt operation; automatic safety train signal; consolidated buzzer system; electric boilers. Represented by Cornell S. Hawley, W. S. Hammond, Jr., Thomas Farmer, Jr., and H. L. Hawley. Space 460.

Consolidated Railway Electric Lighting and Equipment Company, New York, N. Y.—Type "d" equipment 4 K. W., capacity for either 60 or 30 volts in connection with Kennedy regulator. Type "F" equipment 2 K. W., capacity for 60 or 30 volts in connection with Kennedy regulator, besides separate parts of all machines showing their construction. Represented by P. Kennedy, J. L. Watson, Thos. L. Mount, L. J. Kennedy and W. R. Hungerford. Space 449.



Continental Railway Equipment Company, Chicago.—The Murray draft gear. Represented by George C. Murray. Space 323.

Cooper Hewitt Electric Company, New York, N. Y.—Mercury vapor lamps and rectifier for operating same. Represented by J. P. O'Shea, F. R. Fortune, F. M. Haviland and M. B. Buckman. Spaces 27 and 136.

Crane Company, Chicago, Ill.—Cranetilt steam traps; motor operated valve; Crane blow-off valve; locomotive safety valve; locomotive cab hose valves; automatic quick opening locomotive blower valves; locomotive cab valves; brass valves of all kinds; malleable and cast-iron fittings. Represented by F. D. Fenn and G. S. Turner. Space 321.

Crosby Steam Gage and Valve Company, Boston, Mass.—Locomotive safety valves, gages and blow-off valves: Testing instruments. Represented by E. C. Kenyon, J. J. McCormick and A. B. Carhart. Space 429.

Curtain Supply Company, The, Chicago, Ill.—88 ring fixtures; 86 roller tip fixtures; full line of curtain materials; "CSCO," "REX" and "VICTOR" diaphragms; Number 6 roller bearing hooks, and automatic releasable handles for vestibule passageway curtains. Represented by W. H. Forsyth, R. F. Hayes and S. W. Midgley. Space 469.

D. r. Company, New York, N. Y.—Dust guards. Space 238.

Damascus Brake Beam Company, Cleveland, O.—"Waycott Special" high speed beams; Waycott freight beams (Nos. 1 and 2); all steel trussed beam with forged steel heads and forged steel fulcrum (no castings); adjustable brake heads, etc. Represented by Albert Waycott, P. T. Handiges and E. S. Smith. Space 501.

Davis Solid Truss Brake Beam Company, Wilmington, Del.—Davis solid truss brake beams; solid steel brake shoe backs; Davis universal air brake; specially designed deflectometer for accurately measuring deflection of brake beams. Represented by Nathan H. Davis, Thos. C. Davis, C. Theo. Buchholz and Chas. F. Perkins. Space 414.

Dearborn Drug & Chemical Works, Chicago, Ill.—Water treating preparations for the prevention of scale, leaking, foaming and corrosion in locomotive boilers; waters analyzed and treatment specially prepared to suit conditions. Represented by George R. Carr, Grant W. Spear, J. D. Purcell, A. W. Crouch, W. S. Reid and H. G. McConnaughy. Space 8.

Detroit Hoist and Machine Company, Detroit, Mich.—Pneumatic and electric turntable tractors; geared pneumatic hoists. Represented by J. C. Fleming and Frank B. Fleming. Space 109.

Detroit Lubricator Company, The, Detroit, Mich.—Locomotive lubricators, Numbers 0, 5, 11, 21, 31, 41 and 61; single, double and quadruple feed types of sight feed air cylinder lubricators; transfer system for filling lubricators; visible sight feed guide cups; automobile and gas-engine mechanical valveless force feed oil pumps. Represented by F. W. Hodges, Herbert I. Lord and A. D. Homard. Space 15.

Dickinson Inc., Paul, Chicago, Ill.—Dickinson cast iron smoke jack; fire-proofed wood smoke jack; cast iron ventilators; cast iron chimneys. Represented by W. E. Chester, A. J. Filkins, Edward W. Hodgkins and J. A. Meaden. Space 231.

Disston & Sons, Inc., Henry, Philadelphia, Pa.—Metal cutting saws and hand saws of all kinds; regular and superfine files; try squares; screwdrivers and spirit levels. Represented by Geo. Koon, W. T. Lindsey and E. A. Platt. Space D 1.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Graphite products especially adapted for railroad work, including the Dixon pure flake lubricating graphite; graphite greases; silica-graphite paint; crucibles; belt dressings and pencils. Represented by Wm. J. Coane, H. A. Nealley, R. R. Belville, F. R. Brandon, J. J. Tucker, Wm. A. Houston, H. W. Chase and L. H. Snyder. Space 24.

Dressel Railway Lamp Works, The, New York, N. Y.—Locomotive headlights; engine classification lamps; train tail lamps; coach lamps; switch lamps; semaphore lamps; caboose lamps; station lamps; gauge lamps. Represented by F. W. Dressel, Robert Black, H. S. Hoskinson, F. W. Edmunds, Edward W. Hodgkins, B. P. Claiborne and M. B. Williston. Space 383.

Duff Manufacturing Company, The, Pittsburg, Pa.—Barrett track jacks; automatic lowering jacks, geared ratchet jacks; Duff ball bearing screw jacks; Duff-Bethlehem hydraulic jacks; Independent pump hydraulic jacks. Represented by T. A. McGinley, G. A. Edgin and E. A. Johnson. Space 508.

Duntley Manufacturing Company, Chicago.—Duntley pneumatic en-route car cleaner; Duntley air purifier for passenger coaches. Represented by G. A. Graber, A. S. Foote and G. P. Foute. Space 521.

Durbin Automatic Safety Car Coupler Company, The, Fort Scott, Kans.—Automatic safety car coupler or draw bar. Represented by C. T. Hunn, V. S. Durbin and J. F. Durbin. Space 107.

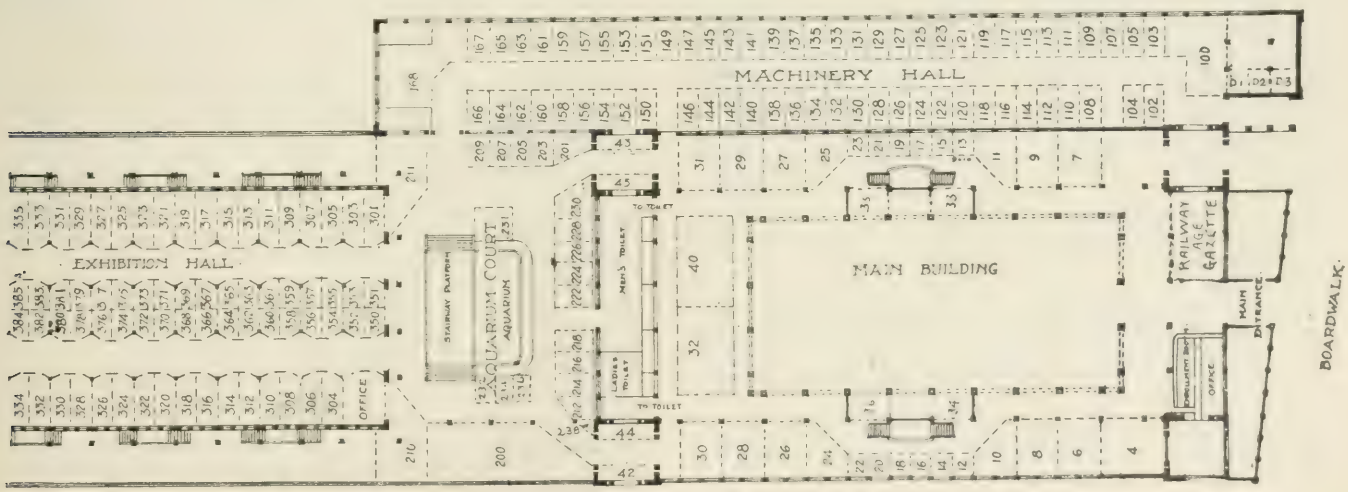
Edwards Company, The O. M., Syracuse, N. Y.—Car window fixtures; sash balances; shade rollers; metal cash; metal trapdoors; sheet metal specialties and railroad padlocks. Represented by O. M. Edwards, E. F. Chaffee, J. J. Edwards, C. H. Rockwell, W. C. Bradbury, E. W. Edwards, 2d, Harold Edwards and T. P. O'Brian. Space 6.

Electric Hose & Rubber Company, Wilmington, Del.—Braided fabric rubber hose. Represented by A. W. Archer, Jr., Wm. M. Sibley, E. F. Brownworth, C. R. Blanchard, C. D. Garretson and J. DeW. Archer. Space 378.

Electric Storage Battery Company, The, Philadelphia, Pa.—Storage batteries for car lighting, signal, vehicle propulsion and automobile ignition service. Represented by J. R. Williams, Charles Blizard, E. L. Reynolds, F. L. Kellogg and H. E. Hunt. Space 409.

Faessler Manufacturing Company, J., Moberly, Mo.—"Boss" improved sectional tube expanders and the Smith driving box. Represented by J. W. Faessler, C. F. Palmer and L. K. Smith. Space 417.

Fairbanks, Morse & Company, Chicago, Ill.—Gasoline section and inspection motor cars; telescopic standpipe and sectionalized valve; chain hoists; tools; rail drills; power pump and motor; line of Geared Ratchet; Ratchet; ball and cone bearing screw jacks and hydraulic jacks. Represented by A. A. Taylor, Geo. J. Akers, E. M. Fisher, F. M. Condit and A. C. Dodge. Space 510.



Flannery Bolt Company, Pittsburgh, Pa.—Tate flexible staybolts; installation tools for applying Tate bolts; radial crown stays and button head crown stays; "F. B. C." nut locks. Represented by B. E. D. Stafford, Geo. E. Howard, Tom R. Davis, Barton H. Grundy, J. Rogers Flannery, Wm. M. Wilson and Thos. J. Leahey. Space 442.

Flower Waste & Packing Company, New York, N. Y.—Resilient journal packing. Represented by Frank D. Waller and George T. Hanchett. Space 308.

Ford & Johnson Company, The, Michigan City, Ind.—Car seats of various types; cane webbing used in car seats; reed and fibre rush chairs for railroad service. Represented by A. D. Martin, G. T. Paraschos, Wm. E. Murphy, B. H. Forsyth and C. A. VanDerveer. Space 314.

Foster, Walter H., New York, N. Y.—Bolt turning machine; staybolt threading and reducing machine; one Potter & Johnson bolt altering machine; staybolt drilling machine; automatic nut-tapping machine; one chaser grinder; lathe dog. Represented by Walter H. Foster and C. K. Lasseter. Space 110.

Forsyth Brothers Company, Chicago.—Forsyth centering device; friction draft gear; cast steel yoke for freight cars; pressed steel doors; Brinkerhoff side construction for passenger cars; pressed steel mouldings and sash. Represented by A. H. Sisson and Mr. Davidson. Space 472.

Franklin Manufacturing Company, Franklin, Pa.—85 per cent magnesia boiler lagging and pipe coverings; corrugated asbestos roofing or sheathing; asbestos "Century" shingles and asbestos building lumber; asbestos "Century" smoke jacks; "Ambler" asbestos ring air pump and throttle packings; asbestos pipe coverings, and asbestos supplies; "Springtite" corrugated copper gaskets; composition metallic gaskets; "Chapman" circular glass cutter; Perfection journal box packing; wool and cotton waste. Represented by R. J. Evans, E. R. Rayburn, L. B. Melville, Geo. S. Stuart, H. S. Hayward, Jr., and Fred Alford. Space 25.

Franklin Railway Supply Company, New York, N. Y.—Booth containing files of daily papers from different parts of the United States. Represented by J. S. Coffin, Samuel G. Allen, A. G. Elvin, C. L. Winey, R. G. Coburn and W. L. Allison. Space 410.

Frost Railway Supply Company, The, Detroit, Mich.—Harvey friction spring gears in different sizes; Detroit metal weather strip. Represented by Harry W. Frost, George A. Cooper and George L. Harvey. Space 578.

Galena-Signal Oil Company, Franklin, Pa.—Reception booth. Represented by S. A. Megeath, C. C. Steinbrenner, E. V. Sedgwick, Harry Hillyer, J. W. Bunn, E. H. Baker, J. P. Ferguson, F. A. Guild, B. H. Grundy, A. I. Gifford, E. W. Grieves, Wm. Holmes, E. G. Johnson, Geo. L. Morton, W. E. Maher, Robert McVicar, L. H. Palmer, J. S. Patterson, P. H. Stack, W. A. Trubee, W. J. Vance, John A. Wilson and W. J. Walsh. Space 32.

Garlock Packing Company, The, Palmyra, N. Y.—Throttle packing; air pump packing; new process sheet packing; new process gaskets; metal packing; hydraulic packing and steam hammer packing. Represented by H. N. Winner, F. S. Bulkley, Philip Arnold and F. P. Dunham. Space 424.

General Electric Company, Schenectady, N. Y.—Portable air compressor (100 lbs. pressure) with pressure regulator; 12 ampere G. I. flaming arc lamps; 6½ ampere multiple magnetite arc lamps; 6½ ampere intensified arc lamps; "Mazda lamps; monogram sign with lamps; Curtis turbo generator for car lighting; cabinet containing an exhibit of train lighting lamps; mercury arc rectifier; 25 Kw. hardening furnace; emery grinder; motor generator set with starting and field rheostats; soldering irons; glue pot; solder melting pot; oil tempering bath; G. E. 212 railway motor; KT-BD-2 motors; motor driven machine tools; switchboard. The apparatus will be shown in operation. Represented by W. J. Clark, J. G. Barry, C. E. Barry, H. L. Monroe, C. A. Raymond, R. E. Moore, W. O. Kellogg, C. C. Pierce, H. D. Hawkes, Frank H. Gale, A. J. Totten, and W. S. Taussing. Space 350.

General Railway Supply Company, Chicago, Ill.—Stub end of a vestibuled passenger car and working models of railway car devices, as follows: Metallic (steel) sheathing; National steel trap doors; Flexolith composition flooring; Imperial car window screens; Perfection sash balances; Resisto insulation; roller deck sash ratchets; National standard roofing; National vestibule curtain catches. Represented by F. L. Wells, H. U. Morton, W. S. Humes and J. F. Oelerich. Space 158.

Gilbert & Barker Manufacturing Company, New York, N. Y.—Self measuring pumps; oil storage tanks; oil storage systems for oil houses, store rooms, etc.; siphons; transfer pumps; storage indicators and lubricating oil tanks. Represented by C. F. Hatmaker. Space 406.

Gold Car Heating & Lighting Co., New York, N. Y.—Car heating and lighting apparatus and car ventilators. Represented by E. B. Wilson, A. B. Strange, W. H. Stocks, Geo. F. Ivers, J. M. Stayman, J. O. Brombaugh, F. H. Smith, F. A. Purdy,

Goldschmidt Thermit Company, New York, N. Y.—All materials required for making welds on locomotive frames, driving wheel spokes, connecting rod and other broken wrought iron and steel sections; samples of welds made on steel bars, trolley rails; standard and extra heavy pipes, etc. Metals free from carbon produced by the Thermit process, including chromium, manganese, molybdenum manganese-copper, manganese-tin, manganese-zinc, ferro-titanium, chromium-copper, manganese-boron, ferro-boron. Cans of heating thermit for reviving dull iron in the ladle, making semi-steel, keeping metal in risers liquid, etc.; cans of titanium thermit for purifying molten iron, increasing its fluidity and enabling the pouring of castings of greater density and higher quality. Represented by H. S. Mann and Wm. Aldrich. Space 324.
F. T. Kitchen and E. J. Roman. Space 301.

Gould Coupler Company, New York, N. Y.—M. C. B. Couplers; Gould malleable iron journal boxes; freight friction draft gears; passenger friction draft gears; Hartman ball bearing centre plates and side bearings; Gould cast steel side frames; passenger cast steel end sill with friction buffer; passenger couplers; steel draft beams; Moritz coupler; cast steel truck bolsters; Gould cast steel freight end sill with friction back of coupler horn; pin type coupler and friction draft gear; Gould cast steel draft beams with friction draft gear; couplers and friction striking plate; 80,000 lb. freight truck with cast steel side frames; angle iron ties; 5 x 9 journal boxes; truck bolster; 5 x 9 axles; Gould car lighting equipment and storage batteries. Represented by F. P. Huntley, Geo. G. Milne, H. N. Loomis, C. E. Rood, W. F. Richards and Dr. C. W. Gould. Space 441.

Greene, Tweed & Company, New York, N. Y.—Palmetto packing; favorite reversible ratchet wrenches. Represented by H. S. Dearmest, F. E. Ransley and B. M. Bulkley. Space 43.

Grip Nut Company, Atlantic City, N. J.—Grip nuts. Represented by E. R. Hibbard, pres.; J. W. Hibbard, treas.; B. C. Wilt, J. W. Cuddy and E. A. Magurn. Space 520.

Hale & Kilburn Manufacturing Company, The, Philadelphia, Pa.—Seats for all standard types of railway cars; all-steel seats for steel cars; reclining seats for chair cars; steel interior finish; steel doors; steel sash; everything in steel for the interior of the modern steel passenger car. Represented by H. T. Bigelow, A. F. Old, B. F. Pilson and C. W. Laskay. Space 504.

Hammett, H. G., Troy, N. Y.—Trojan metallic packing; Trojan bell ringers; radius grinder; triple valve bushing roller. Represented by H. G. Hammett, E. C. Sawyer and A. O. Van Dervort. Space 147.

Harlan & Hollingsworth, Wilmington, Del.—One finished steel coach and one steel coach frame. On exhibit track.

Harrington, Son & Co., Inc., Edwin, Philadelphia, Pa.—Peerless hoists; screw hoists; differential hoists; plain and geared travelers to run on lower flange of I-beam. Represented by Roger Sherron, W. J. Somerset, J. A. Slaughter, M. W. Christian and A. M. Harrington. Space 129.

Heywood Bros. & Wakefield Company, Wakefield, Mass.—New complete line of universal car seats, showing latest pressed steel features. Represented by Bertram Berry, R. F. Fowler and E. C. Lang. Space 386.

Hobart-Allfree Company, The, Chicago, Ill.—A working model of a locomotive, ¼ size, showing the running gear complete and demonstrating the Allfree system of cylinders, valves and new radial outside valve gear. Represented by J. B. Allfree, Frank Smith and W. H. Belmaine. Space 436.

Home Rubber Company, Trenton, N. J.—Black sheet packing; high and low pressure diagonal rod packing; hydraulic packing; flax packing; gum core packing; ring and combination packings. Represented by A. R. Foley. Space 333.

Hunt-Spiller Manufacturing Corporation, South Boston, Mass.—Hunt-Spiller gun iron castings which have been in service and removed for exhibition purposes, such as piston valve rings; piston valve bushing; cylinder packing rings; eccentrics and eccentric straps; crosshead shoes; driving box. Also Hunt-Spiller gun iron castings in the rough, such as

superheater header; piston head; gear, etc. Represented by Frederic Parker, W. B. Leach, J. G. Platt and A. J. O'Connor. Space 474.

Hutchins Car Roofing Company, Detroit, Mich.—Samples of roofing sheets and photographs of cars equipped with the Hutchins roofing. Also track exhibit in the P. & R. R. R. side tracks showing N. Y. Central & Hudson River R. R. car No. 106,986 equipped with Hutchins all-steel steel carline roof. Represented by D. W. Hawksworth and W. D. Thompson. Space 431.

Independent Pneumatic Tool Company, Chicago, Ill.—Thor piston air drills; pneumatic riveting, chipping, caulking and flue-beading hammers; the Thor stay-bolt driver. Represented by James B. Brady, W. O. Jacquette, J. D. Hurley, R. S. Cooper, Geo. A. Gallinger, R. T. Scott, F. W. Buchanan, J. J. Keefe, H. F. Finney, T. J. Carroll and J. P. Bourke. Space 486.

International Correspondence Schools (Railway Department), Scranton, Pa.—Booth attended by students from various Southern railway apprentice instruction classes exhibiting specimens of the work of the students in mathematics and mechanical drawing. Represented by W. N. Mitchell, Ed. M. Sawyer, R. S. Mitchell, G. B. Moir, J. F. Cosgrove, A. E. Sweet, J. E. Drennan, G. H. Brown and N. B. White. Space 26

Jenkins Brothers, New York, N. Y.—Jenkins Bros. brass globe valves, regular and extra heavy; brass gates, medium and extra heavy; brass "Y" valves, regular and extra heavy; automatic Graber gauges; radiator valves and air valves; iron body globes, gates, etc.; safety car discs; "96" packing; pump valves and Jenkins discs. Represented by A. C Langston, Frank Martin, C. B. Yardley, Jr., and B. J. Neely. Space 421.

Johns-Manville Company, H. W., New York, N. Y.—High and low pressure sheet; packings; high and low pressure pipe; coverings; insulating cements; refrigerator car insulation; steel passenger car insulation; asbestos roofings; car and engine cab roofings; asbestos smoke jacks; asbestos lumber; electrical fibre conduit; underground pipe covering; J-M sanitor seats and tanks; vulcabeston throttle and air pump packing; vulcabeston caskets; locomotive boiler laggings; vitribestos pipe coverings; bridge deckings; J-M asbestos sill covering; train pipe coverings; furnace cements. Represented by J. E. Meek, mg'r., J. C. Younglove, G. A. Nicol, H. G. Newman, F. M. Gilmore, Geo. Christenson and C. W. Gearhart. Space 492.

Joliet Railway Supply Company, Joliet, Ill.—Huntoon light and heavy freight brake beams; special freight brake beams; locomotive and passenger brake beams; all steel brake beams; "P. C." and "L. N." high-speed beams; standard U freight beams; Perry passenger and freight roller side bearings, both new and after service. Represented by H. M. Perry, C. A. Huntoon, E. A. Laughlin, J. D. Granville, W. C. Munn and R. C. Fraser. Space 526.

Joyce-Cridland Company, The, Dayton, O.—All types of railroad jacks. Represented by Geo. M. Llewellyn, Edwin Romeiser, P. J. Ford and Nicholas Kohl. Space 444.

Kelly-Arnold Manufacturing Company, Wilkes-Barre, Pa.—Automatic air and steam connector; metal conduits and auxiliary parts. Represented by George F. Royer and John J. O'Donnell. Space 210.

Kerite Insulated Wire and Cable Company, New York, N. Y.—Kerite insulated wires and cables; kerite tape. Represented by R. D. Brixey, Azel Ames, P. W. Miller and J. A. Renton. Western representatives, Watson Insulated Wire Company, J. V. Watson, B. L. Winchell, Jr., R. A. Patterson, Chicago. Space 413.

Keystone Drop Forge Works, Chester, Pa.—Keystone connecting links; safety shackle hooks; wrenches; hoist hooks; shafting collars; thumb screws; thumb nuts; eye bolts; machine handles; special drop forgings. Represented by Geo. H. Berlin and Chas. F. H. MacLaughlin. Space 325.

Keystone Lantern Company, Philadelphia, Pa.—The Casey standard railway hand-lantern. Space 428.

Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.—Automatic M. C. B. air dump construction car. Represented by F. W. Hubbard and A. C. Stansill. On exhibit track.

King Automatic Car Platform Company, Inc., Washington, D. C.—Models of sliding platform extensions for passenger coaches of steel, steel underframe or wooden construction. Represented by J. C. Mayo. Space 327.

Lackawanna Steel Company, New York, N. Y.—Rails; rail joints; tie plates; beams; channels; angles; steel plate; steel forging; corrugated and deformed bars; twisted squares; the Abbott base plate; sheet piling. Represented by F. E. Abbott and A. H. Weston. Space 40.

Landis Machine Company, Waynesboro, Pa.—Double head motor driven bolt threading machine; single head open belt type high speed bolt threading machine; automatic die head for turret lathe; semi-automatic die head for pipe threading machines, and demonstrations of thread cutting and samples of threaded products. Represented by J. G. Benedict, Ira D. Grove and H. L. Fisher. Space 108.

Landis Tool Company, Waynesboro, Pa.—Cylindrical grinders; one gap grinder 16 x 72 in operation, made for railroads; one number 2 universal grinder. Represented by J. H. Hollinger. Space 102.

Linde Air Products Company, Buffalo, N. Y.—Oxy-Acetylene welding and Oxy-Coal gas cutting apparatus and wrecking equipment. Represented by G. E. Kershaw, F. Schoonmaker, J. A. Warfel, M. S. Plumley, E. E. Radcliffe and W. J. Fritz. Space 500.

Love Brake Shoe Company, Chicago, Ill.—Armbrust brake shoes for driver brakes, passenger, freight and coach brakes; also motor brake and traction brake shoes. Represented by C. W. Armbrust and John F. Stevens, Jr. Space B.

Lunkenheimer Company, Cincinnati, Ohio.—Engineering specialties, including brass and iron gate, globe, blow-off and swing check valves. Represented by C. Davies, E. R. Ritter and William Hood. Space 26.

Lupton Sons Company, David, Philadelphia, Pa.—Lupton rolled steel skylight; Lupton steel sash; Pond continuous sash and Pond operating device for pivoted sash. Represented by Clarke P. Pond and H. R. Wilkinson. Space 422.

Macleod & Company, Walter, Cincinnati, Ohio.—Lights for wrecking outfits and construction work; portable oil burners; sand blast machines; oil furnaces; tire heaters; water softening apparatus. Represented by Walter Macleod, F. A. Saylor, P. H. Wilhelm, W. B. Woodbridge and William Hext. Space 503.

Manning, Maxwell & Moore, Inc., New York, N. Y., and its subsidiary companies, The Hancock Inspirator Company, The Ashcroft Manufacturing Company, The Consolidated Safety Valve Company, The Hayden & Derby Manufacturing Company, and The Shaw Electric Crane Company.—Hancock inspirators; main steam valves; boiler check valves; hose strainers; blow-off valves; globe and angle valves and locomotive trimmings; Consolidated safety valves; Ashcroft steam, vacuum, pressure and recording gauges and Tabor indicators; one F. E. Reed Company 24-inch special heavy pattern motor driven engine lathe; one Foote-Burt 24-inch high duty belt driven shaper; one Foote-Burt 36-inch swing high duty belt driven drill; one Cincinnati 26-inch x 8-ft. single head motor driven traverse shaper; one Gridley 4¼-inch single spindle motor driven turret lathe; one Gridley 1¼-inch four-spindle turret lathe; one Hendey No. 4 motor driven milling machine; one Hendey 16-inch geared head engine lathe; one Hendey motor driven shaper; one Dreses 5-foot motor driven full universal radial drill with tapping attachment; one National 1½-inch wedge grip heading and forging machine; one National motor driven double head bolt cutter; one National die sharpener; one Elmore high duty ball bearing single spindle sensitive drill, motor driven. Represented by James B. Brady, W. O. Jacquette, J. N. Derby, C. E. Randall, R. A. Bole, M. A. Sherritt, P. M. Brotherhood and C. L. Lyle. Space 114.

McConway & Torley Company, The, Pittsburg, Pa.—Pitt freight coupler; Janney "X" freight coupler; Pitt passenger coupler; a new swivel head coupler with McConway centering device as being applied to new steel passenger coaches of the Pennsylvania railroad; Pitt tender coupler; Pitt pilot coupler; Buhoup steel truck side frame; Buhoup 3-stem coupler, and the McConway steel wheel. Represented by Stephen C. Mason, E. M. Grove, H. C. Buhoup and I. H. Milliken. Space 527.

McCord & Company, Chicago, Ill.—The following Journal boxes: cast steel passenger; vanadium grey iron passenger; malleable iron steel inserted passenger; pinless lid; malleable iron with outside metal dust guard. Locomotive force

feed lubricator; lubricating driving box; national equalizing wedge; McCord draft gear; and McCord spring dampener; McKim gasket. Models of universal windows for wood and steel cars; universal weatherstripping; gravity wedging sash locks; universal wedging sash locks; universal extension sash locks; one special design metal sash; universal deck sash ratchets. Represented by D. W. McCord, J. A. Lamon, Morrill Dunn, R. L. McIntosh, B. McClellan, W. G. Wilcoxson, F. S. Nickerson, D. J. McOsker and W. J. Schlacks. Space 494.

McGraw Publishing Company, New York, N. Y.—Electric Railway Journal and Engineering books. Space 7.

Midvale Steel Company, The, Philadelphia, Pa.—Rolled steel wheels. Represented by W. P. Barba, E. Harrah, T. W. Illingsworth, S. Griffith, C. Tietze, James Thompson, M. W. Welsh and L. Wells. Space 9.

Milburn Company, The Alexander, Baltimore, Md.—Railroad construction light, 5,000 candle power; lights for wreckers, cranes, steam shovels, etc.; fire lights; miners' lights; construction lights up to 10,000 candle power. Represented by A. F. Jenkins, Charles Pollard and I. E. Stansbury. Space 402.

Modoc Soap Company, Philadelphia, Pa.—Perfectol car and locomotive cleaner. Space 434.

Molleson Company, Geo. E., New York, N. Y.—Tyler charcoal iron boiler tubes; everlasting blow-off valve; spiral staybolt. Represented by Geo. E. Molleson and Huntly H. Gilbert. Space 439.

Moran Flexible Steam Joint Company, Louisville, Ky.—Flexible joints for steam, air, gas and liquid steam coupler for use between engine and dynamo car. Space 155.

Nachod Signal Company, Philadelphia, Pa.—Signal apparatus. Space 234.

Nathan Manufacturing Company, New York, N. Y.—Injectors; lubricators; boiler checks; fire extinguishers; boiler washers and testers; Klinger water gauges; oil cups; feed water strainers; ejectors; water gauges; whistlers; air brake lubricators, and miscellaneous appliances for use on locomotives. Represented by Sanford Keeler, J. S. Seeley, J. C. Currie, Chas. R. Kearns, James E. Minor, M. Stettheimer, Edward S. Toothe and Alfred Nathan. Space 379.

National-Acme Manufacturing Company, The, Cleveland, Ohio. —Automatic screw machine—"Acme-Multiple-Spindle." Represented by W. S. Chase, E. C. Woolgar, L. M. Waite and J. F. Judd. Space 111.

National Lock Washer Company, The, Newark, N. J.—Sash locks; curtain fixtures, sash balances; spring parallel sash guides and lock washers; chain attaching device for sash balances. Represented by: William C. Dodd, Frank B. Archibald, John B. Seymour and Daniel Hoyt. Space 28.

National Malleable Castings Company, The, Cleveland, O. —Sharon, Tower, Climax and Latrobe couplers. Represented by S. L. Smith, W. E. Coffin, F. R. Angell, J. V. Davison, R. T. Hatch, J. H. Jaschka, J. H. Merrell, Jr., G. V. Martin, H. D. Hammond, L. S. Wright, C. A. Bieder, K. R. Johnston, B. Nields, Jr., R. H. Pilson, E. O. Warner and J. A. Slater. Space 522.

National Railway Devices Company, Chicago, Ill.—Uncoupling apparatus which includes positive release of coupler in case of "pull out" (Duplex uncoupler and automatic release); fire door and door operator. Represented by Jay G. Robinson, J. W. Luttrell and J. A. Good. Space 433.

Nelson Valve Company, Philadelphia, Pa.—Valves in bronze, iron and steel; a complete unit of testing apparatus in actual operation; twelve inch electrically operated valve with complete control will be shown running; a superheated steam steel gate valve, absolutely tight after thorough trials for two years. Represented by Carlisle Mason, M. D. Baldy, W. J. Spencer, R. E. Thomas and H. C. Baynard. Space 141.

Newhall Engineering Company, George M., Philadelphia, Pa. —Photographs of wrecking and locomotive cranes; pillar and transfer cranes; pile drivers; transfer tables, rail saws, etc., as manufactured by the Industrial Works, Bay City, Mich.; "NB" hose connections for air brake, signal and steam hose; Pahlow pneumatic hose appliances, and Vance steam trap. Represented by David Newhall, Morton L. Newhall, William L. Brown and Glenn B. Harris. Space 374.

New York Air Brake Company, The, New York, N. Y.— Automatic control equipment for locomotive and tender; automatic control equipment for passenger cars; type K triple valve for freight service; type J triple valve for passenger service; self-locking angle cock handle; combined brake pipe strainer and cut-out cock; improved hose coupling; Forsyth automatic connector and New York producer gas engine plant. Represented by H. F. Bickel, N. A. Campbell, J. E. Forsyth, W. T. Henry, G. O. Hammond, J. A. Hicks, G. A. Kleifges, C. P. Lovell, C. E. Leach, Geo. Marlow and F. M. Whyte. Space 330.

Nichols & Brother, G. P., Chicago, Ill.—Electric turn table tractor. Represented by Geo. P. Nichols and Henry Fries. Space 406.

Nickelized Casting Company, Pittsburgh, Pa.—One 36 inch and one 33-inch worn nickelized chilled car wheels; two 33-inch nickelized chilled car wheels cast from open hearth furnace and double annealed. Represented by Robert C. Totten, George L. Fowler. Space 419.

Niles-Bement-Pond Company, New York.—This exhibit includes also an exhibit of the Pratt & Whitney Company.—A 20-inch La Blonde engine lathe with all-geared head; new type cone head for same; La Blonde universal milling machine; pneumatic tool clamp for steel tire lathe; Pratt & Whitney small tools, gauges, etc. Represented by J. K. Cullen, J. T. McMurray, D. J. Normoyle, G. F. Mills, E. L. Leeds, N. C. Walpole, E. S. Cullen, D. H. Teas and Frank Miles. Space 149.

North Brothers Manufacturing Company, Philadelphia, Pa.— "Yankee" tools; ratchet screw drivers; spiral screw drivers; automatic push drills; hand drills. Represented by F. A. Mutchmore. Space 152.

Norton Company, Worcester, Mass.—Large show case containing an assortment of alundum grinding wheels and India oil stones; alundum in grains. Represented by Geo. C. Montague, Geo. Stone, H. N. Cudworth and Hans Wickstrom. Space 150.

Norton, Incorporated, A. O., Boston, Mass.—High speed ball-bearing lifting jacks. Represented by H. A. Norton, J. O. St. Pierre, R. D. Bates, H. J. Wilson and R. L. Skidmore. Space 489.

Official Railway Guide, New York, N. Y.—Represented by Geo. E. Armstrong and E. Bjerregaard. Space 34.

Okonite Company, The, New York, N. Y.—Specimens of all kinds of cables and wires for electric light, power, transmission, telephone, telegraph, etc. Also specimens of crude fine Para rubber. Represented by Lewis G. Martin, John Langan and F. J. White, assisted by J. M. Lorenz, of Central Electric Co., Chicago, Ill. Space 335.

Pantasote Company, New York, N. Y.—Pantasote curtains and materials; Pantasote upholstery fabrics; Agosote millboards for headlinings, interior trim, etc. Represented by John M. High, W. A. Lake and W. S. Barrows. Space 302.

Parker Car Heating Company, Detroit, Mich.—Parker anti-freezing and hot water system with automatic discharge; complete systems for all classes of equipment. Represented by Thomas Parker, J. M. McEvoy and C. S. Parker, Jr. Space 218.

Parkesburg Iron Company, Parkesburg, Pa.—Photographs of mills showing process of manufacture; also samples of charcoal iron boiler tubes. Represented by H. A. Beale, Jr., C. L. Humpton, J. H. Smythe, W. H. S. Bateman, George Thomas, 3rd, H. C. Hunter, J. A. Kinkead and L. P. Mercer. Space 388.

Pay Within Car Company, Chicago, Ill.—Center door of the Interboro subway cars of New York. Represented by F. H. Lincoln and H. Hellyer. Space 236.

Pennsylvania Flexible Metallic Tubing Company, Philadelphia, Pa.—Flexible metallic hose for steam connection between cars; blower and washout hose. Represented by J. M. Odenheimer. Space 210.

Pilliod Brothers, Toledo, Ohio.—Quarter size model of the Pilliod locomotive valve gear in operation. Represented by C. J. Pilliod and H. J. Pilliod. Space 222.

Pilliod Company, The, Swanton, Ohio.—Baker-Pilliod locomotive valve gear. Radial locomotive ash pans. Represented by R. H. Weatherly, R. F. Darby, F. E. Pilliod, A. Pilliod and J. W. Albeck. Space 400.

Pittsburgh Equipment Company, Pittsburgh, Pa.—Cast steel double web truck bolster; cast steel truck side frame; interlocking cast steel journal boxes; cast steel interlocking spring plank; cast steel draft casting; aluminum model of

center plate and side bearing. Represented by H. V. Seth, John Allison and E. R. Williams. Space 529.

Pocket List of Railroad Officials, New York, N. Y.—Pocket list of railroad officials. Represented by Chas. L. Dinsmore and Harold A. Brown. Space 7.

Pressed Steel Car Company, Pittsburgh, Pa.—Photographs of various products in booth. On Philadelphia & Reading track, Mississippi Avenue, an ore car. Represented by O. C. Gayley, C. E. Postlethewaite, J. H. Mitchell, L. O. Cameron, G. T. Merwin, J. S Turner, Victor von Schlegell, W. H. Wilkinson, M. S. Simpson, J. G. Bower, H. S. Hammond, Geo. W. Restine and Charles A. Lindstrom. Space 509.

Pugh, Job T., Philadelphia, Pa.—Augers, bits and chisels. Represented by Job T. Pugh and Geo. A. Phillips. Space 385.

Railway Age Gazette, New York, N. Y.—Represented by William H. Boardman, Edward A. Simmons, Henry Lee, Frank S. Dinsmore, Lucius B. Sherman, John N. Reynolds, Cecil R. Mills, Samuel O. Dunn, Bradford Boardman, Roy V. Wright, William Forsyth, George L. Fowler, William E. Hooper, Francis E. Lister, Francis W. Lane, William D. Horton, L. B. Mackenzie, Fred W. Bender, George A. McKeague, T. E. Crossman, A. B. Weaver and J. C. Marriott. Space 1.

Railway and Engineering Review, Chicago, Ill.—Represented by Willard A. Smith, A. E. Hooven, P. G. Stevens, John M. Lammedee and G. E. Ryder. Space 12.

Railway List Company, The, Chicago, Ill.—Monthly Official Railway List and Railway Master Mechanic. Represented by W. E. Magraw, C. S. Myers, L. F. Wilson and C. C. Zimmerman. Space 35.

Railways Materials Company, The, Chicago, Ill.—Reception booth. Represented by George L. Bourne, T. B. Cram, C. M. Mendenhall, J. Schurch and Geo. Hoeffle. Space 479.

Rapp Company, John W., New York, N. Y.—Steel car doors and mouldings. Represented by C. A. Leonardi. Space 20.

Restein Company, Clement, Philadelphia, Pa.—Fibrous packing for steam, water, ammonia, hydraulics, oil, gases, acids, etc. Represented by Clement Restein, William J. Cromie and Norman B. Miller. Space 16.

Revolute Machine Company, New York, N. Y.—Continuous electric blue printing machines. Represented by J. V. McAdam and C. J. Everett. Space 328.

Rockwell Furnace Company, New York, N. Y.—Furnaces for railroad shops. Space 4.

Royersford Foundry & Machine Company, Inc., Royersford, Pa.—Punch and shearing machines and Sells roller bearings. Represented by Y. C. Freed, A. Loomis and John D. Sells. Space 115.

Safety Car Heating & Lighting Company, New York, N. Y.—Latest type single mantle lamps; axle-driven dynamo electric lighting equipment; lighting fixtures; demonstration of vapor lighting equipment for branch line service; and the Safety heating system for passenger trains; revolving gas mantle buoy. Represented by R. M. Dixon, J. A. Dixon, L. R. Pomeroy, R. C. Schaal, G. E. Hulse, J. S. Henry, Wm. St. John, D. W. Pye, J. M. Town, R. C. Moore, C. B. Adams and W. L. Garland. Space, stairway platform.

Schoen-Jackson Company, Media, Pa.—Flexible metallic steam hose; water hose; air hose; air brake hose, and flexible metallic hose for every purpose wherein rubber hose is now used. Represented by Charles T. Schoon, M. R. Jackson, W. R. Wood, R. B. Ross and E. C. Pollard. Space 404.

Scullin-Gallagher Iron & Steel Company, St. Louis, Mo.—Cast steel bolsters and truck side frames. Represented by Thomas M. Gallagher, Frank L. Norton, George L. L. Davis, Frank W. Graves, S. M. Dolan, Ed. M. Fitzgerald, S. R. Fuller, Jr., L. C. Ullrich, P. J. Howard, H. H. Waldron, O. G. Mueller and T. W. Aishton. Space 135.

Scully Steel & Iron Company, Chicago, Ill.—Space 437.

Sellers & Company, Inc., William, Philadelphia, Pa.—Locomotive injectors and accessories; model of the original Giffard injector; ball and socket hanger; hanger boxes and couplings; set of three drivers for our extra high power 42-inch car wheel lathe, mounted upon a temporary wooden face plate; a turret rest of this lathe, and a pair of wheels turned by the lathe; a turret rest of our extra high power locomotive driving wheel lathe. Represented by Strickland L. Kneass, John D. McClintock, Clinton B. Conger, Charles T. Wilson, Edward L. Hölljes and Frederick W. Ancona. Space 506.

Sherwin-Williams Company, Cleveland, Ohio.—Sherwin-Williams passenger coach systems. Represented by E. M. Willliams, W. B. Albright, E. M. Richardson, Thomas Madill and F. A. Elmquist. Space 33.

Simplex Railway Appliance Company, New York, N. Y.—In booth with American Steel Foundries. Space 157.

Smith Premier Typewriter Company, Syracuse, N. Y.—Billing and bookkeeping machines; machines for way billing and railway expense billing; new visible typewriter. Represented by H. J. Seddon, A. N. Ashmore and a staff of operators. Space 2.

Spencer Turbine Cleaner Company, Hartford, Conn.—A 5-horsepower vertical direct driven turbine cleaner; new pressed steel vacuum cleaning tools. Represented by E. W. Muzzy, Guy Noble and R. B. Smith. Space 408.

Sprague Electric Company, New York, N. Y.—Flexible steel armored air brake hose; flexible steel armored signal hose; flexible steel armored steam, pneumatic, hydraulic and water hose and fittings for shop use; electric conduit supplies; electric fans. Represented by A. C. Bakewell, D. C. Durland, H. H. Hornsby and Henry W. Uhl. Space 322.

Standard Car Truck Company, Chicago, Ill.—Barber standard lateral motion truck; Barber double action truck and Barber roller bearing center plates. Represented by J. C. Barber, J. T. Milner, L. W. Barber, F. L. Barber and E. W. Web. Space 123.

Standard Coupler Company, New York, N. Y.—Standard steel platforms; Sessions-Standard friction draft gears; Standard slack adjusters. Represented by George A. Post, E. H. Walker, A. P. Dennis, R. D. Gallagher, Jr., and C. D. Jenks. Space 339.

Standard Steel Car Company, Pittsburgh, Pa.—Space 466.

Standard Steel Works Company, Philadelphia, Pa.—A reception booth. Represented by H. DeH. Bright, Charles Riddell, George F. Jones, E. B. Halsey, C. H. Peterson, H. W. Sheldon, F. W. Weston, E. Sidney Lewis, W. H. Pugh, Jr., and H. G. Pearce. Space 484.

Stoever Foundry & Mfg. Co., The, Myerstown, Pa.—One number 2 automatic pipe bending machine, motor driven, capacity 1 in. to 2 in.; one number 2 pipe threading and cutting off machine, motor driven, capacity ¼ in. to 2 in. Represented by W. E. Farrell, Ed. R. Euston and J. F. Morris. Space 121.

Storrs Mica Company, Owego, N. Y.—Samples of mica headlight chimneys for oil and acetylene headlights; mica chimneys for use on caboose, cab, station and switch lamps; mica lantern globes; collection of samples of mica from various parts of the world. Represented by A. P. Storrs and Charles P. Storrs. Space 19.

Strong, Carlisle & Hammond Company, Cleveland, Ohio.—Randall graphite sheet lubricator; Strong's steam specialties, including steam and vacuum traps, pressure reducing valves, steam separators, and the Handy wrench. Represented by B. E. Carpenter and Homer Whepley.

Symington Company, The T. H.—Baltimore, Md.—Farlow draft gear; journal boxes; flexible dust guards; roller side bearings. Represented by T. H. Symington, W. A. Garrett, J. F. Symington, C. J. Symington, E. H. Symington, Donald Symington, W. W. Rosser, T. C. DeRosset, D. F. Mallory, I. O. Wright, B. S. Johnson, A. H. Weston and S. L. Kamps. Space 524.

Talmage Manufacturing Company, Cleveland, Ohio.—Talmage system ash pan cleaner. Represented by J. G. Talmage, E. H. Janes, J. F. Walker and C. F. Kahler. Space 313.

Taylor Manufacturing Company, James L., Bloomfield, N. J.—Car, boilermakers' patternmakers' and machinist clamps. Represented by James L. Taylor and Edward C. Blake. Space 18.

Templeton, Kenly & Co., Ltd., Chicago, Ill.—Simplex car and track jacks; simplex geared jacks, and the component parts of the simplex jacks. Represented by Alfred E. Barron, J. H. Hummel and F. A. Barbey. Space 487.

Tindel Morris Company, Eddystone, Pa.—Paragon cold saw machine, standard and structural type "Tindel" inserted tooth cold saws, saw grinder. Represented by Lincoln W. Gruber and David G. Nixon. Space 306.

Titan Steel Casting Company (formerly Benjamin Atha & Company), Newark, N. J.—Body and truck bolsters; tank car saddle; manganese steel gears and pinions. Represented by Louis A. Shepard, G. T. Paraschos and Chas. W. Owston, Jr. Space 368.

Toledo Pipe Threading Machine Company, The, Toledo, Ohio.—Hand operated threading tools, threading 12-inch, 8-inch and 4-inch standard steel pipe; several smaller threading tools, vises, vise-mounts and pipe cutters. Represented by W. C. Longenecker, S. S. Thornberry and Clarance A. Popp. Space 44.

Tyler Tube & Pipe Company, Washington, Pa.—Space 439.

Underwood & Co., H. B., Philadelphia, Pa.—Portable cylinder boring bar; portable crank-pin returning machine; new portable crank-pin rivet head facer; portable rotary boiler tube cleaner; locomotive pedestal facing machine. Represented by A. D. Pedrick and D. W. Pedrick, 2d. Space 310.

Union Draft Gear Company, Chicago, Ill.—Cardwell friction draft gear; Cardwell rocker side bearings. Represented by J. R. Cardwell, L. T. Canfield, J. D. Ristine, W. G. Krauser and J. E. Tarleton. Space 476.

Union Fibre Company, Winona, Minn.—Linofelt, for the insulation of refrigerator cars; fireproof lith; rigid linofelt and steel car linofelt, for the insulation of steel coaches; waterproof lith and flax lith board, for the insulation of ice houses. Represented by F. J. Bingham, S. E. McPartlin, H. W. Leeds and J. H. Bracken. Space 448.

Union Manufacturing Company, New Britain, Conn.—Lathe; planer; drill; boring mill; car wheel and valve chucks. Represented by M. L. Bailey, A. F. Corbin, E. I. Stevens, H. H. Wheeler, J. W. Carlton, W. F. Curtis and C. S. Newman. Space 145.

Union Spring & Mfg. Company, Pittsburg, Pa.—Elliptic and coil springs; pressed steel spring plates and journal box lids; all-steel Kensington journal boxes; steel castings. Represented by A. M. McCrea, L. G. Woods, C. S. Foller, A. Pancoast, H. B. Darlington, A. C. Woods, T. B. Arnold, H. F. Ayers, E. W. Snowdon and W. F. La Bonta. Space 430.

U. S. Metal & Manufacturing Company, New York, N. Y.—Feasible drop brake staff; diamond tapered steel pole; Owen-Cochran pressed steel journal box; Empire pressed steel bolster; Detroit car door; Barol wood preservative; St. Louis surfacer paint panels; Columbia lock nuts; M. C. B. repair and defect card box; New York Central box car equipped with Hutchins all-steel—steel carline roof on exhibition track. Represented by B. A. Hegeman, Jr., Charles C. Castle, Frederick C. Dunham, Edward D. Hillman, Arthur Masters and Harold A. Hegeman. Space 337.

United States Metallic Packing Company, The, Philadelphia, Pa.—United States multiangular metallic packing and King type metallic packing for locomotive piston rods and valve stems. Collmar pneumatic locomotive bell ringers; valve stem clamps; braided cotton swabs; "Indestructible" oil cups. Represented by Morris B. Brewster, C. B. Ford, C. L. Mellor, J. S. Mace, H. M. Wey, and E. Curtiss. Space 427.

Vanadium Metals Company, Pittsburgh, Pa.—Vanadium metals, comprising vanadium bronze shown in castings of bells, brasses, cold drawn rods and sheets; Vanadium non-corrosive silver metal shown in ornamental fittings; Vanadium anti-friction metal. Represented by J. Rogers Flannery. Space 440.

Von Kokeritz & Company, R. G., New York, N. Y.—Durable high-pressure sheet packing and gaskets; heather high-pressure piston packing; hydra hydraulic packing; cosmos paint; glardon clips. Represented by R. G. Von Kokeritz, N. P. Hill and J. A. Carson. Space 214.

Walker & Bennett Manufacturing Company, New York, N. Y.—Simplified car seats. Represented by John Havron, K. D. Hequembourg and S. A. Walker. Space 36.

Walworth Manufacturing Company, Boston, Mass.—Space 232.

Ward Equipment Company, New York, N. Y.—Car heating apparatus. Complete locomotive steam heat equipment, including reducing valves, starting valves, steam heat gauges and steam couplers with locks. Complete equipments for heating all classes of cars, both steel and wood. Direct steam systems. Ward's ideal heating system, end train line valves, automatic steam traps, steam couplers and special fittings. Ward's car ventilator and Ward's yard plug and car receptacle for charging storage batteries on electrically lighted cars. Represented by John E. Ward, Alfred W. Kiddle, George B. Culver and Richard Voges. Space 462.

Watrous Company, The, (not inc.) Chicago, Ill.—Car water closets; wash stands; and other sanitary specialties. Represented by E. G. Watrous and S. D. Barnett. Space 316.

Watson Insulated Wire Company, Chicago, Ill.—With Kerite Insulated Wire and Cable Company. Represented by J. V. Watson, B. L. Winchell, Jr. and R. A. Patterson. Space 413.

Watson-Stillman Company, The, New York, N. Y.—Shop jacks; wrecking jack; journal box jack; outside and inside pump and independent pump type jacks; telescopic motor lift jack; portable hydraulic beam punch; hydraulic T rail bender; 125 ton crank pin press; 200 ton motor-driven hydro-pneumatic wheel press; 30 ton portable axle bearing press; portable shaft straightener; 4 twinvolute turbine pumps in operation; working model Chambers locomotive throttle valve. Represented by Geo. H. Gillon, Frank Clark, Edwin Stillman, H. A. Prindle, Austin Stillman, Chas. Howells, J. O. Meeks, Richard Baker and A. Eugene Michel. Space 401.

Waugh Draft Gear Company, Chicago, Ill.—Full sized draft gear, 600,000 pounds capacity, as applied to steel underframe cars; two full sized cased gears, 250,000 and 450,000 pounds capacity. Represented by Anson L. Bolte and Samuel T. Rowley. Space A.

Welsbach Company, Gloucester, N. J.—Incandescent gas lamps for railway station, yard and shop lighting; incandescent gas mantles. Represented by Chas. W. Wardell. Space 11.

West Disinfecting Company, Inc., New York, N. Y.—Soap dispensers; disinfectants; disinfecting appliances for toilet rooms; fumigating apparatus. Represented by E. Taussig, Geo. L. Lord and Chas. F. Pierce. Space 426.

Western Railway Equipment Company, St. Louis, Mo.—Acme brake slack adjusters; Western sill and Carline pockets; Western brake jaws; Republic draft gear; Acme pipe clamps; Linstrom eccentrics; Linstrom syphon pipes; Western flush car doors; interchangeable car doors; Western angle cock holders; Hoerr car doors; St. Louis flush car doors; Security dust guard; Downing card holders; Economy slack adjusters; Western bell ringer; car door fastenings; fish hook tie plates; brake pins and tie dating nails. Represented by Louis A. Hoerr and S. H. Campbell. Space 372.

Westinghouse Air-Brake Company, Pittsburgh, Pa.—Seven-car passenger train rack, operative, equipped with the P. C. equipment; in connection with this rack is an electric sign showing braking power and deceleration curves for the purpose of comparing the P. C. equipment with the high-speed equipment in the stopping of modern passenger trains; empty and load brake equipment as applied to cars operative; centrifugal dirt collector and suction demonstration. Represented by A. L. Humphrey, J. R. Ellicott, E. L. Adreon, E. A. Craig, W. V. Turner, C. F. Street, H. F. Woernley, C. C. Farmer, F. V. Green, W. S. Bartholomew, C. J. Olmstead, S. J. Kidder and P. H. Donovan. Spaces 27 and 136.

Westinghouse Automatic Air & Steam Coupler Company, St. Louis, Mo.—Sample of their automatic air and steam coupler. Space 27.

Westinghouse Bureau of Publicity, Pittsburgh, Pa.—Represented by J. C. McQuiston, W. Barnes, Jr. Space 27 and 136.

Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.—Motors, controllers, transformers, switchboards and arc lamps. Represented by Chas. Robins, R. F. Moon, H. C. Mack and J. J. Dorney. Spaces Nos. 27 and 136.

Westinghouse Lamp Company, Bloomfield, N. J.—Incandescent lamps for all classes of railway service; tungsten and carbon filaments, two watts to five hundred watts. Represented by B. F. Fisher, Jr. Spaces 27 and 136.

Westinghouse Machine Company, Pittsburgh, Pa.—Le Blanc condenser and Le Blanc vacuum pump, turbine driven. Represented by E. H. Sniffen, E. Yawger, L. L. Brinsmade, H. Van Barcolm, C. H. Paine and H. P. Childs. Spaces Nos. 27 and 136.

Wheel Truing Brake Shoe Company, Detroit, Mich.—Abrasive brake shoes. Represented by J. M. Griffin. Space 423.

Whipple Supply Company, New York, N. Y.—Reception booth Represented by A. L. Whipple. Space 468.

Williams Company, J. H., Brooklyn, N. Y.—Drop forgings. Space 42.

Wilson Remover Company, New York, N. Y.—Varnish remover and instruments. Represented by I. McNeal Wilson. Space D 3.

Wood, Guilford S., Chicago, Ill.—Wood's flexible nipple end hose protector; monogram bracket and samples of rubber tiling. Represented by Guilford S. Wood and D. F. Jennings. Space 216.

Wright Wrench Manufacturing Company, The, Canton, Ohio.—Wright monkey and pipe wrenches. Represented by Geo. H. Kittoe. Space 23.

Yale & Towne Manufacturing Company, New York, N. Y.—Electric hoists, triplex chain blocks, I-beam trolleys, electric triplex hoists, padlocks, car door checks, night latches, builders' hardware. Represented by C. W. Beaver, C. H. Van Winkle, H. C. Spaulding, H. R. Butler, R. T. Hodgkins and W. C. Allen. Space 154.

M. C. B. REGISTRATION.

Anderson, Geo. T., Supt., New York Despatch Refr. Line.
Arp, W. C., S. M. P., Vandalia R. R.
Brazier, F. W., Supt. R. S., N. Y. C. & H. R. R. R.
Burnett, R. W., M. C. B., Can. Pac. Ry.
Burton, T. L., Gen. Insp., P. & R. R. R., C. R. R. of N. J.
Bussing, G. H., S. M. P. & R. S., Evansville & Terre Haute R. R.
Caton, S. W., G. C. I., Western Maryland R. R.
Chamberlain, E., Chairman Frt. Car Pool Lines, N. Y. C.
Chamberlain, J. T., Past Pres., M. C. B. Ass'n.
Chenowith, E. G., M. E., Erie R. R.
Clark, F. H., G. S. M. P., C. B. & Q. Ry.
Clark, M. Rae, G. M. M., Louisville & Nashville R. R.
Cleaver, F. C., S. M. P., Rutland R. R.
Coleman, Jas., S. C. D., Grand Trunk Ry.
Conally, J. J., S. M. P., D. S. S. & A. R. R
Cornith, A. B., A. S. M. P., A. & C. L. R. R.
Curtis, Theo. H., S. M., L. & N. R. R.
Dawson, L. L., S. M. P., Ft. Worth & Denver R. R.
DeVoy, J. F., M. E., C. M. & St. P. Ry.
Dickerson, S. K., Asst. S. M. P., L. S. & M. S. Ry.
Dooley, W. H., M. M., A. G. S. R. R.
Dow, Geo. N., G. M. I., L. S. & M. S. Ry.
Durburow, R. N., S. M. P., Penna. R. R., East. Div.
Eberle, Wm. F., Gen. Foreman, Penna. R. R.
Everett, Ira, Gen. For., L. V. R. R.
Fitzgerald, D. E., Asst. Gen. S. M. P., Frisco System.
Forsythe, Wm., Railroad Age Gazette.
Fowler, W. E.
Fuller, C. E., S. M. P., Union Pacific R. R.
Goodrich, G. P., M. M., Ft. Smith & Western R. R.
Gossett, C. E., M. M., Iowa Central R. R.
Gould, Jos. E., S. M. P., N. & So. Ry.
Hall, W. B., Mather Stock Car Co.
Hathaway, J. W., Genl. Car Foreman, Frisco System.
Hennessey, J. J., M. C. B., C. M. & St. P. Ry.
Hill, Jno., M. M., Minn. & St. Louis.
Hodgson, Jno., M. C. B., Grand Trunk Ry.
Hogarth, Wm., Supt. Car Dept. Cudahy Refg. Line.
Kalbaugh, I. N., S. M. P., Coal & Coke Ry.
Keegan, J. E., S. M. P., Grand Rapids & Indiana Ry.
Kellogg, W. L., S. M. P., C. H. & D.
Kinter, D. H., G. F. C. D., Monongahela.
LaMar, A., Gen. Car Insp., N. W. System.
Lane, F. W., The Times.
La Rue, Henry, M. C. B., C. R. I. & P. Ry.
Lentz, Jno. S., M. C. B., Lehigh Valley R. R.
Libby, J. E., Swift Ref. Trans. Co.
Luscombe, J. T., M. M. T. & O. C. Ry.
Maher, Peter, S. M. P., C. & A. Ry. & T., St. L. & W.
Manchester, A. E., S. M. P., C. M. & St. P. Ry.
Manning, Jas. H., S. M. P., D. & H. Co.
Martin, P. A., Supt. Equip., National Car Lines.
May, H. C., M. M., Lville. & Nashville R. R.
McFeatters, F. R., Supt., Union R. R. Co.
McWood, Wm., Past Pres. M. C. B. Ass'n.
McKenna, R. F., Past Pres. M. C. B. Ass'n.
McRae, J. A., M. E., Mich. Cent. R. R.
O'Donnell, T. J., Arbitrator, Niagara Frontier Inspection Ass'n.
Passmore, H. E., M. M., Toledo & Ohio Central Ry.
Peterson, A. F., M. C. B., Cold Blast Trans. Co.
Phillips, C., M. M., New Orleans & N. E. R. R.
Prescott, C. H., M. M., Spokane International R. R.
Ramsdell, T. M., M. C. B., C. & O. Ry.
Rockfellow, W. E., Gen. Car Foreman, N. Y. C. & H. R. R.
Ross, D. C., M. C. B., M. C. R. R.
Scheffer, F. H., S. M P., N. Y. C. & St. L. Ry.
Seddon, C. W., S. M. P. & C., Duluth, Messabe & No. Ry.
Seley, C. A., M. E., C. R. I. & P. Ry
Selloy, Samuel H., G. F. C. D., B. & A. R. R.
Smith, R. D., A. S. M. P., B. & A.
Smith, Willard A., Editor, The Railway Review.
Staley, H. F., M. M., Cairo, Clinchfield & Ohio Ry.
Stark, J. L., G. I. C. D., Hocking Valley.
Stiffey, S. S., S. M. P. T. & O. C. R. R., Zanesville & Western.
Swanson, C. N., Genl. Car Insp., A. T. & S. F.
Taylor, J. W., Secy. M. C. B. Ass'n.
Thomas, J. J. Jr., S. M. P., Mobile & Ohio R. R.
Thompson, W. O., M. C. B., N. Y. C. & H. R. R. Co.
Trimyer, H. L., M. C. B., Seaboard Air Line Ry.
Underwood, Sidney S., Chief Draughtsman, Grand Trunk Ry.
Wahlen, John, M. M., Montpelier & Wells River R. R.
Wallis, J. T., S. M. P., Northern Central Ry.
Westervelt, Jos., M. C. B., N. Y. C. & H. R. R. R.
Wildin, G. W., Mech. Supt., N. Y. N. H. & H. R. R.
Wright, R. V.
Young, C. B., M. E., Chicago, Bur. & Quincy R. R. Co.

M. C. B. GUESTS.

Beltzhoover, G. G., S. Agt., Pass. Dept., Penna.
Boyer, C. E., A. G. Car Insp., P. R. R.
Brown, David, Asst. Supt. M. P., D. L. & W.
Buchanan, T. P., T. F. A., M. K. & T.
Burns, Frank, M. M., Frisco System.
Clark, Harold, Care G. S. M. P., C. B. & Q. Ry.
Colkins, A. E., Chief Clerk to Supt. Rolling Stock, N. Y. C. & H. R. R. R.
Cornell, W. S., Pass. Dept., P. R. R.
Cratzer, C. A., Pass. Dept., P. R. R.
Croxton, D. T., President, Cuyahoga Valley Ry.
Donahue, D., M. C. B., A. G. S. R. R.
Egbert, Elisha, Eng., C. of N. J.
Feighan, W. C., Watch Ins., P. & R.
Fuller, Harry C., U. P.
Gardner, J. T.
Hatz, G. J., Shop Supt., U. P.
Hatz, Herbert.
Hyndman, Frank T., S. F. Bowser & Co.
Jackson, S., Secy., S. M. P., Penna. R. R.
Jett, E. E., M. C. B., Morris & Co.
Keegan, J. E. Jr., Chf. Draftsman, G. R. & I. Ry.
Keown, Robert, Jr., P. R. R.
Kimberley, H. D.
Kinney, M. A., M. M., Hocking Valley.
Leach, Henry L.
Maize, W. L., Pin. Agt., Phila. Rapid Transit Co.
Mechlin, Ernest F., U. S. Patent Examiner, U. S. Patent Office, Washington.
Murphy, James S., P. R. R.
McIlwain, J. D., Treas. Rwy. Club.
O'Brien, Jno. J., Sup. Car Dep., Terminal R. R. Ass'n.
Ogilvie, James, Insp. of Ry. Equip. & Safety Ap., Ry. Comm. of Canada.
Phillips, D. C.
Portner, W. H., G. C. I., C. N. O. & T. P. Ry.
Prescott, Dal. C.
Quigley, Joseph, S. M. P., Q. & C.
Ramsdell, T. M., Jr.
Russell, T. M., Gen. Car Inspector, C. H. D. R. R.
Schmidt, Edward C., Assoc. Professor Railway Engineering University of Illinois.
Summerskill, T. A.
Taylor, Clifford, Sec'y to M. C. B., C. & O.
Ten Eyck, W. E., A. C. R. R.
Weighe, John, Foreman Car Inspectors, West Jersey & Sea Shore Ry.
Wheeler, C. H., Sup. Air Brakes, L. S. & M. S.

VALUABLE BOOKS FOR MECHANICS.

Since 1891 the publishers of the International Library of Technology have been engaged in preparing the instruction papers of the International Correspondence Schools, Scranton, Pa., of which they are the owners. These instruction papers, prepared and revised with great care, embody those applications of science to industry that constitute the best American engineering, shop, field, mine and laboratory methods. The difficulties of obtaining this material and the expense of preparing it for publication have been great. The best technical experts have been employed, constituting an unequaled corps of practical, scientific writers. The work was illustrated by a special staff of artists and draftsmen.

After an expenditure said to be over $1,500,000, the publishers offer this practical technical library for sale. It comprises the advanced and technical papers of the International Correspondence Schools, carefully arranged and indexed for ready reference. Ninety-nine volumes are now ready, which cover the leading trades, professions and industrial sciences, and include some 50,000 pages and 25,000 special cuts, drawn in outline, section and perspective, and printed in black and white and in colors.

That I. C. S. textbooks differ in many respects from regular textbooks is proved by their popularity and the enrollment of over a million and a quarter students desiring to use them. The regular school and college textbook deals more or less exhaustively with a subject or subjects, and covers practically the same ground as any one of half a dozen or more other textbooks on the same subject. The aim of the author of such a textbook is to produce a work that may be used by all who wish information that would naturally come under the heading under which the book would be classified, and he is not at liberty to restrict the scope of his book by leaving out sections ordinarily included in work of this character. In the I. C. S. textbooks, the student is given exactly what he wants and needs in connection with the particular line of study he desires to pursue. If he wishes to become a fireman of a stationary engine, and hopes that later he may become an engineer and perhaps have charge of a steam plant, he is offered a course of study suited to his requirements. The textbooks he uses have all been written especially for use in that course. The plan is to give every student exactly what he wants through textbooks with which the student can obtain the information in the shortest possible time. Each course thus has its own series of textbooks written especially for and adapted to it.

INSULATION OF STEEL PASSENGER CARS.

In the many articles describing steel passenger cars, little has been said of insulation. The Master Car Builders' Committee on Steel Passenger Cars, reporting in 1909 said:—"The whole question of material for inside finish, from the standpoint of insulation against heat and cold, has not been thoroughly worked out and is a subject to which manufacturers should give prompt attention, looking toward a speedy production of a serviceable product that is permanently fireproofed." Insulation against excessive noise in operation is also a factor to be considered, because a steel car without proper insulation will be colder in winter, hotter in summer and noisier all the time than a wooden car. This is based on the fact that both heat and sound are more readily transmitted through metals than through wood, although the latter does not rank high as a non-conductor.

A wooden passenger car would be a much more comfortable vehicle if well insulated. This being true, it is certain that the proper insulation of steel equipment for all year comfort, economy in heating and noiseless operation, is a necessity. It is equally certain that this has not been attained or even approximated in the majority of cars in operation today. Materials that have been tried can only be described as experimental.

The problem is serious enough to justify some modification of design, so as to permit more uninterrupted insulation. For instance, a semi-elliptical roof can be wholly insulated while a double-deck roof cannot.

In dealing with steel car insulation it must be borne in mind that the resistance of different substances to heat energy, and the rapidity of heat transmission through those substances is dependent upon their solidity. The most perfect insulators are materials which are filled with minute air cells, and experience has shown the high efficiency in quilted flax fibre, although cork board and mineral wool board, properly prepared, rank high.

Since the first steel passenger cars in the country were placed in service on the Illinois Central suburban trains in 1903, there has come some demand for fireproof construction throughout, practically confined to lines operating through subways, and into New York City through tunnels under the river. This demand for fireproofing extends to the insulation, although it would seem unnecessary considering the fact that the insulation may be enclosed in the shell of the car and protected by steel sheathing on both sides. The insulation problem of combined efficiency, light weight, durability and ease of application is simple without fireproofing, and has been solved by quilted flax fibre. Fireproof materials with some flexibility, which tend toward easy application, are produced, but lack both efficiency and durability. It seems certain that a fireproof insulation having both efficiency and durability must lack flexibility and be applied with steel or band iron ties. Not less than one inch of insulation should be used to obtain satisfactory results. When it is remembered that a steel passenger car weighs over 100,000 lbs., and efficient one-inch fireproof mineral wool board weighs only 1¾ lbs. per sq. ft., the weight of the insulation is a small matter.

One important point must be observed. The sills, posts, plates and carlines are all conductors of heat and sound, and under present designs cannot be insulated, emphasizing the necessity for extraordinary insulation on all other surfaces of the car. Inefficient insulation, even though fireproof, is useless for the purpose designed, and the expense of replacement or repair prohibitive for obvious reasons. Good insulation is good insurance and has but a first cost. The Union Fibre Company, Winona, Minn., has given this difficult problem particular attention for two years. Steel car linofelt and fireproof steel car lith have been designed especially for the requirements of steel passenger equipment and have been tested and found satisfactory. Both materials are on exhibition at space No. 448.

NEW QUICK DUMPING ORE CAR.

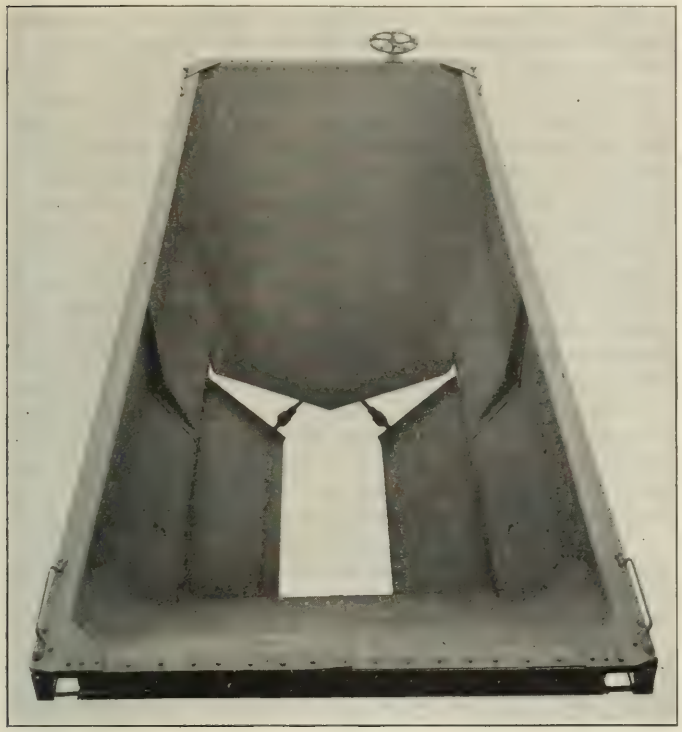
The development of cars to meet modern requirements of transportation of ore from the mines to the docks at points on the Great Lakes, and the unloading of the ore from the cars into the vessels, has been considerably hampered by the permanent and expensive construction of docks with pockets at regular short distances corresponding to those between the hatches on the vessels. Old wooden cars were built in accordance with these dimensions, which cannot now be changed without building new docks and changing the vessels, both of which are impracticable, as they would destroy interchangeability. This necessitates confining new cars to the same length and to nearly the same width and height as the old equipment.

Builders and designers of ore cars for this service are therefore required to work in accordance with strict instructions. These restrictions, together with the comparatively limited knowledge, immediately following the introduction of steel cars, as to the strength and endurance of steel in car construction, naturally resulted in the building of cars not especially adapted to rapid unloading. The question of a reduction in time and labor required to unload the cars has recently become of more importance. This is largely due to labor difficulties, but also in order to effect a more rapid unloading of vessels, as well as less detention of the cars. The railway companies have permitted a number of variations from the old standard dimensions, which permit more ideal ore car construction.

The Pressed Steel Car Company, Pittsburgh, Pa., has just completed a sample car, representing a lot of 300 which it is building at its Chicago plant, the Western Steel Car & Foundry Company, Chicago, for the Duluth & Iron Range and the Duluth, Missabe & Northern. This sample car, shown

in the accompanying illustrations, is of all-steel construction, with the following general dimensions:

Length over striking plates	22 ft. 1 in.
Length inside of body	18 " 1¾ "
Width over side sheet	8 " 7 "
Width inside of body	8 " 6½ "
Height from rail to top of side	9 " 6 "
Height from rail to center of draw heads	2 " 10½ "
Length of door openings	6 " 7¾ "
Cubic capacity, level	686 cu. ft.
Cubic capacity, 10-in. average height	802 "
Rated capacity	100,000 lbs.
Maximum capacity	120,000 "
Weight of car and trucks, empty	32,700 "
Ratio of paying freight to total weight of loaded car	78.6 per cent.



Top View, Showing Doors Open.

The car is of single hopper center dumping type, and in order to make it self-clearing, the area of the bottom opening has been made very large, being about 50 sq. ft. The slopes of the hopper sheets are very steep, being 50 degs. from the horizontal at the ends and 60 degs. at the sides. These conditions were made possible without materially reducing the carrying capacity of the car, by increasing the height and width, reducing the wheel base of the trucks and increasing the distance between their centers.

The opening is closed by two doors hinged at the sides, which form a part of the vertical sides, so that when opened part of the side as well as the bottom falls away from the load, thus making a large unobstructed opening, reducing the chance of bridging to a minimum. The doors meet on the center line of the car and each is supported by two six-in. channel doors, to which the door operating gear bars are attached. The door gear may be operated from either side of the car. It is so arranged that when the doors are closed and the car is loaded there is no strain on the winding gear proper, so that the supporting mechanism is self-locking and the load tends to keep the doors closed. This is accomplished by cranks which turn over a dead center into a position of rest. The doors are connected to the cranks by heavy rods with screw attachment for adjustment, thus preventing stretching and leakage of ore in transit. Gears of this kind have given good service on coal cars and have the further advantage that when the doors are frozen so that they cannot drop by gravity they can be forced down by the connecting rods.

Another feature in connection with the door gear is a positive safety device which will prevent injury to the operator when opening the doors. To operate the doors the usual wrench is applied to the square end of the operating shafts. The crank arms are revolved by block clutches having clearance of half a revolution, which permits the cranks to revolve, after having been brought over the dead center, sufficiently to fully open the doors without moving the wrench in the operator's hands. After the doors have been open the clutches are in proper position for closing them, with no lost motion.

In a recent test made at the Clinton Furnaces at Pittsburgh, Pa., the sample car was loaded with 100,300 lbs. of wet ore and unloaded by one man. The time consumed by the ore in leaving the car was eight seconds. No ore remained in the car and no poking or hammering of the sides to loosen it was necessary. The car was afterwards loaded with



Self-Clearing, Quick Dumping Ore Car.

68,000 lbs. of steel punchings. This load was placed directly over the doors, and although this was a very severe test of the efficiency of the door gear, there is no sign of weakness or leakage. This car is now on exhibition on the track of the Philadelphia & Reading R. R., Mississippi Avenue, and will remain here during the convention.

HIGH SPOTS IN THE LIFE OF THE DAILY.

BY FRANCIS W. LANE.

"The nomadic habit of publishing a daily paper in half a dozen states in as many years has its charms and its excitements; but it is exhausting. Daily newspapers were not intended by Providence as articles of baggage."

These feeling remarks are found in an editorial paragraph in one of the issues of the *Daily* in its eighth year. Many of the forms of excitement that had appeared up to that date were peculiar to the comparative newness of the enterprise, the positive lack of capital and the inadequacy of facilities that could be found abroad or that could be transported from home. It is believed that no confidence is violated in the statement that the least of the early work of the office shears was that of manicuring bonds. At the time of the publishing of the first *Daily* by the *Northwestern Railroader*, that paper itself was only two months old, and its editor and publisher had only that length of experience in the publication of a railway paper. It was a heroic, not to say reckless, enterprise.

The daily that is now the *Daily Railway Age Gazette* is, and always has been, unique. The conditions under which it was started and under which it has been published for 24 consecutive years—with some extraordinary interpolations —were different from those which have surrounded the building of any other daily paper ever published. Not only this, but these conditions have changed with almost every year, and sometimes, in the early days, twice a year, even to the city or town (or "place," perhaps) of its publication.

Though the *Daily* has spoken for itself in tones which were not uncertain, even though their reproduction in printed form sometimes left something to be desired in the way of clearness, yet because of the ever-changing conditions under which it was brought out from year to year, there is a vast unpublished history of events which have had an influence upon the product. Most of these are forgotten even by those who were most thoroughly mixed up with and by them. Some of them which are remembered seem to be of passing interest to the special section of the public to which the efforts of the paper have been directed. It is the purpose of the present chronicle to tell some of the interesting and amusing incidents in its twenty-four years of life.

The *Northwestern Railroader* first appeared, as a weekly, in Minneapolis on April 8, 1887, under the direction of Harry P. Robinson, editor, and W. P. Hallowell, Jr., business manager. The first published mention of the *Daily* was on June 3, when the *Northwestern Railroader* announced its intention to honor the meetings of the Master Car Builders' Association in Minneapolis on June 14, 15 and 16, and of the Master Mechanics' Association in St. Paul the following week, by the publication of two daily issues each week in addition to the regular weekly issue on Friday. For several years, or until the associations happened to meet in places where printing facilities had been created sufficient to enable the publication of a paper without utterly depleting the home office of type and furniture as well as editors, the regular weekly edition of the paper was combined with the last issue of the daily for each week and thus published away from home.

In the first two numbers of its first issue the *Daily* had the facilities of its home office. The paper consisted of two special numbers with eight pages of reading matter and four pages of advertisements. Apparently, there was not a large amount of discussion in the convention, or stenographic and printing facilities might have failed. The first number consisted largely of the reports on couplers,—then and for some years a very live topic—and on air brakes, the latter report being based on the famous Burlington tests. The second half of the issue, published in St. Paul, consisted of two numbers, each of four pages of reading matter and four pages of advertisements. The office was a desk in the lobby of the Ryan Hotel. It was found desirable to publish in one of the daily issues, as well as in the weekly of the preceding week, the complete constitution of the Master Mechanics' Association—possibly because it was easy copy and could be set in advance. Nevertheless, on July 1 the editor took a fall out of a contemporary who was promising to speak of the conventions next week, and gloated over the fact that he had already more than a week before published everything about them "from the alpha of convenement to the omega of adjournment," and had placed it in the hands of the members on the day following the event.

In 1888 the *Daily* began its first annual 1000-mile anabasis with Alexandria Bay as destination. It took along five members of the staff—two editors, a stenographer, and two business representatives—together with a small but varied assortment of type and printing office furniture. The slogan this year was, "Our light will not be hidden under a bushel." It came near suffering eclipse, however, in the darkness engendered by the fact of the location of the nearest printshop at Clayton, 13 miles away as the crow flies, and with no means of communication but the crow except by boat. The plant was described when recollection was fresh:—

"The plant on which we were compelled to print was still in a printing-office only because it was so worn out that there was not enough of it left to be worth selling. That year we killed a foreman and spilled much blasphemy."

The paper was generally some hours late, owing to what were euphemistically described as "certain mechanical obstacles." The editorial rooms were a table in the office of the Thousand Island House. The first number, each number consisting of seven pages of reading matter and five pages of advertisements, commented feelingly upon "the great and holy purpose" enunciated by the associations of confining their work within one-session-a-day limits, since evening sessions were an abomination in a place where evenings were pre-ordained by Providence to be spent in the open air and idleness. The evenings and nights of the editorial staff, however, were spent in a place evidently under the preordination of the opposite controlling influence. When, later, a prominent superintendent of motive power said:

"I believe you fellows would print your daily paper in hell if our meetings were held there," the only possible rejoinder was, "Of course we would; we've done it!"

It was in connection with this meeting that some comment was made upon the anomaly of holding railway conventions 13 miles from the nearest railway, and expression given to the doubt if the experiment would ever be repeated. But it was, in 1895. The same glorious evenings were still there. The same print-shop was still there with seven years' added decrepitude.

In 1889, in keeping up its record, the *Daily* was forced to double its pleasant exertions. The Master Mechanics held their convention at Niagara Falls and the Master Car Builders held theirs at Saratoga. It was bad enough to have to print a paper at all at Niagara Falls. Owing to the necessity, also, of getting out a regular weekly edition on Friday it required something of a "hump" to pack up and get the stuff removed and redistributed at Saratoga in time for another paper early in the week. Part of the hump consisted of a special train of an engine and one car. These various compulsory wanderings are marked in the paper

itself by considerable diversity of type faces, from the nice, clean-faced type carried from Minneapolis to the moth-eaten and charmingly diversified metal of a country shop. Varieties of paper occasionally appear in the same issue. This was not for the same reason that magazines are so made up at the present day.

In 1890 both conventions went to Old Point Comfort. If they had not united to this extent it seems possible at this pessimistic distance that one or other of the associations would have missed its "Daily." The printing-office at Old Point was not at Old Point at all, but at Hampton, four miles away, at the government training school, where young Sioux and Seminoles were instructed in the various arts of peace, including type-setting. The whole wigwam, as Wilson tersely stated (and did more tersely), was "annexed," and the paper got out with a variegated assortment of red, black and white labor, and with a somewhat similarly varied assortment of type. The means of communication between Old Point and Hampton were rather precarious, but it is possible that the difficulty of getting away from the printing office may have mitigated the hardship of staying there. On a later occasion there were found to be certain advantages in the presence at the school of a large supply of colored labor. But that story shall have a paragraph to itself in its proper place.

In 1891, at Cape May, frivolous editorials were written from the Mayor's official chair. His office was the editorial room. The real convincing editorials about the Cape May conventions and some of the features of them which appeared on settling day at the hotel were not written until later, when efforts were in progress to induce a repetition of the visit. Those would have been likely to melt any other type than that which had been so well seasoned in divers places. In 1892 began the pendulum-like movement of the associations which brought them to Saratoga in alternate years. About this time local printers began to sit up and take notice of the *Daily*, and saw that it would be good to ameliorate the conditions under which it was published and to recognize it as one of the features of the conventions to which it might be well to pay some attention. But they did not at once sit up so hard as to bump the ceiling. This year also marked a little eccentricity in the paging of the paper which was perhaps noticed by a few of its patrons. For the sake of better press work on the outside sheets and to save time, the covers were printed in advance. It was surmised in advance that the back cover page should be numbered about 20. It was so done. Unfortunately, reading matter could not be set to bring the pages up to more than 16 in some of the early issues. The gap between 14 and 19, however, was not so perplexing as the effect of this fixed final 20 in later issues when there was a surplus of matter, some of it of the kind that could be, and was prepared in advance. It always did cause a startled look when one had read pages 19, 20, 21 and 22, to find himself back again at 19 without tergiversation on his part.

But the characteristic feature of the 1892 convention, so far as the Master Mechanics' Association was concerned, was the presentation of the historic report on compound locomotives. So far as the *Daily* was concerned, the publication of that report was not only a feature, but pretty nearly the whole face and figure. The report came in late—Friday or Saturday—and the type, cuts and long tabular matter were in New York. When the reproduction appeared as a big 18-page supplement to the appropriate issue of the *Daily*, the Sabbath had been badly broken, the publishers were nearly so, and a bunch of dazed printers in New York and trainmen all the way from New York to Saratoga were wondering whether any Czarish ukase could have been printed and promulgated with more incessant and unrelenting vigor. The fine Russian (or "rushin'") hand of one Wilson was solely responsible. But the report appeared at the proper time, notwithstanding the previous and probably unavoidable official delays. It was particularly acceptable on account of a shortage of the official reports.

In that year the column heading "On the Verandah" will convey a notion of the extent of the exhibit of the supply interests. This meant the verandah of Congress Hall. Later the lawn in the court of the hotel was laid claim to for this purpose. In that year, also, "Conventionalities" for the first time appeared as a distinct department of the *Daily*, but not then had the enterprise grown so successful as to suggest anything lavish in the line of jokes. The men behind the guns felt more like murmuring quiet thanksgivings that nothing was any worse than it was. In that year the publication became the *Daily Railway Age*, consolidation with the *Northwestern Railroader* having taken place in the latter part of 1891.

The *Daily* of 1893 was edited at Lakewood, N. Y., and printed at Jamestown. By this time the movable staff had increased to three editors, one stenographer and four business representatives. Since the consolidation of the two papers, also, there was sufficient available staff material to warrant leaving some of it at home to get out the weekly. For the first time the editors shook hands with themselves over the creditable appearance of the press work; but, alas! for human vanity subject to the vagaries of a country print-shop! Page 5 of one issue contains the self-congratulatory editorial on the beautiful presswork; page 12 bears some resemblance to an impression from a printer's case struck by lightning. Yet, "about this time," as the almanacs used to say, the resolutions of thanks from the associations, which the publishers felt in duty bound to print as a means of tipping over the bushel that might have obscured their light, began to become so numerous as to make their repetition almost painful. One or two jokes came to maturity this year, and were not refused space.

In the year of our Lord 1894—except that the last day of the conventions was evidently under some other jurisdiction—the first labor trouble arose. It was supposed in all innocence of heart and purity of mind that every kind of grief except lightning stroke and snake-bite had been endured, and that with comparatively little complaining. But when the last day's issue was in the printing office and the work was so nearly finished that settlements were being made with the compositors who had been gathered in from New York, Albany and elsewhere—the pendulum had swung back again, and we were at Saratoga—it was discovered that some of these men, "charming fellows, all of them," the editor said, had been assiduously "doctoring their strings," which in newspaper parlance means doping their records to make it appear that they had set more type than they had. It was impossible to separate the sheep from the goats, and they were all turned out bleating and "meck-meck"-ing into a cold world. The jail, almost next door, yawned for them, but it would have caused a delay to take the preliminary steps toward putting them there. On that day it was fine that the bulk of the "must" matter was in plate form—reports, etc., which had been prepared before leaving Chicago. With the assistance of the foreman, who was not implicated in the attempted steal, and availing of some experience in emergency type-setting necessarily acquired in previous years by some of the staff, editorial and miscellaneous matter to the amount of one page was set, the stenographic report of the last day of the convention was boiled down to two-thirds of a column, and a 20-page paper appeared as usual next morning.

(To be continued.)

Before the advent of the locomotive in France between the years 1823 and 1827, railway concessions were first granted with a view to provide improved communication between the centers of production and the waterways of the Loire and the Rhone.

STAFF'S DREAM.

A sort of serio-comedy, in two parts—top and bottom (water on the side).

Mould, Before and After Pouring.

Staff.....B. E. D. Stafford
The Comet.....Halley
Jim.....Nat Tube Goodwin
Youngster.....Dave Champion's Son

First and Second-Story Men, Listeners, Butters-In, Reminiscencers, Jokers—real and thought-so's.

Time: Foremen Boiler Makers' Convention.

Place: Niagara Falls.

Act I.

A room below stairs; tables; chairs; numerous bottles, etc. (principally, etc.); the full company.

Jim: Well, Staff, it's up to you. We're all in.

Staff: Boys, I'm going to tell you a dream I had last night: I went to bed rather late and had just dropped off to sleep when the telephone bell rang. I didn't think it was time for the morning call, so I jumped out of bed and grabbed the receiver.

"Well?"

"Is this you, Staff?"

"Yes; who is it?"

"Why, this is Halley."

"Halley? Hell-oh! Halley who?"

"Why, Halley, the comet man."

"Oh, is that you, Halley? How are you? What brings you around?"

"I understand the boiler foremen are having a convention. Know anything about it? Thought I'd come if there is a good crowd."

"Yes, there is a convention, and the crowd is all right; but what has that got to do with you, Halley?"

"Well, I'm something of a boilermaker myself."

"A boilermaker? What have you ever done for the boilermakers, Halley?"

"Why, don't you remember, I fixed up the first locomotives about 75 years ago—the last time I was here."

"No, Halley, you can't prove it by me; but if you did, you fixed the locomotives all right, so as to keep the boilermakers busy. But what are you going to do for them this time, Halley?"

"Why, Staff, you ought to know. I've done it already."

"Put me next."

"Haven't I given them the Tate flexible staybolt so as to make it easy for 'em?"

"I'm on, Halley; I'm on. You're all right, and I know it. But say; what do you want to haul a fellow out of bed for? O, excuse me, Halley, you're another night owl. I see."

"No, Staff, I've got a message I want you to give the boys. I've been holding back this comet to show it for the first time at this convention. I know a lot of the boys will be sitting up and I will show it for the first time over Niagara Falls tomorrow night. Get busy. Goodby."

Youngster (as he bounds into the room as Staff finishes his story): Halley's comet! The comet is in sight. Come, quick! Come up on the roof! The comet is right over Niagara Falls!

Act II.

Scene: Partly 60,000,000 miles away and partly on the roof, which only seems so (the elevator is not running).

First and Second-Story Men, Listeners, Butters-In, Reminiscencers and Jokers: They at first hesitate, and then have followed the youngster to the roof. The Comet appears R. U. E. in all the glory of a safety match.

Problem: Did the boy lie, or what kind of glasses did the observers use?

Conventionalities.

Edwin Strassburger, western sales manager of the Buffalo Brake Beam Company, is paying his annual visit to the east to attend the convention.

F. C. Dunham, special sales agent, and E. D. Hillman, mechanical engineer, of the U. S. Metal & Manufacturing Company, arrived Monday.

C. A. Schroyer, superintendent car department of the Chicago & Northwestern, stopped off at Philadelphia on his way to attend the conventions, reaching Atlantic City Tuesday.

Fred Atwater, effervescing champion of lock nut fame, hit the Boardwalk Monday. He has since cornered enough sea breeze to last through the convention and will turn a little loose each day to help expound the cause of hale Columbia.

J. Bill Johnson, heap big chief of the entertainment committee, is certainly up aginst it this trip. He's got thirteen submittees (all alive; count 'em); and has actually put a Farmer in charge of those who will run tonight's M. C. B. reception affair!

J. F. DeVoy, carrying as quietly as he can and withal very modestly, his recent honors—the title of assistant superintendent of motive power and the presidency of the Western Railway Club—put in an appearance on Tuesday, and registered among the first.

It is confidently asserted that C. A. Seley, mechanical engineer Rock Island system, has recently amassed more information—and mis-information—about safety appliance matters than he would be able to present to the association, even if there were three sessions a day instead of two.

All conventionites not satisfied with the weather are officially advised to register their complaints with Albert T. Bell, ex-president of the Atlantic City Hotel Men's Association. It was "nominated in the bond" by Mr. Bell that the weather would be perfect for two weeks, beginning this morning.

Friends of W. E. Fowler, past president of the Master Car Builders' Association, whose resignation from the Canadian Pacific on account of ill-health we were unfortunately obliged to note last year, has sufficiently recovered his health so that he is enabled to be with us this year. Mr. Fowler accompanied by Mrs. Fowler and the Misses Fowler.

J. J. Hennessey, exercising equally an efficient guardianship over the car department of the Chicago, Milwaukee & St. Paul, and over matters of repair in interchange as the chairman of the arbitration committee of the Master Car Builders' Association, was among the members of the Old Guard who were early to register.

Ladies in attendance at the ball of this and next week will appreciate the thoughtfulness of the entertainment committee in providing the attendance of maids in the ladies' dressing room, who will render any required attention during the evening. It should be remembered, however, that such attentions will be available only to those who are provided with the proper badge.

This is the week when Tom Aldcorn gets in his work with Chicago Pneumatic drills on the pockets of representatives of exhibiting companies. It has been suggested that he make the job more thorough by afterwards calling in the assistance of some of the numerous vacuum cleaners to gather up any dust that may escape his first investigation.

One Brazier, whose full name is Fred. W., is one of the decreasing number of men in the mechanical associations who

admits that he is a car man first, last and all the time, and not only admits but claims it. (The fact that Mr. Brazier says he was born and learned to eat "pi" in a Boston printshop is the only necessary apology for seeming to use his name with undue familiarity in view of his dignity as a past president.)

"Whistle and I'll come to ye, my lad," is the way one of the earlier poets expressed the compelling influence of puckered lips. On Wednesday evening the invitation will be presented in a more attractive form and a general acceptance on the part of the "lads" may be expected when Mrs. Alice Shaw, "la brillante siffleuse," who is understood to have been engaged at the suggestion of Mrs. F. H. Clark, will entertain at the Master Car Builders' reception at the Blenheim exchange.

It is related that Eugene Chamberlain, chairman of the freight car repair pool, New York Central Lines, and who arrived on Tuesday, has entirely forsworn since last year the use of safety matches of the kind in which the safety consists in the fact that they always go out just half way between the box and the end of a cigar. In talkative or thoughtful moods—he sometimes has them—he has been known to use half a box to one cigar.

Postlethwaite happened in the nick of time.

Poste's always physiological, any way.

It seems that some one located his best ever Ore car in the wrong state and the Exhibit Man of the *Daily* was tipped off accordingly. It got into type and would have gone further but for Poste who exacted a correction as smoothly as if it were an order for pressed steel cars. The compositor has switched Arkansas into Mississippi, and all is well.

Invitations to the receptions—the Master Car Builders' reception on Wednesday evening of this week and the Master Mechanics' reception on Monday evening of next week—have been mailed to every member whose name was on the lists of membership 30 days ago. For the benefit of new members, guests, and others who may be entitled to receive them, invitations will be inclosed in the envelope in which the badge is contained and which will be delivered upon registration, to all who register for the Master Car Builders' Association before 6 P. M. on Wednesday and for the Master Mechanics' Association before 6 P. M. on Monday.

Our railway and railway supply friends have their fads and fancies, just like the rest of us. Assistant General Manager Bracken, of the Union Fibre Company, is no exception to the rule. Next to his family, Mr. Bracken loves his books, his old prints and his etchings and the best place on earth, in his opinion, is his own library in the pleasant Bracken residence in Winona, Minn. Mr. Bracken was admitted to the bar, but gave up the practice of law to become assistant postmaster in the city of St. Louis. He has also seen railway service with the Merchants' Bridge & Terminal Railroad of St. Louis. In recent years he has devoted considerable time to the study of the constitution of the United States, purchasing so many authorities on the question at one time that, according to his friends, in order to avoid the family scowls, he evolved the successful scheme of smuggling the precious books under his coat and vest on entering his home at nights.

WEAR YOUR BADGE!

The Entertainment Committee announces that all members and guests will confer a great favor upon the committee and save themselves possible annoyance and inconvenience by wearing the official badge at all times prominently displayed.

The Exhibit.

Excelsior is the foreword of the Gold Car Heating & Lighting Company, New York, this year. This company's excelsior vapor valve, which can be used with or without drop, is worthy of inspection.

A. J. Gardner, Jr. and Thomas H. King, well known representatives of the Landis Tool Company, Waynesboro, Pa., are here for several days. They are particularly enthusiastic over the engine work being ground on the Landis improved grinders, and the possibilities for the extending use of grinding machines in railway shops.

Representatives of the Dearborn Drug and Chemical Works, Chicago, in attendance at the convention are George B. Carr, vice-president and general manager, and J. D. Purcell, vice-president, of Chicago; Grant W. Spear, vice-president and eastern manager; and H. G. McConnaughy, of New York, and A. W. Crouch, district manager, of Pittsburg, Pa.

The ball room and other floors of the pier are kept clean during the conventions by the frequent use of the Duntley pneumatic cleaner. These effective machines, which were almost a new invention a year ago, have, during the year, been introduced into every part of the country almost as commonly as brooms and with none of the disagreeable features of the operation of the latter.

The office of the Cowles-MacDowell Engineering Company, Chicago, has been moved from the Rector building to 1632-1634 McCormick building. This company installs hot water washout and refilling apparatus for round houses, and automatic vacuum heating plants for railway buildings. Irving Cowles is president; E. H. MacDowell, vice-president and treasurer; and Charles L. Sullivan, sales manager.

The Kewanee union requires no introduction to the mechanical men who have been brought together here by these conventions. The union, with no inserted parts, is known wherever unions are used. However, it is almost a truism that one cannot have too much of a good thing, and we, therefore, direct the attention of our readers to the exhibit of the National Tube Company, Pittsburgh, Pa.

The Independent Pneumatic Tool Company, Chicago, is showing a one-piece long stroke riveting hammer, the barrel and handle being drop forged. No coupling is required for holding the handle and barrel together and the manufacturer claims the trouble heretofore experienced from a leaky joint, causing loss of power, and delay on account of handles coming loose, is entirely eliminated. While this hammer is new and novel in construction, it needs no introduction, as they are in general use on railways throughout the country.

Among the journal boxes exhibited by The T. H. Symington Company, Baltimore, Md., this year is an electric motor truck box designed for the several hundred electric cars now being built for the Southern Pacific. The lid is of the Symington pivot type, with central spring pressure and machined joint. The pedestal ways are machined, making possible a close and parallel fit between the journal box and pedestals. The journal box shown is for a 5 x 9 journal, and weighs, complete with lid, 109 lbs. The light weight is a feature, and is due to the use of a special grade of air furnace iron manufactured by the Symington Company. It is claimed for this metal that it has from two to three times the tensile strength of good gray iron, and that, owing to its close grain, has very superior wearing qualities.

SAMSON SIGNAL CORD.

A very reliable and economical signal cord is that made by the Samson Cordage Works, Boston, Mass., which company makes extra quality braided cord of all kinds. Samson cord is made of fine, even yarn, braided hard and smooth. It is carefully inspected, and is guaranteed free from the imperfections of braid and finish. It is made in a variety of sizes and colors, with or without a wire center, for bell cord, air brake cord, whistle cord, engine bell cord, etc.



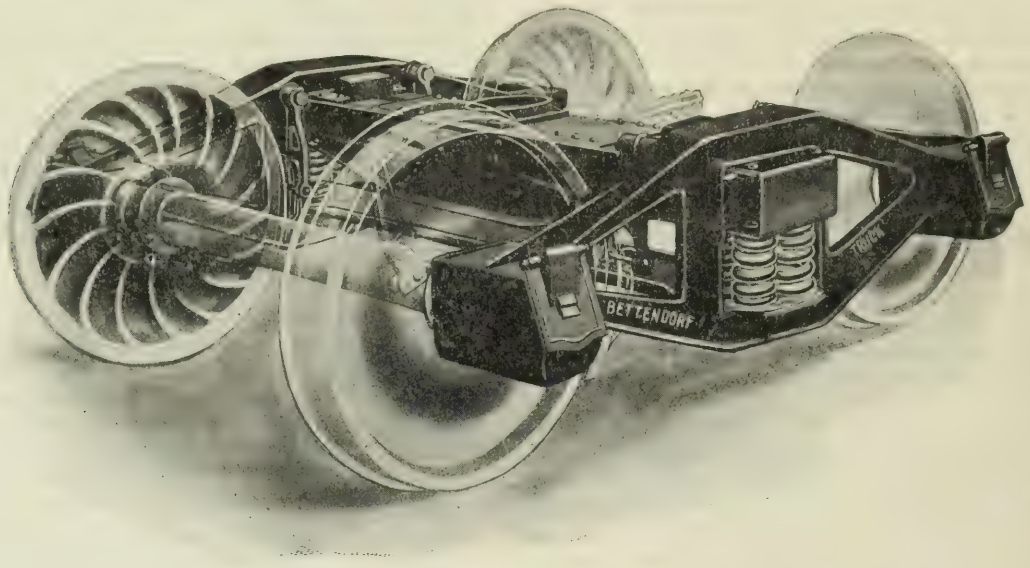
Samson Signal Cord and Trade Mark.

The manufacturers, the Samson Cordage Works, Boston, Mass., will gladly send samples and full particulars on application.

The truck frame is so built so as to be interchangeable with any standard truck frame. Any width of wheel base, design of journal box, height of bolster opening, etc., are possible without interfering with the general feature of the design. A distance of at least 4 in. is obtained between the lower arch bar and the top of the rail. It is claimed that the frame will skid along the roadbed in case of derailment, and not tear up the track, since there are no loose bolts, nuts and parts of the frame to catch on the ties.

The journal boxes are cast integral with the frame, and of any standard design. There is a lug on the bottom of the journal box which may be used for jacking up when the truck is under a car.

The bolster openings are of the shape illustrated for the rigid bolster. The design of Barber roller construction and swing motion bolster provide straight column guides. There is a hole cast in the bottom arch bar, on which a projection on the spring plank is secured. In this way rigidity is overcome to the extent that the truck is adjustable to track irregularities, and at the same time flange wear on wheels and end wear on brasses are reduced to a minimum.



Freight Car Truck with Bettendorf Cast Steel Truck Frames.

BETTENDORF CAST STEEL TRUCK FRAMES.

The first step in the manufacture of cast steel truck frames is to set a metal of the requisite composition. Basic open-hearth cast steel is used in the side frame illustrated herewith, and is of a composition which affords a high elastic limit. In a derailment the frames may be bent out of shape, but it is claimed that they do not break and, in most cases, may be straightened and put back into service.

The Bettendorf truck frame is a one-piece casting with arch bars, columns, spring seat and journal boxes cast integral with the frame. This construction gives a simple design which eliminates bolts and rivets. This latter feature is very important in truck frame construction, as there are no column and oil box bolts and nuts to become lost or broken.

Another important advantage is the reduction in weight which the one-piece frame affords. To illustrate approximately, these frames gave a reduction in weight of about 1,000 lbs. per car.

The distribution of metal is designed effectually to resist all stresses, allowing a high factor of safety, and so that the frame will carry a greater number of load pounds per pound of truck frame than the ordinary arch bar frame. This latter feature is not due entirely to careful designing, but also to the construction of the frames.

Each side frame is tested before leaving the Bettendorf plant, thus insuring the squaring of the truck frame. The number of operations required to assemble a Bettendorf truck is a minimum because of the small number of parts. The ease with which the assembling and dismantling is done is shown daily at the exhibit of the Bettendorf Axle Co., Davenport, Iowa, in space 200.

FORSYTH METAL DOORS.

Forsyth Brothers Company, Chicago, has for some time been manufacturing and furnishing the trade with a metal door in which not only the frame-work but the entire door, including panels, is formed substantially out of one piece of metal. It seems reasonable, that a door thus built is much stronger and more durable and economical than one composed of numerous parts, such as frame members, panels, etc.

In the Forsyth door there is no overlapping of metal sheets, which tends to retain moisture and start rust formations. Further, the forming of the panels and other parts of the

Forsyth door in one piece not only strengthens the latter for the same reason that corrugations formed in sheet metal do, but at the same time obliterates any inequalities in the metal, as well as strengthens the metal itself. The door is thoroughly protected from rust formation both inside and out; is reinforced throughout; and is sound-deadened. Notwithstanding the extra cost of manufacture of this one-piece door over a built-up one, Forsyth Brothers Company is offering it to the trade at a price which will compare favorably with that of other metal doors.

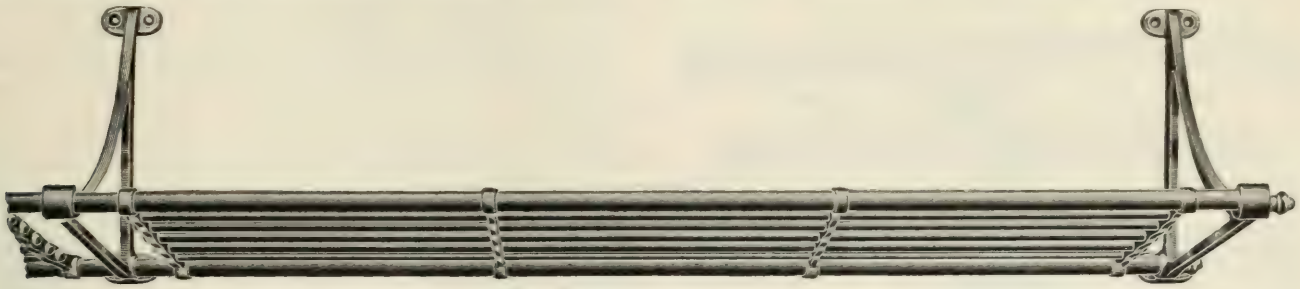
Among the companies on a large number of whose cars the Forsyth one-piece metal doors is being applied are the Harriman Lines; Chicago, Milwaukee & St. Paul; Hudson & Manhattan, and Interborough Rapid Transit (New York).



Forsyth Metal Car Door.

REMOVABLE BOTTOM BASKET RACK.

The removable bottom type of basket rack is becoming very popular on account of its adaptability to the varying conditions of passenger car service. In the same way that the continuous type has practically displaced the individual rack the removable bottom type is being rapidly adopted in place of the unwieldy non-removable bottom.



Removable Bottom Basket Rack, No. 262.

In the event of damage to any particular section of the old style continuous rack, it was necessary to remove all sections and brackets up to the affected part before it could be taken out for repairs or replacement. This is a very expensive proceeding, aside from the fact that whenever the screws are removed from the panel the holes are enlarged and require plugging, rendering them less secure each time, until there is danger of the rack breaking loose and allowing the contents to fall on the heads of passengers.

With the Adams & Westlake Company's patented removable bottom basket rack, it is only necessary to remove the damaged part and replace it with an interchangeable section; or put back the old one when repaired, without disturbing the brackets or the sections on either side.

The illustration shows this company's pattern No. 262, which combines the feature of quick removability with rigidity and security. This company has several different types of removable bottom racks to meet different requirements, both as to appearance and mechanical detail.

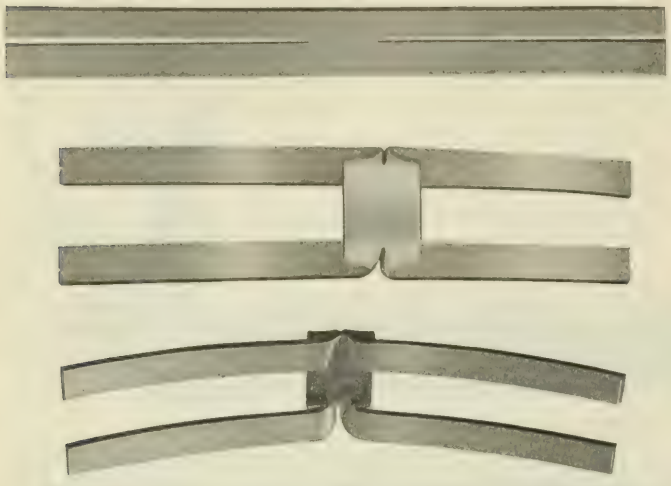
The Adams & Westlake Company, Chicago, manufactures a large variety and number of patterns of general car hardware, such as door locks, sash locks, sash lifts, seat fixtures, coat and hat hooks, vestibule fittings, etc.

DAVIS STEEL BACK BRAKE SHOE.

Great numbers of brake shoes are lost by breaking in pieces when the shoe is only partially worn, and new shoes are also lost by reason of the rupture of the thin portion of the lug through which the brake shoe key passes and against which the key presses. To overcome this difficulty, it has become common practice to cast rods and plates in the back of the shoes so that if the shoe cracks it will be held together by the wrought iron pieces. While these methods are an improvement on the old style plain shoe, it does not altogether preserve the shoe, and the rods are so thick as to make an undesirable combination.

The Davis solid steel brake shoe backs remedy these defects by reason of the back being made in one piece from a thin strip of metal (1½ in. x 3-16 in. x 15¼ in.) which, on account of its peculiar form, engages at all points with the iron cast about it. A cross section of the shoe at the center of the lug shows the full strength of cast metal; it is not cut through by plates or bars as in other devices; the Davis back arches up and over at this point. The strap forming the lug, and the forks forming the plate are in one piece, making it impossible for the lug strap to pull out. As a foundry proposition, Davis steel backs are perfect, being much

more readily placed in position in the mould than backs composed of several pieces. These steel backs may be seen



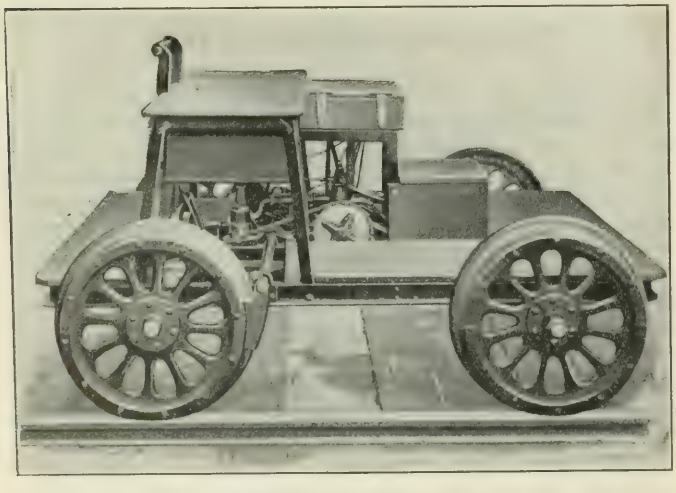
Steel Back of Davis Brake Shoe Before and After Being Pressed to Shape.

at the exhibit of the Davis Solid Truss Brake Beam Company, spaces 414-16-18.

ROCKFORD MOTOR CARS.

The illustration herewith shows the No. 8 Rockford motor car made by the Duntley Manufacturing Company, Chicago. This design of car is made in two sizes, No. 7 and No. 8.

The No. 7 car is the most powerful built by this company. It has 4-in. x 5½-in. cylinders arranged in pairs and opposing each other. Each pair acts on opposite ends of a single long piston and both pistons actuate a single pin which passes through the center of each and drives the connecting rod, necessitating but one throw in the crank. The use of four pistons in this manner insures the continuous application of power twice each revolution, with the care of only one bearing at each end and one connecting rod. The cylinders are air cooled, as the direct connection to the rear axle makes it impossible to run the engine without putting the car in motion.



Rockford No. 8 Motor Car.

A single carbureter is used, of a design similar to that of this company's No. 4 car. It is controlled by a single lever concealed in a depression in the seat deck and covered when not in use, as are the switches and compression relief levers. Of the latter there are two, making it possible to cut out either pair of cylinders when maximum power is not desired.

The frame is rigidly constructed of steel channels braced with angle steel. An ample running board deck for tools for a rail or two, or for other freight, is provided on each side of the central seat deck, which is similar to that of the No. 4 car and has a seating capacity of eight men. This deck, however, is noticeably different from that of the No. 4, in that all controlled levers except the brake are placed below the level, and consequently more protected from accidental damage. When not in use, the lids covering these and the battery and tool boxes may be fastened with a single lock, thus preventing tampering with the car in the owner's absence.

The No. 8 car is similar to the No. 7, except in the following details: The cylinders are 3 in. x 5½ in., the seats run transversely directly over the rear power axle, and will seat about five men, although it has ample power for a number of others standing. The construction of the No. 8 car, while very strong, is much lighter than the No. 7, as it is intended more for inspection for rapid traveling with a few passengers than short hauls of a heavy gang with tools, etc.

The No. 7, a 25-h.p. car, weighs 950 lbs., complete. It will run 40 to 50 miles an hour, and will carry eight to ten men with tools and other material. The No. 8, a 15-h.p. car, weighs 550 lbs., and will run 40 to 50 miles an hour.

THE BAROL LEECHES.

Don't fail to see the brown-skinned peaches,
The famous family of Barol leeches.
Born a million years ago,
They're the liveliest ancients in the show.
And if you want to see 'em squirm,
Just put 'em next to a nice fat germ.
Their name is Carbolineum,
Don't say it if you're chewing gum
And don't think they are only fakes,
But come around and see the snakes.

"Barol" is the trade name for a combination of carbolineum (a distillate of coal tar) and antiseptic copper in solution, used in the preservation of wood structures.

The U. S. Metal & Manufacturing Company, New York, is the general railway agent for this material, and full information can be obtained at booth 337.

DEVELOPMENT OF MICA LAMP CHIMNEYS.

As an illustration of the trivial events which frequently open new fields of enterprise, the development of the mica chimney business is an example.

A. P. Storrs, manager of the railway department of the Storrs Mica Company, Owego, N. Y., in a conversation with some friends, referred to this subject. It seems that he was president of the local gas company of Owego at the time that the Welsbach incandescent lamps were introduced in this country for use in gas lighting. He had one of the new lamps over his desk in the office of the gas company. This light happened to be located where a current of cool air was constantly in motion and the breakage of a chimney was a frequent occurrence. The annoyance of frequently replacing the chimney and often the mantle influenced Mr. Storrs to cast about for a means of preventing this trouble. He secured a large sheet of perfectly clear mica, rolled it into the form of a cylinder, put it on the light and had no further trouble. This suggested to him the possibilities of the mica chimney as a commercial proposition. He devised a practical construction whereby a permanent cylinder could readily be made of this material and started the new device among the gas companies who had already felt a need for something of the kind. Incidentally, Mr. Storrs remarked that on looking up the history of the use of mica it was discovered that it antedated that of

glass for lamp chimneys, as it is a matter of record that lanterns glazed with mica were part of the equipment of Columbus' ships on the occasion of his memorable voyage.

As some of the railway companies began to use the Welsbach lights for station and office lighting, the mica chimneys came to the notice of railway people. They called Mr. Storrs' attention to the fact that the consumption of chimneys on locomotive headlights and other oil lights used by the railways was very large and suggested the application of mica to this field. This was taken up and after repeated experiments Mr. Storrs devised a construction suited to this purpose which has come into wide use by the railways.

HOSE TROUBLES ELIMINATED.

The failure of hose used in air abrake or signal line service is not only troublesome, but it often causes expensive delays, and sometimes loss of life and property.

The exhibit of the Sprague Electric Company, New York, booth 322, is of sufficient importance to justify each delegate taking time enough to investigate the merits of the Sprague electric steel armored hose which is on exhibition. It is claimed that this hose is sufficiently flexible for all requirements, and that the evil effects of contraction and expansion are eliminated by the close-fitting steel armor, which also prevents chafing and kinking. This hose is made to stand a test pressure of 1,500 lbs. per sq. in. The standard fittings are secured by clamps to the shoulders on the nipple and coupling and thus blow-outs are prevented, and when the rubber deteriorates, the armor is designed to bind the rupture to such an extent that the air brake will not set.

CHAMPION RIVET COMPANY.

When the Champion Rivet Company, Cleveland, Ohio, began business over 15 years ago, it was a very difficult matter to interest users of rivets in its product, as the market at that time was almost exclusively in the hands of the manufacturers of iron rivets. However, with the advent of low phosphorus and low sulphur open hearth steel, the company was enabled to put on the market a rivet of superior quality. Its daily output is in the neighborhood of 200 tons of rivets per day. All its rivets are made from the highest grade of low phosphorus, low sulphur steel confined exclusively in its manufacture to the product of one large concern that works especially in this company's analyses. The product consists of rivets ½ in. diameter and larger, also air brake and coupler pins according to standard specifications.

W. H. S. Bateman attends the convention as representative for this company and also for the Parkesburg Iron Company, Parkesburg, Pa.

KARBOLITH FOR STEEL CAR FLOORS.

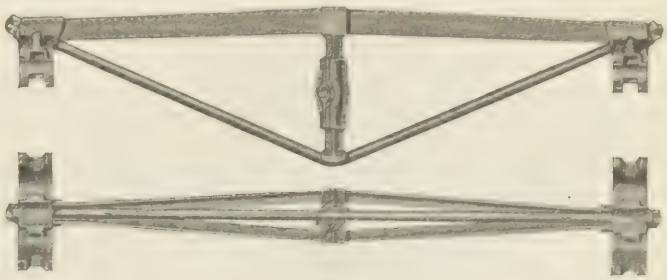
After several years of business in the steel car floor line, the American Mason Safety Tread Company, Boston, Mass., is now putting on the market a flooring composed of car Karbolith, which is a cement, very light, strong and fireproof, on top of which is put ¼ in. of Karbolith, which is very fine grain and has great wearing qualities, as well as non-slipping. This will last about as long as the car will, and will always look well. The top can be made almost any color, although red is preferable.

Another flooring is Karborundum Karbolith Surfacing, the underbody being made of Karbolith and the top, ¼ in. thick, of Karbolith with carborundum mixed through it. This has given excellent satisfaction in the cars of the Interborough Rapid Transit and the Hudson & Manhattan. The company has orders on hand now for several hundred cars of this kind, and reports that the greater part of the steel cars made up to the present time have its floors.

BUFFALO No. 400 DOUBLE TRUSS BRAKE BEAM.

The accompanying illustrations show the new No. 400 double truss brake beam of the Buffalo Brake Beam Company, New York. Tests of it show excellent results, both direct and transverse, and it should be entirely safe as regards buckling or doubling up in the center.

Samples of this beam, together with Buffalo solid and



No. 400 Double Truss Brake Beam.

special brake beams for passenger, freight, tender and electric service, may be seen at the company's booth, spaces 490 and 401.

CAR ROOFING.

A display of interest this year is the exhibit of a prepared canvas car roofing—the Bayonne roof and deck cloth—manufactured by John Boyle & Company, Inc., of New York, at their Bayonne, N. J., factories.

Cotton duck hos long been recognized as a most suitable car roofing, possessing the requisite tensile strength and flexibility. The one fault has been that paint applied to the raw duck has a tendency to burn the fibre, shortening the life of the roof.

This is overcome in the Bayonne process. Besides keeping the dampness out, paint is prevented from reaching the fibre, assuring longer service. Another important feature is that the treatment thoroughly permeates the fabric, so that there is no liability of peeling.

In this connection the report of Charles V. Bacon, analytical chemist, Bayonne, N. J., is of interest:

"I herewith render you final report on your Bayonne roof and deck cloth, which I have had under observation for the last several months, making in and out door exposure tests, and state substantially that as you have used neither raw nor boiled oil but especially prepared linseed oil scientifically treated and applied in such a manner as to practically become a part of the fabric, you have eliminated the features which are undesirable in the so-called oiled goods.

"Upon examination on the various colored materials, I find that the pigments are mainly natural oxides which are not affected by dilute acid or alkali and have the best wearing qualities of any pigments, being able to stand the most severe tests.

"Regarding physical properties, I find the tensile strength increased. After exposure tests there are no signs of checking or chalking and the surface is in perfect condition to be painted, which is almost impossible with painted goods. The elasticity remains constant even after exposure, and to such an extent that the cloth may be folded and turned over sharp corners without breaking.

"On dissolving the oil-like composition, I find it to be practically free from fatty acids and the fibre has undergone no change whatsoever. The above features clearly demonstrate that although the goods have been thoroughly waterproofed and the wearing qualities improved, they have not undergone any change or been affected in any way. The absence of fatty acids eliminates all fear of there being any danger of saponification should paint be applied."

IMPROVED NATIONAL LOCK WASHER.

The National Lock Washer Company, Newark, N. J., makes over 600 different sizes and styles of nut locks. The steels used are made to its own specifications, and must pass the most exacting analytical and physical tests before acceptance.

The machinery used in manufacturing is of special design, fully protected by patents, and owned by the company. The apparatus for, and methods of, heat treatment are also exclusively controlled by the company, being automatic and scientifically accurate in result, whereby the highest efficiency attainable is realized. The finished product is subjected to the most rigid inspection and exhaustive tests for resiliency and toughness that its engineers and mechanics can devise before the goods are permitted to be shipped.

A minute and comprehensive system of record is employed in which every detail of analysis, manufacture and test from start to finish is kept, a feature of great value in duplicating orders.

The improved National lock washer is made of special acid open hearth steel, oil hardened and tempered. The claims for it are: It takes up vibration; a shorter bolt can be used with this lock washer; it is the most economical nut locking device on the market; it is superior to a double nut, lock nut or cotter pin construction, for although these prevent separation of nut and bolt, looseness occurs from stretch of bolt and wear of parts, and initial looseness in moving machinery increases in rapid ratio. It is guaranteed against breakage and loss of spring power.

GUTTA-BALATA BELTING.

Gutta-percha and balata have been used in the manufacture of belting in Great Britain and the European countries for a number of years. Balata belting has been extensively used abroad, and its efficiency and value as an important factor in power transmission are generally well known.

The Boston Belting Company, Boston, Mass., manufacturer of this type of belting, is now offering gutta-balata belting, a product said to compare very favorably with all other balata belting. It is made of very heavy duck, closely woven from hard, twisted, long staple cotton yarns. This duck is treated and then impregnated and coated with gutta-balata compound. The duck thus prepared is then carefully cut and folded so as to make what appears to be two separate belts, although not necessarily of the same number of plies or thicknesses. The selvage edge of each belt is then given a special coating. The two belts are then united, and, it is claimed, in such a way that the bond between them is stronger than that of any other plies in the belt. The seams or joints in the duck are in the interior of the belt. The above method of belt manufacture is covered by the Forsyth patent.

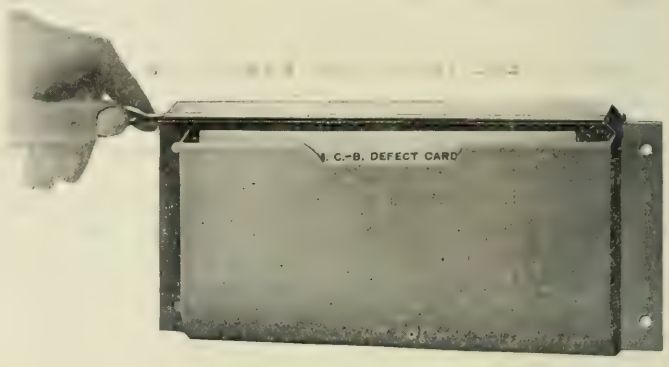
The claims made for the gutta-balata belting, four ply and heavier, made under the Forsyth patent method, are that it is seamless and that the strength of the gutta-balata compound prevents separation of the plies. It has friction surfaces on both sides, so that either can be run next to the pulleys or with a tightener or idler.

Should a gutta-balata belt slip, the heat due to the friction is said to cause its surface to become slightly adhesive, giving a better grip on the pulleys. Moisture to an ordinary extent does not seriously affect the adhesion of the belt, but heat in excess of about 125 deg. is objectionable. This belting is waterproof and requires no dressing. When its surface becomes dry or considerably worn, a very light application of castor oil or boiled linseed oil should be applied. If used as a cross belt, a small amount of floated plumbago should be used.

This belt may be used with straight conveyors or elevators, and also on high-speed pulleys or where grease or oils come into contact with the belt. The best results and greatest economy are derived from the use of wide thin belts in preference to narrow thick ones. The ends of a belt should be cut at right angles to the edges. If rawhide lace is to be used, the holes should be punched in line. The Boston Belting Company strongly recommends the use of wire lacing or suitable metal fasteners. Care should be taken that the holes are all equally distant from the ends of the belt, so that the strain on the lacing or fastening may be uniform and equally distributed. In every case the ends of the belt should be firmly butted and well drawn together.

M. C. B. REPAIR AND DEFECT CARD BOX.

A soiled repair card is often as difficult to decipher as a ticket calling for your "clean" ones in a Chinese shirt renovating emporium; hence, the surest way of obtaining a clean readable bill of expenses is to box the card. The U. S. Metal & Manufacturing Company, New York, booth 337, has eased



M. C. B. Repair and Defect Card Box.

the troubles of Rule 76 in evolving a galvanized iron box that can be attached to any type of car underframe.

A cordial invitation to see the device used in promoting "a clean card game" is extended to all who have seen the "spots" on the cards and know that they do not always give a square deal when they have to go it blind.

DIAPHRAGMS.

The question of diaphragms for car vestibules has become an important one to the railways of this country. The maintenance of the diaphragm has become an important factor in the maintenance charges of the entire car. The wear and tear on a diaphragm is, of course, very great. The Curtain Supply Company, Chicago, is putting on the market and exhibiting at its booth four grades of diaphragms which are built to meet the hardest conditions of actual service. These four grades differ in their specifications and prices.

The company recommends most strongly its CSCO diaphragm, claiming that this is the best on the market to-day. It is made in six pleats, of the best three-ply cotton duck, dyed with fast black dye and bound with binding made especially for this purpose. The peculiar system of reinforcing the corners prevents the tearing apart of the joints or sagging of the diaphragm corners, thus doing away with the two most objectionable features that have existed in the past. The presence of the rawhide foot used in connection with the CSCO diaphragm prevents the rotting and tearing of the feet.

The Rex diaphragm is built along the same general lines as the CSCO, but differs, in that it has a somewhat cheaper binding, does not have the special rawhide foot and the reinforcing pieces are somewhat narrower. Its grade of workmanship, however, is of the best, but its price is correspondingly less than the CSCO.

The Victor diaphragm is put on the market to meet any kind of competition, its price being very attractive to those wishing a diaphragm of this character. It is made of two-ply cotton belting instead of three-ply, dyed fast black, bound with artificial leather binding and has corner reinforcements.

In connection with its diaphragms, The Curtain Supply Company is furnishing hoods or canopies of asbestos cloth and of other materials. The asbestos material is water-proofed, and, being fire-proof by its very nature, affords perfect protection for the diaphragm, thus greatly increasing its durability and life. The hoods are made long enough to completely cover the top of the diaphragm and reach down a foot or more on either side. These hoods or canopies can be used in connection with any other style of diaphragm on the market.

The company invites a careful inspection and criticism of its diaphragms, and is glad to say that it has sold a number of the diaphragms to the leading railways. It will be glad to take up the matter with any railway in the market, submitting samples and prices.

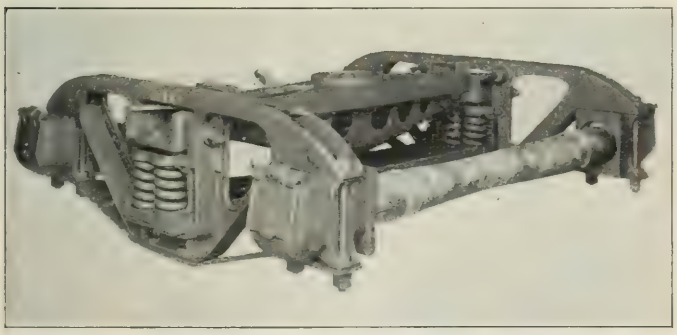
CAST STEEL TRUCK SIDE FRAME AND BOLSTER.

The Gould Coupler Company, Depew, N. Y., shows a cast steel truck assembled, with cast steel truck side frame and truck bolster.

This side frame has a rectangular opening for the bolster, in which opening bolster column guides are inserted similar to the ordinary diamond arrangement. The spring channel or angles are riveted to the base of the column guides, which interlock on the lower portion of the side frame, and their upper portions are secured by lateral bolts. These bolts cannot be lost or misplaced, as they are retained in position by the truck bolster.

This construction provides for flexibility and eliminates the bolster wear on the side frames. These have evenly distributed metal and the tension and compression members are in straight lines, while the portion of the frame over the journal boxes has an exceptional depth for preventing bending and distortion.

The cast steel truck bolster shown with this cast steel truck is of a new and very strong design and particularly



Cast Steel Truck Side Frame, Inset Lid Journal Boxes, U-Type Truck Bolster and New Process Steel Axles.

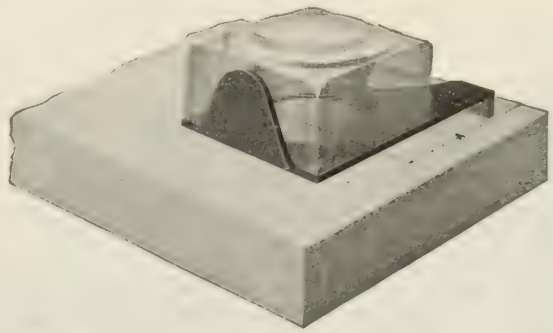
adapted to foundry practice for sound production of the bolsters. Angles and square corners are avoided where at all possible, the design consisting of curves and straight lines.

The bolster has exceptional width at the center plate for lateral strength and a narrow but heavy tension bottom member, allowing extra depth at the center plate without interference with the flanges of the spring channel. This bolster is said to show, under repeated tests, extreme flexibility, exceptional carrying capacity and stability. The design is modified to meet the various requirements as to application to the diversified types of trucks now in service.

A NEW FASTENER.

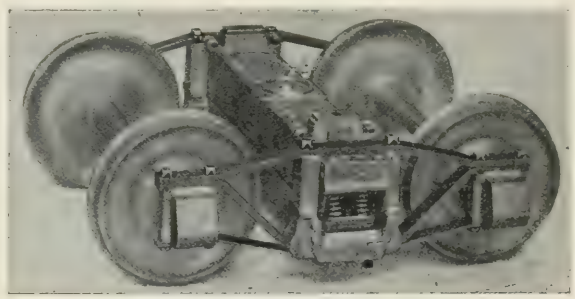
The F. B. C. arch bar nut lock is marketed by the Keystone Nut Lock Company, Pittsburgh, Pa. Its exhibit is with the Flannery Bolt Company (Pittsburgh, Pa.), booth 442.

The fasteners are of simple design, the characteristic features being the corrugated or raised imprints surrounding the bolt hole; these serve as a cushion for the seating of the



F. B. C. Arch Bar Nut Locks.

nut, and allow for irregularities of the nut or bolt head surface. When assembled, the F. B. C. nut lock or fastener has no protruding metal other than its width, equivalent to the square of the nut which spans the arch bar.



Truck with F. B. C. Arch Bar Nut Locks.

Continuous nut locks are also made, embodying the main feature for locking air cylinder bolts and nuts, striking plate bolts and carrier iron bolts.

THE CONSTRUCTION OF NATURAL ICE HOUSES.

The annual waste of ice by melting while stored in natural ice houses is enormous, and much of this waste is unnecessary. The best natural ice houses suffer losses of more than 30 per cent by melting. This fact is known by statistics gathered from every storer of natural ice in the United States. These statistics also show that the average cost of ice houses runs from $1.10 to $2.50 per ton storage capacity. All of the houses showing a cost under $1.60 per ton are five years old or over, and of course, could not be duplicated now within 35 per cent of the original cost. The average cost of storing natural ice by railways is 60 cents per ton.

The great loss of ice in storage can be reduced, by proper insulation, to less than 7 per cent for a full season, in most cases without materially increasing the original cost of the building. If the storer of natural ice will pay for building his house $2.00 for every ton of ice stored the shrinkage can be held down to 7 per cent, and at a cost slightly over $2.00 per ton, the total shrinkage can be kept down to 3 per cent.

That it is very profitable to improve the construction or insulation of these houses can be seen by the following: A 2500-ton storage house at $1.50 per ton will cost stored, $3750.

Taking the ice at a cost of 40 cents per ton (which is the lowest cost we have), 2500 tons would originally cost $1,000. The average meltage in this type of building is 40 per cent. This would mean an annual loss of $400. If this house were properly built and insulated at a cost of $1.85 per ton the guaranteed meltage would not exceed 7 per cent. This increase in the initial cost of the structure would amount to $750, with an insured loss by meltage not to exceed $70, or an annual saving of $330. The difference in cost on this basis would be made up in a little over two years. Of course where the stored ice costs more, as it frequently does, the saving is greater.



Pre-cooling Station of the Sante Fe at San Bernardino.

The method of improved construction and insulation referred to is one that would greatly prolong the life of the building and one which would insure the continuance of the original insulating efficiency for years. In fact, this proposed construction would mean no greater loss by meltage after ten years than when the building was new. It would also mean that there would be no covering of straw or sawdust required over the ice while it is in storage, an antiquated and unsanitary practice.

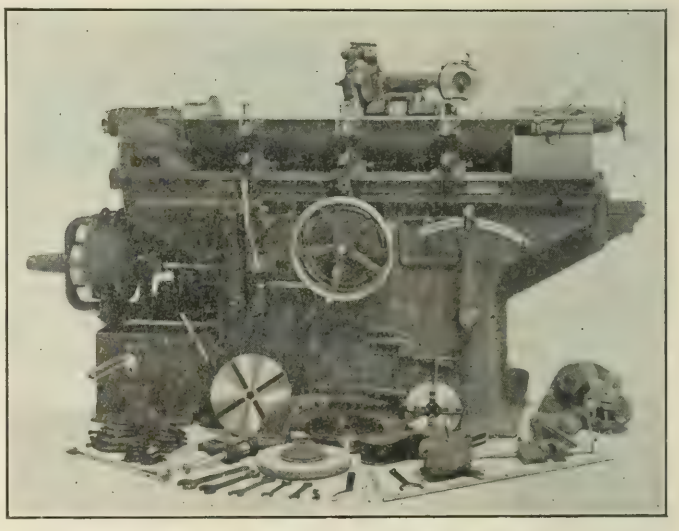
Some of the large western roads have already begun to reinforce by insulation all of their old houses and have decided to adopt entirely different plans for new work. These roads are the Rock Island, the Union Pacific, the Southern Pacific, the Burlington and several other smaller roads. These companies have employed the Union Fibre Company, Winona, Minn., which makes Waterproof Lith Board Insulation, to reinforce their old houses with this type of insulation.

The Union Fibre Company employs a corps of engineers and will be glad to submit plans and sketches to all those interested in the insulation of ice storage houses or cold storage buildings of any kind. The large pre-cooling stations of the Pacific Fruit Express Company at Los Vegas, Nev., and Colton and Roseville, Cal., and the large pre-cooling station of the Santa Fe at San Bernardino, Cal., have been insulated with waterproof lith board by the Union Fibre Company. This insulation is used in fire-proof buildings as well as in wooden buildings. The Union Fibre Company also manufactures Linofelt, which is used largely in the insulation of refrigerator cars. These materials are on exhibition in space 448.

The company says that the ice house of the future will be a fire-proof building which can easily be insulated to keep the annual loss by meltage under 5 per cent and can give the same insulating protection continuously for 20 years without depreciation. A construction which gives all of the advantages of fire-proof construction combined with low first cost is found in a wall construction of reinforced concrete pilasters heavy enough to carry the entire roof structure. Light horizontal concrete beams about 15 feet apart connect the pilasters or columns. The curtain walls are of terra cotta or tile. Waterproof lith board insulation is applied in a continuous and unbroken sheet on the inside of these walls from floor to ceiling. The floor is insulated sufficiently to protect the ice from the higher temperature of the earth, and is pitched toward the center so as to pyramid the ice and provide drainage. The roof of the structure is either frame or steel covered with a heavy metal or composition roof. The storage room is cut off with a heavily insulated ceiling at the plate and the insulation of the ceiling joins the wall insulation at the angles.

LANDIS NO. 3 UNIVERSAL GRINDING MACHINE.

This type of grinding machines, made by the Landis Tool Company, Waynesboro, Pa., embodies many new features and improvements, enabling it to produce accurate and highly finished work with rapidity and economy. It combines both an external and internal grinder, and is especially adapted to tool-room service for finishing such work as straight and taper spindles arbors, rolls, male and female gages, dies, reamers, plain, angular and forming milling cutters and a large variety of other work that can be held by either a face-plate or chuck.



Landis No. 3 Universal Grinding Machine.

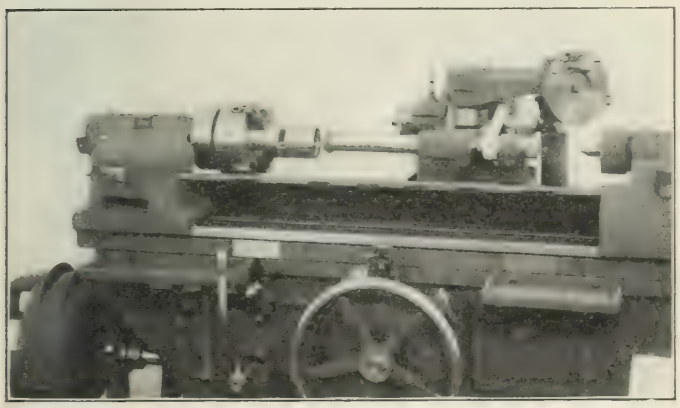
The table swivels for grinding taper, and has two scales graduated in degrees and inches per foot. The headstock

swivels for short abrupt tapers. The spindle revolves for chuck or face-plate work, and is arranged to be locked for grinding on dead centers. The footstock spindle is operated by a hand wheel, and is provided with a variable tension spring, or it may be held rigidly for supporting the center to the work.

The grinding wheel head is of very rigid construction. The slider has long guides with large bearing surfaces, and is arranged to automatically take up any back lash that might occur in the feed gearing, thus preventing any possible jumping in of the wheel when feeding. The spindle is of hardened steel, accurately ground, and runs in self-aligning phosphor-bronze bearings, which are adjustable for wear. A micrometer lateral feed of the spindle is provided, which is useful in grinding shoulders and other similar work. This feature is indispensable for tool work. The entire head swivels on the carriage for taper grinding, and is graduated 90 deg. each side of the center line.

Feeding up of the grinding wheel can be done either automatically or by hand. The grinding wheel travel feed is automatic, and the full range of speed variation is made by the movement of a single lever, requiring no shifting or gearing, clutches or belts. The grinding wheel tarries automatically at reversing points, permitting the wheel to grind itself clear at shoulders before reversing, and, if desired, the time of tarry can be varied.

The automatic cross feed of the grinding wheel operates at each reversal of the wheel carriage, and can be set to reduce the diameter of the work from .00025 in. to .005 in.



Near View, Landis No. 3 Universal Grinding Machine.

The grinding wheel truing fixture is quickly placed and clamped wherever required along the table to the position of the wheel. It is adjustable for different sizes of work, which need not be removed while dressing the wheel. The rests support the work at two points—underneath and in front. These supports are adjusted independently of each other, which is essential to perfect grinding. This plan of construction insures the work being ground perfectly round and free of chatter. The countershaft has self-oiling and self-aligning bearings, and is easily installed.

MANUFACTURE OF BRAIDED RUBBER HOSE.

Rubber is derived from the milk found in the bark of certain trees and vines. The best rubber known comes from Brazil and is known as "Up-River Fine Para." The trees are tapped at a certain time of the year and the milk thus procured is coagulated, the rubber rising to the top. This coagulated latex is then wrapped layer upon layer on a paddle, each layer being smoked over a fire. After the rubber has been built up in this manner to a ball convenient for handling, about 6 to 10 in. in diameter, it is packed and shipped, and it is in this shape that the rubber manufacturer gets it. This rubber contains more or less moisture, and quite a little dirt and bark.

In the first step of manufacture of hose by the Electric Hose & Rubber Company, Wilmington, Del., the rubber is washed by being passed several times between heavy corrugated rolls, while streams of water remove the sand, earth and vegetable substances that are exposed by the tearing action of the rolls. After washing, it is dried. This was formerly done by hanging the rubber in a warm room, but at present the vacuum dryer is used. After the rubber has been dried, it is then mixed with certain ingredients in the



Braiding Machine.

form of powders, which are kneaded into the rubber, only such ingredients being used as are suitable for the purpose for which the hose is intended. After the rubber is mixed, it is fed through a tubing machine and comes out in the form of a long seamless tube. This tube is made in long lengths and is coiled in pans. The tubing is then put through the braiding machine, shown herewith, each machine holding 48 or more separate bobbins. On each bobbin is wound a



Lead Press.

single cord of seine twine, which is very strong, being made of numerous strands of cotton twisted together. The machines, which are automatic, braid the cord circularly around the rubber tubes. If there is a defective piece of yarn, the breaking of the yarn will stop the machine. Each fabric is seamless, and each strand is independent of the



Steam Vulcanizer.

other, yet these brands completely encircle the hose and make a stronger fabric than of any other construction, being the same principle of a hemp rope.

Between each layer of fabric there is put one of rubber and the hose thus built up until it is of the required thickness. After the hose has been made of the desired thickness it is then passed through the lead press shown in the

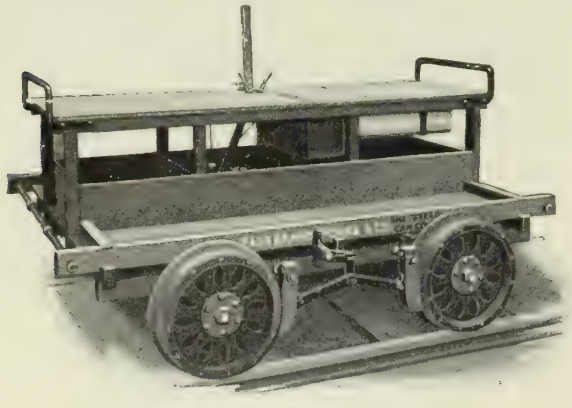
illustration. The hose and pipe are taken up on large iron drums, and as the pipe is made continuous the hose can be made in long lengths, without splice or joint. After the iron drum is filled with the pipe containing the hose a heavy pressure is put on the inside of the hose and locked in, and the whole transferred to the steam vulcanizer shown. It is kept in this vulcanizer for a time, and the liquid inside of the hose expands and forces the rubber up through the meshes of the cotton, uniting rubber with rubber through the cotton, making the hose a homogeneous mass. The hose is vulcanized by the action of sulphur which is kneaded into the rubber in the mixing operation. It is the action of sulphur in the vulcanizing process which sets the rubber and makes it a commercial article. After the hose has been vulcanized the iron reel containing the pipe, hose, etc., is immersed in water, which stops vulcanization. When the hose is sufficiently cooled the pipe is removed, the hose examined for imperfections and is ready for marketing.

GASOLENE SECTION MOTOR CARS.

The new types of motor cars at the exhibit of Fairbanks, Morse & Company, Chicago, are attracting considerable attention, as they show progress and the adaptability of the gasolene engine. The laboring men in most all branches of work have gradually been helped by the application of machinery; but the section laborer on a railway has long been compelled to bend his back and perhaps strain his muscles against a head wind, when going to work in the morning; work all day, and then another hard pump back home. The Fairbanks, Morse & Company section motor cars are intended to change this condition.

The No. 26 type of car, shown herewith, is a straight motor car with a two-cylinder engine, direct connected to rear axle, the crank shaft being integral with the rear axle of the car. The seat is raised a proper height above the deck and runs longitudinally with the car, having capacity for 10 or 12 men. The weight is little more than a standard hand car and four men can lift it off the rails. From seven or eight up to 30 miles per hour can safely be made with this car. The engine is direct connected to rear axle with enclosed dust proof crank case. The lubrication is taken care of by mixing oil with gasolene.

The No. 12 car, from the rear, resembles a standard lever car; but a side or front view shows a single cylinder engine,



Fairbanks, Morse Gasolene Section Car.

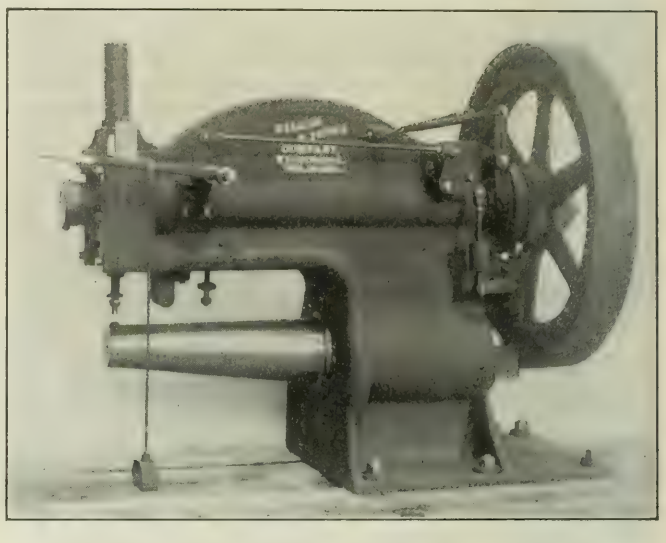
located just in front of the gallows frame, direct connected to the car by a pinion on the extended engine shaft which drives a gear inside of the 20-in. pressed steel car wheel. The engine can be disconnected and the car propelled by hand, but when the car is operated by the engine, the hand lever is thrown out of gear and locked in position. The engine on this No. 12 is the same type as on the No. 26.

After a thorough trial, a western line arranged to equip an 85-mile branch with No. 12 cars, which the figures will result in saving as follows:

Present force with eight hand cars.	
8 sections—1 foreman and 4 men on each.	
Wages laborers, $1.40 per day, 32 men, 30 days....	$1,344.00 per month.
8 foremen, $55.00 per month..	440.00 "
	$1,784.00 "
With section motor cars.	
5 sections—1 foreman and 5 men on each.	
Wages laborers, $1.40 per day, 25 men, 30 days....	$1,050.00 per month.
5 foremen, 30 days.....	275.00 "
	$1,325.00 "
Actual saving in pay roll per month	459.00

RIVETING AND PUNCHING MACHINE.

The accompanying photograph illustrates a high-speed riveting and punching machine, with the riveting tools in position. This type of machine, made by Hilles & Jones Company, Wilmington, Del., has recently been adopted by steel passenger car builders and it is capable of heading



Hilles & Jones Riveting and Punching Machine.

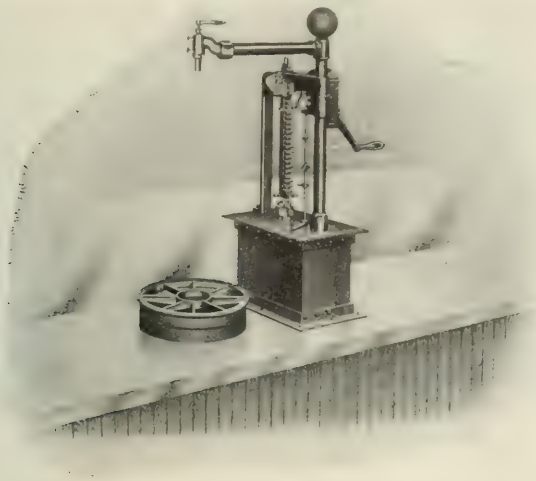
rivets up to ⅜-in. in diameter cold, and punching a ¾-in. hole in a 5-16-in. plate. The die is held in forged steel stake which is keyed through the frame of the machine. The speed is 65 strokes per minute and the sliding head is controlled by an automatic clutch so that the head stops automatically after each blow, or can be run continuously when the hand lever or foot treadle is held down. On account of the high speed of the machine, it is necessary to supply a band brake on the front end of the eccentric shaft to make a quick stoppage on the shaft. This machine is also used for cylindrical work.

OIL STORAGE SYSTEMS.

An important consideration in connection with the oils used by railways for illumination, fuel and lubrication is the opportunity for economical and convenient handling afforded by the storage tanks, pumps, meters, etc., manufactured to suit almost any condition by S. F. Bowser & Company, Inc., Fort Wayne, Ind. The equipments of this firm are so favorably known that a large number of the railways in the United States and Canada are now using some kind of a bowser oil handling device. The company has made some interesting installations during the past year.

Thirty-five rectangular tanks, some of 10,000 gals. capacity,

form the nucleus of a splendid equipment for storing and distributing oils, installed at the Topeka shops of the Atchison, Topeka & Santa Fe. It is one of the largest of its kind in existence, and an inspection will be found both interesting and instructive by railway men interested in the safest and most efficient time and labor-saving devices for handling oils. No expense has been spared to make this equipment as perfect as possible, insuring safety from fire and explosion, a clean, evaporation and leak-prcof storage, and a quick, easy and accurate distribution through Bowser self-measuring

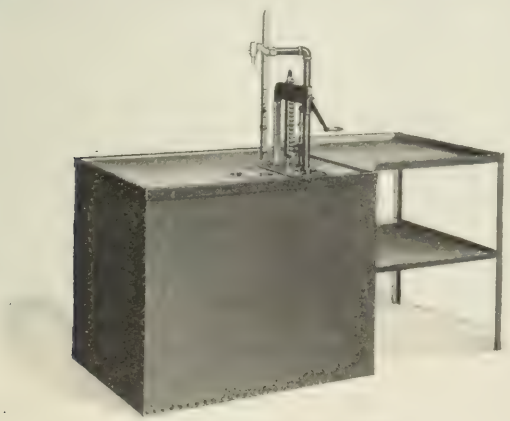


Long Distance Self-Measuring Pump.

pumps, of the long distance type, located near the distributing counter in the store room. While the smaller pumps are operated by hand, the larger ones, used for barreling different kinds of oils, are power pumps.

The Seaboard Air Line and the Baltimore and Ohio R. R. have also increased their oil handling facilities by installing complete Bowser equipments at Jacksonville, Fla., and Benwood Junction respectively. Both equipments are complete and are of the highest order in every respect. The B. & O. outfit is very similar to the Bowser equipment previously installed for this railway at the Union Station in Washington, D. C.

A new installation, and larger than the Santa Fe equipment as far as the number of units is concerned, is being placed by one of the great Canadian railway systems which



Railway Table Oil Tank.

has recently ordered 63 Bowser self-measuring long distance pumps for use at different stations on its western division.

A start has been made by the C. B. & Q. towards equipping its oil supply cars with Bowser tanks, pumps, etc. One of its cars which has been so equipped is in service distributing oils to various stations and is proving greatly superior to the older methods.

Six oil houses belonging to the Western Pacific recently equipped with Bowser systems are said to be proving excellent investments, as will also the equipments recently



Roll Top Steel Oil Cabinet.

furnished to the Sunnyside yard of the Pennsylvania Tunnel and Terminal Co., New York, and to the Vandalia at Terre Haute, Ind.

CAR SEAT COVERING.

There has been rapid and interesting progress made in the manufacture of car seat covering, and after many years of trying a variety of materials, it is quite generally considered that plush cannot be surpassed in appearance and durability. Mohair plush, as made by the Massachusetts Mohair Plush Company, Boston, Mass., is said to be a very natural and satisfactory fabric. It is cleanly, and has a surface which is smooth and glossy, presenting no clinging surface for dust. Although dust settles in the bottom of the fabric, it does not get out until the cloth is beaten or cleansed. Plush is easily cleaned, lasts long, endures harsh treatment and stands up under cleansing and redyeing. While it is difficult to sit still on a smooth surface, the adherence of the pile fabric of mohair plush seems actually to add comfort to a journey.

METHODS OF THE DEARBORN DRUG & CHEMICAL WORKS.

The fact that there are very few waters used for steam purposes in which the kinds and quantities of solid matter contained are alike is said to have been thoroughly understood by the chemists who originated the Dearborn methods, and their purpose from the outset was to inaugurate a system whereby the differences in waters could be determined, and the effects in steam boilers noted. Pursuing the subject further along chemical lines they were enabled to understand the cause of many troubles experienced in practice, and to demonstrate by actual experiment the correctness of their deductions, by the comparison of the kinds and quantities of solid substances contained in the water with the results actually obtained.

While waters being used in different plants may be obtained from the same source, it is seldom that the waters as they enter the boilers are alike, due to the use of heaters, purifiers, or both, or mixture with condensation in varying quantities. All of these factors affect the nature of the waters and change the kinds and quantities of the substances which they carry, so that they differ from the original supply and also from each other, when they enter the boilers.

The Dearborn Company's first step was to establish a

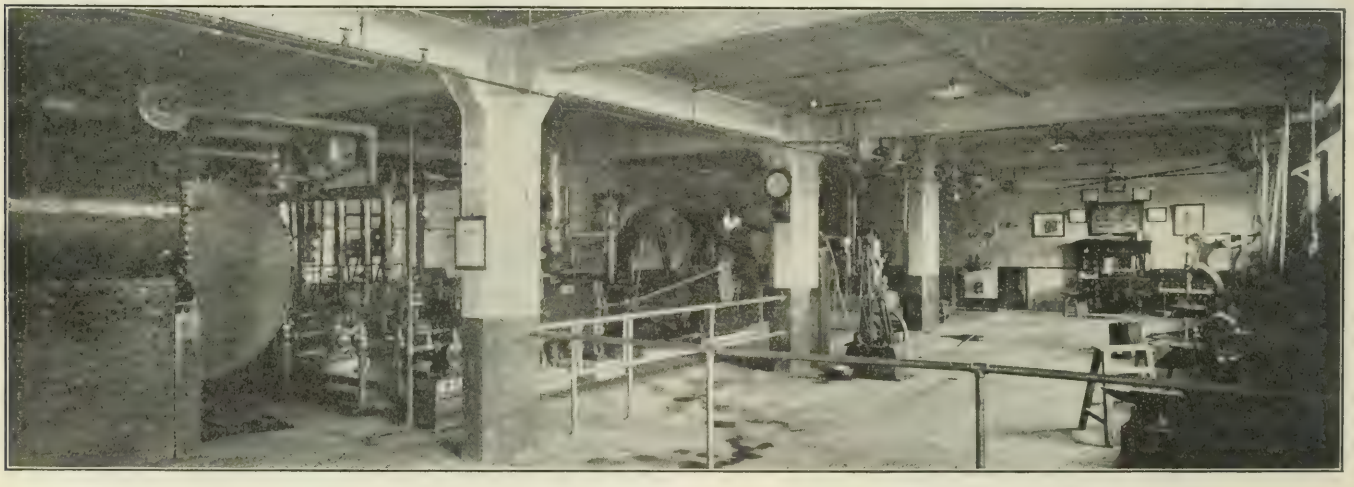
scientific department, having at its command complete laboratories for the analyses of water and scale, and for doing the necessary analytical work to enable the scientific department, with this information and that regarding the operating conditions of the plant under consideration, to reach definite conclusions as to the best method of overcoming the feed-water troubles.

The Dearborn laboratories are supervised by thorough analysts especially trained for this class of work. Having



Loading Platform, Dearborn Factory.

demonstrated from the beginning the original theory that it was necessary to furnish preparations of different composition for waters carrying different kinds and quantities of solid matter, the company has worked along this line strictly, analyzing the water in all cases, and often the scale as well, and obtaining all the information possible regarding the total of which covers the reagents in the formula for the finished product in the same proportionate amount as the different substances exist in the water.



Power and Engine Room, Dearborn Factory.

There are several different sets of conditions which must be considered in this work. For example, the treatment of waters in stationary boilers constitutes one phase of the the operating conditions under which the water is used. One substance is considered at a time, and the necessary amount of the particular reagent each demands determined, subject; those used in locomotive boilers another, and those in boilers for other purposes still another. All of these require special consideration, as the conditions under which the water is used have a very much greater effect or bearing than is usually conceded. It is therefore necessary to maintain a separate and individual department for each, the personnel of the stationary department made up of those conversant with stationary practice, and the railway department of those who are thoroughly conversant with the conditions under which the water is used and is to be handled, in both cases assisted by the scientific and analytical departments.

The method of applying the treatment in any case has much to do with the results actually obtained, consequently this often considered trivial matter must be given careful consideration. The method of procedure in treating locomotive feed-water is as follows:

Samples of waters are analyzed, and the preparations made to suit the conditions as shown by these analyses. The treatment is applied direct to the water in the locomotive tender, no separate treating plant being necessary. Trouble caused from scale, pitting, and corrosion is overcome by applying the treatment at terminals only, while for that caused by priming or foaming, a preparation is made that is applied each time the water supply in the tender is replenished. Experienced engineers are furnished to install the treatment and instruct all concerned in the proper use of it.

The treatment prevents scale formation, pitting and corrosion, materially extending the life of flues and fireboxes and, due to clean boilers, does much toward economy in fuel consumption. The wear and tear of valve gears, cylinder, packing, etc., is also reduced.

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Application made at the Post Office at New York, N. Y., for entry as mail matter of the second class.

The two points brought most prominently to the front in President Clark's address were the improvement in the matter of delays of cars and the application of the new federal safety appliance act and its probable effects. As for the delays, which certainly form a very great source of expense and embarrassment to the railways, no remedy was offered and the speaker contented himself with merely counseling conservatism, on the ground that the M. C. B. Association is too big, too powerful and too influential to do anything that savors in the slightest of hasty and ill-considered action. The question is not one that is easy of solution by such experts as compose the association. To the layman and novice it is very simple and easy. The matter was discussed some time ago at one of the railway clubs, and the railway men touched the matter rather gingerly, not exactly seeing their way clear to a solution, until a professor told them exactly what they should do and how they should do it. And, presto! the air was cleared. Then a railway manager told this story: Once there was a woman who had a very bad boy; so bad that she could do nothing with him. She had prayed for and with him in labor and travail. At last she bethought herself of her minister, to whom she betook herself and told her woes. He listened sympathetically and then said: "My dear madame, I am very sorry for you, but I do not see that I can do anything. You see, I have children of my own, and the only thing I can suggest is that you go to some old maid who has never had any children." So the cure for the wickedness of car delays seems to be beyond the power of the regular minister, but we may hope that something may be suggested that will make it possible to do better than any road can do to-day, and thus add one more to the many economies due to the M. C. B. Association.

As for the effects of the safety appliance law, the president indicated that a spirit of fairness seemed to animate the representatives of the Interstate Commerce Commission in their dealings with the committee of the association. It is to be hoped that this spirit will continue to be dominant. The M. C. B. Association forms the most expert body of men in the world in the matter of car construction and maintenance, and what it has decided upon as proper for a standard should be treated with the respect, one might almost say reverence, which the source from which it emanated ought to inspire. Its standards of sill steps, grabiron, handholds and the like have only been adopted after long and painstaking effort and it could only be the boldness of ignorance and inexperience that would dare to arbitrarily tamper with them. The new law gives wide powers to the Interstate Commerce Commission, so broad that it should think hard and long before exercising them in their full extent. It has the power to step in and at one fell swoop do away with the results of decades of work by this association. But, if it will remember that nothing has been done without paramount attention having been given to the safety of employees, and with a degree of care that the employees or their direct representatives are incapable of giving for themselves, it probably will simply adopt the standards that have been established, and do it in a way that will leave the association still as free as it has been in the past to modify, and change, as requirements change. If it shall do this it will show itself possessed of a broadness and wisdom that, unfortunately, does not alway characterize public commissions. It can honor itself and help the railways and the country by giving a liberal interpretation to the law. It remains to be seen whether it is big enough and broad enough to take advantage of the opportunity that is thus afforded it.

Whether the alarm on the subject of the abuse of the repair card that was stirred a year ago or not was without foundation need not be discussed. Acording to President Clark's address, the improper use of it has now stopped. When, in the whole wide range of applications of that useful document during the past year, but one instance was brought forward of possible impropriety, it speaks well for the general honesty of purpose that now inspires the members of the M. C. B. Association and their subordinates. It is quite possible that, in the past, overzealous inspectors and foremen did not do just the square thing in the use of the card, but it is a magnificent showing for the association that the moment attention is called to what would be a real evil, it ceases to exist.

The report and discussion on the Revision of M. C. B. Standards indicates the lack of responsibility which must result from legislation which in effect makes this committee advisory to the Interstate Commerce Commission. Desired changes in the standards are referred in a haphazard manner to the special committees in charge of those standards. An illustration of the practical working of this method is seen in the design of one of the most important standards of the association, the coupler. The butt end of the coupler and its attachment to the yoke has been changed in some way nearly every year, and it is still unsatisfactory and unsettled. The increase in the clearance for the standard 8-in. spring from ¼ in. to ½ in. has been recommended because it is found that some railways have adopted a butt length to provide for this larger clearance. It is time that the design of the coupler yoke and its attachment should be revised, and its shape and proportions made such as would be dictated by good engineering, and not allowed to be slightly altered year after year on traditional lines which are no longer suited to the severe conditions of present service. The railway supply men are developing such designs more rapidly than the car builders and while uniformity

of standards cannot be obtained by such methods, as President Clark suggested in his address, "it is an injustice to always insist on uniformity where it is not essential to safety." Another evidence of a lack of thoroughness in the report on Revision of Standards was the recommendation of dimensions for fluted roofing for double board roof. This was shown to be incorrectly figured and to be unnecessary, as wooden roofs are rapidly going out of use. The report in general deals with too many details which can be grasped and taken up for profitable discussion at a convention, and it would appear that the revision of the more important standards could be more successfully accomplished by referring them to special committees for that purpose.

THE REQUIREMENTS FOR IMPROVED PASSENGER BRAKES.

The weight of passenger cars has been materially increased during the past ten years. The railways have scarcely realized that the efficiency of the brakes has not kept pace with that increase, nor that the distance required for a modern express train to stop when running 60 miles an hour is 25 to 50 per cent. greater than it was with the same number of cars in 1900. That is, the stop from a speed of 60 miles an hour was then made in 1,000 ft., while now, with ordinary brake equipment, it requires 1,500 ft. Before any large amount of heavy steel equipment is built, it is desirable to bring up the brake efficiency so as to make the stop from 60 miles an hour in not over 1,200 ft.

On account of the limitations of brake shoe pressure and the low coefficient of friction at high speed, advantage must be taken of quick application with little lost motion and of possible improvements in the triple valve. The foundation brake requires careful investigation and some modification in order to accomplish the desired object with cars weighing 130,000 lbs. and over. Realizing the importance of prompt action, the M. C. B. executive committee instructed the air brake committee to take up the question of a new design for foundation brakes with the railways and the brake manufacturers.

The difficulties confronting the brake companies may be briefly described: The 18-in. cylinder and lever ratio of 9 to 1 is sufficient for cars up to 127,000 lbs. Above this, a brake power equivalent to a 20-in. cylinder is required. Cylinders of this size are objectionable for several reasons; first, on account of the increased distance of the center of the cylinder from the car sills and the greater stress due to this longer lever arm; second, because of the increased leakage due to difficulties in getting leather packings of sufficient uniformity; and third, because the heavy piston rods require a larger percentage of the brake power to move them. Various methods of obtaining sufficient brake power without the use of a large 20-in cylinder have been suggested. These are: first, that two cylinders 14 in. in diameter could be used, one at each end of the car, but it would be difficult to operate two cylinders with one triple; second, it has been proposed to place the brake fixtures on the trucks with one or two cylinders on each truck, thus requiring a flexible joint between train pipe and cylinder; plans for such an arrangement have been worked out and applied experimentally on one of the western roads; third, clasp brakes with two brake beams and four shoes to each pair of wheels have been suggested, and there is no doubt but that this is a practical method of overcoming the objection of excessive brake shoe pressure by increasing brake shoe area, but the experience with the clasp shoe in the past seems to discourage its use in the present dilemma.

A sub-committee reported certain coefficients and factors involved in the problem of stopping a train from 60 miles per hour in 1,200 ft. The brake power is derived as follows: The work or energy in the moving mass is $\frac{1}{2} M V^2 = \frac{WV^2}{2g}$ where V = 88 ft. per second; W = wt. of car, and g = 32.2. Then work = $\frac{WX88^2}{64.4}$ = 120 W and = $\frac{120\ W}{1200\ ft.}$ = 1/10 W or 10 per cent of wt. of car = brake power required. The efficiency of the brakes on the engine and tender is much less than that on the cars, and where the energy of the whole train, engine and cars is concerned some modification must be made in the percentage of the total weight to be used as a figure for brake power. It is necessary to assume also some relation between the weight of the engine and the total weight of the cars. The committee agreed to take the weight of cars as twice that of the engine and tender, and the weight of the whole train is, therefore, three times that of the engine and tender. Assume also that the engine and tender brakes have only half the efficiency of the car brakes. Then, if the latter is taken as 100 per cent, the brake effect of the whole train will be in the ratio of 5 to 6. To stop the whole train in 1,200 ft. would, therefore, require brake power on cars to have a capacity sufficient to stop them in 1,000 ft., and this is equal to a retarding force of 12 per cent of their weight.

The committee decided that the maximum pressure per brake shoe should be 18,000 lbs., or 400 lbs. per square inch. The laboratory tests of plain cast iron brake shoes under this pressure at 60 miles per hour gave a coefficient of friction as low as 8.4 and as high as 13.2 per cent. It was decided from this showing that 10 per cent would be a fair average coefficient of friction. The efficiency of the brake gear was taken at 85 per cent to compensate for friction and other losses. It was estimated that the load, consisting of baggage, passengers, etc., is approximately 7 per cent of the weight of the cars. A further adjustment was made because of the fact that when running at 60 miles per hour, after the engineer has started to operate the brake, the train will run about 200 ft. before the brakes are in full application. This reduces the distance of 1,000 ft. to 800 ft., which, in connection with the 7 per cent load, requires a retarding effect equal to 16 per cent of the weight of cars.

With this final factor it was decided that for 85-lb. cylinder pressure an 18-in. brake cylinder would be sufficient for sleeping cars weighing up to 114,000 lbs. and coaches weighing 100,700; two 14-in. cylinders should be used for sleepers weighing 138,000 lbs. and coaches weighing 130,000 lbs.; two 16-in. brake cylinders are required for sleepers weighing 180,000 lbs. The brake beams should not deflect more than 1/16 in. under maximum emergency brake load, and should not take a permanent set under 50 per cent in excess of that load. When two brake cylinders are required they should be attached to the car body, and the air brakes and hand brakes at their respective ends should be entirely independent. The two cylinders may, however, have, if preferred, but one triple or control valve and one reservoir.

As the equipment here recommended had not been tested in service, it was decided that a demonstration be made by actual road tests of trains corresponding to those used in making the calculations, equipped with brakes as described, and that accurate measurements be made of speeds, pressures, distances, etc. The Toledo tests on the Lake Shore, resulting from these recommendations, form the basis of the final report presented at this convention of the M. C. B. Association.

EROSION OF A GASKET UNION.

LEXINGTON, MASS., June 4, 1910.

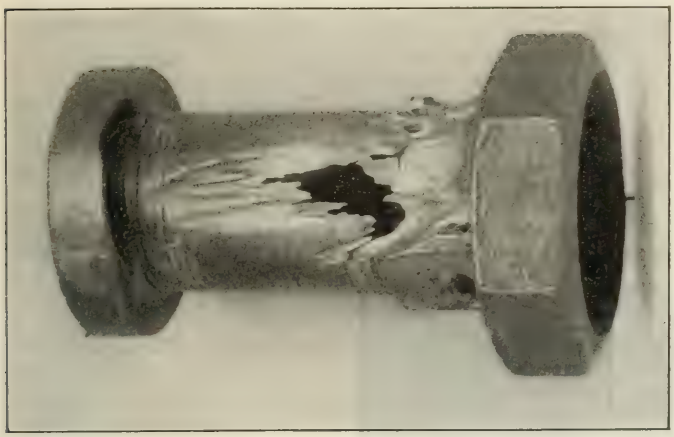
TO THE EDITOR OF THE DAILY RAILWAY AGE GAZETTE:

The accompanying photograph shows what is left of a gasket union we were called upon recently to replace with one of our brass to iron seated unions.

The remarkable feature in connection with the erosion of this union is the fact that it was taken out in the condition shown only three weeks after it had been installed. True, it was called upon for pretty severe service, as it connected a steam trap to a 6-in. water leg 440 ft. from the boiler, carrying steam which was delivered to the engine at 130 lbs. pressure. The trap and joint were located in a brick and

cement pit and were covered with water in which there was considerable sand and grit.

The explanation that occurs to us of how this happened is that the escaping steam stirred up sand and grit, which was sucked into the current of escaping steam and the combination



A Peculiar Case of Erosion.

worked like a sand blast. We would like to know if any of your readers ever had a similar experience, or if any one can offer an explanation other than the above.

JEFFERSON UNION COMPANY.

TODAY'S PROGRAM.

M. C. B. ASSOCIATION.

Morning Session.

Discussion of Reports on:

Rules of Interchange	10:00 A. M. to 10:30 A. M.
Coupler and Draft Equipment	10:30 A. M. to 11:00 A. M.
Car Wheels	11:00 A. M. to 12:00 M.
Safety Appliances	12:00 M. to 12:15 P. M.
Freight Car Trucks	12:15 P. M. to 12:30 P. M.

Adjournment.

Afternoon Session.

Discussion of Reports on:

Splicing Underframes	2:00 P. M. to 2:30 P. M.
Car Framing, Roofs and Doors	2:30 P. M. to 3:00 P. M.
Tank Cars	3:00 P. M. to 3:30 P. M.
Train Pipe and Connections for Steam Heat	3:30 P. M. to 4:00 P. M.

Adjournment.

ENTERTAINMENTS.

10:30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3:30 p.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

9:30 p.m.—Forty-fourth annual ball of the Master Car Builders' Association, Entrance Hall, Million Dollar Pier.

SOCIETY OF RAILWAY CLUB SECRETARIES.

The Society of Railway Club Secretaries will hold its annual meeting at the Marlborough-Blenheim Hotel, June 18, at 10 a. m. The annual dinner will be held on the evening of the same day, the place to be announced later. A move is on foot to form an organization to be known as the American Association of Railway Secretaries, the membership to include the secretaries of all railway organizations, except such as are identified with organized labor. It is quite probable that the Society of Railway Club Secretaries will decide to affiliate with, or at least become a railway club section of, this new organization.

Proceedings.

The first session of the forty-fourth annual meeting of the Master Car Builders' Association was held in the Greek Temple, on Young's Million Dollar Pier, Atlantic City, N. J., on Wednesday, June 15, 1910.

The president, F. H. Clark (C. B. & Q.) called the meeting to order and invited the past presidents and the present officers of the Master Mechanics' and the Master Car Builders' Associations to be seated on the platform. The mayor, Franklin P. Stoy, welcomed the convention to Atlantic City. W. E. Fowler, a past president, replied to Mayor Stoy on behalf of the association,

President Clark then addressed the meeting as follows:

ADDRESS OF PRESIDENT CLARK.

It gives me great pleasure, in opening the forty-fourth annual meeting of the Master Car Builders' Association, to extend a word of greeting to the members and their friends here assembled. Many of you have attended our previous meetings, and your presence today indicates that you have found them either pleasant or profitable. Let us hope that we may all derive both pleasure and profit from this one. Most of our members come here because it is considered that they and the railways they represent are benefited by their presence. I have no reason to doubt that their anticipations will be realized, but I want to suggest that they all contribute something in the way of information and encouragement to the association; that they give as well as receive. Most of the work of the association is necessarily borne by a comparatively small number of its members, but they need assistance in our annual meetings, in conferences and in committee work.

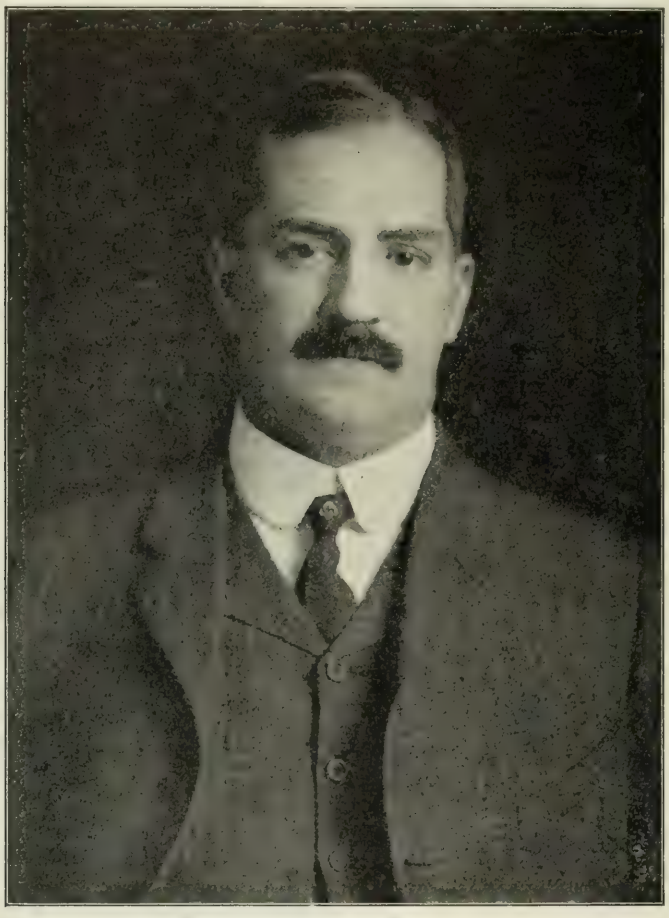
I do not intend this morning to take the time of the association to comment upon the committee reports that will be presented later for your consideration, though perhaps I might avail myself of the privilege usually accorded your president of suggesting to members of committees that their reports would be of greater value if submitted somewhat earlier to the secretary so that they will reach the members in time that they may study them. Our by-laws, as you may know, provide that reports of committees should be in the hands of the secretary by April 1, in order that he may get them out by May 1. From the fact that the reports reached the members about five weeks late, I assume that they were not all in by the first of April.

There are a number of matters concerning the work of the association of which you may not be informed, and which will not be covered by committee reports. One of the most important of these seems to be the present status of the safety appliance question as reported in full by our safety appliance committee Congress passed a bill about two months ago, which received the signature of the President, and which provides that within six months from its passage the Interstate Commerce Commission, after hearing, shall designate the number, dimensions, location and manner of application of sill steps, hand-brakes, ladders, running boards and other parts mentioned in previous safety appliance acts. This bill provides that the rulings of the Interstate Commerce Commission shall be effective July 1, 1911, and that the commission may, upon full hearing and for good cause, extend the time after which any common carrier may be required to comply with the provisions of the act. The commission is also given authority, after hearing, to modify or change, and to prescribe the standard height of drawbars and to fix the time within which modification or change shall become effective. It was suggested about the time the bill passed that the hearing could be materially shortened and better results obtained if a conference was arranged between a committee of your association and the inspectors of the Interstate Commerce Commission, they to represent the commission; and, as the idea met with favor by Mr. Moseley, secretary of the Interstate Commerce Commission, and your executive committee, a special committee was appointed for the purpose. The American Railway Association authorized this committee to give such attention as might be necessary to the question of drawbar heights, a matter that had previously been handled by that association. A preliminary meeting on the whole subject was held on May 24, and subsequent meetings on June 6, 7 and 8, and, as a member of that committee, I would like to testify to the fairness and earnestness of purpose evidenced on both sides. I think it very likely that the final result will be a considerable expenditure of money on the part of the railways in bringing old equipment up to the desired standards, but it seems likely that at the public hearing the Interstate Commerce Commission will grant the rail-

ways reasonable time to make their existing cars comply with the rules which they will prescribe. A public hearing on height of drawbars was held by the Interstate Commerce Commission on the 7th of the month, and it is understood that an order will probably be issued prescribing 34½ inches as the maximum height and 31½ inches as the minimum height of couplers on standard gage freight equipment, 26 inches as the maximum and 23 inches as the minimum height on narrow gage freight equipment, except for two-foot gage, where a maximum height of 17½ inches and a minimum height of 14½ inches is proposed.

This, I believe, will clear up the misunderstanding as to the intent of the present law, which has been given an interpretation somewhat at variance with the ideas of its framers.

It is probable that the public hearing on other details will be postponed until the early Fall in order that the conference committees may be given all the time that will be necessary in which to reach their final conclusions. If in the end there



F. H. Clark.
President, M. C. B. Association.

are any points of difference between the office is of the commission and the representatives of the railways, they will no doubt be settled by the commission at that time.

As I have already suggested, the orders of the commission may involve the railways of the country in considerable expense, this on account of the lack of uniformity in the application of safety appliances to our cars, and this is largely due to the fact that in some cases our safety appliance rules have not, until recently, covered some types of construction with sufficient clearness. Unfortunately, also, the association has not been in a position to enforce its rules, so that some variations have been allowed to continue which should have been corrected. The whole matter is now in the hands of the Interstate Commerce Commission, and your committee may regard itself, I suppose, as an advisory committee to that body. Where questions of safety are clearly involved there cannot very well be any serious differences of opinion, but the committee will take occasion to urge upon the officers of the commission the injustice of requiring uniformity when not essential to safety.

You may remember that at the last meeting of the association there was considerable discussion on the question of abuse of the repair card, and, as the matter was one which could not under our rules be properly handled by the arbitration committee, a resolution was passed asking that any member of the association having evidence of dishonesty in the use of the repair card should submit it to the executive committee, which would undertake to investigate the matter and handle in such manner as seemed to be to the best interest of the association. I am pleased to report that but one case of this kind was reported to the association. I am not prepared to say whether this indicates an improvement in conditions, or that the members have found it possible to adjust their differences without resorting to the good offices of the executive committee, but it has a hopeful look. There have been some claims made of sharp practice during the past year that have been thoroughly investigated by the roads interested and the charges definitely disproved.

There has been a general effort on the part of the railways during the past year or two to reduce delays in the movement of cars, and so obtain more use of the equipment. The discrepancy between the average mileage of cars in motion and the average daily mileage is so great that it seems that an increase should be possible. Delays are due to various causes, most of which would not be affected by any action we might take. The matter of delays to cars in interchange is one over which we have some control, and one to which the officers of your association, and the arbitration committee in particular, have given a good deal of attention It is to be hoped that our rules may be finally so framed that, without working an injustice to the owners, the movement of cars can be somewhat expedited through interchange points. We may not be able, under the rules now proposed by the arbitration committee, to eliminate unnecessary delays altogether, but it is often better to move cautiously in matters of this kind and gradually bring about the desired result than to make radical changes which will bring about confusion and general dissatisfaction.

It is quite possible for this association to take such action as to cause railways considerable unnecessary expense, and such action has occasionally been taken. The possession of power and authority should lead to conservatism, and this association is too powerful, and has too much authority, to

warrant it in taking radical action on matters having to do with rules or standards without careful consideration.

Our committee on consolidation, working jointly with a similar committee of the American Railway Master Mechanics' Association, will present a report, as instructed, on the advantages and disadvantages of consolidation, together with a proposed constitution and by-laws. This is an important matter and one which should not be settled without a full comprehension of the points at issue. The matter has been proposed before, but the subject has never been brought to the point at which it now stands. I hope that it will receive your most careful consideration and that we shall all approach the subject without prejudice.

I am sorry to say that during the year death has claimed the following members of the association: J. J. Ellis, P. H. Peck and J. F. Divine.

Owing to the fact that the Master Car Builders' Association is an unincorporated body it will probably be unable under the laws of the State of New York to receive the Tilletson legacy of $5,000, bequeathed by the widow of a former member of this association.

I wish to thank you in closing for the privilege of presiding over your meetings, and for the assistance rendered during the year in conducting the affairs of the association.

Secretary Taylor then presented his report, which showed the membership to be as follows: Active members, 377; representative members, 332; associate members 14; life members, 19; total membership, 742. The number of cars represented compared with last year is as follows: June, 1909, 2,403,961; June, 1910, 2,298,633.

The secretary announced the deaths during the year of J. J. Ellis, P. H. Peck and J. F. Divine, active members.

The statement of receipts and expenses showed an income of $16,509.50 and expenses, amounting to $15,919.29, leaving a balance of $590.21.

During the year fourteen railways and private car lines have signified their desire to become subscribers to the rules of interchange governing freight cars. Nine railways and private car lines have advised of their acceptance of the code of rules governing the interchange of passenger equipment.

The report of the treasurer presented by the secretary, showed a balance on hand June 10, 1910, of $1,127.82.

President Clark presented the following communication from the treasurer, John Kirby:

I ask you to accept my resignation as treasurer of this association. I have held office for several years and now ask that you elect a younger man in my place who will attend to the duties of the executive committee. I have been an active member of this association from its infancy. On the nineteenth of September, 1866, the following persons met in my office at Adrian: Rural Dean, of the Boston & Worcester; Calvin Stebbins, of the Western Railroad of Massachusetts; R. V. Coon, of the Troy & Boston; Leander Garey, of the N. Y. & Harlem; J. W. Van Houton, R. S. Ramsey, John P. Levan, Pennsylvania Central; George Shattuck, Rome, Watertown & Ogdensburgh; Joseph Jones, New York Central; F. D. Adams, Buffalo & State Line; N. H. Marsh, Cleveland, Painsville & Ashtabula; C. H. Copeland, Cleveland & Toledo, and John Kirby, Michigan Southern & Northern Indiana. Chairman, John Kirby; secretary C. P. Nichols, of the Western. J. W. Van Houton suggested that the master car builders form an association to be called the Master Car Builders' Association of the United States.

At that meeting the chairman was instructed to issue later a call for a general meeting to be held in Springfield, Mass., on May the fifteenth, 1867, to which all master car builders were invited. There was a large gathering; it adjourned to meet at Altoona, Pa., September 18, 1867. At this meeting a constitution and by-laws were adopted. This small beginning has grown to a membership of 447 and receipts amounting to $17,610.95.

In December, 1876, a meeting was called by Leander Garey to meet at the Palmer House, Chicago, to prepare a code of rules governing the interchange of freight cars. That meeting was in session two days and was attended by superintendents and master car builders from quite a number of railways. The result of that meeting is now generally acknowledged; Leander Garey was president, and John Kirby secretary of the meeting.

On the first of October, 1865, the Red Line, a fast freight line, started; its limits were Boston, New York, Chicago. The quota of cars each nine organizations put into this line was one car to every three miles of road. To maintain the cars was a problem, as each company's cars differed in construction from any other company's cars. The next April a meeting of the master car builders was held in Buffalo to decide on some plan for taking care of that rolling stock. It was decided that depots be established at New York, Boston, Albany, Buffalo, Toledo and Chicago for supplies of different parts that were most likely to give out. The present system is an improvement. At the time the line started the gage of track between Boston, New York and Buffalo was 4 ft. 8½ in.; from Buffalo to Erie, 83 miles, was 4 ft. 10 in.; from Erie to Cleveland, 4 ft. 9½ in.; from Cleveland to Toledo, 4 ft. 9 in.; from Toledo to Chicago, 4 ft. 8½ in. To run the cars over this variation of gages was accomplished by spreading to gage of wheels on the axles, widening the throat of guard rails and frogs and increasing the width of wheel tread one inch; that was the origin of "Broad Tread."

This will be more inspiring to young men than any words of mine:

Act now—don't wait for chance or fate
To bring the prize;
Seize now the rope, that's held my hope
And realize.
Climb high—don't stop, there's room on top,
Where eagle's fly;
Above the mass and doubting class
Great honors lie.
Don't cringe—don't flinch should fortune pinch,
And all seem lost;
with might and main,—try, try again,
At any cost.
Fight on; don't yield life's battle field,
To friend or foe;
Press to the front, receive the brunt,
And strike the blow.
Be brave, be true, in all you do,
Hold *honor* high.
Be sure you're right, then force the fight,
And win or die.

F. W. Brazier (N. Y. C. & H. R.): I do not think a communication like that from the "Grand Old Man" of the M. C. B. Association should go by unnoticed. Mr. Kirby is, without doubt, anxious to resign his position. I believe, as he has tendered his resignation, we as a body should accept it and send him a vote of thanks for the long-continued service he has rendered to this Association, and tell him that his letter was an inspiration to us all.

C. A. Seley (C. R. I. & P.): I second the motion, and amend it to the effect that the vote shall be a rising vote. I think we should emphasize in every possible way our appreciation of the service which Mr. Kirby has rendered this Association.

The motion was unanimously carried by a rising vote.

The recommendation of the executive committee that the dues for the current year remain as at present, $4 per vote, was approved.

L. E. Endsley, associate professor of Railway Mechanical Engineering of Purdue University, and E. A. Averill, managing editor of the *American Engineer and Railroad Journal*, were proposed as associate members.

C. A. Seley (C. R. I. & P.), E. W. Pratt (C. & N. W.), and T. H. Goodnow (L. S. & M. S.) were elected members of the auditing committee.

The committee on nominations made the following nominations: For president, T. H. Curtis, superintendent of machinery (L. & N.); A. Stewart, general superintendent motive power (Southern); D. F. Crawford, general superintendent motive power (Penn. Lines).

For vice president, the new constitution requires six members to be named; three are to be elected. The nominees are: T. H. Curtis, superintendent of machinery (L. & N.); A. Stewart, general superintendent motive power (Southern); D. F. Crawford, general superintendent motive power (Penn. Lines); C. E. Fuller, superintendent of motive power (Union Pacific); Henry Bartlett, general superintendent motive power (B. & M.), and E. D. Bronner, superintendent motive power (Michigan Central).

For treasurer: John Kirby, of Adrian, Mich; John S. Lentz, master car builder (Lehigh); J. W. Marden, S. C. D. (B. & M.).

For executive committee: J. D. Harris, general superintendent motive power (B. & O.); C. E. Fuller, superintendent motive power (Union Pacific); H. D. Taylor, superintendent motive power (P. & R.); J. S. Walsh, superintendent motive power (C. & O.); C. A. Seley, mechanical engineer (C. R. I. & P.), and R. D. Smith, assistant superintendent motive power (B. & A.).

The report was accepted and the president announced that the tellers would be named and the ballots distributed on Friday morning; the polls will close at 11.30 on that day, which will give the tellers time to count and report before final adjournment.

REVISION OF STANDARDS AND RECOMMENDED PRACTICE.[1]

1. The usual circular of inquiry was sent out and the replies thereto were carefully considered. In addition a number of subjects were submitted to the committee during the year, which are included in the report.

STANDARDS.

Journal Box and Details.

Pages 581 to 583, Sheets M. C. B. Nos. 1, 2, 4, 5, 7, 8, 10, 11, 13 and A.

2. The question has been raised as to the advisability of opening the bottom of the dust guard slide to facilitate the cleaning out of the core and applying the dust guard to the box. It is also claimed that there would be less breakage of dust guards in service. With the bottom of the box closed it fills up with dirt.

Referred to the Committee on Freight Car Trucks, for investigation and report to the 1911 convention.

3. A member calls attention to the drawing of the M. C. B. box; the wedge stop lug on box is of such height that when wedge is horizontal the height of bearing between wedge and front stop lug is but ¼ inch. In practice it is found that this bearing surface is insufficient, tending to rapid wear, and when in this condition liability of wedge working out of place, resulting in breakage of the boxes. Fig. 1 shows a wedge and box on which the vertical height of this bearing surface is ½ inch; Fig. 2 shows a scheme for providing still more bearing surface; Fig. 3 details the M. C. B. conditions, giving but ¼-inch depth of bearing surface, and Fig. 4 shows the M. C. B. wedge tilted as far as it can go without raising the box, in



R. L. Kleine.

which position there is no bearing surface whatever between lug and wedge. In view of this, it is recommended that the bearing surface of wedges be changed in accordance with Fig. 1.

Referred to the Committee on Freight Car Trucks.

Journal Box and Details.

Pages 581 to 583, Sheets M. C. B. Nos. 3, 6, 9 and 12.

4. A member suggests that the front-end construction of the journal-bearing wedge be changed so as to provide a suitable opening through the top of the wedge, in which to engage a packing hook for the convenient removal of the wedge for rebrassing, and submits a suitable design to provide for this; the oblong hole being forward of the bearing surface of the wedge.

Referred to the Special Committee on Freight Car Trucks, with the approval of this committee.

Journal Box and Details. For Journals 3¾ by 7 Inches.

Page 581, Sheets M. C. B. Nos. 1, 2 and 3.

6. A member calls attention to the last paragraph under this heading, reading as follows: "In 1908 a dimension of 3-16 inch was shown, it being the distance from the center line of bolt hole to inside bearing face of lid." Plate 3 shows the dimension 3-16 inch, which was inserted in 1909, therefore Sheet 3 should have added below "Revised 1894, 1896, 1905," the date "1909."

The committee requests the Secretary to make the addition.

Journal Box and Details. For Journal 5 by 9 Inches.

Pages 582 and 583, Sheets M. C. B. Nos. 7, 8 and 9.

10. A member suggests adding after the word "modified," in last paragraph, under this head, the following: "and words 'cast steel' were omitted from the drawing of the wedge."

The Secretary is requested to make the change.

Journal Box and Details. For Journals 5½ by 10 Inches.

Page 583, Sheets M. C. B. Nos. 10, 11 and 12.

11. A member suggests adding after last paragraph in text, under the heading, "In 1909 the word 'malleable' was stricken out and the words 'drop-forged' substituted for journal-bearing wedge."

The Secretary is requested to make the change.

Standard Axles.

Pages 584 to 586, Sheet M. C. B. No. 15.

13. A communication referred to the committee recommends making the radii of the fillets at the back end of the journal, dust collar seat and wheel seat uniform for each individual type of axle, to avoid changing tools in turning up the fillets above referred to. Investigation develops that tools are not changed at the shops in turning up the axles, the same fillet being used for the journal, dust guard and wheel seat, and if the proper radius is adopted it will not affect the strength of the axles and make the standards consistent with practice.

The present and proposed standards are as follows:

Axle.		Journal Fillet.	Dust-guard Fillet.	Wheel-seat Fillet.
A. (40,000 lbs.)	Present	¼ inch	¼ inch	¾ inch
	Proposer	¼ inch	¼ inch	¾ inch
B. (60,000 lbs.)	Present	5/8 inch	¼ inch	¾ inch
	Proposed	5/8 inch	5/8 inch	5/8 inch
C. (80,000 lbs.)	Present	¾ inch	¼ inch	¾ inch
	Proposed	¾ inch	¾ inch	¾ inch
D. (100,000 lbs.)	Present	¾ inch	¼ inch	¾ inch
	Proposed	¾ inch	¾ inch	¾ inch

The reason for maintaining the fillet of the journal, as specially noted for the A and B axles, is that any change in the journal fillet will result in confusion in car brasses.

Committee, therefore, recommends that the journal, dust guard and wheel seat fillets be changed in accordance with the proposed standards as tabulated.

Wheel Circumference Measure.

Page 586, Sheet M. C. B. No. 16.

14. The wheel circumference measure was omitted from the Standards in the rearrangement of the sheets last year, and the committee requests the Secretary to insert it.

Gauges for Mounting and Method of Mounting Wheels.

Standards, page 588, and Recommended Practice, page 637; Sheet M. C. B. No. 16.

15. A member calls attention to the following: The gauges for mounting and inspecting wheels, as shown on Sheet M. C. B. No. 16, are not in accordance with the text on this subject and furthermore, these gauges for the uses as shown require revision. As they are now portrayed on this sheet they are not understood and, if followed, are not in accordance with proper practice for mounting and inspecting wheels. He suggests that the Standards and Recommended Practice should set forth an approved method for mounting wheels. This member submits corrections in gauges, revision and additions for mounting wheels and recommendations for turning axles, wheel seats, mating wheels and boring wheel fits; also mounting pressures at which wheels should be mounted.

The committee refers the subject to the Committee on Car Wheels, for their consideration and such corrections in gauges as may be found necessary. It is important that we should have some recognized standard for mounting of wheels, as well as the pressures at which they should be mounted.

Brake Beams.

Pages 590 to 592 inclusive, Sheet M. C. B. No. 17.

16. A member suggests that the text under this heading should be revised and the details placed in chronological order.

The committee recommends that the text of the Standards and Recommended Practice be revised to show the action taken historically, under the different subjects, which will be found necessary as the revision is investigated. This to be

as brief as possible and at the same time cover the essential features.

Air Brakes—General Arrangement and Details.

Pages 592 and 593, Sheet M. C. B. No. 18.

18. A member suggests that, inasmuch as the piping layout shown on Sheet M. C. B. No. 18 was intended to apply to wooden cars only, which was approved by letter ballot in 1909, a committee be appointed to present the piping arrangement for steel cars.

As this matter is under the jurisdiction of the Standing Committee on Train Brake and Signal Equipment, the committee referred it to that committee.

19. A member calls attention to the present standards, which provide that the hand-brake chain is to be attached to brake mast by a ½-inch machine bolt instead of an eye bolt, and recommends that a machine bolt as per print submitted be shown on Sheet M. C. B. No. 18 and referred to in Index, under the heading, "Standards of the Association." When the ordinary ½-inch machine bolt is used serious failures occur, due to the heads of the bolts breaking off, therefore indicating that there should be a fillet between the shank of the bolt and head.

This is referred to the Committee on Train Brake and Signal Equipment, with the approval of this committee.

Air Brake Repair Card.

Pages 589 and 599.

20. A member suggests changing the heading in text, "Air Brake Repair Card," to read, "Air Brake Defect Card"; also change the place of application of the defect card from "as near to the car number as possible" to "To be wired to branch pipe as near triple valve as possible." Adopt standard colors and size for these air-brake defect and cut-out cards, showing an eyelet in the top of card so that it can be secured to branch pipe with wire—red color for defective air-brake card and manila color for air-brake cut-out card. The defects enumerated on these cards should be revised so that the defects shown on the defective air-brake card will be such that will not permit a car to be placed between air-brake cars, or, in other words, the following defects: Cut-out cock, angle cock, branch pipe between train line and cut-out cock, train pipe and hose and coupling. The defects on the air-brake cut-out card should only cover defects to the air-brake equipment which will permit the car to be placed between air-brake cars; in other words, a car having the following defects: Triple valve, reservoir, brake cylinder, cylinder packing leather, release cock, brake rigging, odd brake, branch pipe between triple valve and cut-out cock. Sample cards submitted. The new location is better in that it provides a uniform location for attaching these cards. The two colors distinguish the car which has a through train line with the brake cut-out from the car which has a train line in a defective condition.

Referred to the Committee on Train Brake and Signal Equipment.

Safety Appliances—Freight Train Cars.

Pages 602 to 606, Handholds.

21. A member calls attention to Sheet M. C. B. No. 19, revised 1900. Sheets 19-E, 19-F, 19-G, 19-H, 19-I and 19-J were revised, account of eliminating reference to wooden tread 1½ by 2 inches. Cause of revision should be inserted in the notes, under heading "Safety Appliances."

Secretary requested to make the proper reference in text, under the heading "Handholds."

Automatic Coupler.

Page 609, Sheet M. C. B. No. 23.

22. A number of members recommend the addition of the 8½-inch butt to the standards, for the following reasons: The 6½-inch coupler butt was originally designed to use with the 6¼ by 8-inch draft spring and allows ¼-inch clearance. The 9⅛-inch butt was designed to take certain friction gears requiring that width within the yoke. For several years past, the M. C. B. class "G" spring, or springs of that dimension, have been used on many thousand cars, but the 6½-inch butt is not of sufficient depth, and it is not deemed good practice to use liners between the butt and yoke ends. The diameter of a class "G" spring is 8 inches, and if used with a 9⅛-inch butt the clearance is too great and the springs are not central; 8½-inch coupler butts are now being furnished for use with the class "G" spring and many thousands are in service.

Referred to the Standing Committee on Couplers and Draft Equipment, with the recommendation that a suitable 8½-inch butt be designed for use with the class "G" type of draft spring.

23. A member suggests enlarging the slot in the M. C. B. coupler to 1¼ by 5⅛ inches, to accommodate draft key 1⅛ by 5 inches, for both sizes of shank. In addition to increasing the size of slot, it is also recommended to provide additional bearing surface for the key.

Referred to the Committee on Coupler and Draft Equipment.

24. A member calls attention to Sheet M. C. B. No. 23, rearranged in 1909, on account of showing 3-16-inch radius on corner of coupler butt. Reference to this revision should be made in the text, under heading "Automatic Coupler."

Committee requests the Secretary to add reference to text.

25. A member suggests that the text under this heading should be revised and the details placed in chronological order. That the specifications on page 611, reading as follows: "That all couplers must have an eyelet for locking device located immediately above locking pin hole," be changed to read, "That all couplers must have a 1 1-16-inch eyelet," etc., to conform to note on Sheet M. C. B. No. 23.

Committee requests the Secretary to add to text, "That all couplers must have a 1 1-16-inch eyelet," etc.

Specifications for M. C. B. Automatic Couplers.

Pages 612 to 621.

26. A member suggests including under Article 4, page 613, second paragraph, "The lift of the locking pin must not be more than 6 inches." This is now included in the standards, but should also be placed in the specifications.

Secretary requested to add to specifications, "Lift of locking pin must not be more than 6 inches."

Siding, Roofing and Lining.

Page 622.

27. A member suggests that reference to flooring under this heading should be removed and placed under the heading "Flooring," on same page, where it properly belongs.

Secretary is requested to make the change.

RECOMMENDED PRACTICE.

Limit Gauges for Inspecting Secondhand Wheels for Remounting.

Page 637, Sheet M. C. B.—B.

30. A member suggests to advance the Recommended Practice, "In 1907 limit gauges for use at shops when inspecting secondhand wheels for remounting were adopted as Recommended Practice," to Standard, in order that this gauge may be generally used and to prevent badly worn wheels from being remounted.

Committee approves this recommendation.

Wheel Tread and Flange for Steel and Steel-tired Wheels.

Page 638, Sheet M. C. B.—G.

31. A member suggests the following: While text or sheet does not specify that steel or steel-tired wheels, for freight cars, must be 33 inches in diameter when new, it is assumed that the diameter new is to be in accordance with the Recommended Practice for cast-iron wheels.

That this question be referred to the Committee on Car Wheels, with instructions to look into the question of proper diameter for such wheels in so far as maintaining the proper height of couplers for steel freight cars, also in maintaining effective brakes when wheels are worn to the limit, as trouble is experienced in holding couplers on steel cars within the limits, also as the brake details are now such that an effective brake can not be maintained.

Referred jointly to the Committee on Train Brake and Signal Equipment and to the Committee on Car Wheels.

32. A member calls attention to Sheet M. C. B.—G. Worn steel tire shown at the bottom of left-hand corner of the sheet is incorrect, as the thickness through throat is 1⅛ inches or more, instead of 1 inch, as shown.

Referred to the Committee on Car Wheels, with the suggestion that this cut be eliminated, as the subject is covered by the four cuts shown above the old cut referred to.

Brake Beams.

Page 638.

33. A member suggests advancing to Standard the following Recommended Practice, under the head of "Brake Beams": "The brake hangers shall have an angle as nearly as possible to ninety degrees from a line drawn from the center of the brake shoe to the center of the axle when the shoes are half worn."

Referred to the Committee on Train Brake and Signal Equipment, with the request that they investigate the ques-

tion of angularity of brake hangers before any action is taken to advance to Standard.

34. A member suggests advancing to Standard the following Recommended Practice, under the head of "Brake Beams": "That brake beam hanger brackets shall be attached to some rigid portion of the truck."

Committee approves this suggestion.

Carrier Iron.

Page 639.

35. A member suggests to advance to Standard the following Recommended Practice, under the head "Carrier Iron," and change title to read: "Brake Staff Carrier Iron": "In 1908 a Recommended Practice was adopted to use a 'U'-shaped carrier iron for brake shaft bow for new cars, so that the half yoke now largely used would not be extended to new cars."

Committee concurs in this recommendation.

Cleaning Air Brakes.

Page 644.

36. A member makes the following recommendation: Last year it was suggested that the Recommended Practice covering "Cleaning Air Brakes" and diagram of triple valve test rack modified to care for testing of "K" and other late types of triples be advanced to Standard, which suggestion was referred to the Committee on Train Brake and Signal Equipment, but no report. As this is an important matter the recommendation is renewed.

Referred to the Committee on Train Brake and Signal Equipment.

Steam and Air Line Connections.

Page 649, Sheet M. C. B.—Q.

37. The report of Committee on Air Brake Hose to the 1909 convention, with particular reference to "standard dimensions of air-brake hose couplings and gaskets," was received and referred to the Committee on Standards for further investigation and report. Inasmuch as this involved the design of the air-brake hose coupling, gasket and gauges for both new and worn air-brake hose couplings, and should possibly be extended to signal hose couplings, the committee felt that this matter should have been referred to the Standing Committee on Train Brake and Signal Equipment, who have direct jurisdiction over the designing and interchangeability of these parts, and accordingly referred this subject to the Committee on Train Brake and Signal Equipment by letter, dated August 10, 1909, through the Secretary of the Association, who advised, under date of August 13, 1909, that the matter had been so referred.

Coupler Yokes.

Pages 650 and 651, Sheet M. C. B.—C.

39. A member calls attention to Sheet M. C. B.—C, rearranged 1909. The radius of ⅛ inch was added to inside of yoke lip. Mention should be made in the text.

Secretary requested to make the following reference: "In 1909 a ⅛-inch radius was added to inside of yoke lip."

Knuckle-throwing Device.

Page 651.

40. A member suggests to advance to Standard the following Recommended Practice for couplers applied after September 1, 1911: "In 1905, as a result of letter ballot, the following Recommended Practice was adopted: 'That the use of a knuckle-throwing device which will throw the knuckle completely open and operate under all conditions of wear is favored by the Association.'"

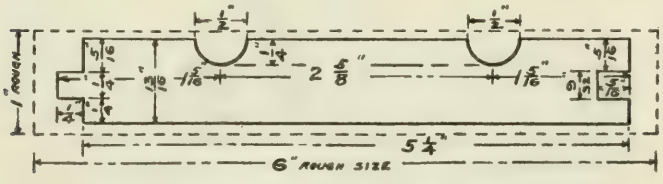
Committee concurs in this recommendation.

Rounding Corners of Doors, Door Jambs and All Other Inside Exposed Corners of Stock Cars, to Prevent Injury to Cattle.

Page 653, Sheet M. C. B.—F.

42. Under date of May 12, 1909, the Pennsylvania Society for the Prevention of Cruelty to Animals brought to the attention of the Master Car Builders' Association that cattle, loaded and unloaded in stock cars with sharp cornered door and door jambs, were being injured by barking their shoulders and hips on these sharp corners, and suggested that the same be rounded. The committee submits the following for Recommended Practice:

Doors, door jambs and all other inside exposed corners of stock cars to be rounded to prevent injury to cattle. Add cut to sheet M. C. B.—F. showing the same. See illustration.



Corner of Doors and Door Jambs Rounded.

Limit Gauges for Round Iron.

Page 665.

43. The Secretary forwarded to the committee a communication received from one of the manufacturers of bar steel that the allowable variations provided by the limit gauges for bars 1⅜ inches, 1½ inches and 1⅝ inches in diameter are rather close for regular mill practice, and can only be met under special conditions and with special care, which commands a special price. They further advise that the standard rolling mill practice for bars 1 5-16 inches in diameter up to 2 inches, inclusive, is .0156 inch variation either way, i. e., above or below the nominal diameter, whereas the present Recommended Practice for round iron within these sizes is as follows:

Nominal Diameter of Iron, Inches.	Large Size + End, Inches.	Small Size — End, Inches.	Total Variation, Inches.
1¼	1.2605	1.2395	.021
1⅜	1.3860	1.3640	.022
1½	1.5110	1.4890	.022
1⅝	1.6140	1.636	.022

Limit gauges for round iron for sizes varying from ¼ inch up to and including 1¼ inch were adopted in 1883. In 1907 the Standing Committee on M. C. B. Couplers recommended limiting diameters for round iron 1⅜-inch, 1½-inch and 1⅝-inch, which were adopted by letter ballot, so as to include sizes for 1⅝-inch knuckle pivot pin steel. In 1909 the Coupler Committee recommended an allowable variation of 1-64 inch above and below the nominal size (1⅝-inch) for knuckle pivot pins, stating that it was difficult to procure steel within the limits of .011 inch above and below the nominal diameter as provided for by the present limit gauges; this recommendation was approved by letter ballot.

Committee recommends the appointment of a special committee to determine whether any changes in the present limits are necessary and desirable, and, if so, to fix new limits. This matter requires investigation before establishing any new limits, on account of the effect increased limits would have upon the standard screw threads used.

Splicing of Steel Center Sills.

Page 666, Sheet M. C. B.—D.

44. A member calls attention to Sheet M. C. B.—D, rearranged in 1909, account of showing end sills on spliced steel sills. Reference should be made in the text calling attention to this revision.

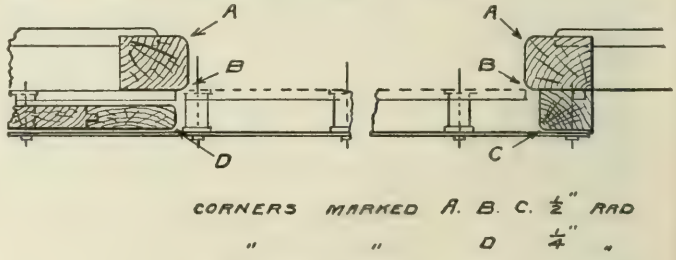
Committee requests the Secretary to make the following addition to text: "In 1909 cuts were revised by the addition of end sills to drawing."

Fluted Car Roofing.

Page 667, Sheet M. C. B.—K (suggested).

45. At the last convention the committee recommended the appointment of a special committee to investigate and submit plans for fluted car roofing. The Executive Committee thought that this could best be handled by the Committee on Standards, and therefore referred it back to your committee for investigation and report. Accordingly, a circular of inquiry was sent out to the members. A majority of the replies received indicated that fluted car roofing was desirable for double board roofs. The designs of fluted roofing submitted were carefully considered and your committee would recommend the following for Recommended Practice:

Fluted roofing for double board roofs shall be of the section as shown on Sheet M. C. B.—K. See cut.



"Fluted Roofing."

The report is signed by: R. L. Kleine (P. R. R.), chairman, Jno. Hair (B. & O. S. W.), T. M. Ramsdell (C. & O.), W. E. Dunham (C. & N. W.), and T. H. Goodnow (L. S. & M. S.).

DISCUSSION OF REPORT ON STANDARDS AND RECOMMENDED PRACTICE.

Mr. Kleine: I might say that in the cut of the fluted roofing the dimension line which goes to the tension, should stop at the root of the tension, so as to make the distance from centre to centre of groove, 2⅝ in.

C. M. Bloxham (U. T. L.): Referring to paragraph 22. The 6½ in. coupler butt gives one-quarter inch clearance when used with the 6¼ in. butt, and with the new proposed 8½ in. coupler butts, gives ½ in. clearance, when used with an 8 in. spring. Why is the additional ¼ in. clearance necessary on the 8 in. spring over the 6¼ in. spring.

Mr. Kleine: I might say that the committee accepted the recommendations of the various members who are now using the 8 in. spring. They are now using the 8½ in. coupler butt with the 8 in. spring.

C. A. Seley (C. R. I. & P.): I was connected with the request of this 8½ in. coupler butt, and would say that it has reference not only to the capacity of the 8 in. spring, but to various types of friction gears. Just why the one-quarter inch was added, originally, I do not know, but the fact remains that a large number of 8½ in. butts are in use with G springs and various types of friction gear, and rather than make another size, for a variation of ¼ in., making an 8 in. butt, it was desirable to make it 8½ in.

C. A. Schroyer (C. & N. W.): Personally, I am opposed to the adoption of another standard coupler, with a different sized butt. If this is done, it necessitates the carrying of an additional coupler in stock to meet the requirements of repairs.

Mr. Kleine: The committee on standards referred this matter to the committee on couplers for their approval, because of the large number of communications received from the different roads as to the necessity for the 8½ in. butt, and the fact that when the 9⅛ in. butt is used with the 8 in. draft spring, it puts the spring out of alignment.

J. H. Manning (D. & H.): I would like to hear a discussion on the question of using a 9⅛ in. tail with the 8 in. spring, by tapering it up from the back. There are a great number of cars in service that way now, and it is apparent that the 9⅛ in. tail can be used for the friction gear as well as the 8 in. G spring. As far as the alignment is concerned, I do not think there will be any trouble with that. We will then have only two couplers.

C. A. Schroyer: If we are to adopt a roof board according to the drawings shown in the report, we will be laughed at by everybody, because there is nothing about that roof board that is correct, and, anyhow, the time for the use of the roof board is very nearly gone. We have for forty years gone on covering our cars with matched and grooved flat roof boards, and now that we are about to abandon that practice, we are presented with a proposed standard for adoption which is not right. That drawing is not right. No one works out roof boards like that.

O. C. Cromwell (B. & O.): Paragraph 30 shows the "Limit Gauges for Inspecting Secondhand Wheels for Remounting," and the committee recommends that this be advanced for adoption as a standard. This is one of the questions which can be well left to the practice of the railway companies individually, and we should be careful not to tie ourselves down to too many standards. I do not see any particular necessity for it in connection with the interchange business.

J. J. Hennessey (C. M. & St. P.): The association should be very careful not to adopt too many standards. The wooden roof is going out gradually, and at times you cannot get lumber that you can make a 5¼ in. width board, although you pay for it; by the time the wood is seasoned, you cannot make the roof board over 5 in. At other times, it is greatly to the advantage of the railway to put on 4 in. roof boards, particularly on the outside of metal roofs. Many roads find it good practice to do away with the grooves entirely on the inside metal roofs, where the boards are put on for protection to the metal. We have come to a point where the double board roof is almost a thing of the past, and I do not believe it is even wise to submit that proposed standard to letter ballot, but that the railways should be left to their own practices in this regard. It is something which has nothing to do with the interchange of cars; it does not tie up traffic, and it may, under some conditions. The 5¼ in. widths cannot always be obtained, but we are constantly asked to allow the use of 4 in. width, which works down to 3½ in., and it makes as good a roofing as the wider roofing, the only objection being that it does not fit in where a given number of 5¼ in. boards are taken out. In view of the fact that the coming roof is to be a metal roof, either inside or outside, the necessity for the adoption of a thing of this kind is passed, and I want to make a motion, in so far as the recommendations relative to the roof board are concerned, that they be eliminated.

A motion was carried that the reference to the roof boards in the report be eliminated.

Mr. Kleine: We had a request from those who use the fluted or double roof board, who wanted to have a standard as to the best method of applying it, and the committee sent out a circular; we had nine replies, eight of which favored the fluted roofing. Under these conditions, what could the committee do but present a recommendation covering a fluted roof board?

Mr. Kleine: Replying to Mr. Cromwell's remarks with reference to paragraph No. 30, which covers the limit gauges for inspecting secondhand wheels for mounting. It is a question that has not received sufficient consideration. We have nothing to show now what is a good secondhand wheel—we have prices given in the Interchange Rules for secondhand wheels, and we should have something to show what is good practice in the remounting secondhand wheels and placing them under foreign cars, that is, the limits in regard to flange thickness.

W. E. Fowler: That subject was discussed by the Wheel Committee, and we came to the conclusion that it was a measure of protection that this Association owed to each of its members to see that when members were called upon to pay for secondhand wheels, they should know they were getting something under their cars that was somewhat serviceable.

C. E. Fuller (U. P.): I want to strongly advocate keeping the rule in. It is one of the best rules that has been offered, and I believe we would be making a mistake to attempt to cut it out.

A motion that paragraph 30 be eliminated from the report was lost.

The report of the committee, as amended, was then accepted.

F. W. Brazier: It is apparent that if we had not changed our constitution we could proceed at this time and finish all of the business laid out for today's two programmes, and be able to adjourn at half past one; but, according to the constitution, we must give one day's notice, and I move that our meeting tomorrow morning be from ten o'clock until the time of adjournment, unless the business should warrant an afternoon session.

The motion was carried.

In the absence of A. J. Cota, chairman of the Committee on Train Brake and Signal Equipment, E. W. Pratt (C. & N. W.), presented the report.

Train Brake and Signal Equipment.

1.—Lake Shore Emergency Brake Tests.

Following is a report covering a historical statement of events which led up to the emergency brake tests, conducted by the Lake Shore & Michigan Southern Railway, and finally the results obtained from the tests, which are herewith presented to those interested in the problem of stopping heavy passenger trains at high speeds.

Representatives from several railroad companies having under construction heavy steel passenger equipment cars proposed to the Executive Committee of this Association, dur-



A. J. Cota.

ing the convention last year, a subject requiring the immediate consideration, namely, "The definition of proper air-

brake equipment for passenger cars weighing 130,000 pounds or over."

The committee on Train Brakes and Signal Equipment was accordingly summoned to attend a joint meeting of the committee and representatives from various railroad companies and manufacturers directly interested in the subject, at the Union Station, Pittsburg, July 1, 1909. A. W. Gibbs, G. S. M. P. (P. R. R.), was elected chairman of the meeting. The object of the meeting was, on the request of the chairman explained by A. L. Humphrey, in effect that some hundreds of passenger cars contracted for early delivery would be of such weight as to have practically outgrown the foundation brake rigging of to-day, and a radically new design was imperative. However, it would be too late for consideration after the next Master Car Builders' convention. The heavy cars contracted for would soon be delivered and brake designs must be decided upon at once. It was further brought out that until five years ago the maximum weight of cars approximated 90,000 to 110,000 pounds, and with such cars it was found necessary to employ 16-in. or 18-in. brake cylinders. The leverage ratio used was as high as 9 to 1, which is the recognized maximum ratio of leverage permissible; the 18-in. cylinder would provide for cars of maximum weight up to 127,000 pounds. For cars above this weight it will be necessary to increase either the leverage ratio or the cylinder power. Cars now under construction will weigh from 140,000 to 150,000 pounds and even more, which makes it necessary to redesign foundation brake rigging so as to provide a suitable brake.

Manufacturers could probably meet the conditions by employing a 20-in. brake cylinder. This, however, is very objectionable from many standpoints. It would involve the question of clearance space underneath the car, severe horizontal stresses in car body members, increased cylinder leakage, it being quite impossible to obtain packing leathers of sufficient uniformity to prevent excessive leakage, and the pistons, rods and levers would become so heavy that it would require some fifteen or twenty per cent of the brake power to move them. It was felt, therefore, that the 20-in. brake cylinder is impracticable.

If not a 20-in. cylinder, it would necessarily call for two cylinders of an approximate equal area, say two 14-in. cylinders, one on each end of the car. This would mean a complication in the way of double equipments, which should receive careful consideration on the part of the Master Car Builders' committee and railroad representatives present. It would also be quite difficult to operate the two equipments with one triple valve.

Another proposition would be to place the entire apparatus on the trucks, using either a single or two cylinders of equal area, which method is considered desirable, would require a flexible connection between the brake pipe and the cylinders.

Another method would be to use the clasp brake, requiring two brake beams or four shoes to each pair of wheels. There are, however, many objections to this design, and it is questionable whether the acknowledged theoretical advantages of the clasp brake would be considered practicable.

Another scheme would be to permit an increase of piston travel by lengthening the brake cylinder. This is also objectionable on account of the undesirable angularity of levers thus involved.

The matter can, therefore, be resolved into five propositions, as follows:

1. A 20-in. diameter brake cylinder, with increased packing leakage.
2. Two brake cylinders per car, which would probably make it necessary to provide two complete brake equipments, including triple valves, etc., whether applied to the car body or trucks.
3. Clasp brakes, meaning the application of two brake shoes per wheel, one on either side. This method would probably provide ample braking power for a 150,000-pound car, using an 18-in. diameter brake cylinder, with a leverage ratio of 9 to 1.
4. Increased length of an 18-in. brake cylinder, and consequent longer piston travel, with an increased leverage ratio and objectionable angularity of levers.
5. Two brake cylinders of equivalent area to one 14-in. cylinder applied to each truck.

The brake apparatus has not kept pace with the increased weights and speed of the modern passenger train. Contributing factors which make necessary a different treatment in the application of braking or retarding force than that heretofore practiced are, briefly:

1. Increased unbraked locomotive weight.
2. Increased train momentum.
3. Increased brake rigging deflection and false motion, due to severe stresses in car members and other causes, which greatly increase the piston travel.
4. Increased brake leverage ratio, with consequent increased piston travel and lower maximum cylinder pressure.
5. Increased time to obtain brake effectiveness, on account of large cylinder volumes.
6. Decreased brake shoe coefficient of friction, due to greater brake shoe pressures and speeds.
7. Possible breaking down of the brake shoe under the severe conditions imposed.

It was the sense of the meeting that the problem should at once be considered from both a practicable and theoretical standpoint, and accordingly a subcommittee, composed of A. J. Cota, T. L. Burton and D. F. Crawford, was appointed, to determine the scope of and establish a basis for the investigation. The following resolutions, as submitted by this committee, were unanimously adopted by vote of the railroad representatives present:

"*Resolved*, That it is the sense of this meeting that the air brakes provided for the heavier passenger cars now building shall be of such design, proportion and capacity as to enable trains of the said heavier passenger cars to be stopped in practically the same distance after the brakes are applied as is now the case with existing lighter cars; and be it further

"*Resolved*, That for the use of this committee and others interested in making calculations, we suggest that it be assumed that the theoretically desirable stop is one which requires the space of not over 1,200 feet after the brakes are applied, the speed of the trains at the time of the application of the brakes being sixty miles per hour."

Another subcommittee was then appointed, composed of W. F. Keisel, Jr., R. B. Kendig, C. S. Knapp, W. V. Turner and F. W. Sargent, to recommend the maximum load per brake shoe, from which figure would be calculated the percentage of retardation necessary and also to make recommendations as to the number of shoes per car for different weight of cars. The subcommittee was continued for a meeting of the representative committee, to be held July 13, at which time they were to report on the following questions:

1. Allowable pressures per shoe.
2. Arrangement of cylinders and number of shoes for eight-wheel cars weighing 90,000 pounds and over.
3. Arrangement of cylinders and number of shoes for twelve-wheel cars weighing 120,000 pounds and over.
4. Recommendations as to limit of capacity and deflection of brake beams where used on above cars.
5. Recommendations as to arrangement of hand brakes.

A brief synopsis of their report follows:

1. F. W. Sargent, chief engineer of the American Brake Shoe & Foundry Company, assisted by R. C. Augur, then of the Westinghouse Air Brake Company, made a number of tests at the former company's laboratory, Mahwah, N. J., for the purpose of determining the mean cofficient of friction between wheel and shoe with M. C. B. standard dimensions for plain and chilled cast-iron shoes. The results of the tests indicated that the mean coefficient of friction as high as 10 per cent could probably be realized in service. Based on these tests, it was the pinion of the committee that the maximum pressure per shoe, the coefficient of friction in some cases pounds per square inch, and that in no case should these pressures be exceeded. It was further noted from Mr. Sargent's tests that with plain cast-iron shoes and 18,000 pounds pressure per shoe, the coefficient of friction in some cases fell as low as 8.4 per cent. This low coefficient of friction, however, was obtained with new shoes before the hard skin had been worn off; after the hard skin had been eliminated and a good bearing secured the coefficient increased above 10 per cent, in some instances running as high as 13.2 per cent. It, therefore, seemed entirely fair to the committee to base the calculations on an average mean coefficient of friction of 10 per cent, which was the figure decided upon.

2. It was agreed that the stop distance should be measured from the point where brake application is made, and that allowance would, therefore, have to be made in the calculations by deduction from the length of stop for the lapsed time before the brake became effective, estimated at two seconds, or a traveled distance of 176 feet, at the initial speed of sixty miles per hour.

3. In order to determine a basis on which to consider the brake power of the cars themselves, an ideal train, consisting of one locomotive and six cars was selected. It was agreed that the total weight of cars in the ideal train should be considered as being twice the weight of locomotive and tender. In other words, the weight of locomotive and tender should be one-third the weight of the entire train. Previous tests seemed to indicate that the effectiveness of the brake on locomotive and tender is decidedly less than on cars. In some previous tests, when the engine was disconnected immediately before brake application, the distance in which the locomo-

tive came to a stop was nearly twice the distance in which cars stopped. It was decided, therefore, to class the effectiveness of locomotive and tender brake at one-half that of the cars. Taking the car effectiveness at 100 per cent and the locomotive at 50 per cent, and assuming the train composed of three unit weights, the brake effect of the ideal train would be in the ratio of 250 to 300, or as 5 to 6, as compared with the 100 per cent effectiveness of the cars. It was assumed, therefore, that a greater car retarding force would be necessary in the proportion of 6 to 5 than that necessary to stop the cars alone in that distance.

4. A further increase in the retarding factor for the cars is required to compensate for the load on cars, which was estimated at 7 per cent of the light weight of train. It was thought advisable to apportion this load over the train as follows:

Sleeping cars, 3 per cent of light weight of cars.
Coaches, 10 per cent of light weight of cars.
Load cars, 15 per cent of light weight of cars.

5. With the foregoing data and assumptions determined, the required retarding force in terms of weight of car could be found as follows:

F = retarding force.
s = desired length of stop in feet.
w = weight of car.
V = velocity in feet per second.

(1) $S = \frac{5(s-2V)}{6}$ = compensated length of stop in feet, allowing for elapsed time to brake effectiveness, and also for the effect of the unbraked weight of locomotive.

l = lading allowance to be added to w,
.03w for sleeping cars,
.10w for coaches,
.15w for load cars.

(2) $w = w \quad l.$
g = acceleration of gravity = 32.2.

Then for the work to be done,

(3) FS = work = $\frac{1}{2} BV^2$, and where $M = \frac{W}{g}$

(4) $F = \frac{W V^2}{2 g S}$

6. The coefficient of friction of the brake shoe against the wheel was decided as 10 per cent. The efficiency of the brake rigging was assumed from previous tests to be 85 per cent. For cars equipped with brake beams the ratio of maximum cylinder pressure to maximum shoe pressure should not exceed 9; for cars without brake beams this ratio should not exceed 9.63. The maximum shoe pressure to be 18,000 pounds, as previously stated. Based on these figures, the maximum car weight for single shoe per wheel could be determined from the formula. If brake beam release springs or other devices materially affecting the efficiency of the brake gear are used suitable allowance should be made.

7. It was recommended that brake beams used on these cars should not deflect more than 1-16 in. under maximum emergency brake load, and that such brake beam should not take a permanent set under a load of 50 per cent in excess of the emergency brake load.

8. It was recommended that the hand brakes should be so connected that neither the cylinder nor hand-brake rod should act as a fulcrum for the other; also that the slack adjuster should be so located that it adjusts both air brake and hand-brake equally; that there should be room for at least 30 in., preferably 36 in., of chain on each shaft or worm of the winding apparatus, with 3,000 pounds pull on the hand-brake rod; that a release spring should be attached to the hand-brake lever to release the hand-brake and prevent excessive sagging of the chain; that cars which are equipped with two cylinders have the hand-brakes at the two ends of car arranged to operate independently of each other, and that each should apply the brake on one truck only. With two cylinders per car, both cylinders should be attached to car body.

9. As there seemed to be a possibility of pushing the axle out of its bearing, on account of high brake power, this question was taken into consideration. The committee recommended that the resultant of static load and brake-shoe pressure on the axle be determined, and that the direction of this resultant be kept inside of a line through the center of the axle and edge of bearing to an amount equal to 10 degrees. Other forces also act at this point, such as brake hanger effect on truck frame and friction between journal and bearing. If careful estimate of direction of resultants, based on all forces acting on the journal, is made, it would seem sufficient to have the direction of this resultant, when passing through center of axle, 5 degrees inside of the line through center of axle and edge of bearing. The direction of the resultant may be varied bby lowering the brake shoe. It was further considered that, on account of the high brake effect on passenger cars, the strain on the axle would be greater than on the same axle in freight service. The minimum resultant of static load and brake pressure in freight cars had been estimated at 125 per cent of static load. For passenger cars the minimum resultant was estimated at 187.5 per cent of static load, or 50 per cent greater than in freight service. Passenger cars, however, have a lower center of gravity than that of freight cars which has a tendency to reduce the strain per journal. Axles are also less subject to shock in passenger service than in freight service, for which reason it did not seem necessary to make an allowance commensurate with this condition. This indicated that it was not advisable to make an arbitrary reduction in axle capacity under static load for passenger service without a more careful investigation than possible in the limited time at command. Since the axle capacity is not a function of the brake designs, this subject can be held in abeyance until the various railroads can look into the question fully and give their recommendations.

Discussion following the reading of report resulted in a consensus of opinion that before acceptance of the recommendations offered a demonstration should be made by actual road tests with trains such as considered, during which tests records should be taken of all items of interest and particularly those representing the basis for calculating lengths of stop. Mr. Crawford assured the meeting that this feature would receive his personal attention and that arrangements would be made to conduct the tests on the Pennsylvania Lines at a time and place dependent upon the many conditions necessary to be taken into consideration.

In the meantime, on the return of the Lake Shore & Michigan Southern officials from the meeting, they took up with their management the question of trying out by actual road demonstrations the recommendations of the committee as applied to the type of cars under construction for them. Accordingly, some of the newly built, heavy, twelve-wheel passenger cars being delivered to that company by the manufacturers were made available for a ten-car test train before turning them into service. The test was arranged to take place in September or early in October. Mr. Gibbs intimated to the Lake Shore officials that, in addition to the heavy twelve-wheel coaches proposed for test, it might be desirable to make some trials with heavy steel eight-wheel coaches for comparison, and that they had available some cars of this type, which were offered for test if agreeable. The offer was accepted and a program was arranged for the test. On request of Mr. Parish, superintendent motive power of the Lake Shore & Michigan Southern, Mr. Gibbs, the chairman of the previous general meetings, called a meeting at Cleveland, on October 12, to discuss and criticise the proposed program of tests.

The program decided upon for the trials contemplated the following comparisons:

1ST.—TRAIN

a. Two locomotives and ten twelve-wheel cars.
b. One locomotive and ten twelve-wheel cars.
c. Two locomotives and six twelve-wheel cars.
d. One locomotive and six twelve-wheel cars.
e. One locomotive and six eight-wheel cars.

Dynamometer car to be used in several runs to measure the unbraked locomotive effect.

2D.—SPEEDS.

a. Sixty miles per hour.
b. Eighty miles per hour.

3D.—BRAKE EQUIPMENT.

Twelve-wheel Cars.

a. High-speed brake, 90 per cent of weight of car, based on 60 pounds cylinder pressure. With maximum cylinder pressure, 85 pounds, equals 127.5 per cent.

b. Retarding percentages as recommended by committee, with cylinder pressure 105 pounds. Note that, as explained in committee's report, this force varies for different classes of cars.

Eight-wheel Cars.

c. High-speed brake, 80 per cent of weight of car, based on 60 pounds cylinder pressure. With maximum, 85 pounds cylinder pressure, equals 113.3 per cent.

d. The same brake leverage at 105 pounds cylinder pressure, which is equivalent to 140 per cent braking power.

4TH.—BRAKE SHOES.

a. Chilled cast-iron shoes.
b. Plain cast-iron shoes.
c. Experimental, or even proprietary brake shoes, if necessary, on account of the possible breaking down of the cast-iron shoes under the enormous test pressures proposed.

It was realized by the Lake Shore officials that in carrying out such an elaborate program a large testing force would be

necessary, and on account of the many observations of a technical nature to be recorded, some assistance would be required from the other railroads interested if the tests were to be made as complete as outlined. This matter was brought before the general committee, with the result that volunteer observers were offered by and accepted from the following roads: Pennsylvania, Baltimore & Ohio, Chicago & North Western, Chicago, Burlington & Quincy, Central Railway of New Jersey, Northern Pacific, and New York Central Lines. The volunteer service made up approximately 50 per cent of the test crew, the balance being drawn from the Lake Shore & Michigan Southern. The Westinghouse Air Brake Company also offered observers, who were accepted, together with the use of chronograph station outfit, telephones and the recording apparatus with which the track and trains were equipped. The American Brake Shoe & Foundry Company offered to furnish the necessary brake shoes required for the tests, which offer was also accepted.

The brake shoes requested for test were as follows:

1. Plain cast-iron, to P. R. R. specification.
2. Chilled end cast iron, commonly known as the "U" shoe, as used on the New York Central Lines.
3. Chilled inset cast-iron, Streeter type, as commonly used on a number of roads.
4. Composite steel and cast iron, commonly known as Diamond S, also used by a number of railroads.

The above types of brake shoes were considered as fairly representing the types commonly used in passenger service throughout the country. In addition, the brake shoe company was requested to furnish another type, if possible, having a greater mean coefficient of friction, considering the service, than those mentioned above; this type was not named, and will be classed simply as "Experimental."

A stretch of ground, with stopping ground, two miles west of Milbury Junction, on the main line of the Lake Shore & Michigan Southern, was selected for the test. This selection was made with the idea of obtaining a perfectly level stopping ground at a point on the road where the passenger train schedule permitted the use of a high-speed testing track for considerable time during the day, without interfering with the regular passenger traffic. There are four tracks between Milbury and Toledo, which permitted the freight movement, uninterrupted, on the outside tracks.

An old box-car body was set off at the stopping ground and fitted up as a cabin, in which were installed the chronograph outfit for recording the successive speeds of train during the stop, telegraph instruments for following the movement of the test train, telephone for communication along the test ground, and drawing-tables, at which were worked up daily, for distribution to members of the crew and visitors, a complete log, showing the results of the runs made the previous day.

Circuit-breakers arranged to record the movement of the test train were located along the track at equal intervals in electric communication with the chronograph. This enabled the speed of train over each 100-foot interval, after passing the trip, to be recorded. The trip consisted of a wedge-shaped obstruction outside the rail, which engaged a mechanism on the locomotive operating a cut-out cock, which in turn made an emergency application of the brake the instant the locomotive passed the trip. Circuit-breakers were also located back of the trip some distance, from which the speed at time of applying the brake could be accurately determined. A more complete description of the testing apparatus is given in the appendix of this report.

The twelve-wheel cars (L. S. & M. S.) used in the test were equipped with the original foundation brake and apparatus as received from the car builders, being at that time the New York Central Lines' standard practice for that class of equipment. The apparatus was of the improved type, with supplementary reservoir to give 105 pounds emergency brake cylinder pressure at 110 pounds brake-pipe pressure, and for want of simpler description will be designated by the manufacturers' symbol, LN. The cylinder levers were changed to conform with the committee's recommendation for retardation at brake shoe. Additional apparatus was installed on each car, so that quick change could be made to the high-speed brake practice for comparison.

The normal weight of the car was approximately 126,000 pounds, and under the conditions laid down by the subcommittee this would not give the maximum permissible brake-shoe pressure. A pressure of 18,000 pounds per brake shoe was provided for, however, by loading one of the cars to 149,000 pounds; another was loaded to 140,000 pounds, as an intermediate step, and the remaining cars tested at normal weight.

The application of such force as 18,000 pounds to a brake shoe involved the design of a special brake beam, which was undertaken by a Cleveland concern, but in the limited time available only a sufficient number were secured to equip the two heavy cars; the remaining cars were equipped with the regular high-speed brake beams of the same general design, which was of the trussed type, having an angle-iron compressing member and round-bar tension member. The special brake beam tested at 49,000 pounds with 1-16-inch deflection, as against 30,000 pounds for the beams used on the normal weight cars. It appears, therefore, entirely feasible to obtain brake beams which will meet the specification requirement contained in the subcommittee report.

The eight-wheel cars used in the test were equipped for high-speed brake, but additional apparatus was supplied to make a quick change to 105 pounds brake cylinder pressure, using the same brake leverage. The normal weight of these cars was 116,000 pounds, some 10,000 pounds heavier than the allowable weight recommended by the committee; for eight-wheel cars one shoe per wheel, so that the recommended retarding force could not be applied without exceeding the proposed limit of brake-shoe pressure.

It is regretted that on account of the unfavorable track conditions approaching the testing ground (a slightly ascending grade, with a bad curve two miles east of the trip) a speed of eighty miles per hour was not attained. Runs above sixty miles per hour were made at maximum speed of the locomotive instead of the program speed. The test was started on October 19 and continued until December 12, 1909, during which time two hundred and fifty-four runs were made, each and every one of which is recorded in the test log (8 sheets) which accompanies this report. S. W. Dudley, assisted by A. H. Elliott and other engineers under the direction of the committee, made a most thorough study and analysis of the data obtained from the tests, and their report is submitted as an appendix to this report, for the benefit of those who wish to make a detail study of the results. A meeting of the subcommittee was held at the general office of the Lake Shore & Michigan Southern, Cleveland, March 4, to consider the results of the test as applying to the assumptions on which their recommendations were based, and after reviewing the data as analyzed in the appendix to this report, the following modifications to their recommendations were agreed upon.

1. Allowable brake-shoe pressure recommended as 18,000 pounds per square inch. The results of the test seemed to indicate that under the test conditions a pressure of 18,000 pounds per shoe can be safely used, and this maximum shoe pressure will stand as originally recommended. Pressures as high as 26,000 pounds total, or over 500 pounds per square inch, were used at sixty miles per hour with all the brake shoes tested, with no apparent bad results, but when the stop was made at higher speeds it was noted that the plain cast-iron shoes would heat to a high degree, emitting molten metal, which deposited on the track, car trucks and body. The only positive indications, however, that the danger point had been reached was on run No. 328, Penna. cars with 20,700 pounds total, or 449 pounds per square inch, brake-shoe pressure, plain cast-iron shoes, speed, 74.75 miles per hour. On this stop a veritable flame of molten metal from 12 to 18 inches long was emitted from each of the shoes and a number of them were heated to a red heat in making the stop.

2. Brake cylinder leverage ratio recommended, 9 to 1. The results of the test seemed to indicate the ratio to be too high. On the L. S. & M. S. six-wheel truck cars the increase of running emergency piston travel over standing emergency piston travel was very noticeable, amounting to as much as 4 or 5 inches. The brake shoes are of necessity hung low on six-wheel trucks and the high braking power was sufficient to drag the shoes downward, imposing a force on the brake hangers sufficient to compress the equalizer springs solid. With 6-in. standing emergency piston travel there would be danger of the piston bottoming in the brake cylinder, especially after the cars had been in service some time, with boxes, pedestals, etc., worn sufficiently to produce additional false piston travel over that obtained in the tests. Car 824 was equipped with two cylinders, giving a cylinder leverage ratio of 5 to 1, and from a study of the performance of this car it is concluded that for this class of car, with brake-shoe centers at least 6 in. below center of wheel, a ratio of 6 to 1 should not be exceeded.

The P. R. R. four-wheel truck cars had brake shoes hung 1½ in. below the center line of wheel, and from the performance of these cars the lever ratio should not exceed 8 to 1. The recommendations would then stand:

Cars having brake shoes hung 0 to 2 in. below center line of wheel, lever ratio 8 to 1; 2 in. to 5 in. below, 7 to 1, and below 5 in., 6 to 1.

3. Time from brake application to brake effectiveness assumed by the committee as two seconds. In explanation, this term was based on the retarding effect produced after full cylinder pressure is obtained, and is the lapsed time when, if the average force had been instantly applied, the same

effect would be produced. It will be noted that every second of time taken from this term would have the effect of actually shortening the stop by a distance corresponding to the velocity in feet per second at the time when brake valve was operated in emergency application. As previously stated, the brake apparatus available at the time of equipping the test trains was 18-in. cylinders on all cars.

(A) Westinghouse LN equipment, designed to obtain in emergency, by means of a supplementary reservoir, a brake-cylinder pressure of 100 pounds at 8-in. piston travel with 110 pounds brake-pipe pressure.

(B) Westinghouse high-speed brake equipment, designed to give with 8-in. travel and 110 pounds brake-pipe pressure a maximum pressure of 80 pounds, which gradually blows down to 60 pounds toward the end of stop.

The test indicated that with the LN equipment the lapsed time was 2½ seconds, and with the high-speed equipment, 2¾ seconds. On account of excessive running emergency piston travel, however, but 95 pounds cylinder pressure was obtained with the LN equipment, instead of the 100 pounds expected. In order to obtain 105 pounds cylinder pressure with this equipment it was necessary to increase the brake-pipe pressure above 110 pounds.

Another triple valve was substituted for the LN triple valve, known as the LGN, with which it was expected to obtain 105 pounds emergency cylinder pressure with 110 pounds train-pipe pressure. This equipment used the same auxiliary reservoir and supplementary reservoir as the LN equipment, but obtained its higher pressure by first equalizing with the auxiliary reservoir, then closing the communication between cylinder and auxiliary reservoir and further equalizing with the supplementary reservoir. This equipment was deficient as to pressure obtained by about two pounds, on account of the long running emergency piston travel experienced. While the test was continued by increasing the brake-pipe pressure to give 105 pounds emergency cylinder pressure, under these conditions it could not be expected with 110 pounds brake-pipe pressure to make quite the same stop as in these tests. The lapsed time to brake effectiveness was the same with this equipment as with the LN. It became evident at this stage of the trials that unless the time from brake application to effectiveness could be shortened there would be small likelihood of making the stop in the desired distance of 1,200 feet.

In order to meet this condition the Westinghouse Air Brake Company undertook the design of an equipment which dispenses with the use of triple valves, using instead a valve of the general type of the distributing valve called a control valve. With this equipment larger pipes and ports between the air reservoirs and the brake cylinders can be used, thus materially shortening the time of obtaining maximum cylinder pressure. In the limited time available during the test they were able to design, build and install on the test train a complete experimental equipment of the type mentioned, and with this equipment the lapsed time between brake application to effectiveness was reduced to two seconds, which answered the requirements of the subcommittee, and with this equipment the desired stop was actually made.

4. Ratio of train weight to locomotive weight assumed by committee as 3 to 1. The six-car L. S. & M. S. train had a weight ratio, train to locomotive, 3.04 to 1, and the B. R. R. train ratio to locomotive was 2.8 to 1. It is seen, therefore, that the previous assumption of the committee represented fair average train conditions and will stand as first recommended.

4-A. Relative effectiveness of locomotive brake to car brakes assumed by committee as 50 per cent. These tests indicate a much greater relative effectiveness of the locomotive brake which, as shown by the results of break-away runs, where the improved type of locomotive and car brakes were used, should be increased to 75 per cent, and that figure is now recommended.

4-B. Ratio of train to car-brake efficiency derived from previous assumption of committee by combining assumptions in paragraphs 4 and 4-A, which was originally 5-6. Combining the revised factors, paragraphs 4 and 4-A, a factor 11-12 is derived.

5. Efficiency of brake gear assumed by committee as 85 per cent of the cylinder effect.

5-A. Coefficient of friction assumed by committee as 10 per cent.

5-B. The apparatus which the committee had available to determine the brake-gear efficiency was not of sufficient capacity to obtain satisfactory results with the heavy cars used in the test. Neither was apparatus available to determine the coefficient of friction. It was therefore necessary to combine these two factors by taking their product. With the committee's previous recommendations this factor is 85 per cent times 10 per cent, or 8.5 per cent. From the data of the break-away tests with the improved equipment, it appears that not more than 7.5 per cent was realized. This factor should, therefore, be changed accordingly.

6. Concerning the additional retarding force to compensate for loads as previously recommended—3 per cent for sleeping-cars, 10 per cent for coaches and 15 per cent for load cars—it was thought advisable to modify this somewhat, to avoid complications in the maintenance of brake gear. The new recommendation would be to make no load allowance for sleeping-cars, coaches and other strictly passenger-carrying cars, except that the recommended retarding force would be considered as a minimum. For load cars an allowance of 15 per cent additional retarding force is recommended, which is considered as the maximum.

Returning to the formulæ for retardation, the new assumptions make the following changes:

$$S = \frac{11\,(S-2V)}{12}$$ instead of 5-6 (S—2V).

$l = 0$ for passenger-carrying cars.

$l = 15$ per cent for load cars.

Then by the substitution of known values in equation (4) the revised retarding force becomes:

$F = 12.8$ per cent for passenger cars.

$F = 14.7$ per cent for load cars.

One of the most interesting and instructive, if not the most important results of the test, was the determination, by means of the dynamometer car, of the loss in tractive effort due to brake shoes rubbing the wheels.

The ten-car, twelve-wheel car train, with dynamometer car between locomotive and cars with brake adjusted at 6-in. standing emergency piston travel, required a drawbar pull of 8,370 pounds at sixty miles per hour, and on the next run same train, but with brakes adjusted at 7-in. standing emergency piston travel and brake shoes pried free of the wheels, the drawbar pull was only 6,200 pounds at the identical speed, indicating a loss of 35 per cent tractive effort on the train with brake shoes rubbing the wheels. These forces were the average forces apportioned to speed over one mile of the run, obtained by subtracting the calculated uniform accelerating force from the observed average dynamometer pull in each case, and this accelerating force was so small and practically uniform in both cases as to be negligible. The 6-in. piston travel in emergency would probably amount to 7-in., or the maximum allowable in service, so that on trains with heavy cars equipped with six-wheel trucks and a 9 to 1 and greater brake-leverage ratio, this loss is going on, day after day, on all our heavy, fast passenger trains. The recommendation of a 6 to 1 leverage, therefore, should be given consideration as the most rational method of correcting this great loss in tractive effort and corresponding waste of fuel. There are hundreds of cars running to-day wherein this saving can be effected and advantage of this knowledge should be taken.

From the revised assumption for cylinder leverage and brake-shoe coefficient of friction times brake efficiency, a new table follows, which gives the size of cylinders recommended by your committee for various weight cars and cylinder pressure 85 pounds per square inch.

PASSENGER-CARRYING CARS.

Brake shoes hung 5 in. and more below wheel centers.
Brake leverage, 6 to 1.

Two 18-in. cylinders,	cars weighing up to	154,000 lbs.
Two 16-in. cylinders,	cars weighing up to	121,000 lbs.
Two 14-in. cylinders,	cars weighing up to	93,000 lbs.

Brake shoes hung 2 to 5 in. below wheel centers.
Brake leverage, 7 to 1.

Two 18-in. cylinders,	cars weighing up to	180,000 lbs.
Two 16-in. cylinders,	cars weighing up to	142,000 lbs.
Two 14-in. cylinders,	cars weighing up to	109,000 lbs.
Two 12-in. cylinders,	cars weighing up to	79,000 lbs.

Brake shoes hung 0 to 2 in. below wheel centers.
Brake leverage, 8 to 1.

Two 18-in. cylinders,	cars weighing up to	205,000 lbs.
Two 16-in. cylinders,	cars weighing up to	162,000 lbs.
Two 14-in. cylinders,	cars weighing up to	124,000 lbs.
Two 12-in. cylinders,	cars weighing up to	91,000 lbs.

Limit of passenger-carrying cars, one shoe per wheel.

12-wheel cars	149,000 lbs.
8-wheel cars	100,000 lbs.

LOAD CARS.

Brake shoes hung 5 in. and more below wheel center.
Brake leverage, 6 to 1.

Two 18-in. cylinders,	cars weighing up to	134,000 lbs.
Two 16-in. cylinders,	cars weighing up to	106,000 lbs.
Two 14-in. cylinders,	cars weighing up to	81,000 lbs.

Brake shoes hung 2 to 5 in. below wheel centers.
Brake leverage, 7 to 1.

Two 18-in. cylinders,	cars weighing up to	156,000 lbs.
Two 16-in. cylinders,	cars weighing up to	123,000 lbs.
Two 14-in. cylinders,	cars weighing up to	95,000 lbs.
Two 12-in. cylinders,	cars weighing up to	70,000 lbs.

Brake shoes hung 0 to 2 in. below wheel centers.
Brake leverage, 8 to 1.

Two 18-in. cylinders, cars weighing up to	178,000 lbs.
Two 16-in. cylinders, cars weighing up to	141,000 lbs.
Two 14-in. cylinders, cars weighing up to	108,000 lbs.
Two 12-in. cylinders, cars weighing up to	80,000 lbs.

Limit of load cars, one shoe per wheel.

12 wheel cars	129,000 lbs.
8 wheel cars	86,000 lbs.

[NOTE.—The Executive Committee thought it unnecessary to print the details of tests conducted, and which appear in the form of an appendix to the original report, but they will appear in the annual report of proceedings in complete form.—SECRETARY.]

T. L. Burton (C. of N. J.): My understanding was that the report was to be received largely as a progress report and brought to the attention of the Executive Committee. We have deemed that this committee, or a special one, should be appointed to draw up specifications for a recommended practice. I do not think there is anything to be acted upon as recommended practice.

J. M. Christopher (T. H. & B.): Do I understand the Committee favored the flange shoe over the plain shoe?

T. L. Burton: The Committee made no recommendation as to flanged shoes. My own experience has been that a flanged shoe can be used to very good advantage when it is used on a brake-beam having an adjustable head, provided with sufficient lateral movement to permit the shoe to adjust itself to the flange under all conditions. Unless the brake is adjustable and has some lateral movement, a slight deflection of the beam under heavy load gives distressing sliding. It seems that the shoe can also be used on what is known as the beamless type of brake, such as we have on a number of the more modern steel cars. There is no question but that the use of the flange shoe on the brake referred to materially increases the efficiency of the brake.



T. H. Curtis,
First Vice-President, M. C. B. Association.

II.—Tests of Triple Valves.

A number of tests were conducted on the Master Car Builders' air-brake testing rack in the Engineering Laboratory, Purdue University, Lafayette, Ind., March 7 to 12, 1910.

The data for these tests are included in the report, but are not reproduced, since the committee does not feel that sufficient data have been obtained to justify it in recommending a new code of tests for triple valves."

III.—Matters Referred to Committee.

The Executive Committee and other committees and individual members of this Association have referred several matters to the committee, but on account of the very large amount of detail work covered during the past year and also due to the fact that several of these communications were received after April 1, the committee has been unable to give them proper consideration in time for presentation to this convention.

The report is signed by: A. J. Cota (C. B. & Q.), chairman; F. H. Scheffer (N. C. & St. L.), R. K. Reading (P. R. R.), E. W. Pratt (C. & N. W.), R. B. Kendig (L. S. & M. S.), T. L. Burton (C. R. R. of N. J.), and B. P. Flory (N. Y. O. & W.).

G. W. Wildin (N. Y., N. H. & H.): This report gives two 18-in. cylinders in two cases. If I read this right, everything would be 18-in. cylinders.

The President: Mr. Pratt cleared that up by saying that was not in accordance with the views of all the members of the committee. I think Mr. Wildin is correct. The impression intended to be conveyed was that where a certain size cylinder was specified, it could be used for that weight and down. That is, those are the maximum weights specified. Mr. Pratt very wisely suggested that the committee should have the privilege of reviewing those statements.

J. F. Devoy (C. M. & St. P): We are going absolutely wild on this brake question. I do not wish to be understood as criticising this report in the slightest manner. In my opinion it indicates and clearly states everything that is absolutely true on the question. It is of vital importance to the Chicago, Milwaukee & St. Paul for the reason that we are now getting a very large number of steel cars. A leverage of 9 to 1 is an impracticable affair; aside from the fact that it does creates more braking power and costs you more money, you cannot operate it on any wheel made, whether it is cast steel or forged steel, for the reason that the brake shoe will cause heating to such an extent that the wheel and the brake-shoe will absolutely fuse. So the question as to what brake or brake-shoe is best is entirely irrelevant to the matter. It is the question of the amount of pressure exerted on the wheel.

The question was also raised as to whether the report meant one or two brake cylinders. The cars that you are getting now in this country weigh 150,000 lbs. or thereabouts. One cylinder will not give the proper shoe clearance and the proper leverage to the brake beams and the levers to take care of the situation. Our cars were first specified with one cylinder, and after experimenting for eight months with 66 cars, we have come to the conclusion that nothing will handle the situation but two brake cylinders. Aside from that, we have found there is no brake arrangement designed today which will give the power. In other words, on one lot of sleeping cars we found the brake-pin shearing. On another lot of cars, by placing the required pressure on the wheels, it bent the brake levers. The whole craze today seems to brake a train in the shortest space possible. You had better go a little bit slower with your brake and your line pressures, or you will destroy the whole foundation. In other words, the state of the art today is not such as will absolutely guarantee your going ahead with the recommendations of this committee, as stated. You cannot do it. I would much rather see a brake on a passenger car that would stop it in 400 or 500 feet longer that the distance recommended. You will spend more money on your brake-shoes—four times over what the whole thing will cost. The committee should take up not only the questions involved in this test, but as to whether you have a wheel and brake-shoe which will do the business required of it.

The report of the committee was received, and the committee is continued.

The following committees were appointed: Correspondence and Resolutions: R. F. McKenna, H. E. Passmore and J. W. Fogg.

Committee on Obituaries: For P. H. Peck—J. W. Taylor. For J. F. Divine—R. E. Smith. For J. J. Ellis—William Moore.

Secretary: In accordance with Article VI, section 4 of the Constitution, the executive committee offers the following ten names as candidates for election on the committee on nominations; five of these are to be elected at the time the general election occurs on Friday: J. F. Deems, A. W. Gibbs, W. H. Lewis, Wm. Garstang, A. E. Manchester, J. F. Walsh, M. K. Barnum, R. E. Smith, E. W. Pratt, C. A. Seley.

In the absence of Professor W. F. M. Goss, Professor Schmidt, of the University of Illinois, presented the report on Brake Shoes.



Le Grand Parish,
Second Vice-President, M. C. B. Association.

TESTS OF BRAKE SHOES.

In addition to its usual duty of investigating the properties of brake shoes, the committee has also been requested to consider and report upon the standards applying to brake beams. This report accordingly deals with both subjects, the former being discussed in Part 1 and the latter in Part 2.

PART 1.

BRAKE SHOES.

Routine Tests.—Since the presentation of its last report the committee has received from B. P. Flory, of the New York,

Ontario & Western, one brake shoe to be tested to determine its frictional qualities. The results of the tests are presented in Appendix C.

Researches of the Year.—Previous to 1907, the work of the committee consisted chiefly in determinging the frictional



W. F. M. Goss.

qualities of brake shoes and in recommending specifications concerning their coefficients of friction. In 1907, and again in 1908, the researches of the committee were extended to include an investigation of the wearing qualities of shoes. In the reports of 1907 and 1908 there are presented certain data concerning the wear of shoes which, however, were not considered sufficient to warrant any recommendation concerning a specification with respect to wear, the chief lack being in any information concerning the effect of the shoes upon the wheel itself. To supply this deficiency, a wheel scale, referred to in the report for 1909, was purchased, and has been in operation during the current year. By its use, it has been possible to determine the loss of weight in the wheel under the action of the shoe, as well as the loss in the shoe itself.

In pursuance of the program outlined in previous reports and approved by the Association, the committee at the beginning of last year selected from cars in service twenty-eight brake shoes which are believed to be representative of the shoes now in use on the railways of the country. These twenty-eight shoes are of fourteen different kinds, each kind in duplicate. One set of fourteen shoes was submitted to the tests outlined below in the Master Car Builders' laboratory at Purdue University. The other set was tested upon the brake-shoe testing machine of the American Brake Shoe and Foundry Company, at Mahwah, New Jersey. A list of these twenty-eight shoes is given in Table 1, which also presents their trade names and other information.

These shoes have been tested under the following schedule:

A. Tests to determine the coefficient of friction of the shoe under the current specifications.
B. Tests to determine the loss in weight of the shoe under repeated applications.
C. Tests to determine the loss in weight of the wheel under the repeated application of the shoe.

The fourteen shoes submitted to the Master Car Builders' laboratory at Purdue University were subjected to the entire schedule. The detailed report submitted by the authorities of Purdue University is included as Appendix A. The shoes submitted to the American Brake Shoe and Foundry Company were tested only for coefficient of friction, and the report of these tests is included as Appendix B.

Acknowledgments.—The committee has pleasure in acknowledging the interest taken in this work by Prof. C. H. Benjamin, dean of the Schools of Engineering of Purdue University; by Prof. L. E. Endsley, of that institution, who has had immediate supervision of the work of the laboratory; by F. W. Sargent, chief engineer of the American Brake Shoe and Foundry Company, who has kindly placed at the disposal of the committee the testing facilities which are under his control, and by Prof. Edward C. Schmidt, of the University of Illinois, who has generously acted as secretary to the committee and has given important aid in the drafting of this report.

Coefficient of Friction.

Each of the twenty-eight shoes has been tested to determine its coefficient of friction under the current specifications of the Association. The coefficient of friction has been determined on a cast-iron chilled wheel in effecting stops from an initial speed of forty miles per hour under three brake-shoe pressures, namely, 2,808, 4,152 and 6,840 pounds. The coefficient of friction has been determined on a steel-tired wheel in effecting stops from an initial speed of sixty-five miles per hour under shoe pressures of 2,808, 6,840 and 12,000 pounds. The fourteen shoes sent to the American Brake Shoe and Foundry Company were also tested on the steel-tired wheel under intermediate and higher pressures. The results of these tests, which are included in the reports of Purdue University and the American Brake Shoe and Foundry Company, have been summarized and are displayed in Table 2. They are also shown in Figs. 1 to 4. The results of the tests on the cast-iron wheel are shown in Figs. 1 and 2, while the results on the steel-tired wheel are shown in Figs. 3 and 4.

The coefficients of friction obtained by the American Brake Shoe and Foundry Company on their testing machine are, at the lower pressures, about the same as those obtained upon the Master Car Builders' standard machine; but at the higher pressures they are considerably lower. The explanation for such differences probably lies in the fact that the flywheel of the former machine is heavier and has, at a like speed, greater kinetic energy than the flywheel of the standard machine. As a result of this, the stops made with the former machine are longer and result in greater heating of the shoe. Because of this difference in the construction and

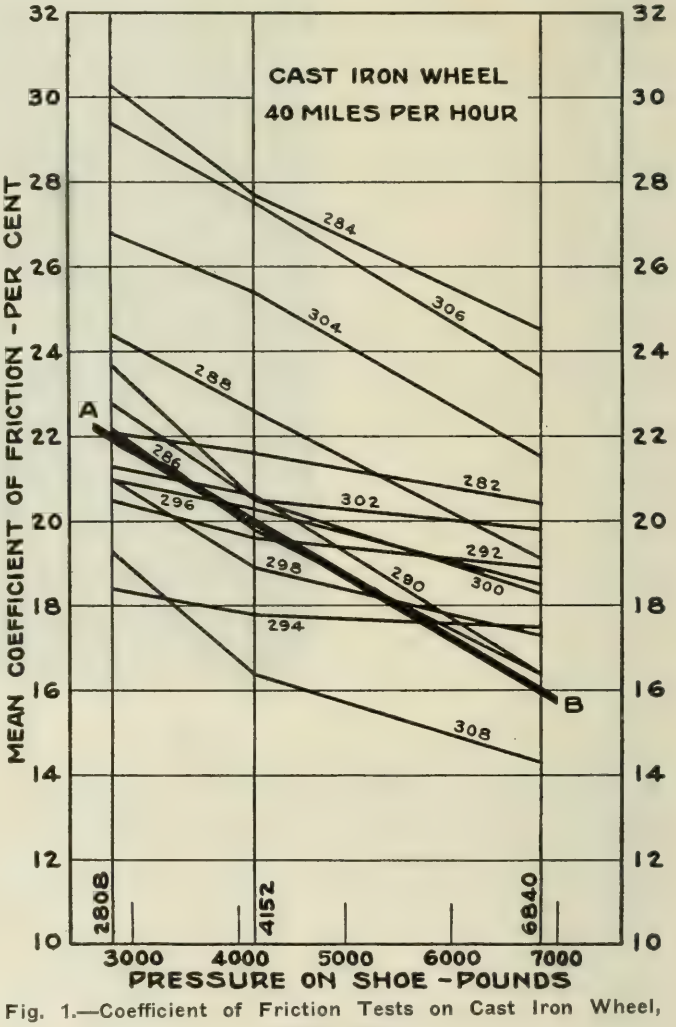


Fig. 1.—Coefficient of Friction Tests on Cast Iron Wheel, Purdue Univ.

in the characteristics of the two testing machines, the committee has limited its consideration to the results obtained in the laboratory of the Association at Purdue University, in determining upon its recommendations concerning coefficients of friction.

From its consideration of the results obtained upon the cast-iron wheel (see Fig. 1), the committee has decided to recommend that shoes when tested upon a cast-iron wheel, in effecting stops from an initial speed of forty miles per hour, shall develop a mean coefficient of friction of not less than

22 per cent when the brake-shoe pressure is 2,808 pounds,
16 per cent when the brake-shoe pressure is 6,840 pounds.

The proposed specification is represented by the line AB in Fig. 1. The only change from the current specification involved in this recommendation is the omission of the specification at the intermediate pressure of 4,152 pounds. With rare exceptions, the shoe which meets the specifications at the two pressures stated will also meet them at the intermediate pressure, and the test at the third pressure is, therefore, considered to be unnecessary.

The current specifications require shoes to be tested on the steel-tired wheel at three different pressures. For the reasons just stated, the committee believes that tests under two pressures will be sufficient. In order to have the test conditions more nearly like those which prevail in practice, it seems desirable that the higher of these two shoe pressures should be 12,000 pounds. The committee accordingly recommends that shoes, when tested upon a steel-tired wheel, in effecting stops from an initial speed of sixty-five miles per hour, shall develop a mean coefficient of friction of not less than

12½ per cent when the brake-shoe pressure is 6,840 pounds.
11 per cent when the brake-shoe pressure is 12,000 pounds.

This recommendation involves dropping from the current specifications the tests at pressures of 2,808 and 4,152 pounds and substituting therefor a test at a pressure of 12,000 pounds. The test at 6,840 pounds shoe pressure is retained; but the coefficient is increased from 12 per cent to 12½ per cent.

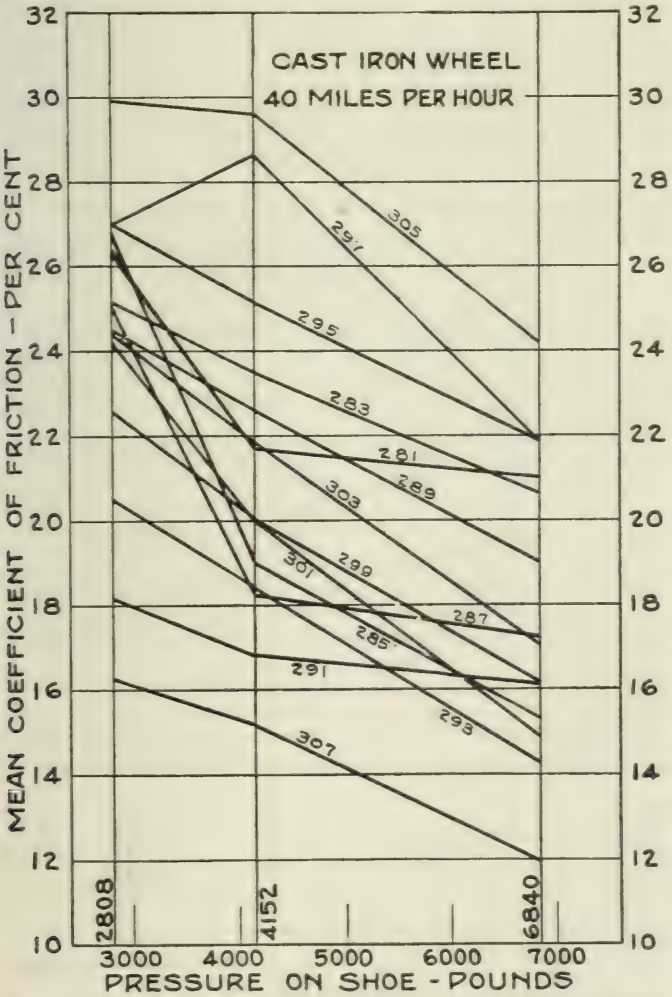


Fig. 2.—Coefficient of Friction Tests on Cast Iron Wheel, A. B. S. & F. Co.

This increase seems warranted by the results of the tests shown in Fig. 3. The line AB, in Fig. 3, represents the proposed specification.

The Association has, for some years, specified that the rise in the coefficient of friction at the end of a stop should not exceed 7 per cent. The experience of the laboratory during

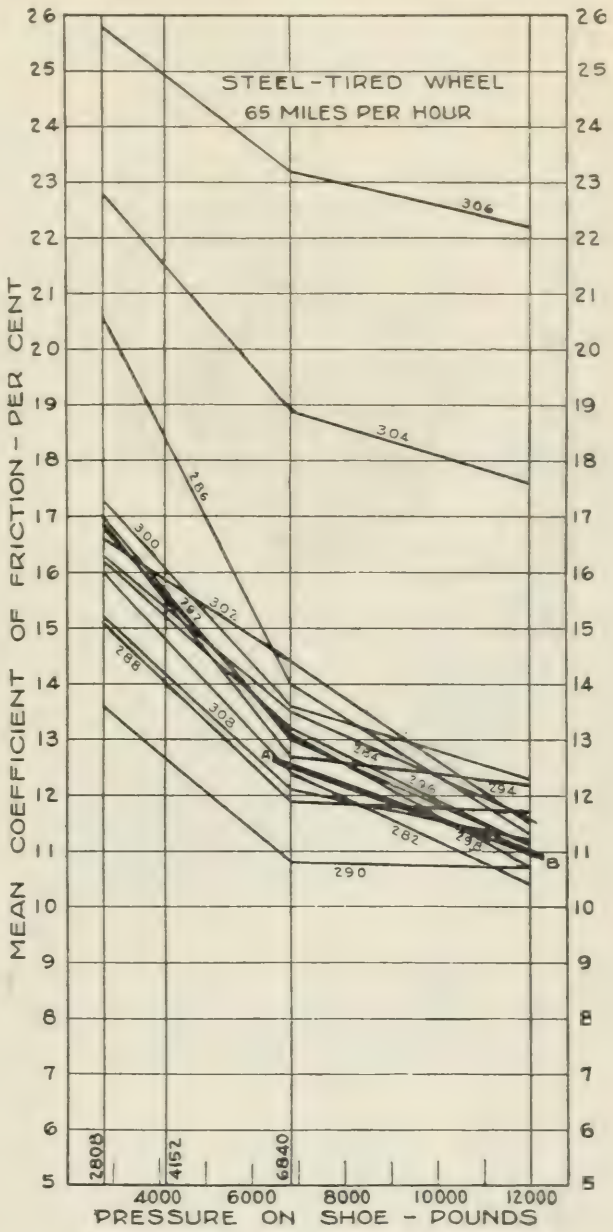


Fig. 3.—Coefficient of Friction Tests on Steel-tired Wheel, Purdue Univ.

the past four or five years indicates that a shoe which meets the specification concerning the *mean* coefficient also generally meets this requirement concerning the final coefficient. Whenever a shoe develops a final coefficient of friction in excess of the specifications it does so only within 4 or 5 feet of the end of the stop; and it is not likely, therefore, to have any harmful effect in service. For these reasons the committee believes that the specification concerning final coefficient of friction may properly be omitted from the standards of the Association, and it so recommends.

Shoe Wear and Wheel Wear.

Each of the fourteen shoes submitted to the laboratory at Purdue University was tested to determine its wear under repeated applications to both the cast-iron and the steel-tired wheel under the conditions cited below. Under these same conditions, the loss in weight of the wheel under the action of the shoe was determined by means of a scale especially designed for the purpose, which was referred to in last year's report, and which is described and illustrated in Appendix A. The shoe wear and wheel wear tests were run under the following conditions:

A. On the cast-iron wheel.—At a constant speed of 20 miles per hour and at shoe pressure of 2,808 pounds.

B. On the steel wheel.—At a constant speed of 20 miles per hour and at a shoe pressure of 2,808 pounds.

C. On the steel wheel.—In effecting stops from an initial speed of 65 miles per hour and at a shoe pressure of 12,000 pounds.

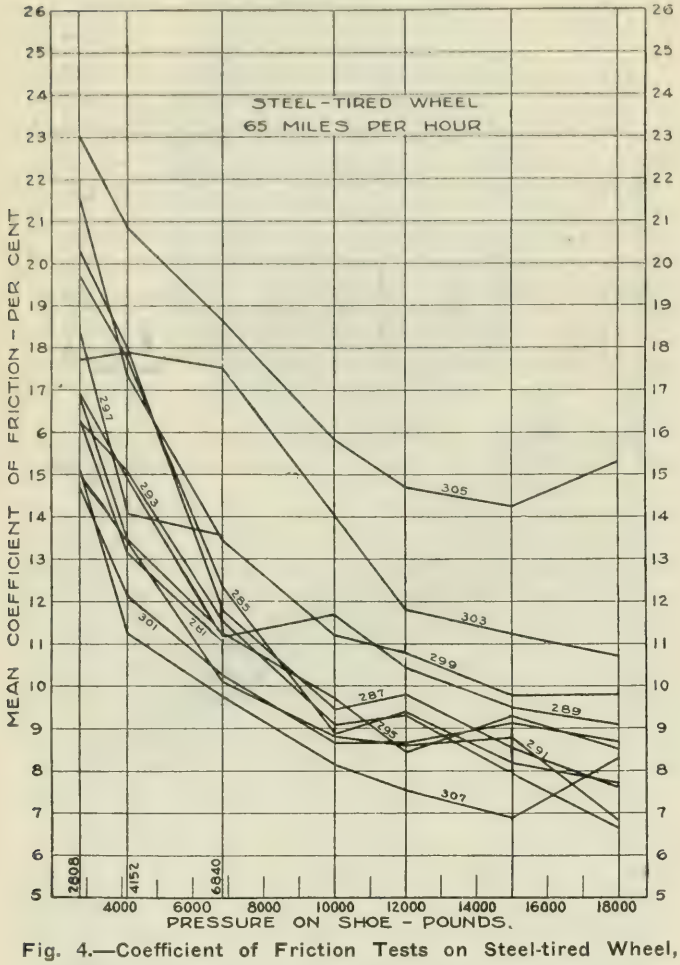


Fig. 4.—Coefficient of Friction Tests on Steel-tired Wheel, A. B. S. & F. Co.

During the tests at the lower pressure (conditions A and B) most of the shoes were applied 300 times to the wheel, while the latter was kept running at a constant speed of twenty miles per hour. A few of the thinner shoes were given only 200 applications, and in one case 100 applications only were made. These applications of the shoe to the wheel were made by means of an automatic device on the testing machine which operates to keep the shoe in contact with the wheel for about one minute, while the interval between contacts is about three minutes. At the end of each 100 applications, both the shoe and the wheel were weighed to determine the metal lost by abrasion.

The tests on the steel wheel at the higher pressure (condition C) were made by a process similar to that employed in determining the coefficient of friction. In most cases, nine stops were made from an initial speed of sixty-five miles per hour, after which both the shoe and the wheel were weighed to determine their loss. With two of the shoes, the number of stops was reduced to six instead of nine.

The results of the tests to determine shoe wear are summarized in Table 3, and the results of the wheel-wear tests are shown in Table 4. These results are also presented graphically in Figs. 5, 6 and 7, in which the shoe wear is represented in the lower part of the diagram, while the wheel wear is represented in the upper part.

Results of the Tests on Wheel Wear.—At a shoe pressure of 2,808 pounds, the only shoe which produced an appreciable wear on the cast-iron wheel is the Congdon shoe, No. 286. It is somewhat significant that this is the shoe showing the least shoe wear. During the tests on the steel wheel, at a pressure of 2,808 pounds, only two shoes caused any considerable wear of the wheel. These are numbers 286 and 288, both Congdon shoes. Shoe 286, which was given 300 applications to the wheel, cut four V-shaped grooves about 1-32-inch deep and several smaller ones around its entire circumference. Shoe 288 had scored the wheel in a similar manner with five grooves after 100 applications. During the tests on the steel wheel at a pressure of 12,000 pounds, only two shoes produced any wear whatever on the wheel, and this was quite inconsiderable in amount. These shoes are Nos. 304 and 306, both Pittsburgh composition shoes. These two, however, did not score the wheel.

Conclusions Concerning Wheel Wear.—The results seem to warrant the conclusion that none of the ordinary shoes in service are likely to cause any appreciable wear on the cast-iron wheel. The wear on the steel wheel, while greater than on the cast-iron wheel, is likewise almost inconsiderable, except in the case of the two insert shoes above cited. The committee regards the scoring of the wheel in these two cases as more or less accidental, and experience with insert shoes in service seems to warrant this opinion. After consideration of all the facts here presented, the committee has concluded that no serious wear of the wheel is to be expected from the action of any of the shoes now in ordinary service, and it, therefore, considers any recommendation concerning wheel wear to be unnecessary.

The committee regards the reassurance which proceeds from such conclusions as ample return for the effort and expense which have been entailed by its research concerning the effect of brake shoes upon the wheel. Such conclusions also clear the way for a recommendation concerning the wear of the shoes themselves, which, until now, the committee has felt unable to make.

Results of the Tests on Shoe Wear.—The results of the shoe-wear tests are shown in Figs. 5, 6 and 7. The wear is there represented in terms of weight lost by the shoe per 100,000,000 foot-pounds of work done. These weights may be accepted as measures of the relative durability of all of the shoes except the composition shoes, Nos. 304 and 306. The density of the shell and filler of these two shoes is less than that of the metallic shoes in the ratio of 1 to 2.4. To compare the durability of these shoes with the durability of the others, their actual loss in weight should, therefore, be multiplied by 2.4. In the diagrams the dotted lines represent, for shoes 304 and 306, the weights obtained by increasing the actual loss in this ratio.

The facts presented in Figs. 5, 6 and 7 may be generalized as follows:

a. The shoes tested present great variation in their wearing qualities, the ratio between the poorest and the best shoe being as great as 1 to 6.

b. The relative resistance to wear exhibited by different shoes is somewhat affected by the severity of the application. Of a series of shoes, the one which suffers least from wear at light pressures may not be the one which suffers least under a heavy pressure.

c. All shoes tested wear more rapidly on a steel-tired wheel than on a cast-iron wheel, when tested under like pressures.

d. In general terms, it may be stated that the shoes which show a wear greatly below the average are those which cause wear in the wheel.

e. All shoes show greater wear, per unit of work performed, when applied under the higher pressure. The ratio is occasionally as great as 1 to 10.

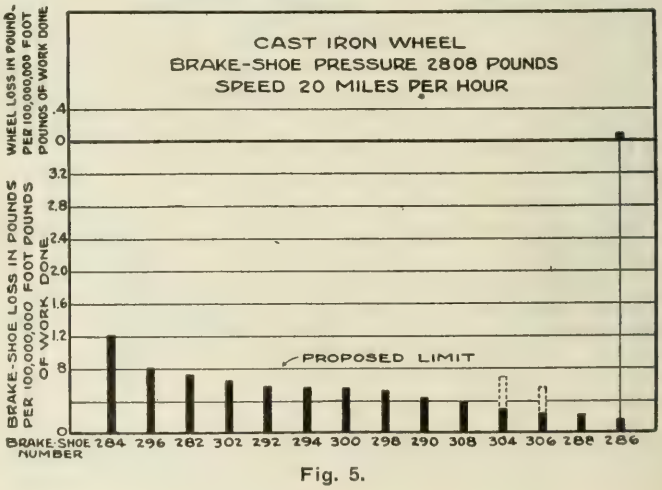


Fig. 5.

Recommendations Concerning Shoe Wear.—The committee recommends:

That on the cast-iron wheel the shoe wear be determined by making 100 applications of the shoe to the wheel, under a pressure of 2,808 pounds, and at a constant wheel speed of twenty miles per hour; at each application the shoe to be in contact with the wheel during 190 revolutions and out of contact during the succeeding 610 revolutions. That, under these conditions, the shoe shall lose in weight not more than 0.8 of a pound for each 100,000,000 foot-pounds of work done. That, on the steel tired wheel, the shoe wear be determined by making ten stops from an initial speed of sixty-five miles per hour, and under a shoe pressure of 12,000 pounds. That, under these conditions, the shoe shall lose in weight not more than 4.0 pounds for each 100,000,000 foot-pounds of work done. That, in the case of non-metallic shoes, these limits of wear be reduced in the ratio of the density of their abraded parts to the density of castiron.

The proposed wear limits are shown in Figs. 5 and 7. Only one of the shoes tested on the cast-iron wheel and one of those tested on the steel wheel fail to meet the proposed specifications. The shoes which develop a high coefficient of friction are also those which are likely to show the greater wear, and, if, therefore, the proposed wear limits are made more exacting than is here proposed, almost all of the

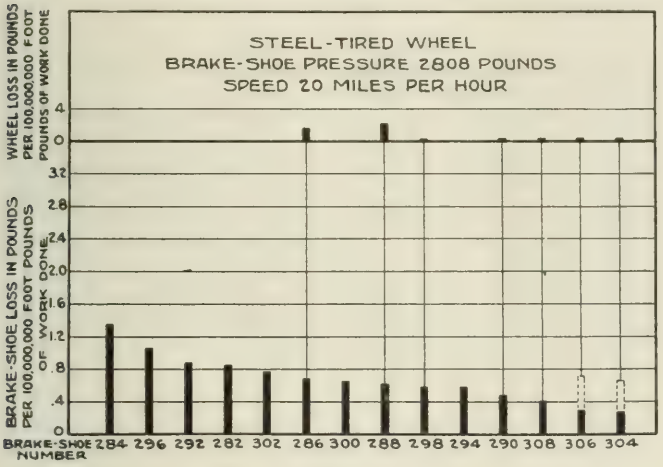


Fig. 6.

shoes which pass the specifications for coefficient of friction would be rejected under the specifications for wear. For these reasons, the committee concluded that the wear limits should not be made more exacting than is proposed in the recommendations above; and it believes that the proposed wear specifications, when combined with the specifications concerning coefficient of friction, will serve their main purpose of protecting the purchaser against the unusually soft shoe.

Shoe Gage and Thickness of Inserts.

Shoe Gage.—The Association has a standard gage for the brake head. Since the back of the shoe must fit this head, the committee believes that a limit gage for the back of the shoe ought also to be added to the standards, and it proposes for this purpose the gage shown in Fig. 8.

Thickness of Inserts.—In many insert shoes the inserts are so thin that they are either worn through or drop out during the first quarter of the life of the shoe. The committee believes that inserts should be made as thick as the processes of manufacture will permit, and it recommends that in no case should the thickness of the insert in the new shoe be less than one-half of the total depth of the shoe.

SUMMARY.

As a conclusion to Part 1 of its report, the committee presents the following summary of its suggestions concerning brake shoes, and recommends that they be adopted as standards of the Association:

1. That the specifications for brake shoes, shown on pages 589 and 590 of the Proceedings for 1909, be replaced by the following:

a. Shoes shall be tested for coefficient of friction and for wear upon the Master Car Builders' Association testing machine, or upon a machine with equivalent characteristics.

Coefficient of Friction.

b. Shoes shall develop upon the *cast-iron wheel*, in effecting stops from an initial speed of 40 miles per hour, a mean coefficient of friction of not less than

22 per cent when the brake-shoe pressure is 2,808 pounds.
16 per cent when the brake-shoe pressure is 6,840 pounds.

c. Shoes shall develop upon the *steel-tired wheel*, in effecting stops from an initial speed of 65 miles per hour, a mean coefficient of friction of not less than

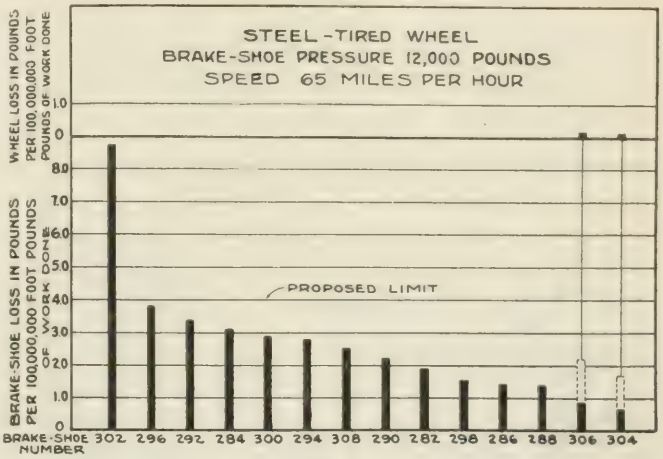


Fig. 7.

12½ per cent when the brake-shoe pressure is 6,840 pounds.
11 per cent when the brake-shoe pressure is 12,000 pounds.

d. No limitation is placed upon the rise in coefficient of friction at the end of the stop.

Shoe Wear.

e. Shoe wear shall be determined upon the *cast-iron wheel*, by making not less than 100 applications of the shoe to the wheel, under a pressure of 2,808 pounds, and at a constant peripheral speed of the wheel of twenty miles per hour. At each application the shoe shall remain in contact with the wheel during 190 revolutions of the latter, and between applications the shoe shall remain out of contact during 610 revolutions of the wheel. Under these conditions, the shoe shall lose in weight not more than 0.8 of a pound for each 100,000,000 foot-pounds of work done.

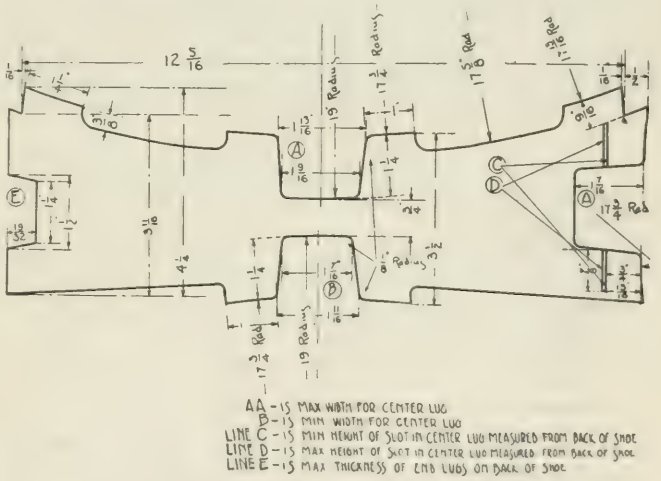


Fig. 8.—Standard M. C. B. Brake Shoe Gage.

f. Shoe wear shall be determined upon the *steel-tired wheel*, by making not less than ten stops from an initial speed of sixty-five miles per hour and under a pressure of 12,000 pounds. Ten minutes shall intervene between successive applications of the shoe. Under these conditions, the shoe shall lose in weight not more than 4.0 pounds for each 100,000,000 foot-pounds of work done.

g. When a shoe not entirely metallic in its composition is tested for wear, its actual loss in weight shall be increased in the ratio which the density of cast iron bears to the mean density of the abraded parts of the shoe, in order to determine the weight which is to be compared with the specifications.

2. That the back of the shoe be made to conform to the gauge shown in Fig. 8, and that this gauge be shown on Sheet M. C. B.—17.

3. That, under the heading "Brake Head and Shoe," page 588 of the Proceedings for 1909, there be added the following:

"All inserts in brake shoes must extend in new shoes to a depth equal to at least one-half of the total shoe depth."

PART 2.

BRAKE BEAMS.

The Executive Committee referred to the committee on Brake Shoes last July the reconsideration of present standards concerning brake beams. Previous to its first meeting during the year, your committee had summarized for its information all actions and discussions of the Association on this subject since the report of the first special committee on brake beams which was presented at the convention in 1906.

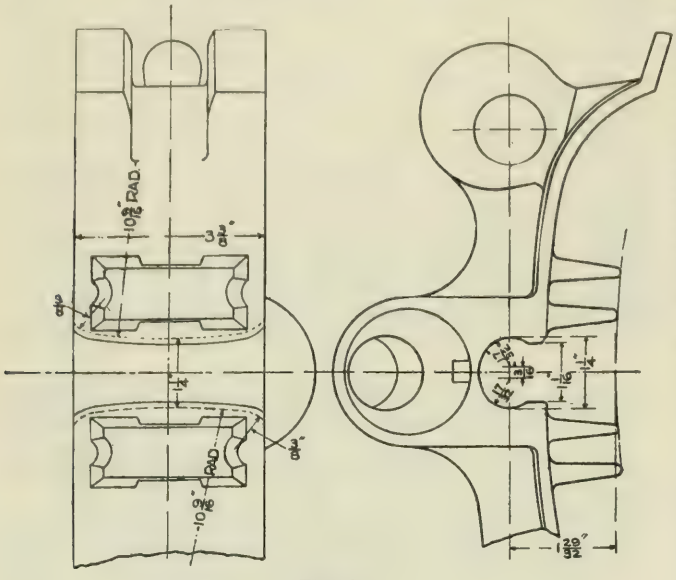


Fig. 9.

After a study of all previous actions shown by this summary, the committee decided to limit its consideration of changes in standards to—(1) size of the hanger hole in the brake head, (2) certain changes in the specifications for beam tests, and (3) limiting dimensions governing the outline for brake beams. Suggestions concerning the three items were embodied in a circular of inquiry which was sent to the members in January.

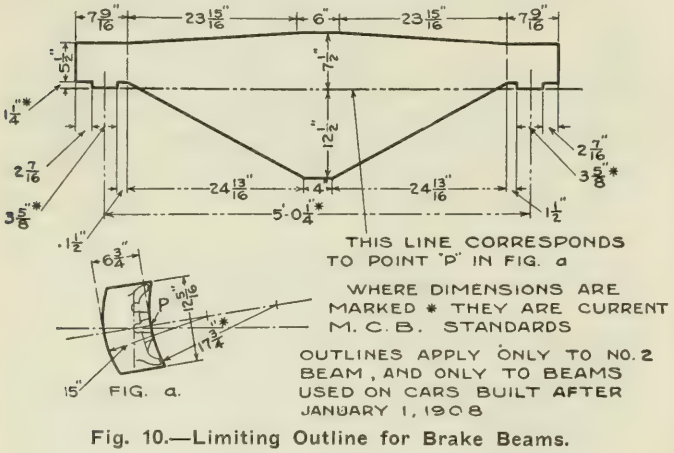


Fig. 10.—Limiting Outline for Brake Beams.

The committee has invited the manufacturers of brake beams to send representatives to its meetings, and representatives of the following companies have been present during certain of its discussion: The American Steel Foundries, The Chicago Railway Equipment Company, The Damascus Brake Beam Company, The Davis Brake Beam Company.

The suggestions made by these representatives have been given due consideration along with the replies received to the circular of inquiry.

Brake Head Hanger Hole.—In the circular it was proposed to increase the size of the hanger hole sufficiently to permit the use of a 1-inch hanger as well as the 7/8-in. hanger.

Table 1.

Brake Shoes Selected for Tests.

SERIAL NO	PURDUE LABORATORY NO.	DESIGNATION	OBTAINED FROM	MARKS FOUND ON SHOE
1	2	3	4	5
1	281	PLAIN CAST IRON	TRUCK IN C&NW SHOPS	C&NW 8386
2	282	" " "	" " " "	C&NW 8386 (NO NOT CLEAR)
3	283	PLAIN CAST IRON - WITHOUT REINFORCEMENT	C&NW CAR NO 92327	2100 C
4	284	" " " "	C&E I CAR NO 61561	5170
5	285	CONGDON 7 INSERTS	TRUCK IN C&NW SHOPS	C&NW 8386
6	286	" " "	" " " "	C&NW 8386-1
7	287	CONGDON - STEEL BACK 5 INSERTS	C&NW CAR NO 9512	CC2 & G
8	288	" " "	C&NW CAR NO 10356	CC2 & G
9	289	STREETER - STEEL BACK	I C CAR NO 23872	(NONE FOUND)
10	290	" " "	C&NW CAR NO 8460	(NOT DISTINGUISHABLE) & ⑤
11	291	LAPPIN - CHILLED ENDS	C&NW CAR NO 99536	Ⓠ 4 1193 FREIGHT NYC LINES
12	292	" " "	" " " "	Ⓠ 4 1193 FREIGHT NYC LINES
13	293	LAPPIN - CHILLED ENDS	C&E I CAR NO 587	Ⓠ 4 1193 FREIGHT NYC LINES
14	294	" " "	NYC H R CAR NO 69732	N Y C LINES FREIGHT
15	295	PLAIN CAST IRON - STEEL BACK	P W SARGENT, AMER B&P CO	(NOT NOTED)
16	296	" " " "	" " " "	PATENTED D 3 N-3470-4-1193
17	297	COLUMBIA	B D LOCKWOOD - FROM C H&D CAR	(NOT NOTED)
18	298	"	" " "	C H & D 1507
19	299	DIAMOND S - STEEL BACK	WM McINTOSH - FROM C&S.N.J. STOCK, APPLIED IN SERVICE 1908 REMOVED	Ⓖ G 724 4
20	300	" " "	DITTO	Ⓖ G 724 4
21	301	WALSH	J A SPOOR OF THE CHICAGO JCT RY	(PRICK PUNCHED) C J
22	302	" "	" " " "	(PRICK PUNCHED) C J
23	303	PITTSBURG - MALLEABLE SHELLS	E R NEEDHAM OF THE WABASH R R	PITTSBURG BRAKE SHOE CO PITTSBURG PA
24	304	" " "	" " " "	PITTSBURG BRAKE SHOE CO PITTSBURG PA
25	305	PITTSBURG - STEEL SHELLS	" " " "	PITTSBURG CO BRAKE SHOE, PITTSBURG, PA
26	306	" " " "	" " " "	PITTSBURG CO BRAKE SHOE
27	307	NATIONAL	W P BUCK OF THE AT&S F RY	(NOT DISTINGUISHABLE)
28	308	" " "	" " " "	36 (NO NOT CLEAR)
		14 SHOES WITH EVEN SERIAL NOS. SENT TO PURDUE UNIVERSITY LABORATORY		
		14 " " ODD " " " "	AMER BRAKE SHOE & FOUNDRY CO	

The change was suggested on account of the breakage of the 7/8-in. hanger under some conditions of service. To the inquiry on this point seventeen replies were received, twelve of which advocated the proposed change. In the five other replies the change is opposed only on account of the increased play which would be allowed when a 7/8-in. hanger would be used in the larger hole. In some of these replies the 7/8-in. hanger is held to be sufficiently strong, especially if it be made with a larger fillet at the bend than is at present customary. After considering all the replies, the committee has decided to recommend the proposed change, and it believes that the edges of the hole ought also be rounded out to permit the use of a filleted hanger. It, accordingly, recommends that the present standard brake head be so modified as to conform in these respects to the head shown in Fig. 9.

Specifications for Tests.—The committee in its circular of inquiry made certain suggestions looking toward a modification of the test procedure for determining beam deflection. This, however, it has finally decided not to recommend. The committee has reconsidered the current test specifications, and it believes that changes are desirable in the two respects referred to below. The present specifications require that, as a preliminary to the deflection tests for both the No. 1 and the No. 2 beams, a load of 6,000 pounds be applied and then released; after which the load for producing deflection is applied. The committee believes that the preliminary load for the No. 1 beam should be reduced to 4,000 pounds, and it so recommends. It is thought that the change will result in more careful assembling of the beam.

The current specifications require no test for the ultimate strength of the beam. On account of the diversity in beam

SHOE NUMBER	LABORATORY AT WHICH THE TEST WAS MADE	MEAN COEFFICIENT IN PER CENT. INITIAL SPEED OF 40 M P H CAST IRON WHEEL SHOE PRESSURE-LBS. 2808	4152	6840	MEAN COEFFICIENT IN PER CENT STOPS FROM AN INITIAL SPEED OF 65 M.P.H STEEL-TIRED WHEEL SHOE PRESSURE - LBS 2808	4152	6840	10000	12000	15000	18000
281	A B S & F Co.	26.3	21.7	21.0	16.3	13.1	11.0				
282	PURDUE	22.1	21.6	20.4	16.0		12.4		10.4		
283	A B S & F Co.	25.1	23.5	20.6	—	—	11.7				
284	PURDUE	30.3	27.7	24.5	16.3		13.5		11.6		
285	A B S & F Co.	26.8	19.0	15.3	19.7	17.7	12.4	8.9	9.4	8.1	7.7
286	PURDUE	22.2	19.8	16.4	20.6		14.0		11.3		
287	A B S & F Co.	25.0	18.3	17.2	20.3	18.0	11.8	9.5	9.8	8.5	7.6
288	PURDUE	24.4	22.6	19.1	15.1		11.9		11.7		
289	A B S & F Co.	24.5	22.6	19.0	16.9	14.9	11.1	11.7	10.4	9.5	9.1
290	PURDUE	21.3	20.6	16.4	13.6		10.8		10.7		
291	A B S & F Co.	18.1	16.8	16.1	15.0	13.4	10.1	8.8	8.6	6.8	6.8
292	PURDUE	20.5	19.6	18.9	17.0		13.0		11.1		
293	A B S & F Co.	20.5	18.4	14.3	16.3	15.1	11.6	9.1	9.3	7.9	6.6
294	PURDUE	18.4	17.8	17.5	16.9		12.7		12.4		
295	A B S & F Co.	27.0	25.1	21.9	16.9	13.5	11.3	9.7	8.4	9.3	8.5
296	PURDUE	21.0	20.3	18.5	16.7		13.2		11.1		
297	A B S & F Co.	27.0	28.6	21.8	18.4	14.0	13.5	—	- -	—	—
298	PURDUE	21.0	18.9	17.3	16.8		13.1		10.7		
299	A B S & F Co.	24.2	20.0	16.2	21.5	17.4	13.5	11.2	10.8	9.8	9.8
300	PURDUE	22.8	20.5	18.3	17.3		13.6		12.3		
301	A B S & F Co.	22.6	20.0	14.9	14.7	12.1	10.3	8.7	8.6	9.1	8.7
302	PURDUE	23.7	20.5	19.8	16.6		14.4		11.5		
303	A B S & F Co.	24.4	21.9	17.0	17.7	17.9	17.5	14.0	11.8	11.2	10.7
304	PURDUE	26.8	25.4	21.5	22.8		18.9		17.6		
305	A B S & F Co.	29.9	29.6	24.2	23.0	20.9	18.7	15.8	14.7	14.2	15.3
306	PURDUE	29.4	27.5	23.4	25.8		23.2		22.2		
307	A B S & F Co.	16.3	15.2	11.9	15.1	11.3	9.8	8.2	7.5	6.9	8.3
308	PURDUE	19.3	16.4	14.3	15.2		12.1		11.2		

Table 2.

Mean Coefficients of Friction Developed by Each Shoe on Cast Iron and Steel-tired Wheels.

designs the deflection test gives but little information concerning their ultimate strength. The committee, therefore, considers it desirable that the beam be finally tested to destruction, and that under this test the maximum load borne shall not be less than 20,000 pounds for the No. 1 beam, 38,000 pounds for the No. 2 beam, and it recommends that such tests be added to the specifications.

Paragraph 2, under "Brake Beams," on page 590 of the Proceedings for 1909, is in conflict with the test specifications. The committee recommends that it be omitted.

Brake-beam Limit Outline.—In its circular, the committee proposed the establishment of an outline which should serve to limit the dimensions of the beam. The purpose of the suggestion is to facilitate replacements of beams on cars in interchange. To the inquiry on this matter fifteen replies were received, in none of which was the feasibility of establishing such a limit called in question. The beam manufacturers have likewise endorsed the proposal. After consideration of the replies received from the railway companies and of the dimensions submitted by the manufacturers, the committee has prepared the outline which is represented in

SHOE NUMBER	DESIGNATION OF THE SHOE	LABORATORY AT WHICH THE TESTS WERE MADE	WHEN TESTED ON THE CAST IRON WHEEL		WHEN TESTED ON THE STEEL-TIRED WHEEL			
			NUMBER OF APPLICATIONS	SHOE PRESS-280 LBS. SHOE LOSS IN POUNDS PER 100,000,000 FOOT-POUNDS OF WORK DONE	NUMBER OF APPLICATIONS	SHOE PRESS-280 LBS. SHOE LOSS IN POUNDS PER 100,000,000 FOOT-POUNDS OF WORK DONE	NUMBER OF APPLICATIONS	SHOE PRESS-1200 LBS. SHOE LOSS IN POUNDS PER 100,000,000 FOOT-POUNDS OF WORK DONE
282	PLAIN CAST IRON	PURDUE	400	.745	300	856	9	1.917
284	PLAIN CAST IRON WITH TWO REINFORCEMENTS	PURDUE	300	1.225	100	1.360	9	3.135
286	CONGDON	PURDUE	200	.163	300	.706	9	1.467
288	CONGDON-STEEL BACK	PURDUE	300	.212	100	.633	9	1.405
290	STREETER-STEEL BACK	PURDUE	300	.433	300	.482	9	2.240
292	LAPPIN-CHILLED ENDS	PURDUE	300	592	300	.885	9	3.405
294	LAPPIN-CHILLED ENDS	PURDUE	300	.572	300	.590	9	2.820
296	PLAIN CAST IRON STEEL BACK	PURDUE	300	.820	300	1.058	9	3.833
298	COLUMBIA	PURDUE	100	.537	100	.592	9	1.594
300	DIAMOND S STEEL BACK	PURDUE	300	.565	300	.662	9	2.925
302	WALSH	PURDUE	300	.671	300	.784	9	8.780
304	PITTSBURG MALLEABLE SHELL	PURDUE	200	.292	200	.273	6	705
306	PITTSBURG STEEL SHELL	PURDUE	200	.239	200	.299	6	.918
308	NATIONAL	PURDUE	300	.396	300	.413	9	2.565

Table 3.

Results of Tests to Determine Shoe Wear on Cast Iron and Steel-Tired Wheels.

Fig. 10. It recommends that the Association adopt as a standard this outline within which all parts of the No. 2 beam must fall, it being further understood that the recommendation is to apply only to beams used on cars built after January 1, 1908.

Use of the No. 2 Beam.—The committee believes that the use of the No. 2 beam should be required on cars of more than 35,000 pounds light weight. The current standards are open to misinterpretation at this point. It, accordingly, recommends that the paragraph on page 591 of the Proceedings for 1909, which reads, "Beam No. 2 to be suitable for cars exceeding 35,000 pounds light weight," be changed to read: "Beam No. 2 must be used on cars of more than 35,000 pounds light weight, and it may be used on cars of 35,000 pounds light weight or less."

An Editorial Change in Current Standards.—On page 591 of the Proceedings for 1909, the last paragraph under the heading "Brake Beam Specifications and Tests" reads as follows: "On cars built after September 1, 1909, it will not be permissible to hang brake beams from any portion of the body of the car." Your committee believes that this statement would more appropriately appear under the heading of "Brake Beams" in the preceding section, and recommends that it be shifted to that place.

Inside Hung Beams.—The Committee on Brake Beams, reporting in 1906, suggested for Recommended Practice that "all beams be inside hung." The whole report of this brake-beam committee was referred to the Committee on Standards, who, reporting in 1907, approved the recommendation noted above, provided it were construed as not requiring outside hung beams then in service to be changed. All other recommendations of the Committee on Standards, except this one item, were submitted to letter ballot in 1907. There is nothing in the discussion before the convention to warrant this omission from the ballot, and that it was not there included is probably due to an error. Your committee, therefore, recommends that this provision be restored to the Recommended Practice of the Association.

SUMMARY.

As a conclusion to Part 2 of its report, the committee presents the following summary of its recommendations concerning brake beams:

Standard:

1. That on Sheet M. C. B.—17, the drawing of the brake head be modified as regards the size and shape of the hanger hole, so that it conforms to Fig. 9 of this report.
2. That, under "Brake Beam Specifications and Tests," page 591 of the Proceedings for 1909, the last two sentences of the second paragraph be omitted; and that in their place there be substituted the following:

"a. Beam No. 1:

"Apply an initial load of 4,000 pounds, then reduce it to zero.

"Apply a test load of 6,500 pounds and under this load measure the deflection, which shall not exceed 0.0625 inch.

"Next load the beam until failure occurs. Under this test the maximum load borne by the beam shall not be less than 20,000 pounds.

"b. Beam No. 2:

"Apply an initial load of 6,000 pounds, and then reduce it to zero.

"Apply a test load of 12,000 pounds and under this load measure the deflection, which shall not exceed 0.0625 inch.

"Next load the beam until failure occurs. Under this test the maximum load borne by the beam shall not be less than 38,000 pounds."

3. That the second paragraph under the heading "Brake Beams," on page 590 of the Proceedings for 1909, be omitted.
4. That all No. 2 beams used on cars built after January 1, 1908, shall be of such dimensions that all parts of the beam will lie within the outline shown in Fig. 10 of this report; and that this outline be shown among the standard drawings.
5. That, on page 591 of the Proceedings for 1909, the seventh paragraph, relating to beam No. 2, be changed to read: "Beam No. 2 must be used on cars of more than 35,000 pounds light weight, and it may be used on cars of 35,000 light weight or less."
6. That the last paragraph on page 591 of the Proceedings for 1909 be printed under the heading "Brake Beams," in the preceding section.

Recommended Practice:

7. That all beams be inside hung.

In concluding this report, the committee desires to express its opinion that, if its recommendations above stated in Parts 1 and 2 be accepted, it considers its work to be finished for the present, and it suggests, therefore, that the committee as a standing committee be discontinued.

The report is signed by: W. F. M. Goss (Univ. of Ill.), chairman; William McIntosh and J. R. Onderdonk (B. & O.).

SHOE NUMBER	DESIGNATION OF THE SHOE	CAST IRON WHEEL		STEEL-TIRED WHEEL			
		NUMBER OF SHOE APPLICATIONS	SHOE PRESS-280 LBS. WHEEL WEAR IN POUNDS PER 100,000,000 FOOT-POUNDS OF WORK DONE BY SHOE	NUMBER OF SHOE APPLICATIONS	SHOE PRESS-280 LBS. WHEEL WEAR IN POUNDS PER 100,000,000 FOOT-POUNDS OF WORK DONE BY SHOE	NUMBER OF SHOE APPLICATIONS	SHOE PRESS-12000 LBS. WHEEL WEAR IN POUNDS PER 100,000,000 FOOT-POUNDS OF WORK DONE BY SHOE
282	PLAIN CAST IRON	400	0.0004	300	0.0046	9	NONE
284	PLAIN CAST IRON	200	NONE	100	NONE	9	"
286	CONGDON	200	0.0859	300	0.1685	9	"
288	CONGDON	300	0.0063	100	0.2330	9	"
290	STREETER	300	NONE	300	0.0192	9	"
292	LAPPIN-CHILLED ENDS	300	"	300	0.0003	9	"
294	LAPPIN-CHILLED ENDS	300	"	300	NONE	9	"
296	PLAIN CAST IRON	300	"	300	NONE	9	"
298	COLUMBIA	100	"	100	0.0273	9	"
300	DIAMOND S	300	"	300	0.0056	9	"
302	WALSH	300	"	300	NONE	9	"
304	PITTSBURG MALL. SHELL	200	0.0045	200	0.6209	6	0.0946
306	PITTSBURG STEEL SHELL	200	0.0026	200	0.0092	6	0.0148
308	NATIONAL	300	NONE	300	0.0242	9	NONE

Table 4.

Results of Tests to Determine Wheel Wear.

Professor Schmidt: The committee has made a recommendation concerning a shoe gage (Fig. 8). The Association has a standard gage for the head itself, with certain allowable limits of variation in the casting of that head. It seems logical, therefore, that the shoe to fit the head should be limited by gage. The committee proposes the gage as a means of facilitating purchase of brake shoes, and insuring facility in interchange.

The President: Professor Schmidt suggests that inasmuch as the committee is making practically two reports, one on brake shoes and one on brake beams, that it might be well to take up this question of brake shoes and dispose of it before taking up the question of brake beams. The part of the paper dealing with brake shoes is now open for discussion.

T. R. Burton (C. of N. J.): Has consideration been given to the effects on the coefficient of friction of brake shoes and the wear resulting from continuous contact between the shoe and wheel in heavy grade service? It is a fact that a large percentage of brake-shoe consumption occurs on roads operating on heavy grades, and it is also difficult to handle extremely heavy cars successfully on 2.5 or 3 per cent grades, with the usual coefficient of friction or braking power.

I have also observed in handling such cars on heavy grades that the braking seemed to be much less effective toward the foot of the grade than at the summit, leading to the conclusion that there is a probable appreciable drop in the coefficient of friction due to continued rubbing. The question of the coefficient of friction is very important.

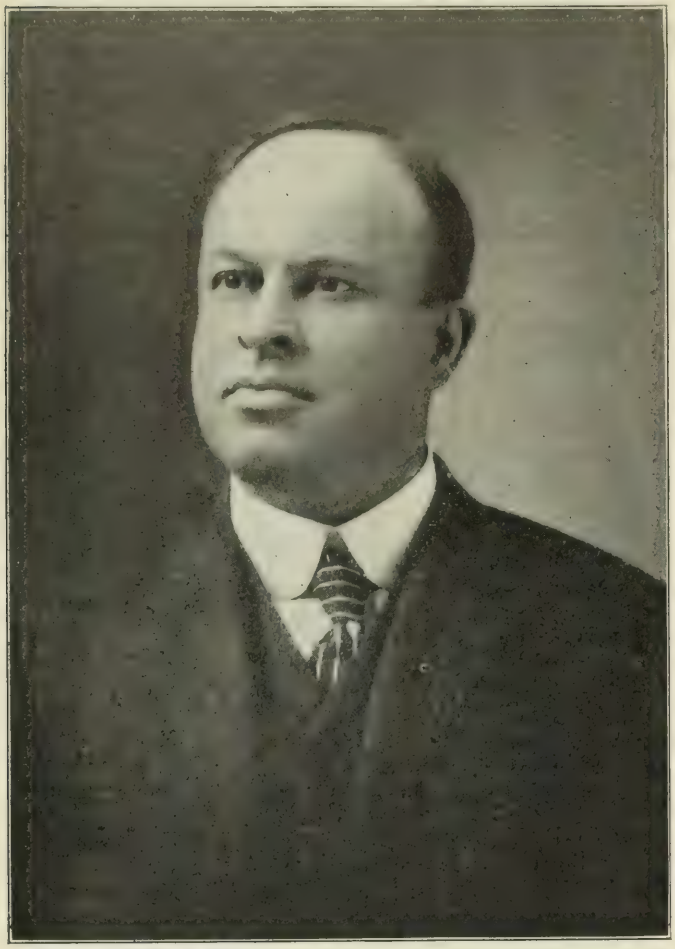
J. P. Young (Pennsylvania): Under the recommendations for the coefficient of friction, I would like to ask if the committee has considered the use of steel or steel-tired wheels in freight service. They have given a test for steel-tired wheels apparently to be used in passenger service only. I believe it would be advisable to have a test for steel wheels, or steel-tired wheels, used in freight service, at least corresponding in a measure to the cast-iron wheels for which they have given a specification. There are a number of steel wheels now being used in that service. The mention of steel wheels is entirely omitted from the recommendation, steel-tired wheels only are mentioned, and I believe they should be included.

The committee on brakes recommends an allowable brake pressure of 18,000 lbs. The committee on brake shoes gives the coefficient of friction for 12,000 lbs., and makes no mention of the braking pressure which the other committee specifies is the allowable pressure. It would seem to me, to make it consistent, that if we specify 18,000 lbs., as the allowable braking pressure in one case, we should in the other report give the coefficient of friction for the 18,000 lbs., to make the two reports consistent.

F. W. Sargent: If the last speaker will look at the back of the report he will find the record there giving the coefficient of friction at 18,000 lbs. load, or 400 lbs. to the square inch of shoe face; tests made on the American Brake Shoe & Foundry machine

Professor Schmidt: I am not sure how far I may reflect the opinion of the committee in my answers to questions. There is no question but that the coefficient of friction decreases as the shoe gets hot. The report proposes no specification under those circumstances, and I do not know that the results at the pressures proposed can be assumed to offer an indication of the relative standing of the shoe as regards the coefficient of friction under continuous application. It is a fact that the shoe which meets the specification at one or two pressures proposed, is very likely to meet them at the lesser and higher pressures, unless those lesser and higher pressures are far removed from the pressures represented in the tests.

Answering Mr. Young's criticism, that the pressure range is not carried sufficiently high in the tests on the steel wheel; it is my understanding that 6,840 represents severe freight conditions, and 12,000 the modern passenger conditions. There again, the shoe meeting 12,000 lbs. pressure will meet it at 18,000 lbs pressure. That is not always true, but insofar as it is true, it constitutes a defence of the committee's action in omitting a variety of pressures. It eliminated a number of the older pressures, as they were too close together to add any additional information; and the proposed change simpli-



A. Stewart,
Third Vice-President, M. C. B. Association.



Joseph W. Taylor,
Secretary, M. M. and M. C. B. Association.

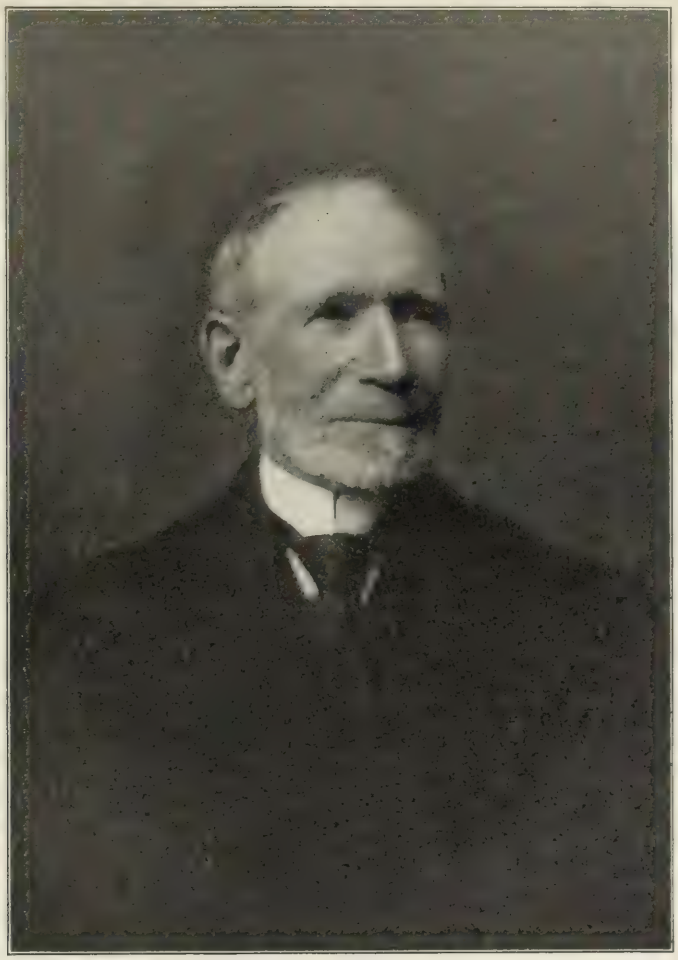
fies the making of tests. There is no reason to believe that the coefficient of the rolled steel or steel-tired wheel would be materially different; and therefore it has not been thought necessary to differentiate or to use more terms.

The President: The summary of the committee's conclusions, as far as brake shoes are concerned, is given in the report. They suggest new specifications for brake shoes to be substituted for our present standard specifications.

F. W. Brazier (N. Y. C. & H. R.): I move that the report of the committee, as far as it refers to brake shoes and its recommendations, be referred to letter ballot. The motion was carried.

Professor Schmidt: Referring to that part of the report referring to brake beams. If such a change in the current specifications appears to be desirable, it would result, probably, in a change of the specifications to read as follows: "Apply a test load of 6,500 lbs. and measure the deflection. The desired maximum deflection is .0625 in., and in its variation, in other words, .0625, or .0627, or .0628 would be satisfactory. I have penciled a modification of this section so as to read: "Apply a test load of 6,500 lbs., and under this load measure the deflection, which is desired to be .0625 in., but shall not exceed 0.07 in." That would apply in the tests of both the No. 1 and No. 2 beams.

The third paragraph, under "a" and "b" for Beams No. 1 and No. 2 applies to all lots of beams of five hundred or less purchased, which would mean the testing to destruction of one beam in each lot, no matter what the size of the lot might be. If the lot is small, we may say we will waive the specification, or we will waive the whole specification. I believe it would be very much better if we would eliminate that sentence "Next load the beam until failure occurs," and say instead "If desired, the beam may then be loaded until failure occurs." That would make a destructive test optional instead of obligatory. Any road desiring it could put it in their specification.



John Kirby,
Treasurer, M. C. B. Association.

1/100 or 5/1000 in. is allowed." That proposal was received by the committee too late to receive adequate attention, but Professor Goss desires to have it presented at this time for such consideration as you wish to give it.

The committee makes one more recommendation: "In concluding this report, the committee desires to express its opinion that if its recommendations be accepted, it considers its work to be finished for the present; and it suggests therefore that the committee, as a standing committee, be discontinued."

Mr. Seley: I have in mind an objection, which has been largely removed by the later remarks of Professor Schmidt, that was, the exact determination of deflection. We all know that the old idea of 1/16 in. was that it would cause undue piston travel by too much deflection of the beam, and I believe in early proposed specifications they started to put it at 1/32 in., but it was found that that would make an unduly stiff, expensive and heavy beam, and 1/16 in. was decided on. I do not believe these people had the idea of .0625, right down to the last figure beyond the decimal point; It would seem to me that the amounts named under the destructive tests are a little high, I do not know very much about it, but it occurs to me with very high ultimate limits, we might lead manufacturers to the use of hard, brittle material, that would give results under test, but would not be desirable as a practical proposition for brake beam material, and it would seem that a factor of 3 to 1 on the test load would give a sufficiently high amount. I would like to make a motion that the recommendation of the committee regarding the expression of the deflection and also the necessity for the destructive testing of the beam being obligatory, be changed as I have quoted in my remarks.

There is one thing more, I do not understand the date under recommendation 4, "After January 1, 1908." I think that must be an error.

Professor Schmidt: That is an error, but I do not know that I can explain fully the reasons on which the date is determined.

T. H. Curtis (L. & N.): Were tests made looking to any specification for the transverse strength of the brake-beam?

Professor Schmidt: There were no tests made in connection with this report, concerning the strength of the beam other than in the line of pull.

Mr. Seley's motion, which provided that the report of the committee be amended and submitted to letter ballot, the amendment consisting in a slight additional allowance in deflection and making destructive tests optional was carried.

In the absence of A. Kearney (N. & W.), the secretary read the report of the committee on Rules for Loading Materials.

RULES FOR LOADING MATERIAL.

While the report of the Committee on Revision of Rules for Loading Material involves several recommendations for changes, still the idea throughout has been to adhere as closely as possible to the rules as they now exist, making only such additions, corrections and omissions as would, in the opinion of the committee, conduce to greater unity, better sequence, and a natural clearness—principles so necessary in formulating rules of this character.

Hence, in presenting this report to the Association, we deem it wise, in order not to take up too much time and yet make it possible to bring to your minds the main points to be considered in our revision, to mention here only such rules as have received radical changes, giving our reasons therefor, with the understanding that there are quite a number not contained in this synopsis, which, by reason of a slight change in construction or phraseology, are none the less important in strengthening the rules in their entirety.



A. Kearney.

As a general prelude to all the recommendations which follow, we are uniform in our opinion in strongly urging that the cuts in the next edition of the Code of Rules for Loading Material be enlarged, as we find several of these cuts very indistinct, on account of the great reduction in size, and we consider there is ample opportunity to make them very much more distinct.

Since Rules 12 and 34 are co-related in a way, in that the former governs the size of stakes for general loading on both flat and gondola cars, while the latter refers to staking and tying of same for lumber loaded on single cars, it has been thought advisable to mention them here together, although in the rules they follow in the natural order.

In rule 12 the use of hemlock for staking has been extended to include not only single loads of sawed lumber, but also loading of tan bark and slab wood; besides, hemlock may be used for blocking and chocking any load. In this rule, as well as throughout them all, the size of nails for tie boards has been reduced from 16-penny to 10-penny.

In Rule 34, governing single loads of lumber, the size of tie boards has been reduced from 1 by 5 inches to 1 by 4 inches, the size of nails, as mentioned above, has been put at 10-penny, and the number of wrappings of wire reduced from six to four strands. The size of stakes for loads in one or more piles, Section B, Rule 34, has also been somewhat reduced, and a new table of substitutes for each pair of 3 by 2 inch stakes, hardwood and hemlock, has been added, to agree with the reductions in stake sizes made in Section B.

Attention is also called to the fact, that, notwithstanding the slight reduction in sizes of tie boards and number of wire wrappings for tying stakes, as outlined in Rule 34, governing loading of lumber on single cars, the point is distinctly made that for overhanging loads of lumber, loading mus be in accordance with Rule 13, which requires 1 by 5 inch tie boards, instead of reduced size 1 by 4 inches, allowable in Rule 34 for single loads of lumber also a greater number of wire wrappings is necessary when substituting for tie boards on loads of this character, six instead of four strands, being used as required under Rule 34.

The next recommendation we would call to your attention is the addition we have made to Rule 15-C, which refers to the restriction of height of superimposed load with respect to the center of gravity. The addition recommended is as follows: "For loads on top of sides of gondola cars the distance from top of rail to center of load, measured at bearing prices, must not exceed 9 feet 3 inches."

The question has received a great deal of discussion pro and con for some time, but since it was the opinion of the majority of the committee that considerable changes have taken place in railroad equipment recently, and that roads were now in better shape to handle such a restriction, this change was decided upon.

L. H. Turner, of the Pittsburgh & Lake Erie, representing the New York Central Lines as well, here puts himself on record as being directly opposed to this change, for the reason that sufficient low-side cars to make the ruling fair to all concerned are not obtainable. However, the majority of the committee are in favor of showing in the rules the figures 9 feet 3 inches as a limitation for the center of gravity, for such loading, and, therefore, it is included.

Quite as important, as well as decided, a step as has been taken in this revision is the recommendation that we change Rule 26, permitting discretionary use of either hardwood or metal spacing blocks, to the exclusive use of metal spacing blocks, striking out all reference to hardwood spacing blocks. The consensus of opinion of the majority present at the meeting seemed to be that the hardwood blocks are unsatisfactory; but right here, we are aware that if metal spacing blocks are adopted, some change will have to be made in the Code of Rules Governing Interchange, to protect metal blocks thus employed, and we offer as a suggestion that such protection be handled in the same way as chains are now taken care of in the Rules of Interchange.

C. E. Fuller, of the Union Pacific, and W. Moir, of the Northern Pacific, both of whom were unavoidably detained from attending the preliminary meeting for discussion of such changes as in the opinion of the committee would be necessary, together with A. Stewart, of the Southern Ry., who as present, have since asserted themselves as being directly opposed to any disturbance of the present ruling. Mr. Fuller believes that metal blocks should not be used exclusively until the matter has been more thoroughly canvassed and an expression from the majority of the trunk lines obtained, while Mr. Moir is positive in his opinion that the exclusive use of metal spacing blocks should not be required. Mr. Stewart compromises in suggesting the use of metal spacing blocks for tandem loads where metal material of large shape is the lading, allowing hardwood spacing blocks for tandem loads in the timber districts where long timber is the lading. Therefore, the committee stands equally divided on this point; but, inasmuch as at the meeting there seemed to be a clear majority in favor of restricting the use of metal blocks, we have drafted it, leaving out all reference to hardwood blocks, and herewith present it, together with the balance of the rules, for your consideration, and for whatever action you deem should be taken. Rule 26 now reads: "The cars must be jacked apart by placing one jack on each side of coupler, separating the cars until the couplers are pulled out to the fullest extent, inserting metal blocks to completely fill the space between horns of coupler and end of sill and coupler release rod chain disconnected, as shown in Figs. 2 and 3."

This brings us to the "Rules for Loading Pipe on Open Cars," Rules 112-117. It has been thought advisable to change these rules materially, and they have been reduced from six general rules to three with sub-divisions, care being exercised to break them up so that the various sizes and kinds of pipe should follow each other in natural order. With this end in view, general instructions with respect to wiring and staking for both classes of open cars, flat and gondola, and for all sizes and kinds of pipe, act as an introduction to the rules, while from this there follow the instructions for loading first on gondola, then on flat cars. The main point we would call your attention to in the revision of this particular set of rules is the change of compulsory facing of bell or sleeve ends of pipe toward center of car, leaving the direction these ends must point to the discretion of the loader.

The next decided revision contained in our recommenda-

tion has to do with the "Rules for Loading Stone, Brick, etc., on Open Cars." Here we have preserved the same number of general divisions as before, but have added two subdivisions and have given marginal sub-headings to some of the main rules in order to classify the various kinds and sizes of this lading readily. We have attempted in this revision to cover the loading of this kind of lading not only in a thoroughly systematic way, but at the same time to comply with the best practices as observed by the shippers, and the rules now formulated are the result of personal contact and experience with the methods employed by some of the largest producers and shippers of stone.

The heading at top of page 106, beginning, "Rules Governing Loading of Scrap Junk and Similar Material on Cars fitted with Racks," has been changed, inasmuch as light scrap and junk are often carried on either open cars or cars fitted with racks, and the rules now read: "Rules Governing Loading of Scrap, Junk and Similar Material on Open Cars With or Without Racks." A figure illustrating the application of such racks follows the rule governing the loading of this lading.

The final recommendation for change of any importance in the rules is the one under the heading of "Rules Governing Loading Material in Box or Stock Cars Where the Opportunity Is Provided for Inspection." Deeming it wise when dealing with any set of rules covering a particular kind of loading, we have incorporated as the first rule under this heading general instructions with respect to inside loading in closed cars, together with requirements for door and open-door protection. In this way we have made the new Rule 124 a general one, from which there follows the loading of various kinds of lading contained under this heading and contained in the Rules 125-132, inclusive.

The loading of barrel staves, fence posts, wooden billets, lath, tan bark and similar short wood has been comprised in new Rule 126, which is a combination of old Rules 125 and 129, with reference to loading of ties and switch timber stricken out, which material is covered in new Rule 127.

The principal change in old Rule 127 is its new number 129, together with the suggestion that in loading car wheels, they should be laid flat with flanges face upward, to facilitate unloading.

New Rule 130 is practically the same as old Rule 130, while old Rule 131 has been incorporated in general instructions with respect to inside loading, new Rule 124 thereby eliminating old Rule 131, whose place is taken by new Rule 131, on the subject of scrap junk material loaded in stock cars, being taken care of and not allowed to pass through spaces between the slats.

This brings us to new Rule 132, covering the loading of sewer pipe, drain tile, etc., in closed cars. There is very little difference between this new rule and its old predecessor, Rule 133, on the same subject.

Here we feel that we should make some comment upon the present Rule No. 6, which some time ago was referred to by Mr. Delano, President of the American Railway Association, suggesting that some modifications of this rule be made to make it harmonize with Rule No. 15 of the American Railway Association. In a letter to F. H. Clark, President of the M. C. B. Association, Mr. Delano suggested that Rule No. 6, of the Rules for Loading Material, should be modified to harmonize with the spirit of the times in the way of increasing the movement of cars in interchange. The letter was referred to us for consideration.

Rule No. 6 of the Rules for Loading Materials reads:

"The height and width of lading must be governed by the clearance limits of the roads over which the lading is to pass." The section of Rule No. 15 of American Railway Association, to which we are inclined to believe reference was made, is "d," showing conditions for which receiving road should pay cost of transfer, and reads: "When cars exceed load limit or can not pass clearances or be moved through on account of any other disability of receiving line, the receiving road shall pay cost of transfer."

The principle of Rule No. 6 was to impose, as far as possible, upon the loader the duty or responsibility of ascertaining the clearance limits on the roads over which lading was to pass, in order to avoid any subsequent cost for readjustment, but it was not within the province of Rule No. 6 to legislate as to who should assume responsibility in cases where transfer or readjustment of load is necessary. In other words, the provisions of the rule serve merely to point out physical requirements of load.

The fundamental principle of section "d," Rule 15, American Association, as we view it, is to impose the responsibility of transferring or adjusting load on the road the car reaches that has such a disability.

Failing to see why the loader of any material should not observe some limitation of clearance, which might be done economically, it being profitable to load within some convenient limitation at no additional cost, or loss in revenue tonnage, and as a compromise to the situation, rather than strike out Rule No. 6 entirely, the idea was suggested of substituting in lieu thereof a rule directing the attention of the parties loading to observe the limits of the standard box car as adopted by the American Railway Association. You will observe, however, we have made no change in the present Rule No. 6, although we had thought that it might be expedient to decide upon some average limitation of load. Upon this assumption, we had labored under the impression that the dimensions of the American Railway Association standard box car would give us just what was wanted, but in this we failed to get relief, because the limits of this standard are for inside measurements only. Hence, we are not leading up to any relief if the opinion still prevails that there is a conflict between Rules 6 and 15.

As a general proposition, it would seem, however, to be good business to load material within certain limitations, which would cause the least interference at the different junction points, and at the same time give us an economical bulk of lading. Therefore, this might point to the advisability of naming, or getting a committee to name, some limitations which can be used in our rules. This question is, therefore, laid before you for your consideration.

Again, your committee has received a letter from Jos. W. Taylor, Secretary, M. C. B. Association, dated May 7, 1910, advising that the Arbitration Committee contemplates suggesting in its report to the convention that the American Railway Association rules for Handling of Explosives and Inflammables and also the M. C. B. requirements regarding tank cars be made a part of the Rules for Loading Material, and that the three sets of rules be incorporated in the Rules of Interchange. The committee has had very little opportunity to consider the proposition; in fact, the information reached us some time after our last meeting, and for that reason we feel we have been unable to ascertain fully the motive prompting the suggestion.

From one standpoint, there might be something gained, in that the rules governing the physical condition of cars, as well as the correct and safe loading of same, would all be confined under one cover, but still it impresses us that a book large enough to carry all data so combined would not only be larger than anticipated, but at the same time the portion covering the Rules of Interchange would be referred to many times during the day, while the Rules for Loading Material would not be used so often, and those for handling Inflammables and Explosives would come into practice comparatively quite infrequently.

Doubtless, many are familiar with the very pertinent references made to this proposition which were brought out in a recent discussion at the Western Railway Club. The drift of the argument rather pointed to a manifest difference in the treatment of the physical condition of cars as taken care of by the Rules of Interchange, as compared to security in methods of building up ladings contained in the Rules for Loading Material.

Still, if the chairman is allowed to express his individual opinion, in the absence of opportunity to discuss with the committee, he really can not see that the cover or binding should in any way affect the force of the rules, because, if the Rules for Loading Material as well as the other two groups of rules referred to are standards of the Association they should be equally observed, whether printed separately or in any combine form—the fact of combining them should not necessarily influence their value and the recognition they should be given.

Before concluding, the committee feels constrained to point out a disadvantage under which it is oftentimes laboring in its endeavor to put the Rules for Loading Material in the best and most desirable shape for all concerned.

It is reasonable to suppose that physical conditions and requirements bring up problems locally which are met by excellent suggestions for changes in the rules. Some may be of minor importance, while again others are of considerable moment. These oftentimes valuable remedies seldom reach us, hence, we refer to the disadvantage, because the committee, less posted, perhaps, in some local situations, is endeavoring to make general and specific rules for the guidance to all.

Occasionally, the secretary will forward the committee a communication—sometimes for the interpretation of the rules covering a particular point, and again for the method of loading a particular commodity, but we are not reaping the benefit of the many good ideas arising in handling commodities under local conditions, which knowledge would tend greatly to increase the efficiency of the committee. We are only endeavoring to bring about a plan by which your committee can derive the benefit of the broader experience, so

that the rules will be still further increased in their efficiency and integrity.

The report is signed by:—A. Kearney (N. & W.), chairman; C. E. Fuller (U. P.), A. Stewart (Southern), W. Moir (N. P.), J. S. Lentz (Lehigh), W. F. Kiesel, (P. R. R.) and L. H. Turner (P. & L. E.).

W. L. Russell (P. & R.): I move the report of the committee be accepted and referred to letter ballot, after the convention has taken such action as to strike out that portion referring to the height of superimposed loads, and also that part of the report requiring the use of metal spacing blocks exclusively, for the reason that the part of the committee proposing those suggestions has given good reasons why they should not be adopted.

In looking into the matter, we find that of the number of cars with low sides to permit such loadings, the Pennsylvania System owns 21,000 cars with 30 in. sides of 100,000 lbs. capacity; the New York Central owns 3,850 of the same type of cars; the Erie owns 1,000; the Baltimore & Ohio owns 3,006; the Philadelphia & Reading owns 500; the B. R. & P. owns 250. If the proposed change is adopted, it makes the height of loading 9 ft. 3 in. from the top of the rail to the centre of the load, and that will legislate out of service for this kind of loading 266,863 cars with 40 in. top sides and higher. Those cars are owned by various roads throughout the country outside of the Pennsylvania system. In obtaining further information on this subject, I had advice from the traffic manager of the Carnegie Steel Company, that they have had as high as one million dollars worth of finished products on their floors at one time awaiting cars for loading. If this proposed change is made, it will work as great a hardship on the manufacturer as it does upon the railways. With these conditions before us, I do not think this convention will agree to such a radical change in the rules at this time. It has been said by the committee that it finds the railways better able to take care of superimposed loads of 9 ft. 3 in. centre of gravity than heretofore. That is true, but it is not so to the extent required. For that reason, I think that part of the report should be stricken out.

As to the metal-spacing blocks, it has been the desire of all railways and their managers to facilitate the movement of freight. If we adopt the rule requiring railways to use metal-spacing blocks instead of wooden ones in certain cases, we will restrict the freight movement further; and for that reason I move that those two clauses be stricken out.

Julius Krause (P. R. R.): When you get the center of gravity up so high, and run over curves with six and seven inches elevation, and you are not running very fast, you are getting a lot of weight on the side-bearing on the low side of the car; and then you want to look out for trouble. Now, as to the wooden spacing block; we have had a lot of trouble during the last few years with those blocks; as our cars and engines have grown in size, the wooden spacing block does not do. I have had to renew them as high as three times in twenty-five miles. You may ask why didn't I let them run? Well, you place your lading seven-tenths between the bearings and three-tenths over, and strike a curve, and what is the result? The wooden spacing block will squash and your load begins to creep one inch at a time, but if it creeps ten times in a minute, it don't take long to spill. I have had two instances in three months where a good wooden car was so badly overloaded that it has broken down.

J. J. Tatum (B. & O.): I have a great deal of sympathy with my friend, Mr. Krause, for I have shared troubles with him; but I do not believe in increasing the troubles; and by this addition to the rules, we are getting more. I think the trouble, instead of being with the center of gravity of the superimposed load being placed above 9 feet 3 inches has been that we have not loaded cars according to the rules adopted by the Association to safely retain the load on the cars. We have investigated this matter very carefully, and we find we have had trouble with but one load, and that was not secured to the car in accordance with the rules of loading long material.

J. J. Hennessey (C. M. & St. P.): It seems to me that in putting the center of gravity at 9 feet 3 inches we are taking a step backwards. We have run under the rules of loading long material for a long time, and I have not heard of a serious accident. Certain roads are unfortunate enough to have such sharp curves and such poor tracks that they cannot carry a load beyond a certain height, but for that shortcoming the roads of the country should not be punished. The pressure on us is to keep cars moving; suppose we establish this height of 9 feet 3 inches, and a car comes to some point of interchange, and is one inch above the established center of gravity, you will have the car held up. I do not think we should go on record as being in favor of any such a proposition as that. I see no necessity for it in the rules to-day; and I move that that portion of the rules be stricken out.

S. Lynn (P. & L. E.): I am from a Pittsburgh district, and we know we are hauling loads higher than the limit proposed in this rule; but we are handling them successfully. I do not think this convention should place a limit on the height of the load. I am in favor of the metal spacing block. It is a good thing.

I. S. Downing (L. S. & M. S.): The Lake Shore gets the bulk of the material loaded on top of the high side coal cars from the Pittsburgh district. I do not recall, in an experience of eighteen years, ever having had an accident on account of such lading. The lading is joined in the center of the cars. I think a wooden block reinforced with iron is better than a cast iron block that may break in two. I do not think we should go to metal-spacing blocks for that reason.

Mr. Schroyer: How do you reinforce the wooden blocks, with angle irons?

Mr. Downing: At the corner.

E. A. Miller (N. C. & St. L.): Before this matter goes to a vote I wish to say that I feel it would be unfortunate should the recommendation carry. Ours is only a small road, and we have built in the last few years a large number of gondola cars, especially for the steel trade. Our first gondolas for that trade were low-side cars. We afterwards built a gondola that was 87 in. from the top of the rail to the top of the box. We reduced that on our next lot of gondola cars to 81 in. from top of rail to top of box. We have known of no trouble on our own road, and we have heard of no trouble with these cars on adjacent lines or the lines with which we do business.

The President: Mr. Tatum's motion was that the proposed change in Rule 15-C be eliminated, the modification of Rule 26 be eliminated and the remainder of the recommendation be submitted to letter ballot.

Mr. Tatum: The motion in substance was that the report of the committee be accepted with the elimination of the reference to the rule fixing the center of gravity at 9 ft. 3 in., and the elimination of the reference to the spacing block.

The motion was carried.

The President: If there is no further discussion on the report, it will be referred to letter ballot.

MR. HOOLEY ON THE EMSEEBEE ASSOCIATION.

"What be thim Emseebees?" inquired Mr. Dennissey on the morning of the arrival of himself and his friend Mr. Hooley at Atlantic City. "Ye towld me about th' McHannix clan 'nd sid th' R'yal Grand Lodge av Emseebees 'd be wit' 'em, 'nd they are, but what they be, I dinnaw."

"Nayther do I," replied Mr. Hooley.

"Ye don't knaw!" ejaculated Mr. Dennissey in some astonishment, as this was the first time he had ever heard an admission of ignorance on the part of his friend. "Iv ye don't know what they are, there a'n't anny."

"That's th' answer, Dinnissey. They a'n't anny," replied Mr. Hooley. "They's a R'yal Grand Lodge av Emseebees, or th' Emseebee Assocyation, 's they carl thimsilves, but they a'n't anny Emseebees no more. They may be tin or twilve arl together, iv ye rake th' Shtates 'nd Canady 'nd Mixico, but th' gr-reat glory av th' assocyation is that they a'n't anny more Emseebees in th' assocyation that th' Emseebees made."

"Wull ye exhplain that?" asked Mr. Dennissey in some perplexity.

"I wull so," said Mr. Hooley. "'Tis this way, Dinnissey. 'Tis like th' Dimmycratic pairty, 'nd th' Raypublican pairty, too, f'r that matter. Ye say, th' Dimmycrats was arl Raypublicans whin th' pairty was begun—about th' time ye was a gossoon on th' owld sod—'nd th' Raypublicans was arl Wigs——"

"Th' gintry arl wore wigs in thim days, I'm towld," remarked Mr. Dennissey thoughtfully.

"Ye'er powers av hearin' 'nd undherstandin' 's gettin' no betther very fast, I persave," moaned Mr. Hooley. I sid Wigs, not wigs—big double-ye, haitch, high, gee,. Wig, iv ye can shpill an aisy wurrd. 'Tis th' name av th' pairty that was before they was anny Raypublicans. I dinnaw jist now why they changed th' names, 'nliss 'twas that they got howld av some man that nayther pairty cud shtand, like Brine, f'r instance, 'nd 'twas thought that be th' change av name they cud get rid av th' man aisier than th' prisint Dimmycratic pairty's been able to get rid av Brine, or th' Raypublican pairty av Rosyvelt. 'Twud be a good thing, I'm thinkin',

Dinnissey, iv th' names av bote pairties cud be changed agin," mused Mr. Hooley thoughtfully.

"'Tis an enthertainin' histurical 'nd pollytickle lecture ye're givin' me," remarked Mr. Dinnissey, "but me comprehinsion's not that quick t' till me what it's arl got to do wit' th' Emseebees."

"'Twas merely an illusthration, Dinnissey, not to be t'rowin' anny bokays at ye'er powers av comprehinsion, ayther," retorted Mr. Hooley. "I sid they was now only about tin or twilve av thim, but I mind me now that me frind Ta-aylor, he's th' sicriturry av th' assocyation, towld me they was about sixty av thim in th' Shtates, countin' in Canady 'nd Mixico, but they was only tin or twilve owld-fashioned relrods that hadn't changed th' name to somethin' else. Some av th' roads has siv'ral av thim. That laves about sivin hundred mimbers av th' assocyation that carls thimsilves by another name 'nd smills as swate, 's th' pote says, against liss than sixty Emseebees. 'Tis a fine wurrkin' majority, I'm thinkin', Dinnissey."

"'Tis about th' same majority as wurrked ye in th' warrd th' last 'liction, 's I raymimber," interjected Mr. Dennissey.

"We're not in th' warrd now, 'nd we're not convairsin' on pollytickle subjicks," returned Mr. Hooley with some warmth. "'Tis thryin' I am to bring to th' livil av ye'er comprehinsion th' illuminatin' fact that th' bigger 'nd sthronger th' Emseebee Assocyation gets, th' liss Emseebees they is in it. They're arl shuperintindints av locommytive power, 'nd shuperintindints av rowlin' shtock—though f'r me pairt I dinnaw anny shtock that rowls axcipt harses 'nd pigs, 'nd they a'n't anny room f'r thim to rowl in th' shtock cars, anny that I've iver seen, annyhow—'nd thin they's th' foremin av car repairs, 'nd a lot av th' McHannixes. Th' bosses av th' assocyation in th' owld times lit arl these min int' th' assocyation t' swill th' vote at th' primaries, as ye might say, Dinnissey, iv we was talkin' pollytics, 'nd didn't shtop to think that arl th' shuperintindints av locommytive power 'nd arl th' McHannixes were mimbers av th' McHannix clan. 'Nd thin th' relrods thimsilves that didn't take anny inthrust in ayther th' assocyation or th' McHannixes was infloonced to carl their Emseebees assistant shuperintindints av locommytive power, 'nd McHannix in charge av rowlin' shtock, 'nd gin'ral foremin, 'nd th' like av that, 'nd that kipt thim fr'm thinkin' that th' R'yal Grand Lodge av Emseebees was th whole thing. Iv ye belong to th' Ancient Ordher 'nd to th' Knights av Brine Boroo, bote, ye're goin' to be nootral whin they's conflictin' inthrusts bechune th' two av thim, a'n't ye, Dinnissey?"

"I voted f'r Brine th' lasht time, 'nd ye didn't carl me no names, nayther," answered Mr. Dennissey somewhat reproachfully. "What d'ye say his other name was?"

"I'm shpakin' av Brine Boroo, th' gr-reatest king Ireland iver had, rist his sowl f'r th' last tin hundred years, 'nd not av th' rimnant av th' Dimmycratic pairty that was. But 'tis no matther. Ye see, Dinnissey, th' Emseebees 'nd th' McHannixes 've got so mixed up 'nd th' relrods a'n't makin' anny more Emseebees, they're thinkin' av makin' a thrust out av th' two av thim. They've appointed commytees av th' assocyation 'nd th' clan t' consider th' matther av th' thrust 'nd rinder an imparshall rayport to bote th' convintions th' year that is. 'Tis an illigant jint commytee. Av th' six mimbers av th' two commytees, they's four shuperintindints av locommytive power that is, 'nd wan that was, 'nd wan shuperintindint av th' car depairtmint. Whin they make their rayport, it'll be signed by thim six min, 'nd how owld is Ann?"

"They's wan thing, though, that may hilp th' Emseebees whin it comes to a vote whither th' locommytive shall go first or back up," added Mr. Hooley thoughtfully. "They're littin' a lot av car inshpectors become mimbers av th' Emseebee Assocyation. They're min av gr-reat inflooence."

"What do car inshpectors do?" inquired Mr. Dennissey.

"Pick off th' buds av th' grane lumber in freight car sills whin th' cars pass th' intherchange points," replied Mr. Hooley, knocking the ashes from his pipe and moving up the Boardwalk.

Conventionalities.

On account of business responsibilities George H. Forsyth, president Forsyth Brothers Company, is not attending the conventions this year.

Wanted—A pitcher or a battery. It is understood that the Western team is in the market for a pitcher or a battery to play in the game on Saturday.

The U. S. Metal hat has again loomed out of the mists and the genial Dunham is once again walking the planks. Let the band proceed. Sombrero grande!

Most men carry their checks in a book. One man carries his in his head. Guess—or blink at Stafford's cap. It certainly is "an abomination unto the Lord."

George T. Anderson, mechanical superintendent of the Whipple Car Company, accompanied by Mrs. Anderson, arrived Monday. They are at the Chalfonte.

George A. Cooper, of Detroit, Mich., arrived Sunday and is at the Marlborough-Blenheim. George has a sure thing on the heavy weight "pug" celebration at San Francisco. Ask him.

Mr. and Mrs. John D. Hurley, of Chicago, got here Monday. Jack never knocks, and yet it is believed that if properly approached he could produce a supply of Thor hammers on short notice.

J. E. Minor and Mrs. Minor appeared on Tuesday. Mr. Minor is one of the earliest and most faithful attendants at these conventions, and has served his fellowmen in several important committee positions.

Mr. and Mrs. Stanley W. Midgley arrived from Chicago Monday evening. They have not missed an M. C. B. and M. M. Convention for the past eight years. Mr. Midgley represents the Curtain Supply Company.

It sure does seem like old times when you get the glad hand from Scott Blewett. His ready smile and always pleasant words give one that kind of inspiration that dispels all thought of burden in one's daily work.

Choose your partners for the Military Euchre. It is promised to be the event of the convention season, and 1,000 volunteers are wanted to storm the numerous forts which will be provided. It comes on Friday evening.

A William Sellers & Company (Inc.) party, consisting of Strickland L. Kneass, Mrs. Kneass, C. B. Conger and John B. McClintock, came over from Philadelphia on Monday in what Conger designates a "gasolene buggy."

D. F. Jennings, of Chicago, came ahead of the conventions. He has not yet fairly opened up his line of talk on Guilford S. Wood's "Railway Necessities," but he brought along a good supply of fish stories with which to fill in the first few days.

Robert F. Carr, president of the Dearborn Drug and Chemical Works, is unable to get to the convention this year, as he is spending a couple of months in Europe. He will attend the International Railway Congress, to be held at Berne, Switzerland, next month.

George R. Carr, vice-president of the Dearborn Drug & Chemical Works, accompanied by his mother, Mrs. E. A. Carr, reached Atlantic City on the Pennsylvania Limited from Chicago Tuesday evening. They are quartered at the Marlborough-Blenheim.

B. A. Hegeman, Jr., president of the U. S. Metal & Manufacturing Company, is on hand, as usual. He is accompanied by his son, Harold A. Hegeman, who is making his debut as a railway salesman. Harold H. sure looks like he's "a chip of the old block."

James T. Milner, vice-president of the Standard Car Truck Company, arrived from Chicago Tuesday. Mr. and Mrs. Milner have just returned from a pleasant trip to foreign lands, having visited England, Ireland, Belgium and witnessed the Passion Play at Oberammergau.

Mr. and Mrs. A. L. Whipple, and their three children and maid, reached Atlantic City Tuesday. "Whip" is a busy man at these conventions. He made a "bee line" from the station to the Million Dollar Pier and at once plunged into the work of the executive committee, of which he is a member.

The many friends of George E. Van Woert will miss his presence this year. Mr. Van Woert died April 14 at his home in Chicago. For twenty-five years he held positions of responsibility with the Murphy Varnish Company, and for the last twenty years was its honored and trusted manager in Chicago.

Once in the year Harry C. Buhoup transfers his affections from Chicago and the Grand Pacific and smiles upon the convention attendants. He is here, and it is suspected upon this evidence alone that J. J. McCarthy is somewhere in hiding—possibly under some kind of a car roof that does not leak.

J. Will Johnson, the hustling chairman of the entertainment committee, has been on the ground—so far as the pier and the Boardwalk may be called ground—for about a week, arranging the details of the numerous functions in his charge. His work has been so far perfected as to permit of his being joined by Mrs. Johnson, who arrived on Sunday.

Among the familiar faces at the convention is that of Thomas E. Carliss, one of the veterans of the metal brake beam business. Mr. Carliss recently resigned his position as superintendent of the Chicago Railway Equipment Company's Jersey City plant, to take the position of manager of the manufacturing department of the Buffalo Brake Beam Company.

Among those whose presence will be missed this year at the conventions is William M. Simpson, of the Railway Materials Company. Mr. and Mrs. Simpson left Chicago last week on a rather extended European trip. Among other interesting events on their program, they will attend the International Railway Congress at Berne.

J. F. Walsh appears at the convention this year with the title of general superintendent of motive power. Up to the present his jurisdiction includes only the lines of the Chesapeake & Ohio; but each of the general superintendents of the three grand divisions of the road has been given a superintendent of motive power reporting to Mr. Walsh.

Frederic Parker, vice-president of the Hunt-Spiller Manufacturing Corporation, is again in attendance at the convention. Mr. Parker's other interests allow him to give very little personal attention to the affairs of the corporation; but he thoroughly enjoys coming to the conventions. As this is the fourth or fifth one he has attended, his circle of acquaintance is naturally growing some.

Mark A. Ross and Mrs. Ross were among the early arrivals on Monday, and both of them are as brightly beaming as one of Moxie's headlights. Perhaps it is that the duties of chairman of the Entertainment Committee which Moxie performed so well a few years ago have been shucked off upon the broad shoulders of J. Will Johnson, Moxie's chief assistant in business.

The man who read the sign over an optician's shop on the Boardwalk, "1421 Eyes Examined Free," was filled with a consuming curiosity as to the mental characteristics of the one-eyed man who must have been included in the number who had thought it worth while to have "it" examined. It finally dawned upon the observer that 1421 was the Boardwalk number of the optician's shop.

No, the pergola-like structures on each side of the ball room were not erected solely for the purpose of herding dancers within narrower limits, nor for the purpose of affording more sitting room for the goats and others. The fact is, that the immensity of the exhibit this year required all the available space—and then some. A part of the space annexed and segregated, as it were, is that on each side of the ball room at the inner end; and by the new arrangement this becomes a part of the space under the galleries.

The multitude of friends of Fred. A. Casey, who appeared at the conventions last year showing plainly the results of a serious railway accident, will be glad to learn that his condition is much improved, though on account of internal injuries he has fears that it may be a year or more before he is fully recovered. The patience and cheerfulness under conditions of suffering in the case of one heretofore so active for the common welfare and happiness, as Mr. Casey has always been, are an inspiration in themselves and an everlasting rebuke to such as find the world an excuse for an eternal frown upon the brow and a grouch in every pocket.

J. W. Griffith, purchasing agent of the Union Pacific, spent Wednesday on the pier greeting his friends and absorbing some of the good that the splendid exhibit affords. Mr. Griffith is at the Marlborough-Blenheim and will leave for Omaha some time to-day.

J. A. Kinkead, New York representative of the Parkesburg Iron Company, has reverted to his old habits of testing materials. At present he is testing lemonade.

George E. Pratt, vice-president of the Crawford Locomotive and Car Company, is receiving the congratulations of his friends and former customers on his return to the car-building field. Mr. Pratt arrived in Atlantic City Wednesday.

Rosser has started out again this year as a bird tamer. He says he's got them so that they now eat out of his hand.

Poste may have happened in the nick of time; but we're not so sure about this title to fame as a physiologist. The editor who received the first and second calls (with emphasis on the "second") prefers to believe that Poste 's psychological.

The system that has enabled the Railway Supply Manufacturers' Association to bring to Atlantic City, for one night, an all-star vaudeville bill, with a car load of scenery, properties, electrical effects and so forth, is that of the United Booking Offices of America. It provides the entertainment for the night of June 18, as well as the special matinees for the week. It is the "hub of the wheel" which books all the first class vaudeville houses in the United Stats, Canada, England, France and Germany. It is affiliated with the Orpheum circuit in the West and the Barresford tour in England.

Daniel M. Brady, who is entitled to rank among the old-timers if anyone is, came down on Tuesday on the New York special. His name appears to have been omitted from the list published on Wednesday morning, though it is not known how even his modesty made him successful in eluding observation. Its probably up to Vought—and Vought's up to us.

Mr. and Mrs. Burton W. Mudge and Master Burton W. Mudge, Jr., arrived from Chicago Wednesday and are at the Brighton. "Junior" Mudge, as some of his Chicago playmates call him, is aged 7 years and may some time succeed his grandfather as president of the Chicago, Rock Island & Pacific. His father is president of Burton W. Mudge & Company.

J. H. Smythe, formerly with the American Locomotive Company, is now with the Parkesburg Iron Company as boiler expert. He is a well-known figure at the conventions of the International Master Boiler Makers, and is enjoying the present meeting to his full extent of six feet four.

"Doc" Bateman, of the Parkesburg Iron Company, has changed his face but not his facility in welcoming old friends at the convention.

Heap Big Johnson is neither an editor nor a proofreader, as any person with but one eye could readily see, without squinting, if he were to wander through the Entertainment Committee's blue book; but he handed one to the scrap-basket editor's proofreader all right. Between them they coined the word "submittees" in Wednesday's *Daily*. Both still lay it to the hoodoo thirteen.

William H. Thomas, formerly of the Southern Railway, and C. H. Cory, formerly of the Cincinnati, Hamilton & Dayton, both life members of the Master Car Builders' Association and both retired, have come to be known among their familiar friends as "those heavenly twins." If one of them appears it is safe to lay a wager of considerable amount that the other is not many feet distant. Members of both associations hope that this pleasant companionship will be continued for many years.

Mr. and Mrs. Walter Macleod, Cincinnati, accompanied by Master Edward Macleod, aged 4 years, are attending the conventions and enjoying the pleasures of Atlantic City. Master Edward is a bright little chap who, like his father, possesses a decided mechanical turn of mind. Mr. Macleod is president of Walter Macleod & Company.

C. A. Dunkelberg, treasurer of S. F. Bowser & Company, and a member of the Entertainment Committee of the Railway Supply Manufacturers' Association, arrived from his home in Fort Wayne, Ind., in time for the opening session. Mr. Dunkelberg is a most willing worker in the affairs of the association and contributed considerable of his time last year to the welfare of all.

The discussion on roof boards in the Wednesday morning session was aptly emphasized by Mr. Schroyer. Mr. Hennessey was contending that, as the board roof was rapidly becoming obsolete, it was unnecessary to specify a certain width of board to be used for this purpose, and that a narrower board was strong enough. Under the weight of Mr. Hennessey's argument, Mr. Schroyer's chair broke under him. He contented himself with remarking, "This chair is built like some cars I know of"—and the subject was changed.

William McWood, member of the Master Car Builders' Association since 1875, life member and past president with three terms to his credit as presiding officer, still maintains his interest in the work sufficiently to come to the conventions. His last term was 20 years ago.

Thomas Madill, Chicago manager of the Sherwin-Williams Company, one of the "Old Guard," is in attendance as usual.

John S. Lentz, member of the Master Car Builders' Association since 1879, a past president and one of those still retaining the original title of master car builder, appeared among his friends on Tuesday. He holds the representative membership for the over 52,000 cars of the Lehigh Valley; and though he says "there are only a few of us left," we all hope to see him among us for many years yet.

Having lost his umbrella several years ago at Saratoga, John Chamberlin did not venture to appear on the pier until Tuesday, when the skies were comparatively clear and pleasant weather might reasonably be expected. Have you seen the cane, though? Its delicate, ladylike taper is a wonder.

A. E. Manchester appears younger and stronger than ever since he has been able to turn over a part of his heavy duties upon the shoulders of his solid and active assistant, DeVoy. He registered among the early ones.

James W. Nelson, of Richard Dudgeon, put in an appearance Tuesday afternoon. Friend Nelson isn't exactly a globe trotter; but he does cover quite some ground in the course of a year in visiting railway officers throughout North America.

R. D. Smith, who some years ago turned his back upon the cornfields of Nebraska in favor of the bean fruit and codfish of Boston, greeted ye editors on Tuesday with his customary smile. The change of diet appears not to have impaired his geniality in the least.

The question has been raised whether the orange-colored blossoms that flourish on the pergola are really orange blossoms, or whther a pumpking seed has secreted itself in one of the jardinieres at the base of the column and sent its thrifty tendrils up to meet the myriad electric lights; or whether, indeed, it may not be a Burbank seedling, the result of planting squashes and watermelons in the same patch.

William O. Duntley, president of the Chicago Pneumatic Tool Company, accompanied by Mrs. Duntley, Miss Nellie Hunt and Crawford Hunt, Chicago, sailed on the steamer George Washington from New York, on June 6, for a pleasure trip in foreign lands. They will go direct to Berlin and then attend the International Railway Congress at Berne.

Reuben C. Hallett, representing the railway department of the estate of Edward R. Ladew, has brought along this year the auditor of the estate, A. R. Surpluss. Mr. Surpluss' presence is not necessarily for the purpose of seeing that Rube keeps his accounts straight, but primarily to become convinced of the importance of these conventions to all who have anything to sell to railways. As early as Wednesday morning Mr. Surpluss expressed himself as fully convinced, and he appears likely to become a "regular."

It is worth while to call attention to the comparatively large number of ladies who appeared in the march of the Master Car Builders from the Marlborough-Blenheim to the Greek Temple on Wednesday morning. Heretofore, only a comparatively small number of ladies have followed the band on such occasions; but many of them were in evidence this year and doubtless assisted otherwise than by mere numbers in making the procession a general one.

The bombardment heard on Wednesday morning was no part of the preliminary skirmishing around the "forts" which

will form the bases of operation in the military euchre struggle. It was only the flashlight photographer making the exhibits look pleasant.

One of the inconveniences of being a newspaper man is the possibility of being roped in at any time as a temporary assistant on the staff of the *Daily*. Another contingency of such assignment is, that the man who thus kindly serves as reporter runs the risk, or almost incurs the certainty, that his own name will be omitted when it should properly appear. Such a fate befell Harry D. Vought, the veteran newspaper man and multiple secretary. He very kindly assisted in furnishing the names of those who came down on the special from New York on Tuesday, but his own name was inadvertently—though it was fated to be so—omitted from the list. It is hoped this item may reach his eye before he discovers the omission. Mrs. Vought accompanies Mr. Vought.

Pop Sisson is sure it this year. He and Wampler, Pop's latest discovery, are sitting on the lid in Mr. Forsyth's absence.

W. M. Wampler, for some time in charge of the electric railway truck department of the American Locomotive Company, has just accepted a position with the sales department of Forsyth Brothers.

L. B. Sherman, formerly secretary of the Railway Supply Manufacturers' Association, has been appointed assistant night mayor of Atlantic City, to serve during the conventions.

L. F. Purtill, accompanied by Miss Purtill and Miss Margaret Sullivan, are staying at the Traymore. This is Mr. Purtill's twenty-second convention. He was initiated as a representative of the Westinghouse Air Brake Company; but for some years past he has attended in the interest of the New York Belting & Packing Company.

A long box closely resembling a coffin box arrived at Booth 509, that of the Pressed Steel Car Company. A. M. Smith, general manager of the Coal & Coke Railway, started inquiries about it. The question arose, "Who is in it? 'Jack' Turner or 'Billy' Wilkinson?" "Billy" turned up at the psychological moment and opened the box amidst exclamations of "Poor Jack!" Then lo! a beautiful model of the new general service car came to light. Therefore "Jack" and "Billy" are still with us; and may they linger long.

One of the most pleased men here is Frank R. Coates, vice-president of the Inter-Ocean Steel Company. He has received positive knowledge that the plant is really turning out tires regularly. Frank is not fond of scaring away anything that makes a noise like an order.

A few days before leaving home, W. C. Arp, superintendent of motive power, Vandalia, announced his intention of getting here a little early in order to put in a day or two at golf. It is feared that he failed to make the proper arrangements with the weather man to insure the perfect success of his scheme, since it is practically impossible for the ordinary man to handle an umbrella and a golf club successfuly at the same time.

Prof. Edward C. Schmidt, of the University of Illinois, appears to have been the earliest of the professorial adjunct to the railway associations to appear upon the scene. Prof. Schmidt's chief interest this year is his individual paper on "Freight Train Resistance," before the Master Mechanics' Association. It is scheduled for next Tuesday.

O. C. Gayley, vice-president of the Pressed Steel Car Company, is on deck, as usual.

McQuiston, of Westinghouse publicity fame, might be made to smile still more broadly if he could only make a t. f. contract for a certain other exhibit booth. For once the tables are turned.

James V. Smith, formerly with the Galena-Signal Oil Company and now manager of the railway department of the Indian Refining Company, hopes to get here before the convention adjourns He's an old timer and his friends hope he'll "make it."

They aren't exactly heavenly twins, Jack Turner and his side partner, Wilkinson; but they resemble closely a double-backed postage stamp.

Champion Rivet Dave must have survived Staff's comet dream, because he's here, as large as life.

"Le vieux garde meurt, mais il se rend jamais." The "Old Guard" of the French army under Napoleon was accustomed to say of itself that its members died but never surrendered, but Waterloo happened. The "Old Guard" of New York has never encountered a Waterloo, but it never surrenders. The fame of this military organization is not only national but international, and its officers and men are the pick of the army, the navy and the national guard. Its Napoleon is Major S. Ellis Briggs, and in the uniform of white coats and tall bearskin hats the organization on parade constitutes a command of which the great Napoleon might have been proud to be the leader. It is the band maintained by this organization that will furnish music for all the important events during the weeks of the conventions. It has toured the country from coast to coast, under the leadership of Patrick S. Gilmore, whose mantle of leadership now rests upon Henry Conrad. The band has taken part in most important national events of a military and social character, such as acting as special escort to the President of the United States, and has been engaged to appear in the reception to Colonel Roosevelt. It will lead the march on the opening day of each of the conventions and will serve at other functions at which its services may be required.

J. Alexander Brown, who is said to have been in attendance at every convention since 1888, and who has been, in more recent years, one of the best known figures at the annual meetings of these and other associations on account of his long service as an executive of the several supply associations, will not be present this year, having been named by the United States government as one of the official delegates to the International Railway Congress at Berne, Switzerland. Whether Alex will find any Alps more steep or lofty than those he encountered on the occasion of the last session of the Congress, held in Washington, D. C., in 1905, is a matter of conjecture; but he can comfort himself on this occasion, as he did before, with the thought that sunny Italy lies beyond. He sailed on Wednesday, June 8, on the Teutonic, in company with Mrs. Brown. A. Stewart, general superintendent of motive power and equipment, Southern Railway, and his wife and daughter, are of the same party. A wireless message received after they had been out about 24 hours announced that they were all well and happy and sent greetings to their friends at Atlantic City. Mr. Brown is, however, represented at the conventions by his son, Harold, a graduate of Lafayette in 1905, and by Charles L. Dinsmore, who has been the efficient representative of The Pocket List in Chicago for many years and who was Brown's right-hand man in his several emergency applications.

THE WAIL OF THE SOUVENIR FIEND.

I miss them, I miss them; I don't care who hears;
I say it like that:—"I want souvenirs!"
I've examined exhibits, I have sought with much craft
To learn the best method of working the graft;
And now my experience has come all to naught;
There's not a blame one, and in vain I have sought
From the Blenheim hotel to the end of the pier,
Without finding one measly, doggone souvenir.

In previous years 'twas as easy as pie;
Look over exhibits as if you would buy;
With patience and interest the whole story hear,
Then accept, as you went, some small souvenir.
For the costlier gifts, the best thing to do
Was to have wife or daughter accompany you;
And thus, in the course of a very few years,
You'd have a collection of choice souvenirs.

Fountain pens, opera glasses, gold pencils and such,
Interspersed with small things not worth quite so much;
Notebooks and card-cases, pocket-books, and alas!
Pass cases, now useless; I can't get a pass!
Paper-weights, pocket mirrors, divers manicure tools,
Canes, hat-pins and stick-pins, steel measuring rules,
Cards, jack-knives, umbrellas—nothing now for two years,
Since supply-men refuse to hand out souvenirs.

The good days are gone, and I say to myself:—
"What good's a convention with no chance of pelf?
What's the good of exhibits at which no one looks
Long enough for the salesman to get in his hooks?
What's the use of the meetings? Nothing but talk—
Might as well take a chair and ride up the Boardwalk,
Or go lie on the beach and get sand in my ears.
Why not? Nothing doing. There are no souvenirs."

MASTER CAR BUILDERS' RECEPTION.

The reception by the president and officers of the Master Car Builders' Association at the Blenheim Exchange on Wednesday evening was one of the most pleasant of the various functions of the convention period. In the receiving party were F. H. Clark and Mrs. Clark, T. H. Curtis and Mrs. Curtis, Le Grand Parish and Mrs. Parish, C. E. Fuller and Mrs. Fuller, F. W. Brazier and Mrs. Brazier, H. D. Taylor and Mrs Taylor and C. A. Schroyer.

The Old Guard Orchestra, stationed in the balcony, rendered a few selections during the course of the reception, and later Mrs. Alice Shaw, professional vaudeville whistler, delighted the company with several of the best selections in her repertoire. Mrs. Shaw has traveled extensively, and aside from her pleasing manner is considered to be the best entertainer in her line that the public has an opportunity of hearing.

Following Mrs. Shaw's part in the evening's entertainment refreshments were served in the west colarium of the Marlborough-Blenheim, and the evening closed with informal dancing.

CONSOLIDATION FROM THE EXHIBITOR'S STANDPOINT.

To the Editor of the Daily Railway Age Gazette:

I have read carefully the arguments against the consolidation of the Master Car Builders' and Master Mechanics' Associations in the editorial in the *Daily Railway Age Gazette* for June 15. I believe that there is entirely too much time wasted under the present arrangement.

If we had one good week's convention the exhibitors would, in the first place, save considerable money in the cost of the attendance of their representatives at the convention, and, in the second, with a convention in session discussing subjects in which some of the members for the moment are not interested, there would be a constant stream of men leaving the convention daily and looking over the exhibits, returning when some subjects in which they are more interested were being discussed.

The attendance of both conventions during one week would increase the average attendance at the exhibits, and they would be able to show the railway world their improved equipment just as well as they can at present, and, in fact, better. I believe that from the supply point of view one good week's convention would be far preferable to two which are strung out over the better part of two weeks.

There are times when the attendance at the exhibits at present is good; there are many other times when nobody is present. You will increase the average attendance per day at the exhibits, and consequently they could be just as efficient with a corresponding decrease in expenses.

An Exhibitor.

MILITARY EUCHRE.

The Entertainment Committee promises that the military euchre scheduled for Friday evening will be the event of the convention season and surpass, in novelty and attractiveness, any similar entertainment that has ever been arranged. The prizes to be fought for will be on exhibition in the ball room, Exhibition Hall, from Friday noon. The committee has provided 72 prizes—36 for gentlemen and 36 for ladies. Provision has been made for the accommodation of about a thousand people, if that number express a desire to join the contest, and the committee earnestly hopes that as many as that number will join in the game.

The game will take place in the ball room, there being no other suitable locality affording sufficient room for the 248 tables which the committee has provided. Each of these tables will represent a fort, and will be designated and known by the name of some prominent railway man. It will perhaps be of interest to know that gentlemen play with ladies as partners, and the same partners play together throughout the evening.

The playing is precisely the same as in any game of euchre. The rules which have been established are as follows:

RULES OF THE GAME.

Reveille will be sounded Friday evening, June 17, at 8:30 o'clock.

All expecting to engage in battle must be on the firing line before 9 o'clock.

Skirmishing (playing) will begin promptly at 9 p. m., and eight (8) games will be played.

Ladies and gentlemen play together.

You will play with the same partner during the entire game.

So far as the playing of cards is concerned, it is the same as in any game of euchre.

Decks of cards contain all cards down to and including the "sevens," as well as the joker.

Couples facing the ends of ball room will begin the skirmish. The remaining couple will defend the "fort" until the return of the skirmishing couple.

The skirmishing couple will progress each time, whether they win or lose.

After four games have been played, the skirmishing party will be ordered back to its home fort. Then the other couples will start on a skirmish.

No playing will begin until the bugle is sounded.

All playing *must cease when the bugle is sounded—no matter how the game stands.*

A card in the hand must not be played.

Where a lone hand is being played and three tricks have been taken by the party playing the hand when the bugle

sounds, only one point can be counted.

In case the lone hand is euchred by the opposing side taking three tricks when the bugle sounds, two points are allowed.

When both couples are playing and three tricks have been taken by either side, no count is allowed, and the score reverts to the previous hand.

Lone hands permitted.

An assisted hand cannot go alone.

Games, not points, will be counted.

Prizes will be awarded to both lady and gentleman.

You cannot take your partner's best.

The party revoking will lose two points.

The couple or couples winning the greatest number of games win the prizes.

Note: Guests of railway men or supply men may play, but will not be contestants for prizes. To be a contestant for prizes one must be: A railway man or a member of the immediate family of one; a railway supply man or a member of a supply man's family.

For the purpose of keeping these rules constantly available, the committee has provided a card bearing upon one side blank spaces for the name of the player, his business or railroad connection and his address. There is also space for keeping a record of the number of games won and the name of the partner. Each card will be examined and approved by a committee of judges. The rules are printed upon the reverse of the card.

MR. HOOLEY ON INTERCHANGE INSPECTION.

"What's thim intherchange things, Mister Hooley?" asked Mr. Dennissey. "I was sittin' in th' caffy at th' Marlbrew-Blennom th' last night's night that was, 'nd some Emseebees 'nd McHannixes was at th' nixt table. They was arl a-talkin' about rulers av intherchange, 'nd inshpection, 'nd intherchange points. What's intherchange points?"

"Them's th' pla-aces where ye'll crarl down off th' thrucks to shtrich ye'er legs on ye'er way home iv ye sit manny more nights in th' Marlbrew-Blennom caffy," replied Mr. Hooley significantly. "Thim's th' places where wan road inds 'nd another begins, only ye don't see no beginnin' nor endin'. 'Twud be well f'r ye, Dinnissey, to get a map 'nd lit me marrk th' intherchange points betwixt here 'nd Tchicago, so't ye'll know where they are 'nd can crarl down at th' nixt shtop before 'nd shtrich ye'er legs be walkin' in. 'Tis a har-rd wurrk t'ride on th' thrucks over th' frogs av a big intherchange point. 'Nd th' inshpictors might pick ye off f'r wan av thim grane buds I was tillin' ye av th' other day."

"Avin so, 'tis betther, I'm thinkin', thin it will be t' have th' byes arl come round th' day afther ye're sint home, 'nd say, 'How nat'ral Hooley looks!' as they'll have th' chance iv ye don't kape away fr'm th' places off th' Boordwalk," retorted Mr. Dennissey, who had become surprisingly improved in repartee during his brief stay in Atlantic City. "What's th' intherchange points iv I ride home in th' varnished cars?"

"They don't cut much figure f'r th' varnished cars," replied Mr. Hooley, wholly subdued by his friend's retort and the thought of the probable knowledge that had prompted it. "They're th' places where wan road resaves freight cars fr'm another road, iv th' inshpictor don't shtop thim, 's he gin'rally does to get avin with th' inshpictor f'r th' other road f'r shtoppin' some av his cars. He's th' ruler av intherchange that ye'er caffy frinds mintioned. I mane he's th' boss, 'nd not th' thing that ye dhraw a sthraight line with."

"Th' inshpictor's a busy man," continued Mr. Hooley. "He's made th' boss av th' intherchange point f'r th' purpose av seein' that a car don't get on th' road he riprisints unliss it's likely to howld together iv it goes slow till it gets where th' nixt road begins. Thin he has to kape avin wit' th' inshpictor av th' line that he takes th' car from 'nd that takes th' cars fr'm his road 'nd who's shtopped some av his cars before. Ivery time he finds something wrong with a car that comes to him he has to write a shtory about it on a car-rd 'nd nail it on th' sill av th' car. Thin, iv he has time 'nd th' matayrials are handy, he minds th' car as th' car-rd says. Ye see, Dinnissey, relrod min's so honest that iv th' inshpictor putts a car-rd on th' car 'nd says he's minded it, th' comp'ny that owns th' car pays th' bill, 'nd th' more bills he can make to be paid to his comp'ny without th' waste av good matayrial, the betther man he is f'r th' comp'ny. Sometimes whin they's a rush av business, he don't have time to do annything but putt on th' car-rd, 'nd his road'll get pay f'r what th' car-rd says. 'Nd thin, iv he's time 'nd plinty av car-rds, he writes out a lot av thim 'nd tacks thim on at th' same time 'nd his comp'ny 'll get pay f'r three or four hose or cooplers putt on th' same car, whin, maybe, they wan't anny putt on. Iv th' man that passes th' bills f'r th' other comp'ny raymimbers that his own inshpictors have used up a lot av car-rds 'nd th' books show that they've not sint in rekisitions f'r much matayrial, he says to himsilf, says he, ' 'Tis a good inshpictor, Jawn is,' says he, 'but he's got no show where he is with only tin thrains a day to inshpict. I'll putt him where he'll have fifty,' says he, ' 'nd he'll make a ricord 'nd some money f'r th' comp'ny, 'nd th' manigemint 'll say I'm a good wan.' Thin he'll pass th' bills, like ye, Dinnissey, wud t'row away the six-spot whin ye'er partner's played th' quane."

"Y'undhershtand, 'tis this way, Dinnissey. Th' relrods arl use th' other road's cars like they was their own, axcipt whin they haven't anny to shpake av av their own, 'nd thin they've got to use th' others annyhow. Th' road that owns th' cars has got to pay f'r th' damages to 'em. Th' cooplers gets knocked off or pulled out, 'nd th' air brake hose shplits, 'nd th' whales gets flat shpots in 'em whin th' engineer gets to dramin' av whin he used to coast down hill on a bar'l stave 'nd forgets to lit off th' brakes. Thin th' valves av th' air brakes gets goomy 'nd th' inshpictor clanes 'em whin they nade it be markin' th' date on th' outside. 'Tis more wurrk to clane th' air brakes than to mind arl th' rist av th' car. Th' inshpictor has to mark th' date on th' thripple 'nd th' cylinder, 'nd he has to get out his stincil 'nd muss himsilf with white paint. Arl th' other repairs he makes wit' th' car-rd, 'nd 'tis a clurical job, forby th' nailin' av th' car-rd on th' car. 'Tis a fine job, barrin' th' times whin he has to go out in th' night, 'nd th' wit, 'nd th' snow, 'nd th' cowld, with his lanthern 'nd his big mittens on, 'nd putt car-rds on a long thrain. Th' thrains won't shtop long, 'nd 'tis a lively job to nail on enough car-rds to kape up his ricord f'r usin' car-rds. Th' more car-rds th' more times th' owld man writes, 'Gr-reat wurrk, Jawn!' Th' bist inshpictor I iver knew was a man who'd been printis to a carpenther 'nd spint his time nailin' lath. He always tuk a clark along with him to putt th' numbers av th' cars 'nd th' litthers av th' road on th' car-rds he'd writed before th' train come in. He's a chafe gin'ral inshpictor now."

"Does th' other road iver find out that th' car-rds have been shtacked?" asked Mr. Dennissey, who had listened attentively.

"Iv th' chafe clark's on his vacation 'nd somebody else O. K.'s th' bills 'nd signs th' owld man's name 'nd takes notice av a bill f'r four hose on wan car wan day putt on at th' same place be wan man, he tills th' owld man iv he thinks av it, 'nd thin th' owld man takes it up with th' inshpictor's owld man, 'nd carls attintion to th' mishtake in th' bill, iv, as I insinooated, he don't think 'tis worth while to lose this thrick f'r th' sake av th' nixt two, afther he's jacked up his own inshpictors 'nd towld thim to get busy."

"Iv he concludes to take that thrick," queried Mr. Dennissey, "how does th' inshpictor come off?"

"Wit' harns 'nd wiskers," replied Mr. Hooley. "He's th' go-at."

IT MIGHT HAVE BEEN.

Bathed in the sun, in the sea far out
Stood the pier worth a million (or thereabout).

'Twas a day in June, and "What's so rare?"
But rare or well-done, I don't care.

The sea was blue, and bright, and grand,
And the whimp'ring wavelets licked the sand.

Near the end of the pier sat the man who'd come
To demonstrate cleaning by vacuum.

The hour was quiet and time was cheap;
With a nod or two he was fast asleep.

But his demonstration was brushing clothes,
And, sleeping, he held in his hand the hose.

As he moved in his sleep the hose slipped through,
And the nozzle dipped in the wavelets blue—

Only a moment, but quick as a wink
The vacuum swallowed a hasty drink;

Only a moment, but one long pull
Filled the canvas dust-bag level full.

Came later a visitor, who wanted to know
If vacuum machines were good on the "blow."

"Sure thing," said the man, aroused from his slumber;
"I've aërated pillows and beds without number,

"And sometimes in dusting it's better to blow;
The action's a little more gentle, you know.

"The pump works as well to compress as exhaust,
In making the change not a moment is lost;

"There's only one coupling I have to adjust;
Then I'll blow from your shirt every atom of dust.

"You see how I do it? There's nothing to do
But transfer the hose to connection No. 2."

When making the change he had shut off the air,
While his visitor looked at the nozzle with care.

The pump being started—Well, what do you think?
That cleaner disgorged all its ill-gotten drink,

With the rest of its contents—a few quarts of dirt—
On the visitor's glist'ning, immaculate shirt!

That's all of the story. We're told in our youth
By those we're enjoined to believe speak the truth,

How completely a vacuum Nature abhors,
And that this is among her unchangeable laws;

But Nature's abhorrence is inactive and mild—
Her laws as uncertain as moods in a child—

Compared with the hostile, unchanging demeanor
Of this man who went wrong on a vacuum cleaner.

HIGH SPOTS IN THE LIFE OF A DAILY.

BY FRANCIS W. LANE.

II.

The next year the conventions went back to Alexandria Bay. It was the same distance from Clayton as in 1888, the St. Lawrence was there, beautiful as of old, but still unsatisfactory as a substitute for a pneumatic tube as a means of communication between editor and printing-office, the printing-office itself was the same as of old, but with seven years of venerability added, and an additional stroke of unkind fate was in store for us. The editor was sick, and his physician peremptorily refused to allow us even the light of his presence. The doctor knew his man, and that bodily presence alone would seem a mockery five minutes after the wheels started. Under these circumstances, the business manager, the sub-editor and the two representatives of the business staff—as many as could be afforded in the times of 1895—conceived a huge joke on their absent chief. They would all put on the armor of the editorial department and forget to change it for pajamas. In wedge formation they would buck the line, introduce some innovations into the offside plays and perpetrate a paper which would at least make the spectators take notice. They did it—both the team and the spectators. The chief in his far-away home also looked, and said it was good. So good, indeed, that a few years later he felt that he could go on a vacation in the middle of the game without any intervention of the medical profession.

The copy-boy at Alexandria Bay was a steam yacht. It served the purpose excellently as to capacity, but was a little given to loitering among the Thousand Islands, and the wages were abnormally high—$30 a day. It was surprising, too, to note the number of people who wanted to make trips with the copy-boy—to see how the paper was printed. Possibly they were curious to see a printing-office that could turn out such spotted work. But we were proud of the substance, and put up with its shadowy impression. Most of the issues were of 16 pages—all the printing plant could stand or lie down upon. An incidental attraction of this issue was a beauty-show contest in the form of a supplement containing half-tone portraits of ten well-known members badly cut up, and to be pieced together properly for prizes of certain literary lucre—"Compound Locomotives," "Biographical Directory of Railroad Officials," etc.

By 1896 the staff of the *Daily* had become so well organized and each year witnessed such improvements in printing facilities available that epoch-making events were of less frequent occurrence. It will not be profitable to follow the course of each year as an individual history. For nine years the advertisements were printed in colors and in advance. The numbers of pages of advertisements and reading matter were constantly and almost regularly increased; of the former, 28, 32, 60, 64, 76 and 88 are representative figures; of the latter, varying with different issues, 24, 32, 40, 48 and 56. When a new printing-office was opened at Saratoga with a thoroughly complete equipment, including linotype machines, and the conventions contracted the habit of going there each year for five years, many of the sources of previous trouble were removed.

The year 1897 was memorable. Mention has been made of the quality of labor and equipment available at Hampton. On the evening of June 14 of the year named, the engine began to grow cranky with the putting on of the first form and continued so nearly all night, or until it finally broke in an essential part. The paper must be run off in a medieval, not to say primeval, fashion. Sixteen husky, dusky sons of the South, in attendance at the government school, were impressed in more ways than one. They were employed to make themselves more useful than in standing around in

open-mouthed astonishment watching a group of Chicago printers sling type. A crank was attached to the cylinder of the press, and in four shifts of four men each, they operated that press by hand for the rest of the night and most of next day, until the engine could be fixed by getting a new part from Richmond to replace the one broken. A photograph of this primitive method of running off a daily paper was taken next day, and a reproduction appears in the issue of June 18. As a job of presswork, the paper so printed compares favorably with any previously issued.

Notwithstanding the efficiency of the Virginia negro when attached as motive power to a printing press, he was generally unsatisfactory in handling exhibits. This, the fact that a bath in the sea sometimes meant another in witch hazel, and the destruction of the Hygeia Hotel at the behest of the government, all contributed to seal the fate of Old Point as a meeting place.

But even at Saratoga engines and presses were not indestructible. In 1900 the press gave out one morning at 2 a. m. Parts for replacement were not available nearer than Albany, and no trains until morning. The foreman and some of his aides—all from Chicago—acquired a wagon from the yard of a calmly-sleeping native, hitched themselves to it, loaded in the forms and started off to complete the job elsewhere. Meanwhile others of the force had hunted up the elsewhere. They found a printing office, broke in, got up steam, and planted the forms on the press. When the proprietor came in in the morning, he found a lively gang running off the paper on his press, and a goodly pile of printed sheets to attest to their earlier activity. Then the boys called up their own manager, told him what they had done and opined that it was up to him to furnish the necessary apologies. He did. Ever since that time it is currently reported that whenever the *Daily* is in town men are covertly watching for an opportunity to throw a stick into the press of the man who happens to have the contract for the printing.

For five years, including 1904, the Saratoga existence, with the exception noted, was comparatively uneventful, though always strenuous. Following the great daily issue covering the International Railway Congress, and of which some account is given further on, only a month intervened before it was necessary to provide for the regular issue of the *Daily*. The conventions were at Manhattan Beach that year, and the printing was necessarily done in New York. This was rather long range, but was compensated by good transportation facilities and an adequate print-shop. This year witnessed the abolition of the rainbow printing and the advance printing of advertisements. Then came four years of conventions at Atlantic City—this is the fifth—during three of which the printing was done at Philadelphia. This was the longest range yet attempted, but it required only a little expedition of work to counterbalance the time consumed in transportation of copy and papers. In 1908 the name became the *Daily Railway Age Gazette*. In 1909 the experiment was tried of printing in New York, from three to four hours' distant from the place of editing. The story of that strenuous experience was told last year, and requires no repetition.

In the year when the conventions had determined to go to Mackinac, but didn't because it was found at the last minute that members would have to run their sleeping races on the relay principle, the *Daily* had made arrangements to build a shack office, equip it with the necessary presses, folders, stitchers, linotypes, etc., and give a real exhibit of itself on the ground. It may have been fortunate that these arrangements were rendered unnecessary by the change back to Saratoga.

(To be continued.)

On the Belgian state railways the operating ratio for 1908 was 69 per cent.

IMPROVEMENT OF THE BOARDWALK.

The concrete columns sticking up in the sand between the pier and the Traymore Hotel are not, as has been supposed by some attendants at the convention, an indication that the level of the Boardwalk is to be raised to the present height of the top of the columns. These columns represent a part of the improvement which will result in increasing the width of the walk between the Traymore and the pier to the same width as beyond the Traymore, that is 60 ft. These columns will eventually be sunk in the sand by the jet process to the same level as the columns at the east end of the row; and concrete girders, for which the reinforcing rods are seen distributed upon the sand, and for which the forms are being placed, will be extended from this row of columns to a similar row underneath the Boardwalk. Three girders will support the 20-ft. extension. It is the policy of the authorities in charge of the maintenance of the Boardwalk to make all repairs and improvements in concrete, and it is probable that eventually the entire wooden structure will be replaced by one of concrete as a matter of protection from loss by fire.

M. C. B. REGISTRATION.

Adams, T. E., G. M. M., St. Louis Southwestern Ry.
Ayres, A. R., M. E., L. S. & M. S. Ry.
Alter, Wm., G. F. C. D., Central R. R. of N. J.
Anthony, F. S., S. M., International & Gt. Nor. Ry.
Appler, A. B., M. E., Delaware & Hudson Co.
Barnum, Ward, Elec. Engineer, Louisville & Nashville R. R.
Baron, Jacob, Ky. & Ind. Bridge & R. R. Co.
Beaumont, H. A., G. F. Car Shops, B. & O. R. R.
Benson, E. A., M. S., Pullman Co.
Bentley, W. F., M. C. B., B. & O. R. R.
Bishop, G. C., S. M. P., Long Island R. R.
Bloxham, C. M., M. C. B., Union Tank Line Co.
Bossinger, H. C., G. F., Ches. & Ohio Ry.
Bottomly, Edw. S., Chief Jnt. Car Insp.
Boughton, Wm., G. M. M., Pere Marquette R. R.
Boutet, H., Chief Joint Inspector.
Braden, J. O., D. S. M. P., N. Y. C. & H. R. R. R.
Brandt, C. A., Asst. Engr. Mech. Const., L. S. & M. S. R. R.
Brown, M. G., M. M., Gulf & Ship Island R. R.
Bruck, Henry T., M. of M., Cumberland & Penn. R. R.
Bryan, H. S., S. M. P., Duluth & Iron Range R. R.
Burns, Robt. C., Genl. Air Bk. Inspector, P. R. R.
Carmer, J. R., G. F. C. S., P. B. & W. R. R.
Carr, W. K., N. & W. Ry.
Chaffee, F. W., G. Car Insp., N. Y. C. & H. R. R. R.
Chambers, C. E., S. M. P., C. R. R. of N. J.
Chambers, J. S., S. M. P., Atlantic Coast Line.
Christopher, Jacob, M. M., Toronto, Hamilton & Buffalo Ry.
Clark, J. H., M. M., Staten Island Rapid Transit Ry. Co.
Cook, J. S., M. M., Ga. R. R. & G. J. & S. R. R.
Correll, W. T., M. C. B., Phila. & Reading Ry.
Cory, C. H.
Coulter, H., G. C. I., Balt. & Wash. R. R.
Courson, J. F., G. F., Penna. R. R.
Coutant, M. R., M. M., Ulster & Delaware.
Craig, James, Chf. Drftsman, B. & M. R. R.
Cromwell, O. C., M. E., B. & O. R. R.
Cromwell, S. A., G. C. F., B. & O. R. R.
Cullinan, Jno., M. M., Central Indiana Ry.
Davis, Geo. G., C. F. C. D., C. C. C. & St. L. Ry.
Demarest, H. N., G. C. I., Penna. R. R.
Dickinson, F. W., M. C. B., Bessemer & Lake Erie R. R.
Dunlap, W. H., M. M., L. & N. Ry.
Dunn, J. F., S. M. P., Oregon Short Line R. R.
Eckhart, Jno., Jr., Erie R. R.
Eddy, F. H., G. F. C. D., B. & M. R. R.
Elmer, Wm., M. M., P. R. R.
Fitzmorris, James, M. M., Chgo. Trac. Ry.
Flory, B. P., S. M. P., N. Y. Ont. & Western Ry.
Fogg, J. W., M. M., B. & O., Chicago Term. Transfer Co.
Fowler, Geo. L.
Fox, Frank L., P. M. R. R.
Friese, N. L., G. F., Norfolk & Western Ry.
Grieves, E. W., Galena Signal Oil Co.
Gage, C. M., G. M., Huntington & Broad Top Mtn. R. R.
Gaines, F. F., S. M. P., Cent. of Ga. Ry.
Gaskill, C. S., Asst. Eng. M. P., P. B. & W. R. R.

Gill, Jno., S. M. P., Chgo Ind. & Lville. Ry.
Goodnow, T. H., M. C. B., L. S. & M. S. R. R.
Goodrich, Max, G. F., New York & Ottawa R. R.
Gorey, E H., G. F., Louisville & Nashville R. R.
Hackett, George, Ex. M. C. B., N. Y. Central Ry.
Hacking, Edw., G. C. F., C. G. W. Ry.
Hamett, Phillip M., S. M. P., Maine Cent. R. R.
Hamilton, T., M. M., Cumberland Valley.
Harris, Wells, G. F. C. R., N. Y. N. H. & H. R. R.
Hendry, Jno., M. C. B., Grand Trunk System.
Henry, W. C. A., S. M. P., Penn. Lines West.
Hitt, Rodney, Asst. Edtr., Elec. Ry. Journal.
Hindman, S. M., Gen. Car Insp., Penn R. R. East Div.
Hogsett, J. W., Chief Jnt. Car Insp.
Kapp, W. F., Supt. Shops & Machy., R. F. & P. Ry.
Kelly, J. W., Div. Car Foreman, Can. Pac. Ry.
Kendig, R. B., M. E., L. S. & M. S. Ry.
Kent, F. S., Penna. R. R.
Kiesel, W. F., Asst. Engr., P. R. R.
Kimmet, M. A., Gen. For. Car Dept., C. R. R. of N. J.
Kleine, R. L., Gen. Car Insp., P. R. R.
Krause, Julius, Gen. Car Insp., Penn. R. R.
Lewis, Harvey L., Foreman Car Shops, D. & H. Co.
Leyonmark, J. H., M. E., C. & A. Ry.
Lungren, W. H., Phil. Balt. & Wash. Ry.
Lynn, Samuel, M. C. B., P. & L. E. R. R.
McCuen, J. P., S. M. P., Cin. New Or. & Tex. Pac.
McCuen, R. E., Lexington & Eastern Ry.
McCully, B. N., For. C. D., N. Y. P. & N.
McFarland, W. W., G. M., Del. Riv. & Union R. R.
McGregor, A. A., M. M., L. & N. Ry.
McIntosh, Wm., Ex. Supt., Cent. R. R. of N. J.
McKinsey, C. R., G. C. I., Phila. Balt. & Wash. Ry.
McNulty, F. M., S. M. P. & R. S., Monongahela Connecting R. R.
Mandeville, H., Gen. Foreman, P. R. R.
Martin, J. H., Supt. Car Serv., Berwind-White Coal M. Co.
Mercur, R. E., T. M., Westmoreland Coal Co.
Middagh, D. B., N. & W. Ry.
Miller, E. A., S. M. P., N. Y. C. & St. L. R. R.
Miller, R. S., G. F. C. D. P., N. Y. C. & St. L. R. R.
Milliken, Jas., Supt. M. P., Balt. & Wash. R. R.
Millar, E. T., Gen. For. B. & M. R. R.
Miller, E. B., Car Insp., B. & O. R. R.
Miller, Geo. A., S. M. P., Fla. E. Coast Rwy.
Miller, Wm., M. C. B., Erie Ry.
Minick, Eli, G. F. C. R., Lehigh Valley R. R.
Moore, B. R., M. M., Miss. Cent. R. R.
Nicholson, Jno., S. M. P. & M., St. L. Brownsville & Mex. Ry.
Newton, Chas. H., Georgia R. R.
Orchard, Jno. H., F. C. D., D. & H. Co.
Osman, H. L., S. C. D., Morris & Co. Refr. Lines.
Ott, Wm. B., Asst. Eng. M. P., P. R. R.
Park, S. T., S. M. P., C. & E. I. R. R.
Paxton, Thos., S. M. P., El Paso & S. W. R. R.
Payne, H. R., V. P., Union Tank Line Company.
Pearson, W. H., Gen. Car Foreman, Can. Pac. Ry.
Peiffer, Charles E., Buf. Roch. & Pitts.
Perine, D. M., S. M. P., P. R. R.
Poole, A. J., G. M. M., Seaboard Air Line Ry.
Pratt, E. W., A. S. M. P., C. & N. W. Ry.
Putnam, C. H., F. C. D., Atlanta, Bir. & Atlantic Ry.
Robider, W. J., Cent. of Ga. R. R.
Robins, S. P., Chief Draughtsman, Can. Pac. Ry.
Rink, Geo. W., M. E., Cent. R. R. of N. J.
Ridgway, H. W., M. M., Colo. & So. Ry.
Rollings, E. O., M. & M., L. & N. Ry.
Rumney, T., Gen'l Mech. Supt., Erie.
Schmoll, G. A., S. M. P., B. & O. R. R.
Schnepel, J. H., Chf. Draughtsman, N. Y. C. & H. R. R.
Schroeder, J. H., Frt. Car Fore., D. L. & W. R. R.
Schroyer, C. A., S. C. D., C. & N. W. Ry.
Shackford, J. M., Chf. Draughtsman, D. L. & W. R. R.
Sharp, Wm. E., Supt., Armour Car Lines.
Sitterly, W. H., Gen. Car Insp., Penna. R. R. Company.
Smith, L. K., Asst. M. M., Wabash R. R.
Stark, F. H., Supt., Pittsburgh Coal Co.
Stearns, W. A., M. E., Louisville & Nashville R. R.
Sternberg, Adam S., G. I. Car Dept., Wabash R. R.
Stillwagon, George W., M. C. B., Pittsburgh, Shawmut & Nor. Ry.
Stubbs, G. W., M. M., Gulf Line Ry.
Sumner, Eliot, A. E. M. P., Pennsylvania R. R.
Sweeley, G. P., M. M., Pennsylvania Lines.
Tatum, John J., S. F. C. D., Baltimore & Ohio R. R.
Taylor, George W., S. M. P., San Antonio & Aransas Pass. Ry.
Tewkesbury, E. M., G. S., South Buffalo Ry.
Thiele, Chas. F., Genl. Car Inspector, P. C. C. & St. L. Ry.
Thomas, I. B., Master Mech., Pennsylvania R. R. Company.
Thomas, W. H.
Thomson, Samuel G., Asst. Eng. Motive Power, Phila. & Read.
Tonge, John, M. M., Minneapolis & St. Louis R. R.
Treleaven, Thos. A., M. C. B., Grand Trunk Ry.
VanBuren, C. W., M. C. B., Can. Pac. Ry.
Vittum, J. E., Chief Joint Inspector.
Walsh, F. O., M. M., Atlanta & West Point & West Ry.
Waughop, Chas., Chief Joint Car Insp.
Wilson, R. D., Asst. Chief Car Insp., P. & R. R. R.
Wyman, R. L., M. M., Lehigh & New England R. R.
Young, Charles D., A. E. M. P., Penna. Lines West.

M. C. B. GUESTS.

Adam, J. W., Piece Work Inspector, B. & O.
Adams, C. S., Jnt. For., N. Y. O. & W.—N. Y. C.
Adams, T. S., M. M., Atlantic City & Shore R. R.
Alter, Fred.
Altvater, Chas. P., Gen. Foreman, C. Dept., Penna. R. R.
Anderson, H. A., Foreman, Penna. R. R.
Atkinson, C. R., Secy. G. S. M. P., P. R. R.
Austin, J. B., Jr., Eng. M. W., Long Island R. R.
Ballweg, F., Asst. Supt., Bayonne, Union Tank Line.
Balsley, John, Freight Train Master, P. R. R.
Baltz, Valentine, Ch. Joint Car Insp., B. & O. and Penna.
Barwis, J. McC., For. Car Insp., P. R. R.
Baugh, R. T., Pur. Agt., Cent. Ry. of Georgia.
Beaghem, Thomas, Jr., Insp., Union Tank Line.
Beamer, J. A., M. M., P. R. R.
Beck, Henry J., Genl. Loco. Insp., P. & R.
Bennett, F. G., Supt. of Agencies, Atlanta & West Point.
Berg, L. J., Mech. Inspr., Pullman Company.
Bernheisel, L. W., Berwind-White Car Company.
Bevan, P. A., Draftsman, P. R. R.
Bill, G. W., M. M., Union Tank Line.
Blair, H. A., Gen. Foreman, B. & O.
Bloxham, C. T.
Bonhoff, H. J., Union Tank Line Insp.
Bradley, E. J., Foreman, P. B. & W.
Bradshaw, J. H.
Brewer, J. W., Asst. M. M., B. & O.
Brubaker, H. H., M. P. Clerk, P. R. R.
Burgoyne, C. J., Asst. Gen. For., P. R. R.
Burke, H. C., Gang Foreman, Shop, B. & O.
Butts, H. M., M. C. & L. Ptr., N. Y. C.
Calder, W. W., Gen. Car Foreman, B. & O.
Cameron, G. M., Berwind-White Car Company.
Cameron, W. R., Supt. Berwind-White Car Company.
Campbell, Chas. S., Gen'l Supt., U. S. Express.
Campbell, H. F., M. E., Q. & C. R. R.
Carsell, H., Asst. Station Master, West Jersey & Seashore.
Carter, B. D., Car For., Virginia Ry.
Chamberlain, J. A., Asst., Union Tank Line.
Chapin, E. S., Ins. M. P. Dept., P. R. R.
Clapp, D. A., Asst. Train Master P. R. R.
Coates, H. T., Jr., Gen'l Foreman Gen'l Mgr. Office, P. R. R.
Cochran, C. C., Sec. to J. F. Walsh, C. & O.
Cook, E. F., Union Tank Line.
Couch, Frederick F., Engineer, P. R. R.
Coulter, A. F., Gen. Car Foreman, Union Ry.
Connor, J., For. Inspectors, Washington Ter.
Connor, Wilver.
Covert, M. F., Asst. M. C. B., Swift Car Lines.
Crone, A. E., Div. S. K., N. Y. C.
Cummin, Robt., Car Insp., L. V.
Daughenbaugh, L. W., Engineer, P. R. R.
Davis, Geo. L.
Davis, Harry E., P. R. R.
Davis, Joseph, Master Mech., P. R. R.
Denchey, Wm., Ch. Clk. to Supt., P. R. R.
Dette, R. E., Shop For., P. R. R.
Dildine, J. A., Chief Clerk, M. P. Dept., Penna. Lines, West Southwest System.
Dillon, Howard W., Draftsman, P. R. R.
Donovan, A. G., Armour Car Line.
Dow, T. W., Gen. Air Br. Insp., Erie.
Downs, M. D., Foreman, P. R. R.
Dressman, J. L., Shop Inspector, B. & O. R. R
Dryden, C. P., Union Tank Line.
Durham, George, M. M., L. & N.
Dunlap, W. H., M. M., L. & N.
Eames, J. P., Car Foreman Pgh. Syst., B. & O.
Effinger, Wm. P., Insp. of Bills, Erie Ry.
Ellsworth, G. M., Chief Motive Power Clerk, P. R. R.
Eugard, A. C., Ch. Eng., U. S. Navy.
Ewan, H. F., Agt., U. S. Exp. Co., Atl. City.
Eyerly, W. S., Air Brake Inspector, B. & O.
Ferguson, O. G., Supt. Transp., Monongahela Conn. Ry.
Fielding, H., Union Tank Line.

Files, F. S.
Finnerty, H. A., Pur. Agt., Union R. R.
Foyle, C. E.
Frost, F. R., El. Eng., Atchison, Topeka & Santa Fe.
Fulmor, J. H., M. M., P. R. R.
Gamey, J. J., For. Car Dept., C. & N. O. & T. P.
Garber, Samuel.
Gardner, G. C., Gen. For., P. R. R.
Geisking, Charles, Gen'l. Foreman, P. R. R.
Gernert, Henry, Foreman, Cent. R. R. of N. J.
Graburn, A. L., Mech., Asst. to 3d V. P., Can. Northern.
Graff, F. M., Ch. Cl., Supt. Car Dept., Erie R. R.
Gray, C. B., Asst. Gen. For., P. R. R.
Griffith, Jno. W., Pur. Agt., Union Pacific.
Grove, P. L., Asst. M. M., P. R. R.
Hackett, Geo.
Hagen, Chas., Gen'l. Foreman Car Shops, W. & L. E.
Hammond, G. O., M. E., New York Air Brake Co.
Hampton, K., Ch. Fr. Inspector, B. & O. and P. & R.
Harris, C. M., M. M., Washington Term. Co.
Harris, T., Div. Car For., Can. Pac. Ry.
Hastings, Frank, Penna. R. R.
Hawthorne, John W., Gen'l Foreman, P. R.R.
Hayward, J. R., Div. Car Insp., M. & W.
Heim, Geo., Supt. Car Shops, Union Tank Line.
Henderson, J. P., Pur. Agt., Armour Car Line.
Hepburn, M. J., M. P. Clerk, P. R. R.
Hess, Geo. F., M. M., B. & O.
Hess, R. A., Foreman Car Dept., C. R. R. of N. J.
Hill, J. P., S. K., P. R. R.
Hill, W. D., G. F. A., P. C. & Y.
Hogan, C. C., Union Tank Line.
Holmes, H. H., Gen'l Agt., P. & R.
Holst, W. A., Ch. Ck. Mch. Dept., Union Tank Line.
Holtz, David, Master of Machinery, Western Md. R. R.
Hudson, B. F., Air Brake Insp., B. & M.
Ingersoll, G. R., P. A., T. I. & M. S.
Ishida, Taro, S. M. P., Western Div. Imperial Gov. Rys. of Japan.
James, C. H., Supt. St. Oil Car Shops, Union Tank Line.
Jansen, E. W., Electrical Engr., Illinois Cent. at Chicago.
Jellison, B. T., Pur. Agt., C. & O.
Jenny, Jacob, Foreman Car Rep., Monon Div., P. R. R.
Johnson, J. O., For. Car Rep., Southern R. R.
Johnston, B., Mech. Engineer, M. & O. R. R.
Jones, W. F., Gen. Store Keeper, N. Y. Cen.
Jordon, L. F., Pur. Agt., Kansas City Southern.
Justus, I. J., Spec. Insp., N. Y. C. & H. R.
Kapp, H. W., Ret. Sp. Agt., P. R. R.
Kauffman, G. B., Pass. Agt., Atlantic City R. R.
Keim, A. W., Union Tank Line.
Kilpatrick, J. B., S. M. P., Chi. Rock Isl. & P.
Kilpatrick, R. F.
Klein, R. A., Supervisor, P. R. R., W. J. & S. S.
Kleine, R. L., C. C. Insp., Penna. R. R.
Klingensmith, W. H., Shop Foreman, Monon Div., P. R. R.
Kyle, Thos., Gen'l Foreman N. Y. P. Div., N. Y. Central.
Lambert, W. H., Union Tank Line.
Lenhart, C. W., Gen. Car For., B. & O.
Lewis, A. E.
Lewis, C. E., Gen. For., Penna. R. R.
Lewis, C. W., M. M., Union Tank Line.
Lipp, Chas., Asst. Foreman Car Shops, P. R. R.
Lynch, Geo., Joint Inspector, Penna. Lake Shore.
McBain, D. R., S. M. P., L. S. & M. S.
McCarthy, J. M., Pur. Agt., Chi. Rock Island & Pac.
McCausland, A. G., Supt., P. & R.
McCormick, C. A., Chief Clerk, Q. & C.
McCrea, J. A., Gen. Sup., Long Island.
McElroy, F., Secy. M. C. B., Union Tank Line.
McGregor, A. A., M. M., Etowah.
McKenzie, R., Div. Car Foreman, Can. Pacific.
McMillan, Jno., Gen'l Car Foreman, Erie R. R.
Mahr, Frank, Clerk, Penna. R. R.
Mann, J. F., Gen. Car For., P. M.
Marsh, H. B., Clerk, P. R. R.
Marshall, Geo., Foreman Car Shops, P. R. R.
Mason, E. F., M. P. Ins., P. R. R.
May, Walter, M. M., C. C. C. & St. L.
Mendenhall, D. H., Gen'l. Foreman, W. T. Ry. Co.
Miller, F. P.
Morris, W. S., Foreman, P. B. & W.
Morrow, C., Union Tank Line.
Milroy, J. R., G. S. K., Frisco R. R.
Neville, Fred. M., Mast. Car Repairs, Union Tank Line.
Nichols, J. S., For., Union Tank Line.
Nunn, W. C.
O'Day, B. J., Gen'l Car Insp., Erie R. R.
Osman, H. C.
Park, Orlando, C. & E. I. R. R.
Peterson, W. E., Shop For., Un. Tank Line.
Peyton, O., Union Tank Line.
Plow, A., Mech. Insp. Car Dept., Can. Pac. Ry.
Porter, W. M., Gen. For., Penna. R. R.
Prentice, W. H., Clerk, P. R. R.
Price, J. H., Mot. Power Clerk, P. R. R., P. B. & W.
Redmond, D. H., Union Tank Line.
Reilly, Thos. E., Clk. Off. of Supt. of Transp., P. R. R.
Renner, C. W., Asst. G. F. C. Shop, P. R. R.
Rhine, Geo. B., Engine House Foreman, P. R. R.
Rollings, E. O., M. M., L. & N. R. R.
Ross, Walter, chief Clerk, Gen. Str. Keeper, N. Y. C. & H. R.
Roth, H. L., Gen. For. Car Dept., C. N. O. & T. P.
Rusling, W. J., Gen. Foreman, Penna. R. R.
Sashby, J. M., Ch. Car Ins., N. Y. P. & N.
Schanze, H. C., Foreman Laborers, P. R. R.
Schenck, Edwin, Jr., Asst. M. M., P. R. R.
Schrader, J. R., Gen'l Foreman Hud. Div., New York Central.
Shupert, F. W., Gen. Boiler Maker Foreman, A. T. & Santa Fe.
Sindall, G. E. M., M. C. B. Clerk, P. R. R.
Singleton, A., Ch. Clk. S. M. P., H. V.
Singleton, C. W., Foreman Car Shops, P. B. & W. R. R.
Smart, Geo. E., Div. Car Foreman, Can. Pac.
Smith, A. E., Union Tank Line.
Smith, A. M., Gen. Mgr., Coal & Coke Ry.
Smith, W. D., Union Tank Line.
Smith, W. T., S. M., P., C. & O.
Stanton, E., Ch. Joint Car Insp., Norfolk & Portsmouth Belt Line.
Stevens, F. J., M. M., Lackawanna & Wyoming Valley.
Stoll, W. J., Chief Interchange Insp.
Stone, H. F., Asst. Supt., Union Tank Line.
Straub, C. F., Bill Clerk, M. C. B., P. & R.
Sullivan, J. C., Insp., Union Tank Line.
Tatum, Chauncey R., B. & O.
Taylor, F. C., M. P. Insp., P. R. R.
Taylor, J. J.
Telford, A., Purchasing Agt., C. N. O. & T. P.
Terrell, C. H., S. M. P., C. & O.
Thomas, W. C., Lumber Agent, P. R. R.
Thorp, Clark N., Union Tank Line.
Trace, A. A., Ch. Bill Clerk, Erie.
Tracey, Thos., Asst. Supt., Car Dept., Erie R. R.
Van Valine, H. D., M. M., B. & O.
Vought, H. D., Secy. N. Y. R. R. Club.
Waterman, J. H., Storekeeper, C. B. & Q. R. R.
Watson, R. B., Engr. of Tests, Erie.
Wiedner, A. B., Asst. Supt., P. & R.
Wilt, W. L., Ch. Clerk, P. R. R.
Wilson, J. W., Ch. Joint Inspector, P. & R. and N. Y. C.
Walker, J. W., Air Brake Insp., P. R. R.
Wescott, E. A., Supt. Car Dept., Erie R. R.
Wheaton, Wm. H., M. M., Wilkes-Barre & Wyoming Valley Tract Co.
Yaiser, H., Asst. Foreman Car Shops, P. R. R.
Yates, L. L., Supt. Car Shops, Pac. Fruit Express Co.

LIST OF EXHIBITORS.

The following represent the additions and corrections to the list as printed in yesterday's *Daily:*

American Mason Safety Tread Company, Boston, Mass.—Mason safety treads; Empire carborundum treads; Karbolith composition floors for coaches and buildings. Represented by Henry C. King and L. H. Myrick. Space 438.

Anchor Packing Company, Philadelphia, Pa.—Metal and fibrous packings and mechanical rubber goods, Tanril sheet packing. Represented by L. E. Adams, W. R. Haggart, E. C. Adams, Geo. L. MacCabe, Chas. M. Barnes, John F. Edmonds and B. J. Miller. Space 319.

Ashton Valve Company, Boston, Mass.—Valves and gages. Represented by Fred. A. Casey, Albert C. Ashton and J. W. Motherwell.

Bird & Company, J. A. & W., Boston, Mass.—Ripolin enamel; signal joint packing; Rex refrigerator felt; red and black rope car insulating paper; car roofing. Represented by C. E. Rahr, F. E. Cooper, C. F. Abbott and P. L. Griffiths. Space 425.

Brown Automatic Coupling Company, Cleveland, Ohio.—Hose coupling. Represented by W. J. Kirkpatrick. Space 316.

Buck Boring Bar Company, Huntington, W. Va.—Boring bar for boring steel car wheels. Represented by C. M. Buck. Space 155.

Carbolineum Wood Preserving Company, New York, N. Y.—Avenarius carbolineum. Represented by E. F. Hartman and Ralph M. Eisenberg. Space 308.

Coale Muffler & Safety Valve Company, Baltimore, Md.—In booth of the Nathan Manufacturing Company. Locomotive safety valves. Represented by H. C. McCarty.

Coe Manufacturing Company, W. H., Providence, R. I.—Coe's ribbon gold leaf and Coe's gilding wheels; Coe's high burnish bronze. Represented by B. A. Smith and Mr. Arlein. Space D. 2.

Davis-Bournonville Company, New York, N. Y.—Reclaimed locomotive crossheads; driving rod strap; coach bumper reclaimed by welding in the middle; grate bar; truck frame; steam boiler with patches welded in; aluminum coffee pot with spout welded on; 4-inch steel bars to be cut; boiler tubing welded into a plate. Represented by W. R. Noxon, William Joyce, John M. Grosart, C. E. Lister and C. F. Gessert. Space beyond the Greek Temple.

Fairbanks, Morse & Company, Chicago, Ill.—Gasoline section and inspection motor cars; telescopic standpipe and sectionalized valve; chain hoists; tools; rail drills; power pump and motor; line of Geared Ratchet; Ratchet; ball and cone bearing screw jacks and hydraulic jacks. Represented by A. A. Taylor, Geo. J. Akers, E. M. Fisher, F. M. Condit, F. H. Douglas and A. C. Dodge. Space 510.

Forsyth Brothers Company, Chicago.—Forsyth centering device; friction draft gear; cast steel yoke for freight cars; pressed steel doors; Brinkerhoff side construction for passenger cars; pressed steel mouldings and sash. Represented by A. H. Sisson and W. M. Wampler. Space 472.

Franklin Railway Supply Company, New York, N. Y.—Booth containing files of daily papers from different parts of the United States. Represented by J. S. Coffin, Samuel G. Allen, A. G. Elvin, C. L. Winey, R. G. Coburn, W. L. Allison and H. S. Hayward. Space 410.

Keystone Lantern Company, Philadelphia, Pa.—The Casey standard railway hand-lantern. Represented by Jno. T. Casey, A. H. McOwen, Percy Jones and B. W. Mudge. Space 428.

Lehon Company, The, Chicago, Ill.—Roofrite roofing for coaches, refrigerator cars, locomotives and railroad shops; also dry-art insulating paper. Represented by Tom Lehon. Space 212.

Locomotive Improvement Company, Clinton, Iowa.—Markel's removable driving box brass; removable side plate (for lateral motion) and flangeless shoes and wedges. Represented by L. W. Barker. Space 13.

McGraw Publishing Company, New York, N. Y.—Electric Railway Journal and Engineering books; Electrical World; Engineering Record; electric railway directories. Represented by H. M. Wilson, Rodney Hitt, H. W. Blake and Walter Boedecker. Space 7.

Modoc Soap Company, Philadelphia, Pa.—Perfectol car and locomotive cleaner. Represented by Henry Roever and J. McD. Holtzinger. Space 434.

Nachod Signal Company, Philadelphia, Pa.—Nachod automatic block signal, type C. Connected up with miniature track to show operation. High speed trolley contact switch. Represented by C. P. Nachod. Space 234.

Newcomb Patents Development Company, Sandpoint, Idaho.—Journal box. Represented by M. P. Newcomb. Space 319.

Osbun Company, B. M., Chicago, Ill.—Samples of the new "Boss" nut lock and literature. Represented by D. O. Ward.

Pennsylvania Steel Company, The, Steelton, Pa.—Switch stands; models of frogs and switches; pictures of material made by the frog and switch and bridge and construction departments; samples of rivet steel; samples of "never slip" switch plate. Represented by Chas. W. Reinoehl and W. M. Henderson. Space beyond the Greek Temple.

Rockwell Furnace Company, New York, N. Y.—Furnaces for railroad shops. Represented by W. S. Quigley, F. S. Bostwick and F. S. Garrett. Space 4.

Scully Steel & Iron Company, Chicago, Ill.—Everlasting blow-off valves; journal box jacks; boiler tools; expanders, etc. Represented by Huntly H. Gilbert. Space 437.

Standard Car Truck Company, Chicago, Ill.—Barber standard lateral motion truck; Barber double action truck and Barber roller bearing center plates. Represented by J. C. Barber, J. T. Milner, L. W. Barber, F. L. Barber and E. W. Webb. Space 123.

Standard Coupler Company, New York, N. Y.—Standard steel platforms; Sessions-Standard friction draft gears; Standard slack adjusters. Represented by George A. Post, E. H. Walker, A. P. Dennis, R. D. Gallagher, Jr., W. H. Sauvage and C. D. Jenks. Space 339.

Standard Steel Car Company, Pittsburgh, Pa.—Reception booth. Represented by John M. Hansen, Jas. B. Brady, R. L. Gordon, H. G. Macdonald and Wm. Libkeman. Space 466.

Walworth Manufacturing Company, Boston, Mass.—Genuine Stillson wrenches; Miller ratchet stocks and dies; Smith friction track drill. Represented by G. F. Elliott. Space 232.

The Exhibit.

The Buffalo Brake Beam Company, New York, has an attractive exhibit, showing its new types of truss brake beams, as well as a full line of its solid and special section beams.

The interesting features of the exhibit of the Gold Car Heating & Lighting Company, New York, are Gold's excelsior vapor system, combination pressure and vapor system with excelsior vapor valve, Gold's cyclone ventilators for passenger and refrigerator cars and Gold's acetylene system of car lighting.

During the business depression of 1908 and a part of 1909 active operations were carried on in the plant of the Crawford Locomotive & Car Company, at Streator, Ill. During a good part of this period as many as 900 employees were on the company's pay roll. Heavy repairs to a large number of cars were the cause of the activity.

This year the Landis Tool Company, Waynesboro, Pa., has instituted a new scheme to distribute its literature. Rather than require those interested to take it away themselves, the company has that literature which covers the railway field enclosed in stamped envelopes; and by leaving a card at the booth, the literature will be mailed to one's office.

Among other exhibits of the Farlow draft gear, The T. H. Symington Company, Baltimore, Md., is giving a very interesting demonstration of the rapidity with which a coupler can be removed and applied with the Farlow link and key attachment; also with what rapidity the entire Farlow draft gear can be taken down and put up. The coupler is removed and applied by one man in less than fifteen minutes. It is well worth the short time necessary to witness a demonstration. A Flory carry iron assists the rapidity of the operation.

In the past 10 years the use of headlight chimneys made of mica has been taken up by a large number of the railways. The use of mica has recently been extended to the lamp chimneys necessary on other styles of oil lamps used in railway service, such as caboose lamps, station lamps and also on long-time burning switch lamps. The Storrs Mica Company, Owego, N. Y., carries in stock a variety of types of mica chimneys for railway use, and is from time to time getting up new forms of chimneys for special purposes in railway use.

The McConway & Torley Company, Pittsburgh, Pa., has an exhibit in space 527 consisting of the Pitt freight coupler, Janney X freight coupler, Pitt passenger coupler, a new swivel head coupler with McConway centering device as applied to new steel passenger coaches of the Pennsylvania Railroad, Pitt tender coupler, Pitt pilot coupler, Janney passenger coupler, Buhoup 3-stem coupler, Buhoup steel truck side frame and the McConway steel wheel. The company is represented by Stephen C. Mason, secretary; E. M. Grove, treasurer; H. C. Buhoup; and I. H. Milliken.

The Independent Pneumatic Tool Company, Chicago, has on exhibition a set of Thor staybolt drivers which have brought forth a great deal of comment from those interested in locomotive and boiler work. This machine consists of two separate tools, each of which has a driving cylinder and holder-on. The driving cylinder is 9 in. stroke and the holder-on is 6½ in. stroke, each having a piston diameter of 1 1-16 in. One man can operate each tool driving both ends of a staybolt at one time, and the machine has ample capacity for driving 100 ends or 50 staybolts per hour.

The seamless steel tube is a modern invention and the use of Shelby seamless steel tubing for bushings of all types and sizes may not be known to all the mechanical men here to-day in whose shop bushings are still bored or forged from solid stock. And yet, the bushing is only one of several hundreds of purposes for which Shelby seamless steel tubing has been found adaptable. The National Tube Company, Pittsburgh, Pa., is always pleased to hear from Mechanical men on the subject of Shelby seamless steel tubing, and to send to such men the literature on the subject which the company has for this purpose.

NATIONAL CURTAIN FIXTURES.

The National (non-creeping) curtain fixture, made by the National Lock Washer Company, Newark, N. J., is of heavy steel tubing with bronze heads and finger pieces. It cannot easily be drawn out of groove by rough handling, is easily adjusted and is composed of few parts. It can have strong tension on rollers so as to make the curtain set smooth. This strong tension on roller also insures quick action when the curtain is raised and holds it firmly when wind is blowing.

This fixture has been specified on 600 new passenger coaches ordered in the last few months.

THEY SHOW THEIR HOSE.

A strong feature of the exhibit of hose for air brake and signal line service at booth 322 is the Sprague flexible steel armored hose, made by the Sprague Electric Company, New York.

This rubber hose, with an interlocking steel armor, which is said to prevent a rupture that will set the brakes seems from the demonstrations, to be all that the Sprague Company claims.

Anything that offers a reduction in maintenance cost and saves delays is worthy of a railway man's consideration. See the exhibit. It will interest you.

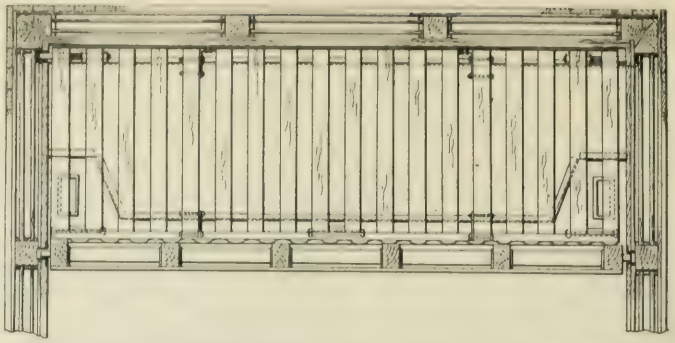
ADLAKE CAR LIGHTING FIXTURES.

The car lighting fixtures made by the Adams & Westlake Company, Chicago, rank high in design, construction, workmanship and finish. A valuable feature which is being used on many of this company's electric lighting fixtures is the Flex shade holder, an ingenious device for holding the shade by means of a flexible spring which grips it evenly all around, yet allows room for expansion. It does away with breakage, which is a common complaint where it is necessary to hold the shade with screws. The ease of operation which allows the quick shade adjustment saves much time, and, from an economical standpoint alone, the holder should appeal strongly to those interested in fixtures. A special circular describing the Flex holder has been issued.

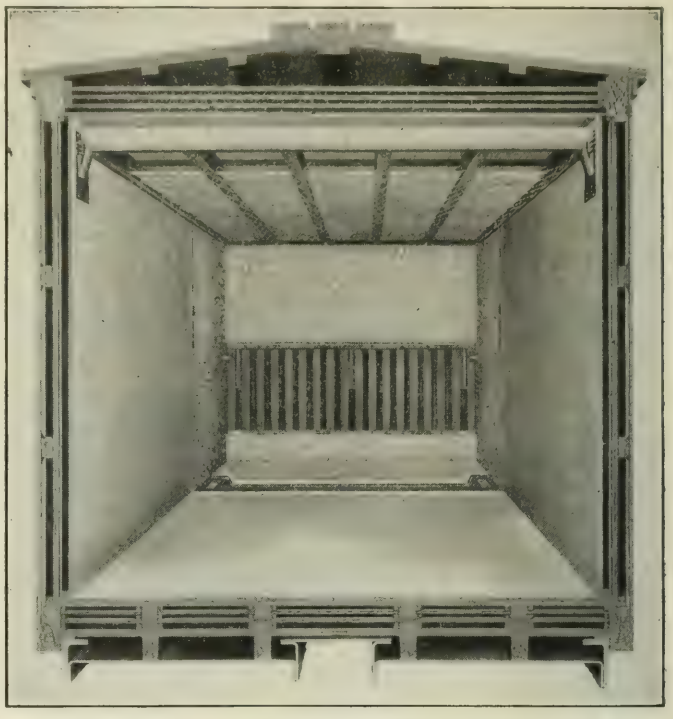
The car lighting fixtures made by this company, and sold under the name Adlake, include electric, acetylene gas, oil and candle fixtures, as well as combination fixtures such as electric and gas, etc. While one would think that from its large stock a selection could be readily made covering every requirement, the company is always willing to submit designs for fixtures demanded for special purposes.

REMOVABLE BULKHEAD PARTITIONS IN REFRIGERATOR CARS.

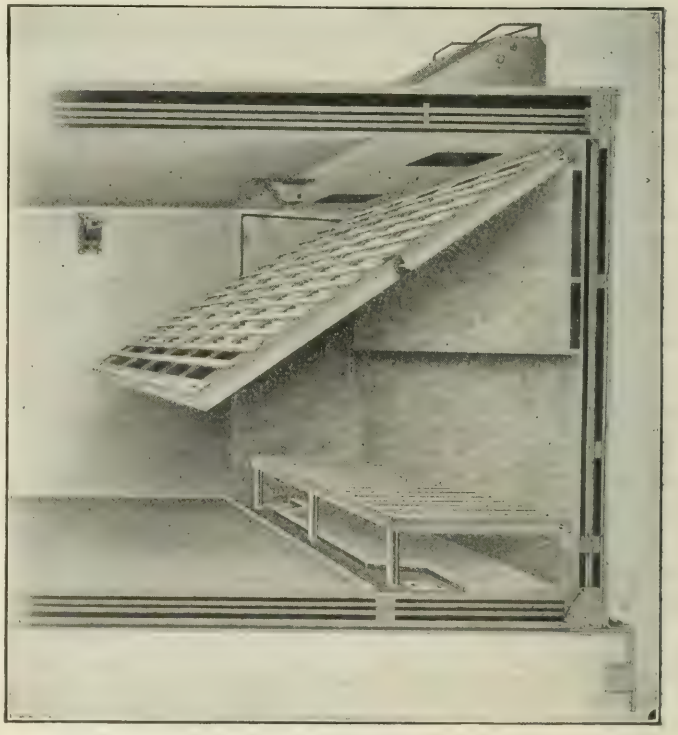
The White Enamel Refrigerator Company, St. Paul, Minn., has made some important improvements in its refrigerator cars so as to add largely to their cubic contents when icing is not required. The arrangement of the car when the bulkhead is in position for icing, as well as that when it is folded up so that the space can be used for freight, is plainly shown



White Enamel Refrigerator Company Bohn Folding Bulkhead.

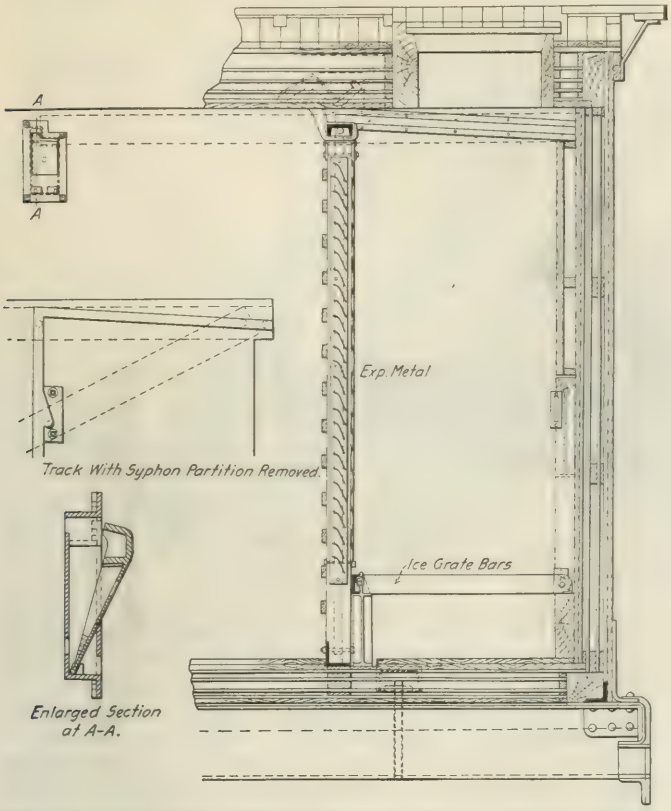


White Enamel Refrigerator Company Folding Bulkhead.



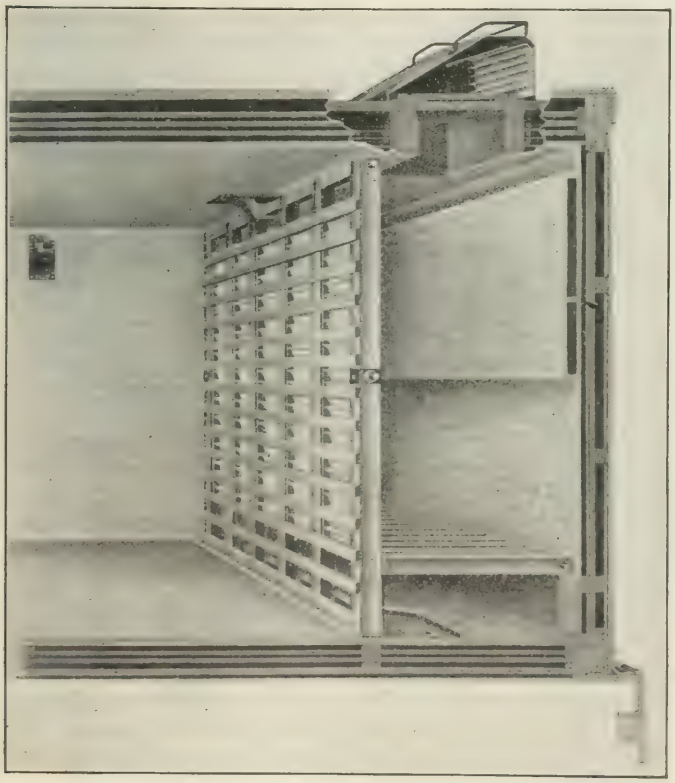
White Enamel Refrigerator Company Folding Bulkhead.

in the photographic illustrations and drawings. Each bulkhead has five sections of Bohn syphons 16 in. wide and 70



White Enamel Refrigerator Company Bohn Folding Bulkhead.

in. long. These are designed to raise up under the roof and the ice grates to fold against the end of the car. The syphon partition or bulkhead is made of 3 x 4 in. white oak standards fastened at the top to a 4-in. steel channel and at the bottom



White Enamel Refrigerator Company Folding Bulkhead.

with a 4-in. angle. Directly under the top channel, extending the full length of the partition and projecting at each end, are 1¼-in. round rods, which form a top trunnion that operates in a horizontal runway on the car side near the roof. The lower trunnions are bolted to the standards. When the partition is folded against the roof it is held there rigidly by a gravity lock fastened to the roof timbers, and on each side of the car is a gravity catch, also intended to hold the partition in position. The ice grate is made of 3 x 3-in. white oak bars held together by a 3-in. channel and 1½-in. angle irons. At each end of the rear of the ice grate is a 1-in. trunnion which works in sockets so as to make a hinge, allowing the grate to fold against the car end. This grate is supported in front by malleable iron legs, the rear resting on a 3-in. partition on the end of the car, and it is held in position by a small gravity catch fastened to the end bar of the ice grate. These fixtures are furnished complete, so that they can be installed in refrigerator cars by any car builder.

BETTENDORF EXHIBIT.

The exhibit of the Bettendorf Axle Company, Davenport, Ia., is in the same location, space No. 200, where it has been for the previous two years, and maintains its characteristic interest. This year the company is showing one 50 ton single center sill underframe, the same as will be furnished for the Harriman Lines, and also one 40-ton double center sill underframe, like those to be furnished for the New York Central Lines. There is also on exhibition a model of the Bettendorf all-steel box car. One of the special features of the exhibit is the Bettendorf truck, which will be dismantled and assembled for the information of any railway officials who visit the exhibit.

While the Bettendorf Company is not one of the oldest exhibitors at the Master Mechanics' and Master Car Builders' conventions, it has had each year for the last ten years a most interesting exhibit. The exhibit shows this year the construction that has been furnished by the company on recent orders. Probably there is no concern in the history of railway supply manufacturing that has made the wonderful growth of this company. The well merited success with which it has met has been due to the originality and practicability of the design of their product.

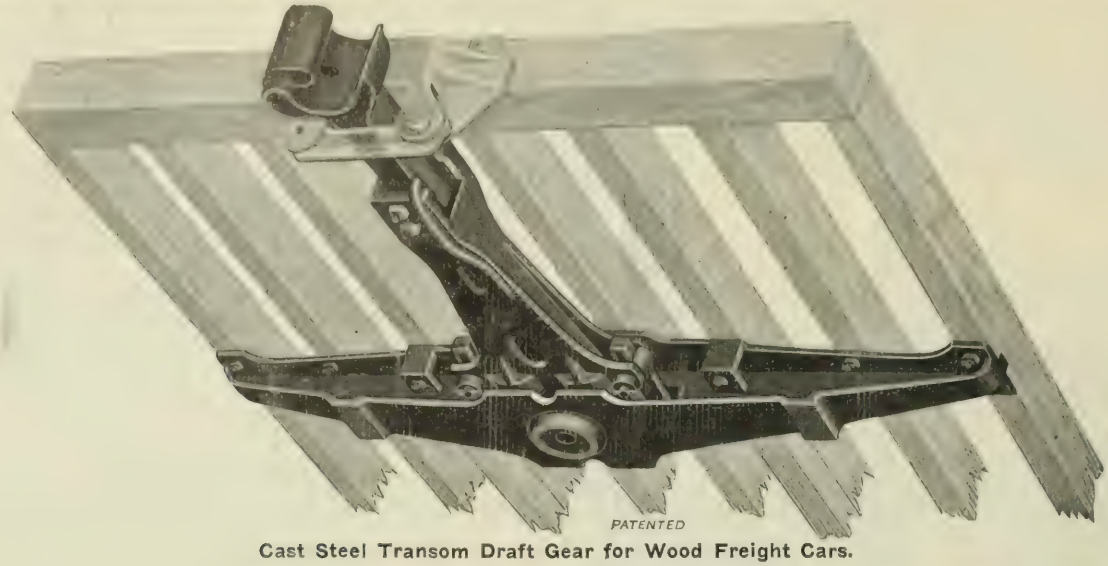
Many of the readers of the *Railway Age Gazette* will remember that only a few years ago, when all exhibits were much smaller, there was a small exhibit of the Bettendorf Company in the court yard of the Grand Union Hotel at Saratoga. The company at that time exhibited the Bettendorf bolster, which since then has seen service on so many thousands of cars on American railways. With the growth of the convention exhibits the Bettendorf exhibit has grown, and each year the company has had something particularly interesting to show to the members of the railway associations. At Washington, in 1905, the Bettendorf Company was one of the few larger railway supply firms which erected a building of its own for exhibit purposes. This added largely to the splendid effect at the Railway Appliances Exposition which was one of the important features of the International Railway Congress, held at that time.

COMMONWEALTH TRANSOM DRAFT GEAR.

The Commonwealth Steel Company, St. Louis, Mo., at Booth 315, is showing models of its transom draft gear and making reports of the service being rendered by the large numbers of this device which are now in use.

The device receives all shocks on a strong, specially designed, body bolster, distributing them evenly to all the sills, and thus removing a large portion of the work from the

center sills. No draft timbers are used with this gear, which is strongly built and has but a few simple parts. As no rivets are employed in its construction, a quick change of couplers is possible. The device is designed to permit easy inspection and changing of the springs. The Commonwealth Steel Company has put the gear to rigid tests, and the large number in long service are said to have proven very satisfactory.



Cast Steel Transom Draft Gear for Wood Freight Cars.

DUNHAM HOPPER DOOR DEVICE.

The Dunham hopper door, manufactured by the U. S. Metal & Manufacturing Company, New York, booth 337, is still breaking records, having been applied to over 30,000 cars to date. Its operation is evidently giving satisfaction to all concerned.

KENNICOTT GROUND OPERATED SOFTENER.

The Kennicott Company, Chicago Heights, Ill., has recently put in operation one of their new Type "K" ground operated softeners for the Chicago, Milwaukee & St. Paul at Miles City, Mont. The capacity of this machine is 12,500 gallons per hour. It is designed to treat water from the Yellowstone River, which is extremely variable in character. Often it is extremely hard; at other times it is relatively soft, but very muddy.



Kennicott Type K Water Softener.

The well-known ability of the Kennicott softeners to handle a variable water ensures the success of the machine in spite of this difficulty. A special apparatus is included for putting in a coagulant at times when the water is muddy. The mechanism of this machine is similar to that of the many other Kennicotts in railroad service, but it has the relatively new feature of ground operation. All parts to which attention is necessary are located in a small house at the foot of the tank, and the man in charge is not required to climb up to the top of the machine. The weather at Miles City is frequently very severe, and this is a distinct advantage.

HUTCHINS ALL STEEL-STEEL CARLINE ROOF.

Details of the construction of the Hutchins all steel-steel carline roof are shown herewith. This roof is said to have had about five years' successful service, it being about that length of time since they were first applied. The most important feature of the design is that no roofing boards are used. It is flexible, and provision is made for the weaving motion of the car. The detailed construction consists of a number of Hutchins steel carlines, rolled by the Carnegie Steel Company, Pittsburgh, Pa., at its Clairton mills. These carlines are shaped to increase the head room in the car and are formed to suit any pitch of roof. They are bent down over the outside of the side plates and secured by one vertical bolt passing from top to bottom of the side plate and two horizontal bolts through its sides. The purlines are gained out for the carlines and form a support for the roofing sheets as well as a longitudinal brace for the car.

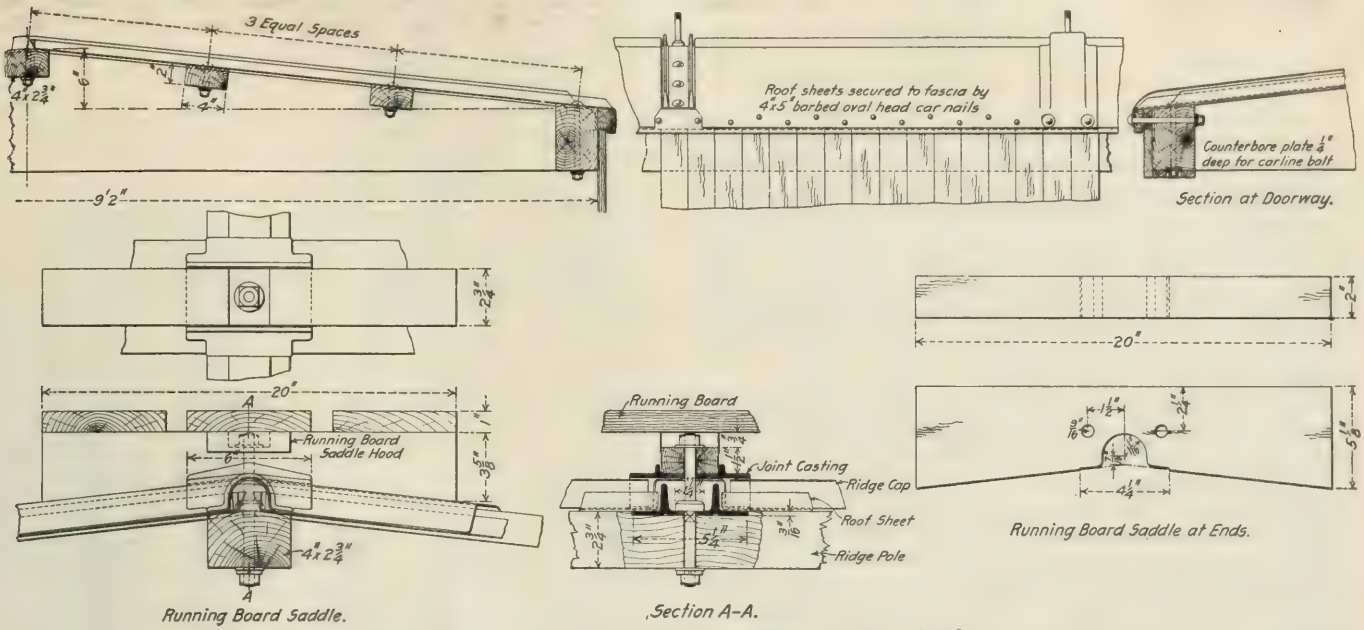
The roofing sheets are made from No. 16 U. S. gage galvanized steel plate with three upstanding and one downstanding flange. The sheets are secured to the car at the eaves and sides of the car with 4-in. oval head barbed car nails, the carline caps being secured by the two horizontal bolts that fasten the carline to the side plate. Upturned edges of the sheets at the ridge of the car are covered by caps which run between the carlines. The carline and ridge caps are made of the same weight of material as are the roofing sheets.

This roof is very easily applied and repaired in case of wreck. The style of the fascie used makes it possible to repair the side sheathing of the car without removing the roof or fascie.

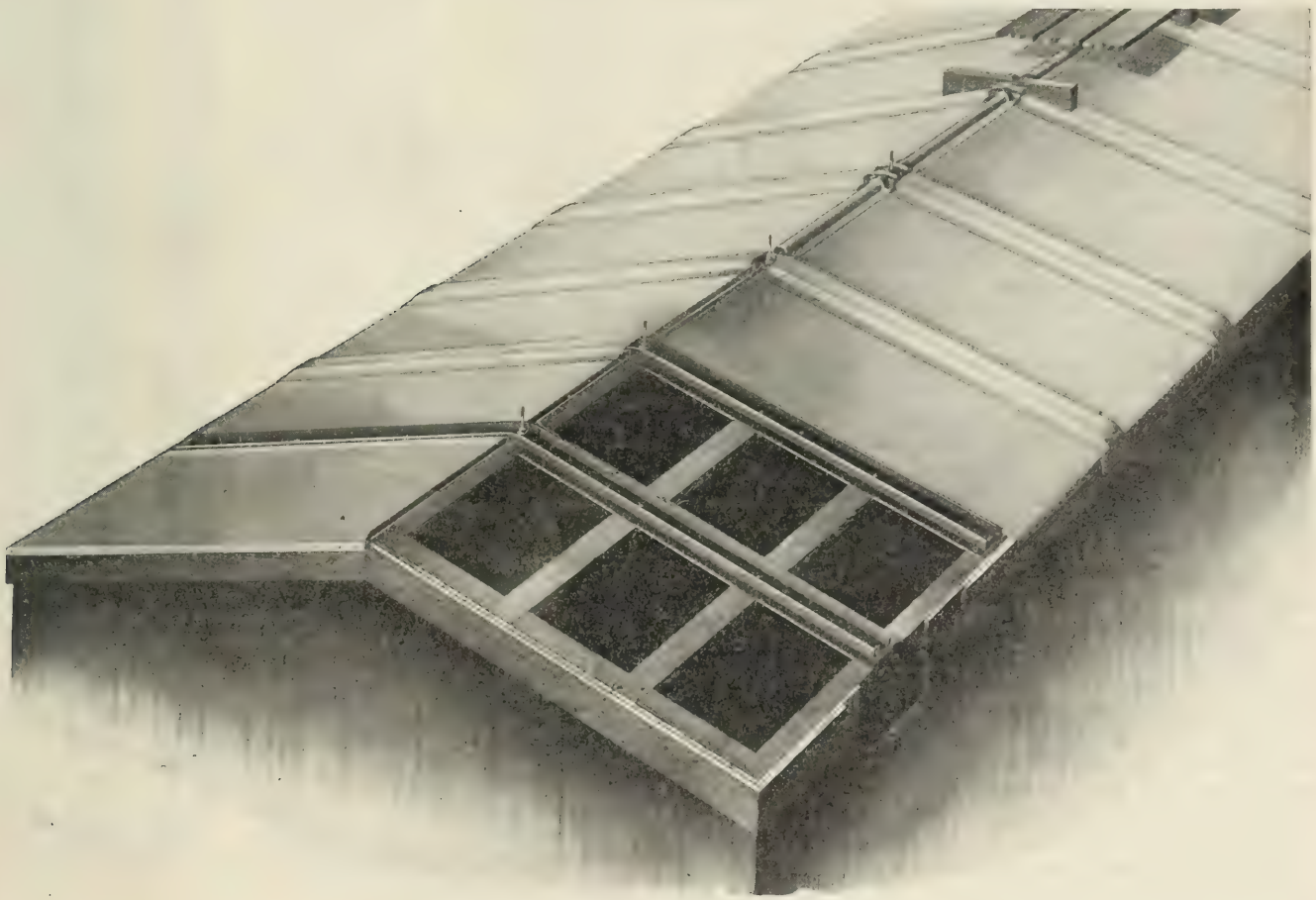
The No. 16 U. S. gage galvanized sheets have been for

some time in use as culverts and such other places where the material is subject to deterioration and faster than on a car roof. Under these conditions galvanized material is

company is represented in Chicago by the Spencer-Otis Company, Railway Exchange, and in New York by the United States Metal & Manufacturing Company.



Details of Hutchins All Steel-Steel Carline Roof.



Hutchins All Steel-Steel Carline Roof.

said to have lasted from 15 to 25 years. The Hutchins roof is designed to reduce the dead weight of a car from 500 to 1,000 lbs. and to increase the cubic capacity from 100 to 200 cu. ft.

The Hutchins Car Roofing Company, Detroit, Mich., manufacturers of this car roof, is exhibiting in space 431. This

WOOD'S NIPPLE END PROTECTOR AND BRACKET.

The depreciation of air brake hose due to abrasion is one of the principal items of expense in the maintenance of the brake rigging. Experience shows that a large part of this damage is done at the upper end of the hose and the life of

the hose is thereby reduced from three years to less than one year. The protection afforded by nipple end protectors should thus effect a very large saving. That this is the case is indicated by the sale of nearly half a million of these nipple end protectors. The coiled wire makes the hose quite flexible in spite of the metal protection, and it can be easily removed from old hose and applied to new hose of any standard size.

In the same booth where these protectors are exhibited are also shown the Monogram bracket, which is intended to overcome the common defects in the attachment to the airbrake train pipes which so often cause leaks. These are due to the insecure fastenings and the shifting of pipes when the cars are bumped together in switching yards. The shifting of the main 1¼-in. brake pipe loosens the connections at the cross over pipe, causing them to leak. The Monogram bracket overcomes this difficulty; and once applied, it largely reduces the cost of maintenance.

The hose angle cock is threaded into the end of the train pipe, which is held in the Monogram bracket located 13½ in. from the center line of the coupler and 13½ in. from the face line of the knuckle, and when the angle cock is set at the required angle of 30 deg. the locking key in the bracket engages the hexagon on the angle cock, holding it in position. The lock nut is tightened with a wrench, holding the key in position and locking into one solid piece of metal, the angle cock, bracket and train pipe; all parts being held in a positive position in a substantial manner, so that pipe shifting is positively prevented. This bracket is used on the steel cars in the Bettendorf exhibit.

The devices described in the foregoing are made by Guilford S. Wood, Chicago.

NATHAN MANUFACTURING COMPANY.

The exhibit of the Nathan Manufacturing Company, of New York City, is one of the most conspicuous and complete among the many noteworthy exhibits of this year's convention. It comprises a full assortment of the well-known appliances made by this company, such as injectors, lubricators, boiler testers, steam fire extinguishers, Klinger reflex water gauges and general boiler fittings.

The attention of those interested is attracted more particularly by the No. 14 Simplex injector, which is made to supply the boilers of large consolidation Mallet compound engines. This injector is said to be suitabe for very heavy as well as light service on account of its enormous capacity, in connection with the fact that this capacity may be reduced fully one-half under normal service conditions.

BRINKERHOFF CAR SIDE CONSTRUCTION.

Forsyth Brothers Company, Chicago, are manufacturing and putting upon the market the Brinkerhoff steel passenger car side construction. This is something quite new and is in line with the present effort to obtain, particularly in steel car work, the maximum strength with the minimum weight and number of parts. Heretofore the girder effect in the side construction of a car has been only directly obtained as between the belt rail and side sill of the car. In the Brinkerhoff construction, however, this girder effect is extended clear up to the side plates. The post and letterboard are formed in one piece of sheet metal instead of being built up of separate parts and riveted together, thereby materially reducing the number of rivets and greatly strengthening these parts. The Brinkerhoff construction includes the use of diagonal bracing, similar to bridge trussing, with the difference that in this invention these trusses are all formed in one piece.

The shock-resisting properties of the Brinkerhoff construction was recently exemplified in a collision between cars

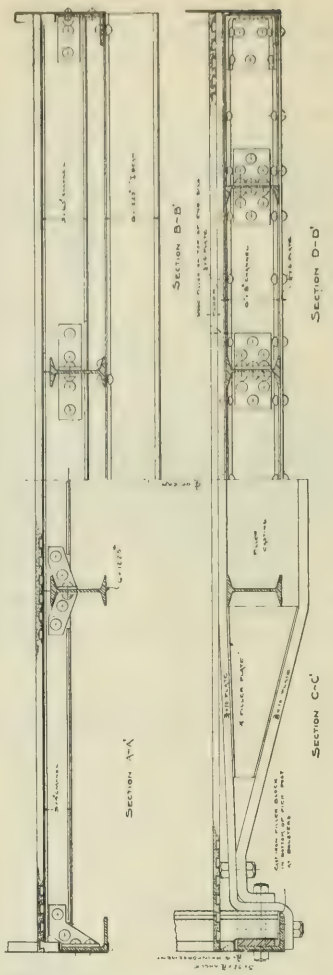


Fig. 3.

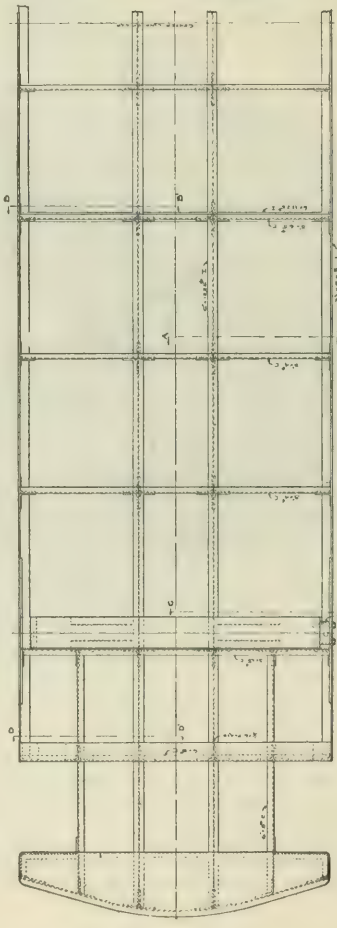
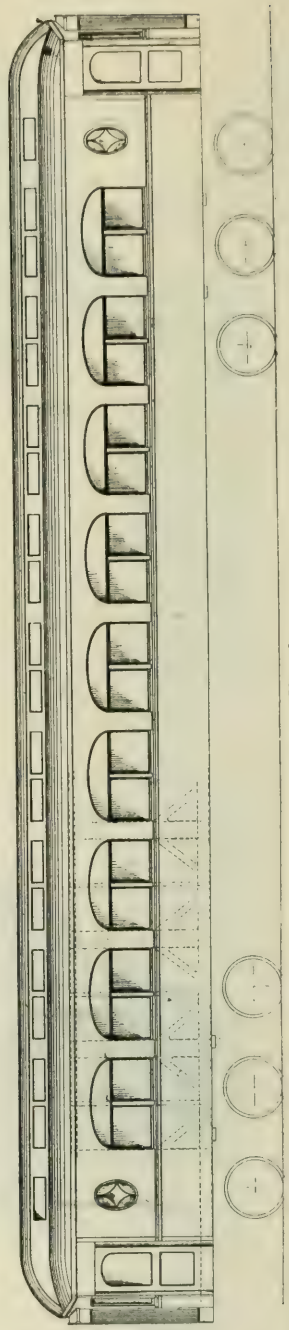


Fig. 2.

Fig. 1.



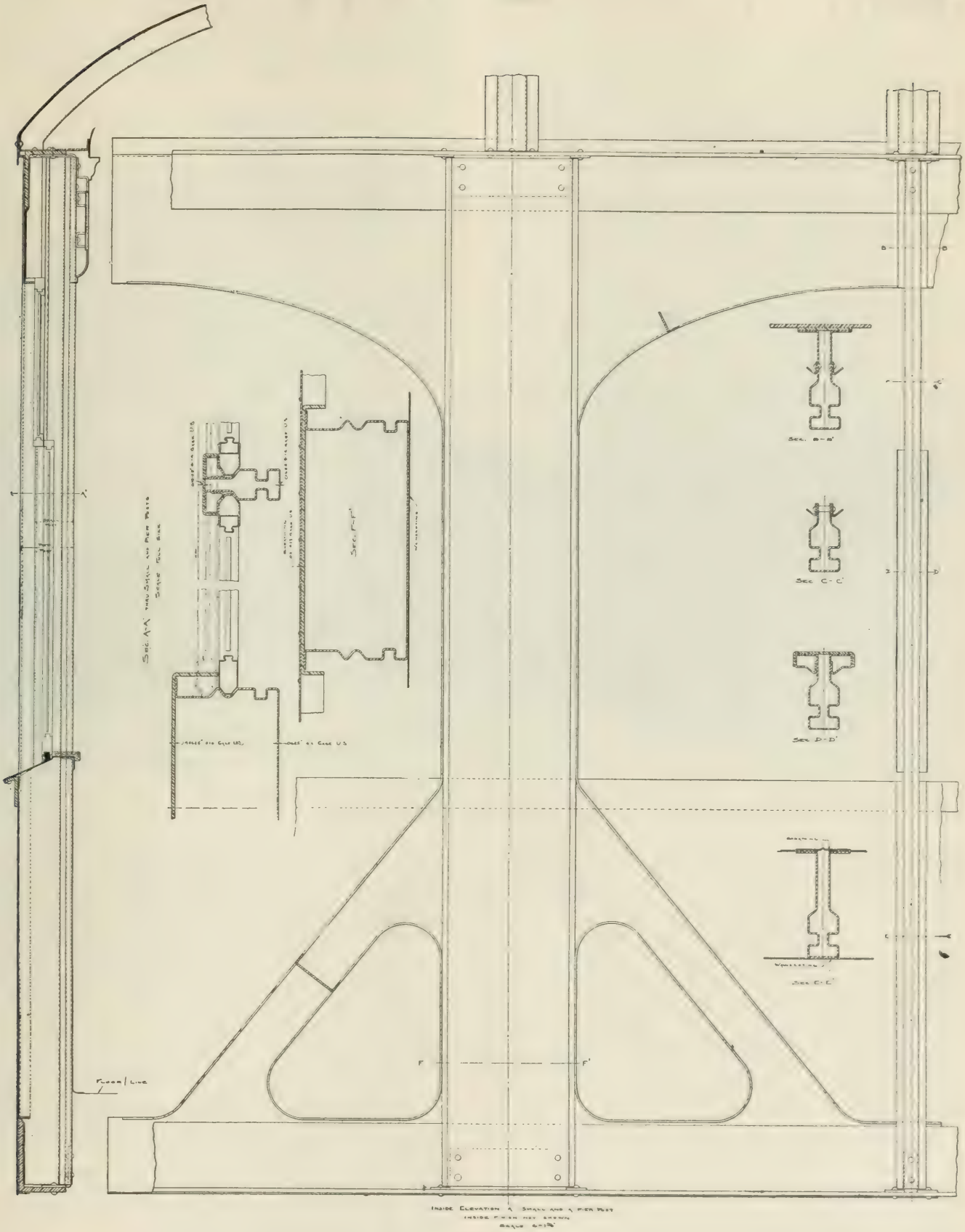


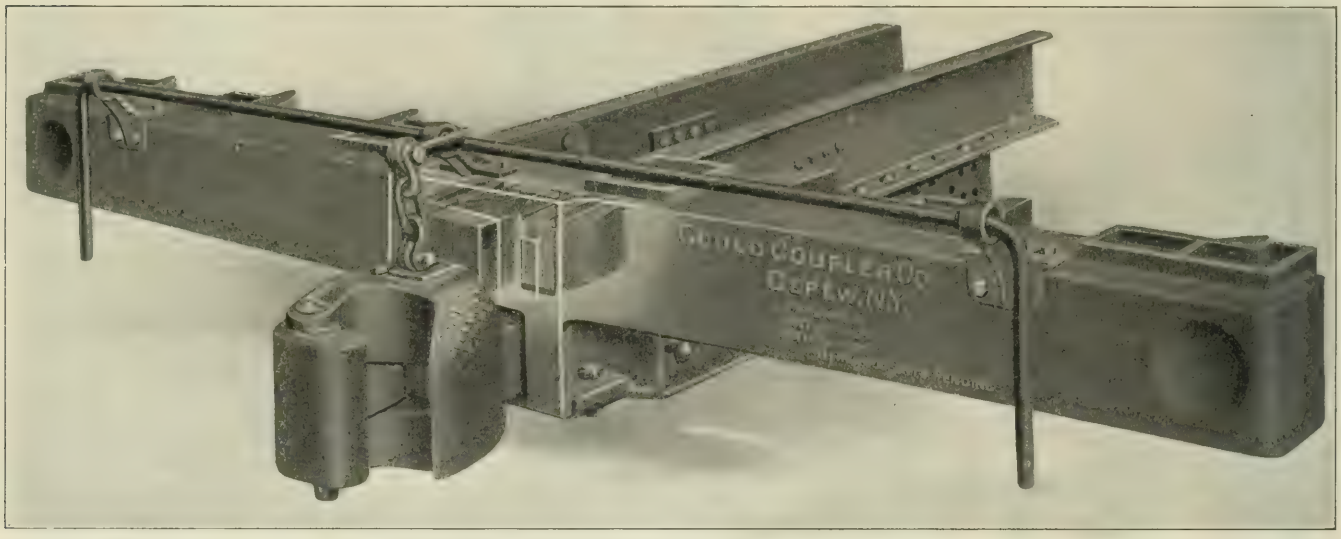
Fig. 5.

Brinkerhoff Side Construction for Passenger Cars.
Detail of Posts and Side Frame as Under Fig. 4.

constructed according to the Brinkerhoff design, which came together at a considerable rate of speed. Practically no damage was sustained by the cars; none of the glass of the side windows was broken. The Brinkerhoff side car construction, therefore, provides a car having resisting properties not merely confined to the lower framing of the car but extending to the roof, thereby greatly adding to the total resistance of the car to shocks. Referring to the drawings illustrative of this construction, Figs. 1, 2 and 3, respectively, show side elevation, side plan, floor framing and cross sections through the floor framing of the Brinkerhoff construction adapted for elevated and subway cars. Fig. 4 shows side elevation of this construction suitable for steam railway passenger service. Fig. 5 shows details of post and side frame for car similar to that shown in Fig. 4. There are a number of cars in service of this type of construction.

FREIGHT EQUIPMENT.

The Gould Coupler Company, Depew, N. Y., exhibited at the 1909 M. C. B. convention the first design of its cast steel end sill with friction buffer. At the present convention the company exhibits a modified and improved form of this device, the changes being mainly in simplification and accessibility of the parts.



Cast Steel Freight Car End Sill with Friction Buffer Back of Coupler Horn and P. T. Type Coupler.

The design of the cast steel end sill proper can be made to suit any requirements and the friction portion arranged accordingly. The limited travel of 2¾ in. for friction draft gears has shown that it is not advisable to have them with a greater capacity than 150,000 to 175,000 lbs.

The friction buffer, which the horn of the coupler engages, is claimed to give an additional 100,000 lbs. resistance in buffing, but to avoid stiffening the draft gears for the pulling strains. This method of increasing only the buffing resistance does not interfere with the handling of the trains.

The device as arranged allows one inch between the coupler horn and the friction buffer, with the buffer having a travel of 1¾ in. This allows one inch travel of the coupler and friction draft gear before the engagement of the coupler horn and friction buffer. The additional buffing shocks taken by the friction buffer are in the direct line of the car underframe. It would appear that this is the proper method of obtaining additional buffing resistance in preference to additional coupler travel and increased friction draft gear.

NEW PIPE BENDING MACHINE.

The machine shown herewith, which may be either belt or motor-driven, for bending pipe and tubing, is one especially adapted for locomotive and car shops. It is designed to bend 1-in., 1¼-in., 1½-in. and 2-in. pipe, the radius of bend varying between the limits of a minimum radius of 2½ in. for 1-in. pipe to a maximum radius of 12 in. for all four sizes of pipe.

The belt-driven machine has a single pulley, power being transmitted through three reduction gears to the vertical spindle holding the main forming roller. These main rollers are made in two pieces, the joint being at the center of the groove in the roller. The lower half is keyed firmly to the spindle, while the upper half may be raised or lowered by the handwheel shown at the top of the spindle. This dividing of the main forming roller is necessary to release the bend after it has been formed, particularly in the case of 180-deg. hot bends.

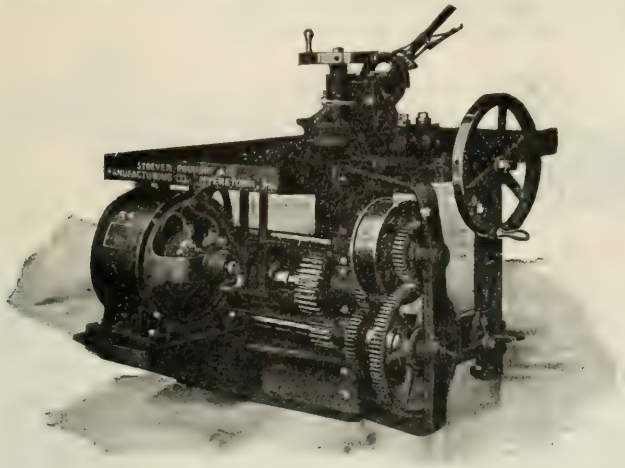
Fastened on to the former, and arranged so that it can be taken off and placed on any former, is a vise having two universally adjustable grips operated by a hand lever. A carriage, or slide in the table, moves from the central forming roller, and is operated by a large handwheel. This slide holds two rollers, one directly in line with the main forming roller, and which serves to force the pipe or tubing into it, while the other is a guide, serving simply to keep the unbent portion of the pipe or tubing in proper position. This slide is made adjustable, so as to accommodate forming rollers of various radii.

The train of gears gives a reversed movement to the spindle, so that when the bend has been formed and removed from the machine a clutch can be thrown into this reverse train and the forming roller returned to its original position. Tapping arms, adjustably located on the vertical spindle and in contact with the adjustable stops on a rod connected with the clutch mechanism, will throw the clutch out on either the forward or reverse movement of the spindle at any angle or position, thus insuring absolute duplication of bends. The clutch can be thrown either way by the foot treadle.

The cut shows the motor-driven machine and the belt pulley in position. The belt-driven machine has but one speed, while it is customary to equip the motor-driven tool

with a variable speed, 3-h.p. motor, so that a variety of speeds can be obtained for making the different bends.

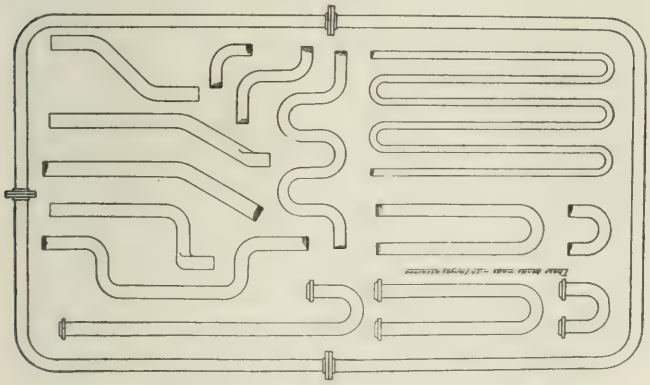
No filling of the pipe is necessary, the normal section being retained throughout the bend. As an illustration of the speed at which the machine can be operated, 16 complete bends are said to have been made in 10 minutes, and on daily runs 300 bends in nine hours. The ones referred to



Stoever Pipe and Tube Bending Machine.

were 180-deg. bends of 2-in. pipe made to a 4-in. radius, the length of the legs being from 5 to 6 ft.

As will be noted from the principle of operation, the machine is intended principally for manufacturing purposes. It is a special machine, like some forms of turret lathes and engine lathes, and when set up for a single piece of work



Sample Bends Made on Stoever Machine.

should be used on that work for some time.

Following are sizes of pipe and radii of bends made on this machine:

Minimum Radii—Cold Bends.	Minimum Radii—Hot Bends.
1 in.....4 in. radius	1 in.....2 in. radius
1¼ " .....5 " "	1¼ " .....2¾ " "
1½ " .....6 " "	1½ " .....3 " "
2 " .....8 " "	2 " .....3¼ " "

The belt-driven machine occupies 54 in. x 60 in. floor space, while the motor-driven machine requires 54 in. x 72 in. It weighs 2,500 lbs. without the formers.

The machine is manufactured by the Stoever Foundry & Manufacturing Company, Myerstown, Pa., whose sales offices are located at 140 Cedar street, New York.

COACH CLEANING AT TERMINALS.

The Duntley No. A pneumatic car cleaner has been especially designed by the Duntley Manufacturing Company, Chicago, to meet a demand in terminal car cleaning. It is mounted on a light truck with 20-in. wheels, and can be easily moved about the yards.

The electric machine is equipped with a 1½-h. p. motor, adapted to any desired current. The vacuum pump is of a special design, only one ball bearing, 15-in. vacuum and a 75-ft. displacement. The exhaust air from the pump can be used for blowing dust and dirt from behind curtains, blinds, windows, from beneath seats, back of steam pipes, etc., as it has about 8 lbs. pressure and a large volume. It has been stated by officers of roads using this machine that one man



Duntley Pneumatic Cleaner as Used in Yards.

thoroughly cleans the seats of 12 cars in 10 hours, which is at the rate of 36 seats per hour.

The complete equipment includes one 12-in. carpet sweeper, two 4-in. renovating nozzles, a renovating handle complete, one 50-ft. piece of vacuum hose, one hose reducer and one blower nozzle.

This cleaner is adapted for cleaning the backs, fronts and cushions of seats, head linings, aisle strips and the general interior of the car.

SECTION HAND CARS.

It is the practice of the manufacturers and their repsentatives, when endeavoring to introduce new articles or an improvement on an old one, to make certain claims, such as greater efficiency, greater durability, fewer repairs, etc. These claims in many cases are necessarily almost altogether theoretical, particularly if it is an article where the special value lies in the comparative durability of the article, and it takes years to prove whether the claims are well founded. It is always a source of much gratification to the manufacturer, however, when in due time he is able to point to samples of his product which have not only come up to but exceeded any claims which he has made.

The photograph herewith shows a car made over fourteen years ago by the Sheffield Car Company. It is still in service, as is evidenced by the following quotation from a letter received from the section foreman having the car in charge:

"I send you to-day thirteen views of one of your fourteen years' service hand cars. This car has been in continuous service, on 1.25 per cent grade, on sections 105 and 106,

Rio Grande division, Texas & Pacific. Has never been shopped, although it has had the following repairs: Two complete sets of brasses, two bull wheels, and two pinion wheels and driving crank, and has been floored twice.



Fourteen Year Old Section Hand Car.

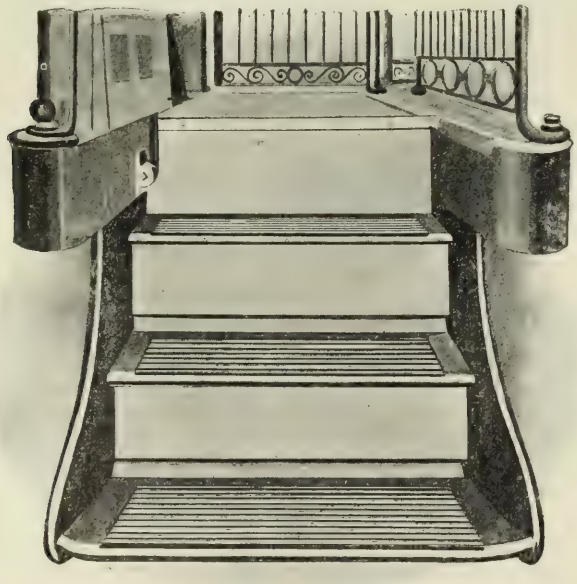
This car has run over 30,000 miles, and we have had from four to seven men on the car all the time. Have run it over this district for inspection many times."

The Sheffield cars are sold through Fairbanks, Morse & Co., Chicago.

MASON SAFETY TREAD.

The accompanying illustration shows the application to car steps of Mason safety tread, made by the American Mason Safety Tread Company, Boston, Mass. This tread is made in two styles: carborundum filled and lead filled.

The Barney & Smith Car Company, Dayton, Ohio, recently ordered a lot of lead filled Mason safety tread for the new



Mason Safety Tread.

cars it is building for the New York Central lines; and the Standard Steel Car Company has ordered the lead filled tread for 69 Pennsylvania Railroad passenger coaches, and is using the carborundum tread on the new Long Island Railroad cars.

SCULLIN-GALLAGHER I-BEAM BOLSTER.

The Scullin-Gallagher Iron & Steel Company, with foundry and general offices at 6700 Manchester avenue, St. Louis, Mo., one of the large manufacturers of cast steel body and truck bolsters, truck side frames and general railway steel castings, is having remarkable success with its I-beam type of body and truck bolsters, which are in general use on many of the largest railway systems of the country.



Cast Steel I-Beam Bolster.

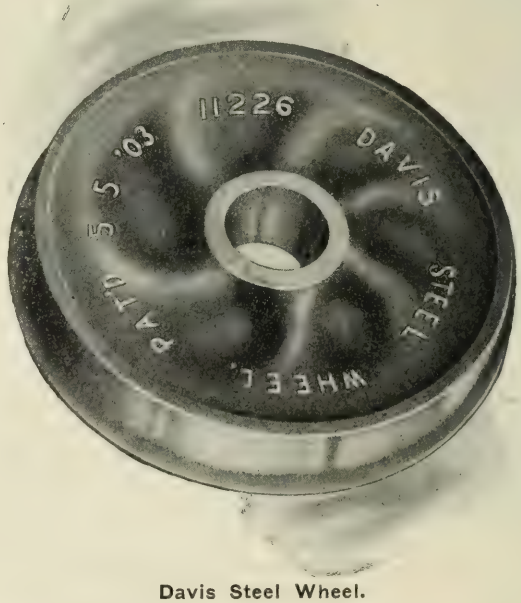
With several hundred thousand of these bolsters in use, the percentage of failures from all causes in proportion to the total number in service has been only about .0007.

The Scullin-Gallagher Company attribute this to the inherent excellence of the I-beam design, which gives a maximum of strength with a minimum of weight, supplemented by the greatest possible care in maintaining that chemical analysis which will insure the quality of castings best adapted to the severe requirements of modern railway operation and the most modern foundry methods and equipment.

A truck showing typical designs of the company's bolsters is attracting the attention of many mechanical men at the Scullin-Gallagher exhibit, spaces 135, 137 and 139.

SPRINGS AND DAVIS STEEL WHEELS.

One of the features of the exhibit of the American Steel Foundries, Chicago, and which is attracting deserved attention, is the display of springs, made at this company's simplex plant. The springs, as shown by the accompanying cut, consist of both coil and elliptics for all classes of cars and locomotives.

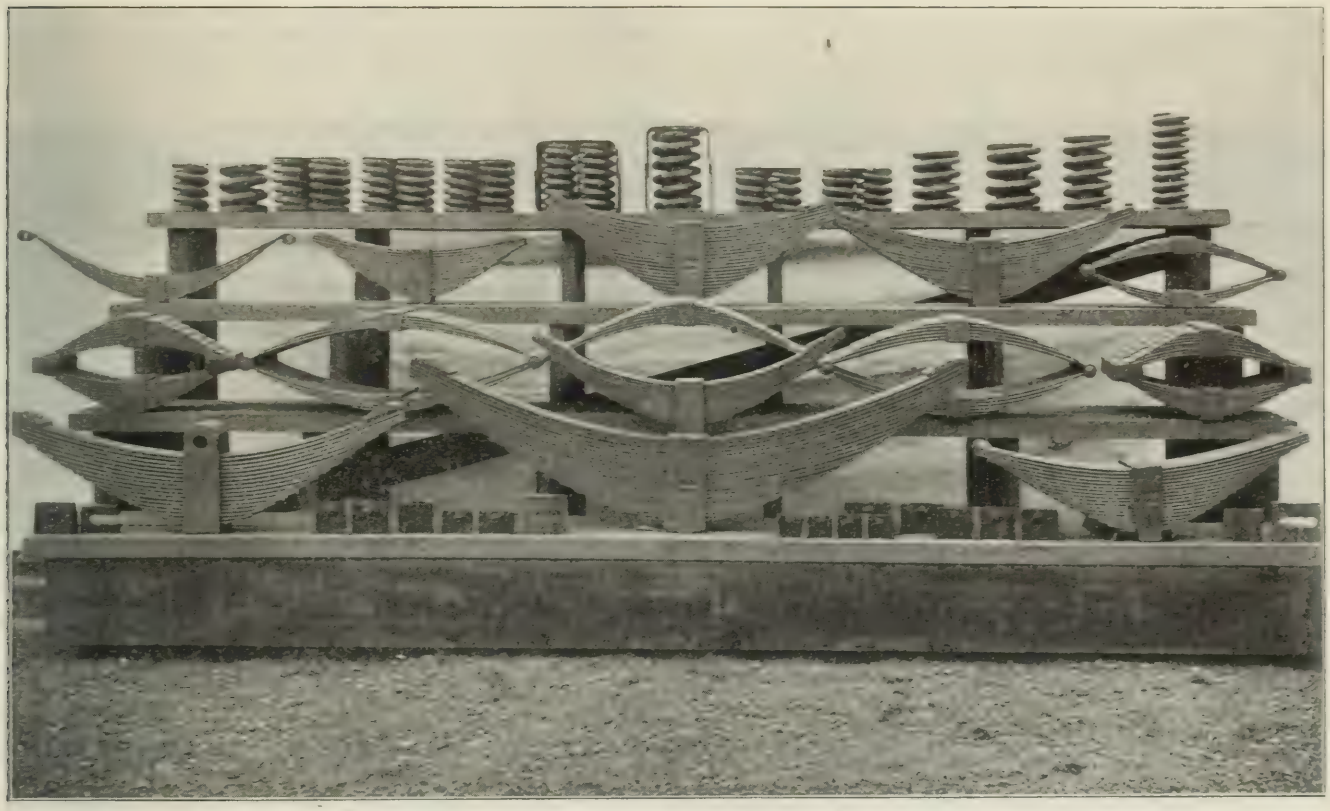


Davis Steel Wheel.

The large locomotive equalizer spring shown on the lower step of the stand in the center is said to be the largest locomotive spring ever manufactured and is of a type used on a recent order for Mallet compounds. This spring has a

total length of 6 ft. 4 in., and weighs 800 lbs. The 22 leaves are made of ½-in. x 5-in. steel. Directly above this is a spring of similar design which was used on heavy consolidation engines such as were in use about 15 years ago. This spring weighs 150 lbs. and is composed of 14 leaves made of ⅜-in. x 4-in. spring steel. The two springs shown on each end of the second step are for tender use, and are provided with Sloan rocker ends, which are said to have been very successful in eliminating the excessive breakage to which tender springs are subject.

Heretofore the upper and lower halves of elliptic springs have commonly been formed with scrolls or eyes at the ends, connected by pins. This arrangement has always been a weak one. The Sloan rocker ends are made of malleable iron, are simple, strong and economical and are adapted to connect the halves of single, double or triple elliptic springs.



American Steel Foundries' Coil and Elliptic Springs.

In operation, the rocker ends retain the spring in proper relative position. Their center and side flanges keep the ends in alinement and prevent thm from twisting out of true. The plates thus move easily as the springs are elongated, or contracted, and afford a bed for the spring ends. With no load and with light load the weight is supported on the extreme ends of the spring, thus promoting easy running. As the load increases, the springs are compressed and shortened on the bed, thereby increasing the capacity and resistance in proportion to the load, in order to meet the needs of heavy locomotive tenders supported on elliptic springs.

On the top shelf of the rack in the center are shown Sloan spring controllers, a combination of a coil spring within a spring steel casing designed to give the same results as elliptics. The load forces the steel plate casings into contact with a resulting friction similar to that in the plates of the elliptic. The amount of friction necessary may be calculated and the easy riding qualities of any elliptic spring can be duplicated. The controllers are used under any class of equipment in substitution of elliptic springs and are of particular advantage where the difference between light and loaded weight of car is very great. Their weight is about one-half that of the elliptic and the cost considerably less.

Due to track clearances, the proper strengthening of cast iron wheels to meet modern conditions has been a difficult problem and the manufacturers of cast iron wheels are entitled to great credit for producing a wheel which has given such general satisfaction under 30-ton, 40-ton, and even under 50-ton equipment in some cases where the service is light and track conditions good. From an original weight of about 525 lbs. for a cast iron wheel used under a 15-ton car, a weight of 700 lbs. has been reached for a wheel under a 50-ton car; an increase of about 175 lbs., or 33 per cent. There is some question as to just how much this increased weight has added to the strength of the wheel, since the weak point is the flange, where the track clearances limit the thickness of metal. While the weight of the wheel has been increased 33 per cent, the capacity of the car has been increased from 15 to 50 tons, or about 230 per cent. There has been a corresponding increase in the light weight of the car and the brake pressure as well as many other changes which have had a material effect in the service, so that the work generally imposed upon the wheel is many times as severe as it was formerly.

Believing that the logical wheel for freight equipment is one that will call for as little departure as possible from general existing practice, the American Steel Foundries have developed and perfected the Davis cast steel wheel. The Davis wheel is made of open hearth cast steel, poured into a revolving mould. Manganese is introduced into the stream of metal from the ladle in sufficient quantities to fill up the tread and flange of the wheel, leaving the center and hub of ordinary soft steel. As manganese steel is very hard and

tough, the flange is many times stronger than cast iron and the tread will have the maximum amount of wear.

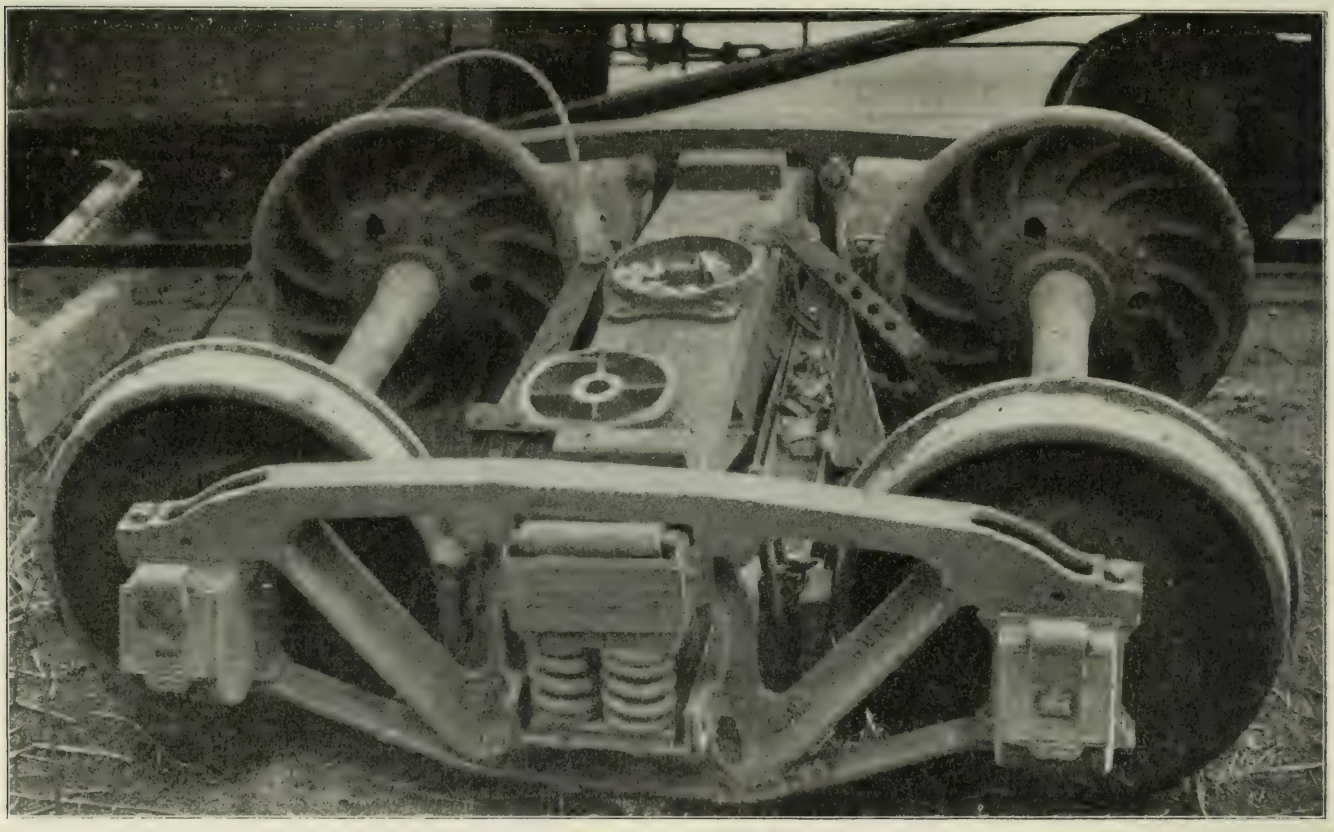
The American Steel Foundries are showing a number of Davis wheels, and service records which have been obtained during the year past entitle the wheel to the serious consideration of all interested in a solid steel wheel. Owing to the great strength of the metal used in the manufacture of these wheels, it has been possible to reduce the weight to about 600 lbs. each, making a saving in weight of 800 lbs. per car when compared with 700-lb. cast iron wheels used under 50-ton cars.

These wheels are ground before shipment, from the apex of the flange to the outside of the tread, so as to be perfectly round and to insure a perfect wearing surface. Davis steel wheels under locomotive tenders in fast local passenger service have shown 30,000 miles per 1-16 in. wear and under passenger cars there are many still in service which have run 160,000 miles.

truck bolster, cast steel body bolster, Simplex bolster springs, Ajax trussed brake beams and Susemihl roller side bearings. Trucks of this description have been adopted as standard by a number of the large railway systems, and are in service generally throughout the country where a truck of high capacity and low cost for maintenance is desired. The accompanying cut shows a truck of this design which went through an unusually severe freight wreck, practically no damage resulting.

To the left of the truck in the exhibit various types of couplers are shown, all in operative position. Directly back of the truck, on racks, are Simplex brake beams in a great variety of styles, while to the right of the truck and grouped along the side of the booth are shown Simplex springs, Susemihl side bearings, miscellaneous castings, Economy draft arms and a large collection of truck and body bolsters.

The walls of the exhibit are hung with some excellent photographs, showing large and difficult castings recently produced by the American Steel Foundries, and also a couple



American Steel Foundries' 50-Ton Freight Car Truck.

THE AMERICAN STEEL FOUNDRIES' EXHIBIT.

The American Steel Foundries, Chicago, have their exhibit in Machinery Hall, occupying Booths 157 to 168, a total of 1,872 square feet.

Most of the well-known products which the American Steel Foundries manufacture at their various plants are displayed in a pleasing and attractive manner, and are arranged, so far as possible, to show them as they would appear in actual service.

The center of Booth 168 is occupied by a full-size, fifty-ton freight truck, standing on a suitable piece of track with the necessary ties and crushed stone ballast. The parts of this truck manufactured by the American Steel Foundries consist of Andrews side frames, Davis steel wheels, Simplex

of colored pictures showing the appearance of an open hearth furnace when the charge is being tapped into the ladle, and when locomotive driving wheel centers are being poured.

The exhibit is well worth a visit from every railway representative attending the convention, and is a credit to the representatives of the American Steel Foundries, among whom the following have already arrived and are registered at the various hotels along the Boardwalk: William V. Kelley, R. P. Lamont, W. W. Butler, George E. Scott, D. W. Call, R. H. Ripley, J. C. Davis, T. D. Kelley, J. V. Bell, G. F. Slaughter, F. K. Shults, W. Ross Gravener, George C. Murray, Theodore Cook, P. J. Kalman, D. T. Harris, J. W. Dalman, A. R. Brunker, W. A. Blanchard, A. S. Crozier, T. H. Hopkirk, R. E. Janney, P. M. Armendariz, George G. Floyd, F. B. Ernst, C. E. Bauer, J. Soule Smith and Louis E. Jones.

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SUPPLY TRADE SECTION 1571

It is, to say the least, an unfortunate coincidence that the federal injunction against the increase of freight rates by the western roads comes at a time when the European market for our railway bonds was opening widely. The adverse effects are not merely economic and related to the law of supply and demand, but sentimental. Not only was Europe, notably France and Germany, waiting to take the overflow of railway loans from our own over-charged market, but the feeling of the individual investor was distinctly friendly, quite apart from our home conditions. It is highly probable that in time not far away the private as well as the syndicate marketings would have increased. In such matters it is well to remember the temperamental character of the European investor. To begin with, he is naturally a conservative. Living in countries with surplus capital and with a limited field for investment at home, he has placed his money much more freely abroad than the American investor—this rule applying especially to English capital. Finally, whether he lives in a kingdom like Belgium or Holland or in an empire like Germany or in a centralized republic in transition like France, or even in England, with her King, Court and aristocracy, the "governmental" idea bulks big in his fiscal sensorium. It is hard to measure the ill results to our railway credit abroad once the idea gets fixed in the foreign investor's mind that his investment in an American railway security is menaced by federal hostility and made the financial shuttlecock of our party politics. It does not take a long look into the future to see how this foreign aspect of our federal policy is a matter to be reckoned with, seriously considered and inwardly digested. Nor does it bear on our railway laws alone.

Last summer the state of Massachusetts by her legislative enactment incorporating the Boston Holding Company receded from her old hostile position against the merger of the Boston & Maine and the New Haven railway interests. At the sacrifice of legal logic Attorney-General Wickersham next withdrew his federal suit against the merger; and the attorney-general of Massachusetts announced in effect his quashing of the suits against letting the New Haven hold some 500 miles of trolley properties in the state. Now comes another retreat with the passage by the state law makers of a bill specifically allowing the New Haven to hold the Berkshire street railway system—a measure by which the state surrenders the whole principle and policy involved in the original contention. So ends, practically, a contest of a New England commonwealth against a railway corporation, lasting for some years, in its earliest stages rancorous to the last degree, intertwined with state policies, injurious to railway credit, holding up important railway improvements, prolific in legal snarls and fees of eminent attorneys and prolonging a conflict which any body of rational financiers or moderate statesmen could have settled peaceably in a fortnight. But what may almost be called the Massachusetts vendetta against the railway teaches some salutary lessons—that railway controversy cannot be settled by impulse and passion; that anti-railway litigation of an obstructive character has its limits as well as anti-railway law-making; and that in such controversies the appeal, within proper bounds, to financial interests on the one hand and the public interest in good railway service on the other, is rarely in vain. The outworking process may be slow, costly and vexatious, but it gets there at last. And the rule applies to larger areas of the railway problem than Massachusetts, albeit she supplies so vivid and telling an example.

The use of the oxy-acetylene process for welding and cutting metals in railway shops is extending rapidly and promises to become one of the essentials of first class shop equipment. It has made greater progress in other countries because the business has been handled with more intelligence. Systematic methods have been used to instruct the men in safe and effective means of handling it and plants of proper capacity have been installed. The principal reason why the process has not been more rapidly introduced here is because the manufacturers of the gas generating apparatuses have constructed them too small, and where railways have bought these small plants, which were sufficient only for a small automobile repair shop, they have been disappointed because they were not adequate for the requirements of the larger shop. In the complete and instructive article on the subject by H. W. Jacobs, which appears in this issue, it is shown that the best method of using oxy-acetylene in railway shops is to have a central supply tank for the gases and pipe it under light pressure to the various shop departments where required. The proper proportions for the gas generators and storage are given, the various burners are described and the economy of the process is demonstrated by figures showing

actual costs. There are questions relating to fire risks in connection with the process and the advantage of its use in various kinds of work about railway shops to which it has not yet been generally applied. There are also the economic features of the cheapest method of obtaining the gases and of the construction of burners which consume the least gas for a given operation. These are questions which could be investigated with advantage by a committee of the Master Mechanics' Association and a careful reading of Mr. Jacobs' article will show how important this subject can be made to railways.

One of the charms of Major Hine's book, "Letters from An Old Railway Official to His Son, a Division Superintendent," is in its constant assumption that in all of the attractive successes which the father describes for the purpose of arousing enthusiasm in the mind of the son everything depends on the energy, ambition and wisdom of the son himself. The idea that success can be imported, or borrowed, or acquired in any way but by working for it with an ambitious and active mind is not only not thought of but is ignored so completely that the only fair conclusion is that the author assumes that the son himself never thought of it. That responsibility for failure can be thrown upon the company, or on a superior officer, or on uncontrollable circumstances is treated as equally unsupposable. We have received a copy of a letter, reprinted in part in the news section, which affords gratifying evidence that in real life old railway men write instructive letters to their sons. This is especially gratifying to one who, like the editor, hears of railway work mostly in only two features, the very good—the things to which the officers point with pride—and the very bad—the accidents, disasters, failures and injustices that come to public notice through courts or state commissions or newspaper grumblings. The everyday life of the rank and file comes to light only through the book of rules—a medium as cold as the right of way of the Hudson's Bay railway in February. But, as here suggested, the really efficient engineman is one who rises above the book of rules. With enough first-class men the book of rules could be abridged one-half. Lack of interest in his "profession," the first fault mentioned in our letter, is seen everywhere. The young runner who has a father that is acquainted with railway work and who can warn him to beware of this manifestation of the hook-worm disease is fortunate indeed. One who is not so fortunate will do well to try hard to elicit an interest in himself on the part of some other man's father. A father's advice has two great virtues or advantages—sincerity on the part of the giver and knowledge of its sincerity on the part of the recipient. Any superintendent who observes the widespread prevalence of the "lack of interest" here mentioned, and the commonness of the suspicion, among short-sighted enginemen, firemen and trainmen, that the superintendent, trainmaster and other superiors do not care much for the subordinates, must feel the necessity of doing anything and everything possible to induce young employees to find someone—whether father or some other competent person—to whose advice they will give the attention which good advice deserves. Our letter writer does well to call attention to the engineman to whom other enginemen look up. Such a man should be cultivated by the superintendent. This is not orthodox doctrine, we know; for the trainmaster *ought* to give all necessary instruction; but it is a condition, not a theory, which confronts us. Whenever all young firemen who are competent to be leaders among their fellows in the strife to accomplish the highest efficiency shall have been induced to fully exercise their untried abilities, an immense advance will have been made.

We like our writer's use of the term "business." One of the dictionary definitions of the word is "an occupation that requires energy, time and thought"; surely a justification of the aptness and accuracy of the use to which the word is here put. And the young runner can well make use of one of Herbert Spencer's "business principles," namely, Do not suppose things are going right till it is proved they are going wrong, but rather suppose they are going wrong till it is proved they are going right. When all our enginemen and signalmen get fully educated up to this standard of conduct collisions will have been well-nigh abolished. Moreover, it is quite possible that the process of education in this direction is not so difficult as it is often assumed to be; for our fatherly adviser assures his son that if he will ride on the engine with successful enginemen he will be able to discover the secret of their success. This suggests the query, Do superintendents generally do all that can and should be done to inculcate in all of their enginemen the knowledge and habits of the best ones? The art of engine running is a vital element in safe railroading, and yet one of its most delicate features, the habit of observing signals and of remembering the little-used rules is nowhere systematically and thoroughly taught. The firemen who is so fortunate as to fire a year or two for a runner who is good at conveying ideas to other people's minds learns his lesson in this respect under the most favorable circumstances possible; and if the fireman himself appreciates his responsibilities the result is usually good. But this training can hardly be called systematic or thorough. What superintendent takes pains to have all of his firemen work for a time with one of the best enginemen? What evidence has anyone that even his best runners do not omit some important teaching? In an efficient school a course of education so important as the fireman's would be deemed incomplete without some post-graduate training, or at least post-graduate examinations. Many a young engineman would be saved one or more humiliating failures if he could have his knowledge of his duties reviewed and corrected by a skilful examiner about six months after his promotion. Our American railways have thousands of skilful engine runners, but in the task of spreading this skill throughout the whole force of runners there is much yet to be accomplished.

THE RAILWAYS AND THE NATION.

The fundamental conception of the railway is a commercial one. Like a factory or a mercantile house it deals in a commodity, transportation. Like a large factory corporation it has a charter. It advertises its transportation as though it were goods; and like any large private corporation it has its wage and cognate problems to solve. But the secondary conception of the railway brings to light variants from the purely commercial idea and from the theory of exclusively private rights. The most important of those divergencies are the power of eminent domain and the acute relation in which the railway, as a public service corporation, stands to public necessity and convenience. It may be added that the relation referred to not only exists but is ever in sight. A great industrial trust may control a commodity essential to life but can, to a very large degree, mask itself behind the increased price of the commodity that it sells. It is in that case a kind of indirect and disguised taxation of the consumer. Not so the railway. Its taxation, if the metaphor may be continued, is direct and immediate. It comes straight from the pocket and jostles the sensitive dollar nerve. The railway passenger who endures placidly the increased price of a single important article of household consumption—albeit he now cries out against the rise of many articles—shrieks lustily against a half cent a mile added to the fare on a railway over which, perhaps, he travels not half a dozen times a year.

In our earlier and midway times this public feeling and its expression were localized and intermittent. They had to do with particular regions on particular railway lines and were spasmodic flashes rather than flame. Once, indeed,

they took on larger size and persistency. The so-called Granger anti-railway movement, which began in 1873 and in which the western prairies were described in lurid imagery as fired by the spark of the locomotive, was that historical and exceptional case. But it was not national and its run of life was short; of frenzy shorter still. What we are seeing now in vivid, not to say alarming contrast, is the old Granger movement revived on a national scale and with many and mazy complications; the railways drawn against their will into state and federal politics; railway capital, with its vast interest identified with the prosperity of the community, placed under a kind of legislative and administrative interdict; the old "big stick" at the federal capital wielded by new hands; and, under the sway of the political and partisan *motif*, demagogical instinct encouraged to look on the railway not only as legitimate prey but as an interest to be deprived of its natural weapons of logic and justice except as they may prevail in the courts. One finds, for one example out of many, the demand of a "business" organization that a certain old and conservative railway company reduce its dividend by 2 per cent.—a demand confusing ridiculously par and market values and which, if complied with, would reduce to probably 3 per cent. the average return of investors or inheritors of the stock during the last and present generations.

In looking for the causes which have thus delocalized the anti-railway sentiment and given it a national impulse, they divide into natural and artificial groups. Among the natural forces probably the foremost is the extensive consolidation of railway properties plus greater centrality of ownership or control. As larger organizations the railways have come to touch larger and larger communities, reaching thus at last the people and the nation as a whole. The units of popular feeling have thus, so to speak, blended; and it must be conceded as another "natural" influence that, in making them unite, the abuses disclosed a few years back, not only in railway but other corporations, were powerful agencies. The trouble has not, however, been so much with railway centrality, which, on the whole, has been benign, nor with certain abuses which were malign, as with the artificial stimulants of the anti-railway sentiment. A big and complex railway situation could have been slowly but steadily readjusted, and that, too, along the lines of government "regulation," by conservative methods. Instead of that, politics have been allowed their play and say, and economic prudence has gone down under the theorem of vote-getting. And federal authority, in moving on the path of its predecessor, swallows not only economic wisdom but its own words.

But, in the lookout ahead, it is not all cloud. If, for the moment, the feeling against the railway seems on a national scale, the inevitable reaction is sure to be of like magnitude. The path to basic equity through the courts is too apt to be long and sinuous, but the key-word "reasonable" is still to be found in the judicial vocabulary as applied to railway profits. And finally, but not least, a nation but lately emerged from the grim realities of industrial and financial loss is hardly eager to challenge their hardships anew.

FEDERAL BOILER INSPECTION.

When the locomotive boiler inspection bill, fathered by the New York Public Service Commission, Second district, was under consideration, attention was directed in these columns to the fact that, as interpreted by the commission, it contained no requirement that could work any real hardship to the railways. Its provisions, as it was passed, were from the regulations in force on a majority of roads. It simply endorsed them and required them to be lived up to. The same is true of the provisions of the Pennsylvania law. In neither instance does the state interfere unduly. A small corps of inspectors keeps a general oversight, but the real work of keeping boilers in good condition is done by the usual force of boiler makers, inspectors and engineers of the railways. Their word, attested before a notary, who is a railway employee, is accepted as evidence that the work is done. The three months' inspection limit is interpreted to mean washing out and staybolt inspection. The only annoyance experienced by the railways is that occasionally it would be convenient to postpone the inspection for a few days beyond the time limit. To avoid complications this is not done, and the work is carried on quietly and systematically.

No one familiar with the facts felt there was any need for such a law, as it is well known that railway boiler inspection is the best boiler inspection in the world, and a real explosion, due to neglect to make repairs or to defective workmanship, is almost unknown. But the enactment of these laws pleased the politicians, who thought they were doing something great, and also the labor leaders, who could direct the attention of their supporters to them as legislation secured nominally in their behalf; it was of inestimable value to the few lucky ones who were fortunate enough to secure jobs as inspectors, which meant an easy livelihood, and it hurt no one but the taxpayers who paid the bills.

An attempt is being made to get a measure of an entirely different nature, but intended ostensibly for the same purpose, through Congress. Several bills have been drawn, but have met with so much opposition that no action has been taken on them. In our issue of June 11, 1909, there was a communication from a superintendent of motive power, in which attention was called to the glaring defects of the bill then pending. It was shown that it betrayed every evidence of having been drawn by someone who was quite unfamiliar with locomotive construction and unable to put down in language intelligible to an engineer what was to be done or avoided. The bill was so decidedly defective that it was withdrawn and another, No. S 6702, has been substituted. A railway officer, who spoke at one of the committee hearings in Washington, said:

> "The bill differs from the former one only in the fact that some organization is provided for, and a method of partial appeal from the decision of the inspector is mentioned. The bill contains nothing which, if it should become a law, would add to the safety of operation of locomotives, as it in no way covers the most frequent cause of locomotive boiler accidents, namely, low water."

If the bill now pending becomes a law it will put into the hands of a department of the government the direct supervision and control of the locomotive boiler inspection of the country. It gives to government inspectors full power to act, but does not hamper them with the least responsibility for the proper condition of boilers. It puts in the hands of the inspector, who must have had five years' experience as a practical boilermaker, the authority to decide on the efficiency of the design, the character of the workmanship and the strength of a boiler, old or new. It sets this man just out of his apprenticeship over the skilled designers of the railways and the locomotive builders, who have spent their lives at the work, and over the equally skilled boiler makers, on whom dependence is placed for proper construction. The absurdity of the proposition is apparent.

At first blush it would seem quite safe to grant this authority on the ground that a man so ignorant and unskilled as the proposed inspectors are apt to be would hardly dare to pit his judgment against that of those by whom a boiler was designed and built. Ordinarily this might hold. But in the hands of an inspector who "had it in," for a certain railway, the authority it is proposed to give would be a weapon of sufficient power to condemn every locomotive on the road and tie up the whole of the traffic. That there is danger of such a proceeding there can be no doubt, especially if a strike were to be threatened by an organization with which the inspector was affiliated.

Even in the hearings before the committee this spirit of vindictiveness was not only manifest, but rampant. Those

who spoke the longest, and probably the loudest, in support of the measure were men who had been going from position to position, never remaining long anywhere, and being everywhere discredited because their work was unsatisfactory. Angered because of repeated requests to quit, they gave testimony before the committee that reeked with the venom that they felt, but which would not have been admitted by any court in Christendom. And, even under the mild questioning (it could not, by any stretch of the imagination, be called cross-examination), to which they were subjected by the committee, their testimony fell to pieces. They betrayed that what they said was but the utterances of men who were venting their malice on the companies that had declined to retain them in their employment.

The committee and the promoters of the bill seemed more inclined to give attention and weight to this testimony, which was merely an arraignment of two roads for alleged neglect, than to listen to the careful analysis of the bill that had been prepared by its opponents, who showed just what its effects would be and how utterly incapable of thorough enforcement it would be. It was shown that under present conditions the inspection of boilers is a continuous performance. At the end of every run, during the run, at the regular periods of washing out and repairing, the boiler is inspected by men who are experts, each in his own line, and there is a constant stream of reports telling the responsible officers of the condition of every boiler on the road. And long before a locomotive boiler becomes in a dangerous condition from any cause except low water it becomes in a condition unsuitable for service. Long before there would be any danger in using the locomotive there are things happening which would make it uneconomical to run it; and repairs are made immediately.

To duplicate this work the bill proposes that the government shall provide itself with 300 inspectors, and that these 300 men of more or less competency shall personally inspect and certify as to the condition of every locomotive boiler in the United States. Could anything be more farcical, when single systems find it necessary to employ from 80 to 100 men to meet their own requirements?

The worthlessness of such a scheme of inspection is evident. Not only would it be worthless, but it would stand as a positive menace to the safety of the public and the employees that it is intended to protect. For though no responsibility rests on the government inspector, railway inspectors cannot fail to rely on him and will inevitably slur their work because of the inspector's certificate in the cab—a certificate that would not be of any real value because, though the powers given to inspectors are ample, there is nothing in the bill to provide that any man in the corps, from the inspector-general down, shall be competent to design a locomotive boiler, or even calculate its probable strength.

The principal objections, then, to the bill, as it stands, are that the governmental inspection will be too superficial to be of value; that it will tend to the deterioration of the railway inspection; that it gives no assurance that competent men will be employed as inspectors; that it will hamper the use of the locomotives and delay their preparation for service; that the reports of the inspectors will be too voluminous to receive attention, and that the proposed legislation is needless because more than 98 per cent. of locomotive boiler failures are due to a cause over which no law can have any control—low water. If legislation could be enacted which would prevent an engine driver from falling into one of those inexplicable lapses that allow the water to get low it would be worth while.

There seems to be little doubt that a boiler inspection bill will be passed. Furthermore, it is not at all probable that, if one were drawn that simply provided for such supervision as is required by the Pennsylvania and New York laws, there would be any opposition on the part of the railways. They do not object to supervision, but arbitrary interference is something of such a different character that, in self-defense, they are obliged to fight it. So the recommendation made by one of the opponents of the bill, that the best way in which to amend the present one is to throw it in the waste basket and start afresh with a clean sheet of paper, is to be indorsed. And if this is done it is also suggested that it would be quite the proper thing to call in an engineer or two, who have some knowledge of locomotive boiler construction and maintenance, and who can so guide the pen of the writer of the bill that his language will be understandable and not filled with the indefiniteness that characterizes the present bill. Then, instead of saddling the country with a useless expense of a million dollars a year, as proposed, let the actual inspection be done as at present, and the government confine its energies to supervision and regulation, and not attempt to duplicate work that is now done far more expeditiously and efficiently than any government bureau can hope to equal for a long time to come.

NEW BOOKS.

The Field Practice of Railway Location. By Willard Beahan, B.C.E., Division Engineer, Chicago & North Western. The Engineering News Publishing Co., New York. Second edition, revised and enlarged. Cloth; 6 in. x 9 in.; 260 pages; illustrated. Price, $3.00.

The first edition of this book was reviewed in the *Railroad Gazette* of March 10, 1905. This second edition is issued in response to a steady demand; the author has corrected all discovered errors, made some rearrangement and added some new matter. His style is vigorous and colloquial, his statements being in consequence emphatic; at times they are dogmatic. As was said in our review of the earlier edition: "The book will be interesting reading to locating engineers, and valuable and suggestive to all young men employed in railway field work."

Handbook of Cost Data for Contractors and Engineers. Second edition. By Halbert P. Gillette, Managing Editor *Engineering-Contracting.* The Myron C. Clark Publishing Co., Chicago and New York. Leather; 4¾ in. x 7 in.; 1854 + xxiv pages; illustrated. Price, $5.00.

Five years ago the first edition of this book appeared and became an indispensable reference for estimators. It has been enlarged in this second edition fourfold, or, as the author states in the preface: "The first edition of this work contained the equivalent of about 250,000 words, while this edition contains more than a million." The additional matter is cost data, nearly all of which has been published within the past five years in leading technical periodicals and in technical society proceedings. The type is somewhat smaller than that used in the first edition, so the number of pages has been increased only threefold.

The author states that much of the new matter was added for the benefit of engineers; the book having been originally compiled for contractors. After 113 pages treating on the principles of engineering economies and cost keeping, the following items are taken up: Earth excavation, 52 pages; rock excavation, quarrying and crushing, 87 pages; roads, pavements and walks, 317 pages; stone masonry, 55 pages; concrete and reinforced concrete construction, 111 pages; water works, 161 pages; sewers, 143 pages; timber-work, 114 pages; buildings, 109 pages; railways, 293 pages; bridges and culverts, 246 pages; steel and iron construction, 28 pages; engineering and surveys, 34 pages; miscellaneous cost data, 62 pages.

The work is a compilation of cost data and not a treatise on costs, the author having added merely enough original matter to assist in avoiding mistakes in using the data. The distinction between "price," the cost to the owner, and "cost," the cost to the contractor, is consistently adhered to. The author was a practicing engineer and contractor for nearly 20 years before he prepared the first edition, so the reader may feel that the book is not the work of an office man.

AUTOGENOUS WELDING IN A RAILWAY SHOP.

BY H. W. JACOBS.
Assistant Superintendent Motive Power, A., T. & S. F.

The oxy-acetylene method of autogenous welding of metals has been in use in this country, to a very limited extent, for a number of years. The feasibility of welding steel or iron by this method has been fully demonstrated, and although the possibilities of the oxy-acetylene process are very great, railways have been slow to take advantage of the savings to be made by this method. The reason is that the apparatus now on the market is very expensive and too small for railway needs. Most of the plants are unable to run over five hours with two burners without stopping to recharge.

The application to a large shop seems to have been lost sight of by the manufacturers of oxygen and acetylene, and it has been left to the railways and large manufacturing companies to develop the details themselves. Preliminary investigations covering several years were made by a western railway, and they became convinced that the oxy-acetylene process of welding metals would be both practical and economical to use in railway repair shops. It was discovered that there was but little expert knowledge that could be obtained and the development was carried on by shop employees.

Portable plants were considered undesirable, as each one would require expert attention and would necessarily be intermittent in their action, due to the charging of the gas tanks. It is necessary to purchase the oxygen in drums from a manufacturing company and as it often comes from a great distance delays in shipment of the drums would result in the entire stoppage of the welding plant. The oxygen is kept at a very high pressure, often as high as 1,800 lbs. per square inch, which would mean great difficulty in keeping the joints tight and consequent loss from leakage, as well as danger from ex-



Fig. 1—Hose Connections from Pipe Line to the Burner.



Fig. 2—Burner for Work in a Horizontal Position.

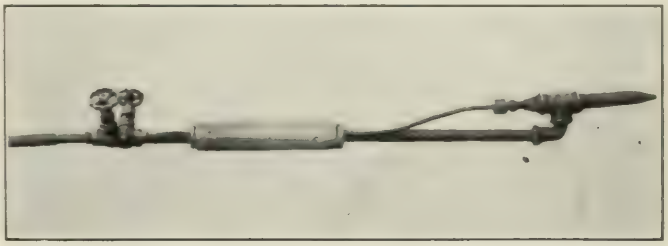


Fig. 3—Burner for Work in a Vertical Position.

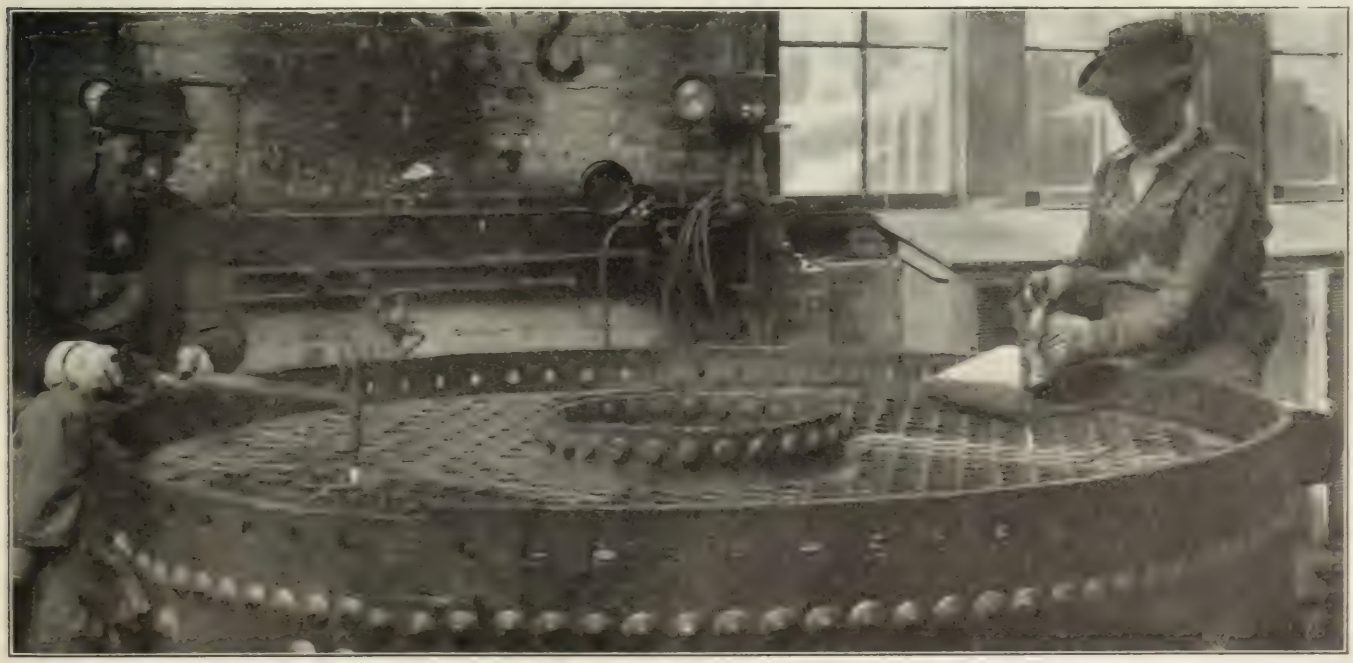


Fig. 4—Welding Tubes in a Jacobs Superheater by the Oxy-Acetylene Process.

plosions. Taking everything into consideration, it was decided to build a central plant and equipment has been installed at one shop consisting of a stationary central generating plant, the oxygen and acetylene being distributed among the different shops through pipe lines.

Oxygen and Acetylene.—The oxygen is generated from calcium oxy-chloride, iron sulphate and copper sulphate, as it was found that this was cheaper than the usual chlorate of potash method and could be done with much less complicated apparatus. The oxygen passes into an ordinary gasometer where it is stored until drawn out by the compressor. Storage tanks are provided and are so arranged that any one of them may be charged or discharged independently. A pressure of from 60 to 70 lbs. per square inch is maintained in the storage tanks while the plant is in operation. This pressure is reduced to 20 lbs. as the oxygen leaves the storage tanks, in order to minimize the loss due to leakage. A separate pipe line, carrying the full storage tank pressure, is run to take care of the burner when used for the cutting process. The acetylene is generated by an automatic water-to-carbide feed generator designed by employees of the railway. A pressure of 2½ lbs. is maintained in the acetylene pipe line.

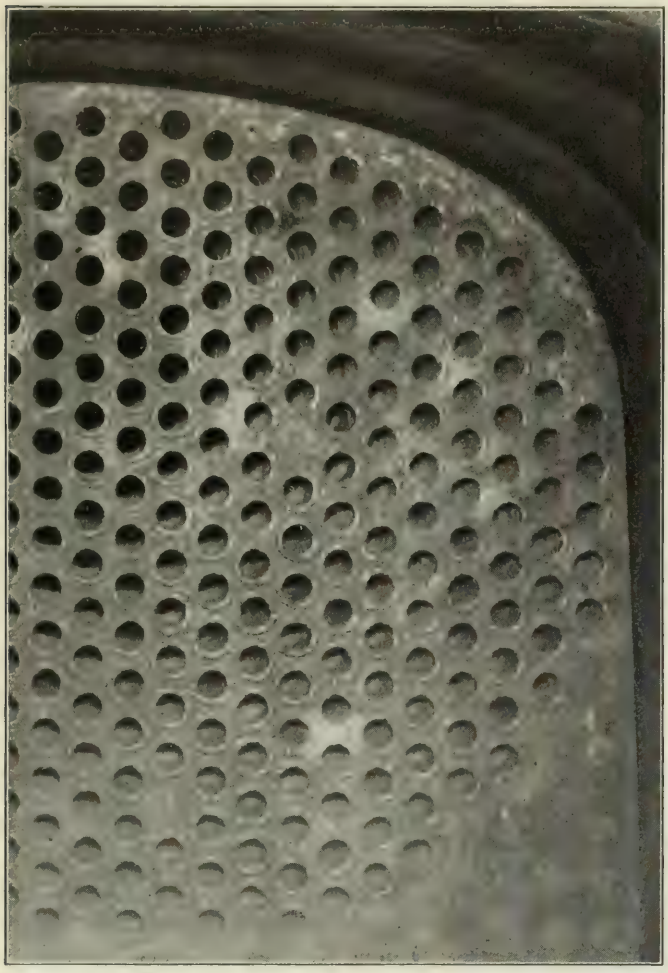


Fig. 5—Boiler Tubes Welded in Flue Sheet of Jacobs-Shupert Firebox.

Advantages of This System.—This system of generating oxygen and acetylene gives a constant supply of the gases at a constant and at the same time a minimum pressure. The great advantage is that there are no interruptions in the pressure due to shutting down the plant when a fresh charge is put in. It is also unnecessary to buy and maintain expensive high pressure receivers and fittings. There are no fluctuations due to recharging, as the plant is absolutely continuous in its operation. A sufficient stock of the necessary ingredients can be kept on hand to cover any emergency so that there is no danger of the stoppage of the plant which might result if the gases were purchased from a manufacturing company.

Shop Plant.—The plant above referred to generates about 2,000 cu. ft. of oxygen per 10-hour day, at a cost of 2 cents per cu. ft. This is less than one-half the cost if purchased in drums from a manufacturing company. This supply is sufficient to operate four burners, which makes the cost 98 cents per burner per hour, including material, labor and the expense of compressing the gas. The cost of the acetylene is 13 cents per burner per hour, thus making the total cost of the gases $1.11 per burner per hour.

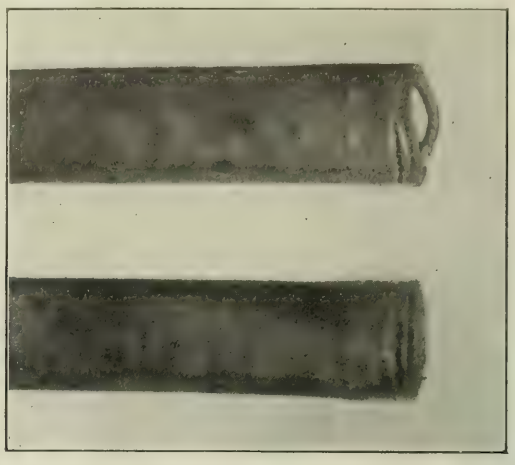


Fig. 6—Rolled and Beaded Boiler Tubes Pulled from Sheet.

The burner or blow pipe is connected by means of rubber tubes to the oxygen and acetylene pipe lines, as shown in Fig. 1. Between the opening in the oxygen pipe line and the rubber tube which connects with the oxygen pipe of the burner or blowpipe, is placed a pressure reducing valve by means of which the blowpipe operator can readily vary the pressure of oxygen in the burner, and which, when once adjusted to deliver gas at any desired pressure, will automatically maintain that pressure in the discharge line regardless of variations in the pipe line pressure. A pressure of about 10 lbs. has been found to give the best results in the burner.

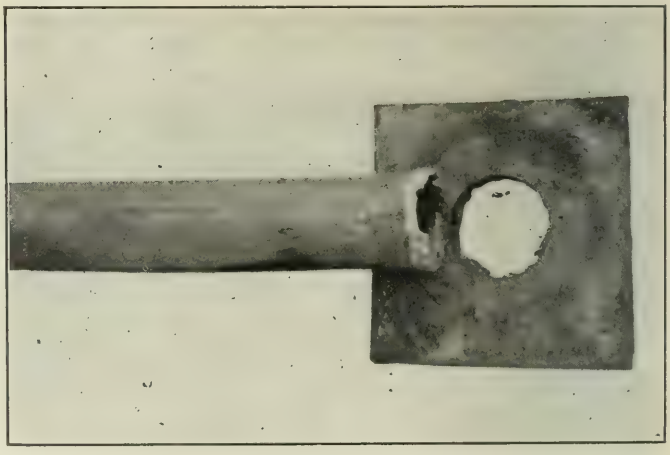


Fig. 7—Welded Tube Pulled from Sheet.

Burners.—There are two general styles of burners used in connection with the oxy-acetylene welding process, one, as shown in Fig. 2, for work in a horizontal position, and the other, as shown in Fig. 3, for work in a vertical position. The burner receives the acetylene gas from the main pipe line through a combined flash back trap and water column

pressure indicator. The flash back trap operates in such a way as to prevent the oxygen from backing up into the



Fig. 8—Defective Part of Sheet Removed and Patch Fitted in Place.

acetylene line, or any pressure in excess of 3 lbs. from accumulating in any part of the acetylene system.

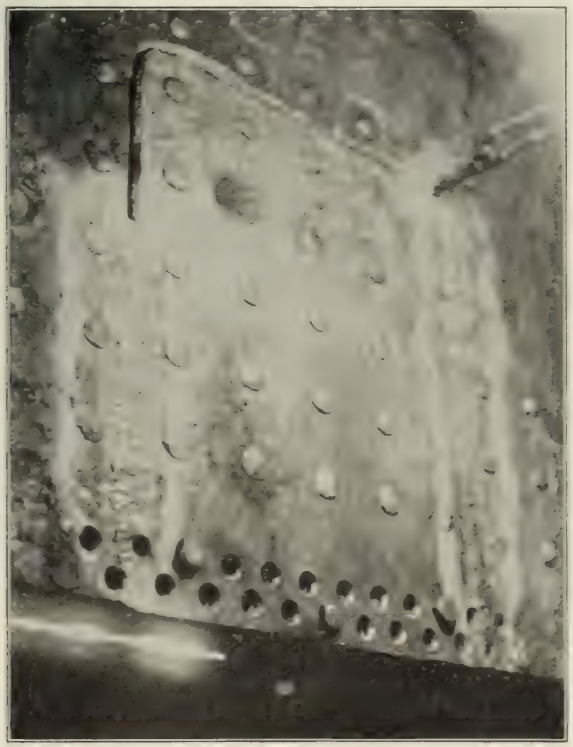


Fig. 9—Patch Partially Welded, Showing Burner in Operation.

Development of the Oxy-Acetylene Method.—The oxy-acetylene method of welding is a trade in itself and can only be mastered by gradual development. This must be carried on in an intelligent and thorough manner, and in such a way that the workman can see and know the result of his work. It is impossible to see the water side of the weld in a firebox, and we must depend on the skill of the workman in making a perfect weld. To train the workmen so that they may know the result of their work, they are provided with test pieces which are welded together and then pulled

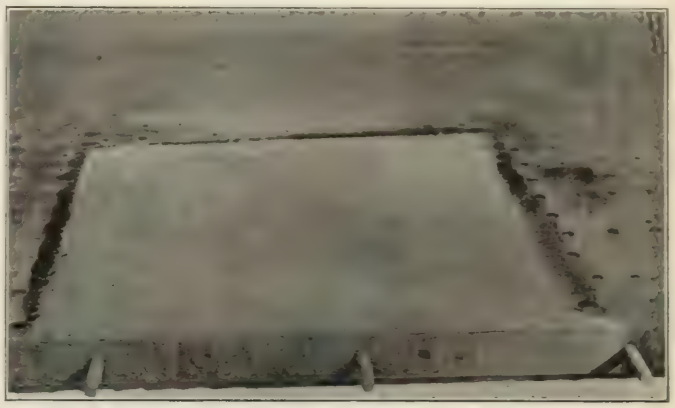


Fig. 10—Patch Welded in Firebox.

in a testing machine, which shows them the exact condition of the weld.

The oxy-acetylene process of welding is adapted to wide application in railway shops and its use is being extended every day. One of the first jobs performed at Topeka was the welding of tubes in a Jacobs superheater. This has proven so satisfactory that in the past year over 20,000 tube ends have been welded with excellent results. Fig. 4 shows the tubes



Fig. 11—Patch Welded on Outside of Firebox.

being welded in a superheater for a tandem compound locomotive. The butt joint in the wrapper sheet has also been welded. This was done before the joint was riveted.

Welding of Boiler Tubes.—Boiler flues have been welded in the flue sheet for a locomotive boiler with the Jacobs-Shupert firebox, as shown in Fig. 5. This is undoubtedly an innovation, but the excellent results obtained from welding superheater tubes have shown that it is not only entirely feasible for welding boiler tubes in the sheet, but will mean an immense saving in the course of a year in the repairs of flue leakages. The actual cost of removing, repairing and replacing 2-in. boiler flues by the usual method of rolling and

beading compared to the cost of welding flues by the oxy-acetylene process is as follows:

Operation	Per 100	
	Rolling and beading.	Oxy acetylene welding.
Remove complete	$2.640	$2.640
Clean	.105	.105
Cut for safe end	.525	.525
Cut to length	.315	.315
Spliced or scarfed	.335	.335
Weld (safe end)	.560	.560
Swedge	.210	.210
Anneal	.030	.030
Make safe ends	.210	.210
File holes	.100	.100
Apply copper ferrules	.430	....
Cost of copper ferrules	2.720	....
Measure for length	.220	.220
Apply and set	.890	.890
Expand, roll and bead	1.540	....
Roll and pin	....	.750
Oxy acetylene weld	....	4.500
Roll and shim front end	.600	.600
Test	.325	.325
Totals	$11.765	$12.325

The actual cost by the welding process is about 5 per cent.

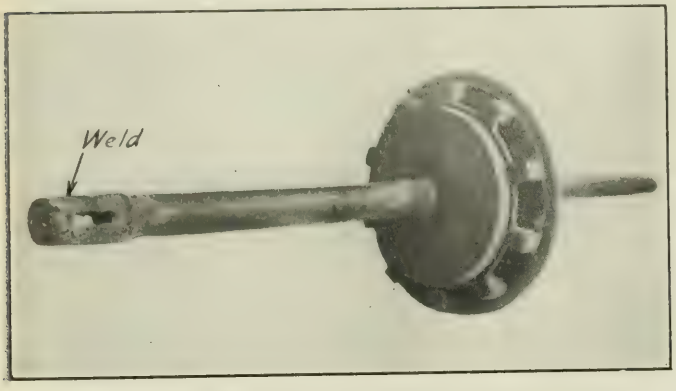


Fig. 12—Piston Rod Showing Metal Welded on End.

higher than by the usual method of rolling and expanding, but the life of the flues is extended almost indefinitely, or at least until they must be removed for some other cause than leaking at the flue sheet joint. The above cost is for welding when the flues are in a horizontal position. The welding cost is reduced about one-half when the flues are placed in a vertical position, such as welding the superheater tubes as shown in Fig. 4. Sample flues were welded into the sheet and pulled in a testing machine and compared with the usual method of

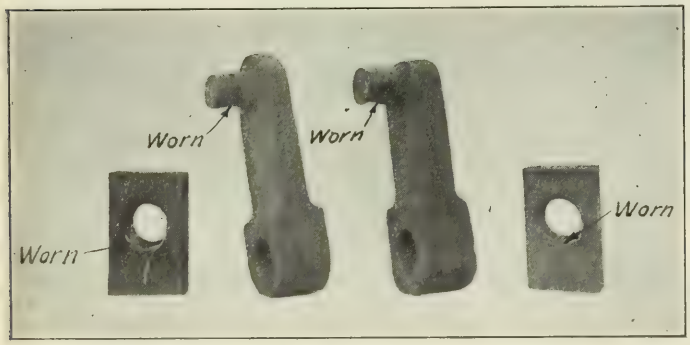


Fig. 13—Trailer Truck Hangers as Removed from Locomotive.

rolling and beading. The results of these tests are shown in Figs. 6 and 7. The welded flues offered an average resistance during the test of 34,330 lbs. as compared to 30,980 lbs. for the rolled and beaded flues, or 10.8 per cent. in favor of the welded flues. The photograph of the welded flue, Fig. 7, shows the weld was stronger than the flue, as the metal was ruptured and part of it left in the sheet.

In welding some parts it is advisable to pre-heat the metal in an ordinary forge, or with an oil burner. With a view of reducing the cost of welding flues this was tried, but it was found that it so distorted the flue sheet that nothing was gained by the practice and it was discontinued.

Firebox Welding.—This method has been successfully used in repairing locomotive fireboxes by welding in patches when it was impossible to repair the firebox in any other way. This has been done repeatedly, when it would otherwise have been necessary to put in a new firebox. Fig. 8 shows a patch in place ready to be welded and Fig. 9 shows the same patch in the process of being welded. Fig. 10 shows a large patch in a wide firebox locomotive. This patch has been in service about nine months and has given no trouble whatever. Patches are easily welded on the outside of fireboxes, as shown in Fig. 11. It is estimated that a saving in firebox renewals for a year will amount to over $35,000 in a shop which repairs locomotives at the rate of 30 per month.

The following tabulated statement shows a few examples of

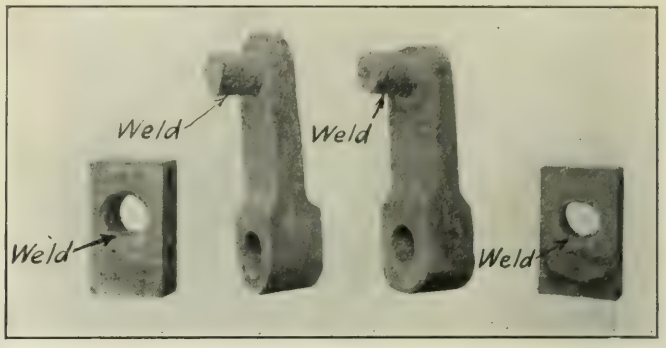


Fig. 14—Hangers Shown in Fig. 13 with Metal Welded On.

the savings that have been effected in fireboxes by the welding on of patches:

Eng. No.	Operation.	Cost Repair	Cost New part
1087	Crack 18 in. long in door sheet and several cracks in flue sheet welded	$18.00	.....
	Door sheet and flue sheet saved	.....	$172.00
1108	Patch 15 x 15 on right side sheet, " 12 x 22 on right side sheet, " 12 x 14 on fire door sheet, " 12 x 18 on fire door sheet	75.00	.....
	Engine needed new firebox	.....	800.00
2264	Patch 12 in. high around entire firebox above mud ring	90.00	.....
	Engine needed new firebox	.....	450.00
169	Patch 26 x 24 in. on right side sheet, mud ring corners patched, several other small cracks on various parts of firebox	70.00	.....
	Engine needed new firebox	.....	470.00
604	Patch 12 x 14 in. on both fire doors, several patches on side sheets, and mud ring corners patched	65.00	.....
	Engine needed new firebox	.....	700.00
345	Two patches 24 x 48 in. on side sheets and several small cracks welded	80.00	.....
	Engine needed new firebox	.....	530.00

Miscellaneous Welding.—Locomotive parts are welded and

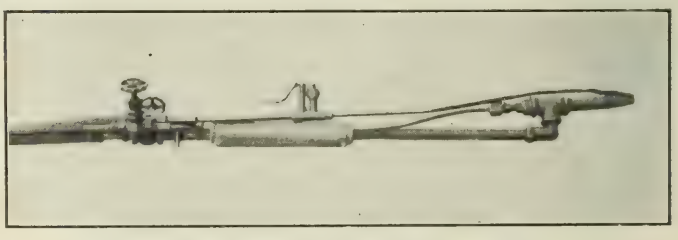


Fig. 15—Burner Used in Cutting.

saved at a trifling expense and made as good as new, when it would be impossible to repair the old part in any other way. The list of such parts is a long one, but a few of the more important ones are rocker arms, side rods, links, frame braces, eccentric blades, crossheads, piston rods, trailer hangers, valve stems, reverse lever quadrants, etc.

Fig. 12 shows a piston rod for a tandem compound locomotive that has had metal welded around the end which fits into the crosshead. This had become worn so that the rod

could no longer be used. In this case the rod was put in a forge and preheated before the oxy-acetylene torch was applied. After about ⅛ in. of stock had been added on, the rod was turned to fit the crosshead without disturbing the location of the key-way, and the crosshead was put on as it was originally. The actual costs are as follows:

Labor welding on metal	$0.38
Oxygen and acetylene	1.67
Labor turning taper	0.20
Total	$2.25

The cost of a new rod is $15, which leaves a saving of $12.75 by the expenditure of $2.25.

Trailer truck bolster hangers are removed on account of the pins becoming badly worn, as shown in Fig. 13. It would cost nearly as much to repair them in the blacksmith shop as it would to make new ones, and after they were repaired in this way, they would require as much machining as new hangers. The metal that has been worn away on the pin or in the block is replaced by the oxy-acetylene torch, as shown by Fig. 14, and the cost of machining is small because the original centers are preserved.

Cutting Burner.—A special burner, Fig. 15, is used in the

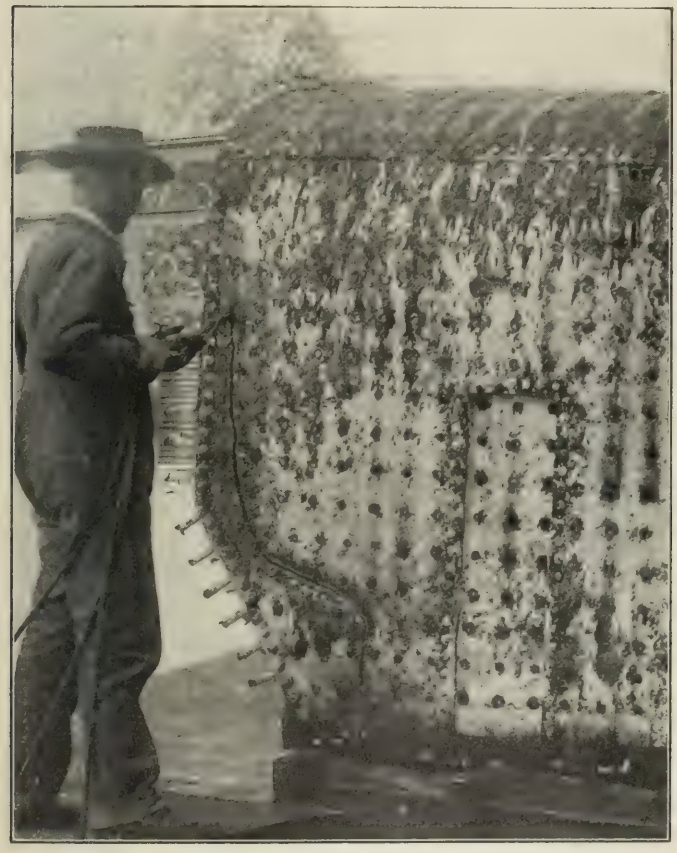


Fig. 16—Oxy-Acetylene Torch Cutting Up Scrap Firebox.

cutting process and consists of the usual burner with an additional oxygen pipe placed alongside. The tip of the pipe is pointed so as to direct the flow of oxygen toward the hottest part of the flame. The metal to be cut is first heated to the melting point by the regular burner, then the additional oxygen is turned on by pressing the spring valve.

Scrap fireboxes are considered practically worthless unless they are cut up in sheets that can be put under the shears. The cost of handling and shipping fireboxes is about as much as they will bring when sold. The oxy-acetylene process has proved to be a money saver in cutting up fireboxes into sheets. An illustration of this method is shown in Fig. 16. The price of scrap steel in uncut fireboxes is $6.05 per ton, and the same firebox cut into sheets would bring $10.75 per ton, a difference of $4.70. The firebox shown in Fig. 16 weighs about two tons and the saving would therefore amount to $9.40 if it were cut up into sheets. The entire cost of cutting by the oxy-acetylene process would amount to about $3.50. The saving thus made is exclusive of the cost of handling and shipping.

Car Truck Repairs.—The use of the oxy-acetylene process has been confined entirely to the locomotive shop, with the exception of repairs to truck bolsters, which are collected and brought to the boiler shop where the necessary repairs are made. Often small cracks appear in the steel castings which, if allowed to spread, would soon cause a rupture. An illustration of a truck bolster that has been repaired and saved is shown in Fig. 17.

The bolster cost new	$21.70
Cost of welding	1.50
Saving	$20.20

Comparative Tests of Electric and Oxy-Acetylene Welds.—Tests were made of electric and oxy-acetylene welds to show the comparative strength. The electrically welded bars came from a locomotive manufacturing company, and the oxy-acetylene welds were made by the railway company. The results are as follows:

Description.	Electric.	Oxy-acetylene.
Size of bar	1¼ x ½ in.	1⅛ x ½ in.
Tensile strength, lbs. per sq. in.	37,600	48,100
Elongation in 4 in., per cent	2	4

These results show a decided advantage in favor of the oxy-acetylene process.

Conclusions.—The oxy-acetylene process of welding metals

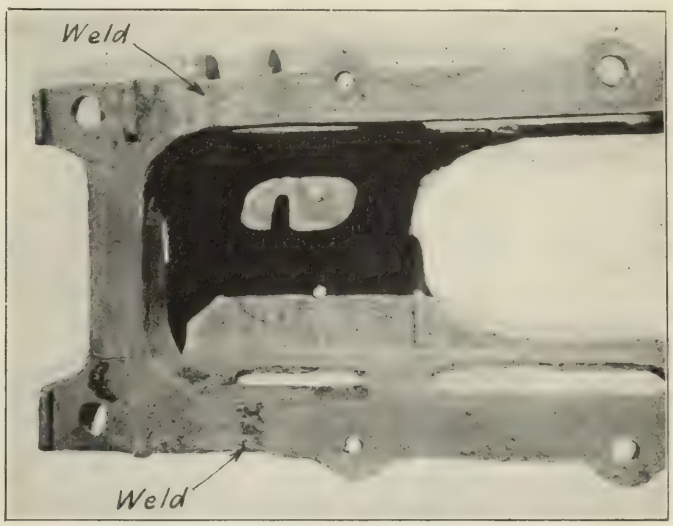


Fig. 17—Cracks Welded in Car Truck Bolster.

has now reached a practical stage of development and is worthy of a place in large manufacturing plants or railway shops. The equipment should be such that the gases are generated at a central plant and distributed in pipe lines to the various shops. A railway shop, overhauling 30 engines a month, should have a plant of sufficient size to generate 6,000 cu. ft. of oxygen per 10-hour day, which would be sufficient to operate 10 or 12 burners. If the oxygen was bought from a manufacturing company in drums containing 100 cu. ft. per drum, it would mean the handling of 60 drums a day, at a cost of more than double what it would cost in a central plant, aside from the inconvenience of handling so many drums.

There is no doubt but that a great saving can be made by the use of this process, and development should be along the lines of reducing the cost of manufacture of the gases for use in large central plants. The purpose of this article is to draw attention to the magnitude of the problem of autogenous welding. Some better and cheaper method of accomplishing the end herein referred to may be discovered, but the writer has no knowledge of anything superior to the process presented, and hopes that its study will result in the invention of improvements in the apparatus and methods suggested.

CURVE EASEMENTS; PRESENT PRACTICE.

The engineers of 56 of the more important railways have replied to questions concerning easement approaches accurately located with an instrument. These replies are fairly indicative of the progress made, inasmuch as the selections of those invited to answer were made somewhat geographically, the important roads in the East, West and South. On 20 railways easement approaches to circular curves have been put in all main line track, as well as on branches where the speeds justify it. On 9 railways more than 75 per cent. of the curves have been eased and the work is in progress. On 22 railways more or less has been done and the work is progressing. Only 5 railways report that they have not put in easement approaches on main line. On some railways the work has been done with unusual thoroughness. For example, on the Lake Shore & Michigan Southern all curves down to 20 minutes have been eased. Major Handy and Mr. Rockwell have had strong opinions on this subject and their refinement seems to be justified, for we will hazard the opinion, subject to everybody's correction, that the Lake Shore has for fast trains the easiest riding track in the world. Few railways, however, put in easement approaches for curves of one degree or less, and many, possibly the majority, limit easement approaches to curves of two degrees or more.

Comfort in riding, avoidance of swerving and unpleasant shocks to passengers, is given by most engineers as the basic reason for curve easements, but that the secondary considerations of economy in track maintenance and flange wear and some reduced drawbar pull have become important is shown by reports of curve easements on tracks reserved for freight only. The necessity for the interference of the engineer in this matter is clearly expressed by Samuel B. Fisher, chief engineer of the Missouri, Kansas & Texas.

"One of the conclusions I came to early in my engineering experience in relining curves on the Pittsburgh, Fort Wayne & Chicago was, that all curves under traffic and adjustment by the section men acquire an easement curve. But the practice of working in the easement curve by lining bars under the eye of the section boss must of necessity increase the degree of curvature near the ends of the curves." That is to say, it is the inevitable tendency of the sectionman wherever he finds the rail is receiving undue wear or strain to move the rail out, with the result that he is liable to make the approach to a curve sharper than the main curve. The spiral approach with accurately located center stakes accomplishes the reverse of this, beginning with a curve of low degree, gradually deflecting the trucks and getting the superelevation reasonably in proportion to the outward thrust.

ENGINEERING COST.

The engineering and labor cost of putting in easement approaches to circular curves in the original construction of a railway is so inconsiderable that it might be ignored altogether. But there are only a few railways in this country built originally, designed and fully prepared for heavy high-speed service. The problem of the last dozen or more years in realinement of curves on existing lines has been to adapt them to safer and more comfortable high-speed service, and this both by a reduction in the degree of curvature and in refining the approaches. The methods of setting center stakes for these approaches have varied considerably, but nearly all of them have been based either on the Searles spiral, the Holbrook spiral, the Talbot spiral, the Hood easement or the Stevens six-cord spiral. The results do not vary much. They all secure easy riding and economies.

There is a chance for a good deal of ingenuity in locating the center stakes for an approach where either the width of the right-of-way, or track structures, put an economic limit to the new location. Nevertheless, the swiftness and accuracy with which a trained transitman can proceed in this job is surprising.

When Howard L. Ingersoll, now assistant to the general manager of the New York Central, was an assistant engineer, it fell to him to do a great amount of this work. In reply to the invitation to review his own experience and attempt to ascertain something like the unit cost of setting center stakes for easement approaches, Mr. Ingersoll says:

"The amount of curvature alinement that can be done by a party of, say, one transitman, two rodmen and a man to drive stakes, costing, including expenses, perhaps $12 per diem, can do in a day is variable. A good deal depends upon the curvature and the adjacent topography. Quite a little depends upon the average amount of central angle embraced by the curve. A good deal depends upon whether it is single or double-track railway.

"Possibly such a party ought to set center line stakes accurately, for about two miles of curvature in a day, under average conditions, decreasing to perhaps a mile a day, with more arduous conditions, with sharper curves, etc.

"Suppose you assume that such a party ought to center-stake and apply easements to 100 degrees of curvature in a day, the stakes to be 50 ft. apart for curves of less than 3 degrees, and, say, 25 ft. apart for the sharper curves. One-third of the expense would be due to the application of the easements, which would give you cost of about four cents per degree of curvature for center-staking a transition curve."

COMFORT IN RIDING.

"Do you find the comfort in riding in trains increased by curve easements?"

The answers are uniformly "Yes," and rarely go beyond a positive statement of the fact, although one officer adds a significant statement: "Curve easement adds decidedly to the comfort of riding in trains and is particularly noticeable in the high-speed trains. Where curves have been eased we find that the superintendents and other operating officers desire to have other curves so treated, as they quickly notice the difference in entering and leaving curves." J. L. Campbell, engineer M. of W. of the El Paso & Southwestern: "We find that the comfort of riding is very much enhanced by the easement, which passes the train from the tangent to the curve with practically perfect smoothness of motion at all ordinary speeds. On our standard tracks, and on curves not exceeding three degrees, passengers do not detect the passage from tangent to curve at scheduled speeds, unless something besides the motion of the train attracts their attention."

REDUCED COST OF MAINTENANCE.

"Do you find by experience that accurately located easements cost more or less for maintenance and rail and flange wear than simple curves?"

Of course, no records have probably ever been kept on any railway to indicate a statistical answer. The answers given are, however, unanimous as expressions of opinion that it costs less to maintain an accurately eased curve than it costs to maintain a circular curve connected directly to a tangent and eased by rule of the thumb, as is customary among track maintenance men. For example, on the Canadian Pacific, where all curves of over one degree on the main line have accurately located spiral approaches, Mr. Schwitzer, assistant chief engineer, writes positively: "We find that accurately located easement curves cost less for maintenance and are easier on flange wear than curves which have not been spiraled." This is a typical reply, nevertheless quotations from a few others throw some additional light on the subject.

W. C. Cushing, chief engineer of maintenance of way, Pennsylvania lines West, gives a brief, valid reason for his belief: "We think that curves so lined cost less for maintenance, and less rail and flange wear, because the equipment rides more easily around them."

J. B. Berry, chief engineer of the Chicago, Rock Island & Pacific: "Experiences show that the outside rail continued into the tangent shows nearly as great a wear for considerable distances as on the main curve, particularly at the leaving end of curves. On track which carries traffic only in one direction this wear on the tangent run-off at the leaving end is very

noticeable and is due to the trucks not straightening up for some distance. There is less labor in maintaining alinement and surface at the beginning of curves that are eased than the simple curves, owing to the change of direction of leading trucks being made gradually and not concentrating the side thrust, due to changing direction of truck within a few feet."

W. D. Williams, chief engineer of the Cincinnati Northern: "All our curves have easement approaches. A main line curve without an easement properly located is a very bad thing. We have permanent monuments established at P. S. and P. C. C."

J. T. Taffany, division engineer of the Erie Railroad: "Spiral curves made mathematically accurate show a decided decrease in cost of maintenance and rail and flange wear."

A. T. Hardin, assistant general manager of the New York Central: "Easement curves cost somewhat less for maintenance, as it is easier to keep the track in proper surface and line."

E. H. McHenry, vice-president of the New York, New Haven & Hartford: "The cost of maintenance is less on account of the elimination of the tendency to throw track out of line at the point on the outer rail where the flanges first take the curve. With simple circular curves on which the superelevation is run out on the tangent all flanges seek the lower rail and upon entering the curve must change to the outer rail, resulting in impacts."

E. G. Tilton, chief engineer of the San Pedro, Los Angeles & Salt Lake: "The less shock the equipment is subjected to, the less wear and tear, consequently less cost of maintenance and rail and flange where rail easement is applied."

A. O. Cunningham, chief engineer of the Wabash: "The easements maintained to properly located points cost less for maintenance, due to uniform wearing of the rail. Where the curve is allowed to become out of line the first two or three of the outer rails at each end of the curve become flange-worn and have to be relaid."

LIMITING RATE OF SUPERELEVATION.

"Have you any limiting rate of change in superelevation of the outer rails for trains at full speed? This question is asked in view of the difficulties that occasionally arise when adhering to the old rule of ¼ in. to rail length."

This old and quite common rule has been in general use where the superelevation has been attained on the tangent and where no spiral intervened. Putting in an easement approach involves a change in the location of the center stakes. The length of the spiral is often limited by local conditions. It is limited also by the cost. The replies to this question indicate that on a spiral approach the elevation can be attained smoothly at fully twice as rapid a rate on a spiral as it can be comfortably attained on a tangent. Indeed, the rate of change seems to be no longer considered as a factor to be dealt with. There is something like unanimity in considering that the length of the spiral should be made 60 ft. for each degree of curvature to be dealt with, that is, a one-degree curve should have a 60-ft. spiral, a four-degree curve should have a 240-ft. spiral, and that the superelevation of the outer rail should be fully attained on the spiral, also that track so treated for any degree of curvature avoids undue wear and affords quite as smooth riding as on the tangent at a speed to which the superelevation is adjusted.

There seems to be also an almost universal restriction of superelevation to six inches. As to the observance of this rule: The writer was riding with the engineer of a road famous for high speed and had just observed the rate was fully 60 miles an hour, when the engineer drew down the window-shades, and said: "Within a few minutes we will pass around a three-degree curve and I would like to have you try to indicate when we reach the curve or are passing through it. The superelevation is six inches and the speed limit 55 miles an hour. I have some reason to believe, but it is unofficial, that the supervisor has got up to seven inches and that the engineman likes to go around it fast." The writer was quite unable to locate the curve and the speed was certainly not decreased.

George H. Webb, chief engineer of the Michigan Central: "In staking out our easement curves, we give the easement the length that conditions permit, without too much expense in widening cuts and fills. Where possible, we use an easement of 150 ft. to the degree and in elevating the outer rail we divide this easement into four equal parts per degree and elevate the rail for each substation; that is, first 37½-ft. substation, ½in.; second, 1 in.; third, 1½ in., and the fourth, at 150 ft., 2 in. On our main line, where trains make maximum speed, we elevate 2 in. to the degree." This is somewhat different from the practice on other roads.

Mr. Morse, of the Atchison, makes three rates of change, depending upon the physical characteristics of the country: "In mountainous country we use a rate of change which gives 1 ft. elevation in 300 ft. In a country of comparatively heavy grade, but not mountainous, a rate of change which gives 1 ft. elevation in 450 ft. In plains country, where we have light grades, we use a rate of change which gives 1 ft. of elevation in 600 ft. This latter rate gives .6 of a foot elevation on a three-degree curve at 60 miles an hour reached in a distance of 356 ft., this being the length of the easement curve."

C. K. Lawrence, chief engineer of the Central of Georgia: "We have no limiting rate of change in superelevation; it depends upon the length of the easement. I prefer much quicker rise and fall than ¼ in. to the rail length, I believe at least ½ in. to the rail length makes better riding."

George H. Burgess, chief engineer, Delaware & Hudson, gets at it in a different way: "Theoretically, it is better to select the length of spirals so that the time in which a given superelevation is attained shall be the same for all curves and for all curves and for all maximum train speeds. In our practise, the length of the spiral depends on the speed to be maintained over the division in which the curve occurs."

J. M. Morrison, engineer of the Central Vermont: "For superelevation of the outer rails we use ½ in. to each rail when we have room enough."

M. L. Byers, chief engineer M. of W. of the Missouri Pacific: "We endeavor to make the length of the spiral 60 ft. per one degree of rate of curvature, although it is sometimes impossible to do this. The elevation run-off is entirely on the spiral, occupying its entire length."

This seems to be the general prevailing practice, or rather, what the engineers aim at, although Mr. Taffany, of the Erie, makes the following practical comment: "On new locations a direct proportion per degree could be decided on, but even then it would be difficult to follow it implicitly, owing to conditions encountered necessitating a change. On existing alinement the spiral should be adapted to accord with local conditions and to clear obstacles in order to secure a minimum expense in track changes. Spirals are so flexible that judicious selection, following only general rules, will ultimately result in an eased curve approach for fast trains at all locations."

INCREASE OF SAFE SPEED LIMIT.

"Do you find the limit of speed increased because of curve easements?"

This question was somewhat carelessly worded, in some cases misunderstood, and the replies vary largely between yes, no and doubtful. W. D. Taylor, chief engineer of the Chicago & Alton, answers categorically: "We do not find the limits of safe speed increased because of curve easements." G. J. Ray, chief engineer of the Delaware, Lackawanna & Western, answers quite as categorically: "We find that the limit of safe speed is greatly increased because of curve easements." In spite of these apparently opposing statements it well may be that these two highly capable engineers do not at all disagree in fact. Curves of two degrees or less are not liable to be a factor in speed limitation. The Alton has not very sharp curves. One may have considered only the changes

made in speed limit signs, due to easements, while the other looked at possibilities.

F. Merritt, chief engineer of the Gulf, Colorado & Santa Fe: "It is somewhat difficult to answer accurately, although we consider that a spiraled curve will admit of higher safe speed than one not spiraled. Of course, this refers to high degree curves rather than low. It probably would not affect the two-degree curve to any noticeable extent."

A. T. Hardin, assistant general manager of the New York Central: "An easement curve eliminates shocks, which otherwise occur at the point of curvature and is, therefore, a factor in speed, but it is not sufficient to attempt an exact statement of it."

Edward Laas, engineer of maintenance of way, Chicago, Milwaukee & St. Paul, makes a similar logical deduction: "It is natural to suppose there will be less tendency of cars or engines to jump the track when they are permitted to enter and leave curves gradually."

NARROW GAGE CARS ON RAILWAY CONSTRUCTION.

BY G. D. BROOKE,
Division Engineer, Baltimore & Ohio.

For ditching long cuts a narrow-gage car with long flat body has been found very valuable on the Baltimore & Ohio. Such a car is illustrated in Figures 1 and 2.

It is 12 ft. in length over all; has a maximum width of 3 ft. 2 in. and a height above rail of 2 ft. 3 in. The gage is 2 ft. The body is 1 ft. deep, 3 ft. wide and 9 ft. long, inside dimensions, giving a capacity of one cu. yd. This can be increased by two cu. yds., if the grade is heavy enough to make the car run freely with the additional load, by using fixed side boards and sliding the end boards which can be removed so as not to interfere with dumping. On account of the length of the car the underframe is necessarily strong. It is built up of 2-in. x 2-in. x ½-in. angles, riveted together, as shown in the illustrations. The arrangement of rollers and U-shaped end frames makes the car easy to dump, so that little time is



Loading Narrow Gage Car.

lost in unloading. When in the normal position the body is held in place by a pin passing through corresponding holes in the center guide straps and the U-shaped end frames.

The car is run on a track laid with short ties along the berm; or, if this is too narrow, with longer ties which extend across the ditch and have bearings at each end. Such a track laid with light rail—weighing about 20 lbs. to the yd.—can be rapidly laid and easily moved in sections with a work train. The car can be handled on ordinary grades by two or three men and can be used in narrow cuts without danger of fouling the main track.

A similar car with low, long body and of such a gage as to allow it to properly clear passing trains will be found useful in handling material in and out of long tunnels where the traffic is very heavy. The congestion at such points makes work-train service very uneconomical. A standard gage truck



Dumping Narrow Gage Car.

car cannot be set off the track in the tunnel with safety. The narrow gage car, operated on its track laid close to the tunnel wall, overcomes this difficulty, keeps the tunnel gang busy and makes practical decided reductions in the cost of tunnel maintenance.

RELINING COMPOUND CURVES.

BY W. H. WILMS,
Engineer Corps, Pennsylvania Lines.

A simple and unique method of relining compound curves was devised some years ago by W. R. Hillary, engineer of maintenance of way, Pennsylvania Lines West. This method is in use on many of the divisions of the Pennsylvania Lines West, and the writer has found it to be a very effective one. It is also valuable in making an investigation of the practicability of substituting simple curves for compound, and ascertaining the amount of track lining necessary without actually staking the curve.

In this method a traverse is run around the curve in the usual way, traverse points being taken at all bridges, road crossings and at all other points where the track throw is restricted within narrow limits.

A point is taken on one tangent in the center of the track, care being used that this point is actually on the tangent or tangent produced. Intermediate points are selected between this point and a point similarly taken on the terminal tangent.

The angles and chords between the traverse points are then accurately measured. All angles should be repeated at least three times, and chords should be measured to the nearest hundredth of a foot. The traverse points should not be taken so far apart as to make chaining between them difficult or inaccurate. In some cases it is convenient and sufficient to read the angles to two or more traverse points in advance of the instrument, measuring the corresponding chords. In such a case the instrument is set up at the extreme point in advance, and not at the intermediate points, a backsight being taken on the last instrument station.

After the chords and angles of the traverse are carefully measured, the latitude and departure, referred to the initial tangent as meridian, and first traverse point as origin, of each traverse point should be figured.

To figure the traverse, the following notation will be used; referring to Fig. 4:—

P = any traverse point in center of existing track.

$\triangle pp$ = central angle of curve up to point P.

C = distance from center of curve to traverse point P, measured radially.

Σsin_p = total departure of point P.

Σcos = total latitude of point P.

d = distance from initial traverse point A to $P.C.$

$P.S.$ = point of spiral.

$E.S.$ = end of spiral.

F = spiral offset.

x' = distance from $P.S.$ to $P.C.$, measured along tangent. (Taken from spiral tables.)

Referring to Fig. 1, consider the initial tangent to be the meridian of the survey, and the first traverse point A to be the origin.

Required, intersection angle and distances OA and OE. Intersection angle = sum of deflection angles = A-B-C-D-E.

Latitude of course $AB = AB \cos A = Ab$.

Departure of course $AB = AB \sin A = Bb$.

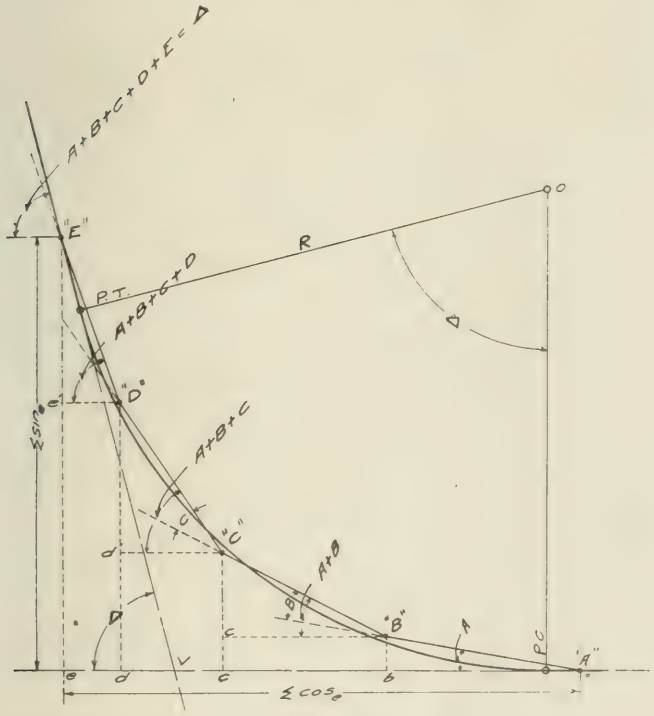


Fig. 1.

Latitude of course $BC = BC \cos (A+B) = Bc$.

Departure of course $BC = BC \sin (A+B) = Cc$.

The latitude of any course = length of course times cosine (deflection angle for that course + sum of all preceding deflection angles). And similarly for departures.

Now, the sum of the latitudes of each course = total latitude of point E, or

$$Ab + bc + cd + de = \Sigma cos_e.$$

And the sum of the departures of each course = total departure of point E, or

$$Bb - c'C + d'D + e'E = \Sigma sin_e.$$

In the triangle VEe

$$VE = (\Sigma sin_e) \ cosec \triangle = (\Sigma sin_e) \frac{1}{sin \triangle}$$

and $Ve = (\Sigma sin_e) \cot \triangle$

hence $AV = \Sigma cos_e - Ve$.

If the traverse consists of no more than two courses it will perhaps be easier to figure the traverse by solving the two resulting triangles.

With this data we are now able to compute the "throws"; i. e., the amount each traverse point must be moved radially in order to put it on the curve selected. This makes possible the running in of the curve by fore-sights, as the instrument is set up at points located by measuring radially the calculated throws from each respective traverse point (forward or away from the center, as the calculations indicate) and not at turning points set instrumentally, as is usually the case.

The writer has effectively used this method in running both simple and compound curves, and to lead to a clear understanding of the method, both cases will be given.

To Calculate Throws: Simple curve, Figure 2. From records the degree of curve which apparently will fit the traverse points best, and cause the least amount of throw is selected. The best curve is the one which will average the throws. If

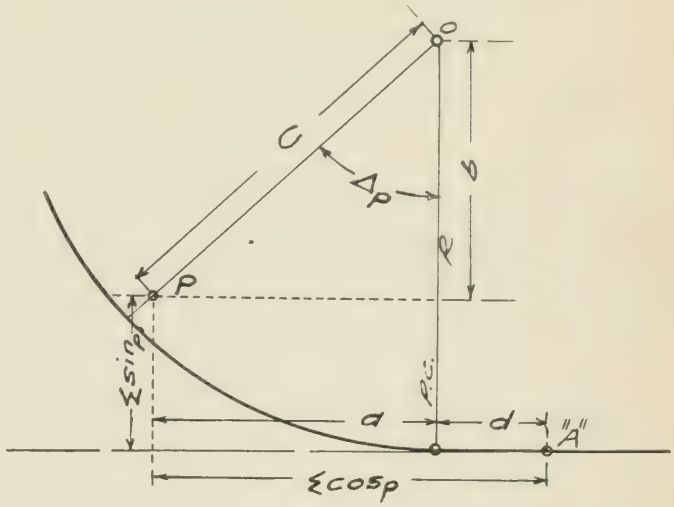


Fig. 2.

the degree of curve is selected to the nearest minute, this last requirement will often be impossible of attainment, especially in long flat curves. As a rule, however, it is good practise to select a curve to the nearest minute for facility in staking, and where the additional cost of throwing track is small.

To find throw at P.

$$a = \Sigma cos_p - d$$

$$R = \frac{a}{\Sigma sin_p}$$

$$C = \frac{a}{sin \triangle_p}$$

$$Throw = R - C$$

If $R > C$ throw will be out.

If $R < C$ throw will be in.

Compound Curve. Figure 3.

To find throw at P.

$$\tan \triangle_p = \frac{pp''}{O_2p''}$$

$$= \frac{Ap' - AK + KP}{O_2N - Pp'' - PN} = \frac{a}{b}$$

$$= \frac{\Sigma cos_p - d + (R_2 - R_1) \sin \triangle.}{R_2 - \Sigma sin_p - (R_2 - R_1) vers \triangle.}$$

then $O_2p = C = \frac{a}{sin \triangle_p}$

and throw = $R_2 - C$

Simple Curve with Spirals. Figure 4.

To find throw at *P*.

$$Op' = R + F - \Sigma \sin_{p} = b.$$

$$Pp' = \Sigma \cos_{p} - (d + x') = a.$$

$$\tan \triangle_{p} = \frac{a}{b}$$

$$OP = C = \frac{a}{\sin \triangle_{p}} \text{ and throw } = R - C$$

(radially).

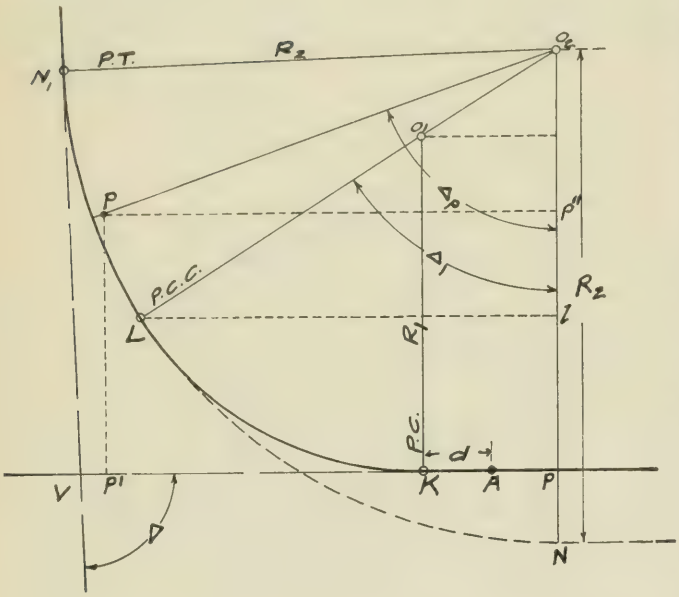


Fig. 3.

If the traverse point *A* falls between the vertex of the curve and the *P.S.* its sign will be minus.

If $R > C$ throw will be out from center.

If $R < C$ throw will be in from center.

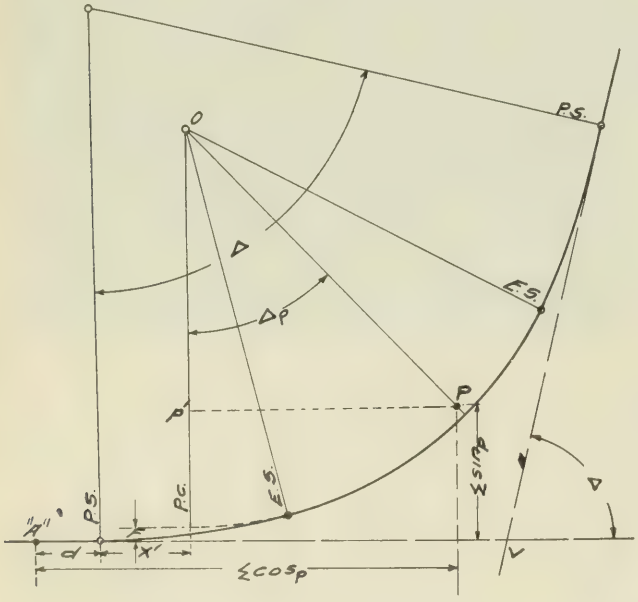


Fig. 4.

If spirals are to be inserted at the ends of the compound curve the preceding method can very easily be modified to give the desired results.

THE RAILWAY SIGNAL ASSOCIATION.

The June meeting of the Railway Signal Association was held in New York City June 14, President H. S. Balliet in the chair. About 250 members were present. The first business taken up was a discussion of the progress report of the sub-committee on standards of committee No. 1. No particular points of interest were brought out in connection with the specifications for pipe except that it was thought advisable to include a specification for galvanizing. The specifications were approved and referred to the annual meeting. In connection with the drawings, it was suggested by Mr. Kelloway that a good deal of weight might be saved by making the bracket signal base of cast steel, but the meeting approved it as drawn. The drawings of pinnacles, as well as those of the ladder foundation, concrete pipe carrier pier and lamp equipment, were recommended for adoption at the annual meeting. The drawing of binding post nut and washer was approved with the exception that it was recommended the washer be made $\frac{9}{16}$ in. x $\frac{1}{16}$ in. with the edges rounded so as not to cut wires. This was in the nature of a compromise with Mr. Waldron, who wanted cupped washers. It was brought out that should the latter be used there was liability of the workmen so placing them as to clamp a wire between two cutting edges. The drawing of the lamp was approved, except that the committee was instructed to show the door on the side opposite the lens so as to render it equally accessible with the lantern on either side of a signal post. A lamp was exhibited, showing a lens in the door in addition to the lens in the front. This latter lens was adjustable so as to be able to focus the lamp when used on a double train order signal situated on a curve.

The first part of the afternoon session was taken up with statements as to work done by the chairmen of all committees. The committee on arrangements announced that it had been unsuccessful in securing any sort of acceptable accommodations at Atlantic City and recommended that the annual meeting be held in Richmond, Va. This suggestion was approved and the matter will be submitted to letter ballot.

The secretary read a memorial to the late Henry Johnson, which was ordered sent to Mrs. Johnson.

J. H. Wisner, Jr., read a paper describing the World Signal, illustrating with lantern slides. There was no discussion. A vote of thanks was extended to Mr. Wisner.

Mr. Waldron, of the Interborough Rapid Transit Co., followed with a paper on speed control signals, which will be found in another column. As before there was no discussion, and a vote of thanks was extended.

The president then called upon W. T. Wreaks, of the Wire Inspection Bureau, for a few remarks on wire inspection. He spoke for ten minutes, emphasizing the importance of thoroughness in inspection and of comparison of results as between different users and makers.

Then followed a brief discussion of the paper on alternating current power transmission by Messrs. Rhea and Kimball, which was presented at the March meeting, but nothing new was brought out.

The afternoon session ended with a very brief and perfunctory discussion of the progress report of committee No. 4 on automatic block signals. The chief result being a request for further collaboration by the committee with the manufacturers.

The greatest of the French railways, the Paris, Lyons & Mediterranean (5,938 miles), earned net in 1909 enough for a dividend of 11.2 per cent. Its shares, 500 francs par, sell at about 1,350 francs. The Northern Railway, which has a heavier traffic than any other French system, dividend 14.4 per cent. Its shares sell for 1,775 francs. The Eastern made a dividend of 7.1 per cent.; the Southern (by the help of the state guarantee), 10 per cent.

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE.

RAILWAYS OF THE UNITED STATES—1908 AND 1909.

[NOTE.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.]

	Miles.		Freight equipment.		In-	Per cent. of	Freight cars per mile of road		Average length of haul		Freight cars— Per 1,000 freight-car miles		Per 1,000 rev'nue-ton miles		Rate, per ton-mile, dollars		Fr't cars per $1,000 freight earn'gs	
New England Roads.	1908.	1909.	1908.	1909.	crease.	ch'ge.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.
Boston & Maine	2,288	2,289	23,964	24,859	895	3.7	10.5	10.8	106.91	104.09	.119	.121	.0111	.0117	.01045	.01083	1.07	1.08
Central Vermont	536	536	2,866	2,730	*136	4.8	5.3	5.1	77.56	89.23	.112	.102	.0119	.0093	.00960	.00840	1.23	1.12
Maine Central	931	932	7,223	7,109	*114	1.6	7.8	7.6	81.61	88.80	.163	.157	.0150	.0141	.01062	.00995	1.42	1.42
N. Y., N. H. & Hartford.	2,047	2,044	29,821	34,184	4,363	14.6	14.6	16.7	94.83	93.77	.156	.174	.0167	.0182	.01414	.01420	1.18	1.29
Total	5,802	5,801	63,874	68,882	5,008	7.8	9.6	10.1	90.23	93.97	.138	.139	.0137	.0133	.01120	.01085	1.23	1.23
Trunk Line Roads.																		
Baltimore & Ohio	3,992	4,004	82,592	80,759	*1,833	2.2	20.7	20.1	197.77	192.25	.114	.119	.0084	.0087	.00569	.00581	1.48	1.50
Buff., Roch. & Pitts.	568	568	15,349	15,199	*150	1.0	27.0	26.8	145.10	155.40	.217	.238	.0118	.0122	.00493	.00482	2.40	2.53
Central of N. J.	610	610	21,247	20,181	*1,066	5.0	34.8	33.1	78.84	75.28	.165	.164	.0102	.0102	.00845	.00839	1.22	1.22
Chesapeake & Ohio	1,840	1,897	34,252	34,182	*70	0.2	18.6	18.0	274.00	275.00	.135	.122	.0076	.0067	.00432	.00410	1.75	1.64
Delaware & Hudson	845	843	21,235	21,152	*83	0.4	25.1	25.0	121.23	134.20	.156	.144	.0099	.0088	.00710	.00670	1.39	1.33
Del., Lack. & Western	958	957	27,211	27,541	330	1.2	28.2	28.8	179.50	172.00	....	....	.0088	.0083	.00785	.00781	1.11	1.06
Erie Railroad	2,171	2,231	54,909	40,941	*3,968	7.2	25.3	22.8	168.35	183.21	.144	.124	.0097	.0085	.00600	.00586	1.62	1.48
Lehigh Valley	1,446	1,441	42,405	41,970	*435	1.0	29.3	29.1	181.08	167.71	.139	.145	.0088	.0092	.00630	.00639	1.40	1.49
N. Y. Cen. & Hud. River	3,781	3,782	61,882	64,846	2,964	4.8	16.3	17.2	197.00	193.26	.084	.083	.0069	.0066	.00643	.00631	1.21	1.19
Pennsylvania Railroad	3,980	4,015	130,163	128,220	*1,943	1.5	32.7	31.9	167.76	158.68	.127	.113	.0077	.0066	.00569	.00580	1.33	1.16
Phila. & Reading	1,007	997	44,676	42,204	*2,472	5.5	44.4	42.3	93.76	94.23	.160	.154	.0101	.0102	.00726	.00759	1.39	1.36
Western Maryland	543	543	5,949	6,444	495	8.3	10.9	11.9	109.86	108.24	.136	.140	0085	.0082	.00655	.00620	1.30	1.32
Total	21,741	21,888	541,870	533,639	*8,231	1.1	25.1	24.4	159.52	159.12	.131	.141	.0090	.0087	.00638	.00632	1.47	1.44
Southern Classification.																		
Atlantic Coast Line	4,407	4,476	24,408	24,255	*153	0.6	5.5	5.4	142.52	142.09	.144	.134	.0170	.0167	.01235	.01259	1.38	1.32
Central of Georgia	1,913	1,916	10,440	10,269	*171	1.6	5.4	5.4	149.64	151.14	.152	.152	.0123	.0123	.01082	.01079	1.37	1.38
Louisville & Nashville	4,365	4,398	40,589	41,720	1,131	2.8	9.3	9.5	172.87	174.40	.132	.130	.0101	.0098	.00779	.00763	1.30	1.28
Mobile & Ohio	926	1,114	11,247	11,066	*181	1.6	12.1	9.9	229.66	220.00	....	.113	.0099	.0096	.00631	.00621	1.58	1.55
Nash., Chat. & St. Louis	1,230	1,230	9,440	9,458	18	0.2	7.7	7.7	161.00	156.00	.300	.266	.0111	.0115	.00890	.00960	1.24	1.20
Norfolk & Western	1,881	1,903	37,276	35,529	*1,747	4.7	19.8	18.6	267.94	268.19	.125	.111	.0075	.0066	.00481	.00460	1.55	1.43
Seaboard Air Line	2,611	2,603	13,902	13,966	64	0.5	5.3	5.4	149.96	154.41	.135	.136	.0148	.0138	.01124	.01129	1.32	1.23
Southern Railway	7,489	7,170	54,086	51,741	*2,345	4.3	7.2	7.2	154.05	169.73	.161	.143	.0155	.0116	.00979	.00952	1.58	1.51
Total	24,822	24,810	201,388	198,004	*3,384	1.7	9.0	8.6	178.45	179.49	.164	.148	.0123	.0115	.00900	.00903	1.41	1.36
Central Classification.																		
Chic., Ind. & Louisville.	616	616	5,563	5,999	436	7.8	9.0	9.7	146.00	143.00	.155	.176	.0135	.0142	.00822	.00825	1.64	1.72
Cin., Ham. & Dayton	1,038	1,036	12,704	12,528	*176	1.4	12.2	12.0	114.19	124.13	.197	.190	.0136	.0125	.00624	.00529	2.27	2.28
C. C. C. & St. Louis	1,982	1,982	22,670	22,123	*547	2.4	11.4	11.7	146.20	152.70	.100	.089	.0079	.0064	.00568	.00544	1.44	1.33
Grand Rapids & Indiana	592	587	3,233	3,226	*7	0.2	5.5	5.5	95.99	104.95	.107	.095	.0092	.0072	.00730	.00666	1.25	1.08
Lake Erie & Western	886	886	4,663	4,237	*426	9.1	5.0	4.8	120.40	123.54	.116	.096	.0092	.0069	.00738	.00686	1.33	1.07
Lake Shore & Mich. So.	1,511	1,663	34,549	34,231	*318	0.9	22.9	20.6	173.50	163.00	.091	.082	.0068	.0057	.00525	.00518	1.33	1.15
Michigan Central	1,746	1,746	18,579	18,249	*330	1.8	10.6	10.5	171.00	162.00	.076	.072	.0068	.0060	.00627	.00626	1.09	1.00
N. Y., Chic. & St. Louis	523	523	11,877	11,716	*161	1.4	22.7	22.4	229.00	205.00	.086	.087	.0071	.0071	.00526	.00516	1.50	1.42
Pennsylvania Company.	1,416	1,416	53,044	53,163	119	0.2	37.4	37.5	79.93	77.26	.172	.149	.0113	.0086	.00610	.00595	1.81	1.45
P. C. C. & St. Louis	1,472	1,469	22,905	23,008	103	0.5	15.6	15.7	118.07	117.39	.084	.077	.0071	.0060	.00640	.00641	1.07	0.93
Pere Marquette	2,298	2,285	18,858	19,641	783	0.2	9.4	9.4	99.78	101.17	.132	.110	.0100	.0088	.00690	.00669	1.41	1.32
Vandalia	829	827	7,832	7,849	17	4.1	8.2	8.6	169.01	180.44	.148	.137	.0117	.0109	.00602	.00577	2.09	2.02
Total	14,909	15,036	216,477	215,970	*507	0.2	14.2	14.4	146.92	137.88	.122	.113	.0096	.0084	.00642	.00649	1.52	1.39
Western Classification.																		
Atch., Top. & Santa Fe	9,431	9,793	51,834	51,445	*389	0.8	5.5	5.3	392.24	363.53	.089	.087	.0065	.0067	.00949	.01026	0.84	0.80
Chicago & Alton	998	998	10,395	12,067	1,672	16.0	10.4	12.1	151.85	151.28	.112	.117	.0076	.0082	.00610	.00570	1.36	1.58
Chic. & Eastern Illinois	957	966	19,983	18,925	*1,058	5.3	20.9	19.6	156.19	159.41	.192	.199	.0105	.0108	.00470	.00480	2.34	2.36
Chic. & North Western.	7,632	7,638	57,620	58,453	833	1.4	7.6	7.3	158.07	148.31	.177	.175	.0119	.0120	.00870	.00900	1.37	1.34
Chic., Bur. & Quincy	9,282	9,279	53,156	51,741	*1,415	2.7	5.7	5.6	240.82	239.74	.099	.093	.0068	.0066	.00800	.00790	1.00	0.98
†Chicago Gt. Western	818	1,476	7,939	10,649	2,710	34.1	9.7	7.2	267.71	235.32	.105	.112	.0094	.0086	.00645	.00688	1.46	1.43
Chic., Mil. & St. Paul	7,301	7,297	44,086	43,692	*394	0.9	6.0	6.0	190.17	183.69	.095	.091	.0077	.0074	.00811	.00838	1.09	1.03
Chic., Rk. Isl. & Pacific.	7,970	8,026	39,581	37,448	*2,133	5.4	4.9	4.7	221.40	212.76	.105	.098	.0087	.0079	.00940	.00940	1.04	0.96
Chic., St. P., M. & Om.	1,730	1,739	12,430	12,430	...	0.0	7.2	7.1	140.17	144.77	....	.204	.0134	.0130	.00893	.00903	1.50	1.44
Colorado & Southern	1,952	1,980	9,166	8,649	*517	5.6	4.7	4.4	132.00	138.00	.130	.114	.0093	.0077	.01034	.01067	0.92	0.82
Denver & Rio Grande	2,499	2,534	11,673	11,668	*5	0.0	4.7	4.6	117.02	108.38	.137	.126	.0108	.0086	.01330	.01310	0.81	0.76
Duluth, S. S. & Atlantic	595	594	2,813	2,804	*9	0.3	4.7	4.7	61.40	67.23	....	....	.0155	.0163	.00987	.00951	1.57	1.72
Great Northern	6,637	6,878	42,131	42,280	149	0.4	6.3	6.1	268.00	267.55	.128	.129	.0070	.0074	.00780	.00810	1.05	1.07
Illinois Central	4,594	4,551	60,871	60,113	*758	1.2	13.2	13.2	241.09	242.91	.130	.128	.0084	.0083	.00586	.00596	1.72	1.67
Iowa Central	558	558	2,924	3,418	494	16.9	5.2	6.1	175.65	162.71	.110	.130	.0069	.0085	.00592	.00616	1.23	1.45
Kansas City Southern	827	827	7,148	6,908	*240	3.4	8.6	8.3	278.64	261.29	.111	.110	.0069	.0071	.00723	.00749	1.07	1.04
Minn. & St. Louis	1,027	1,027	3,942	4,386	444	11.3	3.8	4.3	105.25	102.84	.192	.206	.0145	.0152	.01063	.01075	1.54	1.57
M., St.P. & S. Ste. Marie	2,308	2,395	12,762	12,624	*138	1.1	5.5	5.3	213.65	234.18	.154	.146	.0118	.0116	.00814	.00793	1.63	1.46
Missouri Pacific	6,479	6,489	41,295	39,044	*2,251	5.4	6.4	6.0	218.59	214.13	.128	.113	.0090	.0083	.00685	.00704	1.31	1.18
Miss., Kansas & Texas.	3,072	3,072	22,417	22,031	*386	1.7	7.3	7.2	236.57	219.94	.136	.131	.0147	.0136	.01010	.01042	1.45	1.31
Northern Pacific	5,649	5,733	42,171	41,498	*673	1.6	7.4	7.2	325.60	313.10	.125	.114	.0082	.0066	.00900	.00895	0.90	0.86
St. Louis & San Fran.	5,064	5,251	29,984	26,677	*3,307	11.0	5.9	5.1	154.80	150.29	.140	.125	.0106	.0090	.00970	.01010	1.25	1.04
St. Louis Southwestern.	1,464	1,470	9,452	9,109	*343	3.6	6.5	6.2	240.82	243.22	.149	.139	.0133	.0127	.01010	.01080	1.32	1.18
San An. & Aransas Pass	724	724	1,611	2,150	539	33.5	2.2	3.0	160.80	159.36	.093	.104	.0098	.0111	.01472	.01513	0.75	0.80
Southern Pacific	9,834	9,977	42,677	43,444	767	1.8	4.3	4.4	270.53	256.52	.077	.089	.0054	.0060	.01097	.01154	0.60	0.62
Texas & Pacific	1,885	1,885	11,212	10,917	*295	2.6	5.9	5.8	185.06	185.00	.114	.103	.0122	.0108	.01030	.01030	1.19	1.07
Union Pacific	5,781	6,062	25,040	26 025	985	3.9	4.3	4.3	402.77	383.70	.067	.065	.0040	.0041	.00826	.00845	0.47	0.48
Wabash	2,514	2,515	22,979	22,910	*69	0.3	9.1	9.1	225.23	219.11	.092	.088	.0072	.0073	.00573	.00582	1.34	1.33
Wisconsin Central	1,023	976	7,632	8,098	466	6.1	7.5	8.3	179.32	176.50	.158	.163	.0096	.0097	.00672	.00659	1.43	1.47
Total	110,605	112,710	706,924	701,603	*5,321	0.7	6.4	6.2	210.74	204.99	.124	.125	.0096	.0090	.00867	.00883	1.23	1.20
Total all roads	177,879	180,245	1,730,533	1,718,098	*12,435	0.7	9.7	9.5	178.11	287.69	.130	.128	.0100	.0094	.00803	.00808	1.34	1.30

* Decrease. † Chicago Great Western figures for 1909 include proprietary lines. In 1908 the latter were not included. Figures not kept separate for 1909.

FREIGHT CARS IN SERVICE IN 1900 AND 1909.

[Narrow gage cars excluded. Non-revenue cars excluded. Company freight included.]

	Miles.		Freight equipment.		In-	Per cent. of	Freight cars per mile of road		Average length of haul.		Freight cars Per 1,000 freight car miles.		Freight cars Per 1,000 rev'nue ton miles		Rate, per ton-mile, dollars.		Fr't cars per $1,000 freight earn'gs	
New England Roads.	1900.	1909	1900.	1909.	crease.	ch'nge.	1900.	1909.	1900.	1909.	1900.	1909.	1900.	1909.	1900.	1909.	1900.	1909.
Boston & Maine	1,787	‡2,289	12,230	24,859	12,629	103.3	6.8	10 8	66.99	104.09	.126	.121	.0146	.0117	.01440	.01083	1.02	1.08
Central Vermont	513	536	2,006	2,730	724	36.1	3.9	5.1	94.97	89.23	.063	.102	.0079	.0093	.00880	.00840	0.90	1.12
Maine Central	816	932	3,586	7,109	3,523	98.2	4.4	7.6	81.11	88.80	.163	.157	.0123	.0141	.01130	.00995	1.09	1.42
N. Y., N. H. & Hartford	2,008	2,044	13,116	34,184	21,068	160.6	6.5	16.7	85.36	93.77	.076	.174	.0097	.0182	.01451	.01420	0.67	1.29
Total	5,124	5,801	30,938	68,882	37,944	122.6	6.0	10.1	82.11	93.97	.107	.139	.0112	.0133	.01225	.01085	0.92	1.23
Trunk Line Roads.																		
Baltimore & Ohio	3,199	4,004	61,708	80,759	19,051	30.9	19.3	20.1	194.81	192.25	.128	.119	.0068	.0087	.00412	.00581	1.96	1.50
Buff., Roch. & Pitts. ...	472	568	8,858	15,199	6,341	71.6	18.7	26.8	136.16	155.40	.139	.238	.0097	.0122	.00470	.00482	1.99	2.53
Central of N. J.	639	610	15,002	20,181	5,179	34.5	23.4	33.1	77.88	75.28	.153	.164	.0118	.0102	.00871	.00839	1.36	1.22
Chesapeake & Ohio	1,476	1,897	17,270	34,182	16,912	97.9	21.6	18.0	302.00	275.00	.082	.122	.0058	.0067	.00343	.00410	1.71	1.64
Delaware & Hudson ...	665	843	13,030	21,152	8,122	62.3	19.6	25.0	94.46	134.20	.147	.144	.0113	.0088	.00789	.00670	1.54	1.33
Del., Lack. & Western ..	947	957	27,287	27,541	254	1.0	28.8	28.8	151.00	172.00	....	....	.0144	.0083	.00808	.00781	1.79	1.06
Erie Railroad	2,104	2,231	46,225	50,941	4,716	10.2	21.9	22.8	191.40	183.21	.101	.124	.0089	.0085	.00559	.00586	1.60	1.48
Lehigh Valley	1,382	1,441	34,954	41,970	7,016	20.1	25.3	29.1	188.08	167.71	.135	.145	.0106	.0092	.00542	.00639	1.97	1.49
N. Y. C. & Hud. River..	2,817	3,782	59,180	64,846	5,666	9.6	21.1	17.2	163.00	193.26	....	.083	.0088	.0066	.00560	.00631	1.72	1.19
Pennsylvania Railroad..	3,716	4,015	80,385	128,220	47,835	59.5	21.6	31.9	109.54	158.68	.091	.113	.0067	.0066	.00540	.00580	1.25	1.16
Phila. & Reading	1,000	997	31,824	42,204	10,380	32.6	31.8	42.3	89.42	94.23	.139	.154	.0114	0102	.00831	.00759	1.50	1.36
Western Maryland	279	543	691	6,444	5,753	832.5	2.5	11.9	51.02	108.24	....	.140	.0038	.0082	.00734	.00620	0.53	1.32
Total	18,696	21,888	396,414	533,639	137,225	34.6	21.2	24.4	145.73	159.12	.093	.141	.0092	.0087	.00622	.00632	1.56	1.44
Southern Classification.																		
Atlantic Coast Line....	1,759	4,476	5,378	24,255	18,877	351.0	3.6	5.4	121.90	142.09	....	.134	.0143	.0167	.01401	.01259	.1.02	1.32
Central of Georgia ...	1,196	1,916	5,041	10,269	5,228	103.7	4.2	5.4	148.86	151.14	.107	.152	.0183	.0123	.01096	.01079	1.26	1.38
Louisville & Nashville..	3,007	4,398	23,402	41,720	18,318	78.2	7.7	9.5	163.00	174.40	.096	.130	.0090	.0098	.00758	.00763	1.13	1.28
Mobile & Ohio	876	1,114	5,389	11,066	5,677	105.3	6.2	9.9	195.63	220.00	....	.113	.0076	.0096	.00590	.00621	1.33	1.55
Nash., Chat. & St. Louis	1,189	1,230	5,328	9,458	4,130	77.5	4.4	7.7	151.00	156.00	.113	.266	.0096	.0115	.00880	.00960	1.10	1.20
Norfolk & Western	1,551	1,903	18,656	35,529	16,873	90.4	12.0	18.6	253.41	268.19	.085	.111	.0068	.0066	.00430	.00460	1.58	1.43
Seab'd Air Line (1901)	2,604	2,603	8,335	13,966	5,631	67.5	3.2	5.4	153.32	154.41	.119	.136	.0136	.0138	.01180	.01129	1.14	1.23
Southern Railway	6,306	7,170	26,814	51,741	24,927	93.0	4.2	7.2	168.82	169.73	.107	.143	.0116	.0116	.00916	.00952	1.27	1.51
Total	18,488	24,810	98,343	198,004	99,661	101.3	5.3	8.6	169.49	179.49	.105	.148	.0114	.0115	.00906	.00903	1.23	1.36
Central Classification.																		
Chic., Ind. & Louisville	546	616	5,440	5,999	559	10.3	9.9	9.7	153.00	143.00	.155	.176	.0141	.0142	.00757	.00825	1.86	1.72
Cin., Ham. & Dayton ..	652	1,036	7,838	12,528	4,690	59.8	12.0	12.0	108.96	124.13	....	.190	.0122	.0125	.00610	.00529	2.00	2.28
C. C. C. & St. Louis ...	1,891	1,982	15,484	22,123	6,639	42.9	8.2	11.7	169.30	152.70	.094	.089	.0083	.0064	.00583	.00544	1.42	1.33
Grand Rapids & Indiana	582	587	3,015	3,226	211	7.0	5.2	5.5	90.12	104.95	.140	.095	.0156	.0072	.00870	.00666	1.88	1.08
Lake Erie & Western ..	725	886	5,549	4,237	‡1,312	23.6	7.6	4.8	153.51	123.54	.137	.096	.0110	.0069	.00614	.00686	1.89	1.07
Lake Shore & Mich. So.	1,411	1,663	19,958	34,231	14,273	71.5	14.1	20.6	178.00	163.00	.067	.082	.0055	.0057	.00505	.00518	1.09	1.15
Michigan Central	1,635	1,746	14,219	18,249	4,030	28.3	8.6	10.5	193.50	162.00	....	.072	.0070	.0060	.00592	.00626	1.19	1.00
N. Y., Chic. & St. Louis	513	523	6,743	11,716	4,973	73.7	13.1	22.4	297.00	205.00	.059	.087	.0055	.0071	.00478	.00516	1.16	1.42
Pennsylvania Company.	1,396	1,416	43,967	53,163	9,196	20.9	31.5	37.5	77.95	77.26	.177	.149	.0135	.0086	.00590	.00595	2.30	1.45
P. C. C. & St. Louis ...	1,407	1,469	12,884	23,008	10,124	78.6	9.1	15.7	111.14	117.39	.056	.077	.0052	.0060	.00620	.00641	0.84	0.93
Pere Marquette	1,821	2,285	7,944	19,641	11,697	147.2	4.3	8.6	112.64	180.44	....	.137	.0124	.0109	.00802	.00577	1.55	2.02
Vandalia	727	827	5,922	7,849	1,927	32.5	8.1	9.4	74.46	101.17	.121	.110	.0119	.0088	.00718	.00669	1.66	1.32
Total	13,306	15,036	148,963	215,970	67,007	44.9	11.2	14.4	143.63	137.88	.112	.113	.0102	.0084	.00645	.00649	1.57	1.39
Western Classification.																		
Atch., Top. & Santa Fe.	7,426	9,793	27,486	51,445	23,959	87.1	3.7	5.3	349.19	363.53	.073	.087	.0079	.0067	.00976	.01026	0.81	0.80
Chicago & Alton	855	998	9,386	12,067	2,681	28.5	10.9	12.1	176.16	151.28	.135	.117	.0148	.0082	.00794	.00570	1.87	1.58
Chic. & Eastern Illinois	711	966	8,206	18,925	10,719	130.6	11.5	19.6	144.70	159.41	.132	.199	.0096	.0108	.00483	.00480	1.99	2.36
Chicago & Northwestern	5,219	7,638	40,846	58,453	17,607	43.1	7.8	7.3	151.30	148.31	.108	.175	.0106	.0120	.00830	.00900	1.28	1.34
Chic. Burl. & Quincy ..	7,546	9,279	42,287	51,741	9,454	22.3	5.6	5.6	254.87	239.74	....	.093	.0111	.0066	.00851	.00790	1.29	0.98
*Chicago Gt. Western..	930	1,476	5,782	10,649	4,867	84.2	6.2	7.2	301.68	235.32	.087	.112	.0081	.0086	.00720	.00688	1.13	1.43
Chic., Mil. & St. Paul ..	6,423	7,297	35,740	43,692	7,952	22.2	5.6	6.0	189.07	183.69	.093	.091	.0106	.0074	.00929	.00838	1.14	1.03
Chic.. Rock Isl. & Pac.	3,647	8,026	17,150	37,448	20,298	118.3	4.7	4.7	213.00	212.76	.094	.098	.0096	.0079	.00990	.00940	1.38	0.96
Chic., St. P., M. & Om..	1,557	1,739	10,253	12,430	2,177	21.2	6.6	7.1	160.55	144.77	.149	.204	.0135	.0130	.00971	.00903	1.39	1.44
Colorado & Southern ..	762	1,980	2,979	8,649	5,670	190.3	3.9	4.4	101.00	138.00	.108	.114	.0115	.0077	.01242	.01067	0.93	0.82
Denver & Rio Grande ..	1,674	2,534	8,359	11,668	3,309	39.5	4.9	4.6	.....	108.38	.118	.126	.....	.0086	.....	.01310	1.09	0.76
Dul., So. Sh. & Atlantic.	585	594	2,697	2,804	107	3.9	4.6	4.7	49.07	67.23	....	....	.0209	.0163	.01221	.00951	1.70	1.72
Great Northern	5,418	6,878	21,484	42,280	20,796	96.7	3.9	6.1	192.00	267.55	.104	.129	.0085	.0074	.00899	.00810	0.93	1.07
Illinois Central	3,996	4,551	32,439	60,113	27,674	85.3	8.1	13.2	213.83	242.91	.092	.128	.0094	.0083	.00651	.00596	1.45	1.67
Iowa Central	510	558	2,238	3,418	1,180	52.7	4.4	6.1	152.30	162.71	.099	.130	.0084	.0085	.00696	.00616	1.21	1.45
Kansas City Southern..	833	827	5,118	6,908	1,790	35.0	6.1	8.3	304.41	261.29	.118	.110	.0091	.0071	.00613	.00749	1.49	1.04
Minn. & St. Louis	597	1,027	3,066	4,386	1,320	43.1	5.1	4.3	108.79	102.84	.196	.206	.0155	.0152	.01212	.01075	1.45	1.57
M., St.P. & S. Ste Marie	1,255	2,395	6,631	12,624	5,993	90.4	5.3	5.3	194.65	234.18	.129	.146	.0109	.0116	.00658	.00793	1.67	1.46
Missouri Pacific	4,938	6,489	25,186	39,044	13,858	55.0	5.1	6.0	236.24	214.13	.102	.113	.0095	.0083	.00834	.00704	1.15	1.18
Missouri, Kans. & Tex.	2,218	3,072	9,669	22,031	12,362	127.8	4.4	7.2	298.93	219.94	.073	.131	.0082	.0136	.00840	.01042	0.98	1.31
Northern Pacific	5,006	5,733	23,138	41,498	18,360	79.3	4.6	7.2	309.60	313.10	.105	.114	.0104	.0066	.00987	.00895	1.04	0.86
†St. Louis & San Fran..	1,659	5,251	5,974	26,677	20,703	346.5	3.6	5.1	182.05	150.29	.093	.125	.0114	.0090	.01058	.01010	1.08	1.04
St. Louis Southwestern	1,258	1,470	5,386	9,109	3,723	69.1	4.3	6.2	196.28	243.22	.127	.139	.0130	.0127	.01110	.01080	1.17	1.18
San An. & Aransas Pass	687	724	1,553	2,150	597	38.4	2.3	3.0	162.26	159.36	.113	.104	.0142	.0111	.01861	.01513	0.95	0.80
Southern Pacific	7,576	9,977	29.413	43.444	14,031	47.7	3.9	4.4	307.31	256.52	.096	.089	.0062	.0060	.00957	.01154	0.75	0.62
Texas & Pacific	1,570	1,885	6,263	10,917	4,654	74.3	3.9	5.8	231.77	185.00	.079	.103	.0093	.0108	.01030	.01030	0.91	1.07
Union Pacific	5,428	6,062	21,826	26,025	4,199	19.2	4.0	4.3	305.69	383.70	.080	.065	.0082	.0041	.01046	.00845	0.78	0.48
Wabash	2,340	2,515	13,087	22,910	9,823	75.0	5.6	9.1	216.70	219.11	.071	.088	.0068	.0073	.00558	.00582	1.23	1.33
Wisconsin Central	950	976	7,968	8,098	130	1.6	8.4	8.3	143.16	176.50	.202	.163	.0139	.0097	.00731	.00659	1.91	1.47
Total	83,574	112,710	431,610	701,603	269,993	62.6	5.1	6.2	208.81	204.99	.109	.125	.0107	.0090	.00919	.00883	1.23	1.20
Total all roads 139,188		180,245	1,106,268	1,718,098	611,830	55.3	7.9	9.5	171.92	287.69	.106	.128	.0104	.0094	.00829	.00808	1.33	1.30

†Before consolidation with other companies.
‡Decrease.
*Chicago Great Western figures for 1909 include proprietary lines. In 1900 the latter were not included. Figures not kept separate for 1909.

TONNAGE RATING FOR FAST FREIGHT TRAINS.

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I.

How many cars should a freight locomotive be required to haul? Formerly the demands of commerce led simply to the hauling of as many cars as were ready, but as growing demands approached the limit of capacity of the engine it became necessary that a definite amount be designated as a load for each engine. This amount it was found should be stated as not alone the number of cars but also the number of tons.

Many of the large trunk lines made a long series of tests for the more accurate determination of "tonnage rating," the work done by the Northern Pacific being notable. While large sums of money were expended to insure the accuracy of these experiments, it was not considered at the time unreasonable to reduce the amount, from ratings thus obtained, for the purpose of increasing the speed without making as careful a

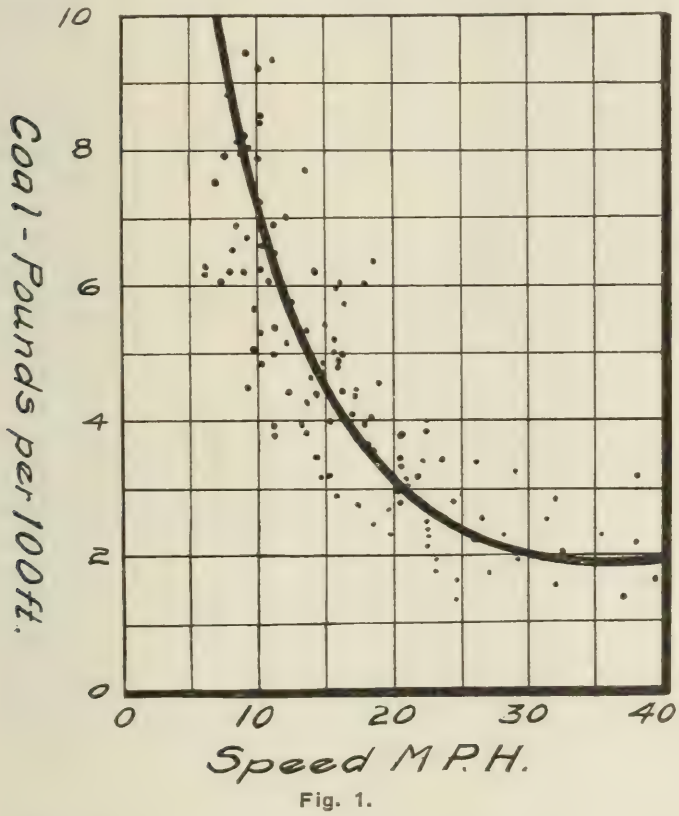


Fig. 1.

determination for the amount of this latter reduction. Furthermore, the "distribution of tonnage," or the proportion of the tons of cars to tons of freight, was not considered with the same consistent carefulness and reductions for this factor that was given to those for weather conditions. Tonnage rating historically has been a process of determining accurately the maximum load for the locomotives and then reducing this load more or less arbitrarily. There are, in fact, some lines in this country to-day still operating on the old car basis with arbitrary reductions which range between 10 and 50 per cent. of the regular load.

The time element, so neglected in the past, must be given due consideration. Unnecessary delays and other "lay overs" are all expensive to the railway, and should be eliminated whenever possible. Demands for increasing speed as well as changes in methods of despatching and controlling trains, have led to the discovery of a method whereby the tonnage of fast trains can be ascertained with the degree of accuracy that has characterized the tonnage rating of slower trains. The "personal equation" of the train crews immediately in charge of the train is taken into consideration when the tests made are in connection with trains in service. The fact that train despatching partakes of the nature of an art rather than a science has until lately deterred scientific effort in attempting a solution of the complicated problem. Business requires that traffic be handled rapidly and the railway management demands that it be handled economically. Some attempts have been made to determine the effect of variations of tonnage on speed, but the results were not sufficiently reliable because the methods involved "experimental psychology" with the train crews rather than a test of mechanical devices alone.

Since fareful analyses have been made of the operation of trains at different points on the profile for speed of trains, it is reasonable to assume that the time required for such operation may be determined in a similar manner. The relation of the speed of freight trains to their tonnage should, it appears, be of a more or less definite and determinative character. The amount of calculation necessary to work out a complete set of analyses would be enormous, but justifiable if the resulting economies were at least equal to the expenditure, not to mention the progress in the art of efficient operation which would be thus effected.

Almost all of the present despatching is based upon the judgment of men whose practical training has been the most reliable source of information available. Conditions of weather would hardly permit of scientific treatment, although attempts have been made to determine train resistances at different temperatures, some large trunk lines having adopted rules for tonnage reductions governed by changes in temperature. The Northern Pacific, for example, uses the following rules:

"Reduce rating 10 per cent. between 30 and 10 deg. above zero; 15 per cent. between 10 above and 10 below zero; 25 per cent. when the temperature is below 10 deg. below zero."

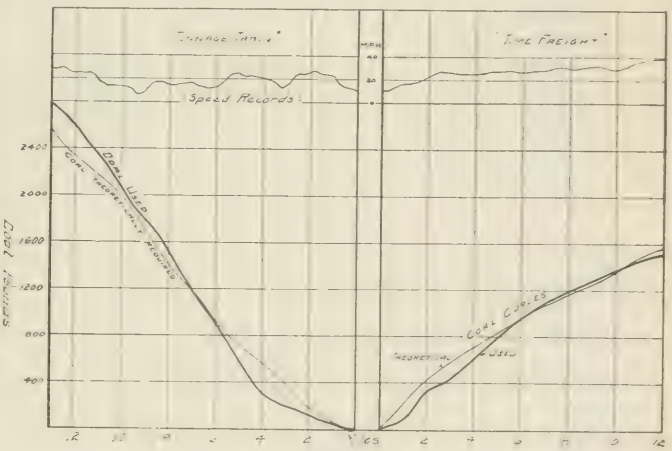


Fig. 2.

Similar rules govern reductions for speed and careful investigation showed that nearly all such rules are based upon the judgment of one or two of the operating officials, without the assistance of any technical information.

The requirements of railway management pressing continually for economies in operation, a demonstration that many of these reductions can be computed with a reasonable degree of accuracy should be entitled to some consideration. The judgment of operating officials can be materially assisted by the information which a scientific determination can offer; although it is admitted that many items cannot be exactly determined and all information obtained will be subject more or less to slight alterations for special conditions.

The president of a railway in the state of Wisconsin, becoming impressed with the necessity for something approaching a "scientific time-card," gave instructions to the chief engineer to proceed at once with the computations. Some investigation showed that this would involve a large amount of labor

in practically a new field, requiring pioneer work in calculations, as well as special testing, it appearing that no previous attempt had been made to do such work. Owing to pressing matters in connection with construction and maintenance the entire force in the engineering department was busy and for these and other reasons it became necessary to secure assistance from the outside. The Railway Department of the University of Wisconsin undertook and successfully carried through the solution of the problem, part of the results of its work being given in this article.

Fortunately a large number of tests of a commendable nature had been made previously, and these furnished valuable data for some of the factors involved in the computations. A number of service tests were also made in order to determine the difference between the maximum possible operating ability of the engine and a reasonable "service value" which might be expected in the regular operation. These tests were successful and revealed, among other important facts, the practice of some train crews to disregard the opportunities for making faster time when it was possible and desirable. The computations were made for the principal classes of locomotives in use, with trains varying from 400 tons to the maximum capacity of the engines. In the tests the tonnage was adjusted to efficiently operate the time-card then in effect, with

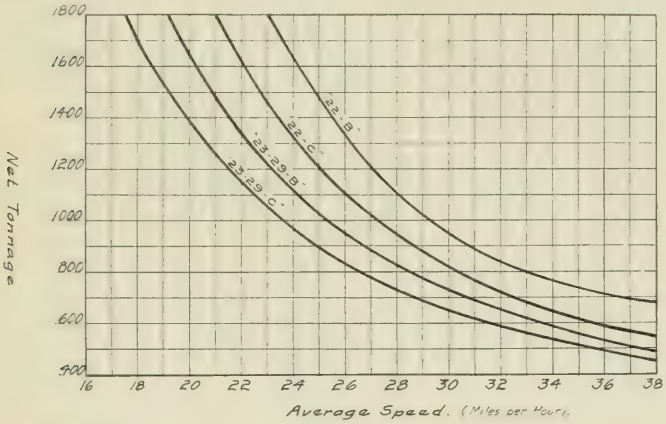


Fig. 3.

the object of testing out the method by which it was proposed to make out a "scientific time-card" adjusted to suit the tonnage requirements.

Some gratifying results were obtained. Trains which had been invariably late were found to have been so heavily loaded that the schedule time expected was clearly a physical impossibility. Under the new rating there was no complaint, and the time was regularly sufficient. Other trains which had been occasionally late and of which complaints had been often made that, "the rating was too high," were given a higher tonnage in a new rating and have been operating since on time and without complaint. In general, under the new rating there was a slight increase in the total tonnage hauled, and the adjustments have increased the fast freight capacity in most cases. After two years of operation under the adjusted tonnage rating the superintendent of transportation stated that, "there has been a decided improvement both in maintaining the schedule time and in holding up the tonnage without complaint." It was decided that unquestionably the merits of this new system more than compensated for the expense of its computation. There can be no reasonable doubt that the experiment has proven a success and the methods were followed in the application to other divisions with the intention of making a complete rating booklet for the entire system.

DESPATCHER'S TABLES.

The efficient despatching of freight trains with variable tonnage depends upon a definite determination of "speed rating." It is a comparatively simple matter to efficiently handle through trains with practically constant tonnage, but difficulties are encouraged when these trains are changing their loads by large amounts. Traffic has frequently been delayed because of the stalling of freight trains on steep grades, which grades they could have overcome had they not been required to stop at some point near the beginning. The despatcher, lacking definite information on this point, could only ascertain the facts by experimenting, the trying of experiments of this kind proving expensive. Through the application of the new method referred to it becomes possible to prepare despatcher's tables which indicate the time required for any train to pass from any given point on the road to any other given point, and also to indicate what are the maximum loads which the locomotives can handle at any point without stalling.

The arrangement of the data found in the "speed-rating" computations formed the basis for the preparation of the despatcher's tables, part of a typical page being shown in Table I. The manner of using this information is as follows:

Engine numbers will be found in the upper left hand corner of each page with the corresponding tonnage of the train (in hundreds of tons) on the same line to the right, below which are the numbers of minutes required to haul that tonnage between the stations named in the left hand margin.

Example: Engine number 244 with 1,484 tons from Nelsons to Stevens Point (see Table I) requires 45 minutes. If stopped at Custer would require 30 minutes; from Custer to Stevens Point (see next to bottom line) requires 18 minutes, or a total of 48 minutes, to which must be added the length of the stop.

Blank spaces indicate the safe limit of tonnage at that point. When "H" appears it indicates that a helper engine is needed. All engines in a group have rating within the hundred tons given. The tonnage line is to be taken which is nearest the tonnage of the train.

TABLE 1.—DESPATCHER'S TABLES—*Waupaca to Stevens Point.*

Northbound. Second Division.

Engine Nos.		Gross tonnage, hundreds of tons.												
108–128, 211–220, 257–266.		5		6		7		8		9				
221–226, 227–230, 231–241.			5		6		7		8		9			
160–176, 242–246, 247–256.				5		6		7		8		9		
From	To	Time, in minutes												
Waupaca	Sheridan	20	17	14	23	19	17	25	20	19	27	22	20	28	23	21
	Nelsons	31	26	25	36	29	27	39	32	29	41	34	31	43	36	33
Sheridan	Nelsons	14	12	11	15	13	12	16	14	13	18	15	14	19	16	14
Nelsons	Amherst	4	4	4	5	4	4	5	4	4	5	5	5	6	5	5
	Amherst Jctn	8	8	7	10	9	8	11	9	9	12	10	9	13	11	10
	Lake Emily	13	11	10	14	12	11	15	13	12	17	14	13	18	15	14
	Custer	22	19	18	24	21	19	26	23	20	28	24	22	30	25	23
	Stockton	26	24	22	28	26	23	30	27	24	33	29	26	35	30	26
	Stevens Point	34	31	30	37	33	31	40	35	33	43	37	35	45	39	36
Amherst	Amherst Jctn.	7	6	5	8	7	6	8	7	7	8	8	7	9	8	7
	Lake Emily	11	9	9	12	10	10	13	11	10	15	12	11	17	12	11
	Custer	20	17	16	22	19	17	24	20	18	26	22	20	28	23	21
	Stockton	25	21	20	27	23	21	29	25	23	30	26	24	34	27	25
	Stevens Point	34	30	28	36	32	30	39	34	32	42	36	33	44	37	34
Amhrst J.	Lake Emily	6	5	5	7	6	5	7	6	6	8	7	6	9	7	6
	Custer	14	13	12	16	14	13	18	15	14	19	16	15	20	17	15
	Stockton	19	17	13	22	18	16	24	19	18	25	21	19	26	22	20
	Stevens Point	28	25	21	31	27	24	33	28	27	35	30	28	36	31	29
Lk Emily.	Custer	10	9	9	11	10	9	12	11	10	13	11	10	13	12	11
	Stockton	15	13	12	16	15	13	17	16	14	18	17	14	19	17	15
	Stevens Point	24	21	19	25	23	21	27	24	23	28	25	24	29	26	25
Custer	Stockton	6	5	5	6	5	6	6	6	6	7	6	6	7	6	6
	Stevens Point	15	13	13	15	14	14	16	15	15	17	15	15	18	16	15
Stockton	Stevens Point	11	10	9	12	11	10	12	11	11	13	12	11	13	12	12

Besides the large table arranged as above described for use between any two individual stations a set of ratings were made for through schedules, and this was arranged as follows:

W. C. Ry.—Through Tonnage Rating on Second District.

Effective Oct. 15, 1907.

Locomotive Nos.	Tonnage of trains. North.	Tonnage of trains. South.	Time freight tonnage. Train numbers. No. 21.	No. 22.	No. 23.	No. 24.	No. 27.	No. 28.
108—128	1,069	1,443	969	1,141	954	1,258	669	873
211—220	1,090	1,474	977	1,172	962	1,282	684	882
257—266	1,130	1,535	983	1,204	963	1,334	698	899
227—230	1,329	1,795	1,094	1,377	1,076	1,517	831	1,047
221—226 } 231—241 }	1,466	1,976	1,202	1,542	1,182	1,687	932	1,157
160—176	1,615	2,179	1,456	1,865	1,421	1,877	1,061	1,349
247—256	1,622	2,183	1,458	1,855	1,398	1,875	1,058	1,345
242—246	1,636	2,196	1,471	1,867	1,411	1,887	1,071	1,357

For empties, deduct one-fifth from the above rating.

Example: What is the rating for Train No. 28 with Engine No. 248, all empties?

From above table rating for loads is found in the last column next to the bottom line to be	1,345 tons.
Deduct one-fifth	269
Balance empties	1,076 tons.

Again: Train No. 22, Engine No. 172 has 915 tons of load. How many tons of empties will fill out the rating?

	Tons	
From the table the rating for loads is	1,865	
Load on	915	915
Balance	950	
Deduct one-fifth	190	
Balance empties	760	760
Total tonnage is		1,675

With this material the despatcher can make his adjustments for time with full information as to the effect upon any of the parts or the entire length of the trip. The manner of taking care of the empties, unique in its simplicity and practicability, is based upon the "20 per cent." distribution allowance which was above justified. This method has been found to be satisfactory and has the advantage over "distribution tables" that it is more exact and more easily used. Any trainman can understand its workings and it is so simple

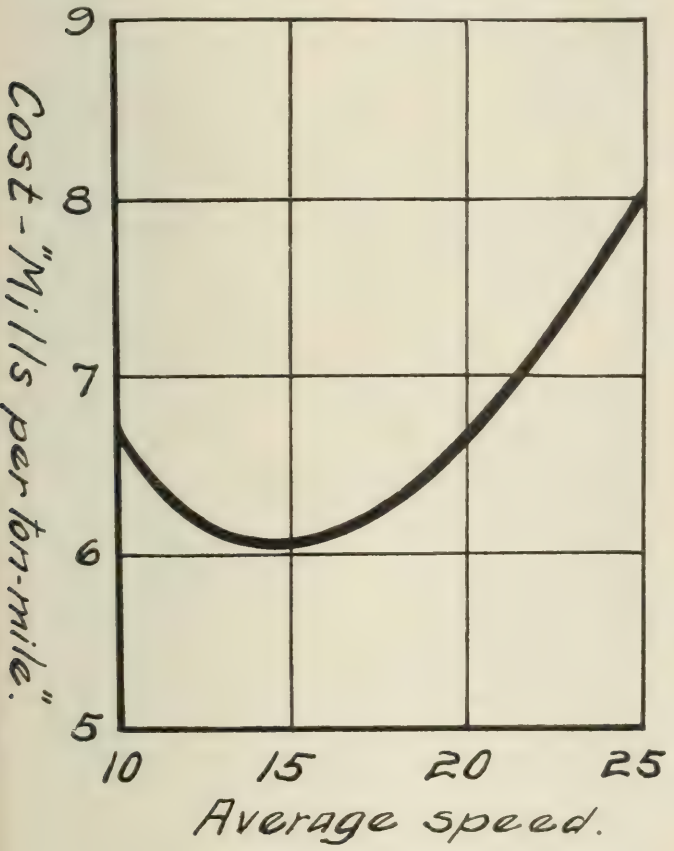


Fig. 4.

that after it has been used a few times the adjustment for empties can be made mentally.

It will be noted that the "time freight" ratings are given in a separate column for each schedule. The advantage of definiteness in this respect has been evidenced in the stopping of all complaints regarding reductions for speed.

The effect of having grade crossings without interlocking plants is easily traced in the large table. It can be shown that an instantaneous stop of freight train of average size will require an average increase in time over the run of about three minutes. Ten crossings requiring such stops would add about half an hour to a run, and in a year's time would make quite a difference in the total time lost from slowing up and accelerating at these points.

There are probably many other practical uses for such data as is here given in Table I, and it appears that what has been done would justify a more extensive application of the method.

A METHOD OF ADJUSTING TONNAGE RATING FOR PARTIALLY LOADED CARS AND EMPTIES.

Derivation of Formulae—

Let A = Tons on train.
B = Number cars on train.
C = Rating to be filled out in train.
X = Equivalent number of loads, at 45 tons average.
Y = Equivalent number of empties, at 15 tons average.

$45X + 15Y = "A"$
$X + Y = "B"$

Combining; $X = \dfrac{A - 15B}{30}$ = Number of "loads" on train.

$Y = B - X$ = Number equivalent "empties" on train.

Deduction (assuming 20 per cent. for empties):

(1)—$\dfrac{(C - 45X)\ .80}{15}$ = Number of "empties" to fill out rating.

(2)—$\dfrac{C - 45X}{45}$ = Number of "loads" to fill out rating.

Now if "partially loaded cars" are to be added—
The per cent. of "equivalent empties" =

$$45 - \frac{\text{(Average weight of all cars)}}{30}$$

Average weight of cars in train or to be put on train is a measure of the per cent. of "equivalent empties," in a corresponding train of loads and empties only.

TABLE 2.

Av. weight.	Per cent. "Equiv. empties."	Per cent. Rating is reduced.	Av. weight.	Per cent. "Equiv. empties."	Per cent. Rating is reduced.
45 tons.	....	....	29 tons.	53.3	10.7
44 "	3.3	0.7	28 "	56.4	11.3
43 "	6.7	1.3	27 "	60.0	12.0
42 "	10.0	2.0	26 "	63.0	12.7
41 "	13.3	2.7	25 "	66.7	13.3
40 "	16.7	3.3	24 "	70.0	14.0
39 "	20.0	4.0	23 "	73.3	14.7
38 "	23.3	4.7	22 "	76.7	15.3
37 "	26.7	5.3	21 "	80.0	16.0
36 "	30.0	6.0	20 "	83.3	16.7
35 "	33.3	6.7	19 "	86.7	17.3
34 "	36.7	7.3	18 "	90.0	18.0
33 "	40.0	8.0	17 "	93.3	18.7
32 "	43.3	8.7	16 "	96.7	19.3
31 "	46.7	9.3	15 "	100.0	20.0
30 "	50.0	10.0			

RULE.

(1) Divide tonnage on train by number of cars.

(2) Increase tonnage on train by per cent. in column 3 (Table II, that is, multiply tonnage (on train) by that per cent. and add result to tonnage on the train).

(3) Subtract result thus obtained from tonnage rating and reduce that by same per cent. if cars to be added have same average weight, *or if not, by the correct per cent. for them.*

(4) This result is tonnage to be added.

EXAMPLE.

Given: "A" = 1,000 tons "B" = 25 cars; now on train.
"C" = 1,540 rating for division.

Req'd: How many more cars at average weight, 37 tons, can be taken?

(1) $\dfrac{1000}{25}$ = 40 tons average in train, or 16.7 per cent. equivalent empties (Column 2, Table II).

(2) 1000 + (3.3 per cent. 1000) = 1000 + 33 = 1033 tons. (Column 3, Table II.)

(3) 1540 — 1033 = 507 tons balance, to be reduced 5.3 per cent. (Column 3, at 37 tons ave. wt.)

5.3 x 507 = 26.9 tons or deduct 27 tons.

507 — 27 = 480.

(4) 480 tons or $\dfrac{480}{37}$ = 13 *more cars.* *Ans.*

ECONOMY IN FASTER FREIGHT TRAIN OPERATION.

Nearly all of the railways in this country have for some time past been operating on the principle that it is not economical to operate a freight train at the minimum speed, or, in other words, with the maximum load. This minimum speed has generally been placed at an average between terminals of 10 miles per hour. In fact, the wages of train crews have been for many years computed on this basis, irrespective of the actual speed of the train. It is reasonable to believe that there are factors which increase the unit cost of train operation at low speeds, in larger proportion than the benefits derived by increased tonnage, tend to decrease that unit cost. As an indication of the trend of judgment of railway managers, it is interesting to note that on several of the large roads there is a conviction that it is not economy to "overload" the locomotives, and it has been observed that a speed of about 15 miles per hour is more economical than a speed of 10 miles per hour. The computations demonstrated that there are economies in fast freight operation. During the study it has been interesting to observe that many of the determinations have supported the apprehensions of some operating officials upon points of economy which previously they had hardly dared voice.

The net result of the study has been the proving that "speed rating" is subject to more or less definite determination, and this important factor in rate making need no longer be so largely an approximation. Since it has been successfully demonstrated there is little reason to doubt that in the future the operation of a railway may be as scientifically conducted as the operation of any other industrial enterprise.

COMPARISON OF THE COST OF OPERATION OF "TIME FREIGHT" AND "TONNAGE" TRAINS.

The following is an outline of the steps involved in the solution of this problem:

(1) Actual road tests on the division.

(2) Accumulation of theoretical data and checking same by actual tests.

(3) Determination of the relation between coal and water consumption and speed.

(4) Determination of the relation between tonnage and speed.

(5) Determination of the cost of operation at the various speeds.

Locomotive tests are not always representative of actual conditions and have been generally run on engines just out of the shops, with a special test train and schedule. The results so obtained do not indicate service conditions, so, in the investigation tests were made on service trains which were representative of actual service conditions.

The amount of coal used per 1,000 ton-miles and the pounds of water evaporated per pound of coal agreed closely with the results obtained in tests made by Mr. Garstang on the Cleveland, Cincinnati, Chicago & St. Louis, and published in the proceedings of the Western Railway Club, 1901.

The relation between the coal consumed in the firebox and the speed of the train was determined in the following manner:

(1) An investigation into the waste of steam on account of radiation, safety valve, etc.

(2) A determination of the volume of steam required for operation under ordinary conditions, based upon indicator card tests.

(3) A computation of the quantity of coal necessary to produce the volume of steam required at various speeds.

It is evident that this determination gives a theoretical coal consumption based upon indicator card tests. Checks with the actual road tests and averages of coal consumed, from the reports of the chief engineer, show that it is not far from that found in actual practice. From the reports of the chief engineer, indicator card tests were available, by the use of which the volume of steam required at different speeds could be determined. For amount of coal required to evaporate the water used, the work of Professor Goss and Mr. Garstang at Purdue University was taken, the average being about 6 lbs. of water per pound of coal. Results were plotted (Fig. 1) and show clearly how coal consumption varies with the speed, the greatest economy being attained at the speed of about 33 miles per hour. A point of special interest in this curve is that it shows the consumption of coal of the different classes of locomotives to vary in the same way, the points being intermingled along the curve, which was checked by road tests. The first check was made by selecting those parts of the speed records in which tonnages were somewhat uniform for all the tests and plotting below them the curve of actual coal consumption per mile, this being shown in Fig. 2. This gives a check which is remarkable and shows that theoretical deductions and actual conditions were not far apart.

In order that a fair comparison could be made of the costs of operation at various speeds, the cost was considered on the "ton-mile" basis, and to do this the necessary relation was determined between the tons hauled and the average speed, by plotting a curve of arbitrary stops from the despatcher's records. It was simply necessary to add the stopping time at a given tonnage to the running time previously found to be necessary for that period with the same tonnage, and divide the sum by the total miles. In Fig. 3 curves are plotted showing the variation at average running speeds.

As before stated, the comparison of operating costs was made on a ton-mile basis, and in view of this fact, the costs in this determination were figured on a unit of 1,000 ton-miles, only those items being considered which would be likely to vary with tons hauled and the speed, a summary of the results being given in Table III. The cost of coal on this division was $2.10 per ton (average) and the cost of water was assumed at 10 cents per 1,000 gallons, as given by Henderson, although it was perhaps high for this road, on which, however, no actual data was obtainable. The costs of locomotive and car repairs were taken from Henderson's determinations as being 15 cents per 1,000 ton-miles. The pay of engineers and firemen is based on a schedule of 100 miles or less, or 10 hours or less per day. The interest allowance was also accepted as figured by Henderson and amounted to $2.50 per day, or practically 10 cents per hour. In line 15 the sum of the different columns is shown and represents the comparative costs of operating, per 1,000 ton-miles. Fig. 4 shows the economical speed for freight trains on this division is somewhere near 15 miles per hour. The curve also shows clearly how the cost increases both at the slower and at the faster speeds.

TABLE 3.—SUMMARY—*Table of Costs.*

1. Average speed between terminals	10	15	20	25
2. Weight of train, back of tender	1,620	1,550	1,070	700
3. Actual time, hours between terminals	14.47	9.65	7.25	5.80
4. Coal burned, lbs. per mile	375	238	168	125
5. Coal burned, lbs. per 1,000-ton miles.	231	153.5	157	179
6. Water used, gallons per mile	215.5	154	104	85
7. Water used, galls. per 1,000-ton miles	133	99.5	97	121
Cost per 1,000-ton Miles.				
8. Cost of coal burned	.243	.161	.165	.188
9. Cost of water used	.0133	.0099	.0097	.0121
10. Cost of repairs	.145	.159	.168	.196
11. Pay of enginemen	.047	.050	.072	.111
12. Interest allowance	.0107	.0103	.0117	.0145
13. Cost of car repairs	.150	.150	.150	.150
14. Pay of trainmen	.0567	.0593	.0860	.1310
15. Total cost	.6657	.5995	.6624	.8026

The results in this table do not, it must be remembered, represent the total operating charge per 1,000 ton-miles, which would probably be a great deal more. The results are of interest in view of the fact that at the time most of the trains were made up on this division on the basis of an average speed of 10 miles per hour, whereas it appears from these computations that an average speed of 15 miles per hour would result in a decided saving.

[In an article in a later issue of the *Railway Age Gazette* Professor Van Zandt will explain the computations in detail and will present other data on which the despatcher's tables in the foregoing article were based.—Editor.]

BLOCK SIGNALS IN THE UNITED STATES, JANUARY 1.

The mileage of railways block signaled on January 1 last, as reported by the Interstate Commerce Commission, was given in a table published in the *Railway Age Gazette* of June 3, page 1339. The supplementary tables accompanying this government statement, in which are shown the kinds of automatic signals in use, and the methods and practices em-

TABLE 2.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—KINDS OF AUTOMATIC SIGNALS.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores.						Normal clear, miles of track.	Normal danger, miles of track.	Total automatic signals.		
					Electro-pneumatic.		Electric motor.		Electro-gas.						
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.			Miles of road.	Miles of track.	Number of block sections.
Atchison, Topeka & Santa Fe:															
Eastern lines			13.3	26.6			36.6	68.7			95.3		49.9	95.3	46
Western lines							35.8	38.2			38.2		35.8	38.2	36
Coast lines			6.4	7.4			7.5	7.5			14.9		13.9	14.9	12
Gulf, Colorado & Santa Fe			8.3	8.3			2.5	2.5			10.8		10.8	10.8	8
Atlantic Coast Line							2.2	4.4			4.4		2.2	4.4	6
Baltimore & Ohio			10.9	11.9	4.6	16.6	80.2	156.8	93.6	186.2	8.2	363.3	189.3	371.5	412
Boston & Maine			8.5	17.5			526.0	1,051.6	8.9	17.8	1,053.1	33.8	543.4	1,086.9	1,353
Boston, Revere Beach & Lynn							13.8	27.6			27.6		13.8	27.6	59
Butte, Anaconda & Pacific			7.9	7.9							7.9		7.9	7.9	7
Central of New Jersey					29.7	116.0	163.3	323.2	19.4	38.0	439.2	38.0	212.4	477.2	751
Chesapeake & Ohio							48.1	96.2			96.2		48.1	96.2	57
Chicago & Alton							561.0	705.9			183.0	522.9	561.0	705.9	368
Chicago & Eastern Illinois [a]			8.7	13.8			98.4	196.8			210.6		107.1	210.6	165
Chicago & Northwestern			715.6	1,449.1	6.3	12.6					1,461.7		721.9	1,461.7	1,140
Chicago & Western Indiana							17.8	35.6			35.6		17.8	35.6	59
Chicago, Burlington & Quincy			23.0	46.0	5.0	20.0					66.0		28.0	66.0	67
Chicago Great Western							8.1	16.0			16.0		8.1	16.0	21
Chicago, Milwaukee & St. Paul			2.4	2.4			42.6	85.2	3.5	3.5	75.2	15.9	48.5	91.1	102
Chicago, Peoria & St. Louis Railway of Illinois							1.2	1.2			1.2		1.2	1.2	1
Chicago, Rock Island & Pacific			8.0	14.0			591.5	865.1			879.1		599.5	879.1	809
Chicago, St. Paul, Minneapolis & Omaha							6.4	12.8			12.8		6.4	12.8	6
Chicago Terminal Transfer			1.0	2.0			5.2	9.6			11.6		6.2	11.6	12
Cumberland Valley							6.7	13.4			13.4		6.7	13.4	13
Cincinnati, Hamilton & Dayton							7.5	15.0			15.0		7.5	15.0	16
Delaware & Hudson			37.8	75.6					369.8	615.3		690.9	407.6	690.9	983
Delaware, Lackawanna & Western			25.6	51.2			506.6	967.3			1,018.5		532.2	1,018.5	1,427
Elgin, Joliet & Eastern							4.0	7.0			7.0		4.0	7.0	4
Erie							75.6	178.4				178.4	75.6	178.4	230
Erie & Jersey							42.3	84.6			84.6		42.3	84.6	88
New Jersey & New York							10.5	21.0				21.0	10.5	21.0	22
Grand Trunk					2.7	4.3					4.3		2.7	4.3	3
Great Northern							70.2	132.2			128.0	4.2	70.2	132.2	138
Illinois Central			27.7	104.1			133.1	253.6	114.9	227.8	186.9	398.6	275.7	585.5	477
Yazoo & Mississippi Valley							6.6	6.6			6.6		6.6	6.6	8
Kanawha & Michigan							.8	.8			.8		.8	.8	1
Lehigh Valley			260.1	544.7			206.5	431.1	14.4	28.8		1,004.6	481.0	1,004.6	1,066
Long Island							91.7	190.1			186.1	4.0	91.7	190.1	279
Louisville & Nashville							52.2	71.5			71.5		52.2	71.5	112
Lehigh & New England							.7	.7			.7		.7	.7	1
Maine Central							319.8	365.5			365.5		319.8	365.5	402
Missouri, Kansas & Texas			.5	.5			2.5	2.5			3.0		3.0	3.0	5
Missouri Pacific							60.7	77.9			77.9		60.7	77.9	53
St. Louis, Iron Mountain & Southern							92.9	101.5			101.5		92.9	101.5	66
Mobile & Ohio							4.7	9.5			9.5		4.7	9.5	3
Monongahela							.5	.5			.5		.5	.5	1
New York & Long Branch							38.0	76.0			76.0		38.0	76.0	98
New York Central Lines:															
Boston & Albany [b]	18.6	83.8		.8			116.0	331.4	2.2	14.4	209.8	220.6	193.5	430.4	581
Chicago, Indiana & Southern							5.0	10.0			10.0		5.0	10.0	24
Lake Shore & Michigan Southern			5.3	5.3			335.7	815.7	179.4	326.7	816.5	631.1	520.4	1,447.6	1,407
Michigan Central [c]			71.9	143.7			190.8	381.7			525.4		262.7	525.4	337
New York Central & Hudson River [d]			11.2	22.4			187.5	483.0	8.1	16.2	267.0	254.5	206.8	521.6	777
Pittsburgh & Lake Erie							148.8	377.3			377.3		148.8	377.3	207
New York, New Haven & Hartford	170.9	322.9	64.7	129.4			20.7	39.8			492.1		256.3	492.1	512
New York, Ontario & Western	71.2	121.1					74.5	134.3			255.4		145.7	255.4	144
Norfolk & Western					.7	.7	137.6	271.8			271.8	.7	138.3	272.5	280
Northern Pacific			2.6	4.5			52.8	104.8	3.8	3.8	113.1		59.2	113.1	111
Northwestern Pacific							13.9	25.4			25.4		13.9	25.4	42
Pennsylvania			5.0	10.0	230.4	838.6	11.4	22.8			871.4		240.8	871.4	1,401
Pennsylvania Co.							240.7	590.8			590.8		240.7	590.8	800
Philadelphia, Baltimore & Washington					36.6	115.2					115.2		36.6	115.2	142
Pittsburgh, Cincinnati, Chicago & St. Louis							9.3	22.8			22.8		9.3	22.8	54
West Jersey & Seashore					94.0	194.3					194.3		94.0	194.3	249
Pere Marquette			2.0	2.0			10.9	10.9			12.9		12.9	12.9	9
Philadelphia & Reading [e]			348.6	762.3	1.0	2.0			14.0	20.1	2.0	782.4	363.6	784.4	918
Atlantic City			86.9	173.8								173.8	86.9	173.8	91
Northeast Pennsylvania			4.7	6.5								6.5	4.7	6.5	8
Philadelphia, Newton & New York			7.5	12.4								12.4	7.5	12.4	15
Queen & Crescent Route:															
Alabama Great Southern	29.4	29.8	9.0	9.0			53.7	53.7			92.5		92.1	92.5	61
Cincinnati, New Orleans & Texas Pacific	38.2	38.7	56.3	57.7			235.6	300.6	5.0	8.0	361.9	43.1	335.1	405.0	332
St. Louis & San Francisco			8.0	11.0			163.3	193.0			197.0	7.0	171.3	204.0	307
St. Louis Merchant's Bridge Terminal							5.9	11.8			11.8		5.9	11.8	30
St. Louis Southwestern							.4	.4			.4		.4	.4	1
San Pedro, Los Angeles & Salt Lake			1.1	1.1							1.1		1.1	1.1	1
Southern							3.0	6.0			6.0		3.0	6.0	9
Southern Illinois & Missouri Bridge							4.6	9.2			9.2		4.6	9.2	18
Southern Pacific, Atlantic System:															
Galveston, Harrisburg & San Antonio							215.3	215.3			215.3		215.3	215.3	163
Louisiana Western							103.6	103.6			103.6		103.6	103.6	73
Morgan's Louisiana & Texas							95.3	95.3			95.3		95.3	95.3	72
Texas & New Orleans							109.8	109.8			109.8		109.8	109.8	77
Southern Pacific, Pacific System			1.0	1.0	6.0	14.0	2,068.2	2,198.3			2,213.3		2,075.2	2,213.3	1,852
Staten Island Rapid Transit			10.0	20.0							20.0		10.0	20.0	49
Terminal Railroad Association of St. Louis							6.0	12.0			12.0		6.0	12.0	16
Ulster & Delaware							24.4	24.4			24.4		24.4	24.4	20
Union			0.6	1.2							1.2		.6	1.2	2
Union Pacific			8.7	15.1			1,260.2	1,682.7	38.6	72.0	1,769.8		1,307.5	1,769.8	1,361
Oregon Railroad & Navigation Co.							415.7	415.7			415.7		415.7	415.7	271
Oregon Short Line			24.0	24.0			350.2	357.1			381.1		374.2	381.1	512
Wabash							7.2	14.4			14.4		7.2	14.4	25
Wabash Pittsburg Terminal							4.1	8.2			8.2		4.1	8.2	11
Washington Terminal					2.1	20.4						20.4	2.1	20.4	13
Total	328.3	596.3	1,894.8	3,796.2	419.1	1,354.7	10,664.4	16,145.6	875.6	1,878.6	18,343.1	5,428.5	14,238.9	23,771.3	24,380

[a] (Chicago & Eastern Illinois.) Includes 8.7 miles inclosed disk not shown in Table 1, the same being covered by manual signals.
[b] (Boston & Albany.) 13.4 miles of road, 47.3 miles of track, covered by slotted signals not shown in this table; the total mileage includes 56.7 miles of road which are not classified.
[c] (Michigan Central.) 9.2 miles double track slotted signals not shown in this table.
[d] (New York Central & Hudson River Railroad.) 2 miles 4-track road on which light signals are used not shown in this table.
[e] (Philadelphia & Reading.) Includes 16.1 miles not shown in Table 1, used exclusively for freight traffic.

TABLE 3.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—METHODS AND APPARATUS, MANUAL SYSTEM.

Names of railroads.	Telegraph.		Telephone.		Electric bells.		Controlled manual.						Electric train staff.		Block signal stations.	
							No track circuit.		Track circuit at stations.		Continuous track circuit.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Total number.	Number closed part time.
Atchison, Topeka & Santa Fe:																
Eastern lines			870.0	1,323.4									7.7	7.7	176	53
Western lines[a]			559.9	561.1									28.5	28.5	104	17
Coast lines													4.3	4.3	4	
Gulf, Colorado & Santa Fe													2.1	2.1	2	
Atlanta & West Point							87.0	93.0							14	2
Atlantic Coast Line	352.5	414.5	135.3	166.1											119	19
Baltimore & Ohio	999.4	1,814.6	2.6	2.6							1.5	1.5			278	2
Baltimore & Ohio Southwestern	973.8	1,029.7													178	115
Baltimore & Sparrows Point	3.0	6.0													3	2
Bessemer & Lake Erie	194.2	298.7											.9	.9	53	9
Boston & Maine									4.8	9.6					2	
Buffalo, Rochester & Pittsburg	422.0	546.2													95	46
Chicago, Indianapolis & Louisville	537.7	537.7													55	51
Caldwell & Northern	2.4	2.4													2	2
Central of Georgia	59.7	66.1													19	3
Central Vermont							.4	.4			1.1	1.1			2	
Chesapeake & Ohio	1,188.6	1,357.6					147.4	147.4	92.1	184.2	28.9	37.7	7.7	8.8	369	79
Coal River			69.3	69.3											13	13
Chicago & Alton							122.7	122.7					18.5	18.5	25	4
Chicago & Eastern Illinois	151.0	207.2	8.9	10.2			61.4	61.4							52	15
Chicago & Northwestern	2,018.7	2,029.5	512.1	616.6											424	236
Chicago & Western Indiana					9.5	22.2									19	
Chicago, Burlington & Quincy	4,956.7	4,956.7	2,460.1	3,004.7			1,201.5	1,201.5			56.9	56.9			1,128	753
Chicago Great Western	288.9	815.7									.5	.5	1.6	1.6	78	21
Chicago, Milwaukee & St. Paul	3,862.6	4,248.0									1.0	1.0	8.5	8.5	646	262
Chicago, Milwaukee & Puget Sound	1,073.3	1,073.3											2.7	2.7	91	
Chicago, Rock Island & Pacific	657.5	657.5	485.3	485.3									9.0	9.0	175	88
Chicago, St. Paul, Minneapolis & Omaha	269.8	269.8	379.8	443.9											118	57
Cincinnati, Hamilton & Dayton	51.6	72.0													18	5
Cincinnati, Indianapolis & Western	41.8	41.8													8	2
Colorado Midland													2.0	2.0	2	
Cornwall & Lebanon	22.0	35.7													7	7
Cumberland & Pennsylvania	7.3	13.3													9	3
Cumberland Valley	17.6	17.6					2.0	2.0							12	
Davenport, Rock Island & Northwestern							41.7	42.8							11	6
Delaware & Hudson			.6	.6											2	
Delaware, Lackawanna & Western											1.5	1.5	4.3	4.3	4	
Duluth & Iron Range			16.8	18.8											8	6
Duluth, South Shore & Atlantic													4.2	4.2	2	
Durham & Southern	56.0	56.0													11	9
Elgin, Joliet & Eastern	9.2	9.2													1	
Erie	285.6	421.1	40.6	53.7	898.8	1,331.7									355	74
Chicago & Erie	248.8	257.2													60	8
Columbus & Erie	22.4	32.2													3	3
New Jersey & New York	26.1	26.1													11	5
New York, Susquehanna & Western and Wilkes-Barre & Eastern					20.7	20.7									17	2
Great Northern	174.8	174.8					65.0	65.0					19.9	19.9	59	3
Hocking Valley	74.7	74.7													24	
Illinois Central							5.0	10.0							2	
Kanawha & Michigan							1.3	1.3							2	
Kansas City, Clinton & Springfield			2.5	2.5											2	
Kentucky & Indiana Bridge and Railroad Co	9.7	14.6													7	
Lackawanna & Wyoming Valley			1.2	2.4									2.2	3.4	3	2
Lehigh Valley	729.4	789.9											6.2	6.2	156	108
Long Island					14.1	28.2			8.6	17.2					37	10
Louisville & Nashville	216.3	265.2													67	10
Marquette & Southeastern	3.7	3.7													2	
Minneapolis, St. Paul & Sault Ste. Marie	2,161.3	2,165.7	24.4	24.4											246	183
Missouri, Kansas & Texas	8.6	8.6													3	1
Missouri Pacific	15.8	15.8	7.0	14.0			1.9	1.9			1.2	1.2	8.2	8.2	12	3
St. Louis, Iron Mountain & Southern	4.6	4.6	1.0	1.0					1.1	2.2	1.2	1.2			7	
Mobile & Ohio	42.4	42.4													15	2
Mississippi Central	150.0	150.0													15	15
Nashville, Chattanooga & St. Louis	103.1	113.4													36	
Newburgh & South Shore							5.3	10.5							4	4
New York Central Lines:																
Boston & Albany							1.6	3.2							3	
Chicago, Indiana & Southern	17.4	17.4													6	3
Cincinnati Northern	206.1	206.1													40	27
Cleveland, Cincinnati, Chicago & St. Louis	763.8	1,016.0	103.6	169.8											226	34
Lake Erie & Western	871.8	880.8													151	111
Lake Shore & Michigan Southern	967.2	988.3	87.5	87.5											207	111
Dunkirk, Allegheny Valley & Pittsburg	90.3	90.3													17	15
Lake Erie, Alliance & Wheeling			87.7	87.7											22	16
Michigan Central	920.2	939.3													137	71
New York Central & Hudson River	2,214.0	2,729.7	2.9	11.6	.9	1.8	4.1	8.1	40.3	110.9	369.3	1,239.7			731	292
Peoria & Eastern			5.3	7.0											6	
Pittsburg & Lake Erie							22.7	25.6							15	9
New York, New Haven & Hartford	199.1	245.0							237.8	627.2	1.0	2.0	2.2	2.2	163	36
Norfolk & Western	1,015.9	1,117.9	490.9	550.6											262	137
Northern Pacific	750.1	845.6	638.6	864.7									1.3	1.3	245	22
Northwestern Pacific	199.2	199.2	51.3	51.3											35	29
Cleveland, Akron & Columbus	142.1	157.7													30	
Cincinnati & Muskingum Valley	11.4	11.4													3	
Pennsylvania	1,888.0	3,058.1	355.5	526.6	.8	1.6					10.9	10.9			618	61
Grand Rapids & Indiana			2.2	4.4											3	3
Northern Central	367.1	549.1	60.8	61.8							.7	1.4			120	18
Pennsylvania Company	615.9	1,043.7	12.7	16.1											179	2
Philadelphia, Baltimore & Washington	284.5	508.0									1.6	3.2			95	13
Pittsburg, Cincinnati, Chicago & St. Louis	1,051.9	1,582.6	9.1	16.8							8.5	8.5			277	17
West Jersey & Seashore			79.7	113.2											23	13
Peoria & Pekin Union	6.0	12.0													3	
Pere Marquette	19.0	19.0													4	
Philadelphia & Reading	274.3	396.1	1.1	1.3							1.1	1.1	1.9	1.9	109	33
Atlantic City	22.6	22.6													8	8
Northeast Pennsylvania													1.7	1.7	2	2
Perkiomen	38.1	38.1													12	9
Reading & Columbia	35.7	35.7													12	12
Queen & Crescent Route:																
Cincinnati, New Orleans & Texas Pacific													.7	.7	2	
Richmond, Fredericksburg & Potomac	87.0	174.7											.7	.7	20	2

TABLE 3.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—METHODS AND APPARATUS, MANUAL SYSTEM.—(*Continued.*)

Names of railroads.	Telegraph.		Telephone.		Electric bells.		Controlled manual.						Electric train staff.		Block signal stations.	
							No track circuit.		Track circuit at stations.		Continuous track circuit.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Total number.	Number closed part time.
St. Joseph & Grand Island					.3	.3									1	
St. Louis & San Francisco	4.1	8.2	270.5	270.5									5.1	5.1	61	25
St. Louis Merchants' Bridge Terminal	1.1	2.2													3	
Seaboard Air Line			206.6	206.6									6.9	6.9	46	16
Southern	1,817.5	2,057.2	11.0	11.0									5.9	5.9	381	115
Southern Pacific: Pacific System											1.0	1.0	94.4	94.4	39	
Spokane, Portland & Seattle	8.4	11.4													5	
Terminal R. R. Assn. of St. Louis									1.1	2.2					2	
Union							.5	.5			.9	.9			2	
Union Pacific													10.9	10.9	4	
Vandalia	237.9	275.9													60	
Virginia & Kentucky			.6	.6											1	
Virginian	2.2	2.2													2	2
Wabash	1,820.7	1,914.7													267	129
Washington Southern	32.2	64.3													9	
Western Ry. of Alabama							138.0	138.0							15	
Total	39,477.4	45,857.3	8,105.0	9,859.7	945.1	1,406.5	1,909.5	1,935.3	385.8	953.5	491.5	1,371.3	270.2	272.5	9,898	3,713

a (Atchison, Topeka & Santa Fe: Western Lines.) These figures include 22.7 miles of double track road on which the electric train staff is used for trains moving in one direction (down grade), and the simple manual block system, by means of the telephone, for trains moving in the opposite direction.

TABLE 4.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—PRACTICES, MANUAL SYSTEM.

Names of railroads.	Permissive signaling forbidden.		Permissive signaling allowed.						Rear-end protection only.		Stop at station recognized as stop for signal opposite office	
			By three-position signal.		By two-position signal and flag or lantern.		By caution card.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.
Atchison, Topeka & Santa Fe:												
Eastern Lines			870.0	1,323.4			a 7.7	7.7				
Western Lines			a 559.9	561.1			a 28.5	28.5				
Coast Lines	4.3	4.3										
Gulf, Colorado & Santa Fe							a 2.1	a 2.1				
Atlanta & West Point	87.0	93.0										
Atlantic Coast Line	76.0	103.2					411.8	477.4				
Baltimore & Ohio	179.8	240.7	823.7	1,578.0								
Baltimore & Ohio Southwestern			b 579.1	631.6	b c 394.7	398.1			973.8	1,029.7	973.8	1,029.7
Baltimore & Sparrows Point			3.0	6.0								
Bessemer & Lake Erie							195.1	299.6				
Boston & Maine	4.8	9.6										
Buffalo, Rochester & Pittsburgh					a 422.0	546.2						
Chicago, Indianapolis & Louisville			537.7	537.7								
Caldwell & Northern	2.4	2.4										
Central of Georgia	59.7	66.1										
Central Vermont	1.5	1.5										
Chesapeake & Ohio							a 1,464.7	1,735.7			1,020.9	1,020.9
Coal River							69.3	69.3				
Chicago & Alton							c 141.2	141.2				
Chicago & Eastern Illinois	13.0	13.0	208.3	265.8								
Chicago & Northwestern							c 2,530.8	2,646.1			2,530.8	2,646.1
Chicago & Western Indiana					9.5	22.2						
Chicago, Burlington & Quincy	60.3	67.5			d 8,614.9	9,152.3	a 1,201.5	1,201.5	6,802.7	6,802.7	8,673.8	9,214.2
Chicago Great Western	291.0	317.8										
Chicago, Milwaukee & St. Paul	313.0	335.7					a c 3,559.1	3,821.4				
Chicago, Milwaukee & Puget Sound							c 1,076.0	1,076.0				
Chicago, Rock Island & Pacific							b 1,151.8	1,151.8			1,151.8	1,151.8
Chicago, St. Paul, Minneapolis & Omaha							c 649.6	719.3				
Cincinnati, Hamilton & Dayton			51.6	72.0								
Cincinnati, Indianapolis & Western					c 41.8	41.8	c 41.8	41.8				
Colorado Midland	2.0	2.0										
Cornwall & Lebanon					c 22.0	35.7						
Cumberland & Pennsylvania			7.3	13.3								
Cumberland Valley	2.0	2.0	a b 17.6	17.6								
Davenport, Rock Island & Northwestern					c 41.7	42.8						
Delaware & Hudson	.6	.6										
Delaware, Lackawanna & Western	5.8	5.8										
Duluth & Iron Range	16.8	20.8										
Duluth, South Shore & Atlantic	4.2	4.2										
Durham & Southern									56.0	56.0		
Elgin, Joliet & Eastern					c 9.2	9.2						
Erie			c 1,225.0	1,806.5							1,225.0	1,806.5
Chicago & Erie			c 248.8	257.2							248.8	257.2
Columbus & Erie			c 22.4	32.2								
New Jersey & New York			c 26.1	26.1							26.1	26.1
New York, Susquehanna & Western and Wilkes-Barre & Eastern			c 20.7	20.7								
Great Northern	19.9	19.9			a c 239.8	239.8	a c 239.8	239.8			239.8	239.8
Hocking Valley			b 74.7	74.7								
Illinois Central	5.0	10.0										
Iowa Central					c 11.0	c 11.0						
Kanawha & Michigan	1.3	1.3										
Kansas City, Clinton & Springfield	2.5	2.5										
Kentucky & Indiana Bridge & R. R. Co			9.7	14.6								
Lackawanna & Wyoming Valley	3.4	5.8										
Lehigh Valley	735.6	796.1										
Long Island							22.7	45.4				
Louisville & Nashville			216.3	265.2								
Marquette & Southeastern			3.7	3.7								
Minneapolis, St. Paul & Sault Ste. Marie							2,185.7	2,190.1				
Missouri Pacific	14.1	21.1					20.0	20.0				
St. Louis, Iron Mountain & Southern	7.9	9.0										
Mobile & Ohio	17.6	17.6			c 24.8	24.8						
Missouri, Kansas & Texas	8.6	8.6										
Mississippi Central					b 150.0	150.0			150.0	150.0	150.0	150.0

TABLE I.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—PRACTICES, MANUAL SYSTEM. (*Continued.*)

Names of railroads.	Permissive signaling forbidden.		Permissive signaling allowed. By three-position signal.		By two-position signal and flag or lantern.		By caution card.		Rear-end protection only.		Stop at station recognized as stop for signal opposite office.	
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.
Nashville, Chattanooga & St. Louis	98.2	103.1										
Newburgh & South Shore					b 5.3	10.5						
New York Central Lines:												
Boston & Albany	1.6	3.2										
Chicago, Indiana & Southern	17.4	17.4										
Cincinnati Northern							a 206.1	206.1			206.1	206.1
Cleveland, Cincinnati, Chicago & St. Louis	851.1	1,169.5			16.3	16.3						
Lake Erie & Western	18.6	18.6	b 853.2	862.2							853.2	862.2
Lake Shore & Michigan Southern							a 1,054.7	1,075.8			1,054.7	1,075.8
Dunkirk, Allegheny Valley & Pittsburg							a 90.3	90.3			90.3	90.3
Lake Erie, Alliance & Wheeling							a 87.7	87.7			87.7	87.7
Michigan Central	920.2	931.3									920.2	931.3
New York Central & Hudson River	2,507.5	3,853.9					a 124.0	248.0				
Peoria & Eastern					5.3	7.0						
Pittsburgh & Lake Erie	22.7	25.6										
New York, New Haven & Hartford	2.2	2.2					c 437.9	874.2				
Norfolk & Western	12.9	12.9	1,296.4	1,458.1	197.5	197.5			1,054.2	1,054.2		
Northern Pacific	666.9	751.9					723.1	959.7			1,390.0	1,711.6
Northwestern Pacific	250.5	250.5										
Pennsylvania			a 1,736.2	2,742.4	519.0	854.8	519.0	854.8				
Cleveland, Akron & Columbus			a b 142.1	157.7							142.1	157.7
Cincinnati & Muskingum Valley			a b 11.4	a b 11.4							11.4	11.4
Grand Rapids & Indiana	2.2	4.4										
Northern Central			a b 168.6	303.3								
Pennsylvania Company			a b 628.6	1,059.8							628.6	1,059.8
Philadelphia, Baltimore & Washington	101.5	182.0	c 184.6	329.2								
Pittsburgh, Cincinnati, Chicago & St. Louis			ab 1,069.5	1,607.9							1,069.5	1,607.9
West Jersey & Seashore							c 79.7	113.2				
Peoria & Pekin Union			c 6.0	12.0								
Pere Marquette	19.0	19.0										
Philadelphia & Reading	63.4	114.2					a 215.0	286.2				
Atlantic City	22.6	22.6										
Northeast Pennsylvania	1.7	1.7										
Perkiomen							b c 38.1	38.1				
Reading & Columbia							b 35.7	35.7				
Queen & Crescent Route												
Cincinnati, New Orleans & Texas Pacific					b .7	.7						
Richmond, Fredericksburg & Potomac							a 87.7	175.4	87.7	175.4		
St. Joseph & Grand Island			.3	.3								
St. Louis & San Francisco	48.9	53.0					c 230.8	230.8				
St. Louis Merchant's Bridge Terminal	1.1	2.2									1.1	2.2
Seaboard Air Line	6.9	6.9					c 206.6	206.6				
Southern	16.9	16.9					c 1,817.5	2,057.2			1,834.4	2,074.1
Southern Pacific, Pacific System	95.4	95.4										
Union Pacific							10.9	10.9				
Spokane, Portland & Seattle									8.4	11.4	8.4	11.4
Terminal Railroad Association of St. Louis	1.1	2.2										
Union	1.4	1.4										
Vandalia			b 237.9	275.9							237.9	275.9
Virginia & Kentucky	.6	.6										
Virginian	2.2	2.2										
Wabash							c 1,820.7	1,914.7	769.1	769.1		
Washington Southern							a 32.2	64.3	32.2	64.3		
Western Railway of Alabama	138.0	138.0										
Total	7,832.8	9,984.9	11,840.4	16,327.6	10,725.5	11,760.7	22,816.9	25,444.4	9,934.1	10,112.8	24,776.4	27,707.7

a Permissive signalling is practiced only in the case of a freight train following a freight train, or in similar movements where neither train carries passengers.
b By rule.
c By dispatcher.
d (Chicago, Burlington & Quincy.) On 4,382.8 miles of road the block system is not used for all trains. Stopping beyond signal applies only to local trains.

ployed in the operation of the manual block system are given herewith.

SPEED CONTROL SIGNALS ON THE INTERBOROUGH.

At the meeting of the Railway Signal Association in New York this week, J. M. Waldron, signal engineer of the Interborough Rapid Transit Company, gave a brief talk on the arrangement that he has introduced at the principal stations on the express tracks of the subway in Manhattan by which trains can with safety be run closer together than formerly, thus materially increasing the capacity of the road. At and near the stations he introduces very short block sections, and compels a reduction of the speed of the trains before they are allowed to enter the short sections. He said, in part:

Speed control signals are intended to compel trains to observe certain fixed pre-determined speeds, and are used on approaches to stations and on approaches to junctions; at junctions, to permit a train to approach near to the junction at a time another train is passing over it; at stations, to permit a train to approach near to the station at the time the track in the station is occupied by another train.

Block signals in the New York subway are automatic. Interlocking signals are semi-automatic. Operating in connection with these signals are automatic stops to apply the brakes on trains automatically should the motorman disregard the stop indication. The successful operation of the automatic stop requires the use of overlapping track circuits; the length of such overlap must be more than the braking distance of a train when moving at its maximum speed.

Subway cars are equipped with very efficient brakes. Tests have shown that a ten-car train weighing more than 900,000 lbs. when running at a speed of forty miles an hour on a 3.1 per cent. minus grade, was brought to a stop inside of 700 ft. With brakes so efficient, what is the object of bringing trains so close together? Surely 700 ft. is not an excessive distance for keeping trains apart; the time consumed in running this short distance ought not to materially interfere with the traffic of a railway. But one-fifteenth of the population of the whole United States lives within twenty miles of the City Hall in New York, and it is necessary to save seconds.

The lines of the Interborough Rapid Transit Company, which include the elevated roads of the Boroughs of Manhattan and the Bronx, and the subway in the Boroughs of Manhattan, Bronx and Brooklyn, operate 29,254 cars made into 4,236 trains, carrying about 2,000,000 of people, each twenty-four hours. The car mileage each day is more than 14½ times around the world at the equator. While the population is increasing very rapidly, the traffic is increasing much faster.

The Interborough, realizing that for the time being it was impossible to immediately build additions to the subway lines devoted its energies to increasing the carrying capacity of the present roads to their utmost limits. The question of

building reservoir stations was seriously considered, and the influence such stations would have on increasing the capacity of the roads was carefully worked out; the building of additional tracks at congested points was considered, and the per cent. increase in capacity which these additional tracks would give was calculated, but owing to the cost and to the great difficulty of doing this work in a crowded city, while at the same time, the operation of more than 1,900 subway trains

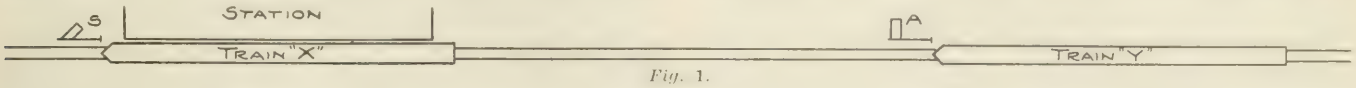


Fig. 1.

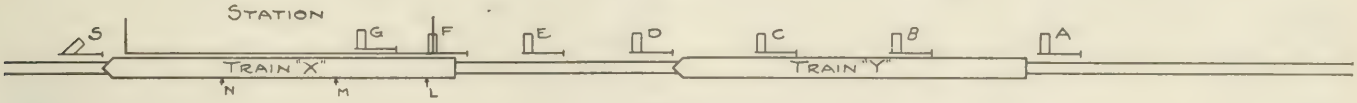


Fig. 2.

Arrangement of Automatic Block Signals at Express Stations, Interborough Rapid Transit Co., New York City.

Fig. 1 shows the arrangement of signals as originally installed at express stations. With train X in the station, the following train, Y, is held at signal A. Signal A clears when rear end of train X has passed signal S.

Fig. 2 shows the speed control signals as now installed at express stations. With train X in the station, the following train, Y, can proceed at a certain predetermined speed to signal D. Signal D clears when rear end of train X has passed L; signal E when rear end of train X has passed M; signal F when rear end of train X has passed N; signal G when rear end of train X has passed signal S.

a day must not be interfered with, these schemes were given up and another solution was sought. That solution was the devising and installation of the "speed control signals."

The length of the station stop is determined by the time consumed in the unloading and loading of trains. This is practically a fixed quantity. While everything possible is done to reduce this stop, it is found that there is a fixed minimum under which it is impossible to go.

Prior to the installation of the speed control signals, the spacing of trains was such that the front end of train "Y," Fig. 1, when approaching a station, was always held from the rear end of train "X," Fig. 1 standing in a station, a distance sufficient to bring train "Y" to a stop before its front end reached the rear end of train "X."

The automatic application of the brakes keeps trains the stopping distance apart. Under this system, it was impossible to operate trains at a headway of less than two (2) minutes.

Speed control signals operate and control trains in the following manner: Train "X," Fig. 2, is standing at a station platform, signal "A" is at caution and signals B, C, D, E, F and G are at stop indication, automatic trips at signals B, C, D and E are at the stop position, trip at signal "A" is clear; signal "B" is located at braking distance from rear end of train "X." When train "Y" passes signal "A," this signal immediately goes to the danger position; when it reaches that position, it starts in operation a timing device which makes contacts after a fixed time which clear signal and stop "B," providing blocks B, C, D and E are clear. This timing device is so adjusted that the motorman must reduce the speed of his train an amount sufficient to consume a pre-determined time interval in running from signal "A" to signal "B." After the front end of train "Y" passes signal "B," this signal goes to the stop position at once and starts a timing device in operation which closes the circuits controlling signal and stop "C" and will clear them providing blocks C, D and E are not occupied. The timing device at signal "B" is so adjusted that train "Y" must take a fixed pre-determined time in moving from signal "B" to signal "C." If train "Y" travels this distance in less than the allotted time, its front end will reach signal and stop "C" before they have cleared, with the result that the train will be tripped and brought to a stop automatically, and as train "Y" has been compelled to reduce its speed in moving from signal "A" to signal "B," its speed is now sufficiently low to bring it to a stop before it reaches rear of train "X," even though its braking distance is much reduced. Train "Y" can now proceed to signal and stop "D," where it is held until train "X" starts to move out of the station. When rear end of train "X" has passed "L" signal and stop, "D" clears. Train "Y" now continues on to signal "E." This signal will not clear until rear end of train "X" has passed "M." It then clears and train "Y" can proceed to signal "F." This signal and stop will clear when rear end of train "X" has passed "N." Train "Y" can now move onto signal "G," which will not clear until rear end of train "X" has passed by the exit end of the platform.

Signals A, B, C, D, E, F and G are so located that train "Y" can continue to move in towards the station without interruption, while train "X" unloads and loads its passengers and moves out of the station. Thus, the time consumed in making additional stops is eliminated. If there should be no train in the station when train "Y" approaches, all signals will be clear and train "Y" can enter station without reducing speed, likewise, if train "X" should leave the station when train "Y" is approaching under control, all signals between train "Y" and the station will immediately show the clear indication

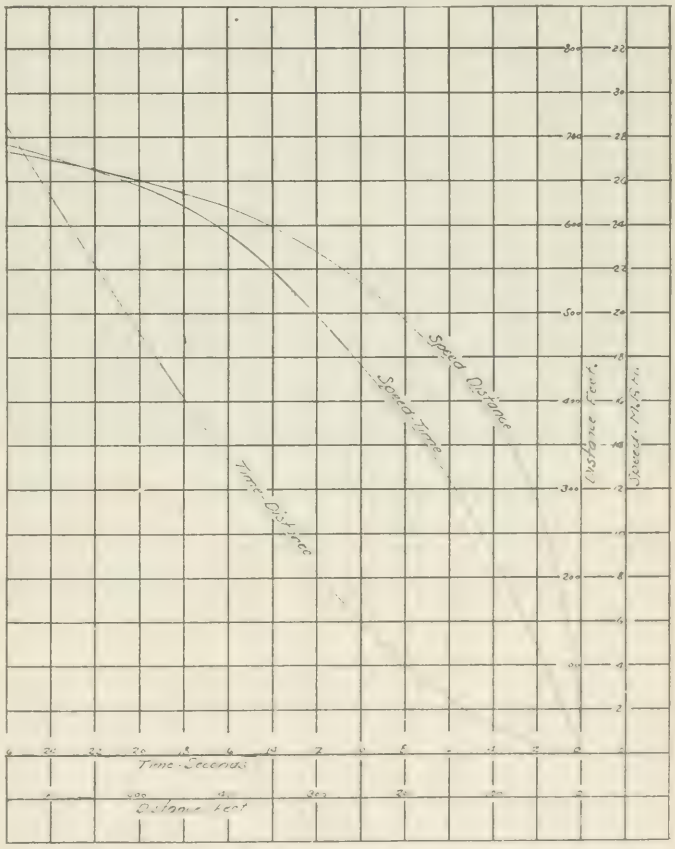


Fig. 3—Time—Speed Diagram; Trains Entering Stations.

when train "X" leaves the station. The time and speed curves for train "Y" entering a station are shown on Fig. 3.

The following comparison of conditions is based on records of northbound express trains through Grand Central Station:

	As in Fig. 1.	As in Fig. 2
Headway	2 min. 0 sec.	1 min. 39 sec.
Station stop	0 min. 46 sec.	0 min. 46 sec.
Trains per hour	30	36.4
Cars per hour	240	291
Gain in capacity	...	21.3 per ct.

General News Section.

Aeroplane wrecked in Kansas by the suction of a passing railway train. More ruinous competition! —*Wall Street Journal.*

The Northern Pacific is now using oil-burning switching engines in Tacoma, and will soon use oil fuel on the locomotives of the passenger trains between Tacoma and Portland.

The Minneapolis, St. Paul & Sault Ste. Marie is to pay pensions to its employees. The plan will be similar to that which has been in force for some time on the Canadian Pacific. The M., St. P. & S. S. M. is controlled by the Canadian Pacific.

The Chicago & North Western has presented to the University of Illinois the locomotive testing plant which for a number of years has been in use at its shops in Chicago. This plant was built for the railway company under the direction of Robert Quayle.

According to the *St. Paul Pioneer Press*, the railways west of that city (particularly the Northern Pacific) have, as a result of the impairment of business prospects by recent court and legislative action, discharged several thousand laborers engaged on new construction.

The Western Electric Company has taken orders from the Atchison, Topeka & Santa Fe for telephone equipment for the lines from Newton, Kan., west to Gainesville, Tex.; from Temple, Tex., to Galveston, Tex.; from Temple to Brownwood, Tex., and from Wichita, Kan., to Clovis, N. M.

The Erie Railroad is now using two of the four tracks of its new line through the Bergen hill cut, approaching Jersey City, and all passenger trains, excepting those of the Northern of New Jersey, now reach the terminal without passing through the tunnel. The ruling grades of the new line are 35 ft. to the mile.

On the night of June 9, near Robsart, N. M., eastbound passenger train No. 2, of the El Paso & Southwestern, was stopped by a robber, who compelled the passengers in the sleeping car to give up all their valuables. The robber had boarded the train at the last station and stopped it simply by ordering the Pullman conductor and a brakeman to pull the bell cord, enforcing this order with a gun.

The University of Pittsburgh (Pa.), beginning next autumn, will provide practical as well as theoretical instruction for students in engineering by giving them employment during four terms of three months each in engineering industries in the Pittsburgh district. Thus in the space of four years a student will have had 12 months' shop or laboratory experience. Arrangements have been made with establishments where mechanical, electrical, chemical and sanitary engineering can be practiced. The university will co-operate with the management of the shops, but the student will be an actual employee of the concern and will work six days in a week and receive the regular wages of student apprentices. The student will report to an instructor at the university every two weeks.

Superintendent R. T. Morrow, of the Pittsburgh division of the Pennsylvania Railroad, in furtherance of the continuous campaign which the Pennsylvania is waging against trespassers, has written a letter to the mayor or other chief officers of each city and borough through which his lines run asking for the co-operation of the local authorities in keeping people off the railway right-of-way; not only children but grown people; not only tramps but those who are respectable. The letter in itself is quite mild. Mr. Morrow "respectfully asks that the mayor take such action as, in his judgment, is warranted." We venture to hope, however, that there is something to be read between the lines. Indeed, it has recently been announced that on some of its lines the Pennsylvania has stationed watchmen to see that warnings against trespassing are respected. The company has reduced the number of trespassers killed and injured during the past three years and proposes to reduce it still farther.

The Southern Railway has increased the pay and decreased the working hours of its telegraph operators in accordance with the decision of the arbitrators appointed under the Erdman act to mediate the differences between the company and its 2,100 telegraphers. The increase in pay amounts to approximately $40 per man per annum, or a total of nearly $9,000. The hours of the one-operator offices are shortened from thirteen to ten, and where two or more operators are employed the hours are reduced from nine to eight. Fifteen days' leave of absence with pay was awarded all operators who have to work as much as five hours a day on Sundays or on legal holidays. This applies to telephone operators as well as telegraphers. The board of arbitrators was composed of J. S. B. Thompson, of Atlanta, Ga., assistant to the president of the Southern Railway; J. J. Dermody, vice-president of the Telegraphers' Union, and Prof. William R. Vance, dean of the law faculty of the George Washington University.

Letter from A Railway Man to His Son, Just "Set Up" from Fireman.

Dear Son: Enclosed herewith is an explanation of Rule 4 of the Standard Code of Train Rules, adopted some time since by the road with which you are identified. * * * That engine and trainmen do not understand the rules is due both to their own lack of interest in their profession and to the failure of their superiors to understand the rules; or, if they do understand them, to make them clear to those employees who have to observe them. Business men are divided into two classes, viz.: Successful, or lucky, and unsuccessful, or unlucky. * * * Good luck does not come to those who do not put forth their best efforts. There are men on all roads who make little or no effort to prepare themselves for increased responsibilities until the word goes out that there are to be promotions. When called upon for examination some pass and some do not. Many of those who do pass again cease all effort; and if asked why, will answer that they know the rules; otherwise they would not have been promoted. The doctor who closes his medical books when admitted to practice develops into a quack. The same may be said of the railway man who closes his book of rules and makes no further effort. There is no such thing as luck on railways. The lucky man is a business man; the unlucky man is not. Engine and trainmen should be better business men than all others, for a failure means loss of reputation, and often of life and limb. There are engine and trainmen on every railway who are looked upon as authorities on the rules—men who are called upon by their fellow-employees to decide questions. There is no reason why every man should not be an authority in his profession. Every road has employees who make successful trips year after year. Their success is charged to good luck. Take a trip with one of these men and you will discover the secret of their success; it is not good luck; they are business men. Then take a trip with an unlucky man and you will soon discover the secret of his bad luck—he is not a business man. You alone must decide in what class you are to journey through life. * * *

Change in the Air-Brake Law.

The Interstate Commerce Commission, in an order dated June 6, has increased from 75 per cent. to 85 per cent. the minimum proportion of power brakes to be used in all trains on railways engaged in interstate commerce. The order says:

"That on and after September 1, 1910, on all railways used in interstate commerce, whenever, as required by the Safety Appliance Act as amended March 2, 1903, any train is operated with power or train brakes, not less than 85 per cent. of the cars of such train shall have their brakes used and operated by the engineer of the locomotive drawing such train, and all power-brake cars in every such train which are associated together with the 85 per cent. shall have their brakes so used and operated."

Proposed Pennsylvania Improvements in Newark.

The Pennsylvania has prepared plans for extensive improvements of the main line in Newark, N. J. The four-track elevated line is to be completed from Fifteenth street, Harrison (east of the river), to a point west of the Newark station, except that the gauntlet over the Passaic river drawbridge will have only two tracks. At present there are two tracks at the Market street station, which is the main station in Newark. With the addition of two more tracks there will be island platforms, one for the two eastbound tracks and another for the westbound. These platforms will be about 30 ft. wide at the widest point and about 800 ft. long. Waiting rooms will be provided on each platform, with entrance stairs leading up direct from the new station, and there will be exit stairs to Market street. Baggage lifts will be provided, so that a minimum amount of trucking will be necessary on the platforms. These platforms will be about level with the floors of the cars and passengers can board trains without using steps, just as will be the case at Harrison Transfer station. The widening necessary for these platforms will require the construction of a new passenger station larger and handsomer than the present structure, to be situated nearly on the site of the present station.

The city of Newark will be asked to vacate Railroad avenue on the north side of the tracks from Lafayette street to Hamilton street, in lieu of which the railroad company will purchase the property and construct a new and wider thoroughfare a short distance north of the existing street. The estimated cost of the improvements is about $500,000.



Study for New Passenger Station at Newark, New Jersey; Looking West. Pennsylvania Railroad.

A Good Word for the Porter.

There is one class of railway employees whose wages are never raised—the humble Pullman car porter. Prices may rise and the cost of living go up by leaps and bounds, yet no one ever suggests an increase of the less than one-dollar-a-day wage these men receive. True they are given tips, and the comic weeklies are always having their fling at the millionaire porter. Nothing could be a bitterer jest—for the porter. Tips fall off or decrease as railway rates go up, with other expenses. On some runs a man can make little; on others the physical hardships are very great, involving days of hard work and nights of little sleep and much discomfort. The Pullman Company makes millions—such enormous profits that the Interstate Commerce Commission has ordered a reduction of rates for upper berths—but it still charges against the porters' pay all loss and breakage. If a passenger steals a towel or a hair-brush the porter must pay for it; no excuse is accepted. The car company also encourages the tipping idea, so that it may shift part, perhaps half, of its wage burden upon the traveling public. Long and faithful service, devotion to the company's interest, all count for nothing. The best porter in the country cannot hope to be a Pullman conductor, because of his color. The vast majority of porters, be it noted, are honest, obliging and well-behaved; cases of dishonesty or flagrant misbehavior are extremely rare.—*Evening Post*, New York.

Governor's Island to Philadelphia Without a Stop.

On Monday last, June 13, Charles K. Hamilton flew, in his biplane, from Governor's island, New York harbor, to Philadelphia, about 85 miles, in one hour, 50 minutes, and after a rest of two hours returned to New York; but on the return journey a fault in his motor compelled him to alight at South Amboy, N. J., and he was detained there six hours making repairs. He reached New York, however, finally at 6:40 p.m., about 11 hours from the time of his departure, and secured a prize which had been offered by the *New York Times*. Hamilton followed the line of the Pennsylvania Railroad as nearly as possible and had a special train on that road to carry his friends and to guide him. He landed in Philadelphia near North Penn junction. The time, it will be seen, was only a trifle slower than that of the fastest express trains between the two cities. Northbound, he left North Philadelphia at 11:30 and passed in sight of Rahway at 12:50. From

Metuchen he followed the Lehigh Valley road and landed in South Amboy, as before stated. The following record is from the *New York Tribune*:

Record of Flight—New York to Philadelphia and Return.

Time.	Place.	Miles.
7:35	New York	...
7:54	Elizabeth, N. J.	14.1
7:58	Railway	22.4
8:09	Metuchen	28.8
8:11	New Brunswick	34.3
8:29	Monmouth Junction	44.0
8:38	Princeton Junction.	50.0
8:50	Trenton	59.0
9:03	Bristol, Pa.	69.8
9:11	Cornwell's	75.3
9:25	North Philadelphia	87.7

*Three miles circling at start are included in flight before reaching Elizabeth. At North Philadelphia Hamilton flew in circles for three miles, not included in above table.

Time.	Place.	Miles.
11:30	North Philadelphia	...
11:46	Cornwell's	12.0
11:53	Bristol	18.0
12:06	Trenton	27.0
12:18	Princeton Junction.	36.7
12:25	Monmouth Junction	42.7
12:34	New Brunswick	51.5
12:43	Metuchen	58.3
12:50	Railway	*64.7
12.54	Ar. South Amboy	61.0
6:20	Lv. South Amboy	....
6:40	New York (Governor's Island)	87.7

†Changed course, leaving the Pennsylvania Railroad. Delayed at South Amboy for repairs and supplies 5 hrs. 26 mins.

In the first hour of the return trip Hamilton traversed 52 miles. At the completion of the round trip at night he said that for most of the distance, both ways, he had remained about 500 ft. above the ground. He said also that but for the thousands of people that gathered around him the delay at South Amboy would not have been over an hour and a half.

At Indianapolis on Monday Walter Brookins, in a Wright biplane, rose to a height of 4,384 ft., reaching that altitude by traveling in a circle at a speed estimated, most of the time, at 60 miles an hour.

Railway Matters in Washington.

Washington, June 15, 1910.

The railway bill was finally fixed up in the Conference Committee yesterday, and it is now being discussed in the Senate. The Democratic conferees did not sign the report, however, and will probably file a minority report. The House will probably take up the revised bill tomorrow, and the more optimistic prophets say that it will go to the President this week. The greater part of the week has been taken up with informal conferences between the majority members of the committee and the parties with whom they find it necessary to make peace; that is to say, the president and the attorney general on the one hand and some of the Democratic senators on the other. In their first conference with the president the members of the committee found Mr. Taft quite strenuous in his wish to have restored to the bill the provision for Federal regulation of railway stock and bond issues. It was made pretty plain, however, that this could be carried through only with difficulty, if at all, and the president withdrew his request; but the law will empower him to appoint a commission to investigate the subject. The principal features of the bill as reported are the following:

Provisions of the Bill.

A Commerce Court of five judges. Practically all of the House provisions relating to the administrative features of the bill. Telegraph, telephone and cable companies are brought under the federal law. Both wire and wireless telegraph companies are included. The revised requirements with respect to classifications, rates, packing, marking, delivery, and other steps of transportation. The stiffened long and short haul section, modifications to be allowed only by the commission after hearing, and only in "special cases." Rates reduced by the railways in competition with water carriers must not be subsequently raised without the permission of the commission. It is made the duty of the carrier to quote rates in writing, with a penalty of $250 for mistake. The commission may suspend rate increases 120 days and, if necessary for investigation of the matter, six months additional. But these questions must be given preference over others and must be expedited. On rates increased since January 1, 1910, the burden of proof is on the carrier to show the increase reasonable. Revised clause making it unlawful for shippers to misrepresent the weight, cost, value, or nature or extent of injury of their goods. The commission may investigate on its own motion. Through rates and classifications shall not be made by the commission between railways and street electric railways, or when the transportation is wholly by water. Shippers have the right to route their freight. Shippers may sue for recovery of money in any state court.

No interlocutory decree or injunction shall be issued by any federal court against any state law, unless heard before three judges, of whom one at least shall be a justice of the supreme court or a circuit judge. There must be at least five days' notice of such hearing. Annual reports to the commission shall be made as of June 30 or December 31, at the discretion of the commission. The bill provides the commission demanded by President Taft to investigate the propriety of a federal law to regulate the issuance of stock and bonds.

The principal sections left out are those permitting traffic agreements; to permit one railway to purchase stock of another which already is controlled, to make physical valuation of railways, and, as above stated, that authorizing federal regulation of stock and bond issues.

The provision permitting the commission to suspend rate increases goes into effect at once, as does that authorizing the appointment of a special commission to investigate the propriety of regulating stock and bond issues; all other provisions go into effect 60 days after the approval of the bill.

Activities of Shippers.

George J. Kindel, of Colorado, encouraged by the recent supreme court decision sustaining his complaint concerning freight rates from the east to Colorado, has now presented to the Interstate Commerce Commission a complaint against the charges of the express companies over the same routes.

A number of representative "shippers" of the West who take to themselves the credit of having induced the president to act in the rate matter, came to Washington this week and called at the White House to tender to him their thanks. The president reminded them of the danger of cutting off one's nose to spite one's face, and observed that the railways should be permitted to share in the prosperity of the country. Some of these shippers seem to feel some regret because their controversy has been so quickly taken out of the hands of the court and is now in the way of being dealt with by the Interstate Commerce Commission; they think the commission has been too friendly to the railways during the past year or two.

The increases in season ticket rates, announced by the New York, New Haven & Hartford and the New York Central, which have been the subject of much agitation before the New York State Public Commission, have now become a Washington topic, those parts of the new tariffs which are interstate having been made the subject of petitions to the Interstate Commerce Commission.

After the close of the conference between the railway officers and the president last week, there was a good deal of perplexity in trying to determine how to carry out the agreement which had been made. Presumably the arrangement to withdraw the proposed increases in the West was informally agreed to by the Interstate Commerce Commission, as members of that body were present at the White House conference; but it does not appear that any formal approval was given and so there has been a good deal of study in the effort to decide whether the increased rates were or were not in effect. Some of those interested say that the increases must remain in effect 30 days, if the law is to be complied with. It has been observed that if the roads maintain the advances contrary to the injunction which was issued by the court, they are guilty of contempt of court. In agreeing not to prosecute, President Taft was within his right and power, of course, but it does not appear that the court has vacated its injunction. The final conclusion seems to have been that rates announced as to go into effect June 1 were officially cancelled, and the old rates restored; those filed as going into effect July 1 have been changed so as to go into effect August 1.

The bill to reimburse the Southern Pacific for its expenditures in repairing the damage to the Colorado river in southern California and Mexico in 1907, was last week reported favorably in the Senate; but it names an amount of $713,647 instead of the larger sum—$1,663,136—which was named in the original bill.

Attorney-General Wickersham has applied to the United States circuit court at Chicago for an injunction against the Union Stock Yard & Transit Co., the Chicago Junction Railway and others to test the right of these local roads to engage in interstate commerce, they having failed to file tariffs.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.;
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues.; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASS'N.—H. C. Donecker, 29 W. 39th St., New York; Oct. 10-14; Atlantic City.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
CANADA.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
TRANSPORTATION CLUB OF TOLEDO.—L. G. Macomber, Woolsen Spice Co., Toledo.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The federal court has enjoined the Oklahoma low rate laws. See Court News.

August 1 is announced as the date for the opening of passenger traffic over the Western Pacific. There are to be two trains each way daily.

The National Tube Co., of Pittsburgh, is shipping 30,000 tons of steel gas pipe to Memphis and Shreveport by boat. This pipe is to be used for a line to convey gas from the Arkansas fields to New Orleans.

A press despatch from Montreal says that officers of the Grand Trunk and the Canadian Pacific are talking about the necessity of increasing freight rates; the situation in Canada is substantially the same as in the United States.

The New York Produce Exchange has complained to the Interstate Commerce Commission against the railways carrying export grain from Lake Erie to New York City, alleging that the rates now in effect give undue preference to grain grown in Canada.

An agricultural instruction train of nine cars is making a three-weeks' trip over the lines of the Northern Pacific in North Dakota and Montana. One of the cars is an open one, carrying exhibits of improved farm machinery. Special attention is being given to instructing new settlers in dry farming.

At the request of the Attorney-General of the United States, the Canadian Pacific and the Bangor & Aroostook have postponed to August 1 an increase of 10 per cent. in rates on lumber which had been announced to go into effect June 15; this for the purpose of allowing the Interstate Commerce Commission an opportunity to investigate the proposed increase.

The Chicago Association of Commerce has filed with the Illinois State Railroad Commission an elaborate complaint against alleged exorbitant rates charged by the express companies. The commission is asked to make a general reduction of 33⅓ per cent.; to establish rates based on weight and distance, and to make special suburban rates for Chicago and vicinity.

The Mayor of Mount Vernon, N. Y., complaining to the New York State Public Service Commission of the increased fares which have been announced by the New York, New Haven & Hartford, bases his argument in part on a contract which he says was made in 1879, in which the road, in consideration of certain concessions on the part of the people, agreed to maintain the present commutation fares.

In May, 1910, there were 8,528,286 net tons of freight passed through the two canals at Sault Ste. Marie. Of this total, 6,769,704 tons was eastbound freight and 1,758,582 tons westbound freight. Of the total tonnage, 3,158,967 tons passed through the United States canal and 5,369,319 tons through the Canadian canal. The tonnage was carried in 2,858 vessels, which carried, besides the freight, 1,387 passengers eastbound and 1,808 passengers westbound.

The trunk lines and the lines in the Central Passenger Association will make a rate of fare and one-half for the round trip for the Merchants' Association of New York City next autumn on the same plan as that employed in former years. The dates will be from trunk line territory (points 100 miles or more from New York City), July 16-19, August 13-16, August 27-30, September 10-13; return limit 15 days. From central territory, July 9-12, July 23-26, August 6-9, August 20-23; return limit 30 days.

The Pacific Steam Navigation Company has ceased its sailings from England to Chile, through the straits of Magellan, after an uninterrupted career of nearly 70 years. This is because of the completion of the railway between Chile and Argentina over the Andes mountains. By this new connection between the Atlantic and the Pacific coasts, the passenger and

mail traffic can reach the west coast so much quicker that the ships sailing around the Horn are no longer attractive. The Pacific Steam Navigation Company has been absorbed by the Royal Mail Steam Packet Company.

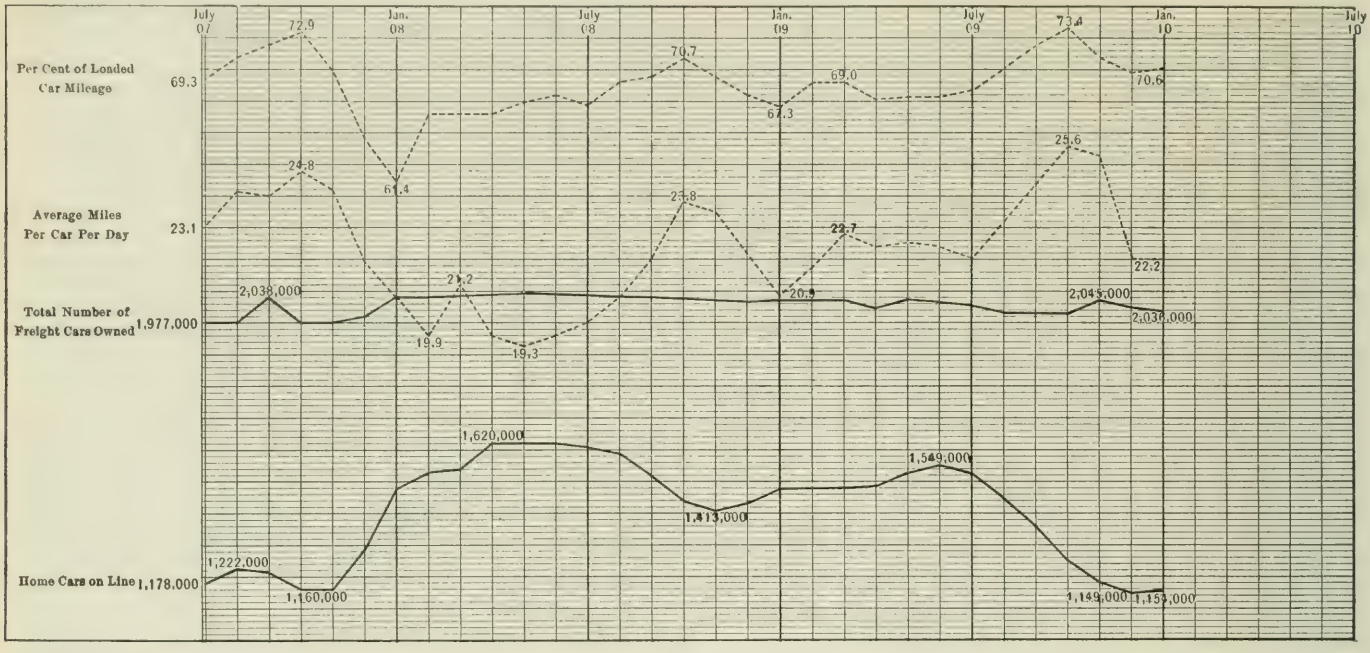
The Barge Canal Terminal Commission of the State of New York, which has been appointed by the legislature to investigate the question of terminal facilities for the enlarged Erie canal, especially at New York City, is to visit Europe this summer and make a five weeks' study of harbor terminals in England and on the continent. This commission consists of Frank M. Williams, state engineer; Frank C. Stevens, superintendent of public works; Edward A. Bond, chairman of the Canal Advisory Board of Engineers, and Harvey J. Donaldson, appraiser of canal lands.

The passenger committee of the Trunk Line Association has been discussing informally the question of establishing rates of fare for passengers riding in sleeping and parlor cars slightly higher than those charged passengers riding in ordinary cars, and it is probable that a conference will be held on the subject with passenger men in western and southern territory. A remark of Chairman Knapp, of the Interstate Commerce Commission in his dissenting opinion in the recent sleeping car case, has encouraged the passenger men to seriously consider the propriety and feasibility of making this very sensible change. Judge Knapp observed that as compared with other passengers, sleeping car passengers get too much rather than too little.

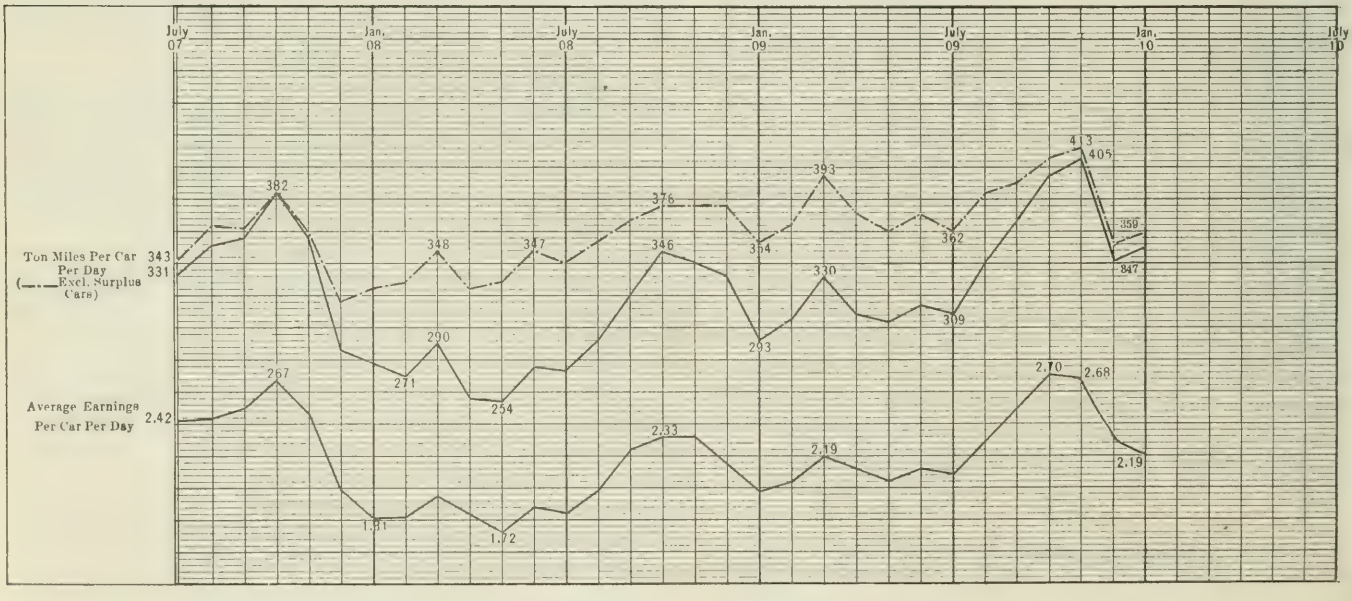
Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 72 covering car balance and performance for January, 1910, says:

"There was little change in the performance results as compared with December. The miles per car per day averaged 22.2, the same as during December. The loaded car mileage averaged 70.6 per cent. of the total, an increase of .7 points.



Car Balance and Performance.



Car Loading and Earnings.

The tons per loaded car show a decrease to 21.7, while the ton-miles per car per day increased from 342 in December to 347 in January. The increase in ton-miles per car per day in the face of decreased car loading and stationary mileage is explained by the omission of tonnage figures from the reports of several roads.

"The earnings per car on line decreased to $2.19. There was a slight increase in the shop percentage, which averaged 5.73 per cent. for the period covered by this report. The car balance percentages indicate a slight homeward movement of equipment, the cars on home lines having increased to 57 per cent. as against 56 per cent. in December.

"With this bulletin are introduced graphic charts covering the important averages of car balance and performance from July, 1907, to date. These charts will be continued from month to month."

Summary of Crop Conditions on June 1.

The following tabulation is a summary for the United States of crop conditions on June 1, with comparisons, as estimated by the United States department of agriculture:

Crop.	Condition June 1— 1910.	1909.	1908.	10-year average.
Winter wheat	80.0	80.7	86.0	81.9
Spring wheat	92.8	95.2	95.0	93.0
Oats	91.0	88.7	92.0	88.4
Barley	89.6	90.6	89.7	90.5
Rye	90.6	89.6	91.3	89.9
Hay (all)	86.1	87.6	96.8	....
Clover, for hay	86.6	84.3	96.7	86.4
Alfalfa	93.1	89.3	88.9	90.4*
Spring pasture	88.5	89.3	97.7	90.9
Apples	53.0	61.4	66.0	69.8
Peaches	62.0	54.1	73.0	65.0
Pears	63.2	61.8	70.9	....
Cabbages	88.5	89.2	90.4	87.8*
Onions	91.1	90.9	92.1	90.1*
Lima beans	86.3	88.0	89.9	....
Asparagus	91.2	89.2	91.7	89.0*
Blackberries	80.0	90.0	94.0	90.0*
Raspberries	79.2	88.4	91.9	82.1*
Watermelons	77.4	81.5	81.1	80.0*
Cantaloupes	77.8	81.8	81.9	80.0*
Hemp	85.6	85.9	86.0	85.0*
Sugar cane	84.7	90.6	91.3	89.7
Sugar beets	90.5	89.0	86.2	88.5
Cotton	82.0	81.1	79.7	....

*Averages for four years.

The general average condition of crop growth on June 1, 1910, was about 84.9, as compared with 85.0, 87.9, 77.8 and 85.5 on June 1, of 1909, 1908 and 1907, and the 10-year average, respectively.

Representing last year's acreages by 100, the preliminary estimates of this year's acreages are: Winter wheat, 102.5; spring wheat, 107.3 (all wheat 104.4); oats, 103.5; barley, 100.7; rye, 101.2; cotton, 102.8; clover for hay, 106.2; sugar cane, 104.2; the total of above crops, about 103.6.

Joint Standing Committee of St. Louis Railways and Business League.

The railways centering in St. Louis, following a conference last week with representatives of the Business Men's League, have agreed to establish a joint standing committee through which, as a medium, shippers and receivers of freight in St. Louis, acting through the Traffic Bureau of the Business Men's League, may confer on questions of rates and other matters of mutual interest. The conference was asked for by Mr. Carleton, chairman of the Board of Managers of the League, for the purpose of presenting certain objections to the advances in freight rates which were recently announced by the railways. Commissioner P. W. Coyle, chief of the Traffic Bureau, of the League, presented a brief argument calling attention to the fact that most of the reductions in freight rates which have been made in the last few years have been in commodity tariffs, thus, in the majority of cases, favoring dealers who ship in large quantities; while the class rates, which apply to the great bulk of the shipments made by St. Louis merchants, have remained stationary. The merchants represented in the Business Men's League therefore think that if the railways need more income they ought to attack first the commodity rates.

CAR BALANCES AND PERFORMANCES IN JANUARY, 1910.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	76,200	666,468	216,370	169,571	173,205	338,984	16,907	134,370	27,304	117,736	99,014	2,036,129
Average number of system cars on line	41,374	364,498	114,568	96,548	86,668	223,785	6,099	76,602	18,218	59,630	66,403	1,154,393
Railroad owned cars on foreign lines	39,030	272,845	91,071	57,720	65,208	164,525	16,390	53,725	20,883	53,395	22,396	857,191
Total cars on line	80,404	667,343	205,642	154,268	151,876	388,310	22,489	130,327	39,101	113,025	88,799	2,011,584
Excess	4,201	.....	.....	.....	.....	49,326	5,582	.....	11,797	.....	.....	.....
Per cent. cars on line to total owned.												
Home	55	55	53	57	50	66	36	57	67	51	67	57
Foreign	51	41	42	34	38	49	97	40	76	45	23	42
All railroads	106	96	95	91	88	115	133	97	143	96	90	99
Private cars on line	3,344	42,330	11,430	3,171	7,040	16,612	1,704	6,615	2,088	8,492	3,029	105,816
Total all cars on line	83,748	679,673	217,072	157,439	158,916	404,922	24,193	136,942	41,189	121,517	91,819	2,117,430
Per cent. of cars in shops	3.72	5.60	6.19	5.87	8.02	4.23	9.07	4.84	4.71	4.84	6.61	5.73
No. of freight engines owned	1,127	10,003	2,860	2,991	2,965	5,171	490	2,463	782	2,328	2,106	33,153
Av. cars on line per locomotive owned	74	68	76	53	62	74	53	56	53	52	44	64
Total freight car miles	10,760,922	189,000,277	114,694,130	111,963,785	219,683,974	322,932,296	24,193	93,440,325	32,088,657	107,762,559	77,278,147	1,455,881,533
Average miles per car per day	129.7	283.2	528.5	713.4	1,386.5	798.6	1,450.0	682.0	784.9	886.4	837.1	687.5
Per cent. loaded miles	74.3	67.9	62.3	66.9	50.1	74.1	77.0	68.5	66.4	70.1	78.0	70.6
Ton-miles of freight, inc. Co. freight	183,139,949	7,883,152,198	2,117,547,975	1,831,907,762	1,762,792,113	2,392,930,093	389,442,359	2,282,027,582	363,127,076	1,561,320,387	1,134,181,886	21,172,178,810
Average haul, miles, including Co. freight	17.02	41.72	18.46	16.36	11.14	7.41	16.09	24.43	11.32	14.49	14.67	14.54
Per car mile	1.70	1.64	1.84	1.63	1.54	1.48	1.78	1.37	1.13	1.46	1.47	1.53
Per loaded car mile	2.29	2.42	2.96	2.44	3.08	2.00	2.31	2.06	1.71	2.10	1.88	2.17
Per car per day	1.75	3.74	3.49	3.99	3.75	3.61	3.71	3.62	2.85	4.18	3.98	3.47
Gross freight earnings	$5,097,706	$46,109,584	$12,926,573	$10,718,398	$10,555,144	$19,459,851	$2,896,946	$11,291,201	$3,318,712	$12,811,108	$6,373,161	$139,109,613
Average daily earnings per car owned	$2.16	$2.18	$1.84	$2.01	$2.11	$2.12	$3.33	$2.44	$2.92	$3.33	$2.73	$2.28
Per car mile	1.61	1.61	1.63	1.60	1.54	1.48	1.78	1.37	1.13	1.46	1.47	1.53
Per loaded car mile	1.99	2.37	2.33	2.39	1.91	2.03	2.30	2.06	1.71	2.10	1.88	2.17
Per car per day	1.75	3.74	3.49	3.99	3.75	3.61	3.71	3.62	2.85	4.18	3.98	3.47
Average daily earnings per car owned	$2.16	$2.18	$1.84	$2.01	$2.11	$2.12	$3.33	$2.44	$2.92	$3.33	$2.73	$2.28
Per railroad owned car on line	2.01	2.26	1.98	2.24	2.42	1.81	4.16	2.61	2.74	3.70	2.62	2.30
All cars on line	1.96	2.14	1.88	2.20	2.31	1.73	3.86	2.39	2.60	3.44	2.53	2.19

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1910.—(See also issue of June 10.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta, Birmingham & Atlantic	670	$152,404	$37,831	$203,868	$27,675	$33,899	$13,277	$83,854	$8,395	$167,100	$36,768	.....	$10,000	$26,768	$17,575
Baltimore & Ohio	4,198*	5,612,439	1,181,813	7,211,382	939,694	1,383,957	166,452	2,477,500	148,041	5,115,644	2,095,738	—66,727	242,484	1,786,527	172,751
Bangor & Aroostook	546	199,372	52,440	265,493	35,563	26,492	2,560	75,189	10,625	150,429	115,064	.....	1,500	113,564	8,517
Buffalo, Rochester & Pittsburgh	567	414,386	77,088	512,523	101,708	159,243	12,674	195,453	12,435	481,513	31,010	113	15,000	16,123	—188,725
Central of Georgia	1,916	578,018	224,307	897,840	175,269	190,299	37,164	310,166	36,417	749,315	148,525	5,116	45,200	108,441	—19,112
Chicago, Rock Island & Gulf	529	155,894	57,627	227,634	70,060	25,607	9,484	91,250	8,272	204,706	22,928	—301	8,593	14,034	—76,946
Cleveland, Cin., Chic. & St. Louis	1,982	1,481,752	565,029	2,274,959	334,369	402,686	70,677	920,774	61,672	1,790,178	484,781	—11,376	74,000	399,405	668
Duluth, South Shore & Atlantic	609	190,203	75,112	279,388	47,089	32,729	8,796	97,266	6,808	192,689	86,699	129	18,000	68,828	15,895
El Paso & Southwestern Co	901	543,832	100,854	674,681	75,572	93,566	10,724	183,144	21,430	384,436	290,245	—848	19,360	270,037	—6,882
Elgin, Joliet & Eastern	780	711,410	5	770,959	97,159	147,258	4,509	253,360	12,065	514,351	256,608	.....	22,450	234,158	16,453
Florida East Coast	583	339,143	118,445	531,617	37,699	45,621	4,659	108,532	6,654	203,165	328,452	.....	15,234	313,218	61,964
Galveston, Harrisburg & San Antonio	1,338	562,012	234,780	839,200	144,769	104,768	23,999	367,609	26,658	667,803	171,898	1,917	28,800	140,681	—51,326
Grand Rapids & Indiana	587	275,193	108,793	415,191	61,166	86,628	12,145	166,679	18,089	344,707	70,484	86	23,674	46,896	6,796
Illinois Central	4,550	3,139,833	931,272	4,644,507	628,766	1,155,243	101,714	1,666,771	95,679	3,648,172	996,334	3,971	204,238	788,125	14,281
International & Great Northern	1,159	460,135	147,965	652,871	109,112	111,814	18,628	332,181	22,570	594,305	58,566	.....	20,000	38,566	—12,021
Lake Erie & Western	886	325,620	58,793	408,128	77,079	76,881	13,971	155,987	11,410	335,328	72,800	.....	19,250	53,550	26,266
Lake Shore & Michigan Southern	1,663†	2,517,799	779,955	3,770,324	619,321	584,477	90,878	1,434,882	79,619	2,809,177	961,147	—5,669	135,000	820,473	—117,067
Long Island	390	288,891	440,226	764,156	103,821	112,289	14,093	334,903	22,646	587,752	176,404	51,204	33,232	194,376	28,194
Michigan Central	1,746	1,587,747	532,677	2,378,802	320,395	298,274	59,529	921,627	38,402	1,638,227	740,575	—5,618	113,000	621,957	78,553
Nashville, Chattanooga & St. Louis	1,230	717,837	188,503	970,625	155,630	172,409	32,439	348,603	24,244	733,325	237,300	—915	21,971	214,414	529
New York Central & Hudson River	3,588	4,563,165	2,220,082	7,669,642	1,028,558	1,260,811	182,670	2,939,546	227,741	5,639,326	2,030,316	—56,259	364,451	1,609,606	—368 159
New York, Chicago & St. Louis	558	789,837	131,928	956,307	39,435	151,836	45,710	337,750	17,710	646,441	309,866	—2,604	27,000	280,262	42,673
New York, Ontario & Western	546	607,767	87,199	730,413	81,364	106,641	11,920	261,187	14,111	465,223	265,190	—5,255	20,000	239,935	36,147
Norfolk & Western	1,951	2,698,750	300,982	3,085,330	374,469	516,543	44,207	872,663	69,289	1,877,171	1,208,159	—1,087	92,800	1,114,272	254,119
Northern Central	467	842,362	161,741	1,061,233	79,089	207,125	15,040	468,910	22,769	792,933	268,300	404	24,709	243,995	1,032
Oregon R. R. & Nav. Co	1,476‡	918,334	320,723	1,328,725	225,508	134,558	32,537	420,852	30,826	844,281	484,444	4,707	36,036	423,701	41,952
Oregon Short Line	1,508§	1,331,090	418,031	1,877,972	243,009	158,086	21,084	391,963	30,815	844,957	1,033,015	—637	55,491	976,887	124,335
Philadelphia & Reading	1,024	3,271,194	601,480	4,047,886	378,203	617,967	37,149	1,198,047	71,258	2,302,624	1,745,262	85,400	75,164	1,755,498	319,600
St. Louis & San Francisco	4,726	2,055,768	738,434	3,000,096	390,928	389,931	90,513	1,127,724	82,147	2,081,243	918,853	.....	122,458	796,395	—206,896
St. Louis Southwestern	773	440,624	94,590	561,638	101,925	98,030	24,557	141,614	22,224	388,351	173,287	1,296	23,818	148,173	20,804
St. Louis Southwestern of Texas	703	175,888	59,137	257,931	88,491	74,137	8,253	127,148	16,896	314,925	—56,994	—278	8,333	—65,605	14,293
Seaboard Air Line	3,013	1,256,724	355,064	1,815,481	240,425	242,612	56,295	581,321	49,786	1,170,439	645,042	—1,980	67,765	575,297	162,059
Southern Pacific Co.—Pacific System	6,070‖	4,556,880	2,713,829	7,797,494	1,167,040	1,052,851	149,963	2,056,375	215,919	4,642,149	3,155,800	—13,524	280,059	2,862,217	48,601
Texas & New Orleans	458	194,479	78,223	289,664	52,758	44,928	5,877	120,401	8,829	232,793	56,871	348	11,835	45,384	12,709
Wabash	2,515	1,490,223	547,686	2,224,979	376,108	425,815	73,207	926,508	63,407	1,865,045	359,934	—3,967	75,538	280,429	—81,180
Yazoo & Mississippi Valley	1,370	542,846	165,491	754,727	199,399	137,653	16,634	258,602	21,531	633,819	120,908	2,579	34,930	88,557	48,226
TEN MONTHS OF FISCAL YEAR, 1910.															
Atlanta, Birmingham & Atlantic	670	1,631,524	430,109	2,181,596	266,944	338,435	123,449	853,456	86,430	1,668,714	512,862	.....	103,265	409,617	130,362
Baltimore & Ohio	4,198*	56,062,861	11,577,395	71,513,845	9,045,660	13,383,908	1,497,504	23,790,798	1,331,676	49,049,546	22,464,299	—507,912	1,976,964	19,979,423	2,450,774
Bangor & Aroostook	546	1,864,595	542,300	2,531,521	368,544	283,408	28,245	698,312	106,184	1,484,693	1,046,828	.....	15,000	1,031,828	159,456
Buffalo, Rochester & Pittsburgh	567	6,156,081	816,328	7,286,727	852,043	1,552,239	96,653	2,061,549	129,919	4,692,402	2,594,325	1,026	136,000	2,459,351	821,119
Central of Georgia	1,916	6,923,815	2,533,875	10,363,691	1,518,625	1,652,538	309,262	3,091,617	414,159	6,986,201	3,377,490	56,998	476,957	2,957,536	398,827
Chicago, Rock Island & Gulf	529	1,819,643	624,507	2,574,255	480,363	207,715	71,123	939,846	85,567	1,784,614	789,641	—2,543	65,595	721,503	26,246
Cleveland, Cin., Chic. & St. Louis	1,982	16,310,746	6,147,266	24,611,298	2,736,965	4,066,992	792,080	9,254,500	491,712	17,342,249	7,269,049	—68,648	730,328	6,479,072	1,623,363
Duluth, South Shore & Atlantic	609	1,752,466	804,796	2,701,054	406,281	293,864	89,278	985,169	67,027	1,841,619	859,435	6,517	188,146	677,806	281,370
El Paso & Southwestern Co	901	4,901,915	887,055	6,071,890	833,770	812,734	100,932	1,657,428	227,481	3,632,345	2,439,545	—8,717	201,251	2,229,577	—127,311
Elgin, Joliet & Eastern	780	7,163,649	157	7,762,762	756,269	1,491,880	42,113	2,399,689	150,999	4,840,950	2,921,812	.....	158,900	2,762,912	896,534
Florida East Coast	583	1,444,161	1,119,948	2,948,337	364,079	405,083	55,942	909,004	81,884	1,815,992	1,132,346	.....	124,735	1,007,611	264,168
Galveston, Harrisburg & San Antonio	1,338	6,243,387	2,178,964	8,864,356	1,253,156	1,247,041	253,917	3,302,088	271,775	6,327,977	2,536,379	—21,908	292,908	2,221,563	—28,093
Grand Rapids & Indiana	587	2,611,907	1,379,889	4,274,249	516,710	708,304	108,879	1,703,490	138,298	3,175,681	1,098,568	—2,291	247,084	874,799	22,675
Illinois Central	4,550	32,781,429	9,883,332	48,645,715	6,309,141	11,219,374	1,050,400	16,440,601	973,310	35,992,826	12,652,889	34,821	2,150,832	10,467,235	13,040
International & Great Northern	1,159	5,181,259	1,617,903	7,251,130	1,200,408	1,201,334	193,106	3,056,164	215,630	5,866,642	1,384,488	.....	212,000	1,172,488	—78,742
Lake Erie & Western	886	3,672,496	701,805	4,609,437	624,142	811,806	128,754	1,622,771	105,105	3,292,578	1,316,859	.....	183,445	1,133,414	586,793
Lake Shore & Michigan Southern	1,663†	26,958,216	8,900,565	40,347,754	4,823,524	5,981,643	950,929	13,065,539	657,464	25,479,099	14,868,655	—57,726	1,248,905	13,562,024	2,139,926
Long Island	390	2,549,019	4,695,449	7,591,407	837,627	1,043,372	144,851	3,292,957	191,782	5,510,589	2,080,818	661,175	332,324	2,409,669	638,792
Michigan Central	1,746	16,050,110	5,743,661	24,064,817	2,965,905	3,123,600	674,913	3,942,362	416,491	16,123,271	7,941,546	—38,580	993,532	6,909,434	1,385,970
Nashville, Chattanooga & St. Louis	1,230	6,869,018	2,140,359	9,604,447	1,452,252	1,596,464	357,088	3,316,028	229,915	6,951,748	2,652,699	—8,725	209,413	2,434,561	292,530
New York Central & Hudson River	3,588	47,441,081	24,376,868	80,065,763	10,444,248	13,446,365	2,041,084	29,327,043	1,848,949	57,107,689	22,958,074	130,031	3,721,199	19,366,906	2,251,012
New York, Chicago & St. Louis	558	7,626,764	1,204,194	9,136,437	720,412	1,005,530	468,274	3,437,532	140,891	5,772,639	3,363,798	—14,872	306,109	3,042,816	918,233
New York, Ontario & Western	546	5,410,627	1,340,995	7,032,938	871,508	1,083,974	116,048	2,632,602	164,342	4,868,474	2,164,464	—38,892	170,000	1,955,572	—34,494
Norfolk & Western	1,951	24,831,034	3,265,674	29,009,257	2,970,719	4,885,418	445,529	8,275,566	591,951	17,169,183	11,840,074	—10,525	875,200	10,954,349	2,320,373
Northern Central	467	8,342,358	1,757,635	10,680,663	1,200,258	2,072,915	136,859	4,636,185	221,777	8,267,994	2,412,669	7,015	247,084	2,172,600	378,471
Oregon R. R. & Nav. Co	1,476‡	8,127,268	3,539,169	12,414,900	1,515,106	1,137,558	296,052	3,972,736	320,923	7,242,375	5,172,525	—8,304	553,662	4,610,559	—203,845
Oregon Short Line	1,508§	11,958,403	4,294,561	17,283,617	1,790,936	1,629,517	264,280	3,796,404	318,264	7,799,401	9,484,216	—3,955	587,768	8,892,493	686,635
Philadelphia & Reading	1,024	29,321,223	5,871,484	36,752,916	2,766,831	7,274,155	374,989	11,058,180	627,549	22,101,704	14,651,212	220,364	737,959	14,133,617	1,448,737
St. Louis & San Francisco	4,726	22,306,933	8,420,084	33,086,180	4,737,385	4,779,488	813,825	11,441,706	961,611	22,734,015	10,352,165	.....	1,176,553	9,175,612	299,537
St. Louis Southwestern	773	4,838,077	1,119,284	6,217,423	870,813	905,165	251,705	1,274,063	220,208	3,621,954	2,595,469	—8,800	210,445	2,376,224	400,319
St. Louis Southwestern of Texas	703	2,152,794	719,238	3,090,628	851,323	681,044	95,401	1,334,370	157,081	3,119,219	—28,591	—2,109	88,602	—119,302	—8,145
Seaboard Air Line	3,013	11,587,999	3,604,609	16,782,685	2,279,528	2,275,285	578,969	5,287,682	499,356	10,920,820	5,861,865	—21,647	612,875	5,227,343	1,282,428
Southern Pacific Co.—Pacific System	6,070‖	47,311,372	26,348,002	78,804,044	9,511,821	9,988,065	1,307,191	20,575,003	2,019,545	43,401,625	35,402,419	—90,226	2,560,606	32,751,587	5,816,166
Texas & New Orleans	458	2,150,202	824,048	3,162,394	489,197	492,056	60,590	1,185,777	89,648	2,325,268	837,126	11,905	123,635	725,396	202,759
Wabash	2,515	16,439,891	5,846,750	24,138,762	2,897,483	3,347,675	765,790	9,145,981	673,994	16,830,923	7,307,839	—24,184	700,248	6,583,407	1,291,111
Yazoo & Mississippi Valley	1,370	5,972,449	1,877,529	8,410,726	1,722,476	1,536,033	165,058	2,758,938	236,207	6,418,712	1,992,014	25,251	356,160	1,661,105	395,658

*Mileage operated on April 30, 1909, 3,992 miles. †Mileage operated on April 30, 1909, 1,511 miles. ‡Mileage operated on April 30, 1909, 1,327 miles. §Mileage operated on April 30, 1909, 1,456 miles. ‖Mileage operated on April 30, 1909, 5,598 miles. —Indicates Deficits, Losses and Decreases.

INTERSTATE COMMERCE COMMISSION.

No Obligation to Publish Combinations of Local Rates (in Lieu of Through Rates).

Canadian Valley Grain Company v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Cockrell.

In the absence of a joint rate from a local station on the line of one carrier to a point on the line of another carrier, it is not incumbent upon initial carrier to post at point of origin tariffs showing combination of local rates applicable to the shipment. Reparation, claimed because of failure so to post, denied.

Through Route Refused: Good One Already Available.

Spring Hill Coal Company v. Erie Railroad et al. Opinion by Commissioner Cockrell.

Complaint for the establishment of through route and joint rate over certain lines dismissed because of the existence over other lines of a "reasonable through route." The complainant has coal mines at Jermyn, Pa., on the lines of defendants, Delaware & Hudson and New York, Ontario & Western railways, and desires to ship coal to points in New York via Carbondale, Pa. Defendants refuse to establish a through route and joint rate. Each of the three defendants filed separate answers denying the material averments of the complaint and asserting that there is a through route and joint rate over the lines of the Delaware & Hudson to Wilkesbarre and thence by the Pennsylvania Railroad. Subsequent correspondence culminated in a letter from complainant expressing a desire to have the case dismissed. An order was entered accordingly. (18 I. C. C., 508.)

Definition of Chains.

Woodward, Wight & Co. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Clark.

Under southern classification there is a rate of 41 cents per 100 lbs. on machinery, conveyor chains, sprocket chains, etc., from East Moline, Ill., to New Orleans, La. At the time the shipment in question was made there was a special commodity rate between East Moline and New Orleans on "chains" "packed" in carloads of 26 cents. The shipment in question consisted of iron conveyor chains and sprocket chains. These chains were shipped in carloads and were riveted together in bundles but were not packed in the sense that they had any form of outside covering. The railway classified the shipments as machinery and charged 41 cents. The complaint says that they should have been classified as "chains packed" and a charge of only 26 cents made. It is evident that these sprocket chains are used for an entirely different purpose and are of much greater value than the ordinary chain of commerce, and we would not be justified in separating this part of machinery from the general machinery rate unless at the same time we separated various other portions of the completed machine when such parts moved separately. The complaint is dismissed. (18 I. C. C., 500.)

Voluntary Rate Reduction By Carrier Not Proof of Unreasonableness of Former Rate.

Sunderland Brothers v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Cockrell.

Rate of $3.75 per net ton on soft coal from Peoria, Ill., to Ainsworth and Valentine, Neb., not found unreasonable. Reparation denied. There were shipped from Christopher, Ill., to complainant at Ainsworth and Valentine, Neb., 14 carloads of soft coal, weighing in the aggregate 815,300 lbs. The shipments moved over the Chicago, Burlington & Quincy to Peoria, and thence over the Chicago & North Western. Valentine and Ainsworth are both located on the North Western line and are respectively 781.7 miles and 735 miles from Peoria. The distances from Christopher to Valentine and Ainsworth over the route the traffic moved are respectively 971 and 924 miles.

Through rates from Christopher to Ainsworth and Valentine were $4.10 and $4.25, respectively.

Complainant's case consists largely of statements of comparisons on a ton-mile basis of rates from Peoria to Valentine and Ainsworth with rates on coal from Peoria, Manitowoc, Chicago and East St. Louis to other points on defendants' lines, but there is nothing in the record upon which a conclusion can be reached respecting the value of the comparisons made. The revenue per ton per mile accruing to the North Western, which is the part complained of, is 4.8 mills on shipments to Valentine and 5.1 mills on shipments to Ainsworth. Rates on this traffic which yield about 5 mills per ton per mile in the territory involved we are unable to find are unreasonable. The voluntary reduction of a rate by a carrier is not of itself such a proof of the unreasonableness of the former rate as to form a proper basis for an award of reparation. (18 I. C. C., 512.)

STATE COMMISSIONS.

The State Railroad Commission of Missouri has called upon the railways to appear at Jefferson City July 6 to show reasons, if any they have, against a proposed reduction of about 15 per cent. in freight rates. The proposed reductions apply to wheat, corn and oats in carloads, and to the general mileage rates on merchandise, so far as these rates can be changed

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF FEBRUARY, 1910.
(Reported to the Interstate Commerce Commission.)

Name of company.	Adams Express.	American Express.	Canadian Express.	Can. Nor. Express.	Globe Express.	Great Nor. Express.	National Express.	Northern Express.	Pacific Express.	Southern Express.	United States Express.	Wells, Fargo & Co.	Western Express
Mileage of all lines covered	34,179	46,409	7,362	3,198	1,900	7,925	1,094	6,569	22,319	31,288	30,094	50,346	3,506
Rail lines	31,172	45,315	4,570	3,176	1,900	7,714	1,094	6,308	21,711	29,640	29,483	45,352	3,502
Other lines	3,372	1,094	2,792	22	.....	211	.....	261	608	1,648	611	4,994	4
Operating revenues:													
Express	$2,175,282	$2,387,557	$141,086	$22,179	$33,367	$152,494	$70,673	$198,356	$565,698	1,055,356	$1,272,319	$1,733,406	$34,522
Misc. transportation	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	103	135
Nontransportation	12,465	89,170	3,421	1,096	458	971	335	2,686	8,099	15,989	20,185	31,852	643
T'l receipts operation	2,187,747	2,476,727	144,507	23,274	33,824	153,466	71,008	201,041	573,786	1,071,345	1,292,503	1,765,361	35,300
Exprs. privileges—Dr.	1,145,751	1,151 748	73,998	8,871	16,659	61,655	23,947	95,718	277,957	508,925	613,870	836,549	21,918
Total	$1,041,996	$1,324,979	$70,509	$14,403	$17,165	$91,810	$47,061	$105,324	$295,828	$562,420	$678,633	$928,812	$13,382
Operating expenses:													
Maintenance	$46,540	$123 925	$1,827	$5	$630	$726	$555	$795	$9,211	$14,755	$31,600	$38,640	$463
Traffic	4,605	21,339	904	346	1,056	728	.....	3,221	6,130	6,798	11,390	15,100	1,299
Transportation	896,357	1,141,527	63,306	8,574	13,244	47,638	38,439	63,848	204,839	357,386	661,421	733,878	17,655
General	72,448	112,236	6,771	1,251	2,971	3,484	2,824	4,556	13,520	49,614	41,858	69,954	2,499
Total	$1,019,949	$1,399,027	$72,809	$10,176	$17,900	$52,576	$41,818	$72,421	$233,700	$428,553	$746,269	$857,571	$21,916
Net operat'g rev. or def.	$22,046	*$74.048	*$2,299	$4,277	*$735	$39,234	$5,243	$32,903	$62,128	$133,866	*$67,636	$71,241	*$8,534
Taxes	14,197	11,818	1,150	130	500	2,457	35	3,500	4,948	9,886	5,871	20,582	371
Operating inc. or loss.	$7,849	†$85,866	†$3,450	$4,096	†$1,235	$36.777	$5,207	$29,403	$57,180	$123,981	†$73,507	$50.659	†$8,904

* Net operating deficit. † Operating loss.

without violating the federal injunction now pending in the United States supreme court.

The Railroad Commission of Louisiana, in ordering a reduction of class and commodity rates between Winnfield and other Louisiana points, says that it has been the custom of the commission in adjusting rates from jobbing centers where competition is severe to apply the principle of equal rates for equal distances, and this rule seems to have resulted, says the commission, in satisfactory adjustments, especially in North Louisiana territory where competition is extremely active and jobbing centers numerous.

The Railroad Commission of Louisiana has ordered the rates on rough oak staves reduced. Under the present adjustment of rates the same rates apply on rough oak staves as apply on barrel staves and heading between points in Louisiana. It has been shown that on a certain carload of rough oak staves shipped from Morganza, on the Texas & Pacific, to New Orleans, the freight amounted to $52 per car, while the proceeds from the sale of the staves amounted to $89—the freight being nearly 60 per cent. of the value of the contents of the car. The reduction ordered varies from 1 cent to 3 cents per 100 lbs.

The State Railroad Commission of New Jersey, after hearing testimony from officers of the principal roads, decided this week to proceed to revalue the property of the principal roads in the state, with a view to inquiring into the justice of the increases in rates which have been announced to go into effect July 1. This action follows complaints concerning increased commutation fares to New York City, which are interstate and, of course, are not subject to the authority of the state commission. Some intrastate were increased, it appears. The railways are called upon for full information concerning their taxes for the past five years.

COURT NEWS.

The New York State court of appeals has sustained the law of that state requiring railways to pay their employees' wages twice a month. The suit was brought by the New York Central and the Erie, and the decision is by Judge Bartlett.

A press despatch says that the suit of the Michigan Central against the state of Michigan for damages on account of abrogating the road's special charter, and the suit of the state against the road for back taxes have been settled by the payment to the state by the railway company of $125,000.

In the United States supreme court at Guthrie, Okla., June 10, a temporary injunction was issued against the enforcement of the Oklahoma 2-cent passenger fare law and the maximum freight rate law. The complaint was made by the Rock Island and the St. Louis & San Francisco, and it is said that these roads will at once re-establish 3-cent passenger fares. The Santa Fe and the M., K. & T. had already obtained similar injunctions.

In the federal court at Chicago, June 11, the petition of the Pullman Company for an injunction to restrain the enforcement of reduced rates for berths, as recently ordered by the Interstate Commerce Commission, was denied. This decision covers also the petition of the Great Northern Railroad, both petitioners being advised to go to the commission for a rehearing. The decision was oral and was given by Judge Grosscup, Judges Baker and Seaman concurring. The court held that the Pullman Co. had failed to show that it would suffer any injury by the order. Plaintiffs were censured for bringing before the court evidence which had not been presented to the Interstate Commerce Commission. The motion was denied without prejudice.

"The long-cherished wish" of delegates to the Prussian Diet for free passage during the session between Berlin and their homes has at last been gratified. They seem not to have ventured to think of "unlimited free passes on all lines, good for the year," much less of passes for members of their families.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

T. W. R. McRae has been appointed claim agent of the Grand Trunk, with office at Montreal, Que., succeeding Sibthorp Wells, deceased.

The directors of the St. Louis, Brownsville & Mexico at the annual meeting elected the following officers: Chairman, B. F. Yoakum; president, B. L. Winchell; first vice-president, Albert T. Perkins; second vice-president, Carl E. Gray; third vice-president, R. J. Kleberg; secretary, J. B. Finnigan; auditor, O. H. Nance; general manager, C. B. Rogers.

A. D. Bethard, who was recently appointed vice-president and general manager of the Missouri, Kansas & Texas of Texas, was born October 24, 1857, in Bushnell, Ill. He entered railway service in 1873 on the Rockford, Rock Island & St. Louis, where he served as a telegraph operator until 1876. He subsequently held positions as telegraph operator, agent, despatcher, chief despatcher and trainmaster of the St. Louis, Iron Mountain & Southern, and in 1881 he became trainmaster and superintendent of telegraph of the Richmond & Allegheny. In 1888 he accepted service with the Missouri, Kansas & Texas and has remained continuously with this system to the present, holding positions as trainmaster, superintendent, superintendent of transportation, assistant general manager and vice-president and general manager, his present position.

Joseph M. Bryson, who has been appointed general solicitor in charge of litigation of the Missouri, Kansas & Texas, with office at St. Louis, Mo., was born in Pittsburgh, Pa., March 26, 1867. When very young he moved with his parents to Missouri, where he attended the public schools and the State Normal School, graduating from the latter in 1887 with a degree of Ph.D. He entered the law offices of Warner, Dean & Hagerman, Kansas City, Mo., in 1887, and secured admission to the bar in 1889. In his practice he has confined his attention to civil law, specializing particularly in corporation law. He has been connected with the law department of the Missouri, Kansas & Texas for more than 20 years and has been steadily advanced to his present position. He is a member of the St. Louis, Missouri State and American Bar Association.

J. W. Mulhern, who has been appointed assistant to the second vice-president and general manager of the Western Pacific, with office at San Francisco, Cal., was born November 25, 1863, at Naples, Ill. He entered railway service in 1881 as a laborer on the Chicago, Burlington & Quincy, at Beardstown, Ill. He continued in the service of that company until 1887, working as a brakeman and later as a freight and passenger conductor. From 1887 to 1902 he was consecutively yardmaster, night trainmaster and trainmaster of the Hannibal & St. Joseph, and from 1902 to 1908 he was superintendent on the Chicago, Burlington & Quincy, consecutively in charge of the Kansas City terminals, the Hannibal division and the Galesburg division. In 1908 he became superintendent of the Chicago & Alton at Bloomington, Ill., the position he recently resigned to become assistant to the second vice-president and general manager of the Western Pacific.

Operating Officers.

F. Kinsey has been appointed inspector of transportation of the Chicago Great Western, with office at Chicago.

E. J. Wright, assistant superintendent of the Mohawk electric division of the New York Central & Hudson River, at Utica, N. Y., has been appointed assistant superintendent of the Western division, with office at Syracuse, succeeding S. J. Kearns, promoted.

Wm. Arthur Durham, who has been appointed assistant general manager of the Missouri, Kansas & Texas, with office at St. Louis, was born March 22, 1867, in Garrard County, Ky. He has been in the service of the Missouri, Kansas & Texas continuously since he first entered railway work in November 1884. He began as messenger and caller at Sedalia,

Mo., and has subsequently held positions as clerk in the superintendent's office, timekeeper, chief clerk in superintendent's office, general time-checker for the system, special accountant, supervisor of wages, assistant to general manager and assistant general manager, the position he now holds.

P. J. Lynch, who was recently appointed superintendent of the Northern division of the Grand Trunk, with office at Allandale, Ont., was promoted in 1898 from the position of passenger conductor on the Northern division of the Grand Trunk to trainmaster at Stratford, in charge of districts north of that place, and the following year he was transferred to Belleville as trainmaster, with jurisdiction between Brockville and Toronto. He returned to Stratford in 1900 as trainmaster, with jurisdiction over lines between Toronto and Sarnia, also between Buffalo and Goderich. Four years later he was appointed assistant superintendent at Allandale, which position he held at the time of his recent appointment as superintendent.

Timothy W. Evans, whose appointment as superintendent of the Buffalo division of the New York Central & Hudson River, with office at Buffalo, N. Y., was recently announced in these columns, was born July 15, 1867, at Morris Run, Tioga county, Pa. He was educated in the common schools and began railway work June 1, 1883, with the Fall Brook Railway, now a part of the New York Central & Hudson River, as a telegraph operator, at Cedar Run. In December of the same year he was transferred to Wellsboro, Pa., remaining at that place until April, 1888, when he was appointed train despatcher of the same road at Jersey Shore, and about five years later he went as train despatcher to the Beech Creek Railway, which became a part of the Pennsylvania division of the New York Central & Hudson River in 1899. He remained in that position until September, 1901, when he was appointed trainmaster of the Beech Creek district of the Pennsylvania division of the New York Central. In December, 1904, he was made chief trainmaster of the Pennsylvania division, and from January, 1906, to October of the following year he was assistant superintendent of the same division. In October, 1907, he was appointed superintendent of the Rochester division, which position he held at the time of his recent appointment as superintendent of the Buffalo division.



T. W. Evans.

Melville M. Fowler, who has been appointed superintendent of the Northern Pacific at Missoula, Mont., as previously reported in these columns, was born December 25, 1857, at Newport, Minn. He entered the service of the Chicago, Milwaukee & St. Paul in 1874 as operator, later being promoted to despatcher and chief despatcher. In 1887 he became train despatcher on the Northern Pacific, since which time he has been in the continuous service of that company. He has held positions of chief despatcher, assistant superintendent, superintendent at Minneapolis, Minn.; trainmaster and then acting superintendent at Missoula, the position he leaves to become superintendent at the same place.

John H. Jackson, who has been appointed superintendent of the St. Louis & San Francisco at Birmingham, Ala., as previously announced in these columns, was born February 28, 1869, at Terre Haute, Ind. He entered railway service October 1, 1893, as station helper on the K. C., O. & S. Ry. He later held positions as truckman and clerk in the Kansas City, Mo., freight house and agent at Kansas City. In April, 1900, the Frisco System absorbed the K. C., O. & S., Mr. Jackson retaining his position as agent. He has been continuously in the service of the Frisco System since that time, having held position as assistant trainmaster, trainmaster and assistant superintendent, from which he was promoted to superintendent.

Alva C. Elston, who has been appointed superintendent of the Buffalo division and branches of the Erie Railroad, also manager of the Union Steamboat Line, with office at Buffalo, N. Y., was born November 18, 1867, at Unionville, Orange county, N. Y. He was educated in the public schools of his native town, and began railway work in 1880 as student operator on the New York, Susquehanna & Western, controlled by the Erie. From 1881 to 1884 he was agent at various places and then for four years he was operator. From 1888 to 1902 he was despatcher and chief train despatcher. In March of the last named year he was promoted to the position of division operator on the Erie. In December, 1903, he was made superintendent of the New York, Susquehanna & Western, remaining in that position until August, 1904, when he was made superintendent of the New York division of the Erie at Jersey City. He held that position until his recent appointment.



Alva C. Elston.

Frank L. Sheppard, general superintendent of the New Jersey division of the Pennsylvania Railroad, has been appointed also general superintendent of the Pennsylvania Tunnel & Terminal Railroad, which consists of the extension to Manhattan and Long Island City, as previously announced in these columns. He retains his office at Jersey City. Mr. Sheppard was born in 1851 at Bridgeton, N. J. He entered the service of the Pennsylvania Railroad as an apprentice at the Altoona shops in 1868, and subsequently was employed as a draftsman and in charge of engineering work. Soon after the lease of the United Railroads of New Jersey to the Pennsylvania, Mr. Sheppard was transferred to that division, serving in various capacities, principally as trainmaster, on the New York division, until 1881, when he was appointed superintendent of the Sunbury division of the Philadelphia & Erie. He continued in that position but a short time, and, in 1882, he was appointed superintendent of motive power at Altoona, serving as such until 1890, when he was appointed general superintendent of the Pennsylvania Railroad division. On January 1, 1899, he was appointed general superintendent of the United Railroads of New Jersey division. The name of this grand division has since been changed to the New Jersey division.



F. L. Sheppard.

Albert Earl Clift, who has been appointed general superintendent of the southern lines of the Illinois Central, with office at New Orleans, La., as previously announced in these columns, was born October 15, 1868, at Urbana, Ill. He entered railway service December 5, 1888, as brakeman on the Illinois Central, and continued with that company as brakeman and conductor until 1892. He then served the Cleveland, Cincinnati, Chicago & St. Louis in the latter capacity for one year, returning to the Illinois Central, where he was promoted to yardmaster and later to trainmaster of the Chicago division, with office at Kankakee, Ill. He was made superintendent of the Freeport division in 1905, and of the St. Louis division in 1907, serving in the latter position until his recent appointment as general superintendent of the southern lines, with office at New Orleans, La.

Traffic Officers.

G. A. Weller has been appointed commercial agent of the Ann Arbor in charge of a new office at Pittsburgh, Pa.

W. A. Adams has been appointed agent of the Traders' Despatch at Seattle, Wash., succeeding J. W. Koester, resigned.

H. M. Adams has been appointed general freight and passenger agent of the Western Pacific, with office at San Francisco, Cal.

Harry J. New, city passenger agent of the Southern Railway, at St. Louis, Mo., has been appointed a traveling passenger agent.

Harley T. Caldwell has been appointed soliciting freight agent of the Atlanta, Birmingham & Atlantic at St. Louis, Mo., succeeding John E. Keane, resigned.

L. F. Boltz has been appointed general freight and passenger agent of the Asherton & Gulf, with office at Asherton, Tex., succeeding J. H. Jackson, resigned.

A. V. Kipp has been appointed a traveling freight agent of the Colorado division of the Union Pacific, with office at Denver, Colo., succeeding J. L. Carney, promoted.

Henry Izzard, soliciting freight agent of the International & Great Northern at Galveston, Tex., has been appointed a traveling freight agent, with office at San Antonio.

Byron H. Bullard has been appointed city passenger agent of the Harriman lines at Chicago, succeeding R. D. Williams, whose appointment as district passenger agent of the Union Pacific has been announced in these columns.

J. C. Sartelle, general agent of the Atchison, Topeka & Santa Fe at New Orleans, La., has been appointed general agent, freight department, at St. Louis, Mo., succeeding B. J. Libbe, whose resignation has been announced in these columns.

F. A. Fetter has been appointed a commercial agent of the Seaboard Air Line, with office at Wilmington, N. C., and J. D. Dawson has been appointed a soliciting freight agent, with office at Baltimore, Md., succeeding A. A. Price, resigned to go to another company.

F. H. Adams has been appointed acting general agent of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal., succeeding F. J. Wheeler, granted leave of absence. J. Cruickshank has been appointed district passenger agent at Los Angeles, Cal.

W. W. Wood, city passenger agent of the Chicago, Rock Island & Pacific at Colorado Springs, Colo., has resigned to enter private business. R. S. Torrington, district passenger agent at Detroit, Mich., succeeds Mr. Wood, and C. C. Gardner, traveling passenger agent at Davenport, Iowa, succeeds Mr. Torrington.

Robert S. Ruble, whose appointment as assistant general passenger agent of the Union Pacific, with office at Omaha, Neb., has been announced in these columns, has served the Union Pacific continuously since he entered railway work in 1891. He served nine years in the passenger department at Denver, Colo., seven years as traveling passenger agent in Utah and California, and since 1907 has been city passenger agent in Denver, Colo. He leaves this position to assume his new duties as assistant general passenger agent.

James Lee West, who has been appointed general freight agent of the Missouri, Kansas & Texas of Texas, with office at Dallas, Texas, as announced in these columns, was born August 16, 1868, at Belleville, Ill. He entered railway service February 10, 1889, as stenographer for the general roadmaster of the Missouri, Kansas & Texas. In 1893 he was made commercial agent of this company, and subsequently held positions as chief clerk in the general freight offices, assistant freight agent and general freight agent. He resigns the latter position to assume his new title.

Guy S. McCabe, who has been appointed general western freight agent and division freight agent of the Chicago terminal division of the Pennsylvania Co., was born July 23, 1873, at Sewickley, Pa. He entered railway service Nov. 1, 1889, as clerk in the general freight office of the Pittsburgh, Cincinnati & St. Louis, and in 1896 he was made traveling freight agent of the Pittsburgh, Cincinnati, Chicago & St. Louis. He later held the position of division freight agent of the same company, and since April 1, 1908, he has been general western and division freight agent of the Pennsylvania Co. at Chicago.

J. W. Allen, whose appointment as general freight agent of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has been announced in these columns, was born July 28, 1855, in Cole county, Mo. He entered railway service September 7, 1880, as bill of lading clerk with the Blue Line at St. Louis. He served a number of companies in clerical positions until 1887, when he was appointed general agent of the Texas & St. Louis, at Memphis, Tenn. He remained with this company until his appointment as assistant general freight agent of the Missouri, Kansas & Texas in November, 1888. About three years later he was promoted to general freight agent, and in 1893 became general freight agent of the Missouri, Kansas & Texas of Texas, the position he leaves to become general freight agent of the Missouri, Kansas & Texas, with office at St. Louis.

William Borner, who has been appointed assistant to the freight traffic manager of the Pennsylvania Lines West, with office in Chicago, as previously announced in these columns, was born March 27, 1842, at Bedford, Pa. He took a course in bookkeeping in Duff's Commercial College, and entered railway service January 1, 1857, with the firm of Leech & Co., agents and forwarders of through freight over the Pittsburgh, Fort Wayne & Chicago, now a part of the Pennsylvania System. He served the Union Line as chief clerk and cashier, and was appointed local agent of the Pennsylvania Co. in Chicago July 1, 1877. Since that date he has been in continuous service of this company, serving as general western and division freight agent since June, 1881. He leaves the latter position for the new one of assistant to the freight traffic manager, with office in Chicago.

S. P. Howard, general freight agent of the Eastern and Lake Superior divisions of the Canadian Pacific, having resigned to engage in other business, H. E. Macdonell, general freight agent, Atlantic division, at St. John, N. B., has been appointed general freight agent of the Eastern division, in charge of Chalk River, Ont., and the territory east of that place, also from Smith Falls to Newport, Megantic and Quebec, including branch lines, with office at Montreal, Que.; W. S. Elliot has been appointed general freight agent of the Lake Superior division, in charge of Chalk River and territory west to Sault Ste. Marie and Port Arthur, not including the lines south of Romford junction, with office at North Bay, Ont. W. B. Bamford, district freight agent at London, Ont., has been appointed general freight agent of the Atlantic division, with office at St. John, succeeding H. E. Macdonell, and L. Mulkern has been appointed a district freight agent, with office at London, succeeding W. B. Bamford.

Edward S. Briggs, whose appointment as assistant general freight agent of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has been announced in these columns, was born October 25, 1872, at Indianapolis, Ind. He entered railway service in 1888 as messenger boy in the local freight department of the Texas & Pacific at Dallas, Tex. He was advanced in clerical positions with this company until 1893, when he resigned to become yard clerk in the local freight department of the Missouri, Kansas & Texas, at Dallas, Tex. In 1895 he went to New Orleans, La., as chief bill clerk of the Texas & Pacific, returning the next year to the local freight department of the Missouri, Kansas & Texas at Dallas. He served in various positions until 1898, when he was trans-

ferred to the general freight department, in which he subsequently held the positions of freight clerk, cotton clerk, chief rate clerk, chief clerk and assistant general freight agent at Houston, Tex., the position he held until his appointment as assistant general freight agent at St. Louis, Mo.

Engineering and Rolling Stock Officers.

H. S. Needham has been appointed assistant engineer of motive power of the Pennsylvania Lines West, succeeding C. D. Young, transferred.

S. D. Warren, signal inspector on the Chicago, Milwaukee & Puget Sound, has been appointed assistant signal engineer, with office at Tacoma, Wash.

John Leisenring, assistant engineer, road and track, of the Hudson & Manhattan, has been appointed signal engineer, with office in New York.

E. J. Robertson has been appointed superintendent car department of the Minneapolis, St. Paul & Sault Ste. Marie, succeeding I. G. Pool, deceased.

R. H. Howard, whose resignation as engineer maintenance of way of the Chicago & Eastern Illinois has been announced in these columns, will enter private business in New York.

F. J. Bauman, assistant supervisor of signals of the Pennsylvania Railroad, at Harrisburg, Pa., has been appointed supervisor of signals of the Renovo division, at Renovo, Pa.

M. J. Carrigan has been appointed district foreman of the Oregon Short Line and the Southern Pacific lines east of Sparks, Nev., succeeding W. E. White, assigned to other duties.

H. Rindal, assistant engineer of the Canadian Pacific at Winnipeg, Man., has been appointed engineer of the Pacific division, with office at Vancouver, B. C., succeeding C. E. Cartwright, resigned.

A. R. Ayers, whose appointment as mechanical engineer of the Lake Shore & Michigan Southern was recently announced in these columns, has been appointed also mechanical engineer of the Chicago, Indiana & Southern and the Indiana Harbor Belt.

L. C. Hartley, whose appointment as engineer maintenance of way of the Chicago & Eastern Illinois, with office in Chicago, has been announced in these columns, was born December 29, 1871, near Morgantown, W. Va. He attended the Ohio State University from 1896 to 1898 and entered railway service in August, 1898, as signal repairman on the Pittsburgh division of the Pittsburgh, Cincinnati, Chicago & St. Louis. He remained with this company until September, 1907, holding positions on the engineering corps and later as assistant engineer maintenance of way. Since September, 1907, he has been signal engineer of the Chicago & Eastern Illinois, the position from which he is now promoted to engineer maintenance of way.

Special Officers.

H. M. Cottrell has been appointed agricultural commissioner of the Rock Island Lines, with office in Chicago.

OBITUARY.

I. G. Pool, superintendent of the car department of the Minneapolis, St. Paul & Sault Ste. Marie, died at his home in Minneapolis June 6. Mr. Pool was 66 years of age and had been in the service of the company for 22 years.

Elisha P. Wilbur, former president of the Lehigh Valley, died at Alexandria Bay, Thousand Islands, N. Y., on June 4, at the age of 77. Mr. Wilbur was born at Mystic, Conn. He went to Mauch Chunk, Pa., in 1852, and helped to make the first surveys of the Lehigh Valley road. He was intimately associated with Judge Asa Packer, one of the principal owners of the Lehigh Valley and allied properties, and was an executor of his estate. Mr. Wilbur's interests embraced not only the Lehigh Valley Railroad and its affiliated properties, but also large iron and coal interests, including the Wilbur Coke Co., owning extensive lands in West Virginia. He was a trustee of Lehigh University. He is survived by a widow and seven sons. One of these, Rollin H., of Philadelphia, was for several years general manager of the Lehigh Valley.

Railway Construction.

New Incorporations, Surveys, Etc.

ALABAMA ROADS.—Surveys are being made and rights-of-way secured for the line projected from Decatur, Ala., southwest to Falls City, about 50 miles. E. H. Allison, New Decatur, may be addressed. (June 10, p. 1436.)

ALASKA ROADS.—Survey is to be started soon for a line to be built from Controller bay, Alaska, into the Bering river coal fields in Alaska, about 22 miles. H. White, president, Los Angeles, Cal., and C. A. L. Alisky, Portland, Ore., is also interested.

ALLIANCE & AKRON SHORT LINE.—An officer writes that a contract has been given to the B. & M. Engineering & Construction Co., Cleveland, Ohio, to build this line. The projected route is from Alliance, Ohio, northwest via Marlboro, New Baltimore, Congress Lake, Logtown and Magadore to Akron, about 26 miles. Construction work will be started soon, and some of the work will probably be sublet. Charles S. Kieth, president, Alliance, and L. C. Marble, chief engineer, 1005 Schofield building, Cleveland.

BOISE & WESTERN.—This company, which was originally promoted by C. E. S. Wood and William Hanley, Burns, Ore., has made application to the government for permission to build through government lands in Oregon along the Malheur valley to the eastern part of Harney county. A promoter writes that right-of-way was secured up the Malheur canyon to a point where it enters Harney valley, 120 miles from Vale. After securing the right-of-way it was turned over to the Hill lines. As the government is willing to grant permission to the company to build that line only on condition that the tracks shall be taken up and removed at any time the government may demand the use of the canyon for water power or reservoir sites, the line will not be built. (Feb. 11, p. 329.)

BOSTON & ALBANY.—The proceeds of the $2,000,000 of bonds which this company has asked permission to issue are to be used for improvements already finished or to be completed during 1910, as follows: Grand Junction Railroad, third-tracking and additional main tracks, $168,000; East Cambridge, Mass., developing delivery yard, $50,000; Chelsea, new freight house, $6,500; Worcester, elimination of grade crossing and new passenger station, $400,000; four-tracking layout, South Worcester, $315,000; signals and interlocking, $331,000; bridge renewals, $250,000; third-tracking and additional main tracks connecting third track between East Greenbush, N. Y., and Rensselaer, $125,000; passing tracks and sidings at West Brookfield, Mass., Westfield, Washington, Canaan, N. Y., State Line, Mass., and East Chatham, N. Y., $49,000; engine facilities at Beacon Park, Mass., West Springfield, North Adams Junction, Hudson, N. Y., and North Adams, $43,200; enlarging team delivery yard at Natick, Mass., $5,000; team and coach yard at South Framingham, $35,000; 60-car yard at Westfield, $10,000; widening track centers and additional two-track tunnel for eastbound main tracks at State Line, $150,000, and buildings at West Springfield, Becket and Westboro, $34,000. The balance of $28,300 is to be expended for miscellaneous permanent improvements of a like nature. (May 6, p. 1183.)

BUTTE & PLUMAS.—Incorporated in California, with $500,000 capital, to build from Oroville, Cal., northeast to Stanwood, about 25 miles. The incorporators include: O. C. Haslett, Alameda; E. S. Dunbar and J. L. Smith, Oroville.

CHICAGO, MILWAUKEE & ST. PAUL.—It is said that this company will double-track its entire Hastings and Dakota division from Minneapolis, Minn., across Minnesota to the South Dakota line.

CRYSTAL CITY & UVALDE.—This company, which operates a line from Uvalde Junction, Tex., south to Crystal City, 41 miles, is said to have part of the work finished on an extension being built to Gardendale, about 40 miles. It is said the company proposes to begin work next month on a further extension from Gardendale southeast either to Corpus Christi or Aransas Pass. Work is said to be under way putting up shops and a roundhouse at Crystal Springs, Tex.

CUBA RAILROAD.—An officer is quoted as saying that this

company will finish extensions in Cuba, totaling 180 miles, during the next six weeks, connecting the port of Manzanillo with inland points. (Oct. 29, p. 827.)

Fairchild & North Eastern.—Capital is said to have been secured and surveys have been made for building an extension from Fairchild, Wis., west to Caryville, about 40 miles. The line is now in operation from Fairchild northeast via Greenwood to Owen, 38 miles.

Fort Smith, Subiaco & Eastern.—This company has been granted permission in Arkansas to extend its line from Subiaco, Ark., via Scranton to Dardanelle, 23 miles. The line is now in operation for about six miles from Paris to Subiaco.

Georgia & Florida.—This company is said to have bought land recently to be used as a right-of-way for an extension of its tracks to its terminal property in Augusta, Ga.

Grand Trunk.—The Massachusetts Railroad Commission has been petitioned to permit the Grand Trunk to build under the name of the Southern New England Railroad the section of its proposed extension from Palmer, Mass., southeast via Monson, Brimfield, Sturbridge, Dudley, Webster and Uxbridge, to Blackstone, about 54 miles, at an estimated cost of $3,500,000. The board held a public hearing on this petition June 7. Consent has already been granted by Rhode Island to extend the line from the Massachusetts border south to tidewater at Providence. (April 22, p. 1066.)

Kansas City, Tulsa & Southwestern.—At a recent meeting of this company it was decided to build from Joplin, Mo., southwest to Tulsa, Okla., about 105 miles. It is said that financial arrangements have been made and construction work will be started soon. Col. C. H. Lynch, president.

Mississippi Roads (Electric).—Franchises have been granted to W. D. Bullard and associates by the town of Scranton, Miss., and other towns to build an electric line connecting Pascagoula, Scranton, Moss Point and Orange Grove, thence east to the Alabama state line.

Monongahela Railroad.—See Pennsylvania Roads.

Naples & Northwestern.—Incorporated in Texas, with $100,000 capital and headquarters at Naples. The plans call for a line from Naples to Sylvania, in Titus county, about 25 miles. The incorporators include: F. T. Atkinson, Cincinnati, Ohio; F. Stacke, J. H. Conley and C. B. Todd, Naples.

Newton Northwestern.—Organized to build from Newton, Miss., northwest via Conchatta and Walnutgrove to Carthage, about 45 miles. Surveys have not yet been made but the promoters expect to ask bids for the work about October 1. D. L. Raglan, president, Newton.

New York, New Haven & Hartford.—The borings through Sylvan hill, in Terryville, Conn., for the tunnel which is to shorten the Willimantic-Poughkeepsie line by about a mile and a half, are about finished. The tunnel will be 3,850 ft. long, and it is expected will be ready for traffic by November 1. (Dec. 17, p. 1214.)

Norfolk & Western.—According to press reports, important double-tracking work is now being carried out between Vivian, W. Va., and Huger, on three sections, a total of about 6.5 miles. The improvements include piercing several tunnels and the work will eliminate a number of curves. The company is said to be making plans to build a new line from Berwind, at the southern end of the Jaeger-Southern branch, southeast to the Clinch Valley line near Tazewell, Va. Extensive improvements are also said to be planned on the Ohio end of the line between Columbus and Kenova, to include double-tracking work and reducing grades and curves.

Nueces River Valley.—An officer is quoted as saying that contracts were let recently for building the first 60 miles of this line. The projected route is from Beeville, Tex., west via Caruso Springs to Eagle Pass, about 175 miles. W. A. Frisby, president; L. Frisby, general manager; J. Andrewartha, chief engineer, Beeville. (March 25, p. 850.)

Pennsylvania Railroad.—Work is now under way building a four-track line, 2.25 miles long, through Bristol, Pa., to eliminate 10 grade crossings, over which all Pennsylvania trains running through Bristol now pass. The work is expected to be finished early in 1911, and involves the grading of about 550,000 cu. yds. of earth and the construction of 5,000 cu. yds. of arch masonry and 12,000 cu. yds. of bridge masonry. There will be nine bridges over streets and public roads, one over the Pennsylvania canal and three over streams. The street bridges will be of reinforced concrete with solid floors. About 250,000 cu. yds. of embankment have been made and 4,000 cu. yds. of concrete masonry built. One of the present tracks will be left on the old location, to be used as an industrial side track. The present line through Bristol is on a heavy curve and the new line will be located on a tangent through the western part of the city, with light curves east and west of the town. (Dec. 10, p. 1168.)

See Pennsylvania Roads.

Pennsylvania Roads.—According to press reports, the Pennsylvania Railroad, the Pittsburgh & Lake Erie and the Monongahela Railroad will jointly carry out improvements as follows: Construction of a bridge over the Monongahela river near Brownsville Junction, Pa., new classification yards, and the elevation of another yard to a new grade at Red Stone, also the erection of a 70-ft. concrete arch. The bridge, which is to carry double-tracks, will cost $750,000, and will have a channel span of 450 ft. The War Department has ordered the removal of the present structure. The Pennsylvania is to build the bridge and establish classification yards. The Pittsburgh & Lake Erie is to raise the yard at Red Stone and the Monongahela is to build the concrete arch and enlarge and elevate the yards at the same place.

Pine Bluff & Northern.—Incorporated in Arkansas to build from Pine Bluff, Ark., north via Tucker, Tomberlins, McCreanor and Hickory Plains to Searcy, about 80 miles. There will be a bridge over the Bayou Meto, 150 ft. long, and another bridge over the Arkansas river, 1,500 ft. long. Bids for the construction and equipment will be received about August 1. Preliminary survey is now being made. A branch is projected west to Little Rock, about 25 miles. W. J. Miller, president, Lamar, Mo.; W. M. Kavanaugh, first vice-president, and C. P. Harmwell, treasurer, secretary and general attorney.

Pittsburgh & Lake Erie.—See Pennsylvania Roads.

San Francisco & Transbay.—Incorporated in California, with $70,000 capital, to build from Niles, Cal., to Dunbarton Point, 70 miles. The incorporators include: H. H. McClosky, E. Schnulenhaus, J. Comerford and L. Block.

Southern New England.—See Grand Trunk.

Southern Pacific.—The line under construction for several years by the Morgan's Louisiana & Texas, from Lafayette, La., northeast to Port Allen (opposite Baton Rouge), about 52 miles, is expected to be finished and in operation by September 1. Additional tracks may be laid at Baton Rouge to accommodate the new line. It was expected to have the line finished last year, but the difficulties encountered in crossing the Atchafalaya river have delayed the work.

South Shore Traction.—This company recently opened the first section from Babylon, N. Y., west to Amityville, nine miles. The company was organized to build a 54-mile line from Patchogue to New York. All the rights-of-way have been secured and the necessary franchises secured for completing the line. J. G. Robin, New York, is the principal promoter.

Southwestern New York Traction.—Application has been made in New York for permission to build an electric line in Allegany county from Bolivar, N. Y., east to Wellsville, 18 miles. The company, which is capitalized at $200,000, will ask for authority to issue bonds to the amount of $300,000. The directors include: C. Van Curen, G. H. Bradley, J. A. Wilbur, Bolivar, and B. F. Patterson, New York.

Vera Cruz, Tabasco & Campeche.—An officer writes that the proposed route is from Santa Lucrecia, Mex., on the Tehuantepec National easterly through Xucuapam, Tancochapa, Hato de Oro, Pichucalco, Teapa, Tacotalpa, Salto de Agua, Palenque to Boca del Cerro, where the Usumacinta river is to be crossed, thence northerly through Tenosique, Picaytun, Mamantel, Chicbul, Sahcabchen and Champoton to Campeche, where connection will be made with the United Railways of Yucatan, 490 miles. An alternate route is being considered from Tancochapa or Hato de Oro northerly through Huimanguillo and Cárdenas to Rosario, thence easterly through

Cunduacán to San Juan Bautista, the capital of the state of Tabasco, where the Grijalva river is to be crossed, thence southeasterly through Macuspana to Salto de Agua. A line via San Juan Bautista will be a trifle longer than the other route. The proposed line will run through one of the richest sections of Mexico, which produces cacao, coffee, rubber, tobacco, tropical fruits, fine cabinet woods and wood from which pulp can be made for the manufacture of paper. Great forests of this timber are found in the district through which the line will pass. Petroleum is also found in paying quantities. Corn, the most valuable article of national food, is generally cultivated, two and three crops a year being raised. The line will open up over 40,000 square kilometers of the finest agricultural, grazing and timber lands in the Republic of Mexico, and will form an important link, connecting the City of Mexico and Merida. The Mexican government, appreciating the value of this line, has given the company a subsidy of $10,000 United States currency per mile on a maximum distance of 470 miles. The work will be light, but there will be considerable heavy bridging. Donato de Chapeaurogue, president, and A. L. van Antwerp, secretary, Apartado No. 870, City of Mexico.

FOREIGN RAILWAY NOTES.

January 1 last the total length of railway in Argentina was 15,860 miles, of which 86 per cent. belonged to 19 companies, and the remainder to the state. In 1909 the new lines opened measured 1,098 miles. The net earnings in the year were $41,410,000. The net was 5.01 per cent. on the capital of the private railways and 1.24 per cent. on that of the state lines.

The district of Cochin, on the west coast of India, near its southern end (latitude 10 degs. north) has a forest of about 50 square miles, which is almost absolutely impenetrable away from the few streams. Here three sections of logging railways have been laid, 20, 4 and 22 miles long, on inclines, with sections of much steeper grades, with double track, on which trains loaded with logs going down by means of a cable haul the empty trains going up—like the old "switch-back."

In Italy work is progressing on a new line between Rome and Naples which will be much shorter than the old one. For this a tunnel was begun at Montorso, which, according to a recent report, has encountered a novel obstacle, namely, a subterranean hollow or cave some 600 ft. long and extending down some 150 ft. below the level of the sea, from the roof of which, now that daylight is let in, great masses of rock are falling, while the water which filters through the overlying limestone strata falls in a constant shower.

The effect of the Siberian Railway on the traffic of Western Siberia is shown very distinctly by the increase in shipments of grain. These, which amounted to 114,687 tons in 1901, increased to 793,321 tons, equivalent to 26,417,000 bushels in 1908. Nearly three-quarters of this was wheat and flour. A great business has grown up wholly since the line was opened, and the towns on the line have increased greatly in population. The grain production is chiefly within a thousand miles of the European border. Further east grain is imported.

There has been for some time so great a production of petroleum in Galicia (Austrian Poland) that the home market was greatly overstocked, and to secure an outlet for some of it Austria negotiated with Germany for special rail rates, which enabled it to compete in the latter country with an institution described as the "Standard Oil Co." Now the Prussian State Railways have given the requisite three months' notice of the abrogation of these special rates, and a return to the regular tariff, which will be an increase of no less than 48 per cent. in the freight to Berlin, making it about 35 cents per 100 lbs. In Rumania also petroleum production is increasing notably, and there a large part of the wells are in the hands of a company controlled by the Standard Oil Co.

Railway Financial News.

ALGOMA CENTRAL & HUDSON BAY.—It is understood that there will shortly be offered to the public £770,000 ($3,850,000) new first mortgage 5 per cent. bonds, unconditionally guaranteed by the Lake Superior Corporation. It is understood that the proceeds from the sale of these bonds are to be used to build an extension of the road north from Sault Ste. Marie to the main line of the Canadian Pacific.

ATLANTA, BIRMINGHAM & ATLANTIC.—The Trust Co. of America (New York) gives notice to holders of the first collateral trust 5 per cent. four-year joint notes of the Atlanta & Birmingham Construction Co. and the A. B. & A., due May 1, 1910, that those who have not assented to the settlement arrangement made by the noteholders' protective committee should present their notes for payment.

ATLANTIC & LAKE SUPERIOR.—See Quebec Oriental.

BOSTON & ALBANY.—The New York State Public Service Commission has approved the proposed issue of $2,000,000 in 4 per cent. bonds to run 25 years, the proceeds to be used principally for improvements, which, however, are largely in Massachusetts.

BOSTON RAILROAD HOLDING CO.—The lower house of the Massachusetts legislature has passed the bill to allow the Boston Railroad Holding Co. to issue preferred stock, untaxable, to help develop the Boston & Maine. The bill is based upon Governor Draper's special message recommending such an issue. The bill had already passed the Senate.

CANADIAN NORTHERN.—See Duluth, Winnipeg & Pacific.

CENTRAL OF NEW JERSEY.—The directors have declared an extra dividend of 2 per cent., payable June 25 to stock of record June 17, and the regular quarterly dividend of 2 per cent., payable August 1 to stock of record July 19. The extra dividend is payable out of the earnings of the Lehigh & Wilkesbarre Coal Co. These dividends will increase Reading income from its stock holdings in Jersey Central about $290,000, making its annual income from that company's stock $1,450,400.

CHICAGO & NORTH WESTERN.—The Nebraska Railroad Commission and the Wisconsin and Michigan state authorities have authorized the company to issue $13,852,200 general mortgage bonds for improvements and to refund outstanding bonds. The bonds have not yet been sold and the formal approval at this time is obtained merely to provide for the sale of the bonds when desired.

CHICAGO, MILWAUKEE & ST. PAUL.—The 250,000,000 francs ($50,000,000) 4 per cent. 15-year debenture bonds sold to a French syndicate, as announced last week, have been entirely resold to small investors and small banks, the number of individual investors being about 250,000 and the average allotment about 1,000 francs ($200).

CORONADO RAILWAY.—See San Diego Southern.

DELAWARE RAILROAD.—See Philadelphia, Baltimore & Washington.

DETROIT, TOLEDO & IRONTON.—The interest coupons on the general lien bonds, due December, 1909, are being paid at the Knickerbocker Trust Co. in the interests of the consolidated mortgage bondholders. A committee representing these bondholders is being formed to actively take up the reorganization of the company.

DULUTH, WINNIPEG & PACIFIC.—Lazard Brothers & Co., London, recently offered at 92½, £950,000 ($4,750,000) 4 per cent. first mortgage debenture stock, on which principal and interest is unconditionally guaranteed by the Canadian Northern.

DUNKIRK, ALLEGHENY VALLEY & PITTSBURGH.—Stockholders are to vote July 1 at Albany, N. Y., and August 1 at Philadelphia, Pa., on the question of making a mortgage to se-

cure an issue of 4½ per cent. 50-year bonds, amounting to $5,000,000, for improvements and to refund outstanding bonds. Stockholders are also to vote on the question of modifying the lease to the New York Central & Hudson River so as to provide that in addition to the payment of an annual dividend of 1½ per cent. on the stock, as provided in the contract, there should be paid as rental, interest on the new bonds.

Fort Dodge, Des Moines & Southern.—On the application of the trustee of the first mortgage bonds of 1907 the property of the company has been put in the hands of Homer Loring, president, and Parley Sheldon, a banker of Ames, Iowa, as receivers.

Galveston, Harrisburg & San Antonio.—The company has asked the Texas Railroad Commission for authority to issue $5,384,000 bonds secured on the Galveston-Victoria division. An issue of $10,000,000 30-year 6 per cent. bonds was authorized May 23 by the stockholders.

Laramie, Hahn's Peak & Pacific.—Lawrence Barnum & Co., New York, are offering at par a block of the $1,800,000 Laramie, Hahn's Peak & Pacific first refunding mortgage 6 per cent. bonds of 1907-1932. The Hahn's Peak road is to be built from Laramie, Wyo., where it connects with the Union Pacific, to Hebron, 108 miles, and there is now in operation 30 miles of this line from Laramie to Centennial.

Metropolitan (N. Y.).—Adrian H. Joline and Douglas Robinson, receivers of the Metropolitan Street Railway Company, having reached an agreement with the city authorities for the settlement of the special franchise taxes due from the company by the payment of $3,750,000, Judge Lacombe, in the United States circuit court, has authorized the issuance of receivers' certificates to the amount of $3,000,000. The certificates are to run for a year and will bear 6 per cent. interest.

Mexican International.—See National Railways of Mexico.

Missouri, Kansas & Texas.—Harry S. Black and F. P. Brazier have been elected directors to fill vacancies on the board.

National City & Otay.—See San Diego Southern.

National Railways of Mexico.—A press despatch from Mexico City says that on July 1 the Mexican International, now operated separately, will become a part of the National Railways of Mexico.

New Mexico Central.—The trustee of the $2,000,000 mortgage bonds of 1901 has brought suit in New Mexico to foreclose the mortgage.

New York Central & Hudson River.—See Dunkirk, Allegheny Valley & Pittsburgh.

New York, New Haven & Hartford.—The Massachusetts Senate without dissent has ordered to a third reading the bill to validate the present outstanding securities of the New Haven, after an examination of its property by the railroad commission, the tax commissioner and the bank commissioner.

Norfolk Southern.—A fourth suit has been brought by the Vandyke-Zell syndicate, of Philadelphia, to annul the sale of the Norfolk & Southern property to the new company, the Norfolk Southern. The property is in the hands of the new company and is being operated by it, but the sale of $5,780,000 bonds is delayed pending decision of the court, which is expected about July 1.

Philadelphia, Baltimore & Washington.—The directors of the Delaware Railroad have declared a 2¾ per cent. dividend, payable July 1, for the four months ended June 30. This is at the rate of 8 per cent. per year and is the first payment under the lease of the Delaware Railroad to the Philadelphia, Baltimore & Washington.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Speyer & Co. and Kuhn, Loeb & Co., both of New York, have bought $4,000,000 consolidated mortgage 4 per cent. bonds, series G, due 1957, and are offering these bonds to the public at 96½. Bonds are guaranteed principal and interest by the Pennsylvania Company. They are issued to retire at maturity July 1, 1910, $1,967,000 Jefferson, Madison & Indianapolis 7 per cent. bonds, which are a first lien on 222 miles, on which the consolidated mortgage bonds now become a first lien. The additional proceeds from the sale of the bonds is to be used to pay for double-tracking.

Quebec Oriental.—The railway commission of Canada is asked to recommend the sanction by Parliament of the sale by the Royal Trust Co. of the Baie des Chaleurs section of the Atlantic & Lake Superior to the Quebec Oriental.

Reading Company.—P. A. B. Widener has been elected a director, succeeding Joseph S. Harris, deceased.

San Diego Southern.—The two companies, the National City & Otay and the Coronado Railway, whose property was taken over by the San Diego Southern some time ago, have been dissolved. The San Diego Southern was incorporated in 1908 with $5,000,000 authorized stock. In May, 1910, there was $1,515,000 stock paid in. The company has no outstanding bonds. The line runs from San Diego to Tia Juana, 18½ miles, with branches, a total of 50 miles. The line between San Diego and Otay, 12 miles, is operated by electricity.

Seaboard Air Line.—The executive committee has recommended the full payment on August 1 of the first semi-annual 2½ per cent. interest coupon on the outstanding $24,979,500 adjustment 5 per cent. income bonds. The distribution calls for $624,487. The earnings of the six months prior, available for payment of interest on the adjustment bonds, amounted to $1,569,015.

Southern Pacific Co.—The $25,000,000 bonds sold in Germany, as reported last week, are to be 40-year 4 per cent. bonds, issued under a mortgage on the Bay Shore line and on real estate terminals.

Senator Smoot has reported from the committee on claims of the Senate bill to reimburse the Southern Pacific to the amount of $773,647 for money the company spent between December 1, 1906, and November 30, 1907, in closing the overflow of the Colorado river.

Texas Central.—R. H. Baker has exercised the option to buy the majority of the $1,324,500 preferred and $2,675,000 common stock of the Texas Central. It is said that the purchase price is about par for each class of stock, and that holders of the minority stock will be given the privilege of selling their stock at about the same price.

Western Ohio Railroad.—This company, incorporated with $10,000 stock, which is to be increased to $1,000,000, is to take over under lease the property of the Western Ohio Railway. The holders of $3,000,000 common stock of the Railway will be offered the privilege of exchanging their Railway stock for Railroad stock on the basis of three shares of the Railway stock for one of the Railroad.

The extension of the Paraguay Central Railway from Pirapo to Encarnacion, on the Parana river, is progressing steadily, the rails being laid into Encarnacion by the end of March. Ferryboat connection will be made with Posadas, on the Argentine side of the river, to which point the Argentine Northeastern Railway is being extended. This will give Paraguay its first connection with the outside world by rail, although the Paraguay Central is the oldest railway in South America. Through service is expected between Asuncion and Buenos Aires by the end of 1910. For through service the wider gage of the Paraguay line is to be changed to that of the Argentine Northeastern, and the old rolling stock entirely replaced by new equipment which has just arrived from England. This consists of 20 locomotives, one officers' car, 223 freight, two dining, three parlor, two compartment, two sleeping and 12 day cars, eight baggage, mail and express cars, one wrecking car and one 20-ton, flat-bottom boat with steam winch. Of the $1,410,000 additional stock issued by the Paraguay Central $1,070,000 was taken by the Argentine Government, which also secures the old rolling stock for use on Patagonia railways. Argentina also appropriated $10,000,000 for the extension of the railway to the north.

Supply Trade Section.

The Griffin Wheel Co., Chicago, is to build four new buildings at its South Tacoma (Wash.) plant, at a total cost of $125,000.

H. W. Davis, 2 Rector street, New York, has been appointed eastern representative of the Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio.

George B. Foster has been appointed Chicago sales manager of the Wisconsin Engine Company, Corliss, Wis. His office will be in the Fisher building.

The Isthmian Canal Commission will receive bids up to June 24 for electrical material, including fixtures, fittings, arc lamps, carbons, fuses, cable, wire, conduit, tape, etc. (Circular No. 590), and up to June 28 for a locomotive crane, steel plates and lumber (Circular No. 589).

The Bettendorf Axle Co., Davenport, Iowa, announces the removal of its Chicago office from the Old Colony building to larger quarters in room 1508 in the McCormick building. The company will keep an exhibit there of several full-size Bettendorf trucks and side frames, also Bettendorf body and truck bolsters.

The Lackawanna Steel Company has decided to move its principal offices from New York to its works at Lackawanna, near Buffalo, N. Y., as soon as the necessary additions to its present office building at Lackawanna can be completed. Selling offices necessary for local business will be maintained at the present location, 2 Rector street, New York City.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Company, Jersey City, N. J., the old board, consisting of Geo. T. Smith, William Murray, William H. Corbin, Edward L. Young, Geo. E. Long, William H. Bumsted and Harry Dailey, were unanimously re-elected. The board of directors re-elected the former officers, namely, Geo. T. Smith, president; William H. Corbin, vice-president; Geo. E. Long, treasurer; Harry Dailey, secretary; J. H. Schermerhorn, assistant treasurer and assistant secretary. William H. Corbin was also re-elected as counsel.

Lucius I. Wightman, for the past six years advertising manager for the Ingersoll-Rand Company, New York, has resigned, effective August 1. Mr. Wightman will open an office in New York City as an independent specialist in machinery advertising, handling the accounts of manufacturers of machinery and engineering products. He brings to his new enterprise qualifications peculiarly fitting him for this line of work. To his long experience in managing one of the largest advertising accounts and publicity departments in the machinery field, he joins a prior experience of years in practical mechanical and electrical engineering, construction work, machine design and manufacture and machinery selling. He is a graduate engineer, the author of a text-book on compressed air, and one of the authorities on compressed air subjects.

TRADE PUBLICATIONS.

Ore Car.—The Pressed Steel Car Co., Pittsburgh, Pa., has just issued a leaflet describing its all-steel, center dumping, self-cleaning, 50-ton ore car.

Exide Battery.—The Electric Storage Battery Co., Philadelphia, Pa., has issued its bulletin No. 124 describing the Exide battery in emergency service.

Air Compressors.—The Ingersoll-Rand Co., New York, in form No. 3006, gives a complete description, with illustrations, of its Class O duplex, steam-driven air compressors.

Incandescent Lighting System.—The Western Electric Co., New York, has just issued bulletin No. 5,533 which describes the Hawthorne series incandescent lighting system with sunbeam Madza lamps.

Lifting Magnets.—The Cutler-Hammer Clutch Co., Milwaukee, Wis., has issued a leaflet containing detail information and description with illustrations of the lifting magnets made by this company.

Metal Culverts.—The Pennsylvania Metal Culvert Co., Warren, Pa., has issued a leaflet containing a number of 6-in. x 10-in. half-tone illustrations of installations of its culverts on steam and electric railways.

Cardwell Friction Draft Gear.—The Union Draft Gear Co., Chicago, has just issued a new catalogue containing a large number of full-page illustrations, with descriptions, of the Cardwell friction draft gear.

Engine and Turret Lathes.—Lodge & Shipley, Cincinnati, Ohio, has issued catalogue No. 21 covering the engine and turret lathes which it manufactures. These machines are designed especially for using high-speed steels.

Russell Snow Plows and Flangers.—The Russell Car & Snow Plow Co., Ridgway, Pa., has issued its 1910 catalogue of Russell snow plows and flangers for use on steam railways. A number of large illustrations are given, with specifications, and also a list of the railways now using these snow plows.

Storage Battery.—The Electric Storage Battery Co., Philadelphia, Pa., has issued a booklet entitled "The Story of the Storage Battery," which contains some very interesting information regarding the wide use of the storage battery for various purposes and the position of this company in the storage battery field.

Bartley Nut and Bolt Fasteners.—The American Nut and Bolt Fastener Co., Pittsburgh, Pa., has just issued its catalogue No. 6 on Bartley nut and bolt fasteners. This catalogue replaces all preceding ones and contains detail descriptions, with illustrations, of these specialties, with a number of lists covering prices and sizes.

Mallet Locomotive.—The American Locomotive Co., New York, has just issued bulletin No. 1004 entitled "Articulated Compound Locomotives Built for the Delaware & Hudson Company," which contains a very complete description of these locomotives and in convenient form. A description of these locomotives appeared in the *Railway Age Gazette* of May 27.

Flexible Staybolts.—The Flannery Bolt Co., Pittsburgh, Pa., has just issued a very interesting and valuable catalogue showing the various standards and assemblages of Tate flexible staybolts. The staybolt is illustrated by dimensioned half-tone cuts, showing both elevation and sectional views. Accompanying the catalogue is a revised price list covering certain changes, effective June 1.

Chicago, Rock Island & Pacific.—A booklet has been issued by the passenger department of the Chicago, Rock Island & Pacific, in connection with the thirty-first triennial conclave of the Knights Templar, to be held in Chicago Aug. 8-13, 1910. Numerous photographs of points of interest in Chicago are printed as comparisons to pages reproduced from the souvenir of the twenty-first triennial conclave issued by the Rock Island Lines in 1880. This parallel arrangement makes an interesting illustration of the growth, not only in the Masonic interests and Knight Templarism, but also in the development of railway terminals, equipment and service in the last 30 years.

Union Pacific.—The Union Pacific is distributing a folder advertising the annual Rose Festival at Portland, Oregon, June 6-11. A short description of this carnival and full information on routes from the East to Portland is given. The illustrations are beautiful colored views of the roses to be seen in Portland. A 20-page booklet describes the tours to the Yellowstone National Park, Lake Tahoe, and the Yosemite Valley. The descriptive matter is based on 14 colored illustrations of scenes along these tours. "An Inland Voyage to Alaska and Return" is the title of a booklet describing our northern possession and the method of reaching it by land from Seattle, which is reached by the Union Pacific, the Oregon Short Line, the Oregon Railroad & Navigation Co. and the Oregon & Washington.

Metal Culverts.—The Canton Culvert Company, Canton, Ohio, manufacturers of Acme nestable corrugated No-Co-Ro

metal culverts. Duro perforated corrugated railway drains, etc., has recently mailed to railway engineers and maintenance of way men, prominent road contractors and others throughout the country, an attractive four-page circular letter embodying references to business with the U. S. Government, foreign governments, prominent railways, etc. The circular reproduces several pages from the company's handsomely illustrated 24-page brochure entitled "Acme Culverts for Steam and Electric Railways," and presents strong evidence that Acme culverts, made of their characteristic heavy gage highly rust-resistant No-Co-Ro metal galvanized sheets, are in favor with the best judges and large users of culverts.

RAILWAY STRUCTURES.

Belle Vernon, Pa.—Contract is said to have been given to the Cuthbert Brothers Construction Co., Pittsburgh, Pa., for building the brick passenger station for the Pittsburgh & Lake Erie in Belle Vernon, at a cost of about $15,000. (May 27, p. 1327.)

Bloomington, Ill.—It is said that residents of this place are raising $165,000 for improvements at the Bloomington shops of the Chicago & Alton. The railway company, it is understood, has agreed to spend $1,000,000 and put up a union passenger station.

Bristol, Pa.—See Pennsylvania Railroad under Railway Construction.

Bronte, Tex.—See Tennyson, Tex.

Brownsville Junction, Pa.—See Pennsylvania Roads under Railway Construction.

Cleveland, Ohio.—According to local reports, the Lake Shore & Michigan Southern has applied for permission to change the location of its tracks at East 105th street preparatory to building a new station at that place. Plans are said to be made for a passenger station, freight house and express buildings. (April 22, p. 1069.)

Fort Chadbourne, Tex.—See Tennyson, Tex.

Kingman, Kan.—The Atchison, Topeka & Santa Fe is taking bids for the building of passenger stations at Kingman, Harper and Stafford, Kan., and Holly, Colo.

Mexico, Mo.—The Chicago & Alton has prepared plans for a brick freight station to cost $16,400.

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Co. will put up a new power plant, it is said, near the Highland boulevard viaduct. Later it is planned to build a large car shop in connection with this improvement. All of the buildings are to be of reinforced concrete construction.

Portland, Ore.—An officer of the Harriman Lines is quoted as saying that $250,000 will be spent for improvements as follows: Two new stations on the Oregon Railroad & Navigation Company's line, including a new freight station in Portland, and machine shop and roundhouse improvements at Le Grand. Work was recently started on a new $1,600,000 bridge over the Willamette river to replace the present structure.

Punxsutawney, Pa.—An overhead bridge is to be built to the central part of Punxsutawney, over the Pennsylvania Railroad tracks and the county bridge at South Pennsylvania street. It is said that the railway company will pay part of the cost of the improvements.

Red Stone, Pa.—See Pennsylvania Roads under Railway Construction.

Tennyson, Tex.—An officer of the Kansas City, Mexico & Orient writes that work is now under way putting up a combined freight and passenger station with limestone walls and red tile roof, one story high, 24 ft. x 85 ft., to cost $2,500. in Tennyson. A station is also being put up at Bronte, 24 ft. x 100 ft., and another at Fort Chadbourne, 24 ft. x 85 ft.

Toronto, Ont.—The Canadian Pacific is said to have bought land in Toronto, and will put up an office building and freight shed.

Late News.

The items in this column were received after the classified departments were closed.

W. D. Lee has been appointed general superintendent of the Rio Grande Southern, with office at Ridgway, Colo.

C. H. Ketcham, for the last six months with the Western Pacific, has been appointed assistant superintendent of the Southern Pacific at Oakland, Cal.

Plans have been made by the city engineer for a bridge to be built over the Lebanon Valley tracks at Tulpehocken, Reading, Pa., which will be submitted to the Philadelphia & Reading.

H. G. Elliott has been appointed first assistant general passenger agent of the Grand Trunk, with office at Chicago, and W. S. Cookson has been appointed assistant general passenger agent, with office at Montreal, Que.

An officer of the Pacific & Idaho Northern writes that contracts are to be let at once for building the extension from Evergreen, Idaho, northeast to Meadows, 15 miles. The line is to have maximum grades of 2 per cent. and maximum curvature of 12 degs. (June 10, p. 1438.)

Consideration of the conference report on the railway bill is delayed in Congress by the illness of Senator Elkins; but both senators and representatives continue to predict that there will not be much discussion on the report and that Congress will be able to adjourn about July 1.

The governor of New York has signed the bill to permit the operation of the Steinway tunnel, the tunnel between the Manhattan and Queens boroughs, under the East river, which was finished more than two years ago but which has lain idle because of the failure of the company and of disputes as to the rights of the city.

The St. Louis & San Francisco and the Southern Pacific lines in Texas have made a traffic agreement, running for 12 years, by which these lines will work in each other's interests in the fostering of traffic from St. Louis, Kansas City and other points in the north to south and central Texas, and *vice versa*. The connecting point between the two lines is Dallas.

New York bankers say that negotiations are under way for the issue of a part of the $30,000,000 4½ per cent. equipment trust certificates of the New York Central which have been in the hands of J. P. Morgan & Co. for some time. The success of the recent offering of $11,000,000 Pennsylvania equipment trust notes on a 4½ per cent. basis is given as a reason for a sale of New York Central certificates at this time.

Bankers in New York City say that the losses by fraudulent bills of lading, which have recently been reported in the newspapers, aggregate nearly ten million dollars, and they are working strenuously for the passage of the Stevens bill, now before Congress, which makes the railways responsible for bills of lading issued by their agents. The sum named covers the fraudulent cotton bills in the South and fraudulent grain bills reported from Albany, N. Y. A committee of insurance men is now making inquiries in the southern states looking to the introduction of a scheme of insurance on bills of lading.

In the United States district court at Philadelphia this week the Philadelphia & Reading and the Lehigh Valley were found guilty of having violated the law in canceling demurrage charges aggregating $231,000 against the Bethlehem Steel Company, and the steel company was found guilty of soliciting and accepting the cancellation. Witnesses for the defense declared that the railways believed they were overcharging the steel company for demurrage and that they adjusted the matter to their mutual satisfaction, but the government retorted that if they were under that impression it was their duty to make the adjustment through the Interstate Commerce Commission. In the indictment against the steel company there were 160 counts. There were 126 against the Lehigh Valley and 87 against the Reading.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Ha Ha Bay Railway has ordered one double-end locomotive from the American Locomotive Co. It will have 14-in. x 22-in. cylinders, 44-in. driving wheels and a total weight of 80,000 lbs.

The Grand Trunk, reported in the *Railway Age Gazette* of May 13 as figuring on 50 locomotives, is said to have ordered 15 consolidation and 25 mogul locomotives. This item is not confirmed.

B. T. Babbitt has ordered one four-wheel saddle tank switching locomotive from the American Locomotive Co. It will have 13-in. x 18-in. cylinders, 36-in. driving wheels and a total weight of 56,000 lbs.

D. A. Langhorne, Brent, Ky., has ordered one four-wheel saddle tank switching locomotive from the American Locomotive Co. It will have 10-in. x 16-in. cylinders, 30-in. driving wheels and a total weight of 36,000 lbs.

The Solvay Process Co., Syracuse, N. Y., has ordered one six-wheel switching locomotive from the American Locomotive Co. It will have 19-in. x 24-in. cylinders, 51-in. driving wheels and a total weight of 123,000 lbs.

The Central Railway of Brazil has ordered two Pacific passenger locomotives from the American Locomotive Co. One will have 22-in. x 24-in. cylinders, 50½-in. driving wheels and a total weight of 200,000 lbs., and the other 17-in. x 20-in. cylinders and 37-in. driving wheels.

The Harriman Lines have ordered 85 locomotives from the Baldwin Locomotive Works for delivery in October, November and December. These will be divided as follows: 18 ten-wheel, 10 eight-wheel, 37 Pacific and 20 Atlantic. These will be divided between the lines of the Harriman system as follows: Oregon & California, 6; Oregon & Washington, 7; Oregon Short Line, 15; Oregon Railroad & Navigation, 22; Union Pacific, 10; Southern Pacific, 20; Southern Pacific of Mexico, 3, and Sonora Railway, 2.

CAR BUILDING.

Morris & Co. have ordered 200 beef cars from the Haskell & Barker Car Company.

The Charlotte, Harbor & Northern has ordered 90 freight cars from the Barney & Smith Car Co.

The Phoenix Bridge Co., Phoenixville, Pa., has ordered two flat cars from the Pressed Steel Car Co.

The Kansas City Southern has contracted with the Sheffield Car & Equipment Co. for the repair of 500 box cars.

The Illinois Central is said to have ordered 50 passenger cars from the Pullman Company. This item is not confirmed.

The United Railroads of San Francisco, Cal., are reported as contemplating ordering 100 electric cars. This item is unconfirmed.

The Illinois Traction Co. has ordered 10 interurban motor, 5 trailer observation and 29 single-truck P. A. Y. E. city cars from the Danville Car Co.

The Grand Trunk has ordered 1,000 all-steel hoppers and 1,500 steel underframe box cars from the Canada Car Company, and 500 steel frame box cars from the Silliker Car Co. This company has also ordered a number of passenger cars.

The Hawley Lines are taking prices on freight cars to be divided as follows: Minneapolis & St. Louis, 750 box and 250 stock; Iowa Central, 500 box; Chicago & Alton, 250 automobile, 250 furniture and 3,000 box. All but 250 of these cars will have steel underframes and all but 250 will be of 80,000 lbs. capacity.

MACHINERY AND TOOLS.

The Kansas City Southern is taking prices on seven or eight lathes and upright drills.

Westinghouse, Church, Kerr & Co. are taking prices on machine tools for the Kansas City, Mexico & Orient, to cost $10,000.

IRON AND STEEL.

The Great Northern has ordered 11,000 tons of rails from the Lackawanna Steel Co.

The Canadian Northern has ordered 5,500 tons of rails from the Lackawanna Steel Co.

The Boston & Maine has ordered 250 tons of structural steel from the American Bridge Co.

The Chicago, Milwaukee & St. Paul has ordered 250 tons of bridge steel from the American Bridge Co.

The New Orleans Railway & Light Company has ordered 500 tons of rails from the Carnegie Steel Co.

The Chicago, Burlington & Quincy has ordered 5,000 tons of ferro titanium rails from the Lackawanna Steel Co.

Stone & Webster have ordered 5,700 tons of rails from the Pennsylvania Steel Co. for the Galveston & Houston Interurban Electric Ry.

The New York, Chicago & St. Louis, reported in the *Railway Age Gazette* of June 10 as in the market for 2,000 tons of bridge steel, has ordered 1,900 tons from the King Bridge Co.

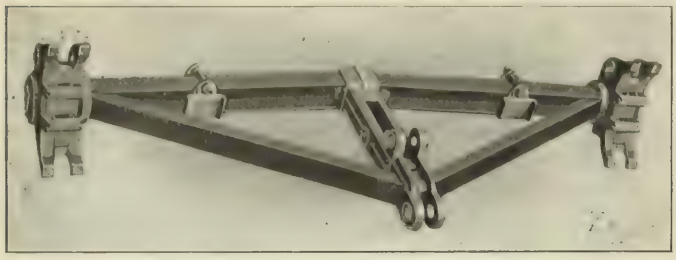
FOREIGN RAILWAY NOTES.

Negotiations are being actively carried on with an American company [the New York address of which is on file at the bureau of manufactures] concerning the construction of a railway line from Sivas to Van, with a branch line to the port of Youmourtalik, near Alexandretta, and another line to Mosul. Thus there will be a network of railway in Anatolia, the trunk line having a length of 1,242 miles. The American concern requires authorization to exploit the mines within a certain distance on both sides of the line and renounces, in return, any claim to a guarantee. The government has accepted in principle this proposition, but on terms requiring the exploitation of the mines within a reasonable period of time. A railway from the port of Samsoun, Turkey, will be connected with the Sivas-Van line at Sivas and extended to Angora. Another will connect the port of Trebizond with Erzeroum and, later on, be extended to the Russian and Persian borders. These latter lines will be built by the government, which is expected to be able to find money in foreign markets for the construction of both roads and railway lines.

A railway is to be built from the port of La Paloma, Uruguay, on the Atlantic, to Treinta y Tres, passing the towns of Rocha and Lascano, and crossing the Cebollati river at its highest navigable point, about 127 miles in length. The state guarantees 3½ per cent. interest on a cost of about $41,500 per mile, which is to be paid in full when the net profits do not exceed one-half per cent. of the capital. Work is to start within six months after the approval of the plans, which are to be submitted eight months after being presented. The railway is to be ready for traffic 45 months after starting. Moles will be constructed at the port of La Paloma and at the crossing of the Cebollati river, although there will be no monopoly. The concession is for 90 years, at the termination of which period the works pass to the state. Colonies will be established, for which a rebate of 20 per cent. of the tariff will be allowed on agricultural products, machinery, utensils and building material. This railway will open up for settlement a vast region now thinly populated and of great argicultural and mineral possibilities.

The Huntoon "LN" High Speed Brake Beam.

The modern high-speed brake reaches a limit at about 18,000 lbs. pressure per brake-shoe because at this load the friction is sufficient to melt the metal surface of the shoe and nothing is gained by the use of higher pressures. It has been determined, therefore, that a maximum load of 36,000 lbs. on the brake-beam should be the limit for emergency application, that under this load the deflection should not exceed $\frac{1}{16}$ in., and that there should be no permanent



Huntoon "LN" High Speed Brake Beam.

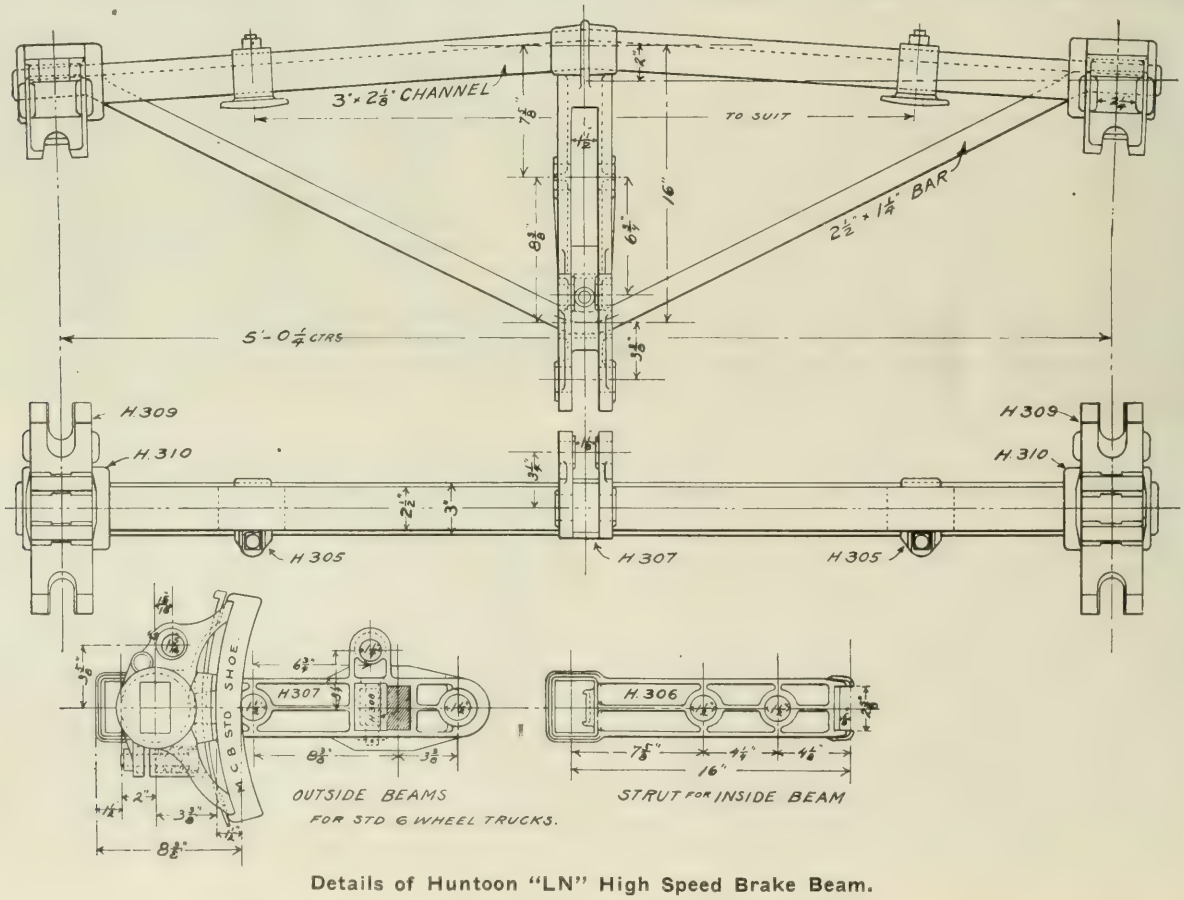
set at 70,000 lbs. The Huntoon "LN" brake-beam was designed to meet this specification and the tests show a deflection of .057 in. under a load of 35,500 lbs. and .11 in. under a load of 70,000 lbs. In the construction of this beam steel of high tensile strength is used, the steel castings having a tensile strength of from 70,000 lbs. to 80,000 lbs. per sq. in.

The tension member is made of specially rolled high tensile steel (2½ in. by 1¼ in. cross section), having no permanent deflection under a load of 35,000 lbs. per sq. in., thus having an elastic value of 109,000 lbs. at the center of the truss, and 218,000 lbs. breaking strength; the factor of safety is 6 to 1 over service conditions, as compared with 3 to 1 in the older types. The ends are upset, as in the former approved Huntoon construction, and are headed to engage the channel compression member, thus locking the truss. The compression member is a special rolled 2½ by 2-in. high carbon steel channel, milled to receive the tension member and sleeve, thus insuring an absolute fit, preventing slack movement. The compression and tension members are held together by a cast steel sleeve, which in turn is provided with large shrinkage collars, which are heated and shrunk on, bringing the fitted ends tightly together and preventing all preliminary deflection; the sleeve is secured from endwise movement by a steel rivet.

The triple strut is one piece of cast steel, whose smallest cross sectional area is 3⅛ sq. in., of a load value of over 218,000 lbs., being 50 per cent. in excess of the breaking value of the connecting rods and exceeding the shearing values of the pins.

The automatically adjustable heads (Huntoon patent) are something entirely new in adjustable brake head construction. For this beam they are made of high tensile steel, of slightly increased metal over the old standard high-speed malleable iron head. The brake lugs extend across the full width of the head, giving a full bearing surface of solid metal for the brake-shoes so that the pressure is transmitted through solid metal from the beam to the wheel. The steel bolt and spring secures the hinged steel clip at the back of the head securely to the steel sleeve upon which the head moves. This binding friction prevents the head from slipping or turning except when the brake pressure is applied, when it immediately adjusts itself to the contour of the wheel, remaining in that position until automatically re-adjusted through the wear of the shoe. Instead of the spring clip pushing the head away from the beam, thus causing preliminary deflection, this construction pulls the head up tight against the face of the sleeve, so that there is absolutely no lost motion, and consequently no preliminary deflection. At the same time the spring is in such position as to take up all wear, and no matter how long in service, the heads are never loose and cannot be shaken or rattled loose.

The Joliet Railway Supply Co. also manufactures a "P. C." high-speed brake-beam similar to the "LN" beam, of the same design and limited dimensions, but of increased capacity to meet the requirements of the new Westinghouse "P. C." air-brake equipment. This beam is interchangeable in every way with the "LN" beam, the same brake-heads being used on both beams. Its capacity is 45,000 lbs. at $\frac{1}{16}$ in. deflec-



Details of Huntoon "LN" High Speed Brake Beam.

tion, with no permanent set at 80,000 lbs. These beams are manufactured by the Joliet Railway Supply Co., Monadnock block, Chicago.

The Hobart Allfree Valve Gear.

The new valve gear of the Hobart Allfree Company, as applied to a locomotive on the Kansas City Southern, is shown in the accompanying illustrations. The operation of the gear will be understood by reference to the drawing and the following description: Beginning with the eccentric crank "A" motion is transmitted through the eccentric rod "B" to the transmission bars "D," the radius bar "C" being connected at its lower end between the transmission bars, and at its upper end to the radius block "J." The position of the radius block "J" upon the radial guides "N" determines the length of cut-off. The position shown in the diagram would be full gear back motion, whereas the opposite position at the forward end of the radial guides would be full gear forward. In the center it would be neutral and would impart no motion to the rocker "E," but the combination lever F through its connection to the crosshead G and H would impart a sufficient movement to the valve to pull off the lap and give the lead, which is the only function of the combination lever. By reason of the lap and lead movement in the valve coming from the crosshead, the movement at the time of opening and closing will be rapid, lowering the pre-admission materially below that of the link motion, but quite similar to a Walschaert motion, except that it is perfectly even, that is, the same pre-admission at either end.

It will be seen from the table of valve events that the closure is unusually late. This, however, is due to the use of the compression controlling valve. Without this valve the closure event would be but little later than a Walschaert gear. It will be observed from the table of events that a very long steam line is obtainable in full gear. With a valve having 1 in. steam lap, over 90 per cent. may be had.

The cut-offs are quite even, practically the same at one end as the other. If there is any difference the long cut-off will always occur at the back end of the cylinder instead of the front, which is the case with other gears.

The reverse shaft "M" is acted upon through the reach rod and motion is transmitted from it through the arms "L" and links "K" to the radial block "J." All of the working parts of the gear are built as a unit, that is, the same design is applicable to practically all types of engines, the only change necessary being that the frame "O" may be lengthened or shortened to suit varying designs of locomotives.

The material advantages of this type of gear, aside from its strength and durability, are that inasmuch as the eccentric rod is on a center line on the driving wheels, at its connection with the transmission bars, the engine will not get out of square due to rounding curves or rough track. No amount of variation of the engine on its springs can put the valves out of square. Even though the springs break the valves will not be out a noticeable quantity. Further material advantage is found in the fact that there is no vibration to the reverse lever regardless of its position, thus eliminating all danger to the engineman, and as the gear is amply strong to withstand any speed in full gear, accidents are not likely to occur. There is sliding wear on the working parts, all joints being pin joints, bronze bushed, unusually large; no heating or abrasion, therefore, will be experienced.

The gear is designed to give as much as 7½ in. valve travel. Even more may be obtained if desirable, or, on the other hand, it may be stopped at any earlier point. Owing to its unusual strength of construction and perfect alinement and balance, the gear may, with perfect safety, be operated at any speed that it is possible for the locomotive to obtain at full stroke, without the slightest danger of heating, locking or other injury to any of the parts. Considerable attention has been given to methods of lubrication. Oil cellars are provided at all important joints, with hard grease cups on the eccentric pin connection. There being no vibration whatever to the reverse lever, the gear will be built when desired with an air reverse, consisting of a small air cylinder connecting either to the reach rod or reverse lever and operated with an air valve similar to the brake valve. By its use no physical effort is required, except to unlatch the lever.

This gear, together with the Allfree cylinders and valves, constitutes a system of great merit. Through the use of the compression controlling valve, from ⅜ in. to ½ in. of the exhaust lap is used on the main valve, making it possible to get much more work out of the steam through increased expansion. The compression controlling valve is timed to release simultaneously with the main valve, a much greater

VALVE-MOTION REPORT

Engine No. 486. Cylinders, 22 in. x 30 in. Diameter drivers ..... Kansas City Southern R. R.
Class 2-8-0. Type of valves, Allfree. Service, Freight.
Type of gear, Allfree: Radial. Exhaust lap, ⅞-in. Admission, Internal.
Steam lap, 1⅛ in. Steam port, 1¼ in. Max. valve travel, 7 in.

Motion		Cut-off position.	Cut-off. Front.	Cut-off. Back.	Pre-admission. Front.	Pre-admission. Back.	Lead Front.	Lead Back.	Port opening Front.	Port opening Back.	Release. Front.	Release. Back.	Closure Front.	Closure Back.
Forward.	Right hand side	Full gear	25¾ in.	25⅞ in.	1/32-in.	-in.	1/16-in.	1/16-in.	Full.	Full.	29½ in.	29½ in.	⅛-in.	⅛-in.
		50 per cent.	15 in.	15¼ in.	1/16-in.	-in.	1/16-in.	3/32-in.	1/32-in.	1/32-in.	27¼ in.	27⅛ in.	3/32-in.	3/32-in.
		33 per cent.	10 in.	10⅛ in.	3/32-in.	1/32-in.	1/16-in.	1/16-in.	1¼-in.	1¼-in.	26¼ in.	26¼ in.	1⅝ in.	1⅝ in.
		25 per cent.	8¾ in.	8¾ in.	1/32-in.	-in.	1/16-in.	1/16-in.	1¾-in.	1¾-in.	25½ in.	25½ in.	2⅜ in.	2⅜ in.
Backward.	Right hand side	Full gear	26⅛ in.	26¼ in.	1/32-in.	1/32-in.	1/16-in.	3/32-in.	Full.	Full.	29½ in.	29½ in.	⅛-in.	⅛-in.
		50 per cent.	15 in.	15 in.	1/32-in.	1/32-in.	1/16-in.	1/16-in.	1/32-in.	1/32-in.	27¼ in.	27¼ in.	3/32-in.	3/32-in.
		33 per cent.	9¾ in.	10 in.	3/32-in.	3/32-in.	1/16-in.	1/16-in.	1¼-in.	1¼-in.	26⅛ in.	26 in.	1⅝ in.	1⅝ in.
		25 per cent.	7⅝ in.	7½ in.	1/32-in.	-in.	1/16-in.	1/16-in.	1¾-in.	1¾-in.	24¾ in.	24¾ in.	2½ in.	2½ in.

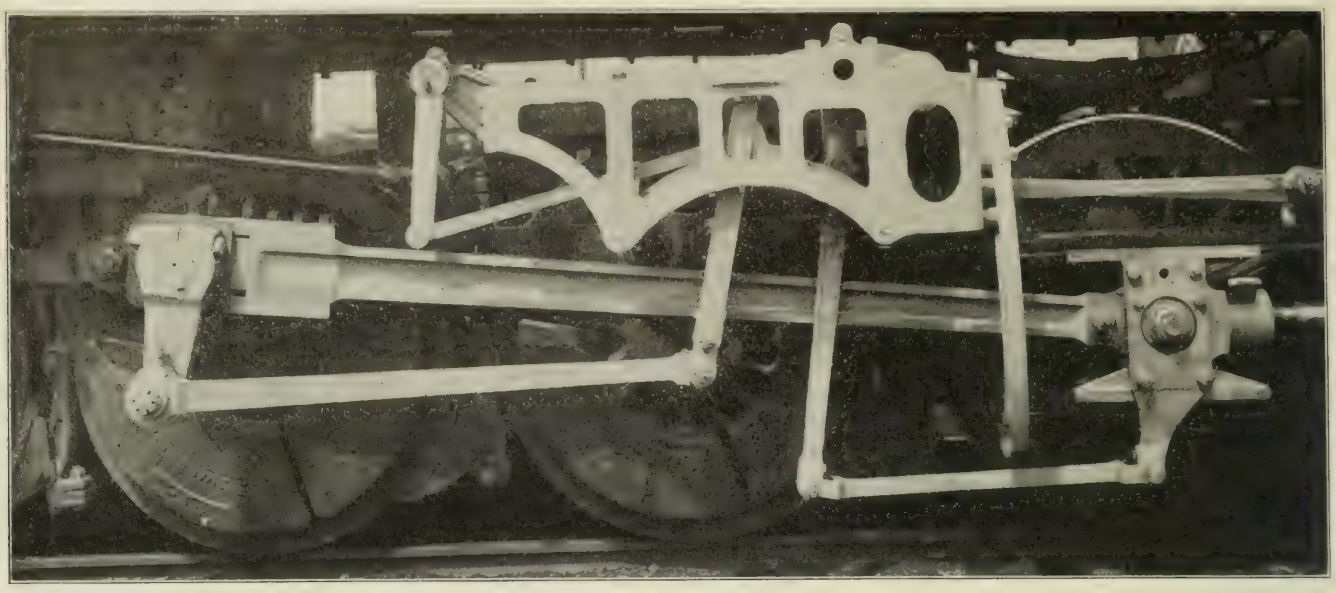


Hobart Allfree Valve Gear on Kansas City Southern Locomotive.

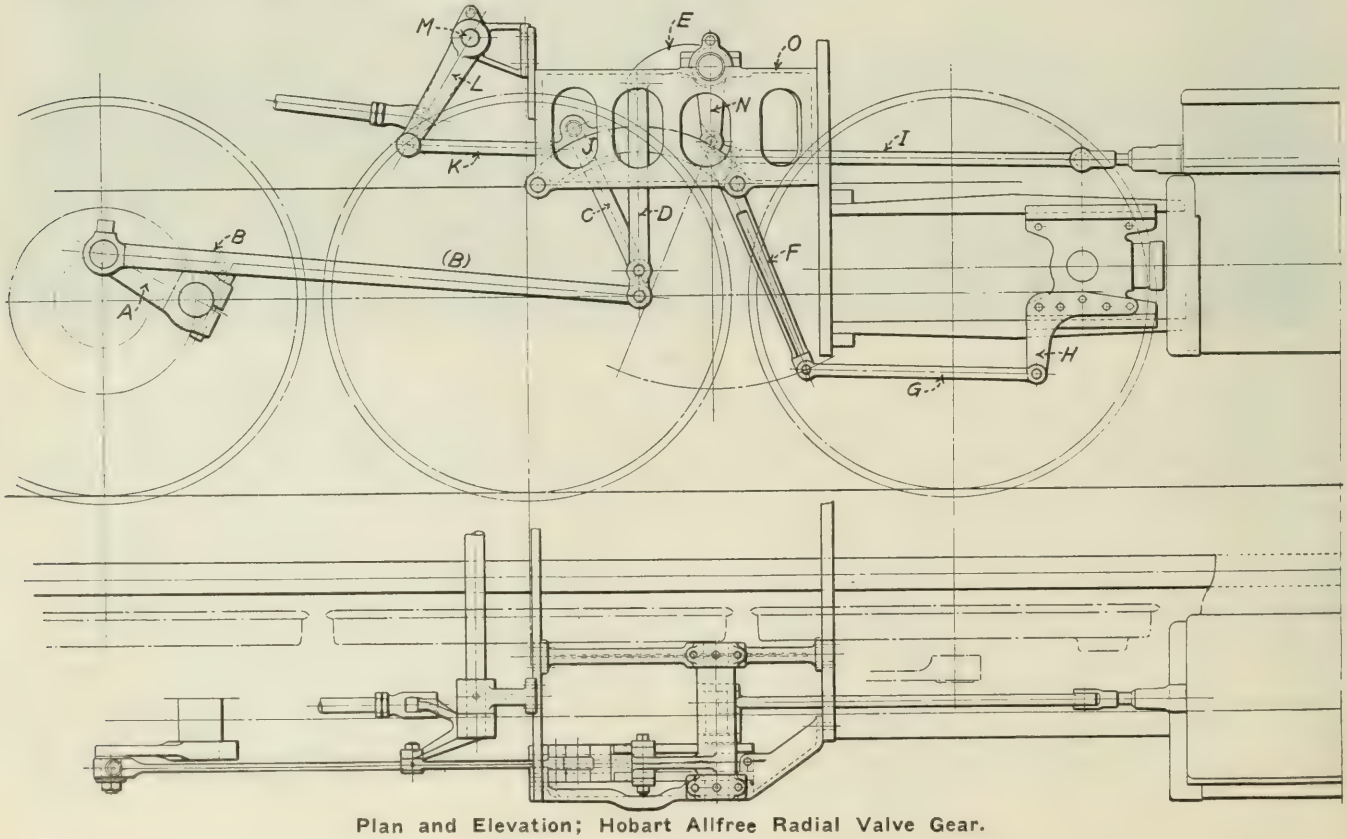
exhaust area is open, and consequently an unusually quick and free exhaust is obtained, justifying a material increase of the exhaust nozzles. Then through the delayed closure a very long turning effort is obtained, materially lowering the slipping tendency, as the pull is long and steady, instead of the short jerky effect due to an early release and early closure. In fact, a result more nearly approaching a continued torque is secured, as is had with the electric locomotive. This principle explains the material increase of tonnage obtained with this valve. The late closure also opens the way to a reduction of cylinder clearance amounting to a difference ordinarily between 10 to 12 per cent., and a standard of 2½ per cent., and yet, notwithstanding the unusually late closure, ample compression is obtained as a result of the low clearance for the necessary cushioning. As a result of these accomplishments we have a stronger, more economical and much faster locomotive.

It has been proven by numerous tests that an engine with this valve will do more and better work with 175 lbs. of steam than a standard engine of the same size and weight will do with 200 lbs., or, in other words, the engine that requires 200 lbs. of steam before conversion will do more and better work with 175 lbs. of steam after conversion, using the same size cylinders. A number of engines whose tonnage rating over a division was 800 tons are hauling, since conversion, 950 tons and making better time than was made with 800 tons before conversion.

While the new gear has been especially designed to operate with special cylinders and valves in order to complete the system for a more perfect steam utilization, it is applicable to any type of cylinder, and will be found more satisfactory not only in steam distribution, but especially in endurance, low cost of maintenance, high speeds and hard work generally.



Hobart Allfree Radial Valve Gear.



Plan and Elevation; Hobart Allfree Radial Valve Gear.

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The insulation of steel passenger cars to prevent them from being too hot in summer and too cold in winter is one of the details connected with steel car construction that has not yet been investigated with the scientific thoroughness and accuracy which its importance deserves. While a number of materials have been found fairly satisfactory so far as heat insulation is concerned, those composed of organic matter are not fireproof, and they defeat in a measure one of the principal advantages of steel construction in passenger equipment. Soft pine wood or poplar has been used in the side walls of steel cars as an insulation, and while it is fairly effective is highly inflammable. But when the inside finish of steel cars is made of oiled and varnished wood, and there is no pretense of making them fireproof, the wooden furring in the side walls should not be regarded as objectionable and it is certainly cheap. The best insulators are usually of organic nature, such as hair felt, wool felt, oakum and flax fibres, but they are not fireproof, though it may be possible to treat organic materials chemically to make them so. Such materials, however, are liable to undergo destructive dissolution or carbonization when heated to temperatures above 212 deg. F., in consequence of which their efficiency as heat insulators is greatly reduced. It would seem, therefore, that the rational course to pursue in the search for the most suitable insulator for fireproof cars would be to develop and improve the inorganic materials into suitable forms, and with composition having high insulating value. Loose wool has about the most insulating value of any of the organic materials, and it is characteristic of these materials that they are better insulators when in a loose state. If we take its value as 8 pounds of water heated 10 deg. F. per hour through 18 sq. ft. and 1 in. thick, the heat being applied at 310 deg. F., the hair felt will heat 10.3 pounds water under the same conditions, its insulating value being in the ratio of 10.3 to 8; loose lamp black, 9.8 pounds; compressed lamp black, 10.6; and loose calcined magnesia, 12.4. When, however, the last named material is compressed its insulating value is reduced more than three times. The figure for slag wool is 13. If it were possible to use a loose material like calcined magnesia, which could be introduced in bulk in the space between the double side walls of the car and in the floor, a very efficient insulation would be obtained; the closer this condition can be secured the more satisfactory will be the results obtained.

Secretary Taylor is to be congratulated upon the excellent condition in which the reports were delivered to members of both associations before the opening of the convention, notwithstanding the fact that many committees were very late in submitting their reports for his handling. President Clark took occasion in his opening address to call attention to the negligence of members in this respect. It is understood that some of the reports, notwithstanding the rules of the associations to the contrary, were not received at the secretary's office until the latter part of May. That they were put through the secretary's mill in time to reach the members at all is entirely due to the energetic action of the secretary.

Some things we have always with us, the iron and loading long material, for example; and the report on the latter subject, though a little confusing unless read with a detailed comparison with the one of a year ago, presented a matter for consideration that could not be slurred, and was not. This is the use of the gondola for superimposed loads. The necessity for such utilization was emphasized in the discussion by the proposal of the committee to limit the height of the center of the load, that is, the center of gravity, to 9 ft. 3 in. With cars running from 108 to 111 in. to the top of the box, it would be pretty difficult to keep the center of gravity down to 112 in. The discussion revolved about the possibility of getting cars during a period of shortage, when steel must lie at the mills or go on top at a height of more than 9 ft. 3 in. Circumstances, therefore, forced the elimination of that section from the report as submitted to letter ballot. With it was the matter of spacing blocks. The use of iron is, of course, to be preferred, provided it is possible to get a material that cannot crush or break, qualities that do not obtain in the ordinary cast iron. This, with the varying openings to be filled, makes the alternative use of wood with angle iron stiffening a necessity. The whole subject is evidently one of those in which mechanical desirability must yield to commercial and operative conditions, things that, in the long run, are usually given consideration in the standards.

The attendance at the meetings is remarkable this year. Thursday morning the room was packed and members were turned away, Both sessions on Wednesday were well attended. It is reported that the officers studied the constitution carefully Wednesday noon to find how many members constituted a quorum, with the idea that there might not be enough present at the second session to enable them to hold a meeting. Much to their surprise, the hall was comfortably filled, and it is not a small room at that. For some reason, possibly because the railways are awakening to the value of the work which is being done by the association, the meetings have been growing larger and larger for the past few years, although the actual membership of the association has increased very litle. The increase in attendance and interest is remarkable compared with the meetings at Saratoga. Few of the younger men attended the conventions at the time; this year there are an exceptionally large number in attendance.

The new specifications for brake beams which the committee has recommended as a standard contain requirements as to maximum load when the beam is tested to destruction, but the conditions under which the beam fails are not clearly defined. A beam may break under the test load and there will then be no doubt as to its failure to meet requirements. It may be slightly distorted so as to deflect ½ in. or 1 in., or it may bend 2 in. under the required load without breaking. What is to guide the inspector in deciding whether the beam has failed when it does not break? Something more should be added to this specification so that there will be no doubt as to whether a brake beam meets the requirements when tested to destruction. Many brake beams are bent sideways and distorted by lateral loads which are much lower than those in the direct line of application of pressure on the shoe, and, as Mr. Curtis suggested, a complete specification for brake beams should include tests of their lateral strength and stiffness as well as those which have been usually required heretofore.

The new specifications for brake shoes contain for the first time requirements relating to the durability of the shoes. The old specifications did not exclude soft cast iron shoes which have a sufficiently high coefficient of friction, but which wear out rapidly; the too highly chilled shoes which wear well but which do not hold as well as the soft iron shoes; and the various insert shoes which have a high coefficient of friction but cut the wheels. The changes in the required coefficient of friction have been slight and the new requirement is important as it will insure some guaranty as to the rate of wear. The Purdue tests and those made at Mahwah by F. W. Sargent have demonstrated the fact that shoes of a proper degree of hardness, and which do not cut either chilled or steel wheels do not wear the wheel to a sufficient degree to warrant wheel wear being made a part of the specification for brake shoes. This having been disposed of, it only remained to formulate requirements relating to shoe wear, and the committee has recommended a definite minimum weight which the shoe shall wear for a given number of foot pounds of work done with separate requirements for cast iron wheels and for steel tired wheels. This is a marked advance over previous brake shoe specifications, and it will serve to clear the field and confine the manufacture to products which, while having a proper coefficient of friction, will not be so soft as to wear out rapidly.

It appears that the comments in Thursday's *Daily* on the discussion on the revision of standards yesterday morning were objectionable to some of the committee on the ground that the subjects are not referred to committees in a "haphazard manner." It is quite possible that the term as used was not exactly appropriate, and certainly it was not intended to intimate that the subjects have been treated in a haphazard manner by the committees having them in charge. In the whole wide range of standards that have been adopted there is not one that does not represent an immense amount of time and labor that have been expended upon it. But in all of this work it is inevitable that some things have been slurred, for even "good Homer sometimes nods." Take, for example, the point alluded to by President Clark, that "it is an injustice to always insist on uniformity where it is not essential to safety." The words were hardly uttered when a report was submitted in which the allowable deflection of a brake beam was given as .0625 in. Objection was immediately raised that this was too close a regulation, for even though it did not mean 1-16 in., it would be easy for an overconscientious inspector to discard a beam that seemed to deflect .063 in. In short, the committee had failed to grasp the full significance of its own language and at once retracted, making the limit of deflection range from .0625 in. desired to .07 in. This was the intent of the criticism, in that the apparent closing in of limits and strict adherence to absolute uniformity conveyed the impression that action, really painstaking, had apparently been of a haphazard character.

In the matter of the report of the committee on the revision of standards, commented on editorially yesterday, the error in the drawing of the fluted roofing was satisfactorily explained by Mr. Kleine. The reason for recommending the fluted roofing as a standard was also explained. It would seem that the members of the association are to be blamed, more or less, for the action which was taken by the committee, inasmuch as only nine of them replied to the circular of inquiry. Of these nine, eight were in favor of recommending the fluted roofing as a standard. Possibly, however, it would have been wiser if the committee had not made mention of it in the report without additional investigation, as the wooden roof is fast becoming obsolete and there is very little need of such a standard as proposed.

SILICON IN STEEL AXLES.

The report of the Committee on Freight Trucks deals principally with the proportions of and weights of standard axles. It contains only brief suggestions relating to the chemical composition of steel for car axles. Future investigation may show that this is of greater importance than is now realized. The stresses in axles are due principally to rapidly repeated bending action combined with action due to shock, and ordinary steel, though possessing much greater strength, higher elastic limit and equal elongation compared with good wrought iron, often fails while iron subjected to the same stresses does not fail. The relation of the percentage of silicon in steel to its resistance to alternating stresses is not generally understood, but laboratory experiments intended to throw some light on the subject have been conducted during the past year, and the indications are that higher percentages of silicon that are now found in axle steel may be beneficial and desirable.

The original specifications for steel axles were prepared from samples of acid process steel having an ultimate strength of 80,000 lbs. Subsequently the basic process replaced the acid, resulting in a steel very low in phosphorus and sulphur and with but a trace of silicon, due to the basic lining and bath in the furnace. This steel was very soft and with carbon up to 0.50 its tensile strength was 55,000 to 60,000 lbs. or about the same as that of boiler steel. The railway chemists and testing engineers did not think it advisable to increase the carbon in this grade of steel on account of the possible effect of the water-cooling of hot journals, and a further study of the problem suggested the use of higher silicon as a stiffener in axle steel. English practice in the metallurgy of steel appeared to favor this suggestion. The plates for torpedo boats, which are required to be light but rigid, and the boiler shell steel for the steamship Mauretania contain a larger content of silicon than is usually found in similar structures. Spring steel is subjected to high stresses and constant vibration, and imported samples of this grade were found to contain silicon as high as 1.25 per cent. This has led to a change in the specifications and the use of higher silicon in spring steel than was formerly the practice by most railways in this country.

Samples of higher silicon axle steel when subjected to revolution tests under alternating loads have shown an endurance equal to 4 or 5 times as many revolutions as the ordinary axle steel. With all these indications pointing in the same direction and in favor of higher silicon it is probable that specifications for axle steel will soon receive some modification, as here suggested, from those which have been in use for nearly 15 years.

FREIGHT CAR WHEELS.

About ten years ago, after the high capacity car had been introduced, the railways found themselves suddenly confronted with a new problem. The bodies and the trucks had grown in strength and size to the new requirements, but the wheel, the burden bearer of the whole, was the same old wheel, with minor modifications, that had been designed and adopted when loads of twenty or twenty-five tons were the maximum. It was found that it was not adapted for a load of 50 tons, and, though the state of affairs was passed over, there was much anxiety because of the frequent failures of the cast-iron wheel. Since then but little has been done to improve that type of wheel, but outsiders have been busy, and the steel wheel has come to the front in its several forms.

The cast-iron wheel had an ample margin of strength for service under the 10 and 20 ton cars, and it is quite evident that the same margin exists in the solid steel wheel, when well made, and put under cars of 50 tons capacity. After the steel wheel had demonstrated its worth, one of the first moves was to safeguard it, and prevent a substitution of the cast wheel for it in repairs by marking up the capacity of the cars under which it was placed to 55 tons, and giving orders that no cast wheels should be placed under such cars, nor should the cars be accepted in interchange unless equipped with steel wheels.

Now comes the next step. The bodies of these old 50-ton cars were of ample strength to carry a heavier load; the steel wheel had the same capacity, so by using a stronger truck, car capacities can be sent ahead another notch. This is being done, and the 70-ton car will soon be in service. The steel wheel has made this possible. It is doubtful if the most enthusiastic advocate of the cast wheel would recommend its use under such conditions. Meanwhile the steel wheel is growing cheaper, and is becoming so common in every day practice that we may look to see it encroaching upon the old domain of its predecessor, the low capacity car, unless some improvement is made.

To maintain that the cast-iron wheel, as marketed, is the very best that can be made is absurd. There is no doubt that it can be improved, and greatly improved over its present condition, but strange to say it is very difficult to obtain data as to just what is being done. Nickel has been added to the metal in small quantities, and the strength has been increased. Wheels made by this process have been in service for a little more than a year, and are giving a good account of themselves, but whether the railways will consider its 50 per cent increase of strength over the ordinary cast-iron wheel a sufficient warrant for its use in high capacity cars, remains to be seen.

Then, there are rumors of the use of titanium, by which the metal will be so cleaned that its strength will be increased, and it will be made suitable for heavy work. Information regarding the results thus far obtained are too meagre to warrant an opinion, other than that a trial along these lines seems worth while.

The Master Car Builders' Association is doing nothing in the matter, and any improvement is evidently expected to come from the makers. The railways know now that a wheel is available at a not too excessive cost that will more than meet their requirements, and that they can relieve themselves from anxiety by using it. With this position of serenity assured, there is no reason why they should worry over the wheel question except in the matter of price. So it is more than ever up to the cast iron wheel makers to bestir themselves and produce the wheel that everyone thinks can be produced, namely, a better one than that now made, if they are to hold the market that was theirs without dispute for so many years.

SUPPLY MEN'S DISTRICT MEETINGS.

District meetings of the Railway Supply Manufacturers' Association for the election of members of the executive committee will be held in the Convention Hall on Friday, June 17. New members will be elected to succeed A. L. Whipple and Thomas Aldcorn, of New York; W. H. Miner, of Chicago, and S. P. Bush, of Columbus, Ohio. The meeting for the second district will be at 3 p. m., for the fourth district at 3.30 p. m., and for the fifth district at 4 p. m.

UNIVERSITY OF ILLINOIS MEN—NOTICE.

All University of Illinois men in attendance at the convention are requested to get together at a dinner to be arranged for Saturday evening, June 18.

Be sure to register your name and address at the booth of the Dearborn Drug and Chemical Company, number 8, immediately to the left as you enter the pier. Register this morning as you go in.

TO-DAY'S PROGRAM.

M. C. B. ASSOCIATION.

Morning Session.

Discussion of Reports on:

Consolidation of Master Car Builders' and Master Mechanics' Associations	10:00 A. M. to 10:30 A. M.
Classes of Cars	10:30 A. M. to 11:00 A. M.
Salt-water Drippings from Refrigerator Cars	11:00 A. M. to 11:15 A. M.
Mounting Pressures on Wheels and Axles	11:15 A. M. to 11:45 A. M.
Individual paper on "Design of Axle to Carry 50,000 Pounds," by E. D. Nelson, Engr. Tests, Pennsylvania Railroad	11:45 A. M. to 12:00 M.
Springs for Freight Car Trucks	12:00 M. to 12:30 P. M.

Adjournment.

Afternoon Session.

Discussion of Reports on:

Train Lighting and Equipment	2:00 P. M. to 2:30 P. M.
Lumber Specifications	2:30 P. M. to 3:00 P. M.
Unfinished business; Reports of Committees on Correspondence, Resolutions, and such other committees as may be named during the convention	3:00 P. M. to 3:15 P. M.
Election of Officers	3:15 P. M. to 4:00 P. M.

Adjournment.

ENTERTAINMENTS.

10:30 A. M.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3 P. M.—Adept mistic. Miss Eva Fay, in her wonderful work of thaumaturgy, occult demonstrations. Miss Vera Berliner, violinist. West Solarium, Marlborough-Blenheim Hotel.

9 P. M.—Military Euchre, Entrance Hall, Million Dollar Pier.

LOST.

Lost—A small pocket-book containing a $5-bill and belonging to Miss Ramona Hubbard. Finder will please leave with E. T. Sawyer at the booth of the Commercial Acetylene Company, or at the office of the *Daily Railway Age Gazette.*

MEN WANTED!

Military Euchre Tonight—Every lady at the convention is looking for a partner to invite her to play military euchre tonight.

ANNUAL MEETING, SUPPLY ASSOCIATION.

The annual meeting of the Railway Supply Men's Association will be held in Convention Hall, on the Million Dollar Steel Pier, Saturday morning at 11 o'clock sharp. A large attendance of supply men is desired, as important business will be presented to the meeting.

M. C. B. REGISTRATION.

The following are additions to the lists published in the *Daily* on June 15 and 16:

Acker, Charles L., M. M., Toledo Terminal R. R., Brunswick Hotel.
Bartlett, Henry, G. S. M. P., Boston & Maine R. R. Co., Brighton Hotel.
Cade, J. R., M. C. B., G. H. & H. Ry. Co., Traymore Hotel.
Craig, Andrew, Gen. Foreman, B. & M. R. R., Room G, Young's Hotel.
Deibert, Jno. H., F. C. R., Lehigh Valley R. R., Boswell Hotel.
Dillon, S. J., M. M., Penn. R. R., Pennhurst Hotel.
Dunham, W. E., S. M. P. & M., C. & N. W. Ry., Haddon Hall.
Fritts, J. C., G. F., Del., Lack. & Western R. R., Traymore Hotel.
Geesey, Roy W., Foreman Car Insp., Penn. R. R.
Gray, B. H., S. M. P., Mobile, Jackson & Kansas City R. R., St. Charles Hotel.
Harris, J. D., G. S. M. P., B. & O. R. R., Brighton Hotel.
Joughins, G. R., S. M. P., Intercolonial Ry., Chalfonte Hotel.
Keagy, Chas. O., Gen. For., Penn. R. R. Co., Chalfonte Hotel.
Kipp, A., G. C. I., N. Y., O. & W. Ry., Chalfonte Hotel.
McIlvaine, C. L., Asst. Engr. M. P., Pennsylvania R. R., Chalfonte Hotel.
Marden, J. W., S. C. D., Boston & Maine R. R., Brighton Hotel.
Plow, A., Mech. Insp., Canadian Pac. Ry., Rudolf Hotel. Hotel.
Rae, C. H., G. M. M., Louisville & Nashville R. R.
Rasbridge, R. B., C. C. I., P. & R. Ry., Dennis Hotel.
Ryan, J. J., S. M. P., Southern Pacific Ry., Traymore Hotel.
Sage, R. V., Cambria Steel Co., Brighton Hotel.
Shone, Wm., G. F., N. Y. C. & H. R. R., 9 Indiana Ave.
Singer, J. W., M. C. B., L. S. & M. S. Ry., Arlington Hotel.
Smith, Benjamin T., Gen. Foreman, W. J. & S. S. R. R., 148 Maryland Ave.
Whitcher, R. P., Gen. For. Car Dept., B. & M. Ry., Monticello Hotel.
Yergy, J. P., Ins. Pas. Equip., Penna. R. R. Co., Philadelphia Hotel.

M. C. B. GUESTS.

The following are in addition to lists published in the *Daily* on June 15 and 16:

Armstrong, Fred B., Foreman, P. R. R.
Banker, L. W., Foreman, P. R. R.
Haynes, Bradley S., Jackson Hotel.
Beaumont, C., Chief Clerk, B. & O., Young's Hotel.
Beswick, K. H., Foreman, Penna. R. R.
Bodell, Thos., Rd. For. Eng., P. R. R., Worthington Hotel.
Boyer, W. P., Asst. Foreman, P. R. R., Biscayne Hotel.
Bond, W. S., Asst. For., P. R. R., New Elberon Hotel.
Boydston, Frank T., Chalfonte Hotel.
Brogan, J. P., Gen. For., D. L. & W., Traymore Hotel.
Brown, B. S., Draftsman, P. R. R.
Buchbaum, F. J., Engine House Foreman, P. R. R.
Bunnell, F. O., Engr. Tests, Rock Island-Frisco Lines, Marlborough-Blenheim Hotel.
Burkhard, A. A., A. G. For., N. Y. C. & H. R.
Burkheimer, H. W., M. M., N. O. G. N., Shelburne Hotel.
Burkheimer, H. W., S. M. P., N. O. G. N., Shelburne Hotel.
Burton, Geo., Jr., For., P. R. R.
Casey, J. T., For. Ptr., P. R. R.
Carmichael, E., Gen'l Foreman, P. R. R.
Clement, S. L., For. Pass. Eq., C. R. R. of N. J.
Cook, C. A., M. Ptr., P. R. R., Dennis Hotel.
Davis, A. G., Traffic Mgr., Cleveland Provision Co., Runnymede Hotel.
Diebert, Wm., Boswell Hotel.
Drawbaugh, E. L., Ch. Car Ins., Cum. Valley, Chalfonte Hotel.
Dress, G. M., Chalfonte Hotel.
Elliott, Edward O., Ch. Draughtsman, P. & R.
Endsley, Louis E, Asst. Pro., Purdue University, Chalfonte Hotel.
Evens, R. C., Pennhurst Hotel.
Fornalt, F. E., Foreman Painter, P. R. R., De Ville Hotel.
Fosnot, G. N., Ch. Cl. M. M., Cum. Valley, Chelsea Hotel.
French, E. L., Air Brake Foreman, P. R. R.
Frost, Harry, Engine House Foreman, P. R. R.
Gardner, G. C., Gen. For. Mot. Power, P. R. R., Marlborough-Blenheim Hotel.
Gardner, J. T., Vandalia, Shelburne Hotel.
Gearhart, J. F., M. Ptr., Penna. R. R., Dunlop Hotel.
Hardy, C. R., M. P. Insp., P. R. R.
Haughey, J. B., Shop Foreman, P. R. R., Biscayne Hotel.
Haynes, I. W., Car Agt., Cornwall & Lebanon, Jackson Hotel.
Jeffery, C. A., Secy. to G. S. M. P., B. & O., Brighton Hotel.
Josias, H., Pur. Agt., Cuba R. R., Brighton Hotel.
Kane, H., Gang Foreman Erecting Shop, B. & O., Monticello Hotel.
Kavanagh, W. J., Asst. Foreman, B. & O., Monticello Hotel.
Kerrigan, Frank, Ch. Cl., G. F. C. S., P. R. R.
Kerrigan, F., Jr.
Kimberly, P. R., Dennis Hotel.
Kincaid, B. M., Inspector Test Dept., P. R. R., Malatesta Hotel.
Kirby, H., Pipe Shop Foreman, B. & O., Mt. Clare Hotel.
Le Compte, J. V., Asst. Foreman Mach. Shop, B. & O., Whittle Hotel.
Longacre, Chas. J., Asst. Foreman, P. R. R.
McCaleb, W. B., Supt., P. R. R., Dennis Hotel.
McCracken, I., Car Foreman, P. R. R.
Machen, John, Asst. Foreman, B. & O., Monticello Hotel.
Mallan, T. L., Foreman Boiler Shops, P. R. R.
Malloy, M. A., M. M., W. J. & S. S., Monticello Hotel.
Markland, W. H., Gen. Shop Inspector, P. R. R., Dunlop Hotel.
Marsh, F. E., Asst. M. M., P. R. R.
Monahan, J. J., M. M., L. & N. R. R., Monticello Hotel.
Neubauer, J. G., Asst. Mgr., Union Tank Line, Young's Hotel.
Overby, C. C., Erecting Shop Gang Foreman, B. & O., Monticello Hotel.
Parks, J. W., Chief Clerk M. P. Dept., Vandalia, Dennis Hotel.
Porter, Chas. E., For. Frt. Shop, P. R. R., New Elwood Hotel.
Pouliette, Paul, Chalfonte Hotel.
Powers, R. C., Foreman Machine Shop, B. & O., Whittle Hotel.
Ramage, J. C., Supt. Tests, Southern R. R., Chalfonte Hotel.
Reisinger, W. H., Jr., Genl. Foreman Car Inspectors, P. R. R., Biscayne Hotel.
Replogle, J. L., Asst. to Pres., Cambria Steel Co., Brighton Hotel.
Roce, F. C., Asst. P. A., J. G. White & Co., Shelburne Hotel.
Ryer, F. A, Asst. P. A., N. Y. C. & H. R. R. R., Shelburne Hotel.
Searles, E. J., Asst. to Genl. S. M. P., B. & O., Shelburne Hotel.
Scatchard, H., Gen. Storekeeper, N. & W., Traymore Hotel.
Scheck, H. G., Road For. Engines, P. R. R., Monticello Hotel.
Shaffer, N. L., For. Ptr., No. Cen. R. R., Dunlop Hotel.
Steele, Frank M., M. M., N. Y. C. Lines, Monticello Hotel.
Stout, H. D., G. S. K., P. R. R., Elwood Hotel.
Stout, Master Albert W., P. R. R., Elwood Hotel.
Stout, Master Henry D., Jr., P. R. R., Elwood Hotel.
Strattan, G. E., Gen. For., P. R. R., Chalfonte Hotel.
Sweeley, E. H., Gen. For. Lo. Eq., Long Island, Windsor Hotel.
Toomey, T. H., Foreman Erecting Shop, P. R. R.
Van Daren, G. L., Supt. Shops, C. of J.
Warthen, J. O., M. M., D. & W., Westminster Hotel.
Wallace, J. E., Warwick Hotel.
Wetteran, J., For. Car Insp., P. & R., N. Florida Ave.
White, George DeWitte, Gen. Storekeeper, N. Y. Di. P. & R., Marlborough-Blenheim Hotel.
Woodruff, F. E., Ins. Train & Sta. Service, N. Y. Cen. Line, Windsor Hotel.

Convention attendants who during their visits to Atlantic City become accustomed to late hours, and who occasionally go to New York, may be interested to know that about Christmas the Pennsylvania Railroad will open on Times Square, New York City, a ticket office which will be kept open for 24 hours in each day. The vicinity named is the heart of the "Great White Way" district, and there is now no ticket office in the neighborhood.

Proceedings.

President Clark called the third session of the Master Car Builders' Association to order at 10:15 A. M.

The president: The next business in order will be the reception and discussion of the report of the Arbitration Committee, on the decisions rendered by the committee and the report on the Revision of Rules of Interchange.

(Vice-President Curtis in the chair.)

The chairman: The secretary will read the report of the arbitration committee and the amendments made to the report at the committee meeting held yesterday.

REVISION OF RULES OF INTERCHANGE.

Last year the committee was instructed to submit a rearrangement of the rules that would bring the related parts closer together. This has been done, and the recommendation of the committee is shown in the Appendix to this report. The suggestions as to revision of the Rules of Interchange are as follows:

Preface.—(a), that the third paragraph of the Preface be changed to read: "Inspection of freight cars for interchange and method of loading will be in accordance with this Code of Rules and the Rules for Loading Materials issued by this Association;"

(b), that Rule 2 be changed as follows: "Cars offered in interchange must be accepted if in safe and serviceable condition, the receiving road to be the judge in cases not provided for in Rules 3 to 56, inclusive, and if loaded, when loaded in accordance with the Rules for Loading Materials;"



J. J. Hennessey.

Chairman, Committee on Arbitration.

(c), the addition of a new rule: "Improperly loaded or overloaded cars—delivering company responsible." This rule is similar to provision (b), of Rule 15, of the American Railway Association.

Rule 3.—Add "Facing the 'B' end of car, the journal boxes in their order on the right side of car shall be known as R1, R2, R3 and R4, and similarly those on the left side of car shall be known as L1, L2, L3 and L4."

Rule 4.—Change to read: "Defect cards shall not be required for defects for which owners are responsible, except for missing material on cars offered in interchange, as provided for in Rules 27, 32, 35 and 42, or in cases of defective air-brake parts, as specified in the latter part of Rule 30. Defect cards shall not be required of the delivering road for improper repairs that were not made by it, with the exception of the cases provided for in Rules 29, 33, 43, 44 and 45."

Rule 5.—Change to "If a car has defects for which the owners are not responsible, but do not render it unsafe to run, nor unsafe to trainmen, nor to any lading suitable to the car, the receiving road must require that a defect card be securely attached to the car, as per Rule 3."

Rule 6.—Substitute the following: "Duplicate defect cards must be furnished promptly on request for lost or illegible cards."

Rule 7.—Change to read: "Shelled out: Wheels with defective treads on account of cracks or shelling out spots 2½ in. or over, or so numerous as to endanger the safety of the wheel."

Rule 9.—Change as follows: "Worn through chill: When the worn spot is 2½ in. or over in length. Care must be taken to distinguish this defect from flat spots caused by sliding wheels."

Rule 10.—Change to read: "Worn flange, cast-iron or cast-steel wheel: Wheels under cars of less than 80,000 pounds capacity, with flanges having flat vertical surfaces extending 1 in. or more from tread, or flanges 15-16 in. thick or less, gauged at a point ⅜ in. above tread. Whels under cars of 80,000 pounds capacity or over, with flanges having flat vertical surfaces extending ⅞ in. or more from tread, or flanges 1 in. thick or less, gauged at a point ⅜ in. above tread. (See Figs. 4 and 4a).

"Worn flanges: Forged steel or steel-tired wheels: Flanges having flat vertical surfaces extending 1 in. or more from tread, or flanges 15-16 in. thick or less. (See Figs. 4 and 4a.)" The committee suggests that the reference to Figs. 4 and 4a be changed as per proposed revision of Rule 21.

Rule 11.—Change last line of this rule to read, "standards of 1907 and 1909." The committee suggests that the reference to Fig. 2 be changed as per proposed revision of Rule 21.

Rule 17.—Reference to Figs. 6 and 6a be changed as per proposed revision of Rule 21.

Rule 19.—Change to read: "Flat sliding—cast-iron wheels: if the spot caused by sliding is 2½ in. or over in length. (Care should be taken to distinguish this defect from worn through chill.)

"Flat sliding—steel or steel-tired wheels; if the spot caused by sliding is 2½ in. or over in length. A defect card shall be furnished for the labor of turning. The delivering company shall also furnish a defect card at the time, to be forwarded to the car owner, covering loss of service metal."

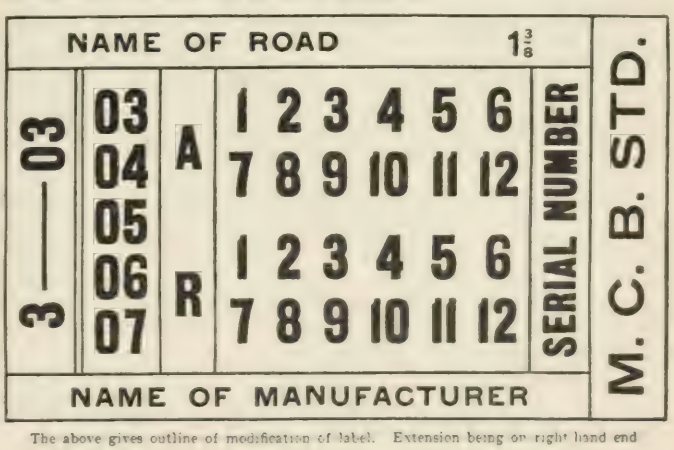
Rule 20.—Change note under Fig. 4 to read: "For cast wheels under cars of less than 80,000 pounds capacity and all forged steel or steel-tired wheels with flanges 15-16 in. thick or less; cast wheels under cars of 80,000 pounds capacity or over, with flanges 1 in. thick or less."

Also change note under Fig. 4a to read: "For cast wheels under cars of less than 80,000 pounds capacity, and all forged steel or steel-tired wheels, 1 in. or more from tread; for cast wheels under care of 80,000 pounds capacity or over, ⅞ in. or more from tread."

Also, the dimensions 4 ft. 5 3-32 in., on Fig. 6a, be changed to 4 ft. 5 5-32 in. due to not mounting more than one wheel with maximum flange thickness on same axle, in accordance with Rule 66.

Rule 21.—The committee recommends a complete revision of this rule, in order to bring the various illustrations referred to closer together and in their regular order, as follows: The determination of flat spots, worn flanges and chipped treads shall be made by a gauge, as shown in Fig. 1, and its application to defective wheels, as shown in Figs. 2, 3, 4 and 5 (old Figs. 3, 4, 4a and 5 and accompanying notations). The determination of thick flanges for all wheels cast prior to the M. C. B. Standard tread and flange adopted in 1907 shall be made by a gauge shown in Fig. 6 (old Fig. 2), and for all wheels cast after January 1, 1908, shall be made by a gauge shown in Fig. 7 (old Fig. 2a).

Rule 22.—Recommends that subheading preceding Rule 25, reading, "Parts of trucks which justify repairs," etc., be changed to read, "Parts of cars which justify repairs if owners are responsible, or repairs or carding if delivering company is responsible," and that it be made the principal head, and the word "Trucks" be made a subhead.



The above gives outline of modification of label. Extension being on right hand end

Rule 32.—Change to read: "If the car has air signal or train-line steam pipes, the hose, pipes and couplings are at owner's risk unless the car is stenciled that it is so equipped."

Rule 33.—Change to "Cars equipped with air-brake hose other than M. C. B. Standard 1⅜ in. and labeled, as shown by cut on preceding page.

"NOTE.—Cars will be accepted in interchange with 1¼-in. M. C. B. standard hose and so labeled, if date is cut out showing application prior to September 1, 1909, or if date is not cut out and the label shows date of manufacture prior to September 1, 1909."

Rule 35.—Omit the sentence reading, "Also pressure retaining valves and pipe when damage to car denotes rough usage," as they are already included in the first part of the rule.

Rule 37.—Change to read: "All freight cars offered in interchange must be equipped with air brakes. All cars built after September 1, 1910, must be equipped with M. C. B. Standard 1¼-in. train line and angle cocks," and that delivering company be made responsible.

The committee recommends that the subheading preceding Rule 38, reading "Parts of bodies which justify repairs," etc., be eliminated, inasmuch as the heading preceding Rule 25 has been modified to cover all parts of cars.

Rule 38.—Change first part of rule to read: "Locks, side doors, end doors, roof doors, grain doors, water troughs and attachments and all inside or concealed parts of cars missing or damaged under fair usage," etc.

Add paragraph as follows: "Steel cars offered in interchange not equipped with card boards for repair and defect cards (owners responsible)."

Rule 40.—Change to read: "Running boards in bad order or insecurely fastened. Sill steps, ladders, grabirons bent, broken, missing or insecurely fastened, except when car has been wrecked or sheathing raked. Handholds or grabirons must be of wrought iron or steel and secured by bolts, rivets or lag screws."

Rule 42.—And water troughs and attachments to the exceptions under this rule.

The Central Railway Club suggests adding, "or any car having tandem attachment found with pocket or single spring."

Neither of these suggestions meets with the approval of your committee.

Rule 47.—Add after "29" in line four, the figures "33," because wrong air-brake hose has been made a delivering company defect. Eliminate the words, "and also in case it should be necessary to replace stem or spindle with pocket attachment," and include in Rule 61.

Rule 49.—Change to read: "Damage to coupler body accompanied by damage to draft timber or its substitute or end sill."

Rule 53.—Committee recommends that the combined front and back coupler stop be cut out of this rule.

Rule 56.—Change to read: "Damaged corner and end posts if necessitating the renewal of, or repairs to, more than two posts."

The committee recommends the appointment of a special committee to propose at the 1911 convention a schedule of prices for labor and material covering repairs to steel cars; also to recommend a combination of damages to steel cars which denote unfair usage.

The recommendations of the Pittsburgh Railway Club suggesting the omission of the first note under this rule, also the omission of the last note relating to front and back coupler stops, are approved.

Rule 58.—Omit the words "and stubs" in fifteenth line.

The committee recommends the consolidation of Rules 58 and 59, inasmuch as both refer to the manner in which repairs shall be made to foreign cars, as follows: "Repairs to foreign cars shall be promptly made, and the work shall conform in detail to the original construction, and with the quality of material originally used, except as provided for in Rules 59 and 62."

Rule 59 (new).—"In repairing foreign cars, M. C. B. standards may be used when of dimensions that do not impair the strength of the cars, in lieu of the parts forming its original construction.

"When using materials for repairs to foreign cars for which the Master Car Builders' Association has adopted specifications as a standard, the materials must comply with the requirements of these specifications.

"Malleable iron, M. C. B. standards, may be substituted for gray iron, M. C. B. standards, but the net cost to car owner in such cases must be no greater than if the original kind and weight of material had been applied. Gray iron, M. C. B. standards, may be substituted for malleable, M. C. B. standards, but in such cases the debits and credits must be for what is actually applied and removed. Repair cards must state kind of material applied and removed.

"When necessary to renew brake beams, any metal brake beam meeting M. C. B. specifications may be used, provided that the beam applied is as strong as the beam standard to the car and does not require any change in hangers or other details.

"Cast-iron brake shoes may be replaced with reinforced brake shoes in repairs to foreign cars.

"White pine, yellow pine, fir or cypress may be used when repairing siding on foreign cars when of equal grade and quality to the material standard to the car."

Rule 61.—The committee recommends a rearrangement of this rule, to cover the change of couplers as referred to in Rules 47, 61 and 62, as follows:

"Couplers of the vertical plane type other than M. C. B. standard, when replaced with M. C. B. standard, the expense of alteration thus necessitated shall be chargeable to car owners.

"Couplers with stem attachments may be replaced with pocket attachment.

"Couplers that exceed the distance of 5⅛ in. between point of knuckle and guard arm, measured perpendicularly to guard arm, must be repaired, in which case owners are responsible, except on cars offered in interchange. (See drawing.)

"When M. C. B. couplers of another make are applied to a car, the uncoupling arrangement shall be made operative at the expense of the company making the repairs."

Rule 62.—The committee, having transferred first sentence of this rule to Rule 61, would suggest a rearrangement of the last sentence, as follows: "In making repairs to foreign cars, the following materials shall not be used: Malleable iron couplers, open knuckles, malleable or steel backed filled journal bearings."

Rule 63.—Rearrange to bring the different items referred to together, as follows:

"The following information must be specified on the repair cards:

"M. C. B. couplers or parts of same applied, whether new or second-hand.

"Couplers applied and removed, the make and kind of material; also size of shank and butt.

"Knuckles applied and removed, whether open or closed.

"Wheels and axles applied, whether new or secondhand.

"Metal brake beams applied, whether new or secondhand.

"Journal bearings applied and removed, whether solid, filled or other kind; also length of bearings.

"Kind of brake shoes applied.

"If necessary to remove load to make repairs, as specified in Rule 114, it must be plainly stated."

Rule 64.—Add: "When bill is to be rendered, the height of car before and after altering must be shown on repair card."

Rule 65.—Mention should be made that sills must not be spliced between cross ties.

Rule 66.—The word "new" be cut out of first line of second paragraph.

Rule 70.—The last line of this rule be changed, to include the capacity, maximum weight or limit weight of the car.

Rule 71.—Insert the figures "1⅜."

Rule 72.—Rearrange rule, as follows: "If light weight of a car is obliterated or if found to vary more than 500 pounds from stenciled weight, the car should be reweighed and restenciled at owner's expense, and owner notified of old and new weights. Car must be cleaned before reweighing."

Rule 73.—Rearrange rule as follows: "Cars undergoing extraordinary repairs, such as sills, resheathing, roofing, etc., must be reweighed and stenciled by the company having the car in its possesion. If the repairs are chargeable, the expense of reweighing and restenciling may be included in the bill, as per Rule 106."

Rule 75.—Change rule to read: "When two or more cars chained together with switch chains and couplers blocked out with metal spacing blocks are delivered at an interchange point, the receiving road shall deliver to the delivering road at the time, an equivalent number of switch chains and metal spacing blocks of the same size as the chains and blocks used on the cars delivered, or in lieu thereof furnish a defect card for such chains and metal spacing blocks."

The committee recommends a new rule, following Rule 75, covering the use of defect and repair cards and their location on car, as follows:

"The end of car toward which the cylinder push rod travels shall be known as the B end, and the opposite end shall be known as A end.

"Facing the B end of car in their order on the right side of car, the journal boxes or their contained parts shall be

known as R1, R2, R3 and R4, and similarly those on the left side of car shall be known as L1, L2, L3 and L4.

"Defect and repair cards must be securely attached to the car with four tacks, preferably on the outside face of intermediate sill between cross-tie timbers on wooden cars, and on steel cars to cardboard located either on cross-tie under car or on inside of side sill at the end of car.

"Duplicate defect or repair cards must be furnished promptly on request for lost or illegible cards."

Rule 76.—Revise as follows: "When repairs of any kind are made to foreign cars, a repair card must be securely attached to car, as per rule (new rule following Rule 75). This card must specify fully the repairs made and reason for same, the date and place where made and name of road making repairs; also show location of parts repaired or renewed (as per new rule following No. 75).

"If no bill is to be rendered, the billing repair card must be attached to the monthly bill, with the words 'no bill' written across the face of the card. In case no bill is to be rendered, the words 'no bill' shall be written across the face of repair card."

Rule 77.—Change to read: "The Repair Card shall be 3½ by 8 in., made in triplicate, to be known as 'Repair Card,' 'Billing Repair Card' and 'Record Repair Card.' The Repair Card to be tacked on car shall be of cardboard, printed on both sides in black ink, and shall be filled in on both sides, one side of which must be filled in with ink or black indelible pencil, and items of repairs made and why made shall be filled in on both sides in writing. The items of repairs must be in writing. The Billing Repair Card shall be printed on one side and show the same information as the Repair Card, and shall be attached to the bill as authority for charge. The Record Repair Card shall be retained by the party making repairs."

Rule 78.—Change to read: "Any road making partial repairs of defects on a car which are covered by defect cards will have the defects repaired crossed off the original card with ink or indelible pencil and card replaced on car. A copy of the card accompanying the bill, with the defects which were not repaired crossed off, will be sufficient authority to bill."

Rule 79.—Combine with new rule following Rule 75.

Rule 80.—Add in next to last line the word "billing" before word "repair" and omit word "stub."

In accordance with the suggestion of the Association of American Railway Accounting Officers, as referred to under Rule 98, it is recommended that the following be added as a note to this rule:

"NOTE.—The following rule of the Association of American Railway Accounting Officers should be observed when rendering or correcting bills:

"Bills shall not be rendered for amounts less than 25 cents in aggregate, but charges for items less than 25 cents may be held until they amount to that sum, provided said aggregate is rendered within sixty days. No bill shall be returned for correction on account of error for less than 100 cents in aggregate of bill, but said bill shall be passed for payment at once, and the alleged error brought to the attention of the road rendering the same within sixty days from date of bill. The receiving road shall at once issue a letter of authority for counterbill to cover the acknowledged error, said letter to be attached to the bill as authority. No bills shall be returned for correction on account of wrong car numbers, but road rendering bill should be communicated with by letter, and if, after investigation, it is found to be a fact that wrong car number has been given, correct number shall be furnished or credit covering amount of charge allowed on next month's bill. When necessary to return bills for correction, all defect cards and billing repair cards should be detached, except those covering repairs to cars, the charge for which there may be some question as to its correctness."

Rule 81.—Omit the word "stub" in second line and substitute the words "billing repair card."

Rule 85.—Eliminate the next to last sentence, referring to A and B ends of car, as it is already included under new rule following Rule 75.

Rule 87.—Revise to read: "Bills may be made against car owner for the labor only of replacing the following material, when lost on the line of the company making the repairs, viz.: Brake beams, including shoes, heads, jaws, key bolts, brake pins and hangers, when lost with beam. Brake levers, lever guides, top and bottom brake rods, whether or not they are lost with the brake beam. Couplers, including yokes, springs and followers, when lost with coupler."

Rule 88.—That the form of statement of repairs made, shown on page 44, be changed as per the following form:

Rule 91.—Add the words "or statements" after the first word, making rule read: "Bills or statements for wheel and axle work must make specific mention of each axle and wheel removed or applied."

Rule 92.—Add the words "or statements" after first word, making rule read: "Bills or statements which do not embody all the information called for by the headings," etc.

Rule 94.—Insert the figures "1⅜ in. in the reference to air-brake hose.

STATEMENT OF REPAIRS MADE TO_____CARS, PER M. C. B. RULES.

BY_____RAILWAY CO.

DURING_____19____

Repairs Made		CAR		DESCRIPTION OF PARTS REPAIRED	Value of Miscellaneous Material		IRON			Chain	Lumber	Springs	Labor	CREDIT FOR SCRAP			
							Cast	Wrot	Mall					Cast	Wrot and Steel	Mall	Steel Springs and Chains
Date	Place	Initials	Number				Lbs	Lbs.	Lbs	Lbs.	Feet	Lbs.	Hours	Lbs	Lbs.	Lbs	Lbs.
				QUANTITY,													
				PRICE,													
				VALUE,													
													Total,				
													Credit for Scrap,				
													Net Charge,				

Journal bearings; weights to be charged and credited as follows:

	Charge (lbs.)	Credit (lbs.)
7 in. and over, but not 8 in. long....	10	6
8 in. and over, but not 9 in. long....	13	8
9 in. and over, but not 10 in. long....	20	12
10 in. and over	25	15

The items referred to in Rule 105, viz.: Altering height of car and putting on handholds, be incorporated under Rule 94, as follows:

Altering height of one end of one car, net, including labor	$1.25
Putting on one handhold or grab iron, net, including labor	.25

Rule 97.—Omit the word "above" and substitute the words "in Rule 94."

Rule 98.—Under the heading of "instructions for Billing," the following be embodied as a note to Rule 80, and that the present Rule 98 be eliminated: "The following rules of the

Association of American Railway Accounting Officers should be observed when rendering or correcting bills:"

Add the word "billing" in second line, and add letter "s" and omit words "and stubs" in same line.

Rule 101.—Eliminate, inasmuch as this provision is covered in Rules 94 and 107.

Rule 102.—Change the last sentence to provide that the credit for brake beam parts released from service in good condition must be fifty per cent of the prices when new.

Rule 103.—Omit the words, "the above list," and the substitution of the words, "Rules 89 and 94."

Rule 105.—Eliminate this rule and incorporate the prices for altering height of car and putting on handholds in Rule 94.

Rule 106.—The committee approves the suggestion that the note following draft timber bolts be inserted between center plate and column bolts, on page 54; the recommendation regarding center sills, as follows:

"1 center sill, spliced, per end, ordinary car, 16 hours; refrigerator car, 20 hours.

"2 center sills, spliced, same end, ordinary cars, 22 hours; refrigerator cars, 26 hours."

The recommendation regarding nuts, modified as follows, is approved:

"Nuts only, ⅞ in. and under, replacing four or less, ¼ hour.....$0.06
Nuts only, 1 in. to 1⅛ in., inclusive, replacing one or two, ¼ hour..... .06
Nuts only, 1¼ in. and over, replacing one, ¼ hour ..... .06"

The recommendations of the Railway Club of Pittsburgh are approved, as follows:

"Brake connection rod or lever, one or both applied, ½ hour.....$0.12

Also, add "side sills" under the caption of "posts, corner, door, end or side, each removed, when associated with renewal of side sills, side or end plates."

Also, under the heading of "sills," change the word "replaced" to "renew."

Also, change last item on page 59 to read: "When necessary to remove load at one end of car to make repairs."

The committee recommends inserting item of bolts as heading for all bolts to be tabulated under this heading, as follows:

BOLTS.

Carrier iron bolts, three or less, at one end of car, applied	2	$0.48	2	$0.48
Carrier iron bolts, all at one end of car, applied	3	.72	3	.72
Carrier iron bolts, 4 in long or less, each	¼	.06	¼	.06
Center plate bolts, where same do not pass through draft timber, one or more, or all at same end	3	.72	3	.72
Center plate bolt or bolts and center plate, replacing, on one end of car	3	.72	3	.72
Column bolts, one or more, replaced in same truck	2	.48	2	.48
Coupler stop bolts, lug strap bolts or draft timber cross-tie bolts, 5 or less, at same end of car, when coupler is not replaced, each	½	.12	½	.12
Coupler stop bolts, lug strap bolts or draft timber cross-tie bolts, 6 or more, same end of car, when coupler is not replaced	3	.72	3	.72
Draft timber bolts, or carrier iron bolts, either or both, three or less, at one end of car, replacing	2	.48	2	.48
Draft timber bolts, or carrier iron bolts, either or both, four or more, at one end of car, replacing	3	.72	3	.72

NOTE.—If center plate bolt or bolts pass through draft timbers, it must be termed center plate bolt and charged three hours.

Journal box bolt, one or two, replaced, same box	1	.24	1	.24

The committee recommends the following additions:

Handhold, removed and straightened, one	½	$0.12	½	$0.12
Handholds, straightened on car, one or two	¼	.06	¼	.06

Rule 108.—Add "Coupler lock."

Rule 109.—Inasmuch as Rules 109 and 110, and first paragraph of Rule 111, specify where no additional labor can be charged, the committee recommends the consolidation of these three items under the head of Rule 109. Add: "No additional labor to be charged for end siding when end plate or end sill under siding is renewed or replaced."

Rule 111.—Insert first paragraph under Rule 109. Change the second paragraph to read: "Where one or more carrier iron bolts over 4 in. long are replaced, where pocket coupler at same end of car is removed and replaced, the regular labor charge should be reduced one hour, except when one or both draft timbers are replaced."

Rule 112.—Add new item: "Triple cylinder bushing, renewed, $1.12," and further it should be included in Rule 94.

Rule 113.—The committee suggests that the heading of the list of car prices reading "bodies—wood" be changed to read "bodies of eight-wheel cars" for both wood and steel cars, and that the words "car—eight-wheel" be eliminated from each item under these headings.

Change third paragraph, page 69, to read: "Where the capacity of any car other than a gondola is 60,000 pounds or over, 10 per cent should be added to the above price for the car bodies."

Change fifth paragraph to read: "Where cars are equipped with metal center sills, the following prices should be added to the values of bodies for the cost of such sills:

"10 inches or less.....$60.00
Over 10 inches..... 80.00"

Also add: "Where cars are equipped with two metal draft members not less than 7 in. depth, continuous from end to end of car in combination with metal needle beams, $30 shall be added to the value of body of car for the cost of such metal draft members."

Also add a new price, as follows: "Flat car, wooden floor, metal underframe, 8-wheel, 30 tons' capacity, 34 feet or over, $500."

Rule 115.—The committee recommends that the item of "tank cars, except the tanks," be eliminated, and that a depreciation on tanks of tank cars of 5 per cent per annum be fixed in Rule 114.

Rule 121.—Suggests the elimination of the time limit of 60 days.

APPENDIX.

Paragraphs 3 (a), 3 (b), 3 (c).—Suggests that candles fuses and incandescent bulbs be as part of the lighting under line expenses.

Paragraph 7.—Change to read: "No labor charge shall be made for applying brake shoes, journal bearings, hose (air, steam or signal), mantels or tips, incandescent bulbs, charging batteries, or for icing, filling lamps, gassing tanks or coaling cars."

Paragraphs 10, 10 (b), 10 (c).—Change last paragraph to read: "Charge for terminal car heating to be 25 cents per day of 24 hours or less." This paragraph be made paragraph A of Rule 11, the present paragraph of Rule 11 to become paragraph B.

Paragraphs 12 (a), 12 (b).—Add another paragraph as follows: "(c) On electrically lighted cars a battery depreciation charge of 75 cents per day shall be made."

Paragraphs 17 (a), 17 (b), 17 (c), 17 (d).—After the word "car," in the first line of paragraph (a), add the words "not in line service." Also, after the word "car," in first line of paragraph (b), add the words "not in line service when." Also, in paragraph (d) the last phrase be changed to read: "the hose removed to accompany car and be reapplied when car leaves the line."

Paragraph 21.—Recommends that this rule be changed to conform to the same rule under the freight car rules.

LIST OF PRICES FOR MAINTENANCE OF PASSENGER EQUIPMENT IN INTERCHANGE.

The prices for journal bearings should be changed to conform to the freight car rules, as follows:

Journal bearings, brass or bronze, lined or unlined, per lb., applied	$0.18	$0.13
Journal bearings, filled brass or bronze shell, per lb., applied	.14	.10
Journal bearings; weights to be charged and credited as follows:		
7 inches and over, but not 8 inches long, lbs.	.10	.6
8 inches and over, but not 9 inches long, lbs.	.13	.8
9 inches and over, but not 10 inches long lbs.	.20	.12
10 inches and over, lbs.	.25	.15
Journal bearings, cast-steel or malleable-iron back, credit for scrap, per lb.		.04

Nos. 19 and 20.—To be combined to read:

"Cleaning baggage and mail cars, each.....$0.50"

Nos. 26 and 27.—Suggests that this item be cut out of the rules.

No. 30.—Suggests that this item be changed to read as follows:

1-inch signal hose, applied.....$1.75
1 M. C. B. Standard 1⅝-inch hose, applied..... 2.00

It is suggested that the price of mantles and gas tips be the cost price.

No. 59.—To be changed to read:

"Wheels, steel, new or re-tired.....Cost."

No. 60.—To be changed to read:

"Loss of metal from steel or steel-tired wheels, $1.50 per 1-16 inch.....$1.50"

(This price will cover the value of wheels when new.)

No. 62.—To be changed to read:

"Removing, turning and replacing same pair steel-tired wheels.....$5.00"

Freight Rule 89.—New price to be inserted as follows:

"New Price.—Turning steel-tired wheels, per pair ..... $1.50"

No. 63.—Steel-tired, cost of re-tiring, should be cut out, as the proposed correction to No. 59 will cover.

No. 24.—The introduction of two items immediately following item 24, as follows:

"Electrical material, incandescent bulbs, fuses, etc. ..... At cost."
"Electric current for charging batteries..... At cost."

The secretary read the first portion of the report relating to the decisions rendered, and moved that the report of the arbitration committee on decisions rendered, Nos. 775 to 809, which have been distributed through the year, be approved by the convention. The motion was carried.

The secretary submitted the following supplemental report:

SUPPLEMENTAL REPORT OF ARBITRATION COMMITTEE.

In accordance with notice given at the sessions yesterday, a meeting of the arbitration committee was held at the Marlborough-Blenheim Hotel last evening at five o'clock, at which representatives of the various railways were present. The chairman of the committee stated that the meeting was called to discuss in an informal manner the recommendations of the arbitration committee in its report to the convention, so that a better understanding might be had thereof. Several suggestions were made and discussed pro and con by those present, and as a result thereof, the arbitration committee offers the following modifications to its report, and suggests their adoption in lieu of those printed in the report:

Old rule 33 (new rule 58).—"The label for air hose has been criticised, it being stated that some of the figures, especially the dimensions 1⅜ in. became illegible after being in service and subject to wear. It is recommended that this matter be referred to the committee on Train Brake and Signal Equipment, with the suggestion that the label be redesigned, making it as legible as possible, but retaining all the information now on the label."

Old rule 40 (new rule 52).—"The committe recommends that in lieu of what was formerly suggested, the rule to changed to read: 'Running boards in bad order or insecurely fastened, sill-steps, ladders, grab-irons, bent, broken, missing or insecurely fastened except when car has been wrecked, cornered or raked.

" 'Handholds or grab-irons must be of wrought iron or steel, and secured by bolts, rivets, or lag screws.' "

Old rule 75 (new rule 47).—"In view of the action taken by the convention, on the subject of metal spacing blocks, the committee withdraws its recommendation as made under this rule, and suggests that the rule be allowed to remain as in the present code.

Old rule 89 (new rule 101).—In its report to the convention, under old rule 89, the committee did not make any recommendations, it being agreed that the matter of loss of service metal would be given consideration and a recommendation made here. In order to make the matter clearer, the following sugestions are now proposed:

Old rule 19 (new rule 68).—Eliminate the last two sentences of the proposed additions, making the rule read: "Flat sliding cast-iron wheels: If the spot caused by sliding is 2½ in. or over in length. (Care should be taken to distinguish this defect from *worn through chill.*) See Fig. 2."

"Flat sliding, steel or steel-tired wheels; if the spot caused by sliding is 2½ in. or over in length."

Old rule 89 (new rule 101).—1. In the table in this rule, it is suggested that the third item reading, "One 33-in. steel or steel-tired wheel," be changed to read, "One 33-in. forged or rolled steel wheel"; that the price now be changed to $24 instead of $23; that the second-hand price $17.25 be eliminated, and that there be no change in the scrap price, viz. $5.

2. That the last paragraph of this rule, shown at the top of page 46 of the Code of Rules, be changed to read: "The price for new forged or rolled steel wheels shall only apply to such wheels having treads 1½ in. thick or over, measured from the witness groove. For wheels having treads less than 1½-in. thick as described, a reduction shall be made in price at the rate of 80 cents for 1-16-in. thickness of tread.

"For loss of service metal from forged or rolled steel wheels on account of defects for which the delivering company is responsible, credit shall be allowed the owners of the car at the rate of eighty cents for 1-16-in. thickness of tread.

"If there is any reduction of service metal on forged or rolled steel wheels removed from foreign cars, the proper credit for it must be given the owners, except when owners are responsible for such loss of metal from wheels turned off, either on account of owners' defects or defect card issued by the owners. When credit is allowed the owners for loss of service metal as noted, if the repairs are covered by defect card of another company, offset cards to cover such credit may be rendered on the defect card by the company making the repairs, giving reference to bill in which credit was allowed the owners as authority for the charge. In cases of slid flat wheels, 1-16 in. for loss of service metal will be allowed for flat spots 2½ in. long, and 1-16 in. for each additional inch or fraction thereof.

"If there is any increase in the amount of service metal on forged or rolled steel wheels applied, charge may be made for the amount of same, at the rate given above, in cases of owners' defects, or on authority of defect card of delivering line, except when repairs are made by owners."

Old rule 92 (new rule 103).—It is suggested that a new paragraph be added in addition to the changes already suggested, making the rule read as follows: "Bills or statements which do not embody all the information called for by the headings of the columns may be declined until made to conform to the requirements of the rule. In all cases of forged or rolled steel wheels, the repair card must show the actual thickness of tread, before and after turning off, measured from base line of tread to the condemning limit of tread, which is ¼ in. above the witness groove; also show actual thickness of tread on other wheels applied. This information must be reported to car owners, regardless of whether repairs are chargeable or not."

The above will cover the matter of service metal from steel wheels, and, while the phraseology of the recommendations made may be subject to some slight modification, the points that have been raised are fully covered.

Old rule 114 (new rule 121).—Another subject presented to the committee yesterday was the subject of depreciation allowable on the tanks of tank cars. The suggestion offered in its report, that this depreciation shauld be 5 per cent. is hereby withdrawn and the following substituted: "The depreciation on the tanks of tank cars for handling noncorrosive substances shall be 4 per cent per annum; for tanks of tank cars handling corrosive substances, the depreciation shall be 5 per cent per annum."

PASSENGER CAR RULES.

Rule 3-c. Several suggestions have been received since the report was prepared proposing the introduction of gas tips, mantles, gas bowls and globes as line expenses under the head of lighting. Inasmuch as the committee on Train Lighting has thoroughly investigated the matter and made certain recommendations for incorporation in the rules, which recommendations have been approved by the committee, we can not approve the further suggestions that have been received.

DISCUSSION ON RULES OF INTERCHANGE.

The Secretary: The supplemental report of the arbitration committee should be considered in connection with the printed report.

F. W. Brazier (N. Y. C. & H. R.): I move that the report of the arbitration committee be accepted and adopted, which includes the acceptance of the decisions rendered by the arbitration committee. The motion was carried.

F. W. Brazier: At this time I think it would be proper to make another motion relating to this report. I think many of the members do not realize the amount of work and time that the arbitration committee has put in—to my knowledge, five or six days in Chicago—and I think they are entitled to a vote of very strong thanks, because they really are our Supreme Court. I move that we give the arbitration committee a rising vote of thanks for this report and for the arduous duties performed in the past year.

The Secretary: The arbitration committee has held five sessions for the preparation of its report, which has been presented to this meeting.

The Chairman: This motion is timely. The arbitration committee certainly does a lot of work and are entitled to a good deal of gratitude on the part of the members for the valuable work they do.

The motion was carried.

Mr. Hennessey: On behalf of the arbitration committee I would say that the vote of confidence which has just been passed is fully appreciated. The duties of the arbitration committee are not pleasant. In every case that is arbitrated, one side must lose. For every recommendation that is made there are usually a half dozen conflicting recommendations. We have tried to do our duty under all conditions and circumstances. I want to thank the convention for this vote of confidence.

(President Clark in the chair.)

W. F. Bentley (B. & O.): At the meeting of the arbitration committee yesterday, I was requested, after the adoption of

the rules, to bring to the attention of the convention certain difficulties which the different inspectors are experiencing in endeavoring to find the label of the size and marking on the hose badge by reason of its location. Sometimes, unless the inspectors uncouple the hose, they must lie on their backs to read it.

Several roads have already taken steps to place the badge so that the inspectors can read it very readily in approaching the hose; that end is being accomplished by placing the reading on the hose in a different position, and instead of placing it upside down, they are turning it around on the quarter, so that when the hose is coupled up the inspectors can read it.

It was thought by bringing this subject to the attention of the different representatives of the railways at this convention they would give it some consideration after they get home, and see to it that the badge on the hose is so placed that the inspectors can save time in inspecting the trains in reading the hose.

The President: That seems to be a good suggestion. It would appear easy to fit up the hose, as suggested by Mr. Bentley, so that the inspectors can read the badge conveniently.

Mr. Hennessey: It seems to me to be a recommendation of considerable importance. It would cost a railway company no more money to mount the hose so that the label could be easily read than it would to mount the hose in any other way. I move that each member of the Master Car Builders' Association, when he returns home, take up these matters with the hose mounting department, and instruct the men in accordance with the suggestions of Mr. Bentley.

The motion was carried.

MISUSE OF THE M. C. B. REPAIR CARD.

The following letter from W. H. Lewis, superintendent of motive power, Norfolk & Western, under date of May 24, 1910, was read:

Since some reference was made last year to the apparent misuse of the M. C. B. repair card, and inasmuch as some reform in that direction seemed so manifestly desirable, if not necessary, no doubt many investigations along these lines have been pursued, all of which tend to have their moral effect for the betterment of conditions.

Unquestionably there has been some improvement in the exercise of fairer practices, and a close check has enabled us to note a most remarkable change for the better at some of the larger interchange points; but there is still a great deal of room for improvement, and doubtless the question is one that will require constant vigilance at all times. Where the subject of the abuse of the repair card has been treated with a great deal of stress and laid before the inspectors and men on the ground, they have profited thereby and good work has been accomplished, but in many places it has been set aside by officers or foremen on the assumption that their men could hardly be guilty of unfair practices.

The trouble is this—the inspector seems prone to sharp practices, probably as a vent for some advantage he considers or imagines has been taken by the inspectors for the other roads, but these practices unfortunately extend or result in distortion of fair and very well defined rules and principles, and in the end the railways have to suffer the consequences.

At the conclusion of the discussion last year, it was recommended that specific cases should be reported to the executive committee for an investigation. That probably was the wisest action at that time, but it is very much doubted whether any one would wish to make a specific charge in such matters, and it is quite natural they should shrink from making prominent any failure or unfair practice on the part of men that would probably result in a reflection upon the management in which they have personal friends associated. While there has been an improvement, I am not so sure the proposition which was made last year for the appointment of a committee to go around through the country to investigate the practices in different yards for the purpose of obtaining uniformity and the proper interpretation of the rules, would not be productive of a great many benefits.

During the year, some comments have been made upon the use of the repair card by the Individual Car Owners' Association. It was very evident they had failed to gather the line of thought prompting the remarks that had been made on the part of the Master Car Builders' Association. In the paper circulated by the Individual Car Owners' Association, a resolution was presented endorsing the inequalities or unfairness of charges, assuming that to be the purport of the remarks on the part of the members of the Master Car Builders' Association, in fact, reference was made to the report presented to the association last year in support of their position. As a matter of fact, the Master Car Builders' rules represent the result of years of hard work and in principle are correct and equitable. It would therefore be wrong to consider their non-observance a fault of their precepts or provisions, or that it makes them any the less valuable, hence any specific infraction of the rules should be handled locally and between the parties at interest.

There is another phase in connection with the use of the card to which attention might now be profitably directed. Rules 76 and 77, of the M. C. B. code of interchange, specify that when repairs of any kind are made to foreign cars a repair card measuring 3½ x 8 in., and bearing certain printed matter on both sides is to be filled out, using black ink or indelible pencil, stating in full the work performed, etc., and, again, while the defect card has a note thereon stating that it is to be securely fastened to the car with four tacks, the repair card carries with it no such requirements.

In the first place, the size and specific form of the card is far from being uniformly followed by all roads. In many instances they are made from very inferior paper instead of card board, which fact has added very much to the difficulty in retaining the record or writing placed thereon. Then there are many forms of cards, differing in one detail or another, and just enough not to agree with the M. C. B. standard; again, some have the printed matter on but one side. Perhaps as a result of this latter condition, or carelessness on the part of the men in the yards, at least 85 per cent of the cards are filled out on but one side and practically the same proportion is secured to cars with but two instead of four tacks; in some instances defect as well as repair cards have been found secured with but one tack. Again, these cards are usually made out with lead pencil instead of ink or indelible pencil as prescribed, hence it is but a short time before they are very difficult to decipher.

Notwithstanding the cards are to specify fully the repairs made, they are often very indifferently filled out. On many, the end of the car upon which the repairs have been made will not be mentioned, neither will the size nor kind of material used be indicated and often the cards are not signed by the inspectors or dated, nor will the place of their application be mentioned. It is estimated that perhaps 40 per cent of the repair jobs are not carded for. Rule 63 calls for certain information on the repair card and stub, yet bills are being presented daily with many omissions. If no bill is to be rendered the repair card should be sent to the owner on or before the twentieth of each month, bearing the words "No Bill," written across the face of the card and cards are supposed to accompany the bills for many of the small repair jobs; still the number made out improperly in this respect is remarkable.

It is confidently believed that if any one will take the time, say thirty days, and closely examine all foreign cards removed from their equipment, they will soon satisfy themselves that there is still room for a great deal of improvement in the matter of filling out and handling cards generally, all of which we consider is well within our power to correct and when corrected would vastly improve the situation and very materially reduce a great deal of unnecessary clerical work.

W. H. LEWIS.

The President: A year ago Mr. Lewis presented a communication on the abuse of the repair card, and this is in the same connection.

Mr. Hennessey: While there has been an apparent improvement during the past year on account of the very earnest discussion in connection with this subject at the last convention, there is still much room for further improvement. If the members of this association would talk on this floor as they write to the Arbitration Committee, I think they would talk the balance of the day on this subject; but it seems when they come here and must look a man squarely in the eye they do not have the moral courage to say what they say to the members of the Arbitration Committee. They write us that such and such roads are not applying repair cards. I understand, of course, that the resolution that was passed last year gave them the right to take this matter up with the Executive Committee, but it seems, as Mr. Lewis says, that they do not like to make these direct charges personally. There are others who go so far as to say that bills are rendered to them for work that has not been done. Now, the life of this association depends entirely on the honesty of its members—everything should be done by every member of this association to secure the most absolute honesty in these matters. If any master car builder has subordinates who are inclined to adopt tricky practices or customs to keep down the expenses, that man should be called. I do not believe for a minute that there is any head of a car department in America who encourages such practices, or who would for a moment retain in his employ a man who indulges in them if he knew that this thing was going on, but it is believed by many that it is a custom of some roads not to put

on the repair cards, and in cases not to make the repairs at all, but to render the bills.

Jacob Christopher (T. H. & B.): The road I am connected with is today holding six cars. We have held them for six months waiting for the representatives of a certain road to come and give us evidence to substantiate certain bills for repairs which have been charged against our road. We have the evidence that we were charged for brasses, drawbars and brakebeams, and we have positive evidence that the brakebeams and brasses were never removed. We have several other points of evidence bearing on the same bills, and yet we have not been able to get the parties interested to come and pass on the cars and verify the bill. We are holding the cars so that we can stand pat on the point we take. We have been charged for material and labor that never was furnished.

F. W. Brazier: I said last year, and I repeat it now, I want every cent that belongs to the New York Central, but we do not want one penny that does not properly belong to us. If you instruct your subordinates to that effect, there would not be any further complaints in this connection.

F. H. Stark (Pitts. Coal Co.): There is one detail that might stand investigation, that is the cleaning, oiling and testing of air-brakes. We have only a small equipment and are able to check the repairs made more closely than most roads. It is interesting to find how frequently air-brakes become dry and dirty. We have some cases where they are cleaned twice by the same road at the same station on the same date. It is common practice to have them cleaned more than once in thirty days. If the air-brakes are cleaned, oiled and tested, and in 10 days the brakes are not operative and the triple is taken down, and it is found that some repairs are necessary, a charge is invariably made, in addition to the repairs, for the cost of cleaning, not only of the triple, but of the cylinder. It would seem that if a triple passes inspection and a charge is made by one road, and it becomes inoperative in a month, that the owner might properly be charged with repairs, but it does not seem right that he should be charged with the cleaning. This is a matter that each one of us should consider for ourselves, and it would be a good idea if, in addition to the date of cleaning, the road should be required to put its initials on the cylinder so as to indicate who did the work. That would assist in tracing the matter. This may seem like a small matter, but if you really knew how many duplicate charges you are paying for, you would take a greater interest in the matter.

Mr. Schroyer: We started to check up on our equipment of sixty thousand cars, the cleaning that had been done on all the triples, where it had been done, by whom and when. My attention for one whole year has not been called to any such condition as Mr. Stark describes. As to cleaning the car twice in one day, that may be a case of two men working on piece-work and each of them turning in a slip for the cleaning of the car. The worst thing that has come to my attention in connection with the handling of cars and billing for work supposed to have been performed, was certain instructions, which were supposed to have been issued by the head of the car department to the inspectors and repairers at interchange points, to the effect that they must perform work enough and get cars enough from the connecting line to pay their salaries.

Mr. Stark: I can send Mr. Schroyer hundreds of repair cards verifying what I have stated.

H. L. Trimyer (S. A. L.): We have the remedy in our own hands, as we have been instructed to bring such matters to the attention of the executive committee. If we did this, some action would be taken to stop the trouble. On the road with which I am connected we have had some bills refused payment on account of no repair cards attached to the cars. We proceeded to remedy the trouble, and possibly if we did that a little more, we would get better results. In addition, I have had a lot of correspondence in regard to improper bills, claiming repairs made which were not made. If we would bring some of these well defined cases which have been referred to, to the notice of the executive committee and some action was taken by the executive committee, we would have no further trouble. As far as the Seaboard Air Line is concerned there has been a wonderful improvement since the action last year. A close checking of our repair bills shows some discrepancies, and many were brought to our attention which we proceeded to remedy. We have instructions out that we will discharge any man in the service who sends in a report claiming repairs which have not been made, and we cannot take any further action until such matters are referred to us. If a case where there is sufficient evidence to justify the charge is referred to the executive committee, and some road is penalized for violation of the rules, it will stop the whole business.

A. E. Manchester (C. M. & St. P.): I have discovered what I felt was a case which should go to the executive committee, a case which seemed to justify such action more than a number of the cases which have been mentioned. In each instance where it was a clear case it would come back to us and be reported as an error, a clerical error. When you get that kind of a report, and the party withdraws his bill or corrects his bill, you have nothing to take to the executive committee. When you catch that same condition coming from the same road with great regularity, it at least leads to a suspicion that there is undue carelessness that ought to be corrected.

Morris La Rue (C. R. I. & P.): There is one point which has not been touched on; that is, in interchange some roads will make a claim for a defect card or missing material, and after the card is on their line they bill the owner for the same material that they have asked a defect card for. That may be honest, but it looks to me as if the man who would do it is too crooked to sleep in a round house.

C. E. Fuller (U. P.): The members of this association should be ashamed of themselves. We are charged with the maintenance and repairs of cars, and if we are crooked we ought to be straightened out. The members were requested to file any cases they had with the executive committee. During the last year there was only one case brought up, which would indicate one of two things—either that the members are unduly suspicious of one another, or else they are afraid to present their cases. It does not seem to me that the question of mistakes ought to be charged as dishonesty. I presume the line that I represent sends out bills that are questioned; in fact, I know we do. We receive bills that we question, and we do not charge dishonesty. The only time we charge dishonesty is when we know the work has not been done. We have not had a case in the last year that we felt was a case of dishonest work. Too much has been said on the subject, and the members should do as they are requested and file their cases. If there is any member of this association that is paying the salary of his card department by dishonest billing, I believe we can stop it; and the only way to stop it is to give us the ammunition. I move that the members of this association give the executive committee the cases, if they have any, by letter.

F. F. Gaines (C. of Ga. Ry.): We may be morally certain that we are getting dishonest bills. If there was some way by which we could identify actual cases of dishonesty, which I know from my personal experience are still going on, there might be more cases referred to the executive committee. It is pretty difficult to get your evidence.

Eugene Chamberlain (N. Y. C. & H. R.): The superintendents of car departments and of motive power have been derelict in their duty. It is not the case of the inspector. This action seems to have produced up to the present time simply a moral effect, and it has not gone any further with one case only before the executive committee. It seems to me that the motion of Mr. Fuller is very pertinent at this time, that the superintendents of motive power and of car departments may not continue to be derelict in their duty, but that they may get after these cases.

The motion was carried.

COUPLER AND DRAFT EQUIPMENT.

The committee submits the following report:

SPECIFICATIONS.

Size of Eyelet for Lock-lift Device.—In order that the text of the Standards for Automatic Couplers may agree with Sheet 23, it is necessary that the size of eyelet in locking device be added: "That all couplers must have a 1 1-16-inch eyelet for unlocking device located immediately above locking pin hole."

Gauges for Knuckle Pivot Pins.—The first sentence in the third paragraph of the specifications for M. C. B. automatic couplers should be changed so as to include knuckle pivot pins.

Use of Knuckle-throwing Devices.—The requirement providing that the coupler must be equipped with an efficient knuckle-throwing device has been a Recommended Practice for a period of five years, and nearly all of the modern couplers in use to-day are provided with some form of knuckle-throwing device. While all of the knuckle-throwing devices in use are not as efficient as the committee believes they should be, it feels that this requirement should be advanced to Standard, incorporating the following: "All couplers must be equipped with a knuckle-throwing device which will throw the knuckle completely open from any position it may assume in service." If this recommendation is adopted as Standard it should be embodied in the Standards in Section 4 of the Specifications for M. C. B. couplers after September 1, 1911, thereby giving time to the manufacturers of couplers which do not at present meet this re-

quirement to improve their models to conform with this specification.

Lock-bearing Area.—The question of adopting a minimum allowable area of effective bearing surface between the knuckle tail and lock, and stipulating that there shall be at least as much bearing between the lock and wall of coupler, has been presented to the committee, with a view of making that minimum as large as possible, in order to



R. N. Durborow.
Chairman, Committee on Coupler and Draft Equipment.

insure a better distribution of pressure and consequently a less rapid wear. The committee suggests that 4 square inches be adopted as the minimum allowable area of these bearing surfaces. Of course, a larger bearing surface is desirable, but in fixing 4 square inches as a minimum at this time the committee feels that no great hardship will be imposed upon manufacturers of existing types of couplers, and that as conditions improve this limiting area may be increased.

Twist Gauge.—The twist gauge shown on the present M. C. B. Sheet "C" should be abolished, as it has not proven useful. After an extended trial it has been found that any distortion of the coupler which this gauge would indicate could easily be detected by the eye, and, therefore, the use of the gauge was discontinued.

Shelf Brackets.—The committee desires to call the attention of the members to the fact that shelf brackets, designed to hold the uncoupling lever in a raised position, are still in use by a number of roads, on cars which are equipped with couplers conforming to the present standards. These brackets were to be abolished in accordance with the letter ballot of 1907 and, therefore, should not be allowed to remain on cars having standard couplers for the following reasons:

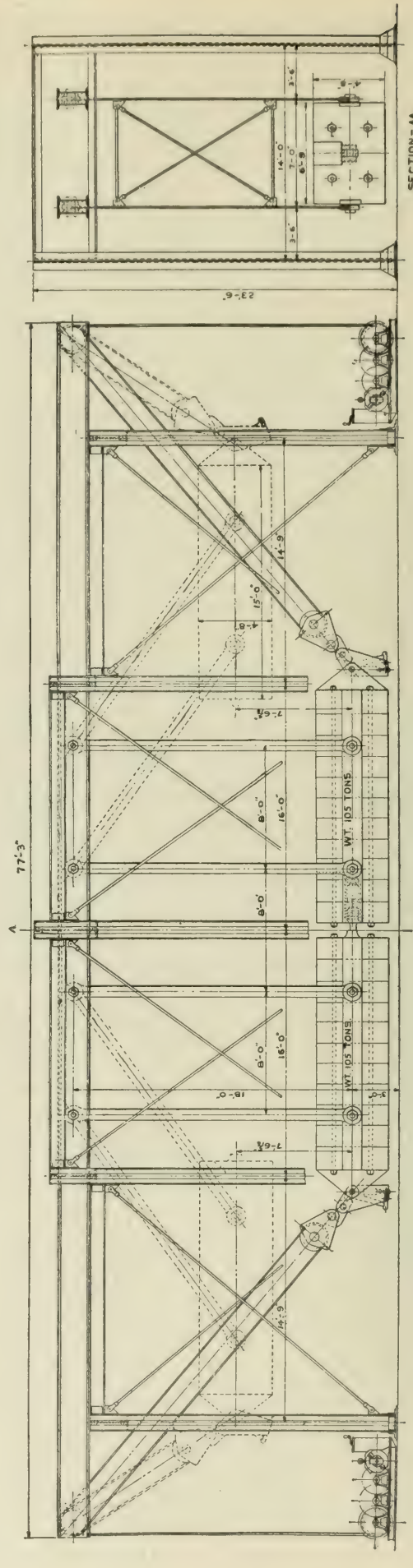
First: That it destroys the feature of the lock set within the head of the coupler; in other words, when the lever is locked in a raised position it must be released again by hand before coupling can be effected.

Second: The use of the inclined shelf bracket allows the rods to be locked in a raised position so that the chain is frequently taut. In case of couplers equipped with a knuckle-throwing device, when the knuckles are closed, the tail of the knuckle will strike the opener, and either bend it out of line or break the uncoupling chain. This is more pronounced in couplers where allowance is made for play of ⅜ inch behind the tail of the knuckle, as recommended in the specifications.

FRICTION DRAFT GEAR.

General Review.—The report of the committee last year called attention to two means of obtaining definite information desired concerning the performance of draft gears, namely, by means of a series of road tests with accurate recording apparatus, and the design of a laboratory testing apparatus which will subject the draft gears to approximately the same pressures and shocks received in service. After careful consideration, the conclusion was reached that the results to be obtained from both investigations could be combined in the latter, providing the action of the draft gears in such a laboratory testing apparatus would approximate service conditions, with the additional advantage of saving time and expense of making actual road service tests.

To make a series of service tests would necessitate equip-



Proposed Pendulum Test Machine for Friction Draft Gears.

ping trains composed of cars of various types with each kind of draft gear in turn, with resulting loss of time in applying each set of draft gears during a period when there may be a great demand for cars, to say nothing of the expense involved. The possibility of using a drop-test machine, using either the standard M. C. B. weight of 1,640 pounds or a heavier one, was considered, but the action of the draft gears under the forces of impact delivered by such a machine was found to differ greatly from their action in service, making this form of drop test undesirable. The use of any kind of static machine would be unsatisfactory, because the load is applied slowly and does not approximate service conditions.

Draft Gear Testing Machine.—In order to place the draft gears in a laboratory testing machine to undergo service conditions, a machine has been designed on the principle of the double pendulum. Each pendulum weighs 210,000 pounds, which represents the probable maximum weight of a car and lading which will be encountered in service. Provision is made for swinging each pendulum through an arc sufficient to give a maximum speed of fifteen miles per hour when at the lowest point of swing, so that with one pendulum at rest and one in motion speed up to that is obtainable, and with both pendulums in motion a maximum speed at the point of contact of thirty miles per hour is available. By using the pendulums many uncertain variables are eliminated, such as the motion between trucks and car body, the shock absorbed by the truck springs, resistance offered by wheel flanges on curves, etc., which would interfere with satisfactory observation in a road service test. The resistance offered to each blow and the force of the blows delivered at the different speeds is constant for each draft gear, making the results directly comparable.

In the illustration a draft gear is shown mounted in one pendulum, the other being simply a solid weight with a buffing surface provided at the end. The draft gear to be tested is equipped with a dummy coupler shank having a flat face which is just in contact with the buffing surface on the other pendulum, when both pendulums are hanging at rest. The movement in either direction of both pendulums, and the movement of the coupler shank in the carrier iron, that is, the movement of the draft gear in either direction, are to be accurately recorded by an oscillograph having a suitable time element, so that distance, velocity and acceleration at any point of swing or recoil can be determined. The records of the motions of the pendulum are obtained electrically from a contact point on each pendulum passing over a series of fixed contacts in the path of swing. The record of the motion of the draft gear is obtainable in a like manner through each ⅛ inch of travel by a contact on the dummy coupler shank passing over a series of fixed contacts in the carrier iron. The pendulums are drawn back to the proper starting positions to give any desired speed, by motor-driven cables, fastened to the weights by hooks which can be released simultaneously by one electric key. The same key which releases these hooks starts the motion of the oscillograph.

Theoretically the difference between the sum of the travels of the pendulums, from the point of release to the point of contact, and the sum of their recoils, will be a measure of the shock absorbed by the draft gear, and, therefore, of the efficiency of the draft gear. Thus, a draft gear having a low recoil would indicate a high absorption of shock and vice versa. The pendulums are necessarily built-up weights, consisting of cast-iron segments, machined to a smooth fit, held together with tie bolts and the longitudinal framing to which the trunnions for the hangers are fastened. Provision has been made in the striking end to accommodate all the types of draft gears to be tested.

The committee regrets that it has been unable to perfect the machine in time to have had a series of tests made during the past year, but expects to have the machine set up and make a series of tests of all kinds of friction draft gears now on the market, submitting a complete report at the convention of the year 1911.

SUMMARY.

The insertion of the 1 1-16-inch dimension for eyelet in locking device is referred to the Secretary, as it has already passed the letter ballot.

A summary of the recommendations which your committee offers to be submitted to the letter ballot, to be adopted either as Standard or Recommended Practice, is as follows:

Specifications for Automatic Couplers.

1. That the first sentence in the third paragraph be changed to read, "Bars, knuckles, locking pins or blocks and knuckle pivot pins must be accurately made to gauges furnished by the manufacturer."

Recommended Practice.

1. That the use of the twist gauge be abolished, and the cut removed from Sheet "C."
2. That the minimum effective area of lock-bearing surface, on knuckle tail, shall not be less than 4 square inches.
3. That the effective area of bearing surface between the lock block and coupler wall shall be equal to or greater than the effective area of lock-block bearing on knuckle tail.

The report is signed by: R. N. Durborow (P. R. R.), chairman; G. W. Wildin (N. Y. N. H. & H.), F. W. Brazier (N. Y. C. & H. R.), T H Curtis (L. & N.), F. H. Stark (Pitts. Coal Co.), Thos. Roope (C. B. & Q.), and W. E. Symons (Consulting Engineer).

DISCUSSION ON COUPLER AND DRAFT EQUIPMENT.

Mr. Stark: The pendulum device is such that a friction gear may be applied to both pendulums and thus have two gears in action.

The report was adopted and referred to letter ballot.

CAR WHEELS.

We presented at the last convention revised drawings for the flange and tread contour of all wheels and a revised design for the 625-pound wheel with corrected specifications covering the three wheels. The committee has held several meetings during the year, two of them being joint meetings with the car-wheel manufacturers, and from the reports of the manufacturers and what we have heard from other lines, the indications are that a larger number of roads have adopted



William Garstang.
Chairman, Committee on Car Wheels.

the new 1909 wheel than have previously purchased wheels made to the M. C. B. design. We learned from the manufacturers that they are rapidly getting in position to furnish the new wheel with the revised tread and flange, and that their orders justify making the change as rapidly as possible. In view of the fact that the 1909 wheel has been so favorably received and that nothing has occurred to justify considering a change in the design, the committee has no recommendations to make covering the wheels or specifications.

We have received some communications during the year requiring attention, which have been handled as follows:

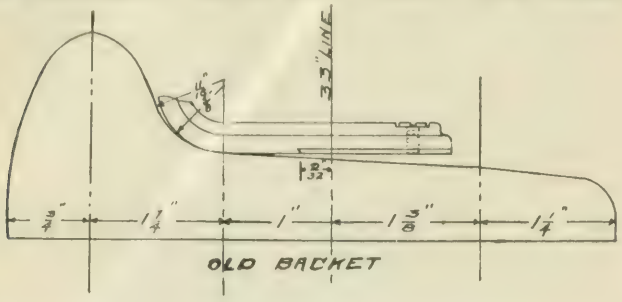
Attention has been called to the maximum flange thickness gauge, Sheet M. C. B.—16, not showing sufficient dimensions to accurately lay out the gauge. To correct this, we submit a new drawing of the gauge (Fig. 2a, Fig. 2b), which is not changed, but has additional dimensions shown.

The committee finds that there is no maximum allowable height of flange specified for cast-iron wheels, so as not to damage track crossings and frog filling blocks, and the committee would recommend for this dimension 1½ in., which is the same as has already been adopted for steel and steel-tired wheels, as shown in cuts on pages 98, 99, 100, and 101 in the 1909 Interchange Rules.

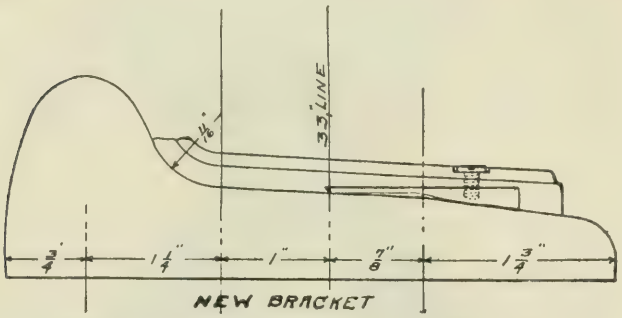
The attention of the committee has been called to the fact that brackets used on existing wheel circumference measuring tapes were made to conform to M. C. B. standard tread and flange contour prior to modification of same at 1907 convention, and it is the recommendation of the committee that

these brackets be replaced with a form of bracket to suit the tread and flange contour adopted in 1909, and we enclose herewith drawing Fig. 2c, showing the proposed new bracket, and recommend its adoption.

R. L. Kleine, chairman of the Committee on Standards and Recommended Practice, also forwards a letter relating



RELATIVE POSITIONS OF NEW AND OLD BRACKET



to the diameter of new all-steel or steel-tired wheels, and the limit in diameter to which they should be turned when used in freight service. This is an important matter, which affects the trucks, brakes, height of couplers and interchange bills to an extent that the committee feels is out of their

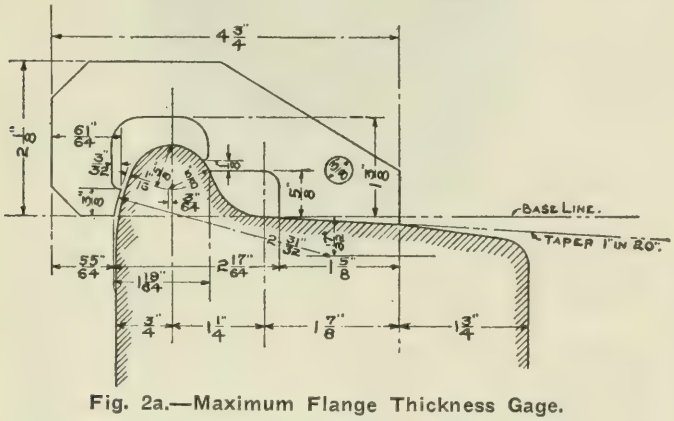


Fig. 2a.—Maximum Flange Thickness Gage.

jurisdiction, and suggests that it be handled by a special committee.

We have a communication from the Wheel Manufacturers' Association, which has been under consideration for several months, but we can not recommend to the Association the

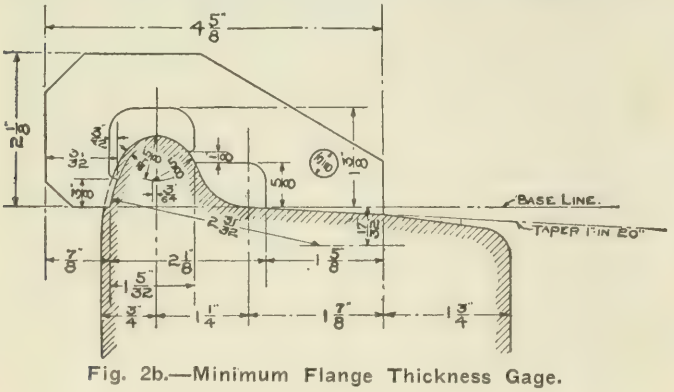


Fig. 2b.—Minimum Flange Thickness Gage.

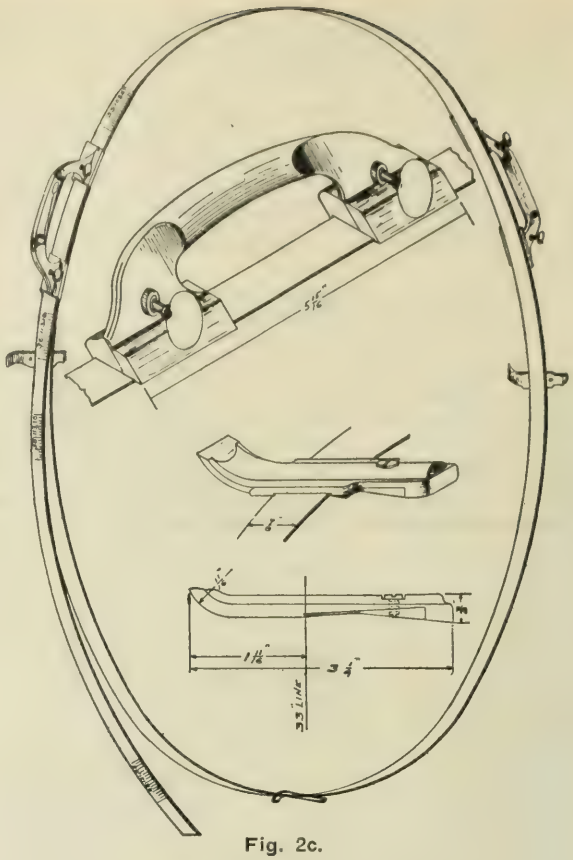


Fig. 2c.

adoption of the suggestions made, as we feel that it is unnecessary to have as a standard of the Association a special wheel weighing 675 pounds for exclusive use under 60,000-pound refrigerator cars when the 675-pound 80,000-pound capacity wheel, by a slight change in the core, can be used. The Manufacturers' Association also ask a modification of the present test requirements, which the committee can not see their way clear to recommend.

The report is signed by:—Wm. Garstang (C. C. C. & St. L.), chairman; A. E. Manchester (C. M. & St. P.), O. C. Cromwell (B. & O.), W. C. A. Henry (Penna. Lines), R. W. Burnett (C. P. R.), A. Kearney (N. & W.) and R. L. Ettenger (So. Ry.).

C. E. Fuller (U. P.): I move that the report be received and the recommendations referred to letter ballot.

A. W. Gibbs (P. R. R.): Will the committee advise us why it declines to take any action in these recommendations for limiting the variation in diameter? I have had opportunity for a good many years of studying the contours of wheels as received on the road, showing wear from original contour and subsequent loss of metal in turning, say two or three times the amount of metal worn off. The critical point about the steel tired wheel has always been the wear of flanges, and we all know that in a majority of cases the wheel will wear on the flange, because all the wear comes at one point,—surely a very important subject. There should be a limit. There is no special difficulty in fixing a limit. It is not like a shrinkage limit. I do not see why this committee could not handle the thing and make definite recommendations that the variations shall not be more than so many tape sizes. I don't know whether it is in order, but I do feel that the committee has missed a very great opportunity.

The President: Perhaps some of the members of the committee can enlighten us on that point.

O. C. Cromwell (B. & O.): That matter came to the committee rather late in the season. They felt that the subject was one of so great importance, and the art and the use of the steel wheel so young at this stage, that they were not prepared without some little further time to make the investigations to give recommendations to the association.

The President: I think perhaps this point will be taken care of by the executive committee in the appointment of committees, either covering it by referring it back to this committee or by appointing a special committee, as suggested. We will vote on Mr. Fuller's motion, to the effect that the

report be received and the recommendations referred to letter ballot. The motion was carried.

The President: The next report on our programme is that of the committee on Safety Appliances, Mr. Seley.

SAFETY APPLIANCES.

The committee regrets having no report for this year, account of pending legislation in the matter of safety appliances. The status of the matter is as follows: During the present session House Bill 5702, passed last year in the house, was taken up, and, after a number of amendments, was passed by both houses and signed by the President, thereby becoming a portion of the Interstate Commerce Law.

Section 2 of the law brings more of the details of cars under scrutiny than was called for in the old acts, namely, sill steps, hand brakes, ladders, running boards and roof handholds. A proviso is also added, covering the case of loading of long commodities requiring more than one car, and it is also understood that hand brakes are not required on logging cars and other vehicles exempted by the primary acts.

Section 3 authorizes the Interstate Commerce Commission to designate the number, dimensions, location and manner of application of the appliances covered by these acts after notice and hearing. Inasmuch as the hearing has not been held, the committee has no definite information as to whether the M. C. B. standards will be acceptable to the Interstate Commerce Commission or not, and until such hearings definitely decide on this point, the committee has felt that any efforts on their part might be wasted labor.



C. A. Seley.

Chairman, Committee on Safety Appliances.

Section 4 provides for movement of bad-order cars for repairs as has been a practical necessity in the past, although such movements would be illegal were the laws strictly construed. The new arrangement gives welcome relief in this respect by permitting the car to be hauled to the nearest available repair shop without liability, except in case of danger to employees during such movement, which is properly provided for.

It is quite possible that special instructions will be issued by the executive committee or by this committee under instructions of the executive committee after the Interstate Commerce Commission hearings have been held and the safety appliances defined.

The report is signed by:—C. A. Seley (C. R. I. & P.), Chairman; A. LaMar (Penn. Lines), T. H. Curtis (L. & N.), C. B. Young (C. B. & Q.), H. Bartlett (B. & M), and T. M. Ramsdell (C. & O.).

The report of the committee was adopted, and the executive committee was directed to send a statement to all members fully explaining the position taken by the Interstate Commerce Commission on the matter of standards.

A motion that the association assemble Friday morning at 9.30 and hold a continuous session until adjournment was carried.

FREIGHT CAR TRUCKS.

The subjects which the committee have had under consideration are as follows:

(a) To investigate and submit recommendations as to what changes in limits of axles are necessary to make them suitable for cars of 65,000 and 90,000 pounds capacity.

(b) To reconcile the discrepancies existing between the measurement of the wheel seat of axle "B," on Sheet M. C. B. 7, and the condemning limits shown in Rule 23 of the Rules of Interchange.

(c) To consider whether any revision of the present specifications for steel axles is necessary.

(d) To consider whether any revision of the drop test for iron axles is necessary.

(a) No intermediate sizes of axles differing from the "A," "B," "C" and "D" standards of the M. C. B. Association should be recommended. These standards have been so universally adopted in the States and Canada that axles designed for the small difference in capacity suggested would only lead to confusion.

(b) This is a matter that involves discrepancies between the first and second tables under Rule 23, the first table having been inherited from the old rules in existence before the axles were redesigned. The second table, in which the diameters are given in connection with maximum weights, was prepared following the method for calculating diameters of axles recommended by a committee in 1896. This was done with the idea that the practice of marking maximum weights would replace the marking by capacity, and is considered necessary for certain classses of cars, such as tank cars, etc. If the diameters given in the first table, which refer to capacity of the car, were made to correspond to those in the second table, it would result in a large number of the older cars being refused at interchange points. For this reason, it is the opinion of the committee that Rule 23 should remain as at present.



A. Stewart.

Chairman, Committee on Freight Car Trucks.

(c) Since the original specifications for steel axles were compiled, considerable data have been accumulated, not only from the service of the axles, which, as far as we can ascertain, have been exceedingly satisfactory, but by the steelmakers, who are offering data of various kinds, which indicates that a change in the composition of the steel will possibly be advisable to still further improve the axle. This refers particularly to the introduction of a higher percentage of silicon, which a few years ago was seriously objected to on account of manufacturing difficulties. However, in recent revolution tests, it appears that the addition of silicon has doubled and in some cases quadrupled the life of the specimen. This work is being continued, and probably in another year will be completed; but at present the committee is of the opinion that it would be unwise to make any change in the axle specifications.

(d) It seems the original committee which drew up the existing specifications for iron axles was quite aware of the fact that, so far as deflections under the drop tests were concerned, it was doubtful whether iron axles would meet the specifications, and it seems to have been its idea to discour-

age their manufacture. As proper wrought-iron scrap, suitable for the manufacture of axles, is becoming more and more difficult to obtain, and fewer iron axles are used each year, it is the opinion of the committee that no changes should be recommended in the present specifications.

The report is signed by:—A. Stewart (Southern), Chairman; J. J. Tatum (B. & O.), A. S. Vogt (P. P. R.), J. F. DeVoy (C., M. & St. P.) and G. A. Hancock (St. L. & S. F.).

The President: You will notice that the committee recommends no action. Consequently no further consideration of the subject is necessary.

SPLICING UNDERFRAMING.

The committee was continued from last year to investigate the following subjects:

(a) Maximum amount of sill splicing allowable as referred to in Rule 65 of the Rules of Interchange;

(b) Strength of various forms of underframing.

While only twenty roads responded to our inquiries, with scarcely any exception, the replies indicate that the committee's report of last year as to the superiority of the reinforced butt splice was favorably received. Considering the information received in the replies and that gained in last year's extensive investigation, which proved that a reinforced butt spliced sill, as per Fig. 9-B, will stand 88 per cent of the abuse that a solid sill will stand and is 375 per cent stronger than a scarfed spliced sill, as per Fig. 9-A, together with the additional information gained by personal investigation of



R. E. Smith.

Chairman, Committee on Splicing Underframes.

individual members of the committee, as well as that gained by the committee as a whole, we feel warranted in making recommendations as follows:

RECOMMENDATIONS.

Maximum amount of sill splicing allowable, as referred to in Rule 65 of Rules of Interchange:

1. That M. C. B. Rule 65 be changed to read as follows:

"Draft timbers must not be spliced. Longitudinal sills may be spliced at two points. No adjacent sills, except center sills, to have entire splice immediately opposite the splice on adjacent sill; splices to be staggered so as to make joint of one splice at least 24 inches from the joint of the splice on adjacent sill, measured from a line drawn at right angles with sills. Center sills must be spliced between body bolsters and cross-tie timbers, but not within 18 inches of either. Splices on all sills other than center sills, as provided for above, can be located at any point between body bolsters or between body bolster and end sill, but not within 12 inches of body bolster.

"When splicing longitudinal sills the plan shown in Fig. 9-B is to be followed.

"Any sill spliced after September 1, 1910, that does not conform to the above, will be considered improper repairs.

"Steel sills may be spliced in the most convenient location, in accordance with Figs. A, B and C. Adjacent steel sills may be spliced. The thickness of each splice must not be less than the thickness of the web of the section spliced."

2. That all figures showing plans for splicing wood sills in M. C. B. Rules be eliminated, except Fig. 9-B.

An analysis of the proposed rule will show that few restrictions have been placed upon the practice of economy in the use of high-grade material, which is rapidly becoming more costly and difficult to obtain; we do not feel that we have recommended too wide a latitude in the number or location of the splices.

It has, of course, been impracticable for the committee to conduct practical tests to demonstrate the soundness of its recommendations, because of the large scale upon which such tests would have to be conducted; and it is questionable whether the testing to destruction of any reasonable number of cars, with sills spliced in a variety of ways and locations, would conclusively confirm or disprove any theory or afford positive data from which to prescribe correct practice. There remained, then, only judgment and experience upon which to base our recommendations, which are respectfully submitted.

Strength of Various Forms of Underframing.

The committee does not understand that it was expected to investigate this subject as broadly as the language might justify, and it has not attempted to do so; an investigation of such scope is beyond the means or the time of this committee; it is understood rather that it was desirable that some information be brought out that would lead to a determination as to what allowances should be made in the rules to cover settlements for the destruction, on foreign lines, of cars with partial metal underframes or subframes.

In view of the fact that we received replies from only twenty roads, only eight of which were using any form of partial metal underframe, and in view of the probability that but a small percentage of cars so equipped meet with total destruction on foreign lines and have to be settled for, it did not appear to the committee that this question justified an elaborate investigation.

It appears that there is but a small percentage of the total equipment of the country provided with partial metal underframes or subframes; that there is a clear distinction between cars with metal underframes, provision for which is distinctly made in Rule 113, and cars with partial metal underframes or subframes; in the former case the entire underframe is of steel, with superimposed or attached timbers of light section, serving merely as a means of securing the superstructure to the steel frame; in the latter case the partial metal underframe is really a subframe upon which the heavy longitudinal sills rest; or it may consist merely of two longitudinal members, placed parallel with or replacing the draft sills, and serving as a more substantial means of securing the draft rigging; in some designs the body bolsters are found riveted up with the frame; in others with the metal cross ties; in still others with both bolsters and cross ties; some are designed to dispense with the body truss rods; they are not in a strict sense car frames, but rather a form of continuous draft gear to which it has been found convenient to attach the body bolsters and cross ties. Some designs are patented, and the prices range between $40 and $300.

It is not clear to the committee whether this form of construction or better, perhaps, form of rebuilding is going to be extensively resorted to or not, but we are of the opinion that it is not. If it should, the question of the proper basis of settlement for cars so equipped, when destroyed on a foreign line, will become more pressing than it is to-day. The committee does not feel that it can, at this time, make a recommendation as to the amount that should be allowed for each design that has come under its notice, and it does not believe that it has seen all designs now in use; nor can it suggest an allowance that would represent a fair average for all designs. The committee is of the opinion that the allowance of $40, provided in present Rule 113, is not excessive for any of the designs.

In this connection, the committee desires to suggest that, in the third paragraph from the bottom of page 69, "40 tons or over," be made to read "less than fifty tons capacity," in order to conform with the phraseology in the fifth paragraph from the bottom of the same page, prescribing the allowance for box-car bodies, and for the further reason that there are many flat cars with steel frames mounted on trucks of 30 tons capacity; the body, being designed to withstand butting and jerking strains, is amply strong to carry a load of 40 tons or more, yet, on account of the character of the business of the owning road, it is advisable to mount the bodies on 30-ton trucks; it does not seem to us that the capacity of the trucks should affect the settlement for the body in this character of equipment. At any rate, there should be provision in the rules for settlement for 30-ton flat cars with steel frames.

The report is signed by:—R. E. Smith (A. C. L.), chairman, W. F. Bentley (B. & O.), I. S. Downing (L. S. & M. S.), H. L. Trimyer (S. A. L.), and F. A. Torrey (C. B. & Q.).

DISCUSSION ON SPLICING UNDERFRAMES.

Mr. Downing: The scarf splice is not a suitable splice for center sills, and the idea of the committee was to get the butt splice adopted for all sills, so that we would not be making scarfs on the end and butts on the center.

Mr. Hennessey: If this is to go to letter ballot, I think the section which reads that splicing, after September 1, 1910, must conform to it cannot be carried out.

Mr. Downing: That should be omitted. I move that the report be referred to the arbitration committee, to be considered next year.

The motion was carried.

CAR FRAMING, ROOFS AND DOORS.

"The Construction of Car Roofs," "End Bracing of Box Car Superstructure" and "Bracing for Side Doors" have been referred to this committee.

In addition to the information obtained through replies received in answer to the circular of inquiry, the members spent several days in the Baltimore terminals and other yards making examinations of box cars, as found in service and located about grain elevators, and of freight loading and unloading platforms, with a view of gaining any information that might assist in arriving at proper conclusions.

THE CONSTRUCTION OF CAR ROOFS.

No. 1. The most durable and economical roof is an outside metal roof of good quality of steel or wrought-iron sheets, with a minimum weight per square foot of 14 ounces, thoroughly and evenly galvanized with a minimum coating of



W. F. Bentley.

Chairman, Committee on Car Framing, Roofs and Doors.

zinc of 1½ ounces per square foot, and provided with flexible joints. Roof supported by a construction to carry at a safety factor of five, a uniformly distributed load of not less than 360 pounds per running foot of length of car.

No. 2. The carlines should be metal, so constructed in connection with purlins running lengthwise and roof boards running crosswise of car, to provide proper tie and bracing to side and end framing at roof line.

No. 3. We recommend that the above details be submitted to letter ballot, with a view of adopting as minimum requirements for Recommended Practice.

A. Our reasons are, that inside metal roofs are causing considerable trouble; after every effort to get a strong roof construction and after paying a very fair price for lumber entering into such a construction, they can not be held intact, on account of lumber splitting, shrinking, warping and decaying; also due to nails breaking, rusting or enlarging of nail holes, thereby failing to hold purlins or other parts, and permitting roof sheets or roofing boards to shift, lift off or slide out of place. With certain forms of construction the entire roof has been known to lift off, thus causing leaks; they are also liable to strike and rake passing trains; further, the metal inside sheets, which are mostly concealed, crack and rust out in time, causing leaks that can only be located with difficulty and considerable expense.

B. The double board and inside plastic, and similarly constructed roofs, have short life, due to decay and inability to hold intact.

C. We understand one railroad is applying, experimentally, a number of steel-riveted roofs made of plates about .1 of an inch in thickness; further, that there are on the market steel roofs and carlines, with the roof sheets removable and of heavy-gauge steel plates, which later construction of roof sheets provide flexibility.

END BRACING FOR BOX CARS.

No. 1. It is recommended that the minimum end construction for the box car of wood superstructure and of American Railway Association dimensions be provided with oak center end posts, 5 by 5, and oak braces, 5 by 5, or material of equal strength, substantially secured at each end through the medium of substantial pocket castings, properly lipped, to prevent shifting by strains due to ordinary shifting of any lading from within. An end plate should be provided equal to 4¼-inch Y pins in thickness, the end plate as well as belt rail or rails, to be strapped or very securely tied to side plate and side belt rails. The end lining to be 1¾ inches in thickness and to extend from about 1 inch above lower edge of end plate to within 3 inches from floor or subsill on cars so provided.

No. 2. The lining at upper edge of belt rail, or rails, to clear them by ½ inch, to permit grain, getting between lining and siding, to fall into car as it is unloaded; further, that at points where braces and posts meet near the bottom, openings be provided in the lining to permit grain and other similar lading, getting between lining and siding below belt rail, or rails, to fall into car as contents are unloaded.

No. 3. At the floor line where lining comes to within 3 inches of floor level or subsill on cars so provided, bevel strips measuring 3 inches on the square sides must be neatly and closely fitted and secured to floor between posts and braces to prevent grain pressure acting on inside of siding and forcing it outward; this to prevent grain leakage.

No. 4. The end construction, including floor, as well as floor at side and door posts, also floor at draft bolts, must be carefully fitted to prevent grain leakage at these points.

No. 5. Care should be exercised in new construction and repairs to keep inside surfaces as free from projections as possible, so as to meet the requirements of the American Railway Association Rules and the Interstate Commerce Commission Regulations for the transportation of explosives, inflammable articles and acids.

No. 6. In box-car construction with metal or part metal superstructure the end construction must be at least as strong as the minimum end construction of entire wood superstructure; further, the lining, flooring, bevel strips, etc., above specified, must be carefully carried out, and interior surfaces must be smooth, to prevent damaging of lading.

No. 7. We recommend that the above details be submitted to letter ballot, with a view of adopting as a minimum requirement for Recommended Practice of the M. C. B. Association.

A. Our reasons for the above are, that the minimum dimensions for material as specified, with secure end pockets, also tieing, etc., are not excessively strong, and break in case of severe rough handling.

B. We are submitting for information of those interested a drawing, which shows a method of end bracing in use on some cars, and which seems to have considerable merit and might be employed to advantage when repairing old equipment.

BRACING FOR SIDE DOORS.

No. 1. The outside-hung, side-sliding door, per drawing No. 2, also flush side door, per drawing No. 3, are to represent the minimum requirements in the door construction and details shown. Care should be exercised in selecting proper fixture details for use as part of the complete box-car side doors.

No. 2. We recommend that the above, on bracing for side doors of box cars, including drawing herewith submitted, be submitted to letter ballot, with a view of adopting as Recommended Practice of the M. C. B. Association, and to supersede the Recommended Practice as included to date on this subject.

A. Our reasons for the above are that side doors of box-car equipment are generally found in poor shape in many respects, and we feel that we can not impress upon the members of this convention too strongly or forcibly the necessity of greater care being exercised in the design of new doors and the maintenance of existing doors and parts connected therewith. Passing trains are being scraped and other accidents are occurring by doors falling off or swinging out.

B. In the examination of many cars loaded and empty in

various yards, the committee was forcibly impressed with the fact that door tracks, door hangers, door hasps, door-hasp keepers, door hoods and door-guide brackets are not being maintained in proper repair on existing cars, and in many cases doors were found worn or broken away at corners, to the extent that when they were closed the door-guide brackets would not engage or hold doors at the bottom.

C. We further recommend that the door-hood coverings be omitted from new cars, and as much as possible in repairs to old cars, not only on account of becoming loose, but for the more important reason that they conceal and prevent proper inspection of the door tracks, door hangers and door rollers, thus preventing proper maintenance and menacing passing trains.

D. It will be noted on the drawing for the outside-hung sliding door, as submitted, that some modifications have been made since the same door was submitted for consideration at the 1909 convention, to meet criticisms made. The changes are as follows:

1. A lip has been added to the open door-stop, which is fastened to belt rail so as to better support the door from swinging out when in a full open position.

2. A note has been added to the drawing in substance as follows: "There must not be less than two bottom door-guide brackets supporting the door in any position, and not less than three bottom door-guide brackets supporting the door in the closed position." This note is added to emphasize the committee's location of bottom door-guide brackets, and we are satisfied, if closely followed, will overcome most of the trouble now experienced with outside doors swinging out.

3. A change has been made in the door handle, for the reason that men operating doors equipped with handles similar to the one on 1909 committee's drawing complained that door handles cut into gloves and hands.

4. Closed door wooden stop and stop brackets have been moved back a sufficient amount to give the door opening the full clearance provided for in the frame.

E. In considering the matter of flush car doors, the one that seems to be in most general use and which seems to give the most satisfaction is the Wagner car door substantially as shown in the M. C. B. 1896 Proceedings on page 286. Some changes have been made by lipping the upper door operating rod slides over the top rail and increasing the rabbet at sides of door from ⅞ to 1½ inches.

F. The men at freight houses who operate these doors claim they open more easily than outside-hung doors, because the first movement of the car door is away from the load and car, while outside-hung sliding doors are frequently retarded in sliding by bulged sides, etc.

G. We know of no patents on the Wagner door and details as shown on drawing submitted.

H. We are also submitting, for information of those interested, prints showing general arrangements of "The Horn flush car door," which several members of the committee had an opportunity to see operated on a car, but as patents are applied for on this device, prints are submitted without comment.

The report is signed by:—W. F. Bentley (B. & O.) chairman; J. A. McRae (Mich. Cen.), R. S. Miller (N. Y. C. & St. L.), C. F. Thiele (Penna. Lines), and G. W. Lillie (St. L. & S. F.).

DISCUSSION ON CAR FRAMING, ROOFS AND DOORS.

H. L. Trimyer (S. A. L.): The report states that purlines should run lengthwise of the car and the sheathing boards crosswise. We have done this, and with the outside metal roofs that are now being used we are firmly of the opinion that longitudinal sheathing of the car is a better way of strengthening the car and the sheathing, and that the running of the boards crosswise under the metal roof is not satisfactory.

We are a little behind the times in the matter of end braces. We have been applying wooden posts for several years, reinforced by I beams, angle bars and Z bars, and with other reinforcement, and in the south this reinforcement has not proven satisfactory in handling dressed lumber and we have practically gone to the steel framing. Our experience is that one and one-quarter in. end lining is ample to protect any lading from breaking through the end of the car, will take care of any shock that will come at that point, and will tear the corner of the car loose before permitting any damage to be done. The 1¾-in. lining would be an unnecessary expense, and the corners of the cars as designed, are not of sufficient strength to require 1¾-in. end lining.

Our traffic in the south is principally perishable freight and lumber, and lading of that character. We have been working on our ends for a good many years, and they are one of the greatest expenses we have to-day, especially on the old cars, but we believe firmly that a 1¼-in. end lining is amply thick.

C. A. Seley (C. R. I. & P.): I agree with the previous speaker as to the advisability of using longitudinal roof boards, particularly with steel upper-framed cars, and I would not like to see as Recommended Practice, the necessity for cross roof boards and the use of purlines. I believe the end linings should be 1¾ in.

J. J. Hennessey (C. M. & St. P.): I have had some experience with longitudinal boards on roofs. Thirty-five years ago I think possibly there were 40 per cent of the cars that had the old circular roof, and the boards were placed lengthwise of the car. These roofs were not in service more than three or four years when the torsion of the car practically tore them all loose. We have used metal outside roofs, commencing in 1892, and our practice has been similar to what is recommended in the report, the boards running crosswise of the car. You strengthen the roof in the cheapest way by gaining in your purlines ¼ in. or ⅜ in. over each carline.

T. H. Curtis (L. & N.): We have all had a great deal of trouble with the outside door getting loose; in switching and shunting the door gets away from the side of the car. The trouble lies chiefly in the fact that we do not fasten the door. The cut shows the door hasp to be ¼ in. thick, but it does not give any width. The malleable iron people generally sell these by the piece and make them as light as possible. The drawings do not show any method of securing the door to the closed door stop, except that there are two holes. The door hasp has two bolts, and that is a move in the right direction; but these bolts are 3-in. centers. It is necessary to widen the clearance, especially with the wide doors used on automobile cars, so as to have more of a door. I have known of new cars only two or three weeks old which have had this hasp taken right out of the door, and we should show some Recommended Practice for a minimum of these fixtures, especially showing how to hold these large and very heavy doors. I am satisfied that this present method is not adequate.

W. K. Carr (N. & W.): The door stop is one of the weakest things in the outside door. It is shown as 2 x 3¾ in. Sometime ago in going through our yards I noticed many of the door stops were cracked; if you use a Z bar and do away with the door stop, it would protect the door from breaking. We have a great deal of damage to lading due to the rain beating in. When the hasp is brought over the staple you have a space and only 1 in. of rabbet for the door to lap over. By using a Z bar instead, you would thus accomplish two things.

C. A. Seley: I believe that sooner or later a great many of the roads now using steel under-frames will appreciate the value of using steel for the upper part or frame as well. The committee has taken a step in that direction in recommending steel columns. The state of the art and the equipment of the country is such that it would be unwise at this time to submit the matter of roof construction and car lines to letter ballot, and I move, therefore, that that portion of the report be not submitted to letter ballot, including all the recommendations for letter ballot under "The construction of car roofs."

The motion was carried.

The President: There are two other subjects to be considered under "End bracing for box cars" and "Bracing for side doors."

Mr. Trimyer: I move that the recommendations of the committee under "End bracing for box cars" be not referred to letter ballot.

The motion was carried.

The President: That leaves for consideration the question of bracing for side doors. What will you do with the recommendations of the committee?

R. L. Kleine (Pennsylvania): I move the recommendations of the committee relating to bracing for side doors be referred to letter ballot. This question has been up for the last two years. In the present recommended practice we have an obsolete door. The committee has done excellent work in securing decided improvement in side door construction.

The motion was carried.

TANK CARS.

In the report to the last convention, attention was directed to tank cars constructed without side sills on which no means are provided for jacking to facilitate handling in derailment and repairs. In order to determine the necessity for these jacking castings, tests were made with a loaded tank

car, limit weight 132,000 pounds, fitted with continuous center sills, but no side sills, and not equipped with jacking castings; also with a loaded tank car, limit weight 132,000 pounds, constructed with reinforced shell, having no center sills or side sills, and not equipped with jacking castings; which involved the following detail operations:

LOADED TANK CAR, LIMIT WEIGHT 132,000 POUNDS, CONSTRUCTED WITH CENTER SILLS AND HAVING NO SIDE SILLS OR JACKING CASTINGS.

Inside pair of wheels removed and replaced:

1. Block wheels in truck at opposite end of car from which inside pair of wheels are to be removed.
2. Block between side bearings on opposite end from which wheels are to be removed.
3. Block between tank and top of center sill construction, to prevent deflection of sills.
4. Place two 35-ton jacks immediately back of coupler and raise tank body 13 in., which was minimum height to clear inside pair of wheels for removal.
5. With two light-capacity jacks, jack truck frame from which wheels are to be removed sufficiently to support load with blocks under the arch bar at eolumn bolts.
6. Remove and replace inside pair of wheels.

Total time elapsed, 35 minutes for 5 men.

NOTE.—When the two 35-ton jacks placed back of coupler were supporting the weight at this end of car, with blocking in between top of center sills and underside of tank, the center sills deflected ¾ in. After the jacks were removed and the weight was placed upon the trucks the center sills showed a permanent set of 3-16 in.

Outside pair of wheels removed and replaced (the same blocking on other truck, as well as blocking between center construction and tank, in place):

Place two 35-ton jacks under center construction just back of coupler, to support the weight, then jack under arch bars with two light-capacity jacks to raise truck sides slightly and block under arch bars to steady load and support weight. Remove the two 35-ton jacks under center construction so that the wheels can be rolled out. Time, 6½ minutes for 5 men. Return operation: 18 minutes for 5 men.

Truck, removed and replaced (the same blocking on other truck, as well as blocking between center construction and tank, in place):

Jack car under center construction, just back of coupler, to permit removal of truck, then jack and block for safety back of truck to be removed (blocking on hand). Continue jacking until side bearings of body clear wheels. Raise blocking back of truck and wedge tightly. Remove jacks back of coupler and run truck out. Time, 32 minutes for 2 men.

Return operation: Replace trucks and make brake connections. Total time. 57 minutes for 2 men.

LOADED TANK CAR, LIMIT WEIGHT 132,000 POUNDS, CONSTRUCTED WITH REINFORCED SHELL, HAVING NO CENTER OR SIDE SILLS, AND NOT EQUIPPED WITH JACKING CASTINGS.

Truck, removed and replaced:

Block wheels and side bearings on other truck. Remove air pipe and piston and disconnect brakes. Place two 35-ton jacks back of coupler. Block up under side bearings after raising tank 8 in., then place 9 by 10 in. timber and saddle back of truck and set one 30-ton jack under center of same, to support weight while resetting 35-ton jacks at both ends of timber, placed back of truck, then raise on all three jacks at same time until draft arrangement on end of car is sufficiently clear of truck to permit removal. Time removing truck, 36 minutes for 4 men.

Return operation: Replace truck. Remove the two 35-ton jacks from the 8 by 10 in. timber back of trucks and place them back of coupler, in order to lower tank on the trucks. Total time with all connections made, 49 minutes for 4 men.

Inside pair of wheels, removed and replaced (permanent planking between rails, and opposite truck and side bearings blocked):

Place two 35-ton jacks back of coupler, then place two 15-ton jacks at sides of truck to raise weight of truck and release wheels. Remove wheels in 9 minutes. Replace wheels in 10 minutes. Total time removing and replacing inside wheels, 19 minutes for 2 men.

Outside pair of wheels, removed and replaced (permanent planking between rails, and opposite truck and side bearings blocked):

Place two 35-ton jacks back of coupler, jack weight of car from trucks, and then set two jacks under truck frame and jack weight of truck. Place blocking under center of arch bars. Remove the two 35-ton jacks from under the coupler and remove outside pair of wheels. Time consumed, 15 minutes. Replace wheels and reset two 35-ton jacks back of coupler, raise weight of car, then remove side jacks and blocking from under arch bar and remove jacks from back of coupler. Time consumed, 10 minutes. Total time removing and replacing wheels, 25 minutes for two men.

In addition to these tests made by the committee as a whole, the individual members of the committee looked into the matter at their home shops, and, while they found comparatively few cases where it was necessary to jack loaded cars not equipped with side sills for the removal of wheels and still a lesser number for the removal of trucks, the consensus of opinion is that jacking castings are desirable to promote safety in doing the work, aside from the question of additional labor involved when these cars are not equipped with suitable jacking castings. The most suitable location would seem to be at the body bolster.

Inasmuch as there are freight cars of other types in service which should also be provided with suitable jacking castings, on account of the present difficulty experienced in jacking up cars not equipped with side sills of sufficient section to withstand the pressure of the head of the jack, this question become one of general importance, and the committee would, therefore, recommend that a special committee be appointed to go into this question generally, so that any Recommended Practice adopted will cover the whole situation.

With this question eliminated, the work of the committee is practically concluded, and, as the provisions of the Tank Car Requirements have now been Recommended Practice for a number of years, your committee would recommend that the present Recommended Practice be advanced to Standard and the committee discharged.

Inasmuch as the various railroads are now printing their own tank car circulars, we think it would be advisable for the M. C. B. Association to have them printed in pamphlet form, so that they can be purchased by the various members at a nominal sum, the same as the Interchange Rules and the Loading Rules.

The report is signed by:—A. W. Gibbs (P. R. R.), chairman; C. M. Bloxham (Union Tank Line), S. K. Dickerson (L. S. & M. S.), and J. W. Fogg (Chicago Ter. Trans.).

DISCUSSION ON TANK CARS.

C. M. Bloxham (Union T. L.): It is rather a delicate matter for me as a member of the committee to criticise the report, but I take exception to the recommendation of the committee as a whole in respect to that feature of it referring to the discharge of the committee. I am sure that Mr. Gibbs, the chairman of the committee, will not misunderstand me when I say that I consider it very important that the committee, at least the chairman of it, should continue the work in respect to the design of the jacking casting for the particular type of tank car referred to. It presents an exceedingly difficult problem to solve, and inasmuch as the present committee has given considerable study and thought to the matter, and has conducted some experimental work in relation to it, and has realized the difficulties and some of the dangers involved in the matter, it should continue the experimental work.

A. W. Gibbs (Pennsylvania): Having been the chairman of this committee for about seven years, I may say the conditions now and the conditions at the time the committee was appointed are very different. At that time the tank car equipment was probably the worst equipment running. The construction was obsolete and some bad wrecks and fires showed the necessity for radical change. In the seven years this committee has been working the owners have generally met the new requirements and at the present time tank car equipment will compare favorably with other equipment. For one I feel that the time has come when we can treat tank cars as we treat other cars. We had to put on a number of requirements, you will remember, about wheels, because of the peculiar loading of tank cars. That point has been taken up and put into the regular working of the cars, under Rule 23, and I think the time has come when the tank car is no longer an unusual or peculiar car, so that its consideration requires a special committee.

R. L. Kleine: I move that the present recommended practice for tank cars be submitted to letter ballot for adoption as standard.

The motion was carried.

TRAIN PIPE AND CONNECTIONS FOR STEAM HEAT.*

The committee, continued from last year, was instructed to report on universal interchangeable steam hose coupling dimensions for both train pipe and connections. The committee decided to make tests to get a comparison between

the large hose and couplings and medium hose and couplings. Tests were conducted at Collinwood, in March, 1910, on a train of thirteen cars, equipped with 2-inch pipe in the usual manner: Inlet controlling valves were all closed; steam was turned on at head end of train and time noted. When water appeared at rear end the time was noted; when steam appeared time was noted. When steam appeared the valve on rear end was closed. Time to get 10, 20, 30, 40, 50, 60 pounds



I. S. Downing.

Chairman, Committee on Train Pipe and Connections for Steam Heat.

such that their passenger equipment seldom interchanges with the roads using the medium coupler; therefore, no difficulty whatever, so far as we can see, will ensue if the roads now using the large coupler continue to use it and the roads now using the medium coupler continue to use it. It in rear car was noted.

From the data obtained, we find, of course, that the large coupling will allow steam to pass more freely than the medium, but the difference is not so great as to be of much consequence. We believe that either large or medium is entirely satisfactory. When the Master Car Builders adopted the large coupling and hose as recommended practice, in 1903, many prominent railroads immediately accepted the recommendation and put the large equipment on all of their passenger cars and passenger locomotives. On the other hand, there are prominent railroads using the medium equipment, which is doing good work. The investment in large and medium couplers is of considerable magnitude; fortunately, the location of the roads using the large coupler is

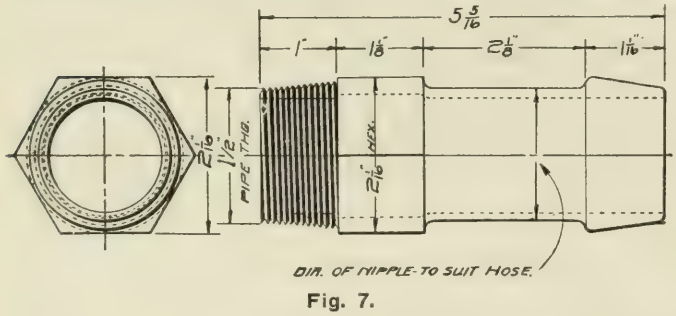


Fig. 7.

would certainly be asking a great deal of either the users of the large or medium couplers to change, and for this reason your committee would not recommend either for standard of this Association.

In regard to end valves: We had the different makes mounted on a rack. It would not be possible to adopt any one of these valves as standard without causing a great expense to the railroads using the other valves, and for this reason we would not recommend any end valve as standard at this time.

RECOMMENDATIONS.

1. Two-inch train line.
2. Location of steam train-line signal and brake pipe as shown on M. C. B. Sheet Q, with the following note: "The dimensions underscored should be maintained, but departures from other dimensions are allowable to suit conditions. Opening shown on steam line is the opening of train end valve."
3. End train-pipe valves.
4. Hose to be 31 inches from face of coupler gasket to end of nipple.
5. Nipple on coupler to be 20 degrees minimum and 25 degrees maximum angle with horizontal.
6. Nipple as shown on Fig. 7.

The committee is indebted to the Lake Shore & Michigan Southern Railway Company for furnishing equipment, men and other necessities to make this test, and to the following steam-heat companies for supplying end valves, hose and couplings: Chicago Car Heating Company, Consolidated Car Heating Company, Gold Car Heating Company, Safety Car Heating & Lighting Company, Ward Equipment Company.

The report is signed by:—I. S. Downing (L. S. & M. S.), chairman, H. E. Passmore (T. & O. C.), T. H. Russum (B. & O.), and J. J. Ewing (C. & O.).

DISCUSSION ON TRAIN PIPE AND CONNECTIONS FOR STEAM HEAT.

The President: The committee has made these recommendations, but I do not see that they have stated just what they want done with them.

Mr. Downing: They are recommended for standards. Hose No. 4 and hose No. 2 are now recommended practice. I believe hose No. 1 is also recommended practice. The committee was appointed to go into the present practices to see whether they should be advanced to standards or not. We recommend that they be advanced to standards.

C. E. Fuller (U. P.): It seems to me that the work of the committee is not complete. I see no reason why we should not have standard nipples for steam heat hose the same as we have for air-brake and train signals. I move that the committee be continued with a view to recommending next year dimensions for standard steam hose; also to reconsider all its recommendations and prepare a specification for steam hose.

J. J. Hennessey (C. M. & St. P.): We should have but one standard. Some of the roads went to a great deal of expense changing their steam lines to 2 in. It is quite necessary; on a very long train the smaller hose does not meet the requirements on the rear cars.

Mr. Fuller: My motion was not with the intention of forcing the roads into a lot of changes, but I do feel that this association should have a standard steam heat hose, standard sizes and standard connections for those who want to use them.

G. W. Wildin: I think the committee should get busy and define the openings of steam passages, so that when the automatic coupling does come they will have to meet the requirements of that opening. We will not, then, have the same variations in the automatic couplers as we have now in the present style of coupler.

The motion made by Mr. Fuller was carried.

BUREAU OF INFORMATION

The Official Railway Guide Bureau of Information is performing a valuable service, not only in furnishing complete information as to all trains leaving Atlantic City by whatever road, but also in relieving members and guests from the trouble of getting tickets and making Pullman reservations. The Bureau has prepared a complete time table of all trains to New York and Philadelphia by both the Pennsylvania and the Philadelphia & Reading, and is also distributing a blank providing for the following entries: Name, booth, time of leaving, by what road and destination. The order, to be left at Booth 34 near the main entrance, will be filled by the purchase of tickets and the reservation of Pullman space, which will be marked on the blank and signed by the agent at the ticket office. The ticket, etc., will then be left at the booth designated.

The United States Express Company is showing its usual promptness in connection with matter intended for members and guests of the convention. Mr. Ewan, who supervised matters in 1909, is in charge of the company's affairs here this year.

Conventionalities.

George W. Smith, superintendent of machinery of the Missouri Pacific, cannot attend this year's conventions on account of a press of important matters.

Arthur Masters, sales agent of the U. S. Metal & Manufacturing Company, arrived Tuesday. He is one of the concern's "Barol" Leech experts.

R. T. Bryden, of the Wadsworth-Howland Company, is always here; not with "Carburet" and "Durelastic," however, but with his usual "glad hand" and bully stories.

"Happy Frank" Bingham, of the Union Fibre Company, owns a gold mine in British Columbia and works for his living in Chicago.

J. G. Barry, manager of the railway department, and H. L. Monroe, manager of the railway department in the Chicago office of the General Electric Company, arrived Saturday and are stopping at The Shelburne.

Mrs. J. F. Dunn, Salt Lake City, wife of the superintendent of motive power and machinery of the Southern Pacific, is attending the conventions after an absence of five years. Mrs. Dunn is a most welcome addition to the ranks of the ladies.

Walter B. Leach, general manager and treasurer of the Hunt-Spiller Manufacturing Corporation, accompanied by Mrs. Leach, is again in attendance at the conventions. This year Mr. Leach is spending less time than usual at the exhibit, as he has more assistants. This speaks well for the company's business and its activities in the railway field.

Mr. and Mrs. H. W. Leeds arrived Sunday evening on the Pennsylvania Limited from Chicago, their home. Mr. Leeds is manager of the railway sales department of the Union Fibre Company. He was formerly a railway official; this is his first convention as a supply man. It is also Mrs. Leeds' first convention, and her addition to the ranks of the convention ladies will be welcome. Mr. and Mrs. Leeds are stopping at Haddon Hall.

Jim Gardner and Mrs. Gardner arrived yesterday from Chicago with Mr. and Mrs. P. R. Kimberly as guests. They are stopping at The Shelburne. Jim has shipped his automobile to New York, and with his guests will make a trip from there to the White Mountains and then back to Chicago. The party will stop at Shelburn Falls, Vt., to visit the grave of Jim's long-time friend, Julian Yale.

Remember that the struggle for the possession of the forts and the winning of the prizes in the Military Euchre will take place in the ballroom on the pier Friday evening, and that there will be room for every one who knows the difference between the ace and the joker.

Robert P. Lamont, first vice-president of the American Steel Foundries, arrived Wednesday and is stopping at the Marlborough-Blenheim. Mr. Lamont will remain several days before returning to his home in Chicago. President William V. Kelley, of the American Steel Foundries, is expected here the latter part of the week.

Frederick W. Sivyer, president of the Northwestern Malleable Iron Company, and one of Milwaukee's most prominent and respected citizens, died last Saturday at his home in Milwaukee. He was a lover and benefactor of school boys and at his own expense founded the Milwaukee School of Manual Training for Boys.

C. E. Barry and F. H. Gale were the early arrivals from the general office of the General Electric Company.

M. E. Davis, eastern representative of the Western Wheeled Scraper Company, is here and is stopping at the Marlborough-Blenheim and is accompanied by his wife and secretary.

The Adams & Westlake Company representatives, including G. L. Walters, Chicago, and E. L. Langworthy, Philadelphia, are quartered at the Traymore. The old-time attendants at the conventions will miss the presence of the genial Fred B. Jones, secretary and later on one of the directors of the Adams & Westlake Company, who has retired from the cares of business life.

H. J. Small, general superintendent of motive power of the Southern Pacific, will not be able to attend the conventions this year, much to the regret of his many friends. Mr. and Mrs. Small have only recently returned from a three months' trip to the Orient, having visited China, Japan, Korea and the Philippines. Mrs. Small has greatly improved in health during the past year. Many of the younger set of those who attend the conventions will miss the presence this year of Miss Barbara Small, who formerly was a regular attendant with her father and mother.

Major H. C. Howell, manager of the railway department of the Fidelity & Casualty Company, New York, is here on his annual pilgrimage to meet his old acquaintances at the conventions and to make a few new ones. The Major takes an optimistic view of the railway and financial situation, provided the people most interested will continue their legitimate work of sawing wood and meanwhile refrain from too great lingual activity.

Answering many inquiries concerning the absence of H. S. Hayward, superintendent of motive power of the Pennsylvania Railroad and first vice-president of the New York Railroad Club, we regret to state that Mr. Hayward has been obliged, on account of ill-health, to take a leave of absence and will be at the hot springs of Virginia for a month or more. His address is Healing Springs Hotel, Bath County, Va.

Among the old-time faces we note David Holtz, who was for more than thirty years master of machinery of the Western Maryland. Mr. Holtz doesn't look one day older than he did ten years ago. And he's just as active. His hobby is work. They tried to retire him, but he wouldn't down. He's keeping body and brain active by selling wood and metal working machinery. With him it's like running a farm, though. He considers himself lucky when he breaks even.

C. A. Seley has relieved his system of a conundrum: "What is worse than a worm in an apple?" Remembering the old one about the white sheep and the black sheep and their eating capacity, you naturally answer, "Two worms." Seley says that that is a fairly good answer; but the correct answer is, "Half a worm." Why? Because you have the other half in your mouth—yah!

Perhaps we can stop the flood of inquiries by explaining that Clarence H. Howard is not here because he can't be in two places at the same time. Mr. Howard sailed for Europe a few days ago, and while abroad will attend the International Railway Congress (we won't add "at Berne," because the printer will run out of the letters used in those words if we repeat them much more). He has turned over his office keys to Vice-President Harry M. Pflager, while his brother, George E., will represent him here at Atlantic City. Mr. Howard has his son, Blake Clinton Howard, with him, and they are staying at the Runnymede. Young Howard is a student in the engineering department of Washington University, St. Louis.

Herbert W. Green, of the firm of Burton W. Mudge & Company, has been in ambush on a side track for the past few days, lying in wait for the stork from which he has wrested a nine-pound boy. He has now boarded a special train which has been waiting for him for four days with steam up. He has passed through Pittsburgh, and is expected at Atlantic City in time to save the M. C. B. Convention. P. S.—He left the boy at home.

The origin of the present systems of cash and parcel carrying in stores, and which from stores has extended to the pneumatic mail service in cities and many forms of package delivery for longer or shorter distance, may be traced to the device installed in his store in Lowell, Mass., by W. S. Lamson, now president and general manager of the American Mason Safety Tread Company. The first arrangement was improvised from a wooden rain spout set on an incline and designed to carry a wooden ball holding cash from the clerk to the cashier's desk, and another spout to return the change from the cashier to the clerk. The utility was so marked that necessity for improvement was manifest; and what has followed in the way of invention is now to be found wherever light and quick transportation service is pressing. Mr. Lamson is visiting in Atlantic City, and is much interested in the exhibits on the pier.

PULLMAN TRANSPORTATION.

Free Pullman transportation can be had upon request to E. A. Benson, mechanical engineer, of the Pullman Company, at Galen Hall. Only the members of the association who are entitled to such transportation can procure it.

CLUB SECRETARIES' DINNER.

The annual dinner of the Railway Club Secretaries' Association will be held on Saturday evening at 7 o'clock in the garden of the Windsor Hotel, weather permitting. If not weather is inclement the dinner will take place in the cafe of the same hotel.

MASTER CAR BUILDERS' BALL

The Master Car Builders' ball last evening was made an eminently successful event, due largely to a novel feature introduced by the committee in charge by means of which the usual difficulty in finding partners was wholly obviated. Around the hall were arranged 12 banners each bearing the name of one of the larger cities, and on the "Order of Dances" was provided opposite each dance a space, not only for the name of the partner for that dance, but also for the entry of the name of the city designating the banner under which the partner was to be found, for instance, opposite Dance No. 8 was entered on both the lady's and gentleman's card the name "Chicago," indicating that for that dance the parters would meet under the banner bearing the name of that city.

The grand march was a very simple one and thus some of the awkward situations that have sometimes been experienced were avoided. It was led by F. H. Clark and Mrs. Clark, personally conducted by J. Will Johnson, chairman of the entertainment committee. The leaders were followed by other officers of the association and their ladies and next in line followed former officers.

The favors for the ladies were directory canes decorated with ribbons, one being handed to each lady before the close of the march. Music was furnished by the Old Guard orchestra. The committee in charge of the ball consisted of J. L. Connors, chairman; W. J. Walsh, E. S. Toothe, J. C. Younglove, E. P. Smith, Frank Martin, George Moses, C. M. Garrett, H. E. Oesterreich, Bartram Berry, C. W. Wardell and Frank Farmer, Jr.

ROCK ISLAND 66-FT. STEEL BAGGAGE CARS.

The Rock Island has recently received from the American Car & Foundry Company, New York, thirty 66-ft. steel baggage cars, and the Frisco line seven of the same kind, making a total of thirty-seven cars, similar to the one here illustrated. The cars are equipped with six-wheel trucks with cast steel frames, the two trucks weighing 42,900 lbs., and the car body 83,400 lbs., making a total of 136,300 lbs.

The principal members of the steel underframe are the two center sills, which are 10-in. I-beams, 35 lbs. per ft., and the side sills, 6 x 6 x ⅜ angles. There are no cover plates



Baggage Car; Chicago, Rock Island & Pacific.

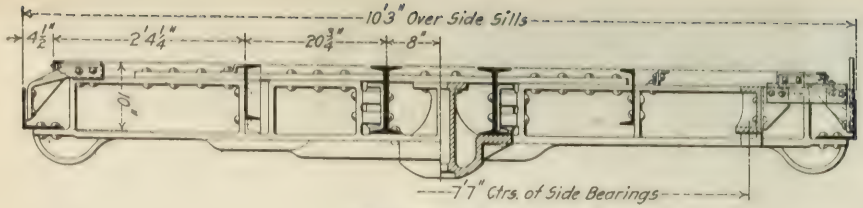
on the center sills, but there is horizontal diagonal bracing through the floor made of 2 x ½-in. bars. The double body bolsters, made by the Commonwealth Steel Company, are arranged so that the center sills are continuous. These sills are intended to carry the buffing stresses, and the principal portion of the load is carried by the trussed side frame. To transmit the load to the side sills there are, in addition to the body bolster, five special pressed steel U-shaped cross bearers which are 6½ in. wide, 7½ in. deep and ¼ in. thick, and directly above them, between the sills, are diaphragms made of special pressed channels ¼ in. thick and the full depth of the sills. This side framing is made of metal posts and braces, something like the construction used in wooden box cars. The principal diagonals are 5-in. 9-lb. channels and the posts 3 x 3 x ⅜ angles, with a belt rail made of 4-in. channels, 5¼ lbs. per ft. The side plate is 5 x 3 x 5-16 angles,



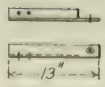
Interior of Rock Island Baggage Car.

and the side covering ⅛-in. steel sheets. The arrangement of the side trussing is shown on interior view, which does not include the corrugated steel lining.

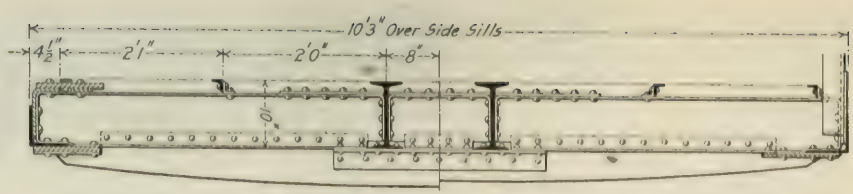
The floor consists of Keystone flooring covered with acandolith cement, and on top of this 1¼-in. wood flooring. The cars are lighted by the axle system supplied by the Safety Car Heating & Lighting Company, New York, and vapor steam heat is used with Spear stove auxiliary.



Sections at Bolster.

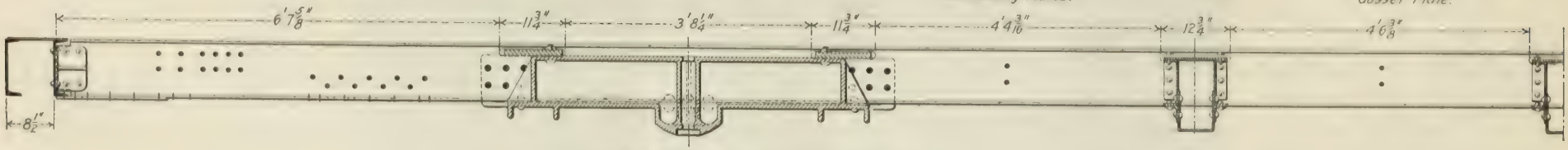


Floor Support
1½" x 1½" x ¼" L.

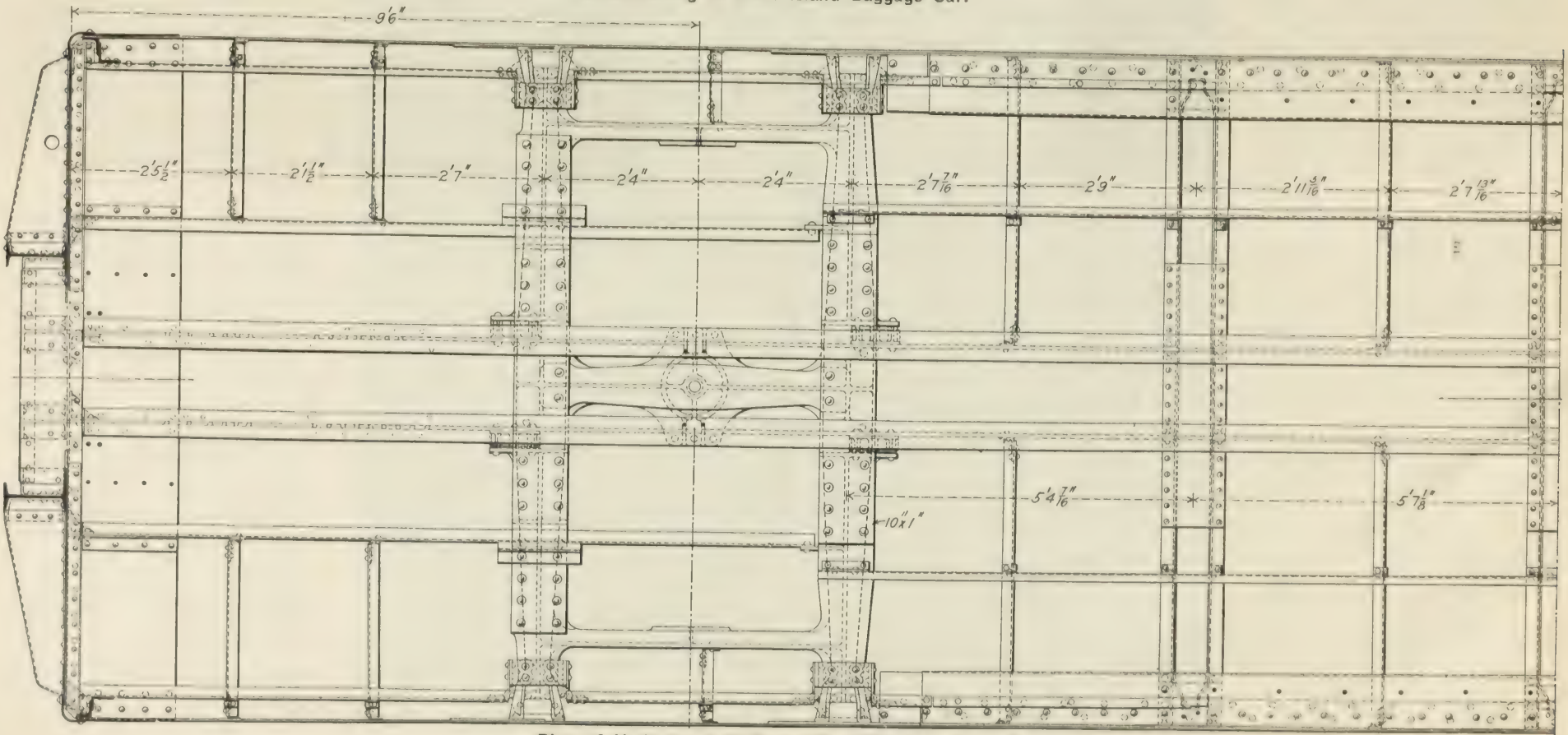


Section Showing Crossbearer and Reinforcing Plates.

Section Showing Crossbearer and Gusset Plate.



Underframing of Rock Island Baggage Car.



Plan of Underframing; Rock Island Baggage Car.

The Exhibit.

L. W. Shugg, who is now advance courier in installation of exhibits for the General Electric Company, Schenectady, N. Y., will remain in charge of the exhibit during the convention.

The Buffalo Brake Beam Company's exhibit of truss and solid brake beams is receiving much attention. Its new type of truss beam is shown for the first time at this convention.

The Landis Tool Company, Waynesboro, Pa., has a quantity of worn piston rods which it uses in its demonstration. These show what actually can be done with these parts.

G. C. Bohn, vice-president of the White Enamel Refrigerator Company, St. Paul, Minn., reports a large business for the new Bohn system of car refrigeration. Recent orders include many from leading railways and the Pullman Company.

The booth of the Gold Car Heating & Lighting Company, New York, is attracting unusual attention this year. This company's excelsior vapor valve, which can be applied to any system of car heating, converting it into vapor or combined pressure and vapor, is a marked advance in the art of car heating.

J. H. Bracken, assistant general manager of the Union Fibre Company; F. J. Bingham and S. E. McPartlin, general sales agents of the same company, and H. W. Leeds, manager of railway sales, arrived Sunday to attend the conventions and take charge of the company's attractive display on the steel pier.

H. W. Leeds, railroad sales manager of the Union Fibre Company, Winona, Minn., has of late given so much time and study to the designing and construction of the Union Fibre Company car showing Linofelt insulation (to be seen on the P. & R. side tracks at Atlantic City) that the car has been not inappropriately called the Leeds private car.

If any person has an order in his pocket for one or more of the several Commonwealth Steel Company products, he will find them lined up in surrender formation at booth 315. "Them" are George E. Howard, vice-president and general sales manager; Boone V. H. Johnson, vice-president and sales agent; Frank S. Barks, mechanical expert; and Burton W. Mudge, president of Burton W. Mudge & Company, of Chicago.

On the numerous "ungetatable" connections on locomotives and cars, the Jefferson union is claimed to be by far the easiest to install. There is no gasket required, and the brass ring is held firmly in place in a channel cut to fit exactly. The brass to iron seat makes it easy to disconnect them, also. The device is made by the Jefferson Union Company, Lexington, Mass.

In the Jefferson brass to iron seated union the effects of expansion and contraction are reduced to a minimum, as the quantity of brass is so small. It is simply a ring, cut from seamless brass tubing and sunk in a channel. The absence of internal strains makes it better able to resist the external strains of rough usage on locomotives. It is made by the Jefferson Union Company, Lexington, Mass.

Anderson Polk (alias W. A. Polk), of the enrollment committee, who was for 14 years associated with the Patterson-Sargent Company, became associated several months ago with Lowe Brothers Company, Dayton, Ohio, as its Eastern representative. An error was made in listing Mr. Polk as still associated with the Patterson-Sargent Company.

The Crawford Locomotive & Car Company, Streator, Ill., manufacture and rebuild freight cars of all designs according to specifications of the purchaser or from its own designs. This company has special shops for rebuilding and reinforcing freight cars with steel underframes. The plant consists of thirty-two acres, and is equipped with modern machinery and tools. It is located on the Atchison, Topeka & Santa Fe, Wabash, Chicago & Alton and New York Central Railways.

The National Tube Company, Pittsburgh, Pa., manufacturers of the famous Kewanee union, also make the Kewanee flange union. In addition to the advantage of requiring no gasket, the construction is such that the flange is loose on the collar, and the bolts match the holes in any position of the flange. A tight joint is assured even when the pipe alinement is imperfect.

The American Car & Foundry Company, New York, installed Mason safety tread on 60 new passenger cars for the New York Central lines. The 50 Hudson & Manhattan cars were floored with car Karbolith and Karborundum Karbolith surfacing. On the 110 cars for the Interborough Rapid Transit it used Karborundum Karbolith surfacing material. This last material is proving decidedly satisfactory, as it not only wears exceedingly well but is non-slippery and tends to prevent accidents. These specialties are made by the American Mason Safety Tread Company, Boston, Mass.

A very interesting exhibit of a roller side bearing is shown this year by The T. H. Symington Company, Baltimore, Md. The single roller of white iron is carried in the body member, and is positively centered by two coil springs in the ends of the retaining casting, the springs exerting pressure on the roller through the medium of small malleable iron followers. The followers are so designed as to push the roller down on its trunions when it is not in contact with the truck member, which avoids any possibility of its rattling in its retaining chamber when not under load. The truck member of this side bearing consists only of a hardened steel wear plate securely fastened to the truck bolster.

The Galena-Signal Oil Company, Franklin, Pa., hasn't what one would ordinarily term "an exhibit;" but it is here in force, as in previous years. Its reception booth, which is tastily furnished, it will be open every day, Sunday excepted. The company is represented by the following officers, salesmen and mechanical experts: S. A. Megeath, first vice-president and general manager; C. C. Steinbrenner, vice-president; E. V. Sedgwick, manager mechanical expert department; Harry Hillyer, Fred A. Guild, Barton H. Grundy, George L. Morton, John W. Bunn, J. P. Ferguson, A. I. Gifford, E. W. Grieves, William Holmes, E. G. Johnson, W. E. Maher, L. H. Palmer, P. H. Stack, W. J Vance and W. J. Walsh.

There is no particular reason under the New Jersey sun (which never seems to shine) why railway men should not know all about the "Boss" nut, manufactured by the B. M. Osbun Company, Chicago, and exhibited on the pier by Vice-President D. O. Ward. Mr. Ward is an old-time nut lock man. He has designed and marketed some of the leading nut locks used by the principal railways of the country. His latest nut, the "Boss," is his best—so he says. The Osbun Company exhibit may be found in Machinery Hall, quite near the Boardwalk end.

Mica is a mineral which has a peculiar interest on account of its unusual formation, a great number of exceedingly thin layers, and also for the reason that deposits of it are found in comparatively few parts of the world. An interesting collection of samples of various kinds of mica ranging from the soft dark mica of South Dakota and the green mica of Argentina to the clear India mica is shown at the exhibit

of the Storrs Mica Company, Owego, N. Y., space 19 in the main building. While a great variety of mica is shown, the only form of the mineral used by that company in the manufacture of its chimneys is the highest quality of clear India mica, which when split to the proper thickness, is as clear as glass and sufficiently soft and pliable to be well suited for the manufacture of lamp chimneys.

NO MORE HOSE FAILURES.

What a relief it would be to feel sure that hose failures in the air brake equipment or signal line service were impossible. The Sprague Electric Company, New York, claims to have brought about this condition with its flexible steel armored hose, which is on exhibition at booth 322.

There is said to be no danger of the hose bursting, as the armor takes all the strain and will stand a test pressure of 1,500 lbs. per sq. in. The standard fittings are secured by clamps which engage the shoulders on the nipple and coupler to prevent blow-outs.

This company also claims another strong feature, brought out in service. When the rubber has deteriorated to such an extent that it pulls, the air pressure forces the rubber hose together against the armor, thus closing the rupture to such an extent that the air brake will not be set and the train can reach its destination before it is necessary to replace the hose. Sprague flexible steel armored hose has the maximum degree of safety.

MISCELLANEOUS CASTINGS.

The improvement in the quality of steel castings, toward the elimination of blow holes and to meet the requirements of present day railway practice is no small accomplishment.

The American Steel Foundries, Chicago, are showing a collection of castings used in railway work, which indicate the progress and advancement being made in this direction.

The castings exhibited are not intended to show any new or novel ideas as to construction or design, but are ordinary railway castings selected at random from regular work going through the foundry with the idea of illustrating results obtained by this company in its efforts to so improve the quality of work of this character that the designers of equipment can confidently specify steel castings for all purposes where great strength is required, and also benefit by the lighter construction to reduce the dead weight to the minimum.



Pouring Steel Driving Wheel Centers at Indiana Harbor, Ind.

An examination of the castings shown would seem to indicate that the large amount of time and money being expended by the American Steel Foundries in improving the quality of castings is accomplishing results.

To enable it to derive the full benefits of improved practice and methods which have been developed, this company has recently put into service at Indiana Harbor, Ind., a new foundry, which is being operated as an independent unit. Here small castings will be kept separate from large pieces, which makes possible the use of methods required to produce castings of this character and of a satisfactory and uniform quality.

One of the features of this foundry is an electric furnace, in which the melting is done by the use of electricity, which eliminates from the metal all the impurities introduced by the fuel used in melting. In a furnace of this design, it is also possible to get a very much higher temperature than has been attained with the furnaces and fuel in ordinary use, also producing a highly liquid metal which greatly facilitates moulding intricate designs.

Steel freight and passenger equipment created a demand for high-grade steel castings. Among the castings exhibited for use under freight equipment are striking plates, pedestals, spring seats, brake lever lugs, fulcrums, center plates, draft castings, columns, stake pockets and numerous castings for use in locomotive and steel passenger car work.

To properly care for its increasing business in miscellaneous castings the American Steel Foundries has recently found it necessary to open a sales office at Pittsburgh, Pa., with A. R. Brunker in charge.



Finishing Room, Indiana Plant, American Steel Foundries.

KEWANEE UNION ELLS AND TEES.

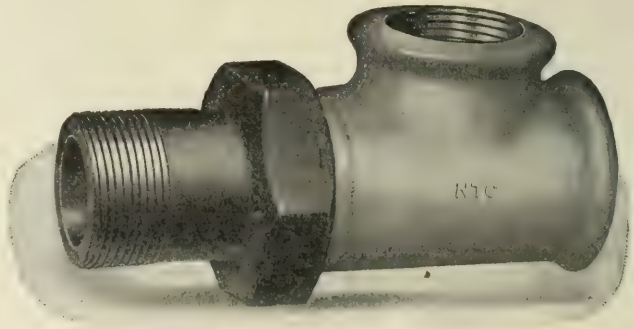
Under the conditions of modern power equipment there is an increasing desire to reduce to a minimum the number of joints in piping. Every joint generally indicates the additional possibility of a leak, and leaks mean—well, it is superfluous to explain the consequences of leaks at these conventions.

To come down to brass tacks, one male Kewanee union ell or tee replaces four ordinary fittings; three possible leaks avoided! These fittings possess what are claimed as the Kewanee union advantages, as follows:

Brass to iron thread connection at the ring. Brass to iron will not rust together, and the joints can be disconnected and reconnected without injury.

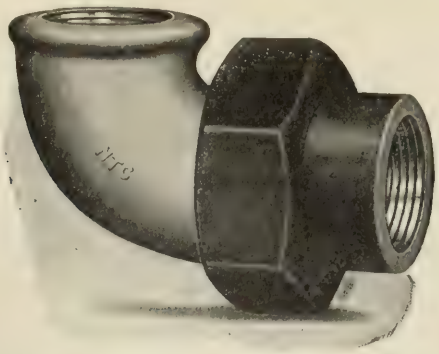
Brass to iron ball joint seat. A joint of two different metals is better than a joint of the same metal, and a brass to iron joint makes a tight seal without the use of a gasket.

Every individual fitting is tested with 100 lbs. air pressure under water; the slightest leak shows in the form of a bubble and every fitting must pass the test with a perfect



Kewanee Union Tee.

record or it is scrapped. This test assures sound fittings. The National Tube Company, Pittsburgh, Pa., manufacturer



Kewanee Union Ell.

of this type of fitting, has recently issued a booklet entitled "The Whole Kewanee Family," a copy of which may be obtained at the booth.

BARTLEY NUT AND BOLT FASTENER.

The American Nut & Bolt Fastener Company, Pittsburgh, Pa., exhibit in booth No. 320 a new nut lock intended especially for track bolts, frogs and crossings, recently patented by Milton Bartley, president of the company. This new lock is made of spring steel plate, with a slight oval rib rolled on one side. It has the advantage of having a flat bearing for the nut and only requires a wrench to apply or remove it and when applied it is a positive lock. When the nut is applied the oval rib is just on the edge of the nut and any effort to become loose is resisted by the oval rib. Call at booth 320 and examine this lock.

CORRUGATED STEEL END FOR BOX CARS.

A sample corrugated steel end for box cars was exhibited on the pier last year by the W. T. Van Dorn Company, Chicago. This year the company shows a further development of the improvement as actually applied to the ends of a Southern Pacific box car and it can be seen on the track exhibit. The plain corrugated end, ¼ in. thick, weighs



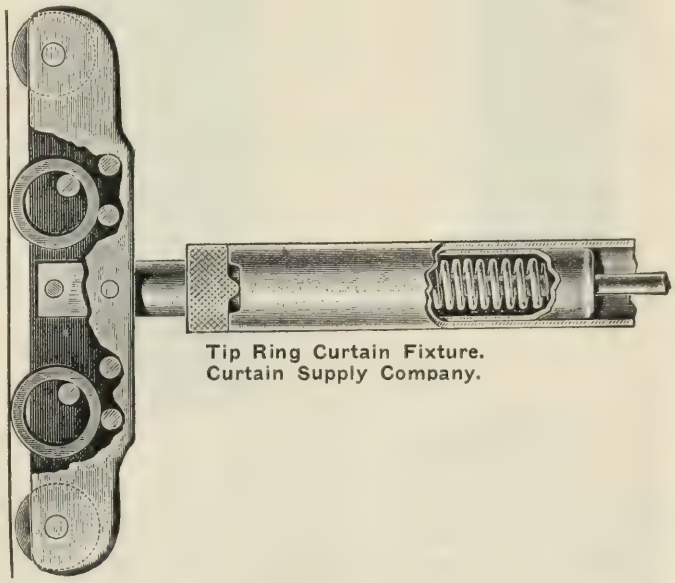
Corrugated Steel End for Box Cars.

850 lbs. The steel end as now exhibited is provided with top and bottom doors for loading long materials such as rails and lumber and these doors have substantial hinges and fastenings. The improved car end strengthens the box car at its weakest point and should prevent much of the damage due to the shifting of the load. It dispenses with posts and braces and numerous bolts, trusses, plates, etc., which are usually employed to strengthen the ordinary car end. The two corrugated steel ends are tied together by substantial rods so that they act together in resisting the blow due to shifting loads. The corrugated steel end is smoothly flanged and is a fine example of hydraulic press work.

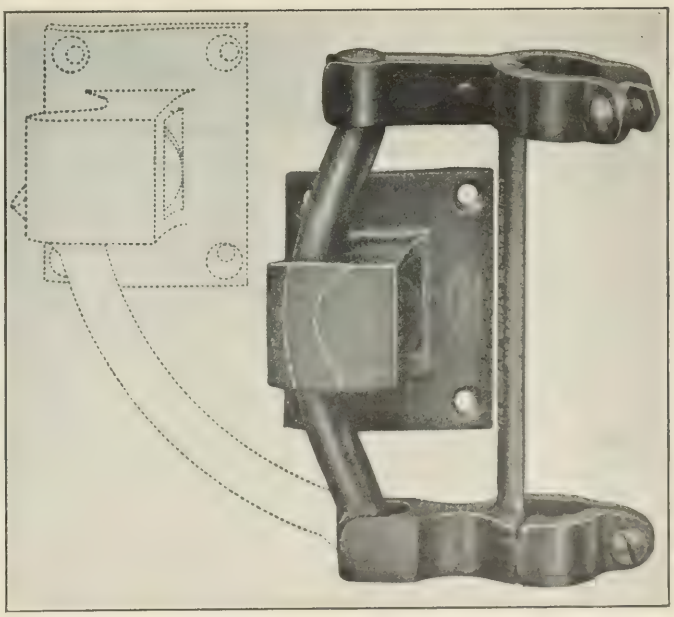
THE CURTAIN SUPPLY COMPANY'S EXHIBIT.

The exhibit of the Curtain Supply Company, Chicago, this year is very effective, and its booth is conspicuous for its attractive appearance. A full line of curtains and curtain fixtures is being exhibited, comprising the widely used ring fixtures. The construction of these fixtures has been somewhat improved during the last year, although the principle of operation is the same.

The company is also showing a full line of curtain materials and is calling special attention to its automatic releasable handles and roller bearing hooks which are used in connection with vestibule curtains. The automatic releasable handles

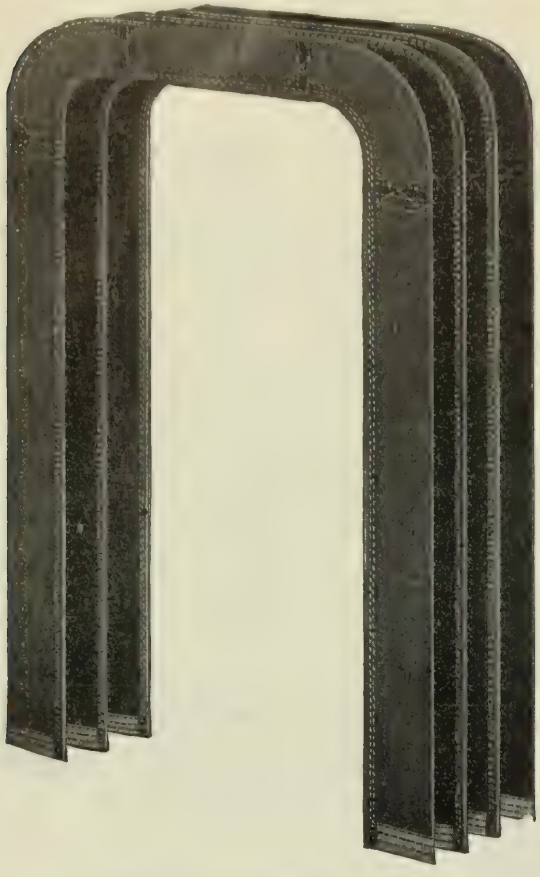


Tip Ring Curtain Fixture.
Curtain Supply Company.



Automatic Releasable Handle for Vestibule Curtains.
Curtain Supply Company.

afford a means of releasing the vestibule curtains when cars are uncoupled, without taking the handle of the vestibule curtain off its hook. The presence of the automatic releasable handle saves the tearing and injuring of the vestibule curtain, the pivoted handle yielding under the pull of the curtain when the cars separate. The No. 6 roller bearing hook is made for saving the great wear on the ordinary hook, which makes its life very short. The roller revolves with the continual rise and fall of the handle, thus doing away with the rubbing friction. Extra rollers and spindles are supplied at low figures.



Curtain Supply Company Diaphragm.

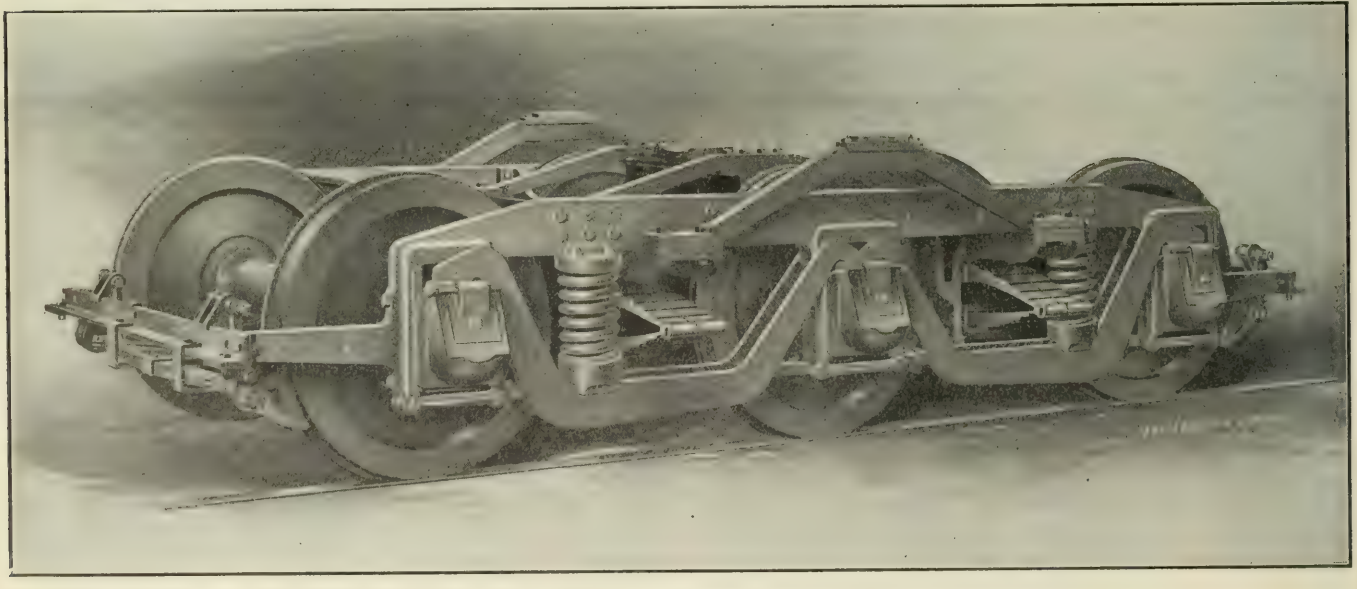
In addition to its regular line, the Curtain Supply Company this year is putting out a full line of diaphragms, comprising the following four brands: CSCO, Rex, Victor and Victor Rubbertexed. These vary in specification and also in price. The full line enables the prospective purchaser to select his diaphragm on specifications and prices satisfactory to himself. In conjunction with the diaphragms, canopies or hoods are exhibited made of various materials. One material which has proven especially popular for this purpose is asbestos. This is treated to become waterproof and, with its own essential feature of being fireproof, affords complete protection to the diaphragm. The company is represented by: W. H. Forsyth, general manager; R. F. Hayes, eastern manager, and S. W. Midgley, western representative.

THE BRILL M. C. B. PASSENGER TRUCKS.

About fifteen years ago the J. G. Brill Company, of Philadelphia, began to build trucks for electric railways which had the wheel piece and pedestals of each side frame embodied in a solid steel forging. This construction so quickly evidenced certain advantages that the process of making solid forged side frames has been steadily developed and special machinery and processes evolved which have enabled the company to secure approximately 60 per cent of the electric railway truck business. The types of trucks which have been manufactured heretofore have for the most part been exclusively electric railway types.

This year for the first time the company is exhibiting a four-wheel M. C. B. type truck and has designed a six-wheel M. C. B. truck, which is shown in the accompanying illustration. Both these trucks have the characteristic Brill solid forged construction. In each the wheel piece is forged in one solid piece, including the pedestals. The mild steel, from which these wheel pieces are made, is shaped under hydraulic pressure of 3,000 to 4,000 tons, insuring a uniform structure throughout the metal and at the same time "working it down" to a density which, together with a very thorough annealing process, renders it proof against crystallization.

Attention is directed to the pedestal tie bars, both long and short. The long bars consist of channels double bolted to an extension or foot on each inside pedestal. The two short tie-bars to each pair of pedestals are held in place by bolts which are not in shear as the strain is entirely on



Brill Six-Wheel M. C. B. Truck With Wheel Piece and Pedestals Embodied in a Solid Forging.

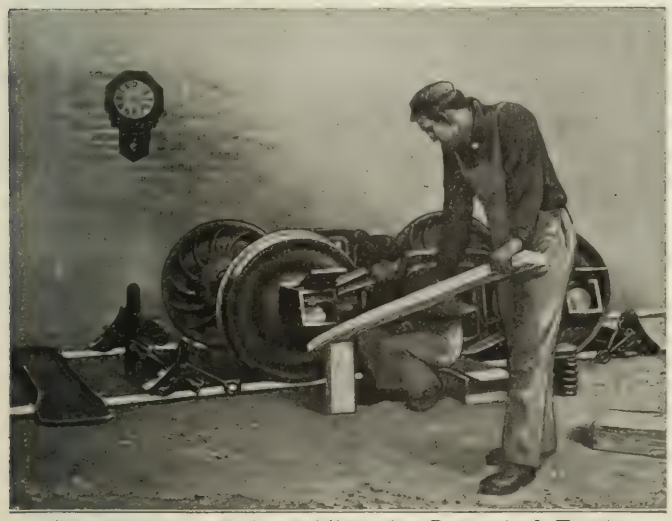
lugs cast on these tie-bars. This arrangement prevents the bolts from rusting in and facilitates the removal of the tie-bars. Pressed steel wear pieces are employed for the inner faces of the pedestals and this part of the pedestal is machined to give a true fit. The arms or extensions which connect with the end piece are brought low to give clearance and also to secure the maximum resistance to cornerwise strains.

It is claimed that this construction has decided advantages because the character of the material and its form are superior to riveted and built-up constructions with their multiplicity of parts, and to castings with their liability to hidden blow holes, porous sections and crystallization. There is little or no deterioration in a truck frame built with the wheel pieces forged in a single piece, including the pedestals, and therefore maintenance charges on the frame are practically eliminated.

DISMANTLING AND ASSEMBLING THE BETTENDORF TRUCK.

Any piece of machinery is only as strong as its weakest part; and, when parts are multiplied, chances are multiplied that sometime some part of that piece of machinery will fail to perform its intended function. With this fact in mind the Bettendorf Company has striven in its manufactures to reduce the number of parts wherever reducible.

In illustration, take their draft and center sills. It has been found that in wrecks as well as in the hard usage of ordinary traffic car ends, especially the draft and center sills, sustain the greatest damage. If these are weakened by dependence on extra castings and rivets for connecting the draft riggings,



Dismantling and Assembling the Bettendorf Truck.

their ability to meet shocks adequately is lessened. To overcome this difficulty, the Bettendorf Company has designed a draft and center sill end casting which has the necessary projections and openings to receive any desired draft rigging. At the same time the design permits the use of a continuous body bolster which can be removed without disturbing the center sills proper. Thus the advantage of one-piece construction is gained with the elimination of innumerable pieces, and yet there is no increase of weight.

Working on this same theory of "fewer parts less trouble," the Bettendorf Company makes a truck which, while it is the highest development of the arch bar truck, presents the important improvement of integral structure. All bolts, nuts, nut locks, and other loose parts common to other trucks, are dispensed with. Even the journal box is combined in one casting with the arch bars, columns and spring seat. The forty-one pieces of the arch bar become one in the Bettendorf truck.

The absence of bolts and nuts on the bottom of the frame prevents the distorting of the truck and the breaking of journal boxes in cases of derailment. And when wheels must be changed, the method necessitated by the new truck gives greater facility than was possible with the regular arch bar truck with its bent and rusty bolts and nuts.

In casting journal boxes integral with the frame, perfect alignment is maintained when once established. This is accomplished by the Bettendorf method of squaring and testing. Flange, collar and end brass wear are thus all reduced to the minimum. Side frames are made of basic open hearth cast steel and are tested as severely as are the journal boxes. Each frame must undergo in the test a load five times as great as it carries in service. The result of this careful manufacture is that the journal box is very rarely broken, so rarely that the Bettendorf Company feels that it can well afford to replace the entire side frame at the cost of an ordinary malleable iron journal box.

The one-piece truck has the advantage of flexibility, enabling it to adjust itself to the inequalities of the track and thus reducing derailment and flange wear to the minimum. It also shows a saving in dead weight of 1000 pounds per car over M. C. B. arch bar trucks. Yet it is so designed that it can be made to interchange with any M. C. B. arch bar type of truck, and can be readily adapted to the use of either top or bottom rollers.

But the most interesting characteristics of the Bettendorf truck are shown in the ease and rapidity of its dismantling and assembling. For this work only the ordinary tools of the repair yard are needed:

2 wood levers or crow bars.
2 car jacks.
2 chains. For these the brake chains may be used.
2 blocks to go under side frames.
1 block to go under bolster.

No wrenches are required, because there are no bolts or nuts on the Bettendorf truck.

Dismantling of freight trucks will proceed as follows:

Jack up the car in the ordinary manner and remove truck from under car. Place blocks underneath center of side frames so as to maintain them in normal position when released.

Remove the brake rigging, detaching the fulcrum from the bolster. Remove the brake beams by swinging the hangers which are attached to the beams far enough toward the center of the beams to allow them to slip over the hanger pins which are cast on the frames.

Place grab chains around each end of the bolster near the side bearings, and by means of the levers raise it into position against the top arch bar.

While one man holds the bolster in position against the top arch bar by means of a lever, let the other remove the springs, which can be easily slipped out when the bolster is raised up.

Still holding the bolster in position against the top arch bar, remove the spring plank.

Lower bolster to the bottom of the openings in the side frames, blocking it at the center so that no weight rests upon the side frames.

With a block and lever raise each journal box and remove the wedges and brasses.

Slide the side frame outwards until the journal boxes are free from the collar of axle, and lay the frame down, lower part on blocks.

The truck is now completely dismantled and any new parts that may be required can easily be substituted, and the truck is ready for assembling.

This entire operation is said to take but nine minutes, while changing the wheels on the M. C. B. arch bar truck

frequently takes from half an hour to an hour and a half, according to the condition of bolts and nuts.

Assembling the truck is a mere reversal of the dismantling process, and, it is claimed, can be accomplished in six minutes, with two minutes extra for replacing the truck under the car—seventeen minutes for the whole operation with the one-piece truck.

The Thomases who doubt the above representations of the wonderful facility and rapidity with which the Bettendorf trucks can be dismantled and assembled will have a chance to witness the actual performance the third week in June. For at the convention the whole operation of dismantling and assembling these one-piece trucks will be carried on for the benefit of the admiring public; and every doubting Thomas may time the performance by his own cherished timepiece.



Near View of Part of the Crawford Locomotive and Car Plant.

CRAWFORD LOCOMOTIVE AND CAR WORKS.

The repair of freight cars by outside shops has developed into a large and important industry, and some of these shops have put in an equipment of machine tools suitable for furnishing complete steel underframes.

The Crawford Locomotive and Car Company plant is at Streator, Ill. This shop is on the main line of the Santa Fe, on a triangular piece of ground covering 32 acres, bounded by other railways, so that its shipping facilities are unusually good. These works were completed and placed in operation in October, 1906, under the direction of R. W. Crawford, the president, who is responsible for the design of the plant and the general direction of the repair work. The main shop building is 126 ft. x 800 ft. and is divided into four bays. The one outside at present is occupied by the wood-working Sterling water tube boilers, each 250 h. p., making a total machinery and wheel and axle machine tools. The remaining bays have through tracks, with a capacity for repairing seventy-five cars under roof, and in the entire plant there are four and one-half miles of railway track, giving a large space for repair work outside.

The power house is a substantial brick building with a capacity for doubling its present equipment of boilers, engines and generators. The chimney is also intended for double capacity. This is a steel stack, partly lined, resting on an octagonal brick base. It is 150 ft. high, 8 ft. in diameter inside at the bottom and 6 ft. at the top. There are four of 1,000 h. p. In the engine room there is a 500 h. p. compound engine from the Ball Engine Company, Erie, Pa. This is connected to a Western Electric A. C. generator, 350 k. w. The air compressor is made by the Bury Compressor Company, Erie, Pa. It has compound air cylinders with a capacity of 1,000 cu. ft. per minute.

The machinery in the car shop is driven by electric motors, partly through line shafts, and quite a number of the tools are driven directly by motors. The shops can turn out twenty new wooden cars per day, or thirty-five repaired wooden cars, or twenty-five reinforced gondolas. The works are now engaged in applying steel underframes to 1,000 tank cars for the Santa Fe, and they have on hand a large number of steel underframes for gondola cars. All these steel underframes were made at these works. Mr. Crawford has plans already prepared and expects to build soon a new forge shop and a new planing mill. When the planing mill is finished the large car building can then be entirely occupied by tracks for cars under repairs.



General View of the Crawford Locomotive and Car Works, Streator, Ill.

The shops are conveniently located for workmen, as there are paved streets and electric street car lines passing the main entrance, and all men who are in charge of the work, from the president down, are practical mechanics who have had much experience in repairs and building of freight cars. The

plant is well supplied with convenient office buildings. There is one general office for the principal officers and accountants, and another for the shop foremen and their clerks. There is

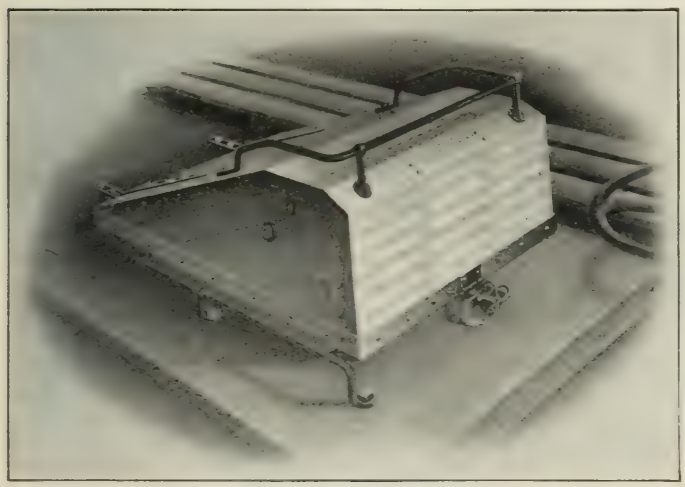


Interior of Erecting Shop, Crawford Locomotive and Car Co.

still another for the inspectors of railways having cars under repairs. This is an unusual convenience, but one which is much appreciated by the inspectors.

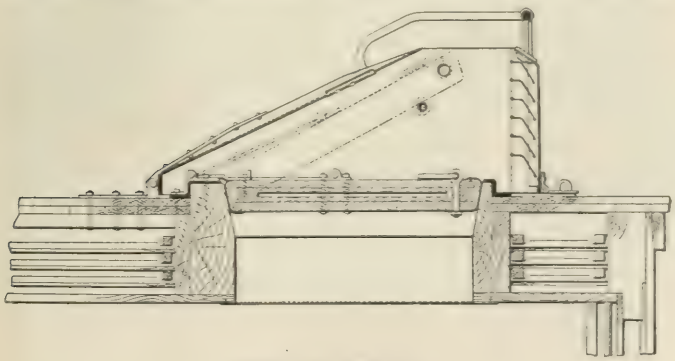
THE WHITE ENAMEL REFRIGERATOR COMPANY HATCH VENTILATOR AND PLUG.

The improved refrigerator hatch ventilator and plug made by the White Enamel Refrigerator Company, St. Paul, Minn., is shown by the attached photographic cut and drawing. The ventilator consists of a galvanized steel hood which covers



White Enamel Refrigerator Company Hatch Ventilator.

the ordinary hatch opening, and it is supplied with steel louvres with a cinder screen in front. This hood is made of No. 20 gauge galvanized steel with a ⅝-in. grab iron on top. This galvanized iron is bound with ¼ x 2 in. steel bands, which are riveted to the sheet; and extending from the bands to the top of the hood are two 1 x 1 in. angle irons notched in front of the ventilators to receive the louvre strips. Extending through the ventilators side by side is a ½-in. iron rod which holds the hinged plug in open position when car is being run under ventilation. At each side of the ventilator is a 1½-in. peep hole, with a small cover intended to be used in determining whether the plug is in ventilating or refrigerating position. The hatch plug is made of Oregon fir filled in with three layers of 1½-in. flax fibre refrigerator car insulation. The outside edges of the plug are covered with canvas stuffed with curled hair, forming a cushion, so that it may be forced tight into the opening. The hinges which attach the plug to the car have ¾-in. play so that it can be forced farther into the opening as the cushion wears down.



Bohn Ventilator.

DUNTLEY AIR PURIFIER.

One of the achievements of modern times is an invention for purifying and cleansing the air in railway coaches and buildings. This process actually washes the air of dust and impurities, leaving it fresh and pure. By the use of the oxygen air purifying powder the air will not only be freed of obnoxious and poisonous gases, but pure oxygen will be liberated. It assimilates the foul gases, such as carbon monoxide, carbon dioxide and sulphureted hydrogen, washes the dust and germs from the air, thoroughly cleansing and deodorizing it.

Realizing the great importance and the extent of the undertaking to perfect such an apparatus, no expense was spared in experimental and scientific research, and as a result the oxygen air purifying powder represents one of the great discoveries of chemistry. While air purifications is the chief aim of this powder, the apparatus may be used with any liquid disinfectant, deodorizer or fumigant.



Duntley Air Purifier.

Beyond the initial cost of the apparatus, the expense of operating the Duntley air purifier is very slight compared with the old methods of disinfecting with liquid sprays, and the work is done without any effort on the part of the operator.

The purifier is made of good quality aluminum and will last for a number of years. It has an air displacement of 500 cu. ft. per minute, and as it weighs but 25 lbs., it is easily carried. It is equipped with four funnels and a Universal motor. The funnels are easily adjusted by a small thumb screw so as to direct the air current in one or four directions. The motor may be operated on either direct or alternating current, the rheostat attachment making it possible to operate at a slow or fast speed. The machine is made by the Duntley Manufacturing Company, Chicago.

IMPROVEMENTS IN BAKER-PILLIOD VALVE GEAR MADE BY THE PILLIOD COMPANY.

This gear has been improved by reverting to the original Baker patents and, also, by improving the mechanical construction. Two levers on each side of the locomotive have been cut out, thus eliminating two triple joints and two bell cranks. The combination lever is very much simplified, which will enable the railway to change the lap and lead if they so desire.

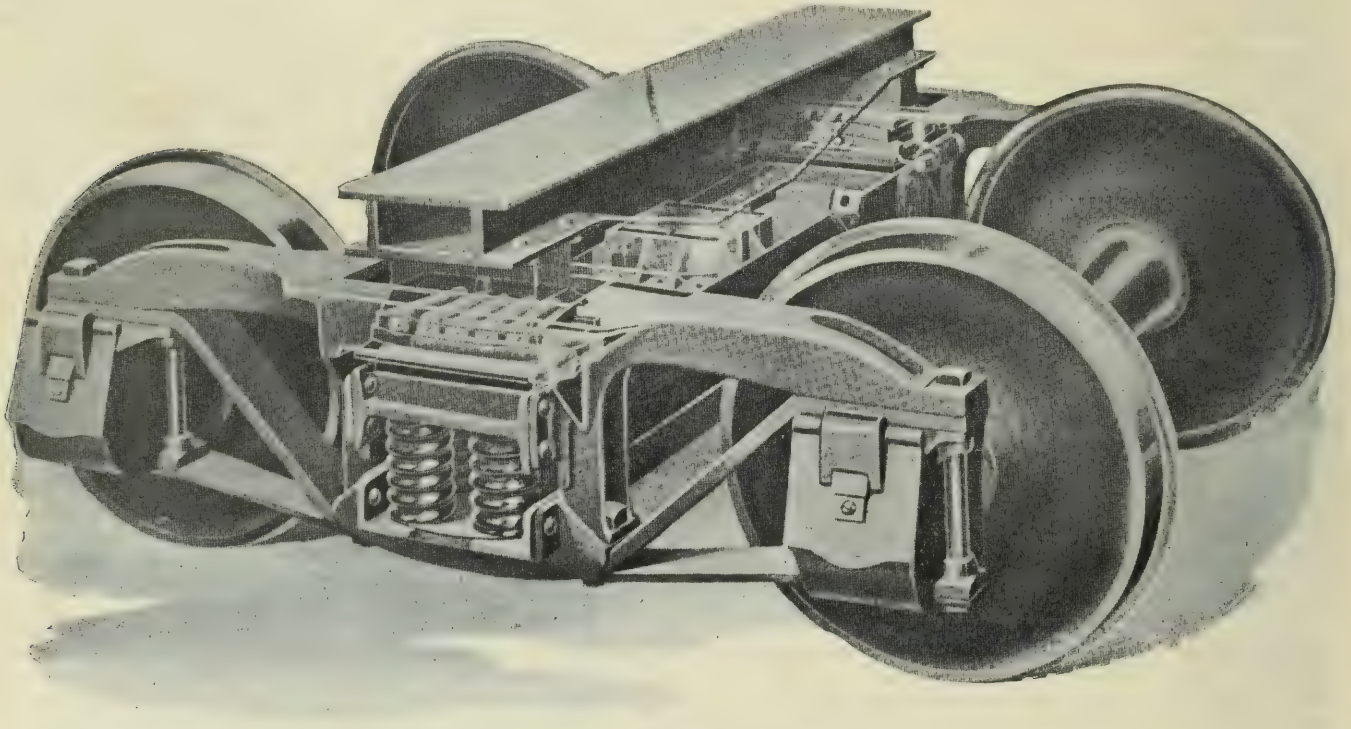
The valve bell crank motion has been reduced, at the same time making it possible to obtain more valve travel. The valve bell crank pin has been increased in size, which, together with the reduction of the motion of the pin, greatly increases the life of this joint. The reversing yoke does not throw as far for full gear as heretofore, thus improving the squareness of valve events. The reversing yoke lays forward in the forward gear instead of backward as heretofore. This makes it possible to connect the reach rod to the center of the top of the reverse yoke and not at the side as heretofore.

The change in this connection increases the leverage that the reach rod has on the yoke, and does away with the twisting movement that existed heretofore. The angularity of the eccentric rod is done away with. The number of the oil holes has been greatly reduced, and all are made easy of access. All pins are double supported, and every pin and nut is in plain view for inspection and repair. All pins are driven in from the inside, so that an engineer can easily drive out any pin if necessary. The frame is made in one piece instead of two. The whole gear is more compact, easier to apply and weighs less than the old gear.

BARBER DOUBLE-ACTION ROLLER BEARING TRUCK.

To do away with center plates and carry all the weight of the car body on the side bearings is a radical change in design; but it has several advantages and has been successfully accomplished in a truck designed by the Standard Car Truck Company, Chicago. The truck shown in the illustration has been in service under a fifty-ton steel ore car on a northwestern road for the past year and a half. There has been practically no flange wear on the wheels; the car has been watched closely, and the results reported have been satisfactory in every way.

A truck embodying the same features, but of a still better design, is on exhibition in the Standard Car Truck Company space, Booth 123. Each side bearing has ten rollers 5 in. long and 2 in. in diameter in place of five rollers 10 in. long, as shown on the engraving. These rollers carry all the weight of the car body, and are between top and bottom side bearing plates of cast steel. The center of the side bearing is above the center of the nest of springs, and the load is transmitted through them directly to the truck side frame and the journals. The side bearings are a sufficient distance from the center of the truck to require a considerable movement of the rollers, and they do not tend to bed in. Lateral motion is provided by the standard arrangement of Barber rollers. The truck side frame has been changed to a one-piece steel casting.



Barber Double-Action Roller Bearing Truck.

The use of the truck will make it possible to relieve the center sills of the greater part of the load, except for the buffing and pulling stresses, thus allowing the utilization of the sides of the car for carrying the greater part of the load and transmitting it directly to the journals.

IMPROVED NATIONAL SASH LOCK.

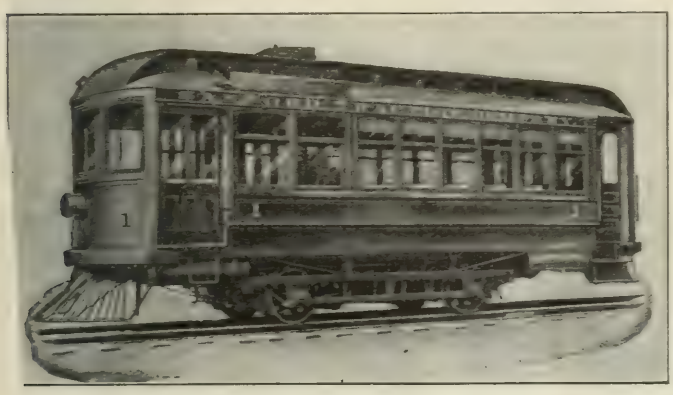
The improved National sash lock, made by the National Lock Washer Company, Newark, N. J., is made of solid bronze with locking levers made of the company's own special mixture, so hard it will not wear and almost to a steel temper, so as not to be brittle. It will lock the window at any height automatically and prevents rattling. A window cannot fall when equipped with this lock; the shaking of a car instead of releasing levers locks the window tighter. It is easily applied, strong in construction and simple in operation. It is not necessary to cut away sash or woodwork, and when used in connection with this company's face and edge springs it makes a dust and draught proof sash.

The company furnishes these sash locks in all modern statuary bronze as well as other finishes. These locks are being installed on over 500 cars.

GASOLENE PASSENGER CAR.

The accompanying illustration shows a gasolene motor car similar to one which is in operation on a railway in Louisiana. The St. Tammany & New Orleans Railway & Ferry Company was organized to operate a railway and line of boats between Covington, Ky., and New Orleans, La., giving the people of Covington and other towns along the route a direct line into New Orleans and saving about three hours' time. The railway runs from Covington to Mandeville, where it connects with the boats. The road has three gasolene cars, two of the type shown, seating 35 people each, and one smaller car with a seating capacity of 20 passengers.

The cars were manufactured and sold by Fairbanks, Morse & Company, Chicago. The large cars, type No. 24, have a semi-convertible body, divided into two compartments. The for-



Fairbanks-Morse Gasolene Passenger Car.

ard compartment is arranged for baggage and express, body op side seats, and can be used for a smoking com- making the e rear has reversible seats upholstered in ra- The engine is the car is hung independently of the ride comfortably and without v 60-h. p. capacity, of a r-cylinder, four-cycle, water-c lbs. The transmission is y heavy type, weighing three speeds in each direction, and t through gears, givir impossible for the operator to throw arranged so that more than on speed at a time and thereby strip the gears. The drive is by roller chain to bolt axles. The cars are epped with air brakes and electric lights.

nother road operating successfully the No. 24 Fairbanks-Mse type of car is the Stanley, Merrill & Phillips, running fr Stanley, Wis., to Ingram. This is a standard steam road, bu in order to take better care of their passenger traffic a solene motor car was installed, with the result that operating expenses have been greatly reduced, while passenger business has increased.

The statement below showing performance of this car during two different months, one after being put in service and one a few months later, are especially interesting in that they show the increased business. Also, they show the actual cost of operating this class of equipment.

	September, 1909.	March, 1910.
Gross revenue	$756.47	$1,075.99
Cost of operation	182.83	241.84
Net revenue	$575.64	$834.15
Pass. carried	1,106	1,905
Miles run	3,234	3,300
Cost of operation per mile	.06	.064
Miles per gal. gasolene	6.28	6.37

OWEN-COCHRAN PRESSED STEEL JOURNAL BOX.

The Owen-Cochran journal box, now being placed on the market by the U. S. Metal & Manufacturing Company, New York, booth 337, is a pressed and forged proposition throughout, no castings being used in its construction. The top and body of the box are pressed separately and while still hot the top is slipped over the upper flanges of the body part and these edges are crimped down, making a tight joint. The dust pan is secured to the back of the box by four rivets. The wedge guide is a forged piece of ¾-in. iron secured to the top of box by two rivets. The guide carries the hinge butt for the lid. Standard M. C. B. lids



chran Pressed Steel Journal Box.

ed to all boxes, thus eliminating the special lid feature. Six rivets only are used in the construction of the box and none of these rivets is subjected to strain. A box car on one of the prominent western roads has been equipped with these boxes on test since December, 1906, and they are said to be still giving excellent service.

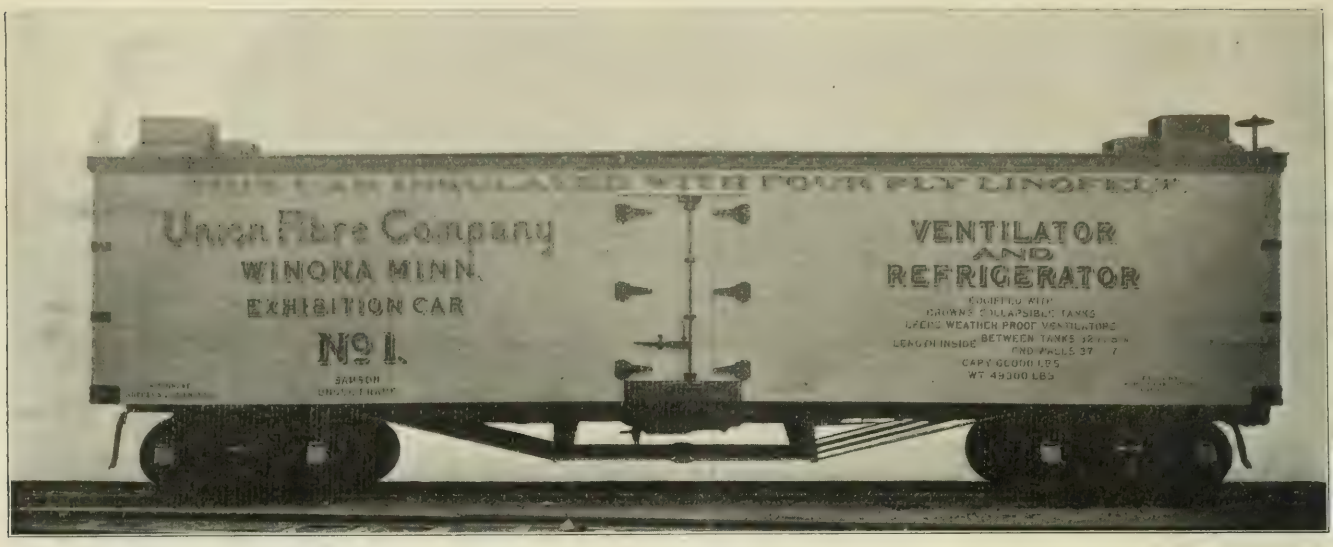
MODEL REFRIGERATOR CAR.

The Union Fibre Company, Winona, Minn., has on the Philadelphia & Reading tracks a model refrigerator car constructed for exhibition and test purposes. This car includes recent improvements and refrigerator car construction and yet retains the simplicity so necessary in freight equipment of this type. Particular attention is directed to the four-ply linofelt insulation, which is illustrated by blue prints in the car and a series of photographs in the Union Fibre Company's booth No. 448. This car is also equipped with three novel devices which will be interesting to car builders: Brown's collapsible tank, which is easily handled by one man; Weatherproof ventilator, an essen-

tial feature with collapsible tanks of all types, and a non-splashing drip pan, which not only prevents water slopping into the car on the load but also affords a level loading floor over the drip pan when the tanks are collapsed.

Those interested in refrigerator and freight equipment should see the car. A company representative will be on hand at all times to furnish additional information.

Hewitt journal bearings
Simplex bolsters
Samson steel underframe
Miner draft gear
Janney improved couplers
Westinghouse air brakes
Miner door lock



Exhibition Car, Union Fibre Company.

The general specifications of the car are as follows:

Length over end sills	40 ft. 0	in.
Width over side sills	9 ft. 3	in.
Length inside, between bulkheads	32 ft. 5	in.
Length inside, bulkheads collapsed	37 ft. 7	in.
Width of car inside	8 ft. 2¼	in.

Trucks, 60,000 lbs. capacity
Andrews cast steel side frames
Griffin wheels, 625 lbs.
LaFlare door packing
Diamond brake beams
Franklin journal boxes
Leeds Weatherproof ventilator
Brown collapsible bulkhead and ice tank
Kellogg non-splashing drip pan
Bird's torsion proof roof
Car insulated all over with half inch linofelt, four-ply
Capacity of ice tanks, 9000 lbs.



Linofelt Insulation.

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There are a large number of the younger men in attendance at the convention, but with a few exceptions they seem to be listeners at the meetings and do not engage actively in the discussions. A study of the makeup of the committees for the past year shows that the executive committee has attempted to place as many of the younger men on the various committees as possible. It is handicapped in the proper selection of these men because of the difficulty in locating the best material. The only clue that the committee has to enable it to locate the young men of ability and who are interested in the work of the association is by the way in which they take part in the meetings. If one expresses himself clearly and forcibly, and shows that he understands the subject he is talking on, he will be sure to attract the attention of the officers and be given an opportunity to engage actively in the committee work. After all, the real work of the association is done between the conventions, and if a young man is fortunate enough to be selected for such work he should put forth his best efforts to make good.

It seems almost impossible that a railway would ask its mechanical department representatives to attend the conventions at Atlantic City, with instructions to look into and report on certain matters of special interest to the road, and yet not pay their expenses. While attending the conventions is a change from the routine of the office, the shop and the road, it is not a vacation by any means, if the representative attends the meetings and looks over the exhibits. There seems to be a more or less mistaken idea in some quarters that the supplyman's chief delight is to entertain the railway officer in such a way as to keep him from making the best use of his time while at the convention. The exhibitors, however, spend too much time and money preparing attractive exhibits to do anything which would tend to keep the railway officer from spending all his time on the Million Dollar Pier. The railway man probably works harder and uses his head more while attending the convention than he does in the same amount of time in his office or shop. The inspiration and the broadening effect of spending a few days meeting and exchanging ideas with men engaged in the same work from all over the country, and in looking over the exhibits, can hardly be overestimated. Fortunately, the number of roads that do not pay the expenses of their representatives is growing smaller each year, and in most cases the roads not only pay the expenses of their men but insist on their attending the conventions.

The M. C. B. Association and the manufacturers have pounded away at the draft gear for years, and have developed methods and machines by which the most beautiful resistance curves could be made and interpreted to mean just what was wanted to show. And then, on the sly, the tester would take you aside and say that too much confidence should not be placed in any drop test, and advise you to look to service results; and if you looked, you saw that cars were punished and gears distorted in a way that did not quite tally with the drop test results. Then you got confused. The proposition, therefore, to build a machine that would work with weights and velocities approximating those of loaded cars is to be welcomed. The very fact that the proposition to build such a machine is considered seriously shows that the importance of the question is appreciated and that the railways are willing to spend large sums of money to get the desired information. But, before any such testing machine as that proposed is built it would be well to consider its design most carefully, and so modify it that it will give motions more closely in accordance with the results in actual service. As it stands the two weights approach each other on the line of a circle, and separate along the same lines. That the approach should be in this way is not very objectionable; but it would seem to be most desirable that after impact the weights should move in a straight horizontal line as they are in service. It would not be a very difficult matter to so modify the apparatus that it would work in this way, and then the results obtained would probably be above criticism.

No one who knows would ever suggest that the members of the M. C. B. Association are seriously afflicted with stage fright as a whole. And no one who was present and noted the crowded condition of the room during the whole of the sessions would feel warranted in declaring for a lack or even a decline of interest in the proceedings. Yet the fact is apparent that the volume of discussion is much less than it has been heretofore, though the importance of the reports has not fallen away. To one who has followed the work of the association for a number of years and listened to the hours of talk where members were of different minds because they were apparently getting different results with the same things, it seems as though these differences in results, which have been invariably found to be the result of working under different conditions, are disappearing, and conditions are becoming more uniform. Probably the wide adoption of the same standards has much to do with it, and the balance is due to the fact that members have come to realize that natural laws always work in the same manner, and differences are due to resultant and not individual effects. Then, too, the committees are gathering information with so much skill and presenting it so effectively that it is becoming more and more difficult to question their conclusions or criticise their methods. A man may ask questions for further information, and he usually get it, but that phrase, "There are some points upon which I differ with the conclusions of the committee," is now very rare. It has been said that, under the rules of strict

logical deduction, all men starting from the same premises will reach the same conclusions. So it seems as though these committee reports has been so carefully drawn that discussion is superfluous. At any rate, the convention, just closed, transacted an amount of business in the three days of its existence that would have been utterly impossible even ten years ago, because of the amount of discussion that would have taken place. It is to be hoped, however, that matters will not come down to such a point of concentration that the proceedings of the conventions of the future will hold the same relation to those of the past that a capsule lunch does to a square meal.

THEODORE H. CURTIS.

A training as mechanical engineer and a considerable period of service in that line have, so far as history is concerned, very seldom led to the position of superintendent of motive power and machinery. It would seem, however, that this is the logical course, admitting, as is generally done in these later days, that some training aside from that of practical experience in the motive power department is desirable.

In this respect Theodore H. Curtis, president-elect of the Master Car Builders' Association, has had a training not wholly unlike that of his predecessor. He, too, is a product of the middle West. Born at Terre Haute, Ind., in 1866, he entered railway service as draughtsman for the Big Four in 1886. He continued the work of the draughting room with the Brooks Locomotive Works and Pittsburg Locomotive Works to 1889 and was afterwards chief draughtsman for the Nickel Plate for about 12 years. Subsequently he was appointed mechanical engineer of the same road; in 1899 he went to the Erie and in 1901 to the Louisville & Nashville in the same capacity; and in 1903, after the death of Pulaski Leeds, he was appointed superintendent of machinery and has held that position to the present time.

Mr. Curtis was known as a capable mechanical engineer before he was appointed to a higher position and that reputation he has still maintained and enhanced notwithstanding the pressure of executive duties. He is a close student of mechanical propositions and not over-eager to express an opinion until he has sounded the depths and weighed carefully the reasons therefor. In this respect, also, he resembles his predecessor.

The heritage which came to him as the natural successor of Pulaski Leeds on the untimely death of the latter was one of which the conditions were not easy to fulfill. Though universally recognized as a man of practical ability and sound judgment, Mr. Leeds emphatically had his own ways of doing things. They were generally not the ways that are taught in modern schemes of education. That Mr. Curtis has successfully handled the duties of the position and with such capability as to merit recognition at the hands of fellow officers of the mechanical departments in the election to one of the highest offices in their power to bestow, indicates that the methods of training to which the younger generations have been subjected are capable of bearing useful fruit.

NO CONSOLIDATION THIS YEAR.

Of course, nobody really expected that the consolidation of the mechanical associations would be effected in a fall-in-love-at-first-sight sort of way. In fact, the two organizations have been coquetting too long (about twenty years); and the members are too long headed and have been too well trained in the development of their standards to tie up indissolubly on the reception of the first serious report, though it did look, for the first few minutes after the presentation of the report, as though the convention was to be stampeded into a hasty action. There was not a sound from the floor for awhile except a proposition to submit consolidation to letter ballot. But silence long continued and timid is not a marked characteristic of the members; and it was followed by brief presentations of the pros and cons, either of which might, if heard alone, so convinced a certain Dutch justice that he would have made up his mind. The particular magistrate referred to, on hearing the statement of one side of a case, declined to listen to the other on the ground that he had made up his mind and did not want to be confused.

But both sides were heard—the advocates of the necessity of minimizing the time occupied and, on the other hand, those who hesitated because of the strain of a week's concentrated effort; of the value of acquaintanceships formed between sessions; of the influence on manufacturers in presenting their wares at the exposition; of the importance of the work to be done; of the probable effect on the status and efficiency of the car department; and of the necessity of careful consideration. The last-mentioned point, being the most important, very properly received the consideration that it deserved, and all propositions to refer the question at once to a letter ballot were set aside, while the suggestion to consolidate was tabled for a year, and the matter was referred to the executive committee for due consideration.

It was urged that during the coming year the members give the subject most careful thought, so that when they come together again they will be in a position to decide as to what should be done. Meanwhile the executive committee will examine into the legal features of the question.

While the matter is in abeyance, it seems as though one suggestion were worthy of the most careful consideration. It was to the effect that a "trial marriage" be effected—that before complete consolidation is effected the two associations come together in joint session for a single week to test by actual experience whether they are adapted to live together and can do their allotted work in so short a time. Such action would throw valuable light on what results might be expected from complete union.

In any event, the railway world can rest assured that no matter what is done finally, no hasty action will be taken, and that the decision finally reached will be that which is conscientiously considered to be in the best interests of all concerned, both members and railways.

SATURDAY'S AND SUNDAY'S PROGRAMS.

SATURDAY

10.30 a.m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

2 p.m.—Baseball parade from Million Dollar Pier to special trolley cars.

3 p.m.—Baseball game, East *vs.* West; at Pennsylvania Railroad Company's Inlet Park Baseball Grounds.

9 p.m.—All-star vaudeville show, at Apollo Theatre.

SUNDAY

11 a.m.—Special program by Marlborough-Blenheim Orchestra, Blenheim Exchange, Marlborough-Blenheim Hotel.

UNIVERSITY OF ILLINOIS MEN—NOTICE.

All University of Illinois men in attendance at the convention are requested to get together at a dinner to be arranged for Saturday evening, June 18.

Be sure to register your name and address at the Booth of the Dearborn Drug and Chemical Company, number 8, immediately to the left as you enter the pier. Register this morning as you go in if you have not done so already.

LOST.

Lost—Badge 3298. Please return to the office of the *Daily Railway Age Gazette*, space 1.

VAUDEVILLE.

The entertainment for Saturday evening consists of a special vaudeville program given at the Apollo Theatre, under the personal supervision of Frances Rockefeller King. The program follows:

1. Overture—Selected. Conductor, Henry Conrad.
2. The Readings. Smart Singing and Dancing Offering.
From Keith & Proctor's Fifth Avenue Theatre, New York
3. The Exposition Four.
A Feast of Song, Music and Jollity.
Alexander Brothers and Brady—Most Entertaining Quartette in Vaudeville.
From Percy G. Williams' Alhambra Theatre, New York
4. Charles Leonard Fletcher.
America's Premier Impersonator.
Presenting His Latest Artistic Novelty—
"An Evening with Mark Twain."
From Keith & Proctor's Fifth Avenue Theatre, New York
5. Jane Courthrope & Company.
By Special Arrangement.
Offer a Breeze from the West—"Lucky Jim."
Characters:
Alice Stafford.....Jane Courthrope
Teddy .....Master Ross
Jim Hamilton.....Charles Forrester
Shorty Martin.....Allen Damon
Prince Jim's Chum..Heidelberg's Prince A. K. G.
N. B.—An elapse of one year between scenes I and II.
From Percy G. Williams' Colonial Theatre, New York
6. The Jack Wilson Trio.
Introducing Jack Wilson—Assisted by Miss Ada Lane and Franklyn Batie in a Comedy Skit, Entitled
"A White Man's Conception of an Upheaval in Darktown."
From Keith & Proctor's Fifth Avenue Theatre, New York
7. Spissell Brothers & Co.
World's Famous Eccentrics—Presenting Their New and Original Pantomime Comedy—
"The Continental Waiter."
Cast:
Dume Franzel, the Waiter.....Frank X. Spissel
Hans Blatsburger, the German.James F. Spissell
Lidaff, a Frenchman.....John Russell
Andie Swift, an American.....George Ayer
Scene: Garden Cafe. Place: Vienne.
From Hammerstein's Victoria Theatre, New York

The entertainment will be followed by informal dancing in the ballroom of the Marlborough-Blenheim, music being furnished by the Old Guard Orchestra. The sub-committee in charge consists of C. A. Dunkelberg, chairman; George R. Carr, C. W. Wardell and J. Soule Smith.

BASE BALL GAME.

The base ball parade, led by the Old Guard band, escorting ladies and players, will start at 2 o'clock this afternoon from the Million Dollar Pier. Special trolley cars will carry those in line to the Inlet Park base ball grounds. Hhe game will be called at 3 p. m. Only those wearing their badges will be permitted on cars or admitted to the park. The batting order of the two teams will be as follows:

WESTERN TEAM.

1. J. E. Tavelton, p., Union Draft Gear Company.
2. W. H. Allen, 3b., C. H. Besley & Company.
3. Adam LaMar, 2b., Pennsylvania Railroad.
4. S. W. Midgley, s.s., Curtain Supply Company.
5. H. S. Hammond, c., Pressed Steel Car Company.
6. J. D. Ristine (capt.), c. f., Union Draft Gear Co.
7. T. H. Goodnow, l. f., L. S. & M. S.
8. I. S. Downing, 1b., L. S. & M. S.
9. W. E. Sharp, r. f., Armour Car Lines.
10. W. M. Wilson, l. f., Flannery Bolt Company.
11. B. H. Forsyth, p., Ford & Johnson Company.

EASTERN TEAMS.

1. C. B. Gilman, c. f., Q. & C. Company.
2. Wm. Murray, 2b., Jenkins Brothers.
3. H. Oviatt, 1b., N. Y. N. H. & H.
4. F. Martin (Capt.), 1b., Jenkins Brothers.
5. J. E. Jeffreys, s. s., B. & O.
6. H. Shoemaker, r. f., D. L. & W.
7. C. Beaumont, 3b., B. & O.
8. B. Stevenson, c., Griffin Car Wheel Company.
9. T. S. Dowling, Jr., p., Manning, Maxwell & Moore.
10. J. Enright, c., Wm. Sellers & Company.
11. P. Jones, l. f., Dearborn Drug & Chemical Works.

UMPIRES.

W. E. Cade, Frank A. Barbey Company.
T. F. Barton, D. L. & W.
H. E. Passmore, T. & O. C.

After indefatigable exertion our enterprising reporter at last succeeded last night in obtaining interviews with the captains of the teams. They were taking their final rub-down after a period of most strenuous training. Captain Ristine, of the Western aggregation, was found to be apparently in the pink of condition, though he absolutely refused to talk. It is surmised in quarters where authoritative information is generally on top that the advertisement for a battery for his team was simply a well-conceived bluff and a repetition of last year's sharp practice to throw the opposing team off guard. It is stated by those who ought to know that he really has a collection of world-beaters.

Likewise Captain Martin gave out no dope, but his knowing smile when some enthusiast remarked in his presence that the Eastern team "could put it all over any Windy City aggregation" leads to the belief that he is confident of success, notwithstanding that one of his crack artists, L. J. Hibbard, Cornell, '03, who played short-stop on the 'Varsity, and has heretofore played on the Supply Men's team, will to-day be fully occupied with his duties as chairman of the base ball committee.

CLUB SECRETARIES.

The annual meeting of the Railway Club Secretaries' Association will be held this morning at 10 o'clock in Room 130, Marlborough-Blenheim. Those who expect to attend the dinner in the evening are urged to be prompt in order to enable attendance upon the vaudeville at the Apollo Theatre.

SUPPLY MEN'S DISTRICT ELECTIONS.

The District Elections for members of the executive committee of the Railway Supply Manufacturers' Association were held in Convention Hall yesterday afternoon, and resulted as follows:

District No. 2, embracing the states of New York and New Jersey—Lucien C. Brown, United Equipment Company, New York, and Edward H. Walker, Standard Coupler Company, New York.

District No. 4, embracing the states of Ohio, Michigan, Kentucky and Tennessee—Herbert I. Lord, Detroit Lubricator Company, Detroit, and John R. Blakeslee, Ajax Manufacturing Company, Cleveland.

District No. 5, embracing the states of Illinois, Wisconsin, Iowa and Minnesota—W. W. Rosser, The T. H. Symington Company, Chicago.

The elections of the above named executive committeemen will be reported to the annual meting of the Railway Supply Men's Association to be held to-day.

Proceedings.

President Clark called the closing session of the Master Car Builders' Association to order at 9:50 a. m.

The President: As announced yesterday, the election will take place to-day. The polls will open at 10 o'clock and close at 11:30. I will appoint three general tellers, who will count the votes for the officers and deliver the votes for other candidates to the respective tellers. The three general tellers will be, R. V. Wright, George Goodrich and W. O. Thompson; for members of executive committee, two tellers, H. L. Trimyer and L. S. Downing; for the committee on nominations, two tellers, S. T. Park and J. J. Tatum; for associate and life members, two tellers, C. A. Seley and R. L. Kleine.

The Secretary read Article 8, Section 10 of the constitution, relating to elections, and explained the method of balloting provided for putting a name before the Convention. That is, for life membership. For associate membership there is only one name, Professor Endsley. That was proposed a year ago.

I would like to say that the committee on nominations, on account of the withdrawal of Mr. Parish from the Railway Service, proposes in his stead the name of D. F. Crawford, General Superintendent of the Pennsylvania lines west of Pittsburg, for president. The candidates for president, as proposed by the committee on nominations, are Mr. Curtis, Mr. Stewart, Mr. Crawford. For vice-president, in place of Mr. Parish, the name of Mr. E. D. Bronner has been proposed. The list of vice-presidents in nomination is: Mr. Curtis, Mr. Stewart, Mr. Crawford, Mr. Fuller, Mr. Bartlett, Mr. Bronner. You can vote for three of these, or three others that you may choose.

Of course, gentlemen, you understand at the first day's session we read a communication from Mr. Kirby, in which he asked to have his name withdrawn as a candidate for treasurer. He is now 87 years old, and he does not very often come to convention, and he asked to be relieved from service. Have I made myself clear to all the members as to the voting?

The President: I will ask the general tellers to distribute the ballots. The general distributers are R. V. Wright, George Goodrich and W. O. Thompson, and I will ask the general tellers, in addition to canvassing the vote for president, to canvass the vote for treasurer.

The next order of business is the reception of the report of the committee on consolidation of Master Car Builders' and Master Mechanics' Associations.

The secretary read the report of the committee.

CONSOLIDATION.

The committee appointed to present the advantages or disadvantages of the union of the Master Car Builders' and the American Railway Master Mechanics' Associations into a new association, and to propose a constitution therefor, beg to report as follows: Apart from any legal questions, it may be granted that neither the Master Car Builders' nor the Master Mechanics' Association would agree to being absorbed by the other. Both have a long and honorable history. Founded in 1867 and 1868, respectively, each has accomplished magnificent results in the investigation of the multitude of problems that have arisen in the gradual development of American railway rolling stock, and in the determination of national practice in design and operation. Both are to-day progressive and successful. There is no question of either needing the assistance of the other to ensure its continuation or development. They stand as preëminent examples of voluntary associations of men employed by the railway companies of the country who have labored and studied for the benefit of those companies as a whole.

Such being the case, if it be decided that, for the benefit and convenience of the members of these associations, it is advisable that their work be continued by one united society in place of two separate ones, the only feasible plan would be to form a new association to take the place of the two older ones, and independently and voluntarily terminate their existence. The legal questions involved in such proceedings require investigation, and it is possible that technically some different arrangements would have to be made. This is not, however, material, and we assume that the question for discussion is not that of absorption or consolidation, but the formation of a new and united association, which, including in its members employees of both the car and locomotive departments of our railways, may be called The American Railway Mechanical Association.

A change of this kind is important and should, we believe, if carried out, be only made after the most careful consideration. There are, no doubt, however, powerful reasons in favor of such a movement; reasons which have developed from the change which has taken place in the organization of the mechanical departments of the railway companies themselves during the existence of the two associations.

The appointment of a joint official in charge of both car and locomotive departments has led to the same men being largely in charge of the design, construction and maintenance of both cars and locomotives. The consequence is that men are attending the Master Car Builders' Association in connection with car matters, and the Master Mechanics' Association in connection with locomotive matters. To a great extent, therefore, the reasons that previously existed for the maintenance of two separate associations have been gradually removed. There is, no doubt, still a considerable feeling in favor of their retention, and it was voiced very clearly by President McKenna in his address to the Master Car Builders' Association last year. We can not do better than quote his words:

"For years the question of consolidating the Master Car Builders' and the American Railway Master Mechanics' Associations has been the subject of discussion. Such action has heretofore not been deemed either necessary or desirable, and conditions at present do not indicate that it would now result in any benefit to railway companies. Unless improvement is possible, changes should not be favored. The two associations are separate and distinct so far as their line of action is concerned. The Master Mechanics' is of a technical character, having no legislative powers, and as the Master Car Builders' find it impossible to devote sufficient time to the proper consideration of the various reports submitted to them, the proposed consolidation seems unwise, especially as new topics, new subjects and new discussions would be introduced into one deliberation. There is sufficient work for each association in its own particular field, and, as the method of procedure in handling work incident to locomotive repairs and construction, car repairs, construction and interchange, differs so very materially, it would seem desirable to handle them as two separate and distinct branches, so that the questions incident to each will be considered by two separate and distinct associations."

Mr. McKenna's remarks undoubtedly require the most careful consideration. They may be regarded not only as a personal opinion, but as expressing that of a large proportion of the membership of the association over which he presided. They describe the Master Car Builders' and Master Mechanics' Associations as having separate and distinct fields of action; the Master Mechanics' as being technical in its nature, while the Master Car Builders' has rather that of a legislative body. There is, no doubt, a great deal of truth in these distinctions, and yet it is questionable whether they do not refer rather to conditions existent in the past than those of to-day. The legislative nature of the Master Car Builders' Association is entirely caused by the successful action of a voluntary association in organizing the rules governing the interchange of equipment between the railway companies of the country. These rules have been so wisely drawn and fairly administered that, without any direct powers having been granted to the associations by the railway companies officially, their accedance has in practically all cases been obtained, and the Master Car Builders' Association is to-day recognized as the organization empowered to formulate regulations required to enable the transfer of cars from road to road with the greatest dispatch consistent with the respective interest of owner and user. This has been but one part, however, of the work of the Association, although it has been so well done that it has secured the admiration and endorsement of all railway managements and has led to this being regarded, perhaps, as its greatest field of usefulness. The other, and equally important, part has been that of a great technical society specializing on subjects connected with the car department and thus supplementing the work of the master mechanics in the locomotive field. The subjects being investigated by committees this year are, with the exception of those pertaining to the interchange of cars, just as much the work of a technical association as are those in the Master Mechanics' Association. The condition actually is that two large engineering societies are in existence: the one investigating matters connected with the design, construction and maintenance of locomotives, the other with similar subjects for cars, while the latter at the same time determines the rules governing the interchange of equipment.

Now, the question really is: Are these lines of action separate and distinct? Are the particular fields of these two associations diverse? Such a question would certainly be answered in the affirmative were different departments of the railways concerned, such as is the case with mechanical work and that under the charge of members of the Engineering and Maintenance of Way or the Association of Railway Accounting Officers; such as was the case with the work

handled by members of the Master Car Builders' and Master Mechanics' Associations.

That it should be answered in the affirmative under present conditions is more doubtful. It is indisputable that the car and locomotive departments in our railways have very generally been united under one head, and that year by year more of the men who are interested in the work of one association have become interested in that of the other. This is, perhaps, more clearly illustrated in the representative membership of the Master Car Builders' Association than in any other way. There are 276 representative members, representing 2,318,607 cars, of which 89, representing 71,550 cars, are officers of other than the car or locomotive departments or of private car lines. Of the balance of 187 members, representing 2,247,057 cars, 162 or 86½ per cent are officers of both the car and locomotive departments, while the number of cars represented by them is 1,705,276, or 75.8 per cent, compared with 541,781 represented by members bearing car department titles only. While not to the same extent, the same is true of the membership as a whole. Out of a total of 515 members whose titles indicate their employment in the mechanical department of a railway, 320, or over 60 per cent, are connected with both car and locomotive affairs.

To state, therefore, that the lines of action and the fields of usefulness of the two associations are entirely separate is to-day simply to differentiate between the various lines of work that are carried on and taken charge of by, to a large extent, the same men. There is a wide difference between a question affecting the design of a cast-iron wheel and one relating to the efficiency of superheaters, but there are also wise differences between the designs of front ends and efficient methods of shop organization, or between the preparation of specifications for couplers and the best method of loading long materials. The fact is that the work for which a mechanical official is held responsible is diverse and multifarious, but the same principles have to be applied in the economical maintenance of cars as in that of locomotives, the same scientific methods are necessary in determining the relative economy of various designs of engines as in the proper system for painting cars. The same men in general are carrying on these many subjects, not as master mechanics or master car builders, but as employees of the mechanical departments of the railways, acting on committees in the Master Car Builders' Association on one subject and in the Master Mechanics' on another, as can easily be seen by a glance at the personnel of the various committees.

The conclusion is evident that the distinction between the work of the two associations is only in kind. It is not a distinction that necessitates the employment of different men with different training, belonging to different departments of the railways. Each is engaged in a portion of the work of the mechanical department, with the same men in charge, interested in the subjects discussed in each and bearing their share of the investigations and experiments in both.

It is difficult, therefore, to-day, to justify the continuation of two separate associations on the ground of the difference in their fields of work or the variation in their memberships. The strongest opposition to such a change is in the statement made by Mr. McKenna: "Unless improvement is possible, change should not be favored." Apart from any question of sentiment, it is a serious matter to disturb the successful operation of over forty years. The question for consideration is really whether the attendant advantages are sufficient to justify the change. The most important is the possible saving in time. Under the present arrangements, to attend the first convention means, for the majority of our members, that they must leave home on the Monday or Tuesday night, and, if they stay for the second, they can not return until the Thursday or Friday of the succeeding week. Practically, therefore, attendance at both conventions means that two weeks must be given up to the work, and, under present conditions, this is frequently more than can be spared, important as these conventions are recognized to be.

The attendance of both conventions suffers from this unreasonably spread-out arrangement, especially that of the Master Mechanics. The regulation of the rules of car interchange by the Master Car Builders' Association introduces a business element into its affairs, of an importance that almost necessitates the attendance of the officials in charge of the car departments, apart from any consideration of the value of the technical questions handled in both associations. Apart, however, from any consideration as to which convention suffers most, it may certainly be taken for granted that both are well worth attending and that both associations need the attendance of the men in charge of car and locomotive departments to retain their representative nature and continue their development in the most efficient way. If, therefore, the substitution of one association for the two existing ones can enable this attendance to be obtained, it is certainly a reason in its favor.

The present arrangement takes three days for the Master Car Builders' Association and three for the Master Mechanics', there being two idle days in between. At each meeting the convention is called to order at 10 A. M., and about an hour and a half is occupied in the opening addresses and in the transaction of routine business of the association. On the second and third days the convention meets at 9.30 A. M., and from the third day at noon the election of officers and other closing business usually occupies the time until adjournment. As the convention adjourns each day at 1.30 P. M., the total number of hours occupied by the meetings is twelve, of which about nine are available for the business which the association is organized to transact.

It would be entirely feasible to provide the time thus required by the two associations in the case of one association meeting at 10 A. M. on the Monday, and 9.30 A. M. each succeeding day, adjourning as at present at 1.30 P. M. Allowing, as before, three hours for the opening and closing business and adjourning at 1.30 P. M. on Friday, there would be sixteen and one-half hours available for the transaction of business. If not sufficient, the election of officers, etc., could be held on the Saturday, or, as would probably be considered preferable, meetings could be held on one or two afternoons during the week, which would certainly afford ample time for any work which may reasonably be expected. There is no objection to one or two afternoon sessions, especially in an association discussing both car and locomotive subjects, but the fact that both classes of subjects are being handled in one convention would in itself save a certain amount of time, as the discussion of the same or similar subjects in two separate conventions would be done away with. It may be stated, therefore, definitely, that one association, by the reduction in time required for opening and closing exercises and routine business, would enable a convention to be conveniently held during one week that would afford as much time for the transaction of business as the two conventions do at present. This would enable the members in the majority of cases to attend the entire convention with an absence from their homes of not over one week, thus effecting a considerable economy in the time required by busy men in attending a meeting of importance to them and correspondingly insuring a more representative attendance.

The existence of one executive committee in place of two would reduce the demands on the time of the men engaged in carrying on the business of the associations, and would facilitate the work of selecting subjects for investigation by committees and the names of the members composing them. Under present conditions, it is practically necessary to hold the meetings of the two executive committees either jointly or in communication with each other, both for this purpose and for business connected with the carrying out of the convention arrangements. One executive committee would be more efficient in handling any matters connected with both car and locomotive departments than are two, and, if selected from various sections of the country, would form a strong and representative body for any work in which their services might be of use.

The discussion of similar subjects in two associations would be done away with. Apart from the committees on Consolidation and Arrangements, there are to-day three subjects, Safety Appliances, Lumber Specifications and Train Brake and Signal Equipment, which are being investigated by committees from both associations. In two cases the membership of the committees is practically the same, a recognition by the executive committees of the desirability of reducing as much as possible the time demanded from our members in carrying on this work. There are other subjects on which committees have been appointed on which joint action would logically be required, were it not for the recognition of the unnecessary work involved in considering the same subject in both conventions. Those referred to are: the Revision of Standards, Brake Shoe Tests, Coupler and Draft Equipment, Car Wheels, Train Pipe and Connections for Steam Heat, Mounting Pressures for Various Wheels and Axles, Widening Gauge on Curves, Steel Tires, all of which might be classified as subjects for joint investigation from the fact that decisions reached by one association will practically be adopted by the other. Subjects on which joint action is required will probably increase in number rather than decrease. The time has largely passed when one practice obtained in the car and another in the locomotive department unless there is a good and valid reason for the difference. The agreement on a uniform practice, if possible, or the acceptance of a reason for divergence, can be far better discussed in one association than in two, apart from the saving in the time of the

members of the committees, the duplication of reports and experiments.

In a joint convention the time allotted to the various subjects could be better allotted than when the two are separate. The work in each varies from year to year, and, while, no doubt, it has a tendency to increase, there is sometimes a question whether the investigation of a subject is not carried out in order to arouse interest in the convention, rather than on account of its pressing necessity. With one executive committee the subjects could be determined on with less reference to the time at disposal and with more consideration to their relative importance. It would also be possible and advantageous to avoid the tendency to hurry the discussion on what may have proved to be a more important and contentious subject than was anticipated, which now frequently occurs in order to enable the program to be completed on time. With double the time at their disposal, the meeting could give each subject the attention it requires, and gain on a subject which did not develop the expected discussion the additional time occupied on one which exceeded expectations.

The committee was not instructed to draw any conclusions as to the desirability or otherwise of forming a new association, and has intended to present the arguments for and against that course. It was also instructed to prepare a constitution for a new association, and considers that one modeled after that adopted by the Master Car Builders' Association last year, with certain modifications to render it applicable to a joint association, would be most suitable. It is appended herewith.

ARTICLE I.

NAME.

SECTION 1. The name of the Association shall be "The American Railway Mechanical Association."

ARTICLE II.

OBJECTS AND LIMITS OF ACTION.

SECTION 1. The objects of this Association shall be the advancement of knowledge concerning the construction, maintenance and service of cars, locomotives and other railway mechanical appliances, by investigations through committees and discussions in convention, and the exchange of information. To provide an organization through which the members, and the companies they represent, may agree upon such joint action as may be required to bring about uniformity and interchangeability of railway equipment. To improve the construction and to adjust the mutual interest growing out of the interchange and repair of railway equipment entrusted to their care.

SEC. 2. The action of the Association shall have only a recommendatory character, and shall not be binding upon any of its members or the companies represented in it.

SEC. 3. Subjects involving legal, transportation, permanent way or traffic questions, or for any other reason requiring such action, may be submitted as recommendations to the American Railway Association.

ARTICLE III.

MEMBERSHIP.

SECTION 1. There shall be four classes of members—Active, Representative, Associate and Life Members. Each member must sign the Constitution or authorize the Secretary to sign for him.

Active members are entitled to one vote on all questions. A person eligible as an active member may become such on the approval of his application by the Executive Committee and the payment of one year's dues. Unless dropped from the Association, his membership shall continue until his written resignation is received by the Secretary.

SEC. 2. The following persons are eligible as active members:

Any person employed by a railway company, or railway companies jointly, having charge of the design, construction or maintenance of the railway equipment thereof, or their direct assistants, or holding a position equivalent to that of Master Mechanics or Divisional Master Mechanics, Master Car Builders or Divisional Master Car Builders, or Superintendent of Car or Locomotive Shops. One person from a company owning or operating 1,000 cars or over, which are not in process of purchase by other parties and having charge of the designing, construction and maintenance of the car equipment thereof.

SEC. 3. Two active members in the employ of a railway company and one active member in the employ of a company other than a railway company may be named to represent such railway or other company by appointment by letter from the President, Vice-President, General Manager or General Superintendent. Such members shall be known as representative members and shall on all measures affecting the interests of the companies represented, which the majority of the Association decide shall be determined on the basis of the cars or locomotives represented, have one vote for each 1,000 cars or 100 locomotives they are authorized to represent.

Provided, that no member shall represent more than one railway or system of railways and that the number of cars or locomotives they are authorized to represent must be specified in their letter of appointment, and must be owned or in use or in progress of construction by the companies represented.

In the enumeration of cars, four axles to count as one car.

SEC. 4. Engineers or other persons having such knowledge of science, or experience in matters pertaining to the construction of railway rolling stock as would be of especial value to the Association or railway companies, may be proposed as associate members by three members not associates. The names of such candidates shall then be referred to the Executive Committee, which shall report to the Association on their fitness for such membership. They shall be elected by written or printed ballot at any regular meeting of the Association, held not less than six months after a candidate has been proposed, and five dissenting votes shall reject. The number of associate members shall not exceed fifty. Associate members shall be entitled to all the privileges of active members, excepting that of voting and being elected to office in the Association.

SEC. 5. Any person who has been for twenty years an active or representative member in good standing of this Association, the Master Car Builders' Association or the American Railway Master Mechanics' Association, or who has served as President of either of these Associations, may become a candidate for life membership on the recommendation of the Executive Committee. The name of such member shall be referred to the Association in convention, for election by written or printed ballot, at any regular meeting of the Association, and five dissenting votes shall reject.

SEC. 6. Any member may be dropped from membership for cause prejudicial to the interests of the Association by a vote of three fourths of all the members of the Executive Committee; provided, that written notice of the charges preferred against him shall have been given him at least two months prior to such action.

EDITOR'S NOTE: The remaining Articles and the By-Laws are practically the same as adopted by the Master Car Builders' Association except for an addition to Article IX and a slight change in the time of opening the morning session. The addition to Article IX reads as follows:

"Propositions recommending the adoption or modification of the Standards or Recommended Practice of the Association, or entailing the expenditure of over $1,000 of the funds of the Association, must be determined by a vote on the basis of the cars or locomotives represented."

The By-Law referring to the hours of session is:

"The regular hours of session shall be from 9.30 A. M. to 12.30 P. M., and from 2 P. M. until 4 P. M. The morning sessions of the Association may be prolonged to 1.30 P. M., and the afternoon sessions omitted by vote of the majority present, or the afternoon sessions of the second or other days of the convention, by resolution, may be made an executive session for the consideration of special subjects, but due notice of such proposed action must be given on the day previous."

The report is signed by:—D. F. Crawford (Penn. Lines), H. H. Vaughan (Can. Pac.), and G. W. Wildin (N. Y., N. H. & H.) for the American Railway Master Mechanics' Association, and by:—F. H. Clark (C. B. & Q.), W. A. Nettleton (Rock Island), and C. A. Schroyer (C. & N. W.) for the Master Car Builders' Association.

DISCUSSION ON CONSOLIDATION.

F. F. Gaines: I move that the report be accepted and referred to letter ballot.

C. E. Fuller: I second the motion.

G. W. Wildin (N. Y. N. H. & H.): I rise to a point of order on that motion It is out of order. You cannot refer this matter to a letter ballot. This question affects every member of the association, and not only the representative membership which is entitled to a vote on the question by letter ballot. If you refer this to letter ballot the majority of the members could not vote on the subject.

F. F. Gaines (Cent. of Ga.): I amend my motion that we accept the report of the committee, and further move that we act on the report of the committee and consolidate the two associations.

Mr. Wildin: I think, as stated in the report, that this matter requires consideration, and there should be more thought given to the matter. I also think we should have an expression of opinion from the members present to-day as to their attitude in the matter. Therefore, I move that it be the sense of this association that a consolidation take place and that the matter be referred to the executive committee for their final disposition and report at some future date.

C. A. Seley (C. R. I. & P.): I believe it is stated in the constitution that both of the associations, on any matter affecting a constitutional change, are to have six months' notice. That ought to be considered in this case. I agree with the ballot idea, but believe we should have an individual ballot. I believe every member of this association, whether able to attend this convention or not, or any convention, has a right to an authoritative expression as a member of this association on this question, and I was hopeful that Mr. Gaines, in amending his letter ballot motion, would make that an individual motion.

Mr. Gaines: If I may be allowed to make a further amendment, I suggest that the matter be referred, not to letter ballot, but to each individual member, not on the basis of representation. That will give every one who is a member of the association a chance to have a vote. If it is referred to the executive committee, as Mr. Wildin suggests, I do not see how the individual members will be given an opportunity to vote on the question.

Mr. Wildin: I did not expect to see this matter rushed through at the present time, but we could easily tell whether it is necessary to refer the matter to letter ballot, or individual ballot, if you put the motion to vote, as an expression of opinion. I believe the members who are both for and against this proposition are very well represented here, and I believe we ought to have an expression of opinion from this meeting.

The President: I do not think we are in a position to decide without some further discussion on this matter as to the merits and objections to this plan, whether we want to put it through or not. Neither do I think that we are in a position at present to settle the matter of letter ballot. The constitution of the Master Car Builders' Association provides that the constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that written notice of the proposed amendment has been given at a previous meeting, at least six months before. The report of the committee constitutes the notice required by the constitution, but it has not been presented to the association at a period six months in advance of this meeting. Consequently I do not see how it is possible for us to take action now, which would settle the matter one way or the other. It is something, I think, which will have to go over for a year, unless someone finds a way out of it, and perhaps the best use we could make of our time at present would be to consider the entire matter, and determine, if possible, how we can handle it in such a way as to take action next year, if it seems that such action is desirable.

F. W. Brazier (N. Y. Cent.): I purposely have kept my seat and refrained from discussing this question thinking that some of the members would take a little more interest in the matter. The association has honored me in the past and elected me as its president. I feel the honor very deeply. I do not believe, to-day, we are ready to take a snap judgment on this. I was going to move that the report be accepted and laid on the table for one year, to give us time to think it over and talk it over. We are too much like people in politics, finding fault with the men they elect, while they never attend a primary to select the right man. Now, let us not go too fast on this. I advocated it at one time. Conditions are changing all the time, and I do not believe to-day that I really am clear as to whether we want to consolidate or not. I think possibly it is going to be the right thing, but let us take time to consider it. I see no harm in accepting the committee's report and letting it lie on the table for another year. I so move.

Mr. Schroyer: In explanation of my seconding that motion, as an approval of the same, I want to say to you that it occurs to me right here that if this consolidation is effected and the attendance of these meetings is increased to the extent that it necessarily will be by that consolidation, you will have a difficult time finding a place to meet. That is one of the thoughts that comes to me. This room is now filled and has been filled at every session of this association. Suppose there were three or four hundred more members here, while it may be true that we could get a room big enough to meet in, what are you going to do about hotels? I think we will overreach ourselves. Another thing: what are you going to do about attending these meetings, two long sessions a day, for four or five days of the week? These manufacturers come here with their exhibits and display the modern machinery, improvements on the old, modern appliances of all kinds, which affords us the very best opportunity we can have to see these appliances combined in such a way that we can get beneficial knowledge in a short time—if you consolidate these associations, we will leave home on Saturday and will return home on Monday, and will have to do a lot of hard work in the meantime. So that I think there are many things to be considered in this connection, and it would be a very wise thing to allow this report to lie over for a year. (Applause.)

A. E. Manchester (C. M. & St. P.): The applause that Mr. Schroyer received is in line with my thoughts, that every member of this association who is not a member of the Master Mechanics' Association will not be in favor of the consolidation. I believe they have good and just reasons for feeling that way. The heads of the railroads rarely come from the car departments. They are either from the locomotive or the engineering departments of the roads, and the thought occurs to me that with that as a fact, there will be a danger of the Master Mechanics' Association finally predominating. I believe it would be a bad thing to have it that way. If there has been effective work done by either of the two associations, we are all, I think, agreed that the most effective work has been done by the car association. I fear that any movement that consolidated the two would have a tendency to weaken the car association, and not materially strengthen the Master Mechanics'. (Applause.)

George L. Fowler: Some years ago there was a paper read before one of the railroad clubs that was a little tiresome, and Mr. Forney, in discussing it afterward, said he had often heard of the fact that if you strained a piece of metal beyond a certain point, you would exceed its limit of elasticity, and it would very soon break. It seems to me as though, if the work of these two conventions were to be compressed into one week, the condition of the members at the end of that week would be very much like that of a piece of metal that had been strained beyond its limit of elasticity, and that the work it was doing on the last two or three days would not be as efficient as it would be if they had a recess in between. We find, in teaching school, that it is necessary to give children a recess in the middle of the day, and it seems to me quite reasonable that an audience, even so vigorous as this, would have to have a recess in between three or four days of such hard work as comes in these conventions. You put the convention on the floor here at nine o'clock in the morning, keep it in session until half-past twelve, then pick it up and do the same thing again in the afternoon, and by the end of the third day you have a tired lot of men that are doing just about as efficient work as your fireman would do after being out on a 150-mile run firing a big engine without assistance. They cannot do the work properly.

Then, there is another point. It has been a matter of universal concession, time out of mind, ever since these conventions were organized, that the discussion among members in between the sessions is of as much benefit personally and individually, and, in fact, of as much value to their railroads, as anything which they get from the conventions themselves. If you take up all the time in the conventions, as will be necessary in order to get through in a week, you cut out that outside discussion and members do not have a chance to get acquainted with one another socially or in a business way, as they will if they have a little more time to themselves.

And, finally, the point that Mr. Schroyer brought out, the fact that these magnificent exhibits are placed here on the pier—it seems to me it is very doubtful whether the manufacturers would go to the expense that they do now, running up into the thousands of dollars every year, to bring these exhibits down here, to show the latest things that have been developed, if their exhibits had to be opened on Monday morning and closed practically on Thursday night; because we all know that although this convention closes formally on Friday noon, the last morning amounts to nothing so far as the manufacturers are concerned.

In view of those three points alone, that an audience simply cannot be got together and kept standing up to the performance of this kind of work for four or five consecutive days; that the members will not have a chance to become acquainted with one another, which the conventions are the most valuable means in the country to bring about, and that the manufacturers will not be able to bring their exhibits together—in view of those considerations, the subject ought to be very carefully considered before we get together and try to effect the impossible. (Applause.)

W. A. Nettleton (C. R. I. & P.): As a member of the committee of your association, I have been asked a great many times my opinion on this matter, and I have talked with a great many people. I cannot find, really, that there is any consensus of opinion on the matter. The principal argu-

ments seem to be the saving of time and the saving of expense, and I do not see how we can act on this thing precipitately, because we do not know whether the young lady is going to like us or not. I should say that if we do get together and try to save time, it should be something in the nature of a trial marriage, a committee appointed by both associations to see whether the duplicate subjects could be cut out, or something along that line..

J. F. DeVoy (C. M. & St. P.): I have looked at this matter for a considerable period at an angle altogether different from that at which almost anyone else has looked at it. You never can convince me for a minute that a truck horse could have the ability to win a derby race. If you have appendicitis, you are not going to send for a horse doctor. The art of car-building must be given more attention by men who know car-building. A purely technical man never was fitted in God's world to build a car. It requires ten or twenty years for him to be able, even in a measure, to attempt to build cars. The average high-class technical man will absolutely put one hundred dollars where ten cents would do the business. I do not think anybody is willing to question me in this, because I start at altogether a different angle. This distribution of steam, valve motion and all that thing, is a scientific study which requires a specialist, and a man that knows the distribution of steam may not know anything more about the strains on the centre sills of a car or draft gear than a mule does. I know just what I am talking about. It is getting to be pretty nearly impossible to get a man that can even lay down the clearances for a car. They will run a pipe through the wheels if they can get it through there. This argument that the supply men should have a show to exhibit hasn't anything to do with it.

W. F. Bentley (B. & O.): I think this matter is one that is deserving of serious consideration. If the railroad companies are to be benefited by consolidation, the change certainly ought to be made. The saving of money for the railroad companies is what the members of this association, I believe, as well as the Master Mechanics' Association, come here for. If by placing additional burdens on the Master Mechanics' Association, giving them additional duties while they are here, they can accomplish the work and do it properly in the same time, they certainly ought to be given the opportunity to do it. It certainly should be a saving in money to the railroad companies from that point of view. Assuming that the Master Mechanics' Association has not sufficient time, and the subjects brought before it are worthy of greater consideration, I imagine that it could not do the additional work that has been done by the car department people, with their assistance, in the same amount of time. There is a point that occurred to me that was brought out in the report, that it seemed might serve both associations to good advantage if considered. The point is that there seems to be a lack of understanding between the two executive committees, and therefore they appoint committees to investigate the same subjects. Possibly a conference between the two from time to time might result in good to both, when the subjects are being selected. I do not think any sentiment should enter into the matter of consolidation, but I believe that the motion Mr. Schroyer has made, that the matter be held over for another year, and be given further consideration, is a good one. It would seem fair, too, that the individual members should be given a vote on the matter at that time, if it is considered by the officials of the railroads represented that they are competent to vote. I assume that by reason of their having become members of the association, with the consent of the railroads, they would, in the majority of cases, at any rate, be considered competent to vote and to pass judgment. I do not think that the railroad companies would want to consolidate simply as a matter of sentiment, but as a matter of dollars and cents. If they can advance ideas and perfect constructions by a consolidation and better conditions in general throughout the country, I think it would be their intention to do so; and I think whether a man is a member of this association or the Master Mechanics' Association, he should, after giving the thing proper consideration, give his vote in the way he thinks the interests of the railroad companies would be best promoted.

J. J. Hennessey (C. M. & St. P.): In the principal line of thought that has been given expression, the only good reason that I have heard advanced for the consolidation of the two associations is the saving of time. I have tried to figure out how much time would be saved. Practically about all the time that can be saved is the time taken up by the presidents' addresses, and the organization of the two associations. I do not know whether an hour or an hour and a half on an important subject like this is worth considering. Both the Master Mechanics' Association and the Master Car Builders' Association have made a record. They have accomplished a great deal of good in their own lines, and I question very much whether we are going to get, by consolidating, as good results in the car department as we are getting to-day. When it comes down to dollars and cents, it is the car department that spends the railroad's money. There will be another tendency, possibly, if the two associations are consolidated, and that is, to make a great many of the younger members in the Master Car Builders' Association become indifferent. The crying need to-day in this country is to interest more young men in the car department. I believe I voice the sentiment of nearly every man of experience in this hall, when I say it is almost impossible to-day to select young men that have the proper training, so that you can give them charge of a large shop in a car department. Why? For the reason that for years the opportunities for young men to come in and learn the car trade have not been as good as they have been in the locomotive department. By the time one apprentice gets through his time, his salary is far above the salary of the apprentice in the car department. The result has been that the brightest young men have drifted into other departments, and the car department to-day is really at a loss for the proper material to conduct its business as it should be conducted. I believe any movement looking to the consolidation of the two associations is going to be a still further drawback to the department that spends more money than any other department of the railroad business.

G. W. Wildin: It seems to be the burden of the argument which we have heard that someone is going to lose money by consolidation. I do not see that we are going to wipe the car men off the face of the earth, nor exalt the locomotive men. What we are trying to do is to get a first-class railway mechanical association that will embody in its membership all men who care to take part in it, without fear or favor to any.

With regard to the question of a man not knowing anything about cars because his principal work is with the locomotives, it is quite evident that Mr. DeVoy has not read the report of the committee very carefully, and the other committee reports presented at the meeting, or he would see that about 95 per cent of the committee men in the M. C. B. Association are really locomotive men and have never had any experience with car matters. If you select such men for committee men it is because they are capable of doing the work which is required of them. Take, for instance, the committee on Air Brakes and the committee on Train Brake Signal Equipment, and you have not a single car man on these committees doing the work of the association here; not a single car man, and I do not think you would find much better committee men than are on these committees if you look the entire car departments over. Take the committee on Brakeshoe Tests, what car man is there on that committee? Take the committees on Coupler and Draft Gear. You have two men, one connected with a private car line, yet they do not have any motive power man, and the other member is with a railroad company. Take your committee on Rules for Loading Material. You have one car man on that. Take the committee on Car Wheels, you have one car man on that. Take the committee on Safety Appliances, you have two car men on that—two car men out of seven members. It is evident that the executive committee of this association is either mistaken in selecting committee men, or some people are mistaken in their ideas of what constitutes a proper man to handle the work of these committees.

Now, there are other things besides the mere matter of wiping out the two associations. I am for consolidation, and I do not think that either association is going to lose anything. I think we should go further, although we did not think it quite proper to put these suggestions in the committee's reports. I think there are other associations that should be dealt with in this connection, and should be consolidated. There is no reason that I can see why, in the consolidation of the M. C. B. and M. M. Associations, we should not include the Traveling Engineers' Association and the Air-Brake Association. Each of these associations has a committee engaged in air-brake work. There is only one body that can do air-brake work and do it properly, and that is the Air-brake Association, and that association ought to be a part of this proposed consolidated association. It should be a part of us, so that what work it does will have some weight. If it is endorsed by this association, it will have weight. As it is now, it formulates policies and practices, and each man goes home to his superintendent of motive power and tries to put these policies and practices into operation, and the matter has no weight whatever. The committees of that association are doing good work. The Traveling Engineers' Association have a Committee on Air-Brakes. That is also a good working committee, the Traveling Engineers' Association is a good working association, and it ought to be a

part of this association in order to enable it to do its work most effectively. Then we have a General Foremen's Association, which has more to do with shop practices than any other organization—the superintendents of motive power are not in touch with them. They have a separate association, and in order to secure the greatest value from the work of that association, it ought to be a part of this association. We have associations all over the country that should be in this General Mechanical Association, and I believe it is only a matter of sentiment that keeps us from consolidating all of these associations. There is nothing to be lost by such a consolidation, and it will have to be made eventually. Every one of these other associations can give its actions no force without our endorsement, and if we endorse their work it will go into action. If they are a part of the new organization, the result would be that we would have more uniform and general practice.

Mr. Schroyer: I call for a point of order on this question. We are all out of order. We are not talking to the question —the question is, whether this report should be laid over for a year.

The President: The point of order is well taken. The chair has allowed this discussion to run along, because he thought it was desirable to get the expression of the members on the question. If there are two or three other members who have something to say, and you will permit the discussion to proceed, I think perhaps it had better be done.

H. H. Vaughan (C. P.): As a member of the committee of the Master Mechanics' Association on this subject, I would like to say that we thoroughly agree with the remarks made by Mr. Hennessey; but I do not believe that that point of view is one that affects the present question very seriously. The way we looked at it was that the question of the advisability of offering better lines for promotion to men in the car department was not one that was going to be affected by any action taken by these two associations. The only way we can look at this matter is that the consolidation of the car and locomotive departments under one heading has already been effected on the majority of railroads. The question of the advisability of that consolidation is one that we did not consider; we have to take things as they are and not as we might like them to be.

I am not by any means prepared to advocate the advisability of the consolidation of the car and locomotive departments. I do not think that is the question at issue. The chief question is, whatever our opinions of the matter may be, that on the majority of roads the car and locomotive departments are under the charge of a mechanical officer. They are two different departments, it is true, but they are under one general superintendent. We have to admit, from the facts which exist, that a large majority of the railroad companies have felt that to be the advisable method. It seems to me that the general feeling of a railroad executive is that he wants a mechanical officer to look to for the direction of both car and locomotive matters. He has his operating man on operating matters, his accounting man on accounting matters, a chief engineer on permanent way matters, and the chief executive of a railroad wants his mechanical man on car and locomotive matters; in other words, on most of the railroads of this country a mechanical department has been organized, and the car and locomotive departments have been merged into and combined in it.

I do not want to enter into any discussion of the relative merits of car and locomotive men in handling either car or locomotive matters. The discussion this morning has shown us distinctly that we have one man who is a locomotive man who knows all about car matters. I am sure he is a locomotive man because his title is such, at the same time he has no objection to coming here and taking a keen interest in the matters of the car department. I feel that is our general proposition—that whatever may be the advisability or non-advisability of the course, we have, as a rule, the same men interested in both car and locomotive matters.

Mr. Wildin has called your attention to the fact that we have mostly locomotive men on a great many of the committees of this association. I do not like that way of putting it. I must disagree with Mr. Wildin. I would say that the mechanical department is represented by a large number of men on the committees of the M. C. B. Association, and that a large number of the same men are on the committees of the M. M. Association. I also call your attention to the fact that your presidents and vice-presidents are men equally eligible to be officers of either the M. C. B. Association or the M. M. Association, and to a large extent the same men are interested to-day in both organizations. As Mr. Hennessey said, the car department is the department on the railroad that entails the expenditure of the most money. I do not think there are any railroads concerning which this is not true, and the consequence is that the officer in charge of the mechanical department of the railroad is practically compelled to attend the meetings of the M. C. B. Association on account of the large amount of interest he has in its meetings. He may have been a car man originally, or he may have been a locomotive man originally, through whichever line he has come up. He is obliged to take a deep interest in the convention of the M. C. B. Association because the proceedings of that association affect his road to such a vital extent.

I cannot but feel that the tendency has been for the meetings of the M. M. Association during the past few years to suffer from the fact that mechanical officers have been called upon to attend the M. C. B. Association on account of the importance of the subjects discussed at its meetings, and also on account of the spreading out of the time occupied by these two associations. It has been a quite frequent occurrence that these men have been obliged to go home, after attending the meeting of the M. C. B. Association, and neglect the meeting of the other association.

My feeling very keenly is that the M. M. Association is the one that needs this consolidation more than the M. C. B. Association. The M. C. B. Association has an amount of business interest to the railroads that compels the attendance of the mechanical department officers, while the M. M. Association, being more technical in its character, naturally suffers through the lack of attendance of these representatives and their failure to take the same interest in its proceedings which they take in the proceedings of the other association.

As far as the question of time is concerned, I do not want to paint any picture of how good an association we might have, or how much time would be saved, but I do feel that one association would be stronger and would have certain advantages over two. I do not think we would be straining beyond the breaking point by attending a convention in one week, instead of spreading it over two weeks, or what practically amounts to two weeks. It seems to me, if the associations were consolidated, that the man who is chiefly interested in locomotive subjects would stroll out and have a look at the exhibits while the question of the splicing of sills was being considered in the convention. On the other hand, the car man might not be interested in the question of superheat for the locomotive, and while that subject is being discussed he would have an opportunity to look at the exhibits. I firmly believe that the attendance at the exhibits would be improved by holding the convention within the period of one week.

I do not believe there is any necessity for regarding the report of the committee as final, but really, if you will look at the present convention, you will see that up to noon on the first day, the time was occupied in preliminary business, and there are only three and a half hours available on the last day, so that the time actually available in these conventions for discussing car and locomotive questions is really very limited when you consider the time that is spent by the members in getting to the meetings. The majority of mechanical officers who live, say twenty-four hours from Atlantic City, have got to give up practically two weeks to these conventions if they want to attend both of them. I feel that both conventions are of sufficient importance for us to attend them. We all feel that way, but I am quite sure that some of our executive officers do not feel that way. They think if a man consumes a week in attending these conventions, that is about all the time that should be consumed; and while I do not want to give the impression that the officers of the Canadian Pacific are less willing to allow their men to take two weeks in attending the conventions than any other railroads, I do know they have a slight feeling that if I leave home on Monday and do not return until the second following Friday, I am putting in more time in attending the conventions that seems to be necessary. If I could leave home on Saturday and return on the second following Monday they would feel that that might be reasonably all the time that could be expected to be given to the work, and I cannot help feeling that that same sentiment is shared by the officers of other roads. I think they would like to see these associations handled in such a way that their mechanical officers could attend the meetings and not give up more than one week's time in doing so. Two weeks in a year is four per cent of your total time to attend these mechanical conventions as now conducted.

I would like to speak with regard to Mr. Schroyer's motion for a minute, if I may. When this matter came up, the committee had to consider if a consolidation was deemed desirable, how it could be effected. I regret to say that we were entirely unable to arrive at any decision in that matter. There are a number of legal questions involved, and, as I think you will realize from the motions made this morning, no one has any clear idea as to how this thing could be handled or in what way the vote should be taken.

It is a question in my mind as to whether the vote of the

membership as a whole is constitutional, whether an amendment to the constitution would not have to be introduced to make such a vote effective. I must confess that I do not understand the legal standing of the M. C. B. Association, and I do not know that anybody else does. All these questions will have to be considered. My feeling, personally, is that Mr. Schroyer's motion is an exceedingly wise one, and it is exactly what should be done with this report—action on it should be delayed for a year to give everybody a good chance to think it over and come to some conclusion about it. It is too serious a thing to jump into without proper study. Your committee never desired any such action as would bring the consolidation about rapidly. All we expected was that the matter would be carefully considered, and carried along for a year or two, so that everybody interested could have a full and unlimited opportunity to thresh it over and see whether or not such a thing was desirable.

I believe we should add to Mr. Schroyer's motion, that the matter should be laid over for a year and, also, that it should be referred to the executive committee for further report and consideration, so that the committee may be in position to look up the legal questions concerning which, owing to a good many delays, we were unable to obtain any information. They might also look up the action that could be taken if a consolidation is deemed desirable. I think that is a matter for the executive committee to deal with. We were unable to do it on account of the delays in getting the consensus of opinion of the various members of the executive committee, and there again is an instance of the desirability of one good, strong, executive committee. We took quite a lot of time in securing the consent of the executive committees of the two associations in order to procure authority to secure legal advice in the matter.

F. W. Brazier: As mover of the original motion, I will be only too glad to accept Mr. Vaughan's suggestion, and I want to thank Mr. Vaughan for the clear and concise way in which he stated the matter, without becoming excited. I believe it will do no harm to let the matter lie on the table for another year, and let the committee consider it. I am sure if the officials of the railroads were to attend our meetings and see our exhibition they would not have the opinion that we come here with any other purpose than that of a most serious desire to do the work mapped out for the meetings. All of the railroads of the country get the benefit of the work which we do. On the New York Central lines we are anxious to have our men attend these meetings, and the road gets the benefit of their talents and the knowledge which is secured at these conventions. If a larger number of the higher officials of the roads would attend the conventions occasionally, I am sure that they would have a very high opinion of the value of the work which we perform.

The President: The motion, as modified by Mr. Brazier, is that the subject be laid on the table for another year, that the executive committee of the association be instructed to consider the legal and other aspects necessary to put the matter through, and that the members be given an opportunity to further consider the matter.

The motion was carried.

The Secretary: In your voting for associate and life membership, the associate member proposed is Prof. Endsley, and the life member proposed is Thomas Millen. Inasmuch as there is only one candidate for each form of membership, you can vote, "yes" or "no," no matter whether you put the name of the candidate on the ballot or not.

The President: The next business is the report of the committee on Classification of cars, of which James Milliken (P. B. & W.) is chairman.

CLASSIFICATION OF CARS.

At a meeting of the American Railway Association, held April 22, 1908, the folllowing resolution was adopted: "*Resolved*, That the Master Car Builders' Association be requested to take up the question of harmonizing the terms used in designating the different classes of cars and the different kinds of cars in each class, according to their physical characteristics and report its recommendations to this Association for final action."

In the report made by the committee at the 1909 convention it developed that Mr. Hale, of the American Railway Association, had been asked to define more clearly the scope of the resolution, and under date of April 10, 1909, advised as follows: "The question of harmonizing the terms of designating cars was originally brought up by the Association of Transportation and Car Accounting Officers, through the committee on Car Service. The first term which they wanted defined was a 'coal car.' The discussion developed that there was a good deal of difference in the minds of Eastern men as to what was a gondola, and then the question came up as to what was a hopper gondola and whether a hopper gondola was different from the hopper. As time went on the question was asked, 'What was a refrigerator car?' That is, must refrigerator cars have ice boxes; and later the question has been raised, 'What is a postal car?' Also, 'What is a mail car?' and 'What is a tourist sleeper?' The M. C. B. dictionary is rather general in its terms, and it was thought that your Association would be the proper one to give full definitions to all the terms in common use and invent proper terms where the vocabulary is not now sufficient. There are doubtless other undefined terms, and the thought was that a full set of names and definitions would be most desirable."

The committee feels that the American Railway Association desired a classification of cars more from a transportation, than a detail construction, standpoint and, therefore, presents a classification of cars, divided, first, into passenger equipment cars; second, freight equipment cars; third, maintenance of way equipment cars; and these classes, in turn are subdivided into distinctive classes of cars, principally in order to facilitate the work of car distribution and car efficiency. We have not taken into consideration the individual physical characteristics, such as kind of truck, draft gear, or other details of construction of a car, as we understand the principal questions to be answered are "what kind of a car" and "how much will it carry." The rolling equipment of forty-three railroads, operating 117,500 miles of track, and owning, approximately, 1,350,500 cars, has been looked into, and it is found to be impracticable to make a definite classification giving the individual characteristics of the cars that would, in any way, be applicable to the equipment of the various railroads of the United States.



James Milliken.

Chairman, Committee on Classes of Cars.

It would, therefore, seem that the classification should be broad in its interpretation, and confined only to the kind of car of general class and the stenciled capacity of the car. With passenger cars, the kind of car, length and seating capacity should be indicated, and possibly the manner of lighting. In arriving at the proposed classification of cars a single designating letter has been given for the general service of the car and a secondary letter to cover the general type of the car. In arriving at the primary and secondary letters, the attempt has been made, as far as practicable, to use letters which give some indication of the type of the car, or letters that are now generally used. In each subdivision a brief description covering the type of car has been given.

DEFINITIONS AND DESIGNATING LETTERS OF GENERAL SERVICE PASSENGER EQUIPMENT CARS.

CLASS "B."

"BA"—Baggage Car. A car run in passenger service, having wide side doors for the admittance of baggage, with or without windows or end doors.

"BE"—Baggage Express. A car similar to baggage, used for either baggage or express matter.

"BH"—Horse or Horse and Carriage Express. A car run in passenger service for the transporting of fine stock, fitted with stalls (movable or stationary) and space left for carriage or horse equipment.

"BR"—Refrigerator Express. A car run exclusively in passenger service and fitted with ice bunkers or boxes and suitable to carry produce, oysters, fish or any commodity requiring icing in transit.

"BX"—Express Car. Exclusively for express matter, having suitable side doors, with or without end doors or windows.

Class "C."

"CA"—Combined Car, Baggage and Passenger. A car having two compartments, one suitable for transporting baggage, the other fitted with seats for passengers, the two compartments separated by bulkheads.

"CS"—Combined Smoking and Baggage Car (Club Car). A car having two compartments, separated by bulkheads, one compartment suitable for transporting baggage, the other fitted with seats or chairs and used as smoking car; at times equipped with buffet or bar.

"CO"—Combined car having three separate compartments, separated by bulkheads, one compartment suitable for transporting baggage, one for mail fitted with suitable apparatus for sorting and classifying it, and the other fitted with seats for the transportation of passengers.

"CB"—Business Car. A special type of car for the convenience of business men, used as smoker and fitted with tables or desks, carrying stationery and fitted with typewriters and carrying regular stenographers.

Class "D."

"DA"—Dining Car. Regular dining car, for the use of passengers in transit, fitted with regular kitchen, tables, chairs or seats, with or without bar, carrying cooks and waiters.

"DB"—Buffet Car. Car for the transportation of passengers and fitted with small broiler or buffet to serve simple meals to passengers; cooking and serving done on removable tables by regular porter in charge of car. With or without facilities for serving liquor.

"DC"—Café Car. A car fitted with kitchen, usually in center of car, one end used as café where meals are served, liquor and smoking allowed, the other end of car fitted with either regular dining room or smoking and card room; carrying cooks and waiters.

"DG"—Grill Room Car. Very similar to café car.

"DO"—Café Observation Car. Car fitted with café at one end, kitchen in center or extreme end, having observation compartment fitted with stationary or movable tables and observation platform at rear.

"DP"—Dining and Parlor Car. A car fitted with dining compartment, kitchen and compartment for passengers, fitted with chairs, stationary or otherwise, carrying regular cooks and waiters.

Class "E."

"EA"—Electric Street Railway Service Car, direct current, for transportation of passengers; without automatic couplings.

"EP"—Electric Passenger Car, for long hauls or suburban service, multiple unit and fitted with automatic couplings and air brakes. Third rail, trolley or pantagraph contact.

"EB"—Electric Baggage Car, for long hauls or suburban service, multiple unit with automatic couplings and air brakes and suitable for the transportation of baggage. Third rail, trolley or pantagraph contact.

"EM"—Electric Mail Car, for use in United States Mail Service, fitted with side doors, with or without mail hook, and suitable apparatus for the sorting and classifying of mail en route. With or without end doors or windows.

"EC"—Electric Combined. A car for long hauls or suburban service, multiple unit with automatic couplings and air brakes. This car is made up of two compartments, separated by bulkhead, one suitable for the transportation of baggage and the other fitted with seats or chairs for the use of passengers. Third rail, trolley or pantagraph contact.

"EG"—Gasoline Motor Propelled Car, for inspection or private use, or use in suburban service, hauling one or more trailers.

"ED"—Gasoline Motor Car. Gasoline engine or engine serving to run dynamo to furnish electricity for axle motors. Car to be used for inspection, private use, or as motive power to haul trailer or trailers; fitted with storage cells and with or without booster.

Class "M."

"MA"—Postal Car. For use of United States Mail Service, fitted with side doors, with or without mail-bag hook, and having suitable apparatus for the sorting and classifying of mail in transit, with or without end doors or windows.

"MB"—Baggage and Mail. A car having two compartments, one for baggage and one for mail, separated by bulkheads; the mail end fitted with suitable apparatus for sorting and classifying mail, and with or without mail-bag catchers, with or without end doors or windows, and having suitable side doors.

"MP"—Postal Car. Suitable for transporting newspapers or large mail packages for United States Mail Service, having side doors and fitted with stanchions, with or without end doors or windows.

"MR"—Postal Storage Cars. For United States Mail Service, suitable for carrying mail in bulk, without appliances for sorting or classifying, fitted with side doors and stanchions and with or without end doors or windows.

"MS"—Mail and Smoker. A combined car having two separate compartments, separated by bulkheads, one compartment suitable for the transportation, sorting and classifying of mail, the other fitted with seats or chairs to be used by passengers as smoking car.

Class "P."

"PA"—Passenger Car. A car for ordinary short haul suburban service, with seats and open platforms.

"PB"—Passenger Car. A vestibule (wide or narrow) car for through service, fitted with seats or reclining seats, and having toilet rooms for men and women, also wash basins.

"PE"—Emigrant or Colonist Car. A second-class passenger car, with floors either bare or fitted with matting, used expressly for emigrant trade on trains where low rate of fare is charged.

"PS"—Sleeping Car. A car for passenger service having seats that can be made up into berths, and usually having one or more separate stateroom compartments, also toilet and washroom facilities for men and women, and smoking compartment for men. Some cars of this class are all compartments, and some compartment and observation combined.

"PN"—Passenger car used exclusively as smoking car, with seats or chairs and fitted with cuspidors or having matting or bare floor.

"PO"—Observation Car. A car having an observation compartment at one end and fitted with either berth facilities, parlor chairs or compartments, usually run in first-class service.

"PV"—Private cars used as officers' or private individuals' car and railroad pay car—usually composed of sleeping compartments, dining compartments, observation end and with kitchen, servants' quarters and toilet and bathroom.

"PT"—Tourist Car. A second-class sleeping-car, fitted usually with cane seats convertible into berths and used mostly on trans-continental trains; cars fitted with smoking compartment, toilet and washroom.

"PC"—Passenger, Parlor or Chair Car. A car fitted with individual stationary or movable chairs, used on trains for daylight runs and having toilet and washrooms.

Class "I."

"IA"—Instruction Cars for use of employees, usually run from one point to another in passenger trains.

Note.—If it is so desired, a small letter "E" can be placed after the larger designating letters to indicate electric lighting, and small "G" for gas lighting, also figures showing approximate length of car or length of baggage or mail compartment.

GENERAL SERVICE FREIGHT EQUIPMENT CARS.

Class "X."

"XM"—Box Car. General service, suitable to lading which should be kept from the weather. A box car is a closed car having side and end housings and roof, with doors in sides or sides and ends.

"XA"—Automobile Car. Box car of similar design to general service car, having exceptionally large side doors or end doors.

"XF"—Furniture Car. Box car of similar design to general service car, except usually greater capacity in cubic feet.

"XV"—Box Car, Ventilated. Similar to ordinary box, only having ventilation, and suitable for the transportation of produce or other foodstuffs not needing refrigeration.

Class "R."

"RM"—Refrigerator or Produce Car. A car suitable for carrying commodities that need icing in transit. This car is equipped with two or more ice bunkers or baskets and suitable means of draining off melted ice or briny water. This car has side and end housings, roof and side doors, usually insulated, with trap doors in roof for admittance of ice and salt; also water seals inside of car.

Class "S."

"SM"—Stock Car. This car is for transportation of stock on the hoof, and is equipped with roof, slatted sides and side doors, and single or double deck. With or without feed or feed and water troughs.

"SD"—Stock Car. Composite having drop doors in floor and means of housing in sides and making drop-bottom box car.

"SP"—Stock Car. Used in poultry trade, fitted with roofs and sides usually of wire netting, fitted with shelves for storing crates of poultry and leaving space for poultrymen, feed bag and watering facilities.

CLASS "G."

"GA"—Gondola Car. This car has sides and ends open at top, and drop bottom; suitable for general coal or ore trade, stone or general trade.

"GE"—Gondola car having drop bottoms and drop sills; suitable for general coal or ore or mill trade.

"GC"—Gondola Coke Car. Gondola car fitted with coke racks and having drop bottoms.

"GD"—Gondola car having side-dump arrangement.

"GM"—Gondola Car. Suited to mill trade, having solid bottom, low sides and drop ends to facilitate twin shipments.

CLASS "H."

"HM"—Hopper Car. Similar in general design to gondola car, having sides and bottom ends and open at top, equipped with hopper bottom and self-cleaning.

"HT"—Hopper (Twin). Similar to ordinary hopper, only equipped with two or more hopper doors instead of one.

"HD"—Hopper car equipped with side-dump hoppers.

"HC"—Hopper car equipped with coke racks.

CLASS "F."

"FM"—Ordinary flat car for general service. This car has flooring laid over sills and without sides or ends.

"FG"—Flat or gun truck car for special transportation of heavy ordnance.

"FW"—Flat well-hole car for special transportation of plate glass, etc. This car is a flat car with hole in middle to enable lading to be dropped down on account of clearance limits.

"FB"—Flat car having skeleton superstructure, suitable for carrying barrels, known as "Barrel Rack Car."

"FL"—Flat logging car or logging truck. This is either an ordinary flat car, or car consisting of two trucks fitted with cross supports over truck bolsters; the trucks connected by a skeleton of flexible frame and logs loaded lengthwise on cross supports.

CLASS "T."

"TM"—Tank car for general service. This car is for general oil or liquid service, and consists of a steel tank mounted on a frame or mounted directly on cradles over truck bolsters. It is equipped with one or two safety release valves, and is emptied by valves or valve at bottom. At the top is a dome, with or without manhole, and openings through which the tank may be filled.

"TA"—Acid Tank. Of same general construction as oil tanks.

"TG"—Tank car having glass or glass-lined tanks, for use in hauling mineral waters and other special products.

"TS"—Tanks for special commercial service.

"TW"—Tank car having wooden tank, instead of steel, and used for water, pickles, etc.

CLASS "N."

"NM"—Freight train service caboose for convenience of trainmen. This caboose is mounted on four wheels and has lookout at top over roof. It is fitted with bunks or benches and a stove for cooking and heating purposes, also tank for storage of drinking and washing water, and small tool storage boxes.

"NE"—Caboose mounted on eight wheels and longer than four-wheel caboose, but of the same general design.

CLASS "Y."

"YM"—Yard Poling Car. This car is used in hump classification and flatyard classification. It is usually fitted with a small house or protection and benches, tool box and stove, a counterweighted pole on each side and running board or step near the ground for convenience of yardmen. It is protected with safety appliances and, when in use, is coupled to an engine.

"YA"—Yard pick-up car for use of car droppers and yardmen in performance of their duty. It might be termed a "Car Dropper's Car." It is protected by a house, around which runs a platform and railing, a long running board on sides near ground and is fitted with benches, tool box and stove.

NOTE.—The capacity of car can be shown by affixing two figures after designating letter: for instance, "80" would mean 80,000 pounds capacity; "10" would mean 100,000 pounds capacity; "60" would mean 60,000 pounds capacity. Where tanks are in question the capacity numbers should indicate capacity in gallons instead of pounds.

GENERAL SERVICE MAINTENANCE OF WAY EQUIPMENT CARS.

"MWB"—Ballast Cars. All descriptions of cars used for the purpose of carrying ballast for the laying of new right of way and repairs. The car used generally for this work is of the gondola type, with side or center dump.

"MWD"—Dump Cars. The type of contractors' car used for building up fills; the body of the car dumps, being raised by means of a counterweight, air or hand power.

"MWF"—Flat Car. Used for transporting rails, ties or ballast and for storage of wrecking trucks, or gathering scrap along right of way. These cars are at times equipped with low sides, about 10 or 12 inches high.

"MWS"—Steam Shovel. Car equipped with donkey engine housed in. Having a boom of wood or steel at the end of which is a shovel or scoop. It may be propelled by its own power or by means of a locomotive and run as a car in freight trains, being equipped with safety appliances. The cubic capacity of shovels, in yards, can be indicated by figures after classification letters.

"MWW"—Wrecking Derrick. A derrick used for wrecking purposes, having donkey engine to raise and lower booms and hoists; engine is housed in and on separate platform with boom and is pivoted in center of car frame in order that it can be worked on either sides or ends; usually fitted with anchor beams to be used for heavy lifting. Fitted with safety appliances and propelled by means of a locomotive. Lifting capacity in tons shown by means of figures.

"MWU"—Wrecking Derrick. This derrick has boom and hoist fitted to frame of flat car and lifting is done by means of hand power; propelled by locomotive.

"MWV"—Wrecking Derrick. This derrick has boom and hoist fitted to flat car and a drum at one end to furnish means of hoisting; steam furnished to donkey engine by means of flexible steam line from attached locomotive; propelled by locomotive.

"MWT"—Tool and Block Car. A car used for carrying all descriptions of tool equipment and blocking. This car has side and end housings and roof, also end platforms. There are doors in sides and ends and usually windows. It is fitted inside with proper racks and boxes for storage of tools.

"MWC"—Caboose and Tool Car. Similar to tool car, but having one end fitted up as a caboose, with bunks, stove and water storage, with or without lookout, and is used in either work or wrecking trains.

"MWH"—Hand Car. This car is flat and mounted on four wheels and propelled by means of pushing; it is known as "Push Car."

"MWL"—Hand Car. This is a small flat car, with or without seats, mounted on four wheels and propelled by means of cranks or hand levers.

"MWG"—Section Gang or Track Inspection Car. Flat car, with or without seats or tool boxes, and equipped with single or double cylinder gasoline engine serving as motive power.

The report is signed by:—J. Milliken (P. B. & W.), chairman; F. M. Whyte (N. Y. C. Lines), and J. N. Mowery (Lehigh).

DISCUSSION.

Mr. Milliken: Since the report has been completed, I have had one communication from Mr. Lentz in which some of his people asked a further subdivision between refrigerator cars and produce cars. He brings it out as follows: "So far as refrigerator and produce cars are concerned, the mileage rate on refrigerator cars is about three cents, and on produce cars, six mills. It is thought, therefore, that these classes should be separated and more clearly defined."

In the body of the report we tried to bring out that we had gone over a great deal of equipment scattered through the country, and we found it simply impossible to make a classification that would be readable or understandable if we attempted to go into a very definite classification of cars. We considered the produce cars, and the committee thought that the XV car would cover a car of that kind, it being a ventilated box car. That is the only suggestion that came to us since the report was completed.

The committee was appointed at the suggestion of the American Railway Association, and it might be proper for me to suggest that it may be well for us to refer the report to that association if anyone will make a motion to that effect.

The report was approved and referred to letter ballot for Recommended Practice.

SALT-WATER DRIPPINGS FROM REFRIGERATOR CARS.

The committee made a series of tests during the hot weather of last summer, the results of which are plotted on the accompanying chart. These tests justify the committee in making the following recommendations:



M. K. Barnum.

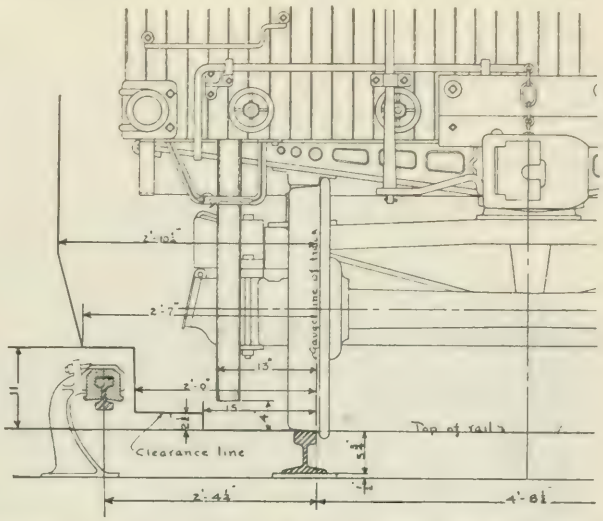
Chairman, Committee on Salt Water Drippings from Refrigerator Cars.

1. All salt-water drippings should be retained in the ice tanks and drained off only at icing stations.

2. The total capacity of drain openings should not exceed the capacity of traps, and the capacity of both drains and traps should be sufficient to release all drippings within the time limit of icing the train.

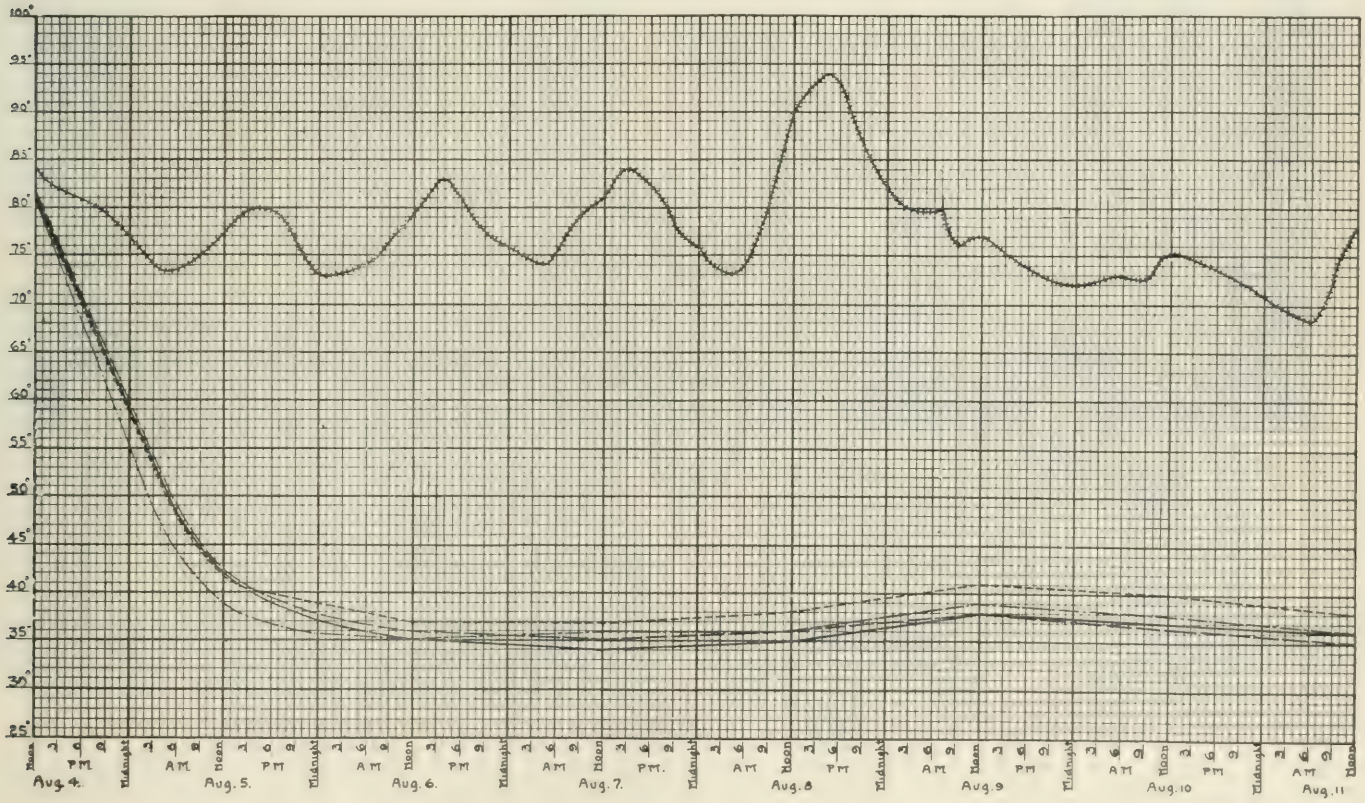
3. The mechanism adopted for handling drain valves should be simple and positive, and so designed as to insure closing the valves before the hatch plugs can be returned to their places.

4. Salt drippings should be conducted from ice tanks through the drain valves above described and thence to the outside of cars through the regular traps and drain pipes.



Showing Location of Third Rail in Tunnel and Clearance of Brine Tank Drain Pipes.

The packing companies have coöperated with the committee in the investigation, and have expressed their willingness to put into effect the practice recommended by the com-



KEY AND EXPLANATION OF CONDITIONS:

A ———— = A R L 8318 No hand hole plates. Brine was allowed to escape as fast as ice melted.

B —·—·—· = A R L 9917 Overflow stopped. All brine was retained throughout the test except that which overflowed the top of tank at re-icings.

C - - - - - - - = A R L 8074 Drained at re-icing. All brine was drained off at times of re-icing.

D ———— = A R L 7103 Standard tanks. 28 inches of brine collected in tank. After that, brine escaped through overflow pipes as ice melted.

Top curve shows outside temperature, taken hourly during test.

CHART SHOWING TEMPERATURES OBTAINED IN A TEST OF ICE AND BRINE TANKS WITH DIFFERANT ARRANGEMENTS FOR DISPOSING OF THE BRINE. MADE AT ARMOUR CAR LINE SHOPS - AUGUST '09

mittee, if these recommendations meet with the approval of the Master Car Builders' Association.

In addition to the subject of "Salt Water Drippings," the committee has received correspondence from the Railroad Refrigerator Service Association, suggesting the following questions:

1. The uniform height of refrigerator cars from the rail to the floor.
2. The adoption of a standard drip cup for refrigerator.
3. Relatively small ice tanks.

The Railroad Refrigerator Service Association has not presented sufficient data to show the necessity for special action on these subjects, and the amount of information which your committee has been able to obtain indicates that any difficulties which may have been experienced from these features of refrigerator cars are due rather to old designs than to prevailing practice. Therefore, if it is the desire of this Association to have these questions investigated, we would recommend either that a special committee be appointed for the purpose, or, if preferred, that the present committee on Salt-Water Drippings be continued for the work.

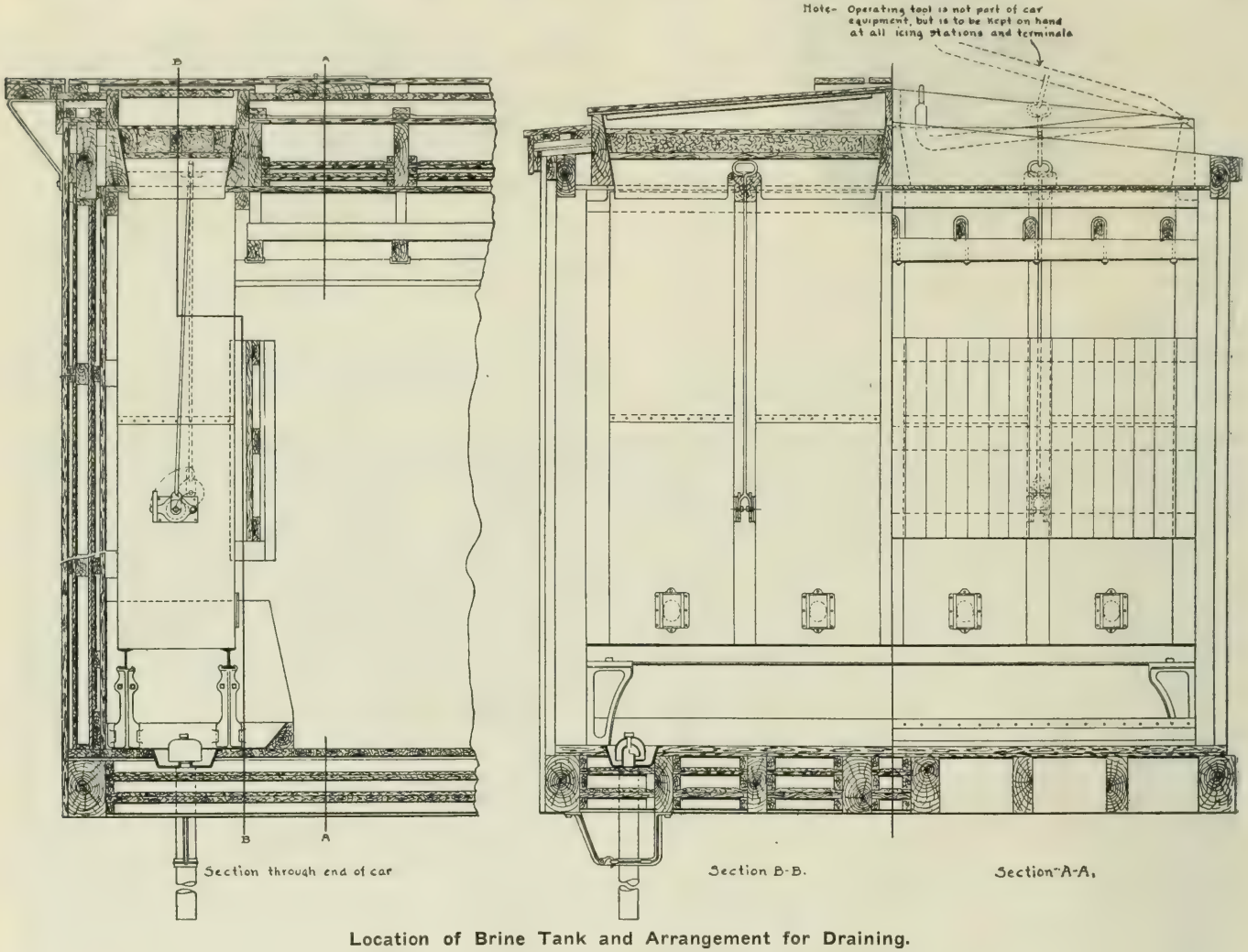
The report was signed by: M. K. Barnum (Ill. Cen.), Chairman; G. W. Lillie (St. L. & S. F.), W. E. Sharp (Armour Co.), E. W. Pratt (C. & N. W.), D. C. Ross (Mich. Cen.), W. C. Arp (Vandalia), and P. Maher (C. & A.).

DISCUSSION ON SALT WATER DRIPPINGS.

F. W. Brazier: I move that the report of the committee be accepted and the recommendations adopted, which means the discharge of the committee, the recommendations to go to letter ballot.

E. W. Pratt (C. & N. W.): As a member of this committee, I feel that we should not let the opportunity go by without saying a word as to the attitude of the packers, who, I believe, own practically 99 per cent of all the meat cars in this country. This matter, as most of you know, was brought more forcibly to the attention of this association on account of the very great damage done to rails, rail-fastenings, bridges, switches and various automatic switching apparatus. The amount of money involved in the depreciation of these various devices has been variously estimated. One railway of not much over fifteen hundred miles claims a depreciation from these causes of a half million dollars. Others are a little less modest in their figures, but the total amount of depreciation, as caculated by the maintenance of way department, is very large. The owners of meat cars are almost invariably private owners, and there have been a good many times when the owners of private cars have been criticised by the railway members of this association.

They have, however, come forward, and, in fact, as early as this spring, voluntarily agreed to equip cars in the manner suggested by the committee as soon as it was found that it was the unanimous report of the committee, deeming it unnecessary even to wait for the action of the association in June. If there is any way to show them our further confidence without more delay, so that all of the cars that are on the repair track during the summer and fall can be changed in accordance with this design, I think we should do it.



Location of Brine Tank and Arrangement for Draining.

J. J. Hennessey (C. M. & St. P.): This is a very important question, one that the Maintenance of Way Association has called to the attention of the M. C. B. Association on various occasions. It is the most intelligent report that ever came before the association, and I feel that the private lines can proceed to equip their cars according to the recommendations of the committee, because I feel assured that the report of the committee will be approved by letter ballot.

Mr. Brazier's motion was carried.

MOUNTING PRESSURES FOR WHEELS.

1. To specify certain mounting pressures for wheels and not specify the greater workmanship in boring the wheels and turning the wheel seats of the axles, would be only incomplete information.

2. A very careful study has been made in one of the larger railroad shops, covering the entire operation of machining and mounting wheels and axles, with the idea of improving the work, and, if possible, reducing the cost.

3. It developed that proper mounting of wheels depends on the grade of workmanship in turning the wheel seats and boring the wheels.

4. It has further been demonstrated that the work can be done properly without any additional cost over a lower grade of workmanship and with the same grade of men as ordinarily



E. D. Nelson.
Chairman, Committee on Mounting Pressures for Wheels and Axles.

employed. The men employed on this class of work usually become experts and can, if properly instructed, turn out work of the best character.

5. It is important to consider that good work can not be performed without good tools. Proper shop practice will not permit lathes and boring mills to get in bad repair. Lathe centers out of line or the V's worn may allow an axle to be turned tapered, while lathes in proper repair will insure wheel seats being turned straight. A tapered wheel seat with the wheel bored straight can not be expected to make a proper fit at any mounting pressure.

6. A very satisfactory test for lathes is to take two or three light cuts from an axle wheel seat, say seven inches

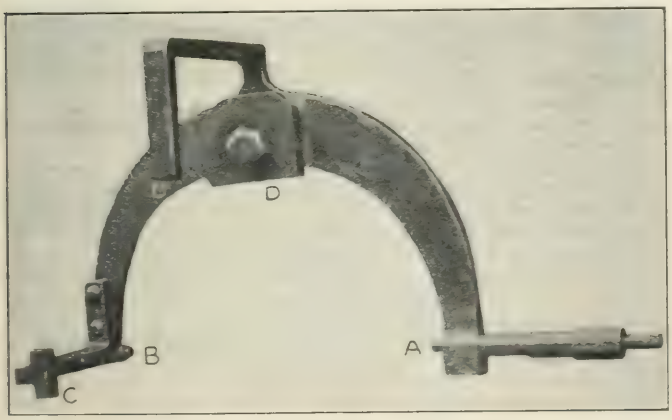


Fig. 1.—Caliper for Wheel Seat.

long, and measure the diameters with micrometer calipers. Good practice indicates that there should not be a variation in diameter exceeding two one-thousandths (.002) of an inch. The same attention given to lathes should be extended to boring mills to see that they are in proper condition to turn out good work.

7. The general tendency has been to finish axles with too rough a wheel seat, which results from too coarse a feed. This makes only partial contact between the wheel seat and axle. While axles may hold satisfactorily under these conditions, there is always an element of uncertainty, which can be eliminated by better practice. The axle, roughly turned in this way, can not be accurately calipered, and this is essential to good fitting and security. Furthermore, in mounting the wheel, the high ridges obtained with a roughly turned wheel seat are pushed off, principally at the outer end of the axle, reducing its diameter and making the turning of the wheel seat necessary when preparing the axle for mounting wheels at a later time. There is, also, a bad moral effect on the men, who, if permitted to carry out this practice, will extend it to journals as well.

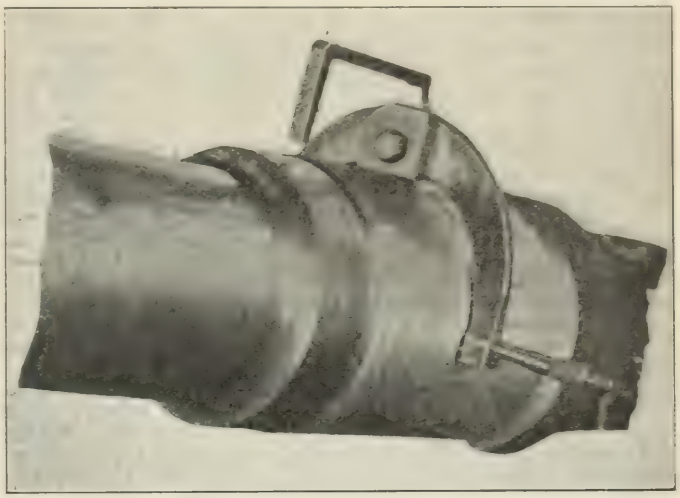


Fig. 2.—Caliper Resting on Wheel Seat.

8. It has been demonstrated with fairly rigid lathes that axles can be turned at a speed of forty to fifty revolutions per minute, the limit of speed being the chattering of the tool rather than the cutting speed. With this high speed, run with a fine feed, an axle can be turned in about the same time as by slow speeds and coarser feed. The higher speed results in better work without increased cost.

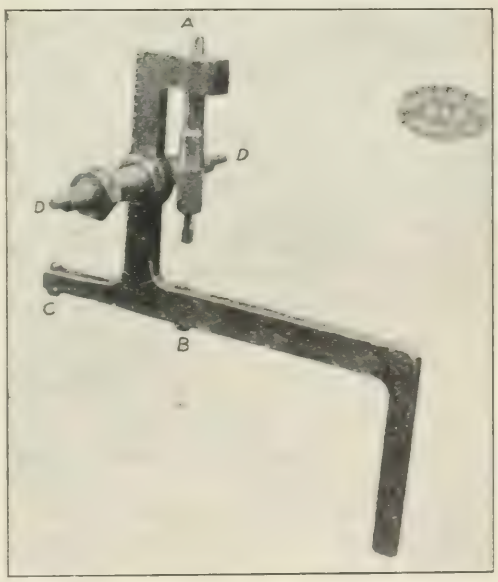


Fig. 3.—Caliper for Wheel Bore.

9. Having secured straight and true wheel seats and wheel bores, the next necessity is for the proper diameters necessary in secure mounting.

10. Micrometer calipers are necessary for several reasons. The axles and wheels can be calipered more quickly and more accurately than by machinist's calipers or snap gauges. The "draw" or difference in diameter of wheel seat and bore which has been determined for a proper fit can be secured without difficulty. The difference between the diameters of wheel seat and bore of wheel expressed in thousandths of an inch can be measured accurately, whereas with ordinary calipers

it is a question of skill of the workman and with snap gauges the same is true to a lesser degree.

11. For shop inspection, certain limits can be set between which the axle or wheel may vary and be good enough for all requirements. The inspector having set limits is not permitted to use judgment, which is always liable to error; if the work is within the limits he must pass it. If not, it must go back to the man who did the work, and he, knowing his work must meet certain definite requirements determined by the proper measuring instrument, naturally endeavors to turn out good work rather than take the chance of doing it over without pay.

12. To successfully use the ordinary trade micrometer caliper for wheels and axles takes time and a certain amount of skill. To reduce this time and skill to the minimum, special micrometer calipers have been designed and used successfully. Fig. 1 shows a photograph of a caliper for wheel seats. "A" is an ordinary micrometer head that can be bought in the open market; "B" is the anvil; "C" is a stop set square with a line through "A" and "B"; "D" is a stop or limit which may be turned, so that the distance from the stop to the line from "A" to "B" shall be approximately the radius of the wheel seat. In practice, this stop "D" for the 5½ inch by 10 inch journal axle is correct for wheel seats 6⅞ inches in diameter, and is approximately correct for wheel seats from 6¾ inches to 7 inches. By turning the stop "D" one-quarter turn, it is suitable for 5 by 9 inch journals.

13. In using this caliper, it is placed over the axle, with stop "D" resting on the wheel seat, as shown in Fig. 2. The stop "C" and anvil "B" are then brought firm against the wheel seat. The micrometer is screwed up by a ratchet stop until the ratchet clicks. The caliper is then removed and read. On a trial, eight axles were measured in five minutes and twelve wheels were measured in the same space of time. Each wheel seat was measured at three points, the average taken and chalked on the axle. The wheel seats had not been previously measured and but few were of the same size. This is much more rapid than calipering by other means, especially for axles varying in diameter.

14. Fig. 3 illustrates a caliper for wheel bore. "A" is the micrometer head, but graduated for internal measurements; "B" is the anvil; "C" the stop, set at right angles to a line from "A" to "B"; "DD" are right and left hand screws, turning together by means of a link not shown.

15. In calipering a wheel the screws "DD" are roughly adjusted somewhat smaller than the bore of the wheel. The anvil "B" and stop "C" are brought against the bore and micrometer screwed out until the ratchet clicks. (See Fig. 4.) On a trial five wheels were calipered and size chalked on wheel in five minutes.

16. The measuring was done by an apprentice, who was able to do it in an entirely satisfactory manner after about one hour's instruction.

17. This method of calipering and marking each wheel seat with the points and the further calipering of the bored wheels with the sizes marked upon them permits the proper selection of wheels at wheel seats for mounting, in order to secure the pressures necessary.

18. As to mounting pressures, the committee recommends the following, in conjunction with the character of workmanship already referred to, as being an essential in the problem.

M. C. B. Axle	Size of Journal	WHEELS			
		Cast Iron (Tons)		Steel (Tons)	
		Maximum	Minimum	Maximum	Minimum
A	3¾ in. x 7 in.	44	36	66	54
B	4¼ in. x 8 in.	44	36	66	54
C	5 in. x 9 in.	55	45	83	68
D	5½ in. x 10 in.	55	45	83	68

19. The following general specifications, which have been quite thoroughly tested, are submitted for consideration.

Axle Wheel Fit.

20. Must be turned as smooth as possible with lathe tool having flat cutting edge. Finishing cut must not be taken with lathe feed coarser than 16 pitch. Taper on axle wheel seat for entering wheel must not exceed one-half inch in length and must be turned with broad, straight-faced tool, making regular taper without ridges or rings. Wheel fits to be calipered at three points, namely: One inch from each end, middle and other points if indications point to excessive variations in diameter.

21. Axles shall not be considered as suitable for mounting where there is a difference in diameter between any two measurements exceeding .003 in. This, however, shall not be construed to mean that wheel seats on each end of axle are to be of one size. Each tenth axle from each lathe shall be measured for soundness. No axle varying over .001 of an inch when measured at two points ninety degrees apart on circumference at equal distance from end shall be considered as suitable for mounting.

Wheels.

22. To be bored smooth. Finishing cut shall be made with tool or tools having a cutting face at least 3-16 of an inch wide. Feed not to exceed 8 pitch. To be bored with a rough and finishing cut. The finishing cutter when taking the finishing cut must not be cutting when roughing tool is also rough-boring, unless the finishing tool is supported independent of roughing tool, the latter to prevent spring of roughing tool being transmitted to finish tool, causing an irregular bore.

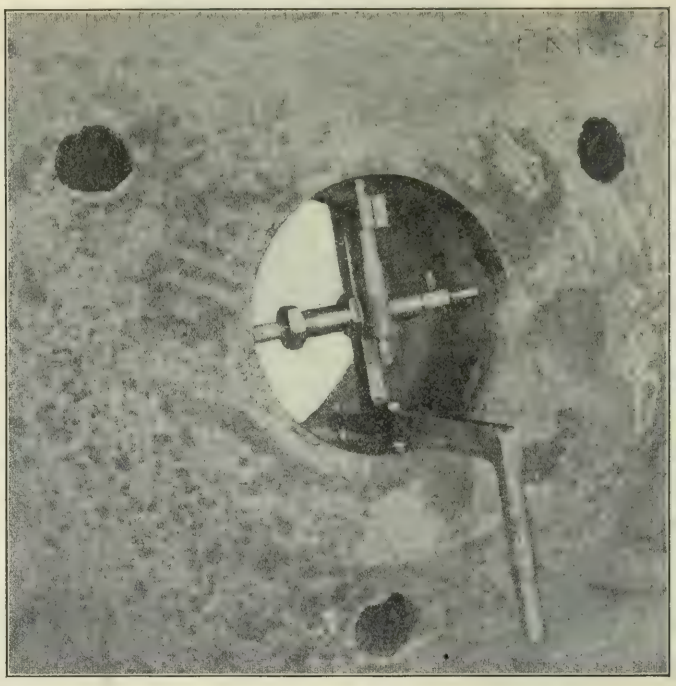


Fig. 4.—Caliper Adjusted to Wheel.

23. Wheels to be calipered with micrometer caliper. A wheel varying over .002 of an inch in any two diameters will not be considered satisfactory for mounting.

24. Mounting presses to be provided with recording pressure gauges. All wheels not mounted within limits given, or wheels that are forced against shoulder, to be withdrawn.

25. One point that may be foreign to the subject should receive attention, that is lathe centers. It would be very desirable if all shops were to adopt one angle. Generally, lathe centers used for ordinary work are sixty degrees, including angle. If this were adopted for all axle work, it would result in the axles running true on centers, reducing the amount of material necessary to turn away when truing up axles that have been previously turned.

The report is signed by:—E. D. Nelson (P. R. R.), A. Forsyth (C. B. & Q.), W. T. Gorrell (P. & R.), J. F. Walsh (C. & O.) and W. P. Richardson (P. & L. E.).

DISCUSSION ON MOUNTING WHEELS ON AXLES.

The President: It is moved and seconded that the report be accepted and printed in the proceedings.

H. H. Vaughan (C. P.): Would that indicate that this report is accepted as reflecting the opinion of this association?

The Secretary: It simply means that no action was taken.

Mr. Vaughan: This report simply specifies the minimum and maximum mounting pressures and the methods by which the fit is obtained. It is impossible to tell whether the method is carried out or not, through any subsequent inspec-

tion of the axle. I feel that any specifications for mounting wheels should include the pressure when the wheel is partly pressed on, and the pressure when it is completely pressed on. The final pressure is not a satisfactory test, unless the fit is prepared in accordance with these specifications. If we are going to use this as recommended practice we should use recording gages that indicate the pressure at different portions of the fit. True, if the axle and wheel are prepared in accordance with the specifications no doubt the pressure will increase uniformly throughout the fit, but it is impossible for anyone to tell, after the wheel is pressed on, whether the men fitting the wheel carried out the instructions, whereas the recording gage showing the pressure at different portions of the fit of the wheel would show whether the wheel was properly mounted.

The mounting of wheels is a thing to which we should give close attention. We are apt to regard a loose wheel in a rather haphazard manner, but at the same time a loose wheel makes an opportunity for an accident, and we cannot emphasize this fact too strongly; the only way to protect ourselves against loose wheels is to have a record measured at the various points along the fit.

T. H. Curtis (L. & N.): I should have liked to have seen the size of the wheel fit in the report. Again, I think the report should have contained a statement as to whether the ton is a net ton; and furthermore, a word of caution would be well in a report of this kind, that the wheel fit should not be tapered at the back to make the axle slip off easily and thereby lose one and one-half inch. It should fit all the way. Furthermore, a note should be added to the effect that the wheel should be fitted to the axle, and not the axle to the wheel.

The motion was carried.

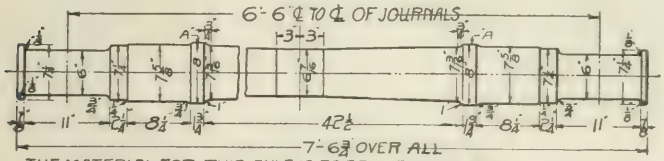
AXLE TO CARRY 50,000 POUNDS.

E. D. Nelson, engineer of tests, Pennsylvania Railroad Company, presented the following paper on the "Design of a Freight Car Axle to Carry a Load of 50,000 Pounds:"

1. During the past year at least four railroad companies, represented in the Master Car Builders' Association, have had under consideration a car axle of a larger capacity than the Standard "D" axle of this Association. As a matter of fact, there have been designs made of axles of larger capacity, and naturally these differ somewhat in detail.

2. The importance of eliminating variations in design is apparent, and I have, therefore, considered it advisable to present a design of axle having a capacity of 50,000 pounds, with a view to its consideration at the present convention.

3. If the Association would, after consideration, recommend that the adoption of this design as Recommended Practice for one year be submitted to letter ballot, it would give an opportunity to establish a design which could be followed by any railroad company during the coming year and prevent axles of larger capacity than the "D" axle, varying in detail, getting into service.



M. C. B. Axle "E," Capacity 50,000 lbs.

4. In submitting this design of axle, the method outlined in the report of the Committee on Axle, Journal Box, Bearing and Wedge, made to the convention of 1896, has been followed. The method outlined at that time is applicable to axles of any capacity, so far as our present knowledge is concerned. The assumed data are as follows:

Weight of body and trucks	55,580	pounds.	
Weight of lading	140,000	"	
10 per cent additional lading	14,000	"	
Total			209,580 pounds.
Deduct weight of 8 33-inch forged steel wheels	5,720	"	
Deduct weight of 4 axles	3,860	"	
Total			9,580 "
Total weight on four axles			200,000 "
Total weight on one axle			50,000 "

5. Assuming for this load that the journal should be 11 in. long, its diameter should be, according to (Formula 5), page 152, and by substitution in (Formula 12), page 153, M. C. B. Proceedings of 1896, 5.38 in. Taking the nearest ⅛ in. above this makes the diameter 5½ in., and an allowance of ½-in. diameter for wear brings the diameter of the journal, when new, to 6 in.

6. Assuming, then, that the journal is 6 in. in diameter by 11 in. long, the consideration, so far as friction and lubrication are concerned, would be, quoting the figures from page 169 of the Proceedings of the Association of 1896, as follows:

4¼ by 8-in. journal, new, pressure per sq. in.	449 lbs.
5 by 9-in. journal, new, pressure per sq. in.	469 "
5½ by 10-in. journal, new, pressure per sq. in.	470 "
6 by 11-in. journal, new, pressure per sq. in.	503 "
4¼ by 8-in. journal, old, pressure per sq. in.	533 "
5 by 9-in. journal, old, pressure per sq. in.	525 "
5½ by 10-in. journal, old, pressure per sq. in.	516 "
6 by 11-in. journal, old, pressure per sq. in.	549 "

7. These figures indicate that from the standpoint of friction and lubrication, satisfactory service may be expected from these journals.

8. Concerning the diameters of the axle at the wheel seat and center (Formula 10), page 152, and (Formula 12), page 153, of the Proceedings of 1896, give the following diameters:

Wheel seat	7.40 in.
Center	6.30 "

For the wheel seat it has been customary to add ¼ in. to the calculated diameter, which would make the diameter at the wheel seat, when new, 7.650 in. It has been customary, however, to keep the diameters at the wheel seat to the nearest ⅛ in., and by making the diameter 7⅝ in., ¼ of an inch diameter can be secured above the calculated diameter within 2½ one-hundredths of an inch. To the calculated diameter at the center, an allowance must be made for the cylindrical portion of the axle, so that this portion does not change abruptly at its intersection with the taper portions of the axle. Taking the diameter to the nearest 1-16 in., would make the diameter at the center 6 7-16 in. The principal dimensions, with the axle new, will, therefore, be as follows:

Journal, diameter	6	in.
Journal, length	11	"
Wheel seat, diameter	7 ⅝	"
Center, diameter	6 7-16	"

9. The satisfactory results which have been obtained with former designs of axles of the M. C. B. Association, based on the formula as given in the report of 1896, seem to warrant the use of a fibre stress of 22,000 pounds per square inch as used for all of the previous M. C. B. axles, and this figure has been taken in the formulas in order to arrive at the diameters which have been given.

10. The drawing shows all the dimensions of the proposed axle. It has been designated in accordance with the former practice of the Association as Axle "E" and the quality of the material is to be the same as that required by the present M. C. B. Specifications.

11. Attention should be called to the fact that the distance between the dust-guard seats is 62½ in., while in all of the other designs of axles of the Association it is 63 in. In the design submitted, this ½ in. was taken off in order to get more clearance back of the journal box, and this will necessitate ¼ in. more dish in the wheels mounted on this design. While at first thought this may apparently indicate inability to interchange wheels between axles, it should be stated that the forged wheels with outside hub diameters suitable for the No. "D" axle, can probably not be bored out so as to fit the present design of axle and leave sufficient material in the hub. It will, therefore, mean that for the axle herewith submitted a special design of wheel will be required.

12. It is only necessary to add finally that, while the axle herewith submitted is nominally for a car having a capacity of 140,000 pounds, it must be understood that the axle is designed to carry a given load and the capacity of the car is only incidental. If a car body weighing less than that assumed above can be constructed, the decrease in the light weight can, of course, be added to the capacity. The point which should be emphasized is that the axle is designed to carry a load of 50,000 pounds and is not necessarily an axle suitable for a car of 140,000 pounds capacity, regardless of the weight of the car body on the trucks.

DISCUSSION ON 50,000-LB. FREIGHT CAR AXLE.

F. W. Brazier (N. Y. C. & H. R.): I move that the paper be accepted and submitted to letter ballot. Referring to Section 3 of the paper, we are coming to this axle sooner or later. Some will want one-half inch or one inch difference,

and some the standard size. I can see no harm in having it go to letter ballot for recommended practice for one year.

J. J. Hennessey (C. M. & St. P.): I question very much the advisability of having a special axle for the higher capacity car. We find it difficult to have our wheels stand up under our so-called 100,000 lbs. capacity cars. I do not know what the wheels will do under cars of 140,000 lbs. capacity. It seems to me that the axle is objectionable and that you will have to have a special wheel for it, with a different dish.

Mr. Kiesel: It will be necessary to have a special wheel for the axle anyway. You could not use the present standard wheel; it would not stand the strain. Therefore, since we need a special wheel anyway, we might as well dish it one-quarter in. more, and give an additional one-quarter in. between the box and the hub of the wheel.

Mr. Hennessey: A great many wheel manufacturers have been making wheels for years, the same for eighty thousand and one hundred thousand lb. axles, and boring the wheel out so it will fit either capacity. I believe a wheel could be so designed that it could be used for either the one hundred thousand pound or the one hundred and forty thousand pound capacity car.

Mr. Kiesel: It is true that some manufacturers have made wheels the same for 80,000 and 100,000 lbs. capacity cars, but the wheel was actually designed for the 100,000 lb. cars, and a compromise was made by boring it smaller for the 80,000 lb., because it had more metal than was necessary. A similar compromise could be made between the 100,000 lb. and the 140,000 lb. capacity car. It would only be necessary to face off one-quarter inch from the outside of the hub in one case,



F. M. Gilbert.

Chairman, Committee on Springs for Freight Car Trucks.

and one-quarter inch from the inside of the hub in the other case.

C. D. Young (Penna. Lines, West): The time has come when we will have to provide a journal box for this axle as well as a wheel, and with the new journal box and the higher capacity there may be some difference in the wheel base which will be required for the truck, the width of the bolster opening and the depth of the brake beam, and with that, of course, would be included the springs. The time has come when we should have a committee appointed to consider the entire truck form for the higher capacity car as recommended practice. The axle presented by Mr. Nelson is an introduction to the subject. It hardly seems practicable to have the axle only, although it would be well to make the present recommended axle the recommended practice. I make a motion to the effect that a committee be appointed to consider a truck for higher capacity cars.

The President: Mr. Young, your remarks will undoubtedly be considered by the executive committee, and perhaps a committee will be appointed to do it, or the committee may decide to refer the matter of designing such a truck to the present committee on Freight Car Trucks. It is moved and seconded that the design of axle submitted by Mr. Nelson be referred to letter ballot for adoption, as recommended practice.

The motion was carried.

SPRINGS FOR FREIGHT CAR TRUCKS.

The committee has not developed the subject sufficiently to make a creditable report, and would respectfully ask for more time.

The report is signed by:—F. M. Gilbert (N. Y. C. & H. R.), chairman; W. F. Keisel, Jr. (P. R. R.), W. H. Wickhorst (C. B. & Q.), T. A. Lawes (So. Ind.), and H. C. May (L. & N.).

W. F. Bentley (B. & O.): I move that the committee on Springs for Freight Car Trucks be granted further time.

The motion was carried.

TRAIN LIGHTING.

The committee has assumed that its scope of action included suggestions for recommended practice which would assist in car interchange, protection against fire, and improved service, but which would not in any way interfere with the development of the art. The committee desires to suggest the following as recommended practice:

(1) That each electrically lighted car be provided with a notice describing the apparatus in the car, in accordance with Exhibit A, and that this notice shall be posted in a conspicuous place in or near the switchboard locker.

(2) That where train line connectors are used, Gibbs' No. 3 G Train Line Connector be used, located as shown on Fig. 1, with connections to the battery, dynamo and jumper, as shown on Fig. 2.

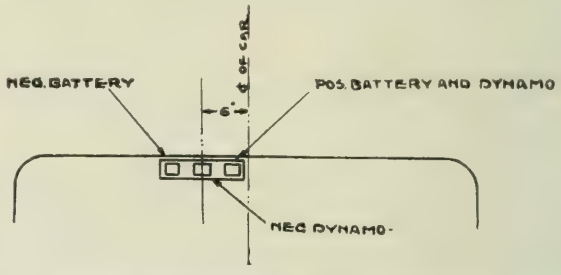


Fig. 1.—Location of Connector and Arrangement of Terminals When Facing Car.

Note.—In Head End System Jumper to be placed across negative battery and negative dynamo.

(3) That batteries shall be connected up with the positive to the right, facing the car, as shown on Fig. 2.

(4) That where double compartment tanks are used, the connections and arrangement of battery terminals are to be as shown on Fig. 3.

A. B. C. R. R. CO.
Electric Lighting.

System.....
No. cells in series.....
No. sets in parallel.....
Amp. hrs. capacity of battery (at 8 hrs. rate).....
Normal charging rate.....Max.....
Size of train line wires.....
Amp. discharge full light.....
Setting axle generator.....
Cut in voltage.....
Amperes no light.....
Amperes full light.....
Axle pulley diameter.....
Generator pulley diam.....

Wiring Diagram.
Show Capacity of Fuses.

(5) That each electrically lighted car shall be provided with two charging receptacles with swivel supports, as shown in detail on Exhibits B, C and D, installed one on each side of the car, as shown on Exhibit E.

(6) That each electrically lighted car be provided with two 150 ampere fuses, close connected to each battery terminal; the fuses to be arranged and placed in a cast-iron box, as shown on Exhibit F, and installed on car, as shown on Exhibit E.

(7) That each electrically lighted car shall have provided on the switchboard in the car a switch, fused switch, or fuses. The switches or fuses to protect and completely disconnect the following parts:

(a) Train line (where train line is used),
(b) Battery,
(c) Axle dynamo (where axle dynamo is used).

(The axle dynamo switch or fuses to control the positive, negative and field of the dynamo.)

Each of the above switches or fuses to be plainly stenciled designating the part controlled.

(8) Where a main lamp switch is used, or where fuses

controlling all lamps are used, they shall be so stenciled in plain letters.

(9) That all fuses on cars shall be National Electric Code fuses.

(10) That where axle dynamos are used, negative, positive and dynamo field shall be fused as close as possible to the dynamo and prior to the said leads either entering the conduits or being secured to the bottom of the car. The above fuses to be used for emergency service only and to be at

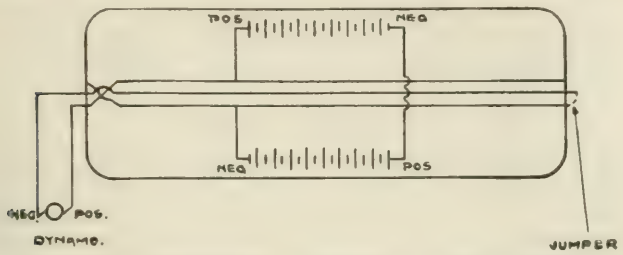


Fig. 2.—Connection of Battery to Train Line.

least 100 per cent above the capacity of the fuses on the switchboards protecting the same leads.

(11) That the following voltages should be used:

60 volts for straight storage, head end and axle dynamo systems.

30 volts for straight storage and axle dynamo systems.

(12) That batteries shall be installed in double compartment tanks as per detail dimensions and design shown on Exhibits G, H and I.

The committee also desires to offer the following suggestions relative to changes in the Master Car Builders' rules covering the interchange of equipment, which suggestions have been forwarded to the Arbitration Committee:

Page 93, Section 3, Paragraph (c), to be changed to read as follows:

"Line expenses shall consist of the expense of terminal cleaning, icing, lubrication (oil, waste, tallow and labor), lighting (oil, charging current, wicks, chimneys, burners, shades, gas, candles, fuses and incandescent bulbs), heating (terminal heating and coal furnished individual car heaters en route), or broken glass."

Page 94, Section 7, to be changed to read as follows:

"No labor charge shall be made for applying brake shoes, incandescent bulbs, journal bearings, hose (air, steam or signal), or for icing, filling lamps, charging batteries, gassing tanks or coaling cars."

Page 94, Section 8, to be changed to read as follows:

"No credit to be allowed for burned-out incandescent bulbs, burned-out fuses, or scrap brake shoes removed.

NOTE.—Steel-back brake shoes not to be removed if over

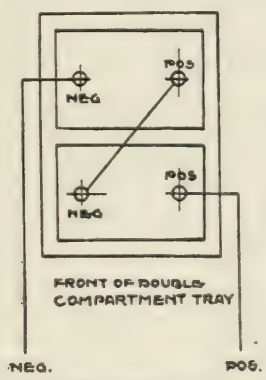


Fig. 3.—Connection and Arrangement of Terminals in Double Compartment Tray.

NOTE.—When Westinghouse Hand Connectors are used male head to be used for positive, female head for negative terminal.

one-half (½) inch thick; gray-iron shoes not to be removed if over three-quarters (¾) inch thick.

An additional paragraph to be added just before "Defects in Wheels," at the bottom of page 95, to read as follows:

"On electrically lighted cars a battery depreciation charge of 75 cents per day shall be made."

On page 104, two items should be added in the list of prices immediately under Item No. 24, as follows:

"Electrical material, incandescent bulbs, fuses, etc., at cost.

"Electric current for charging batteries, at cost."

The report is signed by:—T. R. Cook (Penn. Lines), chairman, E. A. Benson (Pullman Co.), Carl Brandt (L. S. & M. S.), Ward Barnum (L. & N.), and J. H. Davis (B. & O.).

DISCUSSION ON TRAIN LIGHTING.

Mr. Lentz: I would like to ask the privilege of the floor for E. J. Cartwright, electrical engineer of the Lehigh Valley.

Mr. Cartwright: I would like to submit a few exceptions to the report, as follows:

System.
Number cells in series.
Number sets in parallel.
Ampere-hours capacity (at 8 hr. rate)
Normal charging rate maximum
Size of train wires B & S Gauge
Number of train wires
Ampere load—all lights (lights only)
Setting axle generator Amperes
Cut in voltage
Amperes no light
Amperes, full load (lts. & Battery)
Axle pulley—diameter face diam. bore
Generator pulley—diameter face bore
Voltage of lamps

(2) A suitable cap or cover should be provided to cover exposed end of receptacle when not in use.

(3) Should read as follows: "All terminal connections on switchboard, regulators, generators, batteries, train connectors, the positive pole must be on the right, facing the same."

The above is the recommendation of the Association of Railway Electrical Engineers.

(5) Would substitute the following: "That each electrically lighted car having storage battery on it must be provided with two charging receptacles of sufficient carrying capacity to carry 65 amperes of current without heating; each provided with a self-closing cover, and terminal connections to receive an Anderson charging plug type 'A.' The positive pole to be connected to the outside annular ring; negative to center post."

(9) O. K., except fuse in cast iron box under car, which *may be* of the link type with knife contact terminals.

(10) The wording is not clear, but presume that the negative and positive armature leads, also the negative and positive field leads, shall be fused, etc. I do not think it necessary to fuse the field circuit except on the switchboard inside of car. Would suggest that the fuses under car be omitted as relates to the fields of dynamo.

(11) Should read as follows: "That the following voltages should be used: 64 volts (nominal) for head end and straight storage systems. 32 volts (nominal) for axle dynamo system."

(12) Should read: "That storage batteries for car lighting should be installed in lead or rubber lined wooden tanks. Each tank provided with distance pieces, so that a clear air space of at least ¾ in. is provided between the sides, or bottom of battery box, and an adjoining tank."

There are other very important matters relating to train lighting which should be brought to the attention of the committee. I will mention only three:

1. Clearances of generator and its support above top of rail and body of car.
2. Size of axle pulley.
3. Train connectors.

These question have been the subject of considerable discussion among the members of the Association of Railway Electrical Engineers and for your information I quote from their proceedings:

"1. All parts of suspension gear or generator on a new truck, when car is on a level straight track, must have at least a clearance of 6 in. from top of rail and a clearance of at least 3½ in. between any part of the mechanism attached to the car body.

"2. That the internal diameter (or bore) for the axle pulley must be 7½ in., straight. Length of hub 6½ in. That the bushing must be fastened to the axle, independent of the pulley, having a straight pulley seat 8½ in. long and 7½ in. external diameter, finished.

"3. That all cars operated on head end system be equipped with three train lines, and that all cars furnished by foreign roads for service in trains on head end system be equipped with either permanent or temporary train lines, with Gibbs No. 3-G train connector and receptacle.

Mr. Davis: Inasmuch as the art of electric lighting of cars is rapidly being developed, it might be well to continue the committee on Train Lighting. If it is continued, it could, during the coming year, confer with a committee of the Association of Railway Electrical Engineers and others interested. It might be well to accept the committee's recommendations with reference to bearing boxes and to the fusing of various circuits. Those are matters which are important, and which will prevent or minimize the fire hazard.

G. W. Wildin (N. Y. N. H. & H.): The committee recommends a depreciation of 75 cents per day for batteries. That is equivalent to between forty and fifty per cent per year.

It seems to me that is rather a high depreciation. The life of a battery ought to be four years at least.

Mr. Davis: That matter was very carefully considered by the committee. These are the figures upon which five men could agree. They represent a composite opinion. We recognized at the time that it was rather a high rate of depreciation, but the electrically lighted service is worth something, and it is thought that 75 cents a day is so small, as compared to the benefits to be derived, that no one would object to it.

Mr. Wildin: I move that the report be accepted and the committee continued.

The motion was carried.

LUMBER SPECIFICATIONS.

The Committee on Uniform Specifications and Grading Rules for Car and Locomotive Lumber herewith submits its report and recommendations. This matter has been thoroughly canvassed by committees of the Master Car Builders' Association, American Railway Master Mechanics' Association, the Railway Storekeepers' Association and the various lumber manufacturers' associations throughout the country. The specifications meet the approval of the various committees, and especially of the lumber manufacturers.

In order to have standard descriptions of the various woods used by railroads, the following standard names for car and locomotive lumber were agreed upon by the Joint Committee:

1. Ash. To cover what is known as White Ash, Black Ash, Blue Ash, Green Ash and Red Ash.
2. Basswood. To cover what is known as Linden, Linn, Lind or Lime-tree.
3. Beech. To include Red or White Beech.
4. Birch. To include Red, White, Yellow and Black Birch.
5. Buckeye. To cover what is known as Horse Chestnut.
6. Butternut. To cover wood from tree of that name, also known as White Walnut.
7. Cherry. To include Sweet Cherry, Sour Cherry, Red Cherry, Black Cherry and Wild Cherry.
8. Chestnut. To cover wood from tree of that name.
9. Cottonwood. To cover wood from tree of that name. (Do not confuse with Popple or Poplar.)
10. Cypress. To include Red Cypress, Gulf Cypress, Yellow and East Coast Cypress, also known as Bald Cypress.
11. Elm—soft. To cover what is known as White Elm, Gray, Red and Winged Elm.
12. Elm—rock. To cover what is known as Rock Elm.
13. Douglas Fir. To cover Yellow Fir, Red Fir, Western Fir, Washington Fir, Oregon or Puget Sound Fir or Pine, Northwest and West Coast Fir.
14. Gum. To cover what is known as Red Gum, Sweet Gum or Satin Walnut.
15. Hemlock. To cover Southern or Eastern Hemlock; that is, Hemlock from all States east of and including Minnesota.
16. Western Hemlock. To cover Hemlock from the Pacific Coast.
17. Hickory. To include Shellbark, Kingnut, Mockernut, Pignut, Black, Shagbark and Bitternut.
18. Western Larch. To cover species of Larch or Tamarack from the Rocky Mountain and Pacific Coast regions.
19. Maple—soft. To include Soft and White Maple.
20. Maple—hard. To cover what is known as Hard, Red, Rock and Sugar Maple.
21. White Oak. To include White Oak, Burr Oak or Mossy Cup, Rock Oak, Post or Iron Oak, Overcup, Swamp Post Oak, Live Oak, Chestnut Oak or Tan Bark, Yellow or Chinquapin Oak, Basket or Cow Oak.
22. Red Oak. To include Red Oak, Pin Oak, Black Oak, Water Oak, Willow Oak, Spanish Oak, Scarlet Oak, Turkey Oak, Black Jack or Barn Oak, and Shingle or Laurel Oak.
23. Pecan. To cover wood from tree of that name.
24. Southern Yellow Pine. Under this heading two classes of timber are used: (a) Long-leaf Pine; (b) Short-leaf Pine. It is understood that these two terms are descriptive of quality rather than of botanical species; thus, Short-leaf Pine would cover such species as are known as North Carolina Pine, Loblolly Pine and Short-leaf Pine. Long-leaf Pine is descriptive of quality, and if Cuban, Short-leaf or Loblolly Pine is grown under such conditions that it produces a large percentage of hard summer wood, so as to be equivalent to the wood produced by the true Long-leaf, it would be covered by the term Long-leaf Pine.
25. White Pine. To cover timber which has hitherto been known as White Pine, from Maine, Michigan, Canada, Wisconsin and Minnesota.
26. Norway Pine. Also known as Red Pine, from Michigan, Minnesota, Wisconsin and Canada.
27. Idaho White Pine. To cover variety of White Pine from western Montana, northern Idaho and eastern Washington.
28. Western Pine. To cover timber known as White Pine coming from Arizona, California, New Mexico, Colorado, Oregon and Washington. This is the timber sometimes known as Western Yellow or Ponderosa Pine or California White Pine or Western White Pine.
29. Poplar. To cover wood from the Tulip Tree, Whitewood, Yellow Poplar and Canary Wood.
30. Redwood. To include the California wood usually known by that name.
31. Spruce. To cover Eastern Spruce; that is, the Spruce timber coming from points east of and including Minnesota and Canada, including White, Red and Black Spruce.
32. Western Spruce. To cover the Spruce timber from the Pacific Coast.
33. Sycamore. To cover wood from tree of that name, otherwise known as Buttonwood.
34. Tamarack. To cover timber known as Tamarack or Eastern Tamarack, from States east of and including Minnesota.
35. Tupelo. Otherwise known as Tupelo Gum, Bay Poplar.
36. Walnut. To cover Black Walnut (for White Walnut, see Butternut).

It is the opinion that the specifications which we have proposed cover nearly 95 per cent of the lumber used in car and locomotive construction and maintenance, and the question of drawing specifications for the special hardwoods, such as mahogany and other imported lumber, was left open for further consideration.

Recommended Classification, Grading and Dressing Rules for Northern Pine Car Material, Including White and Norway Pine and Eastern Spruce.

1. Norway Pine to cover what is known also as Red Pine.

White Pine to cover the timber which has hitherto been known as White Pine, from Maine, Michigan, Wisconsin, Minnesota and Canada.

Spruce to cover Eastern Spruce; that is, the Spruce timber coming from points east of and including Minnesota and Canada.

2. Northern Pine Lumber shall be graded and classified according to the following rules and specifications as to quality, and dressed stock shall conform to the subjoined table of standard sizes, except where otherwise expressly stipulated between buyer and seller.

3. Recognized defects in Northern Pine are knots, knotholes, splits, shake, wane, wormholes, pitch pockets, torn grain, loosened grain, sap stain, checks and rot.

Knots.

4. Knots shall be classified as pin, small and large or coarse, as to size; and round or spike, as to form; and as sound, loose, encased, pith and rotten, as to quality.

5. A pin knot is sound and should not exceed ½ in. in diameter.

6. A small knot is larger than a pin knot and should not exceed 1½ in. in diameter.

7. A large or coarse knot is one of any size over 1½ in. in diameter.

8. A round knot is oval or circular in form.

9. A spike knot is one sawn in a lengthwise direction.

The mean or average diameter of knots shall be considered in applying and construing the rules.

10. A sound knot is one solid across its face, is as hard as the wood it is in, and is so fixed by growth or position that it will retain its place in the piece.

11. A loose knot is not firmly set, but still retains its place in the piece.

12. A pith knot is a sound knot with a pith hole not more than ¼ in. in diameter in the center.

13. An encased knot is one surrounded wholly by bark or pitch.

14. A rotten knot is one not as hard as the wood it is in.

Pitch.

15. Pitch pockets are openings between the grain of the wood containing more or less pitch or bark, and shall be classified as small, standard and large pitch pockets.

16. A small pitch pocket is one not over ⅛ in. wide.

17. A standard pitch pocket is one not over ⅜ in. wide, or 3 in. in length.

18. A large pitch pocket is one over ⅜ in. wide or over 3 in. in length.

19. A pitch pocket showing open on both sides of the piece ⅛ in. or more in width shall be considered the same as a knothole.

Wane.

20. Wane is bark, or the lack of wood, from any cause, on edge.

Sap.

21. White or bright sap shall not be considered a defect in any of the grades provided for and described in these rules, except where stipulated.

Miscellaneous.

22. Defects in rough stock caused by improper manufacture and drying will reduce grade, unless they can be removed in dressing such stock to standard sizes.

23. All lumber for uses described in these rules shall be inspected on the face side to determine the grade, and the face side is the side showing the best quality or appearance.

24. Chipped grain consists in a part of the surface being chipped or broken out in small particles below the line of the cut, and as usually found should not be classed as torn grain, and shall not be considered a defect.

25. Torn grain consists in a part of the wood being torn out in the dressing. It occurs around knots and curly places, and is of four distinct characters: slight, medium, heavy and deep.

The Secretary: We have with us Mr. McCarthy, purchasing agent of the Rock Island, who is a member of the Storekeepers' Association, and Mr. Waterman, president of the Storekeepers' Association, both of whom are interested in this report. I would suggest that the privileges of the floor be extended to these gentlemen.

J. H. Waterman (C. B. & Q.): This is not a manufacturer's specification. We conceived the idea of having a joint committee of the three associations, the Railway Storekeepers', the Master Car Builders' and the Master Mechanics', to adopt uniform specifications for lumber and thus assist the storekeeper and everybody else in receiving, inspecting and grading lumber. That the committee has done a great deal of work you will note from the report, and especial mention should be made of Mr. McCarthy, who has given it a great deal of personal attention.

C. A. Seley (C. R. I. & P.): I regard this matter of the lumber specifications as one of the most important additions to our literature. The matter of selection and choice of lumber has gotten to such a critical period that we need exact definition of the different kinds of lumber to be used and exact definition of the various gradings covering the entire country. The following minor corrections and changes in the specifications are suggested by Mr. McCarthy.

Paragraph 24:—It is generally recognized that loblolly pine is not suitable for car material. These specifications cover car material only. Paragraph 24 will lead to considerable confusion and controversy, especially the following sentence: "Long leaf pine is descriptive of quality, and if Cuban short leaf, or loblolly pine is grown under such conditions that it produces a large percentage of hard summer wood, so as to be equivalent to the wood produced by the true long leaf, it would be covered by the term long leaf pine." The term "large percentage" is vague. After a piece of timber is cut and delivered it would be very difficult to prove or even indicate under what conditions it was grown.

Paragraph 1:—Same objections to this paragraph as outlined above.

Paragraph 36:—Would recommend that the word "or" be inserted between "large" and "coarse." Make this item read as follows: "Rot and large knots or coarse spike knots."

Paragraph 37:—There might be some objection to including 8 foot and 9 foot lengths in car lining, although of course this could be provided for in specifying, particularly in ordering, as to the lengths ordered.

Paragraphs 37, 38, 39, 40, 41, 43, 44, 45:—All of these grades include the admission of firm red heart. This is about the only defect admitted that might be considered as a form of rot or decay, at least in the earlier stages, and might be objected to for car siding, lining, roofing and decking.

Paragraph 47:—This specification prohibits doty or rotten red heart, which is construed probably as admitting firm, red heart. On the ground that red heart in any form is the first stage of decay, it would seem that it might be objectionable, either firm or doty, and especially in car sills where strength is required.

Paragraph 46:—There might be some objection to including 8 foot and 9 foot lengths in car lining, although of course this could be provided for in specifying, particularly in ordering, as to the lengths ordered.

Paragraph 48:—This specification prohibits doty or rotten red heart, which is construed probably as admitting firm red heart On the ground that red heart in any form is the first stage of decay, it would seem that it might be objectionable, either firm or doty, and especially in car sills where strength is required.

Paragraph 49:—You will note the specifications as drawn call for ½ ft. full over the dressed sizes required. At the present time I think a number of roads are purchasing sills and framing ¼ in. full over the dressed sizes, and I give you below difference in price of 5 x 9 sill 36 ft. long, at $20.00 per M:

5¼ in. x 9¼ in. x 36 ft. = 144.2 = $2.88
5½ in. x 9½ in. x 36 ft. = 156.9 = 3.14 = 26.

If the sills are only cut ¼ in. full over the sizes, there would be places where they would not dress smoothly, but this might not be objectionable in the construction of the car, and further from the fact that sills will probably only be used hereafter for repairs.

Exhibit C:—These diagrams are not intended to represent the actual sticks, but simply theoretical conditions which show how the percentage of sap in hardwood should be measured.

Section V (C):—Objection might be made to the admission of any defect "on 20 per cent of the pieces in each car shipment." If the defect is one that is omitted or excluded on one piece, there should be no reason why it should not be the same on every other piece for the same purpose, inasmuch as each size is ordered for a specific purpose or part of a car and has an individual use. In a car loaded with large sizes and small sizes mixed, it would be very difficult to apply this rule satisfactorily to all parties on account of the various sizes and wide range of number of pieces of each that might be included in any one shipment.

Paragraph 43:—There might be some objection to including 8-ft. and 9-ft. lengths in car lining, although, of course, this could be provided for in specifying particularly in ordering as to the lengths ordered.

This list of modifications or suggestions has been gotten together since the report was put in print. I know somewhat of the arduous work that has been done by the committee, and the amount of expense and travel and study they have put upon it, and I doubt very much if it would pay us to go into an extended discussion of these details. In general, however, considering the importance of the question of having a lumber specification, or at least the start of one, I make a motion that this specification be put into the Recommended Practice of the association, together with notes covering the features or suggestions which have been read, so they can be in completed form, and that the committee be continued or made a standing committee.

J. F. DeVoy (C. M. & St. P.): I spent all the time I possibly could in assisting in this work. There is no man familiar with lumber but who can find fault with some portions of the report, and I do not believe that any explanation at this time will make the specifications any more clearly desirable. It has taken an awful lot of work, and it appears to me that the committee has done all in its power at this time to give you what it thought best, in a specification, for at least a starter, and I would like to see the report at least passed to Recommended Practice.

Mr. Seley: I move that the report of the committee, together with the suggestions that have been submitted, be referred to letter ballot as Recommended Practice of the association, and that the committee be continued.

Mr. Brazier: We are very much indebted to the Storekeepers' Association for the good work they have done. There must have been a tremendous lot of work on the report. I think the thanks of the association are due to the committee as well as to the Storekeepers' Association for the work they have done.

F. H. Stark (Pittsburgh Coal Company): Would it not be well to have the suggestions made by Mr. Seley referred back to the committee, so that it could be given the privilege of considering them and correcting the report accordingly. During the next twelve months the railways will have these specifications printed. The lumber dealers will have become accustomed to them, more or less, and it seems to me that it is placing a burden on the railways as well as on the dealers. There are one or two points that Mr. Seley has brought up, especially with reference to adding one-half inch to the finished dimension, which I think are excessive. If we could refer it back to the committee I am quite sure it would recognize those points.

Mr. Seley: The suggestions which I have submitted are not my own. They are the expression of the chairman of one of the committees which had the matter in hand. While I do not believe that any matter so extended as this specification would in all respects meet the necessities or the requirements of all the railways, yet we have a framework of a very fine definition and specification for lumber.

Mr. McCarthy: If this specification is accepted by the convention we will ask the various lumber associations to adopt it as their standard. They will print and issue it, and it will not be necessary for the railway companies to go to any expense; they can purchase lumber under these specifications or under their own, if they desire. If they will use these

specifications they will find it much easier to get the lumber, and I think they will get it cheaper. It is the intention to have a book printed showing the lumber specification adopted by the Master Car Builders' Association, and issue it to the trade.

The motion was carried.

F. W. Brazier (N. Y. C. & H. R.): I think many of us were very much surprised when we got our notices of the convention to find that we were going to have a morning and an afternoon session, so provided in the By-laws as to require notice a day in advance to make it one session. I would like to move that this article of the By-laws be changed to read: "The regular hours of session shall be arranged by the Executive Committee, and published on the programme for each meeting." Next year the Executive Committee can call us together the first day, from ten o'clock to half-past one, and, if necessary, we can have an afternoon session and convene the next day at nine o'clock. I would rather get to work early in the morning, get through and have the time in the afternoon, than to have the meetings called at ten o'clock. This will simply lie on the table, and next year, if you do not like it, you can kill it.

The motion was carried.

The President: As a result of the election, I declare T. H. Curtis elected president; A. Stewart, C. E. Fuller and D. F. Crawford, vice-presidents; John S. Lentz, treasurer; J. D. Harris, C. E. Fuller and C. A. Seley are elected members of the Executive Committee. As members of the Committee on Nominations: J. F. Deems, A. W. Gibbs, C. A. Seley, W. H. Lewis and J. F. Walsh.

Gentlemen, in turning over the gavel to my successor, I want to thank you for your attendance at this meeting and for the way in which you have assisted me during the session to conduct the business of the association, and also for the assistance rendered during the year in conducting the general business of the association. I want particularly to thank the members of the various committees for the work they have done. I now take pleasure in presenting your new president, T. H. Curtis.

President Curtis: I understand that before we adjourn E. M. Grove, chairman of the Supply Men's Association, desires to say a few words.

Mr. Grove: I wanted to say to your past president a lot of very nice things concerning the manner in which he has conducted the business of the association during the past year, and how well he has done it. We have all appreciated his good service, and personally I have thoroughly appreciated the very good offices that he has extended to the officers of the Railway Manufacturers' Association. His very harmonious treatment of us has lessened our labors. I want at this time, Mr. Clark, to present to you an emblem of our appreciation of that service, which I trust you will treasure, not from its intrinsic value, but as an expression of the good will not only of the members of this association, but also of the Railway Supply Men's Association. I feel that you have deserved it. We are very glad to have you receive it, and I know you will wear it with honor to yourself and credit to both associations; and now, sir, on the eve of your departure across the briny deep, we wish you God-speed, a pleasant journey and a safe return.

Mr. Clark: Gentlemen, I felt at the time of my election last year that I did not adequately express my appreciation of the honor conferred upon me, and I want to say to you that the sense of the honor then conferred has been growing upon me ever since. The work of the association is exceedingly important, and as I indicated a moment ago I have had a growing appreciation of that fact. I feel in retiring that you have done me a great honor. I appreciate it, and I appreciate the emblem which has been presented to me, and assure you that I shall always wear it with great pleasure, and feel honored in being able to wear it. I thank you, gentlemen, and the gentlemen of the Railway Supply Men's Association, for the kind words of their president, Mr. Grove.

Mr. Brazier: Before we adjourn I would like to move that a vote of thanks be extended to Mr. Clark, our retiring president, for the dignified and able manner in which he has presided over our meetings. Associations of this character are judged by the men who are at their head, and the M. C. B. Association has been honored by the fact that Mr. Clark has been its president.

The motion was unanimously carried by a rising vote.

At stations in Belgium, where cartage services are organized and within the boundaries served, the railways undertake the collection and delivery of freight either on their own account or by their agents.

Conventionalities.

Who M. Wilson?

Herbert I. Lord, manager of sales of the Detroit Lubricator Company, arrived Wednesday.

E. W. Grieves, past president of the Master Car Builders' Association, is attending for the twenty-fifth year.

This is the twenty-third time James Timms, of Excel coupler fame, has attended the M. C. B. and M. M. Conventions. A pretty good record.

Mr. and Mrs. E. A. Laughlin, Chicago, are among recent arrivals. Mr. Laughlin is vice-president and general manager of the Joliet Railway Supply Company.

C. L. Humpton is typical of the Parkesburg iron tube which he sells. He is round and uniform in shape, and though working day and night, does not pit nor corrode.

Mr. and Mrs. Mark R. Ross, Mr. and Mrs. R. C. Vilas and Mr. and Mrs. T. Will Johnson, all Pyle-National Electric Headlight people, are stopping at the Marlborough-Blenheim.

Judging from what one hears on all sides, it would seem as though everyone but the editor and his bunch of menials were the only ones who did not motor to Atlantic City.

The editors extend their thanks to the plain, ordinary supply man, whose badge with red center and minus bars and other insignia of office stilled the blast of brass in front of the statuary. We had no idea it was so easy!

There was considerable speculation at the M. C. B. Ball as to whether or not Postlethwaite's sweet peas were real. He certainly looked in the pink of condition, however; and as a human fashion plate he was without a peer.

Wanted—Information as to the identity and whereabout of the party who turned a stray cat loose in Bed Stafford's room at Niagara Falls during the Boilermakers' convention. Apparently other things happened to Staff besides his dream.

John R. Blakeslee, president of the Ajax Manufacturing Company, staggering under the honors of a great trap-shooting contest in his home city of Cleveland, arrived in Atlantic City Wednesday, and left for home Friday.

Charles L. Sullivan, sales manager of the Cowles-MacDowell Engineering Company, is registered at the Dennis. Mr. Sullivan has an uninterrupted record of attendance at the conventions covering a period of many years.

According to the way P. H. Wilhelm counts, this is his nineteenth convention. A serious accident put him out of business for a while, but he is here on the ground, this time in the interest of Walter Macleod & Company.

It is reported that J. J. McCormick, of the Crosby Steam Gage & Valve Company, who has long been a lonely bachelor, in Chicago, has recently joined the ranks of those to whom Benedict is the patron saint.

E. B. Leigh, president of the Chicago Railway Equipment Company, is attending the conventions and is introducing his new assistant, Arthur Wyman. For the genuine blue-ribbon brand of courtesy, we can warmly recommend Mr. Wyman.

Two men, evidently strangers at the conventions, were noticed yesterday morning inquiring for the location of "Th' MacHinery Hall." It turned out that they were Messrs. Hooley and Dennissey from Tchicago.

Raymond Pilson, of the Chicago Railway Equipment Company, again presents some wondrous and natty things in coat cuffs. Take a peep the first time you have a chance; and if the chance does not present itself, search.

D. W. Hawksworth, mechanical engineer of the Hutchins Car Roofing Company, is attending his first convention. Mr. Hawksworth, it will be remembered, was formerly assistant district manager and mechanical engineer of the Detroit plants of the American Car and Foundry Company.

Dan Brady insists that the portrait of William Garstang which appeared on page 1589 in the *Daily* of Friday, is an error on the part of editor or printer. He declares that it represents R. D. Smith. But those who have seen Garstang this year say Brady has another guess coming.

Railway life can't be so severe an existence as some men seem to wish to make it appear. Lots of men grow big and heavy on it—witness F. H. Eddy, of the Boston & Maine, who has been on the East Fitchburg jobs ever since long before Brazier left it.

Frank Moore and Will Gibson were standing on the Boardwalk in animated conversation when along came Magee and Telford, arm in arm. Says Magee, "Why don't you fellows stop hollering and stand side by side so that you can hear each other?"

George M. Basford, who some years ago abandoned the leanness of newspaper business for the flesh-pots of the locomotive builders, took an early opportunity to call at the office of the *Daily* and leave a loving message for some of his former fellow-workers.

"Cromwell, Protector of the Commonwealth"—that is what Oliver C. has been of that part of the common wealth of the Baltimore & Ohio represented in the records of the mechanical department for so many years that he is alleged to have himself forgotten the number.

It's going some when the vice-president of a concern like the Safety Company has to carry a portable buoy with which to find his way home. But, all joking aside, Pye certainly has John Chamberlain's cane beaten all to smithereens. It's loaded, too, and is equipped with a pinch light.

H. G. McConnaughy, a real worker on the staff of the Dearborn Drug & Chemical Works, sustained a slight accident Wednesday, necessitating an enforced rest of a day or so. He slipped on the wet surface of the Boardwalk and strained his back. His return to duty, however, was not long delayed.

H. H. Vaughan, assistant to the vice-president of the Canadian Pacific, and last year president of the Master Mechanics' Association, arrived in time to attend the Master Car Builders' ball. It is not his intention to attend the International Railway Congress, as has been reported.

The attractiveness of the room upstairs over the entrance hall of the pier, in which refreshments were served during the Master Car Builders' Ball, has been enhanced this year by the use of a considerable number of fine Oriental rugs judiciously distributed over the floor.

E. W. Pratt, assistant superintendent of motive power of the Chicago & Northwestern, is one of the men who early cultivated the habit of taking his wife with him to the conventions. In the earlier days Mrs. Pratt contributed greatly to the social success of the Air Brake Association, and is no less helpful in the larger field afforded by the associations now in convention.

C. E. Chambers, the new superintendent of motive power of the Central of New Jersey, bears his honors as modestly as he did the burden of the Elizabethport shops. He has the advantage, so far as organization is concerned, of the example of an efficient predecessor.

Charlie Castle, erstwhile Annanias of the Liars' Club, but now manager of the railway department of the U. S. Metal & Manufacturing Company, arrived Tuesday. Charlie has been in training for a month at the Aquarium getting in shape to land some solar plexus arguments on the habits and customs of the "Barol" leeches.

Mrs. Emily A. Carr, mother of Vice-president George R. Carr, of the Dearborn Drug & Chemical Works, expected to attend the conventions with her son, but accidentally fell and sustained a broken arm in her Oak Park, Chicago, home last Thursday. Mrs. Carr will be remembered as an attendant last year.

William B. McCaleb, superintendent of the Philadelphia division of the Pennsylvania, reached Atlantic City Thursday morning. He spent the time between his arrival and departure yesterday afternoon in looking over the exhibits. While an operating officer, Mr. McCaleb found much of interest to him on the pier.

The Fairbanks, Morse crowd is not, as a rule, foggy; but the weather of the first two days of the convention had its effect. Those who ventured out near the end of the pier observed Taylor and Akers shoveling the fog into tanks and thus discharging it, through standpipes, into the shallow blue sea.

Since the genial E. G. Buchanan, vice-president of the Carbon Steel Company, acquired Harry W. Finnell, the humorously inclined speak of the "large edition" made to the sales force of the steel company. This increase is indeed wonderfully sturdy and happy, although Harry says he has "fallen away to a ton."

G. E. Carson, the genial car builder of the New York Central at West Albany, N. Y., who had expected to arrive with his family on Monday, was prevented from doing so by a very sad accident; the sudden death of his son. The young man, who was about 16 years of age was accidentally hit with a golf ball while playing with a companion, and instantly killed.

Mr. and Mrs. Frank T. Boydston, Chicago, are enjoying their convention visit. They are stopping at the Chalfonte. Mrs. Boydston was formerly Miss Anderson, daughter of George T. Anderson, superintendent of the New York Dispatch Refrigerator Line, and attended the conventions for several years. Her many friends are pleased to see her at Atlantic City.

E. M. Herr, vice-president of the Westinghouse Electric & Manufacturing Company, was able to spend about three hours at the conventions on Wednesday evening and expressed himself as highly pleased with the appearance of the exhibits. The large staff of representatives of the Westinghouse companies succeeded in catching him at Philadelphia and dragged him away from his pressing duties for that length of time.

The Farmer on the Entertainment Committee seriously objects to being printed as Frank. He was waiting in line at the door of the editorial sanctum early the following morning; and when his turn came he called us a bunch of hoboes and a lot of other names equally as complimentary. He concluded by saying that Tom was bad enough; but that he'd rather be called Rube, than Frank.

Robert F. Carr, president of the Dearborn Drug and Chemical Works, accompanied by his brother, Dr. Charles Carr, Chicago, is taking a European trip and will not return before September 1. He will attend the International Railway Congress at Berne. Mr. Carr's presence at the conventions will be missed, as he was always to be found one of the leaders among those that "do things."

The editors acknowledge with thanks the thoughtful offering of roses received from an admirer Thursday evening. At first blush (and even an editor can blush) we were deeply touched by this unexpected appreciation of our efforts; then came the sombre thought that perhaps the gift was occasioned by the conviction that such activities as ours must have a fatal result. So it was with some relief, rather than otherwise, that we learned that the bell-boy had made a mistake in gender.

Dwight C. Morgan, of Kittanning, Pa., vice-president of the Pittsburg & Shawmut, is among the visitors on the pier. Mr. Morgan was formerly chief engineer of the Minnesota Railway Commission, and in that capacity made a physical valuation of the railways of Minnesota two years ago, which at once was recognized by those who had followed the subject of valuation as the fairest and most thorough piece of work of the kind that had been done up to that time. In his present position he is the executive head of the Pittsburg & Shawmut.

Referring to the item published on Thursday morning on the orange-colored blossoms on the pergola, our friend Conger wants to know whether the "pumpking" referred to is a new kind of vegetable or whether it is a euphemistic reference to the chief of the Atlantic City fire department. As a matter of fact, this is another of those cases where a printer makes two jokes grow where only one grew before; and one of them is on us. But what does an injector expert and an airbrake sharp know about flowers, anyway?

Three wise men out of the Northwest—H. S. Bryan, John Tonge, and J. J. Conolly—are seldom missing from the conventions; and though Mr. Tonge is taking life very comfortably these days, he is keeping up his share in the representation of the section with which his name has so long been associated. As for Bryan, there wouldn't be anybody on the North Shore if he were not there; and the upper peninsula of Michigan would waver in the balance if Conolly went anywhere else.

Some closely contested games of bridge have been going on in the last few days among the ladies at the Marlborough-Blenheim. On Wednesday afternoon the contestants were Mesdames Phillips, Gold, Fuller, Miner, W. E. Weatherly, R. H. Weatherly, Flory, Johnson, Langston, Elliott, Humphrey, Lyonmark, Schaffer, Fowler and Miss McIntyre. The first prize was won by Mrs. Gold. On Thursday two tables were engaged, and the participants were Mesdames L. R. Phillips, W. E. Weatherly, George L. Fowler, Alexander Telford, J. O. McCloskey, W. H. Miner, W. B. Firman and C. E. Fuller.

The item published on Thursday morning in reference to Daniel M. Brady appears to have been what is known in some newspaper offices as a "lobster" story. By way of explanation: Two men, disputing about the definition of a lobster, submitted the question to a professor of biology. The definition as submitted was: "A lobster is a fish with a red shell that crawls sideways." The professor said: "Yes, that is an excellent definition, except that a lobster is not a fish, its shell is not red and it does not crawl sideways." The application is, that Mr. Brady never comes to Atlantic City except by the Pennsylvania, and therefore it did not require great modesty on his part to elude observation on a Central of New Jersey train; but if he had, how could Vought overlook his presence? Again, it is probably up to Vought.

There is nothing more refreshing and entertaining than to reminiscence with Albert Waycott. Mr. Waycott grew up in the supply business in the good old days when we didn't have constitutions (that is, printed ones) and bylaws. If someone wanted someone put in some office, and the candidate succeeded in passing the inspection of the back porch committee, of which Albert Waycott was the chairman, and Harry Frost a close second with some claim to the title of vice, that candidate's election was at once assured. We have candidates nowadays and they do seem to get elected all right; but there's fuss and feathers—and we do recall that some of the latter have been known to fly.

A wail from the Pressed Steel Car Company: "Has anybody here seen Victor Von Schlegell? His valet arrived with his baggage, but where, oh! where, is Von?" The only possible clue obtainable, and that a slight one, is a note alleged to have been left by the aforesaid valet: "Mr. Von Schlegell:—I hope that you will find everything O. K. You can see that I followed your trunk right to your room. I came over for the ride and I enjoyed it very much. I will leave here on the 9 o'clock train for New York, and before I go I am going downstairs in the valet room and have a good dinner on you, and hope that you will not be angry with me." But, meanwhile, where is Von?

During the informal dance at the Marlborough-Blenheim Wednesday night, some one whose identity could not be discovered suddenly thrust a neatly wrapped package into the hands of C. E. Fuller, Superintendent of Motive Power of the Union Pacific. The recipient of the gift was rather surprised at the action of the supposed "souvenir friend," but, nevertheless, took time to examine the contents of the package, and was the more confused over the affair on discovering a brand new pair of socks, bright green, in color. Mr. Fuller and his friends enjoyed a hearty laugh over the affair, but he is still speculating over the identity of the donor and the significance of the gift. He promptly accused Stanley Midgley, Fred. Brazier and others of like character, of guilty knowledge of the joke (?)—but all protested complete ignorance. If any of the readers of the *Daily* can supply information which will throw light on the mysterious affair, the favor will be much appreciated by Mr. Fuller and his many interested friends. We understand that the proceeding will not be brought up for official action before the M. M. Association.

We came very nearly forgetting it, and probably would have done so, had we not been reminded. So, lest it be forgotten by others, it is hereby stated on his authority, that 135 years ago yesterday, John Chamberlain, that patriotic citizen of umbrella fame, fired the shot at Bunker Hill that was heard around the world. That is, he pulled the string that fired the shot. In celebration of the event, he has "left his old umbrel' to home:" and, decorated with the American flag, which he thus established in the home of the free and easy, he has come all of the way from Boston town to announce the fact and celebrate the event with his friends. He was ably assisted by Frank A. Barbey, who knows more about pulling legs than pulling strings.

CORNELL DINNER.

Place, Hotel Chelsea.

Time, 7.30 tonight.

To be present, all Cornellians in Atlantic City who registered at the booth of the *American Engineer and Railroad Journal*, or who get word in some way to the secretary before 1 o'clock today. Prof. Barr will probably be present and a special musical program is being arranged by Mr. Thomas. The crowd will attend the vaudeville show after the dinner.

THE MILITARY EUCHRE.

As promised by the entertainment committee, the military euchre last night in the ballroom was a most entertaining and attractive event. The prizes, 36 for ladies and 36 for gentlemen, were attractively displayed in the middle of the room and the 248 tables were arranged in rows of 16 tables each through the length of the room except for a few necessary shorter rows in the middle. The table at the southwest corner was designated as head table and at the conclusion of each game the couple facing the end of the room moved to the next table and so on throughout the game, whether winners or losers. Eight games were played, and the successful contestants were given small silk flags, one for each game. The winners of eight flags, or of the largest number, were given the choice of prizes, and cases of tie were decided by lot.

The members of the committee in charge were all in uniform with caps decorated with crossed swords and the monograms of the two associations. The receiving committee at the entrance, five men, were in command of Ross Hayes armed with a sword and the others carried guns. Refreshments, punch, lemonade and ice water were served at the tables by attendants.

The judges were Messrs. Grove, Wildin, Post, Ross and Turner.

The decorations were illuminated shields at the south end of the room with initials of the associations and along the sides a series of flags were tastefully draped. The winners of prizes were as follows:

Tinted marble figure, Mrs. J. S. Maise.
Bronze figure, "Child Standing on Chair," Mrs. T. M. Ramsdell.
German flower centerpiece, Mrs. De Vilbiss.
Brass fern dish, Mrs. Joseph Quigley.
Teplitz basket, Mrs. W. H. Miner.
Hammered brass coffee pot, Miss J. C. Lindstrom.
Japanese wicker flower basket, Mrs. W. E. Maher.
Tiffany vase, Mrs. R. H. Weatherby.
Cut glass cologne bottle, Mrs. A. S. Sternberg.
Cut glass mayonnaise dish and plate, Mrs. Chas. Shults.
Crystal vase, Mrs. C. A. Dunkelberg.
Cut glass compote and flower holder, Mrs. L. R. Phillips.
Bohemian water bottle, tumbler and tray, Mrs. G. E. Molleson.
Roseville dresser set, Mrs. G. Caleb.
German asparagus set, Mrs. M. E. Davis.
Doulton tea set, including teapot, sugar and cream stand, Mrs. E. F. Chaffee.
Mettlach plaque, Mrs. Henry Bouton.
Copper roll tray, P. P. Sturdevant.
Mahogany serving tray, Mrs. H. C. Edson.
Crystal candle sticks with candles and shade, Mrs. Wm. Miller.
Brass candle sticks, Mrs. D. C. Noble.
Green bronze electric lamp and leaded shade, Mrs. R. W. Burnett.
Brass boudoir electric lamp, Mrs. T. H. Goodnow.
Brass smoking set, F. C. Cleaver.
Brass book rack, G. A. Schmoll.
Brass smoking tray, J. A. Meaden.
Brass and hammered copper umbrella jar, B. P. Flory.
Brass gong, Mrs. F. N. Grigg.
Brass patent ash tray, E. E. Silk.
Alabaster cigar box, George Riley.
Library knife and shears, G. N. Caleb.
Brass cigar lighter, J. M. McCarthy.
Mahogany and brass cigarette box, Wm. E. Maher.
Elephant gong, T. M. Ramsdell.
Hammered brass and copper loving cup, L. E. Jones.
German tankard, H. E. Passmore.
Man's traveling case, John S. Mace.
Man's cane, F. P. Cheeseman.
Thermos bottle, H. Boutet.
Pair military brushes, M. E. Towner.
Shaving set, A. S. Sternberg.
Box of cigars, B. V. Johnson.
Brass basket, Mrs. James Dorney.
Alabaster vase, Mrs. J. M. McCarthy.
Lady's parasol, G. W. Wildin.
Lady's parasol, Helen M. Little.
Lady's veil, Miss Jessie McIntosh.
Lady's bracelet, Mrs. A. T. Stewart.
Porcelain and copper Dutch serving tray, J. S. Seley.
Rockwood ash tray, M. E. Davis.
Genuine bronze figure ("The Kiss"), T. P. O'Brian.
Benares glass tobacco jar, E. F. Chaffee.
Cordial set, including 6 glasses, decanter and brass tray, H. S. Griffith.
Cut glass brandy bottle, L. R. Phillips.
High ball set, including decanter, 6 glasses and tray, C. E. Foyle.
Doulton pitcher, J. F. O'Connor.
Copper and brass serving tray, A. Gordon Jones.
Traveling bag, H. O. Fettinger.
Centerpiece for flowers, Mrs. T. H. Russum.
Lady's garniture, Mrs. F. H. Shaeffer.
Wicker and tapestry tray, Mrs. F. W. Chaffee

The other prizes were selected by Mrs. E. S. Toothe, Mrs. H. S. Griffiths, Mrs. C. L. Jacobs, Miss Munger, W. Boynton, C. A. Dunkelberg, Joseph Quigley, C. W. Sherman and G. H. Bussing.

Among the early arrivals and late stayers is B. H. Gray, superintendent of motive power of the New Orleans, Mobile & Chicago. Mr. Gray is at the St. Charles.

A number of ladies have experienced considerable unpleasantness in connection with the use of roller chairs on account of the insolence of the pushers when they have been required to travel more than a few blocks or when they thought they had not been tipped with sufficient extravagance. The attention of members of the transportation committee has been called to the matter, and they express a desire to deal with any trouble of this sort. If any lady is subjected to the slightest discourtesy, the matter should be at once reported to some member of the transportation committee, with the man's number, as this is the only means of locating the offender. Such a remedy will then be applied that the same individual will have no opportunity to repeat the offense, and the example will be likely to debar others from similar

The ingenuity displayed by the sharp-witted daily newspaper merchants along the Boardwalk in cleverly naming the city in which you reside and offering you your home paper at the usual selling price, plus one hundred per cent, accounts for the extremely large demand for the official registration list. In a second of time one of these urchins will get the number of your badge, look you up in his registration list, call you by name, and, after a pleasant "Good morning, sir," will offer you your home paper and insist that you take it. Verily, the Atlantic City newsboys can well take care of themselves—and their families.

It looks a little ridiculous to say, as was said in an editorial paragraph on Friday morning, that "Some things we have always with us, the *iron* and loading long material, for instance." It is therefore not amiss to state that what the editor wrote was "poor"—that is, what he said was all right but the actual writing was "poor."

H. C. McCarty, president of the Coale Muffler & Safety Valve Company, is making his twenty-seventh annual visit to the M. C. B. convention. Mr. McCarty was master car builder on the Pennsylvania for twenty-seven years, and has been a member of the M. C. B. Association since 1882.

M. C. B. REGISTRATION.

Barry, J. J., M. M., Norfolk & Western R. R., Windsor Hotel.
Crone, S. A., Past. Prest., M. C. B. Assn., Dennis Hotel.
Davis, J. H., Elec. Engr., B. & O. R. R., Imperial Hotel.
De Vilbiss, G. J., S. M. P., Hocking Valley Ry., Traymore Hotel.
Durham, Geo., M. M., L. & N., Chalfonte Hotel.
Ettinger, R. L., C. M. E., Southern Ry. Co., Windsor Hotel.
Harris, Tiffin, Div. Car Foreman, Can. Pac. Ry., Rudolph Hotel.
Higgins, Samuel, G. M., N. Y. N. H. & H. R. R., Shelburne Hotel.
Howard, Jno., S. M. P., N. Y. C. & H. R. R., Marlborough-Blenheim Hotel.
Haugh, Harry, M. M., Brownstone Middletown Ry., Dennis Hotel.
Keiser, C B., M. M., P. R. R., Traymore Hotel.
Kells, Willard, M. M., Lehigh Valley R. R., Cordell Hotel.
Knox, W. J., M. E., Buffalo, Rochester & Pittsburg Ry.
MacBain, D. R., S. M. P., L. S. & M. S. Ry., Marlborough-Blenheim Hotel.
Mann, J F., Gen. Car For., P. M., Shelburne Hotel.
Mengel, Jno. C., M. M., Penn. R. R.
Moore, Edw. W., Pres., Everett-Moore Syndicate, Marlboro-Blenheim Hotel.
Montgomery, H., S. M. P. & E., Bangor & Aroostook R. R., Brighton Hotel.
Mussey, Wm. H., A. E. M. P., Long Island R. R., Runnymede Hotel.
Shreve, W. J., M. M., Minneapolis & Rainy River Ry., Bothwell Hotel.
Smart, Geo. E., Div. Car Foreman, Can. Pac., Young's Hotel.
Tinsley, R., Mgr., Pullman Car Works, Dunlop Hotel.
Vaughan H. H., S. M. P., Can. Pac. Ry. Co., Marlborough-Blenheim Hotel.
Waters, J. J., Supt. Mech. Dept., National Rys. of Mexico, Marlborough-Blenheim-Hotel.

M. C. B. GUESTS.

Adams, A. C., M. M., N. Y. N. H. & H. R. R., Haddon Hall.
Akarman, John, Supt., Atlantic Shore Line Rwy.
Allman, Wm. N., Draftsman, B. & O. Kenberton Hotel.
Armstrong, L. N., Asst. Rd. For. Engines, W. J. & S.
Atkinson, E. M., Agent at Atlantic City, West Jersey & Seashore Ry.
Avis, Samuel H., Agt., D. & A. T. & T. Co.
Bachert, Edgar, Foreman, C. R. R. of N. J., Miller Cottage.
Baird, A. C., Machinist, Amb. Div. P. R. R.
Barrett, C. D., Asst. M. M., P. B. & W.
Bassett, Wm., Traymore Hotel.
Bawden, Wm., M. M., Terminal R. R., Watkins Hotel.
Beaumont, H. A., For. Fgt. Car Rep., P. R. R.
Bennett, J. D., Foreman, C. R. R. of N. J., Edison Hotel.
Benter, C. E., Loco. Engineer, P. R. R., Haddon Hall.
Berry, Norman, M. M., Rio de Janeiro Ry., Light & Power Co., Shelburne Hotel.
Beyer, W. F., Foreman, P. R. R., Ralston Hotel.
Billau, L. S., Asst. Eng., B. & O., Arlington Hotel.
Blanchard, W. E., Ch. Cl. S. M. P., P. R. R., Chalfonte Hotel.
Bosworth, W. M., Draftsman, B. & O., Kenderton Hotel.
Brazier, W. S., Trav. Eng., Boston & Maine, Marlborough-Blenheim Hotel.
Burch, J. J., Asst. Engr. Tests, N. & W. R. R., Dennis Hotel.
Butler, James, Wrecking Master, W. J. & S. R. R.
Caldwell, F. M., Marlborough-Blenheim Hotel.
Cannon, J. M., Manager, Wilmington Shops, The Pullman Co., The Wiltshire Hotel.
Cartwright, D. J., El. Eng., Lehigh Valley, Edison Hotel.
Cassidy, J. P., Form. Frt. Car Repairs, P. R. R., W. J. & S. Ry.
Churchill, W. H., Air Brake Instructor, W. J. & S.
Connor, F. E., Asst. Pur. Agt., Santa Fe, Marlborough-Blenheim.
Connor, Harry E., Asst. Pur. Agt., Sante Fe, Marlborough-Blenheim Hotel.
Conrad, H. M., Foreman, Penna. R. R., Flanders Hotel.
Cosgrove, H., Foreman, Penna. R. R., Flanders Hotel.
Cory, J. M., Dennis Hotel.
Crossman, T. E., Official Stenog., Runnymede Hotel.
Davis, W. E., Foreman Vice Shop, P. R. R.
Dix, C. E., Asst. Pur. Agt., P. R. R.
Doemling, Gustave, Gen. For., Pullman Co.
Downs, J. H., Asst. Rd. For., W. J. & S. S., Ethlyn Hotel.
Downs, J. K., Eng. House For., P. & R., Ramsey Hotel.
Downs, W. E., P. R. R.
Driscoll, F. E., Pur. Dept., Erie R. R., Dennis Hotel.
Dwier, Wm., Phila. R. T. Co.
Eicholtz, G. W., Foreman Freight Car Inspectors, Penna. R. R. Co.
Erb, C. W., S. K., Trenton Shops, P. R. R.
Felton, H. W., Supt. Ferries, A. C. R. R.
Fisher, C. D., P. R. R., Bouvier Cottage.
Triggs, C. H., For., P. B. & W., Strand Hotel.
Fritsch, J. A., Shop Foreman, Pgh. Div., P. R. R., Flanders Hotel.
Garabrant, W. P., Road Form. of Engines, Jer. City, P. R. R., Haddon Hall.
Garaghty, W. C., Air B. Inst., B. & O.
Gillis, H. A., Mech. Eng., Dennis Hotel.
Gonnerman, W. K., Gen. Car For., B. & O., Dunlop Hotel.
Goodrich, Wm., Gen. Supt., Bartlett Hayward Co., Traymore Hotel.
Graham, H. E., Supt., P. A. & McK. R., Strand Hotel.
Greenwood, H. F., Genl. Foreman Loco. Dept., M. & W., Windsor Hotel.
Grim, C. B., For., P. & B. R. R.
Hall, C. B., Inspector Pur. Dept., P. R. R.
Hartman, F. B., Insp., So. Ry., Penhurst Hotel.
Healey, Frank, V. P. & G. M., Interboro Rapid Transit Co., Shelburne Hotel.
Healey, Master Frank C., Interboro Rapid Transit Co., Shelburne Hotel.
Heckman, A. V., Ch. Cl. to Asst. S. M. P., N. & W. R. R., Windsor Hotel.
Heim, J. F., W. J. & S. S., Ethlyn Inn.
Henry, J. M., M. M., P. R. R.
Himmelberger, C. M., F. T. M., P. & R., Worthington Hotel.
Himmelberger, Frank, Worthington Hotel.
Hoffman, John, Phila. & Reading Ry., Watkin's Hotel.
Hinkle, H. M., Asst. Rd. For., W. J. & S. S., Ethlyn Inn.
Hoffman, P. H., Jr., Material Agt., P. R. R.
Houser, John W., M. Clr., Cumberland Valley R. R.
Humphries, Frank, Phila. R. T. Co.
Jackson, C. H., Foreman Car Insp., P. B. & W., Maryland Div., Bon-Air Hotel.
Jaynes, R. T., M. M., Lehigh & Hudson R. R., Traymore Hotel.
Jester, J. G., Disbursing Officer, Panama Canal, Brighton Hotel.
Kane, James, Foreman, P. R. R.
Kerrigan, Frank J., Ch. Cl., M. M., P. R. R.
Koch, Geo. B., Foreman Test Dept., P. R. R., Traymore Hotel.
Koehler, S. C., Asst. Ch. Clk. Gen. For., P. R. R., W. J. & S. Ry.
Lane, R. H., Inspector Test Dept., Southern, Chalfonte Hotel.
Lewis, S. M., Train Master, N. & P. Belt Line R. R., Arlington Hotel
Lowther, H. F., Pur. Dept., D. L. & W., Marlborough-Blenheim Hotel.
McCoubrir, R., Phila. R. T.
McFary, Alex., Chief Electrician Car Dept., N. Y. C. & H. R., Rudolf Hotel.
McMinn, A., P. R. R.
McMurry, W. R., Asst. Chf. Clk., N. Y. C., Pennhurst Hotel.
McQuown, W. I., Clerk Supt. Tel., Penn. Lines, Levan Hotel.
MacBain, D. R., S. M. P., L. S. & M. S., Marlborough-Blenheim Hotel.
Mackrow, H. A., Union Tank Line, Young's Hotel.
Martin, Chas. W., Gen. Air Brake Insp., P. R. R., Jer. City, Haddon Hall.
Maxfield, H. H., M. M., P. R. R., Chalfonte Hotel.
Miller, A. C., M. M., Texas Midland.
Miller, B E., M. P., D. L. & W., Young's Hotel.
Moore, E. S., V. P., Rock Island, Brighton Hotel.
Moore, J. F., Dunlop Hotel.
Morris, W. W., Pur. Dept., P. R. R.
Muller, J., Jr., P. R. R., Chalfonte Hotel.
Munger, E. T., Gen. Supt., H. & M. Ry.
Myers, W. S., Machinist, P. R. R., Renovo, Ralston Hotel.
Narr, H. W., Ch. Clerk to Supt., A. C. R. R.
Noble, H. S., Motive Power Insp., P. R. R., Haddon Hall.
Nutt, A. S., Bouvier Hotel
Oliver, R. G., M. M., Phila. R. T. Co.
Patterson, Philip, Clerk, P. R. R., Camden Shop.
Bietsch, T. A., Loco. Insp., B. & O., Laurel Hotel.
Plummer, W. P., Pur. Agt., Mex. N. W., Shelburne Hotel.
Potts, C. H., M. M., P. R. R., Renovo.
Powers, M. J., M. M., D. & R. G., Arlington Hotel.
Purt. A. F., Penna. R. R., Bouvier Hotel.
Reeder, Wm., Foreman Car Trimmer, C. R. R. of N. J.
Reeve, W. K., Trav. Frt. Agt., N. Y. C. & H. R. R. R., Ponce de Leon Hotel.
Rice, W. L., Gen. For., P. & R., Monticello Hotel.
Rich, S. W., Foreman Wheel Shop, P. R. R.
Richardson, F. E., Air Brake Insp., B. & L. E. R. R., Monticello Hotel.
Ripley, A. P., Marlborough-Blenheim Hotel.
Roberts, A. L., M. E., Lehigh Valley.
Robins, J. B., Foreman, C. R. R. of N. J., Edison Hotel.

Rossiter, G. W., Gen. For., Washington Ter., Ellwood Hotel.
Runkle, Chas., Spec. Pass. Agt., Phila. & Reading R. R., Ponce de Leon Hotel.
Sandhas, H. L., Instructor, C. R. R. of N. J.
Sandman, A. G., Ch. Draughtsman, B. & O. R. R.
Scheifele, John, Asst. R. F. E., P. & R., Osborne Hotel.
Sheridan, R. J., Chief Clerk Mgr. Pur. S., N. Y. N. H. & H., Young's Hotel.
Shultz, J. C., Marlborough-Blenheim Hotel.
Slinker, Chas., For. Blacksmiths, Long Island Ry.
Smith, C. B., D. M., D. & A. T. & T. Co.
Smith, J. A. B., Rear Admiral, U. S. Navy.
Stewart, A. F., M. M., C. & O., Traymore Hotel.
Stewart, H. A., Supt. Shop, Armour Car Lines, Marlborough-Blenheim Hotel.
Street C. F., Marlborough-Blenheim Hotel.
Suhrie, M., Special Engr., P. R. R.
Tippett, W. E., Repairman, P. B. & W., Lexington Hotel.
Towner, M. E., P. A., Frisco Ry., St. L., Shelburne Hotel.
Turner, J. A., Pur. Dept., Southern Rwy., Brighton Hotel.
VanDyke, J. W., Vice-President, Union Tank Line, Dennis Hotel.
Vyne, A. G., Foreman Engine House, P. R. R., Haddon Hall.
Wagner, F. H., Chief Engr., Bartlett Hayward Co., Traymore Hotel.
Walsh, Chas. E., Asst. Ch. Cl. Pur. Dept., Penna. Co., L. W. P., Traymore Hotel.
Warnock, H. R., Gen. For. Loco. Dept., Monongahela, Lexington Hotel.
Waters, J. J., Jr., Marlborough-Blenheim Hotel.
Weaver, A. B., Stenog., Runnymede Hotel.
Wells, Clarence, Sec., Mer. N. W., Shelburne Hotel.
West, Chas. H., Div. Boiler Insp., P. R. R., Amboy Div.
Wieseckel, G. F., M. M., B. & O., Waldorf Hotel.
Williams, D. A., Gen. Storekeeper, B. & O. R. R. Co., Traymore Hotel.
Wilson, Robt., P. & R.
Wise, Howard E., Ch. Insp. Lumber Pur. Dept., P. R. R., Haddon Hall.
Witman, Jas. K., Supt. M. & S., P. & R. Ry., Shelburne Hotel.
Young, W. D., Yardmaster, P. R. R. Co., Elberon Hotel.

HIGH SPOTS IN THE LIFE OF A DAILY.

BY FRANCIS W. LANE.

III.

Something was said awhile back about some extraordinary interpolations in the series of 24 annual bunches of daily issues. The first of these was the publication of the daily journal of the International Railway Congress in Washington in 1905. This amounted to 10 daily papers in duplicate, one series in English and one in French, or 20 issues in all. As a matter of fact, there was a preliminary issue in each language, giving the names, official titles and addresses of all delegates. This was an extra before the event. It made 22 issues of the paper in all. Aside from the advance work of a business nature which was carried on in this country and in Europe for a year and a half before the opening of the Congress, the most strenuous preliminary work was the conversion of the snappy, incisive American-conceived advertisements into the somewhat more suave diction to which French readers are accustomed. There were 100 pages of these advertisements in the English edition, and 84 pages of them were rendered into French. On this work two or three real Frenchmen, who knew the everyday parley-voo, but little technical French, and one imitation Frenchman, who was supposed to know—and did before he got through—some technical stuff in both English and French, were employed constantly for about six weeks. The total number of advertisements to be translated was, of course, much greater than is indicated by the number of pages above noted, not only from the fact that pages were split up into halves, quarters, eighths and sixteenths, but because patrons were permitted to furnish different copy for each day's issue. For instance, the combined Westinghouse companies had eight pages in each issue and changes were made often enough to bring the number up to 40 or 50 pages of different copy. Many advertisers had different copy for each day, and it is as much work to translate an inch advertisement in small type as to do a page of ordinary display. The translation table looked like a lexicographer's study. In perhaps half a dozen cases foreign advertisers furnished copy in German, which involved double translation. Notwithstanding the multitudinous chances of error, and in most cases no opportunity for reading French proof on the part of advertisers, it may be said that only two complaints are remembered as arising from this source. One of these was on account of the doubtful use of a single French preposition in an advertisement for which German copy had been supplied, and for the claimed error in which the advertiser demanded and got a rebate of $85 when settlement day came. The other was an error of fact in calling a Yale & Towne door-check "pneumatique" when it was not pneumatique at all.

Toward the last of the work one of the real and the imitation Frenchman varied their day performances by spending much of the night in a cab and in the four printing-offices where the work of composition was being done for the purpose of reading proof and to save the time which would have been lost in transmission of proofs the next morning. The last piece of copy was an ad. for the Railway Steel Spring Company. It was received at 4 p. m., translated on the way to the printing-office, set in French and English and proof read on each, and both pages were on the way to the electrotype foundry at 6 p. m.

The force for doing the work at Washington comprised 125 people—a few more or less at different stages. For the French composition of reading matter and for press work, the entire plant of the Globe Printing Company was chartered for two weeks. This included five linotype machines fitted with French matrices and operated by two shifts of five men each, imported from Montreal and New Orleans. For the English composition eight linotype machines of the Evening Star Printing Company were available after 5 p. m., when the evening paper had gone to press. The metal handled by the machines at the Star office was conveyed at stated intervals to the Globe plant, three blocks away, as produced and as required for the make-up of the papers. This transportation line was in charge of an apparently faithful colored man who possessed a horse and wagon, and the type was packed in locked boxes, of which duplicate keys were retained at each terminal. Once the colored man fell down and added perceptibly to the weird and unholy assortment of grief which made each day's evil sufficient unto itself without any extras. But this story comes later.

In the temporary editorial force were enrolled two pairs of stenographers—French and English—and one editor and two translators — French-English and English-French — for each of the five sections into which the work of the Congress was divided. These people came variously from Montreal, New Orleans and Paris. Their jobs came near being wrecked in the beginning on account of some villainous contract-labor laws. In the selection of all these, it was necessary to secure specialists in the lines represented by the work of each of the sections, as mechanical engineering, civil engineering, etc. There was also a miscellaneous assortment of editors, translators from both tongues, stenographers, office assistants, messengers, etc., constituting a general staff not attached to any particular section. It should be interjected here that each of the editions of the paper was divided into an official part for which the officers of the Congress were responsible, and for which the publisher was responsible to them, and an unofficial part for which the publishing company was responsible to itself and its public only. In the transmutation of languages these parts became respectively "partie officielle" and "partie officieuse," but before the struggle was over it was sometimes wearily thought that "officious" would have been partially applicable to the supervision of both sections, on account of the difficulty of doing a rush job under the hampering influence of continental European conservatism.

For the make-up, the imitation Frenchman before mentioned was found to be the only one available on account of the mongrel nature of the work. He watched everything

as much as he could in the editorial rooms in the New Willard Hotel from about 10 or 11 o'clock in the morning. The actual work on the stone usually began shortly after midnight and the last forms of both English and French editions were generally completed for the press about 5.30 a. m., when the composing room force and make-up men were free to get what sleep they could in the brilliant sunlight of beautiful May mornings. This schedule was followed rather accurately every day and night for 11 days—except one morning.

About 3 a. m. on that eventful dawn it was announced by telephone that the aforesaid colored gentleman was leaving the Star office with the last batch of type for the English edition. The make-up of both editions was well advanced, but the wanting type did not come. Tracers were sent out with definite—very definite and forcible—instructions to hunt up and bring in that type, nigger or no nigger; preferably with, for the administration of certain other, likewise definite, "instructions." About 4.30 it was reported by telephone from South Washington that a stray horse and wagon answering the unpublished description had been found. The horse was comfortably cropping grass in a small park, the wagon with many galleys of type was in in its assigned place in his rear, and further search disclosed his faithful black driver enjoying a deep and comfortable snooze under a tree. The type was not quite re-melted in its passage over the composing stone and to the press. So the paper came out, but it barely escaped the anomaly of appearing in French alone in an English-speaking country.

On account of the composition of the International Railway Congress, opportunity was afforded for some temporary assignments to editorial work that gave much tone to the staff. On one afternoon, M. Edouard Sauvage, the distinguished consulting engineer of the Western Railway of France, was engaged in the office writing an editorial on compound locomotives and incidentally correcting certain French translations; M. Camille Boell, mechanical superintendent of the State Railways of France, was compounding a feature article; the then editor of the London Times Engineering Supplement, and W. M. Acworth, the well-known English railway expert, were concocting personal notices of distinguished British railway men in attendance on the Congress; and Sir Charles J. Owens was dictating his impressions of the system of handling baggage in this country, based upon having been forced to forego certain evening functions because of the non-arrival of his boxes. On one night about two o'clock the present President of the United States, then Secretary of War, and Stuyvesant Fish, then president of the American Railway Association, and the Illinois Central Railroad, corrected proofs with comparative patience and skill and pared the claws of some antagonistic utterances of an earlier hour of the evening; and numerous other high-well-born Herren, Messieurs, Dons, Signori and the like were occasionally engaged upon minor tasks. It was a great staff.

If memory served it would be possible to write some few thousands of pages of manuscript about the history of this one series of the *Daily*, but the regular series, published at Manhattan Beach, followed so closely upon the former that one nail drove out the other and left only a few ragged fibers to show where the first had been. The latest interpolated series was that published in Chicago in March last in honor of the American Railway Engineering and Maintenance of Way Association—the first real daily published in connection with the meetings of this association. This is too recent to have entered deeply into the realm of history. Its internal life was particularly uneventful, and this is becoming a chronic condition with the *Daily*. Perfection of organization, occasional propinquity of editorial rooms and printing-office, and adequate facilities in both, tend to make the publication of even a peripatetic daily a monotonous and arid waste by comparison with what has gone before.

MR. HOOLEY ON DR. SINCLAIR.

"Who's this Awngus Saint Clare 't I hear so much about?" asked Mr. Dennissey one evening as he and Mr. Hooley sat in the café listening to the music.

"He's it," replied Mr. Hooley.

"He's what?" asked Mr. Dennissey.

"He's it. Th' only wan. Th' whole clan. That's what Mr. Saint Clare is," replied Mr. Hooley. "'T's this way, Dinnissey. Mr. Saint Clare, Docther Saint Clare 'tis, he's the wan that knows all there is and some more about combustyon—that's burnin' up coal in th' engine. He wrote a book wan time about combustyon—'How t' Burn th' Manigemint Whin Ye'er Runnin' th' Engine,' something like that. Ye see, Dinnissey, iv ye'er a fireman, there's siv'ral ways to shovel coal. Iv ye shovel this way, ye burn th' coal, and that's all that's to it, ye don't get no stame; iv ye shovel arl th' time 'nd let th' wather go down ye burn th' crown sheet, and that's all that's to it till the's somethin' else, 'nd ye can't till th' rist 'cause ye a'n't there no more; 'nd iv ye shovel coal th' way th' manigement wants it shoveled, ye're stung, d'ye see?"

"Will, thin, afther Mr. Saint Clare'd wrote the book I was tellin' ye about, where he'd towld th' firemin f'r 500 'nd some pages how to pick th' coal, 'nd swing th' shovel 'nd to tell whin they cud see th' ashpan through th' holes in th' fire—'tis all in th' book—he wint out t' Ioway to show some firemin 't he used to know how to do it like the book said. Awngus, he'd sit on the little binch on the lift hand side av th' engine where the fireman 'd sit iv he was n't shovelin' th' coal, 'nd iv th' fireman t'rowed th' coal through th' little door wit'out shpillin' ut, Awngus 'd mark him 'wan' 'n th' little notebook he'd by him; iv th' coal did n't come out th' stack, Awngus 'd say, 'Ye're a good wan,' 'nd mark 'im 'two;' thin he'd look at th' little clock with wan hand; iv th' engineer was n't swearing too hard because he'd no stame at the fut ov th' hill, Awngus 'd say, 'That's a' recht; now another wan!' 'nd iv th' fireman come up t' th' scratch in five siconds he'd mark 'im 'three' 'nd till 'im how he was savin' coal f'r th' comp'ny, 'nd makin' a ricord f'r himself.

"Thin Awngus wrote all about ut t' th' paper 't he has in N' Yawk, th' 'Locommytive Engine Ear-Ring'—'tis a joolry pa-aper, I'm thinkin'—'nd he told all about how he'd learned th' Ioway firemin t' save five hunthred pounds av coal a day by t'rowin' in only wan small shovelful av coal at a time, 'nd kapin' th' door shut 'nd kapin' a shovelin' iv'ry tin siconds be th' engineer's watch. He made a complate diagonal av th' case—diagonalosis, was ut?—What's thim things a docther makes, Dinnissey?"

"Pills," replied Dennissey promptly.

"'Tis not pills I mane, nor capshules, nor yit funerals; but 'tis no matther. Awngus was no Docther thin, annyhow. He wrote it all out and it come out in th' pa-aper. He wint back to his orfis afther some time 'nd asked Hodgins how 't things'd been goin', 'nd him 'way out in Ioway. Hodgins looked sad 'nd said, said he, 'We've putt on six new min 'th month,' says he.

"'Sax new min! W'y, ye're roonin' me,' says Awngus, he says like that; 'Ye're roonin' me. What's thim for?'

"'T' kape thrack av th' discontinyou'd subscriptions,' sid Hodgins. 'Iv'ry fireman on th' books writes, "I'm stoong! Shtop me pa-aper!" 'nd th' six min's th' back shtop,' says Hodgins.

"Will," resumed Mr. Hooley, after a pause, "They've made Awngus a reel Doc since that time, 'nd iv he makes anny mistakes now he burries 'em, like th' other Docs do. He carries th' sporran bag f'r th' McHannix clan, does Awngus, 'nd he's th' only wan that's in th' race forby th' Jones lad that dayclined th' 'lection 'twas two years gone. He knows combustyon, does Doc Saint Clare, 'nd he's a good Doc. I

dinnaw av but wan better, 'nd he comes fr'm some miles fr'm Em'bro town, too."

"What Doc 's that?" inquired Mr. Dennissey.

"Doch-an-doris," replied Mr. Hooley sententiously, fixing Mr. Dennissey with his eye and beckoning to the waiter.

PACIFIC LOCOMOTIVES FOR THE ST. PAUL.

The passenger service of the Chicago, Milwaukee & St. Paul includes a large number of heavy trains which are run on difficult schedules. Between Chicago and Milwaukee, 420 miles, two of the most important passenger trains are often composed of thirteen to fourteen cars, seldom less than ten, weighing 508 tons. The lighter through trains between Chicago and Omaha, 492 miles, carry seven cars of an aggregate weight of 372 tons. On the Chicago and Milwaukee division, 85 miles, trains of 750 tons, composed of fourteen cars, are common, and as many as sixteen cars have been run in one train.

Till within the last year, a heavy class of Atlantic engine, having a total weight in working order of 210,400 lbs. and a tractive power of 22,200 lbs. was used in this service. The performance of the Atlantic engine, with these trains, considering its limitations of weight and power, was very creditable; but in ordering new passenger equipment last winter, the management adopted the Pacific engine in order to meet the increased requirements of this service, and an order of fifty of this class of power was placed with the American Locomotive Company, New York.

These engines, one of which is illustrated herewith, are the first of this type to be used on the St. Paul. They represent a simple, straightforward design of a powerful locomotive, embodying no new or unusual features. The design, however, is worthy of interest because of the very satisfactory balance obtained between weight, power and boiler capacity.

The specifications in regard to the weight per driving axle were very rigid. The maximum weight per single axle allowed by the railway company was 54,000 lbs. At the same time, as large a boiler capacity was desired as had been provided in some recent Pacific locomotives having a weight per axle as high as 57,000 lbs. To meet these requirements necessitated careful attention to every detail with a view of keeping the dead weight as low as possible consistent with strength. That the problems in connection with the design were successfully solved is evident from a careful study of the principal dimensions and ratios given below.

With an ample factor of adhesion of 4.92, these engines have a theoretical maximum tractive power of 31,900 lbs., which places them among the most powerful of recent engines of their class. Based on the horse-power curves published in the American Locomotive Company's Bulletin No. 1002, the theoretical maximum horse-power which they will develop is 1,770. This would be developed at a piston speed of from 700 to 1,100 ft. per minute. With 79-in. driving wheels and a stroke of 28 in., a piston speed of 1,100 ft. is equivalent to a speed of about 55 miles per hour.

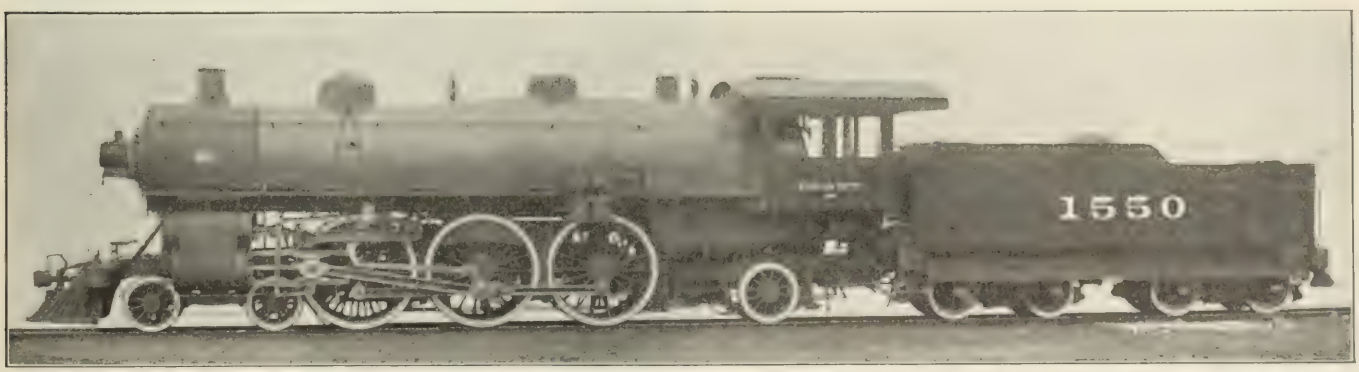
In working order they have a total weight of 247,800 lbs. This gives 7.2 horse-power for every 1,000 lbs. of weight. Compared with a number of the most notable recent Pacific locomotives, this figure is somewhat higher than the average for this ratio.

The large boiler capacity which has been provided is indicated by the ratio between heating surface and horse-power. The boiler, which is of the type having a conical connection sheet, has a total heating surface of 3,937 ft., of which 3,658 sq. ft. is in the tubes, and the remainder in the fire-box and the arch tubes. The design incorporates a 3-ft. combustion chamber which, of course, makes the actual heating surface of the boiler less than it otherwise would be. Based on the actual heating surface, there are 2.22 sq. ft. of heating surface per horse-power, which is about the average for recent designs of this class of engine, and, taking into consideration the fact that the heating surface of the combustion chamber is more effective than the amount of tube heating surface which it replaces, the above ratio would indicate a still greater boiler capacity.

This figure of 2.22 sq. ft. of heating surface per horse-power, taken in conjunction with the 7.2 horse-power per 1,000 lbs. total weight, is evidence of the care with which the design has been worked out; and would indicate a very satisfactory engine for the service for which it is intended. That they have proved successful in service is evidenced by the fact that the St. Paul recently placed an order with the company for twenty more locomotives of this design. The cylinders are 23 in. x 28 in. Steam is distributed to them by 14-in. piston valves, having a maximum travel of 6 in.; a 1-in. steam lap, and ⅛-in exhaust clearance. The valves are operated by the Walschaerts valve gear, the arrangement being the same as that previously employed by the American Locomotive Company on engines of this class, and is designed to give a constant lead of ¼ in. The frames are of cast steel, the main frames being 5 in. wide. The trailing truck is of the Devoy non-radial type with inside bearings.

The following are the important ratios:

Weight on drivers ÷ tractive effort	4.93
Total weight ÷ tractive effort	7.26
Tractive effort x diam. drivers ÷ heating surface	.641
Total heating surface ÷ grate area	80.7
Firebox heating surface ÷ total heating surface (per cent)	6.84
Weight on drivers ÷ total heating surface	.40
Total weight ÷ total heating surface	.63
Volume of two cylinders (cu. ft.)	13.44
Total heating surface ÷ vol. cylinders	.293
Grate area ÷ vol. cylinders	3.63
Total heating surface ÷ theoretical maximum horse-power	2.22
Theoretical maximum horse-power ÷ total weight / 1000	7.2
Theoretical maximum h.-p. ÷ weight on drivers / 1000	11.26



Pacific Locomotive for the St. Paul.

NIMBLE-HANDED FELLOWS.

(Air: "The Absent-Minded Beggar.")

When you're at Atlantic City, when you're browning in the sun,
When the Boardwalk's making blisters on your soles,
Wouldn't it chill your very framework to think how you would stand
If the natives found your pocket full of holes?
They're a lively-handed gentry, their acquisitiveness great,
But you and I must take them as we find them;
The season may be rather short, it's begun so very late,
So they never let good money get behind them.

Chorus.

Hotel, boarding-house, shack a mile from the sea;
All of them there for your bills and coin, and glad to have you stay;
("Haven't a single or double room; give you a suite of three.")
Tap your wad for your credit's sake and pay, pay, pay.

There's the waiter in the dining-room you must never overlook,
For you'll never get your dinner if you do;
The African who snatched your bag by some sly hook or crook—
He wants his little compensation, too.
They're nimble-handed fellows, and they've got us where we live,
Though we know their little tricks, we like to try them;
They know we've got the money, though we may not want to give,
But they never let good silver get far by them.

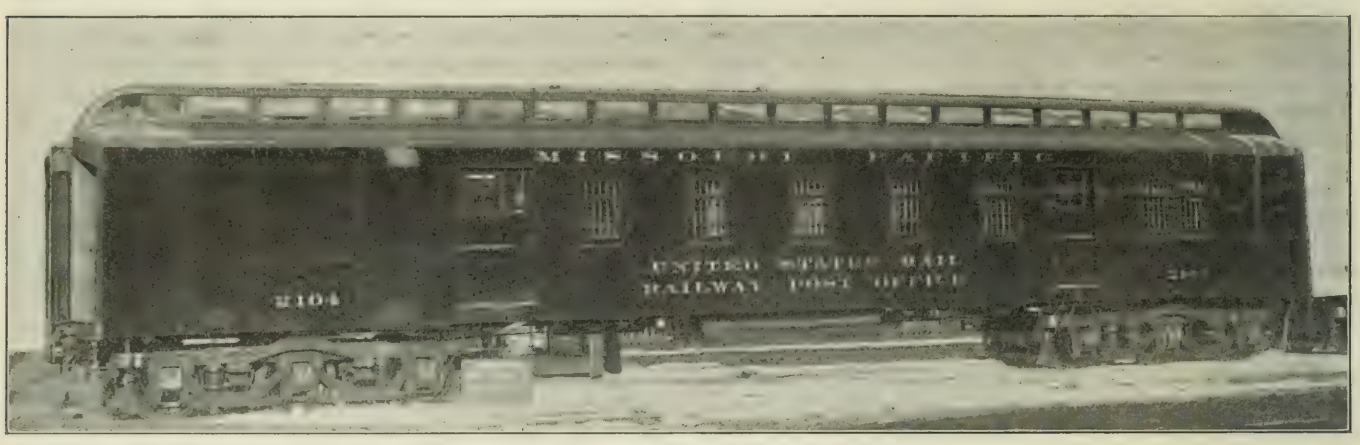
Chorus.

Waiter, chambermaid, elevator man—
If we want their little help we've got to buy them;
("Something else you'd like to have? Too bad it's going to rain.")
Trot out a bill or a silver coin and pay, pay, pay.

MISSOURI PACIFIC STEEL POSTAL CAR.

The new Missouri Pacific postal car as designed and built by the American Car & Foundry Company is illustrated herewith. The length of the car over end posts is 60 ft. 10 in., and the width over side sills 9 ft. 4½ in. The trucks have 38 inch rolled steel wheels, and the axles with 5 x 9 in. journals. The truck frames and bolsters are cast steel, and the total weight of the two trucks is 43,000 lbs., the car body 66,100 lbs., total, 109,100 lbs. The steel underframe is made up of structural shapes. The center sills are 12 in. I-beams 31½ lbs. per ft. These extend in one piece between buffer blocks and pass through the bolsters. The side sills are 8-in. channels 13¾ lb. section. Betwen the center and side sills there are longitudinal supports made of 3 in. channels. Each end sill is built up of two 8 in. channels 11¼ lbs. per ft. The side frame has diagonal braces made of 4-in. channels, except at the door posts, where they are 5 in.

The side posts are 4-in. channels. The outside of the car is entirely of steel, the side sheeting plates being ⅛-in. patent leveled steel, the end sheeting plates 3-16 in. steel, and the roof sheets are No. 16 black steel for both upper and lower decks. The upper deck head lining sheets are No. 22 steel, and the lower deck No. 18, and the side lining No. 16 steel, except at the storage end, where it is No. 11. The interior mail fixtures, tables, letter cases, paper boxes, lockers, etc., are all of wooden construction, and their arrangement is shown in our interior views.



Steel Postal Car; Missouri Pacific.

The side plate is a 4-in. channel with flanges up, and a 11¼-in. plate secured to the inner flange, and the outer flange is riveted to the sign board sheet, which is a 3-16 in. x 11¼ steel. The side frame independent of the side sheeting is the carrying member, the side plate, the side sill, posts and braces forming the required truss.

The body bolster is double built up of plates and rolled shapes, the top plate being 52 in. wide and 5-16 in. thick, running the full width of the car in one piece securely riveted to the top flanges of the side sill channel and center sill I-beams, and to the web plate angle iron stiffeners. The bottom plates, 9¾ in., are also riveted to the side and center sills. There are four main cross bearers placed 10 ft. 9 in. centers, the top cover being 10 x 5-16, extending clear across the car in one piece, and the bottom member is composed of two 3 x 5 x 5-16 angles and 5-16 in. web plate between. There are 14 floor beam supports made of 4-in. channels 5¼ lb. per foot. The lower floor is completely covered by steel plates 3-16 in. thick in the end sections and ⅛ in. thick between bolsters. On top of the 3-16 in. plate is laid a layer of ⅛-in. asbestos board, and over the whole surface of the car will be laid ¼-in. course of asbestos board, and the top floor is maple ¾ x 3¼. The inside lining of the car is 1-16-in., steel, except at the storage end, where it is ¼-in. and ⅛-in. asbestos board is cemented to the back of this lining, covering its entire surface. At each bolted attachment there is a washer of hair felt which serves the double

purpose of insulating the point where the inside finish is brought to bear against the frame of the car and also of deadening the bearing.

A Westinghouse air brake schedule L. N. is used, with automatic slack adjuster and air signals. The braking power



Interior of Missouri Pacific Postal Car.

is 90 per cent of the light weight of the car based on 55 l. s. cylinder pressure. The heating equipment is the Gold direct system of steam heat, with six independent coils and no Baker heater is used. The cars are lighted by Pintsch gas, using 5-mantle center lamps and three single flame lamps on the lower deck over the distributing table, and two single flame bracket lamps on the end transom of car over the mail table.



Interior of Missouri Pacific Postal Car.

The Exhibit.

The Homestead Valve Manufacturing Company, Homestead, Pa., has no exhibit this year, but P. L. Rhodes is here looking after the concern's interests.

If you want to see a ventilator that ventilates see the cyclone ventilator which is being exhibited by the Gold Car Heating & Lighting Company, New York.

The report of the Consolidated Car Heating Company, Albany, N. Y., for the year ended May 31, 1910, shows that the total sales far exceeded any in the history of the company, with one exception only.

Fred. C. Bartels, official snake charmer of the convention, gives snake talks every morning after 10 o'clock at the U. S. Metal & Manufacturing Company's booth 337. Call and hear "Bottles" carol on "Barol."

To more satisfactorily care for the large volume of business being received from the south-eastern railroads, the American Steel Foundries have recently opened an office at 906 Munsey Building, Washington, D. C., which will be in charge of W. Ross Gravener.

Railway men will no doubt be interested to know that the Hunt-Spiller Manufacturing Corporation, Boston, Mass., has on exhibition some side rod and knuckle joint bushings made of Hunt-Spiller gun iron. These have given such service as to warrant investigation.

J. G. Platt, mechanical representative of the Hunt-Spiller Manufacturing Corporation, Boston, Mass., is in charge of the company's exhibit. He will be glad to welcome all his friends. Arthur J. O'Connor, assistant to the manager at the works in Boston, Mass., in attendance at the conventions for the first time, is assisting Mr. Platt in greeting friends who call at the booth.



The Independent Pneumatic Tool Company, Chicago, received numerous visitors yesterday, who called to examine the exhibit and renew the acquaintance of those in attendance. The popularity of Thor air tools in the railway shops throughout the country gives them an important place in shop equipment, and this exhibit will undoubtedly attract considerable attention.

A patented feature of great importance in the Jefferson union is the lip of iron which protects the brass ring in the brass to iron seat from damage by direct contact with the steam, and from injury when the pipe is screwed in as far as it will go. The union is made by the Jefferson Union Company, Lexington, Mass.

The exhibit of the Landis Tool Company, Waynesboro, Pa., is in charge of Howard Hollinger, one of the company's demonstrators who prepared the ground engine parts shown, and who will be pleased to give any information concerning the work.

The Union Fibre Company, Winona, Minn., is exhibiting its refrigerator car on the Reading tracks. The St. Louis & San Francisco has asked for the car at the conclusion of the conventions, and will place it on regular runs for service tests.

The Pressed Steel Car Company, Pittsburgh, Pa., is using car Karbolith and Karborundum Karbolith surfacing on 175 new passenger cars for the Interborough Rapid Transit, on

27 mail storage cars, and on 21 other cars for the Pennsylvania Company. It has also ordered a lot of carborundum safety tread from the American Mason Safety Tread Company, Boston, Mass.

"Things are seldom what they seem,
Skim milk masquerades as cream," etc., etc.

Of course the manufacturers of spellerized steel boiler tubes are quite open to conviction that the friend who tagged a disreputable rusty piece of old iron boiler tube "spellerized steel boiler tube," and sent it to a mechanical railway officer, was under a genuine misapprehension; but it is fortunate, to say the least, that the chemist to-day can as readily distinguish steel from iron as skim milk from cream.

E. L. Dayton, whose investigations into the methods of water proofing cotton duck has resulted in the perfection of the fabric now being placed on the market by John Boyle, Inc., New York, will visit the convention in the interest of the company. Mr. Dayton is superintendent of the Bayonne (N. J.) mills. The cotton duck made for passenger coach roofs shown in the exhibit booth is treated with chemicals that neutralize the effect of the linseed oil, which has a tendency to rot the unprotected cotton fibre.

R. C. Totten and Mrs. Totten are attending the convention this year. Mr. Totten is one of the pioneer car wheel makers in the United States, having been one of the founders of the Ft. Pitt Foundry Company 55 years ago. Since then he has brought out the Nicholized chilled car wheel, which is being exhibited in booth 419 of the Nicholized Casting Company, Pittsburgh, Pa.

SAFETY CAR HEATING & LIGHTING COMPANY'S EXHIBIT.

The large booth of the Safety Car Heating & Lighting Company, New York, is decorated and illuminated by beautiful lamp fixtures for both gas and electric lighting. They show the development of the Pintsch system of mantle lamp for railway cars, and the economy of this system is proved by the fact that the maintenance of cost of mantle lamps is only one cent per 100 candle power per hour. The electric lights are supplied by an axle driven generator, which supplies 140 12-candle power lamps. Experience has demonstrated that the control of an axle lighting dynamo by means of a carbon resistance in series with the field circuit is the one method which fulfills the exacting conditions of car-lighting service. This method was introduced by the Safety Car Heating & Lighting Company, and the type "D" regulator, which is now used, is a re-design of this mechanism with such improvements as experience and careful study have suggested. This dynamo regulator and lamp regulator give constant voltage at the lamps with control of the dynamo which results in the best treatment of the storage battery.

This company also exhibits in operation their new "Thermo jet" system of car heating, which offers a unique method of direct steam car heating. It operates with certainty and minimum attention and provides uniform car temperatures under every weather condition. It does this with a marked economy in the use of steam and with a minimum radiating surface. It is difficult to describe this without drawings; but, briefly stated, the car is equipped with a complete and independent circuit of pipe with loops at the ends to provide for expansion. In each circuit, near the middle of the car and secured rigidly to the truss plank, is a plate, through the two guides of which runs the upper radiating pipe carrying an injector casting. The return portion of the upper pipe is also fastened by a clamp to the truss plank of the car at a distance of about 25 ft. back of the injector casting. In this casting there is a nozzle through which a jet of steam is admitted to the circuit, and this injector action causes a rapid circulation throughout the pipes. The expansion or contraction of the 25 ft. of pipe between the injector and the pipe clamp moves the injector body back and forth between the pipe guides. In this way the admission of steam is automatically adjusted. The temperature of the radiating pipes is maintained at any desired point by means of a regulating handle, and the rotation of this handle through proper mechanism has the effect of requiring a greater or less expansion and temperature in the radiating pipes to close the injector valve. When the regulator is set at any particular point, the temperature of the radiating pipes remains constant in spite of changes in train pipe pressure or the amount of steam condensed, the expansion of the 25 ft. of pipe making an absolutely reliable control. The effectiveness of this apparatus is demonstrated by the fact that a variable range in radiating power of the pipes of nearly one to three is obtained.

THE GARLAND VENTILATORS FOR PASSENGER EQUIPMENT.

Burton W. Mudge & Company, Chicago, is actively developing the business connected with the application of the Garland ventilators to all varieties of passenger equipment. These ventilators have been in use on Pullman cars for several years and have proved so successful that they are now in use on nearly 5,000 of the cars owned by that company, and it has been adopted as a standard by them. At the present time they are applying it to the large order of all-steel sleepers building for the Pennsylvania lines.

This ventilator is the invention of Thomas H. Garland, superintendent of refrigerator service of the Chicago, Burlington & Quincy, who has been a student of ventilation for many years and has finally succeeded in making this practical application to passenger cars. No new principle is involved; the opening provided by the deck sash is simply utilized. All the air currents are upward and hence there is no downward draft to annoy the passenger.

One of the annoyances of passenger travel is the distribution of odors from the dining car throughout the other cars in the train and the contracted space of the kitchen has made this rather difficult to ventilate. The Garland system as developed for dining cars by the Rock Island is now in use on a number of its cars, and it effectually prevents these odors from entering the dining room part of the car. Two large double Garland ventilators are placed on the upper deck over the kitchen at the center of the upper deck. These have registers so that the flow of air through them can be regulated. A single Garland ventilator is placed at one of the deck sashes directly over the range. This is very effective in directly removing the vapors and bad odors arising from the cooking. A duplex ventilator is placed in the sashway directly over the side aisle and is connected by an air duct with the refrigerator. This is also found to be very effective in removing bad odors which so often accumulate in car refrigerators, and provides a circulation of fresh air through the stock of supplies. The dining room also is provided with these ventilators in the same way as they are applied to Pullman cars. The principal difficulty with passenger cars with elliptical roof and no upper deck is in connection with the ventilation, and the Garland ventilator is well adapted for the solution of this problem. Where there is sufficient clearance it can be placed directly on top of the roof, or if necessary down on the sides; and the flow of air is easily regulated by neat registers in the ceiling of the car.

In addition to the large number of Pullman cars and the Pennsylvania steel sleepers, the Garland ventilator is used on the Rock Island steel chair cars; the Frisco steel smok-

ing, cafe and dining cars; Cotton Belt dining cars; Virginian Railway coaches; New York Central dining and buffet cars; Southern Railway dining cars; Seaboard Air Line private car; and on many other lines.

FORSYTH HIGH CAPACITY BUFFING DEVICE.

The buffing device made by Forsyth Brothers Company, Chicago, and illustrated by Figs. 1 and 2, was designed to accomplish two things—(1) prevent the buffer plates from pulling apart under all conditions of draft; and on curves as well as straight track; and (2) absorb the heavier as well as lighter buffing shocks, which occur in ordinary service.

Heretofore, it has frequently happened that people have had their feet caught in openings between the buffer plates; these openings (which took place under draft, and were due to the fact that the buffer plates did not have sufficient forward travel) often exceeding two inches. In the case of the Forsyth buffing device, the buffer plates are always held in tight contact with each other; and this is accomplished without the use of an equalizer bar. The latter is liable to constant failure, involves a high cost of maintenance, and is a source of continual noise during the running of the car.

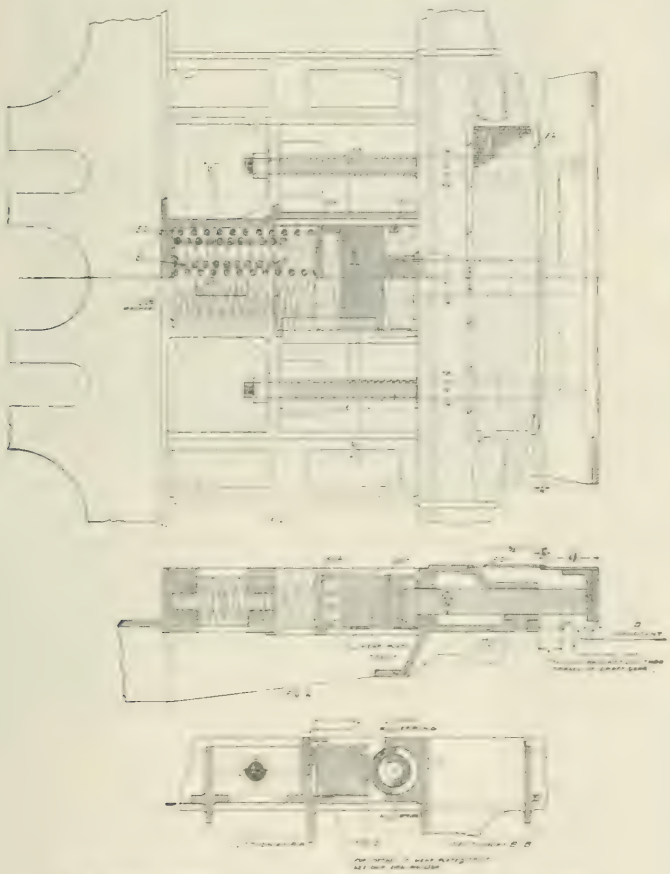


Fig. 2.—Forsyth High Capacity Buffing Device.

While for a considerable time it has been generally appreciated how severe are the buffing shocks in freight equipment, this has not been thoroughly understood with respect to passenger service cars. Dynamometer tests have been made, however, on passenger cars, which show that buffing shocks in this class of equipment and in ordinary service run very high (even during coupling), frequently amounting to several hundred thousand pounds. It must be evident that these shocks are not only responsible for undue jerking and jarring between the cars, but that unless a high cushioning buffing device is used, the shocks are taken almost entirely upon the coupler head and its extension, and the draft gear. This must be apparent, when one remembers that under buff the blows are taken between the outer ends of the pivoted knuckles and the opposing inclined faces of the couplers; or between the bases of the knuckles and the opposing and inclined guard arms. In either case the buffing shocks are multiplied in their destructive effect by being thus taken between relatively pivoted and inclined parts instead of between flat abutting surfaces. For this reason, a high capacity buffing device is particularly necessary to relieve these vulnerable parts of the coupler head, to say nothing of the drawbar extension and the draft gear. Then, too, buffing blows should be taken as nearly as possible on the vertical center of the main sills of the car instead of beneath the platform; the latter having the effect of causing the platform to sag.

The Forsyth buffing device has a shock absorbing capacity of 300,000 lbs. per end of car (or as much more as may be desired) and this cushion will unquestionably be largely instrumental in preventing the loosening of the rivets in the car structure. This device consists of few parts, which are subject to practically no wear; and even if ever driven solid under excessive shocks, the parts so support each other as to prevent failure thereof. The high capacity is afforded by spring friction plates, which, irrespective of the number employed or the force of the blow, can never become deflected beyond the curved surfaces of the follower members between which they lie, which curves are well within the elastic limits of the plates. The friction developed between these plates constitute a large percentage of the capacity of the device and at the same time dampens the recoil to a remarkable degree. One of the peculiar features of this device is that the spring friction plates not only absorb the minor and gradually applied buffing pressures, but, what is much more important, the violent and abrupt shock. The Forsyth device, therefore, differs in this essential respect from other shock absorbing devices.

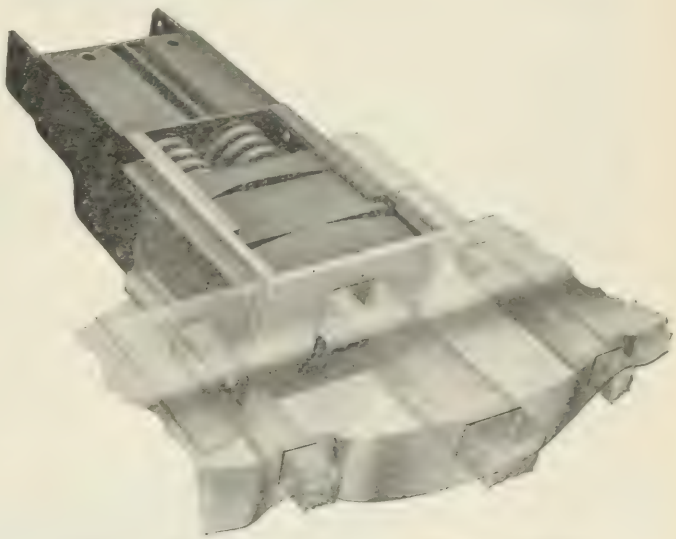


Fig. 1.—Forsyth High Capacity Buffing Device.

The high capacities of the Forsyth buffing device do not come into action until back of the coupling line, consequently coupling is made very easily with this device. In advance of the coupling line, the outward spring tension is almost uniform. Coupling is taken by sufficiently long twin coil springs. Back of the coupling line there comes into action much heavier inner springs; and finally there comes into substantial operation the spring friction plates. The coil springs can never be injured, as they cannot be driven solid, on account of the spring chambers, within which they lie, being deeper than the solid length of the springs.

The Forsyth buffing device may be applied to any built-up, or cast steel end construction of car, as, for example, the

Commonwealth cast steel platform, as shown in Fig. 2. The device is in a cast steel box within which the members are held in proper working relation by means of flanges, which overlap the ends of the followers and plates and prevent the latter from working upwardly.

This device is in service upon numerous cars of the Harriman Lines; Pullman Company; Chicago & Northwestern; Atchison, Topeka & Santa Fe; Baltimore & Ohio, and Southern Railway.

THE TRACK EXHIBIT.

The track exhibit is so conveniently located, and so well deserves attention, that it should receive a host of visitors. Some of the latest improvements in steel hopper cars are shown by the Pressed Steel Car Company, Pittsburgh, Pa., and the Cambria Steel Company, Johnstown, Pa. The steel frame for the Reading coaches affords excellent opportunity for an inspection of every part of the steel structure, both underframe and superstructure. The truck of this car is a new design by the Reading motive power department and is notable for the use of clasp brakes. Master mechanics will be interested in seeing a splendid example of the latest development of the electric locomotive in the 4,000 h.p. engine exhibited by the Pennsylvania Railroad. They will also find a radical departure in firebox construction in the Jacobs-Shupert firebox, which is exhibited by the Baldwin Locomotive Works and the Atchison, Topeka & Santa Fe.

Taking up the exhibit a little more in detail, the Middletown Car Company, Middletown, Pa., shows a 50-ft. steel gondola car, 40-ton capacity, 9 ft. 2 in. wide, weight 36,200 lbs. This car has deep center sills and heavy steel cross bearers. It was built for the Central Railroad of New Jersey. The American Car & Foundry Company, New York, shows a 50-ton gondola with wooden sides, cast steel end sills, and deep side sills. The car is equipped with the Miner friction draft gear. It is 40 ft. long, 8 ft. 6 in. wide and weighs 43,300 lbs.

The Pressed Steel Car Company exhibits a new design of self-clearing, quick-dumping ore car, with safety door operating gear. This car is also equipped with friction draft gear. It has a capacity of 50 tons and the weight light is 32,700 lbs. It was fully illustrated in the *Daily Railway Age Gazette*, June 15, 1910.

The Bettendorf Axle Company, Davenport, Ia., shows a steel side dump gondola which was built for the Chicago, Burlington & Quincy in July, 1908, and is sent to show its condition after more than two years' service. The car is 40 ft. long, of 50 tons capacity, and weighs 37,800 lbs.

The Union Fibre Company, Winona, Minn., sent a refrigerator car which is equipped with Brown's collapsible tank and Leeds' weather-proof ventilator. The car has the Sampson steel underframe built by the Whipple Car Company, Chicago. It is completely insulated by four layers of the Union Fibre Company's linofelt.

The Harlan & Hollingsworth Corporation, Wilmington, Del., has a very interesting and instructive exhibit in two coaches, one the bare steel frame, and the other the completely finished steel coach with wood finish on the outside and inside. This car is 63 ft. long, and has a seating capacity of 78 persons. The weight of the body is 72,200 lbs., and of the two trucks, 29,400 lbs.; total, 101,600 lbs. The underframe is a new design with center sills made up of two 18-in. I-beams laid vertically with one 18-in. I-beam laid horizontally as a spacer and stiffener. The diagonal truss below the windows is made up of channels, the posts are of angle iron and the carlines are of bar iron. The cars are equipped with the Gould vestibule platform and friction buffer. The truck is a novel and interesting design with cast steel pedestals with channels between, and the wide bolster is cast steel with outside anti-friction side bearings. The car is lighted with Pintsch mantle lamps, it has Edwards sash fixtures and platform buffers. These cars are part of an order of 65 cars for the Philadelphia & Reading. Twenty of them are vestibule coaches with dark mahogany finish and inlaid decorations. Twenty-five coaches have open platforms and white mahogany finish, and the rest are baggage and combination cars.

The W. T. Van Dorn Company, Chicago, exhibits a Southern Pacific box car with corrugated pressed steel ends. These are similar to that exhibited by sample end last year, but they are provided with hinged doors so that the car can be loaded through the end with lumber, rails and other long materials.

The Kilbourne & Jacobs Manufacturing Company, of Columbus, Ohio, exhibit a large steel contractor's car with a pneumatic dumping arrangement. It has a capacity of 16 cu. yds. level filled and will carry 23 cu. yds. when heaped. It is 24 ft. long, 9 ft. wide and has a depth of 24 in. The car is made entirely of steel, excepting the floor, which is of hard wood, and is equipped with Westinghouse air brakes and M. C. B. couplers. The Hutchins Car Roofing Company, Detroit, Mich., shows its new all steel-steel carline roof on a New York Central car. Full particulars and samples of this roof are seen in the Hutchins booth on the pier.

The Cambria Steel Company shows a 50-ton steel gondola from the new design having four hoppers. This is one of a thousand cars ordered by the Baltimore & Ohio. Its weight is 49,900 lbs. The Cambria Steel Company also shows a 50-ton low-side steel gondola for the Reading. This car is equipped with Gould friction draft gear. The weight of the car is 44,100 lbs.

The Jacobs-Shubert boiler and firebox, already referred to, as built for locomotives of the Santa Fe, is shown by two full sized fireboxes, one illustrating the inside construction and the other the complete firebox and outer ribbed shell.

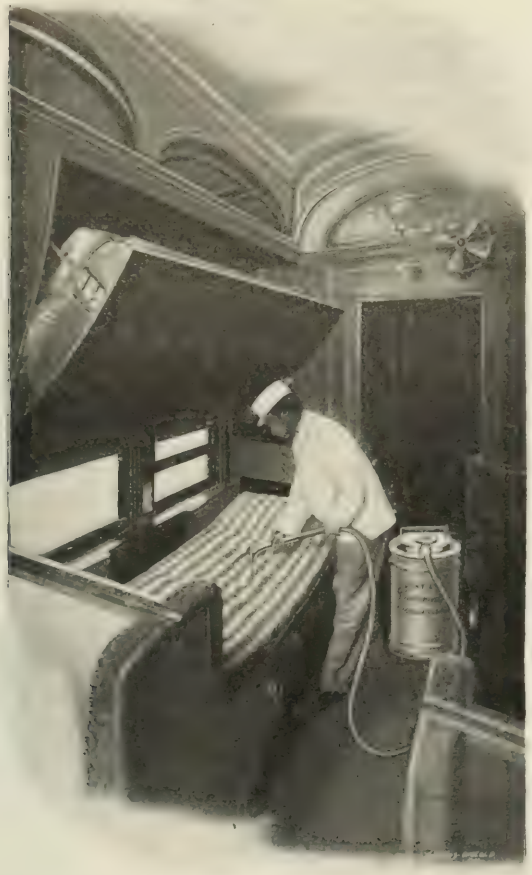
The new electric locomotive of the Pennsylvania Railroad above mentioned is of the articulated double cab type, consisting of two American type locomotives placed back to back. The design is the result of the coöperation of the Westinghouse engineers and the locomotive committee of the Pennsylvania system. The cabs, frame, running gear and mechanical parts were built by the Pennsylvania at its Juniata shops, and the electrical equipments were built and the complete locomotives assembled by the Westinghouse Electric & Manufacturing Company. Each half of it carries its own motor and complete equipment. The two halves are permanently coupled together at the driving wheel ends. The motors are arranged for direct current 600 volts. The weight of the locomotive complete is 157 tons; the weight on drivers 200,000 lbs., and on each axle 50,000 lbs. The total wheel base is 55 ft. 11 in. The contract tractive effort is 60,000 lbs. with a maximum drawbar pull recorded on test of 79,200 lbs. The normal speed with full train 60 miles per hour; normal service 550 ton train to be started and accelerated on the 2 per cent tunnel grades; maximum contract horsepower 4,000. The weight of each motor complete with cranks is 43,000 lbs.

COACH CLEANING BY THE VACUUM PROCESS.

Coach cleaning by the vacuum process is now considered the best, most thorough, and least expensive method.

One large railway having a terminal in Chicago was the pioneer of railway coach cleaning by this method, and it is constantly enlarging and improving its equipment for this work. The old method of cleaning with broom and beater did not successfully remove the dust and dirt, while it destroyed the fabrics. The vacuum cleaner, on the other hand, removes the dust and dirt which lies underneath the carpets as well as that upon the surface and adds to the life and ap-

pearance of upholstered fabrics by straightening and raising the nap. For cleaning mattresses, quilts, comforters, pillows, etc., it is unexcelled. It thoroughly cleans the woodwork of coaches, thus doing away with alkali washes, which are very damaging to the varnish and require expensive rubbing to



Coach Cleaning by the Vacuum Process.

restore the polished surface. Vermin, cinders, dust and dirt of every kind are taken up and deposited in the receptacle. The saving in time and labor alone, it is claimed, will soon pay for the Duntley cleaner, which is made by the Duntley Manufacturing Company, Chicago.

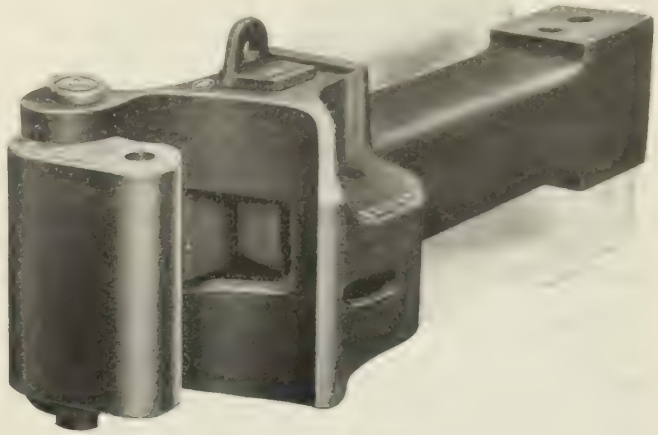
COUPLERS.

The present demands for heavy equipment and high speed, with the almost universal use of hump tracks in switching service, has made the question of couplers an important one, and necessitated a constant effort on the part of manufacturers to turn out a coupler capable of standing the shocks and blows which seem to be unavoidable in present day practice.

The American Steel Foundries, Chicago, are fully prepared to meet the demands of modern service, and this is clearly seen by an inspection of the coupler exhibit at booth 168. A total of 13 couplers are shown, six of them being arranged as they would appear in service. Three styles of couplers, with suitable uncoupling rigging for use on engine pilots and front ends of switching locomotives, are also shown. A side unlocking coupler, a standard top lift freight coupler, a passenger coupler and a top lift freight coupler are also shown.

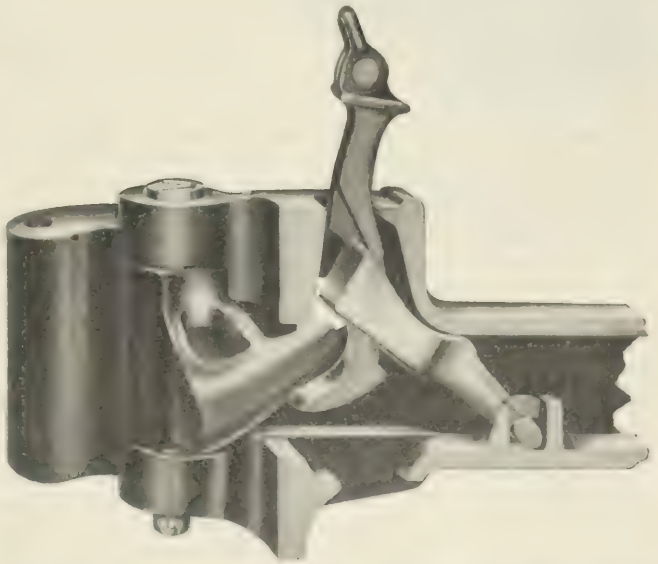
The R. E. Janney coupler, a photograph of which is shown, has been on the market for several years, and is well and favorably known. There are about 750,000 of them in service at the present time. This coupler has been improved during the past year, although it has been a favorite, due to its strength, and small number of moving parts requiring only a single vertical locking pin to perform all necessary operations.

It is designed to meet all the requirements of the M. C. B. tests, as well as the safety appliance law, and is recommended where the needs of service demand a coupler of extreme simplicity.



R. E. Janney Coupler.

The Simplex freight coupler has now been in service for about three years, and about 200,000 of them are in use. The lock of the Simplex coupler, as shown by the accompanying cut, is entirely contained in the interior of the coupler head, where it is well protected from damage. The function of the lifter is only to throw the knuckle open and to raise the lock onto the top of the knuckle tail, after which the lifter drops



Simplex Coupler; Showing Positions of Parts When Throwing Knuckle.

back into its normal position in the coupler head, where it is protected when the knuckle is open ready to couple.

The arrangement of the locking parts of Simplex couplers is such that the lock can be thrown off the lock-set position without opening the knuckle. This is a feature very much appreciated by trainmen when a cut has been made in a string of cars at the wrong place.

The coupler includes all of the recommendations and suggestions which have been made by the Master Car Builders' Association. Special attention has been given to the contour of the knuckle tail and the coupler head, so as to make them coincide accurately and to permit two engaging couplers to mate readily at very slow speed. This feature, with the wide opening provided by the knuckle, makes a positive coupling, regardless of the relative position of the couplers or the speed at which they meet.

A movement in the lifter of only 2¼ in. is required from the closed position with a Simplex coupler to unlock the knuckle, and a total of 4 in. to unlock and throw the knuckle to its fullest extent. The locking surface on the knuckle is 4¼ in. square, and the bearing surface against the opposite wall of the coupler 5½ sq. in. This short lift does not require close adjustment in the uncoupling chain, and also prevents accidental uncoupling on account of short or improperly applied chains.

The Simplex coupler, owing to the locking parts being contained within the head, is well adapted for a side lift arrangement, and the American Steel Foundries are prepared to furnish couplers of this design for ballast car use or where the needs of the service or preference of the users call for a coupler of this style.

THE FAESSLER REMOVABLE DRIVING BOX BEARING.

The time and expense required to renew driving box bearings in locomotives are caused principally by the necessity of taking out the driving wheels; and any improvement which will permit of renewing a bearing with the box in place must result in an important economy.

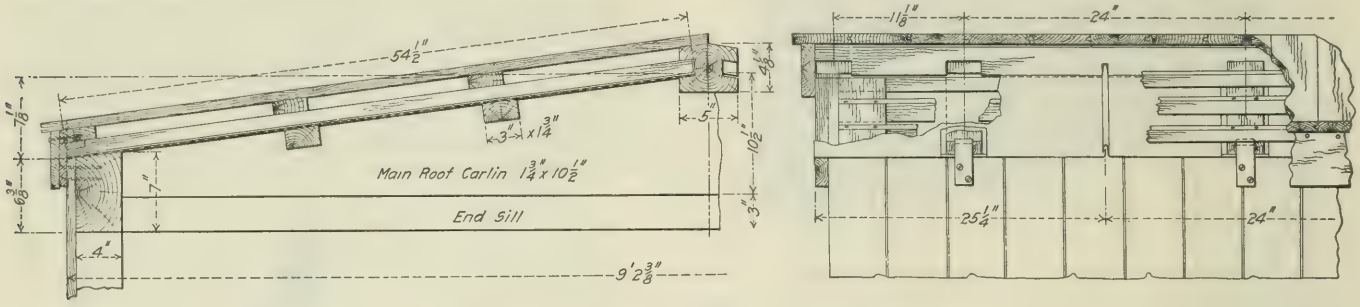
The J. Faessler Manufacturing Company, in addition to their well-known boilermakers' standard and special tools, exhibit a locomotive driving box with removable bearing and special automatic lubricating device. In the box the brass is turned to a neat slip fit and is not pressed in. It is locked in position by a heavy cast steel cellar, which is secured by two nuts. Between the journal and the cellar is a plate of corrugated steel sheet resting on springs which extend down into the cellar. These corrugations are shaped so that the revolution of the axle tends to return the lubricant to the cavity in the top of the box. The lubricant, in the form of grease, is pumped into this cavity in the crown of the box and as it expands it flows over the bearing and is then returned by the action of the corrugated sheet as above described. This improved driving box bearing has been in service on six engines of the Wabash for about a year and a half; it is also in use on the Pere Marquette. In addition to the great advantage of saving time in renewal of bearings, it is economical in the use of the lubricant, and the life of the brass itself is very much longer, as on account of its construction it does not require renewal when loose, as is the case with the pressed bearing, but can be worn down much thinner. The cellar has a tongue and groove fit in the solid projections on the bottom of the box, which prevent the two sides of the box from spreading. The special clamps for extracting the cellar, and jigs, for machining the improved bearing and maintaining their standard sizes, are also exhibited in connection with the box itself.

SOMETHING NEW

The Walker & Bennett Manufacturing Company, New York, is showing in its space on the ballroom floor a unique folding divan for private car use. It can be made any width—a full-sized bed for two people or the dimensions of an arm chair for one person. The sample shown is pure Sheraton in design and upholstered in rich covering. When open as a bed, it contains a mattress, pillows, blankets and sheets, which are supported on an independent spring that does not come in contact with upholstered surfaces. A box or receptacle underneath for odds and ends is conveniently located.

HUTCHINS ALL-METAL INSIDE ROOF.

The detailed drawings shown are of the Hutchins all-metal inside roof. The roofing sheets and subframe work along the eaves of the car are secured by wrought iron clips, passing through the side plates. It is unnecessary to use any caps or pans either above or below the sub-carlines or rafters, as the roofing sheets themselves cover the car with metal. Hutchins felt strips are furnished with the roof, to be placed underneath the sub-carline and on top of the roofing sheet as well as a protection, against water, to the sub-carline. The roofing sheets are independent of the sub-carlines or sub-rafters and are not subject to the weaving strains of these members. The roofing sheets are joined together to provide for the movement of the car as well as the expansion and contraction of the metal roofing sheets.



Details of Hutchins All-Metal Inside Roof.

The Hutchins Car Roofing Company, Detroit, Mich., manufacturer of this car roof, is exhibiting in space 431. This company is represented in Chicago by the Spencer-Otis Company, Railway Exchange, and in New York by the United States Metal & Manufacturing Company.

sheet, to act as a cushion for the protection to the roofing

NATIONAL SPRING PARALLEL GUIDES.

The National Lock Washer Company, Newark, N. J., is exhibiting something entirely new for car windows, called Spring Parallel sash guides. They consist of two rigid metal bars, one on each side of the sash, between the sash stops. They are equipped with springs which press these guides against the sash, making a dust and draught proof sash which can not rattle or swell tight, nor can the sash fall suddenly and cause an accident. The same sash will fit any window opening in a set.

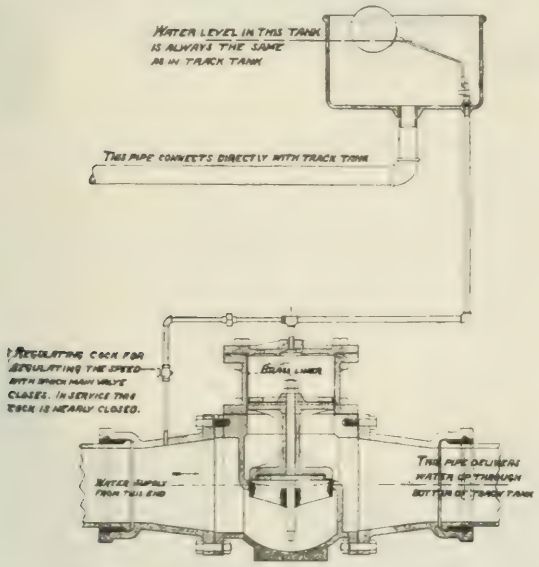
Old car sash can be easily equipped with these guides, making them work as well as those applied to new sash. There can be no rattling of sash in dry weather, and on the other hand it will always work free in wet weather, as guides adjust themselves. There is nothing to get out of order. The company claims that they will last the life of a car, and that the use of these guides eliminates the expense of easing new sash, which has to be done in some cases several times during the first year.

AUTOMATIC TRACK TANK VALVE.

Many of the larger roads have adopted the track trough system for their fast passenger trains, which consists of a trough of suitable width and length, from which the water is scooped up and discharged into the tender by an attachment on the locomotive.

To use this method successfully and economically, some means of automatically controlling the flow of water to the troughs must be employed. The cut herewith shows an apparatus designed especially for this purpose, and used on such roads as the Pennsylvania, the New York Central and Hudson River and the Lake Shore and Michigan Southern, where they have demonstrated their practicability and reliability.

The water level in the trough is regulated by the float in a small tank on the same level as the track trough, and connected to it by a suitable stand pipe. When the water is lowered in the trough, the float valve opens, allowing the water in the hydraulic chamber of the supply line valve to escape. The pressure in the main then gradually forces the valve open and allows the water to flow into the trough. As soon as it has reached its proper level, the float valve closes and the pressure in the main acts on the piston head in the hydraulic cylinder of this valve through the pipe connections shown, and the latter is closed.



Sheffield Automatic Track Tank Valve.

The valve is simple, said to be thoroughly reliable, and is designed to require practically no attention. The device is manufactured by the Sheffield Car Company and sold by Fairbanks, Morse & Co., Chicago.

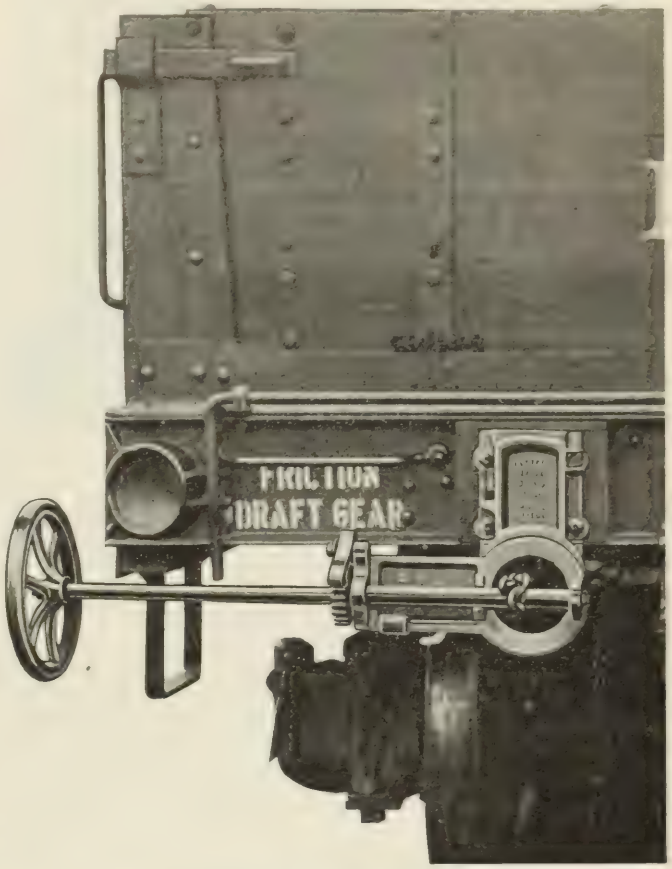
REDUCE YOUR HOSE BILL.

Anything that overcomes the delay of trains, or eliminates the cost of failures, is worthy of the attention of railway men. One of the most essential parts which must be kept in first class condition in order to run trains successfully is the air brake equipment.

At booth 322, the Sprague Electric Company, New York, has on exhibition the Sprague flexible steel armored hose, which the company claims will prevent failures, and at the same time reduce the cost of maintenance. The design consists of a rubber hose covered with an interlocking steel armor, which covers the hose and presents a practically continuous flat surface for it to bear against when under pressure. Visit this booth and see just how this hose is made. Note its flexibility and why it cannot chafe or kink.

FEASIBLE DROP BRAKE STAFF.

Sugar plantations throughout the southern countries are rapidly adopting the Feasible drop brake staff as standard on their flat and cane car equipment, according to reports of the U. S. Metal & Manufacturing Company, New York. Canadian roads are equipping their logging cars with the same device, while numerous roads in the United States have adopted it as standard on their flat and drop-end gondola equipment, having found that the Feasible effects a considerable saving in equipment maintenance. Discarded staffs and wheels, mute witnesses of a hard life, are a rarity along the lines of these roads. A sample staff is on exhibition at booth 337 of the above company.



Feasible Drop Brake Staff in Horizontal Position.

HEAVY GUILLOTINE SHEAR.

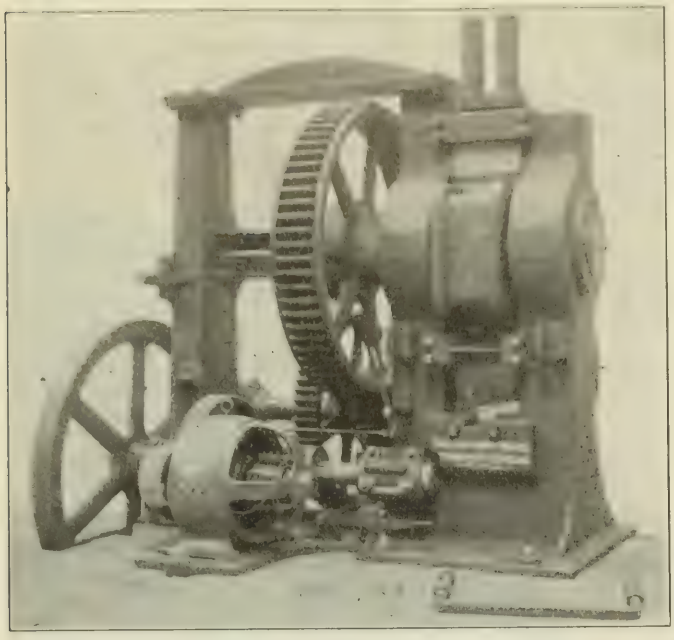
The accompanying photograph illustrates a heavy guillotine frame bar shear designed especially for blacksmith shop work by the Hilles & Jones Company, Wilmington, Del. The main frame, sliding head, gearing and sundry minor parts are of cast steel, making practically an unbreakable shear.

The machine will cut off 5-in. square steel bars cold. The sliding head is counterweighted through heavy springs. The machine is substantially double geared, both driving shafts being carried in split babbited bearings with offset caps so that these shafts may be readily rolled out of position when necessary, also giving the best possible bearing for the shafts.

The clutch is controlled by an automatic stop and operated by both hand and foot levers placed in convenient position for the operator. The driving is by a 30-h. p. motor, directly connected to the fly wheel shaft through cut gearing.

A hold-down is provided to prevent the bars from tilting,

and there is an adjustable gauge block for shearing to lengths. This same machine can be used for shearing angles or round bars by substitution of proper shaped blades. The

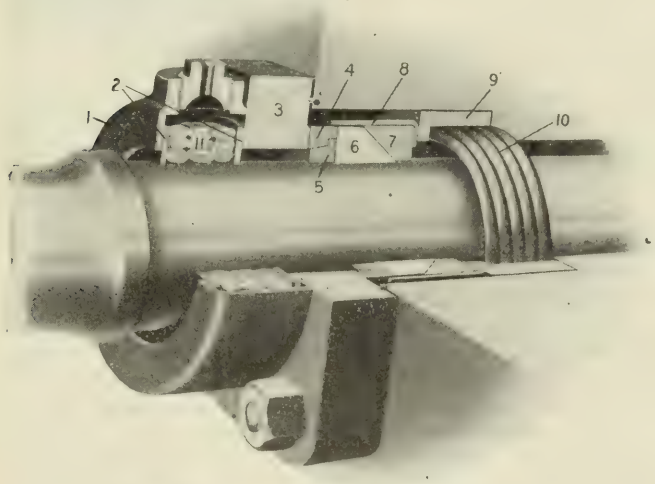


Hilles & Jones Heavy Guillotine Shear.

manufacturers build this type of machine in a variety of sizes down to the small shear suitable for bolts up to 1 in. in diameter.

KING METALLIC PACKING.

For over a quarter of a century The United States Metallic Packing Company, Philadelphia, Pa., has been engaged in making metallic rod packings; in that time bringing its product to the position of the standard metallic packing in American railway service. The company, having a knowledge of the conditions and a clear understanding of the require-

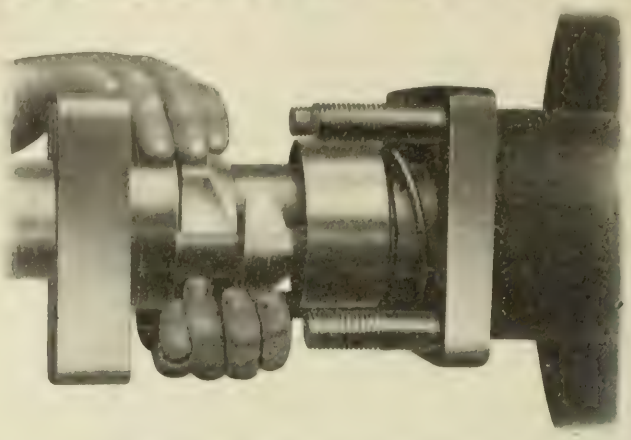


Sectional View of King Metallic Packing.

ments, designed, some two years ago, the King packing, shown in the accompanying illustrations.

In the development of the King packing the aim has been to get a simple packing, to eliminate, as far as possible, those features which have proved to be the usual causes of trouble, and to produce a packing that would be steam tight under service conditions.

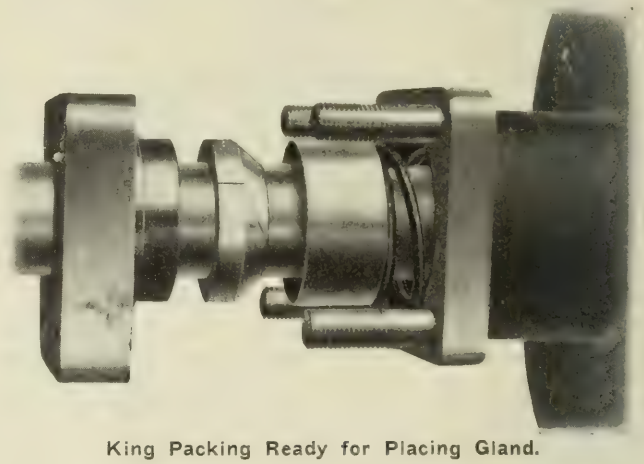
Reference to the illustrations shows that the King packing has few parts and only one ground joint, that between the gland 3, and the sliding plate 4-5. The King packing ring 6 is in two parts only, and these interlock as shown. There is no vibrating cup, parts 7 and 8 acting only as a follower.



Placing King Packing on Shouldered Rod.

By the use of the steel shell 8 the greatest possible room is obtained for vibration in the stuffing box.

Parts 5 and 7 are in halves for shouldered rods. The ease and quickness with which the packing ring can be applied is well shown by the cuts. The convenience of this feature on a locomotive with leaking throttle can readily be seen.



King Packing Ready for Placing Gland.

The King packing is in use on 20 American railways and is giving uniformly good results under very hard service. One of the advantages claimed by the makers is, that other makes of metallic packing can readily be changed over to the King type, at comparatively small expense, by the furnishing of a few new parts.

MOHAIR PLUSH SEAT COVERING.

In the construction of new car equipment, the interior finish should resemble as much as possible a comfortable room in a home. A large quantity of mohair plush in various styles is used for upholstering purposes in drawing rooms, libraries, living rooms and hallways in many of the most carefully appointed homes. It is not generally known, although a fact, that this same class of material is used extensively to cover car seats. From this it will be seen that mohair plush, well selected, tends to make a railway car very homelike and comfortable. The field from which to select patterns and colors is very large; and the color scheme can be determined with considerable ease. The Massachusetts Mohair Plush Company, Boston, Mass., makes a mohair plush well adapted for use in passenger car construction.

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While locomotives using low superheated steam may not require any special attention in the lubrication of valves and cylinders, highly superheated steam requires continuous lubrication. When engines are drifting and there is no flow of steam carrying the lubricant to the piston and valves, these surfaces are very hot and some means must be provided for their lubrication. On the Great Western Railway of England, superheated steam is used on a large number of engines, and special provision is made to prevent cutting under these conditions. An automatic valve is connected to the throttle lever so that a small amount of steam passes through a ½-inch pipe to the cylinders when the main throttle valve is closed and the engine is drifting. In this way sufficient lubrication is provided under all conditions of operation.

The old constitution and bylaws of The Railway Supply Manufacturers' Association were revised by a committee appointed some months ago for that purpose, and its report, with one amendment, was accepted by the members at the annual meeting day before yesterday. The changes were not radical, except, perhaps, in one respect. It has been the practice for years to decide questions brought before the body as a whole, by a majority of *representatives* present. According to new section 3, article 4, of the bylaws, and article 3 of the constitution, this power is confined to the member—("any corporation, co-partnership, or individual engaged in the manufacture and sale of railway materials," etc.) who "shall be entitled to one vote on all matters, which vote shall be cast by its properly accredited delegate." There is, however, no definition of "properly accredited delegate." In the old constitution and bylaws, article 3 of the former and section 1 of the latter were in conflict as to whether the concern or person who paid the prescribed assessment, or the individual representative, was the voting member; and while they now conflict in the same way, new section 3, article 4, seems to define the intent. That the old constitution and bylaws were faulty was, of course, evident from the fact that they were ordered revised. It is too bad, however, that the committee did not go further in its work. The old laws were unnecessarily verbose and lacked words of meaning. Few changes have been made. Section 5, article 4, of the bylaws, while providing that, should the members in any district "fail to elect a member or members to the executive committee," that vacancy shall be filled by the committee, there is no provision as to how many constitute a quorum. In other words, one vote only might be cast in any district, and that one vote would elect. Further, section 6, article 2, of the bylaws makes it possible for any four members, or one-third only, of the executive committee, to decide any question within its province. While they're all jolly good fellows, and the contingency is remote, it is conceivable that this unusual practice might cause trouble. Perhaps the same remarks should be applied to all the points noted in our criticisms. But since it is the aim of those who have their shoulders to the wheel to perfect a real business organization, the foundation should be designed to prevent any possible collapse.

Twenty years ago the Master Mechanics' Association held its convention at Old Point Comfort, following the Master Car Builders, which met the previous week. As each of the conventions began on Wednesday, those who attended both had to be absent from home almost two full weeks. A resolution, presented by Mr. Setchel, was passed providing for a conference with the Master Car Builders' Association, with a view to arranging that the latter meet the second Wednesday in June and the Master Mechanics the following Monday. R. H. Briggs was then president and Angus Sinclair secretary. The address of welcome was made by M. E. Ingalls, president of the Chespeake & Ohio and the Cleveland, Cincinnati, Chicago & St. Louis. It reviewed the incidents of the civil war around Old Point, Norfolk and Richmond; the desperate naval battle between the Monitor and the Merrimac; the interesting history of Jamestown and Williamsburg, and the campaigns of McClelland and Grant and Richmond. This address was one of the prominent and pleasing incidents of the convention, and at one time a resolution was adopted that similar addresses by men prominent in the railway business form a regular part of the proceedings of the conventions, but it is disregarded and seems to have been forgotten. One of the important subjects under discussion at that time was: "Is it safe to run a pony truck under fast express engines?" After the conflicting opinions had been stated, the meeting hesitated to adopt any definite resolution and it was decided to change the question to, "What are the relative merits of mogul and ten-wheel engines for passenger and freight service?" After this question was discussed at length, it was left in the same unsettled condition in which it remains today. At this convention the first report on "Compound Locomotives" was presented. It was read by J. Davis Barnett; other members of the committee were John Player, H. D. Garrett and F. W. Dean. At that time there were in operation a two-cylinder Pitkin compound on the Michigan Central and a four-cylinder Baldwin compound on the Baltimore & Ohio. In reading the proceedings of this convention one is impressed with the fact that it was of unusual interest; the reports were remarkably well prepared and the discussions equally valuable There is a report on "Fireboxes Above the Frame," showing the necessity of larger grate area than that obtained for large engines with the

deep firebox between the frames. With the exception of the very wide Wootten firebox, the large firebox as now generally used had not then been introduced. There was also a report on iron and steel axles and on heavier axles for tenders. A report on exhaust pipes and nozzles and steam passages and stacks by C. F. Thomas, A. W. Gibbs and John Hill, was the beginning of that important experimental work, carried along by committees under the leadership of Robert Quayle and Prof. W. F. M. Goss that led to the final report which included definite rules for the proportion and design of these details.

LOCOMOTIVE HEADLIGHTS.

The relative merits of oil, acetylene and electric headlights have been the subject of considerable discussion of late in railway circles. This discussion has been rendered more spirited by the well meant, if sometimes misdirected, zeal of certain legislatures and railway commissions in the attempt to enforce the use of high power headlights. The whole problem seems to be one which does not admit of any general solution and in which local conditions must play a large part.

The original purpose of carrying a light at the head end of a locomotive was probaby to enable the engineer to see obstructions on the track ahead. With the old fashioned railways having no signal system and a rather precarious right of way, and with the trains moving at comparatively slow rates of speed, the oil headlight probably served its purpose fairly well. It soon became evident, however, that with increasing speeds, little reliance could be placed upon the detection of obstructions by the engineer. While the headlight still served a purpose in warning trespassers on the track it had practically no value for the engineer. The introduction of signals of various kinds, and finally of the block system of control, has made the engineer independent of the headlight, and the movement of trains is controlled now by the dispatcher's orders and by the condition of the track ahead as indicated by the block signals. The safety of a train and the lives of the passengers which it carries are dependent to a large degree upon the accurate working of these signals and their correct interpretation by the engineer. Experiments which have been made on various roads and at various times have shown pretty conclusively that the signals can be read more correctly when a low power headlight is employed and that the use of the electric light in particular is apt at times to be confusing in the extreme. This seems to be due to two causes: First, the puzzling reflections from the roundels in the signal which are apt to be confused with the signal lights themselves, the signal frequently showing, for instance, a green light indicating safety when there is no such light there; and second, to the obscuration of the signals by the glare from an approaching headlight. As trains are quite apt to be on sidings at stations, this last condition frequently prevents the correct reading of the home signal. It has also been noticed that classification signals on approaching engines are almost indistinguishable when the engine carries an electric light, the green signal being particularly liable to obscuration. Of course, this is a serious matter since on some roads the green classification signal indicates another section of a train on the same track. It would seem that these same objections would apply to any high power lamp, whether electric or gas.

The claim that obstructions are more readily seen with the electric light has been substantiated by experiments. The same experiments, however, go to show that most obstructions would not be visible at a sufficient distance to permit of the stopping of a passenger train going at full speed. Obstructions are rarely visible over a thousand feet under the best conditions and it would take nearly double this distance in which to stop a passenger train going 60 or 70 miles an hour.

In spite of what has been said, it must be admitted that under certain circumstances and on many roads, the electric headlight serves a good purpose. On single track roads in the west and south having long stretches of track running through uninhabited country, where landslides and fallen trees are a source of danger, electric headlights have proven their value. It is significant that their introduction so far has been largely on this class of roads and in the sections indicated. On a railway which has two or more tracks equipped with block signals at comparatively short intervals, and where the safety of the trains depends almost entirely upon the reading of these signals, it would be foolish to employ a light which would tend to neutralize these safeguards. The safety of trespassers on the track is something which hardly needs to be considered, it is of so little importance compared with the safety of the train and its passengers.

In view of these circumstances, it would seem that the solution of this important matter can well be left to the railway companies. A company which has spent thousands of dollars in perfecting its block signal system should not be compelled to use devices which interfere with the working of that system. On the other hand, if a railway finds that the safe running of its trains is promoted by the use of high power lights, it should be free to use them. The expense of the electric light as compared with the oil lamp is not sufficient to deter any railway from using it if it seems advantageous. It is hoped that a sane treatment of this matter by legislatures and commissions will allow of its being worked out by each road along rational lines in such a way as to best safeguard the traveling public.

GEORGE W. WILDIN.

George W. Wildin, president of the Master Mechanics' Association, represents the increasingly numerous class of mechanical railway officers who, having received their early training in the west, have given the east the benefit of their abilities and riper experience. Though born at Decatur, Ill., 40 years ago, Mr. Wildin received his education at the Kansas State Agricultural College, at Lawrence, Kans., from which he was graduated with the degree of Bachelor of Science in 1892. He immediately entered the Topeka shops of the Santa Fe as draughtsman, but shortly took up the more active life of machinist and later served as locomotive fireman. From the Santa Fe to the Mexican Central as locomotive engineman was the next step in the acquisition of practical experience, and this, with a period of service as superintendent of the Aermotor Company, Chicago, and some locomotive running on the Chicago & Alton, covers the chief events in his history until he appears as machinist and later mechanical engineer of the Plant System at Savannah, Ga., having been appointed to the latter position in the late nineties. His work there was called in 1901 to the attention of William McIntosh, who had recently gone to the Central of New Jersey as superintendent of motive power and who was on the lookout for a man of exactly Wildin's practical experience and educational qualifications. In three years, however, he outgrew any position the Central of New Jersey could offer and in 1904 he became mechanical superintendent of the Erie. Later he went to the Lehigh Valley, whence he was soon called to become mechanical superintendent of the New York, New Haven & Hartford.

Wildin's strong personality, partially accounted for by a magnificent physique and abounding good nature, has given him a kind of success as the administrative officer of an important department of important roads which never could have been obtained on the basis of technical knowledge alone. It is a common remark of visitors to his office that his desk is always clear and he never seems to have much to do, though the care of upwards of 1,200 locomotives and about 40,000 cars of all kinds and the necessary shop plants for their repair seem to constitute the nucleus of a man's job. It is merely another case of organization, and an organization backed up and conducted in such a spirit that every man in it down to the wiper

in the roundhouse knows that the work laid out for him to do must be done in the best way that he knows how, and that when done he will receive the proper credit for it. Probably it will be difficult to find a better organization for running a mechanical department than that established on the New Haven road, nor is its perfect working due wholly to the compactness of the railway system itself. It is possible that Wildin's training in military organizations has had something to do with the efficiency of his present department, though a milder or more reasonable "old man" toward the well-intentioned employee would be hard to find.

His most effective work for the Master Mechanics' Association has been that in connection with the handling of locomotives at terminals and in those details of locomotive design and repair in which his practical experience as a locomotive engineman and fireman has shown the possibility of improvement. He has also been active in the work of committees on matters relating to motor cars and the revision of standards, and for the Master Car Builders' Association on couplers and draft equipment. Few railway men at 40 have achieved as much with no "pull" but an energetic ambition, few have the promise of a more brilliant future.

LOCOMOTIVE DEVELOPMENT.

In the light of recent progress a quotation from the late M. N. Forney, written 22 years ago, is of considerable interest. Commenting on a report concerning a large locomotive which was then being built at the Schenectady Locomotive Works Mr. Forney said: "The information given is not very definite, so that it is not possible to say whether it is really the largest passenger engine ever built, but the fact that there are examples of passenger engines which weigh 100,000 lbs. or over, leads to reflection and anticipation. How big will locomotives be 50 years from now? is a question that a mechanical engineer cannot help asking himself and his associates. Within 30 years the size of passenger engines has been nearly or quite doubled. Will this rate of increase continue, and in the year 1918 will there be passenger engines running which weigh 200,000 lbs. and over?"

For several years an American railway has been running a passenger locomotive weighing 270,000 lbs; another road is running freight locomotives weighing 462,000 lbs., with a number of years yet to come before reaching the date mentioned in the question asked by Mr. Forney. It is only when we apply some such yard stick as this that we are in position to realize the progress which is being made. Passenger locomotives are increasing in weight and capacity because of increasing weight of trains and the greater severity of conditions which they must meet. Passenger engines which were considered very large 10 years ago are now completely outclassed because of changed conditions. Freight locomotives are increasing in weight and capacity because large units tend to decrease operating expenses. No one would build a large locomotive if a small one would answer the requirements. This tendency toward larger units is not a fad, but is the result of well-defined demands, based upon the success of the advances which have been made in recent years. Those who are interested in the production of greater power for both passenger and freight service are wondering what the limits of size and weight really are, and when they are to be reached. In fact, the question raised by Mr. Forney is continually coming up.

Locomotives for both passenger and freight service have been designed with such large proportions as to point very definitely to the limitations of present methods of firing. The demand in this direction has already reached the point of requiring the consumption of 10,000 lbs. of coal per hour to develop the full capacity of which the locomotives are capable.

Mallet type locomotives have been so successful in demonstrating the possibilities of effecting savings in operation as to lead more than one operating official to the conclusion that still larger ones are desirable. Existing Mallet locomotives have done so well in helper and slow freight service, in which they have been employed, as to lead to a definite demand that they should be built for road service at comparatively high speeds. This, however, should be approached conservatively. Locomotives of the Mallet type have actually been placed in passenger service. This tendency toward still larger units does not seem to be in any sense a mistake, and it does not seem desirable to question the policy of increase as far as power and capacity are concerned, but development has reached a point leading to the suggestion that there may perhaps be better ways of securing a part of the power which is desired than by merely adding to previous designs in the matter of size and weight. With such figures of consumption of fuel as have been mentioned, the meaning of which all motive power men appreciate in connection with the difficulties of firing, comes the conviction of the importance of utilizing to the fullest extent every possible factor which will tend to make a pound of coal go as far as possible in the hauling of trains.

While economy of fuel has always been important in the minds of American railway officials, it has never been considered as paramount to certainty of operation in getting over the road. The time is coming, and very rapidly, when economy will take a still more prominent place, not for its own sake alone, but because of the increased capacity which may be obtained by the aid of factors which produce economy. European railways have been very far in our lead in fuel economy, largely because of the very much higher cost of their fuel. Locomotive development of the future in this country must necessarily follow in this direction, not alone because of the increasing cost of fuel, but because of the weight and size of locomotives involved, as well as the difficulty in handling a sufficient amount of fuel to perform the work required.

We may very well ask whether we are using material as well in the very large locomotives as it was used in the days when locomotives were smaller. It is time that serious, systematic attempts should be made to get more work per pound of locomotive by the use of alloy steels and other improved materials which will reduce the total weight per pound of tractive effort. That much may be accomplished in this direction is already known, but thus far there are no locomotives running on American railways which have approached foreign designs with respect to the saving of weight which has been shown to be possible in the lighter locomotives of European practice. In this direction lies a wide field for future development.

Superheating is no longer experimental except as to details and in view of the success both abroad and on this continent, which it has already attained, superheating has established itself as a factor having important possibilities in the direction of increased capacity. No one need hesitate to adopt superheating to-day. The only question is one of the details of the superheater.

Feed water heating presents a field of possibilities for increased capacity in which success has already been demonstrated to a sufficient extent to promise results which are well worth while.

In the automatic stoker we have another possibility of a line of development which compels attention because of the large amount of fuel involved in the locomotives of large capacity already in service and in the still larger ones which are suggested, but are yet undeveloped. A successful mechanical stoker will free the locomotive from a bondage which has become rigid. This development should be encouraged to the utmost. There is reason to believe that we are on the eve of the appearance of successful mechanical stokers which will fully meet the present difficulty in this direction.

Taken as a whole, the locomotive is at present in its most interesting stage of development, requiring the greatest knowledge and skill for future designing. If the limits of size

and weight have not actually been reached, and there is no reason to believe that they have been, this seems to be an appropriate time to review practice as it stands, having in mind the possibilities of improving the use of factors which are already established, in order to be sure that we have gotten the utmost out of them before proceeding further along the present line of making every thing larger. This is a time for the application of the best knowledge in designing and for the most careful use of factors we know all about, and for rendering locomotives as economical as possible both in weight and in fuel consumption. At best they are likely to be as large as may be comfortably handled for some time to come, for the locomotive has somewhat outgrown facilities at terminals and in shops.

It is not sufficient that American locomotives should be as simple as possible in construction in order to get over the road with certainty, it is necessary that they should embody features which will enable them to get over the road with certainty and with economy, and if these features making for economy involve complications the issue must be faced and the complications must be developed and perfected in such a way that they will not interfere with regularity of service. This constitutes the problem before designers to-day. Those responsible for the locomotive development of the immediate future certainly have no cause to feel that their problem is uninteresting or too easy.

THE M. C. B. BALL.

TO THE EDITOR OF THE DAILY RAILWAY AGE GAZETTE:

The committee on entertainment has taken great pains with its arrangements, and the ball of Thursday evening showed what could be done. But, in spite of their best efforts, there were two points in which matters were painfully lacking, the floor and the music, two essentials to unconfined joy at a dance. Last year there was some complaint that the floor was rough, so this year, to make amends, the floor was waxed at the last minute, which left it in the condition of a glare of ice. All who danced felt that they were taking their lives on their feet, and moved about in such a gingerly way that pleasure and abandon were impossible. The texture of the floor is all that could be desired, and there is no reason why it should not be made smooth.

Then, as to the music. No fault can be found with the time or the rendering, but the selections for the waltzes were simply atrocious. The conductor should learn that dancers want not only time but rhythm and inspiration, and that the two last do not come from the distortion of a popular air into waltz time. Any tune can be so distorted, from "Old Hundred" to "Here's to the Dead Already, Hurrah for the Next to Die." Three-four time does not constitute a waltz, and it is hard to understand why a conductor should persist in selections that have no tendency to make you dance. Why take an adaptation of "My Southern Rose," that was never intended to be danced to, when such music is available as the old Strauss waltzes, like the "Blue Danube," "Wine, Women and Song," the "Kiss Waltz" or the "Merry Widow?" They are the dances that make the body sway and the feet twinkle.

The same criticisms do not hold for the two-step. Two-four time is not easily adapted to the swing of a song of mandolin sentimentality. They are written for dancing and are danced to. But the waltzes! Well, they aren't waltzes. So if the committee will get busy and see to it that the floor is properly prepared and the conductor selects music that was written for the purpose for which he uses it, we will have a dance "as is a dance," and the conductor may himself even learn a thing or two; and one of the two is to choose music fitted to the purpose for which it is intended.

I want to add that none of the foregoing is intended to be in crisicism of the entertainment committee, or of the committee in immediate charge of the ball. Their work, on the whole, has been done splendidly, and deserves and is receiving the warmest praise.

DANCER.

TO-DAY'S PROGRAM.

MASTER MECHANICS' ASSOCIATION.

Prayer	9:30 A. M. to 9:35 A. M.
Address of President	9:35 A. M. to 9:50 A. M.
Intermission	9:50 A. M. to 9:55 A. M.
To allow those who wish to retire to do so, although all are requested to remain.	
Action on minutes of convention of 1909	9:55 A. M. to 10:00 A. M.
Reports of Secretary and Treasurer	10:00 A. M. to 10:15 A. M.
Assessment and announcement of dues; appointment of Committees on Correspondence, Resolutions, Nominations, Obituaries, etc.	10:15 A. M. to 10:25 A. M.
Election of Auditing Committee	10:25 A. M. to 10:30 A. M.
Unfinished Business	10:30 A. M. to 10:35 A. M.
New Business	10:35 A. M. to 10:45 A. M.
Discussion of Reports on:	
Mechanical Stokers	10:45 A. M. to 11:00 A. M.
Revision of Standards	11:00 A. M. to 11:15 A. M.
Individual Paper by W. S. Hayes, Supt. Loco. Operation, Erie R. R., "Fuel Economies"	11:15 A. M. to 12:00 M.
Topical Discussions:	
"Self-dumping Ash Cans," by H. T. Bentley, A. S. M. P., C. & N. W.	12:00 M to 12:30 P. M.
"Apprenticeship Education," by F. W. Thomas, Supervisor of Apprentices, A. T. & S. F.	12:30 P. M. to 1:00 P. M.
Discussion of Report on:	
Motive Power Development	1:00 P. M. to 1:30 P. M.
Adjournment.	

ENTERTAINMENT.

9 a. m.—Grand march from Marlborough-Blenheim Hotel to Convention Hall, Million Dollar Pier.

10:30 a. m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3 p. m.—Piano, song and story recital Willa Holt Wakefield, West Solarium, Marlborough-Blenheim Hotel.

9 p. m.—Reception by the president and officers of the American Railway Master Mechanics' Association, Blenheim Exchange, Marlborough-Blenheim Hotel. Cadets de Gascogne, direct from La Scala Theatre, Milan, Italy.

GO TO THE POST OFFICE!

A large amount of mail has accumulated at the office of Secretary Conway on the pier and it would be well for all persons in attendance to call and inquire.

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BUREAU OF INFORMATION.

The information and assistance furnished by the Official Railway Guide Bureau of Information, as announced in the issue of the *Daily* of June 17, has been found to be so valuable and acceptable in relieving members and guests from the trouble of getting tickets and making Pullman reservations that we are requested to repeat the substance

of the statement of the work the bureau undertakes to perform. It has prepared a complete time table of all trains to New York and Philadelphia by both the Pennsylvania and the Philadelphia & Reading, and is also distributing a blank providing for the following entries: Name, booth, time of leaving, by what road and destination. The order, to be left at booth 34 near the main entrance, will be filled by the purchase of tickets and the reservation of Pullman space, which will be marked on the blank and signed by the agent at the ticket office. The ticket, etc., will then be left at any booth designated, or may be called for at booth 34.

SONG AND STORY RECITAL.

On Monday afternoon, at 3 o'clock, in the west solarium of the Blenheim Exchange, Willa Holt Wakefield will give a song and story recital, including the following:

1. The Girl with the Clockings.
2. She Had a Lot of Things When She Came Back.
3. Ten Dirty Little Fingers.
4. Kissing Time, Help Yourself.
5. Monologue—Bill Smith.
6. The Back Yard.
7. A Laughing Song.
8. Sarah's Spectacles.
9. He's My Pal.

Lost—Badge 2686. Please return to the office of the *Daily*.

LUMBER SPECIFICATIONS.

[Through a mistake in the printing office, most of the abstract of the report of the M. C. B. Association on "Lumber Specifications" was omitted from the *Daily* of June 18; the discussion was printed correctly and fully. The entire abstract of the report is therefore reprinted herewith.—EDITOR.]

The Committee on Uniform Specifications and Grading Rules for Car and Locomotive Lumber herewith submits its report and recommendations. This matter has been thoroughly canvassed by committees of the Master Car Builders' Association, American Railway Master Mechanics' Association, the Railway Storekeepers' Association and the various lumber manufacturers' associations throughout the country. The specifications meet the approval of the various committees, and especially of the lumber manufacturers.

In order to have standard descriptions of the various woods used by railroads, the following standard names for car and locomotive lumber were agreed upon by the Joint Committee:

1. Ash. To cover what is known as White Ash, Black Ash, Blue Ash, Green Ash and Red Ash.

2. Basswood. To cover what is known as Linden, Linn, Lind or Lime-tree.

3. Beech. To include Red or White Beech.

4. Birch. To include Red, White, Yellow and Black Birch.

5. Buckeye. To cover what is known as Horse Chestnut.

6. Butternut. To cover wood from tree of that name, also known as White Walnut.

7. Cherry. To include Sweet Cherry, Sour Cherry, Red Cherry, Black Cherry and Wild Cherry.

8. Chestnut. To cover wood from tree of that name.

9. Cottonwood. To cover wood from tree of that name. (Do not confuse with Popple or Poplar.)

10. Cypress. To include Red Cypress, Gulf Cypress, Yellow and East Coast Cypress, also known as Bald Cypress.

11. Elm—soft. To cover what is known as White Elm, Gray, Red and Winged Elm.

12. Elm—rock. To cover what is known as Rock Elm.

13. Douglas Fir. To cover Yellow Fir, Red Fir, Western Fir, Washington Fir, Oregon or Puget Sound Fir or Pine, Northwest and West Coast Fir.

14. Gum. To cover what is known as Red Gum, Sweet Gum or Satin Walnut.

15. Hemlock. To cover Southern or Eastern Hemlock; that is, Hemlock from all States east of and including Minnesota.

16. Western Hemlock. To cover Hemlock from the Pacific Coast.

17. Hickory. To include Shellbark, Kingnut, Mockernut, Pignut, Black, Shagbark and Bitternut.

18. Western Larch. To cover species of Larch or Tamarack from the Rocky Mountain and Pacific Coast regions.

19. Maple—soft. To include Soft and White Maple.

20. Maple—hard. To cover what is known as Hard, Red, Rock and Sugar Maple.

21. White Oak. To include White Oak, Burr Oak or Mossy Cup, Rock Oak, Post or Iron Oak, Overcup, Swamp Post Oak, Live Oak, Chestnut Oak or Tan Bark, Yellow or Chinquapin Oak, Basket or Cow Oak.

22. Red Oak. To include Red Oak, Pin Oak, Black Oak, Water Oak, Willow Oak, Spanish Oak, Scarlet Oak, Turkey Oak, Black Jack or Barn Oak, and Shingle or Laurel Oak.

23. Pecan. To cover wood from tree of that name.

24. Southern Yellow Pine. Under this heading two classes of timber are used: (a) Long-leaf Pine; (b) Short-leaf Pine. It is understood that these two terms are descriptive of quality rather than of botanical species; thus, Short-leaf Pine would cover such species as are known as North Carolina Pine, Loblolly Pine and Short-leaf Pine. Long-leaf Pine is descriptive of quality, and if Cuban, Short-leaf or Loblolly Pine is grown under such conditions that it produces a large percentage of hard summer wood, so as to be equivalent to the wood produced by the true Long-leaf, it would be covered by the term Long-leaf Pine.

25. White Pine. To cover timber which has hitherto been known as White Pine, from Maine, Michigan, Canada, Wisconsin and Minnesota.

26. Norway Pine. Also known as Red Pine, from Michigan, Minnesota, Wisconsin and Canada.

27. Idaho White Pine. To cover variety of White Pine from western Montana, northern Idaho and eastern Washington.

28. Western Pine. To cover timber known as White Pine coming from Arizona, California, New Mexico, Colorado, Oregon and Washington. This is the timber sometimes known as Western Yellow or Ponderosa Pine or California White Pine or Western White Pine.

29. Poplar. To cover wood from the Tulip Tree, Whitewood, Yellow Poplar and Canary Wood.

30. Redwood. To include the California wood usually known by that name.

31. Spruce. To cover Eastern Spruce; that is, the Spruce timber coming from points east of and including Minnesota and Canada, including White, Red and Black Spruce.

32. Western Spruce. To cover the Spruce timber from the Pacific Coast.

33. Sycamore. To cover wood from tree of that name, otherwise known as Buttonwood.

34. Tamarack. To cover timber known as Tamarack or Eastern Tamarack, from States east of and including Minnesota.

35. Tupelo. Otherwise known as Tupelo Gum, Bay Poplar.

36. Walnut. To cover Black Walnut (for White Walnut, see Butternut).

It is the opinion that the specifications which we have proposed cover nearly 95 per cent of the lumber used in car and locomotive construction and maintenance, and the question of drawing specifications for the special hardwoods, such as mahogany and other imported lumber, was left open for further consideration.

RECOMMENDED CLASSIFICATION, GRADING AND DRESSING RULES FOR NORTHERN PINE CAR MATERIAL, INCLUDING WHITE AND NORWAY PINE AND EASTERN SPRUCE.

1. Norway Pine to cover what is known also as Red Pine.

White Pine to cover the timber which has hitherto been known as White Pine, from Maine, Michigan, Wisconsin, Minnesota and Canada.

Spruce to cover Eastern Spruce; that is, the Spruce timber coming from points east of and including Minnesota and Canada.

2. Northern Pine Lumber shall be graded and classified according to the following rules and specifications as to quality, and dressed stock shall conform to the subjoined table of standard sizes, except where otherwise expressly stipulated between buyer and seller.

3. Recognized defects in Northern Pine are knots, knotholes, splits, shake, wane, wormholes, pitch pockets, torn grain, loosened grain, sap stain, checks and rot.

Knots.

4. Knots shall be classified as pin, small and large or coarse, as to size; and round or spike, as to form; and as sound, loose, encased, pith and rotten, as to quality.

5. A pin knot is sound and should not exceed ½ in. in diameter.

6. A small knot is larger than a pin knot and should not exceed 1½ in. in diameter.

7. A large or coarse knot is one of any size over 1½ in. in diameter.

8. A round knot is oval or circular in form.

9. A spike knot is one sawn in a lengthwise direction.

The mean or average diameter of knots shall be considered in applying and construing the rules.

10. A sound knot is one solid across its face, is as hard as the wood it is in, and is so fixed by growth or position that it will retain its place in the piece.

11. A loose knot is not firmly set, but still retains its place in the piece.

12. A pith knot is a sound knot with a pith hole not more than ¼ in. in diameter in the center.

13. An encased knot is one surrounded wholly by bark or pitch.

14. A rotten knot is one not as hard as the wood it is in.

Pitch.

15. Pitch pockets are openings between the grain of the wood containing more or less pitch or bark, and shall be classified as small, standard and large pitch pockets.

16. A small pitch pocket is one not over ⅛ in. wide.

17. A standard pitch pocket is one not over ⅜ in. wide, or 3 in. in length.

18. A large pitch pocket is one over ⅜ in. wide or over 3 in. in length.

19. A pitch pocket showing open on both sides of the piece ⅛ in. or more in width shall be considered the same as a knothole.

Wane.

20. Wane is bark, or the lack of wood, from any cause, on edge.

Sap.

21. White or bright sap shall not be considered a defect in any of the grades provided for and described in these rules, except where stipulated.

Miscellaneous.

22. Defects in rough stock caused by improper manufacture and drying will reduce grade, unless they can be removed in dressing such stock to standard sizes.

23. All lumber for uses described in these rules shall be inspected on the face side to determine the grade, and the face side is the side showing the best quality or appearance.

24. Chipped grain consists in a part of the surface being chipped or broken out in small particles below the line of the cut, and as usually found should not be classed as torn grain, and shall not be considered a defect.

25. Torn grain consists in a part of the wood being torn out in the dressing. It occurs around knots and curly places, and is of four distinct characters: slight, medium, heavy and deep.

Slight torn grain shall not exceed 1-32 in. in depth, medium 1-16 in., and heavy ⅛ in. Any torn grain heavier than ⅛ in. shall be termed deep.

26. The grade of all regular stock shall be determined by the number, character and position of the defects visible in any piece. The enumerated defects herein described admissible in any grade are intended to be descriptive of the coarsest pieces *such grades may contain*, but the average quality of the grade shall be midway between the highest and lowest pieces allowed in the grade.

27. Lumber and timber sawed for specific purposes must be inspected with a view to its adaptability for the use intended.

28. All dressed stock shall be measured strip count, viz., full size of rough material necessarily used in its manufacture.

29. Lumber must be accepted on grade in the form in which it was shipped. Any subsequent change in manufacture or mill work will prohibit an inspection for the adjustment of claims, except with the consent of all parties interested.

30. The foregoing general observation shall apply to and govern the application of the following rules. The rules referred to under Sections 31, 32, 33, 34 and 35 govern 4 or 6 in. strips, and are intended to cover strips used for car siding, car lining and car roofing.

31. B and Better White Pine. Material of this grade should be practically clear and free of all defects, except will admit of not exceeding three or four pin knots, and bright sap not to exceed 25 per cent of the face of the piece.

32. C and Better Norway Pine. Bright sap is no defect in this grade and stained sap will be admitted to the extent of not exceeding 1-5 the surface of the face of the piece, if not in combination with other defects. This grade should be free from shake, rot, splits, but will admit of three or four pin knots.

33. No. 1 Common White Pine, Norway Pine and Eastern Spruce. This grade admits of small sound knots, but should be free from large or coarse knots, knotholes, should have practically no shake, wane or rot, but will admit of bright sap to any extent.

34. No. 2 Common White Pine, Norway Pine and Eastern Spruce. This grade is similar to No. 1, described above, except that it will admit of spike knots, bright or stained sap, slight shake, slight wane on reverse side, but not a serious combination of any of these defects.

35. No. 3 Common White Pine, Norway Pine and Eastern Spruce. This grade, in addition to the defects mentioned in No. 2, described above, will also admit of large or coarse knots, more shake, sap, wane on reverse side that does not affect the tongue or groove and torn or loosened grain, checks, pin wormholes or splits, but no loose knots or knotholes, nor a serious combination of the defects named.

36. No. 1 Common Norway Pine or Decking or Flooring. This grade will admit of sound knots, any amount of sap, and shall be free from shake, wane, rot or large, coarse spike knots.

37. Standard lengths.

Car Siding—8, 9, 10 and 12 feet or multiples.

Car Roofing—5 feet or multiples.

Car Lining—8, 9, 10, 12, 14, 16, 18 and 20 feet or multiples.

Car Decking—9 and 10 feet or multiples.

All orders shall be shipped in the standard length called for unless otherwise specified, but no lengths of either car siding, lining or roofing shall be shipped except in the lengths specified or multiples thereof. Those who do not desire stock shipped in multiple lengths should so specify.

Recommended Classification Grading and Dressing Rules for Southern Yellow Pine Car Material.

1. Southern Yellow Pine—Under this heading, two classes of timber are used: (a) Long-leaf Pine, (b) Short-leaf Pine.

It is understood that these two terms are descriptive of quality rather than of botanical species. Thus, Short-leaf Pine would cover such species as are now known as North Carolina Pine, Loblolly Pine and Short-leaf Pine. Long-leaf Pine is descriptive of quality, and if Cuban, Short-leaf or Loblolly Pine is grown under such conditions that it produces a large percentage of hard summer wood, so as to be equivalent to the wood produced by the true Long-leaf, it would be covered by the term Long-leaf Pine.

2. Yellow Pine Lumber shall be graded and classified according to the following rules and specifications as to quality, and dressed stock shall conform to the subjoined table of standard sizes, except where otherwise expressly stipulated between buyer and seller.

3. Recognized defects in Yellow Pine are knots, knotholes, splits (either from seasoning, ring hearts or rough handling), shake, wane, red heart, pith, rot, rotten streaks, wormholes, pitch streaks, pitch pockets, torn grain, loosened grain, seasoning or kiln checks and sap stains.

Knots.

4. Knots shall be classified as pin, standard and large, as to size; and round and spike, as to form; and as sound, loose, encased, pith and rotten, as to quality.

5. A pin knot is sound and not over ½ in. in diameter.

6. A standard knot is sound and not over 1½ in. in diameter.

7. A large knot is one any size over 1½ in. in diameter.

8. A round knot is oval or circular in form.

9. A spike knot is one sawn in a lengthwise direction.

The mean or average diameter of knots shall be considered in applying and construing the rules.

10. A sound knot is one solid across its face, is as hard as the wood it is in, and is so fixed by growth or position that it will retain its place in the piece.

11. A loose knot is one not held firmly in place by growth or position.

12. A pith knot is a sound knot with a pithhole not more than ¼ in. in diameter in the center.

13. An encased knot is one surrounded wholly or in part by bark or pitch. Where the encasement is less than ⅛ in. in width on both sides, not exceeding one-half the circumference of the knot, it shall be considered a sound knot. (See Sections 10 and 17.)

14. A rotten knot is one not as hard as the wood it is in.

Pitch.

15. Pitch pockets are openings between the grain of the wood containing more or less pitch or bark, and shall be classified as small, standard and large pitch pockets.

16. A small pitch pocket is one not over ⅛ in. wide.

A standard pitch pocket is one not over ⅜ in. wide or 3 in. in length.

A large pitch pocket is one over ⅜ in. wide or over 3 in. in length.

17. A pitch pocket showing open on both sides of the piece ⅛ in. or more in width shall be considered the same as a knothole.

18. A pitch streak is a well-defined accumulation of pitch at one point in the piece and when not sufficient to develop a well-defined streak, or where the fibre between grains is not saturated with pitch, it shall not be considered a defect.

19. A small pitch streak shall be equivalent to not over one-twelfth the width and one-sixth the length of the piece it is in.

A standard pitch streak shall be equivalent to not over one-sixth the width and one-third of the length of the piece it is in.

Wane.

20. Wane is bark, or the lack of wood, from any cause, on the edge.

Sap.

21. Bright sap shall not be considered a defect in any of the grades provided for and described in these rules, except where stipulated.

Shake.

22. Shakes are splits or checks in timbers which usually cause a separation of the wood between annual rings.

Through Shake—A shake which extends between two faces of a timber.

Ring Shake—An opening between the annual rings.

Miscellaneous.

23. Defects in rough stock caused by improper manufacture and drying will reduce grade, unless they can be removed in dressing such stock to standard sizes.

24. All stock except car sills and framing shall be inspected on the face side to determine the grade. Stock surfaced one side, the dressed surface shall be considered the face side. Stock rough or dressed two sides, the best side shall be considered the face, but the reverse side of all such stock shall not be more than one grade lower.

25. Pieces of siding, lining or roofing with 3-16 in. or more of tongue will be admitted in any grade, provided it does not run more than one-third the length of the piece.

26. In all grades lower than B and better, wane on the reverse side, not exceeding one-third the width and one-sixth the length of any piece, provided the wane does not extend into the tongue, or over one-half the thickness below the groove, is admissible.

27. Chipped grain consists in a part of the surface being chipped or broken out in small particles below the line of the cut, and as usually found shall not be classed as torn grain and shall not be considered a defect.

28. Torn grain consists in a part of the wood being torn out in dressing. It occurs around knots and curly places, and is of four distinct characters: slight, medium, heavy and deep.

Slightly torn grain shall not exceed 1-32 in. in depth; medium, 1-16 in.; heavy, ⅛ in.; any torn grain heavier than ⅛ in. shall be termed deep.

29. Loosened grain consists in a point of one grain being torn loose from the next grain. It occurs on the heart side of the piece and is a serious defect, especially in flooring.

30. Rot, Dote and Red Heart—Any form of decay which may be evident either as a dark-red discoloration not found in the sound wood, or the presence of white or red rotten spots, shall be considered as a defect. Firm red heart shall not be considered a defect in any of the grades of Common Lumber.

31. The grade of all regular stock shall be determined by the number, character and position of the defects visible in any piece. The enumerated defects herein described admissible in any grade are intended to be descriptive of the *coarsest* pieces *such grades may contain*, but the average quality of the grade should be midway between the highest and lowest pieces allowed in the grade.

32. Lumber and timber sawed for specific purposes must be inspected with a view to its adaptability for the use intended.

33. All dressed stock shall be measured strip count, viz., full size of rough material necessarily used in its manufacture.

34. Equivalent means equal, and in construing and applying these rules, the defects, whether specified or not, are understood to be equivalent in damaging effect to those mentioned applying to stock under consideration.

35. Lumber must be accepted on grade in the form in which it was shipped. Any subsequent change in manufacture or millwork will prohibit an inspection for the adjustment of claims, except with the consent of all parties interested.

36. The foregoing general observation shall apply to and govern the application of the following rules:

37. B and Better Car Siding, Lining and Roofing will admit any two of the following, or their equivalent of combined defects: Sap stain not to exceed 5 per cent; firm, red heart not to exceed 15 per cent of the face; three pin knots; one standard knot; three small pitch pockets; one standard pitch pocket; one standard pitch streak; slight torn grain, or small kiln or season checks. Where no other defects are contained, six small pin wormholes will be admitted.

38. Select Car Siding will admit of one standard pitch streak, one standard pitch pocket, or their equivalent; and, in addition, will admit of not exceeding five pin knots and two standard knots, or their equivalent; 10 per cent sap stain; firm red heart; slight shake; heavy torn grain; defects in manufacture or seasoning checks. Pieces otherwise good enough for B, but containing a limited number of pin wormholes shall be graded select. This grade is intended to be accumulated from running *B and Better stock*, and will consist of all the droppings which do not contain defects in excess of those mentioned in this paragraph.

39. No. 1 Common Car Siding will admit of the following defects or their equivalent: Sound knots, not over one-half of cross section of the piece at any point throughout its width. Three pin knots or their equivalent. Wane ½ in. deep on edge not exceeding 1½ in. wide and one-half the length of the piece. Torn grain; pitch pockets; pitch; sap stain; seasoning checks; slight shakes; firm red heart and a limited number of small wormholes well scattered. This grade is intended to be worked from fencing stock, either kiln or air dried.

40. Select Car Lining and Roofing will admit of one standard pitch streak; one standard pitch pocket, or their equivalent, and, in addition, sound knots not over one-half the width of the piece in the rough; 10 per cent sap stain; firm red heart; slight shakes; heavy torn grain; defects in manufacture, or seasoning checks. Pieces otherwise good enough for B, but containing a limited number of pin wormholes shall be graded select. This grade is intended to be accumulated from running *B and Better stock*, and will consist of all the droppings which do not contain defects in excess of those mentioned in this paragraph.

41. No. 1 Common Car Lining and Roofing will admit of the following defects or their equivalent: Sound knots not over one-half the cross section of the piece at any point throughout its length; three pin knots or their equivalent; torn grain; pitch pockets; sap stains; seasoning checks; firm red heart, and a limited number of pim or small wormholes well scattered. This grade is intended to be worked from fencing stock, either kiln or air dried.

42. Standard Patterns. (Insert B/P reference, showing net sizes after working.)

43. All-heart Car Decking or Flooring will admit sound knots not over one-third of the cross section of the piece at any point throughout its length, provided they are not in groups; pitch pockets; firm red heart; shake and seasoning checks which do not go through the piece; loose or heavy torn grain, or other machine defects, which will lay without waste, or will not cause a leakage in cars when loaded with grain. Must be strictly all heart on both sides and both edges.

44. Heart Face Car Decking or Flooring will admit of sound knots not over one-third the cross section of the piece at any point throughout its length, provided they are not in groups; pitch pockets; firm red heart; shake and seasoning checks which do not go through the piece; loosened or heavy torn grain, or other machine defects, which will lay without waste, or will not cause a leakage in cars when loaded with grain. Will admit of any amount of sap provided all of the face side of the piece is strictly all heart.

45. No. 1 Common Car Decking or Flooring will admit of sound knots not over one-half of the cross section of the piece at any point throughout its length, provided they are not in groups; pitch pockets; sap stain; firm red heart; shake and seasoning checks which do not go through the piece; a limited number of pin wormholes; loosened or heavy torn grain, or other machine defects, which lay without waste or will not cause a leakage in cars when loaded with grain.

46. *Standard Lengths:*

Car Siding—8, 9, 10 and 12 feet or multiples.

Car Lining—8, 9, 10, 12, 14, 16, 18 and 20 feet or multiples.

Car Roofing.—5 feet or multiples.

Car Decking or Flooring.—9 and 10 feet or multiples.

All orders shall be shipped in the standard lengths called for, unless otherwise specified, but no lengths of either car siding, lining or roofing shall be shipped, except in the lengths specified or multiples thereof. Those who do not desire stock shipped in multiple lengths should so specify.

Car Sills and Framing.

47. No. 1 Common Heart Car Sills and Framing will admit of sound knots, provided they are not in groups, the mean or average diameter of which shall not exceed two inches; pitch; pitch pockets; slight shake; seasoning checks, or other defects which will not impair its strength more than the defects aforementioned. Must be sawed from sound timber, free from doty or rotten red heart and true to measurements, or at least the measurements at no point on the sill shall be less than the size required. Measurement of the girth at any point throughout the length of the piece must show at least 75 per cent heartwood. Cubical contents shall not be used as basis for obtaining percentage of heartwood under this rule.

48. No. 1 Common Car Sills and Framing will admit of

sound knots, provided they are not in groups, the mean or average diameter of which shall not exceed two inches; pitch; pitch pockets; slight shake; seasoning checks; sap, sap stain, or other defects which will not impair its strength more than the defects aforementioned. Must be sawed true to measurements and from sound timber free from doty or rotten red heart; must be square cornered, except that one inch of wane on one corner or one-half inch of wane on two corners is admissible.

49. Sizes up to 6 in. in width shall measure full when green, and not more than ⅛ in. scant when dry or part dry. Sizes 6 to 12 in. in width shall measure full when green and not more than ¼ in. scant when dry or part dry. Sizes 12 to 16 in. in width shall measure full when green and not more than ⅜ in. scant when dry or part dry. Unless otherwise specified, ¼ in. shall be allowed for each side which is to be dressed. Where stock is wanted dressed smooth all four sides, timber shall be sawed ½ in. full over the dressed sizes required. In pieces 3 by 6 in., and under when ordered in lengths exceeding 30 feet, sound knots shall not exceed one-quarter the width of the face through which they project, and the grain shall not cross sufficient to impair tne strength.

Recommended Classification and Grading Rules For Locomotive and Freight and Passenger Car Oak.

General Instructions.

Those who are not familiar with the anatomy of the oak tree should, when reading over these rules, take into consideration that the rule describes the poorest piece that goes into the grade and that a large per cent is above the grade described.

Definition of Oak for Construction Purposes.

The term 'Construction Oak" means all such products of Oak in which the strength and durability of the timber is the controlling element in their selection and use. The following is a list of products which are recommended for consideration as "Construction Oak":

I.—Construction Oak.

(A), (B), (C), Cover Maintenance of Way Material.
(D) Locomotive Timbers: Sills, End and Truck Timbers.
(E) Car Timbers: Car Framing, including Upper Framing, Car Sills, Ends and Truck Timbers, Car Decking, Inside Lining.
(F), (G), (H), (I), (J), (K), (L), Cover Maintenance of Way Material.

II.—Standard Defects.

Definition of "Defect."—Fault, Blemish, Mark of Imperfection that will materially injure the strength. Measurements which refer to the diameter of knots or holes should be considered as referring to the mean or average diameter.

II.—(A) Knots.

(1) Sound Knots. A sound knot is one which is solid across its face, and which is as hard as the wood surrounding it; it may be any color and contain checks.
(2) Loose Knots. A loose knot is one not firmly held in place by growth or position.
(3) Pith Knots. A pith knot is a sound knot with a pith hole not more than ¼ in. in diameter in the center.
(4) Rotten Knots. A rotten knot is one that is not sound and not as hard as the wood surrounding it.
(5) Pin Knots. A pin knot is a sound knot not over ¾ in. in diameter.
(6) Standard Knots. A standard knot is a knot not over 2 in. in diameter.
(7) Large Knots. A large knot is a sound knot more than 2 in. in diameter.
(8) Round Knot. A round knot is one which is oval or circular in form.
(9) Spike Knots. A spike knot is one sawn in lengthwise direction. The mean or average width shall be considered in measuring this knot.
(10) Bird Peck. Some bruises apparently caused by bird pecks during the growth process of the timber. Considered no defect.

II.—(B) Worm Defects.

(1) Pin Wormholes. Pin wormholes are very small holes caused by minute insects or worms. These holes usually are not over 1-16 in. in diameter, or smaller, and the wood surrounding them is sound and does not show any evidences of the wormhole having any effect on the wood other than the opening.
(2) Spot Worm Defects. (Also known as Flag Worm Defects) Spot worm defects are caused, like pin wormholes, by minute insects or worms working on the timber during its growth. The size of the hole is about the same as pin wormholes, but the surrounding wood shows a colored spot as evidence of the defect. This spot is usually sound and does not affect the strength of the piece.
(3) Grub Wormholes. Grub wormholes are usually from about ⅛ to 3-16 in. in width and vary in length from about 3-16 in. to 1 in. long, and are caused by grub worms working in the wood.
(4) Wooden Rafting Pinholes. This defect sometimes appears on river timber where it has been rafted and holes bored in the solid wood for tying the timber, and a solid plug or pin driven in the hole, filling it completely. These defects must be treated and considered the same as knot defects. Ordinary metal rafting pin or chain dog hole is considered no defect.

II.—(C) Sap.

Definition of "Sap."—The alburnum of a tree—the exterior part of the wood next to the bark; sap wood not considered a defect.
Sound Heart. The term sound heart is used in these rules whenever heart of piece is split or opened and shows on outside of piece and its condition is sound and solid, not decayed. Openings between annual rings are checks not considered a defect.

II.—(D) Wane.

Wane is bark or lack of wood from any cause on edges of timber.

II.—(E) Shakes.

Definition of "Shakes."—Shakes are splits or checks in timber which usually cause a separation of the wood between the annual rings.
(1) Ring Shakes. Ring shakes are openings between the annual rings usually showing only on the end of the timber.
(2) Through Shakes. Through shakes are shakes which extend between two faces of the timber.
(3) Checks. A small crack in the wood due to seasoning; not considered a defect.

II.—(F) Grain.

Crooked or Cross Grain. Crooked or cross grain is a grain which crosses the piece within a section of 24 in. in running length of the piece. This is only considered a defect in certain smaller sizes of dimension for specific purposes.

II.—(G) Rot.

Any form of decay which may be detected as giving the timber a doty or rotten texture is a rotten defect, including what is commonly known as dry rot. Water stain, or what are sometimes called scalded or burned spots, usually caused by timber lying in the water under certain conditions before it is sawed, and burned spots where the timber is improperly piled green, not considered defects, as it does not affect the strength of the piece.

III.—Standard Names for Construction Oak.

Standard names for Construction Oak timbers; White Oak and Red Oak. Unless specially mentioned, these terms include the following:

White Oak.	Red Oak.
White Oak.	Red Oak.
Burr or Mossy Cup Oak.	Pin Oak.
Rock Oak.	Black Oak.
Post or Iron Oak.	Water Oak.
Overcup.	Willow Oak.
Swamp Post Oak.	Spanish Oak.
Live Oak.	Scarlet Oak.
Chestnut or Tan Bark Oak.	Turkey Oak.
Basket or Cow Oak.	Black Jack or Barn Oak.
Yellow or Chinquapin Oak.	Shingle or Laurel Oak.

Term: Mixed Oak means any kind of oak.

IV.—Standard Specifications for Structural Oak Timbers.

(1) General Requirements. Except as noted, all structural timbers shall be white, to be sound timber and sawed specified sizes; free from defects, such as ring shakes and crooked grain, rotten knots, large knots in groups, rot, dote, or wane in amounts greater than allowed in these specifications.
(2) Boxed Hearts. This class of oak in pieces of 5 by 5 square and larger is what is usually known as boxed hearts. The center of the heart should be boxed as near the center of the piece as practical; and not to exceed 30 per cent of the pieces can have the center of the heart nearer than 1½ in. from any face; 20 per cent may show one heart face, corner or edge, not to exceed 75 per cent of the length of the piece.

IV.—(3) Wane; Explanatory.

The term 20 per cent of number of pieces or amount shipped refers to each item and size of each car shipped.

(a) Pieces 5 by 5 to 8 by 8 square may show 1 in. wane, side measurement on any two corners or edges, and this wane not to exceed more than 25 per cent of the length of the piece singly, or 50 per cent in aggregate. In the absence of wane on all corners excepting one, the one corner can contain wane 50 per cent of the length of the piece as above described; not to exceed 20 per cent of number of pieces may have this defect.

(b) Pieces over 8 by 8, including 12 by 12, square, may show 1½ in. wane, side measurement, edge of any two corners or edges, and this wane not to exceed more than 33⅓ per cent of the length of the piece singly, or 66⅔ per cent in aggregate. In the absence of wane on all corners excepting one, the one corner can contain wane 66⅔ per cent of the length of the piece as above described; not to exceed 20 per cent of number of pieces may have this defect.

(c) Pieces over 12 by 12 square may show 1¾ in. side measurement, any two corners or edges, and this wane not to extend more than 40 per cent of the length of the piece singly, or 80 per cent in aggregate. In the absence of wane on all corners excepting one, the one corner can contain wane 80 per cent of the length of the piece as above described; not to exceed 20 per cent of number of pieces may have this defect.

(d) In event that pieces have two faces as wide as above described and two faces narrower the proportion of the amount of wane is admissible.

(e) Pieces 1 in. to 5 in. thick, not exceeding 8 in. wide, are governed by defect specifications above mentioned, with the exception that they cannot contain wane, and not to exceed 20 per cent of pieces 2 in. and thicker may show sound heart on one face; pieces under 2 in. thick must be free of heart. Pieces 8 in. and wider may contain wane as per paragraphs b and d.

(f) Rough sizes of this structural timber cannot vary more than ¼ in. scant of specified size. Dressed sizes may be ½ in. scant after dressing.

V.—(B) Locomotive Timber Oak. Passenger Car Dimension Oak. Refrigerator Car Dimension Oak.

Thickness cut to order, widths cut to order, lengths cut to order. Unless otherwise noted, must be cut from white oak. This stock, wherever practical, should be cut outside the heart and must be free of heart shake in pieces under 6 by 6 square. No attempt should be made to box the heart in pieces smaller than 5 by 7, unless heart is very small and tight. When heart is well boxed it must be firm and tight, and the center of the heart must not be nearer than 2 in. from any face. Must be sawed full to sizes with square edges, and cut from sound timber and free from wormholes, with the exception of a few small pin wormholes well scattered, and an occasional spot worm. None of these defects, however, to affect the serviceability of the piece for the purpose intended. Must be free from split, rot or dote, large, loose, rotten or unsound knots, or, in other words, free of all defects affecting the strength and durability of the piece. Sound standard knots well scattered not considered a defect.

V.—(C) Freight Car Timbers.

Freight car dimension, including all cars other than refrigerator and passenger car. Sizes cut to order. Unless otherwise ordered, must be sawed from good merchantable white or red oak timber. This stock must be free of rot, shakes and splits, large, loose, rotten or unsound knots, any of which will materially impair the strength and durability of the piece for the purpose intended. This stock is intended to work full size and lengh without waste, for side posts, braces and end sills end plates, draft timbers, cross ties, etc., used in the construction of ordinary freight or stock cars. On pieces 3 by 4 in. or equivalent girth measure and larger (nothing under 2 in. thick), heart check showing on one corner, admitted on 20 per cent of the pieces in each car shipment. Well boxed, sound hearts admitted in this material in pieces 5 by 6 and larger.

On pieces 3 by 4 to 6 by 6, inclusive, or equivalent girth measure and larger (nothing under 2 in. thick), in absence of heart defects, wane on one corner, ¾ in. side measurement, admitted on not to exceed 20 per cent of the number of pieces in each car shipment.

Pieces over 6 by 6 square may contain 1 in. wane, side measurement, on one corner, with other conditions same as 3 by 4 to 6 by 6 sizes.

RECOMMENDED CLASSIFICATION AND GRADING RULES FOR DOUGLAS FIR CAR AND LOCOMOTIVE MATERIAL.

1. The term "Douglas Fir" will cover the timber known likewise as Yellow Fir, Red Fir, Western Fir, Washington Fir, Oregon or Puget Sound Fir or Pine, Northwest and West Coast Fir.

2. Fir Lumber shall be graded and classified according to the following rules and specifications as to quality, and dressed stock shall conform to the subjoined table of standard sizes, except where otherwise expressly stipulated between buyer and seller.

3. Recognized defects in Fir are knots, knotholes, splits, check, wane, rot, rotten streaks, wormholes, dog or picaroon holes, pitch seams, shake, pitch pockets, chipped grain, torn grain, loose grain, solid pitch, stained heart, sap stain and imperfect manufacture.

Knots.

4. Knots shall be classified as pin, small, standard and large, as to size; round and spike as to form, and tight, loose and rotten as to quality.

5. A pin knot is tight and not over ½ in. in diameter.

6. A small knot is tight and not over ¾ in. in diameter.

7. A standard knot is tight and not over 1½ in. in diameter.

8. A large knot is tight and any size over 1½ in. in diameter.

9. A round knot is oval or circular in form.

10. A spike knot is one sawn in a lengthwise direction.

The mean or average diameter of knots shall be considered in applying and construing the rules.

11. A tight knot or sound knot is one solid across its face, is as hard as the wood it is in, and is so fixed by growth or position that it will retain its place in the piece.

12. A loose knot is one not held firmly in place by growth or position.

13. A rotten knot is one not as hard as the wood it is in.

Pitch.

14. Pitch pockets are openings between the grain of the wood, containing more or less pitch and surrounded by sound grain wood; they shall be classified as small, standard and large pitch pockets.

15. A small pitch pocket is one not over ⅛ in. wide.

16. A standard pitch pocket is one not over ⅜ in. wide or 3 in. in length.

17. A large pitch pocket is one over ⅜ in. wide or over 3 in. in length.

18. A pitch shake or seam is a clearly defined opening between the grain of the wood and may be either filled with granulated pitch or not, but in either case is considered a defect in any of the grades hereinafter described.

19. A pitch streak is a well-defined accumulation of pitch at one point in the piece, and when not sufficient to develop a well-defined streak, or where fiber between grains is not saturated with pitch it shall not be considered a defect.

20. A small pitch streak shall be equivalent to not over one-twelfth the width and one-sixth the length of the piece it is in.

21. A standard pitch streak shall be equivalent to not over one-sixth the width and one-third of the length of the piece it is in.

Wane.

22. Wane is bark, or the lack of wood, from any cause on edge.

Sap.

23. Bright sap shall not be considered a defect in any of the grades, provided for and described in these rules, except where stipulated.

24. Sap stain shall not be considered a defect, except as provided herein.

25. Discoloration of the heart of the wood, or stained heart, must not be confounded with rot or rotten streaks. The presence of rot is indicated by decided softness of the wood where it is discolored, or by small white spots resembling pin wormholes.

Miscellaneous.

26. Defects in rough stock caused by improper manufacture and drying will reduce grade, unless they can be removed in dressing such stock to standard sizes.

27. All stock, except car sills and framing, shall be inspected on the face side to determine the grade. Stock surfaced one side, the dressed surface shall be considered the face side. Stock rough or dressed two sides, the best side shall be considered the face, but the reverse side of all such stock shall not be more than one grade lower.

28. Chipped grain consists in a part of the surface being chipped or broken out in small particles below the line of the cut, and as usually found should not be classed as torn grain, and shall be considered a defect only when it unfits the piece for use intended.

29. Torn grain consists of a part of the wood being torn out in dressing. It occurs around knots and curly places, and is of four distinct characters—slight, medium, heavy and deep.

30. Slight torn grain should not exceed 1-32 in. in depth; medium 1-16 in. and heavy ⅛ in. Any torn grain heavier than ⅛ in. shall be termed deep.

31. Loosened grain consists in a point of one grain being torn loose from the next grain. It occurs on the heart side of the piece and is a serious defect, especially in flooring.

32. The grade of all regular stock shall be determined by the number, character and position of the defects visible in any piece. The enumerated defects herein described admissible in any grade are intended to be descriptive of the coarsest piece such grades may contain, but the average quality of the grade should be midway between the highest and lowest pieces allowed in the grade.

33. Lumber and timber sawed for specific purposes must be inspected with a view to its adaptability for the use intended.

34. All dressed stock shall be measured strip count, viz., full size of rough material necessarily used in its manufacture.

35. Equivalent means equal, and in construing and applying thse rules, the defects allowed, whether specified or not, are understood to be equivalent in damaging effect to those mentioned applying to stock under consideration.

36. Lumber must be accepted on grade in the form in which it was shipped. Any subsequent change in manufacture or millwork will prohibit an inspection for the adjustment of claims, except with the consent of all parties interested.

37. The foregoing general observation shall apply to and govern the application of the following rules:

The rules referred to under Sections 38, 39 and 40 govern 4-in or 6-in. strips, and are intended to cover strips used for car siding, car roofing and car lining.

The term "Edge Grain" is here used as synonymous with vertical grain, rift-sawn, or quarter-sawed. The term "Flat Grain" is synonymous with slash grain or plain sawed.

No. 2 Clear and Better Edge Grain.

38. Material of this grade shall be well manufactured with angle of grain not less than forty-five degrees. This stock shall be kiln dried and practically free from all defects, but will admit of bright sap on the face; not exceeding three small close pitch pockets not over 2 in. long, one pin knot, slight roughness in dressing, but not a serious combination of these defects.

No. 2 Clear and Better Flat Grain.

39. Material of this grade shall be well manufactured. The stock shall be kiln-dried and practically free from all defects, but will admit of bright sap on the face; not exceeding three small close pitch pockets not over 2 in. long, one pin knot, slight roughness in dressing, but not a serious combination of these defects.

No. 3 Clear.

40. Material of this grade should be sound common lumber and will admit of roughness in dressing, bright sap, and also may contain five pin three small and one standard knot and five pitch pockets in any continuous 5 feet of length of the piece; or any combination of tight knots or pitch pockets equivalent to those mentioned above. This grade particularly refers to stock used for inside lining of freight cars.

Standard Car Decking or Flooring.

41. Stock in this grade shall be well manufactured from sound, live timber and shall be free from splits, shakes, rot, bark or waney edges, and unsound knots, or pitch pockets, pitch seams or large knots which would weaken the piece for the use intended. This grade will admit of sound knots not to exceed one-third width of the piece, provided they are not in clusters, and sap.

Common Car Sills and Framing.

42. Stock in this grade shall be well manufactured from sound live timber, sawed full size to sizes ordered and free from rot, unsound knots, cross grain, bark or waney edges or shakes, but will admit of sap and any number of sound knots, provided they are not in clusters, and do not exceed one-third width of piece; pitch pockets or pitch seams that would not weaken the piece for the purpose intended.

43. Sizes up to 6 in. in width shall measure full when green, and not more than ⅛ in. scant when dry or part dry. Sizes 6 to 12 in. in width shall measure full when green and not more than ¼ in. scant when dry or part dry. Sizes 12 to 16 in. in width shall measure full when green and not more than ⅜ in. scant when dry or part dry. Unless otherwise specified, ¼ in. shall be allowed for each side which is to be dressed. Where stock is wanted dressed smooth all four sides, timber shall be sawed ½ in. full over the dressed sizes required. In pieces 3 by 6 in. and under when ordered in lengths exceeding 30 feet, sound knots shall not exceed one-quarter the width of the face through which they project, and the grain shall not cross sufficient to impair the strength.

44. Standard Lengths.

Car Sidings.—8, 9, 10 and 12 feet or multiples.

Car Roofing.—5 feet or multiples.

Car Lining.—8, 9, 10, 12, 14, 16, 18 and 20 feet or multiples.

Car Decking.—9 or 10 feet or multiples.

All orders shall be shipped in the standard length called for, unless otherwise specified, but no lengths of either car siding, lining or roofing shall be shipped, except in the lengths specified or multiples thereof. Those who do not desire stock shipped in multiple lengths should so specify.

Recommended Classification and Grading Rules for Cypress Car Material.

1. Cypress to include Red Cypress, Gulf Cypress, Yellow and East Coast Cypress, also known as Bald Cypress.

2. Cypress Lumber shall be graded and classified accord'ng to the following rules and specifications as to quality, and dressed stock shall conform to the subjoined table of standard sizes, except where otherwise expressly stipulated between buyer and seller.

3. Recognized defects in Cypress are knots, knotholes, sap, wormholes, shake, season checks, splits and wane.

Knots.

4. Knots shall be classified as standard and small, as to size, and sound or rotten, as to quality.

5. A standard knot is sound and not to exceed 1¼ in. in diameter.

6. A small knot is one not exceeding ¾ in. in diameter.

7. A sound knot is one solid across its face, is as hard as the wood it is in, and is so fixed by growth or position that it will retain its place in the piece.

8. A rotten knot is one not as hard as the wood it is in.

Sap.

9. Stained sap or bright sap shall not be considered a defect in the material specified in these rules.

Season Checks.

10. Ordinary season checks are such as occur in lumber properly covered on yard or season checks of equal size in kiln-dried lumber.

Wane.

11. Wane is bark or lack of wood from any cause on edge.

Miscellaneous.

12. The grade of all regular stock shall be determined by the number, character and position of the defects visible in any piece. The enumerated defects herein described admissible in any grade are intended to be descriptive of the coarsest pieces such grades may contain, but the average quality of the grade shall be midway between the highest and lowest pieces allowed in the grade.

13. Lumber sawed for specific purposes must be inspected with a view to its adaptability for the use intended.

14. All dressed stock shall be measured strip count, viz., full size of rough material necessarily used in its manufacture.

15. Lumber must be accepted on grade in the form in which it was shipped. Any subsequent change in manufacture or millwork will prohibit an inspection for the adjustment of claims, except with the consent of all parties interested.

16. The foregoing general observation shall apply to and govern the application of the following rule. The rule referred to in the following section is intended to govern 4-in. or 6-in. strips and to cover strips used for car siding, car roofing or car lining.

Grading Rule for Cypress Car Roofing, Siding or Lining.

17. Material of this grade shall be well manufactured, and kiln-dried, and will admit of sound knots, any amount of stained sap; very small pin wormholes, such as will readily fill and cover by the usual painting; slight shake; a small split; ordinary season checks; but will not admit of grub wormholes, wane, knotholes, or defects which would prevent the use of each piece in its full width and length for the purpose intended as named above.

18. Standard Lengths.

Car Siding—8, 9, 10 and 12 feet or multiples.

Car Roofing—5 feet or multiples.

Car Lining—8, 9, 14, 16, 18 and 20 feet or multiples.

All orders shall be shipped in the standard lengths called for, unless otherwise specified, but no lengths of either car siding, lining or roofing shall be shipped, except in the lengths specified or multiples thereof. Those who do not desire stock shipped in multiple lengths should so specify.

The report is signed by: G. N. Dow (L. S. & M. S.), chairman; G. H. Gilman (N. P.), and R. W. Burnett (C. P. R.) for the Master Car Builders' Assn., and R. E. Smith (A. C. L.),

and J. F. DeVoy (C. M. & St. P.) for the Master Mechanics' Assn.

T. W. Demarest (Penn. Lines), a member of the Master Mechanics' committee, approves of the report, with the exception of the item of Loblolly pine, referred to under (1) of classification of yellow pine car material and also paragraph 48, with reference to knots in car sills and framing, which should be modified at the convention.

MASTER MECHANICS' REGISTRATION.

Adams, A. C., M. M., N. Y. N. H. & H. R. R.
Aldcorn, Thos., Chicago Pneumatic Tool Co.
Allen, C. W.
Allen, G. S.
Anthony, F. S., S. M., International & Ct. Nor. Ry.
Baker, Horace, G. M., C. N. O. & T. P. Ry., Marlborough-Blenheim Hotel.
Barton, T. F., D. L. & W. R. R., Haddon Hall.
Basford, Geo. M., American Locomotive Co.
Bawden, Wm., M. M., Terminal Assn. of St. Louis.
Beau, S. L., M. S., A. T. & S. F. Ry., Marlborough-Blenheim Hotel.
Bell, J. Snowden, Asst. Member, St. Charles Hotel.
Bentley, H. T., A. S. M. P., C. & N. W. Ry. Marlborough-Blenheim Hotel.
Bingaman, Chas. A., Phila. & Reading Ry.
Black, W. G., M. M., N. Y. C. & St. L. R. R., Chester Inn.
Booth, Jas. K., G. F., B. & L. E. R. R., Monticello Hotel.
Boughton, Wm., G. M. M., Pere Marquette R. R., Traymore Hotel.
Brango, P. H., Dennis Hotel.
Brazier, F. W., Supt. R. S., N. Y. C. & H. R. R. R.
Brown, David, Del. Lack. & Western R. R.
Brown, M. G., M. M., Gulf & Ship Island R. R.
Buchanan, A. Jr., Public Service Commission, Haddon Hall.
Burns, Frank, M. M., St. L. & S. F. Ry.
Burton, T. L., Gen. Insp., C. R. R. of N. J.
Butts, G. W., M. P. Insp., P. R. R., Dennis Hotel.
Carroll, J. T., Supt. M. P., B. & O.
Casey, J. J., Supt., American Car & Fdy. Co.
Chenowith, Edwin G., M. E., Erie R. R.
Chisholm, J. E., Ward Packer Supply Co.
Clark, Jas. H., M. M., Staten Island Rap. Transit Co., Shelburne Hotel.
Cleaver, F. C., S. M. P., Rutland R. R.
Cole, F. J., Amer. Loco. Co., Traymore Hotel.
Connolly, J. J., S. M. P., Duluth So. Shore & Atlantic.
Corey, C. H., Honorary Member.
Coutant, M. R., M. M., Ulster & Del. R. R., Shelburne Hotel.
Cozad, W. S., Shop Specialist, Erie R. R., Schlitz Hotel.
Cromwell, Oliver C., M. E., B. & O. R. R., Shelburne Hotel.
Curtis, Theo. H., S. M., Louisville & Nashville Ry.
Dalton, Wm., Chief Engr., American Loco. Co., Traymore Hotel.
Dawson, L. L., S. M. P., Ft. Worth & Denver.
DeVoy, J. F., A. S. M. P., C. M. & St. P. Ry. Co.
Diehr, C. P., M. M., N. Y. C. & H. R. R. R., Stanley Hotel.
Dillon, S. J., M. M., Penna R. R. Co.
Dooley, Wm. H., M. M., C. N. O. & T. P. Ry.
Dunlap, W. H., M. M., L. & N.
Durham, Geo., M. M., L. & N. R. R.
Elliott, J. B., M. M., Balto. & Ohio R. R., Elberon Hotel.
Endsley, Prof. L. E., Asso. Prof. Ry. Mech. Eng., Purdue University.
Ettenger, R. L., C. M. E., Southern Ry.
Evans, R. C., S. M. P. & C. D., Western Maryland R. R., Pennhurst Hotel.
Ewing, J. J., M. E., Ches. & Ohio Ry. Co.
Flory, B., S. M. P., N. Y. O. & W. R. R.
Fogg, J. W., M. M., Chgo. Ter. Transfer Ry.
Forsyth, Wm., Railroad Age Gazette.
Fowler, George L., Dennis Hotel.
Fuller, C. E., S. M. P., Union Pacic Ry.
Fulmor, John H., M. M., Pennsylvania R. R.
Gaines, F. F., S. M. P., Central of Georgia Ry.
Gill, John, S. M. P., C. I. & L. Ry.
Gilbert, F. M., M. E., N. Y. C. & H. R. R. R. Co., Seaside Hotel.
Goodrich, Geo. P., M. M., Ft. Smith & Western R. R.
Goodrich, Max, M. M., New York & Ottawa R. R. New Holland Hotel.
Gorey, E. H., G. F., Louisville & Nashville R. R.
Gossett, Charles E., M. M., Iowa Central R. R.
Gould, Jos. E., S. M. P., Norfolk & Southern Ry.
Gray, B. H., S. M. P., New Orleans, Mobile & Chicago R. R.
Green, Herbert, Dennis Hotel.
Hale, H. H., M. M., C. H. & D.
Hall, W. H., Chief Car Insp., C. R. R. of N. J.
Hang, Harry, M. M., Brownstone & Middleton Ry.
Harrigan, P. J., M. M., Baltimore & Ohio R. R.
Harrington, H. H., M. M., Erie Ry., Runnymede Hotel.
Harris, C. M., M. M., Washington Terminal R. R.
Hassett, M. W., M. M., N. Y. C. & H. R. R. R., Marlborough-Blenheim Hotel.
Hatz, G. J., Supt. Shops, U. P. Ry.
Hill, John, M. M., Minneapolis & St. Louis Ry.
Hogan, C. H., N. Y. C. & H. R. R. R., Marlborough-Blenheim Hotel.
Hawkins, B. H., D. M. M., D. L. & W. Ry.
Humphrey, A. L., G. M., Westinghouse Air Brake Co., Marlborough-Blenheim Hotel.
Hunter, G. S., Div. M. M., Kansas City Southern Ry.
Hunter, H. S., M. M., Philadelphia & Reading Ry., Worthington Hotel.
James, Charles, M. M., Erie R. R., Schlitz Hotel.
Kapp, W. F., Supt. Shops & Mchy., R. F. & P. Ry.
Kalbaugh, I. N., Coal & Coke Ry.
Kellogg, W. L., M. M., P. M. R. R.
Kells, Willard, M. M., Lehigh Valley R. R.
Kilpatrick, J. B., Asst. S. M. P., C. R. I. & P. Ry.
Kilpatrick, R. F., A. S. M. P., D. & R. G. R. R.
Kinney, M. A., M. M., Hocking Valley Ry.
Kinney, W. H., Genl. Foreman, N. Y. O. & W. Ry., Traymore Hotel.
Kyle, C., M. M., Canadian Pacific Ry., Haddon Hall.
Lane, F. W., London Times, Dennis Hotel.
Leach, H L.
Lockwood, B. D., A. C. E. Pressed Steel Car Co.
Luscombe, J. T., M. M., Toledo & Ohio Central Ry.
McCuen, J. P., S. M. P., C. N. O. & T. P. Ry.
McGill, A. M., M. M., Lehigh Valley R. R.
McGill, A. M., M. M., Lehigh Valley R. R., Traymore Hotel.
McGregor, A. A., M. M., L. & N. R. R.
McLean, W. J., B. B. & B. C. Ry., Dennis Hotel.
McNaughton, Jas., American Locomotive Co.
McNulty, F. M., M. M., Monongahela Connecting R. R.
McRae, G. A., M. E., Mich. Cent.
MacBain, D. R., N. Y. C. & H. R. R. R.
Maher, Peter, S. M. P., T. St. L. & S. W. Ry.
Manchester, A. E., S. M. P., C. M. & St. P. Ry.
Manchester, Henry C., A. S. M. P., Maine Central R. R., Shelburne Hotel.
May, H C., M. M., L. & N.
May, Walter, M. M., C. C. C. & St. L. Ry.
Miller, Geo. A., M. M., Florida East Coast Ry.
Minshull, D. H., M. M., N. Y. O. & W. R. R., Traymore Hotel.
Monkhouse, H., Rome Locomotive Works, Chalfonte Hotel.
Moore, B. R., M. M., G. & S. I. R. R., Traymore Hotel.
Moorehead, L. B., M. E., N. Y. C. & St. L. R. R., Monticello Hotel.
Nicholson, John, S. M. P. & M., St. L. B. & M. Ry.
Noble, L. C., Young's Hotel.
Onderdonk, J. R., B. & O. R. R.
Oplinger, J. W., S. M. P., Atlantic Coast Line R. R., Marlborough-Blenheim Hotel.
Oviatt, H. C., M. M., N. Y. N. H. & H. R. R.
Owens, Wm., M. M., L. V. R. R., Dennis Hotel.
Painter, J. H., M. M., A. C. L. R. R., Chalfonte Hotel.
Parish, Le Grand, L. S. & M. S. Ry., Marlborough-Blenheim Hotel.
Park, S. T., S. M. P., C. & E. I. Ry
Passmore, H E., M. M., T. & O. C. Ry.
Patterson, J. S., Galena Oil Co.
Paxton, Thos., S. M. P., E. P. & S. W. Ry.
Prendergast, A. P., M. M., B. & O. R. R., Shelburne Hotel.
Phillips, C., M. M., N. O. & N. E., & A. V. Rys.
Platt, John G.
Powers, M. J., M. M., Denver & Rio Grande R. R.
Prendergast, A. P., M. M., Baltimore & Ohio R. R.
Prendergast, Jas. L., M. M., Baltimore & Ohio Ry.
Prescott, C. H., Spokane International Ry.
Quigley, Joseph, M. M., C. N. O. & T. P. Ry., Dennis Hotel.
Rae, Clark H., G. M. M., Louisville & Nashville R. R.
Reid, W. L., Supt., American Locomotive Co.
Ridgway, H. W., M. M., Colorado & Southern Ry.
Riley, Geo. N., National Tube Co.
Rink, Geo. W., M. E., C. R. R. of N. J.
Roberts, Joseph, M. M., Union Pacific R. R. Co.
Robertson, D. D., M. M., L. V. R. R., Traymore Hotel.
Rollings, E. O., M. M., L. & N.
Roth, H. L., Q. & C. R. R., Chalfonte Hotel.
Rowland, W. I., M. M., B. & O. R. R., Cornell Hotel.
Schlafge, William, M. M., Erie R. R., Schlitz Hotel.
Scheffer, F. H., Supt. Mchy., N. C. & St. L. Ry., Runnymede Hotel.
Schmidt, Prof. E. C., University of Illinois.

Seddon, C. W., S. M. P. & C., D. M. & N. Ry.
Sedgwick, E. V., Galena Signal Oil Co., Young's Hotel.
Seley, C. A., M. E., C. R. I. & P. Ry.
Seidel, G. W., Supt. Silves Shops, C. R. I. & P. Ry., Marlborough-Blenheim Hotel.
Seidel, G. W., Dennis Hotel.
Smith, E. J., M. M., Atlantic Coast Line R. R., Windsor Hotel.
Smith, F. C., American Locomotive Co., Traymore Hotel.
Smith, R D., A. S. M. P., N. Y. Central Lines.
Smith, W. T., S. M. P., Chesapeake & Ohio Ry. Co.
Stearns, W. A., M. E., Louisville & Nashville R. R.
Stewart, A. F., M. M., Chesapeake & Ohio Ry.
Stewart, C. J., M. M., Central New England R. R., Chalfonte Hotel.
Stocks, W. H., Chalfonte Hotel.
Stuart, Charles M., M. M., Philadelphia & Reading R. R.
Summerskill, T. A.
Sweeley, E. H., G. F. L. R., Long Island R. R., Windsor Hotel.
Swoyer, H., M. M., Rogers Locomotive Works, Traymore Hotel.
Symington, T. H.
Talty, J. A., Traveling Engrs.' Assn., Haddon Hall.
Taylor, G. W., S. M. P., S. A. & A. P. Ry.
Taylor, Joseph W., Secy., A. R. M. M. Assn.
Taylor, Wm. H., M. M., N. Y. S. & W. R. R. Co., Schlitz Hotel.
Terrell, C. H., M. M., Chesapeake & Ohio Ry.
Thomas, Frank W., Supervisor of Apprentices, A. T. & S. F. Ry., Marlborough-Blenheim Hotel.
Thomas, W. H.
Thompson, W. O., M. C. B., N. Y. C. & H. R. R. R.
Tollerton, W. J., A. G. S. M. P., C. R. I. & P. Ry., Marlborough-Blenheim Hotel.
Turner, J. S., Sales Agent, Pressed Steel Car Co.
Van Valin, H. D., D. M. M., B. & O. R. R.
Wahlen, John, M. M., Montpelier & Wells River R. R.
Walsh, F. O., M. M., Atlanta & West Point Ry.
Walsh, J. F., S. M. P., C. & O. R. R.
Waters, J. J., Supt. Mech. Dept., Mexican Central R. R., Marlborough-Blenheim Hotel.
Watson, R. B., Engr. of Tests, Erie R. R.
Watson, Samuel, M. M., N. Y. C. & H. R. R. R.
Whyte, F. M., M. E., N. Y. C. & H. R. R. R.
Wieseckel, Geo. F., M. M., B. & O. R. R.
Wildin, G. W., Mech. Supt., N. Y. C. & H. R. R. R.
Williams, E. V., G. F., N. Y. C. & H. R. R. R., Stanley Hotel.
Wright, R. V.
Wyman, R. L., M. M., Lehigh & New England R. R.
Young, C. B., M. E., C. B. & Q. R. R.
Young, Charles D., A. E. M. P., Pa. Lines West.

MASTER MECHANICS' GUESTS.

Alexander, J. R., Gen. Road For. of Engines, P. R. R.
Andrews, D., Foreman Mach. Shop, B. & O. R. R.
Anderson, H. A., Spec. Agt, Pur. Dept., P. R. R.
Best, J. I., Ch. Cl. S. M. P., P. & R.
Bender, E. N., Gen. Pur. Agt., C. R. R.
Cain, Chas., P. R. R.
Connelly, W. J., Ch. Electrician, C. & O.
Connolly, W. J., C. & O. R. R.
Creighton, J. H., Rodman, M. W. Dept., P. R. R.
Curran, D. D., Pres., N. O. & N. E., & A. V. Rys.
Davies, H. W., Pur. Agt., Norfolk & Southern Ry.
Demarest, Geo. L., Ch. Clerk to Supt. of Shops, C. R. R. of N. J.
Dollar, Geo., Car Inspector, N. Y. C.
Dunphy, H. I., Secy., G. P. A., N. Y. Cen. Lines, Marlborough-Blenheim Hotel.
Farrell, J. F., Purchasing Agt., Mich. Central.
Farrington, R. J., Gen. Piece Work For., P. & R.
Finney, H. R., Asst. R. F. of E., Penna. R. R.
Fox, G. P., Genl. Foreman, N. Y. C. & H. R. R. R.
Frauenthal, B. W., Secy., St. Louis Ry. Club.
Frazier, Geo. H., Secy., N. E. Ry. Club.
Fuhrer, W., Purchasing Agt., Interboro R. T. Co.
Fuss, C. O., For. Pas. Car Shops, C. R. R. of N. J.
Fuss, I. R., Stenographer, C. R. R. of N. J.
Gallagher, B. F., Foreman, B. & O. R. R.
Gethins, Jas. F., Foreman, Del. & Hudson.
Goodwin, Geo. M., C. D., C. R. I. & P. Ry.
Gossler, Geo. S., Erecting Foreman, P. & R.
Hankins, Louis, C. C. Statistical Bureau, W. J. & S. S. R. R.
Harrold, J. W., C. C. Agent, W. J. & S. S. R. R.
Heddon, G., Asst. Rd. For. of Engines, Penna. R. R.
Hinkins, E. H., B. & O. R. R.
Hornig, E O., Ch. Cl. to G. P. A., N. Y. Cen. Lines, Shelburne Hotel.
Huntington, C. C., Genl. Storekeeper, Lehigh Valley.
Jackson, W. S., Super. Track & Line, Atl. City & Sh. Line.
Jones, E., Gen. For. Freight Car Dept., D. H.
Keegan, Geo., Asst. to V. P., Interboro R. T. Co., Marlborough-Blenheim Hotel.
Kniseley, H. S., Car Inspector, N. Y. C.
Koch, Philip, Genl. Foreman Car Shops, C. R. R. of N. J.
Landon, W. B., Chemist, Erie R. R.
Laugley, C. E., Southern Ry.
Lum, W. D., Cl. Ind. Dept., St. L. & S. F. R. R.
McSweeney, J. T., G. F., B. & O. R. R.
Macklin, H. C., Pur. Agt., Seaboard Air Line.
Micklin, H. H.
Mathes, S. R., M. M., Nor. & So. Ry.
Maurer, W. R., Mech. Eng., N. Y. N. H. & H.
Merrill, A. J., Sec., Southern Ry. Club.
Mitchell, A. G., Supt., P. R. R.
Neal, J. H., Nor. & So. Ry.
O'Brien, J. D., Mch. Shop Foreman, L. & N. R. R.
Parks, F. R., Award Clerk, Panama Commission.
Paschal, M. V., Foreman, B. & O. R. R.
Roberts, Roy, M. M., N. P. R. R.
Rogers, J. W., Elect. Supervisor, West J. & Seashore.
Ryan, P. H., C. C. M. P. Dept., N. Y. C. Lines.
Sloan, J. R., Genl. Electrician, P. R. R.
Smith, M., Asst. Pur. Agt., P. R. R.
Snyder, J. Campbell, Ch. Cl. Pur. Dept., N. Y. C. & H. R. R. R., Shelburne Hotel.
Street, J. F., M. E., P. A. & McK. R. R. R.
Sweeley, G. P., M. M., Penna. Lines.
Torback, F. S., Gang Foreman, B. & O. R. R.
Morris, Walborn, Asst. Erecting Foreman, P. & R.
Walker, W. A., B. & O. R. R.
Warner, F. R., Foreman, B. & O. R. R.
Weeks, Chas., Storekeeper, P. R. R.
Weiss, F. A., M. Ptr., Cen. R. R. of N. J.
West, Jno. T., P. A., Seaboard Air Line.
Wheatley, E. H., Clerk to Eng. M. of W., L. V. R. R.
White, Ed. S., Foreman Painter, C. R. R. of N. J.
Wight, T. B., Purchasing Agt., N. Y. C. & H. R. R. R.
Williams, Haskins, Foreman Loco. Dept., Ala. Great Southern.
Wortham, E. S., Asst. to V. P., Chicago & Alton, Chalfonte Hotel.
Yoos, Edw. A., Foreman Air Br. Men, C. R. R. of N. J.

A PROPOSITION FROM SARATOGA.

A committee representing the interests of Saratoga, N. Y., has presented to the executive committees of the Master Car Builders' Association and the Railway Supply Manufacturers' Association a proposition looking to the holding of future conventions at that place, and a similar proposition will be presented to the executive committee of the Master Mechanics' Association on Wednesday afternoon. The Saratoga committee consists of C. H. Booth, president United States Hotel Company, and James D. McNulty, president of the village of Saratoga. The latter presented the plan in substance as follows:

"Representing the citizens of Saratoga Springs, I am here to present a proposition which, I believe, will appeal to you and be, if carried into effect, to our mutual interest. The proposition, in substance, is as follows:

"Saratoga Springs will erect a fire-proof building on its principal street and within one thousand feet of the Delaware & Hudson track for meeting and exhibition purposes, to be used by your association, the Master Car Builders' and the American Interurban & Street Railway Association. This building will be within ten minutes' walk of our principal hotels. It will be connected with the Delaware & Hudson, so that exhibits can be placed in any part of the hall direct from the cars or on the cars. It is contemplated in the tentative plans we have prepared to have two floors; the exhibits to be on the lower floor and the meetings of the associations to be held on the second floor. The building will have an exhibition space of upwards of 100,000 sq. ft., and be located on a plot of ground comprising twelve acres. This is simply an outline of the proposed building, and we will construct it on plans which may be prepared or approved by you.

"The price for exhibition purposes in this building and to cover all expenses for use and occupancy will be 30 cents per sq. ft., it being understood that all associations will use 140,000 sq. ft. each year, and that the three associations, the Master Car Builders' and Master Mechanics', and the American Interurban & Street Railway Association, will meet in this building three times during the next five years, at the end of which time these associations will practically own the building.

"We propose to form an association which will construct a building and from the revenue derived from the 30 cents per sq. ft. for exhibition purposes during three years out of five, pay for the same and give it to the association.

"Now, since you have last met in Saratoga Springs, the hotel accommodations have been improved materially, and I believe you will find the town more attractive than ever before, and Saratogians, should you come there, will do all they can to make your stay pleasant and comfortable. We will establish in connection with this building a bureau of complaints, through which everything will be adjusted to your satisfaction.

"The hotel rates we guarantee as follows (I have reference now to maximum rates): For room and board all over the hotel $5 a day to each person; with bath $2 extra per day; that is, for one person $7, and for two persons $12 with bath. Private parlors and cottages will be furnished for $10 a day.

"Now in conclusion, I wish to thank you for the privilege of appearing before you to-day and assure you that should you come to Saratoga Springs under this proposed plan, you will be heartily welcomed and everything done, as I said before, to make your stay comfortable."

Mr. McNulty filed with the secretary a formal statement of the proposal as above outlined, and the plan will have the consideration of the several executive committees during the coming year.



E. L. Adreon,
President.



B. E. D. Stafford,
Vice-President.



Charles P. Storrs,
Treasruer.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION ANNUAL MEETING.

The annual meeting of the Railway Supply Manufacturers' Association was held in convention hall, on the Million Dollar Pier, at 11 o'clock Saturday morning.

President Grove called the meeting to order. The minutes of the annual meeting held June 19, 1909, were read by the secretary and approved by the meeting.

President Grove then introduced Mayor Stoy of Atlantic City, who made an interesting address of welcome, and presented the freedom of the city to the association. In his remarks, the mayor said that, owing to the strenuosity of his duties during the ten days of this convention, he found it necessary to appoint an assistant Night Mayor, and conferred this honor upon Thomas Aldcorn of New York City, the retiring treasurer.

The report of the committee appointed last year to revise the constitution and by-laws was adopted section by section and as a whole, except that article six was amended. Comment on this will be found in another column.

The reports of the meetings of the district committees were then read and approved.

The following officers were elected:

President, E. L. Adreon, American Brake Company, St. Louis, Mo.

Vice-President, B. E. D. Stafford, Flannery Bolt Company, Pittsburgh, Pa.

Treasurer, Charles P. Storrs, Storrs Mica Company, Owego, N. Y.

Mr. Whipple, chairman of the badge committee, presented Mr. Grove with a retiring president's badge. A vote of thanks was tendered Mr. Grove for his untiring efforts during the past year.

A resolution instructing the executive committee, through its proper officers, to invite those identified with the engineering department of the United States navy to attend these conventions and look over the exhibits, was offered by George A. Post and adopted. Mr. Post explained that the exhibits included much, more especially machine tools, of educational value to the navy department.

D. M. Brady asked thata vote of thanks be tendered the executive committee for the good work it had done. The motion was carried by a rising vote.

CORNELL DINNER.

Cornellians attending the conventions gathered at the Hotel Chelsea on Saturday evening for their fifth annual dinner. It proved to be one of the most enjoyable of the series. Former Professor Barr, now a trustee of the University, came to Atlantic City especially to attend this gathering and gave a most interesting talk on the present and future plans for coping with the greater responsibilities that Cornell is being forced to assume. Other speakers included E. H. Sibley, J. F. DeVoy and J. H. Klinck.

The musical part of the program was of unusual quality, for which the thanks of those present were extended to Mr. Thomas.

F. F. Gaines, superintendent motive power of the Central of Georgia, presided, and R. L. Gordon, assistant to the president of the Standard Steel Car Company, was elected to preside at the next meeting.

The others present were: E. H. Sibley, '80, treasurer Galena Oil Company; J. H. Barr, '89, Smith-Premier Typewriter Company; L. A. Shepard, '92, Titan Steel Castings Company; J. F. DeVoy, '88, assistant S. M. P., C. M. & St. P. Ry.; B. P. Flory, '95, S. M. P., N. Y. O. & W. Ry.; J. S. Goddard, '94, American Steel Foundries; J. H. Mitchell, '96, Pressed Steel Car Company; N. S. Reeder, '96, Canadian Car Company; J. H. Klinck, '94, Westinghouse Electric & Manufacturing Company; C. E. Barry, '96, General Electric Company; W. O. Kellogg, '96, General Electric Company; H. C. Mode, '97, Westinghouse Electric & Manufacturing Company; A. R. Ayres, '00, M. E., L. S. & M. S. Ry.; H. G. Macdonald, '00, Standard Steel Car Company; E. A. Averill, '00, *American Engineer and Railroad Journal;* J. D. Ristine, '04, Union Draft Gear Company; R. S. Cooper, '03, Independent Pneumatic Tool Company; Arthur S. Lewis, '03, Standard Paint Company; H. A. Rogers, '03, Woven Steel Hose & Rubber Company; L. H. Snyder, '06, Joseph Dixon Crucible Company; H. H. Gilbert, '07, Scully Steel & Iron Company; R. F. Stillman, '07, Watson-Stillman Company; E. A. Stillman, '08, Watson-Stillman Company; J. A. Pollak, '07, Block-Pollak Iron Company; R. F. Fowler, '08, Heywood Bros. & Wakefield Company; J. H. Thomas, honorary, Standard Paint Company.

THE ANNUAL BALL GAME.

[REPRINTED FROM THE SPECIAL EDITION OF THE "DAILY RAILWAY AGE GAZETTE" OF JUNE 19.]

East decisively beat West yesterday in the ball game which is an annual entertainment feature at the Mechanical Conventions. The score was 15 to 0.

The Eastern team ran like an 18-hour train engine. The Western team, on the other hand, bucked badly almost from the start; its wheels whirled fast enough, but either the parts of the engine had not been well assembled or the track sadly needed sanding and the Westerners hadn't the needed sand.

A ball game is better than any other kind, from the pea under the thimble, which is psychological, to Halley's daring comet; all good, but the betweens are the best: Billiards, bowling, racquets, cricket, tennis, foot-ball and, best of all, the great, enduring, American team play, base ball.

That is what the convention visitors evidently thought about it, too, and they turned out for the game to the number of several hundreds. As our country newspaper contemporaries say, "a pleasant time was had"—by the Easterners.

Society decorated the great occasion in a spotty way, some here, some there, beaming gladness everywhere. For ornament, extruded metals in great variety of intricate design;" for transportation every way not forbidden by the new Rate Law. The Murphys walked in from Absecon. The Standard Heights and Exhaust Nozzles motored over from the pier. There were toothpick indications of luxurious midday dinners. Al fresco chewing gum luncheon parties were all over the grass, and instantaneous exposures of plate and porcelain gave color to these throngs of society leaders. The boys' evening salvage of scrap amounted to seven kilos of tutti-frutti and dentine—rated as seconds.

The afternoon's festival began when the procession left the Million Dollar Pier at 2.15 o'clock. It was personally conducted by Leonard J. Hibbard, chairman of the base ball committee, and headed by an escort of Atlantic City's fliest cops. Then came the Old Guard band, playing its very best repertoire of marches. The regular musicians were assisted by the rendition of two of them, a recruit in the person of Chairman Johnson, of the Entertainment Committee, who got a taste for tooting in the good old days when he used to pull the whistle of a locomotive, and who now occasionally gratifies the taste by tooting a solo cornet. And, really, he doesn't do it more than half badly.

The eighteen Score Girl mascots, nine representing the East and nine the West, and all chaperoned by Mrs. J. Will Johnson, followed the band, marching two abreast, the first two being the mascots of the Eastern team and the next two of the Western team, and next two of the Eastern, etc. And a group of rosy-cheeked, wholesome and graceful beauty they made, in their dainty white caps and sweaters, tooting jauntily and, more or less, melodiously the megaphones with which all were provided. Each of the Eastern Score Girls wore a red letter "E" on her left sleeve, and each of the Western girls a blue letter "W" on her left sleeve. These letters corresponded in color to those on the uniforms of the players.

The Score Card girls were the following:

East—Mrs. Maud W. Sellers, Montgomery, Ala.; Mrs. R. H. Weatherly, Brooklyn, N. Y.; Mrs. F. O. Walsh, Montgomery, Ala.; Miss Edith May Tewkesbury, Buffalo, N. Y.; Mrs. C. L. Jacobs, Emporia, Kan.; Miss Mabel Brazier, Yonkers, N. Y.; Mrs. R. W. Burnett, Montreal, Canada; Mrs. A. L. Whipple, New York; Mrs. Arthur C. Langston, Columbia, Tenn.

West—Miss Helen M. Little, Minneapolis, Minn.; Miss May Logan, Chicago; Miss Edna H. Fowler, Denver, Col.; Miss Elizabeth MaGraw, Chicago; Mrs. Stanley Wheeler Midgley, Chicago; Miss Allene P. Moran, Louisville, Ky.; Miss Helen Lois Grove, Pittsburgh, Pa.; Miss Jean C. Lindstrom, Pittsburgh, Pa.; Mrs. L. R. Phillips, Chicago.

The Score Girls were followed by the Eastern base ball team, in white uniforms, and the Western team, in gray.

The rest of the procession was made up of intending spectators and innocent bystanders.

At South Carolina avenue the Entertainment Committee had provided fourteen special street cars for all persons wearing badges. The crowd quickly filled them, and was taken to the Pennsylvania Railroad Company's Inlet Park base ball grounds, where the game was played.

The members of the teams all looked like real base ball players until the playing began—and some of them looked that way after it began.

The uniforms were dressy but well designed for serious work. All were equipped with double body bolsters in front and double coil nest springs behind. These were designed to give zest to collisions and a ricochet effect in sliding bases. It was anticipated that a base runner might with skill and some experience land on his nest springs and bound entirely over the basemen at the terminals.

Coke racks were provided for the fielders, so they could hold anything. The grab irons for day coaches, on the side lines, were neat and effective. The umpire, Mr. Passmore, had old-fashioned straight air equipment, and a thermostat to keep him from getting hot about anything. He was well cared for in the matter of body braces, side bearings, outside transoms and all standard appliances for the protection of trainmen.

The flip of a coin by Mr. Hibbard sent the Eastern team to bat.

THE GAME.

It began so nicely, with 9 Western men and only one Eastern player in sight. It looked one sided. The Pressed Steel Car Company (Mr. Hammond) was nearest to me. His head was protected by a basket rack and in his left hand was a receptive Janney coupler. His deck sashes threw a glad light on his head linings as he peered under the National Boiler Washer Company (Mr. Gilman's) elbow, and wig-

wagged signals with his M. C. B. knuckle to the Union Draft Gear Company (Mr. Tarelton). It was fierce, the equipment of the near end, the end all, the statics, the buffer stop, the Gibraltar.

But it was the pitcher, the Union Draft Gear Company (Mr. Tarelton), in the stage center, more simply clad in Diamond S' brake shoes, that held our attention. His the dynamics. In action, a bewildering picture, a highly agitated three-position semaphore. The ball curved from him in the path of a whiplash, recalling Lord Cheltenham's speech in the British Parliament, when he said of Lord Morris: "He is so full of guile, of turns and twists, that if he swallowed a nail it would become a corkscrew."

It did not seem possible to hit such a ball properly, but Mr. Gilman thought differently—being from the West. He lifted the first crack out of the box, the pitcher's box, far down the left field where the Flannery Bolt Company had Mr. Wilson on exhibition. Mr. Wilson moved not at all. He did not need to do so, for when the ball came to his hands he returned it and Mr. Gilman sat down. Jenkins Bros., per William Murray, then safely placed a short fly beyond second. Nobody tried to stop him at first, and he made a brave attempt to steal second. He would have succeeded if he had been a ten second man. By a good catcher's throw and perfect handling by the Pennsylvania Lines West (Mr. La Mar) Jenkins Bros. sphere of influence was shrunk at second. The New Haven R. R. (Mr. Oviatt) then singled to right and stole second, but died there, because, under the Sherman act, the Baltimore & Ohio could not conspire. The B. & O. (Mr. Jeffery) bunted twice unsuccessfully and then grounded out to pitcher and first base. No runs.

The field was now cream white, with only one pearl gray uniform, the Union Draft Gear Company (Mr. Tarelton), who whaled an unduly long left field fly to the near monopolists, Manning, Maxwell & Moore (Mr. Dowling), who missed a difficult catch. Mr. Allen, who honors C. H. Besly & Company with his name, grounded to Mr. Jeffery, who threw him out at first. The Pennsylvania R. R. (Mr. La Mar) then foul-tipped to a grand stand lady with an E on her left arm. This embarrassed the traditionally polite Pennsylvanian so much that he struck out with courteous zeal. It is common rumor that the Curtain Supply Company is willing to sell goods to the B. & O. Mr. Midgley may or may not have heard this rumor; nevertheless he lifted an undirigible foul far beyond third and gave Mr. Beaumont the chance of his life. It was a magnificent running catch. No runs.

Second Inning.

Mr. Dowling grounded to the pitcher, who made a bad throw to first. Beaumont then ran for him, stole second and arrived at his terminal a little later. William Sellers & Company's exhibit (Mr. Enright) then got first on baseman's error, stole second, and the Griffin Car Wheel Company (Mr. Stevenson) made a great drive to the center field fence, bringing in two runs. This was the turning point in the game. Evidently something was expected from Stevenson.

"Two thousand eyes were on him,
When he rubbed his hands in dirt,
One thousand tongues applauded,
While he wiped them on his shirt."
Two hundred chews of gum fell out,
And slid down a hundred skirts.

It happens that we have data for timing Stevenson's run to second, for when the whack was made I was chatting with Miss Carry Iron (Vestibule Drawbar Company). She screamed and we both dropped our gums. I knelt and recovered them and returned hers to her—to Miss Iron. She



The Score Girls.

Top row, left to right—Mrs. Jacobs, Mrs. Walsh, Miss Magraw, Miss Grove, Mrs. Whipple, Mrs. Sellers, Miss Logan, Miss Brazier. Bottom row, left to right—Mrs. Weatherly, Mrs. Burnett, Miss Lindstrom, Miss Little, Mrs. Phillips, Miss Tewkesbury, Mrs. Langston, Miss Moran, Mrs. Midgley, Miss Fowler.

prized it because her mother had given it to her, and she was thanking me profusely when Mr. Stevenson struck second; so it is clear that his time was well within nine seconds, call it eight and two-fifths. The Globe Chemical Company, (Mr. Clancy), died at first because the Curtain Supply Company's Mr. Midgley made a clean pick up and throw. Our attention was again called to B. & O. preferred, when Mr. Beaumont made a line drive over second, scoring Stevenson. He stole second, stole third and scored when the catcher tried to trap him at third—all this at intervals while the mighty Gilman was striking out and Murray was advertising C. H. Besley by giving Mr. Allen a chance to catch his fly ball. Four runs.

The gentlemen from the West went out in 1, 2, 3 order. Mr. Hammond bunted and nearly, but not quite, beat it to first. Mr. Goodnow gave an easy pop fly to the second baseman and Mr. Downing struck out.

pois and 1,000 pounds of energy in the game and held the Flannery bolt. It was great. Carry, I mean Miss Iron, burst into tears of joy and rested her head on—but then there was another distraction for the National Boiler Washer, Mr. Gilman, was traversing space like a comet, and gathering Tarelton's long heavier-than-air balloon in his halo. No runs.

Fourth Inning.

Clancy sent a weak grounder to the pitcher, who threw him out at first. Beaumont struck out, so the umpire said, and kicked so decently and confidently that we all cheered him. Miss Iron cried a little and said the umpire was a robber. Gilman scratched to first and Murray gave the pitcher a nice high fly to hold. No runs. Allen made a fierce grounder toward shortstop, and here was an instance of fine team play: Beaumont made a great dash and running pick-up with Jeffery backing him up—an insured out at first. LaMar un-



Eastern Team.

Top row, left to right—Passmore, Oviatt, Stevenson, Dowling, Jones, Murray, Gilman, Cade. Bottom row, left to right—Clancy, Jeffery, Martin, Hibbard, Enright, Beaumont.

Third Inning.

Beaumont, full of honors, and hopes, came to the coachers box at 3d, and Oviatt batting, scared the life out of him with a line foul which nearly cut off his head. Beaumont handily turned a somersault, and then Oviatt lined safely between center and left. Jeffery tried to bunt, but Allen caught the fly and threw to Downing who dropped the ball and so failed to get a double. Mr. Dowling then violated the Inter-state Commerce law by accepting a free pass. No good came of it, however, for Mr. Enright struck out and Mr. Stevenson grounded to the pitcher who threw to first. No runs. Mr. Sharp, on behalf of the Armour Car Lines, struck out. The Flannery Bolt Company, Mr. Wilson, then, after making a flirtation foul to an Eastern lady in the grand stand, made a terrific drive to left, but Beaumont put 95 pounds avoirdu-

successfully bunted and Midgley was thrown out at first by Jeffery. No. runs.

Fifth Inning.

Oviatt was gladly hit by the pitcher, and Jeffery struck out. The shortstop made a wild throw of Dowling's grounder and Enright bunted safely. With the bases full the mighty Stevenson made a deep center drive, bringing in two runs and establishing temporary hindquarters at second. Clancy's scratch hit was the result of throwing the ball around a good deal in the hope of catching somebody. In the mixup, Enright scored. Beaumont made a long sacrifice fly to center and Stevenson scored. Gilman made a single, extended by courtesy to a double, and Clancy came home. Martin, taking Oviatt's place, singled, but Gilman was caught between bases. Five runs.

The effete East now made some changes: Jeffery pitcher, Dowling to short, Jones in place of left fielder Clancy.

The Western gentlemen finished their half of the fifth inning quite rapidly; Hammond got a pass and stole second, but couldn't pawn it, for Goodnow struck out, Downing died at first and Sharp filed out to Jeffery.

Sixth Inning.

Midgley, shortstop, changed places with Tarelton, pitcher. Murray and Martin singled. While the Western gentlemen were holding an impromptu post-mortem, Mr. Martin strolled to second, but Murray, less alert, was run out. Jeffery flew out to Tarelton. Dowling scratched to first. Enright made a great drive to center, scoring Martin and Dowling. Then we all cheered Tarelton for his running catch of Stevenson's high fly.

The sun seemed to be setting Westerly, for Wilson, Tarelton and Allen went out in an orderly manner.

Seventh Inning.

Jones found a nice safe place to land his drive over second, but Beaumont bunted and forced him out at second. Gilman sacrificed for Beaumont, and Murray brought him home. Then Martin died at first. One run.

Ristine (who replaced LaMar), Midgley and Hammond got no bases.

Eighth Inning.

Jeffery put a safe fly between center and shortstop, Dowling drove for two bases, Enright bunted and while our Western contemporaries were throwing the ball around, Jeffery and Dowling scored. Mr. Stevenson, already distinguished, made a beautiful three base hit, scoring Enright. Jones failed to reach first, and so also did Beaumont and Gilman. Three runs.

Although Downing and Sharp made nice safe hits they did not become assets, because Messrs. Goodnow, Wilson and Tarelton failed to make first.

Ninth Inning.

Murray and Jeffery went out at first. Martin got as far as third. Allen made a drive to center field fence. Ristine flew out to the pitcher. Midgley got a pass but was doubled with Hammond.

SOCIETY AT THE GAME.

The M. C. B. and M. M. "400" were much in evdence. In fact the society editor of the sporting edition of the *Daily Railway Age Gazette* counted many more than four hundred of the elect as they journeyed to the base ball grounds.

Some rode in automobiles, some in carriages, and some in roller chairs along the Boardwalk, while most of them, with characteristic democratic simplicity, took advantage of the free rides on street cars that the committee had provided. None walked.



Western Team.

Top row, left to right—Passmore, Allen, Forsyth, Sharp, Hammond, Downing, La Mar, Cade. Bottom row, left to right—Wilson, Tarelton, Midgley, Hibbard, Ristine, Goodnow.

Handsome gowns, recent importations from Cleveland, Chicago, New York and Wichita, Kan., made more or less expressly for the occasion, were noticed in the boxes and in the automobiles behind third base.

Many faultlessly dressed gentlemen from the great railway and railway supply centers of the country were also noticed among the crowd. The ultra-fashionable tendency during the afternoon among the sterner sex seemed to be natty negligee outing suits of white flannel trousers, blue serge coats (on the automobile seats), straw hats, canes and shirt sleeves.

Among the automobile parties noticed by the society editor and his assistants were the following:

Mr. and Mrs. O. M. Edwards, Mr. and Mrs. J. J. Edwards, Mr. and Mrs. E. F. Chaffee.

Mr. and Mrs. A. E. Ostrander, Mr. and Mrs. C. J. Frost

Mr. and Mrs. C. W. Owston, Jr., Mr. L. A. Shepard, Mr. Charles Harris, Mr. McCabe.

Mr. and Mrs. W. A. Blanchard, Mr. and Mrs. A. S. Blanchard.

Mr. Frank R. Coates, Miss Tobin, Mr. and Mrs. James DeVoy, Mr. F. T. Reese.

Mr. L. J. Hibbard, Mr. E. R. Hibbard, Mr. and Mrs. McBain, Mr. and Mrs. Bloxan, Miss Bloxan.

Mr. and Mrs. E. H. Gold, Mr. and Mrs. Vilas, Mrs. Eacutt.

Mr. C. T. Schoen, Mr. H. Montgomery, Mr. B. P. Flory, Mr. Walter P. Hudson, Mr. C. E. Rood.

Mr. and Mrs. C. B. Young, Mr. and Mrs. Walter B. Leach, Mr. and Mrs. R. D. Smith.

NOTES OF THE GAME.

Ristine says it was because the buffing stresses were too high.

It wasn't a Western bunch that sang vociferously: "How glad I am!"

Jaybill Johnson—but why multiply words? He is an excellent chaperon.

The Eastern Club, despite its excellent team work, never had played together before.

The Score Girls' chorus, "How dry I am," was suggestive of the usual feminine fondness for "pop."

Dives throws the dust of its glittering wheels over the tattered garments of Lazarus."

Brazier accuses his newspaper friends of a breach of confidence in repeating his story of how he first learned to eat "pi" in a printing office, and therefore we are a little timorous about saying he was at the ball game.

When Billy Wilson, who sells staybolts out in the Western Wilds, soaked that liner to short in the last half of the third, a great shout arose from the grand stand. Alas, it was a "bolt" all right, but it didn't "stay" and William was out.

The crowd was perhaps the largest that ever attended a ball game played as one of the entertainment features of the mechanical conventions. It was quite a noisy crowd, too, until the Western team blew up. That reduced is loudness by about 50 per cent.

Montague should have ground his horn to give it a sharper tone and polished his sleigh bells to soften their notes, but probably he did not know where to get any grinding or polishing machinery.

"You're out" yelled the umpire, when Midgley's fine h't to right was caught, and just then a pretty girl dressed in blue, standing in a group of Eastern sympathizers down near the carriage entrance, began to dance a cake-walk. Her graceful dancing caused a round of applause among her friends. Wonder who she was.

EAST.

	Ab.	R.	H.	PO.	A.	E.	SH.
Gilman, C. F.,	5	0	1	1	0	0	1
Murray, 2 B.,	6	0	3	2	2	0	0
Oviatt, 1 B.,	2	1	2	5	0	0	0
Martin, 1 B.,	2	1	0	5	0	0	0
Jeffery, S. S. and P.,	5	1	1	1	3	0	1
Dowling, P. and S. S.,	4	4	1	2	1	0	0
Enright, C.,	5	3	2	6	0	0	0
Stevenson, L. F.,	5	2	3	0	0	0	0
Clancy, R. F.,	2	1	0	1	0	0	1
Jones, R. F.,	1	0	1	1	0	0	1
Beaumont, 3 B.,	4	2	1	3	1	0	1
Totals,	41	15	15	27	7	0	5

WEST.

	Ab.	R.	H.	PO.	A.	E.	SH.
Tarelton, P. and S. S.,	4	0	1	3	3	1	0
Allen, 3 B.,	3	0	1	2	1	1	1
LaMar, 2 B.,	2	0	0	0	1	1	0
Ristine, 2 B.,	2	0	0	1	2	0	0
Midgley, S. S. and P.,	3	0	0	1	7	2	0
Hammond, C.,	3	0	0	5	2	0	0
Goodnow, C. F. and R. F.,	3	0	0	1	1	2	0
Downing, 1 B., and C. F.,	3	0	1	4	1	2	0
Sharp, R. F.,	2	0	0	0	0	1	0
Forsyth, 1 B.,	1	0	1	9	0	0	0
Wilson, L. F.,	3	0	1	1	0	0	0
Totals,	29	0	5	27	18	10	1

The incubator man knew his business. He always, after the first few innings, had another goose egg ready to hang up.

Messrs. Thomas and Cory, who on the Pier and at the hotel are inseparable, even at the ball game were not divided.

Wildin does not smoke, but he has no objection to receiving a paper of matches when they are tendered to him in a proper manner.

Paul Armstrong had a ripping speech on his chest, until the game was about half over, but he was not allowed to get it off. After that he didn't want to.

A crowd of former rah, rah boys in the southern end of the grand stand invented a new yell about the middle of the game. It was: "East, east, east; beat 'em, beat 'em, east, east!"

The band was placed in the northern part of the grand stand, and played airs after each inning, which in future are apt to be more popular as reminiscences in the East than in the West.

John Whitridge occupied a seat in a gasolene wagon and hustled unrecognizingly ahead of his former fellow-laborers in the newspaper field. Thus, even now, "the Chariot of

The Atlantic City Weather Man evidenly is a fan. It was hot, but fine until the game ended. Clouds gathered, thickened and glowered, but the Weather Man restrained their fury until those who attended had time to get indoors. Then—wow, how it did rain!

No; those were not life preservers that were constantly being hung up on the green board at the far end of the field. That is, they were not so intended to be used, but they saved the lives of the Eastern nine, as there happened to be just one apiece in the supply handed out by the Westerners.

The Score Girls occupied a box immediately back of the home plate, where they indulged in cheers and ginger ale. When a foul hit the netting and the bottles leaning against it rattled to the floor, it sounded like Carrie Nation and her hatchet condemning dissipated habits.

There was some difference of opinion among the Score Girls as to the actual score. The one who took our fourth assistant sporting editor into her confidence said that she thought it was 26 to 19 because she saw 26 Eastern men fall down "just before they reached those pillows," and only 19 Western men did. But she wasn't sure, because the dirt didn't show so much on the grey uniform.

MR. HOOLEY ON THE BALL GAME.

"Ye shud have wint to th' ball game th' Saturdah afternoon," remarked Mr. Hooley to his friend Dennissey as they were taking a little something to counteract the effects of electricity and rheumatism in the atmosphere, and as a possible preventive against evil results from cyclonic disturbances. 'Twas a gr-reat game."

'I heard wan man fr'm Tchicago say 'twas th' only game he iver saw whin there was only wan side to play," remarked Mr. Dennissey.

"I dinnaw th' inthricate features av th' game as 'tis played in these days," replied Mr. Hooley, "but I niver wint to a game where th' aujyence av fans dishplayed a greater degray av enthoosiasm. 'Twas a fine day, 'nd th' ride to th' Inlet Par-rk was a jy 'nd a plisure, for by th' change fr'm th' whale chair to a bus, 'nd fr'm th' bus to th' strate cars, 'nd fr'm th' strate cars to yer fate again. I hadn't intinded to have wint to the game but that wan av me friends carled me by tiliphone 'nd towld me I wud miss th' game av me life iv I didn't go. I missed me way.

"I wint to wan game, 'twas twinty years ago th' summer that is, but 'twas a professional game. "Th' min that played th' day was ammychoors. Ye say, Dinnissey, whin a big boonch av relrod min 'nd shupply min have to spind a few days togither with nothing particular on th' mind av th' relrod min, th' shupply min thry to kape thim enthertained. They get up dances 'nd yooker parthies 'nd vodville shows f'r th' avinin' enthertainmint 'nd sacred concerts f'r Sundah whin they play wan piece that's not in rag time 'nd whin some wan has songs like th' Rosary or th' Hooley City that she wants to get off her mind, they lit her sing wanst. That's a sacred concert, Dinnissey. But on Saturdah, whin it's plisint, 'nd not too foggy or too hot like it gin'rally is at 'Tlantic City in th' gladsome summer time, they get up a ball game. Sometimes th' relrod min play against th' shupply min, 'nd thin th' way th' shupply min disicrate th' name av ball players wud make ye think they thought relrod min was lineal descindants av gr-reat Jove himsilf. But whin, as it was on Saturdah, they get up two teams, wan fr'm th' Wist 'nd wan fr'm th' Aste' ye'd expict thim to play ball, wudn't ye, Dinnissey?"

"Thrue f'r ye, Mr. Hooley. Th' Wist niver takes a back sate f'r anny wan, nor anny aggravation av min," replied Mr. Dennissey, with the customary patriotism and civic pride of an adopted Chicagoan. "Did th' Astern team fall down?"

"They did that," replied Mr. Hooley, "but 'twas arlways on th' bag 'nd while th' Tchicago man was pickin' up th' ball, or wondherin' whither th' man who threw it wanted it to go to sicond or first base. They was wan or two plays that I saw that made me think th' min hadn't spint arl their time on th' bleachers, but might have tossed a ball or sthruck at ut with a shtick wanst or twict before th' wint to th' field. Whin I tuk me place among th' rayporthers, th' Midgley lad, him as sills curthains, was a sittin on th' ball f'r fear 'twud get away fr'm him as it had a way av doin' fr'm th' other lads. And, Dinnissey, 'twas a good thing that th' Midgley lad is tall. He gave wan twist to his back 'nd lit his right arm shwing in th' direction av th' man at th' base. 'Twas a good throw, Dinnissey, 'nd I niver saw th' like in th' game I was tellin' ye av.

"There was wan other thing I saw a wistern man do. Th' lad that thravels f'r th' Union Draught Beer Company, 's I undhershtandt ut, was playin' shart shtop whin he wasn't pitchin'. Arl at wanst th' man wit' th' shtick found th' ball 'nd sint it in th' air out toward th' sails av th' schooners in th' Inlit. T'ree times he was playin' there th' ball came his way 'nd he got used to it. Whiniver a man hit th' ball th' lad ran out as far as he cud in th' time that he had. 'nd begorrah, ivery time, as I may say to his surprise, he 'nd th' ball wint in th' same d'rection. 'Twas fine wurrk, Dinnissey, but barrin' th' fine sittin' av Midgley 'twas arl th' game I saw th' Tchicago lads play.

"'Twas a great s'ciety evint, Dinnessey. Th' gasoline buggies was parked in wan side av th' field, 'nd th' rail birds occupied th' fince be th' cinter field, 'nd th' scaw gur-rls in wite had boxes in th' front av th' shtand 'nd some av th' min that had been at th' convintion f'r as much as three nights were ringin' bills 'nd tootin' harns 'nd thrying' to make spaches f'r their own enjymint. Th' scaw at th' close av th' game was 15 to 0, 'nd th' official publisher wud have given th' wistern team more goose eggs iv he had have had em. Th' wistern team laid goose eggs that fast that th' man who had to hang thim up had to take two at a time nd set wan up handy so that he cud reach it without delayin' th' game.

"But th' hittin', Dinnissey. If th' lad that th' wan in th' middle av th' peeled place on th' ground was thryin' to hit wit' th' ball 'd had a shtick like—will, like th' Absecon lighthouse 't ye cud see in th' distance, th' ball might have hit th' shtick wanst in awhile. But th' little shtick 'nd th' ball cudn't get togither. Wan av th' min whin he wint to th' battin' pla-ace, wud arlways t'row his bat on th' ground whin th' ball was startin' towards him. He cud hit a ball as big as th' eart' but nothin' smaller. I'm shpakin' av th' la-ads fr'm th' great city av Tchicago, Dinnissey, 'nd 'tis a great relafe to me to raymimber that I've bin at th' hotel long enough f'r th' city av me risidince to be forgotten be th' hotel people. Th' la-ads fr'm th' Aste played a good game f'r min that are onlyy ammychoors. Whin wan av th' wistern lads by chanst hit th' ball or whin I shud say th' ball hit th' shtick he was holdin', he'd look around to see which way th' ball wint 'nd arlways found that it had wint to th' first base about th' time he thought av gettin' ready to run somewhere in that gineral direction. It always got there first.

"But they was wan thing I saw whin I first wint to me sate," added Mr. Hooley, thoughtfully, "that made me think iv th' Tchicago lads did get th' game 'twud be a meeracul."

"What was that?" inquired Mr. Dinnissey, "nd why didn't ye have 'em know th' luck was against 'em?"

"'Twas their own fault. Th' only grane things was th' scaw board 'nd th' grass, 'nd ivery mother's son av th' wistern team wint into th' game wit' orange sthripes around his ar-rms 'nd th' dicorations av th' pinnants they were playin' f'r was yellow. Th' Tchicago la-ads was just a part av th' scenery," replied Mr. Hooley in a tone calculated to end the conversation.

COMPARATIVE REGISTRATION FIGURES.

A comparison of records of attendance for the three years up to and including last year has been made from the official data of the Railway Supply Manufacturers' Association. The figures are as follows:

	Free Badges	Badges Charged For		
	1907	1908	1909	Increase
Railway Men	736	637	668	31
Ladies	1494	870	901	31
Supply Men	1919	1176	1368	192
Guests	528	572	751	179
	4677	3255	3688	433

The apparent falling off of 1422 at the time of the introduction of the system of payment for badges is partially offset by the duplication of names of railway men; while the actual increase for the second year of the working of the pay system is 433, as shown. It should be noted that in no year was any charge made for the badges for railway men.

Conventionalities.

Whipple is around introducing a new recruit in the form of H. F. Stevenson, who has just been elected secretary of the Whipple Supply Company.

Welling G. Sickel, who was formerly with the United & Globe Rubber Company, is attending the convention in the interest of the Hewitt Rubber Company.

The only man seen or heard knocking during the convention thus far is R. F. Hayes. He had a hatchet and some tacks and a poster announcing the vaudeville performance.

The military features of the euchre party on Friday evening were not extended to the alignment of the tables. Some ranks looked like the butt end of a St. Patrick's Day parade at 4 o'clock in the afternoon.

Everybody is glad that at last we have some weather that makes it appropriate to wear a light suit—everybody, that is, but the man who has got to buy a straw hat before he can put on his.

F. O. Fettinzer, of the Safety Car Heating & Lighting Company, kept our official score card at the game Saturday afternoon. It wasn't the easiest job in the world to keep it straight, but he is some score keeper.

Major Azel Ames, representing the Kerite Insulated Wire & Cable Company, and a member of the Board of Signal and Train Control of the Interstate Commerce Commission, is in attendance at the convention.

J. S. Seabury, who will be remembered as having attended the convention for several years in the interest of Massachusetts Mohair Plush Company, has been unavoidably detained, and will not be able to reach Atlantic City this year.

It is to be regretted that the title of H. H. Vaughan, assistant to the vice-president of the Canadian Pacific, appeared in our registration list on Saturday morning as "S. M. P." Undoubtedly, we notice it much more than Mr. Vaughan does; but, anyway, we fancy the error is one on Joe.

The gentlemen in khaki, who served at the Military Euchre on Friday evening, made a very presentable appearance and it was only in their consciousness of being in uniform and the occasional tripping over a sword that they betrayed any of the characteristics of Coxey's famous army.

J. D. McIlwain and C. S. Rea played as partners in the euchre game and won eight flags. It is understood that they were ruled out of the possession of the first choice of prizes owing to the difficulty of determining which had the more ladylike appearance.

Mayor Stoy, of Atlantic City, spent Saturday morning on the Million Dollar Steel Pier. He was introduced to the officers of the Railway and Railway Supply Associations whom he had not previously met, and later in the morning passed an hour among the exhibits.

It was not exactly a "crochet" effect that our imported base ball editor meant when he was describing the result of the use of a proper equipment of double body bolsters and double-coil nest springs in sliding bases. Knit. He wrote "ricochet." But this was in the Sunday supplement.

The headings to the several articles about the exhibit of the Sprague Electric Company puts one in mind of a haberdashery—or a scene on the boardwalk on a windy day. The only thing missing from the matter printed under the respective heads is some reference to a six months' guarantee against holes.

Louis Turivas is here in the interest of the Great Western Smelting & Refining Company. It is needless to say much about Louis, for every one knows him for his good fellowship. He has not attended these conventions lately, but a few years ago, especially at Saratoga, he was always in evidence.

The first number on the program of the "Song and Story Recital" to be given by Willa Holt Wakefield on Monday afternoon, is "The Girl With the Clockings." As B. L. T., the "Line-o-type Or Two" man of the *Chicago Tribune* says: "You can almost make a poem out of that."

Mr. and Mrs. William Marshall, who hold a long, unbroken record for attendance at these conventions, came pretty near to breaking the continuity. They had engaged steamer passage to the other side, but changed their minds just before sailing.

George A. Post arrived Thursday evening, and has since been dividing his discourses about equally between the devices sold by the Standard Coupler Company and the excellent work that the Railway Business Association has been doing in the way of educating public sentiment on railway affairs.

Leonard J. Hibbard, chairman of the base ball committee, devoted a great deal of time and labor to the arrangements for the base ball game on Saturday, and he deserves great credit for its success. He was ably assisted by the other members of the committee, J. L. Connors, Phillip J. Mitchell, Frank Martin, Fritz B. Ernst, W. J. Walsh and E. P. Smith.

Miss Jessie C. Lungren won a beautiful cut glass vase in the euchre contest and naturally feels disturbed that the nearest approach to a record of her triumph in the *Daily* of Saturday morning was the name "Miss Munger." Our apology is simply to refer to the fact that it was necessary to telephone all the names of winners of prizes to a Philadelphia print-shop at 2 A. M.

When the storm broke on Saturday afternoon it found the big windows forming the front of the *Daily* office wide open and, as usual in such cases, they stuck and wouldn't close. With the assistance of the canvas curtain serving as a sail, the wind lifted a desk off its base and would have overturned it had not a heavy weight member of the staff placed himself in the position of a brace. Later, when the heavens opened and the floods came, all desks had to be hauled to the rear of the space, telephone communication was cut off, the lights went out or wouldn't go on, the floor, and, incidentally, several pairs of trousers and shoes, were flooded and the editors engaged upon the "Base Ball Extra" gratefully accepted the hospitality of a kind neighbor, and did much of their work in his quarters. We were nearly shipwrecked, but succeeded in saving all lives, dope and other property.

CONSOLIDATION BY TRIAL MARRIAGE.

(Respectfully Dedicated to W. A. Nettleton.)

"Where are you going, Miss M. C. B.?"
"About my business, as you see."
"May I go with you where you go?
"You're kindly welcome, as you know."
"Will you help me manage my affairs?"
"I've my own work and many cares."
"I've money given in trust to me."
"I represent my family."
"Will you change your name—take mine instead,"
"My name is my fortune, sir," she said.
"But we can't unite on terms like that!"
"Nobody asked you to. That's flat."

THE ENGINEMAN'S LAMENT.

When the rails is wet and greasy and the sander's full of muck,
And ye hear the "whoosh!-whoosh!-whir-r-r-r" as the engine starts to buck,
And the clankin' of the couplers and the rattlin' of the brakes,
When your ten-wheel's got a load big as what a Mallet takes—
O, that's the time a feller is a-feelin' at his wust,
And he hopes the blamed old biler'll take another fit and bust;
Then he damns the roundhouse foreman up the scale and down, for luck—
When the rails is wet and greasy and the sander's full of muck.

They's something kinder sulphur-like about the atmusfere,
When ye've got to make the sidin' and the number two's most here;
Of course ye nurse the throttle and ye catch her best ye know,
And the fireman's helpin' all he kin to get her on the go;
But when sev'ral tubes are leakin' and the coal's about half slate,
And the stack's a-pullin' holes so 't ye see more'n half the grate,
Ev'ry time the wheels fly 'round, ye swear and cuss ye'er luck—
When the rails is wet and greasy and the sander's full of muck.

Poet Riley hears the raspin' of the tangled leaves of corn,
And the husky, rusty russel of the tossels, gold as morn,
And his heart is set a-clickin' like the tickin' of a clock
'Cause the frost is on the punkin and the fodder's in the shock.
You can see the yellow punkins, but they only make you think
Of that punkin-headed 'ostler who'd had another drink;
And ye'er golden corn-cob pipe's all right, but ye've got no time to suck—
When the rails is wet and greasy and the sander's full of muck.

Ef I wuz bossin' on the job, I don't know, but seems to me,
I'd have a roundhouse foreman who was bright enough to see
That an engine leaves the house all right, and fixed up for a trip,
And so't with decent handlin', there needn't be a slip:
And I'd fix the load accordin' to the tonnage she could haul,
And, just because they's lots of cars, not try to take 'em all;
Because, about five times in ten, it's just an engine's luck
That the rails is wet and greasy and the sander's full of muck.

GRAND OPERA.

At the reception this evening to President Wildin and his fellow officers the Cadets de Gascon will sing in grand opera at 8.30.

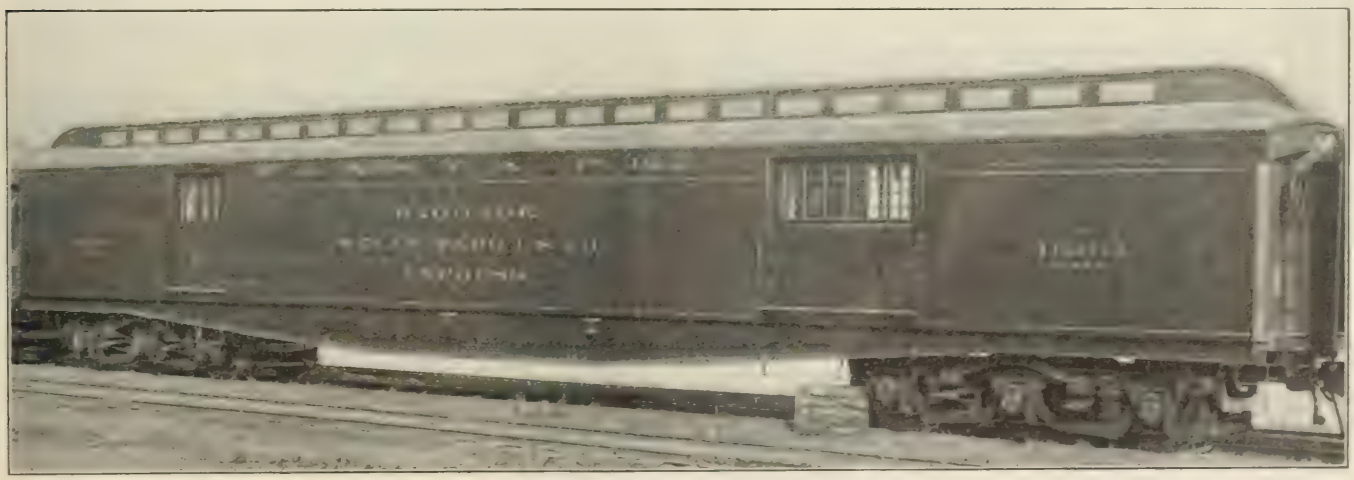
SONG AND STORY RECITAL.

Those who fail to hear Willa Holt Wakefield in her song and story recital, of which the program is given elsewhere, are assured in advance by the entertainment committee that they will miss an opportunity to hear an entertainer who commands a higher recompense for her work than any other entertainer in the country in a similar line.

SANTA FE 70 FT. BAGGAGE CAR.

The large baggage cars recently built for the Santa Fe by the American Car & Foundry Company, New York, are notable for the very stiff and strong construction used in the steel underframe. The superstructure is wood and follows well established practice, excepting that the ends are completely sheathed with ⅛ in. steel plates.

The cars have six wheel trucks with cast steel frames, 5 x 9 in. journals, 37¼ in. wheels. The weight of the two trucks is 42,500 lbs. and the car body 63,500 lbs.; total, 106,000 lbs. The center sills and side sills are fish belly girders with webb plates 5-16 in. thick. These are reinforced by angles at the top and bottom, and there is a ¼-in. cover plate on the top of the center sill. These latter sills are 30½ in. deep at the center and 13 in. deep at bolster and end sills. They have two angles 3 x 3 x ⅜ in. riveted to the bottom and one of the same size riveted to the top of the webb. The whole underframe is braced horizontally by 8 x ¼ in. plate diagonals and in the end panels by wide ¼ in. plate gussets. There is a 5 in. steel channel on each side for the intermediate sill. The double body bolster is made of open hearth steel plates, with pressed steel diaphragms and covers ¼ in. thick, reinforced on the bottom by ½ x ⅛ in. plates. Diaphragms ¼ in. thick and the full depth of the sills for crossbearers are located as shown on drawing. The construction and dimensions of the wood superstructure are shown in the detailed drawings. The roof covering is No. 6 duck, and the usual wood flooring 1¾ in. thick is used in connection with mineral wool deafening. The vapor system of steam heat, supplied by the Chicago Car Heating Company, Chicago, is used, and the lighting is by the Pintsch gas system. The brakes are Westinghouse schedule "L N," with American slack adjusters. The leverages are arranged to produce a braking power of 90 per cent of the light weight of the car.



Santa Fe 70-Ft. Baggage Car.

The Exhibit.

One of the new brake beams shown by the Buffalo Brake Beam Company that is attracting much attention, is a high speed, double truss, passenger beam with adjustable head.

The Independent Pneumatic Tool Company, Chicago, has sold to D. B. Edwards, of Atlantic City, the Thor motorcycle that has formed a part of the company's exhibit in booth 186-188.

John Havron, formerly president of the Rogers Locomotive Works, has been made president of the Walker & Bennett Manufacturing Company, with offices at 519 West Twenty-ninth street, New York. This company is placing on the market a new design of car seat.

The General Electric booth holds many machine tools which have been used in the shop. These were originally belt driven, but have been changed to motor drive. They are shown to prove the ease of changing the method.

engineers' brake valves and taper reamers. These parts were ground on machines similar to those shown in the exhibit, and the demonstrator in charge can give the actual grinding time required for each part.

The United States Express Company was unable to get space among the exhibits on the pier, so it has opened an office directly opposite the main entrance where special attention is given to both incoming and outgoing express matter for all points.

A very complete line of ground locomotive parts is being exhibited at the booth of the Landis Tool Company, Waynesboro, Pa. These include pistons, valve yokes, knuckle pins, crosshead pins, link blocks with plates, air pump pistons with rods, valve rod bolts, link bolts, triple valves, rotary

The Garlock air pump packing is put up in sets to exactly fit the stuffing box. It has had the most exacting service extending over several years in connection with different makes of air brakes. It is lubricated perfectly, prevents groaning of the air pumps, and does not cut or wear the piston rods.

The Long Island Railroad has been buying considerable quantities of car Karbolith from the American Mason Safety Tread Company, Boston, Mass. The New York & Queens County Railway is another recent user of car Karbolith. The new cars for the Harriman Lines, being built by the American Car & Foundry Company at St. Charles, Mo., will require over 10,000 sq. ft. of Mason safety tread.

The Buffalo Brake Beam Company, New York, is showing its new forms of trussed beams. The new section, consisting of a special form of channel for the compression member, is a radical departure in this line. The new beam has stood some severe tests and is strongly recommended for high speed service. This beam also shows a very high resistance on the transverse strain.

The Hunt-Spiller Manufacturing Corporation, Boston, Mass., is exhibiting this year in space 474-475, which is very near the company's location of last year. The exhibit includes castings made of the famous Hunt-Spiller gun iron, taken from service for exhibition purposes. There are also eccentrics and straps, crosshead shoes, driving box shoes and wedges, cylinder packing rings and piston valve bushings. The evidence of service rendered by these products is conclusive.

The T. H. Symington Company, Baltimore, Md., is showing a number of very interesting exhibits of Farlow draft gear applied to different designs of underframing, including Farlow attachments in combination with several friction gears. Special attention is called to the elimination in the Farlow draft gear of the yoke and yoke rivets necessary with some other types of draft gear; failure of these parts, it is claimed by The T. H. Symington Company, being a source of trouble and a heavy maintenance charge.

The Independent Pneumatic Tool Company, Chicago, is attracting an unusually large crowd with its display of air drills, hammers, and staybolt drivers. A complete line of these tools is included in this exhibit, and each class offers some new improvement in construction. The Corliss valve motion in the drills, duplex valves in chipping, chalking and beading hammers and one-piece riveting hammers are a few of the desirable features found in these machines.

A special spring plug cock, designed to overcome the disadvantage of the ordinary cock, is now manufactured by the National Tube Company, Pittsburgh, Pa. Considerable trouble and annoyance may be caused by a defective cock. The special spring plug cock made by the National Tube Company, Pittsburgh, Pa., is proof against much of the injury to which common cocks are subjected. The advantages should be readily recognized; and this new type of cock should not be overlooked by the mechanical man interested in improving his equipment.

The Garlock locomotive throttle packing has been adopted as standard by many railways. A blow-out with this packing is next to impossible. A semi-metallic bottom ring guards the fibrous rings from water where the throttle stem enters the boiler head. It is said to last longer and give better service than any other material that has been used for this service. Known as style 3200, it is put up in sets to fit exactly the stuffing box.

Style 3222 differs from 3200 in that it is a special throttle packing and made to meet particular and exacting conditions, like stuffing on the steam dome, etc.

When a prominent superintendent of motive power was asked for information as to the saving accomplished by the use of mica headlight chimneys, he remarked to Mr. Storrs, of the Storrs Mica Company, Owego, N. Y., while waiting for the figures from his clerical force, that regardless of the comparison in cost of chimneys he would continue to use the mica chimney in all his headlights because of the marked decrease in the number of headlight failures which was clearly effected by the use of the mica chimney. He considered the benefits from their use more than offset the increase in cost. The figures, however, are said to have shown a saving in favor of the mica of over 30 per cent, and other roads have shown even a larger saving.

The claims of merit possessed by the "Boss" nut, manufactured by the B. M. Osbun Company, Chicago, are based upon its biting edges operating in combination with a common nut and bolt; also its yielding character in springing backward, when forced by a wrench, until its threads sink firmly into the valley of the bolt thread. The "Boss" nut can be taken off, but only by the use of a wrench; and it can be put on again, same side as used before or the reverse side, as many times as could possibly be desired. Another claim for the nut is, that it is absolutely "fool-proof." When bent or sprung backward its threads register more deeply into the bolt threads. Vice-President D. O. Ward, of the Osbun Company, is greatly pleased with the reception the device has had among the railway men at Atlantic City.

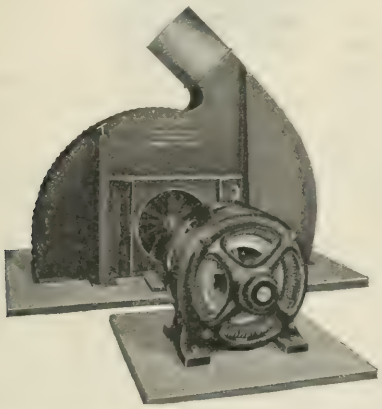
BLOWING EQUIPMENT FOR FORGES, FURNACES AND CUPOLAS.

The proper air supply to the cupola is the chief consideration leading to economical, rapid and continuous melting, also to the fine quality of iron obtained. Both volume for perfect combustion of fuel and pressure to overcome resistance within the cupola have to be thoroughly understood and carefully considered. Assuming that for usual service various capacity tables published by manufacturers are reasonably reliable and a centrifugal blower of standard pro-

portions is selected for the work, the user is hen confronted with the problem of how to drive the blower most economically. The speeds are usually excessive for motor drive, and where alternating current only is available and certain fixed motor speeds have to be considered, direct connection to standard centrifugal blowers is impossible. The same problem must be solved in large railway shops where air at high pressure is required for supplying blast to oil burning furnaces, etc. The desirability of doing away entirely with countershafts and belts is apparent. Gearing is not satisfactory, and is uneconomical.

Appreciating the need of a centrifugal blower to which could be direct connected an electric motor wound for standard speeds, the American Blower Company, Detroit, Mich., designed and put on the market the "ABC" special centrifugal blower. Blowers of this type are being used at the various plants of the American Car & Foundry Company, by the Grand Trunk, at Battle Creek, Mich., and the Central of Georgia for forcing forge fires and oil burning furnaces. By increasing the diameter of the impeller and altering the proportions of the other parts, the speed can be made to conform with that of any motor, and, at the same time, the blower will produce any pressure and deliver any volume of air within the possibilities of accomplishment with centrifugal pressure blowers.

These blowers are built entirely of steel, and are amply strong for the severest conditions. The motor is attached by



ABC Special Steel Motor-Driven Pressure Blower.

a flexible coupling, which avoids any trouble from imperfect alinement through the use of four bearings in a row, two of which are on the motor and two on the blower. These blowers will produce pressures up to 20 ounces per square inch, at moderate speeds, and run coolly and quietly. They are far more efficient than smaller blowers, require much less space than belt-driven outfits and are no more troublesome than the motor. The strain on the bearings, due to the belt pull, is entirely eliminated, and, owing to the slower speed, the tendency to heating of the bearings is materially reduced.

APPRENTICE INSTRUCTION.

There are two methods of apprentice instruction now in operation on railways in this country; one in which the instruction is made a part of the work of the railway staff organization; the other is the method pursued by the International Correspondence Schools, of Scranton, Pa. This school has its system in operation on several roads with considerable success. It is educating a number of apprentice students by bringing them to these conventions. There is a group of more than a dozen young men who, by their proficiency in their studies, have won this privilege and are enjoying it to its full extent. They are spending their time in observing and studying the exhibits. The Railway Department of the International Correspondence Schools, Scranton Pa., has the results of the work of those energetic young men on exhibit in Space 26.

McCONWAY & TORLEY COMPANY'S NEW TRUCK DESIGNS.

In the exhibit of the McConway & Torley Company, Pittsburgh, Pa., will be found the various forms of M. C. B. couplers which have become so well introduced on many of the large railway systems. These include the original Janney passenger coupler, the Pitt freight coupler, the Buhoup 3-stem passenger coupler, the Pitt tender coupler and the Pitt pilot coupler. The company also exhibits a platform showing the Pitt coupler adapted to passenger service and specially designed for the new steel passenger equipment of the Pennsylvania Railroad. In this coupler the head is hinged on the shank by a large pin. It is also porvided with the McConway centering device. The uncoupling rigging is arranged with a side handle so as to uncouple from the ground, and also with a handle on the platform for uncoupling in the usual manner.

This company displays this year some interesting developments and improvements in cast steel truck side frames. One of these is shown in full size casting. The Buhoup cast steel side frame, in addition to the ordinary requirements of the Diamond truck, has distinctive features peculiarly its own. The prominent feature is the adjustable bolster columns, which permit of the insertion of the bolster after the balance of the truck has been assembled; and also of the removal and replacing of bolsters without disturbing any other part of the truck. These bolster columns are hinged on trunnions at the bottom and held in place by a large pin near the top. When it is desired to remove the bolster these pins are pulled out, the columns are thrown back, rotating on the trunnion, and the space is thus widened so as to permit of the easy removal of the bolster. The lower portion of the frame is extended out under the journal box and cast integral with the main frame, thus dispensing with the use of tie bars and all nuts on the journal box bolts, a split key in each bolt being sufficient to secure the box. This avoids the trouble due to the removal of rusty nuts from the journal box bolts and makes it quite easy to renew boxes in repairs.

Another advantage of the hinged bolster columns is the fact that when they are worn they can be easily replaced with new ones, and the main truck side thus becomes a good as new. The brake shoe hanger supports are also cast integral with the bolster columns, so that the brake shoes are maintained at a constant distance from the rail.

This company also exhibits a model of the new Buhoup flexible truck. In this design the bolster has projections on each side which extend through the truck side, with braces on the outside of the truck frame. These projections have widespread spring bearings, so that the tilting action of the truck on rough track is taken up by the springs and not transmitted rigidly to the bolster. The arrangement in effect makes use of the truck frame as an equalizer, and there is thus obtained the benefits of flexibility corresponding to the equalized truck by the use of a much less expensive design. The model has the rails equivalent to a vertical offset of 1½ in. in full size track, and when the model truck is run over this, making a considerable angularity in the truck side, the bolster remains horizontal; and the motion due to such irregularities in the track is not transmitted rigidly to the bolster, as it is in the ordinary rigid truck frame. The central portion of the bolster end is supported on springs in the lower pocket in the usual manner. There are thus four helical springs under the end of the bolster and one under each end of the transmission bar, making six springs in each truck side. By this method more spring motion can be obtained than is possible in the space ordinarily provided for bolster springs. The truck side also has cast projections which carry a bracket for the

brake shoe hangers so that the brakes are hung to the truck side and not to the bolster; and they do not move up and down with the motion of the bolster, but are maintained at a constant distance from the rail.

BRILL IMPROVED BRAKE HANGER.

An important feature of the heavy electric truck at booth 403, that of the J. G. Brill Company, Philadelphia, is an improved type of noiseless brake hanger. This device is new to most of the steam railway master mechanics, for heretofore it has been used only on electric trucks. Since its adoption for all Brill trucks, two years ago, the "half ball brake hanger," as it is called, has proven to be the most advanced type of noiseless and self-adjusting brake hanger ever put on the market. Master mechanics and all interested in truck matters who have not examined this hanger should make a special point of doing so.

A full sized model, with M. C. B. brake shoe and holder, is at hand to help to explain clearly the mechanical features. The adjusting nuts which have defeated the purpose of most noiseless brake hangers are omitted, and it is not only self-adjusting for wear of the hanger parts, but also for changes in the relative position of brake shoe and wheel. The device consists of a pair of hanger forgings with half-ball ends. The ends are held firmly in hemispherical sockets; a spiral spring on a bolt, which is in tension against the spring, being utilized for each pair of hanger ends. The half-ball ends of the hanger forging are milled and the hemispherical sockets of the malleable castings into which they fit are reamed, providing an absolute fit. The load and all movement, and consequently all wear, are brought upon the two finished surfaces, for the bolt which passes through the malleable socket casting and the hanger ends, and on which the compression spring is placed, serves entirely as a compression member for the spring and carries no other load, and is never in shear. In fact, the hole in the socket casting through which the bolt passes is one-eighth inch larger than the diameter of the bolt. This allows a slight torsional movement and makes the hanger self-adjusting for lateral motion of the wheels.

EXHIBIT OF AMERICAN BRAKE SHOE & FOUNDRY COMPANY.

The American Brake Shoe & Foundry Company, Mahwah, N. J., has its usual attractive booth and complete exhibit of brake shoes in space 411. A complete assortment of improved brake shoes is exhibited, some of which are the regular standards in general use, while others show improvements in construction which are well worth the careful attention of all interested in brake shoes for locomotive, coach and car service. The improvement in locomotive brake shoes consists in reinforcement of the cast iron body from face to back, locking the inserts which give durability, friction and tire dressing benefits to the body metal, and preventing the falling out of inserts or the falling away of portions of the body metal during the life of the shoe. The same principle is applied to shoes for heavy passenger service, the amount and character of the inserts being varied to meet the conditions to be met.

The report of the M. C. B. brake shoe committee on tests of brake shoes, both on the Purdue and American Brake Shoe & Foundry Company machines, indicates the superiority of the Diamond "S" brake shoe, both in friction and durability, over all other shoes in test, excepting shoes which are very injurious to the wheels. In the consideration of brake shoes it is well to bear in mind certain *facts*, as follows:—(1) Some shoes hold well and wear fast; (2) some shoes hold less and wear longer; and (3) some shoes hold well, wear long and cut wheels. But the Diamond "S" shoes hold well, wear long and do not cut wheels.

The Diamond "S" construction is shown in the illustration. It is not new, as this type of shoe has been largely used for many years; but the Diamond "S" shoe of to-day has been specially developed with reference to the heaviest and hardest service incident to the improvements in brake mechanism for the high speed trains of modern railway service. It is a reinforced shoe from face to back, with the highest friction and longest life without any bad effect on steel tired or rolled steel wheels. The Diamond "S" shoe will stand up



The Diamond "S" Brake Shoe.

when the plain cast iron shoe melts or falls to pieces, and the chilled shoes disintegrate. These things were proved in the exhaustive tests made on the Lake Shore road last year.

For freight service the Diamond "S" shoe is the most suitable. Its high friction, long life, and harmless action on the wheel tread will increase the efficiency of the brakes, while reducing the cost of maintenance.

The representatives of the American Brake Shoe & Foundry Company are waiting to explain, with sample illustrations, all the improvements and good points of the concern's products. Drop in at booth 411.

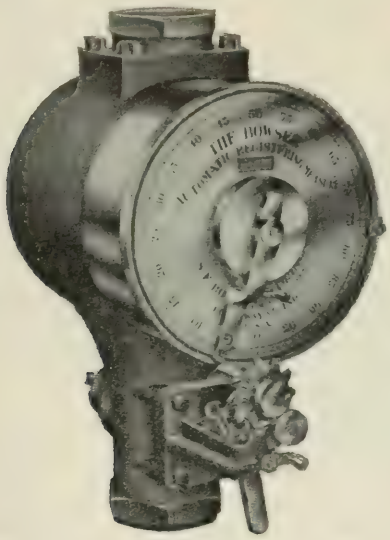
THE BOWSER AUTOMATIC MEASURING PUMP AND METER.

The Bowser system of oil storage, transmission and measurement has been so extensively introduced that its features and advantages are now well understood. The fixtures required for railway oil houses are illustrated by a variety of samples in the exhibit of S. F. Bowser & Company, Fort Wayne, Ind.

Attention is now called to two important additions to the company's line of pumps and measures. To meet the demand for a more rapid method of filling barrels, mixing vats and supply cars, it now furnishes an automatic self-measuring power pump. This pump can be belted or directly connected to any source of power, such as electric motor or line shaft, and wherever located will pump oil any distance from the storage tank and accurately measure any desired quantity, from one to 1,100 gals. When the indicated amount is drawn, the pump stops automatically. If it is desired to fill barrels with 50 gals. of oil, the pump is set at this figure, and it will only cease pumping when the 50 gals. are drawn, unless purposely shut off. Barrels are thus filled one after another as fast as they can be handled. The oil is pumped in this way at the rate of 15 to 20 gals. a minute. In a paint shop this new pump will accurately deliver any required oil or other liquid directly into the mixing vat. It can be set for several

hundred gallons of benzine or for 100 gals. of varnish, and no other attention is required. The exact quantity of liquid is delivered in one-tenth of the time otherwise required.

The Bowser automatic registering measure is another new improvement made by this company, and it is designed to record and control the flow of oil through a pipe of any diameter where the force is supplied by gravity or pressure. It not only acts as a meter registering up to 100,000 gals., but it can be set for any amount from one gallon to 1,100,



Bowser Automatic Registering Measure.

and when the desired quantity has passed through the meter will shut off instantly. This meter is especially useful for filling tenders of oil-burning locomotives, and by its use the consumption of oil by locomotives can be accurately measured and recorded. It is also useful for filling storage tanks directly from tank cars.

In addition to the large business with railway oil houses, S. F. Bowser & Company have developed a large trade in connection with the supply of gasolene for automobiles, and the various features which have been found so convenient and useful in the locomotive oil houses are here employed.

SCIENTIFIC FACTS ABOUT RIVETS.

The Champion Rivet Company, of Cleveland, Ohio, the first rivet maker in the United States to inaugurate a series of standard dimensions for rivetheads and formulæ for finding dimensions, has compiled a very valuable and useful book of information embodying the most important specifications adopted by the United States government and various bureaus of inspection and test in this and foreign countries. Included also are a number of original articles, written especially for this work, on "How to Heat and Drive Good Steel Rivets." Copies of this book may be had on application to W. H. S. Bateman, general eastern and southern sales agent, whose headquarters is at the Parkesburg Iron Company's booth, 388.

THE BETTENDORF PLANT.

A few miles from Davenport, Iowa, and running from the Mississippi River back up to the high ridge of land that parallels the river, is located the town of Bettendorf. A few years ago the farms stretched unbroken where now the plant of the Bettendorf Company covers acres of ground.

The great Bettendorf plant, as shown in the accompanying illustration, stretches along the river, and not far from it, for nearly a mile. At the left of the illustration is shown the new steel foundry which has been built during the last year. This building is 400 ft. x 800 feet. The building immediately in the foreground and in front of the foundry is the office building. The main office building will be seen in the center of the picture in front of the main erecting shop, which extends in its entire length for about half a mile. The machine shop, power house and other buildings are located between the main erecting shop and the river.

Twenty-four hours in the day, train load after train load of the raw material is taken into the plant, and as many more trains taken away of the finished product.

Not only because of the originality of design, but also because of the economical manner of construction, the Bettendorf plant is easily one of the most interesting among the many plants of the various railway supply companies of this country.



Plant of the Bettendorf Axle Company.

HOBART-ALLFREE VALVE GEAR.

The new radial valve gear designed by the Hobart Allfree Company, Chicago, is shown in booth 135 by a model of a complete locomotive. The new valve gear is an outside gear of the radial type and is said to possess all the advantages of other gears without some of their objections. There are no sliding joints, no links or link blocks, and the joints have bushings. This gear was described with illustrations in the large and easily lubricated pins with removable bronze *Railway Age Gazette*, June 17, page 1574. An inspection of the model will show its extreme simplicity. It is easily accessible from all points and the maintenance cost should be quite low. A handsome catalogue, which fully describes and illustrates this gear, can be obtained at the company's booth, or by mail on application. In addition to the illustrations, the catalogue contains a table of valve events taken from a Kansas City Southern engine. These show the actual performance of the gear on a locomotive in regular operation.

NATIONAL SASH BALANCE.

The National sash balance, made by the National Lock Washer Company, Newark, N. J., is a specially constructed spring roller, located in the heading above the sash, and connected with the sash by belts, having brass straps at either end, making a soft, noiseless fixture. The webbing is chemically treated so as to make it water and fire-proof. The company is also furnishing chain connections with this balance, when desired, and has a newly-patented attaching device for fastening the chains to the roller. These chains can be adjusted to any position along the roller, which does away with soldering chains to roller.

FORSYTH HIGH CAPACITY RADIAL DRAFT GEAR AND YOKE.

The high capacity radial draft gear, made by Forsyth Brothers Company, Chicago, is illustrated in Fig. 1. It depends for its cushion upon spring friction plates. These latter are deflected between followers having oppositely curved surfaces between which the plates lie. The curvature of the contacting faces of the followers are within the elastic limits of the plates, and no matter how many plates are used or how severe the buffing shocks, the plates can never become set or injured. The friction developed between these plates is very great; and operates to dampen the recoil to a wonderful degree. This gear in spite of its high capacity (300,000 lbs., or as much more as plates are added) is unusually short, the standard distance between the draft lugs being only 19 in. Also its high capacity can be obtained with a 6½-in. butt of drawbar. The shorter yoke and smaller pocket required, therefore, with this gear, makes the cost of application remarkably low.

The main thing about a draft gear, is not whether it affords a high capacity cushion under gradual strains; but whether it does this under sudden shocks particularly under buff. The Forsyth gear is unique, in that it affords even higher shock absorbing capacities under abrupt than gradual shocks.

The price of the gear is also especially low, from the fact that all the followers are furnished complete. And with most standard gears the carbuilder or road are required to furnish the end followers. In using the Forsyth gear, therefore, there would be a saving owing to this of several dollars per car.

The Forsyth gear can be used with the ordinary wrought iron yoke and with the end followers having the customary flat outer faces. The end followers are here provided with concave formations, and bearing against the latter are convex blocks. Where a wrought iron yoke is used, these convex blocks are riveted at its inner end (taking the place of the filler casting at this point recommended by the M. C. B. Association) and to the top and bottom walls of the yoke immediately back of the drawbar butt. Where the Forsyth cast steel yoke is used, on the other hand, these bearings are cast integral therewith, no riveting of same is required.

One of the greatest problems that the road has had to contend with has been the shearing of yoke rivets and this has been found to be due not so much to draft as to side strains. Heretofore, to maintain a yoke on substantially the center line of the draft rigging, it has been customary to have the follower stops, or draft castings, extend to within a short distance of each side of the yoke, with the result that after the coupler has been moved over a slight distane to one side, as on a curve, the drawbar has been turned into a crowbar. The follower stops, or draft castings, have first become fulcrum points and then the yoke has become actually bound or wedged in between the same. Further, side travel of the drawbar has naturally resulted in a deliberate shear being transmitted to the yoke rivets. In other words, the drawbar and the yoke have been to each other as shear-blades, and it is a small wonder that under these conditions the rivets have been sheared. An examination of freight cars that have been in service for any reasonable time will show a very large percentage of the yoke rivets loose and this has been primarily due to the side-shearing strains. In other words, the yoke should be allowed perfect freedom of lateral strains, along with the drawbar rigidly riveted thereto; and to make this possible, sufficient clearance must be allowed between the follower stops, or draft castings, and the yoke; and especially between the inner end of the yoke and the rear follower stops during buffing on curves. The latter is true, because under buff on curves the pivotal point is between the end of the drawbar butt and the front follower, and this point is further away from the inner end of the yoke than the carry iron. Consequently, clearance at the latter point has to be greatly increased as between the inner end of the yoke and the rear follower stops. This latter can only be obtained by tapering the yoke, according to the Forsyth design, toward its inner end; and in order to do this and at the same time maintain the uniform strength of yoke, the latter has to be vertically tapered in the opposite direction.

The Forsyth yoke further does away with the shearing of the yoke rivets, because it engages the drawbar butt between two sets of shoulders, namely, the forward inwardly turned ends and the bearing blocks cast in one piece with the yoke immediately back of the drawbar butt. If desired, although not necessary, there can be used with the Forsyth yoke the third rivet in advance of the drawbar butt.

Aside from its extraordinary strength and doing away with all shearing of the yoke rivets, the Forsyth yoke possesses the essential qualification that it does not require a special drawbar, which in freight equipment is impracticable. Furthermore, it will be remembered that in the ordinary wrought iron yoke something like 33⅓ per cent of the metal lying back of the drawbar butt is waste: for the reason that the yoke is no stronger than the metal left on each side of the rivet holes. In the Forsyth cast steel yoke, however, enough metal is added on each side of the rivet holes to offset the weakening effect of the holes and to maintain a uniform and higher cross-sectional area and strength of the yoke than the ordinary wrought iron one. The Forsyth yoke also provides what has been long sought, namely, rounded bearings between the followers and the yoke so that under draft and buff on curves the ordinary canting and edgewise cramping of the followers and gear is done away with. In other words, under buffing and draft on curves as well as straight track, the strains are applied on the center of the gear.

The Forsyth yoke, therefore, in a word, not only affords the simplest and strongest connection between the drawbar

and draft gear without any departure from present standards, but it also does away with the shearing of yoke rivets by allowing perfect freedom of side swing of the yoke along with the drawbar. Under the outward thrust of the spring plates (and without the use of any additional centering device) the "radial" feature (including the concave and convex

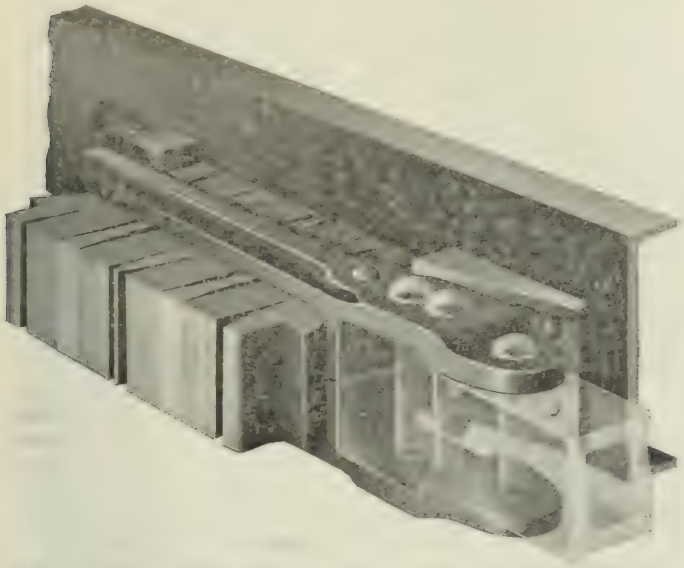


Fig. 1.—Forsyth High Capacity Radial Draft Gear and Yoke.

bearing surfaces) of the Forsyth gear automatically return not only the drawbar, but also the yoke to its normally central position; while at the same time permitting both under draft or buff on curves to swing freely into the line of draft or buff. A drawbar centering device, which engages the

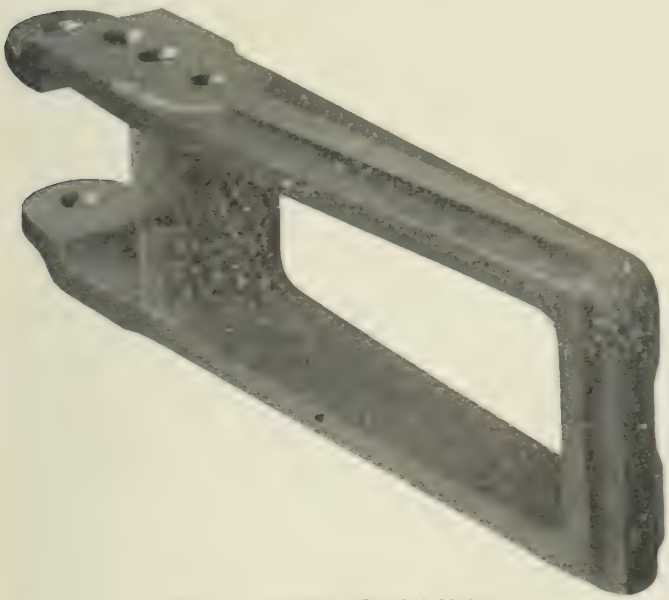


Fig. 2.—Forsyth Radial Yoke.

drawbar at the carry iron is not practical in freight equipment, owing to the fact that it does not return the yoke as well as the drawbar to its normal position when the yoke has the clearance necessary to avoid shearing of its rivets.

The Forsyth end "radial" followers can be used with any standard draft gear, in which case their inner faces are made flat; and the Forsyth yoke can also be used with other draft riggings.

The Forsyth Brothers Company control and own the fundamental patents on this type of plate gear; on the radial feature and on the Forsyth yoke; in spite of which the prices of these devices are extremely reasonable. The Forsyth high capacity radial draft gear and cast steel yoke have been tried out in extensive and most-severe service and have proved altogether satisfactory and accomplished the ends for which they were intended.

SIDE FRAMES AND SIDE BEARINGS.

As the weight and capacity of freight cars increase, the arch bar construction of the trucks becomes responsible for a considerable percentage of the delay to the car on the repair tracks, on account of the continual adjustment required and the replacing of broken or lost parts.

To replace this construction, the American Steel Foundries, Chicago, designed a cast steel side frame of the Andrews



Andrews Steel Foundries Side Frame.

type, which included in one piece as many parts of the arch bar design as were considered desirable, considering the delay to the car when worn or defective wheels were being replaced.

Frames of this design are being produced at the Granite City, Ill., plant of the American Steel Foundries at the rate of 1200 per day of 24 hours, and the accompanying cuts will give some idea of the appearance of the frames as they come through the shop, and of the facilities and capacity possessed by the American Steel Foundries for work of this character.

In addition to the regular types of Andrews side frame

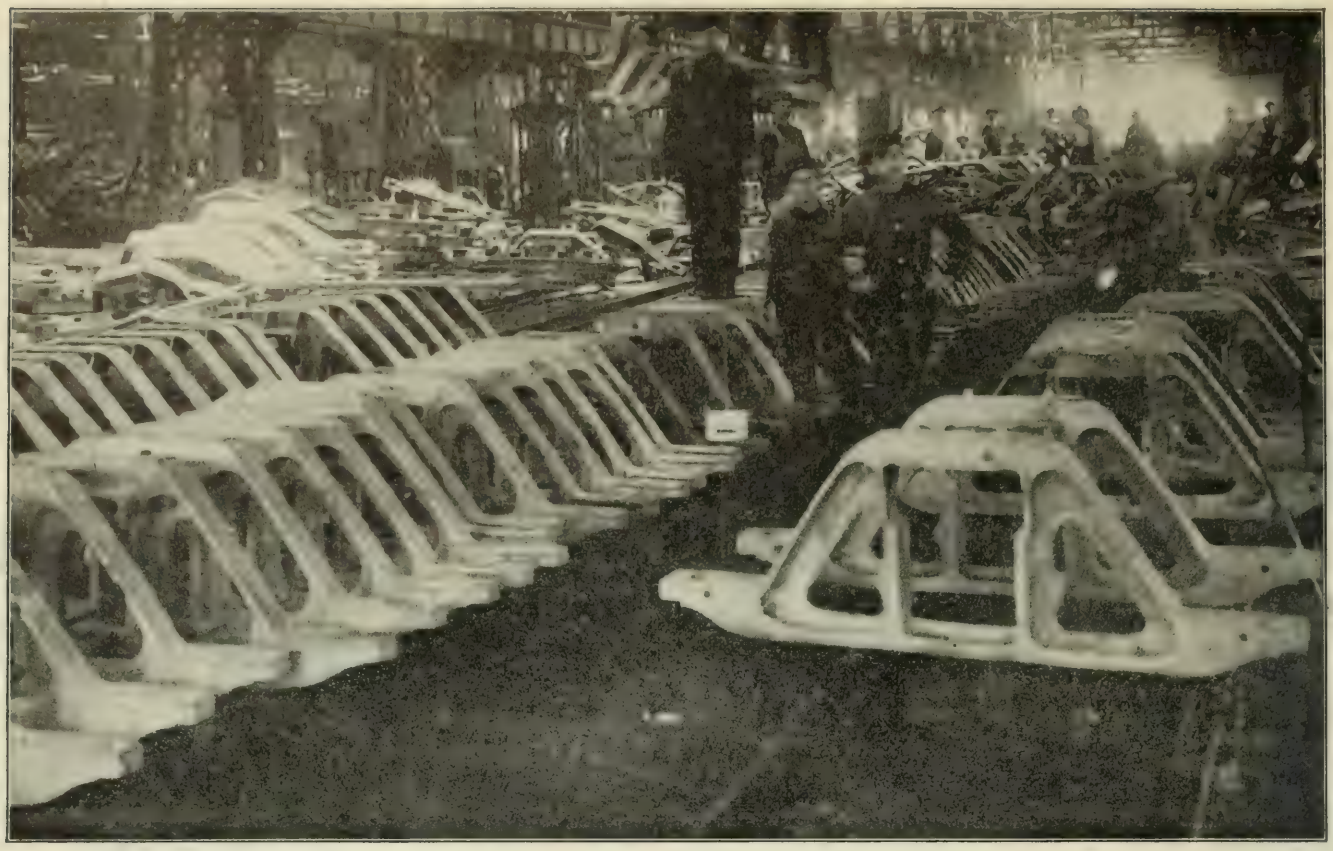


Susemihl Side Bearing in Extreme Position.

as made at the present time, a special frame, shown by the accompanying cut, is being exhibited. This design is known as this company's pedestal type of frame. As will be seen, it does away with tie bar and oil box bolts.

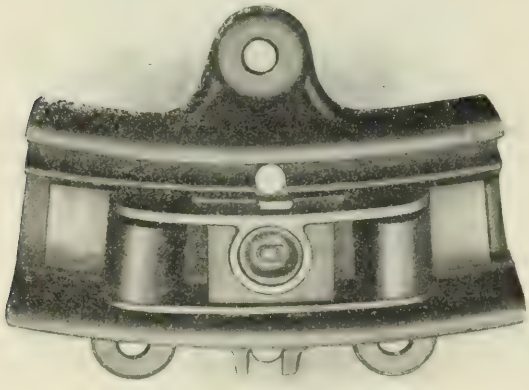
Several types of Susemihl roller side bearings are also being shown at the exhibit of the American Steel Foundries. These are of interest since they accomplish what has proven desirable in any design of roller side bearing, namely, the ability to act as ordinary side bearings in case they are broken or disarranged.

About 250,000 of these bearings are in service on 75 different railways and private car lines and the opinion expressed by those who have had the most experience is that they pay for themselves in one year through saving of flange wear.



Interior of Granite City Plant; American Steel Foundries.

A practical and successful roller side bearing must have some effective means of confining the rollers to prevent them from being lost, and also to prevent friction between the rollers themselves. It is also necessary to employ some method of compelling the rollers to roll and of bringing them back again to their proper position between the bearings even when unloaded. The Susemihl bearing has been designed to meet all these conditions and in the simplest possible form, consisting of two hardened steel rollers fitted in



Susemihl Side Bearing Carriage and Rollers.

a carriage and operated between top and bottom hardened steel plates. In case the car becomes separated from the truck bolster, the side bearings remain intact with the truck bolster and it is impossible for any of the parts to fall out or become misplaced.

The American Steel Foundries furnish Susemihl roller side bearings in a variety of designs to suit truck requirements when used under tenders, passenger equipment or freight cars.

THE ILLUMINATION OF A LOCOMOTIVE ERECTING SHOP.

The importance of an abundant supply of light for locomotive erecting shops is generally recognized. The fact that the materials upon which the work is to be performed are in varying positions, and of widely different sizes and conditions, necessitates a general illumination with as complete absence of shadows and as nearly uniform intensity as it is possible to obtain. With windows rising to a height of nearly 40 ft. on each side, and with an extensive skylight over the center, the means of securing this condition with natural light is provided as completely as structural necessities will permit.

The artificial lighting problem in this case is unquestionably to produce as nearly as possible the conditions of the daylight illumination.

On account of the traveling cranes the location of the lighting units is practically limited to a position above the truss chords of the roof. Furthermore, practically no assistance can be expected, either in the way of additional diffusion or increase of intensity, from reflection from side walls or ceiling. The large area of glass has but little reflecting power, and the walls and ceiling are too begrimed with smoke to afford any assistance worth reckoning.

The problem then narrows itself down to providing direct general illumination of sufficient intensity to enable the workmen not only to see to handle the heavy materials, but also to distinguish fine details, as in reading scale divisions, scriber and prick-punch marks, and the cutting edges of tools.

In the case of the Pennsylvania Company's erecting shop at Fort Wayne, the problem was solved by the installation of Cooper Hewitt lamps. The type used is the double tube pattern (Type H H), shown in Fig. 1. The tubes are each 1 in. in dia. by 20 in. long, and consume normally 192 watts per



Fig. 1.—Type H H Cooper Hewitt Lamp.

tube, or 385 watts per lamp. The lamp is provided with a white enameled steel reflector placed above the tubes. The location of the lamps is shown in the diagram, Fig. 2, being staggered between the roof trusses on either side 20 ft. apart.

Three tracks are run lengthwise through the shop, the center one traversing the entire length; the two outside tracks, placed 15 ft. from the walls to the center of the track, run through the east half of the shop only.

Illuminometer readings were made in a section of the northwest corner of the building. This was chosen as being freer from high machinery and obstructions than the other end. This quarter of the shop was divided into thirty-two equal rectangles, each 20 ft. x 19 ft. 9 in., in the center of each of which a reading was taken at a plane 5 ft. above the floor, the average height of the eye when standing. In no position did any of the machinery intercept the direct light from the lamps to the illuminometer.

The reading* at each station is shown in the following table:

Station.	Foot-candles.	Station.	Foot-candles.
1	.208	17	.313
2	.392	18	.545
3	.495	19	.700
4	.593	20	.781
5	.650	21	.745
6	.570	22	.808
7	.483	23	.747
8	.440	24	.693
9	.495	25	.750
10	.588	26	.786
11	.701	27	.830
12	.563	28	.772
13	.581	29	.795
14	.686	30	.820
15	.805	31	.855
16	.690	32	.825

*Measurements by Sharp Millar portable photometer.

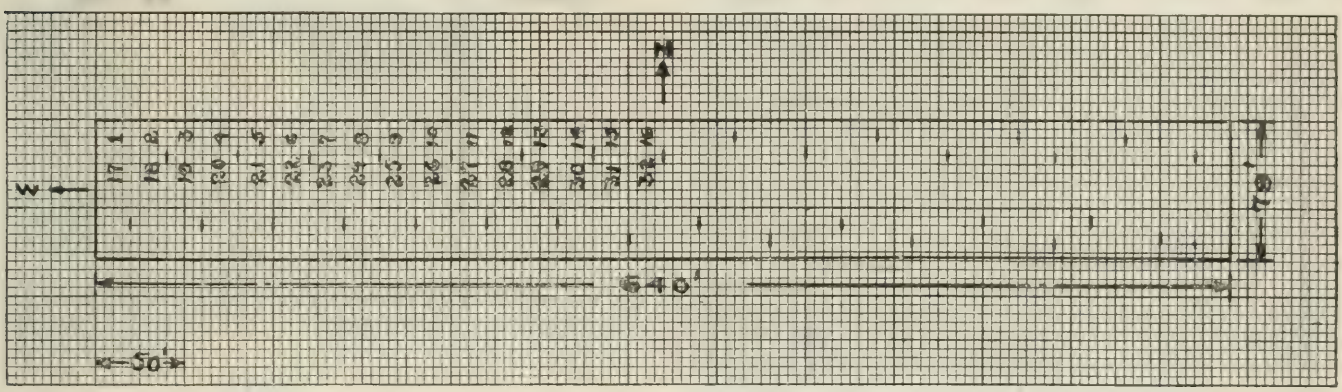


Fig. 2. Floor Plan of Shop, Showing Location of the Lamps and Positions of Test Stations.



Figure 3.
Center View (Night Exposure); Erecting Shop.

The following is a summary of the conditions, and the data obtained from the tests:

Length of shop	640 ft.
Width of shop	79 ft.
Height of shop	60 ft.
Height of lamps	40 ft.
Type of lamps	H H Cooper Hewitt
Number of lamps	32
Total area in square feet	50,560
Average watts per lamp	420.9
Total watts	13,469
Watts per square foot	.266
Average foot-candles	.647
Watts per square foot per foot-candle	.411

In considering the above figures careful attention should be given to the accompanying photographs.

Figure 3 is a night view taken from the east end. The fact that no reflection is obtained from side walls and ceiling is plainly indicated. A careful scrutiny of this picture brings out more important facts in regard to the artificial illumination than can be expressed in any tabulated figures. The clearness with which all details are shown, even underneath boilers or obstructions, by the artificial lighting is truly remarkable, and does not suffer by comparison even with the very complete daylight illumination.

Figure 4 shows a side track about 150 ft. from the east end of the shop, and the uniformity of illumination and the visibility of objects in the shadows.



Figure 4.
Section of Erecting Shop, South Side.

Figure 5 shows a section of the shop where heavy machine tools are in use. The distinctness with which all marks, as well as the cutting points of the tools, can be seen, is particularly worthy of note.

In all of the photographs shown there is the appearance not only of uniformity and distinctness, but of brilliant illumination. In regard to this latter point, the camera does not exactly represent the visual impression. A reference to the illuminometer measurements shows that the measured intensity is comparatively low, only .6 of a foot-candle, which by other artificial illuminants would be hardly sufficient where close eye-work must be done. Taken on the whole, however, the photograph is a faithful representation of the action of the eye in continued use. Those who are at all familiar with the light of the Cooper Hewitt lamp are aware of the fact that at first there is an impression of low intensity. This is due to two causes: First, the low intrinsic brilliancy of the light-source, which entirely removes all dazzling spots of light; and second, the peculiar color quality of the rays. It is a well known fact that in the science of vision the eye distinguishes objects with greater acuity, especially at the lower intensities, with bluish-green light than with yellow light. After the first impression of gloom has worn off the eye follows its normal course of rendering distinct impressions under the apparently lower intensity. It is doubtless for this reason largely that the light of the mercury arc is less fatiguing to the eyes than that of sources which produce a large amount of red and orange rays.



Figure 5.
Wheel and Tire Shop, North Side.

DAVIS UNIVERSAL AIR BRAKE.

The Davis Universal air brake, herewith illustrated, is intended, as it's name "Universal" implies, to be used in any of the positions and combinations in which standard air brake apparatus is used today, and in several positions in which it is not possible to use present devices. In practice today it is common to use the auxiliary reservoir and brake cylinder bolted end to end, and where the car construction does not permit of such length, they are separated and placed side by side. Again there are cases where the foundation brake gear requires a jaw on the rear of the cylinder to receive a lever.

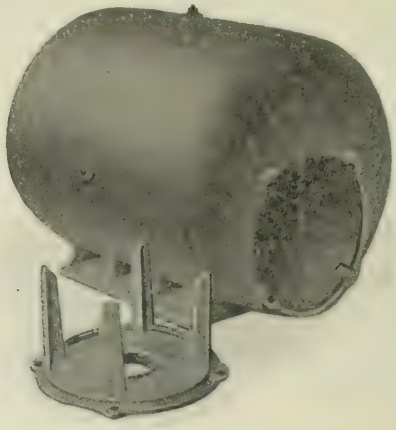


Fig. 1.
Davis Universal Air Brake.

In the construction of the Davis combined auxiliary reservoir and cylinder, the cylinder is placed within the reservoir,



Fig. 2.
Davis Universal Air Brake.

thereby restricting its length to that of the ordinary brake cylinder alone and in the case of the 10″ cylinder, the diameter of the whole apparatus is only 3½″ greater than the reservoir for the 10″ cylinder. The valve seats are so constructed that the triple valve is always vertical, no matter in what position the apparatus may be placed. It has fewer parts than that of any other air brake apparatus; cheaper to

manufacture; less expensive to apply to the car; requires no piping other than the connection to the triple valve; more economical in the use of air, and is quicker in the application of the brakes. The triple valve also can be placed in a more accessible position.

Fig. 1 shows front view of combined auxiliary reservoir and brake cylinder with non-pressure head removed.

Fig. 2 shows rear view of combined auxiliary reservoir and brake cylinder with brake lever jaw and valve seat cover removed. Valve seats exposed.

Fig. 3 shows rear view of combined auxiliary reservoir and brake cylinder with triple valve, brake lever jaw, and cover for side valve seat in place.



Fig. 3.
Davis Universal Air Brake.

The position indicated is one in which the apparatus would be bolted to the under side of the car body. Also in this position the triple valve can be bolted to the side valve seat and the rear seat then not in use would be closed with the cover.

This very interesting device, which was designed by Nathan H. Davis, president, is being exhibited by the Davis Solid Truss Brake Beam Company, Wilmington, Del., in spaces 414-16-18.

CHARCOAL IRON BOILER TUBES.

To one unfamiliar with the process of manufacture of charcoal iron boiler tubes, the exhibit of the Parkesburg Iron Company, Parkesburg, Pa., will be of interest. This exhibit, while including a number of samples of tubing subjected to different tests and which prove the ductility and strength of the iron, has, in addition, a series of views, arranged in a rotating cylindrical transparency, showing every step of the operation, from receipt of the raw material, consisting of carefully selected scrap, to the loading wharf, where tubes are shipped to all parts of the country.

Particular attention is drawn to the conversion of scrap into blooms, running 99.9 per cent pure iron; to the close surface inspection given to the skelp, as well as to the tube in all stages of manufacture; also to the views of the physical and chemical laboratories, where any defects in structure or any undue amount of chemical impurities are detected. The tube mill, the most recent addition to plants of this nature in the country, is included in the views to show the rapid transformation, by properly designed and electrically driven machinery, from skelp to finished tube.

LIMA LOCOMOTIVES FOR THE OLIVER IRON MINING COMPANY.

The accompanying illustration shows one of two locomotives built by the Lima Locomotive & Machine Company, Lima, Ohio, for service in the Eveleth mine of the Oliver Iron Mining Company, at Eveleth, Minn., where they were delivered on May 13.

The locomotives are now operating on a very rough and uneven road with grades from 2 to 5 per cent and sharp curves. Each engine handles four 72-ton loads.

Following are the general dimensions and special equipment used:

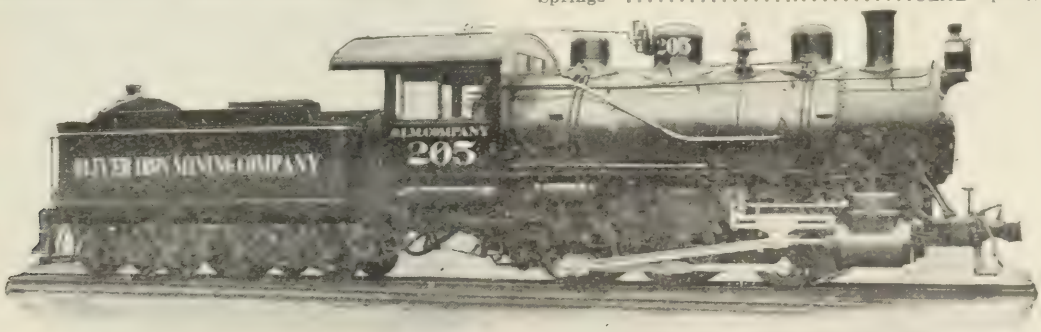
Type of locomotive	0-6-0-8
Weight on drivers	128,000 lbs.
Cylinders	19 in. x 26 in.
Diameter of drivers	50 in.
All tires flanged	6 in. wide
Wheel base, driving	11 ft. 0 in.
Wheel base, total, engine and tender	40 ft. 2¾ in.
Boiler type	Radial stay
Boiler diameter at front	67 9-16 in.
Boiler diameter at rear	180 lbs.
Boiler working steam pressure	[illegible] in.
Boiler built and tested for	190 lbs. pressure
Tubes, number	190
Tubes, outside diameter	2¼ in.
Tubes, length	10 ft. 6 in.
Firebox, length	96 in.
Firebox, width	33 in.
Heating surface, firebox	[illegible] sq. ft
Heating surface, tubes	1165.56 sq. ft.
Heating surface, total	1311.74 sq. ft.
Grate area	22 sq. ft.
Water capacity	4,000 gals.
Coal capacity	7 tons

Ratios.

Weight on drivers ÷ tractive effort, 4.45.
Tractive effort ÷ diameter of drivers ÷ heating surface, 1,094.
Heating surface ÷ grate area, 59.6.
Firebox heating surface ÷ total heating surface, 11.1 per cent.
Weight on drivers ÷ total heating surface, 97.58.
Total heating surface ÷ displacement, two cylinders, 155.
Grate area ÷ displacement, two cylinders, 2.58.

Special Equipment.

Boiler lagging	H. W. Johns-Manville Co.
Brakes	Westinghouse combined automatic and straight air
Brake beams	National
Brake shoes	Streeter, steel back
Bell	National Tube Co., steel
Bell ringer	Golmar
Blow-off valve	National Tube Co.
Couplers	Climax
Draft gear	Farlow
Headlights	Dressel
Injectors	Nathan No. 9 simplex
Injector checks	Hancock
Journal boxes	Kensington
Lubricators	Nathan
Pop valves	Crosby
Metallic packing	Reliance
Springs	Union Spring & Mfg. Co.

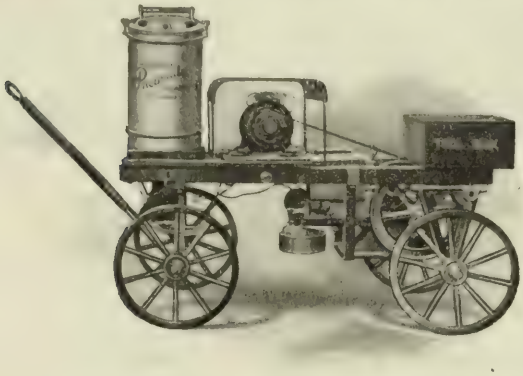


Lima Locomotive; Oliver Iron Mining Company.

PORTABLE ELECTRIC GENERATOR.

The Duntley portable electric generator consists of a gasolene engine and a generator carried on a substantial truck, the outfit complete weighing 500 lbs. The generator proper is a Burke direct current, 10-in. height by 18-in. wide, to be supplied with either 110 or 220 volts of electricity. These generators will operate all sizes of cleaners made by the Duntley Manufacturing Company, Chicago. With one No. 0 or two No. 1 machines, the suction developed by this generator is said to be the same as that developed by operating the cleaner from the regular electric light circuit.

The equipment of the generator consists of a switchboard



Duntley Portable Electric Generator.

and two wall sockets for connecting cleaners or other apparatus. The generator is covered and well protected, so that it may be used out of doors. The generator is belted to the gasolene engine, although this belt may be removed and the engine adapted to other uses. It is claimed for this engine that it is easy to operate and simple in construction; and that one gallon of gasolene will run it for a period of 10 hours. A gasolene tank suspended in the center of the frame or truck just beneath the tank has sufficient capacity to operate the machine about five hours. The frame or truck is made of solid oak, thoroughly seasoned and is ironed and bolted to make it secure. The apparatus is being adapted to use in furnishing electric power for rail bonding work, screw spike driving, etc. The outfit is, for this work, mounted on a standard gage M. C. B. truck to permit easy transportation along railway lines.

NEW ELECTRIC BOILER.

When the trains drawn by steam locomotives reach the electric zone of the New York Central & Hudson River, an electric engine is used to take them into the Grand Central Station at New York. Some difficulty has been encountered in properly heating the trains after the steam locomotive is cut off, and several types of boilers have been designed, using coal, oil or electricity.

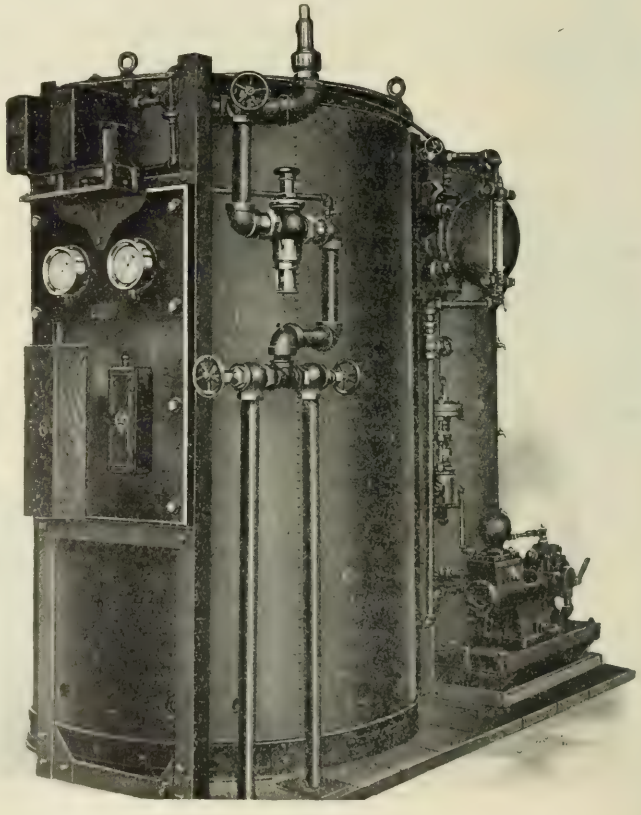
The Consolidated Car Heating Company, New York, has designed a type of steam boiler and electric heating apparatus by which electricity from the third rail is employed in producing heat to generate steam for heating the entire train. A form of electric heating tube is placed within the flues of a multitubular steam boiler. The water does not come in contact with the heating element and no electrolytic action can take place. The complete submergence within the boiler, of the tube containing the heating element compels all of the heat to pass into the water. Thus a high efficiency in the transfer of heat is evidently secured. The connections between the electric heating tubes are made at the end of the boiler and in the space formed at the ends within the projected apron formed by the boiler sheet and the end cover.

An automatic apparatus is provided by which automatic regulation is obtained. A steam pump and a water tank are mounted as a part of the electric boiler set. This pump is automatically controlled by a governor which maintains



Electric Boiler Header Connections.

the proper water level. Should the water in the boiler be lowered about 1 in. below the low water mark, the regulating apparatus cuts off the electric current and the boiler ceases to generate steam. This emergency apparatus also prevents closing the circuit through the heating elements until the proper water level in the boiler has been restored. The current leading to these heating elements is also automatically controlled, being set to shut off at 100 lbs. steam pressure maximum and turned on at 94 lbs. minimum.



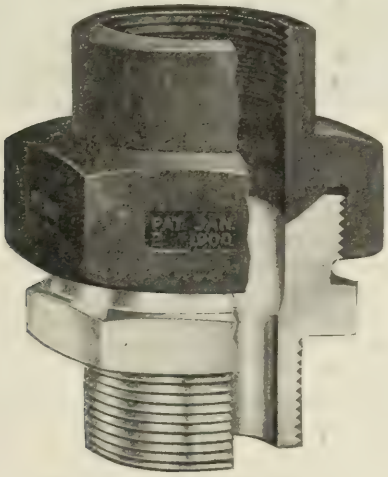
Electric Boiler.

Air is employed as a means of control between the automatic devices and the heating circuits. The main circuit cannot be closed until the air pressure necessary to effect control of the circuit has been produced in the main reservior. This apparatus requires but little attention on the part of the engineer. It is compactly built, thoroughly braced and every part made substantially. It occupies a space in the middle of the cab.

KEWANEE AIR PUMP UNION.

Serviceable locomotive equipment is engaging the attention of a large number of the mechanical men in attendance at the conventions, and for this reason an illustration and a few words on the Kewanee air pump union will be of general interest.

The Kewanee air pump union was especially designed for severe locomotive service. It has all the principal advantages of the Kewanee principle: a brass to iron thread connection, and brass to iron ball joint seat. With this construction,



Kewanee Air Pump Union.

corrosion in the thread connection is said to be prevented, thus making a readily movable joint, even after long service. The junction of a soft and hard metal in the ball joint seat makes an air-tight seal without the use of a gasket. Not alone does the Kewanee air pump union require no gasket, but it is practically certain that each union will make an air-tight joint, for the reason that each one has been individually subjected to a test of 100 lbs. compressed air pressure under water.

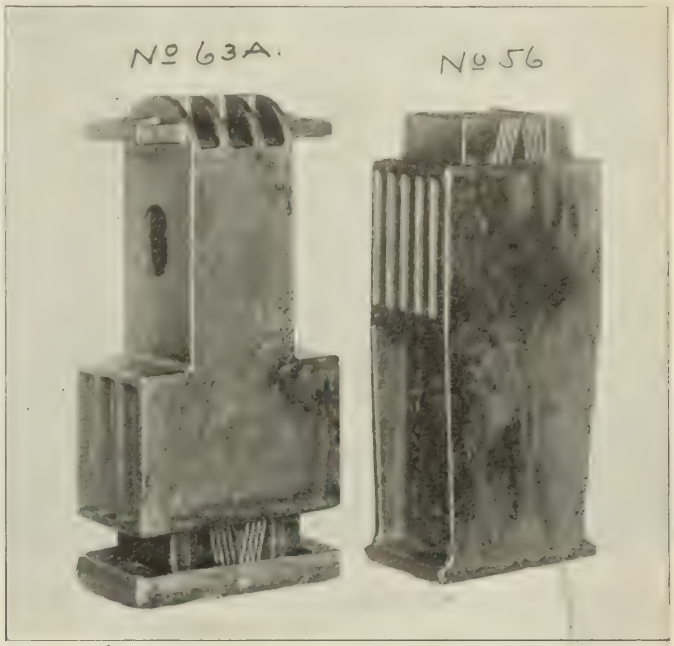
The National Tube Company, Pittsburgh, Pa., is the manufacturer of this latest type of Kewanee union.

FRICTION DRAFT GEARS AND BUFFERS.

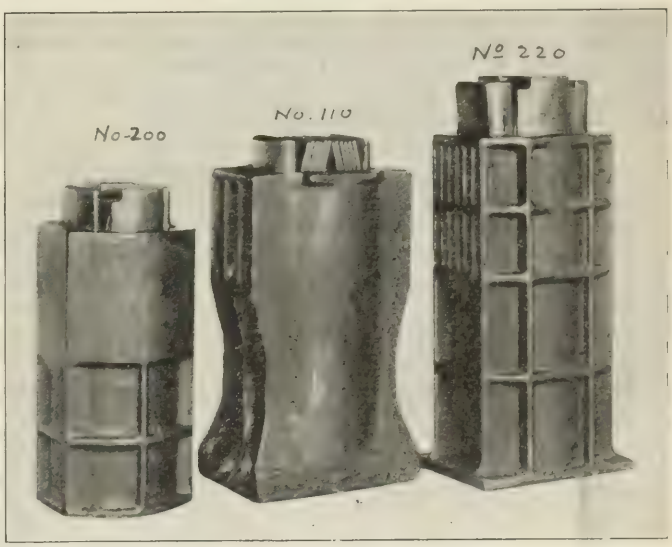
The Gould Coupler Company, Depew N. Y., exhibits its friction draft gears for freight and passenger equipment, as well as its friction buffers arranged for steel platform end sills for steel passenger cars.

These friction gears embody the same principle, a combination of coil release spring and flat plate springs operated laterally by drop-forged, case-hardened wedges. Modifications are provided for the required different applications. In all these friction devices, the containing casing or housing has no direct wear as drop-forged wedge plates in contact with the housing take all the frictional wear. This friction gear is simple, easily taken apart and re-assembled without instructions. It also has a decided advantage in the simple manner of renewing the capacity when worn or slack by inserting a plate filler adapted to take up the amount of slack between the two sets of leaf springs.

The capacity of the friction buffers can be reduced by the removal of the desired number of leaf springs, after which plate shims are put in their places. Their capacity can also



Passenger Friction Draft Gears.
No. 63-A.—1¾ in. travel.
No. 56. —2¼ in. travel; for all-steel cars.



Freight Friction Draft Gears.
No. 200.—2½ in. travel; 150,000 lbs. capacity.
No. 110.—2 in. travel; 170,000 lbs. capacity.
No. 220.—3½ in. travel; 320,000 lbs. capacity.

be increased by the insertion of additional leaf springs to the limit of the permissible space allowed. The principle of this type of friction device allows of its many modifications and to its adaptability.

VANADIUM BRONZE AS A BEARING METAL.

A very interesting demonstration of the toughness, ductility and wearing qualities of Victor vanadium bronze is shown at the exhibit of the Vanadium Metals Company, Pittsburgh, Pa. Although but recently introduced to the railway field, this company has been making rapid progress. Heretofore the marine and automobile industries have provided a market for this company's product, but the successful results obtained



Interior of Foundry; Vanadium Metals Company.

by those railways that have tried Victor vanadium bronze for different purposes augurs well for the future.

The illustration shown herewith covers only one-half of the foundry floor, the furnaces, crucibles, etc., not being visible. Castings weighing thousands of pounds each have been turned out by this company for the United States government in connection with its submarines.

The foundry is at East Braintree, Mass., and the general offices are in the Frick Building, Pittsburgh, Pa.

THE FLEXIBLE STAYBOLT INDUSTRY.

The Flannery Bolt Company, Pittsburgh, Pa., is making quite extensive additions to its factory at Bridgeville, Pa., to cope with the demands for the Tate flexible staybolt. A new brick shop with 17,300 sq. ft. of floor space has just been finished and will be used as the forging, packing and storage shop for bolts and staybolt iron, also comprising a new power plant and stamping department. The power plant consists of 3 Babcock & Wilcox water tube boilers of 337 h.p. each, two 4-valve Ball engines, one of 200 h.p. and the other of 400 h.p., with generators of 125 and 250 k.w. each, respectively. All the automatic screw machines in the machining department of old shop and tool room are to be run with lines driven direct from motors; also the blower exhaust system for cooling in the new forge shop. The lines for hammers, punches and presses, motor trolley and electric hoists are used for conveying material from the forge shop to the shipping and packing departments. Eight motors of 45 h.p. each, three of 13 h.p. and one of 7½ h.p. will be distributed throughout the plant and all main line shafts will be discontinued and motor driven jack shafts used, covering a given number of machines which will be used as independent units, so that any department can be run separately.

A 700-ton iron rack is built in the forge shop for staybolt iron. This iron is taken from the cars, loaded on heavy trucks which run on 80 lb. rails to a 10-ton copper dealers' scale with type registering beam, and an accurate weight record obtained; it is then placed in whatever rack is designated for the brand of staybolt iron used.

The entire plant when finished will be especially equipped to handle each part of the Tate bolt in a systematic manner. The sleeves department, cap department, bolt department and tool department will each run independently as a part of the whole system in turning out the complete product, thus



Factory of the Flannery Bolt Company.

serving the purpose to maintain for each department a high grade of workmanship throughout.

The Tate flexible staybolt is now in service on 150 railways. Approximately 3,000,000 Tate bolts are in use and many of the first customers have adopted and standardized the Tate bolt for all locomotives in high pressure service and have provided installations on their blueprints sufficient to cover the breaking zone of the rigid staybolt, some engines taking 360 Tate bolts to the engine, while others run as high as 1,600 to the engine.

According to the report of the manufacturer, while it has found a few of the Tate bolts broken, such were due to the fact that sufficient area of the sheet had not been covered with Tate bolts to eliminate the breakage of the rigid bolts, and in some instances applications were too tight, especially in the throat sheet and rigid sections of firebox, where the longitudinal stress on the bolt, due to differences of expansion of outer shell and fire box, exceeds the stress due to pressure. When a sufficient area is covered, no breakage of either rigid or flexible bolts is found, the purpose being to cover such sections of all fire sheets where deflection of rigid bolt—due to expansion—is too severe to enable the rigid bolt to withstand the vibratory stress or repeated bending without fatigue and final rupture. When sufficient area is once known and covered by the Tate flexible stay breakages will stop. The fire sheet will tend to more naturally withstand expansion, without bending and cracking, preventing seam leaking and buckling, thereby adding to its life and service value of the complete firebox.

The tendency to install greater numbers of Tate bolts to high pressure engines is due to the remarkable showing of locomotives which were provided with a full installation up to the crown line, having run through a period of service sufficient to prove the value of the Tate bolt from a comparison of the rigid bolt, wherein cost of maintenance for staybolts for the flexible were insignificant against repeated excessive charges for the rigid bolt renewals and side sheet patching.

The Flannery Bolt Company has issued some interesting literature on the staybolt subject, and lately issued a neat catalog of the Tate flexible staybolt.

The organization of the company is as follows: James J. Flannery, president; J. C. Gray, vice-president; Joseph M. Flannery, secretary; H. A. Neeb, treasurer; B. E. D. Stafford, general manager; F. K. Landgraf, shop superintendent. The selling agency is in the hands of J. Rogers Flannery & Company, Pittsburgh, Pa. George E. Howard is eastern representative; W. M. Wilson, western representative; Commonwealth Supply Company, Richmond, Va., southeastern representative; and Tom R. Davis, mechanical expert.

LANDIS PLAIN SELF-CONTAINED GRINDING MACHINE.

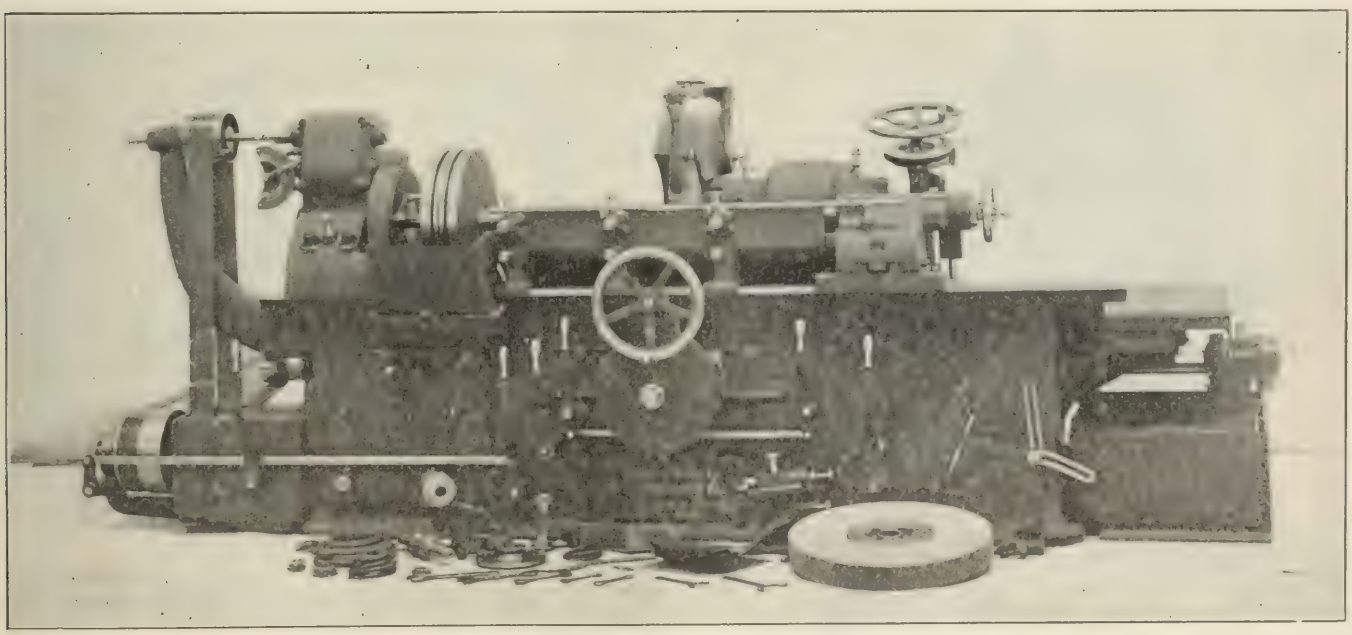
The machine shown herewith, made by the Landis Tool Company, Waynesboro, Pa., embodies the Landis principle of traversing the grinding carriage, which is a fixed weight. The advantages claimed for this principle are: Unvaried duty imposed at all times on the carriage driving mechanism, insuring accuracy of traveling distance between points of reversal; uniform and positive lubrication of the ways; a rigid and stationary foundation for the work; no overhanging of the work table, it being supported throughout its entire length by the main column of the machine, to which it is firmly clamped, thus avoiding vibration. This is a feature which is considered essential to rapid and accurate grinding.

This machine is designed as a self-contained one, having no overhead counter shaft, although when desired to be driven from a line shaft an auxiliary shaft with tight and loose pulleys and a main pulley for belting to the machine are used.

The Landis 16-in. x 72-in. plain self-contained grinding machine may be arranged for handling work with projections requiring a large swing, such as piston rods, valve yokes, crossheads, crosshead pins, engineer's valves, link block plates, knuckle pins, etc. A piston rod from which .025 in. of metal is to be removed may be ground in about 15 minutes; a valve yoke, from which the same amount of metal is to be removed, may be ground in about 10 minutes, and cast iron crossheads, 13 in. in diameter, with shoes 5 in. wide and 12 in. long, having ground guide bearings which allow but .001 in. variation, requiring the removal of 1/32-in. depth of metal, may be ground in 15 minutes.

Of the many kinds of work that can be handled by Landis grinding machines the foregoing covers but a few. Many railway shops undoubtedly have classes of grinding work with which this company has not as yet come in contact, and from these especially it solicits correspondence. If such parties will send drawings or samples of any particular kind of work, the company will send estimates on the time required and show just what can be done on these machines.

The following advantages of finishing on these machines are

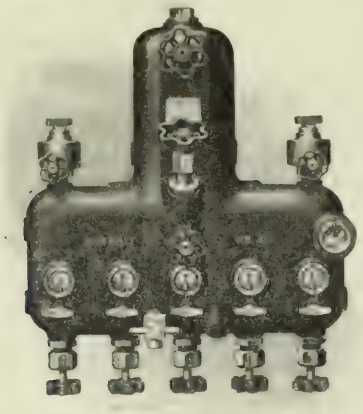


Landis 16-in. x 72-in. Plain Self-Contained Grinding Machine With Gap.

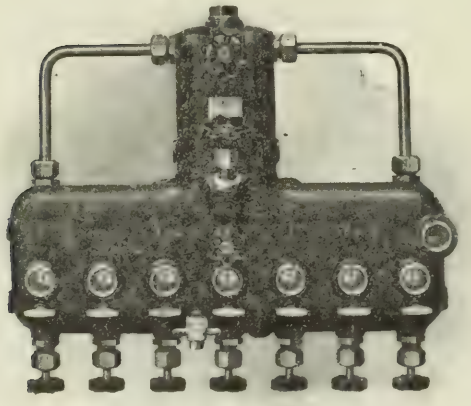
claimed: No finishing cuts on the lathe necessary; no skilled mechanic required, as the machine does accurate work; both headstock and footstock have dead centers insuring trueness; no filing or polishing necessary; all drilling and milling can be done before parts are ground; any change of work or traverse speed may be obtained without changing of belts, gearing or clutches and made while machine is in operation; all levers are within easy reach of the operator, and from the front of the machine; an abundant supply of clean water is provided; the grinding wheel can be dressed in any position of its travel without removing the work; the grinding wheel tarries at points of reversal for grinding clean at shoulders, and the period of tarry can be regulated to suit the work; the operator has an opportunity to make time, the wheel feed stopping automatically when the work has been ground to size, permitting him to prepare work for the next operation; separate work and grinding wheel traverse speeds, permitting a slow work speed and a fast traverse speed, which is necessary to remove stock rapidly.

DETROIT LUBRICATOR COMPANY'S EXHIBIT.

The Nos. 41 (5-feed) and 61 (7-feed) types of Detroit Bullseye locomotive lubricators exhibited at Booth No. 15 by the Detroit Lubricator Company, Detroit, Mich., are striking features of a generally interesting and exceedingly instructive display under the direction of the company's traveling engineer, A. D. Homard.



Five-feed Detroit Bullseye Lubricator.



Seven-feed Detroit Bullseye Lubricator.

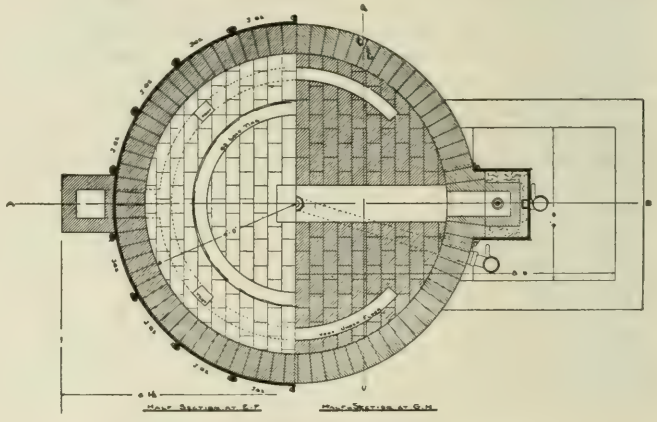
The illustrations herewith show the Nos. 41 and 61. The No. 41 is especially adapted to and in general use with superheater, compound and Mallet locomotives. Four feeds are used for valve and cylinder lubrication, the fifth or middle feed being used with the air pump. Four automatic steam chest plugs are furnished with this style, and the middle or air pump feed is equipped with a choke at the lubricator. Where any different arrangements of the chokes are desired in this type of lubricator, specifications to that effect can be drawn.

The No. 61 lubricator is also especially adapted to use on superheater locomotives where it is desirable to introduce the oil at both ends of the piston valve or any service requiring 7-feeds. Two can be directed to the expansion piston rods if desired. Six automatic steam chest plugs are furnished with each lubricator of this type, and the seventh or middle feed is intended for the air pump and is equipped with choke at the lubricator. Specifications for different arrangements of chokes in this type are also possible.

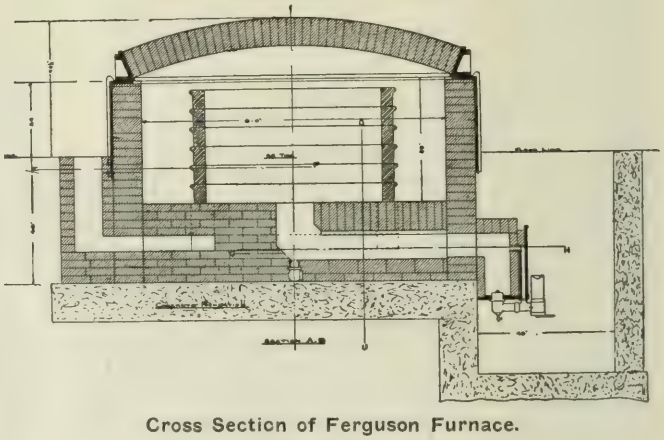
A complete display of the company's full line of locomotive lubricators from a small 1-feed type up to the above described 7-feed type, with a general display of special features, attachments, including a transfer system for filling lubricators, completes an exhibit worth careful study.

TIRE FURNACE.

Some of the large locomotive shops, where several engines are handled daily, together with tire work for outside points, have given considerable attention to the question of handling tires. A section has been provided for this work, having a well drained fire-proof floor, a large jib crane and a tire



Sections Through Ferguson Furnace.

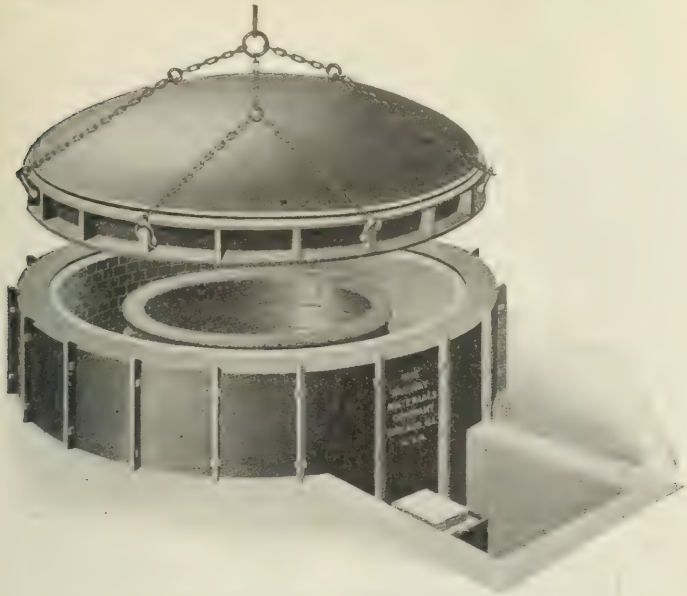


Cross Section of Ferguson Furnace.

furnace of the design illustrated, having capacity for either six or eight tires.

This furnace is designed by the Railway Materials Company, Chicago, is of the Ferguson type and the flame goes up through the center of the pile of tires and does not come in direct contact with the tire, insuring a uniform heat and

expansion. The greater part of the furnace is below the floor line of shop, enabling the operator readily to adjust a three-piece grapple hook to the top tire. The furnace will heat a set of tires in a few minutes; then they can be taken out as desired, the rest remaining in the furnace at a uniform temperature.



Ferguson Tire Heating Furnace.

The layout makes a clean, efficient method of handling tire work, insures a correct uniform shrinkage, and has many good features that should recommend it for large shops. The Philadelphia & Reading shops at Reading, Pa., the New York, New Haven & Hartford at Readville, Mass., and the Central of Georgia shops at Macon, Ga., are equipped with tire furnaces of this description.

LONG LIFE TO YOUR HOSE.

At booth 322 there is an exhibition of hose which every railway man interested in air brake equipment or signal line service should see.

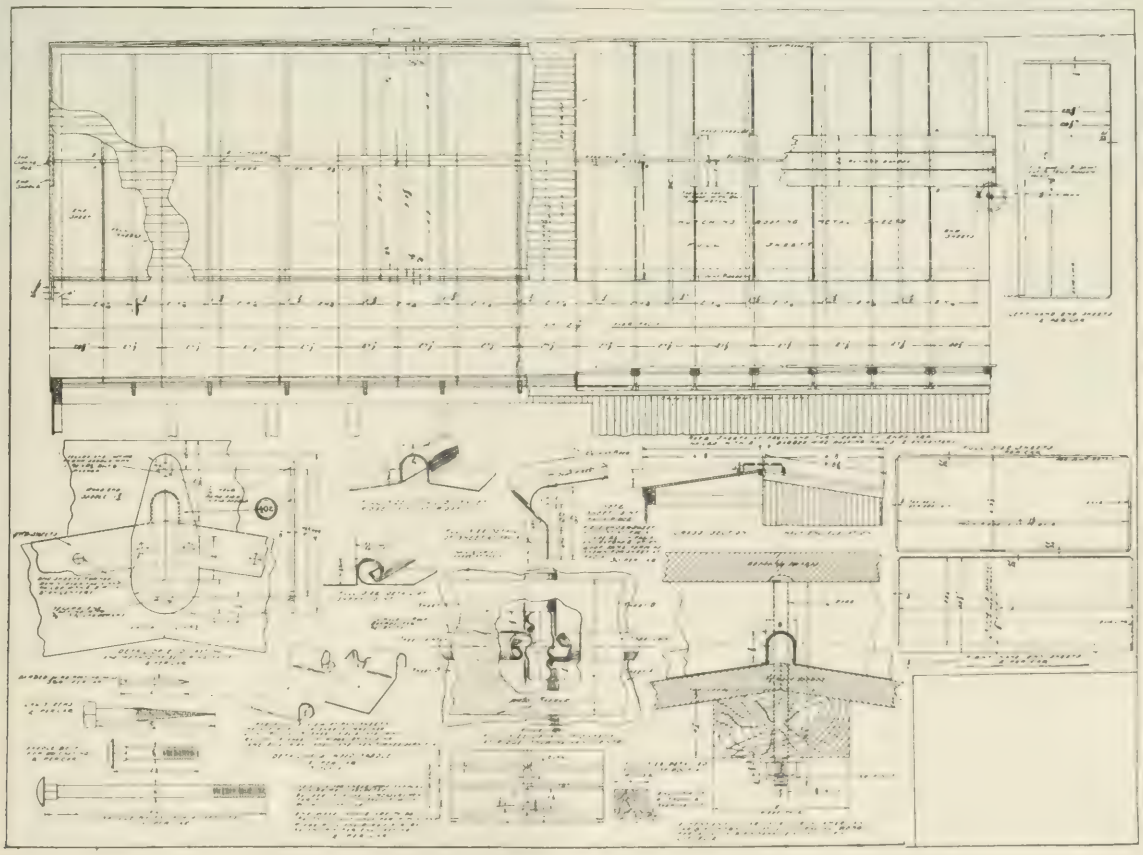
The Sprague flexible steel armored hose, made by the Sprague Electric Company, New York, is favorably known to many, but this is an opportunity for all the delegates to see its superior qualities. The Sprague Company's representative, Mr. Uhl, will be glad to explain its construction and show you why it cannot kink or chafe, and why the cost of hose is reduced. However, the cost of replacing hose is a small item compared with the annoyance, and often expensive delays, if not actual damage, due to hose failures. The construction of this hose is said to not only eliminate failure, but also to greatly increase the life of the hose. It will all be explained at the booth.

HUTCHINS OUTSIDE METAL ROOF, TYPE D.

The detailed drawing herewith shows the construction of the Hutchins outside metal roof, type D. Its principal feature lies in the fact that it is secured to the car without the use of malleable castings. The sheets are joined by the Hutchins rolled lock joints, which are proof against water and at the same time allow for the necessary flexibility. The roofing sheets are secured at the eaves by the Hutchins eave roll bead, intended to allow for the movement of the sheets without tearing them and to relieve the stress of the nails so that they will not pull out or through the roofing sheets.

This roof has been in successful service on a large number of cars for the past ten years.

The Hutchins Car Roofing Company, Detroit, Mich., manufacturer of this car roof, is exhibiting in space 431. This company is represented in Chicago by the Spencer-Otis Company, Railway Exchange, and in New York by the United States Metal & Manufacturing Company.

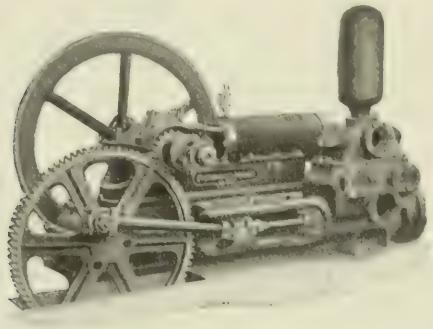


Details of Hutchins Outside Metal Roof, Type D.

COMBINED ENGINE AND PUMP.

The handling of water to the track tanks at the lowest cost is an important problem which seems to be very satisfactorily solved by the use of some style of internal combustion engine, built to use the cheapest fuel available.

The combined gasolene engine and pump illustrated herewith, and made by Fairbanks, Morse & Company, Chicago, is probably as extensively used as any other type of pumping engine. It has the advantage of being very compact, requiring little space and little attention. Their reliability and



Fairbanks, Morse Combined Engine and Pump.

durability is convincingly attested to in a letter from an engineer of maintenance of way of a large and well equipped road:

"The first nine years this engine and pump practically worked day and night, only shutting down often enough to oil up and make such general repairs as were necessary.

"During the last few years, on account of additional water stations on this division, it is not necessary to supply the same amount of water as formerly and the engine only averages about fifteen hours per day."

NEW PIPE THREADING MACHINE.

A new machine recently placed upon the market and which is especially adapted for railway shops is shown herewith. It is designed to thread and cut off pipes from ¼-in. to 2 in. inclusive.

The bed and headstock are cast in one piece, insuring the greatest possible rigidity and stiffness for the bearings. This is particularly necessary in this type of machine, as the operation of the chuck brings a constant strain on the front bearings of the main spindle.

It is equipped with an improved type of lever chuck, the gripping and releasing movement being accomplished while the spindle rotates. The opening and closing mechanism is powerful and the pipe can be gripped with but little pressure applied to the hand lever. The chuck holding the actual gripping parts is enclosed, thus avoiding all danger of catching the clothing of the operator. The three gripping jaws have a universal adjustment. All parts inside of the chuck are made of steel.

The machine has nine separate and distinct speeds, properly designed for threading both steel and iron pipe of the sizes within its capacity. It is driven by a single belt pulley, the nine speeds being obtained through the medium of a sliding gear and a clutch. All of the gearing is enclosed, but can be exposed for inspection by removing the cover. All of the shafts and gears are on the outside of the machine.

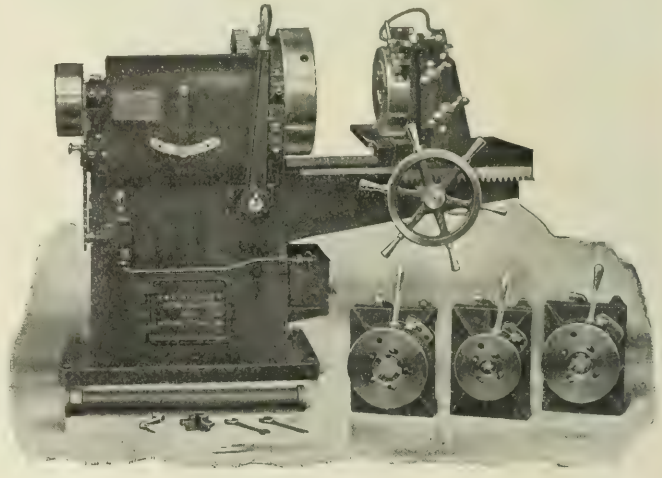
A set of bushings, extending through the spindle, are provided for supporting the various sizes of pipe. These through bushings prevent the operator from jamming the pipe against the jaws in the chuck when the machine is working on the smaller sizes, as when the chuck is open, the jaws are always outside of the bushing through which the pipe is placed.

An improved type of holders is used for making long and short nipples. These holders consist of three pieces of hardened tool steel. They are placed in the same chuck in which the gripping jaws are used, and open and close with the lever movement to release or grip the nipple while the spindle is rotating.

The die head slides on ways, and as it is free to slide, will accommodate itself to any eccentricity in the pipe, relieving the dies of strain and cutting an even depth of thread. It can be pushed to one side, so that it will completely pass the gripping chuck, and, in such position, the cutting-off tools can be brought up very close to the gripping chuck, thus cutting off the shortest possible piece of pipe.

By sliding the head out of the way the pipe can be inserted in the machine from either end equally well, thus giving the operator complete freedom of movement about the machine and enabling him to get his work out to the best possible advantage. When the head is pushed to one side the pipe can be pushed through the stand without dragging it over the dies and damaging them.

The die head is equipped with inserted interchangeable steel cams for taking the thrust of the dies and adjusting



Stoever Pipe Threading Machine.

them to their proper position. Hardened steel plates are also placed in the bottom of all the die slots to resist the wear of the constant contracting and expanding of the dies and keep the lead of all the separate chasers correct. The front face of the head swings open, so that when changing chasers they can be removed from the head at any position on the cams and others inserted. The operation is quickly performed and the interior of the head is exposed for cleaning or inspection.

Two cutting-off tools are used, both being operated by the same screw and handle. A universal adjustment is provided, so that both tools will always be cutting.

The oil pump is driven through a positive steel chain drive, direct from a constant speed pulley, giving a steady and constant flow of oil. A steel geared pump is used, which will deliver oil when running in either direction. The oil flows to the dies and cutting-off tools and then back into the bed of the machine and through strainers into the tank shown below the bed, from which it is drawn to the pump.

The machine can be equipped in two ways; with one universal head, in which all sizes of dies are used, or with a separate head for each size of pipe. The second equipment is very commonly used in jobbing shops, where they are called upon to change from one size of pipe to another very quickly. This interchangeable head equipment is also of advantage where a number of workmen are likely to use

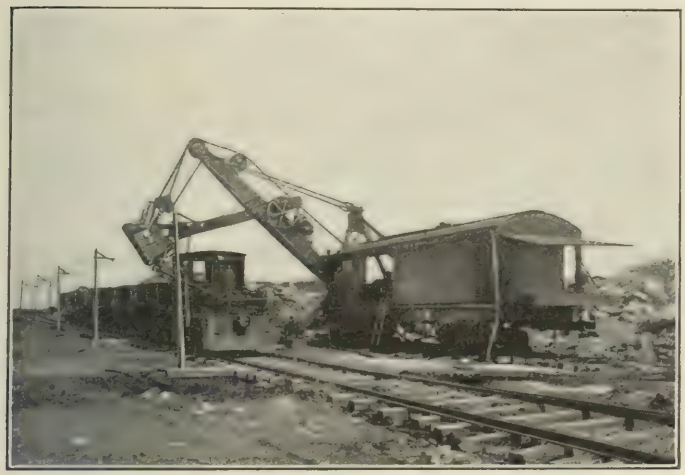
the machine. In such cases, the heads are always set to the proper gauge and require no adjustment.

The net weight of the belt driven machine, with one universal die head, dies, countershaft and bushings, is 2,500 lbs. The machine is manufactured by the Stoever Foundry & Manufacturing Company, Myerstown, Pa., with sales office at 140 Cedar street, New York.

DIAMOND TAPERED STEEL POLE.

Exhaustive tests recently made on this type of pole are said to have proven that for all classes of construction work where varied loads are constantly encountered, the Diamond meets the demand. Two separate concrete foundations were torn apart by two separate Diamond poles under loads of 3500 lbs. each and neither pole showed a permanent set after this performance.

For yard lighting, carrying bridge signal cords or, in fact,



Diamond Tapered Steel Poles Used in Construction Work.

wherever a pole is required, the Diamond is the strongest and lightest type in the market. The U. S. Metal & Manufacturing Company, New York, booth 337, who are United States agents for the Diamond pole, report a steady increase in sales and a large volume of inquiries from home and abroad, the southern countries being especially interested.

ADVANTAGES OF BRAIDED RUBBER HOSE.

The advantages which the Electric Hose & Rubber Company, Wilmington, Del., claim for its braided hose are many, among which are the following:

It is impossible for the fabrics to open and unwrap; the hose is very pliable, yet without any tendency to kink, and will withstand more pressure than the old style hose. Being made under pressure, all defects are developed during the process of manufacture.

The hose is lighter to handle, will last longer and will do more work than any other hose made. Pin holes, allowing air or liquid to escape through the tube and walls of this hose, are unknown, as all such defects are so developed during the process of manufacture that it is impossible for the hose with these defects to get to the user.

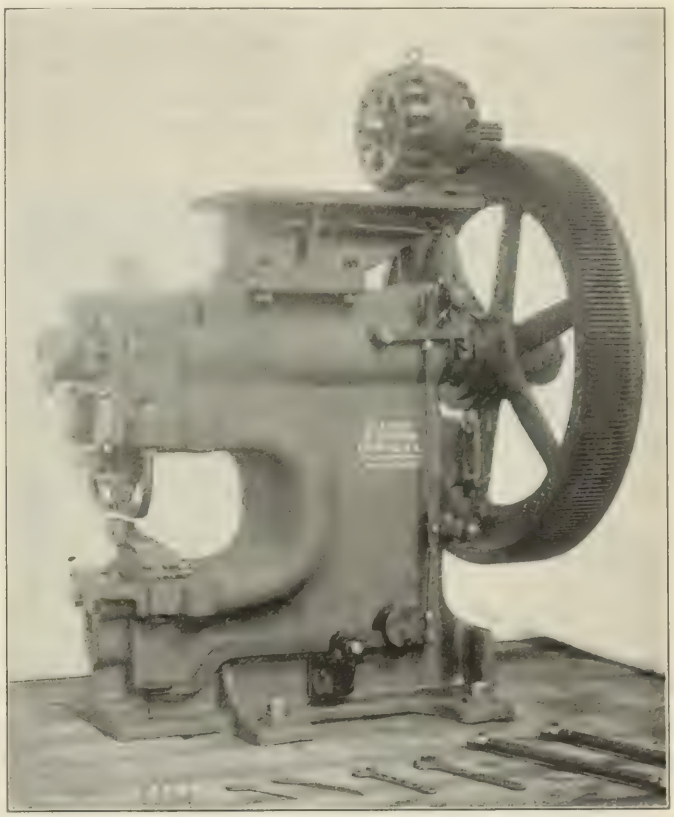
The hose is made under pressure from the inside, the same way that it gets pressure when in use.

The hose cannot be kinked, and is so pliable that it can be tied in knots and still get the same pressure at the outlet as at the inlet. This fact is being demonstrated at the Electric Hose & Rubber Company's booth, No. 378-380, and all visitors to the M. C. B. and M. M. conventions are cordially invited to visit this booth and see a practical demonstration of the above.

HIGH-SPEED PUNCHING MACHINE.

The accompanying photograph shows a high-speed punching machine with motor mounted overhead, the pinion on the armature shaft meshing directly with the teeth cut in the fly wheel.

The sliding head is fitted with three punches, each controlled by a separate hand gag, allowing three different diameters to be punched in a bar or plate at one pass and without loss of time in changing punches and dies. The machine is fitted with a removable stop for punching channels, I-beams, etc., in the flanges, and the design of die block, shown in position, permits the punching of small sections.



Hilles & Jones High-Speed Punching Machine.

The heavy bracket on top of the main frame, in addition to providing a substantial support for the motor, furnishes a base for attaching a self-contained crane.

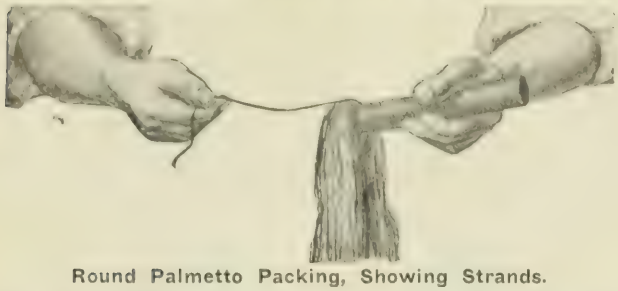
This punch operates at a speed of 65 strokes per minute and has an improved automatic clutch designed particularly for this high-speed work. It is made by Hilles & Jones Company, Wilmington, Del.

PALMETTO PACKING.

During the last few years Palmetto packing has become popular with the mechanical departments of many of the railways of this country, because it has been found to be a packing that not only meets the exacting conditions of both the steam and air pressures, but also to be uniform in quality, which latter is said to be secured through the careful selection of high grade materials. No rubber is used in this packing, as the makers consider that that material has not sufficient endurance to make it serviceable under the temperature incident to present steam and air pressures.

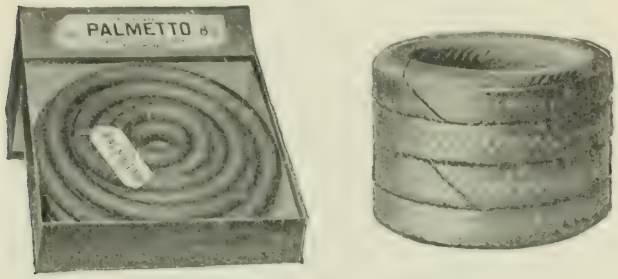
The tendency to harden is overcome in Palmetto by a thorough process of lubrication, by which each strand has the lubricant forced into it before braiding.

The lubricant is carried from every particle of Palmetto to the rod, doing away with the use of oil cups, and reducing friction to a minimum. The makers of Palmetto packing



Round Palmetto Packing, Showing Strands.

have made a study of the requirements of railway locomotive service, and have adapted their packing in form suited to air pumps, throttle valves, Walschaert valve gears, as well as the shop engines, and small globe valves.



Palmetto Packings.

The representatives of Greene, Tweed & Company, New York, the manufacturers of this packing, will be glad to receive the delegates at their booth, No. 43.

CAST STEEL TRUCK SIDE FRAMES.

In these strenuous times the men who guide the destiny of a big railway system are very apt to judge all things by the balance sheet, and that form of equipment which shows the smallest annual maintenance cost is pretty apt to be in the highest favor.

Because of their practical elimination of maintenance charges, cast steel truck side frames and body and truck bolsters have, during the past few years, made great strides toward the goal of universal approval among mechanical men. In busy times cars are worth money, and the loss of revenue caused by having to take a 50-ton car out of service at such a time will more than offset, in the one instance, the slight additional cost involved by the use of the most modern type of construction available.

The Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., has made an enviable record with its bolsters and truck frames, types of which are shown in the exhibit, spaces 135, 137 and 139, and the company's representatives will be glad to furnish you with figures relative to their service records which they believe will convince the most skeptical that the use of these specialties is effective insurance against loss of revenue due to cars out of service in busy times.

FEED WATER TREATMENT.

Dearborn water treating preparations, manufactured by the Dearborn Drug & Chemical Works, Chicago, have been introduced on a great many railways in the East and South during the past year, and they are now said to be standard on more than 100 of the principal railways of the United States. The National Railways of Mexico buy Dearborn preparations in carload quantities, and the principal railway systems of Canada are fast putting Dearborn treatment in service on their lines. Within the past few months Dearborn water treating preparations are said to have been made standard on the three principal railways of Cuba.

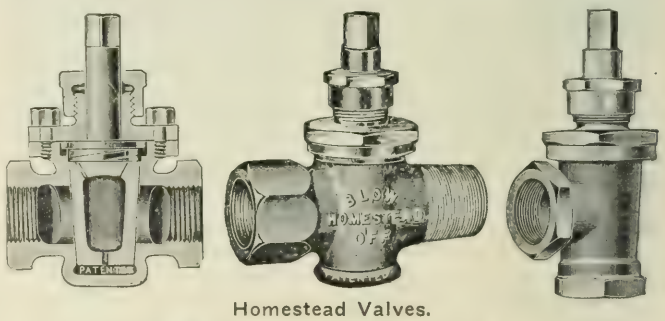
The Dearborn Company analyzes feed water supplies in its laboratories in Chicago, and compounds the treatment to suit. All of the waters on a division or bad water territory are considered together, and a minimum number of preparations furnished. It is usually possible to handle all of the waters on one division with one class of treatment, although two are often necessary. Preparations for removal of scale and prevention of leaks are applied to engine tender at terminals, and treatment to prevent foaming troubles is carried on the engine and applied to the water each time it is taken.

Water samples from China and Japan have been analyzed in the Dearborn laboratories, and Dearborn treatment is used on some of the railways of the Far East. Edward C. Brown, who is manager of the foreign business of the company, is spending a year in the Orient looking after Dearborn interests.

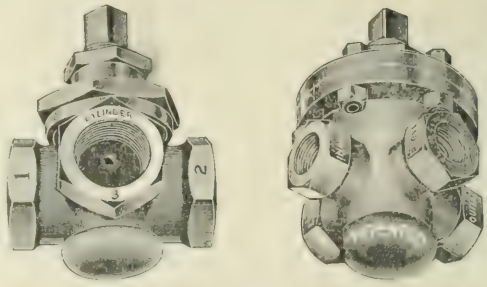
HOMESTEAD VALVES.

It has been the endeavor of the makers of the Homestead valve to produce one which would have superior wearing qualities. They are therefore made very strongly, with a mechanical principle of operation which tends to protect the most vital parts of the valve when in service.

It is made either of brass, of an iron body with brass plug, or of all iron; and in several different styles to meet special conditions of service. The locomotive blow-off valve is shown in one of the accompanying cuts. The Homestead valve has proven successful as a locomotive blow-off valve



Homestead Valves.



Homestead Three and Four-Way Valves.

and is used on many large railways. These valves are also applicable for use on stationary boilers, feed-water lines or for any high-pressure service.

The sectional view of the valve gives some idea of its construction; these same general principles being also carried out in the construction of the three-way and four-way valves shown. All are designed for pressures up to 1,000 lbs. or over, and they are said to be giving satisfaction on pressures as high as 5,000 lbs. They are the product of the Homestead Valve Manufacturing Company, Pittsburgh, Pa.

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The opening session of the Master Mechanics' Association was one of well-sustained interest from beginning to end and the discussions were well up to the standards established by any previous convention. The principal interest related to men rather than machines; and methods of training firemen, and shop opportunities, were treated as of equal importance with the mechanical stoker. The improved apprentice systems which have been established on some of the large railways in recent years, have already produced such good results in providing a supply of better workmen that master mechanics are enthusiastic in commending them to those who have not yet established these improved methods.

The work was begun with perhaps a little too strong a bearing on the school part and not enough attention was given to the shop but, systemmatic methods of teaching will soon work out the best means of giving shop instruction, and enough has already been accomplished by several railways and a number of manufacturing concerns to form the basis of a system of teaching apprentices in the shop which any master mechanic can readily obtain.

The Walschaerts valve gear has lent itself admirably to the requirements of modern locomotive design; in the case of Mallet compound locomotives an outside gear is a necessity, as the spaces between the frames usually occupied by the valve gear are required for pipes and supports for the boiler. While equal to the Stephenson link motion in most of its functions and having advantages in the convenience of repairs, the Walschaerts gear has some objectionable features which are overcome by the new pin-connected outside gears which dispense entirely with the link. In rounding curves the Walschaerts gear is subject to a considerable disturbance, the extent of which could be measured by the new continuous cylinder indicator, and the experiment would be worth while, as irregularity in a valve motion is unfavorable to good engine performance. On account of the sharp upward incline of the eccentric rod on some Walschaerts valve gears there is also a distortion of the valve motion due to the motion of the frame on the driving boxes and with respect to the center of the axle from which the gear derives its motion. On rough track when an engine is rolling this disturbance becomes greater than is desirable in a properly designated valve gear and an investigation of the subject would be an interesting contribution to knowledge of both locomotive design and locomotive performance. The outside valve gears with fixed links are not affected in this way and their successful performance on numerous locomotives in the past year has lead to the invention of other gears of the same type but of different design and construction.

Possibly one of the reasons why there was no suggestion of the desirability of improving the cast iron wheels in the M. C. B. report is that the steel wheel has put the railways in a position of independence of the cast iron wheel. The steel wheel has confessedly taken away all anxiety as to the safety of running cars of 50 tons capacity and has made the construction and use of the 70-ton car a possibility; and so successful have these wheels been under cars of higher rating that we begin to hear rumors, and feel it in the air, that possibly, or even probably, the steel wheel may be a very good thing to put under cars of 30 tons capacity. It has been said all along that the steel wheel would have no chance of application under a 60,000-lb. car, because the cast iron wheel is rendering such satisfactory service. But, now that there is such apparent indifference as to the fate of the cast wheel, railway men are discussing the advisability of putting the steel wheel into a more extensive service. It will be noticed that we have qualified this indifference as "seeming" or "apparent," because it seems impossible that such a state of affairs should exist in the ranks of the wheel makers. It means that no public announcement has been made of any attempt at improvement. We hear no end of statements that the wheel can be improved and believe firmly in their truth; but, with the exception of the trials in the use of nickel, nothing is shown, and if other work is being done it would be of great value to all concerned to let it be known. Meanwhile the steel wheel is coming more and more to the front. It is very young as yet, and its probable life cannot be definitely determined; but, it is a lusty youth that promises much for a vigorous and commanding manhood.

THE LOCOMOTIVE MECHANICAL STOKER.

It would seem from the description of the mechanical stoker for locomotives that was published in the *Railway Age Gazette* for June 10, that a device has at last been produced upon which reliance can be placed for reliable and economical service. During the past few years, in which such strenuous efforts have been made by a number of designers to produce an effective mechanism, descriptions of the work done and the results achieved have been published in these columns. The first and most important thing to be attained was the maintenance of steam pressure under the severe conditions of heavy working to which the modern locomotive is subjected. Apparently this was not very difficult to do. At least, all the stokers that were examined and reported on in detail succeeded in doing this. This done, the next point was to obtain a machine that would do its work with at least the same amount of coal consumption as hand firing.

It was here that trouble was experienced, and trouble of such a serious nature that it does not seem to have been overcome. It was shown that the steam pressure could be maintained, on both heavy passenger and freight service, and that, too, without any severe exertion on the part of the fire-

man. But there was an almost prohibitive development of black smoke, and, though no comparative tests have been made available, it was certain that the coal consumption was much in excess of that attending hand firing. In some cases, provision was made for an easy change from stoker to hand firing; in others the stoker was put upon the footplate as a separate machine. It was then tolerated only so long as it was doing its work; the moment it failed, for any reason, and hand-firing had to be resorted to, it was so much in the way that it was usually incontinently disconnected and thrown out upon the roadway. It was summary treatment, but it had to be given, in order that the train might be run with the least possible delay.

In the case of this latest development, all of these difficulties have been overcome. Instead of making the stoker an excrescence occupying valuable space in the cab, it has been built in as a part of the locomotive, is located out of the way beneath the footplate, so that its existence would not be suspected by the casual observer. This leaves the doorway free and hand firing may be resorted to instantly in the case of a stoker failure, or may even be used to supplement it while the machine is at work; though if there is a drop in the steam pressure and the stoker will not bring it back, a resort to hand firing will be useless. This speaks well for the efficiency of the device as a steam producer. As for efficiency in operation from the standpoint of coal consumption the records go to show that it is probably more economical than hand firing, though as to just how much cannot be determined until an equipped locomotive has been put on the testing plant and tried.

From the standpoint of the public the device is of interest, in that it does away with the smoke nuisance, and even the most carping of inspectors would have difficulty in making an adverse criticism. To the firemen it will be a boon, in that all of the heavy work of the locomotive is done by mechanical means. It will probably mean, too, the appearance of a higher grade of firemen. Under present conditions the possession of strong muscles and great powers of endurance are the prime requisites of a fireman. Intelligence is desirable, but intelligence without the muscle is useless, and intelligence with the muscle more often than not balks at the footplate labors. With the necessity for this overexertion removed, men will be attracted to the service who would not otherwise enter it. Not that the stoker will make the life of a fireman a sinecure, for he will be as busy as ever, and will have to be quite as keenly alert to his work as in hand firing. The difference will be that he will be able to make a long run without undue physical fatigue, and to do as good work at the end as at the beginning.

This is not written with the idea that the officers of the road upon which the stoker has been developed think that it has been perfected to a point where nothing more can be done, for that is not the case. They think merely that it has been developed to a point that warrants a somewhat extensive application with every prospect of success.

THE PREMIUM SYSTEM FOR ENGINEMEN.

The efforts to keep the expenses of mechanical department operation within reasonable bounds have been directed largely to the operation of shops engaged in the repair of locomotives and cars. A large part of the mechanical department expenses have not been touched by the wave of reform which seeks to economize by premium methods. It has been proposed to introduce a premium system for enginemen so as to stimulate greater interest and care in the handling of locomotives, by substantial rewards in money, which will result in larger mileage and less annual cost for repairs. Something in the same line has been adopted for master mechanics and road foremen of engines on one road, and substantial gains have resulted both for the road and the men. It insures a closer supervision of the work of engine repairs and engine operation by enlisting greater interest than before. It should make the enginemen more painstaking in the care of the engines. While they would not do more manual work, more thought would be exercised, greater skill developed, and a larger interest shown in seeing that engines were properly cared for in the roundhouse.

It is true that the premium system was applied to fuel consumption at one time on a number of roads with very good results, and it is still in operation in some foreign countries. Such a system has also been applied to the expenditure for small supplies carried on locomotives, and has resulted in a substantial saving, a large portion of which was given to the enginemen who accomplished the saving.

In the efforts to reduce the expense of locomotive repairs, shop and roundhouse operations only have been considered, but the cost per mile for these repairs is evidently less if the engine makes a large mileage between shoppings, and little has been done in a systematic way to increase this mileage. Locomotives which have been properly repaired and are well maintained should render a nearly uniform mileage between shoppings; as there is a very wide difference in the mileage of different locomotives in the same service on a given division, it must be due in part to the manner in which they are operated, and to the care which the enginemen take to keep them in good working order, always excepting such locomotives as require repairs by reason of wrecks or to which new devices may be applied. The amount of breakage and wear of locomotives, for which enginemen are responsible, is difficult to measure, but with a large number of locomotives the records show that the mileage between shoppings is a fair indication of the interest the engineer has taken in having his locomotive maintained in good running condition.

The record mileages for locomotives which have been obtained by faithful and skilled enginemen, show the great value of these qualities in the men, and if they became the rule instead of the exception there would result a large saving to the railways; it would almost be equivalent to returning to the old-time method when each man had his own engine, and took a personal pride not only in its appearance but also in its working condition. The irregularity of the service obtained from locomotives, as indicated by mileage between shoppings, has been shown by the records from many divisions. On a certain division of one road the engine which made the best performance in passenger service showed a mileage between shoppings of 160,440. The best 25 per cent of the engines made 143,000, and this may be taken as a standard which a majority of the engines could obtain if they were properly handled and properly cared for. But the average mileage made by passenger engines between shoppings was only 103,300 miles. In freight service on the same division, with engines of the predominating class and in similar service, the best engine made 115,470 miles, the best 25 per cent of the engines, 65,490 miles, which is reasonably obtainable. The average on the division and in this service was only 41,075 miles. All locomotives which had suffered damages from wrecks were excluded from these records. While these large differences in the service rendered by locomotives may not exist on other railways, yet it is a matter of degree only, and large enough differences exist on all lines to call for a serious inquiry as to the cause and as to the remedies to be applied.

It is thought possible and perfectly practicable through a system of coöperation, education and mutual help to change irregular records of engine mileage to something much more uniform, and cause them to approach the mileage made by the best 25 per cent. An increased mileage for a given cost will evidently reduce the cost of repairs per mile.

In the application of the premium system to the wages of enginemen, one railway proposes to establish separate al-

lotments for each class of engine on the different divisions, which shall be predetermined standard figures for the cost of running and light repairs per mile. The efficiency is the result of dividing the allotment cost by the actual cost. The payment of the premium begins at about 75 per cent efficiency. Above this efficiency the payments increase proportionally much more rapidly than the efficiency, in order to encourage the men to reach 100 per cent, when the sum is large enough to be appreciated. If the allotment is 5 cents per mile, and the actual cost 5.50 cents, the efficiency is 90 per cent, and the engineer is paid $2.79, the fireman, $0.93, making a total of $3.72 for the month. By careful work on the part of the enginemen the cost may be so reduced as to net them a total premium of $15 or $20 per month. It is also intended to use a different allotment cost for running and light repairs per mile, varying according to the time the engine has been out of shop, the figure increasing for one class of engine about 1-10 cent per mile for each 5,000 miles of service.

As the principle of the premium system has been shown to be correct for other lines of industry, and in other lines of railroading, there appears to be no good reason why it should not be applied to enginemen. It has been said that certain false principles of philosophy and economics are so built into the foundations of the labor organizations that it will take decades, perhaps generations, of patient and conscientious effort to remove the false concepts and replace them with the true. On the other hand, the present rights of the brotherhood to negotiate with railway officers with respect to rates of pay as set forth on existing schedules would not be interfered with or changed by the adoption of the premium system. The most convincing argument would be obtained by giving the system a fair trial, and the organization should not object to that. Something of the kind is needed to secure better service and better care for locomotives, but it will require a firm hand, courage and determination on the part of the railway officers to accomplish it.

THE ADDRESS OF PRESIDENT WILDIN.

It is seldom that any association having so widely diversified interests as has the American Railway Master Mechanics' Association has the opportunity of listening to a presidential address directed so intelligently and forcefully to the heart of its future usefulness and influence as that delivered yesterday morning by President Wildin and which appears in full in another column. Two years ago the *Daily* took occasion to comment upon the greater effect upon an audience of an address which, though written in advance, was so closely an expression of the speaker's deepest thought that it could be delivered as such, rather than as a mere reading of what might have been jotted down in an occasional moment. But, as was said on the previous occasion, all men are not orators nor public speakers of any grade; and the manner of delivering is, after all, a minor matter. It is, however, a satisfactory thought that among our men who are engaged daily in the most practical of all affairs, the management of the mechanical departments of railways, there should be found serving as leaders in their essentially influential organizations men who not only think deeply, but who can express their views so independently of adventitious aids and so forcibly as regards the mere fact of presentation, as in the case of the address under consideration.

But, "it is the thought that quickeneth." The present address goes to the heart of a matter which, perhaps, could never have been brought up so opportunely as at the present time, when the consolidation of the two principal railway mechanical associations is under consideration. There has for many years been a feeling that the Master Car Builders' Association considered itself the leader, as between the two associations, by reason of the fact that it is a representative organization; and that while the Master Mechanics' Association is the larger body and deals primarily with questions as important as those handled by the sister association, the two bodies could never be considered as quite on a level because of this representative status. There is no question here of discussing these relative grades of influence, but merely of following for a moment the line of thought suggested in the address as to the manner in which the Master Mechanics' Association may increase its efficiency and thereby enhance the value of its services as an organization, not only to its membership, but likewise, and perhaps in a greater degree, to the railway interests personally represented.

As is stated in the address, this association is unique. To the consideration of problems such as might appropriately be undertaken by the American Society of Mechanical Engineers, its field adds what appears, from the standpoint of its members as railway employees, the far greater function of adapting to practical purposes what the other association might, without discredit to itself, leave hanging in the air on theoretical supports alone. It is, therefore, essential that the association pull itself together. There is no question of the value of the investigations carried on these many years by the Master Mechanics' Association. They have been the basis upon which American railway practice has been largely revolutionized. That this is true, for the reason and for the sole reason that its members have had confidence in the conclusions drawn by other members as fellow-laborers, and investigators, speaks powerfully for the efficiency of its members as mechanical railway men. As an aggregation, the association has not failed, nor can it fail, to exert a considerable influence. As a unit it has none, solely for the lack of any means of concentrating its individual opinions and activities upon a common point.

In a period when legislative action unrestrained "stalketh abroad at noonday"; when the official in charge of the locomotive department is as liable to be confronted with new federal or state legislation concerning boiler inspection, the candle-power of headlights, the operation of ash-pans or the employment of two or three men upon an engine, as his neighbor of the car department was a few years ago, and seemingly still is, to meet with the requirement to observe certain arbitrary regulations as to the series of so-called safety appliances; or as his other neighbor of the tariff department is to be forced to reconcile the necessity of earning dividends on a certain definite capitalization with certain legally established rates that are more or less confiscatory; it would seem not unwise for an association having railway motive power as its sole subject of consideration to take such measures as will bring the results of its investigations to a definite head, to crystallize its conclusions into a lump upon which it may be said that the association stands as an organization, and to remodel or add to its organization in such a manner that its consensus of opinion may be delivered in the effective form of a rifle bullet, rather than simply in the attention-distracting form of a charge of bird-shot. There is large game in sight.

There is no question here as to the value of the research work which has been done under the auspices of the Master Mechanics' Association. But the investigator or discoverer or inventor rarely gains anything beyond the mere pleasure of investigation and study, nor does the public profit by his years of labor until a differently constituted mind takes up the matter and exploits it on another line. This is the status of the individual investigator. An organization of a thousand or more members of varying degrees of capacity and mental constitution above a certain rather high level, undoubtedly possesses within itself the capability of giving tangible form to the conclusions at which it arrives. With this end in view, the net result of its work would be the converging of its multiple lines of thought and courses of experience rather that their divergence; the production of an ounce ball and

not an ounce of lead in the form of bird-shot, to refer to a former illustration.

Whether the plan proposed in the address to which we have reference—a centralized technical bureau of which the officers of the association would be associated in a consulting capacity—whether this would be the most suitable manner in which to bring about an end undoubtedly desirable, it is too early to say. The suggestion requires more extended consideration. The proposition is fundamentally new. It goes far beyond the matter of motive power development, which is the subject of one of the reports for the present year. It touches the future efficiency of the association. The neglect or the solution as a problem of the question involved will determine whether the American Railway Master Mechanics' Association is to be merely the forum for academic discussion of the work of the motive power department, or whether it is to be a respected and compelling influence in relation to any and all questions that may properly be classified as within the scope of its consideration and action.

JOSEPH W. TAYLOR.

When John W. Cloud—known as the "ideal" secretary of the Master Car Builders' Association for many years and of the Master Mechanics' Association for a shorter period—in 1899, resigned to accept the representation of the Westinghouse Air Brake Company in London, many doubts were expressed as to the possibility on the part of either or both associations of finding a successor whose work would be even a passable substitute for that to which they were accustomed. Wisely, however, as it appeared then and as it has appeared with double force every year since, it was determined that the safest course lay in the selection of one who had had the benefit of Mr. Cloud's training and who, in fact, had done the principal part of the detail office work as Mr. Cloud's assistant. Notwithstanding that the duties of the office have very largely increased by reason of the increased membership and volume of work done by both associations—a fact that is only partially shown by the growth in size of the volumes of proceedings—Joe, as he is almost universally called, has never found the job too big, nor has he failed to come to time when any ordinary or extraordinary demand has been made upon him. Unquestionably and by right of faithful and intelligent work the mantle of the "ideal" secretary now rests upon Taylor's shoulders.

With few exceptions probably the members of neither association appreciate the volume of work which the secretary is called upon to perform between one year's convention and the next. It is an ever-continuing job, though the culmination of its activities is naturally in the period a few months before and a few months after the conventions. The office is the focus of all the movements of both associations. It is the medium through which hastily prepared and sometimes ill-digested plans of a few members are filtered before they come to the attention of the associations as a whole or to the public. The secretary is not only the recorder, accountant and editor; he is in a most unobtrusive and unrecognized way a "whipper-in" and adviser to all the members, the effectiveness of this persuasion and the acceptability of his advice consisting precisely in this unobtrusiveness and lack of recognition.

Taylor has been secretary of these two associations and of the Western Railway Club so long that it is hardly worth while to recall what he was before, except as Mr. Cloud's assistant. He is generally credited with having held down a chief clerkship on the Erie before he went to Chicago; but it doesn't matter. He has made himself and he has made the secretaryship of three important railway organizations—all of them jobs worth bragging about. But "Joe" never does that and that is why his newspaper friends have to step in—like this.

TO-DAY'S PROGRAM.

MASTER MECHANICS' ASSOCIATION.

Discussion of Reports on:	
Widening Gage on Curves	9:30 A. M. to 9:45 A. M.
Steel Tires	9:45 A. M. to 10:00 A. M.
Safety Appliances	10:00 A. M. to 10:15 A. M.
Superheaters	
Individual paper on "Locomotive Performance Under Different Degrees of Superheat," by Prof. C. H. Benjamin, Purdue University.	10:15 A. M. to 12:00 M.
Individual paper on "Locomotive Frame Construction," by H. T. Bentley, A. S. M. P., C. & N. W.	12:00 M. to 12:30 P. M.
Report of Committee on Safety Valves	12:30 P. M. to 1.00 P. M.
Report of Committee on Lumber Specifications	1:00 P. M. to 1:30 P. M.
Adjournment.	

ENTERTAINMENT.

10:30 a. m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

3:30 p. m.—Orchestra concert, Entrance Hall, Million Dollar Pier.

9:30 p. m.—Forty-third annual ball of the American Railway Master Mechanics' Association.

Proceedings.

The first session of the forty-third annual convention of the American Railway Master Mechanics' Association was held on June 20. President G. W. Wildin (N. Y. N. H. & H.) called the meeting to order at 9.40 a. m. The past presidents of the Master Mechanics' Association and the Master Car Builders' Association, and the present officers and the executive committee were invited to occupy seats on the platform. The Rev. Newton W. Cadwell, pastor of the Olivet Presbyterian Church of Atlantic City, opened the exercises of the morning with prayer. Franklin P. Stoy, mayor of Atlantic City, delivered an address of welcome in his usual felicitous manner.

Eugene Chamberlain replied on behalf of the association, as follows: Year after year the mayor from this self-same platform has extended not only to this organization but to many others the large, warm, moist hand of welcome. He has with the skill of a Michael Angelo depicted the beauties of this magnificent city, the Venice of America, until his graphic portrayal has caused us for a moment to forget the ravages of the bell-boy. He has bidden us disport ourselves in the briny deep, attired in a picturesque short-term bathing suit, assuring us, upon his official honor, that royalty was laving its aristocratic though attenuated bodies in the self-same water only three thousand miles away. He has done everything, and more than we could reasonably expect, in the extension of the glad hand, and I, I have been periodically popping up before him as the official can-opener of this and the other organization.

Your Honor, it may be that the beauties of this spot have exerted a certain influence on our frequent coming, but let us say for your private ear, that the greater influence has been exerted by your honorable self. We have not time to dwell upon the importance of this great organization, or the duties that are being daily added to the men who administer the mechanical departments of these great corporations—it is a matter of history; we cannot take the time to dwell upon the importance of this great industrial display, the most magnificent in the history of the conventions, or the men who make this display possible. But let me say that these men are so diplomatic that any one of them could at a moment's notice qualify as an ambassador to the Court of St. James. We cannot dwell upon the scribes, who are here as usual, with pen in hand, to indicate the goings and comings of the wandering Pharisee, but we can, your Honor, take the time and ask your official recognition of the ladies.

It may have occurred to your Honor that we have brought the girls with us again—it is true that we may have had some difficulty in getting them started. You see, the milliner and dressmaker do not get the garments home quite on time, and at first mother thought she could not come, but she is

here, God bless her. And then you know, your Honor, we had a selfish motive in bringing them along—we knew that their presence would add dignity and refinement to this or any other convention. We knew that they are better entertainers than we are, that woman's intuition would seek out the young girl who was new at the conventions, and would welcome her and make her feel at home, and that they would say: "My dear, if the sun ever shines in Atlantic City we will go down and have a ride on the boardwalk in one of the perambulators; we will become better acquainted, and you will enjoy yourself, and, incidentally, my dear, you will learn something about pushing a perambulator of your own." And then we brought them with us because we always feel safer when mother, and wife, and daughter, and sister are present, and, last of all, but by no means least, we brought them along because we love them, because, whether we are willing to admit it or not, woman stands for a constant song of praise, this most precious gift to man.

Your Honor, we accept your hospitality in the same kindly, generous spirit in which you proffer it. We promise you we will use it discreetly and with caution, and we agree to return to your safe keeping the keys of this splendid city untarnished and unbent.

and admiration. Second only to the Master Mechanics' Association do we regard your organization of "Hotel Men," and in this respect our impression is made more indelible every time we observe you thrust forth that strong right arm of unity and rake in the shekels in the form of added conventions. To these you are entitled because of your fairness and liberality.

Friends of the supply fraternity, your good work and influences we fully recognize and appreciate. The splendid exhibits you have arranged at untold expense speak for themselves, and I am sure I voice the sentiment of a unanimous membership when I assert that without exception they constitute the greatest practical educational privilege ever accorded railway officials and men who may care to avail themselves of the opportunity afforded. It is to be hoped that more of our managers and those high in the council of railway operation will interest themselves to a greater extent in this particular feature of our convention and will encourage rather than discourage the attendance of their subordinates, that they may take advantage of, and prosper by your generous assemblage of all the latest devices known to the mechanical art.



G. W. Wildin,
President, M. M. Association.

ADDRESS OF PRESIDENT WILDIN.

It is with keen pleasure, augmented by a high sense of gratitude and appreciation, that I am permitted this morning to extend to you, one and all, a most hearty welcome to the opening exercises of this, the forty-third annual convention of the American Railway Master Mechanics' Association. As an association we are to be congratulated because of the many good things that have come to us during the year just passed, and that we are again privileged to meet for the fifth consecutive time in this beautiful and exhilarating spot, "Atlantic City," a place where hospitality is not stinted nor wholesome privileges curtailed.

As a body we have formed a manly regard for an association of individuals who make it their business to look out for the welfare of this great city, and well may the city be proud of them. Mr. Bell, on behalf of this association I extend to you and your associates our hearty good will

You are the representatives, if not the actual heads, of concerns who compose an organization we railway men very much admire—"The Railway Business Association," organized primarily to protect the interests of its own members, but which has, at the same time, assisted the railways throughout this country in an eminently legitimate manner. The good work already done, although the association is yet in its infancy, is certainly commendable, and we cannot but wish it Godspeed in the noble work it has undertaken.

The general conditions under which we meet at this convention are quite gratifying as compared with those of one and two years ago. We are again operating under normal conditions with good prospects for the continued and even increasing prosperity of our country. Railways are yet in the limelight of legislation and the good old mill is grinding out its usual grist of new, oppressive, and hampering regulations, still I feel like recording my optimism in this direction

and prophesying that the ship of state will again right itself and for some time to come sail on an "even keel."

Our progress during the year just passed shows all the characteristics of that of former years. We have made substantial increases in all directions, financially, in numbers and in power. The several committee reports and individual papers to be presented at this meeting will indicate clearly the good work that has been done by those in charge. It is hardly necessary that I dwell longer upon the past history of the association, as to most of you it is fresh in memory, and I am quite sure I can add nothing to the remarks of my predecessor in office, to whose annual address I most respectfully direct your attention as being the most complete and concise history of the association and its work ever written. Suffice for me to say that none of our past prestige has been lost, but instead another well directed and painstaking year of work has been added to our record.

There comes a time in the history of all organizations when important changes must be inaugurated both in the method of conducting business and in the scope and magnitude of the work to be covered. I feel at this time that as an association we have about reached that point. It is hoped, therefore, that you will pardon my seeming presumption if I enter upon a mild criticism of our usual methods and customs. In doing this, however, I wish it to be most clearly understood that far be it from my intentions, and much less my desire, to detract one jot or tittle from our standing in the mechanical world, or from our past achievements. Disloyalty only would brand the man who as presiding officer of this association would wantonly exercise his prerogative for that purpose.

We have faithfully observed the injunction placed upon us by the framers of our original constitution and by-laws, who in preparing the preamble to it expressed themselves as follows: "We the undersigned railway master mechanics believe that the interests of the companies by whom we are employed may be advanced by the organization of an association which shall enable us to exchange information upon the many important questions connected with our business." Excellent reasons were these for the establishment of this association, and sufficient are they for continuing its existence. But there is urgent need for extending our operations beyond the mere confines of the exchange of ideas and methods.

As a technical association we stand unique and alone in the field of railway mechanical engineering, no other country to my knowledge having a like organization performing like work. True, we have an esteemed body in this country known as the American Society of Mechanical Engineers, of which I have the honor to be a member; but the work of that society and its field of research are so far removed from the practical everyday problems in railroading that as a society it is of but little value to the railway mechanical fraternity. It is, therefore, incumbent upon this association to assume a stronger role, and, in addition to holding our annual experience meetings, to get closer together and concentrate our efforts on unifying mechanical opinions on matters of design, construction, specifications, formulæ and policies.

Possibly we have not had the encouragement we should have received from our superiors, and have not been drawn upon heavily enough to arouse within us the latent powers we possess; consequently without this call upon us we have, as might be expected, assumed a more or less dormant attitude in relation to research work. But it is safe to predict that, with the past two or three years of both national and state legislative activity covering subjects the consideration of which properly belongs to this body, we will in the near future be called upon for action much more strenuous, exacting and positive than we have every experienced before.

With this idea in view, and realizing the many vexing problems we as mechanical men will have to solve, I wish to advocate for your most serious consideration the establishment of a permanent centralized technical bureau within our association to be composed of active members of the association having strong technical and practical training, and to have associated with them the officers of the association as members ex-officio. This body should be clothed with authority to act for the association on all important questions arising in the interim between our annual meetings, making a full report to the association in convention assembled at the first opportunity.

I would further suggest for your consideration that one member of this bureau be a salaried incumbent, the permanency of the office and the emoluments to be such as to permit of its acceptance by an individual fully equipped through experience and training to cope with any and all questions demanding his attention, and who will at all times keep the central body well posted as to the general happenings of interest throughout the country, collect such data as may be required by the body and direct such investigations and research work as may be assigned to him.

It is also quite necessary that we as an association be more of a unanimous mind on questions that are likely to call for or be made the subject of either federal or state legislation. Such questions should be anticipated and acted upon as far in advance as possible, and then when real legislative action is begun a precedence will have been established, so that the dominating and impelling forces which shape the opinions and recommendations of legislative committees will not emanate from the leader of some political clan or labor organization, but will be found recorded in our proceedings and practices as the crystallized judgment of the members of this great engineering body, whose opinion cannot long be ignored.

Examples covering the points I have tried to make with reference to getting together are many and varied. Your attention is called to a few which seem to cover the ground fully and will, I hope, substantiate the position I have taken.

A bill recently introduced in Congress, known as the Federal Boiler Inspection Bill, has created quite a furore and not a little anxiety among railway managers throughout the country. This bill was forced to the front by politicians urged on by labor organization leaders, and it was necessary on the part of this association to take some action in opposition to the forces at work. To this end, although resembling quite closely an eleventh hour repentance, a committee on boiler design, construction and inspection was appointed at the first meeting of our executive committee held at Cleveland last July. This committee has done splendid work in collecting and tabulating data which we hope will enable the American Railway Association committee finally to prosecute successfully its contentions before the House and Senate committees having the bill in charge, but it is well known that the data furnished the committee by the various railways lacked harmony. The opinions and suggestions offered were often diametrically opposite and the whole presented such a lack of uniformity and agreement that it was bewildering, and to glean anything tangible from the mass required almost superhuman effort.

As members of this association we have had more or less to do with the design and construction of locomotive boilers during the past forty-three years, and as railway mechanical men many years longer, yet we are not agreed on the very simple and fundamental question of the factor of safety for locomotive boilers. As a consequence of this lack of agreement some of us are now facing the peculiar dilemma of strengthening locomotive boilers now in service both new and old or of prevailing upon the Public Service Commission to reduce the requirements which they arbitrarily established in the absence of an authoritative standard.

The locomotive headlight question has furnished legislators in many states with a big stick of harassing proportions. On this question, as on many others, we as an association have about as many opinions as we have members, the opinions ranging from the declaration by some that the headlight is an expensive nuisance and should be abolished to the declaration by others that it is a necessary and valuable adjunct and should be of several thousand candle-power.

It is my opinion that such questions as I have mentioned, as well as purely technical questions, covering design and construction are well within the work to be covered by this association, and especially the work of the bureau I advocate. Similar problems will arise as long as railways operate, whether the motive power be steam, electricity or something else, and it is our plain duty to provide some medium through which all vital subjects can at all times be fully and thoroughly investigated, and to be in a position at all times to present a united front on all questions involving the common interests of all railways.

Since we last met in convention, one year ago, 10 members of this association have passed to that unknown beyond from whence no traveler ever returns. All were good men and true and while proper recognition will be given each in our usual obituary notices, I feel that I would be most derelict in the performance of my duty and most ungrateful for the association I have had with him if I did not in some manner express my deep feeling at the untimely and tragic death of our friend and past president, Peter H. Peck. Not since the hand of that mad assassin felled the lamented Pulaski Leeds has this association been so deeply shocked at the death of one of its members. The taking of these two stalwarts in such a tragic manner in the fullness of their manhood, vigor and usefulness brings us close to that feeling that man knows not what is in store for the morrow. Peter Peck was struck by a locomotive while crossing the Rock Island tracks at Seventy-ninth street, Chicago, on Sunday, November 28, 1909, sustaining injuries from which he died the following morning. He was a man of whom it could truly be said his friends were legion and his enemies few. A manly man, typifying in the highest degree those noble characteristics of the true American citizen and patriot, a loving husband and indulgent

father, always ready to extend the right hand of fellowship to those seeking assistance and wise counsel. In his death this association has sustained a great loss. We will, of course, long cherish his memory, and his works we have permanently recorded and securely lodged in the archives of the association, which we must consider truly a golden heritage.

In closing I feel I should be very ungrateful and unappreciative if I did not recognize with thanks the assistance and full coöperation given me by the officers of the association, the executive committee and the several committees and individuals who have prepared reports for this meeting. To one and all my heartiest thanks are given.

The report of the secretary showed the membership to be as follows: Active, 952; associate, 20; honorary, 37; total, 1,009. During the year the secretary received $5,466.56 and expended $5,433.40, leaving a balance of $33.16. The treasurer's report showed the balance on hand June 20, 1910, $6,229.94.

The executive committee recommended that the dues for the coming year be the same as heretofore, $5 per member. The recommendation was approved.



C. E. Fuller,
First Vice-President, M. M. Association.



H. T. Bentley,
Second Vice-President, M. M. Association.

The Secretary: In accordance with the usual custom, we extended an invitation to the Traveling Engineers' Association to have a representative present at this meeting. I am instructed by the secretary of that association that J. A. Talty will represent it.

J. A. Talty: It is the custom for the president of the Traveling Engineers' Association to attend your convention. We do not design locomotives or any part of the power employed by the railways; we try to have the men under our charge render 100 per cent service with the appliances given them, and the traveling engineer who will devote his attention to educating the men under his charge to run the locomotive economically and thoroughly post himself on the equipment that is attached to the engine, so as to ferret out the defects, is an able adjunct to the master mechanic, and for that reason we feel that the Traveling Engineers' Association is an important auxiliary to your association.

The following members were elected on the nominating committee: J. F. DeVoy, C. H. Rae and A. W. Gibbs.

The president appointed the following committee on obituaries: On Peter H. Peck, the Secretary; on Jno. Harrison, Henry Tregelles; on Davis Witherspoon, C. E. Chambers; on W. H. Stulb, F. F. Gaines; on A. B. McHaffie, W. D. Robb; on George Whale, John W. Cloud; on John McKenna, William Garstang; on John Hewitt, the Secretary; on John F. Devine, J. S. Chambers; on Henry Elliott, Jacob Johann.

The committee on Correspondence and Resolutions is, G. M. Basford, Le Grand Parish and C. A. Seley.

The following applications for honorary membership were acted upon by the Executive Committee, and are presented to the Association with the approval of that committee: Edward V. Sedgwick who has been a member since 1885; Thomas Millen, who has been a member since 1885; C. E. Rettew, who has been a member since 1892; Walter L. Gilmore, who has been a member since 1883; James W. Hill, who has been a member since 1887; E. W. Roberts, who has been a member since 1882.

J. F. Walsh (C. & O.): I move that the action of the Executive Committee be approved, and that these members be transferred to the list of honorary members.

The motion was carried.

E. A. Averill, managing editor, *American Engineer and Railroad Journal*, was proposed for associate membership. This proposal will lie over until the next annual convention.

MECHANICAL STOKERS.

The committee decided to briefly refer to the progress and development of stokers reported upon by previous committees, and to describe the stokers which have not previously been dealt with in the reports.

CRAWFORD NO. 8 MECHANICAL STOKER.

The general form of the stoker is shown by accompanying illustrations. All the mechanism is operated by a single

steam cylinder, including the conveyor from the tender. The coal is fed from the tender through an opening in the floor and is then handled by a feeder and breaker sliding backward and forward in the direction of the center line of the tender. This is not a crusher, but has a limited opening, and is provided to prevent large lumps having access to the conveyor beneath. Inside of the conveyor, at eleven points, are placed rake fingers operated from a bar above and extending nearly to the bottom of the trough, and having such a movement as to drag over the coal in moving backward and scraping the coal toward the locomotive in its forward movement.

From the conveyor the coal is led to a point directly beneath the deck plate of the locomotive back of the boiler and dropped into a space from which it is pushed under the mud ring and into two troughs longitudinal to the fire-box and below the surface of the grates. In the bottom of the troughs are additional feeders for conveying the coal to the middle or forward portion of the grate. The plunger or feeder first taking the coal, feeds it principally to the back end of the grate, and the additional feeders carry it forward. The arrangement of these feeders is such that their number can be increased so as to get the desired distribution of coal. The operation of the steam cylinder is controlled by a small valve in the cab, which is operated by the fireman. As already stated, one steam cylinder performs, through a system of levers and connections, all the operations of breaking and feeding from the tender to the actual forcing of the coal from the troughs in the fire-box to the point where the coal burns.

This stoker has been developed and placed in service on Pennsylvania Lines locomotive No. 8592, class "H6b," the principal dimensions of which are as follows:

Diameter of driving wheels	56 in.
Wheel arrangement	2-8-0.
General class	Consolidation.
Cylinders, diameter	22 in.
Cylinders, stroke	28 in.
Type of boiler	Belpaire wide fire-box.
Number of tubes	373.
Outside diameter of tubes	2 in.
Length between tube sheets	164½ in.
Grate area	49.4 square feet.
Total heating surface of boiler	2,844 square feet.
Steam pressure	205 pounds.
Weight of engine in working order	202,000 pounds.
Weight on drivers	179,000 pounds.
Weight of tender	143,000 pounds.
Ratio of heating surface to grate area	57.99.
Tractive power with M. E. pressure equal to 80 per cent boiler pressure	39,588 pounds.
Ratio weight on drivers to tractive power	4.51.

There have been about sixty runs made with this locomotive between Columbus and Dennison, Ohio. The coal used is known as the Panhandle coal, mined west of Pittsburg; Indiana coals have also been used. The distance between the two above-named points is 100 miles, the time of the run varying from four to nine hours. The steam pressure in all tests was good, being probably about 203 pounds, with a few exceptions when a slight derangement of the stoker existed. Out of these trips, 43 were made with no hand firing whatever. There has been as much as 5,200 pounds of coal fired per hour, about 17,000 pounds of coal being used on the trips with preference trains.

Smoke from the locomotive was entirely absent while the stoker was in operation, except that smoke appeared at the stack when the fire was hooked or scraped and when the grates were shaken. The extent of the smoke under these circumstances was about the same as with hand-fired locomotives, but smoke was entirely absent unless this work was being done. The smoke entirely disappeared within a few hundred feet after the operation of hooking or shaking the grates.

The time required to get the fire in condition so that it can be handled by the stoker, before the beginning of the trip, is practically the same as with the hand-fired locomotives. The fire must be started in the usual way and sufficient coal put on the grates by hand while the engine is waiting for its train. As soon as the train starts the stoker is put into operation and thereafter handles the fire entirely without the aid of the fireman, except that necessary for occasional hooking or scraping and the shaking of the grates.

The control of the fire through the stoker mechanism is absolutely satisfactory, the fireman controlling the movement of the conveyor and stoker through one valve in the cab and allowing the stoker to move as many strokes as the fire indicates, or required to supply the necessary coal. The stoking is intermittent. Each movement of the operating steam cylinder delivers about two shovelfuls of coal to the fire. The blowing of the safety valve during the runs was not greater than with the hand firing, and, in general, the control of the fire is quite as satisfactory as with hand firing. The cleaning of fires at the end of the trip is performed by dropping the back drop grates, and no difficulty is experienced in hauling the fire back and discharging through these openings. The fire is then leveled off and banked in the usual way.

As showing the comparative work done in hooking and shaking the grates, a record was kept, which showed for one run that the hook was used with hand firing 13.8 times over the run; with the stoker the hook was used 14.2 times. The shaking of the grate with the hand-fired locomotives of the same class and over the same distance occurred 11 times and with the stoker 13 times. As to the coal consumption, no accurate figures have yet been determined to compare the performance with average firing.

BARNUM STOKER.

The Barnum stoker being experimented with on the Chicago, Burlington & Quincy has not yet reached a state of development which would warrant its general application, and the committee has been informed that, on account of increased demands for locomotive service, the stoker was removed from the locomotive during the winter months. Further tests and experiments will be continued during the summer of 1910.

COMPARATIVE PERFORMANCE TEST, ENGINE 1654 EQUIPPED WITH HAYDEN STOKER, BETWEEN SUSQUEHANNA AND HORNELL, SUSQUEHANNA DIVISION.

SUMMARY.

	Hand.	Stoker.	Difference in Percent of Hand Firing	Hand.	Stoker.	Difference in Percent of Hand Firing
Average running time	7.8892	7.231	.....	8.855	8.29	.....
Number miles run	135	128	.....	135	135	.....
Average ton-miles	316,134	301,160	.....	313,837	306,281	.....
Ton-miles per hour	38,466.6	41,780	.....	35,390	36,960	.....
Average steam pressure	191.59	192.20	.....	191.68	190	.....
Lbs. fuel consumed, dry coal	25,130	24,766	.....	306,080	29.143	.....
Lbs. water evaporated	163,921	161,280	.....	192,306	176,919	.....
Lbs. water evaporated per lb. of fuel	6.47	6.52	.....	6.195	5.960	.....
Weight of ash	3,452	3,286	.....	3,504	4,218	.....
Percent of ash	13.77	12.82	.....	11.54	14.41	.....
Lbs. combustible consumed	22,090	21,960	.....	27,396	25,449	.....
Lbs. water evaporated per lb. of combustible	7.44	7.476	.484	7.01	6.96	.713
*Lbs. water from and at 212° F. per lb. combustible	8.99	8.88	1.22	8.425	8.35	.89
Average temperature feed-water	38.4	36.42	.....	39.72	37.2	.....
Combustible per square foot heating surface per hour	.8035	.9010	.....	.9220	.912	.....
Combustible per square foot grate surface per hour	49.95	55.98	.....	57.59	56.7	.....
Equivalent evaporated per square foot heating surface per hour	7.21	7.985	.....	7.782	7.61	.....
Lbs. dry coal per ton-mile	.07962	.0826	.....	.0993	.0956	.....
Lbs. dry coal per indicated horse-power	4.356	4.716	.....	4.51	4.80	.....
Lbs. dry coal per dynamo horse-power hour	5.28	5.538	.....	5.55	5.76	.....
Lbs. combustible per ton-mile	.0642	.0732	14	.0875	.0830	5.15
Lbs. combustible per indicated horse-power hour	3.83	4.19	9.4	3.90	4.17	6.9
Lbs. combustible per dynamo horse-power hour	4.99	4.91	5.6	4.79	5.01	4.6
Lbs. equivalent evaporated per ton-mile	.629	.648	.....	.737	.699	.....
Lbs. equivalent evaporated per hour per indicated horse-power	34.46	37.12	7.7	33.90	34.8	2.6
Lbs. equivalent evaporated per dynamo horse-power	41.82	43.54	4.15	41.67	41.8	.31

NOTE.—*See curves.

DODGE OR BLACK STOKER.

This stoker, which is under investigation by the Erie, developed several defects in design, the most important being the heating of the bearings of the distributing blades, which was so severe that lubrication was impossible, resulting in excessive wear. The blades were moved back to overcome this difficulty, but in the new position the effectiveness of the coal-spreading device was greatly impaired, thus necessitating further modification, the results from which are not available for this report.

HAYDEN STOKER.

This stoker, in operation on the Erie on five locomotives of a similar type to the one on which the test was made, is, apart from changes to improve effectiveness and reliability, the same as described in the committee's report of 1909. The changes brought about material improvement and the results of the test forming part of the report indicates improved efficiency. It will be noticed in the accompanying data that the equivalent evaporation per pound of combustible showed a loss, in comparison to hand firing, of 1.22 per cent east and .89 per cent west. A comparison on the basis of combustible per ton-mile showed 14 per cent less east and a saving of 5.15 per cent on the west-bound test, while on a basis of combustible per draw-bar h. p. h. the stoker showed a loss of 5.6 per cent east and 4.6 per cent west. In view of the fact that identical tests will show a variation of this amount, it is taken that the stoker showing is at least hopeful.

DIMENSIONS AND PROPORTIONS OF LOCOMOTIVE EQUIPPED WITH HAYDEN STOKER.

Kind of engine	2-8-0.
Type of boiler	Straight top.
Type of firebox	Wide.
Cylinders	R. 22½ in., piston rod 3 29/32 in., L. 22 in.
Stroke	32 in.
Grate surface	54 square feet.
Heating surface	3,358 square feet.
Ratio H. S. to G. S.	62.2.
Area exhaust nozzle	15.98 square inches.
Diameter of drivers	62 in.
Weight on drivers	176,400 pounds.
Weight of tender loaded	137,000 pounds.
Weight of engine	200,700 pounds.
Total weight of engine and tender	337,700 pounds.
No. of flues	380-2 in. by 16 ft.
Tractive power 80 per cent. B. P.	40,034 pounds.
Kind of valve	Richardson balanced.
Kind of coal	Dagus nut and slack.

STREET LOCOMOTIVE STOKER.

The Street locomotive stoker, designed by Clement F. Street, of Cleveland, Ohio, has been in experimental service on the Lake Shore & Michigan Southern continuously since the 1st of May, 1909. The general construction of this device is shown in the accompanying illustrations, in which Fig. 1 is reproduced from a photograph of the rear end of the locomotive, Fig. 2 is a view of the interior of the cab, Fig. 3 a view of the front end of the tender. All these illustrations show the stoker as applied to New York Central Lines locomotive Class G046-C, which is of a 2-8-0 type, and of which the following are some of the important dimensions:



D. F. Crawford,
Third Vice-President, M. M. Association.



Angus Sinclair,
Treasurer, M. M. Association.

Cylinders	23 by 30 in.
Fire box	108 by 73 in.
Grate surface	55 sq. ft.
Number of tubes	460.
Length of tubes	15 ft. 6 in.
Heating surface total	3,957 sq. ft.
Heating surface firebox	232 sq. ft.
Diameter of drivers	57 in.
Weight of drivers	210,000 pounds.
Weight of truck	30,000 pounds
Drop bar pull	49,100 pounds.

This stoker is of the scatter type, in which crushed coal is driven into the firebox by steam jets. It consists essentially of three parts, namely, a crusher, an elevator and a distribution system. The crusher is located on the tender, a small section of the water bottom being cut to accommodate it. It

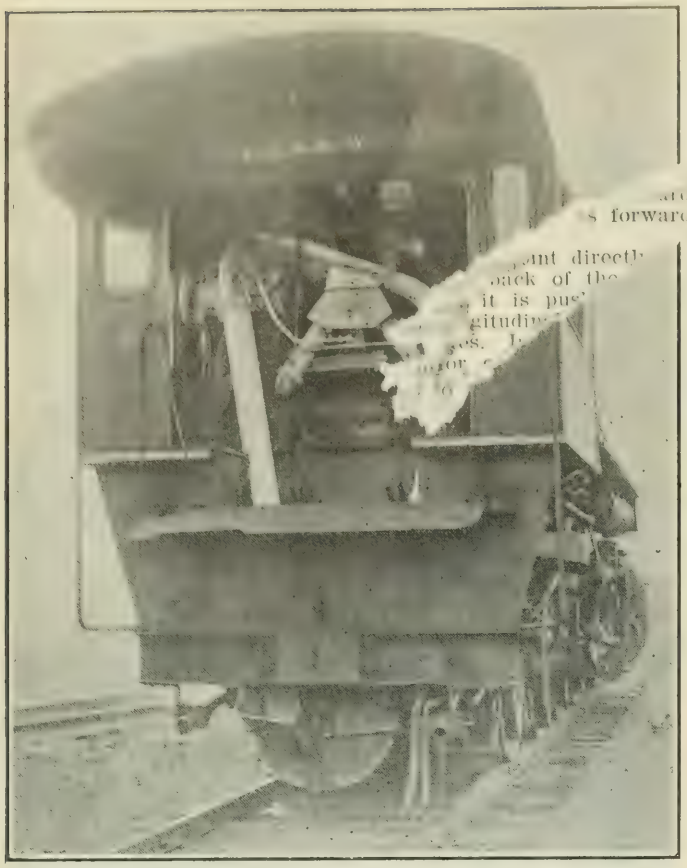


Fig. 1.—Rear View of Locomotive With Street Stoker.

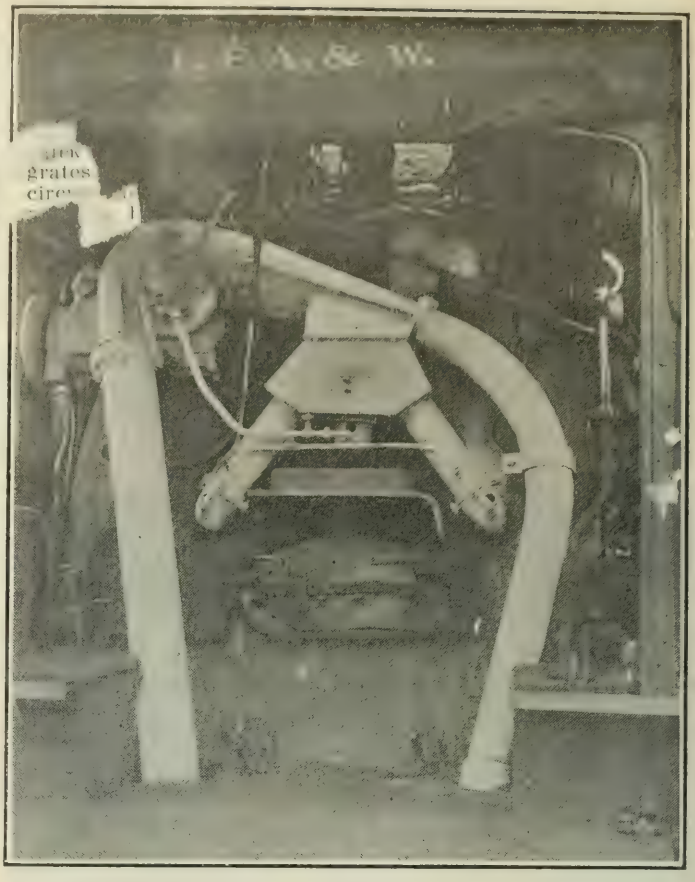


Fig. 2.—Interior of Cab, Showing Street Stoker.

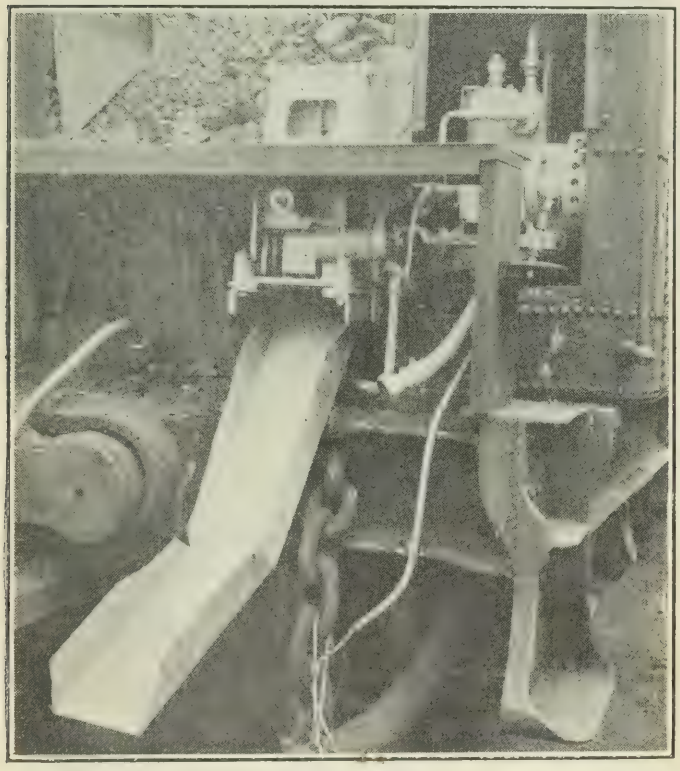
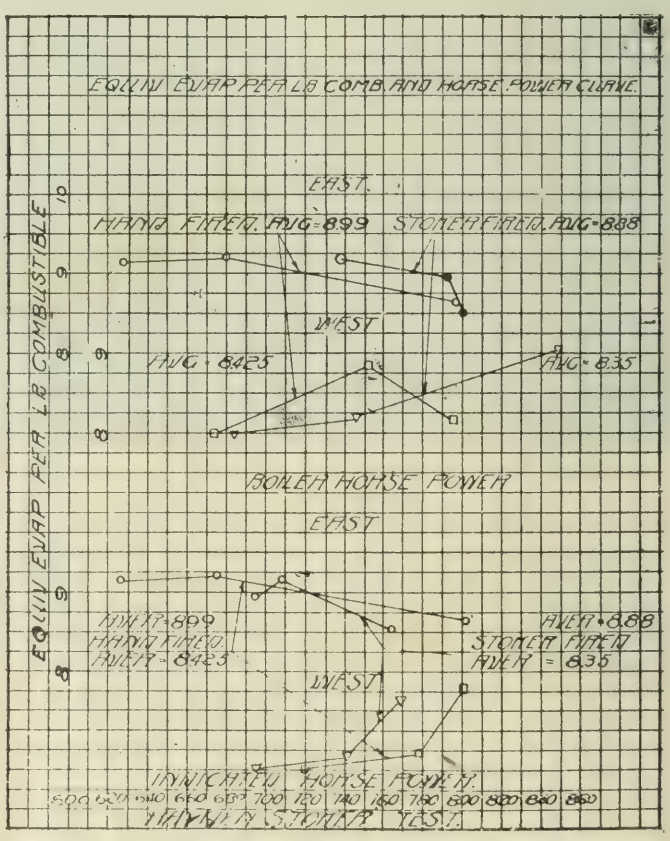
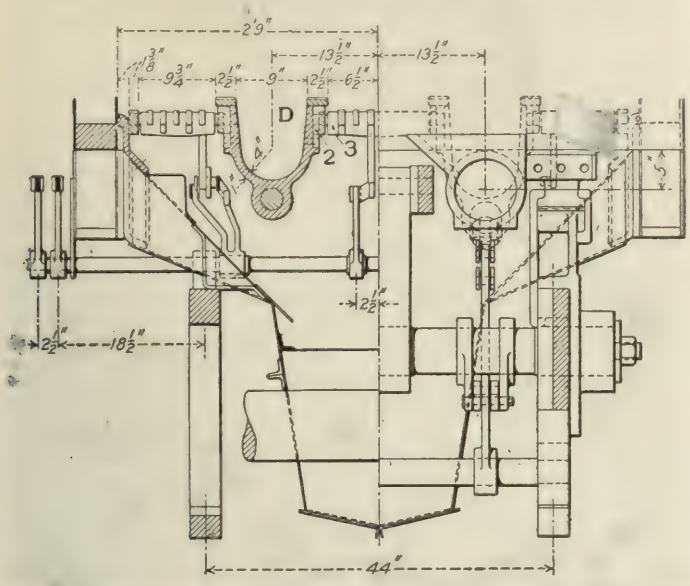


Fig. 3.—Front End of Tender, Showing Conveying Apparatus for Street Stoker.



Test of Hayden Stoker.

is of the swinging-jaw type, and the opening is on a level with the tank floor, so that the coal can be scraped into it without being lifted. The crusher will take "run of mine" coal with lumps up to 8 by 10 in. and reduce them to a size which will pass through a slot about 1½ in. in width. It is driven by a single-acting steam engine bolted rigidly to the crusher and

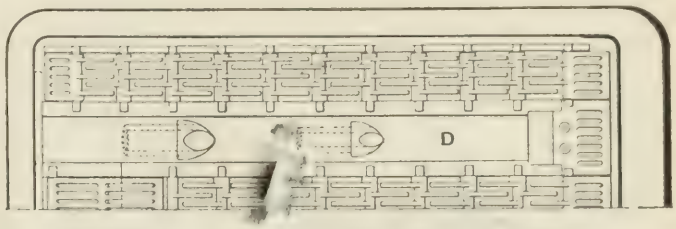


Cross-section Showing Application of Crawford Stoker.

direct connected thereto. The coal, after being crushed, slides by gravity through a boiler-iron trough pivoted to the tender, into a hopper located beneath the deck plate of the locomotive secured thereto and forming the lower end of the elevator casing.

The elevator consists of a double endless chain with drop-forged links, and having malleable-iron buckets riveted thereto. This chain travels in a casing made of gas pipe of standard dimensions. The upper end of this casing is secured firmly to the boiler head and the lower end to the deck plate. At the upper right-hand corner the elevator passes over a steel sprocket wheel which forms the drive. This wheel is driven through a worm by a small steam engine bolted to the boiler head. The coal is discharged from the elevator at a point centrally on the boiler head directly above the fire door. It falls through a distributor hopper into three distributors, one of which is located centrally and each of the other two on the side, and all above the fire door. From these distributors it is, by means of the distribution system, spread over the grates. The distributors are made of cast iron, extending through tubes which are rolled and beaded into the back head of the boiler and the firebox sheet. Each distributor is fitted with a steam nozzle, through which a blast of steam is admitted intermittently for driving the coal into the firebox. A discharge regulator is provided, which, when moved to the right, will give a heavy fire on the right side of the grate, and, when moved to the left, will give a heavy fire on the left side of the grate. The distributor hopper is provided with a deflector, by movement of which the major proportion of the coal can be fed to the center or the slide distributors, as desired.

The experiments have shown that accurate adjustment of the above is not essential. While a considerable change in the position of the reverse lever will affect the distribution, a movement of three or four notches makes no perceptible difference. The steam engines running at a constant speed are both fitted with shaft governors enclosed in a crank case, and the lower end of the connecting rod and valve rod are the only adjustable bearings. The only attention these engines require is the introduction of a small quantity of oil in the crank case every three or four days. The only other parts of the stoker requiring attention are the three bearings on



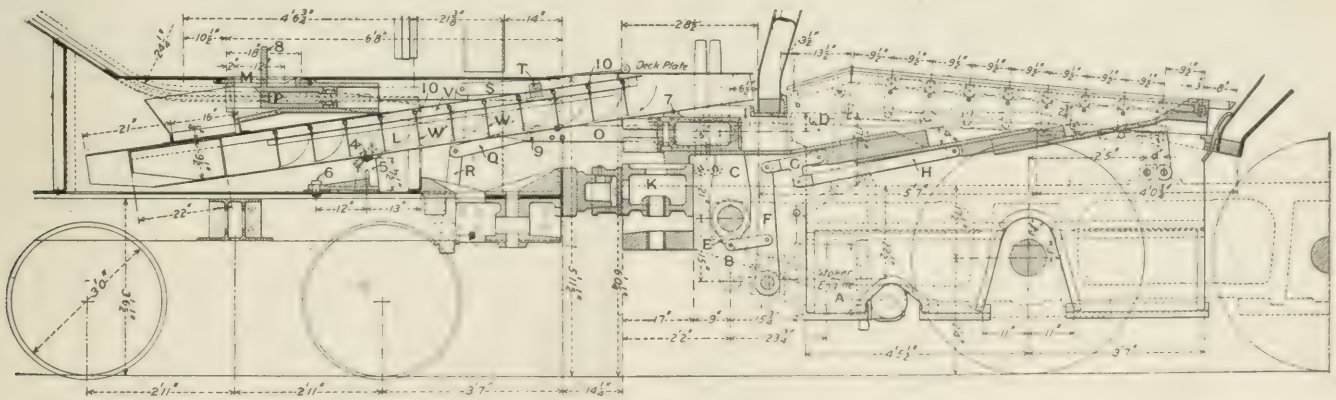
Half-Plan of Grate Used With Crawford Stoker.

the crusher and two on the elevator, which require oiling once a day.

It is, of course, desirable to do away with the crusher, and have crushed coal delivered to the tender, as this will reduce the number of working parts of the stoker. The crusher is provided with a relief spring which makes a breakage impossible and the elevator is made sufficiently strong to stop the engine which drives it without breakage. With crushed coal on the tender a screw conveyor will be used for carrying it to the locomotive. This conveyor will be protected by a wire netting, which will make impossible the introduction of anything which cannot be handled by the elevator and the distributors. The screw conveyor will be driven by the elevator engine, which will be the only engine used with this type of stoker.

The claims made for this stoker are, first, its non-interference with the fire door; second, the simplicity of its construction; third, the ease with which it is operated; fourth, the control it gives the fire; fifth, fuel economy. The fact that this stoker does not in any way interfere with or obstruct the fire door makes it possible for the fireman at any time to inspect his fire, use the hook or supplement the work of the stoker by hand firing. Should the stoker fail, or anything go wrong with it, hand firing can be immediately resorted to, and a stoker failure will not result in a locomotive failure. It has been found, however, during a long series of experimental runs, that it is seldom necessary to open the door at all, and complete round trips over a division of over one hundred miles have been made without the door being opened.

The construction of the engines for operating the mechanism is quite simple. Their protective casings makes it unnecessary for the fireman to do anything to them except lubricate, and the same is true of all the other parts of the machine. It requires only a few seconds to place the stoker in operation and after it has been adjusted, which also requires only a few minutes, it needs no attention of the fireman other than the operation of the mechanism. It is claimed that this stoker gives a much better control of the fire than is possible by hand firing. In regular service the steam pressure has been allowed to fall off from 40 to 30 lbs. and restored to a maximum within two and a half minutes while the locomotive was working at full capacity with the injector



Crawford Locomotive Mechanical Stoker and Coal-Conveying Apparatus.

on. The results of tests seem to indicate that the even distribution in thin layers of coal prevents the formation of clinkers. Under ordinary conditions the cleaning of the fire is not found necessary.

STROUSE STOKER.

This stoker, as mentioned in the report of the committee of 1909, is manufactured by the American Stoker Company, of Milwaukee, and is being experimented with on the Iowa Central, Minneapolis & St. Louis and Chicago & Alton. During the time of comparative tests on the Iowa Central the performance was very satisfactory. During the period of this test the engine was in charge of a regular assigned crew. After the test was completed the engine was assigned to regular chain-gang or pooled service, after which time various failures were experienced due to different parts of the machine breaking. These failures resulted in the stoker being out of commmission a good portion of the time, for the reason that a stock of repairs was not carried. Therefore, when any part failed it was necessary to order it from the manufacturers. This did not, to any great extent, lay up the engine, as when the stoker did fail, either at terminal or on the road, it was removed, which required about twenty minutes, and hand-firing was carried on in the usual manner. It is generally regarded that the failures experienced were largely due to the enginemen being inexperienced in operating the machine.

Experience has shown that the stoker is not mechanically perfect. Therefore, it requires considerable skill and care on the part of the enginemen to avoid failures. The stoker company have made several improvements in the design of the machine in the past year, and, in view of the improvements that have been made that have so materially improved its performance, it is reasonable to assume that this machine will yet prove a successful device for automatic firing of locomotives.

It could hardly be expected that mechanical stokers at the present stage of development could show an economy over hand firing by an expert fireman, but it is considered that, if economy is expected, it must be looked for in the comparison with the average of all grades of firemen in regular service. Designers of the present day are more interested in effecting practicability and security against failure rather than the promoting efficiency by its use, as this effect is more or less taken for granted with any properly designed and thoroughly practical stoker.

The main defect of the present stokers seems to be, to a very great extent, with the coal-conveying apparatus, and it is the failure of this particular feature which usually makes the stokers of to-day somewhat unreliable.

The committee considers the progress and the development of the mechanical stokers during the past years as indicative of a determined effort to build stokers which will be in every way a success, and is convinced that the mechanical stoker is destined to be a very important factor in the operation of heavy locomotives in the not very distant future.

The report is signed by:—T. Rumney (Erie), chairman; E. D. Nelson (P. R. R.), C. E. Gossett, J. A. Carney (C. B. & Q.) and Geo. Hodgins.

Clement F. Street (Cleveland, Ohio): All that it would be becoming for me to say is that my stoker is doing business. The machine has been in regular service. The first experimental machine was put out about a year and a half ago. This machine ran for one year and was gradually developed to a point where a second machine was applied, in February of this year, which has since been operating daily, and at the present time is in regular service, taking any engineer and any fireman that comes along. It is necessary, of course, to have a slight amount of instruction, but the firemen have taken the locomotives without ever having seen the stoker run except as the locomotive was standing. The traveling engineer has gone over the machine and showed the fireman how to operate it, and has gotten off the locomotive and the fireman has made the complete round trip with the stoker, putting all of the coal in the fire-box with it, no hand-firing being necessary. The machine will do this, and is doing it, right along.

The stoker is now working between Ashtabula and Youngstown on the Lake Shore and Michigan Southern. I am applying six more machines, all of which will be in operation inside of the next two or three months.

D. R. MacBain: On behalf of the Lake Shore & Michigan Southern I wish to extend an invitation to any of the members of the Association who feel that they would care to look over Mr. Street's stoker as it is now working on our lines to do so.

John Tonge (M. & St. L.): Is a representative of the Iowa Central here? I would like very much to have him tell us what difficulties they had with stokers. The report says: "It is generally regarded that the failures experienced were largely due to the enginemen being inexperienced in operating the machine." In all my experience with the stoker I have come to the conclusion that there is very little work for the men to do, and that such work as is necessary is very easily done. I feel that the stoker is a success under many conditions, not under all conditions, but I do believe that it is possible to make it a success under all conditions.

C. E. Gossett (I. C.): I am responsible for the statement in the report to the effect that the difficulties we have had in the operation of the stoker are largely due to the enginemen being inexperienced in the operation of the machine—that these difficulties are caused by a lack of familiarity on the part of the enginemen and firemen with the details of the operation of the stoker. The experience required in the operation of the stoker is, first, the amount of steam to be admitted to the stoker, which is graded by an ordinary globe valve. To get a uniform stroke, you must have a uniform pressure or a uniform supply of steam. If the steam pressure on the boiler varies five, ten, or fifteen pounds, it is very noticeable in the action of the stoker. Therefore, the throttle must be regulated, which is done by an ordinary globe valve. Another important feature is the lubrication of the machine; it has got to be well taken care of. Again, in making reports of the failures that occur, when arriving at the terminals, it is important that the enginemen be able to explain what is wrong with the machine—whether it is not making the proper distribution of the coal, or has failed altogether. That is why I have commented upon the experience which I regard as necessary on the part of the enginemen in the satisfactory operation of the stoker.

J. A. Talty (Traveling Engineers' Association): Has a mechanical stoker ever been applied to an anthracite coal burning engine, or an engine burning pea coal?

T. O. Sechrist (C. N. O. & T. P.): We have the Hanna stoker, which is now applied to a Mallet locomotive, which runs on a division 138 miles long between Oakdale and Danville, Kentucky. This division is made up mostly of heavy grades, and there are 23 tunnels on the division. We have used nothing but a nut and slack coal. The 22 x 30 in. engines all use regular run of mine coal which costs $1.35 per ton, and the nut and slack coal costs 90 cents per ton; the actual saving in a forty days' run was 30 per cent in the fuel consumption.

These tests were conducted by the college of mechanical and electrical engineering of the State University of Kentucky, at Lexington; the maximum boiler pressure was maintained at all times on every day of the forty days' run. The firing is light and continuous. We have had several representatives of various railways in the West ride on this engine, and they have all been very well pleased with it; in fact, they have expressed themselves very strongly regarding its efficiency. We have also applied the stoker to the 22 x 30 in. engine, and a test was made for forty-five days; every trip was made without a failure, it not being necessary to use a hook or rake the grates at any time. At the end of a 138-mile run we never found over six inches of fire in the fire-box.

Any extra fireman will handle it as easily as the regular man who has been assigned to it. The tests on the Mallet locomotive were made during rainy weather, very wet rail, and no allowance was made for the amount of water that was absorbed by the slack coal. During the test without the slack coal and without the stoker the weather was very good; in fact, it was clear every day the test was made.

We have installed twelve more of the Hanna stokers on the division between Oakdale and Danville, and I believe it is the intention to equip all of the 22 x 30 in. engines and the Mallet engines with it. Before we placed the Hanna stoker on the Mallet engine, it was necessary to use two firemen; they were unable to keep the steam up, and the flues leaked very badly before the end of the trip; since applying the stoker on both engines, we have never found occasion to roll or caulk the flues. On each of the other divisions, it is necessary to do this at the end of every trip. The regular run of mine coal costs $1.35 per ton, and the slack 90 cents per ton, so you can readily see where we show a reduction of thirty per cent in fuel cost.

J. F. De Voy (C. M. & St. P.): The Chicago, Milwaukee & St. Paul has had a Strouse stoker in operation a little over a year. From March 1, 1910, we have had five Strouse stokers operating on consolidation locomotives; we have kept a detailed record of the performance of these stokers. I would like to read a few extracts from a report which has been made on their performance. In the first place, we believe that a stoker will fire as well or better than a hand-fired engine. There is no question but what an engine

equipped with a stoker will arrive at the home terminal in much better condition than other engines. We have come to the conclusion that when the stoker is properly handled there is no trouble with the steaming on any of the engines. Here are a few reports on the stoker: May 20, 1910, fine coal, hard pulling train, engine steamed O. K., firemen handled stoker properly. May 21, 1910, stoker O. K. and handled O. K. May 23, 1910, good coal, steamed good, fireman and stoker O. K. May 27, 1910, engine hot all the time, did not take coal at Watertown Junction, fireman started to fire too heavy. Was instructed that has been the cause of any failures we have, and you all know that there are many green firemen being continually put on engines; it is due to their not being instructed in the stoker that has caused most of the failures. May 27, 1910, good coal, steamed good, fireman economical, nice fire, heavy train.

A statement showing the number of pounds of coal for engines equipped with stokers, and engines not equipped with stokers, on eastbound runs, shows that stoker engines made an average of 10.42 lbs., against 9.64 lbs. for other engines. On the westbound runs they averaged 11.03 against 11.17 pounds for 100 ton-miles. This test represented 68 trips with stoker engines against 97 trips of engines without stokers. It does not show that the stoker engines have any advantage in coal performance. We now believe, as a general proposition, that the stoker will show very material benefit in performance, so far as leaky flues are concerned, and that it is possible in pinches to get a little more out of the machine, so that the performance altogether is rather favorable to the stoker. This applies to what we think may be accomplished by any form of stoker. It refers to the stoker problem in general.

C. F. Street: I have been following the stoker business pretty closely, and, so far as I know, a stoker has not yet been applied to an engine burning anthracite coal. The problem of firing anthracite coal with a stoker should be much easier than with bituminous coal, owing to the uniform grade of the coal. A uniform grade of coal cuts out two or three of the most difficult propositions for the stoker. Run of mine coal, with very large lumps mixed in with very fine slack, presents a more difficult problem.

D. J. Manning (D. & H.): What is the maximum grate handled up to the present time and the amount of coal handled per hour? In connection with the statement of Mr. DeVoy, I would like to know the grate surface of the engine with the stoker, the kind of coal and about how much they burn per hour.

Mr. DeVoy: The fire-box of the five engines equipped with stokers is 108 in. long by 66 in. wide. We burn Illinois run of mine coal in any shape. Observations lead me to believe that the finer the coal, the better. The stoker will handle the Illinois run of mine coal of poor quality better than the hand-fired engine will do, and the good lump not so well as the hand-fired engine will do. Some of the engines use about eight tons of coal in two hours.

J. F. Walsh (C. & O.): We are using five Strouse stokers. They are in service on the ordinary wide fire-box engine, with about 50 square feet of grate area. We are burning about 2,500 lbs. of coal per hour. These engines haul 4,500 tons on the river grade, and bring back 55 to 65 empty cars. The engines are worked at full capacity all the time. We get as good results, so far as economy of coal and evaporation of water is concerned, from the Strouse stoker as we would from ordinary hand-firing. We burn coal that probably runs from 65 to 90 per cent slack, and I believe, on the whole, you get better results with the stoker where the coal is fine. Some of the parts fail occasionally, but on the whole they perform very satisfactorily. The stoker, in order to be made a fixture on the engine, must be made more attractive to the fireman. There must be some means furnished by which the coal can be carried from the tender to the hopper. This will do much towards making the stoker a fixture on the engine. As the matter now stands, the firemen complain to some extent of the height to which they have to raise the coal—the stoker hopper stands 24 to 26 in. above the footboard, and the firemen have to lift the coal a little higher than they would to put it in the fire-box. In burning the same quantity of coal they claim the only thing to their advantage is the relief from the heat of the furnace which, on a forty-five hundred ton train, is a decided advantage in hot weather.

M. D. Franey (L. S. & M. S.): The stoker should leave the fire-door in such a position that in the event of the stoker failing the fireman can proceed to fire by hand without any delay. When we realize that the stoker conveys the coal from the tender to the hopper on the boiler-head, that it distributes the coal to any point of the grate surface, that it does this satisfactorily and provides a saving of 75 per cent in the labor of the fireman, and that the fireman does not have to lift the coal above the floor of the tender, we can readily understand the difficulties attending the design of the mechanical stoking machine.

The Street stoker was applied to one of our locomotives as described in the report, with a grate area of 55 square feet. It was first applied May 14, 1909, running on the L. E. A. & W. division, 88 miles in length. The road at this point has a ruling grade of 78 feet to the mile, with a maximum grade of 105 feet extending for a distance of one mile; on that one mile a pusher is provided. The tonnage handled is 45 empty cars, or 800 tons. Regular crews were assigned to this point, and the engine gave very good service. The engine was brought to the shop and the improved stoker was applied January of this year. It was then assigned as a hill pusher at Ashtabula on a grade of 72 feet per mile. Two engines were required to haul 25 cars with 1,400 tons, both working to full capacity. We obtained an excellent performance with regular crews, with 75 per cent less work than with hand-firing. This is the statement of the engineer and fireman that operated the engine. The engine was then assigned to service on the division between Ashtabula and Youngstown, a run of 59 miles, with a ruling grade of 15.8 ft. to the mile. No tonnage tests have been made, but the engine gets the average train as made up, and has made seven trips in this service.

I fired the engine 50 miles during the month of March. It had a load of 3,400 tons, and at the time I started out, early in the season, I had on a heavy overcoat—the weather in the morning was cool, but during the day the temperature increased to about 70 degrees. We had several delays on the road—I did not feel uncomfortably warm—and we did not put one shovel of coal through the fire door, did not touch the fire with a rake or shake it once during the entire trip. About 70 per cent of the coal was slack; at the start we had lump coal; then run of mine, and then it ran down to 60 or 70 per cent slack. I examined the fire several times, and it had the appearance of a well-raked garden bed, with little pebbles, probably the size of a marble; a great deal of the coal appeared to be burning in suspension.

On one of the trips we nad sixty-two cars, 3,760 tons, and made the trip in five hours and a half. There was a delay of one hour and a half on account of train movement, and the actual time of running was four hours, with six tons of coal consumed. This consumption of coal is simply an estimate. There was 200 lbs. of steam at all times. The firing in this particular case was all done by the stoker; there was no raking, and there was a light, clean fire at the end of the trip. The engine had a mileage at this time of 30,000 miles; everything about the operation of the engine was entirely satisfactory.

The engineers and firemen in pool service state that the stoker saves 75 per cent of the firemen's labor, in addition to protecting them from the heat of the open firebox door, and that the engines fire equally as well with slack coal as with lump coal. The engineers claim that this engine can be worked, and is worked, harder with the stoker than would be the case if fired by hand. This should increase the efficiency of the locomotive, and especially at the end of trips after being on the road a number of hours with a tired fireman on a very hot day.

Observations indicate a considerable saving of coal with the stoker over hand firing. No test has been completed to verify this, although one is now being made. The amount of black smoke emitted is constant when firing heavy and is of a lighter color when firing lightly, but it is constant and in proportion to the amount of coal fired per unit of time. No attempt has been made to correct this feature. I understand from Mr. Street that he is now considering the smoke feature. The depth of fire carried on the grates is about six in. On account of such light firing it is free from clinkers. The stoker seems to give better control than hand firing. It fires slack under conditions where poor results are obtained by hand firing. The use of the hook and grate shaking are seldom found necessary. The firebox door is seldom opened, and a good many trips have been made without opening the firebox door for the entire trip. The cinders discharged from the stack are very much smaller and have the appearance of being more nearly consumed than those emitted from the stack during hand firing. The maintenance of the Street improved stoker is light, no higher than can be expected of any machine of the same number of working parts which is carefully designed. The stoker will do the hard work of the fireman, though, of course, some skill is necessary to properly operate it. A variation of pressure on the boiler makes no difference whatever in the distribution of the coal. The coal is fed by the conveyor, it dropping into the hopper and is distributed independently of the steam

pressure. The stoker is so satisfactory that we are applying three more of them.

H. T. Bentley (C. & N. W.): There is no question that the automatic stoker is going to suit the conditions of engine firing more and more as improvements are made, and I believe this stoker more fully meets the requirements than any I have heard of, notwithstanding the fact that we have been experimenting for ten years. I understand the Crawford stoker is in operation on the Pennsylvania and doing very satisfactory work. I understand further that they are going to put it on the testing plant at Altoona, and a good many of the things we are confused about can then be tested out. For instance, the question of coal—I do not believe it would pay to try the stoker with only one kind of coal, and I feel satisfied that the Pennsylvania officials will be as anxious to try it with all kinds of coal as anybody else would be. The stoker should be built to handle the coal that is nearest to the point where it will be used.

One thing that is very important to us at this time is to find out how much coal the stoker can use under the most severe service. The reason for this is that we have just had a firemen's arbitration board in Chicago, and some of the stories the firemen told about the amount of coal shoveled into the stoker were astonishing.

Mr. Walsh mentioned that his machine operated with 2,500 pounds of coal per hour, but it is not in it, absolutely not in it—some of the firemen claimed they had to put in six tons of coal an hour, eleven tons in two hours. You have got to get up and do business if you want to compete with that.

As to Mr. Gossett's statement that the machine on the Iowa Central is doing very good work, I heard incidentally that Mr. Maher, on the Alton, was taking off the Strouse stokers. I do not know that that is a fact, but it seems to me funny that they should be giving such good service on one road, and be taken off of another road. I think Mr. Walsh made a statement in this hall last year, that if anyone wanted to buy some stokers cheap they could have them.

I do not agree with Mr. Tonge about the experience matter. Everyone who has spoken this morning says it is necessary for the fireman to have experience. You cannot make a cup of coffee unless you have had experience in doing it. There is no question, Mr. Tonge, as Mr. DeVoy said, that a green man is the cause of most of the difficulties, and if you have green men operating the stokers you will have trouble. I do not care what you put on an engine, you must have men with some experience to operate it. The machine which requires the least amount of experience to operate is the best machine to put on the engine. The difficulty one gentleman complained about, due to variation in the steam pressure, is a serious thing; last winter I heard of one or two engines that went five or ten pounds below normal pressure, and that five pounds variation would make considerable difference in the operation of the machine. The question of smoke is one of the most serious things, and I hope Mr. Street and everyone else connected with the stoker business will give it very serious consideration. In the cities of Chicago, New York and Philadelphia the biggest job that some of us have is the smoke question, and it is no use going around with an automatic stoker, if it will not reduce the amount of smoke emitted.

John Tonge (M. & St. L.): I had the privilege of riding on a flyer engine, as they are called, on the Alton fast train, and also on heavy freight trains, and I want to say that a boy or anyone you could pick up on the street could do the work on that engine. The needle didn't move during the entire trip until I requested that it be moved. I said, "Put some coal in the engine and let us see whether you have the needle fastened or not." The best thing we can do is to advocate, and to work ourselves, for the success of the stoker. In starting out from Minneapolis and running to Albert Lea there would be no variation in steam, no variation in the tonnage of the train, just merely the matter of lifting the coal up and putting in the scoop.

D. R. MacBain (L. S. & M. S.): We ought not to lay too great stress on the matter of economy. What we are after at present is to get something that will do more than a man will do towards supplying fuel to one of the modern locomotives. During the past ten or fifteen years there have been wonderful strides in the weight of equipment, and an effort has been made to keep up with it in designing locomotives that will haul it at higher speeds. Having these things in mind, I would suggest that the Association, for the time being, lose track of the economy feature. It has been my greatest trouble for the past year to get enough coal burned. I have found that with the big Pacific type engines, with heavy trains, the difficulty was in getting a man who could put coal into the firebox fast enough. We ought to work for an efficient stoker, regardless of the economical feature, and take care of the economical feature after we have succeeded in getting something that will take the place of the best man we can find on the locomotive at the present time, and do better than he can. I believe the difficulty with smoke can be largely overcome by making a heavier fire. I have ridden but one stoker locomotive, and on that occasion the engine was belching out a quantity of smoke that was covering the country through which we were running. When we made the first stop I asked how they were getting along; the steam pressure was dragging back to 150 or 160 lbs., and, looking in the firebox, I found the grates barely covered, so the cold air was getting through and the gases had no chance to be consumed, and were being carried out of the smokestack. We increased the thickness of the fire about one hundred per cent, and decreased the emission of smoke in the same proportion, or better.

This Association ought to use its efforts and lend its support to those who are trying to develop a stoker that will take the coal from the tender. The firemen claim the only benefit they have from most of the stokers so far produced is that they do not suffer from the heat. More attention should be given to the matter of carrying the coal from the tender into the hopper. By the time a successful device for that purpose is developed, the stoker will be on a sound enough footing to stand.

W. C. Hayes (Erie): Our experience with stokers so far has not justified any very great expression in their favor. We have five or six in operation, and it is part of my duty to look after them. So far we have had but poor success. It takes about one-third more coal to operate our stokers than it does by hand-firing. If we do not give any more attention to perfecting the work of the stoker after we get it installed, than we have given to the education and perfection of the fellow at the wooden end of a scoop shovel, our stokers are going to be of but little use to us, except to make the fireman expect that you are going to do something for him, and continue to do it indefinitely. I believe that if we were to bend our energies more in the direction of perfecting the work that can be performed by the fireman, we will do more than can possibly be done by the perfection of the stoker. In some specific instances where we made experiments, weighed the coal, indicated the engines, and kept as accurate account of the test as possible, it showed a difference of something like 33 per cent in favor of hand-firing. That may not be exactly fair to the stoker. Everything that we have done is yet in very much of an experimental stage, and we have tried our best to get the stoker on an equal footing with the fireman, but so far have been unable to do so.

We are trying a stoker with a grate surface, as I now remember it, of something in the neighborhood of sixty-five square feet, on a consolidation engine, 22 x 30 in., with forty thousand pounds tractive effort. We have five of them on that class of engine, and the coal used is prepared especially for the stokers. With the stokers that we are using, with the worm feed, we have to prepare the coal in a certain size or it cannot be handled. They will not take the run of mine coal.

Geo. L. Fowler: I have been waiting to hear something in regard to the Pennsylvania stoker, Mr. Crawford's. It was my pleasure a short time ago to ride on an engine that was equipped with that stoker, as well as to watch it from the side of the track when the crew on the engine did not know that they were being watched. The stokers that I had ridden on the engine with before, were noted for the tremendous amount of smoke that they were belching out over the country. The Pennsylvania stoker is practically smokeless. I stood at the head of the grade at Sewickley, just west of Pittsburgh the other day; the engine came up the grade with a fully loaded train and was working as hard as it could be worked. The steam of the exhaust was being condensed by the coolness of the atmosphere, and it was quite possible during the entire run, standing in front of the engine, to look between the steam and the stack and see the landscape beyond perfectly clear. There was no discoloration to the smoke whatever, except at one point, where the fireman opened the door and raked down his fire.

The next day I rode the engine from about twenty miles west of Pittsburgh, nearly to Crestline, or about 150 miles. During all of that time, there was no smoke coming from the stack that would have discolored Pittsburgh atmosphere. The fireman had nothing to do except to open the valve that would start the stoker engine, each stroke of the engine putting about 28 lbs. of coal into the furnace. The coal is taken from the tender. It is crushed, carried forward and put into the fire. The fire-door is perfectly free, so that hand-firing can be resorted to instantly by the fireman; the men on the engine were emphatic in the declaration that if the stoker did not keep up steam, and if there was any failure whatever, there would be no use in resorting to hand firing because the stoker would bring the steam up better than the hand firing

would. That is an example of what is being done with the mechanical stoker on the Pennsylvania Lines West.

About two weeks ago, on June 10, a description of the general record of the work of the stoker was published in the *Railway Age Gazette* and from that you will see that day after day the records show that the stoker did one hundred per cent of the work. One hundred per cent means that it did all of the firing from the time the engine left the roundhouse until it pulled into the terminal at the other end. The fireman did absolutely nothing whatever in regard to the handling of the coal, putting it in the furnace or having anything else to do with it. Looking into the fire-box of the stoker-fired engine is an exceedingly difficult thing to do, because the fire is so bright at all times over the whole surface that it is quite impossible to see the condition of the fire. In order that the fireman may not go astray, he very frequently put his rake in and rakes over the fire in order to feel of it and see whether there are any holes in it. Ordinarily they use blue glass in order to look into the fire. You thus have all of the elements of complete combustion, a clean incandescent surface on the top, the gases being distilled from the bottom of the fire and coming up through it; they are burned almost instantly, and that explains the diminution in the smoke.

The officials are not inclined to say anything as to the efficiency of the stoker until they have had the machine on the testing plant, but the general estimate is that the stoker runs at from five to eight per cent less coal than is used on the hand-fired engine. There is one thing that it does beyond all peradventure, and that any one can see who sees the engine pass by or watches it on the road, and that is that it is practically smokeless. There is a faint brown coming out of the stack almost all of the time, which would run about one-half of the first diagram of the Ringelmann chart, so that there would be no trouble whatever in the use of this stoker, if it worked in the way in which I saw it worked, through any city, no matter how severe or strenuous its smoke ordinances might be.

David Brown (D. L. & W.): I am surprised to find that the information on this subject is rather meagre as yet, that some of us have had no experience and that others have had a little. There is no doubt that we could continue this line of discussion all day, and there is no doubt but that the stoker has come to stay, especially with the narrow fireboxes. There is no trouble whatever in spreading the fire as you want it over a narrow firebox. On the other hand, the wider you get the firebox, the more difficult it becomes, and you can go to the extreme. I know we have fireboxes on which you could not use it at all under any circumstances.

EDUCATION AN ESSENTIAL OF FUEL ECONOMY

W. C. Hayes, superintendent locomotive operation, Erie, presented an individual paper on this subject, an abstract of which follows:

Noting the trend of opinion at the 1909 session, the writer was advised, by your Executive Committee, to take up and follow, step by step, the plan outlined in a former paper and develop one or more of the essentials at that time introduced. Conforming to that idea, this paper will be confined to and deal largely with that phase of the question having to do with the instruction and educational development of enginemen; in doing so, its scope will be to deal with methods of supervision and instruction of engineers, firemen, hostlers, engine preparers and all others having to do with the preparation of engines for service, so far as maintaining or raising steam on locomotives in service is concerned. The above phases of the subject will be considered under the following heads:

1. Methods of the selection of candidates for the position of firemen.
2. Educational plan recommended before employment.
3. Educational methods to be religiously followed after employment.
4. The methods of education to be followed out on the most approved plan, such as, for instance, a well-defined system of instruction, both by class and individual, to be in charge of the road foreman of engines, or a supervisor of locomotive operation.
5. The above to be followed by both written and verbal examinations, to be conducted by the road foreman of engines or by the supervisor of locomotive operation, or a committee that may be selected for that purpose.

Methods of selecting candidates for the position of firemen: The old hit-and-miss plan—in fact, the one generally followed at this time on most railways—which consists of hiring a number of men and trying them out by giving them a letter as a learner or student fireman, requiring them to spend a certain specified time learning the duties they will be called upon to perform before being assigned to duty under pay, such as, for instance, riding four or five trips on different classes of engines in the varying grades of service, passenger, switch, freight and helping, receiving instructions from engineers and firemen with whom they may ride.

The latest plan presented, and one that appeals very strongly to the writer, is one recently introduced by Geo. H. Baker, president of the American Correspondence School, Brooklyn, N. Y. The plan operates as follows: A railway company grants permission to its station agents to act as the representatives of his correspondence course, allowing to each agent a small commission for each student secured. The "Baker plan" then undertakes to educate the candidate in proper methods of firing, incidentally covering all of the principles of combustion, together with instruction in train rules, signals, etc., so as to fit the students for actual service, as well as can be without having practical experience. The only responsibility the railway company assumes is a quasi promise to give preference in employment to all such men as may be available for service when needed, and who can pass all the physical and other employment requirements.

The Erie has employed a number of these men on one of its important main line divisions, with very satisfactory results; in fact, in comparison with men who have been employed as firemen on this same division for three, four and five years, their work, in amount of fuel consumed, is more than favorable, and at this time these men are taking a far greater interest in their duties as firemen than are the elder men. The writer commends to your favorable consideration the adoption of this plan, so far as may be deemed advisable or desirable.

The best educational methods after employment: The engineers and firemen should be required to fully post themselves as to proper methods of combustion, making such a study of the subject, from time to time, as will enable them to apply in everyday practice its cardinal principles. Literature of a well-known character and value can easily be secured that will assist in a study of all branches of the subject. This lays the foundation for progressive examinations of enginemen in fuel economy. The best plan is to furnish a good work on the practice of firing, including the origin of the theory of combustion, that will clearly develop the scheme of progressive examinations by giving to all enginemen a printed list of questions, answers to them being required in writing, upon which a well-developed plan of oral examinations can and will be based. These examinations to be made either by a committee composed of the master mechanic, road foreman and some general officer who may be delegated for that duty by proper authority, or through any other medium that may suggest itself.

Railroads carrying a sufficient force of road foremen to properly supervise the work, so that they are able to ride with and instruct each individual engineer and fireman, personally, in the proper performance of their duties, in order to see that object-lessons that are given as examples of correct work are being absorbed and instructions are faithfully adhered to, will find that even this sort of supervision can be materially reinforced by holding periodically schools of instruction. Class lessons can be arranged from time to time for the purpose of discussing any one or all of the subjects under which an improvement in fuel and other economies can be made that are directly under the control of the engine crew. This arrangement will enable the road foreman of engines to cover a much larger field than would be possible under any other plan except an increase in the number of road foremen.

The writer does not wish to be understood as not being in favor of having a road foreman's territory restricted to about seventy-five or one hundred crews and one hundred miles of main line, when that number of crews are used to that mileage, as being the limit that one man can cover in the way of close supervision that will give the best results. Supervision at long range and in the abstract, or by proxy, does not begin to fill the bill as well as a thoroughly thought out, concrete plan; but where an increase in the force cannot be made, then one hand must be made to wash the other, so to speak, by the road foremen of engines meeting in as large classes as can be mustered periodically all the engineers and firemen under their jurisdiction. They must be prepared to instruct, as well as discuss with the men all matters of vital importance concerning the performance of their duties.

Of course, the subjects can with advantage be divided, so that any one subject may be exhausted and definite conclusions reached as to the best method of handling. For instance, take fuel consumption. Plans could be formulated for reducing the amount consumed by securing the coöperation of

engineers and firemen and all concerned, in making a reduction in the amount consumed per ton and per locomotive mile. If their performance is not checked and they are not required to know how much fuel it takes to haul the trains over different sections of the road and under varying conditions, then their best efforts cannot be aroused over what the author thinks is the unit basis of use. Object-lessons that occur in the experience of every road foreman can be made use of to exemplify every phase of every practice in locomotive operation, stimulating effort in all directions that will be of material benefit to all concerned.

G. H. Baker (President American Correspondence School, Brooklyn, N. Y.): Mr. Hayes said in regard to firemen who had had preparatory instruction, that, "In fact, in comparison with men who have been employed as firemen on this same division for three, four and five years, their work, in amount of fuel consumed, is more than favorable, and at this time these men are taking a far greater interest in their duties as firemen than are the older men." That simply refers back to any old farmer's motto, that, 'as you would have the tree grow, bend the twig." If you ever want to have your enginemen be amenable to instruction, willing to study instruction, willing to pass examinations on instruction, I think you would find it a great deal easier if you would begin their instruction before they were ever employed. Then they are ready to bow to instructions all along the line, even when they become engineers. One further matter in regard to the proper instruction of men in fuel economy is that it lightens labor. A man who knows how to fire an engine properly and with the least coal, works less, worries less. That enables a young man who may be of light physique to keep an engine hot successfully with less labor and less discouragement than some heavier man would put into the same work. I think that carried out, it would reduce a number of necessary replacements of firemen, because there would be more men stick to their job. It is the experience of all employing officers of firemen that a large proportion of the men employed usually leave the service in the first few weeks, or the first month or two, of it. They get tired out and discouraged with the hard work and the hardships.

About thirty years ago I was made over from a train boy into a fireman on the Missouri Pacific by the plan Mr. Hayes describes in his paper as the "old hit and miss" plan. That is I was sent out to ride around on engines for a week with other firemen to learn the signals and how to fire an engine. During that time a good deal was said about avoiding "popping" because the engineer didn't like the noise. Nothing was said about "popping" being a waste of fuel, or that fuel was ever or could be wasted, or that coal cost the company any money. I fired on six different railways in the following five years, and later was a locomotive engineer for six years, but in all that experience I never heard any engineer or officer say to any man so much as: "Be careful of the coal, it costs money." Now, occasionally, instructions respecting fuel economy are given the engineers and firemen on some railways, but the old plan of hiring and "breaking in" new firemen still prevails, with some improvements regarding required physical and mental fitness, but with practically no improvement respecting any required knowledge of the principles of coal burning, or rights of ways of firing, or coal economy.

As a train boy I often participated in the hand braking of passenger trains before even the straight air brake came into general use. I well remember the two foot chasms which then usually existed between the abutting platforms of passenger cars (necessitated by link and pin couplers), which were spanned by gang-planks about four feet long, reaching from platform to platform. Then nearly every locomotive had two pumps to feed the boiler, and an occasional engine had an injector in addition that was usually used only to replenish the boiler when standing, to avoid "pumping up" by uncoupling and running the engine up and down the track five or ten minutes with both pumps working.

Such conditions as these are unknown now. They are but memories of the past in the minds of the older railway men. They have disappeared before a march of progress that has brought about marvelous improvements in nearly every detail of locomotive and car construction, and in railway operating standards all along the line. But in the employment of new firemen the old-fashioned plan of thirty years ago prevails, of letting these comparatively ignorant young men begin the work of burning up each railway's most expensive supply—*coal*—with no other preparation than to send them out on the road to make some trial trips with experienced firemen.

By this plan a new fireman's schooling for his coming important work consists simply of what he picks up about it during the trial trips. He thus partly "learns the road," but what he learns about firing is limited and shaped by the habits of the fireman he is supposed to copy. If he knows nothing himself about the principles of combustion or right ways of firing—then the firemen he rides with become the pattern by which he is shaped as a fireman. Is the pattern perfect? If so, it is well for his future work. But imperfections in the pattern are bound to be imparted to him. He will learn some good things about firing, but he will also probably learn *all the bad habits* of the men who are his teachers. Is not this practice much like taking a used and worn wheel as a pattern for a mould to cast new wheels? If so, then such a plan, that would be instantly condemned in mechanics by every mechanic, cannot justly be defended when it is applied to mould the working habits of a man, who probably is to spend some years of his life in daily consuming a quantity of coal that exceeds his wages in value several times over.

Now the fact is, that the common wasteful habits of locomotive firemen—which are plainly as much in evidence today as they were 25 and 30 years ago—are the natural result of this very practice of shaping the work of new firemen by that of old firemen, thus perpetuating their imperfections through new relays of firemen, year after year. We all know how easily bad habits are formed; also how hard it is to break away from such habits when once acquired. In my experience as an engineer I have known the best disposed firemen to occasionally relapse into old bad habits—long after they realized how evil they were. Under such conditions—How can we expect to accomplish a general permanent improvement in the important work of firing the 60,000 locomotives on North American railways, which daily consume about $600,000 worth of coal, unless we begin the needed improvement at the source of the stream of new firemen who are daily entering and recruiting the locomotive service at the average rate of about 2,000 men a month, or 25,000 a year?

Let us make a rough estimate of what it costs the railways, in coal and money, to "break-in" and educate this army of green firemen annually. Probably few, if any, locomotive men will dissent from the statement I shall make—that a new fireman will ordinarily burn an extra ton of coal a day in firing engines during his first month's service, due to his ignorance and lack of judgment in the work. If so, then he will waste about 25 tons of coal in the month. With the average cost of coal, say $1.50 a ton on the tender, this waste will aggregate a loss to the company of $37.50.

If this estimate is approximately correct, then the 25,000 new firemen annually "broke-in" on all our railways cost the companies about a million dollars ($937,500) a year in wasted coal. Crude and imperfect as this estimate may be, because based largely on observation and belief, yet there is enough of evident truth in it to teach the necessity of some radical reform being now made in the general practice of employing new firemen, to insure that they shall have not only physical fitness for the work, but that in addition to this they shall also acquire—before employment—an intelligent conception of the importance of the work they wish to do, and the value of the fuel they will consume. By all means they should be required to clearly understand the easily obtained and easily understood knowledge of how coal burns and produces either its greatest possible heat in perfect combustion (with sufficient air), or but one-third as much heat in imperfect combustion for want of sufficient air, the air, or the oxygen in the air, being as much the "fuel" of the fire as the coal. It is, and always was, the worst fault of all careless firemen that they disregard the needed supply of air for the fire, and shovel on the coal regardless of waste, because of ignorance of the chemical processes occurring in combustion. This and many other wrong and wasteful practices in firing continue, and are handed on from old to new firemen who know and learn no better, and who in turn teach their successors, as the superstitions of old were handed down by the ignorant from generation to generation.

It should be the A B C of locomotive operation, which every locomotive man must know at the very beginning of his service—that heat is the source of motive power. Heat is what the coal is burned to generate—to boil the water to make the steam to run the locomotive. And all should know that, aside from duties regarding safety, an engineman's most important duty is to get the most possible heat from every charge of coal put on the fire, and then see that as little as possible of it is wasted, until the steam it forms has done its full duty in the cylinders of the engine.

Heat is the source of power of all steam engines. It pushes all pistons and pulls all trains. To produce enough of it for their necessities American railways pay over half a million dollars a day. It is their chief expense. Every man connected with its generation and use on locomotives should have these facts most forcibly impressed upon him at the beginning

of his career. Ignorance of the principles and best practices of his work should not be tolerated henceforth in the man who operates or helps to operate the still most powerful and useful servant of civilization—the locomotive.

I therefore respectfully submit this motion:—That a committee be appointed to investigate and report to the next convention upon: *First*, the desirability of preparatory instruction for locomotive firemen, to be mastered before employment. *Second*, the value in fuel economy and superior service, if any, effected by such instruction, as shown by actual comparison of the services of instructed and uninstructed firemen. *Third*, the subjects which proper preparatory instruction should teach. *Fourth*, the character of examination (oral or written) to ascertain if applicants properly understand the instruction, and should they be permitted to enter service without such examination, same to be completed within first month of service. *Fifth*, examine and report upon the merits and defects of any systems of preparatory instruction for firemen now in use.

T. E. Adams (St. L. S. W.): In the first paragraph, third line from the bottom, the phrase "concrete and systematic way" is used. This is to impress on the members of this association the importance of this subject. To make this more emphatic we wish to say that if any concrete ideas are to be established they must be founded on a solid foundation. A discussion of this subject might be divided under two heads:

1. What is coal and the best recommended practice for using it.

2. The method of instruction; the application of this method, and to see that it is carried out.

First.—It is agreed by those whose authority is recognized, that the study of the fuel question is not founded on concrete ideas. The opinions, generally speaking, of what coal is and how to use it are varied, and the line of instructions issued for the use of it equally so, to the extent that numerous engine failures, whether due to the misuse of it or not, are attributed to it (this will apply to either anthracite or bituminous coal in general use), when, as a matter of fact, if proper methods were introduced the difficulties would have been materially reduced, and many of these failures would have been eliminated. The question of the intelligent use of fuel is one of such vast importance and has such far-reaching effects that nothing should be done or any data furnished, in any capacity, which would convey a wrong impression and lead to the improper use of it.

Coal as it comes from the mines is intended for the use of mankind, and it would seem that all that would be necessary would be to notice the action of nature itself, but we pass by and do not see the object lesson. Take for example a pile of coal in the open air, of size sufficient to maintain combustion. Has anyone ever seen large clinkers form in such a pile of coal when allowed to burn without being disturbed or poked, notwithstanding a large amount of so-called impurities, such as dirt, sulphur, etc.?

It might not be out of order at this time to make a few remarks on the inspection and testing of coal. This subject has been discussed in various ways, as well as put into practice; some are in favor of it and maintain a force of inspectors at the mines; others are opposed to any inspection, leaving the coal to speak for itself in the use of it and studying the quality of the ash at the ash pit, which is the most accurate way to determine the quality of the coal.

Generally speaking it is a hard proposition for an inspector to inspect for impurities, etc., in coal, and intelligently pass on any grade of coal, when he has but a faint conception of what coal is. The principal duties of an inspector at the mines are to see that the equipment furnished for loading does not contain refuse, that is not damaged in loading, checking weights, and to see that the provisions of the contract are fulfilled. In taking the testing of coal up with the secretary I find that this association has never had a test made, nor do we find that an absolute concrete test has been made in any other direction, as to what coal is and how to use it; this we consider the starting point of this great question. As an example, in bulletin No. 403, of the U. S. Geological Survey, in connection with the test of run of mine coal, the statement is made "Fire had to be raked after every other firing and sliced about every fourth or fifth firing, in order to keep it loose."

Then, after the fire had entirely burned down, the clinkers were pulled out of the furnace, weighed, and charged to the test. Do you think that a test of this nature, coming even as it does from the U. S. Government, should be accepted? We do not think so, for the reason that coming from the source which it did, a wrong impression is obtained that this is good and economical practice. In our experience we have never seen any coal in general use but what under the proper condition will burn to practically a flour ash.

To substantiate our position we quote from a paper read by H. H. Stoek, Professor of Mining Engineering, University of Illinois, before the International Railway Fuel Association at Chicago: "In general, coal is usable for ordinary fuel purposes in the condition in which it is delivered at the mouth of the mine, that is, as run of mine, and mechanical preparation is not absolutely necessary."

Again, S. W. Parr, Professor of Applied Chemistry, of the University of Illinois, makes the written statement, "I have had called to my attention during the past year numerous peculiar circumstances connected with the honey-combing of fuel sheets, and this has lead along the lines of study of the fusibility of certain ash of Illinois coal, I am lead to conclude that the fusion point of Illinois coal, while it varies widely, has little to do with the actual clinkering of the coal in use, the latter fact depending almost altogether on the method of firing." I heartily endorse the statement the Professor has made, and wish to add to it that this will apply to the majority of coals now in general use.

As a final quotation we refer you to a book published by Mr. Forney in 1875, during the time he was Associate Editor of the *Railroad Gazette:* "It is true that the composition of coal gives us some indication of its heat producing capacity, but the extent to which that capacity can be converted into actual steam in locomotive boilers depends, to a great extent, upon the conditions under which the fuel is burned."

We have never seen any coal in general use but what, under the proper conditions, will burn to practically a flour ash. Could the railways of this country put this principle into practice, it would in itself eliminate a large part of the trouble and expense experienced in burning grates, ash-pans and cleaning fires, with consequent steam failures, delay to trains, etc.

In the introduction of these efficient methods of using fuel, it is absolutely necessary as a first requisite that the heads of both mechanical and transportation departments have faith in this method of instruction and use of fuel. This must then be followed up by a systematic and vigorous application of it, as it will be found that strenuous opposition will be developed, due to the radical change from present practice, but, after the principles are thoroughly understood by all concerned and the results from such methods are realized, it will meet with the favor of not only the officials of both departments, but enginemen and in fact all parties having anything to do with the handling of fuel.

The idea that we desire to bring out forcibly in connection with the Mr. Hayes paper is, that the correct principle of instructions should be determined. On the railway with which I am associated, these methods have been put into successful practice and the results obtained have had such an effect that the officers of both transportation and mechanical departments of other railways have visited us with a view of not only seeing them demonstrated to their full satisfaction, but returned home with a determination of putting them into operation.

E. A. Miller (N. Y. C. & St. L.): At the present time the getting of men to man our locomotives as firemen is one of the most important questions that we have to meet. I have been employing firemen for the last 30 years. The question to-day, of firing a locomotive and having men to do the work satisfactorily, is a very different question from what it was ten, fifteen or twenty years ago. In the first place, the locomotives are very much larger, and you will all agree with me that the firemen of our locomotives to-day are very hard-worked men. On the other hand, the locomotives in a general way are pooled in service, and the men who are running them are pooled; the fireman and the engineer who are together to-day may not come together again in thirty days in connection with their work on a locomotive. The work that the fireman has to do in shoveling coal is much greater to-day than it ever has been in the past. The conditions under which they work are much more unfavorable for their learning the economical methods of firing than it was before the pooling system came into use. The question of having men educated in the schools, from what little we have tried to follow up their recommendations, has not, with us, been any more satisfactory than hiring the farmer's boy, or whoever would come in with the physical make-up that promised that he would be able to meet the requirements of a locomotive fireman. With all due respect to our agents scattered out over the miles of our road, I am not very highly impressed with their judgment of the men for making good firemen. They have so many men to please, they are a good deal like our politicians. For instance, I could name one or two representatives in the state legislature of New York who could recommend more men for firemanship in one month than we could use in five years, and some of them could not read or write their own name when they came in for

examination. On the other hand, the agent has his friends, and is anxious to make friends for the railway, which is right and proper for him to do, but he is very apt to allow his efforts to please some person or persons in his immediate neighborhood to lead him to recommend some one who proves to be very incapable as a fireman. As an instance of one of those cases, a young man came to me with every appearance of being first-class physically for the work of firing. He had a first-class recommendation from our agent, at a little town. He came in just before lunch time and I told him to bring his papers in to me after one o'clock when I would talk with him; I thought from his appearance that he was just such a man as we wanted. As I went to luncheon, I met that man coming out of a saloon. He stepped out of the door just as I came opposite. I stopped him and told him that he need not come into my office after one o'clock. On the other hand, we find those men who have been educated in the correspondence schools, many of them, for one cause or another, impracticable to be used as firemen. Our efforts in trying to use those men have resulted in a loss of about three out of five that we have tried. With the larger locomotive, it is up to us to lighten the fireman's work as best we can, with the automatic stoker and other improved methods, as we have them and know them to be good at the present time, and to look forward when those who are experimenting with the automatic stoker will have something which will justify the railway companies in adopting it as a standard method of firing. Those of us who are connected with the smaller roads, owe very much to such roads as the Pennsylvania and to such men as Mr. Gibbs, who are in a methodical way testing out methods that have been brought forward, not only in locomotive stoking, but many other directions. When I find that the Pennsylvania has adopted for its own use and has made standard some invention or appliance for an engine, I feel that I am pretty safe in adopting it. This whole matter reminds me a little of a story that I heard some years ago when the first electric railroad was put in operation in Nashville, Tennessee. One of the former Masters noticed an old slave very much excited and interested in the movement of an electric car that was being drawn back and forth on a track, for exhibition purposes. He said to him, "Sam, you seem to be very much interested in what is going on here." He said, "Yes, massa; yes, massa; I was just thinking that them Yankees come down here a few years ago and they 'mancipated the nigger, and now they have come back here and 'mancipated the mule." We want something that will emancipate the fireman from the great amount of coal that he has to shovel into the fire-box.

D. R. MacBain (L. S. & M. S.): I suggested a plan last year whereby the railways might accomplish a great deal in the way of fuel economy; if I remember correctly, my suggestion was that each of the railways ought to put on enough men to instruct its firemen; not put one man on a division, a traveling fireman, and assign a dozen different duties to him, none of which he could give very much attention, but to assign a man to every sixty or seventy men and keep him there for the purpose of instruction. I have thought over that matter a great deal in the past year, and I believe that it is the plan whereby the railways can accomplish much, so far as the men are concerned. We seem to have paid all our attention to the men, on this subject, and in view of that I will take a moment of your time to state what I believe to be a much more important subject so far as fuel economy is concerned. I can look back over my career of a few years and remember how we used to post up each man's record every month. Some of the best men on the road made the poorest fuel records, and most of us who were interested in the thing knew the reason. It was that the locomotives that those men were assigned to were not in condition to give economical service. Now then, if we devote as much energy for the development of the locomotive in a way that will make it steam easily, and, second, toward maintaining it in that condition, I believe we will be doing more toward the economy of fuel than by anything else that can be done, aside from the matter of instruction referred to.

I have stood up on the floor of this convention in past years and said that it was impossible to maintain a brick arch in a large modern locomotive. I believed it at that time, but years of experience and of conscientious work on the part of the motive power organization have convinced me that I was wrong, and, speaking for the New York Central Lines, where we have good water and bad water and all kinds of conditions to contend with, and some of the heaviest power in the United States, I want to say that the use of the brick arch is not only possible, but very necessary in order to get the proper economy and efficiency out of the locomotive. I believe sincerely, and I think there are men in the meeting now who can produce figures to show, that the proper installation and maintenance of the brick arch in the modern power to-day will save at least ten per cent, and that ought to be worth going after.

C. W. Cross (N. Y. C. & H. R.): The necessity for education of employees is conceded by all persons familiar with the subject, and any efforts in that direction are praiseworthy. The principles of apprenticeship can readily be applied to the training of firemen as well as to the training of recruits in the mechanical trades. This training, however, should be under the control and direction of and coincident with the control and direction of the railway, and not by any outside agency. Graduate shop apprentices, in some cases, become firemen and are well adapted to the work on account of the knowledge gained in the apprentice school as well as the practical training in the shop, which enables them to more readily pass the regular progressive examinations for firemen.

The New York Central Lines established in 1903 a set of first, second and third-year progressive examinations for firemen, which can be better described by reading the preface as given in the examination books, which reads as follows: "It is the policy of railways to employ men as locomotive firemen who will be capable in time of becoming locomotive engineers. This requires that a man should have at least a common school education, good habits, and be in good physical condition. He should also be quick and alert and a man of sound judgment. Having these qualifications, advancement will come to those who are conscientious in the discharge of their duties and who devote some of their leisure hours to study. As an aid to this end and in order that there may be derived the highest efficiency from a man engaged as a locomotive fireman, there is placed in the hands of every man who is employed as a fireman a code of questions, and it is expected that in the preparation necessary for correct answering of the questions a course of study will be necessary which shall fit him for the work which he is expected to perform. His answers to the questions will indicate how well he has progressed.

"When a man is employed first as a fireman, he will be given the questions on which he will be examined at the end of the first year. Having answered these questions satisfactorily he will then be given the questions for the following year. Having passed this one, he will be given a third and final set of questions on which he will be examined before being promoted to engineman. It is not expected that a man will answer these questions without assistance, and in order that he may understand them properly there has been established a school of instruction in the use of the air-brake, to which all employees are invited; he is also invited to ask the master mechanic, general foreman, road foreman of engines (or traveling engineer), also air-brake supervisors (or instructors), or any other official, for such information as may be required on any of the questions or on any points in connection with the work. He is not only invited, but is urged to do this as the more knowledge the firemen possess the better the results which can be obtained. He will have ample time to study each set of questions, therefore there is no doubt but that with a reasonable amount of study each week the information required to answer satisfactorily the entire list of each series of questions can be easily mastered in the time given.

"In connection with this examination the work done by the fireman during the time of his service and how the work compares with that of other firemen engaged in the same class of service will be noted carefully; also his record as to the use of coal, oil, etc., will be taken into consideration. It is hoped that he will give everything in detail the consideration it merits and realize fully that it is by looking after the little things that a man succeeds. It should be borne in mind that it is only by filling well the position that one has that a person is entitled to the confidence that makes better positions possible."

The following describes the method and time of holding these progressive examinations: "When a man is employed as a fireman, he shall be given the first series of questions and be notified that at the end of the first year of the service he will be required to pass a written and oral examination thereon, under the direction of the division mechanical officer and air-brake supervisor or air-brake instructor. After passing the first series of questions, he will be given the second series of questions and be notified that at the end of another year of service he will be required to pass a written and oral examination thereon, under the direction of the division mechanical officer and air-brake supervisor (or air-brake inspector). If a man fails to pass the first and second examinations, he shall be dropped from the service. If a man has passed 80 per cent or more in all examinations, he shall be given a diploma. When he has passed the second series of questions he will be given the third series of questions and be

notified that before being promoted and within not less than one year he will be required to pass a written and oral examination before a general board of examiners. At the third examination, if a man shall fail to pass 80 per cent of the questions asked, two more trials, not less than two months apart, will be given him to pass the same examination. If he then fails to pass by a percentage of 80 per cent, he shall be dropped from the service. Firemen passing the third and final series of questions will be promoted in order of their seniority as firemen, except that those who pass on the first trial shall rank, when promoted, above those who pass on the second or third trial, and those passing on the second trial shall rank above those who pass on the third trial. Enginemen employed shall be required to pass the third series of questions before entering the service."

SELF DUMPING ASH PANS.

H. T. Bentley (C. & N. W.) opened the topical discussion on this subject as follows: Are self dumping ash pans entirely satisfactory, and if not what should be done to make them so? In accordance with Federal requirements we equipped our engines with self dumping or legal ash pans, and had all in operation by January 1 of this year. Before going into the application of them we made a careful study of the situation, and went over the drawings of practically every self dumping pan that was then in use, and decided, as we had a number of new engines from the locomotive builders equipped with the bottom slide apparatus, that it would be the most satisfactory arrangement for such engines. Therefore, after considerable thought, we worked up a design that would answer for the largest number of engines, and made standard for those engines the slide, hopper casting, operating rods, cranks, etc.

We had to settle a number of things that came up, such as an arrangement that could be worked from either side, a device that could not be opened from the deck so as to overcome the possibility of dumping live cinders on bridges, etc., where they might cause trouble; make provision for thawing them out in winter, and provide sufficient openings for air to enter without letting fire out. We designed every part amply strong and felt that we were going to be rewarded by having a device that would be reasonably free from causing us trouble, but have been disappointed, and in making inquiries from our neighbors find they have all had more or less difficulty with pans warping and getting out of shape, so that live cinders were dropped, setting fires, and causing other trouble. During cold weather the slides would freeze solid, notwithstanding the fact that we had a heater attached to each one to overcome this difficulty.

It has been suggested that we make the hopper entirely of cast iron, but in looking over pans on other roads we find they have tried this and had to abandon its use, substituting cast steel, which apparently is very little better. On a road having all steel bridges, and running through a well settled territory, the dropping of a few live cinders is not a serious matter, but out in the country, with wooden bridges, dry grass, etc., it is a different proposition. It has been proposed that we have a water connection from the boiler to the ash pan so that occasionally the live cinders can be wetted down. This may be satisfactory in summer, but in winter it might cause trouble. Some people have turned the injector overflow in the pan, which may be satisfactory in the south, but in the north the pan might freeze up.

A number of roads use a steam jet for blowing cinders out of flat bottomed pan, and we understand it works satisfactorily with certain kinds of fuel, but with Iowa or Illinois coal we are afraid the clinkers could not be blown out with steam. The object of this paper is to bring about a discussion as to the difficulties or troubles experienced as a result of the ash pan bill that was passed, and what can be done to overcome them.

J. F. DeVoy (C. M. & St. P.): One of the most serious problems we have ever had on the Milwaukee road has been the ash pan question, and if this convention does not do anything else, it should enter a protest at this time against the passage of bills making railways apply devices which are an absolute detriment, not only to the locomotive, but to the country in general. The idea of making a railway spend $50,000 or $75,000 for a device, in connection with the use of which there is no return, to my mind comes pretty near being confiscatory, if that is the proper term. I do not know whether we can prevent such bills being passed, but the least we can do is to voice our sentiment against such things.

By experimenting with all the ash doors, we obtained the most successful results from the door operating mechanism used by the Chicago, Burlington & Quincy; it is the only ash pan among a dozen we have used with which we have had absolutely no trouble up to date. It has not been on more than ninety days, but it is a good thing.

I know I will be found fault with by the Chicago & Northwestern in the statement I am about to make. They operate nearly everything in the line of an ash pan that can be dug up in any institution in the world. The Smithsonian Institute should get hold of everything they have, because I want to tell you now they are gems, some of them; some are all right. I do not know that I can say anything appropriate on the ash pan question; it is a shame to make a railway company go into anything like that, and it is pretty nearly time that a commission or something of that kind be appointed to determine what is the proper thing to do, because when we were compelled to go into this the federal authorities knew nothing about it, and we knew less.

This is one of the greatest practical problems that confront the railways. We are burning stations and everything we come in contact with. This is a serious matter. You and I do not want to take a chance in riding over a railway when the destruction of a bridge may destroy our equilibrium. It is a serious question, and it was a mistake for Congress to make us put in a self-dumping ash pan at that time, as the device was not developed as it should have been before the railways were compelled to adopt it.

Mr. Bentley: This is the happiest day of my life. I have actually gotten Mr. DeVoy to agree with the Northwestern, and I would like him to give the names of the ash pans which he found were good. I would like to look those up and investigate this matter further.

Mr. DeVoy: I do not know that any were good. I believe I said they were all poor, but the best one I saw was on the Chicago, Burlington & Quincy.

A. E. Manchester (C. M. & St. P.): I did not intend to say anything on the ash pan question, but if there is anyone who has something that is right up to G and will not give trouble, and will not freeze up or scatter fire along the road, will not do any of the things some of us have trouble with, they should be the men to occupy the time of this meeting, because they are the fellows we want to hear from. We want them to tell us about this ash pan.

J. A. Talty: I am one of the inspectors for the Public Service Commission of the State of New York at the present time. My title is assistant supervisor of equipment in the state of New York, and one of my duties is to examine ash pans and spark arrestors. We have recently made an inspection of a certain road on locomotives that run through the forest reserves, and in many ash pans we found an opening larger than the hole in the mesh in the netting.

I realize that the ash pan proposition is a peculiar one, but there are many little difficulties for which a remedy could be applied to decrease the amount of fire scattered along the right of way. For instance, I know of a certain road that has no fastening whatever to hold the slides closed; the vibration of the locomotive will naturally cause the slides to open, and when the fireman shakes his fire, live sparks will fall down through the opening and often times set depots and buildings along the right of way afire, also the woodland and grass along the right of way. Many of these little things could be very easily remedied. I realize that the ash pan warps, and it is hard to keep the openings closed with the steel ash pans. It has been my experience that the cast iron ash pans give better service. They crack once in a while, but the opening is slight, and is usually patched up so that it does not scatter fire to a dangerous extent, and there are many similar little details that can easily be remedied. For instance, only recently I inspected a road, an up-to-date road, whose power was in good shape but very little attention was given to the condition of the ash pan; in fact, in one corner it was so defective that large cinders could fall out. By placing a small plate over the hole, which was no hardship on the railway, the defect was remedied and the hole was stopped up. Usually our reports or suggestions to the man in charge secure prompt remedy, so that it is very satisfactory.

Mr. Bentley: There is an arrangement for an ash pan which has a locking device, so that when you carry the lever over it is impossible for it to work away, and I think any well regulated railway would have a safety device of that character put on its ash pan.

D. R. MacBain (L. S. & M. S.): Our greatest difficulty with the automatic dumping pan has been to have the fireman close it after cleaning the fire on the road. We have had some difficulty with the slides coming out, but so far as the dropping of fire on the right of way is concerned, we have had no serious difficulty, except in the matter of the disciplining of the men. The men are careless about it, and it requires a long campaign of education to have those who operate the locomotive understand the necessity of keeping the hoppers closed properly at all times.

Mr. Gibbs: Our experience has been along the same line that Mr. Bentley has outlined. When Congress had this question up, we showed that the fatalities caused were very slight; we fully explained the troubles about getting a very satisfactory ash pan; we went into the things that caused the trouble, but since the matter was agitated in Congress we have been giving close attention to it and expect that all the difficulties will finally be overcome.

TRAINING APPRENTICES.

F. W. Thomas, Supervisor of Apprentices, Santa Fe System, opened the topical discussion on Training Apprentices as follows:

The awakening of the railway and manufacturing companies to the importance of educating and training young mechanics to recruit their depleting ranks to fill their expanded shops, has been until three years ago very slow—not until the supply had fallen far behind the demand or until they were sorely pressed for men. There has never been a time when the demand for good, all-around, skilled mechanics was greater than it is to-day. Railways have felt the need of such men. Advertising in the daily want columns and searching the employment agencies for machinists, boilermakers, blacksmiths, and carpenters have become fruitless. We were warned of this approaching desert years ago, by the persuasive logic of G. M. Basford, through the pages of the railway magazines. He argued and pleaded with the railways to educate and train apprentices for their future needs. He warned us of the approaching time when we would sorely need these young men. His prophecies have become realities.

Industry was formerly centered in the home, where they used to grow their own food, spin and weave their own cloth, make their soap, dip candles; the father, if he happened to be a cabinet-maker or blacksmith, shaped his wood and forged his metal near his home, within sight of his children; each child was called upon while still young to share the parent's activity. It gained not only an insight into the industrial processes, but it acquired habits of work and training for its future occupation. Now, industry has passed forever from the home into the factory system. Sciences like physics and chemistry have become vital factors in the productive processes. Skill and accurate knowledge are needed as never before. The home can no longer give the boy and girl training for their life's work.

Three years ago we were astonished to see a full description of the "apprentice schools" which had been quietly inaugurated on the New York Central Lines. The opening and establishing of a school in connection with their shops, giving the boys instruction in the shop and in the school room, and paying them while attending school, seemed almost revolutionary. Indeed, it was revolutionary, revolutionizing the methods and means of making and training mechanics. The shop foreman of to-day is not the easy-going, fatherly old man of years ago; he is no longer a sentimentalist; he no longer has time to stop and show a new, green, bashful boy; he is a live-wire to-day, impatient with delays and responsible for the output of the shop. Years ago every man, every foreman had time to stop and show a boy how to gear up his lathe, grind a tool, or chuck a piece of work. Competition and the introduction of piece work and of bonus and merit systems have left the boy alone to "root, hog, or die." It was really the survival of the *un*fittest.

A new order of things has come. The New York Central project was not a failure; it was a success from its inception and has grown more successful, more prosperous, more remunerative and more indispensable every day. Other roads began to give the new scheme a trial. The road which I have the honor of serving has an apprentice school at every mechanical point; not only all of its larger shops but even the isolated places, having only four or five apprentices, have their apprentice schools, where the boys are taught to use their heads along with their hands; and instead of being a drawback, an expense, or an appreciable loss of time, they have become indispensable, a joy and a pride to every foreman and master mechanic on the system. Each points with pride to his apprentice school.

An apprentice system to be fruitful must be practicable; it must be elastic, it must be humane, and must pay a living wage. It must have the backing of the highest operating officials to insure the coöperation of the subordinates. It must have one head, someone with authority. It must be practicable in the subjects taught in the school room. Shop arithmetic and the simpler elements of mechanics, freehand and mechanical drawing to enable the boy to read a blue print intelligently and to make a working sketch, are the subjects which should predominate. Subjects foreign to the trade should not be taught, or, if taught at all, only sparingly. The apprentice should be taught the various parts of an engine, car, or machine, and the function of each part. He should be taught and drilled in mentally adding and subtracting the fractions of an inch occurring in the divisions of a machinist's scale, and not be allowed to pinch the divisions with thumb nails, a practice so common in shops, and so wasteful of time.

The school room should be close and convenient to the shop, and all instruction should be during the regular shop hours, preferably the first hours of the morning. Boys of this age are restless and active; an abundance of red blood is coursing through their veins; they must have some time for recreation and play. Any shop which requires the boys to attend night school is flirting with failure. You have little control of the apprentices after the regular day's work is done. The hours after six o'clock in the evening are their own, and should be. After a boy has worked all day in the shop, he is physically unfit for night study. By requiring him to return and study three hours, you teach him to dislike the school work, and soon he will look upon it as a drudgery. While history records a few men who in boyhood endured all kinds of hardships and privations for the sake of obtaining an education, these are exceptionally rare cases and the autobiographers deemed it of sufficient importance to record the fact. The extraordinarily ambitious boy will rise under any condition, but we are dealing with the average boy, and the natural inclination of the average boy is to play and have a good time while he is young. I would urges daylight instruction and let the boy have the evening as his own.

In the shops there should be an instructor for at least every twenty-five boys, his entire time to be spent with the apprentices, guiding and directing them. It is the shop foreman's duty to allot the job and the instructor's duty to direct the apprentices in machining, erecting or finishing the job. The instructor should be an active, boy-loving man, one who naturally demands respect, and yet one who instinctively draws the boys to him. He should be able to take hold of any machine or work on the floor and bench, and demonstrate to the boy the correct and quickest way of completing the job in hand. He should from the very beginning insist on the job being mechanically and workmanly correct. Cleanliness of person, tools, and machine makes a clean, accurate mechanic. The shop instructor has another duty no less important than the purely mechanical training. He should be a father and a master of the boy, responsible in an influential measure for the moral habits of the young man; he should be a companion to the boy; should listen to his tales of joy or sorrow, and should be ready to advise or lead him when in trouble. These win the boy's confidence, and when you have this you can lead him anywhere and mould and shape his young life into the most desirable cast.

One-third of the apprentices who enter a shop, whether through necessity, whether through parental influence, or the good wages paid, are unfitted for the trade they are indentured to learn. The school and shop instructors are quick to find out the boy's qualifications. If he is unfitted for the trade, he is transferred or dismissed. The weaker, slower and plodding boy, who will eventually make you the best man, is handled to develop the best features of his make-up, and gradually strengthened in his weaker points until the talent which lies dormant is aroused. The boys are treated as individuals and not in classes; they are advanced as they merit it. The brighter and quicker boy will move along faster and the slower boy should not hold him back.

The apprentice school should be a part of your shop organization. No special appropriation should be made for its maintenance, but it should be classed and treated as a department of your shop, similar to the manner in which you organize and maintain your tool room, or your power house. It is just as necessary to make and train the most valuable element of your shop as it is to make and repair tap dies, drills, or jigs, for you can buy these, but you can't buy good, all-around men.

The expense of the project has kept a number of roads and manufacturing establishments from venturing into it. Take my word for it, and the experience of a road which has made a trial, the scheme is a paying proposition for any road and any shop. I have watched the average efficiency of apprentices increase from 65 per cent efficiency at the opening of our apprentice schools to 90 per cent efficiency at the present day. By efficiency here I mean the work done by apprentices as compared to journeymen. The bonus system in vogue on the Santa Fe enables the company to determine each day the actual value of all its mechanical employees, and this includes the apprentices; and when I state that the efficiency of apprentices has been increased from 65 per cent to 90 per

cent under our system of apprentice instruction and education, it is not an estimated statement, but one based on facts and figures.

The following reasons will justify you in establishing and maintaining a system of apprentice instruction and education as outlined in this paper:

First: The undesirable and unfitted material will be weeded out quickly.

Second: With the aid of an instructor the apprentice earns his wages from the very beginning.

Third: With the assistance of an instructor, important and expensive machines may be operated during the temporary absence of the operator, say for half a day, a day, or a week, for it is not always convenient or profitable to put a man on a temporary job.

Fourth: A better class of boys will be induced to enter your shops.

Fifth: The training of a set of men, educated, and schooled into your methods, ways, and standards.

Sixth: The improvement in the moral tone of your shops by injecting into the body first-class, clean-moraled young men.

Seventh: The brightening of the "esprit de corps" of your shop men by graduating into their midst a lot of men made by you, clean, honest, and loyal, and capable of doing any job, or operating any machine.

The following companies have this system, or some modified form in vogue: New York Central Lines; Canadian Pacific; Grand Trunk; Erie; Pennsylvania; Union Pacific; Delaware, Lackawanna & Western; Southern; Missouri Pacific; Santa Fe System, and others; also the Westinghouse Air Brake Company, General Electric Company, Geo. V. Cresson Machine Company, Philadelphia, and other manufacturing concerns. These have adopted the modern method of training apprentices, and each speaks well of the success of its venture. None who have started have turned back. The labor organizations have recently strongly urged more practical features for the manual training courses in our public school systems.

When you can offer such a training, when you tell the boys the most healthful and fascinating occupation is railway work, that the earnings of your graduate apprentices are greater than of the average doctor or lawyer, that the diploma you give them is a bread-earning parchment, insuring them a permanent good wage occupation the moment they are graduated, then you will attract the brightest and best boys to your service.

C. W. Cross (New York Central Lines): In devising the plans for the shop training of apprentices it is exceedingly important that we do not permit our enthusiasm to override our judgment. A natural error would be to attempt to develop the training to an ideal condition from the standpoint of the instruction department and make the shop part of the school when the school must be part of the shop.

It is necessary to remember that the purpose of the shops is to repair locomotives and cars, and any system of apprenticeship to be successful must be handled in a manner to contribute to the output rather than to exploit any theories of instruction. The purpose of the apprenticeship system should be to produce workers who can make money for themselves and their employers; to develop mechanics; to train thinking workmen; to supply capable constructive citizens who will understand that good workmanship is of itself and for its own sake sufficient inspiration for the best endeavors of which humanity is capable.

The boys must be made to realize that they must not get in the way of the output. They must be made to feel they have a part to take in keeping up the output to the maximum. This being desirable on the part of the shop management as well as on the part of the boys, they cannot be allowed to work slowly or spoil work and cause delay thereby.

The course of instruction in the shops must necessarily be a local matter as regards the progress of the apprentice through the several stages of the trades, and no detailed schedule could be adhered to for general use. It is the duty of the shop instructor to give the boys experience on each part of the work with the object of making them competent all-around workmen at the completion of the course.

In the matter of training of men it is less a question of to-day's efficiency than it is a matter of to-day's preparation for results which must be forthcoming to-morrow. The specific value of this plan of apprenticeship is that it enables the railroads to reap an immediate benefit by using the boys in important work, as well as an ultimate benefit from the work done by apprentices due to the special training they receive, both in the shop and schoolroom. Of course, it is not expected that an instructor can be personally expert in all trades, but he can supervise the instruction in a manner to give the apprentices an opportunity to perform a generous proportion of the good work and thereby acquire skill in the trade. The foreman cannot spare the time to instruct the apprentices, but if he gives his approval and support to the instructor the results will be satisfactory to him as well as to all others concerned.

No detailed code of rules for shop instruction can be used successfully in all shops. A better plan is to allow some flexibility, but adhere to the general principles as adopted by this association at the convention of 1908 as recommended practice. The principles referred to are as follows:

1—To develop from the ranks in the shortest possible time carefully selected young men for the purpose of supplying leading workmen for future needs, with the expectation that those capable of advancement will reveal their ability and take the places in the organization for which they are qualified.

It is much easier to make the statement than it is to carry out the principles. To do this requires the most complete scheme possible with facilities to check up at each point to see that it is carried out.

2—A competent person must be given the responsibility of the apprenticeship scheme. He must be given adequate authority, and he must have sufficient attention from the head of the department. He should conduct thorough shop training of the apprentices, and in close connection therewith should develop a scheme of mental training, having necessary assistance in both. The mental training should be compulsory and conducted during working hours at the expense of the company.

The person in charge of the school should be one who will feel he has under his care the men of the future and a responsibility of no mean order.

3—Apprentices should be accepted after careful examination by the apprentice instructor.

The scheme should be such as to produce a waiting list from which only the most promising boys should be selected.

4—There should be a probationary period before apprentices are finally accepted; this period to apply to the apprentice term if the candidate is accepted. The scheme should provide for those candidates for apprenticeship who may be better prepared as to education and experience than is expected of the usual candidate.

This involves the opportunity for most intimate knowledge of every boy and his work, this being the point of weakness in most organizations.

5—Suitable records should be kept of the work and standing of apprentices.

Records should not only be kept but used and be of such a character as to enable those in charge to determine accurately on candidates for promotion.

6—Certificates or diplomas should be awarded to those successfully completing the apprentice course. The entire scheme should be planned and administered to give these diplomas the highest possible value.

The greatest value of the diploma is indicated by its acceptance by those issuing it as proof positive of competency. If the road places a high value on the diplomas the boys are surely likely to do so.

7—Rewards in the form of additional education both manual and mental should be given apprentices of the highest standing.

Those who have put the idea into effect have benefited mostly thereby. This feature constitutes a means of encouragement not to be provided in any other way. It is not essential that those receiving this reward should remain in the service in order to receive great benefit from the idea. It has already proved effective in providing encouragement for those who do not obtain the rewards themselves.

8—It is of the greatest importance that those in charge of apprentices should be most carefully selected. They have the responsibility of preparing the men on whom the roads are to rely in the future. They must be men possessing the necessary ability, coupled with appreciation of their responsibility.

Herein lies the greatest problem connected with apprenticeship. In the future even greater efforts must be made to secure the right kind of instructors.

9—Interest in the scheme must begin at the top, and it must be enthusiastically supported by the management.

A number of promising apprentice systems have been started. It is now up to those systems absolutely to justify continuation of enthusiastic support from the management.

10—Apprenticeship should be considered as a recruiting system and greatest care should be taken to retain graduated apprentices in the service of the company.

There will always be considerable danger of losing the best boys after graduation. Herein lies a problem in organization to make the railroads having apprenticeship systems the best possible organization for young men to work for, so

that they will not be enticed away into other lines of activity which opportunity promises greater rewards but less permanent and less satisfactory in the long run than is the railroad service.

Apprenticeship is now started in a number of places, and it is up to those who inaugurated the system to make their job good and thorough. After all, the fundamental problem in apprenticeship is shop instruction in the trades. We all need to go much farther than we have gone in giving attention to systematic shop instruction, this being a new field of effort in which all of us need development. In fact we need shop instruction methods which will be better than the old kind of apprenticeship when the master had but one apprentice and when it was clearly to the interest of the master to teach the apprentice the maximum of trade knowledge in the minimum of time. We can make spectacular progress in class room work and yet fail, if the trade instruction in the shop is lacking.

H. Gardner (N. Y. C. & H. R.): The financial success of the apprenticeship system depends upon the boys' output in the shop. They must earn as well as learn, and to ensure a profit to the company there must be sufficient shop instruction and supervision to enable each boy to work most advantageously at all times. Exploitation must be discouraged and boys must be given a maximum of experience with a maximum return per hour or machine. To accomplish this more shop instructors are necessary. A shop having fifty machinist apprentices should employ at least two instructors in the shop, and to obtain a maximum output at all times one instructor to every twenty boys is to be recommended. Too many instructors would be objectionable, as the boy would lose in self-reliance and initiative if his every move was directed by the instructor.

Small groups of boys in trades not largely recruited may be supervised by an instructor in some other trade. It is not as essential that the instructor be an expert in that trade as it is for him to have the tact and ability to interest the foreman and journeymen and to obtain their hearty coöperation. In this way the best classes of work will be given the apprentice and opportunities to learn, if not actual instruction, will be afforded them. A competent instructor may increase the output of the boys working at a trade with which he is unfamiliar an amount greater than he could hope to obtain had he a full knowledge of the trade but was dependent upon his unaided efforts for results. Great care should be exercised in the proper selection of instructors. They should have many qualities combined with an ability to identify undesirable boys and to promptly eliminate them.

The school or classroom instruction of apprentices speaks for itself. Much has been written upon the acknowledged benefit derived from this training—education means efficiency, and efficiency means output. But the school work must not be academic; practical shop problems should be taught and the work of the school instructor should be intimately associated with and supplement the work of the shop instructor. Courses should be given which will bear directly upon the trade; for example, if a boy is required to figure the cutting speed when chipping a certain amount of material in a given time, he will attempt to obtain that speed when actually performing the operation in the shop. Problems on cutting speeds and feeds of machine tools with different materials and different classes of work will stimulate similar results in actual practice. The school instruction from the standpoint of immediate profit must be subordinated to the shop instruction, but for ultimate results it may rank first in importance.

The graduate apprentice cannot be held by promises of future reward or promotion. He can only be permanently retained by adequate compensation or by placing him at once in a position of responsibility. The average boy wants money, and he will go where he can get it, unmindful of his present good standing and the advantages incident to railway work. If there is justification for continuing the apprenticeship system the majority of boys upon graduation should be superior in many ways to journeymen not having had similar advantages, and they should be given a journeymen's rate; in some cases for exceptional boys the maximum rate should be given. This recommendation is significant when it is borne in mind that the graduate is beginning his life's work fully prepared for advancement to higher positions.

Too much stress cannot be laid upon the proper selection of apprentices. The shiftless inert boy will not develop the loyalty and make the friendships which will bind him to the company after graduation. Such boys should be promptly dismissed during the probationary period, thus lowering the percentage of desertions. The worthy boy of good habits will become attached to his work and environment; his training has made him contented, and he will hesitate to run after a little more pay or wander about seeking adventure. It is erroneous to state as a permanent loss the percentage of boys who leave the company after graduation. Records prove that a certain percentage of these boys, after obtaining experience in other shops will return to the original railway work improved and broadened by their contact with the world.

C. E. Fuller (U. P.): I can very strongly endorse the benefits derived from the apprenticeship system of instruction. I doubt if there is anyone in the room who has handled apprentices but what has been confronted with the statement that the apprentice who is out of his time is not worth journeymen's pay. The state of affairs existing that will allow an apprentice boy to go through the shops for a period of four or five years and then not be a mechanic is certainly one which reflects on the management of the shops. It is a moral obligation, if nothing else, that we owe the boys. Further, I presume you have all had the experience of being unable to obtain competent foremen. You are hunting the country over for that class of labor. It is another thing, I think we are to blame for, and ought to be ashamed of. If you want good foremen, you must make good men, and to make good men, you have got to start with the boys.

Our experience with the apprenticeship system as inaugurated on the Union Pacific, not exactly the same as the Santa Fe or New York Central, but similar, is such that we have a system requiring a report as to the standing of every apprentice once in each three months, and if the boy's standing is not what it should be, he is cautioned and given three months in which to make up what he has lost, and come up in line with his class. If he fails, he is dropped. The result of this system is that the boys who are not worthy are dropped in the first six or nine months of their apprenticeship. By maintaining an apprentice instructor, the conditions are just as the paper states, the instructor becomes a sort of father to the boys, and the boys feel that they are obtaining something that is worth while, and they realize that their future is in his hands and in their hands. The result is you do not have to scold the boys or call them up for discipline very often. They take hold of their work in a cheerful way, and we have apprentices to-day that we are proud of. They will do any work that any mechanic in the shop can do, do it as quickly and do it as well. We would not think of abolishing the present apprenticeship system. It is making something for the railways that we have all wanted for years, and in case of those of you who have not tried it, if you do not want to go to the full extent of it, put a good, competent, honest instructor in your shop to instruct your apprentices. I can say without contradiction that you will never be without an apprentice instructor again. The value of his services are greater to you than even your shop foreman.

We have gone a little further in our apprenticeship system, or rather in the educational feature. We have establishd an educational bureau for educating all of our men, anybody, it makes no difference what position they hold or what they want to know. If you are a trained man and want instruction in shop work, he can get it; if a machinist wants instruction in transportation matters, he can get it; if a machinist wants to go into the accounting department, he can obtain information concerning that department and perfect himself for a position in that department; in other words, the door is open to all of our employees in all occupations. This scheme of educational betterment is the broadest and most comprehensive plan of the kind so far established by any private corporation in the world.

The Educational Bureau of Information, as it is called, was established to fulfill three principal purposes: first, to assist employes to fit themselves to assume greater responsibility; second, to increase the knowledge and efficiency of employes; and third, to prepare prospective employes for the service, the object being to reach the young man who has not been permitted to remain in school after he is sixteen years of age (this class, it is stated, includes ninety per cent of the entire population of the United States); also, to promote loyalty through appreciation of the company's interest in the welfare of *all* employes, no matter what their positions and occupations may be, thus bringing about courtesy and increased efficiency, and raising the entire personnel to a higher plane.

Courses of instruction are offered on every branch of practical railroading Instruction is given through correspondence; but all of the papers are especally prepared for this particular work, and cover specific information concerning Union Pacific methods and practices, eliminating from the courses unnecessary and impractical instructions as well as methods which are not standard on the Union Pacific. These courses are prepared by the various officials of the company, who are best qualified to write on the individual subjects. The papers on various subjects are edited by the bureau; con-

solidated to make the courses complete; and approved by the heads of all departments interested in the instructions, so that, when they are issued, they are authoritative, official instructions for doing the work. Personal instruction is given in certain cases, where necessary. The work of the bureau is handled by D. C. Buell, its chief, with the assistance and co-operation of an advisory board composed of general officers, one from each department, who have been selected on account of their special fitness for this work.

The bureau can teach every employe something. It is not its object to make officials; but to make more efficient employes from whom will come, naturally, those qualified to become officials. The bureau has no prestige as to promotions, which are made, as heretofore, on the recommendation of the immediate superior of the man in question; but the stepping-stones afforded by the bureau, place in the hands of those ambitious to advance, the means to do so. The men take to the scheme—it is something they have long wanted.

During the nine months the bureau has been established, over thirteen hundred employes have been enrolled as students, the majority of whom are earnestly pursuing their studies to such an extent that success is assured. The possibilities of this work are practically unlimited. The bureau work is free to employes; it does not in any way compete with established schools; it fills a place heretofore unoccupied; and extends to all employes, the opportunity which has heretofore been confined to only a few mechanical apprentices. It is making more efficient employes, and arousing an interest in general knowledge that will call for further investigation and study, extending beyond that which the school alone will supply.

In addition to the foregoing, any employe can ask any question of the bureau at any time, without formality, whether he be a student or not. The bureau is also preparing employes for the service, more particularly in connection with its station school, which supplies trained station helpers for the entire system.

John Powell (Grand Trunk): Our apprenticeship system is a great success and we are getting the services of some very bright young men. Personally, I have been connected with the boys for about fifteen years and the progress they have made is most remarkable and well worth all the expense. I have, as Mr. Thomas says, been almost like a father to the boys, and the interest they take in the work is wonderful. I take exception to that part of his paper where he says the boys should attend school in the daytime. We expect the boys to give two hours on each of two nights in the week, and if the boy does not attend school he must make an explanation of the reason. As to the work that has just been completed; the members of this association would be surprised at what the boys get out, and I would be pleased to give any member any information in regard to our system.

The President: The time of adjournment has arrived. We have no report from the committee on Motive Power Development, and therefore this concludes the program for the day.

The Inter-Ocean Steel Company has just issued handsomely engraved invitations to a limited number of guests "to witness the manufacture of open-hearth steel and the rolling of locomotive and car wheel tires" at its new works at Chicago

The state railways of Belgium deal generously with shippers in the matter of demurrage. They do not hesitate, when a reasonable excuse is offered to reduce demurrage, and frequently do not press the claim for demurrage at all.

Beside the main system of railways in Belgium, which are built with a gage of 1.435 meters and are known as Chemins de fer Grande Section, there is in Belgium a very extensive network of light railways, which follow the course of roads, and, in general, are built with a gage of one meter.

The first section of railway built in Belgium was a line running from Brussels to Malines, and was opened for traffic in 1835. From 1835 to 1840 new lines were both built and operated by the state, but an idea had arisen in the public's mind that the new mode of transit was altogether too costly to become general or to allow the transport of heavy goods owing to the competition of waterways. The low rates rendered necessary gave such unsatisfactory financial results that when the government proposed fresh schemes of extension the chambers refused to sanction a further outlay.

Conventionalities.

Harry Rochester, of Dayton, Ohio, is attending the conventions. Mr. Rochester is assistant to the president of the Barney & Smith Car Company.

J. W. Small, superintendent of machinery of the Kansas City Southern at Pittsburg, Kan., and Mrs. Small, are not here this year. They are missed by their many friends.

The absence will be noticed this year of H. J. Small, general superintendent of motive power of the Southern Pacific. Mr. Small and daughter, Miss Barbara Small, have only recently returned from a three months' trip to the Orient.

C. P. Williams, of the Chicago Railway Equipment Company, is accompanied this year by his wife. Mrs. Williams has been of considerable assistance in the work of the convention ladies.

Mr. Hooley absolutely denies the soft impeachment that the statuary on the front of the Baker-Pilliod locomotive is a counterfeit presentment of himself. That is Mr. Hooligan, a distant cousin, who has been in this country but a short time.

Our old-time friend, H. M. Perry, representing the Joliet Railway Supply Company and the Perry Side Bearing Company, who has been an attendant at the conventions "since the wet spring of '32," or some other ancient date, is very much with us again this year.

Eugene Chamberlain again appeared as the official can-opener of the Master Mechanics' convention. He spoke in his usual pleasing strain, and the only hesitation noticeable in his address was when he overheard some one whisper for a match.

The reputation of A. C. Moore, of the Safety Car Heating & Lighting Company, as an earnest worker, has long since been established. Mr. Moore now promises to become equally famous as a painstaking dresser. Note the checked silk cap matching the checked raiment.

G. S. Allen, an honorary member of the association, who was for fifty-two years in the service of the Philadelphia & Reading at Tamaqua, Pa., is attending the convention with his son C. W. Allen, of the L. J. Bordo Company and his daughter, Mrs. Edith Allen Kase.

Heap Big Chief Johnson has been shouldered with the responsibilities of next year's entertainments. If any man has worked harder or more conscientiously over anything connected with this whole blooming shown than has J. Will, we'd like to have someone point him out.

David Brown, assistant superintendent of motive power of the Lackawanna, and Mrs. Brown have been here since Tuesday last. They are staying at the Traymore. Their charming daughters, however, did not come and their enlivening presence is missed. Mr. Brown has just recovered from a serious operation.

Ye editors were highly entertained Monday a. m. by a performance at the entrance to the Pier. The performers were: Todd, Ogilvie, Barbey and McCarthy. The audience was Tom Prosser. That it was a comedy, we know; because the whole audience was kept in a continuous uproar. But what was it all about?

Among the old-time regular attendants of the conventions who are missing this year we recall particularly Robert M. Van Arsdale, Peter H. Peck and James R. Patterson—all of

whom were taken from us rather suddenly, and all of whom were familiar figures in both the railway and the supply branches which make up the conventions.

Found—A gold cuff button bearing the initials "I. T." The owner may recover it by calling at the office of Treasurer Aldcorn, of the Supply Men's Association.

George E. Molleson and Mrs. Molleson are staying at the Marlborough-Blenheim. While Mr. Molleson is an old-timer at these conventions, he is here this year as the head of a concern of his own. Long life and prosperity to the latest addition to the ranks. Mr. Huntly H. Gilbert, his Western representative, is with him.

A. G. Telford, purchasing agent of the Q. & C., arrived from home Tuesday; left for home Wednesday; and arrived back in Atlantic City Friday. "Gandy" begrudged the time required for railroad travel on the trip, and it is said he is now seriously considering a line of airships between Cincinnati and Atlantic City.

Among our Pacific coast friends, whose faces we miss this year are T. W. Heintzelman, superintendent of motive power of the Southern Pacific at Sacramento, Cal., and Mrs. Heintzelman; F. E. Davisson superintendent of machinery of the San Pedro, Los Angeles & Salt Lake at Los Angeles, Cal., and Mrs. Davisson, and J. F. Graham, superintendent of motive power of the Oregon Railway & Navigation Company at Albina, Ore., and Mrs. Graham.

John S. Cook, master mechanic of the Georgia Railroad at Augusta, Ga., who will be 83 years of age on October 5, next, has been present at this year's convention with Mrs. Cook and granddaughter since the beginning. He entered railway service in 1849, before most of us or many of our parents were born, and has been located in substantially the same place ever since as machinist, locomotive engineer, foreman and master mechanic, having held the latter title since 1879.

E. T. Hendee, manager of the machinery department of Joseph T. Ryerson & Son, arrived from Chicago Saturday evening and with his characteristic energy began at once to renew acquaintances at the hotels along the Boardwalk and on the Million Dollar Pier. Mr. Hendee comes to the conventions brimful of good health and business enthusiasm as the result of a fishing trip with a party of railway men in the woods of Northern Wisconsin. If Mr. Hendee was as successful in catching fish as he has been in getting college degrees he is to be congratulated. Nobody seems to know exactly how many he has, but one of his friends is authority for the statement that he must have at least seven, including a Ph.D., M.A., C.E., etc., etc.

The chairman of an entertainment committee resembles both a President of the United States and a Methodist parson in that it is very desirable for him to have a helpful wife. That Mrs. J. Will Johnson meets this requirement so admirably is one of the reasons, besides her husband's own excellent qualifications, why his work as chairman of this year's entertainment committee has been so successful. Mrs. Johnson's unfailing tact, her constant efforts to make things pleasant for all about her, her tireless and effective help in smoothing over the rough places, have made very many at these conventions her debtors; and among that number the *Daily* has been made, by many kindnesses, one of the most obligated.

J. F. Prendergast, master mechanic of the Baltimore & Ohio at Glenwood, Pa., and Tom R. Davis, of the Flannery Bolt Company, are joint owners of a gasoline yacht—a 40 footer, with seating capacity for 30 people—which they are accustomed to run in the raging waters of the Monongahela and in which they expect some time to go as far as Sinsanity. The name of the yacht is Vodelli; but probably that does not cut any figure. The main fact to be borne in mind is, that the cross-head, tires, boiler, gasoline tank and sparking plug are fitted throughout with Tabe flexible staybolts. Prendergast, who bears the title of admiral, when on the high seas, is keeping his official dignity in order by taking command of the bath tubs on the third floor of the Marlborough-Blenheim, while Davis is investigating the relative merits of steam and gasoline as a motive power for flexible staybolts.

The Gold Dust Twins, as the Davis brothers of solid truss brakebeam fame are called by some of the bunch around these diggings, who drop in on the editor when in need of a really good cigar, have been much in evidence ever since the convention opened. This makes two sets of double-back postage stamps that we've added to our collection this year.

Ill-luck, so far as registration lists are concerned, seems to attend the names of president and past president of the Master Mechanics' Association. The other day we called Mr. Vaughan "S. M. P.," and on Monday Wildin appeared as mechanical superintendent of the New York Central. It was supposed that the first error was up to Joe Taylor, and he may or may not be responsible for the latter. But, anyway, it didn't make so much difference in the first case, as Vaughan says: "There isn't a thing in this 'has-been' racket," and commiserates Wildin on his inevitable come-down on Wednesday. But it is too bad to appear to give scant attention to the presiding officer in his brief career of glory.

GREETINGS FROM PARIS.

The following cable message was received by Secretary Taylor on Friday after the convention had adjourned:

41 Ny Ka Ba 17

Paris, June 17, '10

Joseph Taylor, Sec'y
Car Builders' Ass'n
Atlantic City, N. J.

Greetings. Have nineteen twelve meeting here—
Alexander Stewart
11.22 a Alexander Brown

It is assumed that the preliminary remarks in the first line of the message are expressions of astonishment and delight in the beauties of Paris as they for the first time dawned on these our two Alexanders who are out in search of more worlds to conquer. The numbers apparently indicate that Stewart is more susceptible to foreign influences than is Brown, as 41 appears to be the number of times the former has been impressed to the point of ejaculating these cabalistic words, while Brown, being an advertising man, has had his skin pierced only 17 times. The date for the proposed meeting of the conventions in Paris has been also the subject of some conjecture. Some who have examined the message are of opinion that "nineteen twelve" is a slip of the cable for "nineteen eleven;" others are inclined to think that both Stewart and Brown are so unaccustomed to idleness that it seems a year since they left New York, and that they have put their watches ahead a year instead of a matter of six hours; while still others, bearing in mind the expressions of enjoyment with which the message opens, are inclined to the belief that the message is intended to break gently the news of their intention to prolong their European trip so as to get back to Paris in time for the conventions of 1912, having succeeded in their intention of conquering the world. Our advice in this connection, based upon a somewhat intimate knowledge of the personnel and methods of the International Railway Congress, is that they do not linger long at the congress, lest cobwebs accumulate around their heads and moss upon their backs to such an extent as to make an uncomfortable burden in future travel.

M. M. REGISTRATION.

The following list is additional to that published in the *Daily* of June 20:

Adams, T. E., S. M. P., St. L. & S. W. R. R., Marlborough-Blenheim Hotel.
Appler, A. B., M. E., Delaware & Hudson Ry., Marlborough-Blenheim Hotel.
Arp, W. C., S. M. P., Vandalia, Marlborough-Blenheim Hotel.
Ayers, A. R., A. M. M., L. S. & M. S. R. R., Traymore Hotel.
Baker, Geo. H., Railway Educational Ass'n, Dennis Hotel.
Barry, J. J., M. M., N. & W., Windsor Hotel.
Beamer, Jas. A., M. M., Penna. R. R., Chalfonte Hotel.
Bennett, H. M., M. M., P. R. R., Traymore Hotel.
Billingham, R. A., S. M. P., Pitts. Shaw. & Northern Ry., Traymore Hotel.
Bissett, J. R., M. M., Seaboard Air Line Ry., Monticello Hotel.
Blunt, Jas. G., Supt. Gen. Draw. Rm., American Locomotive Co., Traymore Hotel.
Boldridge, R. M., M. M., Central of Ga. Ry., Chalfonte Hotel.
Booth, John S., M. M., Carolina & Northwestern Ry. Co., St. James Place.
Bowles, C. K., Tidewater & Western R. R. Co., Monticello Hotel.
Brooke, Geo. D., S. M. P. & M., Isthmian Canal Com., Marlborough-Blenheim Hotel.
Brooks, Elliott G., M. M., Mobile & Ohio R. R., Young's Hotel.
Brown, H. B., M. M., Erie R. R., Borton Hotel.
Bruck, Henry T., S. M. P., Cumb. & Penna. R. R., Shelburne Hotel.
Bussing, Geo. H., Supt. M. P. & R. S., Evansville & Terre Haute R. R., Haddon Hall.
Bryan, H. S., S. M. P., Duluth & Iron Range R. R., Brighton Hotel.
Casey, Fred. A., V. P., The Ashton Valve Co., Marlborough-Blenheim Hotel.
Chamberlin, E., Marlborough-Blenheim Hotel.
Chambers, C. E., S. M. P., Central R. R. of N. J., Dennis Hotel.
Chambers, J. S., S. M. P., Atlantic Coast Line R. R., Marlborough-Blenheim Hotel.
Chidley, Joseph, M. M., Lake Shore & Michigan Southern Ry., Marlborough-Blenheim Hotel.
Christopher, J., M. M., Tor. Ham. & Buf. Ry., Young's Hotel.
Cook, John A., M. M., Georgia R. R. Co., Shelburne Hotel.
Cross, C. W., Supt. Ap., N. Y. Lines, Traymore Hotel
Deeter, D. H., M. M., Phila. & Reading Ry., Jackson Hotel.
Dewey, J. J., M. M., Erie R. R., Schlitz Hotel.
Dickerson, S. K., A. S. M. P., L. S. & M. S. Ry., Marlborough-Blenheim Hotel.
Dodds, Ethan I., Asst. Supt. Car Dept., Erie R. R., Windsor Hotel.
Doolittle, R. L., M. M., A. B. & A. R. R., Brighton Hotel.
Dunham, W. E., S. M. P. & M., Chicago & Northwestern Ry., Haddon Hall.
Dunn, Jas. F., S. M. P., Okequoi Short Line R. R., Chalfonte Hotel
Edmonds, Geo. S., M. M., Delaware & Hudson, Chalfonte Hotel.
Edwards, J. B., M. M., Col. Newberry & Laurens R. R., Young's Hotel.
Fetner, W. H., M. M., Central of Georgia Ry., Chalfonte Hotel.
Fitzgerald, D. C., Asst. Gen. S. M. P., Frisco System.
Fitzmorris, Jas., M. M., Chicago Junction Ry., Young's Hotel.
Flavin, J. T., M. M., C. I. & S. R. R., Dennis Hotel.
Foster, O. M., M. M., Lake Shore & Michigan Southern Ry., Traymore Hotel.
Foster, W. H., M. M., N. Y. C. & H. R. R. R., Marlborough-Blenheim Hotel.
Fowler, W. E., Marlborough-Blenheim Hotel.
Foyle, Chas. E., New Belmont Hotel.
Franey, M. D., Asst. M. M., L. S. & M. S. Ry., Traymore Hotel.
Gardner, Henry, Asst. Supt. Appren., N. Y. C. Lines, Chalfonte Hotel.
Gentry, T. W., American Locomotive Co., Wiltshire Hotel.
Gillis, H. A., Dennis Hotel.
Gordon, H. D., Marlborough-Blenheim Hotel.
Graham, Charles, Traymore Hotel.
Greenwood, B. E., G. F., Seaboard Air Line Ry., Monticello Hotel.
Greenwood, H. F., Genl. Foreman, Norfolk & Western Ry., Windsor Hotel.
Gross, E. G., M. M., C. of Ga., Islesworth Hotel.
Harris, J. D., G. S. M. P., B. & O. R. R., Brighton Hotel.
Haskell, B., Chalfonte Hotel.
Hassett, M. W., M. M., N. Y. C. & H. R. R. R., Monticello Hotel.
Hayes, W. C., Erie R. R., Chalfonte Hotel.
Hill, Rufus.
Herr, E. E., M. M., Pennsylvania R. R.
Hildreth, Fred F., Vandalia R. R., Dennis Hotel.
Hill, W. H., M. M., Cornwall R. R.
Hodgins, Geo. S., Haddon Hall.
Holtz, David, Western Maryland R. R., Pennhurst Hotel.
Horsey, A. W., M. E., Canadian Pacific Ry., Haddon Hall.
Hyndman, F. T., M. S., Marlborough-Blenheim Hotel.
Jacobs, Henry W., Asst. S. M. P., A. T. & S. F. Ry., Chelsea Hotel.
Jaynes, R. T., M. M., Lehigh & Hudson River Ry., Traymore Hotel.
Johnson, L. R., Canadian Pacific Ry., Haddon Hall.
Jones, C. H., M. M., Huntingdon & Broad Top Mtn. R. R., Bothwell Hotel.
Joughins, G. R., M. S., Intercolonial Ry., Chalfonte Hotel.
Kendig, R. B., Gen. Mech. Eng., N. Y. C. Lines, Marlborough-Blenheim Hotel.
Kirkpatrick, James, M. M., Baltimore & Ohio R. R., Chetwood Hotel.
Kneass, Strickland L., Wm. Sellers Co., Ltd., Marlborough-Blenheim Hotel.
Lancaster, T. C., Gen. For. Sou. R. R., Miller's Cottage.
Larry, W. L., M. M., N. Y. N. H. & H. R. R., Dunlop Hotel.
Leach, W. B., Marlborough-Blenheim Hotel.
Lee, C. W., M. M., Raleigh & Southport Ry., Ellwood Hotel.
Lovell, Alfred, Traymore Hotel.
Lyonmark, J. H., M. E., C. & A. R. R., Marlborough-Blenheim Hotel.
McCarthy, M. J., C. C. C. & St. L. R. R., New Dunlop Hotel.
McGrath, J. T., M. M., Grand Trunk Ry., Young's Hotel.
McKeen, W. R., Jr., Cons. Engr. Motor Cars, Union Pacific R. R., Brighton Hotel.
Mahle, F. W., Southern Pacific Co., Bellevue-Strafford Hotel, Philadelphia.
Malthaner, W., M. M., Delaware & Hudson Co., Traymore Hotel.
Manning, J. H., S. M. P., D. & H. Co., Marlborough-Blenheim Hotel.
Martin, H. W., Supt., Mt. J. K. & R. R. R., Kentucky House.
Maver, W. A., M. M., Grand Trunk Ry., Windsor Hotel.
Maxfield, H H., M. M., Pennsylvania R. R., Chalfonte Hotel.
Mechling, J. E., M. M., Vandalia R. R., Dennis Hotel.
Meister C. L., M. E., Atlantic Coast Line R. R., Dennis Hotel.
Mellin, C. J., American Locomotive Co., Traymore Hotel.
Miller, E. A., S. M. P., N. Y. C. & St. L. R. R. Co., Traymore Hotel.
Mills, J. H., M. M., Canadian Pacific Ry., Haddon Hall.
Moler, A. L., M. M., Frisco Lines, Windsor Hotel.
Moll, George, M. M., Philadelphia & Reading R. R., Monticello Hotel.
Monohan J. J., M. M., Louisville & Nashville R. R., Dunlop Hotel.
Montgomery, Hugh, S. M. P., Bangor & Aroostook R. R., Brighton Hotel.
Moriarty, G. A., M. M., N. Y. N. H. & H. R. R., Rudolf Hotel.
Mullinix, S. W., S. M. P., C. R. I. & P. Ry., Windsor Hotel.
Newhouse, John F., M. M., Kentucky & Indiana Bridge & R. R., Young's Hotel.
Nolan, J. P., D. M. M., Morgan's La. & Texas R. R. & S. Co., Young's Hotel.
O'Hearne, John E., M. M., W. & L. E. R. R. Co., Traymore Hotel.
Ord, C. R., M. M., Canadian Pacific Ry., Monticello Hotel.
Osborne, C. H., A. S. C. D., C. & N. W. Ry., Chalfonte Hotel. Chalfonte Hotel.
Owens, W. H., Southern Ry. Co., Victoria Hotel.
Patterson, Robert, M. M., Grand Trunk Ry., Young's Hotel.
Pearce, J. S., M. M., N. & W. Ry., Haddon Hall.
Perrine, W. M., M. M., C. R. R. of N. J., Pennhurst Hotel.
Pfafflin, Louis, M. M., Indianapolis Union Ry., Biscayne Hotel.
Pilcher, John A., M. E., Norfolk & Western Ry., Traymore Hotel.
Plank, P. D., M. M., Louisville, Henderson & St. Louis Ry., Young's Hotel.
Pratt, Edward W., A. S. M. P., C. & N. W. Ry., Marlborough-Blenheim Hotel.
Randolph, J. L., M. M., Boston & Maine R. R., Young's Hotel.
Reagan, Frank H., M. M., Lake Erie & Western Ry., Belleville Hotel.
Redding, D. J., M. M., Pittsburg, & Lake Erie R. R., Traymore Hotel.
Reid, H. G., M. M., Canadian Pacific Ry., Haddon Hall.
Reynolds, O. H., Dennis Hotel.
Riegel, S. S., M. E., C. L. & W. R. R., Runnymede Hotel.
Robb, W. D., Supt., Grand Trunk Ry., Marlborough-Blenheim Hotel.

Ryan, J. L., S. M. P., Southern Pacific Ry., Traymore Hotel.
Sanderson, R. P. C., S. M. P., Virginia Ry., Strand Hotel.
Sechrist, T. O., M. M., C. N. O. & T. P. Ry., Dennis Hotel.
Shea, R. T., Inspector Tools & Mchy., New York Central Lines, Marlborough-Blenheim Hotel.
Shreeve, Willis J., M. M., Minneapolis & Rainy River Ry., Bothwell Hotel.
Sinclair, Angus, Haddon Hall.
Sinnott, W., M. M., B. & O. R. R., Pennhurst Hotel.
Smith, Carl B., M. M., Boston & Maine R. R., Penhurst Hotel.
Smith, John L., G. F., P. S. & N. Ry., Bingham Hotel.
Sneck, Harry, M. M., B. P. & R., Mervine Hotel.
Sprowl, N. E., M. M., Atlantic Coast Line R. R., Young's Hotel.
Staley, H. F., M. M., Carolina, Clinchfield & Ohio Ry., Traymore Hotel.
Stansbury, C. M., M. M., Boca & Loyalton R. R., Islesworth Hotel.
Stubbs, G. W., Gulf Line Ry., DeVille Hotel.
Thomas, J. J., Jr., S. M. P., Mobile & Ohio Ry., Chalfonte Hotel.
Thompson, E. B., A. S. M. P., C. St. P. M. & O. R. R., Chalfonte Hotel.
Todd, Louis C., C. M. M., Boston & Maine R. R. Co., Young's Hotel.
Tonge, Thos. J., S. M. P. & R. S., Sante Fe Central Ry., Dennis Hotel.
Trumbull, A. G., A. M. S., Erie R. R., Chalfonte Hotel.
Turner, Calvin, G. M. M., Phila., Balto. & Wash. R. R. Co., Continental Hotel.
Turner, John A., A. M. M., C. St. P. M. & O. Ry., Rudolph Hotel.
Van Doren, G. L., Supt Shops, C. R. R. of N. J., Dennis Hotel.
Vissett, J.R., M. M., Seaboard R. R., Monticello Hotel.
Warthen, H. J., M. M., Washington Southern Ry., Victoria Hotel.
Warthen, J. O., M. M., Danville & Western Ry. Co., Westminster Hotel.
Warnock, Harry R., G. F. L. D., Monogahela R. R., Lexington Hotel.
Weisgerber, E. L., M M., B. & O. R. R., Haddon Hall.
White, A. M., American Locomotive Co., Traymore Hotel.
White, E. T., S. M. P., Mt. Clare Shops, B. & O. R. R., Haddon Hall.
Wiggin, C. H., S. M. P., Boston & Maine R. R. Co., Brighton Hotel.
Williams, W. H., M. M., B. R. & P. R. R., Young's Hotel.
Wilson, Charles, M. M., Lehigh Valley R. R., Elborn Hotel.
Wilson, David H., Jr., Electrical Engr., Erie R. R., Chalfonte Hotel.
Yergens, W. F., M. M., Erie R. R., Schlitz Hotel.

MASTER MECHANICS' GUESTS.

The following list is additional to that published in the *Daily* of June 20:

Andress, S. B., S. A. L., Monticello Hotel.
Andrus, C. H., Gen'l Loco. Insp., P. R. R., Islesworth Hotel.
Baker, George T., Foreman Penna. R. R., Worthington Hotel.
Ballard, Jas. F., Haddon Hall.
Barton, E. O., Foreman Mach. Shop, P. R. R., P. B. & W.
Baynes, P. T., Asst. Insp., P. R. R.
Baynes, P. T., Insp. Pass Trans., P. R. R.
Bender, H. C., For. P. R. R., Hygeia Hotel.
Benedict, B. W., Supervisor, A. T. & S., Marlborough-Blenheim Hotel.
Bennett, R. G., Mot. P. Insp., P. R. R., Monon. Div., Haddon Hall.
Booth, R. S., Mch. Shop Foreman, Erie R. R., St. James Place.
Borup, O. V., Draftsman, B. & O., Kenderton Hotel.
Boyd, C. D., G. F. A., L. & N. R. R., St. Charles Hotel.
Braucher, P. S., Foreman, P. & R.
Brenn, C. H., P. R. R.
Brooks, H. C., B. & O., 9 North Florida Ave.
Brooks, N. S., B. & O. R. R. Co., 7 North Florida Ave.
Brown, H. P. C., Mech. Eng., Windsor Hotel.
Burton, G. H., P. R. R., Young's Hotel.
Cadwell, Rev. W. A., Atlantic Ave.
Campbell, C. S., G. F. A., Atlantic Coast Line, St. Charles Hotel.
Carter, G. H., Genl. Rd. H. For., P. & R., Norwood Hotel.
Chaloner, L. E., Genl. Frt. Agt., Seaboard, St. Charles Hotel.
Chamberlin, F. H., Foreman Mach. Shop, P. R. R.
Clark, R. S., Brighton Hotel.
Clifton, Randall, G. F. A., Sou. Ry., St. Charles Hotel.
Coddington, H. W., Asst. Engr. Test, N. & W. Ry., Traymore Hotel.
Coghill, W. L., Engineman, Southern Ry., Victoria Hotel.
Colquitt, J. C., Secy. Southern Classification Com., St. Charles Hotel.
Cowden, S. D., A. G. F. A., N. C. & St. L., St. Charles Hotel.
Craig, F. A., F. B. M., C. R. R. of N. J., Worthington Hotel.
Crawford, M. R., Foreman, C. R. R. of N. J., Louvan Hotel.
Cromwell, H. C., Draftsman, B. & O., Kenderton Hotel.
Cromwell, J. E., Spec. Ins., B. & O., Kenderton Hotel.
Cuthbert, W. S., Chairman, Fire Committee.
Davidson, W. W., Gen. Foreman, P. R. R.
Davis, M. J., Asst. M. M., P. R. R., Dennis Hotel.
Davis, W. H., Mech. Eng., N. Y. Ont. & West., Chalfonte Hotel.
Denyren, J. N., Genl. Frt. Agt., M. & O. R. R., St. Charles Hotel.
Diven, J. B., Penna. R. R.
Donecher, H. C., Secy., Am. St. & Mt. Rwy. Assn., Marlborough-Blenheim Hotel.
Eddy, W. J., Tool Room Insp., Erie, Young's Hotel.
Eldridge, Col. Geo. P., S. Penna. Ave.
Esterly, W. D., Draftsman, S. & L.
Evans, G. I., C. D., Can. Pac. Ry., Holmhurst Hotel.
Farraday, C. L., Pur. Dept., P. R. R., Devonshire Hotel.
Farrington, A. R., Sp. Appurt., P. & R., Wellsboro Hotel.
Flavin, Carl, C. Q. & S. R. R., Dennis Hotel.
Flynn, Harry A., Del. & Hudson, Arlington Hotel.
Fox, John, N. Y. O. & W. R. R., Wellsboro Hotel.
Frazer, Wm. H., Clerk, Pur. Dept., P. R. R.
Gallagher, J. N., F. E. S., P. R. R. Co., Maryland Hotel.
Gill, John, Jr., C. I. & L. Ry., Haddon Hall.
Gosline, E. W., Foreman, Pipe Shop, P. R. R.
Graham, J. P., For. Elec. Dept., P. R. R., Glenmore Hotel.
Gramm, Rush, Engineer, B. & O. R. R.
Griffin, Martin, M. M., W. Va. Northern R. R.
Gross, Wilford, C. of Ga. Ry., Islesworth Hotel.
Grossman, E. W., For., P. R. R.
Haines, J. R., Asst. P. A., C. B. & Q., Marlborough-Blenheim Hotel.
Halliwell, C. J., Asst. M. M., P. R. R.
Hammond, A. V., Plumber, P. R. R.
Hankins, F. W., Mach. Shop For., Cumberland Valley R. R.
Heiser, G. H., Gen'l Foreman, P. & R., Norwood Hotel.
Hench, C. F., Storekeeper, P. R. R., Osborne Hotel.
Henry, W. E., C. C., S. M. P., S. A. L. Ry., Monticello Hotel.
Henry, W. E., Ch. Cl., S. M. P., Seaboard Air Line, Monticello Hotel.
Hessenbruch, T. E., Draftsman, P. & R., Monticello Hotel.
Higgins, C. C., M. P. Asst., A. T. & S., Marlborough-Blenheim Hotel.
Hoke, H. A., Asst. Eng., P. R. R., Young's Hotel.
Hornblower, J. H., Ch. Clerk, P. R. R.
Hospell, B., Jr., Chalfonte Hotel.
Huber, H. G., Asst. M. M., P. R. R., Chalfonte Hotel.
Hukill, H. O., Pur. Agt., Penna. Lines, Traymore Hotel.
Jeffrey, Thos., Gen. P. W. Ins., D. L. & W., Marlborough-Blenheim Hotel.
Jones, Arthur L., H. & B. T. M. R, R., Bothwell Hotel.
Jones, Chas. Y., H. & B. T. M., Bothwell Hotel.
Jones, H. W., Asst. For. Eng., P. R. R., Bingham Hotel.
Kapp, G. B., Asst. Foreman, P. R. R., Delancy Place
Kase, M. D., Ch. Cl. to M. M., P. & R., Pennhurst Hotel.
Kelly, Walter, Draftsman, P. R. R., Continental Hotel.
Kendig, W. M., Shop Inspector, P. R. R., Ralston Hotel.
Kidd, C. M., Air Br. Insp., N. & W., Windsor Hotel.
Kinter, J. H., Foreman Car Inspectors, P. R. R., Wellsboro Hotel.
Kirtley, J. B., Ch. Cl. to Pur. Agt., C. & O., Marlborough Blenheim Hotel.
Lallace, W. J., Foreman, C. R. R. of N. J., Monticello Hotel.
Landis, J. D., Penna. R. R.
Lea, E. V., Asst. Emp. Of., Erie R. R., Schlitz Hotel.
Leeds, R. Miller, Supt. of Pur., R. R., Windsor Hotel.
Leiby, W. J., Engineer, P. & R.
Longacre, E. C., J. W., Cl. Supt., P. R. R.
McAlister, W., Ex M. M., P. R. R.
McCabe, J. W., Asst. Rd. For. Eng., P. R. R., Bingham Hotel.
McCune, F., G. M., C N. O. & T. P., Phillips House.
McDonald, J., Eng. & For., P. R. R., Ardmore Hotel
McGovern, Winslow, Asst. Secy., Southern Classification Com., St. Charles Hotel.
Maher, Wm., C. I. & S. R. R., Dennis Hotel.
Martin, H. W., Supt. Mt. J. K. & R. R. R., Kentucky House.
Mercer, J. T., Foreman Erecting Shop, B. & O., Ebbett House.
Miller, A. I., Pur. Agt., M. K. & T., Shelburne Hotel.
Minnett, Harry, For. Pas. Car Ins., P. R. R.
Minor, H. C., Inspector Pur. Dept., P. R. R., Chalfonte Hotel.
Moore, R. C., G. F. A., Merchants & Miners, St. Charles Hotel.
Morehead, A. W., Monticello Hotel.
Morningstar, E. E., Draftsman, B. & O., Kenderton Hotel.
Morton, R. C., Draftsman, B. & O., Kenderton Hotel.
Mulholland W. J., Pur. Agt., Am. Rwys. Co., Windsor Hotel.
Nieltopp, R., Foreman, P. R. R.
Norris, W. B., Genl. Foreman, P. R. R., Dennis Hotel.

Norton, D. S., Insp., B. & O., Chalfonte Hotel.
Ord, W. E., Can. Pac., Monticello Hotel.
Osmond, W. H., Ins., P. R. R.
Osmond, W. H., Insp. Pass. Trans., P. R. R.
Peddle, C. R., Pur. Agt., Vandalia, Young's Hotel.
Perrine, Harold, C. R. R. of N. J., Penhurst Hotel.
Pitt, W., Car Dept., G. T. Ry., Monticello Hotel.
Plitt, George M., Mech. Eng., P. R. R., Continental Hotel.
Poveleit, H. A., Genl. Frt. Agt., Queen & Crescent, St. Charles Hotel.
Powell, W. R., Chmn. Sou. Classification Com., St. Charles Hotel.
Preckwinkle, Harry, Larchmont Hotel.
Rach, H. P., Clerk, Passenger Yard Master, P. R. R.
Reed, P. L., Insp. Pur. Dept., P. R. R.
Reyno, E. R., Asst. S. K., P. R. R.
Rhinehart, H. W., Insp., P. R. R., Pgh. Div.
Richardson, E. R., G. F. A., Ocean Steamship Co., St. Charles Hotel.
Roach, Thos. W., Santa Fe, Shoreham Hotel.
Robbins, F. S., Asst. M. M., P. R. R. Monon. Div.
Robertson, A. W., Pur. Dept., D. L. & W., Edison Hotel.
Roche, John, Foreman, P. & R., Monticello Hotel.
Rockey, L. H., Engr., W. T. & S. S. Ry.
Rupert, J. W., M. P. Insp., B. & O., Albemarle Hotel.
Sheaffer, C. M., Supt. Trans. Pass., P. R. R.
Sheaffer, W. P., Sup. Pass. Trans., P. R. R.
Sheaffer, W. P., Asst. Ins., P. R. R.
Scott, H. C., Genl. Mac. Foreman, P. & R., Fredonia Hotel.
Seiders, I. A., R. F. E., P. & R. R., Windsor Hotel.
Seiders, J. L., Foreman, P. & R., Monticello Hotel
Skeen, W. E., Foreman, P. R. R., Osborne Hotel.
Slack, J. H., Grand Trunk, St. Charles Hotel.
Slaybaugh, H. B., Cl. Ch. Ck. Mech. Dept., I. S. & M. S., Marlborough-Blenheim Hotel.
Smith, J. Harold, Ch. Draughtsman, C. R. R. of N. J., Colwyn House.
Smith, Wm., Jr., G. F. A., Ill. Central, St. Charles Hotel.
Sneck, L. G., M. M., B. N. & P. Ry., Mervine Hotel.
Spicer, M. T., Ch. Cl. Pres., C. & O., Brighton Hotel.
Spratt, Thos., Asst. P. A., Norfolk & Western, Traymore Hotel.
Steinbrun, J. J., For. Mach. Shop, P. R. R., Morrow Cottage.
Swab, J. J., Asst. Rd. For. Eng., P. R. R., Bingham Hotel.
Sweet, P. B., Mech. Statistician, A. T. & S., Marlborough-Blenheim Hotel.
Tapman, W. H., B. & O. R. R., Chalfonte Hotel.
Taylor, Jos. M., Dunlop Hotel.
Town, Col. Thos. A., Berkshire Hotel.
Van Buskirk, J. H., C. D., N. Y. C. & H. E., Chalfonte Hotel.
Van Doren, Chas., Larchmont Hotel.
Walk, Lewis, Old Dominion Line, St. Charles Hotel.
Walters, L. J., C. R. R. of N. J., Worthington Hotel.
Warthen, H. J., Wash. Southern Ry., Victoria Hotel.
Watkins, G. H., Eng., House Foreman, P. R.
Watson, A. T., Pur. Agt., Cumberland Val. R. R., Brighton Hotel.
Westley, J. S., Wrecking Shop Foreman, P. & R., Shelburne Hotel.
White, F. B., M. P. Ins., P. R. R., Morrow Cottage.
Whitsitt, Wm. B., Ins., M. P. Dept., B. & O., Young's Hotel.
Wilcox, E. T., A. G. F. A., Frisco, St. Charles Hotel.
Williamson, E. H., L. S. R. R., Albemarle Hotel.
Wine, W. E., Atlantic Coast Line, New Dunlop Hotel.
Witherspoon, Wm., Rd. H. Foreman, C. R. R. of N. J., Monticello Hotel.
Woolven, John Cook, Georgia R. R., Shelburne Hotel.
Wright, N. B., A. G. F. A., Frisco, St. Charles Hotel.
Young, J., Mot. Power Insp., P. R. R.
Zeller, W. G., Ch. Cl., P. R. R.

232,000 MILES WITHOUT SHOPPING.

The mechanical department of the Santa Fe submits for prize competition its record with engine No. 1420 of more than four years' service without being shopped. Perhaps the Baldwin Locomotive Works should join in this offer, for they built engine 1420. It went in passenger service on the Albuquerque division in May, 1906, and up to June 10, 1910, had made 232,894 miles without being shopped.

Engines of this class on the Albuquerque division have a repair allotment of 5.9 cents per mile. According to bookkeeping, in addition to this engine's large mileage, it has a credit of $1,500. It is not easy—it is probably impossible—to properly distribute the credits for this remarkable performance. We might, perhaps, begin with Samuel M. Vauclain, of the Baldwin Locomotive Works, but perhaps W. C. Norman, the engineman in charge of this locomotive, should be first. After that it is Hobson's choice between C. J. Drury, E. M. Sanjule, general roundhouse foreman, M. Weber, general foreman, and C. J. Reynolds, road foreman; but where



Santa Fe Locomotive 1420.

did these men get their zeal and their enthusiasm? Inspiration comes from the top, and here we bow with respect and admiration to S. L. Bean, mechanical superintendent, W. F. Buck, superintendent of motive power, and William Days, master mechanic.

T. A. GRIFFIN ON RAILWAY RATES AND GENERAL BUSINESS.

T. A. Griffin, of the Griffin Wheel Company, continues to carry on his good work in the way of issuing pamphlets on the subject of the relations of the public and the railways. His latest is one entitled "Relation of Railway Rates to General Business," copies of which are being distributed on the Pier. Mr. Griffin points out that, while an advance in freight rates is objectionable to business men personally, they must recognize that improvement in general business is dependent on the betterment of the operating and financial conditions of the railways. That the operating results are not now satisfactory, Mr. Griffin says, is shown by the reports of the Interstate Commerce Commission, and business men should not oppose such advances in rates as are needed to put and keep the roads on a sound basis.

THE RAILWAY CLUB SECRETARIES.

The annual meeting of the Society of Railway Club Secretaries was held at the Marlborough-Blenheim last Saturday. B. W. Frauenthal, of St. Louis, presided, and all but three of the thirteen clubs in the country were represented, not only by their secretaries, but also by some of their principal officers.

Probably the most important matter taken up was a report from a committee consisting of Harry D. Vought, of the New York and Central clubs; George H. Frazier, of the New England club, and C. W. Alleman, of the Pittsburgh club, embodying a tentative plan for an enlarged organization to be known as the "American Association of Railway Secretaries." This is to be submitted to the secretaries of railway organizations throughout the country, and another meeting will be arranged for the coming fall, probably in New York, the date to be

subject to the convenience of a majority of those asked to attend.

The following officers for the next year were elected: Chairman, B. W. Frauenthal, St. Louis; vice-chairman, George H. Frazier, Boston; secretary-treasurer, Harry D. Vought.

The annual dinner of the society was held in the evening at the Windsor. Those participating, in addition to the secretaries, were Daniel M. Brady and Eugene Chamberlain, New York; M. T. Spicer, Richmond, Va.; George E. Howard, St. Louis; C. E. Postlethwait, Pittsburg; H. S. Hayward, Jr., New York; Charles L. Lum, St. Louis; C. L Ferguson, New York; W. F. Jones, Albany, N. Y.; C. J. Mellin, Schenectady, N. Y.; George A. Culver, New York; John H. Smythe, Pittsburg; M. E. Davis, New York; W. H. Blackmar, Atlanta, Ga., and C. L. Humton and H. C. Hunter, Parkersburg, W. Va. Formal speeches were prohibited. Chairman Frauenthal made a brief address of welcome. Mr. Brady delivered a cordial message from W. G. Besler, president of the New York Railroad Club, who has gone abroad to attend the International Railway Congress. Mr. Brady also quoted some extracts from a paper by the late M. N. Forney before the New York Railroad Club, which tended to show that the beginnings of the Master Car Builders' and Master Mechanics' associations are traceable to the railway clubs; a point which Mr. Chamberlain's remarks tended to confirm.

MASTER MECHANICS' RECEPTION.

The reception to the president and officers of the Master Mechanics' Association was as well attended as might be expected from the personal popularity of President and Mrs. Wildin, and was altogether one of the most pleasing events of the season. The weather, too, was propitious. The receiving party consisted of President and Mrs. Wildin and his fellow officers with their ladies. The Cadets de Gascogne, from La Scala Theatre, Milan, Italy, rendered several pleasing selections from grand opera.

THE VAUDEVILLE AND THE DELUGE.

The resource and quick wit of Miss Frances Rockefeller King made a success Saturday evening out of what looked for a while like a catastrophe. The trouble can be traced directly to lack of multiple track and terminal facilities in the alley back of the Apollo Theatre. The show which was giving a matinee during the afternoon had its stuff mostly all packed up ready for removal and occupying all storage space inside the theatre when the baggage of the special performers for the evening arrived. And since you can't comfortably operate trains in both directions over a single track line without sidings, the arriving trunks stayed in the alley. "After us the deluge" murmured the aforesaid trunks, dolefully, and it did get after them so enthusiastically as to overlook only three dresses.

Miss King, who is the originator and manager of that department of the United Booking Offices of America which fills contracts for private entertainments, summoned her cohorts, and J. Will Johnston and C. A. Dunkelberg summoned theirs. They descended *en masse* on a candy shop which boasted open fires, commandered flatirons and heaters, and all but called out the fire department and the militia. What they were up against can be realized from the fact that the Exhibition Four, which was an early number, had to go on the stage with their clothes wringing wet. And in their act they wear four suits one on top of another and make quick changes!

Meantime the audience was filling the house. They read on the program a note to the effect that there was an "elapse" of one year between Scenes 1 and 2 of the playet "Lucky Jim" and they began to think that this "elapse" had been misplaced and made the opening number. Then Miss King got an inspiration: "Keep 'em amused. Ring up the curtain and let 'em see how we set the stage." And it worked like a charm. When the first act started, at about ten o'clock, the house was in the best of humor and showed its increasing appreciation of the show by staying unanimously until the end of the program.

UNIVERSITY OF ILLINOIS CONVENTION BANQUET.

On Saturday evening, at the Shelburne Café, the following graduates of the University of Illinois met at a dinner:

G. W. Spear, Dearborn Drug and Chemical Company; C. B. Young, M. E., C. B. & Q. Railroad; J. A. Kinkead, Parkesburg Iron Company; J. A. McRae, M. E., Michigan Central Railroad; Arthur Brown, Westinghouse, Church, Kerr & Company; J. W. Bunn, John A. Roebling & Sons; George Carr, Dearborn Drug & Chemical Company; Edward C. Schmidt, University of Illinois; E. W. Webb, Standard Car Truck Company; P. G. Stevens, Railway and Engineering Review.

At this meeting classes from 1887 to 1904 were represented. Old acquaintances were renewed and old class history revived during what proved to be a most enjoyable evening. After the dinner the whole company attended the Apollo Theatre.

While there have been for years numerous University of Illinois men among the convention delegates, this is the first time they have thus come together; and at the end of the evening it was agreed that so pleasant and memorable an occasion ought to become a permanent feature of convention week, and plans were accordingly made to bring out a larger attendance next year. Among the Illinois men at the convention, who were unable to attend the dinner, are F. H. Clark, G. S. M. P., C. B. & Q.; F. M. Gilbert, M. E., N. Y. C. & H. R.; and W. C. Bradbury, O. M. Edwards Company.

Any Illini at the convention, who have not already done so, should register at the booth of the Dearborn Drug and Chemical Company, in order that he may be notified of next year's dinner.

MR. HOOLEY ON MECHANICAL STOKERS.

"What's thim make-a-nickel shtokers, Misther Hooley?" asked his friend Dennissey as they returned from the convention at the end of the pier whither they had gone in following the crowd under the impression that it was a political meeting. "Th' broad-shoulthered la-ad with th' crokay mallet ferninst th' big table—d'ye mind him, Misther Hooley?—he said 'twas a most inth'rustin' subjic', 'nd another man in the carner said 'twas a most inth'rustin' subjic' 'nd tuk tin minuts t' till why he had n't no more inth'rust in ut now than th' alderman has in ye th' day afther 'lection, 'nd thin some more ov the lads putt out th' glad hand t' th' subjic'; but arl th' talk was about shovelin' coal. What's inth'rustin about shovelin' coal, Misther Hooley?"

"Th' last shovelful," replied Mr. Hooley. "But I c'n exhplain what 'twas th' lads was sayin' by a parabul."

"Pair o' bulls, ye mane," said Mr. Dennissey.

"I do not. There's only wan," replied Mr. Hooley.

"What's a pair o' bulls, thin, whin there's only wan?" inquired Mr. Dennissey, interestedly.

"'S a dom lie, 't ye're goin' t' belave while I'm tellin' it ye," replied Mr. Hooley, sententiously.

"D'ye always drive thim pair o' bulls, Misther Hooley?" inquired Mr. Dennissey, thoughtfully.

"Don't y' interrupt the paceful flow av me thoughts, Dinnissey. Whin me moind's set on th' inth'rustin' subjic' av shovelin' coal, it's set on shovelin' coal, 'nd whin I'm fixin' me furnace fire 'nd th' Widder Clancy's black cat runs across th' cellar, 'tis a bad thing f'r th' cat and 'tis a waste av coal. Iv it was a white cat now——" began Mr. Hooley in a

happily reminiscent mood. "But ye was askin' what was th' lads sayin' the morn. Ye see, Dinnissey, that since th' farmers have negotyated mortgages on th' last quarter sictions av th' farm to buy autymobils, th' farmer's byes 'd rather dhrive th' buzz-wagon 'nd kill pigs 'nd chickens f'r nothin' a day 'nd found, than to get pay f'r shovelin' coal arl day on a locommytive on th' chanst av runnin' down a team on a grade crossin'. 'Tis th' har-rd wurruk it is, shovelin' coal, 'nd it's a grea-t appetite th' locommytive has f'r that same coal. It's 'Pass th' coal' that the locommytive says arl th' way fr'm th' soup to th' hick'ry nuts, as the rayporthers say in th' pa-apers whin they-ve had a bid to a big dinner 'nd the hid waiter kapes thim in th' hall till th' first speaker's pulled a ream av paper out av his pocket 'nd is just sayin' he was unexpected to be called upon. 'S I was a-sayin', Dinnissey, just previous to this diagression, 'tis a har-rd job to shovel coal two to three tons t' th' mile, 'nd to get no more fun out av ut thin the shoffer gets—that's Frinch, Dinnissey, d'ye mind how I say ut?—'nd the shoffer's no coal t' shovel. 'Tis spoort to run a locommytive, av coorse, but 'tis not the shoffer on th' locommytive that gets the spoort. He shovels coal. 'Tis th' engineer, Dinnissey, th't resaves th' last sigh av th' decapitulated pig, or pulls out th' t'rottle a bit whin it's nip 'nd tuck t' th' crossin' bechuxt him 'nd th' old shtyle farrumer who's paid his taxes 'nd has to swallow hair fr'm his Percheroons whin he comes to town in th' spring. F'r me par-rt, Dinnissey, I prefer t' dhrive a good horse, Dinnissey, but 's the classy lithrachoor says, says ut, 'Disgustin' us, no disputin' done,' which is Latun, 'nd whin it's brought to th' livel av ye'er comprehinsion manes there's no 'countin' f'r th' difference in taste bechune horse hair 'nd gasoline.

"To resoom, thin, Dinnissey. What th' lads was a-talkin' about th' morn, was to get a way t' feed th' coal t' th' locommytive so th' fireman can sit up on th' little binch be the lift hand side av the boiler 'nd look out av th' little windy in froont 'nd have some av th' spoort. Ye ca'a'nt feed th' locommytive, Dinnissey, like I feed me furnace, but th' way th' coal's got to be fed's that dilikit 't wud remind ye av fadin' a tree-monts old baby with a shpoon. Ye see, thin, they've got a machine that shoots th' coal int' th' firebox whin the fireman has shoveled it into a hopper, so that whin it falls fr'm th' hopper it's got to go int' th' firebox, 'nd thin, iv th' coal don't fall int' th' firebox in the place where th' fire needs ut most, Dinnissey, w'y, th' fireman putts some there with his shovel. That's the sto-oker, Dinnissey, 'nd it does arl th' wurruk, as Casey sid about th' lad that was layin' th' bricks at th' top av th' chimbley whin Casey was carryin' th' hod. But whin it wurruks as it ought to wurruk, th' coal slides int' th' firebox 's th' dhrink 'd run into ye'er intarior pla-aces, Dinnissey, iv I sh'd lave ye have the off ind av a rubber choob fr'm th' bar'l. 'Twud save me th' thrubble av settin' out th' glasses 'nd th' bottle, Dinnissey, 'nd 'twud save ye the time av waiting till I toorn me back, Dinnissey, before ye pour out th' stuff.

"Does anybody have annything agin th' choob—th' shtoker?" inquired Mr. Dennissey, feelingly.

"I'd have ye make an ackyrate distinction, Misther Dinnissey, bechune th' facts 'nd the parabull," rejoined Mr. Hooley with some warmth. "'Tis about the relrods I'm talkin' now. 'Tis thrue me frind Dave Crawford av th' Schmoky city on th' Pennsylvany Relrod has made an underfed shtoker that does th' wur-rk be pushin' th' coal up through th' grate, 'nd it wur-rks to th' char-rm av th' firemin, but why mintion it? Crawford's not prisint. He's gone hobnobbin' wit' th' crowned hids av Yurrup, 'nd he'll not be here. But they've got thim sto-okers that'll paddle or push or blow or whirl or throw th' coal int' th' firebox while th' fireman shtands 'nd wiggles th' brass dingus that makes th' blow like a catapullet knock-out on th' cellar plexes, or a gintle tap on th' off side av th' lift peeper. Whin th' min that don't have to wurruk thim and shovel th' coal int' the hopper 'nd some more int' th' firebox—whin they're a-talkin' f'r publication, as me noospaper frinds say—they's nothin' like the sto-oker. Ut saves th' coal, 'nd kapes up th' fire, 'nd makes th' fireman a gintleman av leisure. Whin they get home they'll putt in a rekisition f'r some sto-okers, will they not, Dinnissey?"

"They wull. I belave ye," replied Mr. Dennissey, sure of his ground.

"They will not. That's the parabull, Dinnissey," said Mr. Hooley.

MACHINE TOOL EXHIBIT.

The machine tool exhibit this year, as it appears in machinery hall, is much smaller than last year, but there are a large number of machines scattered throughout the miscellaneous exhibits on the pier. Several firms who have been represented with quite large exhibits heretofore either are not represented or have but a small exhibit. Some of them say they have orders ahead for the balance of the year, and really do not have in stock the kind of tools they would like to exhibit. Manning, Maxwell & Moore have by far the largest exhibit, and this and the group of tools showing the various Lassiter bolt machines, as exhibited by the Walter H. Foster Company, may be said to make up the principal groups.

At the meeting of the Railway Supply Manufacturers' Association on Saturday, a resolution was passed to the effect that an invitation be extended to the engineering officers of the navy department, through the secretary of war, to look over the exhibits, especially of machine tools, at the 1911 convention. The navy department is expending about $3,000,000 a year for tools. The machinery exhibit has grown so extensive, and so many of the tools exhibited are applicable to the work of the navy department, that it is believed the engineering officers will not only be glad to accept this invitation, but will find it greatly to their advantage to look over and study the exhibits.

BOLT ALTERING MACHINE.

This machine is specially adapted, both in its construction and equipment, for changing the lengths and shapes of stock bolts, as produced on the Lassiter straight and taper bolt turning and facing machine, which are made up in standard lengths and diameters and with standard hexagon heads. In using these stock bolts in repair work it is often necessary to cut cotter points, shorten a stock size for a special purpose, face and chamfer the heads, convert standard hexagon heads into round, cheese head or countersink, and many other simple operations. The machine may be seen at the exhibit of The Walter H. Foster Company of New York.

BOLT CUTTERS.

National Bolt Cutter.—Manning, Maxwell & Moore exhibit a motor driven 1½-in. bolt cutter, manufactured by the National Machinery Company. These machines are so well known as to require little description; the principal novelty is the application of the motor drive through a noiseless chain. Bolt cutting machinery is much improved by the motor drive, as these machines are often located in isolated places where power for shafting is not easily available and the increased cost of motor application is well warranted. In the same group is a National die sharpener for scientifically sharpening bolt cutters and other threading dies. By the use of this machine the dies will cut more bolts and last longer than when sharpened in the ordinary way. Every die is ground at the correct angle of throw and proper cutting clearance. All dies in the set are ground uniformly, hence each die does its proper share of work. A minimum of

metal is ground away at each grinding, so more resharpenings are possible on a set of dies. The inaccuracies of hand grinding are eliminated and mechanical accuracy is secured.

Landis Bolt Cutter.—The chasers in the die head of the Landis 1½ in. double bolt cutter, exhibited in operation at booth 108, were operated at a cutting speed of from 40 to 45 ft. per minute for two days during the past week without grinding the dies. The construction of these dies is such as to insure high cutting speed and long life. They may be used for reducing the stock as much as ¼ in. in diameter at the same time the thread is being cut. The regrinding of the dies is a simple and rapid process. In addition to the 1½ in. double bolt cutter the Landis Machine Company, Waynesboro, Pa., is exhibiting a ½ in. single high speed bolt cutter.

BOLT HEADER.

Manning, Maxwell & Moore exhibit a 1½ in. National wedge grip bolt and rivet header. The wedge header presents a novel design. The heading and gripping movements are secured through a single-throw shaft and the grip is operated by a sliding wedge in place of the customary toggle mechanism. This wedge has a bearing the full width of the grip slide and there is solid metal backing when the slide is on the forward or gripping position. This prevents any rocking or wabbling, such as experienced in a toggle operated machine, and the dies have a uniform holding pressure throughout the entire face. This uniform pressure enables the work to be held without squeezing the dies and there can be no opening during the upsetting operation. The dies are set so that the working faces merely touch and do not hammer or batter each other, causing premature wear.

BOLT TURNING MACHINE.

The Lassiter straight or taper bolt turning machine is shown in operation at the booth of The Walter H. Foster Company, of New York. The splendid work and the economical results obtained by this machine were considered in a paper, recently presented by C. K. Lassiter, machinery supervisor of the American Locomotive Company, before the American Society of Mechanical Engineers, and reprinted in the June 6 number of the *Railway Age Gazette.*

DRILLS.

Sensitive Drill.—In the large exhibit of Manning, Maxwell & Moore will be found a variety of interesting metal working tools which are shown in actual operation. Included in these is a small No. 1 Elmore sensitive drill, provided with a new patented belt drive, whereby the several changes of speed are instantly effected while the machine is in motion, the operator not leaving the operating position or shifting the belt. There are four changes of speed, from 500 up to 2,000 rev. per min., produced by the action of friction clutches between the pulleys of different diameters. The speed control is by two levers, conveniently located so that the spindle can be started or stopped, or the speed changed instantly or independently. On account of these features the customary type of loose pulley has been dispensed with and constant drive with single pulley substituted. Drills of this description are made with from 1 to 6 spindles. They are made by the Dwight Slate Machine Co., Hartford, Conn.

High Duty Drills.—Two other larger drill presses are in this exhibit. They are the No. 24 and 25 high duty drills made by the Foote-Burt Company, Cleveland, O. The No. 24 drill has a capacity for high speed drills up to 1¾-in. and the No. 25 up to 2½-in. The machine is single belt driven, requiring no shifting of belts. All speeds and changes are made through quick change gear devices of special design. All changes of feed can be made without the necessity of stopping the machine. Power feed is provided with an adjustable automatic stop and hand stop. The drilling of metals is becoming so highly developed that all these features have become almost an essential requirement, and the advance made in the design and capacity of drill presses in recent years is probably more remarkable than that of any other machine tool.

A High Duty Drill in Operation.—The Celfor Tool Company employs a heavy Colburn drill press for demonstrating the operation of its drills. The Celfor drill is a twist drill made from a specially rolled section of the best high speed steel, and its unique construction gives it marked advantages over other forms of high speed drills. The twist is made while the flat bar is hot, in a machine specially designed for the purpose, and does not impair the quality of the steel in any sense but improves it. The tests of the torsional strength of Celfor drills shows them to be 47 per cent stronger than the torsional strength of the flat bar from which they are made. The section of the Celfor drill, compared with the milled drill, shows that at the center, which is the weakest point, the Celfor drill has twice as large an area as the milled drill of the same diameter. It will be found also that nearly 60 per cent more space is available for the escape of chips in drilling a deep hole with a Celfor drill than with a milled drill. The catalogue published by this company gives tables showing the capacity of the drills working in different grades of metals for drills from ¼ diameter up to 3 in. We may take as representative work the 1-in. drill running at 380 revolutions working in cast iron. With a feed of .018 to .03 in. the length of the hole drilled is 7 to 11 in. per minute. The same size drill in medium steel at 300 revolutions per minute with feeds .01 to .02 drills from 3 to 6 in. per minute; in hard or very tough steel at 200 revolutions per minute the capacity is 1½ to 3 lineal in. per minute. With a 2-in. drill at 190 revolutions per minute in cast iron, the depth of a hole is 4 to 7 in. per minute. In medium steel at 150 revolutions per minute, the depth is 2¼ to 3 in. per minute, and in hard or tough steel at 100 revolutions per minute, the depth of the hole from 1 to 2¼ in. per minute.

FLUE CLEANING MACHINE.

A rotary flue cleaning machine, which will cean flues from 1½ to 2½ in. in diameter and requires a floor space of only 36 by 26 in., is being exhibited by H. B. Underwood & Company, of Philadelphia, Pa., at booth No. 310.

GRINDING MACHINES.

Link Grinder.—H. G. Hammett, of Troy, N. Y., exhibits his improved radius grinder for locomotive links in operation. This machine has developed into a strong, substantial grinder with large bearing surfaces carefully protected with dust guards, and is driven by an electric motor. The grinders are usually furnished with a radius bar for 7 ft., but bars of any desired radius can be furnished.

Gap Grinder.—The railing about the space of the Landis Tool Company, Waynesboro, Pa., is a most unique and attractive exhibit in itself. It is constructed of 1⅞ in. steel shafting about .30 carbon, which was ground on the 16 in. by 72 in. plain self-contained grinding machine with a 32 in. by 15 in. gap, which is on exhibition. The railing is a most convincing argument of the high grade of work which the grinder is capable of turning out. The operator in charge of the exhibit has a goodly supply of worn piston rods, with the pistons in place, and of valve yokes, and is prepared to give a demonstration of the workings of the machine at any time. An important feature of the machine is the back spring rests for supporting the work while it is being ground. When the rods are first placed in the machine they require truing up, and a positive stop is not suitable for supporting them. Therefore, while this work is being done, a spring rest is advisable, especially one in which the spring may be adjusted to furnish a pressure suitable to the work in hand. The rest is so arranged that as soon as the rod is trued

up it may be changed to a positive stop. The machine is driven by a 20-h.p. Reliance motor.

Universal Grinding Machine.—The Landis Tool Company, Waynesboro, Pa., is also exhibiting one of its No. 2 universal grinding machines. It has a 12-in. swing and is 42 in. between centers. It is suitable for general work, including tool grinding, face grinding, internal grinding and light manufacturing. A magnetic chuck may be used to advantage on general work.

LATHES.

20-inch High Duty Lathe.—The Niles, Bement, Pond Company do not exhibit any of their own machines, but their booth is occupied by several machines for which they are distributing agents. There is a handsome 20-inch LeBlond heavy duty engine lathe, with double friction back gear at work turning up a large crank pin made of 3½ per cent nickel steel. This is driven by a General Electric 10 h. p. constant speed motor. The headstock is of the improved drop brace construction which admits of unusual large cone diameter. The cone has three steps for 4½-in. double belt. This is a sturdy, stocky lathe which gives evidence of great strength and capacity for the space occupied and it should prove a favorite for railway locomotive shops.

16-inch Geared Lathe.—Manning, Maxwell & Moore show in operation a 16-in. geared lathe made by the Hendee Machine Company, Torrington, Conn. This company was among the first to introduce the mechanical changes for the feed through transfer gears in rockers. The main spindle of this lathe has taper journals running in annular bearings. The spindle journals are oiled with ring oilers in large oil reservoirs. The adjustment of the front and rear journals in the bearings are independent of each other. Thirty-six different threads and feeds are fed through mounted change gearing.

24-inch Lathe.—Manning, Maxwell & Moore exhibit a 24-in. Reed motor driven engine lathe which is equipped with double back gears and three series of spindle speeds, the fastest and slowest being practically the same as on a belt-driven lathe. This lathe and its motor drive illustrates a recent development in the application of motors to driving lathes. Heretofore constant speed motors have been thought desirable for this purpose, but with the variable speed motor having a range sufficient to fill in between the mechanical steps, the lathe may always be driven at the highest economical cutting speed and maximum production may be obtained. The advantages of the direct current variable speed motor drive for engine lathe work are so many and great that it has been adopted exclusively by the F. E. Reed Company of Worcester, Mass., for its large output of engine lathes.

Motor Drive Applied to Old Lathes.—The addition of new motor driven machine tools to a railway shop often makes it advisable to convert some of the older tools from the belt to the individual motor drive. The General Electric Company has changed thousands of its old tools at the Schenectady works in this way. That the problem, when properly understood, is a comparatively simple one may be demonstrated by a visit to exhibit of this company at booth 350 in exhibition hall. The old tools which were converted to the individual motor drive were selected from tools at the Schenectady works, which could be spared for the occasion. An old 18 in. lathe is equipped with a 2 h.p. General Electric motor with a speed range of 3 to 1. The motor is supported on simple cast iron brackets. The largest step of the cone is connected by a belt to a pulley on the motor shaft. The belt centers are very short, but the motor is mounted in such a way that the tension on the belt may readily be adjusted. While this arrangement was not favorably received when the individual motor drive was introduced a number of years ago, it has been found to work out very successfully in the Schenectady works of the General Electric Company. The motor on this particular lathe has a back-gear arrangement, such that by changing the belt from one pulley to another at the end of the motor shaft two sets of speeds may be obtained. A drum type controller furnishes 18 speeds, for both the forward and reverse motions, at a constant horsepower. The controller handle is placed on the carriage of the lathe, convenient to the operator.

In contrast to this motor application is one on a 24 inch lathe. The motor is mounted in much the same way as on the 18 inch lathe, but the drive is through gearing instead of belting. The motor is a 5 h.p. General Electric, with a speed range of 3 to 1. The drum type controller is the same as that used on the 18 inch lathe, except that it is placed under the bed of the lathe and not at its side, as on the 18 in. lathe.

MILLING MACHINES.

Plain Milling Machine.—Manning, Maxwell & Moore exhibit a No. 4 plain milling machine made by the Hendey Machine Co., Torrington, Conn. This machine, like the Reed lathe, has taper journals back and front, which run in annular bearings, fitted with ring oilers. The thrust is taken on the front bearing, and the journals have independent adjustments in either bearing. The driving shaft pulley engages the shaft through an expanding ring clutch, which is controlled by a lever near the face of the machine column. There are 21 feeds positively driven, and their changes are obtained by simply shifting the lever in the compound gear box. They have a range of from ¼ in. to 25 in. travel per minute.

LeBlond Milling Machine.—In the Niles-Bement-Pond exhibit is a No. 3 LeBlond milling machine, having 16 changes of feed up to .255 in. per revolution.

Horizontal Milling Machine.—An old belt-driven horizontal milling machine which has been changed to an individual motor drive is on exhibition in the General Electric Company's booth. The motor is supported on a bracket above the cone pulley, and a belt connects the motor pulley to the large step on the cone pulley. The motor is a 2 h. p. General Electric, with a speed range of 3 to 1. The controller is placed at the side of the machine, with the handle convenient to the operator. It provides 18 speeds in both the forward and reverse motion, with a constant power at all speeds.

PIPE BENDER.

The Stoever Foundry & Manufacturing Co., Myerstown, exhibit a No. 2 automatic pipe bending machine driven by a 3 h. p. General Electric motor. This machine is designed to bend up to 2-in. pipe, the radius of bend varying between the limits of 2½ for 1-in. pipe to a maximum radius of 12 in. for pipe up to 2 in. The speed of the motor is reduced through a train of spur gears until it finally reaches the vertical spindle carrying the main forming roller on the table. The rollers are made in two pieces, so as to release the bend after it has been formed. One of the principal advantages of this machine is the fact that no filling of the pipe is necessary.

PIPE THREADING MACHINE.

The Stoever Foundry & Manufacturing Company also exhibit a No. 2 lever type pipe threading machine having a capacity up to 2 in. The machine is equipped with an improved type of lever chuck with a gripping and releasing movement accomplished while the spindle is in rotation. This is entirely enclosed and presents a smooth surface, avoiding the danger of catching the clothing of the operator. The oil pump is driven through a positive steel chain drive. The oil flows from the dies back to the bed of the machine through a strainer and is kept in circulation by a pump.

PORTABLE TOOLS.

Boring Bar for Cylinders and General Work.—H. B. Underwood & Company, Philadelphia, Pa., has one of these tools in operation. The boring bar is 3¼ in. in diameter and 6 ft.

long. It will bore cylinders from 8 to 22 in. in diameter and from 44 to 52 in. long, depending on whether one or both cylinder heads are off. A unique feature of the machine is that it is driven by a portable Reliance motor. While in operation the motor is supported by two standards, which may be used for carrying it when it is moved about from place to place.

Locomotive Pedestal Jaw Facer.—One of these tools, manufactured by H. B. Underwood & Company, Philadelphia, Pa., is in operation at the exhibit of that company, Booth 310 in exhibition hall.

Crank Pin Rivet Head Facer.—A universal boring, turning and facing machine which was designed principally for facing off the rivet heads on crank pins when it is necessary to remove them may be seen in operation at the booth of H. B. Underwood & Company, Philadelphia, Pa., at its booth in exhibition hall.

Crank Pin Turner and Reborer.—A No. 1 machine, manufactured by H. B. Underwood & Company, of Philadelphia, Pa., is in operation at its booth, No. 310. It takes in pins up to 8 in. in diameter.

Miscellaneous.—The Watson-Stillman Company, of New York, has a number of portable tools on exhibition at booth 401, including a universal hydraulic beam punch, a portable shaft straightener, a hydraulic T rail bender and a telescopic motor lift jack.

PRESSES.

Crank Pin Press.—An improved portable crank pin press is on exhibition at the booth of the Watson-Stillman Company, of New York. It has a capacity of 125 tons, a movement of 12 in., a vertical adjustment of from 13½ to 24 in. and weighs 1,450 lbs.

Axle Bearing Press.—The Watson-Stillman Company is also showing a portable locomotive axle bearing press, having a capacity of 30 tons, a platen size of 30 by 48 in. and a movement of 12 in.

PUNCH AND SHEAR.

The Royersford Foundry & Machine Company exhibit their No. 1 motor driven table punch and shear. The motor is 4-h.p. and the machine has a capacity of shearing 6 x ½ in. flat, 1¼ in. round and punching ⅞ in. holes through ⅝ in. plate. An important merit claimed for the punches and shears made by this company is the fact that they occupy very small floor space. This company also exhibits Sells roller bearings for shafting. In this device the shafts are protected by slit bushings so that the shaft is not worn, and the bushings are easily renewed. By the use of roller bearings on shafting the friction load can be reduced 25 to 40 per cent, and it has been demonstrated that rollers are much better than ball bearings for shop shafting.

SAWS.

Cold Saw.—A Tindel high duty cold sawing machine of the "Paragon" type and equipped with the Tindel high duty inserted tooth cold saw blades is on exhibition at the booth of the Tindel-Morris Company, Eddystone, Pa. The machine takes a saw blade up to 32 in. in diameter; the traverse of the saw carriage is 26 in. and it will saw stock up to 10½ in. in diameter and 9½ in. square.

Draw Cut Hack Saws.—The Armstrong-Blum Manufacturing Company exhibit a number of sizes of the Marvel high speed draw cut hack saws. On these automatic stock feed is an important feature. This attachment raises the saw frame, opens the chuck, feeds the bar thoroughly, closes the chuck and starts a new cut in from 10 to 15 seconds. The machine is provided with a plunger pump, ball valves and double air cushion chambers which provide a steady stream of cooling liquid to the saw blade. Sample tests show the machines have a capacity of cutting 1-in. round steel in ¾ of a minute, 2-in. round in 2⅛ minutes, 3-in. in 5 minutes, 6-in. round in 24 minutes.

SHAPERS.

Cincinnati Shaper.—Manning, Maxwell & Moore have on exhibition a 26-in. Cincinnati Type B shaper. This is a large and powerful machine. The ram is driven with the Whitworth motion with quick return and the feed is provided with a safety device to prevent injury when the saddle meets with an obstacle. One of the box tables is provided with a strong clutch and there is at the center a cone bracket for chucking circular work.

Old Shaper Equipped With a Motor Drive.—An old belt driven 20 inch shaper which has been changed to an individual motor drive is on exhibition at the General Electric Company's exhibit, booth 350, in exhibition hall. It is mounted on a simple but substantial cast iron bracket at the back of the machine and is connected by a belt to a two-step cone pulley on the driving shaft. It is driven by a 2 h. p. motor with a speed range of 3 to 1; a drum type controller provides 18 speeds in either the forward or reverse motion.

STAYBOLT DRILLING MACHINE.

The Lassiter automatic staybolt drilling machine is in operation at the exhibit of The Walter H. Foster Company, The staybolts are placed in a hopper and are automatically fed to the machine. The machine is adjustable for any length of staybolt up to 12 in. and will drill any depth of hole up to 2½ in. From 60 to 75 staybolts can be drilled per hour and over 500 have been put through the machine without breaking a drill.

STAYBOLT THREADING MACHINE.

A six-spindle Lassiter staybolt threading machine is in operation at the exhibit of The Walter H. Foster Company of New York. The machine threads the bolt at both ends and reduces it at the center. The rapid and accurate work done by it was considered in an article in the *Railway Age Gazette* of June 6.

SCREW AND THREADING MACHINES.

Screw Machines.—Manning, Maxwell & Moore exhibit two Gridley automatic screw machines made by the Windsor Machine Company, Windsor, Vt. One of these is a multiple spindle automatic. These tools are so well known as not to require special description. The multiple spindle machine is 1¼ x 5½ in. There is an entire absence of over-hang to the turning tool and the tools are rigid at the cutting point. A special feed with left hand tools is not required. The other Gridley machine on exhibition is a 4¼ x 8 in. automatic turret lathe. This is a single spindle machine having a capacity of handling a wider range of work than other automatic turret machines; it accommodates pieces about twice the length of others. A feature of the motor drive is the use of two variable speed motors, one driving the spindle and the other the feed. Two controllers are used, which are operated automatically by cams so that different spindle speeds are obtained for each operation.

Automatic Screw Machine.—The National Acme Manufacturing Company exhibit a No. 1 motor driven automatic threading machine. This has a capacity to chuck 1⅝-in. round and 1.4-in. hexagon material. The maximum length of feed is 6 in., and for milling operations, 5 in. An important feature of this tool is that all tooling operations on any piece are performed simultaneously, consequently the time necessary to finish any piece is that required to perform the longest single operation on the piece. The method is a progressive one, a finished piece being cut from each bar after it has been successfully operated upon in four positions. In the Acme machine all rotary movements are continually in one direction, consequently the strain reversing the revolving parts is eliminated. The feeding of the stock is accomplished

by means of positive cam controlled movements against a rigid gauge stock which does not occupy one of the tool positions. The threading operation on the Acme is accomplished while the stock is stationary.

WHEEL LATHES.

Tool Clamp.—The Niles, Bement, Pond Co. exhibit a new power tool clamp intended for rapid work on steel tired wheel lathes. It is intended to enable the operator to rapidly replace and adjust accurately the tools for turning steel tired wheels. This new power tool rest will clamp the largest tools rigidly and instantaneously by the simple opening of an air valve, thus relieving the operator from all exertion. The air cylinder which furnishes the power for clamping a tool is a part of the lower member of the tool rest. The piston working in this cylinder forces a large wedge between a lower fixed roller and an upper roller on the lever end of the clamp itself. By the use of this wedge the strain on the tool is not carried back to the cylinder, and when the rollers are forced apart by the wedge they remain in that position whether the pressure is maintained in the cylinder or not; the clamp is thus a positive lock. This rest is entirely open at the side; the tools are very easily changed with no extra manipulation of any kind. By the aid of this new tool rest it is found possible to turn 33 pairs of steel tired wheels in 10 hours with an average of 18 minutes per pair, and an average depth of cut of 3-16 in.

Car Wheel Lathe.—Wm. Sellers & Co., Philadelphia, Pa., is exhibiting, in space 506, a pair of turret tool posts and slides for the Sellers 42-in. car wheel lathe; also a model of the face-plate with the self-tightening driving dogs attached. The most important features of these devices are the facility with which they may be operated, cutting down the time required for adjusting the work and the machine to a minimum and the massive proportions of the various parts, insuring strength and rigidity. A wheel which was turned on one of these machines is on exhibition, and also a number of chips and cuttings.

Driving Wheel Lathe.—The turret tool post for a 90-in. Sellers driving wheel lathe is also exhibited by the Sellers Company. It is remarkable for the rapidity and accuracy with which the different tools can be adjusted, and for its strength and rigidity.

WHEEL PRESS.

A 200-ton motor-driven hydro-pneumatic wheel press is being shown by the Watson-Stillman Company, of New York. The hydro-pneumatic operating system makes it possible to move the ram to the work in a minimum amount of time, greatly increasing the capacity of the machine. The pneumatic pull-back is also an improvement over the counterweights ordinarily used. The machine measures 46 in. between the bars; the ram has a movement of 18 in. The distance between the ram and the beam is 8 ft. 6 in., and the opening in the beam is 8½ in. The machine weighs 9,250 lbs.

ELECTRIC MOTORS.

One of the noticeable features of the machine exhibits is the increasing use of electric motors for driving machine tools. It is interesting to note that although nine different makes of motors are shown over one-half of all the motors thus used on convention exhibits are of General Electric manufacture. These are distributed as follows:

Chicago Pneumatic Tool Company, one 90 h. p. motor; Detroit Hoist & Machine Company, one 15 h. p. motor; Stoever Foundry & Machine Company, one 2 h. p. motor and one 3 h. p. motor; Niles-Bement-Pond Company, one 5 h. p. and one 10 h. p. motor; Manning, Maxwell & Moore, one 1 h. p., two 3 h. p., two 5 h. p. and two 7½ h. p. motors; Spencer Turbine Cleaner Company, one 5 h. p. motor; Watson-Stillman Company, one 10 h. p. and one 1 h. p. motor; George P. Nicholos & Brother, one 15 h. p. motor.

The Exhibit.

The Garlock Packing Company, Palmyra, N. Y., has in its booth a most complete display of packing for railway purposes. Its latest catalogue of goods, made especially for railways, is well worth preserving for reference.

Brake beams for every service, and to meet every requirement, are shown by the Buffalo Brake Beam Company, New York. Its line consists of truss, solid and special section brake beams; forged steel chain clips, wheel guides and fulcrums.

The General Electric Company, Schenectady, N. Y., has brought to the convention its specialists in the equipment of railway shops with electrical tools. These are A. I. Totten, of Schenectady; W. S. Taussig, of Chicago; W. O. Kellogg and C. A. Raymond, of Philadelphia.

The Gold Car Heating & Lighting Company, New York City, has a new and ingenious ventilator for refrigerator cars in its booth. The intake and exhaust are controlled by turning one lever on the top of the car. The company has a section of a car on which it is exhibiting and demonstrating the device.

From what we hear, it seems that the soft drinks emporium in front of one of the nearby hotels is part of the exhibit of the Parkesburg Iron Company, Parkesburg, Pa. It seems that it was installed out of respect for the New York representative of that concern, who is staying at that particular hostelry.

The quick opening supply and blow-off valves applied to the heating systems of the Gold Car Heating & Lighting Company, New York City, are attracting much attention. A half turn opens full, or closes, the valve. This is quite an advance over the old style, slow thread valve, to which trainmen so seriously object.

Close on to 100 passenger and combination cars being built for the Long Island Railroad have Karbolith flooring. The 56 new New York Central baggage cars also have car Karbolith installed. Some 9,200 sq. ft. of floors of Interborough Rapid Transit cars have the car Karbolith surfaced with Karborundum Karbolith. This flooring is made by the American Mason Safety Tread Company, Boston, Mass.

The initial cost of Jefferson brass to iron seat unions is higher than the cost of gasket or iron to iron seat unions; but they are the most economical in the end because the first cost is the last cost. They are especially applicable to railway work where quality is the keynote for materials used. For full information, address the Jefferson Union Company, Lexington, Mass.

New designs in car seats are to be found in booth 36 on the ball room floor. These are the simplified seats made by the Walker & Bennett Manufacturing Company, New York. Several new ideas in seat construction have been successfully worked out, and these new features are not to be found in other car seats. S. A. Walker and K. D. Hequembourg are demonstrating the operation of this new coach furniture.

The U. S. Metal & Manufacturing Company, New York, is exhibiting on the exhibition track, Mississippi avenue, a New York Central & Hudson River box car, No. 106986. This is one of 16,000 equipped with Hutchins all-steel carline roofs for the New York Central Lines. This type of roof eliminates all woodwork, with the exception of the ridge pole and four purlines, and, being of metal, adds to the strength of the car.

Since all of the railway men could not visit the shops of the Landis Tool Company at Waynesboro, Pa., the company has done all possible to make its exhibit serve the same purpose. The regular railway machine is in operation on railway work and all of the necessary instruments, such as calipers and indicators for determining accuracy and uniformity, are provided, so that every means is afforded to convince the railway men that grinding is necessary in shops.

A most attractive booth is that of the American Car & Foundry Company—space 528, in the Annex. The passer-by, whether he be a railway officer or supply man, is invited to enter by the comfortable and hospitable appearance of the resting-place. The company makes no exhibit; but its interests are carefully watched by W. C. Dickerman, Clark Eaton and J. T. Raymond, representing the New York territory; Scott H. Blewett, W. A. Williams and J. M. Kelley, of the St. Louis district; Clive Runnells, Chicago; W. F. Lowry, W. S. Johnson and Frank Faust, Berwick, Pa., and W. H. Sanford, Buffalo.

The Parkesburg Iron Company, Parkesburg, Pa., following its regular custom has made its headquarters at space 388, one of the most inviting, as well as cosy and attractive, exhibits of the convention. Flowers and palms including a daily supply of American beauty roses, adorn the booth; and a series of illuminated views arranged on a specially designed revolving cylinder show in detail the whole process of the manufacture of charcoal iron, including the making of the celebrated Parkesburg charcoal iron tube. This feature of tube making alone is considered one of the most interesting exhibits on the Pier. H. A. Beale, Jr., president, and a corps of efficient representatives of the company, are constantly on hand to meet all visitors and explain the methods of making charcoal iron and tubes.

There are few subjects in the mechanical world of to-day of more vital interest than the subject of boiler tubes. Vital as regards preservation of human life, and also as regards efficient and economical development of power. The National Tube Company, Pittsburgh, Pa., has not been content with merely manufacturing satisfactory boiler tubes. Coincident with the development of their manufacture, the company has resorted to expert investigation to determine causes of possible failure; to discover chemical or mechanical processes; to overcome or eliminate deficiencies and to investigate new methods of manufacture. As many readers of the *Daily* know, the National Tube Company has abandoned the manufacture of the iron boiler tubes and now devotes its entire attention in this line to the steel tube.

The Columbia Nut & Bolt Company, Inc., Bridgeport, Conn., makers of the Columbia lock nut, took the precaution to protect as many as possible of those making the trip to Atlantic City from possible liabilities to injury incident to the trip, by sending out neat bill fold containing a paid-up accident insurance policy for $2,500. The letter accompanying the policy gives the chief sources of danger as the new "planks" in the boardwalk, and the fact that not all of the passenger, freight and trolley cars, locomotives, frogs, switches and crossings, automobiles and wheel chairs are equipped with Columbia lock nuts. But as the policy is a read bona-fide contract, the holder will be equally protected from the other dangers that beset the paths of M. C. B.'s and M. M.'s. The company is represented by the United States Metal & Manufacturing Company, space 337.

The Storrs Mica Company, Owego, N. Y., claims a very substantial saving to railway companies through the use of its mica headlight chimneys. Not only does this saving apply to the cost of chimneys, which amounts in many cases to 50 per cent, but also in other ways. It saves much of the cleaning of reflectors so often made necessary by a broken chimney and also saves the reflector plating, as it never allows the flame and smoke to come in direct contact with the reflector, as is the case when a chimney is broken. A number of roads are said to have reported another item of saving credited to the mica chimney, in that it decreases considerably the number of headlights burned up. The mica chimney further operates as a safety device by insuring against the blowing out of the headlight, so often caused by a broken chimney, and the attendant risk of running without a headlight.



The Independent Pneumatic Tool Company, Chicago, reports that the number of visitors at its exhibit is indicative of the important place pneumatic tools occupy in the shop equipment of the railways. Particular interest is shown in the Thor close quarter piston air drills, which are in demand for railway shop use. These drills are made in two sizes. The spindle is located near the end of the cylinder, which permits their operation in close quarters where the ordinary center spindle drill cannot be used. A demonstrating machine with the sides of the cylinder removed shows the movement of the various working parts when the drill is in operation.

The representatives of the Bettendorf Axle Company, though numerous, are all attending strictly to business, and are on watch early and late. W. G. Ransom was the first on the ground, but he was closely followed by Messrs. E. J. Bettendorf, Bendixen, McPherson, Caleb, Silk and Clasen. Their exhibit is one of the heaviest outside the track exhibit and is attractively displayed in a manner to enable careful inspection of its various features.

The General Electric booth is specially illuminated with Mazda lamps, "The sun's only rival." These lamps are being very rapidly and largely introduced into railway service. Henry Schroeder, who makes a specialty of the lamp department of the company, is attending the convention.

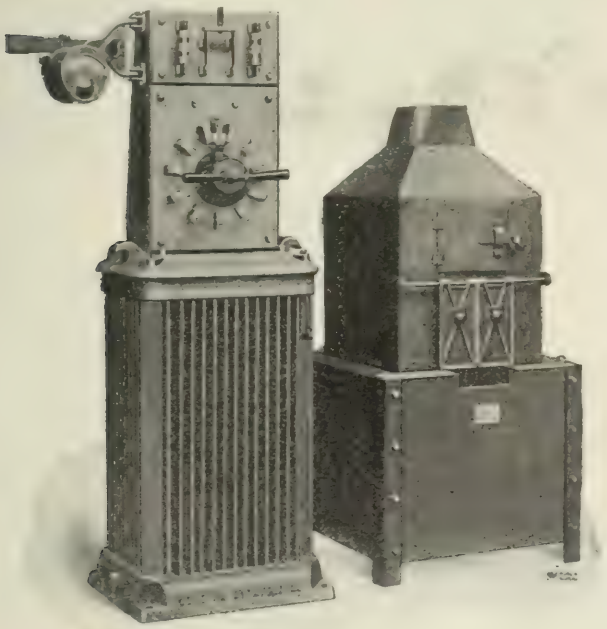
ELECTRIC HARDENING FURNACE.

The rapid development of the tool steel industry from the old-time carbon to the self-hardening, then to the sweating process, and finally to the high speed steels, demanded a corresponding development in the methods of hardening the finished product, and in order to meet this requirement the open fire or coal furnace gave way to the muffle furnace and the externally heated lead and metallic salt baths. These furnaces while being a great improvement are, however, more or less unsatisfactory on account of unequal heating and the consequent cracking and checking of the tools hardened, the inability of the operator to quickly and properly regulate the temperature, the oxidation of tools due to air contact, resulting in large quantities of unsatisfactory work, and in the lead bath the forming of dross on the surface of the bath, the sticking of lead to the tool, the formation of poisonous gases and the floating of the steel on the bath due to the greater specific weight of the lead.

A notable advance in this direction has been made, not only by the development of high speed steel, but also by the introduction of the electric furnace in which metallic salts are brought to a liquid state by passing current through them and in which the heating of the tool to be hardened can be exactly controlled and kept uniform throughout over a wide range of temperature. By its use, hardening and tempering can be carried out on scientific lines, and steel of the proper hardness and temper for any class of work can be obtained readily and economically. Furthermore, a more durable and uniform product can be obtained in this type of electric furnace than with any other method heretofore employed.

Owing to the flexibility of electric control the adjustment of the temperature in the electric furnace is easily accomplished, and with a source of constant power it is possible to maintain the furnace at a uniform temperature for any desired length of time.

The electric furnace manufactured by the General Electric Company, Schenectady, N. Y., is operated from an alternating current, single-phase supply, and the outfit consists of a crucible and a regulating transformer as shown, and includes



General Electric 25 K. W. Electric Hardening Furnace Outfit.

the necessary connecting cables, cleaning scoops and starting electrode.

The crucible is built up of slabs of refractory material cemented together and surrounded by heat insulating material in a substantial sheet iron case. Two soft iron electrodes, located on opposite sides of the crucible, direct the current, from the transformer, through the bath. They are arranged so as to be readily renewable. The life of the electrodes is approximately 3000 hours when operated at 1400 degrees F., and 400 hours when operated at 2200 degrees F. Attention is called to the fact that the heat insulation provided is sufficient so that with the bath at a temperature of 2400 degrees F.. the sheet iron case is not uncomfortable to the touch. This feature not only reduces fire risk, but also allows the quenching bath to be placed very close to the crucible, thus saving time and avoiding the cooling of the tool in air.

The regulating transformer consists of the transformer core and coils which are oil immersed in a substantial iron tank and a regulating switch, line switch, fuses and ammeter mounted on a panel supported on the tank cover. By means of variable voltage it is possible to produce and maintain any temperature in the furnace, depending on the kind of salt used and on the range for which the outfit is designed.

The Electric Furnace reduces hardening and tempering to an exact process and therefore produces uniformly superior results. The important advantages may be summarized as follows: (1) The production and maintenance of constant and uniform temperature for hardening any class of steel. (2) The exact knowledge of the temperature of the steel in its heated condition. (3) The equal and even heating of the material, and therefore the prevention of strains with consequent checks and cracks or the burning off of sharp edges and points. (4) The prevention of air from striking the heated tool, thereby avoiding oxidation. (5) The prevention of foreign matter entering the bath, thereby avoiding the pitting of the steel. (6) The obtaining of clean surfaces after hardening, thus to a considerable extent making unnecessary any cleaning. (7) The practicability of placing the cooling bath close to the furnace. (8) Easy operation of the furnace. (9) Reduction of fire risk. (10) Cleanliness.

NO. 2 IMPROVED KELLER CHIPPING HAMMER.

The Chicago Pneumatic Company, Chicago, Ill., is showing a new air hammer which combines the good features of the old Boyer hammer as well as the Keller chipping hammer. In this combination the Keller cylinder and valve have been joined in the Boyer handle and locking device. It is well known that the Boyer handle is of such a design that it is impossible for it to work loose. The Keller cylinder and valve are hardened inside and out, so that the arrangement forms a tool of maximum durability and efficiency, in that wear is reduced to a minimum and disablement due to the loosening of the handle cannot take place. It is upon this basis that the claim is made that this new chipping hammer is the most reliable of any upon the market.

JOURNAL BEARING METAL.

Olympia bronze, manufactured by the Great Western Smelting & Refining Company, is especially high in tin and copper and contains only a small percentage of zinc, thus making it a "cooling metal," especially adapted for car journal bearings. Anchor brand phosphor bronze, made by the same company, has given splendid results when used for locomotive bearings. It is very high in tin, copper and phosphorus and contains no zinc. They also manufacture a babbitt metal specially adapted to railway service. The Great Smelting & Refining Company is one of the largest concerns of its kind. The main office is at 41st and Wallace Streets, Chicago; but the company also has plants at St. Louis, Mo.; San Francisco, Cal.; Los Angeles, Cal.; Seattle, Wash., and Vancouver, British Columbia. Louis Turivas, the general sales agent, is in attendance at the convention.

ADOPTION OF THE INVERTED MANTLE LAMP

The Safety Car Heating & Lighting Company, New York City, has received valuable statistics from abroad which, combined with those compiled here, make a very interesting and impressive showing of the wide and popular use of the inverted Pintsch mantle lamp for railway service

Over 73,000 lamps, using inverted mantle, have been placed on cars since October 1, 1909, bringing the lamps in service up to the tremendous totals of 60,000 in North America, 69,000 in England, 101,000 in France and 202,000 in Germany. This is practical evidence of world-wide recognition of the merits of the inverted mantle lamp, and emphasizes, in a most emphatic way, that it is possible to obtain unequaled

brilliancy at extremely low cost with this form of car lighting. That a three-fold increase of light and a 40 per cent saving in gas consumption is made possible, and that the cost of operating the lamp is reduced to only one cent per hour with 100 candle-power efficiency, are items of much moment.

An important fact in this development is the rapid rate at which the old lamp equipment is being brought up to date for use with the inverted mantle. About 60 per cent of the railways of North America have already applied the single mantle lamp; some have changed their entire equipment; others have contracted to do so; and on many roads the work is being carried forward as rapidly as it is possible to shop the cars. Over 22,000 flat flame lamps have recently been changed, so that, all told, the Pintsch inverted mantle lamp is now in service on more than 8,200 cars in the United States, Canada and Mexico.

LOCOMOTIVE RUNNING INSTRUCTION.

The Railway department of the International Correspondence Schools, Scranton, Pa., has on display the new Mitchell models on the ET equipment and the K and L triple valves at booth 26. This new air brake apparatus has so many ports, passages and parts that it is extremely difficult to teach its operation, even where the actual or sectional apparatus is at hand for demonstrating purposes. Realizing this, the school concentrated its unequaled facilities on the preparation of these models. An inspection of them will demonstrate that they have produced the simplest, clearest and easiest method of teaching the practical man the construction, operation and maintenance of this new and important air brake apparatus. No person interested in air brake work should leave the convention without inspecting these models and seeing what the Railway department is doing towards keeping railway employees posted. The locomotive running scholarship, in which thousands of engineers and firemen on all railways throughout the country are enrolled, has just been thoroughly revised. In addition to the instruction previously contained, it includes instruction on the Walschaert valve gear, Baker-Pilliod valve gear, Mallet compound locomotives, the lateest improvements in injectors and lubricators, all the improved Westinghouse air brake equipment and other devices that have been adopted in locomotive and train service. Following the usual custom a committee of practical men from active service on railways throughout the United States and Canada was convened at Chicago for the purpose of going over the lesson papers to insure the requirements of the local conditions of the different railways throughout the United States and Canada being covered. These lessons are now being delivered to railway employees enrolling and arrangements have been made by the Railway department to place the revised course in the hands of the students previously enrolled. W. N. Mitchell, general manager of the Railway department, is at the convention and is demonstrating the work that the schools are doing on the railways.

VENTILATING TUNNELS AND SUBWAYS.

Boston was the first American city to adopt the subway for the purpose of relieving the congestion of traffic in its streets; the East Boston tunnel under Boston harbor and the city streets is equipped with apparatus by the American Blower Company, Detroit, Michigan.

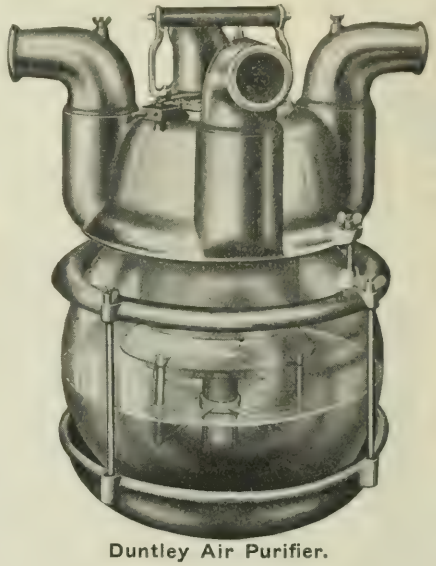
Following this installation, the Interborough Rapid Transit Company, New York City, bought twenty-nine fans from the same company, for the ventilation and cooling of the Manhattan subway, and four for the tunnel under the East River.

Following closely upon its adoption by the Interborough Rapid Transit Company, the engineers of the Hudson Companies decided on American blower equipment for ventilating the McAdoo, or Hudson, tunnels, connecting New York and Jersey City, in which "many giant fans" are used for forcing fresh air into the tunnels and pumping it out of the tubes. Thomas B. Stillman, chemical engineer of Stevens Institute, recently conducted some very extensive tests for the Hudson Companies, upon the result of which he was able to report that "the air in the Hudson River tubes is as pure as the air outside."

The Pennsylvania Railroad employs Sirocco fans for tunnel ventilation at its Washington and New York terminals.

THE DUNTLEY MANUFACTURING COMPANY NEEDS A NEW NAME.

Wanted, a name for a new device. In space 521 the Duntley Manufacturing Company, Chicago, is exhibiting a machine for washing and purifying the air; but the company has



Duntley Air Purifier.

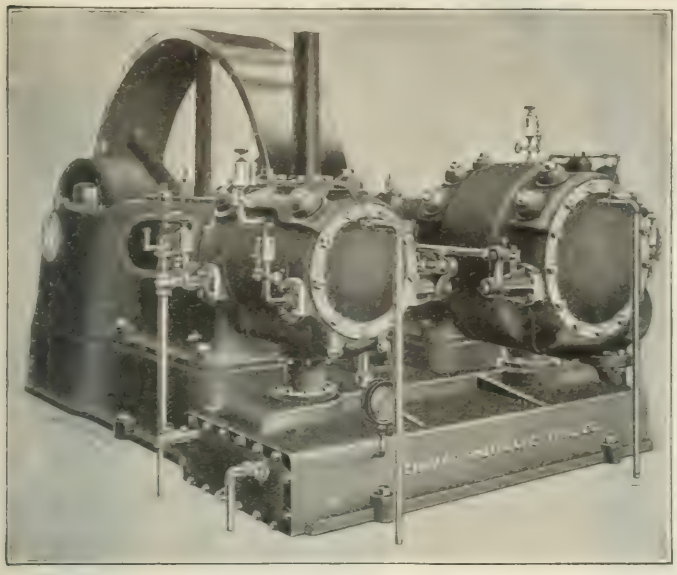
not yet hit upon a suitable name for the device. See the exhibit, examine the new invention, and suggest a name for it to either Mr. Foute or Mr. Graber. Here is a cut of the machine that does the work.

FRANKLIN AIR COMPRESSOR.

The working exhibits on the pier which are operated by compressed air are supplied by a Franklin air compressor of the two stage belt-driven type, having air cylinders 16 and 10 in. in diameter by 12 in. stroke, and having a rated piston displacement capacity of 419 cu. ft. of free air per minute when operating at 150 r.p.m. This machine is suitable for compressing air to a terminal air pressure of from 100 to 110 lbs. per sq. in.

The air cylinders are equipped with mechanically operated Corliss type air inlet valves and poppet type discharge valves. The accessibility of all parts is shown in the illustration. The frame and running gear are designed according to the best steam engine practice, the frame being of box design with bored guides insuring free transmission of the effort from the crank pin to the air piston. The compressor is mounted on a substantial sub-base, making the outfit a self contained unit, insuring a substantial setting and providing for rigidity under the strains of compression. The intercooler is contained in that part of the sub-base directly under the air cylinders. It consists of a nest of brass tubes made according to the best condenser practice. The nest of

cooling tubes is easily accessible and removable for inspection or cleaning by removing the cover plate shown on the near side of the illustration. Regulation is obtained by a throttling unloader connected to the intake of the low pressure air cylinder, and is operated under the influence of the air pressure in the receiver, thus regulating the supply in accordance with the demands of the service.



Franklin Air Compressor.

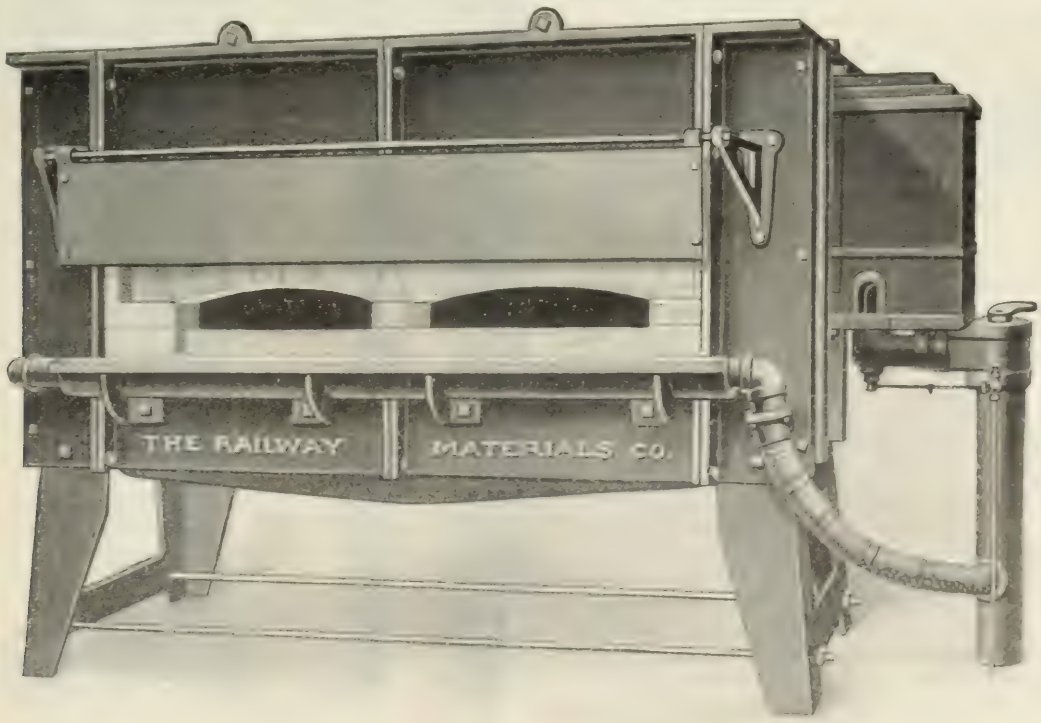
The above compressor is manufactured and sold by the Chicago Pneumatic Tool Company, Chicago and New York, which company will be willing at any time to supply information on the well known line of Franklin type standard air compressors, which it manufactures in capacities from 30 to 5000 cu. ft. of free air per minute, including belt, steam, electric motor driven, combination gasoline power air compressor, and the large Corliss type operated by efficient Corliss engines.

THE SMITH SHOP.

It is generally recognized that a large part of the modern smith shop should be equipped for machine forged work. Great progress has been made in this class of shop machinery during the past few years. The necessary equipment involves considerable expenditure, but its use means better work and reduced costs. The designers and manufacturers of smith or forge shop machinery have done their work so well that in a majority of cases the capacity of the machine is only limited by the rapidity with which the operator can handle the material, and this is generally governed by the efficiency of the furnace equipment.

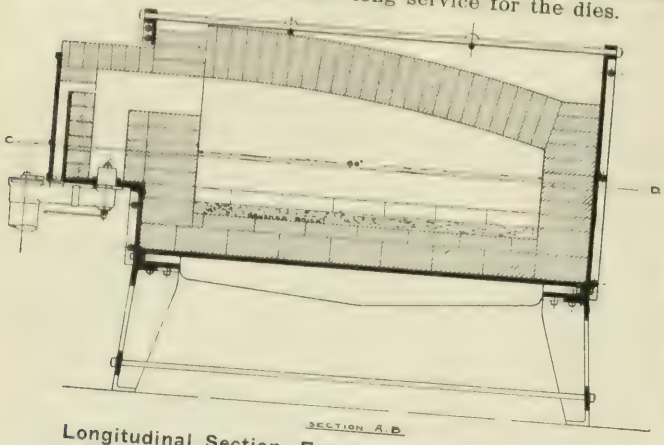
The designing of shop furnaces to meet the modern requirements necessitates a thorough knowledge of the work and machinery. The maximum capacity of the machine and the operator, the size of stock and class of work that can be handled, the general movement of material to and from the machine, as well as the general shop condition, should be given careful consideration. The brick work of furnaces must have attention from time to time and the design must permit of repairs being readily made. The efficiency of a furnace operating at a forging heat depends upon the constant flame temperature that can be maintained in the heating section of the furnace, and that section of the furnace where the work is being heated should not be used as, or expected to, perform the functions of a combustion chamber. The resultant gases from the complete combustion of the fuel should enter the section where the work is being heated at the highest flame temperature attained during the combustion of the fuel.

The Ferguson shop furnaces have been built along these lines, each furnace being designed to meet the requirements of the machine for which it is recommended to facilitate the handling of the stock and make as nearly an ideal shop condition as possible. The fuel is volatilized as it enters the lower portion of the combustion chamber, and combustion is completed when the ascending gases reach the top of the combustion chamber and are brought into combination with the secondary blast or air supply. The resultant gases enter



No. 5 Ferguson Shop Furnace.

the heating section at a very high flame temperature, the material being heated in a soft, non-oxidizing reducing heat, insuring full sized forgings, the minimum amount of oxidation, the maximum output and long service for the dies.



Longitudinal Section, Ferguson Shop Furnace.

The furnace here illustrated is manufactured by the Railway Materials Company, Chicago, and it is especially designed for the largest forging machines, as it will heat stock up to 5 and 6 in. in size. The inside dimensions are 60 in. long and 20 in. wide. The front is divided into two arched doorways so that the fire brick is easily maintained.

BRILL SOLID FORGED WHEEL PIECES.

All who have seen the big electric truck at the exhibit of the J. G. Brill Company Philadelphia, Pa. (booth 403), have been especially interested in the powerful frame which is constructed with wheel pieces, including pedestals of single solid forgings. Forgings of this class are only made at the Brill plant, and the development of this branch of truck building constitutes one of the most interesting chapters in the history of railway rolling construction. Nearly 20 years have been needed to bring the process to its present complete stage.

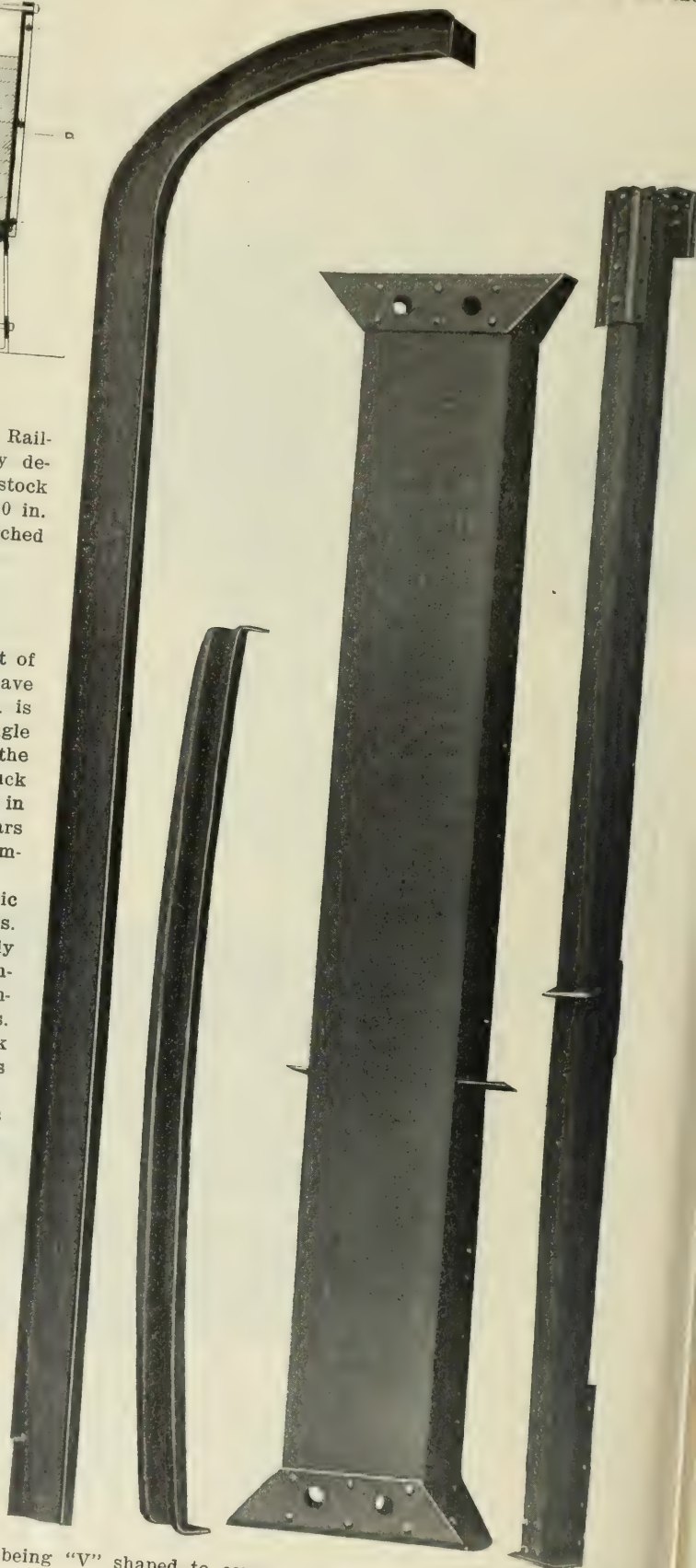
The mild steel which is used is shaped under hydraulic presses, which exert a power of from 3,000 to 4,000 tons. Under this immense compression the metal is given a closely compacted structure, which is preserved by a thorough annealing process and insures against the crystallization common to castings subjected to the same service conditions. There is no limit to the application of this process to truck wheel pieces as is shown by the character of the forgings exhibited.

A pamphlet just issued by the J. G. Brill Company shows a six-wheel passenger truck for steam service which has solid forged wheel pieces in which pedestals are included. A description of this truck, with illustration, will be found in the *Daily Railway Age Gazette* of June 17, 1910, page 1604.

FORSYTH METAL FORMATIONS.

Forsyth Brothers Company, Chicago, is making an extensive line of metal formations for cars, including general interior car finish, posts, carlines, metal doors, sash and moulding. It has furnished large amounts of these formations and is fully equipped to take care of all such work at reasonable prices. The Company has been constantly adding to its present equipment and is planning to put up an extensive plant, thoroughly modern in every particular and with an unlimited capacity for handling such products.

The Doyle post is made out of metal, having formed in its sides corrugations (preferably of "V" shape). These latter not merely reinforce and strengthen the post greatly, but also serve as guides for shoes, which overlap the sides of the sash. Seated in these shoes and bearing against the edges of sash are springs, which automatically maintain the sh in close contact with the guides (the outer edges of the sh



being "V" shaped to correspond to the corrugations in the post). These spring-actuated shoes produce a wedge and tight engagement (at the same time allowing the sash to be

operated easily) with the corrugations in the post, and they also automatically adjust the sash to variations in the spacing and vertical alignment of the posts.

The Doyle post, therefore, does away with the use of the customary stops or guides for sash, thereby effecting a very high initial saving, as well as cost of maintenance. The groove for the curtain fixture is also formed in the Doyle post itself.

Anothed advantage in the use of the Dayle post and shoe is that it permits of the withdrawal of the sash at any time from the opening without requiring the removal of the customary stops or sash guides. This can readily be done by forcing the shoes of the sash inwardly and away from the post against the thrust of the shoe springs, thereby permitting the shoe and sash together to be instantaneously withdrawn from the opening and as readily reinserted therein.

Forsyth Brothers Company is furnishing the Doyle post, and the shoes, for 125 Harriman Lines cars; 350 Chicago Railways cars and several hundred cars of the Interborough Rapid Transit Company.

KENNICOTT WATER SOFTENER AT GEARY, OKLA.

The accompanying photograph shows the water softener and storage tank recently installed by the Kennicott Company of Chicago Heights, Ill., for the Chicago, Rock Island & Pacific at Geary, Okla. The water at this point contains about 22 grains per U. S. gallon of carbonates of calcium



Kennicott Ground Operated Softener.

and magnesium, and has given a great deal of trouble through the formation of scale. The softener will undoubtedly correct this difficulty and effect a great improvement in the service on that division. It is of the new type K, ground operated design and has a capacity of 15,000 gals. an hour. The storage tank has a capacity of 65,000 gals. an hour.

ADLAKE LANTERNS.

The Adams & Westlake Company, Chicago, is showing in spaces 405-7 a number of lanterns with Adlake perfected ventilation, Adlake outside wick raisers and Adlake encased oil pots. These three features add to the convenience of the lanterns, and the claims made for them are very strong.

Adlake perfected ventilation was adopted after it had successfully undergone severe tests. Lanterns were carried at high speeds in blizzards; used in yard service in the sultry heat of summer and in the intermediate degrees of temperature. It was only after they had proved satisfactory under all these conditions that Adlake perfected ventilation was adopted: and during all the tests the lanterns remained lighted and gave a clear, strong signal. Lanterns were carried several nights without cleaning the globes and gave a clear signal all the time. Adlake perfected ventilation eliminates smoked globes and poor light, thus saving time in cleaning and breakage of globes due to imperfect ventilation.

The Adlake outside wick raiser is a great convenience as well as a time saver. The oil pot need not be removed, as a slight turn only is necessary to adjust the flame. A valuable feature is that the burner screws tightly into the collar of the oil pot so the oil cannot leak out.

The Adlake encased oil pot eliminates leakage and the consequent soiling of clothes. It is surrounded by the guard hoop, which forms the casing, is placed in position from the top, and as the bottom of the lantern is closed the oil pot cannot drop out. It dispenses with locking rivets and springs, which are apt to work loose and allow the oil pot to drop out, thus losing the signal.

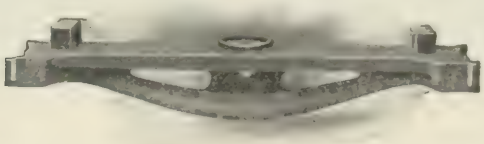
DRAFT ARMS AND BOLSTERS.

Among the devices exhibited by the American Steel Foundries, Chicago, are Cast Steel Economy Draft Arms shown with a cast steel body bolster and a Simplex truck bolster, with the idea of illustrating the position occupied by the draft arms in actual service.

Draft arms of this design are said to have proved very successful in strengthening the ends of wooden cars. On such cars, the old wooden draft timbers require frequent renewal. It has also been found that cars of this construction are not safe when run with modern high capacity steel cars, or wooden cars with steel underframes.

The cast steel draft arms can be designed for use with any type of draft gear, and to replace the old forms of wooden draft timbers. They are bolted to the center sills and designed to receive the wooden end sills and to extend over the body bolster beyond the point where breakages of wooden center sills ordinarily occur.

By the use of these cast steel draft arms many cars which would otherwise be of too weak construction for modern service can be operated in trains composed of high capacity all-steel and steel-frame cars.



T-Shape Bolster.

The cast steel body bolster and the simplex truck bolster are well known designs which the American Steel Foundries manufacture in large numbers. In addition to the two bolsters mentioned, there are many others being exhibited. Of these designs, the most recent is the T-shape cast steel truck bolster which was designed to stand the same or better tests vertically than the I-beam bolster, and at the same time have more lateral strength than this design. The manner in which the I-beam design is moulded makes it difficult to obtain a solid casting.

The T-shape bolster is moulded with the top uppermost, or in the cope side of the mould, while the bottom of the bolster is moulded in the drag of the mould.

The pattern is made in sections and is drawn from the mould through each end. This bolster, as well as the pattern and method of moulding, is fully covered by patents. Bolsters of this type are said to have been adopted as standard by a number of the large railways and are recommended where a bolster of medium weight and great vertical and lateral strength is desired.

TRANSFERRING OIL TO THE LUBRICATOR RESERVOIR.

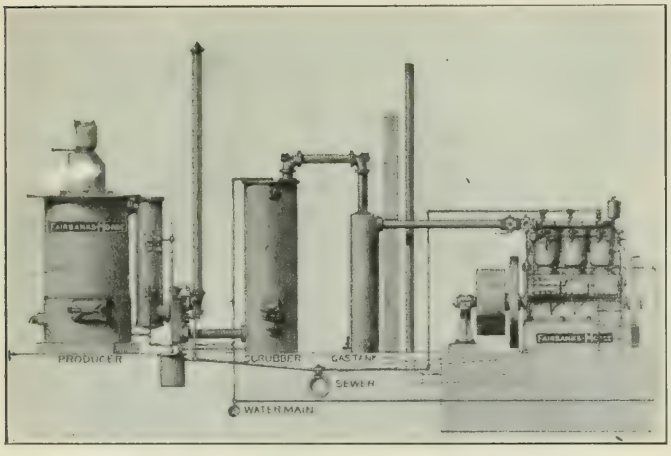
The Detroit Lubricator Company, Detroit, Mich., has adapted the fundamental principle of transfer system of oil to its general line of locomotive lubricators. A simple device designed for the purpose is on exhibition at the company's booth, No. 15, under the direction of its traveling engineer, A. D. Hombard.

Attention has been attracted to this devise because of the convenient and economical features incidental to the filling of the lubricator. It is designed to insure a quick transfer to the reservoir of the regular oil allowance for any given run, the actual time necessary for the transfer being less than three minutes and regardless of whether the locomotive is at rest or working under steam. It is impossible to suffer loss of any oil by drainage and other conditions incidental to previous methods and especially when the lubricator is hot.

FUEL CONSUMPTION IN PRODUCER GAS PLANTS.

Some tests were made recently by the engineering department of the Iowa State College to determine the amount of coal consumed per horse-power hour by a producer gas plant.

The equipment used for these tests was furnished by Fairbanks, Morse & Company, Chicago. It consisted of a 150-h.p. suction gas producer, equipped with vaporizer, scrubber, etc., and a 100-h.p., two-phase generator and exciter. The engine used the pea anthracite coal for fuel.



150-h.p. Fairbanks Morse Producer Gas Plant.

For the brake tests, the belt was thrown off and a pony brake applied to a special brake pulley. The following are the results obtained:

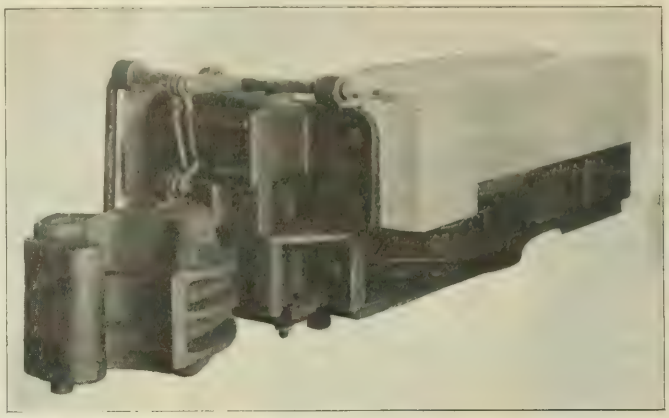
R. P. M.	Brake H.-P.	Coal Consumed Per B. H.-P. H.	Fuel Cost Per B. H.-P. H.
250	40.1	1.511	.0045
250	82.7	1.157	.0034
250	156.9	0.999	.0029

As the fuel cost $6.00 per ton, the cost per brake horse-power hour was therefore $.00297. It is interesting to note that with approximately half load the fuel consumption was only 1.157 lbs. per brake horse-power hour; and with the engine running slightly overloaded the consumption was a trifle less than one pound.

FRICTION STRIKING PLATE BUFFER FOR FREIGHT EQUIPMENT.

The Gould Coupler Company, Depew, N. Y., exhibits a friction striking plate buffer arranged to be operated by the coupler horn.

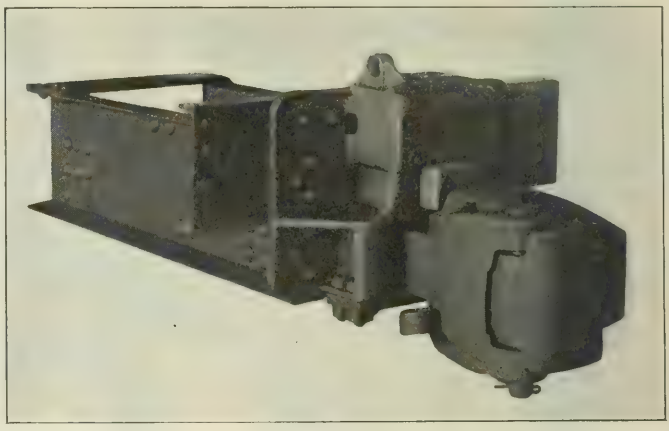
This friction striking plate is adapted to be used in connection with twin, tandem or any type of draft gear. It has a travel of 1¾ in. and a total capacity of 80,000 lbs. The device applied in connection with spring gears gives a friction buffing resistance in direct line of car framing but does not interfere with the draft gear in pulling. The



Friction Striking Plate Buffer, Metal Draft Beams and Top Operated Coupler.

device is simple, the parts are accessible, and it is of strong and substantial construction.

The Gould Coupler Company shows test lines of this device in combination with twin spring draft gear, tandem gear and its new combination spring draft gear. It would appear that this device is particularly adapted to increase buffing resistance



Friction Striking Plate Buffer and Side Operated Coupler.

to cars now equipped with spring gears without material alteration to the present attachment. The arrangement is new and worked out on practical lines and appears to be efficient and supplies an evident necessity for a device to absorb some of the severe shock now taken by the spring draft gear attachments.

This device is shown mounted in connection with the company's couplers and the different types of spring draft gears.

THE HOSE UNDER THE TRAIN.

One of the most essential parts of the equipment, which must be kept in first class condition to prevent delays, is the hose for air brake and signal line service. Sprague flexible steel armored hose, on exhibition at booth 322, is made to overcome troubles and delays due to hose failures.

It is claimed that it cannot kink or chafe, and when it is considered that the rubber hose is covered with an interlocking steel armor, this hose would appear to have all the advantages claimed for it by the Sprague Electric Company, New York. You must see this hose to appreciate it.

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When consolidation was first suggested, away back in the last century, it was the M. C. B. Association that offered the protest and prevented the amalgamation. But that was before the days of the representative member. When he came he lifted the M. C. B. out of its position of secondary importance and has steadily advanced it to the commanding one that it now occupies. The representative members of the M. C. B. Association are the controlling membership of the sister association, and they have nothing to fear from consolidation. Membership has become practically interchangeable in the two and the status of the individual would hardly be affected in a single instance by a consolidation. There are other points to be considered, however. The importance of the individual car builder may suffer a partial eclipse and the master mechanic or superintendent of motive power be exalted, but there are many who think the car builder's department would be pushed to the front by the change. There is so much more in common between the railways as to their cars than their locomotives that the car cannot be obliterated. In fact, of so much more importance is the car department in this respect that fears have been expressed that, in the course of a few years, the subjects pertaining to it will become so pressing that they would crowd out the purely technical matters belonging to the locomotive, and usurp all of the time allowed to the convention of the consolidated association. Its work would be legislative; and this always supersedes the technical in interest, if not in importance. The locomotive man might become so absorbed in the legislative work of the car department that he would have no time to discuss the technical work of his own department. It is a difficulty that could, of course, be provided against in the constitution, but even constitutions are susceptible of amendment. All the discussion of the question tends to show clearly that no one can much more than guess at what would be either the larger or the smaller effects of consolidation.

The report of the secretary of the Master Mechanics' Association refers to the scholarships which have been established at technical schools, with bequests made to the Master Mechanics' Association for the purpose. All these scholarships are now well filled; and the reports showing the good progress of the young men to whom they have been awarded are encouraging. The number of those who are given a technical education in this way is comparatively small, compared with the large membership of the association, and if more prominence were given to this kind of philanthropic work, it is probable that more scholarships could be established. While the members as a rule cannot be regarded as a wealthy class, there are doubtless some who are getting well advanced in years who have no families to provide for and who would be glad to help educate worthy young men who desire to obtain a technical education but are unable to bear the expense. The same is true of other railway officers, and a good example for them is seen in the scholarships established by the late Frank Thomson, a former president of the Pennsylvania Railroad, and who was once a motive power officer. If the conditions surrounding such scholarships were more generally understood by railway men, they probably would take more interest in increasing the financial assistance given toward the work of railway education.

The very wide difference between theory and practice was emphasized by the discussion on ash pans. In the reviews of the drawings of the several devices that have been submitted, the operating efficiency had to be regarded almost solely from a theoretical standpoint. When these devices were put into shape they started at once to lose that shape, through the influences of heat and cold and fire and water. The discussion was a tale of woe. No one could take the floor and assert that a satisfactory mechanism had been found, though any man having one was urged to do so. The plates crack, the doors warp, the sides burn through, the operating mechanism sticks, and there is trouble all along the line. Hot coals and incandescent ashes drop out and set fire to trees, to dry material on the right-of-way, to stations and other adjacent buildings. The railway regulators and walking delegates tell how nicely the law works and how simple a matter it is to keep things so snug and trim that not even a breath of hot air can escape. Meantime, the motive power officials, who have to deal with the actual conditions, are constantly worried by chronic ash pan failures. What are they going to do about it? Well, the only thing, apparently, that they can do, so long as the ash pan law is not repealed or declared unconstitutional, is to go on trying to obey it. The lawmaker knows he can promote his own political interests by voting any measure that somebody says will alleviate the position of the man who works. The ash pan law is not alleviating the position of the man who works, and it is costing the railways from $50,000 to $100,000 each.

THE USE OF SUPERHEATED STEAM IN LOCOMOTIVES.

The application of superheated steam to locomotive engines is a comparatively recent development, and at the present time is exciting considerable attention. The tests made by different railways, and the experiments at the Purdue laboratory have all served to attract attention to this matter. Superheating in stationary practice is comparatively an old expedient, having been used by engineers perhaps fifty years ago. Its use was temporarily abandoned on account of its destructive effect upon the lubricants then employed, and the further fact that compounding seemed to promise more immediate returns. Interest in it has been revived during the past ten years, and it is now used extensively in most important plants. Its advantages are too well known to require much discussion. The disintegrating effect which it has on low grade oils, and consequent difficulties in the lubrication of valves, have been largely overcome by the use of better oils, and by changes in the design of the valves. Superheated steam also has a disagreeable way of finding an exit through ordinary packings and gaskets which necessitates the use of some metallic material.

The advantage in the use of superheating has been shown to consist largely in the prevention of initial condensation, in other words, the furnishing of dry steam at cutoff. To carry it much further than this in stationary practice is of doubtful value. There have been instances where steam has been used which showed superheat at the exhaust pipe, as is the case with the engines of the White steam automobiles, but general stationary practice favors the use of from 100 to 150 deg. of superheat. The annoyances occasioned by higher temperatures will sometimes more than offset the saving of steam. It is, however, well understood that the gain from superheat is in direct proportion to the tendencies and opportunities for radiation and condensation of the steam. An engine which labors under conditions favorable for wet steam profits more by superheat than does one of better design. The locomotive offers a peculiarly attractive field for this kind of improvement. The exposure of the cylinder and steam chest, and the large radiation which results from motion through cold air mean considerable condensation and consequent wet steam. The high temperature of the waste gases, on the other hand, furnishes the remedy.

It is too early to predict the best form of superheater for general use, but experiments thus far prove pretty conclusively that some form of superheater should be used. Road tests made on the Union Pacific recently have shown, for an average superheat of 130 deg., a saving of 14 per cent in coal and of 23 per cent in steam. The degree of superheat increases with the speed on account of the corresponding increase in draft.

Experiments made on the locomotive at the Purdue laboratory, and reported by Dean Goss at the last convention of the Master Mechanics' Association show that the substitution of superheated for saturated steam will insure an increase of from 10 to 15 per cent in the amount of power developed, and a reduction in the water consumption of not less than 5 per cent, accompanied by no increase in the amount of fuel. The degree of superheat in these experiments averaged slightly over 150 deg. From these tests, and those subsequently made on the same engine, it is evident that the limit of economy has not been reached, and that still higher degrees of superheat will be justifiable. As far as these experiments have been carried, the consumption of water and coal has diminished as the superheat has been increased. Just how far this law will hold remains to be seen, and will be made the subject of further experiments. There may come a point where the disadvantages of such high temperatures will outweigh the advantages.

Some difficulty was experienced in the Union Pacific engines by the cutting of the valve seat, and it was found necessary to substitute bronze for cast-iron, and to furnish additional facilities for oiling. In stationary practice, it has been found advisable to use poppet valves for steam temperatures of over 500 deg. F. It may be necessary to make some such change in locomotive practice in order to render all the advantages of superheat available. It is safe to predict, however, that the expense of maintaining superheat will not be as great as that of carrying extremely high pressures, and that the economy will be greater. The future will probably see the use of steam of moderately high pressure coupled with a considerable degree of superheat.

IMPROVEMENTS IN DRIVING BOX AND FRAME CONSTRUCTION.

Mr. Bentley's paper on locomotive frame construction, while principally an investigation of the best American practice in the design of frames, driving boxes, wedges and binders, is full of suggestions for radical departures from the prevailing practice, and describes improvements which have resulted in a material reduction in locomotive repairs. Unfortunately the paper is not illustrated. The drawings of the original features of the improvements referred to would assist in a better understanding of them.

The driving box with removable bearing was illustrated in our issue of June 3, 1910. The proposed increase in the bearing area of shoe and wedges is one already well established in foreign practice, and the Pennsylvania Railroad has for some time used frames with pedestal jaws wider than the main frame rails. With cast steel frames it is an easy matter to secure this extra width for the driving box bearing, but with forged frames it must add a considerable expense not only to forging but to finishing On the Chicago & Northwestern the pedestals of old engine frames have been increased in width 1½ inch by riveting on each side a ¾-inch strip of cold rolled machinery steel, and the flangeless shoe used with this is also made of machinery steel. The locomotives, passenger and freight, recently built for this line have the wide pedestals and flangeless wedges and shoes. The advantages of the latter are so manifest that it is surprising they are not more generally adopted, and the attention which Mr. Bentley's paper calls to the method of construction will doubtless lead to a greater interest in this radical reform in locomotive practice.

On account of the enlarged bearing areas secured by flangeless shoes and wedges there is much less wear of those parts and of the pedestal jaws and the boxes themselves, and the broken flanges of shoes and wedges are no longer a cause of removal and repairs, but it is possible to remove the wedge when necessary without taking down the pedestal brace. Another improvement which the paper suggests is the use of removable hub liners for driving boxes —that is a split and dovetailed liner which is adjustable, and can be removed without taking out the box. The main object of all these changes in general practice is to secure such construction as will make it possible to keep the lost motion well taken up and prevent knocking, which is regarded as a frequent cause of frame breakage. They also prevent the frequent and expensive removal of drivers for box repairs, and make it possible to keep the engine in good running order until it is necessary to remove wheels for turning or removal of driving axles. The paper also takes up the subject of broken frames, frame braces and pedestal binders. It is so full of good and original suggestions that it is worthy of careful study. It should be regarded as the introduction of a subject which should be investigated by a committee for a report at the next convention.

THE BALL MUSIC.

The letter from "Dancer," on the M. C. B. ball, which was published in the *Daily* of June 20, has been the subject of much discussion. A number of those who dance agree with our correspondent's criticisms of the condition of the floor and of the music, but a large majority disagree with him entirely, especially about the character of the music played, and believe that the Entertainment Committee did exactly right in selecting popular airs for the dance programs.

The Entertainment Committee occupies a position similar to that of a theatrical manager. The theatrical manager tries to give the public what it wants; that is his business. Now, the great majority of theatre-goers, even the most intelligent and cultured, do not care for the classic plays all the time, or even much of the time. They want Shakespeare occasionally; but for steady diet they prefer modern plays. The theatrical manager gives them what they want; and then is criticised by the lovers of the classics, because they think he is slighting the classic drama. Similarly, the Entertainment Committee tries to provide music that will please the great majority, and that is its duty; but the more successful it is in doing this duty the more sure is it to be criticised by those who have ears only for the classics—which, by the way, may have been the "popular airs" of the day before yesterday.

The *Daily* has no musical critic; but one thing we do know, and this is that the Entertainment Committee and the Old Guard Band have done their parts this year in a way that has been eminently pleasing and satisfactory to most of the convention visitors. Owing mainly to its great length of 400 ft., the acoustic properties of the ball room on the Million Dollar Pier are not perfect. Sound has to travel so far that while the people at one end of it are dancing to the music, those at the other end often are dancing to echoes of the music, which makes the movements of part of the dancers slower than the movements of others. The echoes also make the execution of the orchestra *seem* much inferior to what it actually is. Those with good ears for music who have heard the Old Guard Orchestra in the Blenheim Exchange, where the acoustic properties are good, have observed that its playing sounds very much finer there than it does on the pier. The orchestra is made up of professional musicians, and they are good ones.

While we are on the subject of the letter on the M. C. B. ball, we wish to say that we have received a number of anonymous communications about various matters connected with the conventions. All these have been promptly consigned to the waste-basket; we will not publish any communication the author of which does not sign his name, not necessarily for publication, but in order that the editors may know his identity. Our columns are always open to those, and only to those, who, having views to express on subjects of interest, are willing to take this paper into their confidence as to the source from which the views expressed come.

CAR WHEELS.

TO THE EDITOR OF THE DAILY RAILWAY AGE GAZETTE:

In your interesting editorial on car wheels for freight service in your issue of June 17 you say that it "is absurd to suppose that no improvement can be made in the chilled iron wheel."

This is only partially true. It may as well be confessed that there is a limit to the improvement of the chilled iron wheel, and such prominent roads as the Pennsylvania R. R. and the Norfolk & Western, which make their own wheels, have reached it, so far as the use of the materials out of which chilled iron wheels have been made is concerned. These railways make a car wheel without regard to expense. They use the best selected car wheel scrap, the best charcoal iron, the best coke iron and the best old steel rails, and with their great experience and intelligence in the mixing of these materials are undoubtedly producing the best car wheel made to-day; and yet these are the very parties who are most anxiously seeking for something that will improve their mixture. They have tried vanadium and titanium without results that are satisfactory.

Something must be *added* to the present mixture if it is to be improved. You refer to nickel as being the new alloy that is "showing good results on the Pennsylvania Railroad after a year's service" under precisely the same service as steel wheels. The results have been reported from time to time through your valuable journal in all their details. We are now prepared to say that the use of nickel has increased the tensile strength of the best mixtures heretofore used for chilled car wheels 50 per cent, and the mixtures in daily use 100 per cent.

You remark that the superintendent of motive power can now seat himself very comfortably and "not worry," because the steel wheel provides him something certain that he can put in the place of his weak chilled wheels; but, when it is remembered that a steel wheel costs the Pennsylvania R. R. an even $10 bill more than its chilled wheel does, we are reminded of the suggestion that you can "change the spot and keep the pain," for the worry is simply transferred to the financial end of the road, and when the financial end discovers that an improved nickelized car wheel that has demonstrated its ability under the most severe service on the Pennsylvania Railroad to do the work of a steel wheel at an additional cost of but $2.90 per wheel, there will be some significant inquiries as to why it is necessary to spend $10 more for each wheel in freight equipment.

ROBERT C. TOTTEN.

TO-DAY'S PROGRAM.

MASTER MECHANICS' ASSOCIATION.

Discussion of Report on:	
Train Brake and Signal Equipment	9:30 A. M. to 10:00 A. M.
Individual paper on "Freight Train Resistance," by Prof. E. C. Schmidt, University of Illinois	10:00 A. M. to 11:00 A. M.
Discussion of Reports on:	
Locomotive and Shop Operating Costs	11:00 A.M. to 11:45 A. M.
Design, Construction and Inspection of Locomotive Boilers	11:45 A. M. to 12:00 M.
Consolidation of Master Mechanics' and Master Car Builders' Associations	12:00 M. to 12:15 P. M.
Resolutions, Correspondence, etc.	12:15 P. M. to 12:30 P. M.
Unfinished Business	12:30 P. M. to 12:45 P. M.
Election of Officers Closing Exercises	12:45 P. M. to 1:30 P. M.

Adjournment.

SUPPLY ASSOCIATION COMMITTEE APPOINTMENTS.

The following chairmen of committees of the Railway Supply Manufacturers' Association for 1910-11 have been named by the executive committee:

Entertainment Committee—J. Will Johnson, Pyle-National Electric Headlight Company, Chicago.

Transportation Committee—Joseph H. Kuhns, Republic Rubber Company, Chicago.

Enrollment Committee—Oscar F. Ostby, Commercial Acetylene Company, New York.

The new finance committee will be composed of Albert C. Ashton, Ashton Valve Company, Boston (chairman); A. C. Langston, Jenkins Brothers, Atlanta, Ga., and Lucien C. Brown, United Equipment Company, New York.

The following were named as members of the exhibit committee: L. R. Phillips, National Tube Company, Chicago (chairman); Herbert I. Lord, Detroit Lubricator Company, Detroit, Mich., and Edward H. Walker, Standard Coupler Company, New York.

Proceedings.

President Wildin called the second session of the Master Mechanics' Association to order at 9.40 on Tuesday morning.

WIDENING GAGE OF TRACKS AT CURVES.

In 1906 a committee was assigned to act jointly with a committee of the American Railway Engineering and Maintenance of Way Association, to consider: "The proper amount to which the gage of track should be widened on curves of different radii, and to secure the best results with engines having different lengths of rigid wheel base." The present membership of the committee has been continued from year to year since the date of first appointment.

Various joint meetings have been held, and the committee of this Association has from year to year reported progress to the convention. At the present time, however, it is possible to make the final report for your approval. The substance of the report was reported by the American Railway Engineering and Maintenance of Way Association, at their meeting last winter, and was adopted, so that, inasmuch as the subject interests the maintenance of way department more than it does the motive power department, it would appear to remain for this Association only to approve the report and the action taken. The recommendation is as follows:

"Curves eight degrees and under should be standard gage. Gage should be widened ⅛ inch for each two degrees or fraction thereof over eight degrees, to a maximum of 4 feet 9¼ inches for tracks of standard gage. Gage, including widening due to wear, should never exceed 4 feet 9½ inches. The installation of frogs upon the inside of curves is to be avoided wherever practicable, but where it is unavoidable the above rule should be modified in order to make the gage of the track at the frog standard."

The report was signed by: F. M. Whyte (N. Y. C. Lines), Chairman; F. C. Cleaver, W. H. Lewis.

DISCUSSION ON WIDENING GAGE OF TRACK AT CURVES.

J. A. Talty (Traveling Engineers' Association): I have noticed in riding locomotives that they do not seem to take the curve in the winter time as they do in the summer. They seem to nose more on the wheels, especially when the rail is frosty. I assume that the adhesion between the rail and the wheel has greatly decreased and they seem to slip from one side to the other and not take the curve, which would indicate a very severe strain being brought on the rails. There is a question in my mind if widening the gage on curves would not bring a greater strain on the rails, especially in winter time.

C. A. Seley (C. R. I. & P.): Inasmuch as this matter has been passed on by the Maintenance of Way Association, a discussion of it would hardly be fruitful of results, and I move that the report of the committee be adopted and the committee be discharged.

The motion was carried.

STEEL TIRES.

The committee appointed to consider specifications for steel tires has been in communication with the tire manufacturers, some of the committee visiting the tire works with the idea of trying to work out specifications which it would be possible to enforce and not impose unnecessary hardships on the manufacturer or excessive cost to the purchaser. The results have not been encouraging, and we feel that any specification we could get up, to give any practical results, would require a test to destruction of at least one finished tire out of each heat. In view of the cost of carrying out a specification containing this requirement, we hesitate to offer it, and, unless it is the opinion of this Association that such a requirement, with the expense of enforcement, would be justified, we ask that the committee be discharged.

The report is signed by: A. Stewart (Southern), chairman; A. S. Vogt (P. R. R.), William Moir (N. P.), E. D. Bronner (Mich. Cen.), and H. D. Taylor (P. & R.).

DISCUSSION ON STEEL TIRES.

F. M. Gilbert (N. Y. C. & H. R.): Our tire troubles have been very numerous during the past year. It is not necessary to enumerate the troubles. Most of the members have had their share of them. Apparently the wheel load is in excess of the strength of the material, and the tires do not give good service, at least large numbers of tires do not do so, possibly due to the increase of the loads. Some of the manufacturers, when you get them into a corner, say they can make tires that will stand the service and that they can make them in commercial quantities; others say that if they should endeavor to make them in commercial quantities, they could not begin to furnish the necessary tires to meet the demands.

Mr. Bentley: Have any of the members made a special request for particularly hard or soft tires, according to the service into which the engine is going? It seems to me, an engine in switching service would require a very different tire from that of an engine in road service, and I believe some of the manufacturers recommend certain tires for certain services. How has this worked out in actual service?

H. H. Vaughan (C. P.): Steel tires are not like bar iron, or firebox steel, or other material that can practically be purchased in the open market. The number of manufacturers is limited, and it is a question in my mind whether it would pay us to go into the matter of specifications for steel tires. I think most tire-makers are giving us steel of good composition in the tires. The price we are paying for the tires is sufficiently high to make the question of the quality of steel put into them comparatively unimportant to them, and it has seemed to me that the chief thing about a tire, in our experience, is the amount of discard from the ingot that is used in making it, and the temper of the finishing process. We had a great deal of trouble with a certain class of tires from one manufacturer—the tires shelled out, which is, I presume, one of the troubles Mr. Gilbert refers to—and we discovered in conference with the manufacturer, that the tires that were made on a new mill, which had been installed, were giving considerable trouble from shelling, while the tires made on the old mill were always free from that trouble, the inference being that the tires on the new and more powerful mill were finished at a higher temperature, and were not in as good condition for service as those finished on the old mill, in which a long time was taken in rolling down the tire. Now, it would be a difficult thing to demand anything of that sort in a specification, it is one of the things in which the manufacturer must work in coöperation with the user, and find out from the user which tires are giving the best results.

We often get misled on the tire question if we go too much on the basis of 1-16 in. tire wear according to mileage in the case of tires from different manufacturers. The natural tendency, if you are driving the manufacturer to give a high mileage per sixteenth inch, is for him to furnish a tire high in carbon, a hard tire. I feel that in comparing the service of tires we should obtain the composition of the tire from the manufacturer, and then judge results on tires of somewhat similar composition. If we do that we will get just as good results as by endeavoring to enforce a specification that very few of us would probably want to check up closely. It is a much easier thing to make a specification than it is to check it up on every shipment, and I believe that for tires we can get along just as well by keeping in touch with the people from whom we are obtaining them, and working with them, as by putting any specifications in force.

We have our share of shelling out, and it has certainly become serious, especially under heavy tenders. We have found that the method of finishing the tire exerts considerable influence on it. The quality of the steel makes very little difference, so far as we can determine. We have had open-hearth steel of different methods and crucible steel, and all gave us trouble in shelling out if made on a rapid finishing mill. Either of the materials were much more free of that trouble if finished at a lower temperature and more care was taken in the finishing. It is a strange thing that on driver tires, so far as I know, we never have any trouble from shelling out, even with the excessive wheel loads we carry on the drivers. The trouble seems almost entirely confined to tender tires, and on the Canadian Pacific we notice a great difference between the summer and winter months. We have a large amount of track that gets frozen almost as hard as rock in winter, and during that time our shell-outs become a great deal more frequent. It is a question in my mind whether carbon steel can be made that will really stand that service under heavy tenders. At the same time we do notice a difference between different tires, and that makes us feel that the trouble is one that is really up to the manufacturer and can be overcome by sufficiently careful workmanship and treatment.

I am not sure that we are not giving the manufacturers rather too severe a job in expecting them to produce tender tires that will stand up on small wheels under heavy wheel loads, but there is a very great difference between different tires, or, perhaps, tires of the same material finished under different processes, in the matter of shelling out, and that

makes it look as though it were partly due to the structure or the quality of the steel.

John Tonge (M. & St. L.): There is one point Mr. Vaughan has not touched upon, which no doubt he will recognize, and that is in the hard tire you don't get the tonnage load over the roadway, as a rule, that you would with a softer tire on the same engine. It will make a material difference in the tonnage on the level, and more especially on the grades.

G. R. Joughins (Intercolonial): One of the most remarkable things we have noticed is the fact that we have very little trouble with driving tires. It is nearly all with either car wheel tires or tender tires, all of a small size, and I concluded from that, in the same way that Mr. Vaughan has, that it depends very much on the work which is put on the steel. Whether it is due to the much greater rolling which the driving tire receives, compared with the small tire, I don't know, but we have tried a good many makes of steel, and some of them have been very expensive. We have bought steel tires which were the highest priced in the market, so far as we could find—of course, I mean the Canadian market, and that includes tires which we get from Europe—and the results have been no better with the high priced tire than with the cheap one. We are in very serious difficulty in the matter, because in the winter time a large number of tires give us trouble and breakages, and we are a little afraid of what the results will be. In the summer time we have practically no trouble.

C. E. Fuller (U. P.): We have had the same trouble, and in discussing it with one of the large tire manufacturers, a man of a great deal of experience, he admitted that the tire for a tender wheel or car wheel was not suitable as a tire for a locomotive, and a locomotive tire was not suitable for a car wheel. The punishment that the tender wheel receives is terrific, and he intimated that the manufacturers could and would have to make a tire that would stand up under tender service. I believe that this committee should not be discharged, but should be requested to work with the manufacturers and experiment to get a tire that will stand up under tenders. We have just gone through a severe winter and have had all kinds of trouble. If the wheel men realize that they have to correct the trouble, they will correct it. They are just as anxious to correct it as we are, and I know of no better way for them to get in touch with the true situation than to do so through a committee. I make a motion that this committee be extended and instructed to work with the tire manufacturers with a view of getting a better tire made for tender and car service—one that will overcome this trouble.

C. E. Chambers (C. R. R. of N. J.): Have any of the members had any experience with vanadium tires?

H. T. Bentley (C. & N. W.): We have a set of tires on a switch engine, and from a report received the other day from the master mechanic, it appears as if there was very little, if any, difference in the wear of the vanadium steel tires as compared to other tires on the same engine, put on at the same time. The manufacturers, of course, try to tell us that the shelling out of tires is due to the locomotive department; that we are responsible for it. One man came to me and told me positively that if our wheels didn't slide we would never have any shelled out spots. He happened to come around one day when we had a very bad case of a shelled out tire on one wheel, and on the other wheel there was absolutely no indication of sliding. Have any of the members used a heavier tire than 3½ in. in thickness? If so, have they received better or worse service? We are afraid that by getting a very thick tire, like 4 or 4¼ in., the rolling would not be as good as would be possible with a thinner, or a 3½ in. tire, such as we are using.

Mr. Tonge: In the fall of 1884 we put two different tires, 5 in. thick, in passenger service, the engine running every night. One of the men that ran the engine is now in the room. There was a great difference in the service of the two tires. One set, at the last report, had run over a million miles and they were still 2¾ in. thick. The other set, when they were about one-half worn, showed cavities around the rim.

F. F. Gaines (C. of Ga.): Several years ago I applied some 4-in. tires to heavy switch engines; the results were not altogether satisfactory. The tires were unquestionably softer and wore faster, and they wore irregularly; they didn't seem to be uniform and were evidently not as well worked as the tire of less thickness. Since that time I have kept down to 3½ in.

Mr. Chambers: What class of engine were the tires applied to which Mr. Tonge mentioned? We have had in service for ten or eleven months a set of vanadium tires on a consolidation engine weighing about one hundred and eight tons. They have not been turned as yet, but I see no perceptible difference in the wear of these tires from that of the ordinary steel tire.

Mr. Tonge: Our engine weighed 40 tons, was in our Chicago train service, running from St. Paul to Albert Lea, connecting with the Rock Island.

Mr. Gilbert: Mr. Vaughan has, I think, recently introduced some passenger trucks on tenders, and I would like to ask if anyone can give any information as to whether the character of the truck has any effect on the wear of the tires. I know that we have comparatively little trouble on passenger equipment where we use passenger trucks, but since the introduction of the Diamond truck and high speed tenders, our troubles seem to have increased.

Mr. Bentley: The tire I mentioned as having been very badly honeycombed on one side, and not on the other, was under a pedestal type truck.

Mr. Gaines: Is not the chief object in using vanadium steel to ensure a tire that will not break, rather than for adding to its wearing qualities? Has anyone any information as to the relative strength of the vanadium steel tire as compared to the ordinary tire?

Mr. Chambers: I have no figures, but I would not care to pay the difference in the price of the tires to have the little assurance that when they got to a certain size they would not break. We have very little trouble with breakage of tires above the scraping limit.

Mr. Bentley: We had during this last winter several cases of 3½-in. new tires breaking a clear break, something I never saw before in my railroading experience.

Mr. Vaughan: I am not sure, but I have a feeling that there is a difference between the diamond truck and the pedestal truck in causing tires to shell out. We used the diamond truck on tenders, and as an instance of how severe the service is, on a rock bottom road bed in very cold weather we really gave up the diamond truck because we were not able to maintain it. We would chew the threads off the column bolts and even took pieces out of the oil boxes and that sort of thing. It was something awful. But the pedestal truck has given better service and those troubles have largely gone. On the division I am referring to, which is our worst division for those conditions, we have had less trouble recently with the pedestal truck with shelled out wheels, than we previously had with the diamond truck. Whether it is due to the tire having been made differently or not, or due to the truck, I am really unable to say, but I have a feeling that there is something in the amount of dead weight on the diamond truck which is pretty high.

Theoretically, and I believe practically, the tender service is the most severe service we put the tire to. Theoretically, the strain on the tire is inversely in proportion to the diameter of the wheel, with a given load. For instance, the tires on a 34 in. wheel under tender weighing 20,000 lbs., are practically strained as severely as the tires on a 69 in. wheel under a tender weighing 40,000 lbs.

We are blaming the tires for breaking, many times, when the trouble is really due to the wheel centers. We have had several cases of tires breaking during winter service, and in every case but one they have been on a light type of cast steel wheel center. If you will try shrinkage tests on the type of wheel center that was in use four or five years ago, with a light rim and spokes thinned down, you will find that it will collapse under the tire almost as much as you want. There is very little strength in the center to resist the force due to the load on the wheel. Many of the light designs of cast steel wheel centers will spring under the load of the engine in heavy winter weather and the tire will take part of the strain and bend. You cannot keep on bending a 3½ in. tire with the weight of the engine on it, without starting a crack. It is my conviction that, in the case of the thick tires which crack, the cracks are due to light designs of cast steel wheel centers. When we had the cast iron wheel center, although it was not as strong as the cast steel, it would stand up under the load, not deflect; whereas when the builder began to lighten up the cast steel wheel center, there was a chance for the bending action. There is the same chance for the bending action in a good many designs of the forged steel wheel centers. We have found that the forged steel wheel center will collapse under the tire to an almost indefinite extent. We make our cast steel wheel centers as stiff as the old cast iron centers, and believe it is the right thing to do. We have also stiffened up the tender wheels by making them of heavy steel castings, to get sufficient rigidity to hold the wheels in shape under the loads they are subjected to. We have less trouble with tire breakages, in the case of the thin tire almost worn to the scrapping line, than we have with thick tires.

Mr. Bentley: The two breakages I referred to were in the case of a new design of wheel centers, on new engines just from the builders.

Mr. Vaughan: Were they stiff centers?

Mr. Bentley: Yes, they were well-designed centers.

Mr. Gaines: All our breakages, with few exceptions, have been new tires or tires that had not been a very long time in service. It is seldom that a tire which has worn down near the limit of service will break. I also agree with Mr. Vaughan as to the pedestal type tender truck. I am a firm believer in that truck, and, in so far as the maintenance of the tender is concerned, it is cheaper and easier to maintain than the diamond truck, and this must have its effect on the tire.

A. E. Manchester (C. M. & St. P.): We have had our tire troubles, and we have had a few cases of the shelling out of the tires; our greatest trouble has been with uneven wear. This uneven wear occurs in the spongy, soft portions, which we have laid to the impurities in the tire, or, in other words, the ingot was not cropped close enough. We have no means of determining the different value of the different trucks, having in use but one type.

C. E. Fuller: I move that the subject be closed and referred to the executive committee for such action as they see fit to take.

The motion was carried.

SAFETY APPLIANCES.

The committee regrets to advise having no report for this year, the reason therefor being that the whole matter of safety appliances has been pending in Congress, and up to this time has not been settled, so that we can know definitely what will be the rule of the Interstate Commerce Commission. The safety appliance law H. R. 5702 has been passed and signed by the President, this act calling for notice and hearing, which at the date of writing has not been held, so that any work this committee might do with reference to establishment of standard safety appliances might be in vain. While the law in question apparently has special reference to freight cars, the principles underlying its application would, to a considerable extent, apply on defining these standards for locomotives. Hence, the committee has felt it inadvisable to make any report or recommendations until the law has been carried out by the Interstate Commerce Commission in defining and locating the safety appliances.

The report is signed by: C. A. Seley (C. R. I. & P.), chairman; T. H. Curtis (L. & N.); C. B. Young (C. B. & Q.); and Henry Bartlett (B. & M.)

The President: There are but very few changes suggested by the Interstate Commerce Commission as regards locomotives. One of the principal changes is that of substituting buffing beam sill steps in the place of pilot steps, with grab-irons on each end of the buffing sill. There have been two preliminary meetings held in Washington with the Interstate Commerce Commission, the commission being represented by Secretary Mosely. I had the privilege of being present at one of these meetings, and had a representative at the other. There will be another meeting some time in July, possibly before the joint meeting of the executive committee of the Master Car Builders' and Master Mechanics' Associations is held, and more complete information will be at hand at that time. I think it would be well for this association to take the same action that the Master Car Builders' Association took in referring the matter to the executive committee, with the suggestion that they prepare a statement which will be sent to each member, giving in full the attitude of the Interstate Commerce Commission on the subject of safety appliances for locomotives.

C. A. Seley: I move that the matter of safety appliances be referred to the executive committee.

The motion was carried.

SUPERHEATERS.

In 1901 the Canadian Pacific, under the leadership of Roger Atkinson, of the Canadian Locomotive Works, introduced the use of superheated steam on locomotives in America. A few years later H. H. Vaughan extended its use, and the success of the superheater is due in a great measure to his push and energy. We have received reports from twenty American roads which have engines equipped with superheaters.

Superheaters are reported on American roads as follows:

A., T. & S. F.	168
Boston & Maine	1
C. & N. W.	1
Canadian Pacific	487
C., B. & Q.	5
Central of Georgia	1
C., R. I. & P.	9
Erie	1
Great Northern	61
M., St. P. & S. S. M.	1
National Ry's. of Mexico	1
Northern Pacific	36
N. Y. Cent. (L. S. & M. S.)	2
Oregon Short Line	2
Pennsylvania	1
Pittsburg, Shawmut & Northern	1
Southern Pacific	2
St. L. & S. F.	21
W. & L. E.	1
Union Pacific	3
Total	805

Superheaters which are considered in the report and the number of engines reported are as follows:

Types of Superheaters.	Number of Railroads.	Number of Engines.
Baldwin	12	79
Churchward (England)	1	61
Cole	6	13
Emerson	2	59
Jacobs	1	104
Schmidt	3	58
Union Pacific	1	1
Vaughan-Horsey	5	491

Schmidt superheaters are used on 130 railroads in Europe, and are in service, or in course of construction, on over five thousand locomotives.

The report contains an illustrated description of each of the above-mentioned superheaters, with the exception of the Churchward. They have been described in the *Railway Age Gazette* as follows: Baldwin, June 7, '07, page 780; March 27, '08, page 453; November 20, '08, page 1401. Cole, May 7, '09, page 992 and June 16, '09, page 1237. Emerson, May 13, 1910, page 1216. Jacobs, October 29, '09, page 814. Schmidt smoke tube, April 10, '08, page 512. Vaughan-Horsey, November 22, '07, page 619.

The Union Pacific superheater is of the smoke-box type, and in effect is the usual steam pipe transformed into a superheater by increasing the area and splitting it up into a number of small tubes. The steam pipe forms vertical headers of a crescent shape at the front and rear of the smoke box, and between them are placed 108 2-inch tubes, arranged horizontally. The ends of the tubes are fastened to the headers by the usual method of expanding with a roller, the roller being inserted in a hole in the header opposite the tube, which is afterwards closed with a screw plug. The steam passes into the top of the rear headers, thence forward through the tubes to the front headers, thence downward to steam-pipe connection to the steam chest.

COST OF COAL PER 100-TON MILE
OR
PER PASSENGER CAR MILE

BALDWIN SUPERHEATER

ROAD.	Superheater.	Non-Superheater.	Per Cent Saving of Superheater Over Non-Superheater.	Per Cent Increased Cost of Superheater Over Non-Superheater.
C. B. & Q.	.0114	.0122	6.5	
	.0106	.0122	13.1	
Oregon Short Line	.200	.230	13 0	
Southern Pacific	.0135	.0135		

COLE SUPERHEATER

Wheeling & Lake Erie	.0169	.0191	11.5	

JACOBS SUPERHEATER

A. T. & S. F.	.0116	.0170	31.8	

SCHMIDT SUPERHEATER

C. B. & Q.	.0105	.0130	19.2	
	.0109	.0133	18.0	
Great Northern (Pass.)	.0195	.0208	6.2	
	.0207	.0248	16.5	

VAUGHAN-HORSEY SUPERHEATER

Canadian Pac.	Freight	.148	.153	3.3	
		.219	.298	26 5	
	Passenger	.0115	.0199	42 2	
		.0187	.0194	3 6	
C. B. & Q.		.0098	.0120	18.3	

COST OF RUNNING REPAIRS PER 100-TON MILES

OR

PER PASSENGER CAR MILE.

BALDWIN SUPERHEATER.

ROAD		Superheater.	Non-Superheater	Per Cent. Saving of Superheater Over Non-Superheater	Per Cent. Increased Cost of Superheater Over Non-Superheater.
A. T. & S. F.		Comparisons not available, as superheater and non-superheater engines do not run on same district.			
Central of Georgia		.038	.046	17.4	
C. B. & Q.		.018	.026	30.8	
		.024	.026	7.7	
Oregon Short Line		.0234	.0225		4 0
Southern Pacific		.059	.050		18.0

COLE SUPERHEATER.

Boston & Maine (Pass.)		.0725	.0641		13.1
Wheeling & Lake Erie		.0366	.0342		7.0

JACOBS SUPERHEATER.

A. T. & S. F.		.124	.161	23.0	

SCHMIDT SUPERHEATER.

C. B. & Q.		.031	.027		14.8
		.030	.027		11.1
Great Northern (Pass.)		.0403	.0807	50.0	
		.193	.092		110.0

VAUGHAN-HORSEY SUPERHEATER.

Canadian Pac.	Freight	.024	.0408	41.1	
		.0415	.0477	13.0	
	Passenger.	.0306	.0376	18.6	
		.0290	.0287		1.0
C. B. & Q.		.0150	.0270	44.5	

COST OF VALVE OIL PER MILE

BALDWIN SUPERHEATER

ROAD.		Superheater.	Non-Superheater.	Per Cent. Saving of Superheater Over Non-Superheater.	Per Cent. Increased Cost of Superheater Over Non-Superheater.
Oregon Short Line		.00123	.00103		19.0
Southern Pacific		.00137	.00118		16 0

COLE SUPERHEATER

Wheeling & Lake Erie		.00118	.00059		100.0

SCHMIDT SUPERHEATER

Great Northern (Pass.)		.00175	.00137		27.7
		.00254	.00132		92 5

VAUGHAN-HORSEY SUPERHEATER

Canadian Pac.	Freight	.0110	.0077		43.0
		.0074	.0061		21 3
	Passenger	.0067	.0069	2.9	
		.1162	.0064	3.1	

Reduction of Boiler Pressure.

The reports show that the general practice is to reduce the boiler pressure when the superheater is applied; at the same time, where there is a considerable reduction made, the diameter of the steam cylinders is increased. On the A. T. & S. F. tandem compound engines have had the high-pressure cylinder removed when the superheater was applied, and the boiler pressure reduced from 220 to 160 pounds. Where reduction of boiler pressure is made the general result shows a reduction of boiler repairs.

Superheater Troubles.

The troubles arising from superheaters are given on the accompanying chart in detail.

Lubrication of Slide-valve Engines.

With the Baldwin superheater, four roads report slide valves on superheater engines as having no trouble in lubricating with superheat from 11 to 44 degrees.

With the Schmidt superheater, Dr. Schmidt reports European practice: "Slide valves have been tried in a few instances on superheated-steam locomotives and to our knowledge they could be worked with a fair measure of satisfaction up to a steam temperature of about 450° F. The trouble experienced with higher degrees of superheated steam on slide-valve engines is due, in our opinion, not so much to the difficulty of lubrication as to valve warping at higher temperatures and seizing on its flat seat."

With the Vaughan-Horsey superheater the Canadian Pacific reports that it is impossible to lubricate slide valves above 190 degrees superheat. A heavier valve oil is used on superheater engines than on non-superheater engines.



L. R. Johnson.

Chairman of the Committee on Superheaters.

The Union Pacific has one slide-valve engine equipped with Vaughan-Horsey superheater, and has had trouble in lubricating with a superheat of from 160 degrees to 219 degrees.

Lubrication.

Forced lubrication is found to be unnecessary with low and moderate degrees of superheat. Different kinds of pumps have been used on some roads when first installing superheaters and later on abandoned for the ordinary sight-feed lubricator. Of course, it is natural that superheater engines should show a little increase in the cost of cylinder lubrication over the non-superheater, but you can buy several pints of valve oil for the price of a ton of coal. In Europe, where a high degree of superheat is the practice, it is found that forced lubrication is necessary.

Piston and Valve Rings.

The result on the majority of railways indicates that it is unnecessary to use a special mixture in casting piston and valve rings. The New York Central, with the Cole and Vaughan-Horsey superheaters, uses a mixture containing more copper. The Canadian Pacific, with the Vaughan-Horsey superheater, reports: "had difficulty at first; have made progress and are still experimenting." The St. Louis & San Francisco report that they recently received twenty Pacific-type engines with the Emerson superheater. The cylinder packing that came with these engines gave out in about 1,500 miles. They are now using a special metal. The Union Pacific, with Vaughan-Horsey superheater on a slide-valve engine, found it necessary to apply a bronze false valve seat. The Canadian Pacific gave results as to life of cylinder and

valve packing rings for the year ending October, 1909. In freight service, packing rings on engines without superheater ran from two to three times as long as the rings on the superheater engines. In passenger service the difference was not so great. In one case the life was the same, while in another case the life of rings on the non-superheater engines was nearly double that of the superheater engines.

Superheated Steam on Compound Engines.

The Jacobs superheater on the Santa Fe is the only superheater reported which superheats the steam between the high and low pressure cylinders on compound engines. These superheaters are now in service on tandem, balanced and Mallet compounds. Tests on this road prove that greater efficiency can be obtained from a superheater giving superheat between the high and low pressure cylinders, than from a superheater giving superheat to high-pressure cylinders only.

Dampers.

The Baldwin, Emerson, Union Pacific and Jacobs superheaters have no dampers and experience no trouble from pipes burning out. The Cole, Schmidt and Vaughan-Horsey superheaters have dampers on all roads reported, except the Great Northern (Schmidt superheater), where the damper interfered with the drafting and was taken out. The dampers are automatic in action, opening and closing as the throttle is opened or closed. They experience no trouble from pipes burning out.

Do Boiler Tubes on Engines Equipped with Superheaters Give Trouble?

All reports show that boiler tubes on engines equipped with superheaters give no more trouble than engines not equipped with superheater.

Packing on Piston and Valve Rods.

The roads using Baldwin and Jacobs superheaters report that it is not necessary to use any special kind of packing on piston and valve rods. The New York Central (Cole superheater) reports a packing used with a higher melting point. The Great Northern (Emerson and Schmidt superheaters) use a special metal for rod packing when the temperature in the steam chest is above 600 degrees. The Canadian Pacific and New York Central (Vaughan-Horsey superheater) use a special kind of packing on outside admission valves.

Boiler Repairs.

The Canadian Pacific (Vaughan-Horsey superheater) was the only road from which figures were received showing cost of boiler repairs.

Class of Engine.	Cost Per Engine-mile. Superheater.	Non-Superheater.
4-6-0—D 6	.19 cents	.91 cents
2-8-0—M 4	.33 cents	.30 cents
4-6-0—E 5	.65 cents	.46 cents
4-6-0—E 5	.47 cents	.31 cents

Type of Superheater.	Railroad.	Does the Superheater Give You Any Trouble on the Road or in the Roundhouse? (Please give as many details as possible and say what has been done to overcome or minimize them.)
BALDWIN	A. T. & S. F.	Some trouble with steam-pipe joints leaking; front end fills up
	C. B. & Q.	No trouble
	Central of Georgia	No. This engine has record of not having a single failure in making 30,595 miles
	Erie	Front end fills up with cinders. Cinders also ruptured several superheater pipes so they had to be plugged
	Nat'l Rys. of Mexico	Front end fills up with cinders. No remedy at present—experimenting
	Oregon Short Line	No trouble. Twelve months' service
	Pennsylvania	No trouble
	Pittsburg, Shawmut & Nor.	Front end fills up
	Rock Island	Cinders cut superheater tubes, due to sand-blast action. Front end filled up with cinders and engine does not make steam
	Southern Pacific	No trouble
	Union Pacific	No data
CHURCHWARD	Gt. Western (England)	Ends of tubes have blown in several cases, but this failure has now ceased
COLE	C. & N. W.	Very little
	Boston & Maine	Superheater flues at firebox end expanded and beaded instead of screwed. Gaskets leaked between headers and T-head; improved design has obviated this trouble. Superheater flues have given trouble by filling up; blower applied and works fairly well. Other small defects; for instance, leaks at junction of the superheater pipes and return bends, ascribed to defects of material rather than of design
	New York Central	A little trouble in roundhouse on account of keeping joints tight; not serious, however
	Northern Pacific	Cinders in passing through tubes wear out return bends. Gaskets at connection between small superheater pipes and main header give same trouble
	Rock Island	Had trouble with Field tubes stopping up. Changed to return-tube system and had no trouble. Had trouble with joints and fastenings. Recent designs obviate this trouble
	Wheeling & Lake Erie	No
EMERSON	Great Northern	Threaded pipes in return bends break off. Now welding pipe into the return bend
JACOBS	A. T. & S. F.	Occasional leaks in steam-pipe joints. Recent designs have joints on the outside
SCHMIDT	C. B. & Q.	Leaks in front end overcome by providing more secure fastening for the blocks connecting superheater pipes to the header and by bracing the header to smoke arch. Clinkers formed on back end of superheater pipes; cleaned off every trip
	European Railways	So far as we know, neither the superheater itself nor the large smoke tubes have given any trouble in European practice. In a few isolated cases, the large smoke tubes have begun to leak at the firebox end; in such cases, investigation has shown that the tubes were not properly expanded in the tube sheets, nor according to our recommendations. These defects have been easily remedied, after which no further difficulty was experienced. No difficulty has been experienced in European practice in keeping the joints of the superheater elements tight. An essential requirement, however, is that the bottom facing of the collector casting shall be properly machined and that the right kind of copper-asbestos gaskets shall be used for these joints; and, further, that the bolts shall be taken up after the engine has been for the first time under steam. In most cases the large smoke tubes have to be blown out every day to avoid clogging. But there are railways, as for instance the Belgian State Railways, which blow the tubes out only every three days on the average. This largely depends upon the kind of fuel used
	Great Northern	Yes. Gaskets leak, also threaded pipes in return bend break off. Now welding the pipe into return bend
	Northern Pacific	Cinders wear out return bends. Gaskets at connection between small superheater pipes and main header give same trouble
UNION PACIFIC	Union Pacific	No
VAUGHAN-HORSEY	Canadian Pacific	Originally gave trouble, due to unsuitable gaskets between superheater pipes and header fittings. Since remedied by using stronger style of gaskets. Nuts connecting pipes to fittings originally made of brass, found to corrode, were replaced by cast steel, and later by drop-forged nuts, which has overcome the trouble. Nuts slacked off remedied by using special nutlocks and by making closer fit of the threads. Cast-iron headers cracked, caused by faulty construction; has been remedied by improved design. The tubes blocked at the return bends; has been overcome by systematic inspection and using proper appliances for cleaning and blowing out tubes
	C. B. & Q.	No more trouble than other engines
	New York Central	Practically no trouble. Old design of holder broke once or twice, but new design gives no trouble
	Northern Pacific	Cinders in passing through tubes wear out the return bends. Gaskets at connection between small superheater pipes and main connection give same trouble
	Union Pacific	No trouble

Tests.

Tests have been made on the Central of Georgia with Baldwin superheater; Santa Fe, with the Jacobs superheater; Southern Pacific, with the Baldwin superheater; Union Pacific, with Vaughan-Horsey and Union Pacific superheaters; Northern Pacific, with Cole, Schmidt and Vaughan-Horsey superheaters, and are presented in somewhat condensed form.

CENTRAL OF GEORGIA RAILWAY CO.

ENGINE TEST—SOUTHWESTERN DIVISION FREIGHT SERVICE, JULY, 1909.

Same fifteen carloads of coal hauled in each test; same engineer and fireman each test.

	Baldwin Superheater.	Non-Superheater.
Engine	1224	1222
Type	2-8-0	2-8-0
Cylinders	22 by 28 in.	22 by 28 in.
Weight on drivers, pounds	143,290	143,290
Boiler pressure, pounds	160	200
Time on road	6 hrs. 45 mins.	6 hrs. 48 mins.
Ton-miles	205,740	205,740
Total coal consumed, pounds	24,200	23,700
Coal per 100 ton-miles	11.8	11.5
Total water consumed, pounds	168,866	166,100
Water per pound of coal	6.98	7.01
Miles run to one ton of coal	16.5	16.9

These figures are the average or the total for two trips.

The results from the Baldwin superheater on the Central of Georgia show no advantage over the non-superheater engine.

ATCHISON, TOPEKA & SANTA FE RY.

TEST OF JACOBS HIGH AND LOW-PRESSURE SUPERHEATER ON TANDEM COMPOUND ENGINE VERSUS SAME CLASS OF ENGINE WITHOUT SUPERHEATER.

	Jacobs Superheater.	Non-Superheater.
Engine	901	923
Type	2-10-2	2-10-2
Cylinders, inches	19 by 32 by 32	19 by 32 by 32
Weight on drivers, pounds	234,600	234,600
Superheating surface, square feet	1,868	
Boiler Pressure, pounds	220	220
Speed, miles per hour	14.05	13.03
Tonnage	1,332	1,221
Pounds of coal per 100 ton-miles	24.4	30.4
Saving in coal	19.6%	
Dry coal per H.-P. hour	3.43	4.10
Decrease per 1 H.-P. hour	16.3%	
Equivalent evaporation of water	8.10	7.81
Saving in water	3.7%	
Superheat:		
High pressure	19.3° average	
Low pressure	95.0° average	

The superheat in high-pressure superheater averaged 19.3 degrees and in low-pressure superheater averaged 95 degrees. The relative performance of superheated engine over non-superheated engine is as follows:

Equivalent evaporation per pound of coal..... 3.7 per cent. gain.
Coal per 100 ton-miles .....19.6 per cent. gain.
Coal per 1 H.-P. hour.....16.3 per cent. gain.

The Southern Pacific has made a test of the Baldwin superheater versus a similar engine without superheater. The superheat averaged 23.2 degrees. The relative performance of superheated engine over non-superheated engine is as follows:

Equivalent evaporation per pound of fuel..... 3.37 per cent. loss.
Ton-miles per pound of fuel..... 1.35 per cent. loss.
Ton-miles per gallon of water..... 3.32 per cent. gain.

The Union Pacific test of the Vaughan-Horsey superheater shows the superheat obtained at varying conditions of speed and cut-off. The maximum superheat is 219 degrees, with an average superheat of 185 degrees. For the Union Pacific type the maximum superheat is 61.9 degrees, with an average superheat of 48.6 degrees.

The tests on the Northern Pacific give the following results from the Cole, Schmidt and Vaughan-Horsey superheaters:

NORTHERN PACIFIC RY.

TEST OF COLE SUPERHEATER VERSUS SAME CLASS OF ENGINE WITHOUT SUPERHEATER.

	Cole Superheater.	Non-Superheater.
Engine	2137	2136
Cylinders, inches	22 by 26	22 by 26
Weight on drivers, pounds	146,300	146,300
Superheating surface, square feet	341	
Boiler pressure, pounds	200	200
Speed, miles per hour	30.26	28.56
Tonnage	556	599
Pounds coal per 100 ton-miles	16.2	20.6
Decrease	21.4%	
Coal per draw-bar horse-power hour	4.91	6.54
Decrease	25.0%	
Equivalent evaporation of water	10.06	9.94
Saving in water	1.2%	
Superheat	147°	

The relative performance of superheated engine over non-superheated engine is as follows:

Equivalent evaporation ..... 1.2% gain.
Coal per draw-bar horse-power ..... 25.0% gain.
Coal per 100 ton-miles ..... 21.4% gain.
Superheat (average) .....147 degrees.

NORTHERN PACIFIC RY.

TEST OF SCHMIDT SUPERHEATER VERSUS SAME CLASS OF ENGINE WITHOUT SUPERHEATER.

	Schmidt Superheater.	Non-Superheater.
Engine	2137	2136
Cylinders, inches	21 by 28	21 by 28
Weight on drivers, pounds	153,504	153,500
Superheating surface, square feet	248	
Boiler pressure, pounds	200	200
Speed, miles per hour	15.74	15.00
Tonnage	2,437	2,429
Pounds of coal per 100 ton-miles	4.98	5.92
Decrease	15.8%	
Coal per draw-bar horse-power hour	4.55	5.64
Decrease	19.3%	
Equivalent evaporation of water	9.04	9.13
Saving in water		1.0%
Superheat	147°	

The relative performance of superheated engine over non-superheated engine is as follows:

Equivalent evaporation ..... 1.0 per cent. loss.
Coal per draw-bar horse-power ..... 19.3 per cent. gain.
Coal per 100 ton-miles ..... 15.8 per cent. gain.
Superheat (average) .....147 degrees.

NORTHERN PACIFIC RY.

TEST OF VAUGHAN-HORSEY SUPERHEATER VERSUS SAME CLASS OF ENGINE WITHOUT SUPERHEATER.

	Vaughan-Horsey Superheater.	Non-Superheater.
Engine	1609	1561
Cylinders, inches	24 by 30	24 by 30
Weight on drivers, pounds	261,500	201,500
Superheating surface, square feet	326	
Boiler pressure, pounds	200	200
Speed, miles per hour	10.50	11.77
Tonnage	2,073	2,034
Pounds coal per 100 ton-miles	13.1	16.2
Decrease	19.1%	
Coal per draw-bar horse-power hour	5.41	6.54
Decrease	17.3%	
Equivalent evaporation of water	6.87	6.87
Saving in water		
Superheat	121°	

The relative performance of superheated engine over non-superheated engine is as follows:

Equivalent evaporation .....Equal.
Coal per draw-bar horse-power ..... 17.3 per cent. gain.
Coal per 100 ton miles ..... 19.1 per cent. gain.
Superheat (average) .....121 degrees.

RECOMMENDATIONS.

The experiences gained by various railroads with superheated steam, which have been reported to your committee, indicate that the use of superheated steam on locomotives is both economical and practical. Many types of superheaters with varying degrees of superheat have been used to advantage in railroad service. In the United States there are about 60,000 locomotives, and from reports received there are 317 locomotives equipped with superheaters, or approximately five-tenths of one per cent. This is such a small proportion that it is evident that the use of superheaters is as yet in its infancy in this country. With this in view, the committee feels that recommendations as to type of superheater or degree of superheat are not warranted at this time. The unanimous opinion of motive power and transportation officials is that the superheater engine gets its load over the division in far better form and in better time than the non-superheater, or, as one superintendent of motive power put it, "'Tis a more snappy machine all around."

The report is signed by:—Lacey R. Johnson (Can. Pac.), chairman; F. F. Gaines (C. of Ga.), R. D. Hawkins (Gt. Nor.), H. W. Jacobs (A. T. & S. F.), and W. J. Tollerton (C. R. I. & P.).

LOCOMOTIVE PERFORMANCE UNDER DIFFERENT DEGREES OF SUPERHEATED STEAM

C. H. Benjamin, Dean of the Schools of Engineering, and Louis E. Endsley, Associate Professor of Railway Mechanical Engineering, Purdue University, Lafayette, Ind., presented a paper on the above subject an abstract of which follows:

I. INTRODUCTION.

1. At the convention in 1909. Dean W. F. M. Goss read a report, entitled "Locomotive Performance Under Saturated and Superheated Steam" (*Railway Age Gazette*, June 18, 1909,

page 1342), in which he made some comparisons of the steam and coal consumption of the locomotive at Purdue University when using saturated and when using superheated steam. In this report Dean Goss showed a considerable economy from the use of a locomotive superheater. As an introduction to the work about to be described, the summary of conclusions reached by him is quoted from the report, as follows:

"*A Summary of Significant Conclusions.*—The substitution of superheated for saturated steam under conditions where the power to be developed is fixed will permit:

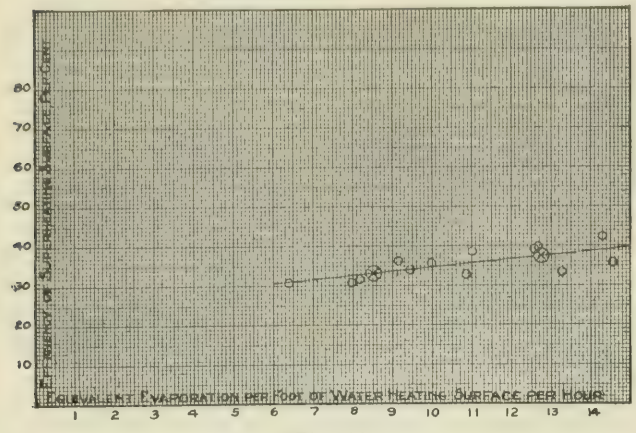


Fig. 11.

"1. The use of comparatively low steam pressures, a generally accepted limit being 160 pounds.

"2. A saving of from fifteen to twenty per cent in the amount of water used.

"3. A saving of from ten to fifteen per cent in the amount of coal used while running, or of from eight to twelve per cent in the total fuel supplied.

"4. Assuming the power developed to equal the maximum capacity of the locomotive in each case, the substitution of superheated for saturated steam will permit an increase of from ten to fifteen per cent in the amount of power developed, accompanied by a reduction in total water consumption of not less than five per cent and by no increase in the amount of fuel consumed."

It has seemed desirable to supplement the excellent work leading to these conclusions by further experiments to determine the effect of lower degrees of superheat than those reported, upon the efficiency of the same locomotive.

2. *Equipment.*—The same locomotive, now known as Schenectady No. 3, was used in all the tests. When used with saturated steam the locomotive was in its normal condition, but was equipped with a Cole superheater for the tests made

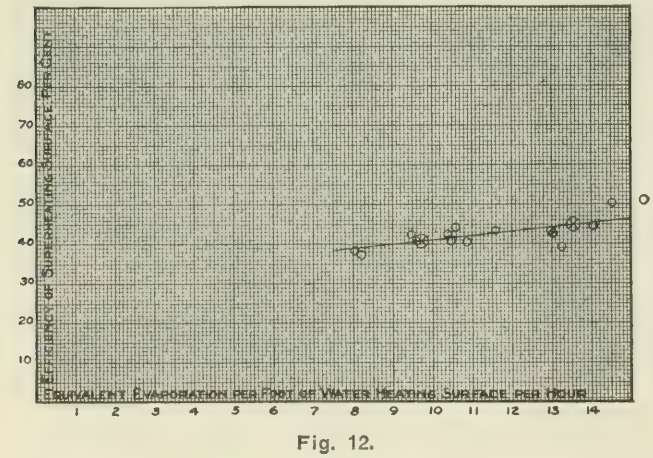


Fig. 12.

on superheated steam. The original superheating surface, as used in the tests reported last year, was 193 square feet (neglecting header). In the experiments described in this report the heating surface in the tubes was reduced by two successive decrements of 42 square feet each, or approximately twenty-two per cent.

The only difference between the superheater as used in the tests reported last year and the one used this year is in the length of the return tubes. Three different lengths of tube have been used in all. The results as reported last year were obtained with the longest tubes and gave the highest degree of superheat. For convenience in referring to these tests, the first superheater has been designated as Cole "A." The second superheater, which had tubes 24 inches shorter than those of Cole "A," has been designated as Cole "B," and the third superheater, which had tubes 48 inches shorter than those of Cole "A," has been designated as Cole "C." The reduction in area in changing from superheater Cole "A" to Cole "B" was accomplished by the cutting off of 24 inches from each return tube. The same reduction was made in changing from Cole "B" to Cole "C." Each change amounted to a reduction of 42 square feet of heating surface. In the work as reported last year, the area of the headers was not included in the superheating surface, as it was thought that the headers would be of little value as heating surface. But after the first reduction in superheating surface had been made, the superheat did not increase in proportion to the decrease in tube surface, thus showing that the headers were doing effective work as heating surface. For this reason, in all the calculations the surface of the headers, amounting to 37 square feet, has been included in the superheating surface for both superheaters, Cole "B" and Cole "C."

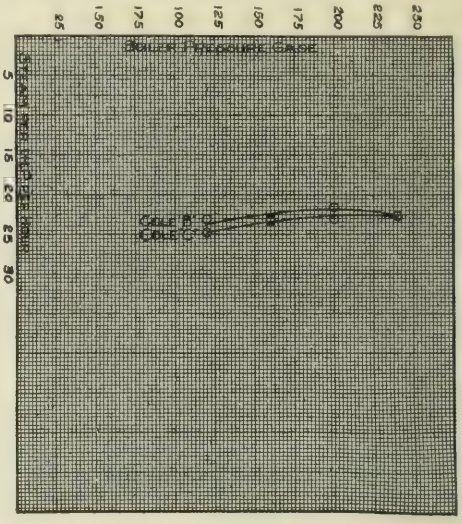


Fig. 17.

The characteristics of the boiler as affected by the change in superheater to Cole "B" are as follows:

Outside diameter of superheater tubes (inches)	1¼
Number of loops	32
Average length of pipe per loop	13.27
Total superheating surface, based on outside surface of tubes, including surface of headers (square feet)	188
Total water heating and superheating surface of boiler (square feet)	1,211

The characteristics of the boiler as affected by the change in superheater to Cole "C" are as follows:

Average length of pipe, per loop	9.27
Total superheating surface, based on outside surface of tubes, including surface of headers (square feet)	146
Total water heating and superheating surface of boiler (square feet)	1,169

II. TESTS WITH SUPERHEATERS COLE "B" AND COLE "C."

3. Following the method primarily adopted, the tests with superheaters Cole "B" and Cole "C" were run at 240, 200, 160 and 120 pounds pressure. Since the performance of the locomotive used in these tests had been well defined under different speeds, pressures and cut-offs, with saturated and with superheated steam, and since the object of this series was to afford a comparison of the efficiencies of the locomotive using different degrees of superheat, it was deemed sufficient to use speeds and cut-offs which had been previously shown to represent the average performance of the locomotive. The speed was thirty miles per hour, except in the case of two tests, where speeds of twenty and forty miles per hour were used.

7. *The Ratio of Heat Absorbed per Square Foot of Super-*

heating Surface to that Absorbed per Square Foot of Water-Heating Surface.—If the efficiency of the superheating surface be expressed as a ratio of heat transmitted through it to the heat transmitted through the water-heating surface of the boiler, or as a ratio of the equivalent evaporations per square foot, and this ratio be plotted for each test against the corresponding equivalent evaporation per square foot of water-heating surface per hour, the diagrams shown in Figs. 11 and 12 will be obtained. Since these represent tests at all pressures it is seen that the efficiency of the superheating surface is increased with increase in the rate of evaporation; also that in all cases the superheating surface of Cole "C" was more efficient than that of Cole "B" by approximately six per cent.

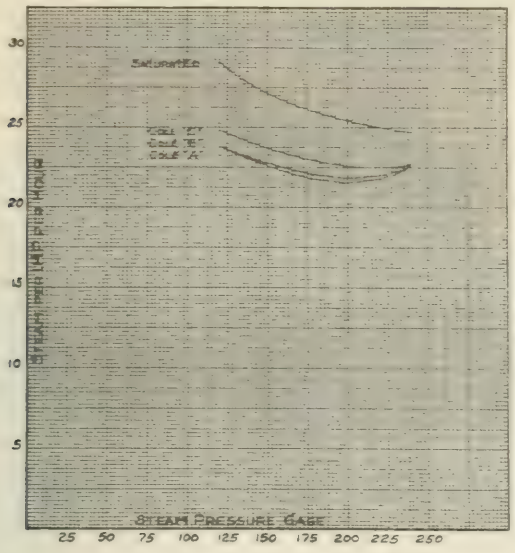


Fig. 18.

8. *Smoke-box Temperatures.*—For both superheaters the smoke box temperature increases with increase in rate of evaporation. The temperature is practically the same for both superheaters at the lower rates of evaporation, but with the higher rates of evaporation the smoke-box temperature is somewhat higher with Cole "C" than with Cole "B."

9. *Draft.*—The draft is measured directly in front of the diaphram. It is not materially affected by the change in superheater.

10. *Steam Consumption Under Different Pressures.*—The points showing average steam consumption at different pressures, Fig. 17, were obtained by averaging the steam consumption for the tests at each pressure, and drawing a smooth curve to include as nearly as possible these average points. The second-notch test, at 160 pounds pressure, which represents very low power and very high steam consumption, was omitted. The general form of the curves is that of the corresponding curves obtained with saturated steam and superheater Cole "A" in the report of Dean Goss. The water rate at the high pressure of 240 pounds is seen to be practically the same for both superheaters, the smaller superheater, Cole "C," showing a higher steam consumption than Cole "B" as the pressure is reduced, until at a boiler pressure of 120 pounds Cole "C" gives a water rate approximately four per cent higher than Cole "B."

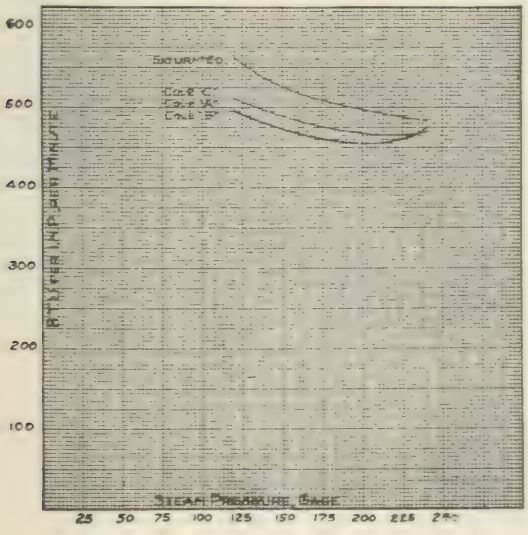


Fig. 19.

11. *Coal Consumption Based Upon Derived Performances of the Locomotive.*—In order to eliminate irregularities in the coal consumption as obtained from individual tests, the coal consumption was derived for each pressure from the average performance of the locomotive. The results are shown in Table II for both superheaters, and include values for every 20-pound difference in pressure from 240 pounds to 120 pounds.

The method of obtaining these results is as follows:

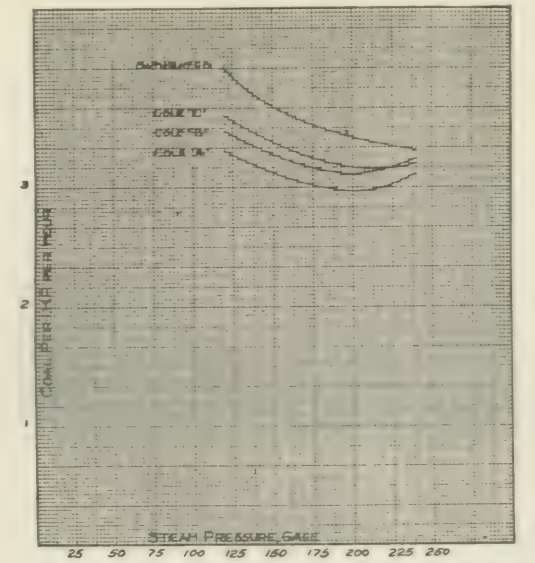


Fig. 20.

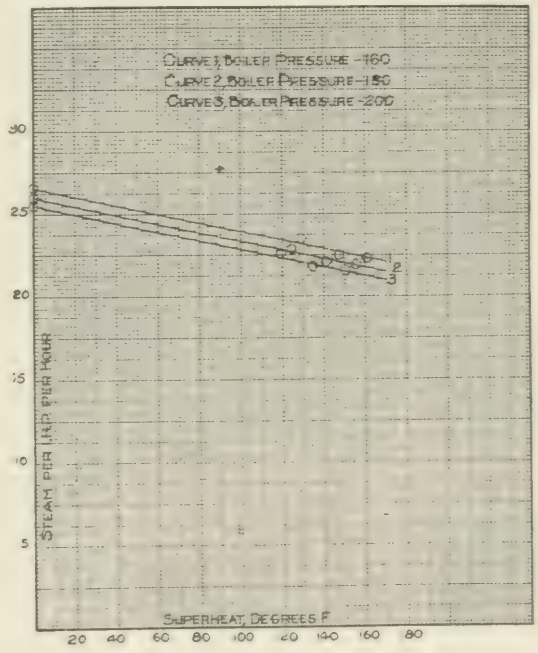


Fig. 21.

Column 3, which gives the degrees of superheating, was obtained from the equation,

$$T = 154 - .309\ P + 3.71\ H$$

for superheater Cole "B," and

$$T = 125.3 - .238\ P + 3.79\ H$$

for superheater Cole "C," in which P is the boiler pressure

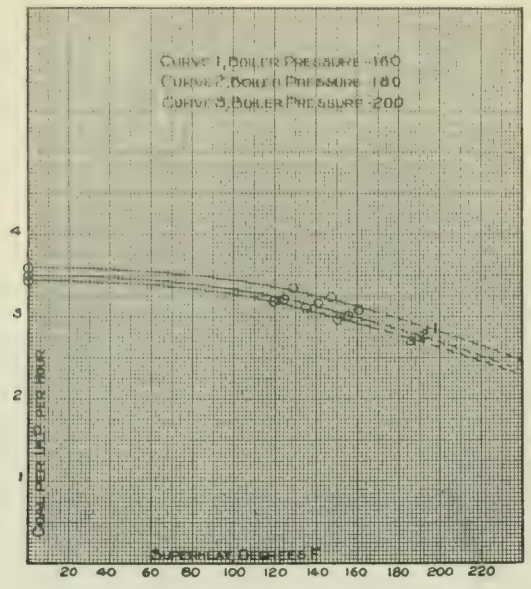


Fig. 22.

by gauge, column 2 and H is the rate of evaporation. In the calculations of column 3, value of H is taken as 11, this being the rate of evaporation necessary to deliver approximately 440 horse-power. This represents a fair value of the performance of the engine and is the one adopted in the work reported last year.

Column 4, which gives pounds of steam per indicated horse-power per hour, is obtained directly from the curves of Fig. 17.

Table II.

Locomotive Performance Under Different Pressures.

Superheater.	Boiler Pressure, Gage.	Superheating. Degrees F. from Equation.	Pounds of Steam per Indicated Horse-power Hour. Values from Curve.	B. T. U. per Pound of Steam. Feed 60 Degrees F. and Superheat from Equation.	Equivalent Pounds of Steam per Indicated Horse-power Hour	B. T. U. per Indicated Horse-power per Minute.	Equivalent Pounds of Steam per Pound of Dry Coal.	Pounds of Coal per Indicated Horse-power Hour.
1	2	3	4	5	6	7	8	9
Cole "B"...	240	120 6	22.6	1245.2	29.03	469.3	8.950	3.244
Cole "B"...	220	126 8	22.1	1247.1	28.43	459.8	9.002	3 158
Cole "B"...	200	133 0	21.8	1247.9	28.06	453.8	9.034	3.106
Cole "B"...	180	139.2	22.1	1248 5	28.46	460.3	8.999	3.163
Cole "B"...	160	145.4	22.5	1248.7	28.98	468.7	8.954	3.237
Cole "B"...	140	151 5	23.0	1248.6	29.62	479.1	8.899	3.329
Cole "B"...	120	157.7	23 8	1248.1	30 64	495.6	8.810	3.478
Cole "C".	240	109.9	22.7	1240 7	29.03	469 5	9.082	3.197
Cole "C"...	220	114 6	22.5	1240.8	28.78	465.5	9 111	3.159
Cole "C"...	200	119.4	22.6	1240.9	28.90	467.5	9.096	3.177
Cole "C"...	180	124.2	22.8	1240.8	29.16	471.6	9.067	3.216
Cole "C"...	160	128 9	23.5	1240.3	30.04	485.9	8.968	3.350
Cole "C"...	140	133 7	24.0	1239.7	30.67	496.1	8.896	3.448
Cole "C"...	120	138 4	24 8	1238.4	31.66	512 1	8 785	3 604

Column 5, which gives the B. T. U. per pound of steam, assuming a feed-water temperature of 60° F. and a superheat as given in column 3, is obtained directly from the steam tables.*

Column 6, which gives equivalent pounds of steam per indicated horse-power per hour, is the product of column 4 and column 5 divided by 970.4 (latent heat of steam at 212° F.).

Column 7, which gives B. T. U. per indicated horse-power

*In this connection it may also be noted that throughout the work of calculation Mark's and Davis' "Tables and Diagrams of the Thermal Properties of Saturated and Superheated Steam" were used.

Table III.

Summary of Observed and Calculated Data.

Designation of Tests. Number.	Laboratory Symbol.	Speed, Miles per Hour	Dry Coal per Square Foot of Grate Surface per Hour, Pounds.	Smoke-box Temperature, Degrees F	Superheating, Degrees F.	Equivalent Evaporation per Square Foot of Heating Surface per Hour, Pounds.	Equivalent Evaporation per Pound of Dry Coal, in Boiler and Superheater.	Cut-off, per Cent of Stroke.	Mean Effective Pressure, Pounds per Square Inch.	Indicated Horse-power.	Pounds of Steam per Indicated Horse-power Hour.	Pounds of Coal per Indicated Horse-power Hour.	Draw-bar Pull, Pounds.	Draw-bar Horse-power.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SUPERHEATER COLE "B."														
1	30-2-240.....	30.0	75 0	746	117	9.73	9.24	15.92	54.31	385.3	23.51	3.31	3541	283.0
2	30-4-240.....	30.4	100 5	787	119	11.90	8.44	21.03	66.81	480.4	22.54	3.55	4786	387.7
3	30-5-240.....	29.8	105 9	823	126	13.11	8.81	24.01	77.50	546.7	21.85	3.29	5731	463.7
4	30-2-200.....	30.0	54.6	678	116	7.31	9.54	14.03	42.42	301.0	22.75	3.08	2278	182.0
5	30-4-200	30.0	70.0	751	126	8.47	8.61	19.85	53.55	380.7	20.59	3.13	3859	309.0
6	30-6-200.....	30.0	92 3	792	148	11.38	8.78	26.56	68.22	484.5	21.29	3.24	4989	399.0
7	30-2-160.....	30 1	41 0	630	115	5.71	9.91	13.09	27.03	192.5	27.94	3.62	1548	124.1
8	30-4-160.....	30.1	51.7	672	116	7.12	9.81	18.63	39.08	278.3	23.77	3.16	2665	213.8
9	30-6-160.....	30.1	68.9	713	136	9.00	9.30	25.15	48.79	347.1	23.71	3.38	3750	300.4
10	30-8-160.....	30.1	94.2	775	152	11.49	8.70	34.62	68.01	484.0	21.80	3.31	4485	359.4
11	30-8-120.....	29.4	56.9	683	140	8.23	10.30	34.00	48.40	336.4	23.06	2.87	3220	251.9
12	30-10-120.....	30.1	75.2	728	156	9.96	9.43	41.99	55.86	398.5	23.30	3.21	4239	340.3
13	30-14-120.....	30.3	114.8	822	168	13.02	8.08	56 86	73.07	523.1	23.04	3.73	5653	456.0
SUPERHEATER COLE "C."														
14	30-2-240.....	29.9	74.4	749	108	10.07	9.30	16.17	50.78	359.1	24.00	3.52	3427	273.1
15	30-4-240.....	30.0	97 6	832	120	12.10	8.52	22.26	66.92	474.3	22.01	3.50	4756	379.8
16	30-5-240.....	30.1	106.7	944	126	13.06	8.42	24.73	72.71	517.1	22.02	3.51	5526	442.7
17	30-2-200.....	30.2	50.1	693	102	7.56	10.39	14.73	37.95	271.3	24.19	3.17	2457	197.8
18	30-4-200.....	30.1	69.5	751	113	9.71	9.60	19.50	51.76	368.1	22.48	3.21	3650	292.3
19	30-6-200	30.0	96.7	809	122	12.25	8.71	27.37	67.36	478.7	22.33	3.43	4882	390.7
20	20-8-160.....	20.0	71.2	775	130	9 86	9.52	32.80	73.71	348.8	24.52	3.48	4759	306.9
21	30-4-160.....	30.0	52.7	675	110	7.43	9.69	19.42	37.58	268.6	24.00	3.34	2576	206.7
22	30-6-160.....	30.1	70.1	750	124	9.65	9.47	25.74	50.72	361.7	23.23	3.30	3676	295.1
23	30-8-160.....	30.1	91.0	799	129	12.06	9.11	34.15	63.87	456.3	22.96	3.39	4879	391.8
24	40-8-160.....	40.4	116.2	833	149	13.62	8.05	33.71	54.83	523.9	22.70	3.77	3979	428.1
25	30-8-120.....	30.2	62.8	716	127	8.78	9.62	32.20	43.03	307.2	24.97	3.47	3218	258.6
26	30-10-120.....	30.0	81.7	745	138	10.77	9.07	42.39	55.05	391.0	24.35	3.55	4181	334.3
27	30-14-120.....	30.2	121.7	820	153	14.37	8.12	57.19	71.36	509.5	25.05	4.06	5693	457.6

per minute, is the product of column 4 and column 5 divided by 60.

Column 8, which gives equivalent pounds of steam per pound of dry coal is obtained as follows: Assuming an average load for the locomotive of 440 indicated horse-power to be delivered under all pressures, the corresponding rate of evaporation per square foot of heating surface equals 440 multiplied by column 6 and divided by the total water and superheating surface, which equals 1,211 for Cole "B" and 1,169 for Cole "C."

This rate of evaporation per square foot of heating surface was then substituted in the following equations:

$$E = 11.461 - .238\ H$$

for Cole "B," and

$$E = 12.36 - .300\ H$$

for Cole "C," and the value of E as given in column 8 was obtained.

Column 9, which gives pounds of coal per indicated horse-power per hour, equals column 6 divided by column 8.

12. *Corrected Results of Individual Tests.*—The results of the individual tests as shown in Table III have been corrected to eliminate individual irregularities, the corrected results being shown in Table IV.

Column 16, which gives equivalent steam supplied to engine per hour, equals pounds of steam supplied to engine per hour from original log multiplied by [(B. T. U. taken up by each pound of steam in boiler and superheated minus (60 minus feed water temperature)], divided by 970.4 (latent heat of evaporation).

Column 17, which gives equivalent evaporation per pound of dry coal, is obtained for superheater Cole "B" by substituting for H, column 16, divided by 1,211 in the equation,

$$E = 11.461 - .238\ H,$$

and for superheater Cole "C" by substituting for H, column 16 divided by 1,169, in the equation,

$$E = 12.36 - .300\ H.$$

Column 18, which gives dry coal per hour, is obtained by dividing column 16 by olumn 17.

Column 19, which gives dry coal per indicated horse-power per hour, is obtained by dividing column 18 by column 11 in Table III.

Column 20, which gives equivalent steam per indicated horse-power per hour, is obtained by dividing column 16 by column 11 in Table III.

Column 21, which gives the machine friction in pounds of mean effective pressure, is taken from the 1909 report by Dean Goss, volume 43, page 158.

Column 22, which gives the machine friction in horse-power, is obtained by using the values of M. E. P. of column 21 and the speed in revolutions per minute of the individual test, together with the indicated horse-power constant of the locomotive.

Column 23, which gives the machine friction in per cent of indicated horse-power, is obtained by dividing column 22 by column 11 and multiplying by 100.

Column 24, which gives dynamometer horse-power, is obtained by substracting column 22 from column 11 in Table III.

Column 25, which gives the draw-bar pull, is obtained by dividing column 24 by (.000547 multiplied by the revolutions per minute), in which .000547 is the tractive horse-power constant of the locomotive.

Column 26, which gives the coal per dynamometer horse-power hour, equals column 18 divided by column 24.

Column 27, which gives steam per dynamometer horse-power per hour, is obtained by dividing column 16 by column 24.

III. A Comparison Of Results Obtained With Saturated And With Three Different Degrees Of Superheated Steam.

13. *The Basis of Comparison.*—In order to summarize the results which have been obtained from the superheater tests up to and including the tests upon the third superheater, Cole "C," it is fair to assume that we have a basis upon which to compare these results. Dean Goss, in his report before the 1909 convention of this Association, pointed out that it was logical to compare the tests upon the locomotive using satu-

Table IV.

Comparative Performance of Locomotive, Assuming Irregularities in Results of Individual Tests to Have been Eliminated.

Designation of Tests.		CORRECTED LOCOMOTIVE PERFORMANCE.											
							Machine Friction.						
Number.	Laboratory Symbol.	Equivalent Steam to Engine per Hour, Feed-water at 60 Degrees F.	Equivalent Evaporation per Pound of Dry Coal by Equations.	Dry Coal Fired per Hour, Corrected by Equations.	Dry Coal per Indicated Horse-power per Hour.	Equivalent Steam per Indicated Horse-power per Hour.	M. E. P.	Horse-power.	Per Cent Indicated Horse-power.	Dynamometer Horse-power.	Draw-bar Pull.	Coal per Dynamometer Horse-power per Hour.	Steam per Dynamometer Horse-power per Hour.
1	2	16	17	18	19	20	21	22	23	24	25	26	27
	SUPERHEATER COLE "B."												
1	30-2-240.....	11606	9.177	1266	3.29	30.15	6.5	46.1	11.97	339.2	4244	3.73	34.25
2	30-4-240.....	13885	8.728	1592	3.31	28.93	8.5	61.1	12.73	419.3	5176	3.80	33.15
3	30-5-240.....	15390	8.433	1826	3.34	28.27	8.9	62.8	11.49	483.9	6089	3.77	31.83
4	30-2-200.....	8735	9.742	898	2.98	29.05	6.5	46.1	15.32	254.9	3190	3.52	34.30
5	30-4-200.....	10047	9.484	1060	2.78	26.41	8.5	60.4	15.87	320.3	4000	3.31	31.40
6	30-6-200.....	13336	8.837	1510	3.12	27.55	9.3	66.1	13.63	418.4	5232	3.61	31.90
7	30-2-160.....	6818	10.119	675	3.51	35.47	6.5	46.3	24.04	146.2	1823	4.62	46.70
8	30-4-160.....	8415	9.807	858	3.08	30.24	8.5	60.6	21.76	217.7	2714	3.94	38.65
9	30-6-160.....	10541	9.387	1124	3.24	30.39	9.3	66.2	19.06	280.9	3508	4.00	37.55
10	30-8-160.....	13603	8.784	1550	3.20	28.13	8.4	59.8	12.35	424.2	5293	3.65	32.09
11	30-8-120.....	9902	9.512	1042	3.10	29.46	8.4	58.4	17.35	278.0	3553	3.75	35.65
12	30-10-120.....	11921	9.115	1309	3.28	29.94	6.9	49.2	12.35	349.3	4349	3.75	34.15
13	30-14-120.....	15541	8.403	1851	3.54	29.76	3.0	21.5	4.11	501.6	6218	3.69	31.01
	SUPERHEATER COLE "C."												
14	30-2-240.....	11010	9.534	1155	3.22	30.66	6.5	46.0	12.81	313.1	3929	3.69	35.16
15	30-4-240.....	13402	8.920	1502	3.17	28.26	8.5	60.3	12.71	414.0	5184	3.63	32.37
16	30-5-240.....	14646	8.601	1703	3.29	28.32	8.9	63.3	12.24	453.8	6346	3.75	32.28
17	30-2-200.....	8334	10.221	815	3.00	30.71	6.5	46.5	17.13	224.8	2792	3.62	37.06
18	30-4-200.....	10558	9.651	1094	2.97	28.68	8.5	60.5	16.42	307.6	3841	3.55	34.31
19	30-6-200.....	13681	8.849	1546	3.23	28.58	9.3	66.1	13.81	412.6	5156	3.75	33.16
20	20-8-160.....	10938	9.553	1145	3.28	31.37	8.4	39.8	11.40	309.0	5799	3.70	35.40
21	30-4-160.....	8176	10.262	797	2.97	30.44	8.5	60.4	22.49	208.2	2601	3.83	39.28
22	30-6-160.....	10722	9.609	1116	3.09	29.64	9.3	66.3	18.33	295.4	3679	3.78	36.29
23	30-8-160.....	13392	8.923	1501	3.29	29.35	8.4	59.9	13.13	396.4	4937	3.79	33.79
24	40-8-160.....	15321	8.428	1818	3.47	29.25	8.4	80.3	15.32	443.6	4124	4.10	34.53
25	30-8-120.....	9748	9.859	989	3.22	31.73	8.4	59.9	19.51	247.3	3078	4.00	39.42
26	30-10-120.....	12107	9.253	1308	3.35	30.97	6.9	49.0	12.53	342.0	4278	3.82	35.40
27	30-14-120.....	16391	8.153	2010	3.94	32.17	3.0	21.4	4.20	488.1	6072	4.12	33.58

rated steam with the tests upon the locomotive using superheated steam as furnished by superheater Cole "A." Since the conditions were precisely the same for the two series of tests which comprise this report as they were for the tests on superheater Cole "A," with the single exception of the amount of superheating surface, and since this report has been worked up along lines parallel to those followed in the above mentioned report, it seems logical that all four series of tests may be compared directly. As has been mentioned before, the steam-table values used in this report differ slightly from those used in the former one, as does also the amount included as superheater surface, but these variations introduce such small differences in the final results that they may be neglected. In the tables and diagrams which follow, all material included under "Saturated Steam" and "Superheater Cole 'A'" has been taken directly and without change from the 1909 report.

Table V.

Steam Per Indicated Horse-Power Per Hour.

Superheater.	Boiler Pressure, Pounds by Gage.	Superheat, Degrees F.	Pounds of Steam per Indicated Horse-power per Hour.	B. T. U. per Indicated Horse-power per Minute.
1	2	3	4	5
Cole "A"	240	139.7	22.6	474
Cole "A"	220	145.0	21.8	459
Cole "A"	200	150.3	21.6	455
Cole "A"	180	155.6	21.9	461
Cole "A"	160	160.8	22.3	468
Cole "A"	140	166.1	22.9	481
Cole "A"	120	171.4	23 8	497
Cole "B"	240	120.6	22.6	469
Cole "B"	220	126.8	22.1	460
Cole "B"	200	133.0	21.8	454
Cole "B"	180	139.2	22.1	460
Cole "B"	160	145.4	22.5	469
Cole "B"	140	151.5	23.0	479
Cole "B"	120	157 7	23.8	496
Cole "C"	240	109 9	22.7	469
Cole "C"	220	114 6	22.5	465
Cole "C"	200	119 4	22.6	467
Cole "C"	180	124.2	22.8	472
Cole "C"	160	128.9	23.5	486
Cole "C"	140	133 7	24.0	496
Cole "C"	120	138.4	24.8	512
None	240	0	24.7	483
None	220	0	25.1	491
None	200	0	25.5	498
None	180	0	26.0	507
None	160	0	26.6	517
None	140	0	27.7	537
None	120	0	29 1	563

14. *Comparison of Engine Performances.*—The steam consumption of the locomotive operating upon saturated steam and the three different degrees of superheated steam represented by Cole "A," "B" and "C," are shown graphically in Fig. 18, the numerical values being given in Table V. From an inspection of these curves, it is seen that the tests with all three superheaters gave a lower water consumption than with the saturated locomotive. The largest superheater, that known as Cole "A," which gave the highest degree of superheat, shows the lowest water consumption.

Table VI.

Coal Consumption Under Different Pressures.

Boiler Pressure, Pounds Gage.	Pounds of Coal per Indicated Horse-power per Hour.			
	Saturated Steam.	Superheater Cole "A."	Superheater Cole "B."	Superheater Cole "C."
1	2	3	4	5
240	3.31	3.12	3 24	3.20
220	3.37	3.00	3 16	3.16
200	3.43	2.97	3.11	3.18
180	3.50	3.01	3.16	3.22
160	3.59	3.08	3 24	3.35
140	3.77	3.17	3.33	3.45
120	4.00	3 31	3 48	3.60

The curves showing the relation between the B. T. U. per I. H. P. per minute for the different conditions of test are given in Fig. 19. These curves serve to emphasize the results as shown by Fig. 18, with the exception that for some unknown reason the results from superheaters "A" and "B" fall practically upon the same line.

The relation in coal consumed per I. H. P. per hour for the three different superheaters and for saturated steam is shown graphically in Fig. 20, the numerical values being given in Table VI. It will be seen from these curves that the pounds of coal per indicated horse-power per hour is less in each case when using the superheater than when not. The results obtained from the use of the largest superheater, Cole "A," show the greatest economy, lines representing results from Cole "B" and "C" lying above those of "A." It will be seen from these curves that the saving in coal is very small at the 240-pound pressure. For some unexplained reason, lines "B" and "C" cross at about 220 pounds.

The consumption of water per indicated horse-power as affected by the degree of superheat is well shown in Fig. 21, in which the pounds of steam per indicated horse-power per hour are plotted against the degrees superheat. The pounds of steam per indicated horse-power per hour were obtained from the curves shown as Fig. 18. It will be seen that the comparisons are made at 160, 180 and 200 pounds steam pressure, these being the pressures that fall in the center of the field of experiment, and for that reason would be more likely to represent correct results. These are also the pressures which represent those in use on the railroads of to-day. While the field of investigation only covers that from 120 to 160 degrees superheat, it will be seen that the relation between the pounds of water per indicated horse-power per hour and the degree of superheat for pressures between 160 and 200 pounds pressure is represented approximately by a straight line. This may be a curve, but the field of experiment is too limited to determine it more accurately.

15. *Coal Consumption.*—The pounds of coal per indicated horse-power per hour, plotted against degree of superheat, is shown as Fig. 22. The pounds of coal per indicated horse-power per hour were obtained from the curve in Fig. 20, and the degree of superheat was obtained in the same manner as shown in Fig. 21.

The same pressures of 160, 180 and 200 were used in this comparison as in the comparison on steam consumption. This relation between the coal per indicated horse-power per hour and the degree of superheat for pressures of 160, 180 and 200 seem to indicate that it would be represented by a curve as shown. In other words, the first 80 or 100 degrees of superheat does not make the same proportional decrease in the coal consumption as does the second 80 or 100 degrees increase. For instance, the coal consumption per indicated horse-power per hour at 180 pounds steam pressure for the locomotive, using saturated steam, was 3.50 pounds, and for 80 degrees of superheat was 3.40 pounds, a gain of efficiency of 2.8 per cent, while the consumption at 160 degrees superheat is 3.00 pounds, a gain of 14.8 per cent, which is five times the saving of the first 80 degrees. Now, if this line indicating a steam pressure of 180 pounds is carried as a smooth curve to 240 degrees superheat as shown, it would indicate a coal consumption of 2.35 pounds, or a saving over the saturated engine of 32.8 per cent.

Practically the same results would be obtained for the curve representing 160 and 200 pounds steam pressure.

16. As a result of comparing the four series of tests, the following general conclusions seem to be justified:

A. When superheated steam is used pressures of more than 200 pounds are uneconomical.

B. Within the limits of superheat observed (about 110° to 180° F.), the steam and coal consumption diminish as the superheat increases.

C. Further experiments with a higher degree of superheat are desirable, in order to determine the economical limit of superheating.

DISCUSSION ON SUPERHEATERS.

Since this paper was prepared and published we have finished another series of tests at the University on a somewhat smaller superheater that gave approximately 80 degrees of superheat. The results show practically three per cent gain in efficiency. We hope to have a new superheater for our locomotive that will give 325 degrees of superheat and to report next year the progress of tests on superheaters giving from 300 to 325 degrees of superheat.

H. H. Vaughan (C. P.): We have with us Mr. Hoffman, of the Schmidt Superheating Company of London, England.

While the Schmidt superheater is to a certain extent a specialty, yet Mr. Hoffman has had so much experience in the application of superheaters to locomotives in Europe that I ask that he be given the privilege of the floor.

L. Hoffman: Of all the data furnished by your committee, the figures given with relation to the saving in coal obtained by the various superheaters will probably be of the most interest to you. With the exception of a few railways, which have used superheaters for very low degrees of superheat all railways report a pronounced saving of coal, amounting to about 20 per cent on the average for simple engines.

Only one railway, the Atchison, Topeka and Santa Fe, has made experiments with the application of superheaters to compound locomotives. The coal saving in their case is stated to have been more than 30 per cent. This is, of course, an exceptionally high figure, especially if the moderate degree of superheat obtained with this particular type of superheater is taken into account. I believe the superheat amounted to only 20 or 30 degrees on the high-pressure side and to about 100 degrees Fahr. on the low-pressure side. In European practice, using superheaters which superheat the steam to more than 200 degrees, the best coal economy so far obtained by the application of a high degree of superheat to compound engines has been between 15 and 20 per cent. The high figure on coal saving given for the Santa Fe test above referred to is probably owing to the special conditions under which those particular engines were tested and are probably only the result of a test of short duration. In the "*American Engineer and Railroad Journal*" of June, 1910, I find a complete report of the tests with this particular engine and it is stated that the decrease in coal consumption averages *20.8 per cent* for upgrade runs and 11.5 per cent for downgrade runs; this would give an average of about 16 per cent. This would be more within the limits of the coal savings obtained with European compound engines.

I find a further note in the committee's report concerning the application of superheated steam to compound engines, which says: "That the tests on the Santa Fe prove that greater efficiency can be obtained from superheaters giving superheat between the high and low-pressure cylinders, than from superheaters giving superheat to high-pressure cylinders only."

The above note probably refers only to low degree superheaters; in such case the result claimed would be quite natural. Taking for example the steam pressure on the high-pressure side at 220 lbs. per sq. in. and on the low-pressure side at 60 lbs. per sq. in., the temperature of the high-pressure steam would be about 395 degrees, whereas the temperature of the low-pressure steam would only be 307 degrees. A superheater in the case referred to, which is only able to superheat the high-pressure steam 20 degrees, could probably superheat the low-pressure side more than 100 degrees and would therefore be of greater advantage on the low-pressure side. But if a high degree superheater is applied, able to superheat the high-pressure steam, say 200 degrees, then it is better to superheat the high-pressure steam only, in order to get and maintain dry steam in both cylinders, the high-pressure side as well as the low-pressure side, whereas in the arrangement recommended by the Santa Fe the losses through condensation in the high-pressure cylinders are not abolished. Receiver-superheaters have the further disadvantage, that they must provide for a much bigger volume of steam to be superheated than a high-pressure superheater. The steam section in receiver-superheaters must therefore be much bigger, or else wire drawing of the steam in the receiver takes place. These are the principal reasons why, in about 500 compound locomotives equipped with the Schmidt superheater in Europe, only the high-pressure steam is superheated.

Regarding the degree of superheat, our committee did not make any recommendations. In this connection I refer you to figure 22 of the paper on "Locomotive Performances Under Different Degrees of Superheated Steam," showing the amounts of coal used per horse power hour for different degrees of superheat. These curves show clearly that the steam and coal consumption diminishes as the superheat increases, and that there is very little economy obtained with low degrees of superheat, or as Prof. Benjamin puts it in his paper: "The first 80 or 100 degrees of superheat does not make the same proportional decrease in the coal consumption as do the second 80 or 100 degrees increase."

I have here an official report of the Belgian State Railways, a road which has about 400 Schmidt superheaters in service, and which has had experience with Schmidt superheaters extending over 5 or 6 years. It is officially stated that practically no coal saving has been obtained with low degrees of superheat, i. e., with only 60 or 70 degrees. Mr. Schmidt has been advocating high degrees of superheat for the past 20 years; many scientific researches bearing on this question have been made and the same conclusion drawn. There are now nearly 6,000 Schmidt superheater locomotives in service or in course of construction in Europe, all of them using high degrees of superheat. In Europe we have gone through a development similar to that which I believe you are going through now. When superheat on locomotives first came up, many experts believed that it was quite sufficient to get only dry steam in the cylinders. Later on it was believed that the steam would be superheated sufficiently high to remain dry during the cut-off, and now experts are glad if they have still some superheat in the exhaust steam.

Comparatively little heat is required to superheat the steam to a high degree. If we take for instance steam of 200 lbs. pressure, about 1,200 heat-units would be required to generate dry steam of this pressure. Taking the specific heat of superheated steam of 0.6, it would require an additional 30 heat-units to superheat to 50 degrees and 120 heat-units to superheat to 200 degrees. In other words, there is required only about 7 per cent more heat-units to generate highly superheated steam of 580 degrees Fahr. than is required to generate a low degree of superheated steam of only 430 degrees Fahr. Thus the additional heat expended in order to highly superheat the steam does not amount to anything compared with the greater advantage gained by the higher degree of superheat.

The most important point in the whole superheater question is the increase in power obtained by the application of a superheater. This item is not mentioned in the different comparison sheets of the report, but it is touched upon in the final conclusions, which state that "The superheater engine gets its load over the division in far better form and in better time than the non-superheater engine." Giving you a conservative figure obtained in many years' service with thousands of Schmidt superheaters, we can say that the increase in power obtained with a high degree superheater is between 20 and 30 per cent. In other words, one ton of iron in a well-proportioned superheater engine gives 20 per cent more power than a ton of iron in a saturated steam engine. That is the principal reason why superheating has come into so much favor on European roads, and I believe it will prove the principal reason for the general introduction of superheated steam on locomotives in this country.

F. J. Cole: Superheating for locomotives has passed the experimental stage, and from figures contained in this report and other sources it can be demonstrated that the repairs and maintenance of the apparatus are very slightly, if at all, in excess of an engine using saturated steam. Because the demand for steam on the boiler to perform a certain amount of work is less when superheated steam is used, the boiler repairs, especially in combination with the low steam pressure commonly used on superheater engines, will more than offset any slight additional charge for the maintenance of the superheater apparatus.

The conclusions of the committee are of considerable interest, especially the statement that "superheater engines get their load over the division in far better form and in better time than the non-superheater, and are a more snappy machine all around."

While it is a fact that the number of superheater locomotives running in the United States is very small in proportion to the total number, it is interesting to remember that one or two years ago where probably only one engine in a lot would be built with a superheater, it is now a very common thing to build 20 to 25 or more engines in one lot all equipped with superheaters.

The number of different types of superheaters built by the American Locomotive Company in service or under contract is as follows:

Vaughan-Hosey	215
Cole (old)	103
" (new)	130
Schmidt	73
Emerson	5
Special	2
Total	528

One of the most important possibilities of locomotives equipped with superheaters has not received the attention it justly deserves; namely, the increased hauling capacity and the greater efficiency which can be obtained than from locomotives using saturated steam. There is no doubt that this is the most important feature of all, and while great economies in fuel and water are obtained, yet the fact that for a given weight of locomotive having a high factor of adhesion it is possible to make a machine of at least 20 per cent greater hauling power, overshadows all other considerations. This is a fact of obviously more importance than the mere question of economies in coal and water.

Nearly all railways are confronted with the problem of

hauling the greatest possible tonnage within certain narrow limitations of weight on driving wheels or total weight of locomotive. Any improvement in a locomotive which will increase its power without increasing its weight, is manifestly of vast importance in transportation problems.

The boiler is usually the controlling factor in most locomotives, because the power of a locomotive is largely a question of boiler capacity to furnish steam in sufficient quantities for the cylinders. Superheating by doing the same work with less fuel and water, without the addition of moving parts or any complication to increase the labors of the engineer and fireman, accomplishes the same result as if the boiler capacity was increased. Therefore, for a given amount of fuel burned and water evaporated, a material increase in the capacity or tractive power of any locomotive may be affected, provided the factor of adhesion is sufficiently high.

In designing locomotives for the use of superheated steam, the best results are obtained by lowering the boiler pressure to about 170 lbs., making the cylinder diameters large enough to give an increase of tractive power over similar saturated steam locomotives. It needs no argument to point out the greater advantages which result from increase of power without increase of weight. We have built superheater locomotives for Brazil, the Argentine Republic, the Natal Government in South Africa and for Cuba. We are advocating the use of superheat, running from 175 to 250 degrees.

C. A. Seley: Our main efforts have been directed towards the practical development of the superheater engine as a road machine, and to remedy the troubles incident to carrying out Godfrey Rhodes' idea that "the first principle of railroading was to get the trains in on time." What we want, when we use superheater engines, is to know that the trains come in on time. The Rock Island had six superheater engines, delivered three or four years ago; for some little time that was the largest number of superheaters on any one road in this country, but not to be compared at all with the record of our friend, Mr. Vaughan across the line.

The first two years of operation of these engines were years of experiment, trying to keep them in service without the loss of time. It finally required quite a little modification and change to do this, which has resulted in a performance which I believe is now very satisfactory. We are evidencing our faith in the superheater by an additional order for these engines, which are now being built.

J. A. Talty: I was connected with a road at one time that had a superheater slide-valve engine and a superheater piston-valve engine. I fully agree with the report of the committee in that the engines were a little more snappy—the slide-valve engine was so snappy that if you went to change the cut-off it was liable to snap you out through the window. We experienced all kinds of trouble in getting a constant supply of lubricant to the valves. The only way in which we were able to lubricate the slide-valve engine was by using a long cut-off and a light throttle, but with a heavy throttle and an economical cut-off the locomotive would only run a very short distance before the valves would get very dry and cut; in fact, it was necessary to face the valves on the locomotive every trip or two. With the piston-valve engine we did not experience as much trouble in obtaining satisfactory lubrication, and in pulling the trains over the road the locomotive would attain a higher rate of speed with a low pressure, perhaps 150 to 160 lbs., than a saturated steam engine. In heavy passenger service, that is, where the time is keyed up good and tight, and the engineer must run right up against the locomotive, there is trouble in obtaining constant lubrication.

H. H. Vaughan (C. P.): The committee's report on the coal-saving on the Canadian Pacific is a little bit mixed. It gives 42 per cent in one case and 3 per cent in another. These figures are widely varying. I understand that they have been obtained by following two engines. I have always objected to following an individual engine. I do not think our coal records are kept with sufficient accuracy to make comparisons between two engines of any value, so I had the figures compiled for a number of engines, some of which had been converted from 10-wheel passenger engines which were originally built as simples. These engines have been running in and out lately on two divisions, and without any change whatever except with the addition of the superheater, which gives us a temperature from about 530 to 550 degrees. On our Quebec section the non-superheater engines used 2,500 tons of coal during the period for which the records were taken, and the superheater engines took 2,000 tons, so that it was a fairly good test, as it extended over three or four months. The saving in fuel was 15.5 per cent for the superheater over the non-superheater. On another section, involving rather less coal, the saving was 33 per cent. I consider that excessive, and possibly due to the engines on that section having been through the shop later, or something of the sort. I see very little reason for questioning the figures we have got, and believe that you can depend on a saving of 10 to 15 per cent in freight service and 15 to 20 per cent in passenger service, by the use of superheater locomotives.

In the use of superheaters in Europe, they reach temperatures up to 600 degrees and over. We are using temperatures of 520 to 580 degrees, what would be known in Europe as moderate superheat. If you want to get any real benefit from superheaters you must go to a reasonably high temperature. I would like to see all of our engines give a superheat of 550 degrees and, if possible, a little more. When you go up to that temperature you get the real benefits from superheating. When you use 40 degrees, 50 degrees or 60 degrees of superheat you get a little better working engine, but you have not really got into the superheating business at all and are simply playing with it. You might as well get into the business and use a reasonable amount of superheat and get the results that are obtained from the use of a moderate or high degree of superheat on locomotives.

The statement has frequently gone out in newspapers and pamphlets to the effect that high superheating—and I believe these statements refer to what I call moderate superheating—involves a number of new processes in the locomotive, and increased cost of repairs, etc. According to our experience these statements are absolutely wrong. We have put superheaters on ordinary simple piston valve engines without any change whatever other than the putting of the superheater into the boiler, and we really find no difference in the maintenance of the engine, with one exception, and that is the renewal of the piston rings. We have to replace piston rings more frequently on the superheaters than on non-superheating engines. The difference is especially noticeable in bad water districts, where there is considerable foaming. Both the piston and the valve rings wear out more quickly under these conditions on superheaters than on non-superheaters. We get from a month to six weeks' service out of the rings in very bad water districts, while they average from two to three months in good water districts, and they run as high as twelve to fourteen months. I am of the opinion that the ring question is largely a question of material, and you can get from three to six months' service in ordinary water from piston rings in superheated locomotives.

The valve rings, which gave trouble on superheater locomotives, did not give trouble in good water districts. We run our valve bushings, as a rule, through two shoppings, and the rings are frequently run from shopping to shopping without attention. In other words, there is very little difference between the valve rings on superheaters and the valve rings on non-superheater locomotives.

We are unable to furnish figures as to the actual cost of repairs, for the reason that we have no simple engines with which to compare our superheaters. Based upon the size of the engine, or the tractive power, the cost of repairs of the superheater engine has been decidedly lower than the cost of repairs of simple engines. I have always felt that that result was due to the superheater being applied to locomotives of more modern type, and, of course, newer engines than the saturated steam-engines, and consequently the figures were not reliable. I have, however, the cost figures for several months for these 10-wheel passenger engines equipped with the superheaters, and the cost for repairing superheater engines was only 3.47 cents a mile, and the non-superheater engines were 3.5 cents, so that the cost was practically identical.

That substantiates what we have always felt, and that is while there is a slight additional expense for the maintenance of superheater locomotives on account of piston rings, there is a slight gain from the fact that you are always working dry steam, and these two things offset each other to a large extent. The only real additional expense in superheaters is a periodical testing of the front end. Our regulations call for a testing every three months to see that everything in the front end is tight. I do not know that it is entirely fair to call that an additional expense, because I do not think it is a bad thing to test the front end of the locomotive, whether it has a superheater or not. It is simply taking a proper precaution instead of waiting for failure. Before we adopted this method of testing we used to run through the summer months very successfully, but when the hard winter weather came on we had complaints of the engine being short of steam. We usually found the steam pipe leaking, or something of that sort. By making a periodic test in a systematic manner you overcome that condition, and keep the engines in good condition right along. I believe there is money in doing this. Another expense is keeping the tubes clean. We clean out the fire tubes every round trip, and, as far as I know, that is carried out religiously. It is only a half-hour's work for a man, a cheap class of labor, and it is not a very great expense.

As far as lubrication is concerned, we notice very little difference in using sight-feed lubrication, between the superheater and the non-superheater. We do not use slide valves on superheaters. It has been tried many times, and in every case it is found to give trouble. You have practically got to put up with piston valves if you go to the superheater locomotive, and I do not know that there is very much objection to using piston valves.

I have had the mileage made by superheater locomotives in passenger service on the Canadian Pacific, Eastern lines, recorded for March and April. There were 790,000 miles made in the passenger service, and there was not a failure due to superheaters. That is a pretty good proof that there is no need for failures due to superheaters, if you will keep after them. Last year I gave figures that showed that we made over two million miles, and that there was no failure due to a superheater, that is, a passenger failure due to superheater itself.

It is a certain amount of satisfaction to me to feel that when we went into this business first we were criticised for putting so much apparatus in the front end. During the past few years everybody's opinion seems to have changed on that, and there seems to be no objection to putting in two or three front ends and filling them with apparatus. We have used the intermediate superheater, by which I mean a boiler with an evaporating section at the back, the superheater in the middle. I won't say a feed water heater, but a front section into which the water is delivered. That engine was originally built as a reheater engine; in other words, the superheater was put in between the high and low pressure cylinders. We subsequently changed it over and put the superheater ahead of the high pressure cylinder. With the superheater acting as a reheater, we were getting ninety degrees superheat in the low pressure steam chests. With the superheater ahead of the high pressure, we obtained from 480 to 580 degrees in the high pressure steam chest; that is, a superheat of 100 to 200 degrees, varying, I think, according to the amount of water that was lifted by the engine, but we obtained very fairly uniformly 30 degrees of superheat in the low pressure steam chest. We didn't make any test on the two engines with the two arrangements. Our opinion was that it simply was not necessary. You could tell by the engine, by the fireman, that there was no comparison between the compound engine using the superheater ahead of the high pressure cylinder and one using no superheat in the high and superheat in the low. It made a different engine out of it. We shall not worry very much about experimenting with reheating. If you can run with 100 to 150 degrees of superheat on a high pressure cylinder, you are fairly safe in knowing that you are going to have a certain amount of superheat in the low pressure steam chest, and that there will be sufficient there to entirely avoid any water troubles in the low pressure cylinder. I feel that if we put in so much of a superheater that we get more superheat than we want in the high pressure steam chest, there is no advantage in going to reheating. We had better put all our heating surface where it does the most good.

I would like to ask Mr. Cole where he has proven that lowering the steam chest pressure is an advantage. I can see that lowering the boiler pressure is an advantage, if the boiler pressure is so high that you are having an abnormal amount of trouble with the boilers. We are running engines with two boiler pressures. In other words, we build a 21-in. engine with 200 lbs. pressure, and a 22½-in. engine with 175 lbs. pressure. We really set the pops at 180 on the lower pressure engine, to avoid the objection made by the engineers that they couldn't get the work out of the 175 lb. engine that they did out of the 200 lb. As a matter of fact, I think there was nothing to that, but their idea was that the more pressure they had, the more business they could do, it didn't make any difference what the size of the cylinder was. In order to avoid criticism, we gave the other engine 5 lbs. more so that she could pull just a little more. I watched those engines very carefully, and I do not see either theoretically or practically, any advantage whatever in reducing the boiler pressure unless you want to do it to save the boilers. In good water districts we certainly do not have trouble enough with the 200 lbs. pressure to make it any serious advantage to go to 180. In bad water districts we do notice a difference and we arrange to use engines with 175 or 180 lbs. pressure, but where you have reasonably good water, I fail to see any advantage whatever in reducing boiler pressures. I grant you that with superheated steam, you can reduce boiler pressures without losing efficiency, a thing that you could not do if you were using saturated steam; but I do not see any reason for obtaining greater efficiency, and I do feel most distinctly that the lower pressure engines, with bigger cylinders, are not as fast or as good as engines with the high pressure. I do not believe there is any difference in the pressure at the nozzle on either engine, and with the big cylinder you lose a greater percentage due to back pressure.

We have not built our passenger engines with 180 lbs. pressure, simply because we felt that a 200 lbs. engine was a faster and a better one. I have heard the statement made a number of times that you can obtain greater economy by reducing the boiler pressure, and I would like to know how it has been proved out, and why it is.

James Christopher (T. H. & B.): Does Mr. Vaughan have to bore out the cylinders more frequently with the superheater than with the simple engine? Is he enabled to run a larger nozzle tip with the superheater than with the simple engine?

Mr. Vaughan: We use bushings on all our cylinders, and we have not noticed extra wear on the bushing as much as we have on the rings. I really haven't any figures to show whether we do bore out more often or not. We use a smaller nozzle tip with the superheater. At least, that is our general experience. If you are using less steam you generally require a smaller nozzle, but the engine will run more freely.

We have plenty of evidence to support Mr. Hoffmann's view that you can obtain additional capacity out of a superheater. The same engine changed from a saturated steam engine to a superheated steam engine will take, say, one car more in six, or one car more in seven, without any question, and make the same time. There is no question whatever but that the engine will run more freely, run faster, and run faster with a smaller nozzle. We have found it necessary to cut the nozzles down some for superheater locomotives. I put that down to the fact that, in spite of everything that has been said, the question of draft is nothing but the number of pounds of steam at the nozzle. It is a question of steam and pressure. You have to have a certain pressure of steam at the nozzle to get a sufficient draft; if you are going to get that pressure with a smaller quantity of steam, you have got to contract the nozzle so as to hold it in enough to get the pressure.

Prof. Endsley: All the tests run at Purdue were run upon a slide valve engine. We ran a wide open valve, 240 lbs. pressure. We were all around the engine and could tell if a valve was sticking; we did use a considerably larger quantity of oil to keep the valves from sticking with the superheater than with the non-superheater, but have never cut a valve, and the engine has run some 15,000 miles with the superheat varying from 120 to 140. We had to decrease the size of the nozzle from 4¼ to 3⅞ in. in order to get the engine to steam. It is a 16-in. x 24-in. engine. Our engine is equipped with two valve pipe cups. The one on the right side broke after about a month, and in order to run a test I cut it off entirely and doubled the amount of oil used. Since that time oil has never been put into that side of the cylinder. Looking at the steam chest and at the cylinder from day to day, I find that side just as bright as the other side. We never have had any trouble from the rings, but we find it cheaper in the way of repairs. We have had no trouble with the cylinders or valves, and we use a slide valve engine.

Mr. Vaughan: How much superheat are you using?

Prof. Endsley: Two hundred. From 180 to 210.

Mr. Vaughan: You say, "from 180," but what temperature?

Prof. Endsley: Six hundred.

Mr. Vaughan: As high as that?

Prof. Endsley: Yes. When using 240 lbs. steam pressure the temperature of the steam is over 400 degrees. Adding the superheat of 200 brings this up to over 600 degrees.

Mr. Vaughan: We have trouble with the slide-valve engine at that temperature. I think very likely it may depend on the type of slide-valve used as much as on the type of lubricator used. Most continental engines use forced lubrication, and are able to run the passenger engines with sight feed lubrication.

Mr. Chambers: What speed per hour did Prof. Endsley attain in his tests, the maximum speed the engines are required to make?

Prof. Endsley: We ran 30, 40 and 50 miles an hour in most of our tests. We do not attempt to get a high speed. We just decide what speed we are going to run at, and put a load on to keep at that speed, but we have found a great increase of power, from ten to fifteen per cent, by using superheat in the Purdue locomotive. In the test this year, we ran at 30 miles an hour, because we had some trouble with hot boxes, because of the engine standing still at the heavy pressure. The results at 30 miles an hour were comparatively the same as at fifty, so far as steam economy was concerned. The tests reported last year were run at 30, 40 and 50 miles an hour, at 240 lbs. pressure, with 200 degrees of superheat.

Mr. Vaughan: Ours is not a high speed road. Most of our passenger traffic is very heavy and is run at slow speed. The highest record we have for a superheater engine, 75 in. wheel, is 75 miles an hour. I mean, sustained speed over long distances. That probably wouldn't be very high, Mr. Chambers would say, but we have handled heavy trains, four or five hundred-ton trains, at 70 miles an hour on the level over quite considerable distances, ten or fifteen miles and the general feeling among our enginemen—and it has been stated in this convention frequently—is that the superheated engines are very much freer running engines than the saturated steam engines.

The nozzle is not very much of a factor in it, I should say, from the fact that we have tried a variable exhaust on our superheater locomotives and found that it was almost impossible to tell from running an engine when the nozzle was increased. The superheater engine is less sensitive to the size of the nozzle than the saturated steam engine. There is no trouble in getting speed out of them. We had some Atlantic type engines with an 84 in. wheel. We changed some of those engines to superheaters—they were previously compounds—and the enginemen told me they were never afraid to run the engine as fast as it would go, though they didn't like to when it was a compound.

Mr. Chambers: I was wondering how it would affect a road that needed to get up to 85, 87 and sometimes 90 miles an hour. In making our tests several years ago we had a great deal of trouble for a few days in trying to get the speed up to 80 miles an hour. We commenced with an 18 x 26 in. cylinder, 84 in. wheel, 4½ in. nozzle. After the first day we increased the nozzle to 4⅝ in. and kept on increasing up to 4⅞ in. Then we could make 84 miles an hour very easily.

Mr. Vaughan: Mr. Steele, of the American Locomotive Company, came down with us, with a 600 ton train and on practically level road; we made mile after mile at 63 miles an hour, with a 63 in. wheel. That is going pretty good for a small wheel.

Henry W. Jacobs (A. T. & S. F.): In the past ten months we have conducted some very extensive road tests. One of these tests was conducted on an engine that had formerly been a saturated steam engine. We put a superheater in it to give an average of 60 degrees of superheat. The conclusions that we drew from these tests were that they would not warrant us in putting in superheaters unless we could get at least 90 degrees of superheat; our practice at the present time is to build our superheaters to get from 90 to 125 degrees.

F. F. Gaines (Cen. of Ga.): My experience is limited to a very low degree of superheat. We have found, however, since making the tests indicated in this report, that by raising the pressure from 160 to 180 lbs. we are getting better results. While we have made no tests, it seems to be the consensus of opinion that the engine is more economical than it used to be, and we probably now show an economy over the simple engine. There is no question, however, that with the small degree of superheat we are using the engine is very much favored by the engineers. It really costs us less for repairs, and, whether it is due to the lower pressure we have used, or what, the fact is it has cost us less for running repairs and it is a more snappy engine, gets over the road more easily, and the engineers all want to get it if they can. Has Mr. Chambers not been running an engine between New York and Philadelphia during the past winter that has been carrying a high degree of superheat? Has he any data on the subject?

Mr. Chambers: I have no data to offer.

O. M. Foster (L. S. & M. S.): We have a couple of superheaters on the Lake Shore. They are piston valve passenger engines. We use about twice as much valve oil as we do on the saturated steam engines of the same class for the same work, but we do not experience any difficulty in lubricating the engines successfully. The only trouble is that when new valve bushings are applied we have to be a little more careful in getting them down to a bearing. After we once get a good working condition established we never have any more trouble with them. The engines carry 200 lbs. pressure. These two engines are better than any other engines of their class, and this is agreed to by everybody. So far as the fuel consumed is concerned, they are more economical, and, so far as hauling trains is concerned, they are better engines. As to maintenance, we do not find any appreciable difference. The failures we have on account of superheater tubes breaking off are not worth mentioning. We have not had more than four such failures in six years. We do not believe there is anything gained, so far as the performance of the engine is concerned, by increasing the size of the cylinder and decreasing the steam pressure. In fact, I am inclined to think that there is a distinct loss in the capacity of the engine, aside from any question of economy. I am led to believe this from the recent experience that we have had in applying superheat to another engine of another class. We have not tested this proposition out sufficiently to be able to say a great deal about it, but we reduced the steam pressure to 180 lbs. and increased the diameter of the cylinder from 22 to 24½ in., which we thought would be about right. The engine has not done what our experience with the other engines would justify us in expecting in the way of performance. It is not much better, so far as hauling trains is concerned, than other engines of its class. We investigated and found apparently that it was on account of the low steam pressure. I do not believe you can run engines fast with low pressure. If you want a fast engine you want fast steam. We are going to put the cylinders back to the original size and put the pressure up. The engine saves coal and is doing better work, but it is not a distinctly better engine on passenger trains, and that is what we expected to get, along with the economy.

F. J. Cole (American Loco. Co.): Answering Mr. Vaughan's question about the low steam pressure. We feel that the use of the moderate boiler pressures is some advantage in boiler repairs. Of course, with the superheated steam you can get any required temperature, and apart from any question of steam there is no advantage in a superheated engine carrying the same pressure. Of course the question of boiler repairs has got to be determined over a long period of time. We felt the moderate steam pressure of, say, 170 or 175 lbs. would, other things being equal, be more economical in boiler repairs than the high pressures of 200 or 210.

L. R. Johnson (Can. Pac.): One of the gentlemen who spoke of the different details in connection with the superheater said it was a pity the committee had not touched upon or given figures to show the increased power of a locomotive equipped with a superheater. The different members of the committee have their own ideas. As a committee, we felt we would be treading on rather dangerous ground in giving figures such as would have to be given. It would tend to make the members think we were rather boosting the superheater as a superheater, and we thought that was somewhat out of our province. I think the figures and information given in the report, together with the results which have been brought out by the discussion, will leave no doubt in the mind of anyone present that the superheater is an advantage to any locomotive which may be equipped with it, whether it is low temperature or high temperature.

The report shows that not only in America—and when I speak of America I mean the whole continent—but also in Europe, the experience has been that it is impossible to use slide valves with any high degree of temperature in the superheater. Mr. Schmidt suggested that it is not altogether the question of lubricator, but that the superheater makes the slide valve work on the valve seat to such an extent that it will break, and that not due to water lubrication so much as from the warping by the increased temperature. The experience given by the gentleman from Purdue is rather astounding, in the face of what we have already heard, but if it is investigated a little further, probably there will be a reason for his success.

I want to express the appreciation of the committee for the very able way in which Mr. Jacobs, of the Santa Fe, came to our assistance and placed his technical facilities at our disposal in order to make the report as interesting as possible by producing these drawings of the different classes of superheater.

LOCOMOTIVE FRAME AND DRIVING-BOX CONSTRUCTION.

H. T. Bentley, assistant superintendent motive power, Chicago & North Western, read a paper on "Locomotive Frame Construction, Including Design of Driving Boxes and Contained Parts," as follows. The subject is treated under two heads:

First: The investigation of the design of driving boxes, brasses, shoes, wedges, binders and frames, that will give increased mileage to locomotives between shoppings.

Second: Frame construction for engines with outside valve gear.

It is getting to be quite a problem to keep our heavy locomotives running without having frequently to drop wheels and refit driving-box brasses, take up lateral wear, line down wedges, etc., and the object of this paper is to bring out a discussion as to what has been, or can be, done to keep engines off the drop pit, and increase their life between general repairs. If it were possible to keep our driving-box

brasses, shoes and wedges snug, and free from pounding, there would be less trouble with frame breakage, and our rod brasses would not need renewing so often.

With this in mind, I am giving a few suggestions that may possibly enable us to keep an engine out of the shop until such time as the driving axles need renewing, unless a frame breakage occurs to take the engine out of service. To get the best results, driving boxes should be made of cast steel, and designed of such proportions in shoe and wedge fit as to give long life, and with an adjustable or removable hub liner, so that lateral motion could be taken up with wheels in place. The driving-box brasses should be made of ample size and made of suitable material for obtaining long life, and of a removable type so that it will be possible to quickly replace them without having to drop the wheels.

Shoes and wedges should be of such a size that a large bearing surface will be in contact with the driving boxes. With the ordinary design, the shoe and wedge face is altogether too small, and the wear very rapid. Flangeless shoes and wedges should be used to overcome the trouble experienced with flanges breaking. To facilitate the lining down of wedges, arrangements should be made so that they can be removed without disturbing the binders, or underhung springs; the wedge bolts should be of sufficient strength and so arranged that in case of breakage it will be an easy matter to replace them. Binders to be so designed that they will securely hold the frame jaws together, and prevent movement, but yet of such construction that they can readily have wear taken up when necessary.

Frames.—Most roads have more or less trouble with frame breakages, and, if these could be eliminated by either improving the design or making them of some material that would stand up under the shocks they are subjected to, a step in the right direction would be made. I noticed an article some time ago on the great amount of frame breakage that was occurring with engines having the Walschaert valve gear. Upon looking into this on our own road, I found we are not having the slightest trouble; not a single case of frame breakage has occurred on any outside gear engine during the past four years.

Frame Construction for Engines with Outside Valve Gear.—As most locomotives are now being built with outside valve gear, there is very little difficulty in designing a suitable cross bracing that will add materially to the strength and life of frames.

The replies to a circular of inquiry are summed up as follows:

No. 1. Have you any suggestion to make in the way of improving the driving box now in general use, and, if so, what do you recommend? Of twenty-six answers sixteen replied "No," whereas the balance suggested using heavy steel boxes, except in one case, where it was recommended that the pedestal jaws be spread farther apart, so that heavier *cast-iron* boxes could be used.

No. 2. Have you any way of taking up lateral wear in driving boxes without removing them? Very little has been attempted in this direction, although replies indicate there is a great need of something that will enable it to be done.

No. 3. Are you using driving boxes with brasses that can be taken out without dropping wheels? Notwithstanding the desirability of such an arrangement, only five roads report using anything of the kind, and all are using the same patented device, experimentally; in three cases satisfactorily, in one case it has not been in service long enough to report on, while the fifth user did not find it entirely satisfactory, but did not state in what respect it failed.

No. 4. What mixture or special metal do you use in driving-box brasses, and is it entirely satisfactory? Do you use grease for lubricating switch engines, and is it giving satisfaction? In the first section of this question, most roads reply that they are making their own mixture (copper 80 per cent, tin 10 per cent and lead 10 per cent), with very satisfactory results, while a few are purchasing special brands, which give good service. In answer to second part of the question there appears to have been a difficulty experienced while using grease in switch engines, and it early became evident that the kind of grease and perforated plates working satisfactorily on road engines would not answer the purpose for the slower moving switch engine, and, therefore, a thinner grease and perforated plates with larger holes were introduced, and this combination appears to give better results.

No. 5. Do you use adjustable or solid shoes and wedges, and are they satisfactory? The general practice appears to favor the solid shoe with adjustable wedge, and, as a whole, it is satisfactory, although with limited bearing surface considerable wear takes place. With engines having Walschaert or other outside gear, there is no reason why the frame jaws cannot be designed to get a width of eight to ten inches, if desired, so that the pressure per square inch could be greatly reduced. On a large number of European engines a solid pedestal of great width is used, with very satisfactory results.

No. 6. Do you have much shoe and wedge flange breakage? If so, how do you overcome it? Considerable trouble appears to have been experienced in this direction and has been overcome in some cases by using bronze shoes and wedges; in others, by thickening flanges where possible, and, on most roads, frame jaws are now rounded off so that a good fillet can be left in shoes and wedges. We have entirely overcome the breakage of flanges by simply leaving them off, and using side plates riveted on the frame, the flanges of the driving box coming in contact with these side plates, instead of the flanges of shoes and wedges, as formerly.

No. 7. What width of bearing face do you have on shoes and wedges where they come in contact with driving boxes? The replies indicate that this varies on different engines and roads, the minimum being 4 in. with 7¾ in. as a maximum, depending on the size of engine. With consolidation engines in service on the Chicago & North Western we have a wedge face of 8¼ by 17½ in., with a pressure per square inch of 122.8 pounds, as compared with our former standard freight engine with 6¼ by 17 in. wedge face, with a pressure of 184.72 pounds per square inch.

No. 8. With outside valve-gear engines, have you tried to increase the width of shoe and wedge face, and, if so, how? In no case does there appear to have been an attempt made to increase frame jaws on engines having outside valve gear, and yet it is a simple proposition, and by doing so increased wearing surface could be obtained.

No. 9. Have you any way of taking down wedges without removing binders or driving box? In no case has this been attempted, although it can be accomplished by using flangeless wedges and cutting away the inside flange of the driving box on the wedge side; what was formerly a four or five-hour job, depending upon size of engine, can be accomplished in less than an hour.

No. 10. Do you use brass or cast-iron shoes and wedges? The general practice appears to favor cast iron for this purpose, but a number of roads prefer bronze shoes and wedges where steel boxes are used, while a few people seem to like a bronze liner on a steel box, and then use a cast-iron shoe and wedge. With this latter arrangement, we have not had very good results, account of difficulty in keeping liners fast on the box; our present practice is to use cast-iron shoes and wedges against steel boxes in freight service, and bronze bearing on passenger engines.

No. 11. Can you line down shoes and wedges without taking them out to apply liners, and, if so, how? The replies are practically the same as to question 9, except that occasionally loose liners are inserted behind the wedge, which, however, can only be done by taking the binder down, so that what should be a simple job is a difficult and expensive one.

No. 12. With underhung springs can you remove and replace broken wedge bolts without taking binders down? Where underhung springs are used, it seems impossible on most roads to remove or apply wedge bolts without removing springs. We had a similar difficulty, and practically overcame it by making binders with slotted holes, which enabled us to take out and replace wedge bolts with springs in place, thus reducing the job from a big to a small one.

No. 13. Which type of binder do you find the most satisfactory? The pedestal cap type meets with most favor, as replies from fourteen roads indicate it is their preference, and that frame breakage is reduced where it is used. The strap binder is next best, seven replies being in favor of it. The clamp over the frame jaw lugs is used on four roads on account of simplicity, and only one road is in favor of using the thimble and bolt. My personal preference is for the pedestal cap type.

No. 14. Have you anything to suggest in the way of a binder that will take up wear without having to be upset and refitted? The replies indicate that the pedestal cap type binder does enable the wear to be taken up with less trouble and expense than any other make, in which conclusion I concur.

No. 15. What suggestion have you to offer in regard to frame construction on engines with outside valve gear? The proper cross bracing of frames is the most logical use to make of the space that was formerly taken up by valve gear, and will do more to overcome frame breakage than almost anything else. One suggestion is to use upper and lower rails over the cylinder casting. This design can and is used, however, with engines not having outside valve gear, and is a great help in reducing front frame breakages and loose cylinders.

No. 16. Do you have as much trouble with frame breakage

when using outside valve gear as you do when using Stephenson gear? There seems to be a reduction of frame breakages with engines having outside valve gear, on account of their being provided with suitable cross bracing. In our experience with engines of exactly the same size and make, one having the inside and the other the outside gear, the former are continually in the shop with broken frames, while the latter, with Walschaert gear, have never given us a minute's trouble in this direction; but the frames are braced laterally, which we consider the cause of our freedom from breakage.

No. 17. Do you use cross bracing between frames of outside gear engines? If so, does it stiffen up and reduce frame breakage? Where outside gears are in use, the frames are generally braced laterally and with splendid results, judging from replies received. Some roads have had such short experience with outside geared engines that they are not in a position to report intelligently.

No. 18. Have you any suggestions to make that will decrease the breakage of locomotive frames? The suggestions offered are various, and may be summarized as follows: Heavier frames. Keep pounds out of driving boxes. All weight-carrying points on frames to be braced to boiler. Make frames of best material. Increase depth of frame in proportion to the tractive power. Make frames in one piece with large radii where possible. Good material properly used.

No. 19. Do you use steel or iron frames? Which is most satisfactory? Cast-steel frames, when properly designed and annealed, appear to be just as satisfactory as wrought iron. Great strides have been made in foundry practice during the past few years, so that first-class castings can be obtained.

In conclusion, I believe there is a great field ahead for the further study of this subject, so that repairs to driving boxes, shoes, etc., will be simplified, and work now taking several hours can be done in very much less time.

DISCUSSION ON FRAME CONSTRUCTION.

D. R. MacBain (L. S. & M. S.): We began about six years ago to increase the bearing surface by lengthening the brass on our Atlantic type engines about twenty per cent. We found, previous to that time, that the best wear we were able to get from those engines between repairs to the main driving box, was about thirty-five to forty thousand miles, at which time the left main box in all cases would be worn to a point where it was not advisable to run it longer. We then increased the length of our brass from 12 to 14⅛ in., letting it extend in onto the axle, shifting the eccentrics over, and putting an offset in the eccentric rods. The first engine we turned out equipped in that way, instead of coming in for repairs to the main boxes at the end of the usual thirty or thirty-five thousand miles, ran 122,500 miles, and the wear upon the left main box was less than that of any other. Meanwhile the engine had worn out two sets of tires in addition to the set it started in with. We were encouraged by that, and immediately applied these boxes to some fifteen or twenty other engines of the same class, and have had uniformly good results. Now that we have the outside valve gear cannot make any change in the wedge or shoe bearing on the frames, I could not suggest anything that would bring more relief to the motive power department than increasing the length of the main and intermediate boxes of the consolidation engines, and the main boxes of the Atlantic and Pacific type engines. It might be that considerable difficulty would be experienced on account of the uneven wear due to the uneven saddle-bearing on top of the box, but we have not found that to be worthy of notice. The difference in wear between the inner and the outer end of the brass was so little that it could be entirely neglected so far as any repair was concerned. I believe that Mr. Bentley's paper ought to receive a great deal of attention, and I will assure you, gentlemen, that if you follow up the suggestions made in the paper, and especially increase the length of your main and intermediate boxes or brasses on the consolidation engine and the main boxes on the Atlantic and Pacific type engines, that you will be very much gratified by the results gained.

F. F. Gaines (Cent. of Ga.): Mr. Bentley's paper is a very valuable one. The suggestions made offer a good deal of food for reflection, and I for one am going home to reflect on them. I am going to take exception, however, to one recommendation that is made in favor of the cast steel box. We have had to use the cast steel box on engines where the pedestals were so long that they wouldn't stand the cast iron, but I believe where you have sufficient space and can use the cast iron, that the results are very much more favorable in every way. I have been going through our standard boxes, and where the pedestals would allow it, getting rid of the cast steel and using a special grade of cast iron. It is toughened by a special process.

You have got to start a steel box off with some sort of hub-line area. With the gray iron box it isn't necessary to have wear. Mr. Bentley speaks about keeping the engine out of the shop until such time as the driving axles need renewing. It seems to me if you keep an engine out of the shop until the driving wheels need general repairs it is going some.

I started several years ago in designing engines to make it a rule wherever there was any weight taken on the frame, to be sure and have that weight carried right up to the boiler somewhere with the connections. On engines with that arrangement, we seldom have broken frames. The use of the Walschaert valve gear unquestionably allows a great deal more freedom in carrying out the design. You have your valve motion outside and nothing to interfere, in case you have to put a weight on the frame, with carrying that weight up to your boiler.

J. A. Talty: I have noticed in riding those high pressure locomotives, that in increasing the speed and using a short cut-off and heavy throttle, that there is a great strain on the main boxes. I presume it is due to a very high back pressure; it is possible to avoid the strain on the main boxes by using a little longer cut-off and lighter throttle. However, on some of the high-pressure roads, experience has taught that you cannot regulate the throttle opening very finely; in other words, one notch on the throttle will produce a very severe vibration. It seems to me that on high-pressure locomotives, if a throttle was designed with which the engineer could regulate the opening more closely, it would very materially increase the life of the main driving box brasses. For instance, when you attain a speed of 70 miles per hour, there is a very severe strain on the machinery, the side rods and the main boxes, and especially on the side rods, if there is lost motion in the main boxes.

C. E. Fuller (U. P.): Mr. Bentley speaks of bringing the weight up to the boiler. In doing this does he fasten the boiler to the brace, or is the boiler simply to rest on the brace? He speaks of lots of trouble with broken frames with the Walschaert gear. We have not had that experience. While we have had lots of broken frames both with and without the Walschaert gear, and I am not prepared to state just the proportion, yet I do not think that we have had as many broken frames with the Walschaert gear as with the link motion. I am talking now about high pressure and large engines, not about small engines. I think the question of bracing the frames has a bearing on this subject.

J. F. DeVoy (C. M. & St. P.): It seems to me that one of the most important points brought out in Mr. Bentley's paper is: "There seems to be a reduction of frame breakages with engines having outside valve gear, on account of them being provided with suitable cross bracing." I believe that the proper bracing of a frame by cross-braces will come more nearly to doing away with frame breakages than any other one thing you can do. This, of course, has been made possible by the use of the outside valve gear. While I do not think that the outside valve gear has had anything to do with it, still I think the removing of the valve gear to the outside, allowing you to put in proper bracing, has done it. I believe you can reduce the weight of the frame, say 25 per cent, on account of putting in the frame bracing, and that the weight of the frame cross-braces will give you a total reduction, in the weight of the frame of from 15 to 20 per cent.

Edward W. Pratt (C. & N. W.): The replies to question 18 seem to indicate that the majority favor frames made in one piece, and it seems to me that if that is the majority opinion of this association, it must be on account of trouble in the fastenings between the parts of the frames. When it comes to an accident to a locomotive, it is quite a serious matter with the front rails badly bent or broken under the saddle, in inaccessible places, to have to remove the whole frame, and I am a little surprised that no one has noted more strongly the splicing of the frames so that they can be repaired, particularly where we have so many Atlantic or Pacific type locomotives.

David Brown (D. L. & W. R. R.): There is only one thing to do about the frames. There is nothing the matter with the design. The locomotive builder has designed the frames in such a manner that I believe they will stand anything, with proper care and attention. The only exception that I take to them is this—I know a great many will differ from me—I would start at the cylinder ends with two keys. We put one in the front. We should also have one in the back. I have seen cylinders loosened at the back end. If you take the bolts out, ream the holes and renew the bolts, you have got all of your bearing at the back end of the cylinder that you had when you started out. But if

you had a key there, and did not chip it off even with the frame, but let it project so that a man could give the key a blow occasionally, and keep it home, you have a better support. There is no job around the engine that deserves more attention than the tail piece at the back end of the frame. The better cross-bracing we can get, the safer we are and the better satisfaction we have with the frames with regard to loosening. We want our driving box brasses to have as much bearing as possible. Furthermore, the wedge must not be allowed to get loose or be down. Keep it up and in proper working order. I believe with these matters attended to, and what has been brought to our notice, we ought to prevent our frames from breaking.

C. E. Fuller: What kind of a side plate does Mr. Bentley rivet to the frame, where he uses the flangleless shoes and wedges; how does he fasten it?

The President: Mr. Chambers, you have been using the one-piece frames for some time. What service are you getting with these frames?

C. E. Chambers (C. of N. J.): We have used locomotives with one-piece frames for several years. Some of them have a front section which is bolted on under the cylinders, so that in case of accident, such as some of the speakers have mentioned, it would only be necessary to renew the front section. We also have other engines with the one-piece frame. If any breakage occurs on the frame back of the front end, it is welded by thermit. We have several of them which have been in successful use for a number of years. The one-piece frame with the removable section in front is a very satisfactory frame.

C. A. Seley (C. R. I. & P.): There is one point in connection with Mr. Gaines' advocacy of cast iron, and that is the question whether it is a better wearing metal than cast steel —cast steel is very bad, and we have all felt the necessity of covering up the surface with something that will protect it. In the west we have used babbitt inserts and brass linings to a considerable extent. I am inclined to believe, where we are under the necessity of using cast steel boxes, that the babbitt inserts at times may practically render the frame satisfactory.

Mr. Bentley: Have any of the members tried some kind of removable brass? I understand on some roads they have a brass similar to a car brass or tender-truck brass, probably on the front and back boxes, which they can take out by jacking the wheel up a little. I think no one has yet had the courage to put a removable box in the main bearing.

F. F. Gaines (C. of Ga.): I was formerly connected with a road where that practice was in vogue on everything except the main box. It was made similar to a tender brass, and you would have to jack it up sufficiently to get a 1½ in. clearance so that you could slide the brass out. We never put it on the main box, because I do not think it would work there. There is too much work and too much motion to put it on the main box, but it worked very satisfactorily on the other boxes.

Mr. Bentley: We have had a number of engines equipped with removable driving box brasses for a good many years, and I have been personally following it up where I could. Some of the savings we have made by the use of this removable brass are remarkable. The fact that you can take an engine into the roundhouse in the morning and by noon have a new brass in it, and have it on the road in the afternoon, as compared with having it out of service for one or two days, which was formerly our practice, is most important. I have some figures that show the cost of driving box brasses, shoes and wedges, and lateral motion plates. We have a lateral motion plate that we can put in position with the wheels under the engine; it may be interesting to know how far we have gone in this direction. We hope it will be the means of everybody doing likewise, as all the roads would gain considerable advantage from such a practice. We find it costs a little more in the first place to apply flangeless shoes and wedges than it costs in the case of the ordinary cast iron shoes and wedges, the difference being $6.49 in favor of the ordinary cast iron ones. Where you have to line down the cast iron shoes and wedges with flanges, as compared with removing the flangeless shoes and wedges, the saving is something remarkable. I have frequently seen engines fitted with a cast iron flanged shoe and wedge have the flanges broken off going around some of the sharp curves entering the Wells Street Depot the day after they were put on, and we had to put in new wedges. With the flangeless wedges this is unnecessary.

In the use of the driving box brass, we can save probably $30, considering the time the engine is out of service, by putting in the removable brass, as compared with dropping the wheels under the old practice and taking the box to the machine and putting the new brass in and getting it back on the engine.

J. A. Pilcher (N. & W.): There has not been any epidemic of breakages, and we have been led to the conclusion that it is better policy for us to adhere to the cast iron boxes, making the box frames very deep to get the strength.

D. R. MacBain: The New York Central Lines some years ago adopted a method of lining steel driving boxes with brass, for the purpose of getting away from the excessive box and shoe and wedge cutting. It was a considerable item of expense and a couple of years ago a committee was appointed to make a series of experiments with cast iron, with a view of determining whether or not we could use cast iron on modern power. The committee has arranged, as I understand the matter, to have about twenty consolidation engines equipped with high grade cast iron boxes, of two different mixtures. Some of the engines have been in service a year, and up to the time I left the New York Central we had not had any failures. The operation of the box so far has been very satisfactory. We simply took out the cast steel box and put in the cast iron boxes with the same dimensions of shoe and wedge.

Mr. Bentley: As I understand Mr. MacBain, he was using a cast iron box instead of a steel box with a cast iron shoe and wedge.

Mr. MacBain: We were using the cast steel box and we started to experiment with the cast iron box.

Mr. Bentley: Mr. MacBain brought up the question of increasing the length of the box and brass, but he seemed to have overlooked what I consider the most vital point in the whole thing, and that is increasing the jaw dimensions. The locomotive builders do not like that kind of an arrangement, because it means a lot of work for them, but if you can increase your jaw fit you will get a greatly increased life from the shoes and wedges.

Mr. Gaines asked about the driving axle. I was reaching rather high probably in trying to make the engines stay on the wheels until the axle was worn out. I saw a driving axle the other day that had only been in service two years, and I do not think that is a long life for a driving axle. It had to be taken out and refitted.

Mr. Fuller spoke about my saying that they put the brass up to the boiler. I did not say that—that was a statement made by one of the gentlemen who replied to my circular of inquiry. We run our brasses up to the boiler over the frame, and instead of riveting them or fastening them on with studs, which causes considerable trouble, we let the boiler rest in an angle iron or T-iron.

Mr. DeVoy spoke about an engine having outside valve gear—he could not see how that would affect the breakage of frames. I did not claim the kind of valve gear we were putting on our engines was responsible for the absence of frame breakages. What I do claim is that the possibilities for cross braces on the outside geared engine is the thing that has helped us.

Mr. Pratt quoted me as saying something that I did not say, and that I did not mean. I did not say anything about a one-piece frame. We have a large number and they are very nice when nothing happens and they do not get into a wreck, but when it becomes necessary to make repairs to one end of a one-piece frame, it is a big job, because you cannot repair the frame in place. I am in favor of a slab connection, where possible, so as to reduce the size of the frame for convenience of repairs.

Mr. Brown spoke of the care given to frames. I understand if you keep the pounding out of the driving box and keep the shoes and wedges snug, that it is giving care to the frames and I do not see that you can give very much further care to them while the engines are in service.

In reply to Mr. Fuller's question. We use a mild steel plate, I think it is about three-quarters of an inch thick and about two inches wide, which we rivet on to the side of the frame, which takes the place of the flanges on the shoes and wedges. The idea of that is whatever wear is caused from the driving box is transmitted to this piece of mild steel, which is easily removed when it is necessary to replace it, and instead of having to repair the frames, we simply take the worn piece of mild steel off and put on another one.

SAFETY VALVES.

The remarks and suggestions below relate to locomotive boilers only. Further, they relate only to locomotive boilers using coal as the fuel, and under the conditions now prevailing for the stimulation of the draft by the use of exhaust steam from cylinders of the locomotive and by means of the ordinary steam blower. A series of tests were made for the committee by E. D. Nelson, engineer of tests of the Pennsylvania, to determine the maximum or worst condition that

the safety valves were required to take care of. With gauge pressures of 190 to 207 pounds, it was found that the maximum discharge of steam was 2.44 pounds, the minimum 1.18 and the mean 2.05 pounds per square foot of heating surface per hour.

The committee has taken twice this mean value as the basis for a formula, which, in its opinion, will reduce safety-valve practice to a uniform basis, and at the same time provide proper relief for the boilers. Such a formula may be expressed as follows:

$$A = \frac{0.08\ H.S.}{P}$$

A = Outlet of valve in square inches.
H. S. = Boiler heating surface in square feet.
P = Absolute pressure = gauge pressure + 15 pounds.

This formula will provide, on boilers carrying 200 pounds gauge pressure, an outlet that will take care of 4.1 pounds of water per square foot of heating surface per hour.

A number of observations were made on locomotives in passenger service, provided with safety valves the combined outlets of which would take care of from 3.64 to 4.06 pounds of steam per square foot of heating surface per hour, and no cases were found where the safety valves failed to properly relieve the boilers. The locomotives on which investigations were made carried 200 pounds gauge pressure, had 4,231 square feet of heating surface and 56½ square feet of grate area. Past investigations have verified that Napier's rule for the flow of steam may be safely taken for the types of muffled safety valves now on the market. In the formulas below, we have used for arriving at results 215 pounds absolute pressure, or 200 pounds gauge pressure.

SUMMARY OF FORMULAS.

No.	Authority	Steam pounds, per hour, per square foot, H. S.	Remarks
1	Am. Ry. M. M. 1908 Report (proposed): $\text{Area} = \frac{0.10266 \times H.S.}{P}$	5.28	For argument in support of this, see Am. Ry. M. M. Proceedings of 1908, page 262.
2	Am. Ry. M. M. 1910 Proposed by Committee: $\text{Area} = \frac{0.08 \times H.S.}{P}$	4.10	Recommended by the committee. Arguments in support of this and its limitations herein.

In the formulas above the area is area in square inches. H.S. indicates total heating surface in the boiler in square feet. P represents absolute pressure or gauge pressure plus 15 pounds.

It is, perhaps, superfluous to state that, having assigned proper values for safety valves, means should be provided for maintaining the values. In other words, the maintenance of proper areas of outlet should be a feature of safety-valve maintenance and repair. For the guidance of the designer, the valve manufacturers' lists should show nominal size of valve, the outlet in square inches under various pressures, and the capacity for discharge of steam in pounds under the various pressures. For the guidance of the repair man, the lifts of valves under the various pressures should also be shown. The committee considers that safety-valve outlets to either of the above formulas will be satisfactory if used as prescribed in the opening of this report.

The report is signed by:—F. M. Gilbert (N. Y. C. & H. R.), James Milliken (P. B. & W.), W. D. Robb (Grand Trunk), M. H. Wickhorst (C. B. & Q.), and J. G. Neuffer (C. G. W.).

DISCUSSION ON SAFETY VALVES.

H. H. Vaughn (C. P.): Is the area specified in the paper the actual area through the valve and not the nominal diameter of the valve.

Mr. Gilbert: The formula gives the opening in square inches which should prevail under the pressure for which the boiler is to be operated.

Mr. Vaughn: Suppose you had a safety valve, how would you get at the area of that valve?

Mr. Gilbert: You would take the area of the lift and divide by the circumference.

Mr. Vaughn: The lift would depend on the pressure, excess pressure?

Mr. Gilbert: Yes.

Mr. Vaughn: Under what excess pressure does it have the maximum lift the valve is capable of?

Mr. Gilbert: I do not see how the question of excess pressure enters in it. It is the opening which is available under the working pressure of the boiler. If you cannot make it up in one valve, you can make it up in any number you see fit. Of course, the outlet feature increases as the pressure increases, but there is a well defined opening which is governed by the working pressure of the boiler, or the pressure supplied for the discharge. It has been the practice in the past to put on so many valves of certain maximum diameter. One valve might give you four times the outlet of the other; therefore a statement that the valves were four inches nominal diameter would carry no definite information and is not a measure of the capacity of the valve to discharge steam. If you give the opening in the actual number of square inches you have a definite basis on which to work. The point the committee was trying to make in the question of the maintenance of valves is that the springs take a certain amount of set, the percentage of this set in larger valves may be largely reduced, and therefore the valve under normal conditions might have a larger capacity for discharge than it would have under conditions which induced certain deteriorations.

George L. Fowler: I think there were some experiments made last winter by one of the valve companies that would throw some light on this subject. If I remember correctly, it was to the effect that the length of the spring had a good deal to do with the lift of the valve. For example, we might take a long spring and screw it down so that it gives a certain static load on the top of the valve, and that spring would allow, under given excess pressure, a greater lift of the valve than one which was shorter and stiffer. Of course, that is in direct accordance with the ordinary spring action and with the formula which they deduced from their experiments. In calculating the capacity of the valve they made it a function of the stiffness of the spring; that is, the possible lift that would be allowable with a spring giving a certain static load, and that would answer Mr. Vaughan's question to a certain extent. Of course, the area for discharge of the steam was calculated by multiplying the circumference, and that lift actually depended on the stiffness of the spring, and not altogether on the static load that was put on it in the first place.

Mr. Vaughan: The way I feel about the report is that the committee has done the work very satisfactorily as far as determining the area of valve which should be used, and I am glad to see that they have not carried it to five decimals like the American Society of Mechanical Engineers did; but I do not think the matter is settled unless a standard method is outlined to determine what the area shall be. I see what Mr. Gilbert means, that if a valve will practically lift off the seat at 200, it will lift as much at 202 or 205; that is, at 200 it will lift about the same distance as at 202 or 205. I think, however, that the method of determining the area should be specified clearly and distinctly, and what the area means. I suppose on this report it meant the actual outlet area and not the diameter of the valve. I do not think we should leave the subject in any indeterminate form, when establishing standard practice for safety valves.

J. A. Pilcher (N. & W.): A good deal depends on the adjustment of the valve as to the lift under a given pressure. In talking that matter over recently with a representative of one of the valve manufacturers, he said that if you have a valve with a small amount of difference between the opening pressure and the closing pressure, you have a small amount of lift. There are a number of varying factors, and the question would have to be placed in some definite form, as proposed by Mr. Vaughan. That is, the opening with a given pressure and with a given adjustment. If you change either one of the factors, you change the conditions in that particular valve.

Mr. Gilbert: The committee sought studiously to avoid the question of the value of low and high lifts, they sought to avoid going into the question of the design of the valve, but I can see that Mr. Vaughan's objection is well taken. We thought that this summation of what the manufacturer should furnish would in one case furnish a clue to the man who is assigning the number of valves, so that he might equip the boiler properly to start with, and that a statement of the lift of the valve under various pressures would be a guide to the man who maintained the valve. While this is capable of misinterpretation the report states: "For the guidance of the designer, the valve manufacturers' lists should show nominal size of valve, the outlet in square inches under various pressures, and the capacity for discharge of steam in pounds under the various pressures. For the guidance of the repair man, the lifts of valves under the various pressures should

also be shown." That was to take care of the slight variation which would naturally occur from increased pressure. We provide the lifts of the valve as a clue to the man who is to maintain them, so that he may maintain the normal condition of the valve.

The President: I feel this is an important subject, and all contributions possible should be made to the report of the committee, if there are any. I feel that we should go beyond the point of avoiding certain recommendations, because of lack of uniformity in manufacture, and we should more or less positively state what we want and let the manufacturer know what we want, provided we can determine what we want.

J. Christopher (T. H. & B.): Many of our larger boilers are now equipped with three pot valves. I would like to get the sentiment of the members as to what is the practice of adjusting these three valves; in what manner is it considered best to set the adjustment? There being three valves, I do not suppose it is desirable or intended that all three should operate at one and the same time. I would like to get an expression on that.

Mr. Gilbert: The practice on the road I am serving, in the case of boilers equipped with two safety valves, is that we set one at the pressure the boiler is allowed to carry and the other at two pounds above the pressure. In case the boiler is equipped with three valves, the first is set at the pressure the boiler is allowed to carry, the second one at two pounds above the pressure, and the third one at three pounds above the second, making a difference between the first and third valve of five pounds.

Mr. MacBain: I move that the report of the committee be accepted.

The motion was carried.

LUMBER SPECIFICATIONS.

The report on Lumber Specification was a joint report prepared for both the Master Mechanics' and the Master Car Builders' Associations. The report was reproduced in full in the *Daily Railway Age Gazette* for June 20, page 1653. A report of the discussion at the Master Car Builders' Association appeared in the *Daily Railway Age Gazette* of June 18, page 1631.

Mr. Seley: This report is the joint production of a committee of this Association, the Master Car Builders' Association and the Railway Storekeepers' Association, and it is, to a certain extent, incomplete. A number of cuts were not prepared in time for printing with the advanced copy, and the chairman of the Railway Storekeepers' Association asked me to present a few modifications, mainly trifling changes of wording, and some notes relative to the interpretation of the specification so far as purchasing was concerned.

The specification was received by the Master Car Builders' Association and adopted as Recommended Practice. It was recognized that it was unnecessary to debate or discuss the report in that convention, and I think the same is true with regard to this convention. There is no doubt the committee has presented a very valuable contribution as a basis for the definition of different kinds of woods used on railways, and also the grading which it is endeavored to make common practice as between the various lumber associations and the railways which are large purchasers. That the report is perhaps less interesting to this Association on account of the limited amount of lumber which we use in locomotive service, although such lumber is included within the scope of the paper.

A motion was made that the report be accepted with the modifications suggested by Mr. Seley, and that it be printed and placed in the proceedings as the Recommended Practice of the association was carried.

WATER SOFTENING.

J. F. Dunn, superintendent of motive power of the Oregon Short Line, presented a report of some tests made by Prof. J. G. Scrugham, of the University of Nevada, covering 110 varieties of locomotive feed water used on the system and reporting their action upon flues, samples of which were provided. The tests were made by placing the water in glass jars and immersing the samples therein. Mr. Dunn expressed the opinion that the action of the waters could be determined in this way better than by chemical analysis.

The initial proposition for railways in Belgium was made in 1832 for a line from Antwerp to Liege.

Conventionalities.

Sure he was here! E. H. Bankard of the B. & O.

Bob Weatherly is having his troubles. Ask him.

Lost—A crescent brooch with one diamond and pearls. Finder please leave at the ticket office of the pier.

It has just been brought to our attention that the gold dust twins have steel backs.

Post says the reason Tom Aldcorn was appointed nightmare of Atlantic City is because Mrs. Aldcorn is a dream.

Query—What has Taylor done with the hat? It is known to be in his possession, but no one admits having seen Joe under it.

Lee Parish has only an ordinary sized coat pocket, but he claims he can produce your home paper on short notice. Ask him, and see!

It seems that one of the staybolts in the item on Prendergast and Davis' gasoline yacht in Tuesday's *Daily* got broken in the printing office.

Location in the ball room has its advantages. Walker & Bennett Manufacturing Company seats are occupied during all the concerts and balls.

R. A. Carter, president of the Carter Iron Company, dropped in on his friends to spend Sunday, but had to leave for Washington early Monday morning.

Edward S. Moore, vice-president in charge of purchases of the Chicago, Rock Island & Pacific, spent two interesting days at the convention.

F. G. Ely was here in old time form. He "reminisced" with a number of the pressed steel car boys and told them what the conventions used to be like.

J. J. Waters, superintendent of machinery of the National Railways of Mexico, with headquarters at Aguascalientes, Mexico, accompanied by his son, J. J. Waters, Jr., is here.

One visitor to the convention from the southwest is John Nicholson, superintendent of motive power and machinery of the St. Louis, Brownsville & Mexico at Kingsville, Tex.

When does Kinkead fail to represent the Parkesburg Iron Company? Answer: When some one calls him Flory and asks about affairs on the Ontario & Western.

B. T. Jellison, purchasing agent of the Chesapeake & Ohio, has been looking over all the exhibits most carefully. This is his first appearance at the convention as a P. A. We trust he liked the crowd and will come again.

Thomas Spratt, purchasing agent of the Norfolk & Western, is again with us. Tom is a great student, and the interest he shows in the exhibits is most encouraging to the exhibitors.

If you want to see an enthusiast in action, just ask G. W. Seidel about his new office at the Rock Island's Silvis shops. He claims to have the finest mechanical department office in the country.

"Mike" Storrs, known in private life as C. P. Storrs, of the Storrs Mica Company, has been enjoying a relief from the arduous duties of chairman of the entertainment committee, which he handled so efficiently in 1908 and 1909. Next year

he will be busy again taking care of the wealth of the Railway Supply Manufacturers' Association. We're wondering, though, who's going to take the chance of furnishing the bond?

We wonder why J. H. Manning, of the D. & H., asked such pointed questions about the size of grade and the capacity of stokers in the discussion Monday morning. Is he thinking of putting one on his big mallet?

Alexander Holland, formerly in the railway supply business, but now with the house of Pouch & Company, brokers, has been renewing acquaintances for several days in Atlantic City.

S. D. Anderson, of the Standard Railway Equipment Company, accompanied by Mrs. Anderson, is attending the conventions, as usual. Mrs. Anderson is a favorite among the convention ladies.

Just get J. P. McCuen, of the Queen & Crescent, to tell about a real good stoker. He doesn't like to "get up in meeting;" but he certainly can tell of its good points when he settles down in an easy chair.

F. S. Barks, Commonwealth Steel Company, has received a telegram from A. R. Thomas, formerly of that company, but now engaged in the oil business in Oklahoma, announcing the arrival of an A. R. Thomas, Jr., weighing 8½ lbs.

A late arrival stepped into the private office of the editor (desk No. 472) yesterday and said: "Do you people publish a daily?" He had disappeared by the time kind friends had restored us to consciousness.

John Carroll, the new superintendent of motive power of the B. & O. at Pittsburg, carries his honors modestly. In spite of his rapid advance, John is still the quiet, genial fellow he was when he started in the blue-print room after leaving Purdue.

"Uncle Tom" Gallagher, Scullin-Gallagher Iron & Steel Company, evidently finds his cabin uncomfortable after a certain hour in the morning. We have it on the authority of our city circulator that Uncle Tom is the first man that he sees on the Boardwalk every morning.

It is somewhat curious that J. Alexander Brown's greetings from Paris to the friends at home were covered by the single code word "Ablution." If it had happened to be "Libation" instead, probably no attempts would have been made to translate it, and we should have taken one on Alex.

Three years ago E. H. Symington, of that ilk, met with an accident in Chicago, but he has so completely recovered that he has since then been twice around the world. Finding himself so near as the Pacific Coast, he made it his business to come here to the conventions.

It is impossible to believe that any accident insurance carried by Vice-President DeLong, of the Chicago Railway Equipment Company, permits him to be so dangerously beautiful in that horrible combination of white flannel trousers, white shoes, yellow gloves and cane.

The *Daily* is usually very fortunate in the selection of the several young men from Atlantic City whom it employs for miscellaneous assistance in the distribution of papers and in the office, but this year one of them has been "cutting-up" most all the time. (He is making the classified scrap book of the *Daily*.)

H. G. Kittredge, of the Kay & Ess Company, in the course of certain investigations into the qualities of certain ingredients thought to be desirable as a part of the combination of a car grease, is said to have developed a remedy of such universal application that he has named its "Restorene." Henceforth he will be known as Doc.

The following cablegram was received yesterday at the Dearborn Drug & Chemical Works booth in the Million Dollar Pier: "Paris, France, June 21, 1910.—Held legnthy conference at Maxim's with Stewart, Brown and President Fallieres. Decided Paris no place for M. C. B.'s, M. M.'s and supply men. ROBERT F. CARR."

B. W. Frauenthal, joint ticket agent at the Union Station, St. Louis, of all the railways using that station, is here, accompanied by Mrs. Frauenthal and their three children. Mr. Frauenthal is secretary of the St. Louis Railway Club and president of the Association of Railway Club Secretaries, an office to which he has been reëlected for another year.

C. W. Cross, supervisor of apprentices on the New York Central Lines, was out bright and early Tuesday morning to get enough copies of the *Daily* containing the apprenticeship discussion to supply each of his schools with one. His assistant, Henry Gardner, is also at the convention doing his part in boosting up-to-date apprenticeship methods.

L. O. Cameron, manager of sales of the Southern District of the Pressed Steel Car Company, didn't have so far to come to the convention this year, as he is now located in Washington, D. C., instead of Atlanta, Ga. Apparently a happy move for him, judging from the general geniality invariably displayed.

Harry Frost says, that the law editor must be a student of some scrub correspondence school. The remark is objected to on the ground, that it is "incompetent, irrelevant and immaterial." We have but one editor of that breed; and he dopes out coporation law. If the game is politics and not business, we'll increase the staff between now and next June.

Harry A. Schroyer, president of the Acme Supply Company, noted for his many athletic attainments, is feeling so fine in Atlantic City that in order to test his physical vigor he won a wager yesterday by pushing three heavy men in a roller chair from the Rudolf to the Million Dollar Pier. At no stage of the journey did he vary from a fast walk.

Dr. Angus Sinclair, treasurer of the Master Mechanics' sociation, appeared on the Boardwalk on Sunday. His friends will be pleased to learn that he will attend the International Railway Congress as the representative of the Erie Railroad, and will sail on Saturday on the St. Paul for Cherbourg. Mrs. Sinclair will accompany him.

It isn't only faith that can move mountains. The mountains, the waterfall, the cabin and the dog all came down from Philadelphia to Atlantic City in a special train, consisting of a baggage car and a locomotive, in order to furnish the setting for "Lucky Jim" at the vaudeville Saturday night.

Carter Blatchford, second vice-president of the Spencer Otis Company, in addition to his duties as representative of the Tyler Tube & Pipe Company, the Hutchins Car Roofing Company and J. T. Ryerson & Son, has taken active part in the work of the transportation committee. He is stopping at the Traymore.

Among the many who are here and whose faces will be looked for again in 1911 are H. O. Hukill, purchasing agent of the Pennsylvania Lines West, and C. R. Peddle, purchasing agent of the Vandalia. Last year was Mr. Hukill's first visit. The exhibits made such an impression on him at

the time that he had been looking forward to the 1910 convention.

The bird tamer has about finished his work, and he did a thoroughly good job. It appeals to us as the highest sort of compliment that the incoming executive committee should have asked Rosser's opinion as to who should do the taming in 1911 and then to have accepted his recommendation. In Ostby he has certainly found a worthy successor. That fellow has been on the job from start to finish.

The way in which Mike Franey, of the Lake Shore, spoke on the operation of stokers on Wednesday was an indication to his friends who had not heard of his change in position that he had turned his back on the shop and was engaged in assisting Joe Chidley in looking after the mechanical operation of his division. They make a good team—and in more ways than one.

H. T. Bentley, assistant superintendent of motive power of the Chicago & Northwestern, was very much disturbed because some one told him his name had appeared in the *Daily* under another man's photograph. His informant, however, was badly mistaken, for the photograph referred to was that of W. F. Bentley, of the B. & O., which appeared in Friday morning's *Daily* properly labeled.

R. D. Smith, like C. A. Seley, has his own conundrum. It is this: "Why does your wife always wiggle when you are hooking up her dress in the back?" No one has yet given the correct answer, and Smith doesn't know himself. He surmises that the contortions arise from a lack of confidence in what a mere man can do as a lady's maid, and she therefore tries to see for herself how the work is getting on.

George Gibbs, chief engineer of electric traction and station construction of the Pennsylvania Tunnel & Terminal Railroad, was a caller at the office of the *Daily* on Tuesday. Mr. Gibbs was formerly one of the most active members of both the Master Car Builders' and Master Mechanics' Associations; but of late years his attention has been directed more particularly along the lines of civil and electrical engineering.

Wm. Latshaw, of Pittsburg, is here. He is prominent at home and did not come to Atlantic City for the convention; but the show has made a great impression on him. Prominent among those hoping the impression is a favorable one are: Frank Moore, Bill Gibson, Demarest, Telford and Posty. Mr. Gibson's recitations are said to be the real thing. Those who have been fortunate enough to be on hand at the entertainments find it difficult to get away.

H. W. Jacobs, assistant superintendent of motive power of the Santa Fe, came in Monday morning and left Tuesday evening. Other Santa Fe men from Topeka in attendance at the convention are: F. W. Thomas, supervisor of apprentices, and Charles Higgins and Paul Sweet. It looked for a while as if Johnny Purcell, the shop superintendent, would come; but Johnny never feels at home outside of Topeka and wired at the last moment that he could not get away.

Dave Redding, the heavy weight president of the Railway Club of Pittsburgh and assistant superintendent of motive power of the Pittsburg & Lake Erie, is doing his best to make up for the absence of L. H. Turner and W. P. Richardson. The Lake Erie has made quite a fad of dynamometer tests for several years, and is busy now testing out a locomotive with a Pilliod valve gear. This accounts for the absence of the mechanical engineer, Mr. Richardson. Mr. Turner is getting so interested in his little farm, the second best, if not the best one, in Ohio, that the convention seems to have lost its charms for him.

George R. Carr, of the Dearborn Drug & Chemical Works, went to New York Sunday to meet his niece, Miss Marie Bricker, who arrived on the steamer Rotterdam in New York the day following. Miss Bricker has been attending the American Girls' School in Munich, Germany, for the past year. Her room mate at the school was Miss Sarah Kouns, daughter of Charles W. Kouns, general manager of the western lines of the Atchison, Topeka & Santa Fe at Amarillo, Tex.

It seems that there was another Eastern nine on deck in addition to the one whose exploits were chronicled in the Sunday and Monday papers; and the peculiarity of it is that they are all Braziers! The nine of them were found on the benches in a corner of the Marlborough-Blenheim on Sunday evening. As described officially, they were: "My wife, daughter and myself, F. O. and his wife, my brother and his wife and Uncle Joe and wife." It may be of interest to get up a game between the Braziers and the Symingtons.

Thomas Aldcorn is entertaining Mr. and Mrs. J. F. Duntley of Detroit and Miss Blanche Duntley of Chicago, respectively father, mother and daughter of W. O. Duntley, president of the Chicago Pneumatic Tool Company, which Tom represents when he is not gathering in shekels from convention exhibitors. The whole party was caught in the storm on an automobile ride on Saturday afternoon, but no serious harm was done. At least, Tom said he was dry a little while after. So was Charlie Booth; but he had not been here long and had not got thoroughly saturated.

J. D. McIlwain, of the Main Belting Company, says he is the oldest member of the Master Mechanics' Association here in point of years of attendance. His first convention was 1873 and Mrs. McIlwain's first was 1875. Both have attended the intervening conventions with considerable regularity. Mr. McIlwain also enjoys the distinction of having been one of 16 men to apply the first air brakes to cars. This was at Steubenville, Ohio, on the Panhandle road in 1866. Of the 16 men engaged in the work only George Westinghouse and McIlwain are now living.

John R. Blakeslee, president of the Ajax Manufacturing Company, returned to his home from Atlantic City last Friday, just prior to his election as a member of the executive committee of the Railway Supply Manufacturers' Association. The news of the election was telegraphed to Mr. Blakeslee at his home in Cleveland, and was a great surprise, as he was not aware of any such move on the part of his friends. Mr. Blakeslee's telegraphic answer to the notification was as follows: "Your wire received. Will do my best to hold up my end."

In view of the remarks by the mayor in welcoming the Master Mechanics, to the effect that he had heard of a movement to impeach his appointee as night-mayor, it may be well to give the substance of the document conferring the appointment, as read at the annual meeting of the Railway Supply Manufacturers' Association on Saturday last. It is as follows: "By this instrument, be it conveyed to all visitors and residents of Atlantic City, including the various organizations connected with the railway interests, that, with a view to adding to the delights and pleasures of life along the strand, I do hereby command, in a lapse of wisdom and forgetfulness of all fear of retribution, that it be now and hereafter known that the office of night-mayor exists and is in effect; and that I have forever waived all hope of salvation and a future political preferment by appointing to that ozonic post, for the period of ten days, Thomas Aldcorn, of the city of New York, whose duty it shall be to enforce a proper observance of the unwritten laws of morality and propriety, so skilfully observed (in the breach) by himself

and his fellow-offenders. And that, on being clothed with the authority of this saline function, the said night-mayor, Thomas Aldcorn, be required to give ample security for the return of all stolen property (including lost reputations) during his term of office. Imposed on a long-suffering public this 18th day of June, A. D. 1910."

The key of the jail door, carrying the freedom of the city in its broadest sense, was received by the president of the supplymen's association in the absence of Mr. Aldcorn.

MR. HOOLEY ON SUPERHEATERS AND LUBRICATION.

"I see that th' relrods are havin' soup-heaters putt on their locommytives now," remarked Mr. Dennissey. "'Tis a good thing. Clancy's Mike 's firin' on th' Coo, 'nd he says 'tis th' wurrst av th' whole game that he's to be out th' endurin' night 'n the winter 'nd the snow 'nd the cowld 'nd niver a warrum sup to his stummick but th' cowld grub fr'm his tin bucket. But till me," he continued, as he examined a cut in the *Daily*, "do they putt the soup heater so't th' min 've to crarl out t' th' front av th' engine to get at ut?"

"'Tis plain, Dinnissey, that ye've seen more hot free lunch stands thin ye have locommytives, 'nd closer by," replied Mr. Hooley, with a mild expression of scorn due to superior wisdom. "'Tis a shuperhater, Dinnissey, 'nd its an arrangemint av th' front ind av th' boiler av the locommytive so whin the stame's as hot as it can get it gets a little hotter. 'Tis no soup kittle. T' illusthrate, as me frind fr'm th' Canadjeen Passific was tellin' me the mornin'," continued Mr. Hooley, forgetting that he was letting his foot slip as to the well-seasoned character of his knowledge—"t' illusthrate: Whin ye hate wather till it gets two hundther 'nd twilve far-in-height—'tis fate, I'm thinkin'—it toorns into stame, 'nd that's as far 's the wather goes. Far-in-height 's a take-a-nickel term, but th' choobs in the boiler make the wather go that far, 'nd thin it's stame."

"But ye get stame fr'm yer tay-kittle," interposed Mr. Dennissey, "'nd the wather don't go thot far in height nor anny other way."

"Th' locommytive's a-thravelin', 'nd that makes it go farther nor it wud alone 'nd makes up th' rist av the distance," replied Mr. Hooley, after a moment of hesitation which was gracefully covered by a renewal of the fire in his pipe. "But 's I was sayin' whin so roodly intherrupted, whin it's two hundther 'nd twilve, 's as far 's the wather goes, 'nd it's stame. Thin they shut up th' stame in the front ind av th' engine in a lot av choobs that's twisted like the bunch av wurrums that ye carry with ye, Dinnissey, whin ye get yer bait at my place 'nd yer fish at th' carner 'nd spind the day undher th' threes be the lake. Th' stame gets hot at bein' shut up with th' wurrums, as ye wud, iv ye had n't th' bait——"

"I wud," ejaculated Mr. Dennissey, "I wud so."

"—'nd whin the stame gets t' th' ind av th' c'lection av wurrums, y' undershtand, it's that hot 'nd it's that sthrong, Dinnissey, that it pushes thim rods, d'ye mind, on th' wheels, 'nd makes th' engine go——"

"The lasht toime I wint fishin'," interrupted Dennissey again, in a reminiscent tone, "I lift me wurrums in me pocket, 'nd—but I had n't no stame."

"Ye did whin ye came t' me place that night," contradicted Mr. Hooley, "'nd ye was a-stheppin' that far in height, too, that I tho't ye'd sthub yer toes on yer chin. But that's anny other ta-ale, 's me frind Roger Kiplin' says, whin Corp'ril Mulvaney's gettin' that ondacint 't he's like t' shpoil th' sale av th' book. Whin d'ye see Mike Clancy last?"

"I heard 'm come home, th' last night 's night that was till we come away."

"He's quit th' Coo," remarked Mr. Hooley, casually. "Th' manigemint cud n't shtand f'r his wastin' the loobricatin' oil. Ye see, 'tis this way, Dinnissey. Whin a man wastes coal, that's all that's to it, 'nd whin a thrain 's behint its shedule, that's all that's to it, 'nd whin a man uses a pint too much loobricatin' oil in a month, that's all that's to it. It's th' only wan thing, whativer wan man's done or did n't have done. That's th' only thing that's kipt the road fr'm payin' dividinds, 'nd kapes th' orfisers in Tchicago instid av in gay Paree, 'nd kapes thim a-figurin' how to cut down wages so 't 'll look as if they was a-raisin' thim, 'nstid of throwin' silver bucks fr'm th' Awful Tower f'r th' delight av little Jawney Crapaud. T'hear Mike till how th' soop'rintindint talked t' 'im, th' Coo'll be resaved int' th' boosom av a coort resavear th' nixt month, 'count av Mike's roonous waste av loobricatin' oil."

"What'd Mike do?" inquired Mr. Dennissey.

"Greased th' pulleys av his Prisident suspenders t' kape 'em fr'm creakin' whin he was shovelin' coal," replied Mr. Hooley as he rose to go.

MASTER MECHANICS' REGISTRATION.

The following list is additional to those already published in the *Daily*.

Best, W. N., W. N. Best International Calorific Co., Marlborough-Blenheim Hotel.
Dickson, Geo. L., Baldwin Loco. Wks.
Dogle, P. F., C. R. R. of N. J., Monticello Hotel.
Emerson, Harrington.
Fitz Simmons, E. S., M. M., Erie R. R., Shelburne Hotel.
Gibbs, George, Long Island R. R., Chelsea Hotel.
Gibbs, J. W., Genl. Foreman, Southern Ry.
Grimshaw, F. G., M. M., W. J. & S. S. Div., Pennsylvania Ry.
Hainen, J., S. M. P., Southern Ry.
Harrison, F. J., B. R. & P. Ry.
Illig, L. J., P. R. R.
Jennings, J. A. L., P. & R.
Johns, M. E., Supt. Erie R. R.
Kaderly, W. F., M. M., Southern Ry.
Kelly, R. J., Long Island R. R., Shelburne Hotel.
Kelly, G. W., C. R. R. of N. J., Worthington Hotel.
Mannion, T. D., M. M., Philadelphia & Reading Ry.
Marsh, F. E., A. M. M., Pennsylvania R. R. Co.
Reese, I., Gen. For., Penn., Eppling Hotel.
Roberson, T., P. R. R.
Sinnott, J. P.
Smock, F. A., M. M., Pennsylvania R. R.
Stewart, T. R., M. M., B. & O., Chetwood Hotel.
Tuma, Frank, M. M., Erie R. R., Shelburne Hotel.
Williams, C. B., Gen. S. K., C. R. R. of N. J.

MASTER MECHANICS' GUESTS.

Allen, W. H., Penn. R. R.
Anderson, J. B., Penn. R. R., Chief Clerk, M. P. Dept., Runnymede Hotel.
Atkinson, R., Baldwin Locomotive Works.
Bayer, C. W., Asst. Foreman Erecting Shop, P. R. R.
Berry, Robt., Penn. R. R., Asst. For., M. P. Dept.
Bickley, W. H., Penn., Round House, Efflin Hotel.
Brown, J. D., Foreman Car Lght., B. & O., Windsor Hotel.
Cullingford, J. E., Penn. R. R., Asst. Chief Clerk.
Dawes, L. M., Penn. R. R., Chief Electrician.
Dietrick, J. C., Penn. R. R., For. Car Shops, Ellwood Hotel.
Dupell, R. E., Penn., Rd. For. Engines, Jackson Hotel.
Edmonds, Wm., B. & O., Engineer, Star Cottage.
Ellis, F. B., Phila. R. T. Co., Chief Clerk M. P. Dept., Shelburne Hotel.
Emley, W. W., Asst. Storekeeper, P. R. R.
Francis, G. E., Asst. Foreman Erecting Shop, P. R. R.
Fryer, E. F., Atlanta & West P. R. R.
Garcelon, H. I., B. & O., Asst. Eng. Tests, Chalfonte Hotel.
Gehret, S. S., Penn. R. R., Gen. For., Stanley Hotel.
Gordon, W. L., Foreman, M. P. Dept., B. & O.
Gority, Jno., Foreman Mac. Shop, P. R. R., Glenmore Hotel.
Grewe, H. F., W. P. Ter. Ry., Gen. For. Mech. Dept., Brighton Hotel.
Heald, W. E., Supt. Construction, B. & O., Windsor Hotel.
Johnson, J. G., Phila. Rapid Transit, Chief Engr.
Keiley, J. D., Elect. Eng., N. Y. C. & H. R., Haddon Hall.

Kimmett, A. D., Asst. M. M., L. & W. V. R. R., Elberon Hotel.
Lowman, H. F., Chief Clerk Mech. Dept., Southern Ry.
Mackey, W. C., Car For., B. & O., Star Cottage.
Malloy, Dr. J. F., Strand Hotel.
Mansfield, J. J., Ch. Boiler Ins., Cen. R. R. of N. J., DeVille Hotel.
Nicholas, R. H., Genl. Foreman, C. R. of N. J.
Pangborn, R. G., Special Apprentice, B. & O.
Ringland, J. A., Round House Foreman, Penn. R. R., Jackson Hotel.
Roberts, W. N., Foreman, Penn. R. R.
Saylor, James M., Rd. House Foreman, P. & R., Magnolia Hotel.
Schaefer, C. W., Foreman, C. of Ga. R. R., Chalfonte Hotel.
Scott, W. L., Gen. For., S. T. R. T., Shelburne Hotel.
Smeltzer, G. H.
Smith, E. J., Storekeeper, Penn. R. R.
Smith, J. A. B., Atlanta & West P. R. R.
Smith, R. J., Agent, Southern Pacific, Marburg Apts.
Stewart, Thos. R., Jr., B. & O., Chetwood Hotel.
Tangue, Wm., Pipe Fitters For., B. & O., Star Cottage.
Walker, T. C., Atlantic City Press.
Whitehead, J. B., Pur. Agt., L. & N. E. R. R.
Whitehead, H. R., Foreman Mac. Shop, P. R. R., Roxborough Hotel.
Wilt, W. L., Chief Clerk M. P. Dept., Penn. R. R., Dennis Hotel.

In granting concessions to private companies to operate railways, the French government has expressly reserved to itself the right of authorizing new railways to effect a junction with railways now in operation, and the present operating companies are forbidden to claim any indemnity so long as the traffic is not impeded by the construction of these new railways, and so long as the company shall not be put to any expense.

The Exhibit.

R. F. Darby looks quite at home as engineer of the locomotive with the Pilliod gear; and R. H. Weatherly, president of the Pilliod Company, New York, makes a fine looking conductor of the exhibit.

The railing which encloses the exhibit of the Landis Tool Company, Waynesboro, Pa., is made of shafting, ground on a 16-in. x 72-in. plain, self-contained gap grinding machine, which machine is now being operated within the booth.

The Delaware, Lackawanna & Western has been ordering safety tread from the American Mason Safety Tread Company, Boston, Mass., for stations. The Interborough Rapid Transit are ordering large quantities of carborundum safety tread for its stations.

"Close connections" are easy to make by using the Jefferson union. They save one nipple and an extra joint with each connection. The swivel action and spherical brass to iron seat also helps to make a tight joint easily even if the pipes are not in perfect alignment. The union is made by the Jefferson Union Company, Lexington, Mass.

The manufacturers of acetylene headlights find it desirable to use a mica chimney or flue which in some cases is suspended above the flame. Unlike its use on the oil headlight, the chimney is not necessary to give proper form to the flame, but its use is of advantage in protecting the reflector from the intense heat of the flame. The Storrs Mica Company, Owego, N. Y., makes a number of styles of chimneys for this use.

"Shelby Steel Tubes and Their Making" is the title of an artistically illustrated brochure published by the National



Some of the Workers on the Transportation Committee.

Top row, left to right—C. O. Taylor, J. A. Renton, J. H. Klink, J. L. Ponic, J. M. Broun. Bottom row, left to right—W. R. Parker, J. D. McClintock, L. C. Broun (chairman), George S. Stewart, F. E. Edwards.

Tube Company, Pittsburgh, Pa., the manufacturers of this interesting material. While it is not the intention to scatter this addition to mechanical literature broadcast, any one needing the information it contains can obtain a copy by writing to the publishers. It is desired that a request for a copy be accompanied by information relative to the proposed use to which the Shelby seamless steel tubing is to be put; and, if possible, a rough sketch or blue print.

Garlock combination packing is made expressly for air compressors. It is particularly designed to withstand the extreme dry heat of compressed air, which enables it to fill the requirements when used to retain dry steam or gas. It has a high grade heat resisting center and a heavy braided cover of long fibre asbestos. It is thoroughly lubricated with the Garlock compound and retains its elasticity under all conditions.

The Dearborn Drug & Chemical Works, Chicago, have, as usual, one of the most attractive booths in Convention Hall. It is designed as a reception room and place of rendezvous for the many friends of the representatives of the company. The Oriental effects are well brought out in the furniture, rugs and the attractive perfume fountain. Among the ornaments particularly deserving of note is a turbine fan for table decoration, an English idea, and the only one of the kind in the United States. The large bronze Chanticler frog which has been an ornament on the Shelburne Hotel lawn this summer in some mysterious manner leaped during the night into the center of the Dearborne booth and is admired by many visitors.

The Carborundum Company, Niagara Falls, N. Y., has a most interesting and complete exhibit of carborundum in its various forms, including carborundum grinding wheels for all kinds of tool grinding—twist drill, reamer, link and guide bar grinding; carborundum sharpening stones for bench work; carborundum paper and cloth for general shop work; and garnet paper for car repairers and builders, and carborundum valve grinding compound for all kinds of valve grinding where a perfect contact seat is required. The following representatives are here: George R. Rayner, C. C. Shoemaker, Charles Nicholson, R. H. Hogg and C. C. Lathrop.

The Standard Coupler Company is showing, in booth 339, several new types of buffing mechanism for passenger cars, to be used in connection with its standard steel platforms, cast steel platforms or steel underframes. They vary somewhat in design and capacity to meet modern requirements. Type A-23 is this company's standard equalizer type, arranged for longer travel and greater ultimate resistance. Type D-3 is an equalizing spring buffer requiring 3¼ in. compression to couple and having a total movement of 5½ ins. and a capacity of 45,000 lb. Type F is a combined spring and friction buffer, designed to equalize on curves, having an easy movement to couple and a resistance gradually increasing to a practically unlimited extent. The company is also showing samples of the well-known Sessions-Standard friction draft gear.

EXHIBIT OF LINDE AIR PRODUCTS COMPANY.

One of the most interesting exhibits is a welded locomotive fire box section which may be seen at space 500. This fire box section has been specially prepared by the Linde Air Products Company, to show the progress which has been made in the application of its oxy-acetylene welding apparatus to fire box repairs, and it stands all day under hydraulic test pressure of 280 lbs. per sq. in.

In addition to this fire box section, the Linde Air Products Company are showing a number of specially constructed welding and cutting appliances for general work; among them is a complete self-contained portable oxy-acetylene welding plant that has been specially designed for railway use, where portability is a determining factor. Many have already been sold to railways and are in daily use.

The Linde Air Products Company also have some interesting photographs of the use of its apparatus in cutting up and removing the wreckage of the Quebec Bridge.

MANTLE LANTERN BUOYS.

During the past year nearly 200 of the Pintsch flat-flame buoy lanterns, made by the Safety Car Heating & Lighting Company, New York, have been changed to mantle lanterns. This change has resulted in largely increasing the power of the light beam given by the lantern.

A revolving lens lantern for buoys has also been recently perfected. The present type of lantern uses a fixed light lens with an automatic occulting mechanism. By revolving a number of flashlight lenses around the source of light, the same effect of flashes is produced, and the power of the beam is increased to many times that of the old arrangement. The mechanism for revolving the lenses is operated by the flow of gas to the burner, and is of simple and unique design.

RUSTLESS IRON.

Rustless iron seems to be a sort of misnomer; for the one thing we do know about iron and the various iron alloys, called steel, is, that they will rust. Theory has been rampant as to why iron rusts; and from almost any one of these theories there have been gathered enough facts to prove almost any case. But above them all stands the dominant fact that it does rust. So, when we hear of rustless iron for the initial time, we look askance; first, to see whether the speaker is in earnest, and then if he is sane. But painstaking laboratory investigations have built up a theory that corrosion is due to a lack of homogeneity in the material; to the presence of slag and other impurities; by which a galvanic electric current is set up on the same principle as that of a pile. If the theory be true, then it would follow that a pure iron would not rust—a pretty stiff proof to which to subject the pudding, and one that would be considered as beyond the pale of commercial work and as belonging to the realm of the laboratory alone. But the refinements of research work are coming more and more into our everyday life, and now we have a practically pure iron, that by the very fact of its great purity has rust resisting properties that were not dreamed of a few years ago. It is called "ingot iron," and is made by the American Rolling Mill Company, of Middletown, Ohio. It is 99.94 per cent pure ferrite and the balance, .06 per cent, is made up of manganese, carbon and phosphorus. But as it approaches pure iron (ferrite) in its composition, so it comes pretty close to being rust proof. It is called "ingot" iron because it is just that. It is melted in an open hearth furnace, in the same way that open hearth steel is made; but by a judicious selection of materials and careful heating the manganese and carbon are cut down to very low limits and the metal is poured into ingots, like steel. The pouring heat is very high, and the results are as stated.

The demand for the material is so great that it is all rolled into sheets and none is available as yet for other purposes, but new mills are being built, so that later it will be put on the market in larger quantities. Meanwhile, the sheets are largely used for culvert purposes. For car, locomotive and shop work, it is of great value. Its use for roofing would cure many of the evils of leaky roofs from which we are now suffering; for locomotive jacketing it would add materially to the life; and for all sorts of conduits in the shop and roundhouses that are subjected to sulphur fumes, it is especially adapted. In short, it is one of those practical applications of pure science that shows how admirably laboratory research fills in and supplements the needs of everyday life, and stands out as by far the best actual demonstration of the truth of the electrolytic theory of corrosion that we have.

GARLAND PASSENGER CAR VENTILATORS.

The rapid introduction of the Garland ventilator on passenger equipment of our railways is contributing largely to the comfort of travel. Its use makes it possible to keep windows closed, thus excluding dust and cinders, while it provides an ample supply of fresh air. The illustration (Fig. 1) shows the arrangement as usually applied to the upper deck sash opening on Pullman cars, coaches, dining cars, etc., while Fig. 2 shows, by arrows, the direction of the air currents.

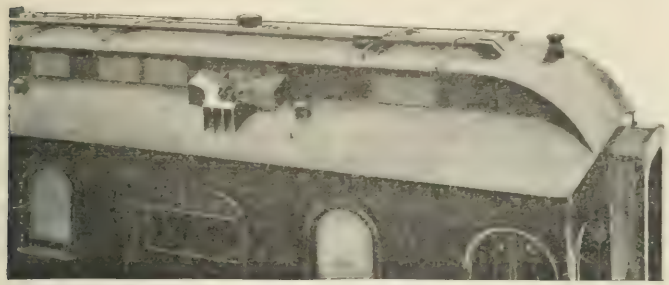


Fig. 1.—Garland Ventilator in Upper Deck Sash.

The direction of car movement is to the right as one looks at the cut. The left side is operative when the movement of the car is reversed. The movement of the air is maintained uniformly by the continuous exhaust at the roof. There is no intake of air at the ceiling and therefore no downward drafts. The construction is such as to make

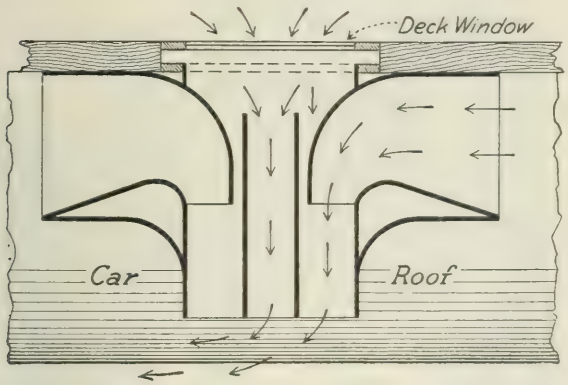


Fig. 2.—Garland Ventilator as Applied to Lower Deck of Monitor Roof.

it impossible for smoke, cinders, rain, snow or dirt to enter the car through the ventilator. It has no moving parts, and requires no adjusting in changing the direction of car travel. Special air intakes are provided when desired; but they are ordinarily not found necessary, as sufficient fresh air enters through the doors to replace that taken out by the ventilators. These ventilators are made by Burton W. Mudge & Company, Peoples Gas Building, Chicago.

KENNICOTT TANKS FOR GRAIN STORAGE.

The Kennicott Company, Chicago, Ill., which makes the Kennicott water softener, as well as tanks, tank cars and other railroad supplies, is now building tanks for grain storage; and shippers along many lines of railway, particularly in the northwest, are rapidly learning to appreciate the advanages of a steel tank for this purpose. Unlike wooden bins, the steel tank does not rot, leak or burn. It is also superior to concrete or tile, in that it cannot be cracked by the frost, is much more quickly constructed and in the smaller sizes can be moved about from place to place. Many individual farmers are purchasing small steel tanks in which to keep their grain, either in the field or at the railway siding. These small tanks have all the advantages of a large steel elevator and enable them to market their crops with much



Kennicott Tanks for Grain Storage

more safety and profit. Steel tanks, such as the Kennicott Company is building, will undoubtedly give the railways a larger tonnage of grain to handle and will allow them to deliver it in a better condition.

THE ACME AUTOMATIC BRAKE SLACK ADJUSTER.

One of the most essential requirements for the movement of the heavy freight trains of the present day is efficient air brake service. A great deal of time is spent in keeping it in proper condition and endeavoring to improve it to the utmost; although in the nature of its application, after a car is turned out of the shops, it soon loses from 20 to 40 per cent of the calculated efficiency. Were it possible to give the service the inspection such as the passenger air brake receives, it would be kept in a high state of efficiency. This not being the case, however, the braking power is constantly reduced through wear in the connections from the air brake cylinder to the point at which the brake acts on the wheel.

Wear on the brake shoes is constant, and as they wear, the pressure on the wheel or braking power is constantly reduced owing to the increased distance through which the piston in the brake cylinder must move to apply the brakes.

Various slack adjusters have been devised to maintain a constant piston travel, but the majority are arranged to apply to the brake cylinder. To meet the requirements for adjustment at the wheels, the Western Railway Equipment Company, St. Louis, Mo., has perfected the Acme automatic brake slack adjuster, of which it has a working model at its exhibit. This device is absolutely automatic for the reason that it maintains a constant distance between the wheels and brake shoes irrespective of the wear on any or all of the shoes. In applying new brake shoes to cars with the Acme automatic adjuster, all that is required is the application of the shoes. The first setting of the brakes adjusts the piston travel to the distance desired to be maintained, either four, five, six or seven inches. About 50,000 sets have been applied and are giving good service.

IMPROVEMENT OF ICING STATIONS.

The insulation of ice storage houses maintained by various railways for supplying ice to refrigerator cars is a necessary development, both for saving ice meltage and for keeping ice in good condition. The Chicago, Rock Island & Pacific, the Chicago, Burlington & Quincy, the Union Pacific, the Southern Pacific, and the Atchison, Topeka and Santa Fe have had many of their ice houses insulated with Lithboard

by the Union Fibre Company (exhibit space 448). The question is being taken up quite generally this year among railway men, and the results obtained already show that a large saving may be effected at small expense.

A small pamphlet, "The Storage of Ice," is published by the Union Fibre Company, Winona, Minn., which gives much interesting information. The company will send copies on request anywhere.

ADLAKE SIGNAL LAMPS.

It would seem that perfection had been reached by the Adams & Westlake Company, Chicago, in the construction of its Adlake non-sweating balanced draught signal lamps. It is claimed for these lamps that they have proven satisfactory as to ventilation under all conditions. Unless one compares Adlake ventilation with the ventilation of a few years ago, it is impossible thoroughly to appreciate the evolution which recent years have witnessed in railway signal lamps. The baffle-plates in the top of the lamps are arranged to deflect the currents of air so as to produce the best possible ventilation, while the non-sweating top ventilation prevents fogging of the lenses; and consequently the maximum of signal efficiency is obtained. There is no flickering of the flame or over-heating of the lamp. Non-sweating insures long life of the body of the lamp on account of the absence of corrosion, and the lamps are made entirely of heavy sheet steel and the parts riveted in order to secure the greatest strength.

VENTILATION IN THE HUDSON RIVER TUBES.

The importance of proper tunnel ventilation cannot be overestimated, and the Hudson Companies, New York, recognizing this fact, have installed a complete system of ventilation in the Hudson River tubes. An abstract of a report by Thomas B. Stillman, of Stevens Institute, shows the high efficiency which has been secured: "Outside atmosphere contains about 3.5 parts carbon dioxide per 10,000 parts air. This may be considered pure air. I have made a careful and thorough analysis of air taken from the under river portion of the Hudson tunnels, and find it contains slightly less than 3.5 parts of carbon dioxide. This is due to the excellent system of ventilation in the tunnels, caused by the immense fans and blowers at various points, which pump fresh air into the tunnels and discharge the air therefrom. Your system of ventilation is further improved by the great displacement of air resulting from the movement of your trains through single tubes.

"I have also taken samples of air in the afternoon rush hour, between 5 and 6 p. m., in the cabins of the principal ferryboats crossing the Hudson River, with the following results: The air in the women's cabin showed an average of 9.4 parts carbon dioxide, and in the men's cabin an average of 17.6 parts of carbon dioxide. The amount of carbon dioxide measures the extent of contamination or impurity of the air, thus showing that in the cabins of the ferryboats, artificially heated and not thoroughly ventilated, there are from three to six times as much carbon dioxide as is contained in pure air.

"Thorough analysis of samples of air taken from crowded trains of the Hudson tunnels between 5 and 6 o'clock p. m. showed that the amount of carbon dioxide was between five and six parts only. This proves beyond doubt that your system of ventilation is highly efficient. Air from the tunnels, not taken from the trains, gave 3.5 parts of carbon dioxide, showing it to be as pure as the air outside."

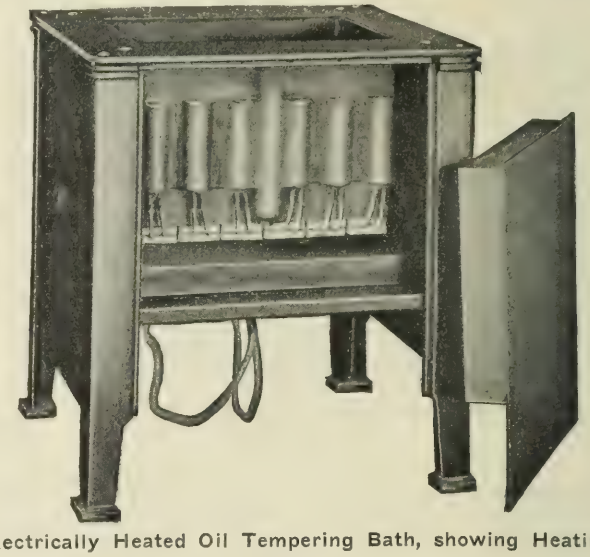
The supply and exhaust ventilating equipment consists of American Blower Company's fans, as follows: Hoboken Station—Two 140-in. "ABC" special steel plate fans, full housed, with pedestals and direct connected 40 h. p. variable speed motors; two 100-in. "ABC" full housed, steel plate fans with direct connected 13 h. p. variable speed motors. Fifteenth Street Station—Two 96-in "ABC" cone fans with direct connected 30 h. p. variable speed motors. Morton Street shaft—Two 180-in. "ABC" full housed steel plate fans with direct connected 55 h. p. variable speed motors. Hudson Street Station—Two 100-in. "ABC" full housed steel plate fans with direct connected 50 h. p. variable speed motors.

ELECTRICALLY HEATED OIL TEMPERING BATHS.

BY H. FULWIDER.

Tempering is probably the most important operation in the manufacture of steel tools. Its successful performance therefore requires that either the workman have a broad experience in this work, or a method be employed which eliminates to a considerable extent the personal factor.

There are several ways of drawing temper, but it is usually accomplished by one of the two following methods: In one, a skilled workman judges the proper tempering temperature by degrees or shades of color; in the other, a thermometer of precision registers the temperature and the workman simply follows a chart—a physiological process against a physical one. In the former method, the steel is introduced into a furnace having a temperature between 500 deg. and 600 deg. F.; in the latter it is immersed in a liquid bath, the temperature of which is between 400 deg. and 550 deg. F. In the first case, good quality of product requires that the workman



Electrically Heated Oil Tempering Bath, showing Heating Units.

be experienced, and capable of accurately judging the degree of temper in the metal by the color shown. This means that the operator must be well paid, resulting in a consequent increase in cost of production. With the latter method, it is only necessary to have a table of temperatures corresponding to certain degrees of hardness in the steel. The operator can then place the work in the bath, bring the latter to the required temperature, indicated by a thermometer, and hold it at that temperature as long as necessary. By this last method tools will be produced having a uniform degree of hardness, independent of what workman does the work. In addition to this, one man can temper a greater quantity of tools in a given time than with the air blast furnace of the first method.

Formerly the oil tempering bath was heated either by means of gas or fuel oil. These sources of heat, although satisfactory to a certain extent, are objectionable because of

the fire risk resulting from an open flame, and the difficulties of obtaining close temperature regulation. Realizing these facts, the General Electric Company has developed a line of electrically heated oil tempering baths which overcome these objections. These baths can be located at any desired point in the factory with perfect safety. The temperature of the bath is easily controlled by means of regulating switches which vary the amount of energy consumed.

The bath proper consists of a rectangular cast iron tank having six lugs cast vertically on each side and evenly spaced; these lugs being drilled out so that "cartridge" type heating units can be inserted in them. It is found that by thus distributing the units an even temperature can be maintained in all parts of the oil.

The bath is surrounded by a heat retaining jacket made up of one bottom and four side sections. These sections are built up in the form of sheet metal boxes with an internal space of 3 in., which is filled in with mineral wool.

At one end of the tank there is a protected recess, in which is placed the thermometer that indicates the temperature of the oil. It is through the agency of this thermometer that the proper degree of hardness can be given to the tools which are being tempered, independent of the judgment or skill of the operator.

The following table gives inside dimensions, weight, oil capacity and energy consumption of the three standard sizes:

No.	Length	Width	Depth	Weight	Oil	Kilowatt
1	22″	12″	8″	420 lbs.	9 gal.	6
2	18″	12″	12″	475 lbs.	11 gal.	7.2
3	30″	16″	18″	900 lbs.	37 gal.	20

NOTE: All sizes furnished for either single or multiple heat control.

The maximum energy consumption of these baths is sufficient to heat the oil to a temperature of 450 deg. F. in less than one hour, starting cold. The maximum temperature which it is possible to obtain is about 600 deg. F., which is very close to the flashing point of the oil commonly used for tempering purposes.

There are two methods of oil tempering. The first is to bring the bath to a temperature of about 250 deg. F., then place the work in the bath and turn on full heat until the oil reaches the desired temperature, when the current is turned off and the work removed. If this procedure is followed, the steel, being introduced at a comparatively low temperature and then gradually heated to the proper point, is not subjected to any shock, and there is therefore no danger of injuring the quality of the tools.

The second method is to maintain the oil bath at the required temperature and plunge the steel into the oil, allowing it to remain there just long enough to acquire the same temperature evenly throughout the metal. The tools are then removed and a new lot is submerged.

By this latter method the process of tempering can be carried on without interruption, whereas in the first method it is necessary each time to cool the bath down to a temperature of about 250 deg. F. before introducing a new lot of steel, with a consequent decrease in output. Thus both methods have their advantages; but the one of gradual heating up involves no doubt as to the quality of the tool.

The heating units of the electrically heated baths are connected in groups, arranged according to the size of the bath, and the leads brought out to the terminal block. The bath can then be used as a single heat device; or, by running the leads to a switchboard designed for the purpose, it is possible to obtain a great number of temperatures. Where the tempering is done by gradually heating up the steel, the single heat bath will do the work satisfactorily; but if it is desired to maintain a constant temperature, it will be necessary to have the multiple heat bath, in which means are provided for varying the energy input by small steps, from zero to maximum. In the latter bath, each group of units is controlled at the panel board by an individual switch, and any desired temperature is obtained by throwing in the number of units necessary to give that temperature approximately. Close regulation is then secured by varying the voltage impressed on one of the units, this being effected by means of a rheostat, also mounted on the controlling board.

The machine shown is made by the General Electric Company, Schenectady, N. Y.

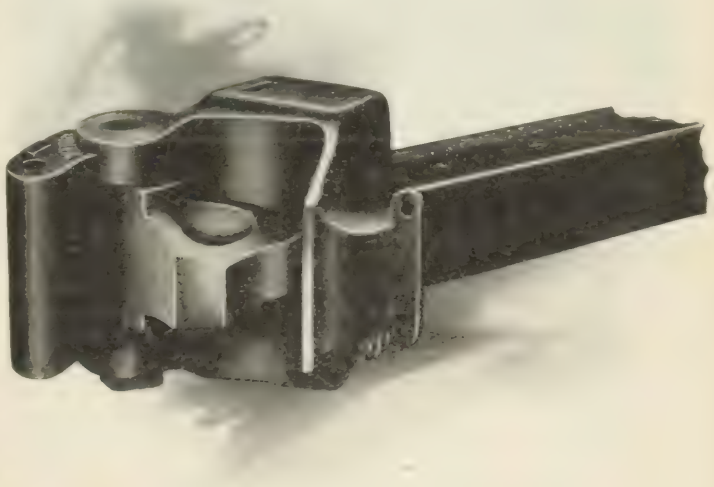
SIMPLEX PASSENGER COUPLER.

Among the interesting exhibits at the booth of the American Steel Foundries, Chicago, the new simplex passenger coupler deserves special mention.

The success and marked favor with which the simplex freight coupler has been received since its introduction two years ago has induced the manufacturers to adapt this type of coupler to passenger requirements, and the results obtained from the several thousand which have been placed in service during the past year fully meet all expectations, and indicate that this type of coupler will be as popular with the railways in passenger as it has been in freight service.



Simplex Passenger Coupler.



Simplex Passenger Coupler With Knuckle Open.

The under side of the head is practically free from any pro-

truding parts, which are easily damaged and broken, not only causing annoyance and unnecessary expense in maintenance, but in many cases making the coupler inoperative.

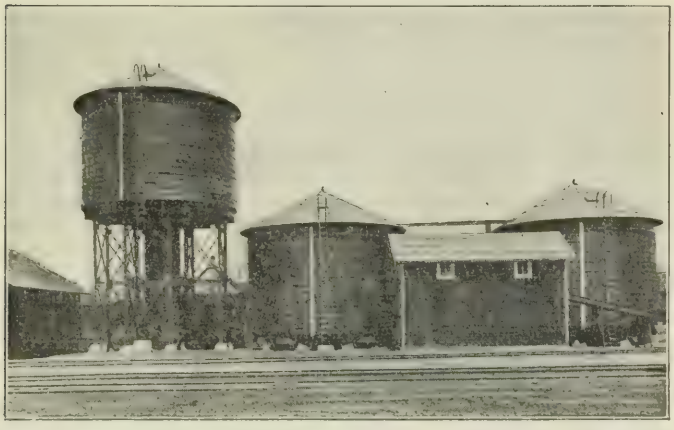
The operative parts consist of a knuckle, lock and a lifter which is made in two parts, all well protected within the head of the coupler, which reduces accidental damage to a minimum. Neither the lifter nor the lock offers any obstructions to the free operation of the knuckle. In opening the knuckle, the lifter is driven from the lock-set and drops to its normal unexposed position, the lock riding on the tail of the knuckle, being free to drop when the knuckle is completely closed.

The best quality of basic open hearth steel is said to be used in the manufacture of simplex passenger couplers, an accurate physical and chemical analysis being taken of each heat of steel. The coupler is later submitted to all the tests required by the master car builders' rules. The American Steel Foundries furnish these couplers in a great variety of different style shanks to suit any and all classes of passenger equipment.

WATER SUPPLY FOR LOCOMOTIVES.

The handling and storing of water for making steam, washing boilers, fire protection and for miscellaneous uses about the shops and terminal yards is becoming more and more worthy of the most careful attention and study.

Fast schedules for passenger service, heavy traffic in freight service and the constant effort to reduce the cost per ton-mile have all combined to make it a very important matter to have a supply of water equal to the demands of the service. It is not sufficient to have water only, it must be good water. If this cannot be obtained in its natural state, it must be obtained through treatment.



Water Softening Plant; C. C. C. & St. L., Terre Haute, Ind.

Fairbanks, Morse & Company, Chicago, manufacture a full line of equipment for water treating plants, including gas, distillate, and gasoline engines and pumps, gas producers, direct and alternating current electric machinery, steam and power pumps for tank work, wash-out purposes and fire protection, wood and steel tanks and towers, water cranes, etc. The illustration herewith shows a water softening plant on the C. C. C. & St. L., at Terre Haute, Ind., designed and built by the company.

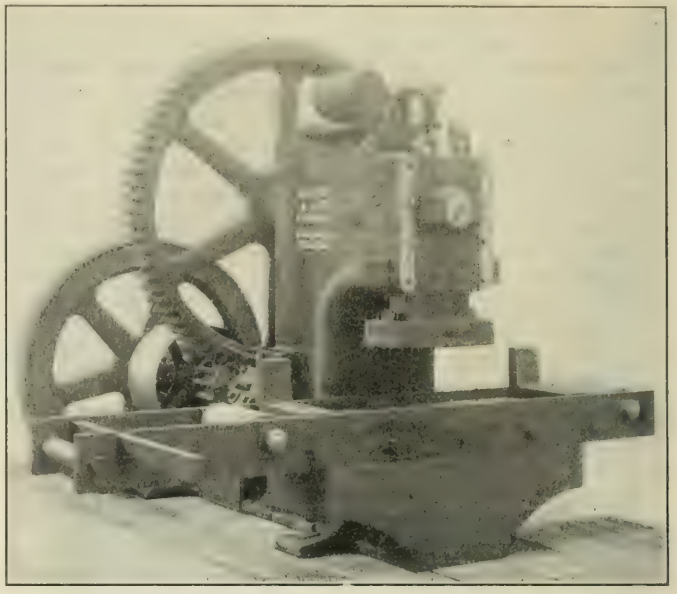
HAVE YOU SEEN THE HOSE DISPLAY?

Railway men will be interested in the exhibit of Sprague flexible steel armored hose for air brake and signal line service shown at booth 322.

The Sprague Electric Company, New York, claims that this rubber hose, with its interlocking steel armor, will reduce your hose bill. It will pay you to examine this hose and get complete information. The claim is that it cannot chafe, kink or burst suddenly, and that the steel armor makes it free from ordinary causes of failure.

STRAIGHTENING PRESS.

The photograph herewith illustrates a medium size straightening press suitable for straightening rails up to 45 lbs. in weight. This press is fitted up without a clutch, the spur gear being keyed directly to the eccentric shaft. It has a speed of 40 strokes per minute. The rollers are provided



Hilles & Jones Straightening Press.

to facilitate handling material. The sliding head is counterbalanced by a weight through a spiral spring, which relieves the shock on the counterbalanced parts. This head is fitted with bronze gib for taking up wear. This machine is made by Hilles & Jones Company, Wilmington, Del.

SCULLIN-GALLAGHER CAST STEEL TRUCK SIDE FRAMES.

The severe demands of modern railway operation have made necessary the 40 and 50 ton car, and it is frequently overloaded. To meet these conditions, cast steel truck side frames are rapidly superseding the old diamond arch bar construction.



Cast Steel Truck Side Frame.

The Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., is showing at its exhibit, spaces 135, 137 and 139, a very popular and successful type of truck frame, the special features being the design, giving maximum strength with minimum weight; the great bolster bearing surface, and the extreme simplicity of assembly coupled with a neat and workmanlike appearance.

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The substantial discussion on steel tires was in marked contrast with the attenuated report presented by the committee, and indicates the necessity of further investigation. The discussion was directed principally to the shelling out and the irregular wear of steel-tired tender wheels; the reasons given for these tire failures being as many and various as the explanations of tender derailments at the convention last year. However, sufficient suggestion is available to form the basis of a valuable report on the subject. With enlarged capacity for production and increased competition provided by the new tire mill in the west, the railways should be in position to demand a higher grade and a more uniform quality of steel in tires than has been furnished in recent years. The tire mills are like rail mills; they are working under such high speed that the finished product is not as satisfactory as that obtained under the older and slower methods of manufacture. The small diameter of tender tires does not permit of as much rolling as the larger tires used for driving wheels, and it is probable that the small tires are finished at too high a temperature. The frequent failure and rapid wear of tender wheels is a matter of so much importance that the Master Mechanics' Association should have a committee state the conditions of tire failure to the manufacturers and request them to improve the quality of the steel and the mill methods so that the life of the tire will be prolonged and irregular wear largely reduced.

The paper on Locomotive Frame Construction by H. T. Bentley emphasized the value and necessity of the convention discussion. It brought up a number of points relative to frame and box construction that had been worked out by the author from his own experience and data he had gotten by correspondence. The paper bristles with hints and suggestions, and many opinions were expressed that needed a little further elucidation in order to show just why they were held. For example, the suggestion that it would be preferable to spread the pedestals of the frame so as to use cast iron boxes instead of steel needed some explanation, in view of the tendency towards and the practice of using steel. But when the member who favored the old material stated his case his reasons were so good that no one took exception to it. And so it was throughout the series of points raised. The paper showed how much more important are experience and judgment than academic calculations in frame and box design. It emphasized without words or allusion that it would be quite impossible to calculate the stresses to which the frames are subjected, or the surfaces that should be used to carry the loads of the boxes on the shoes and wedges. We all know these things, of course, but aside from their purely technical worth, such papers are especially valuable in showing us how dependent mechanical officers are on each other for the assistance received in discussion in settling details of importance, so many of which can not be determined by committee investigations and reports. The paper drove home the importance of the little things and their bearing on the greater. It is the old story of connection between the horseshoe nail and the kingdom that was lost. First, a poorly fitted journal, then a pounding box, a worn wedge, a broken frame, an engine out of service and damages for delayed freight.

"Old stagers" at the conventions have so often heard the remark, "This is the best meeting we ever had" that, while agreeing, in the main, with the sentiment, they take it as a sort of commonplace. But why should not the conventions just closed be regarded as the best ever held? They were very unlike those of twenty-five years ago. Yet the change has come so gradually that it is almost impossible to put the finger on any one year and say that that is the division line between the old and the new, the high and the low. While the change has come almost imperceptibly, there has been some sudden smaller changes. For example, the custom of giving souvenirs grew until souvenirs filled the air, and many of those in attendance degenerated into a mass of souvenir hunters that was a nuisance. Then the entire custom was suddenly abolished, and the exhibitors and railway men again had a chance to talk without interruption. It was a quick change for the better, that notably improved last year's assemblage. Then the change in the arrangement for the distribution of badges has cut off, if not many undesirables, at least many that were not necessary to the success of the meetings. This year we saw no marked innovation, but there was a sense of solidity and substantial success that was most impressive. If we look to the history of the exhibits we read a long story of struggle and endeavor. A model of a steel car does not mean much to the casual passerby, but to the man who stops to think, it implies years of preliminary work on the flow of metals, the upbuilding of a heavy railway traffic that demands the car which the model imitates and then another long series of experiments to make a wheel to carry the load. The value of the exhibits is too well recognized to call for any explanation; and the railway man is seeking them now almost as much as the exhibitor is seeking to interest him in them. The conventions, the exhibit, the entertainment features all were on an impressive scale, both in magnitude and excellence, which meant an immense amount of work and interest on the part of everyone concerned, and which has gone far to warrant the repetition of that threadbare exclamation of commendation: "These *are* the best conventions we have ever had."

Naturally every railway man was interested in the report on Locomotive Boiler Design, Construction and Inspection as that is at present by far the most engrossing subject before the motive power department, because of the pending federal legislation. The statement made in the report, a statement that cannot be refuted, that 98.3 per cent of locomotive boiler failures are due to low water, would seem to wipe out all necessity for an inspection that will put an unnecessary expense on the railways and will be a menace to the safety of the public. The main plea in support of the bill is based on alleged railway negligence, backed by a covert desire to exempt the engine driver from all responsibility. Government records checked by the report of the committee go to show that low water is the cause in almost every case of explosions, and anyone who has examined an exploded boiler where this was the cause could have no doubt that it was the cause. It is, of course, too much to expect that incontrovertible proof will be accepted as a reason for not passing a restrictive bill, but what was shown does knock one of the main props from under the supporters of the bill, and it is to be hoped that we may have merely a burst of flame and a pile of slag, cinder and shot iron to show for the discussion that has been burning for a year or more, but which has not yet melted enough metal to make it safe to tap and pour.

CHARLES E. FULLER.

It is somewhat remarkable that all of the past and newly-elected officers of whom we have had occasion to write during these present conventions possess one characteristic in common, though if memory serves correctly, this is not a *sine qua non* in the matter of election to the presidency of either of the two mechanical associations. The characteristic is that of being men of action rather than of words. Charles E. Fuller belongs emphatically to this class. He has been a man of action ever since he was a boy, and fortune has favored him in giving a great diversity in his fields of influence, not only in geographical location, but in the more restricted limits of his world for the time being—the road with which he was connected. He is by birth a product of the Middle West, having been born at Terre Haute, Ind., in 1862. A friend suggests that Terre Haute should be in the running as a place for holding the conventions next year, both presidents-elect claiming that town as the place of their nativity.

Mr. Fuller entered railway service as apprentice in the drawing room of the Terre Haute & Indianapolis Railroad in 1879, afterwards serving in the machine shop as apprentice and foreman. In 1889 he went east as far as Hornellsville, now Hornell, N. Y., as general foreman of the Erie shops, later becoming master mechanic of the same road. In 1892 he was called to the Central Vermont as superintendent of motive power, from which position he returned to the Erie as master mechanic at Susquehanna in 1900. Two years later he was appointed assistant mechanical superintendent of the Erie, and served in that capacity until 1903, when he went to the Alton as superintendent of motive power. Upon the resignation of W. R. McKeen, he became superintendent of motive power of the Union Pacific.

Probably the best known of Mr. Fuller's work for the association to the presidency of which he has just been elected in his admirable report, presented last year, on "Motor Cars." Motor cars came to Mr. Fuller as a sort of heritage from his predecessor, and though the paper in question purported to be a committee report, it was confessedly the individual work of the chairman. Briefly the report recited the experience of the Union Pacific with one type of internal combustion motor, but the most valuable feature was the foundation laid for future investigation and report in a concise and complete series of questions in the form of a circular of inquiry for future work, which for some reason was not called upon for report the present year.

With a knowledge born of experience of eastern and western conditions, Mr. Fuller has the qualifications most desirable in a president of the Master Mechanics' Association; for the really effective work of the president is in his capacity as the head of the executive committee, and what appears in the sessions of the convention is only the outward manifestation. The affairs of the association are in good hands.

SHOP EFFICIENCY AND THE LABOR UNION.

In his presidential address at the meeting of the Master Mechanics' Association a year ago, H. H. Vaughan made some very useful suggestions in regard to the future work of the association. He called attention to the fact that, unlike the Master Car Builders' Association, the Master Mechanics' Association does not have to regulate the business relationships connected with the interchange of freight cars which forms such an important part of the work of the Master Car Builders' Association. The other principal work of the Master Car Builders' Association is the establishment of standards. It is doubtful whether locomotive standards are of much value, and little remains to be done in that direction. To attain a higher degree of usefulness, the Master Mechanics' committee reports and individual papers should, therefore be supplemented by other activities. Said Mr. Vaughan:

"I believe we should endeavor to pay more attention to the commercial side of our work than we have done in the past. Excellent as the work has been, it has with few exceptions investigated the technical rather than the business problems of the locomotive. While we do not want to decrease our attention to technical matters we could with advantage take more interest in, and exchange information with each other more fully on factors connected with the cost of operation. In short, without in any way reducing the interest we have in locomotive engineering, we must take up in a far more businesslike, serious way the financial problems connected with the operation of the locomotive department, the form of organization that will give the best results, the commercial aspect of the work of a motive power official in conducting his department as though he were manager of a large business enterprise. An important instance is that of comparing the costs of the operation of our repair shops. We manage the largest collection of factories in the world devoted to one substantially uniform product, the repairing of locomotives, and our total expenditure for this item alone amounts to about $80,000,000 per year. Every one should have the keenest interest in knowing whether their methods are the best and the costs among the lowest. Today such progress has been made in shop engineering and management that there is no reason why properly trained observers should not record time studies containing the necessary data to prepare intelligent and valuable statements about one operation after another that is performed on substantially the same parts in hundreds of shops from the Atlantic to the Pacific. Such work is possible and has already been performed in several shops by experienced engineers. By comparing operation by operation their results with those of other roads, by analyzing their methods and available machinery, we should be able to improve the one or justify the expenditure for additions to the other. What I wish most strongly to impress on you is that while still carrying on the technical work which has been so splendidly successful, we should pay more attention to the business problems under our control in which we can be of such mutual service."

These suggestions resulted in the appointment of a committee on "Locomotive and Shop Operating Costs," whose report was presented yesterday and appears in this issue of the *Daily Railway Age Gazette*. The committee states that trained observers of the various operations connected with locomotive construction and repairs have already made studies and records which are available to those who have the courage to use them as a proper measure of the labor to be paid for these operations. An interchange of results obtained by members of the Master Mechanics' Association in improved shop methods and improved machine operations is regarded as very desirable, and the purpose of the report on "shop operating costs" is a beginning in this direction. The continued demands of labor for more pay and

the decrease in the efficiency of the skilled workman render it necessary that the management of railway repair shops on many lines be made more energetic and businesslike. The difficulty in making these comparisons of shop costs is that while some railways have established piecework or some form of premium or contract system as the method of paying for labor, a much larger number of locomotive and car repair shops, including some of the most important, are still working on a day wage basis. The managements of some of these latter shops have compared their labor costs of locomotive repairs with those where piecework is in operation, and they find their costs are 30 to 50 per cent higher than they would be under a proper piecework schedule. Such comparisons are interesting and valuable from a financial standpoint; and they should teach that where this condition exists there is something radically wrong in the relation of the railways to their mechanics. They do not necessarily apply to all shops on a day wage basis. Some of these are favorably located as to labor supply and have a large proportion of good mechanics who are willing to do a fair day's work for a liberal wage. These have established homes within reach of the shop and in some of these shops the labor cost is sufficiently low to enable the roads successfully to compete with the locomotive builders. Other shops have been located in remote places where the desirable locations for homes are held by land companies at high prices, and there shop towns are of slow growth. Here are to be found tramp mechanics who are the least efficient, who demand high wages and resent and even prevent the establishment of piecework prices. The difficulty is that the best workmen are employed by the smaller industries located in town or city, while many of the poorer workmen drift into the railway shop which is located remote from the centres of population.

In shops where the labor unions have become strongly entrenched it is difficult to introduce piecework without a threatened strike, not only in that shop, but in others on the system, and rather than have necessary repair work stopped the roads have continued on with the day wage method of pay. Not content with this the unions have served notice in numerous instances recently that unless wages were advanced to rates higher than ever before there would be a strike. Again, to avoid cessation of work the managers have submitted to the demands of the men, and it has only resulted in strengthening the unions in their resistance to an equitable method of paying for labor, and discipline is weakened. The relation of shop men to the management is now on many railway systems not very different from that of the trainmen and others in the operating department, as described so well and for the most part fairly in the "Confessions of A Railway Signal-man," by J. O. Fagan.

Where such conditions exist in the shop the master mechanic is no longer "master." In the use of improved shop methods, in changes of foremen, and in the introduction of piecework to secure a fair day's work for a liberal wage, he is hampered by the dictates of labor unions. Some of the larger systems have shown themselves strong enough to free themselves of this unreasonable and expensive form of tyranny and have established methods of paying for labor in proportion to the amount performed, resulting in increased output, increased wages and satisfactory relations with the workmen. Where this has not been done, and it is found difficult to do, the mechanical departments should have the assistance of the higher officers, as it is no longer a question of shop management, but one of general railway policy. In such plants it is useless to talk about shop efficiency and shop costs and improved methods which will reduce repair expense 10 or 25 per cent. There must first be a revolution and a reform which will firmly establish the principle that the shop superintendent is the real master and that the methods of shop operation, which he knows to be right and desires to introduce, shall be permanently established without question.

Proceedings.

President Wildin called the third and final session of the Master Mechanics' Association to order at 9.40 Wednesday morning.

Louis E. Endsley, associate professor of railway mechanical engineering of Purdue University, was proposed for associate membership. This lies over until the next annual convention.

FREIGHT TRAIN RESISTANCE.

Edward C. Schmidt, Assistant Professor of Railway Engineering, University of Illinois, presented an individual paper on "The Relation of Freight Train Resistance to Average Car Weight." The tests which he described were thorough, and the paper includes complete data as to the methods employed, the results and the methods used in calculating them, and a discussion of the results. The summary and conclusion are given below. The apparatus used for making the tests was described in detail in the *Railway Age Gazette* of February 19, 1909, by F. W. Marquis.

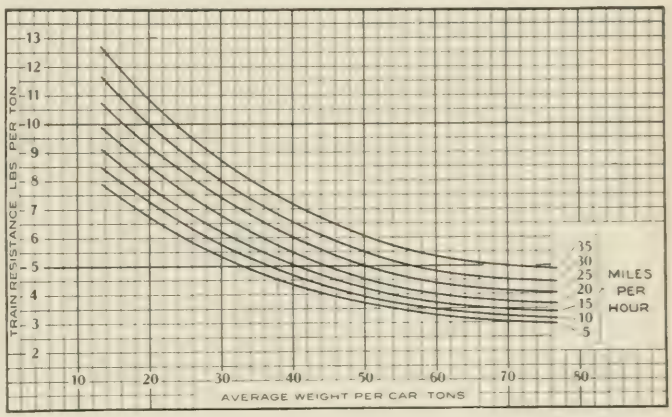


Fig. 10.—The Relation Between Resistance and Average Car Weight at Various Speeds.

Introduction.—Train resistance varies not only with the train speed, but also with the average weight of the cars of which the train is composed. At a given speed the tractive effort required for each ton of weight of the train will be greater, for example, for the train which is composed of cars of 20 tons average gross weight than for the train composed of cars which weigh, on the average, 50 tons each.

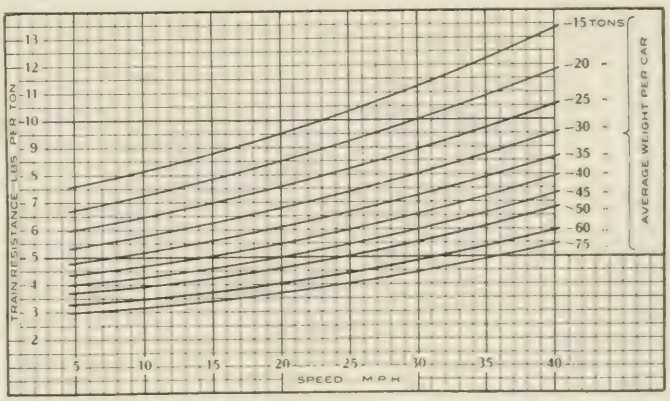


FIG. 11.—The Relation Between Resistance and Speed for Various Average Weights per Car.

While this fact has been known for some years, it has found inadequate expression and but little application. In the establishment of their tonnage ratings many railways have altogether ignored it. In the tonnage ratings of a few roads this variation of resistance with car weight is recognized to the extent of allowing a difference in rating between trains composed of loaded cars and those consisting entirely or partially of empty cars. Generally in such systems a certain

amount is allowed arbitrarily to be added to the weight of empty cars in determining, for purpose of rating, the weight of the train in which they are found. In such ratings no distinction is made between loaded cars of various weights, although such weights vary from 25 to 70 tons. A still smaller group of railways have fully recognized the significance of the facts above stated in establishing their tonnage ratings, which in such cases are usually termed "adjusted" or "equated" ratings. Under these adjusted ratings the actual weight of the train allotted to a particular locomotive varies according to the number of cars in the train. The ratings for the same locomotive with trains of 46, 60 and 80 cars, for example, will be different in each of the three cases. This, of course, is in effect a variation of the ratings with respect to the average car weights. Most of these adjusted ratings have been empirically determined. In the few cases where they rest upon experiments made to determine the variations in train resistance with respect to car weight, the data and results of such experiments have not been fully published. Existing train resistance formulæ likewise fail in most cases to take into account these variations of resistance with car weight, and probably much of the divergence among them is properly to be ascribed to this fact.

Purpose of the Tests.—In view of the facts just stated it has seemed desirable to make the tests whose results are

TRAIN RESISTANCE FORMULAE :—

When W = 15 tons; $R = 7.15 + 0.085 S + 0.00175 S^2$. (1)

" W = 20 " ; $R = 6.30 + 0.087 S + 0.00126 S^2$. (2)

" W = 25 " ; $R = 5.60 + 0.077 S + 0.00116 S^2$. (3)

" W = 30 " ; $R = 5.02 + 0.066 S + 0.00116 S^2$. (4)

" W = 35 " ; $R = 4.49 + 0.060 S + 0.00108 S^2$. (5)

" W = 40 " ; $R = 4.15 + 0.041 S + 0.00134 S^2$. (6)

" W = 45 " ; $R = 3.82 + 0.031 S + 0.00140 S^2$. (7)

" W = 50 " ; $R = 3.56 + 0.024 S + 0.00140 S^2$ (8)

" W = 55 " ; $R = 3.38 + 0.016 S + 0.00142 S^2$. (9)

" W = 60 " ; $R = 3.19 + 0.016 S + 0.00132 S^2$. (10)

" W = 65 " ; $R = 3.06 + 0.014 S + 0.00130 S^2$. (11)

" W = 70 " ; $R = 2.92 + 0.021 S + 0.00111 S^2$. (12)

" W = 75 " ; $R = 2.87 + 0.019 S + 0.00113 S^2$. (13)

here recorded. They were planned to determine the resistance of freight trains under the usual conditions of operation; and were designated to disclose at the same time, if possible, the relation existing at any given speed between train resistance and average car weight. Since the chief use of such information is in the production of locomotive ratings, the conditions of the tests have been made like those which prevail in normal freight train operation. The speed range, for example, is from 5 to 35 miles per hour, and the trains experimented upon were trains in regular service and usual in their make-up. The track upon which the tests were made is believed to be representative of good main-line construction.

The tests have been made as part of the research work of the Engineering Experiment Station of the University of Illinois, conducted by the Railway Engineering Department. They were begun in April, 1908, and were completed in May, 1909. All tests were made by means of Test Car No. 17, a dynamometer car, owned jointly by the University of Illinois and the Illinois Central, and were carried out on the Chicago Division of this road.

In the preparation of the report the aim has been to present it in as brief a statement of the results and conditions as is compatible with a clear understanding of the tests. The original report of these tests was presented to the American Society of Mechanical Engineers, and has been published in the Society journal for May, 1910. The report there published is practically the same in content as the one here presented. The results of the tests will also be published as a bulletin of the Engineering Experiment Station of the University of Illinois. This bulletin will contain, in addition to the facts here published, more detailed information concerning the track, the dynamometer car and the methods of calculation, as well as the tonnage record for each train and the calculated results and resistance curve for each test.

Throughout the report the terms "resistance" and "train resistance" mean the number of pounds of tractive effort required for each ton of the train in order to keep it in motion on straight and level track, at uniform speed and in still air. The report deals exclusively with the resistance of the train behind the locomotive tender. Locomotive and tender resistance are not discussed.

Summary.—The report deals with the results obtained from tests of thirty-two ordinary freight trains, whose chief characteristics were as follows:

	Minimum.	Maximum.
Total weight, tons	747	2,908
Average weight per car, tons	16.12	69.92
Number of cars in the train	26	89

The trains whose average weights were less than 20 tons or more than 60 tons were composed of cars of nearly uniform weight, while those whose average car weights were between 20 and 60 tons were either homogeneous or mixed as regards the weight of the individual cars.

The tests were made during generally fair weather. The minimum air temperature during any test was 34 degrees; the maximum, 82 degrees. The approximate average wind velocity prevailing throughout one test was 25 miles per hour; during all the others it was less than 20 miles per hour.

The tests were made upon well-constructed and well-maintained main-line track, 94 per cent of which is laid with 85-pound rail, the remainder being laid with 75-pound rail. Except through station grounds, where screenings or cinders are used for ballast, the track is full ballasted with broken stone.

TABLE 3

VALUES OF RESISTANCE AT VARIOUS SPEEDS AND FOR TRAINS OF DIFFERENT AVERAGE WEIGHTS PER CAR

THE VALUES ARE DERIVED DIRECTLY FROM THE CURVES OF FIGURE 11 AND REPRESENT THE FINAL RESULTS OF THE TESTS

Speed Miles per Hour	Train Resistance — Pounds per Ton. Column headings indicate the average weights per car												Speed Miles per Hour
	15 tons	20 tons	25 tons	30 tons	35 tons	40 tons	45 tons	50 tons	55 tons	60 tons	65 tons	70 tons	75 tons	
5	76	68	60	54	48	44	40	37	35	33	32	31	30	5
6	77	69	61	55	49	44	41	38	35	33	32	31	30	6
7	78	70	62	55	50	45	41	38	36	34	32	31	31	7
8	80	71	63	56	50	46	42	39	36	34	33	32	31	8
9	81	72	64	57	51	46	42	39	36	34	33	32	31	9
10	82	73	65	58	52	47	43	40	37	35	33	32	32	10
11	83	74	66	59	53	48	43	40	37	35	34	33	32	11
12	84	75	67	60	54	48	44	40	38	36	34	33	33	12
13	86	76	68	61	55	49	45	41	38	36	35	34	33	13
14	87	78	69	62	55	50	45	42	39	37	35	34	34	14
15	88	79	70	63	56	51	46	42	39	37	36	35	34	15
16	90	80	71	64	57	51	47	43	40	38	36	35	35	16
17	91	81	72	65	58	52	48	44	41	39	37	36	35	17
18	93	83	74	66	59	53	48	45	41	39	37	37	36	18
19	94	84	75	67	60	54	49	45	42	40	38	37	36	19
20	96	85	76	68	61	55	50	46	43	40	39	38	37	20
21	97	87	77	69	62	56	51	47	43	41	39	39	38	21
22	99	88	79	70	63	57	52	48	44	42	40	39	38	22
23	100	90	80	71	64	58	53	49	45	43	41	40	39	23
24	102	91	81	73	66	59	54	49	46	43	42	41	40	24
25	104	93	83	74	67	60	55	50	47	44	42	41	40	25
26	105	94	84	75	68	61	56	51	48	45	43	42	41	26
27	107	96	85	77	69	62	57	52	48	46	44	43	42	27
28	109	97	87	78	70	63	58	53	49	47	45	44	43	28
29	111	99	88	79	71	65	59	54	50	48	46	45	44	29
30	113	100	90	80	73	66	60	55	51	49	47	45	45	30
31	114	102	91	82	74	67	61	56	52	50	48	46	45	31
32	116	104	93	83	75	68	62	58	53	50	49	47	46	32
33	118	105	94	85	76	70	63	59	54	52	50	48	47	33
34	120	107	96	86	78	71	65	60	55	53	51	49	48	34
35	123	109	97	88	79	72	66	61	57	54	52	50	49	35
36	125	111	99	89	80	74	67	62	58	55	53	51	50	36
37	127	112	100	90	82	75	69	64	59	56	54	52	51	37
38	129	114	102	92	83	76	70	65	60	57	55	53	52	38
39	131	116	104	94	85	78	71	66	62	58	56	54	53	39
40	134	118	106	95	86	79	73	68	63	60	57	56	55	40

Conclusions.—The results of the tests are presented in Figs. 10 and 11, in Table 3, and in the equations an page 55. The curves, the table and the equations are each different expressions of the same facts. It is believed that by their use one may safely predict the probable total resistance of *entire* freight trains at various speeds, when running upon straight and level track of good construction during weather when the temperature is above 30° F. and the wind velocity is not more than 20 miles per hour, provided the *average* weight of the cars composing the train be known.

The results are applicable to trains of all varieties of make-up to be met with in service. They may be applied, without incurring material error, to trains which are homogenous and to those which are mixed as regards individual car weight.

The results are primarily applicable to trains which have been for some time in motion. When trains are first started from yards, or after stops on the road of more than about twenty minutes' duration, their resistance is likely to be appreciably greater than is indicated by the results here presented. In rating locomotives no consideration need be given this matter, except in determining "dead" ratings for low speeds, and then only when the ruling grade is located within six or seven miles of the starting point or of a regular road stop.

It is to be expected that some trains to be met with in service will have a resistance about 9 per cent in excess of that indicated by Figs. 10 and 11, due to variations in make-up or in external conditions within the limits to which the tests apply. If operating conditions make it essential to reduce to a minimum the risk of failure to haul the allotted tonnage, then this 9 per cent allowance should be made. This consideration, like the one preceding, is important only in rating locomotives for speeds under 15 miles per hour.. At higher speeds, the occasional excess in the resistance of individual trains will result in nothing more serious than a slight increase in running time. It should be emphasized that this allowance, if made, is to be added to the resistance on level track—not to the gross resistance on grades.

DISCUSSION ON FREIGHT TRAIN RESISTANCE.

H. T. Bentley (C. & N. W.): The association owes a debt of gratitude to Prof. Schmidt for the very able paper he has presented this morning. In looking over the explanation of the variation in the test conditions, I do not see anything mentioned about the difference in the diameter of the journals on the cars. The point has been raised by some of our master mechanics that when we are using the 4½ x 8 in. journal under all the cars, the engines were able to pull them very much easier than they now can with the same amount of tonnage in cars equipped with 5 x 10 in. or 5½ x 10 in. journals. We have been trying for the last year to make some experiments to determine whether there was anything in this convention.

F. M. Gilbert (N. Y. C. & H. R.): The fact that the higher resistance goes with the lighter cars seems to indicate that if the increased resistance due to increased journal diameter amounted to anything, it is almost lost; the heavier loaded car showing the less resistance per ton.

Mr. Bentley: What I intended to convey was that the resistance of a car containing 25 tons with a 4¼ x 8 in. journal would be less than that of a car containing the same amount but with a 5½ x 10 in. journal.

Prof. Schmidt: With the same weight per axle, there is no question but that the larger journal will have a larger resistance. The journal friction constitutes a large part of the total resistance anyway, and it is the variation in journal resistance that largely accounts for the results indicated. If you have two cars with the same load per axle, the unit pressure on the larger journal is, of course, less, and the coefficient of friction runs up as the unit pressure is increased.

C. A. Seley (C. R. I. & P.): There has been nothing relating to tonnage ratings before the association for a number of years. The last reference to it, I believe, was in connection with Mr. Henderson's paper in the early nineties. I have had occasion to use the data in that report very frequently. At one time I was called on to make all of the detail ratings for an 8,000-mile road from my desk, using the profiles, and I did a rather poor job of it in some ways, principally on account of the inaccuracy of the profiles. I do not believe in doing that sort of rating, altogether, but where the mechanical department is up against the production of ratings, it is very desirable, after you have correct profiles, to have a correct idea as to the amount of pull per ton on the classes of cars and service which you are endeavoring to handle. I regard this report as a very valuable contribution on information in that direction. I move that a vote of thanks be tendered to Prof. Schmidt.

The motion was carried.

TRAIN BRAKE AND SIGNAL EQUIPMENT.

This report was prepared by a joint committee of the Master Car Builders' and Master Mechanics' Associations. The report and the discussion before the former association appeared in the *Daily Railway Age Gazette* for June 16, page 1491.

DISCUSSION ON TRAIN BRAKE AND SIGNAL EQUIPMENT.

E. W. Pratt (C. & N. W.): The following changes are similar to those presented at the Master Car Builders' Association:

In the second line above the table on page 1495 insert after the word "cars," the words "above 100,000 lbs."

Underneath the heading "Passenger carrying cars," insert sub-heading "One brake shoe per wheel."

In the first line of the table (page 1495), change "18 in." to "16 in." cylinders; and change the end of the line to read, "weighing between 100,000 and 121,000 lbs."

In the second line of table, change to read, "Two 18 in. cylinders, cars weighing between 121,000 and 154,000 lbs."

Strike out line reading "Two 14 in. cylinders," etc.

The table immediately following is changed to read as follows:

"Two 14 in. cylinders, cars weighing between 100,000 and 109,000 lbs."

"Two 16 in. cylinders, cars weighing between 109,000 and 142,000 lbs."

"Two 18. in. cylinders, cars weighing between 142,000 and 180,000 lbs."

Strike out the line reading "Two 12 in. cylinders," etc.

Under the heading "Brake shoes hung 0 to 2 in. below wheel centers."

"Two 14 in. cylinders, cars weighing between 100,000 and 124,000 lbs."

"Two 16 in. cylinders, cars weighing between 124,000 and 162,000 lbs."

"Two 18 in. cylinders, cars weighing between 162,000 and 205,000 lbs."

Strike out the line reading, "Two 12 in. cylinders," etc.

Under the heading "Load cars," insert sub-heading "One shoe per wheel," and correct dimensions and weights as follows:

"Two 16 in. cylinders, cars weighing between 100,000 and 106,000 lbs."

"Two 18 in. cylinders, cars weighing between 106,000 and 134,000 lbs."

Strike out the line reading "Two 14 in. cylinders," etc.

Under heading, "Brake shoes hung 2 to 5 in. below wheel centers," change to read:

"Two 16 in. cylinders, cars weighing between 100,000 and 123,000 lbs."

"Two 18 in. cylinders, cars weighing between 123,000 and 156,000 lbs."

Strike out the line reading "Two 14 in. cylinders," etc.

Also the line reading "Two 12 in. cylinders," etc.

Under the heading "Brake shoes hung 0 to 2 in. below wheel centers," the following changes:

"Two 14 in. cylinders, cars weighing between 100,000 and 108,000 lbs."

"Two 16-in. cylinders, cars weighing between 108,000 and 141,000 lbs."

"Two 18-in. cylinders, cars weighing between 141,000 and 178,000 lbs."

Strike out line reading "Two 12-in. cylinders," etc.

After table, under heading "Limit of load cars, one shoe per wheel," insert the following:

Add to the report "Undoubtedly more consideration will be given the clasp brake (with two brake shoes per wheel), both on account of its reducing the number and size of cylinders and also lessening the dimensions and weight of brake rigging."

C. A. Seley: Inasmuch as a considerable portion of this matter is of more importance to the Master Car Builders' Assn., and relates more particularly to car practice, I move that the matter be handled practically the same as was done in the Master Car Builders' Association—the report was received subject to the changes which were recommended by the committee, and approved for letter ballot.

The motion was carried.

INSPECTION OF LOCOMOTIVE BOILERS.

The committee has not had time to formulate rules and regulations covering the inspection of locomotive boilers, but it has thoroughly investigated the subject of boiler explosions and failures and casualties to employees and others resulting therefrom.

Blanks were forwarded to all of the principal railways of the United States, asking for information in regard to boiler

inspection rules and regulations and also as to casualties resulting from boiler explosions of all natures. Attention is called to the following information received in reports from 157 railways replying to the question as to the number of boiler explosions and failures and casualties to employees and others resulting therefrom during the period from January 1, 1905, to November 1, 1909. These 157 railways own and operate 43,787 locomotives and 157,169 miles of roadway, and during the period from January 1, 1905, to November 1, 1909, they made 6,012,057,467 locomotive miles. We estimate that there are about 58,000 locomotives in service in the United States; therefore, the reports which we have received



T. H. Curtis.

Chairman, Committee on Inspection of Locomotive Boilers.

cover about seventy-five per cent of the total number of locomotives in operation in the United States.

Explosions and failures of locomotive boilers are divided into five classes, as follows. Explosions of boiler shells, explosions of fire boxes, damage by burning, rupture of flues, boiler-fitting failures.

Explosions of boiler shells and fire boxes, or damage by burning, etc., are usually due to low water. Of the failures reported, 98.3 per cent were due to low water and 1.7 per cent to other causes. Of the failures due to low water, 98.6 per cent were due to the failure of men handling or in immediate charge of the locomotive to maintain a proper supply of water in the boiler; the remaining 1.4 per cent. were due to other causes. Automatic devices, either to maintain the water supply or to act as an alarm when proper supply is not provided, have been proposed and given consideration, but it has been determined that such devices are unreliable and have had the effect of taking away from the men in charge their accepted responsibility.

A statement of the explosions, failures and casualties is shown below:

	No.	Average per Year.	No. Killed.	Average per Year.	No. Injured.	Average per Year.
Low Water:						
Explosion of boiler shells	14	2.9	20	4.1	16	3.3
Explosion of fire boxes	246	50.9	127	26.3	144	29.8
Damaged by burning	2,499	517.0	15	3.1	57	11.8
Ruptured flues	66	13.6	0	0.0	3	0.6
Fitting failures	25	5.2	0	0 0	4	0.8
Other Causes:						
Explosion of boiler shells	6	1.3	1	2.0	7	1.4
Explosion of fire boxes	2	0.4	1	0.2	1	0 2
Damaged by burning	40	8.3	1	0.2	1	0.2
Total	2,898	599.5	174	35.9	233	48 1

In the table, of the 407 killed and injured, 386 or 94.8 per cent, were due to accidents caused by low water, while the remaining 21, or 5.2 per cent, were from others causes, some of these being the result of or incident to wrecks, and a small number are thought to be due to accidents caused by defects in design, material, workmanship or the physical condition of the boilers or fittings, but it is doubtful if any of them could have been prevented by any method of inspection in addition to that which is now in force.

In addition to these failures, there were other failures, as follows:

	No.	No. Killed.	No. Injured.
Rupture of flues	3,204	8	21
Boiler fitting failures	1,609	2	51
Total	4,813	10	72

In analyzing the accidents due to the latter causes, attention is invited to the item of ruptured flues, shown to be 3,204. This, however, covers the record of an average number of 42,200 locomotives per annum for a period of four years and ten months. Assuming 250 flues to each locomotive boiler, the result shows one flue failure per year to each 15,912 flues in service, or, stated in other terms, the percentage of flue failures to the number of flues in service is six one hundred thousandth of one per cent.

Both of the above comparisons constitute an excellent endorsement of the present high standard of physical condition of American locomotive boilers, and show how small an opportunity there is to improve the present practice of railways. Of the 1,634 cases of boiler fitting failures reported, 1,609 are somewhat indefinite and apparently include failures occurring from causes other than the primary failure of the fittings, such as wrecks or other external accidents, many of them doubtless being of a minor character.

At the time the different railway companies were asked for information as to boiler explosions, casualties, etc., they were also asked to supply copies of their rules and regulations for the care and inspection of locomotive boilers. A review of such rules and regulations as were submitted shows that a very thorough and vigorous inspection of locomotive boilers is being maintained and recorded, and the rules prescribe very thorough instructions as to the proper care of the locomotive boilers. These rules and regulations plainly show that different localities require different rules and regulations for the care and inspection of locomotive boilers. In some localities the water used in the boilers is very detrimental to them; therefore, frequent inspections must be made, while in other localities the water conditions are very favorable and the period between inspections may be longer. In a general way, the rules and regulations for the care and inspection of the boilers must be made to meet the conditions under which the boilers are being operated, and no general rules will apply in a practical way.

From Senate Document No. 682, the following information was obtained: The average number of employees killed and injured per annum, on account of boiler explosions on locomotives, for the period from August 1, 1903, to November 1, 1908, was 49.7 employees and others killed and 134.2 injured. This Senate document covered a period of five years and three months and includes all the locomotives in use during that time.

During the period from January 1, 1905, to November 1, 1909 (four years and ten months), the replies from 157 railroads, having 43,787 locomotives, with a mileage of 6,012,057,467 miles, show that for said period the average number of employees killed and injured per annum was 38.0 killed and 63.1 injured. As the roads replying only represent about seventy-five per cent of the locomotives in the country, it will be assumed that the figures represent about seventy-five per cent of the casualties, which would make these figures approximate those furnished by the Government as to the number of persons killed and injured.

The report is signed by:—Theo. H. Curtis (L. & N.), chairman; H. W. Jacobs (A. T. & S. F.), A. E. Manchester (C. M. & St. P.), D. R. MacBain (L. S. & M. S.) and A. W. Gibbs (P. R. R.).

DISCUSSION ON INSPECTION OF LOCOMOTIVE BOILERS.

Mr. Curtis presented the report, and at its conclusion said: You will note, as to the number killed, the figures in the committee report and that of the government report are very close. There is not, however, the same closeness with regard to the number injured. This is due to a better record being kept of those killed than those injured, as the government report embodies those who are slightly injured, and, as the report went back for a period of five years, it is probable that some of the slightly injured were not included in the reports furnished to the committee.

A motion was carried that the report be received and all discussion thereon referred to the executive committee for their consideration.

LOCOMOTIVE AND SHOP OPERATING COSTS.

The committees appointed to report on the subject of Locomotive and Shop Operating Costs considered it advisable to confine itself to one of the various classes of expenses which might be included under that description. Such costs, as a whole, are, evidently, too complicated for the purpose of a single report, comprising, as they do, those of fuel, repairs, engine-house expenses and various other items. They will, therefore, chiefly discuss those included in the account "Repairs of Locomotives," and the method adopted in supervising the expenditures of that description.

Inquiries made of a number of the largest railways show that the appropriation plan for determining pay-rolls is in general use. As a rule, an estimate is prepared by the divisional authorities, stating the amount they require for their pay-roll during the coming month, compared with the actual figures for the preceding month, and corresponding month in the previous year, and an explanation of the reason for any increase desired. These estimates are consolidated into a statement at headquarters, and after any criticism or alteration has been decided on, are approved, and practically constitute an authority for the expenditure in labor called for. Generally, it



H. H. Vaughan.

Chairman, Committee on Locomotive and Shop Operating Costs.

is understood that such authority is not to be exceeded unless in case of emergency, and in some cases no overexpenditure is permitted without additional authority being obtained. It is evident that such a rule can not be enforced in the case of roundhouse forces, which must necessarily be maintained, but it may be more or less closely adhered to in general repair shops. On several roads, weekly or biweekly pay-roll statements are prepared for the purpose of checking the actual expenditures against the estimates, but this practice does not appear to be usual, although, no doubt, it is carried on locally even if not recognized as part of a regular system. At the end of the month it is usual to compare the actual with the estimated pay-roll and require an explanation of any increase over the figures approved. This system appears to work successfully and enables close control to be maintained over labor expenditures without unnecessary complication, provided it is handled reasonably and firmly. While it deals with the pay-rolls as a whole, it actually limits the expenses on any one account, since the distribution will usually bear certain proportions.

The limitation of pay-rolls, while requiring in a way the exercise of economy and the production of the best results from a given amount of labor, can not by itself be considered as a complete system. If permanently persisted in beyond certain limits, the condition of the power would deteriorate, or the number of engines requiring repairs would increase. The condition that exists is broadly that a certain amount of work is to be done and that the cost will depend on the efficiency with which it is accomplished. The peculiarity of repair work depends on both of these being important. In this respect, it differs from the usual run of manufacturing operations on which the work to be done is usually determined, or at any rate is not a question for constant watchfulness. In the maintenance of locomotives the amount of work required to keep them in repair per mile may vary widely, and may have a greater effect on the ultimate cost than the efficiency with which it is performed. In the case of running repairs no system appears to have been developed by which any alteration in the work required or its efficiency may be promptly detected. The piecework system in roundhouses has been used and, of course, determines the cost of doing the work. It would, consequently, also detect any increase in its quantity, but it is unfortunately not suitable in many ways for work of this nature. The thorough specification of the various operations is exceedingly complicated, and the time required to properly give out the work and check it is a serious proportion of that of doing it. While, therefore, it has been worked with a fair measure of sucess, it is not entirely satisfactory for roundhouse purposes. On one road a system is in effect by which all mechanical department officials are furnished daily with the labor expenses incurred on the territory under their supervision. This expense is shown in detail; that is to say, it is divided into ordinary locomotive repairs, wreck and other repairs, shop tools and machinery, manufacturing work, etc. This information is, of course, more accurate than that of the pay-roll alone, as it specifies the distribution among various accounts. Another road is trying a system by which roundhouse foremen are notified weekly of the labor charges against running repairs on each engine handled in their terminal. In this case it is possible to watch the cost of maintaining individual engines, and the information is furnished with the idea that any cause leading to unusual expense may be more promptly brought to attention. The whole question of the proper supervision of running repairs is, however, a difficult one. The cost is about one-half of the total cost of locomotive repairs, but the number of engines involved and the variety and small cost of the majority of the operations performed make any detailed watching exceedingly complicated. The work required on any individual engine also varies considerably from day to day. It will run for a time with comparatively little expense and may then require considerable work for a period. For work of this kind it would appear questionable whether much more can be done than to closely watch the pay-roll or distributed labor at each terminal and its relations to the business handled. When these are properly proportioned, any increase in the work required will be quickly known by the foreman in charge, who is in the best position of anyone to discover the reasons. In the case of shop repairs, it is possible to exercise considerably closer supervision. These repairs are occasional in place of being practically continuous, as running repairs are. They can, consequently, be more carefully analyzed, and their cost compared with the service rendered. The distinction between running repairs and shop repairs varies on different roads, from a repair costing over $5 for labor to one costing $400 total. The variation is not important for the purposes of this report, although it effects to a certain extent the practice which is followed in supervising shop repairs.

Several roads require estimates to be submitted and authority obtained before shop repairs are made on an engine. In some cases this applies to all shop repairs, in others to all those over a certain amount, varying from $75 upward. The authority of an executive officer may be required for repairs over a limit which varies from $1,000 to $5,000. Notice of an engine requiring repairs may be submitted thirty days before engine is shopped, in order to enable the cost of the repairs recommended and the service of the engine being investigated. In one case, in which each class of engine is given an allowance per mile for repairs, engines may be shopped without authority if the cause of the repairs will not cause the allowance to be exceeded; otherwise, it must be obtained. When estimates are made, their correctness may be checked by comparison with the actual cost when completed, and explanation required if exceeded. There are, naturally, many variations in the details with which this work is carried out on different roads, but some system for watching the cost of shop repairs in advance is in general use. The committee would call attention to the fact that the most important question, when an engine requires shop repairs, is the miles made since last repaired. While criticism of the nature of the repairs required may occasionally lead to additional mileage being obtained from an engine by the application of minor repairs, this condition is not usual, and, as a rule, the cost of the repairs can not be economically reduced by estimates made before an engine is shopped. Such estimates are difficult to make accurately, and may tend to limit the repairs to the amount allowed. Limiting repairs that are actually required to put an engine into good condition is not economy. Whatever may have been the rea-

son, after an engine has been taken out of service and sent to the shops the cheapest plan is to then make the repairs properly and thoroughly, so that when turned out the engine will make as many miles as possible before needing to be again shopped. The cost of shop repairs is not properly the cost per repair. It depends on the cost per mile, and the miles made between repairs are, therefore, equally as important as the cost of the repairs when made. All shop repairs are not necessarily those which put an engine into thoroughly good condition, but whatever be their nature, the question of their being justified by the mileage made is one of the greatest importance. For this purpose, information as to the miles made since last general overhauling and the nature and cost of the intermediate repairs received will show whether the class of repairs called for should be necessary or not. The introduction of an allowance per mile has the advantage of presenting the influence of large or small mileage in dollars and cents in place of miles only. Whether this is used or not, a simple statement, involving the shop repairs since last general overhauling, the mileage made and the nature of the repairs required, really gives all the information that can be advantageously used in determining whether the engine has been properly maintained and used and a reasonable mileage obtained from it. If the repairs are actually needed there is little doubt that they should be thoroughly made, and to do this in the most economical way is then a problem for the shop.

The great degree of variation in the amount of work required in making locomotive shop repairs, even though they are classified as being of the same general nature, makes it almost impracticable to watch their cost as a whole. When this is done, the best system in use is that which furnishes the foreman or shop superintendent a daily or weekly statement of the labor applied on the individual engines under repair, usually divided to show that in each department separately. By this means, information is obtained, while the work is in progress, which will call attention to any engine on which the labor is exceeding the expected amount. The difficulty usually experienced is that on account of one engine requiring more work than another the differences are difficult to analyze, and, if thorough analysis is attempted, the work has to be split up into a number of different operations so that the cost of each may be individually known. Where piecework or any of the various efficiency systems are in use, this is, of course, the case, but, apart from any question of rewarding labor, the cost of the individual operation appears to be the only logical basis on which the cost of locomotive repairs can be determined in the shop. It is true that much of the work done, even when divided with considerable detail, still varies to a certain extent from one engine to another, but this variation is not sufficient to prevent knowledge being obtained of what the work is costing and enable any increase being immediately known. Whatever may be the system employed, some method of watching the cost of repairs in detail enables the efficiency of a shop to be supervised in a way that is not otherwise possible. The committee does not believe it is necessary to discuss the various systems in use for this purpose. They have been fully dealt with at other times and are generally known and understood. One point may, however, be referred to. Any operation may be reduced to a series of detail operations, and the time required for those may be determined with considerable accuracy. For instance, in turning an axle, the time required to lift the piece, place it in the lathe, take the various cuts, roughing and finishing, and replace it on the floor, may all be individually recorded and thus compared with corresponding operations on other pieces or with known performances. Such records are now generally known as time studies, and their use enables the time required for numerous operations being checked from known data, in place of depending on the results obtained from the man performing the work or the judgment of the foreman in charge. Locomotive shops have the advantage that the work performed in them is repeated time after time, and, under this condition, there are few operations that do not repay time spent in making the proper study of the best method of performing them. What is, however, perhaps equally important, is the means they afford of comparing, for similar operations, the relative costs of different methods or of different types of machines. Such comparisons are evidently valuable when applied to the various repair shops on a railway, and the committee has investigated the possibility of arranging for their exchange among some of the members of this Association. The advantages of such a course are, from one point of view, obvious. There are numerous operations which vary but little in different repair shops, and the determination of the best method or result would be far more certain if derived from the experience of the shops on several railways than from those of one. Comparisons of total times of most operations would be misleading, on account of the differences in conditions and practice, but the same objection does not apply to properly determined time studies, as the details may readily be adjusted to allow for differences in design, conditions, etc. The opinion of those of our members who have been consulted differs as to the advisability of such exchange. Some have signified their willingness to coöperate, while others do not care to. There are, evidently, difficulties connected with the course apart from the practice on some roads of not divulging time or piece work schedules. A road giving information would naturally expect to benefit by receiving from others to a reasonably equal extent, and means by which this could be ensured are not easy to devise. The shops in which this work has been carried out are limited in number, and in many cases it is only partially completed. The committee, therefore, considers that at the present time it would be unwise to recommend any arrangement for the interchange of time studies, although it believes that in the future some benefit might be obtained if a suitable plan could be outlined.

In considering the methods used for watching the results obtained, as opposed to those that have been discussed for watching the expenditures being made, the most important statement is, of course, the performance sheet. The form in which this is made out varies considerably on different roads, and in many cases references are made to units which are evidently retained on account of the familiarity with them of those concerned. Apart from performance sheets there are, however, a number of statements in use which it will be interesting to refer to.

Most roads prepare statements showing cost of shop repairs by classes of engines and nature of repairs, in some cases these being compared with estimate made when engine was shopped. One road reports a very good method for recording the cost of shop repairs, keeping separate the cost of the following divisions of the work:

Stripping.
Repair rods.
Take off frame.
Repair frame.
Put on frame.
Remove cylinders No—.
Apply cylinders No—.
New fire box.
Front flue sheet.
Back flue sheet.
————side sheets.
Flue sheet and————side sheets.
Flue————side and————door.
Remove flues.
Repair flues.
Replace flues.
Boiler work.
Driver brake and rigging.
Air pump, governor, piping, etc.
Driving boxes.
Steam pipes.
Lagging.
Jacket.
Paint engine and tender.
Tank repairs.

In this case the cost of the various items shown are charged separately, and it is evident that a far better comparison is obtained than when the cost is simply shown as a total. In another case the labor on each engine is reported by departments, such as machine shop, boiler shop, erecting shop, etc., and in this case also any tendency to increased cost can be fairly well localized. An output unit may be used based on the tractive power of the engine or its weight. The latter is stated to afford a better comparison of the cost of repairs than the number of engines turned out.

Statements are generally used showing cost of running repairs by classes on different divisions. In some cases cost of individual engine running repairs are not kept separately, but by classes of engines only. This statement would appear to be of considerable value in comparing results, as it enables a comparison to be made on engines of similar types and service. An allowance per mile is sometimes used for different classes of engines. This has already been referred to, but its use in a statement of this nature has another purpose. When an allowance per mile is used for shop and running repairs combined, the surplus accumulated by each engine may be watched, and knowledge thus obtained as to whether that engine when repaired will have performed its service at the cost per mile expected. If, however, the allowance is separated for shop and running repairs, the mileage made between shopping in itself determines whether or not the engine can receive its shop repairs without exceeding its shop repair allowance, while the performance of the engines based on their allowance for running repairs distinguishes in an easy way between those classes or divisions which are costing more or less than the average. In addition, if the allowance be based on the engine mile, the tractive power mile, or the engine ton-mile, whichever unit may be used in comparing results, such a statement shows which classes or divisions have exceeded or which have run below the allowed rate, and, therefore, enables the causes of overexpenditures to be localized to that extent.

A similar statement may also be used for shop repairs, but in that case a difficulty arises from the fact that the number of engines shopped on a road or a division does not necessarily bear any relation to the miles run. Over a considerable period the condition of the power can not vary sufficiently to make the difference important, but for one month or, indeed, for several, shop repairs may be reduced below those required to maintain the power in a uniformly good condition or may be required in excess of the normal in order to improve it. This difficulty may be remedied by referring the cost of each engine receiving shop repairs to the mileage made by it since last repaired, and working out the cost per mile on this basis, in place of comparing the cost to the mileage run during the month. By this means, the cost for each engine or class of engines determines for those repaired during each month their cost per mile for shop repairs since their last shopping, and thus enables the expensive or economical classes to be located without respect to the number of them shopped during the month. It is thus possible to prepare a statement which shows the results of this month's shop repairs with the same accuracy as that showing those for running repairs. Evidently in such a statement the cost of the shop repairs may be made to balance with the charges against that account for the month, but the mileage, and, consequently, the cost per mile, will vary from that run by engines during the month, as it is based upon that made by the engines shopped since last repaired. Over a considerable period the mileage would correspond if no power were purchased or scrapped, but under usual conditions the mileage run exceeds that shopped, owing to that made by new and scrapped engines. The difference is not important, however, and a statement made on this basis has the advantage that the cost per mile for shop repairs is obtained with the same accuracy as that for running repairs, and without reference to the relation between the amount of shop repairs effected in any month and the mileage run during that month. When combined with an allowance per mile or other unit, it is then possible to localize the engines which exceed or are below the average cost and the amount by which they affect the result.

On several roads, while statements showing cost of individual repairs are not prepared separately, the cost per mile for different classes of engines on different divisions is shown in the performance sheet. This can not, however, be said to be general. The performance sheet is usually arranged to show results as a whole rather than in detail, the latter being analyzed by departmental statements. For this purpose there is a tendency to introduce a unit which will afford a better comparison than the engine mile. Owing to the large variation in the size of locomotives now in service and the greater cost of maintaining them as the size increases, the cost per mile no longer compares the expense with the service rendered. The ton-mile is decidedly less accurate, since, while the cost of maintaining the same class of power does not vary greatly on level and hilly districts, the load hauled by them does, and, in fact, the engine that is working on heavy grades, while it may not haul more than one-third the load that it would on the level, costs slightly more to repair per mile run. While, therefore, the cost per ton-mile is important from an operating standpoint, its use in connection with locomotive repair costs introduces a variable which can not be affected by the efficiency with which those repairs are handled. The unit needed is one that takes into account the size and capacity of the engine and those in use are either based on its weight or its tractive power. The weight may be taken as the total weight of the engine without tender, the light weight of the engine or the weight on drivers. The latter corresponds very closely to the tractive power and appears to be the preferable unit. While the total weight of the engine represents, presumably, the power that is available for hauling trains, as it is reasonable to assume that it has been disposed to the best advantage, whether a small tractive power was required for high speeds or a large one for low, yet, the weight on drivers or the tractive power is more closely proportioned to the cost of maintenance. In the case of two engines of equal weight, one constructed as a ten-wheeler, the other as a consolidation, the ten-wheel engine will not only cost less per mile to maintain, but will usually cost less per mile per pound of tractive power or weight on drivers. Again, when two engines of equal weight are employed, the one in freight and the other in passenger service, the cost will usually be less for the passenger engine when based on the tractive power mile, and, as the tractive power or weight on drivers usually bears a smaller proportion to the total weight on passenger engines than in freight, it is evident that if the truth of these two propositions be granted, the unit based on pound of tractive force or weight on drivers represents more accurately than one based on the total or light weight of the engine, the comparative cost of repairs. As between the two former there is little to choose, but as the tractive power represents more closely the service delivered, the committee feels that it is the preferable unit, and wishes to recommend the more general use of it. It considers that the best method is that in which the tractive power of the engine is expressed as a percentage of 100,000 pounds, so that an engine having a tractive power of 30,000 pounds is called a 30-per-cent engine, the tractive power being calculated at 85 per cent of the boiler pressure. The use of such a unit is valuable in including in the cost of maintenance a factor that varies with the increasing size and cost of power, and, consequently, presents that cost with closer reference to the service rendered.

The committee does not feel that any useful purpose would be served by a discussion of the various forms of performance sheets in use. On most roads the desire exists for figures that are comparative with those of past years and rendered useful through custom. The exact way in which these figures are presented is of less importance than the retention of familiar methods which enables them to be easily used. The committee has investigated the willingness of a number of roads to enter into an arrangement for exchange of performance sheets, a plan that should be mutually interesting and advantageous. The replies are not unanimous, but sufficient roads have stated that they would be willing to do this to make the proposition worth recommending. The variations that previously existed in the classification of accounts have now been done away with, so that this objection to the interchange of information no longer exists. While, no doubt, conditions vary widely on different roads, yet, the consolidation of railways into larger systems has led to comparisons between roads in one system which vary just as much from one another as do those which are entirely separate. Mutual exchange of results should, therefore, prove of considerable advantage to those of our members who care to enter into an arrangement for this end. The Master Mechanics' Association could be of use in this matter, by ascertaining which roads would be willing to exchange results and furnishing mailing-lists, or preferably printed addresses, so that the work of sending out the information would be facilitated. It does not appear advisable to exchange performance sheets as a whole. They usually contain a good deal of information that is not of value except to the officers of the road for which they are prepared, and the committee herewith submits the following form, which they would suggest as meeting the requirements for furnishing such results as would be valuable and interesting to exchange.

NAME OF ROAD.

Month of....., 191..

ITEMS.

Number of locomotives.
Average haulage capacity, per cent.
Total locomotive mileage.
Total gross ton-mileage.
Per cent of locomotives in service.
Per cent of locomotives under and waiting repairs (shop).
Per cent of locomotives under and waiting running repairs.
Repairs per locomotive-mile, total.
Repairs per locomotive-mile, shop.
Repairs per locomotive-mile, running.
Fuel, pounds per locomotive-mile, passenger.
Fuel, pounds per locomotive-mile, freight.
Fuel, pounds per locomotive-mile, all classes.
Fuel, pounds per 1,000 ton-miles, passenger.
Fuel, pounds per 1,000 ton-miles, freight.
Fuel, pounds per 1,000 ton-miles, all classes.
Lubricants, cost per locomotive-mile.
Lubricants, cost per locomotive-mile per 100 per cent capacity.
Other supplies, cost per locomotive-mile.
Other supplies, cost per locomotive-mile per 100 per cent capacity.
Enginehouse expenses, cost per locomotive-mile.
Enginehouse expenses, cost per locomotive-mile per 100 per cent capacity.

NOTES.—Haulage capacity per cent equals tractive power at 85 per cent of the boiler pressure divided by 1,000, *i. e.*, an engine of 100 per cent capacity is one having a tractive power of 100,000 pounds.

Results per mile per 100 per cent capacity are based on mileage of each engine or class of engines multiplied by its capacity.

State distinction between shop and running repairs.....

The report is signed by:—H. H. Vaughan (Can. Pac.), Chairman; W. C. A. Henry (Penn. Lines), M. J. McCarthy (C. C. C. & St. L.), Le Grand Parish and G. W. Seidel (C. R. I. & P.).

CONSOLIDATION.

The joint report on the consolidation of the Master Car Builders' and Master Mechanics' Associations and the discussion before the former convention appeared in the *Daily Railway Age Gazette* for June 18, page 1614.

DISCUSSION ON CONSOLIDATION.

The President: The matter was taken up by the Master Car Builders' Association, and was placed on the table for another year and referred to the Executive Committee, so

that they could look into such matters pertaining to the legal phases of the subject as might occur to them. Final action will be taken another year. I think since the Master Car Builders have taken this course about all we can do is to follow suit, and a motion to that effect will be in order, unless there is some discussion on the matter as to whether a consolidation is desirable or not from the standpoint of this association.

A motion was carried that the matter be held over for one year, and that it be referred to the Executive Committee.

C. A. Seley (C. R. I. & P.) presented the following report for the committee on resolutions: "Whereas, The forty-third convention of this association has fully maintained the record for increased attendance and interest at all the meetings as compared to those of former years, successful as they have been; and as it is desired to place on record the appreciation of the association of all who have contributed to the work which has produced these results:

"Be it therefore,

"Resolved, That the appreciative thanks of the association be extended to the President for his able address, to the officers of the association, especially the Secretary, for duties well done in handling the many details in connection with our convention and various committee meetings; to the committees and authors of papers and reports contributed to this convention; to the committee of arrangement for its effective service in making such complete plans for the meetings; to the railways for courtesies extended; to the hotel and business men of Atlantic City for their hospitality; to the Railway Supply Manufacturers' Association for the most complete exhibition of railway appliances ever shown; to the technical press, generally, and to the *Railway Age Gazette*, especially, for daily record of all the features of the conventions.

B. R. MacBain (L. S. & M. S.): Some question has arisen in the minds of motive power men in certain parts of the country as regards the standard contour for steel tires for locomotive and cars. Some action ought to be taken on that matter at this time. There is considerable doubt as to the advisability of going to a one-inch flange on a locomotive, especially on the engine and tender trucks.

A motion was carried that the matter be left in the hands of the executive committee.

ELECTION OF OFFICERS.

The following officers were elected:

President, C. E. Fuller, Union Pacific.

First vice-president, H. T. Bentley, Chicago & Northwestern.

Second vice-president, D. F. Crawford, Pennsylvania Lines.

Third vice-president, T. Rumney, Erie.

Treasurer, Dr. Angus Sinclair.

Executive Committee members, T. H. Curtis (L. & N.), F. F. Gaines (Cen. of Ga.), and G. W. Wildin (N. Y. N. H. & H.).

Mr. Sinclair: During the lull, when nothing else is occupying the attention of the association, I wish to make a sort of complimentary motion. I have attended the Master Mechanics' conventions 27 times, and in that period I have seen a good deal of difference in the way the meetings have been managed—the facility with which the business is attended to depends very greatly upon how the president performs his duties. I make no reflections upon any man who ever presided over these deliberations, but there are giants among men, and I wish to say that in all my experience I have never seen the work done so properly as it has been done by our retiring president, Mr. Wildin, and I move that we give him a vote of thanks on that account.

The motion was unanimously carried by a rising vote.

On the motion of the secretary the privileges of the floor were extended to George A. Post, who made a speech of presentation and gave to Mr. Wildin the badge that had been voted him.

According to the New York *Sun*, it seems that flying-machines sometimes get into trouble at a switch, as well as the drivers of locomotives. When Charles K. Hamilton, "the little red-haired acrobat of the upper airs," as the *Sun* calls him, on June 13 was on the finish of his 172-mile flight from New York to Philadelphia and back in 209 minutes, he mistook the tracks of the Lehigh Valley at Metuchen for those of the Pennsylvania; and instead of landing on Staten Island, as intended, he struck a New Jersey swamp, from which he had some difficulty in extricating himself and his machine. However, like a good engineman, he made such repairs as were necessary, got his machine back on its cloudy tracks and arrived at destination within schedule.

Conventionalities.

Mr. and Mrs. S. W. Midgley, of Chicago, are at the Marlborough-Blenheim.

John A. Hill, president of the Hill Publishing Company, formerly known as Jim Skeevers, was on the Pier for a while on Tuesday evening and Wednesday morning.

LOST—A solid gold chain fob, with a shrine claws pendant. Finder will please return to James A. De Camp, 155 Chambers street, New York City, and receive suitable reward.

One of the supply men was hanging around the booth of the D. P. Company trying to get a line on some of those "dust-proof lids." Said he was getting a good deal of dust in his hair wearing an ordinary straw hat.

Leigh Best, vice-president of the American Locomotive Company, was a late arrival. He is here with his family, and will stay at Atlantic City for a few days after the convention adjourns.

C. B. Young, mechanical engineer of the Burlington, on being asked why the line of the grand march at the Master Mechanics' ball was so much more regular than it was at the Master Car Builders' ball, instantly replied: "That's easy. The men are more mechanical."

A meeting of the executive committee of the Traveling Engineers' Supply Men's Association was held on Tuesday and arrangements were made for the convention, which will be held at the Hotel Clifton, Niagara Falls, Ont., August 16-20. The committee consists of Charles Shults, Alexander Turner, Frank Morrison, F. W. Edwards, A. D. Homard, C. B. Moore and J. Will Johnson.

The best exemplification of the old story of the hen and chickens was supplied during the convention by Frank Moore and Bill Gibson. Young Frank and young Bill arrived Friday. They are young ducks, and took to the water at once. The two fathers immediately assumed the role of the proverbial hen with the web-footed progeny. Frank goes in the water once a year (during the convention), but Bill takes his on the side. Meantime the boys were paying as much attention to their parents as the ducklings did to the mother hen.

MR. HOOLEY ON THE CONVENTION EXHIBITS.

"Well, 'tis a gr-reat exybit," remarked Mr. Hooley as he returned from a stroll on the Pier and found his friend Dennissey enjoying the comforts of the upper porch, and the beneficial effects of the cool air from the ocean. "T' me mind," he continued, after filling his pipe and grumbling at the waste of two matches in getting a light, "t' me mind 'tis th' most raymar-rkable c'llection av relrod appliances that was iver losht in th' fog or exposed to th' salty breezes fr'm th' bosom av th' 'Tlantic. 'Tis a complate exybition av ivery up-to-day machine 'nd tool 'nd matayrial that goes in the shop or is necissary as a part of locommytive or car equipment. 'Tis a gr-reat edoocat'onal inflooence, Dinnissey, f'or th' shuperintindints av locommytive power 'nd McHannixes 'nd car min, whither they carl thim Emseebees or Hex-Why-Zees."

"'Tis so, Mister Hooley, 'tis so," replied Mr. Dennissey. "And 'tis fine f'r th' min that makes arl these things that the relrods have to use to get so many av th' relrod min together to look at 'em arl at once."

"I saw wan crowd th' mornin'," continued Mr. Hooley, paying no attention to his friend's remark. "I saw wan crowd that rayminded me av th' doin's at th' primaries whin Clancy thried to get th' nommynation f'r aldherman in th' warrd. Ye raymimber th' night before whin he come into me pla-ace 'nd hinted to some av th' byes what he wud do f'r arl av thim that shupported him at th' polls. Flannagan'd had th' runnin' in the precinct up to that time, though most av th' min in th' warrd had judeeciously refrained fr'm expressin' anny final opinion till they found out what th' min that was runnin' was goin' to do. Ye raymimber th' nixt day afther Clancy'd dayclared his intintions 'nd iverybody'd had somethin'—'twas a good day f'r business, Dinnissey—ye raymimber th' nixt day, th' day av th' primaries, Clancy min was that thick 't ye cudn't find anny wan, barrin' wan clark and wan judge av th' 'lection, that was wearin' a Flannigan badge."

"Will," continued Mr. Hooley, after a pause, "I saw th' like th' mornin' at wan av th' box stalls that they give to aich exybitor. Th' crowd av shupply min was tin dape arl around, 'nd ivery man lookin' 'nd a-shtrainin' himsilf on th' tips av his toes to look inside. What d'ye think 'twas, Dinnissey, that brought arl these min to that wan place? Wan av th' shupply min towld me. What d'ye think ut was?

"My guessin' an't no good th' day. I guessed wance too manny lasht night," replied Mr. Dennissey, removing his hat to get more of the cooling breeze. "What was ut?"

"Two relrod min lookin' at an exybit," said Mr. Hooley, "'S I sid, 'tis a gr-reat edoocational inflooence, jue to th' opporchoonity for th' new man in th' shupply business to find out what he's got to buck against whin he's thryin' to sill his goods on th' road. Th' relrod min don't nade to shpind th' time. They're goin' to buy th' things that's made be th' comp'nies that they're inthrusted in, or that their shuparior orfisers till thim to buy, for that the shuparior orfisers thimselves howld shtock in th' comp'ny. 'Tis th' tist av a good relrod appliance whin it gets th' hid of an important departmint av a good relrod f'r wan av its directhors. 'Tis sure av wan road where it will be used annyhow, 'nd it helps th' sale whin th' salesman can say, says he, 'Th' Ay, Bay & Say road won't use anny other than th' wan I'm afther tillin' ye about.'

"But f'r all that 'tis a good thing that th' relrod min have to go through th' exybits before they can get to th' convintion hall. Th' shupply min take a chanst that some wan may shtop to see what they've got to show him, 'nd it kapes th' min fr'm bein' so late to show up on th' job that they're here to watch out f'r. 'Twas this wan thing, Dinnissey, 's far 's I can see, that indooced th' arrangemint f'r two sissions a day that they tried to have this year 'nd did f'r one day till they arl got tired av it. Th' manigemint av th' Emseebees thought th' two sissions wud kape th' mimbers fr'm goin' fishin' 'nd yottin' 'nd joy-ridin' 'nd th' like o' that, in th' afthernoons, 'nd not showin' th' proper cutsey to th' min that had spint thousands av dollars in gettin' th' exybits placed on th' pier, besides a little more to get thim fr'm N' Yawk 'nd Tchicago 'nd Saint Looey 'nd other pla-aces. 'Tis a good thing, Dinnissey, to own a pier that ye can call a million dollar pier because ye can get that much out av it ivery year be sillin' exybit space at forty cints a square fut 'nd arl other chairges t'rown in at forty dollars a minit, jist f'r that there a'nt anny other pla-ace big enough to hold arl th' stuff th' min want to exybit. 'Tis me ricolliction that I've bin towld that th' chairge was to be fiftane cints a square fut after a time, whin th' conthract was first made wit' th' enterprisin' citizins av 'Tlantic City; but 'tis not me fun'ral 's me owld pal Terry Muldoon raymarked whin he came to in th' middle av th' wake and sid he smilled Bushmill."

"Ye same to be knockin', th' morning," suggested Mr. Dennissey.

"Not a bit av ut. 'Tis th' facts I'm tillin' ye 's they've bin towld to me," replied Mr. Hooley. "Annyhow, me fayble raymarks 'll not hit anny hid that's not a-shtickin' up. 'Tis th' ayvil mind that thinks ayvil av it,' 's th' Frinch inscription on th' English Ordher av th' Garther says. Wud ye like me to say ut in Frinch, Dinnissey?"

"I wud. I wud so," replied Mr. Dennissey, with some show of interest. "How d'ye say ut in th' Frinch?"

"'Howly shmoke, kape on ye'er pants,'" replied Mr. Hooley in his purest Parisian accent.

THE MECHANICAL TWINS—FULLER AND CURTIS.

The careers of Theodore H. Curtis and Charles E. Fuller, who were elected presidents, respectively, of the Master Car Builders' and Master Mechanics' Associations, have been along curiously parallel lines. Mr. Fuller was born at Terre Haute, Ind., in 1862. Mr. Curtis was born in the same town a little less than four years later. Mr. Fuller went into the drawing room of the shops of the Vandalia in his home town in 1879. Only one boy was taken into the shops in this way at a time; and the boy who entered the same room in the same shops the next year was Theodore Curtis. Terre Haute is a pretty good-sized town, and the boys had not known each other before, but they now became friends, and such they have been ever since.

Mr. Fuller stayed on the Vandalia (then the Terre Haute & Indianapolis) until 1889, while Mr. Curtis left it and went to the Big Four as chief draftsman three years earlier. After 10 years fate brought them together again, Mr. Fuller being master mechanic on the Erie at Susquehanna, Pa., when Mr. Curtis came there as mechanical engineer of the same road.

In 1908 Mr. Curtis was elected second vice-president of the Master Car Builders' Association, and in the same year Mr. Fuller was elected second vice-president of the Master Mechanics' Association. In 1909 they were promoted to the first vice-presidents of the two associations; and this year these two men, who started in railway work together, and who have been so long associated personally and in a business way, have been elected to the presidencies of the two greatest mechanical organizations in the world.

Another interesting fact about them is that both are railway men by right of inheritance. Mr. Fuller's father was a railway master bridge builder. Mr. Curtis' father was not a railway man; but his grandfather, John L. Humiston, was one of those who built the Terre Haute & Indianapolis, later the Vandalia. Mr. Humiston constructed the part of the line eastward from Terre Haute. He was operating a boat line at that time, and he took the first two engines ever used on the Vandalia from New York City to Toledo by rail, and then via his boat line to Terre Haute. These engines were just nearing the end of their service when, many years later, Theodore Curtis entered the Vandalia's shops.

Mr. Humiston was later freight agent at Terre Haute of the St. Louis, Alton & Terre Haute, now part of the Big Four, on which road his grandson, as already stated, was later chief draftsman.

It will be interesting to watch the future careers of these "mechanical twins," among other reasons for doing so being that of seeing how far they will continue to travel along parallel lines.

A CORRECTION.

A mistake was made in the article about the baggage car built for the Rock Island by the American Car & Foundry Company, which was printed in the *Daily* of June 17. The total weight of the car was given as 136,300 lbs. Its true total weight is 126,300 lbs.

THE MASTER MECHANICS' BALL.

The annual Master Mechanics' ball took place in the ball room of the Million Dollar Pier Tuesday evening, and was a very successful affair from every point of view, whether that of decorations, music, attendance or enjoyment.

The function began when President and Mrs. Wilden were met at the entrance by J. Will Johnson, chairman of the entertainment committee. After their wraps had been taken care of, they were escorted to booth 32, while the orchestra played "Hail to the Chief." This booth was the headquarters of the officers of the association during the evening.

The grand march formed in front of booth 32, and after circling the ball room twice came down the center, President and Mrs. Wildin leading, escorted by Mr. Johnson. The couples then took their places in wedge formation, President and Mrs. Wildin being in front, and Mr. and Mrs. Fuller, Mr. and Mrs. Bentley and Mr. and Mrs. Sinclair being in the second row of eight. Then there was a row of sixteen, then one of twenty-four, and the remaining rows contained thirty-two persons each, extending the full width of the ball room.

During the march the ladies received their favors. These were particularly dainty, being leather card cases with the dance programs looped inside by silk cords. They were of different colors—grey and two shades of brown. The music was furnished by the Old Guard Orchestra.

The committee in immediate charge of the ball was composed of L. J. Hibbard, chairman; J. C. Younglove, Bertram Berry, C. M. Garrett, J. L. Connors, Thomas Farmer, Jr., Frank Martin, E. S. Toothe, J. H. Janes, F. B. Ernst, Ralph G. Coburn, J. S. Smith and H. E. Oesterrich.

It will be noted the committee had thirteen members, but that didn't interfere with the success of the affair at all. There were a number of extras in addition to the eighteen dances on the program, and although the evening was unusually warm the dancers demanded two and three encores to every number.

Enginemen and firemen on the Belgian state railways are given premiums for punctuality, but premiums may be withheld from enginemen running on down grades at excessive speeds.

The Exhibit.

The headlight that was burning night and day on the front of the Million Dollar Pier was an exhibit of the Commercial Acetylene Company, New York City.

The Buffalo Brake Beam Company, New York, has recently taken possession of its new plant and testing laboratory at Buffalo, N. Y. The entire equipment is new and modern and the testing appliances are of latest design. The whole plant is operated by electricity.

Connections made with Jefferson male and female unions will stay put. The resiliency of the brass to iron seat, with the small ring of drawn brass protected by an iron lip, will keep the connection tight in spite of the jarring of a locomotive or car. The makers, the Jefferson Union Company, Lexington, Mass., will supply full information on request.

The first electric lighted chair ever on the Boardwalk appeared there Tuesday evening. It was illuminated from a storage battery under the seat, with variegated lights. The system of lighting it was devised by H. G. McConnaughy, manager of sales in New Jersey for the Dearborn Drug & Chemical Company. It was decorated with flowers, and on top were a chanticeler and a streamer bearing the word "Dearborn."

In booth 339, The Standard Coupler Company showed its Standard slack adjuster in operation on full sized wheels. Demonstrations were made showing the accuracy with which the predetermined piston travel and brake shoe clearance is maintained under varying conditions of brake shoe wear. The device is simple and requires no adjustment or attention by car inspectors. It is automatic and foot-proof, as well as weather proof. It works on application of hand brakes or air.

The advantages of the regrinding type of valve over the removable disc for certain conditions of service scarcely require argument. But merely because the name "regrinding" is given to a valve is not always indicative of its true value.



Some of the Men on the Entertainment Committee Who Helped to Drive Dull Care Away.

Top row, left to right—George Moses, H. A. Neally, Charles A. Knill, Charles P. Williams, Ralph G. Coburn, S. L. Walters, E. Payson Smith, Herbert Green, Charles W. Wardell, E. S. Toothe, J. H. Janes, J. Soule Smith.
Bottom row, left to right—Charles A. Dunkelberg, W. J. Walsh, J. L. Connors, Ross F. Hayes, J. Will Johnson (chairman), Bertram Berry, Leonard J. Hibbard, Phillip J. Mitchell, Frank Martin, F. B. Ernst.

It will be well for a prospective purchaser to consider, not alone the manufacturer, but also the difference of construction, the chemical qualities of the composing metal, and recommendations relative to pressure for which any special type of regrinding valve is being considered. It is desirable to secure a valve which has been subjected to a test, before shipment, more rigid than it is likely to receive in actual service. The National Tube Company, Pittsburgh, Pa., makes a regrinding valve which complies with conditions necessary to guide a purchaser in the selection of a good regrinding valve.

Users of boiler tubes are advised by large and well established companies that steel tubes are more modern, as well as more durable, than charcoal iron. The same men, who, by the way, are looking for results for their respective railways, are informed that charcoal iron tubes, which were highly satisfactory in the past, are at present being produced in mills operated by the latest and most improved machinery and the same in quality as the justly famous Allison charcoal iron tube. What is one to believe? Boilermakers who are in the best position to judge the relative merits of iron and steel tubes almost invariably use charcoal iron tubes in their own boilers; and statistics show that to-day the output of charcoal iron is greater than ever before. Although the methods of making steel have improved during the last ten years, segregation has not been eliminated, and the gradual depletion of natural gas and low sulphur ores may necessitate the universal use of charcoal iron to obtain a product running .02 per cent sulphur, necessary to withstand the present severe conditions.

The exhibit of the Commercial Acetylene Company, of New York, contained a most complete display of lights for the use of railways. A great many styles of coach lamps decorated the booth, which burned night and day from the opening of the convention and had not exhausted the contents of two small tanks 16 in. x 48 in. Locomotive tanks were shown which supply acetylene to headlights, cab lights and markers. These are still smaller, being 12 in. x 36 in. The company exhibited a tank cut open to show the method of gas storage. It was filled with asbestos. This substance has the property of absorbing twenty-five times its volume of acetylene. The ordinary coach gas tank is 20 in. x 114 in. and will hold 200 ft. of free gas under 150 lbs. pressure. The same tank filled with asbestos saturated with acetone will hold 2,000 ft. of acetylene under 150 lbs. pressure. The Boston & Maine has recently built a plant at East Deerfield, Mass. This plant is designed to supply 1,000 headlights and 1,000 signal lights along the road. Another interesting part of this exhibit is the flashing device for lighthouses and marine buoys. This is fitted with a sun valve which, by the action of sunlight, automatically cuts off the supply of gas during the daylight hours.

THE WESTINGHOUSE EXHIBIT.

The Westinghouse exhibit included displays by the Westinghouse Air Brake Company, Pittsburgh, Pa.; the Automatic Air & Steam Coupler Company, St. Louis, Mo.; the American Brake Company, St. Louis, Mo.; the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; the Westinghouse Machine Company, Pittsburgh, Pa.; the Westinghouse Lamp Company, Pittsburgh, Pa., and the Cooper-Hewitt Electric Company, Pittsburgh, Pa.

The Westinghouse Air Brake Company showed its new high speed brake for heavy passenger cars, known as schedule "PC"; empty and load brake for freight cars; centrifugal dirt collector; and automatic car and air coupler.

The "PC" equipment was demonstrated in a novel way by an illuminated chart, on which was shown curves on the comparative rate of acceleration of two seven car trains in making stops from a speed of 60 miles an hour; one of the curves representing a seven car train equipped with quick action automatic brakes and high speed reducing valves and the other a similar train equipped with schedule "PC." An actual demonstration of the operation of this equipment was also shown by a seven car rack, which represened the complete equipment for a sever car passenger train, with engine and tender.

The empty and load brake exhibit represented the application of this form of equipment to a modern freight car, demonstrating the movement of levers and forces applied when car is empty and when loaded.

The company also showed a novel means for automatically lubricating triple valves, brake cylinders, etc. This method embodies a device similar in section to a pipe tee, having an elongated vertical section adapted to hold in variable exposure to the air, passing to the brake equipment a solid soluble body of lubricant which is dissolved by the moisture dislodged by the force of the air current and carried to the various parts of the brake requiring lubrication. This system has been in use several years and has proven decidedly advantageous to the brake in general and to the brake cylinders and packing leathers in particular. The company was represented by A. L. Humphrey, E. L. Adreon, Joseph R. Ellicott, E. A. Craig, George Westinghouse, Jr., W. V. Turner, C. P. Cass, S. J. Kidder, Robert Burgess, F. M. Nellis, W. S. Bartholemew, R. P. Noble, F. V. Green, F. A. Hugo and P. H. Donovan.

The Automatic Air & Steam Coupler Company exhibited several sizes and showed the application and operation of metallic flexible connections. This concern was represented by E. L. Adreon and R. E. Adreon.

The American Brake Company had on exhibition an operative model of a slack adjuster applied to a brake cylinder. It was represented by E. L. Adreon, A. L. Humphrey and R. E. Adreon.

The display by the Westinghouse Electric & Manufacturing Company included a representative line of its smaller apparatus, including small power motors. Large direct current motors were represented by type "S" motors for general industrial service; alternating current motors by type "A" single phase; the type "HF" phase, wound secondary, and the type "MS" squirrel cage. This later motor has just recently been placed upon the market and is designed for severe industrial service where a heavy and practically indestructible motor is required. Two sizes of this motor were exhibited, partly dismantled, showing the heavy and rigid construction of the frame, brackets, bearings, shaft and rotating part.

Controllers for both direct and alternating current motors were shown, including the new auto starter for squirrel cage motors. This starter is so designed that the motors can be started only by throwing the handle to the starting position first and then to the running position; and it is impossible to leave the handle in the starting position, thus adapting the starter for service by operators ignorant of the ways of electricity.

There was also displayed a complete line for alternating and direct current arc lamps, including both multiple and series types.

One device this company had in its exhibit was the new automatic type of mercury rectifier, type "AA," used for charging automobile storage batteries which was shown in operation. Another was a new type of automatic remote control controllers for operating direct current motors on large machine tools where it is necessary to start and stop and regulate the direction and speed of the machine driven from diffrent parts of the machine tools. Connected to this controller were two push button stations, located at two different places in the exhibit, and connected to a back

geared motor which could be started and stopped, reversed and accelerated, from either of these push button stations. The controller is also so designed that the operator may use any one, of from one to twelve push button stations for operating the motor, and is not limited to the two push button stations which were shown. Among those in attendance were Charles Robins, J. C. McQuiston, J. H. Klinck, H. C. Mode, J. J. Derney, R. F. Mocn, A. A. Brown and O. T. Smith.

The Westinghouse Machine Company showed a Westinghouse LeBlanc condenser, complete. The LeBlanc condenser bears the same relation to the familiar type of condenser apparatus that the steam turbine does to the reciprocating engine. This piece of apparatus is, in fact, a turbine condenser. Like the turbine it only occupies a small fraction of the space formerly allotted, not by the multiplication of parts, but through a small application of rotary motion with no reciprocating or rubbing parts in valves of any description. This type of condenser has been developed to meet the modern requirements for high vacuum, principally in connection with steam turbine generating units. Among those in attendance were E. H. Sniffin, L. L. Brinsmade, H. P. Childs, C. H. Paine, E. Yawger and H. VanBlarcom.

The Westinghouse Lamp Company featured its newest type of tungsten lamps, the wire type of continuous filament lamps. The manufacture of this filament has been so improved that instead of four or six hair pins of turbine, there is but one long wire of tungsten. The 500, 250, 150, 100, 60 and 15 watt types were shown, burning as commercial products, while the 40 and 25 watt types were shown in the lay exhibit. These new wire type lamps show a marked increase in strength over any other type of construction.

The concern also had a very complete display of its products in a lay exhibit, showing all sizes and voltage for train lighting, both carbon and tungsten filaments.

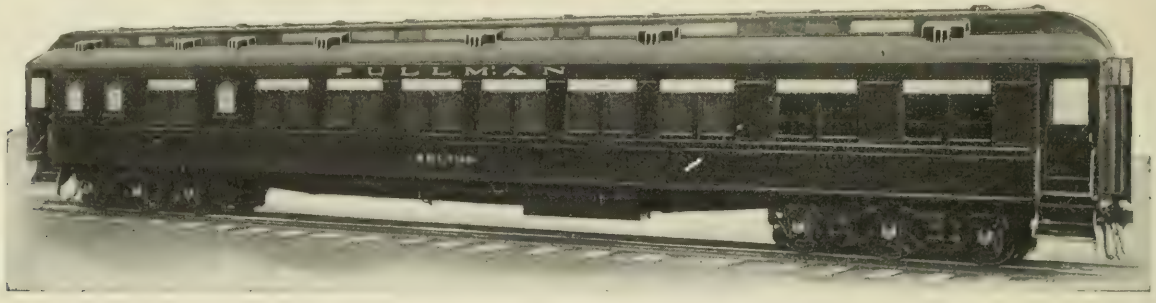
The Cooper-Hewitt Electric Company showed several types of Cooper-Hewitt lamps, designed to operate on alternating and direct current, providing railway repair shops, as well as erecting machine shops. Among the advantages claimed for the Cooper-Hewitt lamps is the practical elimination of all shadows upon the machine and bench work, and the evenly diffused soft light which burns absolutely steady. The company was represented by J. P. O'Shea, F. R. Fortune, M. B. Buckman, Jr., H. M. Haviland and A. D. Childs.

W. Barnes, Jr., representing the Westinghouse Bureau of Publicity, was in charge of the exhibit.

VENTILATION OF PULLMAN SLEEPING CARS.

The Pullman Company, after several years' experiment and thorough test of ventilators for their sleeping, dining and parlor cars, adopted the Garland car ventilator as standard, and it is now applied to nearly 5,000 of these cars. At present it is being applied to the large order of all-steel sleepers for the Pennsylvania Lines, and the cut shows the Garland ventilator as fitted to one of these cars. In this system the exhaust method is effectually employed, producing a strong current, which passes out at the deck sash opening. The air necessary to replace that taken out by the exhauster easily finds its way into the car through the door opening and other small leaks about the windows. The movement of the air is maintained uniformly and automatically when the car is in motion in either direction without any adjustment. As the windows are kept closed, there is no trouble from smoke, cinders or dust, and fresh air is abundantly supplied by exceedingly simple means. This ventilator is especially efficient on dining cars, where it not only provides a constant change of air in the dining room, but when applied to the kitchen and refrigerator, it effectually removes all disagreeable odors and hot air and makes the kitchen much more comfortable.

The Garland ventilators are made by Burton W. Mudge & Company, Chicago.

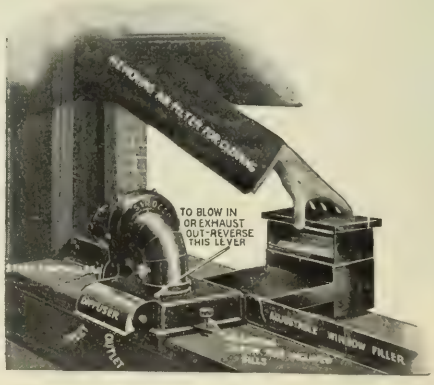


All-steel Sleeping Cars; Pennsylvania Lines.

VENTILATION THE YEAR ROUND.

The Sirocco electric fan and air purifier is a device developed by the American Blower Company, Detroit, Mich., and Troy, N. Y., using a "Sirocco" standard turbine type impellor wheel 3 in. in diam. as the basis for bringing the fan system of ventilation within the reach of every one using electric current. The small space occupied and the light weight combine to make the "Sirocco" device portable and attractive. On acount of the high efficiency of the "Sirocco" fan, the electrice motor is small (one-seventieth of a horsepower) and the electric current requiremnt is almost insignificant. The office boy or stenographer can install the complete outfit upon the window sill without tools.

The manufacturers state that the "Sirocco" will supply 5,000 cubic feet of fresh filtered air every hour, diffusing it throughout the room or in any direction at will, or deflected through a radiator for winter ventilation. By the simple reversal of a small lever without changing the position of or stopping the outfit, the fan will exhaust the dead "used up" air from the



Sirocco Ventilating Set.

room in the same large volume. The complete outfit consists, in addition to the "Sirocco" fan, motor and reversing mechanism, of an adjustable outlet nozzle for summer use, speed controller, a dozen filter cloths and a window sash lock which prevents the window being raised from the exterior after the outfit is in place; also a rustless steel window filler, adjustable to standard width sashes. "Sirocco" turbine fans



Installation of Sirocco Ventilator.

are being applied to the ventilation of kitchens, telephone booths, laundries and toilets on land, shipboard and on wheels. "Sirocco" fans are also used for ventilating, cooling and mechanical draft on modern battleships, cruisers and destroyers.

BRAKE BEAMS.

In re-designing standard devices, and developing new ones so they will have the necessary strength and suitability for use on modern passenger and freight equipment, it is necessary not only to consider the needs of the present, but also to give some thought to what the requirements may be two or three years from now, when the new steel passenger car will have been fully developed and there will perhaps be 60 and 75-ton freight equipment in service.

The Master Car Builders' Association has called attention to the importance of the brake beam subject, and to the necessity for the use of designs of ample strength on high capacity equipment. The original object in using a metal brake beam was to insure the efficiency of the air brake by getting a minimum deflection and consequent minimum piston travel at the required load, and to accomplish this with a structure of the required strength and stiffness at a minimum weight and reasonable cost.

No part or device used about a car is subjected to such abuse and severe conditions of service as brake beams. In their position, suspended from the trucks of the car, they are the first thing to be damaged or torn from place by obstructions and are at all times exposed to the harmful action of gravel and cinder ballast being thrown against them, making it difficult, if not impossible, to keep the beams properly painted.

When it is considered that the proper operation of the air brake is dependent on the brake beams, and that its efficiency is seriously interfered with by the use of beams of poor design, the importance of employing brake beams of known strength and durability is appreciated.

It has been well known for several years that ordinary standard 5 in. rolled sections weighing 9¾ or 12½ lbs. per ft. will not meet the M. C. B. requirements for deflection, and while a 6 in. beam, when the wheel base of the truck permits, will meet the requirements, so far as deflection is concerned, the section is too thin to obtain the necessary durability.

The American Steel Foundries, Chicago, exhibited an unusually interesting collection of brake beams for all classes of equipment; and while they recommend, for the needs of present freight service, their Ajax trussed beam, they are prepared to furnish solid beams made of 5-in. rolled section of any weight desired, and which will stand the same tests as any other make of beam using similar sections. The Ajax beam is made with a special 3-in. channel for the compression member using a tension rod of bar steel from one to 1¼ in. in diameter, depending on the capacity of the beam.

For use under passenger equipment, the Hercules beam, suitable for either four or six wheel trucks, was shown. These beams are made either with malleable or cast steel fulcrums, and with or without adjustable heads, the adjustable



Cast Steel Brake Beam.

feature allowing the beam to be used in any position from 6 in. above the rail to the center of the wheel. This beam is made in a number of different weights to suit the lightest as well as the heaviest high speed passenger requirements.

The brake beam shop of the American Steel Foundries at Hammond, Ind., has a well-earned reputation for the quality of work turned out, great care being exercised to see that all parts and sections of beams manufactured are of full weight, fully up to drawing dimensions and that all parts are accurately and carefully fitted together.

In order to provide a beam of exceptional strength, and one which may be necessary to meet the requirements of future service, a beam made entirely of cast steel has been made and which is shown in the accompanying cut. This beam has been tested to 60,000 lbs. showing less than 1-16 in. deflection.

KENNICOTT WATER WEIGHER.

When installing their water softeners at various points for railways and manufacturers, the Kennicott Company, Chicago, had frequently noted the need of some accurate, automatic and reliable record for measuring the water supply. Meters are notoriously inaccurate, most of them recording to within less than 10 per cent of accuracy; and many railways who buy water from cities and elsewhere are in this way compelled to pay over-heavy charges. To determine the steam making power of a coal, an accurate water weigher is also extremely valuable to motive power superintendents and others. For this reason, the Kennicott Company has placed on the market its new water weigher.



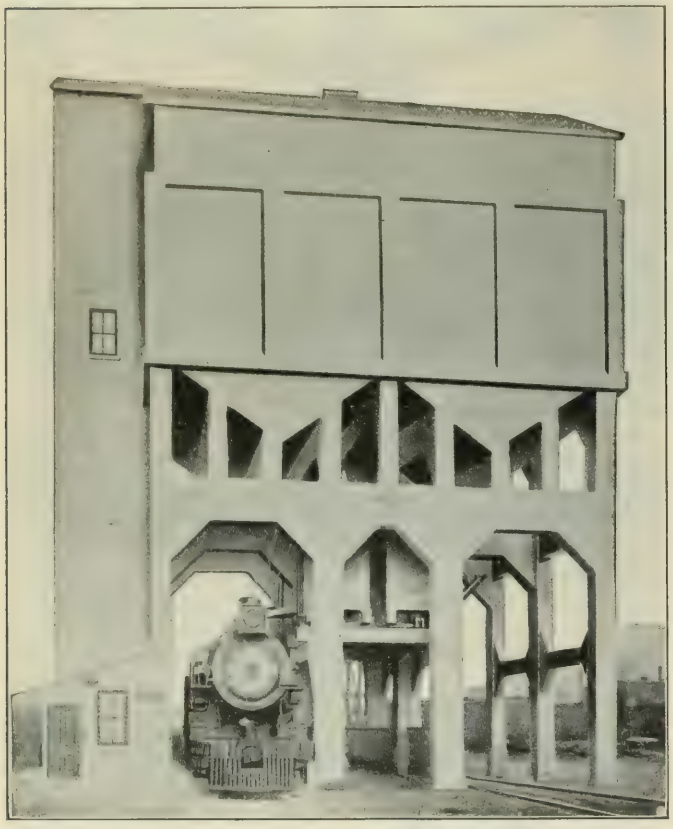
Kennicott Water Weigher.

This device is guaranteed to record the weight of a water supply to within one-half of one per cent of absolute accuracy. It is entirely automatic, has no valves, and, unlike meters of various sorts, cannot easily be deranged. It is made either with or without storage tank, according to the needs of the buyer. Where locomotive supply water is bought, and for those who desire to test the steam making quality of a coal, the Kennicott water weigher meets with favor.

LOCOMOTIVE COALING STATIONS.

The subject of coal handling is a very important one in railway work and within the past few years it has received much consideration. Each plant is a study in itself and requires that the design be made especially to meet the requirements and conditions under which it is to be built and operated.

The main features controlling the design are, in general, as follows: Capacity; kinds of coal handled; daily consumption; kind of cars used; length of receiving hopper; number of tracks served with coal; whether weighing or measuring apparatus is to be considered; track clearances; whether coal is to be crushed or broken; kind of power required; whether coal is mixed; kind of construction; whether ground storage is to be considered; whether sand storage and drying are to



Coaling Station at Asheville, N. C.; Southern Railway.

be considered; whether cinder plants and pits are to be considered; fire regulations and protection; terminal or isolated plant; location; release of cars; and switching.

These features give an idea of the varied conditions which control the design of coal handling plants. After having carefully studied the conditions under which the plant is to be built, the type of structure to be used can be determined. The above conditions govern this to a large degree; but the following are probably the most important ones: Capacity; ground area covered by structure; land value; number of tracks coaled; kind of cars used; kind of coal handled; and whether weighing or measuring pockets are to be considered.

The operating and maintenance costs vary, but are dependent on the following fixed conditions: Kind of cars used; simplicity of design; daily consumption; kind and care of machinery and power; and men operating the plant.

Several types of plants are now in general use. The various types of stations based on handling coal in cars may be classified as follows: Incline trestle type, with maximum incline grade of 5 per cent; steep incline trestle type, with grade from 20 per cent to 25 pr cent; locomotive crane types; clamshell bucket type with trolleys; small bucket conveyor type (commonly known as the mechanical type); continuous belt type; large bucket type, in which buckets of a large unit capacity are used, from one to two and a half tons' capacity.

Among the designers and builders of this class of work are Fairbanks, Morse & Co., Chicago who manufacture a full line of equipment, power, appliances, etc., required in the erection of this particular work.

WATROUS TOILET FIXTURES.

The Watrous Company, exhibited at booth 316, a variety of Watrous vitreous ware, lavatories, closets and other toilet fixtures for railway cars. These include a corner lavatory with push button faucet and tilting lever waste, arranged for cold water only; a 19-in. x 22-in. lavatory, fitted with the Watrous combination Fuller faucet and waste attachment; this fixture has two handles, one of which governs the supply of both hot and cold water, and the other operates the waste plug; a Watrous vitreous ware dental lavatory, fitted with push button faucet, supply and waste connections; this is provided with a double water supply, one for the glass and the other flushes the inside of the bowl; also a number of kinds of vitreous ware car closets, one of which is fitted with the new rotary trap hopper. The plain car closets are in one piece, with no joints or packing to become foul. The valve used on this closet is positive and automatic. It contains no submerged springs or delicate parts to become clogged. The Watrous new push button faucet used with the lavatories is an original design. It is self-closing and operates simply and easily without water hammer. The Watrous liquid soap fixture is of special interest as a car fixture, the objection to dirty soap being thereby eliminated, and it is economical. The automatic delivery of soap serves as a positive protection against unnecessary waste of soap and the misuse of the fixture. The office of the Watrous Company is in the Fisher Building, Chicago.

IS YOUR HOSE EXPENSIVE?

The advantage of a rubber hose with a steel armor, which prevents failures due to ordinary hose, was demonstrated during the convention at booth 322. For air brake and signal line service, this Sprague flexible steel armored hose offers a solution of the hose problem.

The strong feature which the Sprague Electric Company, New York, claims, and which is said to be brought out in service, is that the rubber hose merely acts as a packing in the steel armor and cannot burst. This hose is made to stand a test pressure of 1,500 pounds.

MISCELLANEOUS CAR AND RAILWAY CASTINGS.

The Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., well known as manufacturers of cast steel bolsters and truck side frames, has for many years made a specialty of car and other miscellaneous railway castings. Realizing the importance of this branch of the steel foundry industry, this company has devoted much time and money to the study of the best foundry methods and the most suitable chemical composition to insure castings of uniform quality, free from blow-holes and other defects, and possessing the requisite degree of toughness and strength.

The company has a large and thoroughly modern plant devoted to this class of work, giving exceptional facilities for making prompt shipments.

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It is given out on apparently excellent authority that the railways between Chicago and New York have reached an informal agreement with the principal western meat packers to make a general increase averaging 11 per cent. in the rates on dressed beef and other eastbound packing house products. This is said to be the result of a conference which was held in Chicago last week, at which 29 representatives of the two interests took up the subject in a spirit of conciliation. The principal conciliator was George W. Perkins, of the firm of J. P. Morgan & Company. This firm obviously is well situated to act as an intermediary in dealing with a question like this, representing, as it does, large interests both in the railway and in the industrial fields. The more optimistic observers say that this agreement with the packing interests—which have been the principals in some of the fiercest fights with the railways—will be followed by similar conferences with large shippers of lumber, steel products and other commodities, and with equally hopeful results.

We shall publish next week in pamphlet form the United States laws relating to railways engaged in interstate commerce. It will have marginal indexes, for easy reference, and will consist of the Interstate Commerce Act, as amended by the law passed last week, the acts relating to testimony before the Interstate Commerce Commission, and to immunity of witnesses; the expediting act, the anti-trust law of 1890, the safety appliance acts and the employers' liability act and the laws relating to accidents, to hours of service, to block signals, to ash pans and to arbitration. It is the intention to include in one pamphlet the laws needed for reference by the railway officer. The pamphlet will be for sale at the offices of the *Railway Age Gazette.*

Concrete reinforcement bar specifications for concrete have been adopted by the Association of American Steel Manufacturers. They are printed in full in another column. The chemical qualities of the steel are in accordance with the recommendations of the American Society for Testing Materials for structural steel adopted in 1909. There is a greater range in the tensile strength and the yield point is fixed definitely, instead of being one-half the ultimate tensile strength, as in the specifications mentioned. The cold bend without fracture, it will be noticed, depends upon the grade of steel and also varies with the plain bars and the deformed bars. The general distribution of these specifications will help designers in reinforced concrete work, but the manufacturers might have gone one step further and made some distinction between rounds and squares. It has happened a number of times that specifications have called for rods of a certain size, to be spaced at certain intervals, and the area has not been given, nor the percentage of steel used and the contractor has no information as to the fiber stresses in the materials. The designer meant square bars, but because of the use of the word "rods" the contractor purchased rounds. Such things happen and often result in owners having to pay contractors extra. Dictionaries are not definite as to whether a rod may be round or square. Some engineers say "rod" when rounds are meant and "bar" when squares are meant. We need a learned society jury on this.

We publish elsewhere an article on the very interesting controversy over the terminal problem at St. Louis, which has been going on for about five years, and yet does not now seem as near an end as it did two or three years ago. There was reason five years ago for public sentiment at St. Louis against the eastern railways and the Terminal Railroad Association of St. Louis; they had not given St. Louis a "square deal." But, as the article referred to clearly shows, the railways have since done everything for St. Louis that reasonably could be asked of them. Meantime, the demands on them constantly have grown greater; and each concession they have made to the city has promptly been followed by additional exactions. In such bad faith have the municipal assembly and those shippers and real estate dealers who have been fighting the Terminal acted, that there is good reason for suspecting that if it and the trunk line railways acceded to all the demands at present made of them, the Terminal would again be denied the ordinances under discussion. These ordinances, according to the city's own Bridge and Terminals Commission, ought long since to have been passed, not merely in justice to the Terminal Railroad Association and the roads using the terminals, but even more in the interest of the industry and commerce of St. Louis. It is a strange situation when public service corporations are denied the opportunity

to confer benefits on a community except on condition that they will submit to plain injustice and oppression. The public will hardly get good and adequate service by making it to the interest of public service corporations *not* to give it.

Is the popular hostility to railways egged on by the politicians at Washington and at the state capitals, at last succeeding in intimidating the mechanical associations of this country, the greatest organizations of the kind in the world, into a policy of silence? Reading back in the records of past conventions we find the free communings of the members among themselves; the outpourings of their very hearts as they aired their troubles and expressed themselves as to the safety of any device that came up for discussion. The lid was off, the pot bubbled over, to the great edification of all concerned. The bubbling largely built up the associations and gave them a record the like of which no others of like kind can boast. Men looked to them for instruction, inspiration and guidance and got all. But slowly an insidious element of fear has been creeping in. The speakers at the recent conventions at Atlantic City seemed constantly to have in mind the question, whether any thing they might say could be so distorted that it would serve as a pretext for further legislation imposing additional restrictions and burdens on the railways, or could be used in the courts against them as evidence. Is it safe to speak at all? All this, whether warranted or not, is having its baneful effect and though there is probably no danger of the tendency running to a fatal extreme it cannot fail to have an influence in retarding progress. The associations cannot be criticized for their caution, much as it is to be regretted, for there is ample reason for it, and it will probably continue until sane regulation shall take the place of the baiting to which the railways have been subjected for the past few years.

The principal thing to be said about the amendments to the Interstate Commerce law, which Congress has given to the country after its six months' travail, is that the main results are all in the dim (but not very distant) future. It would be quite possible to exercise the power to suspend increases of rates in a way to do little harm, but as the commission is bound to please its creators, the people, we may expect that only after careful deliberation and gathering of proofs, which means delay, will it venture to approve any increase, and then only to the most moderate degree. In whatever way the power may be exercised there can be little doubt that it will in the long run tend to petrify the rate fabric of the country. The natural course of the railway traffic manager will be to risk no reductions and to place his main dependence on the slow improvement that comes from the growth of the country. But if he fails to make reductions in rates to develop his territory the commission will try to take up the task in his place—seven commissioners with no responsibility to do the work of a hundred freight managers who are hired to make the business of their roads pay. The commission will no doubt make a brave trial at moderation, and few observers will agree with President Ripley, of the Atchison, Topeka & Santa Fe, that state ownership will come in ten years, but there is no denying the tendency. The stiffening of the long and short haul section will affect mainly the territory west of the Missouri river. This change alone will make a great mass of work for the commission and with probably no useful result; for a commission with the wisdom of Solomon could settle the rival claims in this field only by an arbitrary compromise, transferring a burden from one community to another and satisfying no one. The special commission to inquire into the propriety of federal regulation of railway capital can do little but study, for it has no power to call witnesses; but in view of the magnitude and the perplexities of its question and the strong "state's rights" feeling in many states there would seem to be a fair prospect that the result of this section of the law will be innocuous, especially as its only purpose was to get a difficult question out of the way.

President Taft's friends loudly proclaim the new law as his "victory," but it can be called so only from a narrow party standpoint. He had to please the insurgents by giving up his most practicable and useful proposal, that to permit traffic agreements between competing lines (which would put a stop to the constant stultification now imposed by the contradictory requirements of the laws) and he had to let them add the revolutionary provision for suspending rate increases. They dropped the physical valuation idea voluntarily, as they saw that it might hinder instead of promote railway baiting. The President got his special court, but it will be a year or two before anyone can tell whether it will be worth a tithe of what it will cost. The thing most needed is not more hair-splitting study of legal precedents in the musty volumes of the law, but more opportunity for the exercise of common sense in the primary stages of rate making. Suppose, for example, the commission should follow English precedent and refuse to justify an increase in a freight rate unless the carrier could prove an increase in the cost of transporting the particular commodity to which the increase applied. On that basis progress would be blocked at almost every step, and yet there is the time-honored precedent. On the other hand, the commission could appoint a committee of two members who, as matters stand to-day, would see the reasonableness of generally justifying the principle of increased rates after a conference of half a day with two public spirited railway officers. And how is it possible to go beyond broad principles with, perhaps, an estimate of the percentage which will probably be justifiable? To technically justify particular increases beforehand will, in many cases, be impossible, even though the necessity of making them is obvious, unless the advances are made an inch at a time. And, at best, there is still the problem of bringing seven million rate questions within the capacity of seven men working perhaps seven hours a day.

THE RAILWAYS OF THE WORLD.

The *Archivfür Eisenbahnwesen* again publishes statistics of the railways of the world, bringing them down to the end of 1908, or the nearest date of official reports, which for this country and Canada is June 30 of that year. The data given are the mileage for each country for each of the five years ending with 1908, the increase for the last four years and the proportion of railway mileage to area and population. A further but less complete table gives the capital invested in each country and the amount of it per mile.

The grand total for the world is 611,478 miles, which is an increase of 61,505 miles, or 11.2 per cent., since 1904, and of 16,445 miles (2.8 per cent.) over 1907—which seems moderate progress when we remember that 13,000 miles have been built in this country in a single year. But it is fully up to the progress of recent years, the mileage opened in the world in each of the last five years having been:

1904.	1905.	1906.	1907.	1908.
16,508	13,039	17,394	14,627	16,445

which is a reasonably rapid progress, with no greater fluctuations than there have been in other industries.

The distribution of railways at the end of 1908 was as follows:

	Miles.		Miles.
Europe	202,109	North America	274,372
Asia	58,813	South America	39,013
Africa	19,211	Australasia	17,960
Old world	280,133	New world	331,345

Thus North America alone nearly equals in mileage the whole of the Old World. In the division between North and South America, the West Indies, which together have 3,340 miles, are counted with South America.

Of the increase of 61,505 miles since 1904 considerably more than half was in America (33,690 miles), and of this 27,115 miles was in North America, against 12,265 miles in Europe, 10,830 in Asia, 3,574 in Africa and 1,147 in Australia, with which the 89 miles on the Hawaiian Islands are counted. Of all the new countries of the world Australia is most backward in railway construction.

As for a few years past, the most notable fact in this matter is the building of railways in Asia and Africa, where the mileage in each has increased nearly 23 per cent. within four years—proportionately faster than in any other quarter of the globe. In Africa the lines are chiefly built for the traffic of mines, etc., developed by Europeans, not at all for the natives; and unless there should be an unlooked for occupation of the country by European settlers there is little prospect of a long continuance of this construction, though the mileage of Africa (outside of Algiers, Egypt and South Africa, still insignificant) may well be doubled within a few years. But the case is different in Asia, and especially in China, where a vast fertile country and a still vaster industrious population are in sore need of better means of transportation, and now at last really d esire railways, which, sooner or later, we may be sure they will get. It will surprise most to find that at the end of 1908 China had very nearly as much railway as Japan (4,998 miles against 5,035), and its mileage has increased as follows for the four years ending with 1908:

1904.	1905.	1906.	1907	1908.
1,228	2,247	3,700	4,163	4,998

This is still very little for a population which counts by the hundreds of millions, but it is a good start, and it will be natural to expect that soon and for a long time China will be the chief field for railway construction.

More than half of the Asiatic mileage is still in India, where additions are made on a moderate scale, but without interruption.

In Europe perhaps the most notable change in 1908 is the very small amount built in Russia, only 285 miles, while of all European countries it needs new lines the most. It has still 102 miles less than Germany, which has little more than half its population and only one-tenth of its area.

In South America the chief progress has been made since 1907 by Cuba (573 miles=32 per cent.), Brazil (1,224 miles=11⅓ per cent.) and Argentina (1,800 miles=13 per cent). Of the 4,102 miles opened in South America in 1908 3,597 were in these three countries.

The statistics of capital show that 176,905 miles of railway in Europe are represented by $21,459,270,000, which is very nearly as much as the capital of 335,286 miles in other countries, making approximate averages of $121,393 per mile in Europe and $65,100 for the rest of the world. This applied to mileage whose capital is not reported would make the total capital invested in railways in the world $51,184,000,000, not including street and electric lines and the like.

THE GLADBROOK DISASTER OF MARCH 21.

The railroad commissioners of Iowa have made to the governor of the state a report on the disastrous derailment of March 21 on the Chicago Great Western between Green Mountain and Gladbrook, when 44 persons were killed, and they conclude that the cause was soft roadbed and excessive speed; but they print no adequate testimony to support the finding. A perusal of the report leaves the reader with a strong impression that the roadbed was soft, and, in the absence of evidence of any other cause, he is inclined to agree with the conclusion of the commissioners; but they are positive in the conclusion that the speed of the train was not over 25 miles an hour, and railway men will not agree with them that that rate of speed was excessive, solely because the engines were running tender first. The commissioners find that on railways generally the limit of speed for engines running backward is 25 miles, but they say that this limit should be much lower.

The main facts of this derailment were reported in the *Railway Age Gazette*, March 25, page 841, and April 22, page 1,041, and will be recalled by the reader. The principal additional facts brought out in the present report are as follows: The engines weighed 76 tons each. The pilotman was a conductor of the road and familiar with the track. He was fatally injured. The accident occurred on a straight line in clear weather. The engines might have been turned at Marshalltown so as to run head first. This implies an error of judgment on the part of the man who decided to run them backward. Engines as long and as heavy as these have been turned on that table. This train had two orders to run slowly on certain parts of the track, but these had no reference to the point where this derailment occurred. This point was at the far end of a cut about 5 ft. deep and 1,500 ft. long. The bottom of the cut was yellow clay. Water was standing in the ditches at both sides of the track and its surface was about level with the bottoms of the ties. This would seem to indicate that the line of the road at this point was level or nearly so, but the first report of the accident said that it occurred at the top of a slight grade. The rails are 75 lb., and the ties, mostly oak, were found to be sound. There were 23 ties to each 33-ft. rail. The superintendent had inspected the road a few days before and the track walker had been over it twice within 24 hours. The track is in poor condition for over 40 miles. This statement seems to have been based mainly on two facts; a rather large proportion of ties needing renewal and poor or deficient ballast; but nothing is said as to the kind, quantity or quality of the ballast, which perhaps means that there was none at all. It is stated that trains had constantly been running over the road with safety; but as to the speed of these trains or the weights of their engines the report is silent. The derailed engine ran 237 ft. after it left the track. On both derailed engines the throttles were found open and the brakes not applied. There was no evidence of any broken rail. One brake-beam on the leading tender was found down, apparently because of the breakage of one of the castings supporting it, but this break showed a bright fracture and there is no evidence that it occurred before the derailment. It is said that the ties on one side had been forced down into the mud, but the reader is left in doubt as to whether this occurred before or after the wheels of the tender (or engine) had left the rails. In their summary of conclusions the commissioners say that the track "was in a dangerous condition; it lay on a bed of clay which was wet and springy on account of improper drainage."

A report like this suggests forcibly the need of competent government investigators of railway accidents. Congress acted none too soon in passing the bill giving power to the Interstate Commerce Commission in this matter. Both of the roads involved in this disaster—the train belonged to the Rock Island—reported the cause as undiscovered. Where the derailment of a train at moderate speed results in killing two score passengers, reports of that character and brevity are very unsatisfactory, not to say exasperating. And for three commissioners, none of them engineers, to report that the source of the trouble was a soft roadbed combined with excessive speed and to express themselves in such vague language—not to mention a number of absurd conclusions which we have omitted from our abstract of their report—is equally regrettable. With a tender properly built and loaded, a speed of 25 miles an hour on good track cannot be called unsafe. If this tender was of unsuitable design or was not properly loaded, the public wants the evidence of the fact. On track sufficiently poor, a tender, safe in itself, could easily run off the rails, of course. If this was the trouble at Gladbrook the specific evidence of the badness of the track should be set forth; the depth of the ballast, the condition of the ballast or roadbed, as compared with other parts of the track and with safe track; the views of roadmasters and engineers on doubt-

ful points, etc. Again, if there was fault or probable fault in either the track or the tender, the qualifications of the pilotman should have been inquired into. He was a conductor, familiar with the road, but whether or not he was as well qualified as an engineman would have been in the matter of moderating speed for bad track, is a point on which no light is thrown. Ordinarily, the question of properly limiting the speed of a train is entrusted to two men, the engineman and the conductor. Errors of judgment on the part of the engineman ought to be, or at any rate may be, checked by a vigilant conductor. Here the conductor or conductors did not know the road. A pilot in charge of a train of which the enginemen and the conductor are unfamiliar with the road has, therefore, a delicate and grave responsibility. And so has a railway commissioner who has to report on a case like this. Integrity and devotion to the public interest are only a part of his equipment. Familiarity with his problem is essential.

NEW BOOKS.

The Construction of Concrete Fence Posts. Prepared by the Office of Public Roads, United States Department of Agriculture, Washington, D. C. 6 in. x 9 in.; 31 pages; 9 illustrations.

This pamphlet, Farmers' Bulletin No. 403, is elementary, being written for general distribution, but it covers the subject well and has some suggestions which are as valuable to railway officers as to the general public.

Federal Safety Appliance Acts; Index-Digest of Decisions. By Otis Beall Kent. Prepared by direction of the Interstate Commerce Commission and published at the Government Printing Office, Washington, at 70 cents in cloth, and 40 cents in paper covers.

This is a volume of 294 pages, 6 in. x 9 in., containing an index, with explanatory notes given in all necessary fullness, filling about three-fourths of the book, and an appendix containing the safety appliance acts and reports of a number of court decisions on these acts which have not yet been printed in the regular court reports. During the past ten years a number of suits for damages suffered by railway employees on account of personal injuries in coupling cars, etc., have been fought with great persistence, Mr. Moseley and the leaders of the railway brotherhoods taking care to see that all vital points have been carried to the supreme court of the United States; and, as a result, the powers of Congress and of the federal courts, in dealing with interstate commerce under the federal constitution, have, in these cases, been elucidated with great thoroughness. The notes in this volume, therefore, will serve as a useful abstract of the present state of the law, not only as regards the penalties which are imposed on railways for violation of the act, but also as regards the points which have come up in the numerous civil cases arising under Section 8. Under each topic the decisions by the supreme court of the United States are cited first, and decisions of the lower courts, in proper order, follow; and numerous decisions of lower courts, contrary to the views which finally have prevailed, are given in small type.

Letters to the Editor.

CARELESSNESS (?) AMOUNTING TO DISHONESTY.

St. Louis, June 9, 1910.

To the Editor of the Railway Age Gazette:

As a claim agent I have become weary of having to combat statements which are manifestly dishonest. There is a Freight Claim Association which has a lot of rules, some right and proper, some absurd; some of a kind which it has no right to make as an association, because, as an association, it has no more power than would inhere in individual members, and its individual members could not make such rules for their own roads.

One of the objects of the association was stated originally to be the "equitable adjustment" of claims between members. But it provided a committee of arbitration, and it strictly inhibited the arbitrators from adjudging on the *equities* in any case limiting them to its *rules*. The rules provide no basis for credibility. One agent's statement must be accepted and given the same weight as another's. The agents, having learned this, have apparently discovered a way of taking an advantage not intended and not warranted; and the rules, adopted to facilitate adjustments, rather than secure righteous ones, are used to further ends which are not commendable, and often not honest. Let me illustrate.

Claim for blankets; one of two boxes short, but too large to have been carried off. Agent maintains that he "loaded as billed" September 9; no exceptions." They always say that. It is the absolute truth as to the *record*, but not the whole truth as to the *facts;* for the missing box is billed, with charges, by another road on the 31st of December. It was not loaded as billed, for he didn't have it; but by ignoring the fact, he could say that his "record showed no exceptions."

Another agent billed on January 10 two cases oilcloth. Outturn showed but one. Claim was made February 2. Same story—"Loaded, without exception." But, just the same, that agent billed on the 23d of February the missing case as "wt. and charges ahead Jan. 10."

Another agent, against whose seals a box was "short," maintained that he *loaded* it because his "record showed no exceptions." But a man sent to "stay and see every package on the floor" had "a message to Garcia." He stayed. The foreman said that he knew the box was loaded; loaded it himself. But the man with the message persisted. Had to see every box; would begin with the one the foreman was resting his foot on; it looked like the right box. It was.

Another case was that of a box over a water route, where all the loading agent had to say was that it was "checked from the boat to be loaded into car 94018." In this case, for some inscrutable reason, the positive assurance that it *was* loaded was not put in. That particular car had 13 packages over; but the case wanted was checked short. There was much contention; the claim agent of the loading road maintaining that what his agent said had to be accepted. On an arbitration it would have to be, too. But it happened that a lucky turn in another claim developed that that particular case was loaded in another car two days previously, and had been delivered.

This can be elaborated interminably. The agents all say "no exceptions." They tell the truth as to the records; but the records do not tell the truth. These cases have become so numerous as to suggest that failure to make the records conform to the facts is deliberate and intentional in many instances.

The suggestion has been made to me that those who do such things are dominated by the fear of "losing their jobs." I have yet to make the acquaintance of a manager who would set up as the price of a man's job that he barter his personal self-respect or put his honesty in the scale against the few dollars which his company might have to pay for a box which was billed to him but never reached his station, and which a truthful record would show was never loaded.

I believe that when the higher officers are apprised of the facts they will call a halt, and instruct that honest records be made. Stated differently, I believe that managers will not approve of methods which eventuate in, if they do not deliberately contemplate downright fraud, by omissions, equivocations and evasions.

More, I believe that most men, relieved of the fear which besets them (or because of the lack of moral courage), on account of carelessness they may not wish to confess, will make honest records; and that what is really needed is some indication from above that honesty is desirable and is desired; and, when the assurance of this is promulgated we shall soon be having more credible as well as more creditable records and statements.

S. D. WEBSTER.

THE TERMINAL CONTROVERSY AT ST. LOUIS.

BY SAMUEL O. DUNN,
Western Editorial Manager of the *Railway Age Gazette*.

One of the hardest problems with which railway managers in all parts of the country are grappling is the terminal problem. This is both a physical and a traffic problem. Its solution involves the provision of adequate facilities for expeditiously moving freight and passengers within, into, out of and through large centers of population and industry at rates which will yield a reasonable profit on the investment of the carriers, and at the same time will be neither burdensome to traffic nor discriminatory. Two years ago this problem seemed nearer settlement at St. Louis than at any other city in the United States. To-day it seems very far from settlement there. Briefly, the story of how this reversal of conditions occurred is that the terminal problem at St. Louis, when it seemed on the point of just and satisfactory solution, got into a welter of political ambition and manipulation, newspaper sensationalism and agitation, and real estate speculation in which it has floundered and constantly sunk deeper for 21 months. The story, however, deserves to be told at greater length. For the situation at St. Louis is as instructive an example as is now afforded in this country of the difficulties which a public service corporation, at which the affrighting epithet "monopoly" can be hurled, is apt to meet in making a serious, honest attempt to give the public not only the "square deal" which it justly demands, but even more than a square deal. The organization, and the facilities so far as they have been provided, for handling terminal traffic at St. Louis have been developed thus far along almost ideal lines. As, in spite of this, obstacles to the adequate development of terminal facilities have been encountered there which appear almost insuperable, one wonders how the terminal problem is ever to be solved where the conditions are less favorable.

The *Railway Age*, in its issues of February 14 and February 21, 1908, published two articles entitled "Solving the Terminal Problem at St. Louis." The *Railroad Age Gazette* on September 10, 1909, published an article on the same general subject entitled "Proposed Terminal Improvements at St. Louis." It will be necessary, in order to convey an understanding of the points and merits of the heated controversy now waging in that city about the so-called "bridge arbitrary," to summarize the facts given in the articles referred to.

Prior to 1905 the situation at St. Louis in respect to freight rates and terminal facilities was quite unsatisfactory. When the eastern railways first reached the St. Louis terminal zone there were no bridges across the Mississippi and they built their freight stations on the east side of the river, in East St. Louis, and in effect told the business men of St. Louis that when they wished to ship goods east they must haul them across the river and that when goods for them arrived from the East they must come across and get them. No bills of lading between St. Louis and eastern points were issued. The western lines built their terminals on the west side of the river. The Chicago & Alton, which was in both eastern and western business, crossed its western freight nearly 100 miles up the river and made the same rates between East St. Louis and St. Louis and the West, except on business originating at points within a radius of 100 miles. For competitive reasons, other western roads had to do likewise. Similarly, roads handling traffic between both St. Louis and East St. Louis and the Southeast, South and Southwest made the same rates to both cities except within a radius of 100 to 200 miles. Therefore, except on traffic originating near the two cities, the rates from all sections but the East were the same to both, while on all eastern traffic the shippers of St. Louis had to pay extra charges for getting their shipments across the river.

The shippers of St. Louis felt, and properly, that this arrangement discriminated unfairly against them. Furthermore, there was complaint that the Terminal Railroad Association, which is owned by 14 of the trunk lines, and which, since it was organized in 1889, has acquired control of all the important switching and ferrying lines, was not developing its facilities as fast as the growth of the city's commerce demanded.

WORK OF THE BRIDGE AND TERMINALS COMMISSION.

In 1905 the municipal assembly of St. Louis passed an ordinance creating a "Municipal Bridge and Terminals Commission" "to investigate and determine the nature and extent of the hindrances to the commerce of St. Louis, whether as regards delay or inconvenience in the handling of freight, or disadvantageous charges or methods of shipping or billing of freight, or in any other regard"; to ascertain what should be done to improve condtions and to prepare ordinances and take such other steps as might be deemed desirable to further this end. The mayor was made ex-officio chairman of the commission; the president of the board of public improvements was made ex-officio a member, and the following prominent citizens were appointed members by the mayor: Robert H. Whitelaw, Whitelaw Bros., who was made vice-chairman; Hugh McKittrick, Hargadine-McKittrick Dry Goods Co., who subsequently succeeded Mr. Whitelaw as vice chairman; Joseph D. Bascom, Broderick & Bascom Rope Company; C. W. S. Cobb, Glencoe Lime & Cement Company; R. S. Colnon, Fruin & Colnon, contractors; Homer P. Knapp, Butler Bros., and R. W. Shapleigh, Norvell-Shapleigh Hardware Co. When Mr. Whitelaw retired from the board he was succeeded as a member by Bert Lang, Lang Commission Company. The board employed as expert advisers Albert T. Perkins, a skilled and experienced railway operating officer, and Robert Moore, an eminent bridge engineer, and at once started on a thorough study of the entire situation.

As a result of its negotiations with the officers of the eastern lines, the differentials against St. Louis on eastern traffic outside the 100-mile zone were greatly reduced in 1905, and the differential on soft coal, which originates almost entirely within a radius of 100 miles, was reduced from 30 cents to 20 cents. These reductions were estimated to be worth a large amount to the business men of St. Louis. The eastern roads also agreed to issue bills of lading and to publish through rates to and from St. Louis. This established their responsibility for the safe carriage of goods to and from that city. In 1906 the differentials on classes 1 and 2 were further reduced and the eastern roads agreed to deliver soft coal from Illinois mines on through St. Louis rates free of switching charges to industries on the tracks of all the roads in St. Louis; in other words, the eastern lines absorbed, or paid, the switching charges to industries in St. Louis located on the tracks of western roads. These reductions were likewise hailed with delight by the business men of St. Louis. Early in 1907 the eastern differentials were entirely abolished except on traffic within a zone of 100 miles. The rate from St. Louis to the Atlantic seaboard had been 118 per cent. of the rate from Chicago; that from East St. Louis had been 116 per cent. The rates from both cities were made the same, 117 per cent. to all points in Central Freight, Trunk Line and New England territory. It was estimated that these readjustments in favor of St. Louis shippers amounted to in excess of $2,000,000 per year, besides firmly placing that city on the railway map of the country in a most desirable position. There has been a great deal of talk in St. Louis within recent years about the Terminal Railroad Association being a "huge and grasping monopoly." Its total capitalization is $34,682,000. So in about 15 years, taking into consideration the probable increase in tonnage, the foregoing reductions in rates will almost equal the Terminal's capitalization.

PROPOSED DEVELOPMENT OF THE TERMINAL'S FACILITIES.

There was great rejoicing among the city officials and busi-

ness men of St. Louis when these readjustments of rates were completed. They "put St. Louis on the map"; they established it on the same rate basis as East St. Louis; and these had been for years regarded in St. Louis as the great desiderata. The Bridge & Terminals Commission then turned its attention to securing enlargement of the Terminal's facilities. It was found that it had about 1,650 car lengths of team track, and the commission decided that in order to handle its traffic satisfactorily its capacity should be doubled. By improving its old tracks and building new ones it soon increased its team track capacity about 50 per cent. It also bought the so-called "Ranken tract," about 25 acres of land in the Mill Creek Valley district in the neighborhood of Compton avenue, west of the Union passenger station, at a cost of between $2,500,000 and $3,000,000. By developing this property it intended to increase its passenger faciliites 62 per cent. and its freight facilities 141½ per cent. The land was entirely unoccupied and was used by a dairyman as a cow pasture. But in 1868 streets through it—none of which, however, were ever opened—were dedicated to the city. Therefore, before the Terminal could build team tracks on it and otherwise develop it it was necessary to get the municipal assembly to pass ordinances vacating these paper streets. The Bridge & Terminals Commission drafted the necessary ordinances and they were introduced in September, 1908. The improvements which the Terminal proposed to make on the Ranken tract and other parts of its property in St. Louis would have cost an aggregate of $4,000,000.

Besides having been drawn and introduced by the Bridge & Terminals Commission, the ordinances were endorsed by the city legal department, the street commissioner, the sewer commissioner, the engineers of the various railways affected, the Business Men's League, the Merchants' Exchange, the Manufacturers' Association, the North St. Louis Improvement Association, the Commercial Club, the Lumbermen's Club, the Million Population Club and other bodies. Representatives of 95 per cent. of the freight tonnage of the city advocated their enactment. Now, the municipal assembly was not in any way legally bound to pass these ordinances. But it does seem that it was morally obligated to do so. For it had created the Bridge & Terminals Commission, and it was in pursuance of the act creating it that the commission had got the eastern railways to reduce their rates to St. Louis more than $2,000,000 a year and prevailed on the Terminal Association to buy $3,000,000 worth of land. Nothing could be plainer than that if the Terminal had apprehended it would not be allowed to develop the Ranken tract, it never would have bought it. Furthermore, if there was anybody qualified to say whether the ordinances were needed and were fair, surely that body was the Bridge & Terminals Commission. Yet, in spite of all efforts to get them started on their passage they slept in the railroad committee from September, 1908, to March, 1909, and then were reported back with numerous amendments imposing additional burdens on the railways and the Terminal Association. The committee proposed, among other things, the fixing of a maximum switching charge of $2 per car within the city limits, whether the switching was over the tracks of one or more companies; the fixing of a switching charge of 5 cents per ton for shipments in less than car load lots; the abolition of the so-called "bridge arbitraries" by making the charges for passenger and freight traffic between all points inside and all points outside the St. Louis district no higher per mile than the rates generally fixed by the trunk line railways between points outside of the St. Louis district; the restriction of the streets to be closed by tracks; a requirement that the railway tracks be carried over Compton avenue on a viaduct instead of under it in a subway and that the Terminal deposit $400,000 with the city with which to build the viaduct and file a bond of $500,000 to assume responsibility for all damages that might be sued for by property owners in the vicinity, and a requirement that the Terminal connect its tracks with the "free bridge" across the Mississippi for the construction of which the city has been authorized to issue bonds.

THE COMMISSION'S ORDINANCES DEFEATED.

The report of the committee was referred to, and condemned by, the Bridge & Terminals Commission. The commission said that the regulation of switching charges within the city was a matter to be dealt with by the State Railway Commission. The rates on through business, it stated, had been reasonably adjusted in accordance with its requests, and any further readjustment of them was a matter for the Interstate Commerce Commission. The Terminal Association did not decline to carry the streets at Compton avenue overhead if any feasible plan could be worked out, but no such plan had been suggested. The Terminal made no objection to arranging for connections with the proposed "free bridge" if it was ever built, and, in fact, indicated that it would be glad to have connection with and use it. Despite all the concessions the railways had made, the earnest recommendations of the commission and the support given to the ordinances by most of the shippers of the city, the assembly refused to pass them without the proposed amendments.

TERMINAL OFFERS $2,000,000 MORE.

In April, 1909, a new city administration came into power. The negotiations for the passage of ordinances permitting the development of the Ranken tract were renewed. Some promises the Terminal had made in previous years and not kept were recalled, and it was demanded that it be compelled before further franchises were given it to make reparation for these broken promises.

The Terminal, through its president, W. S. McChesney, Jr., consented to do this. It had once agreed, on certain conditions, to build a bridge across Clark avenue. It having failed to do this, the city brought suit to compel it to. The Terminal carried the case to the State Supreme Court, contending it had been released from its obligation by the failure of the city to carry out its part of the contract in failing to pass the necessary ordinance. The Supreme Court decided in favor of the Terminal. Nevertheless, Mr. McChesney agreed that it should give the city $150,000 as reparation for not having carried out this void contract. The Terminal also agreed to pay the city $200,000 for having in building the Union passenger station encroached beyond the line fixed in its ordinance; $150,000 for having failed to build a passenger station on the North Side in violation of a promise made some years before, and in addition to give the city $500,000 for the rights and privileges to be granted by the proposed ordinances. The foregoing sums aggregating $1,000,000 were to be used, the ordinances provided, for the widening of Market street, on which the Union passenger station faces, or for the establishment of a public park opposite the station; but Mr. McChesney expressly said that so far as the Terminal was concerned the city might do what it pleased with the money. The Terminal also agreed to build viaducts over its tracks at Ewing and Compton avenues and viaducts over its tracks at King's Highway and elsewhere at a cost of another million dollars. It also agreed to build a handsome passenger station in North St. Louis. It therefore bound itself to an outlay of more than $2,000,000 for the public benefit which was not provided for in the ordinances which the city's own Bridge & Terminals Commission had drawn. This seemed like very substantial expiation for all its past sins of omission and commission.

The municipal assembly of St. Louis is composed of an upper house, called the council, and a lower house, called the house of delegates. When the ordinances came up in the house of delegates one of the most prominent business men of St. Louis, who was a leading member of the Bridge & Terminals Commission, was asked by the president of the house if the ordinances were satisfactory to him. He re-

plied, "No"—that he would not have "held up" the Terminal Association as was proposed. The ordinances were sent to engrossment by the house. Then a sensational newspaper wired the presidents of the various railways asking if they would meet representatives of the shippers of St. Louis to confer with the shippers at any time on any subject of mutual interest. The newspapers distorted this into an assurance that they were ready to abolish the bridge arbitraries if the ordinances were beaten. In consequence they were defeated. This was in February, 1910. Meantime, the members of the Bridge & Terminals Commission, feeling that the city, by its refusal to carry out their recommendations had discredited them, resigned, and the commission ceased to exist.

After the defeat of this last ordinance, the municipal assembly on March 15, 1910, passed a resolution providing for the appointment of a committee of members from both its houses to co-operate with a committee representing the shippers of St. Louis in negotiations with the proprietary railways controlling the Terminal Association, "to the end that all remaining so-called bridge arbitraries may be abolished, and upon abolition thereof the terminal facilities of said railways may be increased by ordinances passed on fair and reasonable terms." A general conference between the presidents of the proprietary lines and the joint committee representing the municipal assembly and the commercial interests was held, after which a committee to carry on the negotiations for the railways, and composed as follows, was appointed: T. C. Powell, vice-president Southern Railway, chairman; B. M. Flippin, freight traffic manager, Missouri Pacific; E. Hart, Jr., assistant general freight agent, Baltimore & Ohio Southwestern; L. A. Browning, president, St. Louis & O'Fallon; C. W. Galligan, general freight agent, Chicago, Peoria & St. Louis; C. L. Hillery, general agent New York Central lines. I. H. Sawyer, of the Brown Shoe Co., was made chairman of the joint conference committee representing the municipal assembly and the shippers of St. Louis.

CONFERENCE REGARDING RATES PROVES A FAILURE.

All the members of the railway committee were officers of roads owning an interest in the Terminal Railroad Association, except Messrs. Browning and Galligan. They were appointed to represent the interests of certain small, independent lines running from the mines in Illinois to East St. Louis, of which four, the Litchfield & Madison, the St. Louis & O'Fallon and the Belleville Electric and the Troy & Eastern carry 36 per cent. of the coal delivered in St. Louis. The municipal assembly had made it plain that the main thing it wanted was the abolition or absorption by the eastern lines of the charge of 20 cents a ton for switching coal from East St. Louis across the Mississippi river to industries in St. Louis. A flat rate of 32 cents per ton is charged on coal from Illinois mines to East St. Louis for distances varying from 19 to 80 miles. The addition of the flat 20-cent rate from East St. Louis makes the through rate to industries in St. Louis 52 cents. The small independent roads mentioned haul practically nothing but coal. If the demand that the carriers originating this traffic absorb the 20-cent charge were acceded to, this would leave the originating carriers earnings of but 12 cents on coal moving to industries on the Terminal's tracks in St. Louis. When coal moves from the Illinois mines across East St. Louis and St. Louis to industries beyond the Terminal's tracks, and located on the western railways, the western roads make a charge of 10 cents for switching it from the Terminal's tracks to their own. This charge of 10 cents is now absorbed—in other words, paid—by the eastern lines which originate the coal, thus making the rate to all industries in St. Louis, whether on the Terminal's tracks or on those of the individual western railways, 52 cents, and leaving the eastern lines earnings on coal moving to the tracks of the western lines of but 22 cents a ton. If in addition to absorbing this charge of 10 cents, the eastern lines absorbed the Terminal Association's charge of 20 cents, they would be left but 2 cents per ton for hauling from the mines to East St. Louis—distances of 11 to 80 miles—coal destined to industries located on the rails of the individual western roads. This would be a ridiculously non-compensatory rate for even the strong eastern trunk lines on the coal that they originate; and it would mean quick bankruptcy for the small independent roads which handle practically nothing but coal. But despite the vital interest that the small lines had in the negotiations, when the joint committee representing the city and the shippers, and the sub-committee representing the railways, met on March 18, the shippers absolutely refused to treat with the railway committee if Messrs. Browning and Galligan were allowed to remain on it. The conference broke up when the committee representing the Municipal Assembly and the shippers withdrew.

TWO DISTINCT QUESTIONS INVOLVED.

The foregoing shows that there are two questions involved in this controversy. The first is, whether the Terminal Railroad Association, which is owned by 14 trunk lines, shall be allowed to improve and increase its facilities. The second is whether the eastern railways, large and small, some of which have no interest in the Terminal, except that they handle through traffic in connection with it, shall make the same rates to and from St. Louis that they make to and from East St. Louis on traffic originating within a radius of 100 miles, and particularly on coal, its supply of which St. Louis gets entirely from mines east of the river. These, plainly, are distinct questions. The only railways directly concerned in the question whether the Terminal's facilities shall be enlarged are those which own it. In how the question of rates shall be settled, the small lines having no propriety interest in the Terminal are more vitally interested than its proprietors. Furthermore, there is no difference of opinion among the managers of the railways and the shippers and officials of St. Louis as to whether the Terminal's facilities should be improved and increased. On the other hand, there is a wide difference of opinion even among shippers themselves as to the justice of the proposed abolition of the rate differentials within the 100 mile zone. Why, then, it may be asked, are these two questions linked together? The reason is plain. It is sought to use the Terminal's needs as a weapon for coercing both the railways which own it and those which have no interest in it into making the desired concessions in rates. But it is seen that the small lines cannot with the slightest semblance of fairness be asked to absorb the Terminal's 20 cent charge. Therefore it is sought to bar them from the negotiations; it being known that if the desired concessions can be wrung from the eastern trunk lines the small, independent lines will, for competitive reasons, have to meet any through rates which the trunk lines make.

It is so generally conceded that, assuming a fair adjustment of rates, the Terminal should be allowed to make the improvements planned by it, that the only one of these questions that needs to be considered by those not having some special purpose in preventing the Terminal from making those improvements is as to whether the existing adjustment of rates is fair, and if not, how it can be made so.

ALLEGED DISCRIMINATIONS AGAINST ST. LOUIS.

Those who criticise the present adjustment do so upon the ground that it discriminates against and imposes an undue burden on the commerce of St. Louis. The alleged discrimination consists in the fact that on traffic moving between St. Louis and points within 100 miles east of the Mississippi river the rates are higher than the rates of East St. Louis, the difference most complained of being the charge of 20 cents per ton collected by the Terminal Association for delivering coal to all points on its tracks in St. Louis. It is contended that this is contrary to the usual method of making rates. This contention is groundless. It is almost the

universal practice for railways to make an extra charge for short hauls in the course of which commodities move over costly bridges across large rivers. On traffic moving to and from New York and Jersey City an arbitrary for lighterage is charged on shipments within a radius varying from 65 to 135 miles. Among other points which may be cited at which substantial bridge arbitraries are imposed on traffic moving from a minimum of 54 to a maximum of 174 miles are Louisville, Ky., and Jeffersonville, Ind.; Louisville, Ky., and New Albany, Ind., and Omaha, Neb., and Council Bluffs, Ia.

Another contention made is that the adjustment of rates puts shippers in St. Louis at a disadvantage as compared with those in East St. Louis. But, as a matter of fact, the extra charges imposed for crossing the bridges at St. Louis apply both ways. The result is not only to make the rates between eastern points and St. Louis higher than they are to East St. Louis, but also to make the rates between western points and East St. Louis higher than they are to St. Louis; and the differentials both ways are about the same. The following gives the maximum distances on some eastern railways for which the rates from St. Louis are higher than they are from East St. Louis: Chicago & Alton, 99 miles; Southern Railway, 78 miles; Vandalia, 101 miles; Illinois Central, 103 miles; Chicago, Burlington & Quincy, 98 miles. The following gives the maximum distances on some western railways for which the rates from East St. Louis are higher than they are from St. Louis: Missouri Pacific, 117 miles; Chicago, Burlington & Quincy, 75 miles; St. Louis, Iron Mountain & Southern, 180 miles; Wabash, 84 miles; St. Louis & San Francisco, 198 miles. The average distance at which the shippers of East St. Louis cease to pay higher rates on westbound traffic than the shippers of St. Louis is 140 miles, while the average distance at which the shippers of St. Louis cease to pay higher eastbound rates than the shippers of East St. Louis is 106 miles. These figures show that if there is any unfair discrimination it is in favor of St. Louis, and not against it.

THE "UNREASONABLE" BURDEN ON ST. LOUIS.

Those who oppose ordinances to permit the Terminal Association to increase its facilities reply to facts such as the foregoing that at least the rate of 52 cents on coal to St. Louis is unfairly discriminatory and excessive as compared with the rate of 32 cents to East St. Louis and imposes an undue burden on its manufacturers. But, as already indicated, shippers of raw materials originating within the 100 mile zone on the *west* side of the river and moving to *East St. Louis* also have to pay the 20 cent charge across the river. For example, there are manufacturers of glass in both East St. Louis and St. Louis. All of them use a large amount of sand, which is hauled from Klondike and Pacific, Mo. The consequence is that while the glass manufacturers of East St. Louis have an advantage in the rate on coal, the glass manufacturers in St. Louis have the same advantage in the rate on sand. On another very important raw material, lumber, the rate, regardless of whether its point of origin is *east or west* of the river, is 1½ cents per 100 lbs., or 30 cents per ton higher to East St. Louis than to St. Louis.

It is evident that there is no unfair discrimination against St. Louis as compared with East St. Louis. If the 20 cent charge of the Terminal Association is unjust to either St. Louis or East St. Louis it is unjust to both; and if it is unjust to both this must be because it is excessive *per se* for the services rendered. That it is excessive *per se* the critics of the Terminal contend to be the fact. They concede that the rate of 32 cents per ton on coal to East St. Louis is fair and contend that a charge of 20 cents for the additional haul from East St. Louis into St. Louis is excessive. The distances that coal is hauled in large quantities to East St. Louis vary from 11 to 41 miles, and the rates per ton per mile from $^{75}/_{100}$ cents to 2 $^{9}/_{10}$ cents. The distances that the coal is hauled by the Terminal Railroad Association from its connections with the eastern lines in East St. Louis to industries on its tracks in St. Louis vary from 8 to 17 miles and the average rate it receives per ton per mile varies from 1 $^{8}/_{10}$ cents to 2 $^{5}/_{10}$ cents. The rates per ton per mile received by the Terminal Association are little if any greater than those received by the originating carriers. Now, the Eads and the Merchants' bridges over which the Terminal has to haul the coal to get it from East St. Louis into St. Louis cost, respectively, $6,826,730 and $3,733,483. The Municipal Bridge & Terminals Commission estimated that to build a bridge across the Mississippi river to carry four railway tracks would cost $8,000,000. A good, double-track railway can be built for $100,000 a mile. The Eads bridge, therefore, cost the equivalent of 68 miles of good, double-track railway, and the Merchants' bridge the equivalent of 37 miles of good, double-track railway. A bridge is a very expensive structure to maintain and operate, as well as to build. On the basis of cost of construction, maintenance and operation a bridge across the Mississippi river at St. Louis is equivalent, conservatively, to 50 miles of double-track road mileage. Furthermore, all of the lines of the Terminal are located where real estate is very valuable, and are therefore worth a great deal more per mile than the road mileage of even the very best double-track railway. A very low rate for transporting coal for long distances on ordinary road mileage is four mills per ton per mile. The average distance the Terminal Association hauls coal is about 12 miles. The total average distance that it hauls the coal, therefore, is equivalent to at least 60 miles of road mileage. Its actual rate being 20 cents a ton, and its average *constructive* haul 60 miles, its average *constructive* rate per ton per mile is three mills. Far from being a high rate, this is an exceedingly low one.

Not only is the Terminal's 20 cent rate, which is a flat one on traffic moving to all industries on its belt lines, low, but the burden that it imposes on the industries of St. Louis is absurdly exaggerated. The total coal hauled across the river by the Terminal in the year ending June 30, 1909, was 4,882,749 tons. Of this 823,180 tons was for the use of the railways themselves, which, therefore, paid the Terminal's charge on it; and 844,977 tons moved on through rates to points west of St. Louis. Of the rest, 2,159,589 tons was coal which was unloaded on the tracks of the west side lines in St. Louis, and on which, therefore, the eastern lines absorbed the switching charge of 10 cents, leaving them but 22 cents per ton for hauling it, and 1,055,003 tons were unloaded on the Terminal's tracks in St. Louis, making a total of 3,214,592 tons on which the shippers of St. Louis paid freight. Of the total charges collected by the Terminal on this coal $164,333 was paid by the railways on what they consumed; $168,995.40 was paid on coal moving entirely through St. Louis to points west of it; $431,918 was paid by St. Louis shippers on coal delivered on the western railways' tracks and $211,000 was paid by St. Louis shippers on coal delivered on the Terminal's rails. So the total amount of the charges on coal paid by the shippers of St. Louis to the Terminal was $632,918. The total value of the manufactured products of St. Louis in 1909 was $310,000,000. Therefore, the total amount that the shippers of St. Louis paid to the Terminal Association for the transportation of coal was $^{2}/_{10}$ of 1 per cent. of the value of the manufactured products of the city! And this $^{2}/_{10}$ of 1 per cent. is the insuperable obstacle which, it is said, keeps manufacturers from locating in St. Louis; the terrible menace to their prosperity which drives industries now located there to other cities; the incubus whose weight is pressing out the city's commercial life! The *increase alone* in 1909 in the value of the manufactured products of St. Louis was $35,030,451, or 55 times as much as the *total* amount that its shippers paid to the Terminal in coal rates.

THE PROBABLE TRUE REASONS OF OPPOSITION TO THE ORDINANCES.

The foregoing facts and figures amply demonstrate that the Terminal's charge of 20 cents per ton is not unreasonable and that it does not impose any perceptible burden on the industry

and commerce of St. Louis. While it furnishes a good pretext for withholding from the Terminal the ordinances necessary to enable it to develop its facilities, it plainly is not a sufficient cause for the determined, effective opposition to these ordinances.

Perhaps a speech made by Frank H. Gerhart, a prominent St. Louis real estate man, at a public hearing of the committee on railways of the house of delegates on January 21, 1910, and reprinted and widely circulated with the "compliments of the St. Louis real estate exchange," may throw some light on the true source and cause of some of the effective opposition. Mr. Gerhart said that "several other eastern lines may move or extend to St. Louis, caused by the refusal of the municipal assembly to grant privileges to their intermediary Terminal Railroad Association, *which is the very thing that we want.*" He estimated that if the seven lines which now have their freight houses in East St. Louis were forced to establish freight terminals in St. Louis, they would have to spend in St. Louis about $3,000,000 each, or an aggregate of $21,000,000. "If," he said, "we refuse to give any additional franchises to the Terminal Association, the other east side lines are certain to come over. * * * If we insist upon dealing only with them and offer them all reasonable legislation in vacating streets and alleys, etc., for their required freight houses and not with the Terminal Railroad Association, they will come over and locate here."

Now, who would benefit by the enforced expenditure by the eastern railways of $21,000,000 for terminals in St. Louis? Why, obviously, the real estate men for whom Mr. Gerhart spoke. They figure that if, instead of the Terminal Association being allowed to develop its facilites so that it can economically handle the St. Louis traffic of the eastern roads. it is closely bottled up, the eastern roads will have to come across the river themselves and establish terminals, in which event the *public-spirited* real estate men of St. Louis will be able to sell a great deal more real estate than they could sell to the Terminal Railroad Association alone. That the real estate men might cherish such views is not surprising. That they should have the impudence to publicly avow and widely circulate them is an insult to the intelligence of the people of their city. That shippers should lose rather than gain by the establishment of numerous expensive terminals is obvious. This would increase the cost of hauling traffic in and out of the city, and ultimately the shippers would have to pay in the rates the increased fixed charges and cost of operation resulting.

Other influences that have been potent in preventing the passage of the ordinances have been certain active politicians and sensational newspapers. Denunciation of the Terminal "monopoly" has for some years been their chief stock in trade, and many members of the assembly have been loath to vote for additional franchises for the "monopoly" for fear that they would promptly be marked for slaughter by this class of politicians and newspapers. The more fair and conservative papers of St. Louis have consistently advocated the passage of reasonable ordinances.

CITY MORE INJURED BY DELAY THAN RAILWAYS.

The delay in passing reasonable ordinances is injuring both the Terminal and the trunk line railways. The Terminal's fixed charges on the Ranken tract alone, from whose ownership it as yet has received no benefit whatever, amount to $120,000 a year. But ultimately the restrictions on the improvement and expansion of its properties will hurt the commercial interests of St. Louis more than they do the Terminal or the roads that own and use it. About 75 per cent. of the traffic that moves over its rails is business which both originates at and is destined to points outside of St. Louis. It is having no trouble in handling this traffic. It interchanges over 8,000 freight cars per day for the trunk lines with an average detention of but 1.60 days per car, which includes time consumed by receivers and shippers in unloading and loading cars. It will continue to be able to handle this through traffic satisfactorily, as it has bought 100 acres of land between Madison, Ill., and East St. Louis, where it will build a classification yard with a capacity for 4,500 cars. It is its capacity for handling traffic within, and traffic originating in and destined to, St. Louis whose growth is being cramped. Between 1898 and 1909 the bank clearings of the city increased from $1,700,000,000 to $3,442,000,000. The value of its manufactured products increased from $197,000,000 to $310,000,000. The total tonnage received and forwarded at St. Louis and East St. Louis increased from 23,000,000 to 44,000,000 tons. Meantime the facilities of the Terminal for handling freight to, from and within the city increased but 7 per cent. It is quite obvious that unless work is begun very soon on the improvement and enlargement of its steam tracks and other properties it is going to become incapable of handling satisfactorily the traffic of the St. Louis terminal district.

Unless the statements of fact made in this article and the conclusions drawn from them are entirely erroneous, the shippers of St. Louis have no good ground for complaint about their existing rates. But if they really believe they have, it would seem that the policy of trying to force concessions in rates from the through lines by preventing the development of the Terminal is simply cutting off the city's nose to spite the railways' face. If the rates to and from St. Louis are unfair its shippers can get them made fair by appealing to the Missouri Railway Commission or the Interstate Commerce Commission. The city probably will never get the concessions in rates it demands, and by persisting in making the passage of the Terminal's ordinances conditional on them, it will hamper the development of the Terminal's facilities to an extent that will cause losses to the shippers of the city far in excess of all they would gain if they got all the concessions in rates sought.

MAIN POINTS OF THE NEW RAILWAY LAW.

Section 1 establishes the Commerce Court with jurisdiction over:

First.—Enforcement of Interstate Commerce Commission orders, except for penalties, criminal punishment, or collecting money.

Second.—Annulling or suspending commission's orders.

Third.—Commission's suits to correct illegal practices.

Fourth.—Suits to compel compliance with commission's orders under Secs. 20 and 23.

Five additional circuit judges are to be appointed by the President.

Section 2.—Judgments may be appealed to the Supreme Court, and shall have precedence over all except criminal cases.

Sections 3, 4.—Suits against commission's orders shall be vs. United States, and the court decides whether or not the order is stayed.

Section 5.—Attorney-General has control of suits and may employ special counsel; the commission or anyone interested may intervene.

Section 6.—Carriers must designate an agent in Washington to accept service of notices.

Section 7.—Extends interstate commerce law over telegraph, telephone and cable companies, and enlarges list of railway employees who may receive passes; strengthens various details of law.

Section 8.—Changes the long and short haul clause so as to leave the question of similarity of conditions to be decided by the commission. Six months' delay allowed. Rates reduced to meet water rates cannot be increased without commission's authority.

Section 9.—Authorizes the commission to reject tariffs with defective notices. Penalizes the carrier $500 or $25 a day

for non-compliance with orders. On written request carrier must give written statement of freight rates to any place on its tariffs; penalty for delay or mistake $250. Agent's name must be posted at each freight station.

Section 10 revises penalties for false billing, etc., and penalizes frauds in presenting claims for damage to freight. Section 11 empowers commission to act on its own motion in all matters except ordering payment of money; amplifies and strengthens Sec. 13 of old law.

Section 12 authorizes the commission to suspend new tariffs 120 days from date they would go into effect, and six months beyond (10 months in all) if necessary for inquiry. Carrier must prove reasonableness of any proposed increase. Commission shall not compel through rates with street electric passenger railways; nor compel a road to put a *part* of its line between two points into a through route. Wrongful divulging of information about a shipment is penalized.

Section 13 allows suits to compel a carrier to pay money to be entered in state courts.

Section 14 allows commission to require annual reports Dec. 31 instead of June 30 if it see fit.

Section 16 authorizes the President to appoint a commission to investigate propriety of federal regulation of stock and bond issues.

Section 17 regulates issue of interlocutory injunctions to restrain enforcement of state laws.

Section 18.—Law takes effect August 18 except Sections 12 and 16, which take effect at once.

COMPENSATION AND COMPENSATION ACTS.*

BY FRANK V. WHITING,
Claims Attorney of the New York Central.

It may surprise you to know that in 1838 Prussia changed the burden of proof with respect to its railways, by making the companies liable for all accidents that they could not prove to be due to unavoidable circumstances or to the negligence of the victim. Upon the foundation of the German Empire in 1871 this law was adopted and thence it spread throughout Europe, even to despotic Russia. We have gradually seen the defense of "fellow servant" narrowed, so far as corporations are concerned, and broadened with reference to workmen, until in some states, especially with reference to the hazardous part of the railway business, not a vestige remains. Likewise the defense of "assumed risk" has been partially taken away and we are now testing a federal law which, to a great extent, abolishes the doctrine of contributory negligence.

In some form or other these acts have been passed in twenty-three foreign countries and provinces, consisting of the following: Austria, Belgium, British Columbia, Cape of Good Hope, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Luxemberg, Netherlands, New Zealand, Norway, Quebec, Queensland, Russia, South Australia, Spain, Sweden and Western Australia. These countries have adopted systems more or less in conformity with the idea of changing the basis from that of negligence or fault to that of rightful compensation or insurable risk as an incident of the business.

The general provisions of these laws follow:

With the exception of Austria all countries require employers to provide funds to meet payments for accidental disablements and deaths, although in some, notably Germany and Austria, temporary accident disablement is paid from sickness funds. Compulsory insurance by the employer is required in Austria, Belgium, Finland, Greece, Holland and Norway. Indemnity generally includes medical expenses and a percentage of wages running from 50 per cent. to 70 per cent. for permanent disability, and in many states continuing during disability. Practically all provide for payments for partial disability. Death indemnity is usually fixed as to minimum and maximum amounts and based on from three to five years' wages. Frequently provision is made as to the apportionment of the funds and also for the proper investment thereof. In several countries lump sum settlements are authorized for disposing of permanent disability cases. Employers' liability is usually confined to cases of gross negligence and the employee may elect whether to sue or accept under the compensation laws. Funeral benefits in very small sums—$10 to $20—are provided. In Great Britain ten pounds, payable only when no dependents.

One of the most important features of compensation laws is that of the waiting time. This means the time that elapses between the date of the accident and the time when compensation begins. This time has been fixed commencing as in Holland, Belgium and Spain, and in most instances Great Britain, with the date of the accident, and from three days to thirteen weeks in other countries. In Germany, however, the first thirteen weeks of disability from accident are paid from sickness insurance funds, two-thirds being contributed by workingmen and one-third by employers. In Great Gritain the waiting time has been unfortunately fixed so that while no compensation is given if the time lost does not exceed a week, yet if the disability continues for two weeks or more the compensation dates back to the time of the accident. Obviously, this makes an incentive for some men to remain off longer than necessary, and they, in fact, receive a premium for so doing. It is my opinion that at least ten days to two weeks should be allowed as the waiting time and under no circumstances should payments date back.

The British Workman's Compensation Act provides for payment to workmen generally when injured in the course of their employment due to accident arising therefrom, also covering certain trade diseases. Includes all classes of workmen, covering practically every public relationship of master and servant, except any person employed otherwise than by manual labor whose remuneration exceeds $1,216.63 (£250). No liability if caused by serious and willful misconduct of injured servant, *unless* death or serious and permanent injury results. Option is given to sue under civil liability if due to personal negligence or wilful act of employer or some person for whose act or default the employer is responsible. Court may make allowance under act if suit for damage fails. Medical practitioners, appointed by state, to be medical referees. Compensation is based on average earnings for twelve months in case of injury, and three years' earnings for death.

Death.—Three years' earnings, minimum $729.98, maximum $1,459.95. If no next of kin wholly dependent, amount to be agreed upon. If no dependents, medical and burial expenses not exceeding $48.67.

Injury.—Total or partial incapacity, weekly payment not exceeding 50 per cent. of average weekly earnings, but not over $4.87.

Waiting Time.—No allowance for first week if disability under two weeks, if over this, dates back to the time of accident.

Examination.—Workmen required to submit to an examination from time to time.

Arbitration.—(1) By committee representing employer and employee. (2) By single arbitrator agreed upon, or in the absence of agreement, by the judge of the county court.

Diseases Covered.—Anthrax, lead, mercury, phosphorus and arsenic poisoning, ankylostomasis. (mining.)

The Quebec Compensation Act took effect January 1, 1910, and is radically different in some respects from the English Act. It does not apply to workmen who earn in excess of $1,000 per annum. The 50 per cent. allowance for injury applies only where the earnings do not exceed $600. Excess between $600 and $1,000 is on the basis of 25 per cent. The compensation for death, while fixed at four times the average

*A paper read before the Association of Railway Claim Agents at Chattanooga, May 25.

yearly wages, is not less than $1,000 nor more than $2,000. The important features are:

First.—Payment for permanent or partial incapacity is limited to $2,000. Second.—The Act excludes other legal rights as to those workmen that come within it.

The United States Government passed a compensation act in 1907 for its artisans and laborers, providing for the payment of one year's wages if injured in the course of their employment. In case of death dependents receive same as victim would if merely injured. No payment made if accident is due to negligence or misconduct or if not over 15 days' disability.

Various states have studied and are now studying this question through commissions. The Wright Commission in Massachusetts reported six years ago, and as early as 1902 Maryland enacted an insurance law requiring an indemnity for employees, limited to $1,000 in case of death, exempting employers from further liability. The law was held unconstitutional for the reasons that it limited the amount for death, denied trial by jury, and the right to remedy by the law of the land for injury done. It has also been stated that the act was declared unconstitutional on the ground that it attempted to vest judicial powers in the commissioner of insurance. (The act in its operation and the opinion of the Court of Common Pleas appeared in part in the quarterly Journal of Economies, August, 1902, and February, 1905. articles by George E. Barnett.)

In 1907 the Industrial Insurance Commission in Illinois recommended an accident insurance law along the lines of the English Compensation Act. Essential features reported by the Illinois Commission contained provisions permitting the employer to contribute an amount which he would probably have to pay under the law of negligence, releasing him from liability for damage suits, and then distributing the money on the insurance principle, the employee being encouraged to carry as much additional insurance as he could. This law was proposed in the New York Legislature as early as 1898.

The Montana Mining Act tries to put in force the examples of European experience. (Ch. 67, Laws of 1909, page 81.) It creates a state accident fund applying to workmen in and about mines, etc. It taxes employers one cent per ton on coal mined and shipped and employees 1 per cent. of gross monthly earnings. Funds so accumulated are to be invested by the state audtor, who is to pay to dependents (not foreigners) of each employee killed the sum of $3,000. Miners permanently disabled receive a dollar per day. Loss of limb or eye is to be paid $1,000 in addition. Acceptance of these benefits bars all right of action against employers who have paid the tax. Special attention is called to the fact that this act provides for contribution between the employer and employee, but it does not cover injuries of a temporary nature. It is the first state law in this country where the liability to pay is based on the hazard of the particular employment.

Minnesota, Wisconsin and New York, with one or two other states, are now studying the question.

A commission in New York has recently made its first report and as a result there are now pending in the New York Legislature two compensation bills, one a compulsory compensation act, applying to hazardous occupations, such as the erection or demolition of bridges and buildings, working on scaffoldings, electrical work, blasting and the operation and maintenance of railways. (The New York Commission in its report states that this law is not applicable to railway employees engaged in interstate commerce, for whom Congress has already legislated.) Under this act the employee may elect after injury whether to take the compensation or to bring an action at law to recover damages in the regular way. The other is an amendment to the Employers' Liability Act, enhancing the liability of the employer and providing a permissive scheme of compensation which allows the employer and employee to contract in favor of compensation exclusively. The compensation feature of this law is denied to railway companies. (This bill passed the legislature this month.)*

These acts provide for the payment in case of death of 1,200 times the daily wage, but in no case to exceed $3,000, and for injury an allowance of 50 per cent. of time lost for a period of not more than eight years. The compulsory act requires payment for personal injury by accident arising out of and in the course of the employment or one inherent in the nature thereof, or on account of the failure of an employer or any of his employees to exercise due care or to comply with any law affecting such employment. Waiting time fixed at two weeks. No allowance if injured workman is guilty of serious and wilful misconduct. The permissive scheme in the Employers' Liability Law, if accepted, provides for payment under the same conditions.

There was another act recently introduced into the New York Legislature requiring employers to insure employees in an amount not exceeding $20,000, and I doubt if the author knew what was meant.

There is a bill pending in Congress known as the Sabbath bill, which, in my opinion, would bankrupt most of the railways in this country if it became a law. Based on 73 death cases which occurred in the first nine months of 1909 we estimated that under the Sabbath bill it would eventually cost $1,652,419 to dispose of these cases. Taking the same cases as a basis we estimate that under the Compensation Acts in New York the increased average cost for deaths would be more than 200 per cent. This would mean on a death rate of 200 if all employees were brought within the Compensation Acts an increase annually of payments for deaths only of about $400,000.

I mention the above just to show the danger that lies in hasty legislation and in the proposal of laws by persons who are not thoroughly conversant with the subject. It is immaterial to me to what extent they study compensation laws, economic questions, etc.; they must get over on our side of the fence and know something about the number of accidents and the financial liability that corporations would be placed under before they can draft intelligent laws. The objection is not so much to the principle of compensation as the extremities to which we may be forced through lack of understanding by our legislators and the insistent demands of labor. When acts are drawn and proposed, investigation ceases. It is only when something definite is proposed that the results that will naturally follow can be ascertained and investigation should continue. The danger of a large increased expense lies in the amount that may be fixed for death and the length of time for which compensation is payable for permanent injuries which wholly or partially impair the earning capacity.

The demand for this sort of legislation is greater than you think. There is strong current of public opinion in favor of it and I question whether employers generally would be opposed to such legislation if it were reasonable. Two great corporations have voluntarily adopted systems of compensation recently. Many companies practice compensation in a more or less systematic way. In fact, my investigation leads me to say that as a rule, with the exception of the so-called non-liability, serious injury and death cases, railway employees are as well protected and provided for as they would be under any reasonable compulsory scheme of compensation.

There are several important features which have not been given proper consideration and attention in the various compensation laws that have been passed:

1. I can see no reason from an economic or other standpoint why compensation should be given the next of kin for any period of time beyond the expectancy of life of the deced-

*The amended Employers' Liability Act has become a law and the compulsory bill has passed the legislature and is now in the hands of the Governor.

ent. In other words, the maximum amount payable for death should be decreased by a fixed annual percentage with the increased age of the decedent.

2. It seems to me that compensation to a certain extent should be based upon the number and age of the next of kin, i.e., greater compensation should be paid where deceased leaves a widow and several children than where he leaves but a widow. This can be accomplished by increasing the maximum rate on a percentage basis for each child.

3. Definite lump sum payments should be provided in case of certain permanent injuries.

4. All payments should, when possible, be based on previous average earnings and not daily rates.

5. We should follow the advice of economic writers to the effect that when compensation is provided rights to recover damages should be eliminated.

Are we not in this country rapidly drawing to the point where compensation, or rather damages, will have to be paid for all injuries caused in the industrial and transportation fields through negligence? In other words, must we not concede that the defenses of "fellow servant," "assumed risk" and "contributory negligence" are not only rapidly but lawfully being swept away? This being true, it is but a short step across the line to the point where all accidents shall be compensated, even where there is no fault on the part of the employer or his employees. * * * Employers of labor, and especially railway companies, pay out large sums annually for damages on account of accidents to employees. A certain percentage of this money is waste. Some economic writers place this as high as 50 per cent.—but it is a great deal less. The problem seems to be whether the money that now goes to waste in the shape of court expenses, lawyers' fees, etc., can be conserved and paid direct to the injured. Whether the cost for compensation can be fixed so that there will be little or no increase in the expense to employers.

After all it is not wholly a question of expense. The laborer is not only worthy of his hire, he has the right to look for the redress of his wrongs. Lord Asquith says: "The blood of the workmen is a part of the cost of the product." Then why not count it as such? We repair or replace broken or worn out machinery. Why should we not, in part at least, alleviate the distress, the suffering and the want of those who toil for the good of society by requiring that society to bear its fair share of the burden which unfortunately its needs create.

TONNAGE RATING FOR FAST FREIGHT TRAINS.

BY J. G. VAN ZANDT, C.E.

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II.

In a previous article* the writer presented a method for adjusting tonnage and speed ratings of freight trains with examples. It is here proposed to explain in detail the computations and present the data on which this method was based.

The general plan adopted was to determine the theoretical tonnage rating for several selected types of locomotives at present in use. In the determination of the rating, the factors influencing the power of the locomotive were taken as far as possible from actual tests, checked by further data from experiments made upon other types. The results of experiment rather than empirical formulas were used, the investigation resolving itself primarily into the following general divisions:

I Locomotives.
- (a) Selection of types.
- (b) Steam.
- (c) Tractive power.

II Train Resistance.

III Tonnage Rating.

IV Operation.
- (a) Speed-distance computation.
- (b) Speed-time computation.

V Application.
- (a) Profile.
- (b) Theoretical running time.
- (c) Time tonnage curves.

Railway Age Gazette, June 17, 1910, page 1547.

I. LOCOMOTIVES.

(*a*) *Selection of types.*—Of the many locomotives at present in use on the railways of this country, the majority may be

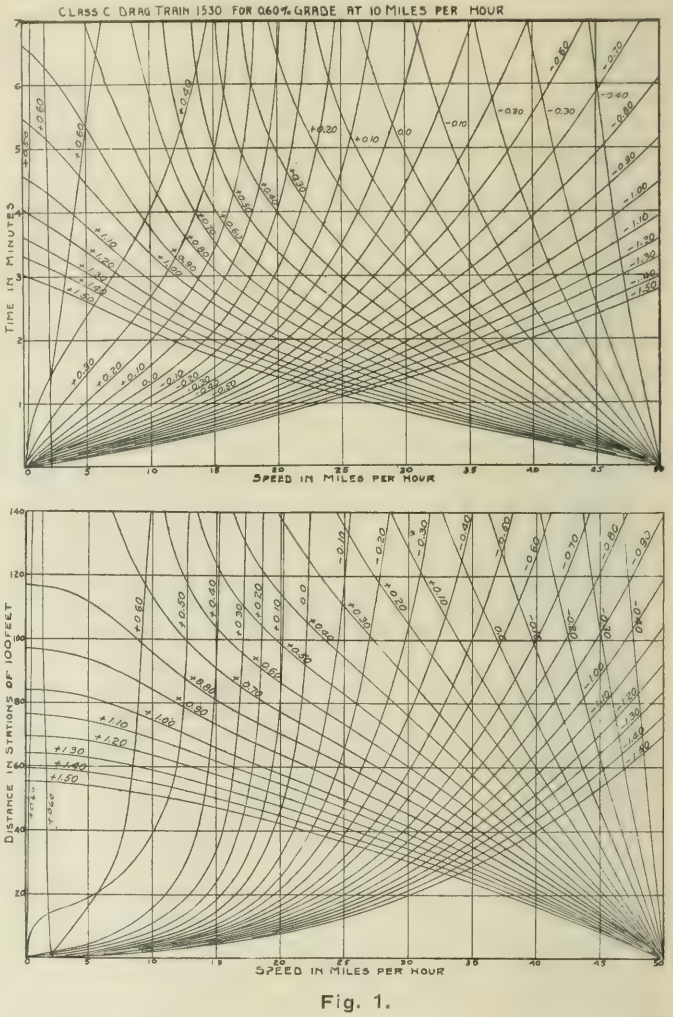


Fig. 1.

classed under the three following general types, details of steam capacity being given in Table I, herewith:

2-6-0 (A) 8-wheel mogul.
2-8-0 (B) Consolidation.
4-6-0 (C) 10-wheeler.

(*b*) *Steam.*—After a careful investigation, both by tests and from records of other authorities and from theoretical computations, the following speeds were adopted as affecting the question of steam consumption and its economy:

Class "A" 9.6 m.p.h.
" "B" 11.72 m.p.h.
" "C" 10.41 m.p.h.

The curve of mean effective pressure for speeds above this point of maximum boiler capacity is dependent on the ability of the boiler and the design of the connections with the cylinders. The results of the tests made by the Baldwin Locomotive Works upon new engines would be expected to come above those of average working conditions and the plotted curve appears to follow the curves thus derived, in a parallel line about 5 per cent. above them. The results of

Wellington's experiments* give values which, when worked up on the same basis of comparison, lie almost coincident with the curves above derived. The curve adopted by the Master Mechanics' Association is an exceptionally satisfactory check upon these results, especially since the curve represents the result of extended research with average conditions.

The heavier types show a slightly higher efficiency in percentage of available boiler pressure, though there seems to be a remarkably close agreement throughout. There is, however, a crossing of the curve at 25 miles per hour, showing that the heavier engines are not capable of as high efficiency at higher speeds. This would become even more apparent if passenger locomotives were used in the comparison, since it is desirable that greater power be available at higher speeds in those designs. In general it would develop that the heavier the locomotive the steeper the slope of the mean effective pressure line, since it is necessary that the greatest efficiency should be developed at slower speeds.

(c) *Tractive power.*—The measure of the ability of a locomotive is not so much the individual factors which have been discussed, but the final available tractive power which the engine, influenced in certain ways and under varying conditions of those factors, is capable of exerting in moving cars. Many methods of interest and value have been suggested and used for the expression of this force, the two following being the most prominent:

1. Tractive effort in pounds at rail.
2. Drawbar pull in pounds back of tender.

During the operation of a train we must assume that we

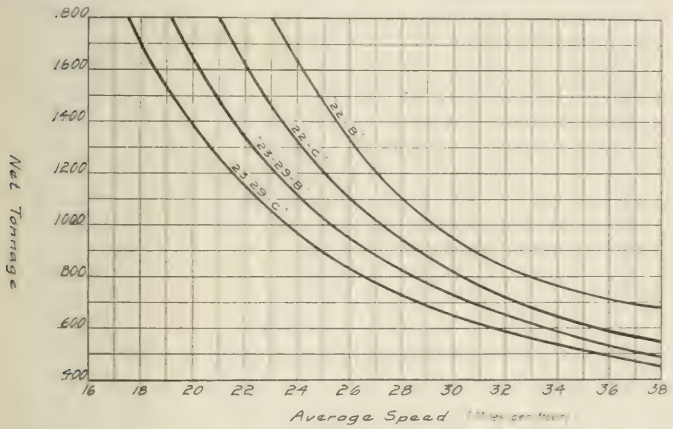


Fig. 2.

are operating with a force only at the pulling of the drawbar of the first car at all times, the amount of that pull to be determined by the tractive force at the rail, less the resistances between that point and the drawbar. As a matter of fact, there is often found to be a drawbar push and at times a pull, much in excess of that obtainable at the drivers. This is due to the momentum of the locomotive, which is by no means a negligible factor. The kinetic energy stored up in the moving engine and tender is a matter of considerable influence in the momentum runs. Further, the energy of the rotating drivers is much greater than that of any other wheels in the train and would materially assist in the increase of this part of the total. Many have overlooked, or not considered this very factor, but in many instances it has been shown to be of importance and hence, in order to secure accuracy of even reasonable amount, it should be included.

For the three types of locomotives selected the available force was plotted, the latest and best of standard formulas being used for the tractive force, resistance of machinery internal in the engine and the internal friction as given by Henderson. The questions considered are shown in Table II. The values of the constants are also stated and the process is indicated. A comparison of results is readily made and many points of interest appear. It is evident that the value of the tractive force, using the formula proposed by Dr. Goss for internal friction, gives the highest results though checking very well above 15 m.p.h. The use of the "St. Louis Constants" gives higher values at low and lower at high speeds. The two formulas of Henderson run nearly together, crossing at about the place where the St. Louis line crosses them both. The theoretical line of the hyperbola, based on higher mean effective pressure curves, represents a slightly lower value at low speeds and somewhat higher for higher speeds up to 50 m.p.h., where it again reaches the lower lines. It checks reasonably well, however, the lower values which seem to lie nearly together and if based upon average conditions at higher speeds would probably lie close all the way. The average of the curves, based upon tests upon these engines, is taken as representing fairly well operation under ordinary conditions.

The explanation of the letters used in Table II is as follows:

M. P. H. = miles per hour.
M. E. P. = mean effective pressure.
T. F. = tractive force.
B. P. = boiler pressure.
R_1 = the internal resistance from formula of Dr. Goss.
R_2 = O.
R_3 = internal resistance as taken from Henderson's formula.
R_4 = resistance of the machinery internal in the engine as determined by the St. Louis tests.
P_1 = M. E. P. from tests made.
P_2 = M. E. P. from tests made, less 8.5 per cent. for friction as recommended by Henderson.
P_3 = available force, taken from Henderson.
D = diameter of drivers.
d = diameter of cylinders.
s = stroke.
$C_1 = \frac{d^2 s}{D}$, a constant for each locomotive.
C_2 = tangential factor with P_3.

II. TRAIN RESISTANCE.

If the amount of resistance caused by a car in rolling along the track were well known and a formula of unquestionable accuracy, well checked and accepted, were available, it would be a simple matter to determine the tonnage rating of any locomotive from the tractive power. Unfortunately there is very little agreement among authorities and less among experimenters in regard to the exact value of this important factor. One thing alone is definite and that is the general inclination of the curves, giving an increased value for higher speeds. When the values obtained from tests actually cover a diagram, it is evident that there must be other items influencing the variation, other than the speed, and in order to determine what these items are and how much they influence the values, a careful analysis must be made. The factors which go to make up the resistance of cars in a moving train are many and difficult of determination. In general they may be classified as follows:

1. Acceleration.
2. Grade.
3. Friction; divided as follows:
   (a) Journal friction.
   (b) Rolling "
   (c) Flange "
   (d) Air "

There is such an accumulation of data upon each of the several items above mentioned and careful investigations differ so widely in their conclusions, it is evident that one would not be justified in making extended investigations for minute discriminations. Each factor was therefore investigated in so far as that investigation promised to be fruitful of information of value.

(1.) *Acceleration.*—The figures given by Wellington were

*"Economic Theory of Railway Location." A. M. Wellington.

adopted in the computations as an average representing a fairly well selected value for ordinary conditions.

(2.) *Grade.*—Grade resistance in pounds per ton is equal to 20 times the rate of grade in percentage, this being an accepted rule credited to Wellington.

(3.) *Friction.*—(a) Journal friction depends upon the design of the journals and lubrication, and varies with the number of journals and the pressure upon them. Speed does not materially affect this factor after it reaches that value at which a continuous film of oil is kept running between the surfaces in contact.

3 (b.) Rolling friction is the friction caused by the wheels in contact with the rail as if there were no flanges. It is generally conceded to be due to a peculiar wave in front of the rail just in front of the wheel, which depresses the track with its weight and therefore would vary as the weight upon the wheels and the condition of the roadbed. The size and shape of the rail and the size of the wheel would also affect this factor, together with other minor influences such as line, surface, snow and dirt.

3 (c.) The term "flange friction" denotes all other resistances between the wheel and the rail not included in the rolling resistances. On level tangent this factor is largely dependent on design of the rail and flanges.

3 (d) Air friction. Besides increasing the flange resistance (as when a wind is blowing against the side of a train) the friction of the air against the sides and suction at the back of the cars would increase the total resistance somewhat.

For miscellaneous factors seemingly impossible of determination the term "oscillation and concussion" is used. The hundred or more train resistance formulas may be arranged into four general forms, all of which deal only with frictional resistances, constants being used for journal friction and for the remaining resistance; sometimes exclusive of wind friction which is given as a separate factor varying as the square of the speed. A very few formulas take into consideration the size of the train, but even these do not mention the size of car-bodies and wheels, or the number of wheels to the car.

That these items might reasonably be expected to influence the resistance is evident from the way in which rolling stock has been changing, in weight and other dimensions, during the years producing train resistance formulas. The practice of simply plotting the train resistance values against the speed, as if that was the only factor influencing the variation, is unreasonable in light of these other changing factors. To determine the proportion of the variation of the train resistance, due solely to changing speed, a coefficient of correlation of the two variations could be made and a mathematical determination of the reasonableness of the practice referred to, computed. For this purpose results from dynanometer tests taken upon test trains of uniform size and conditions of design have been obtained and complete information made available. The speed as a factor in the variation of the train resistance was shown to influence only about 45 per cent. of that variation.

Among other factors doubtless an important influence would be made by the varying weight of the trains and the number of wheels carrying the weight. To determine the amount of this influence a number of test records made at or near the speed of 10 miles per hour were selected and studied. The values obtained were then correlated with the corresponding values of the weight of the train divided by the number of wheels carrying the load, the results proving that for these tests of especially uniform character the correlation was 96 per cent. For heterogeneous conditions the increasing number of other factors would reduce this figure correspondingly, but the fact is apparent that of the 55 per cent. remaining influence in the variation, the weight upon the "wheel units" is an important factor. It is obvious that all those factors which are derived from the contact of the rail with the wheels will vary with the number of wheels. From a study of all that has been done to determine this factor it may be stated, that, generally speaking, the journal friction will vary directly as the number of wheels.

There is evidence that the rolling resistance in pounds per ton is not increased when a truck contains six wheels instead of four. The rolling resistance caused by the elastic wave in front of the wheels is materially less for two trucks of six than for trucks of three or four wheels each, since the wave made by the first wheel affects the second only slightly and hence two instead of three waves will be made. The rolling resistance would reasonably vary inversely as the number of wheels in the truck.

Under normal conditions on a straight level track flange friction is no doubt much less in two six-wheel trucks, since the alinement and rigidity favor reduced friction. The same might be said of oscillation, concussion and other miscellaneous friction factors. On curves the resistance will also be much less, for the number of flanges cutting the rail will be less. Taking a general view of the matter it may be stated that rail resistances vary in pounds per ton, inversely as the number of wheels carrying the load.

Applying these two principles in a preliminary way to two of the most famous and well established formulas for train resistance, a reconciliation is found that shows both may be right. They were both derived from experiments made on good track, under practically the same circumstances, and while ranges of speed were not wide, they have been extended experimentally and substantially checked throughout. It has been stated that there were 5,000 experiments made from which the present "Baldwin Locomotive" formula was derived, the records unfortunately not having been preserved. These experiments, however, were made on 12-wheel high speed passenger cars. The formula is usually written as follows:

$$R = 3 + \frac{V}{6}$$

Adjusting this for 8-wheel freight cars, the first factor is reduced by the ratio of 12 to 8 and the second increased by the same ratio, hence it becomes,

$$R = 2 + \frac{V}{4}$$

which is the celebrated *Engineering News* formula.

The numerous charges that these formulas are based upon figures derived from tests on track, "some of which are the best in the world" and do not represent ordinary practice, have not been justified in the light of later experiments. In fact, later formulas give even lower values and the evidence that these are too low grows less as improved rolling stock and better road conditions are more common. The older the formula, generally speaking, the higher the values obtained by its use.

Considering this practical reconciliation the "wheel unit" of the type of freight car in use would present a practical basis. A number of references have been made to the importance of this wheel unit, Mr. Delano stating that, "the number of wheels and the length of the train are important factors," in train resistance. It might be possible to reduce all present formulae, as in the above case, to the freight car unit, or even to the basis of the number of wheels and the weight on them. It is safer, however, to use the data from which these formulae were derived, with this basis for a closer comparison than to take the mean adopted by the observer or the computer.

A correction must be made for "empties." What shall it be? The term "loaded" is only comparatively indicative of the weight of a car. A number of points enter in because of the relative weights of cars and of empty and loaded cars of early days, as compared with modern cars. It has been contended that the grade over which the empties were pulled should enter as a factor in the allowance, also the speed and the location in the train. Upon the "wheel unit" basis it is evident that the foregoing factors are all taken care of and

allowance of unknown quantity will not be necessary in such cases.

Extreme conditions, such as excessively long, heavy trains, or very light, short trains, will inevitably lead to different results, as the factors of oscillation and concussion and the averaging effect of long trains, as well as the effect of locomotive momentum and resistance, greatly increase or diminish as the size of the train changes. It is a lamentable fact that there is little reliable data regarding the resistance of trains in starting. Wellington's "starting curve" seems to have been well checked in some experiments, but is shown to be considerably off in many others. The conditions surrounding the experiments would probably account for the widest differences.

If the several factors above itemized be added together for average conditions, the result will be a justification of previous experiments or formulae falling within that range. To make a complete comparison of train resistance formulas would require a volume in itself, but sufficient evidence has been produced, it is thought, to justify the adoption of the derived values. As a general average for heavy freight trains it may be said that the *Engineering News* formula gives results very close to representing the actual resistance. The conclusion reached by the Committee of Economic Railway Location of the American Railway Engineering and Maintenance of Way Association, is, that the resistance should be determined for each road by tests, on account of the many variable factors.

The locomotive resistance, after the internal friction is deducted, will be found less in pounds per ton than that of the cars. This is due to the increased size of the wheels and decreased number in proportion to the weight. The majority of tests of locomotive friction have been made with steam shut off and coasting, which condition involves numerous internal forces of resistance. Upon deducting the amount of internal friction from the total thus found, it will appear that there is less "train resistance" in the locomotive than is usually allowed. Wickhorst states that the resistance of a locomotive "is equal to that of an empty car." This includes the internal friction, however, and is deduced from coasting tests. Deducting the internal friction, the curve resulting is found below the average of train resistance. If the "internal friction" is provided for in the computation of tractive force, it should not be included in the train resistance.

In the light of the foregoing the subject of the allowance for empty cars becomes simple and in general the conditions will give about 20 per cent. higher value for empty cars. This result appears to agree well with the results of numerous tests and conclusions from other investigations. The allowance is generally made, however, in the final rating and in this case would require simply that the rating given or remaining should be reduced one-fifth to allow for increased resistance of empty cars. The Santa Fe, as shown in its tonnage booklet, allows about 14 per cent. for very heavy trains. The C., B & Q. uses 23 per cent., which is the same as that employed on the Montana division of the Northern Pacific. From an investigation made by the American Railway Master Mechanics Association it was found that two roads use 25 per cent., several 20 per cent., three 10 per cent. and one eight per cent. for empty cars. Mr. Haas, in the *Railroad Gazette*, Vol. 27, 1895, p. 129, presents a method for determining this reduction by experiment and in his illustration gives a deduction of about 24 per cent. The difficulties lie in the difference in weights of cars and condition of track. The rotative energy, moreover, of the wheels in the train of empties is 4 or 5 per cent. higher for loads, owing to the increased number of wheels. This would probably reduce the higher values and give an average about that here adopted.

III. TONNAGE RATING.

The amount of the resistance in pounds per ton divided into the tractive force gives the tonnage a given locomotive will be able to haul. The determination depends upon the ruling grade on the division and the constant speed adopted as a minimum over grades. Usually this is taken as 10 miles per hour on the "drag grade," but for the purpose of this investigation the drag tonnage for all grades and speeds, from the lowest to the highest in ordinary use, were computed.

Since the tonnage rating depends upon those factors adopted and already discussed, it is evident that any comparison with other ratings depends entirely on the compensating influence of some high values for other lower ones. Some investigators might use a high value of m.e.p. and a corresponding high resistance or a low journal resistance and a compensating higher speed resistance factor. Sufficient evidence has been found, from a comparison of work done by investigators in the subject of locomotive rating, that the rating of the computation represents a fair average for locomotives of the types selected and a foundation is laid for the final adjustment of this rating for increased time.

IV. OPERATION.

(*a*) *Speed Rating.*—In the adjustment of the tonnage for increase of time many suggestions have been made, based, for the most part, on the experience of train dispatchers or operating officers. These adjustments, however, vary widely in amount and in manner of application.

In a discussion of locomotive rating before the Western Railway Club, Mr. Crawford gave a system for dividing the rating into four classes of A, B, C and D, the total difference being that in percentage of the "A" class, which was given a value of 100. This then gave B = 92.5; C = 85, and D = 70. These he states are used as follows:

Temperature above 40° × A
40° to 20° × B
20° to 10° × C
Below 10° × D

Mr. Crawford explains further that "these percentages are founded on data obtained on one of the divisions, the ratings being based on speed instead of grade." When asked as to the increase of speed due to momentum he states that, "the speed would be materially increased over the grades only, consequently the total reduction of time would depend on the number and rates of grades."

It is evident, however, that up to the point of maximum allowable speed, any reduction of tonnage would affect a corresponding reduction of time on any grade or level track and hence, while the greatest salvage may be made on the heaviest grades, it cannot be considered that there is no increase over the level portions. It appears necessary, therefore, that the actual running time for trains of different tonnage should be taken as a basis for this determination, and hence the method to be employed is as follows:

(a) The operation of the trains of tonnage for ruling grades, up to about 0.6 per cent. for all speeds from 10 to 35 miles per hour as above found, were analyzed and the running time for a given profile determined.

(b) Given the running time for trains of different tonnage by the construction of a curve, and, by interpolation, the tonnage for selected intervals of time saved was found.

(*b*) *Speed-time computations.*—The numerous systems of computation suggested and used for the operation of trains over profiles are for the purpose of converting the speed into "velocity head" or, as proposed by Wellington, "potential lift," and from the difference of head at different speeds the remaining items are computed.

The velocity head, or distance a body would fall to acquire a certain speed, is found to be independent of the weight. Expressed in units of head and feet and speed in miles per hour, according to Wellington, it is,

$$h = 0.033445\ V_2$$

and adding 6.14 per cent. for rotation of wheels, axles, etc.,

$$h = 0.0355\ V_2$$

This being worked out is given in Table II; the difference for increments of two miles per hour being also tabulated for convenience of further work.

A given variation of velocity head will require a proportional accelerating force. Expressed in pounds per ton.

$$\frac{P}{2{,}000} = \frac{h_2 - h_1}{S}, \text{ or}$$

$$S = \frac{2{,}000}{P}(h_2 - h_1)$$

The distance then, in which this acceleration would be accomplished, could be found by substitution in the above formula, but for convenience the force will be expressed in "equivalent grade," and the distance in stations of 100 ft. Since the force of gravity is equal to 20 times the rate of grade, the "equivalent grade" × 20 should be substituted for P, and 100 × S for S, in the above formula, giving then

$$S = \frac{h_2 - h_1}{E.\ G.}$$

or, the distance in stations required for any acceleration is equal to the difference of velocity head divided by the equivalent grade. The time which will be consumed in this distance will be found at once by dividing the distance just found by the speed in stations per minute. This last item of speed is tabulated in column 3 of the computation table, together with the train resistance and the tractive force taken from the results of the above investigations.

Referring to Table III, the following steps are taken to compute the operation on grades and at various speeds up to 50 miles per hour:

Column 1 and column 2 give the speeds in miles per hour, while column 3 gives the speeds in stations of 100-ft. per minute, corresponding to the odd values in column 3.

Column 4 is the tractive power of the engine for the speeds shown, taken as an average as above indicated, and column 5 the same in pounds per ton.

Column 7 is the train resistance in pounds per ton and column 6 the algebraic difference between columns 5 and 7. This difference gives the "net force" which is available for acceleration over and above that necessary for the resistances included in column 7.

The equivalent grade is found by dividing column 7 by 20. This is recorded in column 85 and will be plus or minus, as the net force is negative or positive.

The algebraic sum of this series of values and the actual grades given at the head of the 30 columns on each side of column 85, will give the new equivalent grade for each of these actual grades and is accordingly placed in the columns with the heading "Equivalent Grade."

The difference of "Velocity Head" is given in column 9 and it follows from the formula derived, that if this be divided by the equivalent grade, the corresponding distance in stations is at once obtained. This is recorded in the columns having the heading "Partial Stations" and represents the distance required for that change of speed.

When the values of these partial distances are divided by the speed in column 3 the corresponding time is obtained. This is recorded in the columns marked "Partial Time" and the values represent the time required by the train to run those distances at those speeds.

These partial quantities are next added together, accumulating from the top if the speed is accelerating, or from the bottom of the column when the "Equivalent Grade" is plus, which indicates the condition of retardation.

For all "Drag Trains" considered tables of this kind have been made, but are not shown here because of their size. It is evident that the operation has been worked out for changes of speed of two miles per hour with the assumption that the speed for that slight increment is practically constant in its increase or decrease, which is very nearly true in most cases. If the computation were based on intervals of one mile per hour the differences in the result would be very slight and the quantity of work would be doubled. The results are plotted diagrammatically in each case, as shown in Fig. 1, the diagrams being constructed with the speed in miles per hour against the distance in stations and also to the same scale, the speed against the time in minutes.

Diagrams thus derived show in an interesting way the acceleration and retardation of trains of tonnage varying from very light to very heavy for all grades from + 1.5 per cent. to—1.5 per cent. and all speeds up to 50 miles per hour, and for all three classes of locomotives. A convenient arrangement of the curves is seen in the placing of the "Time-Speed" series over the "Distance-Speed" series corresponding, the increments of speed being easily spaced off and the corresponding features readily found.

V APPLICATION.

(*a*) *Profile.*—In order to determine the saving of time due to reduction of tonnage the second division of the Wisconsin Central from Fond du Lac to Abbottsford, Wis., was taken as representing a typical Wisconsin railway with considerable stretches of level track and numerous hills and momentum runs. These latter are especially interesting in an investigation of this kind, since the entire range of the computations may be used. The curves are compensated for at 0.05 per degree and hence the only additional computation necessary is the adjustment of the actual profile for the curves. With these adjustments made and tabulated the theoretical running time may readily be computed for any train.

(*b*) *Theoretical Running Time.*—Given any locomotive with drag train selected, the operation over a profile is at once derived by applying the data at hand. As the train starts from rest and proceeds the given number of stations on the first grade, the corresponding speed is obtained from the diagram and carrying this speed up to the curve of the same grade in the time diagram the required number of minutes is found. This is placed in a column prepared for it and the next increment is found in a similar manner, only the last speed just found is used as the initial speed in this instance and the time increment between the two speeds is recorded. In case the grade is the ruling one and the speed assumes a constant value the time consumed is easily computed from the value in column 3 of the computing table.

In this way all the trains are run in both directions over the entire profile and the theoretical running time is found for operation in both directions. Care is taken to see that the stops are made at all points requiring such and that the speed does not exceed the limit of safe operation. These increments are finally added together and the totals recorded at the ends of the columns.

TABLE 1.—*Steam Capacity.*

Items	Class A.	Class B.	Class C.
(1) Heating surface	1,642.90	2,601.00	2,492.00
(2) Evap'rat'n per sq.ft. pr hr	12.5	17.00	14.00
(3) Tot'l lbs. pr hr [(1)x(2)]	20,540	44,250	34,900
(4) Cu. ft. per lb. at 212° F..	26.60	26.60	26.60
(5) Cu.ft. per hr. [(3)x(4)] .	546,000	1,176.000	928,000
(6) Boiler pres. lbs. per sq.in.	145	200	200
(7) Cu.ft. steam at boiler pressure [14.7÷B. P. x (5)]	55,300	86,400	68,200
(8) Cu.ft. per lb. at B. P....	3,107 00	2,294.00	2,294.00
(9) Cu. ft. evaporat'n at B. P. [(7) ÷ (8)]	17,800	37,650	29,700
(10) Pressure at cylinders....	122.5	169.2	169.2
(11) Cu. ft. per lb. at C. P....	3,641	2,690	2,690
(12) Cu.ft. per hr.[(9) x (11)]	64,800	101,400	80,100
(13) Evap. per sq. ft. heating surface per hr. at B. P. [(9) ÷ (1)]	10.88	14.48	11.95
(14) Cu. ft. pr min.[(12)÷60]	1,080.00	1,690.00	1,335.00
(15) Cu.ft. volume of cylinders per revolution	17.08	21.00	19.10
(16) Revolutions per min.....	63.3	80.5	69.9
(17) Factor of reduction.....	.5335	.5897	.5897
(18) Miles pr hr [(16)÷(17)]	11.85	13.65	11.88

(*c*) *Time-Tonnage Curves.*—Having now found the variation of time for corresponding variation of tonnage the desired result is obtained. The effect on the average speed is shown in Fig. 2. From this diagram (Fig. 2) by interpolation any necessary deduction of tonnage may be found at once for a corresponding desired saving of time.

TABLE 2. TABLE OF TRACTIVE FORCES FOR CLASS "C" LOCOMOTIVE.

Constants: C_1, 165.0; C_2, 164.2; B. P., 200 lbs. sq. ft.; R_1, 627 lbs.; R_1, 1,500 lbs.

Speed.	MEP. B.	HYP. O.	P_1 B x B. P.	P_2 P. x .915.	P_3 O. x B.P.	R_3. $P_1C_1xH.R_3$.	P_1C_1- R (T. F.)$_1$.	P_2C_1 - O (T. F.)$_2$.	P_1C_1 - R_3. (T. F.)$_3$.	P_1C_1 - R_1. (T. F.)$_4$.	P_3C_2 - O (T. F.)$_5$.
0 miles per hr.	88.8	81.2	177.6	162.6	162.4	2,345	28,683	26,880	26,965	27,810	26,710
5 " " "	86.8	79.5	173.6	159.0	159.0	2,365	28,043	26,270	26,305	27,170	26,130
10 " " "	81.2	78.0	162.4	148.8	156.0	2,380	26,173	24,720	24,420	25,300	35,650
15 " " "	66.0	69.5	132.0	120.8	138.0	1,908	21,173	19,950	19,892	20,300	22,680
20 " " "	45.5	52.2	91.0	83.2	104.4	1,350	14,383	13,730	13,660	13,510	17,170
25 " " "	35.6	41.7	71.2	65.2	83.4	1,086	11,123	10,760	10,664	10,250	13,700
30 " " "	30.6	34.8	61.2	56.0	69.6	957	9,473	9,230	9,143	8,600	11,420
35 " " "	27.9	29.8	55.8	51.1	59.6	897	8,583	8,420	8,313	7,710	9,780
40 " " "	26.0	26.1	52.0	47.6	52.2	857	7,953	7,850	7,722	7,080	8,560
45 " " "	24.9	23.2	49.8	45.6	46.4	843	7,603	7,520	7,387	6,730	7,620
50 " " "	34.0	20.9	48.0	43.9	41.8	832	7,293	7,250	7,088	6,420	6,870
55 " " "	23.6	19.0	47.2	43.2	38.0	837	7,153	7,120	6,943	6,280	6,240
60 " " "	23.2	17.4	46.4	42.5	34.8	842	7,033	7,020	6,814	6,160	5,720

TABLE 3. CLASS A, DRAG TRAIN 792, FOR .60 PER CENT. GRADE AT SPEED OF 15 MILES PER HOUR.

Speed, mean.			Tractive power			Train resistance,	Velocity head.		1.50 per cent.				-0.0 per cent.				+ 1.50 per cent.				
									Equiv.	Distance		Time	Equiv.	Distance		Time	Equiv.	Distance		Time	
Miles per hr.	Miles per hr.	100 ft. Sta. per min.	Tractive power, lbs.	Lbs. per ton.	Net F. lbs., ton.	lbs., per ton.	Total, ft.	Diff., ft.	grade, per cent.	Partial Sta.	Total, Sta.	Partial min.	Total, min.	grade, per ct.	Part'l Sta.	Total Sta.	Part'l min.	Total min.	grade, per ct.	Part'l Sta.	Total Sta.	Part'l min.	Total min.
0	..	.....	.....	.....	.....	.....	0.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	63.50	.....	3.95
..	1	0.88	20,000 lbs.	25.3	17.3	8.0	.....	0.14	2.36	0.06	.....	0.07	.....	0.86	0.16	.....	0.18	.....	+ 0.64	0.22	.....	0.25	.....
2	..	.....	.....	.....	.....	.....	0.14	.....	.....	.....	0.06	.....	0.07	.....	.....	0.16	.....	0.18	.....	.....	63.28	.....	3.70
..	3	2.64	19,900 "	25.1	19.9	5.2	.....	0.43	2.49	0.17	.....	0.06	.....	0.99	0.43	.....	0.16	.....	0.51	- 0.84	.....	0.32	.....
4	..	.....	.....	.....	.....	.....	0.57	.....	.....	.....	0.23	.....	0.13	.....	.....	0.59	.....	0.34	.....	.....	62.44	.....	3.38
..	5	4.40	19,500 "	24.6	20.0	4.6	.....	0.71	2.50	0.28	.....	0.06	.....	1.00	0.71	.....	0.16	.....	+ 0.50	—1.42	.....	0.32	.....
6	..	.....	.....	.....	.....	.....	1.28	.....	.....	.....	0.51	.....	0.19	.....	.....	1.30	.....	0.50	.....	.....	61.02	.....	3.06
..	7	6.16	19,200 "	24.3	19.8	4.5	.....	0.99	—2.49	0.40	.....	0.06	.....	0.99	1.00	.....	0.16	.....	+ 0.51	—1.94	.....	0.32	.....
8	..	.....	.....	.....	.....	.....	2.27	.....	.....	.....	0.91	.....	0.25	.....	.....	2.30	.....	0.66	.....	.....	59.08	.....	2.74
..	9	7.92	18,500 "	23.4	18.8	4.6	.....	1.28	—2.44	0.52	.....	0.07	.....	0.94	1.36	.....	0.17	.....	- 0.56	—2.29	.....	0.29	.....
10	..	.....	.....	.....	.....	.....	3.55	.....	.....	.....	1.43	.....	0.32	.....	.....	3.66	.....	0.83	.....	.....	56.79	.....	2.45
..	11	9.68	17,500 "	22.1	17.3	4.8	.....	1.56	2.36	0.66	.....	0.07	.....	0.86	1.81	.....	0.19	.....	+ 0.64	2.44	.....	0.25	.....
12	..	.....	.....	.....	.....	.....	5.11	.....	.....	.....	2.09	.....	0.39	.....	.....	5.47	.....	1.02	.....	.....	54.35	.....	2.20
..	13	11.44	15,600 "	19.7	14.4	5.3	.....	1.85	2.22	0.83	.....	0.07	.....	0.72	2.57	.....	0.22	.....	- .078	2.37	.....	0.21	.....
14	..	.....	.....	.....	.....	.....	6.96	.....	.....	.....	2.92	.....	0.46	.....	.....	8.04	.....	1.24	.....	.....	51.98	.....	1.99
..	15	13.20	14,000 "	17.7	11.9	5.8	.....	2.13	—2.09	1.02	.....	0.08	.....	0.59	3.61	.....	0.27	.....	0.91	2.35	.....	0.18	.....
16	..	.....	.....	.....	.....	.....	9.09	.....	.....	.....	3.94	.....	0.54	.....	.....	11.65	.....	1.51	.....	.....	49.63	.....	1.81
..	17	14.96	12,200 "	15.4	9.1	6.3	.....	2.41	-1.95	1.24	.....	0.08	.....	0.45	5.36	.....	0.36	.....	+ 1.05	2.30	.....	0.15	.....
18	..	.....	.....	.....	.....	.....	11.50	.....	.....	.....	5.18	.....	0.62	.....	.....	17.01	.....	1.87	.....	.....	47.33	.....	1.66
..	19	16.72	10,400 "	13.1	6.3	6.8	.....	2.70	1.81	1.49	.....	0.09	.....	0.31	8.75	.....	0.52	.....	+ 1.19	2.27	.....	0.14	.....
20	..	.....	.....	.....	.....	.....	14.20	.....	.....	.....	6.67	.....	0.71	.....	.....	25.76	.....	2.39	.....	.....	45.06	.....	1.52
..	21	18.48	9,300 "	11.7	4.4	7.3	.....	2.98	-1.72	1.73	.....	0.09	.....	0.22	13.5	.....	0.73	.....	+ 1.28	2.33	.....	0.13	.....
22	..	.....	.....	.....	.....	.....	17.18	.....	.....	.....	8.40	.....	0.80	.....	.....	39.26	.....	3.12	.....	.....	42.73	.....	1.39
..	23	20.24	8,500 "	10.7	2.9	7.8	.....	3.27	- 1.64	2.00	.....	0.10	.....	0.14	23.3	.....	1.15	.....	1.36	2.40	.....	0.12	.....
24	..	.....	.....	.....	.....	.....	20.45	.....	.....	.....	10.40	.....	0.90	.....	.....	62.5	.....	4.27	.....	.....	40.33	.....	1.27
..	25	22.00	7,800 "	9.85	1.5	8.3	.....	3.55	-1.57	2.26	.....	0.10	.....	0.07	50.8	.....	2.31	.....	1.43	2.48	.....	0.11	.....
26	..	.....	.....	.....	.....	.....	24.00	.....	.....	.....	12.66	.....	1.00	.....	.....	113.4	.....	6.58	.....	.....	37.85	.....	1.16
..	27	23.76	7,200 "	8.10	0.4	8.7	.....	3.83	1.52	2.52	.....	0.11	.....	- 0.02	91.0	.....	8.05	.....	- 1.48	2.60	.....	0.11	.....
28	..	.....	.....	.....	.....	.....	27.83	.....	.....	.....	15.18	.....	1.11	.....	.....	42.9	.....	14.36	.....	.....	35.25	.....	1.05
..	29	25.52	6,800 "	8.60	0.6	9.2	.....	4.12	- 1.47	2.80	.....	0.11	.....	+ 0.03	137	.....	5.38	.....	- 1.53	2.58	.....	0.11	.....
30	..	.....	.....	.....	.....	.....	31.95	.....	.....	.....	17.98	.....	1.22	.....	.....	29.2	.....	8.98	.....	.....	32.67	.....	0.94
..	31	27.28	6,500 "	8.20	1.5	9.7	.....	4.40	1.13	3.08	.....	0.11	.....	+ 0.07	—63.0	.....	2.31	.....	- 1.57	2.80	.....	0.10	.....
32	..	.....	.....	.....	.....	.....	36.35	.....	.....	.....	21.06	.....	1.33	.....	.....	22.9	.....	6.67	.....	.....	29.87	.....	0.84
..	33	29.04	6,200 "	7.84	2.4	10.2	.....	4.69	—1.38	3.40	.....	0.12	.....	+ 0.12	—39.0	.....	1.34	.....	- 1.62	2.89	.....	0.10	.....
34	..	.....	.....	.....	.....	.....	41.04	.....	.....	.....	24.46	.....	1.45	.....	.....	189.9	.....	5.33	.....	.....	26.98	.....	0.74
..	35	30.80	6,000 "	7.58	3.0	10.6	.....	4.97	1.35	3.69	.....	0.12	.....	+ 0.15	—33.1	.....	1.07	.....	- 1.65	3.02	.....	0.10	.....
36	..	.....	.....	.....	.....	.....	46.01	.....	.....	.....	28.15	.....	1.57	.....	.....	156.8	.....	4.26	.....	.....	23.96	.....	0.64
..	37	32.56	5,800 "	7.32	3.8	11.1	.....	5.25	1.31	4.01	.....	0.12	.....	+ 0.19	—27.6	.....	0.85	.....	- 1.69	3.11	.....	0.10	.....
38	..	.....	.....	.....	.....	.....	51.26	.....	.....	.....	32.16	.....	1.69	.....	.....	120.2	.....	3.41	.....	.....	20.85	.....	0.54
..	39	34.32	5,650 "	7.13	4.4	11.5	.....	5.54	1.28	4.33	.....	0.13	.....	+ 0.22	—25.2	.....	0.74	.....	- 1.72	3.23	.....	0.09	.....
40	..	.....	.....	.....	.....	.....	56.80	.....	.....	.....	36.49	.....	1.82	.....	.....	104.0	.....	2.67	.....	.....	17.62	.....	0.45
..	41	36.08	5,500 "	6.95	5.1	12.0	.....	5.82	1.25	4.66	.....	0.13	.....	+ 0.25	—23.2	.....	0.64	.....	- 1.75	3.33	.....	0.09	.....
42	..	.....	.....	.....	.....	.....	62.62	.....	.....	.....	41.15	.....	1.95	.....	.....	80.8	.....	2.03	.....	.....	14.29	.....	0.36
..	43	37.84	5,400 "	6.82	5.7	12.5	.....	6.11	1.22	5.00	.....	0.13	.....	+ 0.28	—21.8	.....	0.58	.....	- 1.78	3.43	.....	0.09	.....
44	..	.....	.....	.....	.....	.....	68.73	.....	.....	.....	46.15	.....	2.08	.....	.....	59.0	.....	1.45	.....	.....	10.86	.....	0.27
..	45	39.60	5,300 "	6.70	6.3	13.0	.....	6.39	1.19	5.36	.....	0.14	.....	+ 0.31	—20.6	.....	0.54	.....	- 1.81	3.53	.....	0.09	.....
46	..	.....	.....	.....	.....	.....	75.12	.....	.....	.....	51.51	.....	2.22	.....	.....	38.4	.....	0.91	.....	.....	7.33	.....	0.18
..	47	41.36	5,200 "	6.58	6.9	13.5	.....	6.67	1.16	5.74	.....	0.14	.....	+ 0.34	—19.6	.....	0.47	.....	- 1.84	3.62	.....	0.09	.....
48	..	.....	.....	.....	.....	.....	81.79	.....	.....	.....	57.25	.....	2.36	.....	.....	18.8	.....	0.44	.....	.....	3.71	.....	0.09
..	49	43.12	5,100 "	6.44	7.5	13.9	.....	6.96	1.13	6.15	.....	0.14	.....	+ 0.37	—18.8	.....	0.44	.....	- 1.87	3.71	.....	0.09	.....
50	..	.....	.....	.....	.....	.....	88.75	.....	.....	.....	63.40	.....	2.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

The time consumed in stopping a train is not a matter which requires exact determination, since it seldom happens that the brakes are applied at exactly the moment at which they should be applied so the stop will occur exactly where it is desired, with full pressure acting constantly in retarding the train. Data upon the subject derived from numerous careful tests are given in a catalogue publication entitled "Westinghouse Air Brake Tests," and in general it may be stated that the results of these investigations go to show that there is a very wide range for this factor.

From a long series of tests all trains weighing over 500 tons gave as an average distance to stop from 30 to 40 miles per hour, from 302 ft., for an emergency application, to 1,753 ft. with hand brake. The average with air brake was about 800 ft. and the time consumed about 20 seconds. After investigating a number of speed records the fact was discovered that this value was under the average for operating conditions and it appeared that engineers slow down a considerable distance before the final application of brakes is made. In most instances this slowing down began about 1,500 ft. before the stop and the retardation was more or less regular from about 1,000 ft. to the stop. With passenger trains this is probably not as true as in the case of freight trains, but there is every evidence that modern practice is somewhat inclined toward this kind of operation. It is not improbable that if this speed is taken as decreasing constantly for the last 1,000 ft. that a figure representing the average stopping conditions would be obtained. As a general average it may be stated that the speed may be considered as decreasing uniformly for the last 500 to 1,000 ft., depending upon speed and size of train.

In the tests a speed indicator was used and a chronograph was devised to reduce the labor involved in the determination of the records obtained. The chronograph consisted of a clock attached to the speed recorder with a connecting mechanism so a pencil is drawn down the paper ribbon beside the speed pencil. When the train stops the paper ceases to move, a straight vertical line of given scale is drawn by the clock pencil showing the exact length of that stop. At the end of the run this record reveals the exact running time, which should check the theoretical time above computed for average conditions of operation.

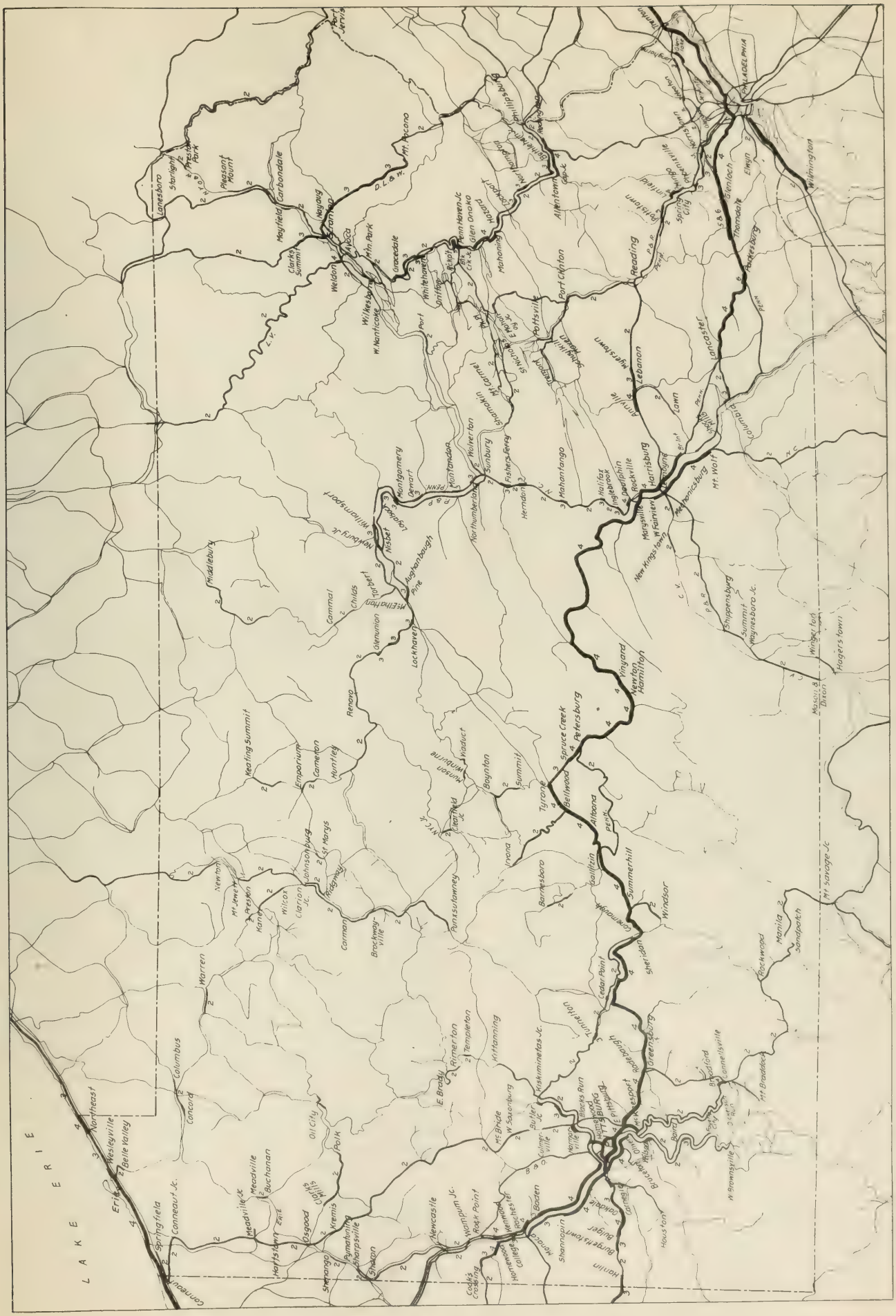
To C. N. Kalk, chief engineer of the Wisconsin Railway, the writer is indebted for these figures and data. The subject is big and it is hoped that this exposition of modern methods in research will develop further interest on other railways in this important factor in economics of railway engineering.

MULTIPLE TRACK RAILWAYS IN PENNSYLVANIA.

The map, given herewith, shows the two-track, three-track and four-track sections of the railways in the state of Pennsylvania. In consequence of the necessarily small scale of the drawing it has been impossible in the case of numerous short sections to show their situation graphically, and the reader will have to turn to the printed list. The termini of the sections are as follows:

PENNSYLVANIA:

	No. tracks.	Approx. miles.
**Baltimore & Ohio.*		
Philadelphia to Wilmington, Del.	2	25
Mt. Savage Jct., Md., to Manila	2	26
Sandpatch to Connellsville	2	60
Connellsville to Broadford	4	2
Broadford to McKeesport	2	40
McKeesport to Wheeling, Jct.	4	13
Wheeling Jct. to Pittsburgh	2	2
Green Jct. to Mt. Braddock	2	6
Rockwood to Wilson Creek Jct.	2	1
Rand to Bruceton	2	..
Allegheny to Haselton, O.	2	76
Bessemer & Lake Erie.		
Conneaut, O., to Osgood, Pa.	2	47
Osgood to Kremis	2	11
Kremis to Woods	2	67
Culmerville to E. Pittsburgh	2	20
Meadville Jct. to Exposition Park	2	2
Buffalo, Rochester & Pittsburgh.		
Carrolton, N. Y., to Newton	2	27
Clarion Jct. to Punxsutawney	2	59
Brockwayville to Carman	2	11
Central of New Jersey.		
Phillipsburg, N. J., to Bethlehem Jct.	2	12
Bethlehem Jct. to Allentown	3	5
Allentown to Northampton	2	6
Northampton to W. of Siegfried	3	1
West of Siegfried to Treichler	2	4
Treichler to Lockport	3	3
Lockport to East End Hazard	2	7
At Hazard	3	2
Hazard to Penn Haven Jct.	2	16
Penn Haven Jct. to Rockport	3	7
Rockport to Solomon's Gap	2	24
Mountain Park to Wilkesbarre	2	8
Gardner's Switch to Scranton	2	2
Cornwall & Lebanon.		
Lebanon to Lawn	2	14
Delaware & Hudson.		
Carbondale to Wilkesbarre	2	35
Delaware, Lackawanna & Western.		
Delaware, N. J., to Mt. Pocono	2	31
Mt. Pocono to Clark's Summit	3	41
Clark's Summit to Binghamton, N. Y.	2	55
Scranton to West Nanticoke	2	24
Erie.		
Port Jervis, N. Y., to Binghamton, N. Y. (Partly in New York)	2	127
Columbus to Concord	2	8
Shenango to Pymatuning	2	6
Sharpsville to Sharon	2	3
Mt. Jewett to Clarion Jct.	2	20
Nayaug to Avoca	2	11
Lanesboro to Carbondale	2	38
Lake Shore & Michigan Southern.		
Clark's Mills to Polk Jct.	2	15
State line to North East	4	5
North East to Wesleyville	3	11
Wesleyville to Conneaut, O.	4	32
Erie to Saybrook	4	45
Lehigh Valley.		
Phillipsburg, N. J., to Redington	2	7
Redington to Gap Jct.	4	10
Gap Jct. to Mahoning	2	26
Mahoning to Glen Onoko	4	6
Glen Onoko to Whitehaven	2	21
Whitehaven to Gracedale	3	13
Gracedale to Falling Spring	2	..
Falling Spring to Weldon	4	..
Weldon to Lockwood, N. Y.	2	91
Penn Haven Jct. to Park Place	2	25
Barry Jct. to Mt. Carmel	2	15
Black Creek Jct. to Silver Brook Jct.	2	17
Lumber Yard to Drifton	2	..
New York, Ontario & Western.		
Scranton to Diamond Crossing	2	..
Jermyn to Mayfield	2	1
Carbondale to Pleasant Mount	2	13
Preston to Starlight	2	3
New York, Chicago & St. Louis.		
Springfield to Conneaut, O.	2	8
Northern Central.		
Sunbury to Selinsgrove Jct.	2	5
Selinsgrove Jct. to Fishers' Ferry	3	3
Fishers' Ferry to Herndon	2	4
Herndon	3	1
Herndon to Mahantango	2	9
At Mahantango	3	1
Mahantango to Halifax	2	11
At Halifax	3	1
Halifax to Inglenook	2	5
Inglenook to Clark's Ferry	3	2
Clark's Ferry to W. of Dauphin	2	5
W. of Dauphin to Dauphin	3	2
Dauphin to Rockville	2	3
Marysville to West Fairview	2	5
West Fairview to Mt. Wolf	4	21
Mt. Wolf to Md. State Line	2	29
Pennsylvania (m means main line).		
m. Trenton, N. J., to Philadelphia	4	33
N. Philadelphia to Chestnut Hill	2	8
m. Philadelphia to Lancaster	4	68
Lancaster to Mountville	2	8
Mountville to Columbia	3	5
Glen Loch to Heaton	2	30
At Heaton	3	2
Heaton to Roxton	2	7
Roxton to Langhorne	3	4
Langhorne to Morrisville	2	9
Glen Loch to Thorndale	2	11
(Tracks 5 and 6 for freight.)		
Parkesburg to Shocks Mills	2	43
Shocks Mills to Mt. Wolf	2	6
m. Lancaster to Branch Intersection	2	26
m. Branch Intersection to Spruce Creek	4	130
m. Spruce Creek to Tyrone	3	7
m. Tyrone to Pittsburgh	4	128
(Includes a few short pieces of 3-track line.)		
Columbia to Branch Intersection	2	20
West Philadelphia to Spring City	2	31
Spring City to Douglassville	2	12
Petersburg to Gallitzin	2	47
Summit to Boynton	2	8
Osceola Jct. to Goss Run Jct.	2	5
Bellewood to Irvona	2	24
Tunnel to E. of Burnesboro	2	..
Greensburg to Connellsville	2	25
Sheridan to Cedar Point	2	25
Cedar Point to Tunnelton	2	10
Tunnelton to Butler Jct.	2	33
Butler Jct. to Natrona	2	4
Natrona to Glassemere	3	4
Glassemere to E. of Denny	2	6
E. of Denny to Harmarville	4	1
Harmarville to Bennett	2	10
Bennett to Allegheny	3	2
At Allegheny	4	1
Radebaugh to County Home Jct.	2	3


LAKE ERIE
PHILADELPHIA
Railway Lines of Two or More Main Tracks in the State of Pennsylvania.

	No. tracks.	Approx. miles.
Brilliant Cut-off	4	..
Pittsburg to Kiskiminetas Jct.	2	29
Pittsburg to Oliver	4	12
Oliver to Wilson	2	6
Wilson to S. of Clairton	4	2
S. of Clairton to Baird	2	13
Baird to Donara	3	2
Donara to W. Brownsville	2	18
Keating Summit to Sizerville	2	1
Oil City to Rocknere	2	4
Schenley to Kittanning	2	15
S. of Templeton to Grays Eddy	2	2
Rimerton to E. Brady	2	9
Erie to Belle Valley	2	6
Irvineton to Warren	2	6
At Preston	2	2
Kane to Wilcox	2	9
Johnsonburg to Ridgeway	2	8
St. Marys to Benzinger	2	5
Emporium to Cameron	2	5
Huntley to Renovo	2	32
Renovo to Glen Union	2	14
At Glen Union	3	5
Glen Union to Farrandsville	2	8
Farrandsville to Ferney	3	2
Farrandsville to Lock Haven	2	6
At Lock Haven	3	1
Lock Haven to W. of Pine	2	7
W. of Pine to Anghanbaugh	3	3
Anghanbaugh to Nisbet	2	10
Nisbet to Williamsport	3	6
Williamsport to Loyalsock	2	10
At Loyalsock	3	2
Loyalsock to Montgomery	2	6
At Montgomery	3	2
Montgomery to Dewart	2	4
Dewart to Watsontown	3	2
Watsontown to Montandon	2	8
At Montandon	3	1
Montandon to Northumberland	2	7
Northumberland	3	2
Northumberland to Sunbury	2	2
Nescopeck to Port	2	6
Sunbury to Wolverton	2	6
Pennsylvania Lines West of Pittsburgh;		
N. W. System.		
Pittsburgh to Allegheny	2	1
Allegheny to Baden	4	19
Baden to Freedom	3	3
Freedom to Rochester	4	2
Rochester to New Brighton	3	3
New Brighton to Homewood	3	20
Homewood to Walnut	4	
Walnut to Cook's Crossing	3	
Cook's Crossing to State Line	2	
Rochester to E. Liverpool, O.	2	19
Lawrence Jct. to New Castle	2	3
Lawrence Jct. to Sharpsville	2	26
Pennsylvania Lines; S. W. System.		
Pittsburgh to Birmingham	2	1
Birmingham to Sheridan	4	26
Sheridan to Idlewood	2	
Idlewood to W. of Carnegie	4	
W. of Carnegie	2	
W. of Carnegie to Oakdale	3	
Oakdale to Bulger	4	
Bulger to Burgettstown	3	
Burgettstown to Harlin	2	5
Hanlin to State Line	3	3
Carnegie to Houston	2	15
Philadelphia, Baltimore & Washington.		
Philadelphia to Wilmington	4	27
Philadelphia to Elwyn	2	15
Wabash Pittsburgh Terminal.		
Pittsburgh to Rook Yard	2	4
Pittsburgh & Lake Erie.		
Pittsburgh to Shannopin	4	14
Shannopin to Monaca	3	9
Monaca to College	2	5
College to Rock Point	4	7
Rock Point to Lowellville Jct., O.	2	19
Pittsburgh to Homestead	4	7
Homestead to Dickerson Run	2	46
McKeesport to Fayette City	2	30
Western Maryland.		
Wingerton to State Line	2	1
Cumberland Valley.		
Lemoyne to Mechanicsburg	2	7
New Kingston to "Q. N." Tower	2	6
At Carlisle	2	2
Shippensburg to Greencastle	2	21
At Greencastle	3	2
Greencastle to Mason-Dixon	2	4
New York Central.		
Middlebury to D. I. Tower	..	..
Cammal to Childs	2	2
Torbert to Newbury Jct.	2	15
Jersey Shore Jct. to McElhattan	2	7
At Viaduct	2	..
Winburn to Munson	2	2
Clearfield Jct. to N. Y. C. Jct.	2	..
Philadelphia & Reading		
Reading to Myerstown	2	22
Myerstown to Lebanon	3	7
Lebanon to Annville	4	4
Annville to Shippensburg	2	62
Wilburtha, N. J., to Glenlake	2	6
Glenlake to Janney	4	4
Janney to Philadelphia	2	22
Newtown Jct. to Neshaminy Falls	2	14
Philadelphia to Chestnut Hill	2	10
Jenkintown to S. Bethlehem	2	46
Glenside to Willow Grove	2	4
Philadelphia to Norristown	2	17
Philadelphia to Bridgeport	2	18
Bridgeport to Abrams	3	1
Abrams to Port Kennedy	2	3
Port Kennedy to Valley Forge	3	2
Valley Forge to Perkiomen Jct.	2	2
Perkiomen Jct. to Phoenixville	3	3
Phoenixville to Mingo	2	3
Mingo to Aramingo	3	3
Aramingo to Linfield	4	1
Linfield to Sanatoga	2	3
Sanatoga to Pottstown	3	3
Pottstown to Pottsville	2	53
Schuylkill Haven to Tremont	2	16
Port Clinton to E. Mahanoy Jct.	2	25
St. Nicholas to Shamokin	2	27
Sunbury to Newberry Jct.	2	46

ANALYSES AND BUYING OF STEAM COAL.

Part II of the report of the committee on fuel supply, Boston Chamber of Commerce, a portion of which report appeared in the *Railway Age Gazette* of May 13, considers the subject of analysis and buying of steam coal.

New England receives nearly all of its coal supply from the Northern Appalachian Field of Pennsylvania, Maryland, West Virginia and Virginia. This field is the richest and most extensive in the world, and contains all kinds of coal, from anthracite to bituminous or gas coal.

While all of the coal in this region was probably formed from similar kinds of vegetable matter, it has received somewhat different treatment from the hand of Nature in the various districts. Since the deposition of the coal beds the coal of some districts has been subjected to more intense heat and pressure than that of others, with the result that the volatile and gaseous constituents were driven off in varying degrees, thus forming almost every character of coal between anthracite with 5 per cent. volatile, and gas coal with 40 per cent. Outside the anthracite district the lowest volatile coal is found closest to the backbone of the Allegheny mountain range. To the northwest at right angles to the mountain ranges, the percentage of volatile in the coal gradually increases, but parallel to the ranges the volatile remains practically constant from the northern part of Pennsylvania to southern West Virginia. Therefore the geographical location of a mine closely indicates the character of the coal with respect to volatile, regardless of the seam from which it is mined.

The quality of coal with respect to ash and sulphur, however, often varies widely even in the same seam in the same district. The source of the ash and sulphur explains to a certain extent why they may be so variable. The original vegetable matter from which coal was formed contained some ash, and the greater part of this is still retained uniformly mixed throughout the coal. Water, carrying sediment and sand, washed over the coal-forming areas and from time to time deposited earthy matter, some of which is interspersed uniformly through the coal seams, but which often occurs in streaks of several inches in thickness; also water carrying mineral compounds in solution is continually percolating through the strata near the earth's surface and the coal seams, acting as filter beds, collect from it iron sulphide, or sulphur balls, lime compounds and other impurities. In mining coal, impurities such as slate and shale from the roof or floor of the mine may also get in. Some of the above-mentioned impurities are so uniformly mixed through the coal that their elimination is impossible, while the amount of others found in the coal as shipped depends upon the care taken in mining and loading.

New England receives about 17,000,000 tons, or 70 per cent. of its total coal supply, from the State of Pennsylvania, approximately half of which is anthracite. Of the steam coal, about 9,000,000 tons, or 58 per cent., is from Pennsylvania, 5,000,000 tons, or 32 per cent., from West Virginia and Virginia, 1,000,000 tons, or 6 per cent., from Maryland, and 600,000 tons, or 4 per cent., from Nova Scotia.

ANALYSIS OF COAL.

It is very desirable to know before purchasing coal whether it is going to be suitable for its intended use. While the true test is in its burning, yet there are methods of deter-

mining its character and quality which give a reliable indication of what may be expected from it in use, and it is possible to go still further and specify the nature and quality of coal desired and determine whether or not such coal has been delivered. Probably the most practicable method of doing this is by chemical analysis and determination of heating value.

For many years the fuel used in metallurgical processes has been analyzed for the impurities that are detrimental to iron or steel, but it is only recently that the United States Government and some private steam coal users have taken up the systematic analysis of coal and purchased it on specifications.

The different constituents that are usually determined in coal are the moisture, volatile, fixed carbon, ash, sulphur, and heating value.

Moisture is determined by noting the loss of weight of a portion of the sample after it has been dried for an hour

Coal Map No.	DISTRICT	STATE	AUTHORITY	BULLETIN	Character of Sample	Number of Samples	Moisture	Volatile	Fixed Carbon	Ash	Sulphur	British Thermal Units: As Received	British Thermal Units: Dry Basis
1	Tioga Co.,	Pa.	Commercial,	–	†Average	6	1 74	19.68	67 09	11 49	1 93	13599	13839
2	Anthracite, Buckwheat,	Pa.	U. S. G. S. & T	339	†Average	40	5 45	2.30	74.57	17.68	0.65	11305	11957
			Commercial,	–	†Average	108	3.24	5 81	74.52	16 43	0 90	11942	12342
			"		**Variation from		8 10	6 87	78 11	20.43	0 99	12441	12853
			"	–	**Variation to		1 95	2 30	71 03	12.92	0 61	10990	11653
2	Anthracite, Screenings,	Pa.	U. S. T.,	–	†Average	20	5 15	–	–	12 08	–	12401	13076
			Commercial,	–	†Average	37	3.18	5 61	78 85	12 36	0 82	12816	13237
3	Broad Top,	Pa.	Commercial,	–	†Average	84	0 71	15 84	72 95	10 50	1 78	13915	14015
			"	–	**Variation from		1.30	17 58	73 27	15 30	2.74	14123	14244
			"	–	**Variation to		0 48	14 12	66 32	8.96	1.02	13015	13132
4	Clearfield Co.,	Pa	U. S. T ,	-	†Average	26	2 59	–	–	8 94	–	13962	14333
			Commercial,	–	†Average	159	2.39	20 47	67 41	9 73	2 02	13749	14086
			"	–	**Variation from		3.62	27 95	74 97	14.71	3.67	14517	14644
			"	–	**Variation to		.82	15 85	62 90	7.16	1 04	13142	13486
5	Cambria Co.,	Pa	U. S G. S. & T	290,332	†Average	69	2.53	17 44	72 60	7.43	1 15	14230	14600
			Commercial,	–	†Average	269	2 53	19.50	69.50	8.47	2.18	13961	14324
			"	–	**Variation from		4.23	25 92	77 23	13.00	4.60	14800	14942
			"	–	**Variation to		0 85	15 80	63.10	5.74	0 81	13143	13484
6	Somerset Co.,	Pa	U S. G. S.,	261,290	†Average	5	2 18	16 42	71 76	9.64	1.70	13873	14182
			Commercial,	–	†Average	219	2.55	17.53	70.52	9.40	1 11	13873	14238
			"	–	**Variation from		3 97	21 89	74.64	12.86	2.13	14283	14437
			"	–	**Variation to		0.94	14.72	68 87	8.58	0.78	13159	13400
8	Jefferson Co.,	Pa.	Commercial,	-	†Average	44	1 54	30 35	58.55	9.56	2.22	13661	13875
10	Indiana Co ,	Pa.	U. S. G. S.,	332	†Average	7	2 95	22 12	63 93	11.00	3.10	13383	13790
			Commercial.	–	†Average	38	1 32	22 78	65.30	10.60	1 83	13861	14048
11	Westmoreland Co. (East'n part),	Pa.	U. S. G. S.,	290,332	†Average	24	3.25	31.08	55.22	10.45	1.64	13399	13849
14	Pittsburg,	Pa.	U. S. G. S.,	290,332	†Average	16	2.75	33.91	56.28	7.06	1.28	13864	14259
20 *	Georges Creek (Big Vein),	Md.	U. S. G. S.,	332,339	†Average	13	3.38	16.59	72.01	8.02	0.93	13960	14449
			Commercial,	-	†Average	186	3.02	18.58	69.93	8.47	1.02	13917	14350
			"	-	**Variation from		4.38	19.30	74.39	9.51	1 10	14493	14687
			"	-	**Variation to		0.79	16.54	69.59	7.08	0 86	13788	14235
21	Upper Potomac and G. C. Small Vein,	Md. and W Va.	U. S. G. S.,	290	†Average	2	2.08	15.07	70.02	12.83	1.51	13341	13625
			Commercial,	-	†Average	114	2.75	20.16	67 02	10.07	1 05	13664	14051
			"	-	**Variation from		4 03	22.03	69.44	12.97	1.49	14185	14347
			"	-	**Variation to		1.22	17.05	63.68	8.53	0.86	13169	13541
22	Fairmont,	W. Va.	U. S. G. S.,	261,290	†Average	17	2 48	36.35	53.60	7.57	1.99	13813	14166
23	New River,	W. Va.	U. S. G. S.,	261 290,362	†Average	33	2.96	20.14	70.80	6.10	0.84	14321	14759
			Commercial,	-	†Average	362	2.98	20.47	70.21	6.34	0.99	14257	14696
			"	-	**Variation from		4.67	23 38	74.69	8.12	1.51	14864	15002
			"	-	**Variation to		0 91	18.38	69.33	5.03	0.73	13988	14418
24	Kanawha,	W. Va.	U. S. G. S.,	261,290,332	†Average	34	3 49	32 39	57 40	6.72	1.12	13809	14309
26	Pocahontas,	W. Va.	U. S. G. S.,	261,362	†Average	18	2 72	16.70	73.93	6.65	0.58	14481	14888
			Commercial,	–	†Average	100	2.86	17.59	72.40	7.15	0.70	14241	14661
			"	–	**Variation from		3.73	20.62	77.30	9.34	0.83	14901	15058
			"	–	**Variation to		0.70	15.49	70.59	5 24	0.59	13912	14322
28	Clinch Valley,	Va.	U. S. G. S.,	290,332	†Average	24	4.27	32.30	57 21	6.22	1 04	13755	14369
	Nova Scotia (½ inch slack)		Commercial,	-	†Average	5	2.03	27 53	55 57	14.87	1 65	12406	12662
	Rhode Island,		U S. G. S.,	332	†Average	1	2.41	4.92	73 61	19 06	0.07	10996	11267

ABBREVIATIONS:—U. S. G. S. For United States Geological Survey. U. S. T. For United States Treasury Department.

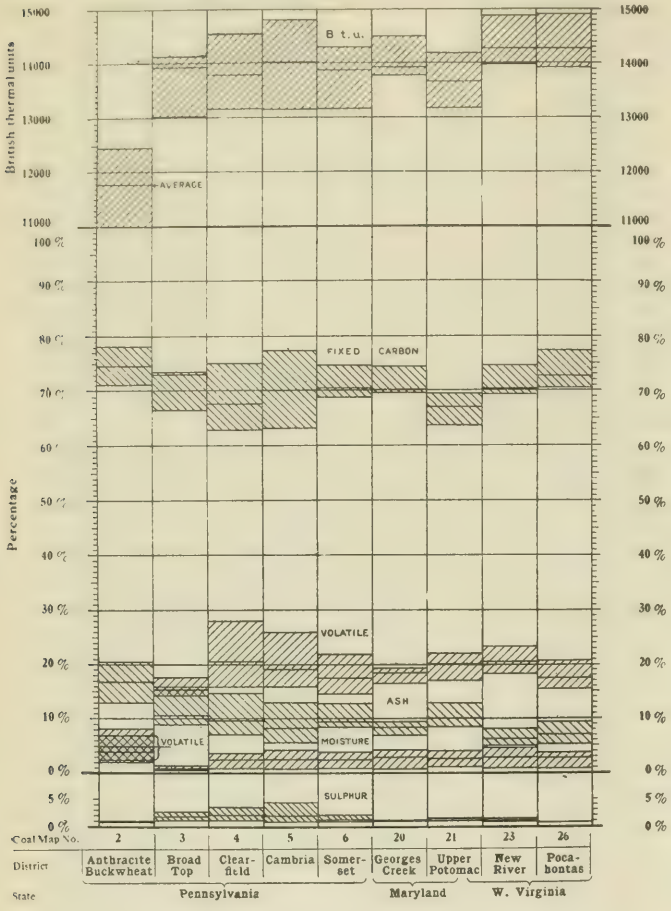
† Average. The figures opposite the word average in each district represent the average amount of all constituents in the number of samples designated—these figures will always total 100%, (exclusive of sulphur, which is included in the other constituents.)

** Variation { from / to } The figures opposite these words show respectively the highest and lowest per cent. of each constituent, independent of any others.

* Compiled from the Bulletins of the U S. Geological Survey; U S. Treasury Department, and collected from New England coal consumers.

Table of Analyses of New England Coals.

at a temperature of about 218 deg. Fahr. Moisture is always present in varying amounts, and while it has little effect upon the burning of coal, it represents so much water that is being bought at the price of coal, and which requires heat to evaporate it in the furnace. In taking samples of coal by the usual method a great deal of moisture is lost, consequently many analyses of coal from the Northern Appalachian field show only 1 to 1½ per cent., while in reality the coal contains 2 to 4 per cent. moisture. The present indications are that special samples must be taken for the moisture determinations at the time when the coal is weighed, as subsequent rain or drying out will be to the disadvantage of the coal company or the purchaser. Many specifications designate only the dry basis or moisture-free analysis, but this obviously does not represent the coal as weighed and paid



Variation in Constitutents of Coal by Districts.
(Compiled from full-page table.)

for, and often results in the consumer paying a high price for water. Under the same weather conditions some kinds of coal contain a higher percentage of moisture than others, so that if the analyses and heating values on the dry basis are compared for the purpose of selecting the most economical coal, the coal with the lower normal moisture content will be at a disadvantage, and the purchaser may make an unwise choice. For instance, anthracite nearly always contains 2 or 3 per cent. more moisture than does semi-bituminous, so that a comparison of their relative values on a dry basis would unjustly favor the anthracite.

Volatile consists of the combustible gases and some water vapor which is combined with them, and cannot be driven off by mere drying. It is determined by heating a moisture-free sample in a closed platinum crucible for seven minutes over a standard gas flame. This process drives off the volatile or gaseous matter, leaving the fixed carbon and ash. The volatile closely represents the amount of gas that can be made from the coal in retorts, and also the gases that are liberated soon after firing the coal in a boiler furnace. The amount of smoke from a furnace depends upon the amount of volatile in the coal as well as the facilities and method of burning. The volatile is the main constituent considered in classifying coals with respect to their character, such as anthracite 3 to 7.5 per cent. volatile, semi-anthracite 7.5 to 12.5 per cent., semi-bituminous 12.5 to 25 per cent., bituminous 25 to 40 per cent. These are merely arbitrary classifications, as the change is very gradual from one part of the coal field to another. Coal from any one mine or small group of mines, however, is very uniform in the percentage of volatile, and for this reason it is a very useful standard in designating coals and detecting substitutions.

Fixed carbon is determined as the loss in weight resulting from burning the volatile-free sample down to ash. It has been considered by many people as representing the fuel value of a coal, but this is by no means true, as much depends upon the proportions of moisture, ash and volatile in the remainder of the coal, and also upon how rich is the volatile in combustible gases. In reality the fixed carbon is of the least importance in determining the characteristics and quality of a coal.

Ash is the residue left after the fixed carbon has been burned off completely. The ash in coal is non-combustible under any circumstances, and is in reality of greater importance than any other impurity contained in coal; for while the purchaser does not care to pay for water at the rate of $4.00 per ton, he much less cares to pay for ash at this rate and then be charged with the additional expense of removing it from his plant, to say nothing of the trouble caused from the formation of clinkers and from the reduction in the steaming capacity of the boilers. The weight of ashes taken from a boiler plant is not a true indication of the ash contained in the coal, as this weight is increased by unburned coal and coke, the amount of which is affected by the kind of grates and the care exercised by the fireman, and diminished by the amount of ash carried up from the grate by the draft.

Sulphur in coal is determined by burning a portion of the sample intimately mixed with some chemical that will retain all the sulphur of the coal in such a form that it can later be separated as a pure sulphur compound, and weighed. The sulphur itself is of secondary importance as far as steam coal is concerned, and its determination is largely a matter of custom. Sulphur is very injurious in the manufacture of iron and steel, and as the iron manufacturer was the first to analyze coal and coke, the steam coal user has naturally adopted many of his methods and ideas.

The heating value, which is usually expressed in British thermal units per pound, is of very great importance in comparing different kinds of steam coal, as the generation of heat is the primary object. The method of determining the heating value of coal in the laboratory is to burn a portion of the sample in a closed steel bomb which contains an excess of pure oxygen and is surrounded by water. From the weight of coal, and the weight of water used in this determination, together with the increase in temperature of the water and calorimeter, resulting from the combustion of the coal, the total number of heat units developed can be determined with accuracy. It is necessary to use thermometers of great precision, and they should always have been calibrated by some such authority as the U. S. Bureau of Standards. These thermometers should be read to a thousandth part of a degree, and corrections made for the small loss due to radiation, which is always taking place to some extent, no matter what precautions have been taken to reduce it. This process results in determining the total heating value of the coal, and with a constant boiler efficiency the practical results obtained in a power plant are proportional to the B.t.u.

A realization of the need of more definite information concerning the analysis and heating value of the various kinds of steam coal coming to New England has led the committee to collect and compile a large amount of reliable data on this subject. These analyses were collected from tests made by

the U. S. Geological Survey (Technologic branch), the U. S. Treasury Department, and the coal consumers of New England who have been doing this work or having it done. The data obtained by the U. S. Geological Survey have been the result of a special appropriation provided by Congress in 1904 and subsequent years, the work being carried on at the testing plants at St. Louis, later at Norfolk and now at Pittsburg. The analyses made by the Survey from samples of coal as shipped from the mines of Pennsylvania, Maryland, West Virginia and Virginia have been averaged by districts and tabulated in a table. In most cases two or more samples of each car or lot shipped were analyzed, and each analysis has been included in order to reduce the possible error that might occur by using too small a number of analyses. In all, there were 193 samples, representing 55 different lots of coal. The results obtained by the Geological Survey are very reliable, but there were so few samples taken from some of the most important districts that they may not thoroughly represent such districts as a whole.

In addition to the analyses made by the U. S. Geological Survey, 155 others were used from published data, regarding the purchase of coal under Government specifications in the Treasury Department, and some 1,700 commercial analyses.

No analyses of mine samples were used, as these are almost invariably better than the coal as loaded for shipment. The

Coal Map No.	District	State	Number of Samples	Moisture	Volatile	Fixed Carbon	Ash	Sulphur	British Thermal Units: As rec'd	British Thermal Units: Dry basis
1	Tioga Co.	Pa.	6	1.74	19.68	67.09	11.49	1.93	13599	13839
2	Anthracite Buck	Pa.	148	3.83	4.86	74.54	16.77	0.84	11771	12238
2	" Screenings.	Pa	57	3.87	5.61	73.26	12.26	0.82	12671	13180
3	Broad Top.	Pa.	84	0.71	15.84	72.95	10.50	1.78	13915	14015
4	Clearfield Co.,	Pa.	185	2.41	20.47	67.50	9.62	2.02	13779	14122
5	Cambria Co.	Pa.	386	2.53	19.08	70.13	8.26	1.97	14016	14382
6	Somerset Co.,	Pa.	224	2.54	17.51	70.54	9.41	1.13	13873	14237
8	Jefferson Co.	Pa.	44	1.54	30.35	58.55	9.56	2.22	13661	13875
10	Indiana Co.	Pa.	45	1.58	22.68	65.08	10.66	2.03	13787	14006
11	Westmoreland Co.,*	Pa	24	3.25	31.08	55.22	10.45	1.64	13399	13849
14	Pittsburg	Pa	16	2.75	33.91	56.28	7.06	1.28	13864	14256
20	Georges Creek,	Md.	199	3.04	18.45	70.07	8.44	1.02	13920	14357
21	Upper Potomac,	Md & W Va.	116	2.74	29.07	67.07	10.12	1.06	13659	14045
22	Fairmont	W Va	17	2.48	36.35	53.60	7.57	1.99	13813	14166
23	New River	W Va	395	2.98	20.44	70.26	6.32	0.98	14260	14701
24	Kanawha,	W Va.	84	3.49	32.39	57.40	6.72	1.12	13809	14309
26	Pocahontas,	W Va.	118	2.83	17.46	72.64	7.07	0.68	14278	14696
26	Other Va.	Va.	24	4.27	32.30	57.21	6.22	1.04	13755	14369
	Nova Scotia (Buck)		5	2.03	27.53	55.57	14.87	1.65	12406	12662
	Rhode Island		1	2.41	4.92	73.61	19.06	0.07	10996	11267

* Estimate Pam.

General Average Analysis of New England Coals.

method of taking mine samples is to spread a canvas on the floor of the mine and dig a groove about 3 in. wide and 3 in. deep from the bottom to the top of the seam, discarding any partings of bone, shale, or slate, which are supposed to be kept out by the miner. The miner, however, cannot do as careful work as does the sampler, having many difficulties that prevent him from loading perfectly clean coal. Consequently, coal as shipped is usually from 1 to 2 per cent. higher in ash than mine samples indicate.

The commercial analyses given in the table represent the average as well as the variation in the results obtained by several New England coal consumers. In compiling these analyses, care and discretion were used in order that only those analyses made from representative samples by proficient chemists should be included. A special representative was engaged to investigate the methods of sampling and analysis and compile the data of the many consumers who are analyzing the coal which they receive. Many instances were encountered where the results were obviously inaccurate and unreliable, and they were consequently not included in the results presented herewith.

The table shows for each district: first, the number of samples taken; second, the average analysis of these samples; third, opposite the words "from" and "to," the range of variation in each constituent.

As a rule there is close agreement between the commercial analyses and those of the U. S. Geological Survey, the widest variation occurring in the moisture and volatile. Some of the commercial samples were taken without due regard for the possible loss in moisture, and they are consequently lower than the true commercial average. The Government analyses are undoubtedly more reliable with respect to moisture. The variation in volatile is largely due to the samples coming from different parts of the field, which, as previously shown, may cause a wide variation.

When referring to the data given in this as well as the other tables it is very important to remember that these values may not accurately represent the average coal coming from the respective districts, but they are given as being the most complete and reliable information that has yet been compiled. The number of analyses that have been averaged from the various districts should be a guide as to the confidence to be placed in them. The same is true of the analyses showing the variation, as there may be better coal than any of that analyzed, and there is very likely still worse coal in the various districts. However, it is believed that these data give a fairly accurate comparison of the relative values of the different kinds of coal available to New England.

One of the most important points brought out by this table is that even though one district may produce coal that is inferior to some other on the average, yet it may contain some coal which is equal or superior to all others.

The general average analysis for each district was compiled from the data in the full page table.

It is to be regretted that much time and money is wasted in obtaining analyses that are misleading, and cause much controversy and dissatisfaction with this method of comparing coals and their fuel values. The most frequent cause of error is in the sampling of the coal for analysis. Coal contains pieces of slate with 100 per cent. ash and no heating value, also very pure pieces of coal, with a low percentage of ash and very high B.t.u., as well as pieces of almost any intermediate quality. There are also lumps as well as fine coal, and sometimes the fine coal is better than the lumps, while in other coal it is just the reverse. Where several hundred, or even thousands, of tons are to be sampled, it is not a simple matter to obtain a truly representative sample. The most frequent cause of error is the taking of too small a sample, as often only a few lumps or a shovelful is taken from the cargo or pile. Even if 100 lbs. be taken, it is quite possible to get a single piece of slate weighing 2 lbs., and this alone represents 2 per cent. of ash. Several hundred pounds should be taken in order that an extra piece of slate or impurity will be a trifling percentage of the total; then, by successively breaking, mixing and dividing the sample, it can be reduced to a few pounds and still retain proportional parts of the various constituents of the original amount. This requires both labor and time, and during the crushing and mixing a great deal of moisture is necessarily lost by evaporation, hence it is necessary to take a separate sample for the moisture determination. Another source of error is in the pulverizing in the laboratory. Before the analysis is made the sample should be fine enough to pass through a 60 or 80-mesh sieve, and in putting it through this sieve some hard particles usually remain that require extra pulverizing. There have been instances where the man doing this work has shirked his duty and thrown this away, leaving only the softer fine coal to be analyzed. In some coal the soft and easily pulverized material is very pure, so that such a sample would be better than the average coal, while in others the reverse is true, owing to the slate being soft and easily disintegrated.

After the sample has been properly taken and prepared, the results obtained in different laboratories should agree, but such does not always appear to be the case. Standard methods have been drawn up and agreed upon by the American Chemical Society, yet many chemists evidently prefer to disregard standards and use special methods of their own. As a rule, any error is likely to be in the direction of lower

results, due to such causes as the blowing out of ash from the crucible, imperfect combustion in the calorimeter, etc. Some companies submitted analyses that were persistently low in ash, as compared with the majority, while others were high in heat units, and others unreasonably erratic in heat units with the same impurities.

There is a wider variation in the B.t.u., or heating value, than in any other of the laboratory determinations. This may be due to the type of calorimeter, accuracy of thermometer, accuracy of standardization, method of manipulation, or the calculation of results from the analysis. Some types of calorimeters give results that are extremely erratic and unreliable, even when manipulated by careful chemists, and care should be taken to secure the best instruments obtainable. Even after the calorimeter has been standardized and the thermometer calibrated, their operation requires skill and care, and should not be entrusted to incompetent persons.

The B.t.u. or heating value of the coal is often calculated from the proximate analysis by means of various formulæ, all based on the assumption that the volatile and the fixed carbon have a certain heating value. These constituents are composed of carbon, hydrogen, sulphur, nitrogen and water in varying amounts, and as the two latter impurities have no heating value, and the B.t.u. of the others vary from 4,000 to 60,000 per pound, none of these formulæ are reliable, and little confidence should be placed in results obtained from their use.

THE PURCHASE OF COAL ON SPECIFICATIONS.

During the past few years a great many coal consumers have taken up the purchase of coal on specifications with varying degrees of success. In this, as in most new movements, some difficulties have been encountered, and the results have not been satisfactory in every case. The principal reasons for failure have been in the application of the method rather than in the method itself. Many misunderstandings have arisen on the one hand because the purchasers are prone to expect too much, to take faulty samples or to act on inaccurate analyses of the coal delivered, and on the other hand because the coal companies are inclined to overestimate the excellence of the coal they are able to deliver.

The general method of buying coal on specifications is for the purchaser to ask for bids, to be based upon the delivery of coal of a specified analysis, allowing certain variations for the B.t.u. and the various constituents. If the analysis shows variations from the specifications, premiums are paid or penalties exacted in proportion to such variations above or below the standard. In some forms of specifications the bidder submits an analysis of coal he proposes to deliver, and the analysis of the successful bidder is taken as a standard for the contract. In some contracts the adjustment of price is based on the moisture, volatile, ash, sulphur and B.t.u., while in others only the ash and B.t.u. are considered.

The B.t.u. should always be one of the factors, as steam coal is purchased for its heating value.

Moisture is also of great importance, as it represents so much valueless material; it should be ascertained when the selling weights are obtained.

Volatile has two objectionable features; first, the production of smoke; second, reduction in boiler efficiency. These may be overcome by proper boiler installation and careful firing with a view to complete combustion. In the absence of these conditions it is best to avoid high volatile coals. It seems that the lower boiler efficiency due to higher volatile coals has been greatly overestimated, for the results of some four hundred boiler tests, made by the U. S. Geological Survey, indicate that the boiler efficiency is about 2 per cent. lower with coal containing 35 per cent. volatile than it is with coal of 15 per cent. volatile.*

Ash affects both the capacity and the efficiency of a boiler, and the price of coal should vary with it. Ash not only replaces combustible material, but also reduces the efficiency of the boiler by clogging the grate, carrying unburned coal with it to the ashpit, and accumulating on the heating surface, thus causing additional labor and extra expense.

Sulphur in excess is penalized because its presence is believed to be a general indication of clinkering properties in coal. This indication is not always correct as fluxing materials other than those accompanying sulphur are usually contained in ash. The average method of analysis does not, however, determine these qualities, nor is it usually worth while to determine them.

There is much diversity of specifications, even for similar coals and similar plants, and there is need for some standardization of their form as well as the method of their application. The American Society for Testing Materials has taken up this matter within the past year, and has appointed a committee of nearly seventy members, consisting of representatives from some of the larger coal consumers, as well as from coal producing and selling companies. This committee expects to outline forms of specification that will cover the various industries besides steam plants who are users of coal, and also cover the methods of sampling and testing. Dr. J. A. Holmes, chairman of this committee, presented a preliminary report at the June, 1909, meeting of this society.

The committee hopes at some future time to furnish information regarding the burning and use of coal.

*Bulletin 325, U. S. Geological Survey.

TRAIN ACCIDENTS IN MAY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of May, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
2.	E. Paso & S. W.	Santa Rosa.	bc.	Ft. & Ft.	0	2
5.	Balt. & Ohio.	Clarksburg.	bc.	Ft. & Ft.	1	5
14.	St. L. & S. F.	Hugo, Okla.	bc.	Ft. & Ft.	0	6
16.	C., H. & D.	Cincinnati.	bc.	P. & P.	1	7
18.	Terminal R.R.	St. Louis, Mo.	xc.	P. & Ft.	0	6
20.	Bess. & L. E.	Queens Junctn.	rc.	Ft. & Ft.	0	4
24.	A., T. & S. Fe.	Belle Plaine.	bc.	Ft. & Ft.	2	0

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
6.	Pennsylvania	Pittsburgh.	boiler.	Pass.	1	5
12.	Pennsylvania	Kensington, O.	unx	Pass.	1	7
14.	K. C., M. & O.	Milton, Kan.	d. track.	Pass.	0	20
16.	La. Ry. & N. Co.	Scotland.	malice.	Pass.	2	0
16.	Union Pac.	Cheyenne Wells	wind.	Ft.	0	1
18.	Wabash	DeWitt, Mo.	cow.	Pass.	1	3
21.	M., K. & Tex.	Waxahachie	unx.	Pass.	0	4
23.	Southern	Catlett, Va.	unx.	Pass.	0	17
23.	Balt. & Ohio.	Columbus, O.	unx.	Pass.	0	4
23.	St. L. & S. F.	Rogers.	unx.	Pass.	3	32
24.	Norf. So.	Hertford.	unx.	Pass.	0	21
25.	Den. & Rio G.	Cucharos Jc.	d. track.	Pass.	0	14
29.	Lehigh Valley	Stull.	unx.	Pass.	2	30
30.	Southern	Sycamore.	unx.	Pass.	0	12
30.	Mobile & O.	Scooba.	ms.	Ft	2	1
31.	Union Pacific.	Ogallala.	b. rail.	Pass.	0	3

None of the accidents in the foregoing list can be called notable or particularly unusual. The butting collision at Cincinnati, on the sixteenth, occurred on a double-track road. One of the tracks was temporarily assigned to emergency use for the trains of another company and in the meantime the other one was operated as single track by the use of telephones. The operator at one end of the section, having control of the line, gave to the other operator authority for a clear signal when the track was not clear. The derailment at

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Kensington, Ohio, on the twelfth, is said to have occurred a moment after a severe application of the brakes, and the accounts seem to indicate that this was what caused the engine to run off the track. In the derailment of a passenger train at Dewitt, Mo., on the eighteenth, the private car of the superintendent of the road was overturned and fell down a bank, but its occupants were not seriously injured. The engineman was fatally scalded. At Cheyenne Wells on the sixteenth nine cars of a freight train were blown off the track by a high wind. The derailment at Stull, Pa., on the twenty-eighth, occurred at a switch leading to a side track remote from any station, and one of the cars was broken in two and fell down a bank. Two passengers in this car were killed. One of the accounts says that this switch had been tampered with, but the evidence to this effect does not appear to be conclusive.

One of the accidents which does not appear in our record, but which was of a kind that may occur more frequently in the future than in the past, is described in a press despatch from Edwardsville, Ill., as follows: "Five officers of the Louisville & Nashville Railroad were injured to-day [May 23] when the gasoline motor in which they were speeding towards Edwardsville was derailed by a dog near the Cahokia creek crossing."

The most prominent railway accident in May occurred on an electric line and so does not appear in our table. It occurred on the Illinois Traction lines at Lovelace, Ill., seven miles south of Carlinville, at 3 o'clock on the morning of the twentieth. It was a butting collision between a northbound train consisting of a single sleeping car, and a southbound train consisting of a motor car drawing two freight cars loaded with whiskey. This southbound train ran past the side track where it should have met the northbound. The wreck was set afire by the short-circuiting of the electric current and was burned so quickly that the five passengers in the sleeping car had barely time to escape. The conductor and motorman of the southbound train were probably killed instantly. Their bodies were burned up. The line of road at this point is straight, or nearly straight, and the fact that the southbound train ran past the side track was seen by the motorman of the northbound, and he had brought his car nearly to a stop.

Eight other accidents were reported on electric lines in the month of May, three of them being attended with fatal results. In one case, near Springfield, Ohio, a freight car broke away from the rear of a train ascending a grade and ran back into a passenger car. In a butting collision near Oakland, Cal., two passengers were killed and 50 were injured.

STANDARD SPECIFICATIONS FOR CONCRETE REINFORCEMENT BARS.

Adopted, 1910, by The Association of American Steel Manufacturers, Pittsburgh, Pa.

MANUFACTURE.

1. Steel may be made by either the open-hearth or Bessemer process. Bars shall be rolled from billets.

CHEMICAL AND PHYSICAL PROPERTIES.

2. The chemical and physical properties shall conform to the limits given in the accompanying table.

CHEMICAL DETERMINATIONS.

3. In order to determine if the material conforms to the chemical limitations prescribed in paragraph 2 herein, analysis shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt or blow of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector.

YIELD POINT.

4. For the purposes of these specifications, the yield point shall be determined by careful observation of the drop of the beam of the testing machine, or by other equally accurate method.

FORM OF SPECIMENS.

5. (a) Tensile and bending test specimens may be cut from the bars as rolled, but tensile and bending test specimens of deformed bars may be planned or turned for a length of at least 9 in. if deemed necessary by the manufacturer in order to obtain uniform cross-section.

(b) Tensile and bending test specimens of cold-twisted bars shall be cut from the bars after twisting, and shall be tested in full size without further treatment, unless otherwise specified as in (c), in which case the conditions therein stipulated shall govern.

(c) If it is desired that the testing and acceptance for cold-twisted bars be made upon the hot rolled bars before being twisted, the hot rolled bars shall meet the requirements of the structural steel grade for plain bars shown in this specification.

NUMBER OF TESTS.

6. At least one tensile and one bending test shall be made from each melt of open-hearth steel rolled, and from each blow or lot of ten tons of Bessemer steel rolled. In case bars differing ⅜ in. and more in diameter or thickness are rolled from one melt or blow, a test shall be made from the thickest and thinnest material rolled. Should either of these test specimens develop flaws, or should the tensile test specimen break outside of the middle third of its gaged length, it may be discarded and another test specimen substituted therefor. In case a tensile test specimen does not meet the specifications, an additional test may be made.

(d) The bending test may be made by pressure or by light blows.

MODIFICATIONS IN ELONGATION FOR THICK MATERIAL.

7. For bars less than $\frac{7}{8}$ in. and more than ¾ in. nominal diameter or thickness, the following modifications shall be made in the requirements for elongation:

(e) For each increase of ⅛ in. in diameter or thickness above ¾ in. a deduction of 1 shall be made from the specified percentage of elongation.

(f) For each decrease of $\frac{1}{8}$ in. in diameter or thickness below $\frac{7}{8}$ in. a deduction of 1 shall be made from the specified percentage of elongation.

(g) The above modifications in elongation shall not apply to cold-twisted bars.

NUMBER OF TWISTS.

8. Cold-twisted bars shall be twisted cold with one complete twist in a length equal to not more than 12 times the thickness of the bar.

FINISH.

9. Material must be free from injurious seams, flaws or cracks, and have a workmanlike finish.

VARIATION IN WEIGHT.

10. Bars for reinforcement are subject to rejection if the actual weight of any lot varies more than 5 per cent. over or under the theoretical weight of that lot.

	Structural steel grade.		Hard grade.		Cold-twisted bars.
	Plain bars.	Deformed bars.	Plain bars.	Deformed bars.	
Phosphorus, maximum: Bessemer	.10	.10	.10	.10	.10
Open-hearth	.06	.06	.06	.06	.06
Ultimate tensile strength, lbs. per sq. in.	55,000 to 70,000	55,000 to 70,000	80,000 min.	80,000 min.	Recorded only
Yield point, minimum, lbs. per sq. in.	33,000	33,000	50,000	50,000	55,000
Elongation, per cent., in 8-in. minimum	1,400,000	1,250,000	1,200,000	1,000,000	5 per cent.
	T. S.*	T. S.*	T. S.*	T. S.*	
Cold bend without fracture:					
Bars under ¾-in. in diameter or thickness	180° d. = 1t.	180° d. = 1t.	180° d. = 3t.	180° d. = 4t.	180° d. = 2t.
Bars ¾-in. in diameter or thickness and over	180° d. = 1t.	180° d. = 2t.	90° d. = 3t.	90° d. = 4t.	180° d. = 3t.

*Tensile strength. NOTE.—The high-grade will be used only when specified.

General News Section.

The Lehigh Valley is to put portable telephones on its passenger trains, with "fish poles" to connect with the line wires at any point on the road.

The Chicago & Alton and the Missouri, Kansas & Texas, now both "Hawley roads," are running sleeping cars through between Chicago and Galveston.

Edward A. Moseley, secretary of the Interstate Commerce Commission, has received from Notre Dame University, Notre Dame, Ind., the honorary degree of Doctor of Laws.

General Manager Dice, of the Philadelphia & Reading, has agreed with representatives of the conductors and trainmen to increase their wages from 6 per cent. to 20 per cent.

Justice William H. Moody, of the supreme court of the United States, is to retire before the end of the present year, continued ill health making it impossible for him to attend to his duties.

At Harrisburg, Pa., E. M. Rader, 22 years old, has been sentenced to two and a half years' imprisonment for stealing wires from automatic block signals and thereby stopping trains.

In the federal court at Chicago this week the Illinois Central was indicted by the grand jury for violation of a public tariff, and the Pennsylvania Company was indicted for destroying waybills of shipments of freight consigned to the Illinois Steel Co.

The Great Northern and the Pullman companies have asked the Interstate Commerce Commission for a rehearing of the case in which their rates for berths were ordered reduced. The Great Northern desires to present detailed statements of the receipts and expenses of sleeping car lines.

The Boston & Maine has increased the pay of its clerks who are members of the Brotherhood of Railway Clerks, granting, according to newspaper reports, the sum of $72,000 to be distributed among the clerks according to the wishes of the committee of the brotherhood. It is said that the average increase will be about 25 cents a day.

President Ripley, of the Atchison, Topeka & Santa Fe, said last week that his company would suspend work on all improvements and extensions so far as this could be done without causing a greater loss than would be incurred by keeping on. President Willard, of the Baltimore & Ohio, says that his road has not countermanded any orders for improvements.

Reports from the City of Mexico say that the National Railways of Mexico—that is, the Government of the republic—will soon acquire the Pan-American, which recently came under the control of D. E. Thompson. The *Mexican Herald* says that the Tehuantepec National and other roads will soon be acquired, so as to make a complete governmental system, leaving out only the Mexican Railway and the lines controlled by the Southern Pacific.

The Pennsylvania has in service on its lines, or on order, nearly 2,000 passenger cars of all-steel construction. These cars have been added to the company's passenger equipment since June, 1906, when it was announced that all future additions to passenger equipment would be of all-steel construction. The lines on which steel cars will be operated, include the lines east and west of Pittsburgh and Erie, the Long Island, the Cumberland Valley, the New York, Philadelphia & Norfolk, the Vandalia and the Grand Rapids & Indiana.

At Knox, Albany county, N. Y., recently, 31 trespassers were arrested in a bunch for stealing coal from cars of the Delaware & Hudson. It is said that these trespassers, who are foreigners employed in a stone quarry, had become so bold that they would display signals to stop coal trains and would be on hand in such large numbers that before the train could be again started they would pull several tons of coal off the cars. Of the 31 persons arrested 13 were fined $10 each, 12 were held for the grand jury and six others were allowed to go on suspended sentences.

All the through passenger trains of the Burlington are now electric lighted throughout, from locomotive to observation platform. Seventy-two complete trains and practically all the reserve passenger equipment of the entire Burlington system have been equipped, including locomotives, baggage cars, mail cars, coaches, chair cars, dining cars, sleeping cars and observation cars. No such extensive and costly improvement of coach lighting has been attempted before. These electric-lighted trains run between Chicago, St. Louis, St. Paul, Omaha, Kansas City, Denver, Billings, Spokane, Seattle, Tacoma and Portland. The dynamo system is used, a dynamo in the baggage car of each train. An electrician is on duty on each train for its entire run.

The Canadian Pacific has agreed with its telegraphers to make an increase of pay which, it is said, will average $5 a month for each operator.

Officers of the Pennsylvania, following protracted negotiations, have sent to the committees of their Brotherhood employees revised schedules of wages, but neither the road nor the employees will give any information as to the amounts of the proposed or desired increases.

Messrs. Knapp and Neill, government mediators, were called in last week to consider disputes between a number of railways of the southeastern states and their conductors and trainmen. These employees have been demanding large increases in pay, and it is said, have lately threatened a strike unless the companies acted promptly. The mediators have also been asked to take up questions concerning wages between the Gulf & Ship Island and its telegraphers.

Railway Matters in Washington.

Washington, June 22, 1910.

The administration railway bill was passed in short order. The conference report was adopted in the Senate last Friday evening without modification, after a discussion of about six hours. The discussion brought out nothing new. The vote on adoption was 50 to 11. Senator Newlands, of the conference committee, who represented a minority report, simply complained that the majority of the conference committee held conferences and agreed on their final course before allowing the minority to have anything to say. The House discussed the bill for about six hours on Saturday, but the representatives, like the senators, simply thrashed over old straw and adopted the bill as it stood. The final vote consisted of such a longdrawn out volume of "ayes" that the very few Democrats who voted against it were scarcely heard. Representative Adamson, of Georgia, the senior minority member of the house committee on interstate commerce, protested against the passage of the law on the ground that it still contained "the initiation of a pernicious system of stock and bond regulation and the creation of a commerce court, a useless and foolish travesty on jurisprudence and an unconstitutional mutilation of our judicial system. The bill still gives to the attorney general, though in a modified form and degree, control of litigation." [A precis of the law will be found in another column.] The following sections which had been passed by one house or the other were left out: (1) That permitting traffic agreements; (2) that permitting one railway to purchase stock of another already controlled; (3) to make physical valuation of railways; (4) authorizing federal regulation of stock and bond issues.

It is announced that President Taft will not appoint the judges for the commerce court until next December. He holds that a federal judge should not sit on the bench until his appointment has been confirmed by the Senate.

Among the appropriations made by the present Congress are one of $200,000 to the Department of Justice for the prosecution of violations of the anti-trust law, and one of $30,000 to enable the Department of Agriculture to see if a substitute can be found for spruce timber for the manufacture of paper.

Congress has passed a bill authorizing an issue of bonds

to the extent of $20,000,000 to facilitate prompt completion of irrigation projects already undertaken.

The proposed law to regulate the issuance of bills of lading is said to have no prospect of passage at the present session of Congress, but the committee has continued to hold hearings and the railways have presented their objections. Roberts Walker told the committee that the bankers and cotton shippers were trying to use railway capital to guarantee bills of lading for their own benefit. He presented figures showing that on the Rock Island only 20 in a hundred of the bills of lading issued were made out to shipper's order, and of these 20 only 3 per cent. are used as a basis of credit. G. W. Neville, of the New York Cotton Exchange, arguing in favor of the bill, said that the sum of $8,000,000 was lost by consignors through fraudulent bills of lading in one year.

Railways Still Breathing.

The railways of this country are not going into bankruptcy; they are not in any general sense going to reduce their dividends even if, as it now appears entirely improbable, the Interstate Commerce Commission should refuse to permit a considerable advance in freight rates. It is highly important to bear in mind that future expansion deals primarily with local traffic, so far as the freight business is concerned. This traffic is not concerned with interstate rates and is a traffic that must, as a result of the development of the country, increase by leaps and bounds from year to year. The great highways of commerce have rights of way which are becoming increasingly valuable, and the railway problem, in a word, has a particularly bright side that seems entirely overlooked in the spread of the current wave of pessimism.—*Journal of Commerce.*

New Engineering Laboratories at Lehigh University.

On June 11 last the new Fritz engineering laboratory and the Eckley B. Cox mining laboratory were formally opened. The following description of these new buildings in taken from the Lehigh University Register, 1910:

Fritz Engineering Laboratory.—John Fritz, a member of the Board of Trustees of Lehigh University ever since its foundation, has recently donated the funds for the erection and thorough equipment of an engineering laboratory. The building was designed by Mr. Fritz and erected under his personal supervision. It is equipped with a general testing section for testing iron and steel, a cement and concrete section and a hydraulic section. The equipment will be used by the civil engineering department as an aid to the instruction of those students in any department who take the courses in strength of materials, hydraulics, and cement.

The building is of steel frame construction, 94 ft. wide and 115 ft. long, with the main central section 65 ft. high and two side sections of lesser height. The exterior walls which enclose the steel frame are of cement, brick lined on the inside. A 10-ton electric traveling crane serves the central portion of the building. The general testing section is equipped with an 800,000-lb. Riehlé vertical screw testing machine, capable of testing columns up to 25 ft. long, tensile specimens up to 20 ft. long and transverse specimens up to lengths of 30 ft.; an Olsen universal testing machine of 300,000-lb. capacity; smaller machines for ordinary tension, compression, transverse and torsion tests; a complete road materials testing equipment, and a small machine shop. The hydraulic section occupies the easterly end of the main room and is equipped with various tanks, weirs, pumps and other hydraulic apparatus. The cement and concrete section has one large room for making and testing specimens and one room for storage of materials.

Eckley B. Cox Mining Laboratory.—This building is of dressed sandstone. It is 100 ft. long by 75 ft. deep, one story high in front, with a raised floor in the rear. The main part of the building contains the ore-dressing laboratory, 40 ft. x 70 ft.; the western wing contains a chemical laboratory, an assaying room and a shop, and the east wing contains the office and a recitation room.

The equipment, made by the Allis-Chalmers Co., Milwaukee, Wis., consists of gyratory crusher, rolls, screens, jigs, Huntington mill, classifiers, concentrators (table and ranner), gravity stamps, copper plates, grinding pan and cyanide plant, with the necessary apparatus. This machinery will be driven by five separate motors and any one part or all of it can be operated at will, thus enabling experimental studies and tests to be made of individual machines or groups of machines, or of an entire process.

Receiver Appointed for Blue Island Car Company.

Charges of fraud are made in a petition for a receiver filed to-day by the Illinois Central aaginst the Blue Island Car & Equipment Co. Judge Windes appointed the Chicago Title & Trust Co. receiver.

Other defendants named in the petition are J. E. Buker, William Renshaw, O. S. Keith and J. M. Taylor, all formerly employed by the Illinois Central, and H. C. Ostermann, and F. H. Niles.

The petition charges that the Blue Island Car & Equipment Co. has no assets other than those out of which the Illinois Central has been defrauded. It is charged that Messrs. Ostermann and Niles conspired with Mr. Buker and the others named to form a corporation, the car and equipment concern, to defraud the railway. Later the business was turned over to a company known as F. H. Niles & Co., the latter later changing its name to the Blue Island Rolling Mill & Car Company. The bill charges that the Blue Island Rolling Mill & Car Company owes the Illinois Central $600,000 and is without adequate assets.

Motor Versus Mules in Virginia Mountains.

A lot of coal, weighing 18 tons, was recently carried from the tracks of the Southern Railway at Culpeper, Va., to Sperryville, twenty miles, on a three-ton motor truck in two and a half days, six trips being made. In the past it has taken a good six-mule team two weeks to accomplish the same work. The road is a good, hard one, but it leads into a mountainous country and has many long and heavy grades. The experiment was made by the C. C. Smoot Sons Company, which runs a tannery at Sperryville. So satisfactory were the results that the company has bought a truck and will hereafter use it in carrying coal and hides to the tannery and taking its products to the market.

Disastrous Collision at Villepreux, France.

In a rear collision of passenger trains at Villepreux, France, on Saturday last 19 persons were killed and 30 injured. A local train standing at the station was run into at the rear by a following express train. The wreck took fire and one of the trains was entirely consumed.

Demurrage Managers' Convention.

The 21st annual meeting of the American Association of Car Demurrage Officers was held at Omaha, Neb., June 17, President M. C. Shields in the chair. A majority of the 35 car demurrage bureaus or associations of the country were represented. The president made no formal address. After roll call the secretary presented his usual address, confining his remarks mainly to a recital of the principal events in the demurrage world which have occurred since the last annual meeting, namely, the adoption of the National Code of Car Demurrage rules by the National Association of Railway Commissioners, approved by the Interstate Commerce Commission and adopted and recommended by the American Railway Association and adopted by most of the car demurrage bureaus of the country.

J. F. Roach, manager of the Central Car Demurrage Bureau, St. Louis, read a paper entitled "The Industrial Line," in which he advocated the importance of some time allowance to be given to the minor railways for switching. It was the consensus of opinion of the members present that some arrangement for this could be agreed upon between the carriers and the minor roads.

The most of the time was devoted to the interchange of views concerning the practices of the different managers in

relation to the application and construction of the uniform demurrage rules and explanations recommended by the American Railway Association.

J. F. Roach, of St. Louis, Mo., was elected president for the ensuing year, and I. R. Tuyl, manager of the Western Car Demurrage Bureau, Omaha, vice-president. A. G. Tromason, Scranton, Pa., was re-elected secretary and treasurer. Niagara Falls, N. Y., was selected as the place for the next annual meeting, which is to be held June 20, 1911.

American Street and Interurban Railway Manufacturers' Association.

Convention Circular No. 2 announces that for the 29th annual convention to be held at Atlantic City, N. J., October 10-14, 1910, the Manufacturers' Association has again secured the use of Young's Million Dollar pier for exhibit purposes. Alterations have been made to the pier, and for the coming convention there will be available upwards of 70,000 sq. ft. of exhibit space, arranged so as to present an excellent layout, with all spaces practically of equal importance as far as location is concerned. The executive committee has fixed the rate for this year at 30 cents per sq. ft., which price includes light, electric power, etc., with booths complete ready to receive exhibits. The exhibit committee is preparing a diagram showing the arrangement of the exhibit space, copy of which will be forwarded to each member, together with full detailed information concerning the exhibits; also an application blank for space. A circular containing information regarding hotel rates is also being prepared and will be issued within a short time.

The Street Railway Association has increased its membership to over 350 member companies, included among which are some of the most prominent steam roads that are electrifying parts of their systems. This increased membership will naturally result in a great increase in the number of railway officers attending the convention.

Roadmasters and Maintenance of Way Association.

The twenty-eighth annual convention will be held at Chicago, September 13-16, 1910. Following are the subjects to be discussed and the commitees of each:

"Proper Care of Track Material and Tools." A. Hensen, chairman, C. & N. W., Green Bay, Wis.; J. W. McManama, B. & M., Waltham, Mass.; James Sweeney, C. & E. I., Danville, Ill.; M. Lumm, Wabash, Montpelier, Ohio; C. H. Cornell, C. & N. W., Antigo, Wis.

"Cattle Guards."—C. J. Muschott, chairman, Benton Harbor, Mich.; M. McFadden, C. & N. W., Marinette, Wis.; James Ryan, Jr., C. & E. I., Villa Grove, Ill.; M. H. Connolly, C. N., Van Wert, Ohio; B. F. Brown, B. & M., Lydonville, Vt.; Charles Newberg, C. & N. W., Eagle Grove, Iowa.

"New and Improved Appliances Including Ties." L. Lawler, chairman, Southern Pacific, Lafayette, Ind.; L. C. Ryan, C. & N. W., Baraboo, Wis.; E. P. Safford, L. S. & M. S., Adrian, Mich.; B. A. West, A., T. & S. F., Pueblo, Colo.; John Nugent, C., R. I. & P., Iowa City, Iowa; John Mulvoy, M. & O., Meridian, Miss.

"Standard Switch Targets."—J. M. Meade, chairman, A., T. & S. F., Topeka, Kan.; M. Hermans, C. & N. W., Green Bay, Wis.; W. H. Putcamp, U. P., Omaha, Neb.; J. G. Hutchison, C., R. I. & P., Herrington, Kan.; F. D. Harrigan, P. M., Saginaw, Mich.; A. Clough, N. Y. C. & H. R., Batavia, N. Y.

"Rail Fastenings Including Insulated Joints."—Thomas Thompson, chairman, A., T. & S. F., Joliet, Ill.; W. A. Brandt, C. & N. W., Clintonville, Wis.; John Heshion, Mo. Pac., Concordia, Kan.; Tilman Burket, Penn. R.R., Bedford, Pa.; M. Foley, B. & O., Myersdale, Pa.; C. E. Boone, B. & A., Houlton, Me.

"Tie Plates and Rail Anchors."—L. C. Ryan, chairman, C. & N. W., Baraboo, Wis.; F. E. Sampson, B. & M., Concord, N. H.; J. O'Leary, C. & A., Joliet, Ill.; P. J. McAndrews, C. & N. W., Belle Plaine, Iowa; Warren Peachy, E. & T. H., Evansville, Ind.; John Boland, U. P., Lawrence, Kan.

Paper on "Treated Timber," by J. L. Single, Newark, N. J.

Paper on subject to be selected by himself by W. M. Camp, Chicago.

Topical questions for discussion: "Dressing of Gravel Ballasted Track," "Paving of Ditches," "Length and Size of Ties," "How to Drain the Midway of Double Track Whether by Surface Ditches or by Tile Drains," "Should the gage on curves be Readjusted to the side of the Rail Head and by Moving which Rail," "Quality of Track Labor."

Committee of Arrangements: W. E. Emery, chairman, Peoria, Ill.; A. E. Hansen, C. & N., Green Bay, Wis.; W. M. Camp, *Railway and Engineering Review*, Chicago.

Baggage Agents.

The American Association of General Baggage Agents held its annual meeting in Detroit last week. The president for the ensuing year is W. M. Skinner, of the New York Central; secretary (re-elected), J. E. Quick, Grand Trunk, Toronto. The meeting next year will be held at San Antonio, Tex., February 15.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues.; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASS'N.—H. C. Donecker, 29 W. 39th St., New York; Oct. 10-14; Atlantic City.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
CANADA.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; annual, Sept. 13-16; Chicago.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago.
TRANSPORTATION CLUB OF TOLEDO.—L. G. Macomber, Woolsen Spice Co., Toledo.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The trunk lines have notified the New York State Public Service Commission that certain increases of rates, which had been announced to go into effect in July, have been postponed because of the postponement of increases in certain interstate rates by reason of action at Washington.

The Colonial Navigation Co., advertising itself as the only independent line between New York and New England, is now running the screw steamers, "Concord" and "Lexington," between New York and Providence; fare between New York and Boston, $2.65; New York and Providence, $1.75.

The Legislature of New York has appropriated $600,000 to be used under the authority of the Public Service Commission for the abolition of grade crossings. Under the New York law improvements of this kind are usually paid for by the railway, the town and the state jointly, the state paying one-fourth of the total cost.

The railways hauling coal to Chicago have sent to the Illinois State Railroad Committee a defense of their proposed increase of ten cents a ton in the rates from Indiana and Illinois mines. They show that the rates on coal are 40 per cent. less than those on other freight, and that in many cases the revenue is barely equal to the cost, and in some cases perhaps less than the cost.

An officer of the Southern Railway says that manufacturers situated on that company's line in Virginia now produce 300 barrels of agricultural lime daily, and soon will be able to furnish 5,000 barrels daily. Extensive areas of land in the southern states have been greatly improved by the use of lime, in addition to ordinary fertilizers, and the industrial department of the road is endeavoring to disseminate information as to the value of lime on lands lacking nitrogen.

E. B. Thomas, president of the Lehigh Valley, has issued a statement explaining the refunding of demurrage charges by his road to the Bethlehem Steel Company, which has been declared illegal by the federal court in a suit tried at Philadelphia. Mr. Thomas says that the bills in question extended over a period of five years, and that after long negotiations the road had agreed to the steel company's view that certain charges had been erroneously assessed. The Bethlehem Steel Co. had complained that the rules applying at Bethlehem were less favorable than those at other steel works, and the road, finding this contention correct, changed the rules. The action of the road was approved by the demurrage bureau and by its own legal department.

The State Railroad Commission of Indiana now issues tariff bulletins monthly. The form is somewhat similar to that issued weekly by the Public Service Commission of the Second district of New York, but in the last Indiana issue seven pages are filled with advances in rates on coal, C. L., arranged in tabular form, somewhat as in ordinary tariffs. Many or most of the coal carriers of the state have advanced their rates but not all the changes are shown in these tables. A lot of 70-cent rates are advanced to 80 cents per net ton; a lot of rates for shorter distances are advanced five cents a ton, and a large group of rates which were $1.20 are advanced to $1.28. From the Linton district, on the Southern Indiana, to certain points on the Big Four the rate per net ton is raised from $1.05 to $1.33, an increase of 28 cents, which is the largest increase that we notice. These increases on coal were originally filed as to take effect July 1, but, by permission of the commission, they have now been changed and they will take effect July 25.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 74, covering car balance and performance for February, 1910, says:

"February reports show a marked improvement over the two

CAR BALANCES AND PERFORMANCES IN FEBRUARY, 1910.

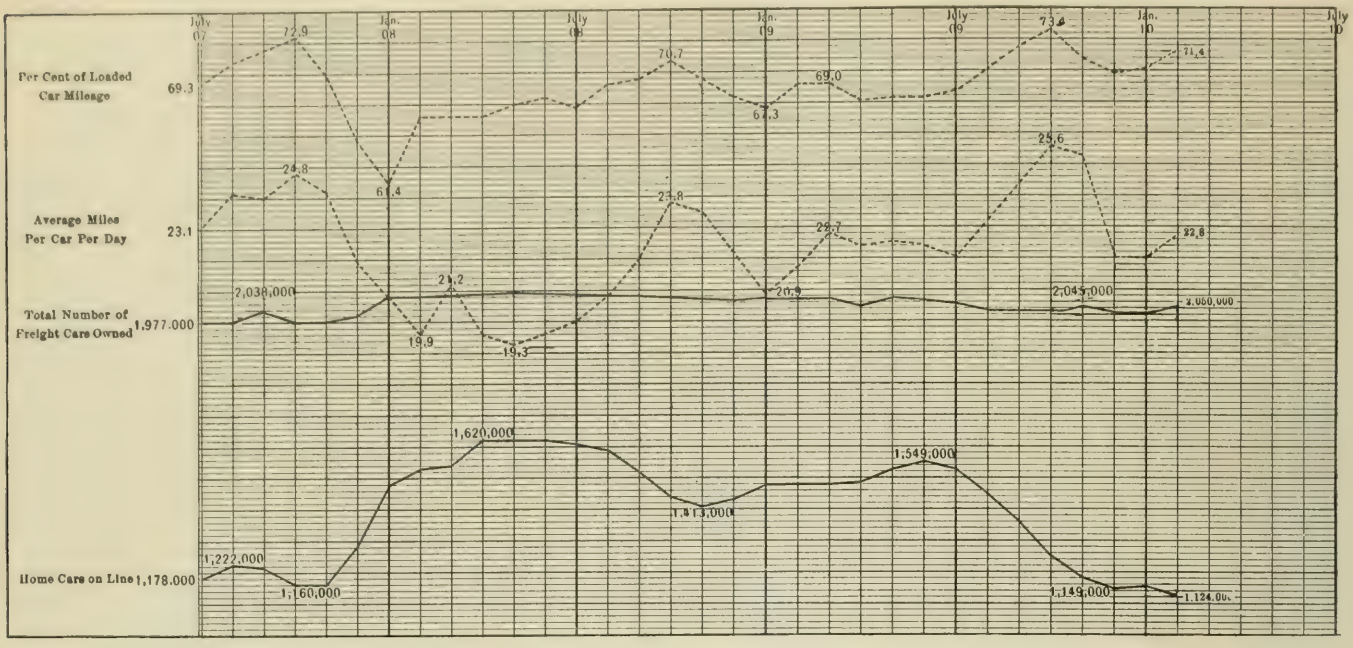
	New England.	New York, New Jersey, Del., Md., Penn. & Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex	Oregon, Idaho, Nev., Cal., Arizona	Canadian Lines	Grand total
Revenue freight cars owned	76,432	676,047	215,716	159,781	175,228	340,515	17,074	134,877	28,115	117,730	101,029	2,050,844
Average number of steam cars on line	39,107	368,446	107,825	90,149	83,980	220,920	5,978	74,669	18,284	57,018	68,634	1,123,910
Railroad owned cars on line	40,598	286,125	95,636	62,931	70,328	183,018	15,646	60,235	19,491	36,980	24,487	911,876
Per cent. cars on line to total owned												
Loads	79,915	661,973	200,861	157,180	141,808	105,393	21,621	131,904	38,173	111,025	88,121	2,095,626
Empty	2,483	.....	.....	.....	.....	68,423	4,550	17	9,760	.....	.....	.....
Per cent. cars on line to total owned												
Home	52	53	50	56	48	65	34	55	65	45	63	59
Foreign	53	42	44	36	40	54	92	45	69	48	54	44
All railroads	105	95	94	92	88	119	126	100	134	93	117	103
Private cars on line	3,339	10,450	10,934	3,922	6,862	17,086	1,451	6,583	2,651	3,659	3,981	104,190
Total, all cars on line	83,254	688,022	211,795	160,702	161,476	421,023	23,078	141,487	40,826	121,684	91,102	2,199,816
Per cent. of cars in shop	3.80	5.45	5.61	3.56	7.25	3.99	3.98	9.70	4.98	4.49	3.49	5.37
No. of freight engines owned	1,139	10,100	2,780	2,992	2,589	5,468	462	2,575	815	2,337	2,484	34,427
Av. cars on line per freight engine owned	64	68	76	51	62	77	30	55	50	52	37	63
Total freight car miles	36,810,035	301,399,817	128,977,181	113,787,913	107,771,923	216,189,460	24,161,131	82,947,071	29,304,603	101,988,029	70,961,950	1,361,852,237
Average miles per car per day	26.6	23.6	21.7	25.3	23.9	18.5	22.7	21.8	25.8	29.8	27.7	23.8
Per cent. loaded mileage	69.2	68.1	73.4	68.7	74.1	73.9	74.1	74.1	68.8	70.8	80.8	74.1
Total miles of freight, inc. to freight engine owned	1,032,000	8,614,766	3,683,605	3,251,026	3,079,198	6,176,013	690,175	2,370,202	837,303	2,913,715	2,027,484	38,910,000
Average train miles, including to freight	14.5	16.6	16.8	15.6	15.3	18.1	17.9	15.1	12.4	15.6	14.1	16.2
Per car mile	2.83	2.40	2.29	2.23	2.18	2.46	2.31	2.21	1.80	2.26	1.87	2.27
Per loaded car mile	3.63	3.45	3.29	3.28	3.05	3.41	3.24	3.06	2.72	3.25	2.65	3.26
Per car per day	186	398	383	365	365	351	324	336	221	460	418	376
Gross freight earnings	$4,950,000	$42,875,190	$11,775,231	$10,786,211	$10,501,499	$22,300,296	$2,708,301	$8,383,414	$3,087,749	$12,929,101	$9,696,109	$138,491,020
Average daily earnings Per car owned	8.31	8.27	8.97	8.29	8.26	8.24	8.77	8.15	8.87	8.93	8.41	8.39
Per railroad car on line	2.71	2.88	2.99	2.95	2.60	1.97	1.96	2.19	2.58	2.65	2.05	2.41
All cars on line	2.12	2.54	1.88	2.40	2.39	1.89	1.27	2.08	2.72	3.80	2.66	2.30

preceding months in all the performance items. The car balance figures denote considerable activity in freight car interchange during the month, the cars on home lines having decreased to 55 per cent., but one point higher than the average for April, 1907, which was the lowest of which there is any record.

"There was a decrease in the shop percentage, which averaged 5.37 per cent., the lowest figure since November, 1907.

"The miles per car per day averaged 22.8. The tons per loaded car made a new record mark of 22.7, which in connection with a loaded car mileage of 71.4 per cent. produced an average of 16.2 tons per car-mile, loaded and empty. The ton-miles per car per day averaged 376, the average exclusive of idle cars being 9 points higher. The average daily earnings were $2.30 per car, an increase of 11 cents over the January figure."

The accompanying charts show the important averages of car balance and performance from July, 1907, to date. We give that part of the bulletin table which shows the totals and averages for the groups.

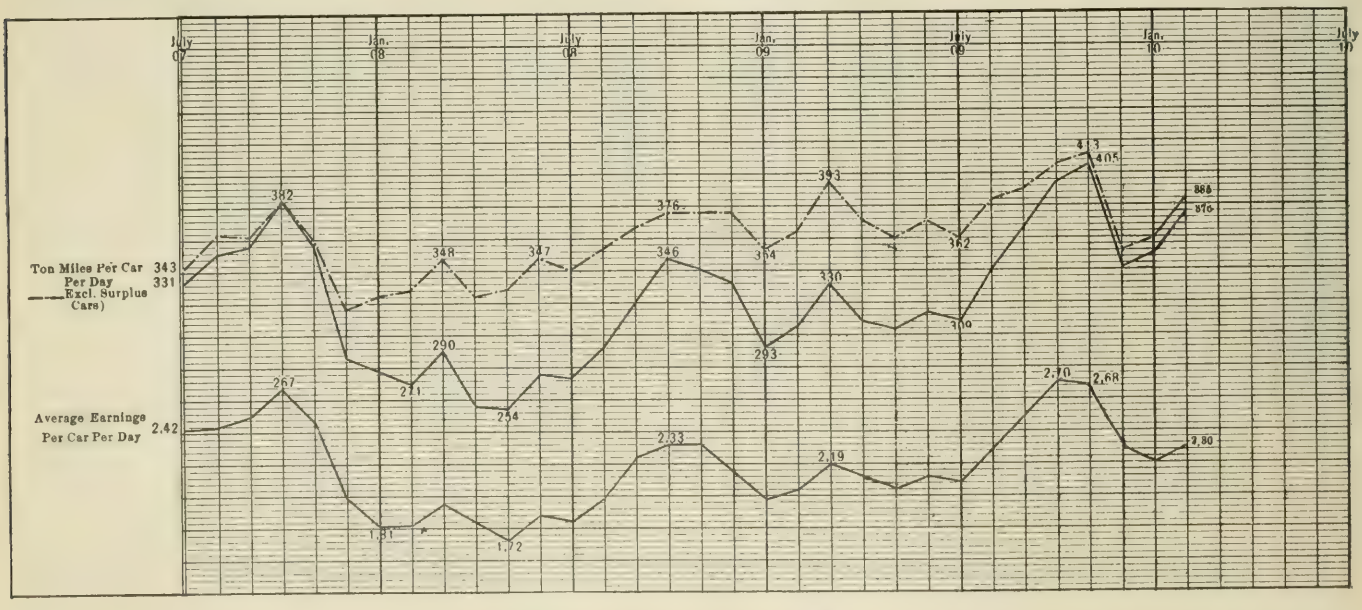


Car Balance and Performance.

Foreign Bankers and Bills of Lading.

The efforts of a committee of bankers to secure a federal law regulating bills of lading have been noticed in a previous issue. Lewis E. Pierson, speaking for the bankers, says that the recent swindles in bills of lading have so shaken the confidence of bankers in England and Germany that there is danger of serious difficulty in moving the crops the coming fall. He believes that in the case of the Albany failure the railway agent signed bills of lading in blank before receipt of the goods. In shipments to this same firm the agents surrendered the grain without taking up the bills of lading, the dates of which were then altered and the instruments used as collateral for loans. Continuing, he says:

"In the case of the two southern failures it is claimed that the bills of lading involved were forgeries, but the evidence shows that it was the custom of the railroads where the firms were located to allow several different employees to sign the same agent's name to the instruments. It has been definitely ascertained that some of these so-called 'forged' bills were



Car Loading and Earnings.

issued for goods the agents never received. In other cases two or three bills appear outstanding against the same shipment. Occurrences of this sort are so general as to lead to the belief that in many cases these practices have taken the place of rebates as a means of retaining the business of favored shippers. A good part of the $10,000,000 losses sustained in these three recent failures will fall on foreign bankers who had accepted drafts accompanied by worthless bills of lading."

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 73, giving a summary of shortages and surpluses by groups from January 20, 1909, to June 8, 1910, says:

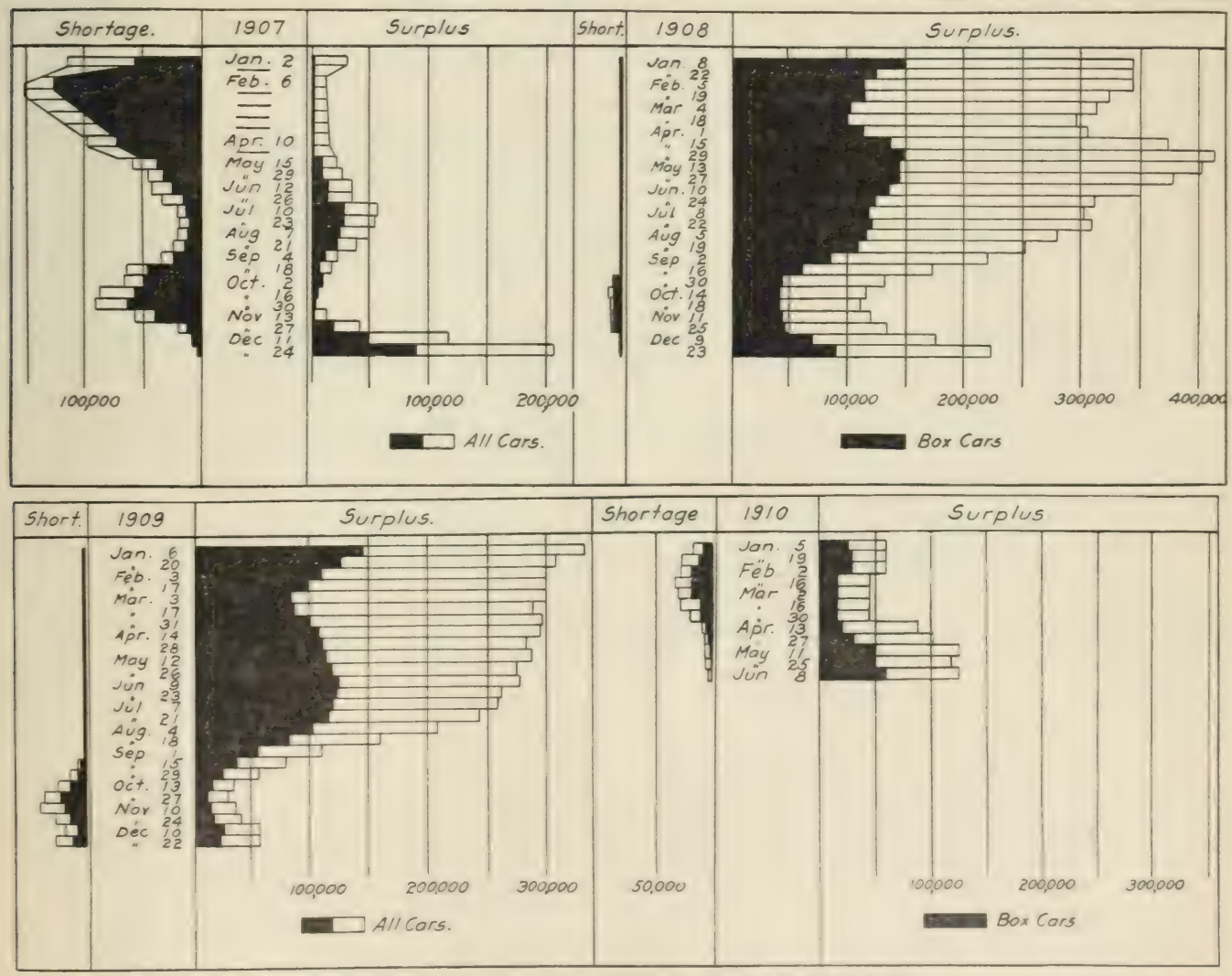
"This report shows an increase in the surplus of 14,118, making a total of 129,508. Of this increase, 7,811 are box cars and 5,629 miscellaneous, the latter being composed chiefly of coke cars in Group 2 (Eastern), and stock cars in Group 6 (Northwestern). The total surplus of coal cars is about stationary, although there are some changes in the group figures, Group 3 (Central) showing a reduction and Group 4 (North Atlantic) an increase."

The accompanying table gives surpluses and shortages by groups on June 8, and the charts show total surpluses and shortages in 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—June 8, 1910	8	141	.....	437	182	760	150	240	56	15	461
" 2.— " 8, 1910	22	9,413	220	4,455	14,750	28,838	.....	.....	37	2	39
" 3.— " 8, 1910	24	17,445	654	8,060	3,912	30,071	31	70	210	23	334
" 4.— " 8, 1910	10	2,273	37	2,653	1,474	6,437	50	427	600	30	1,107
" 5.— " 8, 1910	21	2,576	206	1,794	952	5,528	48	169	2	10	229
" 6.— " 8, 1910	19	6,737	384	3,983	5,756	16,810	289	.....	16	103	418
" 7.— " 8, 1910	4	1,053	67	96	559	1,775	.....	.....	.....	.....	.....
" 8.— " 8, 1910	14	7,854	500	6,324	3,453	18,131	3	3	22	3	31
" 9.— " 8, 1910	9	2,178	350	214	832	3,574	.....	.....	.....	1	1
" 10.— " 8, 1910	23	4,544	1,126	2,275	6,320	14,265	50	20	39	15	124
" 11.— " 8, 1910	5	1,923	5	60	1,331	3,319	253	14	.....	.....	267
Grand total	159	56,137	3,499	30,351	39,521	129,508	884	943	982	202	3,011

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, and North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1910.
(See also issues of June 10 and 17.)

Name of road.	Mileage operated at end of period.	Operating revenues			Maintenance		Operating expenses				Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decrease) compared with last year.
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Alabama & Vicksburg	143	$86,673	$34,874	$131,226	$23,311	$17,222	$4,158	$43,138	$5,768	$93,597	$37,629	....	$4,500	$33,129	$1,211
Alabama Great Southern	309	252,840	90,057	375,589	44,207	64,342	10,645	119,157	8,751	247,102	128,487	1,091	11,522	115,874	18,933
Bessemer & Lake Erie	201	525,572	20,887	555,079	55,357	105,653	7,260	133,417	7,303	308,990	246,089	....	6,000	240,089	102,594
Central New England	278	235,021	25,949	276,504	42,759	26,505	1,452	79,796	4,358	154,870	121,634	....	11,700	110,134	1188
Chicago & Alton	998	543,861	314,796	945,770	87,824	108,426	37,589	386,039	33,397	653,275	292,495	5,592	49,000	237,903	67,316
Chicago & Erie	269	307,859	64,039	403,791	40,163	93,522	17,894	183,470	7,660	342,709	61,082	....	10,938	50,144	3,859
Chicago, Indiana & Southern	329	273,815	19,697	309,712	51,630	63,741	7,738	114,676	7,844	245,629	64,083	141	13,500	50,442	20,356
Chicago, Indianapolis & Louisville	616	349,905	119,374	516,891	59,313	74,236	15,001	169,945	14,697	333,192	183,699	....	26,200	157,499	28,465
Chicago, Milwaukee & Puget Sound	1,466*	1,150,284	123,503	1,292,899	45,316	126,208	31,873	441,640	9,149	654,186	638,713	4,800	22,560	620,953	.
Chicago, Milwaukee & St. Paul	7,511	3,916,456	1,147,035	5,480,335	699,719	656,383	49,508	2,393,498	101,563	3,900,671	1,579,664	1,791	216,040	1,365,415	72,570
Cincinnati, New Orleans & Texas Pac.	337	606,311	117,037	764,596	79,920	111,798	19,653	230,647	17,670	459,688	304,908	2,768	20,000	282,140	48,591
Cumberland Valley	162	218,396	45,569	272,956	44,104	36,116	4,317	80,731	5,738	171,006	101,950	216	4,083	98,083	11,819
Duluth & Iron Range	168	392,053	23,842	425,674	89,966	49,529	265	89,970	8,250	237,980	187,694	6,667	17,001	164,026	170,250
Duluth, Missabe & Northern	293	488,522	38,052	532,275	106,473	79,913	1,889	92,580	9,305	290,160	242,115	1,625	21,394	219,096	224,165
Forth Worth & Denver City	454	263,474	116,236	396,972	44,322	69,635	6,953	125,105	15,226	261,241	135,731	1,070	9,938	124,723	53,546
Iowa Central	558	214,726	38,183	264,866	43,227	51,812	7,991	113,038	8,629	224,697	40,169	....	9,789	30,380	14,545
Minneapolis & St. Louis	1,027	297,609	79,006	402,417	60,421	54,932	10,638	172,218	12,795	311,004	91,413	31	19,266	72,178	35,913
Minneapolis, St. Paul & S. Ste. Marie	2,495†	740,829	261,101	1,070,988	125,086	134,373	18,272	354,363	21,992	654,086	416,902	304	70,924	345,674	34,949
Missouri Pacific	3,883‡	1,517,411	354,463	2,080,568	349,765	328,091	63,250	896,019	69,848	1,706,974	373,594	3,533	95,300	274,761	.
New Orleans & North Eastern	196	230,699	53,423	304,368	33,754	40,365	11,004	99,569	10,185	194,877	109,491	....	8,300	101,191	35,844
New York, Philadelphia & Norfolk	112	242,868	31,840	290,597	29,102	51,478	4,455	99,428	9,285	193,748	96,849	....	6,850	89,999	27,017
New York, Susquehanna & Western	151	143,836	50,323	220,816	20,822	21,932	1,666	85,900	6,253	136,573	84,243	201	11,317	72,725	19,602
Northwestern Pacific	376	86,856	131,274	237,757	48,603	34,610	3,031	84,293	9,251	179,787	57,970	....	10,988	46,982	15,291
Peoria & Eastern	351	177,881	51,467	249,291	39,734	35,683	5,535	96,738	5,790	183,480	65,811	....	9,200	56,611	10,661
Pittsburgh & Lake Erie	191	945,310	122,446	1,103,080	156,409	117,232	16,374	316,544	22,199	628,758	474,322	442	27,200	446,680	83,750
Rutland	468	144,146	79,535	254,661	38,875	34,591	6,096	91,694	6,437	177,694	76,967	....	9,096	67,871	256
St. Louis, Iron Mtn. & Southern	3,287§	1,565,421	449,687	2,201,796	363,045	323,374	61,016	750,082	77,139	1,574,656	627,140	5,580	87,820	533,740	41,446
San Antonio & Aransas Pass	727	190,624	73,235	280,917	59,848	52,277	3,958	120,621	10,897	247,601	33,316	....	9,000	24,316	22,178
San Pedro, Los Angeles & Salt Lake	979‖	197,946	78,862	296,179	164,071	73,230	16,059	125,558	15,619	394,537	98,358	899	22,430	119,889	373,881
Spokane, Portland & Seattle	430¶	272,451	82,775	387,133	49,571	24,298	4,500	116,597	6,650	201,616	185,517	162	20,738	164,617	120,554
Toledo, St. Louis & Western	450	239,563	32,243	291,950	26,304	45,877	7,801	98,487	8,840	187,309	104,641	....	13,900	90,741	5,722
Vicksburg, Shreveport & Pacific	171	60,862	33,539	103,730	20,617	21,735	3,753	33,422	4,357	83,884	19,846	....	6,525	13,321	1,321
Virginian	444°	192,330	15,794	216,482	24,470	40,552	4,694	60,812	7,501	138,029	78,453	355	13,000	65,808	.
West Jersey & Seashore	356	144,286	231,381	402,555	95,923	54,820	14,702	176,290	8,990	350,725	51,830	1,052	20,037	30,741	58,046
Wheeling & Lake Erie	458	387,559	42,003	468,938	70,630	78,021	6,626	176,501	14,143	345,921	123,017	579	19,689	103,907	85,792
Wisconsin Central	1,076	631,382	126,712	806,587	92,578	97,737	17,767	299,738	14,813	522,633	283,954	904	52,046	252,812	79,355
TEN MONTHS OF FISCAL YEAR, 1910.															
Alabama & Vicksburg	143	$912,333	$389,598	$1,400,863	$211,645	$214,795	$37,964	$432,356	$52,397	$949,157	$451,706	.....	$43,701	$408,005	$147,168
Alabama Great Southern	309	2,291,694	875,148	3,470,546	408,960	751,489	92,116	1,034,919	90,503	2,377,987	1,092,559	—$6,927	113,504	972,128	179,388
Bessemer & Lake Erie	201	5,817,674	271,373	6,176,023	596,256	1,060,693	73,290	1,521,673	97,453	3,349,365	2,826,658	.....	93,210	2,733,448	1,046 121
Central New England	278	2 082,075	280,896	2,495,920	400,194	221,371	15,591	739,496	32,770	1,409,422	1,086,498	.....	80,000	1,006,498	247,109
Chicago & Alton	998	6,965,073	3,462,671	11,320,094	1,295,036	1,310,062	392,943	3,971,911	309,504	7,279,456	4,040,638	16,407	371,000	3,653,231	318,874
Chicago & Erie	269	3,315,022	659,714	4,331,618	462,552	911,694	161,680	1,826,273	87,820	3,450,019	881,599	.....	109,385	772,214	374,018
Chicago, Indiana & Southern	329	2,910,181	219,278	3,209,361	430,369	570,427	85,012	1,091,744	82,165	2,259,717	949,644	106	128,503	821,247	390,257
Chicago, Indianapolis & Louisville	616	3,355,140	1,199,930	4,972,274	661,902	674,567	142,543	1,622,866	150,786	3,252,614	1,719,660	.....	218,300	1,501,360	428,023
Chicago, Milwaukee & Puget Sound	1,466*	7,291,830	757,734	8,196,700	378,186	619,109	213,507	2,666,700	101,526	3,979,028	4,217,672	28,579	190,241	4,056,010	.
Chicago, Milwaukee & St. Paul	7,511	37,798,854	11,955,072	53,974,704	7,050,475	6,417,031	1,004,677	21,989,070	957,456	37,418,709	16,555,995	171,996	2,097,291	14,630,700	—1,805,196
Cincinnati, New Orleans & Texas Pac.	337	5,792,441	1,296,759	7,464,557	810,576	1,363,423	196,265	2,056,533	178,911	4,605,708	2,858,849	—3,502	200,000	2,655,347	625 657
Cumberland Valley	162	1,827,934	500,226	2,431,410	335,039	264,980	43,015	729,729	60,418	1,433,181	998,229	4,996	40,836	962,389	70,047
Duluth & Iron Range	168	6,928,905	227,218	7,235,298	870,046	548,493	3,452	1,248,788	103,545	2,774,324	4,460,974	2,579	339,380	4,124,173	1,336,202
Duluth, Missabe & Northern	293	9,453,264	353,421	9,877,264	896,346	860,901	15,515	1,381,038	119,316	3,273,116	6,604,148	25,659	481,654	6,148,153	1,801,038
Forth Worth & Denver City	454	2,801,379	1,428,204	4,422,341	463,172	577,484	66,109	1,318,114	146,023	2,570,902	1,851,439	—5,455	86,272	1,759,712	462,399
Iowa Central	558	2,266,625	453,873	2,841,523	350,309	444,472	85,502	1,199,343	90,029	2,169,655	671,868	.....	78,940	592,928	154,816
Minneapolis & St. Louis	1,027	2,853,353	1,002,712	4,126,543	437,950	484,700	125,094	1,637,373	133,196	2,818,293	1,308,250	—610	189,704	1,117,936	111,402
Minneapolis, St. Paul & S. Ste. Marie	2,495†	8,961,276	2,946,414	12,580,381	1,098,676	1,293,002	234,388	3,610,352	222,444	6,458,862	6,121,519	101,047	730,869	5,491,697	1,540,963
Missouri Pacific	3,883‡	14,021,142	3,411,475	19,251,214	3,019,640	2,889,284	510,385	7,822,930	549,087	14,791,326	4,459,888	—32,410	715,360	3,712,119	.....
New Orleans & North Eastern	196	2,141,755	518,872	2,880,780	288,010	434,989	91,675	955,864	105,879	1,876,417	1,004,363	.....	82,224	922,138	197,374
New York, Philadelphia & Norfolk	112	2,187,210	327,674	2,690,305	276,291	456,633	35,065	952,913	92,818	1,813,720	876,585	.....	64,900	811,685	178,077
New York, Susquehanna & Western	151	1,467,187	526,219	2,242,733	253,553	214,796	16,056	840,644	41,895	1,366,944	875,789	—38,133	113,167	724,489	—32,866
Northwestern Pacific	376	1,036,164	1,307,733	2,551,534	462,829	331,571	26,234	897,709	95,581	1,813,924	727,610	.....	107,846	629,764	153,742
Peoria & Eastern	351	1,946,317	584,016	2,721,083	306,628	471,836	53,925	966,398	52,063	1,850,850	870,233	.....	88,594	781,639	215,026
Pittsburgh & Lake Erie	191	12,615,864	11,231,326	14,208,130	1,383,067	1,134,264	141,048	3,125,756	209,336	5,993,471	8,214,659	—3,852	209,036	8,001,770	3,322,382
Rutland	468	1,446,540	903,762	2,634,197	365,726	367,379	63,768	971,375	57,213	1,825,461	808,736	.....	97,194	711,541	128,439
St. Louis, Iron Mtn. & Southern	3,287§	16,223,155	4,498,504	22,488,460	3,326,476	3,105,593	563,416	7,031,928	694,290	14,721,703	7,766,757	—52,008	738,999	6,975,750	1,059,504
San Antonio & Aransas Pass	727	2,295,524	842,338	3,318,735	535,202	442,901	45,004	1,244,485	90,763	2,358,355	960,380	.....	90,000	870,380	—28,800
San Pedro, Los Angeles & Salt Lake	979‖	3,033,841	1,915,460	5,300,684	1,180,679	931,128	241,023	1,832,503	162,127	4,347,460	953,224	—14,789	239,656	698,779	958,796
Spokane, Portland & Seattle	430¶	2,065,530	659,589	2,852,766	503,321	270,113	32,911	983,303	66,297	1,855,946	996,821	—1,542	252,175	743,104	611,982
Toledo, St. Louis & Western	450	2,576,300	375,759	3,145,296	360,555	464,807	74,718	1,027,651	87,614	2,015,345	1,129,951	.....	125,700	1,004,251	64,161
Vicksburg, Shreveport & Pacific	171	705,765	389,431	1,190,816	216,664	215,736	34,700	352,717	44,239	864,056	326,760	.....	65,243	261,517	41,676
Virginian	444°	1,419,066	171,972	1,662,414	249,374	292,448	56,580	495,984	73,545	1,167,931	494,483	4,223	118,667	380,039	.....
West Jersey & Seashore	356	1,392,865	2,902,850	4,599,995	825,429	553,909	135,352	1,890,190	87,660	3,492,540	1,107,455	1,296	200,371	908,381	81,854
Wheeling & Lake Erie	458	4,844,267	474,481	5,711,544	590,813	1,212,443	69,616	1,971,384	137,989	3,982,245	1,729,299	77,425	219,115	1,587,609	604,116
Wisconsin Central	1,076	5,626,899	1,243,824	7,280,518	881,673	964,890	217,652	2,536,904	163,504	4,764,623	2,515,895	7,199	302,554	2,220,541	465,960

* Began operations on August 1, 1909. † Mileage operated on April 30, 1909, 2,395 miles. ‡ Began operations on August 9,1909. § Mileage on April 30, 1909, 2,608 miles. Total mileage 1,099 miles, of which 126 miles not operated in April, 1910, on account of washout. ¶ Mileage operated on April 30, 1909,, 273 miles. ° Began operations on July 1, 1909. — Indicates Deficits, Losses and Decreases.

INTERSTATE COMMERCE COMMISSION.

Unjust to Apply New Rates to Shipments a Year Back.

Central Lumber Company v. C., M. & St. P. et al. Opinion by Commissioner Harlan.

To accord to complainant's shipments the benefit of a proportional rate from Aberdeen, S. Dak., to Scranton, N. Dak., established about a year after certain carload shipments of lumber had reached Aberdeen on local billing from points in Washington, and as much as five months after most of it had reached Scranton as local movements from Aberdeen, would be in violation of every principle involved in the administration of this law. Petition dismissed. (18 I. C. C., 495.)

Unlawful Use of Tap Line Proportion.

Theo. Fathauer Company v. St. Louis I. M. & S. et al. Opinion by Commissioner Cockrell.

The Iron Mountain road, with the concurrence of the Mississippi, Arkansas & Western, a tap line, published lumber rates from Shults, Ark., a point on the tap line, via Blissville, Ark., the junction point, one cent higher than the rates from Blissville, and allowed the tap line a proportion of two cents thereof. Notwithstanding complainant's shipments were loaded into cars furnished by the Iron Mountain on a spur of the tap line within the corporate limits of Blissville, and from the lumber pile situated adjacent to the Iron Mountain siding at Blissville, the tap line billed said shipments as from Shults; held, that the exaction of the Shults rate was unreasonable to the extent that it exceeded the rate from Blissville on the Iron Mountain. Reparation awarded. Allowance made by the Iron Mountain to the tap line unlawful. (18 I. C. C., 517.)

Duty of Intermediate Carrier to Route Correctly.

Duluth & Iron Range v. C., St. P., M. & O. Opinion by Commissioner Harlan.

Rule 214 of Conference Rulings, Bulletin No. 4, is of continuing application through to destination upon all carriers participating in a movement and does not leave connecting lines in a state of irresponsibility with respect to routing when they accept shipments from an initial carrier without instructions. A connecting line receiving a shipment without instructions may demand instructions from the initial carrier, but if, instead of pursuing that course, it assumes the responsibility of routing the shipment it must accept the resulting liability for any damage in the way of increased charges that necessarily and directly flows from its mistake in selecting the wrong route. It is not excused by the fact that the shipper had given correct routing instructions which the initial carrier had neglected to note on the transfer billing. Connecting lines from the nature of their larger traffic and wider opportunities for knowing what are the reasonably direct routes ought in many cases to relieve small initial carriers of the responsibility for correct routing. (18 I. C. C., 485.)

Railway Not Bound to Use an Ocean Rate Not Filed.

W. G. Hagar Iron Company v. Pennsylvania et al. Opinion by Commissioner Clements.

Rates not on file with the commission cannot be used in constructing a through charge. Under routing instructions given by itself the complainant shipped on a through bill of lading from Breckenridge, Pa., over the Pennsylvania Railroad, the Atlantic Steamship Company, and the Galveston, Harrisburg & San Antonio Railway through the ports of New York and Galveston to Houston, Tex., a carload of steel plates weighing 44,280 lbs., freight charges being assessed on the basis of a combination through rate of 59 cents, constructed of a rate of 16 cents over the Pennsylvania to New York and a joint water-and-rail rate of 43 cents beyond. The complainant claims reparation based upon a combination rate of 32 cents, formed thus: Breckenridge to New York, 16 cents; port-to-port rate New York to Galveston, 10 cents; reconsignment charge at Galveston of 1 cent; and a local rate within the state of Texas from Galveston to Houston of 5 cents. The only rates on file with the commission by which the through rate could possibly have been constructed were the factors actually used. The port-to-port rate New York to Galveston, the reconsignment charge at Galveston, and the intrastate rate Galveston to Houston were not on file, and for this reason we hold that they were not factors to be used in constructing the through charge involved. The complaint is dismissed. (18 I. C. C., 529.)

Sawdust Rate Should Not be Higher Than Wood Fuel Rate.

William Plummer Company v. Northern Pacific. Opinion by Commissioner Cockrell.

Rate on carload of sawdust from East Grand Forks, Minn., to Minnewaukan, N. Dak., found to be unreasonable to the extent that it exceeded rate on wood for fuel. Reparation awarded.

At the time of shipment sawdust was carried in the Western Classification under Class E, which made the rate between East Grand Forks and Minnewaukan 17 cents. This rate could not apply, however, as defendant's tariff provided for the application to sawdust of the specific commodity rate on lumber for 20 cents, which was collected. Subsequent to the hearing sawdust was withdrawn from the commodity tariff on lumber, and the rate now applicable is Class E, or 17 cents.

Complainant, in support of its contention that sawdust should take the same rate as wood for fuel, cited the tariffs of several carriers operating in Minnesota and North Dakota. Defendant alleges that very little sawdust moves for fuel, but that it generally moves for icing purposes and that the Class E rate is the ordinary classification.

Sawdust is a low-grade commodity, and it was stated at the hearing and not disputed that it was valued at about $1.50 per ton, or about the cost of shoveling it into the car.

Under all the circumstances we find that the rate exacted was unreasonable in and to the extent that it exceeded the fuel-wood rate of 8 cents per 100 lbs. (18 I. C. C., 530.)

Charges for Dunnage, Etc., at Cost Not Unreasonable.

Davies v. Louisville & Nashville et al. Opinion by Chairman Knapp.

The commission is unable to find that defendants have charged more for loading and furnishing material and placing dunnage on shipments of fruits and vegetables from Gibson and Humboldt, Tenn., to Chicago, Ill., than the cost of the service, and it is therefore constrained to hold that the charge is not unreasonable.

Complainant's contention that it is the duty of defendants to load, strip and brace carload shipments of fruits and vegetables at their own expense, for the reason that this service is included in the carload rate, is not tenable because the tariffs of the principal defendant provide that shippers shall load and unload carload shipments.

There is no allegation in the complaint that challenges the reasonableness of either the carload or less-than-carload rates on shipments of tomatoes from Gibson and Humboldt to Chicago, except as the claim is made that by adding the loading and bracing charges to carload rates a higher total charge results than would be imposed on the same amount of freight transported at less-than-carload rates. No evidence was submitted with respect to the reasonableness of the rates on either of them, and no finding can therefore properly be made with respect thereto.

It was the practice of the Armour Car Lines to load fruits and vegetables and furnish and place dunnage, etc. Charges for this service seem to have been included in the icing charges which followed shipments and were paid by consignees.

The carload rate on tomatoes from Humboldt to Chicago is 39.6 cents per 100 lbs., minimum 20,000 lbs., and the less-than-carload rate 44 cents per 100 lbs. A charge of $10 per car for loading, bracing, etc., carload shipments of tomatoes

makes the total charge more than would result from the application of tariff rates to the same weight in less-than-carload shipments. The record does not show that this anomalous adjustment is applicable to any large number of commodities. Under the circumstances it appears that the spread between the carload and less-than-carload rates on tomatoes between Humboldt and Chicago is out of line, and there is nothing in the record which justifies such an adjustment.

It is suggested to the Louisville & Nashville that there appears to be no justification for the existing relation of carload and less-than-carload rates. * * * Complaint dismissed. (18 I. C. C., 540.)

STATE COMMISSIONS.

The Indiana Railroad Commission has issued an order relieving the Indianapolis Union from installing automatic block signals. The fact that the company is elevating its tracks and proposes to enlarge the Union Station, through which the tracks pass is deemed good reason for postponing the work. The commission, however, reserved the right to modify its order and require a block system to be installed whenever deemed proper.

New York.—See Court News.

COURT NEWS.

The Supreme Court of New York, appellate division, first department, in the case of Gardiner against the New York Central, sustains the road in its defense that on a 50-trip ticket, sold at a reduced rate, the baggage liability of $50, printed thereon, is valid. The plaintiff sought to collect $1,369 for a piece of baggage that was lost.

The United States Circuit Court of Appeals holds that the Interstate Commerce Commission has no power to regulate fares on street railways extending from one city to another where the two cities are in different states. This decision nullifies the opinion of the commission, reported in the *Railway Age Gazette* December 24, page 1255, declaring excessive the rates charged by the Omaha & Council Bluffs Street Railway from certain points in Omaha, Neb., to certain other points in Council Bluffs, Iowa.

The supreme court of the United States has upheld the Indiana State Employers' Liability Act, thereby sustaining the Indiana supreme court. Spencer Melton, a bridge carpenter on the Louisville & Nashville, was injured, and the accident was alleged to have been due to defective tools. The road contended that the liability law was unconstitutional and alleged that a bridge carpenter was not a direct employee of a railway. The Indiana supreme court held the law valid and that decision is now sustained.

The Court of Errors and Appeals of New Jersey has affirmed the judgment of the Supreme Court directing the State Board of Assessors to make a revaluation of the so-called second-class property of certain railways in Jersey City. The property in question is that used for railway purposes, but is not included in the main stem or hundred-foot right of way, from the taxation of which the state derives a large part of its revenue. The tax on second-class property goes to the municipality in which it is located. The decision is a substantial victory for the railways in their fight against increased taxation.

The New York State Court of Appeals has sustained the lower court in its decision, issued some months since, imposing a small fine on the New York Central for issuing equipment bonds without first applying to the Public Service Commission. The bonds—equipment trust certificates to the amount of $30,000,000—were issued in November and December, 1907. The commission held, under section 55 of the Public Service Commission law, that the consent of the commission was necessary. The controversy was submitted for the purpose of obtaining the construction of the law and the commission asked for only a nominal penalty. This decision does not affect the validity of the certificates, but will make it clear that the statute applies to such securities.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

R. H. Baker has been elected president of the Texas Central, succeeding Henry K. McHarg.

E. M. Alvord has been appointed vice-president and general manager of the Midland Valley, with office at Muskogee, Okla.

John F. Stevens, president of the Oregon Trunk Railway, and general manager of the Oregon Electric Railway Co., has been elected also president of the Pacific & Eastern, which was recently taken over by the Hill interests, with office at Portland, Ore., succeeding John R. Allen, resigned. J. W. Lawlor has been appointed secretary, succeeding C. P. Humphrey.

In the future all vice-presidents of the Canadian Pacific will be on an equal footing, and the titles are no longer numbered. William Whyte is now vice-president at Winnipeg, Man., with the same duties as heretofore; I. G. Ogden, vice-president at Montreal, Que., in charge of the financial and accounting departments, and G. M. Bosworth, vice-president at Montreal, in charge of the company's traffic and ocean steamship lines.

Operating Officers.

J. Irwin has been appointed superintendent of the Fifth district of the Canadian Northern, with office at Saskatoon, Sask.

E. L. Crimmen has been appointed chief train despatcher and car accountant of the South Dakota Central, with office at Sioux Falls, S. D.

T. H. Yorke has been appointed assistant superintendent of the Washington division of the Oregon Railroad & Navigation Co., with office at Spokane, Wash., succeeding J. F. Quinn, assigned to other duties.

C. D. Rowe, chief despatcher of the Trinity division of the Missouri, Kansas & Texas, has been appointed trainmaster, succeeding W. Rudd, whose appointment as superintendent has been announced in these columns.

H. L. Hungerford, superintendent of the Danville division of the Southern Railway, at Greensboro, N. C., has been appointed superintendent of the Charlotte division, with office at Greenville, S. C., succeeding B. G. Fallis, promoted.

C. B. Fletcher, division superintendent of the Illinois Central, with headquarters at Fort Dodge, Ia., has resigned. G. W. Berry, trainmaster at Carbondale, Ill., succeeds Mr. Fletcher. G. S. Rought, assistant trainmaster at Mound, Ill., succeeds Mr. Berry.

F. M. Hawley, trainmaster of the Delaware and Jefferson divisions of the Erie Railroad at Susquehanna, Pa., has been appointed trainmaster of the Susquehanna division and branches, with office at Hornell, N. Y., succeeding C. D. Taylor, promoted. J. J. Mantel succeeds Mr. Hawley, with office at Susquehanna.

F. W. Stanyan, treasurer and general superintendent of the Montpelier & Wells River, has been appointed general manager, succeeding W. A. Stowell, resigned, effective July 1. The office of general superintendent will be abolished and heads of departments now reporting to the general superintendent will thereafter report directly to and be governed by the orders of the general manager.

Edward J. Lambert, whose appointment as superintendent of transportation of the Missouri, Kansas & Texas, with office at Denison, Tex., has been announced in these columns, was born June 17, 1864, at Crestline, O. He began railroad work in 1878 as messenger, clerk and night yard despatcher of the Pittsburgh, Fort Wayne & Chicago, at Fort Wayne, Ind., and continued with this company in various positions until 1887.

From 1887 to 1892 he served a number of minor railway companies, and in the latter year became assistant agent and local freight agent of the Illinois Central at Chicago. He held a number of positions with this company, resigning in 1901 to become trainmaster of the Atchison, Topeka & Santa Fe, at Fresno, Cal. In the same year he entered the service of the Missouri, Kansas & Texas, and has been in the freight department of that company until his recent appointment as superintendent of transportation.

Frank E. McCormack, whose appointment as superintendent of the Rochester division of the New York Central & Hudson River, with office at Rochester, N. Y., has been announced in these columns, was born September 11, 1867, at Lamson, N. Y. He began railway work as a water boy in 1881 on the Delaware, Lackawanna & Western, and was later telegraph operator on that road. In 1885 he went to the Rome, Watertown & Ogdensburg as operator and pumper, and since that time has been in the continuous service of that company and its successor, the New York Central & Hudson River. In 1890 he was appointed train despatcher of the Watertown district, and four years later was made chief despatcher. From 1896 to 1900 he was trainmaster of the Carthage district, and for the following five years was trainmaster of the Watertown district, becoming chief trainmaster in 1905 of the Rome, Watertown & Ogdensburg division. A year later he was appointed assistant superintendent of the same division. In September, 1908, he was appointed superintendent of the Ontario division, at Oswego, N. Y., which position he held at the time of his recent appointment as superintendent of the Rochester division.



F. E. McCormack.

Traffic Officers.

H. J. Maxwell has been appointed a general agent of the Quincy Western, with office at San Francisco, Cal.

Howard B. Chappel has been appointed freight solicitor of the Union line at Chicago, succeeding William J. Baar, promoted.

H. S. Lincoln has been appointed assistant to the vice-president, in charge of traffic of the Southern Pacific, with office at San Francisco, Cal.

Homer W. Watson has been appointed a commercial agent of the Macon & Birmingham, at Nashville, Tenn., succeeding Harry H. Hill, resigned.

E. P. Lannan, dairy agent of the Frisco lines, has been appointed assistant general perishable freight agent. L. E. Gailey succeeds Mr. Lannan.

Walter A. Springall has been appointed a commercial agent of the San Antonio & Aransas Pass, at San Antonio, Tex., succeeding E. S. Trust, deceased.

E. K. Bixby, chief clerk to the assistant general passenger agent of the Pennsylvania lines, with office at Chicago, has been appointed district passenger agent.

Frank Sprayer, station agent of the Chicago, Indianapolis & Louisville, at Delphi, Ind., has been appointed a traveling freight agent, with office at Lafayette, Ind.

J. M. Killian has been appointed traffic manager and auditor of the Stephenville, North & South Texas, with office at Stephenville, Tex., succeeding W. G. Little, resigned.

A. T. Thomson, secretary and treasurer of the Arizona & New Mexico and the Lordsburg & Hachita, at Clifton, Ariz., has been appointed traffic manager of the Arizona & New Mexico, with office at Clifton.

Donald P. Stubbs, chief of the tariff bureau of the Oregon Short Line, with office at Salt Lake City, Utah, has been appointed general agent of the Harriman Lines, with office at Cleveland, O., effective July 1.

A. E. Brown, traveling freight and passenger agent of the Colorado Midland, with headquarters at Chicago, has been appointed traveling freight agent of the Minneapolis, St. Paul & Sault Ste. Marie, at Cincinnati, O., succeeding C. D. Dooley, resigned, to go into business.

F. C. Reilly has been appointed general freight agent and W. H. Richardson, general passenger agent, of the Evansville & Terre Haute, the Evansville & Indianapolis and the Evansville Belt, with offices at Evansville, Ind., succeeding D. H. Hillman, general freight and passenger agent, assigned to other duties.

Edwin H. Coombs, whose appointment as assistant general freight agent of the Missouri, Kansas & Texas, with office at Houston, Tex., has been announced in these columns, was born September 7, 1869. He is a graduate of Ogden College, Bowling Green, Ky. Mr. Coombs began railway work in 1896 as clerk in the office of the assistant general freight agent of the Missouri, Kansas & Texas, at Houston, Tex., and he has been continuously in the service of this company until the present time, serving as contracting agent, at Galveston, Tex., and commercial agent consecutively at Dallas, Denison and San Antonio. He resigns the latter position to become assistant general freight agent with office at Houston, Tex.

Engineering and Rolling Stock Officers.

G. H. Brown has resumed his duties as division engineer on the Philadelphia division of the Pennsylvania Company.

OBITUARY.

W. C. Rinearson, general passenger agent of the Queen & Crescent lines, at Cincinnati, Ohio, died recently in Merion, a suburb of Philadelphia, Pa., after a long illness. Mr. Rinearson was born on March 19, 1853, and entered railway service on the Baltimore & Ohio in the passenger department at Pittsburgh, Pa. Later he was for 11 years traveling passenger agent for the Pennsylvania Company. On December 1, 1887, he was appointed assistant general passenger agent of the New York, Pennsylvania & Ohio, now a part of the Erie Railroad, and about three years later he was made general passenger agent of the New York, Lake Erie & Western. In June, 1892, he was appointed general traveling passenger agent of the Chicago Great Western and the following year was made general passenger agent of the Cleveland, Akron & Columbus. He was appointed general passenger agent of the Cincinnati, New Orleans & Texas Pacific in September, 1893, and since that time has been at the head of the passenger department of the Queen & Crescent lines.

FOREIGN RAILWAY NOTES.

A decree provides for the extension of the Northeastern Railway of Uruguay from Melo to Artigas, a town of some importance on the Yaguaron, instead of to Centurion. Both towns are on the Brazilian border, the former being accessible to ocean-going vessels.

From about July 1 the journey from Buenos Ayres to Valparaiso can be made by railway in 35 hours. Passengers will have to change cars at Mendoza, Argentina, as the Great Western Railway from Buenos Ayres to that city is broad gage, while the Trans-Andean Railway is very narrow gage. Another change must be made at Los Andes from the Trans-Andean to the Chilean State Railway.

Railway Construction.

New Incorporations, Surveys, Etc.

Alaska Northern.—An officer writes that this company has track laid on 41 miles from Seward, Alaska, north. The company expects to have 170 miles of line ready next month for inspection by contractors preparatory to their being asked for bids on work to cost about $7,000,000. The line is eventually to be extended north via Fairbanks and Chena to Chatanika. O. G. Laberee, president and general manager, Seattle, Wash., and A. W. Swanitz, chief engineer, Seward. (June 10, p. 1436.)

Berkshire Street Railway.—See New York, New Haven & Hartford.

Bridgeport & Danbury (Electric).—Application has been made in Connecticut for a certificate of public necessity to build an electric line from Bridgeport, Conn., northwest via Trumbull, Monroe, Newtown and Bethel to Danbury, about 20 miles. The company has a capital of $1,500,000 and headquarters at 137 Housatonic avenue, Bridgeport.

California Roads.—At a recent meeting in Fresno, Cal., residents of that place decided to organize a company with a capital of $4,000,000 for the purpose of building an electric line from Fresno southwest to Coalinga, thence northwest to Monterey. It is expected that construction work will be begun in 60 days and the line finished as far as Coalinga in nine months, and to tidewater at Monterey in two years. A. P. May, Coalinga; A. G. Metz and H. N. O'Bryan, Monterey; A. B. Weiler and E. R. Shaw, San Francisco, are interested.

Canadian Northern Quebec.—According to press reports a contract has been given to J. P. Mullarkey, Montreal, Que., to build the line from Hawkesbury, Ont., east to Montreal. (June 10, p. 1436.)

Canadian Pacific.—According to press reports a contract has been given to Foley, Welch & Stewart to build the first 25 miles of the Kootenay Central from Galloway, B. C., on the Crow's Nest Line, north via Fort Steele.

Central Arkansas & Eastern.—An officer writes that this company is now operating a line from England, Ark., on the Little Rock branch of the St. Louis & Southwestern, east to McGugor, 12 miles, and proposes to build an extension from McGugor east to Stuttgart, 18 miles, also another extension from a junction point two miles from Stuttgart north to Hazen, 16 miles. Contracts for grading, bridging and track laying have been let to John Scott & Sons, St. Louis. The bridges are all to be pile structures, and 60-lb. relaying rails will be used. All the rails, track material and equipment have been ordered. A. M. Van Auken, chief engineer, Stuttgart.

Chicago & Wisconsin Valley.—Incorporated in Wisconsin, with $40,000 capital, to build from Merrill, Wis., south to Janesville, 180 miles. The directors include: A. J. Behymer, J. E. Jones, R. H. Williams, J. W. Purves, J. R. MacMillian and T. W. Potts.

Chicago, Blue Island & Joliet (Electric).—This company was recently organized to build an electric line connecting the Chicago & Southern with the Joliet & Southern near Frankfort, Ill. The company has given a mortgage to secure an issue of $500,000 of bonds. W. H. Conrad, president, and W. H. Merrill, secretary, Chicago.

Decatur Southern Traction.—An officer writes that financial arrangements have been made and contracts will be let about August 1 to build from Decatur, Ill., south through Macon and Assumption to Pana, about 30 miles. Maximum grades will be 1.4 per cent. and maximum curvature 4 degs. There will be a bridge over the Sangamon river. R. McCalman, chief engineer, 318 Citizens T. & T. building, Decatur.

Fort Wayne & Winona Traction.—Organized in Indiana, with $100,000 capital, to build an electric line paralleling the Pennsylvania Lines West from Fort Wayne, Ind., west to Warsaw, 39 miles. The estimated cost of the line is $1,000,000. Surveys are now being made. J. A. Barry, E. W. Cook, E. G. Hoffman and G. M. Leslie, Fort Wayne, and R. A. Barry, New York, are interested.

Halifax & Eastern.—A charter has been granted this company, with a capital of $3,000,000, in Nova Scotia, to build a line from Dartmouth, Halifax Harbor, N. S., east to Country Harbor, with a branch from this line to the Intercolonial Railway at or near New Glasgow. The charter provides that the line must be built and in operation within two years. T. Goff, Toledo, Ohio; J. Bertram, Toronto, Ont., and S. Hirsh, London, are directors.

Hilo (Honolulu).—This road is to be extended from Hakalau to Paauilo, and the stockholders have authorized the issue of $1,000,000 in bonds and $1,000,000 in stock. The bonds have been sold to T. H. Davies & Co.

Kootenay Central.—See Canadian Pacific.

McCrory & Beedeville Southern.—An officer writes that contracts have been let and the right-of-way has been cleared for 11 miles. The company was organized to build a 14-mile line from McCrory, Ark. C. Hailey, president, and G. G. McCrory, chief engineer, McCrory.

Mexican Roads.—According to a Consular report from Hermosillo, Sonora, Mex., a concession has been given to Raymon de Negri and associates, to build from Ures to Kino bay, 168 miles. The line will traverse a mining and farming section. The concession provides that work on the line must be started within six months and finished in about two years. It is expected that the line will be finished in less than two years.

Mexico, Santa Fe & Perry Traction.—This company has filed a mortgage to secure an issue of $1,600,000 of bonds. The company was incorporated in April, 1907, and has partly constructed a line between Mexico, Mo., and Perry, about 27 miles. The line is eventually to be extended north to Hannibal, Mo., a total of 103 miles. M. Crum, president, Mexico.

Missouri, Oklahoma & Gulf.—According to press reports work is to be started as soon as the survey is finished for the extension from the present northern terminus at Wagoner, Okla., north towards Kansas City, Mo. (May 13, p. 1237.)

Montezuma & Western.—According to press reports work is to be started in July on the line from Denver, Colo., southwest to Leadville, about 125 miles. The project is backed by Denver capitalists. (June 10, p. 1437.)

Mount Hope, Patch Grove & Bagley.—A company is being organized to build a line from Bloomington, Wis., to connect with Mount Hope, Patch Grove and Bagley. William Leighton, president; H. Young, vice-president, and W. E. Lewis, secretary and treasurer.

New York, New Haven & Hartford.—This company has petitioned the Massachusetts railroad commissioners for permission to build an extension from the Southbridge branch, near the terminus at Southbridge, Mass., northwest 19.3 miles, to connect with the Central Vermont at Palmer. The total cost will be $2,810,000. Surveys for this line were made in the summer of 1907. This seems to be designed to forestall the Grand Trunk, which proposes to build over the same route. There is already an electric line in operation between these places.

The company is preparing to establish a large new freight yard near Woonsocket, R. I. It is said that the land on which this yard is to be laid out and which was secured some time ago, lies directly across the path which the Grand Trunk will desire to use in its proposed new line through southern Massachusetts and Rhode Island to Providence.

The law which was recently passed in Massachusetts provides that the New Haven may buy the whole or part of the Berkshire Street Railway, and also provides that the company shall before January 1, 1913, construct new lines of street railway as follows: From some convenient point in the town of Huntington to connect with the present line; a line to the summit of Greylock mountain; a line from the present terminus in Great Barrington through the town of Ashfield to the Connecticut boundary; a line connecting the town of Egremont with the road, and extensions, double-tracking and reconstruction in the cities of North Adams and Pittsfield as shall be requested by the mayors and boards of aldermen.

Norfolk & Western.—An officer writes that the work started during the early part of 1910 includes continuation of double-track construction in Ohio on 49.7 miles, and if the

plans are carried out, the line between Kenova, W. Va., and Columbus, Ohio, will be double-tracked early next year.

In West Virginia some gaps are being closed in the double-track line. This work is being carried out between Vivian and Huger on about 5.5 miles, and includes four tunnels, as well as on a section between Wyoming and Devon, 12 miles.

The Dry Fork branch, formerly known as the Iaeger & Southern, is being extended up Dry Fork, 0.75 miles, to No. 4 operation of the New River & Pocahontas Consolidated Coal Co.

Work has been started on a tunnel to be 4,700 ft. long, on the Indian Creek branch, for which a contract has been given to David W. Flickwir, Roanoke, Va. (June 17, p. 1568.)

NORTHWESTERN PACIFIC.—Contracts for building about 25 miles of line are to be let soon, it is said. This work is to be on the section from Shively, Cal., south towards Willits. (Dec. 24, p. 1261.)

OKLAHOMA-KANSAS ELECTRIC.—An officer writes that it is probable that work will be started soon on this line. The projected route is from Columbus, Kan., east to Galena, with a line running south via Baxter Springs to Sunnyside, Okla., and Lincolnville, thence west via Quapaw to Hattonville, and then south to Miami, about 36 miles. The line will connect the large lead and zinc mining districts of Kansas and Oklahoma with the smelters. There will be a 250-ft. steel bridge and another 100 ft. long, also a 4,000-ft. trestle. The company will also put up a car barn. Dr. Charles M. Jones, president; J. M. Cooper, vice-president; M. C. Harper, secretary and general manager, Baxter Springs, and W. K. Palmer Co., engineers, Kansas City, Mo.

ONTARIO & NORTHERN.—Incorporated in Wisconsin, with $75,000 capital, to build from Ontario, Wis., northeast to Wilton, eight miles. The directors include: V. A. Stottard, C. W. Lord, C. M. Sumdon, L. R. Walker, F. G. Bredlow, L. Wallace, H. Teasdale and others.

OTTAWA, RIDEAU VALLEY & BROCKVILLE.—According to press reports work is to be started this fall on the proposed line from a point near Ottawa, Ont., south to Brockville, about 60 miles. W. C. MacLaren, J. H. Gilmour, Brockville; E. W. Clarke, D. H. MacLean and G. H. Kidd, Ottawa; A. McDermott and R. E. Elliott, Montreal, are interested. (April 15, p. 1016.)

PEOPLES RAILWAY.—Bids are wanted up to July 15 by A. N. Warfield, Berlin, Ont., for clearing and grading 29 miles of railway, also for one 400-ft. bridge and the construction of five bridge piers. (See Supply Trade News.)

PRAIRIE FARM & SOUTHWESTERN.—The Wisconsin State Railroad Commission has granted this company a certificate of convenience and necessity to build from Prairie Farm, Wis., southwest to Emerald, 16 miles. Work is now under way. (June 10, p. 1438.)

ROSCOE, SNYDER & PACIFIC.—This company, operating a 49-mile line from Roscoe, Tex., northwest to Fluvanna, is to be extended southeast from Roscoe to Cross Plains, 75 miles. The Texas & Pacific, which connects with the line at Roscoe, is said to be financially interested in the project.

SAN ANTONIO, RIO GRANDE & TAMPICO.—An officer writes that work is now under way by the Harrison Construction Co., building from San Antonio, Tex., southwest to a point in La Salle county, about 90 miles. Track-laying is to be started soon. There will be five steel bridges, station buildings and coaling stations. G. W. Nock, chief engineer, San Antonio. (May 27, p. 1325.)

STATE LINE & SOUTHERN.—An officer writes that this company will be organized this month. The projected route is said to be from the Pennsylvania-Virginia state line south along the Monongahela river to Rivesville, W. Va. S. D. Brady, chief engineer, Fairmont.

TEXAS & PACIFIC.—See Roscoe, Snyder & Pacific.

WAYCROSS & SOUTHERN.—An officer writes that this road is now in operation from Waycross, Ga., south 10 miles. It is expected that the principal freight on the line will be lumber. J. W. Oakford, president, Scranton, Pa.

Railway Financial News.

CENTRAL OF NEW JERSEY.—White, Weld & Co., New York, offer for sale $300,000 of the Lehigh & Wilkesbarre Coal Company's consolidated mortgage gold 4 per cent. bonds guaranteed by the Central of New Jersey. These bonds mature in five, 10 and 15 years, and are offered at prices yielding 4.4 per cent.

CHICAGO, INDIANA & SOUTHERN.—See New York Central.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—See New York Central.

LAKE SHORE & MICHIGAN CENTRAL.—See New York Central.

LEHIGH VALLEY.—The stockholders at a meeting in Philadelphia this week approved an issue of $39,665,200 in new stock, as recommended by the directors on April 20. This will make the total stock of the company $80,000,000. The directors intend to issue at the present time only $20,220,550. President Thomas reviewed the improvement in the company's financial condition since 1903. During the first 10 months of the present fiscal year over $3,380,000 has been spent for new cars and engines and other improvements. Improvements now being made or authorized will aggregate $3,776,000. On September 1 second mortgage 7 per cent. bonds to the amount of $6,000,000 will be retired. Plans for the future embrace extensive additions to third and fourth tracks; additional terminals, and a low grade line for westbound anthracite coal from the mines to the main line. The stockholders of record June 30 may subscribe to the new stock at the rate of 50 per cent. of their present holdings.

MICHIGAN CENTRAL.—See New York Central.

NEW YORK CENTRAL.—Equipment trust certificates have been sold to J. P. Morgan & Co. to the amount of $22,500,000. These certificates bear interest at 4½ per cent. and mature serially, one-fifteenth of the entire issue on January 1 of each year. The agreement provides for the issuance of certificates to the amount of $30,000,000, representing 90 per cent. of the cost of the equipment pledged. The lines concerned have already ordered equipment costing approximately $26,465,000, distributed among the several companies as follows: New York Central, $4,583,833; Lake Shore, $13,152,210; Michigan Central, $4,785,859; Big Four, $2,627,853, and Chicago, Indiana & Southern, $1,318,076. The sale of these certificates will leave the several companies free to use capital which they have raised in other ways this year for miscellaneous improvements including the extension of third and fourth tracks on the West Shore and Lake Shore, the enlargement of yards at Buffalo, Rochester and other points, improvements and additions to block signals, additional roundhouses, large new machine and car shops for the Lake Shore and the Big Four, new passenger station at Rochester, etc. These notes are a part of the issue approved by the New York State Public Service Commission March 31. The certificates are issued by the Guaranty Trust Company as trustee. J. P. Morgan & Co., the First National Bank and the National City Bank are offering them at rates to yield over 4⅝ per cent. About half of the issue has already been disposed of.

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.—Kuhn, Loeb & Co. and Speyer & Co. have sold all of the $4,000,000 in bonds of this company recently bought by them. (June 17, p. 1570.)

WABASH-PITTSBURGH TERMINAL.—A new committee of bondholders is being organized to represent bondholders who are identified with the movement started some weeks ago by the Colonial Trust Company of Pittsburgh to compel a reorganization more favorable to bondholders than that tentatively prepared by the commitee which has represented the first mortgage bondholders since the receiver was appointed two years ago. Most of the members of the new commitee have been selected. It is claimed that the holders of about $6,000,000 of the bonds deposited with the Central Trust have expressed their purpose to join with the new committee.

Supply Trade Section.

The Isthmian Canal Commission will ask bids until July 18 for deformed steel bars, manganese steel rings for rock-crusher screen, pneumatic hoist, gasolene motor and spud timbers. (Circular No. 591.)

The United States Electric Company, New York, announces that W. E. Harkness, who has been identified for a number of years with the Western Electric Company, New York, in the development of telephone train despatching, is now in the service of the U. S. E. Co. He will devote his attention to telephone, telegraph and selector equipment.

The American Railway Supply Company, 24 Park place, New York, has received an order from an automobile manufacturing concern for 128,000 brass tool checks. As far as Mr. Chur, general manager of the American Railway Supply Company, has been able to learn, this is the largest single order for goods of this kind ever given to any concern. It is certainly the record order for his company.

Tenders will be received until July 15, 1910, by A. N. Warfield, People's Railway, Berlin, Ontario, for the following material and equipment: Twenty-nine miles of railway ties, 29 miles of 70-lb. rails, 29 miles of railway spikes, 29 miles of railway track bolts, 29 miles of electric rail bonds, 50 miles of fence wire and gates, 50 miles of fence posts, 29 miles of grooved trolley wire, 29 miles of trolley messenger wire, 29 miles of telephone system.

Frederick W. Sivyer, president of the Northwestern Malleable Iron Co., Milwaukee, Wis., and vice-president of the Chain Belt Co., died on June 11 at his home in Milwaukee. Mr. Sivyer was born in Milwaukee on June 18, 1848, and began making his own living at the age of 14 years. In 1873 he entered the iron business, and after being connected with several prominent concerns, in 1882 he founded the Northwestern Malleable Iron Company. He took a great interest in the trade school movement and has done much for the welfare of Milwaukee's young men.

The General Railway Signal Company, Chicago, has appealed from the order of Judge Ray, of the U. S. circuit court, who, on June 8, granted an interlocutory injunction in favor of the Union Switch & Signal Co., restraining the General from manufacturing or using certain devices in connection with selective relays. The terms of the interlocutary injunction have been suspended pending decision of the case on appeal to the U. S. circuit court of appeals. The General claims that the Strubel patents are void because of anticipation, by prior devices, and that the patents of Young do not infringe in any way. It is claimed that the Young patents antedate those of Strubel, and in any case do not conflict. Owing to the intervention of the summer vacation and recess of the court arguments cannot be heard on the appeal before November next, until which time the interlocutory injunction is suspended.

The report of the Westinghouse Electric & Manufacturing Company for the year ended March 31 shows a rapid recovery from the financial difficulties that resulted in the appointment of receivers and the reorganization of two years ago. The net income for the year was $3,064,664. From the preceding year's operations a deficit of $918,000 resulted, so that an actual increase of $3,979,346 is shown in the year's net. The gross earnings were $29,248,682, an increase of $8,642,090. At the end of its fiscal year the company had unfilled orders on its books amounting to $11,256,197, not counting those of the subsidiary companies, while in April and May additional orders were booked aggregating $7,083,038, making a total of unfilled orders on hand May 31 of $13,000,000. At but one time in the company's history has the unfilled volume been greater. The operations of the Westinghouse Lamp Company, the Perkins Electric Switch Manufacturing Company, the Bryant Electric Company and R. D. Nuttal Company have been greatly expanded and their facilities will be increased. Since the close of the fiscal year $2,000,000 of the treasury funds have been appropriated toward the payment of that amount of the $6,000,000 notes maturing August 1, and arrangements have been completed for the extension of the remaining $4,000,000 of notes for a further period of three years. Through the payment of the $2,000,000 the funded debt of the company will have been reduced since the receivership $3,626,064 and the fixed annual charge reduced by more than $200,000.

Among the sales recently booked by the Crocker-Wheeler Company, Ampere, N. J., are the following: One 300-k.w. engine type generator for supplying light and power; The Barber-Coleman Co., of Illinois. One 150-k.w. engine type d.c. generator; L. A. Becker, of Illinois. One 350-k.w. engine type d.c. generator; Eberhardt-Faber Pencil Co., New York. One 150-h.p. d.c. motor; Columbia Chemical Co., of Ohio. Over 365 h.p. in d.c. motors; A. M. Beyer, of Pennsylvania. These motors will be used for operating rolls, presses, shears and a large variety of similar machinery in a pipe mill. Two 100-k.w. engine type d.c. generators and 190 h.p. in d.c. motors; Panola Cotton Oil Co. One 600-k.w. d.c. engine generator; Keystone Watch Case Co. One 250-k.w., d.c. engine type generator; Standard Gage Steel Co., of Pennsylvania. Over 225 h.p. in d.c. motors for operating packing machinery in the Jersey City plant of Swift & Co., New Jersey. One 100-h.p., d.c. motor; Penn Salt Co., of Pennsylvania. One 100-k.w. synchronous motor generator set; L. C. Smith & Bros. Typewriter Works Co., of New York. This set will be mounted directly on steel I-beams. One 250-k.v.a. engine type a.c. generator with one 14-k.w., 125-volt exciter; American Fork & Hoe Co., of Ohio. One 250-k.v.a. belt type a.c. generator; Western Canada Flour Mills Co., of Ontario. One 200-k.v.a. coupled type a.c. generator with a 9-k.w. exciter and two 200-k.v.a. 15,000-2 300-volt transformers; Sylacauga, Ala. One 250-k.v.a. belt type a.c. generator to be used for supplying power to induction motors; Michigan Buggy Co., Kalamazoo, Mich. Two 100 k.v.a., a.c. generators with an exciter; Hind & Harrison Plush Co., of New York. These machines will be driven by a DeLaval steam turbine.

TRADE PUBLICATIONS.

Locomotive Valve Gear.—The Pilliod Bros., Toledo, Ohio, have issued a booklet on the Pilliod valve gear containing drawings and description of this valve motion, which is described in full in this issue.

Track-Laying Machine.—The Hurley Track-Laying Machine Co., Chicago, has just issued a leaflet giving a number of pointers regarding the Hurley track-laying machine as an economizer of time, labor and motive power.

Alternators.—The Western Electric Co., New York, in bulletin No. 5,210, describes its new design of alternators for belt, engine and water wheel drive, with or without direct-connected exercisers. The illustrations show in detail the steps taken in building up the various parts of the alternators described.

Keweenaw Central.—The passenger department of the Keweenaw Central has issued a 16-page booklet on the rest, health and recreation to be found along the lines of that company. The historic peninsula is attractively described and illustrated. A large photograph of a relief map of the peninsula is also included.

Insulating Varnishes.—The Sterling Varnish Company, Pittsburgh, Pa., has just issued a small pamphlet describing its new Sterling elastic and Sterling extra elastic insulating varnishes. A piece of linen, coated with the extra elastic insulating varnish, accompanies the pamphlet. This sample is intended for testing the insulating qualities of this varnish.

Pulverizers and Crushers.—The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued its catalogue No. 31 C covering Jeffrey crushers and pulverizers. The catalogue contains

a large number of illustrations showing these machines both assembled and disassembled. The latest models of Jeffrey swing hammer pulverizers are also shown in this connection.

RAILWAY STRUCTURES.

BERLIN, ONT.—See Peoples Railway under Railway Construction.

BRATTLEBORO, VT.—Residents of Brattleboro have been asked to appropriate $15,000 for abolishing grade crossings at Bridge street, in Brattleboro, and it is understood that the Public Service Commission of Vermont will contribute $12,500. It it said that the Central Vermont has agreed to build a station at a cost of $10,000 and make other improvements. The total cost of the work will be about $50,000.

CINCINNATI, OHIO.—Revised plans have been made for the Gilbert street viaduct, to be built from Eighth street and Broadway to Gilbert avenue and East Court street, in Cincinnati. The viaduct will have a total length of 1,179 ft. The new plans comprise a change in the design, material and construction. The viaduct is to be built of concrete. There will be a roadway 58 ft. wide, with 11-ft. sidewalks, and tracks for electric surface cars. The cost of the work is estimated at $700,000.

COLUMBUS, GA.—Bids are wanted by W. C. Campbell, superintendent of Public Works, Columbus, Ga., up to July 18, for building a concrete steel Melan arch over the Chattahoochee river, from Dillingham street to a point in Alabama. The structure will carry single-track for the operation of electric surface cars, and will cost about $125,000.

FORT WAYNE, IND.—The Pennsylvania Company is to take bids about August 1 for building a new passenger station. It is to be a three-story brick and stone building, estimated to cost $200,000. (March 18, 1910.)

An officer of the Wabash Railroad writes that the company will put up with its own forces a new bridge at Calhoun street in Fort Wayne. The plans call for a three-span bridge, each span to be about 21 ft., to carry four tracks, with I beams and solid concrete floor on steel bents and masonry abutments.

GREENSBURG, PA.—The Pennsylvania Company is taking bids for building a passenger station to cost about $150,000.

MONTREAL, CANADA.—A contract is said to have been given by the Canadian Pacific to the Foundation Company, Ltd., Montreal, for the pier work on the St. Lawrence river bridge. The Foundation Company is to lengthen the existing 15 piers to twice their present length, and will construct two new piers. The improvements are being carried out by the Canadian Pacific to place double tracks on the bridge.

ORANGEVILLE, MD.—The Northern Central has let the contract to Roberts & Schaefer, Chicago, for building a Holmen coaling station to cost about $45,000.

SAN ANTONIO, TEX.—See San Antonio, Rio Grande & Tampico under Railway Construction.

SAN FRANCISCO, CAL.—The Southern Pacific has filed a contract, made last month with the Missouri Valley Bridge & Iron Co. of Kansas, for putting in four concrete piers to support the new drawbridge across Sacramento river, between Sacramento and Broderick. The work must be finished by December 31. (Jan. 7, p. 71.)

VAN BUREN, ARK.—A combined highway and railway bridge is to be built over the Arkansas river on the line of Jefferson street by the Fort Smith-Van Buren district. There are to be nine spans of 196 ft., also a draw span. The substructure will be of concrete and the superstructure of steel, requiring about 4,227 tons of steel. There will be two tracks for electric cars and one track for steam railways. The total cost is estimated at $563,404. Contract for the foundation let to Kahmann & McMurry, Kansas City, Mo., and for the delivery and erection of the superstructure to the Arkansas Bridge Co., Fort Smith, Ark. The waterproofing material will be furnished by the Goheen Manufacturing Co., Canton, Ohio, and the paint will be furnished by the Patterson-Sargent Co., Cleveland, Ohio.

Late News.

The items in this column were received after the classified departments were closed.

An officer of the Chicago, Burlington & Quincy writes that a contract has been given to A. Guthrie & Co. for building a line from Scribner, Mont., to Fromberg.

The New York Central & Hudson River has given a contract to the Sundstrom & Stratton Co., New York, for work on 12 miles of double-track near Adams, N. Y.

The bill before Congress to require a uniform bill of lading, as asked for by the bankers, will go over until the next session, the Senate committee having decided to take no action on it.

The Gainesville, Oklahoma & Western expects to let contracts in about 30 days for building from Gainesville, Tex., southwest via Era, Slidell, Greenwood and Cowen to Bridgeport, about 56 miles. F. B. Truax, chief engineer, Gainesville. (June 10, p. 1437.)

The state railway commissions of Missouri and Kansas are preparing new tariffs of local freight rates, with a view to adjusting inequalities which have been produced by the change in interstate rates resulting from the recent order of the Interstate Commerce Commission, reducing rates from the East to Missouri river.

The Interstate Commerce Commission has granted a rehearing of the cases involving a reduction of sleeping car rates, but in so doing has sharply criticized the Pullman company for not submitting to the commission all of the facts. While a rehearing of the cases is granted, no stay in the order of the commission is allowed.

According to the *Pioneer Press* of St. Paul, which a week ago gave out large figures in connection with the dismissal of laborers on new railway work west and north of that city, all of the men discharged there were at once engaged by the roads east and south of St. Paul. These latter roads have begun extensive additions to their tracks, which are much needed, and they were glad to get these additional men.

The construction of the new bridge over the Monongahela river at West Brownsville Junction, Pa., by the Pennsylvania Railroad, has been deferred. The elevation of existing tracks and the construction of additional classification tracks in West Brownsville Junction Yard is being done by the company's men of the Monongahela division. None of the work is under contract. So much of the track work as can be done until the new river bridge is built is now nearing completion.

The Board of Conciliation which has been arbitrating differences in wages between the Grand Trunk and the Canadian Pacific railways and the conductors and trainmen employed on those roads, has awarded an increase of 25 per cent. in wages to date from May 1 last; but it is said that the leaders of the employees have refused to accept the award. They had asked for the rates prevailing in the United States, under which it is said the increase in Canada would be 40 per cent. instead of 25 per cent.

Count Zeppelin now promises to run airships regularly over a predetermined route, and to carry passengers; and he made his first trip on Tuesday of this week. It was from Friedrichshafen to Düsseldorf, 300 miles; time, nine hours. This was with the count's third mammoth dirigible balloon, the "Deutschland," and he carried 20 passengers. For a distance of 124 miles the speed was 41 miles an hour. The trip was begun at 3 o'clock a.m., and ended at noon. The route had been carefully marked out in advance and was followed exactly. The railway line between the cities named is roundabout, and between Mannheim and Düsseldorf, where the time of the railway trains is six hours, the balloon accomplished the trip in four hours. Fares by this airship line are to be from $25 to $50, and there will be a buffet aboard.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Central New England has ordered six Mogul locomotives from the American Locomotive Co.

The Youngstown & Ohio River has ordered one 85-ton Mikado locomotive from the Baldwin Locomotive Works.

Corrigan, McKinney & Co. have ordered one six-wheel switching locomotive from the American Locomotive Co.

The Louisiana Railway & Navigation Company has ordered two American type locomotives from the Baldwin Locomotive Works.

The Canadian General Development Co. has ordered one four-wheel saddle tank switching locomotive from the American Locomotive Co.

The McCrory & Beedeville Southern, Clayton Hailey, president, McCrory, Ark., a new line building through this state, is in the market for motive power.

The Canadian Western Lumber Co. is said to have ordered one six-coupled locomotive from the Baldwin Locomotive Works. This item is not confirmed.

The Temiskaming & Northern Ontario, as reported in the *Railway Age Gazette* of May 20, has ordered four Pacific locomotives from the Canadian Locomotive Co.

General Dimensions.

Weight on drivers	135,500 lbs.
Total weight	202,500 lbs.
Cylinders	21 in. x 28 in.
Diameter of drivers	69 in.
Type of boiler	Extended wagon top
Working steam pressure	200 lbs.
Heating surface, tubes	2,705 sq. ft.
" " firebox	162 "
" " total	2,867 "
Tubes, number	272
" outside diameter	2 in.
" length	19 ft.
Firebox, type	Wide
" length	95¼ in.
" width	69¼ in.
Grate area	46 sq. ft.
Water capacity	5,500 Imp. gals.
Coal capacity	10 tons

Special Equipment.

Axles	Nova Scotia Steel Co.'s o.-h. steel
Bell ringer	Chicago Pneumatic Tool Co.'s "Little Giant"
Boiler lagging	Magnesia—Carey's, 85 per cent.
Brakes	Westinghouse E. T. 6
Brake-beams	Simplex
Brake-shoes	Steel back
Brick arch	Supported on arch tubes
Couplers	Tower
Driving boxes	Cast steel
Headlight	Pyle-National, electric
Injector	Ohio No. 9
Journal bearings	Canadian Bronze Co.
Piston valves	Semi-plug, American Balance Valve Co.
Piston and valve rod packings	U. S. Metallic
Safety valves	Coales, muffled
Sanding devices	Wilson pneumatic
Sight-feed lubricators	Detroit bullseye
Springs	Montreal Steel Co.
Staying	Radial—Monkbridge staybolt iron
Steam gages	Jas. Morrison, Toronto
Steam heat equipment	Gold
Tires	Midvale
Truck and tender	Schoen steel
Tubes	"Keroa" steel
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The People's Railway, A. N. Warfield, Berlin, Ont., Canada, will receive bids until July 15, 1910, for a number of car bodies and trucks.

The Illinois Central has issued inquiries for two observation-parlor, two passenger-baggage, two café-coach and two café-parlor cars.

The Litchfield & Madison is taking prices on 200 tight bottom and 200 drop bottom gondolas. The cars will be all steel and of 50 tons capacity.

The McCrory & Beedeville Southern, Clayton Hailey, president, McCrory, Ark., a new line building through this state, is in the market for rolling stock.

The Cudahy Oil Tank Line, reported in the *Railway Age Gazette* of June 10 as having ordered 10 all-steel tank cars, gave this order to the German-American Car Co.

The Temiskaming & Northern Ontario, as reported in the *Railway Age Gazette* of May 20, has ordered 12 Otis steel, drop bottom cinder cars and 50 steel underframe box cars from the Canadian Car & Foundry Co. The cinder cars will have a capacity of 40 tons and will weigh 39,500 lbs. They will be 36 ft. 9½ in. long, 9 ft. 6 in. wide, 3 ft. 10 in. high, inside measurements, and 39 ft. 10 in. long, 10 ft. ½ in. wide, 8 ft. 2⅛ in. high, over all. The box cars will have a capacity of 40 tons and will weigh 40,500 lbs. They will be 36 ft. long, 8 ft. 6 in. wide, 8 ft. high, inside measurements, and 37 ft. 9½ in. long, 9 ft. 10⅜ in. wide, 14 ft. 6 in. high, over all. The special equipment includes:

Axles	Nova Scotia Steel Co.
Bolsters, truck	Simplex
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Steel back
Brasses	Canadian Bronze Co.
Couplers	Tower
Draft gear	Miner
Dust guards	Harrison
Journal boxes	McCord
Paint	Graphite
Side bearings	Susemihl
Uncoupling levers	Acme
Wheels	Cast iron

The box cars will have Chicago Winslow corrugated iron roofs and arch bar trucks.

MACHINERY AND TOOLS.

The Canadian Northern is in the market for a list of 28 machine tools, including drills, presses, lathes, a power hack saw, emery wheel stands and punch and shears.

The United States Steel Corporation has ordered from the Allis-Chalmers Co., Milwaukee, Wis., six gas-engine-driven electrical units for its Gary, Ind., power plant. The Allis-Chalmers Co. has already installed 25 engines in this plant, and with the addition of the six just ordered the combined capacity will be raised to 150,000 h.p., making this the largest power plant of its kind in the world. These units will operate on blast furnace gas.

IRON AND STEEL.

The Elgin, Joliet & Eastern has ordered 200 tons of bridge steel from the American Bridge Co.

The Atchison, Topeka & Santa Fe has ordered 1,200 tons of bridge steel from the American Bridge Co.

The Chicago & North Western has ordered 1,350 tons of structural steel for shop buildings from the American Bridge Co.

The Canadian Pacific has ordered 10,000 tons of bridge steel from the American Bridge Co. for a bridge over the St. Lawrence river.

The Southern has ordered from the McClintic-Marshall Construction Co. 300 tons of structural steel for a boiler shop at Spencer, S. C.

The Pennsylvania has ordered from Lewis F. Shoemaker & Company 300 tons of structural steel for two small bridges at Greenville, Pa.

The Missouri, Kansas & Texas has ordered 1,300 tons of structural steel from the American Bridge Co. for its new freight house at St. Louis, Mo.

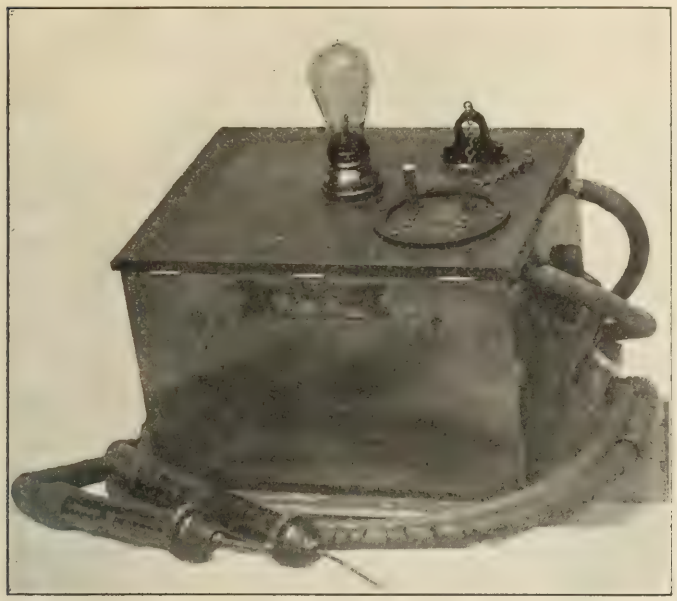
The Kentucky & Indiana Bridge & Railroad Company has ordered 15,000 tons of bridge steel from the American Bridge Co. for a bridge at Louisville, Ky.

General Conditions in Steel.—Reports indicate a good demand for steel bars and plates, and that orders for structural material have been fair during the week. The railways have been doing some little buying in rails, but car and locomotive orders have practically ceased, which condition, however, is usual for this time of the year. The steel mills of the country can be kept fairly well employed on present unfilled orders for some time to come, but unless there is an increase in new business in July and August operations will be on a reduced scale.

Low Tension Portable Testing Outfit.

A small portable testing outfit, which the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa., has recently developed, is shown herewith. There are continual

calls about central stations, railway plants, car barns, repair shops, etc., for a portable testing device that will give an alternating voltage sufficiently high to test armature coils, meters, switches, and other details that are used in low tension systems and require an insulation test varying from 500 to 2,000 volts. Such an outfit must often be handled by men not familiar with high voltage; it should be semi-portable, and afford a sufficient number of steps in the testing voltage.



Westinghouse Low Tension Portable Testing Outfit.

The Westinghouse Company offers, for such service, a small bench-type, portable outfit, with a rating of 0.5 k.w., which provides different testing voltages up to and including 2,000 volts in 100-volt steps. It is designed for use on circuits of any frequency from 15 cycles up. Either a 110-colt or a 220-volt primary may be supplied. This capacity will be found sufficient for any normal testing up to 2,000 volts. The 110-volt low tension side may be connected to any source such as a lamp socket, walk receptacle, etc.

The testing voltage is varied by two small rheostat dials mounted within the box. The taps are brought from the high tension winding of the transformer to the contacts of the dial. The rheostat dials, as well as the high tension binding posts, are mounted within the box. When the hinged cover is lifted to change the dial setting, the low tension primary circuit is automatically opened, so that the box is absolutely proof against any touching of the dials, binding posts, etc., while the transformer is excited. The high tension testing leads, consisting of rubber-covered cable, passing through rubber tubing, are brought out of the box and provided with heavily insulated terminals so that they may be handled with perfect safety by the tester.

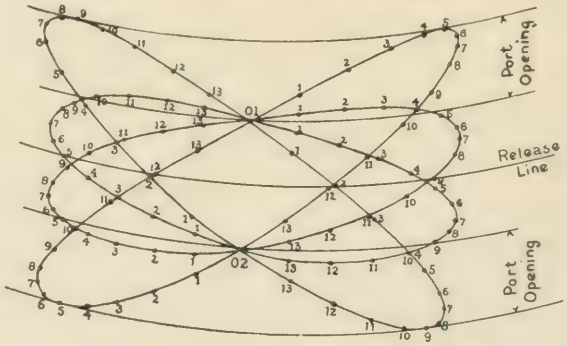
A pilot lamp, connected across the low tension primary circuit and mounted on top of the box, promptly indicates when the primary circuit is closed. A plug switch and fuse holder are provided in the primary to protect and control the circuit.

New Locomotive Valve Gear.

A design of locomotive valve gear, which differs from other gears both in principle and effect, has been perfected by Charles J. Pilliod and Henry J. Pilliod and is illustrated herewith.

Some of the features claimed for this gear are the following: A uniform cut-off, a uniform release, a possible 25 per cent. cut-off with 75 per cent. release, and a late release in the working notches of the quadrant.

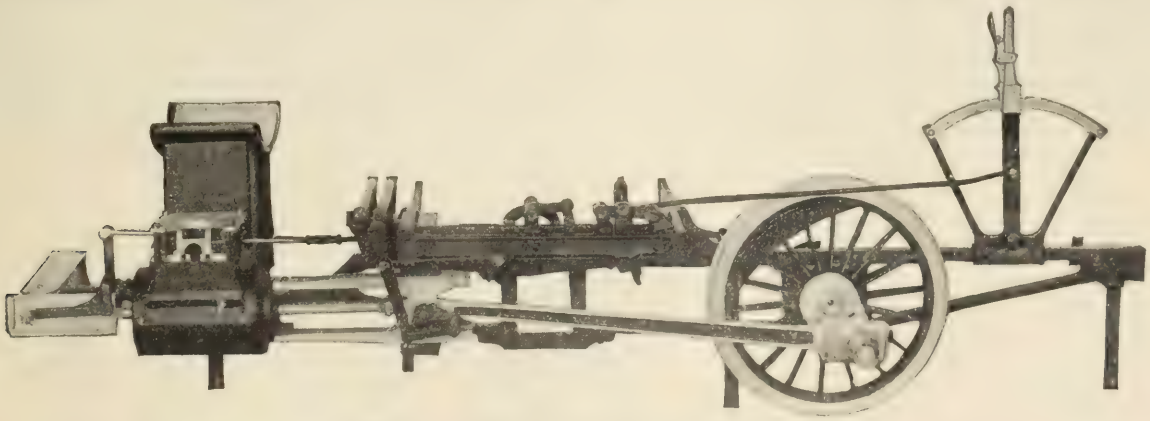
In the design of any valve motion, the first consideration must be the action of the parts furnishing the power. The troubles of the valve gear designer lie principally in the difficulty of the conversion of the circular motion at one end of the connecting rod into a reciprocating motion at the other, and in the elimination of the objectionable effects of the resultant angularities.



Pilliod Valve Gear Motion Ellipses.

To explain the effect of this angularity of the driving parts, let the crank circle shown in the piston and crank travel diagram be divided into 28 equal parts, or the half circle into 14, the latter representing one piston stroke of the engine, as shown in one of the diagrams. The front and back centers of the crank locate two points, each of which marks the beginning of the piston stroke in either forward or backward motion. The piston moves the faster while the crank is traveling through the first half of the piston stroke, or through 90 deg. of the crank circle. For the purpose of clearness, the piston stroke may be divided into four equal parts, 25 per cent., 50 per cent. and 75 per cent. By drawing radii equal to the length of the main rod from each of the points above mentioned it will be seen that for 25 per cent. of the piston travel from the front end the crank has traveled 4½ parts of the crank circle; for 50 per cent., 6¾ parts, and for 75 per cent., 9 parts. On the back end the results are for 25 per cent., 5 parts; 50 per cent., 7¼ parts, and for 75 per cent., 9½ parts. These are the conditions of angularity which must be met in the proper distribution of steam through the medium of the valve gear.

In the motion ellipse the upper haif corresponds to the

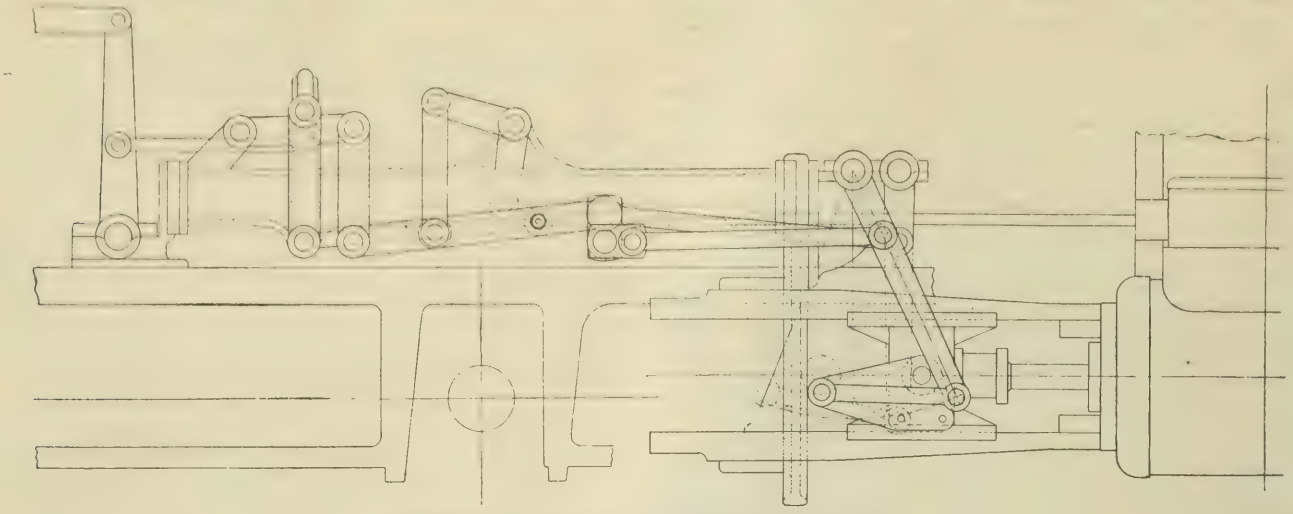


Model of Pilliod Locomotive Valve Gear.

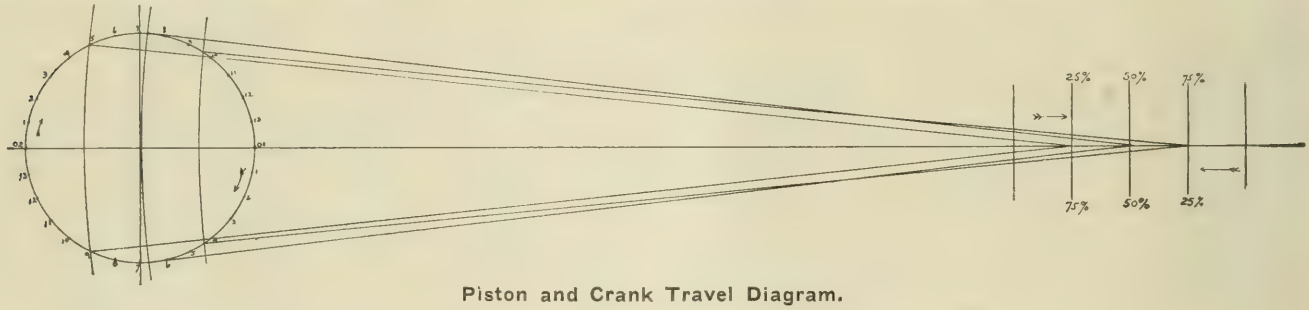
travel of the valve for the front end of the cylinder and the lower half corresponds to the travel of the valve for the back end of the cylinder. The ellipses show the two extremes of service conditions, full gear and 25 per cent. travel, which are the same in both forward and backward motion. With the two extreme positions in harmony, the intermediate positions will correspondingly harmonize. In these ellipses are shown the corresponding movements of the valve for each movement or position of the crank. The diagram clearly indicates conformity to the angularity of the crank motion, at the same time showing equal port opening at each cut-off in either forward or backward motion.

attending distortion of the main frames results in appreciable error in the operation of the valve gear.

All parts of either design of gear are interchangeable, as they are also for either inside or outside admission valves. The absence of large or flat wearing parts in a valve gear is appreciated by those who are in charge of its maintenance, and in this gear, as in several others, all wear is taken by pin connections, which may be case-hardened and replaced at minimum cost. The absence of any great weight in the moving parts also tends to reduce defects of wear, and at the same time this feature adds to the ease with which the locomotive is controlled from the cab.



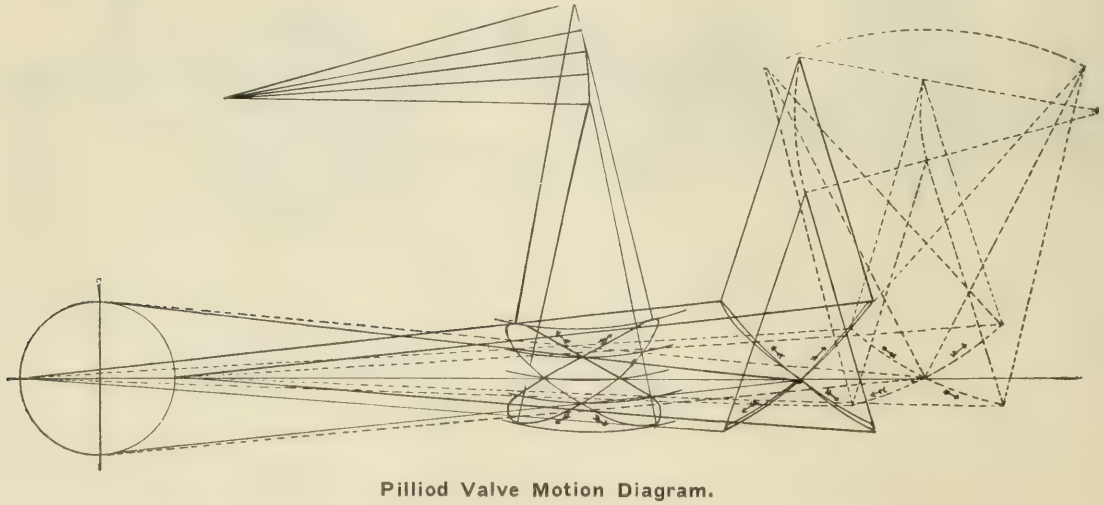
Elevation of Pilliod Locomotive Valve Gear.



Piston and Crank Travel Diagram.

An interesting feature of the Pilliod valve is the fact that without change in essential details, the imparting motion may be taken from a single crosshead connection or from a return crank, as in the conventional design. This will be of particular interest to those who have more or less trouble with the operation of locomotives on sharp curves, where the

In the case of the gear which necessitates the use of a link, errors due to loss motion are often uncorrected for long periods of time, due to the difficulty of making some of the adjustments, which in the case of the gear with pins only, a correction is easily made by the adjustment of tapers, or by the use of new parts, which are inexpensive.



Pilliod Valve Motion Diagram.

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